

COMMONWEALTH OF MASSACHUSETTS



**CONTRACT DOCUMENTS
AND SPECIAL PROVISIONS**

PROPOSAL NO.	607901-113676
P.V. =	\$2,356,000.00
PLANS	YES

FOR

**Federal Aid Project No. CMQ-003S(160)X
Roadway Reconstruction and Related Work on
along a Section of Elm Street and Rustcraft Road**

in the Town

of

DEDHAM

In accordance with the STANDARD SPECIFICATIONS
for HIGHWAYS AND BRIDGES dated 2020

This Proposal to be opened and read:

WEDNESDAY, JANUARY 20, 2021 @ 2:00 P.M.

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Charles D. Baker, Governor
Karyn E. Polito, Lieutenant Governor
Stephanie Pollack, Secretary & CEO
Jonathan L. Gulliver, Highway Administrator



January 15, 2021

Proposal No. 607901-113676

ADDENDUM NO. 1

To Prospective Bidders and Others on:

DEDHAM
Federal Aid Project No. CMQ-003S(160)X
Roadway Reconstruction and Related Work
along a Section of Elm Street and Rustcraft Road

BIDS TO BE OPENED AND READ: WEDNESDAY, JANUARY 20, 2021 @ 2:00 P.M.

Transmitting changes to the Contract Documents as follows:

RESPONSES TO CONTRACTOR'S QUESTIONS

1 page

DOCUMENT 00104

Revised Page 3

DOCUMENT 00880

Revised Pages 3-11

DOCUMENT A00801

Revised Pages 15 & 83

DOCUMENT B00420

Revised Pages 8 thru 20

Please take note of the above, substitute the revised pages for the originals and acknowledge Addendum No. 1 in your Expedite Proposal file before submitting your bid.

Very truly yours,

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

jb
cc A. Belov, Project Manager

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

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DEDHAM
Federal Aid Project No. CMQ-003S(160)X
Roadway Reconstruction and Related Work
along a Section of Elm Street and Rustcraft Road
Proposal No. 607901-113676

Question from Advanced Drainage Systems, Inc., Dated 1/6/2021 @ 12:21 PM

Question 1.) The Project is currently specified with 12-inch Reinforced Concrete Pipe (RCP). Item Number and quantity is as follows:

241.12 = 12-Inch Reinforced Concrete Pipe (800 LF)

We would like to respectfully request that corrugated polypropylene pipe (per AASHTO M330) be allowed under the pipe option for the above referenced items; polypropylene pipe (per AASHTO M330) is included within the Commonwealth of Massachusetts Department of Transportation Standard Specifications for Highways and Bridges (2020 Edition) Division III-Materials Specifications, Section M5.03.10 Corrugated Plastic Pipe. If allowed, the installation of the corrugated polypropylene pipe (per AASHTO M330) would follow MassDOT Installation Guidelines

Response 1.) The Pipe Option is acceptable for use on this project. Please see revised pages A00801-15 and B00420-8 issued via this addendum.

Question from Vigil Electric, Dated 1/10/2021 @ 12:20 AM

Question 2.) The existing flashing warning beacons to be removed are AC powered. It would make sense to have the new Flashing Warning Beacons, Items 824.451 and 824.452 be AC powered. The former, Location 1 at Sta. 22+95, RT +/- can be powered with the power coming from the Utility Pole at Sta. 23+25, RT 24' while the latter, Location 2 at Sta. 27+98 LT +/- can be powered with the power coming from the Utility Pole at Sta. 28+25, RT 22'. Solar Powered Warning Signs require more maintenance than AC powered signs. Based on our experience this is what I recommend. Please advise.

Response 2.) Items 824.451 & 824.452 will remain solar as designed.

Question from E.T.& L. Corp. Dated 1/14/2021 @ 9:05 AM

Question 3.) Sheet 42 of the Contract Plans calls for Concrete Pipe Ends OF-3 and OF-4. Please provide a pay item for these pipe ends.

Response 3.) Item 235.12 – 12 Inch Drainage Pipe Flared End-Option is hereby added with a Quantity of 2. Please see revised pages A00801-15 & 83 and B00420-8 issued via this addendum.

DOCUMENT 00010

TABLE OF CONTENTS

DOCUMENT 00010
 TABLE OF CONTENTS 00010-1 through 4

DOCUMENT 00104
 NOTICE TO CONTRACTORS..... 00104-1 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 2

DOCUMENT 00440
 SUBCONTRACTOR PROJECT EVALUATION FORM 00440-1 through 2

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

DOCUMENT 00711
 PRECAST CONCRETE HIGHWAY UNITS 00711-1 through 14

DOCUMENT 00713
 SUBSECTION 7.01 CEMENT CONCRETE SIDEWALKS,
 PEDESTRIAN CURB RAMPS, AND DRIVEWAYS AND
 GUIDE TO THE INTERIM SUBSECTION 701..... 00713-1 through 34

DOCUMENT 00715
 SUPPLEMENTAL SPECIFICATIONS 00715-1 through 60

DOCUMENT 00719
 SPECIAL PROVISIONS FOR PARTICIPATION BY DISADVANTAGED
 BUSINESS ENTERPRISES 00719-1 through 18

DOCUMENT 00760
 REQUIRED CONTRACT PROVISIONS FOR FEDERAL-AID
 CONSTRUCTION CONTRACTS..... 00760-1 through 16

DOCUMENT 00811
 MONTHLY PRICE ADJUSTMENT FOR HOT MIX ASPHALT
 (HMA) MIXTURES..... 00811-1 through 2

DOCUMENT 00812
 MONTHLY PRICE ADJUSTMENT FOR DIESEL FUEL AND GASOLINE 00812-1 through 2

DOCUMENT 00813
 PRICE ADJUSTMENTS FOR STRUCTURAL STEEL
 AND REINFORCING STEEL 00813-1 through 4

DOCUMENT 00814
 PRICE ADJUSTMENT FOR PORTLAND CEMENT CONCRETE MIXES 00814-1 through 2

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

TABLE OF CONTENTS (Continued)

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 WAGE RATES 00861-1 through 40

DOCUMENT 00870
 STANDARD FEDERAL EQUAL EMPLOYMENT OPPORTUNITY
 CONSTRUCTION CONTRACT SPECIFICATIONS 00870-1 through 8

DOCUMENT 00880
 FEDERAL WAGE RATES 00880-1 through 12

DOCUMENT A00801
 SPECIAL PROVISIONS A00801-1 through 144

DOCUMENT A00802
 DETAIL SHEETS A00802-1 through 8

DOCUMENT A00808
 PROJECT UTILITY COORDINATION FORM A00808-1 through 6

DOCUMENT A00810
 MASSDOT HERBICIDE USE REPORT A00810-1 through 2

DOCUMENT A00811
 MBTA RAILROAD OPERATIONS DIRECTORATE..... A00811-1 through 132

DOCUMENT A00812
 MBTA FLAGGING REQUEST FORM..... A00812-1 through 4

DOCUMENT A00813
 MBTA SPECIAL INSTRUCTIONS..... A00813-1 through 14

DOCUMENT A00814
 MBTA CONSTRUCTION SAFETY..... A00814-1 through 12

DOCUMENT A00815
 MBTA LICENSE FOR ENTRY PARCEL ID 16528..... A00815-1 through 36

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

DOCUMENT A00830
 ARMY CORPS OF ENGINEERS
 SELF VERIFICATION NOTIFICATION FORM..... A00830-1 through 4

DOCUMENT A00860
 MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
 NOTICE OF INTENT FILING A00860-1 through 288

DOCUMENT A00861
 MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
 ORDER OF CONDITIONS – DEDHAM CONSERVATION COMMISSION
 MASS DEP FILE #141-0534 A00861-1 through 14

DOCUMENT A00880
 CONTRACTOR COVID-19 GUIDELINES COMPLIANCE CHECKLIST A00880-1 through 4

DOCUMENT B00420
 PROPOSAL.....B00420-1 through 20

TABLE OF CONTENTS (Continued)

DOCUMENT B00853
SCHEDULE OF PARTICIPATION BY DISADVANTAGED
BUSINESS ENTERPRISES (DBEs)B00853-1 through 2

DOCUMENT B00854
DISADVANTAGED BUSINESS ENTERPRISES (DBE) PARTICIPATION
LETTER OF INTENTB00854-1 through 2

DOCUMENT B00855
DBE JOINT CHECK ARRANGEMENT APPROVAL FORM.....B00855-1 through 2

DOCUMENT B00856
JOINT VENTURE AFFIDAVITB00856-1 through 4

*** END TABLE OF CONTENTS ***

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DOCUMENT 00104

**NOTICE TO CONTRACTORS**

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

WEDNESDAY, JANUARY 20, 2021 at 2:00 P.M. **

DEDHAM

**Federal Aid Project No. CMQ-003S(160)X
Roadway Reconstruction and Related Work
along a Section of Elm Street and Rustcraft Road**

****Date Subject to Change**

PROJECT VALUE = \$2,356,000.00

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

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

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

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

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

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

NOTICE TO CONTRACTORS (Continued)

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

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

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

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

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

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

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

① ADDENDUM NO. 1, JANUARY 15, 2021

NOTICE TO CONTRACTORS (Continued)

① **PRICE ADJUSTMENTS**

This Contract contains price adjustments for hot mix asphalt and Portland cement mixtures, diesel fuel, and gasoline. For this project the base prices are as follows: liquid asphalt **\$495.00** per ton, Portland cement **\$142.79** per ton, diesel fuel **\$1.896** per gallon, and gasoline **\$1.693** per gallon. MassDOT posts the **Price Adjustments** on their Highway Division's website at <https://www.mass.gov/topics/highway-construction-resources>

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

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

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

BY: Stephanie Pollack, Secretary and CEO, MassDOT
Jonathan L. Gulliver, Administrator, MassDOT Highway Division
SATURDAY, DECEMBER 19, 2020

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DOCUMENT 00210

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

July 1, 1981, updated October 2016

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

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

- (1) "Contractor" means any person, corporation, partnership, joint venture, sole proprietorship, or other entity awarded a contract pursuant to sections thirty-eight A1/2 to thirty-eight O, inclusive, of chapter seven and any contract awarded or executed pursuant to section eleven C of chapter twenty-five A, section thirty-nine M of chapter thirty, or sections forty-four A to forty-four H, inclusive, of chapter one hundred and forty-nine, which is for an amount or estimated amount greater than one hundred thousand dollars.
- (2) "Contract" means any contract awarded or executed pursuant to sections thirty-eight A1/2 to thirty-eight O, inclusive, of chapter seven and any contract awarded or executed pursuant to section eleven C of chapter twenty-five A, section thirty-nine M of chapter thirty, or sections forty-four A through forty-four H, inclusive, of chapter one hundred and forty-nine, which is for amount or estimated amount greater than one hundred thousand dollars.
- (3) "Records" means books of original entry, accounts, checks, bank statements and all other banking documents, correspondence, memoranda, invoices, computer printouts, tapes, discs, papers and other documents or transcribed information of any type, whether expressed in ordinary or machine language.
- (4) "Independent Certified Public Accountant" means a person duly registered in good standing and entitled to practice as a certified public accountant under the laws of the place of his residence or principal office and who is in fact independent. In determining whether an accountant is independent with respect to a particular person, appropriate consideration should be given to all relationships between the accountant and that person or any affiliate thereof. Determination of an accountant's independence shall not be confined to the relationships existing in connection with the filing of reports with the awarding authority.
- (5) "Audit", when used in regard to financial statements, means an examination of records by an independent certified public accountant in accordance with generally accepted accounting principles and auditing standards for the purpose of expressing a certified opinion thereon, or, in the alternative, a qualified opinion or a declination to express an opinion for stated reasons.
- (6) "Accountant's Report", when used in regard to financial statements, means a document in which an independent certified public accountant indicates the scope of the audit which he has made and sets forth his opinion regarding the financial statements taken as a whole with a listing of noted exceptions and qualifications, or an assertion to the effect that an overall opinion cannot be expressed. When an overall opinion cannot be expressed the reason therefor shall be stated. An accountant's report shall include as a part thereof a signed statement by the responsible corporate officer attesting that management has fully disclosed all material facts to the independent certified public accountant, and that the audited financial statement is a true and complete statement of the financial condition of the contractor.
- (7) "Management", when used herein, means the chief executive officers, partners, principals or other person or persons primarily responsible for the financial and operational policies and practices of the contractor.
- (8) Accounting terms, unless otherwise defined herein, shall have a meaning in accordance with generally accepted accounting principles and auditing standards.

- (b) Subsection (a)(2) hereof notwithstanding, every agreement or contract awarded or executed pursuant to sections thirty-eight A 1/2 to thirty-eight O, inclusive, of chapter seven, or eleven C of chapter twenty-five A, and pursuant to section thirty-nine M of chapter thirty or to section forty-four A through H, inclusive, of chapter one hundred and forty-nine, shall provide that:
- (1) The contractor shall make, and keep for at least six years after final payment, books, records, and accounts which in reasonable detail accurately and fairly reflect the transactions and dispositions of the contractor, and
 - (2) Until the expiration of six years after final payment, the office of inspector general, and the commissioner of capital asset management and maintenance shall have the right to examine any books, documents, papers or records of the contractor or of his subcontractors that directly pertain to, and involve transactions relating to, the contractor or his subcontractors, and
 - (3) If the agreement is a contract as defined herein, the contractor shall describe any change in the method of maintaining records or recording transactions which materially affect any statements filed with the awarding authority, including in his description the date of the change and reasons therefor, and shall accompany said description with a letter from the contractor's independent certified public accountant approving or otherwise commenting on the changes, and
 - (4) If the agreement is a contract as defined herein, the contractor has filed a statement of management on internal accounting controls as set forth in paragraph (c) below prior to the execution of the contract, and
 - (5) If the agreement is a contract as defined herein, the contractor has filed prior to the execution of the contracts and will continue to file annually, an audited financial statement for the most recent completed fiscal year as set forth in paragraph (d) below.
- (c) Every contractor awarded a contract shall file with the awarding authority a statement of management as to whether the system of internal accounting controls of the contractor and its subsidiaries reasonably assures that:
- (1) transactions are executed in accordance with management's general and specific authorization;
 - (2) transactions are recorded as necessary
 - i. to permit preparation of financial statements in conformity with generally accepted accounting principles, and
 - ii. to maintain accountability for assets;
 - (3) access to assets is permitted only in accordance with management's general or specific authorization; and
 - (4) the recorded accountability for assets is compared with the existing assets at reasonable intervals and appropriate action was taken with respect to any difference.

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

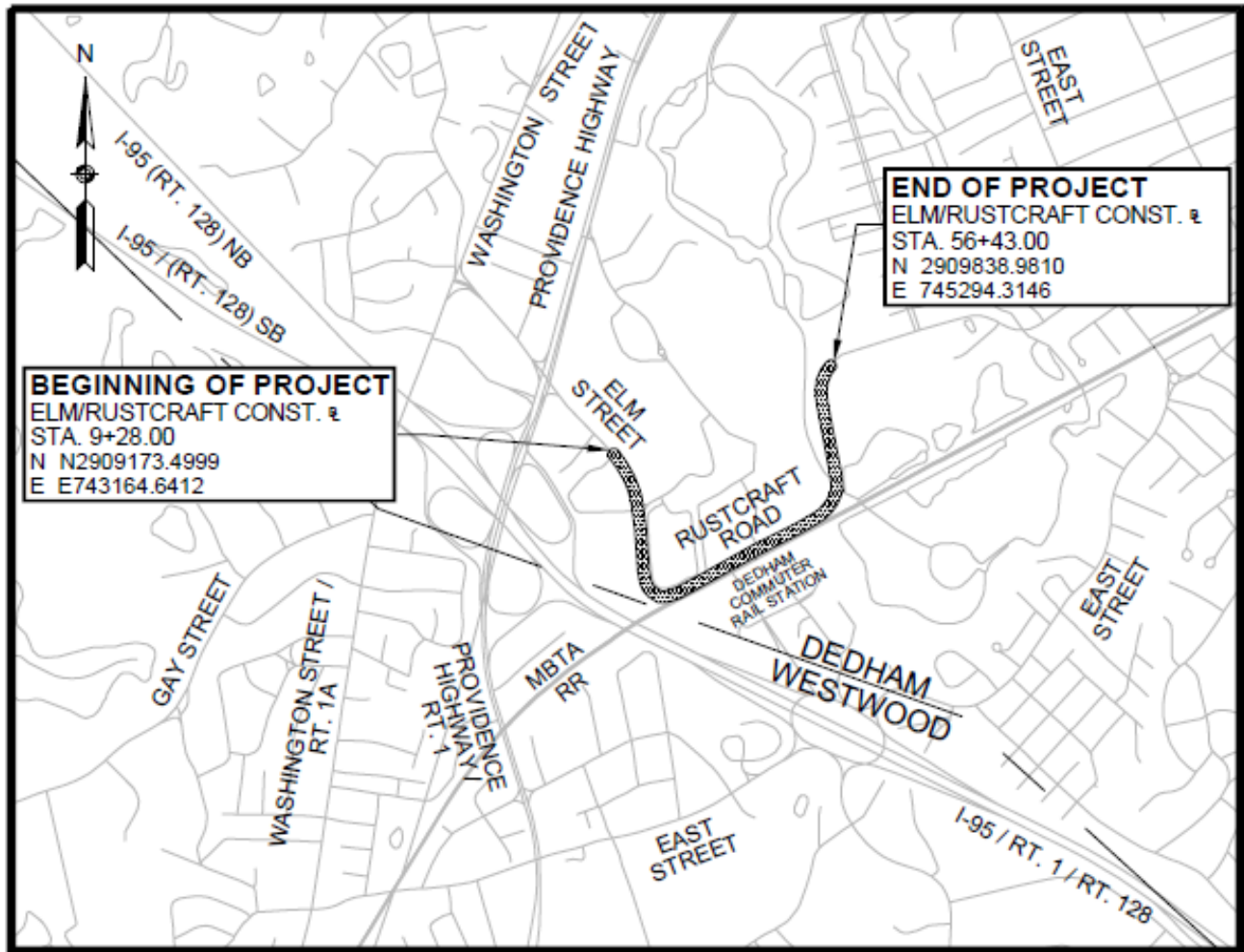
- (1) whether the representations of management in response to this paragraph and paragraph (b) above are consistent with the result of management's evaluation of the system of internal accounting controls; and
- (2) whether such representations of management are, in addition, reasonable with respect to transactions and assets in amounts which would be material when measured in relation to the applicant's financial statements.

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DOCUMENT 00331

LOCUS MAP

DEDHAM
Federal Aid Project No. STP-003S(160)X
Roadway Reconstruction and Related Work
along a Section of Elm Street and Rustcraft Road



LENGTH OF PROJECT = 4543.00 FEET = 0.860 MILES

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DOCUMENT 00439



Final Report

Interim Report

CONTRACTOR PROJECT EVALUATION FORM

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

Date: _____

City/Town: _____ Contractor: _____

Project: _____ Address: _____

F.A. No: _____ Contract Number: _____

Bid Price: _____ Notice to Proceed: _____

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

Date Work Started: _____ Date Work Completed*: _____

Contractor's Superintendent: _____

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

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

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

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

District Construction Engineer's Signature/Date

Resident Engineer's Signature/Date

Contractor's Signature Acknowledging Report/Date

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

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

DOCUMENT 00440



Final Report

Interim Report

SUBCONTRACTOR PROJECT EVALUATION FORM

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

Date: _____

City/Town: _____

Subcontractor: _____

Project: _____

Address: _____

F.A. No.: _____

Contract Number: _____

Prime Contractor _____

Current Contract Completion Date: _____

Date Work Started: _____

Date Work Completed*: _____

Subcontractor's Superintendent: _____

Type of Work Performed by Subcontractor: _____

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

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

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

District Construction Engineer's Signature/Date

Resident Engineer's Signature/Date

Contractor Signature Acknowledging Report/Date

Subcontractor Signature Acknowledging Report/Date

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

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

Contractor's Comments:

DOCUMENT 00710

GENERAL CONTRACT PROVISIONS

Revised: 06/02/2020

NOTICE OF AVAILABILITY

The STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES dated 2020, the SUPPLEMENTAL SPECIFICATIONS, the 1996 METRIC CONSTRUCTION AND TRAFFIC STANDARD DETAILS, the 1990 STANDARD DRAWINGS FOR SIGNS AND SUPPORTS; the 1968 STANDARD DRAWINGS FOR TRAFFIC SIGNALS AND HIGHWAY LIGHTING and the 2017 CONSTRUCTION STANDARD DETAILS are available online at <https://www.mass.gov/massdot-highway-division-manuals-and-publications>

SPECIAL PROVISIONS FOR RIGHT-TO-KNOW ACT REQUIREMENTS

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

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

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

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

ALTERNATIVE DISPUTE RESOLUTION

Forum, Choice of Law and Mediations:

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

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DOCUMENT 00711

SUBSECTION M4.02.14
Precast Concrete Highway Units

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SUBSECTION M4.02.14 Precast Units

Replace this Subsection with the following :

SUBSECTION M4.02.14 Precast Concrete Highway Units

The following Precast Concrete Highway Units shall meet the materials and fabrication requirements specified herein:

- (a) Standard Temporary and Permanent Barriers
- (b) Box Culverts with spans less than or equal to 10 feet
- (c) Catch basins
- (d) Drainage Pipes
- (e) Pipe Flared Ends
- (f) Manholes
- (g) Handholes
- (h) Proprietary Retaining Wall Systems
- (i) Traffic Light Pole Bases
- (j) Luminaire Bases

Precast Concrete Highway Units shall be fabricated in conformance with the MassDOT Construction Standard Details, Traffic Standard Drawings for Traffic Signals and Highway Lighting, Overhead Signal Structure and Foundation Standard Drawings, and Standard Drawings for Signs and Supports. Circular vertical precast reinforced concrete manholes and structures used in sewer, drainage, and water works shall conform with the requirements of AASHTO M 199. The outside surface of the tapered or cone section of precast drainage structures shall be dried, cleaned, and coated with an RS-1-H coating meeting the requirements of AASHTO M 140.

QUALITY ASSURANCE**A. General.**

Quality Assurance includes all the planned and systematic actions necessary to provide confidence that a product or facility will perform satisfactorily in service. It is an all-encompassing term that includes Quality Control (performed by the Fabricator) and Acceptance (performed by MassDOT). Fabricator Quality Control activities and MassDOT Acceptance activities shall remain independent from one another. MassDOT Acceptance activities shall not replace Fabricator Quality Control activities.

B. Plant.

Prior to the fabrication of Precast Concrete Highway Units, the Fabricator's precast concrete plant shall obtain the following:

- (a) Certification by the National Precast Concrete Association (NPCA) Plant Certification Program or Precast/Prestressed Concrete Institute (PCI) Plant Certification Program, for the applicable types of Precast Concrete Highway Unit(s) being fabricated
- (b) MassDOT Approval

C. Fabricator Quality Control.

Quality Control shall be performed by the Fabricator. The Fabricator shall maintain a Quality Control system to monitor, assess, and adjust placement and fabrication processes to ensure the fabricated Precast Concrete Highway Unit(s) meet the specified level of quality, through sufficient Quality Control sampling, testing, inspection, and corrective action (where required). The Fabricator's Quality Control system shall address all key activities during the placement and fabrication and shall be performed in conformance with the Fabricator's NPCA or PCI Certification. Quality Control inspection documentation shall meet the requirements of the *Fabricator Quality Control – Documentation* section below. Upon request, Fabricator Quality Control documentation shall be provided to the MassDOT Plant Inspector.

SUBSECTION M4.02.14 PRECAST UNITS (Continued)**1. Personnel.**

The Fabricator shall provide adequate training for all QC personnel in accordance with the Fabricator's NPCA or PCI Certification. A sufficient amount of QC personnel shall be trained and certified to perform the tests as specified in M4.02.13, Part D. At a minimum, the Fabricator's Quality Control personnel shall maintain the following qualifications and certifications:

- (a) QC Manager with an active NETTCP Field Technician or ACI Concrete Field Testing Technician – Grade I certification or higher, and a minimum of six (6) months continuous experience in the manufacture of Precast Concrete Highway Products. The QC Manager shall be on site while the batch plant is producing and placing concrete for MassDOT projects.
- (b) Technicians/Inspectors with an active American Concrete Institute (ACI) Concrete Field Testing Technician – Grade I certification, or higher.

The Fabricator shall provide to the MassDOT Plant Inspector copies of the Fabricator's Quality Control Personnel required qualifications, as specified above.

2. Laboratory.

The Fabricator shall provide a room of sufficient size to house all equipment and to adequately perform all testing. The room shall have either a separate moisture storage room or curing box for concrete cylinders. The moisture storage room or curing box shall be thermostatically controlled to maintain temperatures consistent with AASHTO T23. The laboratory shall include a desk and file cabinet for proper record keeping, and have good lighting and ventilation. This room shall be kept for testing and quality control and not used for any other purpose. An additional desk and file cabinet shall be provided for exclusive use of the Engineer. No exception from these requirements will be allowed without the express written permission of the Engineer.

3. Testing Equipment.

At a minimum, the Fabricator's plant facility shall have the following testing equipment:

- (a) Air Content Meter Type A or B: AASHTO T152
- (b) Air Content Meter Volumetric Method: AASHTO T196 (Required for Lightweight Concrete)
- (c) Slump Cone: AASHTO T119
- (d) Cylinder Molds: AASHTO M205
- (e) Concrete Testing Machine: AASHTO T22
- (f) Screening Sieve: AASHTO T27, AASHTO T11
- (g) Curing Box: AASHTO T23
- (h) Spread Test Base Plate for Self-Consolidating Concrete (SCC): ASTM 1611
- (i) All other equipment prescribed by AASHTO and ASTM standards for the tests to be performed by the Fabricator as specified

4. Inspection.

Quality Control personnel shall monitor and inspect the fabrication of each Precast Concrete Highway Unit. Quality Control personnel shall report all inspection activities on Quality Control Inspection Reports and non-conformances on Non-Conformance Reports (NCRs) throughout the entire fabrication process, as specified herein.

5. Temperature Monitoring.

At a minimum, the Fabricator shall monitor, record, and report the temperatures of the form and ambient temperatures surrounding the concrete continuously, without interruption as specified below:

SUBSECTION M4.02.14 PRECAST UNITS (Continued)

- (a) Prior to placement of concrete to verify the temperatures are greater than or equal to 50°F.
- (b) Immediately after placement to verify that the temperatures are greater than or equal to 50°F.
- (c) Throughout the entire duration of the curing cycle, at regular intervals not to exceed one hour until 70% Design Strength (f'_c) is attained.

At a minimum, the temperature measuring devices shall record and report the temperature of the concrete to the nearest 2°F. The Fabricator shall verify all temperature requirements meet the specifications herein. Fabricator Quality Control concrete temperature monitoring records reporting the concrete temperature at the specified minimum frequency shall be provided to the MassDOT Inspector upon request.

6. Sampling and Testing.

At a minimum, the Fabricator shall perform random Quality Control sampling and testing for each Sublot of concrete produced as specified in *Table 1: Quality Control Sampling and Testing*. The Fabricator shall perform additional Quality Control sampling and testing on concrete that has been retempered with admixtures or hold-back water during fabrication. Test specimens shall conform to the requirements of Subsection M4.02.13 and AASHTO R 60.

Table 1: Quality Control Sampling and Testing

Quality Characteristic	Test Method	Sample Size	Specification Limit	Lot Size ^(b)	Sublot Size ^(c)	Frequency	Point of Sampling
Slump (in.) ^(a)	AASHTO T 119	Per AASHTO	≤ 8 in. or as approved by the Engineer				
Air Content (%)	AASHTO T 152	Per AASHTO	5% ≤ % ≤ 8%				
Temperature (°F)	AASHTO T 309	Per AASHTO	50°F ≤ °F ≤ 90°F				
Compressive Strength (psi)	AASHTO T 22 AASHTO T 23	Stripping Cylinders: One (1) set of Three (3) 4 x 8 in.	≥ 70% f'_c at Stripping	Total Quantity of Concrete (cy) produced in a year, per Mix Design	50 cy	One (1) per Sublot or fraction thereof	Point of Discharge
		7-day Cylinders: One (1) set of Three (3) 4 x 8 in.	For Information at 7 days				
		28-day Cylinders: One (1) set of Three (3) 4 x 8 in.	≥ 100% f'_c at 28 days				

Notes:

- (a) Self-consolidating concrete (SCC) shall meet the requirements of M4.02.17.
- (b) Lot shall be defined as a specific quantity of material from a single source, produced or placed by the same controlled process.
- (c) Sublot shall be defined as an equal division or part of a Lot from which a sample of material is obtained in order to assess the Quality Characteristics of the Lot.

SUBSECTION M4.02.14 PRECAST UNITS (Continued)**7. Certificate of Compliance.**

The Fabricator shall provide a Certificate of Compliance in accordance with Standard Specifications, Division I, Subsection 6.01, stating that QC test cylinders have achieved the design strength, f'_c . A Certificate of Compliance shall accompany each shipment and shall be presented to the MassDOT Resident Engineer or designee upon delivery to the site.

8. Documentation.

At a minimum, the Fabricator shall maintain a filing system for the following QC records and documentation. All QC records and documentation shall be made available to MassDOT upon the request of the Department.

- (a) Current MassDOT Approved Mix Design Sheet(s) and Approval Letter(s)
- (b) PCI or NPCA Certification
- (c) Current Qualifications and Certifications for QC Manager(s) and QC Technician(s)
- (d) Most current set of MassDOT Standard Shop Drawings
- (e) Fabricator Certificate of Compliance for each fabricated Precast Concrete Highway Unit
- (f) Admixture Manufacturer's Certification of Compliance and Technical Data Sheet for each approved Admixture
- (g) Completed QC Inspection Checklist for each fabricated Precast Concrete Highway Unit
- (h) Identification Number for each fabricated Precast Concrete Highway Unit
- (i) Time and date of casting of each fabricated Precast Concrete Highway Unit
- (j) Date of stripping the forms of each fabricated Precast Concrete Highway Unit
- (k) Batch Ticket Printout reporting the quantity of concrete produced for each batch of concrete produced
- (l) QC Test Report Forms for each subplot of concrete produced
- (m) Non-Conformance Reports (NCRs)
- (n) Documentation of Repairs (if applicable)

D. Acceptance.

MassDOT will perform Acceptance inspection, sampling, and testing during fabrication and installation, to evaluate the quality and degree of compliance of the fabricated Precast Concrete Highway Unit to MassDOT specifications. Additionally, MassDOT Inspectors will monitor the Fabricator's Quality Control activities to ensure the Fabricator is properly administering Quality Control in conformance with the Fabricator's NPCA or PCI Certification. Acceptance inspection and test results not meeting MassDOT specifications will result in Non-conformance Reports (NCR) being issued by MassDOT to the Fabricator or Contractor for corrective action. Final Acceptance for the fabricated Precast Concrete Highway Units shall be determined by MassDOT.

1. Inspection.

A MassDOT Inspector may be assigned to perform Acceptance activities during the fabrication of the Precast Concrete Highway Products, which includes the inspection of the materials, work procedures, and Precast Concrete Highway Units. When a MassDOT Inspector is assigned to the Fabricator's plant, at least seven (7) days prior to the scheduled start of fabrication, the Fabricator shall contact the MassDOT Research and Materials Section (RMS) to provide notice of the scheduled start date. The Fabricator shall perform the following activities prior to notifying MassDOT RMS of the scheduled start date:

- (a) Receive approval for all submitted Fabricator cement concrete mix designs from the MassDOT Research and Materials Section for the current year, as specified under the *Mix Design* section and *Table 3: Trial Batch Sampling Testing for New Mix Designs*. Self-consolidating concrete shall meet the requirements of M4.02.17.

SUBSECTION M4.02.14 PRECAST UNITS (Continued)

Prior to the start of fabrication, the Fabricator shall review the fabrication schedule with the MassDOT Inspector. Fabrication shall only proceed when:

- (a) The QC Inspector and MassDOT Inspector are present to inspect the Precast Concrete Highway Unit(s) being fabricated.
- (b) The QC Manager is present at the Fabricator’s plant.

The Fabricator shall grant access to all required areas of the Fabricator’s plant to the MassDOT Inspector, during the hours of fabrication. Fabrication without MassDOT Inspector access to required areas is prohibited, and will result in the rejection of the fabricated Precast Concrete Highway Unit(s).

Additionally, the MassDOT Inspector will monitor the adequacy of the Fabricator’s Quality Control activities. MassDOT Inspector Acceptance activities performed at the Fabricator’s plant shall remain independent from the Fabricator, and does not replace the Fabricator’s required Quality Control activities.

2. Sampling and Testing.

At a minimum, the MassDOT Inspector will perform random Acceptance sampling and testing for each Sublot of concrete produced as specified in *Table 2: Acceptance Sampling and Testing*. The MassDOT Inspector will also perform Acceptance sampling and testing on concrete that has been retempered with admixtures or hold-back water during production. Test Specimens will conform to the requirements of Section M4.02.13 of the MassDOT Standard and Supplemental Specifications and AASHTO R 60.

Table 2: Acceptance Sampling and Testing

Quality Characteristic	Test Method	Sample Size	Specification Limit	Lot Size ^(c)	Sublot Size ^(d)	Frequency	Point of Sampling
Slump (in.) ^(a)	AASHTO T 119	Per AASHTO	≤ 8 in. or as approved by the Engineer				
Air Content (%)	AASHTO T 152	Per AASHTO	5% ≤ % ≤ 8%				
Temperature (°F)	AASHTO T 309	Per AASHTO	50°F ≤ °F ≤ 90°F				
Compressive Strength (psi)	AASHTO T 22 AASHTO T 23	7-day Cylinders: One (1) set of Three (3) 4 x 8 in.	For Information at 7 days	Total Quantity of Concrete (cy) produced in a year, per Mix Design	50 cy	One (1) per Sublot or fraction thereof	Point of Discharge
		28-day Cylinders: One (1) set of Three (3) 4 x 8 in.	≥ 100% f _c at 28 days				
		56-day Cylinders: One (1) set of Three (3) 4 x 8 in.	≥ 100% f _c at 56 days ^(b)				

Notes:

- (a) Self-consolidating concrete (SCC) shall meet the requirements of M4.02.17.
- (b) 56-day Compressive Strength test specimens shall require testing only when 28-day Compressive Strength test specimens have failed to meet Design Strength (f_c).

SUBSECTION M4.02.14 PRECAST UNITS (Continued)

- (c) Lot shall be defined as a specific quantity of material from a single source, produced or placed by the same controlled process.
- (d) Sublot shall be defined as an equal division or part of a Lot from which a sample of material is obtained in order to assess the Quality Characteristics of the Lot.

MATERIALS

E. Materials.

Materials shall meet the following specifications, where applicable:

General	M4.00.00
Portland Cement	M4.01.0
Blended Hydraulic Cements	M4.01.1
Fly Ash	M4.01.2
Cement Concrete	M4.02.00
Cement	M4.02.01
Aggregates	M4.02.02
Lightweight Aggregates	M4.02.03
Water	M4.02.04
Cement Concrete Additives	M4.02.05
Proportioning	M4.02.06
Mixing and Delivery	M4.02.10
Test Specimens	M4.02.13
Self-Consolidating Concrete (SCC)	M4.02.17
Slag	AASHTO M-302
High Performance Cement Concrete	M4.06.1
Reinforcing Bars	M8.01.0
Epoxy Coated Reinforcing Bars	M8.01.7
Asphalt Emulsions	M3.03.0

1. Cement Concrete Mix Design.

Cement concrete for Precast Concrete Highway Units shall meet the requirements of M4.02.0. When used, High Performance Cement Concrete shall meet the requirements of M4.06.1 and self-consolidating concrete (SCC) shall meet the requirements of M4.02.17. The cement concrete shall be composed of specified proportions by the mass of aggregates, cement, supplementary cementitious materials (SCMs), water, and QCML approved admixtures to form a homogenous composition. The particular quantities and uniform combination of materials and sources of supply to be used by the Fabricator on MassDOT Highway Construction contracts shall be reported on the MassDOT Cement Concrete Mix Design Sheet and submitted to MassDOT RMS for review and approval. All mix design yields shall be designed for 1.0 cubic yards of concrete, with an allowable tolerance of +/- 1.0 %. All liquids incorporated into the proposed mix design(s) shall include both water and admixtures in the liquid mass calculation.

Prior to the production and placement of the cement concrete for Precast Concrete Highway Units, the Fabricator's proposed mix design shall be approved by MassDOT RMS. Modifications made to the aggregate, cement, supplementary cementitious materials (SCMs), admixtures (including coloring agents), or formulation to previously approved mix designs during fabrication are prohibited. All new mix design formulations and modifications made to previously approved mix designs will require resubmission of the Cement Concrete Mix Design Sheet to MassDOT RMS for review and trial batch testing for the new mix design(s) by the Fabricator. The Fabricator shall notify MassDOT RMS to schedule trial batch testing for the new mix design(s). Trial batch testing shall meet the following requirements:

SUBSECTION M4.02.14 PRECAST UNITS (Continued)

- (a) Performed by a qualified laboratory and/or AASHTO accredited laboratory.
- (b) Performed and/or sampled in the presence of a MassDOT Inspector.
- (c) Meet the requirements as specified in *Table 3: Trial Batch Sampling Testing for New Mix Designs*. Self-consolidating concrete (SCC) shall meet M4.02.17.

Failure to perform all of the required trial batch testing or provide MassDOT RMS trial batch test results within the Specification Limits (as specified in Table 3) will result in the disqualification of the Fabricator's proposed mix design(s).

Table 3: Trial Batch Sampling and Testing for New Mix Designs

Quality Characteristic	Test Method	Sample Size	Specification Limit	Performed By
Slump ^(a)	AASHTO T 119	Per AASHTO	Max. 8 inches or as approved by the Engineer	Quality Control
Air Content (AC)	AASHTO T 152	Per AASHTO	$5\% \leq AC \leq 8\%$	Quality Control
Temperature (°F)	AASHTO T 309	Per AASHTO	$50^{\circ}\text{F} \leq ^{\circ}\text{F} \leq 90^{\circ}\text{F}$	Quality Control
Compressive Strength ^(b)	AASHTO T 22 AASHTO T 23	28-day Cylinders: One (1) set of Three (3) 4 x 8 in.	Lab Mixed: 130% f'_c at 28 days	MassDOT
			Batch Mixed: 120% f'_c at 28 days	
Alkali-Silica Reaction (ASR) ^(c)	ASTM C 1567	Per ASTM	M4.02.00	Quality Control
Resistance to Chloride Ion Penetration ^(d)	AASHTO T 358 ^(e)	28-day Cylinders: One (1) set of Three (3) 4 x 8 in.	Resistivity ≥ 15 k Ω -cm at 28 days	MassDOT

Notes:

- (a) Self-consolidating concrete (SCC) shall meet the requirements of M4.02.17.
- (b) Trial batch compressive strength testing shall be performed by MassDOT. Cylinders shall be haLaboratory mixed trial batch compressive strength results shall achieve 130% Design Strength (f'_c). Batch mixed trial batch compressive results shall achieve 120% f'_c . Acceptance will be based on compressive strength testing performed by MassDOT.
- (c) Alkali Silica Reaction (ASR) testing shall meet the requirements of M4.02.00. Independent laboratories performing ASR testing shall be listed on the MassDOT Quality Construction Materials List (QCML).
- (d) Resistance to Chloride Ion Penetration testing shall be performed only on proposed High Performance Cement Concrete mix designs. The calcium nitrite shall be removed from mix designs containing the admixture and replaced by an equivalent quantity of water when preparing Chloride Ion Penetration resistance trial batch test specimens.
- (e) The Wenner probe tip spacing "a" shall be 1.5.

CONSTRUCTION METHODS – PLANT FABRICATION

F. Shop Drawings.

Fabricator shop drawings for Precast Concrete Highway Units shall conform with the MassDOT Construction Standard Details, Traffic Standard Drawings for Traffic Signals and Highway Lighting, Overhead Signal Structure and Foundation Standard Drawings, and Standard Drawings for Signs and Supports. Circular vertical precast reinforced concrete manholes and structures used in sewer, drainage, and water works shall conform with the requirements of AASHTO M 199.

G. Tolerances.

Precast unit tolerances shall be as indicated on the plans, as specified in Subsection 901, or as indicated in the MassDOT Construction Standard Details, as appropriate.

H. Forms.

Concrete shall be cast in rigidly constructed forms, which will maintain the Precast Concrete Highway Units within specified tolerances to the shapes, lines and dimensions shown on the MassDOT Construction Standard Details. Forms shall be constructed from flat, smooth, non-absorbent material and shall be sufficiently tight to prevent the leakage of the plastic concrete. When wood forms are used, all faces in contact with the concrete shall be laminated or coated with a non-absorbent material. All worn or damaged forms, which cause irregularities on the concrete surface or damage to the concrete during form removal, shall be repaired or replaced before being reused. Any defects or damage of more than minor nature, due to form work, stripping or handling, shall be cause for rejection, as defined in Repairs and Replacement, unless approved for repair through the NCR process. If threaded inserts are cast into the elements for support of formwork, the inserts shall be recessed a minimum of 1 inch and shall be plugged after use with a grout of the same color as that of the precast cement concrete.

I. Mixing of Concrete.

The concrete shall be proportioned and mixed in conformance with the Fabricator's MassDOT approved mix design and M4.02.10 Mixing and Delivery. Fabrication shall not occur without a MassDOT approved mix design. The Fabricator shall provide copies of batch tickets to the MassDOT Plant Inspector. The MassDOT Plant Inspector will verify if the batch ticket quantities are within the tolerances of the Fabricator's MassDOT approved mix design.

J. Placement of Concrete.

Prior to the placement of concrete, the temperature of the forms shall be greater than or equal to 50°F. Quality Control inspection shall be performed by the Fabricator as specified in the *Fabricator Quality Control* section. The Quality Control Inspector shall inspect and accept the placement of the reinforcing steel prior to the placement of concrete into the forms. When a MassDOT Inspector is assigned to perform Acceptance activities at the Fabricator's facility, placement of the concrete shall not proceed until the MassDOT Plant Inspector is present to perform inspection and begin monitoring Fabricator Quality Control inspection activities, and is in compliance with specifications. The MassDOT Plant Inspector shall inspect and accept the placement of the reinforcing steel prior to the placement of concrete into the forms. The Fabricator shall verify all materials and equipment required for protecting and curing the concrete are readily available and meet the requirements of the *Final Curing Methods* section below. All items encased in the concrete shall be accurately placed in the position shown on the Plans and firmly held during the placing and setting of the concrete. Clearance from the forms shall be maintained by supports, spacers, or hangers and shall be of approved shape and dimension.

During placement, the concrete shall maintain a concrete temperature range between 50°F and 90°F. The Fabricator shall minimize the time to concrete placement (measured from start of mixing to completion of placement). In no event shall time to placement exceed 90 minutes. The Fabricator shall perform additional Quality Control sampling and testing on concrete that has been retempered with admixtures or hold-back water during the placement of the concrete as specified in the *Fabricator Quality Control* section above. Delays or shutdowns of over 30 minutes shall not be allowed during the continuous filling of individual forms.

SUBSECTION M4.02.14 PRECAST UNITS (Continued)

K. Consolidation of Concrete.

Suitable means shall be used for placing concrete to prevent segregation or displacement of reinforcing steel or forms. The concrete shall be thoroughly consolidated by external or internal vibrators or a combination of both. Vibrators shall not be used to move concrete within the forms. Vibrators shall be used as specified in 901.63C and as directed by the Engineer. Concrete shall be placed and consolidated in a way that minimizes the presence of surface voids or bug holes on the formed surfaces. When used, self-consolidating concrete (SCC) shall meet the requirements of M4.02.17.

L. Exposed Surfaces of Precast Concrete Highway Units.

As soon as conditions permit and before the concrete has fully hardened; all dirt, laitance, and loose aggregate shall be removed from the exposed concrete surfaces. Contractor shall not allow foot traffic on the uncured concrete until it has reached sufficient strength to prevent damage.

M. Final Curing Methods.

All exposed concrete surfaces shall meet the requirements of the selected final curing method and maintain the required concrete temperature ranges throughout the duration of the final curing method cycle. Controlled and gradual termination of the final curing method cycle shall occur after all the specified conditions are met.

1. Water Spray Curing.

The final curing method cycle shall begin immediately after the concrete has hardened sufficiently to prevent surface damage from the water spray. After the concrete has sufficiently hardened, all exposed concrete surfaces shall remain moist with a continuous fine spray of water throughout the entire duration of the final curing method cycle. Controlled and gradual termination of the final curing method cycle shall occur after all specified conditions are met (see *Table 4: Termination of Curing Cycle for Water Spray Curing*).

Table 4: Termination of Curing Cycle for Water Spray

Sustained Ambient Temperature	Compressive Strength
50°F ≤ °F ≤ 90°F	≥ 70% f _c

2. Saturated Covers for Curing.

The final curing method cycle shall begin immediately after the concrete has hardened sufficiently to prevent surface damage from the saturated burlap. After the concrete has sufficiently hardened, all exposed concrete surfaces shall be covered with water-saturated burlap throughout the entire duration of the final curing method cycle. Controlled and gradual termination of the final curing method cycle shall occur after all specified conditions are met (see *Table 5: Termination of Curing Cycle for Saturated Cover Curing*).

Table 5: Termination of Curing Cycle for Saturated Covers

Sustained Ambient Temperature	Compressive Strength
50°F ≤ °F ≤ 90°F	≥ 70% f _c

SUBSECTION M4.02.14 PRECAST UNITS (Continued)

3. Curing Covers.

Curing covers shall be Plastic Coated Fiber Blankets or Polyethylene Curing Covers. Proposed curing covers shall be submitted for approval to the Designer of Record with a copy to the MassDOT Research and Materials Section. The final curing method cycle shall begin immediately after the concrete has hardened sufficiently to prevent surface damage from the curing covers. After the concrete has sufficiently hardened, all exposed concrete surfaces shall be covered with curing covers throughout the entire duration of the final curing method cycle. The Fabricator shall ensure that the surface of the concrete remains wet until the covers are placed. If forms are removed from the Precast Concrete Highway Unit, curing covers shall be placed over the exposed concrete for the remainder of the final curing method cycle. Adjoining covers shall overlap not less than 12 inches. All edges of the covers shall be secured to maintain a moist environment (100% minimum relative humidity). Controlled and gradual termination of the final curing method cycle shall occur after all specified conditions are met (see *Table 6: Termination of Curing Cycle for Curing Covers*).

Table 6: Termination of Curing Cycle for Curing Covers

Sustained Ambient Temperature	Compressive Strength
50°F ≤ °F ≤ 90°F	≥ 70% f _c

N. Stripping.

The Fabricator shall not strip forms or handle the Precast Concrete Highway Unit until Quality Control compressive strength cylinders attain a minimum compressive strength of 70% Design Strength (f_c).

O. Handling and Storage of Precast Concrete Highway Units.

Precast Concrete Highway Units shall not be exposed to temperatures below 50°F until Quality Control compressive strength results have achieved 70% f_c. Precast units shall be lifted at the designated points by approved lifting devices embedded in the concrete and in accordance with proper lifting and handling procedures. Storage areas shall be smooth and well compacted to prevent damage due to differential settlement. Precast units shall be supported on the ground by means of continuous blocking.

Precast units shall be loaded on a trailer with continuous blocking. Shock-absorbing cushioning material shall be used at all bearing points during transportation of the precast units. Blocking shall be provided at all locations of tie-down straps. The precast units shall not be subject to damaging torsional or impact stresses.

P. Repairs and Replacement (not including Proprietary Retaining Wall Systems)

Where noted, defects shall be repaired according to the PCI Northeast Region Guidelines for Resolution of Non-Conformances in Precast Concrete Highway Units, Report Number PCINE-18-RNPCBE. Please note that reference to PCINE-18-RNPCBE is made for repair details only. In the case of conflict with this specification, this specification shall govern.

Any required repairs shall utilize materials listed on the MassDOT QCML. All repairs shall be completed at the expense of the Contractor.

Q. Repairs and Replacement for Proprietary Retaining Wall Systems.

In the event defects are identified, they shall be classified in the following categories and a non-conformance report (NCR) shall be filed if required. The NCR shall be submitted to MassDOT for review. Defects in all categories shall be documented by plant Quality Control personnel and made available to MassDOT upon request. Any required repairs shall utilize materials listed on the MassDOT QCML.

1. Category 1, Surface Defects.

Category 1 defects do not need to be repaired, and an NCR does not need to be filed. Surface defects are defined as:

SUBSECTION M4.02.14 PRECAST UNITS (Continued)

- (a) Surface voids or bug holes that are less than 5/8-inch in diameter and less than 1/4-inch deep, except when classified as Category 3
- (b) cracks less than or equal to 0.006" wide

2. Category 2, Minor Defects.

Category 2 defects shall be repaired and documented. Non-conformance Reports are not required for this category. Documentation of the repair shall be submitted to the MassDOT District Engineer. Minor defects are defined as:

- (a) Spalls, honeycombing, surface voids that are less than 2 inches deep and have no dimension greater than 12 inches
- (b) Cracks greater than 0.006" and less than or equal to 0.060"
- (c) Broken corners without exposed reinforcing steel

Defects and cracks shall be repaired according to the Guidelines for Resolution of Non-Conformances in Precast Concrete Highway Units, Report Number PCINE-18-RNPCBE and this specification. All repairs shall be completed at the expense of the Contractor. Any required repairs shall utilize materials listed on the MassDOT QCML.

3. Category 3, Rejectable Defects.

Rejectable defects as determined by the MassDOT Inspector and MassDOT Resident Engineer will be rejected, unless the Fabricator receives MassDOT approval of a Non-Conformance Report. Some rejectable defects are defined as:

- (a) Surface defects on more than 5% of the surface area
- (b) Minor defects that in total make up more than 5% of the surface area of the unit
- (c) Concentrated area of defects consisting of four or more Category 2 Defects within a 4-square foot area.
- (d) Exposed reinforcing steel
- (e) Spalls, honeycombing and surface voids that are deeper than 2 inches or have any dimension greater than 12 inches, when measured along a straight line
- (f) Cracks greater than 0.060" in width
- (g) Elements fabricated outside of the specified tolerances
- (h) Compressive strength that does not meet the specified Design Strength, f'_c

R. Loading.

Prior to the Fabricator loading the Precast Concrete Highway Unit on to the truck for shipping, the Fabricator shall provide the MassDOT Plant Inspector and RMS a minimum seven (7) days' notice of the Fabricator's intent to load the Precast Concrete Highway Unit. Inspection by the MassDOT Plant Inspector shall take place while the element is still on dunnage in the yard. The element shall not be loaded onto the truck until the MassDOT Plant Inspector has performed the inspection.

S. Shipping.

Prior to shipment, the Fabricator shall perform the following actions and provide the required documentation to the MassDOT Plant Inspector:

SUBSECTION M4.02.14 PRECAST UNITS (Continued)

- (a) Precast Concrete Highway Units shall remain at the Fabricator's plant for a minimum of 7 days after cast date.
- (b) QC Inspection Reports shall be signed by the Quality Control Manager and provided to the MassDOT Plant Inspector.
- (c) QC Compressive Strength Test Report Forms attaining Design Strength, f'_c for the Precast Concrete Highway Unit's representative Sublot shall be generated by the Fabricator and provided to the MassDOT Plant Inspector.
- (d) Certificate of Compliance shall be generated by the Fabricator as described under the Fabricator Quality Control section and provided to the MassDOT Plant Inspector.
- (e) All MassDOT RMS approved Corrective Actions submitted on the Non-Conformance Reports (NCR), shall be verified to have been completed by the MassDOT Plant Inspector and Quality Control Manager.
- (f) All NCRs shall be signed off by the Quality Control Manager and MassDOT Inspector and/or MassDOT RMS.

T. Delivery.

Upon Delivery, the following documentation shall be provided to the MassDOT Resident Engineer or designee:

- (a) QC Compressive Strength Test Report Forms attaining Design Strength, f'_c for the Precast Concrete Highway Unit's representative Sublot.
- (b) Certificate of Compliance generated by the Fabricator as described under the *Fabricator Quality Control* section.
- (c) QC Inspection Reports signed by the Quality Control Manager.

The Contractor shall inspect Precast Concrete Highway Units upon receipt at the site. Precast Concrete Highway Units damaged during delivery shall be repaired or replaced at MassDOT's direction at no cost to MassDOT..

DOCUMENT 00713

Subsection 701

Cement Concrete Sidewalks, Pedestrian Curb Ramps, and Driveways

Guide to the Interim Subsection 701 Cement Concrete Sidewalk Specification

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INTERIM SUBSECTION 701: CEMENT CONCRETE SIDEWALKS, PEDESTRIAN CURB RAMPS, AND DRIVEWAYS

DESCRIPTION

701.20: General

This work shall consist of the construction of cement concrete sidewalks, pedestrian curb ramps, and driveways in accordance with the specifications and within the tolerances established on the plans.

MATERIALS

701.30: General

Materials shall meet the requirements specified in the following Subsections of Division III, Materials except as noted herein:

Gravel Borrow, Type b.....	M1.03.0
Cement Concrete ($\geq 4,000$ psi)	M4.02.00
Preformed Expansion Joint Filler.....	M9.14.0 ^[1]

^[1] Preformed expansion joint filler shall conform to Subsection M9.14.0 or ASTM D8139.

The following best practices may be incorporated into the cement concrete mix design at no additional cost to the Department as identified herein.

A. Combined Aggregate System.

The combined aggregate system for the mix design may be analyzed using the Tarantula Curve, Shilstone Chart, fineness modulus, and coarse aggregate content to enhance the properties of the concrete.

1. Tarantula Curve.

The combined aggregate system for the mix design may be analyzed using the Tarantula Curve to evaluate potential properties of the concrete, including workability, segregation, edge slumping, surface finishing, and cohesion.

Table 701.30-1: Tarantula Curve Particle Size Distribution

Sieve Opening	Percent by Mass Targets (%)		Percent by Mass Retained (%)		
	Passing	Retained			
1-1/2 in.	100	-	-	-	-
1 in.	92	8	0 - 16	-	-
3/4 in.	82	10	0 - 20	-	-
1/2 in.	69	13	4 - 20	-	-
3/8 in.	56	13	4 - 20	-	-
No. 4	43	13	4 - 20	-	-
No. 8	37	6	0 - 12	Coarse Sand 20 - 40	-
No. 16	31	6	0 - 12		-
No. 30	18	13	4 - 20	Fine Sand 24 - 34	-
No. 50	5	13	4 - 20		-
No. 100	0	5	0 - 10		-
No. 200	0	0	0 - 2		-

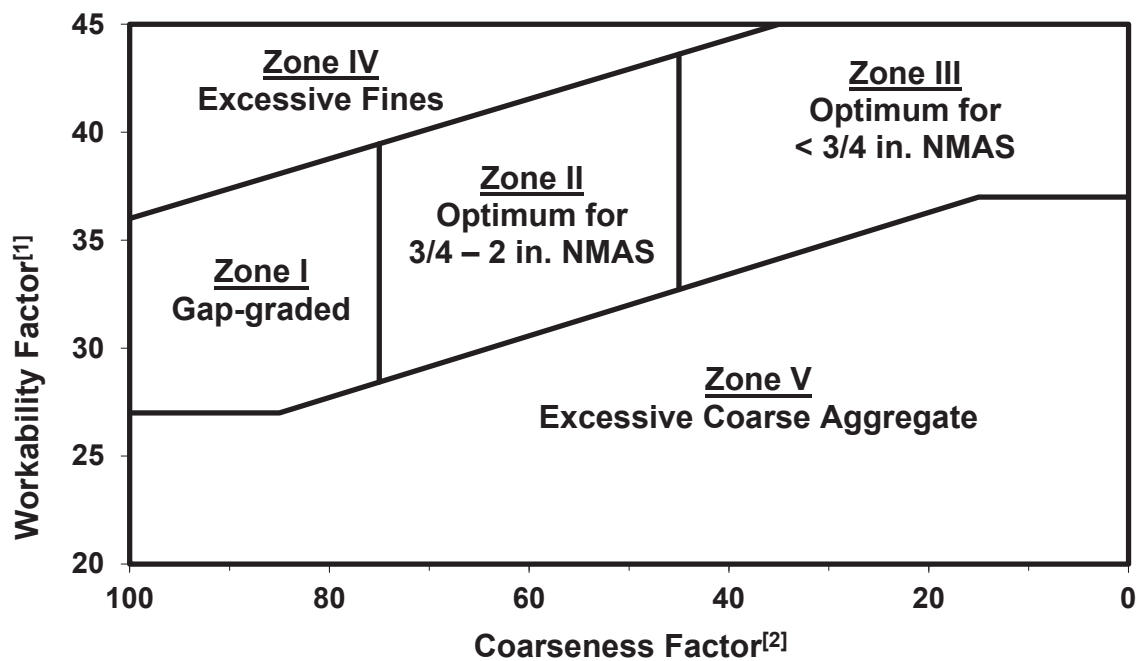
2. Shilstone Workability-Coarseness Chart.

The combined aggregate system for the mix design may be analyzed using the Shilstone Workability-Coarseness Chart, to evaluate potential properties of the concrete, including workability.

Table 701.30-2: Shilstone Workability-Coarseness

Zone	Property	Cause
Zone I	Gap-graded; High potential for segregation during placement and consolidation; Cracking, blistering, spalling, and scaling	Deficiency in intermediate particles; Non-cohesive
Zone II	Optimum mixture for nominal maximum aggregate size from 2 in. - 3/4 in.	Optimized workability factor and coarseness factor
Zone III	Optimum mixture for nominal maximum aggregate size < 3/4 in.	Optimized workability factor and coarseness factor
Zone IV	Sticky; High potential for segregation during consolidation and finishing; Variable strength, high shrinkage, cracking, curling, spalling, and scaling	Excessive fines
Zone V	Rocky; Lacking plasticity	Excessive amount of coarse and intermediate aggregate

Figure 701.30-1: Shilstone Workability-Coarseness Chart



^[1] The workability factor is determined by the equation $WF = W + (C - 564) / 38$, where WF = workability factor, W = percent passing No. 8 sieve and C = total cementitious materials content.

^[2] The coarseness factor is determined by the equation $CF = (Q/R) / 100$, where CF = coarseness factor, Q = cumulative percent retained on 3/8 in. sieve and R = cumulative percent retained on No. 8 sieve.

3. Fineness Modulus.

The combined aggregate system for the mix design may be analyzed using the fineness modulus, to evaluate potential properties of the concrete, including the fineness or coarseness of the mix design and estimating the design proportions of fine and coarse aggregates. The coarseness of the mix design increases as the fineness modulus increases. The fineness modulus is determined by calculating the total cumulative percentages by mass retained on each designated sieve and dividing by 100.

4. Coarse Aggregate Content.

The combined aggregate system for the mix design may be analyzed using the coarse aggregate content. The coarse aggregate content is determined by calculating the total cumulative percentages by mass retained on the No. 4 sieve.

B. Paste System.

The quality of the paste system is determined by the water-cementitious ratio, air content, cementitious materials, and chemical admixtures incorporated into the mix design.

1. Water-Cementitious Ratio.

The water-cementitious ratio for the mix design may be analyzed to evaluate potential properties of the concrete, including strength, concrete and reinforcement bonding, and resistance to freezing, thawing, de-icing, sulfate reaction, corrosion of steel reinforcement, drying shrinkage, cracking, and volume change from wetting and drying. The water-cementitious ratio is determined by calculating the total water content by mass and dividing by the total cement and supplementary cementitious material (SCM) content by mass. The recommended water-cementitious ratio design target is identified in Table 701.30-3. The water-cementitious ratio shall be less than or equal to 0.45.

Table 701.30-3: Freezing, Thawing, and De-icing Resistance

Exposure Class	Severity	Condition	Water-Cementitious Ratio	
			Recommendation	Requirement
F3	Very Severe	Exposed to freezing and thawing cycles and accumulation of snow, ice, and de-icing chemicals; Frequent exposure to water	≤ 0.40	≤ 0.45

2. Air Content.

The air content for the mix design may be analyzed to evaluate potential properties of the concrete, including strength and resistance to freezing, thawing, de-icing, and sulfate reaction. The recommended air content design targets are identified in Table 701.30-4.

Table 701.30-4: Freezing, Thawing, and De-icing Resistance

Exposure Class	Severity	Condition	Nominal Maximum Aggregate Size (in.)	Air Content Target Recommendation (%)
F3	Very Severe	Exposed to freezing and thawing cycles and accumulation of snow, ice, and de-icing chemicals; Frequent exposure to water	3/8	7.5
			1/2	7.0
			3/4	6.0

3. Cement and Supplementary Cementitious Materials Content.

The cement and supplementary cementitious materials content incorporated into the mix design shall promote quality properties of the cement concrete, including resistance to alkali silica reaction, freezing, thawing, de-icing, and sulfate reaction. Incorporation of supplementary cementitious materials (SCM) in cement concrete may affect workmanship properties, including workability, bleed rate, setting time, and other properties. Adequate adjustments in Contractor workmanship practices, including placement, finishing, curing, and other construction practices shall be required to account for these changes in properties and to prevent scaling due to freezing, thawing, and de-icing cycles. The cement and supplementary cementitious materials content shall meet the design criteria identified in Table 701.30-5.

Table 701.30-5: Alkali Silica Reaction and Freezing, Thawing, and De-icing Resistance^{[1][2]}

Exposure Class	Severity	Condition	Material	Replacement by Weight of Cement (%)
F3	Very Severe	Exposed to freezing and thawing cycles and accumulation of snow, ice, and de-icing chemicals; Frequent exposure to water	Low Alkali Cement ($\leq 0.60\%$ Alkalinity)	–
			Blended Hydraulic Cement ^[3]	–
			Fly Ash (Class F)	15 – 30
			Slag (Grade 100 or 120)	25 – 50
			Silica Fume	5 – 10
			Total SCM	≤ 50
			Total Fly Ash and Silica Fume	≤ 35

^[1] Acceptable replacement by weight of cement for alkali silica reaction resistance shall be determined by the alkali silica reaction resistance performance test results and the criteria identified in Table 701.73-1: Minimum Acceptance Sampling and Testing Requirements.

^[2] Test results meeting the alkali silica reaction resistance performance criteria of Table 701.30-6: Alternative Performance Evaluation to Alkali Silica Reaction Resistance Design Criteria may supersede the replacement by weight of cement design criteria.

^[3] SCMs in blended hydraulic cement shall meet the criteria identified for fly ash, slag, and silica fume.

Table 701.30-6: Alternative Performance Evaluation to Alkali Silica Reaction Resistance Design Criteria

Method	Quality Characteristic	Criteria
C295	Petrographic Examination for Potential Alkali Aggregate Reactive Constituents and Deleterious Materials in Aggregate ^[1]	–
	Optically Strained, Microfractured or Microcrystalline Quartz (%)	≤ 5.0
	Chert or Chalcedony (%)	≤ 3.0
	Trydimite or Cristobalite (%)	≤ 1.0
	Opal (%)	≤ 0.5
	Natural Volcanic Glass (%)	≤ 3.0
T 380	Alkali Silica Reaction Resistance: Expansion of Miniature Concrete Prisms at 56 days (%)	≤ 0.03 ^[2]

^[1] Examination of aggregate shall be performed and reported to identify and quantify potential alkali-aggregate reactive constituents and deleterious materials in aggregate, as defined in ASTM C294 Standard Descriptive Nomenclature for Constituents of Concrete Aggregates and ASTM C295 Standard Guide for Petrographic Examination of Aggregates for Concrete.

^[2] 56-day expansion results greater than 0.03 but less than or equal to 0.04 shall be considered non-reactive if the average two-week rate of expansion from day 56 to day 84 is less than or equal to 0.01%, otherwise, expansion results shall be considered reactive.

4. Chemical Admixtures.

Chemical admixtures may be incorporated into the mix design to enhance the properties of the concrete.

Table 701.30-7: Chemical Admixtures

Spec.	Type	Chemical Admixture	Properties
M 194	A	Water-Reducing	Increases Workability and Air Content; Decreases Water Demand (5 – 10%, 3 – 6 in. Slump)
	B	Retarding	Increases Initial and Final Setting Time, Air Content, Long-Term Strength; Offsetting of Accelerating Effect of Hot Weather; Decreases Early-Age Strength
	C	Accelerating	Increases Early-Age Strength; Decreases Initial and Final Setting Time
	D	Water-Reducing and Retarding	Type A and Type B Admixture Properties
	E	Water-Reducing and Accelerating	Type A and Type C Admixture Properties
	F	High Range Water-Reducing	Increases Workability (More Effective than Type A), Air Content, Early-Age Strength, and Ultimate Strength; Decreases Water Demand (12 – 40%, > 6 in. Slump) and Permeability
	G	High Range Water-Reducing and Retarding	Type F and Type B Admixture Properties
	S-SRA	Shrinkage Reducing	Increases Setting Time; Decreases Drying Shrinkage Cracking and Bleed Rate
	S-CRA	Crack Reducing	Decreases Cracking (More Effective than SRAs) and Crack Width
M 154	AEA	Air-Entraining	Increases Cohesion, Workability, Stabilization of Air Bubbles, Resistance to Freezing, Thawing, and De-icing, Resistance to Alkali-Reactive Environment, and Resistance to Sulfate Reaction
M 194 ^[1]	MRWRA	Mid Range Water-Reducing	Type A and Type F Admixture Properties; Increases Workability (Especially Concrete with SCMs); Decreases Water Demand (6 – 12 %, 5 – 8 in. Slump)
C1622	CWA	Cold Weather	Increases Hydration Rate; Decreases Freezing Point of Mixing Water

^[1] Mid range water-reducing admixtures (MRWRA) may meet either water-reducing (A) or high range water-reducing (F) admixture criteria.

5. Paste Content.

The paste content for the mix design may be optimized to enhance potential properties of the concrete, including workability, strength, permeability, and resistance to drying shrinkage and cracking and volume change from wetting and drying. The volume of paste should adequately fill the voids and provide sufficient separation between the aggregate particles to promote workability and effective bonding of particles.

Table 701.30-8: Paste Content

Mix Design Characteristic	Recommendation
Volume of Cement Concrete (cf) ^[1]	27
Paste Content (%) ^[2]	≤ 28 ^[3]
Paste Content to Aggregate Void Content Ratio ^[4]	1.25 – 1.75
Excess Volume of Paste for Workability (%) ^[5]	–

^[1] The volume of cement concrete is determined by the following equation, where W = Weight (lbs.), SG = Specific Gravity, D = Density (pcf), and V = Volume (cf).

$$V_{\text{CEMENT}} = W_{\text{CEMENT}} / SG_{\text{CEMENT}} * D_{\text{WATER}}$$

$$V_{\text{SCM}} = W_{\text{SCM}} / SG_{\text{SCM}} * D_{\text{WATER}}$$

$$V_{\text{ADMIXTURE}} = V_{\text{ADMIXTURE}} \text{ in oz.} / 957.5 \text{ oz. per cf}$$

$$V_{\text{WATER}} = V_{\text{WATER}} \text{ in gal.} / 7.48 \text{ gal. per cf}$$

$$V_{\text{COARSE}} = W_{\text{COARSE}} / SG_{\text{COARSE}} * D_{\text{WATER}}$$

$$V_{\text{FINE}} = W_{\text{FINE}} / SG_{\text{FINE}} * D_{\text{WATER}}$$

$$V_{\text{CONCRETE}} = V_{\text{CEMENT}} + V_{\text{SCM}} + V_{\text{ADMIXTURE}} + V_{\text{WATER}} + V_{\text{COARSE}} + V_{\text{FINE}} + V_{\text{AIR}}$$

^[2] The paste content by volume of cement concrete is determined by the following equation, where V = Volume (cf) and PC = Paste Content (%).

$$V_{\text{PASTE}} = V_{\text{CEMENT}} + V_{\text{SCM}} + V_{\text{ADMIXTURE}} + V_{\text{WATER}}$$

$$PC_{\text{CONCRETE}} = V_{\text{PASTE}} / V_{\text{CONCRETE}}$$

^[3] The cracking tendency of structural concrete is significantly reduced when the paste content by volume is less than or equal to 28 percent.

^[4] The paste content to aggregate void content ratio is determined by the following equation, where D = Density (pcf), SG = Specific Gravity, BD = Bulk Density (pcf), VC = Void Content (%), V = Volume (cf), AVC = Aggregate Void Content (%), PC = Paste Content (%), and R = Ratio. Workability increases as the paste content to aggregate void content ratio increases. Decreased paste content to aggregate void content ratios will result in decreased workability, where water-reducing admixtures provide no benefit.

$$V_{\text{COARSE}} = SG_{\text{COARSE}} * D_{\text{WATER}} - BD_{\text{COARSE}} / D_{\text{COARSE}}$$

$$V_{\text{FINE}} = SG_{\text{FINE}} * D_{\text{WATER}} - BD_{\text{FINE}} / D_{\text{FINE}}$$

$$V_{\text{AGGREGATE}} = [(V_{\text{COARSE}} / (V_{\text{COARSE}} + V_{\text{FINE}})) * VC_{\text{COARSE}} + (V_{\text{FINE}} / (V_{\text{COARSE}} + V_{\text{FINE}})) * VC_{\text{FINE}}]$$

$$AVC_{\text{CONCRETE}} = [V_{\text{AGGREGATE}} * ((V_{\text{COARSE}} + V_{\text{FINE}}) / V_{\text{CONCRETE}})]$$

$$R_{\text{PC-AVC}} = PC_{\text{CONCRETE}} / AVC_{\text{CONCRETE}}$$

^[5] The excess paste content for workability is determined by the following equation, where PC = Paste Content (%), AC = Air Content (%), AVC = Aggregate Void Content (%), and EPC = Excess Paste Content for Workability (%).

$$EPC_{\text{CONCRETE}} = PC_{\text{CONCRETE}} + AC_{\text{CONCRETE}} - AVC_{\text{CONCRETE}}$$

C. Initial Curing Materials.

The materials and procedures used for initial curing methods of cement concrete shall meet the Manufacturer's instructions and recommendations and the requirements specified herein.

Cement concrete with a low to negligible bleeding rate, exposure to highly evaporative environments, high content of silica fume, fine cement, or other fine cementitious material, low water to cementitious ratio, high air content, or water-reducing admixtures have an increased susceptibility to surface drying and plastic shrinkage between placement and finishing operations. Initial curing materials and procedures shall be applied immediately after the bleed water sheen has disappeared from the surface of the concrete or the concrete surface exhibits loss of moisture and surface drying, between placement and finishing operations. Initial curing materials shall not be worked into the surface in subsequent finishing operations.

1. Liquid-Applied Evaporation Reducers.

Liquid-applied evaporation reducers used for initial curing methods shall produce an effective monomolecular film over the bleed water layer, to reduce the rate of evaporation of the bleed water from the surface and plastic shrinkage when the evaporation rate equals or exceeds the bleeding rate.

D. Intermediate Curing Materials.

The materials and procedures used for intermediate curing methods of cement concrete shall meet the Manufacturer's instructions and recommendations and the requirements specified herein.

In instances where finishing operations have been completed prior to the concrete achieving final set and the concrete surface exhibits loss of moisture and surface drying, the following curing materials and procedures shall be applied immediately to the concrete surface prior to the application of final curing materials, to prevent the loss of moisture without damaging the concrete surface, until final set of the concrete has been achieved and final curing materials have been applied to the concrete surface.

- 701.30.C.1: Liquid-Applied Evaporation Reducers
- 701.30.E.3.a: Liquid Membrane-Forming Compounds for Curing
- 701.30.E.3.b: Liquid Membrane-Forming Compounds for Curing and Sealing

E. Final Curing Materials.

The materials and procedures used for final curing methods of cement concrete shall meet the Manufacturer's instructions and recommendations and the requirements specified herein.

Curing water shall be free of deleterious impurities, causing staining and deterioration. The potential staining ability of curing water shall be evaluated by means of CRD-C401 (US Army Corps of Engineers 1975) for instances where curing water quality is questioned. Curing water shall not exceed a temperature differential of more than 20°F from the internal concrete temperature, to prevent cracking due to temperature gradients causing strain that exceeds the strain capacity of concrete. Curing water shall remain above freezing temperatures throughout the duration of the curing cycle.

Final curing materials and procedures shall be applied to the concrete surface immediately after application of initial and intermediate curing materials, finishing operations, and final set of cement concrete, to prevent the loss of moisture and surface drying.

Materials used for final curing methods of cement concrete shall accommodate all exposed cement concrete surfaces with a continuous application of moisture throughout the entire duration of the final curing method cycle and provide controlled and gradual termination of the final curing method cycle.

Final curing materials applied to the concrete shall allow the concrete to mature sufficiently to achieve its designed and desired properties, including strength, volume stability, permeability, durability, and resistance to freezing, thawing, and de-icing cycles. Insufficient application of final curing materials results in decreased strength and durability of the top surface of concrete.

Protection to the concrete surface and curing materials shall be required in instances where adverse weather conditions are present, until curing operations can be initiated without damaging the surface of the concrete.

Final curing materials and procedures shall be applied to the concrete surface throughout the entire duration of the curing cycle and meet minimum sustained temperature, duration, and strength requirements, as specified in applicable Division II: Construction Details and herein. Controlled and gradual termination of the final curing method cycle shall begin only after all specified conditions are met, until the concrete gradually cools to within 20°F of the ambient temperature.

1. Saturated Covers.

Saturated covers used for final curing methods shall meet AASHTO M 182, Class 3. Saturated covers shall be in good condition, free from holes, tears, or other defects that would render it unsuitable for curing cement concrete and cementitious materials. Saturated covers shall be dried to prevent mildew when storing. Prior to application, saturated covers shall be thoroughly rinsed in water and free of harmful substances that are deleterious or cause discoloration to cement concrete and cementitious materials. Saturated covers shall have sufficient thickness and proper positioning onto the surface to maximize moisture retention. Saturated covers shall contain a sufficient amount of moisture to prevent moisture loss from the surface of cement concrete and cementitious materials. Saturated covers shall have the ability to retain sufficient moisture from continuous watering so that a film of water remains on the surface of cement concrete and cementitious materials throughout the entire duration of the final curing method cycle. Saturated covers shall not absorb water from cement concrete and cementitious materials. Polyethylene film may be applied over the saturated cover to limit the amount of continuous watering required for sufficient moisture retainage. Saturated covers shall accommodate uniform and slow drying of cement concrete and cementitious materials surfaces immediately prior to removal.

2. Sheet Materials.

Sheet materials, including polyethylene film, white burlap-polyethylene sheeting, and reinforced paper, used for final curing methods shall meet ASTM C171 and the requirements specified herein. Sheet materials shall inhibit moisture loss and reduce temperature rise in concrete exposed to radiation from the sun during the final curing method cycle. Adjoining covers shall overlap not less than 12 inches. All edges of the sheet materials shall be secured to maintain a moist environment.

a. Polyethylene Film.

Polyethylene film shall be clear, white, or black in color and consist of a single sheet manufactured from polyethylene resins, be free of visible defects, including tears, wrinkles, and discontinuity. The film shall prohibit mottling and uneven spots from appearing on the surface of concrete, due to variations in temperature, moisture content, or both. Application of additional curing water under the film or application of a polyethylene film bonded to absorbent fabric to the concrete surface may be required to prevent mottling and to retain and evenly distribute the moisture. Polyethylene film shall accommodate concrete surfaces with constant contact without damage. The film shall be sufficient in length to extend beyond the edges of the concrete surface. Edges of adjacent polyethylene film shall overlap a minimum of 6 inches and be tightly sealed with the use of sand, wood planks, pressure-sensitive tape, mastic, or glue to maintain close contact with the concrete surface, retain moisture, and prevent the formation of air pockets throughout the entire duration of the final curing method cycle.

i. White Polyethylene Film.

White polyethylene film shall minimize heat gain caused by absorption of solar radiation and shall be exclusively used during warm weather applications.

ii. Clear and Black Polyethylene Films.

Clear and black polyethylene films shall inhibit absorption of solar radiation for cold weather applications.

b. White Burlap-Polyethylene Sheeting.

White burlap-polyethylene sheeting shall be securely bonded to the burlap so to avoid separation of the materials during handling and curing of the concrete.

c. Reinforced Impervious Paper.

Reinforced impervious paper shall be white in color, consist of two sheets of kraft paper cemented together with a bituminous adhesive, and reinforced with embedded cords or strands of fiber running in both directions. Reinforced impervious paper shall be free of holes, tears, and pin holes from deterioration of the paper through repeated use. Reinforced impervious paper shall be treated to prevent tearing when wetted and dried. Reuse of reinforced impervious paper shall be permitted so long as it is able to retain moisture on the surface of concrete. The paper shall be discarded and prohibited from use when moisture is no longer retained in the material.

3. Liquid Membrane-Forming Compounds.

Compounds shall form a continuous, non-yellowing, and durable film with quality moisture-retention properties. Compounds shall maintain the relative humidity of the concrete surface above 80% for seven days to sustain cement hydration. Compounds shall not affect the original color of the concrete surface. Compounds shall not degrade due to exposure to ultraviolet light from direct sunlight. Compounds shall meet the local and federal allowable Volatile Organic Compound (VOC) content limits.

White-pigmented compounds shall be used in instances where solar-heat gain is concern to the concrete surface. White-pigmented compounds shall be agitated in the container prior to application to prevent pigment from settling out resulting in non-uniform overage and ineffective curing.

Careful considerations shall be made by the Contractor to determine if the evaporation rate is exceeding the rate of bleeding, thus causing the surface to appear dry even though bleeding is still occurring. To diagnose and prevent this condition, the Contractor may place a transparent plastic sheet over a test area of the uncured and unfinished concrete surface and shall determine if any bleed water accumulates under the plastic. Under such conditions, the application of liquid membrane-forming compounds to the concrete surface shall be delayed to prevent bleed water from being sealed below the concrete surface, map cracking of the membrane films, reduction in moisture-retention capability, and the need for reapplication of the compound.

Prior to use, compounds shall be thoroughly mixed, stirred, and agitated per the Manufacturer's instructions and recommendations.

Compounds shall be applied continuously and uniformly to the surface of the concrete per the Manufacturer's instructions and recommendations. Compounds shall be applied immediately after the disappearance of the surface water sheen following final finishing. Applying of the compound immediately after final finishing and before all free water on the surface has evaporated will help prevent the formation of cracks. When using compounds to reduce moisture loss from formed surfaces, the exposed surface shall be wetted immediately after form removal and kept moist until the curing compound is applied. The concrete shall be allowed to reach a uniformly damp appearance with no free water on the surface, and then application of the compound shall begin at once. Delayed application will result in surface drying, absorption of the compound into the concrete, and no forming of a continuous membrane.

The concrete surface shall be damp when the compound is applied. Power-driven spray equipment shall be used for uniform application of compounds on large paving projects. Spray nozzles recommended by the compound Manufacturer and use of windshields shall be arranged by the Contractor to prevent wind-blown loss of compound and to ensure proper coverage application rates are achieved. The compound shall be applied by power sprayer, using appropriate wands and nozzles with pressures between 25 and 100 psi. The Contractor shall fill the power sprayer with curing compound from the Manufacturer's original container in the presence of the Engineer. Any dilution as recommended by the Manufacturer shall take place in the presence of the Engineer. For very small areas such as repairs, the compound shall be applied with a wide, soft-bristled brush or paint roller.

The Contractor shall verify the application rate and procedures are in accordance with the Manufacturer's instructions and recommendations. At least one uniform coat shall be applied at a rate of 150 to 200 ft²/gallon. On very deeply textured surfaces, the surface area to be treated shall be at least twice the surface area of the surface. In such cases, two separate applications may be needed, each at 200 ft²/gallon or greater if specified by the Manufacturer to achieve the desired moisture retention rate, with the first being allowed to become tacky before the second is applied. If two coats are necessary to ensure complete coverage, for effective protection the second coat should be applied at right angles to the first. Complete coverage of the surface shall be attained due to the potential for formation of small pinholes in the membrane, which will result in loss of moisture from the concrete. Compounds shall not sag, run off peaks, or collect in grooves.

Compounds and procedures shall be compatible with concrete surfaces receiving subsequent applications or placements of concrete, overlays, coatings, paints, sealers, finishes or other toppings to ensure acceptable bonding to the concrete. Testing to establish compatibility among the curing compound, subsequent surface treatments, concrete moisture content and the actual finished surface texture of the concrete shall be conducted when compatibility is not known. The compound Manufacturer shall be consulted by the Contractor to determine the compatibility of the application. Compounds shall not be applied to concrete surfaces where bonding of subsequent applications or placements is incompatible or is of concern. The use of wax-based curing compounds shall be prohibited in instances where concrete surfaces are subject to additional toppings and vehicular, pedestrian, or other traffic. Deliberate removal of compounds in the presence of the Engineer and in accordance with Manufacturer's instructions and recommendations shall be conducted as an alternative to compatibility testing, incompatibility, or in instances where bonding is of concern. Bonding of subsequent materials may still be inhibited by the presence of the compound even after the moisture retention characteristics of the compound have diminished.

a. Liquid Membrane-Forming Compounds for Curing.

Liquid membrane-forming compounds for curing shall meet ASTM C309, the Manufacturer's instructions and recommendations, and the requirements specified herein.

Table 701.30-1: Types of Compounds for Curing

Type	Description
Type 1	Clear or translucent without dye
Type 1-D	Clear or translucent with fugitive dye
Type 2	White pigmented

Table 701.30-2: Composition Class of Compounds for Curing

Type	Description
Class A	Unrestricted composition, generally wax-based products
Class B	ASTM D883 resin-based products

b. Liquid Membrane-Forming Compounds for Curing and Sealing.

Liquid membrane-forming compounds for curing and sealing shall meet ASTM C 1315, the Manufacturer's instructions and recommendations, and the requirements specified herein.

In addition to moisture-retention capabilities compounds shall exhibit specific properties, including alkali resistance, acid resistance, adhesion-promoting quality, and resistance to degradation by ultraviolet light.

Table 701.30-3: Types of Compounds for Curing and Sealing

Type	Description
Type I	Clear or translucent
Type II	White pigmented

Table 701.30-4: Class of Compounds for Curing and Sealing

Type	Description
Class A	Non-yellowing

F. Protective Sealing Compounds.

Protective sealing compounds shall maintain valid listing on the Department Qualified Construction Materials List (QCML) and meet AASHTO M 224, NCHRP Report 244 and the requirements specified herein.

Protective sealing compounds shall sufficiently penetrate the concrete to seal the surface pores and fill the capillaries of the concrete by chemically reacting with the concrete and forming a hydrophobic layer. Protective sealing compounds shall limit the penetration of liquids, gases, and harmful substances into hardened concrete, including water, de-icing agents, and carbon dioxide to protect concrete from freezing, thawing, and de-icing cycles, corrosion of reinforcing steel, and acid attack. Protective sealing compounds shall limit the buildup of vapor pressure between the concrete and the applied sealer. Protective sealing compounds shall retard the penetration of harmful substances into hardened concrete. Protective sealing compounds shall maintain their protective properties during environmental exposure to freezing, thawing, and de-icing cycles. Protective sealing compounds shall not reduce the frictional properties of the concrete. Protective sealing compounds shall not affect the original color of the concrete surface if maintaining the original color is desired by the Department. Protective sealers shall meet the local and federal allowable Volatile Organic Compound (VOC) content limits.

Curing methods conforming to Department specifications shall be applied to the concrete prior to the application of protective sealers. Protective sealers shall not be applied to the concrete for a minimum of 28 days after placement and the surface shall be sufficiently prepared, clean, and dry for at least 24 hours with ambient temperatures exceeding 60°F. Protective sealers shall not be applied to concrete placed where freezing, thawing, and de-icing cycles are expected immediately after, due to the retainage of water in the concrete. Periodic re-application shall be required for protective penetrants requiring multiple applications and for concrete surfaces exhibiting wear to ensure long-term protection of the concrete surface.

G. Cold Weather Concreting Materials.

Cold weather concreting shall be defined as the procedures, operations, materials, and equipment required for the mixing, delivery, placement, finishing, curing, and protection of concrete during cold weather conditions, while exposed to air temperatures falling below, or expected to fall below 40°F.

The protection period shall be defined as the minimum duration required to prevent concrete from the negative effects of cold weather exposure. The protection period shall remain in place while cold weather conditions exist. Controlled and gradual termination of the protection period shall be conducted only after 100% $f'c$ is attained and all specified conditions are met.

The procedures, operations, materials, and equipment selected for cold weather concreting shall adequately maintain specified temperature ranges by addressing all variables, including ambient weather conditions, geometry of the structure, and mix design proportions. Concrete temperatures for cold weather concreting shall meet Table 701.30-5.

Table 701.30-5: Concrete Temperature Requirements for Cold Weather Concreting

Phase	Cold Weather Temperature (°F)	Concrete Temperature (°F)
Mixing	30-39	60-75
	0-30	65-80
	< 0	70-85
Placement	< 40	55-75
Protection Period	< 40	55-75
Termination of Protection Period – Allowable Rate of Decrease in 24 Hours	< 40	≤ 50

Cold weather concreting procedures, operations, materials, and equipment shall be developed and performed to prevent damage to concrete due to freezing at early ages, to ensure that the concrete develops the recommended strength for safe removal of forms, to maintain curing conditions that promote quality strength and durability development, to limit rapid temperature fluctuation, and to provide protection consistent with intended serviceability of the structure. The Contractor shall develop and submit to the Department for review and approval, cold weather concreting procedures for the mixing, delivery, placement, finishing, curing, and protection of concrete during cold weather, including:

- Procedures for protecting the subgrade from frost and the accumulation of ice or snow on reinforcement or forms prior to placement
- Methods and requirements for cold weather protection and temperature control of constituent materials incorporated into the mix design
- Chemical admixtures incorporated into the mix design for cold weather protection and temperature control
- Methods and requirements for cold weather protection and temperature control during mixing, delivery, placement, finishing, curing, and protection period
- Curing methods to be used during and following the protection period
- Types of covering, insulation, heating, or enclosures to be provided
- Methods for verification of in-place strength
- Procedures for measuring and recording concrete temperatures
- Procedures for preventing drying during dry, windy conditions

All procedures, operations, materials, and equipment required for adequate protection and curing shall be present and ready for use prior to concrete production.

1. Insulating Materials.

Insulating materials used for cold weather concreting shall meet the requirements specified herein. The thermal resistance of the proposed insulation system shall be determined to meet the concrete temperature range requirements specified herein. Supplemental heat, including hydronic heating systems, shall be applied in instances where insulating materials cannot achieve the concrete temperature requirements.

2. Heaters.

Heaters used for cold weather concreting including direct fired, indirect fired, and hydronic heaters shall meet ANSI A10.10 carbon monoxide limits, safety regulations for ventilation, and the stability, operation, fueling, and maintenance of heaters and the requirements specified herein.

a. Direct Fired Heaters.

Direct fired heaters generate heat to an enclosed space through the combustion of fossil fuels, including oil, kerosene, propane, gasoline, and natural gas. Hot air comprised of carbon dioxide and carbon monoxide combustion products, is discharged into the enclosed space. Direct fired heaters shall be prohibited from heating the air directly surrounding the concrete surface due to calcium carbonate formation interfering with the hydration reaction, from the reaction between the carbon dioxide generated from the combustion of fossil fuels and the calcium hydroxide on the surface of freshly placed concrete, resulting in a soft, chalky, and nondurable concrete surface. Direct fired heaters shall only be used on concrete surfaces protected from fossil fuel combustion products.

b. Indirect Fired Heaters.

Indirect fired heaters generate heat to an enclosed space through the combustion of fossil fuels, including oil, kerosene, propane, gasoline, and natural gas. The carbon dioxide and carbon monoxide combustion products are expelled through venting, resulting in clean heated air discharged into the enclosed space. Indirect fired heaters are suitable for heating the air directly surrounding the concrete surface.

c. Hydronic Heaters.

Hydronic heaters generate heat to an enclosed space through the circulation of the heat-transfer fluid in a closed system of pipes or hoses. The heat-transfer fluid is comprised of a propylene glycol water solution and is heated through the combustion of fossil fuels, including diesel fuel and kerosene. The combustion of fossil fuel occurs outside of the enclosed space and does not expose the concrete surface to the deleterious effects of carbon dioxide.

After the concrete placement achieves final set, polyethylene film or other suitable material shall sufficiently serve as a vapor barrier. The heat-transfer hoses shall be placed on top of the vapor barrier and covered with insulating materials meeting 701.30.G.1. Hydronic heaters shall be used to thaw or preheat subgrades prior to concrete placement and provide supplementary heat to insulating materials. Hydronic heaters shall provide an even distribution of heat to prevent curling and cracking induced by temperature gradients within concrete.

3. Enclosures.

Enclosures shall be made of wood, canvas tarpaulins, polyethylene film, or prefabricated rigid plastic. Enclosures shall be airtight, block wind, prevent admittance of cold air, conserve heat, and withstand wind and snow loads. Enclosures shall provide adequate headroom for craftsmen and sufficient space between the concrete and the enclosure to permit free circulation of warm air. Supplementary heat shall be supplied to enclosures by hydronic heaters, live steam, hot forced air, or indirect fired combustion heaters. Icing along the perimeter of the enclosure shall be prevented when live steam is utilized. Heaters and ducts shall be positioned to prevent the hot, dry air from overheating or drying the concrete surface. Insulating materials meeting 701.30.G.1 shall be applied as a vapor barrier to the concrete surface immediate after final set is attained.

H. Hot Weather Concreting Materials.

Hot weather concreting shall be defined as the procedures, operations, materials, and equipment required for the mixing, delivery, placement, finishing, bleed water evaporation, curing, and protection of concrete during hot weather conditions, while exposed to air temperatures exceeding, or expected to exceed 80°F; concrete temperatures approaching, or expected to approach 90°F; evaporation rates of surface water approaching, or expected to approach the bleeding rate of the concrete; high solar radiation; low relative humidity; and high wind speed.

The protection period shall be defined as the minimum duration required to prevent concrete from the negative effects of hot weather exposure, including the acceleration of rate of moisture loss and rate of cement hydration, difficulties in curing, increased concrete temperature, increased water demand, accelerated slump loss, increased rate of setting, increased tendency for plastic shrinkage and thermal cracking, increased potential for cold joints, and difficulties in controlling entrained air content. The protection period shall remain in place while hot weather conditions exist. Controlled and gradual termination of the protection period shall be conducted when conditions permit. The allowable rate of temperature decrease shall not exceed 5°F per hour and meet the allowable rate of temperature decrease specified in 701.30.G: Cold Weather Concreting Materials.

The procedures, operations, materials, and equipment selected for hot weather concreting shall adequately maintain specified temperature ranges and evaporation rates by addressing all variables, including ambient weather conditions, geometry of the structure, and mix design proportions. Initial materials meeting 701.30.C: Initial Curing Materials shall be applied to the concrete surface while the concrete and air temperatures, relative humidity of the air, and the wind speed have the capacity to evaporate free water from the fresh concrete surface at a rate that is equal to or greater than bleeding rate of the concrete. The evaporation rate of surface water shall be determined by the following equation:

$$E = (T_c^{2.5} - r * T_a^{2.5})(1 + 0.4V) \times 10^{-6}$$

where E = evaporation rate of water-covered surface (lb/ft²/hr), T_c = concrete temperature of the evaporating surface (°F), r = relative humidity of air surrounding the evaporating surface (%), T_a = temperature of the air surrounding the evaporative surface (°F), and V = average wind speed 20 inches above the evaporating surface. The air surrounding the evaporating surface shall be defined as the air approximately 4 to 6 feet above the evaporating surface on the windward side and shielded from the sun's rays.

Hot weather concreting procedures, operations, materials, and equipment shall be developed and performed to prevent damage to concrete and promote long-term durability. The Contractor shall develop and submit to the Department for review and approval, hot weather concreting procedures for the mixing, delivery, placement, finishing, curing, and protection of concrete during hot weather, including:

- Procedures for preparing the subgrade prior to placement
- Methods and requirements for hot weather protection and temperature control of constituent materials incorporated into the mix design
- Chemical admixtures incorporated into the mix design for hot weather protection and temperature control
- Methods and requirements for hot weather protection and temperature control during mixing, delivery, placement, finishing, curing, and protection period
- Initial curing methods to be used to reduce surface evaporation
- Curing methods to be used during and following the protection period
- Types of covering, insulation, cooling, or enclosures to be provided
- Evaporation rate and bleeding rate of concrete calculations
- Procedures for measuring and recording concrete temperatures
- Procedures for preventing drying during dry, windy conditions

All procedures, operations, materials, and equipment required for adequate protection and curing shall be present and ready for use prior to concrete production.

CONSTRUCTION METHODS

701.40: Pre-Placement

A. Excavation.

Excavation of the area shall be in accordance with the applicable portions of Subsection 120: Excavation.

B. Subgrade and Subbase.

The subgrade for the sidewalks and driveways shall be shaped parallel to the proposed surface of the sidewalks and driveways and thoroughly compacted. All depressions in the subgrade shall be filled with suitable material and again compacted until the surface is smooth and hard. Prior to the placement of the subbase, the Contractor shall inspect the prepared subgrade to ensure that it is in conformance with the required grade and cross-section. Subgrade shall be fine graded to meet the applicable requirements of Subsection 170: Grading.

After the subgrade has been prepared, a gravel subbase shall be placed upon it. After being compacted thoroughly, the subbase shall be at least 8 inches thick and parallel to the proposed surface of the sidewalk. Prior to the placement of the cement concrete, the Contractor shall inspect the prepared subbase material to ensure that it is in conformance with the required grade and cross-section. Subbase material that is not in accordance with the plans or specifications shall be reworked or replaced to meet the applicable requirements of Subsection 170: Grading before the start of cement concrete placement. When placing cement concrete, the compacted subbase shall not be frozen or have standing water.

C. Forms.

Side forms and transverse forms shall be smooth, free from warp, of sufficient strength to resist springing out of shape, of a depth to conform to the thickness of the proposed sidewalk or pedestrian curb ramp and of a type satisfactory to the Engineer.

All mortar or dirt from previously used forms shall be completely removed prior to use. The forms shall be well staked and thoroughly graded and set to the established lines with their upper edge conforming to the grade of the finished sidewalk or pedestrian curb ramp which shall have sufficient pitch to the roadside edge to provide for surface drainage.

All pedestrian curb ramp joints and transition sections which define grade changes shall be formed staked and checked for dimension, grade and slope conformance prior to placing cement concrete.

All forms shall be oiled before placing concrete.

701.41: Placement

The concrete shall be placed in alternate slabs 30 ft long except as otherwise ordered. The slabs shall be separated by transverse preformed expansion joint filler ½ in. thick.

Preformed expansion joint filler shall be placed adjacent to or around existing structures as directed.

Detectable warning panels conforming to the plans shall be securely incorporated into the work by means acceptable to the Engineer.

On the foundation as specified above, the concrete shall be placed in such quantity that after being thoroughly consolidated in place it shall be 4 in. deep. At driveways, the sidewalks shall be 6 in. deep.

In conveying the concrete from the place of mixing to the place of deposit, the operation shall be conducted in such a manner that no mortar will be lost, and the concrete shall be so handled that the concrete will be of uniform composition throughout, showing neither excess nor lack of mortar in any one place.

The surface of all concrete sidewalks shall be uniformly scored into block units of areas not more than 36 ft². The depth of the scoring shall be at least ½ in. deep and no more than ½ in. wide.

701.42: Initial Curing

In instances where the bleed water sheen has disappeared from the surface of the concrete or the concrete surface exhibits loss of moisture and surface drying between placement and finishing operations, the Contractor shall apply one of the following initial curing materials and procedures meeting 701.30.C: Initial Curing Materials until finishing operations occur.

- 701.30.C.1: Liquid-Applied Evaporation Reducers

Initial curing materials shall not be worked into the surface in subsequent finishing operations.

701.43: Finishing

The finishing of concrete surface shall be done by experienced and competent cement finishers. No finishing operation shall be performed while free water is present. Finishing operations shall be delayed until all bleed water and water sheen has left the surface and the concrete has started to stiffen. After water sheen has disappeared, edging operations, where required, shall be completed. After edging and joining operations, the surface shall be floated. Magnesium floats shall be used for all finishing operations. If necessary tooled joints and edges shall be rerun before and after floating to maintain uniformity. After floating, the surface shall be brushed by drawing a soft-bristled push broom with a long handle over the surface of the concrete to produce a nonslip surface.

701.44: Intermediate Curing

In instances where finishing operations have been completed prior to the concrete achieving final set and the concrete surface exhibits loss of moisture and surface drying, the Contractor shall apply one of the following intermediate curing materials and procedures meeting 701.30.D: Intermediate Curing Materials immediately to the concrete surface prior to the application of final curing materials, to prevent the loss of moisture without damaging the concrete surface, until final set of the concrete has been achieved and final curing materials have been applied to the concrete surface.

- 701.30.C.1: Liquid-Applied Evaporation Reducers
- 701.30.E.3.a: Liquid Membrane-Forming Compounds for Curing
- 701.30.E.3.b: Liquid Membrane-Forming Compounds for Curing and Sealing

701.45: Final Curing

The Contractor shall apply one of the following final curing materials and procedures meeting 701.30.E: Final Curing Materials to the concrete surface immediately after application of initial and intermediate curing materials, finishing operations, and final set of cement concrete, to prevent the loss of moisture and surface drying.

- 701.30.E.1: Saturated Covers
- 701.30.E.2: Sheet Materials
- 701.30.E.3.a: Liquid Membrane-Forming Compounds for Curing
- 701.30.E.3.b: Liquid Membrane-Forming Compounds for Curing and Sealing

The Contractor shall apply final curing materials and procedures to the concrete surface throughout the entire duration of the curing cycle and meet minimum sustained temperature, duration, and strength requirements, as specified in in Table 701.45-1. Controlled and gradual termination of the curing cycle shall begin after all specified conditions are met.

Table 701.45-1: Termination of Curing Cycle

Sustained Concrete Temperature	Final Curing Cycle Duration	Compressive Strength ^[1]
50°F ≤ °F ≤ 90°F	≥ Seven (7) days	≥ 70% f _c

^[1] Compressive strength cylinders for termination of curing cycle shall be cast and field cured with the same environmental conditions that the sidewalk is subjected to throughout the entire duration of the final curing cycle, per 701.73: Acceptance Sampling and Testing.

701.46: Protective Sealing

The Contractor shall apply sealing materials and procedures meeting 701.30.F: Protective Sealing Compounds only if one or more of the following final curing materials and procedures were applied:

- 701.30.E.1: Saturated Covers
- 701.30.E.2: Sheet Materials
- 701.30.E.3.a: Liquid Membrane-Forming Compounds for Curing

Protective sealing compounds shall not be applied to concrete surfaces applied with a final curing material and procedure meeting 701.30.E.3.b: Liquid Membrane-Forming Compounds for Curing and Sealing.

701.47: Cold Weather Concreting

The Contractor shall conduct cold weather concreting procedures, operations, materials, and equipment required for the mixing, delivery, placement, finishing, curing, and protection of concrete, while surfaces are exposed to air temperatures falling below, or expected to fall below 40°F in accordance with 701.30.G: Cold Weather Concreting Materials. All procedures, operations, materials, and equipment required for adequate protection and curing shall be present and ready for use prior to concrete production.

701.48: Hot Weather Concreting

The Contractor shall conduct hot weather concreting procedures, operations, materials, and equipment required for the mixing, delivery, placement, finishing, curing, and protection of concrete, while surfaces are exposed to air temperatures exceeding, or expected to exceed 80°F; concrete temperatures approaching, or expected to approach 90°F; evaporation rates of surface water approaching, or expected to approach the bleeding rate of the concrete; high solar radiation; low relative humidity; and high wind speed in accordance with 701.30.H: Hot Weather Concreting Materials. All procedures, operations, materials, and equipment required for adequate protection and curing shall be present and ready for use prior to concrete production

CONTRACTOR QUALITY CONTROL

701.60: General

The Contractor shall provide adequate Quality Control (QC) to ensure that all materials and workmanship conform with the specification requirements. The Contractor shall perform QC activities as outlined further below.

701.61: Contractor Quality Control Plan

The Contractor shall provide and maintain a Quality Control Plan (QC Plan). The QC Plan should sufficiently document the QC processes of all Contractor parties (i.e. Prime Contractor, Subcontractors, Producers) performing work required under this specification.

701.62: Production Personnel

A. Foreman.

A foreman shall be present throughout the entire duration of the construction operation with at least one of the following personnel certifications.

- NRMCA Concrete Exterior Finisher Certification
- ACI Concrete Flatwork Technician and Flatwork Finisher

The foreman is responsible for the oversight of the construction operation per the requirements specified in Table 701.62-1.

Table 701.62-1: Minimum Foreman Activities

Operation	Foreman	Activity
Oversight	One (1)	Review and compare batch ticket quantities and sources to approved mix design
		Monitors conformance to AASHTO M 157 Standard Specification for Ready-Mixed Concrete
		Monitors conformance to Department specifications
		Monitors Production Personnel activities
		Verifies proper equipment is on hand prior to start of construction
		Monitors equipment, environmental conditions, materials, and workmanship
		Prohibits the use of prohibited equipment and practices
		Acknowledges sampling, testing, and inspection results

B. Operators.

Concrete sidewalk shall be constructed by sufficiently staffed, trained, experienced, and qualified equipment operators and craftsmen, who are presently involved in sidewalk construction, throughout the entire duration of the construction operation, per the requirements specified in Table 701.62-2.

Table 701.62-2: Minimum Operator Activities

Operation	Operators^[1]	Activity
701.40: Pre-Placement	Two (2)	Apply sufficient base compaction
		Moisten sub-base, free of standing water
		Secure forms, straight and level
		Mark expansion locations
		Prohibited Practices: Placement on frozen sub-grade
701.41: Placement (Concrete Discharging)	Two (2)	Direct concrete trucks
		Handle chute discharge and truck movement
		Assist in preparing concrete for testing
		Direct trucks to washout area
		Provide general help
		Prohibited Practices: Adding constituent materials not in conformance with AASHTO M 157 or without Department consent
701.41: Placement	Two (2)	Localize placement to minimize moving material
		Level concrete in front of the screed
		Operate come-alongs or flat headed shovel to move concrete in form
		Consolidate concrete along form edge to avoid honeycombing
		Operate screed over top of forms in sawing action for surface leveling
		Operate magnesium bull float to push coarse aggregate below the surface and fill in the low spots or depressions
		Prohibited Practices: Toothed raking, dragging of internal vibrator, and internal vibrator to move concrete; steel troweling or floating
701.42: Initial Curing	Apply an initial curing material and procedure per 701.42	
	One (1)	701.30.C.1: Liquid-Applied Evaporation Reducers
701.43: Finishing	Two (2)	Permit bleed water to dissipate and concrete to set
		Operate a hose drag or squeegee to remove water from the surface
		Check surface for flatness, fill/cut as necessary
		Finish surface with magnesium float
		Apply pulled broom finish at proper time to acceptable texture
		Clean broom when excessive mortar adheres
		Remove excess water from broom before use
		Finish edges and joints
		Finish well formed, properly spaced joints to sufficient depth
Prohibited Practices: Steel troweling or floating; adding water to the surface; excessive working of surface; pushing broom across surface		

^[1] Recommended number of operators.

Table 701.62-2: Minimum Operator Activities (Continued)

Operation	Operators^[1]	Activity
701.44: Intermediate Curing		If applicable, apply an intermediate curing material and procedure per 701.44
	One (1)	701.30.C.1: Liquid-Applied Evaporation Reducers
	One (1)	701.30.E.3.a: Liquid Membrane-Forming Compounds
	One (1)	701.30.E.3.b: Liquid Membrane-Forming Compounds for Curing and Sealing
701.45: Final Curing		Apply a final curing material and procedure meeting 701.45
	Four (4)	701.30.E.1: Saturated Covers
	Four (4)	701.30.E.2: Sheet Materials
	One (1)	701.30.E.3.a: Liquid Membrane-Forming Compounds
	One (1)	701.30.E.3.b: Liquid Membrane-Forming Compounds for Curing and Sealing
701.46: Protective Sealing	One (1)	If applicable, apply a protective sealing material and procedure per 701.46
701.47: Cold Weather Concreting	Four (4)	If applicable, apply cold weather concreting materials and procedures per 701.47 and the Department approved Contractor cold weather concreting plan
701.48: Hot Weather Concreting	Four (4)	If applicable, apply hot weather concreting materials and procedures per 701.48 and the Department approved Contractor hot weather concreting plan

^[1] Recommended number of operators.

701.63: Quality Control Inspection

Quality Control inspection shall be performed and reported on inspection report forms by qualified Quality Control Technicians, to confirm conformance to specifications and to visually inspect equipment, environmental conditions, materials, and workmanship. Quality Control Technicians shall obtain at least one of the following personnel certifications.

- NRMCA Concrete Exterior Finisher Certification
- ACI Concrete Flatwork Technician and Flatwork Finisher

Quality Control inspection report forms shall be completed by the Contractor and submitted to the Department for review.

DEPARTMENT ACCEPTANCE

701.70: General

Acceptance shall be performed by the Department, including consultants under direct contract with the Department independent of the Contractor, to evaluate the degree of compliance with contract requirements, to monitor each Contractor entity's Quality Control activities, to determine the corresponding value for a given product, and to determine the acceptability of all material produced and placed.

701.71: Acceptance of Contractor Quality Control Plan

The Department will review the Contractor Quality Control Plan. Department approval shall be subject to conformance with the requirements specified herein.

701.72: Acceptance Inspection

Acceptance inspection will be performed and reported by qualified Department (or designee) Acceptance Technicians, to confirm conformance to specifications and to visually inspect equipment, environmental conditions, materials, and workmanship.

701.73: Acceptance Sampling and Testing

Acceptance sampling and testing will be performed and reported by qualified Department (or designee) Acceptance Technicians, to provide quality characteristic data used for Department Acceptance determination, per the requirements specified herein.

Table 701.73-1: Minimum Acceptance Sampling and Testing Requirements

Property	Method	Quality Characteristic	Sublot Size	Minimum Test Frequency	Point of Sampling	Criteria
Uniformity	T 119	Slump Allowable Tolerance (in.) ^[1]	100 cy	1 per Sublot	Point of Discharge	Target \pm 1.5
Workability	T 119	Segregation Resistance ^[2]	100 cy	1 per Sublot	Point of Discharge	Pass
Thermal	T 309	Concrete Temperature ($^{\circ}$ F)	100 cy	1 per Sublot	Point of Discharge	50 – 90
Strength	T 22	Compressive Strength at 7 Days for Curing Termination (psi) ^[3]	100 cy	1 per Sublot	Point of Discharge	\geq 70% f_c
		Compressive Strength at 28 Days (psi) ^[3]	100 cy	1 per Sublot	Point of Discharge	\geq 100% f_c
		Compressive Strength at 56 Days (psi) ^{[3][4]}	100 cy	1 per Sublot	Point of Discharge	\geq 100% f_c
Durability	T 121 T 152 T 196	Freezing and Thawing Resistance: Air Content (%)	100 cy	1 per Sublot	Point of Discharge	5.5 – 8.5
	T 303 or C1567	Alkali Silica Reaction Resistance: Expansion at 14 Days (%)	–	1 per Annual Mix Design Submission Cycle	–	\leq 0.08

^[1] Test result and the Producer's mix design target shall be within the specified allowable tolerances. Slump shall be reported on the Producer's mix design batch ticket for each delivery.

^[2] Testing for segregation resistance shall be performed while the concrete is being discharged and during AASHTO T 119 Standard Method of Test for Slump of Hydraulic Cement Concrete. Visual signs of segregation include coarse particles advancing in front of or behind the fine particles and mortar and a tendency for coarse aggregate to separate from the mortar, particularly when the mixture is being consolidated.

^[3] Three (3) 4 x 8 in. compressive strength cylinders shall be cast and tested for each age per sublot.

^[4] Testing only required if compressive strength results at 28 days do not conform with specifications.

COMPENSATION

701.80: Method of Measurement

Cement Concrete Sidewalks, Pedestrian Curb Ramps, and Driveways will be measured in square yards.

Excavation will be measured by the cubic yard as specified in 120.80: Method of Measurement.

Gravel Borrow will be measured by the cubic yard as specified in 150.80: Method of Measurement.

Fine grading and compacting will be measured by the square yard as specified in 170.88: Method of Measurement.

701.81: Basis of Payment

Cement Concrete Sidewalk, Cement Concrete Pedestrian Curb Ramp, and Cement Concrete Driveway will be paid for at the contract unit price per square yard complete in place, including detectable warning panels and all incidental materials, labor, and equipment necessary to complete the work to the satisfaction of the Engineer.

Gravel will be paid for at the contract unit price per cubic yard under Item 151: Gravel Borrow.

Fine grading and compacting will be paid for at the contract unit price per square yard under Item 170: Fine Grading and Compacting – Subgrade Areas.

Excavation will be paid for at the contract unit price per cubic yard under the excavation items.

701.82: Payment Items

701.	Cement Concrete Sidewalk	Square Yard
701.1	Cement Concrete Sidewalk Driveways	Square Yard
701.2	Cement Concrete Pedestrian Curb Ramp.....	Square Yard

GUIDE TO THE INTERIM SUBSECTION 701 CEMENT CONCRETE SIDEWALK SPECIFICATION

MATERIALS ACTIVITIES

Section	Activity	
701.30.A	Combined Aggregate System	
701.30.A.1	The mix design's combined aggregate system should meet Table 701.30-1: Tarantula Curve Particle Size Distribution.	Recommendation
701.30.A.2	The mix design's combined aggregate system should meet Table 701.30-2 / Figure 701.30-1: Shilstone Workability-Coarseness.	Recommendation
701.30.A.3	The mix design's combined aggregate system should be analyzed using the Fineness Modulus.	Recommendation
701.30.A.4	The mix design's combined aggregate system should be analyzed using the Coarse Aggregate Content.	Recommendation
701.30.B	Paste System	
701.30.B.1	The mix design's Water-Cementitious Ratio should be ≤ 0.40 (Table 701.30-3: Freezing, Thawing, and De-icing Resistance).	Recommendation
701.30.B.1	The mix design's Water-Cementitious Ratio shall be ≤ 0.45 (Table 701.30-3: Freezing, Thawing, and De-icing Resistance).	Required
701.30.B.2	The mix design's Air Content should approach the recommended Air Content Targets identified in Table 701.30-4: Freezing, Thawing, and De-icing Resistance.	Recommendation
701.30.B.3	The mix design's Cement and Supplementary Cementitious Materials (SCM) Content shall meet Table 701.30-5: Alkali Silica Reaction and Freezing, Thawing, and De-icing Resistance requirements.	Requirement
701.30.B.3	Test results meeting Table 701.30-6: Alternative Performance Evaluation to Alkali Silica Reaction Resistance requirements may be used in lieu of the mix design requirements identified in Table 701.30-5: Alkali Silica Reaction and Freezing, Thawing, and De-icing Resistance requirements.	Optional
701.30.B.4	The mix design should incorporate Chemical Admixtures identified in Table 701.30-7: Chemical Admixtures to enhance the properties of the concrete.	Recommendation
701.30.B.5	The mix design's Paste Content should approach the recommended targets identified in Table 701.30-8: Paste Content.	Recommendation

701.73 Acceptance Sampling and Testing		
T 119	The Slump shall meet Table 701.71-1: Minimum Acceptance Sampling and Testing Requirements (± 1.5 from Slump Target identified by the Concrete Producer on the Batch Ticket).	Requirement
T 119	The Segregation Resistance shall meet Table 701.71-1: Minimum Acceptance Sampling and Testing Requirements.	Requirement
T 309	The Concrete Temperature shall meet Table 701.71-1: Minimum Acceptance Sampling and Testing Requirements.	Requirement
T 22	The Compressive Strength (7, 28, and 56 days) shall meet Table 701.71-1: Minimum Acceptance Sampling and Testing Requirements.	Requirement
T 121 T 152 T 196	The Air Content shall meet Table 701.71-1: Minimum Acceptance Sampling and Testing Requirements (5.5 – 8.5%).	Requirement
T 303 or C1567	The resistance to Alkali Silica Reaction shall meet Table 701.71-1: Minimum Acceptance Sampling and Testing Requirements (One per year for mix design verification).	Requirement

CONTRACTOR ACTIVITIES

Section	Activity	
701.40	Pre-Placement	
	The Contractor should have a minimum of two (2) Operators.	Recommendation
	The Contractor shall apply sufficient base compaction.	Requirement
	The Contractor shall moisten sub-base, free of standing water.	Requirement
	The Contractor shall secure forms, straight and level.	Requirement
	The Contractor shall mark expansion locations.	Requirement
	The Contractor shall be prohibited from performing the following practices: Placement on frozen sub-grade.	Requirement
701.41	Placement (Concrete Discharging)	
	The Contractor should have a minimum of two (2) Operators.	Recommendation
	The Contractor shall direct concrete trucks.	Requirement
	The Contractor shall handle chute discharge and truck movement.	Requirement
	The Contractor shall assist in preparing concrete for testing.	Requirement
	The Contractor shall direct trucks to washout area.	Requirement
	The Contractor shall provide general help.	Requirement

	The Contractor / Concrete Producer shall be prohibited from performing the following practices: Adding constituent materials not in conformance with AASHTO M 157 or without Department consent.	Requirement
701.41	Placement	
	The Contractor should have a minimum of two (2) Operators.	Recommendation
	The Contractor shall localize placement to minimize moving material.	Requirement
	The Contractor shall level concrete in front of the screed.	Requirement
	The Contractor shall operate come-alongs or flat headed shovel to move concrete in form.	Requirement
	The Contractor shall consolidate concrete along form edge to avoid honeycombing.	Requirement
	The Contractor shall operate screed over top of forms in sawing action for surface leveling.	Requirement
	The Contractor shall operate magnesium bull float to push coarse aggregate below the surface and fill in the low spots or depressions.	Requirement
	The Contractor shall be prohibited from performing the following practices: Toothed raking, dragging of internal vibrator, and internal vibrator to move concrete; steel troweling or floating.	Requirement
701.42	Initial Curing (When Applicable)	
	The Contractor should have a minimum of one (1) Operator.	Recommendation
	The Contractor shall apply 701.30.C.1: Liquid-Applied Evaporation Reducers when applicable.	Required when applicable
701.43	Finishing	
	The Contractor should have a minimum of two (2) Operators.	Recommendation
	The Contractor shall permit bleed water to dissipate and concrete to set.	Requirement
	The Contractor shall operate a hose drag or squeegee to remove water from the surface.	Requirement
	The Contractor shall check surface for flatness, fill/cut as necessary.	Requirement
	The Contractor shall finish surface with magnesium float.	Requirement
	The Contractor shall apply pulled broom finish at proper time to acceptable texture.	Requirement
	The Contractor shall clean broom when excessive mortar adheres.	Requirement
	The Contractor shall remove excess water from broom before use.	Requirement

	The Contractor shall finish edges and joints.	Requirement
	The Contractor shall finish well formed, properly spaced joints to sufficient depth.	Requirement
	The Contractor shall be prohibited from performing the following practices: Steel troweling or floating; adding water to the surface; excessive working of surface; pushing broom across surface.	Requirement
701.44	Intermediate Curing (When Applicable, Apply One of the Methods)	
	The Contractor should have a minimum of one (1) Operator.	Recommendation
	The Contractor shall apply 701.30.C.1: Liquid-Applied Evaporation Reducers when applicable and if selected.	Required when applicable
	The Contractor shall apply 701.30.E.3.a: Liquid Membrane-Forming Compounds when applicable and if selected.	Required when applicable
	The Contractor shall apply 701.30.E.3.b: Liquid Membrane-Forming Compounds for Curing and Sealing when applicable and if selected.	Required when applicable
701.45	Final Curing (Apply One of the Methods)	
	The Contractor should meet the minimum number of operators identified in Table 701.62-2: Minimum Operator Activities.	Recommendation
	The Contractor shall apply 701.30.E.1: Saturated Covers if selected.	Requirement
	The Contractor shall apply 701.30.E.2: Sheet Materials if selected.	Requirement
	The Contractor shall apply 701.30.E.3.a: Liquid Membrane-Forming Compounds if selected.	Requirement
	The Contractor shall apply 701.30.E.3.b: Liquid Membrane-Forming Compounds for Curing and Sealing if selected.	Requirement
701.46	Protective Sealing (If Required)	
	The Contractor should have a minimum of one (1) Operator.	Recommendation
	The Contractor shall apply 701.30.F: Protective Sealing Compounds at least 28 days after placement. Application of 701.30.F: Protective Sealing Compounds is NOT REQUIRED IF 701.30.E.3.b: Liquid Membrane-Forming Compounds for Curing and Sealing was applied.	Required if 701.30.E.3.b Curing and Sealing Compound was Not Applied
701.47	Cold Weather Concreting (When Applicable)	
	The Contractor should have a minimum of four (4) Operators.	Recommendation
	The Contractor shall submit a Cold Weather Concreting Plan meeting 701.47.	Required when applicable

	The Contractor shall apply cold weather concreting materials and procedures meeting 701.47 and the Department approved Contractor cold weather concreting plan.	Required when applicable
701.48	Hot Weather Concreting (When Applicable)	
	The Contractor should have a minimum of four (4) Operators.	Recommendation
	The Contractor shall submit a Hot Weather Concreting Plan meeting 701.48.	Required when applicable
	The Contractor shall apply hot weather concreting materials and procedures meeting 701.47 and the Department approved Contractor hot weather concreting plan.	Required when applicable
701.61	Contractor Quality Control Plan	
	The Contractor shall prepare and submit a Quality Control Plan (QC Plan) to the Department for review.	Requirement
701.62	Production Personnel	
701.62.A	Foreman	
	The Contractor shall have a minimum of One (1) Foreman.	Requirement
	A Foreman shall be present throughout the entire duration of the construction operation with at least one of the following personnel certifications. <ul style="list-style-type: none"> • NRMCA Concrete Exterior Finisher Certification • ACI Concrete Flatwork Technician and Flatwork Finisher 	Requirement
	The Contractor's Foreman shall review and compare batch ticket quantities and sources to approved mix design.	Requirement
	The Contractor's Foreman shall monitor conformance to AASHTO M 157 Standard Specification for Ready-Mixed Concrete.	Requirement
	The Contractor's Foreman shall monitor conformance to Department specifications.	Requirement
	The Contractor's Foreman shall monitor Production Personnel activities.	Requirement
	The Contractor's Foreman shall verify that proper equipment is on hand prior to start of construction.	Requirement
	The Contractor's Foreman shall monitors equipment, environmental conditions, materials, and workmanship.	Requirement
	The Contractor's Foreman shall prohibit the use of prohibited equipment and practices.	Requirement
	The Contractor's Foreman shall acknowledge sampling, testing, and inspection results.	Requirement

701.62.B	Operators	
	Concrete sidewalk shall be constructed by sufficiently staffed, trained, experienced, and qualified equipment operators and craftsmen, who are presently involved in sidewalk construction, throughout the entire duration of the construction operation, per the requirements specified in Sections 701.40 to 701.48.	Requirement
701.63	Quality Control Inspection	
	<p>Quality Control inspection shall be performed and reported on inspection report forms by qualified Quality Control Technicians, to confirm conformance to specifications and to visually inspect equipment, environmental conditions, materials, and workmanship. Quality Control Technicians shall obtain at least one of the following personnel certifications.</p> <ul style="list-style-type: none"> • NRMCA Concrete Exterior Finisher Certification • ACI Concrete Flatwork Technician and Flatwork Finisher <p>Quality Control inspection report forms shall be completed by the Contractor and submitted to the Department for review</p>	Requirement

DOCUMENT 00715



SUPPLEMENTAL SPECIFICATIONS (English Units)

DATE: SEPTEMBER 30, 2020

The 2020 *Standard Specifications for Highways and Bridges* are amended by the following modifications, additions and deletions. This Supplemental Specifications prevail over those published in the Standard Specifications.

The MassDOT–Highway Specifications Committee has issued these Supplemental Specifications for inclusion into each proposal until such time as they are approved as Standard Specifications.

Contractors are cautioned that these Supplemental Specifications are dated and may vary from time to time as they are updated.

GLOBAL MODIFICATIONS

Replace the term “wheelchair ramp” with “pedestrian curb ramp” at each occurrence throughout the *Standard Specifications*

DIVISION I GENERAL REQUIREMENTS AND COVENANTS

SECTION 4.00: SCOPE OF WORK

Subsection 4.04 Changed Conditions.

(page I.22) Delete the two sequential paragraphs near the end that begin “The Contractor shall be estopped...” and “Any unit item price determined ...”

SECTION 8.00: PROSECUTION AND PROGRESS

Subsection 8.08 Preservation of Roadside Growth

(page I.74) Delete the last paragraph of this subsection which reads; All scars on trees shall be painted as soon as possible with an approved tree paint.

**DIVISION II
CONSTRUCTION DETAILS**

SECTION 200: DRAINAGE

SUBSECTION 230: CULVERTS, STORM DRAINS, AND SEWAR PIPES

SUBSECTION 230: CULVERTS, STORM DRAINS, AND SEWAR PIPES

(page II.63) Change SEWAR to SEWER in the title of this subsection.

Subsection 230.20 General.

(page II.63) Delete the words Reinforced Concrete or Metal.

Subsection 230.40 General.

Subsection 230.62 Pipe Joints.

Subsection 230.82 Payment Items

(page II.63, II.64 and II.68) Replace the words Corrugated Plastic (Polyethylene) Pipe with the words Corrugated Plastic Pipe.

Subsection 230.64 Field Testing of Corrugated Plastic Pipe

(page II.65) Delete the word thermoplastic in the first sentence of this subsection.

**SECTION 400: SUB-BASE, BASE COURSES, SHOULDERS, PAVEMENTS AND
BERMS**

SUBSECTION 440: ROADWAY DUST CONTROL

SUBSECTION 440 Roadway Dust Control.

(page II.101) Item 441. Bitumen for Roadway Dust control has been deleted. Replace the entire subsection with the following;

440.20: General

This work: shall consist of furnishing and applying approved dust control material to the surface of the subgrade or elsewhere as directed in accordance with these specifications.

440.40: General

Calcium Chloride shall meet the requirements of Division III, Materials, M9.01.0.

CONSTRUCTION METHODS

440.60: General

The required material shall be properly applied where directed by the Engineer and distributed uniformly at the rate specified or ordered. The means of distribution shall depend upon the kind of material used, and the method and equipment used shall be satisfactory to the Engineer. The number and frequency of applications shall be as determined by the Engineer.

440.61: Treatment with Calcium Chloride

Calcium chloride shall be uniformly applied at the rate of 1½ lb per yd² or at any other rate as directed by means of a mechanical spreader, or other approved methods.

440.62: Treatment with Water

Water shall be applied at locations at such times, and in the amount as directed by the Engineer. Quantities of water wasted or applied without authorization will not be paid for.

Watering equipment shall consist of pipelines, tanks, tank trucks, or other devices, approved by the Engineer, which are capable of applying a uniform spread of water over the surface. A suitable device for a positive shut-off and for regulating the flow of water shall be located so as to permit positive operator control.

COMPENSATION

440.80: Method of Measurement

Calcium chloride will be measured by the pound.

Water will be measured for payment by the number of M gallons (1,000 gallons). The water will be measured in tanks or tank trucks of predetermined capacity, or by means of satisfactorily installed meters. Any and all measuring devices shall be furnished by the Contractor.

440.81: Basis of Payment

Calcium chloride will be paid for at the contract unit price per pound under the item for Calcium Chloride for Roadway Dust Control, complete in place.

Water will be paid for at the contract price per “M” gallons for Water for Roadway Dust Control which price shall include all water, labor, tools and equipment required to furnish and measure the water applied to surfaces designated by the Engineer and at the times specified.

440.82: Payment Items

440.	Calcium Chloride for Roadway Dust Control.....	Pound
443.	Water for Roadway Dust Control	M. Gallons

SUBSECTION 450: HOT MIX ASPHALT PAVEMENT

Subsection 453.93 Payment Items.

(page II.181) Change the pay unit of item 452. Tack Coat from Ton to Gallons and the pay unit of item 453. HMA Joint Sealant from Ton to Foot.

SUBSECTION 477: MILLED RUMBLE STRIPS

SUBSECTION 477 Milled Rumble Strips.

(page II.261) Replace sections 477.20, 477.62, 477.80, 477.81 and 477.82 with the following:

477.20: General

The work consists of constructing rumble strips on paved highway shoulders by milling grooves into finished hot mix asphalt surfaces. Milled Rumble Strips are categorized as Type A, Type B, or Type C. Type A are rectangular milled grooves at regular intervals in the paved surface, Type B rumble strips are rectangular grooves at regular intervals with designed gaps between intervals to accommodate bicyclists and Type C rumble strips form continuous grooves in the paved surface in the form of a vertical sinusoidal wave pattern.

477.62: Installation of Milled Rumble Strips

Rumble strips shall be installed in accordance with the locations, dimensions, and Type shown on the plans.

477.80: Method of Measurement

Milled Rumble Strip (Type A) and Milled Rumble Strip (Type C) will be measured by the total length of installed rumble strip. Milled Rumble Strip (Type B) will be measured by the total length of installed rumble strip excluding the designed gaps. Breaks at castings, bridge decks, intersections or other breaks will not be measured for payment for all types.

477.81: Basis of Payment

Payment for Milled Rumble Strip (Type A), Milled Rumble Strip (Type B), and Milled Rumble Strip (Type C) will be made at the contract unit price per foot of rumble strips, complete in place. Such payment will be full compensation for furnishing all equipment and labor for satisfactorily performing the work including cleanup and disposal of excess materials.

477.82: Payment Items

477.	Milled Rumble Strip (Type A).....	Foot
477.1	Milled Rumble Strip (Type B).....	Foot
477.2	Milled Rumble Strip (Type C).....	Foot

SECTION 600: HIGHWAY GUARD, FENCES AND WALLS

SUBSECTION 601: GUARDRAIL

Subsection 601.82 Payment Items.

(page II.278) Add the following payment item in numerical order,

620.131	Guardrail, Deep Post (Single Faced).....	Foot
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SUBSECTION 628: PERMANENT IMPACT ATTENUATORS

Subsection 628.80 Method of Measurement.

(page II.280) Delete the last sentence which reads "There will be a separate bid item for each location."

SUBSECTION 630: MAINTENANCE OF HIGHWAY GUARD

Subsection 630.82 Payment Items.

(page II.286) Add the following payment item in numerical order,

632.11	Guardrail, Deep Post - Steel.....	Each
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SECTION 700: INCIDENTAL WORK

SUBSECTION 701: CEMENT CONCRETE SIDEWALKS, PEDESTRIAN CURB RAMPS AND DRIVEWAYS

Subsection 701.82 Payment Items

(page II.302) Revise the description of pay item 701.1 to read as follows,

701.1	Cement Concrete Sidewalk At Driveways.....	Square Yard
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SUBSECTION 702: HOT MIX ASPHALT SIDEWALKS AND DRIVEWAYS

Subsection 702.41 Preparation of Underlying Surface.

(page II.303) Add the following sentence to the end of the first paragraph;

Existing pavements shall be sawcut in accordance with 450.49: Hot Mix Asphalt Joints.

Subsection 702.81 Basis of Payment.

(page II.314) Add the following after the last paragraph;

All required sawcutting in the existing pavement in accordance with this specification will be included in the contract unit price for Hot Mix Asphalt Sidewalks and Driveways.

SUBSECTION 765: SEEDING

Subsection 765.40 General.

(page II.332) Add the following material to the end of this subsection;

Short Term Erosion Control Seed M6.03.1

Subsection 765.63 Seeding Grass.

(page II.333) Replace the first sentence with the following;

After the loamed or topsoil areas have been prepared and treated as hereinbefore described, grass seed conforming to the respective formulas hereinbefore specified shall be carefully sown thereon at the rate as specified by the supplier.

Subsection 765.65 Seeding Grass by Spray Machine.

(page II.333) Change the title of this subsection to Hydroseeding. Delete the last paragraph of this subsection that begins with "If the results ...", and Replace the first two sentences of the first paragraph with the following;

A hydroseed machine approved by the Engineer and designed specifically for seed dissemination may be utilized. The application of limestone as necessary, fertilizer as necessary and grass seed may be accomplished in one operation by the use of the approved hydroseed machine.

Subsection 765.81 Basis of Payment.

(page II.334) Replace this subsection with the following;

Payment for Seeding and Seeding for Short Term Erosion Control, including all mowing, will be paid for at the contract unit price per square yard, complete in place. When a satisfactory stand of grass has not been established at the time of acceptance, no payment for seeding shall be allowed at the time of acceptance. At the time the final estimate is ready to be forwarded to the Contractor the seeded areas will again be inspected by the Engineer and the seeded areas with a satisfactory stand of grass will be included for payment.

Subsection 765.82 Payment Items.

(page II.334) Add the following payment item;

765.2 Seed for Short Term Erosion Control Square Yard

SUBSECTION 766: REFERTILIZATION

SUBSECTION 766 Refertilization.

(page II.335) Delete this entire subsection.

SUBSECTION 767: MULCHING; SEED FOR EROSION CONTROL

Subsection 767 Mulching; Seed for Erosion Control.

(page II.336) Change the title of this subsection to Mulching and Erosion Control.

Subsection 767.40 General.

(page II.336) Delete Seeding for Erosion Control ... M6.03.1.

Subsection 767.62 Hay Mulch with Seed for Erosion Control.

(page II.337) Change the title of this subsection to Hay Mulch with Seed for Short Term Erosion Control.

Subsection 767.80 Method of Measurement.

(page II.338) Delete the last paragraph of this subsection which reads "Seed for Erosion Control will be measured by the pound."

Subsection 767.81 Basis of Payment.

(page II.338) Delete the last paragraph of this subsection which reads "Seed for Erosion Control will be paid for at the contract unit price per pound."

Subsection 767.82 Payment Items.

(page II.339) Delete item 765.2 Seed for Erosion Control.

SUBSECTION 771: PLANTING TREES, SHRUBS AND GROUNDCOVER

Subsection 771.40 General.

(page II.338) Replace the last three paragraphs of third, fourth and fifth paragraphs of this subsection with the following;

All plants shall be northern grown nursery stock. The American Standards for Nursery Stock (ANSI Z60.1 shall serve as the Department's standard for plants and for plant, root ball, and container size, as well as growth and form requirements.

The latest editions of ANSI A300 Standards Part 1 Pruning and Part 6 Planting and Transplanting shall apply for all work of planting and pruning.

Trees and shrubs shall be balled and burlapped (B&B) or containerized. The caliper, height, age and other dimensions as specified for all planting material shall apply at the time planting is done and the plants will be inspected by the Engineer at this time as to these requirements as well as the quality or grade and varieties required. The Contractor shall remove all plants not approved by the Engineer from the project.

Subsection 771.61 Seasons for Planting.

(page II.346) In table 771.61-1: Calendar Guidance for Planting replace "March 21 through May 15" with "March 21 through June 15".

SECTION 900: STRUCTURES

SUBSECTION 901: CEMENT CONCRETE

Subsection 901.40 Materials.

(page II.429) Delete the reference to Silica Fume Modified Cement Concrete ... M4.06.0.

Subsection 901.82 Payment Items.

(page II.466) Delete payment items 904.2 and 905.1.

Subsection 901.66 Placement, Finishing and Curing of Concrete Bridge Decks

(page II.449) Replace A. Placement and Curing Plan Submission Requirements., B. Limitations on Placement, and D. Consolidation with the following;

A. Placement and Curing Plan Submission Requirements.

At least 30 days prior to the proposed start of placing the concrete bridge deck, the Contractor shall submit to the Engineer for approval a Placement and Curing Plan that will specify all of the steps, methods, equipment and personnel that Contractor shall use to construct the concrete deck in compliance with these specifications. Approval of this plan will not relieve the Contractor of the responsibility for the satisfactory performance of his/her methods and equipment. The Placement and Curing Plan shall, at a minimum, specify:

1. The method that will be used to convey the concrete from the truck to all locations on the deck where it will be placed. This will also include the conveyance equipment, rate of concrete placement and the estimated time for the completion of all concrete placement, consolidation and finishing operations up to the start of curing.
2. The type and number of finishing machines and work bridges including the plan for erecting the rails and operating the finishing machine. This will include proof of the following minimum operator qualifications for the bridge deck finishing machine:
 - a) Five years experience operating machines or similar type and manufacturer as that proposed.
 - b) Proof of no less than five bridge decks of similar size, placed using a machine of the same manufacturer as that proposed.Or, as a substitute for a. and b.:
 - c) A representative of the manufacturer of the bridge deck finishing machine shall be present on the site a minimum of 24 hours in advance of the proposed deck placement to approve the setup of the machine and rail system, and the representative shall be present for the entire duration of the placement of the deck concrete using the bridge deck finishing machine.
3. The sequence of concrete pours, including any retarders or other concrete admixtures and dosage rates required to complete the placement, consolidation and finishing operations prior to curing in accordance with the Contractor's intended sequence of operations.
4. The provisions for consolidating the concrete including the number of vibrators and number of personnel that will be dedicated exclusively for this operation.
5. The method for curing the concrete deck. This will include the number of personnel that will be exclusively dedicated for this operation, the means for pre-wetting the burlap, the location of the wet burlap at the work site, the means for conveying the wet burlap to the work bridges and the amount of wet burlap that will be required to completely cover the deck. It shall also include a letter certifying that the fogging equipment attached to the finishing machine produces atomized water droplets with an average droplet diameter of 0.003 inches or less that are uniformly distributed at a rate of at least 0.10 gallons/square foot/hour
6. Consideration of weather conditions that can be anticipated at the time of placement of the deck concrete. When cold weather can be reasonably expected either within 7 days before the anticipated concrete placement, or during the 14 day wet curing period, the Contractor shall include detailed procedures for the production, transportation, and placement of the concrete, including: provisions for enclosures to protect the placed concrete, including a plan of heating devices, types and locations around structure and the means for holding the enclosure securely in place; cold weather curing procedures; and the means for monitoring the temperature of concrete during cold weather.

7. Equipment that will be used to measure ambient air temperature, concrete temperature and relative humidity of the air at the construction site.
8. The number of all other personnel, in addition to the ones already identified in bullets 4 and 5, who will be engaged in the concrete placement operation and their assigned tasks. All personnel, including the ones already identified in bullets 4 and 5, shall have the experience and skills appropriate to their working assignment
9. A contingency and backup plan in case of equipment failure.

A pre-placement meeting shall be held between the Contractor and the Engineer at least 2 weeks prior to the start of any concrete placement for the deck slab. The Contractor and the Engineer shall review all aspects of the approved Placement and Curing Plan.

Twenty four hours before the scheduled start of concrete placement, the Engineer shall verify that all equipment and materials identified in the Placement and Curing Plan are onsite and have been tested to insure that they are in working order and are functioning as required. Upon the successful completion of this verification, the Engineer shall allow the concrete placement to proceed. If any equipment or material such as burlap is missing or equipment is malfunctioning, the concrete placement operations shall be canceled and shall not be re-scheduled until such time as the missing equipment or material is delivered to the site or the equipment has been repaired and is demonstrated to be in working order and functioning as required. The Contractor shall be responsible for any costs associated with the cancellation and rescheduling of the concrete placement operation that is due to missing equipment or material or malfunctioning equipment.

B. Limitations on Placement.

The requirements of 901.64 shall be satisfied in addition to the requirement of this section. Cement concrete for bridge decks shall not be placed when the ambient air temperature exceeds 85°F (29°C) or is expected to exceed 85°F (29°C) during the placement of the deck.

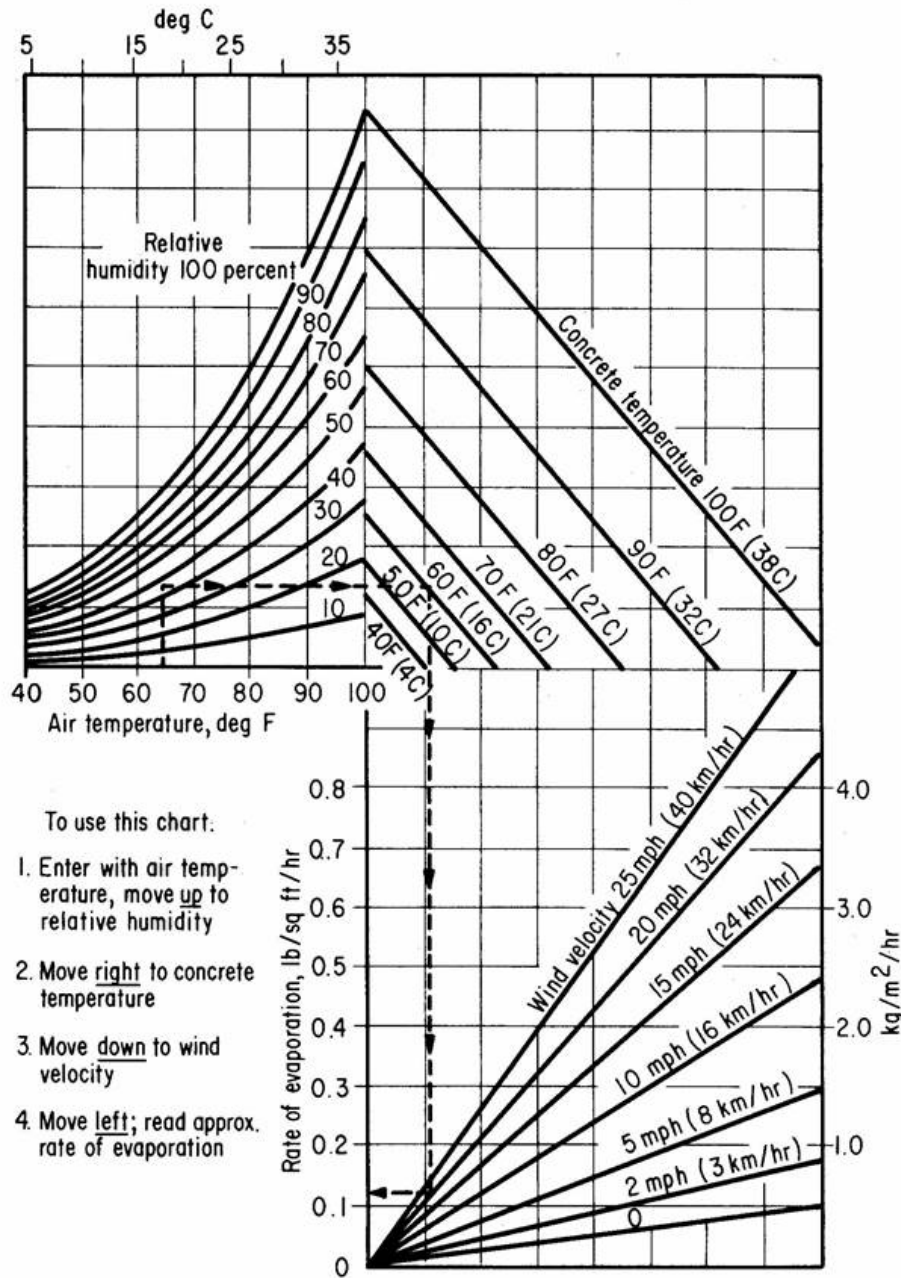
The evaporation rate of the exposed concrete surface shall not exceed 0.15 psf per hour. The deck surface evaporation rate shall be determined in accordance with Figure 901.66-1, obtained from ACI 305R-10.

The contractor shall determine the evaporation rate by measuring the ambient air temperature, relative humidity of the air at the construction site and concrete temperature prior to the placement of concrete and every hour thereafter until the end of the concrete placement, consolidation and finishing operation. Concrete temperature will be taken from the same sample used for slump and air content tests. To document the readings, Form 901.66 Bridge Deck Placement Environment will be provided by the Engineer and shall be filled out by the Contractor and returned to the Engineer.

The Contractor must provide suitable equipment and take appropriate actions as approved by the Engineer to maintain limit the evaporation rate to 0.15 psf per hour or less including one or more of the following actions:

1. Misting the surface of the concrete with pressurized equipment attached to the finishing machine until the curing cover is applied. The water mist shall be distributed at a rate of at least 0.10 gallons/square foot/hour. For example, on a deck that is 30 feet wide, the system must be able to apply at least 3.0 gallons of water per linear foot per hour. The nozzles must produce an atomized fog mist that will maintain a sheen of moisture on the concrete surface without ponding. The atomized water droplets shall have an average droplet diameter of 0.003 inches or less. The area of coverage from each nozzle shall overlap all adjacent coverage areas by at least 12 inches. Water that drips from the nozzles shall not be allowed to fall onto the concrete that is being cured.
2. Construct windscreens or enclosures to effectively reduce the wind velocity throughout the area of placement. If the use of windscreens is required, the windscreens shall consist of canvas barriers of suitable height erected on the windward side of the concrete placement.
3. Reduce the temperature of the concrete.
4. Reschedule the placement until such time as the environmental conditions are acceptable, such as at night or during early morning hours.

Figure 901.66-1: Deck Surface Evaporation Rate



D. Consolidation.

The concrete shall be consolidated by means of approved high frequency internal vibrators (9000 – 12,500 vibrations per minute in concrete) that shall be applied in a manner to ensure the consolidation of the concrete throughout the full depth of the deck in advance of the finishing machine. The Contractor shall use rubber vibrator heads or take other approved preventive measures to ensure that the vibrators will not damage the epoxy coated reinforcement. The Contractor shall have approved vibrators in service for each placement operation in accordance with the following schedule and a minimum of two backup vibrators in case of equipment failure,

Table 901.66-1: Minimum Number of Internal Concrete Vibrators Required

Concrete Placement Rate	Number of Vibrators Required
Between 35 and 60 cubic yards per hour	3
Greater than 60 cubic yards per hour	4

These vibrators shall be in operation in addition to the surface vibratory action from the vibrating pan(s) of the finishing machine. Consolidation by the vibrators shall leave the concrete free from voids and insure a dense surface texture, but the vibration of the concrete shall not be continued so long as to cause segregation or bleeding. A small uniform quantity of concrete shall be maintained ahead of the screed on each pass. At no time shall the quantity of concrete carried ahead of the screed be so great as to cause slipping or lifting.

SUBSECTION 965: MEMBRANE WATERPROOFING FOR NEW BRIDGE DECKS

SUBSECTION 965 Membrane Waterproofing for New Bridge Decks.

(page II.552) Add this new section.

SUBSECTION 965: MEMBRANE WATERPROOFING FOR NEW BRIDGE DECKS

DESCRIPTION

965.20: General

Membrane waterproofing systems are defined as a thin impermeable membrane that is used to protect the concrete deck from penetration of moisture and deicing chemicals.

The work to be performed shall consist of the furnishing and application of an approved membrane system and all concrete surface preparation work necessary to install the membrane system. The membrane waterproofing system applied to the surface of the bridge deck as indicated on the plans shall consist of the primer, spray applied membrane (either methyl methacrylate, polyurea, or polyurethane methyl methacrylate), aggregate keycoat, and polymer modified tack coat.

MATERIALS

965.30: General

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

Spray Applied Waterproofing Membrane M9.08.1

CONSTRUCTION METHODS

965.40: Submittals

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

1. Initial submission (at least 30 days prior to application):
 - The membrane system to be installed.
 - The manufacturer’s installation instructions for the applicable system
 - Safety data sheets (SDS) for all components
 - Cleaning solvents approved by the membrane manufacturer
2. At the pre-application meeting (at least 14 days prior to application):
 - Manufacturer’s written approval of the Applicator’s qualifications.
 - List of personnel performing the installation, inspection, and testing.
 - Installation procedure including storage and protection instructions as well as handling and mixing instructions.
 - List of application equipment to be used.

- Manufacturer's written approval of the proposed polymer modified tack coat and the application rate that it shall be applied at.
 - Certificate of Compliance certifying that the aggregate for the keycoat meets the required hardness.
3. A minimum of 48 hours prior to installation a certificate of analysis for the proposed polymer modified tack coat shall be submitted by the Supplier of the tack coat to the Engineer for approval.
 4. Upon completion of installation:
 - All QC installation test results for the tests specified in the materials section, including the name, address, and contact person of the laboratory that performed the tests and the date of the tests.
 - A Certificate of Compliance, from the membrane waterproofing system manufacturer, certifying that the membrane waterproofing system materials meet the requirements of the manufacturer and the contract specifications.

965.41: Preconstruction

Membrane waterproofing shall be installed in accordance with the manufacturer's instructions. The handling, mixing, and addition of membrane components shall be performed in a safe manner to achieve the desired results in accordance with the manufacturer's recommendations. Care shall be taken to prevent adjacent areas from overspray or other contamination.

965.42: Applicator Qualifications

The Contractor applying the waterproofing system shall be certified by the membrane waterproofing system manufacturer and have at least 2 years of experience in membrane installation. The Engineer shall receive the manufacturer's written approval of the contractor's qualifications at least 30 days prior to the application of any system component. This approval shall apply only to the named individuals performing the application.

965.43: Material Delivery and Storage

All components of the membrane system shall be delivered to the site in the manufacturer's original packaging, clearly identified with the products type and batch number. The storage area for all components shall be cool, dry, out of direct sunlight, and comply with relevant health and safety regulations. Copies of safety data sheets for all components shall be given to the Engineer and kept on site at the Contractor's field office.

965.44: Pre-Application Meeting

A minimum of 14 days before the anticipated start of membrane application, the Contractor shall schedule and conduct a pre-application meeting at the site to review the approved submittals, and other pertinent matters related to the application including the schedule for coordination between trades. At a minimum, the Contractor, the subcontractor performing the application and the Engineer shall be present at the meeting.

965.45: Mockup to Validate Bond Strength

For those projects where the concrete will be aged less than 28 days the manufacturer shall concur that the system is acceptable for use with the shortened aging period and a mockup shall be required. The intent is to validate the bond strength using the membrane waterproofing manufacture's primer and membrane.

In order to emulate the actual placement conditions, the mockup shall take place as close as possible to the intended date of the waterproofing application but be a minimum of 7 days before concrete placement. The mockup activities shall be representative of what will take place during the specified final bridge placement. It shall include the placement and surface preparation of the concrete and installation of membrane waterproofing system.

Inspection and testing shall be in accordance with Tables 965.63-1 and 965.64-1. The results of moisture and adhesion testing performed on a mockup of the bridge deck and closure pours shall meet these specifications. The mockup shall simulate the actual job conditions in all respects including air temperature, transit equipment, travel conditions, admixtures, forming, placement equipment, and personnel. If the mockup is unable to validate that the waterproofing membrane meets the project requirements, then the Engineer may require the Contractor to conduct additional mockups.

Removal of the mockup after its completion shall be the responsibility of the Contractor. In addition to the requirements contained herein, all weather and concrete temperature requirements contained in Section 901 shall be satisfied.

Acceptance of the mockup shall be the responsibility of the Engineer.

965.46: Application

The installation procedure shall consist of preparation of the concrete surface and application of primer, membrane, aggregate keycoat, and polymer modified tack coat. Special attention shall be paid to the bridge deck surface preparation prior to the membrane waterproofing system application. The membrane system shall be installed in accordance with the manufacturer's requirements. The Contractor shall be responsible for the field testing including, but not limited to, adhesion bond testing, deck moisture content measurement, and all other required documentation and reporting.

The membrane waterproofing system shall not be applied in either wet, damp, or foggy weather, or when the ambient temperature is 40°F or below or is forecast to fall below 40°F during the application period. The temperature of the concrete deck surface shall also exceed the dew point by at least 5°F.

The membrane waterproofing shall not be placed until the Contractor is ready to follow within 24 hours with the first layer of hot mix asphalt pavement. A longer period will be allowed only with prior written approval from the Engineer.

Where the areas to be waterproofed are bound by a vertical surface including, but not limited to, a curb or a wall, the membrane waterproofing system shall be continued up the vertical as necessary. A neat finish with well-defined boundaries and straight edges shall be provided.

A. Concrete Surface Preparation

Concrete surfaces which are to be waterproofed shall be screeded to the true cross section and sounded. All spalls and depressions shall be repaired prior to the application of the primer. Depressions shall be filled to a smooth flush surface with 1:2 mortar (1-part cement to two parts sand) or an approved rapid setting patching mortar that is compatible with the membrane waterproofing system. Other surfaces shall be trimmed free of rough spots, projections, or other defects which might cause puncture of the membrane so that the surface profile of the prepared concrete surface shall not exceed a ¼ inch amplitude, peak to valley.

The use of resin or wax-based deck curing membranes are not acceptable. Unless a mockup is completed in accordance with 965.45, the concrete shall be aged a minimum of 28 days, including curing time, before application of the membrane waterproofing system.

Immediately prior to the application of the primer, the concrete to which the membrane is to be applied shall be cleaned of all existing bond inhibiting materials in accordance with ASTM D4259 or as required by the manufacturer. Dust or loose particles shall be removed using clean, dry, oil-free compressed air or industrial vacuums. The surface preparation shall produce a clean dry surface and ensure that the concrete surface is free of asphaltic product, surface laitance, oil staining, soiling, and dust.

Any exposed steel components to receive membrane waterproofing shall be blast cleaned in accordance with the Society for Protective Coatings (SSPC) SSPC-SP6 or as required by the manufacturer and coated with the membrane waterproofing system within the same work shift.

B. Applying Primer

The primer shall only be applied when the temperature of the concrete deck surface exceeds the dew point by at least 5°F and when the concrete deck surface has a moisture content of 5% or less, as confirmed by a portable electronic surface moisture meter supplied by the Contractor.

The primer shall be applied in a manner to ensure full coverage and shall consist of one coat with an overall coverage rate of 125-175 ft²/gallon unless otherwise recommended in the manufacturer's written instructions. All components shall be measured and mixed in accordance with the manufacturer's recommendations. The primer shall be spray applied using a single or multiple component spray system approved for use by the manufacturer. If required by site conditions, brush or roller application shall be allowed. The primer shall be allowed to cure tack-free for a minimum of 30 minutes or as required by the manufacturer's instructions, whichever time is greater, prior to application of the first lift of waterproofing membrane.

A second coat of primer shall be required if the first coat is absorbed by the concrete. The membrane shall be applied within the primer re-coat drying time allowed by the manufacturer but in no case shall it exceed 24 hours. Beyond this period, the surface shall be prepared again and re-primed following the manufacturer's recommendations prior to membrane application.

C. Applying Membrane

The waterproofing membrane shall be applied following the approved mixing and application procedure. The membrane shall be spray applied, with the mixing of the two components taking place at the nozzle and shall be applied to the primed deck in accordance with the manufacturer's instructions. The spray equipment shall be controlled so that the quantities applied may be monitored and shall allow for coverage rates to be checked.

Following the application of the membrane waterproofing system, the cured surface shall be visually inspected. If any defects or pinholes are found, an appropriate quantity of membrane material shall be mixed and repaired in accordance with Subsection 965.46 Part D. In all cases, the thickness of the repair shall be sufficient to bring the area up to the specified thickness. The thickness of the repair patch, measured over peaks, shall be a minimum of 80 mils or the thickness used to pass the ASTM C1305 Crack Bridging Test, whichever is greater.

For multi-stage construction, the subsequent stage membrane application shall overlap the existing cured membrane from the previous stage to form a continuous layer with a 6-inch overlap onto the existing membrane. The existing membrane shall be cleaned of all contamination including tack coat material or dirt to an edge distance of a least 6 inches and wiped with a solvent as approved by the membrane waterproofing manufacturer.

D. Repairs

If an area of membrane requires repair or if the membrane becomes damaged, a patch repair shall be carried out to restore the integrity of the membrane waterproofing system. The damaged area shall be cut back to sound materials and wiped with a solvent up to a width of at least 6 inches beyond the periphery of the damaged area, removing contaminants. The concrete shall be primed as necessary followed by the application of the membrane. A continuous layer shall be obtained over the concrete with a 6-inch overlap onto the existing membrane. The solvent shall be as approved by the membrane waterproofing manufacturer. Repairs shall comply with the manufacturer's guidelines for any over-coating times.

Where the membrane is to be joined to existing cured material and at joints, the new application shall overlap the existing membrane/joint by at least 4 inches. The existing membrane/joint shall be cleaned of all contamination including tack coat material or dirt to an edge distance of a least 6 inches and wiped with a solvent as approved by the membrane waterproofing manufacturer.

If pin holes or holidays are observed in the membrane surface they shall be repaired in accordance with the manufacturer's instructions and the approved Contractor Quality Control Plan (QC Plan).

In all cases, the thickness of the repair shall be sufficient to bring the area up to the specified thickness. The thickness of the repair patch, measured over peaks, shall be a minimum of 80 mils or the thickness used to pass the ASTM C1305 Crack Bridging Test, whichever is greater.

E. Applying Aggregate for Keycoat

Following the membrane application, an additional layer of membrane or resin, compatible with the membrane, shall be spray applied to a thickness of 30 to 40 mils into which an aggregate approved by the membrane manufacturer shall be broadcast ensuring a minimum coverage of 95%. The application rate shall be designated by the manufacturer. Loose aggregate shall be removed with brooms or oil/moisture-free compressed air before applying the tack coat.

For multi-stage construction, the aggregate keycoat of the previous stage shall be applied to a limit of 6-inches from the stage construction joint to allow the subsequent stage membrane material to bond directly to the existing membrane. The application of the aggregate keycoat for the subsequent stage shall cover the 6-inch overlap.

F. Applying Tack Coat

The polymer modified tack coat shall be applied in accordance with the membrane manufacturer's recommendations after a minimum of three hours from initial membrane application. The tack coat shall be allowed to cool for a minimum of 1 hour prior to HMA paving. The tack coat application rate shall be in accordance with the manufacturer's recommendation. The application rate of the tack coat shall be set at a rate that achieves the specified residual rate and coverage. Tack coat shall be applied to cover a minimum of 95% of the membrane surface. The tack coat application shall be monitored by Quality Control personnel in accordance with the approved QC Plan.

G. HMA Pavement Over Membrane

Placement of the HMA surface shall be in accordance with Section 450 and the contract specifications. During paving, a light soap spray should be applied to the paving equipment wheels to prevent tack coat pick-up.

965.47: Protection of Exposed Surfaces

The Contractor shall exercise care in the application of the waterproofing membrane system to prevent surfaces not receiving treatment from being spattered or marred, such as the face of curbs, copings, finished surfaces, substructure exposed surfaces, and outside faces of the bridge. Any material that spatters on these surfaces shall be removed and the surfaces cleaned to the satisfaction of the Engineer.

CONTRACTOR QUALITY CONTROL

965.60: General

The Contractor shall provide a Quality Control System (QC System) and, when required, a QC Plan, adequate to ensure that all materials and workmanship meet the required quality levels for each specified Quality Characteristic. The Contractor shall provide qualified QC personnel and QC laboratory facilities and perform Quality Control inspection, sampling, testing, data analysis, corrective action (when necessary), and documentation as outlined further below.

965.61: Contractor Quality Control Plan

The Contractor shall provide and maintain a QC Plan which should sufficiently document the QC processes of all Contractor parties (i.e. Prime Contractor, Subcontractors, Producers) performing work required under this specification.

A. QC Plan Submittal Requirements

At the pre-construction meeting, the Contractor shall be prepared to discuss the QC Plan. Information to be discussed shall include the proposed QC Plan submittal date, QC organization, and sources of materials. The Contractor shall submit the QC Plan to the Engineer for approval not less than 30 days prior to the start of any work activities related to membrane waterproofing installation (including preparation of underlying surface) addressed in Subsections 965.40 thru 965.47. The Contractor shall not start work on the subject work items without an approved QC Plan.

B. QC Plan Format and Contents

The QC Plan shall be structured to follow the format and section headings outlined in the MassDOT Model QC Plan. The pages of the QC Plan shall be sequentially numbered. The QC Plan shall address, in sufficient detail, the specific information requested under each section and subsection contained in the MassDOT Model QC Plan.

C. QC Plan Approval and Modifications

Approval of the QC Plan will be based on the inclusion of the required information. Revisions to the QC Plan may be required prior to approval for any part of the QC Plan that is determined by the Department to be insufficient. Approval of the QC Plan does not imply any warranty by the Engineer that the QC Plan will result in completed work that complies with the specifications. It remains the responsibility of the Contractor to demonstrate such compliance. The Contractor may modify the QC Plan as work progresses when circumstances necessitate changes in Quality Control personnel, laboratories, or procedures. In such case, the Contractor shall submit an amended QC Plan to the Department for approval a minimum of three calendar days prior to the proposed changes being implemented.

965.62: Quality Control Personnel Requirements

The Contractor's Quality Control organization shall, at a minimum, consist of the personnel qualified by the manufacturer to perform the required inspection and testing. Every effort should be made to maintain consistency in the QC organization; however, substitution of qualified personnel shall be allowed. When circumstances necessitate substitution of QC personnel not originally listed in the approved QC Plan, the Contractor shall submit an amended QC Plan for approval in accordance with Subsection 965.61 Part C.

965.63: Quality Control Inspection

The Contractor shall perform QC inspection of all work items addressed under this specification. Inspection activities during placement may be performed by qualified production personnel (e.g. Skilled Laborers, Foremen, and Superintendents). However, the Contractor's QC personnel shall have overall responsibility for QC inspection. The Contractor shall not rely on the results of the Engineer's Acceptance inspection for QC purposes. The Engineer shall be provided the opportunity to monitor and witness all QC inspection.

QC inspection activities must address the following four primary components:

- a) Equipment
- b) Materials
- c) Environmental Conditions
- d) Workmanship

The minimum frequency of QC inspection activity shall be in accordance with the requirements below and as outlined in the approved QC Plan. The Contractor shall document the results and findings of QC inspection.

The quality of each waterproofing membrane surface will be inspected and evaluated on the basis of Lots and Sublots. A Lot is defined as an isolated quantity of work which is assumed to be produced by the same controlled process. A Lot shall constitute no greater than the entire waterproofing membrane surface area on the bridge deck completed within the same construction season using the same placement process. Each Lot shall be divided into Sublots of equal sizes unless specified otherwise below.

All inspection reports shall be submitted to the Engineer within 72 hours of the test completion.

A. QC Inspection for Preparation of Underlying Surface

The Contractor's personnel will perform QC inspection during preparation of the underlying surface in accordance with the requirements of Subsection 965.46 Part A. The minimum items to be inspected shall be as outlined in Table 965.63-1. The Contractor shall identify in the QC Plan the specific inspection activities necessary to ensure the quality of the work, including any additional inspection activities not specifically listed in the table.

B. QC Inspection for Placement of Waterproofing Membrane

The Contractor's QC personnel will perform QC inspection at the site of waterproofing membrane field placement to ensure that the production and placement processes are providing work conforming to the contract and manufacturer requirements. The minimum items to be inspected for each waterproofing membrane Lot shall be in accordance with the requirements of Subsection 965.43 thru Subsection 965.47 and as outlined in Table 965.63-1. The Contractor shall identify in the QC Plan the specific inspection activities necessary to ensure the quality of the work, including any additional inspection activities not specifically listed in the table. Inspection shall include:

- a) Pin Hole/Holidays: The surface of the membrane shall be inspected for pin holes and/or holidays. All pin hole/holidays shall be located, marked for repair, documented, and repaired in accordance with a repair procedure developed by the manufacturer and approved by the Engineer.
- b) Coverage Rates: Rates for all layers shall be monitored by checking quantity of material used against the area covered.
- c) Visual inspections shall be conducted throughout the application process. The Contractor shall take progress photos for incorporation with the final review report to the Engineer.

Table 965.63-1 - Minimum QC Inspection of Waterproofing Membrane Operations

Inspection Component	Inspection Attribute	Minimum Inspection Frequency	Point of Inspection	Inspection Method
Equipment	As specified in QC Plan	Per QC Plan	Per QC Plan	Per QC Plan
Materials	Primer (Correct Type)	Per QC Plan	Per QC Plan	Check Manufacturer COC
	Membrane (Correct Type)	Per QC Plan	Per QC Plan	Check Manufacturer COC
	Aggregate (Correct Type)	Per QC Plan	Per QC Plan	Check Manufacturer COC
	Tack Coat (Correct Type)	Per QC Plan	Per QC Plan	Check Manufacturer COC
Environmental Conditions	Temperature of Air & Underlying Surface	1 per Day	At Project Site	Check Measurement
	Underlying Surface (Soundness)	Per QC Plan	Underlying Surface	Visual Check
	Surface (Standing Moisture)	Per QC Plan	Underlying Surface & Membrane Surface	Visual Check
	Surface (Cleanliness)	Per QC Plan	Underlying Surface & Membrane Surface	Visual Check
Workmanship	Pin Hole/Holidays	Per QC Plan	Membrane Surface	Visual Check
	Membrane Coverage Rate	Per QC Plan	From Distributor	Check Measurement
	Aggregate Coverage Rate	Per QC Plan	Membrane Surface	Visual Check
	Tack Coat Application Rate	Per QC Plan	From Distributor	Check Measurement

965.64: Quality Control Sampling and Testing Requirements

The Contractor's QC personnel will perform QC sampling and testing at the site of membrane waterproofing placement to ensure that the production and placement processes are providing work conforming to the contract and manufacturer's requirements. The Engineer will not sample or test for Quality Control or assist in controlling the Contractor's operations. All QC sampling and testing shall be in accordance with the current AASHTO, ASTM, NETTCP, or Department procedures specified in Table 965.64-1. The Contractor shall furnish approved containers for all material samples. The Engineer shall be provided the opportunity to monitor and witness all QC sampling and testing.

The following testing shall be conducted and recorded on a test report form to be submitted to the Engineer. All reports shall be submitted to the Engineer within 72 hours of the test completion.

- a) Deck moisture: The concrete deck's surface moisture content shall be measured to determine if it is suitable to allow for installation to proceed.
- b) Primer Adhesion: Random tests for adequate tensile bond strength shall be conducted in accordance with ASTM D7234 using the membrane Manufacturer's primer. Minimum bond strength of 100 psi and failure in the concrete will be required for acceptance. Testing shall be at a frequency of 1 test per 5,000 square feet with a minimum of 3 tests per day. Areas smaller than 5,000 square feet shall receive a minimum of 3 tests.
- c) Film Thickness:
 - Wet film thickness shall be checked every 300 square feet in accordance with ASTM D4414 using a gauge pin or standard comb type thickness gauge or a magnetic gauge. Film thickness checks shall be carried throughout the application process.
 - Dry Film Thickness: If the membrane waterproofing system cures too quickly to perform wet film thickness testing, dry film thickness shall be checked every 300 square feet in accordance with ASTM D6132 using magnetic or ultrasonic gauges or using a destructive method. If a destructive method is used, areas shall be repaired in accordance with Subsection 965.46 Part C.
- d) Membrane Adhesion: Random tests for adequate tensile bond strength shall be conducted in accordance with ASTM D7234 using the membrane Manufacturer's primer and membrane. The portion of the membrane to be tested shall be separated from the rest of the membrane surface prior to performing the test so only that portion under the dolly receives the tensile force. A minimum bond strength of 100 psi and failure in the concrete will be required for acceptance. Testing shall be at a frequency of 1 test per 5,000 square feet with a minimum of 3 tests per day. Areas smaller than 5,000 square feet shall receive a minimum of 3 tests.

The Contractor shall take a representative sample of the membrane from that day's installation. The samples shall consist of 2 10-inch by 10-inch square samples of the membrane with smooth surfaces. The primer and aggregate shall not be incorporated into the sample. The sample shall be sprayed separate from the bridge deck on a non-adhesive surface using the same application techniques used for the deck. These samples shall be peeled off the non-adhesive surface and be provided to the Engineer to be tested by the Department.

Table 965.64-1: Minimum Quality Control Sampling & Testing of Waterproofing Membrane Lots

Quality Characteristic	Test Method(s)	Sublot Size	Minimum Test Frequency	Point of Sampling	Engineering Limits
Deck Concrete Moisture	Manufacturer’s Recommendation	5,000 ft ²	1 per Sublot ⁽¹⁾	Deck Concrete Surface	≤ 5%
Primer Adhesion to Concrete	ASTM D7234	5,000 ft ²	1 per Sublot ⁽¹⁾	Primed Concrete Surface	≥ 100 psi minimum and failure in concrete
Film Thickness	Wet: ASTM D4414 Dry: ASTM D6132 or other approved method	300 ft ²	1 per Sublot ⁽¹⁾	Membrane Surface	≥ 80 mils minimum measured over peaks or ≥ Thickness used to pass ASTM C1305 (Whichever thickness is greater)
Membrane Adhesion to Concrete	ASTM D7234	5,000 ft ²	1 per Sublot ⁽¹⁾	Membrane Surface	≥ 100 psi minimum and failure in concrete

⁽¹⁾ In the event that the total daily production is less than three Sublots, a minimum of three random QC samples shall be obtained for the day’s production.

DEPARTMENT ACCEPTANCE

965.70: General

The Department is responsible for performing all Acceptance activities and making the final Acceptance determination for each membrane waterproofing surface. The Department’s Acceptance system will include monitoring the Contractor’s QC activity and performing Acceptance inspection and testing in order to determine the quality and corresponding payment for each Lot.

965.71: Acceptance Inspection

The Engineer will perform Acceptance inspection of all work items addressed under Section 965 to ensure that materials and completed work are in conformance with the contract requirements. Acceptance inspection is intended to visually assess the quality of each Lot produced and placed and will address only the inspection components of Materials and Workmanship in support of the Department’s final Acceptance determination.

All Acceptance inspection activities by the Department will be performed independent of the Contractor’s QC inspection.

Table 965.71-1 – Department Acceptance Inspection of Waterproofing Membrane Operations

Inspection Component	Inspection Attribute	Minimum Inspection Frequency	Point of Inspection	Inspection Method
Materials	Primer (Correct Type)	1 Per Day	At Placement Site	Check Manufacturer COC
	Membrane (Correct Type)	1 Per Day	At Placement Site	Check Manufacturer COC
	Aggregate (Correct Type)	1 Per Day	At Placement Site	Check Manufacturer COC
	Tack Coat (Correct Type)	1 Per Day	At Placement Site	Check Manufacturer COC
Workmanship	Pin Hole/Holidays	25% of Sublots	Membrane Surface	Visual Check
	Membrane Coverage Rate	25% of Sublots	From Distributor	Check Measurement
	Aggregate Coverage Rate	25% of Sublots	Membrane Surface	Visual Check
	Tack Coat Application Rate	25% of Sublots	From Distributor	Check Measurement

965.72: Acceptance Sampling and Testing Requirements

The 2 10-inch by 10-inch samples fabricated by the Contractor during installation shall be submitted to the Department for testing.

Table 965.72-1: Department Acceptance Sampling and Testing of Waterproofing Membrane Lots

Quality Characteristic	Test Method(s)	Engineering Limits
Minimum Thickness (Membrane only)	ASTM D6132 or other approved method	≥ 80 mils minimum measured over peaks or ≥ thickness used to pass ASTM C1305 (Whichever thickness is greater)
Percent Elongation at Break	ASTM D638	≥ 130%
Tensile Strength	ASTM D638 Type IV @ 2 in/min	> 1,100 psi
Shore Hardness	ASTM D2240 ⁽¹⁾	≥ 50 Type 00

⁽¹⁾ ASTM D2240 shall be modified in accordance with ASTM C836 Section 6.5.

965.73: Lot Acceptance Determination Based on Inspection Results

The Engineer’s Acceptance inspection results will be used in the final Acceptance determination for all Lots. Prior to final Acceptance of each Lot produced and placed, the Engineer will periodically evaluate all Acceptance inspection information for the prepared underlying surface and the Lot. The materials and product workmanship for the completed work will be evaluated for conformance with the plans and the requirements specified in Subsections 965.40 thru 965.47.

When the Acceptance information identifies deficiencies in either material quality or product workmanship for any underlying surface location or waterproofing membrane Sublot(s), the location or Sublot(s) will be isolated and further evaluated by the Engineer through additional Acceptance inspection (or sampling and testing, if relevant or possible). Depending upon the findings of the additional Acceptance inspection activity, the Engineer will determine the disposition of the nonconforming work in accordance with Division I, Subsection 5.03, Conformity with Plans and Specifications.

965.74: Lot Acceptance Determination Based on Testing Data

Evaluation of Testing Data

Prior to final Acceptance of each Lot produced and placed; the Engineer will periodically evaluate all available Acceptance testing data for the Lot.

Conformance with Engineering Limits

The Engineer will evaluate all Acceptance testing data and Contractor QC testing data for each Lot to determine conformance with the Engineering Limits in Tables 965.63-1 and 965.72-1. Each Sublot test value for the Acceptance Quality Characteristics identified in the tables shall be within the Engineering Limits.

If a Sublot test result is outside of the Engineering Limits, the Contractor and Engineer will further assess the Sublot quality to determine whether the material in the Sublot can remain in place. The Engineer will determine the disposition of the Sublot in accordance with Division I, Subsection 5.03, Conformity with Plans and Specifications.

If the Engineer's assessment determines that the material quality is not sufficient to permit the Sublot to remain in place the Sublot shall be removed and replaced. When a nonconforming Sublot is corrected or replaced, the Engineer will perform Acceptance testing of the Sublot and evaluate the test results for conformance with the Engineering Limits. Once the above requirements have been met, the Engineer will accept all completed Sublots.

965.75: Final Lot Acceptance Determination

For each Lot produced and placed, the Engineer will evaluate all Acceptance inspection and testing data for the Lot after all Sublots are complete in place. The final review and visual inspection shall be conducted jointly by the Contractor and Engineer. Irregularities or other items that do not meet the requirements of the specifications and plans shall be addressed/repared at this time, at no additional cost to the Department.

After each Lot is complete, including any corrective action, the Engineer will perform a final evaluation of all Acceptance data and Contractor QC data for the Lot. The Engineer will accept the Lot if the Engineer's evaluation of all inspection and testing data for the Lot is in conformance with this specification and the contract documents.

COMPENSATION

965.90: Method of Measurement

Membrane Waterproofing for Bridge Decks will be measured by the square foot of the membrane system complete in place with no allowance for overlapping or for edges turned up or carried into recesses for seals, except that the area of the full membrane turned down in back of the backwalls and extended up the face of the curb or under and in back of median curbs shall be included for payment.

965.91: Basis of Payment

Payment under this Item shall be made at the unit bid price per square foot, which includes the primer, spray applied membrane, aggregate for keycoat, polymer modified tack coat, and all labor, materials, equipment, safety devices, tools, inspections and incidentals necessary to complete all work specified under this Item.

965.92: Payment Items

965. Membrane Waterproofing for Bridge Decks Square Foot

SUBSECTION 966: MEMBRANE WATERPROOFING FOR BRIDGE DECK REPAIRS

SUBSECTION 966 Membrane Waterproofing for Bridge Deck Repairs.

(page II.552) Add this new section.

SUBSECTION 966: MEMBRANE WATERPROOFING FOR BRIDGE DECK REPAIRS

DESCRIPTION

966.20: General

Membrane waterproofing applied to the repaired deck surface as indicated on the plan and elsewhere as directed shall consist of one of the following systems:

- Sheet membrane - either reinforced rubberized asphalt or reinforced tar and resin.
- Hot applied rubberized asphalt membrane. This system shall not be used on grades in excess of 3 percent.

MATERIALS

966.30: General

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

Asphalt Emulsions.....	M3.03.1
Sheet Membrane.....	M9.08.2
Hot Applied Rubberized Asphalt Membrane	M9.08.3
Primer	M9.09.1

CONSTRUCTION METHODS

966.40: Application

A. Preparation of Surface

No waterproofing shall be done in wet, damp or foggy weather, nor when the ambient temperature is 40°F or below, without permission of the Engineer.

The membrane waterproofing on bridge deck repairs shall not be placed unless the Contractor is ready to follow within 24 hours with the first layer of hot mix asphalt pavement; a longer period of time will be allowed only with the approval of the Engineer.

Immediately prior to the membrane application, the concrete surface shall be thoroughly swept and blown clean with an air compressor to remove any loose debris. If the concrete surface is damp it shall be dried by use of a propane gas torch or similar equipment.

B. Applying Primer

The primer shall be applied to all surfaces at a rate of 0.015 gallon per square yard. The primer shall be thoroughly mixed and continuously agitated during application. It shall be applied by spray or squeegee. It shall thoroughly dry before application of the rubberized asphalt membrane. Should the membrane not be placed over the primed surface within 8 hours the surface shall be re-primed.

C. Applying Membrane

(1) Sheet Membranes

This system shall consist of the application of preformed reinforced rubberized asphalt membrane. Composition and dimensional requirements shall be as stipulated by the manufacturer of the sheet membrane.

Membrane Application

Membrane application shall be in accordance with the manufacturer's instructions. The preformed membrane sheets shall be applied to the primed surfaces either by hand or by mechanical applicators.

The membrane sheet shall be placed in such a manner that a shingling effect is achieved in the direction that water will drain. After being laid, the membrane sheets shall be rolled with hand rollers or other apparatus as necessary to develop a firm and uniform bond with the primed concrete surface. Wrinkles and air bubbles shall be eliminated to the extent possible.

A mastic, approved by the Sheet Membrane manufacturer, shall be applied as a bead along the exposed edge of the membrane sheet that extends up the barrier railing or curb face and that terminates in the high-side gutter after the sheets have been installed.

Any tears, cuts, or narrow overlaps shall be patched, using a satisfactory adhesive and by placing sections of membrane sheet over the defective area in such a manner that the patch extends at least 6 inches beyond the defect.

(2) Hot Applied Rubberized Asphalt Membrane

Membrane Application

Melting of the rubberized asphalt membrane shall be in accordance with the manufacturer's instructions. The kettle shall be equipped with a suitable agitator and temperature gauges for the kettle.

Sufficient lead time shall be allowed for heating of the rubberized asphalt so that it will be in a fluid state at the time scheduled for application. Caution should be observed that the melting temperature does not exceed the manufacturer's recommendation. When fluid, the material shall be drawn off in suitable containers and poured onto the primed and dried deck surface.

It shall be evenly spread with a special spray nozzle or silicone squeegees at a uniform rate to yield a coating at a minimum thickness of 1/8 inch and an average of 3/16 inch. All horizontal surfaces shall be completely covered and vertical surfaces (curbing, edging, etc.) shall be covered up to 4 inches above the deck surface.

Any defects shall be repaired in accordance with the manufacturer's recommendations prior to HMA pavement overlayment.

Immediately following the application of the hot applied rubberized asphalt membrane and before it cools, the protective covering shall be laid parallel to the roadway centerline covering the entire area of membrane waterproofing.

D. Repairs

If an area of membrane requires repair or if the membrane becomes damaged, a patch repair shall be carried out to restore the integrity of the membrane waterproofing system. The damaged area shall be cut back to sound materials to a width of at least 6 inches beyond the periphery of the damaged area, removing contaminants. The concrete shall be primed as necessary followed by the application of the membrane. A continuous layer shall be obtained over the concrete with a 6-inch overlap onto the existing membrane. The solvent shall be as approved by the membrane waterproofing manufacturer. Repairs shall comply with the manufacturer's guidelines.

Where the membrane is to be joined to existing cured material and at joints, the new application shall overlap the existing membrane/joint by at least 4 inches. The existing membrane/joint shall be cleaned of all contamination including tack coat material or dirt to an edge distance of a least 6 inches.

If pin holes or holidays are observed in the membrane surface they shall be repaired in accordance with the manufacturer's instructions.

E. Applying Tack Coat

Tack coat, meeting Subsection 966.30, shall be applied in accordance with the membrane manufacturer's recommendations after a minimum of three hours from initial membrane application. The tack coat application rate shall be in accordance with the manufacturer's recommendation. The application rate of the tack coat shall be set at a rate that achieves the specified residual rate and coverage.

F. HMA Pavement Over Membrane

Placement of the HMA surface shall be in accordance with Section 450 and the contract specifications. To eliminate any possible damage to the membrane and in accordance with Subsection 450.50, the HMA overlayment shall be applied as soon as possible. Caution must be observed to assure that the paver does not cause damage to the membrane. During paving, a light soap spray should be applied to the paving equipment wheels to prevent tack coat pick-up.

966.41: Protection of Exposed Surfaces

The Contractor shall exercise care in the application of the waterproofing membrane system to prevent surfaces not receiving treatment from being spattered or marred, such as the face of curbs, copings, finished surfaces, substructure exposed surfaces, and outside faces of the bridge. Any material that spatters on these surfaces shall be removed and the surfaces cleaned to the satisfaction of the Engineer.

CONTRACTOR QUALITY CONTROL

966.60: General

The Contractor shall provide Quality Control (QC) activities to ensure that their operations will provide waterproofing that conforms to the specified material and workmanship requirements.

966.61: Quality Control Inspection

The Contractor shall perform QC inspection of all work items addressed under this specification. Inspection activities during placement may be performed by qualified production personnel (e.g. Skilled Laborers, Foremen, and Superintendents). The Contractor shall not rely on the results of the Engineer's Acceptance inspection for QC purposes. The Engineer shall be provided the opportunity to monitor and witness all QC inspection.

QC inspection activities must address the following four primary components:

- a) Equipment.
- b) Materials.
- c) Environmental Conditions.
- d) Workmanship.

The minimum frequency of QC inspection activity shall be in accordance with the requirements below. The Contractor shall document the results and findings of QC inspection.

A. QC Inspection for Preparation of Underlying Surface

The Contractor's personnel will perform QC inspection during preparation of the underlying surface in accordance with the requirements of Subsection 966.40 Part A. The minimum items to be inspected shall be as outlined in Table 966.61-1.

B. QC Inspection for Placement of Waterproofing Membrane

The Contractor will perform QC inspection at the site of waterproofing membrane field placement to ensure that the production and placement processes are providing work conforming to the contract and manufacturer requirements. The minimum items to be inspected for each waterproofing membrane shall be in accordance with the requirements of Subsection 966.40 Parts C thru F and as outlined in Table 966.61-1. Inspection shall include:

- a) Pin Hole/Holidays: The surface of the membrane shall be inspected for pin holes and/or holidays. All pin hole/holidays shall be located, marked for repair, documented, and repaired in accordance with a repair procedure approved by the manufacturer.
- b) Visual inspections shall be conducted throughout the application process. The Contractor shall take progress photos for incorporation with the final review report to the Engineer.

Table 966.61-1 - Minimum QC Inspection of Waterproofing Membrane Operations

Inspection Component	Inspection Attribute	Minimum Inspection Frequency	Point of Inspection	Inspection Method
Equipment	As specified by Contractor	As specified by Contractor	As specified by Contractor	As specified by Contractor
Materials	Primer (Correct Type)	1 per Day	As specified by Contractor	Check Manufacturer COC
	Membrane (Correct Type)	1 per Day	As specified by Contractor	Check Manufacturer COC
	Tack Coat (Correct Type)	1 per Day	Per QC Plan	Check Manufacturer COC
Environmental Conditions	Temperature of Air & Underlying Surface	1 per Day	At Project Site	Check Measurement
	Underlying Surface (Soundness)	Entire Surface	Underlying Surface	Visual Check
	Surface (Standing Moisture)	Entire Surface	Underlying Surface & Membrane Surface	Visual Check
	Surface (Cleanliness)	Entire Surface	Underlying Surface & Membrane Surface	Visual Check
Workmanship	Pin Hole/Holidays	Entire Surface	Membrane Surface	Visual Check
	Membrane Coverage Rates	Entire Surface	From Distributor	Visual Check
	Tack Coat Application Rate	1 per Day	From Distributor	Check Measurement

DEPARTMENT ACCEPTANCE**966.70: General**

The Department is responsible for performing all Acceptance activities and making the final Acceptance determination for each membrane waterproofing surface. The Department's Acceptance system will include monitoring the Contractor's QC activity and performing Acceptance inspection in order to determine the quality and corresponding payment.

966.71: Acceptance Inspection

The Engineer will perform Acceptance inspection of all work items addressed under Section 966 to ensure that materials and completed work are in conformance with the contract requirements. Acceptance inspection is intended to visually assess the quality of the materials and work and will address only the inspection components of Materials and Workmanship in support of the Department's final Acceptance determination.

All Acceptance inspection activities by the Department will be performed independent of the Contractor's QC inspection.

Table 965.71-1 – Department Acceptance Inspection of Waterproofing Membrane Operations

Inspection Component	Inspection Attribute	Minimum Inspection Frequency	Point of Inspection	Inspection Method
Materials	Primer (Correct Type)	1 Per Day	At Placement Site	Check Manufacturer COC
	Membrane (Correct Type)	1 Per Day	At Placement Site	Check Manufacturer COC
	Tack Coat (Correct Type)	1 Per Day	At Placement Site	Check Manufacturer COC
Workmanship	Pin Hole/Holidays	Entire Surface	Membrane Surface	Visual Check
	Membrane Coverage Rates	Entire Surface	At Placement Site	Visual Check
	Tack Coat Application Rate	1 per day	At Placement Site	Check Measurement

966.72: Acceptance Determination

The Engineer's Acceptance inspection results will be used in the final Acceptance determination. Prior to final Acceptance, the Engineer will periodically evaluate all Acceptance inspection information for the prepared underlying surface and the waterproofing membrane. The materials and product workmanship for the completed work will be evaluated for conformance with the plans and the requirements specified in Subsections 966.40 and 966.41.

When the Acceptance information identifies deficiencies in either material quality or product workmanship for any underlying surface location or waterproofing membrane, the location will be isolated and further evaluated by the Engineer through additional Acceptance inspection. Depending upon the findings of the additional Acceptance inspection activity, the Engineer will determine the disposition of the nonconforming work in accordance with Division I, Subsection 5.03, Conformity with Plans and Specifications.

The final review and visual inspection shall be conducted jointly by the Contractor and Engineer. Irregularities or other items that do not meet the requirements of the specifications and plans shall be addressed/repared at this time, at no additional cost to the Department.

After the work is complete, including any corrective action, the Engineer will perform a final evaluation of all Acceptance data and Contractor QC data. The Engineer will accept the work if the Engineer's evaluation of all inspection data is in conformance with this specification and the contract documents.

COMPENSATION

966.90: Method of Measurement

Membrane waterproofing for bridge deck repairs will be measured by the square foot of surface covered with no allowance for overlapping or for edges turned up or carried into recesses for seals, except that the area of the full membrane turned down in back of the backwalls and extended under and in back of curb or edging will be included for payment.

966.91: Basis of Payment

The membrane waterproofing will be paid for at the contract unit price per square foot under the item for Membrane Waterproofing for Bridge Deck Repairs, complete in place. Tack coat shall be paid under item 452. Tack Coat.

966.92: Payment Items

966.	Membrane Waterproofing for Bridge Deck Repairs	Square Foot
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SUBSECTION 970: BITUMINOUS DAMP-PROOFING

SUBSECTION 970 Bituminous Damp-Proofing.

(page II.552) Replace this subsection with the following.

SECTION 970: DAMP-PROOFING

DESCRIPTION

970.20: General

Damp-proofing to be applied as shown on the plans shall consist of a primer and damp-proofing material. If material other than that specified herein is permitted to be used, the method of application shall conform to the published specifications of the manufacturer.

MATERIALS

970.30: General

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

Primer	M9.09.1
Damp-proofing	M9.09.2

CONSTRUCTION METHODS

970.40: General

Concrete surfaces shall be allowed to dry for a period of at least 5 days after the removal of forms before damp-proofing is applied.

Surfaces to be damp-proofed shall be made reasonably smooth and free from all projections and holes. All holes in concrete surfaces shall be satisfactorily filled with 1-part cement to 2 parts sand mortar before damp-proofing is applied. Concrete surfaces shall be properly cured before being damp-proofed. Surfaces shall be dry and immediately before the application of the damp-proofing shall be thoroughly cleaned of dust and all loose material. Damp-proofing shall not be done during wet, damp, or foggy weather, or when the ambient temperature is 40°F or below or is forecast to fall below 40°F during the application period. The temperature of the concrete surface shall also exceed the dew point by at least 5°F.

One coat of primer shall be uniformly applied to the surface in accordance with the manufacturer’s recommendation. The material for damp-proofing shall be mopped or sprayed on the designated surfaces in two coats. Application methods, rates, temperature constraints shall be as recommended by the manufacturer.

The initial coat of damp-proofing shall be allowed to dry thoroughly before a second coat is applied. The final coat shall be thoroughly dry before any fill is placed against it.

CONTRACTOR QUALITY CONTROL

970.60: General

The Contractor shall provide Quality Control (QC) activities to ensure that their operations will provide damp-proofing that conforms to the specified material and workmanship requirements.

970.61: Damp-proofing Materials and Workmanship

The Contractor shall verify that they are using the correct damp-proofing materials as specified under Subsection 970.30. All damp-proofing operations shall exhibit satisfactory workmanship including ensuring a dry, smooth, and clean concrete surface which is cured properly, as well as, correct application of the primer and damp-proofing.

DEPARTMENT ACCEPTANCE

970.70: General

The Department shall verify that the Contractor is correctly performing the work and QC activities.

970.71: Damp-proofing Materials and Workmanship

The Engineer will verify that the damp-proofing materials and workmanship conform with Subsection 970.61.

COMPENSATION

970.80: Method of Measurement

Damp-proofing will be measured by the actual area of surface covered in square foot.

970.81: Basis of Payment.

Damp-proofing will be paid for at the contract unit price per square foot of surface and shall include the primer and all materials, equipment and labor to install the damp-proofing complete in place.

970.82: Payment Items.

970.	Damp-Proofing	Square Foot
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DIVISION III MATERIALS SPECIFICATIONS

SECTION M1: SOILS AND BORROW MATERIALS

SECTION M1 Soils and Borrow Materials.

(page III.2) Replace the words "AASHTO T 11 and T 27" with "AASHTO T 311" where encountered in M1.02.0, M1.03.0, M1.04.1, M1.09.0 and M1.10.0.

SECTION M2: AGGREGATES AND RELATED MATERIALS

Subsection M2.01.0 Crushed Stone.

(page III.10) In table M2.01.0-1 under the column for M2.01.6 3/8 Inch Crushed Stone change the percent passing the No.4 sieve from 20-20 to 20-50.

Subection M2.01.7 Dense Graded Crushed Stone for Sub-base

(page III.11) Replace the second paragraph from the bottom of this subsection with the following:

Testing shall be in accordance with AASHTO T 311.

SECTION M3: ASPHALTIC MATERIALS

SECTION M3: ASPHALTIC MATERIALS

(page III.15) Replace this subsection with the following;

M3.00.0 General.

Asphaltic materials (also referred to as bituminous materials) include liquid asphalts as well as Hot Mix Asphalt (HMA) mixtures and other related materials. All asphaltic materials shall conform to the requirements of the specifications as designated hereinafter.

Unless otherwise stipulated, the sampling of liquid asphalt materials shall be in accordance with AASHTO R 66.

The following procedure shall be followed in obtaining liquid asphalt samples from pressure distributors or tankers used for the transport of liquid asphalt materials:

1. Distributors and tankers shall be equipped with approved sampling valves. The sampling valves on tankers shall be installed in the rear bulkhead approximately 1/3 of the height from the bottom. The sampling valves on pressure distributors may be located in the side of the tank somewhere in the middle third of the tank depth.
2. At least 1 gallon of material shall be drained off through the sampling valve and discarded before the sample is obtained.
3. Sample containers shall be new, clean and sealed with a tight-fitting cap. Washing of sample containers with solvents or water will not be permitted.

M3.01.0 Performance Graded Asphalt Binder.

Performance Graded Asphalt Binder (PGAB) delivered to a project or to an HMA plant must be accompanied by a Bill of Lading (BOL) signed by the asphalt binder Supplier's authorized representative in accordance with AASHTO R 26. Shipments of material not accompanied by a BOL will not be accepted for use in the work.

The PGAB Supplier and the Contractor shall perform random Quality Control (QC) sampling and testing of PGAB as specified in Subsection 450.65F(1). The Contractor shall furnish, to the Engineer, the PGAB Supplier's BOL for each truckload of asphalt binder shipped to the project or HMA plant. The Contractor shall also submit to the Engineer the Supplier's Certificate of Compliance (COC) along with copies of the Certificate of Analysis (COA) showing the certified AASHTO M 320 test results for each Supplier Lot of PGAB. The COA shall meet the requirements of AASHTO R 26. The Contractor shall maintain a copy of the COA for each Lot of PGAB used, with a copy attached to each sample obtained for testing.

The Contractor shall assist the Engineer in obtaining random Department Acceptance samples of PGAB from the HMA plant in accordance with AASHTO R 66 and as specified in Subsection 450.74C. Each sample shall be labeled with the PGAB grade, Supplier source and Lot number, sampling location, quantity represented, project name, plant, date, and the sampling inspector. When the PGAB is used for HMA production under Section 450 the sample shall be obtained from an in-line sample valve located between the asphalt tanks and mixing chamber at a sampling location downstream of all additive injection ports.

The Engineer will test the Department Acceptance samples for verification of the PGAB grade. The material shall conform to the specification requirements for the applicable performance grade as specified herein. Material not conforming to specification requirements shall be subject to corrective action, production suspension, rejection, or removal as determined by the Engineer.

The blending of binder of different grades or binder from different Suppliers at the HMA plants is strictly prohibited without the Engineer's approval. Contractors may switch to another approved source of binder, upon written notification to the Engineer, and by certifying that the tank to be utilized has been drained to an un-pumpable condition. The binder tanks at the HMA production facility shall be managed in a manner which prevents contamination.

Contractors who modify, blend PG binders, or add additives to the PGAB at the HMA production facility will be reclassified as a Supplier and shall be required to certify the binder in accordance with AASHTO R 26.

A copy of the COA for each Lot shall be provided in accordance with AASHTO R 26. The data reported shall meet the requirements of the specific binder specification:

1. For AASHTO M 320 – Table 1
2. For AASHTO M 332 – Table 1
3. For Crumb Rubber Modified Asphalt ASTM D6114-09 – Table 1

M3.01.1 Standard Asphalt Binder Grade.

The asphalt binder for HMA mixtures shall be a PGAB which meets the specification requirements of AASHTO Standard M 320. PGAB shall be provided by an Approved Supplier in accordance with AASHTO R 26. Approved Suppliers shall be listed on the MassDOT Qualified Construction Materials List (QCML).

Unless indicated otherwise on the Plans or in the Special Provisions, the standard PGAB Grade of **PG64-28** shall be used.

M3.01.2 Modified Asphalt Binder Grades.

When specified by the contract documents, the PGAB shall be modified in accordance with the following:

A. Polymer Modified Asphalt Binder

The polymer modified asphalt binder shall be a PGAB which meets the specification requirements of AASHTO M 332, however “E” grades will not be subject to the $J_{nr,diff}$ difference requirement. PGAB shall be provided by an approved Supplier in accordance with the AASHTO R 26. The modified PGAB Grade of **PG64E-28** shall be used.

B. Crumb Rubber Modified Asphalt Binder

The modified binder shall be in accordance with ASTM D6114-09, Type II. Virgin PGAB for the crumb rubber modified asphalt shall be a PG 58-28 or PG 64-28 provided by an approved Supplier in accordance with the AASHTO R 26. The grade selected shall be based on laboratory testing by the asphalt rubber Manufacturer.

The granulated rubber shall be vulcanized rubber product from the ambient temperature processing of scrap, pneumatic tires. The granulated rubber shall meet the gradation found in Table M3.1.

Table M3.1 – Crumb Rubber Gradation

Sieve Size	Percent by Weight Passing
#10	100
#16	90 – 100
#30	25 – 75
#80	0 – 20

The use of crumb rubber of multiple types from multiple sources is acceptable provided that the overall blend of crumb rubber meets the gradation requirements. The length of the individual rubber particles shall not exceed 1/8”. The rubber shall be certified by the crumb rubber Manufacturer.

The percent of crumb rubber shall be a minimum of 15% by weight of binder. The temperature of the asphalt shall be between 350°F and 400°F at the time of addition of the granulated crumb rubber. The asphalt and crumb rubber shall be combined and mixed together in a blender unit and reacted in the distributor for a period of time as required by design. The temperature of the asphalt rubber mixture shall be above 325°F during the reaction for a period of one hour.

M3.01.3 Asphalt Binder Grade for Recycled Asphalt Materials.

For any HMA mixture containing recycled asphalt materials, a binder that is softer than the standard asphalt binder shall be utilized in the mixture to account for the amount and stiffness of the recycled binder in accordance with Table M3.2.

If greater than 25% Reclaimed Asphalt Pavement (RAP) or any quantity of Recycled Asphalt Shingles (RAS) are used in an asphalt mixture, the virgin PGAB grade when blended with the RAP binder shall meet the binder grade specified by the project. The resulting final PGAB grade shall be in accordance with Table M3.2. Only PGABs meeting the requirements of AASHTO M 320 or M 323 will be used.

The type and amount of virgin asphalt binder to be used in the HMA mixture shall be included as part of the Laboratory Trial Mix Formula (LTMF). The Contractor shall submit certified test results from an AASHTO accredited laboratory showing the testing of the individual binders and the blending.

Table M3.2 – PGAB Grades for HMA Containing RAP/RAS

Amount of RAP in Mixture	Virgin PGAB Grade	Resulting PGAB Grade
≤ 25% RAP by Weight of Mixture	Project Specified Grade	Project Specified Grade
> 25% to 40% RAP by Weight of Mixture	Follow AASHTO M 323 Appendix X1	
≤ 5% RAS by Weight of Mixture	Follow AASHTO PP 78	

M3.01.4 Warm Mix Asphalt Additive.

All HMA shall be modified using a warm mix asphalt (WMA) additive. The WMA additive shall be evaluated by AASHTO's National Transportation Product Evaluation Program (NTPEP) and be listed on the MassDOT QCML. No WMA foaming technology which requires the mechanical injection of steam or water into the liquid asphalt will be permitted.

For HMA placed on bridge decks, the WMA additive shall not be used to lower the mixing and compaction temperatures. The mixing and compaction temperatures specified for the binder prior to addition of the WMA additive shall be used.

The WMA additive must be compatible with polyphosphoric acid modified binders, polymer modified binders, and anti-stripping agents. The WMA additive shall be introduced in accordance with the Manufacturer's dosing rates and approved blending methods.

The HMA mixture design shall incorporate the requirements of AASHTO R35 Appendix X2: Special Mixture Design Considerations and Practices for Warm Mix Asphalt (WMA). Laboratory mixing and compaction temperatures shall be reduced per the WMA Manufacturer's recommendations, however, the optimum laboratory compaction temperature for unmodified asphalt binders shall be less than 260°F. Target laboratory mixing and compaction temperatures shall be submitted to the Research & Materials Section (RMS) for review prior to performing a mix design.

When the asphalt binder is modified with the WMA additive at the HMA plant, all WMA additive equipment shall be fully automated and integrated into the plant controls and shall record actual dosage rates on the plant printouts. The Contractor's Quality System Manual shall provide mixture production and placement alterations due to the WMA additive and shall incorporate the modification of asphalt binders when the WMA additive is blended with the asphalt binder at the plant. This plan shall specifically address WMA metering requirements, tolerances and other Quality Control measures.

M3.01.5 Asphalt Anti-Stripping Additive.

An anti-stripping additive may be required in an HMA mixture to increase the resistance of the asphalt binder coating to stripping in the presence of water. An anti-stripping additive may be a liquid anti-strip or hydrated lime.

The Engineer may verify the effectiveness of the anti-strip used in an HMA mixture. When added at the dosage rate recommended by the Manufacturer to an HMA mixture showing moisture susceptibility, the anti-strip shall cause an improvement to the mixture's moisture susceptibility. This shall be determined by testing specimens with and without the liquid anti-strip additive in accordance with AASHTO T 324. If the antistrip does not show an improvement in the moisture susceptibility the additive will not be permitted for use.

The Manufacturer shall certify that the material is in accordance with this specification. The Manufacturer shall submit a COC for each Lot in accordance with Division 1 Section 6.0. The COC shall also include the:

1. Brand name and designation.
2. Composition or description of the anti-strip additive.
3. Manner in which the material will be identified on the containers.

A. Hydrated Lime

The hydrated lime for HMA shall conform to the requirements of AASHTO M 303.

B. Liquid Anti-Strip

The anti-strip Manufacturer shall submit product documentation, including the recommended dosage rate, to RMS for approval. Approved anti-strip additives shall be listed on the MassDOT QCML.

Anti-stripping additives shall be an organic chemical compound free from inorganic mineral salts or inorganic mineral soaps. The anti-strip additive shall be chemically inert to asphalt binder and shall not appreciably alter the specified characteristics of the asphalt binder. When blended with asphalt binder, it shall be stable and withstand storage at a temperature of 400°F for extended periods without loss of effectiveness.

M3.01.6 Asphalt Release Agents.

Approved asphalt release agents will be listed on the MassDOT QCML. The asphalt release agent shall not be detrimental to the HMA and shall not dissolve asphalt binder when applied to the truck bed. Dilution by diesel or other petroleum products will not be permitted.

Asphalt release agents shall be evaluated by AASHTO's National Transportation Product Evaluation Program (NTPEP). Release agents shall meet the following minimum requirements:

1. 7-Day Stripping Test
 - a. No stripping or discoloration when used in full strength and diluted forms.
2. Mixture Slide Test
 - a. 10.0 grams retained, maximum.
3. Asphalt Performance Test
 - a. Able to pull the cooled binder from the metal plate without adherence, a minimum of three pours.
4. Flash Point, ASTM D93
 - a. Have a flash point greater than 400°F on the undiluted product and contain no flammable materials, solvents, or petroleum elements.

The Manufacturer shall submit a Certificate of Compliance (COC) for each Lot of asphalt release agent in accordance with Division 1 Section 6.0. The COC shall also include the:

1. Brand name and designation.
2. Composition or description of the release agent.
3. Manner in which the material will be identified on the containers.

The Manufacturer shall certify that the material is in accordance with this specification. In addition, the Manufacturer shall furnish information for any dilution requirements, including the minimum dilution rate and special application requirements.

M3.02.0 Cutback Asphalts.

These materials shall be blends of asphalt cements and suitable solvents. They shall be homogeneous, free from water and conform to the requirements of AASHTO M 81 for the rapid curing type and AASHTO M 82 for the medium curing type.

M3.03.0 Asphalt Emulsions.**M3.03.1 Anionic Emulsified Asphalt.**

These materials shall conform to the requirements of AASHTO M 140. Anionic emulsion used for tack coat shall be grade **RS-1h**.

When supplied in 5-gallon buckets the anionic emulsion used for tack coat shall be grade **RS-1**.

M3.03.2 Cationic Emulsified Asphalt.

This material shall conform to the requirements of AASHTO M 208. Cationic asphalt emulsion used for tack coat shall be grade **CRS-1h**.

When supplied in 5-gallon buckets the cationic emulsion used for tack coat shall be grade **CRS-1**.

M3.03.3 Polymer Modified Emulsified Asphalt.

This material shall conform to the requirements of AASHTO M 316. Polymer modified asphalt emulsion used for tack coat shall be grade **CRS-1P**.

M3.05.0 Hot Poured Joint Sealer.

This sealer shall meet the requirements of ASTM D6690 Type II. Products shall be evaluated by the National Transportation Product Evaluation Program (NTPEP) as an HMA Crack Sealer (CS) and be listed on the MassDOT QCML.

M3.05.1 Asphalt-Fiber Joint and Crack Sealer.

This material shall consist of a blend of asphalt cement (PG64-28) and polyester fibers. The asphalt-fiber blend shall consist of 6% fiber by weight of asphalt binder.

M3.05.2 Preformed Bituminous Joint Filler for Concrete.

This material shall be a non-extruding and resilient bituminous type preformed expansion joint filler. It shall conform to the requirements of AASHTO M 213.

M3.05.3 Hot Applied Asphalt Crack Sealer.

This specification covers a hot applied crack sealer suitable for use in cement concrete and hot mix asphalt pavement. This sealer shall meet the requirements of ASTM D6690 Type II. Products shall be evaluated by the National Transportation Product Evaluation Program (NTPEP) as an HMA Crack Sealer (CS) and be listed on the MassDOT QCML.

M3.11.0 Hot Mix Asphalt.**M3.11.1 General.**

All Hot Mix Asphalt (HMA) mixtures shall meet the requirements of the Superpave volumetric mix design system as well as the following. Asphalt mixtures shall be composed of the following:

1. Mineral aggregate.
2. Mineral filler (if required).
3. Performance Graded Asphalt Binder (PGAB).

The use of recycled materials shall be at the Contractor's option in accordance with these specifications. And as permitted, recycled materials shall be limited to:

1. Recycled Asphalt Pavement (RAP).
2. Recycled Asphalt Shingles (RAS).
3. Processed Glass Aggregate (PGA).

Each HMA pavement course placed shall be compromised of one of the mixture types listed in Table 450.1HMA Pavement Courses & Mixture Types.

M3.11.2 Aggregate for Hot Mix Asphalt.**A. Coarse Aggregate**

The coarse mineral aggregate shall be clean, hard, durable, crushed rock consisting of the angular fragments obtained by breaking and crushing shattered natural rock, reasonably free from thin and/or elongated pieces, free from dirt or other objectionable materials. It shall be surface dry and shall have a moisture content of not more than ½ percent after drying. Aggregates from multiple sources of supply shall not be mixed or stored in the same stockpile.

B. Fine Aggregate

The fine aggregate shall consist of one of the following:

1. 100% Natural Sand.
2. 100% Stone Sand.
3. A blend of sand and stone screenings, the proportions of which shall be approved by the Engineer.
4. A blend of natural sand and stone sand.

Natural sand shall consist of inert, hard, durable grains of quartz or other hard, durable rock, free from topsoil or clay, surface coatings, organic matter or other deleterious materials.

Stone sand shall be a processed material prepared from stone screenings to produce a consistently graded material conforming to specification requirements.

Stone screenings shall be the product of a secondary crusher and shall be free from dirt, clay, organic matter, excess fines or other deleterious material.

C. Consensus Properties

Aggregates utilized in HMA mixtures, including RAP if used in the mixture, shall be tested for conformance with the Consensus Property requirements outlined in AASHTO M 323 Sections 6.2 to 6.6 and Table M3.5 below.

D. Source Properties

The coarse aggregate utilized in asphalt mixtures shall be clean, crushed rock consisting of the angular fragments obtained by breaking and crushing shattered natural rock. It shall be free from dirt or other objectionable materials. The coarse aggregate, including RAP if used in the mixture, shall be tested for conformance with the requirements indicated in Table M3.6. The specific gravity of each aggregate component shall be determined as specified in Table M3.7 below.

To determine the bulk specific gravity of RAP aggregate, the method outlined in FHWA Publication Number FHWA-HRT-11-021 "Reclaimed Asphalt Pavement in Asphalt Mixtures: State of the Practice" shall be used. The following excerpt is the method to be followed:

If the source of RAP is known and original construction records are available, the bulk specific gravity (BSG) value of the virgin aggregate from the construction records may be used as the BSG value of the RAP aggregate. However, if original construction records are not available, the recommended procedure for estimating BSG of the RAP aggregate is a simple three-step process as follows:

Determine the maximum theoretical specific gravity of the RAP mixture, G_{mm}^{RAP} , according to AASHTO T 209.

Calculate the effective specific gravity of the RAP aggregate, G_{se}^{RAP} , using G_{mm}^{RAP} , the asphalt content of the RAP mixture (P_b) and an assumed asphalt specific gravity (G_b) as follows:

$$G_{se}^{RAP} = \frac{100 - P_b}{\frac{100}{G_{mm}^{RAP}} - \frac{P_b}{G_b}}$$

Where $G_b = 1.030$.

The asphalt absorption, P_{ba} , shall be assumed to be 0.5%. Use this value to estimate the BSG of the RAP aggregate, G_{sb}^{RAP} , from the calculated G_{se}^{RAP} .

$$G_{sb}^{RAP} = G_{se}^{RAP} / \left(\frac{P_{ba} \times G_{se}^{RAP}}{100G_b} + 1 \right)$$

E. Recycled Asphalt Pavement

Reclaimed Asphalt Pavement (RAP) shall meet the requirements of Subsection M3.11.2C and D as well as the following. RAP shall consist of the material obtained from state highways or streets by crushing or milling existing HMA pavements. This material shall be transported to the HMA production facility yard and processed through an appropriate crusher so that the resulting material will contain no particles larger than the maximum aggregate size of the HMA mixture in which it will be used.

The RAP shall be stockpiled on a free draining base and kept separate from the other aggregates. RAP stockpiles shall be covered in a manner that prevents the intrusion of water but also allows the flow of air. The RAP stockpiles shall have a reasonably uniform gradation from fine to coarse and shall not be contaminated by foreign materials. The RAP used in the HMA mix production shall have a moisture content such that the final HMA contains no more than 0.5% moisture.

The use of RAP will be permitted at the option of the Contractor and provided that the end product is in conformance with the approved Job Mix Formula (JMF). The proportion of RAP to virgin aggregate shall be in accordance with Table M3.4 and Subsection M3.01.3.

Table M3.4 – Maximum Allowed RAP Content by Mix Type

Mix Type	Maximum Amount of RAP Allowed (%)	Maximum Amount of RAS Allowed (%) ⁽¹⁾
Friction Course (OGFC)	0	0
Friction Course (ARGG)	10	0
Surface Course	15	0
Leveling Course		5
Bridge Surface Course		0
Bridge Protective Course		0
Intermediate Course		5
Base Course	40	5

(1) When RAS is used in HMA mixtures containing RAP or other recycled materials, the RAS will be considered as part of the overall allowable weight of recycled materials in the mixture.

F. Recycled Asphalt Shingles

Recycled Asphalt Shingles (RAS) shall consist of only the by-product materials obtained from the roofing shingle manufacturing process. Post-consumer shingle waste and re-roofing shingle scrap will not be allowed. The Contractor or the plant shall provide certification from the roofing shingle manufacturer that RAS material provided is a by-product of the shingle manufacturing process. This material shall be transported to the HMA production facility yard and processed through an appropriate crusher so that the resulting material will contain no particles larger than ½ inch. The material shall be stockpiled on a free draining base and kept separate from the other aggregates. The material contained in the processed stockpile shall not be contaminated by foreign materials. RAS stockpiles shall be covered in a manner that prevents the intrusion of water but also allows the flow of air.

RAS may be used in HMA leveling courses, HMA intermediate courses, and HMA base courses at a maximum rate of 5% by weight. When RAS is used in HMA mixtures containing RAP or other recycled materials, the RAS will be considered as part of the overall allowable weight of recycled materials in the mixture.

G. Processed Glass Aggregate

The use of Processed Glass Aggregate (PGA) meeting the requirements of Subsection M2.01.8 may be added at a maximum addition rate of 10% by weight. This addition will only be allowed in base and intermediate mixtures. PGA in mixes containing RAP will be considered as part of the overall allowable mass of RAP in the mix. If PGA is used in the mix, a separate aggregate bin shall be used and the use of lime as an anti-stripping agent shall be required.

Table M3.5 – Aggregate Consensus Property Requirements

Traffic Level	Design ESALs (Millions) ⁽¹⁾	Fractured Faces, Coarse Aggregate, ⁽²⁾ % Minimum		Uncompacted Void Content of Fine Aggregate, % Minimum		Sand Equivalent, % Minimum	Flat and Elongated, ⁽²⁾ % Maximum
		All Courses (except Base Course)	Base Course	All Courses (except Base Course)	Base Course		
1	< 0.3	55/--	--/--	-- ⁽⁴⁾	--	40	--
2	0.3 to < 10	85/80 ⁽³⁾	60/--	45	40	45	10
3	≥ 10	95/90	80/75	45	40	45	10

(1) The anticipated project traffic level expected on the design lane over a 20-year period. Regardless of the actual design life of the roadway, determine the design ESALs for 20 years.
 (2) This criterion does not apply to 4.75 mm nominal maximum size mixtures.
 (3) 85/80 denotes that 85 percent of the coarse aggregate has one fractured face and 80 percent has two or more fractured faces.
 (4) For 4.75 mm nominal maximum size mixtures designed for traffic levels below 0.3 million ESALs, the minimum Uncompacted Void Content is 40.

Table M3.6 – Aggregate Source Property Requirements

Source Property Test	Test Method	Limit
Toughness	AASHTO T 96	< 30 %
Soundness	AASHTO T 104	< 10 %
Deleterious Materials	AASHTO T 112	< 0.5 %

Table M3.7 – Aggregate Specific Gravity Test Method

Aggregate Type	Test Method
Coarse	AASHTO T 85
Fine	AASHTO T 84 or ASTM D7370
Mineral Filler	AASHTO T 100
RAP	From FHWA-HRT-11-021

M3.11.3 Performance Graded Asphalt Binder.

The PGAB utilized in the HMA mixture shall be specified by the Contract and shall comply with the requirements of Subsection M3.01.0.

M3.11.4 Hot Mix Asphalt Mixture Design.

The Contractor shall be responsible for development of all HMA mixture designs. All HMA surface courses, intermediate courses, base courses, leveling courses, bridge surface courses, and bridge protective courses shall be supported by volumetric mixture designs using the Superpave mixture design system. All Superpave HMA designs shall be developed in accordance with the following AASHTO standards, as modified herein:

1. AASHTO M 323
2. AASHTO R 35
3. AASHTO T 312

Open Graded Friction Course (OGFC) and Asphalt Rubber Gap Graded (ARGG) mixtures shall be designed in accordance with Subsections M3.11.4G and M3.11.4H, respectively.

A. Development of Laboratory Trial Mix Formula

The Contractor shall develop and submit a Laboratory Trial Mix Formula (LTMF) for each HMA mixture type, which is to be proposed as a Job Mix Formula (JMF), a minimum of sixty (60) days prior to HMA production. Each LTMF shall be submitted with supporting documentation and adequate amount of blended aggregate material and PGAB in order to verify the LTMF.

Once verified by the Department, the LTMF may become the Job Mix Formula (JMF) for a project. Two or more JMFs per HMA type may be approved for a particular plant, however, only mixture conforming to one JMF is permitted to be produced and placed on any given day.

B. Estimated Design Traffic

The estimated traffic level to be used for HMA mix designs shall be specified by the contract. The traffic level shall be expressed in Equivalent Single Axle Loads (ESALs) for the design travel lane over a 20-year period in million 18-kip ESALs.

C. Specific Gravity Requirements

The individual aggregate, mineral filler, and PGAB specific gravities shall be included with the LTMF. The Contractor shall provide samples of each aggregate material a minimum of sixty (60) days prior to production for each LTMF to the Department for verification specific gravity of each stockpile.

D. Superpave Aggregate Gradation Requirements

The combined aggregate blend for each Superpave HMA mixture shall conform to the Gradation Control Point requirements specified in Table M3.8. The results of the selected optimum design aggregate structure shall be plotted on a 0.45 power chart and included with the LTMF.

The combined aggregate gradation shall be classified as coarse-graded when it passes below the Primary Control Sieve (PCS) control point as defined in Table M3.9. All other gradations shall be classified as fine graded.

When a Superpave Surface Course - 19.0 (SSC - 19.0) is specified in the contract, the LTMF aggregate gradation shall provide a fine-graded HMA mixture as defined in Table M3.9.

E. Gyrotory Compaction Criteria

Each asphalt mixture shall be designed and controlled during production using an approved gyrotory compactor which meets the requirements of AASHTO T 312. Compaction shall be in accordance with the requirements of AASHTO T 312. The density of each HMA mixture shall be evaluated at the initial number of gyrations (N_{initial}), the design number of gyrations (N_{design}), and the maximum number of gyrations (N_{max}). The gyrotory-compacted specimens for each LTMF shall meet the density requirements specified in Table M3.10 below.

F. Superpave Volumetric Design Requirements.

Each Superpave HMA mixture shall be designed in accordance with the volumetric mixture design specifications contained in AASHTO M 323 and procedures contained in AASHTO R 35, as modified herein. Each HMA mixture LTMF shall be tested for conformance with the following volumetric properties:

1. Air Voids at N_{design} (V_a).
2. Voids in the Mineral Aggregate at N_{design} (VMA).
3. Voids Filled with Asphalt at N_{design} (VFA).
4. Fines to Effective Asphalt Ratio ($P_{0.075} / P_{be}$).

The volumetric property test results shall be submitted with the LTMF for each Superpave HMA mixture. The required minimum or maximum criteria for each of the volumetric property tests are specified in Tables M3.10, M3.11, and M3.12.

Table M3.8 – Superpave Aggregate Gradation Control Points

Sieve	Nominal Maximum Aggregate Size – Control Points (% Passing)											
	#4 (4.75 mm)		3/8" (9.5 mm)		1/2" (12.5 mm)		3/4" (19.0 mm)		1" (25.0 mm)		1 1/2" (37.5 mm)	
Inches	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
2											100	
1 1/2									100		90	100
1							100		90	100		90
3/4					100		90	100		90		
1/2	100		100		90	100		90				
3/8	95	100	90	100		90						
#4	90	100		90								
#8			32	67	28	58	23	49	19	45	15	41
#16	30	55										
#30												
#50												
#100												
#200	6	13	2	10	2	10	2	8	1	7	0	6

Table M3.9 – Gradation Classification

PCS Control Point for Mixture Nominal Maximum Aggregate Size (% Passing)					
Nominal maximum aggregate size	3/8" (9.5 mm)	1/2" (12.5 mm)	3/4" (19.0 mm)	1" (25.0 mm)	1 1/2" (37.5 mm)
Primary control sieve	#8 (2.36 mm)	#8 (2.36 mm)	#4 (4.75 mm)	#4 (4.75 mm)	3/8" (9.5 mm)
PCS control point, % passing	47	39	47	40	47

Table M3.10 – Superpave Asphalt Mixture Design Laboratory Compaction Requirements

Traffic Level	Design ESALs (millions)	Number of Gyration			Percent Density of G _{mm} from Asphalt Mixture Gyratory Specimen		
		N _{ini}	N _{des}	N _{max}	N _{ini}	N _{des}	N _{max}
1	< 0.3	6	50	75	≤ 91.5	96.0	≤ 98.0
2	0.3 to < 10	7	75	115	≤ 90.5	96.0	≤ 98.0
3	≥ 10	8	100	160	≤ 89.0	96.0	≤ 98.0

Table M3.11 – Superpave Volumetric Requirements

	Nominal Maximum Aggregate Size					
	#4 (4.75 mm)	3/8" (9.5 mm)	1/2" (12.5 mm)	3/4" (19.0 mm)	1" (25.0 mm)	1 1/2" (37.5 mm)
P _b	LTMF Value					
G _{mb}						
G _{mm}						
V _a	4.0					
VMA	≥ 17.0	≥ 16.0	≥ 15.0	≥ 14.0	≥ 13.0	≥ 12.0
VFA	Table M3.12					
Dust/P _{bc} ⁽¹⁾	0.9 - 2.0	0.6 - 1.2	0.6 - 1.2	0.6 - 1.2	0.6 - 1.2	0.6 - 1.2
Mixture Temp	Unmodified PGAB ≤ 325°F Modified PGAB ≤ 350°F					
<p>(1) If the aggregate gradation passes beneath the PCS Control Point specified in M 323 Table 5, the dust-to-binder ratio range may be increased from 0.6-1.2 to 0.8-1.6 at the Engineer's discretion.</p> <p>(2) Laboratory mixing and compaction temperatures shall be based on the PGAB Certificate of Analysis. When additives such as WMA, polymers, and rubber are introduced the mixing and compaction temperatures may be modified from the PGAB COA. Temperature modifications shall be recommended by the binder Supplier and approved at the Engineer's discretion.</p>						

Table M3.12 – Superpave Asphalt Mixture VFA Requirements

Traffic Level	Design ESALs (Millions)	Voids Filled with Asphalt (VFA) Based on Nominal Maximum Aggregate Size					
		#4 (4.75 mm)	3/8" (9.5 mm)	1/2" (12.5 mm)	3/4" (19.0 mm)	1" (25.0 mm)	1 1/2" (37.5 mm)
1	< 0.3	70 - 80	70 - 80	70 - 80	70 - 80	67 - 80	64 - 80
2	0.3 to < 10	65 - 78	65 - 78	65 - 78	65 - 78	65 - 78	64 - 78
3	≥ 10	75 - 78	73 - 76	65 - 75	65 - 75	65 - 75	64 - 75

G. Open Graded Friction Course Design Requirements

Each OGFC asphalt mixture shall be designed in accordance AASHTO PP 77, as modified herein. The combined aggregate gradation shall conform to Table M3.13 and the mixture shall conform to Table M3.14.

1. OGFC-P will utilize asphalt binder meeting the requirements of Subsection M3.01.2A.
2. OGFC-AR will utilize asphalt binder meeting the requirements of Subsection M3.01.2B.

Table M3.13 – OGFC Aggregate Gradation Control Points

Sieve	Nominal Maximum Aggregate Size Control Points (% Passing)	
	3/8" (9.5 mm)	
Inches	Min	Max
1	-	-
3/4	-	-
1/2	100	-
3/8	85	100
#4	20	40
#8	5	15
#200	0	4

Table M3.14 – OGFC Mixture Requirements

Property	Requirement
N _{des} , gyrations	50
P _b , % (Polymer)	≥ 6.5
P _b , % (Asphalt Rubber)	≥ 7.5
V _a , %	18 – 22
VCA _{mix} , %	< VCA _{DRC}
Draindown, % ⁽¹⁾	≤ 0.3
Abrasion Loss, % ⁽²⁾	≤ 15
Moisture Susceptibility, % ⁽³⁾	≥ 70
Permeability, in/sec ⁽⁴⁾	≥ 0.0178
(1) Draindown shall be tested in accordance with AASHTO T 305 at the production temperature. (2) Abrasion loss shall be tested in accordance with AASHTO TP 108. (3) Moisture susceptibility shall be tested in accordance with AASHTO T 283. (4) Permeability shall be performed in accordance with the procedure outlined by RMS.	

H. ARGG Design Requirements

Each Asphalt Rubber Gap Graded (ARGG) asphalt mixture shall be designed in accordance with the AASHTO M 323 and procedures contained in AASHTO R 35, as modified herein. The combined aggregate gradation shall conform to Table M3.15 and the mixture shall conform to Table M3.16.

ARGG will utilize asphalt binder meeting the requirements of Subsection M3.01.2B.

Table M3.15 – ARGG Aggregate Gradation Control Points

Sieve	Nominal Maximum Aggregate Size Control Points (% Passing)	
	½" (12.5 mm)	
Inches	Min	Max
1	-	-
¾	100	-
½	90	100
⅜	83	87
#4	28	42
#8	14	22
#200	0	6

Table M3.16 – ARGG Mixture Requirements

Property	Requirement
N _{des} , gyrations	100
P _b , %	≥ 7.6
V _a , %	3 – 6
VMA, %	18 – 23
Draindown, % ⁽¹⁾	≤ 0.3
(1) Draindown shall be tested in accordance with AASHTO T 305 at the production temperature.	

M3.11.5 Verification of Laboratory Trial Mix Formula.

The Contractor shall submit an LTMF in accordance with Subsection M3.11.4. The Engineer will perform laboratory verification of each LTMF.

If the Engineer is unable to verify the Contractor's LTMF in accordance with the applicable LTMF Verification Limits in Table M3.17, Table M3.18, or Table M3.19, then the Engineer will work with the Contractor to resolve the verification issue(s). The Contractor shall not proceed with production and placement of a Control Strip under Section 450 until the LTMF is verified by the Engineer.

Table M3.17 – Superpave LTMF Verification Limits

Properties	Test Method	LTMF Verification Limit
Asphalt Binder Content (P_b)	AASHTO T 308	Target \square 0.3%
Gradation Passing #4 (4.75 mm) and Larger Sieves	AASHTO T 30	Target \square 6.0%
Gradation Passing #8 (2.36 mm) Sieve		Target \square 5.0%
Gradation Passing #16 (1.18 mm) to #50 (0.30 mm) Sieve		Target \square 3.0%
Gradation Passing #100 (0.15 mm) Sieve		Target \square 2.0%
Gradation Passing #200 (75 μ m) Sieve		Target \square 1.0%
Bulk Specific Gravity (G_{mb})		AASHTO T 166
Max. Theo. Specific Gravity (G_{mm})	AASHTO T 209	Target \square 0.020
Air Voids (V_a)	AASHTO R 35	Target \square 1.0%
Voids in Mineral Aggregate (VMA)		Target \square 1.0%
Voids Filled With Asphalt (VFA)		Target \square 5.0%
Rutting and Moisture Susceptibility	AASHTO T 324	Table M3.20

Table M3.18 – OGFC LTMF Verification Limits

Properties	Test Method	LTMF Verification Limit
Asphalt Binder Content (P_b)	AASHTO T 308	Target \square 0.3%
Gradation Passing #4 (4.75 mm) and Larger Sieves	AASHTO T 30	Target \square 6.0%
Gradation Passing #8 (2.36 mm) Sieve		Target \square 5.0%
Gradation Passing #16 (1.18 mm) to #50 (0.30 mm) Sieve		Target \square 3.0%
Gradation Passing #100 (0.15 mm) Sieve		Target \square 2.0%
Gradation Passing #200 (75 μ m) Sieve		Target \square 1.0%
Bulk Specific Gravity (G_{mb})		AASHTO T 331
Max. Theo. Specific Gravity (G_{mm})	AASHTO T 209	Target \square 0.020
Air Voids (V_a)	AASHTO R 35	Target \square 2.0%
Voids in Mineral Aggregate (VMA)		Target \square 2.0%
Voids Filled with Asphalt (VFA)		Target \square 5.0%
Draindown	AASHTO T 305	\leq 0.3%
Abrasion Loss	AASHTO TP 108	\leq 15%
Tensile Strength Ratio	AASHTO T 283	\geq 70%

Table M3.19 – ARGG LTMF Verification Limits

Properties	Test Method	LTMF Verification Limit
Asphalt Binder Content (P_b)	AASHTO T 308	Target \square 0.3%
Gradation Passing $\frac{3}{4}$ " (19.0 mm) Sieve	AASHTO T 30	Target \square 0.0%
Gradation Passing #4 (4.75 mm) to $\frac{1}{2}$ " Sieve		Target \square 6.0%
Gradation Passing #8 (2.36 mm) Sieve		Target \square 5.0%
Gradation Passing #16 (1.18 mm) to #50 (0.30 mm) Sieve		Target \square 3.0%
Gradation Passing #100 (0.15 mm) Sieve		Target \square 2.0%
Gradation Passing #200 (75 μ m) Sieve		Target \square 1.0%
Bulk Specific Gravity (G_{mb})		AASHTO T 166
Max. Theo. Specific Gravity (G_{mm})	AASHTO T 209	Target \square 0.020
Air Voids (V_a)	AASHTO R 35	Target \square 1.0%
Voids in Mineral Aggregate (VMA)		Target \square 1.0%
Draindown	AASHTO T 305	\leq 0.3%
Rutting and Moisture Susceptibility	AASHTO T 324	Table M3.20

Evaluation of Rutting and Moisture Sensitivity

Each HMA mixture, with the exception of Base Courses and OGFC, shall be tested by RMS for rutting and moisture sensitivity in accordance with the requirements of AASHTO T 324 using the Hamburg Wheel-Tracking Device (HWTD).

The Engineer may also require that mixtures meet the requirements of AASHTO T 283 with a minimum tensile strength ratio of 80%.

Table M3.20 – Hamburg Wheel Tracking Device Requirements

Traffic Level	Maximum Rut Depth Inches (mm)	Minimum number of passes before Stripping Inflection Point is observed
1	½ (12.5)	10,000
2		15,000
3		15,000

M3.11.6 HMA for Driveways, Sidewalks, Berm, and Curb.

HMA mixtures for driveways, sidewalks, berm, and curb shall conform to the master ranges in Table M3.21. The PGAB shall conform to Subsection M3.01.1. The Contractor shall submit a Job Mix Formula (JMF) prior to production which shows the target aggregate gradation and PG asphalt binder content for each HMA mixture for driveways, sidewalks, berm, and curb.

With the approval of the Engineer, the Contractor may substitute a MassDOT approved 9.5 mm or 12.5 mm Superpave Surface Course mixture (Traffic Level 1 or 2) for Driveways and Sidewalks.

The Contractor shall perform QC testing at the start of plant production and in conjunction with the calibration of the plant in order to verify that the JMF can be produced within the Engineering Limits specified in Table M3.22.

The composition limits in Table M3.21 are HMA mix design master ranges for aggregate gradation and asphalt binder content. The JMF for each HMA mixture type shall establish a single percentage of aggregate passing each required sieve size, and a single percentage of asphalt binder material to be added to the aggregate.

The JMF shall be submitted in writing by the Contractor to the Engineer at least 30 days prior to the start of paving operations and shall include the following as a minimum:

1. Source of materials.
2. Percent of each aggregate stockpile.
3. Percent passing each sieve size.
4. Combined aggregate specific gravity.
5. Percent of asphalt binder.
6. Performance grading test results and Certificate of Compliance certifying the PG grade.
7. Mixing temperature.
8. Compaction temperature.
9. Temperature of mix when discharged from the mixer.
10. Maximum theoretical specific gravity of the mixture.

AASHTO T 195 (Ross Count) with a coating factor of 98% will be used when necessary to evaluate proper mixing time.

The use of recycled materials will be permitted at the option of the Contractor and provided that the end product is in conformance with the designated JMF. The proportion of reclaimed materials (including RAP, PGA, and RAS) in the total mix shall be limited to a maximum of 15%.

All HMA JMFs for sidewalks, pedestrian curb ramps, driveways, and berm will be submitted to the Engineer for approval. The JMF shall bind the Contractor to furnish paving mixtures not only within the master ranges, but also conforming to the exact formula thus set up for the project, within the Engineering Limits found in Table M3.22.

For each project, at least one QC sample shall be randomly obtained by the Contractor for every 2,000 tons produced, but not less than one QC sample per day. The Engineer shall also obtain a minimum of one random Acceptance sample for every 2,000 tons produced. The sample will be tested for conformance with the submitted JMF and Engineering Limits. When testing shows the mixture is not in conformance the Engineer will determine the disposition in accordance with Section 6.04 of Division I.

The JMF for each mixture shall be in effect until modified in writing by the Contractor and approved by the Engineer. Should a change in sources of materials be made, a new JMF must be approved by the Engineer before the new material is used.

Table M3.21 – Master Ranges for HMA for Driveways, Sidewalks, Berm, and Curb

Mixture Type	Nominal Maximum Aggregate Size Control Points (% Passing)			
	Driveways, Sidewalks, and Berm		Berm and Curb Only	
	Min	Max	Min	Max
Sieve (Inches)				
1	-	-	-	-
3/4	100	-	-	-
1/2	95	100	100	-
3/8	87	93	87	93
#4	57	69	62	73
#8	41	45	52	55
#16	30	36	40	45
#30	21	25	28	34
#50	14	17	18	23
#100	9	12	10	14
#200	4	5	6	6
P _b , %	6.0	6.6	7.4	7.6

Table M3.22 – Engineering Limits for Aggregate Gradation and Asphalt Binder Content

Sieve Designation / Binder Content	Engineering Limits
Passing No. 4 and larger sieve sizes	JMF Target ± 6%
Passing No. 8 sieve	JMF Target ± 5%
Passing No. 16 to No. 50 sieves (inclusive)	JMF Target ± 3%
Passing No. 100 sieve	JMF Target ± 2%
Passing No. 200 sieve	JMF Target ± 1%
Asphalt Binder Content	JMF Target ± 0.4%

M3.11.7 Cold Patch for Temporary Patching.

When HMA is not available due to seasonal limitations the Contractor shall use stockpiled cold patch mixtures approved by the Research & Materials Section.

M3.11.8 Stress Absorbing Membrane & Stress Absorbing Membrane Interlayer.

All Stress Absorbing Membrane (SAM) and Stress Absorbing Membrane Interlayer (SAMI) mixtures shall meet the requirements as specified below. SAM & SAMI mixtures shall be composed of the following:

1. Mineral aggregate
2. Performance Graded Asphalt Binder

A. Aggregate.

The aggregate shall conform to Subsection M3.11.2. Crushed gravel stone will not be permitted. The aggregate shall be pre-heated to a temperature between 200°F and 300°F, and be pre-coated with 0.4% to 0.8% asphalt binder (by weight of aggregate) prior to application. The aggregate shall meet the requirements in Tables M3.23 and M3.24.

Table M3.23 – SAM & SAMI Aggregate Control Points

Type	Nominal Maximum Aggregate Size – Control Points (% Passing)					
	3/8" (9.5 mm)		1/2" (12.5 mm)		3/8" (9.5 mm) SAMI ONLY	
Sieve (Inches)	Min	Max	Min	Max	Min	Max
5/8	100	-	100	-	100	-
1/2	100	-	90	100	100	-
3/8	85	100	25	65	85	100
#4	0	8	0	8	0	30
#8	0	4	0	4	0	5
#200	0	2	0	2	0	2

Table M3.24 – SAM & SAMI Aggregate Source Property Requirements

Source Property Test	Test Method	Limit
Toughness	AASHTO T 96	< 30 %
Flakiness Index (For SAM)	TEX-224-F ⁽¹⁾	< 20%
Flakiness Index (For SAMI)	TEX-224-F ⁽¹⁾	< 30%
(1) Determined following TxDOT’s Test Procedure for Determining Flakiness Index.		

B. Performance Graded Asphalt Binder.

The PGAB binder to be applied to the pavement shall be in conformance with Subsection M3.01.2B. Asphalt binder that is pre-coated onto the aggregate shall be in conformance with Subsection M3.01.1.

M3.11.9 Ultrathin Bonded Overlay

All Ultrathin Bonded Overlay (UTBO) mixtures shall meet the requirements as specified below. UTBO mixtures shall be composed of the following:

1. Mineral aggregate.
2. Mineral filler (if required).
3. Performance Graded Asphalt Binder (PGAB).

The use of recycled materials will not be permitted.

A. Coarse Aggregate.

Coarse aggregate shall meet the requirement of M3.11.2A. Where coarse aggregates for these mixes are from more than one source or of more than one type of material, they shall be proportioned and blended to provide a uniform mixture.

B. Fine Aggregate.

Fine aggregate shall meet the requirement of M3.11.2B as well as one of the following. Fine aggregate shall be 100% crushed and consist of one of the following:

1. 100% Stone Sand.
2. A blend of stone sand and stone screenings.

Table M3.25 – Fine Aggregate Consensus Property Requirements

Source Property Test	Test Method	Limit
Sand Equivalence	AASHTO T 176	> 60 %
Methylene Blue	AASHTO T 330	≤ 10 mg/g

C. Mineral Filler

Hydrated lime, fly ash, baghouse fines, and cement are acceptable as mineral filler.

Typical acceptable gradation: #30 - 100% passing
 #200 - 75-100% passing

D. Performance Graded Asphalt Binder.

The PGAB utilized in the HMA mixture shall be specified by the Contract and shall comply with the requirements of Subsection M3.01.2.

E. UTBO Mixture Design.

The Contractor shall be responsible for development of all UTBO mixture designs. All UTBO designs shall be developed in accordance with the requirements specified below.

F. Development of Laboratory Trial Mix Formula

The Contractor shall develop and submit a Laboratory Trial Mix Formula (LTMF) for each UTBO mixture type, which is to be proposed as a Job Mix Formula (JMF), a minimum of sixty (60) days prior to UTBO production. Each LTMF shall be submitted with supporting documentation and adequate amount of blended aggregate material and PGAB in order to verify the LTMF. Once verified by the Department, the LTMF may become the Job Mix Formula (JMF) for a project.

G. Specific Gravity Requirements

The individual aggregate, mineral filler, and PGAB specific gravities shall be included with the LTMF. The Contractor shall provide samples of each material a minimum of sixty (60) days prior to production for each LTMF to the Department for verification specific gravity of each stockpile.

H. UTBO Aggregate Gradation Requirements

The combined aggregate blend for each UTBO mixture shall conform to the Gradation Control Point requirements specified in Table M3.26. The results of the selected optimum design aggregate structure shall be plotted on a 0.45 power chart and included with the LTMF.

Table M3.26 – UTBO Aggregate Control Points

Type	Nominal Maximum Aggregate Size – Control Points (% Passing)					
	Type 1		Type 2 ⁽¹⁾		Type 3 ⁽¹⁾	
	Min	Max	Min	Max	Min	Max
Sieve (Inches)						
¾	100	-	100	-	100	-
½	100	-	92	100	85	100
3/8	85	100	55	90	45	85
#4	24	40	24	41	24	41
#8	21	32	21	33	21	33
#16	16	26	15	26	15	26
#30	12	20	11	20	11	20
#50	8	16	8	16	8	16
#100	5	10	5	10	5	10
#200	5	7	4	7	4	7

(1) When asphalt rubber is specified the gradation master ranges may be modified with the prior approval from the Research & Materials Section.

I. UTBO Mixture Requirements

The combined mixture for each UTBO mixture shall conform to the mixture requirements specified in Table M3.27. The results of the selected optimum design shall be included with the LTMF.

Table M3.27 – UTBO Mixture Requirements

Property	Requirement
P _b , % (Polymer)	4.8 – 5.2
P _b , % (Asphalt Rubber) ⁽¹⁾	5.8 – 6.2
Draindown, % ⁽²⁾	≤ 0.1
Moisture Susceptibility, % ⁽³⁾	≥ 80

(1) Type 1 UTBO shall not use asphalt rubber.
 (2) Draindown shall be tested in accordance with AASHTO T 305 at the production temperature.
 (3) The mixture shall be compacted according to AASHTO T 312 and tested in accordance with AASHTO T 283.

J. Verification of Laboratory Trial Mix Formula.

The Contractor shall submit an LTMF in accordance with Subsections M3.11.9A to M3.11.9I. The Engineer will perform laboratory verification of each LTMF.

If the Engineer is unable to verify the Contractor’s LTMF in accordance with the applicable LTMF Verification Limits in Table M3.28, then the Engineer will work with the Contractor to resolve the verification issue(s). The Contractor shall not proceed with production and placement of a Control Strip under Section 467 until the LTMF is verified by the Engineer.

Table M3.28 – UTBO LTMF Verification Limits

Properties	Test Method	LTMF Verification Limit
Asphalt Binder Content (P _b)	AASHTO T 308	Target □ 0.3%
Gradation Passing ¾" (19.0 mm) Sieve	AASHTO T 30	Target □ 0.0%
Gradation Passing #4 (4.75 mm) and Larger Sieves		Target □ 6.0%
Gradation Passing #8 (2.36 mm) Sieve		Target □ 5.0%
Gradation Passing #16 (1.18 mm) to #50 (0.30 mm) Sieve		Target □ 3.0%
Gradation Passing #100 (0.15 mm) Sieve		Target □ 2.0%
Gradation Passing #200 (75 µm) Sieve		Target □ 1.0%
Draindown		AASHTO T 305
Tensile Strength Ratio	AASHTO T 283	≥ 80%

M3.12.0 Hot Mix Asphalt Production Facility.

All facilities producing HMA must be approved on an annual basis by the Department. All sources of materials used for the production of HMA must be approved by the Department prior to their use. Such materials shall include:

1. Coarse aggregate.
2. Fine aggregate.
3. Mineral filler.
4. Performance graded asphalt binder.
5. Modifiers and/or additives.

HMA production operations shall follow industry accepted best management practices including:

1. Aggregate handling and stockpile management.
2. Recycled asphalt pavement handling and stockpile management.
3. PGAB storage.
4. Plant process controls.
5. Silo loading.
6. Truck loading.

The plant shall meet the requirements of AASHTO M 156 as well as the following provisions. HMA plants meeting these requirements and which have been approved by RMS shall be listed on the MassDOT QCML.

An adequate quantity of each size aggregate, mineral filler and asphalt binder shall be maintained at the HMA plant site at all times while the plant is in operation to ensure that the plant can continuously produce mixtures that meet these specifications. The quantity of such materials shall never be less than one day's production capacity.

M3.12.1 Scales.

Plant and truck scales shall be certified:

1. At the start of each construction season, prior to use for MassDOT projects.
2. At intervals of not more than 90 calendar days.
3. Whenever the plant changes location.
4. At any time as requested by the Engineer.

M3.12.2 Calibration of Plant Equipment.

The plant's systems shall be calibrated:

1. At the start of each construction season, prior to use for MassDOT projects.
2. Whenever there is a significant change to the material.
3. Whenever a plant component supply system affecting the ingredient proportions has been repaired, replaced, or adjusted.
4. At any time as requested by the Engineer.

M3.12.3 Automatic Recordation.

Recordation equipment shall be provided. Each recorder shall include an automatic printer system. The printer shall be so positioned that the digital display and the printer can be readily observed within the plant's control room by the Engineer and the plant operator, simultaneously. The delivery ticket shall be printed with an original and at least one copy. The original shall be furnished to the Engineer at the paving site and the copy to the Engineer at the plant. The delivery ticket format shall be approved by RMS and will include the following information:

1. Company / plant location.
2. MassDOT contract number and/or distinct project name.
3. MassDOT mix ID number and/or distinct mix description.
4. Percentage of RAP in the mixture.
5. Percentage of asphalt binder in the mixture.
6. Date and time of loading.
7. Sequential load number for the contract for a 24-hour period.
8. Total weight of mix in truck (pay weight).

The following mixture production information shall also be provided:

For Batch Plants

1. Date mixed.
2. Time of batching.
3. Tare weight of aggregate weigh box.
4. Tare weight of PGAB weigh bucket.
5. Moisture content of recycled materials.
6. Target and actual cumulative or net weights as batched for each bin with a batch total for all net ingredients.
7. Target and actual weight of PGAB.
8. Total weight of mix in truck (pay weight).

Note: This information shall be included on the delivery ticket when the mix is batched directly into a truck. When the mix is batched and stored in a silo the information may be separate from the delivery ticket however it must be provided to the Engineer at the plant.

For Drum Plants

1. Percent of mixture as well as the target and actual production rate for each individual mix component including:
 - a. Aggregate
 - b. Mineral Filler
 - c. PGAB
 - d. Recycled materials
 - e. Additives
2. Moisture content of aggregates and recycled materials.
3. PGAB temperature.
4. Target and actual mix temperature.
5. Target and actual mix production rate.

Note: This information is not required to be included on the delivery ticket however it must be provided to the Engineer at the plant.

M3.12.4 Surge and Storage Silo Holding Time.

Unless otherwise permitted by the Engineer, the mixtures shall not be stored in surge and storage bins longer than the following:

1. Unheated and not insulated 2 hours
2. Unheated and insulated with heated gate 15 hours
3. Insulated and heated 24 hours

Note: In order to prevent excessive draindown, OGFC shall not be stored in a surge or storage bin for longer than two (2) hours. ARGG shall not be stored for more than six (6) hours.

M3.12.5 Asphalt Release Agents.

The plant shall have a method of applying MassDOT approved asphalt release agents to the haul units in accordance with the Manufacturer's recommendations. Spray systems may either be manual or automated but application of the release agent must be at the rate specified by the Manufacturer.

M3.12.6 Air Quality.

The plant shall be designed and operated to meet all current Federal and State air quality requirements.

M3.12.7 Equipment Failure.

If at any time the automatic proportioning or recording system becomes inoperative, the plant will cease all HMA production. Work will only be allowed to restart once all automatic controls and recording systems are functional.

M3.12.8 HMA Plant Facility Inspection.

The Engineer shall have access at any time to all parts of the plant for:

1. Inspections of the conditions and operations of the plant.
2. Confirmation of the adequacy of the equipment in use.
3. Verification of the character and proportions of the mixture.
4. Determination of temperatures being maintained in the preparation of the mixture.
5. Inspection of incidental related procedures.

M3.13.0 Hot Mix Asphalt Materials Testing Laboratory and Equipment.

M3.13.1 Contractor Quality Control Laboratory.

All Contractor QC testing shall be performed in laboratories that are approved by RMS and qualified through the NETTCP Laboratory Qualification Program (LQP) or accredited through the AASHTO Accreditation Program (AAP). All laboratories shall maintain a Quality System Manual (QSM) in accordance with the outline maintained by the Research & Materials Section.

1. Laboratories that perform HMA mix designs or QC testing under Section 450 shall at a minimum be qualified as a NETTCP LQP Category 2 laboratory.
2. Laboratories performing only QC testing shall be qualified as a NETTCP LQP Category 3 laboratory.
 - a. Contractors who do not produce mixtures under Section 450 will not be required to have their own laboratory at the production facility but will be required to either test at their central laboratory or hire a Consultant testing company to perform the QC testing required in the specification. The Contractor will still be required to maintain a QSM for the HMA Production Facility.

The Contractor's QC laboratory shall be qualified to perform all testing required by Table M3.29 as well as contract specifications.

Laboratories meeting these requirements, and which have been approved by the RMS shall be listed on the MassDOT QCML.

The Contractor's QC Manager shall have overall responsibility for ensuring that all laboratories utilized for Quality Control are in compliance with the requirements of the NETTCP LQP. This includes providing required AASHTO, ASTM, and NETTCP reference documents and ensuring that all required equipment and tools are properly functioning and calibrated.

The Engineer shall be permitted unrestricted access to inspect and review the Contractor's laboratory facility.

Along with the required testing capabilities the laboratory facilities shall meet the following:

1. Be kept clean and all equipment shall be maintained in proper working condition.
2. Provide adequate environmental control to the satisfaction of the Engineer and must be able to maintain an inside temperature of 68 to 86°F during working hours.
3. Adequate ventilation to remove dust and fumes from the laboratory.
4. Hot and cold potable water.
5. First aid kit and emergency eye wash station.
6. Multi-class ABC fire extinguisher.
7. A restroom shall also be made available within 500 ft of the laboratory during all work shifts. The restroom facilities shall be enclosed in a separate room with proper ventilation and comply with applicable sanitary codes as well as:
 - a. A flush toilet.
 - b. A sink with hot and cold running water.
 - c. A sewer or septic tank with connections.
 - d. Adequate rest room supplies.
 - e. Maintained environmental control and cleanliness.

M3.13.2 Department Acceptance Laboratory at HMA Production Facility

The Engineer shall be provided laboratory working space meeting the requirements of Subsection M3.12.1 as well as the following. A desk must be located in close proximity to the laboratory but be separated from the ovens, sieve shakers, and anything else that can cause poor air and sound quality. The Engineer's desk and laboratory space will not be shared with any other entity.

Contractors who do not produce mixtures under Section 450 will not be required to have a Department Acceptance Laboratory at the production facility but will be required to allow the Engineer to perform Acceptance testing at their central laboratory or Consultant testing company laboratory. These laboratories are still required to meet Subsection M3.12.1.

If the Engineer is unable to perform their duties either due to lack of working space, poor working conditions, or access to equipment it will be considered a laboratory facility deficiency. The Engineer will advise the Contractor in writing of any noted deficiencies concerning the laboratory facility, equipment, supplies, or testing personnel and procedures. Deficiencies shall be grounds for the Engineer to order an immediate stoppage of work until the deficiencies are corrected.

Unless approved by the Engineer, the plant, silos, and sample rack shall be in view of laboratory when performing testing under Section 450.

The Engineer shall be provided with the following:

A. Computer

For plants producing HMA in accordance with Section 450, the Engineer shall be furnished with a computer with high speed internet access which conforms to the requirements determined by RMS. The minimum requirements shall include:

1. The Engineer is required to have one (1) computer at the laboratory.
2. Computers shall be required to have the latest MS Office Professional with all security updates, Antivirus software with all current security updates maintained, and any other software required by RMS.
3. A laser printer with the capability to also scan and copy. The printer shall be compatible and connected to the laboratory's computer.

B. Testing Equipment

The Contractor shall supply the Engineer with the following equipment. This equipment shall only be utilized by the Engineer and shall be labeled as such. It shall be the Contractor's responsibility to maintain and replace equipment as needed.

1. For T 27 and T 30:
 - a. 12-inch sieve stack (2 inch to #200) with cover and pan.
 - b. Mechanical sieve shaker (only for Section 450 Category A Lots).
 - c. Electronic balance (only for Section 450 Category A Lots).
2. For T 166 and T 209:
 - a. Complete setup (only for Section 450).
3. For T 312:
 - a. Gyrotory mold.
4. For T 308:
 - a. Ignition oven sample basket.
 - b. Ignition oven and two (2) sample baskets (only for Section 450 Category A Lots).
5. Miscellaneous equipment such as sample buckets, scoops, pans, brushes, thermometers, etc.
6. Oven which meets AASHTO R 30 and is capable of storing the sample buckets for 3 samples (only for Section 450 Category A Lots).
7. Supply of sample boxes.
8. Sample rack which is a suitable sampling platform from which the Engineer is able to stand and sample the material in the truck bed adequately and safely. The rack shall:
 - a. Be of sturdy construction.
 - b. Be able to safely accommodate at least two people at a time (min. standing area of 4 ft x 4 ft).
 - c. Have a safe stairway that is attached to the sampling platform.
 - d. Be at a height which allows the Technician the ability to reach the HMA in the bed of any size truck safely and efficiently.
 - e. Have a mounted spot light to allow for sampling at night.
 - f. Be within 100 ft of the laboratory and visible from the laboratory.
 - g. Meet applicable OSHA standards.

Table M3.29 – Required Test Methods by Laboratory

Test Method	Description	Mix Design Laboratory	QC Laboratory	Department Acceptance Laboratory
AASHTO M 323	Superpave Volumetric Mix Design	X		
AASHTO R 30 ⁽¹⁾	Mixture Conditioning of HMA	X		
AASHTO R 35	Superpave Volumetric Design for Asphalt Mixtures	X		
AASHTO R 47	Reducing Samples of HMA to Testing Size	X	X	X
AASHTO R 66	Sampling of Asphalt Materials		X	
AASHTO R 76	Reducing Samples of Aggregate to Testing Size	X	X	
AASHTO R 79 ⁽²⁾	Vacuum Drying Compacted HMA Specimens		X	
AASHTO R 90	Sampling of Aggregates		X	
AASHTO R 97	Sampling Bituminous Paving Mixtures		X	X
AASHTO T 11	Material Finer Than #200 Sieve by Washing	X	X	X
AASHTO T 27	Sieve Analysis of Fine and Coarse Aggregates	X	X	X
AASHTO T 30	Sieve Analysis of Extracted Aggregate	X	X	X
AASHTO T 84	Specific Gravity and Absorption of Fine Aggregate	X		
AASHTO T 85	Specific Gravity and Absorption of Coarse Aggregates	X		
AASHTO T 96	Coarse Aggregate L.A. Abrasion	X		
AASHTO T 104	Soundness of Aggregates	X		
AASHTO T 166	Bulk Specific gravity of HMA	X	X	X
AASHTO T 176	Sand Equivalence	X		
AASHTO T 209	Theoretical Maximum Specific Gravity of HMA	X	X	X
AASHTO T 255	Moisture Contents of Aggregates		X	
AASHTO T 283 ⁽⁴⁾	Resistance of Compacted Asphalt Mixtures to Moisture-Induced Damage	X		
AASHTO T 304	Un-compacted Void Content of Fine Aggregate	X		
AASHTO T 305 ⁽³⁾	Draindown in Uncompacted Asphalt Mixtures	X		
AASHTO T 308	Asphalt Binder Content by Ignition Oven		X	X
AASHTO T 312	Density of HMA by Superpave Gyratory	X	X	X
AASHTO T 329	Moisture Control of HMA		X	X
AASHTO T 331 ⁽⁴⁾	Bulk Specific Gravity and Density of Compacted Asphalt Mixtures Using Automatic Vacuum Sealing	X	X	X
AASHTO T 335	Determining the Percentage of Fracture in Coarse Aggregate	X		
ASTM D3549	Thickness of Compacted HMA Specimens		X	
ASTM D4791	Flat & Elongated Particles in Coarse Aggregate	X		
ASTM D7370 ⁽²⁾	Relative Density and Absorption of Aggregate Using Combined Vacuum Saturation and Rapid Submersion	X		

(1) Two ovens shall be required; one to heat binder, aggregate, and mixing tools to mixing temperature and one to condition the loose mixture at the compaction or conditioning temperature.

(2) Optional test.

(3) Required for Open Graded Friction Course and Asphalt Rubber Gap Graded.

(4) Required for Open Graded Friction Course.

SECTION M5: PIPE, CULVERT SECTIONS AND CONDUIT

Subsection M5.03.10 Corrugated Plastic Pipe.

(page III.74) Replace this subsection with the following:

Pipe shall consist of corrugated polyethylene or polypropylene tubing, flare ends, couplings and fittings. Materials, dimensions, physical properties and fabrication shall be in accordance with AASHTO M 294, Type S or D or AASHTO M330 Type S or D. Perforated pipe shall meet Type SP, DP or CP.

SECTION M6: ROADSIDE DEVELOPMENT MATERIALS

Subsection M6.03.0 Long Term Seed Mixes for Lawns and Slopes.

(page III.79) In table M6.03.0-1 Grass Seed Requirements for Lawn Grass Areas change the proportion of Creeping Red and/or Chewing Fescue from 55% to 59% and change the proportion of Dutch White Clover from 5% to 1%. In table M6.03.0-2 Grass Seed Requirements for Slopes and Shoulders change Kentucky Blue Grass to Tall Fescue. Delete table M6.03.0-3 Grass Seed Requirements for Warm Season Mix.

Subsection M5.03.1 Short Term Erosion Control Seed.

(page III.79) Change the subsection number from M5.03.1 to M6.03.1. Change the table number from M5.03.1-1 to M6.03.1-1.

SECTION M9: MISCELLANEOUS MATERIALS

Subsection M9.08.0: Preformed Sheet Membrane

(page III.128) Replace this subsection with the following:

M9.08.0: Waterproofing Membranes

M9.08.1: Spray Applied Waterproofing Membrane

A. General Requirements

Only products listed on the MassDOT Qualified Construction Materials List (QCML) will be accepted for use. The membrane waterproofing system shall consist of:

- Primer
- One or two coat rapid curing cold liquid spray applied seamless methyl methacrylate, polyurea, or polyurethane methyl methacrylate membrane
- Aggregate keycoat
- Polymer modified tack coat

B. Material Requirements

The total minimum base thickness for the membrane shall be 80 mils measured over peaks. The membrane shall easily accommodate the need for day joints and patch repairs. The membrane shall be able to bridge live cracks up to 1/8 inch in width and meet the criteria specified in Table M9.08.1-2.

The membrane waterproofing system shall be asbestos-free. The chemical composition of the primer, membrane, aggregate keycoat and tack coat that make up the membrane waterproofing system shall conform to the manufacturer's specifications for the material. All components shall be approved by the manufacturer as being compatible for use with the specified membrane. Cleaning solvents shall also be approved by the manufacturer for use with the membrane.

Primer for Spray Applied Membrane

The primer shall promote adhesion of the membrane to the concrete surface.

Table M9.08.1-1: Primer Material Properties

Property	Test	Requirements
Gel Time		> 5 minutes
Tack Free Time		< 2.5 hours, max at 77°F
Adhesion to Concrete	ASTM D7234	≥ 100 psi minimum and failure in concrete

Membrane

The membrane shall be meet the requirements in Table M9.08.1-2.

Table M9.08.1-2: Spray Applied Waterproofing Membrane Material Properties

Property	Test	Requirements
Solids Content		100%
Stability	ASTM C836	≥ 6 months
Crack Bridging (Neat Material + Aggregated Keycoat)	ASTM C1305 ⁽¹⁾	Pass, no cracking
Extensibility after Heat Aging	ASTM C1522	For information only
Percent Elongation at Break	ASTM D638	≥ 130%
Tensile Strength	ASTM D638 Type IV @ 2 in/min	≥ 1,100 psi
Shore Hardness	ASTM D2240 ⁽²⁾	≥ 50 Type 00
Minimum Thickness (Membrane only)	ASTM D6132 or other approved method	≥ 80 mils minimum measured over peaks or ≥ thickness used to pass ASTM C1305 (Whichever thickness is greater)
Membrane Waterproofing System Adhesion to Concrete	ASTM D7234	≥ 100 psi minimum and failure in concrete
Permeance	ASTM E96 Water Method, Procedure B	≤ 1.0 perms

⁽¹⁾ ASTM C1305 shall be modified to 25 cycles at -15°F no failure at 1/8 inch per hour.

⁽²⁾ ASTM D2240 shall be modified per ASTM C836 section 6.5.

Aggregate for Keycoat

The broadcast aggregate shall be durable and provide shear resistant to prevent the hot mix asphalt (HMA) from shoving. Aggregate shall have a minimum Mohs hardness rating of seven (7) and be approved by the manufacturer.

Polymer Modified Tack Coat

The tack coat shall consist of either a polymer modified asphalt emulsion, or a polymer modified asphalt binder approved for use by the membrane waterproofing manufacturer and the Engineer. The tack coat shall be either supplied by the membrane waterproofing manufacturer or by a MassDOT approved asphalt emulsion Supplier.

C. Material Qualification

A manufacturer requesting approval of a spray applied membrane system shall furnish to the Research and Materials Section the following:

1. The membrane system material specifications including product performance data.
2. Certified independent test reports demonstrating conformance to Table M9.08.1-2.
 - The independent lab shall be recognized by the National Cooperation for Laboratory Accreditation (NACLA) in Construction Materials Engineering and Testing (CMET) or an equal program approved by Research and Materials.
 - All testing shall be performed by one independent lab unless approved by the Engineer. Independent test reports must be dated within two (2) years from the initial submission.
 - Samples for all required testing shall be fabricated at the same time. Test reports shall denote the lot of material as well as the sample fabrication and testing dates.
3. MassDOT shall perform prequalification testing on the membrane.
 - Two (2) 10 inch by 10-inch square samples of the proposed membrane with smooth surfaces (no primer or aggregate in the keycoat). The samples shall be a minimum of 80 mils thick or the thickness used to pass the crack bridging requirement found in Table M9.08-4.

All submittals shall be certified to be in conformance with the manufacturer's instructions. Systems qualified by MassDOT per the performance criteria shall be considered for placement on the MassDOT QCML. Membrane waterproofing systems shall remain on the QCML for a period of five (5) years at which time the manufacturer will be required to submit certified test reports demonstrating conformance to this specification.

M9.08.2: Sheet Membrane

A. General Requirements

Only products listed on the MassDOT Qualified Construction Materials List (QCML) will be accepted for use. Chemical composition, physical properties and dimensional requirements of the sheet membrane shall conform to the manufacturer's specifications for the material.

Also, all accessory materials such as, flashing, primer, etc., used in the application of the sheet membrane will be considered a part of this specification and shall conform to the manufacturer's requirements. The membrane waterproofing system shall consist of:

- Primer
- Sheet Membrane
- Mastic

B. Material Requirements

The primer shall meet the requirements of Subsection M9.09.1.

The membrane sheet shall meet the requirements in ASTM D6153 and Table M9.08.2-1.

The mastic for use with rubberized sheets shall be a rubberized asphalt cold-applied joint sealant. The mastic for use with modified bitumen sheet shall be a blend of bituminous and synthetic resins. The mastic shall be approved for use by the manufacturer.

Table M9.08.2-1: Sheet Membrane Material Properties

Property	Test	Requirements
Thickness	ASTM D3767	≥60 mils
Permeance	ASTM E96 Water Method, Procedure B	≤0.1 perms
Pliability	ASTM D146 ⁽¹⁾	No breaks

⁽¹⁾ The test temperature of the specimen shall be 0°F after 24 hours and 180° bend over a ¼ inch mandrel.

C. Material Qualification

A manufacturer requesting approval of a preformed sheet membrane shall furnish to the Research and Materials Section the following:

1. The membrane system material specifications including product performance data.
2. The peel-off backing material shall be tear resistant to prevent portions of it from remaining after the membrane is applied.
3. Certified independent test reports demonstrating conformance to ASTM D6153, Table M9.08.2-1, and the submitted product performance data.
 - The independent lab shall be recognized by the National Cooperation for Laboratory Accreditation (NACLA) in Construction Materials Engineering and Testing (CMET) or an equal program approved by Research & Materials. All testing shall be performed by the same independent lab
 - Independent test reports must be dated within two (2) years from the initial submission. Samples for all required testing shall be fabricated at the same time. Test reports shall denote the lot of material as well as the sample fabrication and testing dates.
4. A detailed summary of successful installations that have occurred in the United States, including owner contact information, design and construction details (substrate type & condition, membrane system components, hot mix asphalt overlay thickness and mix details, etc.), year constructed, tests performed, performance monitoring and/or testing, and any other additional information requested by the Department.

All submittals shall be certified to be in conformance with the manufacturer's instructions. The Research & Materials Section shall review the manufacturer's submitted documentation. A demonstration of the product's installation and performance may be required to be qualified by MassDOT. Systems qualified by MassDOT shall be considered for placement on the MassDOT QCML. Preformed sheet membrane systems shall remain on the QCML for a period of five (5) years at which time the manufacturer will be required to submit certified test reports demonstrating conformance to this specification.

M9.08.3: Hot Applied Rubberized Asphalt Membrane

A. General Requirements

Only products listed on the MassDOT Qualified Construction Materials List (QCML) will be accepted for use. Chemical composition, physical properties and dimensional requirements of the sheet membrane shall conform to the manufacturer's specifications for the material. The membrane waterproofing system shall consist of:

- Primer
- Hot poured rubberized asphalt membrane consisting of a single component hot applied asphalt
- Protective covering

B. Material Requirements

The primer shall meet the requirements of Subsection M9.09.1.

The membrane shall be able to bridge live cracks up to 1/8 inch in width and meet the criteria specified in Table M9.08.3-1.

The protective covering shall be rolled asphalt sheets conforming to ASTM D6380, Type II.

DOCUMENT 00719

(Revised June 6, 2016 – for all Federally Aided Projects)

**SPECIAL PROVISIONS FOR PARTICIPATION BY
DISADVANTAGED BUSINESS ENTERPRISES**

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

Section:

Page 00719-

POLICY2

1. DEFINITIONS.....3

2. DBE PARTICIPATION5

 a. Goal.....5

 b. Bidders List.....5

3. CONTRACTOR ASSURANCES6

4. REQUIRED SUBCONTRACT PROVISIONS6

5. ELIGIBILITY OF DBES.....6

 a. Massachusetts DBE Directory6

 b. DBE Certification6

 c. Joint Venture Approval.....7

6. COUNTING DBE PARTICIPATION TOWARDS DBE PARTICIPATION GOALS7

 a. Commercially Useful Function.....7

 b. Counting Participation Toward The Contract Participation Goal7

 c. Joint Check Policy9

 d. Joint Check Procedure(s).....10

7. AWARD DOCUMENTATION AND PROCEDURES.....11

8. COMPLIANCE13

9. SANCTIONS16

10. FURTHER INFORMATION; ENFORCEMENT, COOPERATION AND
CONFIDENTIALITY.16

11. LIST OF ADDITIONAL DOCUMENTS.18

POLICY

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

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

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

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

<i>Type of Info</i>	<i>Website</i>	<i>Description</i>
MassDOT Highway Division Policies and Info	http://www.massdot.state.ma.us/highway/DoingBusinessWithUs/ContractorVendorInformation.aspx	MassDOT– Highway Div’n Page
For copies of the Code of Federal Regulations	http://www.gpo.gov/fdsys/browse/collectionCfr.action?collectionCode=CFR	FDsys – US Gov’t Printing Office
For information about the U.S.DOT DBE Program	https://www.transportation.gov/small-business/disadvantaged-business-enterprise-dbe-program	U.S. DOT/ FHWA page

1. DEFINITIONS

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

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

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

“Contract” shall mean the Contract for work between the Contractor and MassDOT.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

"Responsive" and "Responsible" refers to the bidder's submittal meeting all of the requirements of the advertised request for proposal. The term responsible refers to the ability of the Contractor to perform the work. This ability can be determined prior to bid invitations.¹

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

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

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

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

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

¹ <http://www.fhwa.dot.gov/resourcecenter/teams/operations/gloss.cfm>

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

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

2. DBE PARTICIPATION

a. Goal

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

Design-Bid-Build Projects: DBE Participation Goal 8 %

(One half of this goal shall be met in the form of Subcontractor construction activity)

Design-Build Projects: DBE Design Participation Goal _____% and DBE Construction Participation Goal _____%

(One half of the Construction Goal shall be met in the form of Subcontractor construction activity)

b. Bidders List

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

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

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

3. CONTRACTOR ASSURANCES

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

4. REQUIRED SUBCONTRACT PROVISIONS

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

5. ELIGIBILITY OF DBES

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

a. Massachusetts DBE Directory

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

Contractors are encouraged to make use of the DBE Directory maintained by SDO on the Internet. This listing is updated daily and may be accessed at the SDO's website at: <https://www.sdo.osd.state.ma.us> .

b. DBE Certification

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

c. Joint Venture Approval

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

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

6. COUNTING DBE PARTICIPATION TOWARDS DBE PARTICIPATION GOALS

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

a. Commercially Useful Function

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

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

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

b. Counting Participation Toward The Contract Participation Goal

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

c. Joint Check Policy

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

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

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

Other factors MassDOT may consider:

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

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

d. Joint Check Procedure(s)

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

7. AWARD DOCUMENTATION AND PROCEDURES

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

- (1) The full company name, address and telephone number of each DBE with whom the bidder intends to make a commitment;
- (2) The contract item(s), by number(s) and quantity(ies), if applicable, or specific description of other business activity to be performed by each DBE as set forth in the Letters of Intent. The Bidder shall list only firms which have the capacity to perform, manage and supervise the work proposed in accordance with the requirements of 49 CFR Part 26 and Section 6.b of these Special Provisions.
- (3) The total dollar amount to be paid to each DBE. (Bidders are cautioned that at least one half of the participation goal must be met with construction activity work.)
- (4) The total dollar amount to be paid to each DBE that is eligible for credit toward the DBE participation goal under the counting rules set out in Section 6.b.
- (5) The total creditable DBE participation as a percentage of the total bid price.

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

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

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

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

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

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

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

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

- (1)** Soliciting through all reasonable and available means (e.g., attendance at pre-bid meetings, advertising and/or written notices) the interest of all certified DBEs who have the capability to perform the work of the Contract. The bidder must solicit this interest within sufficient time to allow the DBEs to respond to the solicitation. The bidder must determine with certainty if the DBEs are interested by taking appropriate steps to follow up initial solicitations.
- (2)** Selecting portions of the work to be performed by DBEs in order to increase the likelihood that the DBE participation goal will be achieved. This includes, where appropriate, breaking out contract work items into economically feasible units to facilitate DBE participation, even when the Prime Contractor might otherwise prefer to perform these work items with its own forces.
- (3)** Providing interested DBEs with adequate information about the plans, specifications, and requirements of the contract in a timely manner to assist them in responding to a solicitation.
- (4)** Negotiating in good faith with interested DBEs. It is the bidder's responsibility to make a portion of the work available to DBE Subcontractors and suppliers and to select those portions of the work or material needs consistent with the available DBE Subcontractors and suppliers, so as to facilitate DBE participation. Evidence of such negotiation includes the names, addresses, and telephone number of DBEs that were considered; a description of the information provided regarding the plans and specifications for the work selected for subcontracting; and evidence as to why additional agreements could not be reached for DBEs to perform the work.

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

- (5) Not rejecting DBEs as being unqualified without sound reasons based on a thorough investigation of their capabilities. Contractors should be careful of adding additional requirements of performance that would in effect limit participation by DBEs or any small business. The Contractor's standing within its industry, membership in specific groups, organizations, or associations and political or social affiliations (for example union vs. nonunion employee status) are not legitimate causes for the rejection or non-solicitation of bids in the Contractor's efforts to meet the Contract participation goal.
- (6) Making efforts to assist interested DBEs in obtaining bonding, lines of credit, or insurance as required by the recipient or contractor.
- (7) Making efforts to assist interested DBEs in obtaining necessary equipment, supplies, materials, or related assistance or services.
- (8) Effectively using the services of available minority/women community organizations; minority/women contractors' groups; local, state, and federal minority/women business assistance offices; and other organizations as allowed on a case by case basis to provide assistance in the recruitment and placement of DBEs.

8. COMPLIANCE

- a. All activity performed by a DBE for credit toward the Contract participation goal must be performed, managed and supervised by the DBE in accordance with all commercially useful function requirements of 49 CFR Part 26. The Prime Contractor shall not enter into, or condone, any other arrangement.
- b. The Prime Contractor shall not perform with its own organization, or assign to any other business, an activity designated for the DBE(s) named on the Schedule(s) submitted by the Prime Contractor under Section 7 or under paragraph 8.f of this section, without the approval of MassDOT in accordance with the requirements of paragraphs 8.f and 8.j of this section.
- c. MassDOT may suspend payment for any activity that was not performed by the DBE to whom the activity was committed on the approved Schedule of Participation, or that was not performed in accordance with the requirements of Section 6.
- d. MassDOT retains the right to approve or disapprove of any or all Subcontractors. Requests by the Prime Contractor for approval of participation by a DBE Subcontractor for credit toward the Contract participation goal must include, in addition to any other requirements for Subcontractor approval, the following:
 - (1) A copy of the proposed subcontract. The subcontract must be for at least the dollar amount, and for the work described, in the Bidder's Schedule of Participation.
 - (2) A resume stating the qualifications and experience of the DBE Superintendent and/or foreperson who will supervise the on-site work. A new resume will be required for any change in supervisory personnel during the progress of the work.
 - (3) A Schedule of Operations indicating when the DBE is expected to perform the work.
 - (4) A list of (1) equipment owned by the DBE to be used on the Project, and (2) equipment to be leased by the DBE for use on the Project.

- (5) A list of: (1) all projects (public and private) which the DBE is currently performing; (2) all projects (public and private) to which the DBE is committed; and (3) all projects (public and private) to which the DBE intends to make a commitment. For each Contract, list the contracting organization, the name and telephone number of a contact person for the contracting organization, the dollar value of the work, a description of the work, and the DBE's work schedule for each project.
- e. If, pursuant to the Subcontractor approval process, MassDOT finds that a DBE Subcontractor does not have sufficient experience or resources to perform, manage and supervise work of the kind proposed in accordance with the requirements of 49 CFR Part 26, approval of the DBE Subcontractor may be denied. In the event of such denial, the Prime Contractor shall proceed in accordance with the requirements paragraphs **8.f** and **8.j** of this section.
- f. If, for reasons beyond its control, the Prime Contractor cannot comply with its DBE participation commitment in accordance with the Schedule of Participation submitted under Section 7, the Prime Contractor shall submit to MassDOT the reasons for its inability to comply with its obligations and shall submit, and request approval for, a revised Schedule of Participation. If approved by MassDOT, the revised Schedule shall govern the Prime Contractor's performance in meeting its obligations under these Special Provisions.
- g. A Prime Contractor's compliance with the participation goal in Section 2 shall be determined by reference to the established percentage of the total contract price, provided, however, that no decrease in the dollar amount of a bidder's commitment to any DBE shall be allowed without the approval of MassDOT.
- h. If the contract amount is increased, the Prime Contractor may be required to submit a revised Schedule of Participation in accordance with paragraphs **8.f** and **8.j** of this section.
- i. In the event of the decertification of a DBE scheduled to participate on the Contract for credit toward the participation goal, but not under subcontract, the Contractor shall proceed in accordance with paragraphs **8.f** and **8.j** of this section.
- j. The Prime Contractor shall notify MassDOT immediately of any facts that come to its attention indicating that it may or will be unable to comply with any aspect of its DBE obligation under this Contract.
- k. Any notice required by these Special Provisions shall be given in writing to: (1) the Resident Engineer; (2) the District designated Compliance Officer; and (3) the Director of Compliance, MassDOT Office of Civil Rights, 10 Park Plaza, 4th Floor East, Boston, MA, 02116.
- l. The Prime Contractor and its Subcontractors shall comply with MassDOT's Electronic Reporting System Requirements (MassDOT Document 00821) and submit all information required by MassDOT related to the DBE Special Provisions through the Equitable Business Opportunity Solution ("EBO"). MassDOT reserves the right to request reports in the format it deems necessary anytime during the performance of the Contract.
- m. Termination of DBE by Prime Contractor
- (1) A Prime Contractor shall not terminate a DBE Subcontractor or an approved substitute DBE firm without the prior written consent of MassDOT. This includes, but is not limited to, instances in which a Prime Contractor seeks to perform work originally designated for a DBE Subcontractor with its own forces or those of an affiliate, a non-DBE firm, or with another DBE firm.

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- (2) MassDOT may provide such written consent only if MassDOT agrees, for reasons stated in its concurrence document, that the Prime Contractor has good cause to terminate the DBE firm.
- (3) For purposes of this paragraph, good cause includes the following circumstances:
- (i) The DBE Subcontractor fails or refuses to execute a written contract;
 - (ii) The DBE Subcontractor fails or refuses to perform the work of its subcontract in a way consistent with normal industry standards. Good cause, however, does not exist if the failure or refusal of the DBE Subcontractor to perform its work on the subcontract results from the bad faith or discriminatory action of the Prime Contractor;
 - (iii) The DBE Subcontractor fails or refuses to meet the Prime Contractor's reasonable, non-discriminatory bond requirements.
 - (iv) The DBE Subcontractor becomes bankrupt, insolvent, or exhibits credit unworthiness;
 - (v) The DBE Subcontractor is ineligible to work on public works projects because of suspension and debarment proceedings pursuant 2 CFR Parts 180, 215 and 1,200 or applicable State law;
 - (vi) MassDOT has determined that the listed DBE Subcontractor is not a responsible contractor;
 - (vii) The listed DBE Subcontractor voluntarily withdraws from the Project and provides written notice of its withdrawal;
 - (viii) The listed DBE is ineligible to receive DBE credit for the type of work required;
 - (ix) A DBE owner dies or becomes disabled with the result that the listed DBE Contractor is unable to complete its work on the Contract;
 - (ix) Other documented good cause that MassDOT determines compels the termination of the DBE Subcontractor. Good cause, however, does not exist if the Prime Contractor seeks to terminate a DBE it relied upon to obtain the Contract so that the Prime Contractor can self-perform the DBE work or substitute another DBE or non-DBE Contractor after Contract Award.
- (4) Before transmitting to MassDOT a request to terminate and/or substitute a DBE Subcontractor, the Prime Contractor must give notice in writing to the DBE Subcontractor, with a copy to MassDOT, of its intent to request to terminate and/or substitute, and the reason for the request.
- (5) The Prime Contractor must give the DBE five (5) business days to respond to the Prime Contractor's notice. The DBE must advise MassDOT and the Contractor of the reasons, if any, why it objects to the proposed termination of its subcontract and why MassDOT should not approve the Prime Contractor's action. If required in a particular case as a matter of public necessity (e.g., safety), MassDOT may provide a response period shorter than five (5) business days.
- (6) In addition to post-award terminations, the provisions of this section apply to pre-award deletions of or substitutions for DBE firms.
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n. Prompt Payment.

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

9. SANCTIONS

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

- a.** Retain, in connection with final acceptance and final payment processing, an amount determined by multiplying the total contract amount by the percentage in Section 2, less the amount paid to approved DBE(s) for work performed under the Contract in accordance with the provisions of Section 8.
- b.** Suspend, terminate or cancel this Contract, in whole or in part, and call upon the Prime Contractor's surety to perform all terms and conditions in the Contract.
- c.** In accordance with 720 CMR 5.05(1)(f), modify or revoke the Prime Contractor's Prequalification status or recommend that the Prime Contractor not receive award of a pending Contract. The Prime Contractor may appeal the determination of the Prequalification Committee in accordance with the provisions of 720 CMR 5.06.
- d.** Initiate debarment proceedings pursuant to M.G.L. c. 29 §29F and, as applicable, 2 CFR Parts 180, 215 and 1,200.
- e.** Refer the matter to the Massachusetts Attorney General for review and prosecution, if appropriate, of any false claim or pursuant to M.G.L. c. 12, §§ 5A to 5O (the Massachusetts False Claim Act).
- f.** Refer the matter to the U.S. DOT's Office of the Inspector General or other agencies for prosecution under Title 18, U.S.C. § 1001, 49 CFR Parts 29 and 31, and other applicable laws and regulations.

10. FURTHER INFORMATION; ENFORCEMENT, COOPERATION AND CONFIDENTIALITY.

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

- (1) If you are a firm that does not meet the eligibility criteria of 49 CFR, Parts 26.61 to 26.73 (“subpart D”), that attempts to participate in a DOT- assisted program as a DBE on the basis of false, fraudulent, or deceitful statements or representations or under circumstances indicating a serious lack of business integrity or honesty, MassDOT or FHWA may initiate suspension or debarment proceedings against you under 49 CFR Part 29.
 - (2) If you are a firm that, in order to meet DBE Contract participation goals or other DBE Program requirements, uses or attempts to use, on the basis of false, fraudulent or deceitful statements or representations or under circumstances indicating a serious lack of business integrity or honesty, another firm that does not meet the eligibility criteria of subpart D, FHWA may initiate suspension or debarment proceedings against you under 49 CFR Part 29.
 - (3) In a suspension or debarment proceeding brought either under subparagraph **a.(1)** or **b.(2)** of this section, the concerned operating administration may consider the fact that a purported DBE has been certified by a recipient. Such certification does not preclude FHWA from determining that the purported DBE, or another firm that has used or attempted to use it to meet DBE participation goals, should be suspended or debarred.
 - (4) FHWA may take enforcement action under 49 CFR Part 31, Program Fraud and Civil Remedies, against any participant in the DBE Program whose conduct is subject to such action under 49 CFR Part 31.
 - (5) FHWA may refer to the Department of Justice, for prosecution under 18 U.S.C. 1001 or other applicable provisions of law, any person who makes a false or fraudulent statement in connection with participation of a DBE in any DOT-assisted program or otherwise violates applicable Federal statutes.
- b.** Pursuant to 49 CFR Part 26.109, the rules governing information, confidentiality, cooperation, and intimidation or retaliation are as follows:
- (1) Availability of records.

 - (i) In responding to requests for information concerning any aspect of the DBE Program, FHWA complies with provisions of the Federal Freedom of Information and Privacy Acts (5 U.S.C. 552 and 552a). FHWA may make available to the public any information concerning the DBE Program release of which is not prohibited by Federal law.
 - (ii) MassDOT shall safeguard from disclosure to unauthorized persons information that may reasonably be considered as confidential business information, consistent with Federal and Massachusetts General Law (M.G.L. c. 66, § 10, M.G.L. c. 4, §7 (26), 950 CMR 32.00).
 - (2) Confidentiality of information on complainants. Notwithstanding the provisions of subparagraph **b.(1)** of this section, the identity of complainants shall be kept confidential, at their election. If such confidentiality will hinder the investigation, proceeding or hearing, or result in a denial of appropriate administrative due process to other parties, the complainant must be advised for the purpose of waiving the privilege. Complainants are advised that, in some circumstances, failure to waive the privilege may result in the closure of the investigation or dismissal of the proceeding or hearing.

- (3) Cooperation. All participants in FHWA's DBE Program (including, but not limited to, recipients, DBE firms and applicants for DBE certification, complainants and appellants, and Contractors using DBE firms to meet Contract participation goals) are required to cooperate fully and promptly with U.S. DOT and recipient compliance reviews, certification reviews, investigations, and other requests for information. Failure to do so shall be a ground for appropriate action against the party involved (e.g., with respect to recipients, a finding of noncompliance; with respect to DBE firms, denial of certification or removal of eligibility and/or suspension and debarment; with respect to a complainant or appellant, dismissal of the complaint or appeal; with respect to a Contractor which uses DBE firms to meet participation goals, findings of non-responsibility for future Contracts and/or suspension and debarment).
- (4) Intimidation and retaliation. No recipient, Contractor, or any other participant in the program, may intimidate, threaten, coerce, or discriminate against any individual or firm for the purpose of interfering with any right or privilege secured by this part or because the individual or firm has made a complaint, testified, assisted, or participated in any manner in an investigation, proceeding, or hearing under this part. If any recipient or contractor violates this prohibition, that entity is in noncompliance with this 49 CFR Part 26.

11. LIST OF ADDITIONAL DOCUMENTS.

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

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

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

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

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

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

*** END OF DOCUMENT ***

DOCUMENT 00760

FHWA-1273
REQUIRED CONTRACT PROVISIONS FOR FEDERAL-AID CONSTRUCTION CONTRACTS
Revised May 1, 2012

- I. General
- II. Nondiscrimination
- III. Nonsegregated Facilities
- IV. Davis-Bacon and Related Act Provisions
- V. Contract Work Hours and Safety Standards Act Provisions
- VI. Subletting or Assigning the Contract
- VII. Safety: Accident Prevention
- VIII. False Statements Concerning Highway Projects
- IX. Implementation of Clean Air Act and Federal Water Pollution Control Act
- X. Compliance with Government wide Suspension and Debarment Requirements
- XI. Certification Regarding Use of Contract Funds for Lobbying

ATTACHMENTS

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

I. GENERAL

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

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

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

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

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

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

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

II. NONDISCRIMINATION

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

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

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

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

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

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

a. The contractor will work with the contracting agency and the Federal Government to ensure that it has made every good faith effort to provide equal opportunity with respect to all of its terms and

conditions of employment and in their review of activities under the contract.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

d. The contractor will promptly investigate all complaints of alleged discrimination made to the contractor in connection with its obligations under this contract, will attempt to resolve such complaints, and will take appropriate corrective action within a reasonable time. If the investigation indicates that the discrimination may affect persons other than the complainant, such corrective action shall include such other persons. Upon completion of each investigation, the contractor will inform every complainant of all of their avenues of appeal.

6. Training and Promotion:

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

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

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

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

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

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

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

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

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

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

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

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

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

10. Assurance Required by 49 CFR 26.13(b):

a. The requirements of 49 CFR Part 26 and the State DOT's U.S. DOT-approved DBE program are incorporated by reference.

b. The contractor or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR Part 26 in the award and administration of DOT-assisted contracts. Failure by the contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the contracting agency deems appropriate.

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

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

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

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

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

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

III. NONSEGREGATED FACILITIES

This provision is applicable to all Federal-aid construction contracts and to all related construction subcontracts of \$10,000 or more.

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

IV. Davis-Bacon and Related Act Provisions

This section is applicable to all Federal-aid construction projects exceeding \$2,000 and to all related subcontracts and lower-tier subcontracts (regardless of subcontract size). The requirements apply to all projects located within the right-of-way of a roadway that is functionally classified as Federal-aid highway. This excludes roadways functionally classified as local roads or rural minor collectors, which are exempt. Contracting agencies may elect to apply these requirements to other projects.

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

1. Minimum wages

a. All laborers and mechanics employed or working upon the site of the work, will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph 1.d. of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR 5.5(a)(4).

Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph 1.b. of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

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

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

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

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

(2) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(3) In the event the contractor, the laborers or mechanics to be employed in the classification or

their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Wage and Hour Administrator for determination. The Wage and Hour Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(4) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs 1.b.(2) or 1.b.(3) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

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

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

2. Withholding

The contracting agency shall upon its own action or upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor under this contract, or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the contracting agency may, after written notice to the contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

3. Payrolls and basic records

a. Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of

the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

b. (1) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the contracting agency. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g. , the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at <http://www.dol.gov/esa/whd/forms/wh347instr.htm> or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the contracting agency for transmission to the State DOT, the FHWA or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the contracting agency..

(2) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(i) That the payroll for the payroll period contains the information required to be provided under §5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under §5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;

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

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

(3) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph 3.b.(2) of this section.

(4) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.

c. The contractor or subcontractor shall make the records required under paragraph 3.a. of this section available for inspection, copying, or transcription by authorized representatives of the contracting agency, the State DOT, the FHWA, or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the FHWA may, after written notice to the contractor, the contracting agency or the State DOT, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

4. Apprentices and trainees

a. Apprentices (programs of the USDOL).

Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice.

The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed.

Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination.

In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

b. Trainees (programs of the USDOL).

Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration.

The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration.

Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed.

In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

c. Equal employment opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.

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

Apprentices and trainees working under apprenticeship and skill training programs which have been certified by the Secretary of Transportation as promoting EEO in connection with Federal-aid highway construction programs are not subject to the requirements of paragraph 4 of this Section IV. The straight time hourly wage rates for apprentices and trainees under such programs will be established by the particular programs. The ratio of apprentices and trainees to

journeymen shall not be greater than permitted by the terms of the particular program.

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

6. Subcontracts. The contractor or subcontractor shall insert Form FHWA-1273 in any subcontracts and also require the subcontractors to include Form FHWA-1273 in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

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

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

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

10. Certification of eligibility.

a. By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

b. No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

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

V. CONTRACT WORK HOURS AND SAFETY STANDARDS ACT

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

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

2. Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (1.) of this section, the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (1.) of this section, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (1.) of this section.

3. Withholding for unpaid wages and liquidated damages. The FHWA or the contacting agency shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract

subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (2.) of this section.

4. Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (1.) through (4.) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (1.) through (4.) of this section.

VI. SUBLETTING OR ASSIGNING THE CONTRACT

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

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

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

(1) the prime contractor maintains control over the supervision of the day-to-day activities of the leased employees;

(2) the prime contractor remains responsible for the quality of the work of the leased employees;

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

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

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

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

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

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

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

VII. SAFETY: ACCIDENT PREVENTION

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

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

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

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

VIII. FALSE STATEMENTS CONCERNING HIGHWAY PROJECTS

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

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

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

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

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

Whoever knowingly makes any false statement or false representation as to material fact in any statement, certificate, or report submitted pursuant to provisions of the Federal-aid Roads Act approved July 1, 1916, (39 Stat. 355), as amended and supplemented;

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

IX. IMPLEMENTATION OF CLEAN AIR ACT AND FEDERAL WATER POLLUTION CONTROL ACT

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

By submission of this bid/proposal or the execution of this contract, or subcontract, as appropriate, the bidder, proposer, Federal-aid construction contractor, or subcontractor, as appropriate, will be deemed to have stipulated as follows:

1. That any person who is or will be utilized in the performance of this contract is not prohibited from receiving an award due to a violation of Section 508 of the Clean Water Act or Section 306 of the Clean Air Act.

2. That the contractor agrees to include or cause to be included the requirements of paragraph (1) of this Section X in every subcontract, and further agrees to take such action as the contracting agency may direct as a means of enforcing such requirements.

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

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

1. Instructions for Certification – First Tier Participants:

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

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

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

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

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

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

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

h. A participant in a covered transaction may rely

upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the Excluded Parties List System website (<https://www.epls.gov/>), which is compiled by the General Services Administration.

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

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

* * * * *

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

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

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

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

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

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

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

2. Instructions for Certification - Lower Tier Participants:

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

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

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

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

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

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

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

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

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

i. Except for transactions authorized under paragraph e of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

* * * * *

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

1. 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 participating in covered transactions by any Federal department or agency.

2. 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.

* * * * *

XI. CERTIFICATION REGARDING USE OF CONTRACT FUNDS FOR LOBBYING

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

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

a. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an

employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

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

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

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

ATTACHMENT A - EMPLOYMENT AND MATERIALS PREFERENCE FOR APPALACHIAN DEVELOPMENT HIGHWAY SYSTEM OR APPALACHIAN LOCAL ACCESS ROAD CONTRACTS

This provision is applicable to all Federal-aid projects funded under the Appalachian Regional Development Act of 1965.

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

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

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

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

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

3. The contractor shall give full consideration to all qualified job applicants referred to him by the State Employment Service. The contractor is not required to

grant employment to any job applicants who, in his opinion, are not qualified to perform the classification of work required.

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

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

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

*** END OF DOCUMENT ***

DOCUMENT 00811

SPECIAL PROVISIONS

**MONTHLY PRICE ADJUSTMENT FOR HOT MIX ASPHALT (HMA) MIXTURES
ENGLISH AND METRIC UNITS**

Revised: 06/04/2019

This provision applies to all projects using greater than 100 tons (91 megagrams) of hot mix asphalt (HMA) mixtures containing liquid asphalt cement as stipulated in the Notice to Contractors section of the bid documents.

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

Base Price

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

Period Price

The Period Price is the price of liquid asphalt for each monthly period as determined by the Department using the average selling price per standard ton of PG64-28 paving grade (primary binder classification) asphalt, FOB manufacturer's terminal, as listed under the "East Coast Market - New England, Boston, Massachusetts area" section of the Poten & Partners, Inc. "Asphalt Weekly Monitor". This average selling price is listed in the issue having a publication date of the second Friday of the month and will be posted as the Period Price for that month. The Department will post this Period Price on its website at <https://www.mass.gov/service-details/2019-massdot-contract-price-adjustments> within two (2) business days following its receipt of the relevant issue of the "Asphalt Weekly Monitor". Poten and Partners has granted the Department the right to publish this specific asphalt price information sourced from the Asphalt Weekly Monitor. This method of period price determination was formerly called the New Asphalt Period Price Method. Separate website postings using both the New Asphalt Period Price Method and the Old Asphalt Period Price Method were discontinued after June 2013.

Price Adjustment Determination, Calculation and Payment

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

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

The Price Adjustment applies only to the actual virgin liquid asphalt content in the mixture placed on the job in accordance with the Standard Specifications for Highways and Bridges, Division III, Section M3.11.03.

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

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

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

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DOCUMENT 00812

SPECIAL PROVISIONS

MONTHLY PRICE ADJUSTMENT FOR DIESEL FUEL AND GASOLINE

ENGLISH UNITS

Revised: 06/04/2019

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

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

The Base Price of Diesel Fuel and Gasoline will be the price as indicated in the Department’s web site (<https://www.mass.gov/service-details/2019-massdot-contract-price-adjustments>) for the month in which the contract was bid, which includes State Tax.

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

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

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

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

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

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

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DOCUMENT 00813

SPECIAL PROVISIONS

PRICE ADJUSTMENTS FOR STRUCTURAL STEEL AND REINFORCING STEEL

December 15, 2020

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

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

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

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

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

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

Base Prices and Period Prices are defined as follows:

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

The Base Price Date is the month and year in which MassDOT opened bids for the project. This date is used to select the Base Price Index.

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

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

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

Period Prices are determined as follows:

Period Price = Base Price X Index Factor

Index Factor = Period Price Index / Base Price Index

Example of a Period Price Calculation:

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

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

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

Index Factor = Period Price Index / Base Price Index = 218.0 / 229.4 = 0.950

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

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

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

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

End of example.

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

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

Structural Steel

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

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

Reinforcing Steel

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

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

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

TABLE

Steel Type		Price per Pound
1	ASTM A615/A615M Grade 60 (AASHTO M31 Grade 60 or 420) Reinforcing Steel	\$0.35
2	ASTM A27 (AASHTO M103) Steel Castings, H-Pile Points & Pipe Pile Shoes (See Note below.)	\$0.48
3	ASTM A668 / A668M (AASHTO M102) Steel Forgings	\$0.48
4	ASTM A108 (AASHTO M169) Steel Forgings for Shear Studs	\$0.52
5	ASTM A709/A709M Grade 36 / AASHTO M270M/M270 Grade 36 or 250 Structural Steel Plate	\$0.56
6	ASTM A709/A709M Grade 36 / AASHTO M270M/M270 Grade 36 or 250 Structural Steel Shapes	\$0.51
7	ASTM A709/A709M Grade 50 / AASHTO M270M/M270 Grade 50 or 345 Structural Steel Plate	\$0.56
8	ASTM A709/A709M Grade 50 / AASHTO M270M/M270 Grade 50 or 345 Structural Steel Shapes	\$0.51
9	ASTM A709/A709M Grade 50WT / AASHTO M270M/M270 Grade 50WT or 345WT Structural Steel Plate	\$0.57
10	ASTM A709/A709M Grade 50WT / AASHTO M270M/M270 Grade 50WT or 345WT Structural Steel Shapes	\$0.52
11	ASTM A709/A709M Grade 50W / AASHTO M270M/M270 Grade 50W 345W Structural Steel Plate	\$0.57
12	ASTM A709/A709M Grade 50W / AASHTO M270M/M270 Grade 50W or 345W Structural Steel Shapes	\$0.52
13	ASTM A709/A709M Grade HPS 50W / AASHTO M270M/M270 Grade HPS 50W or 345W Structural Steel Plate	\$0.60
14	ASTM A709/A709M Grade HPS 70W / AASHTO M270M/M270 Grade HPS 70W or 485W Structural Steel Plate	\$0.63
15	ASTM A514/A514M-05 Grade HPS 100W / AASHTO M270M/M270 Grade HPS 100W or 690W Structural Steel Plate	\$0.97
16	ASTM A992/A992M Grade 50S / AASHTO M270M/M270 Grade 50S or 345S Structural Steel Plate	\$0.57
17	ASTM A992/A992M Grade 50S / AASHTO M270M/M270 Grade 50S or 345S Structural Steel Shapes	\$0.52
18	ASTM A276 Type 316 Stainless Steel	\$2.89
19	ASTM A240 Type 316 Stainless Steel	\$2.89
20	ASTM A148 Grade 80/50 Steel Castings (See Note below.)	\$1.00
21	ASTM A53 Grade B Structural Steel Pipe	\$0.64
22	ASTM A500 Grades A, B, 36 & 50 Structural Steel Pipe	\$0.64
23	ASTM A252, Grades 240 (36 KSI) & 414 (60 KSI) Pipe Pile	\$0.50
24	ASTM 252, Grade 2 Permanent Steel Casing	\$0.50
25	ASTM A36 (AASHTO M183) for H-piles, steel supports and sign supports	\$0.55
26	ASTM A328 / A328M, Grade 50 (AASHTO M202) Steel Sheetpiling	\$0.94
27	ASTM A572 / A572M, Grade 50 Sheetpiling	\$0.94
28	ASTM A36/36M, Grade 50	\$0.56
29	ASTM A570, Grade 50	\$0.55
30	ASTM A572 (AASHTO M223), Grade 50 H-Piles	\$0.56
31	ASTM A1085 Grade A (50 KSI) Steel Hollow Structural Sections (HSS), heat-treated per ASTM A1085 Supplement S1	\$0.64
32	AREA 140 LB Rail and Track Accessories	\$0.33

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

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DOCUMENT 00814

SPECIAL PROVISIONS

PRICE ADJUSTMENT FOR PORTLAND CEMENT CONCRETE MIXES

January 12, 2009

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

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

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

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

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

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

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

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

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

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DOCUMENT 00820

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

I. Definitions

For purposes of this contract,

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

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

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

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

II. Equal Opportunity, Non-Discrimination and Affirmative Action

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

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

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

The Contractor shall post hereafter in conspicuous places, available for employees and applicants for employment, notices to be provided by the Massachusetts Commission Against Discrimination setting forth the provisions of the Fair Employment Practices Law of the Commonwealth (Massachusetts General Laws Chapter 151 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 preceding paragraph by executing Document 00859 Contractor/Subcontractor Certification Form.

Rev'd 03/07/14

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DOCUMENT 00821

**ELECTRONIC REPORTING REQUIREMENTS
CIVIL RIGHTS PROGRAMS AND CERTIFIED PAYROLL**

Implemented on March 2, 2009

Revised June 04, 2019

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

Contractor and Sub-Contractor EBO User Certification

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

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

Vetting of Firms and Designated Firm Individuals

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

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

Interim Reporting Requirements

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

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DOCUMENT 00859

CONTRACTOR/SUBCONTRACTOR CERTIFICATION FORM ‡

_____ (Contractor) **Date:** _____
‡This form shall be prepared and submitted to MassDOT for each and every subcontractor; the Prime Contractor shall ensure that the indicated documents have been given, as applicable, to its SubContractors.

_____ (Subcontractor) District Approved Subcontractor

Contract No: 113676 **Project No:** 607901 **Federal Aid No:** CMQ-003S(160)X

Location: DEDHAM

Project Description: Roadway Reconstruction and Related Work along a Section of Elm Street and Rustcraft Road

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

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

This is not a Federally-aided construction project

Document #

- 00718 – Participation By Minority Or Women's Business Enterprises and SDVOBE†
- 00761 – Certification Regarding Debarment, Suspension, Ineligibility, and Voluntary Exclusion
- 00820 – MA Supplemental Equal Employment Opportunity, Non-Discrimination, and Affirmative Action Program
- 00821 – Electronic Reporting Requirements, Civil Rights Programs, and Certified Payroll
- 00859 – Contractor/Subcontractor Certification Form (this document)
- 00860 – MA Employment Laws
- 00861 – Applicable State Wage Rates in the Contract Proposal**
- B00842 – MA Schedule of Participation By Minority or Women Business Enterprises (M/WBEs)†
- B00843 – MA Letter of Intent – M/WBEs†
 - ** Does not apply to Material Suppliers, unless performing work on-site
 - † Applies only if Subcontractor is a M/WBE; only include these forms for the particular M/WBE Entity
- B00844 – Schedule of Participation By SDVOBE
- B00845 – Letter of Intent – SDVOBE
- B00846 – M/WBE or SDVOBE Joint Check Arrangement Approval Form
- B00847 – Joint Venture Affidavit

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

Document #

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

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

*Applicable only to Contracts or Subcontracts in excess of \$10,000

**Does not apply to Material Suppliers, unless performing work on-site

† Applies only if Subcontractor is a DBE; only include these forms for the particular DBE Entity

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

(Print Name and Title)

(Authorized Signature)

PART 2

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

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

DOCUMENT 00860

COMMONWEALTH OF MASSACHUSETTS PUBLIC EMPLOYMENT LAWS

Revised February 20, 2019

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

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

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

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

The Prevailing Wage Rate generally includes the following:

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

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

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

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

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

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

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

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

STATEMENT OF COMPLIANCE

Date: _____

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

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

(Contractor or Subcontractor)

on the _____
(MassDOT Project Location and Contract Number)

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

Signature _____

Title _____

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

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

MassDOT will request the updates no later 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 WAGE RATES

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CHARLES D. BAKER
Governor

KARYN E. POLITO
Lt. Governor

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

Prevailing Wage Rates

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

ROSALIN ACOSTA
Secretary
MICHAEL FLANAGAN
Director

Awarding Authority: MassDOT Highway Division
Contract Number: (607901-113676) **City/Town:** DEDHAM
Description of Work: DEDHAM: FAP# CMQ-003S(160)X Roadway Reconstruction and Related Work along a Section of Elm Street and Rustcraft Road (607901)
Job Location: DEDHAM: Section of Elm Street and Rustcraft Road

Information about Prevailing Wage Schedules for Awarding Authorities and Contractors

- 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 from the Department of Labor Standards (“DLS”) 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 any sub-contractor.
- All apprentices working on the project are required to be registered with the Massachusetts Department of Labor Standards, Division of Apprentice Standards (DLS/DAS). Apprentice must keep his/her apprentice identification card on his/her person 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 DLS/DAS regardless of whether or not they are registered with any other federal, state, local, or private agency must be paid the journeyworker's rate for the trade.**
- 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. Awarding authorities are required to request these updates 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, 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. Contractors are required to obtain the wage schedules from awarding authorities, and to pay no less than these rates to covered workers. The annual update requirement is not applicable to 27F “rental of equipment” contracts.
- Every contractor or subcontractor which performs construction work on the project is required to 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. A sample of a payroll reporting form may be obtained at <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.
- Employees not receiving the prevailing wage rate set forth on the wage schedule may report the violation to the Fair Labor Division of the office of the Attorney General at (617) 727-3465.
- 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.

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Construction						
(2 AXLE) DRIVER - EQUIPMENT <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE A</i>	12/01/2020	\$36.25	\$12.91	\$14.82	\$0.00	\$63.98
	06/01/2021	\$37.05	\$12.91	\$14.82	\$0.00	\$64.78
	08/01/2021	\$37.05	\$13.41	\$14.82	\$0.00	\$65.28
	12/01/2021	\$37.05	\$13.41	\$16.01	\$0.00	\$66.47
(3 AXLE) DRIVER - EQUIPMENT <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE A</i>	12/01/2020	\$36.32	\$12.91	\$14.82	\$0.00	\$64.05
	06/01/2021	\$37.12	\$12.91	\$14.82	\$0.00	\$64.85
	08/01/2021	\$37.12	\$13.41	\$14.82	\$0.00	\$65.35
	12/01/2021	\$37.12	\$13.41	\$16.01	\$0.00	\$66.54
(4 & 5 AXLE) DRIVER - EQUIPMENT <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE A</i>	12/01/2020	\$36.44	\$12.91	\$14.82	\$0.00	\$64.17
	06/01/2021	\$37.24	\$12.91	\$14.82	\$0.00	\$64.97
	08/01/2021	\$37.24	\$13.41	\$14.82	\$0.00	\$65.47
	12/01/2021	\$37.24	\$13.41	\$16.01	\$0.00	\$66.66
ADS/SUBMERSIBLE PILOT <i>PILE DRIVER LOCAL 56 (ZONE 1)</i>	08/01/2020	\$103.05	\$9.40	\$23.12	\$0.00	\$135.57
For apprentice rates see "Apprentice- PILE DRIVER"						
AIR TRACK OPERATOR <i>LABORERS - ZONE 1</i>	12/01/2020	\$40.65	\$8.60	\$17.32	\$0.00	\$66.57
	06/01/2021	\$41.67	\$8.60	\$17.32	\$0.00	\$67.59
	12/01/2021	\$42.68	\$8.60	\$17.32	\$0.00	\$68.60
	06/01/2022	\$43.68	\$8.60	\$17.32	\$0.00	\$69.60
	12/01/2022	\$44.68	\$8.60	\$17.32	\$0.00	\$70.60
	06/01/2023	\$45.68	\$8.60	\$17.32	\$0.00	\$71.60
	12/01/2023	\$46.93	\$8.60	\$17.32	\$0.00	\$72.85
For apprentice rates see "Apprentice- LABORER"						
AIR TRACK OPERATOR (HEAVY & HIGHWAY) <i>LABORERS - ZONE 1 (HEAVY & HIGHWAY)</i>	12/01/2020	\$40.65	\$8.60	\$17.32	\$0.00	\$66.57
	06/01/2021	\$41.67	\$8.60	\$17.32	\$0.00	\$67.59
	12/01/2021	\$42.68	\$8.60	\$17.32	\$0.00	\$68.60
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
ASBESTOS REMOVER - PIPE / MECH. EQUIPT. <i>HEAT & FROST INSULATORS LOCAL 6 (BOSTON)</i>	12/01/2020	\$38.10	\$12.80	\$9.45	\$0.00	\$60.35
ASPHALT RAKER <i>LABORERS - ZONE 1</i>	12/01/2020	\$40.15	\$8.60	\$17.32	\$0.00	\$66.07
	06/01/2021	\$41.17	\$8.60	\$17.32	\$0.00	\$67.09
	12/01/2021	\$42.18	\$8.60	\$17.32	\$0.00	\$68.10
	06/01/2022	\$43.18	\$8.60	\$17.32	\$0.00	\$69.10
	12/01/2022	\$44.18	\$8.60	\$17.32	\$0.00	\$70.10
	06/01/2023	\$45.18	\$8.60	\$17.32	\$0.00	\$71.10
	12/01/2023	\$46.43	\$8.60	\$17.32	\$0.00	\$72.35
For apprentice rates see "Apprentice- LABORER"						
ASPHALT RAKER (HEAVY & HIGHWAY) <i>LABORERS - ZONE 1 (HEAVY & HIGHWAY)</i>	12/01/2020	\$40.15	\$8.60	\$17.32	\$0.00	\$66.07
	06/01/2021	\$41.17	\$8.60	\$17.32	\$0.00	\$67.09
	12/01/2021	\$42.18	\$8.60	\$17.32	\$0.00	\$68.10
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
ASPHALT/CONCRETE/CRUSHER PLANT-ON SITE <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2020	\$49.98	\$13.50	\$15.70	\$0.00	\$79.18
	06/01/2021	\$51.08	\$13.50	\$15.70	\$0.00	\$80.28
	12/01/2021	\$52.23	\$13.50	\$15.70	\$0.00	\$81.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
BACKHOE/FRONT-END LOADER <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2020	\$49.98	\$13.50	\$15.70	\$0.00	\$79.18
	06/01/2021	\$51.08	\$13.50	\$15.70	\$0.00	\$80.28
	12/01/2021	\$52.23	\$13.50	\$15.70	\$0.00	\$81.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
BARCO-TYPE JUMPING TAMPER <i>LABORERS - ZONE 1</i>	12/01/2020	\$40.15	\$8.60	\$17.32	\$0.00	\$66.07
	06/01/2021	\$41.17	\$8.60	\$17.32	\$0.00	\$67.09
	12/01/2021	\$42.18	\$8.60	\$17.32	\$0.00	\$68.10
	06/01/2022	\$43.18	\$8.60	\$17.32	\$0.00	\$69.10
	12/01/2022	\$44.18	\$8.60	\$17.32	\$0.00	\$70.10
	06/01/2023	\$45.18	\$8.60	\$17.32	\$0.00	\$71.10
For apprentice rates see "Apprentice- LABORER"						
BLOCK PAVER, RAMMER / CURB SETTER <i>LABORERS - ZONE 1</i>	12/01/2020	\$40.65	\$8.60	\$17.32	\$0.00	\$66.57
	06/01/2021	\$41.67	\$8.60	\$17.32	\$0.00	\$67.59
	12/01/2021	\$42.68	\$8.60	\$17.32	\$0.00	\$68.60
	06/01/2022	\$43.68	\$8.60	\$17.32	\$0.00	\$69.60
	12/01/2022	\$44.68	\$8.60	\$17.32	\$0.00	\$70.60
	06/01/2023	\$45.68	\$8.60	\$17.32	\$0.00	\$71.60
For apprentice rates see "Apprentice- LABORER"						
BLOCK PAVER, RAMMER / CURB SETTER (HEAVY & HIGHWAY) <i>LABORERS - ZONE 1 (HEAVY & HIGHWAY)</i>	12/01/2020	\$40.65	\$8.60	\$17.32	\$0.00	\$66.57
	06/01/2021	\$41.67	\$8.60	\$17.32	\$0.00	\$67.59
	12/01/2021	\$42.68	\$8.60	\$17.32	\$0.00	\$68.60
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
BOILER MAKER <i>BOILERMAKERS LOCAL 29</i>	01/01/2020	\$46.10	\$7.07	\$17.98	\$0.00	\$71.15

Apprentice - BOILERMAKER - Local 29

Effective Date - 01/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	65	\$29.97	\$7.07	\$11.69	\$0.00	\$48.73
2	65	\$29.97	\$7.07	\$11.69	\$0.00	\$48.73
3	70	\$32.27	\$7.07	\$12.59	\$0.00	\$51.93
4	75	\$34.58	\$7.07	\$13.49	\$0.00	\$55.14
5	80	\$36.88	\$7.07	\$14.38	\$0.00	\$58.33
6	85	\$39.19	\$7.07	\$15.29	\$0.00	\$61.55
7	90	\$41.49	\$7.07	\$16.18	\$0.00	\$64.74
8	95	\$43.80	\$7.07	\$17.09	\$0.00	\$67.96

Notes:

Apprentice to Journeyworker Ratio:1:4

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
BRICK/STONE/ARTIFICIAL MASONRY (INCL. MASONRY WATERPROOFING) <i>BRICKLAYERS LOCAL 3 (FOXBORO)</i>	08/01/2020	\$53.61	\$10.75	\$21.45	\$0.00	\$85.81
	02/01/2021	\$54.21	\$10.75	\$21.45	\$0.00	\$86.41
	08/01/2021	\$55.61	\$10.75	\$21.61	\$0.00	\$87.97
	02/01/2022	\$56.19	\$10.75	\$21.61	\$0.00	\$88.55

Apprentice - BRICK/PLASTER/CEMENT MASON - Local 3 Foxboro

Effective Date - 08/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$26.81	\$10.75	\$21.45	\$0.00	\$59.01
2	60	\$32.17	\$10.75	\$21.45	\$0.00	\$64.37
3	70	\$37.53	\$10.75	\$21.45	\$0.00	\$69.73
4	80	\$42.89	\$10.75	\$21.45	\$0.00	\$75.09
5	90	\$48.25	\$10.75	\$21.45	\$0.00	\$80.45

Effective Date - 02/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$27.11	\$10.75	\$21.45	\$0.00	\$59.31
2	60	\$32.53	\$10.75	\$21.45	\$0.00	\$64.73
3	70	\$37.95	\$10.75	\$21.45	\$0.00	\$70.15
4	80	\$43.37	\$10.75	\$21.45	\$0.00	\$75.57
5	90	\$48.79	\$10.75	\$21.45	\$0.00	\$80.99

Notes:

Apprentice to Journeyworker Ratio:1:5

BULLDOZER/GRADER/SCRAPER <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2020	\$49.45	\$13.50	\$15.70	\$0.00	\$78.65
	06/01/2021	\$50.54	\$13.50	\$15.70	\$0.00	\$79.74
	12/01/2021	\$51.68	\$13.50	\$15.70	\$0.00	\$80.88

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

CAISSON & UNDERPINNING BOTTOM MAN <i>LABORERS - FOUNDATION AND MARINE</i>	12/01/2020	\$41.05	\$8.60	\$17.47	\$0.00	\$67.12
	06/01/2021	\$42.07	\$8.60	\$17.47	\$0.00	\$68.14
	12/01/2021	\$43.08	\$8.60	\$17.47	\$0.00	\$69.15

For apprentice rates see "Apprentice- LABORER"

CAISSON & UNDERPINNING LABORER <i>LABORERS - FOUNDATION AND MARINE</i>	12/01/2020	\$39.90	\$8.60	\$17.47	\$0.00	\$65.97
	06/01/2021	\$40.92	\$8.60	\$17.47	\$0.00	\$66.99
	12/01/2021	\$41.93	\$8.60	\$17.47	\$0.00	\$68.00

For apprentice rates see "Apprentice- LABORER"

CAISSON & UNDERPINNING TOP MAN <i>LABORERS - FOUNDATION AND MARINE</i>	12/01/2020	\$39.90	\$8.60	\$17.47	\$0.00	\$65.97
	06/01/2021	\$40.92	\$8.60	\$17.47	\$0.00	\$66.99
	12/01/2021	\$41.93	\$8.60	\$17.47	\$0.00	\$68.00

For apprentice rates see "Apprentice- LABORER"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
CARBIDE CORE DRILL OPERATOR <i>LABORERS - ZONE 1</i>	12/01/2020	\$40.15	\$8.60	\$17.32	\$0.00	\$66.07
	06/01/2021	\$41.17	\$8.60	\$17.32	\$0.00	\$67.09
	12/01/2021	\$42.18	\$8.60	\$17.32	\$0.00	\$68.10
	06/01/2022	\$43.18	\$8.60	\$17.32	\$0.00	\$69.10
	12/01/2022	\$44.18	\$8.60	\$17.32	\$0.00	\$70.10
	06/01/2023	\$45.18	\$8.60	\$17.32	\$0.00	\$71.10
	12/01/2023	\$46.43	\$8.60	\$17.32	\$0.00	\$72.35

For apprentice rates see "Apprentice- LABORER"

CARPENTER <i>CARPENTERS -ZONE 1 (Metro Boston)</i>	09/01/2020	\$51.53	\$9.40	\$18.95	\$0.00	\$79.88
	03/01/2021	\$52.38	\$9.40	\$18.95	\$0.00	\$80.73
	09/01/2021	\$53.28	\$9.40	\$18.95	\$0.00	\$81.63
	03/01/2022	\$54.13	\$9.40	\$18.95	\$0.00	\$82.48
	09/01/2022	\$55.03	\$9.40	\$18.95	\$0.00	\$83.38
	03/01/2023	\$55.88	\$9.40	\$18.95	\$0.00	\$84.23

Apprentice - CARPENTER - Zone 1 Metro Boston

Effective Date - 09/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$25.77	\$9.40	\$1.73	\$0.00	\$36.90
2	60	\$30.92	\$9.40	\$1.73	\$0.00	\$42.05
3	70	\$36.07	\$9.40	\$13.76	\$0.00	\$59.23
4	75	\$38.65	\$9.40	\$13.76	\$0.00	\$61.81
5	80	\$41.22	\$9.40	\$15.49	\$0.00	\$66.11
6	80	\$41.22	\$9.40	\$15.49	\$0.00	\$66.11
7	90	\$46.38	\$9.40	\$17.22	\$0.00	\$73.00
8	90	\$46.38	\$9.40	\$17.22	\$0.00	\$73.00

Effective Date - 03/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$26.19	\$9.40	\$1.73	\$0.00	\$37.32
2	60	\$31.43	\$9.40	\$1.73	\$0.00	\$42.56
3	70	\$36.67	\$9.40	\$13.76	\$0.00	\$59.83
4	75	\$39.29	\$9.40	\$13.76	\$0.00	\$62.45
5	80	\$41.90	\$9.40	\$15.49	\$0.00	\$66.79
6	80	\$41.90	\$9.40	\$15.49	\$0.00	\$66.79
7	90	\$47.14	\$9.40	\$17.22	\$0.00	\$73.76
8	90	\$47.14	\$9.40	\$17.22	\$0.00	\$73.76

Notes:

% Indentured After 10/1/17; 45/45/55/55/70/70/80/80
Step 1&2 \$34.32/ 3&4 \$41.14/ 5&6 \$60.96/ 7&8 \$67.84

Apprentice to Journeyworker Ratio:1:5

CARPENTER WOOD FRAME <i>CARPENTERS -ZONE 2 (Wood Frame)</i>	04/01/2020	\$27.12	\$7.21	\$5.80	\$0.00	\$40.13
	04/01/2021	\$27.87	\$7.21	\$5.80	\$0.00	\$40.88
	04/01/2022	\$28.62	\$7.21	\$5.80	\$0.00	\$41.63
	04/01/2023	\$28.97	\$7.21	\$5.80	\$0.00	\$41.98

Classification

All Aspects of New Wood Frame Work

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

Apprentice - CARPENTER (Wood Frame) - Zone 2

Effective Date - 04/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$16.27	\$7.21	\$0.00	\$0.00	\$23.48
2	60	\$16.27	\$7.21	\$0.00	\$0.00	\$23.48
3	65	\$17.63	\$7.21	\$2.00	\$0.00	\$26.84
4	70	\$18.98	\$7.21	\$2.00	\$0.00	\$28.19
5	75	\$20.34	\$7.21	\$5.80	\$0.00	\$33.35
6	80	\$21.70	\$7.21	\$5.80	\$0.00	\$34.71
7	85	\$23.05	\$7.21	\$5.80	\$0.00	\$36.06
8	90	\$24.41	\$7.21	\$5.80	\$0.00	\$37.42

Effective Date - 04/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$16.72	\$7.21	\$0.00	\$0.00	\$23.93
2	60	\$16.72	\$7.21	\$0.00	\$0.00	\$23.93
3	65	\$18.12	\$7.21	\$2.00	\$0.00	\$27.33
4	70	\$19.51	\$7.21	\$2.00	\$0.00	\$28.72
5	75	\$20.90	\$7.21	\$5.80	\$0.00	\$33.91
6	80	\$22.30	\$7.21	\$5.80	\$0.00	\$35.31
7	85	\$23.69	\$7.21	\$5.80	\$0.00	\$36.70
8	90	\$25.08	\$7.21	\$5.80	\$0.00	\$38.09

Notes:

% Indentured After 10/1/17; 45/45/55/55/70/70/80/80
 Step 1&2 \$19.41/ 3&4 \$24.13/ 5&6 \$31.99/ 7&8 \$34.71

Apprentice to Journeyworker Ratio:1:5

CEMENT MASONRY/PLASTERING BRICKLAYERS LOCAL 3 (FOXBORO)	01/01/2020	\$44.67	\$12.75	\$22.41	\$0.62	\$80.45
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Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
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Apprentice - CEMENT MASONRY/PLASTERING - Foxboro

Effective Date - 01/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$22.34	\$12.75	\$15.41	\$0.00	\$50.50
2	60	\$26.80	\$12.75	\$17.41	\$0.62	\$57.58
3	65	\$29.04	\$12.75	\$18.41	\$0.62	\$60.82
4	70	\$31.27	\$12.75	\$19.41	\$0.62	\$64.05
5	75	\$33.50	\$12.75	\$20.41	\$0.62	\$67.28
6	80	\$35.74	\$12.75	\$21.41	\$0.62	\$70.52
7	90	\$40.20	\$12.75	\$22.41	\$0.62	\$75.98

Notes:

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

Apprentice to Journeyworker Ratio:1:3

CHAIN SAW OPERATOR <i>LABORERS - ZONE 1</i>	12/01/2020	\$40.15	\$8.60	\$17.32	\$0.00	\$66.07
	06/01/2021	\$41.17	\$8.60	\$17.32	\$0.00	\$67.09
	12/01/2021	\$42.18	\$8.60	\$17.32	\$0.00	\$68.10
	06/01/2022	\$43.18	\$8.60	\$17.32	\$0.00	\$69.10
	12/01/2022	\$44.18	\$8.60	\$17.32	\$0.00	\$70.10
	06/01/2023	\$45.18	\$8.60	\$17.32	\$0.00	\$71.10
	12/01/2023	\$46.43	\$8.60	\$17.32	\$0.00	\$72.35

For apprentice rates see "Apprentice- LABORER"

CLAM SHELLS/SLURRY BUCKETS/HEADING MACHINES <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2020	\$50.98	\$13.50	\$15.70	\$0.00	\$80.18
	06/01/2021	\$52.08	\$13.50	\$15.70	\$0.00	\$81.28
	12/01/2021	\$53.23	\$13.50	\$15.70	\$0.00	\$82.43

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

COMPRESSOR OPERATOR <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2020	\$33.00	\$13.50	\$15.70	\$0.00	\$62.20
	06/01/2021	\$33.75	\$13.50	\$15.70	\$0.00	\$62.95
	12/01/2021	\$34.54	\$13.50	\$15.70	\$0.00	\$63.74

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

DELEADER (BRIDGE) <i>PAINTERS LOCAL 35 - ZONE 1</i>	07/01/2020	\$51.51	\$8.25	\$22.40	\$0.00	\$82.16
	01/01/2021	\$52.06	\$8.25	\$22.75	\$0.00	\$83.06

Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

Apprentice - PAINTER Local 35 - BRIDGES/TANKS

Effective Date - 07/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$25.76	\$8.25	\$0.00	\$0.00	\$34.01
2	55	\$28.33	\$8.25	\$6.05	\$0.00	\$42.63
3	60	\$30.91	\$8.25	\$6.60	\$0.00	\$45.76
4	65	\$33.48	\$8.25	\$7.15	\$0.00	\$48.88
5	70	\$36.06	\$8.25	\$19.10	\$0.00	\$63.41
6	75	\$38.63	\$8.25	\$19.65	\$0.00	\$66.53
7	80	\$41.21	\$8.25	\$20.20	\$0.00	\$69.66
8	90	\$46.36	\$8.25	\$21.30	\$0.00	\$75.91

Effective Date - 01/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$26.03	\$8.25	\$0.00	\$0.00	\$34.28
2	55	\$28.63	\$8.25	\$6.16	\$0.00	\$43.04
3	60	\$31.24	\$8.25	\$6.72	\$0.00	\$46.21
4	65	\$33.84	\$8.25	\$7.28	\$0.00	\$49.37
5	70	\$36.44	\$8.25	\$19.39	\$0.00	\$64.08
6	75	\$39.05	\$8.25	\$19.95	\$0.00	\$67.25
7	80	\$41.65	\$8.25	\$20.51	\$0.00	\$70.41
8	90	\$46.85	\$8.25	\$21.63	\$0.00	\$76.73

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

DEMO: ADZEMAN <i>LABORERS - ZONE 1</i>	12/01/2020	\$40.05	\$8.60	\$17.32	\$0.00	\$65.97
	06/01/2021	\$41.07	\$8.60	\$17.32	\$0.00	\$66.99
	12/01/2021	\$42.08	\$8.60	\$17.32	\$0.00	\$68.00
	06/01/2022	\$43.08	\$8.60	\$17.32	\$0.00	\$69.00
	12/01/2022	\$44.08	\$8.60	\$17.32	\$0.00	\$70.00
	06/01/2023	\$45.08	\$8.60	\$17.32	\$0.00	\$71.00
	12/01/2023	\$46.33	\$8.60	\$17.32	\$0.00	\$72.25

For apprentice rates see "Apprentice- LABORER"

DEMO: BACKHOE/LOADER/HAMMER OPERATOR <i>LABORERS - ZONE 1</i>	12/01/2020	\$41.05	\$8.60	\$17.32	\$0.00	\$66.97
	06/01/2021	\$42.07	\$8.60	\$17.32	\$0.00	\$67.99
	12/01/2021	\$43.08	\$8.60	\$17.32	\$0.00	\$69.00
	06/01/2022	\$44.08	\$8.60	\$17.32	\$0.00	\$70.00
	12/01/2022	\$45.08	\$8.60	\$17.32	\$0.00	\$71.00
	06/01/2023	\$46.08	\$8.60	\$17.32	\$0.00	\$72.00
	12/01/2023	\$47.33	\$8.60	\$17.32	\$0.00	\$73.25

For apprentice rates see "Apprentice- LABORER"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
DEMO: BURNERS <i>LABORERS - ZONE 1</i>	12/01/2020	\$40.80	\$8.60	\$17.32	\$0.00	\$66.72
	06/01/2021	\$41.82	\$8.60	\$17.32	\$0.00	\$67.74
	12/01/2021	\$42.83	\$8.60	\$17.32	\$0.00	\$68.75
	06/01/2022	\$43.83	\$8.60	\$17.32	\$0.00	\$69.75
	12/01/2022	\$44.83	\$8.60	\$17.32	\$0.00	\$70.75
	06/01/2023	\$45.83	\$8.60	\$17.32	\$0.00	\$71.75
	12/01/2023	\$47.08	\$8.60	\$17.32	\$0.00	\$73.00
For apprentice rates see "Apprentice- LABORER"						
DEMO: CONCRETE CUTTER/SAWYER <i>LABORERS - ZONE 1</i>	12/01/2020	\$41.05	\$8.60	\$17.32	\$0.00	\$66.97
	06/01/2021	\$42.07	\$8.60	\$17.32	\$0.00	\$67.99
	12/01/2021	\$43.08	\$8.60	\$17.32	\$0.00	\$69.00
	06/01/2022	\$44.08	\$8.60	\$17.32	\$0.00	\$70.00
	12/01/2022	\$45.08	\$8.60	\$17.32	\$0.00	\$71.00
	06/01/2023	\$46.08	\$8.60	\$17.32	\$0.00	\$72.00
	12/01/2023	\$47.33	\$8.60	\$17.32	\$0.00	\$73.25
For apprentice rates see "Apprentice- LABORER"						
DEMO: JACKHAMMER OPERATOR <i>LABORERS - ZONE 1</i>	12/01/2020	\$40.80	\$8.60	\$17.32	\$0.00	\$66.72
	06/01/2021	\$41.82	\$8.60	\$17.32	\$0.00	\$67.74
	12/01/2021	\$42.83	\$8.60	\$17.32	\$0.00	\$68.75
	06/01/2022	\$43.83	\$8.60	\$17.32	\$0.00	\$69.75
	12/01/2022	\$44.83	\$8.60	\$17.32	\$0.00	\$70.75
	06/01/2023	\$45.83	\$8.60	\$17.32	\$0.00	\$71.75
	12/01/2023	\$47.08	\$8.60	\$17.32	\$0.00	\$73.00
For apprentice rates see "Apprentice- LABORER"						
DEMO: WRECKING LABORER <i>LABORERS - ZONE 1</i>	12/01/2020	\$40.05	\$8.60	\$17.32	\$0.00	\$65.97
	06/01/2021	\$41.07	\$8.60	\$17.32	\$0.00	\$66.99
	12/01/2021	\$42.08	\$8.60	\$17.32	\$0.00	\$68.00
	06/01/2022	\$43.08	\$8.60	\$17.32	\$0.00	\$69.00
	12/01/2022	\$44.08	\$8.60	\$17.32	\$0.00	\$70.00
	06/01/2023	\$45.08	\$8.60	\$17.32	\$0.00	\$71.00
	12/01/2023	\$46.33	\$8.60	\$17.32	\$0.00	\$72.25
For apprentice rates see "Apprentice- LABORER"						
DIRECTIONAL DRILL MACHINE OPERATOR <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2020	\$49.45	\$13.50	\$15.70	\$0.00	\$78.65
	06/01/2021	\$50.54	\$13.50	\$15.70	\$0.00	\$79.74
	12/01/2021	\$51.68	\$13.50	\$15.70	\$0.00	\$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
DIVER <i>PILE DRIVER LOCAL 56 (ZONE 1)</i>	08/01/2020	\$68.70	\$9.40	\$23.12	\$0.00	\$101.22
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER TENDER <i>PILE DRIVER LOCAL 56 (ZONE 1)</i>	08/01/2020	\$49.07	\$9.40	\$23.12	\$0.00	\$81.59
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER TENDER (EFFLUENT) <i>PILE DRIVER LOCAL 56 (ZONE 1)</i>	08/01/2020	\$73.60	\$9.40	\$23.12	\$0.00	\$106.12
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER/SLURRY (EFFLUENT) <i>PILE DRIVER LOCAL 56 (ZONE 1)</i>	08/01/2020	\$103.05	\$9.40	\$23.12	\$0.00	\$135.57
For apprentice rates see "Apprentice- PILE DRIVER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
DRAWBRIDGE OPERATOR (Construction) <i>DRAWBRIDGE - SEIU LOCAL 888</i>	07/01/2020	\$26.77	\$6.67	\$3.93	\$0.16	\$37.53
ELECTRICIAN <i>ELECTRICIANS LOCAL 103</i>	09/01/2020	\$54.45	\$13.00	\$19.73	\$0.00	\$87.18
	03/01/2021	\$55.41	\$13.00	\$20.01	\$0.00	\$88.42
	09/01/2021	\$56.84	\$13.00	\$20.06	\$0.00	\$89.90
	03/01/2022	\$58.04	\$13.00	\$20.09	\$0.00	\$91.13
	09/01/2022	\$59.48	\$13.00	\$20.13	\$0.00	\$92.61
	03/01/2023	\$60.67	\$13.00	\$20.17	\$0.00	\$93.84

Apprentice - ELECTRICIAN - Local 103

Effective Date - 09/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$21.78	\$13.00	\$0.65	\$0.00	\$35.43
2	40	\$21.78	\$13.00	\$0.65	\$0.00	\$35.43
3	45	\$24.50	\$13.00	\$14.87	\$0.00	\$52.37
4	45	\$24.50	\$13.00	\$14.87	\$0.00	\$52.37
5	50	\$27.23	\$13.00	\$15.31	\$0.00	\$55.54
6	55	\$29.95	\$13.00	\$15.75	\$0.00	\$58.70
7	60	\$32.67	\$13.00	\$16.19	\$0.00	\$61.86
8	65	\$35.39	\$13.00	\$16.63	\$0.00	\$65.02
9	70	\$38.12	\$13.00	\$17.07	\$0.00	\$68.19
10	75	\$40.84	\$13.00	\$17.53	\$0.00	\$71.37

Effective Date - 03/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$22.16	\$13.00	\$0.66	\$0.00	\$35.82
2	40	\$22.16	\$13.00	\$0.66	\$0.00	\$35.82
3	45	\$24.93	\$13.00	\$15.13	\$0.00	\$53.06
4	45	\$24.93	\$13.00	\$15.13	\$0.00	\$53.06
5	50	\$27.71	\$13.00	\$15.57	\$0.00	\$56.28
6	55	\$30.48	\$13.00	\$16.01	\$0.00	\$59.49
7	60	\$33.25	\$13.00	\$16.46	\$0.00	\$62.71
8	65	\$36.02	\$13.00	\$16.90	\$0.00	\$65.92
9	70	\$38.79	\$13.00	\$17.34	\$0.00	\$69.13
10	75	\$41.56	\$13.00	\$17.80	\$0.00	\$72.36

Notes :

App Prior 1/1/03; 30/35/40/45/50/55/65/70/75/80

Apprentice to Journeyworker Ratio:2:3***

ELEVATOR CONSTRUCTOR <i>ELEVATOR CONSTRUCTORS LOCAL 4</i>	01/01/2020	\$61.42	\$15.73	\$18.41	\$0.00	\$95.56
	01/01/2021	\$63.47	\$15.88	\$19.31	\$0.00	\$98.66
	01/01/2022	\$65.62	\$16.03	\$20.21	\$0.00	\$101.86

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Apprentice - ELEVATOR CONSTRUCTOR - Local 4						
Effective Date - 01/01/2020						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$30.71	\$15.73	\$0.00	\$0.00	\$46.44
2	55	\$33.78	\$15.73	\$18.41	\$0.00	\$67.92
3	65	\$39.92	\$15.73	\$18.41	\$0.00	\$74.06
4	70	\$42.99	\$15.73	\$18.41	\$0.00	\$77.13
5	80	\$49.14	\$15.73	\$18.41	\$0.00	\$83.28

Effective Date - 01/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$31.74	\$15.88	\$0.00	\$0.00	\$47.62
2	55	\$34.91	\$15.88	\$19.31	\$0.00	\$70.10
3	65	\$41.26	\$15.88	\$19.31	\$0.00	\$76.45
4	70	\$44.43	\$15.88	\$19.31	\$0.00	\$79.62
5	80	\$50.78	\$15.88	\$19.31	\$0.00	\$85.97

Notes:

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

Apprentice to Journeyworker Ratio:1:1

ELEVATOR CONSTRUCTOR HELPER <i>ELEVATOR CONSTRUCTORS LOCAL 4</i>	01/01/2020	\$42.99	\$15.73	\$18.41	\$0.00	\$77.13
	01/01/2021	\$44.43	\$15.88	\$19.31	\$0.00	\$79.62
	01/01/2022	\$45.93	\$16.03	\$20.21	\$0.00	\$82.17
For apprentice rates see "Apprentice - ELEVATOR CONSTRUCTOR"						
FENCE & GUARD RAIL ERECTOR <i>LABORERS - ZONE 1</i>	12/01/2020	\$40.15	\$8.60	\$17.32	\$0.00	\$66.07
	06/01/2021	\$41.17	\$8.60	\$17.32	\$0.00	\$67.09
	12/01/2021	\$42.18	\$8.60	\$17.32	\$0.00	\$68.10
	06/01/2022	\$43.18	\$8.60	\$17.32	\$0.00	\$69.10
	12/01/2022	\$44.18	\$8.60	\$17.32	\$0.00	\$70.10
	06/01/2023	\$45.18	\$8.60	\$17.32	\$0.00	\$71.10
	12/01/2023	\$46.43	\$8.60	\$17.32	\$0.00	\$72.35
For apprentice rates see "Apprentice- LABORER"						
FENCE & GUARD RAIL ERECTOR (HEAVY & HIGHWAY) <i>LABORERS - ZONE 1 (HEAVY & HIGHWAY)</i>	12/01/2020	\$40.15	\$8.60	\$17.32	\$0.00	\$66.07
	06/01/2021	\$41.17	\$8.60	\$17.32	\$0.00	\$67.09
	12/01/2021	\$42.18	\$8.60	\$17.32	\$0.00	\$68.10
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
FIELD ENG.INST.PERSON-BLDG,SITE,HVY/HWY <i>OPERATING ENGINEERS LOCAL 4</i>	11/01/2020	\$45.23	\$13.00	\$15.70	\$0.00	\$73.93
	05/01/2021	\$46.38	\$13.00	\$15.70	\$0.00	\$75.08
	11/01/2021	\$47.38	\$13.00	\$15.70	\$0.00	\$76.08
	05/01/2022	\$48.53	\$13.00	\$15.70	\$0.00	\$77.23
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
FIELD ENG.PARTY CHIEF-BLDG,SITE,HVY/HWY <i>OPERATING ENGINEERS LOCAL 4</i>	11/01/2020	\$46.74	\$13.00	\$15.70	\$0.00	\$75.44
	05/01/2021	\$47.90	\$13.00	\$15.70	\$0.00	\$76.60
	11/01/2021	\$48.91	\$13.00	\$15.70	\$0.00	\$77.61
	05/01/2022	\$50.07	\$13.00	\$15.70	\$0.00	\$78.77
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FIELD ENG.ROD PERSON-BLDG,SITE,HVY/HWY <i>OPERATING ENGINEERS LOCAL 4</i>	11/01/2020	\$22.73	\$13.00	\$15.70	\$0.00	\$51.43
	05/01/2021	\$23.41	\$13.00	\$15.70	\$0.00	\$52.11
	11/01/2021	\$24.01	\$13.00	\$15.70	\$0.00	\$52.71
	05/01/2022	\$24.68	\$13.00	\$15.70	\$0.00	\$53.38
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FIRE ALARM INSTALLER <i>ELECTRICIANS LOCAL 103</i>	09/01/2020	\$54.45	\$13.00	\$19.73	\$0.00	\$87.18
	03/01/2021	\$55.41	\$13.00	\$20.01	\$0.00	\$88.42
	09/01/2021	\$56.84	\$13.00	\$20.06	\$0.00	\$89.90
	03/01/2022	\$58.04	\$13.00	\$20.09	\$0.00	\$91.13
	09/01/2022	\$59.48	\$13.00	\$20.13	\$0.00	\$92.61
	03/01/2023	\$60.67	\$13.00	\$20.17	\$0.00	\$93.84
For apprentice rates see "Apprentice- ELECTRICIAN"						
FIRE ALARM REPAIR / MAINTENANCE / COMMISSIONING <i>ELECTRICIANS LOCAL 103</i>	09/01/2020	\$40.84	\$13.00	\$17.53	\$0.00	\$71.37
	03/01/2021	\$42.11	\$13.00	\$17.88	\$0.00	\$72.99
	09/01/2021	\$43.77	\$13.00	\$18.00	\$0.00	\$74.77
	03/01/2022	\$45.27	\$13.00	\$18.12	\$0.00	\$76.39
	09/01/2022	\$46.99	\$13.00	\$18.24	\$0.00	\$78.23
	03/01/2023	\$48.54	\$13.00	\$18.37	\$0.00	\$79.91
For apprentice rates see "Apprentice- TELECOMMUNICATIONS TECHNICIAN"						
FIREMAN (ASST. ENGINEER) <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2020	\$40.75	\$13.50	\$15.70	\$0.00	\$69.95
	06/01/2021	\$41.66	\$13.50	\$15.70	\$0.00	\$70.86
	12/01/2021	\$42.61	\$13.50	\$15.70	\$0.00	\$71.81
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FLAGGER & SIGNALER (HEAVY & HIGHWAY) <i>LABORERS - ZONE 1 (HEAVY & HIGHWAY)</i>	12/01/2020	\$24.50	\$8.60	\$17.32	\$0.00	\$50.42
	06/01/2021	\$24.50	\$8.60	\$17.32	\$0.00	\$50.42
	12/01/2021	\$24.50	\$8.60	\$17.32	\$0.00	\$50.42
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
FLOORCOVERER <i>FLOORCOVERERS LOCAL 2168 ZONE 1</i>	09/01/2020	\$47.79	\$9.40	\$19.25	\$0.00	\$76.44
	03/01/2021	\$48.59	\$9.40	\$19.25	\$0.00	\$77.24
	09/01/2021	\$49.39	\$9.40	\$19.25	\$0.00	\$78.04
	03/01/2022	\$50.19	\$9.40	\$19.25	\$0.00	\$78.84

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Apprentice - FLOORCOVERER - Local 2168 Zone I						
Effective Date - 09/01/2020						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$23.90	\$9.40	\$1.79	\$0.00	\$35.09
2	55	\$26.28	\$9.40	\$1.79	\$0.00	\$37.47
3	60	\$28.67	\$9.40	\$13.88	\$0.00	\$51.95
4	65	\$31.06	\$9.40	\$13.88	\$0.00	\$54.34
5	70	\$33.45	\$9.40	\$15.67	\$0.00	\$58.52
6	75	\$35.84	\$9.40	\$15.67	\$0.00	\$60.91
7	80	\$38.23	\$9.40	\$17.46	\$0.00	\$65.09
8	85	\$40.62	\$9.40	\$17.46	\$0.00	\$67.48

Effective Date - 03/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$24.30	\$9.40	\$1.79	\$0.00	\$35.49
2	55	\$26.72	\$9.40	\$1.79	\$0.00	\$37.91
3	60	\$29.15	\$9.40	\$13.88	\$0.00	\$52.43
4	65	\$31.58	\$9.40	\$13.88	\$0.00	\$54.86
5	70	\$34.01	\$9.40	\$15.67	\$0.00	\$59.08
6	75	\$36.44	\$9.40	\$15.67	\$0.00	\$61.51
7	80	\$38.87	\$9.40	\$17.46	\$0.00	\$65.73
8	85	\$41.30	\$9.40	\$17.46	\$0.00	\$68.16

Notes: Steps are 750 hrs.
 % After 09/1/17; 45/45/55/55/70/70/80/80 (1500hr Steps)
 Step 1&2 \$32.70/ 3&4 \$39.20/ 5&6 \$58.52/ 7&8 \$65.09

Apprentice to Journeyworker Ratio:1:1

FORK LIFT/CHERRY PICKER <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2020	\$49.98	\$13.50	\$15.70	\$0.00	\$79.18
	06/01/2021	\$51.08	\$13.50	\$15.70	\$0.00	\$80.28
	12/01/2021	\$52.23	\$13.50	\$15.70	\$0.00	\$81.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
GENERATOR/LIGHTING PLANT/HEATERS <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2020	\$33.00	\$13.50	\$15.70	\$0.00	\$62.20
	06/01/2021	\$33.75	\$13.50	\$15.70	\$0.00	\$62.95
	12/01/2021	\$34.54	\$13.50	\$15.70	\$0.00	\$63.74
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
GLAZIER (GLASS PLANK/AIR BARRIER/INTERIOR SYSTEMS) <i>GLAZIERS LOCAL 35 (ZONE 1)</i>	07/01/2020	\$46.80	\$8.25	\$22.40	\$0.00	\$77.45
	01/01/2021	\$47.35	\$8.25	\$22.75	\$0.00	\$78.35

Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

Apprentice - GLAZIER - Local 35 Zone 1

Effective Date - 07/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$23.40	\$8.25	\$0.00	\$0.00	\$31.65
2	55	\$25.74	\$8.25	\$6.05	\$0.00	\$40.04
3	60	\$28.08	\$8.25	\$6.60	\$0.00	\$42.93
4	65	\$30.42	\$8.25	\$7.15	\$0.00	\$45.82
5	70	\$32.76	\$8.25	\$19.10	\$0.00	\$60.11
6	75	\$35.10	\$8.25	\$19.65	\$0.00	\$63.00
7	80	\$37.44	\$8.25	\$20.20	\$0.00	\$65.89
8	90	\$42.12	\$8.25	\$21.30	\$0.00	\$71.67

Effective Date - 01/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$23.68	\$8.25	\$0.00	\$0.00	\$31.93
2	55	\$26.04	\$8.25	\$6.16	\$0.00	\$40.45
3	60	\$28.41	\$8.25	\$6.72	\$0.00	\$43.38
4	65	\$30.78	\$8.25	\$7.28	\$0.00	\$46.31
5	70	\$33.15	\$8.25	\$19.39	\$0.00	\$60.79
6	75	\$35.51	\$8.25	\$19.95	\$0.00	\$63.71
7	80	\$37.88	\$8.25	\$20.51	\$0.00	\$66.64
8	90	\$42.62	\$8.25	\$21.63	\$0.00	\$72.50

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

HOISTING ENGINEER/CRANES/GRADALLS	12/01/2020	\$49.98	\$13.50	\$15.70	\$0.00	\$79.18
OPERATING ENGINEERS LOCAL 4	06/01/2021	\$51.08	\$13.50	\$15.70	\$0.00	\$80.28
	12/01/2021	\$52.23	\$13.50	\$15.70	\$0.00	\$81.43

Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

Apprentice - OPERATING ENGINEERS - Local 4

Effective Date - 12/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	\$27.49	\$13.50	\$0.00	\$0.00	\$40.99
2	60	\$29.99	\$13.50	\$15.70	\$0.00	\$59.19
3	65	\$32.49	\$13.50	\$15.70	\$0.00	\$61.69
4	70	\$34.99	\$13.50	\$15.70	\$0.00	\$64.19
5	75	\$37.49	\$13.50	\$15.70	\$0.00	\$66.69
6	80	\$39.98	\$13.50	\$15.70	\$0.00	\$69.18
7	85	\$42.48	\$13.50	\$15.70	\$0.00	\$71.68
8	90	\$44.98	\$13.50	\$15.70	\$0.00	\$74.18

Effective Date - 06/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	\$28.09	\$13.50	\$0.00	\$0.00	\$41.59
2	60	\$30.65	\$13.50	\$15.70	\$0.00	\$59.85
3	65	\$33.20	\$13.50	\$15.70	\$0.00	\$62.40
4	70	\$35.76	\$13.50	\$15.70	\$0.00	\$64.96
5	75	\$38.31	\$13.50	\$15.70	\$0.00	\$67.51
6	80	\$40.86	\$13.50	\$15.70	\$0.00	\$70.06
7	85	\$43.42	\$13.50	\$15.70	\$0.00	\$72.62
8	90	\$45.97	\$13.50	\$15.70	\$0.00	\$75.17

Notes:

Apprentice to Journeyworker Ratio:1:6

HVAC (DUCTWORK) <i>SHEETMETAL WORKERS LOCAL 17 - A</i>	08/01/2020	\$50.67	\$13.50	\$24.12	\$2.65	\$90.94
	02/01/2021	\$52.32	\$13.50	\$24.12	\$2.70	\$92.64
	08/01/2021	\$54.07	\$13.50	\$24.12	\$2.75	\$94.44
	02/01/2022	\$55.82	\$13.50	\$24.12	\$2.80	\$96.24

For apprentice rates see "Apprentice- SHEET METAL WORKER"

HVAC (ELECTRICAL CONTROLS) <i>ELECTRICIANS LOCAL 103</i>	09/01/2020	\$54.45	\$13.00	\$19.73	\$0.00	\$87.18
	03/01/2021	\$55.41	\$13.00	\$20.01	\$0.00	\$88.42
	09/01/2021	\$56.84	\$13.00	\$20.06	\$0.00	\$89.90
	03/01/2022	\$58.04	\$13.00	\$20.09	\$0.00	\$91.13
	09/01/2022	\$59.48	\$13.00	\$20.13	\$0.00	\$92.61
	03/01/2023	\$60.67	\$13.00	\$20.17	\$0.00	\$93.84

For apprentice rates see "Apprentice- ELECTRICIAN"

HVAC (TESTING AND BALANCING - AIR) <i>SHEETMETAL WORKERS LOCAL 17 - A</i>	08/01/2020	\$50.67	\$13.50	\$24.12	\$2.65	\$90.94
	02/01/2021	\$52.32	\$13.50	\$24.12	\$2.70	\$92.64
	08/01/2021	\$54.07	\$13.50	\$24.12	\$2.75	\$94.44
	02/01/2022	\$55.82	\$13.50	\$24.12	\$2.80	\$96.24

For apprentice rates see "Apprentice- SHEET METAL WORKER"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
HVAC (TESTING AND BALANCING -WATER) <i>PIPEFITTERS LOCAL 537</i>	09/01/2020	\$56.44	\$11.70	\$20.24	\$0.00	\$88.38
	03/01/2021	\$57.94	\$11.70	\$20.24	\$0.00	\$89.88
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
HVAC MECHANIC <i>PIPEFITTERS LOCAL 537</i>	09/01/2020	\$56.44	\$11.70	\$20.24	\$0.00	\$88.38
	03/01/2021	\$57.94	\$11.70	\$20.24	\$0.00	\$89.88
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
HYDRAULIC DRILLS <i>LABORERS - ZONE 1</i>	12/01/2020	\$40.65	\$8.60	\$17.32	\$0.00	\$66.57
	06/01/2021	\$41.67	\$8.60	\$17.32	\$0.00	\$67.59
	12/01/2021	\$42.68	\$8.60	\$17.32	\$0.00	\$68.60
	06/01/2022	\$43.68	\$8.60	\$17.32	\$0.00	\$69.60
	12/01/2022	\$44.68	\$8.60	\$17.32	\$0.00	\$70.60
	06/01/2023	\$45.68	\$8.60	\$17.32	\$0.00	\$71.60
	12/01/2023	\$46.93	\$8.60	\$17.32	\$0.00	\$72.85
For apprentice rates see "Apprentice- LABORER"						
HYDRAULIC DRILLS (HEAVY & HIGHWAY) <i>LABORERS - ZONE 1 (HEAVY & HIGHWAY)</i>	12/01/2020	\$40.65	\$8.60	\$17.32	\$0.00	\$66.57
	06/01/2021	\$41.67	\$8.60	\$17.32	\$0.00	\$67.59
	12/01/2021	\$42.68	\$8.60	\$17.32	\$0.00	\$68.60
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
INSULATOR (PIPES & TANKS) <i>HEAT & FROST INSULATORS LOCAL 6 (BOSTON)</i>	09/01/2020	\$49.00	\$13.80	\$17.14	\$0.00	\$79.94
	09/01/2021	\$51.40	\$13.80	\$17.14	\$0.00	\$82.34
	09/01/2022	\$53.85	\$13.80	\$17.14	\$0.00	\$84.79

Apprentice - ASBESTOS INSULATOR (Pipes & Tanks) - Local 6 Boston

Effective Date - 09/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$24.50	\$13.80	\$12.42	\$0.00	\$50.72
2	60	\$29.40	\$13.80	\$13.36	\$0.00	\$56.56
3	70	\$34.30	\$13.80	\$14.31	\$0.00	\$62.41
4	80	\$39.20	\$13.80	\$15.25	\$0.00	\$68.25

Effective Date - 09/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$25.70	\$13.80	\$12.42	\$0.00	\$51.92
2	60	\$30.84	\$13.80	\$13.36	\$0.00	\$58.00
3	70	\$35.98	\$13.80	\$14.31	\$0.00	\$64.09
4	80	\$41.12	\$13.80	\$15.25	\$0.00	\$70.17

Notes:

Steps are 1 year

Apprentice to Journeyworker Ratio:1:4

IRONWORKER/WELDER <i>IRONWORKERS LOCAL 7 (BOSTON AREA)</i>	09/16/2020	\$48.66	\$8.10	\$25.10	\$0.00	\$81.86
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Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Apprentice - IRONWORKER - Local 7 Boston						
Effective Date - 09/16/2020						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$29.20	\$8.10	\$25.10	\$0.00	\$62.40
2	70	\$34.06	\$8.10	\$25.10	\$0.00	\$67.26
3	75	\$36.50	\$8.10	\$25.10	\$0.00	\$69.70
4	80	\$38.93	\$8.10	\$25.10	\$0.00	\$72.13
5	85	\$41.36	\$8.10	\$25.10	\$0.00	\$74.56
6	90	\$43.79	\$8.10	\$25.10	\$0.00	\$76.99

Notes:
 ** Structural 1:6; Ornamental 1:4

Apprentice to Journeyworker Ratio:**

JACKHAMMER & PAVING BREAKER OPERATOR <i>LABORERS - ZONE 1</i>	12/01/2020	\$40.15	\$8.60	\$17.32	\$0.00	\$66.07
	06/01/2021	\$41.17	\$8.60	\$17.32	\$0.00	\$67.09
	12/01/2021	\$42.18	\$8.60	\$17.32	\$0.00	\$68.10
	06/01/2022	\$43.18	\$8.60	\$17.32	\$0.00	\$69.10
	12/01/2022	\$44.18	\$8.60	\$17.32	\$0.00	\$70.10
	06/01/2023	\$45.18	\$8.60	\$17.32	\$0.00	\$71.10
	12/01/2023	\$46.43	\$8.60	\$17.32	\$0.00	\$72.35
For apprentice rates see "Apprentice- LABORER"						
LABORER <i>LABORERS - ZONE 1</i>	12/01/2020	\$39.90	\$8.60	\$17.32	\$0.00	\$65.82
	06/01/2021	\$40.92	\$8.60	\$17.32	\$0.00	\$66.84
	12/01/2021	\$41.93	\$8.60	\$17.32	\$0.00	\$67.85
	06/01/2022	\$42.93	\$8.60	\$17.32	\$0.00	\$68.85
	12/01/2022	\$43.93	\$8.60	\$17.32	\$0.00	\$69.85
	06/01/2023	\$44.93	\$8.60	\$17.32	\$0.00	\$70.85
	12/01/2023	\$46.18	\$8.60	\$17.32	\$0.00	\$72.10

Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

Apprentice - LABORER - Zone 1

Effective Date - 12/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$23.94	\$8.60	\$17.32	\$0.00	\$49.86
2	70	\$27.93	\$8.60	\$17.32	\$0.00	\$53.85
3	80	\$31.92	\$8.60	\$17.32	\$0.00	\$57.84
4	90	\$35.91	\$8.60	\$17.32	\$0.00	\$61.83

Effective Date - 06/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$24.55	\$8.60	\$17.32	\$0.00	\$50.47
2	70	\$28.64	\$8.60	\$17.32	\$0.00	\$54.56
3	80	\$32.74	\$8.60	\$17.32	\$0.00	\$58.66
4	90	\$36.83	\$8.60	\$17.32	\$0.00	\$62.75

Notes:

Apprentice to Journeyworker Ratio:1:5

LABORER (HEAVY & HIGHWAY)	12/01/2020	\$39.90	\$8.60	\$17.32	\$0.00	\$65.82
LABORERS - ZONE 1 (HEAVY & HIGHWAY)	06/01/2021	\$40.92	\$8.60	\$17.32	\$0.00	\$66.84
	12/01/2021	\$41.93	\$8.60	\$17.32	\$0.00	\$67.85

Apprentice - LABORER (Heavy & Highway) - Zone 1

Effective Date - 12/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$23.94	\$8.60	\$17.32	\$0.00	\$49.86
2	70	\$27.93	\$8.60	\$17.32	\$0.00	\$53.85
3	80	\$31.92	\$8.60	\$17.32	\$0.00	\$57.84
4	90	\$35.91	\$8.60	\$17.32	\$0.00	\$61.83

Effective Date - 06/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$24.55	\$8.60	\$17.32	\$0.00	\$50.47
2	70	\$28.64	\$8.60	\$17.32	\$0.00	\$54.56
3	80	\$32.74	\$8.60	\$17.32	\$0.00	\$58.66
4	90	\$36.83	\$8.60	\$17.32	\$0.00	\$62.75

Notes:

Apprentice to Journeyworker Ratio:1:5

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
LABORER: CARPENTER TENDER <i>LABORERS - ZONE 1</i>	12/01/2020	\$39.90	\$8.60	\$17.32	\$0.00	\$65.82
	06/01/2021	\$40.92	\$8.60	\$17.32	\$0.00	\$66.84
	12/01/2021	\$41.93	\$8.60	\$17.32	\$0.00	\$67.85
	06/01/2022	\$42.93	\$8.60	\$17.32	\$0.00	\$68.85
	12/01/2022	\$43.93	\$8.60	\$17.32	\$0.00	\$69.85
	06/01/2023	\$44.93	\$8.60	\$17.32	\$0.00	\$70.85
	12/01/2023	\$46.18	\$8.60	\$17.32	\$0.00	\$72.10
For apprentice rates see "Apprentice- LABORER"						
LABORER: CEMENT FINISHER TENDER <i>LABORERS - ZONE 1</i>	12/01/2020	\$39.90	\$8.60	\$17.32	\$0.00	\$65.82
	06/01/2021	\$40.92	\$8.60	\$17.32	\$0.00	\$66.84
	12/01/2021	\$41.93	\$8.60	\$17.32	\$0.00	\$67.85
	06/01/2022	\$42.93	\$8.60	\$17.32	\$0.00	\$68.85
	12/01/2022	\$43.93	\$8.60	\$17.32	\$0.00	\$69.85
	06/01/2023	\$44.93	\$8.60	\$17.32	\$0.00	\$70.85
	12/01/2023	\$46.18	\$8.60	\$17.32	\$0.00	\$72.10
For apprentice rates see "Apprentice- LABORER"						
LABORER: HAZARDOUS WASTE/ASBESTOS REMOVER <i>LABORERS - ZONE 1</i>	12/01/2020	\$40.05	\$8.60	\$17.32	\$0.00	\$65.97
	06/01/2021	\$41.07	\$8.60	\$17.32	\$0.00	\$66.99
	12/01/2021	\$42.08	\$8.60	\$17.32	\$0.00	\$68.00
	06/01/2022	\$43.08	\$8.60	\$17.32	\$0.00	\$69.00
	12/01/2022	\$44.08	\$8.60	\$17.32	\$0.00	\$70.00
	06/01/2023	\$45.08	\$8.60	\$17.32	\$0.00	\$71.00
	12/01/2023	\$46.33	\$8.60	\$17.32	\$0.00	\$72.25
For apprentice rates see "Apprentice- LABORER"						
LABORER: MASON TENDER <i>LABORERS - ZONE 1</i>	12/01/2020	\$40.15	\$8.60	\$17.32	\$0.00	\$66.07
	06/01/2021	\$41.17	\$8.60	\$17.32	\$0.00	\$67.09
	12/01/2021	\$42.18	\$8.60	\$17.32	\$0.00	\$68.10
	06/01/2022	\$43.18	\$8.60	\$17.32	\$0.00	\$69.10
	12/01/2022	\$44.18	\$8.60	\$17.32	\$0.00	\$70.10
	06/01/2023	\$45.18	\$8.60	\$17.32	\$0.00	\$71.10
	06/01/2024	\$46.43	\$8.60	\$17.32	\$0.00	\$72.35
For apprentice rates see "Apprentice- LABORER"						
LABORER: MASON TENDER (HEAVY & HIGHWAY) <i>LABORERS - ZONE 1 (HEAVY & HIGHWAY)</i>	12/01/2020	\$40.15	\$8.60	\$17.32	\$0.00	\$66.07
	06/01/2021	\$41.17	\$8.60	\$17.32	\$0.00	\$67.09
	12/01/2021	\$42.18	\$8.60	\$17.32	\$0.00	\$68.10
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
LABORER: MULTI-TRADE TENDER <i>LABORERS - ZONE 1</i>	12/01/2020	\$39.90	\$8.60	\$17.32	\$0.00	\$65.82
	06/01/2021	\$40.92	\$8.60	\$17.32	\$0.00	\$66.84
	12/01/2021	\$41.93	\$8.60	\$17.32	\$0.00	\$67.85
	06/01/2022	\$42.93	\$8.60	\$17.32	\$0.00	\$68.85
	12/01/2022	\$43.93	\$8.60	\$17.32	\$0.00	\$69.85
	06/01/2023	\$44.93	\$8.60	\$17.32	\$0.00	\$70.85
	12/01/2023	\$46.18	\$8.60	\$17.32	\$0.00	\$72.10
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
LABORER: TREE REMOVER <i>LABORERS - ZONE 1</i>	12/01/2020	\$39.90	\$8.60	\$17.32	\$0.00	\$65.82
	06/01/2021	\$40.92	\$8.60	\$17.32	\$0.00	\$66.84
	12/01/2021	\$41.93	\$8.60	\$17.32	\$0.00	\$67.85
	06/01/2022	\$42.93	\$8.60	\$17.32	\$0.00	\$68.85
	12/01/2022	\$43.93	\$8.60	\$17.32	\$0.00	\$69.85
	06/01/2023	\$44.93	\$8.60	\$17.32	\$0.00	\$70.85
	12/01/2023	\$46.18	\$8.60	\$17.32	\$0.00	\$72.10
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 <i>LABORERS - ZONE 1</i>	12/01/2020	\$40.15	\$8.60	\$17.32	\$0.00	\$66.07
	06/01/2021	\$41.17	\$8.60	\$17.32	\$0.00	\$67.09
	12/01/2021	\$42.18	\$8.60	\$17.32	\$0.00	\$68.10
	06/01/2022	\$43.18	\$8.60	\$17.32	\$0.00	\$69.10
	12/01/2022	\$44.18	\$8.60	\$17.32	\$0.00	\$70.10
	06/01/2023	\$45.18	\$8.60	\$17.32	\$0.00	\$71.10
	12/01/2023	\$46.43	\$8.60	\$17.32	\$0.00	\$72.35
For apprentice rates see "Apprentice- LABORER"						
LASER BEAM OPERATOR (HEAVY & HIGHWAY) <i>LABORERS - ZONE 1 (HEAVY & HIGHWAY)</i>	12/01/2020	\$40.15	\$8.60	\$17.32	\$0.00	\$66.07
	06/01/2021	\$41.17	\$8.60	\$17.32	\$0.00	\$67.09
	12/01/2021	\$42.18	\$8.60	\$17.32	\$0.00	\$68.10
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
MARBLE & TILE FINISHERS <i>BRICKLAYERS LOCAL 3 - MARBLE & TILE</i>	08/01/2020	\$42.57	\$10.75	\$20.27	\$0.00	\$73.59
	02/01/2021	\$43.08	\$10.75	\$20.27	\$0.00	\$74.10
	08/01/2021	\$44.20	\$10.75	\$20.43	\$0.00	\$75.38
	02/01/2022	\$44.67	\$10.75	\$20.43	\$0.00	\$75.85

Apprentice - MARBLE & TILE FINISHER - Local 3 Marble & Tile

Effective Date - 08/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$21.29	\$10.75	\$20.27	\$0.00	\$52.31
2	60	\$25.54	\$10.75	\$20.27	\$0.00	\$56.56
3	70	\$29.80	\$10.75	\$20.27	\$0.00	\$60.82
4	80	\$34.06	\$10.75	\$20.27	\$0.00	\$65.08
5	90	\$38.31	\$10.75	\$20.27	\$0.00	\$69.33

Effective Date - 02/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$21.54	\$10.75	\$20.27	\$0.00	\$52.56
2	60	\$25.85	\$10.75	\$20.27	\$0.00	\$56.87
3	70	\$30.16	\$10.75	\$20.27	\$0.00	\$61.18
4	80	\$34.46	\$10.75	\$20.27	\$0.00	\$65.48
5	90	\$38.77	\$10.75	\$20.27	\$0.00	\$69.79

Notes:

Apprentice to Journeyworker Ratio:1:3

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
MARBLE MASONS, TILELAYERS & TERRAZZO MECH <i>BRICKLAYERS LOCAL 3 - MARBLE & TILE</i>	08/01/2020	\$55.77	\$10.75	\$22.08	\$0.00	\$88.60
	02/01/2021	\$56.41	\$10.75	\$22.08	\$0.00	\$89.24
	08/01/2021	\$57.81	\$10.75	\$22.24	\$0.00	\$90.80
	02/01/2022	\$58.38	\$10.75	\$22.24	\$0.00	\$91.37

Apprentice - MARBLE-TILE-TERRAZZO MECHANIC - Local 3 Marble & Tile

Effective Date - 08/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$27.89	\$10.75	\$22.08	\$0.00	\$60.72
2	60	\$33.46	\$10.75	\$22.08	\$0.00	\$66.29
3	70	\$39.04	\$10.75	\$22.08	\$0.00	\$71.87
4	80	\$44.62	\$10.75	\$22.08	\$0.00	\$77.45
5	90	\$50.19	\$10.75	\$22.08	\$0.00	\$83.02

Effective Date - 02/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$28.21	\$10.75	\$22.08	\$0.00	\$61.04
2	60	\$33.85	\$10.75	\$22.08	\$0.00	\$66.68
3	70	\$39.49	\$10.75	\$22.08	\$0.00	\$72.32
4	80	\$45.13	\$10.75	\$22.08	\$0.00	\$77.96
5	90	\$50.77	\$10.75	\$22.08	\$0.00	\$83.60

Notes:

Apprentice to Journeyworker Ratio:1:5

MECH. SWEEPER OPERATOR (ON CONST. SITES) <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2020	\$49.45	\$13.50	\$15.70	\$0.00	\$78.65
	06/01/2021	\$50.54	\$13.50	\$15.70	\$0.00	\$79.74
	12/01/2021	\$51.68	\$13.50	\$15.70	\$0.00	\$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
MECHANICS MAINTENANCE <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2020	\$49.45	\$13.50	\$15.70	\$0.00	\$78.65
	06/01/2021	\$50.54	\$13.50	\$15.70	\$0.00	\$79.74
	12/01/2021	\$51.68	\$13.50	\$15.70	\$0.00	\$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
MILLWRIGHT (Zone 1) <i>MILLWRIGHTS LOCAL 1121 - Zone 1</i>	04/06/2020	\$42.32	\$9.40	\$20.45	\$0.00	\$72.17
	01/04/2021	\$44.07	\$9.40	\$20.45	\$0.00	\$73.92
	01/03/2022	\$45.82	\$9.40	\$20.45	\$0.00	\$75.67
	01/02/2023	\$47.57	\$9.40	\$20.45	\$0.00	\$77.42

Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

Apprentice - PAINTER Local 35 - BRIDGES/TANKS

Effective Date - 07/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$25.76	\$8.25	\$0.00	\$0.00	\$34.01
2	55	\$28.33	\$8.25	\$6.05	\$0.00	\$42.63
3	60	\$30.91	\$8.25	\$6.60	\$0.00	\$45.76
4	65	\$33.48	\$8.25	\$7.15	\$0.00	\$48.88
5	70	\$36.06	\$8.25	\$19.10	\$0.00	\$63.41
6	75	\$38.63	\$8.25	\$19.65	\$0.00	\$66.53
7	80	\$41.21	\$8.25	\$20.20	\$0.00	\$69.66
8	90	\$46.36	\$8.25	\$21.30	\$0.00	\$75.91

Effective Date - 01/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$26.03	\$8.25	\$0.00	\$0.00	\$34.28
2	55	\$28.63	\$8.25	\$6.16	\$0.00	\$43.04
3	60	\$31.24	\$8.25	\$6.72	\$0.00	\$46.21
4	65	\$33.84	\$8.25	\$7.28	\$0.00	\$49.37
5	70	\$36.44	\$8.25	\$19.39	\$0.00	\$64.08
6	75	\$39.05	\$8.25	\$19.95	\$0.00	\$67.25
7	80	\$41.65	\$8.25	\$20.51	\$0.00	\$70.41
8	90	\$46.85	\$8.25	\$21.63	\$0.00	\$76.73

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (SPRAY OR SANDBLAST, NEW) *	07/01/2020	\$48.28	\$8.25	\$22.40	\$0.00	\$78.93
* If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used. PAINTERS LOCAL 35 - ZONE 1	01/01/2021	\$49.75	\$8.25	\$22.75	\$0.00	\$80.75

Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

Apprentice - PAINTER Local 35 Zone 1 - Spray/Sandblast - New

Effective Date - 07/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$24.14	\$8.25	\$0.00	\$0.00	\$32.39
2	55	\$26.55	\$8.25	\$6.05	\$0.00	\$40.85
3	60	\$28.97	\$8.25	\$6.60	\$0.00	\$43.82
4	65	\$31.38	\$8.25	\$7.15	\$0.00	\$46.78
5	70	\$33.80	\$8.25	\$19.10	\$0.00	\$61.15
6	75	\$36.21	\$8.25	\$19.65	\$0.00	\$64.11
7	80	\$38.62	\$8.25	\$20.20	\$0.00	\$67.07
8	90	\$43.45	\$8.25	\$21.30	\$0.00	\$73.00

Effective Date - 01/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$24.88	\$8.25	\$0.00	\$0.00	\$33.13
2	55	\$27.36	\$8.25	\$6.16	\$0.00	\$41.77
3	60	\$29.85	\$8.25	\$6.72	\$0.00	\$44.82
4	65	\$32.34	\$8.25	\$7.28	\$0.00	\$47.87
5	70	\$34.83	\$8.25	\$19.39	\$0.00	\$62.47
6	75	\$37.31	\$8.25	\$19.95	\$0.00	\$65.51
7	80	\$39.80	\$8.25	\$20.51	\$0.00	\$68.56
8	90	\$44.78	\$8.25	\$21.63	\$0.00	\$74.66

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (SPRAY OR SANDBLAST, REPAINT)	07/01/2020	\$46.26	\$8.25	\$22.40	\$0.00	\$76.91
PAINTERS LOCAL 35 - ZONE 1	01/01/2021	\$46.81	\$8.25	\$22.75	\$0.00	\$77.81

Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

Apprentice - PAINTER Local 35 Zone 1 - Spray/Sandblast - Repaint

Effective Date - 07/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$23.13	\$8.25	\$0.00	\$0.00	\$31.38
2	55	\$25.44	\$8.25	\$6.05	\$0.00	\$39.74
3	60	\$27.76	\$8.25	\$6.60	\$0.00	\$42.61
4	65	\$30.07	\$8.25	\$7.15	\$0.00	\$45.47
5	70	\$32.38	\$8.25	\$19.10	\$0.00	\$59.73
6	75	\$34.70	\$8.25	\$19.65	\$0.00	\$62.60
7	80	\$37.01	\$8.25	\$20.20	\$0.00	\$65.46
8	90	\$41.63	\$8.25	\$21.30	\$0.00	\$71.18

Effective Date - 01/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$23.41	\$8.25	\$0.00	\$0.00	\$31.66
2	55	\$25.75	\$8.25	\$6.16	\$0.00	\$40.16
3	60	\$28.09	\$8.25	\$6.72	\$0.00	\$43.06
4	65	\$30.43	\$8.25	\$7.28	\$0.00	\$45.96
5	70	\$32.77	\$8.25	\$19.39	\$0.00	\$60.41
6	75	\$35.11	\$8.25	\$19.95	\$0.00	\$63.31
7	80	\$37.45	\$8.25	\$20.51	\$0.00	\$66.21
8	90	\$42.13	\$8.25	\$21.63	\$0.00	\$72.01

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

Painter / Taper (Brush, New) *	07/01/2020	\$46.80	\$8.25	\$22.40	\$0.00	\$77.45
* If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used. PAINTERS LOCAL 35 - ZONE 1	01/01/2021	\$47.35	\$8.25	\$22.75	\$0.00	\$78.35

Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

Apprentice - PAINTER - Local 35 Zone 1 - BRUSH NEW

Effective Date - 07/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$23.40	\$8.25	\$0.00	\$0.00	\$31.65
2	55	\$25.74	\$8.25	\$6.05	\$0.00	\$40.04
3	60	\$28.08	\$8.25	\$6.60	\$0.00	\$42.93
4	65	\$30.42	\$8.25	\$7.15	\$0.00	\$45.82
5	70	\$32.76	\$8.25	\$19.10	\$0.00	\$60.11
6	75	\$35.10	\$8.25	\$19.65	\$0.00	\$63.00
7	80	\$37.44	\$8.25	\$20.20	\$0.00	\$65.89
8	90	\$42.12	\$8.25	\$21.30	\$0.00	\$71.67

Effective Date - 01/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$23.68	\$8.25	\$0.00	\$0.00	\$31.93
2	55	\$26.04	\$8.25	\$6.16	\$0.00	\$40.45
3	60	\$28.41	\$8.25	\$6.72	\$0.00	\$43.38
4	65	\$30.78	\$8.25	\$7.28	\$0.00	\$46.31
5	70	\$33.15	\$8.25	\$19.39	\$0.00	\$60.79
6	75	\$35.51	\$8.25	\$19.95	\$0.00	\$63.71
7	80	\$37.88	\$8.25	\$20.51	\$0.00	\$66.64
8	90	\$42.62	\$8.25	\$21.63	\$0.00	\$72.50

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER / TAPER (BRUSH, REPAINT)	07/01/2020	\$44.86	\$8.25	\$22.40	\$0.00	\$75.51
PAINTERS LOCAL 35 - ZONE 1	01/01/2021	\$45.41	\$8.25	\$22.75	\$0.00	\$76.41

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Apprentice - PAINTER Local 35 Zone 1 - BRUSH REPAINT						
Effective Date - 07/01/2020						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$22.43	\$8.25	\$0.00	\$0.00	\$30.68
2	55	\$24.67	\$8.25	\$6.05	\$0.00	\$38.97
3	60	\$26.92	\$8.25	\$6.60	\$0.00	\$41.77
4	65	\$29.16	\$8.25	\$7.15	\$0.00	\$44.56
5	70	\$31.40	\$8.25	\$19.10	\$0.00	\$58.75
6	75	\$33.65	\$8.25	\$19.65	\$0.00	\$61.55
7	80	\$35.89	\$8.25	\$20.20	\$0.00	\$64.34
8	90	\$40.37	\$8.25	\$21.30	\$0.00	\$69.92

Effective Date - 01/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$22.71	\$8.25	\$0.00	\$0.00	\$30.96
2	55	\$24.98	\$8.25	\$6.16	\$0.00	\$39.39
3	60	\$27.25	\$8.25	\$6.72	\$0.00	\$42.22
4	65	\$29.52	\$8.25	\$7.28	\$0.00	\$45.05
5	70	\$31.79	\$8.25	\$19.39	\$0.00	\$59.43
6	75	\$34.06	\$8.25	\$19.95	\$0.00	\$62.26
7	80	\$36.33	\$8.25	\$20.51	\$0.00	\$65.09
8	90	\$40.87	\$8.25	\$21.63	\$0.00	\$70.75

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER TRAFFIC MARKINGS (HEAVY/HIGHWAY) <i>LABORERS - ZONE 1 (HEAVY & HIGHWAY)</i>	12/01/2020	\$39.90	\$8.60	\$17.32	\$0.00	\$65.82
	06/01/2021	\$40.92	\$8.60	\$17.32	\$0.00	\$66.84
	12/01/2021	\$41.93	\$8.60	\$17.32	\$0.00	\$67.85
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)						
PANEL & PICKUP TRUCKS DRIVER <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE A</i>	12/01/2020	\$36.08	\$12.91	\$14.82	\$0.00	\$63.81
	06/01/2021	\$36.88	\$12.91	\$14.82	\$0.00	\$64.61
	08/01/2021	\$36.88	\$13.41	\$14.82	\$0.00	\$65.11
	12/01/2021	\$36.88	\$13.41	\$16.01	\$0.00	\$66.30
PIER AND DOCK CONSTRUCTOR (UNDERPINNING AND DECK) <i>PILE DRIVER LOCAL 56 (ZONE 1)</i>	08/01/2020	\$49.07	\$9.40	\$23.12	\$0.00	\$81.59
For apprentice rates see "Apprentice- PILE DRIVER"						
PILE DRIVER <i>PILE DRIVER LOCAL 56 (ZONE 1)</i>	08/01/2020	\$49.07	\$9.40	\$23.12	\$0.00	\$81.59

Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

Apprentice - PILE DRIVER - Local 56 Zone 1

Effective Date - 08/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$24.54	\$9.40	\$23.12	\$0.00	\$57.06
2	60	\$29.44	\$9.40	\$23.12	\$0.00	\$61.96
3	70	\$34.35	\$9.40	\$23.12	\$0.00	\$66.87
4	75	\$36.80	\$9.40	\$23.12	\$0.00	\$69.32
5	80	\$39.26	\$9.40	\$23.12	\$0.00	\$71.78
6	80	\$39.26	\$9.40	\$23.12	\$0.00	\$71.78
7	90	\$44.16	\$9.40	\$23.12	\$0.00	\$76.68
8	90	\$44.16	\$9.40	\$23.12	\$0.00	\$76.68

Notes:

% Indentured After 10/1/17; 45/45/55/55/70/70/80/80
Step 1&2 \$34.01/ 3&4 \$41.46/ 5&6 \$62.80/ 7&8 \$69.25

Apprentice to Journeyworker Ratio:1:5

PIPEFITTER & STEAMFITTER	09/01/2020	\$56.44	\$11.70	\$20.24	\$0.00	\$88.38
PIPEFITTERS LOCAL 537	03/01/2021	\$57.94	\$11.70	\$20.24	\$0.00	\$89.88

Apprentice - PIPEFITTER - Local 537

Effective Date - 09/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$22.58	\$11.70	\$8.25	\$0.00	\$42.53
2	45	\$25.40	\$11.70	\$20.24	\$0.00	\$57.34
3	60	\$33.86	\$11.70	\$20.24	\$0.00	\$65.80
4	70	\$39.51	\$11.70	\$20.24	\$0.00	\$71.45
5	80	\$45.15	\$11.70	\$20.24	\$0.00	\$77.09

Effective Date - 03/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$23.18	\$11.70	\$8.25	\$0.00	\$43.13
2	45	\$26.07	\$11.70	\$20.24	\$0.00	\$58.01
3	60	\$34.76	\$11.70	\$20.24	\$0.00	\$66.70
4	70	\$40.56	\$11.70	\$20.24	\$0.00	\$72.50
5	80	\$46.35	\$11.70	\$20.24	\$0.00	\$78.29

Notes:

** 1:3; 3:15; 1:10 thereafter / Steps are 1 yr.
Refrig/AC Mechanic **1:1;1:2;2:4;3:6;4:8;5:10;6:12;7:14;8:17;9:20;10:23(Max)

Apprentice to Journeyworker Ratio:**

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
PIPELAYER <i>LABORERS - ZONE 1</i>	12/01/2020	\$40.15	\$8.60	\$17.32	\$0.00	\$66.07
	06/01/2021	\$41.17	\$8.60	\$17.32	\$0.00	\$67.09
	12/01/2021	\$42.18	\$8.60	\$17.32	\$0.00	\$68.10
	06/01/2022	\$43.18	\$8.60	\$17.32	\$0.00	\$69.10
	12/01/2022	\$44.18	\$8.60	\$17.32	\$0.00	\$70.10
	06/01/2023	\$45.18	\$8.60	\$17.32	\$0.00	\$71.10
	12/01/2023	\$46.43	\$8.60	\$17.32	\$0.00	\$72.35
For apprentice rates see "Apprentice- LABORER"						
PIPELAYER (HEAVY & HIGHWAY) <i>LABORERS - ZONE 1 (HEAVY & HIGHWAY)</i>	12/01/2020	\$40.15	\$8.60	\$17.32	\$0.00	\$66.07
	06/01/2021	\$41.17	\$8.60	\$17.32	\$0.00	\$67.09
	12/01/2021	\$42.18	\$8.60	\$17.32	\$0.00	\$68.10
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
PLUMBERS & GASFITTERS <i>PLUMBERS & GASFITTERS LOCAL 12</i>	09/01/2020	\$58.69	\$13.57	\$17.26	\$0.00	\$89.52
	03/01/2021	\$60.19	\$13.57	\$17.26	\$0.00	\$91.02

Apprentice - PLUMBER/GASFITTER - Local 12

Effective Date - 09/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	\$20.54	\$13.57	\$6.24	\$0.00	\$40.35
2	40	\$23.48	\$13.57	\$7.08	\$0.00	\$44.13
3	55	\$32.28	\$13.57	\$9.63	\$0.00	\$55.48
4	65	\$38.15	\$13.57	\$11.33	\$0.00	\$63.05
5	75	\$44.02	\$13.57	\$13.03	\$0.00	\$70.62

Effective Date - 03/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	\$21.07	\$13.57	\$6.24	\$0.00	\$40.88
2	40	\$24.08	\$13.57	\$7.08	\$0.00	\$44.73
3	55	\$33.10	\$13.57	\$9.63	\$0.00	\$56.30
4	65	\$39.12	\$13.57	\$11.33	\$0.00	\$64.02
5	75	\$45.14	\$13.57	\$13.03	\$0.00	\$71.74

Notes:

** 1:2; 2:6; 3:10; 4:14; 5:19/Steps are 1 yr
Step4 with lic\$66.82, Step5 with lic\$74.39

Apprentice to Journeyworker Ratio:**

PNEUMATIC CONTROLS (TEMP.) <i>PIPEFITTERS LOCAL 537</i>	09/01/2020	\$56.44	\$11.70	\$20.24	\$0.00	\$88.38
	03/01/2021	\$57.94	\$11.70	\$20.24	\$0.00	\$89.88
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
PNEUMATIC DRILL/TOOL OPERATOR <i>LABORERS - ZONE 1</i>	12/01/2020	\$40.15	\$8.60	\$17.32	\$0.00	\$66.07
	06/01/2021	\$41.17	\$8.60	\$17.32	\$0.00	\$67.09
	12/01/2021	\$42.18	\$8.60	\$17.32	\$0.00	\$68.10
	06/01/2022	\$43.18	\$8.60	\$17.32	\$0.00	\$69.10
	12/01/2022	\$44.18	\$8.60	\$17.32	\$0.00	\$70.10
	06/01/2023	\$45.18	\$8.60	\$17.32	\$0.00	\$71.10
	12/01/2023	\$46.43	\$8.60	\$17.32	\$0.00	\$72.35

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
For apprentice rates see "Apprentice- LABORER"						
PNEUMATIC DRILL/TOOL OPERATOR (HEAVY & HIGHWAY) <i>LABORERS - ZONE 1 (HEAVY & HIGHWAY)</i>	12/01/2020	\$40.15	\$8.60	\$17.32	\$0.00	\$66.07
	06/01/2021	\$41.17	\$8.60	\$17.32	\$0.00	\$67.09
	12/01/2021	\$42.18	\$8.60	\$17.32	\$0.00	\$68.10
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
POWDERMAN & BLASTER <i>LABORERS - ZONE 1</i>	12/01/2020	\$40.90	\$8.60	\$17.32	\$0.00	\$66.82
	06/01/2021	\$41.92	\$8.60	\$17.32	\$0.00	\$67.84
	12/01/2021	\$42.93	\$8.60	\$17.32	\$0.00	\$68.85
	06/01/2022	\$43.93	\$8.60	\$17.32	\$0.00	\$69.85
	12/01/2022	\$44.93	\$8.60	\$17.32	\$0.00	\$70.85
	06/01/2023	\$45.93	\$8.60	\$17.32	\$0.00	\$71.85
For apprentice rates see "Apprentice- LABORER"						
POWDERMAN & BLASTER (HEAVY & HIGHWAY) <i>LABORERS - ZONE 1 (HEAVY & HIGHWAY)</i>	12/01/2020	\$40.90	\$8.60	\$17.32	\$0.00	\$66.82
	06/01/2021	\$41.92	\$8.60	\$17.32	\$0.00	\$67.84
	12/01/2021	\$42.93	\$8.60	\$17.32	\$0.00	\$68.85
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
POWER SHOVEL/DERRICK/TRENCHING MACHINE <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2020	\$49.98	\$13.50	\$15.70	\$0.00	\$79.18
	06/01/2021	\$51.08	\$13.50	\$15.70	\$0.00	\$80.28
	12/01/2021	\$52.23	\$13.50	\$15.70	\$0.00	\$81.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PUMP OPERATOR (CONCRETE) <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2020	\$49.98	\$13.50	\$15.70	\$0.00	\$79.18
	06/01/2021	\$51.08	\$13.50	\$15.70	\$0.00	\$80.28
	12/01/2021	\$52.23	\$13.50	\$15.70	\$0.00	\$81.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PUMP OPERATOR (DEWATERING, OTHER) <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2020	\$33.00	\$13.50	\$15.70	\$0.00	\$62.20
	06/01/2021	\$33.75	\$13.50	\$15.70	\$0.00	\$62.95
	12/01/2021	\$34.54	\$13.50	\$15.70	\$0.00	\$63.74
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
READY-MIX CONCRETE DRIVER <i>TEAMSTERS 170 - Rosenfeld (Walpole)</i>	01/01/2020	\$23.50	\$11.01	\$8.00	\$0.00	\$42.51
	01/01/2021	\$23.50	\$11.51	\$8.00	\$0.00	\$43.01
RECLAIMERS <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2020	\$49.45	\$13.50	\$15.70	\$0.00	\$78.65
	06/01/2021	\$50.54	\$13.50	\$15.70	\$0.00	\$79.74
	12/01/2021	\$51.68	\$13.50	\$15.70	\$0.00	\$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
RIDE-ON MOTORIZED BUGGY OPERATOR <i>LABORERS - ZONE 1</i>	12/01/2020	\$40.15	\$8.60	\$17.32	\$0.00	\$66.07
	06/01/2021	\$41.17	\$8.60	\$17.32	\$0.00	\$67.09
	12/01/2021	\$42.18	\$8.60	\$17.32	\$0.00	\$68.10
	06/01/2022	\$43.18	\$8.60	\$17.32	\$0.00	\$69.10
	12/01/2022	\$44.18	\$8.60	\$17.32	\$0.00	\$70.10
	06/01/2023	\$45.18	\$8.60	\$17.32	\$0.00	\$71.10
	12/01/2023	\$46.43	\$8.60	\$17.32	\$0.00	\$72.35
For apprentice rates see "Apprentice- LABORER"						
ROLLER/SPREADER/MULCHING MACHINE <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2020	\$49.45	\$13.50	\$15.70	\$0.00	\$78.65
	06/01/2021	\$50.54	\$13.50	\$15.70	\$0.00	\$79.74
	12/01/2021	\$51.68	\$13.50	\$15.70	\$0.00	\$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
ROOFER (Inc.Roofing Waterproofing &Roofing Damproofing) ROOFERS LOCAL 33	08/01/2020	\$46.60	\$11.75	\$16.15	\$0.00	\$74.50
	02/01/2021	\$48.03	\$11.75	\$16.15	\$0.00	\$75.93
	08/01/2021	\$49.46	\$11.75	\$16.15	\$0.00	\$77.36
	02/01/2022	\$50.89	\$11.75	\$16.15	\$0.00	\$78.79

Apprentice - ROOFER - Local 33

Effective Date - 08/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$23.30	\$11.75	\$3.81	\$0.00	\$38.86
2	60	\$27.96	\$11.75	\$16.15	\$0.00	\$55.86
3	65	\$30.29	\$11.75	\$16.15	\$0.00	\$58.19
4	75	\$34.95	\$11.75	\$16.15	\$0.00	\$62.85
5	85	\$39.61	\$11.75	\$16.15	\$0.00	\$67.51

Effective Date - 02/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$24.02	\$11.75	\$3.81	\$0.00	\$39.58
2	60	\$28.82	\$11.75	\$16.15	\$0.00	\$56.72
3	65	\$31.22	\$11.75	\$16.15	\$0.00	\$59.12
4	75	\$36.02	\$11.75	\$16.15	\$0.00	\$63.92
5	85	\$40.83	\$11.75	\$16.15	\$0.00	\$68.73

Notes: ** 1:5, 2:6-10, the 1:10; Reroofing: 1:4, then 1:1
 Step 1 is 2000 hrs.; Steps 2-5 are 1000 hrs.
 (Hot Pitch Mechanics' receive \$1.00 hr. above ROOFER)

Apprentice to Journeyworker Ratio:**

ROOFER SLATE / TILE / PRECAST CONCRETE ROOFERS LOCAL 33	08/01/2020	\$46.85	\$11.75	\$16.15	\$0.00	\$74.75
	02/01/2021	\$48.28	\$11.75	\$16.15	\$0.00	\$76.18
	08/01/2021	\$49.71	\$11.75	\$16.15	\$0.00	\$77.61
	02/01/2022	\$51.14	\$11.75	\$16.15	\$0.00	\$79.04

For apprentice rates see "Apprentice- ROOFER"

SHEETMETAL WORKER SHEETMETAL WORKERS LOCAL 17 - A	08/01/2020	\$50.67	\$13.50	\$24.12	\$2.65	\$90.94
	02/01/2021	\$52.32	\$13.50	\$24.12	\$2.70	\$92.64
	08/01/2021	\$54.07	\$13.50	\$24.12	\$2.75	\$94.44
	02/01/2022	\$55.82	\$13.50	\$24.12	\$2.80	\$96.24

Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

Apprentice - SHEET METAL WORKER - Local 17-A

Effective Date - 08/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	42	\$21.28	\$13.50	\$5.89	\$0.00	\$40.67
2	42	\$21.28	\$13.50	\$5.89	\$0.00	\$40.67
3	47	\$23.81	\$13.50	\$11.13	\$1.45	\$49.89
4	47	\$23.81	\$13.50	\$11.13	\$1.45	\$49.89
5	52	\$26.35	\$13.50	\$12.08	\$1.56	\$53.49
6	52	\$26.35	\$13.50	\$12.33	\$1.57	\$53.75
7	60	\$30.40	\$13.50	\$13.70	\$1.73	\$59.33
8	65	\$32.94	\$13.50	\$15.15	\$1.83	\$63.42
9	75	\$38.00	\$13.50	\$16.56	\$2.04	\$70.10
10	85	\$43.07	\$13.50	\$17.96	\$2.24	\$76.77

Effective Date - 02/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	42	\$21.97	\$13.50	\$5.89	\$0.00	\$41.36
2	42	\$21.97	\$13.50	\$5.89	\$0.00	\$41.36
3	47	\$24.59	\$13.50	\$11.13	\$1.48	\$50.70
4	47	\$24.59	\$13.50	\$11.13	\$1.48	\$50.70
5	52	\$27.21	\$13.50	\$12.08	\$1.58	\$54.37
6	52	\$27.21	\$13.50	\$12.33	\$1.59	\$54.63
7	60	\$31.39	\$13.50	\$13.70	\$1.76	\$60.35
8	65	\$34.01	\$13.50	\$15.15	\$1.88	\$64.54
9	75	\$39.24	\$13.50	\$16.56	\$2.08	\$71.38
10	85	\$44.47	\$13.50	\$17.96	\$2.28	\$78.21

Notes:

Steps are 6 mos.

Apprentice to Journeyworker Ratio:1:4

SPECIALIZED EARTH MOVING EQUIP < 35 TONS <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE A</i>	12/01/2020	\$36.54	\$12.91	\$14.82	\$0.00	\$64.27
	06/01/2021	\$37.34	\$12.91	\$14.82	\$0.00	\$65.07
	08/01/2021	\$37.34	\$13.41	\$14.82	\$0.00	\$65.57
	12/01/2021	\$37.34	\$13.41	\$16.01	\$0.00	\$66.76
SPECIALIZED EARTH MOVING EQUIP > 35 TONS <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE A</i>	12/01/2020	\$36.83	\$12.91	\$14.82	\$0.00	\$64.56
	06/01/2021	\$37.63	\$12.91	\$14.82	\$0.00	\$65.36
	08/01/2021	\$37.63	\$13.41	\$14.82	\$0.00	\$65.86
	12/01/2021	\$37.63	\$13.41	\$16.01	\$0.00	\$67.05
SPRINKLER FITTER <i>SPRINKLER FITTERS LOCAL 550 - (Section A) Zone 1</i>	10/01/2020	\$61.97	\$9.68	\$20.55	\$0.00	\$92.20
	01/01/2021	\$61.45	\$10.00	\$20.75	\$0.00	\$92.20
	03/01/2021	\$63.47	\$10.00	\$20.75	\$0.00	\$94.22

Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

Apprentice - TELECOMMUNICATION TECHNICIAN - Local 103

Effective Date - 09/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	45	\$18.38	\$13.00	\$0.55	\$0.00	\$31.93
2	45	\$18.38	\$13.00	\$0.55	\$0.00	\$31.93
3	50	\$20.42	\$13.00	\$14.20	\$0.00	\$47.62
4	50	\$20.42	\$13.00	\$14.20	\$0.00	\$47.62
5	55	\$22.46	\$13.00	\$14.53	\$0.00	\$49.99
6	60	\$24.50	\$13.00	\$14.87	\$0.00	\$52.37
7	65	\$26.55	\$13.00	\$15.20	\$0.00	\$54.75
8	70	\$28.59	\$13.00	\$15.53	\$0.00	\$57.12
9	75	\$30.63	\$13.00	\$15.87	\$0.00	\$59.50
10	80	\$32.67	\$13.00	\$16.20	\$0.00	\$61.87

Effective Date - 03/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	45	\$18.95	\$13.00	\$0.57	\$0.00	\$32.52
2	45	\$18.95	\$13.00	\$0.57	\$0.00	\$32.52
3	50	\$21.06	\$13.00	\$14.47	\$0.00	\$48.53
4	50	\$21.06	\$13.00	\$14.47	\$0.00	\$48.53
5	55	\$23.16	\$13.00	\$14.80	\$0.00	\$50.96
6	60	\$25.27	\$13.00	\$15.14	\$0.00	\$53.41
7	65	\$27.37	\$13.00	\$15.47	\$0.00	\$55.84
8	70	\$29.48	\$13.00	\$15.80	\$0.00	\$58.28
9	75	\$31.58	\$13.00	\$16.15	\$0.00	\$60.73
10	80	\$33.69	\$13.00	\$16.48	\$0.00	\$63.17

Notes:

Apprentice to Journeyworker Ratio:1:1

TERRAZZO FINISHERS	08/01/2020	\$54.69	\$10.75	\$22.09	\$0.00	\$87.53
BRICKLAYERS LOCAL 3 - MARBLE & TILE	02/01/2021	\$55.33	\$10.75	\$22.09	\$0.00	\$88.17
	08/01/2021	\$56.73	\$10.75	\$22.25	\$0.00	\$89.73
	02/01/2022	\$57.32	\$10.75	\$22.25	\$0.00	\$90.32

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Apprentice - TERRAZZO FINISHER - Local 3 Marble & Tile						
Effective Date - 08/01/2020						
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$27.35	\$10.75	\$22.09	\$0.00	\$60.19
2	60	\$32.81	\$10.75	\$22.09	\$0.00	\$65.65
3	70	\$38.28	\$10.75	\$22.09	\$0.00	\$71.12
4	80	\$43.75	\$10.75	\$22.09	\$0.00	\$76.59
5	90	\$49.22	\$10.75	\$22.09	\$0.00	\$82.06

Effective Date - 02/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$27.67	\$10.75	\$22.09	\$0.00	\$60.51
2	60	\$33.20	\$10.75	\$22.09	\$0.00	\$66.04
3	70	\$38.73	\$10.75	\$22.09	\$0.00	\$71.57
4	80	\$44.26	\$10.75	\$22.09	\$0.00	\$77.10
5	90	\$49.80	\$10.75	\$22.09	\$0.00	\$82.64

Notes:

Apprentice to Journeyworker Ratio:1:3

TEST BORING DRILLER <i>LABORERS - FOUNDATION AND MARINE</i>	12/01/2020	\$41.30	\$8.60	\$17.47	\$0.00	\$67.37
	06/01/2021	\$42.32	\$8.60	\$17.47	\$0.00	\$68.39
	12/01/2021	\$43.33	\$8.60	\$17.47	\$0.00	\$69.40

For apprentice rates see "Apprentice- LABORER"

TEST BORING DRILLER HELPER <i>LABORERS - FOUNDATION AND MARINE</i>	12/01/2020	\$40.02	\$8.60	\$17.47	\$0.00	\$66.09
	06/01/2021	\$41.04	\$8.60	\$17.47	\$0.00	\$67.11
	12/01/2021	\$42.05	\$8.60	\$17.47	\$0.00	\$68.12

For apprentice rates see "Apprentice- LABORER"

TEST BORING LABORER <i>LABORERS - FOUNDATION AND MARINE</i>	12/01/2020	\$39.90	\$8.60	\$17.47	\$0.00	\$65.97
	06/01/2021	\$40.92	\$8.60	\$17.47	\$0.00	\$66.99
	12/01/2021	\$41.93	\$8.60	\$17.47	\$0.00	\$68.00

For apprentice rates see "Apprentice- LABORER"

TRACTORS/PORTABLE STEAM GENERATORS <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2020	\$49.45	\$13.50	\$15.70	\$0.00	\$78.65
	06/01/2021	\$50.54	\$13.50	\$15.70	\$0.00	\$79.74
	12/01/2021	\$51.68	\$13.50	\$15.70	\$0.00	\$80.88

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

TRAILERS FOR EARTH MOVING EQUIPMENT <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE A</i>	12/01/2020	\$37.12	\$12.91	\$14.82	\$0.00	\$64.85
	06/01/2021	\$37.92	\$12.91	\$14.82	\$0.00	\$65.65
	08/01/2021	\$37.92	\$13.41	\$14.82	\$0.00	\$66.15
	12/01/2021	\$37.92	\$13.41	\$16.01	\$0.00	\$67.34

TUNNEL WORK - COMPRESSED AIR <i>LABORERS (COMPRESSED AIR)</i>	12/01/2020	\$52.13	\$8.60	\$17.92	\$0.00	\$78.65
	06/01/2021	\$53.15	\$8.60	\$17.92	\$0.00	\$79.67
	12/01/2021	\$54.16	\$8.60	\$17.92	\$0.00	\$80.68

For apprentice rates see "Apprentice- LABORER"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TUNNEL WORK - COMPRESSED AIR (HAZ. WASTE) <i>LABORERS (COMPRESSED AIR)</i>	12/01/2020	\$54.13	\$8.60	\$17.92	\$0.00	\$80.65
	06/01/2021	\$55.15	\$8.60	\$17.92	\$0.00	\$81.67
	12/01/2021	\$56.16	\$8.60	\$17.92	\$0.00	\$82.68
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - FREE AIR <i>LABORERS (FREE AIR TUNNEL)</i>	12/01/2020	\$44.20	\$8.60	\$17.92	\$0.00	\$70.72
	06/01/2021	\$45.22	\$8.60	\$17.92	\$0.00	\$71.74
	12/01/2021	\$46.23	\$8.60	\$17.92	\$0.00	\$72.75
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - FREE AIR (HAZ. WASTE) <i>LABORERS (FREE AIR TUNNEL)</i>	12/01/2020	\$46.20	\$8.60	\$17.92	\$0.00	\$72.72
	06/01/2021	\$47.22	\$8.60	\$17.92	\$0.00	\$73.74
	12/01/2021	\$48.23	\$8.60	\$17.92	\$0.00	\$74.75
For apprentice rates see "Apprentice- LABORER"						
VAC-HAUL <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE A</i>	12/01/2020	\$36.54	\$12.91	\$14.82	\$0.00	\$64.27
	06/01/2021	\$37.34	\$12.91	\$14.82	\$0.00	\$65.07
	08/01/2021	\$37.34	\$13.41	\$14.82	\$0.00	\$65.57
	12/01/2021	\$37.34	\$13.41	\$16.01	\$0.00	\$66.76
WAGON DRILL OPERATOR <i>LABORERS - ZONE 1</i>	12/01/2020	\$40.15	\$8.60	\$17.32	\$0.00	\$66.07
	06/01/2021	\$41.17	\$8.60	\$17.32	\$0.00	\$67.09
	12/01/2021	\$42.18	\$8.60	\$17.32	\$0.00	\$68.10
	06/01/2022	\$43.18	\$8.60	\$17.32	\$0.00	\$69.10
	12/01/2022	\$44.18	\$8.60	\$17.32	\$0.00	\$70.10
	06/01/2023	\$45.18	\$8.60	\$17.32	\$0.00	\$71.10
12/01/2023	\$46.43	\$8.60	\$17.32	\$0.00	\$72.35	
For apprentice rates see "Apprentice- LABORER"						
WAGON DRILL OPERATOR (HEAVY & HIGHWAY) <i>LABORERS - ZONE 1 (HEAVY & HIGHWAY)</i>	12/01/2020	\$40.15	\$8.60	\$17.32	\$0.00	\$66.07
	06/01/2021	\$41.17	\$8.60	\$17.32	\$0.00	\$67.09
	12/01/2021	\$42.18	\$8.60	\$17.32	\$0.00	\$68.10
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
WASTE WATER PUMP OPERATOR <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2020	\$49.98	\$13.50	\$15.70	\$0.00	\$79.18
	06/01/2021	\$51.08	\$13.50	\$15.70	\$0.00	\$80.28
	12/01/2021	\$52.23	\$13.50	\$15.70	\$0.00	\$81.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
WATER METER INSTALLER <i>PLUMBERS & GASFITTERS LOCAL 12</i>	09/01/2020	\$58.69	\$13.57	\$17.26	\$0.00	\$89.52
	03/01/2021	\$60.19	\$13.57	\$17.26	\$0.00	\$91.02
For apprentice rates see "Apprentice- PLUMBER/PIPEFITTER" or "PLUMBER/GASFITTER"						
Outside Electrical - East						
CABLE TECHNICIAN (Power Zone) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	08/30/2020	\$29.67	\$9.25	\$1.89	\$0.00	\$40.81
	For apprentice rates see "Apprentice- LINEMAN"					
CABLEMAN (Underground Ducts & Cables) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	08/30/2020	\$42.03	\$9.25	\$10.27	\$0.00	\$61.55
	For apprentice rates see "Apprentice- LINEMAN"					
DRIVER / GROUNDMAN CDL <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	08/30/2020	\$34.62	\$9.25	\$10.07	\$0.00	\$53.94
	For apprentice rates see "Apprentice- LINEMAN"					
DRIVER / GROUNDMAN -Inexperienced (<2000 Hrs) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	08/30/2020	\$27.20	\$9.25	\$1.82	\$0.00	\$38.27
	For apprentice rates see "Apprentice- LINEMAN"					

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
EQUIPMENT OPERATOR (Class A CDL) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i> For apprentice rates see "Apprentice- LINEMAN"	08/30/2020	\$42.03	\$9.25	\$14.35	\$0.00	\$65.63
EQUIPMENT OPERATOR (Class B CDL) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i> For apprentice rates see "Apprentice- LINEMAN"	08/30/2020	\$37.09	\$9.25	\$10.87	\$0.00	\$57.21
GROUNDMAN <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i> For apprentice rates see "Apprentice- LINEMAN"	08/30/2020	\$22.25	\$9.25	\$1.67	\$0.00	\$33.17
GROUNDMAN -Inexperienced (<2000 Hrs.) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i> For apprentice rates see "Apprentice- LINEMAN"	08/30/2020	\$27.20	\$9.25	\$1.82	\$0.00	\$38.27
JOURNEYMAN LINEMAN <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	08/30/2020	\$49.45	\$9.25	\$17.48	\$0.00	\$76.18

Apprentice - LINEMAN (Outside Electrical) - East Local 104

Effective Date - 08/30/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$29.67	\$9.25	\$3.39	\$0.00	\$42.31
2	65	\$32.14	\$9.25	\$3.46	\$0.00	\$44.85
3	70	\$34.62	\$9.25	\$3.54	\$0.00	\$47.41
4	75	\$37.09	\$9.25	\$5.11	\$0.00	\$51.45
5	80	\$39.56	\$9.25	\$5.19	\$0.00	\$54.00
6	85	\$42.03	\$9.25	\$5.26	\$0.00	\$56.54
7	90	\$44.51	\$9.25	\$7.34	\$0.00	\$61.10

Notes:

Apprentice to Journeyworker Ratio:1:2

TELEDATA CABLE SPLICER <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	02/04/2019	\$30.73	\$4.70	\$3.17	\$0.00	\$38.60
TELEDATA LINEMAN/EQUIPMENT OPERATOR <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	02/04/2019	\$28.93	\$4.70	\$3.14	\$0.00	\$36.77
TELEDATA WIREMAN/INSTALLER/TECHNICIAN <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	02/04/2019	\$28.93	\$4.70	\$3.14	\$0.00	\$36.77

Additional Apprentice Information:

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

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

All steps are six months (1000 hours.)

Ratios are expressed in allowable number of apprentices to journeymen or fraction thereof, unless otherwise specified.

** Multiple ratios are listed in the comment field.

*** APP to JM; 1:1, 2:2, 2:3, 3:4, 4:4, 4:5, 4:6, 5:7, 6:7, 6:8, 6:9, 7:10, 8:10, 8:11, 8:12, 9:13, 10:13, 10:14, etc.

**** APP to JM; 1:1, 1:2, 2:3, 2:4, 3:5, 4:6, 4:7, 5:8, 6:9, 6:10, 7:11, 8:12, 8:13, 9:14, 10:15, 10:16, etc.

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DOCUMENT 00870

**STANDARD FEDERAL EQUAL EMPLOYMENT OPPORTUNITY
CONSTRUCTION CONTRACT SPECIFICATIONS**

(EXECUTIVE ORDER 11246)

Revised April 9, 2019

1. As used in these specifications:
 - a. "Covered area" means the geographical area described in the solicitation from which this contract resulted;
 - b. "Director" means Director, Office of Federal Contract Compliance Programs, United States Department of Labor, or any person to whom the Director delegates authority.
 - c. "Employer identification number" means the Federal Social Security number used on the Employer's Quarterly Federal Tax Return, U.S. Treasury Department Form 941.
 - d. "Minority" includes:
 - (i) Black (all persons having origins in any of the black African racial groups not of Hispanic origin);
 - (ii) Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American or other Spanish Culture or origin, regardless of race);
 - (iii) Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands); and
 - (iv) American Indian or Alaskan Native (all persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification).
2. Whenever the Contractor, or any Subcontractor at any tier, subcontracts a portion of the work involving any construction trade, it shall physically include in each subcontract in excess of \$ 10,000 the provisions of the specifications and the Notice which contains the applicable goals for minority and female participation and which is set forth in the solicitations from which this contract resulted.
3. If the Contractor is participating (pursuant to 41 CFR 60-4.5) in a Hometown Plan approved by the U.S. Department of Labor in the covered area either individually or through an association, its affirmative action obligations on all work in the Plan area (including goals and timetables) shall be in accordance with that Plan for those trades which have unions participating in the Plan. Contractors must be able to demonstrate their participation in and compliance with the provisions of any such Hometown Plan. Each Contractor or Subcontractor participating in an approved Plan is individually required to comply with its obligations under the EEO clause, and to make a good faith effort to achieve each goal under the plan in each trade in which it has employees. The overall good faith performance by other Contractors or Subcontractors toward a goal in an approved Plan does not excuse any covered Contractor's or Subcontractor's failure to take good faith efforts to achieve the Plan goals and timetables.
4. The Contractor shall implement the specific affirmative action standards provided in Paragraphs 7a through p of these specifications. The goals set forth in the solicitation from which this contract resulted are expressed as percentages of the total hours of employment and training of minority and female utilization the Contractor should reasonably be able to achieve in each construction trade in which it has employees in the covered area. The Contractor is expected to make substantially uniform progress toward its goals in each craft during the period specified.
5. Neither the provisions of any collective bargaining agreement, nor the failure by a union with whom the Contractor has a collective bargaining agreement, to refer either minorities or women shall excuse the Contractor's obligations under these specifications, Executive Order 11246, or the regulations promulgated pursuant thereto.

6. In order for the nonworking training hours of apprentices and trainees to be counted in meeting the goals, such apprentices and trainees must be employed by the Contractor during the training period, and the Contractor must have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees must be trained pursuant to training programs approved by the U.S. Department of Labor.
7. The Contractor shall take specific affirmative actions to ensure equal employment opportunity. The evaluation of the Contractor's compliance with these specifications shall be based upon its effort to achieve maximum results from its actions. The Contractor shall document these efforts fully, and shall implement affirmative action steps at least as extensive as the following:
 - a. Ensure and maintain a working environment free of harassment, intimidation, and coercion at all sites, and all facilities at which the Contractor's employees are assigned to work. The Contractor, where possible, will assign two or more women to each construction project. The Contractor shall specifically ensure that all foremen, superintendents, and other on-site supervisory personnel are aware of and carry out the Contractor's obligation to maintain such a working environment, with specific attention to minority or female individuals working at such sites or in such facilities.
 - b. Establish and maintain a current list of minority and female recruitment sources, provide written notification to minority and female recruitment sources and to community organizations when the Contractor or its unions have employment opportunities available, and maintain a record of the organizations' responses.
 - c. Maintain a current file of the names, addresses and telephone numbers of each minority and female off-the-street applicant and minority or female referral from a union, a recruitment source or community organization and of what action was taken with respect to each such individual. If such individual was sent to the union hiring hall for referral and was not referred back to the Contractor by the union or, if referred, not employed by the Contractor, this shall be documented in the file with the reason therefor, along with whatever additional actions the Contractor may have taken.
 - d. Provide immediate written notification to the Director when the union or unions with which the Contractor has a collective bargaining agreement has not referred to the Contractor a minority person or woman sent by the Contractor, or when the Contractor has other information that the union referral process has impeded the Contractor's efforts to meet its obligations.
 - e. Develop on-the-job training opportunities and/or participate in training programs for the area which expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the Contractor's employment needs, especially those programs funded or approved by the Department of Labor. The Contractor shall provide notice of these programs to the sources compiled under 7b above.
 - f. Disseminate the Contractor's EEO policy by providing notice of the policy to unions and training programs and requesting their cooperation in assisting the Contractor in meeting its EEO obligations; by including it in any policy manual and collective bargaining agreement; by publicizing it in the company newspaper, annual report, etc; by specific review of the policy with all management personnel and with all minority and female employees at least once a year; and by posting the company EEO policy on bulletin boards accessible to all employees at each location where construction work is performed.
 - g. Review, at least annually, the company's EEO policy and affirmative action obligations under these specifications with all employees having any responsibility for hiring, assignment, layoff, termination or other employment decisions including specific review of these items with on-site supervisory personnel such as Superintendents, General Foremen, etc., prior to the initiation of construction work at any job site. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.
 - h. Disseminate the Contractor's EEO policy externally by including it in any advertising in the news media, specifically including minority and female news media, and providing written notification to and discussing the Contractor's EEO policy with other Contractors and Subcontractors with whom the Contractor does or anticipates doing business.

- i. Direct its recruitment efforts both oral and written, to minority, female and community organizations, to schools with minority and female students and to minority and female recruitment and training organizations serving the Contractor's recruitment area and employment needs. Not later than one month prior to the date for the acceptance of applications for apprenticeship or other training by any recruitment source, the Contractor shall send written notification to organizations such as the above, describing the openings, screening procedures, and tests to be used in the selection process.
 - j. Encourage present minority and female employees to recruit other minority persons and women and, where reasonable, provide after school, summer and vacation employment to minority and female youth both on the site and in other areas of a Contractor's work force.
 - k. Validate all tests and other selection requirements where there is an obligation to do so under 41 CFR Part 60-3.
 - l. Conduct, at least annually, an inventory and evaluation at least of all minority and female personnel for promotional opportunities and encourage these employees to seek or to prepare for, through appropriate training, etc., such opportunities.
 - m. Ensure that seniority practices, job classifications, work assignments and other personnel practices, do not have a discriminatory effect by continually monitoring all personnel and employment related activities to ensure that the EEO policy and the Contractor's obligations under these specifications are being carried out.
 - n. Ensure that all facilities and company activities are nonsegregated except that separate or single-user toilet and necessary changing facilities shall be provided to assure privacy between the sexes.
 - o. Document and maintain a record of all solicitations of offers for subcontracts from minority and female construction contractors and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations.
 - p. Conduct a review, at least annually, of all supervisor's adherence to and performance under the Contractor's EEO policies and affirmative action obligations.
8. Contractors are encouraged to participate in voluntary associations which assist in fulfilling one or more of their affirmative action obligations (7a through p). The efforts of a contractor association, joint contractor-union, contractor-community, or other similar group of which the contractor is a member and participant, may be asserted as fulfilling any one or more of its obligations under 7a through p of these Specifications provided that the Contractor actively participates in the group, makes every effort to assure that the group has a positive impact on the employment of minorities and women in the industry, ensures that the concrete benefits of the program are reflected in the Contractor's minority and female work force participation, makes a good faith effort to meet its individual goals and timetables, and can provide access to documentation which demonstrates the effectiveness of actions taken on behalf of the Contractor. The obligation to comply, however, is the Contractor's and failure of such a group to fulfill an obligation shall not be a defense for the Contractor's noncompliance.
 9. A single goal for minorities and a separate single goal for women have been established. The Contractor, however, is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and non-minority. Consequently, the Contractor may be in violation of the Executive Order if a particular group is employed in a substantially disparate manner (for example, even though the Contractor has achieved its goals for women generally, the Contractor may be in violation of the Executive Order if a specific minority group of women is underutilized).
 10. The Contractor shall not use the goals and timetables of affirmative action standards to discriminate against any person because of race, color, religion, sex, or national origin.
 11. The Contractor shall not enter into any Subcontract with any person or firm debarred from Government contracts pursuant to Executive Order 11246.

12. The Contractor shall carry out such sanctions and penalties for violation of these specifications and of the Equal Opportunity Clause, including suspension, termination and cancellation of existing subcontracts as may be imposed or ordered pursuant to Executive Order 11246, as amended, and its implementing regulations, by the Office of Federal Contract Compliance programs. Any Contractor who fails to carry out such sanctions and penalties shall be in violation of these specifications and Executive Order 11246, as amended.
13. The Contractor, in fulfilling its obligations under these specifications, shall implement specific affirmative action steps, at least as extensive as those standards prescribed in paragraph 7 of these specifications so as to achieve maximum results from its efforts to ensure equal employment opportunity. If the Contractor fails to comply with the requirements of the Executive Order, the implementing regulations, or these specifications, the Director shall proceed in accordance with 41 CFR 60-4.8.
14. The Contractor shall designate a responsible official to monitor all employment related activity to ensure that the company EEO policy is being carried out, to submit reports relating to the provisions hereof as many be required by the Government and keep records. Records shall at least include for each employee the name, address, telephone numbers, construction trade, union affiliation if any, employee identification number when assigned, social security number, race, sex, status (e.g., mechanic, apprentice, trainee, helper, or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and locations at which the work was performed. Records shall be maintained in an easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, contractors shall not be required to maintain separate records.
15. Nothing herein provided shall be construed as a limitation upon the application of other laws which establish different standards of compliance or upon the application of requirements for the hiring of local or other area residents (e.g., those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program).

APPENDIX A

The following goals and timetables for female utilization shall be included in all Federal and federally assisted construction contracts and subcontracts in excess of \$ 10,000. The goals are applicable to the Contractor's aggregate on-site construction workforce whether or not part of that workforce is performing work on a Federal or federally-assisted construction contract or subcontract.

Area covered: Goal for Women apply nationwide

Goals and Timetables

Timetable

Goals (percent)

From Apr. 1, 1980 until further notice

6.9

APPENDIX B-80

Until further notice, the following goals for minority utilization in each construction craft and trade shall included in all Federal or federally assisted construction contracts and subcontracts in excess of \$ 10,000 to be performed in the respective geographical areas. The goals are applicable to each nonexempt contractor's total on- site construction workforce, regardless of whether or not part of that workforce is performing work on a Federal, federally assisted or nonfederally related project, contract or subcontract.

Construction contractors participating in an approved Hometown Plan (see 41 CFR 6-4.5) are required to comply with the goals of the Hometown Plan with regard to construction work they perform in the area covered by the Hometown Plan. With regard to all their other covered construction work, such contractors are required to comply with the applicable SMSA or EA goal contained in this Appendix B-80.

Economic Areas

<u>STATE:</u>	<u>Goals (percent)</u>
MASSACHUSETTS	
004 Boston MA:	
SMSA Counties:	
1123 Boston-Lowell-Brockton-Lawrence-Haverhill, MA-NH	4.0
MA Essex, MA Middlesex, MA Norfolk, MA Plymouth, MA Suffolk, NH Rockingham.	
5403 Fall River- New Bedford MA, Bristol	1.6
9243 Worcester-Fitchburg-Leominster, MA	1.6
6323 Springfield-Chicopee-Holyoke MA-CT MA Hampden, MA Hampshire	4.8
Non-SMSA Counties: MA Barnstable, MA Dukes, MA Nantucket	3.6
Non-SMSA Counties: MA Franklin	5.9

APPENDIX C

During the performance of this contract, the contractor, for itself, its assignees, and successors in interest (hereinafter referred to as the “contractor”) agrees as follows:

1. **Compliance with Regulations:** The contractor (hereinafter includes consultants) will comply with the Acts and Regulations relative to Non-discrimination in Federally-assisted programs of the U.S. Department of Transportation, Federal Highway Administration (FHWA), as they may be amended from time to time, which are herein incorporated by reference and made a part of this contract.
2. **Non-discrimination:** The contractor, with regard to the work performed by it during the contract, will not discriminate on the grounds of race, color, national origin (including limited English proficiency), age, sex, disability, or low-income status in the selection and retention of subcontractors, including procurements of materials and leases of equipment. The contractor will not participate directly or indirectly in the discrimination prohibited by the Acts and the Regulations, including employment practices when the contract covers any activity, project, or program set forth in Appendix B of 49 CFR Part 21.
3. **Solicitations for Subcontractors, including Procurements of Materials and Equipment:** In all solicitations, either by competitive bidding, or negotiation made by the contractor for work to be performed under a subcontract, including procurements of materials, or leases of equipment, each potential subcontractor or supplier will be notified by the contractor of the contractor’s obligations under this contract and the Acts and the Regulations relative to nondiscrimination on the grounds of race, color, national origin (including limited English proficiency), age, sex, disability, or low-income status.
4. **Information and Reports:** The contractor will provide all information and reports required by the Acts, the Regulations, and directives issued pursuant thereto, and will permit access to its books, records, accounts, other sources of information, and its facilities as may be determined by the Massachusetts Department of Transportation (MassDOT) or FHWA to be pertinent to ascertain compliance with such Acts, Regulations, and instructions. Where any information required of a contractor is in the exclusive possession of another who fails or refuses to furnish this information, the contractor will so certify to MassDOT or FHWA, as appropriate, and will set forth what efforts it has made to obtain the information.
5. **Sanctions for Noncompliance:** In the event of a contractor’s noncompliance with the Nondiscrimination provisions of this contract, MassDOT will impose such contract sanctions as it or FHWA may determine to be appropriate, including, but not limited to:
 - a. withholding payments to the contractor under the contract until the contractor complies; and/or
 - b. cancelling, terminating, or suspending a control, in whole or in part.
6. **Incorporation of Provisions:** The contractor will include the provisions of paragraphs one through six in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Acts, the Regulations, and directives issued pursuant thereto. The contractor will take action with respect to any subcontract or procurement as MassDOT or FHWA may direct as a means of enforcing such provisions including sanctions for noncompliance. Provided, that if the contractor becomes involved in, or is threatened with litigation by a subcontractor, or supplier because of such direction, the contractor may request MassDOT to enter into any litigation to protect the interests of MassDOT. In addition, the contractor may request the United States to enter into the litigation to protect the interests of the United States.

APPENDIX D

During the performance of this contract, the contractor, for itself, its assignees, and successors in interest (hereinafter referred to as the “contractor,” which includes consultants) agrees to comply with the following non-discrimination statutes and authorities; including but not limited to:

PERTINENT NON-DISCRIMINATION AUTHORITIES:

- Title VI of the Civil Rights Act of 1964 (42 U.S.C. § 2000d *et seq.*, 78 stat. 252) (prohibits discrimination on the basis of race, color, national origin); and 49 CFR Part 21
- The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (42 U.S.C. § 4601) (prohibits unfair treatment of persons displaced or whose property has been acquired because of Federal or Federal-Aid programs and projects)
- Federal-Aid Highway Act of 1973 (23 U.S.C. § 324 *et seq.*) (prohibits discrimination on the basis of sex)
- Section 504 of the Rehabilitation Act of 1973 (29 U.S.C. § 794 *et seq.*), as amended (prohibits discrimination on the basis of disability) and 49 CFR Part 27
- The Age Discrimination Act of 1975, as amended (42 U.S.C. § 6101 *et seq.*) (prohibits discrimination on the basis of age)
- Airport and Airway Improvement Act of 1982 (49 U.S.C. § 471, Section 47123), as amended (prohibits discrimination based on race, creed, color, national origin, or sex)
- The Civil Rights Restoration Act of 1987 (PL 100-209) (broadened the scope, coverage, and applicability of Title VI of the Civil Rights Act of 1964, the Age Discrimination Act of 1975, and Section 504 of the Rehabilitation Act of 1973, by expanding the definition of the terms “programs or activities” to include all of the programs or activities of Federal-Aid recipients, sub-recipients, and contractors, whether such programs or activities are Federally funded or not)
- Titles II and III of the Americans with Disabilities Act (42 U.S.C. §§ 12131-12189), as implemented by Department of Transportation regulations at 49 CFR parts 37 and 38 (prohibits discrimination on the basis of disability in the operation of public entities, public and private transportation systems, places of public accommodation, and certain testing entities)
- The Federal Aviation Administration’s Non-Discrimination Statute (49 U.S.C. § 47123) (prohibits discrimination on the basis of race, color, national origin, and sex)
- Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (ensures discrimination against minority populations by discouraging programs, policies, and activities with disproportionately high and adverse human health or environmental effects on minority and low-income populations)
- Executive Order 13166, Improving Access to Services for People with Limited English Proficiency, and resulting agency guidance, national origin discrimination includes discrimination because of limited English proficiency (LEP). To ensure compliance with Title VI, you must take reasonable steps to ensure that LEP persons have meaningful access to your programs (70 Fed. Reg. at 74087 to 74100)
- Title IX of the Education Amendments Act of 1972, as amended (20 U.S.C. 1681 *et seq.*) (prohibits discrimination on the basis of sex in education programs or activities)

*** END OF DOCUMENT ***

DOCUMENT 00880

MINIMUM WAGES FOR FEDERAL AND FEDERALLY ASSISTED CONTRACTS
Revised February 20, 2019



DEPARTMENT OF LABOR

Employment Standards Administration

**MINIMUM WAGES FOR
FEDERAL AND FEDERALLY
ASSISTED CONSTRUCTION**

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ADDENDUM NO. 1, JANUARY 15, 2021

General Decision Number: MA20210022 01/01/2021

Superseded General Decision Number: MA20200022

State: Massachusetts

Construction Type: Highway

County: Norfolk County in Massachusetts.

HIGHWAY CONSTRUCTION PROJECTS

Note: Under Executive Order (EO) 13658, an hourly minimum wage of \$10.95 for calendar year 2021 applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least \$10.95 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in calendar year 2021. If this contract is covered by the EO and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must pay workers in that classification at least the wage rate determined through the conformance process set forth in 29 CFR 5.5(a)(1)(ii) (or the EO minimum wage rate, if it is higher than the conformed wage rate). The EO minimum wage rate will be adjusted annually. Please note that this EO applies to the above-mentioned types of contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but it does not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60). Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

ADDENDUM NO. 1, JANUARY 15, 2021

Modification Number Publication Date

0 01/01/2021

ELEC0103-003 03/01/2020

Rates Fringes

ELECTRICIAN (Includes Traffic
Signalization).....\$ 53.50 38.00

ENGI0004-028 06/01/2020

Rates Fringes

POWER EQUIPMENT OPERATOR

Group 1.....\$ 48.73 29.25+A
GROUP 1.....\$ 49.33 29.75+a
Group 2.....\$ 48.84 27.50
GROUP 2.....\$ 48.81 29.75+a

FOOTNOTE FOR POWER EQUIPMENT OPERATORS:

A. PAID HOLIDAYS: New Year's Day, Washington's Birthday,
Labor Day, Memorial Day, Independence Day, Patriot's Day,
Columbus Day, Veteran's Day, Thanksgiving Day, Christmas Day

POWER EQUIPMENT OPERATORS CLASSIFICATIONS

Group 1: Backhoe/Excavator/Trackhoe; Bobcat/Skid Steer/Skid
Loader; Broom/Sweeper; Crane; Gradall; Paver (Asphalt,
Aggregate, and Concrete); Post Driver (Guardrail/Fences)
Group 2: Bulldozer; Grader/Blade; Milling Machine; Roller

ADDENDUM NO. 1, JANUARY 15, 2021

ENGI0004-029 12/01/2017

	Rates	Fringes
POWER EQUIPMENT OPERATOR:		
(Loader)	\$ 30.06	26.66+A

FOOTNOTE FOR POWER EQUIPMENT OPERATORS:

A. PAID HOLIDAYS: New Year's Day, Washington's Birthday,
 Labor Day, Memorial Day, Independence Day, Patriot's Day,
 Columbus Day, Veteran's Day, Thanksgiving Day, Christmas Day

* IRON0007-026 03/16/2020

	Rates	Fringes
IRONWORKER (ORNAMENTAL AND STRUCTURAL)		
	\$ 48.02	33.43

LABO0022-015 06/01/2018

	Rates	Fringes
LABORER		
Common or General	\$ 33.25	22.92
Fence Erection	\$ 33.50	22.92
Guardrail Installation	\$ 33.50	22.92
Landscape	\$ 33.25	22.92

LABO0133-001 06/01/2018

	Rates	Fringes
LABORER (Concrete Surfacer)	\$ 33.50	22.92

ADDENDUM NO. 1, JANUARY 15, 2021

PAIN0035-023 07/01/2019

	Rates	Fringes
PAINTER (Steel).....	\$ 50.66	30.90

SUMA2014-012 01/11/2017

	Rates	Fringes
CARPENTER, Includes Form Work....	\$ 43.64	22.09
CEMENT MASON/CONCRETE FINISHER...	\$ 56.70	21.08
IRONWORKER, REINFORCING.....	\$ 44.52	19.36
LABORER: Asphalt, Includes Raker, Shoveler, Spreader and Distributor.....	\$ 33.65	17.32
LABORER: Concrete Saw (Hand Held/Walk Behind).....	\$ 44.43	14.18
LABORER: Jack Hammer.....	\$ 38.69	17.33
OPERATOR: Forklift.....	\$ 64.67	0.00
OPERATOR: Mechanic.....	\$ 48.74	11.79
OPERATOR: Piledriver.....	\$ 42.56	17.34
PAINTER: Spray (Linestriping)....	\$ 47.30	6.42
TRAFFIC CONTROL: Flagger.....	\$ 23.00	20.44

ADDENDUM NO. 1, JANUARY 15, 2021

TRAFFIC CONTROL:

Laborer-Cones/

Barricades/Barrels -

Setter/Mover/Sweeper.....\$ 53.35 12.78

TRUCK DRIVER: Concrete Truck....\$ 33.69 15.79

TRUCK DRIVER: Dump Truck.....\$ 37.74 11.86

TRUCK DRIVER: Flatbed Truck.....\$ 48.53 0.00

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

ADDENDUM NO. 1, JANUARY 15, 2021

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

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

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than ""SU"" or ""UAVG"" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

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

ADDENDUM NO. 1, JANUARY 15, 2021

Survey Rate Identifiers

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

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

Union Average Rate Identifiers

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

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

ADDENDUM NO. 1, JANUARY 15, 2021

WAGE DETERMINATION APPEALS PROCESS

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

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

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

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

ADDENDUM NO. 1, JANUARY 15, 2021

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

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

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END OF GENERAL DECISION

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DOCUMENT A00801

SPECIAL PROVISIONS**DEDHAM****Federal Aid Project No. CMQ-003S(160)X
Roadway Reconstruction and Related Work
along a Section of Elm Street and Rustcraft Road**

Labor participation goals for this Project shall be 15.3% for minorities and 6.9% for women for each job category. The goals are applicable to both Contractor's and SubContractor's on-site construction workforce. Refer to Document 00820 for details.

SCOPE OF WORK

All work under this contract shall be done in conformance with the *2020 Standard Specifications for Highways and Bridges*, the *Supplemental Specifications* contained in this book, the *2017 Construction Standard Details*, the *Traffic Management Plans and Detail Drawings*, *MassDOT Work Zone Safety Temporary Traffic Control*, the *1990 Standard Drawings for Signs and Supports*; the *2015 Overhead Signal Structure and Foundation Standard Drawings*, the *2009 Manual on Uniform Traffic Control Devices (MUTCD)* with Massachusetts Amendments; the *1968 Standard Drawings for Traffic Signals and Highway Lighting*; *The American Standard for Nursery Stock*; the Plans and these Special Provisions.

The work to be performed consists of the reconstruction of Elm Street and Rustcraft Road from Fox Drive to Fairbanks Park. The work includes areas of box widening and areas of pavement milling and resurfacing. Other work includes cement concrete sidewalks, pedestrian curb ramps, installation of new granite curb, stormwater improvements, installation of new rapid rectangular flashing beacon (RRFB) crosswalk lights at three (3) locations, signs, pavement markings and other various Items to complete the improvements.

CONTRACTOR QUESTIONS AND ADDENDUM ACKNOWLEDGEMENTS

Prospective bidders are required to submit all questions to the Construction Contracts Engineer by 1:00 P.M. on the Thursday before the scheduled bid opening date. Any questions received after this time will not be considered for review by the Department.

Contractors should email questions and addendum acknowledgements to the following email address massdotSpecifications@dot.state.ma.us. The MassDOT project file number and municipality is to be placed in the subject line.

ACCESS MASSDOT HIGHWAY INFORMATION ON WEBSITE

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

<http://www.mass.gov/massdot/highway>

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY LICENSE FOR ENTRY

License for entry will allow the Contractor access to **Parcel ID 16528** for construction purposes as stated in the terms of the license.

The Massachusetts Bay Transportation Authority (MBTA) License for Entry has been included as Document A00815.

SUBSECTION 7.05 INSURANCE REQUIREMENTS

B. Public Liability Insurance

The insurance requirements set forth in this section are in addition to the requirements of the Standard Specifications and supersede all other requirements.

Paragraphs 1 and 2

The Massachusetts Department of Transportation and applicable railroads shall be named as additional insureds.

Paragraph 4

Asbestos Liability Insurance shall be obtained for this project. The Contractor and the Massachusetts Department of Transportation shall be named as additional insureds.

MBTA INSURANCE REQUIREMENTS

The insurance requirements set forth in this section are in addition to the requirements of the Standard Specifications.

Railroad Operations Directorate: Section F:

Railroad Protective Insurance (Required if work is performed within fifty (50) feet from the center line of the nearest railroad track).

1. The Contractor shall furnish, with respect to the operations of the Contractor or any of the Contractor's SubContractors performing within the Railroad right-of-way, broad form Railroad Protective Liability Insurance covering all work performed under this Contract in the amount of not less than \$5,000,000 per occurrence, \$10,000,000 aggregate combined bodily injury and property damage. The Contractor shall carry Worker's Compensation Insurance, including Employers Liability Insurance as provided by Massachusetts General Laws, Chapter 152, as amended, covering all work performed by him under the Contract. The Contractor shall carry Umbrella Liability Coverage with limits of not less than \$10,000,000 per occurrence, covering all work performed by him under this Contract. Automobile Liability Insurance: The Contractor shall provide Automobile Liability Insurance to include the use of all vehicles; owned, leased, hired and non-owned, with limits not less than \$1,000,000 combined single limit covering all work performed under the Contract.

2. Such insurance shall be written on an occurrence basis.

MBTA INSURANCE REQUIREMENTS (Continued)

3. The MBTA and applicable railroads shall be the named insureds on such insurance. Additional named insured are listed below. Original policies and certificates shall be made out to the MBTA and applicable railroads and mailed to:

MBTA: Treasurer-Controller
 Massachusetts Bay Transportation Authority
 10 Park Plaza
 Boston, MA 02116
 Tel. (617) 222-3064

Keolis: General Counsel
 Keolis Commuter Services, LLC
 470 Atlantic Avenue
 Boston, MA 02210

4. The Contractor shall furnish to the MBTA and railroad companies a signed original of the Railroad Protective Liability Policy prior to entry upon the railroad right-of-way.

5. Such policies shall provide 30 days notice to each named insured by the insurance company before any change or cancellation of the policies.

6. Such Railroad Protective Insurance policies may be provided in forms commonly referred to as AAR/AASHTO or ISO/RIMA but not Oregon.

Questions regarding insurance should be directed to the MBTA's Risk Manager at 617-222-3064.

The Contractor shall be aware of the latest MBTA insurance limits / requirements. See the following link for more information:

<https://www.mbtarealty.com/licenses.html>

SHEETING & SHORING

The Contractor is advised that construction operations may require support of excavation and dewatering for the installation of drainage structures; pipes; protection of existing buildings; existing structures and utilities, etc. The Contractor shall submit his/her proposed means and methods of providing support of excavation, including design calculations, and dewatering stamped by a Massachusetts Registered Professional Structural Engineer to the Engineer for review and approval. No separate measurement or payment shall be made for support of excavation and all labor, materials and equipment necessary to furnish, install, maintain and remove any support of excavation, as required for the safe and proper performance of the work, shall be considered incidental to the Item to which it pertains. In addition, no separate measurement or payment shall be made for dewatering and all labor, materials and equipment necessary to dewater the work area, properly treat, and dispose of, any water shall be considered incidental to the Item to which it pertains.

CONTRACT AWARD AND NOTICE TO PROCEED PROCEDURES

(Amending and Supplementing Subsections 3.03 and 3.05)

The prepared Contract Package is to be completed in duplicate by the successful Bidder who shall execute and deliver the Contract Package and furnish the required surety to the Department. The date of the Contract shall be the date of the Bidder's signature and shall be typed on all forms by the successful Bidder. The Contract Package consists of the contract forms for execution all of which must be returned. These documents are available on www.bidx.com as a separate file.

The company's corporate seal should be affixed to both the Contract and bonds.

The Board of Director's Vote will indicate who is authorized to sign and execute the Contract and bonds and affix the corporate seal. The vote shall show that said vote is in full force and effect and has not been amended or rescinded. The vote of the board of directors should be dated the same date as indicated on the contract form and should bear the imprint of the company's corporate seal.

WORK SCHEDULE

(Supplementing Subsection 8.02)

No work, including the setting up and taking down of work zone traffic control devices shall be done on existing roadways areas between the hours of 6:00 AM to 9:00 AM and from 3:00 PM to 6:00 PM without written approval from the Engineer and the Town of Dedham. Work shall be permitted in areas outside and off the roadway during these periods.

No work shall be done on this contract on Saturdays, Sundays, or Holidays. Work will not be allowed the day before or the day after a weekend which involves a Holiday (The Fourth of July and Christmas holidays could fall in this category) without prior approval by the Engineer.

EQUIVALENT SINGLE AXLE LOADS (ESALS)

The estimated traffic level to be used for SUPERPAVE HMA mixture designs for this contract, expressed in Equivalent Single Axle Loads (ESALs) for the design travel lane over a 20-year period, is **0.3 - 3.0** 18-kip (80-kn) ESALs.

SHOP DRAWING SUBMITTAL

(Supplementing Subsection 5.02)

All shop drawing related calculations shall be stamped by a Professional Engineer registered in Massachusetts. Above procedure shall also be used for submission of catalog cuts.

DRAINAGE

(Supplementing Subsection 7.13)

The Town of Dedham Design & Construction standards can be found here:

<http://www.dedham-ma.gov/departments/Engineering/design-construction-standards>

It shall be the Contractor's responsibility to maintain proper drainage at all times in the areas under construction until the final system is put into use.

If the roadway is to be left at base course over the winter months, only catch basins at low points and those structures identified by the Engineer shall be adjusted to base course grade. Further adjustment of these structures to final grade shall be paid for under Item 220.

The castings of all structures, which are required to be set or reset under this project shall not be set complete in place to the final grade until after the bituminous concrete binder course has been completed and top course is scheduled to be completed with 2 weeks.

Before placement of top course material begins, utility structures shall be adjusted to final grade. Utility structures shall be exposed above binder grade for not more than 48 hours before placement of top course material will be required.

No separate payment will be made for sawcutting required for installation of drainage pipe trenches and structures. All such costs shall be taken as included in the unit prices bid for the various pipe Items.

All new pipes and structures within the limits of this contract shall be left in a clean and operable condition at the completion of the work.

All the above work shall be included under the relevant drainage Item without additional compensation therefore. Any adjustments made to new drainage structures will be included under the contract unit price for the respective structures including winter shutdown and low point adjustments.

MATERIALS REMOVED AND STACKED

(Supplementing Subsections 580.64, 630.63)

Materials directed to be removed and stacked which are the property of the Town of Dedham, shall be removed and stacked by the Contractor and transported to the town yard by the town forces. All materials shall be neatly stacked as directed by the Town of Dedham highway and/or water/sewer superintendents. In addition, all materials stacked shall be signed for by said superintendents.

If the Town of Dedham highway and/or water/sewer superintendents and the Engineer determines that any part of the stacked materials are unsuitable for re-use by the Town of Dedham, the Department, or if other owners decide to abandon part or all of their materials, such materials shall become the property of the Contractor and he shall dispose of them away from the site.

The contract prices for the various Items shall include full compensation for the services noted above.

MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION FILE NUMBER SIGN

This project is subject to Massachusetts General Laws, Chapter 131, Section 40 as amended. Signs shall be in accordance with the latest MassDOT Construction Standards. All costs for the manufacture, erection, maintenance, moving, and removal of the signs shall be absorbed by the Contractor with no additional compensation other than the contract unit prices.

For this project the Massachusetts Department of Environmental Protection File Number is **141-0534**.

ENVIRONMENTAL CONTROLS

Payment for work required by the Order of Conditions, unless otherwise provided for, shall be considered incidental to other Items, and no additional payment shall be made for this work.

DEWATERING

The Contractor's attention is directed to construction operations which may occur in wetland areas, streams, culver at brooks and/or surface or subsurface areas where surface water or groundwater may exist or accumulate. All dewatering and related work shall be conducted in such a manner as to prevent siltation or contamination of any adjacent resource area. Pumping discharge shall not be allowed to enter directly or indirectly into any wetland resource area without prior treatment (filter bags, silt sacks, settling basins, etc.). The Contractor shall include under each pertinent Item all labor, materials and equipment necessary to dewater the affected areas for proper installation of the respective Items. No additional compensation will be made for dewatering but shall be considered incidental and included in the price for each respective Item.

PROPERTY BOUNDS

(Supplementing Subsection 7.13)

The Contractor shall exercise due care when working around all property bounds which are to remain. Should any damage to a bound result from the actions of the Contractor, the bound shall be replaced and/or realigned by a land surveyor registered in the Commonwealth of Massachusetts hired by the Contractor as directed by the Engineer. The registered land surveyor shall provide a sketch of the subject property and/or property bound bearing his/her stamp and signature and showing the bound in question as having been reset by said registered land surveyor. No further compensation will be due the Contractor for the materials and labor required to re-establish the bound in its proper position as shown on the plans or as found in the field.

NOTIFICATION OF FUNDING SOURCES FOR WORK TO BE PAID BY OTHERS

This contract has an agreement with the *Town of DEDHAM*; whereas when the construction costs for the contract scope exceed the total participating contract bid price by more than ten percent (10%), the *Town* shall be responsible for the amount over 110% of the total participating contract bid price.

POTENTIALLY IMPACTING RELEASES AND HASP RECOMMENDATIONS

Activity and Use Limitations (AULs) have been placed on the property located at 400 Commercial Circle and a portion of the property located at 367-419 Rustcraft Road. Portions of the project area overlap with the limits of the disposal site/AUL area as described below. The AULs and information on the MassDEP disposal sites are available on-line at <https://eeaonline.eea.state.ma.us/portal#!/search/wastesite>. It is the Contractor's responsibility to review the AULs; prepare plans required by the AULs and adhere to the requirements of the AULs during their work.

The following is a summary of the information obtained during the file review for the release sites at 250 Elm Street, 367-419 Rustcraft Road, and 400 Commercial Circle.

RTN 3-1196, 250 Elm Street, Hersey Products Inc

- The site is currently occupied by residential buildings, which were constructed in approximately 2006. From about 1955 until 1987 the site was a foundry and manufacturing facility used for the casting and production of brass and iron valves; the industrial buildings were demolished in 2001.
- The site was assigned RTN 3-1196 in 1988 based on releases of petroleum and chlorinated volatile organic compounds (VOCs). A 1987 site assessment had identified a release of #6 fuel oil to soil from corroded transfer lines, chlorinated VOCs in groundwater, and elevated lead concentrations in waste foundry sand.
- Lead- and petroleum-impacted soil was excavated and disposed of and a groundwater treatment system was operated on the site.
- An A-3 RAO for the site was submitted in 2012.
- The boundaries of the release site within the project area are the same as the property boundaries for 250 Elm Street. Some minor work associated with the project will take place within the release site boundaries between Sta 17+00 and Sta 30+00.
- The area of overlap between the release site and the project area does not contain any identified soil or groundwater contamination. The AUL associated with the A-3 RAO covers only part of the release site and does not overlap with the project area.
- Project work should not encounter known contamination associated with RTN 3-1196. However, the Contractor will be working within the boundaries of a hazardous materials release site, and should be especially attentive to the possibility of encountering unknown soil and/or groundwater contamination.

POTENTIALLY IMPACTING RELEASES AND HASP RECOMMENDATIONS

(Continued)

RTN 3-16844, 367-419 Rustcraft Rd, Parcels 49 and 52

- As of 2011, the site was partially undeveloped and partially occupied by a paved parking lot. It was used for storage by New England Pipe Corporation (NEPCO) from approximately 1950 to 1988, and was for an unknown period of time used for new vehicle storage by Nissan Realty, LLC.
- RTN 3-16844 was assigned to the site in 1998 after an environmental site assessment found reportable concentrations of copper and lead in soil.
- Further investigation found fill material (containing brick, concrete, asphalt fragments, wood and cinder) in the northern portion of the property. Elevated levels of polycyclic aromatic hydrocarbons (PAHs) were found in the fill material. VOCs, volatile petroleum hydrocarbons (VPH), extractable petroleum hydrocarbons (EPH), and several metals were also found in soil. VOCs, PAHs, and zinc were found in concentrations greater than applicable regulatory standards.
- Groundwater was sampled as well, and no exceedances of the applicable regulatory standards were found. Low levels of VOCs and some metals were noted.
- A B-2 RAO was submitted for the site in 2011. The associated AUL covers the southwestern corner of the property, from approximately Sta 36+00 to Sta 39+50 on Rustcraft Road.
- The project area overlaps the edge of this release site between approximately Sta 36+00 and Sta 44+50 on Rustcraft Road.
- This is a large site with variable conditions. In the areas that overlap with the project, soil contamination noted consists of elevated levels of VOCs, metals, and EPH in fill soil, which is found at variable depths ranging from surficial to at least five feet bgs. Elevated levels of arsenic and barium were also found in groundwater, which is extremely shallow within the wetlands portion of this area and is found on the site at a maximum depth of 4.5 feet bgs.
- Excavation within the boundaries of the Parcel 52 property between approximately Sta 36+00 and Sta 44+50 may encounter contaminated soil and/or groundwater.
- **Any work within the boundaries of the Parcel 52 property between approximately Sta 36+00 and Sta 39+50 must comply with the requirements of the applicable AUL. The AUL requires that any construction within the AUL Area or excavation to a depth of greater than one foot bgs be performed only with the implementation of a Health and Safety Plan and a Soil Management Plan.**

POTENTIALLY IMPACTING RELEASES AND HASP RECOMMENDATIONS

(Continued)

RTN 3-23517, 400 Commercial Cir, Lot 49 Rustcraft Road

- As of 2006 the site was occupied by a newly constructed residential complex consisting of three apartment buildings, a maintenance building, parking, and landscaped and undeveloped areas. Mining of sand and gravel took place on the site between 1949 and 1953, and the site was filled sometime after 1954 when the site was taken over by a concrete pipe manufacturer, which operated until 1985. Between 1985 and 2004, the site was vacant land.
- RTN 3-23517 was assigned to the site in 2004 after site-wide fill material was found to contain reportable concentrations of metals, petroleum compounds, semi-volatile compounds, and dioxin and furans compounds. These substances were also found in groundwater, though not at reportable concentrations. One location on the site did contain a reportable concentration of vinyl chloride in groundwater.
- Fill material composed primarily of sand and gravel with pieces of concrete and concrete pipe, with some brick, glass, metal, and wood, is found throughout the site at depths ranging from ground surface in the northern portion of the site to 32 feet below grade in the southern portion.
- Depth to groundwater was not provided. It is mentioned that dewatering was required during the construction of the buildings currently on the site.
- Release Abatement Measure (RAM) activities performed during the recent construction included:
 - the excavation, on-site treatment, re-use, and/or disposal of contaminated soil
 - the placement of at least 3 feet of clean fill in most landscaped areas, with one to three feet of clean fill along the northwestern and eastern border of the site
 - the placement of a geo fabric marker layer beneath the clean fill the treatment of groundwater prior to discharge during dewatering activities
- **An A-3 RAO was submitted for the site in 2006. The AUL associated with the RAO requires that any excavation be done in compliance with a site-specific Health and Safety Plan and Soil Management Plan approved by a Licensed Site Professional (LSP), that any cover over contaminated soil be repaired and/or replaced after completion of construction activity, that contaminated soil not be moved off-site or to a shallower location on-site without an LSP Opinion that the relocation does not pose a significant risk, and that the site-related surface characteristics of the site (clean fill, pavement, etc.) not be altered without repair or an LSP Opinion that no risk is associated with the alteration.**
- The area of overlap between the project area and the release site/AUL boundaries is on the northern side of Rustcraft Road between approximately Sta 29+75 and Sta 36+00. Excavation in this area may encounter contaminated soil and/or groundwater, and any activity in this area must be performed in accordance with the requirements of the AUL.

POTENTIALLY IMPACTING RELEASES AND HASP RECOMMENDATIONS

(Continued)

Based on the information obtained during the DEP file review, contamination may exist in the project area. Residual contamination may be present in soil and/or groundwater within the project area, as described above. Please see the uploaded specifications: Item 180.01 (Environmental Health and Safety Program), Item 180.02 (Personal Protection Level C Upgrade), Item 180.03 (Licensed Site Professional Services), Item 181.11 (Disposal of Unregulated Soil), Item 181.12 (Disposal of Regulated Soil — In-State Facility), Item 181.13 (Disposal of Regulated Soil — Out-of-State Facility), Item 181.14 (Disposal of Hazardous Waste. Based on the groundwater conditions in the project area, dewatering may be required. If dewatering does occur, potentially impacted groundwater should be properly handled and disposed. Please see uploaded specifications: Item 183.1 (Treatment of Contaminated Groundwater) and Item 183.2 (Disposal of Granular Activated Carbon).

PUBLIC PARTICIPATION

The Contractor shall support MassDOT by preparing documents, presentations, and assisting in updating the Project website required for communicating Project information to the public.

The Contractor will be required to hold a Public Information Meeting (PIM) thirty (30) days prior to the commencement of construction activities and major traffic phase changes. The PIM shall be coordinated with MassDOT and shall specifically address traffic management, upcoming construction activities and other issues as needed.

The Contractor responsibilities shall include:

- Preparing meeting notices
- Attending Public Meetings
- Preparing graphics and other visual aids for presentation at Public Meetings
- Providing construction photographs and video footage of Project activities for posting on the Project website immediately after completion of milestones (such as completion of substructure, superstructure erection, Phase I construction, etc.)
- Advisories
- Traffic updates and alerts
- Prepare detour maps of each detour route for use on the website and distribution to media, stakeholder groups, etc.

The Contractor shall have no claim for additional costs or delays associated with attending these PIMs. Contractor shall at a minimum be responsible for attending the PIMs, providing presentation materials/updates as they relate to construction schedule, traffic impacts (including detours), abutter impacts, and answering any questions from the Public as they relate to the Contractor's planned operations.

The public participation effort will be coordinated with MassDOT's Construction Project Manager and MassDOT Communications and all standard protocols, Title VI of the Civil Rights Act of 1964, and guidance in the MassDOT Public Participation Plan will be followed.

COMPLIANCE WITH THE NATIONAL DEFENSE AUTHORIZATION ACT

(Supplementing Subsection 7.01)

On all projects, the “Prohibition on Certain Telecommunications and Video Surveillance Services or Equipment” Regulation (2 CFR 200.216) prohibits the Contractor from using or furnishing the following telecommunications equipment or services:

- Telecommunications equipment produced by Huawei Technologies Company or ZTE Corporation (or any subsidiary or affiliate of such entities).
- For the purpose of public safety, security of government facilities, physical security surveillance of critical infrastructure, and other national security purposes, video surveillance and telecommunications equipment produced by Hytera Communications Corporation, Hangzhou Hikvision Digital Technology Company, or Dahua Technology Company (or any subsidiary or affiliate of such entities).
- Telecommunications or video surveillance services provided by such entities or using such equipment.
- Telecommunications or video surveillance equipment or services produced or provided by an entity that the Secretary of Defense, in consultation with the Director of the National Intelligence or the Director of the Federal Bureau of Investigation, reasonably believes to be an entity owned or controlled by, or otherwise connected to, the government of a covered foreign country.

This prohibition applies to all products manufactured by the aforementioned companies, including any individual components or parts.

By submitting a bid on a project, the Contractor certifies that all work will be in compliance with the terms of 2 CFR 200.216. The Contractor shall submit a COC indicating compliance with the above provisions for all telecommunications equipment or services included in the Contract.

Payment for the Item in which the materials are incorporated may be withheld until these COCs are received. Any cost involved in furnishing the certificate(s) shall be borne by the Contractor.

BIDDERS LIST

Pursuant to the provisions of 49 CFR Part 26.11 all official bidders will be required to report the names, addresses and telephone numbers of all firms that submitted bids or quotes in connection with this project. Failure to comply with a written request for this information within 15 business days may result in a recommendation to the Prequalification Committee that prequalification status be suspended until the information is received.

The Department will survey all firms that have submitted bids or quotes during the previous year prior to setting the annual goal and shall request that each firm report its age and gross receipts for the year.

CONTRACTOR/SUBCONTRACTOR CERTIFICATION – CONTRACT COMPLIANCE

(Revision 03-23-10)

Pursuant to 23 C.F.R. § 633.101 et seq., the Federal Highway Administration requires each Contractor to “insert in each subcontract, except as excluded by law or regulation, the required contract provisions contained in Form FHWA–1273 and further requires their inclusion in any lower tier subcontract that may in turn be made. The required contract provisions of Form FHWA–1273 shall not be incorporated by reference in any case. The prime Contractor shall be responsible for compliance by any subContractor or lower tier subContractor with the requirements contained in the provisions of Form FHWA–1273.” The prime Contractor shall therefore comply with the reporting and certification requirements provided in MassDOT’s CONTRACTOR/SUBCONTRACTOR CERTIFICATION Form (DOT-DIST-192) certifying compliance with 23 C.F.R. § 633.101 for each subcontract agreement entered into by the Contractor. The Contractor shall provide a fully executed original copy of said CONTRACTOR/SUBCONTRACTOR CERTIFICATION Form to MassDOT upon execution of any subcontract agreement. Failure to comply with the reporting and certification requirement of the CONTRACTOR/SUBCONTRACTOR CERTIFICATION Form may result in action against the prequalification status of the prime Contractor with MassDOT.

COVID 19 GUIDELINES AND PROCEDURES

Commonwealth of Massachusetts COVID-19 GUIDELINES AND PROCEDURES FOR ALL CONSTRUCTION SITES AND WORKERS AT ALL PUBLIC WORK dated March 2020 as amended shall be adhered to.

It is the Contractor’s responsibility to stay current with any changes or addendums issued to these guidelines. For copies of the guidelines go to:

<https://www.mass.gov/covid-19-guidelines-and-procedures-for-all-construction-sites-and-workers-at-all-public-work>

These Guidelines and Procedures will remain in effect until further notice. At the start of the Work the Contractor is required to submit a letter to the Engineer certifying that the Contractor is in compliance with CDC, OSHA and the Commonwealth’s COVID-19 guidelines. The certification applies to the general Contractor as well as all subContractors engaged with the Work covered under this contract. No Work will be allowed to begin until the letter is submitted and approved by the Engineer. In addition, on a daily basis, the Contractor is required to submit a copy of the MassDOT Contractor COVID-19 Guidelines Compliance Checklist to the Engineer. If the Contractor fails to submit the daily checklist no work will be allowed until one is submitted. Any Items checked with a NO will require immediate corrective action by the Contractor before any Work can begin.

Per Subsection 5.09 – Inspection of the Work - the Contractor is required to provide assistance to the Engineer to make a complete and detailed inspection of the work. That assistance includes furnishing equipment to perform the inspection, therefore the Contractor will be required to provide CDC compliant Personal Protective Equipment (PPE) to Department personnel field staff. The CDC compliant PPE shall consist of face masks, gloves and eye protection.

All costs associated with compliance with this provision are considered to be incidental to the contract cost and therefore the Contractor will not be entitled to any additional compensation.

HOLIDAY WORK RESTRICTIONS

(Supplementing Subsection 7.09)

The District Highway Director (DHD) may authorize work to continue during these specified time periods if it is determined by the District that the work will not negatively impact the traveling public. DHD may allow work in those areas on a case by case basis and where work is behind barrier and will not impact traffic

Below are the holiday work restrictions:

New Years Day (Federal Holiday)

No work on major arterial roadways from 5:00 AM on the day before until the normal start of business on the next subsequent business day. No work on local roadways on the holiday without permission by the DHD and the local police chief.

Martin Luther King's Birthday (Federal Holiday)

No work restrictions due to traffic concerns, however work on local roadways requires permission by the DHD and local police chief.

President's Day (Federal Holiday)

No work restrictions due to traffic concerns, however work on local roadways requires permission by the DHD and local police chief.

Evacuation Day (Suffolk County State Holiday)

No work restrictions due to traffic concerns.

Patriot's Day (State Holiday)

Work restrictions will be in place for Districts 3 and 6 along the entire Boston Marathon route and any other locations that the DHD in those districts determine are warranted so as to not to impact the marathon. All other districts work restrictions will be as per DHD.

Mother's Day

No work on Western Turnpike and Metropolitan Highway System from 5:00 AM on the Friday before, until the normal start of business on the following day.

Memorial Day (Federal Holiday)

No work on major arterial roadways from 5:00 AM on the Friday before, until the normal start of business on the following day.

Bunker Hill Day (Suffolk County State Holiday)

No work restrictions due to traffic concerns.

Independence Day (Federal Holiday)

No work on major arterial roadways from 5:00 AM on the day before until the normal start of business on the next subsequent business day. No work on local roadways on the holiday without permission by the DHD and the local police chief.

HOLIDAY WORK RESTRICTIONS (Continued)

Labor Day (Federal Holiday)

No work on major arterial roadways from 5:00 AM on the Friday before, until the normal start of business on the following day.

Columbus Day (Federal Holiday)

No work on major arterials from 5:00 AM on the Friday before, until the normal start of business on the following day

Veterans' Day (Federal Holiday)

No work restrictions due to traffic concerns.

Thanksgiving Day (Federal Holiday)

No work on major arterials from 5:00 AM two days before until the normal start of business on the following Monday.

Christmas Day (Federal Holiday)

No work on major arterial roadways from 5:00 AM on the day before until the normal start of business on the next subsequent business day.

NORTHERN LONG-EARED BAT PROTECTION

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

This project has been consulted with the USFWS through the Optional Framework to Streamline Section 7 Consultation and is consistent with the Programmatic Biological Opinion under the authority of section 4(d) of the Endangered Species Act and the Final 4(d) Rule published in the Federal Register on January 14, 2016. No conservation measures or time of year restrictions on tree cutting are required. If additional cutting is proposed by the Contractor that is outside the scope of this contract, additional review is required by the MassDOT Highway Division's Environmental Services Section, additional review may be required by the USFWS, and time of year restrictions could apply to such tree cutting.

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.

① ADDENDUM NO. 1, JANUARY 15, 2020

 ① **MATERIAL OPTIONS**

The Contractor shall inform the Engineer of his option prior to the installation of the material. Once the option is designated, all material for the option item(s) shall remain the same throughout the job.

<u>OPTIONS</u>		
<u>Item Number</u>	<u>Item Description</u>	<u>Unit</u>
234.12	12 Inch Drainage Pipe-Option	Foot
235.12	12 Inch Drainage Pipe Flared End-Option	Each
<u>Pipe Options</u>		
	Reinforced Concrete Pipe	
	Corrugated Plastic (Polyethylene) Pipe	
	Corrugated Plastic (Polypropylene) Pipe	

NOTICE TO OWNERS OF UTILITIES

District 6 Utility/Constructability Engineer
 Joseph Doucette; (781) 431-5740; Joseph.K.Doucette@dot.state.ma.us

The Contractor shall investigate to determine the existence of other utilities that may be affected by the Contractor's operations.

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 his/her intention to commence operations in accordance with Chapter 82, Section 40 of the General Laws, as amended, of the commencement of such operations and the Contractor shall, at that time, file a copy of each such notice with the Engineer. If notice cannot be given before the work is started, then during or after the work is completed the Contractor shall, in writing, inform the utility owners that work was done near their facilities. It is the intent that affected utilities be notified at least one week in advance of the commencement of such operations.

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

Select District 6

Select the Town of Dedham,

and then locate the utility

The utility contact list is for guidance only and is not guaranteed to be complete or up to date. Town officials are shown at website <https://www.mass.gov/lists/massachusetts-cities-and-towns> and select the required City/Town website.

State Police are shown at website <https://www.mass.gov/info-details/massachusetts-state-police-troop-boundaries>. Select the area of jurisdiction to find the local station.

The Contractor shall be responsible for informing the following officials in each area that he is assigned to work in:

Superintendent, Department of Public Works or Town Engineer.

Superintendent, Water Department, Superintendent, Sewer Departments.

Police Department, Fire Department, Electric Company, Railroads.

NOTICE TO OWNERS OF UTILITIES (Continued)

The following are utility owners, contact personnel and telephone numbers of utilities presumed to be affected, but the completeness of the list is not guaranteed.

DEDHAM - Pole Data

<u>Municipality</u>	<u>Pole Set Responsibility</u>	<u>Updated</u>
DEDHAM	Eversource	3/28/2008

Utility Data**Electric**

<u>Company</u>	<u>Address</u>	<u>City</u>	<u>State</u>	<u>Zip</u>	<u>Updated</u>
Eversource Electric "A"	1165 Massachusetts Avenue	Dorchester	MA	02125	2/12/2020

<u>Contact</u>	<u>Office</u>	<u>Extension</u>	<u>Email</u>
Terence Doonan	617-541-5714		terence.doonan1@eversource.com

Gas

<u>Company</u>	<u>Address</u>	<u>City</u>	<u>State</u>	<u>Zip</u>	<u>Updated</u>
Eversource Gas	157 Cordaville Road, 3113	Southborough	MA	01772	5/31/2018

<u>Contact</u>	<u>Office</u>	<u>Extension</u>	<u>Email</u>
Jeffrey Evans-Mongeon	508-305-6970		Jeffrey.Evans-Mongeon@eversource.com

Telephone

<u>Company</u>	<u>Address</u>	<u>City</u>	<u>State</u>	<u>Zip</u>	<u>Updated</u>
Verizon	385 Myles Standish Blvd.	Taunton	MA	02780	11/8/2013

<u>Contact</u>	<u>Office</u>	<u>Extension</u>	<u>Email</u>
Karen Mealey	774-409-3160		karen.m.mealey@verizon.com

Water

<u>Company</u>	<u>Address</u>	<u>City</u>	<u>State</u>	<u>Zip</u>	<u>Updated</u>
Dedham-Westwood Water District (Mun.)	PO Box 9137	Dedham	MA	02027	10/1/2008

<u>Contact</u>	<u>Office</u>	<u>Extension</u>	<u>Email</u>
Matthew Lanen	781-329-7090		mlanen@dwwd.org

<u>Company</u>	<u>Address</u>	<u>City</u>	<u>State</u>	<u>Zip</u>	<u>Updated</u>
MWRA	2 Griffin Way	Chelsea	MA	02150	

<u>Contact</u>	<u>Office</u>	<u>Extension</u>	<u>Email</u>
Ralph Francesconi	617-305-5827		Ralph.Francesconi@mwra.state.ma.us

NOTICE TO OWNERS OF UTILITIES (Continued)**Sewer**

<u>Company</u>	<u>Address</u>	<u>City</u>	<u>State</u>	<u>Zip</u>	<u>Updated</u>
Dedham DPW	55 River Street	Dedham	MA	02026	

<u>Contact</u>	<u>Office</u>	<u>Extension</u>	<u>Email</u>
Joseph Flanagan	781-751-9350		5/1/2014

<u>Company</u>	<u>Address</u>	<u>City</u>	<u>State</u>	<u>Zip</u>	<u>Updated</u>
MWRA	2 Griffin Way	Chelsea	MA	02150	

<u>Contact</u>	<u>Office</u>	<u>Extension</u>	<u>Email</u>
Kevin McKenna	617-305-5956		Kevin.McKenna@mwra.state.ma.us4/17/2020

Railroad

<u>Company</u>	<u>Address</u>	<u>City</u>	<u>State</u>	<u>Zip</u>	<u>Updated</u>
MBTADocument Group	Control500 Arborway	Boston	MA	02130	4/16/2020

<u>Contact</u>	<u>Office</u>	<u>Extension</u>	<u>Email</u>
Tyler Scott			tscott@mbta.com4/16/2020

<u>Company</u>	<u>Address</u>	<u>City</u>	<u>State</u>	<u>Zip</u>	<u>Updated</u>
Amtrak	30th Street Station, Box 64/ 2955 Market Street	Philadelphia	PA	19104	3/19/2018

<u>Contact</u>	<u>Office</u>	<u>Extension</u>	<u>Email</u>
Jonathan Harmen DeVries	215-349-1750		Jonathan.DeVries@amtrak.com12/3/2020

Cable

<u>Company</u>	<u>Address</u>	<u>City</u>	<u>State</u>	<u>Zip</u>	<u>Updated</u>
RCN	956 Massachusetts Avenue	Arlington	MA	02476	9/21/2016

<u>Contact</u>	<u>Office</u>	<u>Extension</u>	<u>Email</u>
Margot Jones	781-316-8881		Margot.Jones@rcn.net11/16/2017

<u>Company</u>	<u>Address</u>	<u>City</u>	<u>State</u>	<u>Zip</u>	<u>Updated</u>
Comcast Cable Corporation	PO Box 6505, 5 Omni Way	Chelmsford	MA	01824	8/8/2018

<u>Contact</u>	<u>Office</u>	<u>Extension</u>	<u>Email</u>
Wendy Brown	978-848-5163		Wendy_Brown@comcast.com4/8/2019

<u>Company</u>	<u>Address</u>	<u>City</u>	<u>State</u>	<u>Zip</u>	<u>Updated</u>
AT&T Teleport Communications America, c/o Siena Engineering Group	50 Mall Road - Suite 203	Burlington	MA	01803	4/15/2014

NOTICE TO OWNERS OF UTILITIES (Continued)

<u>Contact</u>	<u>Office</u>	<u>Extension</u>	<u>Email</u>
Hayleigh Walker	781-221- 8400	x7023	Hayleigh.Walker@sienaEngineeringgroup.com 1/3/2018

<u>Company</u>	<u>Address</u>	<u>City</u>	<u>State</u>	<u>Zip</u>	<u>Updated</u>
Crown Castle	80 Central Street	Boxborough	MA	01719	1/18/2018

<u>Contact</u>	<u>Office</u>	<u>Extension</u>	<u>Email</u>
Mark Bonanno	508 616-7818		mark.bonanno@crowncastle.com 7/17/2018

<u>Company</u>	<u>Address</u>	<u>City</u>	<u>State</u>	<u>Zip</u>	<u>Updated</u>
MCI-Verizon Business	P.O. Box 600	Charlton	MA	01507	2/22/2017

<u>Contact</u>	<u>Office</u>	<u>Extension</u>	<u>Email</u>
Stephen Parretti	508-248-1305		stephen.parretti@verizon.com 7/24/2017

<u>Company</u>	<u>Address</u>	<u>City</u>	<u>State</u>	<u>Zip</u>	<u>Updated</u>
Eversource Fiber	247 Station Drive, Stop: SUM SE 320	Mail Westwood	MA	02090	8/1/2018

<u>Contact</u>	<u>Office</u>	<u>Extension</u>	<u>Email</u>
Tomi Fadipe	781-441-3864		oloruntomi.fadipe@eversource.com 8/1/2018

Fire Alarm

<u>Company</u>	<u>Address</u>	<u>City</u>	<u>State</u>	<u>Zip</u>	<u>Updated</u>
Dedham Fire Alarm	436 Washington Street	Dedham	MA	02026	3/14/2014

<u>Contact</u>	<u>Office</u>	<u>Extension</u>	<u>Email</u>
Joseph Goode	781-751-9417		jgoode@dedham-6/20/2019 ma.gov

DPW

<u>Company</u>	<u>Address</u>	<u>City</u>	<u>State</u>	<u>Zip</u>	<u>Updated</u>
Dedham Director Engineering	of 55 River Street	Dedham	MA	02026	12/10/2012

<u>Contact</u>	<u>Office</u>	<u>Extension</u>	<u>Email</u>
Jason Mammone	781-751-9350		5/1/2014

Other

<u>Company</u>	<u>Address</u>	<u>City</u>	<u>State</u>	<u>Zip</u>	<u>Updated</u>
Lumen	1025 Eldorado Blvd.	Broomfield	CO	80021	9/18/2020

<u>Contact</u>	<u>Office</u>	<u>Extension</u>	<u>Email</u>
Renoy Thomas	516-712-3041		relocations@lumen.com 9/18/2020

EVERSOURCE EMERGENCY TELEPHONE NUMBERS

GAS:

Outage/ Emergency: 800-592-2000

New Service: 866-678-2744

Customer Support: 800-592-2000

ELECTRIC:

Outage/ Emergency: 800-592-2000 or 844-726-7562

New Service: 1-888-633-3797 (1-888-need pwr)

Customer Support: 1-800-340-9822

MBTA COMMUTER RAIL

Keolis Commuter Service (KCS) operates the commuter rail for the MBTA. All references to MBTA in the provisions will mean Keolis Commuter Service (KCS).

MBTA FLAGGING

The Contractor shall provide a minimum two week notice for flagging support for MBTA bridges and railroads. This applies only to bridges and railroads operated by Keolis Commuter Services (KCS). This two week notice does not apply to emergency work, only to routine or scheduled work activities. The contact person for advance request for flagging services is Rich Arnold, MBTA Railroad Operations Department, Phone number (617)-222-3635, email address: rarnold@mbta.com.

MBTA RAILROAD COORDINATION / ACCESS TO MBTA PROPERTY

The Contractor shall be required to coordinate the work of this Contract with the MBTA and Keolis Commuter Services Co. (“KCS”) through the MassDOT Resident Engineer and MassDOT designated Field Staff. A majority of the prerequisites for the Contractor to perform work on or adjacent to MBTA transit lines may be found in the “MBTA Special Instructions” provided herein. The Contractor shall be required to comply with the all applicable requirements of the latest edition of the MBTA Special Instructions available at the time of Contract Award.

The Contractor will have to perform construction related activities on, over, under, within or adjacent to railroad property owned or controlled by the MBTA. Any work that will affect Commuter Rail operations, involve work on, over, under, within or adjacent to the commuter rail right of way must be coordinated with MBTA Railroad Operations and KCS and shall comply with the latest version of the MBTA Railroad Operations Directorate.

An owner or Contractor who wishes permission to enter upon or perform work over, on, under or adjacent to MBTA property shall submit to the offices of the MBTA’s designated representative, a request in writing, a minimum of forty-two (42) days prior to the owner or the Contractor’s planned commencement of any of the above stated activities.

MBTA COORDINATION – SUBSTITUTE BUSING

Substitute bus transportation will be required for weekend MBTA Commuter Rail shutdowns. The Contractor must coordinate with MBTA Operations Department for provision of bus service. The Contractor shall contact MBTA Operations Dept. a minimum of 6 weeks prior to any planned rail shutdown. The MBTA will be responsible for planning, procuring, and administering the necessary substitute bus transportation services and operations based on the Contractor's approved work schedule.

Prime Contact:
Mr. Corey Lynch
Deputy Director-RR Ops.
32 Cobble Hill Road
Somerville, MA 02143
Office: 617-222-1776
Cell: 617-388-4388
cnlynch@mbta.com

Secondary Contact:
Mr.: Tom Foster
MBTA RR Ops.
32 Cobble Hill Road
Somerville, MA 02143
Office: 617-222-1776
tfoster@mbta.com

The Contractor shall be required to attend the MBTA Weekly Track Outage Schedule Coordination Meetings held Wednesdays at 10:00 am at 32 Cobble Hill Road in the small classroom located in the training area at the rear of the building.

SUBSECTION 8.14 UTILITY COORDINATION, DOCUMENTATION, AND MONITORING RESPONSIBILITIES

A. GENERAL

In accordance with the provisions of Section 8.00 Prosecution and Progress, utility coordination is a critical aspect to this Contract. This section defines the responsibility of the Contractor and MassDOT, with regard to the initial utility relocation plan and changes that occur as the prosecution of the Work progresses. The Engineer, with assistance from the Contractor shall coordinate with Utility companies that are impacted by the Contractor's operations. To support this effort, the Contractor shall provide routine and accurate schedule updates, provide notification of delays, and provide documentation of the steps taken to resolve any conflicts for the temporary and/or permanent relocations of the impacted utilities. The Contractor shall provide copies to the Engineer of the Contractor communication with the Utility companies, including but not limited to:

- Providing advanced notice, for all utility-related meetings initiated by the Contractor.
- Providing meeting minutes for all utility-related meetings that the Contractor attends.
- Providing all test pit records.
- Request for Early Utility work requirements of this section (see below).
- Notification letters for any proposed changes to Utility start dates and/or sequencing.
- Written notification to the Engineer of all apparent utility delays within seven (7) Calendar Days after a recognized delay to actual work in the field – either caused by a Utility or the Contractor.
- Any communication, initiated by the Contractor, associated with additional Right-of-Way needs in support of utility work.
- Submission of completed Utility Completion Forms.

SUBSECTION 8.14 (Continued)**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.

SUBSECTION 8.14 (Continued)**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 Contractor 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.

SUBSECTION 8.14 (Continued)**F. POST UTILITY SURVEY – NOTIFICATION**

Following completion of a utility survey of existing locations, the Contractor will be responsible to notify the Engineer of any known conflicts associated with the actual location of utilities prior to the start of the work. The Engineer and the Contractor will coordinate with any utility whose assets are to be affected by the Work of this Contract. A partial list of utility contact information is provided in the Project Utility Coordination Form.

G. MEETINGS AND COOPERATION WITH UTILITY OWNERS

The Contractor shall notify the Engineer in advance of any meeting they initiate with a Utility Owner's representative to allow MassDOT to participate in the meeting if needed.

Prior to the Pre-Construction Meeting, the Contractor should meet with all Utility Owners who will be required to perform utility relocations within the first 6 months of the project, to update the affected utilities of the Project Utility Coordination Form and all other applicable Contract requirements that impact the Utilities. The Contractor shall copy the Engineer on any correspondence between the Utility Owner and the Contractor.

H. FORCE ACCOUNT / UTILITY MONITORING REQUIREMENTS

The Engineer will be responsible for recording daily Utility work force reports. The start, suspension, re-start, and completion dates of each of the Utilities, within each phase of the utility relocation work, will be monitored and agreed to by the Engineer and the Contractor as the work progresses.

I. ACCESS AND INSPECTION

The Contractor shall be responsible for allowing Utility owners access to their own utilities to perform the relocations and/or inspections. The Contractor shall schedule their work accordingly so as not to delay or prevent each utility from maintaining their relocation schedule.

SUBSECTION 8.02 SCHEDULE OF OPERATIONS

Replace this subsection with the following:

An integrated cost and schedule controls program shall be implemented by the Contractor to track and document the progress of the Work from Notice to Proceed (NTP) through the Contractor Field Completion (CFC) Milestone. The Contractor's schedules will be used by the Engineer to monitor project progress, plan the level-of-effort required by the Department's work force and consultants and as a critical decision-making tool. Accordingly, the Contractor shall ensure that it complies fully with the requirements specified herein and that its schedules are both accurate and updated as required by the specification throughout the life of the project. Detailed requirements are provided in Division II, Section 722 Construction Scheduling.

SECTION 722
CONSTRUCTION SCHEDULING
DESCRIPTION

722.20 General

The Contractor's approach to prosecution of the Work shall be disclosed to the Department by submission of a Critical Path Method (CPM) schedule and a cost/resource loaded Construction Schedule when required in this Subsection. These requirements are in addition to, and not in limitation of, requirements imposed in other sections.

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

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

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

SECTION 722 (Continued)

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

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

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

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

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

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

MATERIALS, EQUIPMENT, PERSONNEL**722.40 General****A. Software Requirements** (Types A, B and C)

The Contractor shall use Primavera P6 computer scheduling software.

In addition to the requirements of Subsection 740 – Engineer’s Field Office and Equipment, the Contractor shall provide to the Department one (1) copy of the scheduling software, one (1) software license and one (1) computer capable of running the scheduling software for the duration of the Contract. This computer and software shall be installed in the Engineer’s Field Office within twenty-eight (28) Calendar Days after Notice to Proceed. The computer and software shall be maintained and serviced as recommended by the computer manufacturer and/or as required by the Engineer during the duration of the Contract at no additional cost to the Department. The Contractor shall provide professional training in the basic use of the software for up to eight (8) Department employees. The trainer shall be approved by the Engineer. This training shall be provided within twenty-eight (28) Calendar Days after Notice to Proceed.

SECTION 722 (Continued)**B. Scheduler Requirements**

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

CONSTRUCTION METHODS**722.60 General****A. Schedule Planning Session**

(Types A, B and C)

The Contractor shall conduct a schedule planning session within seven (7) Calendar Days after the Contractor receives the NTP and prior to submission of the Baseline Schedule. This session will be attended by the Department and its consultants. During this session, the Contractor shall present its planned approach to the project including, but not limited to:

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

This will be an interactive session and the Contractor shall answer all questions that the Department and its consultants may have. The Contractor shall provide a minimum of five (5) copies of a written summary of the information presented and discussed during the session to the Engineer. The Contractor's Baseline Schedule and accompanying Schedule Narrative shall incorporate the information discussed at this Schedule Planning Session.

SECTION 722 (Continued)**B. Schedule Reviews by the Department (All Types)**

1. Baseline Schedule Reviews

The Engineer will respond to the Baseline Schedule Submission within thirty (30) Calendar Days of receipt providing comments, questions and/or disposition that either accepts the schedule or requires revision and resubmittal. Baseline Schedules shall be resubmitted within fifteen (15) Calendar Days after receipt of the Engineer's comments.

2. Contract Progress Schedule / Monthly Update Reviews

The Engineer will respond to each submittal within twenty-one (21) Calendar Days. Schedules shall be resubmitted by the Contractor within five (5) Calendar Days after receipt of the Engineer's comments.

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

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

Each Contract Progress Schedule shall fully conform to these requirements.

A. LOGIC

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

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

B. ACTIVITIES

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

1. NTP
2. Each component of the Work defined by specific activities
3. Detailed activities to satisfy permit requirements
4. Procurement of fabricated materials and equipment with long lead times, including time for review and approval of submittals required before purchasing
5. The preparation and submission of shop drawings, procedures and other required submittals, with a planned duration that is to be demonstrated to the Engineer as reasonable
6. The review and return of shop drawings, procedures and other required submittals, approved or with comments, the duration of which shall be thirty (30) Calendar Days, unless otherwise specified or as approved by the Engineer
7. Interfaces with adjacent work, utility companies, other public agencies, sensitive abutters, and/or any other third-party work affecting the Contract

SECTION 722 (Continued)

8. The Critical Path, clearly defined and organized
9. Float shall be clearly identified
10. Access Restraints – restrictions on access to areas of the Work that are defined by the Department in the bid package, in Subsection 8.06 – Limitations of Operations or elsewhere in the Contract
11. Milestones listed in Subsection 8.03 - Prosecution of Work or elsewhere in the Contract Documents
12. Sub-Contractor approvals at fifteen (15) Calendar Days from submittal to response
13. Full Beneficial Use (FBU) Contract Milestone per the requirements of Subsection 8.03 - Prosecution of Work
14. Contractor's request for validation of FBU (ready to open to traffic)
15. The Department's confirmation of completed work to allow for FBU
16. Substantial Completion Contract Milestone per the requirements of Subsections 7.15 - Claims Against Contractors for Payment of Labor, Materials and Other Purposes and 8.03 - Prosecution of Work
17. Contractor's request for validation of Substantial Completion
18. Punchlist Completion Period of at least thirty (30) Calendar Days per the requirements of Subsections 5.11 - Final Acceptance, 7.15 - Claims Against Contractors for Payment of Labor, Materials and Other Purposes and 8.03 - Prosecution of Work
19. Contractor confirmation that all punch list work and documentation has been completed
20. Physical Completion of the Work Contract Milestone per the requirements of Subsections 5.11 - Final Acceptance and 8.03 - Prosecution of Work
21. Documentation Completion per the requirements of Subsections 5.11 - Final Acceptance and 8.03 - Prosecution of Work
22. Contractor Field Completion Contract Milestone per the requirements of Subsections 5.11 - Final Acceptance and 8.03 - Prosecution of Work
23. Utility work to be performed in accordance with the Project Utility Coordination (PUC) Form as provided in Subsection 8.14 - Utilities Coordination, Documentation and Monitoring Responsibilities
24. Traffic work zone set-up and removal, night work and phasing
25. Early Utility Relocation (by others) that has been identified in the Contract
26. Right-of-Way (ROW) takings that have been identified in the Contract
27. Material Certifications
28. Work Breakdown Structure in accordance with the MassDOT-Highway Division Contractor Construction Schedule Toolkit located on the MassDOT-Highway Division website at:

<https://www.mass.gov/info-details/massdot-highway-contractors-schedule-toolkit>
29. For Type A and B Contracts only: All Items to be paid, including all Unit Price and Lump Sum pay Items, shall be identified by activity. This shall include all non-construction activities such as Engineering work; purchase of permanent materials and equipment, purchase of structural steel stock, equipment procurement, equipment delivery to the site or storage location and the representative amount of overhead/indirect costs that was included in the Contractor's Bid Prices.

SECTION 722 (Continued)**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 to resources and production rates that correspond to the Contractor's Bid Price. Within all of the Department-required schedules, the Contractor shall plan the Work using durations for all physical construction activities of no less than one (1) Work Day and no greater than fourteen (14) Work Days, unless approved by the Engineer as part of the Baseline Schedule Review.

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

E. MATERIALS ON HAND (for Types A and B only)

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

F. ACTIVITY DESCRIPTIONS

The Contractor shall use activity descriptions in all schedules that clearly describe the work to be performed using a combination of words, structure numbers, station numbers, bid Item numbers, work breakdown structure (WBS) and/or elevations in a concise and compact label as specified in the MassDOT-Highway Division Contractor Construction Schedule Toolkit located on the MassDOT-Highway Division website at:

<https://www.mass.gov/info-details/massdot-highway-Contractors-schedule-toolkit>

G. ACTIVITY IDENTIFICATION NUMBERS

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

H. ACTIVITY CODES

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

SECTION 722 (Continued)**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.

Examples of special calendars include, but are not limited to:

- Winter Shutdown Period, specific work is required by separate special provision to be performed during the winter. See Special Provision 8.03 (if applicable)
- Peak traffic hours on heavily traveled roadways. This shall be from 6:30 am to 9:30 am and from 3:30 pm to 7:00 pm, unless specified differently elsewhere in the Contract.
- Special requirements by sensitive abutters, railroads, utilities and/or other state agencies as defined in the Contract.
- Cape Cod and the Islands Summer Roadway Work Restrictions: A general restriction against highway and bridge construction is enforced between Memorial Day and Labor Day, unless otherwise directed by the Engineer. Refer to the Project Special Provisions for specific restrictions.
- Cape Ann Summer Roadway Work Restrictions: While there are no general restrictions for Cape Ann as there are for Cape Cod and the Islands, project-specific restrictions may be enforced. Refer to the Project Special Provisions for specific restrictions.
- Turtle and/or Fish Migration Periods and/or other in-water work restrictions: Refer to the Project Special Provisions for specific restrictions.
- Working over Waterways Restricted Periods: Refer to the Project Special Provisions for specific restrictions.
- Night-time paving and striping operations, traffic and temperature restrictions: Refer to the Project Special Provisions for specific restrictions.
- Utility Restrictions shall be as specified within the Contract.

J. FLOAT

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

SECTION 722 (Continued)**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.
8. For Type A Schedules, each month, the Contractor will be paid using the Cost-loaded CPM activities for Lump Sum payment Items. This requirement supersedes any requirements elsewhere in this Contract regarding partial payments of schedule-of-values for all Lump Sum Items.

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

1. Milestones or constraint dates not specified in the Contract
2. Scheduled work not required for the accomplishment of a Contract Milestone
3. Use of activity durations, logic ties and/or sequences deemed unreasonable by the Engineer
4. Delayed starts of follow-on trades
5. Float suppression techniques

SECTION 722 (Continued)**722.62 Submittal Requirements**

All schedules shall be prepared and submitted in accordance with the requirements listed below.

Each monthly Contract Progress Schedule submittal shall be uniquely identified.

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

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

A. Narratives

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

1. Itemize and describe the flow of work for all activities on the Critical Path in a format that includes any changes made to the schedule since the previous Contract Progress Schedule / Monthly Update or the Baseline Schedule, whichever is most recent;
2. provide a description of any specification requirements that are not being followed. Identify those that are improvements and those that are not considered to be meeting the requirements;
3. provide all references to any Notice of Delay that has been issued, within the time period of the Contract Progress Schedule Update, by letter to the Engineer. Note that any Notice of Delay that is not issued by letter will not be recognized by the Engineer. See Subsection 722.64.A - Notice of Delay;
4. provide a description of each third-party utility's planned vs. actual progress and note any that are trending late or are late per the durations and commitments as provided in the PUC Form; provide a description of the five (5) most important responses needed from the Department and the need date for the responses in order to maintain the current Schedule of Record;
5. provide a description of all critical issues that are not within the control of the Contractor or the Department (third party) and any impact they had or may have on the Critical Path;
6. provide a description of any possible considerations to improve the probability of completing the project early or on-time;
7. compare Early and Late Dates for activities on the Critical Path and describe reasons for changes in the top three (3) most critical paths;
8. describe the Contractor's plan, approach, methodologies and resources to be employed for completing the various operations and elements of the Work for the top three (3) most critical paths. For update schedules, describe and propose changes to those plans and verify that a Proposal Schedule is not required;
9. describe, in general, the need for shifts that are not 5 days/week, 8 hours/day, the holidays that are inserted into each calendar and a tabulation of each calendar that has been used in the schedule;

SECTION 722 (Continued)

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.

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

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

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

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

C. Detailed Activity Schedule Comparisons

A Detailed Activity Schedule Comparison (DASC) is a simple reporting tool in the format of a graphical report that will provide Resident Engineers with immediate, timely and up-to-date information. The DASC consists of an updated bar chart that overlays the current time period's bar chart onto the previous time period's bar chart for an easily-read comparison of progress during the present and previous reporting periods. The DASC shall be prepared and submitted in accordance with the instructions contained in the Construction Schedule Toolkit located on the MassDOT-Highway Division website at:

<https://www.mass.gov/info-details/massdot-highway-Contractors-schedule-toolkit>

The reports described in Subsections D, E and F below shall be submitted with all of the schedules listed in Subsection 722.20 - General:

SECTION 722 (Continued)**D. Activity Cost Report and Monthly Cash Flow Projections (Type A only)**

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

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

1. activity ID and description,
2. forecast start and finish dates for each activity and,
3. when submitted as a revised schedule, actual start and finish dates for each completed activity.

For Unit Price pay Items, in addition to the above, estimates to complete and any variance to the estimated Contract quantity shall be shown.

E. Resource Graphs (Type A only)

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

F. Projected Spending Reports (Types B, C and D)

A Projected Spending Report (PSR) shall be prepared and submitted in accordance with the instructions listed at the end of this section. The PSR shall indicate the monthly spending (cash flow) projection for each month from NTP to Contractor Field Completion (CFC). Each month's actual spending shall be calculated using all CQEs paid during that month. If the difference between the Contractor's monthly projections vs. the actual spending is greater than 10%, the Contractor's monthly spending projection shall be revised and resubmitted within fifteen (15) Calendar Days.

The Projected Spending Report (PSR) shall be depicted in a tabular format and printed in color on 11 x 17-sized paper or larger as approved by the Engineer. For additional instructions and a template for preparing the Projected Spending Report (PSR), refer to the Contractor's Construction Schedule Toolkit located on the MassDOT-Highway Division website at:

<https://www.mass.gov/info-details/massdot-highway-Contractors-schedule-toolkit>

or consult with the District Construction Scheduler.

722.63. Progress Schedule Requirements**A. Baseline Schedule**

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

SECTION 722 (Continued)

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.

C. Contract Progress Schedules / Monthly Updates (Types A, B, C and D)

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

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

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

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

SECTION 722 (Continued)

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

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

D. Short-Term Construction Schedule

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

The Short-Term Construction Schedule shall be submitted every two weeks. It shall display all work for a thirty-five (35) Calendar Day period consisting of completed work for the two (2) week period prior and all planned work for the following three (3) week period. The initial submission shall be provided no later than thirty (30) Calendar Days after NTP or as required by the Engineer.

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

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

722.64 Impacted Schedule Requirements**A. Notice of Delay**

The Contractor shall notify the Engineer in writing, with copies to the District and State Construction Engineers, within three (3) Calendar Days of the start of any delays to the Critical Path that are caused by actions or inactions that were not within the control of the Contractor. Delay notifications that are not provided in a letter to the Engineer, such as a delay notification in the schedule narrative, will not be recognized as contractual notice in the determination of any Time Extension related to the impacts to the work associated with this specific alleged delay. Should such delay continue for more than one (1) week, the Contractor shall note it in the Schedule Narrative until the delay is no longer impacting the Critical Path for the completion of the Contract Milestones. The Engineer will evaluate the alleged delay and its impact and will respond to the Contractor within ten (10) Calendar Days after receipt of a notice of delay.

SECTION 722 (Continued)**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 Sub-sections 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.

TEAs shall be submitted:

1. as part of any Extra Work Order that may impact Contract Time,
2. with a request for a Time Extension,
3. within fourteen (14) Calendar Days after a request for a TEA by the Engineer for any other reason.

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

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

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

When accepted, the changes included in a TEA shall be incorporated into the next Contract Progress Schedule per the requirements of Subsection 722.63.C - Contract Progress Schedules / Monthly Updates.

SECTION 722 (Continued)

During the review of any TEA, all Contract Progress Schedules shall continue to be submitted as required.

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

C. Recovery Schedules

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

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

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

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

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

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

D. Proposal Schedules

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

SECTION 722 (Continued)

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

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

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

Proposal Schedules shall clearly indicate any proposed overtime hours, additional shifts, and the resources that are proposed to be incorporated in the schedule. The Engineer shall have final discretion over the use of overtime hours and additional shifts.

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

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

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

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

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

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

All required schedule-related work, including, but not limited to computers, computer software, the planning and coordination with utilities, training, schedule preparation and schedule submittals will be paid for under the fixed price amount.

This fixed price amount is for payment purposes only and is separate from what the Department considers to be the Contractor's General Condition costs. If the Contractor deems it necessary to include additional costs to provide all of the requirements of this section, these additional costs shall be included in the Contractor's overall bid price.

Twenty percent (20%) of this pay Item will be paid upon the Engineer's acceptance of the Contractor's Baseline Schedule, prepared and submitted in accordance with Subsection 722.63.A.

SECTION 722 (Continued)

The remaining eighty percent (80%) of this pay Item will be paid in equal monthly installments distributed across the Contract Duration from Notice to Proceed (NTP) to Contractor Field Completion (CFC), less the 2 months required for the submittal and review of the Baseline Schedule in accordance with the following formula:

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

The timely and accurate submission of the Baseline Schedule is critical to the Contract and the Department's ability to make informed decisions. Only payments under Item 740 - Engineer's Field Office and Item 748 - Mobilization will be made until the Baseline Schedule is accepted by the Engineer.

No payment for any other pay Item will be processed beyond seventy-five (75) Calendar Days from Notice to Proceed (NTP) until the Baseline Schedule is accepted by the Engineer. Until the Engineer's acceptance of the Baseline Schedule, the combined total of all payments made to the Contractor will be limited to an amount no greater than the total price for Item 748 - Mobilization or 3% of the contract price, whichever is less.

All Contract Progress Schedule Updates submitted later than ten (10) Calendar Days after the CQE (Contract Quantity Estimate) completion date, or greater than forty (40) Calendar Days from the Data Date of the previous submission, will be deemed to be no longer useful and will not qualify for payment. Late submittal of missed Contract Progress Monthly Updates will not result in recovery of the previously forfeited portion of the Schedule of Operations Fixed Price Payment Item.

Failure to submit schedules as and when required may result in the forfeiture of that portion of the Schedule of Operations Fixed Price Payment and/or the withholding of the full or partial CQE payments by the Engineer.

Failure to submit schedules that are acceptable to the Engineer may result in the forfeiture of that portion of the Schedule of Operations Fixed Price Payment and/or the withholding of the full or partial CQE payments by the Engineer.

The Schedule of Operations pay Item will be adjusted to pay for only the actual quantity of schedules that have been submitted in accordance with this section.

The Contractor's failure or refusal to comply with the requirements of this Section shall be reasonable evidence that the Contractor is not prosecuting the Work with due diligence and may result in the withholding of full or partial payments by the Engineer.

Should there be a Time Extension granted to the Contractor, the Engineer may provide an Equitable Adjustment for additional Contract Progress Schedule Updates at intervals directed by the Engineer. Item 100. will be the basis for this Equitable Adjustment.

SECTION 722 (Continued)

722.82 Payment Items

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

DESIGNER/PROJECT MANAGER

Darshan N. Jhaveri, Project Manager
BETA Group, Inc.
315 Norwood Park South
Norwood, MA 02062
Tel: 781-255-1982

Aleksey Belov, Project Manager
Massachusetts Department of Transportation
Ten Park Plaza
Boston, MA 02116
Tel: 857-368-9338

ITEM 101.**CLEARING AND GRUBBING****ACRE**

The work to be done under this Item shall conform to the relevant provisions of Subsection 101 supplemented with the following:

All trees, including trees greater than 24 inches, stump, shrubs, and brush between the existing edge of the roadway and proposed top or bottom of slope or back of proposed walls shall be removed under Item 101.

Trees called out to be removed outside the clearing and grubbing limit, as shown on the plans, shall be paid for under Item 103.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 101., Clearing and Grubbing will be measured and paid for at the contract unit price per ACRE; which price shall be full compensation for all labor, equipment, materials, and incidentals for the satisfactory completion of the work, including the services of a certified arborist, labor, material, equipment, and incidental costs required to complete the work.

The work involved in clearing and grubbing of stormwater treatment area shall be paid under Item 228, Infiltration Basin.

ITEM 102.2**TREE TRIMMING****LUMP SUM****GENERAL**

All work shall be done in accordance with the relevant provisions of Subsection 101 of the Standard Specifications and the following:

Work includes Tree Trimming all necessary trees within the Limit of Work as described below and shown on the plans.

DESCRIPTION

All branches and limbs of trees which restrict signal and sign visibility, sight distance, or restrict horizontal or vertical clearances shall be trimmed and painted. The trees to be trimmed shall be determined by the Engineer and all work shall be done to the satisfaction of the Engineer. Tree trimming require for overhead utility wire, utility pole and guy wires relocations and possibly mast arms installation shall be coordinated with the Engineer for the limit of work.

The quality and method of work must conform to accepted tree trimming practices according to the following:

- MAA – Massachusetts Arborist Association
- ISA- International Society of Arborists

ITEM 102.2 (Continued)

METHOD OF CONSTRUCTION

All tree trimming work will be performed by a Massachusetts Certified Arborist. A copy of the Arborist's current certification will be provided to the Engineer prior to the start of the work.

DELIVERY STORAGE AND HANDLING

The method of disposal of all materials shall be the responsibility of the Contractor and shall be approved by the Engineer. All methods of disposal shall be accomplished in accordance with all applicable Federal, State and local ordinances. Burning on-site will not be permitted.

BASIS OF PAYMENT

Item 102.2, Tree Trimming will be paid for at the contract LUMP SUM price; which price shall include all labor, material, equipment and incidental costs required to complete the work.

ITEM 102.3 **CONTROL OF INVASIVE PLANTS EXISTING ON SITE** **HOUR**

Work under this Item consists of controlling invasive plants within the project limits. An Invasive Plant Management Strategy (IPMS) for their control shall be submitted to the Engineer for review and approval and the IPMS shall be implemented on site. The IPMS shall be measured and paid for under Item 102.33, Invasive Plant Management Strategy.

Work under this Item shall be coordinated with work and schedule for Selective Clearing, Clearing and Grubbing, Mowing, Tree Removal, Planting, and Wetland Mitigation Items.

Herbicide shall be applied during daytime hours only.

Payment is per hour on site and shall be compensation for a minimum crew of 2 licensed applicators, 2 back-pack sprayers and mist-blowers, a properly equipped spray truck with spray hoses, and a tank with sufficient capacity for a full day of work.

The overall intent is to improve the habitat value of the site, protect proposed landscape restoration, improve future maintenance operations, and attempt to prevent future spread both on-site and to adjacent sites.

Measures to prevent the introduction of invasive plant species to the site and to correct their introduction as a result of construction-related activities shall be covered under the Standard Specifications, Division I - Sections 7.01(D) Plant Pest Control and 7.13 Protection and Restoration of Property as amended in these Special Provisions.

Plant species targeted for management under this Item shall be as determined in the field per the site walk and as specified in the IPMS.

ITEM 102.3 (Continued)

The definition of invasive plant species shall be as described by Massachusetts Invasive Plant Advisory Group (MIPAG): “non-native species that have spread into native or minimally managed plant systems in Massachusetts, causing economic or environmental harm by developing self-sustaining populations and becoming dominant and/or disruptive to those systems.”

Control of invasive plants shall begin immediately with the initiation of construction activities and prior to any clearing or site disturbance. Treatment areas shall include stockpile locations and may, upon approval of the Engineer, extend outside the project limit. Treatment shall be done each consecutive year for the duration of the contract unless specified otherwise in the IMPS or unless directed otherwise by the MassDOT invasive species contact. Work shall be done during the growing season from May – October unless otherwise specified in the IPMS.

Areas identified for vegetation control measures shall be as shown on the plans and as determined in the field by the Engineer and a MassDOT Landscape Architect. Contact at MassDOT Landscape Design Section is Andrew Schlenker at (857) 368 – 9176.

SUBMITTALS

No work shall begin without approval of the submittals.

Within 15 business days prior to the site walk, the Contractor shall submit all qualifications to the Engineer for approval by MassDOT Landscape Design.

Submittals include the following Items.

Qualifications

1. Company must provide proof of qualifications by providing the following:
 - a. Narrative describing company, its expertise and experience with invasive plant control.
 - b. Demonstrate experience with herbicide treatment as part of restorations and in sensitive areas
 - c. Describe company’s technical qualifications and past performance.
2. Company must meet licensing requirements:
 - a. All crew applicators must have a Massachusetts Commercial Applicator License (CORE).
 - b. At least one or more applicator must have ROW certification if required for specific project.
 - c. Company must provide name(s) of applicator(s) and Applicator License/Certification number for all Contractor crew leaders working on the project.
 - d. Company must provide documentation of any warnings, penalties or fines received in the last three (3) years.

ITEM 102.3 (Continued)

3. Company must provide proof of experience with invasive plant control and include following:
 - a. At least five (5) references from prior invasive plant control work completed in last five (5) years. Provide contact information including address, phone number and email.
 - b. Provide a summary of each of these projects including nature of the problem, specific invasive vegetation treated, dates and period of treatment, methodologies used, and summary of success or not in terms of meeting performance objectives. Include summary of equipment used.
 - c. Photo documentation of these projects.
 - d. GPS coordinates of project locations, if available.
4. Crew leader must have expertise with invasive plant control and provide the following:
 - a. Have held Core license for at least five (5) years.
 - b. Resume listing five (5) or more years of experience applying pesticides with the company or with another company specializing in vegetation management.

The following companies are pre-approved by MassDOT Landscape Design Section:

Groundscapes Express, Inc.

P.O. Box 737
Wrentham, MA 02093
Contact: Butch Goodwin
Email: butch@groundscapesexpress.com
Phone: 508-400-5366

Solitude Lake Management

590 Lake Street
Shrewsbury, MA 01545
Contact: Keith Gazaille
Email: kgazaille@solitudelake.com
Phone: 508-885-0101

Land Stewardship, Inc.

PO Box 511
Turner Falls, MA 01376
Contact: Chris Polatin
Email: info@landstewardshipinc.com
Phone: 413-367-5292

SWCA Environmental Consultants

15 Research Drive
Contact: Scott Fisher
Phone: 413-658.2056
Email: sfisher@swca.com
Amherst, MA 01002

Native Habitat Restoration

P.O. Box 582
Stockbridge, MA 01262
Contact: Jess M. Toro : 413-358-7400
Email: nativehabitatrestoration@gmail.com
Phone: 413-394-0277

Vegetation Control Service, Inc.

2342 Main St.
Athol, MA 01331
Contact: Andrew Powers
Email: apowers@vegetationcontrol.com
Phone: 800-323-7706

ITEM 102.3 (Continued)**Invasive Plant Management Strategy (IPMS)**

At least thirty (30) days prior to proposed treatment the IPMS shall be submitted for approval by the Engineer and MassDOT Landscape Architect. All chemicals, methods and work shall be consistent with the IPMS. The IPMS shall be as described under Item 102.33.

Follow-Up Treatment

Depending on treatment results after the first year, the IPMS may be amended for the second year to address additional concerns or adjust to conditions. Treatment shall be adjusted accordingly.

Herbicide Use Report

Within two (2) weeks after each application, the Contractor shall provide to the Engineer a completed and signed MassDOT Herbicide Use Report. Where applicable, the Contractor shall provide the name/s of the associated water body/bodies affected by potential discharge, per the requirements of Sections 7.1 and 7.2 of the USEPA Pesticide General Permit for the Discharges from the Application of Pesticides.

Photo Documentation

Digital photos with date and time stamp shall be provided with IPMS and follow-up reporting. Photos shall show existing conditions and post-treatment conditions.

MATERIALS

All proposed herbicides shall be as approved in the IPMS. Herbicides shall be labeled for the method of treatment and shall meet all federal, state and local regulation requirements. Application rates will depend on herbicide proposed and shall be per the manufacturer's label for specific application.

CONSTRUCTION METHODS

All methods used shall be as approved in the IPMS.

Prior to the start of any work, Contractor shall walk the site with the Engineer and the MassDOT Landscape Architect. The purpose of the site inspection is to identify limits of work, mark locations of areas designated for treatment, and mark individual plants targeted for treatment or removal according to the IPMS. Contractor shall be responsible for marking delineated areas and plants to be preserved, removed, or otherwise treated. Fencing or other materials needed for marking and delineating protected areas shall be incidental to this Item.

ITEM 102.3 (Continued)**Herbicide Applications**

All herbicide application shall conform to Massachusetts Pesticide Laws and Regulations per the Massachusetts Department of Agricultural Resources (MDAR) Pesticide Bureau.

Mixing, applying and/or disposing of herbicides shall always be in accordance with instructions on their labels and all applicable federal, state, and local regulations. Mixing shall not occur within sensitive areas, wetlands, or buffer zones.

Contractor shall not spray 2 hours prior to precipitation, during rain, or during windy conditions. The Contractor shall be responsible for monitoring weather conditions and adjusting the work schedule as appropriate for the herbicide and application method to be used.

Targeted vegetation shall be identified and marked prior to treatment. Plants treated by foliar spray, injection or glove application or other methods that leave standing vegetation, as opposed to cut-stump application, shall remain clearly marked for identification through the contract period.

Desirable vegetation shall be protected from both spray and other physical damage.

Contractor is responsible for any damage to vegetation not designated for removal or treatment. Vegetation damaged shall be restored. Cost of replacement plants and/or restoration shall be borne by the Contractor.

Contractor shall ensure that the public does not enter a work area while herbicide application or spraying is underway.

Disposal Of Invasive Plant Material

All material to be cleared shall become the property of the Contractor. The satisfactory disposal of all cleared plant material (seeds, roots, woody vegetation, associated soils, etc.) shall be the Contractor's responsibility.

The Contractor shall take measures to prevent viable plant material from leading to further infestations (seeds, roots, woody material, etc.) while stockpiled, in transit, or at final disposal locations. All precautions shall be taken to avoid contamination of natural landscapes with invasive plants or invasive plant material.

Chipping, shredding, or on-site burning of plant material shall not be permitted unless written approval is given as part of the Invasive Plant Management Strategy.

For plant material taken to an incinerating facility per the IPMS, a receipt from that facility shall be submitted to the Engineer as proof of disposal.

ITEM 102.3 (Continued)

Where feasible, it is preferable to dispose of plants on site or to bury them on site with on-going monitoring for re-sprouting. Disposal locations and methods must be approved and included in the IPMS. Site work such as grading and seeding to stabilize and restore disposal area shall be incidental to this Item.

Contractor shall be responsible for treating areas of re-growth due to improper disposal.

MONITORING

After initial herbicide treatment, all treated plants and areas shall be monitored through visual observation and re-treated as necessary and appropriate throughout the season and for the duration of the contract per the management proposal and schedule for control submitted by Contract. Monitoring shall be incidental paid for under Item 102.33, Invasive Plant Management Strategy.

MEASURE OF SUCCESS

The expectation is a minimum of 85-95 percent control achieved after the first treatment, depending on plants targeted and extent of population, and based on the expectations laid out in the IPMS. The expectation for the contract duration is 95-100% eradication by the end of the treatment period, unless otherwise specified in the IPMS.

METHOD OF MEASUREMENT

Item 102.3 will be measured for payment by the HOUR of crew time spent on the project doing actual work. A crew shall be defined as a minimum of two licensed applicators each equipped with (at minimum) back-pack sprayer and mist blower. The crew shall also have a properly equipped spray truck with hoses and a tank with sufficient capacity for a full day of work.

BASIS OF PAYMENT

Item 102.3 will be paid for at the contract unit price per HOUR; which price shall include all labor, materials, equipment, tools and all incidentals required to complete the work.

Payment will be based upon time spent on the project doing actual work and shall not include travel time to and from the Contractor's place of business and shall also not include time for investigative field trips.

The Invasive Plant Management Strategy will be paid for under Item 102.33.

ITEM 102.33 **INVASIVE PLANT MANAGEMENT STRATEGY** **HOUR**

This Item consists of providing an Invasive Plant Management Strategy (IPMS) for the control of invasive plants on the project site and shall be coordinated with Item 102.3 Control of Invasive Plants Existing on Site. The IPMS shall be submitted to the Engineer for review and approval and the IPMS shall be implemented on site.

Invasive plant control treatment on site shall be as described under Item 102.3 Control of Invasive Plants Existing on Site and shall be compensated per that Item.

Work under this Item shall be coordinated with work and schedule for Selective Clearing, Clearing and Grubbing, Mowing, Tree Removal, Planting, and Wetland Mitigation Items.

Individual attending the site walk and determining the Invasive Plant Management Strategy must demonstrate expertise with vegetation management and invasive plant control.

SUBMITTALS

Individual shall be from the same company as that providing services for Item 102.3 Control of Invasive Plants Existing on Site or shall meet the following requirements:

- Submit copy of current Core license
- Submit a resume listing five (5) or more years of experience managing invasive plants with a company specializing in vegetation management.

Task Summary: for measurement of payment, the Contractor shall submit the total sum and a breakdown of hours for the following tasks performed, which shall include at least: Site Walk/s, IPMS Written Reports, Site Monitoring if required, and Final Report if required.

Invasive Plant Management Strategy (IPMS)

Prior to the start of any invasive plant control treatment, submit in writing an IPMS proposal and Schedule of Control for approval by the Engineer and MassDOT Landscape Architect at least thirty (30) days prior to proposed treatment. All chemicals and methods proposed shall be consistent with applicable Massachusetts Wetlands Protection Act Order of Conditions.

The IPMS shall include the following:

1. Description of treatment areas including identification of targeted invasive plant species, locations, approximate size of areas and digital photos with time/date stamp. Delineate treatment areas with polygons outlining their perimeter or locations of individual plants. A free-hand sketch drawn on construction plans or an aerial photo can be used to show locations.
2. Note coordination as required with Items for clearing, clearing and grubbing, tree removal, mowing, planting, and wetland mitigation.
3. Describe strategy for management of soils that contain invasive plant roots or seeds based on input from the Contractor and the Engineer.

ITEM 102.33 (Continued)

4. Proposed methods of treatment for each species or area. Treatment may include manual removal if herbicides are not permitted.
5. If herbicides are proposed, submit product label including application methods and rates (entire MSDS information need not be submitted if available online).
6. Proposed time of treatment based on target plant species and construction schedule.
7. Method for disposing of invasive plant material including stems, trunks, branches, roots, and roots, if required.
8. General monitoring schedule.
9. Preliminary re-treatment schedule. Re-treatment shall be based on assessment of initial results and time of year.
10. Proposed performance metrics, or measure of treatment success, which shall be agreed upon by MassDOT.
11. Expected end date of contract and last treatment.

Note: The IPMS is critical for identifying pre-construction conditions as well as strategies for minimizing import or spread of invasive plants. Failure to provide approved IPMS may jeopardize this Item, in which case, the Contractor will be responsible for control of invasive plants found on site at no cost to the contract.

Follow-Up Treatment Schedule

Depending on treatment results after the first year, the IPMS may be amended for the following year/s to address additional concerns or adjust to conditions. A follow-up treatment schedule shall follow the same format as outlined above and submitted to the Engineer and MassDOT Landscape Architect for approval at least thirty (30) days prior to proposed treatment.

Reporting

Within two (2) weeks after each application, the Contractor shall provide to the Engineer a completed and signed MassDOT Herbicide Use Report. Where applicable, the Contractor shall provide the name/s of the associated water body/bodies affected by potential discharge, per the requirements of Sections 7.1 and 7.2 of the USEPA Pesticide General Permit for the Discharges from the Application of Pesticides.

Final Report

A final report documenting status of invasive control at the end of the project may be required for regulatory purposes or for instances where control will be continued by other means. Report shall include photo documentation, notation on a plan or aerial image of area treated, summary of treatment performed, and control achieved.

Photo Documentation

Digital photos with date and time stamp shall be provided with IPMS and follow-up reporting.

ITEM 102.33 (Continued)**METHOD OF MEASUREMENT**

Item 102.33 will be measured for payment by the HOUR. The basis for measurement shall be per the completion of tasks as approved under the Task Summary submittal.

BASIS OF PAYMENT

Item 102.33 will be paid for at the contract unit price per HOUR; which price shall include all labor, materials, equipment, tools and all incidentals required to complete the work.

Payment shall not include travel time to and from the Contractor's place of business.

ITEM 102.511 **TREE PROTECTION – ARMORING & PRUNING** **EACH**

The work under this Item shall conform to the relevant provisions of Subsection 771 and shall be for furnishing and installing temporary tree trunk protection and for limb pruning to prevent injury to the tree from construction equipment and activities.

Trunk armoring is for instances where construction activity (the use of heavy equipment) comes close enough to potentially damage the tree trunk or limbs. It is to be used where shown on the plans and as directed by the Engineer.

REFERENCES

If requested, the Contractor shall provide to the Engineer one copy of the latest edition of the American National Standards Institute (ANSI) A300 Standard Practices for Tree, Shrub, and Other Woody Plant Maintenance: Part 1-Pruning and Part 5-Construction Management Standard. Provision of reference shall be incidental to this Item.

MATERIALS

Trunk armoring shall be such that it prevents damage to the trunk from construction equipment. Selected material shall be such that installation and removal will not damage the trunk.

Acceptable materials include 2x4 wood cladding with wire or metal strapping, or, for instances when duration of construction activities is less than three months, corrugated plastic pipe mounted with duct tape. Height of cladding shall be from base of tree (including root flare) to the bottom of the first branch or as recommended by the Arborist. Material and methods shall be approved by the Engineer.

Other materials or methods may be acceptable if approved by MassDOT Landscape Design or an Arborist.

ITEM 102.511 (Continued)**METHODS OF WORK**

Prior to construction activities, the Engineer, the Contractor, the Town Tree Warden, and the Arborist, if specified, shall review trees noted on the plans to be protected. Final decision as to trees armored and/or pruned shall be per the Engineer.

Care shall be taken to avoid damage to the bark during installation and removal of armoring. Trunk armoring shall be replaced and maintained such that it is effective for as long as required and shall be removed immediately upon completion of work activities adjacent to trees.

Pruning of limbs shall conform to the techniques and standards of the most recent ANSI A300 standards.

DAMAGES & PENALTIES

In the event that trees designated for protection under this Item are damaged, including root damage from unapproved trespassing onto the root zone, the Contractor shall, at his own expense obtain an Arborist. The Arborist shall be approved by MassDOT.

If, based on the recommendations of the Arborist, the Engineer determines that damages can be remedied by corrective measures, such as repairing trunk or limb injury, soil compaction remediation, pruning, and/or watering, the damage will be repaired as soon as possible within the appropriate season for such work and according to industry standards.

If the Engineer determines that damages are irreparable, the Contractor shall pay for the damages in the amount of \$500.00 per diameter inch at breast height (DBH) per tree.

Additionally, if the Engineer determines that the damages are such that the tree is sufficiently compromised as to pose a future safety hazard, the tree shall be removed. Tree removal will include cleanup of all wood parts, grinding of the stump to a depth sufficient to plant a replacement tree or plant, removal of all chips from the stump site, and filling the resulting hole with topsoil.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 102.511 will be measured and paid at the contract unit price per EACH. This will include full compensation for all labor, equipment, materials, and incidentals for the satisfactory completion of the work and the subsequent removal and satisfactory disposal of the protective materials upon completion of the contract.

In the event of tree damage, cost of Arborist services, of remediation measures, and/or tree removal will be borne by the Contractor.

ITEM 102.511 (Continued)

Payment under this Item will be scheduled throughout the length of contract:

- 40% of value shall be paid upon installation of trunk armoring and completion of pruning work, if required.
- 60% shall be paid at the end of construction operations that would damage the tree and after protection materials have been removed and properly disposed of by the Contractor. In the event of repairable damages, payment shall be made after the completion of remediation measures.

In the event of irreparable damage due to lack of proper protective measures being take there will be no compensation in addition to the \$500.00 per diameter inch penalty.

ITEM 102.521

TREE AND PLANT PROTECTION FENCE

FOOT

The work under this Item shall conform to the relevant provisions of Subsections 644 and 771 of the Standard Specifications and the following:

Work under this Item consists of furnishing, installing, removing and resetting, maintaining fence in a vertical and effective position at all times, and final removal of temporary fence.

The purpose of the fence is to prevent damage to tree roots, tree trunks, soil, and all other vegetation within a delineated Tree and Plant Protection Zone (TPPZ) as shown on the plans, as directed by the Engineer, and as described herein.

Protection shall be for the duration of the construction activities unless otherwise directed.

MATERIALS

Temporary Fence shall be such that it provides a minimum 48-inch tall barrier that remains vertical and effective (not sagging) for the duration of period required. Fence shall be plastic orange safety fence (recommended where high visibility is necessary), wooden snow fencing, or other approved material.

Per the Engineer, additional posts, deeper post depths, and/or additional attachments will be used if the fabric or fence sags, leans or otherwise shows signs of failing to create a sufficient barrier to access.

REFERENCES

If requested, the Contractor shall provide to the Engineer one copy of the American National Standards Institute (ANSI) A300 Standard Practices for Tree, Shrub, and Other Woody Plant Maintenance Part 1, Pruning and Part 5, Construction Management Standard. Provision of reference shall be incidental to this Item.

ITEM 102.521 (Continued)**ESTABLISHMENT OF TPPZ**

Fencing shall be used for construction areas, staging areas, and stockpile areas as shown on the plans and as directed by the Engineer to establish the Tree and Plant Protection Zone (TPPZ).

Fence shall be located as close to the work zone limit and as far from the trunk as possible to maximize the area to be protected. Fence shall run parallel and adjacent to construction activity to create a barrier between the work zone and the root zone or designated limit of plants and soils to be protected.

When construction activities surround (or have the potential to surround) trees or plants to be protected, a circular enclosure shall be used. In these instances, the TPPZ limit shall be the Drip Line of each tree or as close as possible to the Drip Line, and as shown on the plans and details. The Drip Line is defined as the limit of tree canopy.

The Contractor shall not engage in any construction activity within the TPPZ without the approval of the Engineer, including: operating, moving or storing equipment; storing supplies or materials; locating temporary facilities including trailers or portable toilets; and shall not permit employees to traverse the area to access adjacent areas of the project or use the area for lunch or any other work breaks.

METHOD OF WORK

Fence shall be installed prior to any construction work or staging activities and shall be installed and maintained in a vertical and effective position at all times.

Fence shall be repositioned where and as necessary for optimum effectiveness. Repositioning shall be incidental to this Item. Fence shall not be moved without prior approval by the Engineer.

The TPPZ shall be protected at all times from compaction of the soil; damage of any kind to trunks, bark, branches, leaves, and roots of all plants; and contamination of the soil with construction materials, debris, silt, fuels, oils, and any chemicals substance.

After construction activities are completed, or when directed by the Engineer, fence, stakes, and other materials shall be removed and disposed off-site by the Contractor.

REQUIRED WORK WITHIN THE TPPZ

In the event that grading, trenching, utility work, or storage is unavoidable within the TPPZ, the Engineer shall be notified. Measures may be required for tree protection and preservations, including air spading, the use of six-inch depth of wood chips or approved matting for root protection, pruning of branches, and/or trunk protection. These protection measures will be paid under applicable Items.

Landscaping work specified within the TPPZ shall be accomplished by hand tools. Where hand work is not feasible, with permission of the Engineer, work shall be conducted with the smallest mechanized equipment necessary.

ITEM 102.521 (Continued)**TREE AND PLANT DAMAGES OR LOSS**

If the TPPZ is intruded upon, at the discretion of the Engineer, the Contractor will be required to provide a more durable barrier (e.g., Jersey Barriers) to secure the area. Cost of furnishing and installing additional or more durable barrier shall be borne by the Contractor.

If the Contractor intrudes into a TPPZ without approval, soil will be considered compacted and tree root damage will be assumed. Action will be taken as specified below.

In the event that trees designated for protection under this Item are damaged, including root damage from unapproved trespassing onto the root zone, the Contractor shall, at his own expense obtain an Arborist. The Arborist shall be approved by MassDOT.

In the event of spills, compaction or damage, the Contractor shall take corrective action immediately using methods approved by the Engineer in coordination with the Arborist.

If, based on the recommendations of the Arborist, the Engineer determines that damages can be remedied by corrective measures, such as repairing trunk or limb injury, soil compaction remediation, pruning, and/or watering, the damage will be repaired as soon as possible within the appropriate season for such work and according to industry standards.

If the Engineer determines that damages are irreparable, the Contractor shall pay for the damages in the amount of \$500.00 per diameter inch at breast height (DBH) per tree.

Additionally, if the Engineer determines that the damages are such that the tree is sufficiently compromised as to pose a future safety hazard, the tree shall be removed. Tree removal will include cleanup of all wood parts, grinding of the stump to a depth sufficient to plant a replacement tree or plant, removal of all chips from the stump site, and filling the resulting hole with topsoil.

Shrubs will be replaced with a plant of similar species and equal size or the largest size plants reasonably available. The Engineer will approve the size and quality of the replacement plant. Replacement will include a minimum of one year of watering and care.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 102.521 will be measured and paid for payment by the FOOT of Tree and Plant Protection Fence, complete in place. This includes all labor, materials, equipment, maintenance, final removal and disposal of the protective materials, damages repair, and all incidental cost required to complete the work.

Payment of 40 percent of value will be made upon installation of Fence. The remaining 60 percent will be made when protection materials have been removed and disposed off-site.

No separate payment will be made for costs of remedial actions, including addition of more durable barriers, or arborist services, but all costs in connection therewith shall be included in the Contract unit price bid.

In the event of irreparable damage due to lack of proper protective measures being take there will be no compensation in addition to the \$500.00 per diameter inch penalty.

ITEM 180.01 ENVIRONMENTAL HEALTH AND SAFETY PROGRAM LUMP SUM

The work shall consist of ensuring the health and safety of the Contractor's employees and subcontracting personnel, the Engineer, their representatives, the environment, and public welfare from any on-site chemical contamination present in air, soil, water and sediment.

The Contractor shall prepare and implement a site-specific Environmental Health and Safety Plan (EHASP) which has been approved and stamped by a Certified Industrial Hygienist (CIH) and includes the preparer's name and work experience. The EHASP shall include appropriate components required by OSHA Standard 29 CFR 1910.120(b) and the Massachusetts Contingency plan (MCP) 310 CMR 40.0018 and must comply with all applicable state and federal laws, regulations, standards and guidelines, and provide a degree of protection and training appropriate for implementation on the project. The EHASP shall be a dynamic document with provision for change to reflect new information, new practices or procedures, changing site environmental conditions or other situations which may affect site workers and the public. The EHASP shall be developed and implemented independently from the standard construction HASP required to work on all MassDOT construction projects.

Health and safety procedures provided by the Contractor shall comply with all the appropriate regulations that address employee working conditions, including but not limited to standards established by OSHA and National Institute for Occupational Safety and Health (NIOSH). Equipment used for the purpose of health and safety shall be approved by and meet pertinent standards and specifications of the appropriate regulatory agencies.

A copy of the most up-to-date version of the EHASP shall be maintained on-site at all times by the Contractor. The on-site copy shall contain the signature of the Engineer and each on-site employee of the MassDOT, Contractor, and Sub-Contractors involved with on-site activities. The employee's signature on the EHASP shall be deemed prima facie evidence that the employee has read and understands the plan. Updated copies of signature sheets shall be submitted to the Engineer.

The EHASP shall specify a Contractor Site Safety and Health Officer responsible for implementation of the EHASP and to oversee all construction activities, including handling, storage, sampling and transport, which require contact with or exposure to potentially hazardous materials.

The level of protection required to ensure the health and safety of on-site personnel will be stipulated in the EHASP. The Site Safety and Health Officer shall implement the EHASP based on changing site and weather conditions, type of operation or activity, chemical compounds identified on-site, concentration of the chemicals, air monitoring data, physical state of the hazardous materials, potential duration of exposure to hazardous materials, dexterity required to perform work, decontamination procedures, necessary personnel and type of equipment to be utilized.

During implementation of the EHASP, a daily log shall be kept by the Site Safety and Health Officer and a copy shall be provided weekly to the Engineer. This log shall be used to record a description of the weather conditions, levels of personal protection being employed, screening data and any other information relevant to on-site environmental safety conditions. The Site Safety and Health Officer shall sign and date the daily log.

ITEM 180.01 (Continued)**METHOD OF MEASUREMENT AND BASIS OF PAYMENT**

Preparation and implementation of the Environmental Health and Safety Program, including the monitoring, protection and storage of all contaminated materials, as well as subsequent modifications to the EHASP, will be measured and paid for at the LUMP SUM Price.

Payment of 50% of the Environmental Health and Safety Program contract price will be made upon the initial acceptance of the EHASP by the Engineer. Payment of the remaining 50% of the Environmental Health and Safety Program contract price will be made upon completion of the work.

The bid price shall include preparation and implementation of the EHASP as well as the cost for its enforcement by the Site Safety and Health Officer along with any necessary revisions and updates. The work of implementing the Environmental Health and Safety Program includes work involving, but not limited to, the monitoring, protection, and storage of all contaminated materials.

ITEM 180.02 **PERSONAL PROTECTION LEVEL C UPGRADE** **HOUR**

The work shall consist of providing appropriate personal protective equipment (PPE) for all personnel in an area either containing or suspected of containing a hazardous environment.

Contingencies for upgrading the level of protection for on-site workers will be identified in the EHASP and the Contractor shall have the capability to implement the personal protection upgrade in a timely manner. The protective equipment and its use shall be in compliance with the EHASP and all appropriate regulations and/or standards for employee working conditions.

Personal Protection Level C Upgrade will be measured and paid only upon upgrade to Level C and will be at the contract unit price, per HOUR, per worker, required in Level C personal protection. No payment will be made to the Contractor to provide Level D PPE.

ITEM 180.03**LICENSED SITE PROFESSIONAL SERVICES****HOUR**

Within limited areas of the project site, soils, sediments and/or groundwater may be contaminated. A Licensed Site Professional (LSP) shall be required to provide the services necessary to comply with the requirements of the MCP. These services may include sampling, analysis and characterization of potentially contaminated media, preparation of Immediate Response Action (IRA) Plans, Utility-Related Abatement Measure (URAM) and Release Abatement Measure (RAM) Plans, Imminent Hazard Evaluations, status reports, transmittal forms, release notification forms, risk assessments, completion statements, and related documents required pursuant to the Massachusetts Contingency Plan (MCP). LSP hours related to the characterization and disposal of contaminated soil and/or sediment are incidental to the disposal Items. An estimate of LSP services to be provided shall be submitted to the Engineer for approval before any LSP activity begins.

The name and qualifications of the LSP and all environmental technicians to be assigned to the project shall be submitted to the Engineer for approval at least four weeks prior to initial site activities. The LSP shall have a current, valid license issued by the Massachusetts Board of Registration of Hazardous Waste Site Cleanup Professionals. The LSP shall have significant experience in the oversight of MCP activities at active construction sites. Qualification packages for the LSP and each technician shall include a resume, all recent work assignments with responsibilities identified (previous 5 years), and applicable training and certifications. A list of all Notices of Noncompliance, Notice of Audit Findings and Enforcement Orders issued by the DEP shall be submitted for all work assignments listed for the LSP and environmental technicians.

The LSP shall evaluate soil and/or sediment with discoloration, odor, and presence of petroleum liquid or sheening on the groundwater surface, or any abnormal gas or materials in the ground which are known or suspected to be oil or hazardous materials. Excavated soil and sediment which is suspected of petroleum contamination shall be field screened using the jar headspace procedures according to established DEP Guidance. All field screening equipment must be pre-approved by the Engineer. The LSP shall ensure proper on-site calibration of all field screening instrumentation.

The Engineer shall be contacted immediately when observations or any field screening results verify contamination requiring further analysis, and/or enhanced management of suspect soil and/or sediment. Any enhanced management of contaminated soil to ensure proper stockpiling and storage is incidental to the LSP Services Item. The LSP shall adequately characterize subsurface conditions prior to backfill in areas where contaminated material has been excavated. The Engineer shall approve the locations of the testing sites prior to the sampling.

ITEM 180.03 (Continued)

Contaminated soil, sediment and/or groundwater shall be handled in accordance with all applicable state and federal statutes, regulations and policies. The LSP shall adequately characterize contaminated media for comparison to the requirements of the MCP. The Contractor and the LSP shall be aware of the reporting requirements for releases of oil and/or other hazardous material (OHM) as set forth in federal and state laws and regulations and shall both be held responsible for performing the work in accordance with all applicable Federal and State laws and regulations. The LSP shall maintain written records in a clear and concise format which tracks the excavation, stockpiling, analysis and reuse/disposal of all suspect contaminated soils, sediments and groundwater. These records shall be up-to-date and available to the Engineer on a bi-weekly basis. The LSP shall review and summarize the laboratory data from any analyses performed on contaminated media. A report shall be delivered to the Engineer outlining the material sampling methods, laboratory analysis results and proposed course of action. The laboratory report together with Chain of Custody forms for all analytical results shall be submitted to the Engineer within 14 days after completion of such analyses.

The LSP and Contractor shall be held responsible for the submission of all MCP-related documents to the Engineer at least 14 days in advance of any timeframe specified in the MCP and for the timely submission of data and tracking information as noted within this Item. All documents prepared under this Item must be reviewed and signed by the approved LSP. The Contractor and LSP shall be responsible for all fines, penalties and enforcement requirements imposed by applicable regulatory agencies for failure to meet regulatory and contract timeframes. No compensation will be provided for such fines, penalties and enforcement actions.

The Contractor and the LSP shall be aware of the reporting requirements for releases of oil and/or other hazardous material (OHM) as set forth in federal and state laws and regulations and shall both be held responsible for performing the work in accordance with all applicable Federal and State laws and regulations.

If the Contractor causes a release of OHM, the Contractor shall be responsible for assessing and remediating the release in accordance with all pertinent State and Federal regulations, including securing the services of a LSP, at his own expense.

The LSP shall coordinate all activities involving both MassDOT and the DEP through the Engineer. Any notification of release shall be approved by the Department before submittal to the DEP, except if an imminent hazard condition exists as defined in 309 CMR 4.03(4)(b).

ITEM 180.03 (Continued)**Laboratory Testing in Support of LSP Services**

Laboratory testing provides for analytical testing in support of LSP services related to maintaining MCP compliance, such as delineating the extent and type of contamination present. Sampling and testing for disposal purposes are not included.

In order to maintain compliance with the MCP or other regulatory requirements, the LSP shall request approval from the Engineer to obtain samples from various locations and depths within the project area and to perform laboratory analyses on those samples. The samples shall be delivered to a DEP-certified laboratory using proper chain-of-custody documentation for analyses which, depending upon site conditions and suspected and/or identified contaminants of concern, may include, but are not limited to, metals, polychlorinated biphenyls (PCBs), volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, polycyclic aromatic hydrocarbons (PAHs), extractable petroleum hydrocarbons (EPHs) and volatile petroleum hydrocarbons (VPHs). Subsequent testing, depending upon initial results, may be required for Toxicity Characteristic Leaching Procedure (TCLP) analyses (EPA Method 1311) for metals.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

LSP Services for work under this Item will be measured per person, per HOUR of service provided by LSP, Environmental Technicians and other approved personnel. Travel time shall not be included in the billable hours. LSP hours related to soil/sediment disposal (disposal characterization, landfill acceptance, disposal package preparation, etc.) shall be incidental to disposal Items.

The quantity and type of laboratory tests must be approved by the Engineer beforehand. The Contractor will be reimbursed upon satisfactory written evidence of payment. The Contractor may be required to obtain cost estimates from three DEP certified laboratories for the Engineer to choose the service provider. Laboratory testing related to soil/sediment disposal (disposal characterization, landfill acceptance, disposal package preparation, etc.) shall be incidental to disposal Items.

LSP Services will be paid at the Contractor bid price for each hour, or fraction thereof, spent to perform the work as described above. The bid price shall be a blended rate that includes the cost of the LSP, environmental technicians and other personnel, the performance of all work tasks and field screening, including required equipment, materials and instrumentation, and production of all documentation described above. All requests for payment must be accompanied by the following information: the names of the personnel associated with the work charged under LSP Services, dates and hours worked, work conducted, including, where appropriate, locations as identified on the construction plans, and a copy of the field diary for the dates submitted.

Laboratory Testing will be reimbursed upon receipt of paid invoices for testing approved by the Engineer.

<u>ITEM 181.11</u>	<u>DISPOSAL OF UNREGULATED SOIL</u>	<u>TON</u>
<u>ITEM 181.12</u>	<u>DISPOSAL OF REGULATED SOIL - IN-STATE FACILITY</u>	<u>TON</u>
<u>ITEM 181.13</u>	<u>DISPOSAL OF REGULATED SOIL - OUT-OF-STATE FACILITY</u>	<u>TON</u>
<u>ITEM 181.14</u>	<u>DISPOSAL OF HAZARDOUS WASTE</u>	<u>TON</u>

The work under these Items shall include the transportation and disposal of contaminated material excavated or excavated and stockpiled. It shall also include the cost of any additional laboratory analyses required by a particular disposal facility beyond the standard disposal test set.

Excavation of existing subsurface materials may include the excavation of contaminated soils. The Contractor shall be responsible for the proper coordination of characterization, transport and disposal, recycling or reuse of contaminated soils. Disposal, recycling or reuse will be referred to as “disposal” for the purposes of this specification. However, regardless of the use of the term herein, there will be no compensation under these Items for reuse within the project limits. The Contractor will be responsible for coordinating the activities necessary for characterization, transport and disposal of contaminated soils. Such coordination will include the Engineer and his/her designee overseeing management of contaminated materials. Contaminated soils must be disposed of in a manner appropriate for the soil classification as described below and in accordance with the applicable laws of local, state and federal authorities. The Contractor shall be responsible for identifying disposal facility (ies) licensed to accept the class of contaminated soils to be managed and assure that the facility can accept the anticipated volume of soil contemplated by the project. The Contractor shall be responsible for hiring a Licensed Site Professional (LSP) and all ancillary professional services including laboratories as needed for this work. The Contractor will be responsible for obtaining all permits, approvals, manifests, waste profiles, Bills of Lading, etc. subject to the approval of the Engineer prior to the removal of the contaminated soil from the site. The Contractor and LSP shall prepare and submit to the Engineer for approval all documents required under the Massachusetts Contingency Plan (MCP) and related laws and environmental regulations to conduct characterization, transport, and disposal of contaminated materials.

ITEMS 181.11 thru 181.14 (Continued)**CLASSES OF CONTAMINATED SOILS**

The Contractor and its LSP shall determine if soil excavated or soil to be excavated is unregulated soil or contaminated soil as defined in this section. Such materials shall be given a designation for purposes of reuse or disposal based on the criteria of the MCP. Soils and sediments which are not suitable for reuse will be given a designation for purposes of off-site disposal based on the characterization data and disposal facility license requirements. The Classes of Contaminated Soils are defined as follows:

UNREGULATED SOIL consists of soil, fill and dredged material with measured levels of oil and hazardous material (OHM) contamination at concentrations below the applicable Reportable Concentrations (RCs) presented in the MCP. Unregulated soil consists of material which may be reused (or otherwise disposed) as fill within the Commonwealth of Massachusetts subject to the non-degradation criteria of the MCP (310 CMR 40.0032(3)), in a restricted manner, such that they are sent to a location with equal or higher concentrations of similar contaminants. Disposal areas include licensed disposal facilities, approved industrial settings in areas which will be capped or covered with pavement or loamed and seeded, and for purposes of this project should be reused as fill within the project site construction corridor whenever possible. The material cannot be placed in residential and/or environmentally sensitive (e.g. wetlands) areas. Under no circumstances shall contaminated soils be placed in an uncontaminated or less contaminated area (including the area above the groundwater table if this area shows no sign of contamination).

The Contractor shall submit to MassDOT the proposed disposal location for unregulated soils for approval. If such a disposal location is not a licensed disposal facility, the Contractor shall submit to the Engineer analytical data to characterize the disposal area sufficiently to verify that the unregulated material generated within the MassDOT construction project limits is equal to or less than the contaminant levels at the disposal site and meets the non-degradation requirements of the MCP. In addition, the Contractor shall provide written confirmation from the owner of the proposed disposal location that they have been provided with the analytical data for both the materials to be disposed as well as the disposal site characterization and that s/he agrees to accept this material. A Material Shipping Record or Bill of Lading, as appropriate, shall be used to track the off-site disposal of unregulated soil and a copy, signed by the disposal facility or property owner, shall be provided to the Engineer in order to document legal disposal of the unregulated material.

The cost of on-site disposal of unregulated soil within the project area will be considered incidental to the Item of work to which it pertains.

ITEMS 181.11 thru 181.14 (Continued)

REGULATED SOIL consists of materials containing measurable levels of OHM that are equal to or exceed the applicable Reportable Concentrations for the site as defined by the MCP, 310 CMR 40.0000. Regulated soil which meets the MCP reuse criteria of the applicable soil/groundwater category for this project area may be reused on site provided that it meets the appropriate geotechnical criteria established by the Engineer. Regulated Soil may be reused (as daily or intermediate cover or pre-cap contouring material) or disposed (as buried waste) at lined landfills within the Commonwealth of Massachusetts or at an unlined landfill that is approved by the Massachusetts Department of Environmental Protection (DEP) for accepting such material, in accordance with DEP Policy #COMM-97-001, or at a similar out-of-state facility. It should be noted that soils which exceed the levels and criteria for disposal at in-state landfills, as outlined in COMM-97-001, may be shipped to an in-state landfill, but require approval from the DEP Division of Solid Waste Management and receiving facility. An additional management alternative for this material is recycling into asphalt. Regulated Soils may also be recycled at a DEP approved recycling facility possessing a Class A recycling permit subject to acceptance by the facility and compliance with DEP Policy #BWSC-94-400. Regulated Soil removed from the site for disposal or treatment must be removed via an LSP approved Bill of Lading, Manifest or applicable material tracking form. This type of facility shall be approved/permitted by the State in which it operates to accept the class of contaminated soil in accordance with all applicable local, state and federal regulations.

HAZARDOUS WASTE consists of materials which must be disposed of at a facility permitted and operated in full compliance with Federal Regulation 40 CFR 260-265, Massachusetts Regulation 310 CMR 30.000, Toxic Substances Control Act (TSCA) regulations, or the equivalent regulations of other states, and all other applicable local, state, and federal regulations. All excavated materials classified as hazardous waste shall be disposed of at an out-of-state permitted facility. This facility shall be a RCRA hazardous waste or TSCA facility, or RCRA hazardous waste incinerator. This type of facility shall be approved/permitted by the State in which it operates to accept hazardous waste in accordance with all applicable local, state and federal regulations and shall be permitted to accept all contamination which may be present in the soil excavate. The Contractor shall ensure that, when needed, the facility can accept TSCA waste materials i.e. polychlorinated biphenyls (PCBs). Hazardous waste must be removed from the site for disposal or treatment via an LSP approved Manifest.

MONITORING/SAMPLING/TESTING REQUIREMENTS

The Contractor shall be responsible for monitoring, sampling and testing during and following excavation of contaminated soils to determine the specific class of contaminated material. Monitoring, sampling and testing frequency and techniques should be performed in accordance with Item 180.03 – LSP Services. Additional sampling and analysis may be necessary to meet the requirements of the disposal facility license. The cost of such additional sampling and analysis shall be included in the bid cost for the applicable disposal Items. The Contractor shall obtain sufficient information to demonstrate that the contaminated soil meets the disposal criteria set by the receiving facility that will accept the material.

ITEMS 181.11 thru 181.14 (Continued)

No excavated material will be permanently placed on-site or removed for off-site disposal until the results of chemical analyses have been received and the materials have been properly classified. The Contractor shall submit to the Engineer results of field and laboratory chemical analyses tests within seven days after their completion, accompanied by the classification of the material determined by the Contractor, and the intended disposition of the material. The Contractor shall submit to the Engineer for review all plans and documents relevant to LSP services, including but not limited to, all documents that must be submitted to the DEP.

WASTE TRACKING

Copies of the fully executed Weight Slips/Bills of Lading/ Manifests/Material Shipping Records or other material tracking form received by the Contractor from each disposal facility and for each load disposed of at that facility, shall be submitted to Engineer and the Contractor's LSP within three days of receipt by the Contractor. The Contractor is responsible for preparing and submitting such documents for review and signature by the LSP or other appropriate person with signatory authority, three days in advance of transporting soil off-site. The Contractor shall furnish a form attached to each manifest or other material tracking form for all material removed off-site, certifying that the material was delivered to the site approved for the class of material. If the proposed disposition of the material is for reuse within the project construction corridor, the Contractor shall cooperate with MassDOT to obtain a suitable representative sample(s) of the material to establish its structural characteristics in order to meet the applicable structural requirements as fill for the project.

All material transported off-site shall be loaded by the Contractor into properly licensed and permitted vehicles and transported directly to the selected disposal or recycling facility and be accompanied by the applicable shipping paper. At a minimum, truck bodies must be structurally sound with sealed tail gates, and trucks shall be lined and loads covered with a liner, which shall be placed to form a continuous waterproof tarpaulin to protect the load from wind and rain.

DECONTAMINATION OF EQUIPMENT

Tools and equipment which are to be taken from and reused off site shall be decontaminated in accordance with applicable local, state and federal regulations. This requirement shall include, but not be limited to, all tools, heavy machinery and excavating and hauling equipment used during excavation, stockpiling and handling of contaminated material. Decontamination of equipment is considered incidental to the applicable excavation Item.

REGULATORY REQUIREMENTS

The Contractor shall be responsible for adhering to regulations, specifications and recognized standard practices related to contaminated material handling during excavation and disposal activities. MassDOT shall not be responsible at any time for the Contractor's violation of pertinent State or Federal regulations or endangerment of laborers and others. The Contractor shall comply with all rules, regulations, laws, permits and ordinances of all authorities having jurisdiction including, but not limited to, Massachusetts DEP, the U.S. Environmental Protection Agency (EPA), Federal Department of Transportation (DOT), Massachusetts Water Resources Authority (MWRA), the Commonwealth of Massachusetts and other applicable local, state and federal agencies governing the disposal of contaminated soils.

ITEMS 181.11 thru 181.14 (Continued)

All labor, materials, equipment and services necessary to make the work comply with such regulations shall be provided by the Contractor without additional cost to MassDOT. Whenever there is a conflict or overlap within the regulations, the most stringent provisions shall apply. The Contractor shall reimburse MassDOT for all costs it incurs, including penalties and/or for fines, as a result of the Contractor's failure to adhere to the regulations, specifications, recognized standard practices, etc., that relate to contaminated material handling, transportation and disposal.

SUBMITTALS**I. Summary of Sampling Results, Classification of Material and Proposed Disposal Option.**

The following information, presented in tabular format, must be submitted to the Engineer for review and approval prior to any reuse on-site or disposal off-site. This requirement is on-going throughout the project duration. At least two weeks prior to the start of any excavation activity, the Contractor shall submit a tracking template to be used to present the information as stipulated below. Excavation will not begin until the format is acceptable to MassDOT.

Characterization Reports will be submitted for all soil, sediment, debris and groundwater characterized through the sampling and analysis program. Each report will include a site plan which identifies the sampling locations represented in the Report. The Construction Plan sheets may be used as a base plan to record this information.

The Sampling Results will be presented in tabular format. Each sample will be identified by appropriate identification matching the sample identification shown on the Chain of Custody Record. The sample must also be identified by location (e.g. grid number or stockpile number). For each sample, the following information must be listed: the classification (unregulated, regulated, etc.), proposed disposal option for the stockpile or unit of material represented, and, all analytical results.

Each Characterization Report will include the laboratory analytical report and Chain of Custody Record for the samples included in the Report.

II. Stockpiling, Transport, and Disposal.

At least two weeks prior to the start of any excavation activity, the Contractor shall submit, in writing, the following for review and shall not begin excavation activity until the entire submittal is acceptable to MassDOT.

Excavation and Stockpiling Protocol:

Provide a written description of the management protocols for performing excavation and stockpiling and/or direct loading for transport, referencing the locations and methods of excavating and stockpiling excavated material.

ITEMS 181.11 thru 181.14 (Continued)

Disposal and Recycling Facilities:

1. Provide the name, address, applicable licenses and approved waste profile for disposal and/or recycling location(s) where contaminated soil will be disposed. Present information substantiating the suitability of proposed sites to receive classifications of materials intended to be disposed there, including the ability of the facility to accept anticipated volumes of material.
2. Provide a summary of the history of compliance actions for each disposal/recycling facility proposed to be used by the Contractor. The compliance history shall include a comprehensive list of any state or federal citations, notices of non-compliance, consent decrees or violations relative to the management of waste (including remediation waste) at the facility. Material should not be sent to facilities which are actively considered by the DEP, USEPA or other responsible agency to be in violation of federal, state or local hazardous waste or hazardous material regulations. MassDOT reserves the right to reject any facility on the basis of poor compliance history.

Transportation:

The name, address, applicable license and insurance certificates of the licensed hauler(s) and equipment and handling methods to be used in excavation, segregation, transport, disposal or recycling.

III. Material Tracking and Analytical Documentation for Reuse/Disposal.

The following documents are required for all excavation, reuse and disposal operations and shall be in the format described. At least two weeks prior to the start of any excavation or demolition activity, the Contractor shall submit the tracking templates required to present the information as stipulated below. Excavation or demolition will not begin until the format is acceptable to MassDOT.

All soils, sediments and demolition debris must be tracked from the point of excavation to stockpiling to onsite treatment/processing operations to off-site disposal or onsite reuse as applicable.

Demolition Debris:

Demolition debris must be tracked if the debris is stockpiled at a location other than the point of origin or if treatment or material processing is conducted. Identification of locations will be based on the station-offset of the location. The tracking table will identify date and point of generation, any field screening such as PID or dust monitoring, visual observations/comments, quantity, and stockpile ID/processing operation location. For each unit of material tracked, the table will also track reuse of the material on-site, providing reuse date, location of reuse as defined by start and end station, width of reuse location by offset, the fill elevation range, quantity, and finish grade for said location. For demolition debris which is not reused on site, the table will also track disposal of the material as defined by disposal date, quantity and disposal facility. The table must provide a reference to any analytical data generated for the material.

ITEMS 181.11 thru 181.14 (Continued)

Soil/Sediment:

Soil excavation will be identified based on the station-offset of the excavation location limits. The tracking table will identify date and point of generation, any field screening such as PID or dust monitoring, visual observations, quantity, and stockpile number/location. For each unit of material tracked, the table will also track reuse of the material on-site and disposal of the material off-site using the same categories identified for demolition debris above.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Disposal of contaminated soil shall be measured for payment by the TON of actual and verified weight of contaminated materials removed and disposed of. The quantities will be determined only by weight slips issued by and signed by the disposal facility. The most cost-effective, legal disposal method shall be used. The work of the LSP for disposal under these Items shall be incidental to the work with no additional compensation.

ITEM 181.11 Measurement for Disposal of Unregulated Soil shall be under the Contract Unit Price by the weight, in tons, of contaminated materials removed from the site and transported to and disposed of at an approved location or licensed facility, and includes any and all costs for approvals, permits, fees and taxes, additional testing/characterization required by the facility beyond the standard disposal test set, decontamination procedures, transportation and disposal.

ITEM 181.12 Measurement for Disposal of Regulated Soil – In-State Facility shall be under the Contract Unit Price by the weight in tons of contaminated materials removed from the site and transported to and disposed of at an approved in-state facility, and includes any and all costs for approvals, permits, fees and taxes, testing/characterization required by the facility beyond the standard disposal test set, decontamination procedures, transportation and disposal.

ITEM 181.13 Measurement for Disposal of Regulated Soil - Out-of-State Facility shall be under the Contract Unit Price by the weight in tons of contaminated materials removed from the site and transported to and disposed of at an approved out-of-state facility, and includes any and all costs for approvals, permits, fees and taxes, testing/characterization required by the facility beyond the standard disposal test set, decontamination procedures, transportation and disposal.

ITEM 181.14 Measurement for Disposal of Hazardous Waste shall be under the Contract Unit Price by the weight in tons of hazardous waste removed from the site and transported to and disposed of at the licensed hazardous waste facility, and includes any and all costs for approvals, permits, fees and taxes, testing/characterization required by the facility beyond the standard disposal test set, decontamination procedures, transportation and disposal.

ITEM 182.1**INSPECTION AND TESTING FOR
ASBESTOS****LUMP SUM**

The work shall include the inspecting and testing of all materials suspected of containing asbestos. When any demolition is required to enable the inspection and testing of the suspected material it will be considered incidental to this Item and the Contractor must perform all asbestos handling and testing in accordance with the regulations stated below.

Dust suppression in the form of light water sprays, foams, dust suppressants and calcium chloride will be implemented as required to control dusting during any disturbance of asbestos suspected material. Alternatively, intrusive activities may be reduced or curtailed under high wind or heavy rain conditions, which in the opinion of the Health And Safety Plan (HASP) may pose a safety hazard to the workers.

The Contractor shall employ the services of a Massachusetts licensed "Asbestos Inspector" to inspect the material to determine whether or not "ITEM 182.2 REMOVAL OF ASBESTOS" is required. Should the asbestos inspector determine laboratory testing is required, a state certified laboratory shall be used to perform all necessary tests.

REGULATIONS

U.S. Department of Labor, Occupational Safety and Health Administration, (OSHA) including but not limited to:

- 29 CFR 1910 Section 1001 and 29 CFR 1926 Section 58 Occupational exposure to Asbestos, Tremolite, Anthophyllite and Actinolite, Final Rule
- 29 CFR 1910 Section 134 Respiration Protection
- 29 CFR 1926 Construction Industry
- 29 CFR 1910 Section 2 Access to Employee Exposure and Medical Records
- 29 CFR 1910 Section 1200 Hazard Communication
- 29 CFR 1910 Section 145 Specifications for Accident Prevention Signs and Tags

U.S. Environmental Protection Agency, (EPA) including but not limited to:

- 40 CFR 762, CPTS 62044, FRL 2843-9, Federal Register Vol. 50 no.134, July 12, 1985 p.28530 - 28540 Asbestos Abatement Projects Rule
- 40 CFR 61 Subpart A Regulation for Asbestos
- 40 CFR 61 Subpart M (Revised Subpart B) National Emission Standard for Asbestos

U.S. Department of Transportation 49 CFR 172 and 173

Massachusetts Department of Labor and Industries Regulations, (DLI) including but not limited to:

- 453 CMR 6.00 Removal, Containment and Encapsulation of Asbestos

ITEM 182.1 (Continued)

Massachusetts Department of Environmental Protection (DEP) including but not limited to (supplementing subsection 7.01):

310 CMR 7.00, Section 7.09 Odor and Dust, Section 7.10 Noise,
Section 7.15 Air Pollution Control Regulations
310 CMR 18.00 and 19.00 Solid Waste Regulations

Massachusetts Division of Industrial Safety 45 CMR 10.00

Local Requirements including but not limited to those of Health Departments, Fire Departments and Inspection Services Departments

Wherever there is a conflict or overlap of the above references, the most stringent provision shall apply.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Measurement and payment will be at the contract unit price per LUMP SUM for ITEM 182.1 INSPECTION AND TESTING FOR ASBESTOS as specified above including all materials, tools, equipment and labor to complete the inspecting and testing of the asbestos suspected material.

All costs in connection with the protection of general public, private property, and all costs associated with the proper inspecting and testing of the material shall be included in the price and no additional compensation will be allowed.

ITEM 182.2**REMOVAL OF ASBESTOS****FOOT**

The work shall include the removal and satisfactory disposal of existing asbestos. The Contractor's attention is directed to the fact that existing asbestos shall be inspected and tested prior to removal, to determine if special removal and disposal is required. The Contractor shall follow all the rules and regulations stated in "ITEM 182.1 INSPECTION AND TESTING FOR ASBESTOS". If asbestos is present, the Contractor shall follow all the rules and regulations stated in the section "REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING MATERIALS", under this Item. The Contractor should notify and coordinate his/her efforts with the proper utility accordingly.

REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING MATERIALS

This section specifies the requirements for the handling and removal of asbestos containing material. The Contractor must perform all asbestos handling and removal work in accordance with these specifications and the following additional requirements.

U.S. Department of Labor, Occupational Safety and Health Administration, (OSHA) including but not limited to:

- 29 CFR 1910 Section 1001 and 29 CFR 1926 Section 58 Occupational exposure to Asbestos, Tremolite, Anthophyllite and Actinolite, Final Rule
- 29 CFR 1910 Section 134 Respiration Protection
- 29 CFR 1926 Construction Industry
- 29 CFR 1910 Section 2 Access to Employee Exposure and Medical Records
- 29 CFR 1910 Section 1200 Hazard Communication
- 29 CFR 1910 Section 145 Specifications for Accident Prevention Signs and Tags

U.S. Environmental Protection Agency, (EPA) including but not limited to:

- 40 CFR 762, CPTS 62044, FRL 2843-9, Federal Register Vol. 50 no.134, July 12, 1985 p.28530 - 28540 Asbestos Abatement Projects Rule
- 40 CFR 61 Subpart A Regulation for Asbestos
- 40 CFR 61 Subpart M (Revised Subpart B) National Emission Standard for Asbestos

U.S. Department of Transportation 49 CFR 172 and 173

Massachusetts Department of Labor and Industries Regulations, (DLI) including but not limited to:

- 453 CMR 6.00 Removal, Containment and Encapsulation of Asbestos

Massachusetts Department of Environmental Protection (DEP) including but not limited to (supplementing subsection 7.01):

- 310 CMR 7.00, Section 7.09 Odor and Dust, Section 7.10 Noise, Section 7.15 Air Pollution Control Regulations
- 310 CMR 18.00 and 19.00 Solid Waste Regulations

Massachusetts Division of Industrial Safety 45 CMR 10.00

ITEM 182.2 (Continued)

Local Requirements including but not limited to those of Health Departments, Fire Departments and Inspection Services Departments

Wherever there is a conflict or overlap of the above references, the most stringent provision shall apply.

All asbestos material shall be removed and properly disposed of by a Contractor or subContractor with a current Massachusetts Abatement Contractors License issued by the Department of Labor and Industries. Work shall be supervised by a competent person as required by OSHA in 29 CFR 1926 to ensure regulatory compliance. This person must have completed a course at an EPA Training Center or equivalent course in asbestos abatement procedures, have had a minimum of four years on-the-job training and meet any additional requirements set forth in 29 CFR 1926 for a Competent Person. This person must also be certified by the Commonwealth as an Asbestos Abatement Supervisor and Asbestos Abatement Project Designer as required by 453 CMR 6.00.

Asbestos removal work shall be coordinated with all other work under the contract and shall be completed prior to performing any activities which could disturb the asbestos material or produce airborne asbestos fibers.

Dust suppression in the form of light water sprays, foams, dust suppressants and calcium chloride will be implemented as required to control dusting during trenching and excavation. Alternatively, intrusive activities may be reduced or curtailed under high wind or heavy rain conditions, which in the opinion of the HASP may pose a safety hazard to the workers.

NOTIFICATION AND PERMITS

The Contractor shall prepare a formal pre-notification form at least ten (10) days prior to the start of asbestos removal work. This form must be submitted to the appropriate Regional Office of the Massachusetts Department of Environmental Protection and to the U.S. Environmental Protection Agency Region I Air and Hazardous Material Division. A copy of the submitted forms must be provided to the Engineer and kept at the work site.

Prior to starting any work, the Contractor shall also obtain any required asbestos removal permit(s) from the city/town. A copy of the permit(s) must be provided to the Engineer and posted at the work site.

The Contractor shall also obtain and pay all other applicable asbestos waste transportation and disposal permits, licenses and fees.

ITEM 182.2 (Continued)**STANDARD OPERATING PROCEDURES**

The standard operating procedure shall ensure the following:

1. Proper site security including posting of warning signs and restricting access to prevent unauthorized entry into the work spaces.
2. Proper protective clothing and respiratory protection prior to entering the work spaces.
3. Safe work practices including provisions for communications; exclusion of eating, drinking, smoking, or use of procedures or equipment that would in any way reduce the effectiveness of respiratory protection or other Engineering controls.
4. Proper exit practices from the work space through the showering and decontamination facilities.
5. Removing asbestos containing material in ways that minimize release of fibers.
6. Packing, labeling, loading, transporting and disposing of contaminated material in a way that minimizes or prevents exposure and contamination.
7. Emergency evacuation of personnel, for medical or safety (fire and smoke) so that exposure will be minimized.
8. Safety from accidents in the work space, especially from electrical shocks, slippery surfaces and entanglements in loose hoses and equipment.
9. Provisions for effective supervision and OSHA - specified personnel air monitoring for exposure during work.

REQUIRED SUBMITTALS

The Contractor shall submit to the Engineer the following listed Items at least ten (10) calendar days prior to the start of asbestos work. No asbestos removal work activities shall commence until these Items are reviewed by the Engineer, unless otherwise waived. Submittals shall be clearly labeled and in sufficient detail to enable the Engineer to form an opinion as to its conformity to the specifications.

1. Name, experience and DLI certification of proposed Supervisors and Foreman responsible for asbestos work.
2. Summary of workforce by disciplines and a notarized statement documenting that all proposed workers, by name, have received all required medical exams and have been properly trained and certified for asbestos removal work, respirator use and appropriate Massachusetts DLI, EPA and OSHA standards.

ITEM 182.2 (Continued)

3. Notarized statement that workers are physically fit and able to wear and use the type of respiratory protection proposed for the project. Notarized certification signed by an officer of the abatement contracting firm that exposure measurements, medical surveillance and worker training records are being kept in conformance with 29 CFR 1926.
4. Written plan of action and standard operating procedures to include: location and layout of decontamination areas; sequencing of asbestos work; detailed schedule of work activities by date and interface with other project activities which affect work performance; methods used to assure safety and security; worker protection and exposure monitoring; contingency and emergency evacuation procedures; detailed description of methods to be employed to control pollution; waste handling procedures.
5. Written respiratory protection program specifying level of protection intended for each operation required by the project and details of daily inspection and maintenance elements.
6. Copies of the U.S. EPA, State and local asbestos removal pre-notification forms. If applicable, lists and copies of all permits, licenses, or manifests which will be applied for and used.
7. Name, location and applicable approval certificates for primary and secondary landfill for disposal of asbestos-containing or asbestos contaminated waste. Name, address and license number(s) of hauler permitted to transport waste. (Submit copies of completed manifests upon disposal).

The Contractor must provide copies of daily inspection and record logs upon request of the Engineer, at any time during project. This information will include but is not limited to work area entry data, respirator inspections and maintenance, HEPA-exhaust inspections and maintenance and other work applicable activities or reports of accidents or unusual events.

METHOD OF MEASUREMENT

ITEM 182.2 will be measured by the FOOT for the complete removal and disposal of the asbestos containing material.

BASIS OF PAYMENT

Payment will be at the contract unit price per FOOT for ITEM 182.2 REMOVAL OF ASBESTOS, as specified above including all materials, tools, equipment and labor necessary to complete the work specified above.

All costs in connection with the protection of the general public, private property and all costs associated with the proper disposal of the material removed shall be included in the price and no additional compensation will be allowed.

ITEM 183.1 TREATMENT OF CONTAMINATED GROUNDWATER GALLON

This Item addresses the treatment and disposal of contaminated groundwater encountered during excavation operations. The work generally consists of furnishing the materials, equipment, labor, services, testing/sampling, waste characterization, transportation, disposal, permits and agreements necessary to perform the work required for the collection, treatment and disposal of contaminated groundwater.

The Contractor is advised that contaminated groundwater may be encountered during dewatering activities. The levels and nature of contamination may vary depending on location and/or depth. No data has been provided in this specification indicating the types of contaminants that may be found in groundwater encountered during this work. It will be the responsibility of the Contractor to ensure that water removed during dewatering operations is treated and disposed of in accordance with all applicable laws and regulations and in accordance with this specification.

The Contractor shall monitor the quantity of groundwater collected for treatment using an in-line totalizer flowmeter or an alternate method approved by MassDOT. The Contractor shall, at all times, minimize the quantity of groundwater removed from the excavations. All groundwater determined to be contaminated will be managed in accordance with all applicable local, state and federal regulations.

It is not the intent herein for the Department to design for or specify to the Contractor which particular treatment is to be used, if necessary. Rather, it is the Department's intent to provide guidance to the Contractor for informational and bidding purposes only. It is, therefore, the Contractor's responsibility to use a treatment method to allow him/her to meet any and all laws, regulations, policies, guidelines and permit requirements. Treatment of contaminated groundwater for dewatering operations is generally performed using a mobile treatment trailer equipped with one or more granular-activated carbon (GAC) canisters, although other techniques are also used.

It is likely that treatment of the contaminated groundwater using granular-activated carbon will be required to complete the work under this Contract. The Methods described under Item 183.1 provides for the identification, testing, management and treatment or disposal of contaminated groundwater and shall be implemented, at a minimum and as necessary by the Contractor via Methods under Item 183.1.

The overall handling and management of contaminated groundwater is regulated under the provisions of 310 CMR 40.0000, 314 CMR 3.00 and 5.00, NPDES and other applicable laws. The unpermitted discharge of contaminated dewatering effluent into the environment (storm drain, surface water body, onto the ground) is a violation of federal and state laws and regulations. Should dewatering of contaminated groundwater be necessary, approvals must be sought from the appropriate federal, state, or local regulatory jurisdiction. The USEPA will not specify a treatment system or method, but normally requires that the treated discharge meet Massachusetts Drinking Water Standards.

ITEM 183.1 (Continued)

The discharge standards are normally met by treating the dewatered groundwater through granular-activated carbon canisters, or similar techniques. Longer term discharges to surface waters or storm drains, and any discharges to the ground, require approval and/or issuance of a permit from the DEP Division of Water Pollution Control. The Contractor shall be responsible for applying for, paying all fees for and obtaining all permits required for treatment and/or disposal of contaminated groundwater. Additional requirements may be mandated by local/regional sewer authorities for discharge to sanitary sewer or Publicly Owned Treatment Works (POTW). Copies of permit applications and correspondence from federal and state agencies and sewer authorities shall be supplied to the Engineer prior to dewatering activities.

EPA regulations published in the Federal Register on September 9, 2005 (70 FR 53663) require a National Pollutant Discharge Elimination System (NPDES) Remediation & Miscellaneous Contaminated Sites General Permit (RGP) for all contaminated construction site dewatering activities in Massachusetts (MAG910000) that will involve the discharge of water to classes of receiving waters designated in the Massachusetts Water Quality Standards (314 CMR 4.00). The application requires that operators of proposed new discharges seeking coverage under this general permit submit a Notice of Intent (NOI) to EPA New England post-marked at least 14 days prior to commencement of discharge. The Contractor is solely responsible for applying for and obtaining coverage under the NPDES Remediation General Permit from EPA and, if applicable, DEP, including the costs associated with sampling and analysis of groundwater and any application fees. The Contractor is required to submit a completed copy of the NOI to the Engineer and the Director of Environmental Programs, Construction Division, 10 Park Plaza, Boston, prior to commencement of discharge.

Upon permanent cessation of the discharges authorized by the RGP, the Contractor shall be responsible for submitting a Notice of Termination (NOT) to EPA New England within 30 days of the permanent cessation. The Contractor is required to submit to MassDOT a completed copy of the NOT within 14 days of the permanent cessation of the discharges authorized by the RGP. All costs and fees associated with the submission of the NOT will be the responsibility of the Contractor.

The Contractor shall be responsible for adhering to regulations, specifications, and recognized standard practices related to contaminated groundwater handling during dewatering activities. MassDOT shall not be responsible at any time for the Contractor's violation of pertinent local, state or federal regulations or endangerment of laborers and others. The Contractor shall comply with all rules regulations, laws, permits and ordinances of all authorities having jurisdiction including, but not limited to, Massachusetts Department of Environmental Protection (DEP), the U.S. Environmental Protection Agency (EPA), Federal Department of Transportation (DOT), Massachusetts Water Resources Authority (MWRA), the Commonwealth of Massachusetts and other applicable local, state and federal agencies governing this work.

ITEM 183.1 (Continued)

The Contractor shall be responsible for determining compliance with the requirements of any permit and for any sampling, testing, and disposal required in connection with said permits. MassDOT and the City/Town reserve the right to collect additional samples of dewatered groundwater to determine the Contractor's compliance with the Permit's requirements. All laboratory testing is to be performed by a DEP certified laboratory for all parameters being tested. Copies of all field and laboratory testing results, reports, etc. required by the permits must be supplied to the Engineer. MassDOT, DEP, and the permit-granting agency, where applicable, reserve the right to collect additional samples of discharged groundwater to verify compliance with permit requirements.

For the purpose of these specifications and to establish a basis for the bid, it is anticipated that granular-activated carbon will be the treatment medium for dewatered contaminated groundwater. The bidder shall factor into the payment Item all costs associated with the testing and analyses that may be required by the permitting agency. In addition, any laboratory testing of groundwater is to be performed by a DEP certified laboratory for the parameters being tested. Copies of all field and laboratory testing results will be supplied to the Engineer. Bid price shall also include full compensation for labor, materials, maintenance, mobilization, rental and other related costs. Item 183.2 will be used for disposal of used granular-activated carbon canisters.

SUBMITTALS

Prior to initiating work, the Contractor shall submit an excavation dewatering plan to the MassDOT that includes a detailed description of the approach to dewatering, a description of methodology for sealing the excavation to minimize infiltration of groundwater, if deemed applicable to the work, anticipated treatment, discharge points, sampling frequency, required permits, transporters and waste facilities complete with license numbers, permit numbers, contact person, and address and telephone number that the Contractor plans to utilize for waste disposal. The plan shall be submitted for the record.

The Contractor shall submit to MassDOT for review, the proposed methods for dewatering and groundwater treatment and disposal for the various portions of the work to be done. The review shall be for methods only. The Contractor shall remain responsible for the maintenance, performance, structural integrity and safety of the systems installed for this work as well as regulatory compliance of the applicable local, state and federal discharge standards. The Contractor shall provide all groundwater sampling and analyses, results and reports required by all applicable local, state and federal agencies. The Contractor shall submit to MassDOT for review all plans and documents that must be submitted to the EPA and DEP, including NOI, NOT, treatment system analytical reports and correspondence. Copies of all permits and approvals and lab analyses and test results associated with groundwater treatment and disposal must be submitted to MassDOT within 3 days of receipt by the Contractor.

ITEM 183.1 (Continued)**ESTABLISHMENT OF TREATMENT PROCEDURE**

Since concentrations of contaminants in groundwater cannot be easily assessed in the field, all groundwater extracted from the ground will be considered contaminated and will be initially pumped and stored into open settling tank(s) or a fractionation tank until it can be sampled and analyzed, unless otherwise directed by MassDOT. The Contractor will perform initial sampling and analyses of the groundwater to determine the need for a permit to dispose of contaminated groundwater. Based on the results of the initial sample analysis, which must be provided to the Engineer within twenty-four (24) hours of the time the samples are received by the laboratory, the Contractor will determine the necessity for treatment(s) and disposal procedures. Sampling must also be performed to meet applicable discharge criteria as set by the appropriate regulatory agencies for the permit obtained for disposal. All discharges must meet regulatory standards set forth in the permits required for discharge. For the purposes of the bidding process, it is anticipated that the treatment system will consist of sedimentation tanks, an oil water separator and liquid-phase granular activated carbon as the primary on-site treatment medium for dewatered contaminated groundwater. MassDOT may require additional treatment processes if such is determined necessary during the groundwater testing procedure. The Contractor shall integrate the additional treatment process into the treatment system, if necessary.

The Contractor shall provide all labor, equipment and appurtenances required to treat the groundwater, subject to the approval of MassDOT. Groundwater stored and tested but not requiring treatment or off-site disposal shall be discharged to a location subject to the approval of MassDOT without payment to the Contractor.

TREATMENT UNITS

The Contractor shall furnish all labor and materials, and shall install and operate temporary groundwater treatment and disposal system(s) as necessary to treat contaminated groundwater pumped from excavations during construction activities under the Contract. Such systems shall be capable of treating groundwater to meet applicable discharge criteria as set by the appropriate regulatory agencies.

The Contractor or their Environmental Consultant shall operate, maintain and modify the selected treatment system, and conduct the necessary monitoring and reporting of influent, midpoint and effluent results, as required by the discharge permit for the disposal option selected.

ITEM 183.1 (Continued)**COMPENSATION:****METHOD OF MEASUREMENT**

Provide a treatment system that meets permit discharge requirements, mobilize it to the site, provide copies of laboratory analytical data indicating that the system is performing appropriately to meet permit requirements, and demobilize it from the site. This includes management and disposal of wastes generated during treatment prior to discharging such as activated carbon, etc. Work under Item 183.1 is based upon the number of gallons disposed or contaminated groundwater pumped through the granular-activated carbon (Item 183.2) as the medium for the treatment of contaminated groundwater that is found in pipe trenches, manhole excavations, catch basin excavations, that need to be dewatered.

BASIS OF PAYMENT

Payment shall be made at the unit price bid per liter of groundwater pumped, stored, treated as needed and tested as required by discharge permits and regulatory requirements, which price shall be full compensation for all necessary labor and materials, mobilization, maintenance, demobilization of the appropriate unit(s), freight, rental costs, field and laboratory testing costs and permits. Costs associated with the disposal of granular-activated carbon shall be covered under Item 183.2.

ITEM 183.2 **DISPOSAL OF GRANULAR-ACTIVATED CARBON** **POUND****GENERAL**

Work under Item 183.2 is based upon the disposal of used granular-activated carbon as the treatment medium for contaminated groundwater (Item 183.1) that is found during excavations in which contaminated groundwater is encountered.

BASIS OF PAYMENT

Payment shall be made at the unit price bid per POUND of carbon that is properly disposed and replaced, as necessary, to meet treated water discharge requirements during dewatering operations at the site. Payment for Disposal of Granular Activated Carbon shall include compensation for all labor, equipment, materials, permits, characterization, sampling and on-site or laboratory analysis as needed or required by permits, for replacement and disposal of liquid-phase activated carbon for the on-site contaminated groundwater pumping, collection, treatment and treated water discharge system during the time period required to complete the work. No payments shall be made for replacing carbon which is spent due to the Contractor's failure to remove floating petroleum product or excess sediments prior to the groundwater entering the carbon treatment units. All other costs associated with treatment of contaminated groundwater will be covered under Item 183.1- Treatment of Contaminated Groundwater.

ITEM 184.1 **DISPOSAL OF TREATED WOOD PRODUCTS** **TON**
 (Rev 08/09/2016)

Work under this Item shall include the transportation and disposal of all treated existing wood product as directed by the Engineer.

The timber components of the existing structure are suspected to be treated with creosote, pentachlorophenol and/or CCA. This Item shall include all costs for sampling, laboratory testing, loading, transportation and disposal of the treated wood. The Contractor is required to submit disposal manifests to the Engineer prior to the completion of the project. All aspects of this Item are to be completed in accordance with state and federal regulations.

COMPENSATION

Measurement and payment will be by the weight, in TONS, of treated timber transported and accepted at a licensed facility. The work shall be considered full compensation for all labor, tools, equipment, materials, testing, loading, transportation, approvals, and permits necessary for the completion of the work.

<u>ITEM 201.</u>	<u>CATCH BASIN</u>	<u>EACH</u>
<u>ITEM 201.6</u>	<u>ALTERNATE TYPE CATCH BASIN</u>	<u>EACH</u>
<u>ITEM 202.</u>	<u>MANHOLE</u>	<u>EACH</u>
<u>ITEM 202.15</u>	<u>MANHOLE – 5 FOOT DIAMETER</u>	<u>EACH</u>
<u>ITEM 204.</u>	<u>GUTTER INLET</u>	<u>EACH</u>

The work to be done under these Items shall conform to the relevant provisions of Section 200 of the Standard Specifications, and the following:

Catch basins, alternate type catch basins, manholes, and gutter inlets shall be constructed as shown on the Construction Details plan sheets and shall be placed on 8” crushed stone (M2.01.4) foundation as directed by the Engineer.

Manhole – 5 Foot Diameter shall be constructed as shown on the Precast Drainage Manhole detail on the Construction Details plan sheet with the exception that the inside diameter shall be five feet.

Precast concrete weir walls shall be provided in manholes at locations shown on the plans in accordance with the Precast Concrete Weir Wall detail on the Construction Details plan sheets. Cast-in-place weir walls will no be allowed. No separate payment shall be made for precast concrete weir walls.

Catch basins, alternate type catch basins, and gutter inlets adjacent to sidewalks shall include an environmental catch basin placard as shown on the Construction Details plan sheets. No separate payment shall be made for environmental catch basin placards.

ITEMS 201. thru 204. (Continued)

Alternate eccentric cone sections or flat top sections with offset openings shall be used in areas where drainage structures are in close proximity to existing underground utilities, as shown on the plans or as directed by the Engineer. No additional payment will be made for eccentric cones or flat top structures with offset openings.

Flat top structures shall have a minimum 28 day compressive strength of 4000 psi, reinforced for AASHTO H-20 loading with ASTM A 615 Grade 60 steel. Catch basins shall be equipped with hoods. Hoods shall be Town Standard or approved equal and shall be sized to match the respective outlet pipes.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Measurement and Payment for work under these Items shall be at the contract unit price, per EACH; which price shall be full compensation for labor, materials, equipment, tools, sawcut, excavation, asphalt patch, and other incidentals necessary to satisfactorily complete the work. Method of measurement shall follow standard specifications.

The cost of furnishing and installing hoods shall be paid for under Item 225.52.

The crushed stone for bedding shall be paid for under Item 156.

<u>ITEM 220.2</u>	<u>DRAINAGE STRUCTURE REBUILT</u>	<u>FOOT</u>
<u>ITEM 220.6</u>	<u>SANITARY STRUCTURE REBUILT</u>	<u>FOOT</u>
<u>ITEM 220.7</u>	<u>SANITARY STRUCTURE ADJUSTED</u>	<u>EACH</u>

Work under these Items shall conform to the relevant provisions of Section 200 and shall be applicable to all types of municipal structures, including drainage and sanitary structures, where existing castings are to remain.

Clay brick shall be used in setting frames. The use of cement concrete brick will not be allowed. Castings shall be set to line and grade and provided with a concrete collar. Collars shall be constructed of 4,000 psi, 3/4 inch 610 cement concrete (high early). No additional compensation for concrete collars shall be allowed. Concrete collars shall be brought to a height that will allow placement of the full depth of the specified pavement wearing surface over the collar. Concrete collars shall be tacked coated with RS-1 Asphaltic Emulsion prior to the placement of pavement.

All dirt and debris caused by the Contractor shall be cleaned by the Contractor at his own expense.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Remove and Stack of the existing casting shall be paid for under Item 223.1.

All existing sewer castings to be reused shall be limited to one payment under Item 220.7. No additional payment will be made for adjustments required by construction phasing or winter shutdown.

Structures specified to be rebuilt on the plans shall be measured per vertical foot exclusive of casting and paid under Item 220.2 for Drainage and Item 220.6 for Sanitary Structure.

ITEM 222.3**FRAME AND GRATE (OR COVER)**
MUNICIPAL STANDARD**EACH**

The work of this Item shall conform to the relevant provisions of Section 200 of the Standard Specifications and the following:

The work done under this Item shall conform to the relevant provisions of Subsection 201.

Drain and Sewer manhole covers and frames shall conform to the Town of Dedham's standard (with star), as manufactured East Jordan Iron Works or approved equal. Sewer manhole covers shall have the word SEWER cast into the cover.

Catch basin frames and grates shall be the Town of Dedham's standard, as manufactured by East Jordan Iron Works or approved equal.

Frames four-inches in height shall be substituted for standard frames in areas of low cover as detailed on the plans or as directed by the Engineer. No additional payment shall be made for four-inch frames.

Frames shall be set using clay brick. Cement concrete brick will not be allowed.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 222.3 shall be measured and paid at the contract unit price per EACH; which price shall include all labor, tools, material and necessary incidental expenses.

Payment under this Item shall include any adjustments to new castings required to meet finished grade. No additional payment will be made for new castings to be reset from binder to top course elevation, such as in the case of a winter shut down.

Payment for Removing and Stacking of existing castings shall be paid for under Item 223.1.

ITEM 223.1**FRAME AND GRATE (OR COVER)**
REMOVED AND STACKED**EACH**

The work to be performed under this Item shall conform to the relevant provisions of Subsection 201 and 220; Basins, Manholes and Inlets, amended and supplemented as follow:

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

All existing castings which are salvageable where designated on plans or as determined by the Engineer, shall be removed and stacked and transported by the town forces to the Dedham Town Yard or call the DPW department. Non-salvageable castings shall become the property of the Contractor and shall be disposed of off the site.

Item 223.1 shall be measured and paid at the contract unit price per EACH; which price shall include all labor, tools, material and necessary incidental expenses.

ITEM 225.52**TRAP AND HOOD
MUNICIPAL STANDARD****EACH**

The work of this Item shall conform to the relevant provisions of Section 200 of the Standard Specifications and as shown on detail.

The Trap and Hood shall conform to the Town of Dedham standard, as manufactured by Best Management Practices, Inc. or approved equal and shall be sized to match the respective outlet pipes. Trap and Hood shall only be installed in new catch basins and as directed by the Engineer.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 225.52 shall be measured and paid at the contract unit price per EACH; which price shall include all labor, tools, material and necessary incidental expenses to furnish and install trap and hood in the new basins designated on the plans.

ITEM 227.22**SLUICE STRUCTURE****EACH**

The work under this Item shall conform to the relevant provisions of Section 700 and include installation of sidewalk inlet structure called sluice structure.

Sluice structures shall be constructed as shown in the construction details. The structure shall be installed in place of sidewalk panel and shall meet AAB/ADA requirements. The finish surface shall match with sidewalk surface.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 227.22 shall be measured and paid at the contract unit price per EACH; complete in place, which price shall include all labor, materials, equipment, cement concrete, steel, and incidental costs required to complete the work.

ITEM 228.**INFILTRATION BASIN****LUMP SUM**

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

The work shall include constructing the infiltration basin at STA 53+50 LT along Rustcraft Road:

The proposed work includes constructing the basin and sediment forebay to the line and grade, including clearing and grubbing, excavation, and fine grading and compaction, shown on the plans and as directed by the Engineer.

① ADDENDUM NO. 1, JANUARY 15, 2021

ITEM 228. (Continued)**BASIS OF PAYMENT**

Payment under this Item shall be at the contract LUMP SUM price; which price shall be full compensation for all labor, materials, equipment, tools, and incidentals necessary to satisfactorily complete the infiltration basin work including but not limited to earth excavation, clearing and grubbing, and fine grading and compaction as shown on plans and details.

Payment for gravel borrow shall be made under Item 151. Gravel Borrow.

Payment granite curb shall be made under Item 504. Granite Curb Type VA4 – Straight.

Payment for loam borrow shall be made under Item 751. Loam Borrow.

Payment for seeding shall be made under Item 765.441 Seeding – Low Upland Mix.

Payment for geotextile fabric shall be paid under Item 698.4. Geotextile for Permanent Erosion Control.

Payment for Modified Rockfill shall be made under Item 986. Modified Rockfill.

Payment for granite edging shall be made under Item 988.01 Sediment Forebay Paving

① **ITEM 235.12** **12 INCH DRAINAGE PIPE FLARED END – OPTION** **EACH**

The work under these Items shall conform to the relevant provisions of Subsection 230 of the standard specifications and the following:

Pipe shall meet the material requirements of Subsection 230 for the option selected.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 235.12 will be measured and paid at the contract unit price per EACH; which price shall include all labor, material, equipment and incidental costs required to complete the work.

ITEM 238.10 **10 INCH DUCTILE IRON PIPE** **FOOT**

The work under this Item shall conform to the relevant provisions of Subsections 230 and 301 of the Standard Specifications and the following:

The work shall include the furnishing and installation of ductile iron drain pipe in areas where insufficient cover or utility obstructions warrant and/or as directed by the Engineer.

Ductile iron pipe for drainage shall conform to the material requirements of M5.05.3 of the Standard Specifications.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 238.10 will be measured and paid at the contract unit price per FOOT; which price shall include all labor, material, equipment and incidental costs required to complete the work.

ITEM 263.**LEACHING CHAMBER****FOOT**

This work under this Item shall conform to the relevant provisions of Subsection 230 of the Standard Specifications and the following:

Leaching chambers shall be used for storm water recharge at locations shown on the plans. Leaching chambers shall be injection molded using corrosive resistant polypropylene resin or High Density Polyethylene (HDPE) and shall conform to ASTM F2418 or ASTM F2922, as applicable, and ASTM F2787. Chamber units shall be designed for HS-20 live traffic loads and shall also consider earth loads for the specified depth.

Chambers shall be installed and backfilled in accordance with the leaching chamber detail shown on the plans and the manufacturer's latest installation instructions. Any settlements or other defective work and material shall be promptly repaired or replaced at the Contractor's expense.

Terminal sections of leaching chambers shall be fitted with end caps capable of connecting to HDPE pipe and shall be designed to fit into any corrugation of a chamber, which allows for capping a chamber that has its length trimmed. End caps shall be from the same manufacturer as the leaching chamber. Contractor shall provide all materials and labor to make connections to HDPE pipe per recommendations of the manufacturer.

A bedding of $\frac{3}{4}$ " crushed stone conforming to M2.01.4 shall be placed around the chamber units including Geotextile Fabric for Subsurface Drainage and an impermeable 30 mil PVC liner shall be placed between the chamber units and roadway as shown on the detail and as directed by the Engineer. Geotextile Fabric for Subsurface Drainage shall meet the material requirements of AASHTO M 288 and PVC liner shall conform to ASTM 7176-06 (2011).

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 263. will be measured and paid at the contract unit price per FOOT; complete in place, which price shall be full compensation for all excavation, backfilling, crushed stone, shoring and bracing, trimming, end caps, chamber units, 12 inch HDPE pipe, woven and non-woven geotextile fabric, impermeable PVC liner, and all labor materials and incidentals required to complete the work.

<u>ITEM 358.</u>	<u>GATE BOX ADJUSTED</u>	<u>EACH</u>
<u>ITEM 359.1</u>	<u>MWRA STRUCTURE ADJUSTED</u>	<u>EACH</u>

Work under these Items shall conform to the relevant provisions of Subsection 301 of the Standard Specifications and the following:

This work will consist of adjusting gate boxes regardless of size for water gates and sewer force main gates to grade as shown on the plan and if required as directed by the Engineer.

The MWRA water manhole cover shall be adjusted under Item 359.1 to the finish grade.

Any gate box or cover damaged due to the Contractor's operations; will be replaced by the Contractor at his own expense.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Items 358. and 359.1 will be measured and paid at the contract unit price per EACH; which price shall be considered full compensation for all labor, equipment, materials, and incidentals necessary to complete the work to the satisfaction of the Engineer.

<u>ITEM 381.3</u>	<u>SERVICE BOX ADJUSTED</u>	<u>EACH</u>
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Work under this Item shall conform to the relevant provisions of Subsection 301 of the Standard Specifications and the following:

Under this Item the Contractor shall adjust to grade service box. Service box in driveways shall have collars. Service box in sidewalk areas are not required to have a collar.

Service box located in the roadway shall be removed and reset to behind proposed curb line. Existing curb stop in the roadway shall remain in place in the open position. New curb stop and copper tubing shall be installed between the retained curb stop to the new curb stop behind the proposed curb line.

Any service box damaged due to the Contractor's operations, will be replaced by the Contractor at his own expense.

Service box found to be inoperable due to no fault of the Contractor shall be replaced with new and paid for under Item 381.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 381.3 will be measured and paid at the contract unit price per EACH; which price shall be considered full compensation for all labor, equipment, materials, removal of old service box and incidentals necessary to complete the work to the satisfaction of the Engineer.

ITEM 390.01**SPRINKLER SYSTEM MODIFIED****EACH**

All work shall be done in accordance with the relevant Subsections of the Standard Specifications and the following:

Where a sprinkler system is encountered during the construction, they will be removed and reset at new locations or modified as directed by the Engineer. The exact locations will be determined by the Engineer in the field to the satisfaction of the owner.

Possible location of Sprinkler System:

Along Legacy Place on Elm Street

#333 Elm Street

Service box located in the roadway shall be removed and reset to behind proposed curb line. Existing curb stop in the roadway shall remain in place in the open position. New curb stop and copper tubing shall be installed between the retained curb stop to the new curb stop behind the proposed curb line.

All sprinkler heads and pipes etc. shall be removed carefully. The Contractor will be held responsible for any damage done during the removal and resetting of these Items and shall replace or repair the damaged Item as directed by the Engineer at his own expense.

Sprinkler heads and the pipes shall be relocated to new locations or eliminated as determined by the Engineer. All necessary piping shall be provided and installed by the Contractor.

The operation of the sprinkler system shall be guaranteed by the Contractor for a period of one month from the date of completion of work.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 390.01 will be measured and paid at the contract unit price per EACH location modified; which price shall include all labor, materials, equipment, all sprinkler heads, pipes, pipe sleeves, all components, and all incidental costs required, in order to relocate the existing sprinkler system (with testing) to the new location or eliminate the existing sprinkler system in one property, as described above and as required by the Engineer.

Any eliminated materials shall be disposed of properly and shall be considered incidental to this Item.

ITEM 470.2 **HOT MIX ASPHALT BERM TYPE A – MODIFIED** **FOOT**

Work under this Item shall conform to the relevant provisions of Subsection 470 and the following:

All Hot Mix Asphalt Berm Type A – Modified is to be set as shown in the construction details.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 470.2 will be measured and paid at the contract unit price per FOOT, complete and in place, along the gutter line; which price shall be full compensation for all labor, materials, tools, equipment and incidentals required to complete the work.

ITEM 472. **TEMPORARY ASPHALT PATCHING** **TON**

Work under this Item shall conform to the relevant provisions of Subsections 420, 460, 470, 501, 701 and the following:

Temporary asphalt patching for miscellaneous work shall be used to for hot mix asphalt walkways and temporary access and egress to those properties abutting the work area as determined by the Engineer. It shall also be used for temporary widening, temporary pedestrian curb ramp, restoration of pavement surface after construction stages, the installation of drainage pipes, structures, and pavement patch repairs where such areas as specified by the Engineer. The Contractor is advised that this material which will be spread primarily by hand.

Temporary patching work shall be placed only upon the direction of the Engineer.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 472. will be measured and paid at the contract unit price per TON; which price shall include all labor, materials, equipment, placement, removal, transportation and incidental costs necessary to complete the work to the satisfaction of the Engineer.

No payment will be made for roadway patching done outside the limit of pay excavation shown on the Plans and details.

The subsequent removal of this asphalt material, if directed by the Engineer, shall also be included in this Item.

ITEM 630.2 **HIGHWAY GUARD REMOVED AND DISCARDED** **FOOT**

The work under this Item includes removing and discarding of steel posts, steel rails, and associated hardware as noted in the plans and as directed by the Engineer.

The existing guardrail, posts, and hardware shall be removed and disposed of off-site the same day it is removed from its existing position. Old post holes shall be backfilled with suitable material and compacted.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 630.2 will be measured and paid at the contract unit price per FOOT from center to center of the end posts; which price shall include full compensation for all labor, tools, materials and equipment necessary for removing and discarding the highway guard.

ITEM 670. **FENCE REMOVED AND RESET** **FOOT**

All work shall be done in conformance with the applicable Subsections of the Standard Specifications and the following:

The work shall consist of removing existing fences and gates and resetting them in accordance with these specifications and in close conformity with the lines and grades shown on the plans or as directed by the Engineer.

Removal and resetting of chain-link fence or any other fence shall be paid under this Item.

Existing fence elements which, in the judgment of the Engineer, are unsuitable for reuse due to deterioration, or from damage caused by the Contractor's operation, shall be replaced with new materials of matching type, size and, in the case of wood fences, wood species.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 670. will be measured and paid at the contract unit price per FOOT; which price shall be full compensation for all labor, tools, materials and incidentals required to remove and reset a fence complete and in place and restore any disturbed areas.

No separate payment will be made for the excavation, footing, backfill and any necessary new materials and all costs shall be included in the unit bid price.

ITEM 697.1**SILT SACK****EACH**

Work under this Item shall conform to the relevant provisions of Subsections 227 and 670 of the Standard Specifications and the following:

The work under this Item includes the furnishing, installation, maintenance and removal of a reusable fabric sack to be installed in drainage structures as needed for the protection of wetlands and other resource areas and the prevention of silt and sediment from the construction site from entering the storm water collection system. Devices shall be ACF Environmental (800)-448-3636; Reed & Graham, Inc. Geosynthetics (888)-381-0800; The BMP Store (800)-644-9223; or approved equal.

CONSTRUCTION

Silt sacks shall be installed in retained existing catch basins and drop inlets within the project limits and as required by the Resident Engineer.

The silt sack shall be as manufactured to fit the opening of the drainage structure under regular flow conditions and shall be mounted under the grate. The insert shall be secured from the surface such that the grate can be removed without the insert discharging into the structure. The filter material shall be installed and maintained in accordance with the manufacturer's written literature and as directed by the Engineer.

Silt sacks shall remain in place until the placement of the pavement overlay or top course and the graded areas have become permanently stabilized by vegetative growth. All materials used for the filter fabric will become the property of the Contractor and shall be removed from the site.

The Contractor shall inspect the condition of silt sacks after each rainstorm and during major rain events. Silt sacks shall be cleaned periodically to remove and disposed of accumulated debris as required. Silt sacks, which become damaged during construction operations, shall be repaired or replaced immediately at no additional cost to the Department.

When emptying the silt sack, the Contractor shall take all due care to prevent sediment from entering the structure. Any silt or other debris found in the drainage system at the end of construction shall be removed at the Contractors expense. The silt and sediment from the silt sack shall be legally disposed of offsite. Under no condition shall silt and sediment from the insert be deposited on site and used in construction.

All curb openings shall be blocked to prevent stormwater from bypassing the device.

All debris accumulated in silt sacks shall be handled and disposed of as specified in Subsection 227 of the Standard Specifications

COMPENSATION

Silt sacks will be measured and paid at the Contract unit price per EACH, complete in place, which price shall include all labor, materials, equipment and incidental costs required to complete the work. No separate payment will be made for removal and disposal of the sediment from the insert, but all costs in connection therewith shall be included in the Contract unit price.

ITEM 698.4

**GEOTEXTILE FABRIC FOR
PERMANENT EROSION CONTROL**

SQUARE YARD

The material to be supplied under this Item shall conform to the relevant provisions of Subsection M9.50.0 and AASHTO M 288 for the intended application, and the following:

The work under this Item consists of the installation of fabric under stone check dams and modified rock fill.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 698.3 shall be measured for payment complete in place per SQUARE YARD; which measurement shall be the actual areas within the lines and grades with no allowances made for overlaps.

Item 698.3 will be paid for at the contract unit price per SQUARE YARD complete in place; which price shall include all labor, tools, equipment, materials and incidentals required to complete the work to the satisfaction of the Engineer.

ITEM 707.81

BOLLARD REMOVED AND RESET

EACH

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

The work shall consist of removing steel bollards which, in the judgment of the Engineer, are unsuitable for reuse due to deterioration, or from damage caused by the Contractor's operation and resetting them in accordance with these specifications and in close conformity with the lines and grades shown on the plans or as directed by the Engineer.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 707.81 will be measured and paid at the contract unit price per EACH bollard reset; which price shall be full compensation for all labor, tools, materials and incidentals required to complete the work.

No separate payment will be made for the excavation, footing, backfill, concrete fill of pipe, or any new materials but all costs shall be included in the price of this Item.

ITEM 740. ENGINEERS FIELD OFFICE AND EQUIPMENT (TYPE A) MONTH

The Work under this Item shall conform to the relevant provisions of Subsection 740 and the following:

Two (2) computer systems, a printer system, and a digital camera meeting the requirements set forth below including installation, maintenance, power, paper, disks, and other supplies shall be provided at the Resident Engineer's Office:

All equipment shall be UL approved and Energy Star compliant.

The Computer System shall meet the following minimum criteria or better:

Processor:	Intel, 3.5 GHz
System Memory (RAM):	8GB
Hard Drive:	500GB
Optical Drive:	DVD-RW/DVD+RW/CD-RW/CD+RW
Graphics Card:	4GB
Card Reader:	6-in-1 Card Reader, 2 total USB 3.0, audio
Network Adapter:	10/100 Mbit/s
USB Ports:	6 USB 3.0 ports
Keyboard:	Generic
Mouse:	Optical mouse with scroll, MS-Mouse compliant
OS:	Windows Professional with all security updates
Web Browser:	Latest Internet Explorer with all security updates
Applications:	Latest MS Office Professional with all security updates Latest Adobe Acrobat Professional with all security updates Latest Autodesk AutoCAD LT Antivirus software with all current security updates maintained through the life of the contract.
Monitor:	24" LED with built-in speakers, 1920 x 1200 max resolution
Flash drives:	2 - 32GB USB 3.0
Internet access:	High Speed (min. 24 mbps) internet access with wireless router.

ITEM 740. (Continued)

The Multifunction Printer System shall meet the following minimum criteria or better:

Color laser printer, fax, scanner, email and copier all in one with the following minimum capabilities:

- Estimated volume 8,000 pages per month
- LCD touch panel display
- 50 page reversing automatic document feeder (RADF)
- Reduction/enlargement capability
- Ability to copy and print 11" x 17" paper size
- email and network pc connectivity
- Microsoft and Apple compatibility
- ability to overwrite latent images on hard drive
- 600 x 600 dpi capability
- 30 pages per minute print speed (color),
- 4 Paper Trays Standard (not including the bypass tray)
- Automatic duplexing
- Finisher with staple functions
- Standard Ethernet. Print Controller
- Scan documents to PDF, PC and USB
- ability to print with authenticated access Protection

The Contractor shall supply a maintenance contract for next day service, and all supplies (toner, staples, paper) necessary to meet estimated monthly usage.

A Digital Camera shall meet the following minimum criteria or better:

Resolution:	12 Megapixel
Optical Zoom:	5x
Internal Memory Included:	Yes
Memory:	8 GB SD Card
Screen:	3 inch Clear Photo LCD
Min Operating Temperature:	14° F
Max Depth of Water Resistant:	30 feet
Height of Shock Resistant:	5 feet
Battery Power:	2 rechargeable batteries and a battery charger
Carrying Case:	Rain-proof with shoulder strap

The Engineer's Field Office and the equipment included herein including the computer system, printer and camera shall remain the property of the Contractor at the completion of the project.

Disks, flash drives, and card readers with cards shall become the property of the Department.

COMPENSATION

Compensation for this work will be made at the contract unit price per MONTH; which price includes full compensation for all services and equipment, and incidentals necessary to provide equipment, maintenance, insurance as specified and as directed by the Engineer

ITEM 751.
ITEM 765.01

LOAM BORROW
HYDROSEEDING

CUBIC YARD
SQUARE YARD

The work under these Items shall conform to the relevant provisions of Subsection 751, 765, 767, 770 and as supplemented below. Work includes the placement of approved loam borrow, top dressing with loam borrow, lime, fertilizer, and seeding to finish areas denoted on the plans or restore all disturbed grassed areas, as authorized by the Engineer.

Loam Borrow shall meet with Material Specifications M1.07.0. Loam Borrow shall pass a 3/8" screen and shall be free of grass and other unsuitable materials. The placement of new loam borrow shall be as follows.

In new lawn areas or areas of significant disturbance, loam borrow shall be placed with a minimum depth of 6 inches after compaction.

In existing grass areas to remain, or where there is minimal disturbance to the surface, depressions shall be filled, and a top dressing of loam borrow shall be applied to a general depth of 1 inch after compaction. Prior to the application of the top dressing, the Contractor shall be required to mechanically aerate these areas by a means acceptable to the Engineer.

For areas within existing tree protection (under branch spread) mechanical aeration shall not be allowed but the surface shall be scarified by hand rake.

Loam Borrow shall be used to fill depressions and shape the surface to provide for proper flow of drainage, as well as enhance the general appearance of these grassed areas.

Areas adjacent to curbs and other such hard surfaces shall be pre-worked and tapered down 1 to 2 inches so as to allow the top dressing to end up flush with the hard surface.

Apply Lime and Fertilizer to the prepared loam areas. Lime shall be ground limestone containing not less than 95% calcium and magnesium carbonates. Lime shall be applied at a rate of 75 to 100 lbs. per 1,000 square feet prior to seeding. Fertilizer shall contain the following analysis:

24 percent available Nitrogen (N)
24 percent available Phosphoric Acid (P)
4 percent available Potassium (K)

Significant quantities of trace elements such as iron, boron, etc. shall also be contained in the fertilizer. Seventy-five percent of available nitrogen shall be in a slow-release form as is found in certain urea-form products or natural organic forms or a combination of both. The salt index of the fertilizer shall not exceed 35.

Hydro-seed shall conform to the relevant provisions of Subsection 765.65. Fertilizer shall be a complete commercial fertilizer, 10-20-20 grade. Fertilizer in the hydro-seed mixture shall be applied at the rate of 30 lbs. per 1,000 square feet and seed in the hydro-seed mixture shall be applied at a rate of at least 120 lbs. per acre or 3 lbs. per 1,000 square feet.

ITEMS 751. & 765.01 (Continued)

The seed mix shall be:

Seed Mix	% by Weight	% by Volume (Pure Live Seed)
Creeping Red Fescue	70%	78%
Kentucky Bluegrass	15%	68%
Perennial Ryegrass	15%	85%

The Seeding rate shall be 150 lbs. per Acre.

The Contractor shall be responsible for watering the seeded areas daily for a minimum of two weeks or until the grass has become established. The Town will provide water via a hydrant connection.

Lawn Establishment shall begin immediately after any area is seeded, mulched, and erosion control matting (if used) is in place, and shall continue for a minimum of 60 days active growing period following the completion of all grass installation work and until final acceptance of the project. In the event that seeding operations are completed past October 1, then Establishment shall continue into the following spring and reseeding shall take place as necessary at that time.

The Contractor shall provide all labor and water required for establishment. Contractor shall water all seeded areas as necessary during Establishment period to ensure uniform soil moisture to a depth of 2 inches or greater. Watering shall provide uniform coverage without eroding soil or grassed surfaces. Establishment shall include placement and resetting of protective barriers as required.

Maintenance and monitoring shall begin concurrently with Establishment period. Maintenance will include all necessary watering, repair, and reseeding to ensure establishment of perennials and grasses. Maintenance shall also include monitoring for invasive species. Any invasive species shall be immediately removed. All plant remains, including roots and shoots, shall be appropriately disposed off-site.

A satisfactory stand of grasses, as determined by the Engineer shall be required for acceptance. Seeded areas shall have a close stand of grass with no weeds present and no bare spots greater than 4 inches in diameter. At least 95 percent of the grass established shall be permanent grass species. At the time of acceptance, the Contractor shall remove temporary barriers used to protect grassed areas. Absolutely no debris may be left on the site.

All areas and parts of areas which, in the opinion of the Engineer, fail to show a uniform stand of grass, for any reason whatsoever, shall be reseeded by a method approved by the Engineer and during an approved season. Reseeding shall be repeated until all areas are covered with a satisfactory growth of grass. All reseeding, together with necessary re-grading, soil amendment and erosion control, shall be done at the expense of the Contractor.

ITEMS 751. & 765.01 (Continued)

Unless otherwise approved by the Engineer, surfaces disturbed outside the Limits of Work line shown for the Contractor's convenience, shall be restored as specified herein, at the Contractor's own expense.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 751 will be measured in place to the depth specified herein and paid for at the contract unit price per CUBIC YARD applied; which price shall be full compensation for preparing surfaces; furnishing, placing, raking, shaping and compacting new loam borrow; and furnishing and applying lime.

Item 765.01 will be measured and paid at the contract unit price per SQUARE YARD; which price shall be full compensation for preparing the loam surface, furnishing and applying seed, including lime and fertilizer, as well as the maintenance of seeded areas.

ITEM 751.72**COMPOST TOPDRESSING****SQUARE YARD**

The work under this Item shall conform to the relevant provisions of Subsection 751 of the Standard Specifications and the following.

Work shall consist of furnishing and pneumatically applying compost as specified below. Compost shall be applied as a thin mulch blanket over prepared loam or prepared soil and shall be used in conjunction with seeding or planting unless specified otherwise. The intent of compost topdressing is to provide temporary soil stabilization and organic matter for plant growth.

For areas where compost is proposed with seeding, seed shall be broadcast and seeding shall occur in conjunction with compost topdressing, as specified under the relevant seeding Item.

SUBMITTALS

Contractor shall submit to the Engineer samples and certified test results 60 days prior to application of compost. Test will be for compost, not a soil test, as specified below. Vender certification that material delivered meets the test results shall be submitted if requested.

No materials shall be delivered until the required submittals have been approved by the Engineer. Delivered materials shall match the approved samples. Approval of test results does not constitute final acceptance. The Engineer will reject any material that does not meet the Specifications.

MATERIALS

Compost may be a blended product of compost and fine wood chips.

ITEM 751.72 (Continued)

Compost testing shall be by a laboratory approved by the US Compost Council using the Testing Method for the Examination of Compost and Composting (TMECC) protocols.

- Organic matter content shall be minimum 30 percent (dry weight basis).
- Moisture content shall be 30-60 percent (wet weight basis).
- Bulk Density <1000 lb/cy
- pH shall be 5.5-7.5
- Conductivity shall be a maximum of 4 mmhos.
- Where soil is intended for vegetation (plants or grass), compost shall be tested for stability by CO₂ method and shall produce a maximum of 8mg CO₂-C per gram of organic material per day.

Particle size shall not exceed ¾ inch.

No kiln-dried wood, construction debris or ground palette is allowed.

The Engineer shall approve the Contractor's equipment for application.

CONSTRUCTION METHODS

Application of compost material shall not begin until the Engineer has approved the site and soil conditions. The Contractor shall notify the Engineer when areas are ready for inspection and application of compost.

Prior to application of compost, all areas to be topdressed shall have been graded to an even surface, and all debris and stones 2 inches or larger shall be removed. Surface preparation shall be compensated under applicable Item for placement of loam, sand, ordinary borrow, topsoil rehandled and spread, or other specified substrate.

Compost topdressing shall be pneumatically applied (blown on) to a depth of one half to one inch unless specified otherwise on the plans.

For areas where compost is proposed with seeding, seed shall be broadcast and shall occur in conjunction with compost topdressing, as specified under the relevant seeding Item.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 751.72 will be measured and paid at the contract unit price per SQUARE YARD; which price shall include all labor, materials, equipment, and all incidental costs required to complete the work of pneumatically applying compost.

Surface preparation of substrate receiving compost topdressing shall be compensated under applicable Item for placement of loam, sand, ordinary borrow, topsoil re-handled and spread, or other, specified substrate.

Seeding will be compensated for under the appropriate seeding Item.

ITEM 751.8**LOAMY SAND BORROW****CUBIC YARD**

The purpose of this section is to provide a relatively low organic, free draining material as seed bed for Restoration Seed Mix in the Extended Dry Detention Basin, sediment forebays, and other areas designated on the Plans. Unless otherwise specified on the drawings, the depth shall be 4 inches installed.

At least 30 days prior to ordering, the Contractor shall submit a one gallon sample of the loamy sand borrow and soil test results to the Engineer. Soil testing of the loamy sand shall include a Routine Soil Analysis that includes pH, Buffer pH, Extractable Nutrients, Extractable Aluminum and Lead etc. Additional soil testing shall include Soil Organic Matter and Soil Texture (USDA Textural Classification) which includes particle size analysis and grain size distribution.

No material shall be ordered until submitted soil samples and soil testing results have been approved by the Engineer. Delivered materials shall match approved materials.

Loamy Sand Borrow

Loamy sand borrow (from off-site) shall be a "Loamy Sand Borrow" determined by mechanical analysis and based on the USDA Classification System. It shall be of uniform composition without mixture of subsoil. It shall be free of stones, lumps, plants and their roots, debris, or other deleterious material.

All loam used in the work of this Item shall be tested and approved for use by the Engineer prior to being spread. The Contractor shall provide the laboratory with representative soil samples for testing and shall have the test reports sent directly to the Engineer.

Loamy Sand shall be 85-90% sand on the upper limit or 70-85% sand on the lower limit (25% or more very coarse, coarse, and medium sand plus less than 50% of any other single grade of sand. The percentage of silt plus 1.5 times the percentage of clay will never be less than 15 on the upper limit and the percentage of silt plus 2 times the percentage of clay will not exceed 30 on the lower limit.

Organic matter shall be 3-8% and pH shall be between 6.5 and 7.8. Loamy sand shall have the following grain size distribution:

Size	Percent Passing
3/4"	100
3/8"	95-100
No. 4	95-100
No. 10	80-90
No. 40	30-35
No. 60	15-18
o. 140	8-15

ITEM 751.8 (Continued)

Prior to placement of loamy sand borrow; the sub-surface shall be free of stones larger than 2 inches.

Loamy sand borrow shall be spread to a depth of four (4) inches under Restoration seeding areas in swales. Loamy sand borrow shall then be prepared by scarifying and raking. All large stiff clumps, brush, litter, stones over one (1) inch in diameter, etc. shall be removed. The loamy sand borrow shall be raked and all depressions shall be refilled and re-graded until a uniform finish is achieved.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Payment under this Item shall be the Contract Unit Price bid per CUBIC YARD based on a depth of 4 inches after compaction. This price shall be full compensation for preparing surfaces; furnishing, placing, raking, shaping and compacting loamy sand borrow.

ITEM 755.35**INLAND WETLAND REPLICATION AREA****LUMP SUM**

The work under this Item shall conform to the relevant provisions of Subsections 120, 770, 771 of the Standard Specifications and the following:

The work under this Item shall include furnishing material and the construction and maintenance of inland wetland replication areas as shown on the drawings and as required by the Engineer. Inland Wetland Replication Area(s) shall hereafter be referred to as Replication Area.

All work shall be in coordination with an approved Wetland Specialist. The Wetland Specialist overseeing the wetland construction work shall not be from the same company as that planting, seeding, or participating in any aspect of the wetland construction.

Replication Area shall be constructed prior to wetland impacts unless otherwise approved by the Engineer. Construction schedule shall be appropriate to planting and seeding season (see below). Changes to this schedule will require written approval from the Engineer.

Wetland Restoration for remediation of impacted wetlands shall be as specified under the appropriate Item and compensated under that Item.

Construction of tidal wetlands shall be as specified under the appropriate Item for tidal wetland mitigation.

ITEM 755.35 (Continued)**DESCRIPTION OF WORK**

Construction of the Replication Area shall be completed as shown on the drawings at the following location(s):

Location(s): Sta. 40+12 – 41+08 LT
Area: 760 SF

Replication Area shall be constructed to meet the requirements of all associated permits and certifications, including relevant performance standards of the Massachusetts Wetlands Protection Act (MGL C. 131, s40), Section 401 Water Quality Certification, and Section 404, U.S. Army Corps of Engineers General Permit.

The Contractor is responsible for protection and preservation of natural areas adjacent to the Replication Area both within and outside the project limits for the duration of the contract. Damage to soils or vegetation due to sedimentation, compaction, trampling, vehicles, storage of materials, or other negligence shall be repaired to the satisfaction of the Engineer and at the Contractor's expense.

SUBMITTALS - DOCUMENTS

Request for Conditional Acceptance: As specified below, a letter requesting Conditional Acceptance of the work and the site conditions shall be submitted to the Engineer.

Request for Certificate of Compliance (Partial or Full): If applicable, request for a Certificate of Compliance shall be submitted to the Engineer for distribution to appropriate regulatory agencies as specified below.

Request for Final Acceptance: As specified below, a letter requesting Final Acceptance of the work and the site conditions shall be submitted to the Engineer.

Monitoring Reports: Reports shall be submitted to the Engineer as specified below. Reports shall be compensated under Item 755.76 Wetland Monitoring Reports.

SUBMITTALS - MATERIAL**Soil and Amendments**

No soil, compost, or other soil amendment imported to the work site shall contain seeds, roots, stems, or other viable parts of invasive plants.

At least sixty (60) days prior to installation Contractor shall submit for approval all sources of soil and amendments, including compost, prior to ordering. Off-site sources shall be identified and available for inspection by the Wetland Specialist prior to transport of material to the site to verify that they are likely to be free of invasive plant species, including all viable plant parts.

Samples of tested and approved wetland soil and soil amendments will be required if requested by the Engineer.

ITEM 755.35 (Continued)**Seed Mix**

Certificate of Materials from the supplier shall be submitted and approved 30 days prior to ordering seed. Seed species listed on the certificate shall include ecotype region (i.e., *Asclepias incarnata*, PA Ecotype).

Seed tag from the bag of seed used shall be submitted to the Engineer at the time of seeding. Seed tag shall include ecotype region and species, shall match the Certificate of Materials, include the name of the supplier, and date material was sent.

Bill of lading or notarized Certificate of Compliance from the Supplier serving as proof of purchase shall be submitted if requested by the Engineer. Document shall include date of sale, quantity, lot number, and address of Supplier. This shall match the seed tag.

Plant Certification

Plant Certification shall be per the applicable requirements of Subsection 771, PLANTING TREES, SHRUBS AND GROUND COVER, of the latest edition of the Standard Special Provisions. The nursery source shall certify the provenance or origin of all plants.

Other Material: Submittals shall be per the respective Item.

MATERIALS**Sediment Barrier**

Sediment Barriers shall be per Item 767.121 except that no straw wattles with plastic netting shall be used in or near existing or proposed wetland.

Erosion Control

In addition to permanent seeding, erosion control for adjacent slopes and soil stabilization shall be Compost Topdressing, Jute Mesh Erosion Control Fabric, or seeding with a quick establishing annual mix.

Sediment and erosion controls shall be compensated under the respective Items.

Wetland Soil

Wetland soil for Replication Area may be either soil excavated from impacted wetland area or manufactured hydric soil.

If using soil from the impacted wetland area, soil shall be handled such that the original soil structure is preserved and shall not be compacted, screened, or otherwise processed.

Wetland soil from the impacted wetland that is infested with invasive plant species shall not be used in the Replication Area, unless approved by the Wetland Specialist. To the extent possible, that infested soil shall be disposed of within the project limits in an upland area or buried at least three feet deep.

ITEM 755.35 (Continued)

Manufactured wetland soil shall consist of on-site borrow from the proposed replacement site thoroughly mixed with compost to achieve a target organic content of 10-12% by weight. Where empirical data are lacking, compost to soil ratio shall be 1:1 by volume. Off-site borrow may be used for mixing if approved in advance by the Engineer.

No soil or soil amendment shall be brought on-site without approval of the material source by the Wetland Specialist and the Engineer. Soils used in the Replication Area shall be free of rocks greater than 4 inches in diameter.

Plants

Plant material shall conform to the applicable requirements of Subsection 771, PLANTING TREES, SHRUBS AND GROUND COVER, of the latest edition of the Standard Special Provisions.

Plants shall be straight native species, not cultivars. To the extent possible, plants shall originate from the applicable EPA Level III Ecoregion.

Transplanting and plant material collected from the wild is prohibited unless approved in writing by the Engineer. Plants shall be selected from certified nurseries that have been inspected by state and/or federal agencies.

Seed Mix

Seeding shall conform to the Standard Specifications SUBSECTION M6, ROADSIDE DEVELOPMENT MATERIALS

Seed mix shall be Roadside Riverbank – Part Shade Mix per Item 765.442.

Fertilizers shall not be used.

Water

The Contractor shall provide water and all equipment required at no extra cost. Water shall be suitable for irrigation and free from ingredients harmful to plants and wildlife. According to DEP requirements, water from the adjacent water bodies or waterways shall not be utilized. It is the Contractor's responsibility to correct injury or damage due to the lack of water, too much water, or use of contaminated water.

Mulch/Topdressing for Seeding

Hydromulch shall be per the manufacturer's recommendations and shall be wood fiber or straw mulch only. Compost topdressing, if used, shall meet the material and submittal requirements of that Item and shall be applied as specified below. Mulch or compost topdressing for seeding shall be incidental to this Item.

ITEM 755.35 (Continued)**CONSTRUCTION METHODS & SEQUENCE****SITE PROTECTION MEASURES****Minimizing Damage**

The Contractor shall plan and execute operations in a manner minimizing the amount of excavated and exposed fill or other foreign materials that could be washed or otherwise carried into the Replication Area and nearby resource areas.

Construction of and access to the Replication Area shall minimize damage to existing vegetation and soils as specified herein. Damage to soils or vegetation shall be repaired to the satisfaction of the Engineer and at the Contractor's expense. If required for soil remediation, tilling and the addition of compost shall be at the Contractor's expense.

The Contractor shall use boards, mats, or other approved material as necessary, to protect existing and/or new wetlands from compaction due to heavy foot traffic or if equipment is required to travel over wetland soil. All labor and materials required for protection and preservation of site shall be incidental to this Item.

Stockpiling of Soil

Stockpiling of soil, including hydric soil for replication, shall be outside the resource area and at least 100 feet from the edge of the wetland unless approved otherwise by the Engineer. Stockpiled soils shall be securely stabilized and contained. In the event that there is excess borrow, it shall be disposed of without additional compensation.

Sediment Barriers

Placement: Sediment barriers shall be installed along the downslope perimeter of the Replication Area beginning and ending in the surrounding upland so that no excavated material or disturbed soil can enter adjacent wetlands or waters. Where roadway work is immediately upgradient of the wetland, barriers shall be located so as to protect the Replication Area until slopes are stabilized. Sediment barriers shall be in place and approved by the Engineer prior to excavation work. No work shall take place outside the barriers.

Maintenance: The Contractor shall ensure that all sediment barriers function as intended and at all times per the specifications of the sediment barrier Item. Barriers shall be inspected after each rainfall and at least daily during prolonged rainfall. The Contractor shall remove sediment deposits as necessary to maintain the filters in working condition at all times.

Upon completion of work, biodegradable compost filter tubes may remain in place to degrade over time. Wooden stakes shall be removed or left neatly and discretely on-site.

ITEM 755.35 (Continued)**Existing Trees**

Tree protection shall be as shown on the plans or as required by the Engineer. To protect root systems of existing trees, the limits of the Replication Area may be adjusted, but, the total area of replication required by all permits shall not be reduced. To the extent possible, limits shall be a minimum of 6 feet from trunks of existing trees. Access route may be adjusted as required to avoid damage to trees.

Trees to be left as snags (upright dead or dying trees left for wildlife habitat) within or adjacent to the Replication Area shall be as shown on the plans or as directed by the Wetland Specialist or Landscape Architect and shall be marked prior to clearing. Trees that pose a potential fall hazard (i.e., are near a roadway) should have limbs and trunk cut such that the tree does not pose a fall hazard.

Woody debris in the form of cut trees, logs, and brush to be incorporated as shown on the plans or as directed by the Wetland Specialist or Landscape Architect shall be selected and marked by the Wetland Specialist and placed as specified below under Incorporation of Coarse Woody Debris.

All trees, stumps, or brush not specified to remain shall be removed. Materials shall not be stockpiled in the resource areas or buffer zone while awaiting disposal.

Work shall be coordinated with Clearing or Tree Removal Item and compensated under that Item.

PRE-CONSTRUCTION SITE WALK

Staking & Marking: The Contractor shall stake out Replication Area boundaries and the intended access route and set grade stakes for approval by the Wetland Specialist and Engineer. Following staking and demarcation of areas, the Engineer and Wetland Specialist shall approve or modify as necessary the limits of work, the access route, final location and configuration of replication, grade stake elevations, proposed location of sediment barriers, and review proposed construction methods.

Snags and Woody Debris: The Wetland Specialist will mark trees and select course woody debris to be retained for re-use.

Invasive Plants: As part of the initial site walk, the wetland to be impacted and the proposed replication site shall be inspected for the presence of invasive plants. If invasive plants are found they shall be addressed as described herein under Invasive Plants.

SOIL WORK

Final grades in the Replication Area shall meet the target elevations as shown on the Plans or as adjusted by the Wetland Specialist. If adjustments are required, a Request for Information (RFI) shall be submitted to the Engineer for approval. Adjustments shall be documented and included in the As-Built plans (if required) and/or other applicable required documents.

ITEM 755.35 (Continued)**Excavation & Grading of Sub-Grade**

If suitable soils are not present at the required depth within the target elevations, the proposed wetland area shall be excavated to a depth of one (1) foot below proposed target elevations and backfilled with planting soil as described in the materials section.

Where the proposed wetland area is an extension of an existing wetland area, excavation shall begin at the limit of work shown on the plans and shall be a minimum depth of 12 inches below the adjacent wetland grade or as established by the Wetland Specialist.

Usable soil in the proposed wetland areas that must be removed for grades to conform to the proposed elevations shall be stripped and stockpiled in an approved location for reuse. Stockpiled soils shall be kept wet and not allowed to dry out. Procedures for maintaining appropriate moisture levels shall be documented by the Wetland Specialist in the monitoring reports.

Placement of Wetland Soil

Following excavation and grading of sub-grade, and after the sub-grade elevations are approved by the Wetland Specialist, the native wetland topsoil previously removed or manufactured soil shall be spread over the proposed wetland areas as shown on the plans and as directed by the Wetland Specialist.

Final Grading

The finished grade of the Replication Area shall be at an elevation that will provide a hydrologic connection between the Replication Area and adjacent resource areas. The hydrologic connection should be in keeping with restoring the intended function of the replacement wetland. The Contractor shall verify that this elevation is not at a level that could negatively alter the hydrology of an adjacent wetland. Microtopography shall be as shown on the plans or as adjusted by the Wetland Specialist. Final elevations and grading of wetland soil shall be approved by the Wetland Specialist and the Engineer.

To avoid compaction once soil has been placed, no heavy equipment shall travel across placed soil and no work shall occur in wet or moist soil. Soil that is compacted due to construction activities shall be replaced with hydric soil as specified herein and at the Contractor's expense.

RESTORING VEGETATION**Incorporation of Coarse Woody Material**

If specified within this contract or if directed by the Wetland Specialist or Landscape Architect, logs and coarse woody debris shall be incorporated into the Replication Area and/or adjacent upland buffer. Material shall be placed as shown on the plans or as directed following placement of wetland soil and prior to application of compost and/or seed. Woody material shall cover a minimum of 15-20 percent of the Replication Area, depending on whether it is a meadow or woodland wetland and how much wood is available from construction clearing. Where trees are cut for construction purposes, logs of a minimum length of 8 feet must comprise a minimum of 50% of the woody material left on-site. Brush shall be included along with logs and stumps as directed. Woody material shall be placed in a deliberate and naturalistic manner.

ITEM 755.35 (Continued)**Planting**

Following placement of wetland soil and approval of final grade and conditions, Replication Area shall be planted. Planting shall conform to Subsection 771 PLANTING TREES, SHRUBS AND GROUND COVER of the Division I Standard Special Provisions and as amended below.

Planting Season shall be May 15-June 15 and September 1-November 1 unless approved following written request from the Contractor.

Prior to planting, the Wetland Specialist shall approve the condition of the plant material and the method of installation and shall oversee the planting work. Replication Area shall be planted in the dry and according to the Plans. Unless otherwise noted on the Plans, final plant locations shall be determined on-site and located with regard to expected hydrology, plant growth characteristics, habitat desired, and water protection.

Plant material shall be installed as soon as possible after delivery. Plants stored on-site prior to installation shall be stored in the shade and watered twice daily up until time of installation. Plants showing signs of stress or compromised health may be rejected by the Engineer or Wetland Specialist with replacement at the Contractor's expense.

Seeding

Following placement of wetland soil and planting (if included), the Replication Area shall be seeded using one of the following methods:

- Hand broadcast seed and straw mulch.
- Seeding with hydromulch per the Standard Specifications and per the manufacturer's directions.
- Hand broadcast seed with compost topdressing pneumatically applied at the same time to ensure light cover of soil over seed.

If required, seeding limits for different seed mixes shall be determined by the Wetland Specialist.

Seed tags shall be submitted with the Request for Conditional Acceptance.

PLANT ESTABLISHMENT AND INVASIVE MANAGEMENT

Plants shall be watered as necessary to maintain healthy establishment. Plants that fail by September 1 after spring planting or by June 1 after fall planting shall be replaced at the Contractor's expense.

Seeding that fails to established shall be over-seeded as required by the Engineer. Excessive weed growth shall be cut prior to over-seeding. Cutting and over-seeding are incidental to this Item.

ITEM 755.35 (Continued)

Invasive Plants: Plant species listed as invasive by Massachusetts Invasive Plant Advisory Group (MIPAG) and the US Army Corp of Engineer's New England District shall be identified in the monitoring reports and corrective measures taken to remove them within the limits of the Replication Areas for the duration of the monitoring period.

The strategy for chemical and/or manual removal shall be as directed by the Wetland Specialist and shall be incidental to this Item.

Conditional Acceptance shall indicate approval of the wetland construction work and agreement that work has been done according to plan or modified as approved.

Upon completion of wetland construction, the Contractor shall submit a Request for Conditional Acceptance. Request shall include submittal of the documentation of pre-existing conditions and construction work as specified under Item 755.75 Wetland Specialist.

Upon receipt of a Request for Conditional Acceptance, the Engineer, the Wetland Specialist and regulatory representative (if required) shall assess the replication and surrounding areas. The following conditions shall be included in the narrative and reviewed as part of the on-site assessment:

- The target elevations have been met and maintained. Areas that are too high or too low should be identified along with suggested corrective measures.
- Hydrology meets performance standards.
- Specified seed mix has been seeded. If inspected 30 or more days after spring seeding, seeded species in the wetland and adjacent upland shall show signs of germination and healthy growth. Fall seeding shall be inspected in May of the following spring. Poor establishment will require immediate re-seeding.
- Planted woody and herbaceous species meet specifications and are establishing well.
- Soils are stabilized and there is no sediment in the wetland and no channeling of slopes.
- There are no invasive plants visible in the replication area.

Upon approval of the work, MassDOT will issue a letter of Conditional Acceptance. If the replication work is not approved, MassDOT will issue a rejection letter requiring corrective actions. Corrective actions shall be at the Contractor's expense.

Erosion of adjacent slopes or the flow of sediments into the wetland between Conditional and Final Acceptance shall be immediately addressed.

CERTIFICATE OF COMPLIANCE APPLICATION

If required, a request for a Certificate of Compliance application shall be prepared and submitted within 30 days following Conditional Acceptance. The Replication Area shall be surveyed and as-built Drawings prepared by the Contractor to accompany the Request.

ITEM 755.35 (Continued)

The request for Certificate of Compliance shall include the following:

- A brief narrative of the work on company letterhead signed by the Wetland Specialist or Land Surveyor. Narrative shall be in MS Word document and shall include substantive explanation that demonstrates compliance with EACH relevant permit condition. Narrative shall note variations from the originally permitted design and shall include a minimum of 4 photographs documenting site conditions.
- As-built Drawings signed or stamped by the Contractor's Professional Engineer. As-built drawings shall show hydrologic conditions, plantings, and seeding. Plans should note variations from the originally permitted design.

When required, drawings shall meet the Army Corp of Engineer's New England District's Compensatory Replication Guidance, including: scale in the range of 1"=20' to 1" = 100', contours at 1' intervals, spot elevations for intermediate elevations, and polygons outlining each wetland Replication area. The As-built Drawings shall be provided to the Engineer electronically in Portable Document Format (PDF). If requested by the Engineer, the Drawings shall be provided in printed paper format (11" x 17" sheets, unless otherwise directed). Drawings must be scalable.

- Other documents as required.

Work that does not meet the requirements specified above shall be corrected by the Contractor, Corrective actions shall be at the Contractor's expense.

FINAL acceptance OF WORK

Following one full growing season, the Contractor shall submit a Request for Final Acceptance. Submittal shall include a brief narrative of conditions. Upon receiving the Request, the Engineer, Wetland Specialist and regulatory representative (if required) shall assess the Replication Area. Final Acceptance will initiate the start of the Wetland Monitoring Period.

The following conditions shall be inspected and approved for acceptance and payment.

- Hydrology is functioning as intended.
- Seeded species are establishing well and cover 100 percent of the area.
- No sediments have entered the wetland.
- Adjacent slopes are stabilized with desirable vegetation.
- All planted species (if included) are living and establishing well.
- There are no visible invasive plants.
- Silt fence and non-biodegradable sediment barrier materials have been removed.

If the replication work is not approved, MassDOT will issue a rejection letter requiring corrective action.

MONITORING REPORTS FOR REGULATORY COMPLIANCE

Monitoring Reports shall be as follows:

- MassDEP
- ACOE
- Conservation Commission

ITEM 755.35 (Continued)

Reports shall be completed and submitted by the Wetland Specialist as specified and compensated under Item 755.76, Wetland Monitoring Reports.

Spring Reports, when required, shall be submitted to the Engineer by July 1 for dispersal to the appropriate permitting agencies.

End of Year Reports (which may serve as the Fall Report) shall be based on inspections that occur prior to October 15th. Reports shall be submitted to the Engineer no later than November 1 of each year.

All regulatory requirements and the following, at a minimum, shall be met upon at each inspection:

- Hydrology is functioning as intended.
- Seeded species are well-established.
- No sediments have entered into wetland.
- Adjacent slopes are stabilized with desirable vegetation.
- All planted species (if included) are living and establishing well.
- There are no visible invasive plants.

If, at the end of the required monitoring period, the requirements have not been met, the Contractor shall provide corrective measures. All costs associated with corrective measures and plant replacement shall be incidental to this Item.

BASIS OF PAYMENT

Item 755.35 will be paid for at the contract LUMP SUM price; which price shall include all labor, materials, equipment, submittals, maintenance, all required hydric soil, site preparation, grading, seeding, mulching, watering, monitoring wells, as-built plans, Requests for Acceptance, Certificate of Compliance, and all incidental costs necessary to complete the work as required.

Payment shall be as follows:

- 60% upon Conditional Acceptance.
- 20% after receipt and acceptance of Certificate of Compliance by the Engineer and once all permit construction requirements have been met and approved.
- 20% upon Final Acceptance.

Excavation will be paid under Item 120.

Compost Topdressing will be paid under Item 751.7 unless used in conjunction with seeding.

Sediment Barrier will be paid under Item 767.121

Wetland Specialist will be paid under Item 755.75

Wetland Monitoring Reports for follow-up monitoring will be paid under Item 755.76

ITEM 755.75**WETLAND SPECIALIST****HOUR**

Work under the Item shall be for services of a Wetland Scientist, Wetland Ecologist, Restoration Ecologist, or other professional with similar qualifications hereafter referred to as the Wetland Specialist. Wetland Specialist shall demonstrate knowledge and expertise to coordinate and oversee all work associated with the mitigation work as defined herein, as shown on the Plans, and as specified under Item 755.35 Inland Wetland Replication Area (hereafter referred to as 755.35).

Regulatory monitoring reports following Final Acceptance of the wetland replication shall be per Item 755.76, Wetland Monitoring Reports.

For all onsite work, the Wetland Specialist shall sign in and sign out with the Engineer.

The Wetland Specialist shall not be from the same company as the company responsible for planting, seeding, and/or maintaining the wetland. QUALIFICATIONS

The Wetland Specialist shall have a minimum of five (5) years of experience with construction and monitoring of wetland mitigation areas similar in size, type, and complexity to the contract mitigation. When required by permits, ten (10) years of experience may be required. The Wetland Specialist shall be thoroughly versed in the Commonwealth of Massachusetts Wetlands Protection Act (MGL C.131, s.40), U.S. Army Corps of Engineers New England District Compensatory Mitigation Guidance, and all other relevant regulations of the Massachusetts Department of Environmental Protection and the U.S. Army Corps of Engineers New England District.

SUBMITTALS - QUALIFICATIONS

Within sixty (60) days following the Notice to Proceed, the Contractor shall provide proof of qualifications for the Wetland Specialist to the Engineer for approval. Submittals shall include, but not be limited to, the following:

- Resume of the individual on-site implementing the wetland specialist work. If the Wetland Specialist changes over the course of the project, the new individual shall submit resume and qualifications for approval 30 days prior to doing any work on-site.
- Resume of any personnel working on-site in place of the Wetland Specialist. Individual shall be approved prior to work on-site.
- Narrative describing the company, its expertise, technical qualifications and experience with wetland construction.
- At least three (3) references from prior work of a similar nature completed in the last five (5) years and by the individuals who will perform the work. Provide contact information for each reference including address, phone number and email.
- A summary of each reference project including nature of the work, project size, dates, and period of construction and monitoring, methodologies used, and summary of success (or not) in terms of meeting performance objectives. Summary shall include a minimum of one before and one after photo for each project.

ITEM 755.75 (Continued)**SUBMITTALS – DOCUMENTATION AND REPORTS****Wetland Construction Oversight**

Wetland Specialist shall provide documentation of pre-existing conditions and wetland construction as specified below and as part of fulfilling the Scope of Work. Documentation shall include photos that are clear and legible with date and time stamps. Photos are incidental to this Item.

- ***Site Walk Prior to Construction of Wetland:*** Provide brief assessment with photos, including documentation of the existing wetlands to be impacted, proposed wetland replicaton site(s), and reference/model wetland areas (typically an adjacent undisturbed wetland).
- ***Excavation and Grading:*** Documentation shall include minimum of two photos of the excavated wetland and two photos after final grading prior to planting and seeding.
- ***Planting and Seeding:*** Provide assessment and photos of vegetation upon completion of placement of wood material, planting, and seeding.
- Wetland construction documentation and reports shall be submitted with Request for Conditional Acceptance and for the Order of Conditions, Water Quality Certifications, and other regulatory permits as required.

Acceptance of Work & Regulatory Compliance

The Wetland Specialist shall submit the following documents as specified herein and under Item 755.35:

- Request for Conditional Acceptance.
- Request for Certificate of Compliance (Partial or Full) when applicable.
- Request for Final Acceptance.

SCOPE OF WORK

In the event of discrepancies with the applicable permits, the Wetland Specialist shall submit a Request for Information (RFI) to the Engineer.

General

The Wetland Specialist shall be responsible for the following:

- Review and have a comprehensive knowledge of the environmental permits relevant to the specific mitigation work being done so as to ensure compliance throughout the duration of the contract.
- Identify and inform the Contractor and Engineer of unique site conditions which may require adjustments to the schedule, design, or construction methods. For example, wildlife nesting, illegal dumping, or rare species.
- Identify and inform the Contractor and Engineer of any sediment or erosion control problems observed within mitigation areas.
- Advise so as to avoid impacts to adjacent areas and regulated wetland resources.
- Participate in necessary meetings as required by permits and when requested by the Engineer.

ITEM 755.75 (Continued)**Inspections & Construction Oversight**

The Wetland Specialist shall be responsible for oversight and approval of, but not limited to, the following:

- Pre-Construction Site Walk
 - Following surveying, flagging, and staking of all relevant boundaries and elevations by the Contractor, the Wetland Specialist shall walk the site with the Engineer and the Contractor to review existing and proposed conditions, recommend changes if necessary, and approve the following: location and boundaries of replication area, target elevations and grades, location of tree protection associated with the replication area, and limits of clearing for replication area and access route.
 - Select and mark snags, logs, and woody material to be retained for incorporation into the wetland, is appropriate.
 - Note invasive plants in and adjacent to wetland.
- Excavation, Soil Placement, Grading for Replication Areas
 - Approve excavated depth and grading and approve finished grade of placed wetland soil. If grades need to be adjusted, submit an RFI to the Engineer.
 - Adjust grades as required and approve microtopography.
- Re-vegetation of mitigation area(s)
 - Locate logs and woody material.
 - Verify seed used complies with specifications and site conditions, determine limits for wetland seeding based on elevations, approve seeding and mulching methods, and collect seed tags to submit with Request for Conditional Acceptance.
 - Review planting methods prior to installation and oversee layout of plants if required.

Conditional Acceptance

Upon completion of construction of the wetland, as part of the Request for Conditional Acceptance, the Wetland Specialist shall provide a brief narrative demonstrating that the wetland construction work was done according to plans (or how modified) and meets the required conditions. Submittal shall include a report and photo documentation of pre-construction conditions, construction work, seeding, planting, and other work as specified under Item 755.35.

Upon receipt of a Request for Conditional Acceptance, the Engineer, the Wetland Specialist and regulatory representative (if required) shall assess the Replication and surrounding area to ensure that it meets the conditions specified under Item 775.35.

Upon approval, MassDOT will issue a letter of Conditional Acceptance. If the replication work is not approved, MassDOT will issue a rejection letter requiring corrective action. The Wetland Specialist shall recommend corrective actions.

ITEM 755.75 (Continued)

Request for Certificate of Compliance

If required, a Request for Certificate of Compliance shall be prepared and submitted to Engineer immediately following Conditional Acceptance. Request shall be as specified under Item 755.35.

Request for Final Acceptance

Following one full growing season, the Wetland Specialist shall provide a brief narrative of the status of the Wetland Replication Area to be submitted with the Request for Final Acceptance.

Upon receipt of the Request, the Engineer, the Wetland Specialist, and the regulatory representative (if required) shall assess the condition of the replication and surrounding areas as specified under Item 755.35. Final Acceptance will initiate the start of the Monitoring Period.

If the Replication Area is not approved, MassDOT will issue a rejection letter requiring corrective action. The Wetland Specialist shall recommend corrective actions.

METHOD OF MEASUREMENT

Item 755.75 Wetland Specialist shall be measured per HOUR for on-site service provided by the Wetland Specialist.

Work shall include all inspections, photos, submittals, and associated tasks for construction and restoration oversight, narratives for Conditional and Final Acceptance, documentation required for permits, and all other work specified above. Payment shall not include travel time or time spent off-site on reports. Decimal Pay Limits will be 0.25 hours.

BASIS OF PAYMENT

Item 755.75 Wetland Specialist shall be paid at the contract unit price per HOUR, or fraction thereof, spent on-site to perform the work as described above. Reports and photo documentation are required for payment.

Post wetland construction reports shall be per Item 755.76, Wetland Monitoring Reports.

ITEM 755.76**WETLAND MONITORING REPORTS****LUMP SUM**

Work under this Item shall be for the submittal of post-construction Wetland Monitoring Reports and shall include all inspections, photos, and other work required to complete those reports as specified herein and under Item 755.35 Inland Wetland Replication Area (hereafter referred to as 755.35).

The Contractor shall retain the services of a Wetland Scientist, Wetland Ecologist, Restoration Ecologist, or other professional with similar qualifications, hereafter referred to as the Wetland Specialist, to complete the work of those reports.

The Wetland Specialist shall not be from the same company as the company responsible for planting, seeding, and/or maintaining the wetland.

All on-site wetland specialist services required to complete the construction and revegetation of the wetland replication shall be per Item 755.75 Wetland Specialist.

WETLAND SPECIALIST QUALIFICATIONS

The Wetland Specialist shall have a minimum of five (5) years of experience with construction and monitoring of wetland mitigation areas similar in size, type, and complexity to the contract mitigation. When required by permits, ten (10) years of experience may be required. The Wetland Specialist shall be thoroughly versed in the Commonwealth of Massachusetts Wetlands Protection Act (MGL C.131, s.40), U.S. Army Corps of Engineers New England District Compensatory Mitigation Guidance, and all other relevant regulations of the Massachusetts Department of Environmental Protection and the U.S. Army Corps of Engineers New England District.

Within sixty (60) days following the Notice to Proceed, the Contractor shall provide proof of qualifications for the Wetland Specialist to the Engineer for approval. Submittals shall include, but not be limited to, the following:

- Resume of the individual on-site implementing the wetland specialist work. If the Wetland Specialist changes over the course of the project, the new individual shall submit resume and qualifications for approval 30 days prior to doing any work on-site.
- Resume of any personnel working on-site in place of the Wetland Specialist. Individual shall be approved prior to work on-site.
- Narrative describing the company, its expertise, technical qualifications and experience with wetland construction.
- At least three (3) references from prior work of a similar nature completed in the last five (5) years and by the individuals who will perform the work. Provide contact information for each reference including address, phone number and email.
- A summary of each reference project including nature of the work, project size, dates, and period of construction and monitoring, methodologies used, and summary of success (or not) in terms of meeting performance objectives. Summary shall include a minimum of one before and one after photo for each project.

ITEM 755.76 (Continued)**SCOPE OF WORK****Post-Construction Wetland Monitoring Reports**

Inspections and reports shall be performed to ensure compliance with mitigation requirements defined under Item 755.35 and with all applicable environmental permits. Photos illustrating the status of hydrologic conditions, planted and seeded vegetation, and naturalized or invasive vegetation shall be included with the Monitoring Reports.

Reports shall be submitted to the Engineer as a digital copy in Portable Document Format (PDF). Hard copies shall be provided as requested by the Engineer. All reports shall be marked with the applicable permit numbers and identifying information as required in the permits.

Spring Reports, when required, shall be submitted to the Engineer by July 1 for dispersal to the appropriate permitting agencies.

End of Year Reports (which may serve as the Fall Report) shall be based on inspections that occur prior to October 15th. Reports shall be submitted to the Engineer no later than November 1 of each year.

Summary of reports to be submitted as required for permits is as follows:

- Year 1
 - One (1) End of Year Report with one end of year inspection.
- Year 2
 - Regulatory Agency X: One (1) End of Year Report

BASIS OF PAYMENT

Item 755.76 Wetland Monitoring Reports and associated inspections shall be at the contract LUMP SUM price; which price shall include all labor, materials, equipment, and all incidental costs required to complete the work.

The LUMP SUM price will be paid in equal installments divided by the number of reports submitted. Payment shall be made upon submittal of the report, based on the following schedule:

- Year 1 = 1 Report
- Year 2 = 1 Report

ITEM 756.**NPDES STORMWATER POLLUTION
PREVENTION PLAN****LUMP SUM**

This Item addresses the preparation and implementation of a Storm Water Pollution Prevention Plan required by the National Pollutant Discharge Elimination System (NPDES) and applicable Construction General Permit (CGP) issued by the U.S. Environmental Protection Agency (EPA).

Pursuant to the Federal Clean Water Act, construction activities which disturb one acre or more are required to apply to the EPA for coverage under the NPDES General Permit for Storm Water Discharges from Construction Activities. On February 16, 2012 (77 FR 12286), EPA issued the final NPDES Construction General Permit (CGP) for construction activity. The Contractor shall be fully responsible for compliance with the CGP. Should a fine or penalty be assessed against it, or MassDOT, as a result of a local, state, or federal enforcement action due to non-compliance with the CGP, the Contractor shall take full responsibility.

The NPDES CGP requires the submission of a Notice of Intent (NOI) to the EPA prior to the start of construction (defined as any activity which disturbs land, including clearing and grubbing). There is a fourteen (14) day review period commencing from the date on which EPA enters the Notice into their database. The Contractor is advised that, based on the review of the NOI, EPA may require additional information, including but not limited to, the submission of the Storm Water Pollution Prevention Plan (SWPPP) for review. Work may not commence on the project until final authorization has been granted by EPA. Any additional time required by EPA for review of submittals will not constitute a basis for claim of delay.

In addition, if the project discharges to an Outstanding Resource Water, vernal pool, or is within a coastal ACEC as identified by the Massachusetts Department of Environmental Protection (DEP), a separate notification to DEP is required. DEP may also require submission of the Storm Water Pollution Prevention Plan for review and approval. Filing fees associated with the notification to DEP and, if required, the SWPPP filing to DEP shall be paid by the Contractor.

The CGP also requires the preparation and implementation of a SWPPP in accordance with the afore-mentioned statutes and regulations. The Plan will include the CGP conditions and detailed descriptions of controls of erosion and sedimentation to be implemented during construction. It is the responsibility of the Contractor to prepare the SWPPP to meet the requirements of the most recently issued CGP. The Contractor shall submit the Plan to the Engineer for approval at least four (4) weeks prior to any site activities. It is the responsibility of the Contractor to comply with the CGP conditions and the conditions of any state Wetlands Protection Act Order, Water Quality Certification, Corps of Engineers Section 404 Permit and other environmental permits applicable to the project and to include in the SWPPP the methods and means necessary to comply with applicable conditions of said permits (reference to Part 9.1.1 of the 2012 CGP)

ITEM 756. (Continued)

It is the responsibility of the Contractor to complete the SWPPP in accordance with the EPA CGP, provide all information required, and obtain any and all certifications as required by the CGP. Any amendments to the SWPPP required by site conditions, schedule changes, revised work, construction methodologies, and the like are the responsibility of the Contractor. Amendments will require the approval of the Engineer prior to implementation.

Included in the CGP conditions is the requirement for inspection of all erosion controls and site conditions on a weekly basis as well as after each incidence of rainfall exceeding 0.25 inches in twenty-four hours. For multi-day storms, EPA requires that an inspection must be performed during or after the first day of the event and after the end of the event. The CGP requires that inspections be performed by a qualified individual. MassDOT requires proof of completion of a 4 hour minimum sedimentation and erosion control training class current to the latest CGP. This individual can be, but not limited to, someone that is either a certified inspector, certified professional, or certified storm water inspector. The documentation shall be included as an appendix in the SWPPP. The Engineer must approve the Contractor's inspector. This individual shall be on-site during construction to perform these inspections. In addition, if the Engineer determines at any time that the inspector's performance is inadequate, the Contractor shall provide an alternate inspector. Written weekly inspection forms, storm event inspection forms, and Monthly Summary Reports must be completed and provided to the Engineer. Monthly Summary Reports must include a summary of construction activities undertaken during the reporting period, general site conditions, erosion control maintenance and corrective actions taken, the anticipated schedule of construction activities for the next reporting period, any SWPPP amendments, and representative photographs.

The Contractor is responsible for preparation of the Plan, all SWPPP certifications, inspections, reports and any and all corrective actions necessary to comply with the provisions of the CGP. Work associated with performance of inspections is not included under this Item. The Standard Specifications require adequate erosion control for the duration of the Contract. All Control measures must be properly selected, installed, and maintained in accordance with manufacturer specifications and good Engineering practices. If periodic inspections or other information indicates a control has been used inappropriately or is no longer adequate, it is the responsibility of the Contractor to replace or modify the control for site conditions at no additional cost to the Department. Contractor must maintain all control measures and other protective measures in effective operating condition and shall consider replacement of erosion controls for each construction season.

This Item addresses acceptable completion of the SWPPP, any revisions/amendments required during construction, and preparation of monthly reports. In addition, any erosion controls beyond those specified in bid Items elsewhere in this contract which are selected by the Contractor to facilitate and/or address the Contractor's schedule, methods and prosecution of the work shall be considered incidental to this Item.

ITEM 756. (Continued)

The Contractor is advised The CGP provides specific requirements for temporary and final stabilization. This shall be incorporated into the project schedule. The permit defines specific deadline requirements for Initial Stabilization (“immediately”, i.e., no later than the end of the next work day following the day when earth-disturbing activities have temporarily or permanently ceased) and for Complete Stabilization Activities (no later than 14 calendar days after the initiation of stabilization). Stabilization criteria for vegetative and non-vegetative measures are provided in the CGP.

The CGP requires the submission of a Notice of Termination (NOT) from all operators when final stabilization has been achieved, as well as removal and proper disposal of all construction materials, waste and waste handling devices, removal of all equipment and construction vehicles, removal of all temporary stormwater controls, etc. Approval of final stabilization by the Engineer and confirmation of submission of the NOT will be required prior to submission of the Resident Engineer’s Final Estimate. The permittee is required to use EPA’s electronic NOI system or “eNOI system” to prepare and submit NOT. The electronic NOT form can be found at <https://www.epa.gov/npdes/stormwater-discharges-construction-activities#ereporting>. If you are given approval by the EPA Regional Office to use a paper NOT, you must complete the form in Appendix K of the 2012 CGP.

COMPENSATION

Payment for all work under this Item shall be made at the contract LUMP SUM price; which price shall include all the work detailed above, including Plan preparation, required revisions, revisions/addenda during construction, monthly reports and filing fees.

Payment of fifty (50) % of the contract price shall be made upon acceptance of the Stormwater Pollution Prevention plan.

Payment of forty (40) % of the contract price shall be made in equal installments for implementation of the Stormwater Pollution Prevention plan.

Payment of the final ten (10) % of the contract price shall be paid upon satisfactory submissions of a Notice of termination (NOT) when final stabilization has been achieved.

ITEM 765.441
ITEM 765.442**LOW GROWING UPLAND MIX**
ROADSIDE RIVERBANK – PART SHADE MIX**SQUARE YARD**
SQUARE YARD

The work under this Item shall conform to the relevant provisions of Subsection 765 of the Standard Specifications and the following:

The work shall consist of planting and establishing a stand of grass in the areas shown on the plans or as required by the Engineer.

For the purposes of these specifications, the term “grass” shall apply to all the forbs, grasses, sedges, and rushes included in the materials.

All seeding shall be done by a company having a minimum of five years of experience with native grass establishment. Prior to beginning work, the applicator shall furnish proof of qualifications to the Engineer for approval. Proof of qualifications includes providing documentation to demonstrate knowledge and expertise with native seeding and proof of having completed successful native seeding projects.

SEEDING SEASON

Seeding seasons shall be April 1 through May 15 and October 1 through November 15 for dormant seeding. For seeding that occurs outside of these periods, the seed rate shall be increased by 50%.

MATERIALS**Seed****Samples and Submittals**

- 1) Certificate of Materials. Prior to ordering, the Contractor shall submit to the Engineer the manufacturer or supplier’s notarized Certificate of Materials. This document shall not be used as proof of purchase, proof of material delivered, or proof of material seeded, but simply to verify supplier availability of seed listed on the date certified. The species listed shall match those specified on the plans or herein, however, cultivars may vary due to availability. Substantial substitutions or changes in the mix from that specified on the plans or herein shall be approved by MassDOT Landscape Design Section.
- 2) Seed Tag Certification. All seed lots have a seed analysis tag as required by State and Federal law. The Contractor shall submit seed tags for each bag of seed used on the project site or ensure that each tag is photo documented by the Engineer. Number of tags shall match number of bags sent by the supplier to meet rate of Pure Live Seed specified on the plans. Tag must include: kind and variety of seed; lot number; origin of seed; net weight; % purity; germination; dormant seed; germination test date; inert matter; weed, noxious and other crop seed; and name and address of company responsible for the analysis. Seeding may be considered unacceptable for payment if no tags are submitted.

ITEMS 765.441 & 765.442 (Continued)

- 3) Certificate of Compliance. Prior to payment, Contractor shall submit a signed, dated and notarized Certificate of Compliance from the Supplier that serves as proof of purchase or bill of lading. This document shall include kind and variety of seed, lot number, net weight shipped, date of sale, invoice number under which seed was purchased, and name and address of Supplier or Manufacturer. All information must be included on the notarized form, including lot number and net weight shipped for specified job. This information shall match Seed Tag Certification and quantity of seed applied on the job. Seeding may be considered unacceptable for payment if information is incomplete.
- 4) Seed Sample. Contractor may be asked, prior to seeding, to submit a seed sample for testing. Testing shall be incidental to this Item.

Quantities specified are Pure Live Seed (PLS). Greater quantities of ordered seed may be required to achieve actual specified seeding rates. Pure Live Seed is defined as the fraction of pure seed species within the mix that, by standard seed testing practices, will germinate. This is determined by multiplying the percent of seed purity by the percent of seed germination.

Seed mix shall be a custom blend as shown on the plans or shall be as specified below. Seed cultivars shall be those that are as regional to New England or the local ecotype as possible.

Item 765.441 Seeding – Low Upland Mix

Herbaceous Species may be substituted with similar species native to Massachusetts if those specified are not available. Please check with MassDOT Landscape Design on grass substitutions.

<u>Botanical Name</u>	<u>Common Name</u>	<u>% PLS By Weight</u>
Grass		
Schizachyrium scoparium		
'Albany Pine'	Little Bluestem 'Albany Pine'	52.0%
Elymus virginicus	Virginia Wild Rye	20.00%
Festuca rubra	Creeping Red Fescue	10.0%
Panicum clandestinum 'Tioga'	Deer Tongue 'Tioga'	5.00%
Agrostis perennans	Upland Bentgrass	4.00%
Juncus tenuis	Path Rush	1.0%
		92.0%
Herb/Forb		
Chamaecrista fasciculata	Partridge Pea	4.10%
Penstemon digitalis	Beard-tongue	2.00%
Solidago nemoralis	Grey Goldenrod	0.5%
Solidago caesia	Woodland Goldenrod	0.5%
Aster cordifolius	Blue Wood Aster	0.3%
Aster laevis	Smooth Aster	0.2%
Pycnanthemum tenuifolium	Slender Mountain Mint	0.2%
Baptisia tinctoria	Wild Indigo	0.20%
		8.0%
		100.00%

ITEMS 765.441 & 765.442 (Continued)

Seeding Rate

Apply this mix at 20 lbs PLS/acre on areas of less than 3:1 slope and 60 lbs PLS on areas of greater than 3:1 slope.

Add 30 lbs/acre of a cover crop. For a cover crop use either grain oats (1 Jan to 31 July) or grain rye (1 Aug to 31 Dec). Cover crop shall be incidental to seeding Item.

Item 765.442 Seeding – Roadside Riverbank –Part Shade Mix

<u>Botanical Name</u>	<u>Common Name</u>	<u>% PLS By Weight</u>
Grass		
Elymus virginicus	Virginia Wild Rye	25.00%
Elymus canadensis	Canada Wild Rye	20.00%
Schizachyrium scoparium 'Albany Pine'	Little Bluestem 'Albany Pine'	20.00%
Festuca rubra	Creeping Red Fescue	12.00%
Dichanthelium clandestinum 'Tioga'	Deertongue grass 'Tioga'	8.00%
Agrostis perennans	Upland Bentgrass	6.00%
Carex vulpinoidea	Fox Sedge	2.00%
Juncus tenuis	Path Rush	2.00%
Juncus effusus	Soft Rush	0.10%
		<hr/> 95.10%
Herb/Forb		
Penstemon digitalis	Beard-tongue	2.00%
Aster novae-angliae	New England Aster	1.00%
Solidago caesia	Woodland Goldenrod	0.50%
Aster cordifolius	Blue Wood Aster	0.50%
Eupatorium maculatum	Joe-pye Weed	0.30%
Geum canadense	White Avens	0.30%
Solidago rigida	Rigid Goldenrod	0.20%
Rudbeckia hirta	Black-eyed Susan	0.10%
		<hr/> 4.90%
		100.00%

Seeding Rate:

Apply this mix at 20 lbs PLS/acre on areas of less than 3:1 slope and 25 lbs PLS on areas of greater than 3:1 slope.

Add 30 lbs/acre of a cover crop. For a cover crop use either grain oats (1 Jan to 31 July) or grain rye (1 Aug to 31 Dec). Cover crop shall be incidental to seeding Item.

ITEMS 765.441 & 765.442 (Continued)**Fertilizer**

No fertilizers shall be applied.

Water

Water, including hose and all other watering equipment required for the work, shall be furnished by the Contractor to the site at no additional cost. Water shall be suitable for irrigation and free from ingredients harmful to plant life. All plants injured or work damaged due to the lack of water or the use of too much water shall be the Contractor's responsibility to correct.

Mulch

Seed areas shall be separately mulched with hydromulch, straw or as specified below when incorporated with compost topsoil.

Photo Documentation

Contractor shall submit photo documentation to the Engineer and Landscape Design Section. Each photo shall be date stamped. Photos shall be submitted after the following stages of construction:

- Soil preparation
- Seed and hydromulch/Compost topsoil and seed
- Germination
- Grass establishment after one full growing season (June-September)

CONSTRUCTION**Surface Preparation**

Soil preparation and seeding shall occur only when the bed is in a friable condition, not muddy or hard. Bare soils shall be raked to remove large stiff clods, lumps, brush, roots, stumps, litter and other foreign matter. All ruts and any depressions caused by settlement or rolling shall be filled with additional loam or compost and the soil shall be re-graded and rolled until presenting a firm, smooth and even finish corresponding to the required grades. No tracking or rolling shall be done on wet soil.

Seeding Methods**Seeding on Loam**

Seeding application shall be by broadcast methods followed by hydromulching. Seed may be broadcast by using a cyclone or whirlwind seeder, or by hand.

If spread by hand, small or light-seeded species such as bluestem may be mixed with approved filler (e.g., sawdust, rice, kitty litter, or clean damp sand) to achieve an even distribution. Broadcast seeding shall be undertaken in two separate passes at ninety degrees to each other. One-half the seeding rate shall be applied in each direction. Seed shall be incorporated 1/8 to 1/4-inch deep by raking or dragging, culti-packing, or tracking with heavy machinery. Raked areas shall be rolled with a weighted roller to provide good seed to soil contact. Do not roll or track the seed if the soil is wet.

ITEMS 765.441 & 765.442 (Continued)

Immediately following completion of broadcast seeding and packing, area shall be hydromulched. Hydromulch shall be per the Standard Specifications and per the manufacturer's directions. Mulch for hydroseeding shall be wood fiber only.

Seeding in Combination with Compost Topsoil

If proposed in the contract, compost topsoil shall be as specified under Item 751.7 Compost Topsoil.

Seeding shall be done as a second operation after placement of compost has been approved by the Engineer. Seeding shall be broadcast followed by hydro-mulching.

Contractor shall notify Engineer prior to seeding operation to obtain written approval of site preparation and compost topsoil application.

Irrigation

After seeding and mulching, water seeded areas to moisten soil to a depth of at least 2 inches.

No seeding shall be done if soils are muddy or dry and compacted.

Care during Seed Germination

Contractor shall care for seeded areas as required. Care shall include irrigation and weed removal as necessary for germination and healthy growth.

Over-seeding

If there are numerous areas of bare ground greater than 10-12 inches, these areas shall be over-seeded. Areas where seed fails to germinate and that become invaded by weeds shall be mowed as low as possible and over-seeded. Soil that is compacted shall be raked or roughened prior to seeding to ensure seed to soil contact.

Over-seeding application rates and methods shall be the same as those listed above. After seeding, areas shall be mulched with straw mulch or ¼ - ½ inch compost topsoil and watered with a fine mist to moisten soil to a depth of at least 2 inches.

Over-seeding shall be incidental and shall not be paid for separately.

ITEMS 765.441 & 765.442 (Continued)**Care during Grass Establishment**

Following germination of seeded species, the Contractor shall maintain the stand of grasses to ensure healthy growth.

Work shall include mowing or weed-whacking for weed control, irrigation if necessary, and monitoring for invasive plants. Watering shall provide uniform coverage without eroding soil or grassed surfaces. Treatment of invasive plants shall be per the requirements of the Engineer and the MassDOT Landscape Architect.

The Contractor shall provide all labor, equipment, materials, and water required for establishment. Contractor shall water all seeded areas as necessary to a depth of 2 inches or greater.

EXPECTATIONS OF ESTABLISHMENT

Native upland grasses and forbs will not look like turf grass. Many of the native grasses are bunch type grasses and will not form a uniform growth or have a sod-type appearance. However, seeded area shall show general uniform growth of the seeded species throughout the area. Areas with gaps of bare soil greater than 10-12 inches will be considered unacceptable and shall be over-seeded.

A well-established stand of grasses at the end of one full growing season (June-September), as determined by the Engineer in consultation with the MassDOT Landscape Architect, will be required for acceptance. At least 90-95 percent of the grass established shall be the seeded species.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Items 765.441 and 765.442 will be measured for payment by the SQUARE YARD at the end of one full growing season in the presence of the MassDOT Landscape Architect.

Items 765.441 and 765.442 will be paid for at the contract unit price per SQUARE YARD; complete in place, which price shall be full compensation for all excavating and backfilling, grading, amendments, seeding, reseeding, irrigating, care during germination and establishment, labor, materials, equipment, photo documentation, and all incidental costs required to complete the work.

ITEM 767.121**SEDIMENT CONTROL BARRIER****FOOT**

The work under this Item shall conform to the relevant provisions of Subsections 670, 751 and 767 of the Standard Specifications and shall include the furnishing and placement of a sediment control barrier. Sediment control barrier shall be installed prior to disturbing upslope soil.

The purpose of the sediment control barrier is to slow runoff velocity and filter suspended sediments from storm water flow. Sediment barrier may be used to contain stockpile sediments, to break slope length, and to slow or prevent upgradient water or water off road surfaces from flowing into a work zone. Contractor shall be responsible for ensuring that barriers fulfill the intent of adequately controlling siltation and runoff.

Twelve-inch diameter (after installation) compost filter tubes with biodegradable natural fabric (i.e., cotton, jute, burlap) are intended to be the primary sedimentation control barrier.

For small areas of disturbance with minimal slope and slope length, the Engineer may approve the following sediment control methods:

- 9-inch compost filter tubes
- Straw bales which shall be trenched

No straw wattles may be used. Additional compost filter tubes (adding depth or height) shall be used at specific locations of concentrated flow such as at gully points, steep slopes, or identified failure points in the sediment capture line.

When required by permits, additional sediment barrier shall be stored on-site for emergency use and replacement for the duration of the contract.

Where shown on the plans or when required by permits, silt fence shall be used in addition to compost filter tubes and straw bales and shall be incidental to the Item.

Sediment control barriers shall be installed in the approximate location as shown on the plans and as required so that no excavated or disturbed soil can enter mitigation areas or adjacent wetlands or waterways. Barriers shall be in place prior to excavation work. No work shall take place outside the barriers.

MATERIALS AND CONSTRUCTION

Prior to initial placement of barriers, the Contractor and the Engineer shall review locations specified on the plans 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.

ITEM 767.121 (Continued)**Compost Filter Tube**

Compost material inside the filter tube shall meet M1.06.0, except for the following: no manure or bio-solids shall be used; no kiln-dried wood or construction debris shall be allowed; material shall pass through a 2-inch sieve; and the C:N ratio shall be disregarded.

Outer tube fabric shall be made of 100% biodegradable materials (i.e., cotton, hemp or jute) and shall have a knitted mesh with openings that allow for sufficient water flow and effective sediment capture.

Tubes shall be tamped, but not trenched, to ensure good contact with soil. When reinforcement is necessary, tubes shall be stacked as shown on the detail plans.

Straw Bales

Straw bales shall be used if shown on the plans or when specified by Orders of Condition or other permit requirements.

Bales should be placed in a single row, lengthwise on the contour, with ends of adjacent bales tightly abutting one another. All bales should be either wire-bound or string-tied. Straw bales should be installed so that bindings are oriented around the sides (rather than along the tops and bottoms) of the bales in order to prevent deterioration of the bindings.

The barrier should be entrenched and backfilled. A trench should be excavated the width of a bale and the length of the proposed barrier to a minimum depth of 4 inches. The trench must be deep enough to remove all grass and other material which might allow underflow. After the bales are staked and chinked (filled by wedging), the excavated soil should be backfilled against the barrier. Backfill soil should conform to the ground level on the downhill side and should be built up to 4 inches against the uphill side of the barrier.

Each bale should be securely anchored by at least 2 stakes or re-bars driven through the bale. The first stake in each bale should be driven toward the previously laid bale to force the bales together. Stakes or re-bars should be driven deep enough into the ground to securely anchor the bales. For safety reasons, stakes should not extend above the bales but should be driven in flush with the top of the bale.

The gaps between the bales should be chinked (filled by wedging) with straw to prevent water from escaping between the bales. Loose straw scattered over the area immediately uphill from a straw bale barrier tends to increase barrier efficiency. Wedging must be done carefully in order not to separate the bales.

When used in a swale, the barrier should be extended to such a length that the bottoms of the end bales are higher in elevation than the top of the lowest middle bale to assure that sediment-laden runoff will flow either through or over the barrier but not around it.

ITEM 767.121 (Continued)**Silt Fence**

Materials and Installation shall be per Subsection 670.40 and 670.60 of the Standard Specifications and the following:

Silt fence shall only be used if shown on the plans or when specified by Orders of Condition or other permit requirements.

When used with compost filter tubes, the tube shall be placed on a minimum of 8 inches of folded fabric on the upslope side of the fence. Fabric does not need to be trenched.

When used with straw bales, an 8-inch deep and 4-inch wide trench or V-trench shall be dug on the upslope side of the fence line. One foot of fabric shall be placed in the bottom of the trench followed by backfilling with compacted earth or gravel. Stakes shall be on the down slope side of the trench and shall be spaced such that the fence remains vertical and effective.

Width of fabric shall be sufficient to provide a 36-inch high barrier after fabric is folded or trenched. Sagging fabric will require additional staking or other anchoring.

MAINTENANCE

Maintenance of the sediment control barrier shall be per 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 and continues to provide effective water and sediment control, barrier does not necessarily require replacement.

DISMANTLING & REMOVING

Barriers shall be dismantled and/or removed, as required, when construction work is complete and upslope areas have been permanently stabilized and after receiving permission to do so from the Engineer.

Regardless of site context, nonbiodegradable material and components of the sediment barriers, including photo-biodegradable fabric, plastic netting, nylon twine, and silt fence, shall be removed and disposed off-site by the Contractor.

For naturalized areas, biodegradable, natural fabric and material may be left in place to decompose on-site. In urban, residential, or other locations where aesthetics is a concern, the following shall apply:

ITEM 767.121 (Continued)

- Compost filter tube fabric shall be cut and removed, and compost shall be raked to blend evenly (as would be done with a soil amendment or mulch). No more than a 2-inch depth shall be left on soil substrate.
- Straw bales shall be removed and disposed off-site by the Contractor. Areas of trenching shall be raked smooth and disturbed soils stabilized with a seed mix matching adjacent seeding or existing grasses (i.e., lawn or native grass mix).
- Silt fence, stakes, and other debris shall be removed and disposed off-site. Site shall be restored to a neat and clean condition.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 767.121 will be measured and paid for at the contract unit price per FOOT of sediment control barrier which price shall include all labor, equipment, materials, maintenance, dismantling, removal, restoration of soil, and all incidental costs required to complete the work.

Silt fence, when used in conjunction with compost filter tubes or straw bales, will be incidental to this Item.

Additional barrier, such as double or triple stacking of compost filter tubes, shall be paid for per foot of tube installed.

Barriers that have been driven over or otherwise damaged by construction activities shall be repaired or replaced as directed by the Engineer at the Contractor's expense.

ITEM 770.1 **WATER QUALITY (GRASS) SWALE** **SQUARE YARD**

The work under this Item shall conform to the relevant provisions of the Standard Specifications, the detail shown on the plans and the following:

Geotextile Fabric for Subsurface Drainage shall conform to AASHTO M 288 and be used to wrap crushed stone. Prior to placement of crushed stone, geotextile fabric shall be placed on sides of the excavation to prevent infiltration of fines into the crushed stone. Following placement of crushed stone, the geotextile fabric shall be overlapped a minimum of 12 inches over the top of the stone as shown on the details.

Crushed Stone shall conform to M2.01.4 and shall be washed stone, free of any fines, dust, sediment or soil matter.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 770.1 will be measured and paid at the contract unit price per SQUARE YARD of swale constructed, measured horizontally; which price shall be full compensation for all shaping, grading, preparing surfaces; furnishing, and installing crushed stone, 3"-Peastone, geotextile fabric and all related labor, materials and equipment to complete the work.

Loam borrow shall be paid for under Item 751. and Seed- Low Upland Mix shall be paid for under Item 765.441.

<u>ITEM 776.563</u>	<u>MAPLE – RED 1.5-2 INCH CALIPER</u>	<u>EACH</u>
<u>ITEM 788.013</u>	<u>ALDER SHRUB – SPECKLED 2 GALLON</u>	<u>EACH</u>
<u>ITEM 789.633</u>	<u>BLUEBERRY – Highbush 2-3 FEET</u>	<u>EACH</u>
<u>ITEM 790.719</u>	<u>DOGWOOD – SILKY 2-3 FEET</u>	<u>EACH</u>
<u>ITEM 794.735</u>	<u>SUMMERSWEET SHRUB 24-30 INCH</u>	<u>EACH</u>
<u>ITEM 795.009</u>	<u>VIBURNUM – ARROWOOD 18-24 INCHES</u>	<u>EACH</u>
<u>ITEM 795.157</u>	<u>WINTERBERRY – FEMALE 24-30 INCH</u>	<u>EACH</u>
<u>ITEM 795.433</u>	<u>WILLOW – PUSSY 2-3 FEET</u>	<u>EACH</u>

The work under these Items shall conform to the applicable requirements of Subsection 771, PLANTING TREES, SHRUBS AND GROUND COVER, of the Standard Specifications, except as amended and supplemented as indicated on the Contract Drawings.

ITEM 804.3**3 INCH ELECTRICAL CONDUIT
TYPE NM - PLASTIC -(UL)****FOOT**

Work under this Item shall conform to the relevant provisions of Subsection 801 of the Standard Specifications and the following:

The work shall include the furnishing and installation of 3-inch non-metallic conduit for traffic signal systems in accordance with the Plans and as directed by the Engineer. The conduit material shall be Schedule 80 polyvinyl chloride (PVC) plastic conduit. The conduit quantity may be increased or decreased by the Engineer depending upon actual conditions encountered as provided for in Section 4.06 of the Standard Specifications.

CONDUIT IN GRASS OR IN PLANTED AREAS

Where new conduits are installed in grass and planted areas, no separate payment shall be made for the excavation, sand bedding, gravel backfill, including necessary compaction, or incidental materials, but all costs in connection therewith shall be included in the contract unit price for Item 804.3.

CONDUIT UNDER SIDEWALK, MEDIAN OR DRIVEWAYS

Where conduit is installed in a sidewalk, paved median or asphalt driveway areas, no separate payment shall be made for the saw-cutting, excavation, and sand bedding, gravel backfill, including necessary compaction, or incidental materials, but all costs in connection therewith shall be included in the contract unit price for Item 804.3. Payment for cement concrete or asphalt pavement shall be paid under the respective Item.

CONDUIT CROSSING ROADWAYS

Trenches in existing bituminous concrete pavements not subject to full depth reconstruction shall be sawcut to an 18 inch width. The existing pavements shall be sawcut through their full depth and the pavement removed.

After conduit installation, the trench shall be backfilled with controlled density-fill (CDF). CDF shall be Type 2E and shall be specified in Section M4.08.0 of the Standard Specifications. The finished grade of the CDF shall be below existing pavement surface as shown on the construction details.

Where conduit crosses roadways, no separate payment shall be made for the saw-cutting of pavement, excavation, sand bedding, controlled density fill, or incidental materials, but all costs in connection therewith shall be included in the contract unit price for Item 804.3.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Payment under this Item shall be at the Contract Unit Price bid per FOOT for furnishing and installing conduit, which price shall be full compensation for all necessary or incidental work, including saw-cutting, excavation, pull wires, warning strip, sand bedding, gravel borrow backfill, controlled density fill and compaction complete in place.

Temporary pavement for surface restoration to match the existing surface, where required shall be paid under Item 472 Temporary Asphalt Patching.

<u>ITEM 813.811</u>	<u>ELECTRIC SERVICE RISER – STA 16+03 LT</u>	<u>EACH</u>
<u>ITEM 813.812</u>	<u>ELECTRIC SERVICE RISER – STA 24+86 RT</u>	<u>EACH</u>

The work shall conform to the relevant provisions of Subsection 813 and the following:

The work under this Item shall consist of moving and relocating the existing underground utility services from utility poles.

Utility Pole # 50/25 at STA 16+03 LT

Utility Pole # UPL at STA 24+03 LT

New utility poles will be installed “By Others”. The underground conduit shall be extended by the Contractor to where the new utility poles are installed. New conduit risers and wiring shall be installed and connected to the newly relocated utility poles and power lines. The utility company will connect the risers to the power lines and not the MassDOT Contractor.

The work shall include all excavation and backfill, compaction, concrete encasement and materials or any other requirements set by the respective utility company, local codes and guidelines.

The work associated with disconnecting power and reconnecting power services to the buildings should be performed overnight between midnight and 5:00 AM or at a time convenient to the property owners or tenants occupying the building. The actual time of day or evening for the disconnecting and reconnecting will be agreed upon between the Engineer, Power Company and the property owner/tenant during construction.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Items 813.811 & 813.812 will be measured and paid for at the contract unit price per EACH; which price shall be considered full compensation for the furnishing of all labor, materials, tools and equipment associated with the work complete in place.

The work associated with the removal of utility poles, transfer of wiring to the new utility poles, and supplying and installing the new utility poles, new wiring and new riser shall be the responsibility of the respective utility companies and shall not be paid for under this Item.

<u>ITEM 824.211</u>	<u>RECTANGULAR RAPID FLASHING BEACON (AC POWER), LOCATION 1</u>	<u>LUMP SUM</u>
<u>ITEM 824.212</u>	<u>RECTANGULAR RAPID FLASHING BEACON (AC POWER), LOCATION 2</u>	<u>LUMP SUM</u>
<u>ITEM 824.213</u>	<u>RECTANGULAR RAPID FLASHING BEACON (AC POWER), LOCATION 3</u>	<u>LUMP SUM</u>

All work under this Item shall be in accordance with Section 800 of the Standard Specifications, the Plans, and the following:

DESCRIPTION

The work shall include furnishing and installing three AC-powered, pedestrian actuated, rectangular rapid flashing beacon (RRFB) systems at the locations shown in the plans. RRFBs are intended to provide supplemental warning to approaching vehicles of the potential for pedestrians to be crossing in an adjacent crosswalk.

Locations are identified as follows:

Location 1: Rustcraft Road Sta. 17+70

Location 2: Rustcraft Road Sta. 29+97

Location 3: Rustcraft Road Sta. 48+99

MATERIALS

Each RRFB system shall, at a minimum, consist of the following Items, which shall be included in the lump sum bid:

- (2) concrete foundations;
- (2) 15' traffic signal posts and pedestals;
- (2) APS pushbutton systems;
- (4) dual rectangular yellow LED beacons in NEMA enclosures;
- (2) 9"x12" R10-25 (PUSH BUTTON TO TURN ON WARNING LIGHTS) signs;
- (4) 30"x30" W11-2 (Pedestrian Warning) signs;
- (2) 24"x12" W16-7PR and (2) 24"x12" W16-7PL (Diagonal Downward Arrow) signs;
- (2) NEMA Type 3R or higher enclosures to house:
 - Electrical components, including wiring and solid-state circuit boards;
 - On-board user interface;
 - Frequency hopping spread spectrum (or other alternate FCC approved) wireless activation unit with a minimum 150' range; and
- All mounting and supporting hardware and wiring necessary to complete a working system.
- Underground service connection to listed utility pole.

ITEMS 824.211, 824.212 & 824.213 (Continued)

RRFB controller and LED beacons, APS pushbutton systems, and traffic signal posts and pedestals shall be listed on the Qualified Traffic Control Equipment List. Pedestals shall be cast iron.

The light intensity of the LED beacons during daytime conditions shall meet the minimum specifications for Class 1 yellow peak luminous intensity in the Society of Automotive Engineers (SAE) Standard J595 (Directional Flashing Optical Warning Devices for Authorized Emergency, Maintenance, and Service Vehicles) dated January, 2005. An automatic signal dimming device shall be included to reduce the brilliance of the LED beacons during nighttime conditions.

A pilot light shall be integrated into the housing of the dual rectangular yellow LED beacons, facing pedestrians in the crosswalk, to provide confirmation that the RRFB is in operation.

All signs shall be MUTCD-compliant. R10-25 signs shall have a black border and legend on a white background. W11-2, W16-7PR, and W16-7PL signs shall have a black border and legend on a fluorescent yellow-green background. All sign sheeting materials shall be per Subsection 828.41.

R10-25 signs may be integrated into the APS pushbutton system as a single unit or mounted separately on Type A aluminum.

W11-2, W16-7PR, and W16-7PL signs shall be Type A aluminum per Subsection 828.42.

Any proprietary software required for the programming and/or operation of the system shall be included at no additional cost.

FUNCTIONAL REQUIREMENTS

The RRFB system shall remain dark until pedestrian actuation.

Upon actuation, all LED beacons shall activate and flash in a rapidly flashing sequence. Each sequence shall last 800 milliseconds and there shall be 75 sequences per minute. The sequence shall be the same for each pair of LED beacons in an enclosure and shall be as follows:

1. The RRFB indication on the left-hand side shall be illuminated for approximately 50 milliseconds.
2. Both RRFB indications shall be dark for approximately 50 milliseconds.
3. The RRFB indication on the right-hand side shall be illuminated for approximately 50 milliseconds.
4. Both RRFB indications shall be dark for approximately 50 milliseconds.
5. The RRFB indication on the left-hand side shall be illuminated for approximately 50 milliseconds.
6. Both RRFB indications shall be dark for approximately 50 milliseconds.
7. The RRFB indication on the right-hand side shall be illuminated for approximately 50 milliseconds.
8. Both RRFB indications shall be dark for approximately 50 milliseconds.
9. Both RRFB indications shall be illuminated for approximately 50 milliseconds.
10. Both RRFB indications shall be dark for approximately 50 milliseconds.
11. Both RRFB indications shall be illuminated for approximately 50 milliseconds.
12. Both RRFB indications shall be dark for approximately 250 milliseconds.

ITEMS 824.211, 824.212 & 824.213 (Continued)

The flash rate of each individual RRFB indication, as applied over the full flashing sequence, shall not be between 5 and 30 flashes per second.

All RRFBs within the system shall commence and cease operation simultaneously.

The length of the flashing cycle upon each actuation shall be per the plans. There shall be no minimum time between actuations. These settings shall be user-programmable through the on-board user interface. No-fee wireless (Wi-Fi, Bluetooth®, etc.) may be used as an alternative programming method.

Each APS pushbutton shall have a tactile arrow and locator tone. The tactile arrow shall be oriented to point in the direction of the crosswalk. The locator tone shall have a duration of 0.15 seconds or less and shall repeat at 1-second intervals. The locator tone shall be set 2 to 5 dBA above ambient sound, shall automatically adjust intensity, but cap at a maximum volume of 100 dBA. The tone shall be audible whenever the LED modules are not active.

Upon activation of the LED modules, a speech message shall state, "Yellow lights are flashing." This message shall be stated twice. No vibrotactile or percussive indications shall be used.

CONSTRUCTION METHODS

No work shall commence until the shop drawings are approved.

Layout and design of the RRFB system shall conform to the plans.
Conduit installations shall be per Subsection 801.60.

Pull box installations shall be per Subsection 801.61.

Foundation installations shall be per Subsection 801.62. The top of the foundation shall be ¼" to 1" proud of the sidewalk and chamfered at 45 degrees. Gaps between the sidewalk and foundation shall be no larger than ¼" and grouted with preformed joint filler.

Equipment grounding shall be per Subsections 813.61 and 813.62.

Service connection shall be per Subsection 813.63. Contractor shall be required to pay all costs associated with the utility connection until final acceptance of the system. Upon acceptance, the Contractor shall notify the Town of Dedham in writing with the account number and meter number in order to transfer payment of the account.

The Contractor shall diagnose and replace any part of the pedestrian activated warning system that is found to be defective in workmanship, material, or manner of functioning within six months of final acceptance by the Engineer. This requirement does not supersede the one-year warranty period on materials specified in Subsection 815.20.

ITEMS 824.211, 824.212 & 824.213 (Continued)

COMPENSATION

Items 824.211, 824.212 & 824.213 shall be paid for at the contract LUMP SUM price; which price shall include all labor, materials, equipment, service connections, and incidental costs required to complete the work.

Conduit, pull boxes, and equipment grounding shall be paid for separately under their respective pay Items.

<u>ITEM 824.451</u>	<u>FLASHING WARNING BEACON – LOCATION 1</u>	<u>LUMP SUM</u>
<u>ITEM 824.452</u>	<u>FLASHING WARNING BEACON – LOCATION 2</u>	<u>LUMP SUM</u>

Work under these Items shall conform to the relevant provisions of Section 800 of the Standard Specifications, the Manual on Uniform Traffic Control Devices (MUTCD), and the following:

Included in the work are the following Items: signal posts and foundations; curve warning signs and supplemental signs; 12-inch yellow (amber) Light Emitting Diode (LED) signal heads; power adapter (NEMA 4 cabinet assembly); sawcuts; all cable and wiring; ground rods; equipment grounding and bonding; service connection; and all other equipment and materials necessary to provide a fully operational pedestrian warning beacon system as specified herein and as shown on the plans and detail drawings.

The system shall conform to all provisions of the Manual of Uniform Traffic Control Devices (MUTCD), Chapter 4L, Flashing Beacons.

Locations are identified as follows:

Location 1: Rustcraft Road Sta. 22+95 RT±

Location 2: Rustcraft Road Sta. 27+98 LT±

Equipment and Operation

The equipment to be provided under these Items shall include the following:

- Post-top mounted directional 12-inch amber LED flashing signals and bracket mounted directional 12-inch amber LED flashing signals. The LED signals shall be mounted on a 14-foot continually tapered aluminum pedestal pole with an internally lockable (Type II police lock), side-of-pole mounted control box (NEMA 4 cabinet assembly). The control box (NEMA 4 cabinet assembly) shall be pre-wired and tested by an authorized factory representative prior to delivery. The control box shall not constitute a Protruding Object per PROWAG section R402 and shall be mounted on the non-sidewalk side of the post. The proposed curve warning sign shall be mounted on the pedestal pole immediately below the post top LED signal.

ITEMS 824.451 & 824.452 (Continued)

- 12-inch amber LED flashing signals shall flash in an alternating fashion.
- Beacons shall be solar powered with top-mounted solar panels.
- Each location shall have a W1-2 Curve Warning Sign (30"x30") mounted between the two LED flashing signals. A clear distance of 12" shall be provided between the edge of each warning beacon and the edge of the nearest sign panel (see MUTCD Section 4L.01.05).
- Flashing beacons shall operate continuously, 24 hours a day, 365 days a year.

Posts and Bases

Signal posts and bases shall be aluminum with pedestal bases, painted Federal Yellow. Signal base foundations shall not obstruct a sidewalk or crosswalk so that passage by physically-challenged persons is impaired. Posts and bases shall be on MassDOT's Traffic Control Devices Approved Equipment List.

Shop Drawing Submittal

Within 30 days following execution of the Contract, the Contractor shall submit shop drawings for ornamental posts and bases, a list of equipment, and manufacturer's equipment specifications to the Engineer in accordance with the relevant provisions of Section 815.20.

No work shall be commenced by the Contractor until approval of the shop drawings and manufacturer's data has been received in writing from the Engineer.

Solar Power Requirements

The solar panel shall meet the design qualification and type approval of photovoltaic modules in accordance with IEC 61215. This specification includes radiation testing, thermal testing, and mechanical testing for environmental conditions such as UV-exposure, thermal cycling, as well as degradation of maximum power output.

The solar panel shall consist of no more than two panels, mounted to the solar engine.

Solar engine shall be constructed from powder coated aluminum, painted Federal Yellow. The solar engine shall be vented to provide cooling of the battery and electronic system. The vent shall be covered by wire mesh to prevent intrusion of insects.

Signal Housing

The bracket assembly shall be constructed such that the signal housings can be removed easily in the field without removing the solar engine. The signal housings shall be easily removable from the assembly and must be able to rotate independent from the bracket for lens alignment.

ITEMS 824.451 & 824.452 (Continued)

Warranty

The assembly and all components shall be replaced or repaired by the manufacturer if it exhibits a failure due to workmanship or material defects within the first 60 months of field operation.

System Documentation

The Contractor shall submit to the Engineer four (4) copies of the operating and maintenance instructions for all equipment complete in wiring diagram of the internal, external and field connections of all equipment the Contractor has installed on the project.

Painting

All traffic signal posts and bases and signal head housings shall be painted Federal Yellow. Controller cabinets, service meter socket boxes, mounting brackets and hardware shall be painted Federal Yellow or maintain an unpainted galvanized finish.

BASIS OF PAYMENT

Items 824.451 and 824.452 shall be paid for at their respective contract LUMP SUM prices; which prices shall constitute full and complete compensation for all labor, materials, and equipment including, but not limited to, saw-cutting, excavation, cement concrete, reinforcement, signal posts, bases and foundations; curve warning signs, 12" LED signal heads, connectors, solar panel and solar engine, NEMA cabinet, all cable and wiring, equipment grounding and bonding, and for all other incidentals necessary to complete the work as shown on the plans or as directed by the Engineer.

ITEM 824.51**FLASHING WARNING BEACONS
REMOVED AND STACKED****LUMP SUM**

The work under this Item shall conform to the relevant provisions of Section 800 of the Standard Specifications and the following:

This Item of work includes removal of all flashing beacons and associated signs and supporting structures and hardware within the project limits.

Locations are as follows:

Pedestrian Warning Sign with two 2-way flashing beacons:
Rustcraft Road, Sta. 29+93 LT

Pedestrian Warning Sign with two 2-way flashing beacons:
Rustcraft Road, Sta. 29+93 RT

Warning Beacon with 2-section flashing beacon:
Rustcraft Road, Sta. 23+30 RT

Curve Warning Sign with 2-section flashing beacon:
Elm Street, Sta. 25+92 RT

No sign shall be deactivated or removed until proposed replacements are active and operational.

Work under this Item shall include but not necessarily be limited to: removing, transporting and stacking existing flashing beacons within the project limits, as directed by the Engineer, also including the removal and disposal of posts, foundations, signs, beacons and associated electrical systems, and disconnecting the beacon power source. Old cable should be removed and properly disposed of by the Contractor.

Work includes excavation and disposal of existing foundations, and the supplying and placing of compacted gravel backfill where foundations and posts are removed and restoration of surface.

The Contractor shall carefully remove, transport and stack all material that, in the opinion of the Engineer, is salvageable. The material shall be stacked on site and the Contractor shall coordinate with the Town to schedule pick-up time and location.

If the Engineer determines that any part of the stacked material is unsuitable for reuse, or if the Town of Dedham decides to abandon part or all of such materials, said materials shall become the property of the Contractor, and he shall dispose of them away from the site. Compensation for the removal and disposal of unsuitable or abandoned shall be included under this Item.

BASIS OF PAYMENT

Item 824.51 will be paid for at the contract LUMP SUM price; which price shall be full compensation for all labor, material, equipment and incidental costs required to complete the work.

ITEM 852.11
ITEM 852.12**TEMPORARY PEDESTRIAN BARRICADE**
TEMPORARY PEDESTRIAN CURB RAMP**FOOT**
EACH**Description**

Work under these Items consist of furnishing, deploying, maintaining in proper operating conditions, and removing temporary pedestrian barricades and temporary pedestrian ramps as part of a Temporary Pedestrian Access Route (TPAR) in order to guide pedestrians around a fully- or partially-closed sidewalk. These devices are intended to prevent pedestrians from entering the work area and to prevent pedestrians from inadvertently entering the vehicle travel lane by providing visual and physical separation between each space.

Materials

The Temporary Pedestrian Barricade shall have a continuous bottom rail or edge no more than two (2) inches above the ground and eight (8) inches in height (minimum) to accommodate cane users, have a smooth and continuous hand railing along the top edge no less than 32 inches above the ground and not obstruct or project into the pedestrian path of travel. Barricade walls shall be nearly vertical and generally within the same plane.

If exposed to traffic, Temporary Pedestrian Barricades shall be crashworthy.

The Temporary Pedestrian Curb Ramp shall provide a 48-inch minimum width, with a firm, stable, and non-slip surface. Protective edging with a two (2) inch minimum height shall be installed when the curb ramp or landing platform has a vertical drop of six (6) inches or greater.

The Temporary Pedestrian Curb Ramp walkway and landing area surface shall be of a solid, continuous, contrasting color abutting up to the existing sidewalk.

If a Temporary Pedestrian Curb Ramp leads to a crosswalk, a detectable warning pad must be used at the base of the ramp; if it leads to a protected path that does not conflict with vehicular traffic then a detectable pad shall not be used.

Construction Methods

The Temporary Pedestrian Barricade shall be placed in an area that will provide pedestrians with a TPAR on a smooth, continuous hard surface for its entirety. The geometry and alignment of the facility shall meet the applicable requirements of the "Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities" and the Massachusetts Architectural Access Board.

The recommended width of the TPAR is 60 inches, but if constraints exist a minimum clear width of 48 inches shall be provided along its entirety. If a 60-inch width cannot be accommodated in full, a 60 inch by 60 inch passing space shall be provided every 200 feet or less along the TPAR.

Turning areas shall be 60 inches by 60 inches minimum.

Lateral joints between any surfaces shall not exceed 0.5 inches. Lateral edges may be vertical up to 0.25 inches high and shall be beveled at 1V:2H between 0.25 inches and 0.5 inches.

The TPAR shall be kept clear of debris, snow, and ice and the Temporary Pedestrian Barricades and Temporary Pedestrian Curb Ramps shall not obstruct drainage.

ITEMS 852.11 & 852.12 (Continued)

Removal and/or resetting of Temporary Pedestrian Barricades and Temporary Pedestrian Curb Ramps shall be considered incidental.

COMPENSATION

Payment for Temporary Pedestrian Barricades will be made at the contract unit price per FOOT installed in place, including all incidental Items. This price shall include the cost of furnishing, installing, resetting, removal, and maintaining in good working condition.

Payment for Temporary Pedestrian Curb Ramps will be made at the contract price per EACH unit installed in place, including all incidental Items. This price shall include the cost of furnishing, installing, resetting, removal, and maintaining in good working condition.

ITEM 859.

REFLECTORIZED DRUM

DAY

The work under this Item shall conform the relevant provisions of Section 850 of the Standard Specifications and the following:

Reflectorized drums placed in advanced of the work zone, along the gutter line to delineate intersection geometric curb alignment changes shown on the plans, and as required by the Engineer shall be equipped with Type A flashing warning lights. Flashing units shall be maintained in operation from dusk to dawn.

ITEM 859.1 **REFLECTORIZED DRUMS WITH SEQUENTIAL** **DAY**
FLASHING WARNING LIGHTS

The work under this Item shall conform the relevant provisions of Section 850 of the Standard Specifications and the following:

Work under this Item consists of furnishing, installing, maintaining in proper operating conditions, and removing reflectorized drums, and any necessary ballast, equipped with sequential flashing warning lights.

MATERIALS

Reflectorized drums shall be listed on the MassDOT Qualified Traffic Control Equipment List. Reflective sheeting on drums shall meet or exceed ASTM D4956 Type VIII. All drums shall be maintained in a satisfactory manner including the removal of oils, dirt, and debris that may cause reduced retroreflectivity.

The Contractor shall use one of the following sequential flashing warning light systems unless otherwise approved by the Engineer:

1. Empco-Lite LWCS D.
2. pi-Lit® Sequential Barricade-Style Lamp; or
3. Unipart Dorman SynchroGUIDE.

Sequential flashing warning lights shall be secured to reflectorized drums per the light manufacturer's specifications.

CONSTRUCTION METHODS

The first ten (10) drums in any merging or shifting taper as designated in the Temporary Traffic Control Plan shall be equipped with sequential flashing warning lights. These lights shall be operating, at a minimum, between dusk and dawn when the taper is deployed.

ITEM 859.1 (Continued)

The successive flashing of the sequential warning lights shall occur from the upstream end of the merging or shifting taper to the downstream end of the taper in order to identify the desired vehicle path. Each warning light in the sequence shall be flashed at a rate of not less than 55, nor more than 75 times per minute.

Warning lights shall be powered off when drums are not deployed in a taper.

METHOD OF MEASUREMENT

A group of ten (10) reflectorized drums with sequential flashing warning lights is considered one (1) unit and will be measured by the DAY. Each period of up to 24 hours during which this unit is in use will be measured as one day regardless of the number of times that the drums are positioned, repositioned, removed, or returned to service.

BASIS OF PAYMENT

Reflectorized Drums with Sequential Flashing Warning Lights will be paid for at the contract unit price per DAY; which shall include full compensation for furnishing, positioning, repositioning, and removing the group of ten (10) drums as directed by the Engineer.

ITEM 874.**STREET NAME SIGN****EACH**

The work to be done under this Item shall conform to the relevant provision of Subsections 828 and 840 and the following:

Town of Dedham seal shall be shown on all major street (Elm St & Rustcraft Rd) name signs. Seal specifications shall be obtained from the Town of Dedham Engineering department. All minor streets (Robinwood Rd) shall not display Town of Dedham seal.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Street name sign installations require two panels back to back per sign, which assembly shall be measured for payment as a single unit - EACH.

Item 874. will be paid for at the contract unit price per EACH; which price shall be full compensation for panel, hardware, brackets, bolts, painting, and all labor, materials equipment and incidentals required to complete the work.

Breakaway Sign post assembly(ies) with foundation shall be paid for under Item 847.1 and Item 848.1.

ITEM 874.45 MISCELLANEOUS SIGNS REMOVED AND RESET EACH

The work under this Item shall conform to the relevant provision of Section 800 of the Standard Specifications and the following:

Work shall include the dismantling, removal, transporting, storing and resetting of existing traffic signs at the locations shown on the plans. The Contractor shall completely remove the sign and post and reset said sign and post at the new location. If existing sign and/or post are not suitable for reuse as determined by the Engineer, the Contractor shall provide new sign and/or post under Items 832. and/or 847.1 respectively. New attachment hardware shall be furnished as necessary to replace any missing or unusable existing hardware.

Existing sign and/or post damaged or lost by the Contractor's operations shall be replaced in-kind by the Contractor at no additional compensation

The Contractor shall backfill with compacted gravel all holes resulting from the removal of the existing signs and their foundations and restore the area to match existing conditions of adjacent areas.

MATERIALS

Materials for signs removed and reset shall be the existing signs and supports, excluding D6 style signs. If in the opinion of the Engineer, the existing sign panel or sign support is unsuitable for reuse, a new sign panel or sign support of a size and composition equal to the existing sign panel shall be furnished, as directed by the Engineer. The hardware used to attach the sign panel to the new or existing sign support shall be the existing bolts, brackets or clamps, or new and equal quality equipment furnished by the Contractor, as directed by the Engineer.

D6 "Kiss & Ride" sign panel shall be reset on new supports following MassDOT design standards.

CONSTRUCTION METHODS

Sign panels to be removed and reset shall be cleaned before being remounted on new or existing sign supports.

The Contractor shall replace all sign panels or sign supports that are damaged or lost as a result of the Contractor's operations. The cost of replacing the damaged signs and supports shall be paid by the Contractor.

Work shall also include the excavation (including Class "B" Rock) of any existing foundations, to be removed, to a depth of at least 6 inches below grade and the supplying and placing of compacted gravel.

ITEM 874.45 (Continued)

METHOD OF MEASUREMENT

Item 874.45 will be measured for payment per EACH sign unit remove and reset; which will include dismantling, excavating and removing, loading, transporting, and resetting of the signs and their supports; gravel backfill; and concrete foundations where required.

BASIS OF PAYMENT

Item 874.45 will be paid for at the contract unit price per EACH; which price will be considered full compensation for all labor, materials, equipment and incidental costs required to complete the work.

Replacement of sign panels and supports that have been determined to be unsuitable for reuse shall be paid for under the appropriate contract Item. No payment shall be made for any sign panels or sign supports that have been damaged by the Contractor's operation.

Supports (including foundations) for D6 sign to be reset shall be paid for under Item 841.2. New P-5 breakaway sign supports shall be paid for under Item 847.1 or Item 848.1, as appropriate.

ITEM 874.51

**MISCELLANEOUS SIGNS
REMOVED AND DISCARDED**

LUMP SUM

Work under this Item includes the dismantling, removal, transportation and discarding of the existing roadside signs shown on the plans and removal and disposal of the sign supports and their foundations.

The existing signs shall not be removed until the new signs and structures replacing them are ready for traffic or until the Engineer shall permit.

BASIS OF PAYMENT

Item 874.51 will be paid for at the contract LUMP SUM price; which price shall be full compensation for dismantling, loading, transporting, and discarding of the signs as designated above, the excavating and disposal of the existing foundation and supports of the same, and the supplying and placing of compacted gravel backfill where foundations and posts are removed and restoration of surface.

ITEM 988.01

SEDIMENT FOREBAY PAVING

SQUARE FOOT

The work under this Item shall conform to the relevant provisions of Subsections 501 and 983 of the Standard Specifications and the following:

The purpose of this Item is to provide a level protective surface over a compacted gravel borrow foundation to facilitate in maintenance of the pretreatment sedimentation forebay.

The work shall include the construction to the line and grade of a level sedimentation forebay protective bottom surface conforming to the minimum size and dimensions shown on the Contract Drawings and the following:

Each piece of granite curb or edging shall have a minimum length of eighteen (18) inches, minimum width of four (4) inches and minimum depth of four (4) inches. Granite curb or edging shall be placed in an offset tile pattern with two (2) inch spacing on all sides. Material may either be new or existing curb or edging designated to be discarded as shown on the plans within the Project limits of work.

Reused curbing shall include removal, temporary storage and protection, cutting, removal and disposal of all foreign matter and installation.

Curb layout pattern shall be pre-approved by the Engineer.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 988.01 will be measured for payment per SQUARE FOOT of curbing installed and accepted as specified on the Contract Drawings.

Item 988.01 will be paid for at the contract unit price per SQUARE FOOT; which price shall include compensation for all labor, equipment and materials necessary to complete the specified work.

Gravel borrow will be paid for separately by the cubic yard under Item 151.

*** END OF DOCUMENT ***

PROJECT NO: 607901SHEET 1 of 8**ESTIMATE OF QUANTITIES – DETAIL SHEETS**

TOWN/CITY: DEDHAM YEAR: 2020
 STA.: 9+28.00 TO 56+43.00 ROAD: ELM STREET /
RUSTCRAFT ROAD

Earth Excavation	<u>2200 CY</u>	Gravel Sub-base	<u>800 CY</u>
Class "B" Rock Excavation.	<u>0 CY</u>	Gravel for Driveways	<u>300 CY</u>
Class B Trench	<u>160 CY</u>	Gravel for Sidewalks	<u>900 CY</u>

PAVEMENT MILLING AND OVERLAY

Area =92,400 SF

SURFACE 2" Superpave Surface Course - 12.5 (SSC-12.5) over
COURSE: Asphalt Emulsion for Tack Coat (RS-1H) over

PAVEMENT 2" Pavement Milling
MILLING:

PAVEMENT OVERLAY

Area =61,800 SF

SURFACE 2" Superpave Surface Course 12.5 (SSC-12.5) over
COURSE: Asphalt Emulsion for Tack Coat (RS-1H) over
 Binder Course By Others

FULL DEPTH PAVEMENT BOX WIDENING

Area = 4,900 SF

SURFACE 2" Superpave Surface Course 12.5 (SSC-12.5) over
COURSE: Asphalt Emulsion for Tack Coat (RS-1H) over

INTERMEDIATE 2" Superpave Intermediate Course 12.5 (SIC-12.5) over
COURSE: Asphalt Emulsion for Tack Coat (RS-1H) over

BASE COURSE: 4" Superpave Base Course 37.5 (SBC-37.5) over

SUB BASE: 4" Dense Graded Crushed Stone for Sub Base over
 8" Gravel Borrow Type b

BOX WIDENING LESS THAN 4'

Area = 6,800 SF

SURFACE 2" Superpave Surface Course 12.5 (SSC-12.5) over
COURSE: Asphalt Emulsion for Tack Coat (RS-1H) over

INTERMEDIATE 2" Superpave Intermediate Course 12.5 (SIC-12.5) over
COURSE: Asphalt Emulsion for Tack Coat (RS-1H) over

BASE COURSE: 6" Cement Concrete Base Course over

SUB BASE: 8" Gravel Borrow Type b

PROJECT NO: 607901

SHEET 2 of 8

ESTIMATE OF QUANTITIES – DETAIL SHEETS

TOWN/CITY: DEDHAM
STA.: 9+28.00 TO 56+43.00

YEAR: 2020
ROAD: ELM STREET /
RUSTCRAFT ROAD

CEMENT CONCRETE SIDEWALK AND PEDESTRIAN RAMPS

Area = 29,100 SF

SURFACE: 4" Cement Concrete Walk Surface (4000 PSI, 3/4", 610)
COURSE

FOUNDATION 8" Gravel Borrow Type B

CEMENT CONCRETE DRIVEWAYS

Area = 2,300 SF

SURFACE 6" Cement Concrete Walk Surface (4000 PSI, 3/4", 610)
COURSE

FOUNDATION 8" Gravel Borrow Type B

HMA DRIVEWAYS

Area = 5,500 SF

SURFACE 1-1/2" SUPERPAVE SURFACE COURSE 9.5 (SSC-9.5) OVER
COURSE

INTERMEDIATE 2-1/2" Superpave Intermediate Course 12.5 (SIC-12.5) over
COURSE:

FOUNDATION 8" Gravel Borrow Type B

Plan No.'s _____
Profile No.'s _____

Estimated by KYL
Reviewed by DJ

PROJECT NO: 607901

SHEET 3 of 8

ESTIMATE OF QUANTITIES – DETAIL SHEETS

TOWN/CITY: DEDHAM
STA.: 9+28.00 TO 56+43.00

YEAR: 2020
ROAD: ELM STREET /
RUSTCRAFT ROAD

Calculation Book No.'s 11276

Submitted by BETA Group, Inc.

102.2 TREE TRIMMING

Station 9+78 to 9+96 RT
Station 10+13 to 10+70 RT
Station 13+23 to 13+76 RT
Station 29+91 to 30+02 LT
Trees at
Station 15+50 RT
Station 24+68 LT
Station 26+65 LT
Station 26+84 LT
Station 27+07 LT
Bush at
Station 17+59 LT

For UP and Overhead Wire Relocation
As necessary for sight distance and any vertical and horizontal clearances required

102.511 TREE PROTECTION – ARMORING & PRUNING

Station 16+05 LT
Station 17+72 LT
Station 17+80 LT
Station 18+29 LT
Station 18+44 LT
Station 18+55 LT

102.521 TEMPORARY TREE PROTECTION FENCE

Station 17+50 to 17+85 LT
Station 18+25 to 18+60 LT

PROJECT NO: 607901SHEET 4 of 8**ESTIMATE OF QUANTITIES – DETAIL SHEETS**TOWN/CITY: DEDHAMYEAR: 2020STA.: 9+28.00 TO 56+43.00ROAD: ELM STREET /
RUSTCRAFT ROAD**103. TREE REMOVED – DIAMETER UNDER 24 INCHES**

Station 24+62 LT

Station 14+92 RT

Station 17+65 RT

Station 21+48 RT

Station 22+70 RT

Station 23+20 RT

227.22 SLUICE STRUCTURE

Station 36+88 RT

263. LEACHING CHAMBER

Station 48+22 to 48+85 LT

358. GATE BOX ADJUSTED**Water Gates**

Station

10+08 LT 34+65 RT

10+11 RT 39+68 RT

13+21 RT 39+75 RT

15+05 LT 39+83 LT

15+11 LT 40+38 LT

15+14 RT 40+73 RT

17+00 LT 40+93 RT

19+30 RT 41+00 LT

21+28 LT 46+26 LT

23+45 RT 46+30 RT

23+66 RT 46+31 RT

23+78 RT 46+36 RT

26+72 LT 49+79 RT

26+73 LT 51+47 RT

Sewer Gates

Station

30+01 LT

30+17 LT

37+76 RT

37+90 RT

41+00 RT

41+13 RT

45+96 RT

46+09 RT

50+23 RT

50+36 RT

PROJECT NO: 607901SHEET 5 of 8**ESTIMATE OF QUANTITIES – DETAIL SHEETS**

TOWN/CITY: DEDHAM YEAR: 2020
STA.: 9+28.00 TO 56+43.00 ROAD: ELM STREET /
RUSTCRAFT ROAD

28+77 LT	51+54 RT
29+74 LT	51+61 RT
29+81 LT	51+71 RT
29+92 LT	54+30 LT
33+98 RT	55+52 LT
34+12 RT	55+57 RT

381. SERVICE BOX

Used in case of broken Service Box is encountered

381.3 SERVICE BOX ADJUSTED

Adjustment required for new sidewalk.

384. CURB STOP

Used in case of broken Curb Stop is encountered.

390.01 SPRINKLER SYSTEM MODIFIED

Legacy Place between Sta 12+00 and 14+00 LT
Sta 17+57 LT
Sta 24+00 to 24+40 RT
And any additional sprinkler location encountered

402.1 DENSE GRADED CRUSHED STONE FOR SUB-BASE

Used in Full Depth Box Widening > 4' in addition to
Shoulder at Sta 42+03 to 46+47 LT (4 inch depth)

451. HMA FOR PATCHING

Drainage and utility patches within micromilling and resurfacing areas.

PROJECT NO: 607901SHEET 6 of 8**ESTIMATE OF QUANTITIES – DETAIL SHEETS**TOWN/CITY: DEDHAMYEAR: 2020STA.: 9+28.00 TO 56+43.00ROAD: ELM STREET /
RUSTCRAFT ROAD**472. TEMPORARY ASPHALT PATCHING**

Patching of miscellaneous work throughout the project and temporary ramping.

580. CURB REMOVED AND RESET

Station 9+34 to 9+39 RT
Station 9+86 to 9+97 RT
Station 10+13 to 10+20 RT
Station 11+96 to 12+46 RT
Station 12+82 to 13+57 RT
Station 13+84 to 13+88 RT
Station 14+57 to 14+99 RT
Station 15+36 to 15+69 RT
Station 15+97 to 16+49 RT
Station 10+99 to 16+36 LT
Station 16+77 to 16+98 LT
Station 30+70 to 32+26 LT
Station 32+80 to 34+02 LT
Station 34+61 to 35+21 LT

630.2 HIGHWAY GUARD REMOVED AND DISCARDED

Station 17+64 to 23+04 LT
Station 23+13 to 26+24 LT

670. FENCE REMOVED AND RESET

Station 11+93 to 12+52 RT

711. BOUND REMOVED AND RESET

Station 12+46 LT

751. LOAM BORROW

In front of Residential and Commercial Areas, at water quality swales, and planting area.

PROJECT NO: 607901SHEET 7 of 8**ESTIMATE OF QUANTITIES – DETAIL SHEETS**TOWN/CITY: DEDHAMYEAR: 2020STA.: 9+28.00 TO 56+43.00ROAD: ELM STREET /
RUSTCRAFT ROAD**751.72 COMPOST TOPDRESSING**

At Wetland Replication and Riverfront Restoration Areas and at Roadside within Woods and Wetland, not including water quality swale areas.

751.8 LOAMY SAND BORROW

Used at bottom and sides of infiltration basin.

765.01 HYDROSEEDING

Used in front of Residential and Commercial areas.

765.441 LOW GROWING UPLAND MIX

Used at water quality swales, planting area, and infiltration basin/sediment forebay.

765.442 ROADSIDE RIVERBANK – PART SHADE MIX

Used in Wetland Replication and Riverfront Restoration Areas and at Roadside within Woods and Wetlands.

767.121 SEDIMENT CONTROL BARRIER

Station 35+64 to 55+93 LT

Station 36+44 to 47+07 RT

767.6 AGED PINE BARK MULCH

At Legacy Place

Station 11+76 to 14+71 LT

Station 16+37 to 16+52 LT

Station 16+73 to 17+13 LT

PROJECT NO: 607901

SHEET 8 of 8

ESTIMATE OF QUANTITIES – DETAIL SHEETS

TOWN/CITY: DEDHAM

YEAR: 2020

STA.: 9+28.00 TO 56+43.00

ROAD: ELM STREET /
RUSTCRAFT ROAD

769. PAVEMENT MILLING MULCH UNDER GUARDRAIL

Station 17+72 to 26+60 LT

Station 52+92 to 53+62 LT

770.1 WATER QUALITY (GRASS) SWALE

Station 36+70 TO 37+10 RT

Station 38+00 to 38+50 LT

Station 39+00 to 41+90 LT

Station 46+50 to 47+70 LT

813.811 ELECTRICAL SERVICE RISER – STA 16+03 LT

UP #20/25 LT

813.812 ELECTRICAL SERVICE RISER – STA 24+86 RT

UPL RT

DOCUMENT A00808

PROJECT UTILITY COORDINATION FORM

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Project Utilities Coordination (PUC) Form

CONTACTS AND GENERAL UTILITY INFORMATION

Revision
Date:
10/23/2020
PRINTED

City/Town: Dedham	Project File #: 607901	Utility Pole Set: Eversource
Route/Street: Pedestrian Improvements On Elm St & Rustcraft Rd	Resident Engineer: TBD	Scheduled Ad Date: 12/19/2020
Consultant: Municipality Consultant - Beta Group, Inc		Total Poles Relocated: 12

Municipality Company	Contact	Office #	Cell #	Email	Scope, Budget, Duration Submitted		Reimbursement		Notes	Utilities On Bridge/Structure		Utilities Underground (UG) /Aerial (OH)	
					Yes	No	Agreement	Non-Reimb		YES	NO	YES	NO
Eversource Electric	Richard Comeau Terence Doonan Alex Clarke	781-441-8162 617-541-5714 508-660-5257		richard.comeau@eversource.com terence.doonan@eversource.com alex.clarke@eversource.com	X		X	X	Direct buried cable adjacent to utility pole line. 16 MH and ductbank to be installed as non-reimbursable.			X	X
Dedham Fire Alarm	Joseph Goode John Howard	781-751-9417		jgoode@dedhamfire.com	X		X		OHW Relocations			X	X
Comcast Cable Corporation	Wendy Brown Michael Cooney	978-848-5163 508-884-2329		Wendy_Brown@comcast.com Michael_Cooney@comcast.com	X		X		OHW Transfers. Rebuild aerial trunk and feeders			X	X
RCN	Margot Jones	781-316-8881		Margot.Jones@rcn.net	X		X		OHW Relocations			X	X
Verizon	Karen Mealey Paul Diamantopolous	774-409-3160		karen.mealey@verizon.com paul.diamantopolous@verizon.com	X		X		OHW Transfers. Install and splice new fiber and copper			X	X
Eversource Gas	Jeffrey Evans-Mongeon	508-305-6970		Jeffrey.Evans-Mongeon@eversource.com	X		X		3 Prop locations			X	X
For Information Only													
Dedham Director of Engineering	Jason Mammone	781-751-9350											
Dedham-Westwood Water District (Mun.)	Matt Lanen Stephen Locke	781-329-7090		matt.lanen@wwd.com					Please contact for Water Gate Adjustment Workout				
Dedham DPW	Joseph Flanagan	781-751-9350											
No Facilities or No Conflicts													
AT&T/Teleport Communications America, c/o Siena Engineering Group	Hayleigh Walker	781-221-8400/7023		Hayleigh.Walker@usa.net			X		No Facilities 11-3-2015				
Lumen	Reyn Thomas	516-712-3041		reyn@lumen.com			X		No Facilities 05-11-2020				
Crown Castle	Mark Bonanno	508-616-7818		mark.bonanno@crowncastle.com			X		No Facilities 05-19-2020				
Eversource Fiber	Tomi Fadige	781-441-3864		tomifadige@eversource.com			X		No Facilities 06-17-2020				
MCI-Verizon Business	Stephen Parrretti	508-248-1305		stephen.parrretti@verizon.com			X		No Facilities 8-25-15				
MWRA Sewer	Kevin McKenna	617-305-5956		Kevin.McKenna@mwra.state.ma.us			X		No Facilities 10-6-2016				
MWRA Water	Ralph Francesconi	617-305-5827		Ralph.Francesconi@mwra.state.ma.us			X		No Facilities 7-26-2015				

Utility Relocation Notes for MassDOT Contractor
 Unless otherwise noted by Contract, the MassDOT Contractor is to provide the District Construction Office with 7 Calendar Days advance notification in order to validate the current progress and provide the required 30 Days advance notice-to-proceed for the first Utility - and each subsequent Utility. These advance notifications are to be identified in the Contractor's Schedules (Pre-Con preparation, Baseline, Subnets, and Updated/Monthly Schedules) as specified in Subsection 8.02 (for DBB Contracts) and/or Section 9 (of DB Contracts). Note: The durations included below do not include these lead-times. See Additional 'Important Basis notes for Contractor' - on last PUC Form page.

Additional notes:

Suggested Sequence of Relocation (Based on Consultant proposed construction staging)
 The sequence as detailed on the following pages is based on the consultants proposed staging plan. This information was compiled through meetings that included all of the utilities listed below along with the designer and the Town of Dedham. The information provided is the best available information prior to project advertisement.

PUC FORM - CONTINUED

is 'enabling' (prep) work, by the Contractor, necessary prior to the start of the first series of utility relocations:

Yes	No
X	

is there the 'potential' for any of the identified Utility work to happen concurrently:

Yes	No
X	

Project File #: 607901
 City/Town: Dedham
 Route/Street: Pedestrian Improvements On Elm St & Rustcraft Rd



10/23/2020
PRINTED

RESPONSIBLE PARTY	DESCRIPTION - Utility Relocation Phases, Tasks and Activities	Estimated Duration (Work Days) by Utilities (Lead time not included)				Concurrent / Exclusive Utility Work				Access Restraint & Limitations of Operations Notes		
		Utility working with other utilities on site	Utility working with no other utilities in vicinity	No Contractor physical construction operations on-site (while Utility is working)	Contractor and Utility are working on-site - but NOT in the same vicinity	Exclusive Utility on site	Concurrent Utilities	Contractor Off-Site	Contractor Concurrent	Potential Access Restraint (Yes/No)	Reason/Note (optional)	
C	Enabling work by the Contractor - Prep site (Clearing, grubbing, guard rail removal) as required. Contractor will also install project environmental controls (hay bales, silt fence, etc.) as required per the project plans prior to the start of any work.											
C	UTILITY OPERATIONS - UNDERGROUND											
Task: 1	Eversource Gas											
u	Eversource crew mobilize pipe, equipment, materials, and perform project review.											
u	Dig and shore main connection/tie-in openings.											
u	Fabricate and install new 6" plastic main permanent bypass at sta. 26+20 +/-											
u	Perform gas main connection to the existing. Cut, cap, and abandon existing gas main. Backfill & restoration.											
u	Eversource crew mobilize pipe, equipment, materials, and perform project review.											
u	Dig and shore main connection/tie-in openings.											
u	Fabricate and install new 8" plastic main permanent bypass at sta. 43+50 +/-											
u	Perform gas main connection to the existing. Cut, cap, and abandon existing gas main. Backfill & restoration.											
u	Eversource crew mobilize pipe, equipment, materials, and perform project review.											
u	Dig and shore main connection/tie-in openings.											
u	Fabricate and install new 8" plastic main permanent bypass at sta. 45+30 +/-											
u	Perform gas main connection to the existing. Cut, cap, and abandon existing gas main. Backfill & restoration.											
	Sub-Total											
Task: 2A	Eversource Electric											
u	Install 6 manholes											
u	Install / replace conduit											
u	Install cable											
u	Splicing											
u	Remove cable											
	Sub-Total											
Task: 2	UTILITY OPERATIONS - AERIAL											
C	Enabling work by the Contractor - Mark out relocated poles, Field meeting to walk the poles with all utilities and reconfirm pole relocations.											
Task: 2B	Eversource Electric											
u	Relocate / replace poles											
u	Overhead transfers											
u	Replace / remove transformers											
u	Build risers											
u	Install guy / anchors											
u	Replace switches											
	Sub-Total											
Task: 3	Dedham Fire Alarm											
u	Transfer Wire to new poles from old											
u	Run new wire where needed and piece back into city loop											
	Sub-Total											
Task: 4	RCN											
u	Move slack on fiber where possible and run new fiber create new slack point											
u	Replace coax and strand to new pole locations											
u	Splice fiber & coax											
u	Test all splices											
	Sub-Total											
Task: 5	Comcast											
u	Build new strand and coax along major run											
u	Multiple fibers to be relocated along run											
	Sub-Total											
Task: 6	Verizon											
u	Verizon line crew places support strands on new poles & guys to balance loads on new poles											
u	Verizon contractor breaks out and extends conduit at P-50/30 Elm St to new pole location											
u	Verizon line crew places new copper and fiber cables on poles											
u	Verizon splice crew cuts over new copper and fiber cable on poles											
u	Verizon splice crews trim out dead copper and fiber cables											
u	Verizon line crew removes dead cables and terminals											
u	Verizon splice crew recons working lines to buildings											

RESPONSIBLE PARTY	DESCRIPTION - Utility Relocation Phases, Tasks and Activities	Estimated Duration (Work Days) by Utilities (Lead time not included)	Concurrent / Exclusive Utility Work				Access Restraint & Limitations of Operations Notes	
			Exclusive Utility on site	Concurrent Utilities	Contractor Off-Site operations on-site (while Utility is working)	Contractor Concurrent	Potential Access Restraint (Yes/No)	Reason/Note (optional)
C = Contractor	u Verizon line crew transfers cables, guying, and terminals onto new poles	4		x				
u	Verizon line crew removes anchors, extension arms and guying from old poles	1	x					
u	Verizon line crew removes old poles	3	x					
	Sub-Total	78						
Stage: 3	Enabling work by the Contractor - Notify Utilities prior to final paving							
Task: 7	UTILITY OPERATIONS - Adjust Structures for HMA Paving							
u	Eversource Electric	2						* DUCE EST.
u	Verizon	2						* DUCE EST.
u	Eversource Gas	2						* DUCE EST.
C	Water, Drainage, Sewer							* DUCE EST.
	Sub-Total	6						
	IMPORTANT BASIS NOTES - FOR CONTRACTOR							
	1 Unless otherwise specified in the MassDOT Construction Contract, or unless specifically noted within this PUC Form, these durations (herein) are based upon the Contractor providing <i>unimpeded access</i> to the Utility company to perform Utility relocations (see Note 5 - Access).							
	2 "Concurrent Utilities" operations noted herein, are to signify those Utility Company operations that can be worked concurrently (e.g. Utility A and Utility B work on-site together) - MassDOT and the Contractor are to prepare NTPs to Utilities accordingly.							
	3 "Potential Access Restraints" noted within this PUC Form are for planning purposes. See MassDOT Contract for Contractual Access Restraints (refer to Subsections 8.02, 8.03, and/or 8.06 for Design Bid Build Contracts and Volume II Section 9 for Design Build Contracts).							
	4 Utility non-work periods - For planning purposes, the durations above contain some non work days (contingency) for New England conditions (precipitation, high temperatures, low temperatures, snow, ice). Gas line work however, typically has a seasonal restriction and can NOT be installed from 15-November to 15-March. Municipally Owned Electric and Gas Utilities are also restricted from proceeding from 15-November to 15-March. The Contractor shall (and the CTD plan reflect this calendar restriction within the schedule (unless otherwise note).							
	5 Access - Unless otherwise noted in the Contract, and in addition to the 'enabling' notes above, the Contractor must provide safe and unimpeded access (for trucks, lifts, cranes, etc.) to the Utilities, to allow for the proposed relocation(s) - including but not limited to snow removal, clearing and grubbing, guard rail removal, barrier removal, tree removal, and grading. Any costs associated with these tasks are deemed to be incidental to the project.							
	6 For all MassDOT construction contracts issued after January 2014, the new Utility Coordination/documentation specification is required. This is Section 8.14 in Design-Bid-Build Contracts (see Design-Build index reference for applicable section #).							
	7 Prior to starting any and all enabling work for Utilities, the Contractor is to plan in advance with submittals and approved durations.							
	8 * Potential District Initiated Early Utility Relocation - if noted herein, the District reserves the right to initiate early utility relocation in advance of the Contract NTP. In submitting a bid price and in the development/basis of the Baseline Schedule, the Contractor shall not plan the Work with the potential benefit of any form of 'early utility relocation.' As a requirement of the Baseline submission, unless otherwise noted in this Specification, the earliest that the first Utility company is to receive the 30 days advance notification to mobilize to the site, will be 7 calendar days after the pre-construction meeting and never sooner than 7 days after the Contract NTP.							
	9							

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DOCUMENT A00810

MassDOT Herbicide Use Report

MassDOT Herbicide Use Report

Date Submitted:

Use multiple sheets for multiple application techniques or sites as needed.

Contractor
Performing Work:

Project or Contract No:

Town/s:

Associated Route:

Project Description:

Treatment Description:

Area Treated (as applicable)

Acres: **Sq Yds:** **Miles:**

Weeds Targeted:

Gallons Formula Used:

Application Method:

Date/Time Began:

Date/Time End:

Product Used:

Name: _____
EPA Reg. No: _____
% Active Ingredient
Dry: _____
Liquid: _____
Formulation (dilution rate): _____

Name: _____
EPA Reg. No: _____
% Active Ingredient
Dry: _____
Liquid: _____
Formulation (dilution rate): _____

Name: _____
EPA Reg. No: _____
% Active Ingredient
Dry: _____
Liquid: _____
Formulation (dilution rate): _____

Additional products used (surfactants, etc.) or other information:

Applicators:

License Numbers:

Upon completion, please submit form to MassDOT District Engineer and Landscape Design Section in Boston office.
11-16-2017



**MASSACHUSETTS
BAY
TRANSPORTATION
AUTHORITY**

RAILROAD OPERATIONS DIRECTORATE

The attached Specifications are required for any construction and/or related activities on, over, under, within or adjacent to railroad property owned or controlled by the Massachusetts Bay Transportation Authority. They are intended to provide general guidelines and safeguards. Attachment "A" of Construction Guidelines and Procedures contains a summary of MBTA Railroad Operations Specifications which may be required. It is the responsibility of the Contractor to obtain all the necessary specifications for each project.

AUGUST 2014



**MASSACHUSETTS BAY
TRANSPORTATION
AUTHORITY**

RAILROAD OPERATIONS DIRECTORATE



GUIDELINES AND PROCEDURES
FOR CONSTRUCTION ON
MBTA RAILROAD PROPERTY

AUGUST 2014

SECTION 1. SCOPE

- 1.01 These specifications provide general safeguards to railroad property owned or controlled by the Massachusetts Bay Transportation Authority and to railroad operations upon that property during the performance of construction and/or related activities on, over, under, within or adjacent to the railroad property. They are intended as guidelines and do not represent all legal requirements which are or may be associated with construction and/or related activities. The MBTA reserves the right to require additional information and clarification and to make unilateral changes to these specifications at any time, at its sole discretion.

SECTION 2. DEFINITIONS

MBTA

Massachusetts Bay Transportation Authority; Massachusetts Realty Group, Designated Representative of MBTA Real Estate

RAILROAD COMPANY

The particular reference for the purpose of these specifications is the railroad company which maintains and/or operates or has trackage rights on the subject MBTA Railroad Property, including, but not limited to:

- Massachusetts Bay Transportation Authority (MBTA")
- Keolis Commuter Services
- Providence and Worcester Railroad (PW)
- National Railroad Passenger Corporation ("Amtrak")
- CSX Transportation ("CSX")
- Pan Am Railways (PAR) and subsidiaries The Boston and Maine Corporation (BM), The Springfield Terminal Railway Company (ST), its affiliates, successors and assigns
- Bay Colony Railroad Corporation (BLCR)

MBTA RAILROAD PROPERTY

All railroad rights of way and adjacent owned and/or controlled by the MBTA.

OWNER

The individual, utility, government, or corporation having title to the structure to be constructed upon, over or adjacent to the railroad property owned or controlled by the MBTA.

UTILITY

Public or private communication, water, sewer, electric, gas and petroleum companies or other entity governed by the Massachusetts Department of Public Utilities.

GOVERNMENT

Federal, State, Town, City, County and other forms of government.

CORPORATION

Any firm duly incorporated under laws of a state government.

INDIVIDUAL

Any party not defined by "Owner, Utility, Government or Corporation".

CONTRACTOR

The individual, partnership, firm, corporation or any combination thereof, or joint venture, contracting with a Utility, Government, Firm, Company, Corporation or Individual for work to be done on, over, under, within or adjacent to MBTA Railroad Property.

OWNER OR ITS CONTRACTOR

As used in these specifications, does not affect the responsibilities of either party for work conducted on, over, under, within or adjacent to MBTA Railroad Property.

CONSTRUCTION DRAWINGS

Original drawings, submitted to the Engineer by the Contractor pursuant to the Work, including, but not limited to: stress sheets, working drawings, diagrams, illustrations, schedules, performance charts, brochures, erection plans, falsework plans, framework plans, cofferdam plans, bending diagrams for reinforcing steel, or other supplementary plans or similar data which are prepared by the Contractor or a Subcontractor, manufacturer, supplier or distributor, and which the Contractor is required to submit for review and approval by the MBTA. Working Drawings: Contractor prepared plans for temporary

structures and facilities. Working Drawings for elements of work which may affect safety of persons or property included but are not limited to Contractor's plans for temporary structures such as decking, temporary bulkheads, support of utilities, and for such other work as may be required for construction but which do not become an integral part of completed project.

SECTION 3. SUBMITTALS

3.01 INITIAL CONTACT

- A. The MBTA owns the majority of the railroad lines in eastern Massachusetts. Many of these railroad lines are operated for passenger service, using a Railroad Company as an operating and maintaining Contractor. Some of the railroad lines are used for freight-only service, operated and maintained by other Railroad Company(s). In most instances, both passenger and freight service are operated over the same railroad lines.
- B. All of the MBTA railroad lines are maintained by a designated Railroad Company(s), excepting rapid transit and light rail lines. The maintaining Railroad Company(s) has rights and responsibilities, in addition to the MBTA's property owner's rights.
- C. To obtain further information concerning License Agreements, Easements, Licenses for Entry and performance of construction related activities which affect MBTA Railroad Property, a written request may be forwarded to:

License Administrator
Massachusetts Realty Group
20 Park Plaza, Suite 1120
Boston, MA 02116

or you may access the website at www.mbtarealty.com

The License Administrator is also the contact person for information concerning rapid transit and light rail lines.

SECTION 4. PLANS AND SPECIFICATIONS

- 4.01 SCOPE: It is the intent of the MBTA to eliminate or minimize any risk involved with construction or related activities on, over, under, within or adjacent to MBTA Railroad Property. Therefore, MBTA approval and

frequently one or more Railroad Company(s) approval of construction plans and specifications for all phases of a proposed project affecting MBTA Railroad Property is required.

- 4.02 GENERAL: If requested by the License Administrator, the applicant must provide six (6) sets of plans and specifications to the License Administrator. These plans and specifications must meet the approval of the Railroad Company(s) and the MBTA prior to the start of construction. These plans are to be prepared in sizes as small as possible (no smaller than 11" x 17") and are to be folded to an 8-1/2 inch by 11 inch size (folded dimensions) with a 1-1/2 inch margin on the left side and a 1 inch margin on the top.
- A. After folding, the title block and other identification of the plans shall be visible at the lower right corner, without the necessity of unfolding. Each plan shall bear an individually identifying number and an original date, together with subsequent revision dates, clearly identified on the plan.
 - B. All plans are to be individually folded or rolled and where more than one plan is involved, they shall be assembled into complete sets before submission to the MBTA.
- 4.03 PLANS: The plans are to show all the work which may affect MBTA Railroad Property, and contain a location map and plan view of the project, with appropriate cross sections and sufficient details. The proposed construction or related activities must be (orated with respect to top of rail (vertical) and center line of track (horizontal). The plan must also include railroad stationing, property lines and subsurface soil conditions. The subsurface information is to be in the form of boring logs with the borings located on the plan view. The plans must be stamped by a Professional Engineer registered in the state of Massachusetts. (The purchase of railroad valuation plans may be arranged by contacting MBTA Engineering offices at (617) 222-6178).
- 4.04 SPECIFICATIONS: The specifications summarized on Attachment "A" attached hereto are the Standard Specifications of the MBTA Railroad Operations Department and apply to all types of construction work affecting MBTA Railroad Property.
- A. In addition to "Maintenance and Protection of Railroad Traffic" and "Insurance Specifications" which are required for all work on, over, under, within or adjacent to MBTA Railroad Property, certain other Specifications contained in Attachment "A" shall be incorporated into construction/engineering submittals when deemed necessary by the MBTA and/or Railroad Company(s). (The purchase

of additional specifications may be arranged by contacting MBTA offices at (617) 222-3448 or visiting Massachusetts Realty Group website at www.mbtarealty.com.

SECTION 5. SUBMISSION REVIEW

- 5.01 An initial submission of six (6) sets of plans and specifications for MBTA review must be forwarded to the License Administrator, along with a completed MBTA Application for Entry (Attachment "B"). The submission will be circulated for review and comment to MBTA departments which may be impacted by the proposed project. If approved by the MBTA, the Railroad Company(s) will review.
- 5.02 The applicant is advised that the MBTA's initial review process requires a minimum forty-five (45) day period, prior to the Railroad Company(s) involvement, and additional processing time may be required for specific documents (See Section 9).

SECTION 6. INSPECTIONS/PAYMENTS

- 6.01 The MBTA may inspect all projects affecting MBTA Railroad Property at least twice, at the applicant's sole expense. The actual number of MBTA inspections will depend on the size and complexity of the project.
- 6.02 The MBTA may utilize Railroad Company inspectors and flagmen for daily inspection and protection of rail traffic during the term of the construction period or related activities. The Owner or Contractor will be responsible for advance payment of all associated fees.
- 6.03 Advance payments to the MBTA for construction/engineering review of plans and specifications by MBTA staff must be submitted when initial contact is made with the License Administrator. Payments shall be in the form of check or money order, made payable to the Massachusetts Bay Transportation Authority.
- 6.04 Advance payments covering the services for Railroad Company(s) construction/engineering review of plans and specifications, or services of an inspector or flagman, will be paid directly to the Railroad Company(s). The MBTA will advise when such services are required, and the Railroad Company(s) will advise of the amount of the required advance payment.

SECTION 7. EXAMINATION OF PLANS OR PROPERTY

- 7.01 The Contractor/Applicant shall have no claim for any differences between MBTA valuation plans and the actual conditions encountered in the field.

SECTION 8. INSURANCE AND INDEMNIFICATION

- 8.01 Prior to entry upon MBTA Railroad Property, insurance will be provided to and approved by the MBTA and affected Railroad Company(s), as outlined in "Insurance Specifications."
- 8.02 Additionally, all MBTA Licenses and Letters of Authorization contain a clause for Indemnifying MBTA and the Railroad Company(s) from and against any and all liabilities, losses, damages, costs, expenses, causes of action, suits, claims, demands and/or judgments of any nature whatsoever that may be imposed upon or incurred by or asserted against the MBTA or the Railroad Company(s).

SECTION 9. LEGAL DOCUMENTS FOR TEMPORARY AND PERMANENT INSTALLATIONS

- 9.01 The nature of entry upon or installation within MBTA Railroad Property will determine the authorizing document to be issued. Listed below are brief descriptions of MBTA documents:
- A. **License for Entry:** Authorizes short-term entry for purposes of survey, Inspection, test borings, access, etc. One time administrative/engineering/legal review and access fees.
 - B. **License Agreement:** Authorizes installations, subject to termination clause, if Applicant chooses not to pursue an Easement. One time administrative/engineering/legal review fee as well as annual rental fee.
 - C. **Easement:** Authorizes permanent installations in form suitable for recording at Registry Deeds. All easements are non-exclusive and subject to relocation at the Owner's expense, for Mass transportation purposes:
 - 1. Easements must receive MBTA Board of Directors approval, which involves considerable time. Once approved by the Board of Directors and upon payment in full to the MBTA, a License for Construction is issued. Upon final inspection and acceptance of the installation by the MBTA the Easement document is issued.
 - 2. Permanent Subsurface Easement widths are limited to a maximum three-foot distance on either side of the occupation.

3.
 - a) A one-time administrative/engineering/legal review fee, in addition to value of easement, as established by independent appraisal conducted at the Applicant's expense.
 - b) If easement size is minimal, as determined by the MBTA, a fixed fee, encompassing administrative/engineering/legal review fee.
- D. **Letter of Authorization**: Authorizes installations and construction activities in association with Master License Agreements. One-time administrative/engineering/legal review as well as access and/or annual fees.

ATTACHMENT "A"

SUMMARY OF MBTA RAILROAD OPERATIONS SPECIFICATIONS

I. GUIDELINES AND PROCEDURES FOR CONSTRUCTION ON MBTA RAILROAD PROPERTY

This general specification outlines the immediate design requirements and methodology for progressing construction activities on MBTA Railroad Property.

II. MAINTENANCE AND PROTECTION OF RAILROAD TRAFFIC

This specification will be included in ALL work requirements on MBTA Railroad Property, and covers rules, requirements, and protective services or any construction-related activity on MBTA Railroad Property. Supplemental specifications are listed below.

III. INSURANCE SPECIFICATIONS

This specification details the required insurance coverages and limits of the MBTA and Railroad Company(s).

IV. PIPELINE OCCUPANCY SPECIFICATIONS

This specification details requirements for all pipeline borings/jacking's and open cuts on or adjacent to MBTA Railroad Property, as well as requirements for Drawing submittals.

V. SPECIFICATIONS FOR WIRE CONDUIT AND CABLE OCCUPATIONS

This specification details requirements for clearances and installations of parallel and overhead crossings on MBTA Railroad Property, as well as requirements for Drawing submittals.

VI. BRIDGE ERECTION DEMOLITION AND HOISTING OPERATIONS

This specification details plan preparation for demolition and/or hoisting and erection of structures on and over MBTA Railroad Property.

VII. TEMPORARY SHEETING AND SHORING

This specification details requirements for plan preparation and calculations necessary for sheeting and shoring for construction on or adjacent to MBTA Railroad Property.

VIII. BLASTING SPECIFICATIONS

This specification outlines submittals, details and requirements for blasting on or adjacent to MBTA Railroad Property.

IX. TEMPORARY PROTECTION SHIELDS FOR DEMOLITION AND CONSTRUCTION

This specification outlines criteria for plan preparation related to protection of MBTA Railroad Property when work takes place on overhead structures.

X. INDUSTRIAL SIDE TRACK SPECIFICATIONS

This specification outlines minimal requirements for materials and installation submission for private railroad side tracks up to MBTA property line and/or clearance point. Other provisions, site-specific, may be required, including signal protection maintenance and protection of railroad traffic.

XI. RIGHT OF WAY FENCING SPECIFICATIONS

This specification details the requirements for the materials, construction and installation of standard right of way fence.

XII. TEST BORING SPECIFICATIONS

This specification outlines procedures and requirements for the performance of test borings on MBTA Railroad Property.

XIII. FIBER OPTIC CABLE SPECIFICATIONS

This specification details requirements for design and installation of fiber optic cables on MBTA Railroad Property; and is modified by site-specific requirements, including the construction methodology, location and type of fiber optic cables and protection conduits.

XIV. RAILROAD OPERATIONS BOOK OF STANDARD PLANS, TRACK AND ROADWAY, MW-I SPECIFICATIONS FOR CONSTRUCTION AND MAINTENANCE OF TRACK

Certain construction activities may require obtaining this comprehensive package if rail construction details and requirements are related to the track operation.

XV. COMMUTER RAIL DESIGN STANDARDS

ATTACHMENT "B"

**MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
APPLICATION FOR ENTRY UPON MBTA RAILROAD, TRANSIT,
OR OTHER PROPERTY**

Date _____

1. Name of Applicant: _____

2. Type of Entity (Partnership, Corporation, Proprietorship, Public Authority, etc.):

3. Mailing Address: _____

4. Contact info: _____

5. If incorporated, state of incorporation: _____

6. Proposed license term commencement date: _____

7. Agents for applicant for service of notice or process: _____

8. Administrative Fee: 1,000.00 paid with application

9. If plan reviews by The MBTA Design and Construction are deemed necessary the following fee shall apply:

Design and Construction Plan Review Fee: 1,600.00 Paid with Application Fee

10. Applicant shall submit Drawings in pdf form and one set of paper Drawings to License Administrator

11. If applicant is self-insured, please provide limits of self-insurance and attach copies of authorizing legislation or certification thereof: _____

12. If applicant is authorized by public authority to enter into such license agreement, please provide:

Motion, Resolution, or Ordinance No.: _____

Date of Adoption: _____

Adopted by: _____

13. Is the applicant seeking permission to perform environmental testing and/or assessment on Authority property?

a) Is the proposed testing and/or assessment required by the Massachusetts Contingency Plan ("MCP")?

b) What is the Release Tracking number and current status of the MCP work?

14. Name, title and email of applicant's officer authorized to sign agreement: _____

Project Description

1. Brief description of construction (including types of pipes and other attachments or ancillary facilities to be installed on MBTA Railroad Property): _____

2. Brief description of purpose of entry and/or installation: _____

Space Requirements
[*To Be Provided*]

Technical Information

1. Is this occupancy within the limits of a public road? _____
Attach copies of applicant's franchise to occupy such space.

2. If occupancy is under, over, through, or attached to undergrade or overhead bridge, who owns such bridge? _____

3. Type of occupancy (facility):
 - a) Exact Length of MBTA Railroad Property to be burdened by occupancy: _____

 - b) Width of excavation facility on MBTA Railroad Property:

 - c) Number of manholes: _____

A. Aerial or underground wire and cable:

- (1) Telephone and other communication cables:
Number of cables: _____
Number of pairs/cable: _____
Are these composite coaxial cables? _____

- (2) Power Cables:
Number of cables/size: _____
Number of volts per conductor: _____
Are these pipe-type cables consisting of one or more high voltage cables encased in steel pipe under inert oil pressure? _____

- (3) Fiber optic cables:
Number of cables: _____
Number of distribution cables: _____
Number of transmission cables: _____
Number of strands in each cable: _____

Number of repeater stations on MBTA Railroad Property: _____

Systems (check one):

Transmission _____

Distribution _____

Sensor _____

(4) Number of spare or unoccupied ducts to be installed: _____

B. Pipes and Sewers

(1) Circular line carrying no pressure:

Number of pipes: _____

Number of inches of inside nominal diameter per pipe: _____

(2) Circular lines under pressure and carrying non-flammable, non-explosive, or non-combustible supporting materials, except coal and slurry:

Number of pipes: _____

Number of inches of inside nominal diameter per pipe: _____

(3) Circular lines under pressure and carrying flammable, explosive, or combustible supporting material:

Number of pipes: _____

Number of inches of inside nominal diameter per pipe: _____

(4) Non-circular pipe: _____

(5) Will a pipe tunnel be constructed? _____

(6) Will pipe be supported by MBTA structures, bridges, etc.? _____

Explain: _____

(7) Will pipe be attached to MBTA structures, bridges, etc.? _____

Explain: _____

C. Ancillary Facilities

Number of wooden poles to be installed on MBTA Railroad Property:

Other wooden supporting structures: _____

Steel supporting structures: _____

Explain: _____

Number of braces, stub poles: _____

Number of guy wires anchored on MBTA Railroad Property: _____

Number of span guy wires crossing MBTA Railroad Property: _____

D. Attachments

- (1) Attachment of aerial wires and cables to poles or other structures of MBTA used in wire line construction or support:

Number of wires attached to MBTA cross-arm: _____

Voltage of wire: _____

Number of wires attached to applicant's cross-arm or bracket: _____

Voltage of wire: _____

Number of cross-arms or brackets attached to MBTA poles: _____

- (2) Attachment of aerial wires and cables to building or structures other than those used in wire line construction or support:

Number of wires or cables attached to MBTA's building or structures:

- (3) Attachment of cable terminals to poles, buildings, or structures including highway bridges, railroad bridges over highways, or other bridges of MBTA:

Number of cable terminals, loading coils, transformers, or like devices attached:

Explain: _____

E. Guy wire crossings and overhanging cross-arms and power wires of pole lines outside MBTA right-of-way.

Number of guy wires crossing MBTA Railroad property but not anchored thereon: _____

Number of cross-arms overhanging MBTA Railroad Property from poles located outside thereof: _____

Number of cross-arms on any poles: _____

It is hereby understood and agreed that the undersigned applicant will bear any and all costs associated with MBTA's preliminary and final engineering review in connection with this application. Any charges in excess of the initial advance payment will be billed directly to the address indicated in Item #3 above.

Agent: _____

For: _____
Name of Applicant

By: _____
(Title)

(Date)

REVENUE ENFORCEMENT AND PROTECTION PROGRAM CERTIFICATION

Pursuant to M.G.L. Ch. 62C, Sec. 49A, I certify under penalties of perjury that I (my company), to my best knowledge and belief, have (has) filed all state tax returns and paid all state taxes required under law.

Social Security Number or
Federal Identification Number

Signature of Individual or Corporate Name

By: _____
Corporate Officer
(If applicable)

Date: _____

EMPLOYER'S CERTIFICATE OF COMPLIANCE WITH
MASSACHUSETTS EMPLOYMENT SECURITY LAW

Pursuant to G. L. C. 151A, Sec. 19A (b), I _____

on behalf of (Name of Employer) _____,

D.E.T. ID Number _____, certify under the penalties of perjury¹ that the
aforementioned employer has complied with all laws of the Commonwealth relating to contributions
and payments in lieu of contributions.

Signed under the penalties of perjury this _____ day of _____, 20__.

Name of Employer

Signature

Name (Printed)

Title (Printed)

¹ The employer may certify its compliance if it has entered into and is complying with a repayment agreement satisfactory to the Commissioner or there is a pending adjudicatory proceeding or court action contesting the amount due pursuant to G. L. C. 161A, Sec. 19A(c).

STATEMENT REGARDING BENEFICIAL INTEREST

In compliance with the provisions of Chapter 7, Sec. 40J of the General Laws, I hereby state, under the penalties of perjury, that the true names and addresses of all persons who have or will have a direct or indirect beneficial interest in the real property subject to this Application dated

_____, 20___,

between _____ as applicant/tenant, for premises in the building (on the site) know as _____, and located at _____

_____ are listed below.

Name and residence of all persons with beneficial interests:

- 1. _____
- 2. _____
- 3. _____
- 4. _____
- 5. _____
- 6. _____

Signed: _____

Title: _____

Date: _____

ATTACHMENT "C"

REFERENCED STANDARDS AND SPECIFICATIONS

- A. Wherever standards or specifications issued by a recognized industry association or regulatory body are referenced in these Specifications, the reference shall be interpreted as incorporating the referenced standard or specification in total into these Specifications as applicable. In the event of a difference between referenced standard or specifications and these Specifications, the latter shall govern.
- B. Technical Reference Abbreviations - References are made to recognized standards by use of the acronyms listed below. Addresses are included for convenience, and the accuracy of the addresses is not warranted:

AA	The Aluminum Association 900 19th Street NW Washington, DC 20006
AAR	The Association of American Railroads American Railroads Building 50 F Street NW Washington, DC 20001
AASHTO	American Association of State Highway and Transportation Officials 444 North Capitol Street NW Suite 249 Washington, DC 20001
ACGIH	American Conference of Governmental Industrial Hygienists 1330 Kemper Meadow Drive Cincinnati, OH 45240
ACI	American Concrete Institute P. O. Box 19150 Detroit, MI 48219
AFPA	American Forest and Paper Association 1111 19th Street, NW Suite 700 Washington, DC 20036

AIA	American Insurance Association 1130 Connecticut Avenue NW Washington, DC 20036
AISC	American Institute of Steel Construction Inc. 1 East Wacker Drive Suite 1300 Chicago, IL 60601
AISI	American Iron and Steel Institute 1101 17th Street NW Suite 1300 Washington, DC 20036-4700
AITC	American Institute of Timber Construction 7012 South Revere Parkway Suite 140 Englewood, CO 80112
ANSI	American National Standards Institute 11 West 42nd Street New York, NY 10036
APA	American Plywood Association P. O. Box 11700 Tacoma, WA 98411
APHA	American Public Health Association 1015 15th Street NW Washington, DC 20005
AREA	American Railway Engineering Association 50 F Street NW Washington, DC 20001
ASCE	American Society of Civil Engineers 345 East 47th Street New York, NY 10017
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers 1791 Tullie Circle, NE Atlanta, GA 30329
ASME	American Society of Mechanical Engineers 345 East 47th Street New York, NY 10017

ASTM	American Society for Testing and Materials 1916 Race Street Philadelphia, PA 19103
AWPA	American Wood Preservers' Association P. O. Box 286 Woodstock, MD 21163-0286
AWS	American Welding Society 550 NW 42nd Avenue Miami, FL 33126
AWWA	American Water Works Association, Inc. 6666 W. Quincy Avenue Denver, CO 802350
CSI	Construction Specifications Institute 601 Madison Avenue Alexandria, VA 22314-1791
FHA	Federal Highway Administration 400 7th Street SW Washington, DC 20590
FRA	Federal Railroad Administration 403 7th Street SW Washington, DC 20590
ICBO	International Conference of Building Officials 5360 Workman Mill Road Whittler, CA 90601
IIA	Incinerator Institute of America 60 East 42nd Street New York, NY 10017



**MASSACHUSETTS BAY
TRANSPORTATION
AUTHORITY**

RAILROAD OPERATIONS DIRECTORATE

||

MAINTENANCE AND PROTECTION OF RAILROAD TRAFFIC

AUGUST 2014

SECTION 1. GENERAL

- 1.01 The Contractor should note that these specifications govern proposed work that involves construction on, over, under, within or adjacent to MBTA Railroad Property. Requirements must be strictly observed whenever the tracks, structures, or properties of the MBTA are involved or affected.
- 1.02 If the tracks or other facilities of the MBTA are endangered, the Contractor shall immediately perform such work as directed by the Railroad Company(s), and upon failure of the Contractor to carry out such orders immediately, the Railroad Company(s) may take whatever steps are necessary to restore safe conditions. The cost and expense to the Railroad Company(s) and/or MBTA of restoring safe conditions or of any damage to the MBTA's trains, tracks, or other facilities caused by the Contractors' or subcontractors' operations, shall be at the sole expense of the Contractor and will be collected as appropriate. This cost shall be paid for by the Contractor and may be deducted from any monies due and that may become due to the Contractor.
- 1.03 Before entering upon MBTA Railroad Property:
- A. The Owner or its Contractor shall be fully informed of all requirements of the MBTA pertaining to the specific project and shall conduct all their work accordingly. Any questions relating to the requirements of the MBTA should be directed to the Director of Engineering for MBTA Railroad Operations or their authorized representative.
 - B. The Owner or its Contractor shall execute an MBTA License for Entry, and shall provide the MBTA and Railroad Company(s) with the information required in the "Insurance Specifications".
 - C. The Owner or its Contractor shall take note that if an excavation is to be made within a 2 to 1 slope line commencing 5.5 feet from the centerline of track, they shall be required to submit the proposed method of soil stabilization for approval by the Director of Engineering for MBTA Railroad Operations.
 - D. The Owner or its Contractor shall furnish detailed plans for falsework, bracing, sheeting, or other supports adjacent to the tracks for approval by the Director of Engineering for MBTA Railroad Operations and the Railroad Company(s), and the work shall be performed in accordance with temporary "Sheeting and Shoring". All plans and calculations shall be stamped by a Registered Professional Engineer.
 - E. The Owner or its Contractor shall give written notice to the Director of Engineering for MBTA Railroad Operations and the applicable

Railroad Company(s) at least 21 days in advance of starting work or locating equipment at the site.

- F. The Owner or its Contractor shall make all necessary arrangements with the MBTA before entering upon MBTA Railroad Property.

1.04 After entering upon MBTA Railroad Property:

- A. The Owner or its Contractor shall have, in their possession on the job site, the contract plans and specifications which bear the stamp of approval of the Director of Engineering for MBTA Railroad Operations or Railroad Company(s). The Owner or its Contractor shall conduct all their work according to these plans and specifications.
- B. All work shall be performed and completed in a manner fully satisfactory to the MBTA Chief Engineering Officer or authorized representative(s). Railroad Company(s) inspection of the work shall be conducted at any time and the Owner or its Contractor shall cooperate fully with the MBTA and Railroad Company(s) representatives.
- C. All equipment used by the Owner or its Contractor on MBTA Railroad Property may be inspected by the Railroad Company(s) and shall not be used if considered unsatisfactory by the Railroad Company(s) representative. Equipment of the Owner or its Contractor to be used adjacent to tracks shall be in first class condition so as to positively prevent any failure that would cause delay in the operation of trains or damage to MBTA or railroad facilities. Equipment shall not be placed or put into operation adjacent to a track without first obtaining the permission of the Railroad Company(s).
- D. Operators of such equipment must be properly licensed and may be examined by the Railroad Company(s) representative to determine their fitness. If it is determined that they are unfit to work, then the Owner or its Contractor shall remove them from MBTA Railroad Property.
- E. If the Director of Engineering for MBTA Railroad Operations deems it necessary, the Owner or its Contractor shall furnish and erect in close proximity to the site of the work a suitable, furnished shelter with lights, heat, telephone, etc., for use by Railroad Company(s) personnel providing services to the Owner's or Contractor's work.
- F. The Owner or its Contractor's work shall be performed in such manner that the tracks, train operations and appurtenances of the MBTA and the Railroad Company(s) will be safeguarded.

- G. Open excavations shall be suitably planked and safeguarded when construction operations are not in progress.
- H. Blasting will be permitted under or adjacent to tracks only after proof that blasting is required and all methods have been approved by the Director of Engineering for MBTA Railroad Operations and the Railroad Company(s). All blasting operations must comply with the MBTA's "Blasting Specifications".
- I. The Owner or its Contractor shall be fully responsible for all damages arising from their failure to comply with the requirements of these specifications. Failure to comply may result in their removal from MBTA Railroad Property, at the MBTA's sole discretion.

SECTION 2. RULES, REGULATIONS, AND REQUIRMENTS.

- 2.01 Railroad traffic shall be maintained at all times with safety and continuity, and the Contractor shall conduct all operations on, over, under, within or adjacent to MBTA Railroad Property within the rules, regulations, and requirements of the Railroad Company(s) and/or MBTA. The Contractor shall be responsible for acquainting themselves with such requirements as the Railroad Company(s) and/or MBTA may demand.
- 2.02 The Contractor shall obtain verification of the time and schedule of track occupancy from the Railroad Company(s) before proceeding with any construction or demolition work on, over, under, within or adjacent to MBTA Railroad Property. The work shall not proceed until the plans and method of procedure have been approved by the Director of Engineering for MBTA Railroad Operations or their authorized representative.
- 2.03 All work to be done on, over, under, within or adjacent to MBTA Railroad Property shall be performed by the Contractor in a manner satisfactory to the MBTA and the Railroad Company(s), and shall be performed at such times and in such manner, as to not interfere with the movement of trains or operations upon the tracks of the MBTA. The Contractor shall use all necessary care and precaution in order to avoid accidents, delays or interference with the MBTA's trains or other property.
- 2.04 The Contractor shall give written notice to the Railroad Company(s) at least twenty- one (21) days prior to the commencement of any work, or any portion of the work, by the Contractor or their subcontractors on, over, under, within or adjacent to MBTA Railroad Property, in order that necessary arrangements may be made by the Railroad Company(s) to protect railroad operations.

- 2.05 If deemed necessary by the Railroad Company(s), it may assign an inspector and/or engineer who will be placed on the work site during the time the Contractor or any subcontractor is performing work on, over, under, within or adjacent to MBTA Railroad Property. The cost and expense will be paid directly by the contracting party with an advance deposit to the Railroad Company(s), unless otherwise approved.
- 2.06 Before proceeding with any construction or demolition work, on, over, under, within or adjacent to the MBTA's Railroad Property, a pre-construction meeting shall be held at which time the Contractor shall submit for approval of the MBTA and Railroad Company(s), Drawings, computations, and a detailed description of the method for accomplishing the construction work, including methods of protecting railroad operations. Such approval shall not serve in any way to relieve the Contractor of complete responsibility for the adequacy and safety of the referenced methods.
- 2.07 During any demolition procedure, the Contractor must provide an approved shield to prohibit all debris from falling onto MBTA Railroad Property. A protective fence must be erected at both ends of the project to prohibit trespassers from entering MBTA Railroad Property.
- 2.08 Cranes, shovels, or any other equipment shall be considered to be fouling the track when located in such position that failure of same with or without load brings the equipment within the fouling limit. The Contractor's employees and equipment will not be permitted to work near overhead wires or apparatus.
- 2.09 The Contractor shall conduct their work and handle their equipment and materials so that no part of any equipment should foul an operated track or wire line without the written permission of the Railroad Company(s). When it becomes necessary for the Contractor to foul any track, they must give the Railroad Company(s) written notice of their intentions twenty-one (21) days in advance, so that if approved, arrangements may be made for proper protection of the Railroad Company(s).
- 2.10 The Contractor's equipment shall not be placed or put into operation adjacent to tracks without first obtaining permission from the Railroad Company(s). Under no circumstances shall any equipment or materials be placed or stored within fifteen (15) feet from the centerline of the closest track.
- 2.11 Materials and equipment belonging to the Contractor shall not be stored on MBTA Railroad Property without first having obtained permission from the Railroad Company(s), and such permission will be on the condition that the MBTA and/or Railroad Company(s) will not be liable for damage to such materials and equipment from any cause. The Contractor shall keep the

tracks adjacent to the site clear of all refuse and debris that may accumulate from construction operations, and shall leave the MBTA Railroad Property in the condition existing before construction commencement. Equipment repair, refueling or extended storage is prohibited on MBTA Railroad Property.

- 2.12 The Contractor shall consult the Railroad Company(s) in order to determine the type of protection required to insure safety and continuity of railroad operations. The railroad field engineer may assign track foremen, flagmen, signalmen or other employees deemed necessary for protective services by the Railroad Company(s), to insure the safety of trains and MBTA Railroad Property. The cost of same shall be paid directly by the contracting party with an advance deposit to the Railroad Company(s), unless otherwise approved.
- 2.13 The provision of such protective services, and other precautionary measures, shall not relieve the Contractor from liability for the cost of any and all damages caused by their operations.
- 2.14 The Railroad Company(s) will require protection during all periods when the Contractor is working on, over, under, within or adjacent to MBTA Railroad Property or as may be deemed necessary. When protection is required, the Contractor shall make the request in writing to the Railroad Company(s) at least twenty-one (21) days before such protection is required.
- 2.15 The Contractor shall not bill the Railroad Company(s) or MBTA for any work which they are proposing to perform, unless the Railroad Company(s) or MBTA authorizes the said work in writing. This work must be to the benefit of the MBTA or Railroad Company(s).
- 2.16 The Contractor, subcontractor and respective employees who will come within the limits of the MBTA Railroad Property, must first attend the Railroad Company(s) Safety Orientation Class. They are required to comply with the Railroad Company(s) Safety Requirements throughout the entire construction period. All costs associated with compliance of the Railroad Company(s) Safety Requirements will be at the sole expense of the Contractor and subcontractors.
 - A. The Contractor for the project must appoint a qualified person who will be designated as a Safety Representative. They must be approved by the Railroad Company(s) Safety Representative. The Contractor's designee will be responsible to give Safety Orientation to the Contractor's/subcontractor's employees who will come onto the MBTA's Railroad Property for short periods of time after the initial Safety Orientation Class has been given by the Railroad Company(s). The Contractor's designee will keep the Railroad Company(s) Safety Representative informed of the temporary employees who received Safety Orientation. The Railroad Company(s)

Safety Orientation Class will be repeated when employee turnover or groups of Contractor's and subcontractor's employees are such that another Railroad Company(s) Safety Orientation Class is justified.

- B. All Contractors shall follow established safety procedures and remain 15 feet or more from the closest rail of the closest track. When it becomes necessary for Contractors to encroach on this 15 foot limitation, the proper fouling procedures will be arranged with the Railroad Company(s).
 - C. Contractors will establish the 15 foot foul line by installing stakes and taping off the area prior to beginning work.
- 2.17 Upon completion of the work, the Contractor shall remove from the MBTA Railroad Property, all machinery, equipment, surplus materials, falsework, rubbish, temporary buildings and other property of the Contractor, or any subcontractor, and shall leave MBTA Railroad Property in a condition satisfactory to the MBTA and Railroad Company(s). Failure to comply will result in Railroad Company(s) forces restoring MBTA Railroad Property at the Contractor's expense.
- 2.18 The Contractor will pay the Railroad Company(s) directly, for all protective services unless otherwise approved. The services are performed to insure safe operation of trains when construction work would, in the Railroad Company(s) opinion, be a hazard.

SECTION 3. DEFINITION OF HAZARD

- 3.01 Protection Services will be required whenever the Contractor is performing work on, over, under, within or adjacent to MBTA Railroad Property. This will include excavating, sheeting, shoring, erection, removal of forms, handling material, using equipment which by swinging or by failure could foul the track, and when any other type of work being performed, in the opinion of the Railroad Company(s), requires such service.
- 3.02 Railroad operations will be considered subject to hazard when explosives are used in the vicinity of MBTA Railroad Property during the driving or pulling of sheeting for footings adjacent to a track, when erecting structural steel across or adjacent to a track, when operations involve swinging booms or chutes that could in any way come closer than 5 feet to the center line of a track or wire line. None of these or similar operations, shall be carried on without Railroad Company(s) protective services personnel on site.
- 3.03 A signal line or communication line shall be considered fouled and subject to hazard when any object is brought closer than ten (10) feet to any wire or cable. An electrical supply line shall be considered fouled and subject to hazard when any object is brought closer than ten (10) feet to any

wire of the line.

- 3.04 As excavation approaches pipes, conduits, or other underground structures on or adjacent to MBTA Railroad Property, digging by machinery shall be discontinued and the excavation shall continue by means of hand tools. All existing pipes, poles, wires, fences, property line markers, and other structures, which the MBTA and/or Railroad Company(s) decides must be preserved in place, shall be carefully protected from damage by the Contractor or its Owner. Should such items be damaged, they shall be restored by the Railroad Company(s), at the Owner's or Contractor's sole expense to the original condition prior to construction commencement. If any excavation is taken beyond the work limit indicated on the approved Drawings or prescribed herein, the Owner or its Contractor shall backfill and compact to the satisfaction of the Railroad Company(s) at the Contractors expense.

SECTION 4. BACKFILL

4.01 Backfilling

- A. All backfill material adjacent to any Railroad Company(s) facility shall be approved by the Railroad Company(s). Backfill material shall be free from hard lumps and clods larger than 3 inches in diameter, and free from large rocks or stumps. Uniformly fine material shall be placed next to any pipe liable to dent or break.
- B. All backfill material shall be compacted at or near optimum moisture content, in layers not exceeding 6 inches in compacted thickness by pneumatic tampers, vibrator compactors, or other approved means to the base of the railroad subgrade. Material shall be compacted to not less than 95 percent of AASHTO T 99, Method C. The Contractor will be required to supply to the job site, ballast stone (AREA #4) to be installed by the Railroad Company(s).

4.02 Certification

The Owner or its Contractor shall provide testing, through the use of a testing lab or Professional Engineer, to insure that the in place density of the backfill meets or exceeds the requirements of Section 4.01(B). Written certification of the tests shall be given to the Railroad Company(s) immediately upon completion of the test.

4.03 Alternate

In the case of an open cut crossing of the MBTA Railroad Property, the Owner or its Contractor may backfill with concrete having a three-day compressive strength of 1000 psi to the base of the track subgrade. This

may be used in lieu of providing the certification of proper compaction when using gravel backfill. The Owner or its Contractor will be required to supply to the job site, ballast stone (AREA #4) to be installed by the Railroad Company(s).

SECTION 5. CLEARANCES

- 5.01 Staging falsework or forms shall at all times be maintained with a minimum vertical clearance of 226" above top of the high rail and a minimum horizontal clearance of 15' from the center line of track.

SECTION 6. PROTECTION SERVICES

- 6.01 The MBTA shall require railroad inspection and may require railroad flagging. Prior to the start of any work on MBTA Railroad Property, the Owner or its Contractor shall submit a deposit to the amount required by the Railroad Company(s). If Railroad Company(s) expenses are greater than the amount of deposit, the Owner or its Contractor shall reimburse the Railroad Company(s) for the balance when billed, and, if the Railroad Company(s) expenses are less than the amount of deposit, the Railroad Company(s) will refund the balance to the Owner or its Contractor. The Railroad Company(s) reserves the right to request additional deposits as project work progresses.
- 6.02 If the MBTA or Railroad Company(s) determines that flagmen are necessary, the number required shall be on duty at the site during the hours of hazard described under Section 3. No work shall be performed if flagmen are required but are not on duty.
- 6.03 It shall be the responsibility of the Owner or its Contractor to keep the MBTA and Railroad Company(s) informed at all times when the Owner or its Contractor shall be working on, over, under, within or adjacent to MBTA Railroad Property and creating the hazards described under Section 3. Failure of the Owner or its Contractor to give the MBTA and Railroad Company(s) suitable advance notice of hazardous operation shall result in the shutdown of the work by the Railroad Company(s), until such time as sufficient numbers of flagmen are on duty at the site. If this becomes a repeat occurrence, the Contractor will be removed from the project.
- 6.04 The Railroad Company(s) will make its best effort to provide protective services personnel. Should the situation arise where such personnel are not available, Contractor operations must cease. The Railroad Company(s) is not liable for any monetary claims incurred during the absence of protective services personnel.

SECTION 7. INSPECTION

- 7.01 If deemed necessary by the Director of Engineering for MBTA Railroad Operations, the MBTA will furnish and assign an engineer(s) for inspection and the Railroad Company(s) will furnish an appropriate inspector for general inspection purposes or for general protection of MBTA Railroad Property and operations during construction. All protection services will be at the expense of the Owner or its Contractor.

SECTION 8. EXTRA-CONTRACT SERVICES

- 8.01 Temporary and permanent changes of tracks and all railroad utilities made necessary by the work of the Contractor, will be made by the MBTA or Railroad Company(s) at the expense of the Owner or its Contractor.
- 8.02 All other changes made or services furnished by the Railroad Company(s), at the request of the Owner or its Contractor, will be at the Owner's or its Contractor's expense.



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INSURANCE SPECIFICATIONS

The insurance outlined in these Specifications is required of the Owner or Contractor, and shall be provided by or in behalf of all subcontractors performing any portion of the work. The Owner or Contractor shall be responsible for any modifications, deviations or omissions of the required insurance as it applies to subcontractors.

All insurance policies, unless otherwise specified under Railroad Protective Liability Insurance, are to be written either on an occurrence basis or, if a claims-made form, applicable renewals must have a date retroactive to the construction start date and shall be maintained in force for one year following the acceptance of the work by the MBTA or its duly authorized representative.

With the exception of Railroad Protective Liability Insurance, all insurance policies must name the MBTA as an additional insured as its interest appears and waive any rights of subrogation against the MBTA.

Certificates of Insurance evidencing (1) either the claims-made or occurrence form coverage, (2) work description/location, (3) Owner or Contractor's corporate name, and (4) individual, company, government agency or municipality for which the work is being performed, are to be furnished to the MBTA prior to work commencement, and within fifteen (15) days of expiration of the insurance coverage, when applicable.

All policies must contain a minimum thirty (30) day written notice of cancellation clause, and provide that the Insurance Company shall notify the Owner, Contractor, MBTA and Railroad Company(s), via registered mail, of any cancellation, change or expiration of the policy.

Original Insurance Certificate(s) shall be received and approved by the MBTA before the Owner or Contractor will be allowed entry upon MBTA Railroad Property. Certificates, including any required endorsements, shall be furnished to the MBTA, c/o Risk Manager, Office of the Treasurer-Controller, Ten Park Plaza, Room 8450, Boston, MA 02116, and shall provide stated coverage and a provision that Notice of Accident (occurrence) and Notice of Claim shall be given to the Insurance Company as soon as practicable after notice to the insured(s).

Original Insurance Binders reflecting Railroad Protective Insurance shall be received and approved by the MBTA and the appropriate Railroad Company(s) prior to entry upon MBTA Railroad Property. Mailing addresses for transmittal of original Insurance Binders to the named insured Railroad Company(s) are contained on Page Four of these Specifications.

The Owner or Contractor shall indemnify, defend and save harmless the MBTA and the appropriate Railroad Company(s) from and against any and all liabilities, losses (including losses of revenue), claims, costs, damages and expenses (including reasonable attorney's fees and expenses) that may be asserted against or incurred by the MBTA and the Railroad Company(s) arising from or as a result of the Owner or Contractor's work, or its use of adjacent land. Said indemnification shall include claims, whether covered by insurance or not, including, but not limited to

Workers Compensation and similar insurance.

The Owner or Contractor shall maintain, during the life of the contract, from company (s) authorized to do business in the Commonwealth of Massachusetts and satisfactory to the MBTA:

A. COMMERCIAL GENERAL LIABILITY INSURANCE for personal injury, bodily injury and property damage in an amount not less than \$1,000,000 per occurrence and \$3,000,000 in the aggregate covering all work performed on over or adjacent to MBTA Railroad Property (the "work"), including:

1. All operations;
2. Contractual liability;
3. Coverage for the so-called "X, C, U" hazards, i.e., collapse of building, blasting, and damage to underground property;
4. Asbestos abatement, when applicable.

B. AUTOMOBILE LIABILITY INSURANCE including the use of all vehicles owned, non-owned, leased and hired, in an amount not less than \$1,000,000 combined single limit covering all the work.

C. WORKER'S COMPENSATION INSURANCE including Employees, Liability Insurance, as provided by Massachusetts General Laws, Chapter 152, as amended, covering all the work.

D. UMBRELLA LIABILITY COVERAGE in an amount not less than \$10,000,000 per occurrence covering all the work.

E. HAZARDOUS MATERIALS INSURANCE if the work involves hazardous materials, the following coverage is required:

1. **Pollution Liability insurance** for sudden and gradual occurrences in an amount not less than \$1,000,000 per occurrence and \$5,000,000 in the aggregate arising out of the work, including but not limited to all hazardous materials identified in the contract.
2. When applicable, the Owner or Contractor shall designate the disposal site and furnish a Certificate of Insurance from the Disposal Facility for Environmental Impairment Liability Insurance for (a) sudden and accidental occurrences in an amount not less than \$3,000,000 per occurrence and \$6,000,000 in the aggregate and (b) non-sudden occurrences in an amount not less than \$5,000,000 per occurrence and \$10,000,000 in the aggregate.

3. Certificates of insurance shall clearly state the hazardous materials exposure work being performed.

F. RAILROAD PROTECTIVE LIABILITY INSURANCE is specifically designed for insuring Railroads, and is purchased by the Owner or Contractor in the name of the MBTA and the Railroad Company(s). **The Railroad Company(s) is the named insured on the policy.** Railroad Protective Liability Insurance is required for any work performed within fifty (50) feet from center line of the nearest railroad track; it is not a substitute for any types of insurance outlined in these Specifications. Required limits are:

Bodily injury: not less than \$5,000,000 for all damages arising out of bodily injuries to or death of one person, and subject to that limit for each person, a total limit of \$6,000,000 for all damages arising out of bodily injury to or death of two or more persons in any one accident;

Property Damage: not less than \$10,000,000 or all damages arising out of injury to or destruction of MBTA property in any one accident, and subject to that limit per accident, a total of \$10,000,000 in the aggregate for all damages arising out of injury to or destruction of MBTA property.

Questions regarding insurance should be directed to MBTA's Risk Manager at (617) 222-3064.

Questions regarding train counts and train speeds should be directed to the appropriate Railroad Company(s) listed on Page Four.

PROOF OF INSURANCE

MAILING ADDRESSES:

MBTA

Risk Manager
c/o Treasurer-Controller
10 Park Plaza
Boston, MA 02116
cc: Massachusetts Realty Group

National Railroad Passenger Corporation (Amtrak)

Boston Division Office
c/o Division Engineer
2 South Station 5th Floor
Boston, MA 02110

CSX Transportation Inc.

500 Water St.
Jacksonville, FL 32202

Bay Colony Railroad Corporation

General Manager
4 Freight House Road
East Wareham, MA 02571

Boston and Maine Corporation
and Springfield Terminal Railway
Co.

Chief Engineer
402 Amherst Street
Suite 300
Nashua, NH 03063-1287

Providence and Worcester
Railroad Company

P. O. Box 1188
Worcester, MA 01601

Keolis Commuter Services

Chief Engineering Officer
470 Atlantic Ave.
Boston, MA 02110



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IV

PIPELINE OCCUPANCY SPECIFICATIONS

INDEX

<u>SUBJECT</u>	<u>PAGE</u>
<u>SECTION 1. GENERAL REQUIREMENTS</u>	
1.01 Description of Work and Location	1
1.02 License to Enter Railroad Company(s) Property	1
1.03 Work on Railroad Property	1
1.04 Coordination	3
1.05 Layout of Work	3
1.06 Indemnification	3
1.07 Scientific or Historic Artifacts	3
1.08 Record Documents	4
<u>SECTION 2. SUBMITTALS</u>	
2.01 Application for Occupancy	4
2.02 Submission of Construction Drawings and Specifications	4
<u>SECTION 3. TEMPORARY FACILITIES AND CONTROLS</u>	
3.01 Requirements of Regulatory Agencies	7
3.02 Installation and Coordination - General	7
3.03 Sanitary Facilities	8
3.04 Light and Power	8
3.05 Temporary Water	8
3.06 Temporary Traffic Controls	8

<u>SUBJECT</u>	<u>PAGE</u>
3.07 Temporary Work and Storage Areas	8
3.08 Pollution Abatement Controls	9
3.09 Protection of Persons and Properties	10
3.10 Vermin Control	11
3.11 Rubbish and Debris Removal	11
<u>SECTION 4. PIPELINE OCCUPANCY GENERAL CRITERIA</u>	
4.01 Method of Installation	12
4.02 General Requirements	13
4.03 Inspection and Testing	14
4.04 Cathodic Protection	14
4.05 Soil Investigations	15
4.06 Ground Stabilization	16
4.07 Support of Tracks	16
4.08 Geotechnical Monitoring	17
4.09 Pipelines On Bridges	18
4.10 Bonding and Grounding of Pipelines In Electrified Territory	18
4.11 Abandoned Pipelines or Facilities	19
4.12 Drainage	19
<u>SECTION 5. CARRIER PIPE</u>	
5.01 Design Criteria - General	20
5.02 General - Products	20

5.03	Oil and Gas Pipes	21
5.04	Cast Iron Pipe	21
5.05	Vitrified Clay Pipe	21
5.06	Corrugated Metal Pipe	21
5.07	Asbestos Cement Pipe	21
5.08	Other	22
5.09	Shut-Off Valve	22
5.10	Signs	22
5.11	Installation - Execution	22
SECTION 6. <u>CASING PIPE</u>		
6.01	Design Criteria - General	23
6.02	Protection at Ends of Casing	24
6.03	Vents	24
6.04	Steel Pipe - Products	25
6.05	Cast Iron Pipe	25
6.06	Corrugated Metal Pipe and Corrugated Structural Plate Pipe	25
6.07	Reinforced Concrete Pipe	25
6.08	Tunnel Liner Plates	25
6.09	Depth of Installation - Execution	26
6.10	Method of Installation	26
6.11	Construction	27

<u>PLATES</u>	<u>PAGE</u>
Plate I Pipe Crossing	33
Plate II Pipe Crossing	34
Plate III Longitudinal Occupancy	35
Plate IV Pipe Crossing Data Sheet	35
Plate V Table of Minimum Wall Thickness	37

SECTION 1. GENERAL REQUIREMENTS

1.01 DESCRIPTION OF WORK AND LOCATION

These specifications apply to the design and construction of pipelines carrying flammable and non-flammable substances and to casings over 4-inches in diameter containing wires and cables, under, across or along MBTA Railroad Property, facilities and tracks.

1.02 LICENSE TO ENTER RAILROAD PROPERTY

- A. Entry upon MBTA Railroad Property for the purpose of conducting surveys, field inspections, obtaining soil information, or any other purpose associated with the design and engineering of the proposed occupancy, will be authorized by an MBTA License for Entry (See "Guidelines and Procedures for Construction on MBTA Railroad Property").
- B. Issuance of the License does not constitute authority to proceed with the actual construction.

1.03 WORK ON RAILROAD PROPERTY

- A. The safety and continuity of train operations shall be the first priority. The Applicant shall arrange the work so that the trains will be protected and safeguarded at all times. Whenever the work may affect the safety and movement of trains, the method, sequence and time schedule of performing such work shall be submitted to the Director of Engineering for MBTA Railroad Operations or their authorized representative for approval.
- B. The Applicant waives all claims against the Railroad Company(s) and/or the MBTA for delays or any interference occasioned by railroad traffic or railroad maintenance.
- C. All Applicant-designed temporary construction on MBTA Railroad Property shall be designed in accordance with the appropriate railroad criteria and all construction performed on, over, under, within or adjacent to MBTA Railroad Property will be subject to the inspection and approval of the Railroad Company(s) and/or MBTA.
- D. A minimum of fourteen (14) days advance written notice shall be given to the Railroad Company(s) prior to construction related activities.
- E. The Railroad Company(s) will furnish such qualified flagmen, signalmen or protection men as may be required to insure complete

protection of train operations and railroad facilities. The need for this type of service will be determined by the Railroad Company(s) on the basis of railroad regulations and the Applicant's approved construction schedule. No work shall proceed without proper protection on the site.

- F. All expenses incurred in connection with protection of railroad facilities by Railroad Company(s) employees will be borne by the Applicant. Billings for such service or expense, including labor, materials and equipment will be made directly to the Applicant for payment.
- G. During construction, railroad traffic shall be maintained at all times without interruption, except when approved in advance, in writing, by the Director of Engineering for MBTA Railroad Operations or their authorized representative.
- H. All construction operations shall be conducted so as not to interfere with, interrupt, or endanger the operation of trains, nor damage, destroy, or endanger the integrity of railroad facilities. All work on or near MBTA Railroad Property shall be conducted in accordance with the Railroad safety rules and regulations. The Applicant shall secure and comply with the Railroad safety rules and shall give written acknowledgment to the Railroad Company(s) that they have been received, read, and understood by the Applicant and their employees. Construction operations will be subject to Railroad Company(s) inspection at any and all times.
- I. All cranes, lifts, or other equipment that will be operated in the vicinity of the MBTA's electrification and power transmission facilities shall be electrically grounded as directed by the Railroad Company(s).
- J. At all times when the work is progressing, a field supervisor for the work with no less than twelve (12) months experience in the operation of the equipment being used shall be present. Certification of the above must be submitted to the Railroad Company(s).
- K. Whenever equipment or personnel are working closer than fifteen (15) feet to the closest rail of an adjacent track, that track shall be considered as being obstructed. As best possible, all construction operations shall be conducted no less than this distance. Construction operations closer than fifteen (15) feet to the closest rail of a track shall be conducted only with the permission of, and as directed by, a qualified Railroad Company(s) employee present at the work site.
- L. Crossing of tracks at grade by equipment and personnel is prohibited except by prior arrangement with, and as directed by, the Director of

Engineering for MBTA Railroad Operations or their authorized representative.

- M. All tunneling, jacking and boring operations within railroad influence lines will be done on a 24 hour per day basis to minimize Railroad exposure to construction hazards.

1.04 COORDINATION

The Applicant shall coordinate the work with their Contractors, subcontractors, utility companies, governmental units, and any affected Railroad Company(s) with regard to site access, establishment and use of temporary facilities, work schedules, and other elements of the specified work which require interfacing with others.

1.05 LAYOUT OF WORK

The Applicant shall lay out their work true to lines and grades indicated on the Drawings and shall be responsible for all measurements in connection therewith. The Applicant will be held responsible for the execution of the work to such lines and grades indicated on the approved construction Drawings or such other lines and grades as may be directed or established by the Director of Engineering for MBTA Railroad Operations or their authorized representative.

1.06 INDEMNIFICATION AND INSURANCE

See requirements in "Guidelines and Procedures for Construction on MBTA Railroad Property" and "Insurance Specifications."

1.07 SCIENTIFIC OR HISTORIC ARTIFACTS

The Applicant shall immediately notify the Director of Engineering for MBTA Railroad Operations of the discovery of scientific or historical artifacts and shall protect same until identified and removed by the appropriate Authorities exercising jurisdiction.

1.08 RECORD DOCUMENTS

- A. The Applicant shall furnish the Railroad Company(s) and the MBTA with one reproducible "As Built" copy of each approved Construction Drawing, marked to indicate all changes and deviations from same.
- B. All project record documents shall be received and accepted by the MBTA and the Railroad Company(s) prior to final inspection.

SECTION 2. SUBMITTALS

2.01 APPLICATION FOR OCCUPANCY

The Applicant must agree, upon approval of the construction details by the Director of Engineering for MBTA Railroad Operations, to execute the MBTA Pipeline Occupancy Agreement and pay any required fees and/or rentals outlined therein. Refer to "Guidelines and Procedures for Construction on MBTA Railroad Property" for application policy.

2.02 SUBMISSION OF CONSTRUCTION DRAWINGS AND SPECIFICATIONS

- A. Six (6) sets of Drawings and specifications for proposed pipeline occupations shall be submitted to the AGM for Real Estate and Asset Development and meet the approval of the Railroad Company(s) and the MBTA prior to the start of construction. These plans are to be prepared in sizes as small as possible and are to be folded to an 8-1/2 inch by 11-inch size (folded dimensions) with a 1-1/2 inch margin on the left side and a 1-inch margin on the top.
1. After folding, the title block and other identification of the Drawings shall be visible at the lower right corner, without the necessity of unfolding. Each Drawing shall bear an individually identifying number and an original date, together with subsequent revision dates, clearly identified on the Drawing.
 2. All Drawings are to be individually folded or rolled and where more than one Drawing is involved, they shall be assembled into complete sets before submission to the MBTA.
- B. Drawings shall be to scale and show the following (see attached Plates).
1. Plan view of proposed pipeline in relation to all railroad facilities.
 2. Location of pipe (in feet) from nearest railroad milepost, centerline of a railroad bridge (giving bridge number), or centerline of an existing or former passenger station, or other fixed point. In all cases, the name of the City or Town and County in which the proposed facilities are located must be shown.
 3. Profile of ground on centerline of pipe from field survey showing relationship of pipe and casing to ground level, tracks and other facilities. For longitudinal occupations, the profile of adjacent track(s) must be shown.

4. All MBTA property lines. If pipeline is in a public highway, the limits of the right-of-way for the highway shall be clearly indicated with dimensions from centerline.
 5. The angle of crossings in relation to centerline of tracks.
 6. Location of valves or control stations of the pipeline.
 7. "Pipe Crossing Data Sheet" completed and out on Plan.
- C. The Drawing must be specific (both on MBTA Railroad Property and under tracks that are not on MBTA Railroad Property) as to:
1. Method of installations.
 2. Size and material of casing pipe.
 3. Size and material of carrier pipe.

These items shall not have an alternative.

- D. Once an application is approved by the Director of Engineering for MBTA Railroad Operations or their authorized representative, proposed variances from the approved plans, specifications, method of construction, etc., will be resubmitted for approval.
- E. Location and dimensions of jacking, boring, or tunneling pits shall be shown with details of their sheeting and shoring. If the bottom of the pit excavation nearest the adjacent track intersects a line from a point 5.5 feet horizontally from center line of adjacent track at the plane of the base of fall drawn on a slope of 2 horizontal to 1 vertical, submit design and details of the pit construction to the MBTA for approval complete with computations prepared by a Registered Professional Engineer. In any event, the face of the pit shall be no less than 25 feet from adjacent track, unless otherwise approved by the Director of Engineering for MBTA Railroad Operations or their authorized representative. Pits shall be fenced, lighted, and otherwise protected as directed by the Railroad Company(s).
- F. All Drawings and computations, including those submitted by Contractors, must bear the seal of a Registered Professional Engineer.
- G. Computations for all structures involving the support or protection of railroad track, embankment and facilities must be prepared by and bear the seal of a Registered Professional Engineer and shall be submitted within the construction Drawings.
- H. When computer calculations are included with design calculations, the following documentation shall be furnished:

1. A synopsis of the computer program(s) stating briefly required input, method of solution, approximations used, second order analysis incorporated, specifications or codes used, cases considered, output generated, extent of previous usage of certification of program(s) and program(s) author.
 2. Identification by number, indexing and cross-referencing of all calculation sheets, including supplemental "long-hand" calculation sheets.
 3. Fully identified, dimensioned, and annotated diagram of each member or structure being considered.
 4. Clear identification and printing of all input and output values, including intermediate values if such values are necessary for orderly review.
 5. Identification of the processing unit, input/output devices, storage requirements, etc., if such supplemental information is significant and necessary for evaluation of the submittal.
- I. Specifications shall conform to Construction Specifications Institute (CSI) 16 Division, 3-part Section Format.
- J. If other than American Railway Engineering Association (AREA), American Society for Testing and Materials (ASTM), or American National Standards Institute (ANSI) specifications are referred to for design, materials or workmanship on the Construction Drawings and specifications for the work, then copies of the applicable sections of such other specifications referred to shall accompany the Construction Drawings and specifications for the work.

SECTION 3. TEMPORARY FACILITIES AND CONTROLS

3.01 REQUIREMENTS OF REGULATORY AGENCIES

Applicant shall:

- A. Obtain and pay all costs for required permits for installation and maintenance of temporary facilities and controls.
- B. Comply with all applicable Federal, State and local codes, regulations and ordinances.
- C. Comply with regulations and requirements of all utility or service companies from which temporary utilities or services are obtained, and pay all costs incurred therewith.

3.02 INSTALLATION AND COORDINATION - GENERAL

Applicant shall:

- A. Install all temporary facilities and controls in a neat and orderly manner.
- B. Make all temporary facilities structurally and functionally sound throughout.
- C. Construct temporary facilities and controls to give continuous service and to provide safe working conditions.
 - 1. Enforce conformance with applicable standards
 - 2. Enforce safe practices.
- D. Modify, extend or relocate temporary facilities and controls as work progress requires.
- E. Locate temporary facilities and controls to avoid interference with, or hazards to:
 - 1. Work or movement of railroad personnel or traffic.
 - 2. Vehicular traffic.
 - 3. General Public.
 - 4. Work of other contracts.
 - 5. Railroad Passengers.
- F. Obtain easements as may be required across non-MBTA Railroad Property.
- G. Provide materials for temporary facilities and controls for the purpose intended and shall not violate requirements of applicable codes and shall not create unsafe conditions.

3.03 SANITARY FACILITIES

Prior to the start of work, the Applicant shall furnish necessary toilet conveniences, secluded from public observation. They shall be kept in a clean and sanitary condition and comply with the requirements and regulations of the area in which the work is performed.

3.04 LIGHT AND POWER

Applicant shall make their own arrangements for obtaining temporary light and power as required for the work, and shall maintain such temporary facilities in a proper and safe condition, including compliance with applicable codes.

3.05 TEMPORARY WATER

Applicant shall make their own arrangements for obtaining all temporary water service as required for the work.

3.06 TEMPORARY TRAFFIC CONTROLS

Applicant shall cooperate with the directives of the MBTA and/or Railroad Company(s) regarding vehicular traffic control and provide any temporary controls or devices required to eliminate or minimize congestion or obstruction of vehicular traffic caused by the work, including use of designated routes of ingress and egress from the work area.

3.07 TEMPORARY WORK AND STORAGE AREAS

- A. The areas designated by the MBTA as the temporary parking, work and storage area(s) will be provided to the Applicant in accordance with the terms of the MBTA License Agreement.
- B. All designated temporary parking, work and storage areas used by the Applicant shall be restored to their original condition prior to completion of the work, subject to inspection and approval of the MBTA and the Railroad Company(s).

3.08 POLLUTION ABATEMENT CONTROLS

Applicant shall:

- A. Conduct operations in a manner to minimize pollution of the environment surrounding the area of work by every means possible. Specific controls shall be provided as follows:
 - 1. Vehicles: All vehicles and material transport trucks leaving the site and entering paved public streets shall be cleaned of mud and dirt clinging to the body and wheels of the vehicle. Trucks arriving at or leaving the site with materials shall be loaded in a manner which will prevent dropping of materials or debris on the streets. Spills of materials in public areas shall be removed immediately at no cost to the MBTA or Railroad Company(s).

2. Waste Materials: No waste or erosion materials shall be allowed to enter natural or man-made water or sewage removal systems. Erosion materials from excavations, borrow areas or stockpiled fill shall be contained within the work area. The Applicant shall develop methods for control of waste and erosion which shall include such means as filtration, settlement and manual removal to satisfy the above requirements. Do not dispose of machinery lubricants, fuels, coolants and solvents on the site. If hazardous waste is encountered, the Applicant shall dispose of it in accordance with all federal, state and local codes. Verification of proper disposal must be provided, in writing, to the MBTA and the Railroad Company(s).
 3. Burning: No burning of waste shall be allowed without prior written permission. In cases where permission is granted, burning shall be conducted in accordance with the regulations of the appropriate jurisdictional agency.
 4. Dust Control: The Applicant shall at all times control the generation of dust by their operations. Control of dust is mandatory and shall be accomplished by water sprinkling or by other methods approved by the MBTA or Railroad Company(s).
 5. Noise Control: The Applicant shall take every action possible to minimize the noise caused by their operation. When required by agencies having jurisdiction, noise producing work shall be performed during less sensitive hours of the day or week as directed by the MBTA or Railroad Company(s) or as required by local ordinance.
 6. Environmental: All local and state environmental laws will be strictly adhered to. All applications, permits, licenses, approvals, etc., will be the sole responsibility of the Applicant.
- B. Submit a program for pollution control with applicable licenses and permits for all piping carrying non-potable liquids, gases or other pollutants.

3.09 PROTECTION OF PERSONS AND PROPERTY

A. Safety Requirements

1. The Applicant must adhere to the most stringent provisions of the applicable statutes and regulations of the political subdivision in which the work is being performed. The Applicant must also observe the Department of Labor-

Occupational Safety, Health Administration provision, pertaining to the safe performance of the work, and further, the methods of performing the work must not involve undue danger to the personnel employed thereon, Railroad Company(s) employees, the public, or to public and private property. Should charges of violation of any of the above be issued to the Applicant in the course of the work, a copy of each charge shall immediately be forwarded to the Railroad Company(s). The Applicant shall pay all fines and penalties levied against him.

2. The Applicant shall erect and maintain, as required by existing conditions and progress of the work, all reasonable safeguards for safety and protection. This includes posting danger signs and other warnings against hazards, promulgating safety regulations and notifying owners and users of adjacent utilities.

B. Safety of Persons and Property - The Applicant shall take all reasonable precautions for the safety of, and shall provide all reasonable protection to prevent damage, injury or loss to:

1. All employees on the work site and all other persons who may be affected.
2. All materials and equipment, whether in storage on or off the site, under the care, custody or control of the Contractor or any of their subcontractors.
3. Other property at the site or adjacent thereto, including walks, pavements, roadways, structures, and utilities not designated for removal, relocation or replacement in the course of construction. Any damage to such items shall be restored to original condition by the Applicant at no cost to the MBTA or Railroad Company(s).

C. First Aid

The Applicant shall maintain adequate first aid supplies at the site as prescribed by Federal, State or Local codes and regulations.

D. Use of Explosives

Non blasting methods are preferred. See "Blasting Specifications."

E. Site Security

The Applicant shall:

1. Maintain a secure work site protecting the MBTA and the Railroad Company(s) interests and property from claims arising from trespass, theft and vandalism.
2. Permit access to the work site only to employees, Contractors and those persons having business related to the work.
3. Provide security measures as required to protect Contractor or subcontractor's tools, equipment and property from damage, theft or vandalism.
4. Assume all costs for any MBTA and/or local police details required by the work.

3.10 VERMIN CONTROL

- A. Do not permit food scraps, lunch bags, food wrappers or other items which would attract rats or other vermin to be left lying around the site. Deposit such items in closed, rat-proof metal containers for disposal on a regular basis.
- B. The Applicant must provide vermin control as required by the MBTA or Railroad Company(s).

3.11 RUBBISH AND DEBRIS REMOVAL

- A. Rubbish and debris resulting from the work must be neatly piled in a single location and legally disposed of at least once a week. If rubbish or debris interferes with railroad activities, or creates a fire or safety hazard, it must be removed on a more frequent basis.
- B. Volatile waste such as mineral spirits, oil, or paint thinner shall not be disposed of in storm or sanitary drains, streams or waterways or any location upon the site.

SECTION 4. PIPELINE OCCUPANCY GENERAL CRITERIA

GENERAL:

4.01 METHOD OF INSTALLATION:

- A In a public way:
 1. No work shall be done without a Railroad Company(s) Inspector present.
 2. Open cuts will not be allowed in or immediately adjacent to an at

grade crossing. Sleeves will be installed by the jerking method, unless otherwise approved by the Director of Engineering for MBTA Railroad Operations.

3. Jerking is the preferred method of installation in or immediately adjacent to and at grade crossing. The sleeve may be installed by the open cut method with the Applicant paying for the complete rebuilding of the crossing, pending approval of the Director of Engineering for MBTA Railroad Operations. Approval will be given only under very unusual circumstances.
4. Jacking is the preferred method of installation in or immediately adjacent to and at grade crossing scheduled for rebuilding. The sleeve may be installed by the open cut method within seven (7) calendar days of the scheduled date of the crossing reconstruction. In the case of any open cut, strict adherence shall be made to the backfill specifications which provide the MBTA with written certification from a testing lab or Professional Engineer, that the backfill density requirements of the MBTA specifications have been met or exceeded.

B. Not within a Public Way:

The preferred method of crossing the railroad is by jacking of a pipe sleeve under the railroad. Only upon written request, will an alternate of open cut be given consideration. The engineering decision shall be based upon, but not limited to, the following: (1) track usage, (2) depth of cut, (3) soil conditions, (4) physical restraints. In the event an open cut is allowed, the following items shall be adhered to, and (5) any other circumstances which may necessitate an open cut.

1. The installation is to be a continuous operation and performed according to an MBTA approved schedule.
2. No work shall be done without a Railroad Company(s) Inspector present.
3. MBTA backfill specifications by the Owner or its Contractor.
4. The Owner or its Contractor may be required to provide a non-refundable lump sum payment for "after the fact maintenance." The determination of this amount is based on the individual situation. No work will be allowed until this payment is received. This payment is not to be confused with payments for Drawings and specification review, flagging, inspection, etc. (also required from the Owner or its Contractor before they enter upon MBTA property.)

4.02 GENERAL REQUIREMENTS

- A. Pipelines under or across MBTA tracks on rights-of-way shall be encased in a larger pipe or conduit called the casing pipe as indicated in Plate II.
- B. Casing pipe will be required for all pipelines carrying oil, gas, petroleum products, or other flammable, highly volatile substances which, from their nature or pressure, might cause damage if escaping on or near MBTA Railroad Property.
- C. For non-pressure sewer or drainage crossings where the installation can be made without interference to railroad operations, the casing pipe may be omitted when the pipe strength is capable of withstanding railroad loading. This type of installation must be approved by the Director of Engineering for MBTA Railroad Operations.
- D. The casing pipe shall be laid across the entire width of the right-of-way. Casing pipe shall extend beyond the right-of-way when the right-of-way line on either side of the tracks is less than the minimum length of casing specified in Section 6, Para. 6.01(E).
- E. Pipelines laid longitudinally on railroad right-of-way shall be located in accordance with Plate III. If located within 25 feet of the closest rail of any track or closer than 45 feet to nearest point of any bridge, building or other structure, the carrier pipe shall be encased.
- F. Where practicable, pipelines shall be located to cross the tracks at approximate right angles, but preferably at not less than 45 degrees.
- G. Pipelines shall not be placed within a culvert, under railroad bridges, or closer than 45 feet to any portion of a railroad bridge, building, or other structure, except in special cases, and then by special design, as approved by the Director of Engineering for MBTA Railroad Operations.
- H. Pipelines carrying liquefied petroleum gas shall, where practicable, cross the railroad where tracks are carried on embankment.
- I. Any replacement or modification of an existing carrier pipe and/or casing shall be considered a new installation, subject to the requirements of these Specifications.
- J. Where laws or orders of public authority prescribe a higher degree of protection than specified herein, the higher degree so prescribed shall be deemed a part of these Specifications.

- K. Pipelines and casings shall be suitably insulated from underground conduits carrying electric wires on MBTA Railroad Property.

4.03 INSPECTION AND TESTING

For pipelines carrying flammable or hazardous materials, ANSI Codes B 31.8 and B 31.4, current at time of constructing the pipeline, shall govern the inspection and testing of the facility on MBTA Railroad Property, except that proof-testing of strength of carrier pipe shall be in accordance with the requirements of ANSI Code B 31.4, as applicable, for all pipelines carrying all liquefied petroleum gas, natural or manufactured gas, and other flammable substances.

4.04 CATHODIC PROTECTION

- A. Cathodic protection shall be applied to all pipelines and casings carrying flammable substances.
- B. Where casing and/or carrier pipe is cathodically protected by other than anodes, the Director of Engineering for MBTA Railroad Operations shall be notified and suitable testing shall be made. This testing shall be witnessed by the Railroad Company(s) to insure that other railroad structures and facilities are adequately protected from the cathodic current in accordance with the recommendations of Reports of Correlating Committee on Cathodic Protection, current issue by the National Association of Corrosion Engineers.

4.05 SOIL INVESTIGATIONS

- A. Soil borings (or other soil investigations approved by the Railroad Company(s)) will be performed to determine the nature of the underlying material for all pipe crossings under tracks. See Test Boring Specifications.
- B. Borings shall be made on each side of the tracks, on the centerline of the pipe crossing, and as close to the tracks as practicable.
- C. Soil borings shall be in accordance with the current issue of the American Railway Engineering Association Specifications, Chapter 1, Part 1, "Specifications for Test Borings". Soils shall be investigated by the split-spoon and/or thin-walled tube method and rock shall be investigated by the Boring method specified therein.
- D. Soil boring logs shall clearly indicate all of the following:
 - 1. Boring number as shown on boring location Drawing.

2. Elevation of ground at boring, using same datum as the pipeline Construction Drawings.
 3. Description or soil classification of soils and rock encountered.
 4. Elevations or depth from surface for each change in strata.
 5. Identification of where samples were taken and percentage of recovery.
 6. Location of ground water at time of sampling and, if available, subsequent readings.
 7. Natural dry density in lbs./sq.ft. for all strata.
 8. Unconfined compressive strength in tons/sq.ft., for all strata.
 9. Water content (percent). Liquid limit (percent) and plastic limit (percent).
 10. Standard penetration in blows/ft.
- E. The location of the carrier pipe and casing shall be superimposed on the boring logs before submission to the Director of Engineering for MBTA Railroad Operations.
- F. Soil investigation by auger, wash, or rotary drilling method is not acceptable.
- G. Soil boring logs shall be accompanied by a Drawing drawn to scale showing location of borings in relation to the tracks and the proposed pipe location, the elevation of around surface at each boring, and the elevation of the base of rail of the tracks.

4.06 GROUND STABILIZATION

Soil stabilization shall take place prior to the start of jacking. Stabilization shall be achieved by dewatering, grouting or a combination of both to maintain the stability of the face of the heading.

- A. The Owner or its Contractor shall lower and maintain the ground water level a minimum of two (2) feet below the invert at all times during construction by well points, vacuum well points, or deep wells to prevent inflow of water and/or soil into the heading. Ground water observation wells shall be installed in the area to be dewatered to demonstrate that the dewatering requirements are being complied with.
- B. The grouting Contractor shall be a specialist in the field with a minimum

of five (5) continuous years of successfully grouting soils. All granular soils (silty sands, sand or sand and gravel) shall be stabilized by injection of a cement or chemical grout from the ground surface or from the pipe heading. The stabilization shall extend as far as necessary outside the periphery of the casing pipe in order to maintain a stable face at the heading.

- C. Railroad Company(s) forces will survey the crossing prior to, during and after construction. If it is necessary to align or surface the tracks as a result of construction, the Railroad Company(s) will perform the work at the expense of the Owner or the Owner's Contractor.

4.07 SUPPORT OF TRACKS

- A. When jacking, boring, or tunneling, temporary track support structures shall be installed. The track support structures shall be provided by the Applicant and installed by the Railroad Company(s) at the Applicant's expense. The Contractors proposed type of temporary track support structures shall be subject to the approval of the Railroad Company(s)
- B. All work involving rail, signals, ties and other track material will be performed by the Railroad Company(s) at the Applicant's expense.
- C. The Applicant shall deliver the track support structures to a site approved by the Railroad Company(s). Provisions for unloading shall be provided by the Applicant at no expense to the Railroad Company(s) and the Applicant shall provide the necessary labor to handle the material for pre-installation inventory.

4.08 GEOTECHNICAL MONITORING

THE FOLLOWING SPECIFICATIONS ARE REQUIRED FOR ALL PIPE JACKING OPERATIONS.

- A. Jacking shall be performed on a continuous basis, 24 hours per day, and 7 days per week.
- B. The monitoring points shall be set up one week before the jacking operation begins. The MBTA and Railroad Company(s) shall be notified. Elevation readings shall begin two days prior to the start of jacking and continue for a minimum of two weeks after the completion of the jacking operation. Initial readings immediately after any surfacing operations shall serve as new baseline figures. All future elevation readings shall be compared to the adjusted baseline. If the

track deviates to a condition not acceptable to the MBTA or Railroad Company(s), corrections shall be made at the proponent's expense.

- C. Elevation readings shall be taken from the top rail of each track.
- D. Elevation readings shall be taken every four hours or two times per shift, i.e., six times per day. The readings shall be faxed to the MBTA and Railroad Company(s) on a daily basis and all information is to be presented in legible print. Additional readings may be required by the MBTA or Railroad Company(s).
- E. Stations shall be spaced at 15-1/2 foot intervals. The number of stations required shall be determined by the depth of the pipe. There shall be a minimum of two stations on either side of the centerline jacking. Additional stations may be required at the discretion of the MBTA or Railroad Company(s),
- F. Elevation readings must show the date, time, weather conditions and temperature. Each reading must also provide the following information: track number, compass direction, station number, base elevation (with date), static elevation, change in elevation (recorded in hundredths and in inches), dynamic reading and total deflection in inches. See sample sheet attached.
- G. Station "0" shall be located at the centerline of the pipe jacking with Stations 1 and being to the right and Stations -1 and -2 being to the left when standing in the gauge of the near track and looking at the receiving pit. In multiple track areas the stations as determined herein are to be carried across each track perpendicular to the near track.
- H. Elevation readings taken from the top of the rail for static measurement and the dynamic readings shall be combined and the sum compared to the adjusted baseline. This reading will demonstrate the difference in elevation caused by the jacking operation.
- I. The MBTA requires that the truck be maintained at all times within established criteria for the specific track classification. At the completion of the project the requirement for tamping and realigning the tracks, caused by the settlement from the construction activity, remains with the Contractor for the duration as specified by the MBTA in their initial review of the work plans. This tamping and track realignment will be performed by the MBTA or Railroad Company(s) at the sole expense of the Contractor.

4.09 PIPELINES ON BRIDGES

- A. Pipelines carrying flammable or non-flammable substances which by their nature might cause damage if escaping on or near railroad facilities or personnel shall not be installed on bridges over railroad tracks or bridges carting railroad tracks.
- B. The Director of Engineering for MBTA Railroad Operations may approve such an installation when it is demonstrated that no practicable alternative is available.
- C. When allowed by the Director of Engineering for MBTA Railroad Operations, pipelines on bridges shall be located in a way to minimize the possibility of damage from vehicles, railroad equipment, vandalism and other external causes. Pipelines on bridges may be installed in a utility bay that is constructed between the girders of the bridge. The utility bay shall be protected from the environment by a removable shield bolted to the girders. This will allow utility companies to comply with the Code of Federal Regulations for Periodic Inspection.
- D. In the event of pipe relocation due to the reconstruction of a bridge, the installation of the new pipe must comply with the requirements in these Specifications.

4.10 BONDING AND GROUNDING OF PIPELINES IN ELECTRIFIED TERRITORY

- A. Carrier pipe shall be enclosed in a metal casing that is isolated from carrier pipe by approved insulators having a dielectric value of not less than 25 kV that provide an air gap between carrier pipe and casing of not less than 2 inches.
- B. Carrier pipe supporting hangers, mountings or cradles shall provide an insulation value of not less than 25 kV and an air gap of not less than 2 inches between casing and any portion of mounting assembly.
- C. Any grounding or isolation methods used must have a minimum dielectric of 25,000 volts.

4.11 ABANDONED PIPELINES OR FACILITIES

- A. For all pipeline occupations on the railroad right-of-way, the owner of the pipeline shall notify the MBTA, in writing, of the intention to abandon the pipeline. Upon abandonment the carrier pipe shall be removed and the casing shall be filled with cement grout, compacted sand or other material approved by the Director of Engineering for

MBTA Railroad Operations. If it is impractical to remove the carrier pipe, then the carrier must be filled along with the annular space between the casing and carrier.

- B. Facilities other than pipelines shall be removed or altered at abandonment to the satisfaction of the Director of Engineering for MBTA Railroad Operations.

4.12 DRAINAGE

- A. Occupancies shall be designed, and constructed, so that adequate and uninterrupted drainage of railroad right-of-way is maintained. If it becomes necessary to block a ditch, pipe or other drainage facility, the applicant shall install temporary pipes, ditches or other drainage facilities as required to maintain adequate drainage, as approved by the MBTA or Railroad Company(s). Upon completion of the work, the temporary drainage facilities shall be removed and the permanent facilities restored.
- B. Water may not be pumped or disposed of onto railroad rights-of-way unless discharged into an existing drainage facility, providing discharge does not cause erosion or leave sediment.
- C. When water runoff is disposed of onto MBTA Railroad Property, it must be demonstrated to the Railroad Company(s) that the existing drainage facility can accommodate the increased runoff. Drainage calculations stamped by a Registered Professional Engineer must accompany all requests to use railroad culverts or drainage ditches.
- D. If in the estimation of the Director of Engineering for MBTA Railroad Operations or their authorized representative, the railroad culvert or drainage ditch has to be cleaned in order to allow the increased flow to safely pass through the culvert, it must be cleaned at the expense of the applicant.

SECTION 5. CARRIER PIPE

GENERAL:

5.01 DESIGN CRITERIA

- A. If the maximum allowable stress in the carrier pipe on either side of the occupancy of MBTA Railroad Property is less than specified herein, the carrier pipe on MBTA Railroad Property shall be designed at the same stress as the adjacent carrier pipe.

- B. Requirements for carrier pipe under railroad tracks shall apply for a minimum distance equal to that of the casing pipe.
- C. Carrier pipes within a casing shall be designed for railroad live loads as if they were not encased.
- D. All pipes, ditches and other structures carrying surface drainage on MBTA Railroad Property and/or crossing under railroad tracks shall be designed to carry the run-off from a one hundred (100) year storm. Computations indicating this design and suitable topographic plans, prepared by a Registered Professional Engineer, shall be submitted to the Director of Engineering for MBTA Railroad Operations, or their authorized representative, for approval. If the drainage is to discharge into an existing drainage channel on railroad right-of-way and/or under railroad tracks, the computations should include the hydraulic analysis of any existing structures. Submitted with the computations should be formal approval of the proposed design by the appropriate governmental agency.

PRODUCTS:

5.02 GENERAL

- A. All pipes shall be designed for the external and internal loads to which they will be subjected. The dead load of earth shall be considered 120 pounds per cubic foot. Railroad live loading shall be Cooper's E-80 with 50% added for impact. On railroad right-of-way or where railroad loading will be experienced, the following shall be the minimum requirements for carrier pipes:
 - 1. Reinforced concrete pipe - ASTM Spec. C-76, Class V, Wall C.
 - 2. Ductile Iron Pipe - For Culverts and Gravity Sewers - ASTM Spec, A-142 Extra Heavy.

5.03 OIL AND GAS PIPES

- A. Pipelines carrying oil, liquefied petroleum gas, natural or manufactured gas and other flammable products shall conform to the requirements of the current ANSI B 31.4, with Addenda, "Liquefied Petroleum Transportation Piping Systems," ANSI B 31.8, "Gas Transmission and Distribution Piping Systems," and other applicable ANSI codes, except that the minimum allowable stresses for the design of steel pipe shall not exceed the following percentages of the specified minimum yield strength (multiplied by the longitudinal joint factor) of the pipe as defined in the ANSI Codes:

1. Steel pipe within a casing under, across and longitudinally on MBTA Railroad Property. (The following percentages apply to hoop stress):
 - a. Seventy-two percent for installation on oil pipelines.
 - b. Fifty percent for pipelines carrying liquefied petroleum gas and other flammable Liquids with low flash point.
 - c. Sixty percent for installations on gas pipelines.
 2. Steel pipe without a casing laid longitudinally on MBTA Railroad Property. (The following percentages apply to hoop stress):
 - a. Sixty percent for installations on oil pipelines.
 - b. Forty percent for pipelines carrying liquefied petroleum gas and other flammable Liquids with low flash point.
 - c. Forty percent for installations on gas pipelines.
- B. Design computations showing compliance with the requirements of Paragraph 5.03(A) above, and prepared by a Registered Professional Engineer, shall accompany the application for occupancy.
- 5.04 CAST IRON PIPE: For water and other materials under pressure shall conform to the current ANSI specifications A-21 Series 21/45 Iron strength with plain end, compression type or mechanical joints. The strength to sustain external railroad and other loadings shall be computed in accordance with the current ANSI A-21.1 "Thickness Design of Cast Iron Pipe."
- 5.05 VITRIFIED CLAY PIPE: ASTM Spec C-700, Extra Strength.
- 5.06 CORRUGATED METAL PIPE: AREA Spec Chapter I, Part 4
- 5.07 ASBESTOS CEMENT PIPE (Non-pressure): ASTM Spec. C-428, C1. 5000 Min. Pressure: AWWA Spec. C400, C1. 150 Min.
- 5.08 OTHER: Other miscellaneous piping not specified above shall be submitted to approval by the Director of Engineering for MBTA Railroad Operations.
- 5.09 SHUT-OFF VALVE
- A. Provide accessible emergency shut-off valves at each side of the railroad within distances and at locations as directed by the Chief Engineering Officer.

- B. Where pipelines are provided with automatic control stations and within distances approved by the Director of Engineering for MBTA Railroad Operations, no additional valves will be required.

5.10 SIGNS

- A. Prominently identify all pipelines at rights-of-way by durable, weatherproof signs located over the centerline of the pipe. Mark pipelines at under crossings on both sides of track. Signs shall display the following:
 - 1. Name and address of pipeline Owner.
 - 2. Contents of Pipe.
 - 3. Pressure in Pipe.
 - 4. Depth below grade at point of sign.
 - 5. Emergency telephone in event of pipe rupture.
 - 6. Railroad File Number.
- B. For pipelines running longitudinally on MBTA Railroad Property, place signs over the pipe (or offset and appropriately mark) at all changes in direction the pipeline. Locate signs so that when standing at one sign, the next adjacent marker in either direction is visible. In no event shall pipeline identification signs be placed more than 500 feet apart, unless otherwise directed by the Director of Engineering for MBTA Railroad Operations.
- C. Submit details of signs (materials, size, methods of support, etc.) to the Director of Engineering for MBTA Railroad Operations for approval.

EXECUTION:

5.11 INSTALLATION:

- A. Install carrier pipes in accordance with approved Construction Drawings, requirements of this specification, and all applicable codes and ordinances.
- B. Install carrier pipes with sufficient slack so they are not in tension.

SECTION 6. CASING PIPE

GENERAL:

6.01 DESIGN CRITERIA

- A. Casing pipe and joints shall be of metal and of leak-proof construction.
- B. Casing pipe shall be designed for the earth and/or other pressures present, and for railroad live load. The dead load of earth shall be considered 120 pounds per cubic foot. Railroad Live load shall be Cooper E-80 with 50g added for impact.
- C. The inside diameter of the casing pipe shall be such as to allow the carrier pipe to be removed subsequently without disturbing the casing or the roadbed. For carrier pipe less than six (6) inches in diameter, the inside diameter of the casing pipe shall be at least two (2) inches greater than the largest outside diameter of the carrier pipe joints or couplings. For carrier pipe six (6) inches and over in diameter, the inside diameter of the carrier pipe shall be at least four (4) inches greater than the largest outside diameter of the carrier pipe joints or couplings.
- D. For flexible casing pipe, a minimum vertical deflection of 3 percent of its diameter, plus 1/2 inch, shall be provided so that no loads from the roadbed, track, traffic or casing pipe itself are transmitted to the carrier pipe. When insulators are used on the carrier pipe, the inside diameter of the flexible casing pipe shall be at least two (2) inches greater than the outside diameter of the carrier pipe for pipe less than eight (8) inches in diameter; at least 3-1/4 inches greater for pipe 8 to 16 inches in diameter, and at least 4-1/2 inches greater for pipe 18 inches and over in diameter. In no event shall the casing pipe diameter be greater than is necessary to permit the insertion of the carrier pipe.
- E. Casing pipe under railroad tracks and across MBTA Railroad Property shall extend the greater of the following distances, measured at right angles to centerline of track:
 - 1. Across the entire width of MBTA Railroad Property.
 - 2. Two (2) feet beyond ditch line.
 - 3. Three (3) feet beyond toe of slope.
 - 4. A minimum distance of 25 feet each side from centerline of outside track when casing is sealed at both ends.
 - 5. A minimum distance of 45 feet from centerline of outside track when casing is open at both ends.

F. If additional tracks are constructed in the future, the casing shall be extended at the expense of the Applicant.

G. Table of Live Loads

LIVE LOADS, INCLUDING IMPACT, FOR VARIOUS HEIGHTS OF COVER
FOR COOPER E- 80

COVER (FT)	LOAD (PSF)	COVER (FT)	LOAD (PSF)	COVER (FT)	LOAD (PSF)
2	3800	10	1100	20	300
5	2400	12	800	30	100
8	1600	15	600		

6.02 PROTECTION AT ENDS OF CASING

- A. Casings for carriers of flammable substances shall be sealed to the outside of the carrier pipe. Details of seals shall be shown on the Drawings.
- B. Casings for carriers of non-flammable substances shall have both ends of the casing blocked in such a way as to prevent the entrance of foreign material, but allowing leakage to pass in the event of a carrier break.
- C. Where ends of casing are at or above ground surface and above high water level, they may be left open, provided drainage is afforded in such a manner that leakage will be conducted away from railroad tracks and structures.

6.03 VENTS

- A. Sealed casings for flammable substances shall be properly vented. Vent pipes shall be of sufficient diameter, but in no case less than two (2) inches in diameter, and shall be attached near each end of the casing and project through the ground surface at right-of-way lines or not less than 45 feet (measured at right angles from centerline of nearest track).
- B. Vent pipes shall extend at least four (4) feet above the ground surface. Top of vent pipe shall have a down-turned elbow, properly screened, or a relief valve. Vents in locations subject to high water shall be extended above the maximum elevation of high water and shall be supported and protected in a manner approved by the Director of Engineering for MBTA Railroad Operations.
- C. Vent pipes shall be at least four (4) feet from the closest aerial electric

wires.

- D. When the pipeline is in a public highway, street-type vents shall be installed.

PRODUCTS:

6.04 STEEL PIPE

The minimum yield strength for steel pipe shall be 35,000psi. Smooth wall pipes with a nominal diameter greater than 70 inches require special approval by the Director of Engineering for MBTA Railroad Operations. See Plate V, "Table of Minimal Wall Thickness for Steel Casing Pipe."

6.05 CAST IRON PIPE

May be used for a casing, provided the method of installation is by open trench. Cast iron pipe shall conform to ASTM Specification A-142, Extra Heavy. The pipe shall be of the mechanical joint type or plain end type with compression type couplings.

6.06 CORRUGATED METAL PIPE AND CORRUGATED STRUCTURAL PLATE PIPE

May be used for casing only when emplaced by the open-cut method. Jacking or boring through railroad embankment is not permitted. Pipe shall be bituminous coated and shall conform to AREA Specifications Chapter 1, Part 4.

6.07 REINFORCED CONCRETE PIPE

Shall conform to ASTM Specification C 76, Class V, Wall C. It shall be used only in the open cut and jacking methods of installation. If concrete pipe is to be jacked into place, grout holes tapped for at least 1-1/2 inch pipe spaced at approximately 8 feet around the circumference and approximately 4 feet longitudinally shall be cast into the pipe at manufacture. Immediately upon completion of jacking operations, the installation shall be pressure grouted.

6.08 TUNNEL LINER PLATES

Shall be four flange and otherwise conform to American Railway Engineering Association Specifications Chapter 1, Part 4. In no event shall the liner plate thickness be less than 0.1046 inches. Tunnel liner plates are to be used only to maintain a tunneled opening until the carrier pipe is installed. After installation the annular space between the carrier and liner must be filled

with 1:6 cement grout or lined with 6 inches of concrete, reinforced with 6x6-6/6 wire mesh for tunnels up to 108 inches in diameter. Required thickness of lining for larger tunnels shall be determined by span and structural analysis. Manufacturer's Shop Detail Drawings and manufactures computations showing the ability of the tunnel liner plates to resist the jacking stresses shall be submitted to the Director of Engineering for MBTA Railroad Operations for approval.

EXECUTION:

6.09 DEPTH OF INSTALLATION:

- A. Casing pipe under railroad tracks and across MBTA Railroad Property shall be at least 6-1/2 feet from top of rail to top of casing at its closest point. Under secondary or industrial tracks this distance shall be at least 5-1/2 feet. On other portions of MBTA Railroad Property where casing is not directly beneath any track, the depth from ground surface or from bottom of ditches to top of casing shall be at least four (4) feet, unless otherwise specified herein.
- B. Pipelines laid longitudinally on MBTA Railroad Property 50 feet or less from centerline of track shall be buried not less than five (5) feet from ground surface to top of pipe. This applies to all pipelines carrying oil, gas, petroleum products, or other flammable or highly volatile substances under pressure, and all non-flammable substances which by their nature or presence in the judgment of the Director of Engineering for MBTA Railroad Operations may be hazardous to life or property. For pipelines carrying water, sewage and non-flammable substances, the distance from surface of ground to top of pipe shall not be less than four (4) feet.
- C. Pipelines located within the line of track live load influence (as shown on Plates II and III) are subject to railroad loading and require a casing or are to be of special design approved by the Director of Engineering for MBTA Railroad Operations. All longitudinal occupation locations must be approved by the Chief Engineering Officer.
- D. The minimum cover shall be at least three (3) feet when pipeline is laid more than 50 feet from center line of track.
- E. Pipelines installed under or adjacent to any overhead structure must be a minimum of 29 feet from the bottom of the structure to the top of the casing. Such installations must comply with the above requirements.

6.10 METHOD OF INSTALLATION

- A. The Owner or its Contractor shall submit to the Director of Engineering for MBTA Railroad Operations, data and information demonstrating that the Contractor or their subcontractors have had successful previous experience in jacking, or using the proposed method of installation, in similar situations.
- B. Before any work is begun within the limits of jacking, the Owner or its Contractor shall have assembled all tools, materials, and equipment which will be required. When the Owner or its Contractor has started the jacking operation, they shall proceed in a continuous operation without stopping. This will minimize the tendency of the material to freeze around the pipe.
- C. A jacking shield shall be used and jacked ahead of the casing pipe. The excavation within the jacking pipe should not advance beyond the head of the pipe shield. If the stability at the face needs to be maintained from raveling or running soil, suitable temporary bulkheads, struts, and bracing shall be required. After completion of the sleeve installation the annular space around it shall be completely grouted with cement grout under pressure.
- D. Casing pipe ends shall be beveled with a single V-groove toe field welding. Pipe joints shall be butt welded and shall be a full penetration on the outside circumference of the pipe. The single V-groove butt weld shall conform to the latest A.W.S. Welding Code. All joints of the casing pipe shall be butt welded, by a certified welder, prior to being subject to the jacking operation.

Alternate method: The casing pipe may be jacked without being butt welded through the use of a continuous 1/2"x12" interior collar plate. The collar plate shall be welded completely upon completion of the jacking operation. All welding shall conform to the latest A.W.S. Welding Code, and shall be performed by a certified welder.

6.11 CONSTRUCTION:

- A. The casing pipe shall be constructed so as to prevent leakage of any substance from the casing throughout its length, except where the ends are left open, or through vent pipes when the ends are sealed. The casing shall be installed so as to prevent the formation of a waterway under the railroad, shall have an even bearing throughout its length, and shall slope to one end (except for longitudinal occupancy).
- B. Casing pipes shall be installed by the following methods:

1. Jacking

- a. This method shall be in accordance with the most current edition of the American Railway Engineering Association Specifications, "Jacking Culvert Pipe Through Fills." This operation shall be conducted without hand mining ahead of the pipe and without the use of any type of boring, auguring, or drilling equipment.
- b. Bracing and backstops shall be designed and jacks of sufficient rating used so that the jacking will be continuous.

2. Drilling

This method employs the use of an oil field type rock roller bit or a plate bit made up of individual roger cutter units which are welded to the pipe casing being installed and which are turned as it is advanced. The pipe is turned for its entire length from the drilling machine to the ground being drilled. A high density slurry is injected through a small supply line to the head which acts as a cutter lubricant. This slurry is injected at the rear of the cutter units to prevent any jetting action ahead of the pipe. The drilling machine runs on a set of steel rails and is advanced (thus advancing the pipe) by a set of hydraulic jacks. The method is the same whether earth or rock is being drilled. Any other drilling methods shall be submitted to the Director of Engineering for MBTA Railroad Operations for approval.

3. Tunneling

- a. Tunneling operations shall be conducted as approved by the Railroad Company(s). Care shall be exercised in trimming the surface of the excavated section in order that the steel liner plates fit snugly against the undisturbed material. Excavation shall not be advanced ahead of the previously installed liner plates any more than is necessary for the installation of the succeeding liner plate. The vertical face of the excavation shall be supported as necessary to prevent sloughing. At any interruption of the tunneling operation, the heading shall be completely bulkheaded. Tunneling shall be conducted continuously, on a 24 hour basis until the tunnel liners extend at least one foot beyond the railroad line of influence.
- b. When tunneling, tight breasting must be maintained around the entire face. On any shutdowns (under or beyond railroad influence line, see Plate II), the entire

face shall be fully breasted and packed with hay.

- c. The tail void shall be filled with pea stone (or other approved material) simultaneously with each advancement of the shield.
- d. An ample supply of hay and/or sandbags must be kept at the site to fill any voids caused by the removal of large stones or other obstructions extending outside the shield.
- e. A uniform mixture of 1:6 cement grout shall be placed under pressure behind the liner plates, in addition to the previously placed pea stone. Grout holes, tapped for at least 1-1/2 inch pipe and spaced 3 feet around the tunnel liner, shall be placed in every other ring. Grouting shall start at the lowest dole and proceed upwards. A threaded plug shall be installed in each grout hole as the grunting is completed at that hole.
- f. Grouting shall be kept as close to the heading as possible, using grout stops behind the liner plates. If necessary, grouting shall proceed as directed by the Railroad Company(s), but in no event shall more than six lineal feet of tunnel be progressed beyond the grouting.

4. Tunneling Shields

- a. All pipes 70 inches and larger in diameter shall be emplaced with the use of a tunneling shield, unless otherwise approved by the Director of Engineering for MBTA Railroad Operations. Pipes of smaller diameter may also require a shield when, at the sole discretion of the Director of Engineering for MBTA Railroad Operations, soil, or other conditions indicate its need.
- b. The shield shall be of steel construction, designed to support railroad track loading as specified in Paragraph 6.01 B herein, in addition to other loadings it must sustain. The advancing face shall be provided with a hood, extending no less than 20 inches beyond the face and extending around no less than the upper 240 degrees of the total circumference. Installations made with liner plates shall be provided with a full 360 degree shield. It shall be of sufficient length to permit the installation of at least one complete ring of liner plates within the shield before it is advanced for the installation of the next ring of liner plates, It shall conform to and not exceed the outside dimensions of the pipe being emplaced by more than one inch at any point in the periphery.

- c. The shield must be adequately braced and provided with necessary appurtenances for completely bulkheading the face with horizontal breastboards, and arrange so that the excavation can be benched as may be necessary. Excavation shall not be advanced beyond the edge of the hood, unless otherwise approved by the Railroad Company(s).
 - d. Manufacturer's Shop Detail Drawings and computations showing the ability of the tunnel liner plates to resist the jacking stresses shall be submitted to the Director of Engineering for MBTA Railroad Operations for approval.
 - e. For jacking reinforced concrete pipe, the shield shall be fabricated as a special section of reinforced concrete pipe with the steel cutting edge, hood, breasting attachments, etc., cast into the pipe. The wall thickness and reinforcing shall be designed for the jacking stresses.
 - f. Grout holes tapped for no less than 1-1/2 inch pipe, spaced at approximately 3 foot centers around the circumference of the shield (or the aforementioned special reinforced concrete section) and no more than 4 foot centers longitudinally shall be provided.
 - g. Detail Drawings sufficient to determine the adequacy of the shield, accompanied with design calculations prepared by a Registered Professional Engineer, shall be submitted to the Director of Engineering for MBTA Railroad Operations for approval and no work shall proceed until such approval is obtained.
5. Boring
- a. This method consists of pushing the pipe into the fill with a boring auger rotating within the pipe to remove the spoil. When augers, or similar devices, are used for pipe emplacement, the front of the pipe shall be provided with mechanical arrangements or devices that will positively prevent the auger and cutting head from leading the pipe so that there will be no unsupported excavation ahead of the pipe. The auger and cutting head arrangement shall be removable from within the pipe in the event an obstruction is encountered. The over-cut by the cutting head shall not exceed the outside diameter of the pipe by more than one-half inch. The face of the cutting head shall be arranged to provide reasonable obstruction to the free flow of soft or poor material.
 - b. Drawings and descriptions of the auger stop arrangement to be used shall be submitted to the Director of Engineering for MBTA Railroad Operations for approval,

and no work shall proceed until such approval is obtained and the arrangement is inspected in the field by the Railroad Company(s).

- c. The use of water or other Liquids to facilitate casing emplacement and/or spoil removal is prohibited.
 - d. Any method which employs simultaneous boring and jacking or drilling and jacking for pipes over 8 inches in diameter which does not have the above approved arrangement WILL NOT BE PERMITTED. For pipes 8 inches and less in diameter, augering or boring without this arrangement may be considered for use only as approved by the Director of Engineering for MBTA Railroad Operations.
- C. If an obstruction is encountered during the installation which stops the forward action of the pipe, and it becomes evident that it is impossible to advance the pipe, operations shall cease and the pipe shall be abandoned in place and filled completely with grout, in accordance with Section 4, Paragraph 4.10.
- D. Bored or jacked installations shall have a bored hole essentially the same as the outside diameter of the pipe plus the thickness of the protective coating. If voids should develop or if the bored hole diameter is greater than the outside diameter of the pipe (plus coating) by more than 1 inch, grouting or other methods approved by the Railroad Company(s) shall be employed to fill such voids.
- E. Pressure grouting or freezing of the soils before or during jacking, boring, or tunneling may be required at the direction of the Railroad Company(s) to stabilize the soils, control water, prevent loss of material and prevent settlement or displacement of the embankment and/or tracks. Grout shall be cement, chemical or other special injection material selected to accomplish the necessary stabilization.
- F. The materials to be used and the method of injection shall be prepared by a Registered Professional Engineer (Geotechnical), or by an experienced and qualified company specializing in this work and submitted for approval to the Railroad Company(s) before the start of work. Proof of experience and competency shall accompany the submission.
- G. When water is expected to be encountered, pumps of sufficient capacity shall be provided and maintained at the site, and continually attended on a 24-hour basis, until in the sole judgment of the Railroad Company(s), their operation can be safely halted.

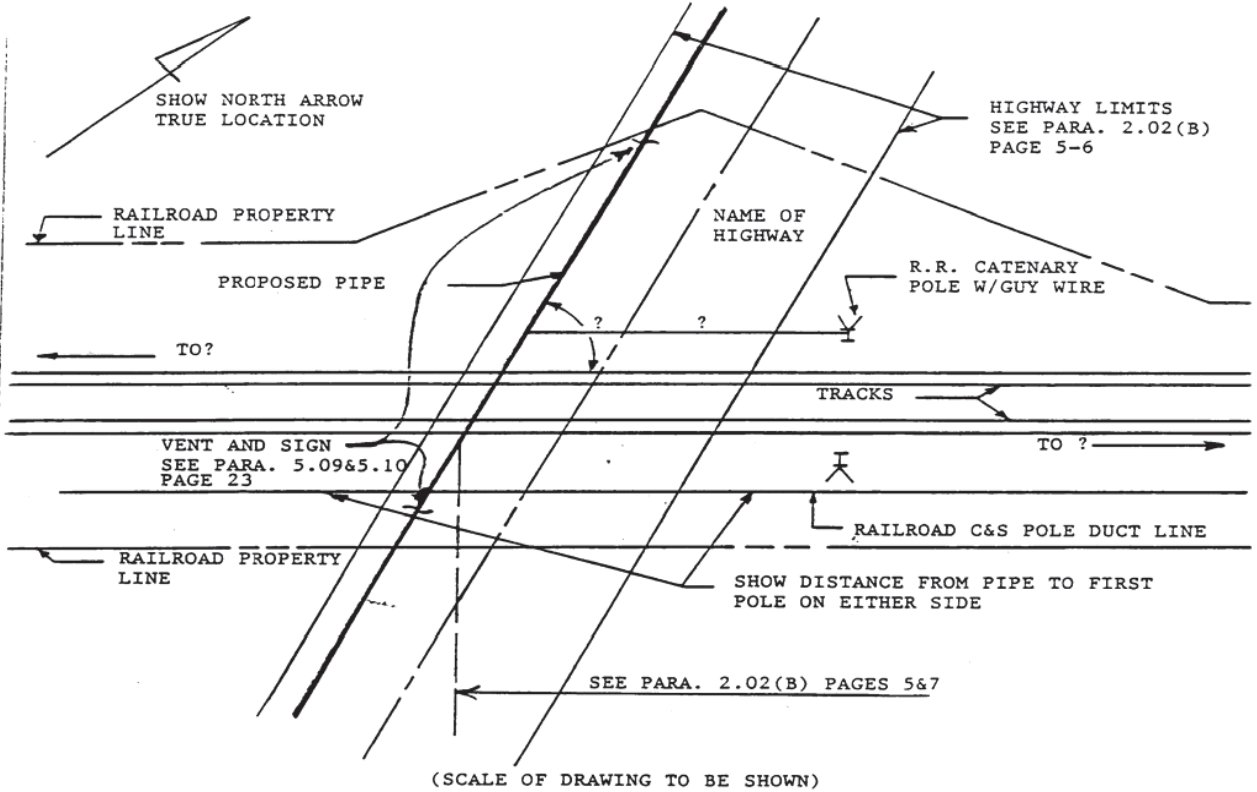
When dewatering, close observation shall be maintained to detect any settlement or displacement of railroad embankment, tracks, and facilities.

- H. Proposed methods of dewatering must be submitted to the Railroad Company(s) for approval prior to implementation. The discharge from the dewatering operations in the vicinity of the railroad shall be carefully monitored. If in the opinion of the Railroad Company(s), there is an excessive loss of fine soil particles at any time during the dewatering process, the dewatering shall be halted immediately. The dewatering operation cannot resume until the unsatisfactory condition is remedied to the satisfaction of the Railroad Company(s).

PLATE I

PIPE CROSSING

INFORMATION TO BE SHOWN ON PLAN SECTION OF DRAWING



NOTE:

IF MANHOLES ARE PLACED ON MBTA RAILROAD PROPERTY, DETAILS OF SAME, WITH CLEARANCES TO THE CENTERLINE OF THE NEAREST TRACK ARE TO BE SHOWN ON THE DRAWINGS.

IF THE PROPOSED PIPE IS TO SERVE A NEW DEVELOPMENT, A MAP SHOWING THE AREA IN RELATION TO ESTABLISHED AREAS AND ROADS IS TO BE SENT WITH THE REQUEST.

THE PROPOSED PIPE IS NOT WHOLLY WITHIN HIGHWAY LIMITS, THE SAME INFORMATION IS REQUIRED AS SHOWN ON THIS PLATE.

PLATE II

PIPE CROSSING

INFORMATION TO BE SHOWN ON PROFILE SECTION OF DRAWING

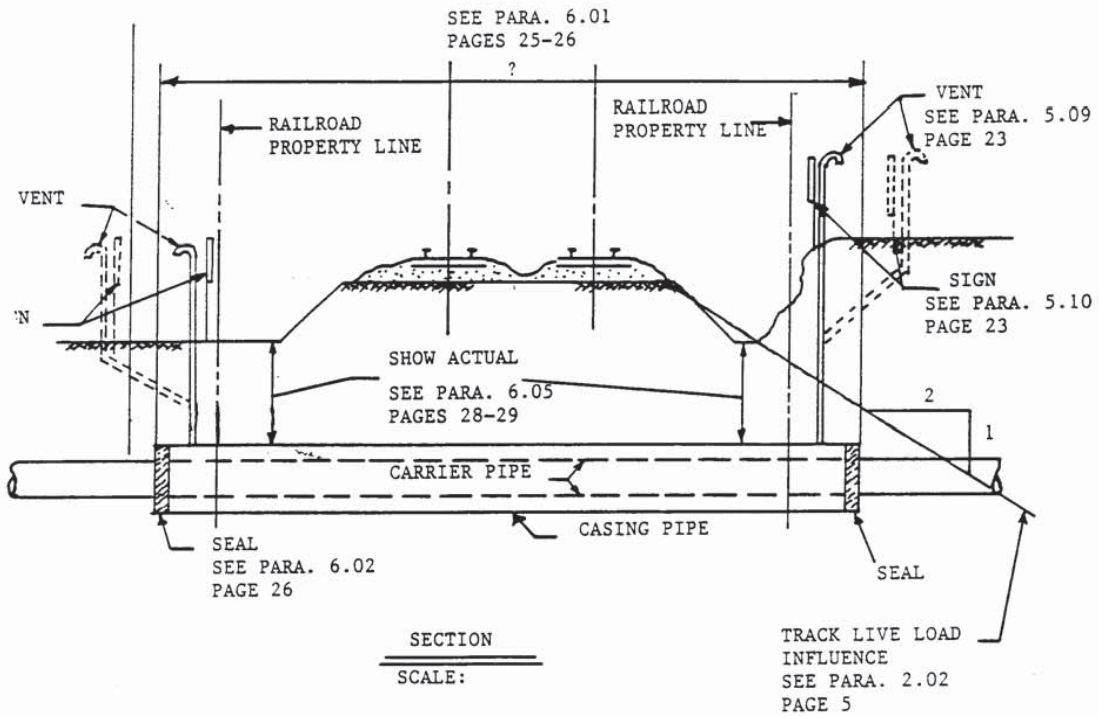
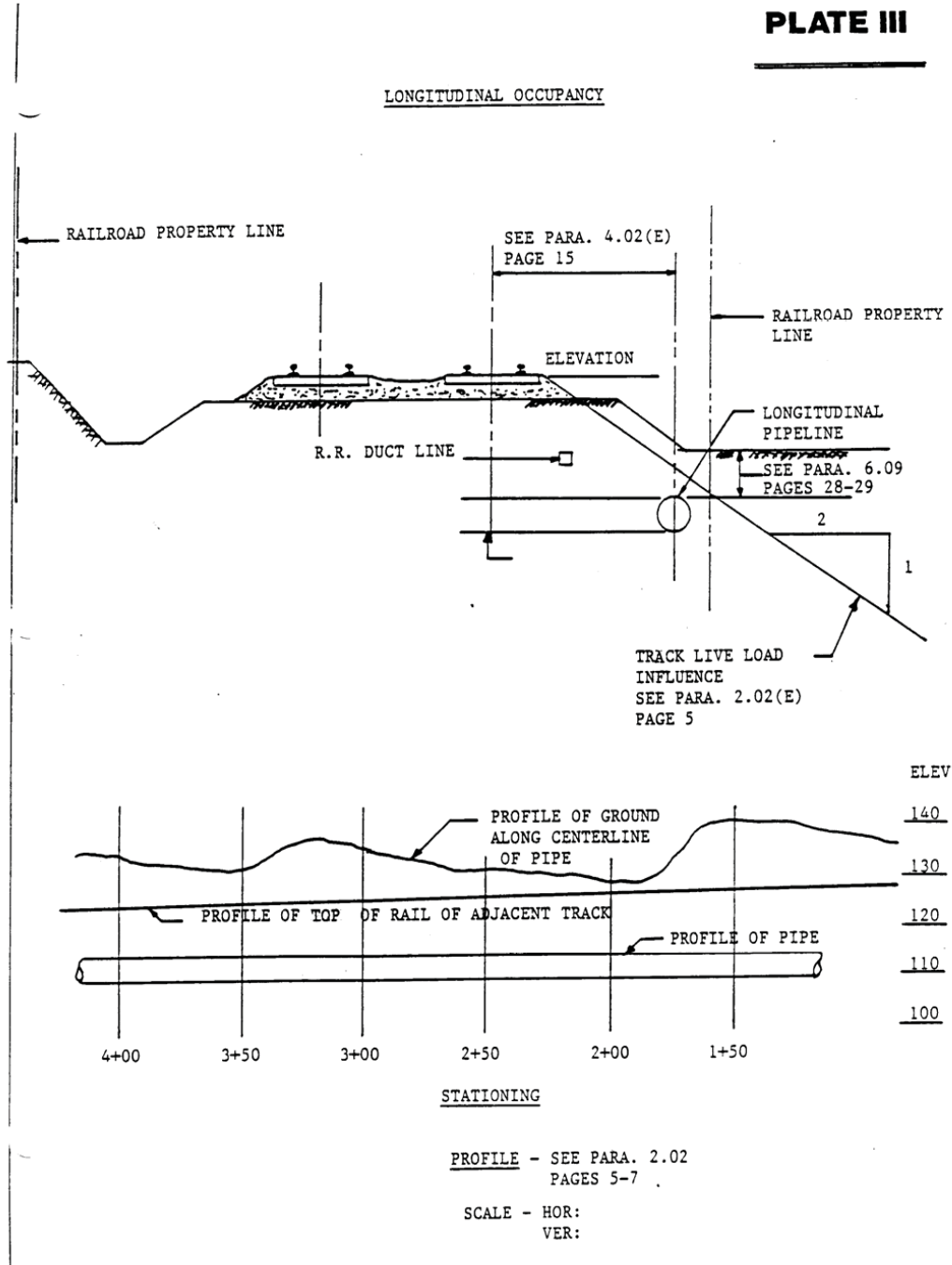


PLATE III

LONGITUDINAL OCCUPANCY



PIPE CROSSING DATA SHEET

PLATE IV

In addition to plan and profile of crossing, Drawings submitted for the Railroad Company(s) approval shall contain the following information:

	<u>Pipe Data</u>	
	<u>Carrier Pipe</u>	<u>Casing Pipe</u>
Contents To Be Handled	_____	_____
Normal Operating Pressure	_____	_____
Normal Size of Pipe	_____	_____
O.S. Diameter	_____	_____
I.S. Diameter Wall	_____	_____
Thickness Weight	_____	_____
Per Foot Material	_____	_____
Process of Manufacture	_____	_____
Specification	_____	_____
Grade or Class	_____	_____
Test Pressure	_____	_____
Type of Joint	_____	_____
Type of Coating	_____	_____
Details of Cathodic Protection	_____	_____
Details of Seal or Protection at Ends of Casing:	_____	_____
Method of Installation	_____	_____
Character of Subsurface: Material At the Crossing Location	_____	_____
Approximate Ground Water Level	_____	_____
Source of Information on Sub-surface conditions (Test Pits, Borings or Other)	_____	_____

NOTE: Any soil investigation made on MBTA Railroad Property, or adjacent to tracks shall be carried on under the supervision of the Railroad Company(s).

PLATE V

TABLE OF MINIMUM WALL THICKNESS FOR STEEL CASING PIPE
(FOR INFORMATION ONLY)

PROTECTED WALL THICKNESS

PIPE SIZE (INCHES)	WALL THICKNESS (PROTECTED)
10	0.375
12	0.375
14	0.375
16	0.375
18	0.375
20	0.375
22	0.375
24	0.375
26	0.375
28	0.406
30	0.469
32	0.501
34	0.532
36	0.532
38	0.569
40	0.569
42	0.569
44	0.594
46	0.688
48	0.688
50	0.688
52	0.813
54	0.813
56	0.876
58	0.876
60	0.876
62	0.876
64	0.876
66	0.876
68	0.876
70	0.906

NOTE: - FOR UNPROTECTED PIPE 26" AND UNDER ADD 0.032" TO PROTECTED WALL THICKNESS. FOR UNPROTECTED PIPE 28" AND OVER, ADD 0.063" TO PROTECTED WALL THICKNESS.



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V

SPECIFICATIONS FOR WIRE CONDUIT AND CABLE
OCCUPATIONS

SECTION 1. SCOPE

- 1.01 These specifications apply to the design of electric transmission wires and cables (power and communication) which are to be located over, under, across or upon property, facilities, and tracks owned by the MBTA.

SECTION 2. LICENSE TO ENTER MBTA RAILROAD PROPERTY

- 2.01 Individuals, corporations, or municipalities desiring wire or cable occupations must agree, upon approval of the construction details by the Director of Engineering for MBTA Railroad Operations, to execute an appropriate occupational agreement and pay any required fees and/or rentals outlined therein.

- 2.02 Application for an occupancy shall be submitted in writing to:

AGM for Real Estate and Asset Development
MBTA, 10 Park Plaza
Boston, Massachusetts 02116

See "Guidelines and Procedures for Construction on MBTA Railroad Property."

- 2.03 All applications shall be accompanied with six (6) copies of all Construction Drawings, specifications and computations concerning the proposed occupancy.

SECTION 3. APPROVAL OF DRAWINGS

- 3.01 Entry upon MBTA Railroad Property for the purpose of conducting surveys, field inspections, obtaining soil information, or any other purpose associated with the design and engineering of the proposed occupancy will be permitted only with a proper entry permit prepared by the MBTA Real Estate Department. The issuance of such a permit does not constitute authority to proceed with the actual construction. Construction cannot begin until the proper insurance certificate is received and a formal agreement is executed by the MBTA and permission is received by the Railroad Company(s).

- 3.02 Drawings shall be drawn to scale and show the following: (See attached plates I -VI)

- A. Plan view of crossing or occupation in relation to all Railroad Company(s) facilities. (See Plate 1)
- B. Location of wire or cane (in feet) from nearest railroad mile post, center line of a railroad bridge (giving bridge number), or center line of a passenger station. In all cases, the name of the County and City or

Town in which the proposed facilities are located must be shown.

- C. Profile of ground on center line of pole or tower line, showing clearances between top of rail and bottom of sag, as well as clearances from bottom wire or cable to top wire or cable of the MBTA's transmission, signal and communication lines and catenary. If none of these facilities are in existence at the point of crossing, the plan should so indicate. Actual under-clearances are to be shown. (See Plate V for the required clearances).
- D. Show all known property lines. If wires, cables or conduits are within public highway limits, such limits should be clearly indicated with dimensions from center line.
- E. The Drawing must be specific as to:
 - 1. Base diameter, height, class and bury of poles. Poles shall be set no closer than 13' 6" from face of pole to center line of nearest track. When necessary, however, each location will be analyzed by the MBTA to consider speed, traffic, access, etc.
 - 2. Number, size and material of power wires, as well as number of pairs in communication cables.
 - 3. Nominal voltage of line, type of current and frequency.
 - 4. Number, location, size and material of anchors and all guying for poles and arms.

NOTE: Double cross-arms are required on poles adjacent to track. Any tower designs must be accompanied by engineering computations and data.

SECTION 4. CONSTRUCTION REQUIREMENTS

- 4.01 Power and communication lines shall be constructed in accordance with "Safety Rules for the Installation and Maintenance of Electric Supply and Communication Lines, National Electrical Safety Code Handbook, Part 2" (current issue), with the following exceptions:
 - A. Item 3 (c), page 2.
 - B. Casing pipes to contain power or communication wires or cables having an outside diameter of over four (4) inches shall be constructed in accordance with the current issue of MBTA Railroad Operations "Pipeline Occupancy Specifications".

SECTION 5. LONGITUDINAL OCCUPATIONS

- 5.01 Wires and cables running longitudinally along railroad right-of-way shall be

constructed as close to MBTA property lines as possible in accordance with Plate III. For electrical power lines and cables with voltages of 34,500 or over and communication canes containing over 180 pairs, the following information must be submitted in addition to the detail of the pole top configuration as called for on Plate IV of these specifications:

- A. Voltage of circuit(s) or number of pairs. B. Phase of electrical circuit(s).
- B. Number of electrical circuits.
- C. Size (AWG or CM) and material of wires and cables.

5.02 Any facilities overhanging MBTA Railroad Property must have approval of the MBTA and appropriate rental charges will be applied.

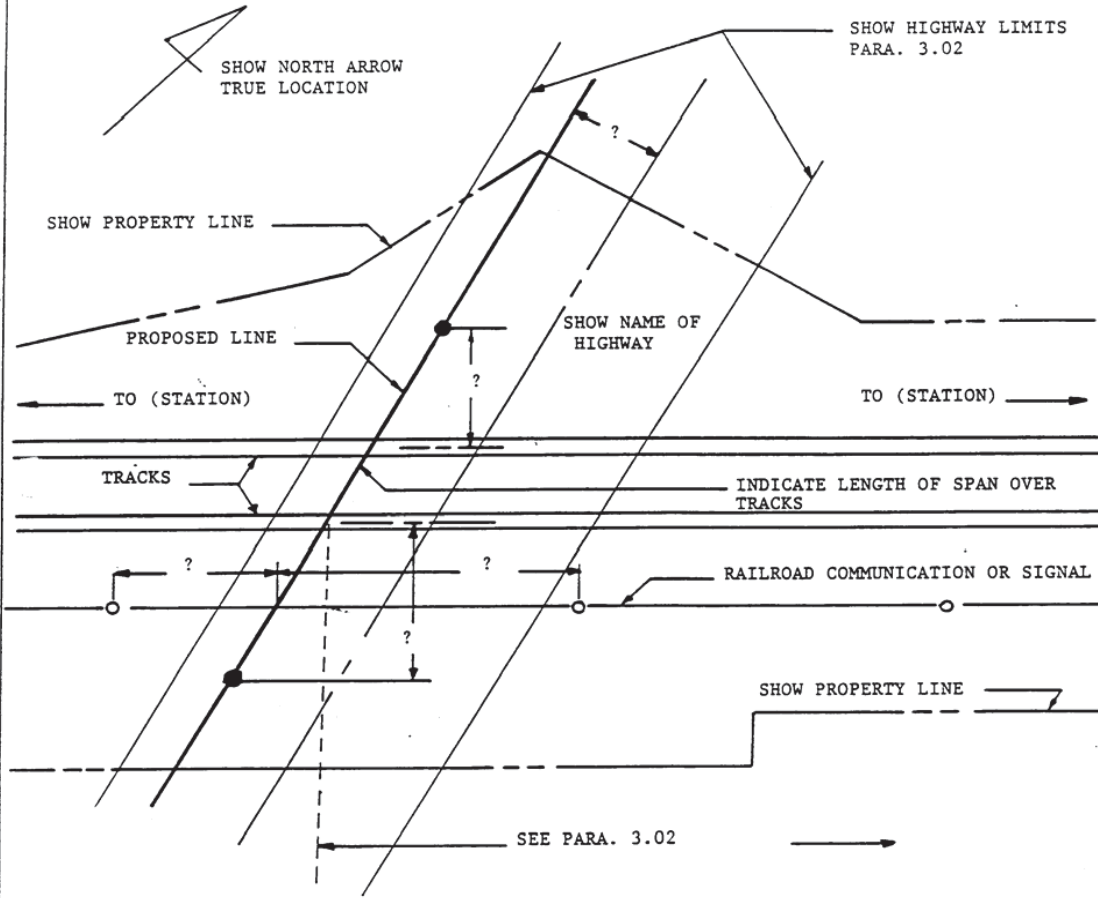
SECTION 6. INDUCTIVE INTERFERENCE

6.01 On agreements covering longitudinal occupations, provisions shall be included that hold the Applicant responsible to provide appropriate remedies, at their own expense, to correct any inductive interference with MBTA facilities.

PLATE I

PLAN VIEW

INFORMATION TO BE SHOWN ON PLAN SECTION OF DRAWINGS
WHEN FACILITY IS A CROSSING



SCALE OF DRAWING TO BE SHOWN

NOTE:

IF THE PROPOSED LINE IS TO SERVE A NEW DEVELOPMENT, A MAP SHOWING THE AREA IN RELATION TO ESTABLISHED AREAS AND ROADS IS TO BE SENT WITH THE REQUEST.

IF THE PROPOSED LINE IS NOT WHOLLY (OR PARTIALLY) WITHIN HIGHWAY LIMITS, THE SAME INFORMATION IS REQUIRED AS SHOWN ON THIS PLATE.

PLATE II

PIPE CROSSING

INFORMATION TO BE SHOWN ON PROFILE SECTION OF DRAWING

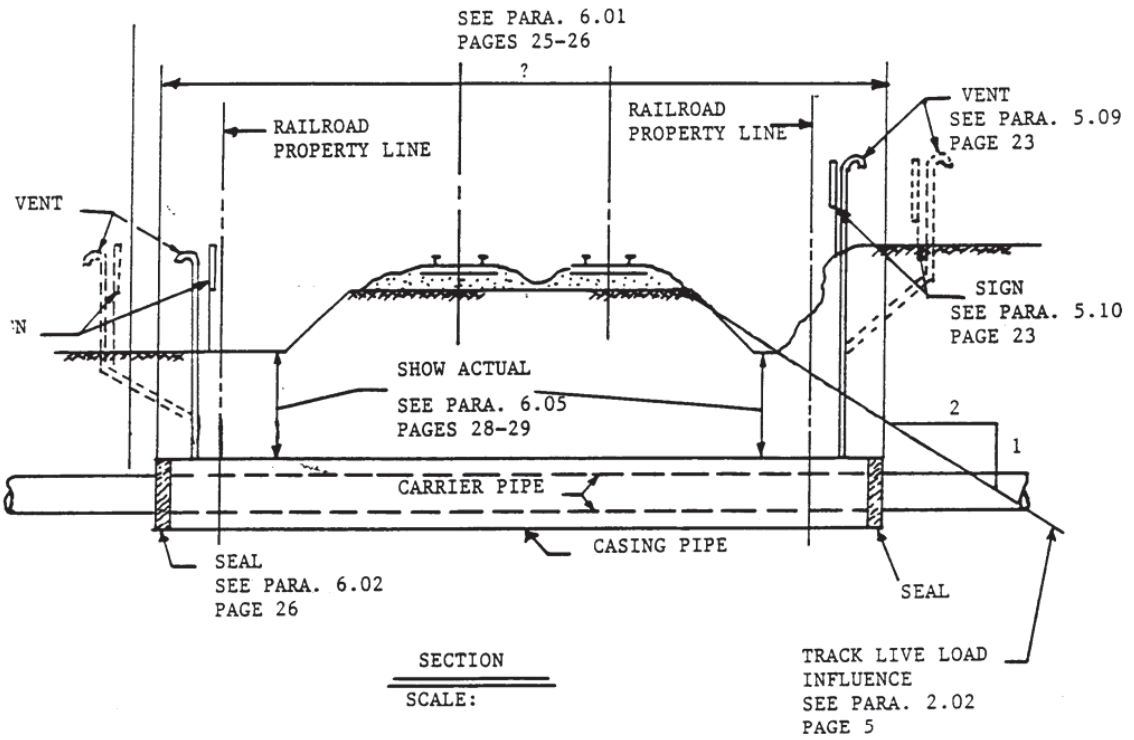
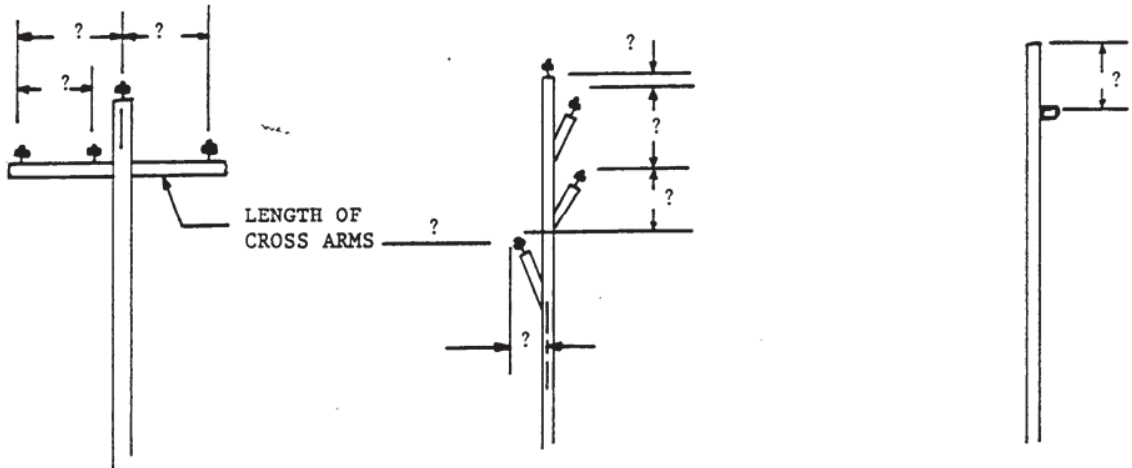
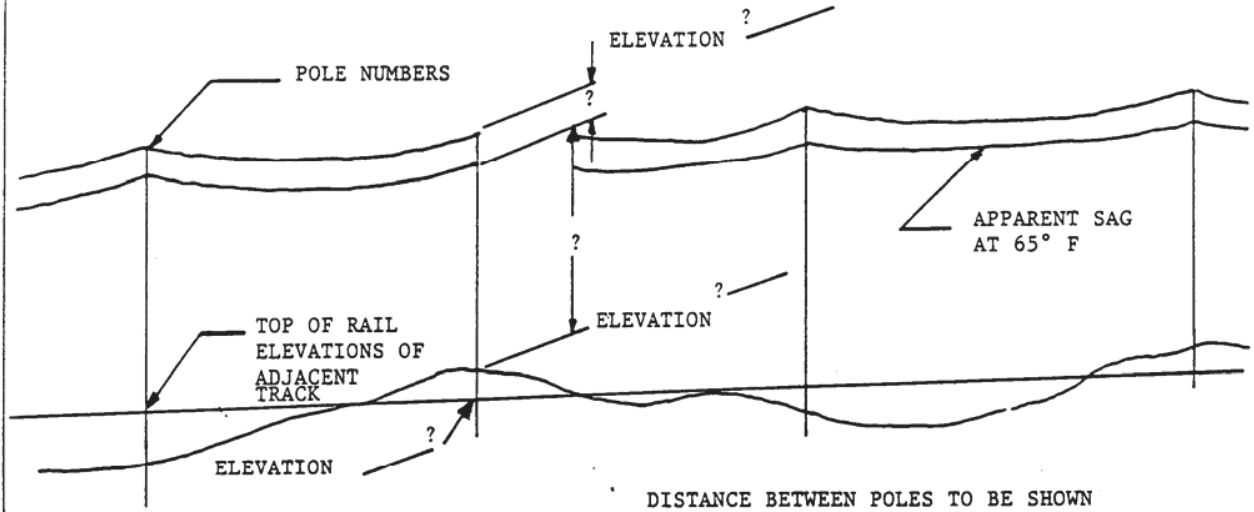


PLATE III

PROFILE VIEW

INFORMATION TO BE SHOWN ON PROFILE SECTION OF DRAWINGS
IN CASES OF LONGITUDINAL OCCUPATIONS



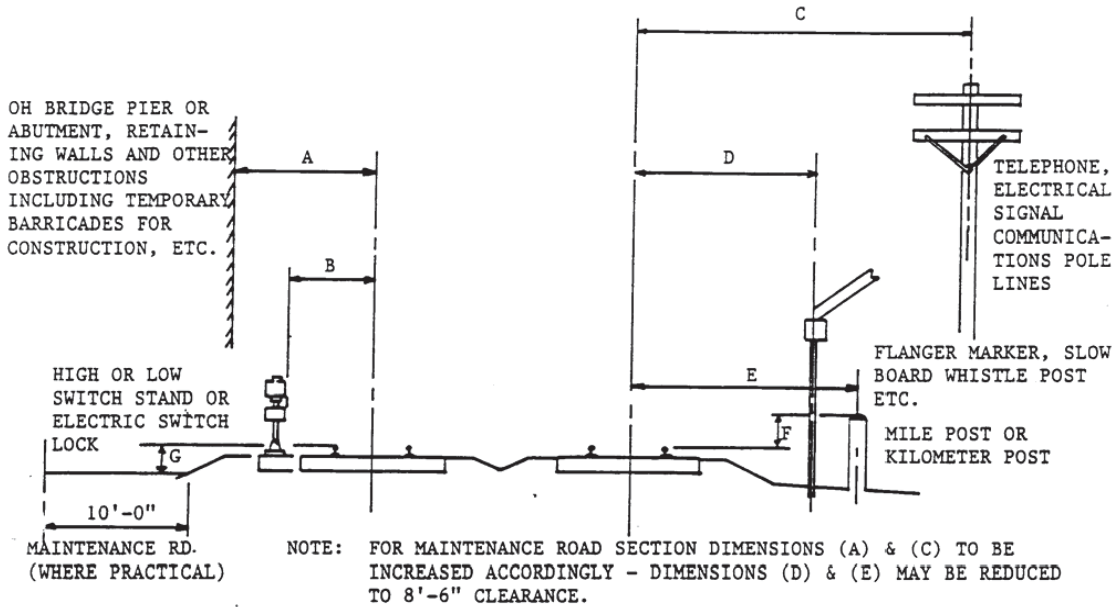
POLE TOP CONFIGURATION TO BE SHOWN SIMILAR TO SAMPLES ABOVE

NOTE: IF POWER LINE CROSSES ANY TRACK, THEN INFORMATION SHOWN ON PLATE II IS ALSO REQUIRED.

PLATE IV

STANDARD SIDE CLEARANCES - TANGENT TRACK

(FOR OBSTRUCTIONS OTHER THAN PASSENGER STATIONS)



DIMENSION	DESCRIPTION	
A	GENERAL MINIMUM SIDE CLEARANCE	8'-6"
	OVERHEAD BRIDGE PIERS & ABUTMENT, RETAINING WALLS & OTHER EXISTING STRUCTURES	8'-6"
B	LOW SWITCH STANDS (3'-0" MAX HEIGHT)	6'-6"
	HIGH SWITCH STANDS (OVER 3'-0" HEIGHT)	9'-0"
	ELECTRIC SWITCH LOCKS	6'-6"
C	POLE LINES - TELEPHONE, ELECTRIC, SIGNAL COMMUNICATIONS (MIN)	13'-6"
D	CENTERLINE WHISTLE POSTS, FLANGER MARKERS, SLOW OR SPEED BOARDS AND OTHER WAYSIDE SIGNS	12'-0"
	AUTOMATIC HIGHWAY CROSSING PROTECTION (MIN)	8'-6"
	AUTOMATIC HIGHWAY CROSSING PROTECTION (DESIRED)	15'-0"
E	MILE POSTS - HORIZONTAL	13'-6"
F	MILE POSTS - VERTICAL	7'-0"
G	DEPRESSION OF MAINTENANCE ROAD	

PLATE V

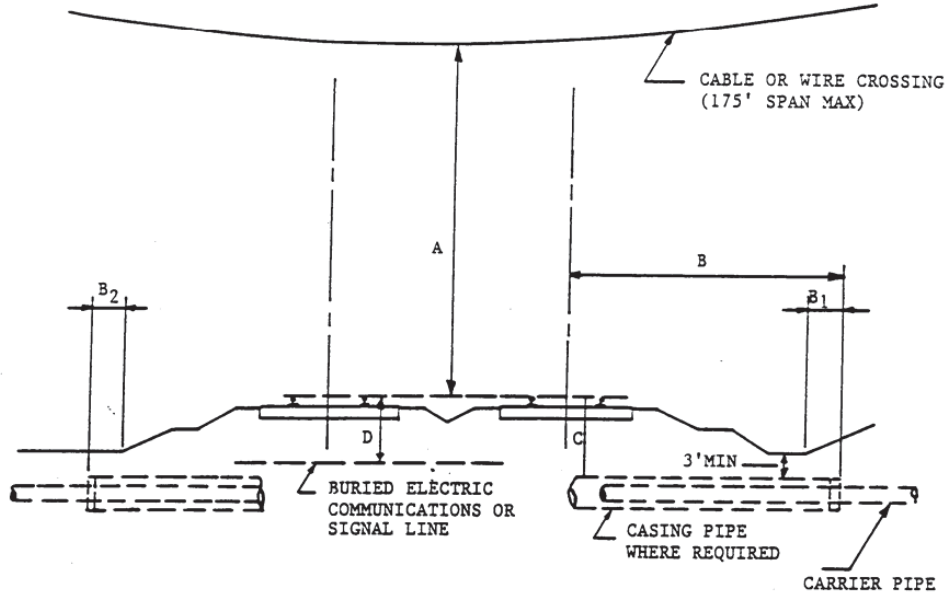
<u>VOLTAGE</u>	<u>OVERHEAD CLEARANCE</u> (Top of Rail to <u>Bottom of Sag</u>)	
0- 750	27'0"	} At 120°F Ambient Temperature
750- 15,000	28'0"	
15,000 - 50,000	30'0"	
69,000	30'8"	
115,000	32'2"	
138,000	33'0"	
345,000	39'10"	
500,000	45'0"	
745,000	53'2"	
765,000	53'10"	
Other than power lines	27'0"	

(Calculation is 30'0" + 0.4" per 1,000 volts over 50,000 volts)

.....

CLEARANCES FOR OVERHEAD AND BURIED UTILITY CROSSINGS

PLATE VI



DIMENSION	DESCRIPTION		
A	POWER LINES 0 TO 750V	27'-0"	} At 120°F Ambient Temperature
	POWER LINES 750V TO 15,000V	28'-0"	
	POWER LINES 15 TO 50KV	30'-0"	
	OTHER THAN POWER LINES	27'-0"	
B	SEALED ENDED CASINGS	25'-0"	
	OPEN ENDED CASINGS	45'-0"	
B ₁	END CASING BEYOND DITCH	2'-0"	
B ₂	END CASING BEYOND SLOPE	3'-0"	
C	CASING PIPE	4'-6"	
	CARRYER PIPE WITHOUT CASING	6'-6"	
D	BURIED ELECTRIC LINES	6'-6"	
	RAILROAD SIGNAL LINES (220V)	2'-6"	
	COMMUNICATIONS LINES	3'-6"	



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VI

**BRIDGE ERECTION, DEMOLITION AND HOISTING
OPERATIONS**

Submittals for bridge erection, demolition, or other hoisting operations shall be prepared and stamped by a Registered Professional Engineer and must include the following:

1. Plan view showing locations of crane or cranes, operating radii, with delivery or disposal locations shown.
2. Crane rating sheets showing cranes to be adequate for 150% of the lift. Crane and boom nomenclature is to be indicated.
3. Drawings and computations showing weight of picks.
4. Location plan showing obstructions, indicating that the proposed swing is possible.
5. Data sheet listing type and size of slings or other connecting equipment. Include copies of catalog cuts or information sheets of specialized equipment. The method of attachment must be detailed on the erection plan. All lifting components must be adequate for 150% of the lift.
6. A complete procedure indicating the order of lifts and any repositioning or re-hitching of the crane or cranes.
7. Drawings detailing temporary support of any components or intermediate stages.
8. A time schedule (by hour and day) of the various stages, as well as a schedule for the entire lifting procedure.



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VII

TEMPORARY SHEETING AND SHORING

The following items are to be included in the design and construction procedures for all permanent and temporary facilities on, over, under, within or adjacent to MBTA Railroad Property:

1. Footings for all piers, columns, walls or other facilities shall be located and designed so that any temporary sheeting and shoring for support of adjacent track or tracks during construction will not be closer than toe of ballast slope. (See dimensions in the MBTA's Book of Standard Plans, #1000 and #1002 for tangent and curved track). Sheeting shall be required when excavation is inside of a line which extends horizontally from 5.5 feet off center line of adjacent track, then on a 2 (horizontal) to 1 (vertical) slope. This is known as the zone of influence.
2. Where physical condition of design impose insurmountable restrictions requiring the placing of sheeting closer than specified above, the matter must be submitted to the Director of Engineering for MBTA Railroad Operations for approval of any modifications.
3. When support of track or tracks is necessary during construction of above mentioned facilities, interlocking steel sheeting adequately braced and designed to carry E-80 live load plus 50% impact is required. Soldier piles and lagging will be permitted for supporting adjacent track or tracks only when required penetration of steel sheet piling cannot be obtained or when in the opinion of the Director of Engineering for MBTA Railroad Operations, or their authorized representative, steel sheet piling would be impracticable to place.
4. Exploratory trenches, three (3) feet deep and fifteen (15) inches wide in the form of an "H" with outside dimensions matching the outside of sheeting dimensions are to be hand dug, prior to placing and driving steel sheeting, in areas where railroad underground installations are known to exist. These trenches are for exploratory purposes only and are to be backfilled and compacted immediately. This work must be done in the presence of a railroad inspector.
5. Absolute use of track is required while driving sheeting adjacent to any track. Procedure for arranging the use of track shall be through the Railroad Company(s) representative on the project.
6. Cavities adjacent to sheet piling, created by driving of sheet piling, shall be filled with sand and any disturbed ballast must be restored and tamped immediately as required by the Railroad Company(s).
7. Sheet piling shall be cut off at top of tie during construction. After construction and backfilling has been completed, the piling within twelve (12) feet from centerline of track shall be cut off 24" below bottom of tie or 24" below finished grade, whichever is greater. Sheeting, used as a form on a permanent

structure, shall be cut as directed by the Railroad Company(s).

8. The excavation adjacent to the track shall be covered and protected by handrails and barricades, warning lights shall be provided by the Contractor as directed by the Railroad Company(s).
9. Graded backfill material shall be compacted at near optimum moisture content, in layers not exceeding 6 inches in compacted thickness, by pneumatic tampers, vibrator compactors, or other approved means to the base of the railroad subgrade. Material in the vicinity of sheet pile shall be compacted to not less than 95 percent of AASHTO T 99, Method C. The Contractor shall be required to supply, to the job site, ballast stone as prescribed herein to be installed by the Railroad Company(s).
10. The Contractor is to advise the Railroad Company(s) of the time schedule of each operation and obtain approval of the Railroad Company(s) for all work to be performed adjacent to MBTA tracks so that it may be properly supervised by railroad personnel.
11. All Drawings for temporary sheeting and shoring shall be prepared and stamped by a Registered Professional Engineer and shall be accompanied by complete design computations when submitted for approval.
12. Particular care shall be taken to avoid erosion or filling of the Railroad Company(s) drainage facilities. Erosion and sediment control in the vicinity of the railroad shall be as approved by the Director of Engineering for MBTA Railroad Operations. Correction of disrupted Railroad Company(s) drainage facilities shall be at the Contractor's sole expense.

MBTA REQUIREMENTS FOR GEOTECHNICAL MONITORING

THE FOLLOWING SPECIFICATIONS ARE REQUIRED FOR ALL PILE DRIVING/EXCAVATING OPERATIONS:

1. Pile driving shall be on a continuous basis for each pile driven. Once a pile is started, it shall be driven or cut off at an elevation not to exceed the plane across the top of the rails of any track within 8'-6" plus 2" for each degree of curvature from centerline of track to the closest edge of the edge or excavation.
2. The monitoring points shall be set up one week before the pile driving or excavation operations begin. The MBTA and the Railroad Company(s) shall be notified. Elevation readings to establish the initial baseline reading shall begin two days prior to the start of driving. Readings shall be for a minimum of two weeks after the completion of the driving or backfilling of the excavation, whichever is longer. Initial readings immediately after any surfacing operations shall serve as new baseline figures. All future elevation readings shall be compared to the adjusted baseline. If the track deviates to a condition that is unacceptable to the MBTA or Railroad Company(s), corrections shall be made at the Contractor's expense.
3. Elevation readings shall be taken from the top of each rail of each track within the "zone of influence" the excavation. See Section 1, Page 1 of this specification.
4. Elevation readings will be taken once per eight hour shift. The readings shall be faxed to the MBTA Railroad Company(s) on a daily basis and all information is to be presented in legible print. During excavation within the sheet pile protected area, the top of rail elevations shall be checked every hour. Additional readings may be required by the MBTA or Railroad Company(s).
5. Stations shall be spaced at 15-1/2 foot intervals. The number of distractions required will be determined by the length of the excavation parallel to the tracks. There will be four additional stations on each end of the pile driving/excavation operation along the track. Extra stations may be required by the MBTA or Railroad Company.
6. Elevation readings must show the date, time, weather conditions and temperature. Each reading must also provide the following information: track number, compass direction, station number, base elevation (with date), static elevation, change in elevation (recorded in hundredths and in inches), dynamic reading and total deflection in inches. See sample sheet attached.
7. Station "0" will be located at the centerline of the project with Stations 1, 2, 3, etc., being to the right and Stations -1, -2, -3, etc., being to the left when

standing on the near track and looking at the work. In multiple track areas the stations as determined herein are to be carried across each track located within any part of the zone of influence. See Plate I.

8. At each monitoring station a dynamic load measurement shall be taken. The dynamic load measurement device shall consist of a wooden stake placed firmly in the ballast and in initially in contact with the bottom of the rail. The loaded measurement is the resultant gap between the bottom of the rail and the top of the stake caused by the deflection of the rail under the load of a passing train. Based on field observations of the excavation, and at the option of the MBTA or railroad company(s), this requirement may be reduced.
9. Elevation readings taken from the top of rail for static measurement and the dynamic reading shall be combined and the sum compared to the adjusted baseline. This reading will demonstrate the difference in elevation caused by the excavation.
10. The MBTA requires that the track be maintained at all times within established criteria for the specific track classification. At the completion of the project the requirement for tamping and realigning the tracks, caused by the settlement from the construction activity, remains with the Contractor for the duration as specified by the MBTA in their initial review of the Construction Drawings. This tamping and track realignment will be performed by the MBTA or railroad company(s) at the sole expense of the Contractor.



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VIII

BLASTING SPECIFICATIONS

Blasting on, over, under, within or adjacent to MBTA Railroad Property will be permitted only in special cases where it is demonstrated to the Director of Engineering for MBTA Railroad Operations that there is no practicable alternative to perform the work.

In such cases when blasting is permitted, the Contractor must submit a detailed blasting program to the MBTA and Railroad Company(s) for approval prior to the commencement of any work. The blasting program must contain the following information:

- a. Site plan with location of nearest MBTA structure.
- b. Plan of each blast showing hole spacing and delay pattern.
- c. Diameter and depth of each hole.
- c. Amount of explosives per hole.
- d. Total pounds of explosives per day.
- e. Total amount of explosives per blast.
- f. Type of non-electric delays to be used.
- h. Amount of stemming in each hole.
- g. Type of explosive to be used.
- h. Soil and rock profile in blast zone.
- i. Scaled distance to the nearest MBTA facility.
- j. Type and location of seismograph to be used.
- m. Size of blasting mats to be used.
- k. Safety precautions to be followed.

The following general requirements are to be adhered to:

- a. Obtain the services of a qualified vibration and blasting consultant to monitor the blasting.
- b. Use a non-electric detonation system whenever possible. If electric caps are used, a check must be made for stray currents, induced current and radio frequency energy to insure that this hazardous extraneous electricity is at an acceptable safe level.
- c. Provide an open face for maximum relief of burden.
- d. Limit the maximum peak particle velocity to 1 inch per second. Depending on existing conditions, this may be modified to 2 inches per second.
- e. Maintain an initial scale distance of 60 ft. per 1-1/2 lbs. After initial blasting, scale distance may be modified to a minimum of 50 ft. per 1-1/2 lbs., if conditions permit.

Scale distance -- Distance from blast to structure (in feet)

Weight of explosives per delay (in pounds)

The Contractor shall provide for a pre-blast and post blast survey, including photographs. An inspection of all nearby MBTA facilities shall be made to determine any changes that may occur due to blasting operations.

The Contractor shall coordinate all blasting with the MBTA and Railroad Company(s) in advance to determine when the charges may be set. The Contractor is advised that the MBTA and Railroad Company(s) use two way radios for train control. The radios operate in the 160 MHz area. These radios cannot be turned off at any time.



**MASSACHUSETTS BAY
TRANSPORTATION
AUTHORITY**

RAILROAD OPERATIONS DIRECTORATE

IX

**TEMPORARY PROTECTION SHIELDS FOR DEMOLITION AND
CONSTRUCTION**

The Railroad Company(s) will determine when and where protection shields are required. The designated construction of temporary protection shields must adhere to the following specifications:

1. The construction of temporary protection shields shall be designed to prevent any dust, debris, concrete, formwork, paint, or tools from falling on MBTA Railroad Property below.
2. The temporary protection shields shall be erected prior to the start of work. The Railroad Company(s) will determine whether or not sufficient protection has been provided to perform the work over any particular area.
3. The temporary protection shields shall remain in place until all work over the railroad has been completed and shall be removed only when ordered by the Railroad Company(s).
4. To minimize the inconvenience to the users of any properties below and adjacent to the project, the Contractor shall be required to complete the actual erection and removal of the temporary shields within time limits acceptable to the Railroad Company(s).
5. The erected temporary protection shields shall not infringe on any existing minimum vertical clearance.
6. The Contractor shall be required to obtain the approval of the Railroad Company(s) before commencing any work beneath the shield. In certain areas, depending on the nature of the work, the Railroad Company(s) may require a specific method of protection.
7. The horizontal shield shall be designed to carry a live load of 100 pounds per square foot and a single concentrated load of 2,000 pounds located to produce maximum stress. The vertical shield shall be designed to carry a wide load of 30 pounds per square foot.
8. Prior to the start of construction, the Contractor shall be required to submit the details of the temporary protection shield to the Railroad Company(s), who will review and approve the details only as to the methods of erection and as to whether or not the proposed installation will provide the level of protection required at the various locations. It is the Contractor's responsibility to design these protections so that they are in conformance with all existing laws, regulations and specifications that govern this type of work. Shield plans must include a material list and shall be designed by a Registered Professional Engineer. The Drawings and calculations must bear their seal when they are submitted to the Railroad Company(s).
9. If during the actual construction, the Railroad Company(s) deems that the shield is not providing the desired level of protection or that the Contractor has failed to properly maintain the shield, all work at the

affected location shall cease until corrective measures acceptable to the Railroad Company(s) are instituted.

10. All temporary shields shall be constructed using new material.



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X

INDUSTRIAL SIDE TRACK SPECIFICATIONS

SECTION 1. GENERAL

- 1.01 All railroad track construction shall be performed under competent supervision of personnel experienced in railroad construction and shall conform to the standards of the MBTA. The MBTA and Railroad Company(s) will inspect and approve all side tracks prior to being put in service. This specification shall be used for side tracks directly on or within 15 feet of the MBTA property line. Any construction outside of the MBTA property line shall be in compliance with the standards of the serving freight railroad.

SECTION 2. MATERIALS

2.01 MATERIAL

Rails, ties, switches, frogs, etc. shall conform to the standards of the MBTA for various types of turnouts and track installations thereby insuring replacement availability.

2.02 RAIL

The rails shall be 100# ASCE Section or of a heavier rail section in common use, new or relay. Relay rails shall not have more than 1/4" top wear measured vertically along center line of rail and not more than 3/8" side wear measured horizontally 3/4" below the normal top of rail. Rails shall be free from kinks, excessive rust and excessive head flow. Rails having line or surface bends that cannot be spiked will be rejected. Rail shall be free of internal defects. Rail used on the limits of MBTA Railroad Property shall be equal in weight and in section to the attached main line.

2.03 CROSS TIES

Cross ties shall conform to MBTA specifications, minimum size shall be 7" x 8" x 8'6" and shall be treated with creosote in accordance with MBTA specifications. Relay ties may be approved after inspection by the MBTA and Railroad Company(s) prior to installation.

2.04 SWITCH TIMBER

Switch timber shall be new hardwood and conform to MBTA specifications 7" x 9" and of lengths required by MBTA standard turnout bill of materials. All timber shall be creosote treated as specified for cross ties. Relay timber as above.

Tie plates shall be new or relay at least 7-1/2" x 10-3/4", 1/2" thick,

double shoulder and should be canted. Tie plates must conform to MBTA specifications. Damaged plates or plates showing more than 25% reduction in section due to corrosion or wear will be rejected.

2.06 JOINT BARS

Joint bars shall be new or relay, 100% toeless, 24" long or equal and conform to MBTA specifications. Relay bars must be free from appreciable wear. Joint bars shall have a minimum of four holes and the holes are to fit the punching's of the rail. Holes to have a clearance of 1/16". Joint bars that cannot be drawn up to give a tight fit will be rejected. No fewer than 4 bolts per joint will be allowed.

2.07 BOLTS, NUTS AND WASHERS

Bolts and nuts shall be new and of a size to fit the rail punching's. They shall conform to AREA specifications for low carbon steel track bolts and nuts. Washers shall be new spring type of appropriate size and shall conform to MBTA specifications.

2.08 TRACK SPIKES

Track spikes shall be 6" long, 5/8" square with an oval head and conform to MBTA specifications for soft steel track spikes. Tangent track shall have at least 2 rail holding spikes per tie plate and all curves over 3" shall have 3 spikes per tie plate.

2.09 BALLAST

Ballast shall conform to MBTA Material Specification 9248.

2.10 BUMPING POSTS

Bumping posts shall be Hayes type, Durable "D" or equal, unless otherwise specified, and will conform to MBTA Material Specification 9206.

2.11 DERAIL

Type and quality of derail shall be specified for each individual side track requirement. Derail shall be connected into the railroad signal system, which will be performed by the Railroad Company(s) at the Owner's expense. Two pairs of insulated joints shall be installed by the Contractor at a location to be determined by the MBTA. Side tracks with a descending grade toward the main track shall require a split switch type derail.

SECTION 3. INSTALLATION

- 3.01 The track shall be properly installed with a standard gauge of 4'8-1/2" except on sharp curves. In cases of sharp curves, gauge will be specified by the MBTA or the Railroad Company(s).
- 3.02 Ballast shall be installed on top of subgrade for a depth of at least 6" below the bottom of tie and brought up to the top of the tie at the center and slope off to 1" below top of tie at the ends. It shall then extend 1' beyond the end of the tie at that height, at which point it shall slope off at a rate of 2:1 to the sub- ballast.
- 3.03 Cross ties shall be placed not more than 24" on center on tangent track and 19 ½ " on center on curved track. When relay rails are used the unworn side shall be placed on the gauge side. Tie plates shall be installed on each cross tie. The center of the joint shall be installed so as to be suspended by two ties.
- 3.04 It shall be the responsibility of the builder of that portion of track designated as "property line to end" to connect to that portion of track designated as "clearance to property line" and provide the necessary joints or compromise joints with bolts as the weights of rail would dictate.

SECTION 4. BONDING

- 4.01 Where track bonding is necessary, it will be performed by the Railroad Company(s) in accordance with MBTA standards.

SECTION 5. APPROVAL

- 5.01 Plans for track installation must be approved by the MBTA and Railroad Company(s) before the design of the facility to receive rail service is finalized.

SECTION 6. CURVATURE OF TRACK

- 6.01 The recommended curvature shall be 8⁰ or less. The maximum allowable degree of curve is not to exceed 12⁰ 30', unless approved by the Director of Engineering for MBTA Railroad Operations.

SECTION 7. GRADE OF TRACK

- 7.01 The maximum allowable grade for all tracks shall not exceed 1.5% descending towards mainline or 3% descending from mainline using 100 foot vertical curves.

SECTION 8. ELEVATION

8.01 Super elevation shall not exceed 1 inch.

SECTION 9. SUBGRADE

9.01 Subgrade shall be prepared to a grade 18" - 20" below the proposed top of rail and shall be of a material that is compacted to 95% and provides for adequate drainage.

SECTION 10. ACCEPTANCE

10.01 Before track is placed into service to receive cars, it shall be inspected and approved by a qualified track inspector from the MBTA, the Railroad Company, and the freight carrier.

10.02 No exceptions to these specifications are authorized without the written approval of the Director of Engineering for MBTA Railroad Operations.



**MASSACHUSETTS BAY
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RAILROAD OPERATIONS DIRECTORATE

XI

RIGHT OF WAY FENCING SPECIFICATIONS

SECTION 1. GENERAL

1.01 DESCRIPTION

This section specifies the furnishing and installing of new Type I galvanized steel or Type II aluminum coated steel chain link fence. Right of way fence shall be 6', 8' or 10' as required by site specific conditions.

1.02 SUBMITTALS

Shop Drawings

1. Include cross sectional dimension of posts, braces, rails, fittings, accessories and gate frames, design of gates, and details of gate hardware.
2. Include a layout drawing showing the spacing of posts and location of all gates, abrupt changes in grade, and all corner, gate, anchor, end and pull posts.

SECTION 2. PRODUCTS

2.01 MATERIALS

A. General

1. Steel pipe dimensions and weights: ASTM A-53, Schedule 40 (except the hydrostatic testing requirement is waived). Dimensions specified are outside diameter (O.D.).
2. Provide post with accepted semi-steel or pressed steel tops, so designed as to fit securely over post and carry top rail or spring tension wire; the base of post top fitting shall fit over the outside of post and shall exclude moisture from post. All fittings and accessories shall be hot dipped galvanized in accordance with ASTM A-53.

B. Line Post: For all post heights, unless otherwise noted, Schedule 40, 2.375" O.D. pipe weighing 3.65 lbs./ft. ASTM A-53 with a 2 oz. hot dipped galvanized coating shall be used.

C. Gate post: Furnish post to support single gate leaf, or one leaf of a double gate installation, for the following gate widths:

<u>Leaf Width</u>	<u>Gate Post</u>	<u>Sch. 40</u>
up to 6'	2.875" O.D.	5.79 lb./ft.
6' to 12'	4.000" O.D.	9.11 lb./ft.
12' to 18'	6.625" O.D.	18.97 lb./ft.
18' to 32'	8.625" O.D.	28.55 lb./ft.

D. End, Corner and Intermediate Posts

For all post heights, unless otherwise noted, Schedule 40, 2.875" O.D. pipe weighing 5.79 lbs./ft. ASTM A-53 with a 2 oz. hot dipped galvanized coating shall be used.

E. Top rail and Spring Tension Wire

1. Top Rail

- a. Schedule 40, 1.66" O.D, pipe weighing 2.27 lbs./ft. ASTM A-53 with a 2 oz. hot dipped galvanized coating.
- b. Couplings and expansion sleeves: Outside sleeve type, minimum six inches long.

2. Spring tension wire: shall be marcelled (spiraled or crimped) #7 gauge (.177 inches) plus or minus 0.005 inches in diameter. ASTM A-824. 1.2 oz. zinc per sq. ft.

F. Braces and Tension Rods

1. Compression braces: Same type and size as top rail.
2. Tension rods: 3/8" round rods with drop forged turnbuckles or other approved type of adjustment.

G. Fence Fabric

1. Type I galvanized steel ASTM A-392 Class 2 coating 2 oz.
 - a. Typical-2" diamond mesh 6 gauge (192") 2 oz.
 - b. Hot dipped galvanizing after weaving.
2. Type II aluminum coated steel ASTM A-491 size 2. 3/8" mesh.
3. Selvages: All types
 - a. Fabric shall be knuckled at both selvages.
 - b. Fabric over 60 inches high: knuckled at one selvage and twisted and barbed at the other.

H. Fabric Bands, Brace Bands and Stretcher Bars

1. Fabric Bands: 12 gauge pressed steel 7/8 inch wide.
2. Brace Bands: 11 gauge pressed steel 1 inch wide.
3. Stretcher Bars: 3/16" x 3/4" galvanized steel.

- I. Tie wire and miscellaneous Items
 - 1. Tie Wire: Galvanized steel 6 gauge (.192") for post and rails.
 - 2. Hog rings: Galvanized steel 6 gauge (.192") for spring tension wire.
 - 3. Rail and Truss Cups: Galvanized semi-steel or pressed steel.

- J. Barbed Wire and Extension Arms
 - 1. Barbed Wire; ASTM A121, 12-1/2 gauge, 4-point round barbs, Class 3 coating.
 - 2. Extension Arms: Projecting at an angle of approximately 45 degrees, fitted with clips or other means of attaching three strands of barbed wire, the top outside wire approximately 12 inches from the fence line and the other wires spaced uniformly between the top outside wire and the fence fabric.

- K. Gates
 - 1. General: Furnish gates complete with necessary hinges, latches, and drop bar locking devices; corners shall be welded or fastened and reinforced with suitable fittings.
 - 2. All gates fabricated from 1.90" O.D. Schedule 40 pipe weighing 2.72 lbs./ft. with a 2 oz. hot dipped galvanized coating.

- L. Concrete: Class 2500 psi concrete consisting of aggregate passing the No. 8 sieve.

SECTION 3. EXECUTION

3.01 INSTALLATION

- A. Place terminal post at each end, corner, gate post, pull post (minimum 500'), or any change in grade or direction greater than 30 degrees.

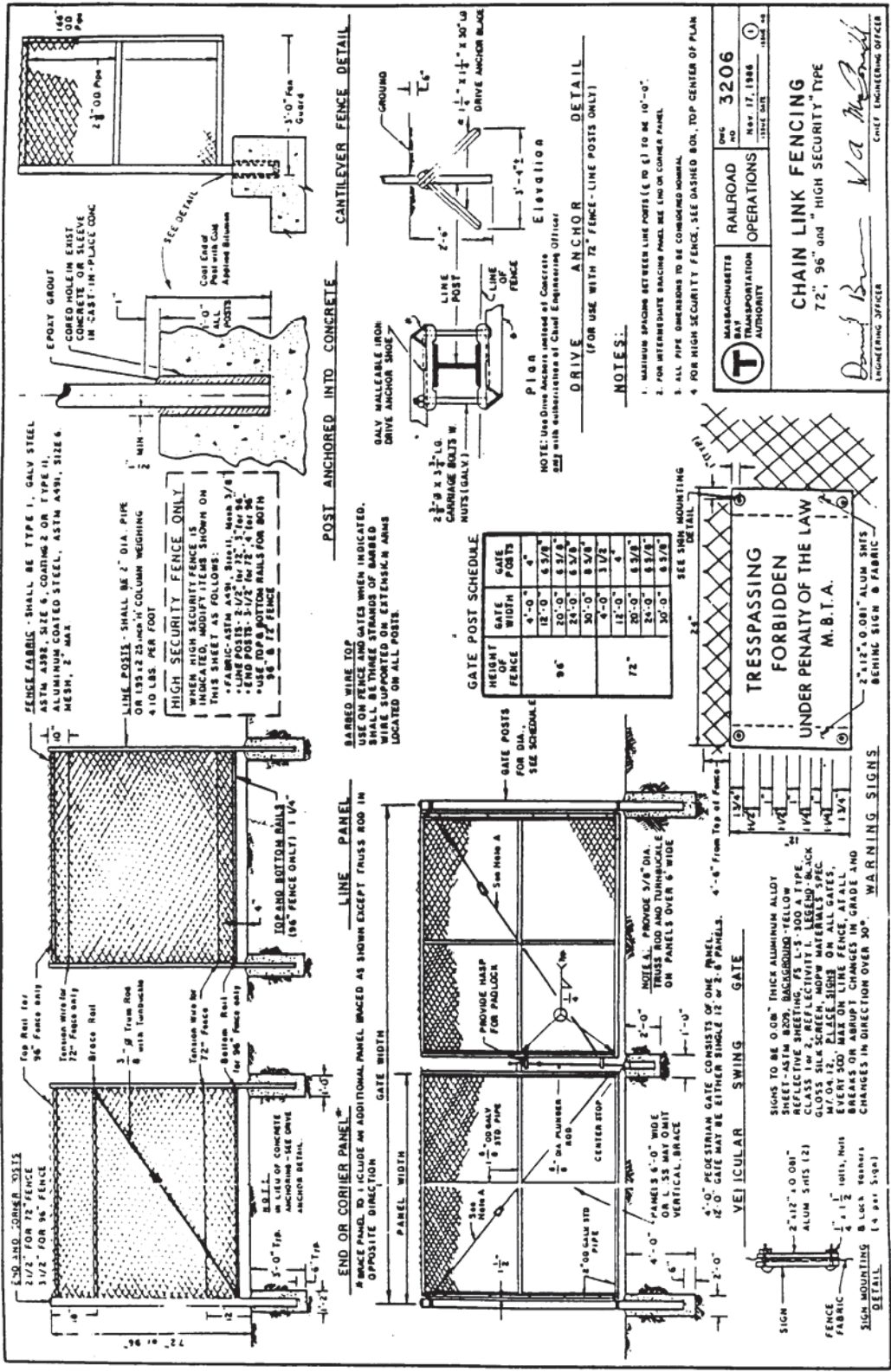
- B. Line posts shall be spaced on a maximum of 10 foot centers. In determining the post spacing, measure parallel to slope of finished grade. All posts to be set plumb and in line. Post spacing on radius as follows:

200' - 500' radius 8' O.C.
100' - 200' radius 6' O.C.
less than 100' radius 5' O.C.

- C. When fencing is installed on the top of concrete structures, use galvanized sleeve and grout posts or install with suitable galvanized flange casing and galvanized anchor bolts. Set all other posts permanently in concrete.
- D. Excavate post hole footings at least 12" in diameter for line post and 16" for terminal and gate posts up to 4" O.D. Larger gate posts require 18" diameter footings. All footings excavated to a depth of 42" with a minimum post embedment of 36". Crown top of concrete to shed water and allow curing for not less than 72 hours before proceeding with further work on the post.
- E. Brace end, corner pull, and gate posts to the nearest line post with diagonal or horizontal brace rails used as compression chambers, and with truss rods with turnbuckles used as tension members. Brace line posts horizontally and truss in both directions as required, at approved intervals.
- F. Install fabric on post side which best secures MBTA's Railroad Property. Pull fabric taut and tie to all line posts, rails, braces and spring tension wire spacing all ties at 12" intervals. Use hook shaped steel ties confined to the diameter of the pipe to which it is attached, clasping pipe and fabric firmly with both ends twisted at least 2 turns.
- G. Barbed wire and tension wire must be taut and properly secured with brace bands at each terminal and gate post.
- H. Electric Ground: Where a power line carrying more than 600 volts passes over fence, install ground rod at the nearest point directly below each point of crossing. Ground all substation fences and gates and perform other electrical grounding as indicated.

3.02 TOUCH-UP AND REPAIR WORK

Remove and replace fencing which is improperly located or is not true to line, grade and plumb within tolerances as indicated.





**MASSACHUSETTS BAY
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RAILROAD OPERATIONS DIRECTORATE

XII

TEST BORINGS SPECIFICATIONS

SECTION 1. GENERAL

All borings on MBTA Railroad Property are to be performed according to the following requirements:

- 1.01 Work on MBTA Railroad Property must be performed with a Railroad Company(s) inspector and/or flagman present.
- 1.02 Where access can only be gained by crossing the tracks, a temporary crossing must be used. This crossing shall adhere to the following:
 - A. The location and material must be approved in advance by the Chief Engineering Officer or Railroad Company(s).
 - B. The crossing will be constructed by Railroad Company(s) forces at the Contractor's expense.
 - C. The crossing must be protected at all times when not in use. Access shall be prohibited through the use of right-of-way gates which will be constructed by Railroad Company(s) forces at the Contractor's expense.
 - D. No crossing of the track shall be made without a railroad flagman and/or inspector present.
 - E. The crossing of tracks shall be kept to a minimum.
- 1.03 Boring locations, including positioning of the boring rig, shall be kept at least 8'-6" from the center line of track.
- 1.04 All borings must be cased to insure adequate return (of mud and water) and to avoid undermining of the track.
- 1.05 All holes shall be backfilled with cement grout to fill the voids and protect against an artesian condition.
- 1.06 The location of all utilities owned or private, shall be located and suitably marked by the Railroad Company(s) and/or the private owner at the Contractor's expense to avoid damage to the utility and/or track structure.
- 1.07 Prior to entry upon the MBTA Railroad Property, all necessary contracts, insurance policies and financial obligations shall be provided in a form acceptable to the Railroad Company(s).
- 1.08 Work within the operating right-of-way that has potential to foul the tracks, shall be restricted to periods of non-peak passenger operations.

- 1.09 While performing the work, full cooperation with the inspector and flagman is essential. The work will be terminated immediately if the safety of all traffic and personnel is jeopardized in any way.

SECTION 2. TESTING

- 2.01 Soil borings shall be in accordance with the current issue of the American Railway Engineering Association Specifications, Chapter 1, Part 1, "Specifications for Test Borings". Soils shall be investigated by the split-spoon and/or thin-walled tube method and rock shall be investigated by the Coring method specified therein.

- 2.02 Soil boring logs shall clearly indicate all of the following:

1. Boring number as shown on boring location plan.
2. Elevation of ground at boring.
3. Description or soil classification of soils and rock encountered.
4. Elevations or depth from surface for each change in strata.
5. Identification of where samples were taken and percentage of recovery.
6. Location of ground water at time of sampling and, if available, subsequent readings.
7. Natural dry density in lbs./sq. ft. for all strata.
8. Unconfined compressive strength in tons/sq. ft. for all strata.
9. Water content (percent). Liquid Limit (percent) and plastic limit (percent).
10. Standard penetration in blows/ft.

- 2.03 Soil boring logs shall be accompanied by a plan drawn to scale showing location of borings in relation to the tracks, the elevation of ground surface at each boring, and the elevation of the top of rail of the tracks.

- 2.04 Soil investigation by auger, wash, or rotary drilling method is not acceptable.

- 2.05 Borings shall be taken no more than two (2) feet from the field stake which marks the boring location. The stake should not be disturbed during boring operations. Lost stakes shall be reinstalled.

- 2.06 Unless a boring hole is actively being worked, it shall be securely covered or otherwise protected until permanently filled. When work at each boring hole is completed, the hole shall be properly filled.

- 2.07 Access to the boring locations must be approved by the Railroad

Company(s). When possible, access shall be from public roads. Licenses for Entry, Insurance and Flag Protection must be obtained by the Contractor in accordance with all applicable MBTA Specifications.

- 2.08 Boring operations shall be confined to each boring location to the extent possible.

The Contractor shall take necessary precautions to prevent damage to structures and facilities. The site shall be restored to a condition satisfactory to the Railroad Company(s).



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RAILROAD OPERATIONS DIRECTORATE

XIII

FIBER OPTIC CABLE SPECIFICATIONS

SECTION 1. GENERAL

- 1.01 The purpose of the following standards is to provide basic information about the MBTA's requirements with respect to the design and construction of fiber optic cables on MBTA Railroad Property to fiber optic cable companies and their Contractors.
- 1.02 All work performed on or affecting MBTA Railroad Property must be designed and constructed in accordance with the Commuter Rail Design Standards (Vol. I and II), MBTA Book of Standards, Railroad Operations Specifications and the following standards. Additional job specific requirements will be contained in the MBTA's Fiber Optic License Agreement and can be obtained by contacting:

AGM for Real Estate and Asset Development
Ten Park Plaza
Boston, MA 02116

The Director of Engineering for MBTA Railroad Operations or their designated representative will be responsible for the approval of all work. No modifications, changes or deletions will be made without their approval.

SECTION 2. PROJECT REVIEW AND COORDINATION

- 2.01 All Drawings and specifications shall be reviewed and approved by the MBTA and Railroad Company(s) prior to construction. The MBTA must approve the construction schedule and sufficient Railroad Company(s) personnel must be available before work begins.
- 2.02 If another fiber optic cable company has previous or exclusive rights along the proposed route, the alignment and cable location must be approved in accordance with existing agreements.
- 2.03 The fiber optic cable companies must coordinate the construction with others to minimize the disruptions to the MBTA railroad operations.

SECTION 3. CONDUCT OF WORK

- 3.01 In order to minimize the manpower requirements of the Railroad Company(s) and afford better control, supervision, and protection, the Contractor will conduct their work sequentially and minimize the number of crews and their proximity. Crews should be confined geographically to an area that can be covered easily by a minimum number of Railroad Company(s) personnel. This can be accomplished by a block method of construction. A construction block will be used and is a 1-4 mile segment of right of way in which up to 3 fiber optic cable installation crews can work. The crews can work within the construction block, but cannot work outside of it. The construction block

must move as a unit along the right of way. The crews cannot work two blocks concurrently.

SECTION 4. CONSTRUCTION SCHEDULE

- 4.01 The fiber optic company or its Contractor will submit a schedule of work to the MBTA for approval. The schedule will be based on methods of construction acceptable to the MBTA and Railroad Company(s). No work shall begin prior to approval by the MBTA.
- 4.02 Any changes or modifications to the schedule proposed by the fiber optic company or its Contractor must be submitted to and approved by the MBTA prior to implementation. The MBTA, however, may be required to change or modify the construction schedule on account of its operations, maintenance requirements, or manpower shortages. In this event, the MBTA will give the fiber optic cable company as much advance notice as possible.
- 4.03 Construction schedules will be reviewed and updated every two (2) weeks or as required.

SECTION 5. ESTIMATE OF EXPENSES

- 5.01 An estimate of anticipated expenses will be provided based on durations provided by the fiber optic cable company or their Contractor and construction schedules approved by the Railroad Company(s). Any changes in the schedule will cause the estimate to be revised. The fiber optic cable company or their Contractor will be responsible for all of the costs incurred by the MBTA and Railroad Company(s) in support of the construction activities. This includes design review, engineering support, administration and supervision.

SECTION 6. BILLING

- 6.01 The fiber optic cable company or its Contractor will be required to pay for railroad protective services in advance of costs incurred.

MBTA FLAGGING REQUEST FORM

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Flagging Request

Date: _____

Company/Agency: _____

Project Name: _____

Project Location: _____

Point of Contact: _____

Email: _____ Phone: _____

Project Number: _____ Funding Source: _____

RAILROAD OPERATIONS TRACKING NUMBER _____

Date Needed: _____

Start/Finish: _____

Flaggers Required: _____

Scope of Work:

(Attach additional SOW, if necessary.)

Schedule:

(Attach additional info, if necessary.)

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MBTA SPECIAL INSTRUCTIONS

April 1, 2003

PAGE 1

APPENDIX M

MBTA SPECIAL INSTRUCTIONS

MARCH 2003

Table of Contents

LETTER OF TRANSMITTAL REGARDING SPECIAL INSTRUCTIONS.....	2
1. ACCESS TO AUTHORITY PROPERTY.....	2
2. INSURANCE REQUIREMENTS.....	6
3. SUBMITTAL OF SPECIFICATIONS, DRAWINGS, DESIGN AND METHODS OF CONSTRUCTION..... (Applies to non-MBTA Construction Contracts. MBTA Construction Contracts are covered under Division I)	6
4. OPERATIONAL RESTRICTIONS.....	7
5. PROTECTION SERVICES.....	10
6. ANNUAL CERTIFICATION OF HI-RAIL EQUIPMENT.....	11

MBTA SPECIAL INSTRUCTIONS

April 1, 2003

PAGE 2

MBTA SPECIAL INSTRUCTIONS

APRIL 2003

LETTER OF TRANSMITTAL REGARDING SPECIAL INSTRUCTIONS

The Subway Operations, Bus Operations, Safety, Systemwide Maintenance & Improvements, Operations Support, and the Design and Construction Departments of the MBTA have determined that certain limitations regarding Contractor's activities are required while working on a construction project.

These Supplementary Conditions are included herein to augment the MBTA Standard Specifications, Division I - General Requirements, Section 00700 General Conditions, Article 6 - Prosecution and Progress, Paragraph 6.04 Limitations of Operations with additional information, which is applicable to construction projects.

However, for non-MBTA construction projects where Division I does not apply, such as in the case of rights to construct on MBTA property granted under a lease or license agreement, the enclosed Special Instructions are still applicable unless otherwise directed.

Contract drawings and specifications for non-MBTA construction projects, relative to all work that will be performed within or directly adjacent to MBTA property, must be submitted to the Authority's Chief Engineer of Design and Construction, Director of Subway Operations, Director of Bus Operations, Director, of Systemwide Maintenance & Improvements, Director of Operations Support, Director of Safety, and the Director of Real Estate. The addresses and phone numbers are listed on the next page. The special instructions contain information to be complied with by the owner, contractors, and others associated with the project.

Applicable provisions of the special instructions plus additional requirements from other MBTA departments must be included in the contract specifications as instructions to the contractor when performing work on or adjacent to MBTA property. Permission to perform work on MBTA property will be granted by the Director of Real Estate only when contract plans and specifications are approved by the MBTA.

The enforcement of any of the following conditions shall not be construed as waiving any of the rights of the Authority in any of the other conditions of an MBTA contract.

A meeting to further discuss MBTA requirements may be arranged by contacting the offices of those listed in Article 1.a. and/or b. herein.

1. ACCESS TO AUTHORITY PROPERTY

- A. For MBTA Contractors Only: An owner or Contractor who wishes permission to enter upon or perform work over, on, under or adjacent to Authority property shall submit to the offices of the Authority's Chief Engineer of Design and Construction, the Director of Bus Operations, the Director of Subway Operations, Director of Systemwide

MBTA SPECIAL INSTRUCTIONS

April 1, 2003

PAGE 3

Maintenance & Improvements, and the Director of Operations Support, a request in writing, a minimum of forty-two (42) days prior to the owner or the Contractor's planned commencement of any of the above stated activities. Addresses of the above are as follows:

MBTA's Chief Engineer of Design and Construction
6th Floor
10 Park Plaza
Boston, MA 02116
617 222-3116

Director of Systemwide Maintenance & Improvements
500 Arborway
Jamaica Plain, MA 02130
617 222-5454

Director of Subway Operations
10th Floor
45 High Street
Boston, MA 02110
617 222-4554

Director of Bus Operations
10th Floor
45 High Street
Boston, MA 02110
617 222-3368

Director of Operations Support
10th Floor
45 High Street
Boston, MA Q2110
617 222-5460

Director of Safety
2nd Floor
21 Arlington Avenue
Charlestown, MA 02129
617 222-4244

- B. Non-MBTA Construction Contractors For Lessees or Licenses of the MBTA Only: An owner or Contractor who wishes permission to enter upon or perform work over, on, under or adjacent to Authority property shall submit to the offices of the MBTA's designated representative for real estate listed below, a request in writing, a minimum of forty-two (42) days prior to the owner or the Contractor's planned commencement of any of the above stated activities. The designated representative will distribute plan sets to the above MBTA departments and will coordinate departmental approvals. Application forms and instructions for obtaining access to MBTA property

MBTA SPECIAL INSTRUCTIONS

April 1, 2003

PAGE 4

can be obtained by visiting the designated representative's website listed below and selecting "MBTA" and "Licensing."

License Administrator
Massachusetts Realty Group
20 Park Plaza, Suite 1120
Boston, MA 02116
617-316-1654
www.mbtarealty.com

The designated representative reports directly to:

MBTA Director of Real Estate
5th Floor
10 Park Plaza
Boston, MA 02116
617 222-3255

- C. Requests shall specify the name of the owner or the contractor, the reasons for entering the property, where the property will be entered, each individual location where work of a different nature is to be performed, the nature of such work, and the number of days, including time schedule, the owner or the contractor intends to remain on the property at each location. The Authority will process such requests and meet with the owner or contractor to work out a schedule and phasing for the work plus other arrangements including financial. The Authority shall request a list of the names of each individual who will enter upon or perform work on Authority property.
- D. The owner or contractor shall notify the representative of the Design and Construction Department and the appropriate Operations Director at least seventy-two (72) hours prior to entering the property as agreed upon earlier with the Authority. The owner or contractor shall notify the Design and Construction, and Operations Departments immediately if the job is to be closed down unexpectedly and shall again notify the Authority as specified above when work will commence.
- E. The owner or contractor shall make all necessary arrangements with the Authority before entering upon the property and perform the work in accordance with an MBTA approved work schedule. The owner or contractor shall not enter MBTA property or perform any work on Authority property without the presence of an assigned MBTA representative from the Design and Construction Department or the Operations Department who is responsible for monitoring the work of that owner or contractor for the Authority. Working on Authority property without an assigned MBTA representative present shall be cause for immediate eviction from the property.
- F. The owner or contractor must have in place a method of payment for all Authority support services such as flagging, work trains, power shut offs, etc., prior to commencement of any work. This will be processed through a written force account agreement between the Authority and the owner or contractor prior to commencement of work. Direct billing to contractors for Authority support services requires the contractor's authorized representative to agree in writing that the company will reimburse the Authority for those support services, including overhead and fringe benefits. Once the Authority receives the signed statement from the contractor, the General Accounting

MBTA SPECIAL INSTRUCTIONS

April 1, 2003

PAGE 5

Office will open a reimbursable account for specific Authority department(s) to charge costs, and the contractor will be billed directly.

- G. The work associated with this project, except as hereinafter expressly provided, will be done without interruption of or change in the regular work or operation of vehicles of the Authority. No work shall be done affecting the operations of vehicles or operations of stations until the contractor has submitted details of his procedures to the Design and Construction and the applicable Operations representatives thirty (30) working days prior to start of work and has secured written permission to proceed.
- H. The Authority reserves the right to require work affecting the safety of the operations to be performed at prescheduled non-operating periods from approximately 1:30 a.m. to 5:00 a.m. daily (1:30 a.m. - 4:30 a.m. effective); 1:30 a.m. to 6:00 a.m. Sunday (1:30 a.m.-5:30 a.m. effective). The contractor will not be permitted to remain within the track right-of-way after 5:00 am. (6:00 a.m. Sunday). The Authority may, during emergencies or at times when the Authority work forces are required to work in the area of the contractors work, order the contractor to cease work and remove his work forces and equipment from the property leaving the right-of-way in a safe operating condition. The Authority also reserves the right to stop or postpone any contractor's previously approved work if, in the Authority's opinion, such work is being performed in a manner that will endanger and/or delay the Authority's regular work or operations.
- I. The owner or contractor shall make their own provisions for electric power, compressed air, water, ventilation, and disposal of seepage water. No use of existing MBTA utilities will be permitted unless approved in advance by the Authority.
- J. The owner or the contractor's attention is directed to other projects that will be ongoing simultaneously in the work area. The Authority will determine priorities for site access between this project and others.
- K. The Authority reserves the right to deny the contractor access to the right of way because of operational requirements, adverse weather conditions or emergency track, signal, and power repairs. The contractor shall reasonably expect to be denied access to the site a total of 10 (ten) days per calendar year, this does not include the following holidays; New Year's Day, President's Day, Patriot's Day, Memorial Day, Bunker Hill Day, Independence Day, Labor Day, Columbus Day, Veteran's Day, Thanksgiving Day, and Christmas Day. In addition, right of way access may be denied on days when various Special Events impact service as well as during Red Sox home games on the Green Line.

Furthermore, the contractor shall also expect to have his access to the site delayed a total of 4 (four) times per month. Each delay shall be 60 (sixty) minutes or less. The contractor shall make allowances for these possible events in their bid. Due to increased stopping distances associated with slippery rail conditions, non-emergency access will not be allowed within ten (10) feet of the centerline of the track under adverse weather conditions.

- L. The contractor shall perform his work at all times so as to cause no interruption of service during operating hours and shall at all times after performing work during either operating hours or non-operating hours leave the Authority's property in a clean and safe operating condition.

MBTA SPECIAL INSTRUCTIONS

April 1, 2003

PAGE 6

- M. On occasion, the Authority will operate work cars, test trains, security trains, and/or hirait Vehicles in, the area of the work. At no time during these occurrences will the contractor be allowed to work on the right-of-way, except with the approval of the Authority or the Authority personnel providing protection services as defined in Protection Services.

2. INSURANCE REQUIREMENTS

- A. The owner or Contractor's for MBTA Construction Contracts insurance requirements shall conform to the latest version of MBTA Standard Specifications, Division 1 - General Requirements, Section 00700 .General Conditions, Article 5 .Legal Relations and Responsibility to the Public, Paragraph 5.04 . Insurance Requirements. Owners or Contractors under a lease or license agreement with the MBTA shall provide insurance in accordance with the requirements of said agreement.

3. SUBMITTAL OF SPECIFICATIONS DRAWINGS, DESIGN AND METHODS OF CONSTRUCTION

(Applies to non-MBTA Construction Contracts. MBTA Construction Contracts are covered under Division I)

- A. An owner or contractor or others performing a non-MBTA construction contract that requires performing construction over, on, under or adjacent to the Authority's property shall submit to both the Design and Construction Department and to the appropriate Operations Department two (2) sets each of contract drawings and specifications at the 30%, 60%, 90% and 100% phases of design of the project. 100% drawings and specifications must be submitted forty-two (42) days prior to the planned commencement of any work.
- B. The contractor's drawings and specifications shall define the work in detail and a Professional Engineer registered in the Commonwealth of Massachusetts shall stamp the final drawings. The contractor or owner shall also submit a crane or heavy equipment location, if used, with dimensions to the face of abutments and structures and calculations of crane equipment loading on Authority structures showing no adverse effect on any structures. All calculations shall be stamped by a Professional Engineer registered in the Commonwealth of Massachusetts. The drawings must include any excavation support systems, shoring, underpinning, protective shielding, or any work required for the protection of MBTA property.
- C. Unless otherwise agreed to in advance, the owner or contractor's structures shall not attach to, be placed against, pass through, or impose any loads upon any structures or facilities owned by the MBTA.
- D. All construction work shall be performed in strict conformity with final plans and specifications that have been reviewed and approved by the MBTA. Any changes requested by the owner or contractor which affect MBTA property or operations must be submitted to the MBTA for review and approval at least 30 days prior to the planned commencement of the work. Approvals or rejections shall be submitted by the MBTA within thirty (30) days following submission to the MBTA for review.

MBTA SPECIAL INSTRUCTIONS

April 1, 2003

PAGE 7

- E. The owner or the contractor performing construction work over, on, under, or adjacent to Authority property shall submit to the Director of Design four (4) sets each of the design, drawings and specifications of any earth support system, shoring, underpinning, protective shielding, or any work required for the protection of the Authority's facilities and property, a minimum of forty-two (42) working days prior to the planned commencement of any of the above work. The design, drawings and specifications shall define in detail the methods of construction and materials to be used. The design and drawings shall be stamped and signed by a Professional Engineer registered in the Commonwealth of Massachusetts.
- F. Unless otherwise agreed to in advance, earth support structures or shoring systems shall not be attached to any structure owned by the MBTA, nor shall MBTA structures be use to support loadings or be used for excavation support.
- G. Engineering drawings of MBTA structures are available for reference or duplication at the MBTA Plan Room, 500 Arborway, Jamaica Plain, MA 02130. For information call the Technical Librarian at 617-222-5285.

4. OPERATIONAL RESTRICTIONS

- A. The owner or contractor is made aware that the work will be performed adjacent to or over operating tracks, signal lines, communication lines, power lines, cables and other facilities belonging to the Authority. The owner or contractor is to take all due precautions to protect the Authority's facilities, utilities, and operations during the course of his work. When in the opinion of the Authority's Chief Engineer of Design and Construction, Director of Subway Operations, Director of Systemwide Maintenance & Improvements, Director of Operations Support, or their representatives, the contractor's work would cause hazard to the Authority's facilities, infrastructure, or to the safe operation of the transit system, the Authority will assign qualified personnel deemed necessary to protect the property, facilities and operations, all at the expense of the contractor.
- B. The contractor is specifically prohibited from conducting any operations next to or over the right-of-way that have the potential to adversely impact the operations of Authority revenue service during normal operating hours (approximately 5:00 a.m. to 1:30 a.m.). Certain work adjacent to the right-of-way, described below as hazardous work, may take place during restricted revenue hours at the discretion of the Chief of Orange, Red, Green, or Blue Line Operations as applicable and require flagmen present.
- C. Access to the MBTA right-of-way, which encompasses all MBTA property (fence to fence, wall to wall, and property line to property line over which Authority vehicles operate, including sidings and yards), is. contingent upon Owner or Contractor compliance with the "MBTA Right-of-Way Safety Rulebook" that outlines Right-of-Way Safe Practices for Access on or Near the Right-Of-Way.

As specified in the Right of Way Safety Rulebook, all persons who access the MBTA right of way must attend a one-day, eight-hour training class conducted by Subway Operations Training and the Safety Department Attendees must successfully complete the Right of Way Safety Training in order to

MBTA SPECIAL INSTRUCTIONS

April 1, 2003

PAGE 8

receive a Right of Way license. The license is valid for a two-year period after which the person must attend the Authority's Right of Way re-certification class. To register for the "Right of Way Safety" class, contact:

Supervisor and Chief Rules Examiner of Training
Cabot RTL Training
275 Dorchester Avenue, 2nd floor
South Boston, MA 02127
Telephone: (617) 222-5377

D. The Authority will consider the property; facilities and operations fouled or subject to hazard when the following occurs:

1. When any object or operation is or can be brought nearer than ten (10) feet to the centerline of operating track.
2. When an object or excavation is brought nearer than four (4) feet to a signal or communication line.
3. When an object or excavation is brought nearer than ten (10) feet to a power line or cable.
4. When explosives are used in the vicinity of the premises. Explosives shall not be used on or adjacent to the Authority's property or facilities without written consent of the Authority's Chief Engineer of Design and Construction and then shall be used only by a licensed blaster, licensed in the Commonwealth of Massachusetts, at times and under conditions acceptable to the Authority.
5. When cranes, trucks, power shovels, pile driver or any other equipment are working in positions that failure with or without load could occur nearer than 10 feet to the centerline of an operating track.

It shall be the responsibility of the contractor to inform the Chief of Orange, Red, Green, or Blue Line Operations as applicable in writing thirty (30) working days prior to all times when they intend to perform hazardous work as described above. Submittal must include a site plan, the reasons for entering the property, where the property will be entered, each individual location where work of a different nature is to be performed, the nature of such work, and number of days, including time schedule, the contractor intends to remain on the property at each location. Failure of the contractor to provide the appropriate Line Chief with the specified advanced notice of hazardous work will result in the stoppage of work by the Authority.

D. The Contractor will be allowed on the right-of-way only after normal revenue service (approximately 1:30 a.m. to 5:00 a.m.). On occasion, the Authority will operate work cars in the area of the project work during non-revenue hours. At no time during these occurrences will the contractor be allowed to work on the right-of-way except with the approval of the Authority. The contractor shall coordinate their schedule at least twenty-four (24) hours in advance with the Authority.

E. No weekday/weekend transit service interruptions will be allowed on this project. The contractor must schedule all work requiring a shutdown of revenue service and/or station and/or platform operations during non-revenue hours.

MBTA SPECIAL INSTRUCTIONS

April 1, 2003

PAGE 9

- F. Prior to the contractor leaving any work site, at the completion of each workday, the contractor shall ensure that the site is in proper condition to permit normal transit operations to resume. If, in the opinion of the Authority, the site is not suitable for normal transit operations due to conditions caused by the contractor, the Authority will allocate a suitable number of personnel to rectify the site. The owner or his contractor shall be charged full costs of such personnel and necessary equipment, including the full cost of replacement services during the cleanup period.

- G. In the event that the contractor does not adhere to the work period limitations of the special conditions and causes delay in returning the right-of-way to revenue service at the end of any work period, the owner or his contractor shall pay the Authority for substitute bus service a sum not to exceed \$120.00 per hour per bus for the entire duration of the delay and including mobilization and demobilization of the bus service. The minimum charge shall be (3) hours per bus per delay... The owner or the contractor will reimburse the Authority for the hourly costs of personnel used during such delays (egg., supervisors, officials, gatepersons, flagpersons, and automotive). The required number of buses to adequately accommodate all Authority customers who are inconvenienced by the delay shall be at the sole discretion of the Authority's Bus Operations Department. Whatever sum of money may become due and payable to the Authority by the owner or his contractor under this article may be retained out of money belonging to the contractor in the hand and possession of the Authority. This article shall be construed and treated by the parties to the contract not as imposing a penalty upon the contractor for failing fully to complete the work within the periods as specified herein, but as liquidation damages to compensate the Authority for additional costs incurred by the Authority because of the failure of the contractor to fully complete said work within the work periods specified.

- H. The contractor shall assume full responsibility for the safety of all their work. They shall perform the work in a manner that will ensure the safety of both personnel and property. The contractor shall prevent against safety hazards, and the exposure of persons and equipment to hazardous and/or potentially hazardous conditions. All, work in the construction of the project shall comply with the requirements of the Authority, Department of Labor, Occupational Safety and Health Administration (OSHA) provisions, as well as those of state and local regulations. Safe breathing levels must conform to the Massachusetts Department of Environmental Protection (DEP) standards. In the case of conflict of regulations, the most stringent will apply. If the standards are not met, the Authority has the right to stop the work until such time as the contractor is in compliance with standards.

5. PROTECTION SERVICES

- A. When the contractor is performing work in the vicinity of Authority rights-of-way or public areas, the Authority will require the contractor to have at the site such authorized and qualified personnel as may be required to adequately protect the Authority's customers, employees, property, facilities and operations from hazardous conditions.

- B. The need for protection services is outlined and described in the Authority's Right-of-Way Safety Rulebook. The appropriate Line Chief, or their representative, shall determine what protection services are required and assign flagging personnel, officials, supervisors, coordinators or any other such personnel as may be required to ensure the safety of the Authority's operations. Personnel shall be provided from the Authority's workforce in such numbers as the Line Chief determines.

MBTA SPECIAL INSTRUCTIONS

April 1, 2003

PAGE 10

Costs for all protection services and supplies shall be the responsibility of the owner or contractor. No work will be allowed if flagmen are required, but not on duty.

- C. When it is determined that protection services are required, the contractor must notify the Authority twenty-four (24) hours in advance and before 10.00 a.m. on the workday preceding the day that protection services will be required. Requests for protection services for weekends and/or holidays, must be made on the preceding Friday before 10.00 a.m., or before 10.00 a.m. on the workday preceding the holiday.

Requests for protection services for Non-Operating hours 1.30 a.m.—5.00 a.m. and in order for the work to be included on the Night Orders you must contact the:

Planning and Scheduling Coordinator
Maintenance of Way
617-222-5419.

Requests for protection services for Operating hours 5.00 a.m.-1.30 a.m. and in order for the work to be included on the Day Orders, you must contact:

Orange, Red, Green, or Blue Line Superintendent as applicable.
617-222-5844 (Orange); 617-222-5099(Red);
617-222-5982 (Green); 617-222-5532 (Blue).

It will be at the sole discretion of the Authority whether the contractor will be allowed to perform work on any particular day or night.

- D. The contractor will be required to provide each flagperson on duty with properly functioning safety equipment as approved by the Authority's Safety Department. This equipment includes but is not limited to: orange safety cones, red, yellow, and green flags, airhoms, hardhats, safety goggles, and hearing protection. The contractor will not be allowed on or adjacent to the right-of-way if flagging personnel are not equipped with required safety personal protective equipment.
- E. The contractor will supply properly functioning Authority-frequency portable radios to each flagperson on duty on a daily basis.. The contractor will be responsible for storing and maintaining radios throughout the life of the contract.
- F. All workers employed by the contractor who are to work within the Authority's stations, track area, right-of-way or adjacent to the traction power system or any high voltage electrical cables, shall be required to attend a safety awareness course at the Authority's Subway Operations Training School. The course is to make the contractor's personnel aware of the particular hazards related to the Authority's operations.
- G. All personnel working on the project site in the immediate vicinity of, or within the right-of-way, are required to wear orange reflective safety vests, similar to standard Authority equipment as specified in the Right-of-Way safety Rulebook.
- H. Work activities necessitating the traction power system (third rail and catenary) deenergization will require the services of an Authority power lineperson on site at all times and the contractor is responsible for any. costs incurred by the Authority as. a result of this action.

MBTA SPECIAL INSTRUCTIONS

April 1, 2003

PAGE 11

- I. Prior to the implementation of the contracted work, and throughout the life of the contract, the contractor will be required to supply professionally rendered signs, as directed by the Authority's Marketing Department. These signs will include, but are not limited to, the following:
 - 1. Informational signs for revenue service diversion.
 - 2. Station directional and stairway, platform, exit closing signs.
 - 3. General project informational signs for Authority customers.

- J. Upon the direction of the Authority's Chief Engineer of Design and Construction, Director of Safety, and or Director of Subway Operations or their representatives, the contractor will be required to supply and install partitions and wooden barricades to cordon off the work site; such partitions and barricades shall be maintained and remain graffiti free by the contractor for the duration of the project.

- K. Upon direction from the Authority's Chief Engineer of Design and Construction and / or Director of Subway Operations or their representatives, the contractor will supply the following when site conditions warrant:
 - 1. Emergency and temporary lighting.
 - 2. Exhaust fans of sufficient size and numbers to adequately ventilate the work site, tunnel and or adjacent stations.
 - 3. Fire and / or garden hose for the purpose of dust control.

- L. It shall be the responsibility of the contractor to keep the Authority informed prior to all times when they intend to perform hazardous work. Failure of the contractor to provide the Authority with suitable advance notice of hazardous work will result in the stoppage of the work by the Authority until such time as sufficient numbers of protection personnel are on duty at the site.

6. ANNUAL CERTIFICATION OF HI-RAIL EQUIPMENT

- A. All equipment used by the contractor on Authority property shall be inspected by the Maintenance of Way engineer and/or the MBTA Safety Department for clearance and safety standards, and shall not be used if considered unsafe. All contractor/ subcontractor equipment (including hi-rail) operators must be trained, certified, and properly licensed. Documentation of same must be readily available and provided to the Authority upon request. If the contractor equipment is involved in a derailment or near miss incident or an accident, which caused injury or exposed personnel to injury and or caused damage to Authority property, that equipment will be subject to the Impound Policy Procedure.

- B. Contractor equipment to be used on or in the vicinity of the track shall be in first class condition, so as to positively prevent any failure that would cause delay in Authority operations or damage to its property or compromise the health and safety of personnel working on the project. Equipment shall not be placed or operated within the fouling distance of track without first obtaining the permission of the Authority.

- C. The contractor shall not, at any time, operate equipment or machinery over Authority's right-of-

MBTA SPECIAL INSTRUCTIONS

April 1, 2003

PAGE 12

way without the use of hi-rail gear. All equipment that the contractor proposes to operate shall 'be modified to operate over the Authority's track and special work (e.g., switches, crossover frogs third rail, and restraining rail). Qualified Authority personnel shall control the movement of all hi-rail equipment at all times while operating on the Authority right-of-way. The contractor shall supply a portable radio for each hi-rail vehicle entering the Authority's right-of-way. No hi-rail equipment will be allowed on Authority's property without a functioning portable radio tuned to an Authority frequency.

- D. The contractor shall furnish hi-rail equipment capable of operating within the strict confines of the right-of-way. No Authority owned equipment is available for the contractor's use. In addition to equipment necessary to complete the work on a regular basis, the contractor shall be required to have on site sufficient standby equipment capable of: a) removing disabled equipment from the right-of way, and b) replacing disabled equipment in order to return the right-of-way to normal operating status by the end of the designated work period. As part of the pre-qualification statement, the contractor shall furnish an itemized list of all equipment to be used on the project, including:
1. Type of equipment (e.g., pickup, flatbed or dump trucks, excavator, cranes, etc.).
 2. Make, model and date of manufacture.
 3. Ownership.
 4. Present use and date of availability.
 5. Location where equipment may be inspected by Authority personnel during the prequalification period.
- E. The contractor shall have proof of competency for hi-rail operators (e.g., documentation, that the operator of hi-rail equipment is certified to operate that specific piece of equipment). The Authority reserves the right to review the lesson plan and audit the training class. The hi-rail operator will be responsible for ensuring and documenting that the vehicle is safe for operation and that all required equipment is present and properly secured. This must be done on a daily basis prior to operating the equipment.
- F. The contractor is required to have an Annual Certification of hi-rail equipment (separate form the Registry Inspection) signed by a competent person (e.g. Manufacturer's representative) asserting to the fact that the equipment is Original Equipment Manufacturer (OEM), that it conforms to the latest standards, was installed per the manufacturer's specification, and is functioning properly.
- G. The contractor must keep a copy of the Manufacturer's Operating Manual or instructions onboard the hi-rail equipment at all times.
- H. The operator shall operate the hi-rail equipment at a reasonable speed for the existing conditions, being alert for another vehicle (or any other obstruction along the right of way). In addition, said operator must maintain a safe spacing of traveling equipment.
- I. The contractor's hi-rail vehicles must be equipped with a horn (warning device), and an exhaust gas purifier.
- J. All equipment when used in tunnels and or darkness must conform to the Authority's standards for

MBTA SPECIAL INSTRUCTIONS

April 1, 2003

PAGE 13

headlights and marker lights. In addition, when vehicles are operating in tandem such as rail carts; flat cars, etc., such vehicles must be equipped with a flashing/strobe light when the lead vehicle is other than the operating vehicle. Diesel powered equipment only will be allowed in the tunnel and shall be removed from the tunnel each night unless otherwise permitted by the Director of Subway Operations.

K. Contractors must comply with the Authority's Propane Gas policy.

L. Contractor's doing "hot work" must have appropriate permits and follow all applicable rules and procedures for same.

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SECTION 01568

MBTA CONSTRUCTION SAFETY

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This Section specifies requirements to establish a practical, sound, and effective program for the prevention of construction accidents, and to assign specific responsibilities to Contractors for program compliance.
- B. Contractors and their supervisors must control hazardous activities and conditions within their respective areas of contract responsibility.

1.2 SUBMITTALS

- A. Safety and Health Plan: The contractor shall, within thirty (30) days after receipt of the award of a contract, submit for approval to the MBTA, a detailed operational Safety and Health Plan.
- B. Safety Supervisor: The Contractor shall within thirty (30) days after receipt of the award of a contract submit the resume of the qualifications and work experience of the designated Safety Supervisor proposed for assignment to the Project. No construction work shall begin until the project Safety Supervisor has been approved by the MBTA. The Safety Supervisor shall have a minimum of 5 years of experience in construction safety or a related field.
- C. Monthly Accident Experience Summary: The Contractor shall submit an Accident Experience Report monthly during the course of construction to the MBTA.
- D. Industrial Industry Records: Prior to start of work, the Contractor shall submit their Injury/Illness Records for the previous 3 years. In addition, the Contractor shall submit annually to the MBTA all subsequent Illness/Injury Reports for the duration of the project.

PART 2 - PRODUCTS

None

PART 3 - EXECUTION

3.1 SAFETY AND HEALTH PLAN

- A. The Contractor shall submit a project Safety and Health Plan. At a minimum, the plan shall include the following sections:
- i. Emergency Action Plan
 - ii. First Aid Facilities
 - iii. Serious Accidents
 - iv. Emergency Telephone Numbers
 - v. Protection of the Public
 - vi. Site Visits
 - vii. Substance Abuse/Prevention/Testing

3.2 SAFETY SUPERVISOR

- A. Complete daily safety inspections of the job site and contiguous public areas, and take any corrective actions to eliminate unsafe conditions.
- B. Establish and implement a project safety training program for supervisors and employees as applicable to their job.
- C. Attend project safety meetings.
- D. Review Foreman accident and investigation reports, and initiate corrective action to prevent reoccurrence.
- E. Maintain copies of all Contractor Safety Reports.
- F. Assist Foremen in accident investigations.
- G. Encourage establishment of incentive programs designed to recognize individual employee safety efforts and contributions towards improved safety.
- H. Prepare a Safety Audit Checklist and complete the checklist each week during the course of construction. The completed Audit Checklists shall be submitted to the Authority weekly.
- I. The Safety Supervisor needs to be on the project site when major work tasks are being performed. During work periods when the Contractor is not performing contract work, the Safety Supervisor can be absent from the project site with permission from the Authority.

3.3 ACCIDENT INVESTIGATION

- A. Serious accidents shall be reported immediately to the MBTA Resident Engineer. Contractors shall issue standing orders to all supervisors directly in charge of operations that the scene of the accident shall not be disturbed, except for rescue or other emergency measures, until otherwise directed. Contractor's forces either witnessing or party to the accident shall be detained at the site to provide detailed accounting of facts.
- B. All reports shall be submitted to the MBTA. The accident investigation shall generate appropriate recommendations for corrective actions to prevent similar recurrence of similar accidents.
- C. The requirements of MBTA Safety Procedure 7.3 Contractor Safety Violation Program shall be followed by the Contractor when completing an accident report.

3.4 FIRST AID FACILITIES

- A. In formulating the Health and Safety Plan, the Contractor shall provide for the establishment and staffing of appropriate first aid facilities for the treatment of on the job injuries.
- B. Off-site medical treatment of employee injuries shall be performed at medical facilities named in the Contractor's Safety Submittal.

3.5 EMERGENCY TELEPHONE NUMBERS

To ensure that emergency actions are promptly taken, Contractors shall post emergency telephone numbers in conspicuous places.

3.6 ORIENTATION PROGRAM

- A. The Contractor shall establish and maintain an orientation program for new employees which shall include:
 - i. For each individual the hazards present in their work assignment and in the general area in which he will be working.
 - ii. Personal protective equipment required.
 - iii. Instruction in the proper procedure for reporting unsafe job conditions which he/she may encounter.

3.7 RIGHT OF WAY SAFETY AWARENESS

- A. All Contractor and sub-contractor personnel shall complete either the MBTA Rapid Transit right-of-way safety training or the MBCR Commuter Rail right-of-way safety training prior to entering the project site. ROW safety training will be required on all MBTA property including the RR track, stations, parking garages and maintenance car houses. Personnel will not be allowed on the job site unless they have attended a Right-of-Way Safety Awareness training session. Workers are required to carry their certification card while on site.

3.8 OSHA

- A. The Contractor shall comply with the OSHA 1926 Construction Safety Standards that apply to the project work. The Contractor shall meet the reporting requirements, and employers with eleven (11) or more employees must meet recordkeeping requirements.
- B. All Contractor and Sub-Contractor personnel shall possess an OSHA 10 Hour Certification card when working on the project site.
- C. All fatality cases and/or serious accidents and illness shall be reported to OSHA immediately by phone to an Occupational Safety and Health Area Office. Employers must report immediately all blasting accidents.
- D. Part of the OSHA requirements is that each employer must post in a prominent location the "Safety and Health Protection on the Job" poster. The poster briefly states the intent and coverage of the Act. Failure to post this document is a citable offense under the Act.

3.9 PROSECUTION OF THE WORK

- A. The Contractor shall take all reasonable precautions in the performance of the work to protect the safety and health of its employees and members of the public and shall comply with all applicable MBTA, Local, State and Federal safety and health regulations and associated reporting requirements.
- B. The Contractor Safety Supervisor is charged with sole responsibility of on-site safety management under the direction of the Contractor Project Superintendent. All potential safety hazards identified shall be promptly corrected. The Safety Supervisor shall complete daily reviews of the project site and document then results on the inspection.
- C. The MBTA shall notify the Contractor of any non-compliance and of the corrective action required. This notice, when delivered the Contractor or the Contractor's representative at the site of the work, shall be deemed sufficient notice of the non-compliance and corrective action required after receiving the notice, the contractor shall immediately take corrective action. If the contractor fails or refuses to take corrective action promptly, the MBTA may, without prejudice to other legal or contractual rights, issue an order stopping all or part of the work; and may subject contractor to safety violation assessments as deemed appropriate by the MBTA. Resumption **of work** may be issued by the MBTA Safety Department.
- D. The Contractor shall maintain an accurate record of exposure data on all accidents and incidents occurring under this contract and report this data in a manner prescribed by the MBTA.
- E. The Contractor shall be responsible for all its lower-tier sub-contractor's and vendor's compliance.
- F. Contractor management shall make a commitment for accident prevention and fire prevention. Safety shall take precedence over schedule and production. Enforcement action is mandatory.

3.10 WORK AUTHORIZATIONS

A. The following work authorizations will be issued by the MBTA:

- i. Excavation
- ii. Hot Work
- iii. Confined Space Entry
- iv. Cranes and Suspended Platforms

3.11 WORKING NEAR THE THIRD RAIL

A. When working on or near the third rail, when the power is off, the contractor must have a third rail high-voltage warning device on the job site approved by the MBTA Power Department. This device will warn work crews if the third rail becomes energized at any time during work activity involving the right-of-way.

3.12 HAZARDOUS SUBSTANCES

A. Any Contractor who uses substances on the hazardous substances list to which workers might be exposed under either normal work conditions or reasonable foreseeable emergency conditions resulting from work place operations must provide those workers with the required hazardous substance information.

3.13 PERSONAL PROTECTIVE EQUIPMENT

A. All Contractor personnel must wear the required personal protective equipment when on the job site. Personal protective equipment includes hard hats, safety vest, safety glasses and proper footwear.

3.14 PROTECTION OF THE PUBLIC

A. All necessary precautions to prevent injury to the public or damage to property of others shall be taken. The public is defined as all persons not employed by or under contract or subcontract to the MBTA. Installation of temporary barriers and/or fencing designated to protect the public shall be reviewed and approved by the MBTA. Precautions shall include but not be limited to the following:

B. Work shall not be performed in any area occupied by the public unless specifically permitted by the contract or in writing by the MBTA.

3.15 SUBSTANCE ABUSE/PREVENTION/TESTING PROGRAM

A. The Contractor shall establish a substance abuse policy and testing program that includes the following elements:

- Deterrence

- Treatment and Rehabilitation
- Detection
- Enforcement

The MBTA reserves the right to approve the proposed substance abuse program prior to commencing the contract.

3.16 CONDUCT OF TOURS


- A. Group tours must be cleared through the MBTA, allowing maximum advance notice and in compliance with MBTA Policy and Procedures.
- B. MBTA will coordinate the tour arrangements and ensure notification to the Contractors Project Manager.

3.17 HOUSEKEEPING

- A. A basic concept in any effective accident prevention program is "good housekeeping." No one item has a great impact on the overall success of a safety program for a construction project. The importance of good housekeeping is such that it must be planned from the beginning of the job and carefully supervised through the final cleanup.
- B. During the course of construction, work areas, passageways and stairs, in and around buildings and structures, shall be kept clear of debris. Construction materials shall be stored in an orderly manner. Storage areas and walkways on the site shall be maintained free of depressions, obstructions and debris.

PART 4 - MEASUREMENT AND PAYMENT

- A. No separate measurement or payment will be made for work required under this Section.



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[Home](#)

[Workers](#)

[Regulations](#)

[Enforcement](#)

[Data & Statistics](#)

[Training](#)

[Publications](#)

[Newsroom](#)

[Small Business](#)

[Anti-Retaliation](#)

[Regulations \(Standards - 29 CFR\) - Table of Contents](#)

- **Part Number:** 1926
- **Part Title:** Safety and Health Regulations for Construction
- **Standard Number:** 1926
- **Title:** Table of Contents

PART 1926 -- SAFETY AND HEALTH REGULATIONS FOR CONSTRUCTION

Subpart A -- General

Sec.

1926.1 Purpose and scope.

1926.2 Variances from safety and health standards.

1926.3 Inspections - right of entry.

1926.4 Rules of practice for administrative adjudications for enforcement of safety and health standards.

1926.5 OMB control numbers under the Paperwork Reduction Act.

1926.6 Incorporation by reference.

Subpart B -- General Interpretations

1926.10 Scope of subpart.

1926.11 Coverage under section 103 of the act distinguished.

1926.12 Reorganization Plan No. 14 of 1950.

1926.13 Interpretation of statutory terms.

1926.14 Federal contracts for "mixed" types of performance.

1926.15 Relationship to the Service Contract Act; Walsh-Healey Public Contracts Act.

1926.16 Rules of construction.

Subpart C -- General Safety and Health Provisions

1926.20 General safety and health provisions.

1926.21 Safety training and education.

1926.22 Recording and reporting of injuries. [Reserved]

1926.23 First aid and medical attention.

1926.24 Fire protection and prevention.

1926.25 Housekeeping.

1926.26 Illumination.

1926.27 Sanitation.

1926.28 Personal protective equipment.

1926.29 Acceptable certifications.

1926.30 Shipbuilding and ship repairing.

1926.31 Incorporation by reference.

1926.32 Definitions.

1926.33 Access to employee exposure and medical records.

1926.34 Means of egress.

1926.35 Employee emergency action plans.

Subpart D -- Occupational Health and Environmental Controls

1926.50 Medical services and first aid.

1926.51 Sanitation.

1926.52 Occupational noise exposure.

1926.53 Ionizing radiation.

1926.54 Nonionizing radiation.

1926.55 Gases, vapors, fumes, dusts, and mists.

1926.56 Illumination.

1926.57 Ventilation.

1926.58 [Reserved]

1926.59 Hazard communication.

1926.60 Methyleneedianiline.

1926.61 Retention of DOT markings, placards and labels.

1926.62 Lead.

1926.64 Process safety management of highly hazardous chemicals.

1926.65 Hazardous waste operations and emergency response.

1926.66 Criteria for design and construction for spray booths.

Subpart E -- Personal Protective and Life Saving Equipment

1926.95 Criteria for personal protective equipment.

1926.96 Occupational foot protection.

1926.97 [Reserved]

1926.98 [Reserved]

1926.99 [Reserved]

1926.100 Head protection.

1926.101 Hearing protection.
 1926.102 Eye and face protection.
 1926.103 Respiratory protection.
 1926.104 Safety belts, lifelines, and lanyards
 1926.105 Safety nets
 1926.106 Working over or near water.
 1926.107 Definitions applicable to this subpart.

Subpart F -- Fire Protection and Prevention

1926.150 Fire protection.
 1926.151 Fire prevention.
 1926.152 Flammable and combustible liquids.
 1926.153 Liquefied petroleum gas (LP-Gas).
 1926.154 Temporary heating devices.
 1926.155 Definitions applicable to this subpart.
 1926.156 Fixed extinguishing systems, general.
 1926.157 Fixed extinguishing systems, gaseous agent.
 1926.158 Fire detection systems.
 1926.159 Employee alarm systems.

Subpart G -- Signs, Signals, and Barricades

1926.200 Accident prevention signs and tags.
 1926.201 Signaling.
 1926.202 Barricades.
 1926.203 Definitions applicable to this subpart.

Subpart H -- Materials Handling, Storage, Use, and Disposal

1926.250 General requirements for storage.
 1926.251 Rigging equipment for material handling.
 1926.252 Disposal of waste materials.

Subpart I -- Tools -- Hand and Power

1926.300 General requirements.
 1926.301 Hand tools.
 1926.302 Power operated hand tools.
 1926.303 Abrasive wheels and tools.
 1926.304 Woodworking tools.
 1926.305 Jacks - lever and ratchet, screw and hydraulic.
 1926.306 Air Receivers.
 1926.307 Mechanical power-transmission apparatus.

Subpart J -- Welding and Cutting

1926.350 Gas welding and cutting.
 1926.351 Arc welding and cutting.
 1926.352 Fire prevention.
 1926.353 Ventilation and protection in welding, cutting, and heating.
 1926.354 Welding, cutting and heating in way of preservative coatings.

Subpart K -- Electrical

GENERAL

1926.400 Introduction.
 1926.401 [Reserved]

INSTALLATION SAFETY REQUIREMENTS

1926.402 Applicability.
 1926.403 General requirements.
 1926.404 Wiring design and protection.
 1926.405 Wiring methods, components, and equipment for general use.
 1926.406 Specific purpose equipment and installations.
 1926.407 Hazardous (classified) locations.
 1926.408 Special systems.
 1926.409-1926.415 [Reserved]

SAFETY-RELATED WORK PRACTICES

1926.416 General requirements.
 1926.417 Lockout and tagging of circuits.
 1926.418-1926.430 [Reserved]

SAFETY-RELATED MAINTENANCE AND ENVIRONMENTAL CONSIDERATIONS

1926.431 Maintenance of equipment.
 1926.432 Environmental deterioration of equipment.
 1926.433-1926.440 [Reserved]

SAFETY REQUIREMENTS FOR SPECIAL EQUIPMENT

1926.441 Battery locations and battery charging.
 1926.442-1926.448 [Reserved]

DEFINITIONS

1926.449 Definitions applicable to this subpart.

Subpart L -- Scaffolds

1926.450 Scope, application and definitions applicable to this subpart.
 1926.451 General requirements.
 1926.452 Additional requirements applicable to specific types of scaffolds.
 1926.453 Aerial lifts
 1926.454 Training requirements.

APPENDIX A TO SUBPART L -- Scaffolds

APPENDIX B TO SUBPART L -- Scaffolds

APPENDIX C TO SUBPART L -- Scaffolds

APPENDIX D TO SUBPART L -- Scaffolds

APPENDIX E TO SUBPART L -- Scaffolds

Subpart M -- Fall Protection

1926.500 Scope, application, and definitions applicable to this subpart.
 1926.501 Duty to have fall protection.
 1926.502 Fall protection systems criteria and practices.
 1926.503 Training requirements.

APPENDIX A TO SUBPART M -- DETERMINING ROOF WIDTHS

APPENDIX B TO SUBPART M -- GUARDRAIL SYSTEMS

APPENDIX C TO SUBPART M -- PERSONAL FALL ARREST SYSTEMS

APPENDIX D TO SUBPART M -- POSITIONING DEVICE SYSTEMS

APPENDIX E TO SUBPART M -- SAMPLE FALL PROTECTION PLANS

Subpart N -- Cranes, Derricks, Hoists, Elevators, and Conveyors

1926.550 [Reserved].
 1926.551 Helicopters.
 1926.552 Material hoists, personnel hoists and elevators.
 1926.553 Base-mounted drum hoists.
 1926.554 Overhead hoists.
 1926.555 Conveyors.
 1926.556 [Removed].

Subpart O -- Motor Vehicles, Mechanized Equipment, and Marine Operations

1926.600 Equipment.
 1926.601 Motor vehicles.
 1926.602 Material handling equipment.
 1926.603 Pile driving equipment.
 1926.604 Site clearing.
 1926.605 Marine operations and equipment.
 1926.606 Definitions applicable to this subpart.

Subpart P -- Excavations

1926.650 Scope, application, and definitions applicable to this subpart.
 1926.651 Specific Excavation Requirements.
 1926.652 Requirements for protective systems.

APPENDIX A TO SUBPART P -- SOIL CLASSIFICATION

APPENDIX B TO SUBPART P -- SLOPING AND BENCHING

APPENDIX C TO SUBPART P -- TIMBER SHORING FOR TRENCHES

APPENDIX D TO SUBPART P -- ALUMINUM HYDRAULIC SHORING FOR TRENCHES

APPENDIX E TO SUBPART P -- ALTERNATIVES TO TIMBER SHORING

APPENDIX F TO SUBPART P -- SELECTION OF PROTECTIVE SYSTEMS

Subpart Q -- Concrete and Masonry Construction

1926.700 Scope, application, and definitions, applicable to this subpart.
 1926.701 General requirements.
 1926.702 Requirements for equipment and tools.
 1926.703 Requirements for cast-in-place concrete.
 1926.704 Requirements for precast concrete.
 1926.705 Requirements for lift-slab construction operations.
 1926.706 Requirements of masonry construction.

APPENDIX TO SUBPART Q -- REFERENCES TO SUBPART Q OF PART 1926

Subpart R -- Steel Erection

1926.750 Scope.
 1926.751 Definitions.
 1926.752 Site layout, site-specific erection plan and construction sequence.
 1926.753 Hoisting and rigging.
 1926.754 Structural steel assembly.
 1926.755 Column anchorage.
 1926.756 Beams and columns.
 1926.757 Open web steel joists.
 1926.758 Systems-engineered metal buildings.
 1926.759 Falling object protection.
 1926.760 Fall protection.
 1926.761 Training.

APPENDIX A TO SUBPART R -- GUIDELINES FOR ESTABLISHING THE COMPONENTS OF A SITE-SPECIFIC ERECTION PLAN: NON-MANDATORY GUIDELINES FOR COMPLYING WITH § 1926.752(e)

APPENDIX B TO SUBPART R -- [RESERVED]

APPENDIX C TO SUBPART R -- ILLUSTRATIONS OF BRIDGING TERMINUS POINTS: NON-MANDATORY GUIDELINES FOR COMPLYING WITH § 1926.757(a)(10) and § 1926.757(c)(5)

APPENDIX D TO SUBPART R -- ILLUSTRATION OF THE USE OF CONTROL LINES TO DEMARCATATE CONTROLLED DECKING ZONES (CDZs): NON-MANDATORY GUIDELINES FOR COMPLYING WITH § 1926.760(c)(3)

APPENDIX E TO SUBPART R -- TRAINING: NON-MANDATORY GUIDELINES FOR COMPLYING WITH § 1926.761

APPENDIX F TO SUBPART R -- PERIMETER COLUMNS: NON-MANDATORY GUIDELINES FOR COMPLYING WITH § 1926.756(e) TO PROTECT THE UNPROTECTED SIDE OR EDGE OF A WALKING/WORKING SURFACE

APPENDIX G TO SUBPART R -- FALL PROTECTION SYSTEMS CRITERIA AND PRACTICES FROM § 1926.502: NON-MANDATORY GUIDELINES FOR COMPLYING WITH § 1926.760(d)

APPENDIX H TO SUBPART R -- DOUBLE CONNECTIONS: ILLUSTRATION OF A CLIPPED END CONNECTION AND A STAGGERED CONNECTION: NON-MANDATORY GUIDELINES FOR COMPLYING WITH § 1926.756(c)(1)

Subpart S -- Tunnels and Shafts, Caissons, Cofferdams, and Compressed Air

1926.800 Underground construction.
 1926.801 Caissons.
 1926.802 Cofferdams.
 1926.803 Compressed air.
 1926.804 Definitions applicable to this subpart.

APPENDIX A TO SUBPART S -- DECOMPRESSION TABLES

Subpart T -- Demolition

1926.850 Preparatory operations.
 1926.851 Stairs, passageways, and ladders.
 1926.852 Chutes.
 1926.853 Removal of materials through floor openings.
 1926.854 Removal of walls, masonry sections, and chimneys.
 1926.855 Manual removal of floors.
 1926.856 Removal of walls, floors, and material with equipment.
 1926.857 Storage.
 1926.858 Removal of steel construction.
 1926.859 Mechanical demolition.
 1926.860 Selective demolition by explosives.

Subpart U -- Blasting and Use of Explosives

1926.900 General provisions.
 1926.901 Blaster qualifications.
 1926.902 Surface transportation of explosives.
 1926.903 Underground transportation of explosives.
 1926.904 Storage of explosives and blasting agents.
 1926.905 Loading of explosives or blasting agents.
 1926.906 Initiation of explosive charges - electric blasting.
 1926.907 Use of safety fuse.
 1926.908 Use of detonating cord.
 1926.909 Firing the blast.
 1926.910 Inspection after blasting.
 1926.911 Misfires.
 1926.912 Underwater blasting.
 1926.913 Blasting in excavation work under compressed air.
 1926.914 Definitions applicable to this subpart.

Subpart V -- Power Transmission and Distribution

1926.950 General requirements.
 1926.951 Tools and protective equipment.
 1926.952 Mechanical equipment.
 1926.953 Material handling.
 1926.954 Grounding for protection of employees.
 1926.955 Overhead lines.

1926.956 Underground lines.
 1926.957 Construction in energized substations.
 1926.958 External load helicopters.
 1926.959 Lineman's body belts, safety straps, and lanyards.
 1926.960 Definitions applicable to this subpart.

Subpart W -- Rollover Protective Structures; Overhead Protection

1926.1000 Rollover protective structures (ROPS) for material handling equipment.
 1926.1001 Minimum performance criteria for rollover protective structures for designated scrapers, loaders, dozers, graders, and crawler tractors.
 1926.1002 Protective frames (roll-over protective structures, known as ROPS) for wheel-type agricultural and industrial tractors used in construction.
 1926.1003 Overhead protection for operators of agricultural and industrial tractors.

APPENDIX A TO SUBPART W -- Figures W-14 through W-28

Subpart X -- Stairways and Ladders

1926.1050 Scope, application, and definitions applicable to this subpart.
 1926.1051 General Requirements.
 1926.1052 Stairways.
 1926.1053 Ladders.
 1926.1054-1926.1059 [Reserved]
 1926.1060 Training Requirements

APPENDIX A TO SUBPART X -- Ladders

Subpart Y -- Commercial Diving Operations

GENERAL

1926.1071 Scope and application.
 1926.1072 Definitions.

PERSONNEL REQUIREMENTS

1926.1076 Qualifications of dive team.

GENERAL OPERATIONS PROCEDURES

1926.1080 Safe practices manual.
 1926.1081 Pre-dive procedures.
 1926.1082 Procedures during dive.
 1926.1083 Post-dive procedures.

SPECIFIC OPERATIONS PROCEDURES

1926.1084 SCUBA diving.
 1926.1085 Surface-supplied air diving.
 1926.1086 Mixed-gas diving.
 1926.1087 Liveboating.

EQUIPMENT PROCEDURES AND REQUIREMENTS

1926.1090 Equipment

RECORDKEEPING

1926.1091 Recordkeeping requirements.
 1926.1092 [Removed]

APPENDIX A TO SUBPART Y -- EXAMPLES OF CONDITIONS WHICH MAY RESTRICT OR LIMIT EXPOSURE TO HYPERBARIC CONDITIONS

APPENDIX B TO SUBPART Y -- GUIDELINES FOR SCIENTIFIC DIVING

Subpart Z -- Toxic and Hazardous Substances

1926.1100 [Reserved]
 1926.1101 Asbestos
 1926.1102 Coal tar pitch volatiles; interpretation of term.
 1926.1103 13 Carcinogens (4-Nitrobiphenyl, etc.).
 1926.1104 alpha-Naphthylamine.
 1926.1105 [Reserved]
 1926.1106 Methyl chloromethyl ether.
 1926.1107 3,3'-Dichlorobenzidine (and its salts).
 1926.1108 bis-Chloromethyl ether.
 1926.1109 beta-Naphthylamine.
 1926.1110 Benzidine.
 1926.1111 4-Aminodiphenyl.
 1926.1112 Ethyleneimine.
 1926.1113 beta-Propiolactone.
 1926.1114 2-Acetylaminofluorene.
 1926.1115 4-Dimethylaminoazobenzene.
 1926.1116 N-Nitrosodimethylamine.
 1926.1117 Vinyl chloride.
 1926.1118 Inorganic arsenic.
 1926.1127 Cadmium.

1926.1128 Benzene.
 1926.1129 Coke oven emissions.
 1926.1144 1,2-dibromo-3-chloropropane.
 1926.1145 Acrylonitrile.
 1926.1147 Ethylene oxide.
 1926.1148 Formaldehyde.
 1926.1152 Methylene Chloride.

Subpart AA-BB -- [RESERVED]

Subpart CC -- Cranes and Derricks in Construction

1926.1400 Scope.
 1926.1401 Definitions.
 1926.1402 Ground conditions.
 1926.1403 Assembly/Disassembly--selection of manufacturer or employer procedures.
 1926.1404 Assembly/Disassembly--general requirements (applies to all assembly and disassembly operations).
 1926.1405 Disassembly--additional requirements for dismantling of booms and jibs (applies to both the use of manufacturer procedures and employer procedures).
 1926.1406 Assembly/Disassembly--employer procedures--general requirements.
 1926.1407 Power line safety (up to 350 kV)--assembly and disassembly.
 1926.1408 Power line safety (up to 350 kV)--equipment operations.
 1926.1409 Power line safety (over 350 kV).
 1926.1410 Power line safety (all voltages)--equipment operations closer than the Table A zone.
 1926.1411 Power line safety--while traveling.
 1926.1412 Inspections.
 1926.1413 Wire rope--inspection.
 1926.1414 Wire rope--selection and installation criteria.
 1926.1415 Safety devices.br> 1926.1416 Operational aids.
 1926.1417 Operation.
 1926.1418 Authority to stop operation.
 1926.1419 Signals--general requirements.
 1926.1420 Signals--radio, telephone or other electronic transmission of signals.
 1926.1421 Signals--voice signals--additional requirements.
 1926.1422 Signals--hand signal chart.
 1926.1423 Fall protection.
 1926.1424 Work area control.
 1926.1425 Keeping clear of the load.
 1926.1426 Free fall and controlled load lowering.
 1926.1427 Operator qualification and certification.
 1926.1428 Signal person qualifications.
 1926.1429 Qualifications of maintenance & repair employees.
 1926.1430 Training.
 1926.1431 Hoisting personnel.
 1926.1432 Multiple-crane/derrick lifts--supplemental requirements.
 1926.1433 Design, construction and testing.
 1926.1434 Equipment modifications.
 1926.1435 Tower cranes.
 1926.1436 Derricks.
 1926.1437 Floating cranes/derricks and land cranes/derricks on barges.
 1926.1438 Overhead & gantry cranes.
 1926.1439 Dedicated pile drivers.
 1926.1440 Sideboom cranes.
 1926.1441 Equipment with a rated hoisting/lifting capacity of 2,000 pounds or less.
 1926.1442 Severability.

Appendix A to Subpart CC of part 1926--Standard Hand Signals

Appendix B to Subpart CC of part 1926--Assembly/Disassembly--Sample Procedures for Minimizing the Risk of Unintended Dangerous Boom Movement

Appendix C to Subpart CC of part 1926--Operator Certification--Written Examination--Technical Knowledge Criteria

APPENDIX A TO PART 1926 -- DESIGNATIONS FOR GENERAL INDUSTRY STANDARDS INCORPORATED INTO BODY OF CONSTRUCTION STANDARDS.

SOURCE: 44 FR 8577, Feb. 9, 1979; 44 FR 20940, Apr. 6, 1979, unless otherwise noted.

EDITORIAL NOTE: At 44 FR 8577, Feb. 9, 1979, and corrected at 44 FR 20940, Apr. 6, 1979, OSHA reprinted without change the entire text of 29 CFR Part 1926 together with certain General Industry Occupational Safety and Health Standards contained in 29 CFR Part 1910, which have been identified as also applicable to construction work. This republication developed a single set of OSHA regulations for both labor and management forces within the construction industry.

Editorial Note: The Federal Register of August 2, 1995, page 39254 issued a Final Rule; correcting amendment. OSHA will maintain the existing fall protection requirements for steel erection activities pending rulemaking that addresses the steel erection industry. This affected 1926.104, 1926.105, 1926.107, 1926.500, and 1926.753.

[55 FR 42328, Oct. 18, 1990; 55 FR 47687, Nov. 14, 1990; 58 FR 26627, May 4, 1993; 58 FR 35077, June 30, 1993; 59 FR 215, Jan. 3, 1994; 59 FR 36695, July 19, 1994; 59 FR 40729, Aug. 9, 1994; 59 FR 40964, Aug. 10, 1994; 60 FR 5131, Jan. 26, 1995; 60 FR 39254, Aug. 2, 1995; 61 FR 5507; Feb. 13, 1996; 61 FR 9227, March 7, 1996; 61 FR 31427, June 20, 1996; 61 FR 46025, Aug. 30, 1996; 62 FR 1493, Jan. 10, 1997; 63 FR 1152, Jan. 8, 1998; 63 FR 1919, Jan. 13, 1998; 63 FR 3813, Jan. 27, 1998; 63 FR 13338, March 19, 1998; 63 FR 17093, April 8, 1998; 63 FR 20098, April 23, 1998; 63 FR 33450, June 18, 1998; 63 FR 35137, June 29, 1998; 64 FR 18810, April 16, 1999; 66 FR 5265, Jan. 18, 2001; 70 FR 76985, Dec. 29, 2005; 71 FR 2885, Jan. 18, 2006; 71 FR 16675, April 3, 2006; 75 48130, Aug. 9, 2010]

 Next Standard (1926 Subpart A)

DOCUMENT A00815

MBTA LICENSE FOR ENTRY

PARCEL ID 16528

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MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

LICENSE FOR ENTRY | MBTA – 16528

RAILROAD PROPERTIES

DEDHAM, MASSACHUSETTS

TOWN OF DEDHAM

1. **The License for Entry**

The Massachusetts Bay Transportation Authority, a body politic and corporate and a political subdivision of the Commonwealth of Massachusetts, established and existing pursuant to Chapter 161A of the Massachusetts General Laws, with a usual place of business at 10 Park Plaza, Boston, Massachusetts (the “MBTA”), hereby grants to the Town of Dedham, a municipal corporation, with a usual place of business at 55 River Street, Dedham, Massachusetts 02026 (“Licensee”), the right and privilege to enter onto the Premises (as defined in Section 2.5 below) solely to conduct the Scope of License (as defined in Section 2.6 below), subject to the terms and conditions of this License for Entry.

2. **General Conditions**

Among the terms and conditions of this License for Entry are included the following General Conditions:

2.1 Effective Date: July 13, 2020

2.2 Licensee: Town of Dedham

2.3 Term: From the Effective Date to July 12, 2021; except that the MBTA may terminate this License for Entry with thirty (30) days written notice.

2.4 Fees:

Administrative Fee: Waived.

License Fee: Waived.

Design and Construction Plan Review Fee: \$1,600.00 paid in accordance with Section 4.1(h) below.

2.5 Premises: Those certain areas and temporary easement area adjacent to the MBTA’s Dedham Corporate Commuter Rail Station at Rustcraft Road, Dedham, Massachusetts, as more fully described/shown as “Parcel X-TE-22” and the surrounding property on the plan in Exhibit A, attached hereto and incorporated herein, but only to the extent that use of such property is reasonably necessary to permit Licensee to conduct the activities described in Section 2.6 below.

2.6 Scope of License: Licensee may access the Premises to perform roadway and sidewalk improvements to the abutting public ways, which work may include grading and slope work on Parcel X-TE-22 shown on Exhibit A, all in accordance with the terms and conditions of this License for Entry and the plans and/or documentation attached as Exhibit A. No other

investigations or activities of any kind may be performed on the Premises or any other property of the MBTA. Licensee shall have the right to permit its employees, contractors, and agents to use the Premises as permitted hereunder and acting by and through Licensee, subject to all of the terms and conditions of this License for Entry.

Licensee understands and agrees to the following terms and conditions:

1. Licensee shall adhere to the terms and conditions of the MBTA's Railroad Operations Department's correspondence dated January 23, 2020, hereto attached as Exhibit C and incorporated herein by reference.
2. Licensee shall adhere to the terms and conditions of the MBTA's Safety Department's correspondence dated December 6, 2019, hereto attached as Exhibit D and incorporated herein by reference.
3. Licensee shall adhere to the terms and conditions of the MBTA's Capital Delivery Department's correspondence dated November 14, 2019, hereto attached as Exhibit E and incorporated herein by reference.
4. Licensee shall adhere to the terms and conditions of Keolis Commuter Services, LLC's ("KCS") correspondence dated February 27, 2020, hereto attached as Exhibit F and incorporated herein by reference.

In the event of a conflict between the conditions stated in this Section 2.6 and other provisions of this License for Entry, whichever provisions are more restrictive of Licensee or impose a higher standard on Licensee shall control.

2.7 Notices:

The MBTA:

The MBTA Real Estate Department
Massachusetts Bay Transportation Authority
10 Park Plaza, Suite 5720
Boston, Massachusetts 02116
Attn: Deputy Chief Real Estate Officer

and

The MBTA Capital Delivery Department
10 Park Plaza, Suite 5170
Boston, Massachusetts 02116
Attn: Assistant General Manager

and

The MBTA Railroad Operations Department
Engineering and Maintenance
32 Cobble Hill Road
Somerville, Massachusetts 02143
Attn: Director of Engineering

and

Keolis Commuter Services, LLC ("KCS")
32 Cobble Hill Road
Somerville, Massachusetts 02143
Attn: John Connors

and

CSX Transportation, Inc. ("CSX")
500 Water Street
Jacksonville, Florida 32202
Attn: Mark E. Austin

and

Massachusetts Realty Group
20 Park Plaza, Suite 1120
Boston, Massachusetts 02116
Attn: MBTA License Management

LICENSEE:

Town of Dedham
55 River Street
Dedham, Massachusetts 02026
Attn: Jason L. Mammone

3. Consideration

The rights contained in this License for Entry are granted for good and valuable consideration, the sufficiency of which is hereby acknowledged.

4. Terms and Conditions of License for Entry

This License for Entry is subject to the following terms and conditions:

4.1 Scope of Activity

(a) Scope of Activity:

The Scope of Activity is the Scope of License (Section 2.6) as modified by the terms of this License for Entry, including, without limitation, Exhibit B attached hereto and incorporated herein. Licensee shall minimize the disruption to and alteration of the Premises and, as soon as possible after each entry onto the Premises, shall return the Premises to the condition existing immediately prior to the initiation of the Scope of Activity and entry hereunder; except as specifically authorized under the Scope of License.

Except pursuant to an approved Access Plan, defined in Exhibit B, attached hereto and incorporated herein, or in case of emergency, Licensee shall provide at least ten (10) days' prior written notice of its desire to enter the Premises to the MBTA's applicable operations department(s), including the MBTA's Railroad Operations Department, in accordance with this License for Entry at the address(es) noted above and shall also make arrangements at least ten (10) days in advance with the applicable Railroad Companies (as defined below) for access. The MBTA and the Railroad Companies (as defined below) may have an observer present at all times when Licensee is present on the Premises. See Exhibit B for required notice from Licensee when Licensee needs access because of an emergency. Licensee shall do all work in accordance with the Plan described in Exhibit B.

(b) Utilities:

Licensee acknowledges that there may be surface and subsurface utilities on and adjacent to the Premises and agrees to exercise extreme caution in performance of the Scope of Activity. Licensee shall comply with Massachusetts General Laws, Chapter 82, Section 40 (said statute also known as the "Dig Safe" law) and the regulations promulgated pursuant thereto including but not limited to the Code of Massachusetts Regulations, more particularly, 220 CMR 99.00 et seq. To the extent the MBTA, the Railroad Companies (as defined below), or parties acting on behalf of any of them, locate and mark railroad utilities in the railroad rights of way and appurtenant thereto, Licensee shall be responsible for payment to such parties for such services which may include, but not be limited to, locating and marking utilities, facilities and appurtenances thereto serving the railroad and transit line(s) or used in connection with services or operations of the MBTA and/or the Railroad Companies (as defined below). Any damage to any utilities on or near the Premises caused by Licensee shall be the sole responsibility of Licensee. If Licensee does not immediately repair any utilities it has damaged, the MBTA, without being under any obligation to do so and without waiving Licensee's obligation hereunder, may repair any utilities damaged by Licensee immediately and without notice in case of emergency. In the event the MBTA exercises such right, Licensee shall pay to the MBTA immediately upon demand all of the MBTA's cost of performing such repairs plus a fee equal to twenty-five percent (25%) of the MBTA's cost of performing such repairs to reimburse the MBTA for its administrative costs.

(c) Subordination to the MBTA's Operating Requirements:

The work permitted hereby shall be subordinate to the requirements of the MBTA in maintaining and operating a transportation system and may be stopped or delayed, at any time, in response to each requirement. The MBTA shall not be responsible for any damages incurred by Licensee as a result of any such work stoppage, delay or required relocation.

(d) Environmental Cooperation:

If for any reason Licensee is not responsible for Hazardous Materials, defined below, on the Premises then Licensee agrees to cooperate with the MBTA in the determination of the party liable for the remediation of the Premises under applicable Federal and/or state law. Such cooperation may include the temporary adjustment of the rights granted to Licensee hereunder. The MBTA shall not be responsible for any damages incurred by Licensee as a result of such temporary adjustment. "Hazardous Materials" shall mean "oil" or "hazardous materials", as those terms are defined in Massachusetts

General Laws Chapter 21E (“Chapter 21E”) and the regulations promulgated pursuant thereto, the Massachusetts Contingency Plan, 310 CMR 40.0000 et seq. (the “MCP”).

- (e) Remediation Obligation of Licensee:
Whenever by law or the terms of this License for Entry, Licensee is responsible for remediation of Hazardous Materials on MBTA property, Licensee, upon written demand of the MBTA, shall conduct, at Licensee’s sole cost and expense (or, at the MBTA’s election, reimburse the MBTA for the cost and expense incurred by the MBTA in connection with the MBTA’s conduct of), all response actions required by Chapter 21E and the MCP with respect to the Hazardous Materials (including the hiring of a Licensed Site Professional). Any such response action, if performed by Licensee, shall be performed in accordance with Chapter 21E, the MCP, any other applicable statutes and regulations, and in accordance with plans and specifications approved by the MBTA, shall be completed in a timely manner to the reasonable satisfaction of the MBTA, and shall allow the MBTA to use the Premises, and/or adjacent or contiguous property owned by the MBTA, for its present use and for any future transportation use. Licensee shall also be responsible for the reasonable costs incurred by the MBTA in hiring consultants (including a Licensed Site Professional) to review, supervise and inspect any plans, specifications, proposed method of work, installation, operation and results.

- (f) Notice of Project Commencement and Completion:
Upon commencement and completion of its work, Licensee shall provide written notice to the MBTA and the Railroad Companies (as defined below) at the notice addresses set forth in Section 2.7.

- (g) Evidence of Financial Responsibility:
Prior to commencement of Licensee’s activities hereunder, Licensee shall provide evidence to the MBTA’s reasonable satisfaction that Licensee has sufficient financial resources available to discharge any anticipated obligations hereunder. Such resources may be in the form of Licensee’s net worth, insurance coverage, a bond or such other financial security as may be acceptable to the MBTA in form and amount.

- (h) Plan Review Costs:
In addition to the Fees allocated in Section 2.4 above, Licensee shall also be responsible for any additional costs that may be incurred by the MBTA for Design and Construction Plan Review within thirty (30) days of being invoiced for same. Such costs and Fees are in addition to the Administrative Fee and the License Fee, and are included within the Licensee’s indemnity obligations in Section 4.2(a) below.

- (i) Settlement, Heaving or Lateral Movement
Licensee shall be responsible for any settlement, heaving or lateral movement caused to the roadbed, right-of-way and/or tracks, facilities and appurtenances of the MBTA or the Railroad Companies, arising from or as a result of the Scope of License or other Licensee activities at the Premises for a period of two (2) years from the date of completion of the Scope of License, and Licensee agrees to pay the MBTA and/or the Railroad Companies the full cost and expense of repair or

restoration to the MBTA's and/or Railroad Companies' facilities, promptly upon receipt of invoices therefore.

4.2 Indemnification and Release of the MBTA

- (a) Licensee shall indemnify, defend (at the option of the MBTA) and save the MBTA, KCS, CSX, and any other company operating on the rights-of-way (collectively, except for the MBTA, the "Railroad Companies"; and individually, each a "Railroad Company") harmless from and against any and all liabilities, losses, damages, costs, expenses (including reasonable attorneys' expenses and fees), causes of action, suits, claims, demands or judgments of any nature whatsoever including, without limitation, those related to Hazardous Materials that may be imposed upon, incurred by, or asserted against the MBTA or the Railroad Companies by reason of any of the following occurrences:
- (1) the activities of Licensee hereunder or the exercise by Licensee of any rights or privileges hereby granted; or
 - (2) the presence, discovery or revealing of any pre-existing Hazardous Materials on the Premises (or other property of the MBTA adjacent to the Premises) (i) which discovery is a result of Licensee's activities hereunder; (ii) where said Hazardous Materials are present because of Licensee's previous occupancies of the Premises, whether those occupancies were unauthorized or permitted pursuant to prior agreements between the parties; or (iii) where those pre-existing Hazardous Materials migrated from land now or previously owned, leased, occupied or operated by Licensee or for which Licensee is a potentially responsible party as defined under Chapter 21E; or
 - (3) the placement or accidental release of any Hazardous Materials onto the Premises (or other property of the MBTA adjacent to the Premises) by Licensee or its employees, agents, contractors or consultants or by the employees, agents, or consultants of Licensee's contractors or subcontractors; or
 - (4) any use, condition or occupation of the Premises or any part thereof by Licensee; or
 - (5) any failure of Licensee to perform or comply with any of the terms hereof, or of any contracts, agreements or restrictions, statutes, laws, ordinances or regulations affecting the activities or any part thereof.

In subsection (2) above, Licensee's previous occupancies of the Premises include occupancies by the predecessors in interest of Licensee.

- (b) Licensee has inspected the Premises and decided that the Premises are suitable for the uses Licensee contemplates. Licensee assumes all the risk of entry on to the Premises.
- (c) Licensee hereby releases the MBTA and the Railroad Companies from any responsibility for Licensee's losses or damages related to the condition of the Premises, and Licensee covenants and agrees that it will not assert or bring, nor cause any third-party to assert or bring, any claim, demand, lawsuit or cause of action (whether by way of original claim,

cross claim, counterclaim, contribution claim, indemnification claim, third-party claim or any other claim) (hereinafter "Claims") against the MBTA or the Railroad Companies, including, without limitation, claims for response actions, response costs, assessments, containment, removal and remedial costs, governmental oversight charges, including any overhead or response action costs incurred or assessed by DEP, fines or penalties, permit and annual compliance fees, reasonable attorney and expert fees, natural resource damages, property damages, including diminution in property value claims, and personal injury damages and damages related to a person's death relating to, or arising from, the condition of the Premises.

Licensee shall obtain a written release of liability similar to the one in this Section 4.2(c) and including the language of Section 4.2(d) in favor of the MBTA and the Railroad Companies from each of Licensee's consultants and contractors before they enter onto the Premises.

- (d) In clarification of the above release and covenants of defense and indemnification, and not in limitation of them, Licensee shall indemnify, defend (at the option of the MBTA) and save the MBTA and the Railroad Companies harmless from and against any and all liabilities, losses, damages, costs, expenses (including reasonable attorneys' expenses and fees), causes of action, suits, claims, demands or judgments related to the injury, illness or death of any employee of Licensee or of an employee of Licensee's contractors or consultants; except if the "Claim" arose because of the gross negligence or willful misconduct of the MBTA or the Railroad Companies. It shall not be grossly negligent to allow access to the Premises that are in substantially the condition they were in when Licensee inspected the Premises before accepting this License for Entry.
- (e) Licensee shall be notified, in writing, by the MBTA and each of the affected Railroad Companies of the assertion of any claim against it that Licensee has agreed to indemnify above (the "Indemnified Claim").
 - (1) If the MBTA decides to itself conduct the defense of an Indemnified Claim against it or to conduct any other response itself, Licensee shall reimburse the MBTA for all costs and expenses (including, without limitation, reasonable attorneys' fees and expenses) incurred by the MBTA in connection with the MBTA's defense of the Indemnified Claim against it and/or the conduct of all response actions, including, without limitation, those required by Chapter 21E and the MCP. The settlement or compromise of any Indemnified Claim shall not include the admission of guilt (or comparable plea), wrongdoing or negligence or the permitting or imposition of civil or criminal penalties or indictments, or the entering of consent decrees or orders of any kind by the MBTA on behalf of Licensee or any other action that would materially prejudice the rights of Licensee without Licensee's express written approval. Licensee shall cooperate fully and promptly with the MBTA in the defense of any Indemnified Claim. This same right of self-defense and the right to Licensee reimbursement shall apply to each of the Railroad Companies that has an Indemnified Claim against it.
 - (2) If the MBTA decides to have Licensee defend the Indemnified Claim or handle the response action, the MBTA shall notify Licensee of that decision in writing and Licensee shall bear the entire cost thereof and shall have sole control of the defense

of any Indemnified Claim and all negotiations for its settlement or compromise provided that the MBTA is fully indemnified by Licensee and provided further that the settlement or compromise shall not include the admission of guilt (or comparable plea), wrongdoing or negligence or the permitting or imposition of civil or criminal penalties or indictments, or the entering of consent decrees or orders of any kind by Licensee on behalf of the MBTA or any other action that would materially prejudice the rights of the MBTA without the MBTA's express written approval. The MBTA shall cooperate with Licensee in the defense of any Indemnified Claim. If any of the Railroad Companies want Licensee to defend it against an Indemnified Claim, then they must agree to this Section 4.2(e)(2).

If any response action due to the presence of Hazardous Material or the threat of release of Hazardous Waste onto the Premises (or other property of the MBTA which abuts the Premises), is performed by Licensee, the response action shall be performed in accordance with Section 4.1(e).

- (f) Licensee and contractor shall provide to the MBTA financial assurance guaranteeing Licensee's performance of the obligations of this License for Entry in a form satisfactory to the MBTA.

For purposes of this Section 4, Licensee shall include Licensee and its directors, officers, employees, agents, successors and assigns and the MBTA shall include the MBTA and its directors, officers, employees, agents, successors and assigns.

The provisions of Sections 4.1 and 4.2 shall survive the termination or expiration of this License for Entry.

4.3 Insurance

Prior to entry hereunder, Licensee and its consultants and contractors shall provide the MBTA, KCS, CSX, and the Railroad Companies with a certificate or certificates of insurance and shall, during the Term hereof, renew and replace any expired certificate, evidencing the insurance of the activities permitted hereunder, and Licensee's covenant of indemnification hereinabove, with companies that are reasonably acceptable to the MBTA, as stated below, in which the MBTA and others hereinafter specified are either additional insureds as their interests may appear or named insureds and which provide minimum liability coverage as follows:

- (a) Commercial General Liability Insurance:
Insuring Licensee, the MBTA, the Railroad Companies, the Premises, and all activities of Licensee permitted pursuant to this License for Entry, as well as Licensee's indemnification obligations contained herein, with minimum liability coverage for personal injury, bodily injury and property damage with limits not less than One Million Dollars (\$1,000,000) per occurrence and Two Million Dollars (\$2,000,000) in aggregate. Such insurance shall be written on an occurrence basis (as opposed to a claims made basis). This policy shall name the MBTA and the Railroad Companies as additional insureds. This policy shall provide coverage on a primary and non-contributory basis for the MBTA and the Railroad Companies. The policy shall contain a clause waiving the right of subrogation in favor of the MBTA and the Railroad Companies. This policy must contain endorsement(s) or

language, which must be stated on the certificate of insurance, providing coverage equivalent to the coverage provided by ISO form CG 24 17 10 01.

- (b) Workers' Compensation and Employers' Liability Insurance:
Insuring all persons employed by Licensee in connection with any work done on or about the Premises with respect to which claims for death or bodily injury could be asserted against the MBTA, including (i) Workers' Compensation Insurance providing statutory coverage as required by the Commonwealth of Massachusetts, and (ii) Employers' Liability Insurance coverage with limits of not less than One Million Dollars (\$1,000,000) per accident. Each of Licensee's contractors, subcontractors, and consultants performing work on or about the Premises shall have similar policies covering their employees. All policies of insurance required by this Section 4.3 (b) must contain a clause waiving the right of subrogation in favor of the MBTA and the Railroad Companies.
- (c) Automobile Liability Insurance:
Automobile liability insurance with limits of not less than One Million Dollars (\$1,000,000) covering all owned, non-owned, hired, rented or leased vehicles of Licensee, its employees, officers, subcontractors and consultants that are used in the activities permitted hereunder. Such insurance shall be written on an occurrence basis (as opposed to a claims made basis). This policy shall name the MBTA and the Railroad Companies as additional insureds. This policy shall provide coverage on a primary and non-contributory basis for the MBTA and the Railroad Companies. This policy must contain endorsement(s) or language, which must be stated on the certificate of insurance, providing coverage equivalent to the coverage provided by ISO form CA 20 70 10 01.
- (d) Umbrella Liability Insurance:
Umbrella liability insurance with limits of not less than Ten Million Dollars (\$10,000,000) providing excess coverage over all limits and coverage noted in paragraph (a) and paragraph (c) above. Such insurance shall be written on an occurrence basis (as opposed to a claims made basis). This policy shall name the MBTA and the Railroad Companies as additional insureds. This policy shall provide coverage on a primary and non-contributory basis for the MBTA and the Railroad Companies. The policy shall contain a clause waiving the right of subrogation in favor of the MBTA and the Railroad Companies. This policy must contain endorsement(s) or language, which must be stated on the certificate of insurance, providing coverage equivalent to the coverage provided by ISO form CU 24 09 03 05.
- (e) Insurance during Construction and Installation:
Licensee shall procure or cause to be procured builder's all risk insurance during any period when a construction project is being undertaken by or on behalf of Licensee on the Premises.
- (f) Railroad and Transit Protective Liability Insurance:
In the event that any work occurs within fifty (50) feet of an active right-of-way or if any work of any kind by Licensee poses a risk to foul an active right-of-way, Licensee shall procure Railroad Protective Liability Insurance insuring the MBTA and the Railroad Companies with limits of not less than Five Million Dollars (\$5,000,000) for all damages arising out of bodily injuries to or death of one (1)

person, and, subject to that limit for each person, a total limit of Ten Million Dollars (\$10,000,000) for all damages arising out of bodily injury to or death of two (2) or more persons in any one (1) accident. The MBTA and the Railroad Companies shall be "first named insureds" on the Railroad Protective Liability Insurance Policy. KCS shall be provided with an original policy of Railroad Protective Liability Insurance and the MBTA and remaining Railroad Companies shall be provided with a certificate of insurance.

The MBTA may require reasonable increases in limits of the above insurance coverages from time to time. The required insurance coverages hereinbefore specified shall be placed with insurance companies licensed by the Massachusetts Division of Insurance to do business in the Commonwealth of Massachusetts and having a Best's rating of A- or better, shall be kept in full force and effect at all times, shall be primary and non-contributory to any insurance or self-insurance maintained by the MBTA and the Railroad Companies, and shall require that the MBTA be given at least thirty (30) days' advance written notice in the event of any cancellation or non-renewal in coverage. All required policies of insurance shall not contain any exclusions for acts of terrorism, and shall fully cover any acts of terrorism. All such insurance as is required of Licensee shall be provided by or on behalf of all contractors, subcontractors and consultants to cover their operations performed. At the inception date of this License for Entry and throughout the term of this License for Entry, the MBTA shall be provided with certificates of insurance evidencing that such insurance policies are in place and provide coverage as required. Licensee shall be held responsible for any modifications, deviations, or omissions in the compliance with these requirements by any contractor, subcontractor or consultant of Licensee.

ALL CERTIFICATES OF INSURANCE PERTAINING TO THIS REQUEST (AS WELL AS RENEWAL CERTIFICATES) SHOULD DESCRIBE THE SITE THAT IS COVERED.

4.4 Compliance with Laws

Licensee shall comply with, and shall cause all work performed to comply with all federal, state, county, municipal and other governmental statutes, laws, rules, orders, regulations and ordinances.

Licensee shall also be responsible for obtaining any and all federal, state, and/or local permits and/or approvals necessary to carry out the activities permitted hereunder.

4.5 Non-Exclusive Use

The MBTA makes no representations or warranty, express or implied, that Licensee shall have sole or exclusive use of the Premises under this License for Entry. In the event other agreements, licenses, or easements have been or are granted, Licensee shall be responsible for coordinating its work and activities with that of other licensees and parties in interest. The MBTA shall not be liable for delays, obstructions, or like occurrences affecting Licensee, arising out of the work of the MBTA or other licensees or parties in interest.

Licensee's rights herein are granted subject to easements and rights of record and existing leases and licenses.

4.6 No Warranty

Licensee accepts the Premises "As Is" and the MBTA makes no warranty, express or implied, as to the condition of the Premises.

4.7 Termination

At the termination of this License for Entry, Licensee agrees to restore the Premises promptly to the condition it was in at the commencement of the term hereof, and to remove all of Licensee's personal property and debris from the Premises. Should Licensee not perform such restoration at the end of the Term, the MBTA may perform any and all necessary restoration at the sole expense of Licensee. Any personal property not so removed shall, at the option of the MBTA, either become the property of the MBTA or be removed by the MBTA and disposed of without any liability in the MBTA for such removal and disposition, all at the sole expense of Licensee.

4.8 Assignment

Licensee shall not, without the prior written consent of the MBTA, transfer or assign this License for Entry or any part hereof. Such consent may be withheld in the sole discretion of the MBTA. Any assignment made by Licensee without the prior written consent of the MBTA shall be rendered null, void, and of no further force or effect.

5. Notices

All notices, demands, requests, consents, approvals and other instruments required or permitted to be given pursuant to the terms hereof (hereinafter "Notice"), shall be in writing and shall be deemed to have been properly given when deposited in registered or certified United States mail, postage prepaid, return receipt requested, addressed, as described in Section 2.7 or when delivered by messenger or overnight mail service to the correct addressee. Notice shall be deemed received when actually received or when the proffered Notice has been refused by the addressee. The signature of an employee, servant or agent of the addressee shall be determinative on the issue of actual receipt.

Licensee and the MBTA shall, at any time and from time to time, have the right to specify as their proper addresses for purposes of this License for Entry any other address or addresses giving fifteen (15) days' written notice thereof to the other party.

6. Results

If this License for Entry explicitly allows Licensee to conduct certain investigations on MBTA owned land, then if asked to do so by the MBTA in writing, Licensee agrees to provide to the MBTA, at no cost, a copy of the results of such investigations (including data and analysis) and all other work conducted under this License for Entry in both hard copy form and in a digital format specified by the MBTA regardless of whether the report was prepared by Licensee, its agent, consultant or contractor, or prepared on behalf of Licensee. All results and reports shall be provided to the MBTA within ten (10) days of Licensee's receipt of the written request of the MBTA. Licensee agrees to consult with the MBTA prior to contacting any governmental entity, regarding any information, results of analysis or reports regarding the Premises. Licensee shall give the MBTA a copy of any reports or notifications, including but not limited to release notifications, prior to submitting the same to any governmental entity.

7. Default and Termination

(a) Termination for Non-Payment:

In the event that Licensee shall neglect or fail to pay any sum herein specified to be paid upon the due date hereunder, Licensee shall be in default and the MBTA shall have the right at any time thereafter to terminate this License for Entry by giving Licensee two (2) weeks written notice of the MBTA's decision to terminate for non-payment ("Termination Notice"). Licensee shall not

be entitled to cure any such default by tendering payment after the expiration of the two (2) week grace period which starts upon Licensee's, or Licensee's servants, agents or employee's receipt of (or refusal to accept) the MBTA's Termination Notice. Any amount due hereunder that is not paid when due shall be charged to 1.5% per month and 18% per annum.

(b) Default of Terms and Conditions:

Licensee shall also be in default if Licensee:

- (1) fails to perform or observe any of the other covenants or agreements contained in this instrument and on its part to be performed or observed, or
- (2) makes any assignment for the benefit of creditors or files petition for relief under bankruptcy law, or
- (3) has a bankruptcy petition filed against it that is not dismissed within sixty (60) days, or
- (4) has its estate taken by process of law, proceeding in bankruptcy or insolvency or otherwise,

and if such defaults continue after two (2) weeks' written notice given by the MBTA to Licensee to cure, the MBTA may terminate this License for Entry by written notice to Licensee and/or deny access to the Premises and expel Licensee and those claiming through or under Licensee and remove Licensee's effects from the Premises without prejudice to any remedies which might otherwise be available for such breach of covenant, and, upon entry as aforesaid, the rights of Licensee created by this License for Entry shall terminate. Notwithstanding the preceding, if Licensee begins to cure a default as soon as possible within said two (2) week period and thereafter continues to pursue a cure with all due diligence, then the MBTA shall not terminate this License for Entry until and unless Licensee ceases to pursue a cure with all due diligence and has not in fact cured said default. Licensee agrees to pay any expense including reasonable attorneys' fees incurred by the MBTA in enforcing any of Licensee's obligations hereunder.

Notwithstanding the preceding, if the default is one that threatens the safety of the public or the ability of the MBTA or a Railroad Company to operate its transportation system, then it shall be considered an emergency default ("Emergency Default") and if Licensee does not affect an immediate cure, the MBTA may terminate the License for Entry upon reasonable notice and use self-help at the expense of Licensee and Licensee shall be responsible for such expenses as well as for a twenty-five percent (25%) administrative fee above the expenses.

In the event this License for Entry is terminated pursuant to this Section 7, the MBTA shall retain the License Fee as partial damages, without prejudice to its right to claim additional damages as a result of the breach.

8. Holding Over

If Licensee desires to continue the work defined in the Scope of Activity after the expiration or termination of this License for Entry, the resulting license shall be on a month-to-month basis and may be terminated by either party at any time by providing the other party with thirty (30) days prior written notice of termination. During the holding-over period, a monthly fee equal to three (3) times the equivalent monthly License Fee (calculated based on the length of the original term and the original License Fee established hereunder) shall be paid monthly in advance by Licensee to the

MBTA. During such holding-over period, Licensee shall be bound by all applicable provisions of this License for Entry.

9. Work in Harmony

Licensee agrees that in any work performed in or about the Premises, it will employ only labor which can work in harmony with all elements of labor being employed by the MBTA or the Railroad Companies.

10. Promotional Material

Licensee shall not, without the prior written approval of the MBTA, refer to the MBTA in any promotional matter or material, including, but not limited to advertising, letterheads, bills, invoices and brochures.

11. Nondiscrimination

With respect to its exercise of all rights and privileges herein granted, Licensee shall undertake affirmative action as required by Federal and state laws, rules and regulations pertinent to Civil Rights and Equal Opportunity unless otherwise exempted therefrom. Licensee agrees that it shall comply with any and all required affirmative action plans submitted pursuant to the directives of any Federal agency and in accordance with applicable federal law and applicable state laws, rules and regulations.

Licensee shall not discriminate against any person, employee or applicant for employment because of race, color, creed, national origin, age, sex, sexual orientation, disability or military veteran status in its activities at the Premises, including without limitation, the hiring and discharging of employees, the provision or use of services and the selection of suppliers, contractors, or subcontractors.

Consistent with the law, Licensee shall use reasonable efforts to contact, encourage and utilize minority and female business enterprises in the procurement of materials and service under this License for Entry.

12. Taxes

Licensee shall be solely responsible for the payment of any taxes, levies, betterments or assessments, fees or charges, whether in existence on the date hereof or becoming applicable during the Term, which may be assessed against Licensee or the MBTA which are directly attributable to Licensee's installations in, or use of, the Premises, or any personal property or fixtures of Licensee located thereon (collectively referred to as "Taxes"). Licensee shall pay all Taxes directly to the taxing authority before delinquency and before any fine, interest, or penalty shall become due or be imposed by operation of law for their nonpayment. Such payments shall constitute an additional License Fee hereunder.

Licensee may contest, in good faith for its own account and at its own expense, the validity or amount of any Taxes, provided Licensee shall indemnify the MBTA against any resulting loss, cost and expense. Licensee shall not permit a lien or encumbrance on the Premises by reason of failure to pay any Taxes.

13. No Third-Party Beneficiaries

This License for Entry shall not be construed to create any third-party beneficiary rights in favor of any other parties (except the explicit rights granted to the Railroad Companies) or any right or privilege for the benefit of any other parties.

14. Entire Agreement

This License for Entry contains the entire agreement of the parties hereto with respect to the subject matter hereof, and no representations, inducements, promises, or agreements, oral or otherwise, between the parties hereto with respect to the subject matter hereof not embodied herein shall be of any force or effect.

15. Governing Law

This License for Entry shall be construed and interpreted under and pursuant to the laws of the Commonwealth of Massachusetts, and the Massachusetts and Federal conflict of laws provisions shall not be applied if the result is that other than Massachusetts law shall govern.

16. Successors and Assigns

The provisions of this License for Entry shall be binding on and inure to the benefit of the parties hereto and their respective successors and assigns.

17. Limitation on Damages

The MBTA shall not be liable to Licensee for any loss of business or any indirect, incidental, special, consequential or exemplary damages or lost profits unless specified herein.

18. No Waiver

No failure by the MBTA to insist upon strict performance of any term, covenant or condition hereof, or to exercise any right or remedy consequent upon a breach thereof shall constitute a waiver of any such breach or of any such term, covenant or condition. The acceptance by the MBTA of any amount less than the full amount due to the MBTA hereunder shall not be deemed a waiver by the MBTA of its right to collect the full amount due. The MBTA may deposit checks or drafts that state "final payment", "payment in full" or the like without being deemed to have waived its right to receive all amounts due hereunder. Any waiver by the MBTA of any term, covenant or condition hereof shall not be effective unless such waiver is in writing.

[Signature Page Follows]

IN WITNESS WHEREOF, the parties hereto have caused this License for Entry to be executed as of the Effective Date.

**MASSACHUSETTS BAY TRANSPORTATION
AUTHORITY, AS LICENSOR**

By: _____
Richard Henderson
Chief Real Estate Officer

TOWN OF DEDHAM, AS LICENSEE

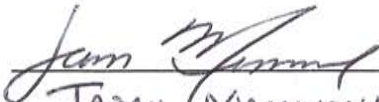
By: 
Name: JASON MAMMONE
Title: DIRECTOR OF ENGINEERING
(Duly Authorized Representative)

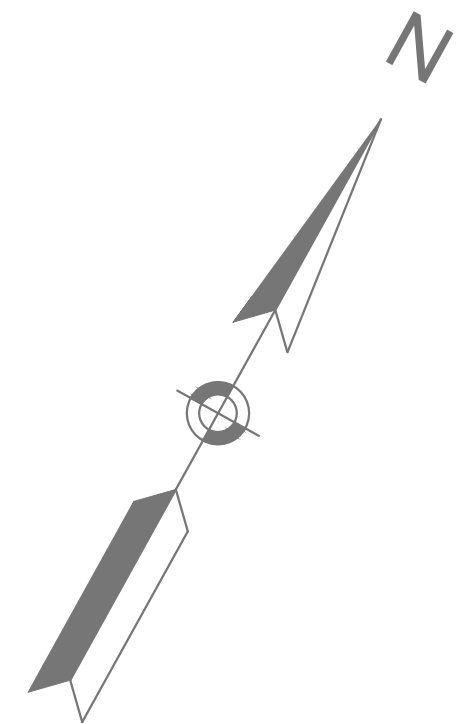
EXHIBIT A

PLAN OF PREMISES

DEDHAM
ELM STREET AND RUSTCRAFT ROAD

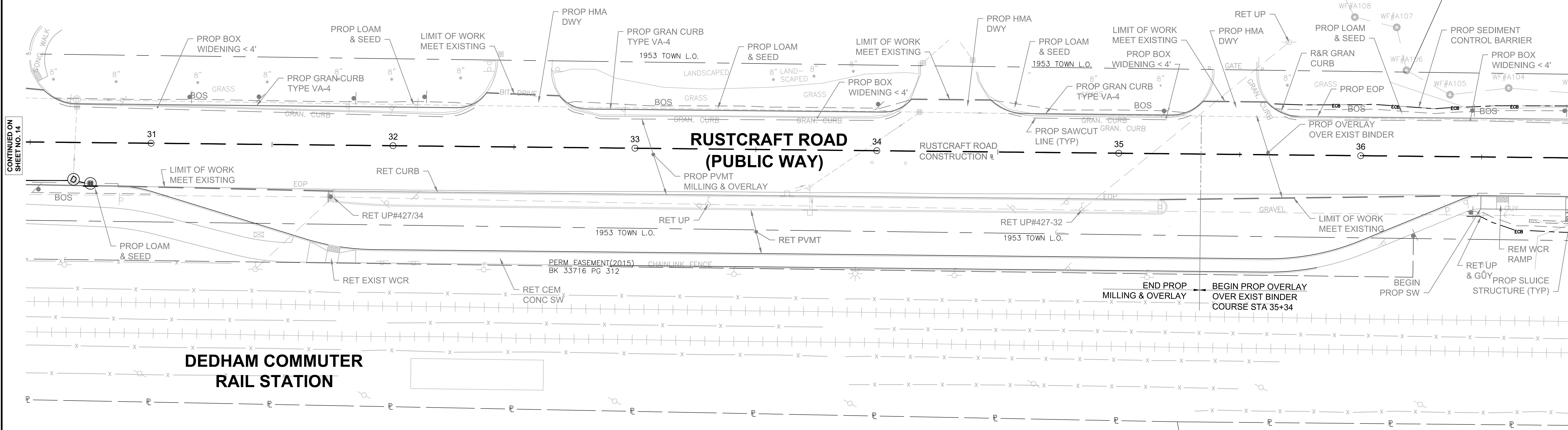
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XX-XXX(XXX)	15	19
PROJECT FILE NO. 607901			

PRELIMINARY RIGHT OF WAY
PROPERTY PLAN



N/F
RAR2 JEFFERSON AT DEDHAM STATION MN INC
PARCEL ID 163-2
DEED BK 870 PG 75

N/F
RAR2 JEFFERSON AT DEDHAM STATION MN INC
PARCEL ID 163-2
DEED BK 870 PG 75



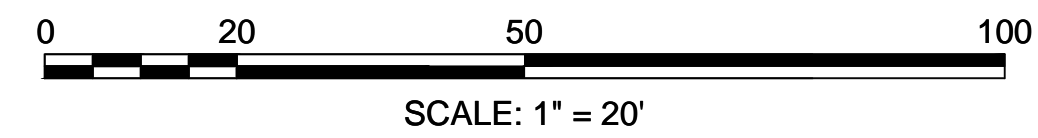
CONTINUED ON
SHEET NO. 14

CONTINUED ON
SHEET NO. 16

DEDHAM COMMUTER
RAIL STATION

RUSTCRAFT ROAD
(PUBLIC WAY)

N/F
MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
PARCEL ID 176-5



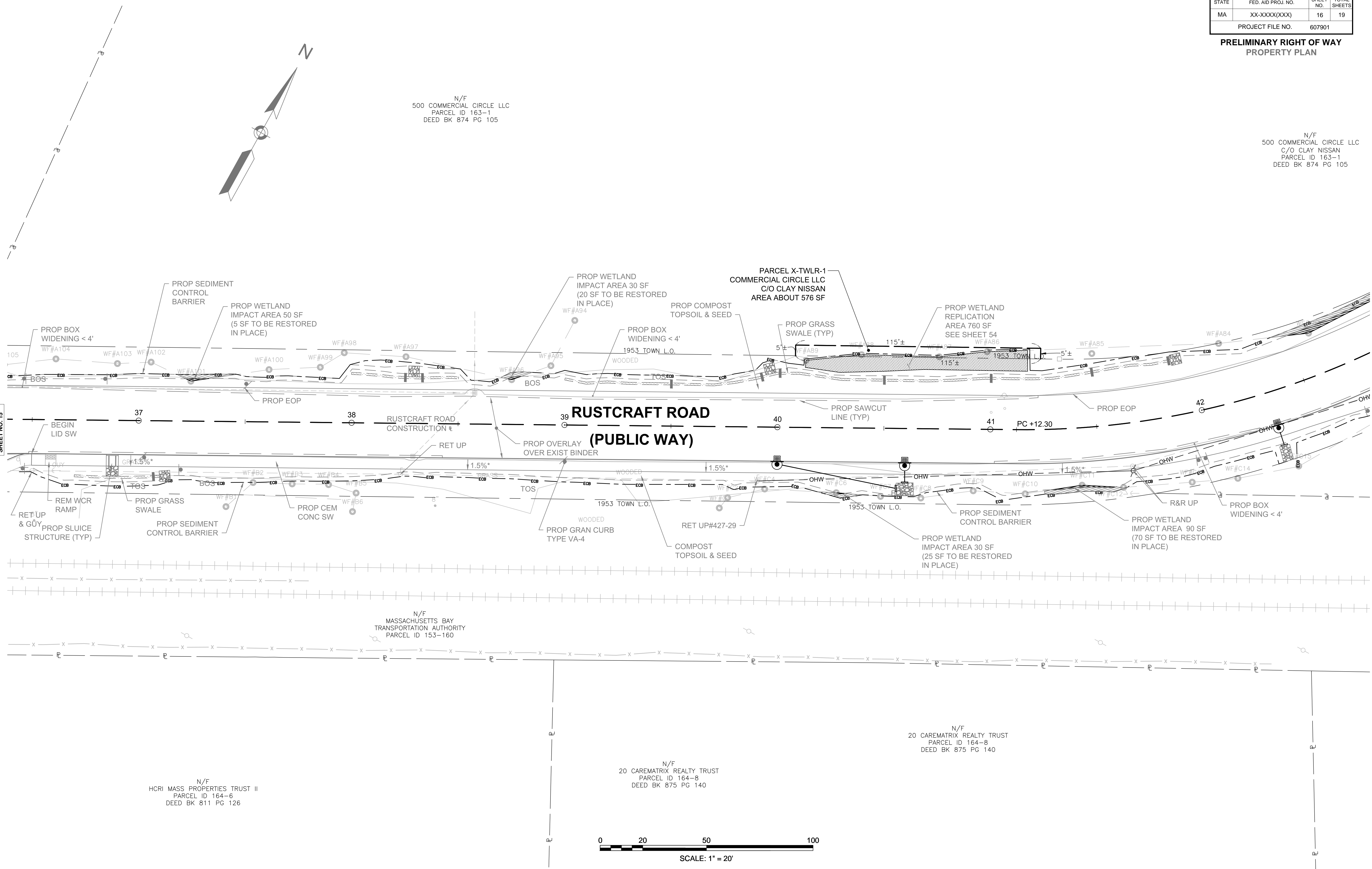
DEDHAM
ELM STREET AND RUSTCRAFT ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XX-XXX(XXX)	16	19

PROJECT FILE NO. 607901
**PRELIMINARY RIGHT OF WAY
PROPERTY PLAN**

N/F
500 COMMERCIAL CIRCLE LLC
PARCEL ID 163-1
DEED BK 874 PG 105

N/F
500 COMMERCIAL CIRCLE LLC
C/O CLAY NISSAN
PARCEL ID 163-1
DEED BK 874 PG 105



CONTINUED ON SHEET NO. 15

CONTINUED ON SHEET NO. 17

N/F
HCRI MASS PROPERTIES TRUST II
PARCEL ID 164-6
DEED BK 811 PG 126

N/F
20 CAREMATRIX REALTY TRUST
PARCEL ID 164-8
DEED BK 875 PG 140

N/F
20 CAREMATRIX REALTY TRUST
PARCEL ID 164-8
DEED BK 875 PG 140

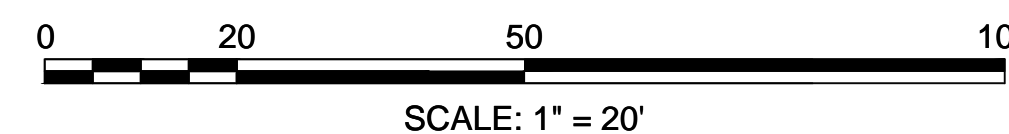


EXHIBIT B

SCOPE OF ACTIVITY

Subject to the terms and conditions in this License for Entry Agreement, Licensee, its agents, employees, contractors, subcontractors, and/or representatives are hereby granted a license to enter upon the Premises for the sole purpose as described in Section 2.6.

Licensee shall conduct all activities within the Premises in a safe manner and immediately notify the MBTA and the applicable Railroad Companies if any problem occurs which may result in a safety hazard. If any unsafe situation should occur, Licensee will correct the situation by eliminating any safety hazard immediately or, if the situation cannot be reasonably cured immediately, then in such longer time as is reasonably required, and in all such unsafe situations, the MBTA Railroad Operations Safety Procedures shall be followed.

Licensee shall submit a plan and detailed specifications (including the materials to be used) and the proposed methods of performing the work, or any part thereof (the "Plan") to the MBTA, KCS and other applicable Railroad Companies. Licensee shall not enter the Premises until the Plan has been approved by the MBTA and the applicable Railroad Company or Railroad Companies. Such approval may be withheld in the MBTA's, or the applicable Railroad Company's sole discretion. The Scope of Activity for said construction, installation, maintenance, operation and/or replacement will be more fully defined in the approved Plan, which approved Plan will automatically be incorporated herein by reference and made part of this License for Entry. Licensee shall also provide the MBTA with a detailed schedule of times when Licensee, its employees, contractors, subcontractors, or agents would like to be on the Premises to undertake the Scope of Activity (the "Access Plan"). The MBTA and the applicable Railroad Companies shall have full power to make a final determination of when Licensee may be on the Premises as it is necessary to coordinate the work of all those desiring or having the right to access the Premises.

Unless entry is made pursuant to an Access Plan approved by both the MBTA and the applicable Railroad Companies, Licensee agrees to give, each time it desires entry, at least ten (10) days' prior written notification to the MBTA and the applicable Railroad Companies (except in cases of emergency when notice shall be given to the MBTA and the applicable Railroad Companies as quickly as possible) of its need to access the Premises for all work to be performed under this License for Entry. Licensee understands that the more notice given to the MBTA and the applicable Railroad Companies, the more likely it will be that Licensee can gain access at the times requested. The Licensee shall present evidence of the required insurance coverage before each entry. In the case of an emergency, Licensee shall as soon as possible contact the MBTA Control Center 617-222-5278.

No activities permitted herein may be performed by Licensee except as approved in writing by the MBTA; and no method of testing, installation or construction shall be used by Licensee except with prior written approvals or written approvals received in the field from the MBTA's representatives at the time the work is performed.

If at any time during the work of installation or connection, either the MBTA or the applicable Railroad Company should, in its sole and absolute discretion, deem flaggers, watchpersons, communications/signaling personnel, electric traction personnel, inspectors assigned to construction crews, and/or other measures, including but not limited to train re-routing, desirable or necessary to protect its operations, its property or its employees or other persons on or near the Premises, the MBTA and/or a Railroad Company shall upon notice to Licensee (where such notice is feasible) have the right to place such personnel, including personnel of the MBTA's or the Railroad Company's agents or to take such measures, at the sole cost and expense of Licensee. Such cost and expense shall include the current

wages and fringe benefits due and owing to such personnel in and for the performance of such measures. Licensee hereby covenants and agrees to bear the full cost and expense thereof and to reimburse the MBTA and/or the Railroad Company within thirty (30) days of receiving an itemized, written invoice for such reimbursement. The MBTA's or a Railroad Company's failure to furnish such personnel or take such measures shall not relieve Licensee of any obligation or liability it might otherwise have assumed, and shall not give rise to any liability to Licensee on the part of the MBTA or the Railroad Companies. Upon being notified that the personnel or measures referred to in the first sentence of this paragraph have been deemed desirable or necessary by the MBTA and/or a Railroad Company, Licensee shall not commence or continue construction or repair measures, as the case may be, unless and until such personnel or measures are in place.

If Licensee shall deem any requirement for flagging or the like by the MBTA, a Railroad Company, or one of their agents for supervision of the activity hereunder as unreasonable, Licensee shall nevertheless pay for such flagging and the like, but may take exception in writing thereto as an unreasonable requirement in each instance. The parties agree to review such exceptions at the times of billings for such services and attempt to adjust them as the MBTA may deem appropriate. This reimbursement is in addition to the License Fee and Administrative Fee required hereunder.

Licensee shall comply with all applicable MBTA Railroad Operations Directorate requirements including, but not limited to, those entitled: "I - Guidelines and Procedures for Construction on MBTA Railroad and Transit Properties", "II - Maintenance and Protection of Railroad Traffic", "III - Insurance Specifications" dated August 2014 and MBTA Special Instructions dated April 2003. To the extent that there is an irreconcilable conflict between the aforementioned requirements and this License for Entry, the terms and conditions contained in the MBTA Railroad Operations Directorate Procedures shall control, unless the requirements in this License for Entry are more strict.

No individual, including representatives and employees of Licensee, may enter onto the Premises unless that individual has first attended KCS's Roadway Worker Protection ("RWP") class.

EXHIBIT C



Charles D. Baker, Governor
Karyn E. Polito, Lieutenant Governor
Stephanie Pollack, MassDOT Secretary & CEO
Steve Poftak, General Manager



January 23, 2020
TEM 020-010

Mr. Brian Clarizia
Massachusetts Realty Group
20 Park Plaza – Suite 1120
Boston, MA 02116
RE: MBTA 16528

Dear Mr. Clarizia,

Railroad Operations (RRO) has reviewed the request of The Town of Dedham related to a temporary easement for the use of MBTA property as associated with roadway and sidewalk reconstruction. The approximate area of the easement is 1,591 sf. The work location is adjacent to the Dedham Corporate Commuter Rail Station access along Rustcraft Road.

Railroad Operations (RRO) has no objection to the work described as in the request provided:
:

- Fully complies with the MBTA Railroad Operations Directorate- available on line at mbtarealty.com
- Work shall not impede access/egress to the station from Rustcraft Road and RRO shall receive the proposed Traffic Management Plan for review and approval along the impacted area prior to any work commencing
- Obtains all required insurance and indemnifies the MBTA, Keolis, and CSX
- No fencing shall be removed along the work area and grading shall meet at this point
- All contractors involved in the work shall obtain RWP Training as required by Keolis
- Notifies Dig Safe and Keolis to have existing utilities located prior to any work
- Requests flagging as deemed necessary by Keolis
- Notification is provided to RRO and Keolis prior to any work
- Obtains any/all other applicable permits and/or licenses as required
- Stabilizes any impacted area adjacent to the row to the satisfaction of RRO
- The MBTA reserves the right to amend this approval based on site conditions
- Notifies the MBTA designee, Kevin Biggins @ 617-304-8769 at least 5 days prior to the commencement of the work.

The applicant should contact Keolis prior to the commencement of the project to any coordinate training and Train Protection Support as may be required.

Sincerely,


William Lally,
Director – Engineering and Maintenance Railroad Operations
Cc: MBTA: K. Biggins

EXHIBIT D

MASSACHUSETTS REALTY GROUP
REAL ESTATE CONSULTANTS TO THE MBTA

MEMORANDUM

TO: William Lally, Director of Railroad Engineering
Maggie Lackner, Director of Design and Architecture
John Connell, Director of Safety Engineering

FROM: Brian Clarizia – Director of Licensing

DATE: 11/6/2019

RE: MBTA - 16528

Please Respond by December 6, 2019

Please review the attached information from the Town of Dedham requesting to perform roadway and sidewalk improvements on Elm Street and Rustcraft Road, from Fox Drive to Fairbanks Park, in order to complete the cement concrete sidewalk work on Rustcraft Road, which will require temporary access to the MBTA's property at Dedham Corporate Station, in Dedham, MA.

The work is being performed by MassDOT in conjunction with the Town of Dedham. Proposed sidewalk will be on town property, however there may be minor grading/slope work done on the MBTA's property as a result of the sidewalk installation.

Attached Rustcraft Road Improvement plan sheet 1 of 3 shows the temporary easement (X-TE-22) of 1591 square feet required for construction purposes. Sheets 2 and 3 does not require any type of easements since all proposed roadway and sidewalk work will be outside of the MBTA property.

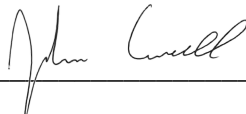
Please advise us as to your concerns and any special conditions that may apply. Reference to the file number on all correspondence is helpful.

Cc: MBTA: K. Biggins, B.Losordo, A.Sweeney, L.DOliver, K.Belovarac

APPROVED:

NOT APPLICABLE:

APPROVED WITH CONDITIONS:



DENIED:
(Please provide an explanation)





Charles D. Baker, Governor
Karyn E. Polito, Lieutenant Governor
Stephanie Pollack, MassDOT Secretary & CEO
Steve Poflak, General Manager



MEMORANDUM

To: John Connell
Director of Safety Engineering

From: Alex Stone *JC for*
Safety Analyst

Date: December 6, 2019

Subject: Town of Dedham
MRG Project #MBTA – 16528

MBTA Safety has received and reviewed the proposal from Town of Dedham to perform roadway and sidewalk improvements on Elm Street and Rustcraft Road, from Fox Drive to Fairbanks Park, in order to complete the cement concrete sidewalk work on Rustcraft Road, which will require temporary access to the MBTA's property at Dedham Corporate Station, in Dedham, MA.

The work is being performed by MassDOT in conjunction with the Town of Dedham. Proposed sidewalk will be on town property, however there may be minor grading/slope work done on the MBTA's property as a result of the sidewalk installation.

This request was submitted to MBTA Safety via the Massachusetts Realty Group (MRG).

Based on the information submitted, MBTA Safety should deem the request to be "Approved with Conditions". In addition to all conditions set forth by Railroad Engineering and Design and Architecture, the following conditions shall be met:

1. All personnel working on or near the Commuter Rail Right of Way (ROW) must complete Keolis Roadway Worker Protection (RWP) training prior to beginning work. All personnel must have valid Keolis RWP ID cards on their person while working on or near the ROW.
2. All work must be coordinated with MBTA Railroad Operations to ensure proper scheduling and flagging. Based on certain requirements, work may be deemed necessary for non-revenue hours.
3. Existing MBTA infrastructure, including underground utilities, must be protected during work.
4. Proper Personal Protective Equipment (PPE) must be worn on MBTA property at all times.
5. Continued and unrestricted pedestrian and employee access must be maintained.
6. Applicant must establish a secure work zone during construction to provide for passenger protection.
7. If at any time the MBTA deems the Applicant's activities as unsafe to its operations, infrastructure, customers, employees, or the general public, the Applicant must cease all work until safer conditions are established and approved by MBTA personnel.

If you have any questions or concerns, please feel free to contact me.

EXHIBIT E



Charles D. Baker, Governor
Karyn E. Polito, Lieutenant Governor
Stephanie Pollack, MassDOT Secretary & CEO
Steve Poftak, General Manager



November 14, 2019

Mr. Brian Clarizia
Director of Licensing
Massachusetts Realty Group
20 Park Plaza, 11th Floor, Suite 1115A
Boston, MA 02116

Re: **MRG Request No. 16528**
Town of Dedham Sidewalk and Roadway Work near Dedham Corp. Station
Dedham, MA

Dear Mr. Clarizia,

The MBTA Capital Delivery Department has reviewed your November 6, 2019 request from the Town of Dedham for a license to make roadway and sidewalk improvements on Rustcraft Road, next to the Dedham Corporate Commuter Rail Station, requiring a temporary construction easement.

This Department does not object to the proposed license request; however, requires that the Applicant meet the following conditions:

1. Submit a Work Plan to the Capital Delivery Department for review and approval at least three weeks prior to the start of work, identifying the sequence of construction and details for maintaining pedestrian access to the station.
2. Coordinate with Railroad Operations, Keolis, and Safety concerning advanced notifications, scheduling, RWP training, safety protocols, and on-site flagging for which a Keolis PI agreement shall be established prior to commencing work.
3. The construction shall not interfere with station operations, maintenance or passenger accessibility, shall not block station signage and shall employ MBTA approved construction controls.
4. The Applicant shall install and maintain a construction fence to separate the easement area from adjacent MBTA property.
5. The Applicant shall ensure that no drainage can flow from the work area onto MBTA property.

**MRG Request No. 16528
Town of Dedham Sidewalk and Roadway Work near Dedham Corp. Station
Dedham, MA**

6. The Applicant shall promptly remove any construction debris that migrates or falls onto MBTA property.
7. The easement area shall be restored to a condition acceptable to the MBTA at the conclusion of the project.
8. No crane swings, picks, or other work shall occur within 30 feet of the centerline of the nearest track without MBTA authorization and the presence of a Keolis flag person and a Capital Delivery Inspector.
9. No work shall be permitted on and/or abutting MBTA property without an approved Work Plan.
10. Any proposed change to the proposed Work Plan and submittals shall be brought to the attention of this office for review and approval prior to the work being performed.
11. All MBTA comments to the Work Plan and submittals shall be incorporated into a revised submittal or shall otherwise be resolved in writing to the satisfaction of this department.
12. MBTA reserves the right to stop work at any time if it is determined that the work poses unacceptable risk to MBTA customers, employees, operations, or infrastructure.
13. The Applicant shall bear all costs for MBTA personnel associated with the support of this project and will be required to enter into a Force Account Agreement in order to cover costs incurred by the MBTA, including oversight by an MBTA Capital Delivery Inspector.
14. The Applicant shall make any repairs to MBTA infrastructure necessitated by activities of the Applicant, which shall be performed by the Applicant at no cost to, and to the satisfaction of, the MBTA.
15. The Applicant will be responsible for any replacement transportation costs associated with any halt to MBTA services due to project activity.

This Department has no objections to this request subject to the conditions stated above. Any conditions that other MBTA Departments may have, shall be incorporated with the conditions stated above.

MRG Request No. 16528

**Town of Dedham Sidewalk and Roadway Work near Dedham Corp. Station
Dedham, MA**

Please contact Marggie Lackner, Director of Design and Architecture (Interim TOD Director), at mlackner@mbta.com or at 617-222-3083 with any questions you may have.

Sincerely,

A handwritten signature in blue ink that reads "Charles F. Cayton". The signature is fluid and cursive, with the first name "Charles" and last name "Cayton" clearly legible.

Charles F. Cayton, P.E.
Interim AGM for Capital Delivery

cc: W. Lally, M. Lackner, J. Connell

EXHIBIT F



January 27th, 2020

Mr. Brian Clarizia
Director of Licensing
Massachusetts Realty Group
20 Park Plaza – Suite 1120
Boston, MA 02116

SUBJECT: Request from The Town of Dedham related to a temporary easement for the use of MBTA property as associated with roadway and sidewalk reconstruction. The approximate area of the easement is 1,591 sf. The work location is adjacent to the Dedham Corporate Commuter Rail Station access along Rustcraft Road. Dedham, MA. (Franklin Branch MP 11.08 +/-) – MBTA #16528

Dear Mr. Clarizia:

Keolis Commuter Services, LLC (KCS) has reviewed the roadway and sidewalk reconstruction described in the above referenced MRG canvass subject and provides following comments and conditions:

1. Contractor shall adhere to all of the Railroad Operations Directorate – Guidelines and Procedures for Construction on MBTA Property.
2. Train protection services shall be required for all activities on, over or adjacent to the Massachusetts Bay Transportation Authority (MBTA) property if deemed necessary.
3. KCS shall identify all railroad utilities prior to start of scope.
4. Contractor's activities shall be determined by KCS in order to maintain the safety of train operations.
5. Contractor shall possess an executed license prior to start of work.
6. Contractor may be required to enter into a Third Party Agreement with KCS. The Third Party Agreement shall contain an estimate of KCS's anticipated costs to support the project. KCS's support shall include flagging protection if needed, protection of railroad utilities if needed, and project management. An advance payment in full to KCS for the anticipated cost for support of the project is required prior to scheduling flagging or support personnel. Following the satisfactory completion of all work, KCS shall provide a final billing statement based on actual costs.
7. All personnel working on, over or adjacent to the railroad right of way shall be KCS safety trained Contractor must contact RWP@keoliscs.com for a request for training. All personnel shall have safety ID's available for inspection at all times.

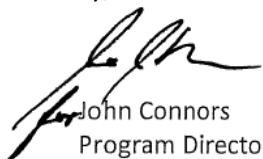
32 Cobble Hill Road
Somerville, MA 02143

Mr. Brian Clarizia
January 27th, 2020
Page 2

8. KCS's insurance requirements are as follows:
 - Commercial general liability (CGL) insurance protecting against all claims which might arise from or out of the Work, including but not limited to the involvement of the Railroad Personnel in the Work, including premises operations, independent contractors, products-completed operations, personal injury, bodily injury, death or property damage (including loss of use thereof), blanket contractual liability and subject to limits of not less than one million dollars (\$1,000,000) inclusive per occurrence; and three million dollars (\$2,000,000) in aggregate.
 - Commercial umbrella, subject to limits of not less than ten million dollars (\$10,000,000);
 - Railroad protective liability insurance, subject to limits of not less than five million dollars (\$5,000,000) inclusive per occurrence, ten million dollars (\$10,000,000) aggregate;
 - Motor vehicle insurance subject to limits of not less than one million dollars (\$1,000,000) inclusive per occurrence;
 - Workers' compensation or FELA insurance, as applicable to Contractor's employees;
 - Such other insurance as KCS may reasonably request.
9. Flagging protection may be scheduled ten business days after execution of the third party agreement.

If you have any questions or need additional information, please contact me at 617-593-1851 or john.connors@keoliscs.com.

Sincerely,



John Connors
Program Director – Supplemental Work
Engineering Operations

Copies: KCS – David Agnello, James Welch, Amy Wetterskog
MBTA – William Lally

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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: DEDHAM Project File Number: 607901

Contract Number: 113676

Project Description: Roadway Reconstruction and Related Work along a Section of Elm Street and Rustcraft Road

All AutoCAD files are provided solely as a courtesy to facilitate public access to information. MassDOT attempts to provide current and accurate information but cannot guarantee so. MassDOT provides such documents, files or other data "as is" without any warranty of any kind, either expressed or implied, including but not limited to, accuracy, reliability, omissions, completeness and currentness. The Commonwealth of Massachusetts and its Consultants shall not be liable for any claim for damages, including lost profits or other consequential, exemplary, incidental, indirect or special damages, relating in any way to the documents, files or other data accessible from this file, including, but not limited to, claims arising out of or related to electronic access or transmission of data or viruses. Because data stored on electronic media can deteriorate undetected or be modified without our knowledge, MassDOT cannot be held liable for its completeness or correctness. MassDOT makes no representation as to the compatibility of these files beyond the version of the stated CAD software.

By signing this form, I agree that it shall be my responsibility to reconcile this electronic data with the conformed contract documents, and that only the conformed contract documents shall be regarded as legal documents for this Project. I understand that this authorization does not give me the right to distribute the files. I agree to the terms above and wish to receive the AutoCAD files.

This signed form shall be emailed to the Highway Design Engineer at the MassDOT -Highway Division at the following email address:

DOTHighwayDesign@dot.state.ma.us

Attn: AutoCAD Files

Name of person requesting AutoCAD files: _____

Affiliation/Company: _____

Address: _____

Telephone number: _____

Email address: _____

Signature/Date: _____

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DOCUMENT A00830

ARMY CORPS OF ENGINEERS

SELF VERIFICATION NOTIFICATION FORM

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**US Army Corps
of Engineers**®
New England District

V: Self-Verification Notification Form
(for all tidal and non-tidal projects subject to Corps jurisdiction)

Complete **all** fields (write “none” if applicable) below or use the fillable form at www.nae.usace.army.mil/missions/regulatory/state-general-permits/massachusetts-general-permit. Before work within Corps jurisdiction commences, and unless otherwise specified, email this form, a location map, and project plans drawn to scale and not larger than 11” x 17”, to cenae-r@usace.army.mil, (978) 318-8303 (fax), or “Regulatory Division, U.S. Army Corps of Engineers, New England District, 696 Virginia Road, Concord, MA 01742-2751”. The Corps will acknowledge receipt of this form in writing. Please call (978) 318-8338 with questions.

Permittee: Susan McArthur, MassDOT - Highway Division
 Address, City, State & Zip: Room 4260, 10 Park Plaza, Boston, MA 02116
 Phone(s) and Email: 857-368-8807 susan.mcarthur@state.ma.us

Contractor (write none if same as permittee): _____
 Address, City, State & Zip: _____
 Phone(s) and Email: _____

Prior Corps File or Permit Numbers(s): N/A
 Project Location (provide detailed description if necessary): Elm Street at Robinwood Road at the western limit and Rustcraft Road at Fairbanks Park as the eastern limit
 Address, City, State & Zip: Elm Street and Rustcraft Road, Dedham MA 02026
 Latitude/Longitude Coordinates (if address doesn't exist): Start: 42°13'48.01"N; 71°10'41.35"W Stop: 42°13'57.32"N; 71°10'12.55"W
 Waterway Name: Little Wigwam Stream and associated wetlands

Work will be done under the following activity(s) in Section III, Eligible Activities (check all that apply):

- | | | | | | |
|---------|---------|-------------|-------------|----------|----------|
| 1 _____ | 5 _____ | 9 _____ | 13 _____ | 17 _____ | 21 _____ |
| 2 _____ | 6 _____ | 10 <u>x</u> | 14 <u>x</u> | 18 _____ | 22 _____ |
| 3 _____ | 7 _____ | 11 _____ | 15 _____ | 19 _____ | 23 _____ |
| 4 _____ | 8 _____ | 12 _____ | 16 _____ | 20 _____ | |

Project Purpose: To improve pedestrian and bicycle accommodations and safety along the corridor, while also rehabilitating the roadway pavement.

Work Description: The Project area includes 2,200 feet along Elm Street and Rustcraft Road in Dedham, MA. Proposed improvements include roadway widening, pavement milling and overlay, sidewalk reconstruction, installation of high visibility crosswalk beacons, and new signs and pavement markings. The proposed widening is limited to a total width of 4 feet to accommodate current MassDOT standards for bicycle lanes and two 11-foot travel lanes. In areas adjacent to wetlands, a single 5-foot-wide sidewalk will be constructed along the south side of the road to limit impacts while still meeting the current standards. Direct permanent impacts to wetlands be mitigated through construction of two wetland replication areas totaling 750 square feet, as specified on the Project Plans.

(continued on next page)

Aggregate total wetland impact area:	temporary <u>675</u> SF	permanent <u>335</u> SF
Aggregate total waterway impact area:	temporary <u>0</u> SF	permanent <u>0</u> SF
Aggregate total area of structures (e.g., floats, pile-supported structures)	temporary <u>0</u> SF	permanent <u>0</u> SF

Does your project include any indirect or secondary impacts? (See General Condition 3.)

Yes _____ No X

If yes, describe here: The project avoids indirect or secondary impacts by constructing two wetland replication areas to mitigate for the 675 square feet of permanent impacts to vegetated wetlands. The replication areas total 750 square feet and will be constructed in close proximity to the impacted areas. These areas will be planted with native species as specified on the attached plans.

Proposed Work Dates: Start: _____ Finish: _____

Your name/signature below, as permittee, confirms that: a) your project meets the self-verification criteria; and b) you accept and agree to comply with the applicable terms and conditions in the General Permits for Massachusetts.

Permittee Printed Name: Susan M. McArthur

Permittee Signature: Digitally signed by Susan
DN: cn=Susan, o=MassDOT, ou=Wetlands, email=susan.mcarthur@state.ma.us, c=US
Date: 2019.11.05 12:53:57 -0500  Date: 11/5/2019

DOCUMENT A00860

**MASSACHUSETTS DEPARTMENT OF
ENVIRONMENTAL PROTECTION**

NOTICE OF INTENT FILING

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Dedham, MA

Roadway and Sidewalk Improvements Elm Street and Rustcraft Road

MassDOT Highway Division Project File #607901

February 2018

NOTICE OF INTENT



BETA

315 Norwood Park South
2nd Floor
Norwood, Massachusetts 02062
781.255.1982
www.BETA-Inc.com

Roadway and Sidewalk Improvements Elm Street and Rustcraft Road

Dedham, MA

MassDOT Highway Division Project File #607901

NOTICE OF INTENT

Prepared by: **BETA GROUP, INC.**
Prepared for: Town of Dedham

February 2018

NOTICE OF INTENT CONTENTS

- **WPA Form 3 – Notice of Intent**
- **Stormwater Checklist**
- **Abutter Notification**
 - Notification to Abutters
 - Certified Abutters List
- **Notice of Intent Narrative**

WPA FORM 3 – NOTICE OF INTENT



Massachusetts Department of Environmental Protection
 Bureau of Resource Protection - Wetlands

WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

MassDEP File Number

Document Transaction Number

Dedham

City/Town

Important:
 When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



Note:
 Before completing this form consult your local Conservation Commission regarding any municipal bylaw or ordinance.

A. General Information

1. Project Location (**Note:** electronic filers will click on button to locate project site):

<u>Elm Street and Rustcraft Road</u>	<u>Dedham</u>	<u>02026</u>
a. Street Address	b. City/Town	c. Zip Code
<u>Latitude and Longitude:</u>	<u>42.229309</u>	<u>-71.170799</u>
	d. Latitude	e. Longitude
<u>N/A</u>	<u>N/A</u>	
f. Assessors Map/Plat Number	g. Parcel /Lot Number	

2. Applicant:

<u>Jason</u>	<u>Mammone</u>	
a. First Name	b. Last Name	
<u>Dedham Department of Public Works</u>		
c. Organization		
<u>55 River Street</u>		
d. Street Address		
<u>Dedham</u>	<u>MA</u>	<u>02026</u>
e. City/Town	f. State	g. Zip Code
<u>781-751-9350</u>	<u>(781) 751-9359</u>	<u>jmammone@dedham-ma.gov</u>
h. Phone Number	i. Fax Number	j. Email Address

3. Property owner (required if different from applicant): Check if more than one owner

<u></u>	<u></u>	
a. First Name	b. Last Name	
<u></u>		
c. Organization		
<u></u>		
d. Street Address		
<u></u>	<u></u>	<u></u>
e. City/Town	f. State	g. Zip Code
<u></u>	<u></u>	<u></u>
h. Phone Number	i. Fax Number	j. Email address

4. Representative (if any):

<u>Joseph</u>	<u>Freeman</u>	
a. First Name	b. Last Name	
<u>BETA Group, Inc.</u>		
c. Company		
<u>315 Norwood Park South, 2nd floor</u>		
d. Street Address		
<u>Norwood</u>	<u>MA</u>	<u>02062</u>
e. City/Town	f. State	g. Zip Code
<u>781-255-1982</u>	<u>JFreeman@BETA-Inc.com</u>	
h. Phone Number	i. Fax Number	j. Email address

5. Total WPA Fee Paid (from NOI Wetland Fee Transmittal Form):

<u>Fee Exempt</u>	<u>\$0</u>	<u>\$0</u>
a. Total Fee Paid	b. State Fee Paid	c. City/Town Fee Paid



WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
MassDEP File Number
Document Transaction Number
Dedham
City/Town

A. General Information (continued)

6. General Project Description:

Roadway widening, pavement milling and overlay, sidewalk reconstruction, installation of high visibility crosswalk beacons, and new signs and pavement markings to improve pedestrian and bicycle accommodations and safety within Bordering Vegetated Wetlands, Bordering Land Subject to Flooding, Riverfront Area and the 100-foot and 200-foot Buffer Zones

7a. Project Type Checklist: (Limited Project Types see Section A. 7b.)

- 1. Single Family Home
- 2. Residential Subdivision
- 3. Commercial/Industrial
- 4. Dock/Pier
- 5. Utilities
- 6. Coastal engineering Structure
- 7. Agriculture (e.g., cranberries, forestry)
- 8. Transportation
- 9. Other

7b. Is any portion of the proposed activity eligible to be treated as a limited project (including Ecological Restoration Limited Project) subject to 310 CMR 10.24 (coastal) or 310 CMR 10.53 (inland)?

1. Yes No If yes, describe which limited project applies to this project. (See 310 CMR 10.24 and 10.53 for a complete list and description of limited project types)
- 10.53(f)-Maintenance and improvement of existing public roadways, but limited to widening less than a single lane, adding shoulders, correcting substandard intersections, and improving

If the proposed activity is eligible to be treated as an Ecological Restoration Limited Project (310 CMR10.24(8), 310 CMR 10.53(4)), complete and attach Appendix A: Ecological Restoration Limited Project Checklist and Signed Certification.

8. Property recorded at the Registry of Deeds for:

_____	_____
a. County	b. Certificate # (if registered land)
_____	_____
c. Book	d. Page Number

B. Buffer Zone & Resource Area Impacts (temporary & permanent)

- 1. Buffer Zone Only – Check if the project is located only in the Buffer Zone of a Bordering Vegetated Wetland, Inland Bank, or Coastal Resource Area.
- 2. Inland Resource Areas (see 310 CMR 10.54-10.58; if not applicable, go to Section B.3, Coastal Resource Areas).

Check all that apply below. Attach narrative and any supporting documentation describing how the project will meet all performance standards for each of the resource areas altered, including standards requiring consideration of alternative project design or location.



Massachusetts Department of Environmental Protection
 Bureau of Resource Protection - Wetlands

WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
MassDEP File Number
Document Transaction Number
Dedham
City/Town

B. Buffer Zone & Resource Area Impacts (temporary & permanent) (cont'd)

For all projects affecting other Resource Areas, please attach a narrative explaining how the resource area was delineated.

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
a. <input type="checkbox"/> Bank	1. linear feet	2. linear feet
b. <input checked="" type="checkbox"/> Bordering Vegetated Wetland	675 sf - temporary 335 sf - permanent	760 2. square feet
c. <input type="checkbox"/> Land Under Waterbodies and Waterways	1. square feet 3. cubic yards dredged	2. square feet

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
d. <input checked="" type="checkbox"/> Bordering Land Subject to Flooding	8,610 - temporary 1. square feet 0 3. cubic feet of flood storage lost	0 2. square feet 0 4. cubic feet replaced
e. <input type="checkbox"/> Isolated Land Subject to Flooding	1. square feet 2. cubic feet of flood storage lost	3. cubic feet replaced
f. <input checked="" type="checkbox"/> Riverfront Area	Little Wigwam Brook - inland 1. Name of Waterway (if available) - specify coastal or inland	

2. Width of Riverfront Area (check one):

- 25 ft. - Designated Densely Developed Areas only
- 100 ft. - New agricultural projects only
- 200 ft. - All other projects

3. Total area of Riverfront Area on the site of the proposed project: 82,180 square feet

4. Proposed alteration of the Riverfront Area:

<u>72,220</u>	<u>60,280</u>	<u>11,940</u>
a. total square feet	b. square feet within 100 ft.	c. square feet between 100 ft. and 200 ft.

5. Has an alternatives analysis been done and is it attached to this NOI? Yes No

6. Was the lot where the activity is proposed created prior to August 1, 1996? Yes No

3. Coastal Resource Areas: (See 310 CMR 10.25-10.35)

Note: for coastal riverfront areas, please complete **Section B.2.f.** above.



Massachusetts Department of Environmental Protection
 Bureau of Resource Protection - Wetlands

WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

MassDEP File Number

Document Transaction Number

Dedham

City/Town

B. Buffer Zone & Resource Area Impacts (temporary & permanent) (cont'd)

Check all that apply below. Attach narrative and supporting documentation describing how the project will meet all performance standards for each of the resource areas altered, including standards requiring consideration of alternative project design or location.

Online Users:
 Include your document transaction number (provided on your receipt page) with all supplementary information you submit to the Department.

<u>Resource Area</u>	<u>Size of Proposed Alteration</u>	<u>Proposed Replacement (if any)</u>
a. <input type="checkbox"/> Designated Port Areas	Indicate size under Land Under the Ocean, below	
b. <input type="checkbox"/> Land Under the Ocean	_____	
	1. square feet	

	2. cubic yards dredged	
c. <input type="checkbox"/> Barrier Beach	Indicate size under Coastal Beaches and/or Coastal Dunes below	
d. <input type="checkbox"/> Coastal Beaches	_____	_____
	1. square feet	2. cubic yards beach nourishment
e. <input type="checkbox"/> Coastal Dunes	_____	_____
	1. square feet	2. cubic yards dune nourishment
	<u>Size of Proposed Alteration</u>	<u>Proposed Replacement (if any)</u>
f. <input type="checkbox"/> Coastal Banks	_____	
	1. linear feet	
g. <input type="checkbox"/> Rocky Intertidal Shores	_____	
	1. square feet	
h. <input type="checkbox"/> Salt Marshes	_____	_____
	1. square feet	2. sq ft restoration, rehab., creation
i. <input type="checkbox"/> Land Under Salt Ponds	_____	
	1. square feet	

	2. cubic yards dredged	
j. <input type="checkbox"/> Land Containing Shellfish	_____	
	1. square feet	
k. <input type="checkbox"/> Fish Runs	Indicate size under Coastal Banks, inland Bank, Land Under the Ocean, and/or inland Land Under Waterbodies and Waterways, above	

	1. cubic yards dredged	
l. <input type="checkbox"/> Land Subject to Coastal Storm Flowage	_____	
	1. square feet	
4. <input type="checkbox"/> Restoration/Enhancement	If the project is for the purpose of restoring or enhancing a wetland resource area in addition to the square footage that has been entered in Section B.2.b or B.3.h above, please enter the additional amount here.	
	_____	_____
	a. square feet of BVW	b. square feet of Salt Marsh
5. <input type="checkbox"/> Project Involves Stream Crossings		
	_____	_____
	a. number of new stream crossings	b. number of replacement stream crossings



WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
MassDEP File Number
Document Transaction Number
Dedham
City/Town

C. Other Applicable Standards and Requirements

- This is a proposal for an Ecological Restoration Limited Project. Skip Section C and complete Appendix A: Ecological Restoration Notice of Intent – Required Actions (310 CMR 10.11).

Streamlined Massachusetts Endangered Species Act/Wetlands Protection Act Review

- Is any portion of the proposed project located in **Estimated Habitat of Rare Wildlife** as indicated on the most recent Estimated Habitat Map of State-Listed Rare Wetland Wildlife published by the Natural Heritage and Endangered Species Program (NHESP)? To view habitat maps, see the *Massachusetts Natural Heritage Atlas* or go to http://maps.massgis.state.ma.us/PRI_EST_HAB/viewer.htm.

- a. Yes No **If yes, include proof of mailing or hand delivery of NOI to:**

**Natural Heritage and Endangered Species Program
Division of Fisheries and Wildlife
1 Rabbit Hill Road
Westborough, MA 01581**

- September 2016
b. Date of map

If yes, the project is also subject to Massachusetts Endangered Species Act (MESA) review (321 CMR 10.18). To qualify for a streamlined, 30-day, MESA/Wetlands Protection Act review, please complete Section C.1.c, and include requested materials with this Notice of Intent (NOI); *OR* complete Section C.2.f, if applicable. *If MESA supplemental information is not included with the NOI, by completing Section 1 of this form, the NHESP will require a separate MESA filing which may take up to 90 days to review (unless noted exceptions in Section 2 apply, see below).*

- c. Submit Supplemental Information for Endangered Species Review*

- Percentage/acreage of property to be altered:
 - (a) within wetland Resource Area _____
percentage/acreage
 - (b) outside Resource Area _____
percentage/acreage

2. Assessor’s Map or right-of-way plan of site

- Project plans for entire project site, including wetland resource areas and areas outside of wetlands jurisdiction, showing existing and proposed conditions, existing and proposed tree/vegetation clearing line, and clearly demarcated limits of work **
 - (a) Project description (including description of impacts outside of wetland resource area & buffer zone)
 - (b) Photographs representative of the site

* Some projects **not** in Estimated Habitat may be located in Priority Habitat, and require NHESP review (see <http://www.mass.gov/eea/agencies/dfg/dfw/natural-heritage/regulatory-review/>). Priority Habitat includes habitat for state-listed plants and strictly upland species not protected by the Wetlands Protection Act.

** MESA projects may not be segmented (321 CMR 10.16). The applicant must disclose full development plans even if such plans are not required as part of the Notice of Intent process.



Massachusetts Department of Environmental Protection
 Bureau of Resource Protection - Wetlands

WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
MassDEP File Number
Document Transaction Number
Dedham
City/Town

Online Users:
 Include your document transaction number (provided on your receipt page) with all supplementary information you submit to the Department.

C. Other Applicable Standards and Requirements (cont'd)

4. Is any portion of the proposed project within an Area of Critical Environmental Concern (ACEC)?
 - a. Yes No If yes, provide name of ACEC (see instructions to WPA Form 3 or MassDEP Website for ACEC locations). **Note:** electronic filers click on Website.
 - b. ACEC

5. Is any portion of the proposed project within an area designated as an Outstanding Resource Water (ORW) as designated in the Massachusetts Surface Water Quality Standards, 314 CMR 4.00?
 - a. Yes No
6. Is any portion of the site subject to a Wetlands Restriction Order under the Inland Wetlands Restriction Act (M.G.L. c. 131, § 40A) or the Coastal Wetlands Restriction Act (M.G.L. c. 130, § 105)?
 - a. Yes No
7. Is this project subject to provisions of the MassDEP Stormwater Management Standards?
 - a. Yes. Attach a copy of the Stormwater Report as required by the Stormwater Management Standards per 310 CMR 10.05(6)(k)-(q) and check if:
 1. Applying for Low Impact Development (LID) site design credits (as described in Stormwater Management Handbook Vol. 2, Chapter 3)
 2. A portion of the site constitutes redevelopment
 3. Proprietary BMPs are included in the Stormwater Management System.
 - b. No. Check why the project is exempt:
 1. Single-family house
 2. Emergency road repair
 3. Small Residential Subdivision (less than or equal to 4 single-family houses or less than or equal to 4 units in multi-family housing project) with no discharge to Critical Areas.

D. Additional Information

- This is a proposal for an Ecological Restoration Limited Project. Skip Section D and complete Appendix A: Ecological Restoration Notice of Intent – Minimum Required Documents (310 CMR 10.12).

Applicants must include the following with this Notice of Intent (NOI). See instructions for details.

Online Users: Attach the document transaction number (provided on your receipt page) for any of the following information you submit to the Department.

1. USGS or other map of the area (along with a narrative description, if necessary) containing sufficient information for the Conservation Commission and the Department to locate the site. (Electronic filers may omit this item.)
2. Plans identifying the location of proposed activities (including activities proposed to serve as a Bordering Vegetated Wetland [BVW] replication area or other mitigating measure) relative to the boundaries of each affected resource area.



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
MassDEP File Number
Document Transaction Number
Dedham
City/Town

D. Additional Information (cont'd)

3. Identify the method for BVW and other resource area boundary delineations (MassDEP BVW Field Data Form(s), Determination of Applicability, Order of Resource Area Delineation, etc.), and attach documentation of the methodology.

4. List the titles and dates for all plans and other materials submitted with this NOI.

Elm Street and Rustcraft Road Roadway and Sidewalk Improvements

a. Plan Title

BETA Group, Inc.

b. Prepared By

2/5/18

d. Final Revision Date

Darshan Jhaveri, PE

c. Signed and Stamped by

varies

e. Scale

f. Additional Plan or Document Title

g. Date

- 5. If there is more than one property owner, please attach a list of these property owners not listed on this form.
- 6. Attach proof of mailing for Natural Heritage and Endangered Species Program, if needed.
- 7. Attach proof of mailing for Massachusetts Division of Marine Fisheries, if needed.
- 8. Attach NOI Wetland Fee Transmittal Form
- 9. Attach Stormwater Report, if needed.

E. Fees

1. Fee Exempt: No filing fee shall be assessed for projects of any city, town, county, or district of the Commonwealth, federally recognized Indian tribe housing authority, municipal housing authority, or the Massachusetts Bay Transportation Authority.

Applicants must submit the following information (in addition to pages 1 and 2 of the NOI Wetland Fee Transmittal Form) to confirm fee payment:

2. Municipal Check Number

3. Check date

4. State Check Number

5. Check date

6. Payor name on check: First Name

7. Payor name on check: Last Name



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

Provided by MassDEP:

WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

MassDEP File Number

Document Transaction Number

Dedham

City/Town

F. Signatures and Submittal Requirements

I hereby certify under the penalties of perjury that the foregoing Notice of Intent and accompanying plans, documents, and supporting data are true and complete to the best of my knowledge. I understand that the Conservation Commission will place notification of this Notice in a local newspaper at the expense of the applicant in accordance with the wetlands regulations, 310 CMR 10.05(5)(a).

I further certify under penalties of perjury that all abutters were notified of this application, pursuant to the requirements of M.G.L. c. 131, § 40. Notice must be made by Certificate of Mailing or in writing by hand delivery or certified mail (return receipt requested) to all abutters within 100 feet of the property line of the project location.

	1/31/18
1. Signature of Applicant	2. Date
3. Signature of Property Owner (if different)	4. Date
	1/31/18
5. Signature of Representative (if any)	6. Date

For Conservation Commission:

Two copies of the completed Notice of Intent (Form 3), including supporting plans and documents, two copies of the NOI Wetland Fee Transmittal Form, and the city/town fee payment, to the Conservation Commission by certified mail or hand delivery.

For MassDEP:

One copy of the completed Notice of Intent (Form 3), including supporting plans and documents, one copy of the NOI Wetland Fee Transmittal Form, and a **copy** of the state fee payment to the MassDEP Regional Office (see Instructions) by certified mail or hand delivery.

Other:

If the applicant has checked the "yes" box in any part of Section C, Item 3, above, refer to that section and the Instructions for additional submittal requirements.

The original and copies must be sent simultaneously. Failure by the applicant to send copies in a timely manner may result in dismissal of the Notice of Intent.

STORMWATER CHECKLIST

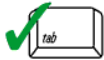


**Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program**

Checklist for Stormwater Report

A. Introduction

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the [Massachusetts Stormwater Handbook](#). The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.¹ This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8²
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

¹ The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

² For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

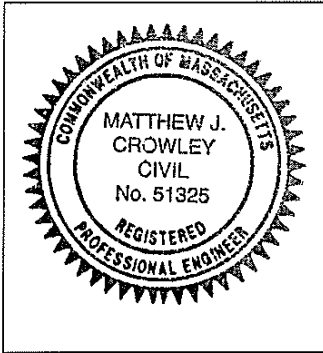
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature



Matthew J. Crowley 2/2/18
Signature and Date

Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

- New development
- Redevelopment
- Mix of New Development and Redevelopment



Massachusetts Department of Environmental Protection
 Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

Checklist (continued)

LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

- No disturbance to any Wetland Resource Areas
- Site Design Practices (e.g. clustered development, reduced frontage setbacks)
- Reduced Impervious Area (Redevelopment Only)
- Minimizing disturbance to existing trees and shrubs
- LID Site Design Credit Requested:
 - Credit 1
 - Credit 2
 - Credit 3
- Use of "country drainage" versus curb and gutter conveyance and pipe
- Bioretention Cells (includes Rain Gardens)
- Constructed Stormwater Wetlands (includes Gravel Wetlands designs)
- Treebox Filter
- Water Quality Swale
- Grass Channel
- Green Roof
- Other (describe): Disconnected impervious area - sidewalks pitched away from roadway

Standard 1: No New Untreated Discharges

- No new untreated discharges
- Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth
- Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.



Massachusetts Department of Environmental Protection
 Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

- Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.
- Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.
- Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

- Soil Analysis provided.
- Required Recharge Volume calculation provided.
- Required Recharge volume reduced through use of the LID site Design Credits.
- Sizing the infiltration, BMPs is based on the following method: Check the method used.
 - Static Simple Dynamic Dynamic Field¹
- Runoff from all impervious areas at the site discharging to the infiltration BMP.
- Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.
- Recharge BMPs have been sized to infiltrate the Required Recharge Volume.
- Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:
 - Site is comprised solely of C and D soils and/or bedrock at the land surface
 - M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
 - Solid Waste Landfill pursuant to 310 CMR 19.000
 - Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.
- Calculations showing that the infiltration BMPs will drain in 72 hours are provided.
- Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

¹ 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.



Massachusetts Department of Environmental Protection
 Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

- The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.
- Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
 - Provisions for storing materials and waste products inside or under cover;
 - Vehicle washing controls;
 - Requirements for routine inspections and maintenance of stormwater BMPs;
 - Spill prevention and response plans;
 - Provisions for maintenance of lawns, gardens, and other landscaped areas;
 - Requirements for storage and use of fertilizers, herbicides, and pesticides;
 - Pet waste management provisions;
 - Provisions for operation and management of septic systems;
 - Provisions for solid waste management;
 - Snow disposal and plowing plans relative to Wetland Resource Areas;
 - Winter Road Salt and/or Sand Use and Storage restrictions;
 - Street sweeping schedules;
 - Provisions for prevention of illicit discharges to the stormwater management system;
 - Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
 - Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
 - List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.
- A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.
 - Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:
 - is within the Zone II or Interim Wellhead Protection Area
 - is near or to other critical areas
 - is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
 - involves runoff from land uses with higher potential pollutant loads.
 - The Required Water Quality Volume is reduced through use of the LID site Design Credits.
 - Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

- The BMP is sized (and calculations provided) based on:
 - The ½" or 1" Water Quality Volume or
 - The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.
- The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.
- A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

- The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.
- The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted **prior to** the discharge of stormwater to the post-construction stormwater BMPs.
- The NPDES Multi-Sector General Permit does **not** cover the land use.
- LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.
- All exposure has been eliminated.
- All exposure has **not** been eliminated and all BMPs selected are on MassDEP LUHPPL list.
- The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

- The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.
- Critical areas and BMPs are identified in the Stormwater Report.



Massachusetts Department of Environmental Protection
 Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

Checklist (continued)

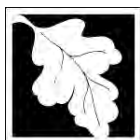
Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

- The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:
 - Limited Project
 - Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
 - Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
 - Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
 - Bike Path and/or Foot Path
 - Redevelopment Project
 - Redevelopment portion of mix of new and redevelopment.
- Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.
- The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
 - Construction Period Operation and Maintenance Plan;
 - Names of Persons or Entity Responsible for Plan Compliance;
 - Construction Period Pollution Prevention Measures;
 - Erosion and Sedimentation Control Plan Drawings;
 - Detail drawings and specifications for erosion control BMPs, including sizing calculations;
 - Vegetation Planning;
 - Site Development Plan;
 - Construction Sequencing Plan;
 - Sequencing of Erosion and Sedimentation Controls;
 - Operation and Maintenance of Erosion and Sedimentation Controls;
 - Inspection Schedule;
 - Maintenance Schedule;
 - Inspection and Maintenance Log Form.
- A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

Checklist (continued)

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

- The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has **not** been included in the Stormwater Report but will be submitted **before** land disturbance begins.
- The project is **not** covered by a NPDES Construction General Permit.
- The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.
- The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

- The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:
 - Name of the stormwater management system owners;
 - Party responsible for operation and maintenance;
 - Schedule for implementation of routine and non-routine maintenance tasks;
 - Plan showing the location of all stormwater BMPs maintenance access areas;
 - Description and delineation of public safety features;
 - Estimated operation and maintenance budget; and
 - Operation and Maintenance Log Form.
- The responsible party is **not** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:
 - A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
 - A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

- The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;
- An Illicit Discharge Compliance Statement is attached;
- NO Illicit Discharge Compliance Statement is attached but will be submitted **prior to** the discharge of any stormwater to post-construction BMPs.

ABUTTER NOTIFICATION

NOTIFICATION TO ABUTTERS
Under the Massachusetts Wetlands Protection Act
and
The Dedham Wetlands Protection By-Law

In accordance with the second paragraph of the Massachusetts General Laws Chapter 131, Section 40, you are hereby notified of the following proposed project:

The Town of Dedham Department of Public Works has filed a Notice of Intent (NOI) with the Dedham Conservation Commission for the **widening Elm Street and Rustcraft Road to provide bicycle accommodations and a sidewalk** on **February 2, 2018** under the Wetlands Protection Act (M.G.L c.131 § 40) and the Dedham General Wetlands Protection Bylaw (Chapter XXIII of the General By-Laws of Dedham).

Copies of the Notice of Intent may be examined during regular office hours at **BETA Group, Inc., 315 Norwood Park South, 2nd Floor, Norwood, MA, (781) 255-1982.**

Copies may also be examined during regular office hours at the Dedham Conservation Department located at 26 Bryant Street, Dedham, MA, (781) 751-9210.

Notice of the public hearing including the date, time and place will be published at least five (5) days in advance in the **Dedham Times**.

Notice of the public hearing including the date, time and place will be posted in the Dedham Town Hall at least forty eight (48) hours in advance in the public hearing.

The **public hearing** will be held on **February 15, 2018, at 7:00 PM** , in the Lower Conference Room, Dedham Town Hall, which is located at 26 Bryant Street in Dedham. Please call the Conservation Commission offices at (781) 751-9210 if you have any questions.

You may also contact the Massachusetts Department of Environmental Protection, Northeast Regional Office, Wilmington, MA at (978) 694-3200.

151-45
THAKUR MARY M
133 RUSTCRAFT RD
DEDHAM MA 02026

152-29
DEDHAM TOWN OF
CONSERVATION
26 BRYANT ST
DEDHAM MA 02026

151-27
DEFILIPPIS NANCY S ETAL
LAZNICKA OLDRICH M TE
40 TAFT LN
DEDHAM MA 02026

151-46
TAPPLY SARAH C
125 RUSTCRAFT RD
DEDHAM MA 02026

152-4
ALESSIO ANTHONY V ETUX
ALESSIO CHARLOTTE M TE
24 MCKINLEY AVE
DEDHAM MA 02026

152-25
DATTILIO PAUL THOMAS ETUX
DATTILIO ANN MARIE
230 FAIRBANKS RD
DEDHAM MA 02026

151-47
KOEBLER BERNARD ETUX
KOEBLER LAURA TE
121 RUSTCRAFT RD
DEDHAM MA 02026

151-23
WEINSTEIN ADAM C
45 MCKINLEY AVE
DEDHAM MA 02026

152-24
MCGUINNESS MATTHEW J ESTATE OF
C/O RICHARDSON
19 CLARK HILL DR
NO EASTON MA 02356

152-1
MONTREVIL CHANTAL
S/O TEMPESTA GREGORY J ETUX
115 RUSTCRAFT RD
DEDHAM MA 02026

150-14
LEGACY PLACE LLC
WS ASSET MANAGEMENT INC
33 BOYLSTON ST STE 3000
CHESTNUT HILL MA 02467

151-30
KOLODNY JONATHAN
41 TAFT LN
DEDHAM MA 02026

152-2
LUNN REALTY TRUST
LUNN MARICHELLE TRS
111 RUSTCRAFT RD
DEDHAM MA 02026

151-37
A A YEBBA & D A YEBBA FAMILY TR 2008
YEBBA ALFRED A & DOLORES A TRUSTEES
340 CENTRAL AVE
DEDHAM MA 02026

152-74
PORTER LUKE E ETUX
YOUNGERS ANNE E TE
29 TAFT LN
DEDHAM MA 02026

151-41
HOLMES STEFANIE
50 MCKINLEY AVE
DEDHAM MA 02026

152-28
DEDHAM TOWN OF
CONSERVATION
26 BRYANT ST
DEDHAM MA 02026

152-20
GREENWOOD SHELLEY
15 TAFT LN
DEDHAM MA 02026

151-40
PAUL CARLOS
44 MCKINLEY AVE
DEDHAM MA 02026

151-24
MOSES JAMES G ETUX
MOSES MARGARET TE
6 SNOW LN
DEDHAM MA 02026

151-29
RIZVI SYED ALI ETUX
HELEFELD RUTH E TE
4 MATTHEWS ST
DEDHAM MA 02026

152-3
FARES FADIZ
105 RUSTCRAFT RD
DEDHAM MA 02026

152-27
DEDHAM TOWN OF
26 BRYANT ST
DEDHAM MA 02026

152-23
DEDHAM TOWN OF
26 BRYANT ST
DEDHAM MA 02026

151-39
KEAR DAVID P ETUX
KEAR ALLISON J TE
40 MCKINLEY AVE
DEDHAM MA 02026

151-33
44 TAFT LANE RLTY TR
FERRENBURG VIRGINIA TRS
44 TAFT LN
DEDHAM MA 02026

151-21
38 MILLS STREET TRUST
VAZ STEVE TRUSTEE
38 MILLS ST
DEDHAM MA 02026

152-6
GIANNANGELO BONI A ETUX
LIFE ESTATE
32 MCKINLEY AVE
DEDHAM MA 02026

150-13
LEGACY PLACE LLC
WS ASSET MANAGEMENT INC
33 BOYLSTON ST STE 3000
CHESTNUT HILL MA 02467

150-7A
SIP TRUST
STERGIS MARGERY K & BRYANT HELEN TRS
80 BOXFORD RD
ROWLEY MA 01969-2420

152-22
DEDHAM TOWN OF
26 BRYANT ST.
DEDHAM MA 02026

138-108
FINDLEN JOSEPH E ETUX
S/O HIBBARD JEFFREY C ETAL
278 CENTRAL AVE
DEDHAM MA 02026

138-92
LORD DOROTHY A
LIFE ESTATE
260 CENTRAL AVE
DEDHAM MA 02026

139-2
SCANLON DONNA J
207 FAIRBANKS RD
DEDHAM MA 02026

138-99
SMITH ROBERT A ETUX
SMITH DEBORAH L TE
12 MILLS ST
DEDHAM MA 02026

138-97
FUKUSHIMA GLENN H ETUX
FUKUSHIMA LAURA M TE
7 WILDWOOD DR
DEDHAM MA 02026

151-20
HERLIHY EDWARD P ETUX
HERLIHY MARILYN J TE
32 MILLS ST
DEDHAM MA 02026

139-8
DEDHAM TOWN OF
26 BR YANT ST
DEDHAM MA 02026

138-90
SCHAEFER KENDYL ETAL
SCHAEFER THERESA JT
8 GIBSON AVE
DEDHAM MA 02026

139-9
CARDILLO FAMILY REALTY TRUST
CARDILLO CHARLES A JR TRUSTEE
61 THOMPSON ST
DEDHAM MA 02026

138-107
FREDERICK P FINDLEN REV TR
FINDLEN FREDERICK P TRS
32 WILDWOOD DR
DEDHAM MA 02026

138-89
CEPEDA MARIANO L
4 GIBSON AVE
DEDHAM MA 02026

139-95
SCOTS CHARITABLE SOCIETY
C/O WAYNE MACDONALD
25 MARKET STREET
BILLERICA MA 01871

138-106
MCCORMICK KELLEY B ETUX
MCCORMICK NANCY L TE
22 WILDWOOD DR
DEDHAM MA 02026

138-113
HUNG NU NU
165 FAIRBANKS RD
DEDHAM MA 02026

138-100
JOHNSON THOMAS J ETUX
JOHNSON HOPE M TE
24 MILLS ST
DEDHAM MA 02026

138-98
BALZARINI JOHN P ETUX
BALZARINI DIANE L TE
10 WILDWOOD DR
DEDHAM MA 02026

138-114
DEFELICE PAUL E ETAL
DEFELICE EDWARD ETAL TC
159 FAIRBANKS RD
DEDHAM MA 02026

138-109
MOSES ROBERT G ETUX
MOSES JACQUELINE TE
290 CENTRAL AVE
DEDHAM MA 02026

139-7
MCADAM JEFFREY N ETUX
MCADAM CYNTHIA R TE
182 FAIRBANKS RD
DEDHAM MA 02026

137-27
DEDHAM LAND TRUST INC THE
C/O EMERY BARBARA
47 HAVEN STREET
DEDHAM MA 02026

149-3B
SIP TRUST
STERGIS MARGERY K & BRYANT HELEN TRS
80 BOXFORD RD
ROWLEY MA 01969-2420

138-112
MERRITT JANICE C
179 FAIRBANKS RD
DEDHAM MA 02026

137-24
SUSEMIHL KAI ETUX
S/O JIA HONGQI ETUX
99 WILDWOOD DR
DEDHAM MA 02026

138-104
HICKEY FAMILY TRUST
HICKEY EDWARD J TRS
15 MILLS ST
DEDHAM MA 02026

138-93
GIBSON JAMES N ETUX
MCINERNEY ELIZABETH M TE
31 WILDWOOD DR
DEDHAM MA 02026

138-21
KLEINSASSER ZACHARY C ETUX
KLEINSASSER MICHELLE C TE
87 GIBSON AVE
DEDHAM MA 02026

139-2A
LEARY KEVIN ETUX
LEARY JULIANNE TE
195 FAIRBANKS RD
DEDHAM MA 02026

138-96
BODNER VLADIMIR ETUX
BODNER FAINA TE
15 WILDWOOD DR
DEDHAM MA 02026

137-19
O'DONNELL JAYME L ETUX
O'DONNELL RYAN W TE
95 GIBSON AVE
DEDHAM MA 02026

137-21
DEDHAM LAND TRUST INC THE
C/O EMERY BARBARA
47 HAVEN STREET
DEDHAM MA 02026

151-7
SMITH WENDALINE L
S/O TRAYNOR THOMAS M
23 OSCARS WAY
DEDHAM MA 02026

151-13
DAVID AUGUST F ETUX
DAVID EILEEN MARIE TE
26 OSCARS WAY
DEDHAM MA 02026

138-22
MUSTO GIUSEPPE ETUX
MUSTO MARCELLA TE
73 GIBSON AVE
DEDHAM MA 02026

151-8
HUBBARD JENNIE MAY ETAL
C/O W PODOLSKI
58 WILDWOOD DRIVE
DEDHAM MA 02026

151-12A
DAVID AUGUST F ETUX
DAVID EILEEN MARIE TE
26 OSCARS WAY
DEDHAM MA 02026

138-27
ZYLA IVAN P ETUX
ZYLA MICHELE A TE
65 GIBSON AVE
DEDHAM MA 02026

150-11
DEDHAM TOWN OF
CONSERVATION
26 BRYANT ST
DEDHAM MA 02026

151-12
DEBARTOLO JOSEPH S ETUX
DEBARTOLO MELISSA G TE
22 OSCARS WAY
DEDHAM MA 02026

137-31
BERNARD RUDOLPH ETUX
BUCHANAN-BERNARD ALECIA B. TE
91 WILDWOOD DR
DEDHAM MA 02026

150-10
DEDHAM TOWN OF
CONSERVATION
26 BRYANT ST
DEDHAM MA 02026

151-16
BOTTARO ANTHONY D ETUX
BOTTARO TERESA M TE
43 MATTHEWS ST
DEDHAM MA 02026

138-8
LOOBY CHRISTOPHER ETUX
MCGRATH CRISTIE TE
83 WILDWOOD DRIVE
DEDHAM MA 02026

151-2
IULIANO JOHN R ETUX
IULIANO LAURIE A TE
43 PLAIN ST
DEDHAM MA 02026

151-17
KEENE JEANETTE JONES
109 NASON HILL ROAD
SHERBORN MA 01770

138-11
CIVITARESE DOMINIC B. ETUX
CIVITARESE JOAN M TE
67 WILDWOOD DR
DEDHAM MA 02026

151-4
CHEN XIU
37 PLAIN ST
DEDHAM MA 02026

151-11
GREEN MARK C ETUX
GREEN ANN M TE
291 CENTRAL AVE
DEDHAM MA 02026

138-17
ORTIZ ALEXANDER ETUX
CABRERA YOSANI TE
66 GIBSON AVE
DEDHAM MA 02026

151-3
90 WILDWOOD DR NOM TRUST
LYDON JOHN E ETUX TRUSTEES
90 WILDWOOD DRIVE
DEDHAM MA 02026

151-1
PETRUZZIELLO MARIA N
47 OSCARS WAY
DEDHAM MA 02026

151-6
COOKE IRREVOCABLE TRUST
COOKE THOMAS & MARY J TRS
29 PLAIN ST
DEDHAM MA 02026

150-1
LYDON LOUISE E ETAL
LYDON JOHN C TE
90 WILDWOOD DR
DEDHAM MA 02026

151-57
PETRUZZIELLO GIORGIO
47 OSCARS WAY
DEDHAM MA 02026

138-7
70 WILDWOOD DRIVE LLC
S/O BARTON ANDREW ETUX
70 WILDWOOD DR
DEDHAM MA 02026

138-4
PODOLSKI WILLIAM A JR
LIFE ESTATE
58 WILDWOOD DR
DEDHAM MA 02026

151-14
SMITH BRIAN
46 OSCARS WAY
DEDHAM MA 02026

138-5
BEAUDOIN DEBORAH A
62 WILDWOOD DR
DEDHAM MA 02026

151-15
MALOOF RONALD S ETUX
MALOOF MICHELLE D TE
51 MATTHEWS ST
DEDHAM MA 02026

138-16
ZHONG RICHARD ETUX
HAHN JEANNIE TE
59 WILDWOOD DR
DEDHAM MA 02026

138-24
VITI MICHAEL D ETUX
VITI TANYA TE
55 GIBSON AVE
DEDHAM MA 02026

152-8
MULROY JANET E
30 TAFT LN
DEDHAM MA 02026

151-36
ELLIS PATRICIA A
334 CENTRAL AVE
DEDHAM MA 02026

138-86
JEFFREY CHARLES L
C/O BOSWORTH
4500 CONNECTICUT AVE NE
WASHINGTON DC 20008

152-76
MOSCHOVIS PETER P ETUX
NIAVRADAKI ARIADNI TE
11 SNOW LN
DEDHAM MA 02026

151-25
MUNCHBACH ARTHUR L ETUX
MUNCHBACH ELIZABETH TE
10 SNOW LN
DEDHAM MA 02026

138-87
TOWARD INDEPENDENT LIVING & LEARNING
7 GIBSON AVE
DEDHAM MA 02026

152-26
DEDHAM TOWN OF
26 BRYANT ST
DEDHAM MA 02026

151-50
ST CYR JOHN J ETUX
ST CYR MARIA E TE
83 TAFT LN
DEDHAM MA 02026

152-12
VAN RYZIN PAUL D ETUX
VAN RYSIN URSULA B TE
33 MCKINLEY AVE
DEDHAM MA 02026

137-25
DEDHAM LAND TRUST INC THE
C/O EMERY BARBARA
47 HAVEN STREET
DEDHAM MA 02026

151-54
MCGAFFIGAN JOHN V ETUX
McGAFFIGAN CYNTHIA TE
7 MATTHEWS ST
DEDHAM MA 02026

152-19
HOWSEN MATTHEW B ETUX
HOWSEN JENNIFER C TE
223 FAIRBANKS RD
DEDHAM MA 02026

138-10
CIVITARESE DOMINIC B ETUX
CIVITARESE JOAN M TE
67 WILDWOOD DR
DEDHAM MA 02026

151-56
JONES KAREN A
292 CENTRAL AVE
DEDHAM MA 02026

152-14
RETTMAN NOMINEE TRUST
RETTMAN RITA F TRUSTEE
21 MCKINLEY AVE
DEDHAM MA 02026

138-9
O'CALLAGHAN SEAN ETUX
O'CALLAGHAN LESLIE E TE
71 WILDWOOD DR
DEDHAM MA 02026

138-103
MALONEY PATRICK H ETUX
MALONEY CAROLYN A
19 MILLS ST
DEDHAM MA 02026

152-15
DEDHAM TOWN OF
26 BRYANT ST
DEDHAM MA 02026

138-20
WALTER STRAPPS ETUX
TADIN STRAPPS MARIJA TE
86 GIBSON AVE
DEDHAM MA 02026

164-7
DIV CCM RUSTCRAFT
S/O RUSTCRAFT OWNER LLC
55 CAMBRIDGE ST
BURLINGTON MA 01803

152-17
PUDNEY JEFFREY A ETUX
PUDNEY BARBARA PLATT TE
281 FAIRBANKS RD
DEDHAM MA 02026

137-41
GIBSON AVE HOMEWONERS ASSN TR
MICHELE ZYLA
65 GIBSON AVE
DEDHAM MA 02026

150-3
DEDHAM TOWN OF
CONSERVATION
26 BRYANT ST
DEDHAM MA 02026

152-13
CASTONGUAY REALTY TRUST THE
CASTONGUAY WENDY R TRUSTEE
27 MCKINLEY AVE
DEDHAM MA 02026

151-35
BLUESTEIN IRVING ETUX
NEWMAN-BLUESTEIN DONNA TE
330 CENTRAL AVE
DEDHAM MA 02026

137-40
DEDHAM TOWN OF
RECREATIONAL OR CONSERVATION
26 BRYANT STREET
DEDHAM MA 02026

152-11
MCCORMICK JOHN P ETUX
MCCORMICK JENNIFER M TE
5 SNOW LN
DEDHAM MA 02026

151-48
LAWSON CHESTER V ETUX
LAWSON LINDA ANN
PO BOX 321
WESTPORT POINT MA 02791-0321

151-44
DIV CCM RUSTCRAFT
S/O RUSTCRAFT OWNER LLC
55 CAMBRIDGE ST
BURLINGTON MA 01803

164-1
DIV CCM RUSTCRAFT
S/O RUSTCRAFT OWNER LLC
55 CAMBRIDGE ST
BURLINGTON MA 01803

151-31
LOUGHLIN MICHAEL WILLIAM ETUX
LOUGHLIN HANNAH W TE
306 CENTRAL AVE
DEDHAM MA 02026

138-13
RONALD S GARLICK REV TRUST
GARLICK RONALD S & CYNTHIA M TRS
267 CENTRAL AVE
DEDHAM MA 02026

151-43
385 CENTRAL AVE REALTY TRUST
FRASCA ANNE M TRUSTEE
358 CENTRAL AVE
DEDHAM MA 02026

151-18
BIELAWSKI FRANCIS M
299 CENTRAL AVE
DEDHAM MA 02026

137-34
DEDHAM TOWN OF
REC/CONSERVATION
26 BRYANT ST
DEDHAM MA 02026

151-49
GIANNOTTA ELENI ETAL
SIOKAS KONSTANTINOS TE
343 CENTRAL AVE
DEDHAM MA 02026

151-55
TIERNEY FAMILY TRUST
THOMAS TIERNEY
13 BARBERRY LANE
NORWOOD MA 02062

137-20
DEDHAM LAND TRUST INC THE
C/O EMERY BARBARA
47 HAVEN STREET
DEDHAM MA 02026

151-38
RIEDER RONALD W ETUX
RIEDER HUAJIE TE
346 CENTRAL AVE
DEDHAM MA 02026

138-2
REEM PROPERTY LLC
S/O MODESTO JORGE
7 OSCARS WAY
DEDHAM MA 02026

138-148
SANCHEZ DAVID LLORENTE ETUX
S/O SANCHEZ DAVID LLORENTE ETUX
252 CENTRAL AVENUE
DEDHAM MA 02026

149-6
200 COMMERCIAL CIRCLE RLTY TRUST
ROUTE 1 MANAGEMENT LAND TR LLC TR
1039 EAST ST
DEDHAM MA 02026

137-26
DEDHAM LAND TRUST INC THE
C/O EMERY BARBARA
47 HAVEN STREET
DEDHAM MA 02026

138-84
MALCOLM DONALD J ETUX
LIFE ESTATE
118 WENTWORTH ST
DEDHAM MA 02026

150-12
CHARLES CAPONE CONSTRUCTION CO
125 QUABISH RD
DEDHAM MA 02026

138-3
KATHLEEN B PODOLSKI LIV TR
PODOLSKI KATHLEEN B TRS
50 WILDWOOD DR
DEDHAM MA 02026

152-73
DEDHAM TOWN OF
26 BRYANT ST
DEDHAM MA 02026

151-34
DONOGHUE MARIE S
324 CENTRAL AVE
DEDHAM MA 02026

137-33
DEDHAM TOWN OF
RECREATIONAL OR CONSERVATION
26 BRYANT ST
DEDHAM MA 02026

163-1
500 COMMERCIAL CIRCLE LLC
C/O CLAY NISSAN
P O BOX 70
NORWOOD MA 02062

151-52
MARINELLI ROSE ETALS
LIFE ESTATE
315 CENTRAL AVE
DEDHAM MA 02026

138-25
MEDWID RICHARD A ETUX
MEDWID COLLEEN TE
251 CENTRAL AVE
DEDHAM MA 02026

150-4
DEDMA LLC
7978 COOPER CREEK BLVD STE 100
UNIVERSITY PARK FL 34201

151-53
DEDHAM TOWN OF
RECREATION
26 BRYANT ST
DEDHAM MA 02026

138-26
REED REALTY TRUST
REED MARY I TR (LIFE ESTATE)
245 CENTRAL AVE
DEDHAM MA 02026

149-7
LEGACY PLACE LLC
WS ASSET MANAGEMENT INC
33 BOYLSTON ST STE 3000
CHESTNUT HILL MA 02467

151-32
MINTZ MARY F
79 MECHANICS ST
FOXBORO MA 02035

138-15
CUCURULLO JOHN J ETUX
S/O J&M CUCURULLO FAM RLTY TR
261 CENTRAL AVE
DEDHAM MA 02026

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162-16
ROBERT G MCCUE 2010 IRRV TRUST
MCCUE STEVEN P TRUSTEE
P.O. BOX 635
DEDHAM MA 02027

162-34
CAPOBIANCO NICHOLAS R ETUX
CAPOBIANCO KAREN TE
35 ROBINWOOD RD
DEDHAM MA 02026

162-22
WEIR PAUL H ETUX
WEIR MICHELLE E TE
203 ELM ST
DEDHAM MA 02026

162-17
PETRIE DANIEL D ETUX
PETRIE MARY-KATE TE
80 ROBINWOOD RD
DEDHAM MA 02026

162-35
RIVERA GLORYVI ETAL
RIVERA RAMON TE
29 ROBINWOOD RD
DEDHAM MA 02026

162-32
DEGRAZIO MICHAEL N ETUX
DEGRAZIO SOPHIE TE
11 JEFFERSON DR
NORWOOD MA 02062

162-18
TODESCO MARC ETUX
TODESCO KATHERINE TE
86 ROBINWOOD RD
DEDHAM MA 02026

162-36
O'MALLEY MARTIN J
23 ROBINWOOD RD
DEDHAM MA 02026

162-23
PHYLLIS YAFFE FAMILY IRR TRUST
YAFFE MICHAEL A ETALS TRUSTEES
199 ELM ST
DEDHAM MA 02026

162-19
MEJIA ANGEL ETAL
PEREA JASMINE JT
92 ROBINWOOD RD
DEDHAM MA 02026

162-37
DIORIO EDWARD M ETUX
DIORIO ELIZABETH C TE
19 ROBINWOOD RD
DEDHAM MA 02026

162-4
ARCHSTONE LEGACY PLACE LP
C/O AVALONBAY COMMUNITIES INC.
671 N GLEBE R STE 800
ARLINGTON VA 22203

162-15
WHALEN ROBERT ETUX
CORONA-WHALEN SORANGE TE
68 ROBINWOOD RD
DEDHAM MA 02026

149-42
DEDHAM SPORTSMEN'S CENTER INC
940 PROVIDENCE HWY
DEDHAM MA 02026

162-33
COYNE THOMAS J JR ETUX
COYNE JACQUELINE E TE
41 ROBINWOOD RD
DEDHAM MA 02026

162-31
DESTEFANO DAVID J ETUX
DESTEFANO MINERVA TE
40 ROBINWOOD RD
DEDHAM MA 02026

162-10
DRISCOLL WILLIAM J ETUX
BOSWORTH-CASHELL CARYN TE
93 ROBINWOOD RD
DEDHAM MA 02026

162-24
PIRINT MILENA ETAL
PIRINT ARTHU TE
193 ELM ST
DEDHAM MA 02026

162-30
DUFF MAUREEN M ETAL
DUFF THOMAS G TE
34 ROBINWOOD RD
DEDHAM MA 02026

162-43
KTVU LLC
PO BOX 105376
ATLANTA GA 30348

162-26
FREIHA CHAOUKI F ETUX
FREIHA ZEINA N TE
185 ELM ST
DEDHAM MA 02026

162-29
MIRLOCCA SALVATORE M ETUX
MIRLOCCA JUNE P TE
28 ROBINWOOD RD
DEDHAM MA 02026

148-70
AVERY OAK REALTY LLC
C/O TAX DEPT WALGREEN CO
P.O. BOX 1159
DEERFIELD IL 60015

162-38
CARTER DAVID H ETUX
CARTER ISABELLA M TE
11 ROBINWOOD RD
DEDHAM MA 02026

162-28
STODDARD ALMERINDA
20 ROBINWOOD RD
DEDHAM MA 02026

162-20
MAZZA ROBERT L
213 ELM ST
DEDHAM MA 02026

162-3
NATIONAL AMUSEMENTS INC
ATTN: TAX DEPT
846 UNIVERSITY AVE/ PO BX 9108
NORWOOD MA 02062-9108

162-25
CHRISTOULIS NIKOLAOS ETUX
CHRISTOULIS EFSTATHIA TE
189 ELM ST
DEDHAM MA 02026

162-21
NGUYEN SON VAN ETUX
NGUYEN APARECIDA
211 ELM ST
DEDHAM MA 02026

162-40
MAMOKHIN DMITRI ETUX
MAMOKHIN GLORIA TE
165 ELM ST
DEDHAM MA 02026

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CHESTNUT HILL MA 02467-1140

162-7
BIJAL HOTEL LIMITED PARTNERSHIP
S/O GIRI HOTELS LLC
1212 HANCOCK ST STE 200
QUINCY MA 02169

162-8
RANDO CHRISTOPHER
227 ELM ST
DEDHAM MA 02026

162-13
BOWSE DONNA
75 ROBINWOOD RD
DEDHAM MA 02026

162-12
HERNANDEZ FRANCISCO P ETUX
HERNANDEZ VIVIAN TE
81 ROBINWOOD RD
DEDHAM MA 02026

162-11
CEDRONE ROBERT L ETUX
CEDRONE PATRICIA TE
87 ROBINWOOD RD
DEDHAM MA 02026

162-14
A'HEARN EILEEN P
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DEDHAM MA 02026

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WS ASSET MANAGEMENT INC
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CHESTNUT HILL MA 02467

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BOSTON MA 02210

162-28
STODDARD ALMERINDA
20 ROBINWOOD RD
DEDHAM MA 02026

162-22
WEIR PAUL H ETUX
WEIR MICHELLE E TE
203 ELM ST
DEDHAM MA 02026

176-4
NORTHEAST REALTY TRUST
LETTS DAVID R TRUSTEE
301 BERKELEY STREET #4
BOSTON MA 02116-2002

162-25
CHRISTOULIS NIKOLAOS ETUX
CHRISTOULIS EFSTATHIA TE
189 ELM ST
DEDHAM MA 02026

162-23
PHYLLIS YAFFE FAMILY IRR TRUST
YAFFE MICHAEL A ETALS TRUSTEES
199 ELM ST
DEDHAM MA 02026

176-2
EXTRA SPACE PROPERTIES THIRTY LLC
PTA - EX # 1205
PO BOX 320099
ALEXANDRIA VA 22320

162-10
DRISCOLL WILLIAM J ETUX
BOSWORTH-CASHELL CARYN TE
93 ROBINWOOD RD
DEDHAM MA 02026

162-4
ARCHSTONE LEGACY PLACE LP
C/O AVALONBAY COMMUNITIES INC.
671 N GLEBE R STE 800
ARLINGTON VA 22203

176-5
MASS BAY TRANS AUTHORITY

TEN PARK PLAZA
BOSTON MA 02116

164-7
DIV CCM RUSTCRAFT
S/O RUSTCRAFT OWNER LLC
55 CAMBRIDGE ST
BURLINGTON MA 01803

162-24
PIRINT MILENA ETAL
PIRINT ARTHU TE
193 ELM ST
DEDHAM MA 02026

177-1A
JUMBO CAPITAL DEDHAM PARTNERS LLC
1900 CROWN COLONY DR STE 405
QUINCY MA 02169

164-1
DIV CCM RUSTCRAFT
S/O RUSTCRAFT OWNER LLC
55 CAMBRIDGE ST
BURLINGTON MA 01803

162-26
FREIHA CHAOUKI F ETUX
FREIHA ZEINA N TE
185 ELM ST
DEDHAM MA 02026

164-8
HCR1 MASS PROPERTIES TRUST II
C/O KINDRED HEALTHCARE TAX DEPT
680 SOUTH FOURTH STREET
LOUISVILLE KY 40202

149-6
208 COMMERCIAL CIRCLE RLTY TRUST
ROUTE 1 MANAGEMENT LAND TR LLC TR
1039 EAST ST
DEDHAM MA 02026

162-45
GENCEL REALTY LLC
C/O NATIONAL AMUSEMENTS/TX DEPT
846 UNIVERSITY AVE/PO BX 9108
NORWOOD MA 02062-9108

164-4
DEDHAM TOWN OF
CONSERVATION PURPOSES
TOWN HALL
DEDHAM MA 02026

175-1
NORFOLK PLACE EQUITY PARTNERS LLC
160 EAST 58TH ST STE 2000
NEW YORK NY 10155

162-3
NATIONAL AMUSEMENTS INC
ATTN: TAX DEPT
846 UNIVERSITY AVE/ PO BX 9108
NORWOOD MA 02062-9108

164-8
NBCRE PARTNERS II LLC
C/O TRANSWESTERN
LITTLETON MA 01460

162-5
CHATHAM DEDHAM RI LLC
222 LAKEVIEW AVE # 200
WEST PALM BEACH FL 33401

162-44
LEGACY PLACE OP LLC
C/O WS ASSET MANAGEMENT INC
33 BOYLSTON ST SUITE 3000
CHESTNUT HILL MA 02467

164-3A
MASSACHUSETTS BAY
TRANSPORTATION AUTHORITY
TEN PARK PLAZA
BOSTON MA 02116

162-20
MAZZA ROBERT L
213 ELM ST
DEDHAM MA 02026

163-1
500 COMMERCIAL CIRCLE LLC
C/O CLAY NISSAN
P O BOX 70
NORWOOD MA 02062

162-19
MEJIA ANGEL ETAL
PEREA JASMINE JT
92 ROBINWOOD RD
DEDHAM MA 02026

162-21
NGUYEN SON VAN ETUX
NGUYEN APARECIDA
211 ELM ST
DEDHAM MA 02026

163-2
RAR2 JEFFERSON AT DEDHAM STATION MN
C/O THOMSON REUTERS DEPT 207
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TOWN OF WESTWOOD

BOARD OF ASSESSORS

580 High St.

Westwood, Ma. 02090

Maureen Bleday
Michael P. Krone
Mark F. Murphy

phone: 781-326-1904
fax: 781-251-2588

January 22, 2018

Joe Freeman, Associate
BETA Group, Inc.


Mr. Freeman,

Attached please find a list of abutters and abutters to abutters for Elm St/Rustcraft Rd. Improvements – Dedham, 1,000 feet of Westwood, also known as the following:

Address	Map-Lot
28-30 Southwest Park	17_063
32 Southwest Park	17_064
21 Southwest Park	17_066
33-35 Southwest Park	17-065
10 Poplar Street	17_148
15 Poplar Street	17_146
27 Poplar Street	17_145
33 Poplar Street	17_144
39 Poplar Street	17_143
43 Elm Street	17_147
53 Elm Street	17_159
63 Elm Street	17_158
69 Elm Street	17_157
77 Elm Street	17_156
42 Hawthorn Street	17_149
50 Hawthorn Street	17_150
58 Hawthorn Street	17_151
33 Hawthorn Street	17_142
39 Hawthorn Street	17_141
45 Hawthorn Street	17_140
51 Hawthorn Street	17_139
55 Westdale Road	17_126
47 Westdale Road	17_127
41 Westdale Road	17_128

This list reflects owners of record as of January 1, 2018 or current owners, according to our records.

Sincerely,

Mark F. Murphy 
Assessor

jb

LABS REALTY, LLC
30 SOUTHWEST PARK
WESTWOOD, MA 02090

R6 HOLDINGS, LLC
34 SOUTHWEST PARK
WESTWOOD, MA 02090

21 SOUTHWEST PROPERTIES, LLC
22 COMEAU STREET
WELLESLEY, MA 02481

33-35 SOUTHWEST PARK, LLC
33-35 SOUTHWEST PARK
WESTWOOD, MA 02090

CAROL A LEBLANC
10 POPLAR STREET
WESTWOOD, MA 02090

EDWARD M CATALDO
15 POPLAR STEET
WESTWOOD, MA 02090

SAMUEL C WOOD
MARSHA H WOOD
27 POPLAR STREET
WESTWOOD, MA 02090

CRAIG CAMPAGNA
KRISTINA CAMPAGNA
33 POPLAR STREET
WESTWOOD, MA 02090

HOAN NGUYEN
PHUOC VO
39 POPLAR STREET
WESTWOOD, MA 02090

LI LIN
43 ELM STREET
WESTWOOD, MA 02090

CHRISTINE MCKEE
MARK MCKEE
53 ELM STREET
WESTWOOD, MA 02090

JAMES R HARRIS
THERESA M HARRIS
63 ELM STREET
WESTWOOD, MA 02090

MICHAEL E CAGAN
KAREN FLOWERS CAGAN
69 ELM STREET
WESTWOOD, MA 02090

STANLEY A MARCHAND
DEBRA L J/T
77 ELM STREET
WESTWOOD, MA 02090

ANNIE LEWIS O'CONNOR
42 HAWTHORNE STREET
WESTWOOD, MA 02090

ROBERT W DOHERTY
50 HAWTHORN STREET
WESTWOOD, MA 02090

KONTRIMAS NOMINEE TRUST OF 2017
PETER S & JANE S KONTRIMAS TRUSTEES
58 HAWTHORNE STREET
WESTWOOD, MA 02090

EDWARD A RUFFONI
LAUREN RUFFONI
33 HAWTHORN STREET
WESTWOOD, MA 02090

PAUL C MCLAUGHLIN
39 HAWTHORN STREET
WESTWOOD, MA 02090

BRENDAN K MULLEN
ELIZABETH B DOWNEY
45 HAWTHORN STREET
WESTWOOD, MA 02090

NEIL D FLEMING
51 HAWTHORN STREET
WESTWOOD, MA 02090

GAIL DECOSTE
55 WESTDALE ROAD
WESTWOOD, MA 02090

AMY C SULLIVAN
47 WESTDALE ROAD
WESTWOOD, MA 02090

FREDERICK L DEPAROLESA
EILEEN F DEPAROLESA
41 WESTDALE ROAD
WESTWOOD, MA 02090

ABUTTERS LIST FOR 333 ELM ST DEDHAM
WESTWOOD, MA

MAP & LOT	OWNER	CO-OWNER	Mailing Address	City	St Zip	Location
17061	12-16 SOUTHWEST PARK REAL		16 SOUTHWEST PARK	WESTWOOD	MA 02090	14 SOUTHWEST PK
17062	20 SWP LLC	C/O RICHARD LEE	80 ARLO ROAD	NEWTON	MA 02464	18-20 SOUTHWEST PK
17063	LABS REALTY LLC		30 SOUTHWEST PK	WESTWOOD	MA 02090	28-30 SOUTHWEST PK
17064	R6 HOLDINGS LLC		34 SOUTHWEST PARK	WESTWOOD	MA 02090	32-36 SOUTHWEST PK
17065	33-35 SOUTHWEST PARK LLC		33-35 SOUTHWEST PARK	WESTWOOD	MA 02090	33-35 SOUTHWEST PK
17066	21 SOUTHWEST PROPERTIES L		22 COMEAU STREET	WELLESLEY	MA 02481	21-25 SOUTHWEST PK
17067	TWINS REAL ESTATE HOLDING		19 YAWKEY WAY	BOSTON	MA 02215	15 SOUTHWEST PK
17124	CONNELY MARTIN	MARY E	34 WESTDALE RD	WESTWOOD	MA 02090	34 WESTDALE RD
17125	HARDIMAN BRIAN T	SHANNON MARIE HARDIMAN	40 WESTDALE RD	WESTWOOD	MA 02090	40 WESTDALE RD
17126	DECOSTE GAIL		55 WESTDALE RD	WESTWOOD	MA 02090	55 WESTDALE RD
17127	SULLIVAN AMY C		47 WESTDALE RD	WESTWOOD	MA 02090	47 WESTDALE RD
17128	DEPAROLESA FREDERICK L	EILEEN F	41 WESTDALE RD	WESTWOOD	MA 02090	41 WESTDALE RD
17129	KEEFE RACHEL L		35 WESTDALE ROAD	WESTWOOD	MA 02090	35 WESTDALE RD
17130	MCQUADE LAWRENCE W	BURNS SANDRA M	29 WESTDALE RD	WESTWOOD	MA 02090	29 WESTDALE RD
17131	KRISHNAN SUVARNA S	BALAMURUGESWARAN PARAMESW	23 WESTDALE RD	WESTWOOD	MA 02090	23 WESTDALE RD
17137	MASIELLO ROBERT M & MARY	MASIELLO R M JR & DILETTA	63 HAWTHORN ST	WESTWOOD	MA 02090	63 HAWTHORN ST
17138	FERRARO GAYLE P		57 HAWTHORN ST	WESTWOOD	MA 02090	57 HAWTHORN ST
17139	FLEMING NEIL D		51 HAWTHORN ST	WESTWOOD	MA 02090	51 HAWTHORN ST
17140	MULLEN BRENDAN K	ELIZABETH B DOWNEY	45 HAWTHORN ST	WESTWOOD	MA 02090	45 HAWTHORN ST
17141	MCLAUGHLIN PAUL C		39 HAWTHORN ST	WESTWOOD	MA 02090	39 HAWTHORN ST
17142	RAFFONI EDWARD A	LAUREN RAFFONI	33 HAWTHORN ST	WESTWOOD	MA 02090	33 HAWTHORN ST
17143	NGUYEN HOAN V	PHUOC VO	39 POPLAR ST	WESTWOOD	MA 02090	39 POPLAR ST
17144	CAMPAGNA CRAIG	KRISTINE CAMPAGNA	33 POPLAR ST	WESTWOOD	MA 02090	33 POPLAR ST
17145	WOOD SAMUEL C	MARSHA H WOOD	27 POPLAR ST	WESTWOOD	MA 02090	27 POPLAR ST
17146	CATALDO EDWARD M		15 POPLAR ST	WESTWOOD	MA 02090	15 POPLAR ST
17147	LIN LI		43 ELM ST	WESTWOOD	MA 02090	43 ELM ST
17148	LEBLANC CAROL A		10 POPLAR ST	WESTWOOD	MA 02090	10 POPLAR ST
17149	LEWIS-OCONNOR ANNIE		42 HAWTHORN ST	WESTWOOD	MA 02090	42 HAWTHORN ST
17150	DOHERTY ROBERT W		50 HAWTHORN ST	WESTWOOD	MA 02090	50 HAWTHORN ST
17151	KONTRINAS NOMINEE TRUST O	PETER S & JANE S C KONTRI	58 HAWTHORN ST	WESTWOOD	MA 02090	58 HAWTHORN ST
17152	WELCH JOHN J	PAMELA A WELCH	64 HAWTHORN ST	WESTWOOD	MA 02090	64 HAWTHORN ST
17154	LAWLOR THOMAS A		208 CARROLL AVE	WESTWOOD	MA 02090	208 CARROLL AVE
17155	TAN ALBERT	REGINA TAN	85 ELM ST	WESTWOOD	MA 02090	85 ELM ST
17156	MARCHAND STANLEY A	DEBRA L J/T	77 ELM STREET	WESTWOOD	MA 02090	77 ELM ST
17157	CAGAN MICHAEL E	KAREN FLOWERS CAGAN	69 ELM ST	WESTWOOD	MA 02090	69 ELM ST
17158	HARRIS JAMES R	THERESA M HARRIS	63 ELM ST	WESTWOOD	MA 02090	63 ELM ST
17159	MCKEE CHRISTINE	MARK MCKEE	53 ELM ST	WESTWOOD	MA 02090	53 ELM ST
17160	MEDICAL INFORMATION TECH		MEDITECH CIRCLE	WESTWOOD	MA 02090	131 EAST ST
17173	CUMMINS NORTHEAST INC		100 ALLIED DRIVE	DEDHAM	MA 02026	100 ALLIED DR
17174	EXTRA SPACE PROPERTIES T	C/O PTA EX 1205	P.O. BOX 320099	ALEXANDRIA	VA 22320	122 ALLIED DR
17176	NORFOLK PLACE EQUITY PART		150 EAST 58TH STREET	NEW YORK NEW YORK	NY 10155	333 DEDHAM ELM ST
17177	CHATHAM DEDHAM RI LLC		222 LAKEVIEW AVE NO.200	WEST PALM BEACH	FL 33401	259 DEDHAM ELM ST
17190	TOWN OF WESTWOOD		580 HIGH ST	WESTWOOD	MA 02090	ELM ST

NOTICE OF INTENT NARRATIVE

TABLE OF CONTENTS

1.0 Notice of Intent Narrative.....	1
1.1 Site Description.....	1
1.2 Wetland Resource Areas	1
1.2.1 Bordering Vegetated Wetlands (BVW)	1
1.2.2 Land Under Water Bodies and Waterways.....	3
1.2.3 Bank (Naturally Occurring Banks and Beaches)	3
1.2.4 Bordering Land Subject to Flooding.....	3
1.2.5 Riverfront Area.....	4
1.3 Buffer Zone	4
1.4 Vernal Pools.....	4
1.5 Work Description.....	5
1.6 Work in Wetland Resource Areas and Conformance to Performance Standards.....	6
1.6.1 Bordering Vegetated Wetlands.....	6
1.6.2 Bordering Land Subject to Flooding.....	8
1.6.3 Riverfront Area.....	9
1.7 Work in Buffer Zones.....	16
2.0 BVW and Riverfront Area Alternatives Analysis	17
3.0 Wetland Replication Plan.....	19
3.1 BVW	19
3.2 Riverfront Area Restoration	20
4.0 Stormwater Management.....	22
4.1 Existing Conditions.....	22
4.2 Proposed Stormwater Management Best Management Practices.....	22
4.3 Compliance with Stormwater Performance Standards.....	23
5.0 Photos	26

LIST OF TABLES

Table 1. BVW Impacts (sf).....	6
Table 2. By-Law Buffer Zone Impacts.....	16

LIST OF FIGURES

Figure 1. Project Locus.....	2
------------------------------	---

Dedham, MA

Figure 2. FEMA Map..... 4

Figure 3. Potential Vernal Pools in Project Area 5

Figure 4. Typical Roadway Section..... 6

Figure 5. Wetland Replication Plan..... 19

Figure 6. Wetland Replication Area Detail..... 20

Figure 7. Riverfront Area Restoration Plan 20

Figure 8. Riverfront Area Restoration Detail 21

LIST OF APPENDICES

Appendix A: Wetlands Delineation Information

Appendix B: Project Plans

Appendix C: Stormwater Management Report (provided separately)



1.0 NOTICE OF INTENT NARRATIVE

BETA Group, Inc. (BETA) has prepared this Notice of Intent on behalf of the Town of Dedham under the provisions of the Massachusetts Wetlands Protection Act and the Dedham Wetlands Protection By-Law.

1.1 SITE DESCRIPTION

The project study area, shown in Figure 1 **Error! Reference source not found.**, is located in the southern portion of Dedham, Massachusetts. The project extends along Elm Street and Rustcraft Road from Robinwood Road to Fairbanks Park, a distance of approximately 7/8 miles. Elm Street intersects Providence Highway approximately 900 feet northwest of the western project limit, providing access to Route 1, I-95/Route 128, and surrounding towns. The Dedham Corp Center Commuter Rail Station is located along Rustcraft Road within the project limits, providing travel between Boston's South Station and the Town of Franklin. Rustcraft Road intersects with East Street approximately ½ mile east of the eastern project limit. Elm Street and Rustcraft Road form a continuous roadway, transitioning from one to the other at a sharp horizontal curve where the roadway shifts from the primarily north-south alignment of Elm Street to the primarily east-west alignment of Rustcraft Road.

The purpose of this project is to improve pedestrian and bicycle accommodations and safety along the corridor, while also rehabilitating the roadway pavement. Proposed improvements include roadway widening and pavement milling and overlay, sidewalk reconstruction, high visibility crosswalk beacons, and new signs and pavement markings.

1.2 WETLAND RESOURCE AREAS

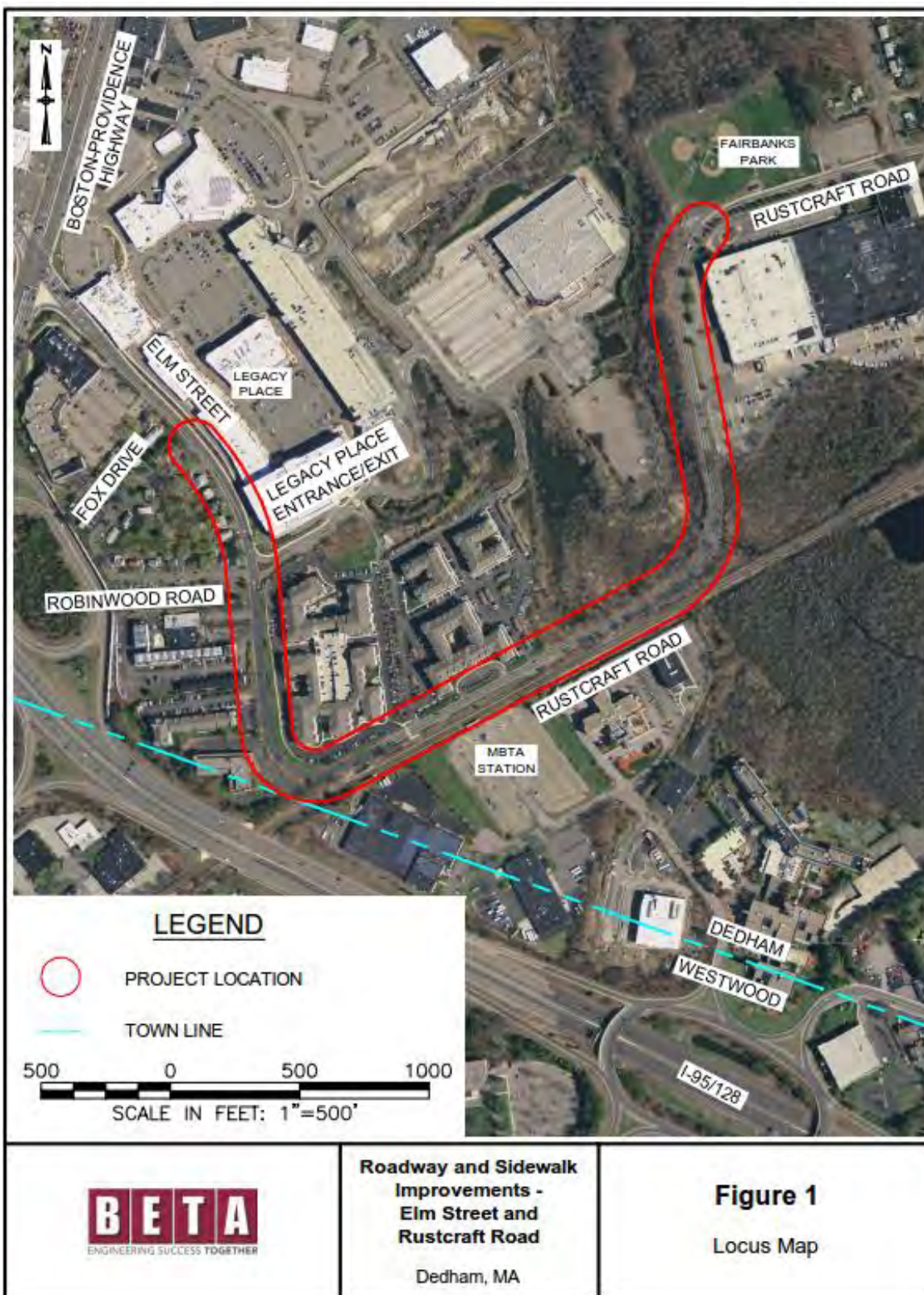
Five regulated wetland resource areas, regulated under the Dedham Wetlands Protection By-Law and the Massachusetts Wetlands Protection Act, exist in the project area.

The project area, 2,200 feet along Elm Street and Rustcraft Road in Dedham was reviewed the area the presence of any jurisdictional wetland resource areas within 100 feet of the roads. There are no jurisdictional wetland resource areas along Elm Street. Along Rustcraft Road, much of the project area is comprised of dense wooded areas to the north of the road and commercial development to the south. Little Wigwam Stream, a perennial stream, crosses beneath Rustcraft Road and connects Little Wigwam Pond to Wigwam Pond. Its location is shown on the enclosed Figure 1. Project The stream supports a Bordering Vegetated Wetland (BVW).

1.2.1 BORDERING VEGETATED WETLANDS (BVW)

Wetland Series A

Wetland A is located adjacent to Wigwam Stream on the north side of Rustcraft Road. Flags A1 through A 110 were placed to denote the edge of the BVW using pink/black sequentially numbered tape. Vegetation within the BVW is a dense mixture of red maple (*Acer rubrum*) trees, highbush blueberry (*Vaccinium corymbosum*) and viburnum shrubs, and robust stands of mature poison ivy (*Toxicodendron radicans*). A steep slope limits the edge of the wetland as it drops from Rustcraft Road to the edge of the wetland.



Dedham, MA

Wetland Series B

Wetland B is located on the south side of Rustcraft Road. It was flagged using pink/black tape identified as B1 through B6. This series defines the wetlands associated with a narrow ditch running parallel to Rustcraft Road. The ditch appears to serve as a roadway retention area, collecting storm water runoff from Rustcraft Road. There were no up-stream or down-stream culverts observed connecting it to other wetlands. Vegetation used to establish the edge of the BVW included highbush blueberry, red maples and sensitive ferns (*Onoclea sensibilis*). The wetland is confined to the edge of the ditch due to the roadway on one side and the MBTA rail way on the opposite side.

Wetland Series C

Wetland C is associated with Little Wigwam Stream and is located south of Rustcraft Road. It runs parallel to Rustcraft Road and is located between Rustcraft Road and the MBTA rail line. Predominant vegetation in the BVW includes red maple, highbush blue berry and viburnum shrubs in the upper canopy with cattails and horsetails below. The edge of wetland series C was flagged with flags labeled as C 1 through C 33.

1.2.2 LAND UNDER WATER BODIES AND WATERWAYS

The land lying between the Mean Low Water elevation of the Little Wigwam Stream is delineated as Land Under Water Bodies and Waterways.

1.2.3 BANK (NATURALLY OCCURRING BANKS AND BEACHES)

The top of the bank or the mean annual high water mark of Little Wigwam Stream was established and marked in the field with two series of flags. On the north side of Rustcraft Road, the top of the bank is coincident with the BVW, as the steep slope at the top of the bank limits the landward edge of the BVW. Blue flags labeled B3 through B68 denote the top of bank to the north of Rustcraft. On the south side of Rustcraft Road, the top of bank was flagged using blue tape labeled B1 through B8.

1.2.4 BORDERING LAND SUBJECT TO FLOODING

An area of 1% Annual Chance (100-year) Floodplain associated with Little Wigwam Stream intersects Rustcraft Road (**Figure 2**). This area is considered Bordering Land Subject to Flooding under the Act the Dedham Wetlands Protection By-Law.

Note that no 1% Annual Chance flood elevation is given on the Flood Insurance Rate Map (Panel # 25021C0181E, effective 07/17/2012) for the A Zone delineated on the FIRM for the area. The Flood Insurance Rate Study for the Town of Dedham also does not specify a flood elevation for the floodplain along Rustcraft Road. The location of the floodplain has been determined based on MassGIS and FEMA mapping for the area.

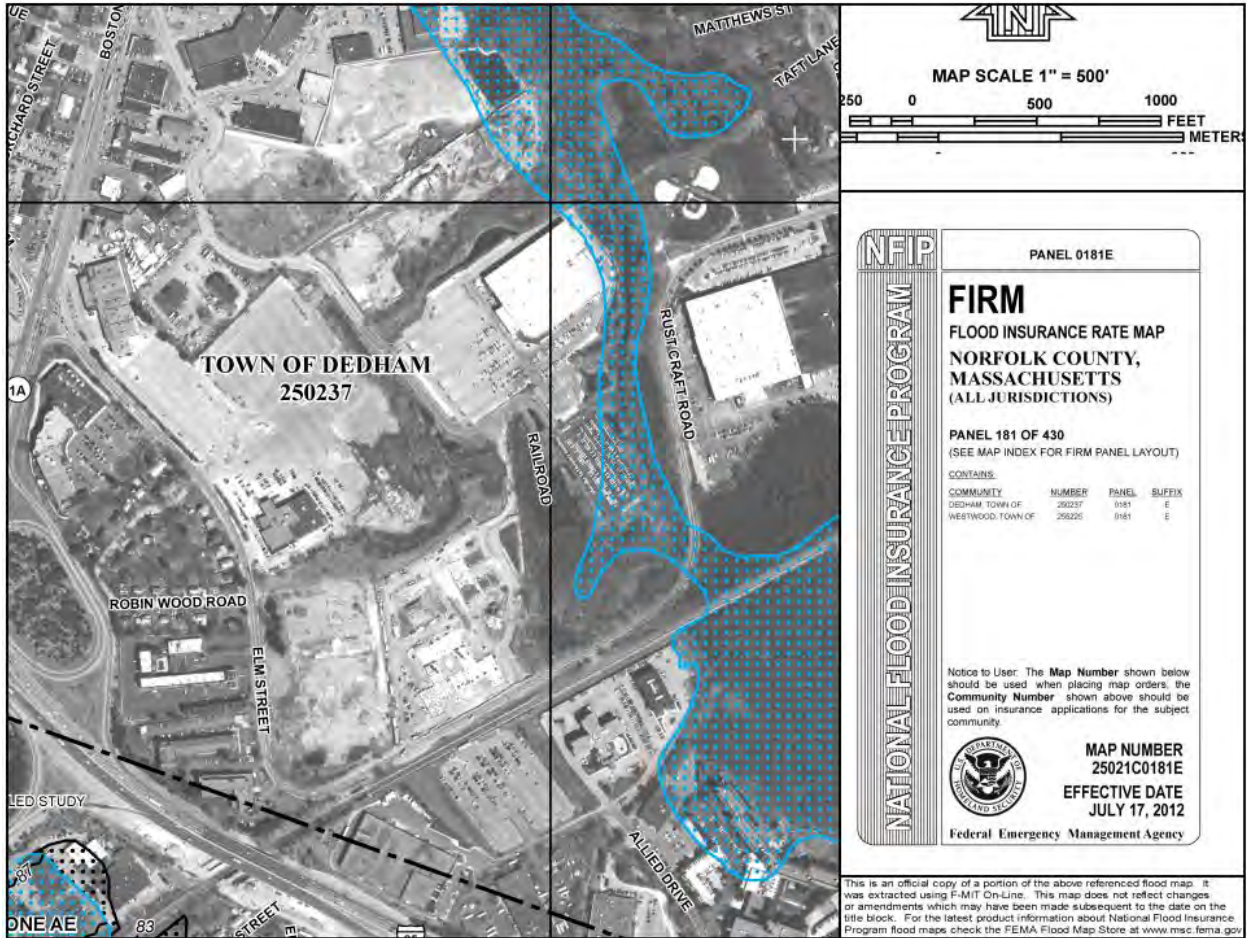


Figure 2. FEMA Map

1.2.5 RIVERFRONT AREA

Little Wigwam Stream was determined to be a perennial stream; therefore there is a 200-foot Riverfront area corridor extending landward from the top of the Bank of Little Wigwam Stream in either direction.

1.3 BUFFER ZONE

The jurisdictional 100-foot Buffer Zone in the project area is regulated under the WPA and the Dedham Wetlands Protection By-Law.

Under the WPA and the Wetlands By-Law, a 100-foot Buffer Zone extends from the landward limit of the Bank along Little Wigwam Stream, and within 100-feet of the edge of BVW.

1.4 VERNAL POOLS

Two (2) potential vernal pools have been identified on MA GIS within the A series of wetland flags. They are both located north of Rustcraft Road and are shown on **Figure 3**. No Certified Vernal Pools exist in the project area.

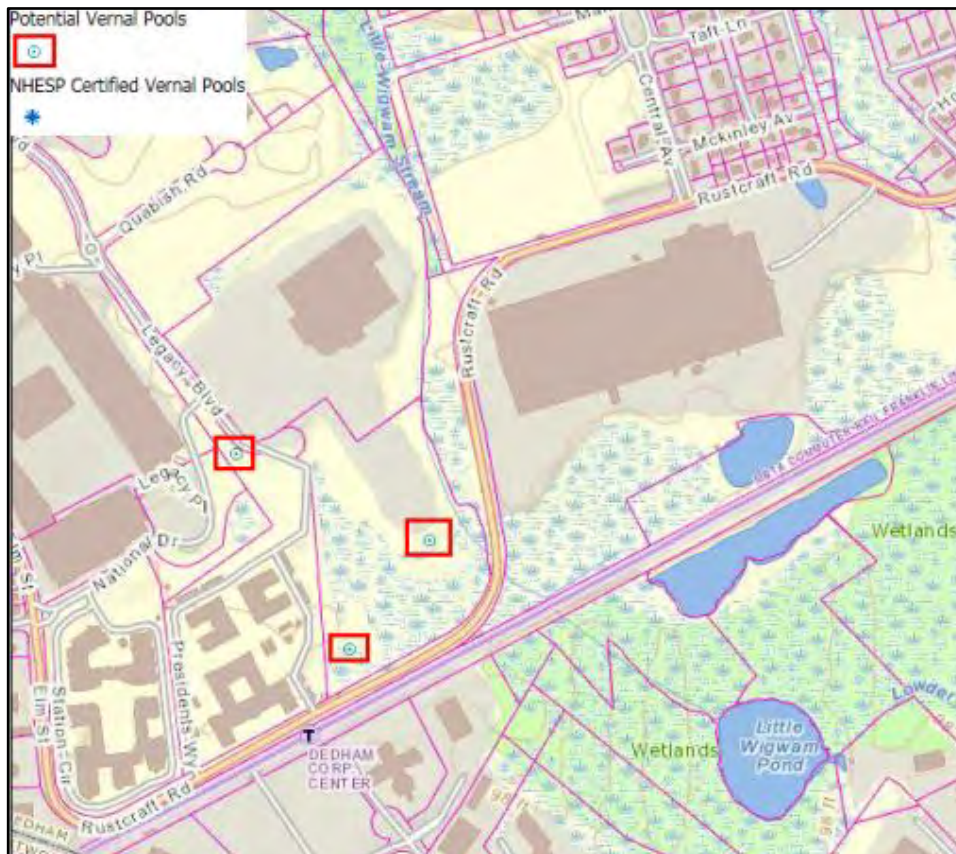


Figure 3. Potential Vernal Pools in Project Area

1.5 WORK DESCRIPTION

As noted, the work proposed within the area subject to wetlands jurisdiction includes roadway widening and pavement milling and overlay and sidewalk reconstruction. **Figure 4** below shows a typical cross-section of the work proposed along Rustcraft Road. Roadway widening is limited to a total width of 4-feet in order to accommodate current MassDOT standards for bicycle lanes (two five foot shoulders) and two 11-foot travel lanes. Within the area subject to wetlands jurisdiction along Rustcraft Road a single sidewalk will be constructed along the south side of the road and limited in width to the minimum acceptable width to meet current standards, or 5 feet plus the curb. To avoid placing fill within the mapped 1% annual chance (100-year) floodplain, the elevation of the sidewalk will be matched to the existing elevation of the roadway. No change in elevation will occur within the limits of the mapped floodplain along Rustcraft Road.

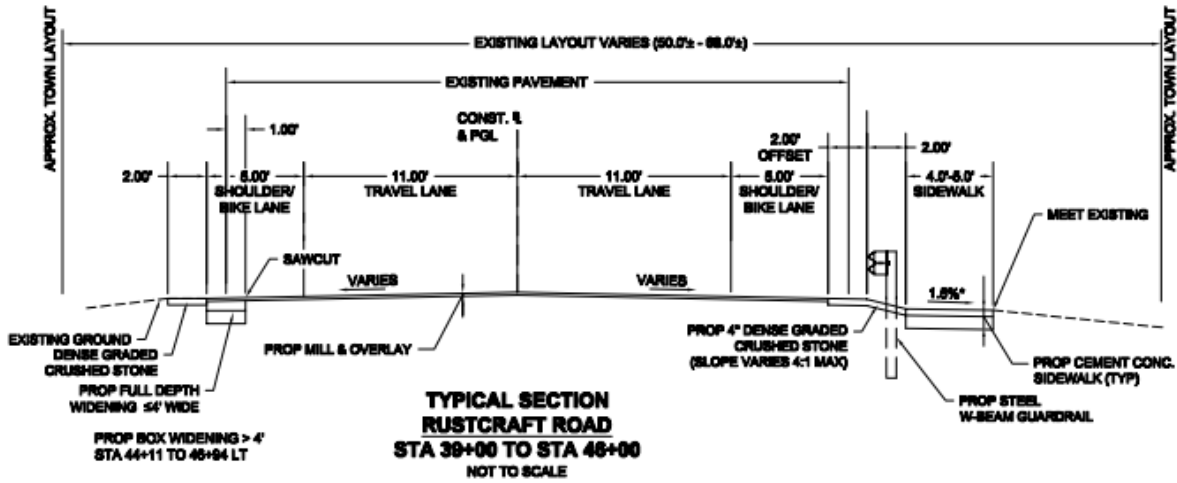


Figure 4. Typical Roadway Section

1.6 WORK IN WETLAND RESOURCE AREAS AND CONFORMANCE TO PERFORMANCE STANDARDS

1.6.1 BORDERING VEGETATED WETLANDS

The proposed improvements to Rustcraft Road will result in both temporary and permanent impacts to BVW as detailed in Table 1 below. Temporary impacts will be restored in place; permanent impacts will be mitigated through the construction of wetland replication areas adjacent to the impacted areas.

Table 1. BVW Impacts (sf)

Location	Temporary Impacts	Permanent Impacts	Total
Sta. 37 + 18 to 37 + 46 North side	5	45	50
Sta. 38 + 70 to 38 + 85 North side	20	10	30
Sta. 40 + 19 to 40 + 40 South side	25	5	30
Sta. 41 + 25 to 41 + 61 South side	70	20	90
Sta. 42 + 41 to 43 + 46 North side	175	100	275
Sta. 42 + 78 to 43 + 88 South side	205	95	300
Sta. 44 + 46 to 44 + 94 South side	65	10	75
Sta. 45 + 07 to 45 + 39 South side	25	0	25
Sta. 46 + 07 to 46 + 67 South side	85	50	135
TOTAL	675	335	1,010

The following discussion outlines the proposed project's conformance with the Performance Standards for Bordering Vegetated Wetlands (BVW) at 310 CMR 10.54(4):

(a) Where the presumption set forth in 310 CMR 10.55(3) is not overcome, any proposed work in a Bordering Vegetated Wetland shall not destroy or otherwise impair any portion of said area.

Conformance: The proposed project will result in permanent impacts to 335 square feet and temporary impacts to 675 square feet of BVW, these impacts cannot be avoided. Design accommodations, including limiting new sidewalks to one side of the roadway in wetland areas, have minimized permanent impacts to the BVW to the greatest extent possible. Wetland replication areas totaling 760 square feet have been proposed to mitigate the permanent impact to BVW, a 2.3:1 ratio of replication area to impacted area.

(b) Notwithstanding the provisions of 310 CMR 10.55(4)(a), the issuing authority may issue an Order of Conditions permitting work which results in the loss of up to 5,000 square feet of Bordering Vegetated Wetland when said area is replaced in accordance with the following general conditions and any additional, specific conditions the issuing authority deems necessary to ensure that the replacement area will function in a manner similar to the area that will be lost:

- 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");*
- 2. the ground water and surface elevation of the replacement area shall be approximately equal to that of the lost area;*
- 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;*
- 4. the replacement area shall have an unrestricted hydraulic connection to the same water body or waterway associated with the lost area;*
- 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;*
- 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 methods; and*
- 7. the replacement area shall be provided in a manner which is consistent with all other General Performance Standards for each resource area in Part III of 310 CMR 10.00.*

In the exercise of this discretion, the issuing authority shall consider the magnitude of the alteration and the significance of the project site to the interests identified in M.G.L. c. 131, § 40, the extent to which adverse impacts can be avoided, the extent to which adverse impacts are minimized, and the extent to which mitigation measures, including replication or restoration, are provided to contribute to the protection of the interests identified in M.G.L. c. 131, § 40.

Conformance: The wetland replication plan described in section **Error! Reference source not found.** describes the proposed plan in detail. The proposed replication area more than equals the area lost; groundwater and surface water elevations for the replication will be equal to the impact area; the configuration and location of the replication area will be similar to the area impacted; an unrestricted hydraulic connection to the same waterbody is provided; and the replication areas are located in close proximity to the impact areas.

(c) Notwithstanding the provisions of 310 CMR 10.55(4)(a), the issuing authority may issue an Order of Conditions permitting work which results in the loss of a portion of Bordering Vegetated Wetland when;

1. said portion has a surface area less than 500 square feet;
2. said portion extends in a distinct linear configuration ("finger-like") into adjacent uplands; and
3. in the judgment of the issuing authority it is not reasonable to scale down, redesign or otherwise change the proposed work so that it could be completed without loss of said wetland.

Conformance: As the project will alter more than 500 square feet of BVW this standard is not applicable.

(d) Notwithstanding the provisions of 310 CMR 10.55(4)(a),(b) and (c), 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.

Conformance: Not applicable, there are no mapped areas of Estimated Habitat of Rare Wetlands Wildlife in the project area.

(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 designated by the Secretary of Energy and Environmental Affairs under M.G.L. c. 21A, § 2(7) and 301 CMR 12.00: Areas of Critical Environmental Concern. 310 CMR 10.55(4)(e):

1. supersedes the provisions of 310 CMR 10.55(4)(b) and (c);
2. shall not apply if the presumption set forth at 310 CMR 10.55(3) is overcome;
3. shall not apply to work proposed under 310 CMR 10.53(3)(l); and
4. shall not apply to maintenance of stormwater detention, retention, or sedimentation ponds, or to maintenance of stormwater energy dissipating structures, that have been constructed in accordance with a valid order of conditions.

Conformance: Not applicable, the project is not located in an Area of Critical Environmental Concern.

1.6.2 BORDERING LAND SUBJECT TO FLOODING

The following discussion outlines the proposed project's conformance with the Performance Standards for Bordering Land Subject to Flooding Land at 310 CMR 10.57(4)(a) and (c):

(a) *Bordering Land Subject to Flooding.*

1. *Compensatory storage shall be provided for all flood storage volume that will be lost as the result of a proposed project within Bordering Land Subject to Flooding, when in the judgment of the issuing authority said loss will cause an increase or will contribute incrementally to an increase in the horizontal extent and level of flood waters during peak flows.*

Compensatory storage shall mean a volume not previously used for flood storage and shall be incrementally equal to the theoretical volume of flood water at each elevation, up to and including the 100-year flood elevation, which would be displaced by the proposed project. Such compensatory volume shall have an unrestricted hydraulic connection to the same waterway or water body. Further, with respect to waterways, such compensatory volume shall be provided within the same reach of the river, stream or creek.

Conformance: The proposed project will not result in any fill being placed within the limits of the mapped 1% Annual Chance floodplain along Rustcraft Road and no existing flood storage volume will be lost as a result of the project. The project conforms to this performance standard.

2. *Work within Bordering Land Subject to Flooding, including that work required to provide the above-specified compensatory storage, shall not restrict flows so as to cause an increase in flood stage or velocity.*

Conformance: As noted, there will be no fill placed within the limits of the mapped 1% Annual Chance floodplain and no flood storage will be displaced. The existing flow within the Little Wigwam Brook culvert under Rustcraft Road will be maintained. No increase in flood stage or velocity is anticipated as a result of the project, the project conforms to the performance standard.

3. *Work in those portions of bordering land subject to flooding found to be significant to the protection of wildlife habitat shall not impair its capacity to provide important wildlife habitat functions. Except for work which would adversely affect vernal pool habitat, a project or projects on a single lot, for which Notice(s) of Intent is filed on or after November 1, 1987, that (cumulatively) alter(s) up to 10% or 5,000 square feet (whichever is less) of land in this resource area found to be significant to the protection of wildlife habitat, shall not be deemed to impair its capacity to provide important wildlife habitat functions. Additional alterations beyond the above threshold, or altering vernal pool habitat, may be permitted if they will have no adverse effects on wildlife habitat, as determined by procedures contained in 310 CMR 10.60.*

Conformance: The affected BLSF has not been determined to contain significant wildlife habitat, therefore this standard is not applicable.

*(b) Isolated Land Subject to Flooding. **Not Applicable***

(c) Protection of Rare Wildlife Species. Notwithstanding the provisions of 310 CMR 10.57(4)(a) or (b), no project may be permitted which will have any adverse effect on specified wildlife habitat sites of rare vertebrate or invertebrate species, as identified by procedures established under 310 CMR 10.59.

Conformance: Not applicable, there are no mapped areas of Estimated Habitat of Rare Wetlands Wildlife in the project area.

1.6.3 RIVERFRONT AREA

The proposed improvements to Rustcraft Road will result in both temporary and permanent impacts to Riverfront Area. The total area of Riverfront Area within the right-of-way of Elm Street and Rustcraft Road totals 82,180 square feet. The proposed project will result in alteration of 72,220 square feet of the Riverfront Area – 60,280 square feet within 0 – 100 feet and 11,940 square feet within 100 – 200 feet. Much of the Riverfront Area is previously developed as defined at 310 CMR 10.58(5) including “...areas degraded prior to August 7, 1996 by impervious surfaces from existing structures or pavement...”

The majority of the alteration is temporary and involves work on the existing paved roadway surface which will result in no change to existing conditions. Areas of widened pavement and new sidewalk (11,110 square feet) and construction of the proposed stormwater detention basin (3,000 square feet) are permanent alterations to the Riverfront Area and total 14,110 square feet, or 17% of the total Riverfront Area.

Impacts to the 200-foot Riverfront Area are coincident with impacts to the Dedham Wetlands Protection By-Law 200-foot Buffer Zone to Little Wigwam Brook.

The following discussion outlines the proposed project's conformance with the Performance Standards for Riverfront Area at 310 CMR 10.56(4):

4) General Performance Standard. Where the presumption set forth in 310 CMR 10.58(3) is not overcome, the applicant shall prove by a preponderance of the evidence that there are no practicable and substantially equivalent economic alternatives to the proposed project with less adverse effects on the interests identified in M.G.L. c.131 § 40 and that the work, including proposed mitigation, will have no significant adverse impact on the riverfront area to protect the interests identified in M.G.L. c. 131 § 40. In the event that the presumption is partially overcome, the issuing authority shall make a written determination setting forth its grounds in the Order of Conditions and the partial rebuttal shall be taken into account in the application of 310 CMR 10.58 (4)(d)1.a. and c.; the issuing authority shall impose conditions in the Order that contribute to the protection of interests for which the riverfront area is significant.

Conformance: The proposed project represents the most practicable alternative with the least impact to the Riverfront Area. A full alternatives analysis is included in Section **Error! Reference source not found.**

(a) Protection of Other Resource Areas. The work shall meet the performance standards for all other resource areas within the riverfront area, as identified in 310 CMR 10.30 (Coastal Bank), 10.32 (Salt Marsh), 10.55 (Bordering Vegetated Wetland), and 10.57 (Land Subject to Flooding). When work in the riverfront area is also within the buffer zone to another resource area, the performance standards for the riverfront area shall contribute to the protection of the interests of M.G.L. c. 131, § 40 in lieu of any additional requirements that might otherwise be imposed on work in the buffer zone within the riverfront area.

Conformance: As noted in sections 1.6.1 and 1.6.2 above, the proposed project meets the applicable performance standards for BVW and BLSF in the project area.

(b) Protection of Rare Species. No project may be permitted within the riverfront area which will have any adverse effect on specified habitat sites of rare wetland or upland, vertebrate or invertebrate species, as identified by the procedures established under 310 CMR 10.59 or 10.37, or which will have any adverse effect on vernal pool habitat certified prior to the filing of the Notice of Intent.

Conformance: There are no mapped areas of Estimated Habitat of Rare Wetlands Wildlife in the project area. The potential vernal pools identified in the area will not be impacted by the proposed roadway widening and addition of sidewalk; there are no certified vernal pools in the project area. The project conforms to this performance standard.

(c) Practicable and Substantially Equivalent Economic Alternatives. There must be no practicable and substantially equivalent economic alternative to the proposed project with less adverse effects on the interests identified in M.G.L. c. 131 § 40.

1. *Definition of Practicable...* (text deleted)

Conformance: In consultation with the Conservation Commission, the applicant has determined that the proposed roadway widening and addition of a sidewalk along only one side of Rustcraft Road represents the minimum practicable alternative improvement project that meets the purpose of the project. A No Build alternative will not meet the purpose of the project, will not provide the needed safety and access improvements, and is not considered to be a practicable alternative.

2. *Scope of Alternatives. The scope of alternatives under consideration shall be commensurate with the type and size of the project. The issuing authority shall presume that alternatives beyond the scope described below are not practicable and therefore need not be considered. The issuing authority or another party may overcome the presumption by demonstrating the practicability of a wider range of alternatives, based on cost, and whether the cost is reasonable or prohibitive to the owner; existing technology; proposed use; and logistics in light of the overall project purpose... (additional text deleted)*

Conformance: As noted above, the applicant has consulted with the Conservation Commission in determining the proper scope of the alternatives for the project. The proposed project improvements represent the minimum acceptable project that meets the project purpose.

3. *Evaluation of Alternatives. The applicant shall demonstrate that there are no practicable and substantially equivalent economic alternatives as defined in 310 CMR 10.58(4)(c)1., within the scope of alternatives as set forth in 310 CMR 10.58(4)(c)2., with less adverse effects on the interests identified in M.G.L. c. 131 § 40. The applicant shall submit information to describe sites and the work both for the proposed location and alternative site locations and configurations sufficient for a determination by the issuing authority under 310 CMR 10.58(4)(d). The level of detail of information shall be commensurate with the scope of the project and the practicability of alternatives.*

Conformance: The proposed project represents the most practicable alternative with the least impact to the Riverfront Area. A full alternatives analysis is included in Section **Error! Reference source not found.**

(d) No Significant Adverse Impact. The work, including proposed mitigation measures, must have no significant adverse impact on the riverfront area to protect the interests identified in M.G.L. c. 131, § 40.

1. *Within 200 foot riverfront areas, the issuing authority may allow the alteration of up to 5000 square feet or 10% of the riverfront area within the lot, whichever is greater, on a lot recorded on or before October 6, 1997 or lots recorded after October 6, 1997 subject to the restrictions of 310 CMR 10.58(4)(c)2.b.vi., or up to 10% of the riverfront area within a lot recorded after October 6, 1997, provided that:*
 - a. *At a minimum, a 100 foot wide area of undisturbed vegetation is provided. This area shall extend from mean annual high-water along the river unless another location would better protect the interests identified in M.G.L. c. 131 § 40. If there is not a 100 foot wide area of undisturbed vegetation within the riverfront area, existing vegetative cover shall be preserved or extended to the maximum extent feasible to approximate a 100 foot wide corridor of natural vegetation. Replication and compensatory storage required to meet other resource area performance standards are allowed within this area; structural stormwater management measures may be allowed only when there is no practicable alternative. Temporary impacts where necessary for installation of linear site-related utilities are allowed, provided the area is restored to its natural conditions. Proposed work which does not meet the*

requirement of 310 CMR 10.58(4)(d)1.a. may be allowed only if an applicant demonstrates by a preponderance of evidence from a competent source that an area of undisturbed vegetation with an overall average width of 100 feet will provide equivalent protection of the riverfront area, or that a partial rebuttal of the presumptions of significance is sufficient to justify a lesser area of undisturbed vegetation;

- b. Stormwater is managed according to standards established by the Department in its Stormwater Policy.*
- c. Proposed work does not impair the capacity of the riverfront area to provide important wildlife habitat functions. Work shall not result in an impairment of the capacity to provide vernal pool habitat identified by evidence from a competent source, but not yet certified. For work within an undeveloped riverfront area which exceeds 5,000 square feet, the issuing authority may require a wildlife habitat evaluation study under 310 CMR 10.60.*
- d. Proposed work shall not impair groundwater or surface water quality by incorporating erosion and sedimentation controls and other measures to attenuate nonpoint source pollution. The calculation of square footage of alteration shall exclude areas of replication or compensatory flood storage required to meet performance standards for other resource areas, or any area of restoration within the riverfront area. The calculation also shall exclude areas used for structural stormwater management measures, provided there is no practicable alternative to siting these structures within the riverfront area and provided a wildlife corridor is maintained (e.g. detention basins shall not be fenced).*

Conformance: The proposed roadway improvements cannot be constructed without alterations within the first 100 feet of the Riverfront Area along Little Wigwam Brook. Minor roadway widening and construction of a new sidewalk are necessary to address existing geometric deficiencies and provide increased safety for the increasing number of bicyclists and pedestrians in the area. The total area of impact has been minimized by eliminating a new sidewalk on one side of Rustcraft Road in the area of the BVW and BLSF associated with the brook.

Stormwater management BMPs will be installed to improve water quality and manage stormwater runoff in accordance with the Stormwater Performance Standards.

Existing wildlife habitat functions will not be impacted, the existing riverfront area adjacent to Rustcraft Road has minimal habitat value. An area adjacent to both sides of Little Wigwam Brook as it runs under Rustcraft Road will be planted with a variety of wetland plantings designed to provide enhanced wildlife habitat in the area.

Finally, erosion and sedimentation controls will be installed during construction to minimize impacts during construction.

2. 25 foot riverfront areas...

Conformance: This performance standard is not applicable; Dedham is not a community with a 25-foot Riverfront Area.

3. *Notwithstanding the provisions of 310 CMR 10.58(4)(d)1. or 2., the issuing authority shall allow the construction of a single family house, a septic system if no sewer is available, and a driveway, on a lot recorded before August 7, 1996 where the size or shape of the lot within the riverfront area prevents the construction from meeting the requirements of 310 CMR 10.58(4)(d)1. or 2., provided that:*
- a. *The lot can be developed for such purposes under the applicable provisions of other municipal and state law; and*
 - b. *The performance standards of 310 CMR 10.58(4)(d) are met to the maximum extent feasible. In difficult siting situations, the maximum extent of yards around houses should be limited to the area necessary for construction. Except where the lot contains vernal pool habitat or specified habitat sites of rare species, a wildlife habitat evaluation study shall not be required.*

Conformance: Not Applicable – the project is not a single family house project.

4. *Notwithstanding the provisions of 310 CMR 10.58(4)(d)1. or 2., the issuing authority may allow the construction of a commercial structure of minimum feasible dimension, on a lot recorded before August 7, 1996 where the size or shape of the lot within the riverfront area prevents the construction from meeting the requirements of 310 CMR 10.58(4)(d)1. or 2., only if:*
- a. *The lot can be developed for such purposes and cannot be developed for any other purposes under the applicable provisions of other municipal and state law;*
 - b. *The work is not eligible for 310 CMR 10.58(5); and*
 - c. *The performance standards of 310 CMR 10.58(4)(d)1. or 2. are met to the maximum extent feasible.*

Conformance: Not Applicable – the project is not a commercial structure.

The Performance Standards for Previously Developed Riverfront Areas are contained at 310 CMR 10.58(5).

(5) Redevelopment Within Previously Developed Riverfront Areas; Restoration and Mitigation.

Notwithstanding the provisions of 310 CMR 10.58(4)(c) and (d), the issuing authority may allow work to redevelop a previously developed riverfront area, provided the proposed work improves existing conditions. Redevelopment means replacement, rehabilitation or expansion of existing structures, improvement of existing roads, or reuse of degraded or previously developed areas. A previously developed riverfront area contains areas degraded prior to August 7, 1996 by impervious surfaces from existing structures or pavement, absence of topsoil, junkyards, or abandoned dumping grounds. Work to redevelop previously developed riverfront areas shall conform to the following criteria:

(a) At a minimum, proposed work shall result in an improvement over existing conditions of the capacity of the riverfront area to protect the interests identified in M.G.L. c. 131 § 40. When a lot is previously developed but no portion of the riverfront area is degraded, the requirements of 310 CMR 10.58(4) shall be met.

Conformance: As noted, the majority of the work in River front Area falls within Previously Developed Riverfront Area. The roadway work includes stormwater BMPs that will provide improved stormwater discharge water quality within the project area, including unimpacted Riverfront Area. In addition, the project includes a 720 square foot area where the adjacent Riverfront Area will be enhanced with diverse plantings intended to provide better wildlife habitat and improve existing conditions.

(b) Stormwater management is provided according to standards established by the Department.

Conformance: The project is classified as a redevelopment project under the first definition: “[m]aintenance and improvement of existing roadways, including widening less than a single lane, adding shoulders, correcting substandard intersections, improving existing drainage systems and repaving. Proposed deep sump catchbasins with hoods, water quality/infiltration swales, subsurface infiltration systems, and an infiltration basin will provide treatment to the maximum extent practicable. Section 4.2 of this narrative details how the project complies with the Stormwater Performance Standards.

(c) Within 200 foot riverfront areas, proposed work shall not be located closer to the river than existing conditions or 100 feet, whichever is less, or not closer than existing conditions within 25 foot riverfront areas, except in accordance with 310 CMR 10.58(5)(f) or (g).

Conformance: The proposed project can be considered a Limited Project under the provisions of 310 CMR 10.53(f) – “[m]aintenance and improvement of existing public roadways, but limited to widening less than a single lane, adding shoulders, correcting substandard intersections, and improving inadequate drainage systems.”

The project cannot be constructed without additional work closer to Little Wigwam Brook within the Riverfront Area. Additional work has been minimized to the greatest extent practicable consistent with achieving the public safety improvements included with the project.

(d) Proposed work, including expansion of existing structures, shall be located outside the riverfront area or toward the riverfront area boundary and away from the river, except in accordance with 310 CMR 10.58(5)(f) or (g).

Conformance: As noted, the project is a Limited Project under the provisions of 310 CMR 10.53(f). The additional alteration of the Riverfront Area has been minimized to the greatest extent practicable.

(e) The area of proposed work shall not exceed the amount of degraded area, provided that the proposed work may alter up to 10% if the degraded area is less than 10% of the riverfront area, except in accordance with 310 CMR 10.58(5)(f) or (g).

Conformance: As noted, the majority of the work in Previously Developed Riverfront Area is temporary and involves work within the existing roadway. Areas of widened pavement and new sidewalk (11,110 square feet) and construction of the proposed stormwater detention basin (3,000 square feet) are permanent alterations to the Riverfront Area and total 14,110 square feet, or 17% of the total Riverfront

Area. The proposed detention basin is an allowable alteration within the Riverfront Area per 310 CMR 10.58(4)(d).

(f) When an applicant proposes restoration on-site of degraded riverfront area, alteration may be allowed notwithstanding the criteria of 310 CMR 10.58(5)(c), (d), and (e) at a ratio in square feet of at least 1:1 of restored area to area of alteration not conforming to the criteria. Areas immediately along the river shall be selected for restoration. Alteration not conforming to the criteria shall begin at the riverfront area boundary. Restoration shall include:

- 1. removal of all debris, but retaining any trees or other mature vegetation;*
- 2. grading to a topography which reduces runoff and increases infiltration;*
- 3. coverage by topsoil at a depth consistent with natural conditions at the site; and*
- 4. seeding and planting with an erosion control seed mixture, followed by plantings of herbaceous and woody species appropriate to the site;*

(g) When an applicant proposes mitigation either on-site or in the riverfront area within the same general area of the river basin, alteration may be allowed notwithstanding the criteria of 310 CMR 10.58(5)(c), (d), or (e) at a ratio in square feet of at least 2:1 of mitigation area to area of alteration not conforming to the criteria or an equivalent level of environmental protection where square footage is not a relevant measure. Alteration not conforming to the criteria shall begin at the riverfront area boundary. Mitigation may include off-site restoration of riverfront areas, conservation restrictions under M.G.L. c. 184, §§ 31 through 33 to preserve undisturbed riverfront areas that could be otherwise altered under 310 CMR 10.00, the purchase of development rights within the riverfront area, the restoration of bordering vegetated wetland, projects to remedy an existing adverse impact on the interests identified in M.G.L. c. 131, § 40 for which the applicant is not legally responsible, or similar activities undertaken voluntarily by the applicant which will support a determination by the issuing authority of no significant adverse impact. Preference shall be given to potential mitigation projects, if any, identified in a River Basin Plan approved by the Secretary of the Executive Office of Energy and Environmental Affairs.

Conformance: The project does not include mitigation for impacts within the Riverfront Area – this standard does not apply. However, a 720 square foot Riverfront Area enhancement area is proposed to provide improved wildlife habitat functions in Riverfront Area adjacent to the roadway.

(h) The issuing authority shall include a continuing condition in the Certificate of Compliance for projects under 310 CMR 10.58(5)(f) or (g) prohibiting further alteration within the restoration or mitigation area, except as may be required to maintain the area in its restored or mitigated condition. Prior to requesting the issuance of the Certificate of Compliance, the applicant shall demonstrate the restoration or mitigation has been successfully completed for at least two growing seasons.

Conformance: This performance standard applies to the Conservation Commission. If required, monitoring of the proposed Riverfront Area restoration area will be coordinated with any required monitoring of the proposed BVW replication areas.

1.7 WORK IN BUFFER ZONES

Buffer Zones in the project area include those regulated by both the WPA and the Dedham Wetlands Protection By-Law. The 100-foot Buffer Zone under the WPA lies adjacent to the BVW identified in the project area.

Under the Dedham Wetlands Protection By-Law and Regulations, there are two separate buffer zones – a 100-foot Buffer Zone, which lies adjacent to the BVW and the BLSF identified in the project area, and the 200-foot Buffer Zone from the banks of the Little Wigwam Brook (coterminous with the Riverfront Area to the brook).

A majority of the work in the Buffer Zones consists of milling and overlay of the existing pavement. Mill and overlay work will result in temporary alteration, the roadway will remain in its current location and orientation and no permanent alteration will result. A portion of the work in the Buffer Zones consists of improvements including minor roadway widening and new sidewalks and will result in the alteration of existing buffer zone areas to new impervious surface.

Total alteration of the 100-foot By-Law Buffer Zone to BVW and BLSF is 93,999 square feet (2.16 acres). A total of 57,707 square feet (1.32 acres) consists of mill and overlay or overlay over existing binder work within the existing Rustcraft Road pavement. Permanent alteration of the 100-foot By-Law Buffer Zone totals 36, 292 square feet (0.83 acres). **Table 2** presents the 100-foot By-Law Buffer Zone impacts.

The Dedham Wetlands Protection By-Law also specifies a 200-foot Buffer Zone to certain local streams and rivers, including Little Wigwam Brook. The Buffer Zone runs inland from the top of the Bank of the stream or river, and is largely coincident with the 200-foot WPA Riverfront Area in this case.

As with the 100-foot By-Law Buffer Zone impacts, the majority of the 200-foot By-Law Buffer Zone impacts consists of mill and overlay or overlay over existing binder work on the existing Rustcraft Road pavement and is considered temporary alteration and totals 58,110 square feet (1.33 acres). Permanent alteration of the 200-foot By-Law Buffer Zone totals 14,110 square feet (0.32 acres). Total impacts to the 200-foot By-Law Buffer Zone totals 72,220 sf (1.66 acres). 200-foot By-Law Buffer Zone impacts are also presented in **Table 2**.

Table 2. By-Law Buffer Zone Impacts

Temporary (mill and overlay or overlay over existing binder)	Permanent	TOTAL
100-Foot Buffer Zone to BLSF and BVW		
57,707 sf (1.32 ac)	36,292 sf (0.83 ac)	93,999 sf (2.16 ac)
200-Foot Buffer Zone		
58,110 square feet (1.33 acres)	14,110 square feet (0.32 acres)	72,220 sf (1.66 acres)

An invasive plant management plans will be implemented during project construction in areas of the Buffer Zone as detailed in the plans. Common Buckthorn (*Rhamnus cathartica*), Black Locust (*Robinia pseudoacacia*), Purple Loosestrife (*Lythrum salicaria*), Japanese Knotweed (*Polygonum cuspidatum*) and Common Reed (*Phragmites australis*) will be removed in areas adjacent to the roadway. The contract specifications will require the contractor to implement the invasive species removal in accordance with MassDOT standard provisions.

2.0 BVW AND RIVERFRONT AREA ALTERNATIVES ANALYSIS

In accordance with the regulatory performance standards for BVW at 310 CMR 10.55(4) and Riverfront Area at 310 CMR 10.58(4) the following presents an analysis of practicable alternatives to the proposed improvements to Rustcraft Road in the Riverfront Area to Little Wigwam Brook.

It is important to note that the proposed improvements are to an existing public roadway within the Riverfront Area, and that the addition of a sidewalk and wider shoulders are intended to improve the safety of the increasing amount of pedestrians and bicycle riders in the project area along Elm Street and Rustcraft Road.

MassDOT's *Healthy Transportation Policy* requires the inclusion of sidewalks on both sides of the roadway for pedestrian accommodation. The proposed design includes sidewalks on both sides of Elm Street and Rustcraft Road from the western project limit through the intersection at Legacy Place to the MBTA station, a distance of approximately 1,900 feet. This segment includes the residential neighborhood of Robinwood Road, the Legacy Place retail development, two hotels, and the Avalon and Jefferson at Dedham Station apartment complexes. Crosswalks are provided across Elm Street at the Legacy Place entrance and across Rustcraft Road between the Avalon and Jefferson apartments and the MBTA station. Both crosswalks will provide Rapid Rectangular Flashing Beacons (RRFBs), providing an added level of awareness for approaching drivers when pedestrians are crossing.

East of the MBTA station, a single sidewalk will continue on the south side of Rustcraft Road to a crosswalk near the southern entrance to the Red Cross parcel (Sta. 0+30 to Sta. 0+56.5). From this point, a single sidewalk will continue on the north side of Rustcraft Road for the remainder of the project, connecting to the existing sidewalk at Fairbanks Park. The project will provide a continuous pedestrian path from Providence Highway to Fairbanks Park and the eastern project limit.

Providing a second sidewalk east of the MBTA station would significantly increase the impacts of the project, particularly wetland and environmental impacts, and is not supported by officials representing the Town of Dedham.

The proposed design has many advantages summarized as follows:

- Avoids significant impacts to all BVW
- Minimizes removal of existing vegetation
- Reduces extent of temporary and permanent easements required
- Pedestrian crossings are located at the Legacy Place Intersection, the MBTA Commuter Rail Station and the American Red Cross Building for a continuous sidewalk along the project.
- Minimizes extent of utility pole relocations

The alternate design, with sidewalk on both sides of Rustcraft Road throughout the project, would fully satisfy the *Healthy Transportation Policy*; however, there are a significant number of disadvantages:

- The fully-compliant project would result in additional and significant BVW impacts, approximately 4,000 square feet, which would require mitigation through extensive wetland replication. A partial reduction of wetland impacts could be achieved through the use of retaining walls; however, these would substantially increase the construction cost.
- The northerly side of the roadway would be curbed for its entire length, thereby losing the ability to utilize country drainage and other low impact design techniques adjacent to the roadway. All roadway stormwater runoff would need to be conveyed by closed drainage;

however, there is a limited amount of land suitable for accommodation of stormwater treatment areas. This will significantly reduce the stormwater quality for the project.

- Additional right of way acquisitions would be required; the proposed project is accommodated entirely within the existing right-of-way.

As part of the early coordination and outreach for the project, the Conservation Commission offered comments on the preliminary design. A few of the relevant comments relating to the fully-complaint design include the following:

- “These impacts will be extremely difficult to mitigate and, therefore, permit, and, per the State Wetlands Act, would require significantly more time for review.”
- “It would reduce the filling of BVW to 2,650 sq. ft, reduce additional impervious area to 28,000 sq. ft. and require less filling within a flood zone”
- “The Commission also understands the need for MassDOT's complete vehicular, bicycle, and pedestrian accommodations for projects; however, due the environmental site constraints with this section of Rustcraft Road, we strongly recommend and hope that MassDOT consider support of a design that includes only one sidewalk through this section to reduce the significant environmental impacts.”

3.0 WETLAND REPLICATION PLAN

3.1 BVW

The project includes the creation of 760 square feet of BVW replication area, located adjacent to the roadway and connected to the existing BVW on the north side of the roadway, approximately 100-foot long and running from Sta. 40 + 12 to Sta. 41 + 06. The proposed BVW replication area fully complies with the Performance Standards for BVW replication, particularly 310 CMR 10.54(4)(b).

The replication area plan and planting details are included in full size on the project plans and illustrated in **Figure 5** below. Details for the replication area are illustrated in **Figure 6** below.

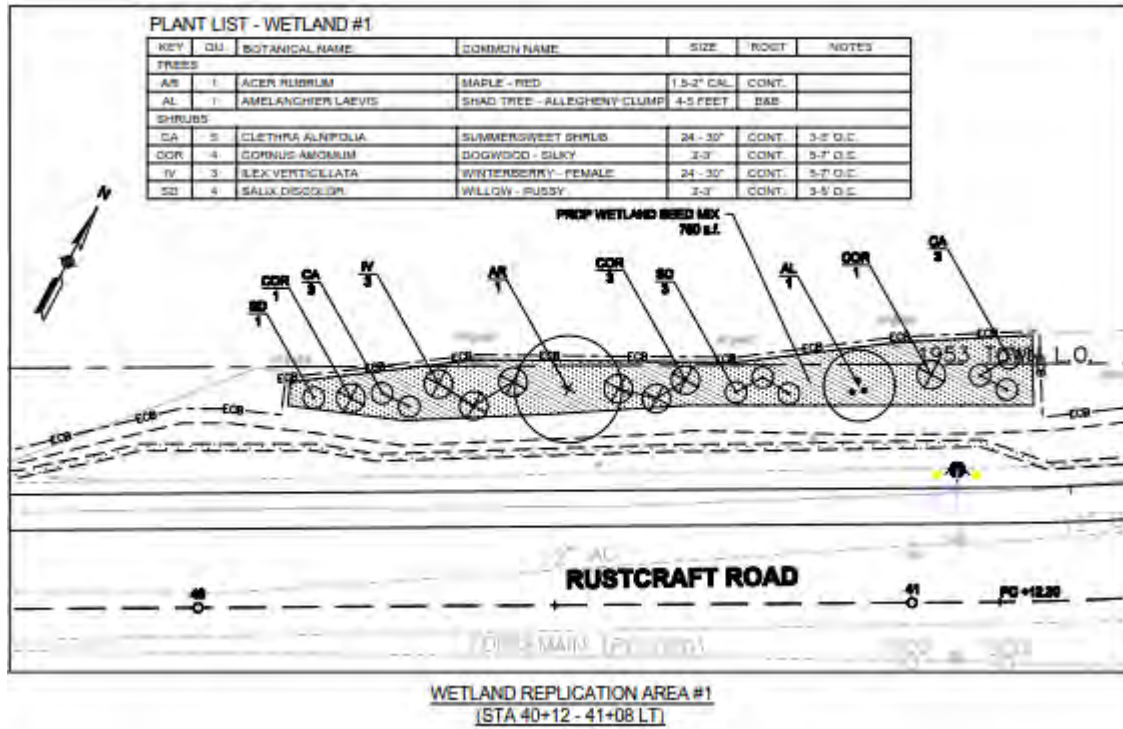


Figure 5. Wetland Replication Plan

Wetland tree and shrub species including Red Maple (*Acer rubrum*), Shad Tree (*Amelanchier laevis*), Summersweet Shrub (*Clethra alnifolia*), Silky Dogwood (*Cornus amomium*), Winterberry (*Ilex verticillata*), and Pussy Willow (*Salix discolor*) will be planted and spaced in accordance with standard practice. The replication area will be excavated 12-inches below the adjacent wetland grade, backfilled with an organic planting soil mix, and 2-inches of compost topsoil will be placed on top before planting of the wetland plant species at the recommended spacing. Finally, a wetland seed mixture will be spread throughout the replication area.

In addition, the temporary impacts to 675 square feet of BVW will be mitigated by restoration in place of the impacted areas. Existing grades will be restored with an organic planting soil mix and the wetland seed mixture will be spread throughout the restoration areas.

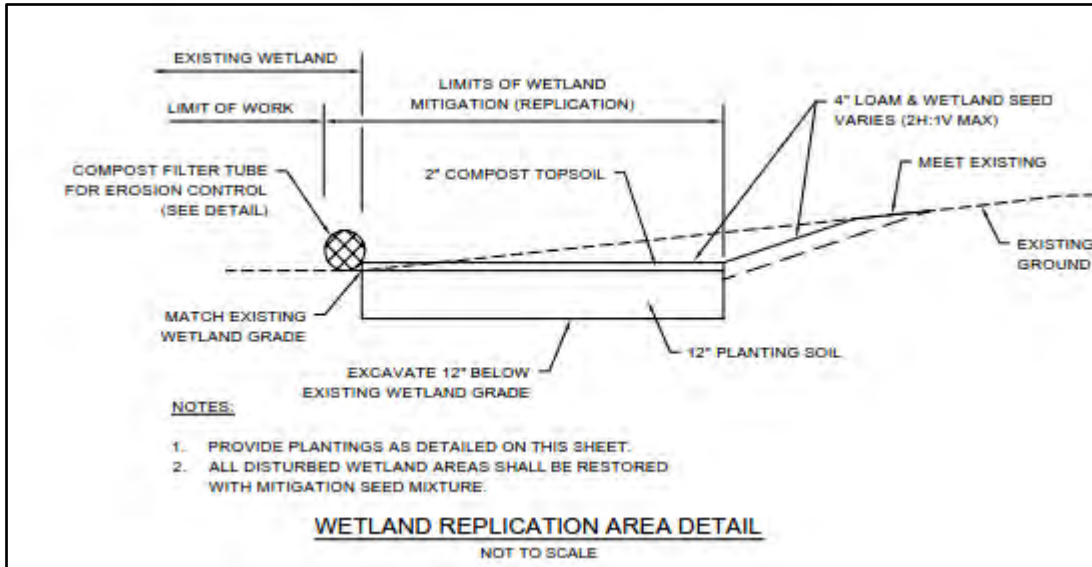


Figure 6. Wetland Replication Area Detail

3.2 RIVERFRONT AREA RESTORATION

An area of Riverfront Area adjacent to the brook will be enhanced with plantings to improve habitat in the area. Similar to the wetland replication area details described above, the Riverfront Area restoration area will be planted with wetland tree and shrub species including Red Maple (*Acer rubrum*), Shad Tree (*Amelanchier laevis*), Summersweet Shrub (*Clethra alnifolia*), Silky Dogwood (*Cornus amomium*), Winterberry (*Ilex verticillata*), and Pussy Willow (*Salix discolor*) will be planted and spaced in accordance with standard practice. A 2-inch layer of compost topsoil will be added and a wetland seed mixture will be sown throughout the restoration area. The Riverfront Area restoration plan is included in the full size project plans and is illustrated in **Figure 7** below. **Figure 8** shows a typical detail for the restoration area.

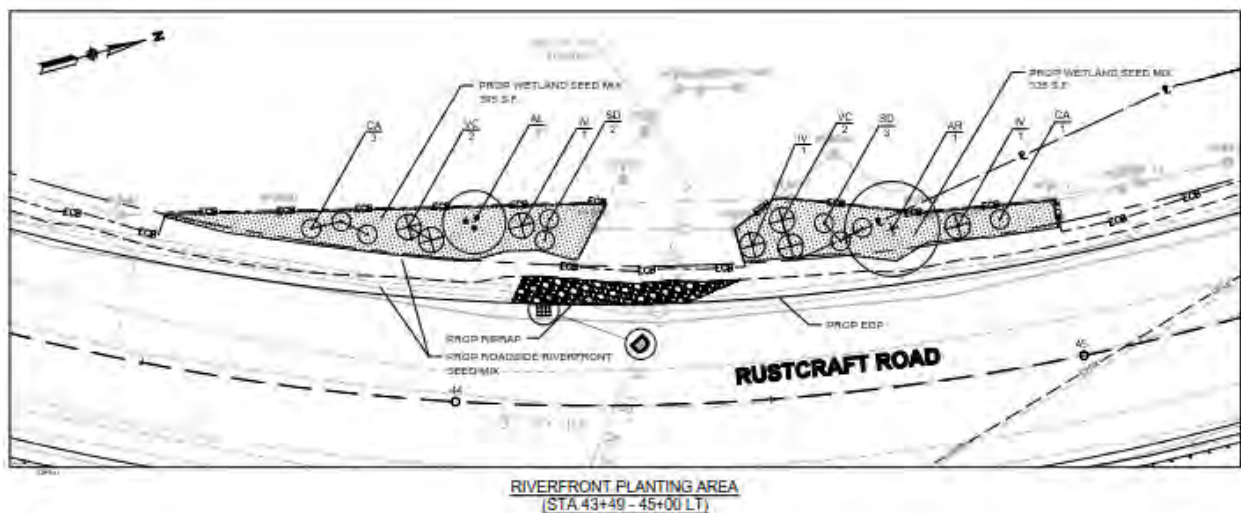


Figure 7. Riverfront Area Restoration Plan

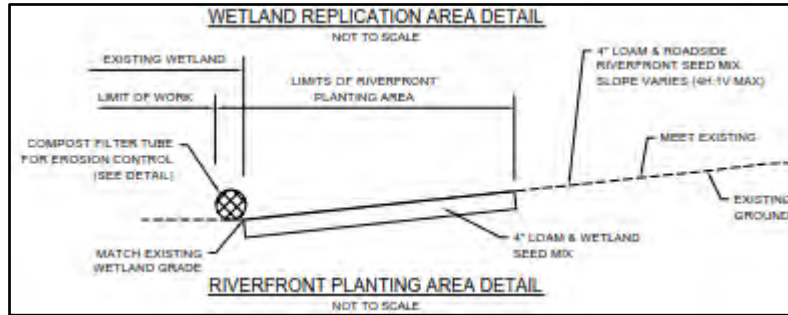


Figure 8. Riverfront Area Restoration Detail

4.0 STORMWATER MANAGEMENT

A detailed Stormwater Management Report is attached as Appendix C.

4.1 EXISTING CONDITIONS

Natural Resources Conservation Service (NRCS) maps for the project area list soils as Merrimac-Urban Land Complex, rated in hydrologic soil group (HSG) A, and Urban Land and Udorthents, wet substratum, unrated on the western portion of the project area and Freetown muck, rated in HSG A/D, Udorthents loamy, rated in HSG A, and Urban land, unrated on the eastern portion of the project area. For the purposes of calculations included in this report Urban Land and Udorthents was conservatively assumed to contain HSG A soils as soils surrounding the project area are rated in HSG A.

The project is located within the Charles River watershed, which is listed as an impaired waterway/water body.

Stormwater runoff is primarily collected through a number of catchbasins located on Elm Street and Rustcraft Road, routed through closed drainage systems, and discharged through several outfalls along the road. There are two distinct drainage basins associated with the project. The first system is located between the northerly project limit and a roadway high point approximately 400 feet south of Charnstaff Lane and discharges to the aforementioned 36" corrugated metal culvert. The second system, located between the southerly project limit and the roadway high point, continues to flow approximately 1,800 feet through the closed drainage south of the project limits, ultimately discharging adjacent to the intersection of Boston Road and Glad Valley Drive. Analysis of the drainage system north of the roadway high point indicates the system to be insufficient to carry stormwater for storms greater than the 2-year event. The drainage system to the south of the roadway high point was not analyzed for capacity due to the project's limited contribution to the upstream portions of the system.

The total watershed area, including upstream areas that flow onto the roadway, is approximately 12.1 acres. Watershed areas and discharge locations are shown in the Watershed Plans in the Stormwater Report.

4.2 PROPOSED STORMWATER MANAGEMENT BEST MANAGEMENT PRACTICES

Proposed Best Management Practices (BMPs) and Low Impact Development (LIDs) Techniques include country drainage, disconnected impervious area, water quality swales, deep sump catchbasins with hoods, subsurface infiltration systems, and an infiltration pond. LID techniques utilized along portions of the project consist of country drainage, water quality/infiltration swales, and LID sidewalks that are pitched away from the roadway surface (disconnected impervious area).

The proposed BMPs will remove between 25% and 94% of Total Suspended Solids (TSS) for approximately 91,400 sq. ft. of impervious surfaces within the project area. The project-wide TSS removal rate is approximately 21.0%, which is equivalent an 80% TSS removal rate for approximately 61,963 sq. ft. Details and areas of each treatment train are included in the Stormwater Management Report (Appendix C). Recharge and infiltration system design calculations are also provided in the report. Proposed BMPs including subsurface infiltration systems and an infiltration basin are consistent with recommended treatment practices for nutrients and pathogens and will provide compliance with the Charles River Watershed TMDL. Mitigation measures and locations are shown on the plan set (Appendix B) and the proposed project as is relates to the MassDEP's Stormwater Management Standards is described in the section below.

4.3 COMPLIANCE WITH STORMWATER PERFORMANCE STANDARDS

Performance Standards for stormwater management are included at 310 CMR 10.05(6)(k) through (q).

(k) No Area Subject to Protection under M.G.L. c. 131, § 40 other than bordering land subject to flooding, isolated land subject to flooding, land subject to coastal storm flowage, or riverfront area may be altered or filled for the impoundment or detention of stormwater, the control of sedimentation or the attenuation of pollutants in stormwater discharges, and the applicable performance standards shall apply to any such alteration or fill. Except as expressly provided, stormwater runoff from all industrial, commercial, institutional, office, residential and transportation projects that are subject to regulation under M.G.L. c. 131, § 40 including site preparation, construction, and redevelopment and all point source stormwater discharges from said projects within an Area Subject to Protection under M.G.L. c. 131, § 40 or within the Buffer Zone shall be provided with stormwater best management practices to attenuate pollutants and to provide a setback from the receiving waters and wetlands in accordance with the following Stormwater Management Standards as further defined and specified in the Massachusetts Stormwater Handbook:

Standard 1. *No new stormwater conveyances (e.g. outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.*

Conformance: No new untreated discharges to wetlands are created as part of this project – project complies.

Standard 2. *Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates. This Standard may be waived for discharges to land subject to coastal storm flowage as defined in 310 CMR 10.04.*

Conformance: The project will mitigate impacts to peak runoff rates to the maximum extent practicable by installing water quality/infiltration swales, subsurface infiltration systems, and an infiltration basin. Project-wide there will be minor increases to the peak rates of runoff and volume of stormwater discharged from the site – project complies to the maximum extent practicable.

Standard 3. *Loss of annual recharge to ground water shall be eliminated or minimized through the use of infiltration measures including environmentally sensitive site design, low impact development techniques, stormwater best management practices and good operation and maintenance. At a minimum, the annual recharge from the post- development site shall approximate the annual recharge from the pre-development conditions based on soil type.*

This Standard is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the Massachusetts Stormwater Handbook.

Conformance: Subsurface infiltration systems, water quality/infiltration swales and an infiltration basin will provide the required recharge volume for new impervious surfaces – project complies.

Standard 4. *Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS). This Standard is met when:*

- a. Suitable practices for source control and pollution prevention are identified in a long-term pollution prevention plan and thereafter are implemented and maintained;*
- b. Structural stormwater best management practices are sized to capture the required water quality volume determined in accordance with Massachusetts Stormwater Handbook; and*
- c. Pretreatment is provided in accordance with the Massachusetts Stormwater Handbook.*

Conformance: Proposed drainage system improvements, including the installation of deep sump catchbasins with hoods, water quality/infiltration swales, subsurface infiltration systems, and an infiltration basin will provide treatment of stormwater runoff that does not currently exist. The proposed project will provide a TSS removal rate between 25% and 94% for approximately 91,400 sq. ft. of impervious surfaces. The project will provide an 80% TSS removal equivalent treatment area of over 61,963 sq. ft. and exceeds the proposed new impervious area of 29,800 sq. ft. – project complies to the maximum extent practicable.

Standard 5. *For land uses with higher potential pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable. If through source control and/or pollution prevention, all land uses with higher potential pollutant loads cannot be completely protected from exposure to rain, snow, snow melt and stormwater runoff, the proponent shall use the specific structural stormwater BMPs determined by the Department to be suitable for such use as provided in the Massachusetts Stormwater Handbook.*

Stormwater discharges from land uses with higher potential pollutant loads shall also comply with the requirements of the Massachusetts Clean Waters Act, M.G.L. c. 21, §§ 26 through 53, and the regulations promulgated thereunder at 314 CMR 3.00: Surface Water Discharge Permit Program, 314 CMR 4.00: Massachusetts Surface Water Quality Standards and 314 CMR 5.00: Ground Water Discharge Permit Program.

Conformance: The project does not propose Land Uses with Higher Potential Pollutant Loads – not applicable.

Standard 6. *Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply and stormwater discharges near or to any other critical area require the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such area as provided in the Massachusetts Stormwater Handbook. A discharge is near a critical area, if there is a strong likelihood of a significant impact occurring to said area, taking into account site-specific factors.*

Stormwater discharges to Outstanding Resource Waters and Special Resource Waters shall be removed and set back from the receiving water or wetland and receive the highest and best practical method of treatment. A “storm water discharge” as defined in 314 CMR 3.04(2)(a) or (b) to an Outstanding Resource Water or Special Resource Water shall comply with 314 CMR 3.00: Surface Water Discharge Permit Program and 314 CMR 4.00: Massachusetts Surface Water Quality Standards. Stormwater discharges to a Zone I or Zone A are prohibited, unless essential to the operation of the public water supply.

Conformance: The project will not result in any direct stormwater discharges to critical area – not applicable.

Standard 7. *A redevelopment project is required to meet the following Stormwater Management Standards only to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural stormwater best management practice requirements of Standards 4, 5 and 6. Existing stormwater discharges shall comply with Standard 1 only to the maximum extent practicable. A redevelopment project shall also comply with all other requirements of the Stormwater Management Standards and improve existing conditions.*

Conformance: The project is classified as a redevelopment under the first definition “Maintenance and improvement of existing roadways, including widening less than a single lane, adding shoulders, correcting substandard intersections, improving existing drainage systems and repaving. Proposed deep sump catchbasins with hoods, water quality/infiltration swales, subsurface infiltration systems, and an infiltration basin will provide treatment to the maximum extent practicable. Standards 1, 3, and 8-10 are met and Standards 2 and 4 are met to the maximum extent practicable. Standards 5 and 6 are not applicable to this project.

Standard 8. *A plan to control construction related impacts including erosion, sedimentation and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation and pollution prevention plan) shall be developed and implemented.*

Conformance: A Construction Period Pollution Prevention and Erosion and Sediment Control Plan is included in the Stormwater Report. A Stormwater Pollution Prevention Plan will be provided with the construction documents and a Notice of Intent will be filed with EPA prior to commencement of construction.

Standard 9. *A long-term operation and maintenance plan shall be developed and implemented to ensure that the stormwater management system functions as designed.*

Conformance: Operations and maintenance of stormwater management systems will be the responsibility of the Town of Dedham DPW. Therefore, street sweeping and inspection and maintenance of catchbasins, manholes, infiltration systems, and water quality swales will be in accordance with the Town-wide Operations and Maintenance schedule.

Standard 10. *All illicit discharges to the stormwater management system are prohibited.*

Conformance: There are currently no known illicit discharges within the project limits and new discharges are prohibited.

5.0 PHOTOS



Typical slope along north side of roadway adjacent to wetlands (Sta. 45+00± to 46+00± LT)



Wetlands at Existing Edge of Pavement (Sta. 44+25± LT)



Wetlands at Existing Edge of Pavement (Sta. 44+25± to 38+00± LT)



Wetlands at Existing Edge of Pavement (Sta. 42+50± to 43+50± LT)

APPENDIX A – Wetlands Delineation Information

Wetland Strategies, Inc.

5 Main Street Ext., Suite 303
Plymouth, MA 02360

Phone: 508.747.4266
FAX: 781.723.0406

August 6, 2014

Phil Paradis, PE
BETA Group, Inc.
315 Norwood Park South
Norwood, MA 02062

RE: Professional wetland services
Rustcraft Road
Dedham, MA

Dear Phil:

Wetland Strategies, Inc. (WSI) is pleased to present this report of the wetland resource areas identified and flagged by this office at the above referenced location. WSI was tasked with conducting a site inspection and identifying the boundaries of any wetland resource areas located within 100 feet of Rustcraft Road in Dedham MA. The project scope is the area within 100 feet of Rustcraft Road from its intersection with Presidential Way east to the Dedham Youth Soccer Athletic Field. Our findings and conclusions have been compiled for your review as follows.

The area investigated by WSI encompasses approximately 2,200 linear feet of Rustcraft Road in Dedham, MA. WSI reviewed the area for the presence of any jurisdictional wetland resource areas within 100 feet of Rustcraft Road. Much of the subject area is comprised of dense wooded areas to the north of the road and commercial development to the south. Little Wigwam Stream, a perennial stream, crosses beneath Rustcraft Road and connects Little Wigwam Pond to Wigwam Pond. Its location is shown on the enclosed Figure 1. The

stream supports a bordering vegetated wetland (BVW) which was flagged by this office during the course of the investigation.

Wetland resource areas identified and flagged by this office include the following.

Wetland Series A:

Wetland A is a bordering vegetated wetland, located adjacent to Wigwam Stream on the north side of Rustcraft Road. WSI located flags A1 through A 110 to denote the edge of the BVW using pink/black sequentially numbered tape. Vegetation within the BVW is a dense mixture of red maple trees, highbush blueberry and viburnum shrubs, and robust stands of mature poison ivy. A steep slope limits the edge of the wetland as it drops from Rustcraft Road to the edge of the wetland.

Wetland Series B:

Wetland B is another BVW located on the south side of Rustcraft Road. It was flagged by this office using pink/black tape identified as B1 through B6. This series defines the wetlands associated with a narrow ditch running parallel to Rustcraft Road. The ditch appears to serve as a roadway retention area, collecting storm water runoff from Rustcraft Road. There were no up-stream or down-stream culverts observed connecting it to other wetlands. Vegetation used to establish the edge of the BVW included highbush blueberry, red maples, and sensitive ferns. The wetland is confined to the edge of the ditch due to the roadway on one side and the MBTA rail way on the opposite side.

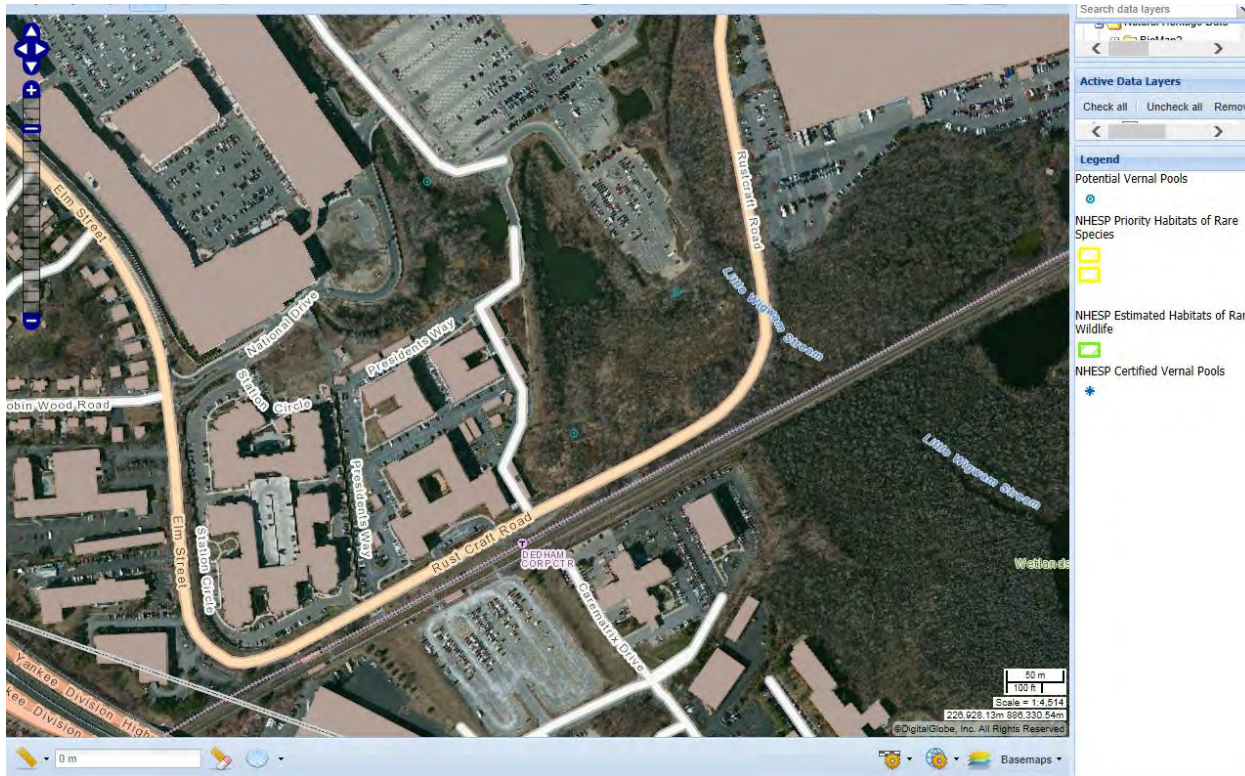
Wetland Series C:

Wetland C is a BVW associated with Little Wigwam Stream and is located south of Rustcraft Road. It runs parallel to Rustcraft Road and is located between Rustcraft and the MBTA rail line. Predominant vegetation in the BVW includes red maple, highbush blue berry and viburnum shrubs in the upper canopy with cattails and horsetails below. WSI flagged the edge of wetland series C with flags labeled as C 1 through C 33.

Little Wigwam Stream:

WSI established the top of bank, or mean annual high water mark along the banks of Little Wigwam Stream. Establishing the top of bank is required for purposes of determining the riverfront area associated with the stream. Riverfront area is a 200-foot corridor extending landward from the top of bank. WSI established the top of bank on both the north and south sides of Rustcraft Road at Little Wigwam Stream. On the north side, the top of bank is coincident with the edge of the BVW, as the steep slope at the top of the bank limits the landward edge of the BVW. Blue flags labeled B3 through B68 denote the top of bank to the north of Rustcraft. On the south side of Rustcraft, the top of bank was flagged using blue tape labeled B1 through B8.

In addition to the site inspection and top of bank flagging, WSI also researched the publicly available site information. Based on that review, WSI notes that there are no rare or endangered species habitats identified at the site (Source: MA GIS, Natural Heritage and Endangered Species Program, 2008). Two (2) potential vernal pools have been identified on MA GIS within the A series of wetland flags. They are both located north of Rustcraft Rd. and are shown as the blue dots in the photo below.



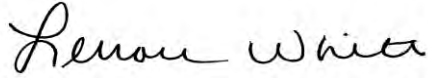
FEMA has identified a flood zone at the site and WSI has prepared the enclosed firmette. As shown on the enclosed firmette, the 100 year flood elevation has not been determined, but shows as an-determined A zone. Flood zones are one type of jurisdictional wetland resource areas and any fill in a flood zone must comply with the performance standards for Bordering Land Subject to Flooding found in the MA wetland regulations at 310 CMR 10.57.

In sum, WSI reviewed the site for the presence of any wetland resource areas. A site inspection was conducted and WSI flagged the edge of the wetland or bordering vegetated wetlands to the north and south of Rustcraft Road. In addition, the top of bank, or mean annual high water line for purposes of identifying the 200-foot riverfront area associated with Little Wigam Stream. Bordering Land Subject to Flooding is found at the site and WSI prepared the enclosed firmette which shows the extent of the flood zone. Little Wigam Stream is a perennial stream and thus includes Land Under Waterways and Water Bodies,

which is another wetland resource area. Land Under Water begins at mean low water and extends to the top of bank.

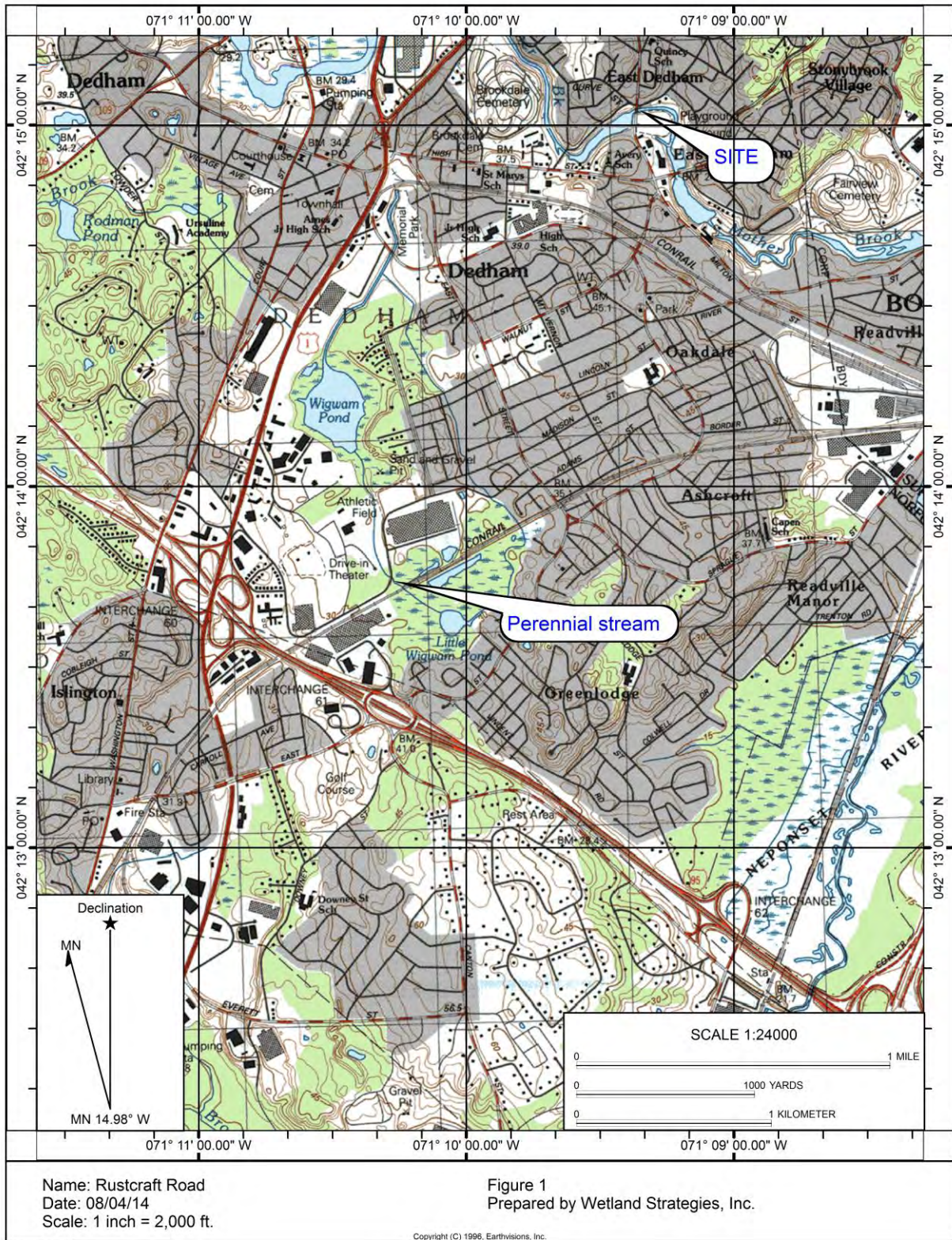
Thank you for using the services of Wetland Strategies, Inc. Should you have any questions, please do not hesitate to contact this office.

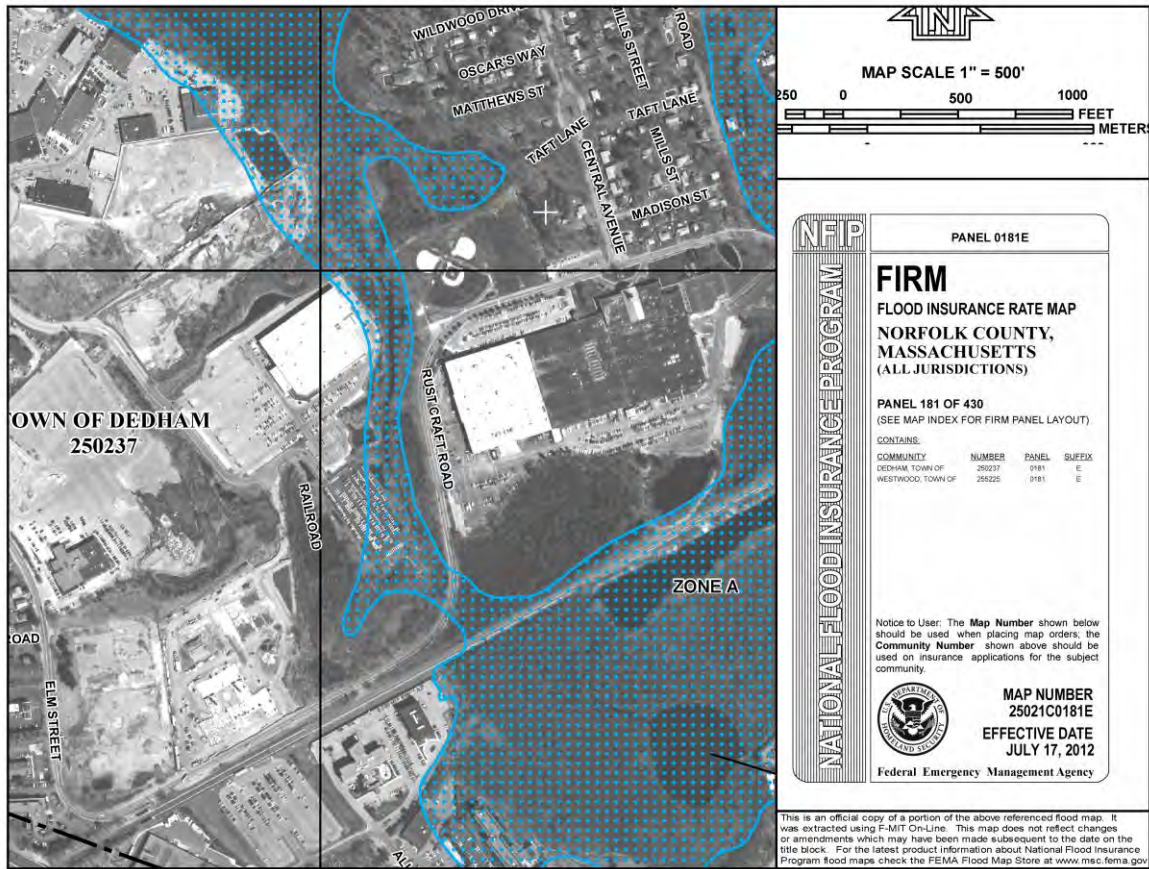
Sincerely,
Wetland Strategies, Inc.

A handwritten signature in cursive script that reads "Lenore White".

Lenore White, PWS
Principal

Enclosures





DEP Bordering Vegetated Wetlands (310 CMR 10.55) Delineation Field Data Form

Applicant: BETA Group, Inc. **Prepared by:** Lenore White, PWS, Wetland Strategies, Inc.
Project Location: Rustcraft Road, Dedham, MA **DEP #** _____

Check all that apply:

- Vegetation alone presumed adequate to delineate BVW boundary: fill out Section I only
- Vegetation and other indicators of hydrology used to delineate BVW boundary: fill out Sections I & II
- Method other than dominance test used (attach additional information)

Section I. Vegetation	Observation Plot Number: <u>1</u>	Transect Number: <u>A6-wetland</u>	Date: 07.08.2014
-----------------------	-----------------------------------	------------------------------------	------------------

A. Sample Layer and Plant Species (by common/scientific name)	B. Percent Cover (or basal area)	C. Percent Dominance	D. Dominant (yes or no)	E. Wetland Indicator Category*
Red maple (<i>Acer rubrum</i>)	45%	50	Y	FACW+
Glossy Buckthorn (<i>Rhamnus sp.</i>)	25%	28	Y	FAC
Poison ivy (<i>Toxicodendron radicans</i>)	10%	16	N	FAC
Cinquefoil (<i>Potentilla sp.</i>)	10%	5	N	FACU

* Use an asterisk to mark wetland indicator plants: plants listed in the Wetlands Protection Act (MGL c.131, s.40); plants in the genus Sphagnum; plants listed as FAC, FAC+, FACW-, FACW+, or OBL; or plants with physiological or morphological adaptations; if any plants are identified as wetland indicator plants due to physiological or morphological adaptations, describe the adaptations next to the asterisk

Section I: Vegetation Conclusion

Number of dominant wetland indicator plants: 2 Number of dominant non-wetland indicator plants: 0

Is the number of dominant wetland indicator plants equal to or greater than the number of dominant non-wetland indicator plants? Yes X No

If vegetation alone is presumed adequate to delineate the BVW boundary, submit this form with the Request for Determination of Applicability or Notice of Intent.

DEP Bordering Vegetated Wetlands (310 CMR 10.55) Delineation Field Data Form

Applicant: BETA Group, Inc. **Prepared by:** Lenore White, PWS, Wetland Strategies, Inc.
Project Location: Rustcraft Road, Dedham, MA **DEP #** _____

Check all that apply:

- Vegetation alone presumed adequate to delineate BVW boundary: fill out Section I only
- Vegetation and other indicators of hydrology used to delineate BVW boundary: fill out Sections I & II
- Method other than dominance test used (attach additional information)

Section I	Vegetation	Observation Plot Number: <u>1</u>	Transect Number: <u>A6-upland</u>	Date: <u>07.08.2014</u>
-----------	------------	-----------------------------------	-----------------------------------	-------------------------

A. Sample Layer and Plant Species (by common/scientific name)	B. Percent Cover (or basal area)	C. Percent Dominance	D. Dominant (yes or no)	E. Wetland Indicator Category*
Japanese Knotweed (<i>Polygonum cuspidatum</i>)	65%	65	Y	UPL
Crabapple	20%	20	Y	UPL
Black cherry (<i>Prunus serotina</i>)	15%	15	N	UPL
Red Maple (<i>Acer rubrum</i>)	10%	10	N	FACW
Cinquefoil (<i>Potentilla</i> sp.)	25%	25	Y	UPL

* Use an asterisk to mark wetland indicator plants: plants listed in the Wetlands Protection Act (MGL c.131, s.40); plants in the genus Sphagnum; plants listed as FAC, FAC+, FACW-, FACW+, or OBL; or plants with physiological or morphological adaptations; if any plants are identified as wetland indicator plants due to physiological or morphological adaptations, describe the adaptations next to the asterisk

Section I: Vegetation Conclusion

Number of dominant wetland indicator plants: 0 Number of dominant non-wetland indicator plants: 3

Is the number of dominant wetland indicator plants equal to or greater than the number of dominant non-wetland indicator plants? Yes No

If vegetation alone is presumed adequate to delineate the B V W boundary, submit this form with the Request for Determination of Applicability or Notice of Intent.

APPENDIX B – Project Plans (Attached Separately)

APPENDIX C – Stormwater Management Report (Attached Separately)

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION HIGHWAY DIVISION

PLAN AND PROFILE OF ELM STREET AND RUSTCRAFT ROAD ROADWAY AND SIDEWALK IMPROVEMENTS

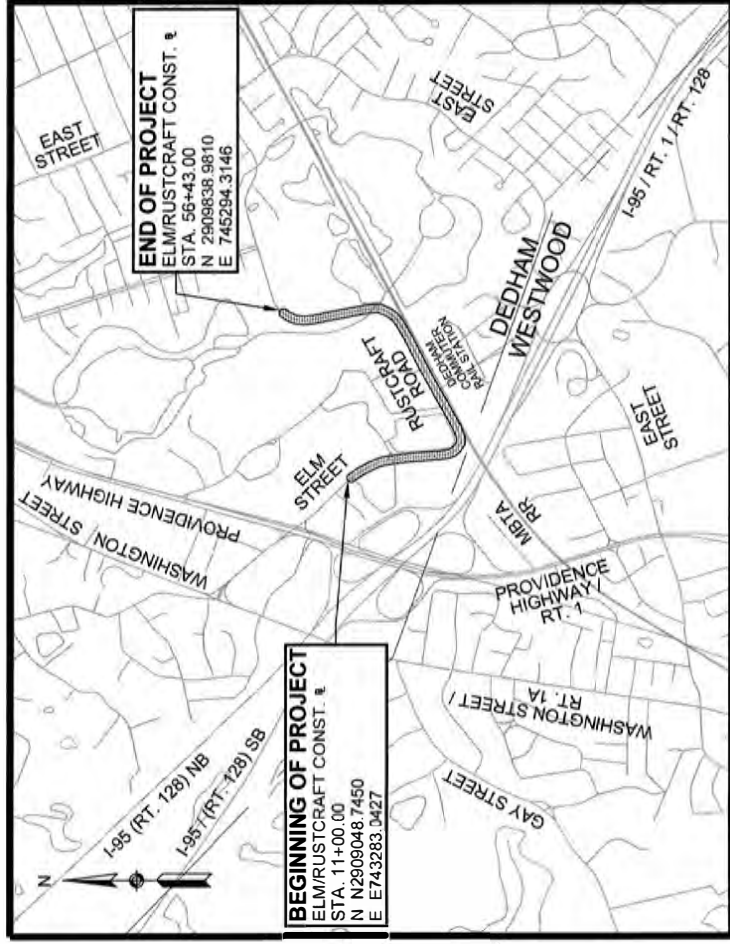
IN THE TOWN OF
DEDHAM
NORFOLK COUNTY

FEDERAL AID PROJECT NO. XX-XXXX(XXX)

INDEX

SHEET NO.	DESCRIPTION
1	TITLE SHEET & INDEX
2	LEGEND & ABBREVIATIONS
3	KEY PLAN & BORING LOCATIONS
4-5	TYPICAL SECTIONS
6	GENERAL NOTES
7-13	CONSTRUCTION DETAILS
14-22	CONSTRUCTION PLANS
23-27	PROFILES
28-36	CURB TIE & GRADING PLANS
37-45	DRAINAGE & UTILITY PLANS*
46-50	SIGNS & PAVEMENT MARKING PLANS
51	TRAFFIC SIGN SUMMARY
52-53	TEMPORARY TRAFFIC CONTROL PLANS
54	WETLAND & RIVERFRONT PLANTING PLAN
55	INVASIVE PLANT LOCATION PLAN
56-68	CROSS SECTIONS
	WETLAND IMPACT PLANS

*INCLUDED IN NOTICE OF INTENT PERMIT SET



LENGTH OF PROJECT = 4543.00 FEET = 0.860 MILES

THE MASSACHUSETTS HIGHWAY DEPARTMENT STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES DATED 1988, AS AMENDED, THE SUPPLEMENTAL SPECIFICATIONS DATED JULY 1, 2015, THE OCTOBER 2017 CONSTRUCTION STANDARD DETAILS, THE 2015 OVERHEAD SIGNAL STRUCTURE AND FOUNDATION STANDARD DRAWINGS, MASSDOT TRAFFIC MANAGEMENT PLANS AND DETAIL DRAWINGS, THE LATEST MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS WITH MASSACHUSETTS AMENDMENTS, THE 1990 STANDARD DRAWINGS FOR SIGNS AND SUPPORTS, THE 1968 STANDARD DRAWINGS FOR TRAFFIC SIGNALS AND HIGHWAY LIGHTING, AND THE LATEST EDITION OF THE AMERICAN STANDARD FOR NURSERY STOCK, WILL GOVERN.

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XX-XXXX(XXX)	1	68

PROJECT FILE NO. 607901

TITLE SHEET & INDEX

DESIGN DESIGNATION	ELM STREET	RUSTCRAFT ROAD
DESIGN SPEED	30 MPH*	30 MPH
ADT (2014)	14,700	6,900
ADT (2024)	15,450	7,250
K	8.8%	7.6%
D	52% (NB)	55% (WB)
T (PEAK HOUR)	5.9%	8.2%
T (AVERAGE DAY)	4.3%	5.3%
DHV	1,360	551
DDHV	707	303
FUNCTIONAL CLASSIFICATION	URBAN MINOR ARTERIAL	URBAN MINOR ARTERIAL

*STA. 19+00 TO 31+00
20 MPH PER SPEED REGULATION

NOTICE OF INTENT PERMIT SET

DATE	DESCRIPTION	REV #
02/05/2018	NOI PERMIT SET	0



PREPARED BY:

DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
APPROVED:

DIVISION ADMINISTRATOR

RECOMMENDED FOR APPROVAL

CHIEF ENGINEER

APPROVED

HIGHWAY ADMINISTRATOR

GENERAL SYMBOLS		DESCRIPTION
	EXISTING	JERSEY BARRIER
	PROPOSED	JERSEY BARRIER
	EXISTING	CATCH BASIN
	PROPOSED	CATCH BASIN
	EXISTING	FLAG POLE
	PROPOSED	FLAG POLE
	EXISTING	GAS PUMP
	PROPOSED	GAS PUMP
	EXISTING	MAIL BOX
	PROPOSED	MAIL BOX
	EXISTING	POST SQUARE
	PROPOSED	POST SQUARE
	EXISTING	WELL
	PROPOSED	WELL
	EXISTING	ELECTRIC HANDHOLE
	PROPOSED	ELECTRIC HANDHOLE
	EXISTING	FENCE GATE POST
	PROPOSED	FENCE GATE POST
	EXISTING	GAS GATE
	PROPOSED	GAS GATE
	EXISTING	BORING HOLE
	PROPOSED	BORING HOLE
	EXISTING	MONITORING WELL
	PROPOSED	MONITORING WELL
	EXISTING	TEST PIT
	PROPOSED	TEST PIT
	EXISTING	LIGHT POLE
	PROPOSED	LIGHT POLE
	EXISTING	COUNTY BOUND
	PROPOSED	COUNTY BOUND
	EXISTING	CABLE MANHOLE
	PROPOSED	CABLE MANHOLE
	EXISTING	DRAINAGE MANHOLE
	PROPOSED	DRAINAGE MANHOLE
	EXISTING	ELECTRIC MANHOLE
	PROPOSED	ELECTRIC MANHOLE
	EXISTING	GAS MANHOLE
	PROPOSED	GAS MANHOLE
	EXISTING	MISC MANHOLE
	PROPOSED	MISC MANHOLE
	EXISTING	SEWER MANHOLE
	PROPOSED	SEWER MANHOLE
	EXISTING	TELEPHONE MANHOLE
	PROPOSED	TELEPHONE MANHOLE
	EXISTING	WATER MANHOLE
	PROPOSED	WATER MANHOLE
	EXISTING	MASSACHUSETTS HIGHWAY BOUND
	PROPOSED	MASSACHUSETTS HIGHWAY BOUND
	EXISTING	MONUMENT
	PROPOSED	MONUMENT
	EXISTING	STONE BOUND
	PROPOSED	STONE BOUND
	EXISTING	TOWN OR CITY BOUND
	PROPOSED	TOWN OR CITY BOUND
	EXISTING	TRAVERSE OR TRIANGULATION STATION
	PROPOSED	TRAVERSE OR TRIANGULATION STATION
	EXISTING	TROLLEY POLE OR GUY POLE
	PROPOSED	TROLLEY POLE OR GUY POLE
	EXISTING	UTILITY POLE W/ FIREBOX
	PROPOSED	UTILITY POLE W/ FIREBOX
	EXISTING	UTILITY POLE WITH DOUBLE LIGHT
	PROPOSED	UTILITY POLE WITH DOUBLE LIGHT
	EXISTING	UTILITY POLE W/ 1 LIGHT
	PROPOSED	UTILITY POLE W/ 1 LIGHT
	EXISTING	UTILITY POLE
	PROPOSED	UTILITY POLE
	EXISTING	GUY
	PROPOSED	GUY
	EXISTING	BUSH
	PROPOSED	BUSH
	EXISTING	TREE
	PROPOSED	TREE
	EXISTING	STUMP
	PROPOSED	STUMP
	EXISTING	SWAMP / MARSH
	PROPOSED	SWAMP / MARSH
	EXISTING	WATER GATE
	PROPOSED	WATER GATE
	EXISTING	OVERHEAD CABLE/WIRE
	PROPOSED	OVERHEAD CABLE/WIRE
	EXISTING	CURBING
	PROPOSED	CURBING
	EXISTING	CONTOURS (ON-THE-GROUND SURVEY DATA)
	PROPOSED	CONTOURS (ON-THE-GROUND SURVEY DATA)
	EXISTING	CONTOURS (PHOTOGRAMMETRIC DATA)
	PROPOSED	CONTOURS (PHOTOGRAMMETRIC DATA)
	EXISTING	UNDERGROUND DRAIN PIPE (DOUBLE LINE 24 INCH AND OVER)
	PROPOSED	UNDERGROUND DRAIN PIPE (DOUBLE LINE 24 INCH AND OVER)
	EXISTING	UNDERGROUND ELECTRIC DUCT (DOUBLE LINE 24 INCH AND OVER)
	PROPOSED	UNDERGROUND ELECTRIC DUCT (DOUBLE LINE 24 INCH AND OVER)
	EXISTING	UNDERGROUND GAS MAIN (DOUBLE LINE 24 INCH AND OVER)
	PROPOSED	UNDERGROUND GAS MAIN (DOUBLE LINE 24 INCH AND OVER)
	EXISTING	UNDERGROUND SEWER MAIN (DOUBLE LINE 24 INCH AND OVER)
	PROPOSED	UNDERGROUND SEWER MAIN (DOUBLE LINE 24 INCH AND OVER)
	EXISTING	UNDERGROUND TELEPHONE DUCT (DOUBLE LINE 24 INCH AND OVER)
	PROPOSED	UNDERGROUND TELEPHONE DUCT (DOUBLE LINE 24 INCH AND OVER)
	EXISTING	UNDERGROUND WATER MAIN (DOUBLE LINE 24 INCH AND OVER)
	PROPOSED	UNDERGROUND WATER MAIN (DOUBLE LINE 24 INCH AND OVER)
	EXISTING	BALANCED STONE WALL
	PROPOSED	BALANCED STONE WALL
	EXISTING	RETAINING WALL (TYPE AS NOTED)
	PROPOSED	RETAINING WALL (TYPE AS NOTED)
	EXISTING	GUARD RAIL - STEEL POSTS
	PROPOSED	GUARD RAIL - STEEL POSTS
	EXISTING	CHAIN LINK OR METAL FENCE
	PROPOSED	CHAIN LINK OR METAL FENCE
	EXISTING	WOOD FENCE
	PROPOSED	WOOD FENCE
	EXISTING	HAY BALES/SILT FENCE
	PROPOSED	HAY BALES/SILT FENCE
	EXISTING	TREE LINE OR LIMIT OF CLEARING AND GRUBBING
	PROPOSED	TREE LINE OR LIMIT OF CLEARING AND GRUBBING
	EXISTING	SAWCUT LINE
	PROPOSED	SAWCUT LINE
	EXISTING	TOP OR BOTTOM OF SLOPE
	PROPOSED	TOP OR BOTTOM OF SLOPE
	EXISTING	LIMIT OF EDGE OF PAVEMENT OR COLD PLANE AND OVERLAY
	PROPOSED	LIMIT OF EDGE OF PAVEMENT OR COLD PLANE AND OVERLAY
	EXISTING	BANK OF RIVER OR STREAM
	PROPOSED	BANK OF RIVER OR STREAM
	EXISTING	BORDER OF WETLAND
	PROPOSED	BORDER OF WETLAND
	EXISTING	100 FT WETLAND BUFFER
	PROPOSED	100 FT WETLAND BUFFER
	EXISTING	200 FT RIVERFRONT BUFFER
	PROPOSED	200 FT RIVERFRONT BUFFER
	EXISTING	STATE HIGHWAY LAYOUT
	PROPOSED	STATE HIGHWAY LAYOUT
	EXISTING	TOWN OR CITY LAYOUT
	PROPOSED	TOWN OR CITY LAYOUT
	EXISTING	RAILROAD SIDELINE
	PROPOSED	RAILROAD SIDELINE
	EXISTING	TOWN OR CITY BOUNDARY LINE
	PROPOSED	TOWN OR CITY BOUNDARY LINE
	EXISTING	PROPERTY LINE OR APPROXIMATE PROPERTY LINE
	PROPOSED	PROPERTY LINE OR APPROXIMATE PROPERTY LINE
	EXISTING	EASEMENT
	PROPOSED	EASEMENT
	EXISTING	HIGHWAY/PROPERTY BOUND (TYPE AS NOTED)
	PROPOSED	HIGHWAY/PROPERTY BOUND (TYPE AS NOTED)
	EXISTING	BORING/PAVEMENT CORE
	PROPOSED	BORING/PAVEMENT CORE
	EXISTING	EROSION CONTROL BARRIER/COMPOST FILTER TUBES
	PROPOSED	EROSION CONTROL BARRIER/COMPOST FILTER TUBES
	EXISTING	SIGN AND POST
	PROPOSED	SIGN AND POST
	EXISTING	SIGN AND POST (2 POSTS)
	PROPOSED	SIGN AND POST (2 POSTS)
	EXISTING	CONSTRUCTION BASELINE
	PROPOSED	CONSTRUCTION BASELINE
	EXISTING	SURVEY LINE
	PROPOSED	SURVEY LINE
	EXISTING	WHEELCHAIR RAMP
	PROPOSED	WHEELCHAIR RAMP
	EXISTING	TREE (SIZE AND TYPE AS NOTED)
	PROPOSED	TREE (SIZE AND TYPE AS NOTED)

DEDDHAM
ELM STREET AND RUSTCRAFT ROAD

STATE	FED. AD PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XX-XXX-XXXX	2	68
PROJECT FILE NO.			607901

LEGEND & ABBREVIATIONS

ABBREVIATIONS (cont.)

GENERAL	PROJECT
PROJ	PROPOSED
PROP	PLANTABLE SOIL BORROW
PSB	POINT OF TANGENCY
PT	POINT OF VERTICAL CURVATURE OF POLY-VINYL-CHLORIDE-PIPE
PVC	POINT OF VERTICAL INTERSECTION
PVI	POINT OF VERTICAL TANGENCY
PVT	PAVEMENT
PVMT	PAVED WATER WAY
PWW	RADIUS OF CURVATURE
R	REMOVE AND DISPOSE
R&R	REINFORCED CONCRETE PIPE
RCP	ROAD
RD	ROADWAY
RDWY	REMOVE
REM	RETAIN
RET	RETAINING WALL
RET WALL	RIGHT OF WAY
ROW	RAILROAD
RR	REMOVE AND RESET
R&R	REMOVE AND STACK
R&S	RIGHT
RT	STONE BOUND
SB	SUBDRAIN
SD	SHOULDER
SHLD	SHEET
SHD	SHEET
SHT	SEWER MANHOLE
SMH	STREET
ST	STATION
STA	STOPPING SIGHT DISTANCE
SSD	STATE HIGHWAY LAYOUT LINE
SHLO	SIDEWALK
SW	TANGENT DISTANCE OF CURVE/TRUCK %
T	TANGENT
TAN	TEMPORARY
TEMP	TOP OF CURB
TC	TOP OF SLOPE
TOS	TOP OF WALL
TOW	TRAFFIC SIGNAL
TS	TAPPING SLEEVE, VALVE AND BOX
TSV&B	TYPICAL
UP	UTILITY POLE
UPL	UTILITY POLE w/ LIGHT
UP	VARIES
VERT	VERTICAL
VC	VERTICAL CURVE
VCP	VITRIFIED CLAY PIPE
VGC	VERTICAL GRANITE CURB
WCR	WHEEL CHAIR RAMP
WG	WATER GATE
WIP	WROUGHT IRON PIPE
WM	WATER METER/WATER MAIN
WQU	WATER QUALITY UNIT
X-SECT	CROSS SECTION

ABBREVIATIONS

GENERAL	ANNUAL AVERAGE DAILY TRAFFIC
AADT	ANNUAL AVERAGE DAILY TRAFFIC
ABAN	ABANDON
ADJ	ADJUST
APPROX	APPROXIMATE
A.C.	ASPHALT CONCRETE
ACCM PIPE	ASPHALT COATED CORRUGATED METAL PIPE
ALT	ALTERATION
BIT.	BITUMINOUS
BC	BOTTOM OF CURB
BD.	BOUND
BL (or E)	BASELINE
BLDG	BUILDING
BM	BENCHMARK
BO	BOTTOM OF SLOPE
BOW	BOTTOM OF WALL
BR	BRIDGE
BSW	BACK OF SIDEWALK
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
CIT	CHANGE IN TYPE
CLF	CHAIN LINK FENCE
CL	CENTERLINE
CMP	CORRUGATED METAL PIPE
CPP	CORRUGATED PLASTIC PIPE
CSP	CORRUGATED STEEL PIPE
CO.	COUNTY
CONC	CONCRETE
COND	CONDUIT
CONT	CONTINUOUS
CONST	CONSTRUCTION
CR GR	CROWN GRADE
DHV	DESIGN HOURLY VOLUME
DI	DROP INLET
DIA	DIAMETER
DIP	DUCTILE IRON PIPE
DW	STEADY DON'T WALK - PORTLAND ORANGE
DWY	DRIVEWAY
ELEV (or EL.)	ELEVATION
EMB	EMBANKMENT
EOP	EDGE OF PAVEMENT
EXIST (or EX)	EXISTING
EXC	EXCAVATION
F&G	FRAME AND COVER
F&G	FOUNDATION
FDN.	FOUNDATION
FLDSTN	FIELDSTONE
FM	FORCE MAIN
GAR	GARAGE
GG	GROUND
GG	GAS GATE
GI	GUTTER INLET
GIP	GALVANIZED IRON PIPE
GRAN	GRANITE
GRAV	GRAVEL
GRD	GUARD
HDW	HEADWALL
HMA	HOT MIX ASPHALT
HOR	HORIZONTAL
HYD	HYDRANT
INV	INVERT
IP	IRON PIPE
JCT	JUNCTION
L	LENGTH OF CURVE
LB	LEACH BASIN
LID	LOW IMPACT DEVELOPMENT
LP	LIGHT POLE or LOW POINT
LT	LEFT
MAX	MAXIMUM
MB	MAILBOX
MH	MANHOLE
MHB	MASSACHUSETTS HIGHWAY BOUND
MIN	MINIMUM
NIC	NOT IN CONTRACT
NO.	NUMBER
O.C.	ON CENTER
PC	POINT OF CURVATURE
PCC	POINT OF COMPOUND CURVATURE
P.G.L.	PROFILE GRADE LINE
PI	POINT OF INTERSECTION
POC	POINT ON CURVE
POT	POINT ON TANGENT
PRC	POINT OF REVERSE CURVATURE

TRAFFIC SIGNAL

CAB.	CLOSED CIRCUIT VIDEO EQUIPMENT
CCVE	CLOSED CIRCUIT VIDEO EQUIPMENT
DW	STEADY DON'T WALK
FDW	FLASHING DON'T WALK
FR	FLASHING CIRCULAR RED
FRL	FLASHING RED LEFT ARROW
FRR	FLASHING RED RIGHT ARROW
FY	FLASHING CIRCULAR AMBER
FYL	FLASHING AMBER LEFT ARROW
FYR	FLASHING AMBER RIGHT ARROW
G	STEADY CIRCULAR GREEN
GL	STEADY GREEN LEFT ARROW
GR	STEADY GREEN RIGHT ARROW
GSL	STEADY GREEN SLASH LEFT ARROW
GSR	STEADY GREEN SLASH RIGHT ARROW
GV	STEADY GREEN VERTICAL ARROW
OL	OVERLAP
PED	PEDESTRIAN
PTZ	PAN, TILT, ZOOM
R	STEADY CIRCULAR RED
RL	STEADY RED LEFT ARROW
RR	STEADY RED RIGHT ARROW
TR SIG	TRAFFIC SIGNAL
TSC	TRAFFIC SIGNAL CONDUIT
W	STEADY WALK
Y	STEADY CIRCULAR AMBER
YL	STEADY AMBER LEFT ARROW

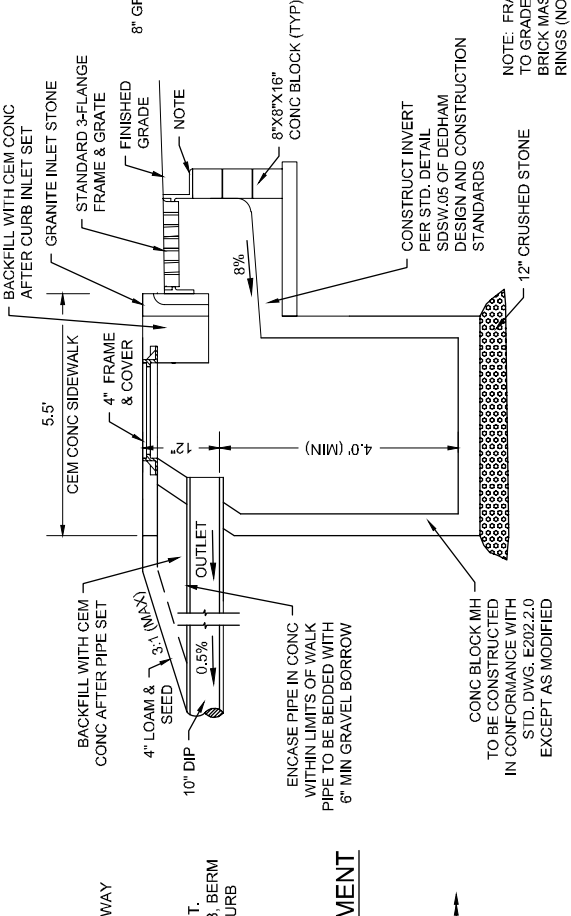
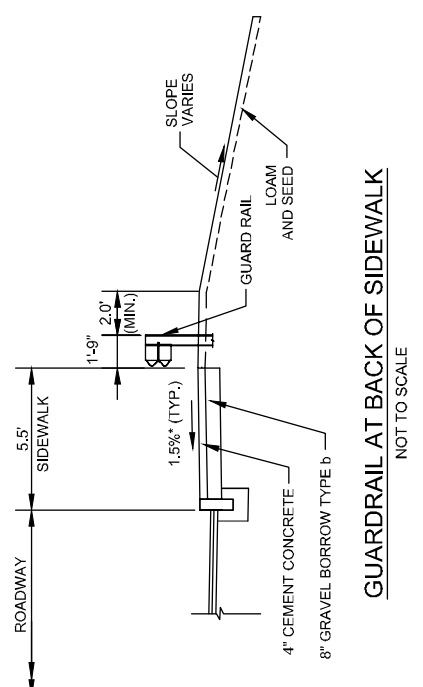
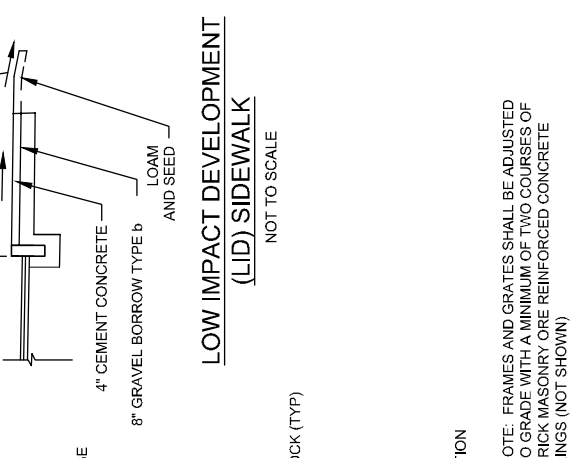
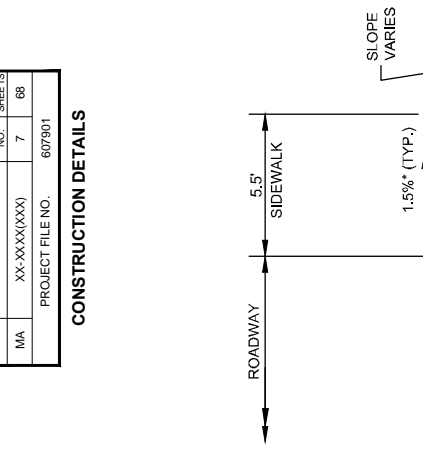
PAVEMENT MARKINGS AND SIGNING SYMBOLS

PROPOSED	DESCRIPTION
	CROSSWALK, 2 - 12" WHITE LINES (8" WIDTH)
	STOP LINE - 12" WHITE LINE 4" BEHIND CW (TYP)
	SOLID WHITE EDGE LINE - 4"
	SOLID WHITE CHANNELIZING LINES - 12" (SPACING NOTED)
	SOLID WHITE GORE LINE 12" @ 33°, (SPACING NOTED)
	SOLID WHITE LANE LINE - 4"
	SOLID WHITE PARKING LINE - 4"
	BROKEN WHITE LANE LINE - 4"
	DOTTED WHITE LANE EXTENSION LINE - 4" (2" LINE & 6" GAP)
	DOTTED YELLOW LANE EXTENSION LINE - 4" (2" LINE & 6" GAP)

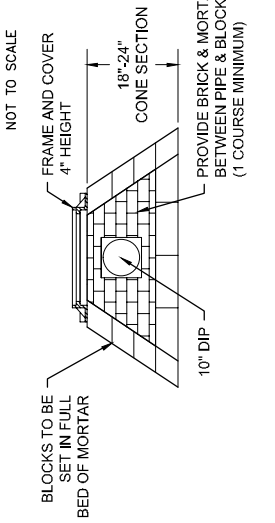
DEDHAM
ELM STREET AND RUSTCRAFT ROAD

STATE	FED. AD PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XX-XXX(XXX)	7	68
PROJECT FILE NO.		607901	

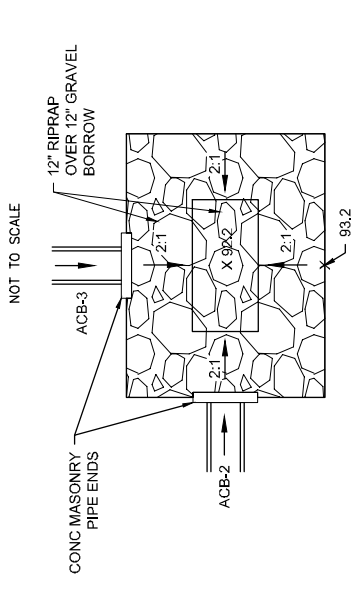
CONSTRUCTION DETAILS



SIDEWALK INLET BASIN (SIB) ITEM 201.4

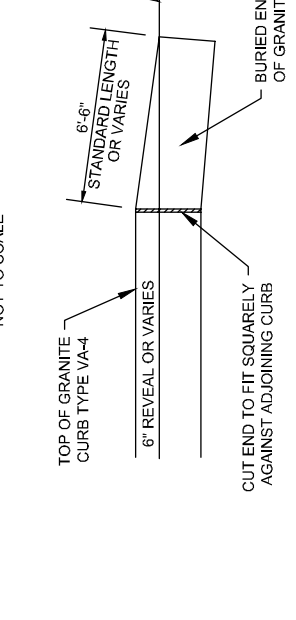
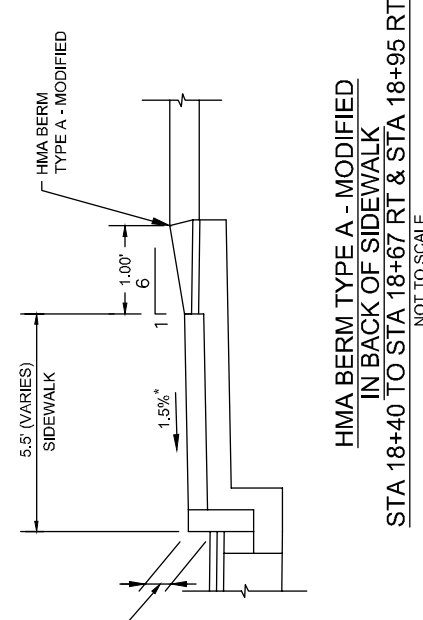


DETAIL OF PIPE THROUGH CONE SECTION OF SIDEWALK INLET BASIN



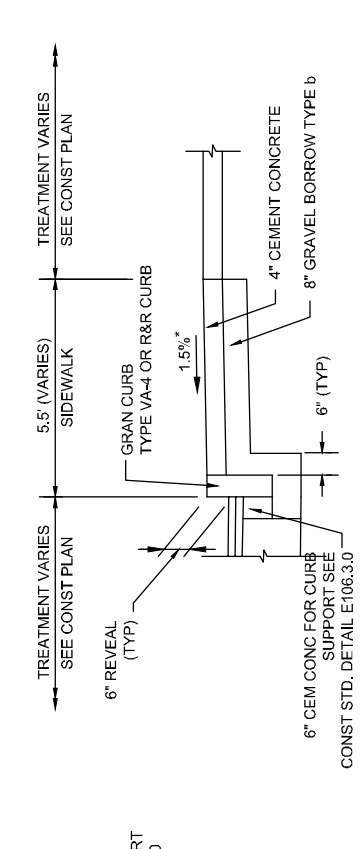
OUTLET SEDIMENT TRAP FOR ACB-2 AND ACB-3

NOT TO SCALE



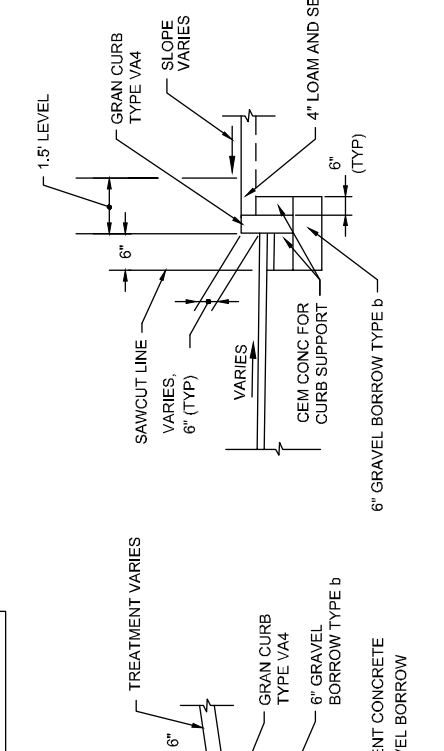
DETAIL FOR TRANSITION CURB

TRANSITION CURB - PROP CURB TO EXISTING EDGE OF PAVEMENT



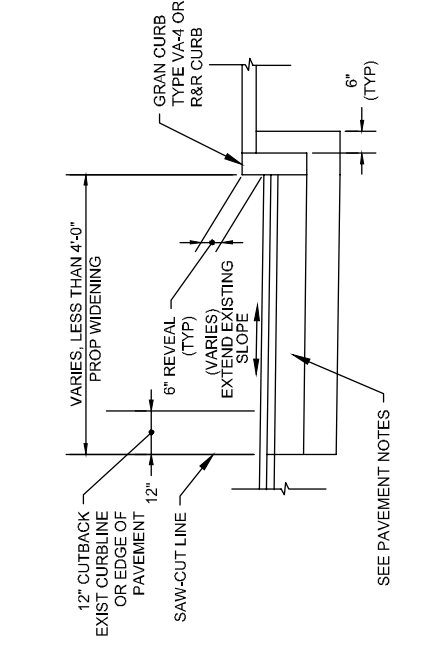
DETAIL FOR SIDEWALK WITH GRANITE CURB

DETAIL FOR SIDEWALK WITH GRANITE CURB



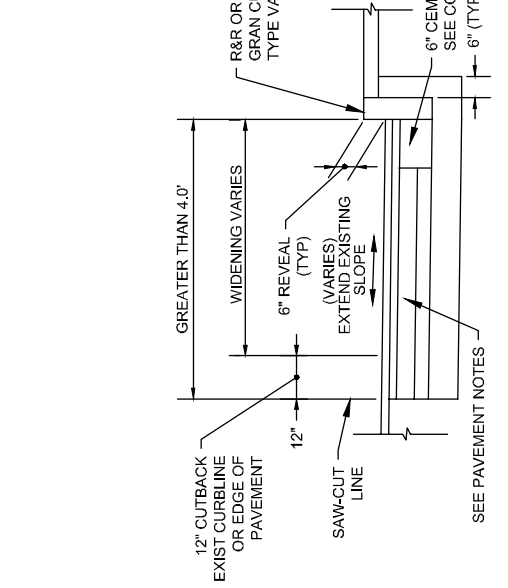
DETAIL FOR GRANITE CURB WITHOUT SIDEWALK IN MILLING AREA

NOT TO SCALE



DETAIL FOR BOX WIDENING 4.0' OR LESS

DETAIL FOR BOX WIDENING 4.0' OR LESS

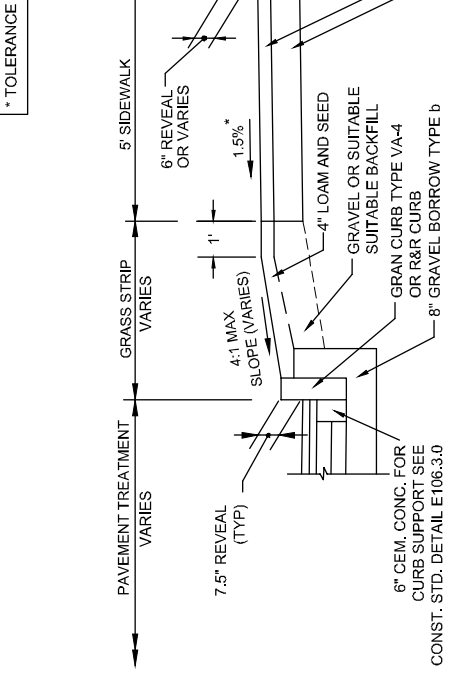


NOTE: SEE PAVEMENT NOTES SHEET 4

DETAIL FOR BOX WIDENING GREATER THAN 4.0'

DETAIL FOR BOX WIDENING GREATER THAN 4.0'

DETAIL FOR BOX WIDENING GREATER THAN 4.0'



DETAIL FOR SIDEWALK WITH GRASS STRIP & GRANITE CURB AT BACK OF WALK

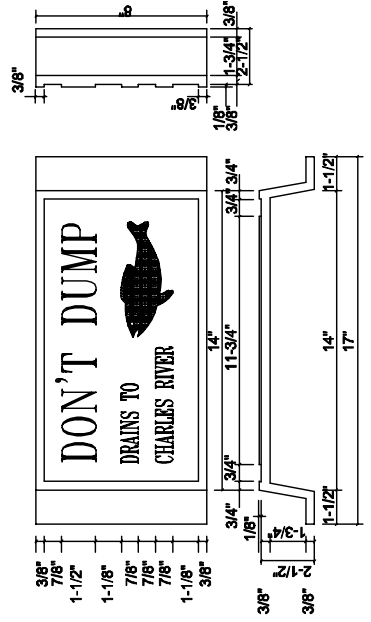
NOT TO SCALE

607901_H(4816 DETAILS).DWG
 Plotted on 2-Feb-2018 5:31 PM

DEDHAM
 ELM STREET AND RUSTCRAFT ROAD

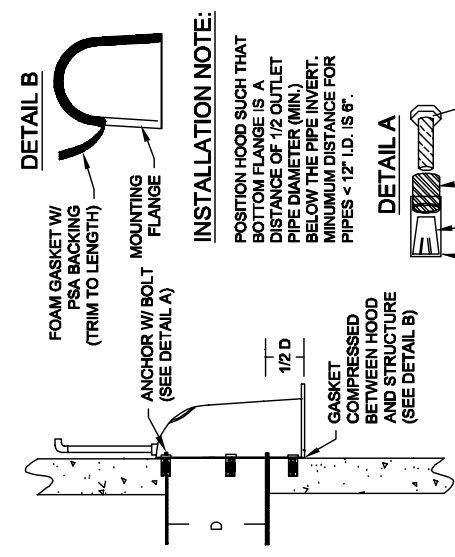
STATE	FED. AD PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XX-XXX-XXX	12	68
PROJECT FILE NO. 607901			

CONSTRUCTION DETAILS

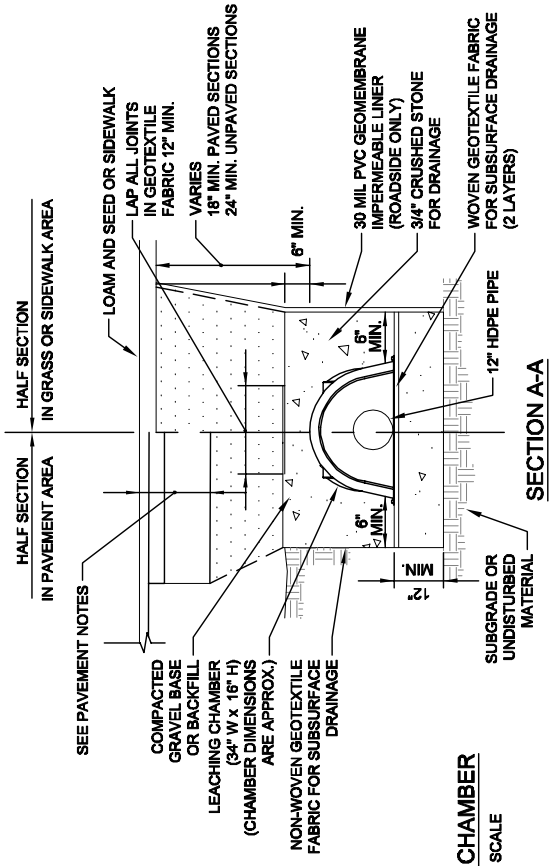


ENVIRONMENTAL CATCH BASIN PLACARD
 NOT TO SCALE

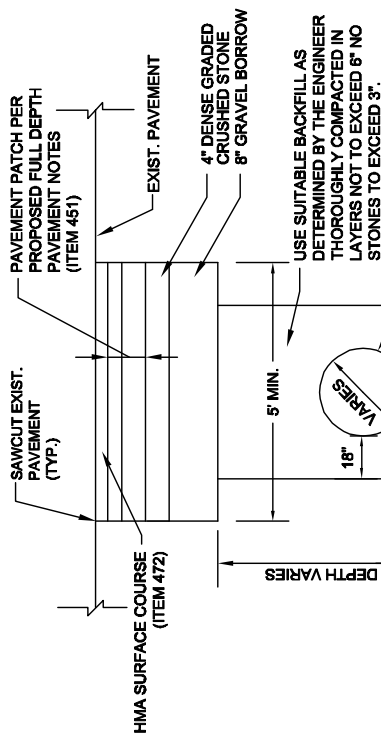
- NOTES:
1. LETTERING SYMBOLS AND BORDER ALL CUT AT 1/8" HEIGHT.
 2. THE SIZE OF THE FISH SHALL BE TO THE SCALE SHOWN ON THE DRAWING.
 3. MINIMUM WEIGHT - 18 LBS. PER CASTING.
 4. CASTING TO BE MADE OF CAST IRON.



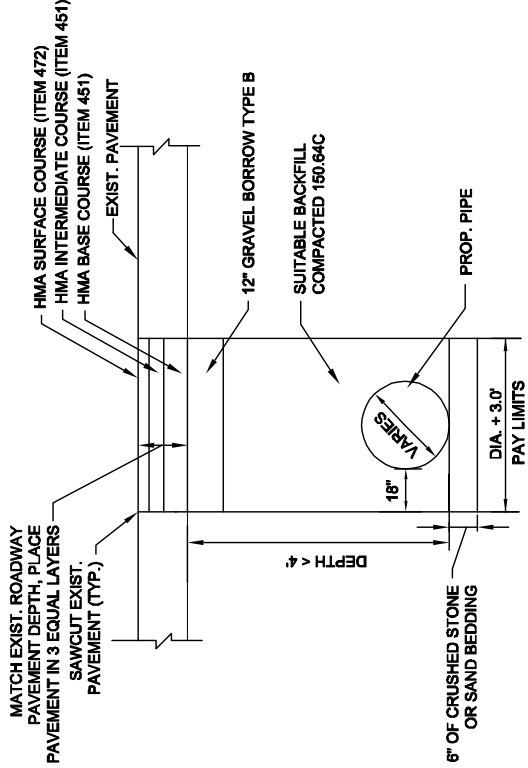
CATCH BASIN HOOD DETAIL
 NOT TO SCALE



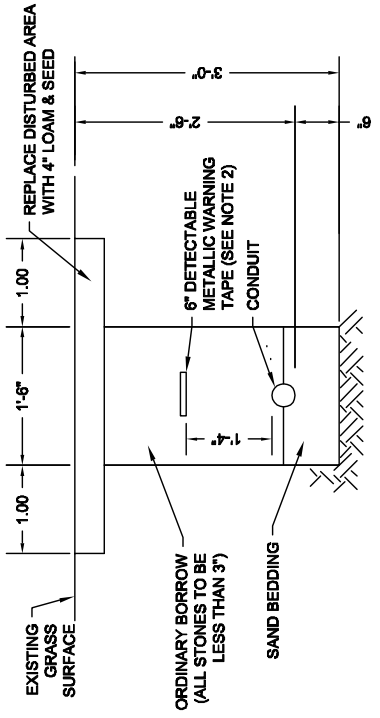
LEACHING CHAMBER
 NOT TO SCALE



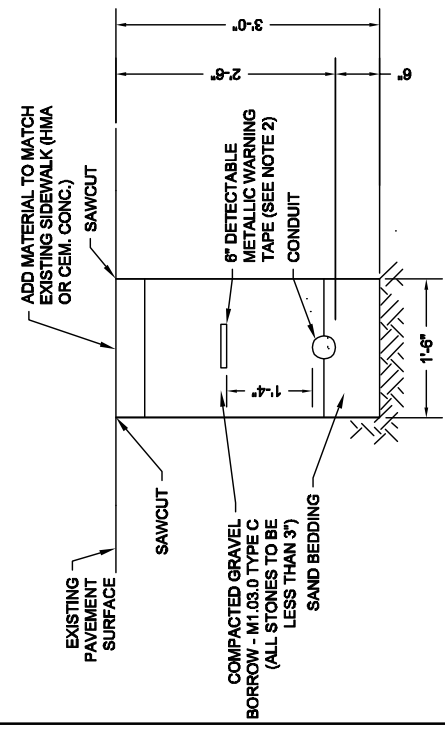
DETAIL FOR PIPE TRENCH IN MILLING AREAS
 NOT TO SCALE



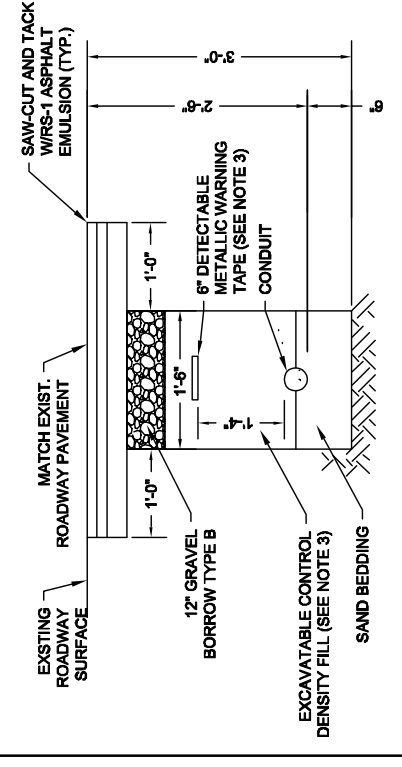
DETAIL FOR TEMPORARY DRAINAGE PIPE TRENCH IN FULL DEPTH AREAS
 NOT TO SCALE



CONDUIT UNDER GRASS AREAS
 NOT TO SCALE



CONDUIT UNDER SIDEWALK AREAS
 NOT TO SCALE



CONDUIT CROSSING ROADWAY
 NOT TO SCALE

- NOTES:
1. SCHEDULE 80 ELECTRICAL CONDUIT TYPE NM-PLASTIC (UL), WITH PULL ROPE UNLESS OTHERWISE APPROVED BY THE ENGINEER.
 2. WARNING TAPE SHALL BE PER CURRENT APWA STANDARDS.
 3. CONTROL DENSITY FILL SHALL MEET THE REQUIREMENTS OF SUBSECTION M4.08.0
 4. CONDUIT DETAILS SHOWN HERE CAN BE USED FOR MULTIPLE CONDUIT TRENCH WITH APPROVED SPACING.

PRECAST CONCRETE CATCH BASIN WITH DEEP SUMP
 NOT TO SCALE



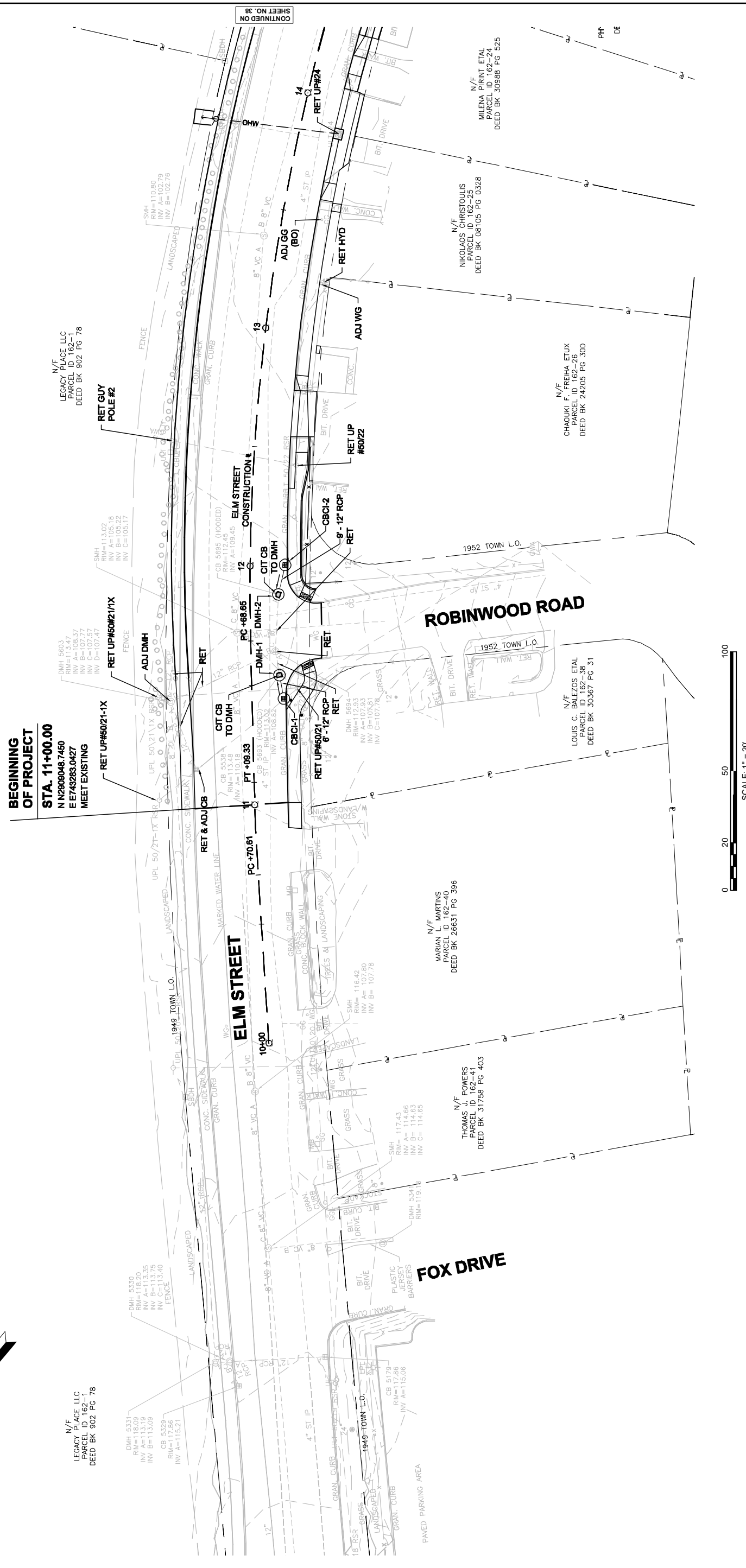
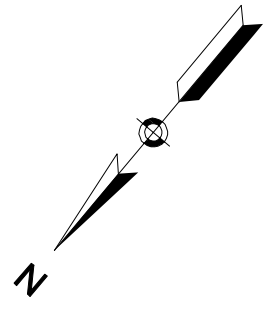
DEDHAM
ELM STREET AND RUSTCRAFT ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XX-XXX(XXX)	37	68
PROJECT FILE NO.		607901	

DRAINAGE & UTILITY PLANS

DRAINAGE STRUCTURE TABLE

NAME	STATION	OFFSET	RIM	INV. ELEV. IN	INV. ELEV. OUT	NOTES
CBCH-1	11+44	13.3 R	113.14		I=108.05' (DMH-1)	
CBCH-2	12+01	14.6 R	112.12		I=109.70' (DMH-2)	
DMH-1	11+54	11.7 R	112.83	I=107.95' (CBCH-1)		CHANGE IN TYPE
DMH-2	11+88	11.9 R	112.54	I=109.50' (CBCH-2)		CHANGE IN TYPE



CONTINUED ON SHEET NO. 38

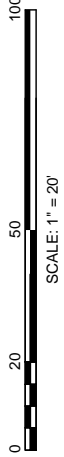
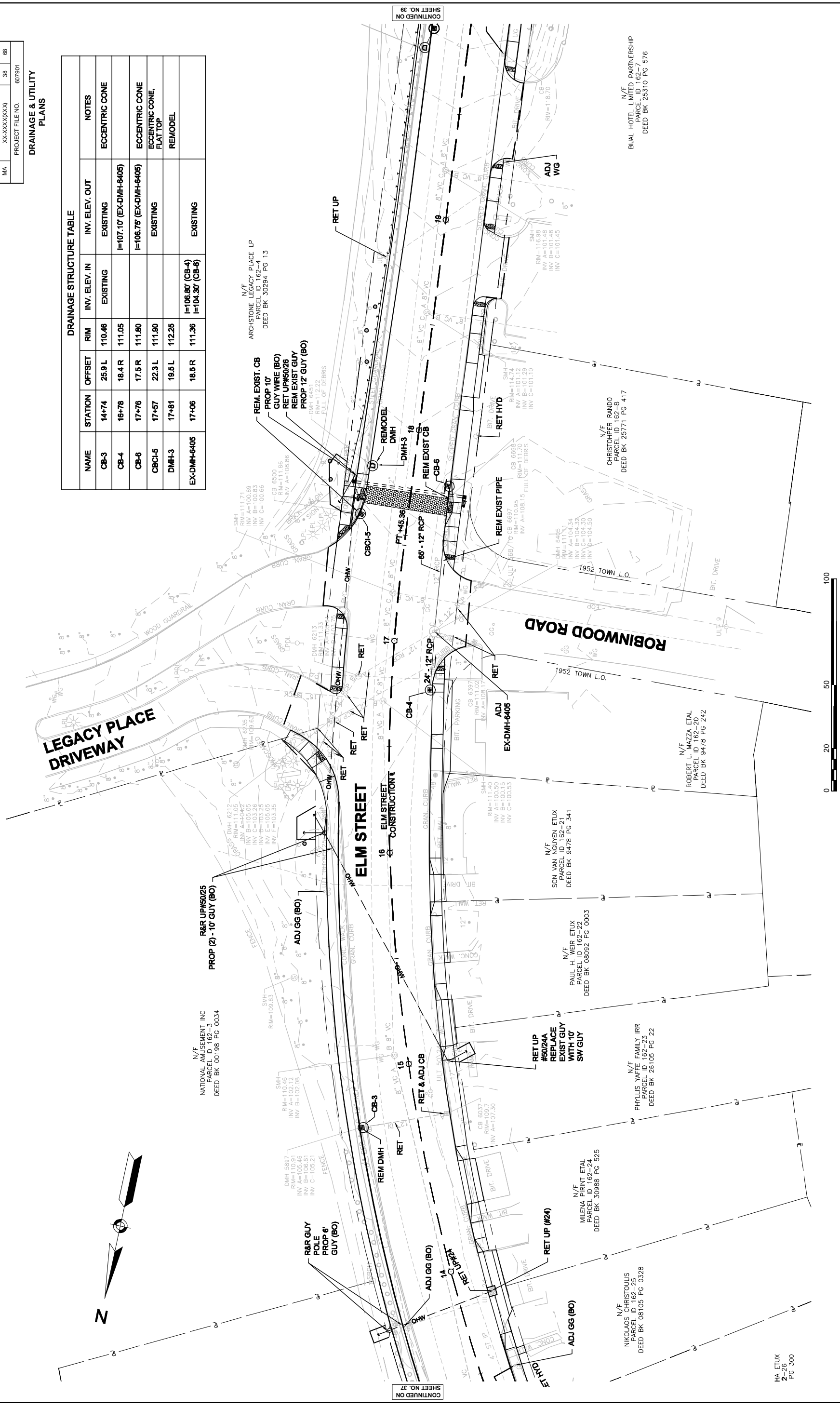
DEDHAM
ELM STREET AND RUSTCRAFT ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XX-XXX(XXX)	38	68
PROJECT FILE NO. 607901			

DRAINAGE & UTILITY PLANS

DRAINAGE STRUCTURE TABLE

NAME	STATION	OFFSET	RIM	INV. ELEV. IN	INV. ELEV. OUT	NOTES
CB-3	14+74	25.9 L	110.46	EXISTING	EXISTING	ECCENTRIC CONE
CB-4	16+78	18.4 R	111.05		I=107.10' (EX-DMH-6405)	
CB-6	17+76	17.5 R	111.80		I=106.75' (EX-DMH-6405)	ECCENTRIC CONE FLAT TOP
CBCH-5	17+57	22.3 L	111.90	EXISTING		
DMH-3	17+81	19.5 L	112.25			REMODEL
EX-DMH-6405	17+06	18.5 R	111.36	I=106.80' (CB-4) I=104.30' (CB-6)	EXISTING	



CONTINUED ON SHEET NO. 37

CONTINUED ON SHEET NO. 39

HA ETUX
2-26
PG 300

DEDHAM
ELM STREET AND RUSTCRAFT ROAD

STATE	FED. AD PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XX-XXX-XXXX	39	68
PROJECT FILE NO.		607901	

DRAINAGE & UTILITY PLANS

DRAINAGE STRUCTURE TABLE

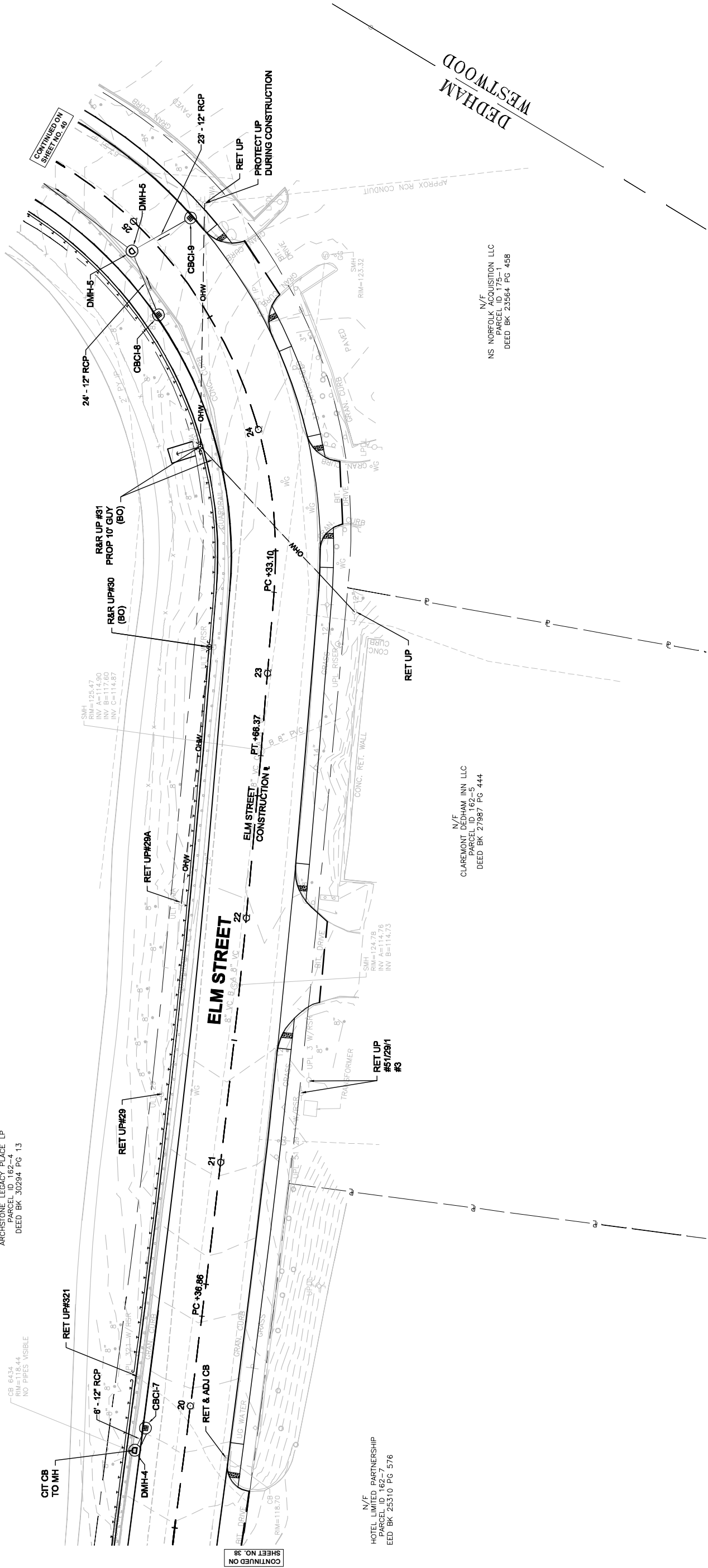
NAME	STATION	OFFSET	RIM	INV. ELEV. IN	INV. ELEV. OUT	NOTES
CBCI-7	19+89	17.0 L	119.09		I=115.20' (DMH-4)	ECCENTRIC CONE
CBCI-8	24+63	17.1 L	120.29		I=115.20' (DMH-5)	
CBCI-9	24+86	17.7 R	120.01		I=115.20' (DMH-5)	
DMH-4	19+79	20.2 L	119.09	I=115.10' (CBCI-7)		CHANGE IN TYPE
DMH-5	24+92	9.0 L	118.84	I=114.90' (CBCI-9) I=114.80' (CBCI-8)	I=112.00' (DMH-6)	



N/F
ARCHSTONE LEGACY PLACE LP
PARCEL ID 162-4
DEED BK 30294 PG 13

N/F
ARCHSTONE LEGACY PLACE LP
PARCEL ID 162-4
DEED BK 30294 PG 13

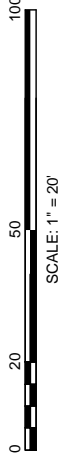
CS 6434
RIM=118.44
NO PIPES VISIBLE



N/F
CLAREMONT DEDHAM INN LLC
PARCEL ID 162-5
DEED BK 27987 PG 444

N/F
NS NORFOLK ACQUISITION LLC
PARCEL ID 175-1
DEED BK 23564 PG 458

N/F
HOTEL LIMITED PARTNERSHIP
PARCEL ID 162-7
EED BK 25310 PG 576



607901_HD(4816 GRAD UTILITY).DWG Plotted on 5-Feb-2018 9:46 AM

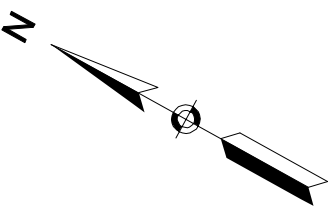
DEDHAM
ELM STREET AND RUSTCRAFT ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XX-XXX-XXX(X)	40	68
PROJECT FILE NO.		607901	

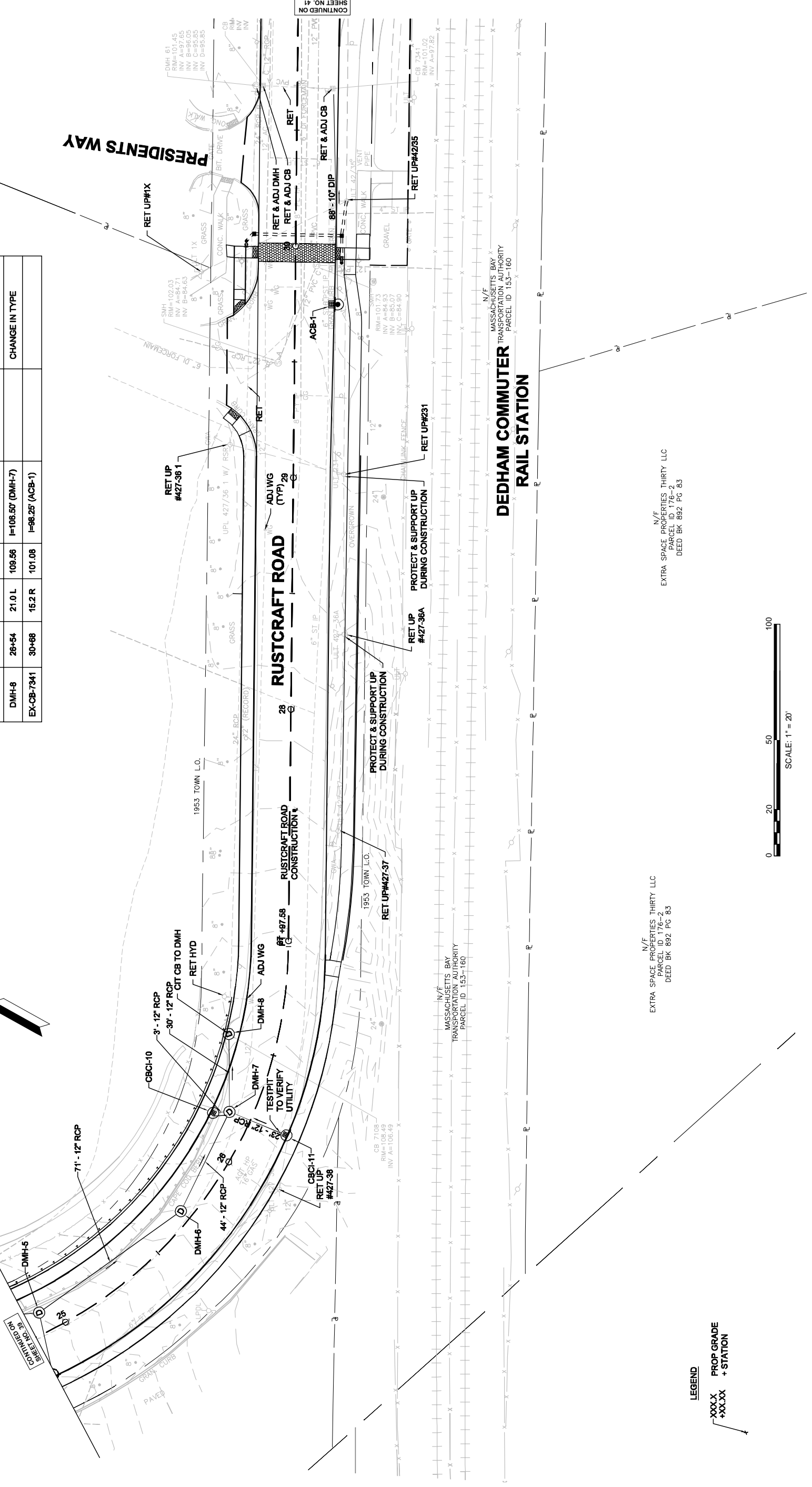
DRAINAGE & UTILITY PLANS

DRAINAGE STRUCTURE TABLE

NAME	STATION	OFFSET	RIM	INV. ELEV. IN	INV. ELEV. OUT	NOTES
ACB-1	29+75	16.0 R	101.78		I=88.80' (EX-CB-7341)	DEDHAM STD SDSW.03
CBCI-10	28+16	15.9 L	110.87		I=107.10' (DMH-7)	FLAT TOP
CBCI-11	28+21	16.9 R	111.59		I=107.50' (DMH-7)	FLAT TOP, OFFSET CB
DMH-6	25+70	4.9 L	114.11	I=110.00' (DMH-5)	I=107.50' (DMH-7)	
DMH-7	28+20	9.7 L	111.16	I=107.00' (DMH-6) I=107.00' (CBCI-10) I=107.00' (CBCI-11)	I=107.00' (DMH-8)	
DMH-8	26+54	21.0 L	109.56	I=106.50' (DMH-7)		CHANGE IN TYPE
EX-CB-7341	30+66	15.2 R	101.08	I=98.25' (ACB-1)		



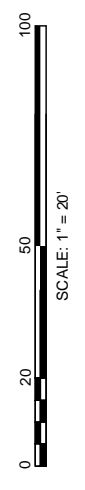
N/F
ARCHSTONE LEGACY PLACE LP
PARCEL ID. 1622-4
DEED BK 30294 PG 13



N/F
EXTRA SPACE PROPERTIES THIRTY LLC
PARCEL ID. 176-2
DEED BK 892 PG 83

N/F
EXTRA SPACE PROPERTIES THIRTY LLC
PARCEL ID. 176-2
DEED BK 892 PG 83

LEGEND
XXXXX PROP GRADE
+XXX.XX + STATION

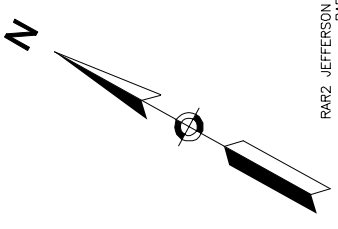
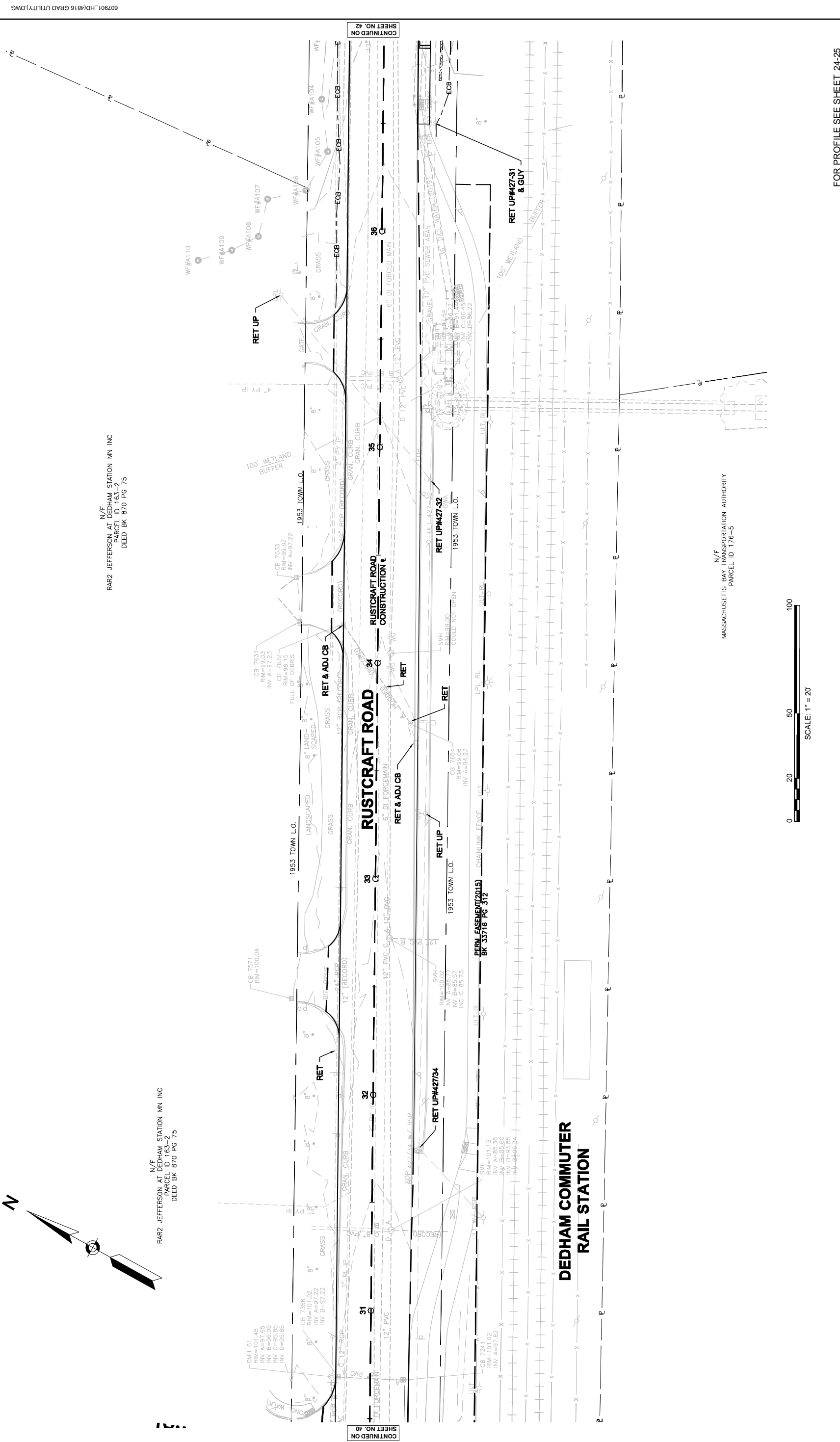


FOR PROFILE SEE SHEET 24

DEDHAM
ELM STREET AND RUSTCRAFT ROAD

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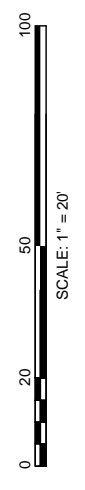
DRAINAGE & UTILITY PLANS



N/F
RAR2 JEFFERSON AT DEDHAM STATION MN INC
PARCEL ID 163-2
DEED BK 870 PG 75

N/F
RAR2 JEFFERSON AT DEDHAM STATION MN INC
PARCEL ID 163-2
DEED BK 870 PG 75

N/F
MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
PARCEL ID 176-5



CONTINUED ON
SHEET NO. 42

CONTINUED ON
SHEET NO. 40

FOR PROFILE SEE SHEET 24-25

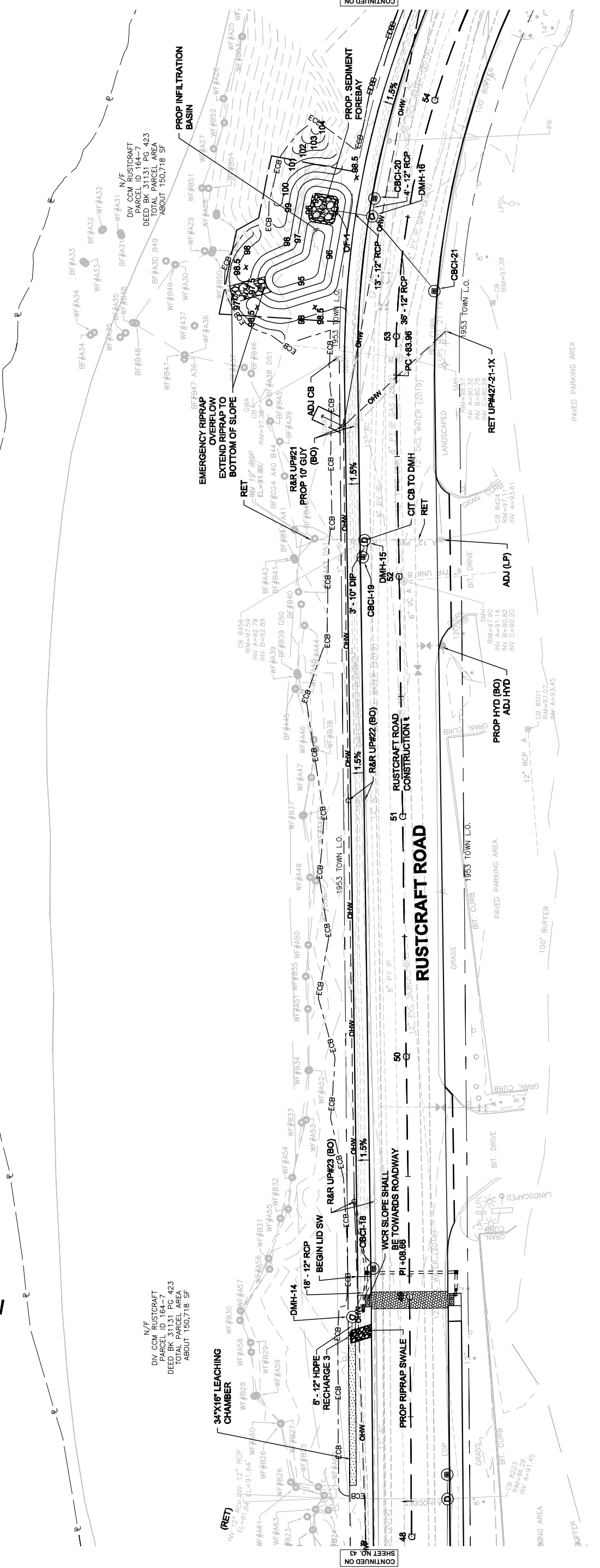
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DEDHAM
 ELM STREET AND RUSTCRAFT ROAD

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PROJECT FILE NO.		607901	

DRAINAGE & UTILITY PLANS

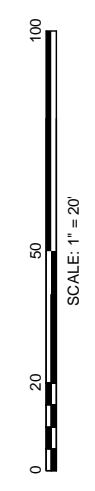
N/F
 DEDHAM CORP. CENTER REALTY TRUST
 PARCEL ID 164-7
 DEED BK 642 PG 170



N/F
 DIV. CMM RUSTCRAFT
 PARCEL ID 164-1
 DEED BK 31131 PG 423

DRAINAGE STRUCTURE TABLE

NAME	STATION	OFFSET	RIM	INV. ELEV. IN	INV. ELEV. OUT	NOTES
CBCL-18	48+12	15.0 L	96.71		I=82.80' (DMH-14)	
CBCL-19	52+08	15.0 L	97.89		I=93.60' (DMH-15)	
CBCL-20	53+55	14.9 L	98.67		I=95.20' (DMH-16)	FLAT TOP
CBCL-21	53+20	14.8 R	98.50		I=96.20' (DMH-16)	FLAT TOP
DMH-14	48+92	23.9 L	97.03	I=92.70' (CBCL-18)	I=92.70' (RECHARGE 3)	CHANGE IN TYPE
DMH-15	52+15	14.1 L	97.94	I=93.50' (CBCL-19)		
DMH-16	53+48	14.7 L	98.62	I=95.10' (CBCL-21) I=95.10' (CBCL-20)	I=95.10' (OF-1)	
OF-1	53+48	29.4 L		I=95.00' (DMH-16)		
RECHARGE 3	48+84	24.4 L	93.70	I=92.60' (DMH-14)		



FOR PROFILE SEE SHEET 26

DEDHAM
ELM STREET AND RUSTCRAFT ROAD

STATE	FED. AD PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XX-XXX-XXX(X)	45	68

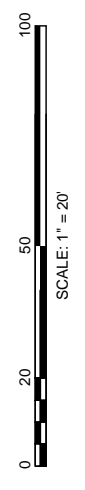
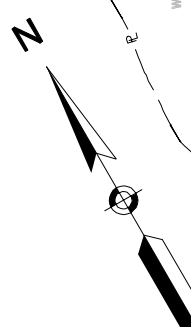
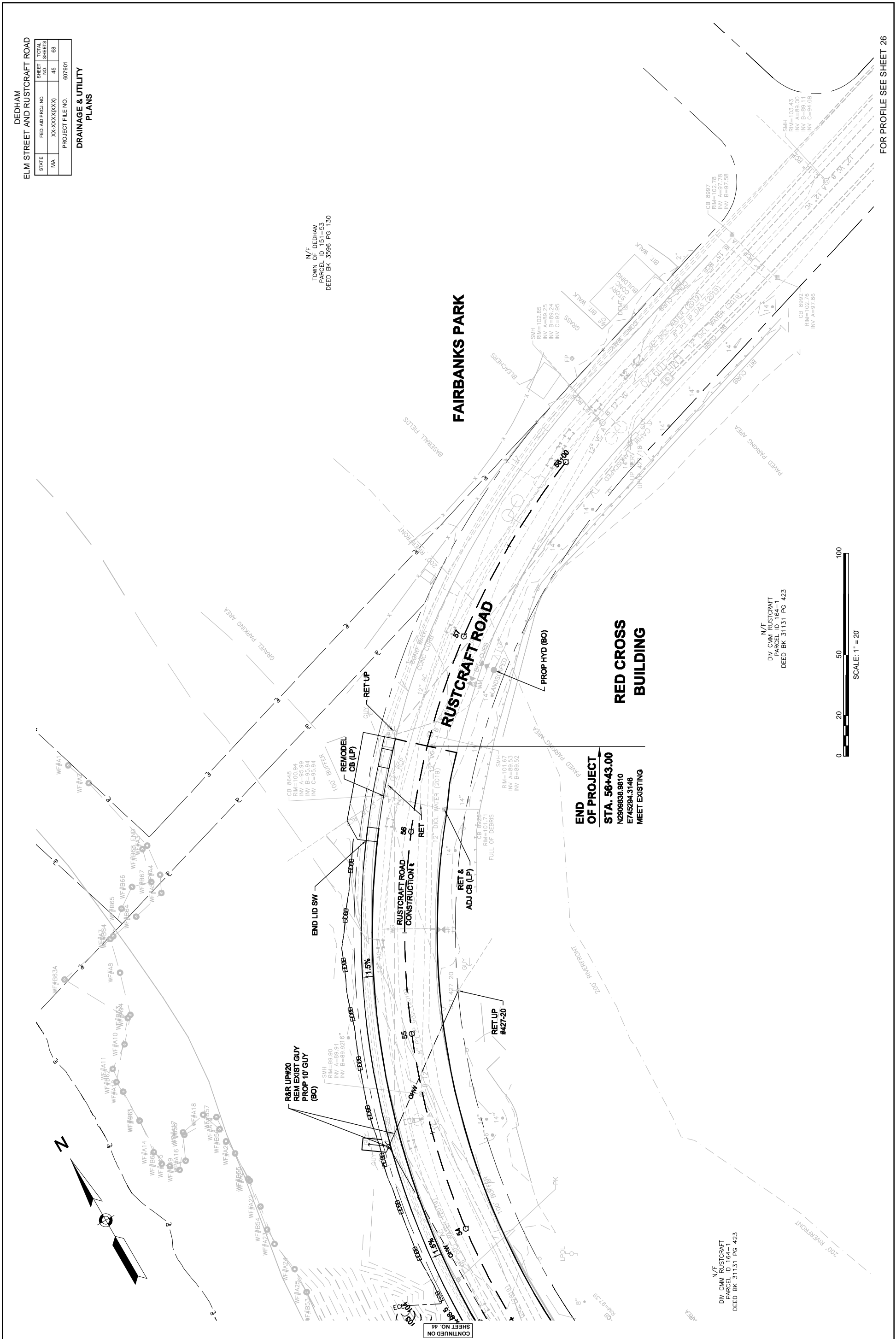
PROJECT FILE NO. 607901

DRAINAGE & UTILITY PLANS

N/F
TOWN OF DEDHAM
PARCEL ID 151-53
DEED BK 3596 PG 130

N/F
DIV OMM RUSTCRAFT
PARCEL ID 164-1
DEED BK 31131 PG 423

N/F
DIV OMM RUSTCRAFT
PARCEL ID 164-1
DEED BK 31131 PG 423



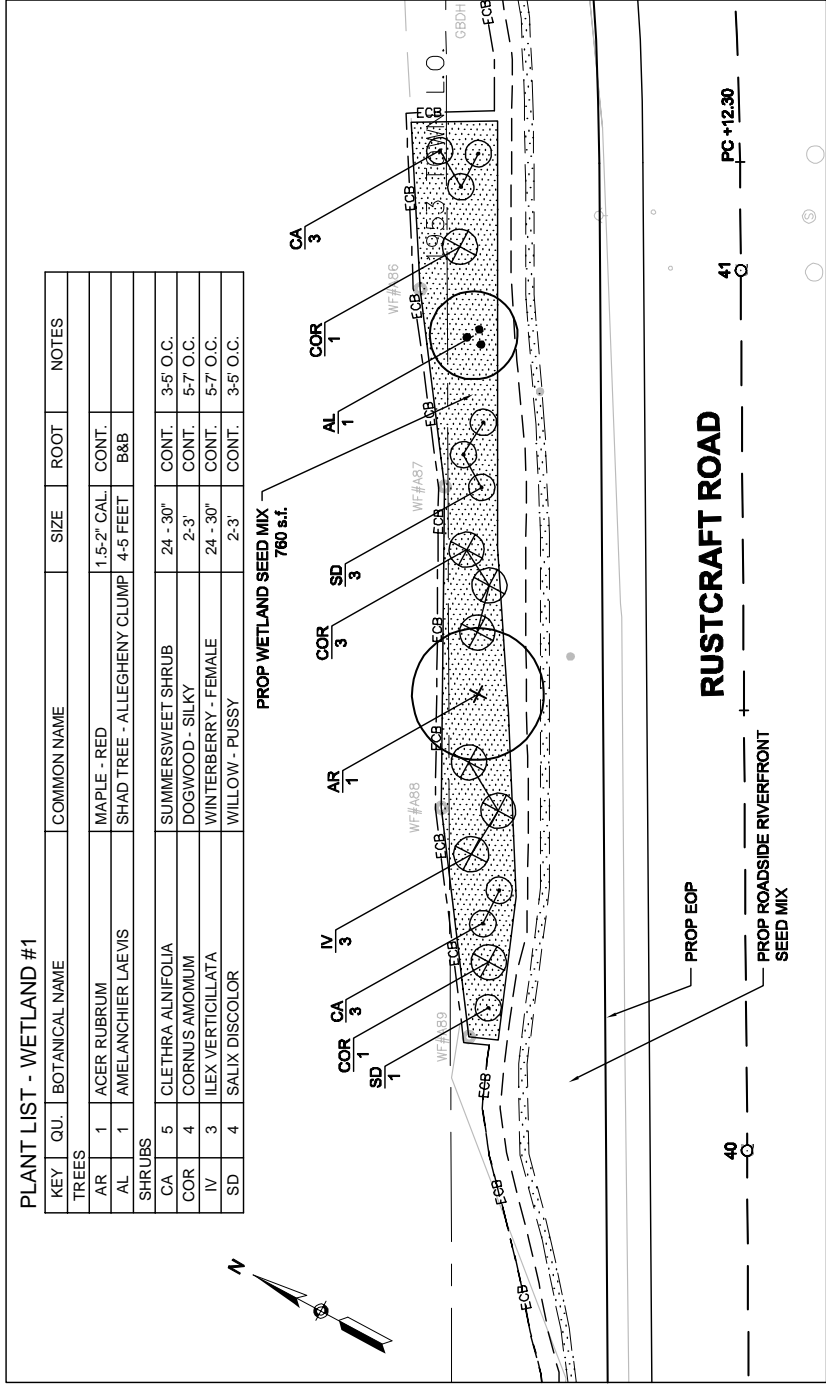
FOR PROFILE SEE SHEET 26

CONTINUED ON SHEET NO. 44

DEDHAM
ELM STREET AND RUSTCRAFT ROAD

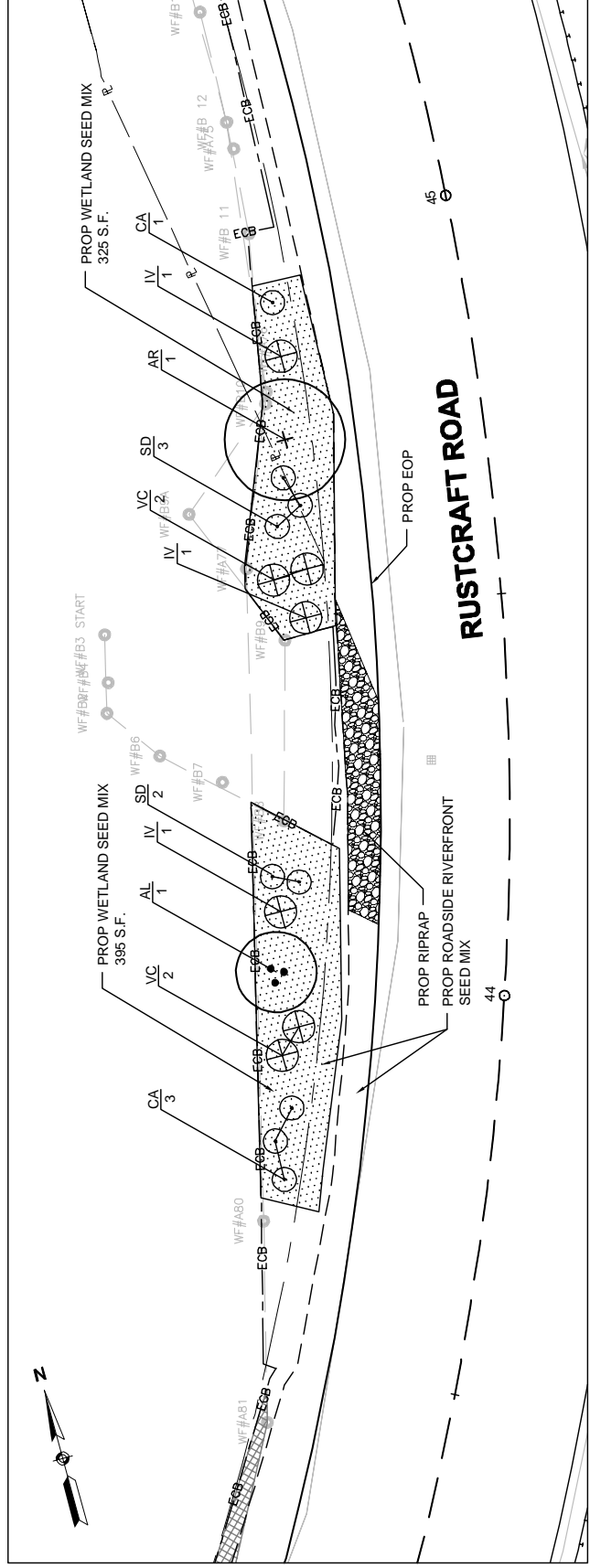
STATE	FED. AD PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XX-XXX-XXX(X)	54	68
PROJECT FILE NO.		607901	

WETLAND & RIVERFRONT PLANTING PLAN



NOTES:
1. ADDITIONAL TEMPORARY WETLAND IMPACTS AND RESTORATION AREAS ARE SHOWN ON THE CONSTRUCTION PLANS.
2. THESE AREAS SHALL RECEIVE WETLAND SEED MIX.

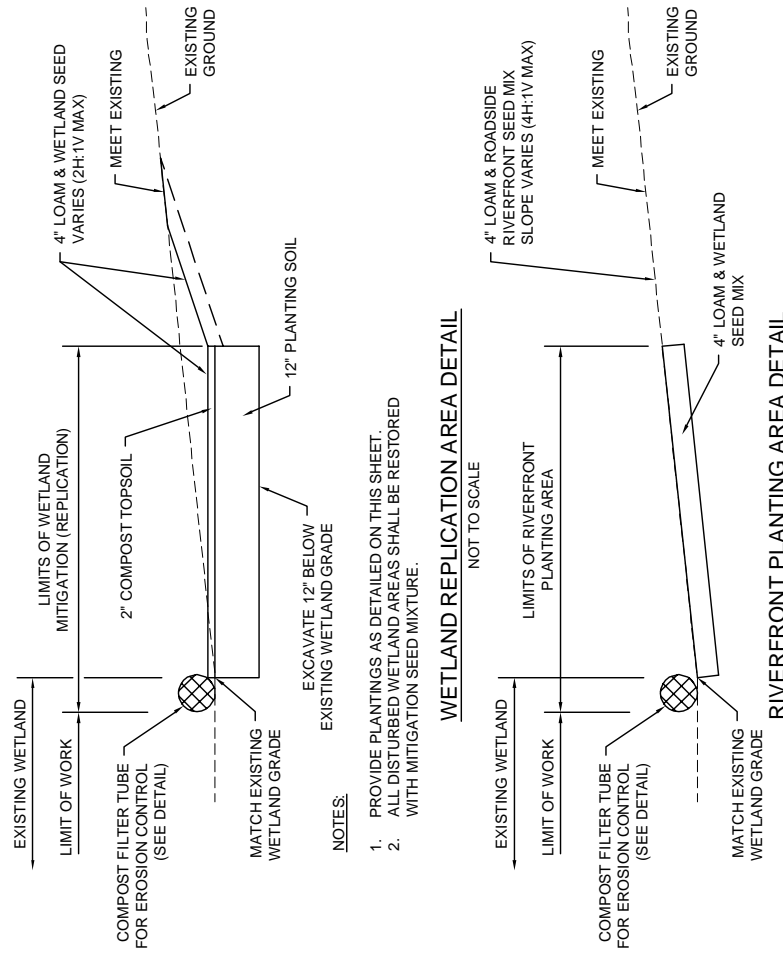
WETLAND REPLICATION AREA #1
(STA 40+12 - 41+08 LT.)
SCALE: 1" = 10'



WETLAND REPLICATION AREA #2
(STA 43+49 - 45+00 LT.)
SCALE: 1" = 10'

PLANT LIST - RIVERFRONT PLANTING AREA

KEY	QU.	BOTANICAL NAME	COMMON NAME	SIZE	ROOT	NOTES
TREES						
AR	1	ACER RUBRUM	MAPLE - RED	1.5'-2" CAL.	CONT.	
AL	1	AMELANCHIER LAEVIS	SHAD TREE - ALLEGHENY CLUMP	4-5 FEET	B&B	
SHRUBS						
CA	4	CLETHRA ALNIFOLIA	SUMMERSWEET SHRUB	24 - 30"	CONT.	3-5' O.C.
IV	3	ILEX VERTICILLATA	WINTERBERRY - FEMALE	24 - 30"	CONT.	5-7' O.C.
SD	5	SALIX DISCOLOR	WILLOW - PUSSY	2-3'	CONT.	3-5' O.C.
VC	4	VACCINIUM CORYMBOSUM	BLUEBERRY - HIGHBUSH	2-3'	CONT.	5-7' O.C.



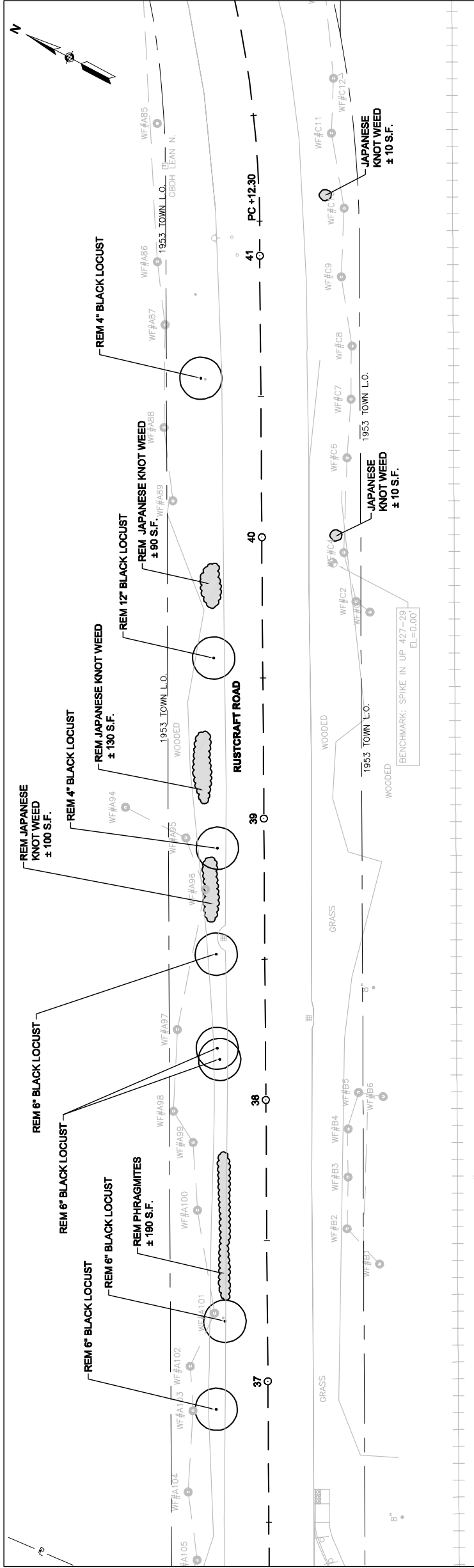
MASTER PLANT LIST

KEY	QU.	BOTANICAL NAME	COMMON NAME	SIZE	ROOT	NOTES
TREES						
AR	2	ACER RUBRUM	MAPLE - RED	1.5'-2" CAL.	CONT.	
AL	2	AMELANCHIER LAEVIS	SHAD TREE - ALLEGHENY CLUMP	4-5 FEET	B&B	
SHRUBS						
CA	9	CLETHRA ALNIFOLIA	SUMMERSWEET SHRUB	24 - 30"	CONT.	3-5' O.C.
COR	4	CORNUS AMOMUM	DOGWOOD - SILKY	2-3'	CONT.	5-7' O.C.
IV	6	ILEX VERTICILLATA	WINTERBERRY - FEMALE	24 - 30"	CONT.	5-7' O.C.
SD	9	SALIX DISCOLOR	WILLOW - PUSSY	2-3'	CONT.	3-5' O.C.
VC	4	VACCINIUM CORYMBOSUM	BLUEBERRY - HIGHBUSH	2-3'	CONT.	5-7' O.C.

DEDHAM
ELM STREET AND RUSTCRAFT ROAD

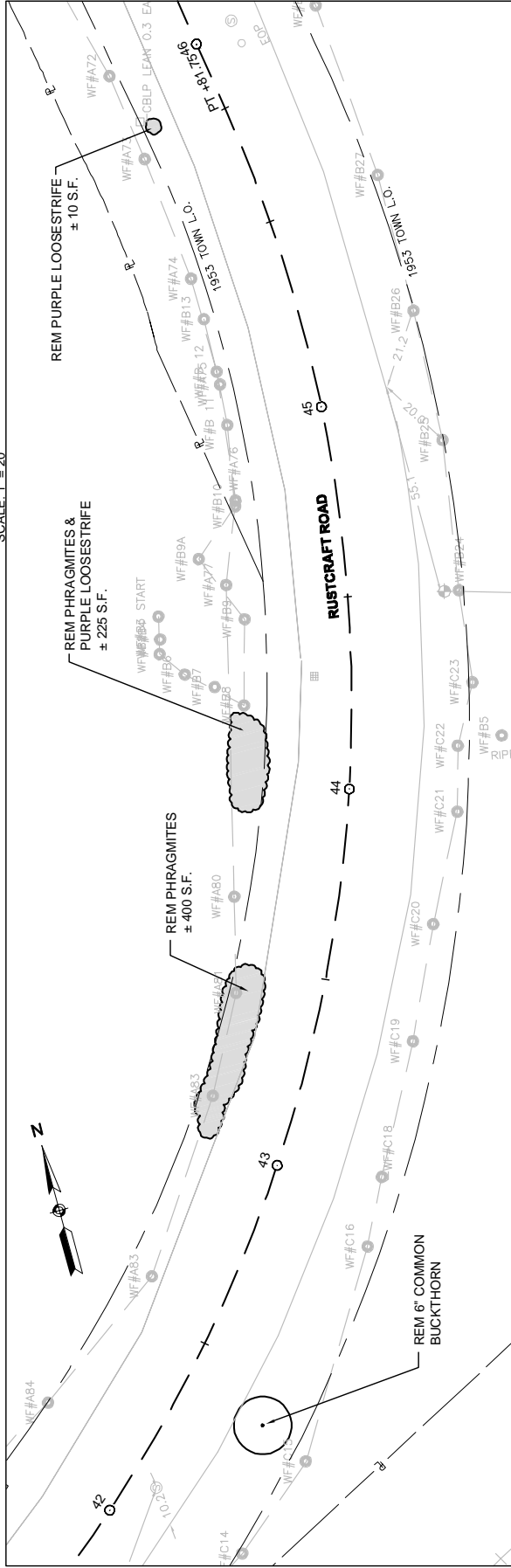
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MA	XX-XXX-XXXX	55	88
PROJECT FILE NO.		607901	

INVASIVE PLANT LOCATION PLAN



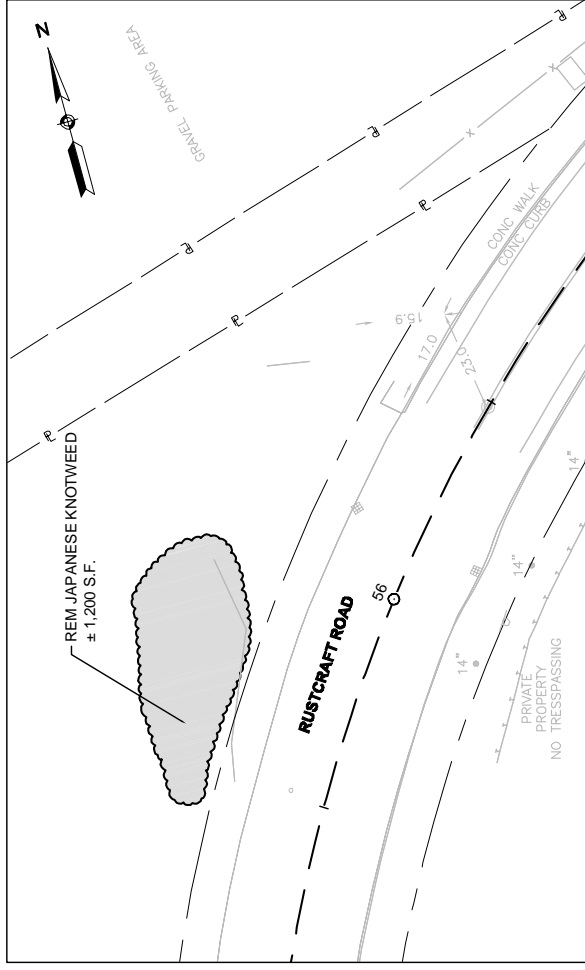
EXISTING INVASIVE PLANT LOCATIONS
STA 36+75 - 41+50 (LT/RT)

SCALE: 1" = 20'



EXISTING INVASIVE PLANT LOCATIONS
STA 42+25 - 46+00 (LT/RT)

SCALE: 1" = 20'



EXISTING INVASIVE PLANT LOCATIONS
STA 55+50 - 56+00 (LT)

SCALE: 1" = 20'

INVASIVE SPECIES NOTES:

- THE MAPPING OF EXISTING INVASIVE SPECIES AS SHOWN ON THE PLANS WAS PREPARED BY BETA GROUP IN THE SUMMER OF 2016 AND IS PROVIDED TO THE CONTRACTOR FOR INFORMATION ONLY.
- THE CONTRACTOR SHALL, AS DESCRIBED UNDER ITEM 102.3, DOCUMENT THE EXTENT OF EXISTING INVASIVE PLANTS WITHIN THE PROJECT AREA AND AS SHOWN ON THE PLANS.
 - PROPOSE AN INVASIVE PLANT MANAGEMENT STRATEGY FOR THEIR CONTROL AND
 - IMPLEMENT THE STRATEGY AS APPROVED BY MASSDOT LANDSCAPE SECTION.
- TREATMENT AND REMOVAL OF EXISTING INVASIVE PLANT MATERIAL SHALL BE DONE IMMEDIATELY BY THE CONTRACTOR AFTER LIMIT OF WORK LINES HAVE BEEN ESTABLISHED.
- EXISTING INVASIVE PLANT MATERIAL INCLUDES BUT IS NOT LIMITED TO THE FOLLOWING SPECIES.

LEGEND

- INVASIVE TREE TO BE REMOVED
- INVASIVE PERENNIAL TO BE REMOVED

BOTANICAL NAME	COMMON NAME
Rhamnus cathartica	Common Buckthorn
Robinia pseudoacacia	Black Locust
Lythrum salicaria	Purple Loosestrife
Polygonum cuspidatum	Japanese Knotweed
Phragmites australis	Common Reed

DEDHAM
ELM STREET AND RUSTCRAFT ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XX-XXX(XXX)	1	4

PROJECT FILE NO. 607901

WETLAND IMPACT PLANS

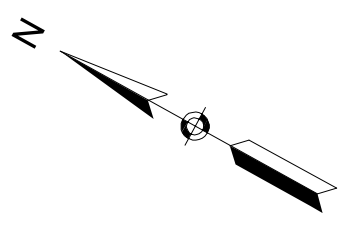
N/F
500 COMMERCIAL CIRCLE LLC
C/O CLAY NISSAN
PARCEL ID 163-1
DEED BK 874 PG 105

DRAINAGE DETAILS
SEE BELOW

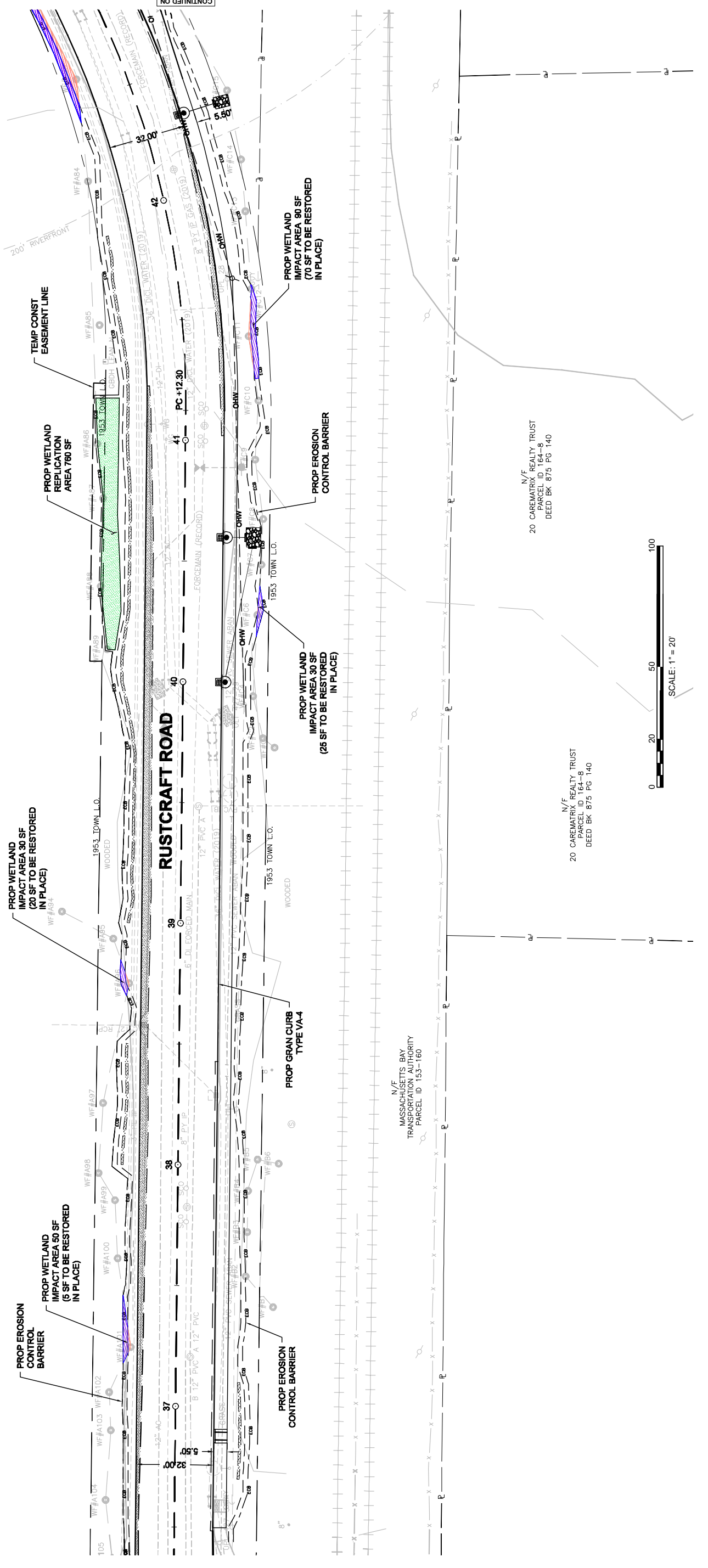
WATER SUPPLY ALTERATIONS
SEE BELOW

TRAFFIC SIGNAL CONDUIT
NONE

HIGHWAY GUARD DETAILS
NONE



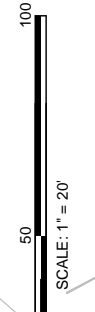
N/F
500 COMMERCIAL CIRCLE LLC
PARCEL ID 163-1
DEED BK 874 PG 105



N/F
20 CAREMATRIX REALTY TRUST
PARCEL ID 164-8
DEED BK 875 PG 140

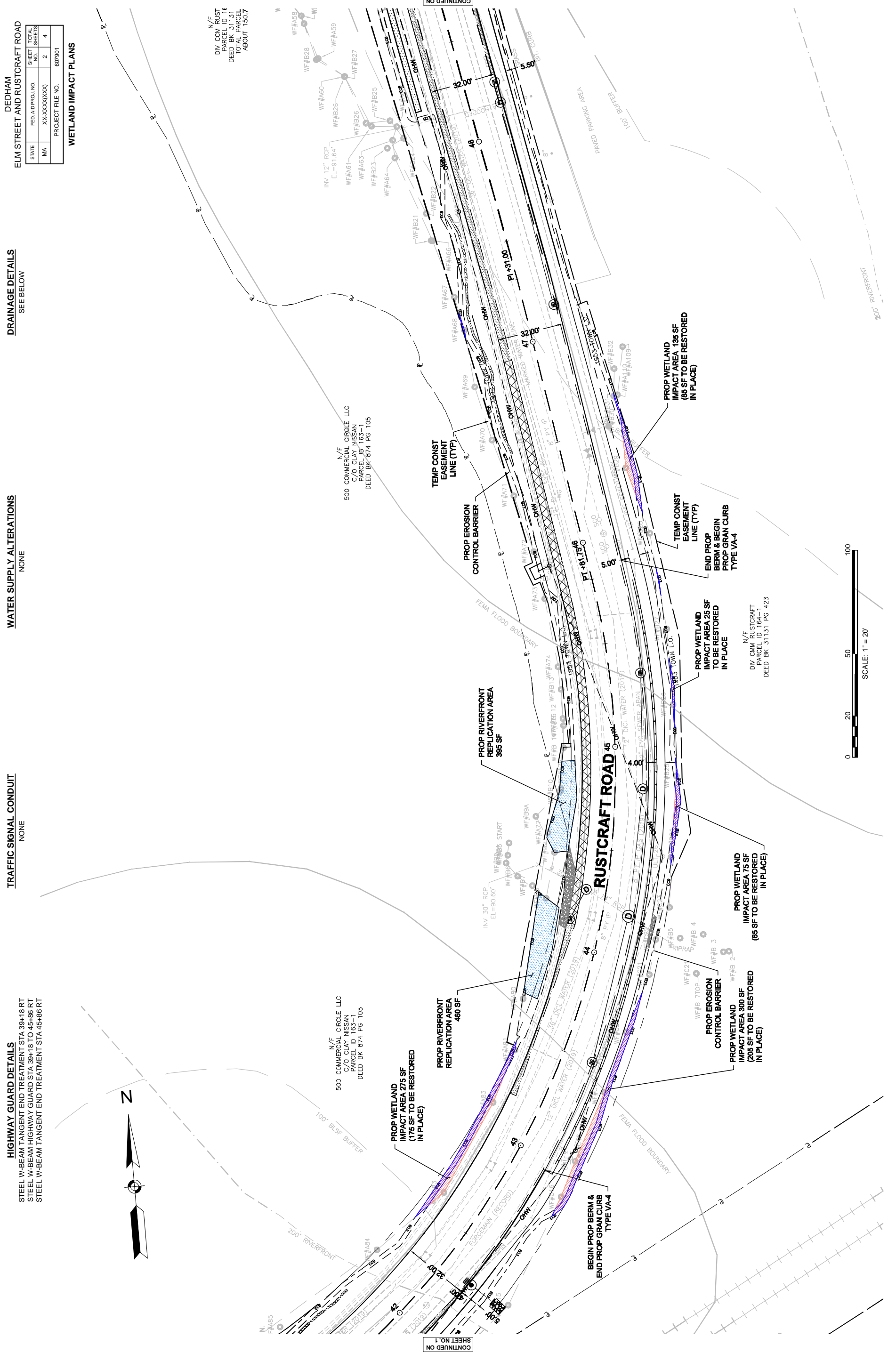
N/F
20 CAREMATRIX REALTY TRUST
PARCEL ID 164-8
DEED BK 875 PG 140

N/F
MASSACHUSETTS BAY
TRANSPORTATION AUTHORITY
PARCEL ID 153-160



CONTINUED ON SHEET NO. 2

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DEDHAM
ELM STREET AND RUSTCRAFT ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XX-XXXX(XXX)	2	4

PROJECT FILE NO. 607901

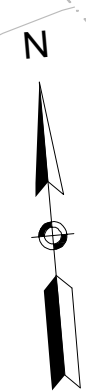
WETLAND IMPACT PLANS

DRAINAGE DETAILS
SEE BELOW

WATER SUPPLY ALTERATIONS
NONE

TRAFFIC SIGNAL CONDUIT
NONE

HIGHWAY GUARD DETAILS
STEEL W-BEAM TANGENT END TREATMENT STA 39+18 RT
STEEL W-BEAM HIGHWAY GUARD STA 39+18 TO 45+86 RT
STEEL W-BEAM TANGENT END TREATMENT STA 45+86 RT

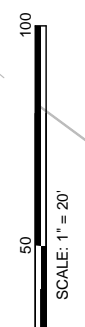


N/F
DIV CCM RUST
PARCEL ID 14
DEED BK 31131
TOTAL PARCEL
ABOUT 150.7

N/F
500 COMMERCIAL CIRCLE LLC
O/CLAY NISSAN
PARCEL ID 6-
DEED BK 874 PG 105

N/F
500 COMMERCIAL CIRCLE LLC
O/CLAY NISSAN
PARCEL ID 6-
DEED BK 874 PG 105

N/F
DIV CMM RUSTCRAFT
PARCEL ID 164-1
DEED BK 31131 PG 423



CONTINUED ON
SHEET NO. 3

CONTINUED ON
SHEET NO. 1

DEDHAM
ELM STREET AND RUSTCRAFT ROAD

FED AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA XX-XXXXXXX	3	4
PROJECT FILE NO. 607901		

WETLAND IMPACT PLANS

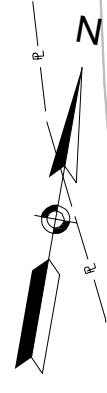
TRAFFIC SIGNAL CONDUIT
NONE

WATER SUPPLY ALTERATIONS
NONE

DRAINAGE DETAILS
SEE BELOW

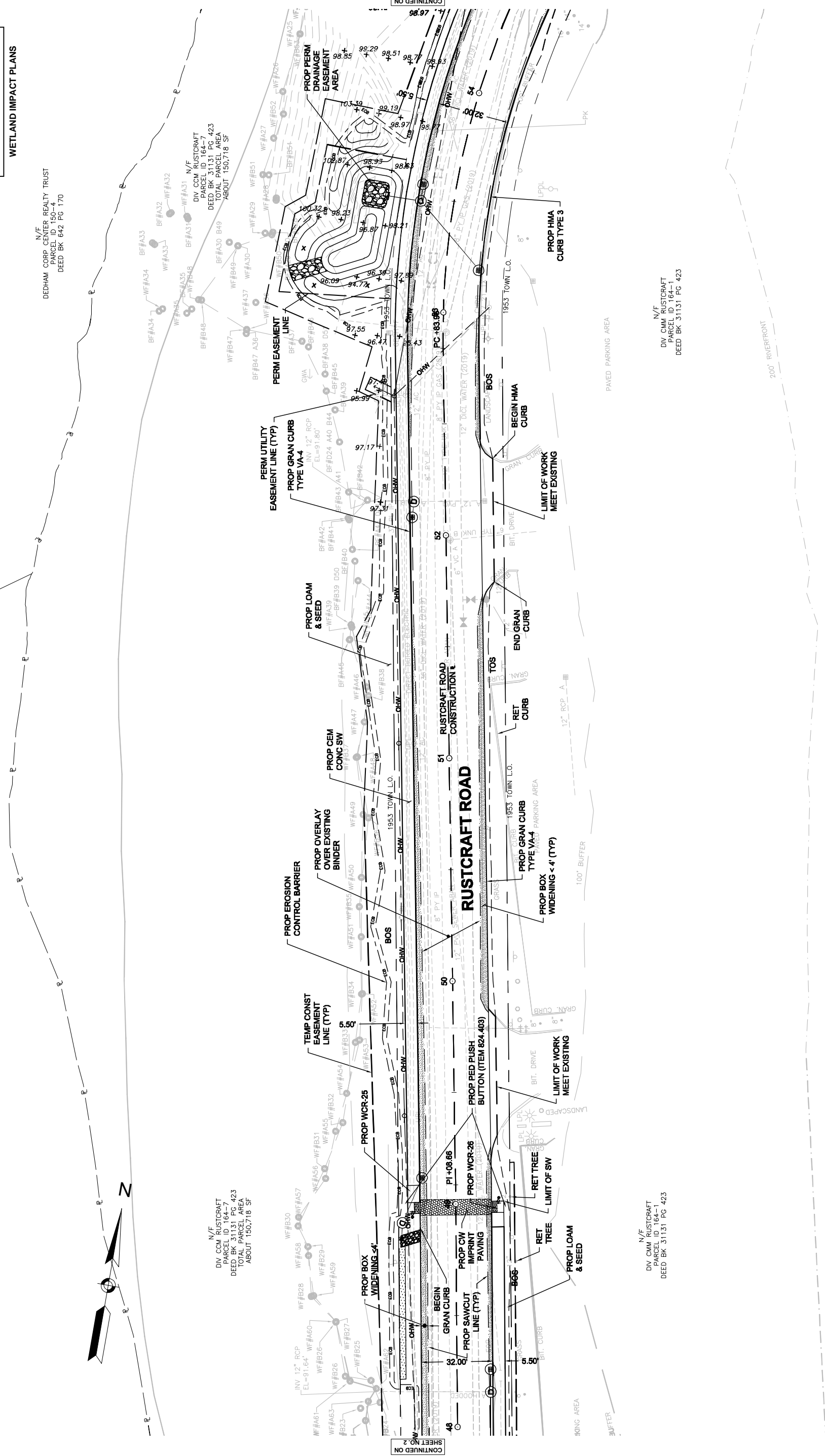
HIGHWAY GUARD DETAILS
NONE

N/F
DEDHAM CORP. CENTER REALTY TRUST
PARCEL ID 164-7
DEED BK 642 PG 170



N/F
DIV CCM RUSTCRAFT
PARCEL ID 164-7
DEED BK 31131 PG 423
TOTAL PARCEL AREA
ABOUT 150,718 SF

N/F
DIV CCM RUSTCRAFT
PARCEL ID 164-1
DEED BK 31131 PG 423



CONTINUED ON SHEET NO. 2

CONTINUED ON SHEET NO. 4

DEDHAM
ELM STREET AND RUSTCRAFT ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XX-XXXX(XXX)	4	4

PROJECT FILE NO. 607901

WETLAND IMPACT PLANS

DRAINAGE DETAILS
SEE BELOW

WATER SUPPLY ALTERATIONS
NONE

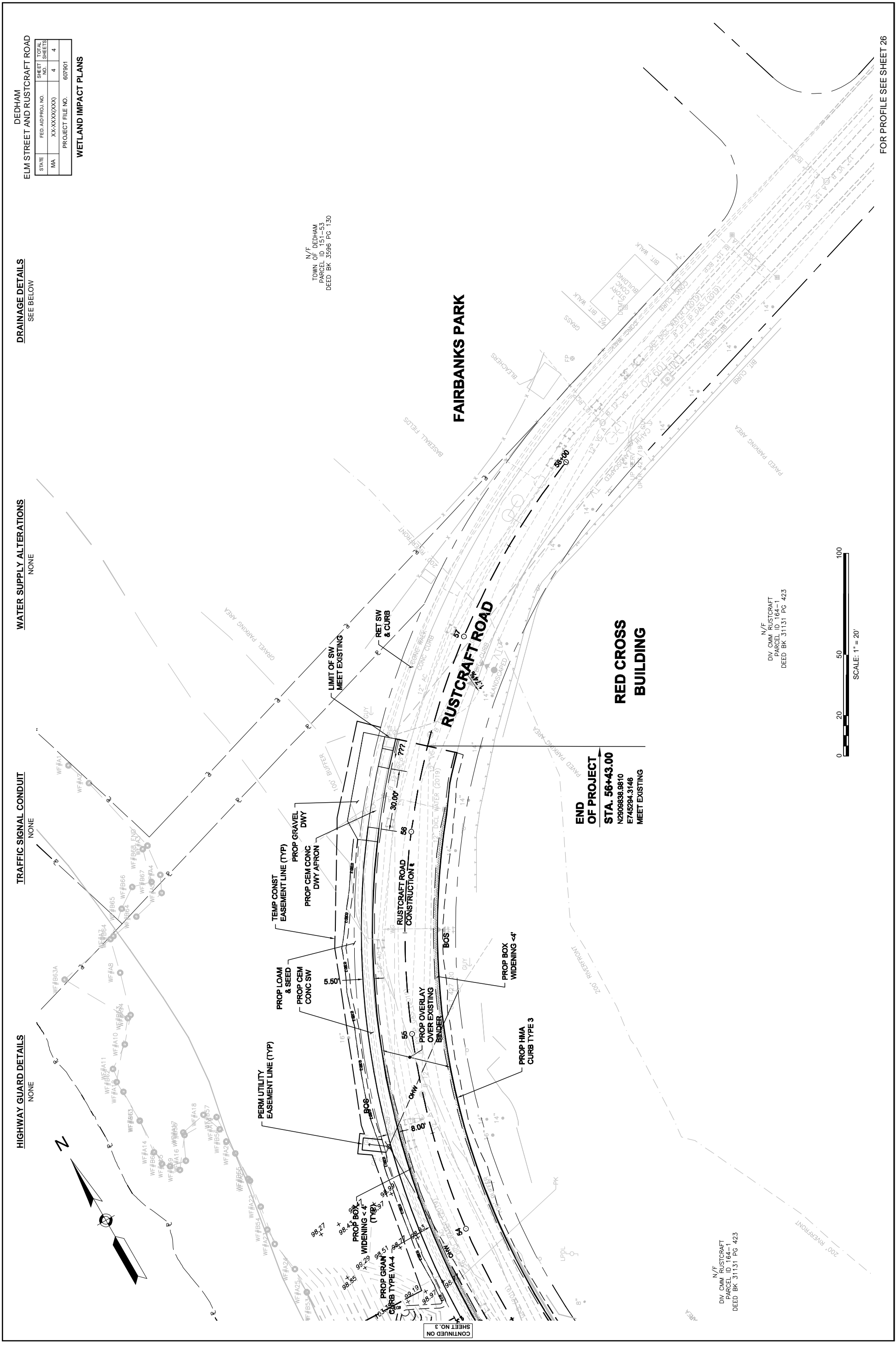
TRAFFIC SIGNAL CONDUIT
NONE

HIGHWAY GUARD DETAILS
NONE

N/F
TOWN OF DEDHAM
PARCEL ID 151-53
DEED BK 3596 PG 130

N/F
DIV OMM RUSTCRAFT
PARCEL ID 164-1
DEED BK 31131 PG 423

N/F
DIV OMM RUSTCRAFT
PARCEL ID 164-1
DEED BK 31131 PG 423



FOR PROFILE SEE SHEET 26

CONTINUED ON SHEET NO. 3

Dedham, MA

Roadway and Sidewalk Improvements Elm Street and Rustcraft Road

MassDOT Highway Division Project File #607901

May 2018

STORMWATER MANAGEMENT REPORT



BETA

315 Norwood Park South
2nd Floor
Norwood, Massachusetts 02062
781.255.1982
www.BETA-Inc.com

Roadway and Sidewalk Improvements Elm Street and Rustcraft Road

Dedham, MA

MassDOT Highway Division Project File #607901

STORMWATER MANAGEMENT REPORT

Prepared by: **BETA GROUP, INC.**
Prepared for: MassDOT Highway Division

May 2018

TABLE OF CONTENTS

Site Aerial Map..... 1

Stormwater Management Checklist 2

Objective of Calculations 11

Calculation Methods and Assumptions 11

Equations and Sources of Data Used 11

Points of Analysis 11

Existing Conditions Description 12

Proposed Condition Description with Mitigation 13

Summary of Results 14

Comments and Conclusions..... 15

Summary of Compliance with the Ten Stormwater Management Standards..... 15

LIST OF TABLES

Table 1 : Stormwater Runoff Flow Rate Summary..... 14

Table 2: Stormwater Runoff Volume Summary 14

LIST OF FIGURES

Figure 1: Site Aerial Map..... 1

LIST OF APPENDICES

- APPENDIX A – EXISTING CONDITIONS CALCULATION
- APPENDIX B – PROPOSED CONDITIONS CALCULATION
- APPENDIX C – CONSTRUCTION PERIOD POLLUTION PREVENTION AND EROSION AND SEDIMENTATION CONTROL PLAN
- APPENDIX D – LONG TERM OPERATIONS & MAINTENANCE PLAN
- APPENDIX E – SUPPLEMENTAL CALCULATIONS
- APPENDIX F – SUPPLEMENTAL MAPS
- APPENDIX G – REDEVELOPMENT QUALIFICATIONS
- APPENDIX H – WATERSHED PLANS

SITE AERIAL MAP

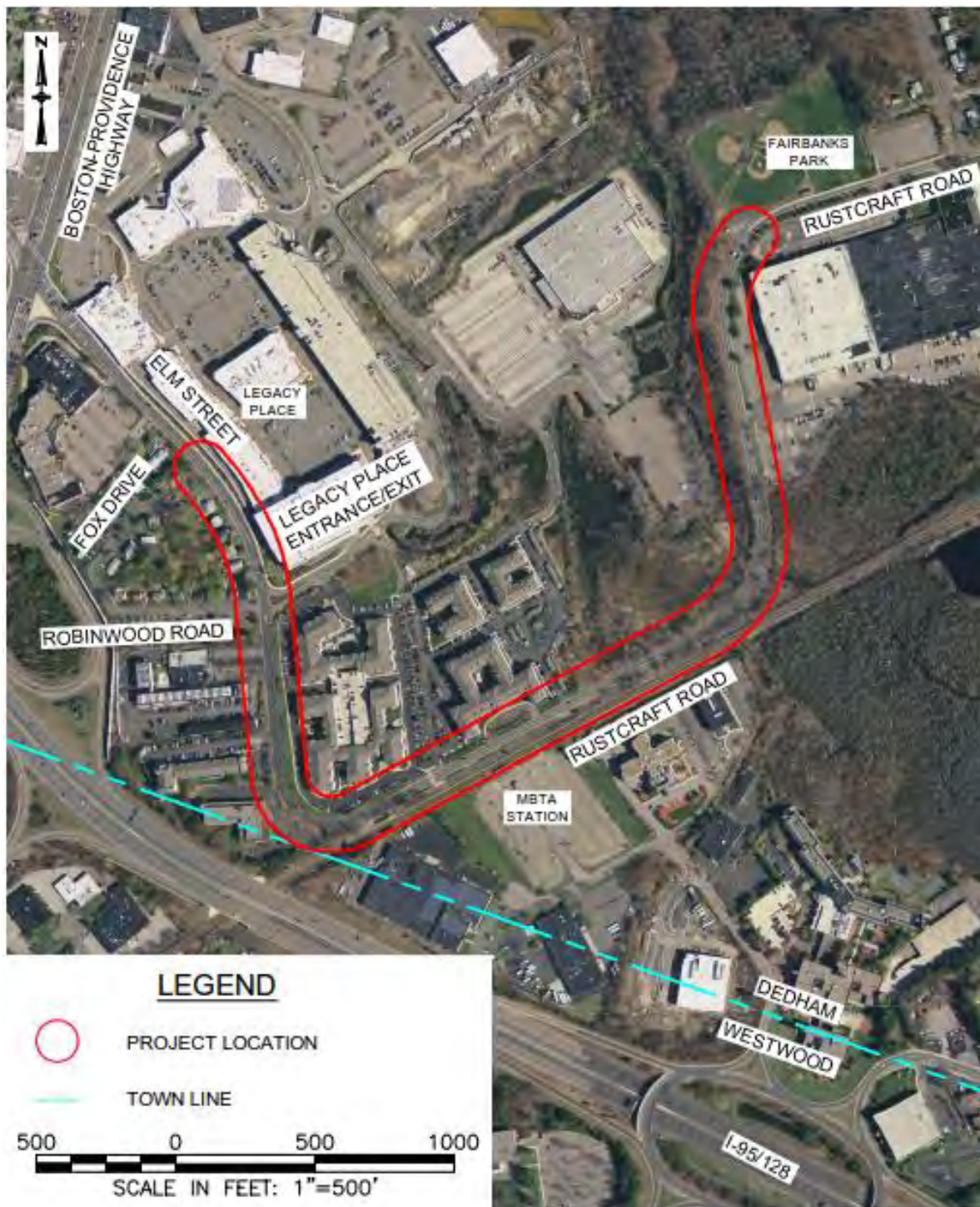


Figure 1: Site Aerial Map
(Source: MassGIS)

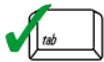


**Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program**

Checklist for Stormwater Report

A. Introduction

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the [Massachusetts Stormwater Handbook](#). The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.¹ This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8²
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

¹ The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

² For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

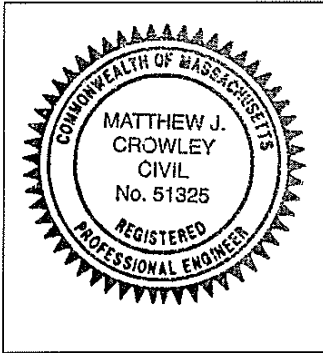
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature



Matthew J. Crowley 2/2/18
Signature and Date

Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

- New development
- Redevelopment
- Mix of New Development and Redevelopment



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Checklist for Stormwater Report

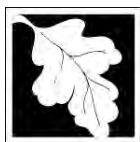
Checklist (continued)

LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

- No disturbance to any Wetland Resource Areas
- Site Design Practices (e.g. clustered development, reduced frontage setbacks)
- Reduced Impervious Area (Redevelopment Only)
- Minimizing disturbance to existing trees and shrubs
- LID Site Design Credit Requested:
 - Credit 1
 - Credit 2
 - Credit 3
- Use of "country drainage" versus curb and gutter conveyance and pipe
- Bioretention Cells (includes Rain Gardens)
- Constructed Stormwater Wetlands (includes Gravel Wetlands designs)
- Treebox Filter
- Water Quality Swale
- Grass Channel
- Green Roof
- Other (describe): Disconnected impervious area - sidewalks pitched away from roadway

Standard 1: No New Untreated Discharges

- No new untreated discharges
- Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth
- Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.



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Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

- Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.
- Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.
- Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

- Soil Analysis provided.
- Required Recharge Volume calculation provided.
- Required Recharge volume reduced through use of the LID site Design Credits.
- Sizing the infiltration, BMPs is based on the following method: Check the method used.
 - Static Simple Dynamic Dynamic Field¹
- Runoff from all impervious areas at the site discharging to the infiltration BMP.
- Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.
- Recharge BMPs have been sized to infiltrate the Required Recharge Volume.
- Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:
 - Site is comprised solely of C and D soils and/or bedrock at the land surface
 - M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
 - Solid Waste Landfill pursuant to 310 CMR 19.000
 - Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.
- Calculations showing that the infiltration BMPs will drain in 72 hours are provided.
- Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

¹ 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.



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 Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

- The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.
- Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
 - Provisions for storing materials and waste products inside or under cover;
 - Vehicle washing controls;
 - Requirements for routine inspections and maintenance of stormwater BMPs;
 - Spill prevention and response plans;
 - Provisions for maintenance of lawns, gardens, and other landscaped areas;
 - Requirements for storage and use of fertilizers, herbicides, and pesticides;
 - Pet waste management provisions;
 - Provisions for operation and management of septic systems;
 - Provisions for solid waste management;
 - Snow disposal and plowing plans relative to Wetland Resource Areas;
 - Winter Road Salt and/or Sand Use and Storage restrictions;
 - Street sweeping schedules;
 - Provisions for prevention of illicit discharges to the stormwater management system;
 - Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
 - Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
 - List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.
- A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.
 - Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:
 - is within the Zone II or Interim Wellhead Protection Area
 - is near or to other critical areas
 - is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
 - involves runoff from land uses with higher potential pollutant loads.
 - The Required Water Quality Volume is reduced through use of the LID site Design Credits.
 - Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

- The BMP is sized (and calculations provided) based on:
 - The ½" or 1" Water Quality Volume or
 - The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.
- The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.
- A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

- The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.
- The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted **prior to** the discharge of stormwater to the post-construction stormwater BMPs.
- The NPDES Multi-Sector General Permit does **not** cover the land use.
- LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.
- All exposure has been eliminated.
- All exposure has **not** been eliminated and all BMPs selected are on MassDEP LUHPPL list.
- The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

- The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.
- Critical areas and BMPs are identified in the Stormwater Report.



Massachusetts Department of Environmental Protection
 Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

Checklist (continued)

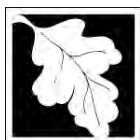
Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

- The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:
 - Limited Project
 - Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
 - Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
 - Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
 - Bike Path and/or Foot Path
 - Redevelopment Project
 - Redevelopment portion of mix of new and redevelopment.
- Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.
- The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
 - Construction Period Operation and Maintenance Plan;
 - Names of Persons or Entity Responsible for Plan Compliance;
 - Construction Period Pollution Prevention Measures;
 - Erosion and Sedimentation Control Plan Drawings;
 - Detail drawings and specifications for erosion control BMPs, including sizing calculations;
 - Vegetation Planning;
 - Site Development Plan;
 - Construction Sequencing Plan;
 - Sequencing of Erosion and Sedimentation Controls;
 - Operation and Maintenance of Erosion and Sedimentation Controls;
 - Inspection Schedule;
 - Maintenance Schedule;
 - Inspection and Maintenance Log Form.
- A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

Checklist (continued)

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

- The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has **not** been included in the Stormwater Report but will be submitted **before** land disturbance begins.
- The project is **not** covered by a NPDES Construction General Permit.
- The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.
- The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

- The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:
 - Name of the stormwater management system owners;
 - Party responsible for operation and maintenance;
 - Schedule for implementation of routine and non-routine maintenance tasks;
 - Plan showing the location of all stormwater BMPs maintenance access areas;
 - Description and delineation of public safety features;
 - Estimated operation and maintenance budget; and
 - Operation and Maintenance Log Form.
- The responsible party is **not** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:
 - A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
 - A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

- The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;
- An Illicit Discharge Compliance Statement is attached;
- NO Illicit Discharge Compliance Statement is attached but will be submitted **prior to** the discharge of any stormwater to post-construction BMPs.

OBJECTIVE OF CALCULATIONS

This calculation is an analysis of the site hydrology and stormwater runoff for the Existing Conditions Case and the Proposed Conditions Case. The project is considered a redevelopment project and the objective of this analysis is to demonstrate that measures have been implemented to mitigate stormwater impacts to the maximum extent practicable. Analysis of the Existing and Proposed Conditions is included for the two, ten, twenty-five, fifty, and one hundred year rainfall events. A complete description of the project and how it relates to the ten Stormwater Management Standards is included.

CALCULATION METHODS AND ASSUMPTIONS

Stormwater runoff is analyzed using the following:

- “HydroCAD™ Stormwater Modeling System,” by Applied Microcomputer Systems based upon SCS Technical Releases No. 55 and 20 for generating hydrologic calculations including peak flows and runoff volumes
- Microsoft Excel spreadsheet calculations used to determine Total Suspended Solids (TSS) removal rates, water quality volumes, and groundwater recharge volumes

EQUATIONS AND SOURCES OF DATA USED

- Type III 24-Hour Rainfall data (Town of Dedham Drainage & Stormwater Management Design Standards, Revised July 31, 2002)

2 year = 3.2 inches	10 year = 4.9 inches	25 year = 6.1 inches
50 year = 7.3 inches	100 year = 8.5 inches	
- Soils information from the Natural Resources Conservation Service (NRCS) website (Version 13, October 6, 2017)

POINTS OF ANALYSIS

Stormwater runoff generated from roadway corridor is discharged to three separate regions within the project area. Watersheds were delineated within the full extents of the right-of-way to account for the proposed widening of the road and sidewalks. Runoff rates and volumes were analyzed at each Point of Analysis (POA) and correspond to the following:

- Discharge Point 1 – Closed drainage system on the western portion of the roadway project site (Station 5+50± to Station 23+15±), discharge through Legacy Place Driveway.
- Discharge Point 2 – Existing hydraulically connected wetlands on the eastern portion of the roadway project site (Station 23+15± to Station 59+35± LT and RT).
- Discharge Point 3 – Existing Wetlands (Station 37+50± RT), no direct hydraulic connection to other wetlands.

EXISTING CONDITIONS DESCRIPTION

Elm Street and Rustcraft Road within the project area have an existing roadway width varying from 30 feet to 32 feet, with a typical cross section of one 12-foot lane in each direction with a solid white edge line delineating an edge offset typically 1 to 2 feet in width. Intersecting side streets provide one lane in each direction. Elm Street widens at its intersection with the Legacy Place driveway.

Sidewalks are typically not provided along the corridor, except for a concrete sidewalk separated by vertical granite curb on the east side of Elm Street, connecting Providence Highway with Legacy Place. Sidewalk is also provided for approximately 800 feet on the north side of Rustcraft Road bordering Fairbanks Park and its adjacent parking area at the eastern project limits. Curbing varies throughout the project area.

Land use along Elm Street and Rustcraft Road is a mix of commercial, residential, and open space. Natural Resources Conservation Service (NRCS) maps list soils within the project limits primarily as Urban Land (unrated) and Freetown muck, rated in hydrologic soil group (HSG) B/D. Other mapped soils directly abutting the project area include Udorthents, wet substratum (unrated), Merrimac-Urban Land Complex (HSG A), Hinkley Loamy Sand (HSG A), and Udorthents loamy (HSG A). Refer to Appendix F – Supplemental Maps. For the purposes of the hydrologic calculations included in this report unrated Urban Land and Udorthents were conservatively assumed to be rated in HSG B.

Portions of the project are located in proximity of and within protected and regulated resource areas, including bordering vegetated wetlands, Riverfront, and a FEMA mapped 100-year floodplain. Refer to Notice of Intent for summary of project compliance.

EPA does not list any record of superfund sites in Dedham. DEP lists six spills on properties adjacent to the project with four that have associated Activity Use Limitations (200 & 250 Elm Street, 400 Commercial Circle, and a non-specific address on Rustcraft Road).

The project is located within the Charles River watershed, which is listed as an impaired waterway/water body.

Stormwater runoff is primarily collected through a number of catchbasins located on Elm Street and Rustcraft Road, routed through closed drainage systems, and discharged through several outfalls along the roadway. A significant portion of the roadway also discharges stormwater via country drainage and to the adjacent wetland systems.

There are three distinct watershed areas associated with the project. The first watershed is located between the roadway area approximately 550 feet west of the southerly project limit and a roadway high point approximately at Station 23+25. This system flows to a series of catch basins along the roadway and into a closed drainage system, which is directed beneath the Legacy Place driveway. The second watershed is comprised of the areas between the northerly project limit and the roadway high point at approximate Station 23+25 (less the area of the third watershed). Stormwater from this watershed is either directed to several series of closed drainage systems/outfalls or overland via country drainage. All stormwater from this watershed is directed to a series of hydraulically connected wetlands located on the north and south sides of the roadway. The third watershed is comprised of a small portion of Rustcraft Road that is discharged overland to an existing wetland series located at approximate Station 37+50 RT. This wetland is not hydraulically connected to any other wetland series and does not have a defined discharge location.

The total watershed area, including upstream areas that flow onto the roadway, is approximately 11.3 acres. Watershed areas and discharge locations are shown on the attached Watershed Plans.

PROPOSED CONDITION DESCRIPTION WITH MITIGATION

The Elm Street and Rustcraft Road corridor has physical and operational deficiencies which require improvements for safe and efficient vehicular, bicycle, and pedestrian use. The proposed improvements will address these potential deficiencies. Based on examination of existing conditions, deficiencies, future traffic volumes, and discussions with State and Town officials, the following proposed improvements were developed to address the existing deficiencies.

- Provide uniform 32 to 36-foot width for Elm Street and Rustcraft Road within the project limits. This will be striped for an 11 to 12-foot travel lane and a five to six-foot shoulder in each direction.
- Provide a minimum 5'-6" paved sidewalk along the project length. Sidewalks will be provided on both sides of the roadway beginning at Robinwood Road. Proposed sidewalks will continue eastward through the project to a crosswalk connecting the Avalon and Jefferson at Dedham Station apartment complexes with the MBTA station, beyond which a single sidewalk will continue along the south side of Rustcraft Road to the crosswalk near the Red Cross building. From this point, sidewalk will continue on the north side of Rustcraft Road for the remainder of the project, connecting to the existing sidewalk at Fairbanks Park. The project will provide a continuous pedestrian path from Providence Highway to Fairbanks Park and the eastern project limit.
- Provide Rapid Rectangular Flashing Beacon (RRFB) on both sides of the roadway at crosswalks at Legacy Place, the MBTA Kiss and Ride and the Red Cross building.
- Install granite curb adjacent to proposed sidewalk on Elm Street and Rustcraft Road along the project length.
- Provide new ADA-compliant wheelchair ramps at the intersection of Elm Street at Legacy Place and Robinwood Road as well as at all crosswalks throughout the corridor.
- Provide new pavement markings and signs throughout project.
- Relocate utility poles at locations of roadway widening.
- Provide stormwater Best Management Practices (BMP) and Low Impact Development Techniques (LID) to the maximum extent practicable. Proposed BMPs and LIDs include country drainage, disconnected impervious area, water quality swales, deep sump catchbasins with hoods, subsurface infiltration systems, and an infiltration pond.

The proposed BMPs will remove between 25% and 80% of Total Suspended Solids (TSS) for approximately 84,950 sq. ft. of impervious surfaces within the project area. The project-wide TSS removal rate is approximately 18.5%, which is equivalent an 80% TSS removal rate for approximately 53,321 sq. ft. of impervious surfaces. Details and areas of each treatment train are included in Appendix E – Supplemental Calculations on the TSS removal worksheets. Recharge and infiltration system design calculations are also provided in this Appendix. Proposed BMPs including subsurface infiltration systems and an infiltration basin are consistent with recommended treatment practices for nutrients and pathogens and will provide compliance with the Charles River Watershed TMDL. Mitigation measures and locations are shown on the plan set and the proposed project as is relates to the MassDEP's Stormwater Management Standards is described in the Summary of Compliance with the Ten Stormwater Management Standards section.

SUMMARY OF RESULTS

Table 1 : Stormwater Runoff Flow Rate Summary

<u>Peak Rate of Runoff</u>		Flow (cubic feet per second)									
		2 Year Storm		10 Year Storm		25 Year Storm		50 Year Storm		100 Year Storm	
Outlet To:		Exist	Prop	Exist	Prop	Exist	Prop	Exist	Prop	Exist	Prop
DP1	Western Segment	13.19	13.72	23.30	24.16	30.46	31.53	37.59	38.88	44.40	46.19
DP2	Eastern Wetlands	6.52	7.25	12.25	14.00	16.45	18.52	20.69	23.00	24.95	27.47
DP3	Wetlands 37+50 RT	0.71	1.03	1.50	1.78	2.10	2.30	2.70	2.83	3.31	3.35
Project Total		20.42	22.00	37.05	39.94	49.01	52.35	60.98	64.71	72.66	77.01

Table 2: Stormwater Runoff Volume Summary

<u>Volume of Runoff</u>		Volume (acre-feet)									
		2 Year Storm		10 Year Storm		25 Year Storm		50 Year Storm		100 Year Storm	
Outlet To:		Exist	Prop	Exist	Prop	Exist	Prop	Exist	Prop	Exist	Prop
DP1	Western Segment	0.948	0.969	1.707	1.737	2.261	2.296	2.82	2.859	3.383	3.426
DP2	Eastern Wetlands	0.595	0.668	1.123	1.258	1.517	1.693	1.922	2.134	2.333	2.580
DP3	Wetlands 37+50 RT	0.052	0.074	0.107	0.130	0.149	0.171	0.193	0.212	0.293	0.253
Project Total		1.595	1.711	2.937	3.125	3.927	4.160	4.935	5.205	6.009	6.259

Recharge Volume Required (MassDEP)= 29,800 sq. ft. new impervious x 0.35"/12= 870 cu. ft.

Recharge Volume Required (Dedham) = 29,800 sq. ft. new impervious x 0.25"/12= 620 cu. ft.

Recharge Volume Provided = 2,900 cu. ft.

Water Quality Volume Required (MassDEP) = 29,800 sq. ft. new impervious x 0.5"/12 = 1,242 cu. ft.

Water Quality Volume Required (Dedham) = 29,800 sq. ft. new impervious x 1"/12 = 2,484 cu. ft.

Water Quality Volume Provided = 2,900 cu. ft.

Sediment forebay sizing: 14,411 sq. ft. of impervious x 0.1"/12 = 121 cu. ft.

Sediment Forebay Storage Provided = 125 cu. ft.

Existing TSS Removal Rate = N/A

Proposed TSS Removal Rate for Impervious Areas = 25% to 80%

Proposed TSS Removal Rate of Project Wide Impervious Areas = 18.5%

Proposed New Impervious Area = 29,800± sq. ft.

Proposed 80% TSS Removal Rate Equivalent Area = 53,321 sq. ft.

COMMENTS AND CONCLUSIONS

As a result of the aforementioned proposed mitigation measures runoff will be captured, peak flows will be controlled to the maximum extent practicable, recharge will be provided and total suspended solids (TSS), nutrients, and pathogens will be reduced.

The proposed stormwater management system has been designed to meet the DEP's Stormwater Management Policy to the maximum extent practicable as a redevelopment project and will be an improvement over the existing conditions. The proposed system has also been designed to be in compliance with the Upper/Middle Charles River TMDLs.

Although any site construction can impact local hydrology and water quality, the plans as presented incorporate design features intended to mitigate adverse effects to down-gradient wetlands and aquifers.

SUMMARY OF COMPLIANCE WITH THE TEN STORMWATER MANAGEMENT STANDARDS

The Town of Dedham and MassDOT are proposing improvements for safe and efficient vehicular, bicycle, and pedestrian use along Elm Street and Rustcraft Road. Refer to project narrative for a complete description.

LID Measures:

Low Impact Development (LID) techniques utilized along portions of the project consist of country drainage, water quality/infiltration swales, minimizing disturbance to existing trees and shrubs, and LID sidewalks that are pitched away from the roadway surface (disconnected impervious area).

Standard 1: No New Untreated Discharges

No new untreated discharges to wetlands are created as part of this project and new outfalls have been designed to prevent erosion – **project complies.**

Standard 2: Peak Rate Attenuation

The project will mitigate impacts to peak runoff rates to the maximum extent practicable by installing water quality/infiltration swales, subsurface infiltration systems, and an infiltration basin. Project-wide there will be minor increases to the peak rates of runoff and volume of stormwater discharged from the site – **project complies to the maximum extent practicable.**

Standard 3: Recharge

Subsurface infiltration systems, water quality/infiltration swales and an infiltration basin will provide the required recharge volume for new impervious surfaces (refer to Appendix E) – **project complies.**

Standard 4: Water Quality

Proposed drainage system improvements, including the installation of deep sump catchbasins with hoods, water quality/infiltration swales, subsurface infiltration systems, and an infiltration basin will provide treatment of stormwater runoff that does not currently exist. The proposed project will provide a TSS removal rate between 25% and 80% for approximately 84,950 sq. ft. of impervious surfaces. The project will provide an 80% TSS removal equivalent treatment area of over 53,321 sq. ft. and exceeds

the proposed new impervious area of 29,800 sq. ft. – **project complies to the maximum extent practicable.**

The project is located within the Upper/Middle Charles River Watershed, an impaired water body with Final Total Maximum Daily Loads (TMDLs) for Bacteria/Pathogens and Phosphorus.

As stated in the Final Pathogen TMDL for the Charles River Watershed, leading sources of bacterial surface water pollution include “Illicit connection of sewerage to storm drains, failing sewer infrastructure, Combined Sewer Overflows (CSOs), and stormwater discharges.” There are no existing or proposed CSOs within the project limits and existing sewer lines are cleaned and inspected every 3-5 years. Segments in need of repair have been lined within the past 10 years to ensure system integrity and there are no known illicit discharges. As a transportation facility, pathogen loads from the roadway surfaces are anticipated to be minimal. The proposed infiltration systems will provide a reduction in the bacterial load directed to waterbodies. The MassDEP Stormwater Management Handbook reports that infiltration basins are capable of removing 90% of bacterial loads. The infiltration systems will also be effective in reducing the load of phosphorus directed to water bodies. The Stormwater Handbook reports removal rates between 60% and 70%. The project proposes to direct approximately 44,800 sq. ft. of impervious surfaces to infiltration structures, which exceeds the proposed new impervious area of 29,800 sq. ft. The following infiltration structures that provide bacterial and nutrient load reductions are proposed within the project limits:

- Water Quality Swale: Sta. 38+00 – 38+50 LT
- Water Quality Swale: Sta. 39+00 – 42+00 LT
- Subsurface Infiltration System: Sta. 48+50 LT
- Infiltration Basin: Sta. 53+25 LT

Standard 5: Land Uses with Higher Potential Pollutant Loads (LUHPPLs)

The project does not propose any Land Uses with Higher Potential Pollutant Loads – **not applicable.**

Standard 6: Critical Areas

The project will not result in any direct stormwater discharges to a critical area – **not applicable.**

Standard 7: Redevelopment

The project is classified as a redevelopment under the first definition “*Maintenance and improvement of existing roadways, including widening less than a single lane, adding shoulders, correcting substandard intersections, improving existing drainage systems and repaving*” (refer to Appendix G – Redevelopment Qualification). Proposed deep sump catchbasins with hoods, water quality/infiltration swales, subsurface infiltration systems, and an infiltration basin will provide treatment to the maximum extent practicable and represent an improvement to the existing conditions. Standards 1, 3, and 8-10 are met and Standards 2 and 4 are met to the maximum extent practicable. Standards 5 and 6 are not applicable to this project.

Standard 8: Construction Period Pollution Prevention and Erosion and Sediment Control

A Construction Period Pollution Prevention and Erosion and Sediment Control Plan is included. A Stormwater Pollution Prevention Plan will be provided with the construction documents and a Notice of Intent will be filed with EPA prior to commencement of construction.

Standard 9: Long Term Operation and Maintenance Plan

A Long Term Operation and Maintenance Plan has been included. Operations and maintenance of stormwater management systems will be the responsibility of the Town of Dedham DPW. Therefore, street sweeping and inspection and maintenance of catchbasins, manholes, infiltration systems, and water quality swales will be in accordance with the Town-wide Operations and Maintenance schedule.

Standard 10: Prohibition of Illicit Discharges

There are currently no known illicit discharges within the project limits and new illicit discharges are not proposed.

APPENDIX A – EXISTING CONDITIONS CALCULATION

Existing Conditions_B Soil
 Prepared by Beta Group, Inc
 HydroCAD® 9.00 s/n 01895 © 2009 HydroCAD Software Solutions LLC
 Type III 24-hr 2-yr Rainfall=3.20"
 Printed 2/22/2018
 Page 2

Summary for Subcatchment 3S: EX-WS-A1

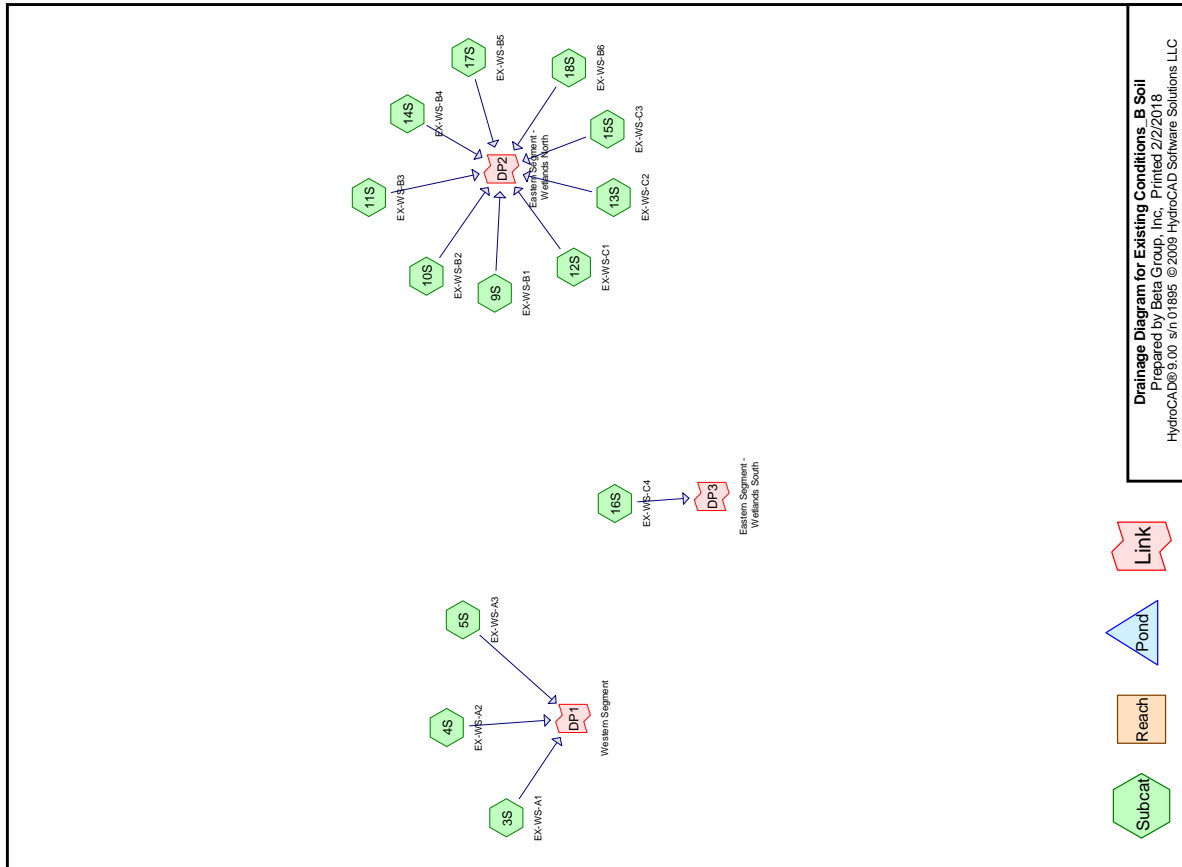
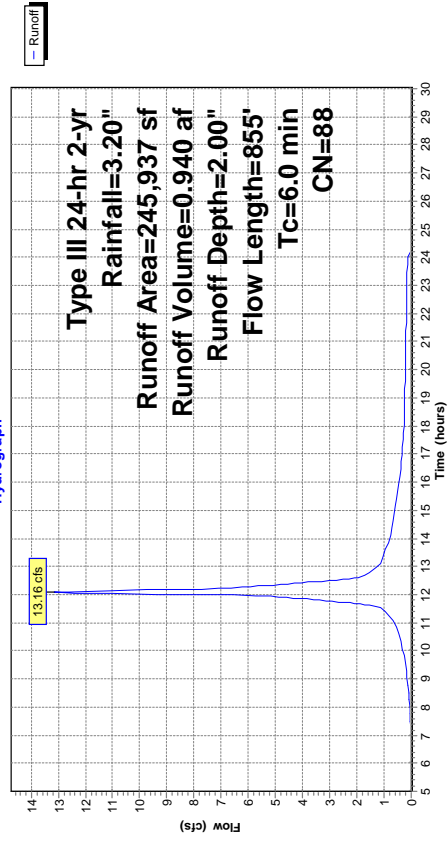
Runoff = 13.16 cfs @ 12.09 hrs, Volume= 0.940 af, Depth= 2.00"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 2-yr Rainfall=3.20"

Area (sf)	CN	Description
18,499	61	>75% Grass cover, Good, HSG B
8,431	61	>75% Grass cover, Good, HSG B
59,122	72	1/3 acre lots, 30% imp, HSG B
159,885	98	Paved roads w/curbs & sewers, HSG B
245,937	88	Weighted Average
68,315		27.78% Pervious Area
177,622		72.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	100	0.0200	1.38		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.20"
4.4	755	0.0203	2.89		Shallow Concentrated Flow, Paved KV= 20.3 fps
5.6	855	Total	Increased to minimum		Tc = 6.0 min

Subcatchment 3S: EX-WS-A1

Hydrograph



Drainage Diagram for Existing Conditions_B Soil
 Prepared by Beta Group, Inc. Printed 2/22/2018
 HydroCAD® 9.00 s/n 01895 © 2009 HydroCAD Software Solutions LLC

Summary for Subcatchment 5S: EX-WS-A3

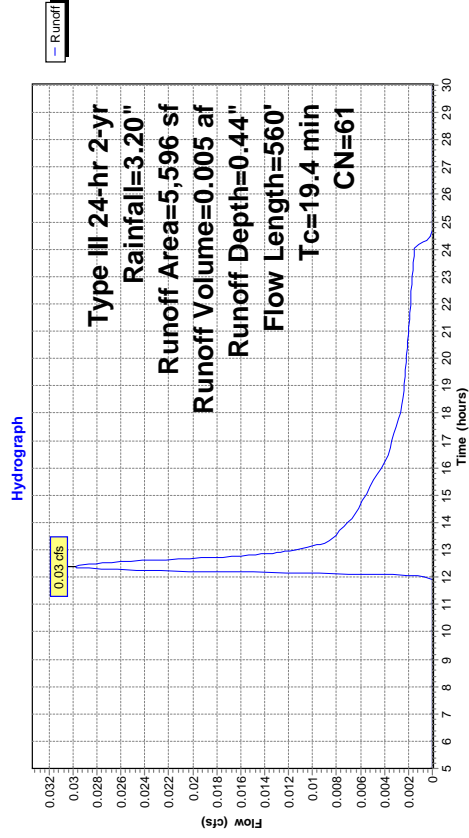
Runoff = 0.03 cfs @ 12.39 hrs, Volume= 0.005 af, Depth= 0.44"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 2-yr Rainfall=3.20"

Area (sf)	CN	Description
5,176	61	>75% Grass cover, Good, HSG B
420	61	>75% Grass cover, Good, HSG B
5,596	61	Weighted Average
5,596	61	100.00% Pervious Area

Tc (min)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.9	100	0.0100	0.13	Sheet Flow, Grass: Short n= 0.150 P2= 3.20"
6.5	460	0.0283	1.18	Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
19.4	560	Total		

Subcatchment 5S: EX-WS-A3



Summary for Subcatchment 4S: EX-WS-A2

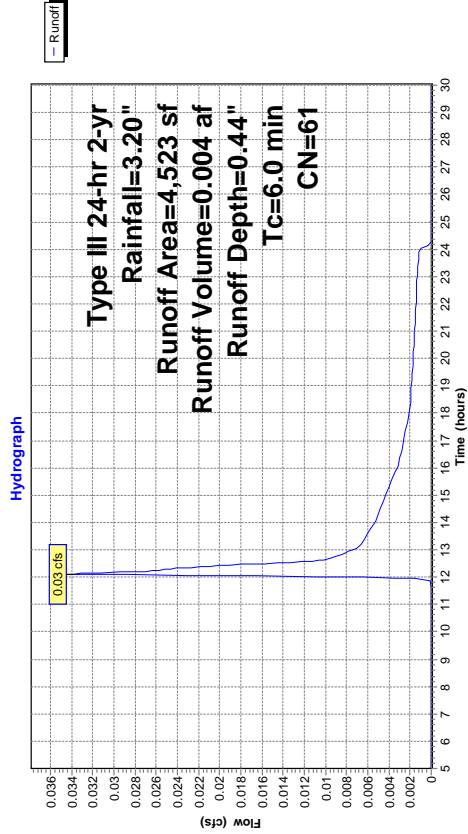
Runoff = 0.03 cfs @ 12.12 hrs, Volume= 0.004 af, Depth= 0.44"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 2-yr Rainfall=3.20"

Area (sf)	CN	Description
3,273	61	>75% Grass cover, Good, HSG B
1,250	61	>75% Grass cover, Good, HSG B
4,523	61	Weighted Average
4,523	61	100.00% Pervious Area

Tc (min)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0				Direct Entry, Minimum Tc

Subcatchment 4S: EX-WS-A2



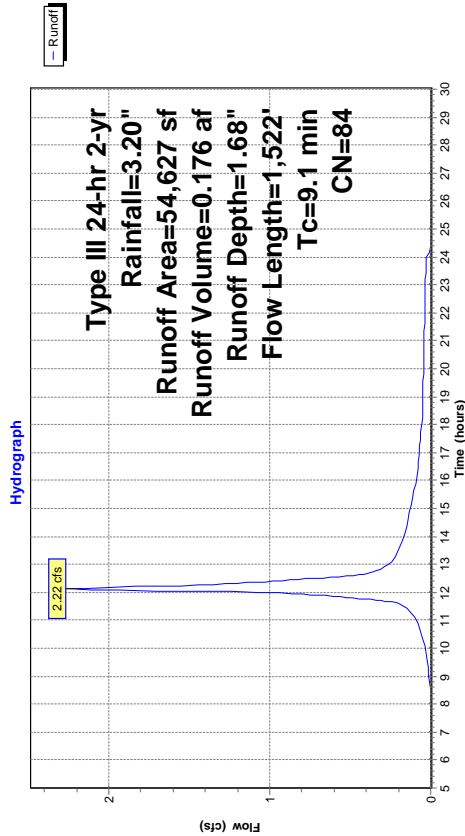
Summary for Subcatchment 9S: EX-WS-B1

Runoff = 2.22 cfs @ 12.13 hrs, Volume= 0.176 af, Depth= 1.68"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 2-yr Rainfall=3.20"

Area (sf)	CN	Description
13,321	61	>75% Grass cover, Good, HSG B
5,152	58	Woods/grass comb., Good, HSG B
1,619	61	>75% Grass cover, Good, HSG B
34,535	98	Paved roads w/curbs & sewers, HSG B
54,627	84	Weighted Average
20,092		36.78% Pervious Area
34,535		63.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	30	0.0200	1.08		Sheet Flow, Smooth surfaces n=0.011 P2= 3.20"
8.6	1,492	0.0202	2.89		Shallow Concentrated Flow, Paved Kv= 20.3 fps
9.1	1,522	Total			

Subcatchment 9S: EX-WS-B1



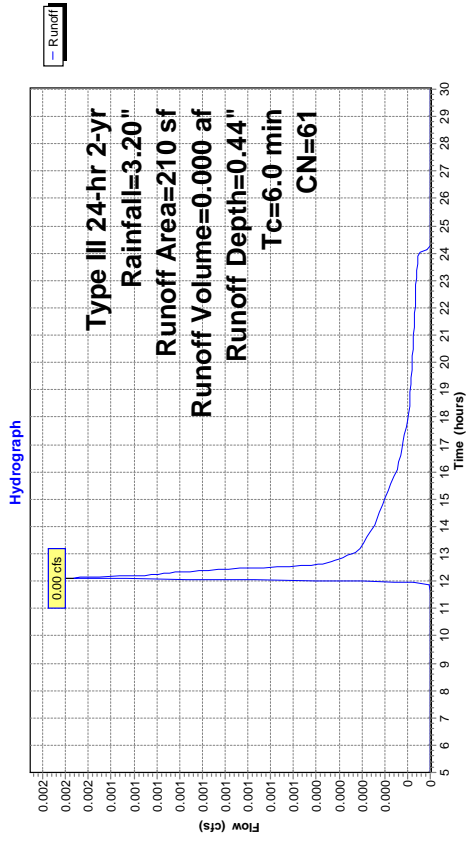
Summary for Subcatchment 10S: EX-WS-B2

Runoff = 0.00 cfs @ 12.12 hrs, Volume= 0.000 af, Depth= 0.44"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 2-yr Rainfall=3.20"

Area (sf)	CN	Description
210	61	>75% Grass cover, Good, HSG B
210		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Minimum Tc

Subcatchment 10S: EX-WS-B2



Existing Conditions_B Soil
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 Type III 24-hr 2-yr Rainfall=3.20"
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 Page 8

Summary for Subcatchment 12S: EX-WS-C1

Runoff = 0.01 cfs @ 12.30 hrs, Volume= 0.002 af, Depth= 0.37"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, d= 0.02 hrs
 Type III 24-hr 2-yr Rainfall=3.20"

Area (sf)	CN	Description
1,192	61	>75% Grass cover, Good, HSG B
959	48	Brush, Good, HSG B
442	61	>75% Grass cover, Good, HSG B
197	98	Paved roads w/curbs & sewers, HSG B
2,790	59	Weighted Average
2,593		92.94% Pervious Area
197		7.06% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.0	68	0.0294	0.13		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
0.1	27	0.0740	5.52		Shallow Concentrated Flow, Paved Kv= 20.3 fps
1.5	147	0.0540	1.63		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.8	121	0.0248	1.10		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
12.4	363	Total			

Existing Conditions_B Soil
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 Type III 24-hr 2-yr Rainfall=3.20"
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 Page 7

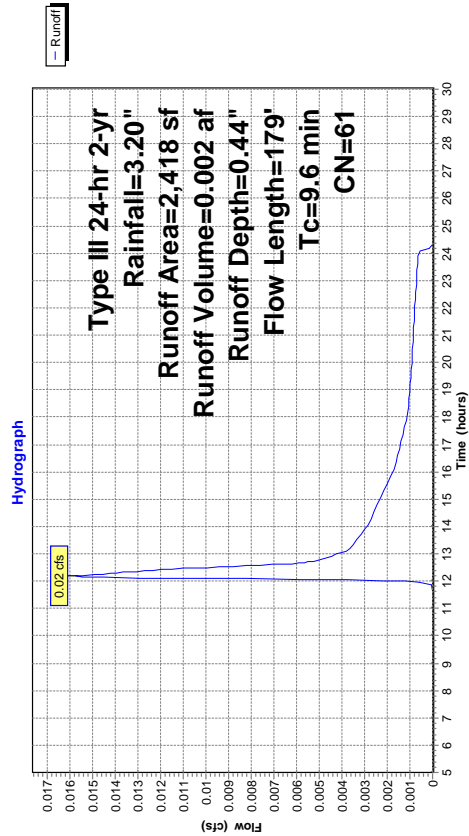
Summary for Subcatchment 11S: EX-WS-B3

Runoff = 0.02 cfs @ 12.18 hrs, Volume= 0.002 af, Depth= 0.44"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, d= 0.02 hrs
 Type III 24-hr 2-yr Rainfall=3.20"

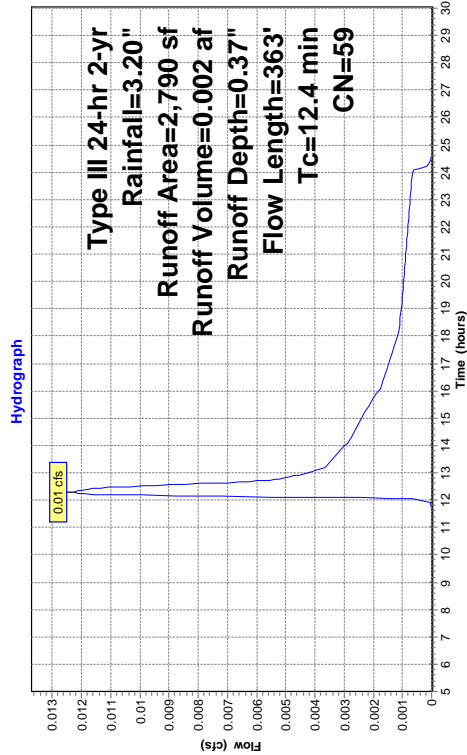
Area (sf)	CN	Description
2,418	61	>75% Grass cover, Good, HSG B
2,418		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.9	100	0.0650	0.19		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
0.7	79	0.0696	1.85		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
9.6	179	Total			

Subcatchment 11S: EX-WS-B3



Subcatchment 12S: EX-WS-C1



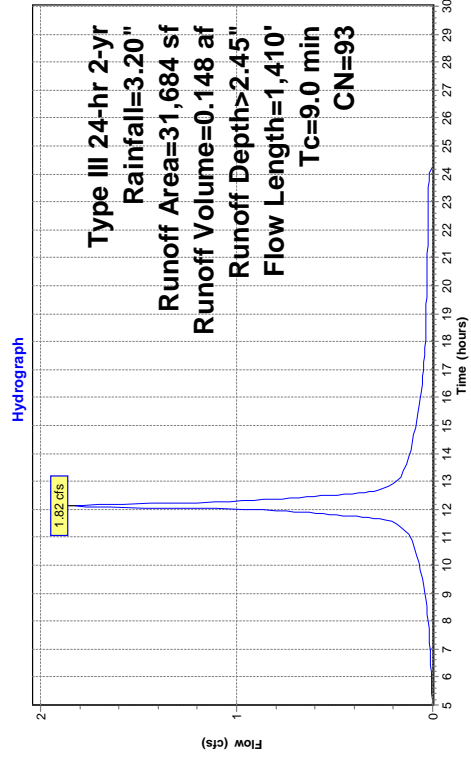
Summary for Subcatchment 13S: EX-WS-C2

Runoff = 1.82 cfs @ 12.12 hrs, Volume= 0.148 af, Depth> 2.45"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 2-yr Rainfall=3.20"

Area (sf)	CN	Description
1,324	61	>75% Grass cover, Good, HSG B
2,171	48	Brush, Good, HSG B
7	61	>75% Grass cover, Good, HSG B
28,182	98	Paved roads w/curbs & sewers, HSG B
31,684	93	Weighted Average
3,502		11.05% Pervious Area
28,182		88.95% Impervious Area

Tc (min)	Slope (feet)	Velocity (ft/ft)	Capacity (cfs)	Description
0.8	100	0.0550	2.06	Sheet Flow, Smooth surfaces n=0.011 P2= 3.20"
8.2	1,310	0.0172	2.66	Shallow Concentrated Flow, Paved Kv= 20.3 fps
9.0	1,410	Total		

Subcatchment 13S: EX-WS-C2



Existing Conditions_B Soil Type III 24-hr 2-yr Rainfall=3.20"
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Summary for Subcatchment 15S: EX-WS-C3

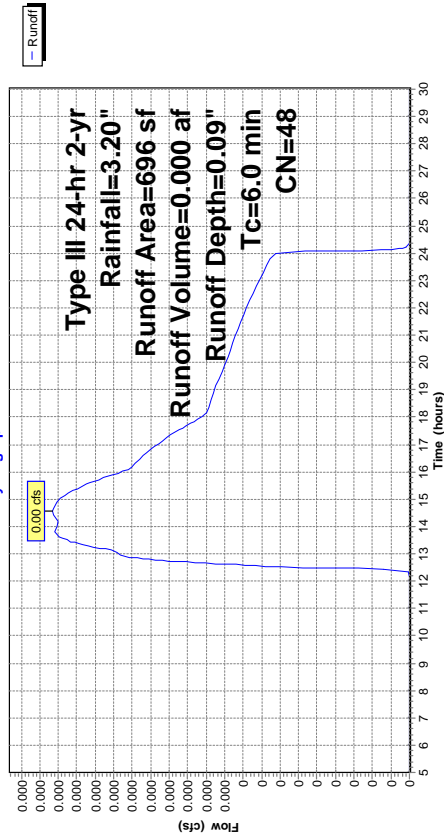
Runoff = 0.00 cfs @ 14.56 hrs, Volume= 0.000 af, Depth= 0.09"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, d= 0.02 hrs
 Type III 24-hr 2-yr Rainfall=3.20"

Area (sf)	CN	Description
696	48	Brush, Good, HSG B
696		100.00% Pervious Area

Tc (min)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0				Direct Entry, Minimum Tc

Subcatchment 15S: EX-WS-C3

Hydrograph



Existing Conditions_B Soil Type III 24-hr 2-yr Rainfall=3.20"
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Summary for Subcatchment 14S: EX-WS-B4

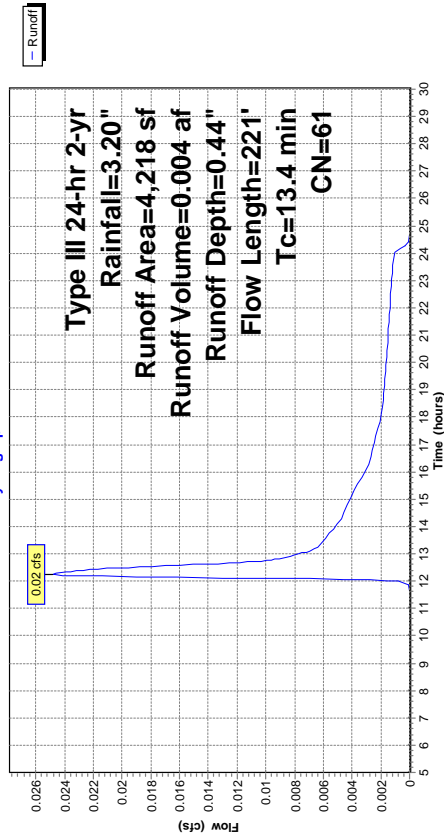
Runoff = 0.02 cfs @ 12.26 hrs, Volume= 0.004 af, Depth= 0.44"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, d= 0.02 hrs
 Type III 24-hr 2-yr Rainfall=3.20"

Area (sf)	CN	Description
4,218	61	>75% Grass cover, Good, HSG B
4,218		100.00% Pervious Area

Tc (min)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.4	100	0.0350	0.15	Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
2.0	121	0.0207	1.01	Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
13.4	221	Total		

Subcatchment 14S: EX-WS-B4

Hydrograph



Existing Conditions B Soil
 Type III 24-hr 2-yr Rainfall=3.20"
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 Page 13

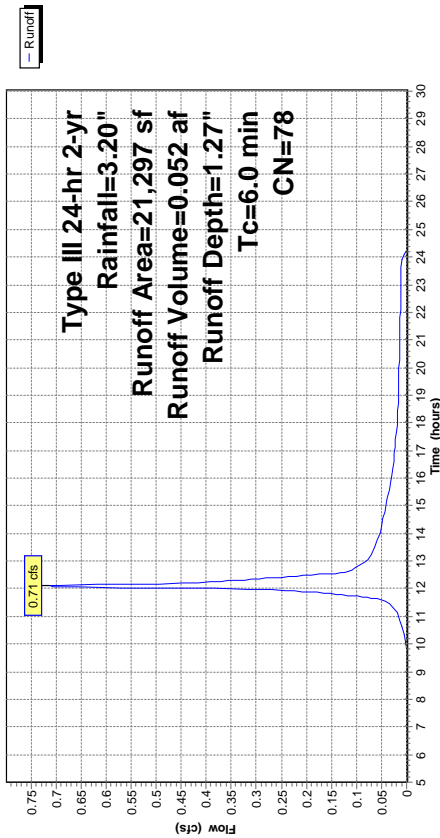
Summary for Subcatchment 16S: EX-WS-C4

Runoff = 0.71 cfs @ 12.09 hrs, Volume= 0.052 af, Depth= 1.27"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 2-yr Rainfall=3.20"

Area (sf)	CN	Description
3,410	61	>75% Grass cover, Good, HSG B
3,400	58	Woods/grass comb., Good, HSG B
11,406	98	Paved roads w/curbs & sewers, HSG B
3,081	48	Brush, Good, HSG B
21,297	78	Weighted Average
9,891		46.44% Pervious Area
11,406		53.56% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Minimum Tc

Subcatchment 16S: EX-WS-C4



Existing Conditions B Soil
 Type III 24-hr 2-yr Rainfall=3.20"
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 Page 14

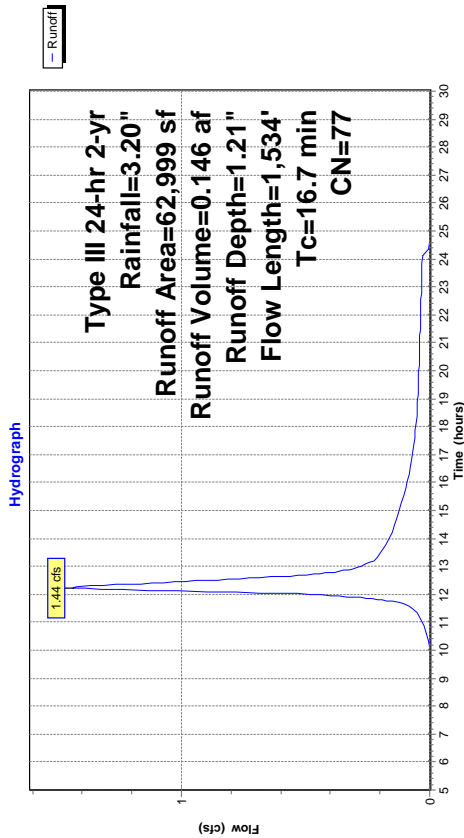
Summary for Subcatchment 17S: EX-WS-B5

Runoff = 1.44 cfs @ 12.24 hrs, Volume= 0.146 af, Depth= 1.21"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 2-yr Rainfall=3.20"

Area (sf)	CN	Description
13,903	61	>75% Grass cover, Good, HSG B
20,498	58	Woods/grass comb., Good, HSG B
405	61	>75% Grass cover, Good, HSG B
28,193	98	Paved roads w/curbs & sewers, HSG B
62,999	77	Weighted Average
34,806		55.25% Pervious Area
28,193		44.75% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	25	0.0200	1.04		Sheet Flow, Smooth surfaces n=0.011 P2= 3.20" Shallow Concentrated Flow, Paved Kv= 20.3 fps
16.3	1,509	0.0058	1.55		
16.7	1,534	Total			

Subcatchment 17S: EX-WS-B5



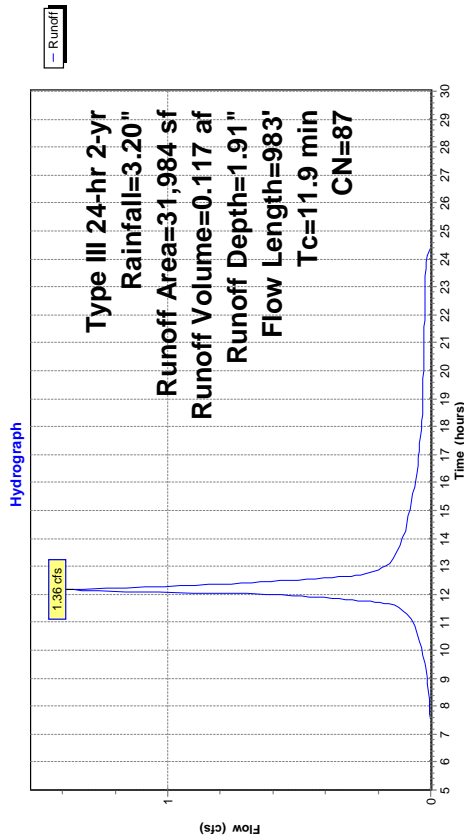
Summary for Subcatchment 18S: EX-WS-B6

Runoff = 1.36 cfs @ 12.16 hrs, Volume= 0.117 af, Depth= 1.91"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 2-yr Rainfall=3.20"

Area (sf)	CN	Description
4,963	61	>75% Grass cover, Good, HSG B
3,359	58	Woods/grass comb., Good, HSG B
570	61	>75% Grass cover, Good, HSG B
23,092	98	Paved roads w/curbs & sewers, HSG B
31,984	87	Weighted Average
8,892		27.80% Pervious Area
23,092		72.20% Impervious Area

Tc (min)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	25	0.0200	1.04	Sheet Flow, Smooth surfaces n= 0.011 P2= 3.20"
11.5	958	0.0047	1.39	Shallow Concentrated Flow, Paved Kv= 20.3 fps
11.9	983	Total		

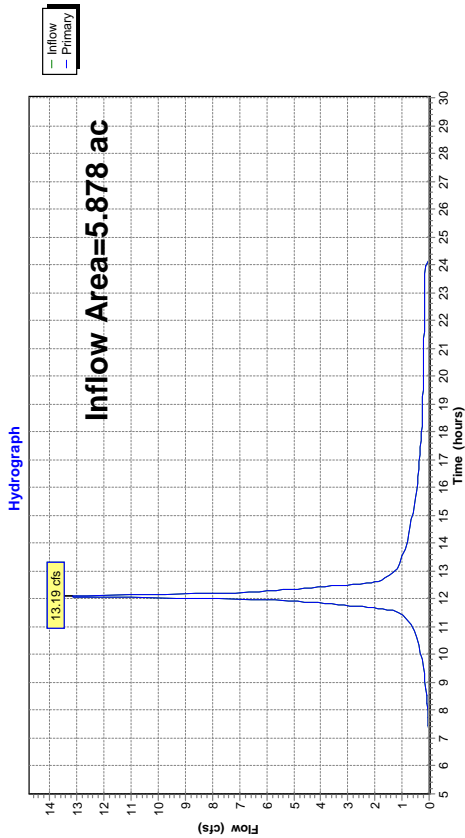
Subcatchment 18S: EX-WS-B6



Summary for Link DPI: Western Segment

Inflow Area = 5.878 ac, 69.37% Impervious, Inflow Depth = 1.94" for 2-yr event
 Inflow = 13.19 cfs @ 12.09 hrs, Volume= 0.948 af
 Primary = 13.19 cfs @ 12.09 hrs, Volume= 0.948 af, Atten= 0%, Lag= 0.0 min
 Primary outflow = Inflow, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs

Link DPI: Western Segment

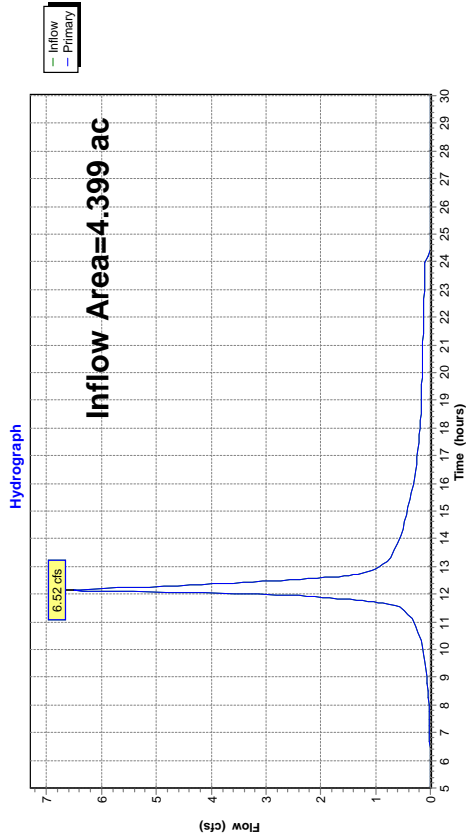


Existing Conditions_B Soil
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 Type III 24-hr 2-yr Rainfall=3.20"
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 Page 17

Summary for Link DP2: Eastern Segment - Wetlands North

Inflow Area = 4.399 ac, 59.59% Impervious, Inflow Depth > 1.62" for 2-yr event
 Inflow = 6.52 cfs @ 12.15 hrs, Volume= 0.595 af
 Primary = 6.52 cfs @ 12.15 hrs, Volume= 0.595 af, Atten= 0%, Lag= 0.0 min
 Primary outflow = Inflow, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs

Link DP2: Eastern Segment - Wetlands North

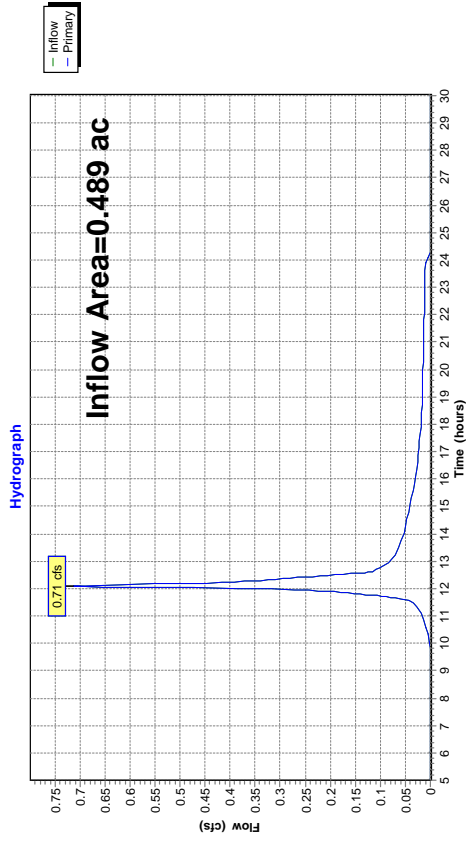


Existing Conditions_B Soil
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 Type III 24-hr 2-yr Rainfall=3.20"
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 Page 18

Summary for Link DP3: Eastern Segment - Wetlands South

Inflow Area = 0.489 ac, 53.56% Impervious, Inflow Depth = 1.27" for 2-yr event
 Inflow = 0.71 cfs @ 12.09 hrs, Volume= 0.052 af
 Primary = 0.71 cfs @ 12.09 hrs, Volume= 0.052 af, Atten= 0%, Lag= 0.0 min
 Primary outflow = Inflow, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs

Link DP3: Eastern Segment - Wetlands South



Summary for Subcatchment 3S: EX-WS-A1

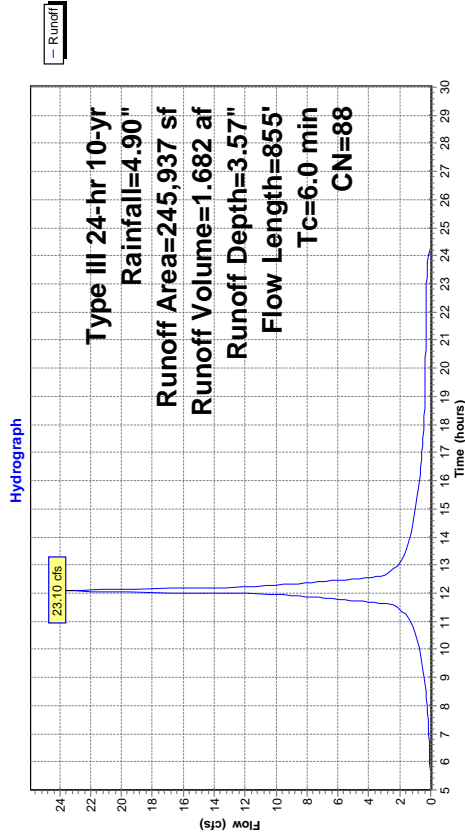
Runoff = 23.10 cfs @ 12.09 hrs, Volume= 1.682 af, Depth= 3.57"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 10-yr Rainfall=4.90"

Area (sf)	CN	Description
18,499	61	>75% Grass cover, Good, HSG B
8,431	61	>75% Grass cover, Good, HSG B
59,122	72	1/3 acre lots, 30% imp, HSG B
159,885	98	Paved roads w/curbs & sewers, HSG B
245,937	88	Weighted Average
68,315		27.78% Pervious Area
177,622		72.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	100	0.0200	1.38		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.20"
4.4	755	0.0203	2.89		Shallow Concentrated Flow, Paved Kv= 20.3 fps
5.6	855	Total, increased to minimum			Tc = 6.0 min

Subcatchment 3S: EX-WS-A1



Summary for Subcatchment 4S: EX-WS-A2

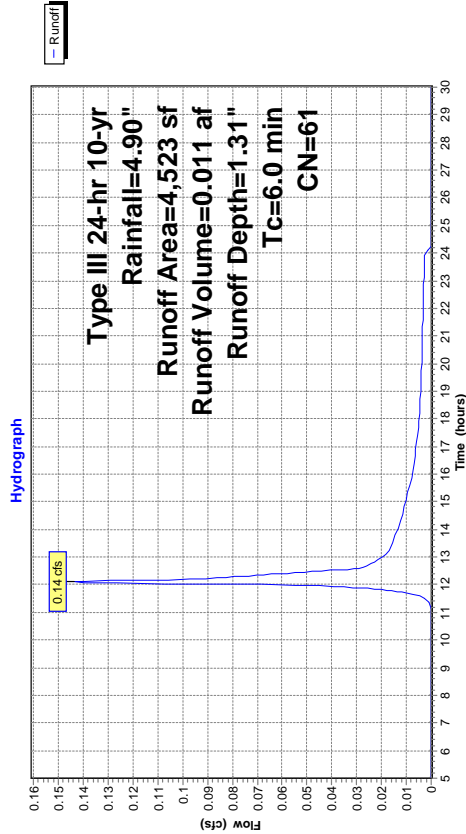
Runoff = 0.14 cfs @ 12.10 hrs, Volume= 0.011 af, Depth= 1.31"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 10-yr Rainfall=4.90"

Area (sf)	CN	Description
3,273	61	>75% Grass cover, Good, HSG B
1,250	61	>75% Grass cover, Good, HSG B
4,523	61	Weighted Average
4,523		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Minimum Tc

Subcatchment 4S: EX-WS-A2



Existing Conditions B Soil
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 Type III 24-hr 10-yr Rainfall=4.90"
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 Page 21

Summary for Subcatchment 5S: EX-WS-A3

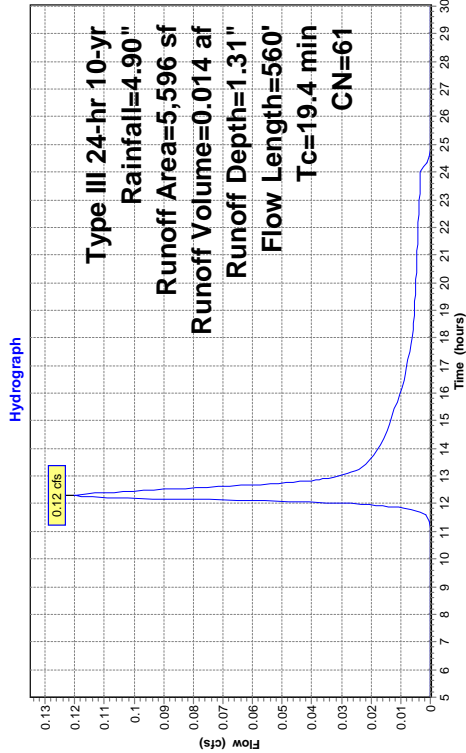
Runoff = 0.12 cfs @ 12.30 hrs, Volume= 0.014 af, Depth= 1.31"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, d= 0.02 hrs
 Type III 24-hr 10-yr Rainfall=4.90"

Area (sf)	CN	Description
5,176	61	>75% Grass cover, Good, HSG B
420	61	>75% Grass cover, Good, HSG B
5,596	61	Weighted Average
5,596		100.00% Pervious Area

Tc (min)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.9	100	0.0100	0.13	Sheet Flow, Grass: Short n= 0.150 P2= 3.20"
6.5	460	0.0283	1.18	Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
19.4	560	Total		

Subcatchment 5S: EX-WS-A3



Existing Conditions B Soil
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 Type III 24-hr 10-yr Rainfall=4.90"
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 Page 22

Summary for Subcatchment 9S: EX-WS-B1

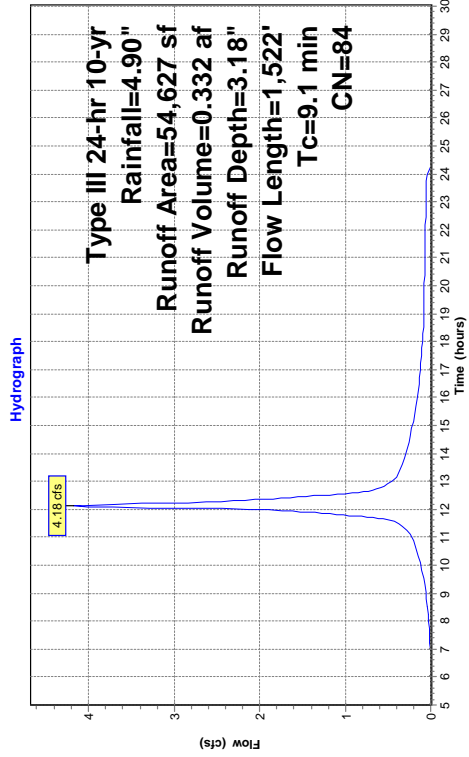
Runoff = 4.18 cfs @ 12.13 hrs, Volume= 0.332 af, Depth= 3.18"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, d= 0.02 hrs
 Type III 24-hr 10-yr Rainfall=4.90"

Area (sf)	CN	Description
13,321	61	>75% Grass cover, Good, HSG B
5,152	58	Woods/grass comb., Good, HSG B
1,619	61	>75% Grass cover, Good, HSG B
34,535	98	Paved roads w/curbs & sewers, HSG B
54,627	84	Weighted Average
20,092		36.78% Pervious Area
34,535		63.22% Impervious Area

Tc (min)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	30	0.0200	1.08	Sheet Flow, Smooth surfaces n= 0.011 P2= 3.20"
8.6	1,492	0.0202	2.89	Shallow Concentrated Flow, Paved Kv= 20.3 fps
9.1	1,522	Total		

Subcatchment 9S: EX-WS-B1



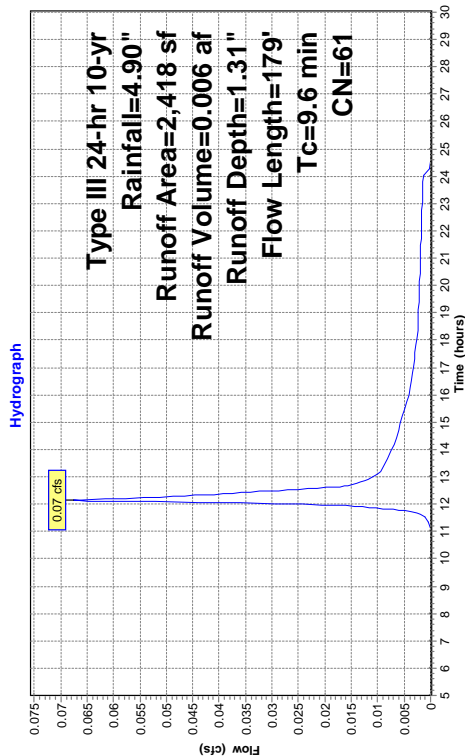
Existing Conditions_B Soil Type III 24-hr 10-yr Rainfall=4.90"
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Summary for Subcatchment 11S: EX-WS-B3

Runoff = 0.07 cfs @ 12.15 hrs, Volume= 0.006 af, Depth= 1.31"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, d= 0.02 hrs
 Type III 24-hr 10-yr Rainfall=4.90"

Area (sf)	CN	Description		
2,418	61	>75% Grass cover, Good, HSG B		
2,418		100.00% Pervious Area		
Tc (min)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.9	100	0.0650	0.19	Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
0.7	79	0.0696	1.85	Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
9.6	179	Total		

Subcatchment 11S: EX-WS-B3



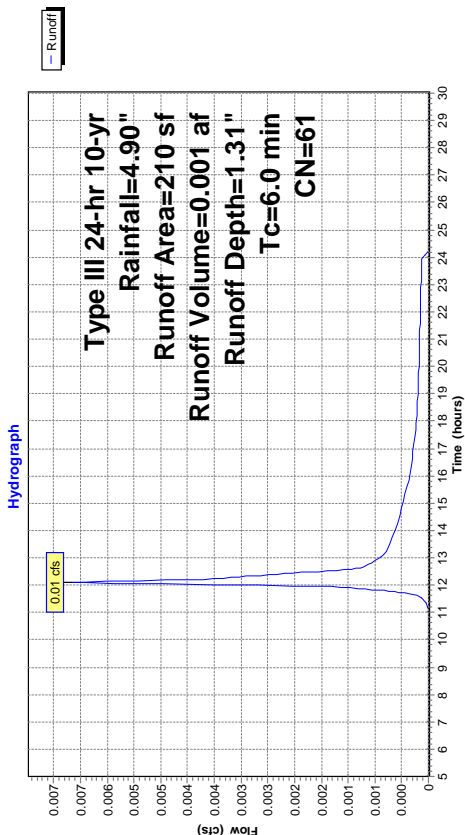
Existing Conditions_B Soil Type III 24-hr 10-yr Rainfall=4.90"
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Summary for Subcatchment 10S: EX-WS-B2

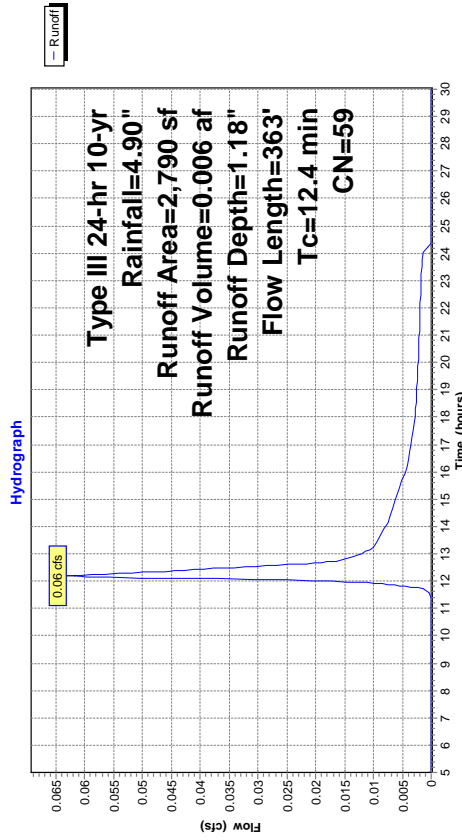
Runoff = 0.01 cfs @ 12.10 hrs, Volume= 0.001 af, Depth= 1.31"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, d= 0.02 hrs
 Type III 24-hr 10-yr Rainfall=4.90"

Area (sf)	CN	Description		
210	61	>75% Grass cover, Good, HSG B		
210		100.00% Pervious Area		
Tc (min)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0				Direct Entry, Minimum Tc

Subcatchment 10S: EX-WS-B2



Subcatchment 12S: EX-WS-C1



Summary for Subcatchment 12S: EX-WS-C1

Runoff = 0.06 cfs @ 12.19 hrs, Volume= 0.006 af, Depth= 1.18"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 10-yr Rainfall=4.90"

Area (sf)	CN	Description		
1,192	61	>75% Grass cover, Good, HSG B		
959	48	Brush, Good, HSG B		
442	61	>75% Grass cover, Good, HSG B		
197	98	Paved roads w/curbs & sewers, HSG B		
2,790	59	Weighted Average		
2,593		92.94% Pervious Area		
197		7.06% Impervious Area		
Tc (min)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.0	68	0.0294	0.13	Sheet Flow.
0.1	27	0.0740	5.52	Grass: Dense n= 0.240 P2= 3.20" Shallow Concentrated Flow,
1.5	147	0.0540	1.63	Paved KV= 20.3 fps Shallow Concentrated Flow,
1.8	121	0.0248	1.10	Short Grass Pasture KV= 7.0 fps Shallow Concentrated Flow,
12.4	363	Total		Short Grass Pasture KV= 7.0 fps

Existing Conditions B Soil
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 Type III 24-hr 10-yr Rainfall=4.90"
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 Page 27

Summary for Subcatchment 13S: EX-WS-C2

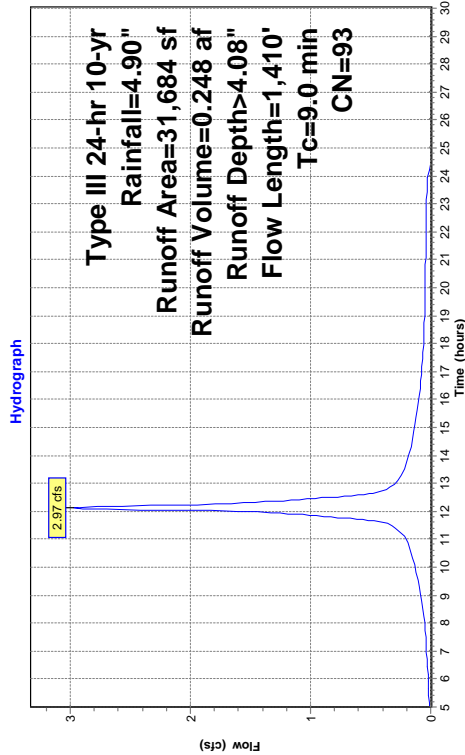
Runoff = 2.97 cfs @ 12.12 hrs, Volume= 0.248 af, Depth> 4.08"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 10-yr Rainfall=4.90"

Area (sf)	CN	Description
1,324	61	>75% Grass cover, Good, HSG B
2,171	48	Brush, Good, HSG B
7	61	>75% Grass cover, Good, HSG B
28,182	98	Paved roads w/curbs & sewers, HSG B
31,684	93	Weighted Average
3,502		11.05% Pervious Area
28,182		88.95% Impervious Area

Tc (min) Length (feet) Slope (ft/ft) Velocity (ft/sec) Capacity (cfs) Description
 0.8 100 0.0550 2.06 **Sheet Flow**,
 Smooth surfaces n= 0.011 P2= 3.20"
 8.2 1,310 0.0172 2.66 **Shallow Concentrated Flow**,
 Paved Kv= 20.3 fps

9.0 1,410 Total

Subcatchment 13S: EX-WS-C2



Existing Conditions B Soil
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 Type III 24-hr 10-yr Rainfall=4.90"
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 Page 28

Summary for Subcatchment 14S: EX-WS-B4

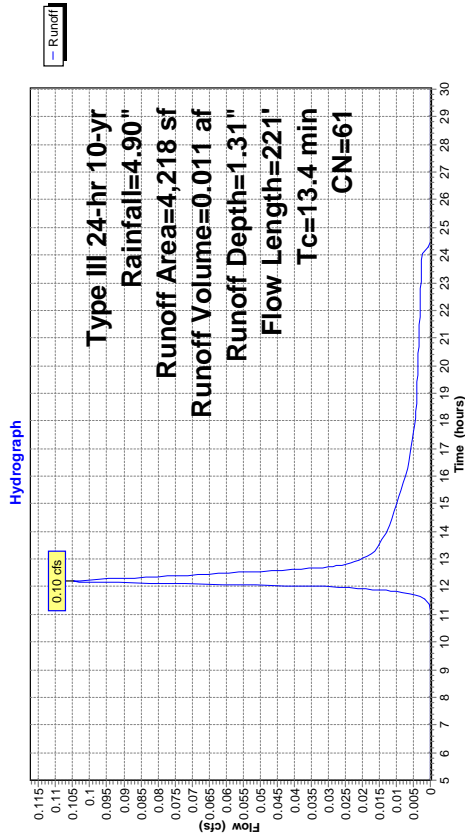
Runoff = 0.10 cfs @ 12.20 hrs, Volume= 0.011 af, Depth= 1.31"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 10-yr Rainfall=4.90"

Area (sf)	CN	Description
4,218	61	>75% Grass cover, Good, HSG B
4,218		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.4	100	0.0350	0.15		Sheet Flow , Grass: Dense n= 0.240 P2= 3.20"
2.0	121	0.0207	1.01		Shallow Concentrated Flow , Short Grass Pasture Kv= 7.0 fps

13.4 221 Total

Subcatchment 14S: EX-WS-B4



Existing Conditions_B Soil Type III 24-hr 10-yr Rainfall=4.90"
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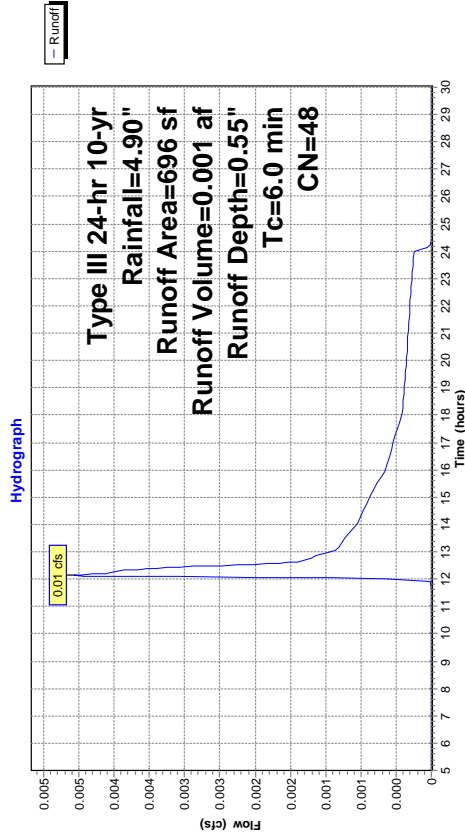
Summary for Subcatchment 15S: EX-WS-C3

Runoff = 0.01 cfs @ 12.14 hrs, Volume= 0.001 af, Depth= 0.55"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 10-yr Rainfall=4.90"

Area (sf)	CN	Description		
696	48	Brush, Good, HSG B		
696		100.00% Pervious Area		
Tc (min)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0				

Direct Entry, Minimum Tc

Subcatchment 15S: EX-WS-C3



Existing Conditions_B Soil Type III 24-hr 10-yr Rainfall=4.90"
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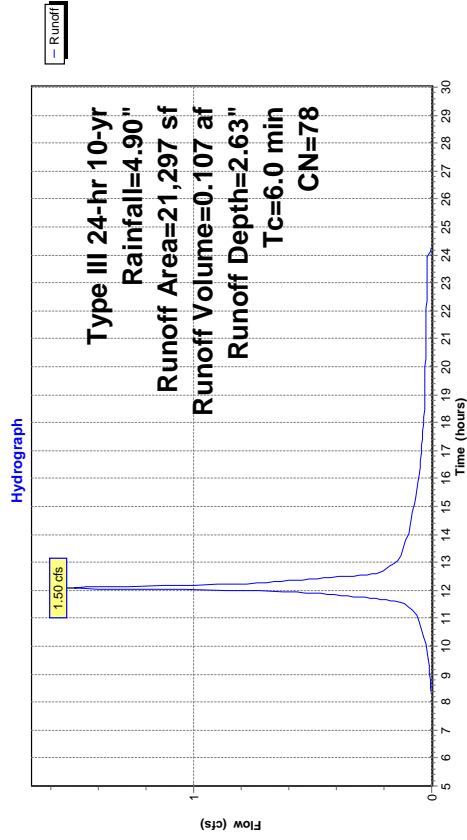
Summary for Subcatchment 16S: EX-WS-C4

Runoff = 1.50 cfs @ 12.09 hrs, Volume= 0.107 af, Depth= 2.63"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 10-yr Rainfall=4.90"

Area (sf)	CN	Description		
3,410	61	>75% Grass cover, Good, HSG B		
3,400	58	Woods/grass comb., Good, HSG B		
11,406	98	Paved roads w/curbs & sewers, HSG B		
3,081	48	Brush, Good, HSG B		
21,297	78	Weighted Average		
9,891		46.44% Pervious Area		
11,406		53.56% Impervious Area		
Tc (min)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0				

Direct Entry, Minimum Tc

Subcatchment 16S: EX-WS-C4



Existing Conditions B Soil Type III 24-hr 10-yr Rainfall=4.90"
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Summary for Subcatchment 17S: EX-WS-B5

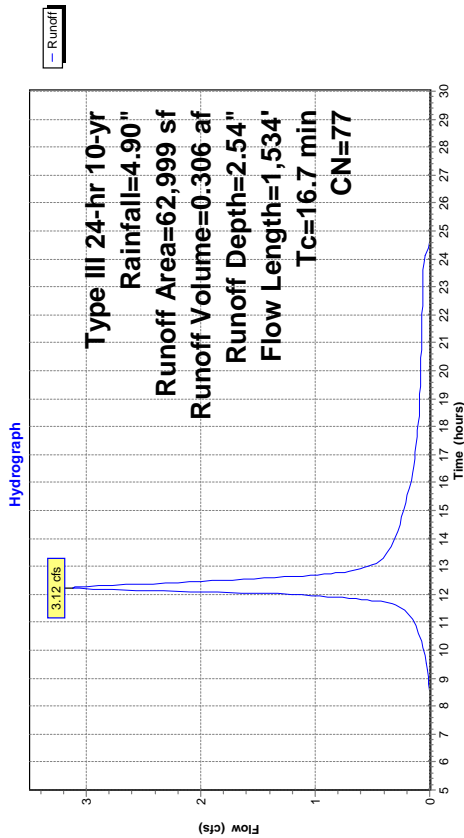
Runoff = 3.12 cfs @ 12.23 hrs, Volume= 0.306 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 10-yr Rainfall=4.90"

Area (sf)	CN	Description
13,903	61	>75% Grass cover, Good, HSG B
20,498	58	Woods/grass comb., Good, HSG B
405	61	>75% Grass cover, Good, HSG B
28,193	98	Paved roads w/curbs & sewers, HSG B
62,999	77	Weighted Average
34,806		55.25% Pervious Area
28,193		44.75% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	25	0.0200	1.04		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.20"
16.3	1,509	0.0058	1.55		Shallow Concentrated Flow, Paved Kv= 20.3 fps
16.7	1,534	Total			

Subcatchment 17S: EX-WS-B5



Existing Conditions B Soil Type III 24-hr 10-yr Rainfall=4.90"
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Summary for Subcatchment 18S: EX-WS-B6

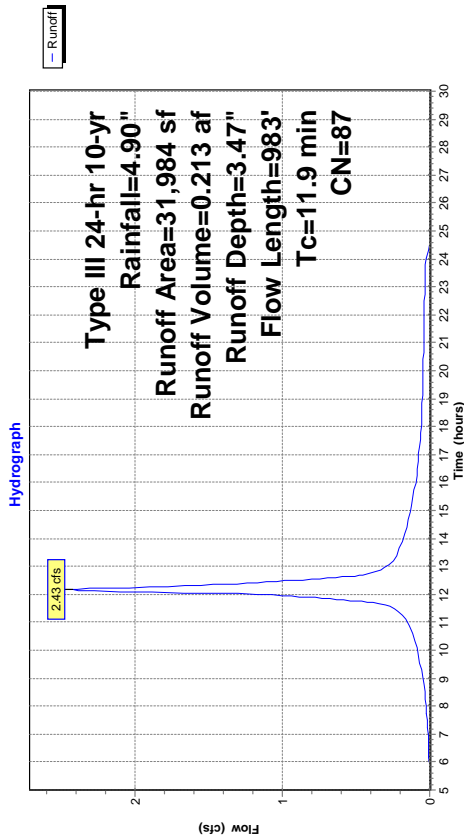
Runoff = 2.43 cfs @ 12.16 hrs, Volume= 0.213 af, Depth= 3.47"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 10-yr Rainfall=4.90"

Area (sf)	CN	Description
4,963	61	>75% Grass cover, Good, HSG B
3,359	58	Woods/grass comb., Good, HSG B
570	61	>75% Grass cover, Good, HSG B
23,092	98	Paved roads w/curbs & sewers, HSG B
31,984	87	Weighted Average
8,892		27.80% Pervious Area
23,092		72.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	25	0.0200	1.04		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.20"
11.5	958	0.0047	1.39		Shallow Concentrated Flow, Paved Kv= 20.3 fps
11.9	983	Total			

Subcatchment 18S: EX-WS-B6

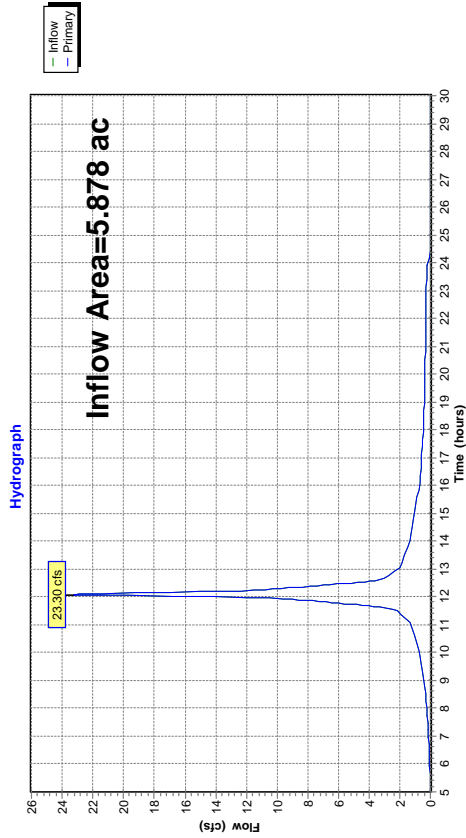


Existing Conditions_B Soil Type III 24-hr 10-yr Rainfall=4.90"
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Summary for Link DP1: Western Segment

Inflow Area = 5.878 ac, 69.37% Impervious, Inflow Depth = 3.48" for 10-yr event
 Inflow = 23.30 cfs @ 12.09 hrs, Volume= 1.707 af
 Primary = 23.30 cfs @ 12.09 hrs, Volume= 1.707 af, Atten= 0%, Lag= 0.0 min
 Primary outflow = Inflow, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs

Link DP1: Western Segment

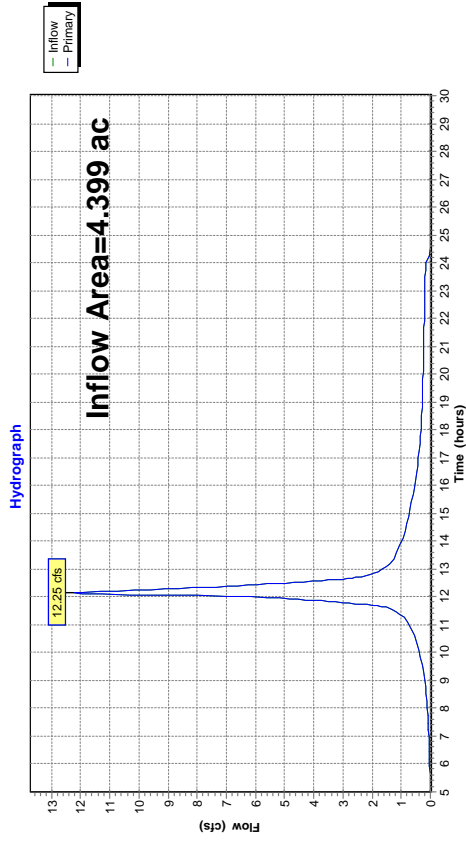


Existing Conditions_B Soil Type III 24-hr 10-yr Rainfall=4.90"
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Summary for Link DP2: Eastern Segment - Wetlands North

Inflow Area = 4.399 ac, 59.59% Impervious, Inflow Depth > 3.06" for 10-yr event
 Inflow = 12.25 cfs @ 12.15 hrs, Volume= 1.123 af
 Primary = 12.25 cfs @ 12.15 hrs, Volume= 1.123 af, Atten= 0%, Lag= 0.0 min
 Primary outflow = Inflow, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs

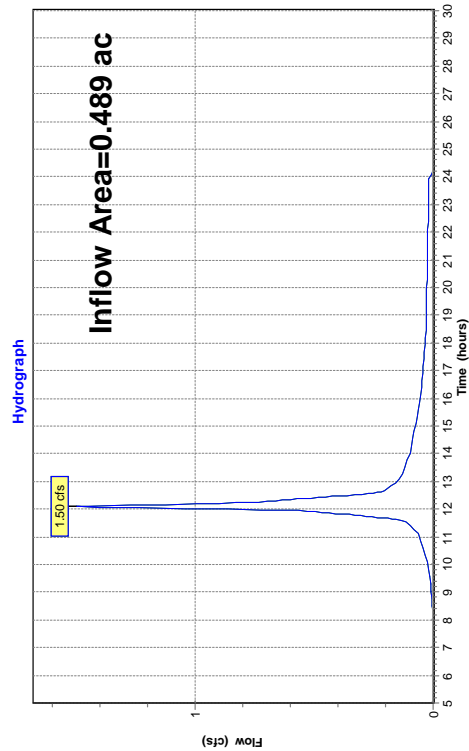
Link DP2: Eastern Segment - Wetlands North



Summary for Link DP3: Eastern Segment - Wetlands South

Inflow Area = 0.489 ac, 53.56% Impervious, Inflow Depth = 2.63" for 10-yr event
 Inflow = 1.50 cfs @ 12.09 hrs, Volume= 0.107 af
 Primary = 1.50 cfs @ 12.09 hrs, Volume= 0.107 af, Atten= 0%, Lag= 0.0 min
 Primary outflow = Inflow, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs

Link DP3: Eastern Segment - Wetlands South



— Inflow
 — Primary

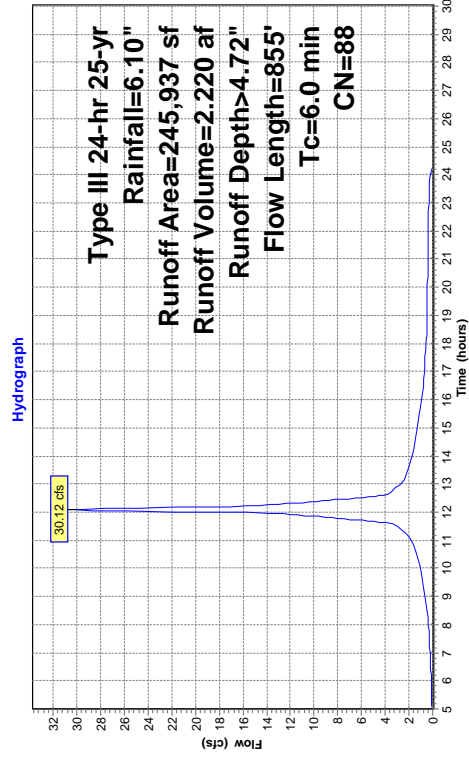
Summary for Subcatchment 3S: EX-WS-A1

Runoff = 30.12 cfs @ 12.09 hrs, Volume= 2.220 af, Depth> 4.72"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 25-yr Rainfall=6.10"

Area (sf)	CN	Description
18,499	61	>75% Grass cover, Good, HSG B
8,431	61	>75% Grass cover, Good, HSG B
59,122	72	1/3 acre lots, 30% imp, HSG B
159,885	98	Paved roads w/curbs & sewers, HSG B
245,937	88	Weighted Average
68,315		27.78% Pervious Area
177,622		72.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	100	0.0200	1.38		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.20"
4.4	755	0.0203	2.89		Shallow Concentrated Flow, Paved Kv= 20.3 fps
5.6	855				Total, Increased to minimum Tc = 6.0 min

Subcatchment 3S: EX-WS-A1



— Runoff

Existing Conditions B Soil Type III 24-hr 25-yr Rainfall=6.10"
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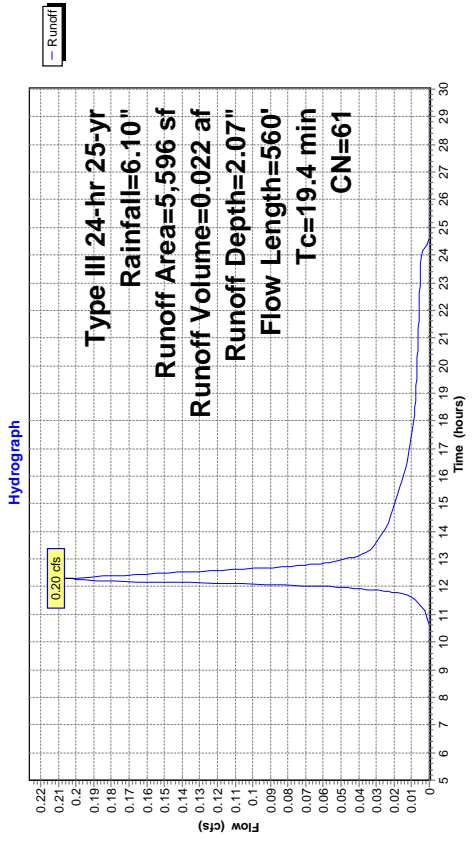
Summary for Subcatchment 5S: EX-WS-A3

Runoff = 0.20 cfs @ 12.29 hrs, Volume= 0.022 af, Depth= 2.07"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 25-yr Rainfall=6.10"

Area (sf)	CN	Description
5,176	61	>75% Grass cover, Good, HSG B
420	61	>75% Grass cover, Good, HSG B
5,596	61	Weighted Average
5,596		100.00% Pervious Area

Tc (min)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.9	100	0.0100	0.13	Sheet Flow, Grass: Short n= 0.150 P2= 3.20"
6.5	460	0.0283	1.18	Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
19.4	560	Total		

Subcatchment 5S: EX-WS-A3



Existing Conditions B Soil Type III 24-hr 25-yr Rainfall=6.10"
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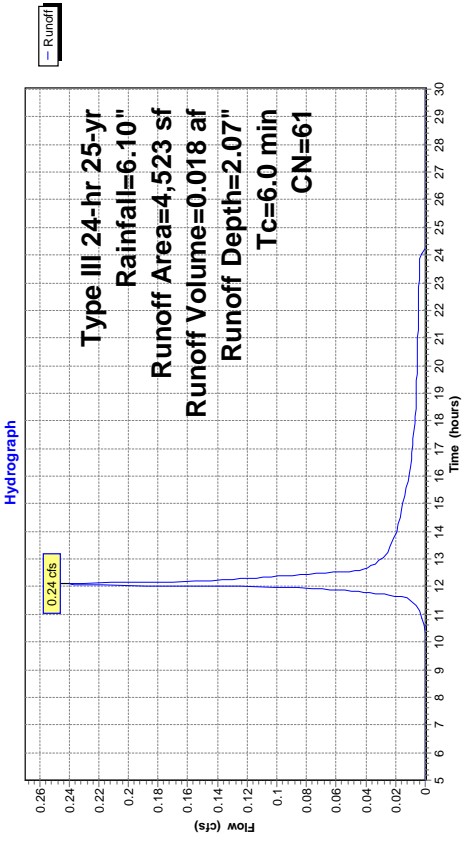
Summary for Subcatchment 4S: EX-WS-A2

Runoff = 0.24 cfs @ 12.10 hrs, Volume= 0.018 af, Depth= 2.07"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 25-yr Rainfall=6.10"

Area (sf)	CN	Description
3,273	61	>75% Grass cover, Good, HSG B
1,250	61	>75% Grass cover, Good, HSG B
4,523	61	Weighted Average
4,523		100.00% Pervious Area

Tc (min)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0				Direct Entry, Minimum Tc

Subcatchment 4S: EX-WS-A2



Summary for Subcatchment 9S: EX-WS-B1

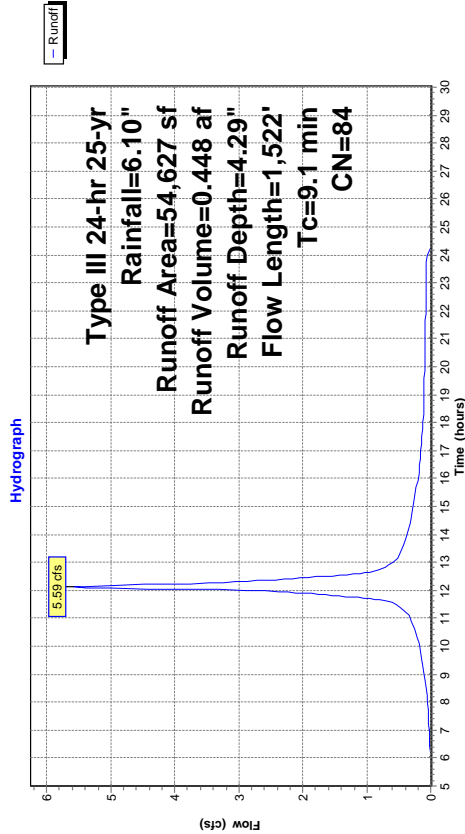
Runoff = 5.59 cfs @ 12.13 hrs, Volume= 0.448 af, Depth= 4.29"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 25-yr Rainfall=6.10"

Area (sf)	CN	Description
13,321	61	>75% Grass cover, Good, HSG B
5,152	58	Woods/grass comb., Good, HSG B
1,619	61	>75% Grass cover, Good, HSG B
34,535	98	Paved roads w/curbs & sewers, HSG B
54,627	84	Weighted Average
20,092		36.78% Pervious Area
34,535		63.22% Impervious Area

Tc (min)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	30	0.0200	1.08	Sheet Flow, Smooth surfaces n=0.011 P2= 3.20"
8.6	1,492	0.0202	2.89	Shallow Concentrated Flow, Paved Kv= 20.3 fps
9.1	1,522	Total		

Subcatchment 9S: EX-WS-B1



Summary for Subcatchment 10S: EX-WS-B2

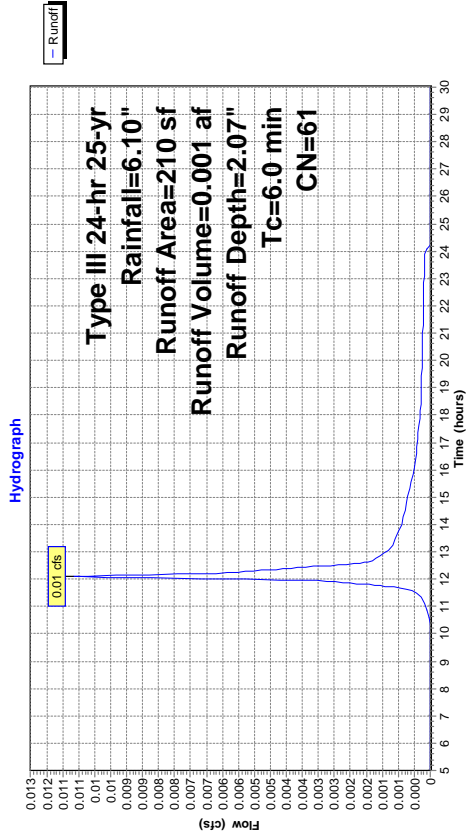
Runoff = 0.01 cfs @ 12.10 hrs, Volume= 0.001 af, Depth= 2.07"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 25-yr Rainfall=6.10"

Area (sf)	CN	Description
210	61	>75% Grass cover, Good, HSG B
210		100.00% Pervious Area

Tc (min)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0				Direct Entry, Minimum Tc

Subcatchment 10S: EX-WS-B2



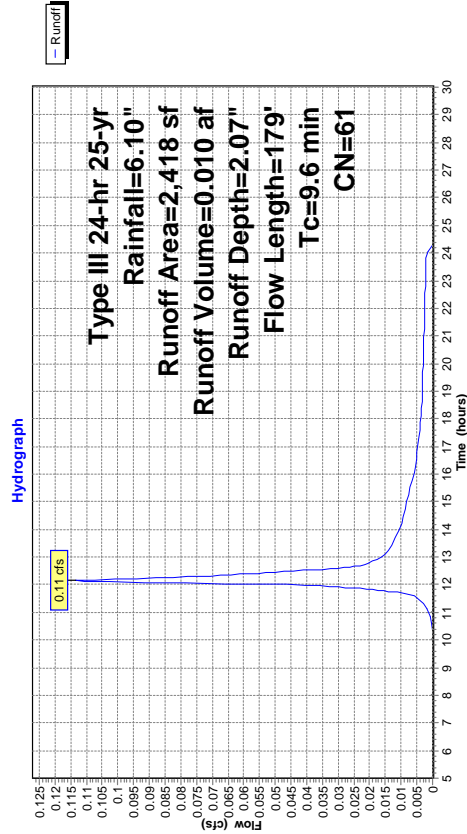
Existing Conditions_B Soil
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 Type III 24-hr 25-yr Rainfall=6.10"
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 Page 41

Summary for Subcatchment 11S: EX-WS-B3

Runoff = 0.11 cfs @ 12.14 hrs, Volume= 0.010 af, Depth= 2.07"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, d= 0.02 hrs
 Type III 24-hr 25-yr Rainfall=6.10"

Area (sf)	CN	Description		
2,418	61	>75% Grass cover, Good, HSG B		
2,418		100.00% Pervious Area		
Tc (min)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.9	100	0.0650	0.19	Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
0.7	79	0.0696	1.85	Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
9.6	179	Total		

Subcatchment 11S: EX-WS-B3



Existing Conditions_B Soil
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 Type III 24-hr 25-yr Rainfall=6.10"
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 Page 42

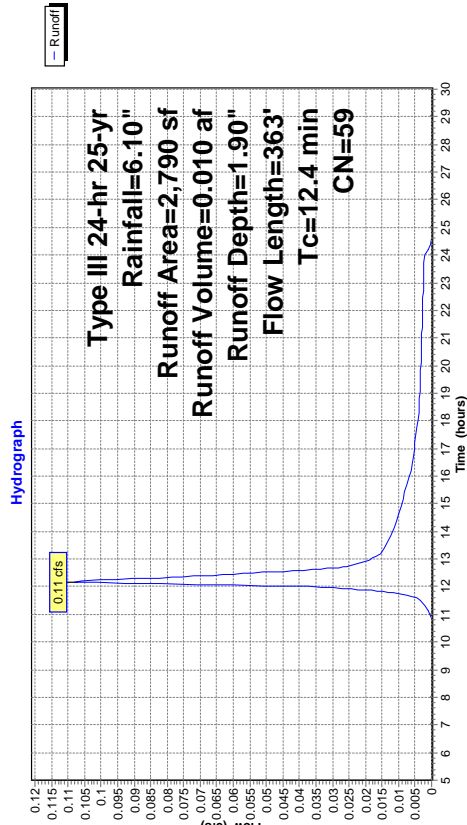
Summary for Subcatchment 12S: EX-WS-C1

Runoff = 0.11 cfs @ 12.19 hrs, Volume= 0.010 af, Depth= 1.90"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, d= 0.02 hrs
 Type III 24-hr 25-yr Rainfall=6.10"

Area (sf)	CN	Description
1,192	61	>75% Grass cover, Good, HSG B
959	48	Brush, Good, HSG B
442	61	>75% Grass cover, Good, HSG B
197	98	Paved roads w/curbs & sewers, HSG B
2,790	59	Weighted Average
2,593		92.94% Pervious Area
197		7.06% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.0	68	0.0294	0.13		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
0.1	27	0.0740	5.52		Shallow Concentrated Flow, Paved Kv= 20.3 fps
1.5	147	0.0540	1.63		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.8	121	0.0248	1.10		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
12.4	363	Total			

Subcatchment 12S: EX-WS-C1



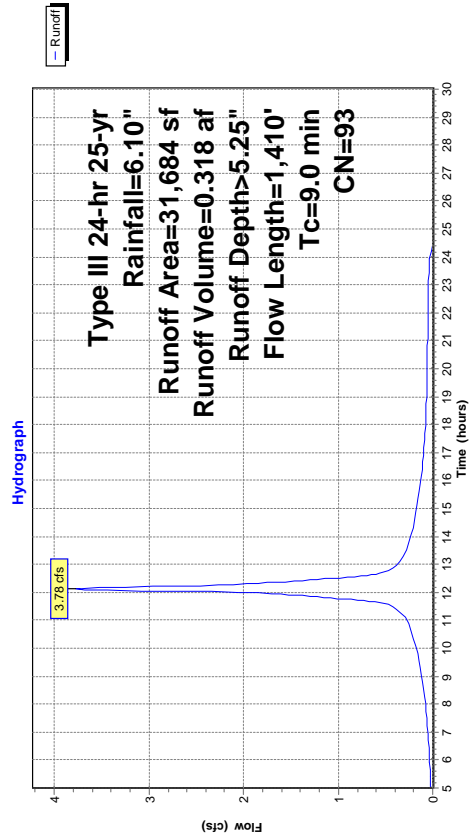
Summary for Subcatchment 13S: EX-WS-C2

Runoff = 3.78 cfs @ 12.12 hrs, Volume= 0.318 af, Depth> 5.25"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 25-yr Rainfall=6.10"

Area (sf)	CN	Description
1,324	61	>75% Grass cover, Good, HSG B
2,171	48	Brush, Good, HSG B
7	61	>75% Grass cover, Good, HSG B
28,182	98	Paved roads w/curbs & sewers, HSG B
31,684	93	Weighted Average
3,502		11.05% Pervious Area
28,182		88.95% Impervious Area

Tc (min)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	100	0.0550	2.06	Sheet Flow, Smooth surfaces n= 0.011 P2= 3.20"
8.2	1,310	0.0172	2.66	Shallow Concentrated Flow, Paved Kv= 20.3 fps
9.0	1,410	Total		

Subcatchment 13S: EX-WS-C2



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 Type III 24-hr 25-yr Rainfall=6.10" Printed 2/2/2018
 Page 46

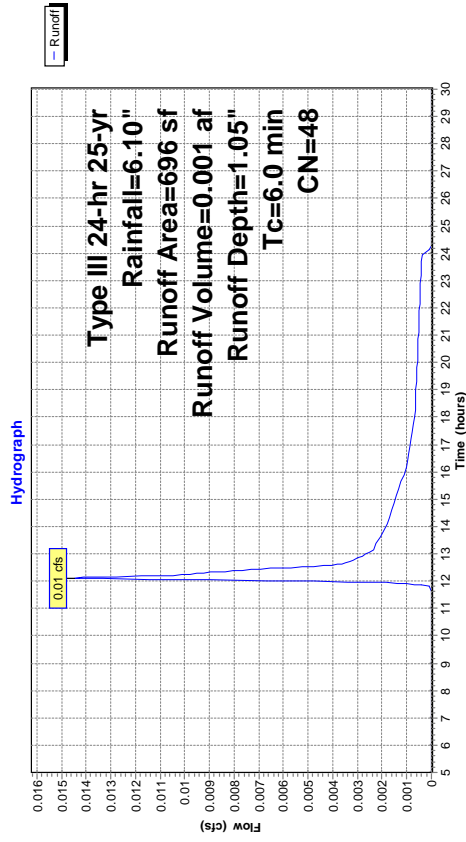
Summary for Subcatchment 15S: EX-WS-C3

Runoff = 0.01 cfs @ 12.11 hrs, Volume= 0.001 af, Depth= 1.05"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, d= 0.02 hrs
 Type III 24-hr 25-yr Rainfall=6.10"

Area (sf)	CN	Description
696	48	Brush, Good, HSG B
696		100.00% Pervious Area

Tc (min)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0				Direct Entry, Minimum Tc

Subcatchment 15S: EX-WS-C3



Existing Conditions_B Soil
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 Type III 24-hr 25-yr Rainfall=6.10" Printed 2/2/2018
 Page 45

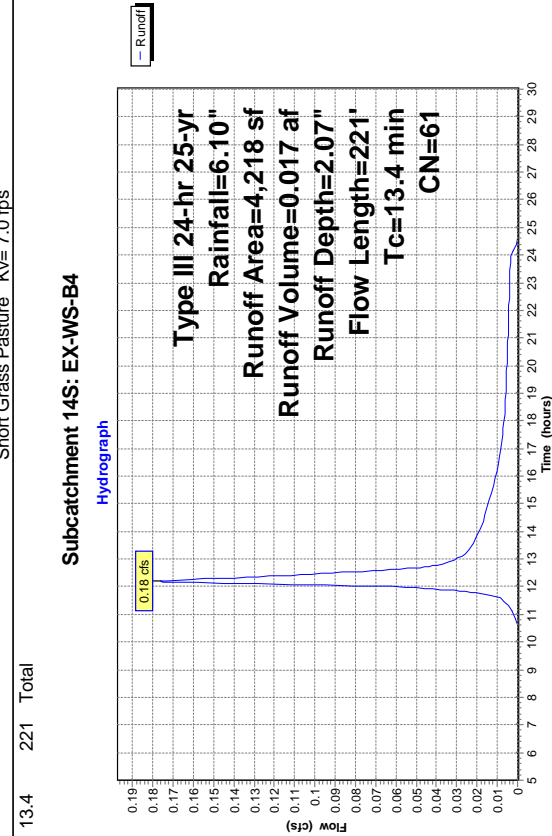
Summary for Subcatchment 14S: EX-WS-B4

Runoff = 0.18 cfs @ 12.20 hrs, Volume= 0.017 af, Depth= 2.07"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, d= 0.02 hrs
 Type III 24-hr 25-yr Rainfall=6.10"

Area (sf)	CN	Description
4,218	61	>75% Grass cover, Good, HSG B
4,218		100.00% Pervious Area

Tc (min)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.4	100	0.0350	0.15	Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
2.0	121	0.0207	1.01	Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
13.4	221	Total		

Subcatchment 14S: EX-WS-B4



Existing Conditions B Soil
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 Type III 24-hr 25-yr Rainfall=6.10"
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 Page 47

Summary for Subcatchment 16S: EX-WS-C4

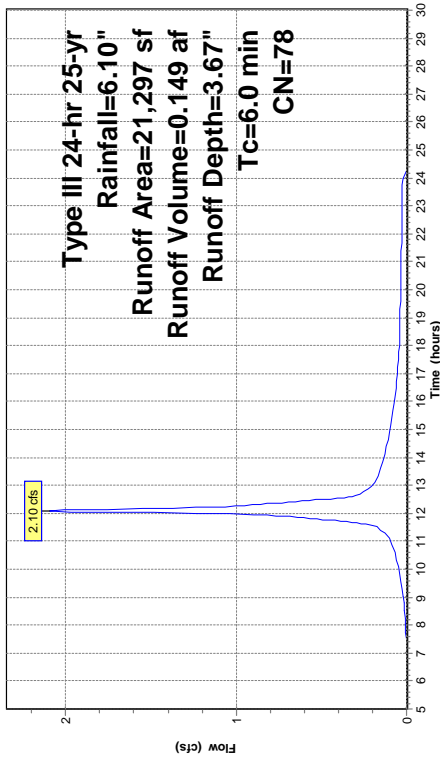
Runoff = 2.10 cfs @ 12.09 hrs, Volume= 0.149 af, Depth= 3.67"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 25-yr Rainfall=6.10"

Area (sf)	CN	Description
3,410	61	>75% Grass cover, Good, HSG B
3,400	58	Woods/grass comb., Good, HSG B
11,406	98	Paved roads w/curbs & sewers, HSG B
3,081	48	Brush, Good, HSG B
21,297	78	Weighted Average
9,891		46.44% Pervious Area
11,406		53.56% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Minimum Tc

Subcatchment 16S: EX-WS-C4



Existing Conditions B Soil
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 Type III 24-hr 25-yr Rainfall=6.10"
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 Page 48

Summary for Subcatchment 17S: EX-WS-B5

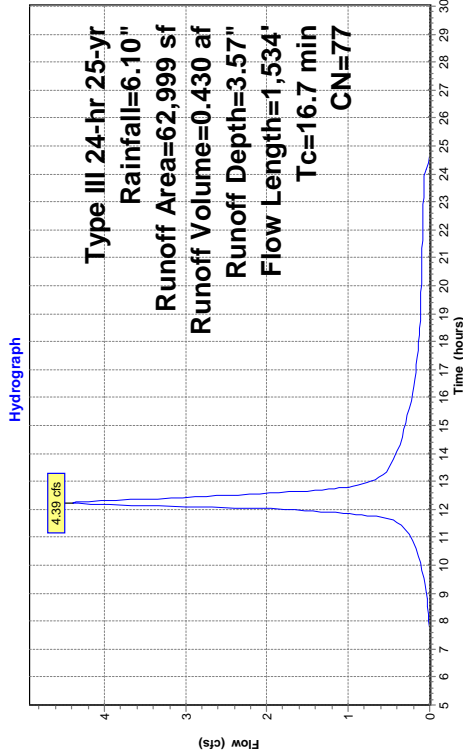
Runoff = 4.39 cfs @ 12.23 hrs, Volume= 0.430 af, Depth= 3.57"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 25-yr Rainfall=6.10"

Area (sf)	CN	Description
13,903	61	>75% Grass cover, Good, HSG B
20,498	58	Woods/grass comb., Good, HSG B
405	61	>75% Grass cover, Good, HSG B
28,193	98	Paved roads w/curbs & sewers, HSG B
62,999	77	Weighted Average
34,806		55.25% Pervious Area
28,193		44.75% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	25	0.0200	1.04		Sheet Flow, Smooth surfaces n=0.011 P2= 3.20"
16.3	1,509	0.0058	1.55		Shallow Concentrated Flow, Paved Kv= 20.3 fps
16.7	1,534	Total			

Subcatchment 17S: EX-WS-B5



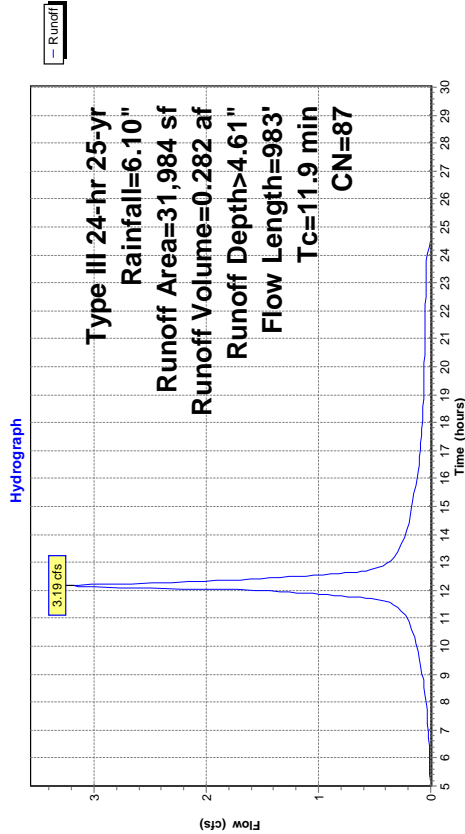
Summary for Subcatchment 18S: EX-WS-B6

Runoff = 3.19 cfs @ 12.16 hrs, Volume= 0.282 af, Depth> 4.61"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 25-yr Rainfall=6.10"

Area (sf)	CN	Description
4,963	61	>75% Grass cover, Good, HSG B
3,359	58	Woods/grass comb., Good, HSG B
570	61	>75% Grass cover, Good, HSG B
23,092	98	Paved roads w/curbs & sewers, HSG B
31,984	87	Weighted Average
8,892		27.80% Pervious Area
23,092		72.20% Impervious Area

Tc (min)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	25	0.0200	1.04	Sheet Flow, Smooth surfaces n= 0.011 P2= 3.20"
11.5	958	0.0047	1.39	Shallow Concentrated Flow, Paved Kv= 20.3 fps
11.9	983	Total		

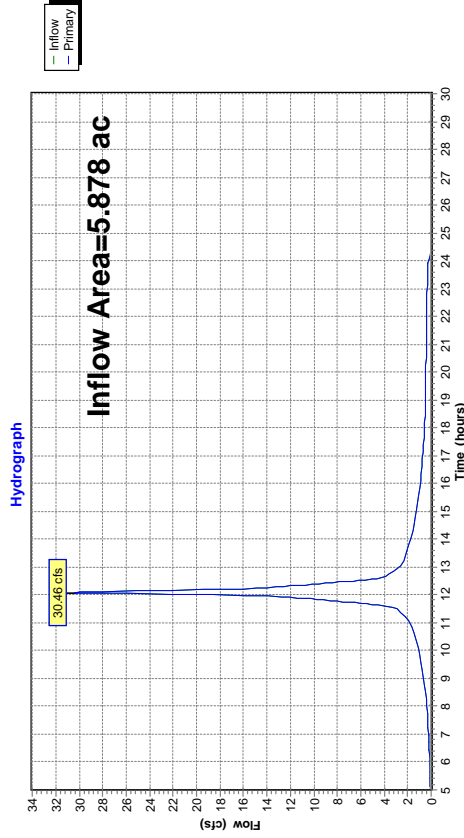
Subcatchment 18S: EX-WS-B6



Summary for Link DPI: Western Segment

Inflow Area = 5.878 ac, 69.37% Impervious, Inflow Depth > 4.61" for 25-yr event
 Inflow = 30.46 cfs @ 12.09 hrs, Volume= 2.261 af
 Primary = 30.46 cfs @ 12.09 hrs, Volume= 2.261 af, Atten= 0%, Lag= 0.0 min
 Primary outflow = Inflow, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs

Link DPI: Western Segment

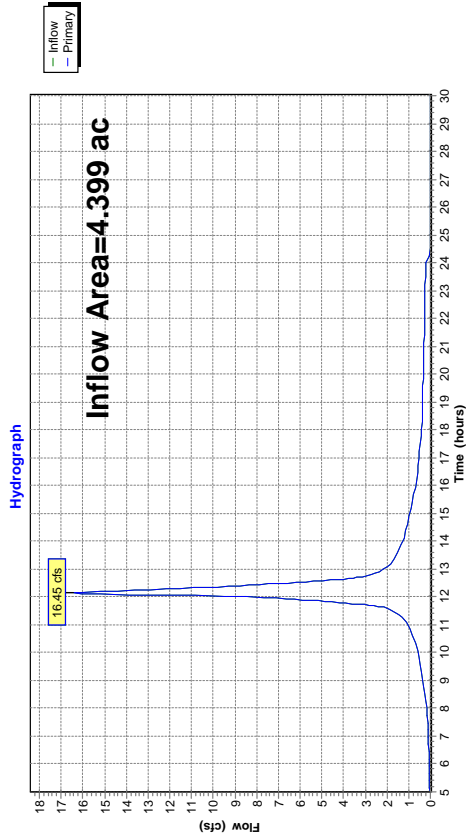


Existing Conditions_B Soil Type III 24-hr 25-yr Rainfall=6.10"
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Summary for Link DP2: Eastern Segment - Wetlands North

Inflow Area = 4.399 ac, 59.59% Impervious, Inflow Depth > 4.14" for 25-yr event
 Inflow = 16.45 cfs @ 12.15 hrs, Volume= 1.517 af
 Primary = 16.45 cfs @ 12.15 hrs, Volume= 1.517 af, Atten= 0%, Lag= 0.0 min
 Primary outflow = Inflow, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs

Link DP2: Eastern Segment - Wetlands North

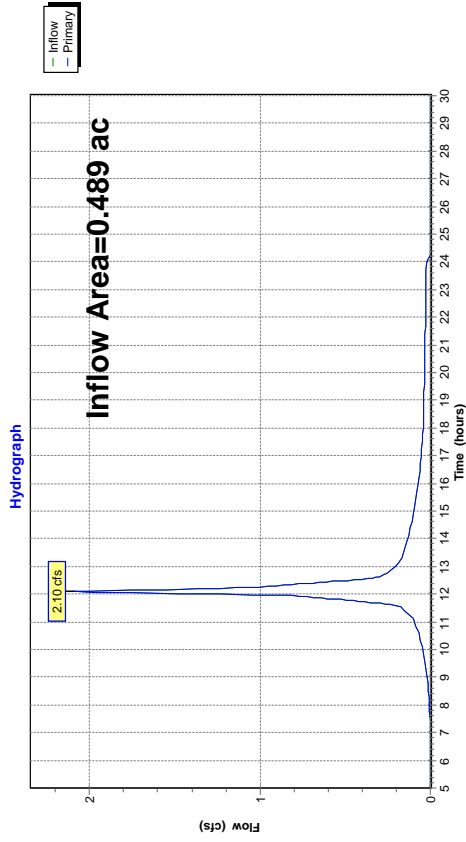


Existing Conditions_B Soil Type III 24-hr 25-yr Rainfall=6.10"
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Summary for Link DP3: Eastern Segment - Wetlands South

Inflow Area = 0.489 ac, 53.56% Impervious, Inflow Depth = 3.67" for 25-yr event
 Inflow = 2.10 cfs @ 12.09 hrs, Volume= 0.149 af
 Primary = 2.10 cfs @ 12.09 hrs, Volume= 0.149 af, Atten= 0%, Lag= 0.0 min
 Primary outflow = Inflow, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs

Link DP3: Eastern Segment - Wetlands South



Existing Conditions B Soil Type III 24-hr 50-yr Rainfall=7.30"
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Summary for Subcatchment 3S: EX-WS-A1

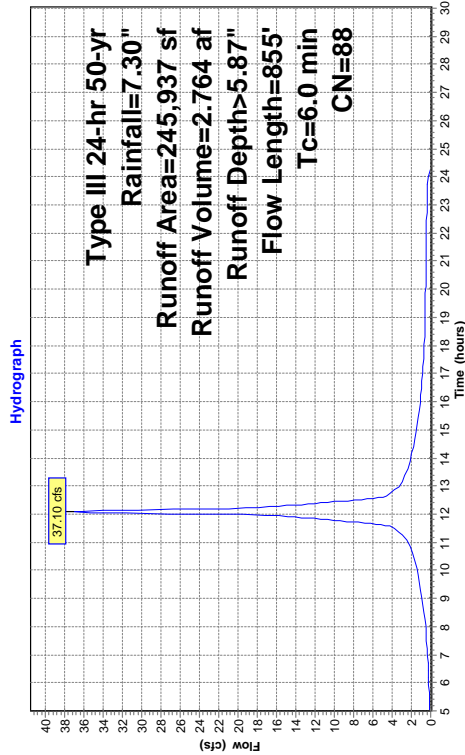
Runoff = 37.10 cfs @ 12.08 hrs, Volume= 2.764 af, Depth> 5.87"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 50-yr Rainfall=7.30"

Area (sf)	CN	Description
18,499	61	>75% Grass cover, Good, HSG B
8,431	61	>75% Grass cover, Good, HSG B
59,122	72	1/3 acre lots, 30% imp, HSG B
159,885	98	Paved roads w/curbs & sewers, HSG B
245,937	88	Weighted Average
68,315		27.78% Pervious Area
177,622		72.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	100	0.0200	1.38		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.20"
4.4	755	0.0203	2.89		Shallow Concentrated Flow, Paved Kv= 20.3 fps
5.6	855	Total, increased to minimum			Tc = 6.0 min

Subcatchment 3S: EX-WS-A1



Existing Conditions B Soil Type III 24-hr 50-yr Rainfall=7.30"
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Summary for Subcatchment 4S: EX-WS-A2

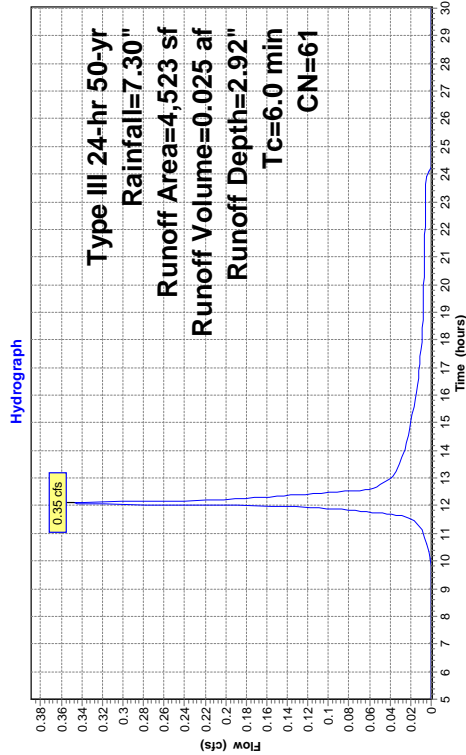
Runoff = 0.35 cfs @ 12.09 hrs, Volume= 0.025 af, Depth= 2.92"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 50-yr Rainfall=7.30"

Area (sf)	CN	Description
3,273	61	>75% Grass cover, Good, HSG B
1,250	61	>75% Grass cover, Good, HSG B
4,523	61	Weighted Average
4,523		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Minimum Tc

Subcatchment 4S: EX-WS-A2



Existing Conditions B Soil
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 Type III 24-hr 50-yr Rainfall=7.30"
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 Page 55

Summary for Subcatchment 5S: EX-WS-A3

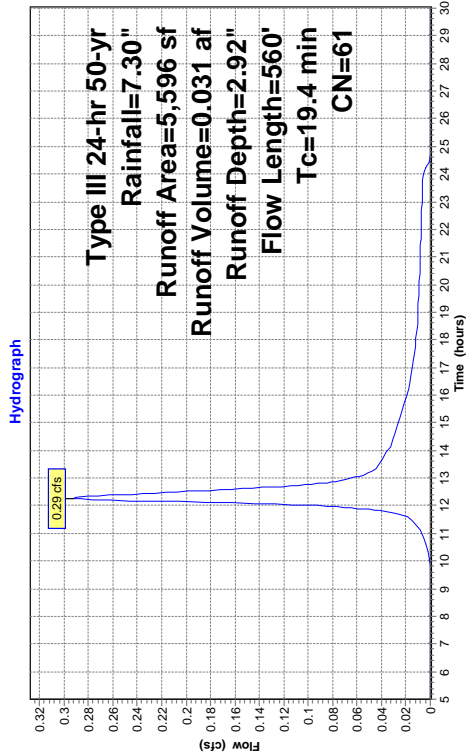
Runoff = 0.29 cfs @ 12.28 hrs, Volume= 0.031 af, Depth= 2.92"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 50-yr Rainfall=7.30"

Area (sf)	CN	Description
5,176	61	>75% Grass cover, Good, HSG B
420	61	>75% Grass cover, Good, HSG B
5,596	61	Weighted Average
5,596		100.00% Pervious Area

Tc (min)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.9	100	0.0100	0.13	Sheet Flow, Grass: Short n= 0.150 P2= 3.20"
6.5	460	0.0283	1.18	Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
19.4	560	Total		

Subcatchment 5S: EX-WS-A3



Existing Conditions B Soil
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 Type III 24-hr 50-yr Rainfall=7.30"
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 Page 56

Summary for Subcatchment 9S: EX-WS-B1

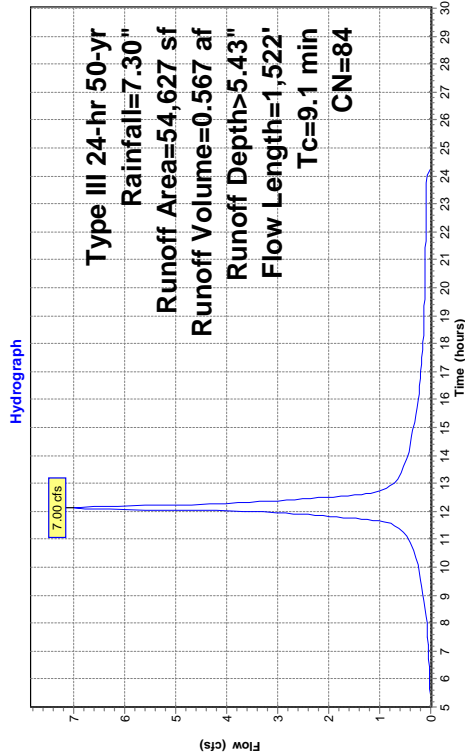
Runoff = 7.00 cfs @ 12.12 hrs, Volume= 0.567 af, Depth> 5.43"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 50-yr Rainfall=7.30"

Area (sf)	CN	Description
13,321	61	>75% Grass cover, Good, HSG B
5,152	58	Woods/grass comb., Good, HSG B
1,619	61	>75% Grass cover, Good, HSG B
34,535	98	Paved roads w/curbs & sewers, HSG B
54,627	84	Weighted Average
20,092		36.78% Pervious Area
34,535		63.22% Impervious Area

Tc (min)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	30	0.0200	1.08	Sheet Flow, Smooth surfaces n= 0.011 P2= 3.20"
8.6	1,492	0.0202	2.89	Shallow Concentrated Flow, Paved Kv= 20.3 fps
9.1	1,522	Total		

Subcatchment 9S: EX-WS-B1



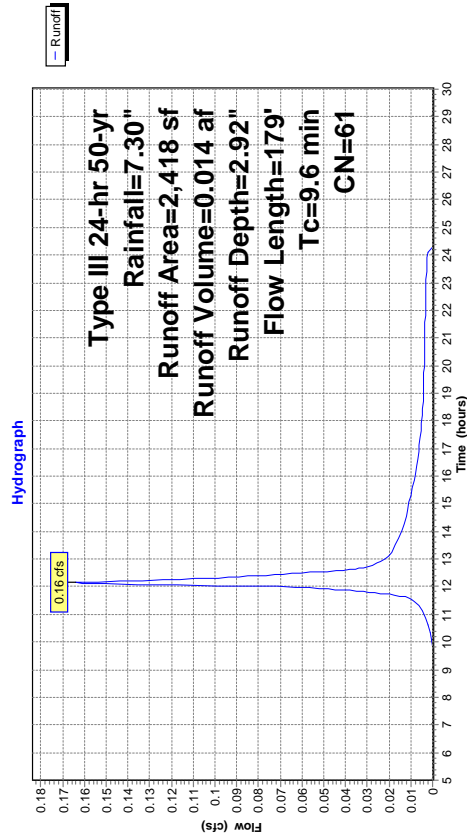
Existing Conditions_B Soil Type III 24-hr 50-yr Rainfall=7.30"
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Summary for Subcatchment 11S: EX-WS-B3

Runoff = 0.16 cfs @ 12.14 hrs, Volume= 0.014 af, Depth= 2.92"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, d= 0.02 hrs
 Type III 24-hr 50-yr Rainfall=7.30"

Area (sf)	CN	Description		
2,418	61	>75% Grass cover, Good, HSG B		
2,418		100.00% Pervious Area		
Tc (min)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.9	100	0.0650	0.19	Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
0.7	79	0.0696	1.85	Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
9.6	179	Total		

Subcatchment 11S: EX-WS-B3



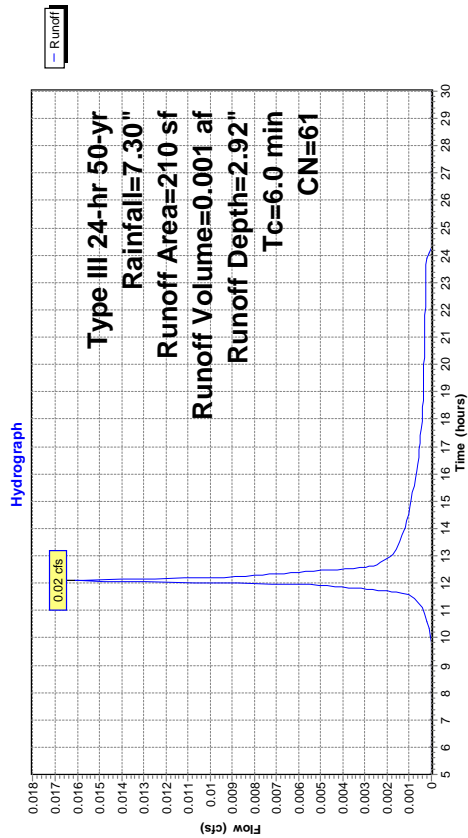
Existing Conditions_B Soil Type III 24-hr 50-yr Rainfall=7.30"
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Summary for Subcatchment 10S: EX-WS-B2

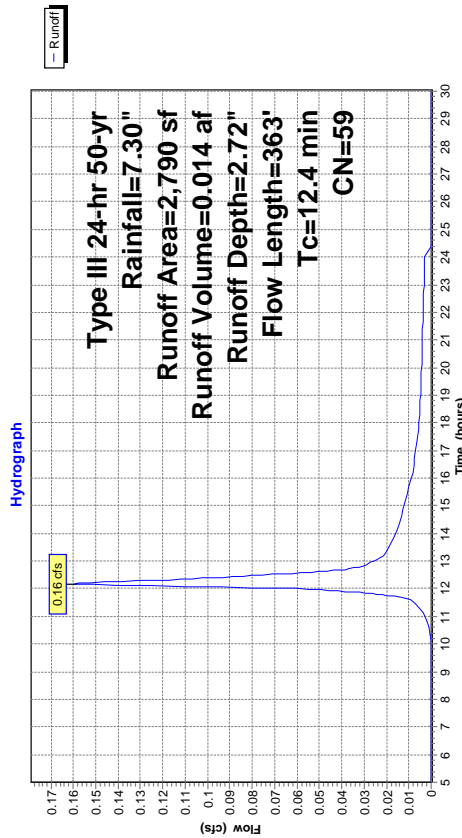
Runoff = 0.02 cfs @ 12.09 hrs, Volume= 0.001 af, Depth= 2.92"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, d= 0.02 hrs
 Type III 24-hr 50-yr Rainfall=7.30"

Area (sf)	CN	Description		
210	61	>75% Grass cover, Good, HSG B		
210		100.00% Pervious Area		
Tc (min)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0				Direct Entry, Minimum Tc

Subcatchment 10S: EX-WS-B2



Subcatchment 12S: EX-WS-C1



Summary for Subcatchment 12S: EX-WS-C1

Runoff = 0.16 cfs @ 12.18 hrs, Volume= 0.014 af, Depth= 2.72"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 50-yr Rainfall=7.30"

Area (sf)	CN	Description
1,192	61	>75% Grass cover, Good, HSG B
959	48	Brush, Good, HSG B
442	61	>75% Grass cover, Good, HSG B
197	98	Paved roads w/curbs & sewers, HSG B
2,790	59	Weighted Average
2,593		92.94% Pervious Area
197		7.06% Impervious Area

Tc (min)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.0	68	0.0294	0.13	Sheet Flow.
0.1	27	0.0740	5.52	Grass: Dense n= 0.240 P2= 3.20" Shallow Concentrated Flow,
1.5	147	0.0540	1.63	Paved KV= 20.3 fps Shallow Concentrated Flow,
1.8	121	0.0248	1.10	Short Grass Pasture KV= 7.0 fps Shallow Concentrated Flow,
12.4	363	Total		Short Grass Pasture KV= 7.0 fps

Existing Conditions B Soil
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 Type III 24-hr 50-yr Rainfall=7.30"
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 Page 61

Summary for Subcatchment 13S: EX-WS-C2

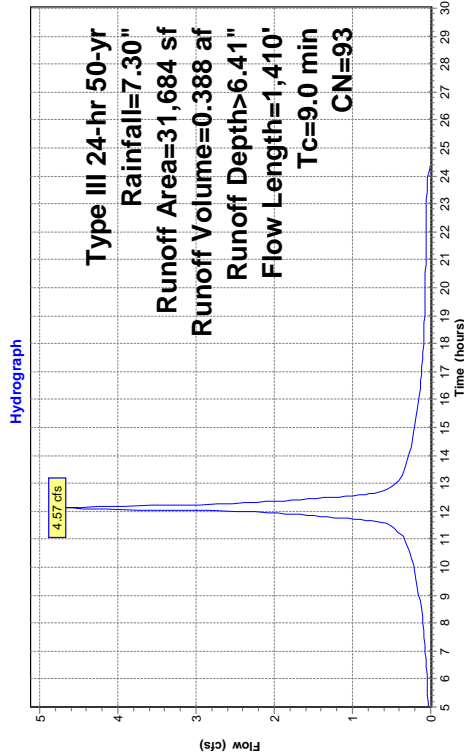
Runoff = 4.57 cfs @ 12.12 hrs, Volume= 0.388 af, Depth> 6.41"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 50-yr Rainfall=7.30"

Area (sf)	CN	Description
1,324	61	>75% Grass cover, Good, HSG B
2,171	48	Brush, Good, HSG B
7	61	>75% Grass cover, Good, HSG B
28,182	98	Paved roads w/curbs & sewers, HSG B
31,684	93	Weighted Average
3,502		11.05% Pervious Area
28,182		88.95% Impervious Area

Tc (min)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	100	0.0550	2.06	Sheet Flow, Smooth surfaces n= 0.011 P2= 3.20"
8.2	1,310	0.0172	2.66	Shallow Concentrated Flow, Paved Kv= 20.3 fps
9.0	1,410	Total		

Subcatchment 13S: EX-WS-C2



Existing Conditions B Soil
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 Type III 24-hr 50-yr Rainfall=7.30"
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 Page 62

Summary for Subcatchment 14S: EX-WS-B4

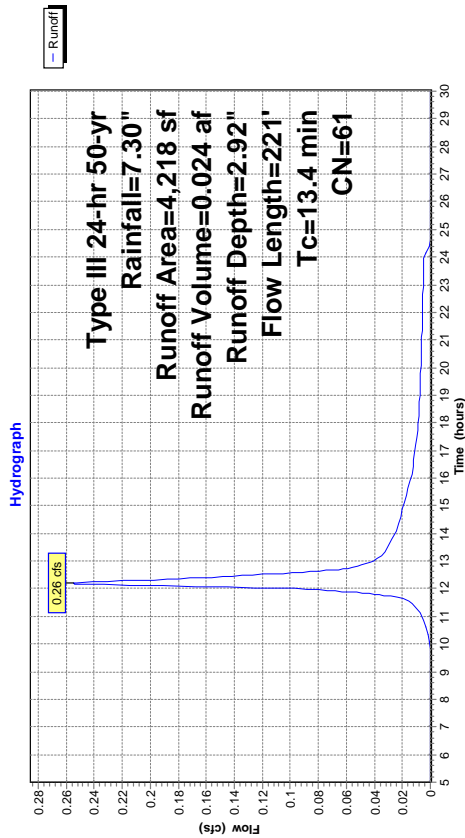
Runoff = 0.26 cfs @ 12.19 hrs, Volume= 0.024 af, Depth= 2.92"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 50-yr Rainfall=7.30"

Area (sf)	CN	Description
4,218	61	>75% Grass cover, Good, HSG B
4,218		100.00% Pervious Area

Tc (min)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.4	100	0.0350	0.15	Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
2.0	121	0.0207	1.01	Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
13.4	221	Total		

Subcatchment 14S: EX-WS-B4



Existing Conditions_B Soil Type III 24-hr 50-yr Rainfall=7.30"
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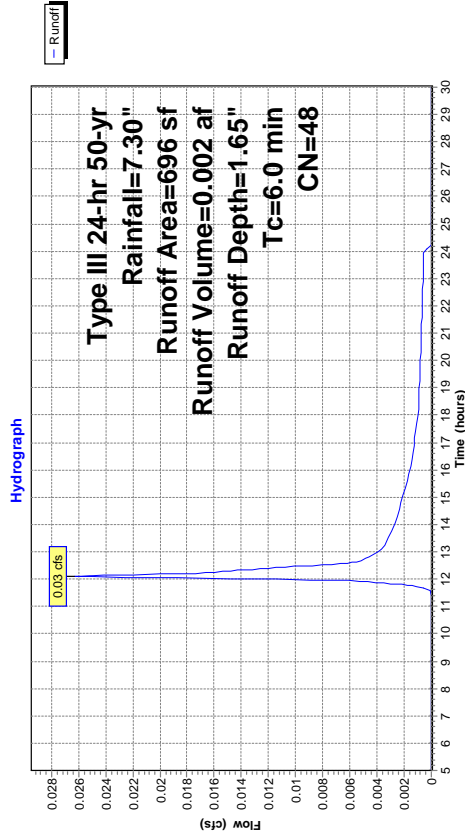
Summary for Subcatchment 15S: EX-WS-C3

Runoff = 0.03 cfs @ 12.10 hrs, Volume= 0.002 af, Depth= 1.65"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 50-yr Rainfall=7.30"

Area (sf)	CN	Description
696	48	Brush, Good, HSG B
696		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Minimum Tc

Subcatchment 15S: EX-WS-C3



Existing Conditions_B Soil Type III 24-hr 50-yr Rainfall=7.30"
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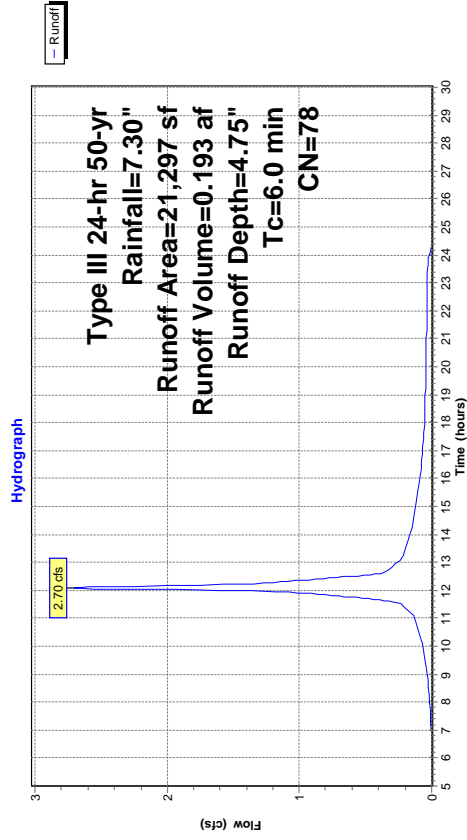
Summary for Subcatchment 16S: EX-WS-C4

Runoff = 2.70 cfs @ 12.09 hrs, Volume= 0.193 af, Depth= 4.75"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 50-yr Rainfall=7.30"

Area (sf)	CN	Description
3,410	61	>75% Grass cover, Good, HSG B
3,400	58	Woods/grass comb., Good, HSG B
11,406	98	Paved roads w/curbs & sewers, HSG B
3,081	48	Brush, Good, HSG B
21,297	78	Weighted Average
9,891		46.44% Pervious Area
11,406		53.56% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Minimum Tc

Subcatchment 16S: EX-WS-C4



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 Page 65

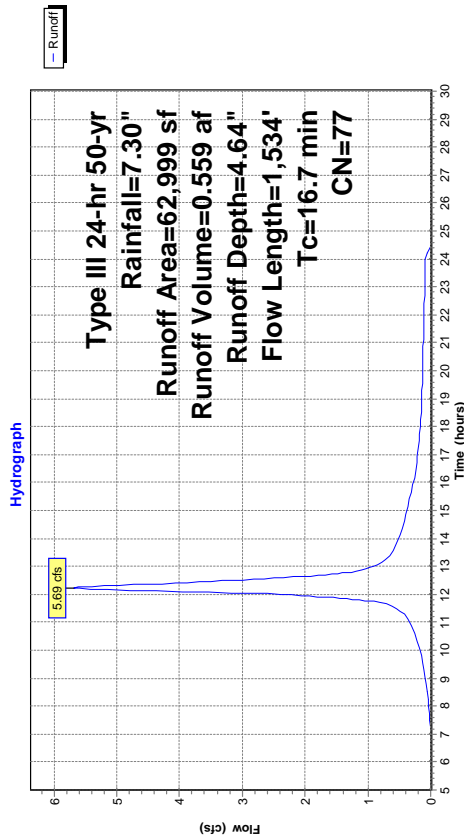
Summary for Subcatchment 17S: EX-WS-B5

Runoff = 5.69 cfs @ 12.23 hrs, Volume= 0.559 af, Depth= 4.64"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 50-yr Rainfall=7.30"

Area (sf)	CN	Description
13,903	61	>75% Grass cover, Good, HSG B
20,498	58	Woods/grass comb., Good, HSG B
405	61	>75% Grass cover, Good, HSG B
28,193	98	Paved roads w/curbs & sewers, HSG B
62,999	77	Weighted Average
34,806		55.25% Pervious Area
28,193		44.75% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	25	0.0200	1.04		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.20"
16.3	1,509	0.0058	1.55		Shallow Concentrated Flow, Paved Kv= 20.3 fps
16.7	1,534	Total			

Subcatchment 17S: EX-WS-B5



Existing Conditions B Soil
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 Type III 24-hr 50-yr Rainfall=7.30"
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 Page 66

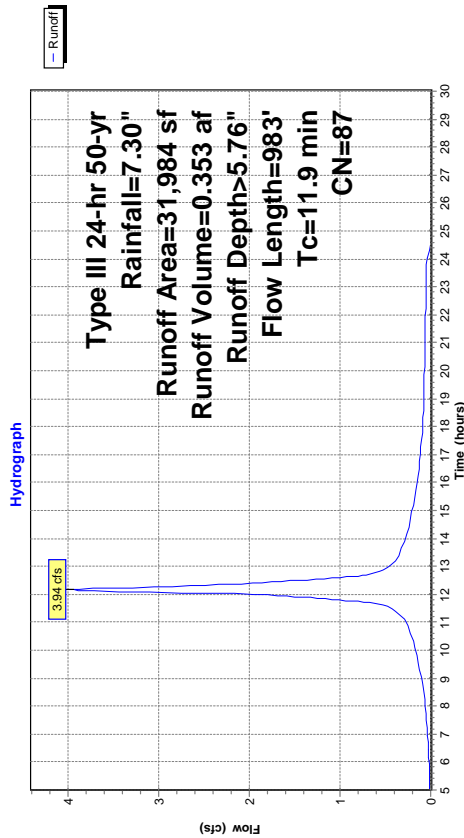
Summary for Subcatchment 18S: EX-WS-B6

Runoff = 3.94 cfs @ 12.16 hrs, Volume= 0.353 af, Depth> 5.76"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 50-yr Rainfall=7.30"

Area (sf)	CN	Description
4,963	61	>75% Grass cover, Good, HSG B
3,359	58	Woods/grass comb., Good, HSG B
570	61	>75% Grass cover, Good, HSG B
23,092	98	Paved roads w/curbs & sewers, HSG B
31,984	87	Weighted Average
8,892		27.80% Pervious Area
23,092		72.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	25	0.0200	1.04		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.20"
11.5	958	0.0047	1.39		Shallow Concentrated Flow, Paved Kv= 20.3 fps
11.9	983	Total			

Subcatchment 18S: EX-WS-B6

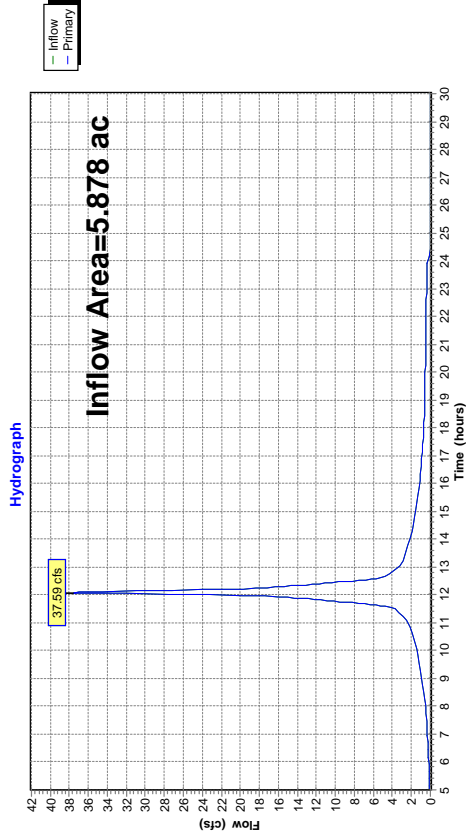


Existing Conditions_B Soil Type III 24-hr 50-yr Rainfall=7.30"
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Summary for Link DP1: Western Segment

Inflow Area = 5.878 ac, 69.37% Impervious, Inflow Depth > 5.76" for 50-yr event
 Inflow = 37.59 cfs @ 12.08 hrs, Volume= 2.820 af
 Primary = 37.59 cfs @ 12.08 hrs, Volume= 2.820 af, Atten= 0%, Lag= 0.0 min
 Primary outflow = Inflow, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs

Link DP1: Western Segment

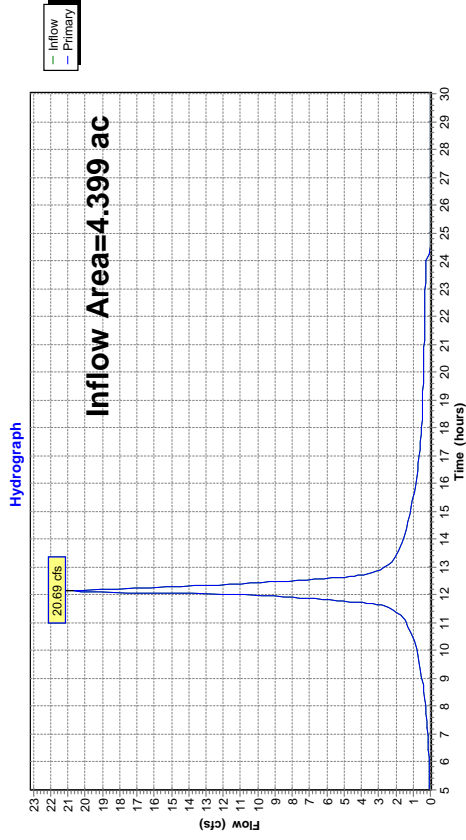


Existing Conditions_B Soil Type III 24-hr 50-yr Rainfall=7.30"
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Summary for Link DP2: Eastern Segment - Wetlands North

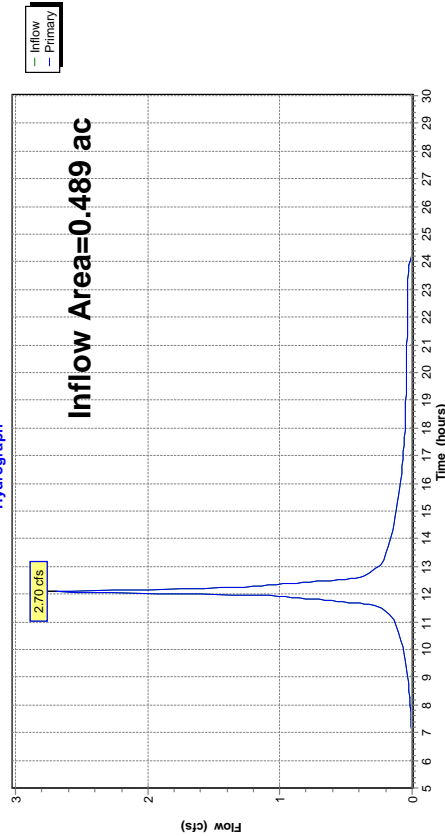
Inflow Area = 4.399 ac, 59.59% Impervious, Inflow Depth > 5.24" for 50-yr event
 Inflow = 20.69 cfs @ 12.15 hrs, Volume= 1.922 af
 Primary = 20.69 cfs @ 12.15 hrs, Volume= 1.922 af, Atten= 0%, Lag= 0.0 min
 Primary outflow = Inflow, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs

Link DP2: Eastern Segment - Wetlands North



Summary for Link DP3: Eastern Segment - Wetlands South

Inflow Area = 0.489 ac, 53.56% Impervious, Inflow Depth = 4.75" for 50-yr event
 Inflow = 2.70 cfs @ 12.09 hrs, Volume= 0.193 af
 Primary = 2.70 cfs @ 12.09 hrs, Volume= 0.193 af, Atten= 0%, Lag= 0.0 min
 Primary outflow = Inflow, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs



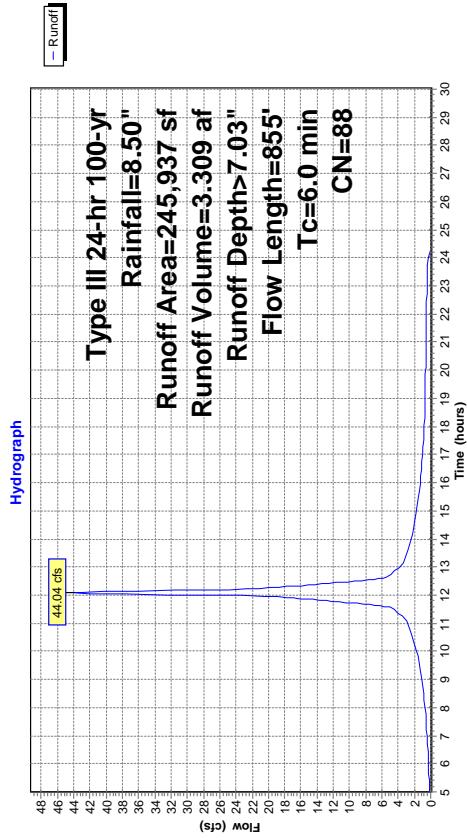
Summary for Subcatchment 3S: EX-WS-A1

Runoff = 44.04 cfs @ 12.08 hrs, Volume= 3.309 af, Depth> 7.03"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 100-yr Rainfall=8.50"

Area (sf)	CN	Description
18,499	61	>75% Grass cover, Good, HSG B
8,431	61	>75% Grass cover, Good, HSG B
59,122	72	1/3 acre lots, 30% imp, HSG B
159,885	98	Paved roads w/curbs & sewers, HSG B
245,937	88	Weighted Average
68,315		27.78% Pervious Area
177,622		72.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	100	0.0200	1.38		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.20"
4.4	755	0.0203	2.89		Shallow Concentrated Flow, Paved Kv= 20.3 fps
5.6	855				Total, Increased to minimum Tc = 6.0 min

Subcatchment 3S: EX-WS-A1



Existing Conditions B Soil Type III 24-hr 100-yr Rainfall=8.50"
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Summary for Subcatchment 5S: EX-WS-A3

Runoff = 0.39 cfs @ 12.27 hrs, Volume= 0.041 af, Depth= 3.83"

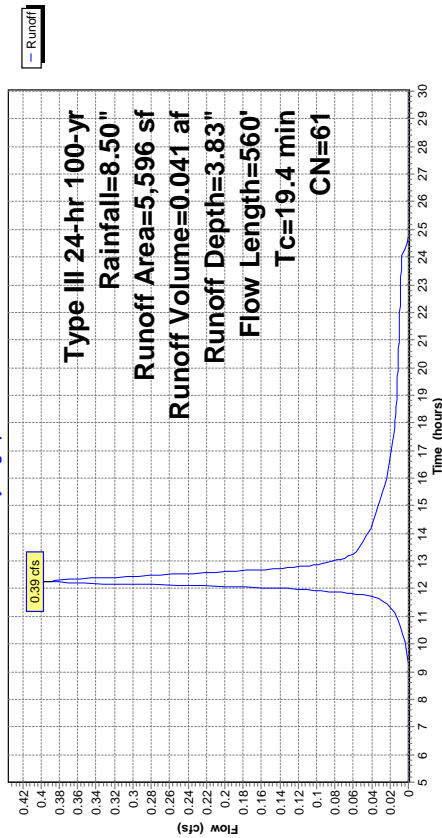
Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 100-yr Rainfall=8.50"

Area (sf)	CN	Description
5,176	61	>75% Grass cover, Good, HSG B
420	61	>75% Grass cover, Good, HSG B
5,596	61	Weighted Average
5,596	61	100.00% Pervious Area

Tc (min)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.9	100	0.0100	0.13	Sheet Flow, Grass: Short n= 0.150 P2= 3.20"
6.5	460	0.0283	1.18	Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
19.4	560	Total		

Subcatchment 5S: EX-WS-A3

Hydrograph



Existing Conditions B Soil Type III 24-hr 100-yr Rainfall=8.50"
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Summary for Subcatchment 4S: EX-WS-A2

Runoff = 0.46 cfs @ 12.09 hrs, Volume= 0.033 af, Depth= 3.83"

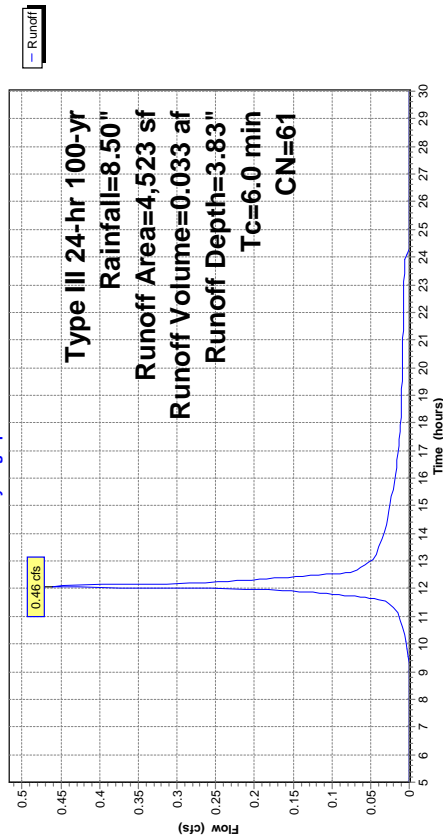
Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 100-yr Rainfall=8.50"

Area (sf)	CN	Description
3,273	61	>75% Grass cover, Good, HSG B
1,250	61	>75% Grass cover, Good, HSG B
4,523	61	Weighted Average
4,523	61	100.00% Pervious Area

Tc (min)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0				Direct Entry, Minimum Tc

Subcatchment 4S: EX-WS-A2

Hydrograph



Existing Conditions B Soil Type III 24-hr 100-yr Rainfall=8.50"
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Summary for Subcatchment 9S: EX-WS-B1

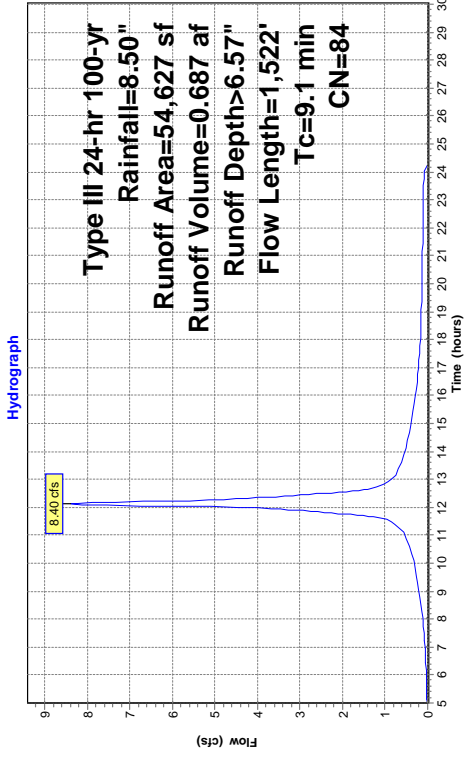
Runoff = 8.40 cfs @ 12.12 hrs, Volume= 0.687 af, Depth> 6.57"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 100-yr Rainfall=8.50"

Area (sf)	CN	Description
13,321	61	>75% Grass cover, Good, HSG B
5,152	58	Woods/grass comb., Good, HSG B
1,619	61	>75% Grass cover, Good, HSG B
34,535	98	Paved roads w/curbs & sewers, HSG B
54,627	84	Weighted Average
20,092		36.78% Pervious Area
34,535		63.22% Impervious Area

Tc (min)	Slope (feet)	Velocity (ft/ft)	Capacity (cfs)	Description
0.5	30	0.0200	1.08	Sheet Flow, Smooth surfaces n= 0.011 P2= 3.20"
8.6	1,492	0.0202	2.89	Shallow Concentrated Flow, Paved Kv= 20.3 fps
9.1	1,522	Total		

Subcatchment 9S: EX-WS-B1



Existing Conditions B Soil Type III 24-hr 100-yr Rainfall=8.50"
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Summary for Subcatchment 10S: EX-WS-B2

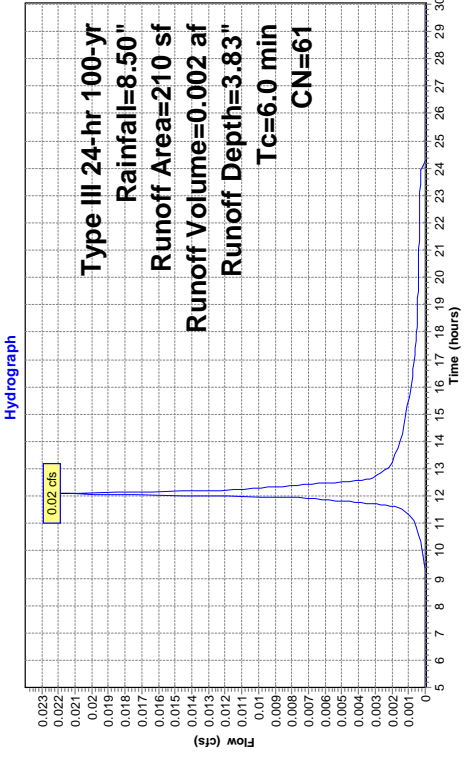
Runoff = 0.02 cfs @ 12.09 hrs, Volume= 0.002 af, Depth= 3.83"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 100-yr Rainfall=8.50"

Area (sf)	CN	Description
210	61	>75% Grass cover, Good, HSG B
210		100.00% Pervious Area

Tc (min)	Slope (feet)	Velocity (ft/ft)	Capacity (cfs)	Description
6.0				Direct Entry, Minimum Tc

Subcatchment 10S: EX-WS-B2



Existing Conditions_B Soil
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 Type III 24-hr 100-yr Rainfall=8.50"
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 Page 76

Summary for Subcatchment 12S: EX-WS-C1

Runoff = 0.22 cfs @ 12.18 hrs, Volume= 0.019 af, Depth= 3.60"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, d= 0.02 hrs
 Type III 24-hr 100-yr Rainfall=8.50"

Area (sf)	CN	Description
1,192	61	>75% Grass cover, Good, HSG B
959	48	Brush, Good, HSG B
442	61	>75% Grass cover, Good, HSG B
197	98	Paved roads w/curbs & sewers, HSG B
2,790	59	Weighted Average
2,593		92.94% Pervious Area
197		7.06% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.0	68	0.0294	0.13		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20" Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.1	27	0.0740	5.52		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.5	147	0.0540	1.63		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.8	121	0.0248	1.10		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
12.4	363	Total			

Existing Conditions_B Soil
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 Type III 24-hr 100-yr Rainfall=8.50"
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 Page 75

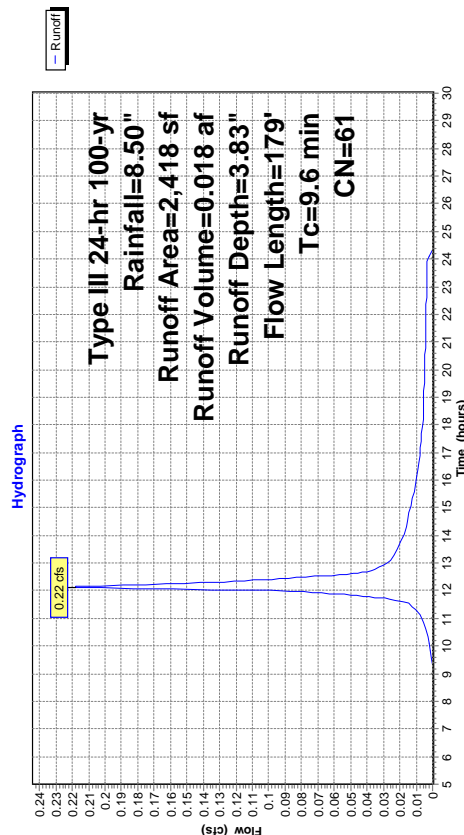
Summary for Subcatchment 11S: EX-WS-B3

Runoff = 0.22 cfs @ 12.14 hrs, Volume= 0.018 af, Depth= 3.83"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, d= 0.02 hrs
 Type III 24-hr 100-yr Rainfall=8.50"

Area (sf)	CN	Description
2,418	61	>75% Grass cover, Good, HSG B
2,418		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.9	100	0.0650	0.19		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20" Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.7	79	0.0696	1.85		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
9.6	179	Total			

Subcatchment 11S: EX-WS-B3



Summary for Subcatchment 13S: EX-WS-C2

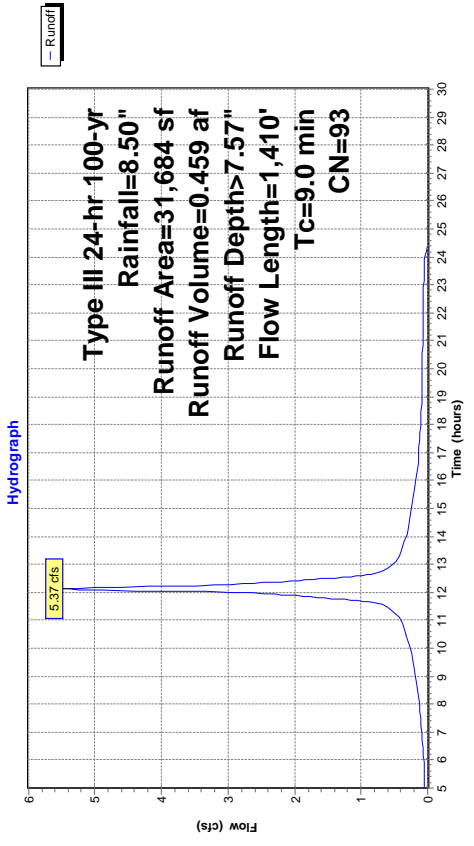
Runoff = 5.37 cfs @ 12.12 hrs, Volume= 0.459 af, Depth> 7.57"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 100-yr Rainfall=8.50"

Area (sf)	CN	Description
1,324	61	>75% Grass cover, Good, HSG B
2,171	48	Brush, Good, HSG B
7	61	>75% Grass cover, Good, HSG B
28,182	98	Paved roads w/curbs & sewers, HSG B
31,684	93	Weighted Average
3,502		11.05% Pervious Area
28,182		88.95% Impervious Area

Tc (min)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	100	0.0550	2.06	Sheet Flow, Smooth surfaces n=0.011 P2= 3.20"
8.2	1,310	0.0172	2.66	Shallow Concentrated Flow, Paved Ky= 20.3 fps
9.0	1,410	Total		

Subcatchment 13S: EX-WS-C2



Subcatchment 12S: EX-WS-C1

Runoff = 0.22 cfs @ 12.12 hrs, Volume= 0.002 af, Depth> 0.02 hrs

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 100-yr Rainfall=8.50"

Area (sf)	CN	Description
1,324	61	>75% Grass cover, Good, HSG B
2,171	48	Brush, Good, HSG B
7	61	>75% Grass cover, Good, HSG B
28,182	98	Paved roads w/curbs & sewers, HSG B
31,684	93	Weighted Average
3,502		11.05% Pervious Area
28,182		88.95% Impervious Area

Tc (min)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	100	0.0550	2.06	Sheet Flow, Smooth surfaces n=0.011 P2= 3.20"
8.2	1,310	0.0172	2.66	Shallow Concentrated Flow, Paved Ky= 20.3 fps
9.0	1,410	Total		

Subcatchment 12S: EX-WS-C1



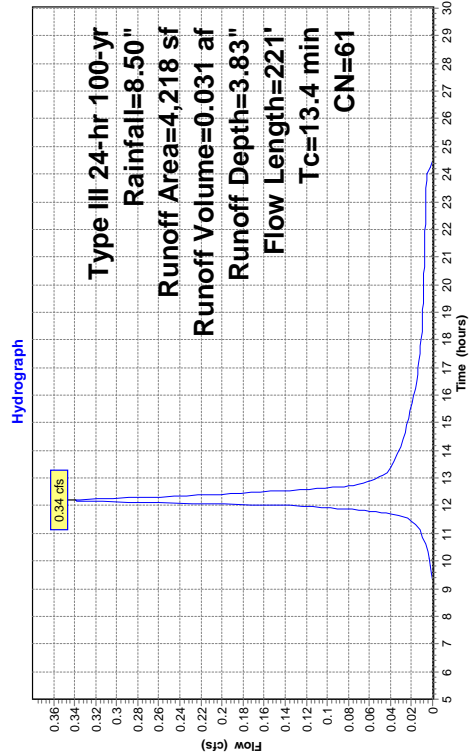
Existing Conditions_B Soil Type III 24-hr 100-yr Rainfall=8.50"
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Summary for Subcatchment 14S: EX-WS-B4

Runoff = 0.34 cfs @ 12.19 hrs, Volume= 0.031 af, Depth= 3.83"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, d= 0.02 hrs
 Type III 24-hr 100-yr Rainfall=8.50"

Area (sf)	CN	Description		
4,218	61	>75% Grass cover, Good, HSG B		
4,218		100.00% Pervious Area		
Tc (min)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.4	100	0.0350	0.15	Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
2.0	121	0.0207	1.01	Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
13.4	221	Total		

Subcatchment 14S: EX-WS-B4



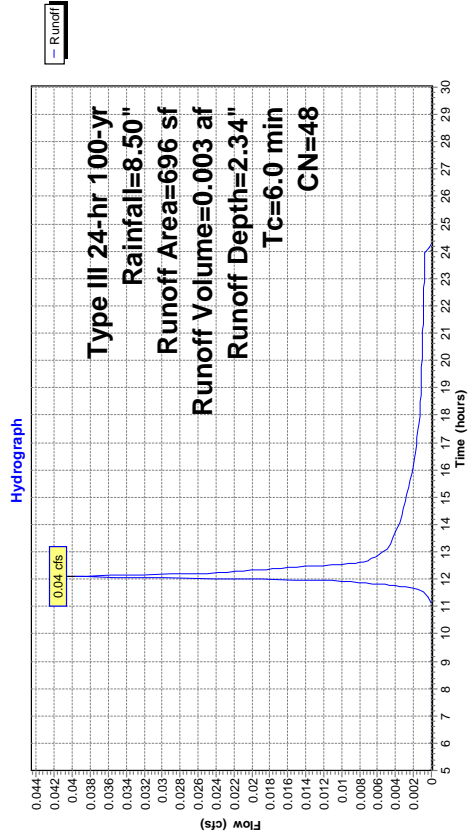
Existing Conditions_B Soil Type III 24-hr 100-yr Rainfall=8.50"
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Summary for Subcatchment 15S: EX-WS-C3

Runoff = 0.04 cfs @ 12.10 hrs, Volume= 0.003 af, Depth= 2.34"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, d= 0.02 hrs
 Type III 24-hr 100-yr Rainfall=8.50"

Area (sf)	CN	Description		
696	48	Brush, Good, HSG B		
696		100.00% Pervious Area		
Tc (min)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0				Direct Entry, Minimum Tc

Subcatchment 15S: EX-WS-C3



Existing Conditions B Soil Type III 24-hr 100-yr Rainfall=8.50"
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Summary for Subcatchment 16S: EX-WS-C4

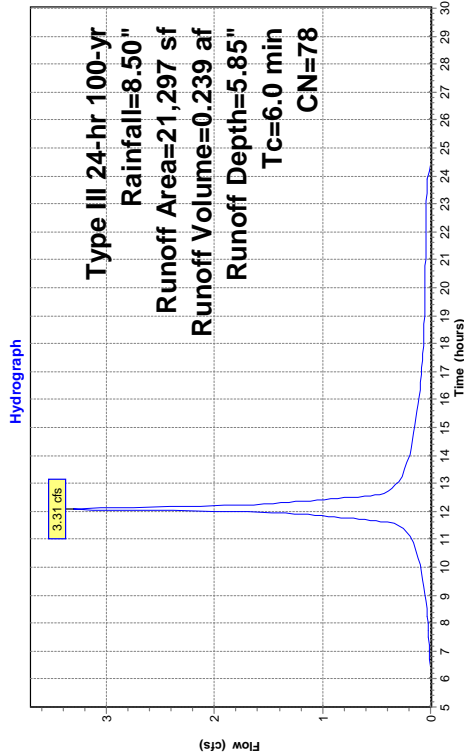
Runoff = 3.31 cfs @ 12.09 hrs, Volume= 0.239 af, Depth= 5.85"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 100-yr Rainfall=8.50"

Area (sf)	CN	Description
3,410	61	>75% Grass cover, Good, HSG B
3,400	58	Woods/grass comb., Good, HSG B
11,406	98	Paved roads w/curbs & sewers, HSG B
3,081	48	Brush, Good, HSG B
21,297	78	Weighted Average
9,891		46.44% Pervious Area
11,406		53.56% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Minimum Tc

Subcatchment 16S: EX-WS-C4



Existing Conditions B Soil Type III 24-hr 100-yr Rainfall=8.50"
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Summary for Subcatchment 17S: EX-WS-B5

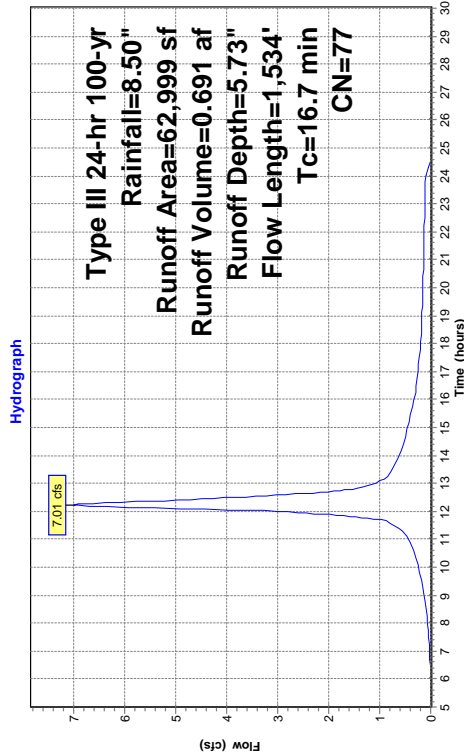
Runoff = 7.01 cfs @ 12.22 hrs, Volume= 0.691 af, Depth= 5.73"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 100-yr Rainfall=8.50"

Area (sf)	CN	Description
13,903	61	>75% Grass cover, Good, HSG B
20,498	58	Woods/grass comb., Good, HSG B
405	61	>75% Grass cover, Good, HSG B
28,193	98	Paved roads w/curbs & sewers, HSG B
62,999	77	Weighted Average
34,806		55.25% Pervious Area
28,193		44.75% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	25	0.0200	1.04		Sheet Flow, Smooth surfaces n=0.011 P2= 3.20"
16.3	1,509	0.0058	1.55		Shallow Concentrated Flow, Paved Kv= 20.3 fps
16.7	1,534	Total			

Subcatchment 17S: EX-WS-B5



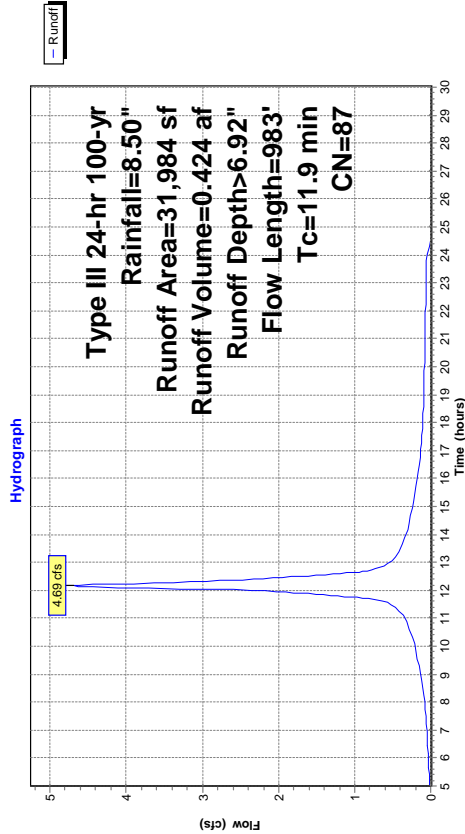
Summary for Subcatchment 18S: EX-WS-B6

Runoff = 4.69 cfs @ 12.16 hrs, Volume= 0.424 af, Depth> 6.92"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 100-yr Rainfall=8.50"

Area (sf)	CN	Description
4,963	61	>75% Grass cover, Good, HSG B
3,359	58	Woods/grass comb., Good, HSG B
570	61	>75% Grass cover, Good, HSG B
23,092	98	Paved roads w/curbs & sewers, HSG B
31,984	87	Weighted Average
8,892		27.80% Pervious Area
23,092		72.20% Impervious Area

Tc (min)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	25	0.0200	1.04	Sheet Flow, Smooth surfaces n= 0.011 P2= 3.20"
11.5	958	0.0047	1.39	Shallow Concentrated Flow, Paved Kv= 20.3 fps
11.9	983	Total		

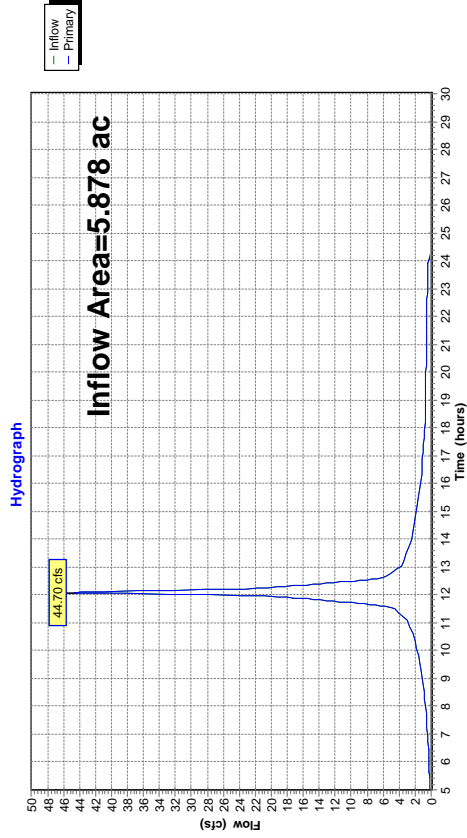
Subcatchment 18S: EX-WS-B6



Summary for Link DP1: Western Segment

Inflow Area = 5.878 ac, 69.37% Impervious, Inflow Depth > 6.91" for 100-yr event
 Inflow = 44.70 cfs @ 12.08 hrs, Volume= 3.383 af
 Primary = 44.70 cfs @ 12.08 hrs, Volume= 3.383 af, Atten= 0%, Lag= 0.0 min
 Primary outflow = Inflow, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs

Link DP1: Western Segment

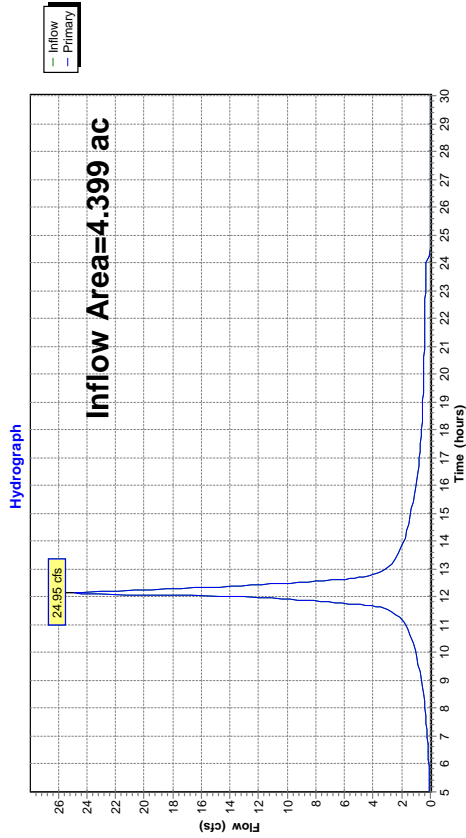


Existing Conditions_B Soil Type III 24-hr 100-yr Rainfall=8.50"
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Summary for Link DP2: Eastern Segment - Wetlands North

Inflow Area = 4.399 ac, 59.59% Impervious, Inflow Depth > 6.36" for 100-yr event
 Inflow = 24.95 cfs @ 12.15 hrs, Volume= 2.333 af
 Primary = 24.95 cfs @ 12.15 hrs, Volume= 2.333 af, Atten= 0%, Lag= 0.0 min
 Primary outflow = Inflow, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs

Link DP2: Eastern Segment - Wetlands North

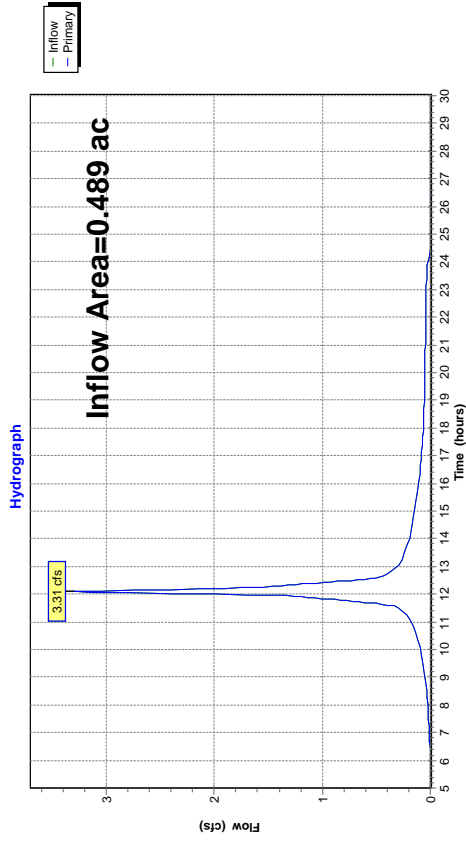


Existing Conditions_B Soil Type III 24-hr 100-yr Rainfall=8.50"
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Summary for Link DP3: Eastern Segment - Wetlands South

Inflow Area = 0.489 ac, 53.56% Impervious, Inflow Depth = 5.85" for 100-yr event
 Inflow = 3.31 cfs @ 12.09 hrs, Volume= 0.239 af
 Primary = 3.31 cfs @ 12.09 hrs, Volume= 0.239 af, Atten= 0%, Lag= 0.0 min
 Primary outflow = Inflow, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs

Link DP3: Eastern Segment - Wetlands South



APPENDIX B – PROPOSED CONDITIONS CALCULATION

Proposed Conditions_B Soil - Revised 5-24-18 Type III 24-hr 2-yr Rainfall=3.20"
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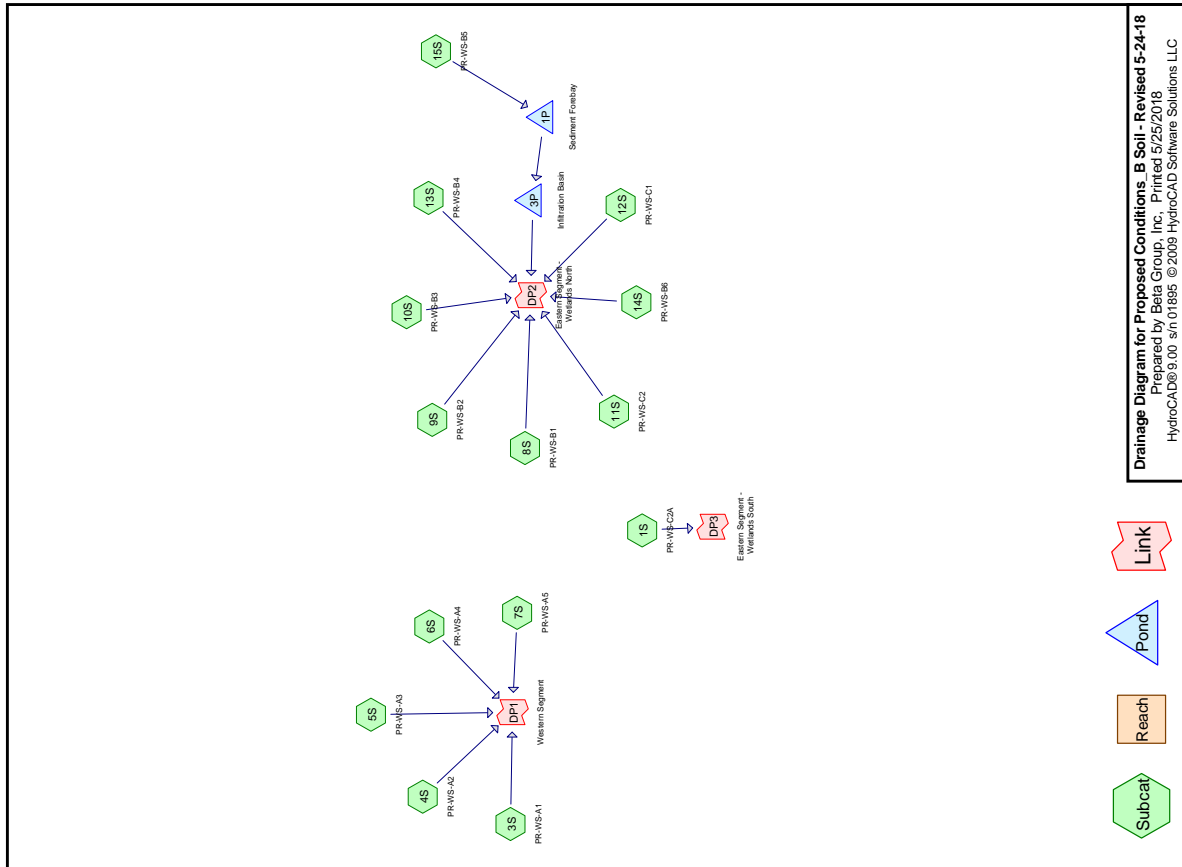
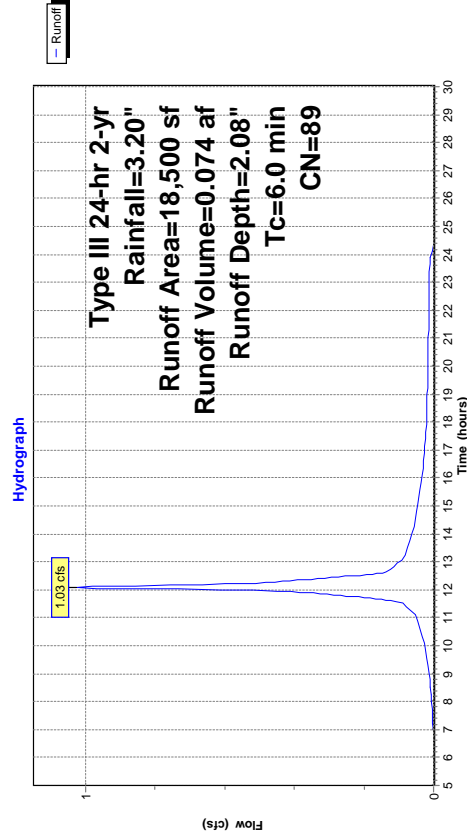
Summary for Subcatchment 1S: PR-WS-C2A

Runoff = 1.03 cfs @ 12.09 hrs, Volume= 0.074 af, Depth= 2.08"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 2-yr Rainfall=3.20"

Area (sf)	CN	Description
3,670	61	>75% Grass cover, Good, HSG B
13,970	98	Paved roads w/curbs & sewers, HSG B
860	58	Woods/grass comb., Good, HSG B
18,500	89	Weighted Average
4,530		24.49% Pervious Area
13,970		75.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Increased to 6 min

Subcatchment 1S: PR-WS-C2A



Summary for Subcatchment 3S: PR-WS-A1

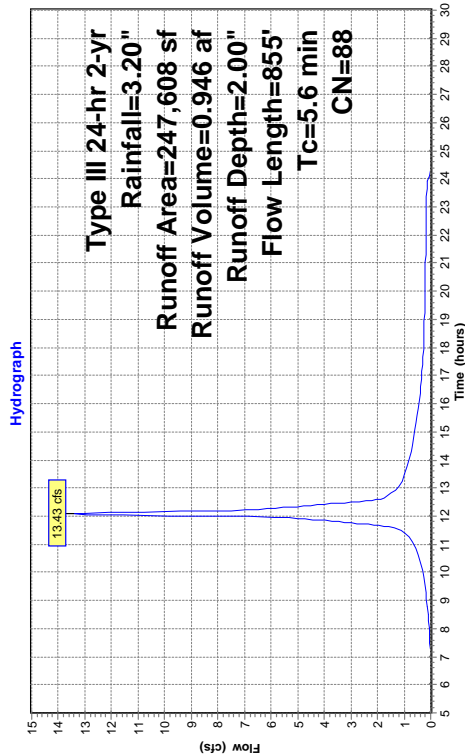
Runoff = 13.43 cfs @ 12.08 hrs, Volume= 0.946 af, Depth= 2.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, d= 0.02 hrs
 Type III 24-hr 2-yr Rainfall=3.20"

Area (sf)	CN	Description
14,875	61	>75% Grass cover, Good, HSG B
8,776	61	>75% Grass cover, Good, HSG B
59,116	72	1/3 acre lots, 30% imp, HSG B
164,841	98	Paved roads w/curbs & sewers, HSG B
247,608	88	Weighted Average
65,032		26.26% Pervious Area
182,576		73.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	100	0.0200	1.38		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.20"
4.4	755	0.0201	2.88		Shallow Concentrated Flow, Paved Kv= 20.3 fps
5.6	855	Total			

Subcatchment 3S: PR-WS-A1



Summary for Subcatchment 4S: PR-WS-A2

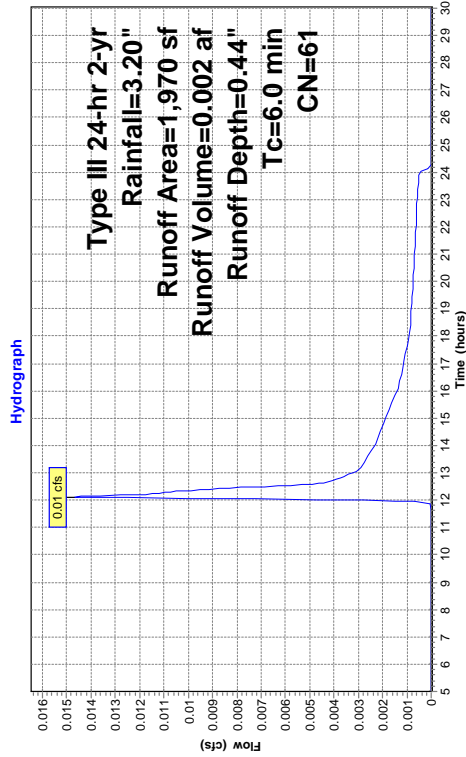
Runoff = 0.01 cfs @ 12.12 hrs, Volume= 0.002 af, Depth= 0.44"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, d= 0.02 hrs
 Type III 24-hr 2-yr Rainfall=3.20"

Area (sf)	CN	Description
1,647	61	>75% Grass cover, Good, HSG B
323	61	>75% Grass cover, Good, HSG B
1,970	61	Weighted Average
1,970		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Tc Minimum

Subcatchment 4S: PR-WS-A2



Proposed Conditions B Soil - Revised 5-24-18 Type III 24-hr 2-yr Rainfall=3.20"
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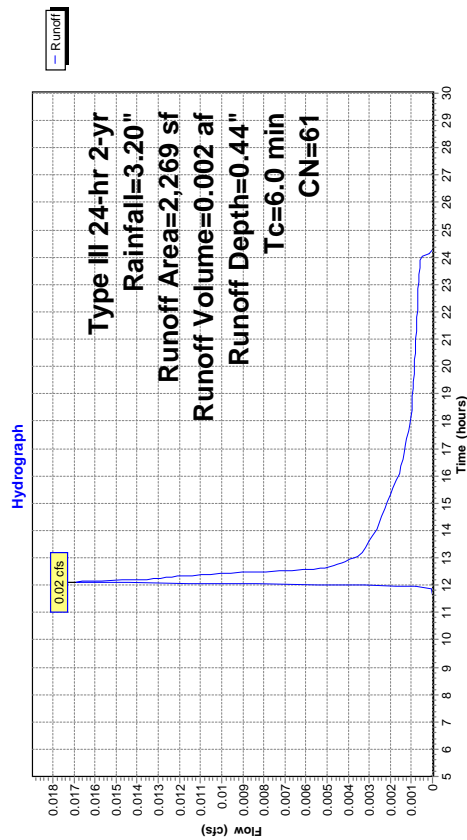
Summary for Subcatchment 6S: PR-WS-A4

Runoff = 0.02 cfs @ 12.12 hrs, Volume= 0.002 af, Depth= 0.44"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 2-yr Rainfall=3.20"

Area (sf)	CN	Description
2,269	61	>75% Grass cover, Good, HSG B
2,269		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Tc Minimum

Subcatchment 6S: PR-WS-A4



Proposed Conditions B Soil - Revised 5-24-18 Type III 24-hr 2-yr Rainfall=3.20"
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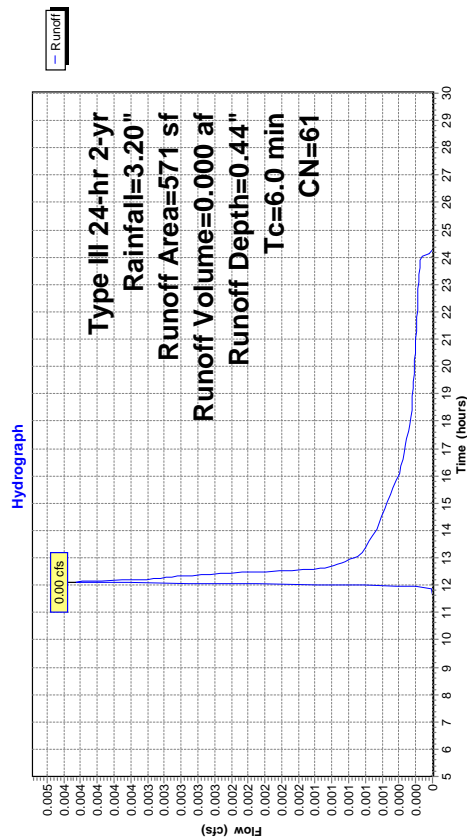
Summary for Subcatchment 5S: PR-WS-A3

Runoff = 0.00 cfs @ 12.12 hrs, Volume= 0.000 af, Depth= 0.44"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 2-yr Rainfall=3.20"

Area (sf)	CN	Description
571	61	>75% Grass cover, Good, HSG B
571		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Tc Minimum

Subcatchment 5S: PR-WS-A3



Proposed Conditions, B Soil - Revised 5-24-18 Type III 24-hr 2-yr Rainfall=3.20"
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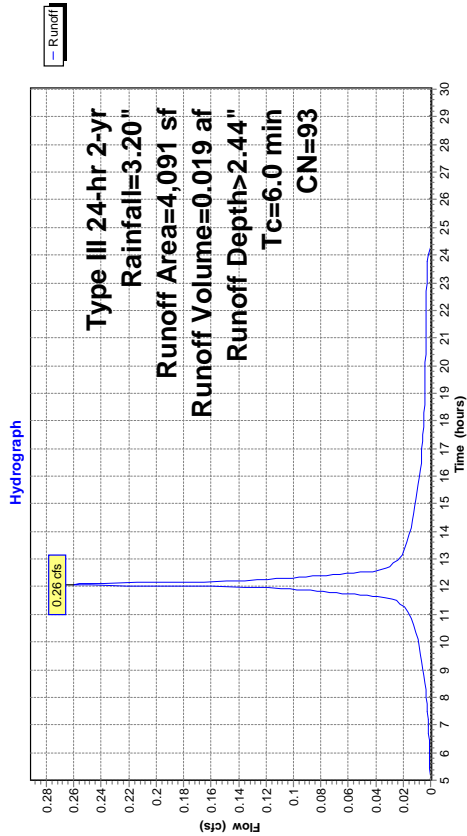
Summary for Subcatchment 7S: PR-WS-A5

Runoff = 0.26 cfs @ 12.09 hrs, Volume= 0.019 af, Depth> 2.44"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 2-yr Rainfall=3.20"

Area (sf)	CN	Description
556	61	>75% Grass cover, Good, HSG B
3,535	98	Paved roads w/curbs & sewers, HSG B
4,091	93	Weighted Average
556		13.59% Pervious Area
3,535		86.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Tc Minimum

Subcatchment 7S: PR-WS-A5



Proposed Conditions, B Soil - Revised 5-24-18 Type III 24-hr 2-yr Rainfall=3.20"
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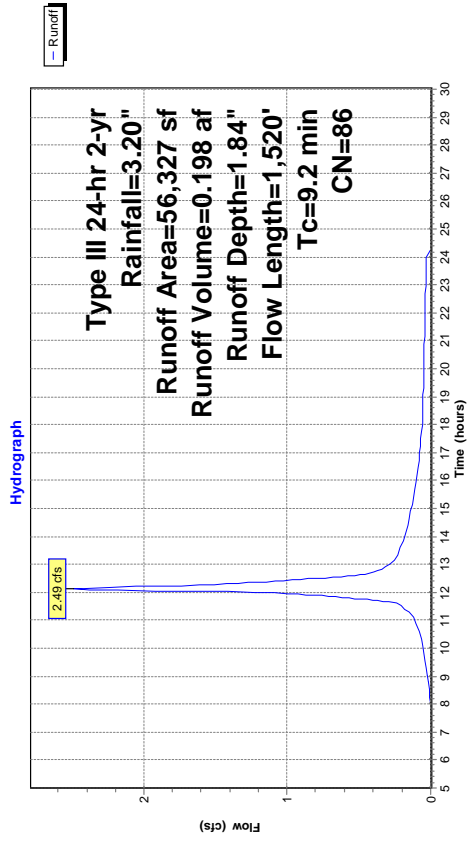
Summary for Subcatchment 8S: PR-WS-B1

Runoff = 2.49 cfs @ 12.13 hrs, Volume= 0.198 af, Depth= 1.84"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 2-yr Rainfall=3.20"

Area (sf)	CN	Description
13,861	61	>75% Grass cover, Good, HSG B
2,593	58	Woods/grass comb., Good, HSG B
1,276	61	>75% Grass cover, Good, HSG B
38,597	98	Paved roads w/curbs & sewers, HSG B
56,327	86	Weighted Average
17,730		31.48% Pervious Area
38,597		68.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	28	0.0107	0.83		Sheet Flow, Smooth surfaces n=0.011 P2= 3.20"
8.6	1,492	0.0204	2.90		Shallow Concentrated Flow, Paved Kv= 20.3 fps
9.2	1,520	Total			

Subcatchment 8S: PR-WS-B1



Proposed Conditions B Soil - Revised 5-24-18 Type III 24-hr 2-yr Rainfall=3.20"
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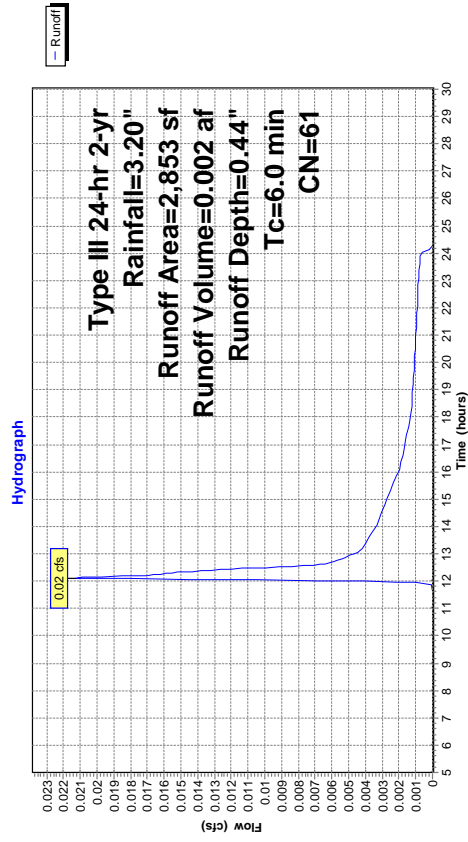
Summary for Subcatchment 10S: PR-WS-B3

Runoff = 0.02 cfs @ 12.12 hrs, Volume= 0.002 af, Depth= 0.44"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 2-yr Rainfall=3.20"

Area (sf)	CN	Description
2,853	61	>75% Grass cover, Good, HSG B
2,853		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Tc Minimum

Subcatchment 10S: PR-WS-B3



Proposed Conditions B Soil - Revised 5-24-18 Type III 24-hr 2-yr Rainfall=3.20"
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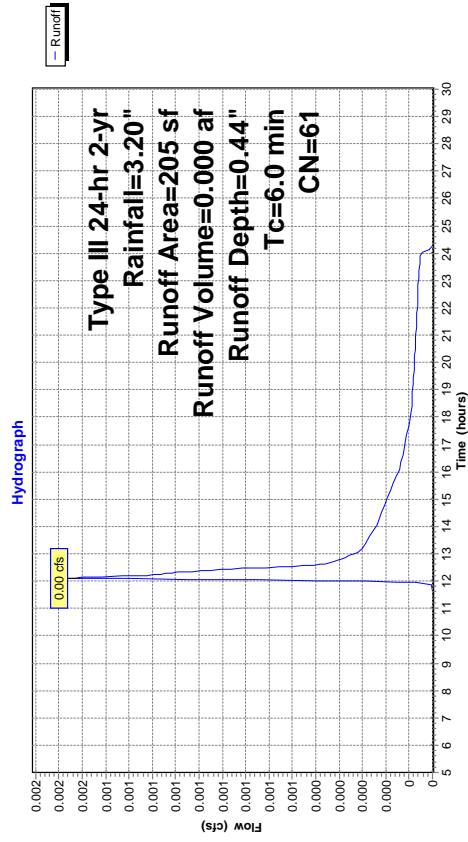
Summary for Subcatchment 9S: PR-WS-B2

Runoff = 0.00 cfs @ 12.12 hrs, Volume= 0.000 af, Depth= 0.44"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 2-yr Rainfall=3.20"

Area (sf)	CN	Description
205	61	>75% Grass cover, Good, HSG B
205		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Tc Minimum

Subcatchment 9S: PR-WS-B2



Summary for Subcatchment 11S: PR-WS-C2

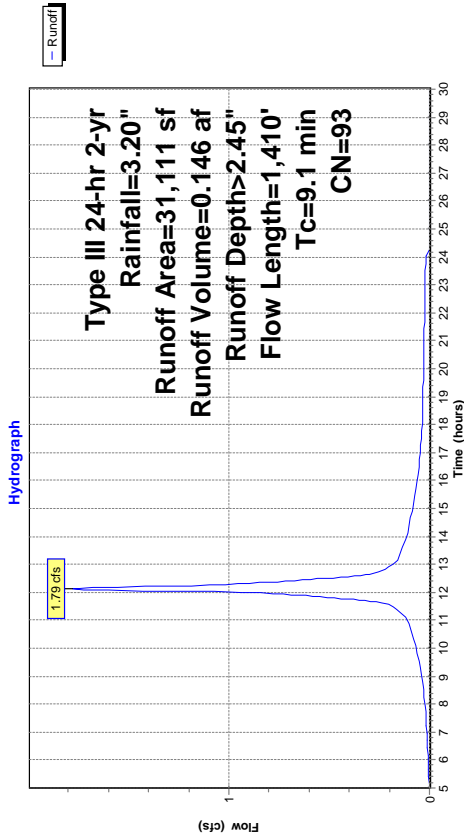
Runoff = 1.79 cfs @ 12.12 hrs, Volume= 0.146 af, Depth> 2.45"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 2-yr Rainfall=3.20"

Area (sf)	CN	Description
4,466	61	>75% Grass cover, Good, HSG B
26,645	98	Paved roads w/curbs & sewers, HSG B
31,111	93	Weighted Average
4,466		14.36% Pervious Area
26,645		85.64% Impervious Area

Tc (min)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	100	0.0740	2.32	Sheet Flow, Smooth surfaces n=0.011 P2= 3.20"
8.4	1,310	0.0165	2.61	Shallow Concentrated Flow, Paved KV= 20.3 fps
9.1	1,410	Total		

Subcatchment 11S: PR-WS-C2



Summary for Subcatchment 12S: PR-WS-C1

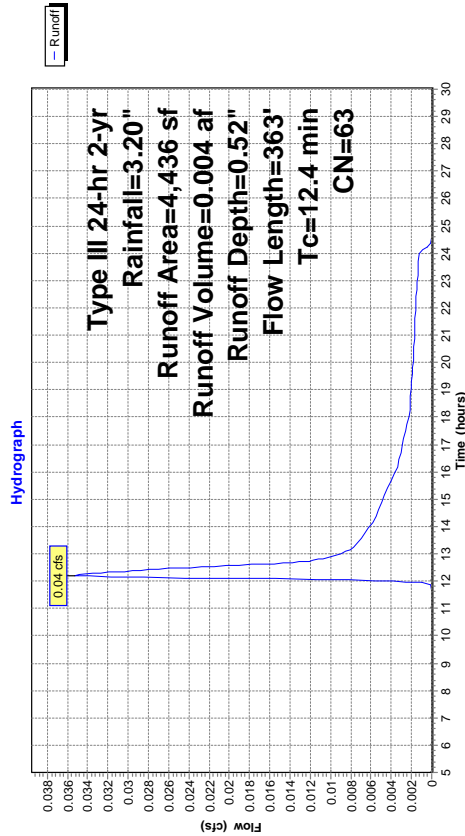
Runoff = 0.04 cfs @ 12.22 hrs, Volume= 0.004 af, Depth= 0.52"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 2-yr Rainfall=3.20"

Area (sf)	CN	Description
3,779	61	>75% Grass cover, Good, HSG B
450	61	>75% Grass cover, Good, HSG B
207	98	Paved roads w/curbs & sewers, HSG B
4,436	63	Weighted Average
4,229		95.33% Pervious Area
207		4.67% Impervious Area

Tc (min)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.0	68	0.0294	0.13	Sheet Flow, Grass: Dense n=0.240 P2= 3.20"
0.1	27	0.0740	5.52	Shallow Concentrated Flow, Paved KV= 20.3 fps
1.5	147	0.0540	1.63	Shallow Concentrated Flow, Short Grass Pasture KV= 7.0 fps
1.8	121	0.0248	1.10	Shallow Concentrated Flow, Short Grass Pasture KV= 7.0 fps
12.4	363	Total		

Subcatchment 12S: PR-WS-C1



Proposed Conditions, B Soil - Revised 5-24-18 Type III 24-hr 2-yr Rainfall=3.20"
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Summary for Subcatchment 13S: PR-WS-B4

Runoff = 1.21 cfs @ 12.24 hrs, Volume= 0.120 af, Depth= 1.34"

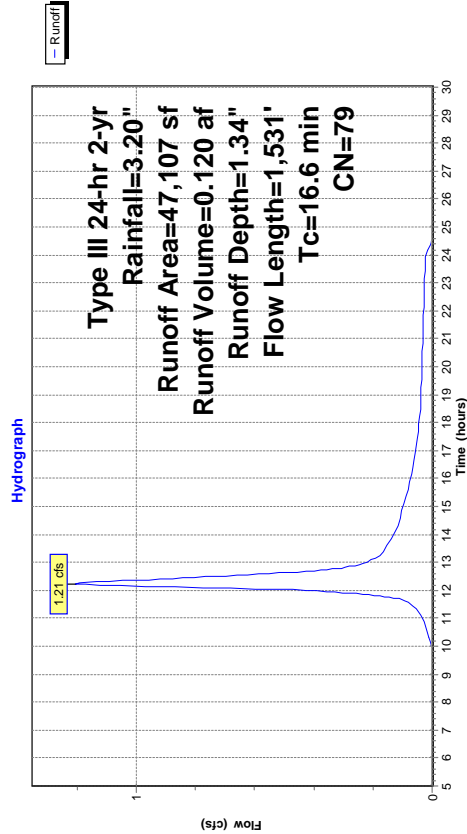
Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 2-yr Rainfall=3.20"

Area (sf)	CN	Description
9,416	61	>75% Grass cover, Good, HSG B
13,651	58	Woods/grass comb., Good, HSG B
24,040	98	Paved roads w/curbs & sewers, HSG B
47,107	79	Weighted Average
23,067		48.97% Pervious Area
24,040		51.03% Impervious Area

Tc (min)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	24	0.0170	0.97	
16.2	1,507	0.0058	1.55	
16.6	1,531	Total		

Sheet Flow,	
Smooth surfaces	n= 0.011 P2= 3.20"
Shallow Concentrated Flow,	
Paved	Kv= 20.3 fps

Subcatchment 13S: PR-WS-B4



Proposed Conditions, B Soil - Revised 5-24-18 Type III 24-hr 2-yr Rainfall=3.20"
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Summary for Subcatchment 14S: PR-WS-B6

Runoff = 2.03 cfs @ 12.16 hrs, Volume= 0.177 af, Depth= 2.08"

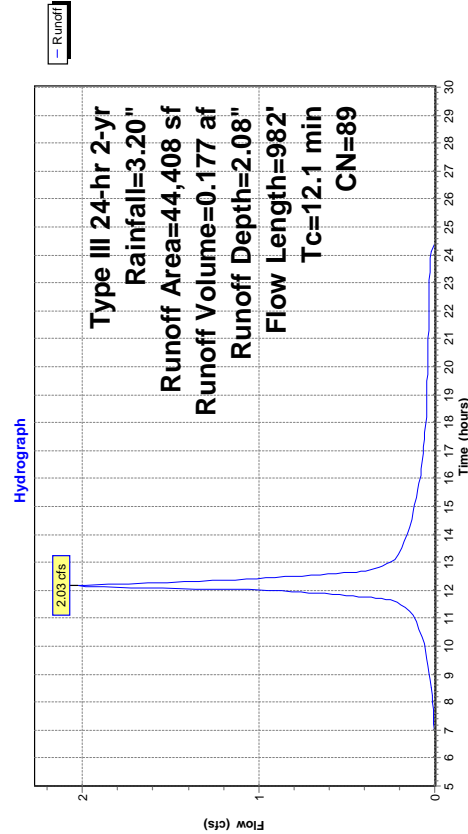
Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 2-yr Rainfall=3.20"

Area (sf)	CN	Description
8,907	61	>75% Grass cover, Good, HSG B
1,165	58	Woods/grass comb., Good, HSG B
545	61	>75% Grass cover, Good, HSG B
33,791	98	Paved roads w/curbs & sewers, HSG B
44,408	89	Weighted Average
10,617		23.91% Pervious Area
33,791		76.09% Impervious Area

Tc (min)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	24	0.0042	0.55	
11.4	958	0.0048	1.41	
12.1	982	Total		

Sheet Flow,	
Smooth surfaces	n= 0.011 P2= 3.20"
Shallow Concentrated Flow,	
Paved	Kv= 20.3 fps

Subcatchment 14S: PR-WS-B6



Summary for Pond 1P: Sediment Forebay

Inflow Area = 0.415 ac, 70.82% Impervious, Inflow Depth = 1.91" for 2-yr event
 Inflow = 1.12 cfs @ 12.00 hrs, Volume= 0.066 af
 Outflow = 1.10 cfs @ 12.01 hrs, Volume= 0.063 af, Atten= 2%, Lag= 0.4 min
 Primary = 1.10 cfs @ 12.01 hrs, Volume= 0.063 af

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Peak Elev= 96.19' @ 12.01 hrs Surf.Area= 170 sf Storage= 157 cf
 Plug-Flow detention time= 35.9 min calculated for 0.063 af (96% of inflow)
 Center-of-Mass det. time= 11.8 min (825.1 - 813.3)

Volume Invert Avail.Storage Storage Description
 #1 95.00' 295 cf Custom Stage Data (Prismatic) Listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
95.00	80	0	0
96.00	170	125	125
97.00	170	170	295

Device	Routing	Invert	Outlet Devices
#1	Primary	96.00'	5.0' long x 1.0' breadth Broad-Crested Rectangular Weir
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00
			2.50 3.00
			Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30
			3.31 3.32

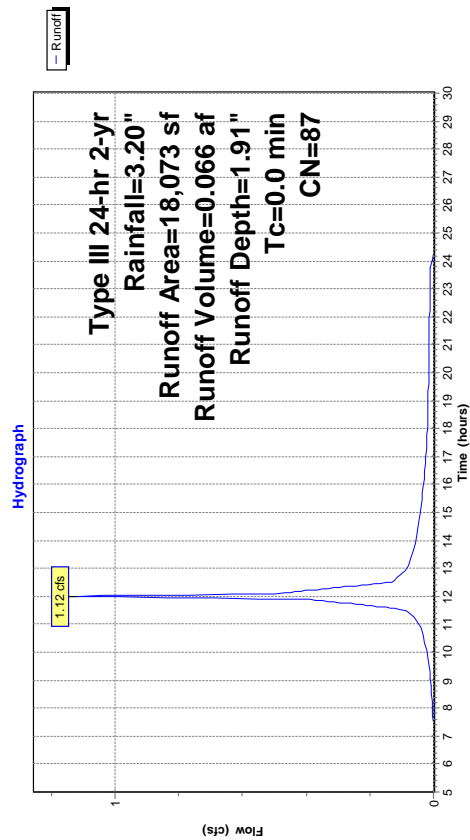
Primary OutFlow Max=1.08 cfs @ 12.01 hrs HW=96.19' (Free Discharge)
 1-Broad-Crested Rectangular Weir (Weir Controls 1.08 cfs @ 1.16 fps)

Summary for Subcatchment 15S: PR-WS-B5

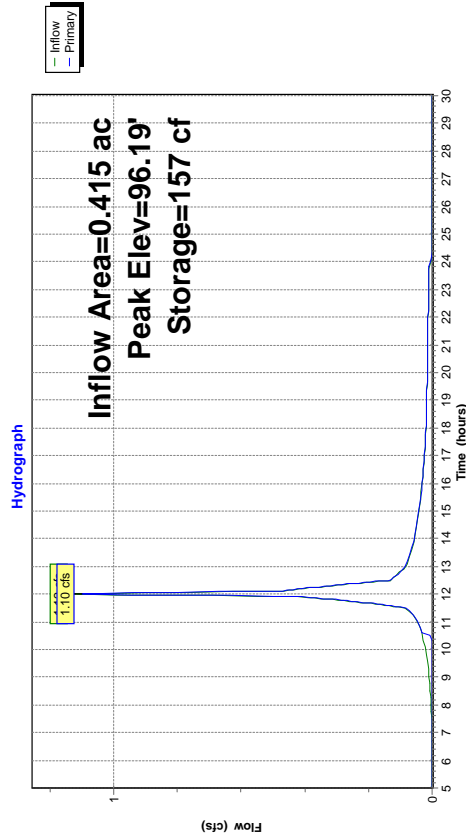
Runoff = 1.12 cfs @ 12.00 hrs, Volume= 0.066 af, Depth= 1.91"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 2-yr Rainfall=3.20"

Area (sf)	CN	Description
12,800	98	Paved roads w/curbs & sewers, HSG B
5,273	61	>75% Grass cover, Good, HSG B
18,073	87	Weighted Average
5,273		29.18% Pervious Area
12,800		70.82% Impervious Area

Subcatchment 15S: PR-WS-B5



Pond 1P: Sediment Forebay



Summary for Pond 3P: Infiltration Basin

Inflow Area = 0.415 ac, 70.82% Impervious, Inflow Depth = 1.83" for 2-yr event
 Inflow = 1.10 cfs @ 12.01 hrs, Volume= 0.063 af
 Outflow = 0.06 cfs @ 13.86 hrs, Volume= 0.021 af, Atten= 95%, Lag= 111.4 min
 Primary = 0.06 cfs @ 13.86 hrs, Volume= 0.021 af

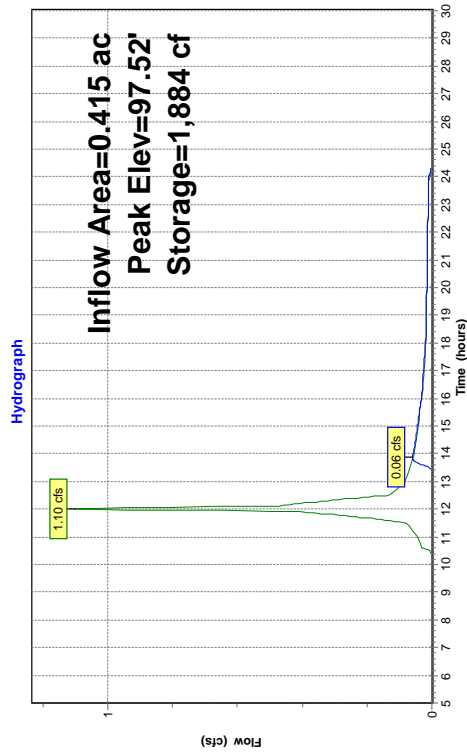
Routing by Stor-Ind method, Time Span= 5:00-30:00 hrs, dt= 0.02 hrs
 Peak Elev= 97.52' @ 13.86 hrs Surf.Area= 1,249 sf Storage= 1,884 cf
 Plug-Flow detention time= 332.2 min calculated for 0.021 af (33% of inflow)
 Center-of-Mass det. time= 211.4 min (1,036.5 - 825.1)

Volume	Invert	Avail.Storage	Storage	Description
#1	95.00'	2,476 cf	2,476 cf	Custom Stage Data (Prismatic) Listed below
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	
95.00	268	0	0	
96.00	596	432	432	
97.00	1,013	805	1,237	
98.00	1,465	1,239	2,476	

Device	Routing	Invert	Outlet Devices
#1	Primary	97.50'	5.0' long Sharp-Crested Rectangular Weir 2 End Contractions

Primary Outflow Max=0.06 cfs @ 13.86 hrs HW=97.52' (Free Discharge)
 1-Sharp-Crested Rectangular Weir (Weir Controls 0.06 cfs @ 0.49 fps)

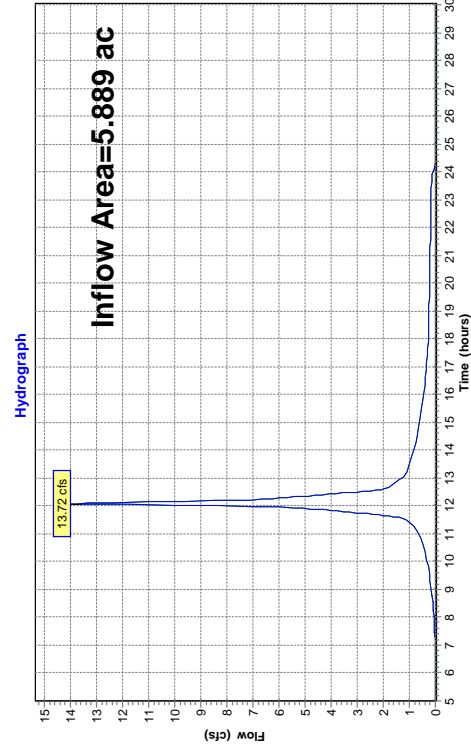
Pond 3P: Infiltration Basin



Summary for Link DPI: Western Segment

Inflow Area = 5.889 ac, 72.56% Impervious, Inflow Depth = 1.98" for 2-yr event
 Inflow = 13.72 cfs @ 12.08 hrs, Volume= 0.969 af
 Primary = 13.72 cfs @ 12.08 hrs, Volume= 0.969 af, Atten= 0%, Lag= 0.0 min
 Primary outflow = Inflow, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs

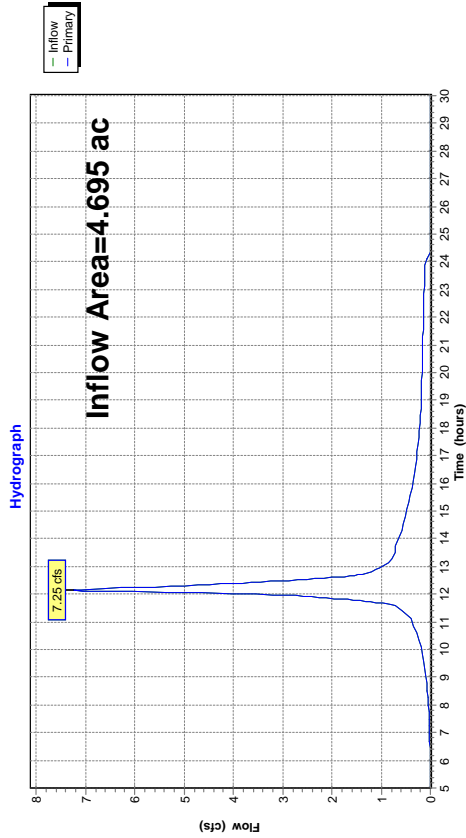
Link DPI: Western Segment



Summary for Link DP2: Eastern Segment - Wetlands North

Inflow Area = 4.695 ac, 66.54% Impervious, Inflow Depth > 1.71" for 2-yr event
 Inflow = 7.25 cfs @ 12.15 hrs, Volume= 0.668 af
 Primary = 7.25 cfs @ 12.15 hrs, Volume= 0.668 af, Atten= 0%, Lag= 0.0 min
 Primary outflow = Inflow, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs

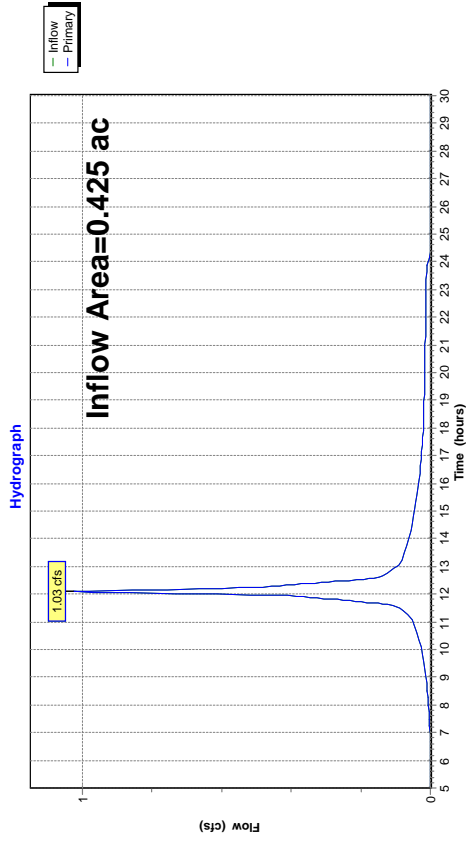
Link DP2: Eastern Segment - Wetlands North



Summary for Link DP3: Eastern Segment - Wetlands South

Inflow Area = 0.425 ac, 75.51% Impervious, Inflow Depth = 2.08" for 2-yr event
 Inflow = 1.03 cfs @ 12.09 hrs, Volume= 0.074 af
 Primary = 1.03 cfs @ 12.09 hrs, Volume= 0.074 af, Atten= 0%, Lag= 0.0 min
 Primary outflow = Inflow, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs

Link DP3: Eastern Segment - Wetlands South



Proposed Conditions, B Soil - Revised 5-24-18 Type III 24-hr 10-yr Rainfall=4.90"
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Summary for Subcatchment 1S: PR-WS-C2A

Runoff = 1.78 cfs @ 12.09 hrs, Volume= 0.130 af, Depth> 3.68"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, d= 0.02 hrs
 Type III 24-hr 10-yr Rainfall=4.90"

Area (sf)	CN	Description
3,670	61	>75% Grass cover, Good, HSG B
13,970	98	Paved roads w/curbs & sewers, HSG B
860	58	Woods/grass comb., Good, HSG B
18,500	89	Weighted Average
4,530		24.49% Pervious Area
13,970		75.51% Impervious Area

Tc (min)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0				Direct Entry, Increased to 6 min

Subcatchment 1S: PR-WS-C2A



Proposed Conditions, B Soil - Revised 5-24-18 Type III 24-hr 10-yr Rainfall=4.90"
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Summary for Subcatchment 3S: PR-WS-A1

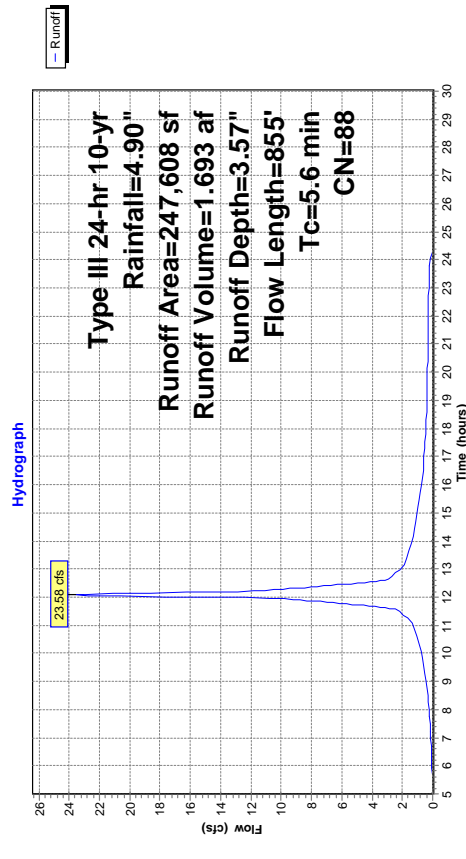
Runoff = 23.58 cfs @ 12.08 hrs, Volume= 1.693 af, Depth= 3.57"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, d= 0.02 hrs
 Type III 24-hr 10-yr Rainfall=4.90"

Area (sf)	CN	Description
14,875	61	>75% Grass cover, Good, HSG B
8,776	61	>75% Grass cover, Good, HSG B
59,116	72	1/3 acre lots, 30% imp, HSG B
164,841	98	Paved roads w/curbs & sewers, HSG B
247,608	88	Weighted Average
65,032		26.26% Pervious Area
182,576		73.74% Impervious Area

Tc (min)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	100	0.0200	1.38	Sheet Flow, Smooth surfaces n= 0.011 P2= 3.20"
4.4	755	0.0201	2.88	Shallow Concentrated Flow, Paved Kv= 20.3 fps
5.6	855	Total		

Subcatchment 3S: PR-WS-A1



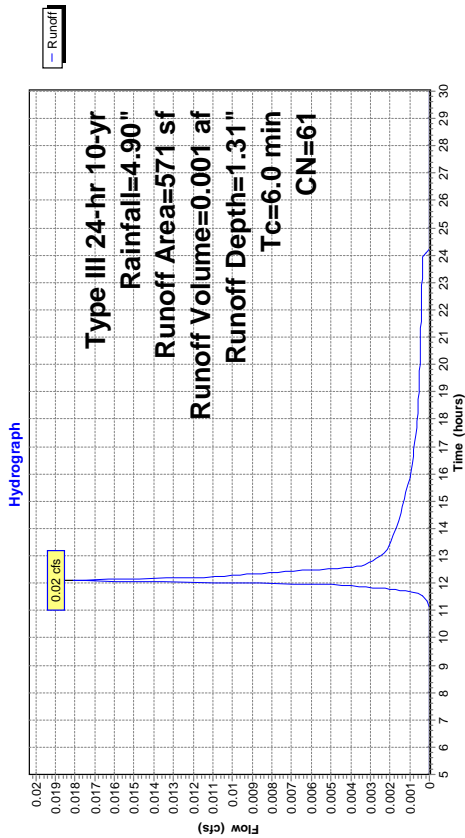
Summary for Subcatchment 5S: PR-WS-A3

Runoff = 0.02 cfs @ 12.10 hrs, Volume= 0.001 af, Depth= 1.31"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 10-yr Rainfall=4.90"

Area (sf)	CN	Description
571	61	>75% Grass cover, Good, HSG B
571		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Tc Minimum

Subcatchment 5S: PR-WS-A3



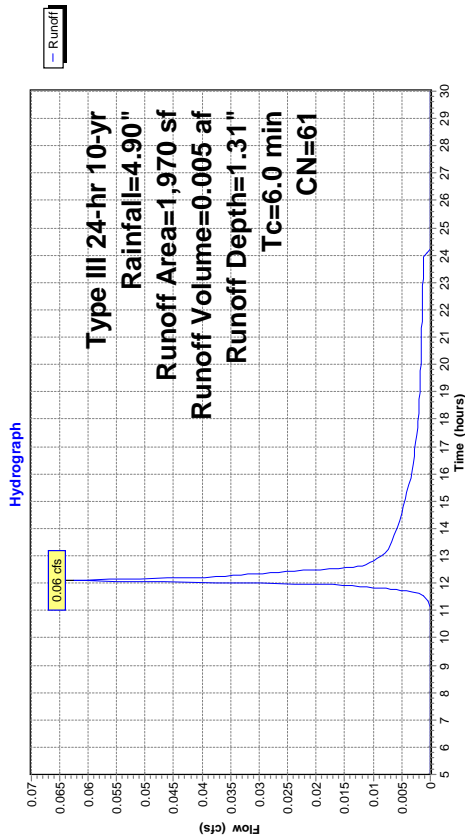
Summary for Subcatchment 4S: PR-WS-A2

Runoff = 0.06 cfs @ 12.10 hrs, Volume= 0.005 af, Depth= 1.31"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 10-yr Rainfall=4.90"

Area (sf)	CN	Description
1,647	61	>75% Grass cover, Good, HSG B
323	61	>75% Grass cover, Good, HSG B
1,970	61	Weighted Average
1,970		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Tc Minimum

Subcatchment 4S: PR-WS-A2



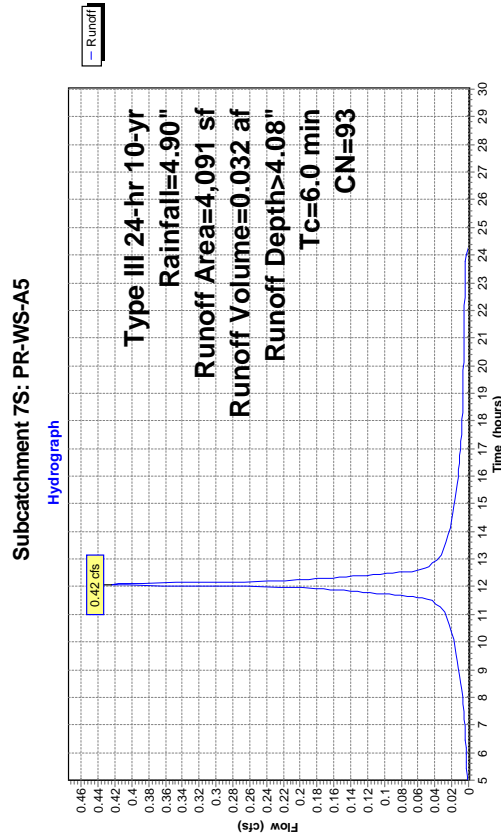
Proposed Conditions B Soil - Revised 5-24-18 Type III 24-hr 10-yr Rainfall=4.90"
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Summary for Subcatchment 7S: PR-WS-A5

Runoff = 0.42 cfs @ 12.08 hrs, Volume= 0.032 af, Depth> 4.08"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 10-yr Rainfall=4.90"

Area (sf)	CN	Description
556	61	>75% Grass cover, Good, HSG B
3,535	98	Paved roads w/curbs & sewers, HSG B
4,091	93	Weighted Average
556		13.59% Pervious Area
3,535		86.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Tc Minimum



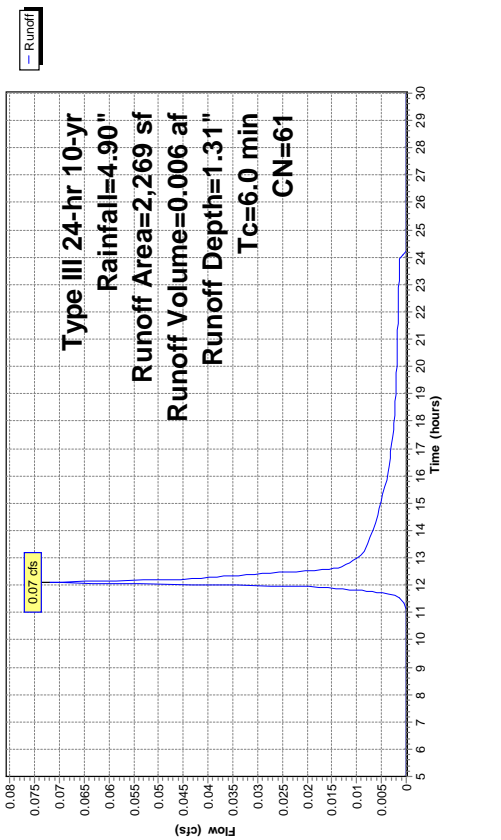
Proposed Conditions B Soil - Revised 5-24-18 Type III 24-hr 10-yr Rainfall=4.90"
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Summary for Subcatchment 6S: PR-WS-A4

Runoff = 0.07 cfs @ 12.10 hrs, Volume= 0.006 af, Depth= 1.31"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 10-yr Rainfall=4.90"

Area (sf)	CN	Description
2,269	61	>75% Grass cover, Good, HSG B
2,269		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Tc Minimum



Proposed Conditions, B Soil - Revised 5-24-18 Type III 24-hr 10-yr Rainfall=4.90"
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Summary for Subcatchment 8S: PR-WS-B1

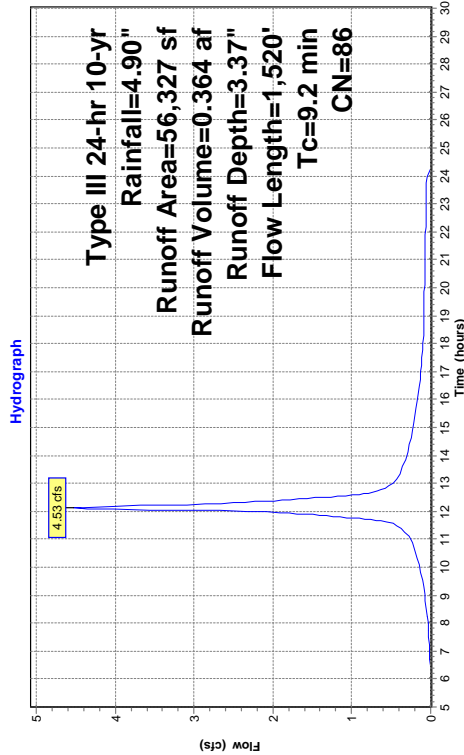
Runoff = 4.53 cfs @ 12.13 hrs, Volume= 0.364 af, Depth= 3.37"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 10-yr Rainfall=4.90"

Area (sf)	CN	Description
13,861	61	>75% Grass cover, Good, HSG B
2,593	58	Woods/grass comb., Good, HSG B
1,276	61	>75% Grass cover, Good, HSG B
38,597	98	Paved roads w/curbs & sewers, HSG B
56,327	86	Weighted Average
17,730		31.48% Pervious Area
38,597		68.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	28	0.0107	0.83		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.20"
8.6	1,492	0.0204	2.90		Shallow Concentrated Flow, Paved Kv= 20.3 fps
9.2	1,520	Total			

Subcatchment 8S: PR-WS-B1



Proposed Conditions, B Soil - Revised 5-24-18 Type III 24-hr 10-yr Rainfall=4.90"
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Summary for Subcatchment 9S: PR-WS-B2

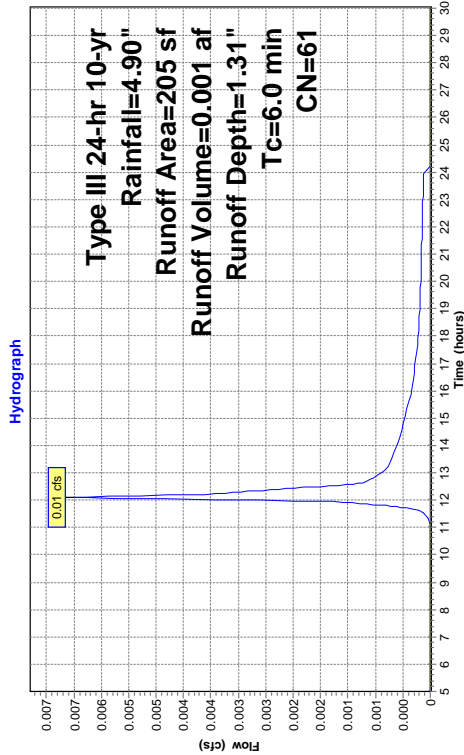
Runoff = 0.01 cfs @ 12.10 hrs, Volume= 0.001 af, Depth= 1.31"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 10-yr Rainfall=4.90"

Area (sf)	CN	Description
205	61	>75% Grass cover, Good, HSG B
205		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Tc Minimum

Subcatchment 9S: PR-WS-B2



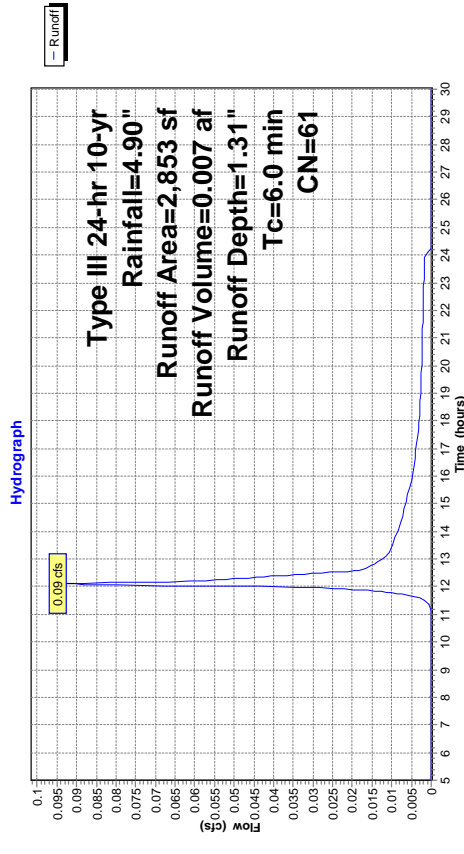
Proposed Conditions_B Soil - Revised 5-24-18 Type III 24-hr 10-yr Rainfall=4.90"
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Summary for Subcatchment 10S: PR-WS-B3

Runoff = 0.09 cfs @ 12:10 hrs, Volume= 0.007 af, Depth= 1.31"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, d= 0.02 hrs
 Type III 24-hr 10-yr Rainfall=4.90"

Area (sf)	CN	Description		
2,853	61	>75% Grass cover, Good, HSG B		
2,853		100.00% Pervious Area		
Tc (min)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0				Direct Entry, Tc Minimum

Subcatchment 10S: PR-WS-B3



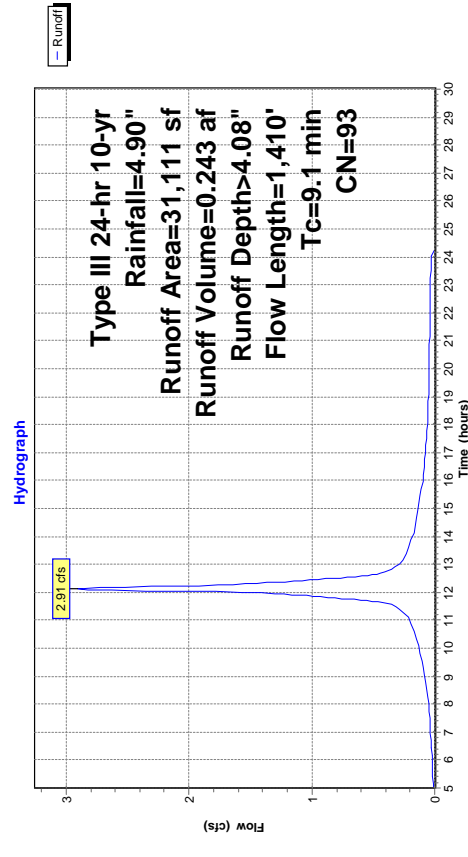
Proposed Conditions_B Soil - Revised 5-24-18 Type III 24-hr 10-yr Rainfall=4.90"
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Summary for Subcatchment 11S: PR-WS-C2

Runoff = 2.91 cfs @ 12:12 hrs, Volume= 0.243 af, Depth> 4.08"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, d= 0.02 hrs
 Type III 24-hr 10-yr Rainfall=4.90"

Area (sf)	CN	Description		
4,466	61	>75% Grass cover, Good, HSG B		
26,645	98	Paved roads w/curbs & sewers, HSG B		
31,111	93	Weighted Average		
4,466		14.36% Pervious Area		
26,645		85.64% Impervious Area		
Tc (min)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	100	0.0740	2.32	Sheet Flow, Smooth surfaces n= 0.011 P2= 3.20"
8.4	1,310	0.0165	2.61	Shallow Concentrated Flow, Paved Kv= 20.3 fps
9.1	1,410	Total		

Subcatchment 11S: PR-WS-C2



Proposed Conditions, B Soil - Revised 5-24-18 Type III 24-hr 10-yr Rainfall=4.90"
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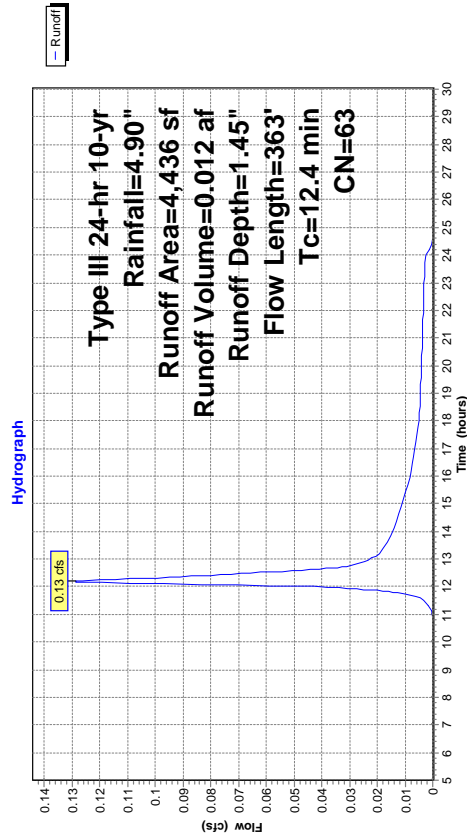
Summary for Subcatchment 12S: PR-WS-C1

Runoff = 0.13 cfs @ 12.19 hrs, Volume= 0.012 af, Depth= 1.45"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 10-yr Rainfall=4.90"

Area (sf)	CN	Description
3,779	61	>75% Grass cover, Good, HSG B
450	61	>75% Grass cover, Good, HSG B
207	98	Paved roads w/curbs & sewers, HSG B
4,436	63	Weighted Average
4,229		95.33% Pervious Area
207		4.67% Impervious Area

Tc (min)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.0	68	0.0294	0.13	Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
0.1	27	0.0740	5.52	Shallow Concentrated Flow, Paved Kv= 20.3 fps
1.5	147	0.0540	1.63	Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.8	121	0.0248	1.10	Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
12.4	363	Total		

Subcatchment 12S: PR-WS-C1



Proposed Conditions, B Soil - Revised 5-24-18 Type III 24-hr 10-yr Rainfall=4.90"
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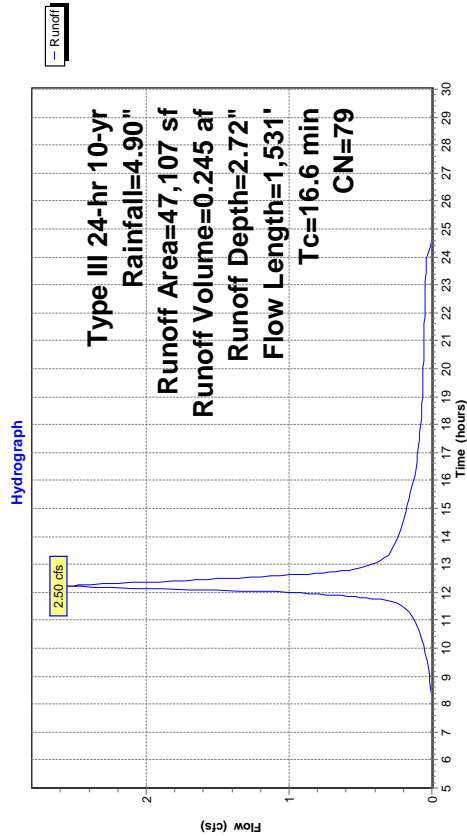
Summary for Subcatchment 13S: PR-WS-B4

Runoff = 2.50 cfs @ 12.23 hrs, Volume= 0.245 af, Depth= 2.72"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 10-yr Rainfall=4.90"

Area (sf)	CN	Description
9,416	61	>75% Grass cover, Good, HSG B
13,651	58	Woods/grass comb., Good, HSG B
24,040	98	Paved roads w/curbs & sewers, HSG B
47,107	79	Weighted Average
23,067		48.97% Pervious Area
24,040		51.03% Impervious Area

Tc (min)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	24	0.0170	0.97	Sheet Flow, Smooth surfaces n= 0.011 P2= 3.20"
16.2	1,507	0.0058	1.55	Shallow Concentrated Flow, Paved Kv= 20.3 fps
16.6	1,531	Total		

Subcatchment 13S: PR-WS-B4



Proposed Conditions, B Soil - Revised 5-24-18 Type III 24-hr 10-yr Rainfall=4.90"
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Summary for Subcatchment 14S: PR-WS-B6

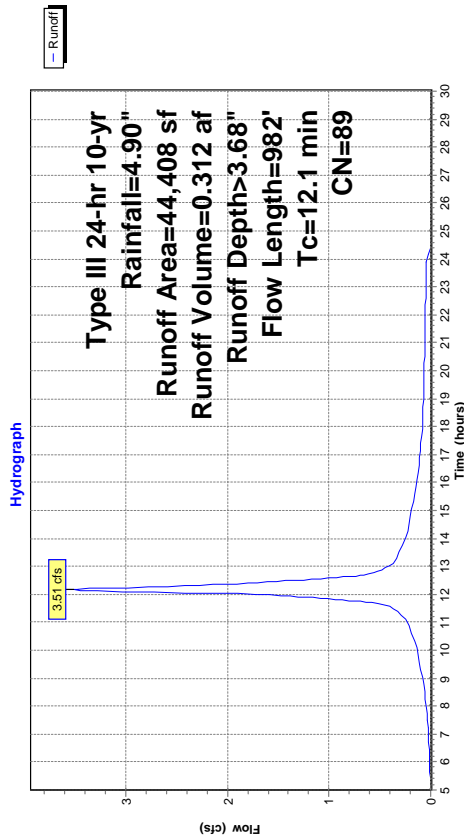
Runoff = 3.51 cfs @ 12.16 hrs, Volume= 0.312 af, Depth> 3.68"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 10-yr Rainfall=4.90"

Area (sf)	CN	Description
8,907	61	>75% Grass cover, Good, HSG B
1,165	58	Woods/grass comb., Good, HSG B
545	61	>75% Grass cover, Good, HSG B
33,791	98	Paved roads w/curbs & sewers, HSG B
44,408	89	Weighted Average
10,617		23.91% Pervious Area
33,791		76.09% Impervious Area

Tc (min)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	24	0.0042	0.55	Sheet Flow, Smooth surfaces n= 0.011 P2= 3.20"
11.4	958	0.0048	1.41	Shallow Concentrated Flow, Paved Kv= 20.3 fps
12.1	982	Total		

Subcatchment 14S: PR-WS-B6



Proposed Conditions, B Soil - Revised 5-24-18 Type III 24-hr 10-yr Rainfall=4.90"
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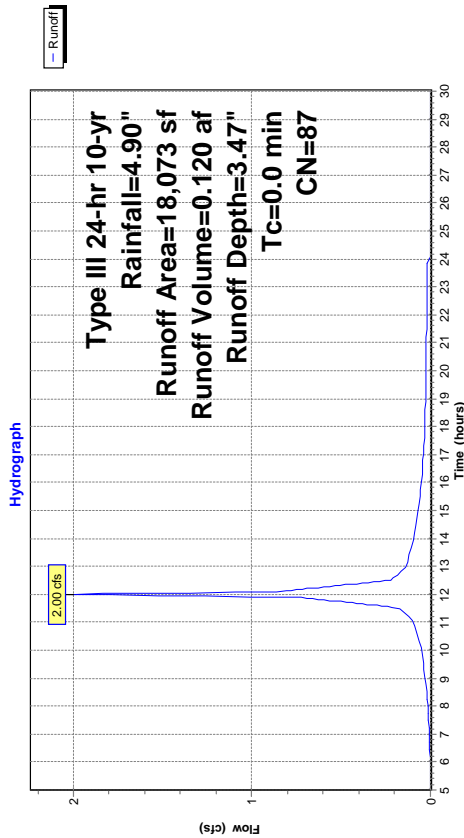
Summary for Subcatchment 15S: PR-WS-B5

Runoff = 2.00 cfs @ 12.00 hrs, Volume= 0.120 af, Depth= 3.47"

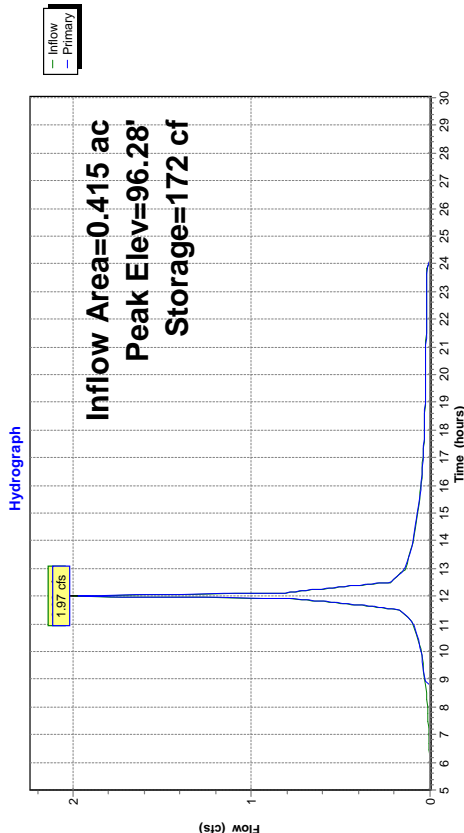
Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 10-yr Rainfall=4.90"

Area (sf)	CN	Description
12,800	98	Paved roads w/curbs & sewers, HSG B
5,273	61	>75% Grass cover, Good, HSG B
18,073	87	Weighted Average
5,273		29.18% Pervious Area
12,800		70.82% Impervious Area

Subcatchment 15S: PR-WS-B5



Pond 1P: Sediment Forebay



Summary for Pond 1P: Sediment Forebay

Inflow Area = 0.415 ac, 70.82% impervious, Inflow Depth = 3.47" for 10-yr event
 Inflow = 2.00 cfs @ 12.00 hrs, Volume= 0.120 af
 Outflow = 1.97 cfs @ 12.01 hrs, Volume= 0.117 af, Atten= 1%, Lag= 0.3 min
 Primary = 1.97 cfs @ 12.01 hrs, Volume= 0.117 af

Routing by Stor-Ind method, Time Span= 5:00-30:00 hrs, dt= 0.02 hrs
 Peak Elev= 96.28' @ 12.01 hrs Surf.Area= 170 sf Storage= 172 cf

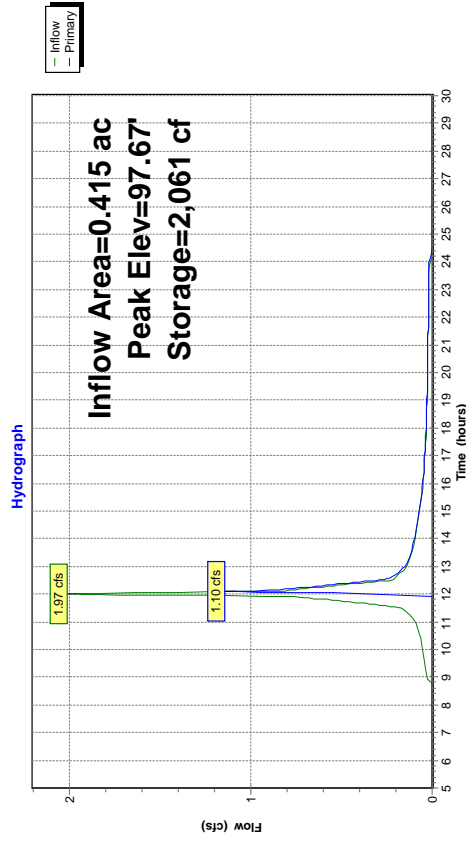
Plug-Flow detention time= 23.0 min calculated for 0.117 af (98% of inflow)
 Center-of-Mass det. time= 8.8 min (805.2 - 796.4)

Volume	Invert	Avail.Storage	Storage Description
#1	95.00'	295 cf	Custom Stage Data (Prismatic) Listed below
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
95.00	80	0	0
96.00	170	125	125
97.00	170	170	295

Device	Routing	Invert	Outlet Devices
#1	Primary	96.00'	5.0' long x 1.0' breadth Broad-Crested Rectangular Weir
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00
			2.50 3.00
			Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30
			3.31 3.32

Primary Outflow Max=1.94 cfs @ 12.01 hrs HW=96.27' (Free Discharge)
 1.94 cfs @ 12.01 hrs HW=96.27' (Weir Controls 1.94 cfs @ 1.41 fps)

Pond 3P: Infiltration Basin



Summary for Pond 3P: Infiltration Basin

Inflow Area = 0.415 ac, 70.82% Impervious, Inflow Depth = 3.39" for 10-yr event
 Inflow = 1.97 cfs @ 12.01 hrs, Volume= 0.117 af
 Outflow = 1.10 cfs @ 12.09 hrs, Volume= 0.075 af, Atten= 44%, Lag= 4.9 min
 Primary = 1.10 cfs @ 12.09 hrs, Volume= 0.075 af

Routing by Stor-Ind method, Time Span= 5:00-30:00 hrs, dt= 0.02 hrs
 Peak Elev= 97.67' @ 12.09 hrs Surf.Area= 1,314 sf Storage= 2,061 cf
 Plug-Flow detention time= 173.8 min calculated for 0.075 af (64% of inflow)
 Center-of-Mass det. time= 74.8 min (880.0 - 805.2)

Volume	Invert	Avail.Storage	Storage Description
#1	95.00'	2,476 cf	Custom Stage Data (Prismatic) Listed below
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
95.00	268	0	0
96.00	596	432	432
97.00	1,013	805	1,237
98.00	1,465	1,239	2,476

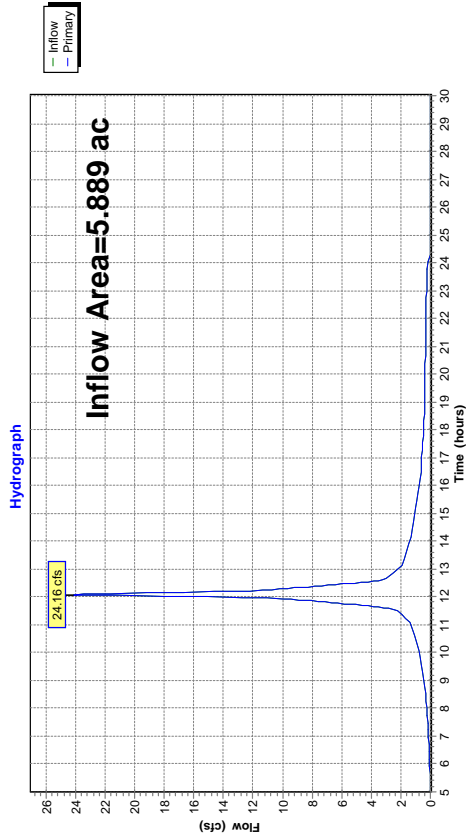
Device	Routing	Invert	Outlet Devices
#1	Primary	97.50'	5.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

Primary OutFlow Max=1.08 cfs @ 12.09 hrs HW=97.66' (Free Discharge)
 ↳ **1-Sharp-Crested Rectangular Weir** (Weir Controls 1.08 cfs @ 1.32 fps)

Summary for Link DP1: Western Segment

Inflow Area = 5.889 ac, 72.56% Impervious, Inflow Depth > 3.54" for 10-yr event
 Inflow = 24.16 cfs @ 12.08 hrs, Volume= 1.737 af
 Primary = 24.16 cfs @ 12.08 hrs, Volume= 1.737 af, Atten= 0%, Lag= 0.0 min
 Primary outflow = Inflow, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs

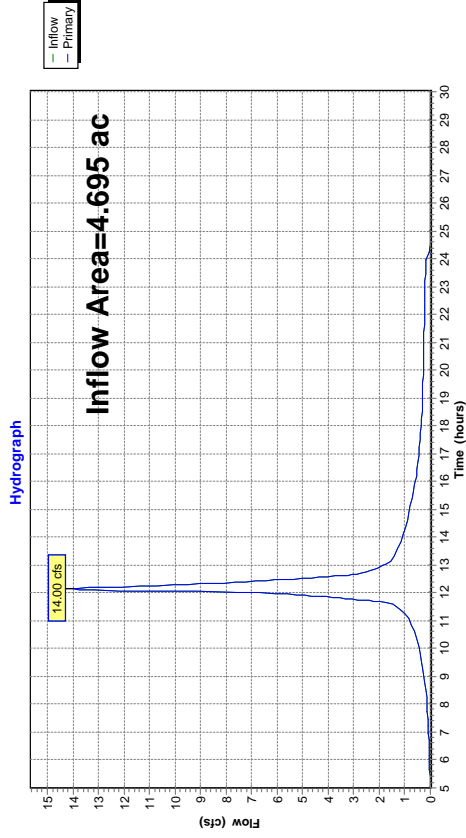
Link DP1: Western Segment



Summary for Link DP2: Eastern Segment - Wetlands North

Inflow Area = 4.695 ac, 66.54% Impervious, Inflow Depth > 3.22" for 10-yr event
 Inflow = 14.00 cfs @ 12.14 hrs, Volume= 1.258 af
 Primary = 14.00 cfs @ 12.14 hrs, Volume= 1.258 af, Atten= 0%, Lag= 0.0 min
 Primary outflow = Inflow, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs

Link DP2: Eastern Segment - Wetlands North



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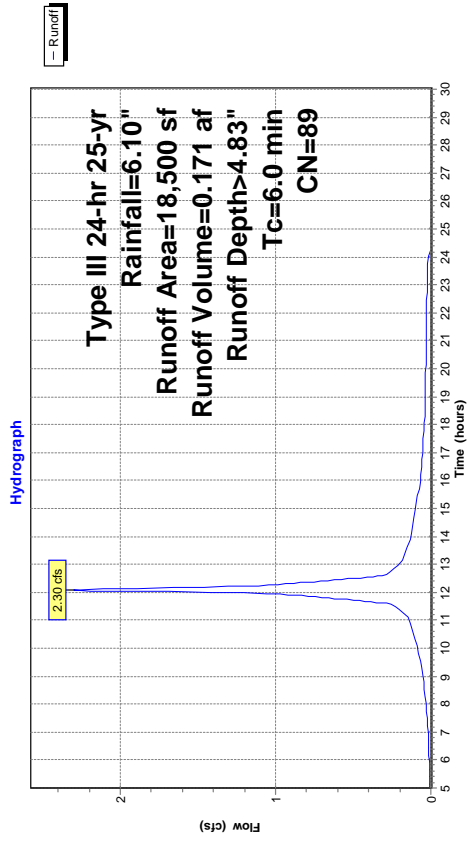
Summary for Subcatchment 1S: PR-WS-C2A

Runoff = 2.30 cfs @ 12.08 hrs, Volume= 0.171 af, Depth> 4.83"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 25-yr Rainfall=6.10"

Area (sf)	CN	Description
3,670	61	>75% Grass cover, Good, HSG B
13,970	98	Paved roads w/curbs & sewers, HSG B
860	58	Woods/grass comb., Good, HSG B
18,500	89	Weighted Average
4,530		24.49% Pervious Area
13,970		75.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Increased to 6 min

Subcatchment 1S: PR-WS-C2A

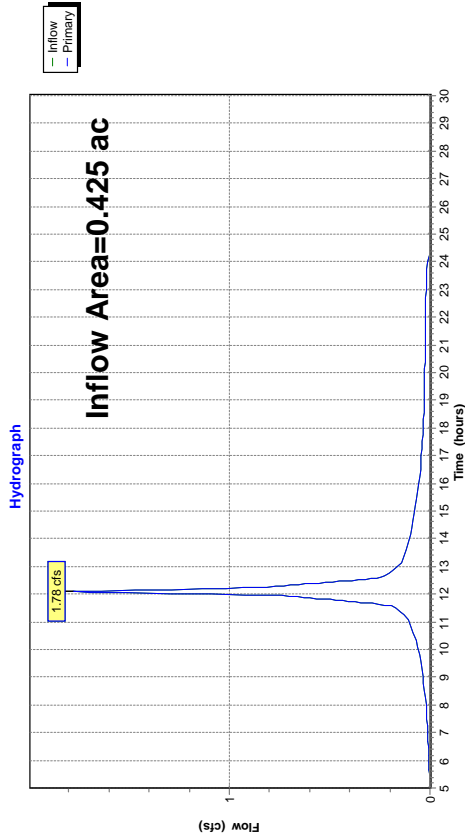


Proposed Conditions_B Soil - Revised 5-24-18 Type III 24-hr 10-yr Rainfall=4.90"
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Summary for Link DP3: Eastern Segment - Wetlands South

Inflow Area = 0.425 ac, 75.51% Impervious, Inflow Depth > 3.68" for 10-yr event
 Inflow = 1.78 cfs @ 12.09 hrs, Volume= 0.130 af
 Primary = 1.78 cfs @ 12.09 hrs, Volume= 0.130 af, Atten= 0%, Lag= 0.0 min
 Primary outflow = Inflow, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs

Link DP3: Eastern Segment - Wetlands South



Proposed Conditions, B Soil - Revised 5-24-18 Type III 24-hr 25-yr Rainfall=6.10"
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Summary for Subcatchment 3S: PR-WS-A1

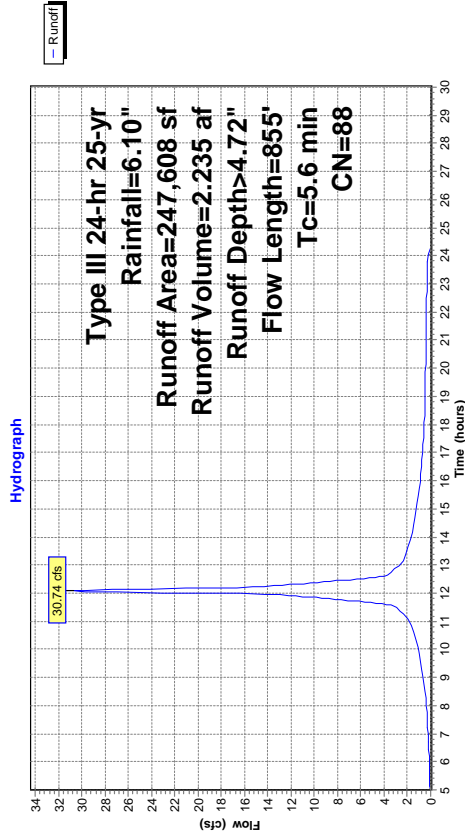
Runoff = 30.74 cfs @ 12.08 hrs, Volume= 2.235 af, Depth> 4.72"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 25-yr Rainfall=6.10"

Area (sf)	CN	Description
14,875	61	>75% Grass cover, Good, HSG B
8,776	61	>75% Grass cover, Good, HSG B
59,116	72	1/3 acre lots, 30% imp, HSG B
164,841	98	Paved roads w/curbs & sewers, HSG B
247,608	88	Weighted Average
65,032		26.26% Pervious Area
182,576		73.74% Impervious Area

Tc (min)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	100	0.0200	1.38	Sheet Flow, Smooth surfaces n= 0.011 P2= 3.20"
4.4	755	0.0201	2.88	Shallow Concentrated Flow, Paved Kv= 20.3 fps
5.6	855	Total		

Subcatchment 3S: PR-WS-A1



Proposed Conditions, B Soil - Revised 5-24-18 Type III 24-hr 25-yr Rainfall=6.10"
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Summary for Subcatchment 4S: PR-WS-A2

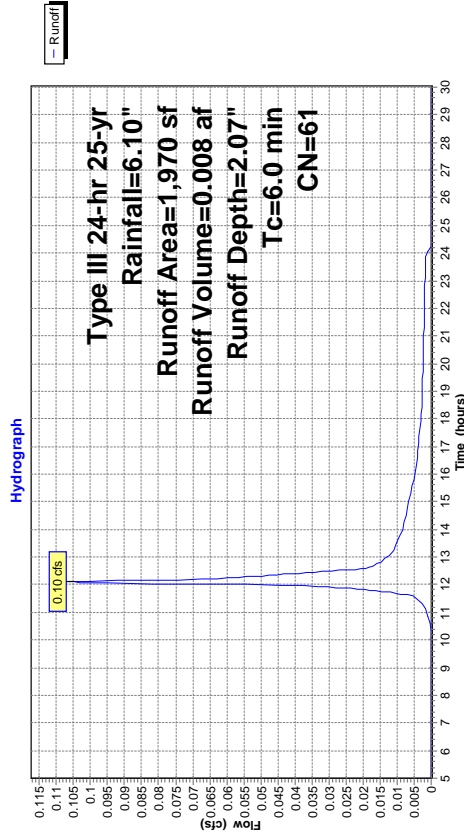
Runoff = 0.10 cfs @ 12.10 hrs, Volume= 0.008 af, Depth= 2.07"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 25-yr Rainfall=6.10"

Area (sf)	CN	Description
1,647	61	>75% Grass cover, Good, HSG B
323	61	>75% Grass cover, Good, HSG B
1,970	61	Weighted Average
1,970		100.00% Pervious Area

Tc (min)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0				Direct Entry, Tc Minimum

Subcatchment 4S: PR-WS-A2



Proposed Conditions B Soil - Revised 5-24-18 Type III 24-hr 25-yr Rainfall=6.10"
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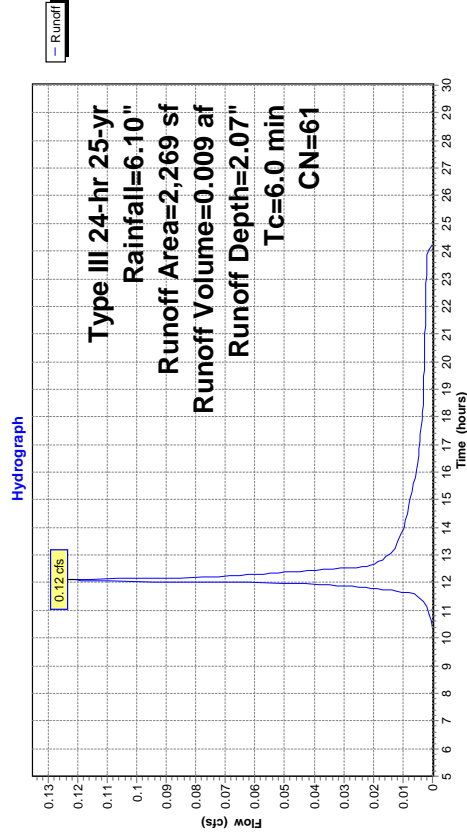
Summary for Subcatchment 6S: PR-WS-A4

Runoff = 0.12 cfs @ 12.10 hrs, Volume= 0.009 af, Depth= 2.07"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 25-yr Rainfall=6.10"

Area (sf)	CN	Description
2,269	61	>75% Grass cover, Good, HSG B
2,269		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Tc Minimum

Subcatchment 6S: PR-WS-A4



Proposed Conditions B Soil - Revised 5-24-18 Type III 24-hr 25-yr Rainfall=6.10"
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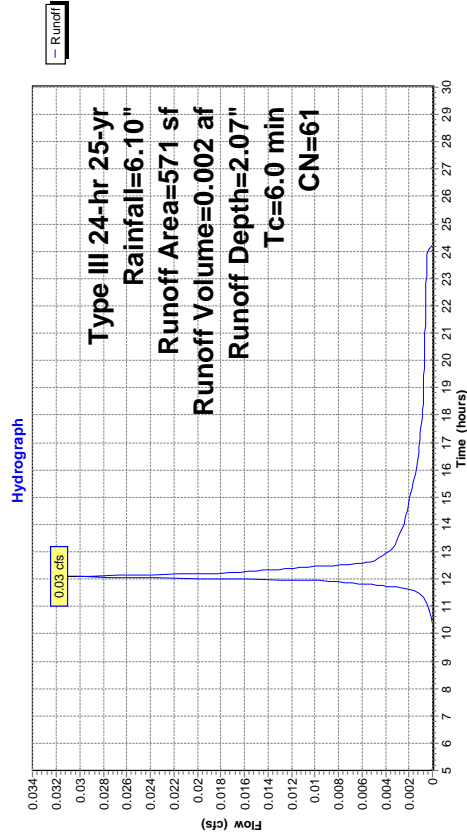
Summary for Subcatchment 5S: PR-WS-A3

Runoff = 0.03 cfs @ 12.10 hrs, Volume= 0.002 af, Depth= 2.07"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 25-yr Rainfall=6.10"

Area (sf)	CN	Description
571	61	>75% Grass cover, Good, HSG B
571		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Tc Minimum

Subcatchment 5S: PR-WS-A3



Proposed Conditions, B Soil - Revised 5-24-18 Type III 24-hr 25-yr Rainfall=6.10"
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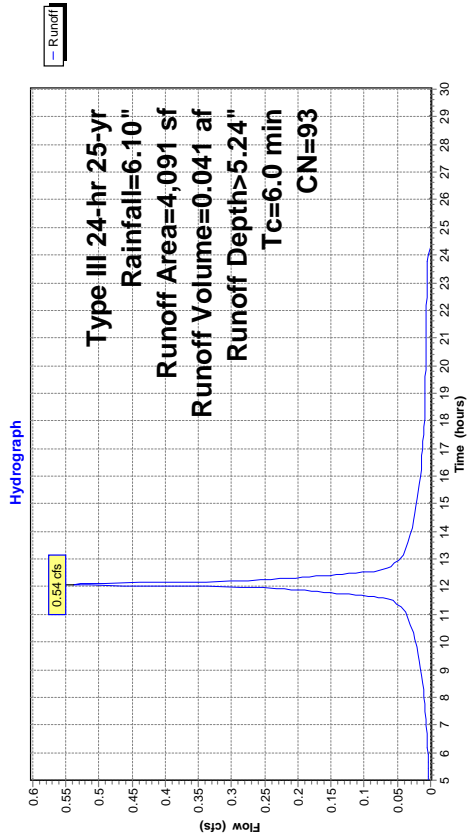
Summary for Subcatchment 7S: PR-WS-A5

Runoff = 0.54 cfs @ 12.08 hrs, Volume= 0.041 af, Depth> 5.24"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 25-yr Rainfall=6.10"

Area (sf)	CN	Description
556	61	>75% Grass cover, Good, HSG B
3,535	98	Paved roads w/curbs & sewers, HSG B
4,091	93	Weighted Average
556		13.59% Pervious Area
3,535		86.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Tc Minimum

Subcatchment 7S: PR-WS-A5



Proposed Conditions, B Soil - Revised 5-24-18 Type III 24-hr 25-yr Rainfall=6.10"
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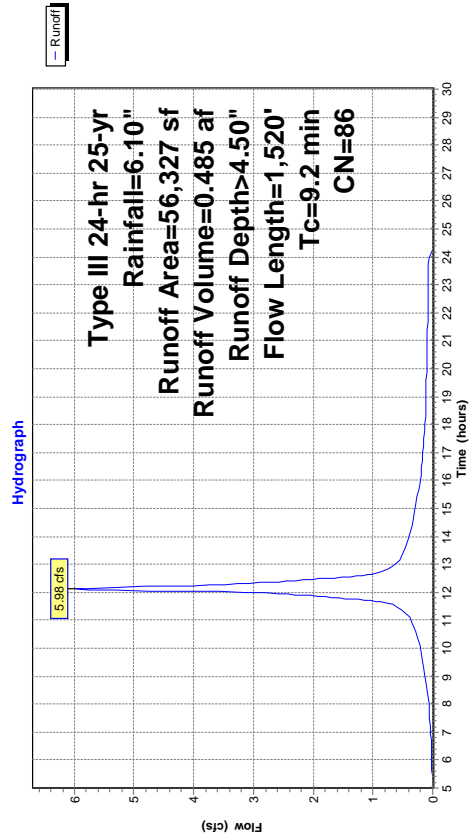
Summary for Subcatchment 8S: PR-WS-B1

Runoff = 5.98 cfs @ 12.13 hrs, Volume= 0.485 af, Depth> 4.50"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 25-yr Rainfall=6.10"

Area (sf)	CN	Description
13,861	61	>75% Grass cover, Good, HSG B
2,593	58	Woods/grass comb., Good, HSG B
1,276	61	>75% Grass cover, Good, HSG B
38,597	98	Paved roads w/curbs & sewers, HSG B
56,327	86	Weighted Average
17,730		31.48% Pervious Area
38,597		68.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	28	0.0107	0.83		Sheet Flow, Smooth surfaces n=0.011 P2= 3.20"
8.6	1,492	0.0204	2.90		Shallow Concentrated Flow, Paved Kv= 20.3 fps
9.2	1,520	Total			

Subcatchment 8S: PR-WS-B1



Proposed Conditions B Soil - Revised 5-24-18 Type III 24-hr 25-yr Rainfall=6.10"
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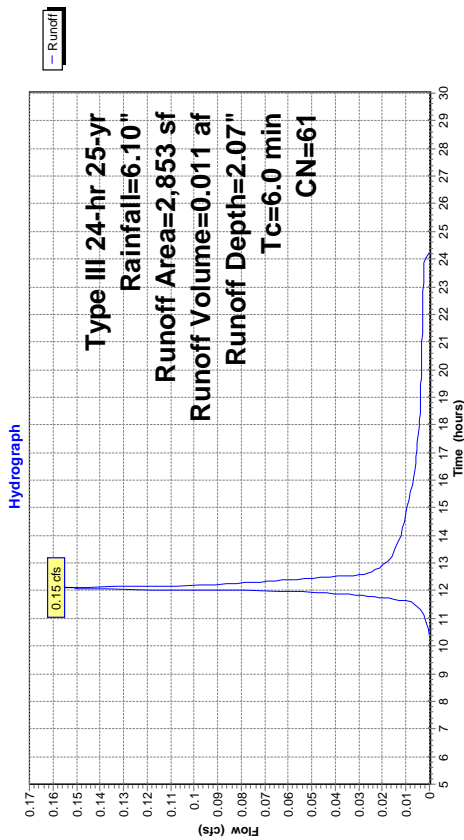
Summary for Subcatchment 10S: PR-WS-B3

Runoff = 0.15 cfs @ 12.10 hrs, Volume= 0.011 af, Depth= 2.07"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 25-yr Rainfall=6.10"

Area (sf)	CN	Description
2,853	61	>75% Grass cover, Good, HSG B
2,853		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Tc Minimum

Subcatchment 10S: PR-WS-B3



Proposed Conditions B Soil - Revised 5-24-18 Type III 24-hr 25-yr Rainfall=6.10"
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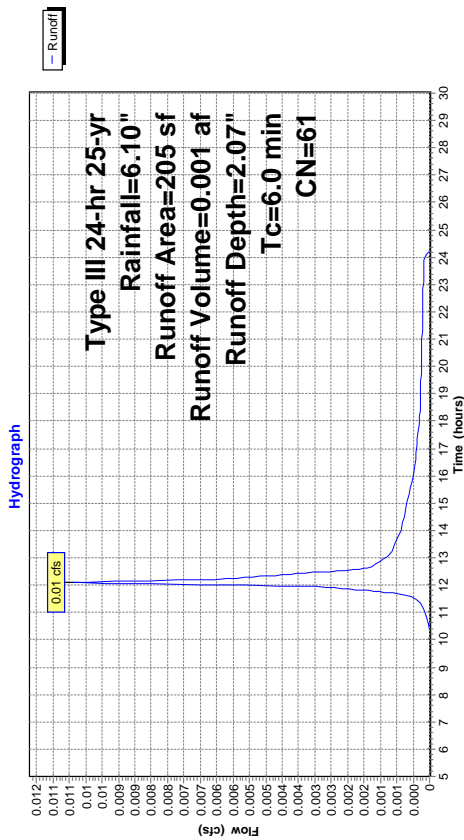
Summary for Subcatchment 9S: PR-WS-B2

Runoff = 0.01 cfs @ 12.10 hrs, Volume= 0.001 af, Depth= 2.07"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 25-yr Rainfall=6.10"

Area (sf)	CN	Description
205	61	>75% Grass cover, Good, HSG B
205		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Tc Minimum

Subcatchment 9S: PR-WS-B2



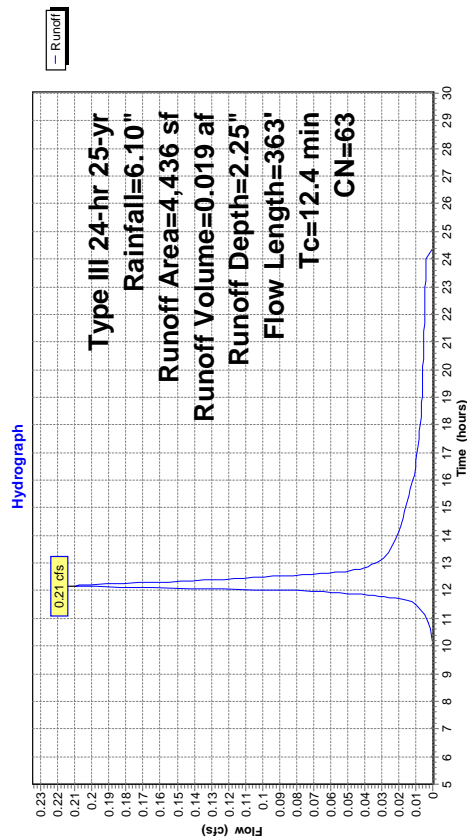
Summary for Subcatchment 12S: PR-WS-C1

Runoff = 0.21 cfs @ 12.18 hrs, Volume= 0.019 af, Depth= 2.25"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 25-yr Rainfall=6.10"

Area (sf)	CN	Description
3,779	61	>75% Grass cover, Good, HSG B
450	61	>75% Grass cover, Good, HSG B
207	98	Paved roads w/curbs & sewers, HSG B
4,436	63	Weighted Average
4,229		95.33% Pervious Area
207		4.67% Impervious Area

Tc (min)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.0	68	0.0294	0.13	Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
0.1	27	0.0740	5.52	Shallow Concentrated Flow, Paved KV= 20.3 fps
1.5	147	0.0540	1.63	Shallow Concentrated Flow, Short Grass Pasture KV= 7.0 fps
1.8	121	0.0248	1.10	Shallow Concentrated Flow, Short Grass Pasture KV= 7.0 fps
12.4	363	Total		

Subcatchment 12S: PR-WS-C1



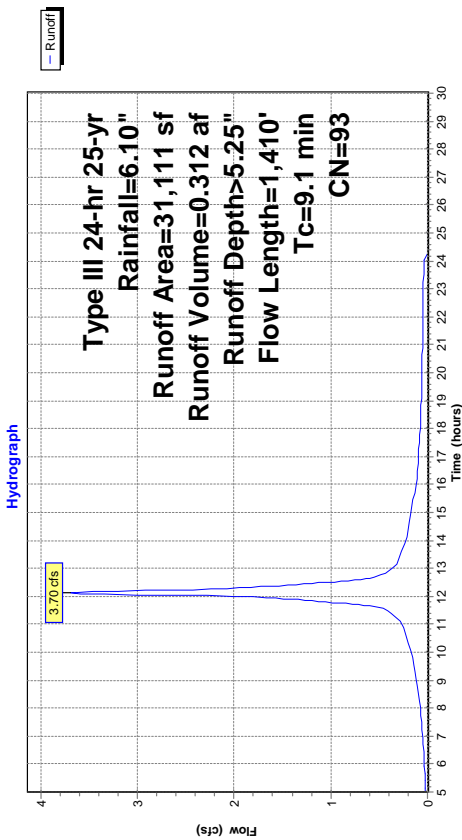
Summary for Subcatchment 11S: PR-WS-C2

Runoff = 3.70 cfs @ 12.12 hrs, Volume= 0.312 af, Depth> 5.25"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 25-yr Rainfall=6.10"

Area (sf)	CN	Description
4,466	61	>75% Grass cover, Good, HSG B
26,645	98	Paved roads w/curbs & sewers, HSG B
31,111	93	Weighted Average
4,466		14.36% Pervious Area
26,645		85.64% Impervious Area

Tc (min)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	100	0.0740	2.32	Sheet Flow, Smooth surfaces n= 0.011 P2= 3.20"
8.4	1,310	0.0165	2.61	Shallow Concentrated Flow, Paved KV= 20.3 fps
9.1	1,410	Total		

Subcatchment 11S: PR-WS-C2



Proposed Conditions, B Soil - Revised 5-24-18 Type III 24-hr 25-yr Rainfall=6.10"
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Summary for Subcatchment 13S: PR-WS-B4

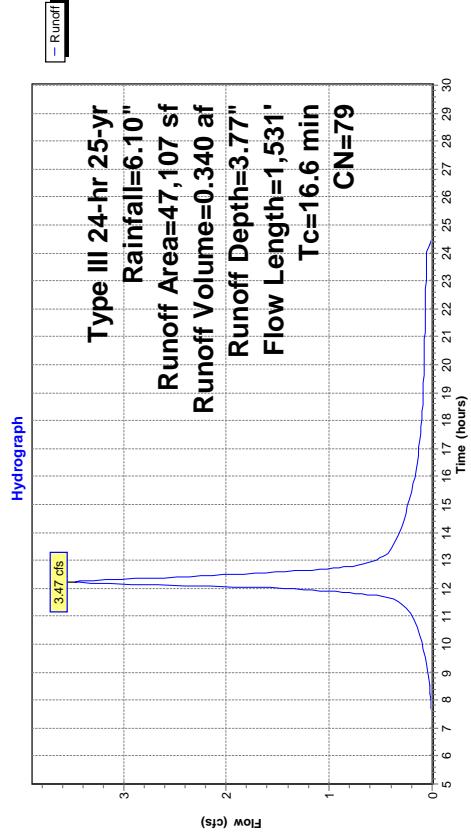
Runoff = 3.47 cfs @ 12.23 hrs, Volume= 0.340 af, Depth= 3.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 25-yr Rainfall=6.10"

Area (sf)	CN	Description
9,416	61	>75% Grass cover, Good, HSG B
13,651	58	Woods/grass comb., Good, HSG B
24,040	98	Paved roads w/curbs & sewers, HSG B
47,107	79	Weighted Average
23,067		48.97% Pervious Area
24,040		51.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	24	0.0170	0.97		
Sheet Flow, Smooth surfaces n= 0.011 P2= 3.20"					
16.2	1,507	0.0058	1.55		Shallow Concentrated Flow, Paved Kv= 20.3 fps
16.6	1,531	Total			

Subcatchment 13S: PR-WS-B4



Proposed Conditions, B Soil - Revised 5-24-18 Type III 24-hr 25-yr Rainfall=6.10"
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Summary for Subcatchment 14S: PR-WS-B6

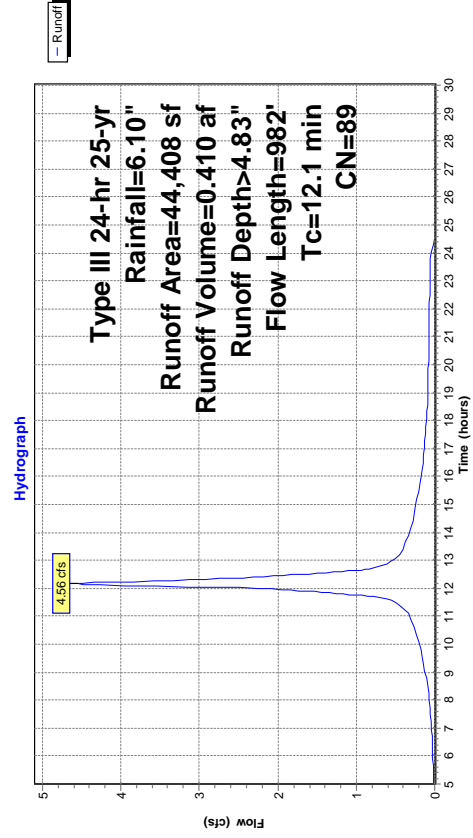
Runoff = 4.56 cfs @ 12.16 hrs, Volume= 0.410 af, Depth> 4.83"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 25-yr Rainfall=6.10"

Area (sf)	CN	Description
8,907	61	>75% Grass cover, Good, HSG B
1,165	58	Woods/grass comb., Good, HSG B
545	61	>75% Grass cover, Good, HSG B
33,791	98	Paved roads w/curbs & sewers, HSG B
44,408	89	Weighted Average
10,617		23.91% Pervious Area
33,791		76.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	24	0.0042	0.55		
Sheet Flow, Smooth surfaces n= 0.011 P2= 3.20"					
11.4	958	0.0048	1.41		Shallow Concentrated Flow, Paved Kv= 20.3 fps
12.1	982	Total			

Subcatchment 14S: PR-WS-B6



Summary for Pond 1P: Sediment Forebay

Inflow Area = 0.415 ac, 70.82% Impervious, Inflow Depth > 4.61" for 25-yr event
 Inflow = 2.62 cfs @ 12.00 hrs, Volume= 0.159 af
 Outflow = 2.59 cfs @ 12.01 hrs, Volume= 0.157 af, Atten= 1%, Lag= 0.3 min
 Primary = 2.59 cfs @ 12.01 hrs, Volume= 0.157 af

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Peak Elev= 96.33' @ 12.01 hrs Surf.Area= 170 sf Storage= 181 cf
 Plug-Flow detention time= 18.6 min calculated for 0.156 af (98% of inflow)
 Center-of-Mass det. time= 7.6 min (796.2 - 788.7)

Volume	Invert	Avail. Storage	Storage Description
#1	95.00'	295 cf	Custom Stage Data (Prismatic) Listed below

Elevation (feet)	Surf. Area (sq-ft)	Inc. Store (cubic-feet)	Cum. Store (cubic-feet)
95.00	80	0	0
96.00	170	125	125
97.00	170	170	295

Device	Routing	Invert	Outlet Devices
#1	Primary	96.00'	5.0' long x 1.0' breadth Broad-Crested Rectangular Weir
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00
			2.50 3.00
			Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30
			3.31 3.32

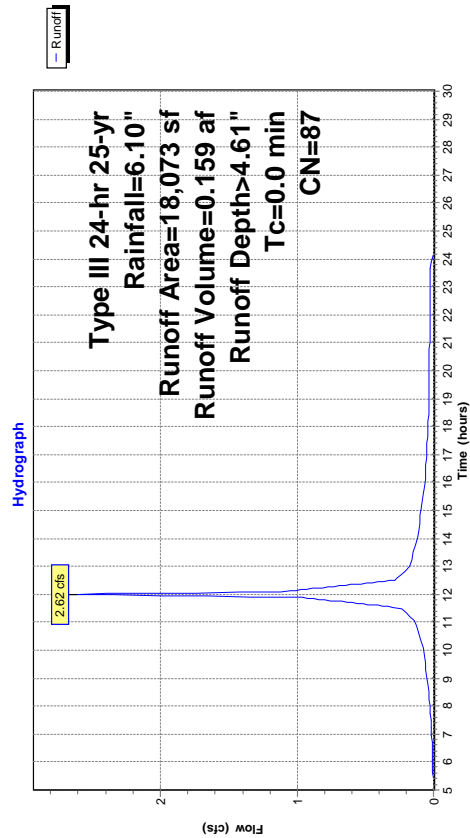
Primary OutFlow Max=2.55 cfs @ 12.01 hrs HW=96.33' (Free Discharge)
 1-Broad-Crested Rectangular Weir (Weir Controls 2.55 cfs @ 1.55 fps)

Summary for Subcatchment 15S: PR-WS-B5

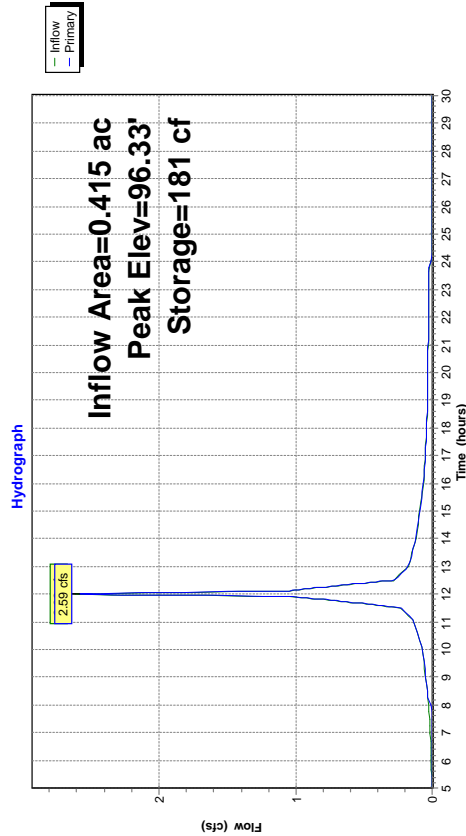
Runoff = 2.62 cfs @ 12.00 hrs, Volume= 0.159 af, Depth> 4.61"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 25-yr Rainfall=6.10"

Area (sf)	CN	Description
12,800	98	Paved roads w/curbs & sewers, HSG B
5,273	61	>75% Grass cover, Good, HSG B
18,073	87	Weighted Average
5,273		29.18% Pervious Area
12,800		70.82% Impervious Area

Subcatchment 15S: PR-WS-B5



Pond 1P: Sediment Forebay



Summary for Pond 3P: Infiltration Basin

Inflow Area = 0.415 ac, 70.82% Impervious, Inflow Depth = 4.53" for 25-yr event
 Inflow = 2.59 cfs @ 12.01 hrs, Volume= 0.157 af
 Outflow = 2.31 cfs @ 12.03 hrs, Volume= 0.114 af, Atten= 11%, Lag= 1.6 min
 Primary = 2.31 cfs @ 12.03 hrs, Volume= 0.114 af

Routing by Stor-Ind method, Time Span= 5:00-30:00 hrs, dt= 0.02 hrs
 Peak Elev= 97.77' @ 12.03 hrs Surf.Area= 1,362 sf Storage= 2,194 cf

Plug-Flow detention time= 144.3 min calculated for 0.114 af (73% of inflow)
 Center-of-Mass det. time= 56.9 min (853.1 - 796.2)

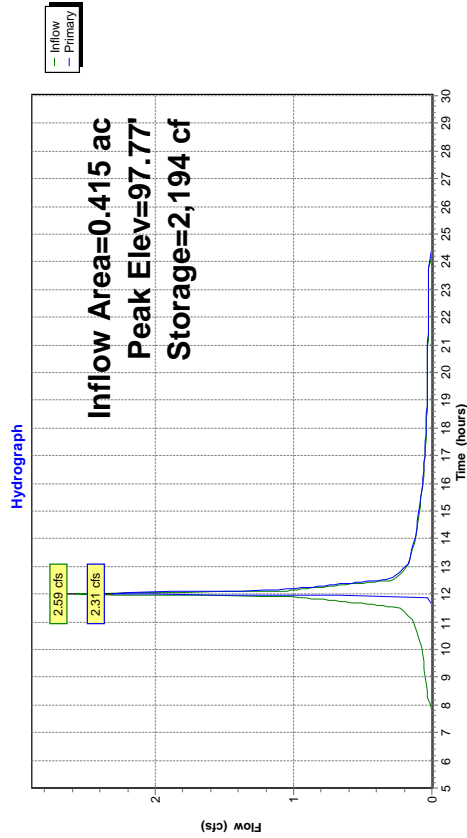
Volume #1	Invert	Avail.Storage	Storage Description
	95.00'	2,476 cf	Custom Stage Data (Prismatic) Listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
95.00	268	0	0
96.00	596	432	432
97.00	1,013	805	1,237
98.00	1,465	1,239	2,476

Device #1	Routing	Invert	Outlet Devices
	Primary	97.50'	5.0' long Sharp-Crested Rectangular Weir 2 End Contractions

Primary Outflow Max=2.29 cfs @ 12.03 hrs HW=97.77' (Free Discharge)
 1-Sharp-Crested Rectangular Weir (Weir Controls 2.29 cfs @ 1.70 fps)

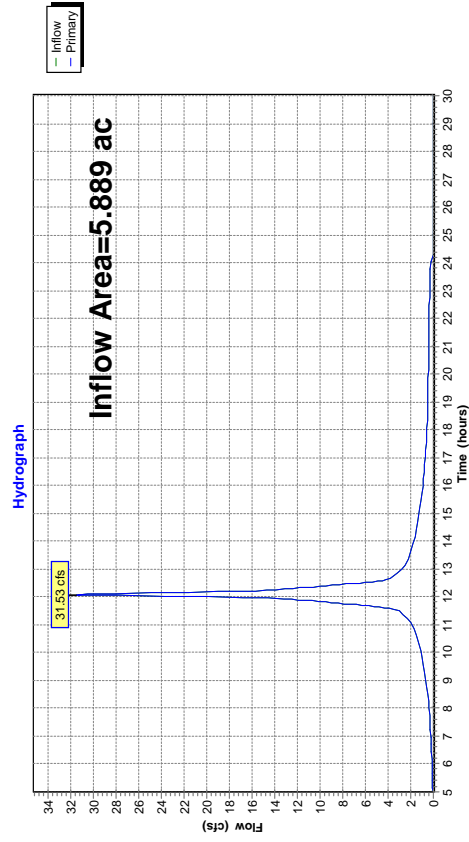
Pond 3P: Infiltration Basin



Summary for Link DP1: Western Segment

Inflow Area = 5.889 ac, 72.56% Impervious, Inflow Depth > 4.68" for 25-yr event
 Inflow = 31.53 cfs @ 12.08 hrs, Volume= 2.296 af
 Primary = 31.53 cfs @ 12.08 hrs, Volume= 2.296 af, Atten= 0%, Lag= 0.0 min
 Primary outflow = Inflow, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs

Link DP1: Western Segment

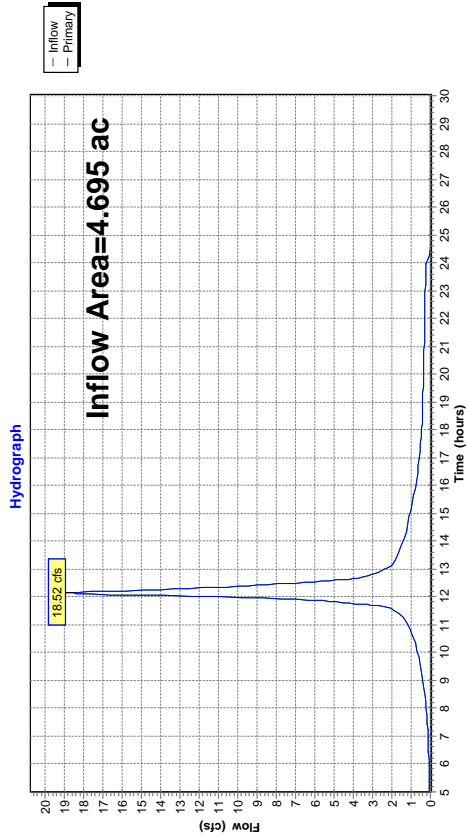


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Summary for Link DP2: Eastern Segment - Wetlands North

Inflow Area = 4.695 ac, 66.54% Impervious, Inflow Depth > 4.33" for 25-yr event
 Inflow = 18.52 cfs @ 12.14 hrs, Volume= 1.693 af
 Primary = 18.52 cfs @ 12.14 hrs, Volume= 1.693 af, Atten= 0%, Lag= 0.0 min
 Primary outflow = Inflow, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs

Link DP2: Eastern Segment - Wetlands North

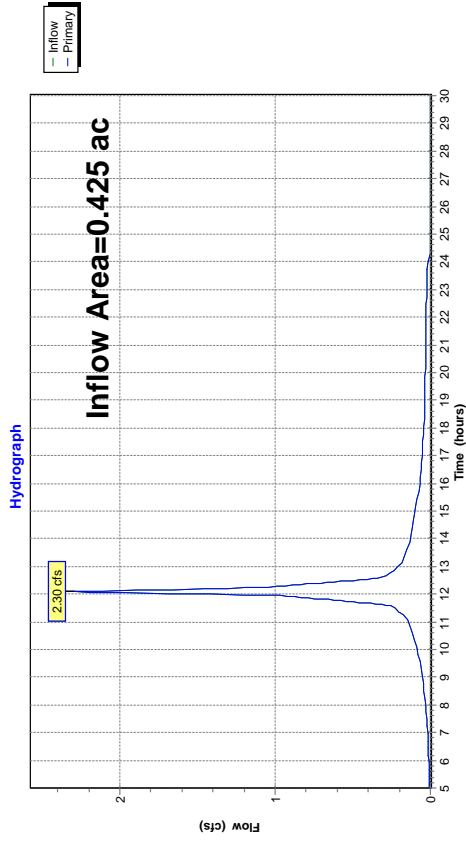


Proposed Conditions_B Soil - Revised 5-24-18 Type III 24-hr 25-yr Rainfall=6.10"
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Summary for Link DP3: Eastern Segment - Wetlands South

Inflow Area = 0.425 ac, 75.51% Impervious, Inflow Depth > 4.83" for 25-yr event
 Inflow = 2.30 cfs @ 12.08 hrs, Volume= 0.171 af
 Primary = 2.30 cfs @ 12.08 hrs, Volume= 0.171 af, Atten= 0%, Lag= 0.0 min
 Primary outflow = Inflow, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs

Link DP3: Eastern Segment - Wetlands South



Proposed Conditions, B Soil - Revised 5-24-18 Type III 24-hr 50-yr Rainfall=7.30"
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Summary for Subcatchment 1S: PR-WS-C2A

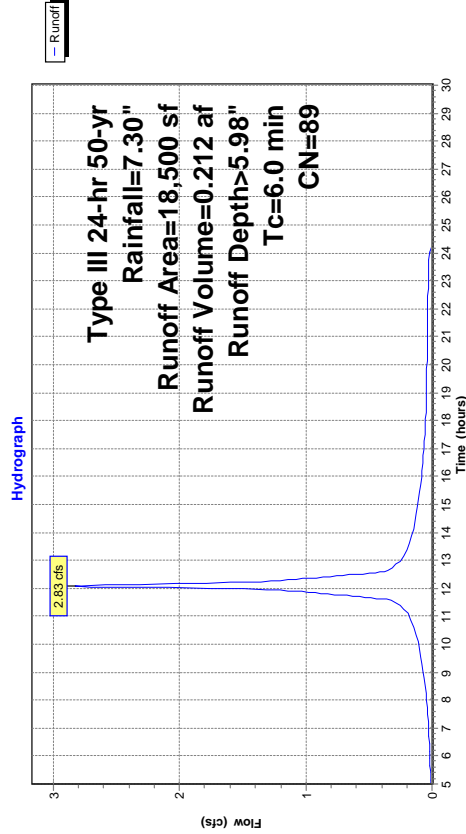
Runoff = 2.83 cfs @ 12.08 hrs, Volume= 0.212 af, Depth> 5.98"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 50-yr Rainfall=7.30"

Area (sf)	CN	Description
3,670	61	>75% Grass cover, Good, HSG B
13,970	98	Paved roads w/curbs & sewers, HSG B
860	58	Woods/grass comb., Good, HSG B
18,500	89	Weighted Average
4,530		24.49% Pervious Area
13,970		75.51% Impervious Area

Tc (min)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0				Direct Entry, Increased to 6 min

Subcatchment 1S: PR-WS-C2A



Proposed Conditions, B Soil - Revised 5-24-18 Type III 24-hr 50-yr Rainfall=7.30"
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Summary for Subcatchment 3S: PR-WS-A1

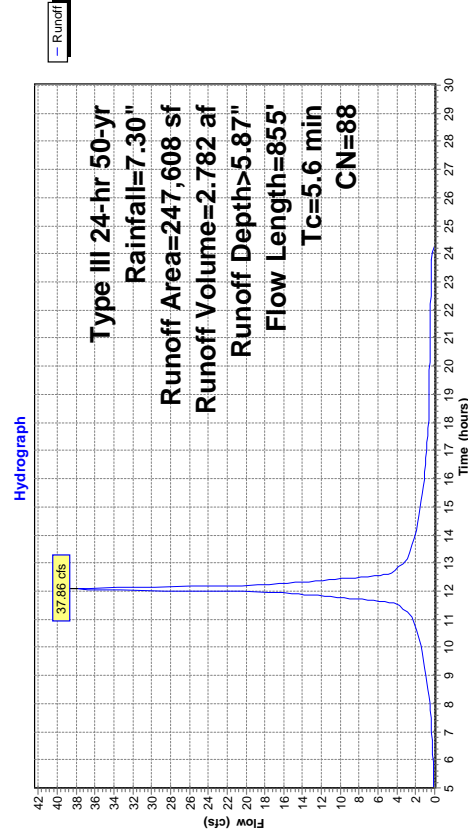
Runoff = 37.86 cfs @ 12.08 hrs, Volume= 2.782 af, Depth> 5.87"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 50-yr Rainfall=7.30"

Area (sf)	CN	Description
14,875	61	>75% Grass cover, Good, HSG B
8,776	61	>75% Grass cover, Good, HSG B
59,116	72	1/3 acre lots, 30% imp, HSG B
164,841	98	Paved roads w/curbs & sewers, HSG B
247,608	88	Weighted Average
65,032		26.26% Pervious Area
182,576		73.74% Impervious Area

Tc (min)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	100	0.0200	1.38	Sheet Flow, Smooth surfaces n= 0.011 P2= 3.20"
4.4	755	0.0201	2.88	Shallow Concentrated Flow, Paved Kv= 20.3 fps
5.6	855	Total		

Subcatchment 3S: PR-WS-A1



Proposed Conditions_B Soil - Revised 5-24-18 Type III 24-hr 50-yr Rainfall=7.30"
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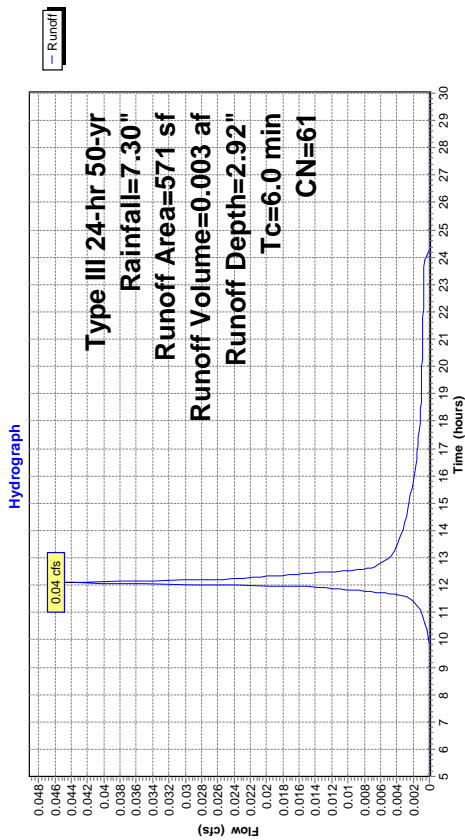
Summary for Subcatchment 5S: PR-WS-A3

Runoff = 0.04 cfs @ 12.09 hrs, Volume= 0.003 af, Depth= 2.92"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 50-yr Rainfall=7.30"

Area (sf)	CN	Description
571	61	>75% Grass cover, Good, HSG B
571		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Tc Minimum

Subcatchment 5S: PR-WS-A3



Proposed Conditions_B Soil - Revised 5-24-18 Type III 24-hr 50-yr Rainfall=7.30"
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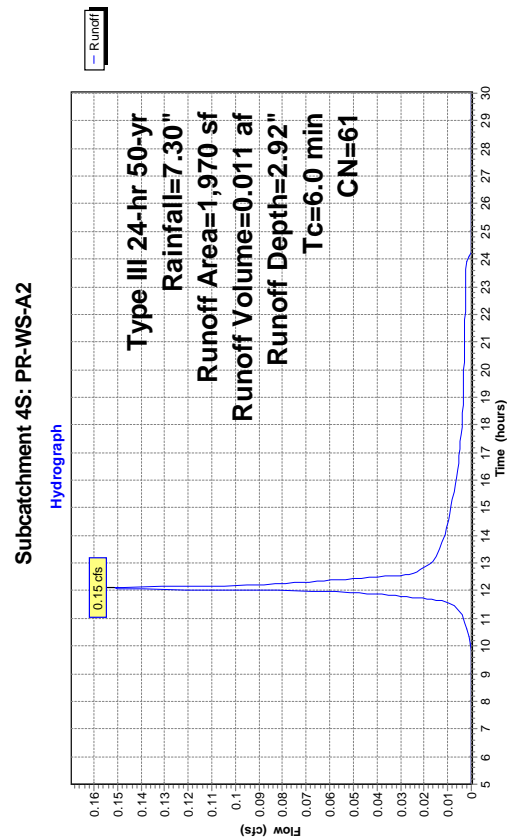
Summary for Subcatchment 4S: PR-WS-A2

Runoff = 0.15 cfs @ 12.09 hrs, Volume= 0.011 af, Depth= 2.92"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 50-yr Rainfall=7.30"

Area (sf)	CN	Description
1,647	61	>75% Grass cover, Good, HSG B
323	61	>75% Grass cover, Good, HSG B
1,970	61	Weighted Average
1,970		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Tc Minimum

Subcatchment 4S: PR-WS-A2



Proposed Conditions, B Soil - Revised 5-24-18 Type III 24-hr 50-yr Rainfall=7.30"
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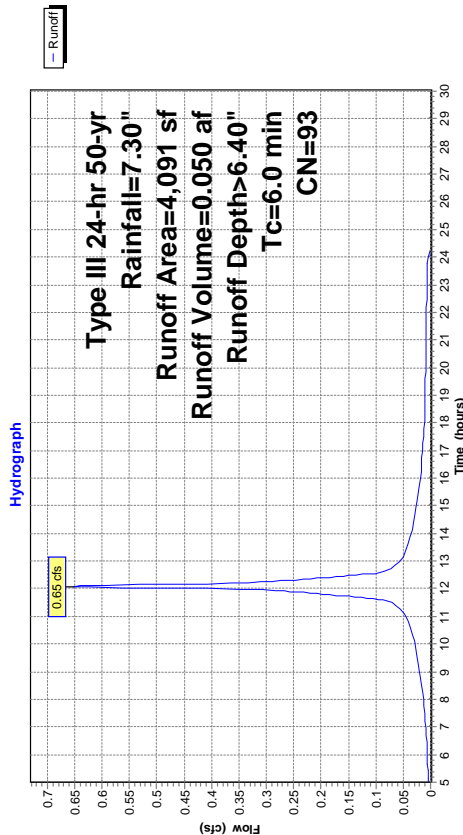
Summary for Subcatchment 7S: PR-WS-A5

Runoff = 0.65 cfs @ 12.08 hrs, Volume= 0.050 af, Depth> 6.40"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 50-yr Rainfall=7.30"

Area (sf)	CN	Description
556	61	>75% Grass cover, Good, HSG B
3,535	98	Paved roads w/curbs & sewers, HSG B
4,091	93	Weighted Average
556		13.59% Pervious Area
3,535		86.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Tc Minimum

Subcatchment 7S: PR-WS-A5



Proposed Conditions, B Soil - Revised 5-24-18 Type III 24-hr 50-yr Rainfall=7.30"
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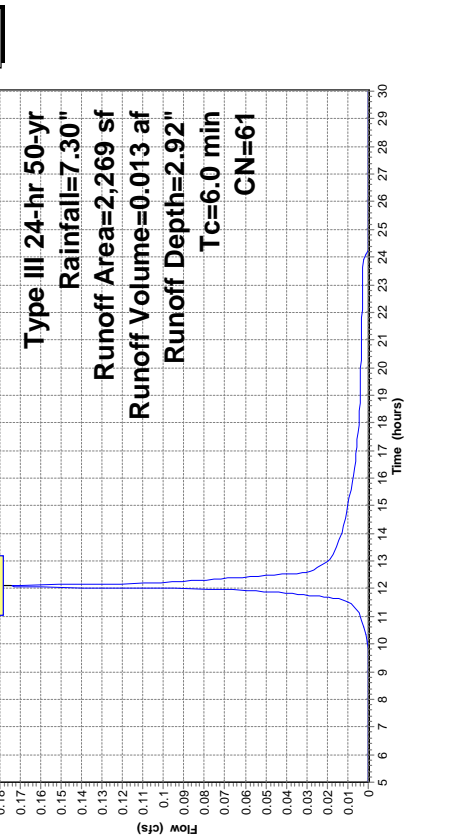
Summary for Subcatchment 6S: PR-WS-A4

Runoff = 0.17 cfs @ 12.09 hrs, Volume= 0.013 af, Depth= 2.92"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 50-yr Rainfall=7.30"

Area (sf)	CN	Description
2,269	61	>75% Grass cover, Good, HSG B
2,269		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Tc Minimum

Subcatchment 6S: PR-WS-A4



Proposed Conditions, B Soil - Revised 5-24-18 Type III 24-hr 50-yr Rainfall=7.30"
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Summary for Subcatchment 8S: PR-WS-B1

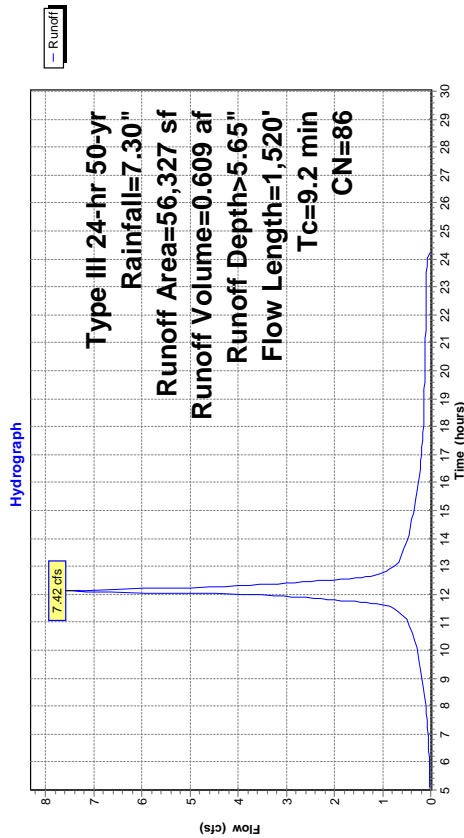
Runoff = 7.42 cfs @ 12.13 hrs, Volume= 0.609 af, Depth> 5.65"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 50-yr Rainfall=7.30"

Area (sf)	CN	Description
13,861	61	>75% Grass cover, Good, HSG B
2,593	58	Woods/grass comb., Good, HSG B
1,276	61	>75% Grass cover, Good, HSG B
38,597	98	Paved roads w/curbs & sewers, HSG B
56,327	86	Weighted Average
17,730		31.48% Pervious Area
38,597		68.52% Impervious Area

Tc (min)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	28	0.0107	0.83	Sheet Flow, Smooth surfaces n= 0.011 P2= 3.20"
8.6	1,492	0.0204	2.90	Shallow Concentrated Flow, Paved Kv= 20.3 fps
9.2	1,520	Total		

Subcatchment 8S: PR-WS-B1



Proposed Conditions, B Soil - Revised 5-24-18 Type III 24-hr 50-yr Rainfall=7.30"
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Summary for Subcatchment 9S: PR-WS-B2

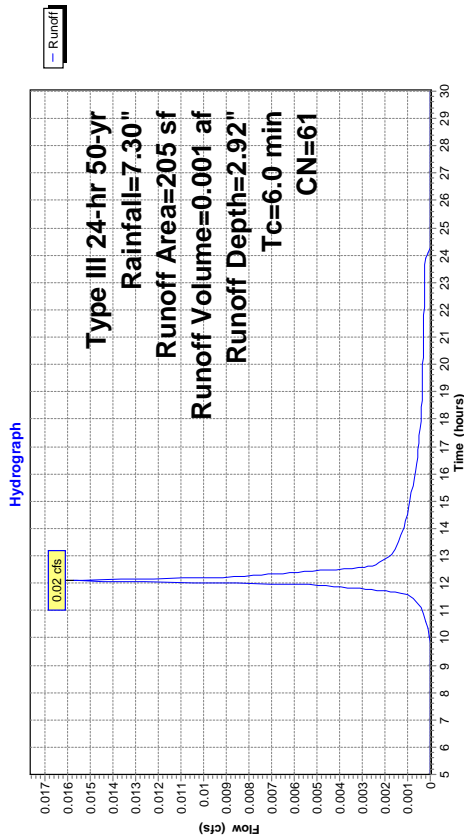
Runoff = 0.02 cfs @ 12.09 hrs, Volume= 0.001 af, Depth= 2.92"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 50-yr Rainfall=7.30"

Area (sf)	CN	Description
205	61	>75% Grass cover, Good, HSG B
205		100.00% Pervious Area

Tc (min)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0				Direct Entry, Tc Minimum

Subcatchment 9S: PR-WS-B2



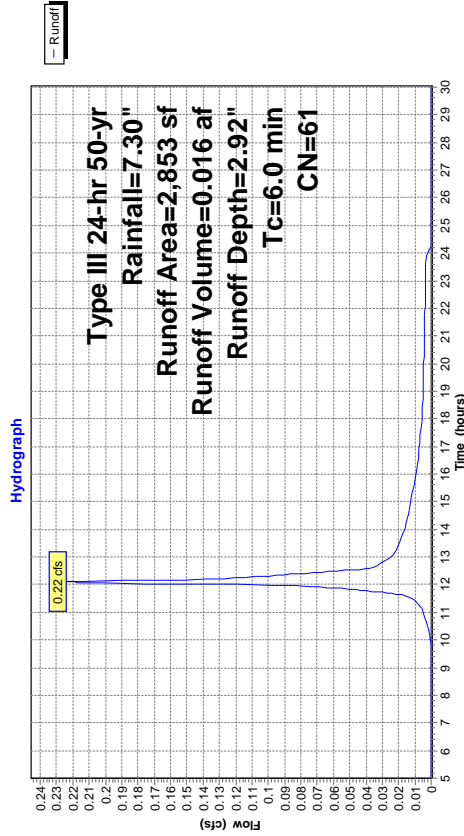
Proposed Conditions_B Soil - Revised 5-24-18
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 Type III 24-hr 50-yr Rainfall=7.30"
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 Page 73

Summary for Subcatchment 10S: PR-WS-B3

Runoff = 0.22 cfs @ 12.09 hrs, Volume= 0.016 af, Depth= 2.92"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, d= 0.02 hrs
 Type III 24-hr 50-yr Rainfall=7.30"

Area (sf)	CN	Description		
2,853	61	>75% Grass cover, Good, HSG B		
2,853		100.00% Pervious Area		
Tc (min)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0				Direct Entry, Tc Minimum

Subcatchment 10S: PR-WS-B3



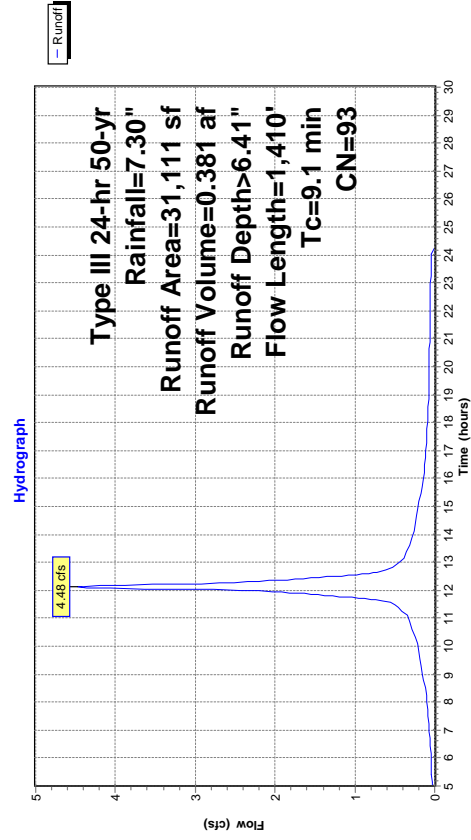
Proposed Conditions_B Soil - Revised 5-24-18
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 Type III 24-hr 50-yr Rainfall=7.30"
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 Page 74

Summary for Subcatchment 11S: PR-WS-C2

Runoff = 4.48 cfs @ 12.12 hrs, Volume= 0.381 af, Depth> 6.41"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, d= 0.02 hrs
 Type III 24-hr 50-yr Rainfall=7.30"

Area (sf)	CN	Description		
4,466	61	>75% Grass cover, Good, HSG B		
26,645	98	Paved roads w/curbs & sewers, HSG B		
31,111	93	Weighted Average		
4,466		14.36% Pervious Area		
26,645		85.64% Impervious Area		
Tc (min)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	100	0.0740	2.32	Sheet Flow, Smooth surfaces n= 0.011 P2= 3.20"
8.4	1,310	0.0165	2.61	Shallow Concentrated Flow, Paved Kv= 20.3 fps
9.1	1,410	Total		

Subcatchment 11S: PR-WS-C2



Summary for Subcatchment 12S: PR-WS-C1

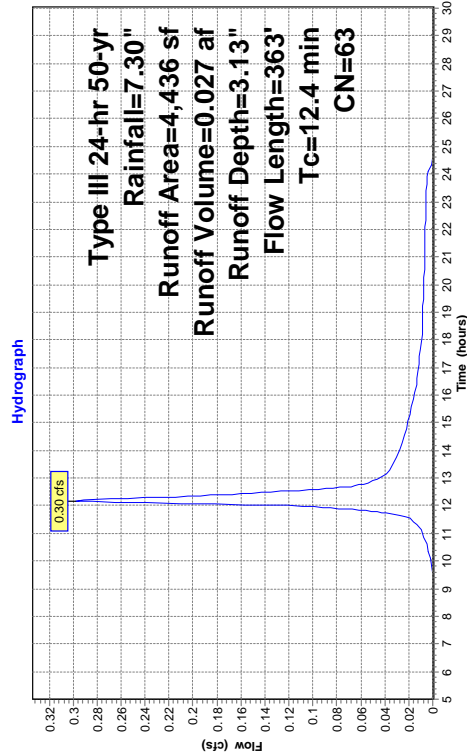
Runoff = 0.30 cfs @ 12.18 hrs, Volume= 0.027 af, Depth= 3.13"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 50-yr Rainfall=7.30"

Area (sf)	CN	Description
3,779	61	>75% Grass cover, Good, HSG B
450	61	>75% Grass cover, Good, HSG B
207	98	Paved roads w/curbs & sewers, HSG B
4,436	63	Weighted Average
4,229	95.33%	Pervious Area
207	4.67%	Impervious Area

Tc (min)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.0	68	0.0294	0.13	Sheet Flow , Grass: Dense n= 0.240 P2= 3.20"
0.1	27	0.0740	5.52	Shallow Concentrated Flow , Paved Kv= 20.3 fps
1.5	147	0.0540	1.63	Shallow Concentrated Flow , Short Grass Pasture Kv= 7.0 fps
1.8	121	0.0248	1.10	Shallow Concentrated Flow , Short Grass Pasture Kv= 7.0 fps
12.4	363	Total		

Subcatchment 12S: PR-WS-C1



Summary for Subcatchment 13S: PR-WS-B4

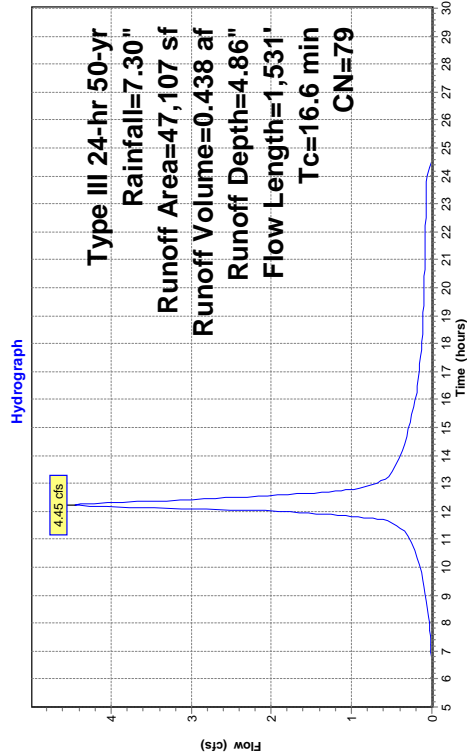
Runoff = 4.45 cfs @ 12.22 hrs, Volume= 0.438 af, Depth= 4.86"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 50-yr Rainfall=7.30"

Area (sf)	CN	Description
9,416	61	>75% Grass cover, Good, HSG B
13,651	58	Woods/grass comb., Good, HSG B
24,040	98	Paved roads w/curbs & sewers, HSG B
47,107	79	Weighted Average
23,067	48.97%	Pervious Area
24,040	51.03%	Impervious Area

Tc (min)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	24	0.0170	0.97	Sheet Flow , Smooth surfaces n= 0.011 P2= 3.20"
16.2	1,507	0.0058	1.55	Shallow Concentrated Flow , Paved Kv= 20.3 fps
16.6	1,531	Total		

Subcatchment 13S: PR-WS-B4



Proposed Conditions, B Soil - Revised 5-24-18 Type III 24-hr 50-yr Rainfall=7.30"
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Summary for Subcatchment 14S: PR-WS-B6

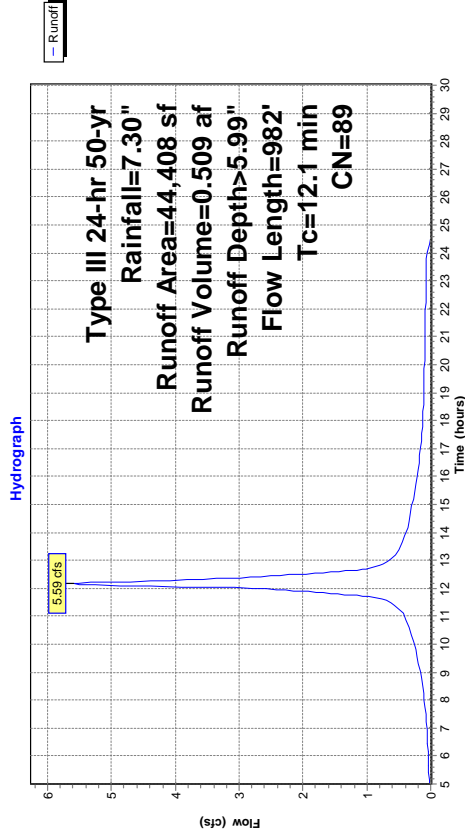
Runoff = 5.59 cfs @ 12.16 hrs, Volume= 0.509 af, Depth> 5.99"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 50-yr Rainfall=7.30"

Area (sf)	CN	Description
8,907	61	>75% Grass cover, Good, HSG B
1,165	58	Woods/grass comb., Good, HSG B
545	61	>75% Grass cover, Good, HSG B
33,791	98	Paved roads w/curbs & sewers, HSG B
44,408	89	Weighted Average
10,617		23.91% Pervious Area
33,791		76.09% Impervious Area

Tc (min)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	24	0.0042	0.55	Sheet Flow, Smooth surfaces n= 0.011 P2= 3.20"
11.4	958	0.0048	1.41	Shallow Concentrated Flow, Paved Kv= 20.3 fps
12.1	982	Total		

Subcatchment 14S: PR-WS-B6



Proposed Conditions, B Soil - Revised 5-24-18 Type III 24-hr 50-yr Rainfall=7.30"
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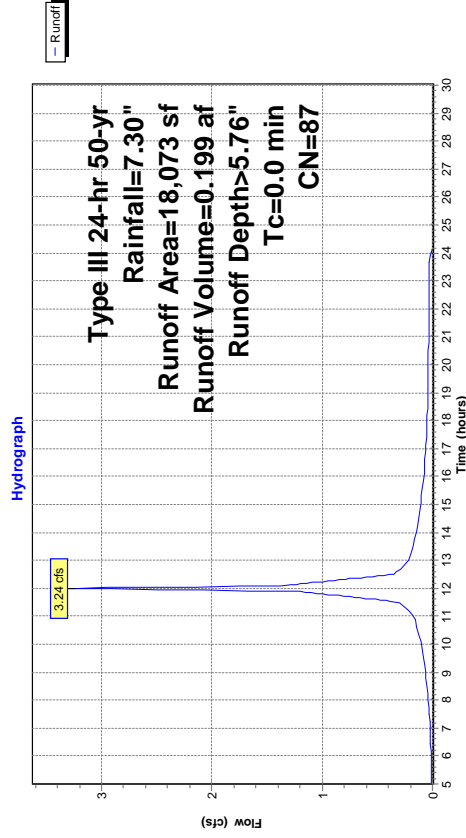
Summary for Subcatchment 15S: PR-WS-B5

Runoff = 3.24 cfs @ 12.00 hrs, Volume= 0.199 af, Depth> 5.76"

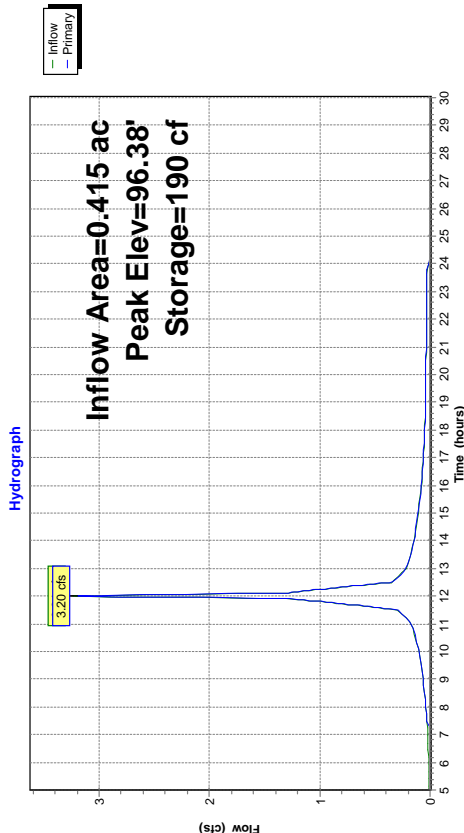
Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 50-yr Rainfall=7.30"

Area (sf)	CN	Description
12,800	98	Paved roads w/curbs & sewers, HSG B
5,273	61	>75% Grass cover, Good, HSG B
18,073	87	Weighted Average
5,273		29.18% Pervious Area
12,800		70.82% Impervious Area

Subcatchment 15S: PR-WS-B5



Pond 1P: Sediment Forebay



Summary for Pond 1P: Sediment Forebay

Inflow Area = 0.415 ac, 70.82% impervious, Inflow Depth > 5.76" for 50-yr event
 Inflow = 3.24 cfs @ 12.00 hrs, Volume= 0.199 af
 Outflow = 3.20 cfs @ 12.00 hrs, Volume= 0.196 af, Atten= 1%, Lag= 0.2 min
 Primary = 3.20 cfs @ 12.00 hrs, Volume= 0.196 af

Routing by Stor-Ind method, Time Span= 5:00-30:00 hrs, dt= 0.02 hrs
 Peak Elev= 96.38' @ 12.00 hrs Surf.Area= 170 sf Storage= 190 cf

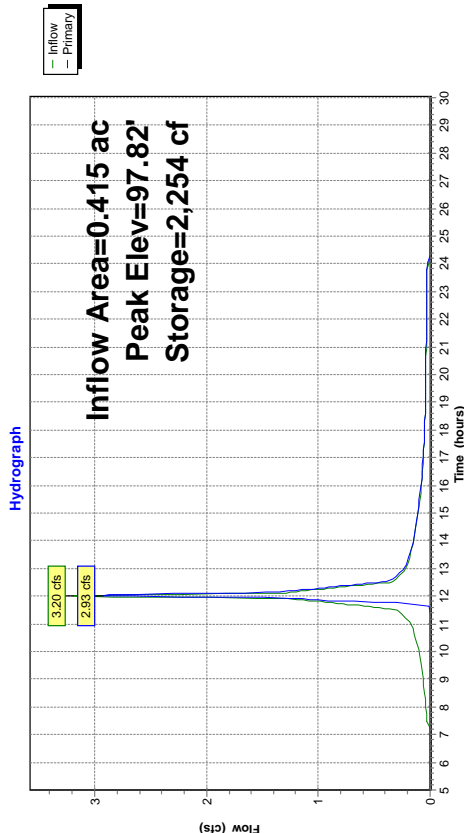
Plug-Flow detention time= 15.6 min calculated for 0.196 af (99% of inflow)
 Center-of-Mass det. time= 6.6 min (789.7 - 783.1)

Volume	Invert	Avail. Storage	Storage Description
#1	95.00'	295 cf	Custom Stage Data (Prismatic) Listed below
Elevation (feet)	Surf. Area (sq-ft)	Inc. Store (cubic-feet)	Cum. Store (cubic-feet)
95.00	80	0	0
96.00	170	125	125
97.00	170	170	295

Device	Routing	Invert	Outlet Devices
#1	Primary	96.00'	5.0' long x 1.0' breadth Broad-Crested Rectangular Weir
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00
			2.50 3.00
			Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30
			3.31 3.32

Primary Outflow Max=3.16 cfs @ 12.00 hrs HW=96.38' (Free Discharge)
 1-Broad-Crested Rectangular Weir (Weir Controls 3.16 cfs @ 1.67 fps)

Pond 3P: Infiltration Basin



Summary for Pond 3P: Infiltration Basin

Inflow Area = 0.415 ac, 70.82% Impervious, Inflow Depth = 5.68" for 50-yr event
 Inflow = 3.20 cfs @ 12.00 hrs, Volume= 0.196 af
 Outflow = 2.93 cfs @ 12.03 hrs, Volume= 0.154 af, Atten= 8%, Lag= 1.3 min
 Primary = 2.93 cfs @ 12.03 hrs, Volume= 0.154 af

Routing by Stor-Ind method, Time Span= 5:00-30:00 hrs, dt= 0.02 hrs
 Peak Elev= 97.82' @ 12.03 hrs Surf.Area= 1,384 sf Storage= 2,254 cf
 Plug-Flow detention time= 127.1 min calculated for 0.154 af (78% of inflow)
 Center-of-Mass det. time= 49.0 min (838.7 - 789.7)

Volume #1	Invert	Avail.Storage	Storage Description
	95.00'	2,476 cf	Custom Stage Data (Prismatic) Listed below
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
95.00	268	0	0
96.00	596	432	432
97.00	1,013	805	1,237
98.00	1,465	1,239	2,476

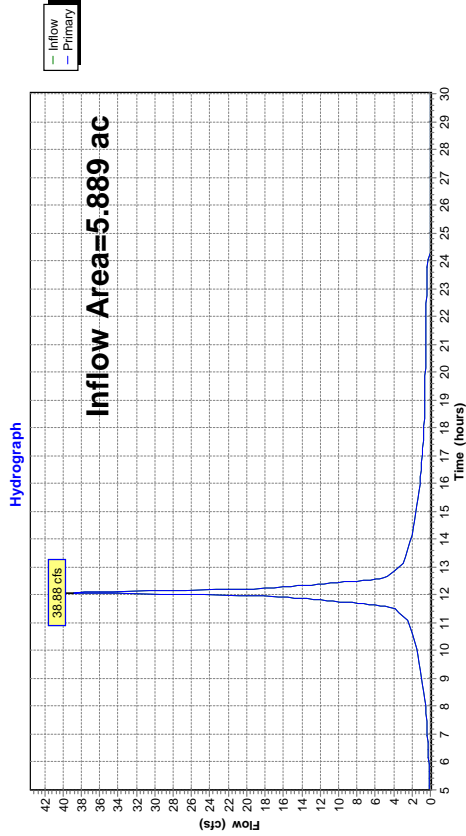
Device #1	Routing	Invert	Outlet Devices
	Primary	97.50'	5.0' long Sharp-Crested Rectangular Weir 2 End Contractions

Primary Outflow Max=2.90 cfs @ 12.03 hrs HW=97.82' (Free Discharge)
 1-1=Sharp-Crested Rectangular Weir (Weir Controls 2.90 cfs @ 1.85 fps)

Summary for Link DP1: Western Segment

Inflow Area = 5.889 ac, 72.56% Impervious, Inflow Depth > 5.83" for 50-yr event
 Inflow = 38.88 cfs @ 12.08 hrs, Volume= 2.859 af
 Primary = 38.88 cfs @ 12.08 hrs, Volume= 2.859 af, Atten= 0%, Lag= 0.0 min
 Primary outflow = Inflow, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs

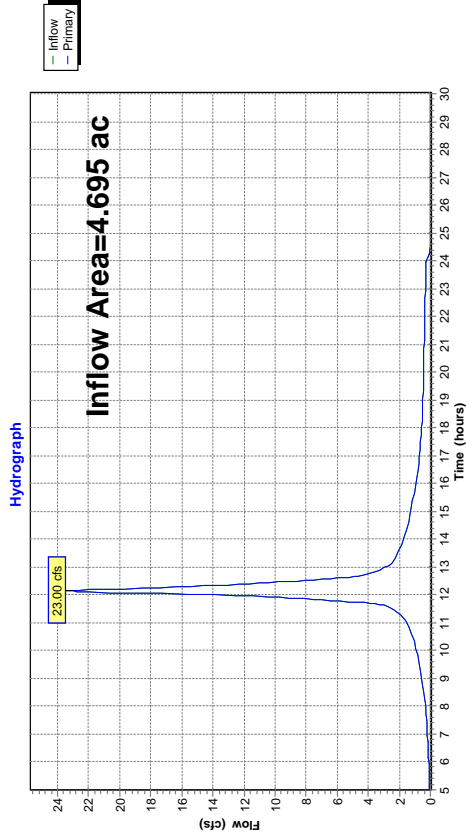
Link DP1: Western Segment



Summary for Link DP2: Eastern Segment - Wetlands North

Inflow Area = 4.695 ac, 66.54% Impervious, Inflow Depth > 5.45" for 50-yr event
 Inflow = 23.00 cfs @ 12.14 hrs, Volume= 2.134 af
 Primary = 23.00 cfs @ 12.14 hrs, Volume= 2.134 af, Atten= 0%, Lag= 0.0 min
 Primary outflow = Inflow, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs

Link DP2: Eastern Segment - Wetlands North



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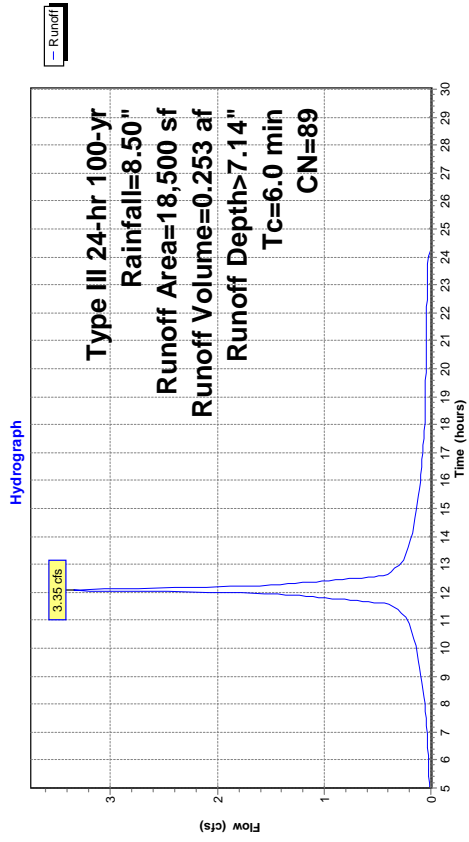
Summary for Subcatchment 1S: PR-WS-C2A

Runoff = 3.35 cfs @ 12.08 hrs, Volume= 0.253 af, Depth> 7.14"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 100-yr Rainfall=8.50"

Area (sf)	CN	Description
3,670	61	>75% Grass cover, Good, HSG B
13,970	98	Paved roads w/curbs & sewers, HSG B
860	58	Woods/grass comb., Good, HSG B
18,500	89	Weighted Average
4,530		24.49% Pervious Area
13,970		75.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Increased to 6 min

Subcatchment 1S: PR-WS-C2A

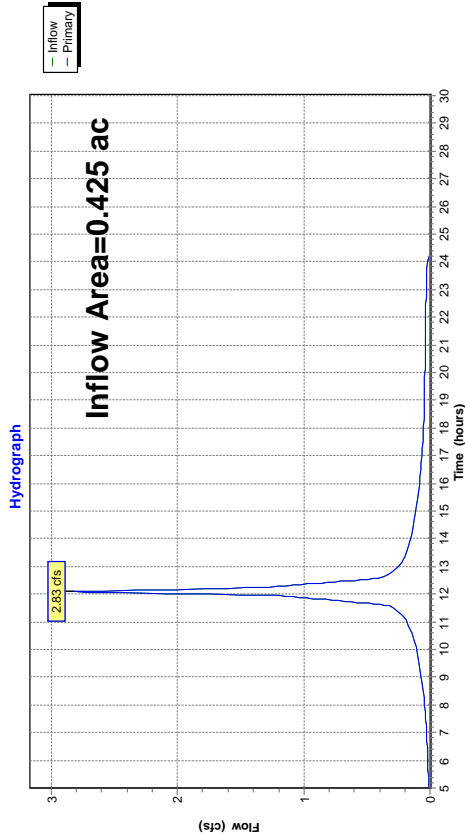


Proposed Conditions_B Soil - Revised 5-24-18 Type III 24-hr 50-yr Rainfall=7.30"
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Summary for Link DP3: Eastern Segment - Wetlands South

Inflow Area = 0.425 ac, 75.51% Impervious, Inflow Depth > 5.98" for 50-yr event
 Inflow = 2.83 cfs @ 12.08 hrs, Volume= 0.212 af
 Primary = 2.83 cfs @ 12.08 hrs, Volume= 0.212 af, Atten= 0%, Lag= 0.0 min
 Primary outflow = Inflow, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs

Link DP3: Eastern Segment - Wetlands South



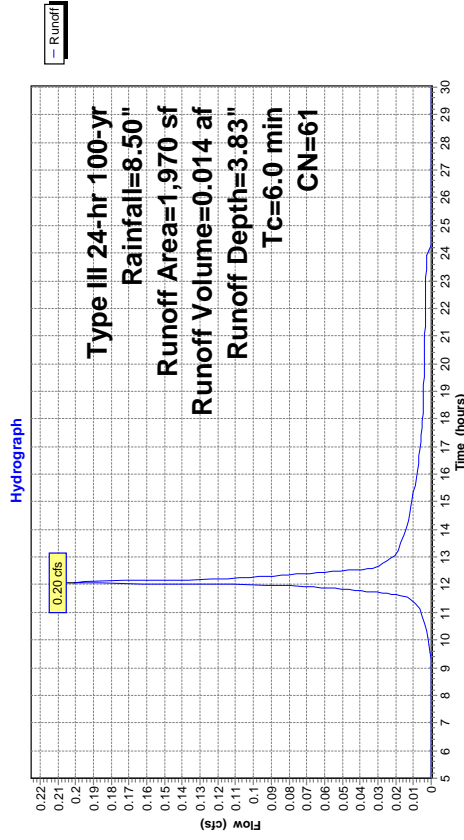
Summary for Subcatchment 4S: PR-WS-A2

Runoff = 0.20 cfs @ 12.09 hrs, Volume= 0.014 af, Depth= 3.83"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 100-yr Rainfall=8.50"

Area (sf)	CN	Description
1,647	61	>75% Grass cover, Good, HSG B
323	61	>75% Grass cover, Good, HSG B
1,970	61	Weighted Average
1,970		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Tc Minimum

Subcatchment 4S: PR-WS-A2



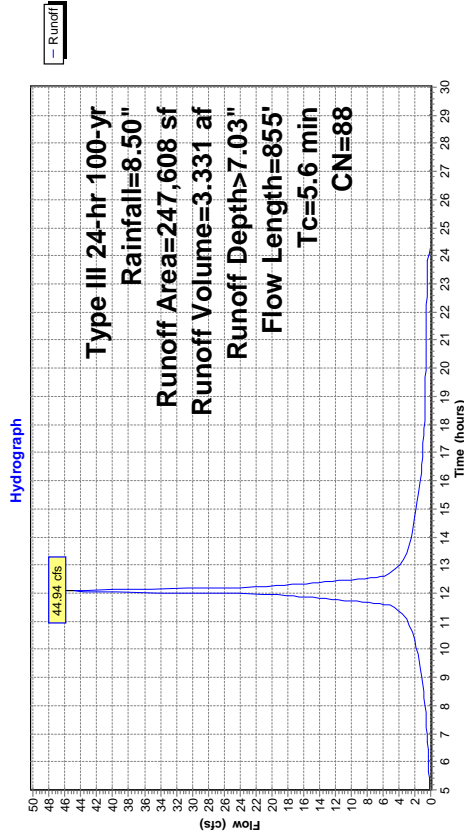
Summary for Subcatchment 3S: PR-WS-A1

Runoff = 44.94 cfs @ 12.08 hrs, Volume= 3.331 af, Depth> 7.03"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 100-yr Rainfall=8.50"

Area (sf)	CN	Description
14,875	61	>75% Grass cover, Good, HSG B
8,776	61	>75% Grass cover, Good, HSG B
59,116	72	1/3 acre lots, 30% imp, HSG B
164,841	98	Paved roads w/curbs & sewers, HSG B
247,608	88	Weighted Average
65,032		26.26% Pervious Area
182,576		73.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	100	0.0200	1.38		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.20"
4.4	755	0.0201	2.88		Shallow Concentrated Flow, Paved Kv= 20.3 fps
5.6	855	Total			

Subcatchment 3S: PR-WS-A1



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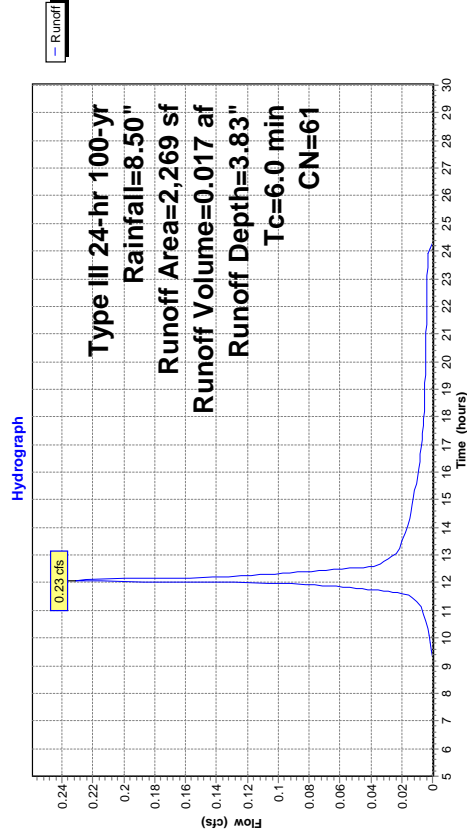
Summary for Subcatchment 6S: PR-WS-A4

Runoff = 0.23 cfs @ 12.09 hrs, Volume= 0.017 af, Depth= 3.83"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 100-yr Rainfall=8.50"

Area (sf)	CN	Description
2,269	61	>75% Grass cover, Good, HSG B
2,269		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Tc Minimum

Subcatchment 6S: PR-WS-A4



Proposed Conditions B Soil - Revised 5-24-18 Type III 24-hr 100-yr Rainfall=8.50"
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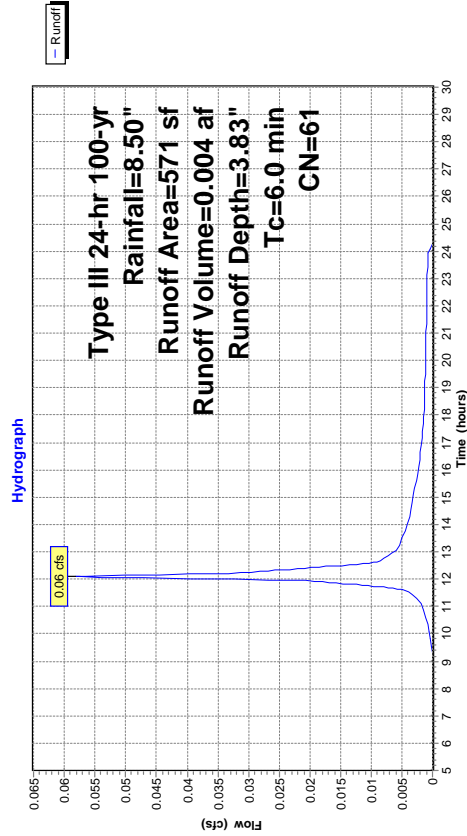
Summary for Subcatchment 5S: PR-WS-A3

Runoff = 0.06 cfs @ 12.09 hrs, Volume= 0.004 af, Depth= 3.83"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 100-yr Rainfall=8.50"

Area (sf)	CN	Description
571	61	>75% Grass cover, Good, HSG B
571		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Tc Minimum

Subcatchment 5S: PR-WS-A3



Proposed Conditions, B Soil - Revised 5-24-18 Type III 24-hr 100-yr Rainfall=8.50"
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Summary for Subcatchment 7S: PR-WS-A5

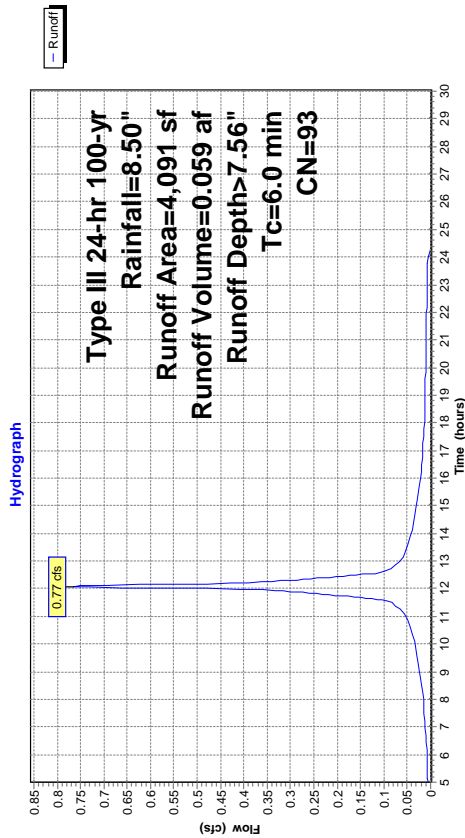
Runoff = 0.77 cfs @ 12.08 hrs, Volume= 0.059 af, Depth> 7.56"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 100-yr Rainfall=8.50"

Area (sf)	CN	Description
556	61	>75% Grass cover, Good, HSG B
3,535	98	Paved roads w/curbs & sewers, HSG B
4,091	93	Weighted Average
556		13.59% Pervious Area
3,535		86.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Tc Minimum

Subcatchment 7S: PR-WS-A5



Proposed Conditions, B Soil - Revised 5-24-18 Type III 24-hr 100-yr Rainfall=8.50"
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Summary for Subcatchment 8S: PR-WS-B1

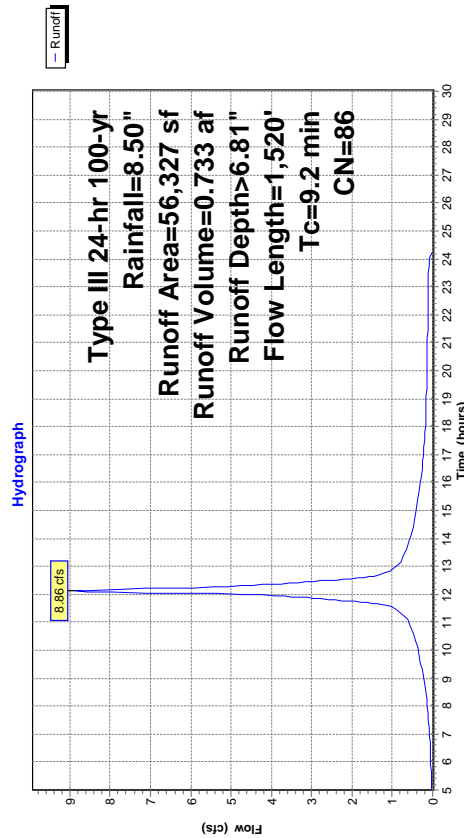
Runoff = 8.86 cfs @ 12.13 hrs, Volume= 0.733 af, Depth> 6.81"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 100-yr Rainfall=8.50"

Area (sf)	CN	Description
13,861	61	>75% Grass cover, Good, HSG B
2,593	58	Woods/grass comb., Good, HSG B
1,276	61	>75% Grass cover, Good, HSG B
38,597	98	Paved roads w/curbs & sewers, HSG B
56,327	86	Weighted Average
17,730		31.48% Pervious Area
38,597		68.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	28	0.0107	0.83		Sheet Flow, Smooth surfaces n=0.011 P2= 3.20"
8.6	1,492	0.0204	2.90		Shallow Concentrated Flow, Paved Kv= 20.3 fps
9.2	1,520	Total			

Subcatchment 8S: PR-WS-B1



Proposed Conditions B Soil - Revised 5-24-18 Type III 24-hr 100-yr Rainfall=8.50"
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Summary for Subcatchment 10S: PR-WS-B3

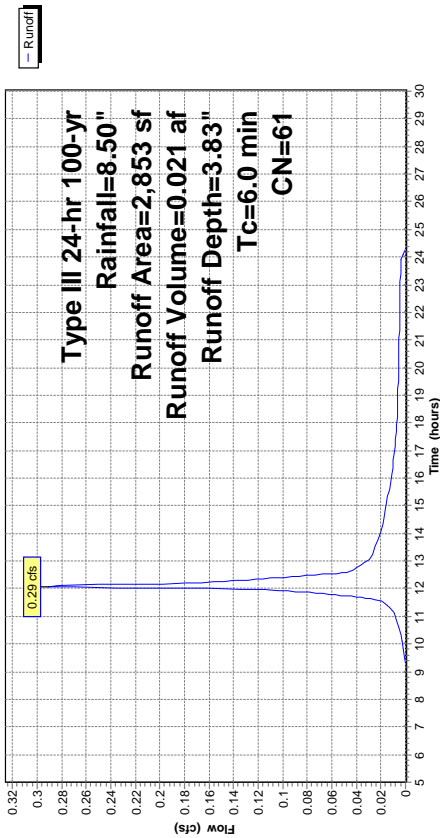
Runoff = 0.29 cfs @ 12.09 hrs, Volume= 0.021 af, Depth= 3.83"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 100-yr Rainfall=8.50"

Area (sf)	CN	Description
2,853	61	>75% Grass cover, Good, HSG B
2,853		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Tc Minimum

Subcatchment 10S: PR-WS-B3

Hydrograph



Proposed Conditions B Soil - Revised 5-24-18 Type III 24-hr 100-yr Rainfall=8.50"
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Summary for Subcatchment 9S: PR-WS-B2

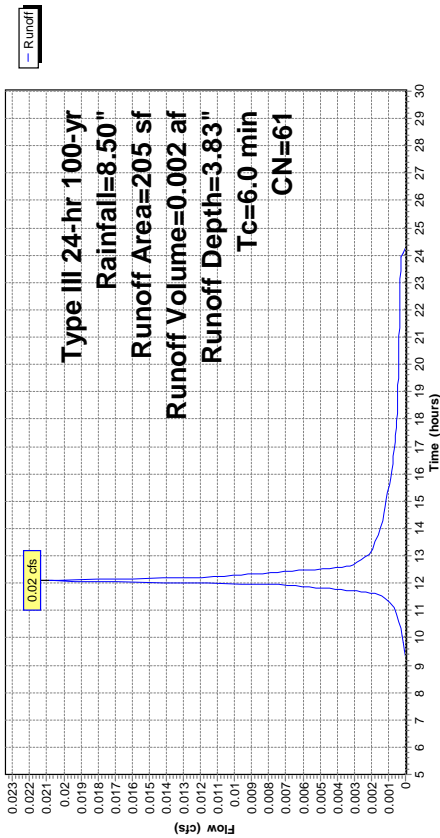
Runoff = 0.02 cfs @ 12.09 hrs, Volume= 0.002 af, Depth= 3.83"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 100-yr Rainfall=8.50"

Area (sf)	CN	Description
205	61	>75% Grass cover, Good, HSG B
205		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Tc Minimum

Subcatchment 9S: PR-WS-B2

Hydrograph



Summary for Subcatchment 11S: PR-WS-C2

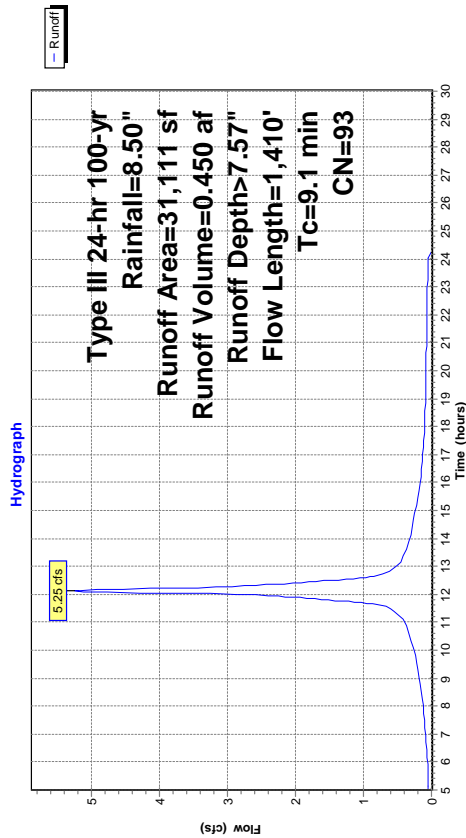
Runoff = 5.25 cfs @ 12.12 hrs, Volume= 0.450 af, Depth> 7.57"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 100-yr Rainfall=8.50"

Area (sf)	CN	Description
4,466	61	>75% Grass cover, Good, HSG B
26,645	98	Paved roads w/curbs & sewers, HSG B
31,111	93	Weighted Average
4,466		14.36% Pervious Area
26,645		85.64% Impervious Area

Tc (min)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	100	0.0740	2.32	Sheet Flow, Smooth surfaces n=0.011 P2= 3.20"
8.4	1,310	0.0165	2.61	Shallow Concentrated Flow, Paved KV= 20.3 fps
9.1	1,410	Total		

Subcatchment 11S: PR-WS-C2



Summary for Subcatchment 12S: PR-WS-C1

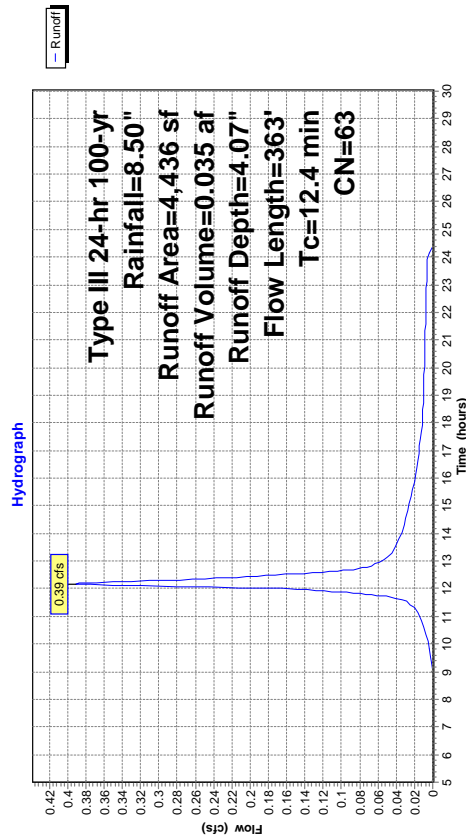
Runoff = 0.39 cfs @ 12.17 hrs, Volume= 0.035 af, Depth= 4.07"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 100-yr Rainfall=8.50"

Area (sf)	CN	Description
3,779	61	>75% Grass cover, Good, HSG B
450	61	>75% Grass cover, Good, HSG B
207	98	Paved roads w/curbs & sewers, HSG B
4,436	63	Weighted Average
4,229		95.33% Pervious Area
207		4.67% Impervious Area

Tc (min)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.0	68	0.0294	0.13	Sheet Flow, Grass: Dense n=0.240 P2= 3.20"
0.1	27	0.0740	5.52	Shallow Concentrated Flow, Paved KV= 20.3 fps
1.5	147	0.0540	1.63	Shallow Concentrated Flow, Short Grass Pasture KV= 7.0 fps
1.8	121	0.0248	1.10	Shallow Concentrated Flow, Short Grass Pasture KV= 7.0 fps
12.4	363	Total		

Subcatchment 12S: PR-WS-C1



Proposed Conditions, B Soil - Revised 5-24-18 Type III 24-hr 100-yr Rainfall=8.50"
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Summary for Subcatchment 13S: PR-WS-B4

Runoff = 5.44 cfs @ 12.22 hrs, Volume= 0.538 af, Depth= 5.98"

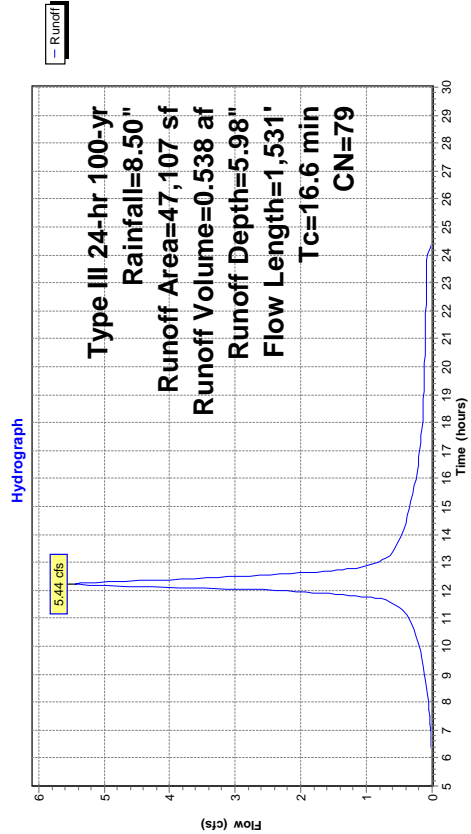
Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, d= 0.02 hrs
 Type III 24-hr 100-yr Rainfall=8.50"

Area (sf)	CN	Description
9,416	61	>75% Grass cover, Good, HSG B
13,651	58	Woods/grass comb., Good, HSG B
24,040	98	Paved roads w/curbs & sewers, HSG B
47,107	79	Weighted Average
23,067		48.97% Pervious Area
24,040		51.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	24	0.0170	0.97		
16.2	1,507	0.0058	1.55		
16.6	1,531	Total			

Sheet Flow,	
Smooth surfaces n= 0.011 P2= 3.20"	
Shallow Concentrated Flow,	
Paved Kv= 20.3 fps	

Subcatchment 13S: PR-WS-B4



Proposed Conditions, B Soil - Revised 5-24-18 Type III 24-hr 100-yr Rainfall=8.50"
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Summary for Subcatchment 14S: PR-WS-B6

Runoff = 6.63 cfs @ 12.16 hrs, Volume= 0.607 af, Depth> 7.15"

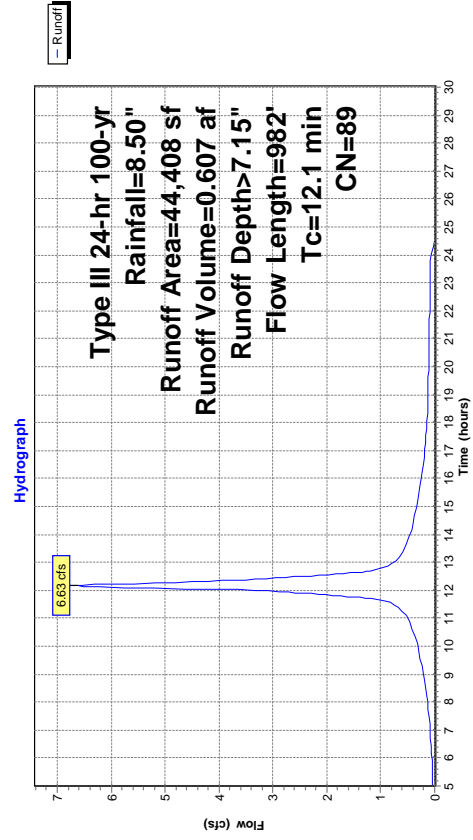
Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, d= 0.02 hrs
 Type III 24-hr 100-yr Rainfall=8.50"

Area (sf)	CN	Description
8,907	61	>75% Grass cover, Good, HSG B
1,165	58	Woods/grass comb., Good, HSG B
545	61	>75% Grass cover, Good, HSG B
33,791	98	Paved roads w/curbs & sewers, HSG B
44,408	89	Weighted Average
10,617		23.91% Pervious Area
33,791		76.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	24	0.0042	0.55		
11.4	958	0.0048	1.41		
12.1	982	Total			

Sheet Flow,	
Smooth surfaces n= 0.011 P2= 3.20"	
Shallow Concentrated Flow,	
Paved Kv= 20.3 fps	

Subcatchment 14S: PR-WS-B6



Summary for Pond 1P: Sediment Forebay

Inflow Area = 0.415 ac, 70.82% Impervious, Inflow Depth > 6.92" for 100-yr event
 Inflow = 3.85 cfs @ 12.00 hrs, Volume= 0.239 af
 Outflow = 3.81 cfs @ 12.00 hrs, Volume= 0.236 af, Atten= 1%, Lag= 0.2 min
 Primary = 3.81 cfs @ 12.00 hrs, Volume= 0.236 af

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Peak Elev= 96.43' @ 12.00 hrs Surf.Area= 170 sf Storage= 198 cf
 Plug-Flow detention time= 13.4 min calculated for 0.236 af (99% of inflow)
 Center-of-Mass det. time= 5.8 min (784.7 - 778.9)

Volume	Invert	Avail.Storage	Storage Description
#1	95.00'	295 cf	Custom Stage Data (Prismatic) Listed below
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
95.00	80	0	0
96.00	170	125	125
97.00	170	170	295

Device	Routing	Invert	Outlet Devices
#1	Primary	96.00'	5.0' long x 1.0' breadth Broad-Crested Rectangular Weir
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00
			2.50 3.00
			Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30
			3.31 3.32

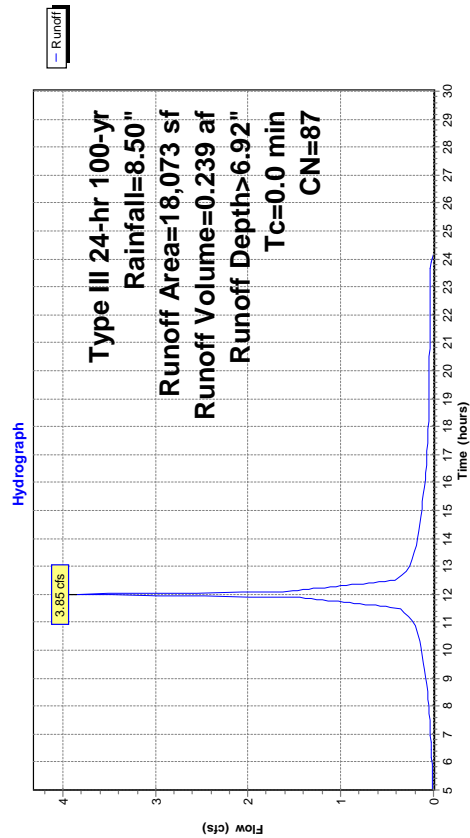
Primary OutFlow Max=3.76 cfs @ 12.00 hrs HW=96.42' (Free Discharge)
 1-Broad-Crested Rectangular Weir (Weir Controls 3.76 cfs @ 1.77 fps)

Summary for Subcatchment 15S: PR-WS-B5

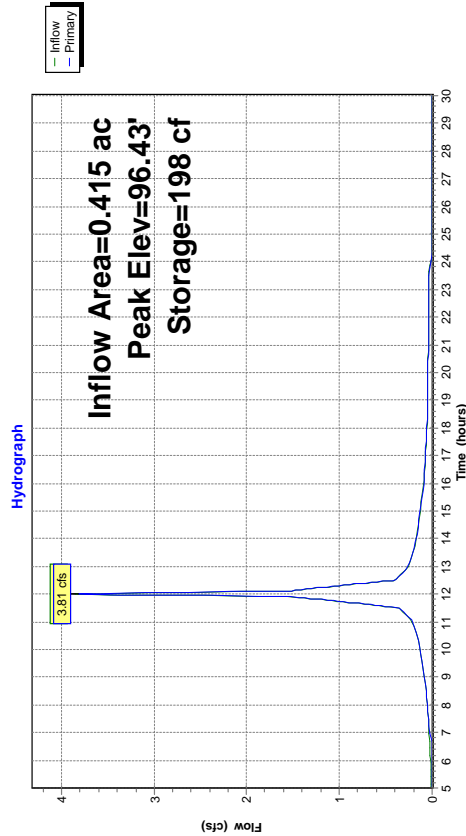
Runoff = 3.85 cfs @ 12.00 hrs, Volume= 0.239 af, Depth> 6.92"
 Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs
 Type III 24-hr 100-yr Rainfall=8.50"

Area (sf)	CN	Description
12,800	98	Paved roads w/curbs & sewers, HSG B
5,273	61	>75% Grass cover, Good, HSG B
18,073	87	Weighted Average
5,273		29.18% Pervious Area
12,800		70.82% Impervious Area

Subcatchment 15S: PR-WS-B5



Pond 1P: Sediment Forebay



Summary for Pond 3P: Infiltration Basin

Inflow Area = 0.415 ac, 70.82% Impervious, Inflow Depth = 6.83" for 100-yr event
 Inflow = 3.81 cfs @ 12.00 hrs, Volume= 0.236 af
 Outflow = 3.52 cfs @ 12.03 hrs, Volume= 0.194 af, Atten= 8%, Lag= 1.3 min
 Primary = 3.52 cfs @ 12.03 hrs, Volume= 0.194 af

Routing by Stor-Ind method, Time Span= 5:00-30:00 hrs, dt= 0.02 hrs
 Peak Elev= 97.86' @ 12.03 hrs Surf.Area= 1,403 sf Storage= 2,305 cf

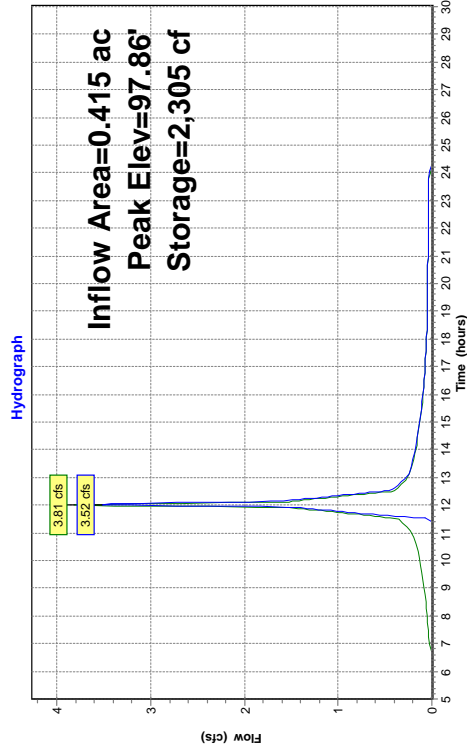
Plug-Flow detention time= 114.6 min calculated for 0.194 af (82% of inflow)
 Center-of-Mass det. time= 44.6 min (829.3 - 784.7)

Volume #1	Invert	Avail.Storage	Storage Description
	95.00'	2,476 cf	Custom Stage Data (Prismatic) Listed below
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
95.00	268	0	0
96.00	596	432	432
97.00	1,013	805	1,237
98.00	1,465	1,239	2,476

Device #1	Routing	Invert	Outlet Devices
	Primary	97.50'	5.0' long Sharp-Crested Rectangular Weir 2 End Contractions

Primary Outflow Max=3.48 cfs @ 12.03 hrs HW=97.86' (Free Discharge)
 1-Sharp-Crested Rectangular Weir (Weir Controls 3.48 cfs @ 1.96 fps)

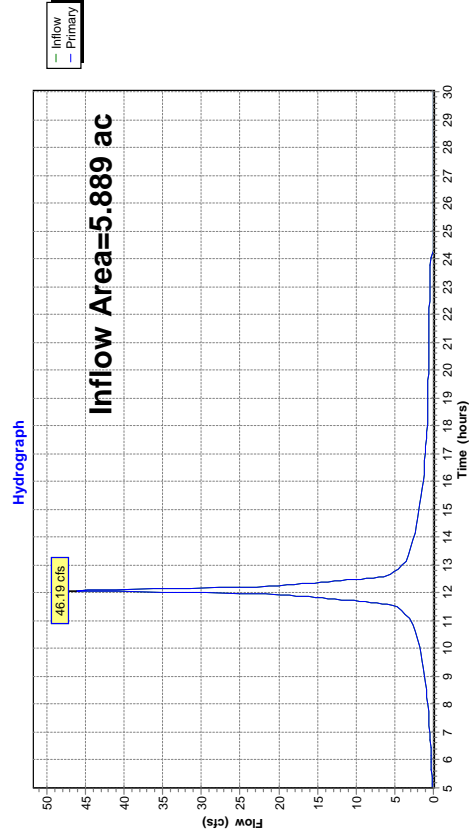
Pond 3P: Infiltration Basin



Summary for Link DP1: Western Segment

Inflow Area = 5.889 ac, 72.56% Impervious, Inflow Depth > 6.98" for 100-yr event
 Inflow = 46.19 cfs @ 12.08 hrs, Volume= 3.426 af
 Primary = 46.19 cfs @ 12.08 hrs, Volume= 3.426 af, Atten= 0%, Lag= 0.0 min
 Primary outflow = Inflow, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs

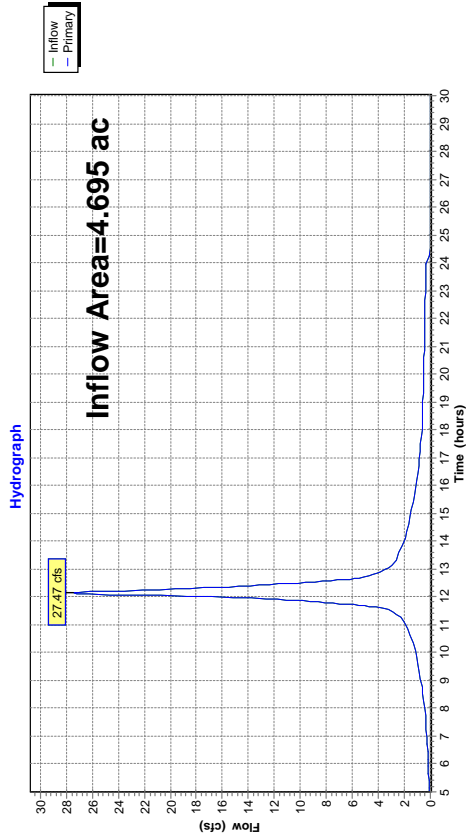
Link DP1: Western Segment



Summary for Link DP2: Eastern Segment - Wetlands North

Inflow Area = 4.695 ac, 66.54% Impervious, Inflow Depth > 6.59" for 100-yr event
 Inflow = 27.47 cfs @ 12.14 hrs, Volume= 2.580 af
 Primary = 27.47 cfs @ 12.14 hrs, Volume= 2.580 af, Atten= 0%, Lag= 0.0 min
 Primary outflow = Inflow, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs

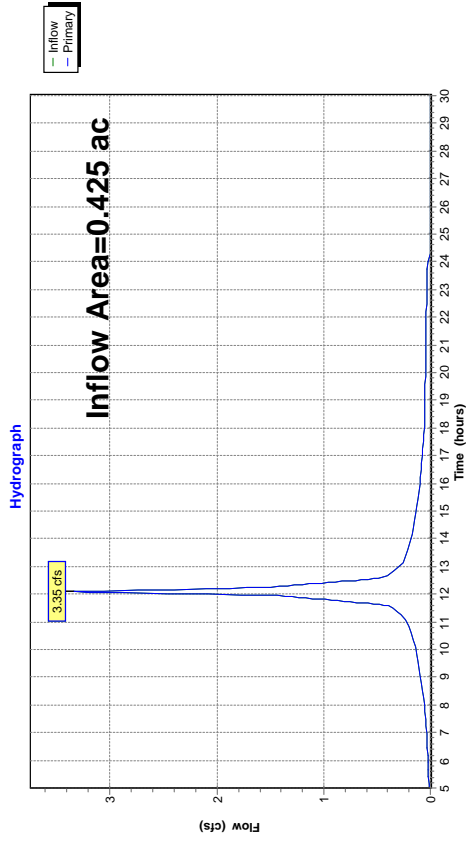
Link DP2: Eastern Segment - Wetlands North



Summary for Link DP3: Eastern Segment - Wetlands South

Inflow Area = 0.425 ac, 75.51% Impervious, Inflow Depth > 7.14" for 100-yr event
 Inflow = 3.35 cfs @ 12.08 hrs, Volume= 0.253 af
 Primary = 3.35 cfs @ 12.08 hrs, Volume= 0.253 af, Atten= 0%, Lag= 0.0 min
 Primary outflow = Inflow, Time Span= 5.00-30.00 hrs, dt= 0.02 hrs

Link DP3: Eastern Segment - Wetlands South



APPENDIX C – CONSTRUCTION PERIOD POLLUTION PREVENTION AND EROSION AND SEDIMENT CONTROL PLAN

Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan**Elm Street and Rustcraft Road**

Dedham, MA

Introduction

The project is anticipated to disturb greater than one acre; therefore, filing a Notice of Intent with EPA and developing of a Stormwater Pollution Prevention Plan (SWPPP) is required. The SWPPP will be provided as part of the construction documents and will be submitted to the Town of Dedham Conservation Commission prior to commencement of construction. The following plan provides general guidance for the prevention of pollution and erosion and sedimentation during construction, however.

Project Description

The Town is proposing vehicular, bicycle and pedestrian safety improvements along Elm Street and Rustcraft Road, a distance of approximately 0.86 miles. Refer to project narrative for a complete description.

Potential Erosion and Sedimentation

Portions of the project involve soil disturbance in areas upgradient of stormwater collection systems and wetland resources. Site preparation, scheduling, and construction practices need to be carefully planned to prevent construction debris and erosion caused by stormwater runoff over exposed soils from causing degradation of downstream wetland resources. Although it is not always possible to avoid impacts from storm events the following guidelines shall be followed:

- Minimize land disturbance area and soil exposure to stormwater and wind erosion.
- Minimize time that area is disturbed.
- Avoid routing stormwater runoff or dewatering flows through disturbed areas.
- Inspect and maintain erosion controls until all soils are stabilized.
- Maintain good housekeeping practices.
- Stabilize disturbed soils as soon as possible to limit exposure.

Erosion and Sedimentation Plan

This Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan has been prepared in accordance with the Department of Environmental Protection's Massachusetts Erosion and Sedimentation Guidelines for Urban and Suburban Areas for the improvement of the intersection.

Pre-Construction and Site Preparation

- Contractor shall install all erosion control barrier in accordance with the construction documents prior to commencing any land disturbance activity.
- Inspect and maintain erosion controls until all soils are stabilized.
- Monitor weather reports daily and stabilize/prepare site if storm event in excess of the 2-year storm is expected.

Inspection and Maintenance of Erosion Controls during Construction

Inspect erosion controls weekly and after every storm event until all soils are stabilized.

- Erosion control barrier: Check for sedimentation accumulation, removing sediments when they reach excessive volumes. Also remove sediments when runoff ponds for 24 or more hours to prevent potential mosquito breeding habitat.

Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan

Elm Street and Rustcraft Road

Dedham, MA

- Catchbasin Inlet Protection: Check for sedimentation accumulation, removing sediments when they reach excessive volumes.

Good Housekeeping

- Minimize hazardous materials stored on site. All materials stored on site shall be stored in original containers and sealed.
- Any spills of hazardous materials shall be reported, contained, and removed in accordance with local, State, and Federal regulations.

Plans

See proposed construction drawings for locations of all proposed erosion and sedimentation controls

APPENDIX D – LONG TERM OPERATIONS & MAINTENANCE PLAN

Long Term Operations & Maintenance Plan

Elm Street and Rustcraft Road

Dedham, MA

This stormwater management system (SWMS) operations and maintenance plan has been prepared in accordance with the Massachusetts Department of Environmental Protection’s Stormwater Management Standards.

General Information

Project Name: Roadway and Sidewalk Improvements
Elm Street and Rustcraft Road

Project Type: Transportation

Address: Elm Street (From north of Robinwood Road to Rustcraft Road) and Rustcraft Road (from Elm Street to 750 south of Plain Street), a distance of approximately 0.86 miles

SWMS Owner: Town of Dedham Department of Public Works
 55 River Street, Dedham, MA 02026

Responsible Party: Town of Dedham Department of Public Works
 55 River Street, Dedham, MA 02026

Contact: Joseph M. Flanagan, Director of Public Works
 781-751-9350

It shall be the responsibility of the Owner to provide a revised plan to the Conservation Commission indicating any change of ownership or responsible party.

BMP Inspection and Maintenance Procedures

Effectiveness of Best Management Practices (BMPs) is maximized when properly maintained. The following inspections schedule and maintenance required of BMPs for this project (see attached plan) shall be as outlined and documented below.

- **Pavement Sweeping:** Paved areas shall be swept annually to remove excess sediments and trash. This will result in a decreased sediment and trash load that the drainage system will have to remove from the runoff. Use of salt for de-icing purposes on the roadway during the winter months should be kept to a minimum to reduce the need for removal and treatment.
- **Deep Sump Catchbasins:** Grates shall be checked periodically and following heavy rainfall to verify that the inlet openings are not clogged by debris or trash. Debris and trash shall be removed from the grate. Structures shall be inspected on an annual basis and cleaned of all accumulated debris if necessary. If the sump of the catchbasin is greater than 50% full it must be inspected and cleaned every six months. Annual cleaning should be performed in the spring after the winter sanding season. All material removed from these structures shall be disposed of in accordance with all applicable regulations. Condition of frames, grates, concrete, bricks and hoods (if installed) should be noted during inspections. Repair or replace damaged materials.
- **Subsurface Detention System with Isolation Row:** Systems shall be inspected on an annual basis and cleaned of all accumulated debris and trash if necessary. If greater than three inches of sediment is observed on the bottom of the system or if standing water is observed for greater than 72 hours, remove accumulated sediments and trash using a sewer jet. All material removed from the system shall be disposed of in accordance with all applicable regulations.



Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan

Elm Street and Rustcraft Road

Dedham, MA

- **Water Quality (Grass) Swales:** The water quality swales shall be inspected annually. Debris, trash, and accumulated sediment shall be removed. They shall be mowed as necessary to maintain grass height between 3 and 6 inches. Dispose of all material removed in accordance with applicable local, state, and federal guidelines and regulations.
- **Infiltration Basin with Sediment Forebay:** The sediment forebay shall be inspected periodically and after heavy rainfall for sedimentation and erosion. Debris, trash, and accumulated sediment shall be removed on an annual basis. If the sediment forebay is found to be greater than 50% full it must be inspected and cleaned every six months. Dispose of all material removed in accordance with applicable local, state, and federal guidelines and regulations. Following sediment removal, replace any vegetation damaged during the clean-out process. Areas affected by erosion in the infiltration basin and/or sediment forebay shall be repaired as required

Public Safety and Features

1. Provide police detail for extended occupation of roadway if traffic dictates.
2. All excavations and entry into closed structures will be completed in accordance with OSHA requirements.

Approximate Maintenance Budget

Inspection and maintenance for this site is estimated as follows.

1. Street Sweeping	part of Town-wide budget
2. Deep Sump Catchbasins	part of Town-wide budget
3. Subsurface Detention Systems	\$500
4. Water Quality Swales	\$500
5. Infiltration Basin with Sediment Forebay	\$200
Annual Total	\$1,200

Long Term Operations & Maintenance Plan

Elm Street and Rustcraft Road

Dedham, MA

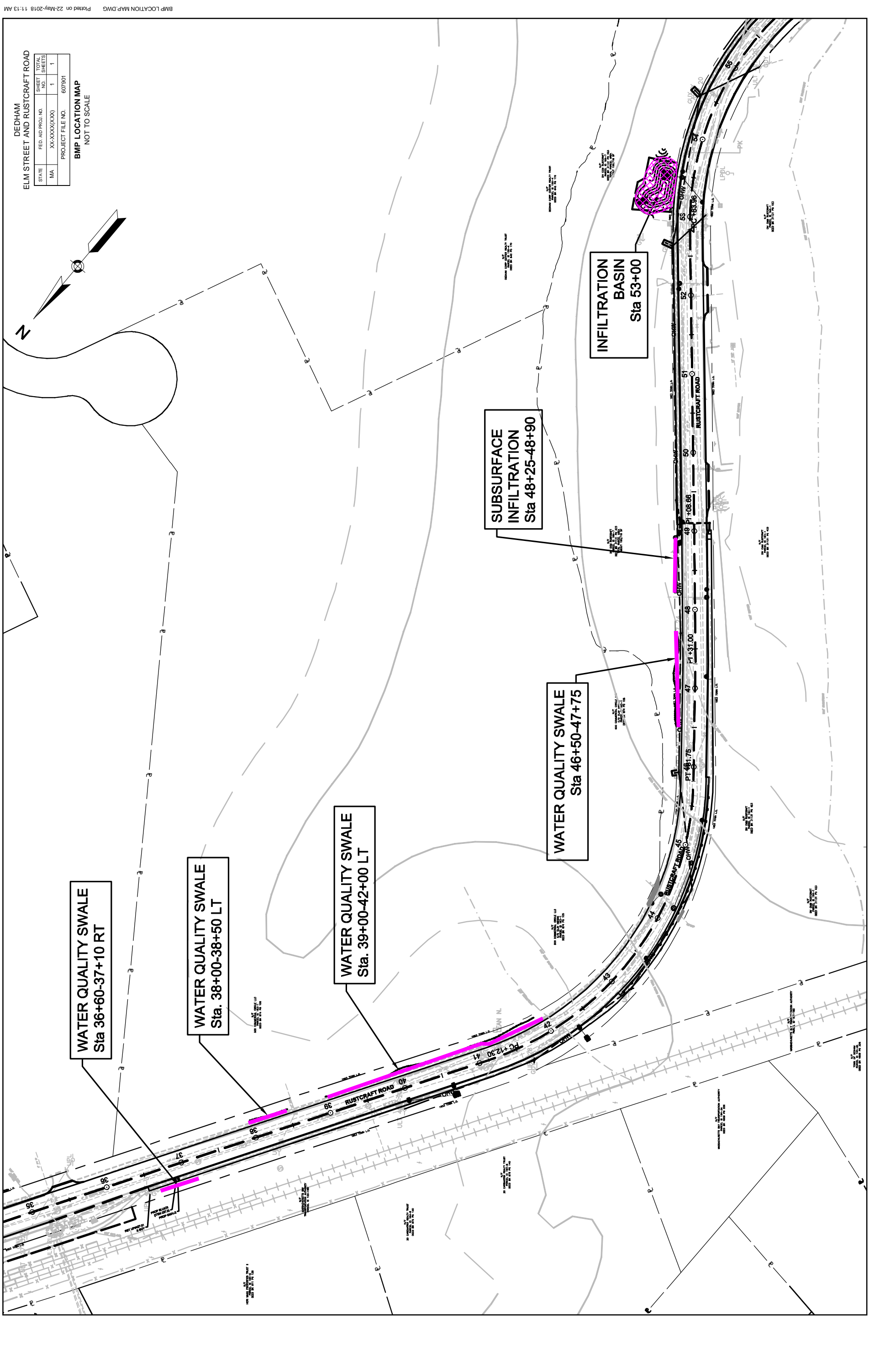
BMP Inspection and Maintenance Documentation Form

Inspection No.: _____ Date: _____ Weather: _____

Date & Amount of Last Precipitation Event: _____

Inspector Name: _____ Inspection Signature: _____

BMP	Condition/Stability	Comment & Recommendations	Date Corrected
Street Sweeping			
Catchbasins			
Subsurface Detention Systems			
Water Quality Swales			
Infiltration Basin with Sediment Forebay			
Other			
Additional Comments			



DEDHAM
ELM STREET AND RUSTCRAFT ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XX-XXXX(XXX)	1	1

PROJECT FILE NO. 607901

BMP LOCATION MAP
NOT TO SCALE

WATER QUALITY SWALE
Sta 36+60-37+10 RT

WATER QUALITY SWALE
Sta. 38+00-38+50 LT

WATER QUALITY SWALE
Sta. 39+00-42+00 LT

WATER QUALITY SWALE
Sta 46+50-47+75

SUBSURFACE INFILTRATION
Sta 48+25-48+90

INFILTRATION BASIN
Sta 53+00

APPENDIX E – SUPPLEMENTAL CALCULATIONS

Outfall Velocities						
Outfall No.	Existing/Proposed	Station	Size/Material	25-Year Flow	25-Year Velocity	Note
OF-1	Existing	STA 16+45 LT	12" CPP	N/A	N/A	
OF-2	Proposed	STA 36+88 RT	Sluice	1.73	1.41	Equivalent diameter to sluice is 15 inch RCP
OF-3	Existing	STA 38+53 LT	12" RCP	N/A	N/A	
OF-4	Proposed	STA 40+50 RT	10" DIP	0.31	0.57	
OF-5	Proposed	STA 40+55 RT	10" DIP	0.22	0.40	
OF-6	Proposed	STA 42+28 RT	10" DIP	0.12	0.22	
OF-7	Existing	STA 44+15 RT	18" RCP	N/A	N/A	
OF-8	Existing	STA 44+30 LT	30" RCP	N/A	N/A	
OF-9	Existing	STA 48+14 LT	12" RCP	N/A	N/A	
OF-10	Existing	STA 52+14 LT	12" RCP	N/A	N/A	
OF-11	Proposed	STA 53+20 LT	Riprap Overflow	2.31	1.7	From HydroCAD



JOB Elm & Rustcraft Road, Dedham
 CALC CRL
 CHKD MC
 DESC Sizing Calculations

NO. 4816
 DATE 05/24/18
 DATE
 SHEET 1 OF 1

ACB-2 (Outfall 4)
 Rational Method for Catchment Area
 $Q=C*i*A$
 $C=0.9, A=0.0583, i=6.0 \text{ in/hr (25-year storm)}$
 $Q=0.9*6.0*0.0583$
Q=0.31 cubic feet per second Peak Flow

Mannings Formula

$$Q = VA = (1.49/n)(A)(r_H)^{2/3}(S)^{1/2}$$

n = roughness coefficient

A = cross section area

S = slope

r_H = hydraulic radius = A/P

P = wetted perimeter

Mannings Formula

$$Q=VA=(1.49/n)(A)(r_H)^{2/3}(S)^{1/2}$$

n = 0.013

A = 0.79 sf.

S = 0.0235 ft/ft

12 in RCP

r_H 0.25

P 3.14

$$Q_{FULL} = 5.48 \text{ cfs}$$

$$V_{FULL} = 6.9727408$$

5.48 cfs > 0.31 cfs (OK)



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ACB-3 (Outfall 5)
 Rational Method for Catchment Area
 $Q=C*i*A$
 $C=0.9, A=0.0404, i=6.0 \text{ in/hr (25-year storm)}$
 $Q=0.9*6.0*0.0404$
Q=0.22 cubic feet per second Peak Flow

Mannings Formula

$$Q = VA = (1.49/n)(A)(r_H)^{2/3}(S)^{1/2}$$

n = roughness coefficient

A = cross section area

S = slope

r_H = hydraulic radius = A/P

P = wetted perimeter

Mannings Formula

$$Q=VA=(1.49/n)(A)(r_H)^{2/3}(S)^{1/2}$$

n = 0.013

A = 0.79 sf.

S = 0.0183 ft/ft

12 in RCP

r_H 0.25

P 3.14

$$Q_{FULL} = 4.83 \text{ cfs}$$

$$V_{FULL} = 6.1531164$$

4.83 cfs > 0.22 cfs (OK)



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 CALC CRL
 CHKD MC
 DESC Sizing Calculations

NO. 4816
 DATE 05/24/18
 DATE
 SHEET 1 OF 1

ACB-4 (Outfall 6)
 Rational Method for Catchment Area
 $Q=C*i*A$
 $C=0.9, A=0.0229, i=6.0 \text{ in/hr (25-year storm)}$
 $Q=0.9*6.0*0.0229$
0.12 cubic feet per second Peak Flow

Mannings Formula

$$Q = VA = (1.49/n)(A)(r_H)^{2/3}(S)^{1/2}$$

n = roughness coefficient

A = cross section area

S = slope

r_H = hydraulic radius = A/P

P = wetted perimeter

Mannings Formula

$$Q=VA=(1.49/n)(A)(r_H)^{2/3}(S)^{1/2}$$

n = 0.013

A = 0.79 sf.

S = 0.0090 ft/ft

12 in RCP

r_H 0.25

P 3.14

$$Q_{FULL} = 3.39 \text{ cfs}$$

$$V_{FULL} = 4.3150998$$

3.39 cfs > 0.12 cfs (OK)



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 CHKD MC
 DESC Sizing Calculations

NO. 4816
 DATE 05/24/18
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CBCI-20
 Rational Method for Catchment Area
 $Q=C*i*A$
 $C=0.9, A=0.163, i=6.0 \text{ in/hr (25-year storm)}$
 $Q=0.9*6.0*0.163$
 $Q=0.88 \text{ cubic feet per second Peak Flow}$

Mannings Formula

$$Q = VA = (1.49/n)(A)(r_H)^{2/3}(S)^{1/2}$$

n = roughness coefficient

A = cross section area

S = slope

r_H = hydraulic radius = A/P

P = wetted perimeter

Mannings Formula

$$Q=VA=(1.49/n)(A)(r_H)^{2/3}(S)^{1/2}$$

n = 0.013

A = 0.79 sf.

S = 0.0130 ft/ft

12 in RCP

r_H 0.25

P 3.14

$$Q_{FULL} = 4.07 \text{ cfs}$$

$$V_{FULL} = 5.1861045$$

4.07 cfs > 0.88 cfs (OK)



JOB Elm & Rustcraft Road, Dedham
 CALC CRL
 CHKD MC
 DESC Sizing Calculations

NO. 4816
 DATE 05/24/18
 DATE
 SHEET 1 OF 1

CBCI-21
 Rational Method for Catchment Area
 $Q=C*i*A$
 $C=0.9, A=0.032, i=6.0 \text{ in/hr (25-year storm)}$
 $Q=0.9*6.0*0.032$
Q=0.17 cubic feet per second Peak Flow

Mannings Formula

$$Q = VA = (1.49/n)(A)(r_H)^{2/3}(S)^{1/2}$$

n = roughness coefficient

A = cross section area

S = slope

r_H = hydraulic radius = A/P

P = wetted perimeter

Mannings Formula

$$Q=VA=(1.49/n)(A)(r_H)^{2/3}(S)^{1/2}$$

n = 0.013

A = 0.79 sf.

S = 0.0812 ft/ft

12 in RCP

r_H 0.25

P 3.14

$$Q_{FULL} = 10.18 \text{ cfs}$$

$$V_{FULL} = 12.961271$$

10.18 cfs > 0.17 cfs (OK)



JOB Elm & Rustcraft Road, Dedham
 CALC CRL
 CHKD MC
 DESC Sizing Calculations

NO. 4816
 DATE 05/24/18
 DATE
 SHEET 1 OF 1

DMH-16
 Rational Method for Catchment Area
 $Q=C*i*A$
 $C=0.9, A=0.195, i=6.0 \text{ in/hr (25-year storm)}$
 $Q=0.9*6.0*0.195$
Q=1.05 cubic feet per second Peak Flow

Mannings Formula

$$Q = VA = (1.49/n)(A)(r_H)^{2/3}(S)^{1/2}$$

n = roughness coefficient

A = cross section area

S = slope

r_H = hydraulic radius = A/P

P = wetted perimeter

Mannings Formula

$$Q=VA=(1.49/n)(A)(r_H)^{2/3}(S)^{1/2}$$

n = 0.013

A = 0.79 sf.

S = 0.0058 ft/ft

12 in RCP

r_H 0.25

P 3.14

$$Q_{FULL} = 2.72 \text{ cfs}$$

$$V_{FULL} = 3.4640455$$

2.72 cfs > 1.05 cfs (OK)



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 DESC Riprap Calculations

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Riprap Apron Design - using highest calculated flow rate at sediment forebay

Riprap Stone Size

$$D_{50} = 0.2D(Q/g)^{1/2}(D)^{2.5}{}^{4/3}(D/TW)$$

D_{50} = riprap size (ft)

TW = tailwater (ft) if unknown use 0.4D

Q = design discharge (cfs)

g = acceleration due to gravity (32.2 ft/s²)

D = culvert diameter (ft)

Q = **1.05** cfs

D = **1.0** ft

$D^{2.5} = 1.0$

TW = **0.4** ft

$D/TW = 2.5$

g = 32.2 ft/s²

$g^{1/2} = 5.675$

$D_{50} = 0.05$ ft

0.6 in x

1.5

safety factor =

0.9 in

Approx. Weight = 1.1 Lb

Depth (3.3 D_{50}) = 3 inches

Length (4D) = 4 ft

Width (at pipe) = 3 ft

Width (apron end) = 5.666667 ft

Calculation Equations taken from;

HEC14 - Hydraulic Design for Energy Dissipators for Culverts and Channels



JOB Elm & Rustcraft Road, Dedham
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 DESC Riprap Calculations

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Riprap Apron Design For Sluice Structure

Rational Method for Catchment Area

$Q=C*i*A$

C=0.9, A=0.3207, i=6.0 in/hr (25-year storm)

$Q=0.9*6.0*0.3207$

Q=1.73 cubic feet per second Peak Flow

Riprap Stone Size

$D_{50} = 0.2D(Q/g)^{1/2}(D)^{2.5})^{4/3}(D/TW)$

D_{50} = riprap size (ft)

TW = tailwater (ft) if unknown use 0.4D

Q = design discharge (cfs)

g = acceleration due to gravity (32.2 ft/s²)

D = culvert diameter (ft)

Q = **1.73** cfs

D = **1.0** ft

$D^{2.5} = 1.0$

TW = **0.4** ft

$D/TW = 2.5$

g = 32.2 ft/s²

$g^{1/2} = 5.675$

$D_{50} = 0.09$ ft

1.0 in x

1.5

safety factor =

1.5 in

Approx. Weight = 2.9 Lb

Depth (3.3 D_{50}) = 5 inches

Length (4D) = 4 ft

Width (at pipe) = 3 ft

Width (apron end) = 5.6666667 ft

Calculation Equations taken from;

HEC14 - Hydraulic Design for Energy Dissipators for Culverts and Channels



**Total Suspended Solids (TSS)
 Removal Rate Worksheet
 Elm Street/Rustcraft Road
 Dedham, MA**

Deep Sump Catchbasins (Treats 40,135* sq. ft. of impervious)

*excludes deep sump catchbasins that are part of other treatment trains

Best Management Practice (BMP)	BMP Removal Rate	Remaining TSS	Cumulative Removal Rate
Untreated Runoff	0%	100%	0%
Deep Sump Catchbasins	25%	75%	25%



**Total Suspended Solids (TSS)
 Removal Rate Worksheet
 Elm Street/Rustcraft Road
 Dedham, MA**

Infiltration/Water Quality Swales (Treats 32,292 sq. ft. of impervious)

Best Management Practice (BMP)	BMP Removal Rate	Remaining TSS	Cumulative Removal Rate
Untreated Runoff	0%	100%	0%
Street Sweeping	0%	100%	0%
Water Quality/Infiltration Swale	70%	30%	70%



**Total Suspended Solids (TSS)
 Removal Rate Worksheet
 Elm Street/Rustcraft Road
 Dedham, MA**

Subsurface Infiltration System (Treats 2500 sq. ft. of impervious)

Best Management Practice (BMP)	BMP Removal Rate	Remaining TSS	Cumulative Removal Rate
Untreated Runoff	0%	100%	0%
Deep Sump Catch Basin	0%	100%	0%
Isolator Row	0%	100%	0%
Subsurface Infiltration System	80%	20%	80%



**Total Suspended Solids (TSS)
 Removal Rate Worksheet
 Elm Street/Rustcraft Road
 Dedham, MA**

Infiltration Basin (Treats 10,023 sq. ft. of impervious)

Best Management Practice (BMP)	BMP Removal Rate	Remaining TSS	Cumulative Removal Rate
Untreated Runoff	0%	100%	0%
Deep Sump Catch Basin	0%	100%	0%
Sediment Forebay	0%	100%	0%
Infiltration Basin	80%	20%	80%

**Total Suspended Solids (TSS)
 Removal Rate Worksheet
 Elm Street/Rustcraft Road
 Dedham, MA**

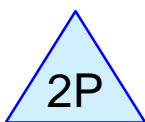
Project Wide Totals

	A	B	AxB
Best Management Practice (BMP)	BMP Removal Rate	Treatment Area (sq. ft.)	
Untreated Runoff	0%	145,190	0
Deep Sump Catchbasins	25%	40,135	10,034
Water Quality/Infiltration Swales	70%	32,292	22,604
Subsurface Infiltration Systems	80%	2,500	2,000
Infiltration Basin	80%	10,023	8,018

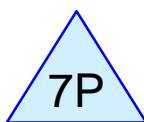
Totals = 230,140 42,657

Project Wide TSS Removal Rate **18.5%**

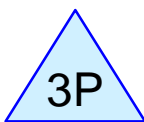
Equivalent Area for 80% TSS Removal Rate (sq. ft.) **53,321**



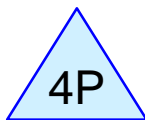
Subsurface Recharge
48+50 LT



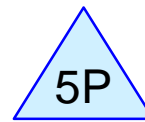
Infiltratio Basin 53+00
LT



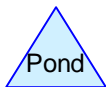
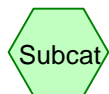
Infiltration Swale 38+00
- 38+50 LT



Infiltration Swale 39+00
- 42+00 LT



Infiltration Swale 46+50
- 47+75 LT



Drainage Diagram for Elm St. - Rustcraft Recharge Calculations - 2018
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Elm St. - Rustcraft Recharge Calculations - 2018

Type III 24-hr 100-yr Rainfall=8.50"

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Page 2

Pond 2P: Subsurface Recharge 48+50 LT - Chamber Wizard Field A

Chamber Model = StormTech SC-310

Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf

Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap

34.0" Wide + 0.0" Spacing = 34.0" C-C

9 Chambers/Row x 7.12' Long = 64.08' + 6.0" End Stone x 2 = 65.08' Base Length

1 Rows x 34.0" Wide + 6.0" Side Stone x 2 = 3.83' Base Width

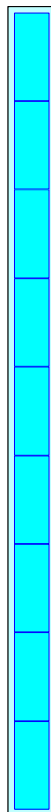
6.0" Base + 16.0" Chamber Height + 6.0" Cover = 2.33' Field Height

9 Chambers x 14.7 cf = 132.7 cf Chamber Storage

582.1 cf Field - 132.7 cf Chambers = 449.4 cf Stone x 40.0% Voids = 179.8 cf Stone Storage

Stone + Chamber Storage = 312.4 cf = 0.007 af

- 9 Chambers
- 21.6 cy Field
- 16.6 cy Stone



Elm St. - Rustcraft Recharge Calculations - 2018

Type III 24-hr 100-yr Rainfall=8.50"

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Page 3

Stage-Area-Storage for Pond 2P: Subsurface Recharge 48+50 LT

Elevation (feet)	Storage (acre-feet)	Elevation (feet)	Storage (acre-feet)	Elevation (feet)	Storage (acre-feet)
100.00	0.000	101.08	0.004	102.16	0.007
100.02	0.000	101.10	0.004	102.18	0.007
100.04	0.000	101.12	0.004	102.20	0.007
100.06	0.000	101.14	0.004	102.22	0.007
100.08	0.000	101.16	0.004	102.24	0.007
100.10	0.000	101.18	0.004	102.26	0.007
100.12	0.000	101.20	0.004	102.28	0.007
100.14	0.000	101.22	0.004	102.30	0.007
100.16	0.000	101.24	0.004	102.32	0.007
100.18	0.000	101.26	0.004		
100.20	0.000	101.28	0.004		
100.22	0.001	101.30	0.004		
100.24	0.001	101.32	0.005		
100.26	0.001	101.34	0.005		
100.28	0.001	101.36	0.005		
100.30	0.001	101.38	0.005		
100.32	0.001	101.40	0.005		
100.34	0.001	101.42	0.005		
100.36	0.001	101.44	0.005		
100.38	0.001	101.46	0.005		
100.40	0.001	101.48	0.005		
100.42	0.001	101.50	0.005		
100.44	0.001	101.52	0.005		
100.46	0.001	101.54	0.005		
100.48	0.001	101.56	0.005		
100.50	0.001	101.58	0.005		
100.52	0.001	101.60	0.005		
100.54	0.001	101.62	0.005		
100.56	0.001	101.64	0.006		
100.58	0.001	101.66	0.006		
100.60	0.002	101.68	0.006		
100.62	0.002	101.70	0.006		
100.64	0.002	101.72	0.006		
100.66	0.002	101.74	0.006		
100.68	0.002	101.76	0.006		
100.70	0.002	101.78	0.006		
100.72	0.002	101.80	0.006		
100.74	0.002	101.82	0.006		
100.76	0.002	101.84	0.006		
100.78	0.002	101.86	0.006		
100.80	0.002	101.88	0.006		
100.82	0.003	101.90	0.006		
100.84	0.003	101.92	0.006		
100.86	0.003	101.94	0.006		
100.88	0.003	101.96	0.006		
100.90	0.003	101.98	0.006		
100.92	0.003	102.00	0.006		
100.94	0.003	102.02	0.006		
100.96	0.003	102.04	0.007		
100.98	0.003	102.06	0.007		
101.00	0.003	102.08	0.007		
101.02	0.003	102.10	0.007		
101.04	0.003	102.12	0.007		
101.06	0.004	102.14	0.007		

Elm St. - Rustcraft Recharge Calculations - 2018

Type III 24-hr 100-yr Rainfall=8.50"

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Page 4

Stage-Area-Storage for Pond 3P: Infiltration Swale 38+00 - 38+50 LT

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
100.00	50	0	100.54	50	11
100.01	50	0	100.55	50	11
100.02	50	0	100.56	50	11
100.03	50	1	100.57	50	11
100.04	50	1	100.58	50	12
100.05	50	1	100.59	50	12
100.06	50	1	100.60	50	12
100.07	50	1	100.61	50	12
100.08	50	2	100.62	50	12
100.09	50	2	100.63	50	13
100.10	50	2	100.64	50	13
100.11	50	2	100.65	50	13
100.12	50	2	100.66	50	13
100.13	50	3	100.67	50	13
100.14	50	3	100.68	50	14
100.15	50	3	100.69	50	14
100.16	50	3	100.70	50	14
100.17	50	3	100.71	50	14
100.18	50	4	100.72	50	14
100.19	50	4	100.73	50	15
100.20	50	4	100.74	50	15
100.21	50	4	100.75	50	15
100.22	50	4	100.76	50	15
100.23	50	5	100.77	50	15
100.24	50	5	100.78	50	16
100.25	50	5	100.79	50	16
100.26	50	5	100.80	50	16
100.27	50	5	100.81	50	16
100.28	50	6	100.82	50	16
100.29	50	6	100.83	50	17
100.30	50	6	100.84	50	17
100.31	50	6	100.85	50	17
100.32	50	6	100.86	50	17
100.33	50	7	100.87	50	17
100.34	50	7	100.88	50	18
100.35	50	7	100.89	50	18
100.36	50	7	100.90	50	18
100.37	50	7	100.91	50	18
100.38	50	8	100.92	50	18
100.39	50	8	100.93	50	19
100.40	50	8	100.94	50	19
100.41	50	8	100.95	50	19
100.42	50	8	100.96	50	19
100.43	50	9	100.97	50	19
100.44	50	9	100.98	50	20
100.45	50	9	100.99	50	20
100.46	50	9	101.00	50	20
100.47	50	9			
100.48	50	10			
100.49	50	10			
100.50	50	10			
100.51	50	10			
100.52	50	10			
100.53	50	11			

Storage within Stone

Storage volume above stone (refer the water quality swale detail)
 = $2 \times (1/2 \times 1.5' \times 0.5') + 1' \times 0.5' = 1.25 \text{ cu. ft./ LF of swale.}$

Total Storage = 20 cu. ft. + 1.25 cu. ft./LF x 50' = 82 cu. ft.

Elm St. - Rustcraft Recharge Calculations - 2018

Type III 24-hr 100-yr Rainfall=8.50"

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Page 5

Stage-Area-Storage for Pond 4P: Infiltration Swale 39+00 - 42+00 LT

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
100.00	300	0	100.54	300	65
100.01	300	1	100.55	300	66
100.02	300	2	100.56	300	67
100.03	300	4	100.57	300	68
100.04	300	5	100.58	300	70
100.05	300	6	100.59	300	71
100.06	300	7	100.60	300	72
100.07	300	8	100.61	300	73
100.08	300	10	100.62	300	74
100.09	300	11	100.63	300	76
100.10	300	12	100.64	300	77
100.11	300	13	100.65	300	78
100.12	300	14	100.66	300	79
100.13	300	16	100.67	300	80
100.14	300	17	100.68	300	82
100.15	300	18	100.69	300	83
100.16	300	19	100.70	300	84
100.17	300	20	100.71	300	85
100.18	300	22	100.72	300	86
100.19	300	23	100.73	300	88
100.20	300	24	100.74	300	89
100.21	300	25	100.75	300	90
100.22	300	26	100.76	300	91
100.23	300	28	100.77	300	92
100.24	300	29	100.78	300	94
100.25	300	30	100.79	300	95
100.26	300	31	100.80	300	96
100.27	300	32	100.81	300	97
100.28	300	34	100.82	300	98
100.29	300	35	100.83	300	100
100.30	300	36	100.84	300	101
100.31	300	37	100.85	300	102
100.32	300	38	100.86	300	103
100.33	300	40	100.87	300	104
100.34	300	41	100.88	300	106
100.35	300	42	100.89	300	107
100.36	300	43	100.90	300	108
100.37	300	44	100.91	300	109
100.38	300	46	100.92	300	110
100.39	300	47	100.93	300	112
100.40	300	48	100.94	300	113
100.41	300	49	100.95	300	114
100.42	300	50	100.96	300	115
100.43	300	52	100.97	300	116
100.44	300	53	100.98	300	118
100.45	300	54	100.99	300	119
100.46	300	55	101.00	300	120
100.47	300	56			
100.48	300	58			
100.49	300	59			
100.50	300	60			
100.51	300	61			
100.52	300	62			
100.53	300	64			

Storage within Stone

Storage volume above stone (refer the water quality swale detail)
 $= 2 \times (1/2 \times 1.5' \times 0.5') + 1' \times 0.5' = 1.25 \text{ cu. ft./ LF of swale.}$

Total Storage = 120 cu. ft. + 1.25 cu. ft./LF x 300' = 495 cu. ft.

Elm St. - Rustcraft Recharge Calculations - 2018

Type III 24-hr 100-yr Rainfall=8.50"

Prepared by {enter your company name here}

Printed 2/2/2018

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Page 6

Stage-Area-Storage for Pond 5P: Infiltration Swale 46+50 - 47+75 LT

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
100.00	125	0	100.54	125	27
100.01	125	1	100.55	125	27
100.02	125	1	100.56	125	28
100.03	125	2	100.57	125	28
100.04	125	2	100.58	125	29
100.05	125	2	100.59	125	30
100.06	125	3	100.60	125	30
100.07	125	3	100.61	125	30
100.08	125	4	100.62	125	31
100.09	125	5	100.63	125	31
100.10	125	5	100.64	125	32
100.11	125	5	100.65	125	33
100.12	125	6	100.66	125	33
100.13	125	6	100.67	125	34
100.14	125	7	100.68	125	34
100.15	125	8	100.69	125	34
100.16	125	8	100.70	125	35
100.17	125	9	100.71	125	35
100.18	125	9	100.72	125	36
100.19	125	9	100.73	125	37
100.20	125	10	100.74	125	37
100.21	125	10	100.75	125	38
100.22	125	11	100.76	125	38
100.23	125	12	100.77	125	38
100.24	125	12	100.78	125	39
100.25	125	13	100.79	125	40
100.26	125	13	100.80	125	40
100.27	125	13	100.81	125	41
100.28	125	14	100.82	125	41
100.29	125	15	100.83	125	41
100.30	125	15	100.84	125	42
100.31	125	16	100.85	125	42
100.32	125	16	100.86	125	43
100.33	125	16	100.87	125	44
100.34	125	17	100.88	125	44
100.35	125	17	100.89	125	45
100.36	125	18	100.90	125	45
100.37	125	19	100.91	125	45
100.38	125	19	100.92	125	46
100.39	125	20	100.93	125	47
100.40	125	20	100.94	125	47
100.41	125	20	100.95	125	48
100.42	125	21	100.96	125	48
100.43	125	22	100.97	125	48
100.44	125	22	100.98	125	49
100.45	125	23	100.99	125	49
100.46	125	23	101.00	125	50
100.47	125	23			
100.48	125	24			
100.49	125	24			
100.50	125	25			
100.51	125	26			
100.52	125	26			
100.53	125	27			

Storage within Stone

Storage volume above stone (refer the water quality swale detail)
 $= 2 \times (1/2 \times 1.5' \times 0.5') + 1' \times 0.5' = 1.25 \text{ cu. ft./ LF of swale.}$

Total Storage = 50 cu. ft. + 1.25 cu. ft./LF x 125' = 206 cu. ft.

Elm St. - Rustcraft Recharge Calculations - 2018

Type III 24-hr 100-yr Rainfall=8.50"

Prepared by {enter your company name here}

Printed 2/2/2018

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Page 7

Stage-Area-Storage for Pond 7P: Infiltratio Basin 53+00 LT

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
95.00	281	0	97.70	1,290	2,050
95.05	296	21	97.75	1,312	2,110
95.10	311	43	97.80	1,334	2,170
95.15	326	64	97.85	1,357	2,230
95.20	340	86	97.90	1,379	2,290
95.25	355	107	97.95	1,401	2,350
95.30	370	129	98.00	1,423	2,410
95.35	385	150			
95.40	400	172			
95.45	415	193			
95.50	430	215			
95.55	444	236			
95.60	459	258			
95.65	474	279			
95.70	489	301			
95.75	504	322			
95.80	519	344			
95.85	533	365			
95.90	548	387			
95.95	563	408			
96.00	578	430			
96.05	598	468			
96.10	618	507			
96.15	638	546			
96.20	658	585			
96.25	679	624			
96.30	699	663			
96.35	719	702			
96.40	739	741			
96.45	759	780			
96.50	779	819			
96.55	799	858			
96.60	819	897			
96.65	839	936			
96.70	859	975			
96.75	880	1,014			
96.80	900	1,053			
96.85	920	1,092			
96.90	940	1,131			
96.95	960	1,170			
97.00	980	1,209			
97.05	1,002	1,269			
97.10	1,024	1,329			
97.15	1,046	1,389			
97.20	1,069	1,449			
97.25	1,091	1,509			
97.30	1,113	1,569			
97.35	1,135	1,629			
97.40	1,157	1,689			
97.45	1,179	1,749			
97.50	1,202	1,809			
97.55	1,224	1,869			
97.60	1,246	1,929			
97.65	1,268	1,989			

Storage below overflow elevation



Infiltration BMP Drawdown Calculation Worksheet

BMP: Infiltration Basin 53+00 LT			
Rv (cu. ft.) =	1,809	Drawdown (hrs) =	34.7
K (in/hr) =	0.52		
Bottom Area (sq. ft.) =	1,202	Less than 72 hrs?	PASS

BMP: Subsurface Recharge 48+50 LT			
Rv (cu. ft.) =	313	Drawdown (hrs) =	29.0
K (in/hr) =	0.52		
Bottom Area (sq. ft.) =	249	Less than 72 hrs?	PASS

BMP: Infiltration Swale (Typ. 100' section)			
Rv (cu. ft.) =	40	Drawdown (hrs) =	53.3
K (in/hr) =	0.09		
Bottom Area (sq. ft.) =	100	Less than 72 hrs?	PASS

BMP:			
Rv (cu. ft.) =		Drawdown (hrs) =	
K (in/hr) =			
Bottom Area (sq. ft.) =		Less than 72 hrs?	FAIL

To determine whether an infiltration BMP will drain within 72 hours, the following formula must be used²¹:

$$Time_{drawdown} = \frac{Rv}{(K)(Bottom\ Area)}$$

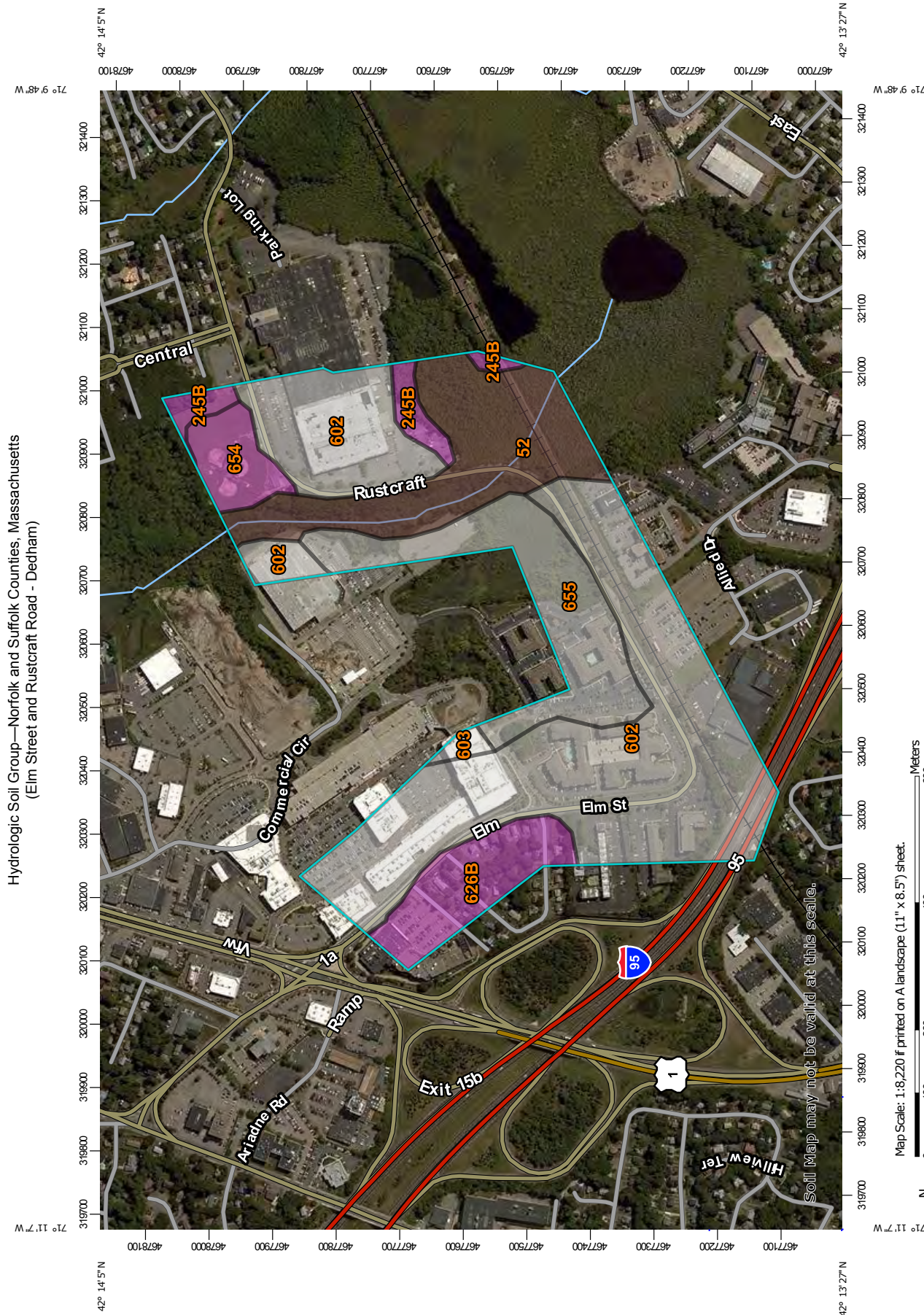
Where:

Rv = Storage Volume

K = Saturated Hydraulic Conductivity For "Static" and "Simple Dynamic" Methods, use Rawls Rate (see Table 2.3.3). For "Dynamic Field" Method, use 50% of the in-situ saturated hydraulic conductivity.

Bottom Area = Bottom Area of Recharge Structure²²

APPENDIX F – SUPPLEMENTAL MAPS



MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:25,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

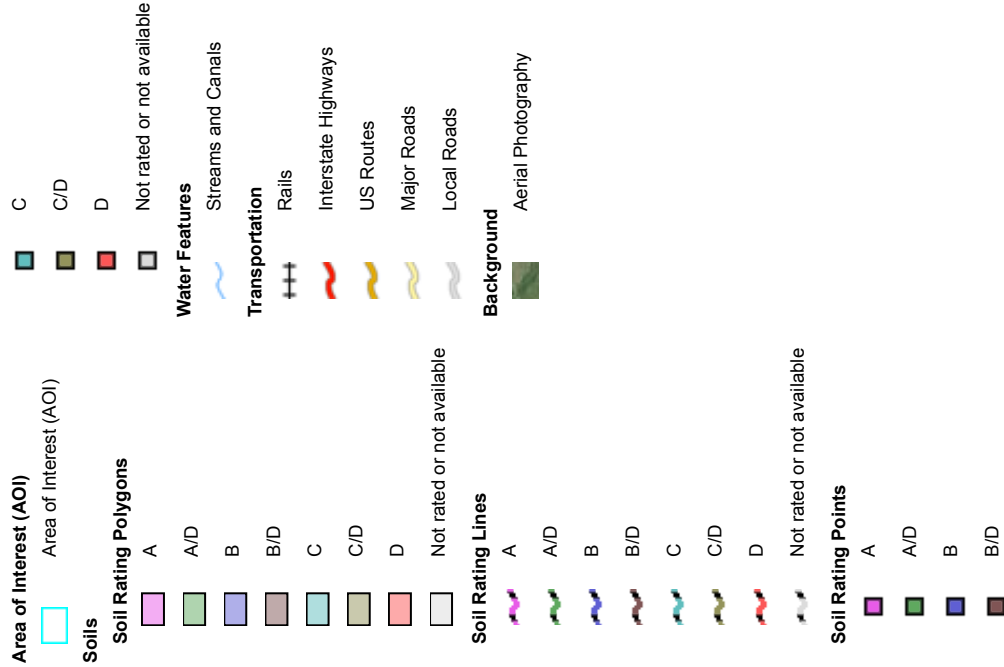
Soil Survey Area: Norfolk and Suffolk Counties, Massachusetts
Survey Area Data: Version 13, Oct 6, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 10, 2014—Aug 25, 2014

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

MAP LEGEND



Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
52	Freetown muck, 0 to 1 percent slopes	B/D	17.7	16.9%
245B	Hinckley loamy sand, 3 to 8 percent slopes	A	3.3	3.1%
602	Urban land, 0 to 15 percent slopes		55.3	52.7%
603	Urban land, wet substratum, 0 to 3 percent slopes		0.8	0.7%
626B	Merrimac-Urban land complex, 0 to 8 percent slopes	A	8.3	7.9%
654	Udorthents, loamy	A	4.3	4.1%
655	Udorthents, wet substratum		15.2	14.5%
Totals for Area of Interest			104.9	100.0%

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

APPENDIX G – REDEVELOPMENT QUALIFICATION



Under the Massachusetts Stormwater Management Standards (Standards) Redevelopment is defined (Vol. 1 Ch. 1 pp. 20-21) to include:

- Maintenance and improvement of existing roadways, including widening less than a single lane, adding shoulders, correcting substandard intersections, improving existing drainage systems, and repaving;
- Development rehabilitation, expansion and phased projects on previously developed sites, provided the redevelopment results in no net increase in impervious area; and
- Remedial projects specifically designed to provide improved stormwater management, such as projects to separate storm drains and sanitary sewers, and stormwater retrofit projects.

Although the Standards do not specifically address sidewalks as they relate to Redevelopment, a roadway cross-section is traditionally defined to include not only the travel lanes and shoulders, but also adjacent sidewalks. The addition of sidewalks is considered an improvement to a roadway from both an engineering and safety standpoint, and additional impervious areas associated with sidewalks causes no more impact than the addition of shoulders; therefore, it is reasonable to interpret that the addition of sidewalks along a roadway falls within the definition of a Redevelopment. In support of this presumption, 310 CMR 10.05(6)(m) states:

“The Stormwater Management Standards shall apply to the maximum extent practicable to the following: ...6. Footpaths bikepaths and other paths for pedestrian and/or nonmotorized vehicle access.”

The Standards further state (Vol. 1 Ch. 1 pp. 21-22) that “The portion of a property that is currently undeveloped is not a redevelopment and thus does not fall under Standard 7” (i.e. additional impervious surfaces must fully comply with the Standards). The Redevelopment Checklist (Vol. 2 Ch. 3 pg. 3) gives additional guidance for determining the classification of a project and includes the following:

Is the project a redevelopment project?

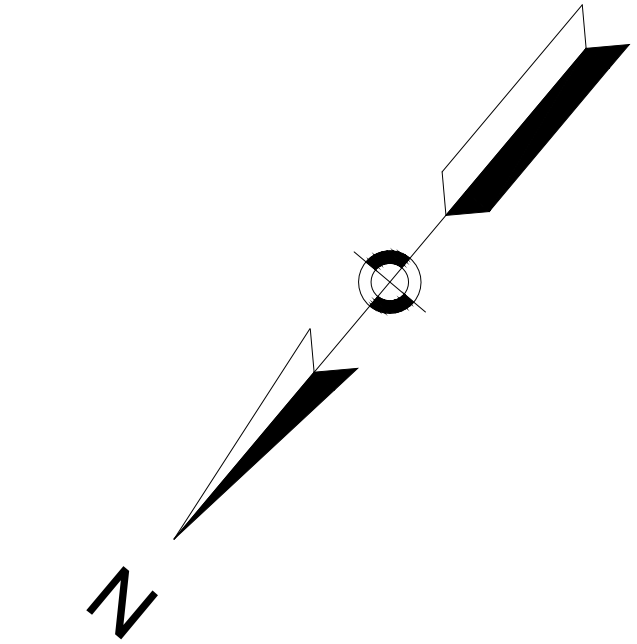
- Maintenance and improvement of existing roadways
- Development of rehabilitation, expansion or phased project on redeveloped site, or
- Remedial stormwater project

For **non-roadway** projects, is any portion of the project outside the definition of redevelopment?

- Development of previously undeveloped area
- Increase in impervious surface

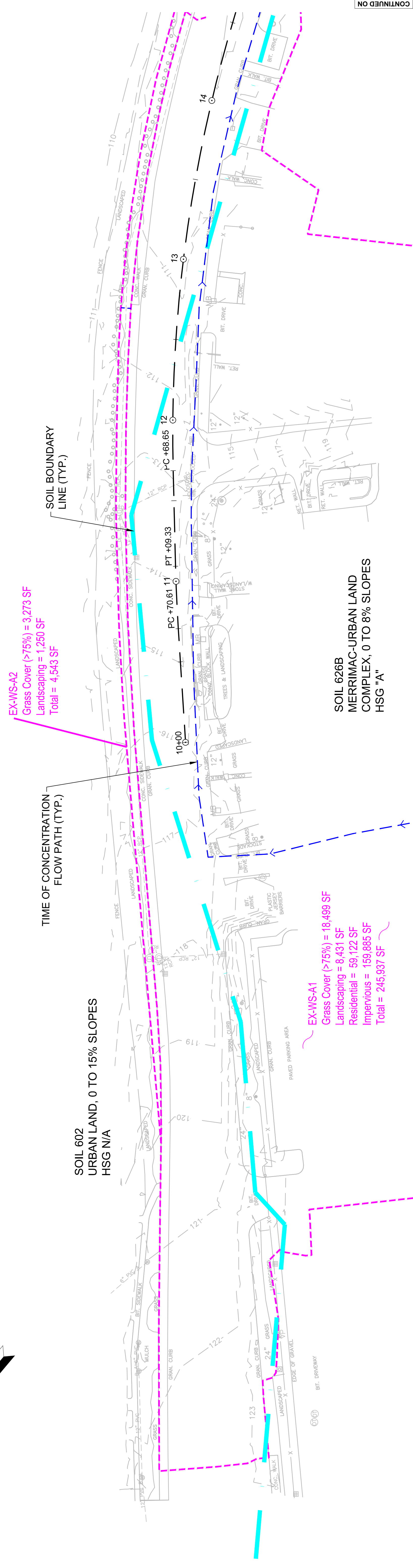
Since increases in impervious areas are noted to be outside the definition of redevelopment only for non-roadway projects, it is reasonable to interpret that roadway projects may have an increase in impervious area and still be fully considered a Redevelopment. Notwithstanding the above, the Standards are clear that although some relief is granted to a project falling under the definition of a Redevelopment, the project must still improve existing conditions and meet the Standards to the maximum extent practicable.

APPENDIX H – WATERSHED PLANS



DEDHAM
ELM STREET AND RUSTCRAFT ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XX-XXXXXXX	6	6
PROJECT FILE NO. 607901		STORMWATER WATERSHED MAPS	



OVERALL WATERSHED C - EXISTING CONDITIONS
 Grass Cover (>75%) = 3,410 SF
 Brush = 3,081 SF
 Grass/Woods Combo = 3,400 SF
 Impervious = 11,406 SF
 Total = 21,297 SF

OVERALL WATERSHED B - EXISTING CONDITIONS
 Grass Cover (>75%) = 41,998 SF
 Brush = 3,826 SF
 Grass/Woods Combo = 35,107 SF
 Landscaping = 2,594 SF
 Impervious = 114,199 SF
 Total = 197,724 SF

OVERALL WATERSHED A - EXISTING CONDITIONS
 Grass Cover (>75%) = 26,948 SF
 Landscaping = 10,101 SF
 Residential = 59,122 SF
 Impervious = 160,358 SF
 Total = 256,529 SF

EX-WS-A2
 Grass Cover (>75%) = 3,273 SF
 Landscaping = 1,250 SF
 Total = 4,543 SF

EX-WS-A1
 Grass Cover (>75%) = 18,499 SF
 Landscaping = 8,431 SF
 Residential = 59,122 SF
 Impervious = 159,885 SF
 Total = 245,937 SF

SOIL BOUNDARY LINE (TYP.)

TIME OF CONCENTRATION FLOW PATH (TYP.)

SOIL 602
URBAN LAND, 0 TO 15% SLOPES
HSG N/A

SOIL 626B
MERRIMAC-URBAN LAND
COMPLEX, 0 TO 8% SLOPES
HSG "A"

WATERSHED BOUNDARY (TYP.)

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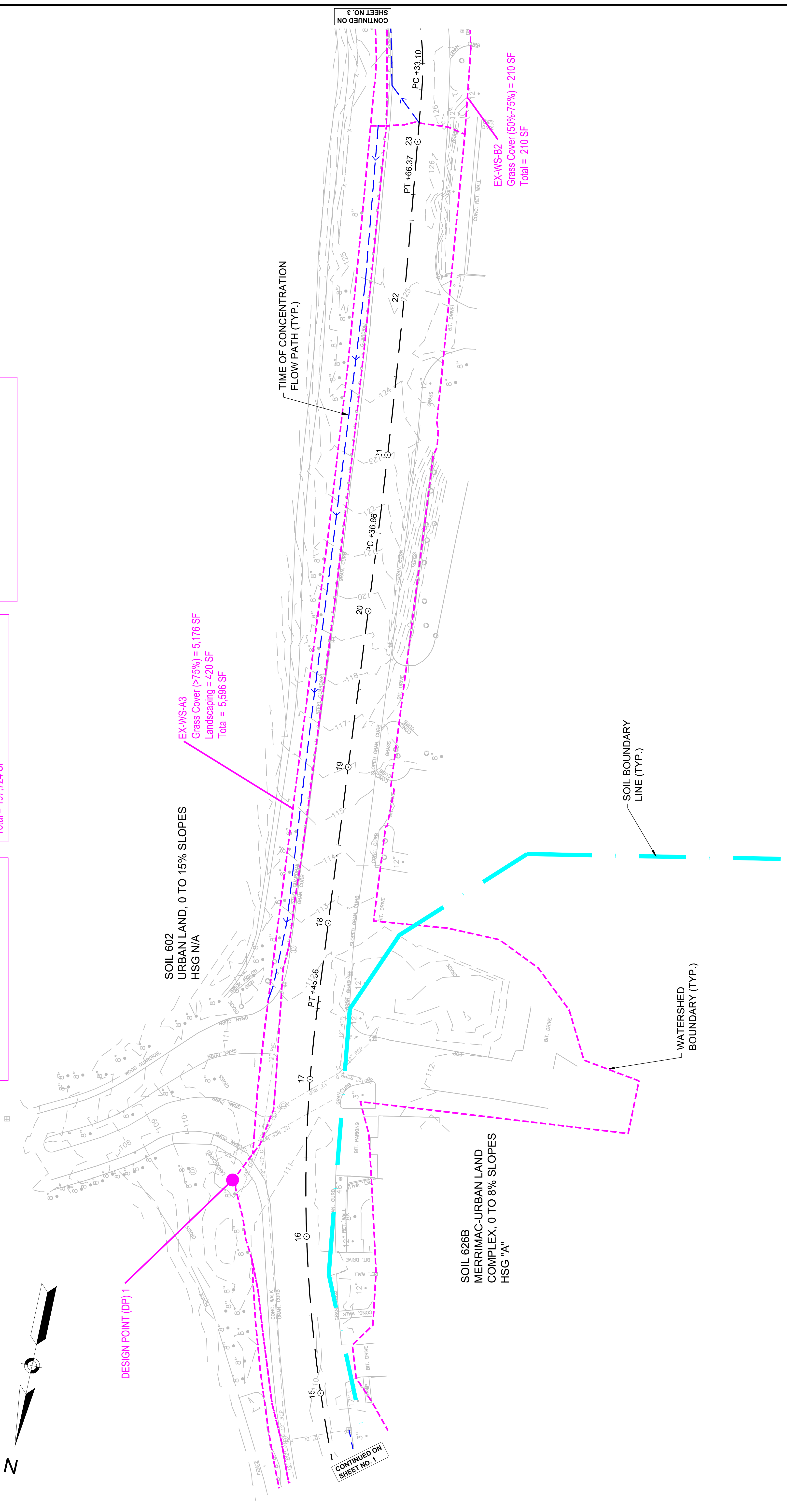
DEDHAM
ELM STREET AND RUSTCRAFT ROAD
STORMWATER WATERSHED MAPS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XX-XXX(XXX)	607901	6

OVERALL WATERSHED C - EXISTING CONDITIONS
 Grass Cover (>75%) = 3,410 SF
 Brush = 3,081 SF
 Grass/Woods Combo = 3,400 SF
 Impervious = 11,406 SF
 Total = 21,297 SF

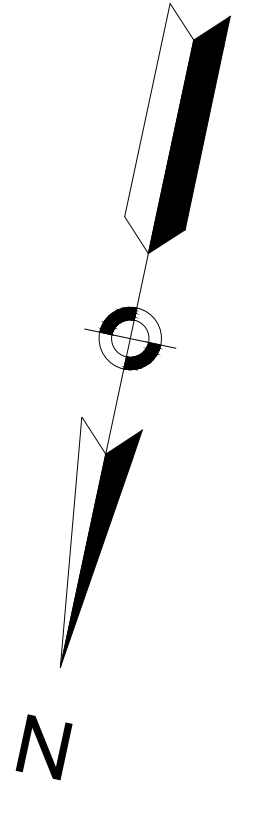
OVERALL WATERSHED B - EXISTING CONDITIONS
 Grass Cover (>75%) = 41,998 SF
 Brush = 3,826 SF
 Grass/Woods Combo = 35,107 SF
 Landscaping = 2,594 SF
 Impervious = 114,199 SF
 Total = 197,724 SF

OVERALL WATERSHED A - EXISTING CONDITIONS
 Grass Cover (>75%) = 26,948 SF
 Landscaping = 10,101 SF
 Residential = 59,122 SF
 Impervious = 160,358 SF
 Total = 256,529 SF



CONTINUED ON SHEET NO. 1

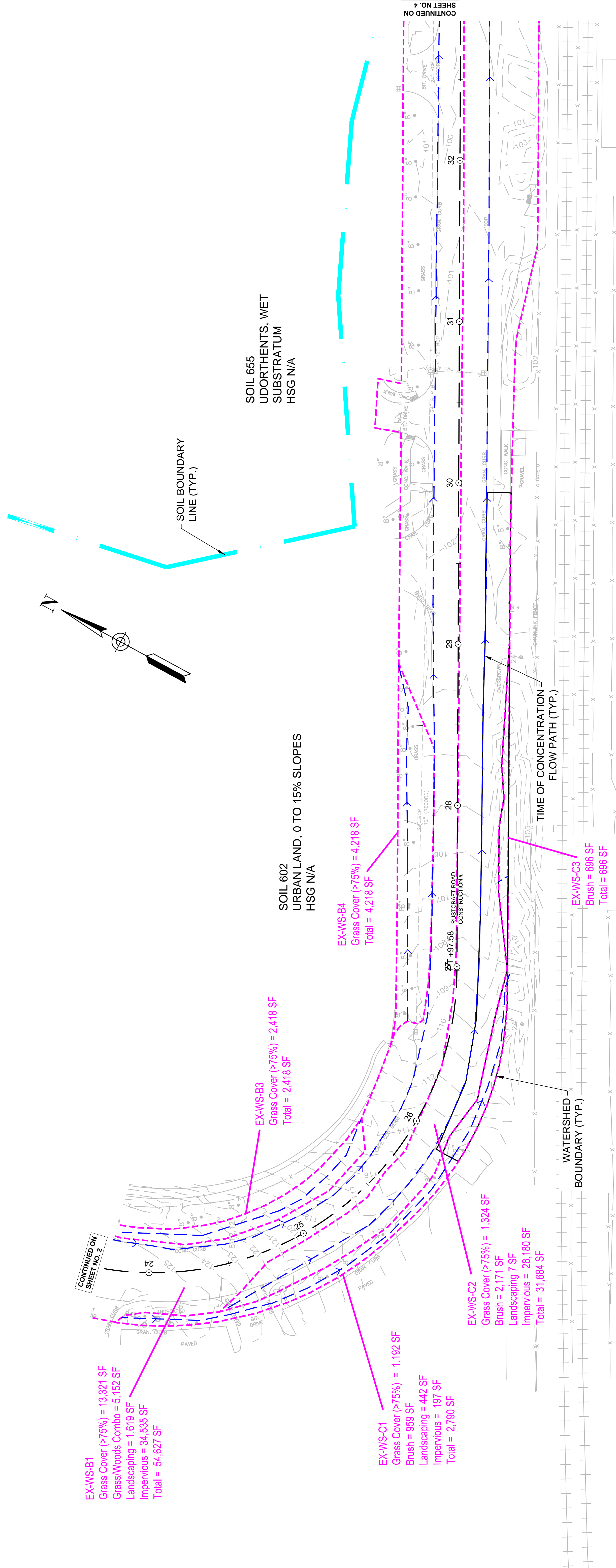
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DEDHAM
ELM STREET AND RUSTCRAFT ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XX-XXX(XXX)	6	6
PROJECT FILE NO.		607901	

STORMWATER WATERSHED MAPS



EX-WS-B1
Grass Cover (>75%) = 13,321 SF
Grass/Woods Combo = 5,152 SF
Landscaping = 1,619 SF
Impervious = 34,535 SF
Total = 54,627 SF

EX-WS-C1
Grass Cover (>75%) = 1,192 SF
Brush = 959 SF
Landscaping = 442 SF
Impervious = 197 SF
Total = 2,790 SF

EX-WS-C2
Grass Cover (>75%) = 1,324 SF
Brush = 2,171 SF
Landscaping / SF
Impervious = 28,180 SF
Total = 31,684 SF

EX-WS-B3
Grass Cover (>75%) = 2,418 SF
Total = 2,418 SF

EX-WS-B4
Grass Cover (>75%) = 4,218 SF
Total = 4,218 SF

EX-WS-C3
Brush = 696 SF
Total = 696 SF

OVERALL WATERSHED A - EXISTING CONDITIONS
Grass Cover (>75%) = 26,948 SF
Landscaping = 10,101 SF
Residential = 59,122 SF
Impervious = 160,358 SF
Total = 256,529 SF

OVERALL WATERSHED B - EXISTING CONDITIONS
Grass Cover (>75%) = 41,998 SF
Brush = 3,826 SF
Grass/Woods Combo = 35,107 SF
Landscaping = 2,594 SF
Impervious = 114,199 SF
Total = 197,724 SF

OVERALL WATERSHED C - EXISTING CONDITIONS
Grass Cover (>75%) = 3,410 SF
Brush = 3,081 SF
Grass/Woods Combo = 3,400 SF
Impervious = 11,406 SF
Total = 21,297 SF

SOIL 602
URBAN LAND, 0 TO 15% SLOPES
HSG N/A

SOIL 655
UDORTHERENTS, WET
SUBSTRATUM
HSG N/A

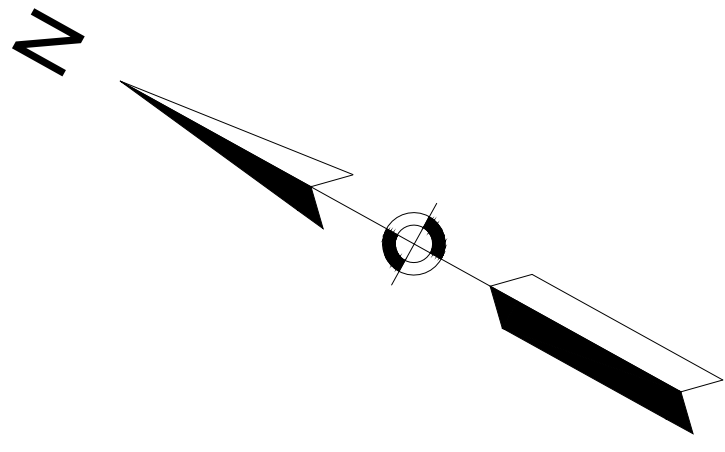
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SHEET NO. 2

DEDHAM
ELM STREET AND RUSTCRAFT ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XX-XXX(XXX)	6	6
PROJECT FILE NO.		607901	

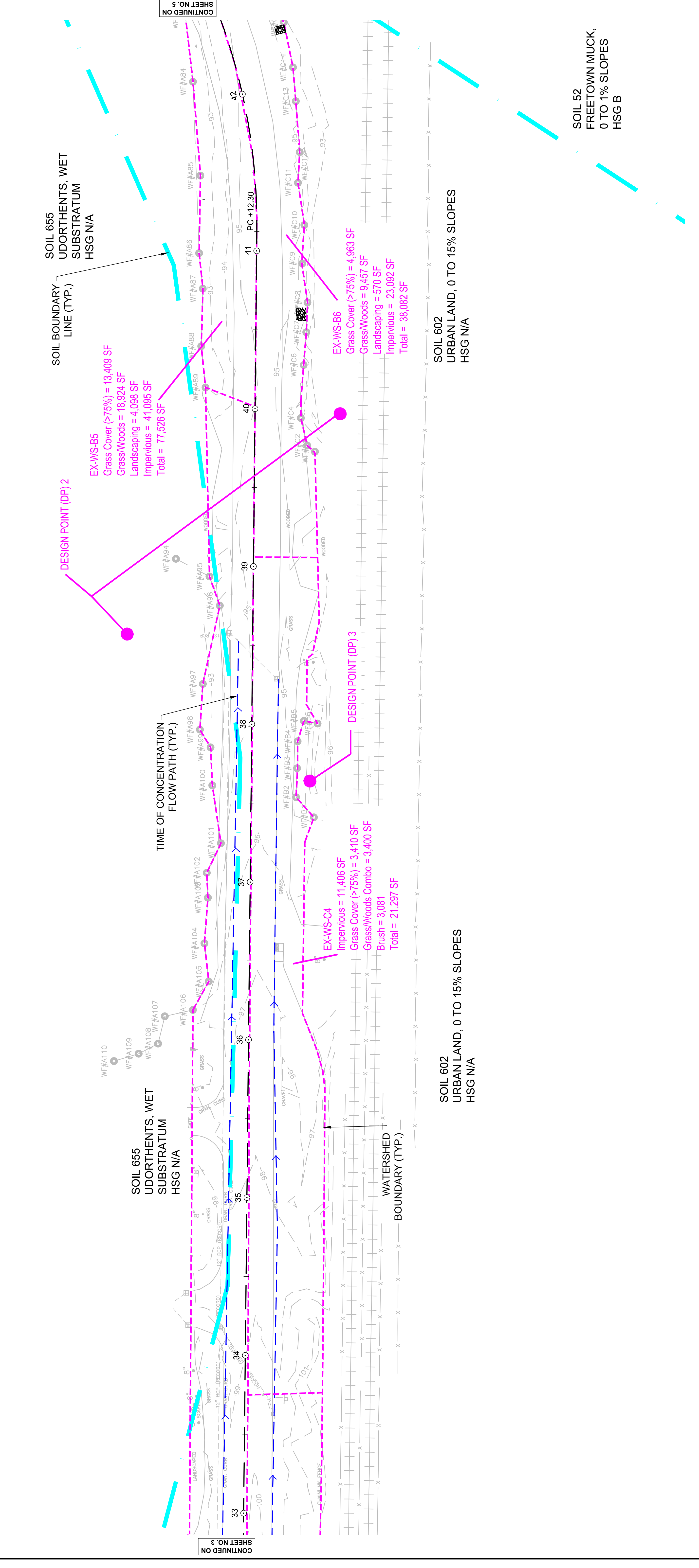
STORMWATER WATERSHED MAPS



OVERALL WATERSHED A - EXISTING CONDITIONS
 Grass Cover (>75%) = 26,948 SF
 Landscaping = 10,101 SF
 Residential = 59,122 SF
 Impervious = 160,358 SF
 Total = 256,529 SF

OVERALL WATERSHED B - EXISTING CONDITIONS
 Grass Cover (>75%) = 41,998 SF
 Brush = 3,826 SF
 Grass/Woods Combo = 35,107 SF
 Landscaping = 2,594 SF
 Impervious = 114,199 SF
 Total = 197,724 SF

OVERALL WATERSHED C - EXISTING CONDITIONS
 Grass Cover (>75%) = 3,410 SF
 Brush = 3,081 SF
 Grass/Woods Combo = 3,400 SF
 Impervious = 11,406 SF
 Total = 21,297 SF



SOIL 655
UDORTHENTS, WET
SUBSTRATUM
HSG N/A

SOIL 602
URBAN LAND, 0 TO 15% SLOPES
HSG N/A

SOIL 52
FREETOWN MUCK,
0 TO 1% SLOPES
HSG B

TIME OF CONCENTRATION
FLOW PATH (TYP.)

DESIGN POINT (DP) 2

DESIGN POINT (DP) 3

EX-WS-B5
 Grass Cover (>75%) = 13,409 SF
 Grass/Woods = 18,924 SF
 Landscaping = 4,098 SF
 Impervious = 41,095 SF
 Total = 77,526 SF

EX-WS-B6
 Grass Cover (>75%) = 4,963 SF
 Grass/Woods = 9,457 SF
 Landscaping = 570 SF
 Impervious = 23,092 SF
 Total = 38,082 SF

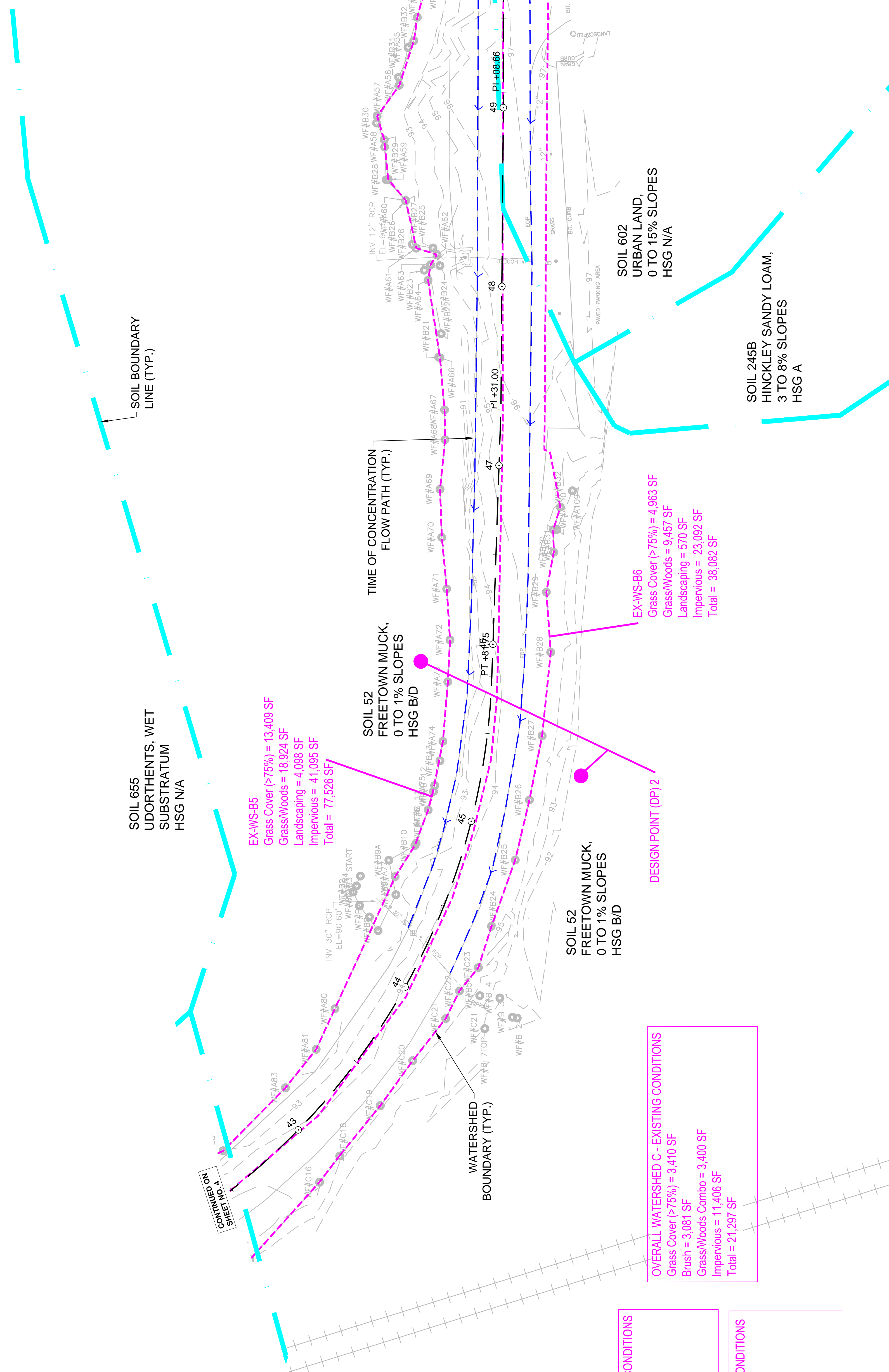
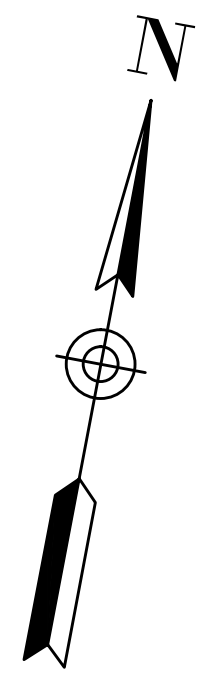
EX-WS-C4
 Impervious = 11,406 SF
 Grass Cover (>75%) = 3,410 SF
 Grass/Woods Combo = 3,400 SF
 Brush = 3,081
 Total = 21,297 SF

CONTINUED ON
SHEET NO. 3

CONTINUED ON
SHEET NO. 5

DEDHAM
ELM STREET AND RUSTCRAFT ROAD
STORMWATER WATERSHED MAPS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XX-XXX(XXX)	6	6
PROJECT FILE NO. 607901			



SOIL 655
UDORTHERENTS, WET
SUBSTRATUM
HSG N/A

EX-WS-B5
Grass Cover (>75%) = 13,409 SF
Grass/Woods = 18,924 SF
Landscaping = 4,098 SF
Impervious = 41,095 SF
Total = 77,526 SF

SOIL 52
FREETOWN MUCK,
0 TO 1% SLOPES
HSG B/D

SOIL 52
FREETOWN MUCK,
0 TO 1% SLOPES
HSG B/D

OVERALL WATERSHED C - EXISTING CONDITIONS
Grass Cover (>75%) = 3,410 SF
Brush = 3,081 SF
Grass/Woods Combo = 3,400 SF
Impervious = 11,406 SF
Total = 21,297 SF

OVERALL WATERSHED A - EXISTING CONDITIONS
Grass Cover (>75%) = 26,948 SF
Landscaping = 10,101 SF
Residential = 59,122 SF
Impervious = 160,368 SF
Total = 256,529 SF

OVERALL WATERSHED B - EXISTING CONDITIONS
Grass Cover (>75%) = 41,998 SF
Brush = 3,826 SF
Grass/Woods Combo = 35,107 SF
Landscaping = 2,594 SF
Impervious = 114,199 SF
Total = 197,724 SF

EX-WS-B6
Grass Cover (>75%) = 4,963 SF
Grass/Woods = 9,457 SF
Landscaping = 570 SF
Impervious = 23,092 SF
Total = 38,082 SF

SOIL 602
URBAN LAND,
0 TO 15% SLOPES
HSG N/A

SOIL 245B
HINCKLEY SANDY LOAM,
3 TO 8% SLOPES
HSG A

TIME OF CONCENTRATION
FLOW PATH (TYP.)

WATERSHED
BOUNDARY (TYP.)

SOIL BOUNDARY
LINE (TYP.)

CONTINUED ON
SHEET NO. 4

CONTINUED ON
SHEET NO. 6

DEDHAM
ELM STREET AND RUSTCRAFT ROAD
STORMWATER WATERSHED MAPS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XX-XXX(XXX)	607901	6
PROJECT FILE NO.		607901	

OVERALL WATERSHED A - EXISTING CONDITIONS
 Grass Cover (>75%) = 26,948 SF
 Landscaping = 10,101 SF
 Residential = 59,122 SF
 Impervious = 160,358 SF
 Total = 256,529 SF

OVERALL WATERSHED C - EXISTING CONDITIONS
 Grass Cover (>75%) = 3,410 SF
 Brush = 3,081 SF
 Grass/Woods Combo = 3,400 SF
 Impervious = 11,406 SF
 Total = 21,297 SF

EX-WS-B6
 Grass Cover (>75%) = 13,409 SF
 Grass/Woods = 18,924 SF
 Landscaping = 4,098 SF
 Impervious = 41,095 SF
 Total = 77,526 SF

EX-WS-B6
 Grass Cover (>75%) = 4,963 SF
 Grass/Woods = 9,457 SF
 Landscaping = 570 SF
 Impervious = 23,092 SF
 Total = 38,082 SF

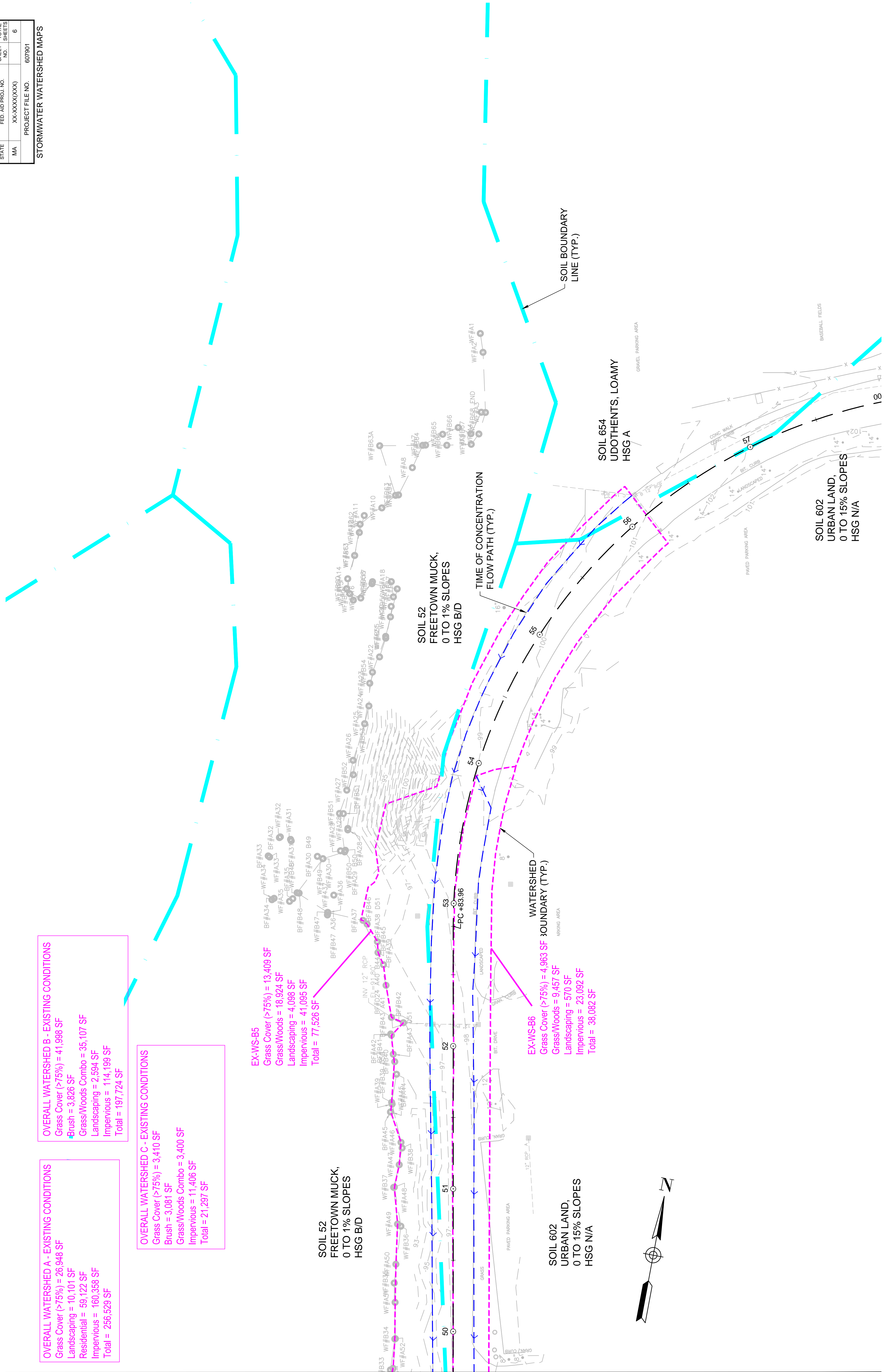
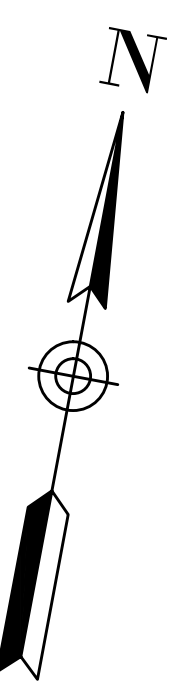
**SOIL 52
 FREETOWN MUCK,
 0 TO 1% SLOPES
 HSG B/D**

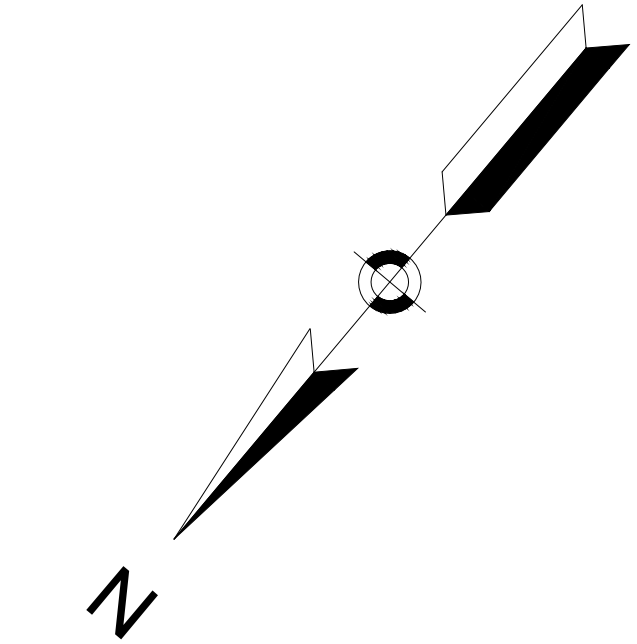
**SOIL 602
 URBAN LAND,
 0 TO 15% SLOPES
 HSG N/A**

**SOIL 654
 UDOOTHENTS, LOAMY
 HSG A**

**SOIL 602
 URBAN LAND,
 0 TO 15% SLOPES
 HSG N/A**

CONTINUED ON
SHEET NO. 5





DEDHAM
ELM STREET AND RUSTCRAFT ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XX-XXX(XXX)	607901	6
PROJECT FILE NO.		607901	

STORMWATER WATERSHED MAPS

OVERALL WATERSHED A - PROPOSED CONDITIONS
 Grass Cover (>75%) = 19,918 SF
 Landscaping = 9,099 SF
 Residential = 59,116 SF
 Impervious = 168,396 SF
 Total = 296,529 SF

OVERALL WATERSHED B - PROPOSED CONDITIONS
 Grass Cover (>75%) = 39,998 SF
 Grass/Woods Combo = 13,573 SF
 Landscaping = 1,821 SF
 Impervious = 110,923 SF
 Total = 166,315 SF

OVERALL WATERSHED C - PROPOSED CONDITIONS
 Grass Cover (>75%) = 11,915 SF
 Grass/Woods Combo = 856 SF
 Landscaping = 450 SF
 Impervious = 39,156 SF
 Total = 52,377 SF

PR-WS-A2
 Grass Cover (>75%) = 1,647 SF
 Landscaping = 323 SF
 Total = 1,970 SF

PR-WS-A1
 Grass Cover (>75%) = 14,875 SF
 Landscaping = 8,776 SF
 Residential = 59,116 SF
 Impervious = 164,841 SF
 Total = 247,608 SF

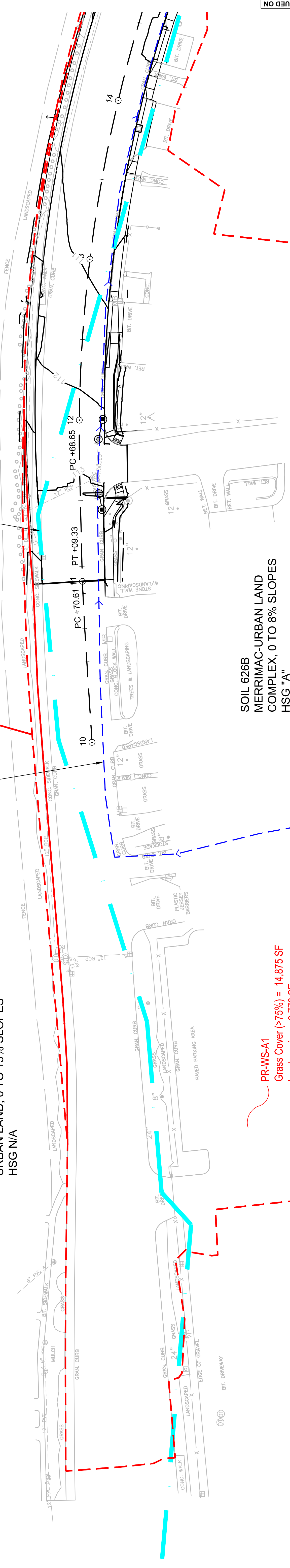
SOIL 602
URBAN LAND, 0 TO 15% SLOPES
HSG N/A

SOIL 626B
MERRIMAC-URBAN LAND
COMPLEX, 0 TO 8% SLOPES
HSG "A"

TIME OF CONCENTRATION
FLOW PATH (TYP.)

SOIL BOUNDARY
LINE (TYP.)

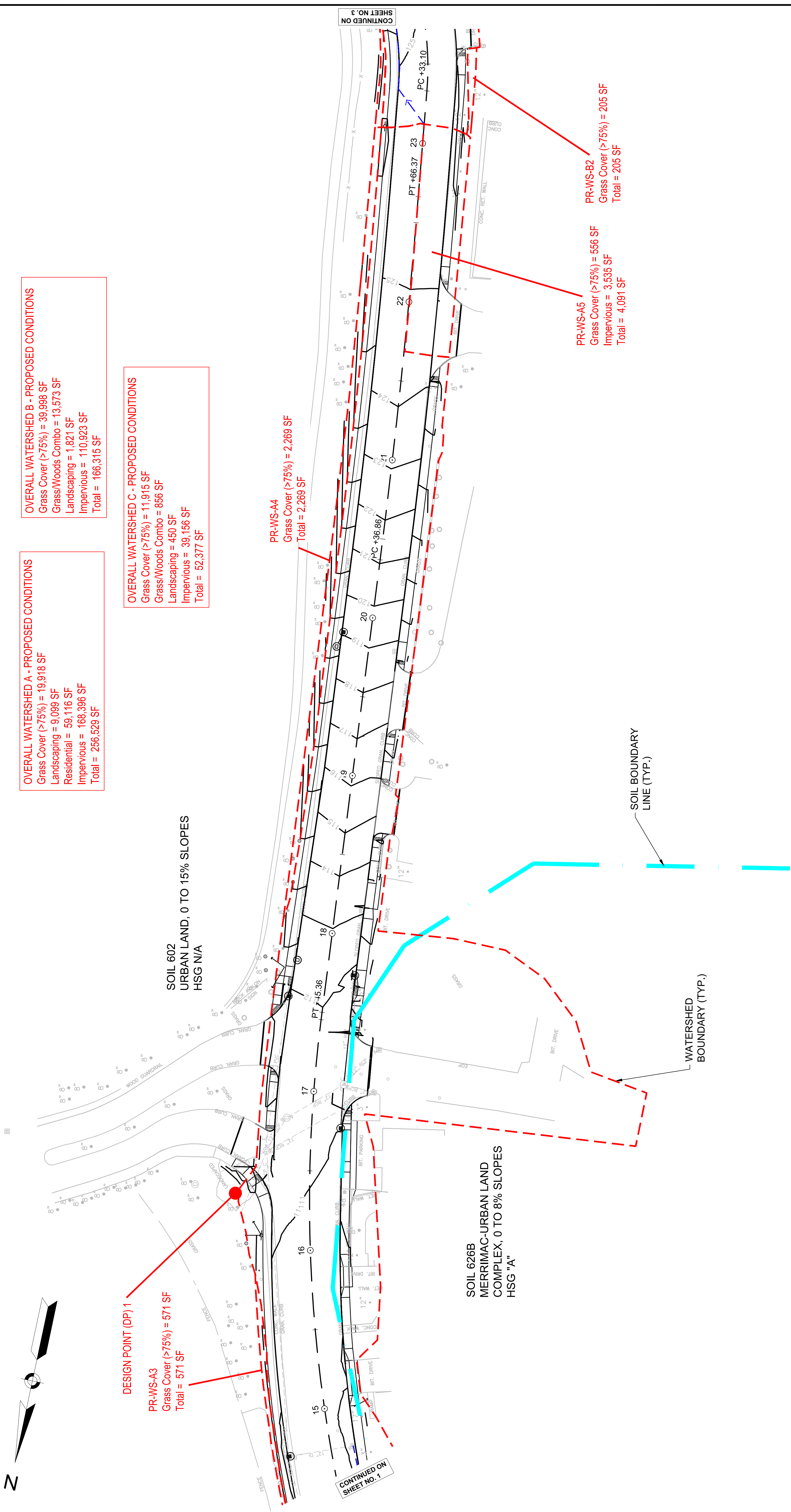
WATERSHED
BOUNDARY (TYP.)



CONTINUED ON
SHEET NO. 2

DEDHAM
ELM STREET AND RUSTCRAFT ROAD
STORMWATER WATERSHED MAPS

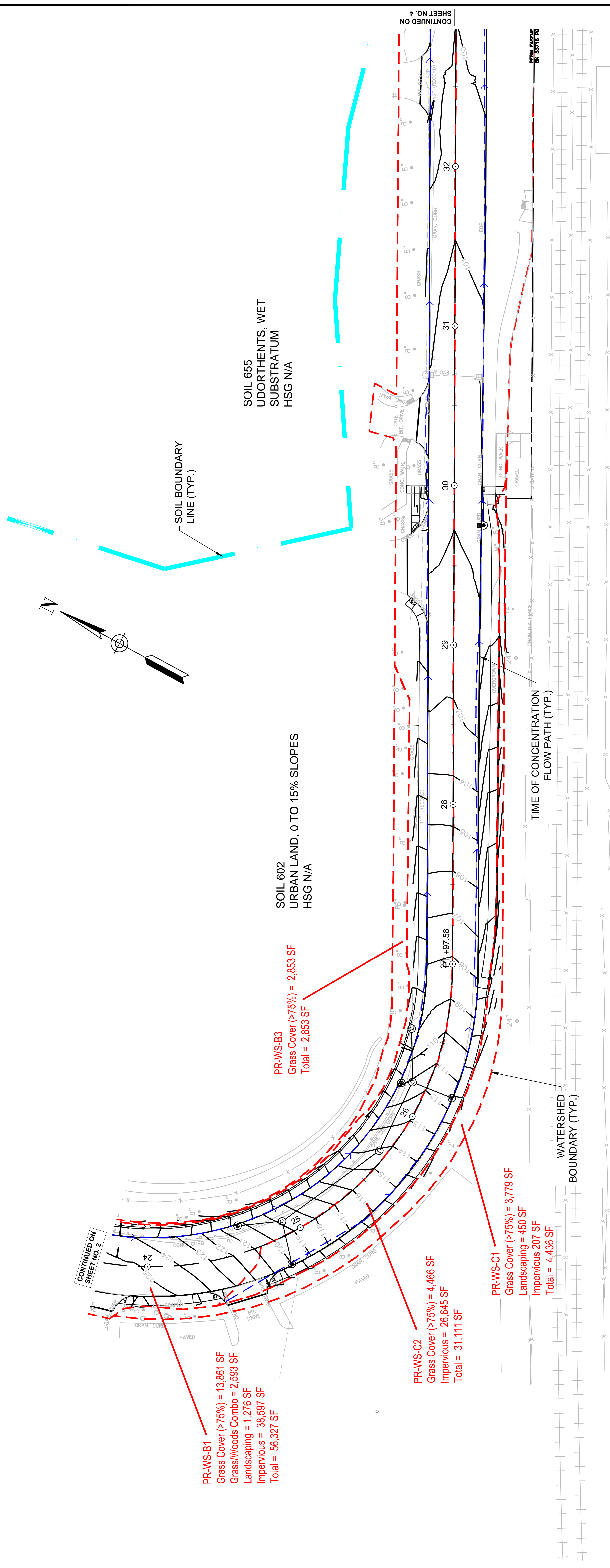
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XX-XXX(XXX)	6	6
PROJECT FILE NO.		607901	



DEDHAM
ELM STREET AND RUSTCRAFT ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XX-XXX(XXX)	607901	6

PROJECT FILE NO. 607901
STORMWATER WATERSHED MAPS



PR-WS-B1
Grass Cover (>75%) = 13,861 SF
Grass/Woods Combo = 2,593 SF
Landscaping = 1,276 SF
Impervious = 38,597 SF
Total = 56,327 SF

PR-WS-C2
Grass Cover (>75%) = 4,466 SF
Impervious = 26,645 SF
Total = 31,111 SF

PR-WS-C1
Grass Cover (>75%) = 3,779 SF
Landscaping = 450 SF
Impervious 207 SF
Total = 4,436 SF

PR-WS-B3
Grass Cover (>75%) = 2,853 SF
Total = 2,853 SF

SOIL 602
URBAN LAND, 0 TO 15% SLOPES
HSG N/A

SOIL 655
UDORTHERENTS, WET
SUBSTRATUM
HSG N/A

SOIL 602
URBAN LAND, 0 TO 15% SLOPES
HSG N/A

OVERALL WATERSHED A - PROPOSED CONDITIONS
Grass Cover (>75%) = 19,918 SF
Landscaping = 9,099 SF
Residential = 59,116 SF
Impervious = 168,396 SF
Total = 256,529 SF

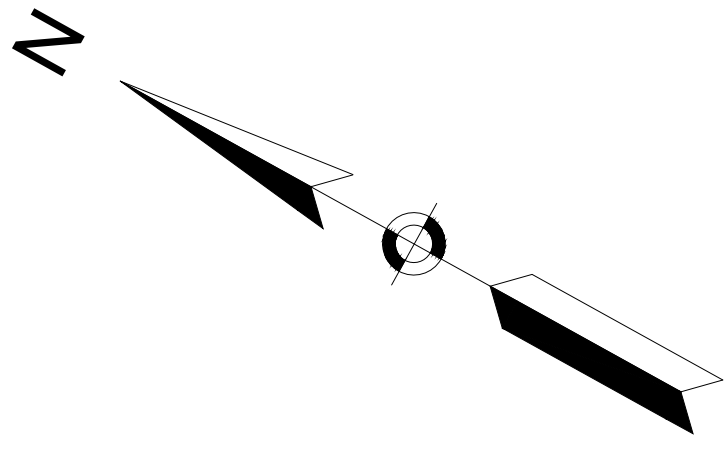
OVERALL WATERSHED B - PROPOSED CONDITIONS
Grass Cover (>75%) = 39,998 SF
Grass/Woods Combo = 13,573 SF
Landscaping = 1,821 SF
Impervious = 110,923 SF
Total = 166,315 SF

OVERALL WATERSHED C - PROPOSED CONDITIONS
Grass Cover (>75%) = 11,915 SF
Grass/Woods Combo = 856 SF
Landscaping = 450 SF
Impervious = 39,156 SF
Total = 52,377 SF

DEDHAM
ELM STREET AND RUSTCRAFT ROAD

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XX-XXX(XXX)	6	6
PROJECT FILE NO. 607901			

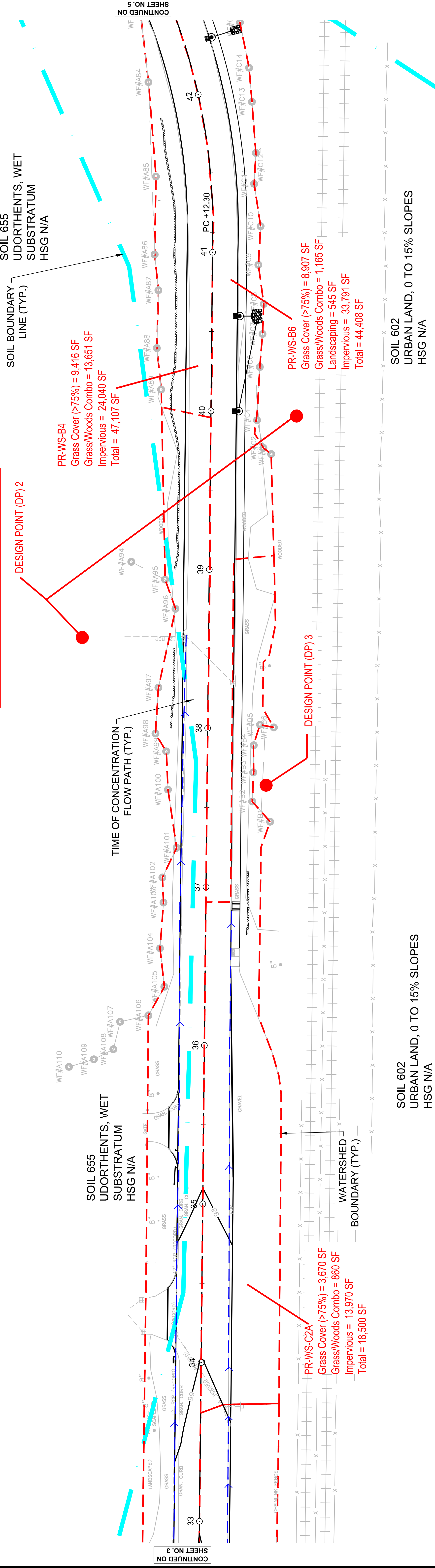
STORMWATER WATERSHED MAPS



OVERALL WATERSHED B - PROPOSED CONDITIONS
 Grass Cover (>75%) = 39,998 SF
 Grass/Woods Combo = 13,573 SF
 Landscaping = 1,821 SF
 Impervious = 110,923 SF
 Total = 166,315 SF

OVERALL WATERSHED A - PROPOSED CONDITIONS
 Grass Cover (>75%) = 19,918 SF
 Landscaping = 9,099 SF
 Residential = 59,116 SF
 Impervious = 168,396 SF
 Total = 256,529 SF

OVERALL WATERSHED C - PROPOSED CONDITIONS
 Grass Cover (>75%) = 11,915 SF
 Grass/Woods Combo = 856 SF
 Landscaping = 450 SF
 Impervious = 39,156 SF
 Total = 52,377 SF



PR-WS-B4
 Grass Cover (>75%) = 9,416 SF
 Grass/Woods Combo = 13,651 SF
 Impervious = 24,040 SF
 Total = 47,107 SF

PR-WS-B6
 Grass Cover (>75%) = 8,907 SF
 Grass/Woods Combo = 1,165 SF
 Landscaping = 545 SF
 Impervious = 33,791 SF
 Total = 44,408 SF

PR-WS-C2A
 Grass Cover (>75%) = 3,670 SF
 Grass/Woods Combo = 860 SF
 Impervious = 13,970 SF
 Total = 18,500 SF

CONTINUED ON
SHEET NO. 3

CONTINUED ON
SHEET NO. 5

TIME OF CONCENTRATION
FLOW PATH (TYP.)

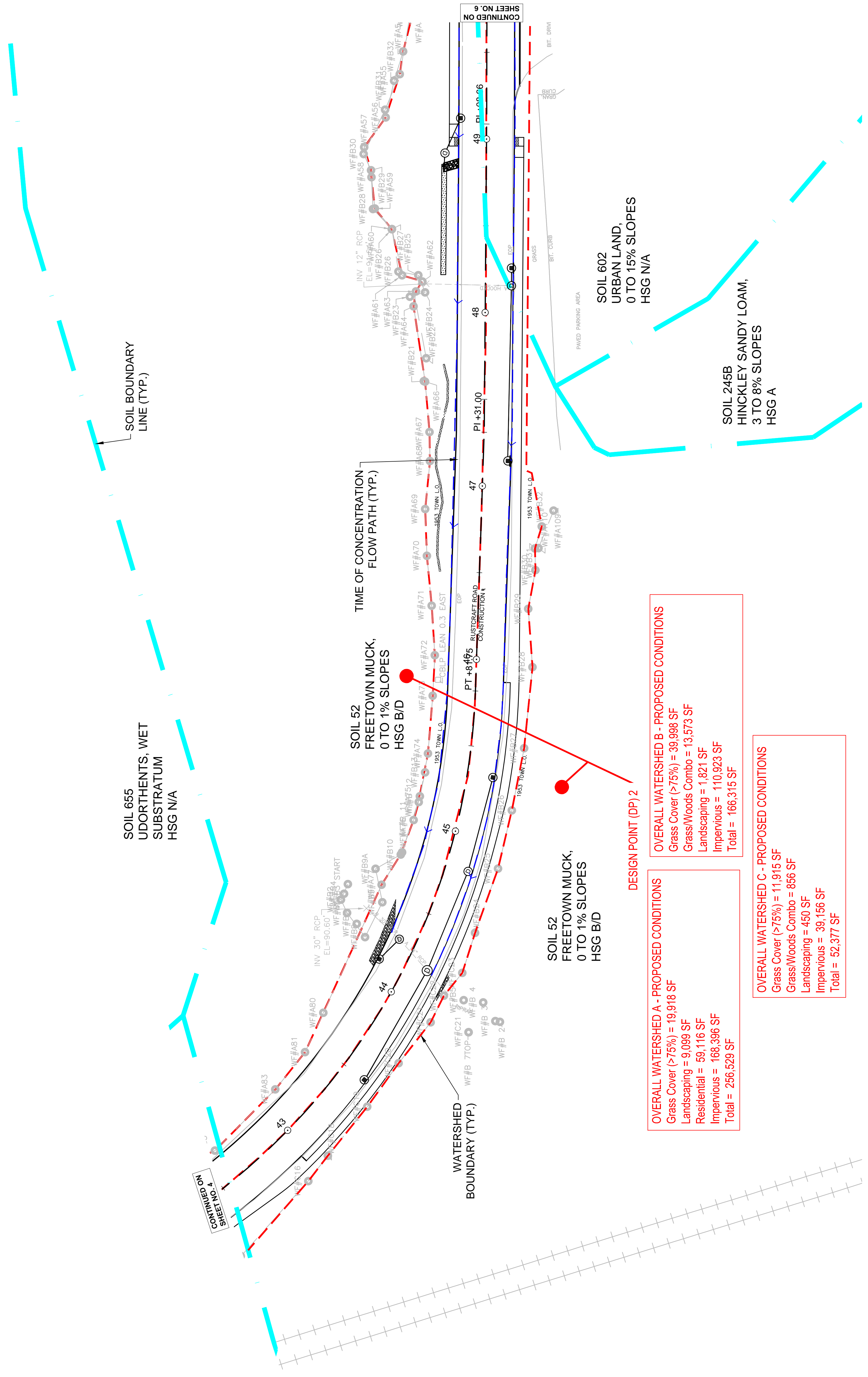
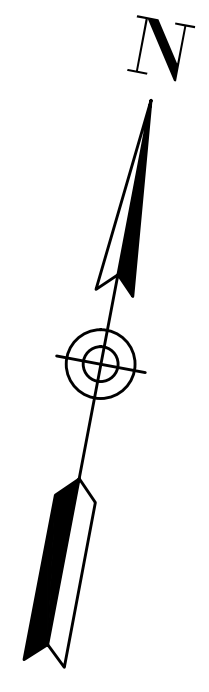
SOIL 655
UDORTHERENTS, WET
SUBSTRATUM
HSG N/A

SOIL 602
URBAN LAND, 0 TO 15% SLOPES
HSG N/A

SOIL 52
FREETOWN MUCK,
0 TO 1% SLOPES
HSG B

DEDHAM
ELM STREET AND RUSTCRAFT ROAD
STORMWATER WATERSHED MAPS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XX-XXX(XXX)	6	6
PROJECT FILE NO. 607901			



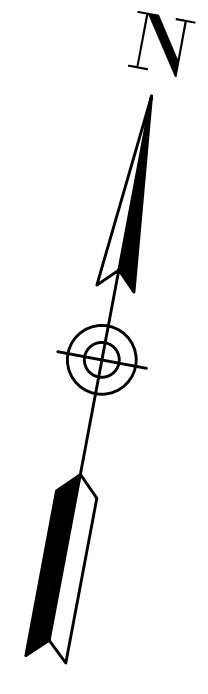
DESIGN POINT (DP) 2

OVERALL WATERSHED B - PROPOSED CONDITIONS
 Grass Cover (>75%) = 39,988 SF
 Grass/Woods Combo = 13,573 SF
 Landscaping = 1,821 SF
 Impervious = 110,923 SF
 Total = 166,315 SF

OVERALL WATERSHED A - PROPOSED CONDITIONS
 Grass Cover (>75%) = 19,918 SF
 Landscaping = 9,099 SF
 Residential = 59,116 SF
 Impervious = 168,396 SF
 Total = 256,529 SF

OVERALL WATERSHED C - PROPOSED CONDITIONS
 Grass Cover (>75%) = 11,915 SF
 Grass/Woods Combo = 856 SF
 Landscaping = 450 SF
 Impervious = 39,156 SF
 Total = 52,377 SF

CONTINUED ON SHEET NO. 5



OVERALL WATERSHED A - PROPOSED CONDITIONS
 Grass Cover (>75%) = 19,918 SF
 Landscaping = 9,099 SF
 Residential = 59,116 SF
 Impervious = 188,396 SF
 Total = 256,529 SF

OVERALL WATERSHED B - PROPOSED CONDITIONS
 Grass Cover (>75%) = 39,998 SF
 Grass/Woods Combo = 13,573 SF
 Landscaping = 1,821 SF
 Impervious = 110,923 SF
 Total = 166,315 SF

OVERALL WATERSHED C - PROPOSED CONDITIONS
 Grass Cover (>75%) = 11,915 SF
 Grass/Woods Combo = 866 SF
 Landscaping = 450 SF
 Impervious = 39,166 SF
 Total = 52,377 SF

**SOIL 52
 FREETOWN MUCK,
 0 TO 1% SLOPES
 HSG B/D**

**SOIL 602
 URBAN LAND,
 0 TO 15% SLOPES
 HSG N/A**

PR-WS-B5
 Grass Cover (>75%) = 5,273 SF
 Impervious = 12,800 SF
 Total = 18,073 SF

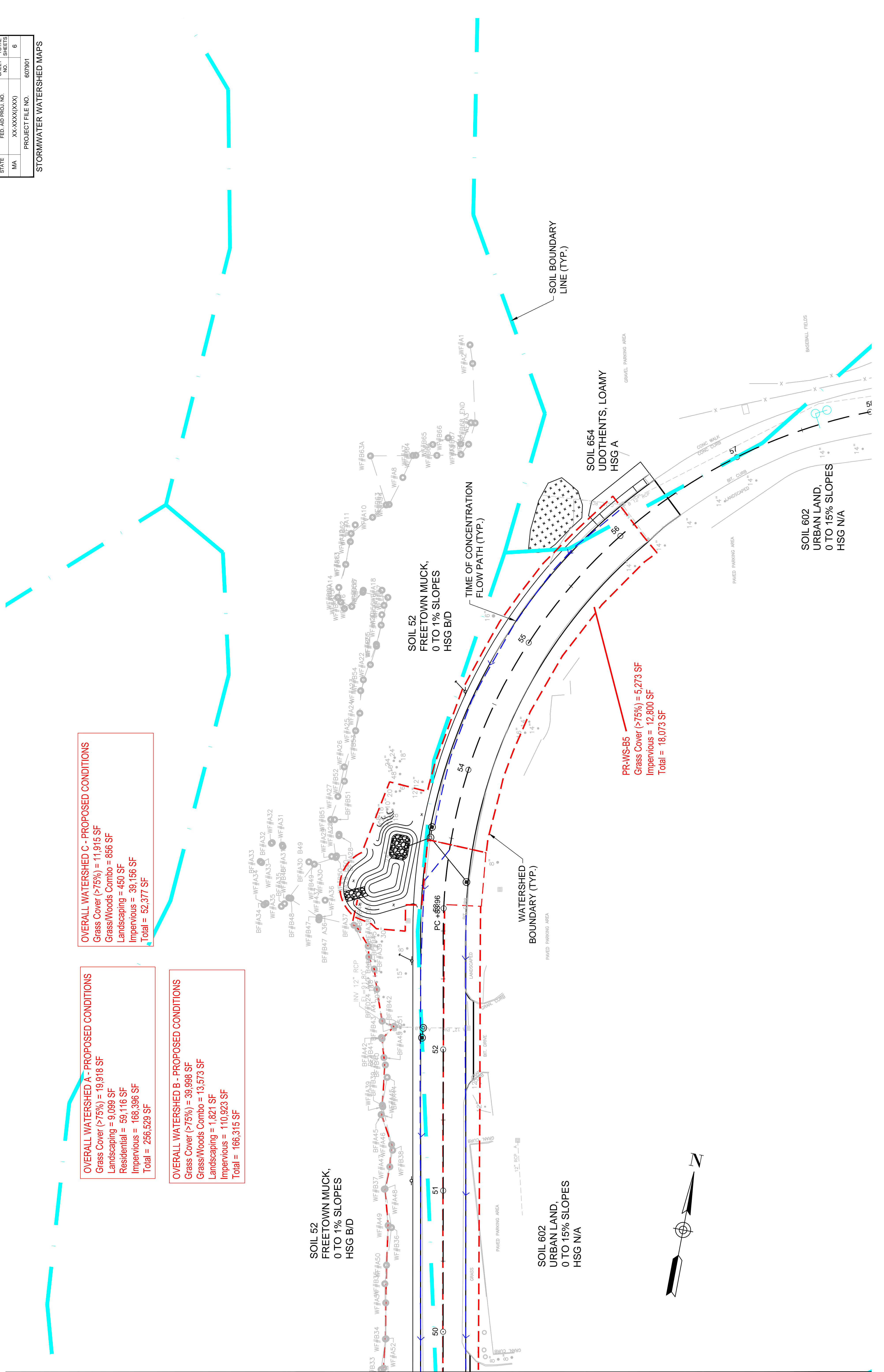
**SOIL 52
 FREETOWN MUCK,
 0 TO 1% SLOPES
 HSG B/D**

**SOIL 654
 UDOTHENTS, LOAMY
 HSG A**

**SOIL 602
 URBAN LAND,
 0 TO 15% SLOPES
 HSG N/A**

DEDHAM
 ELM STREET AND RUSTCRAFT ROAD
 STORMWATER WATERSHED MAPS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XX-XXX(XXX)	607901	6
PROJECT FILE NO.		607901	



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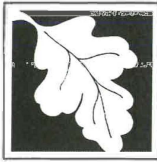
**MASSACHUSETTS DEPARTMENT OF
ENVIRONMENTAL PROTECTION**

ORDER OF CONDITIONS –

DEDHAM CONSERVATION COMMISSION

MASS DEP FILE #141-0534

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Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
WPA Form 5 – Order of Conditions
 Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
 141-0534
 MassDEP File #
 eDEP Transaction #
 Dedham
 City/Town

A. General Information

Please note:
 this form has been modified with added space to accommodate the Registry of Deeds Requirements

Important:
 When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



1. From: Dedham
 Conservation Commission

2. This issuance is for (check one):
 a. Order of Conditions b. Amended Order of Conditions

3. To: Applicant:
Jason a. First Name Mammone b. Last Name

Dedham Engineering Department c. Organization

55 River Street d. Mailing Address

Dedham e. City/Town MA f. State 02026 g. Zip Code

4. Property Owner (if different from applicant):
 _____ a. First Name _____ b. Last Name

_____ c. Organization

_____ d. Mailing Address

_____ e. City/Town _____ f. State _____ g. Zip Code

5. Project Location:
Elm Street and Rustcraft Road a. Street Address Dedham b. City/Town

_____ c. Assessors Map/Plat Number _____ d. Parcel/Lot Number

Latitude and Longitude, if known: 42.2229309d m s -71.170799d m s
 d. Latitude e. Longitude



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 5 – Order of Conditions

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

141-0534

MassDEP File #

eDEP Transaction #

Dedham

City/Town

A. General Information (cont.)

6. Property recorded at the Registry of Deeds for (attach additional information if more than one parcel):

a. County

b. Certificate Number (if registered land)

c. Book

d. Page

7. Dates:

a. Date Notice of Intent Filed

b. Date Public Hearing Closed

c. Date of Issuance

8. Final Approved Plans and Other Documents (attach additional plan or document references as needed):

Notice of Intent Permit Set

a. Plan Title

Beta Group, Inc.

b. Prepared By

June 20, 2018

d. Final Revision Date

See list attached

c. Signed and Stamped by

1":20'

e. Scale

f. Additional Plan or Document Title

g. Date

B. Findings

1. Findings pursuant to the Massachusetts Wetlands Protection Act:

Following the review of the above-referenced Notice of Intent and based on the information provided in this application and presented at the public hearing, this Commission finds that the areas in which work is proposed is significant to the following interests of the Wetlands Protection Act (the Act). Check all that apply:

- a. Public Water Supply
- b. Land Containing Shellfish
- c. Prevention of Pollution
- d. Private Water Supply
- e. Fisheries
- f. Protection of Wildlife Habitat
- g. Groundwater Supply
- h. Storm Damage Prevention
- i. Flood Control

2. This Commission hereby finds the project, as proposed, is: (check one of the following boxes)

Approved subject to:

- a. the following conditions which are necessary in accordance with the performance standards set forth in the wetlands regulations. This Commission orders that all work shall be performed in accordance with the Notice of Intent referenced above, the following General Conditions, and any other special conditions attached to this Order. To the extent that the following conditions modify or differ from the plans, specifications, or other proposals submitted with the Notice of Intent, these conditions shall control.



**Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands**

WPA Form 5 – Order of Conditions

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

141-0534

MassDEP File #

eDEP Transaction #

Dedham

City/Town

B. Findings (cont.)

Denied because:

- b. the proposed work cannot be conditioned to meet the performance standards set forth in the wetland regulations. Therefore, work on this project may not go forward unless and until a new Notice of Intent is submitted which provides measures which are adequate to protect the interests of the Act, and a final Order of Conditions is issued. **A description of the performance standards which the proposed work cannot meet is attached to this Order.**
- c. the information submitted by the applicant is not sufficient to describe the site, the work, or the effect of the work on the interests identified in the Wetlands Protection Act. Therefore, work on this project may not go forward unless and until a revised Notice of Intent is submitted which provides sufficient information and includes measures which are adequate to protect the Act's interests, and a final Order of Conditions is issued. **A description of the specific information which is lacking and why it is necessary is attached to this Order as per 310 CMR 10.05(6)(c).**
- 3. Buffer Zone Impacts: Shortest distance between limit of project disturbance and the wetland resource area specified in 310 CMR 10.02(1)(a) _____ a. linear feet

Inland Resource Area Impacts: Check all that apply below. (For Approvals Only)

Resource Area	Proposed Alteration	Permitted Alteration	Proposed Replacement	Permitted Replacement
4. <input type="checkbox"/> Bank	a. linear feet	b. linear feet	c. linear feet	d. linear feet
5. <input checked="" type="checkbox"/> Bordering Vegetated Wetland	675 temp 335 perm	675 temp 335 perm	c. square feet	d. square feet
6. <input type="checkbox"/> Land Under Waterbodies and Waterways	a. square feet	b. square feet	c. square feet	d. square feet
	e. c/y dredged	f. c/y dredged		
7. <input checked="" type="checkbox"/> Bordering Land Subject to Flooding	8,610 temp a. square feet	8,610 temp b. square feet	c. square feet	d. square feet
Cubic Feet Flood Storage	e. cubic feet	f. cubic feet	g. cubic feet	h. cubic feet
8. <input type="checkbox"/> Isolated Land Subject to Flooding	a. square feet	b. square feet		
Cubic Feet Flood Storage	c. cubic feet	d. cubic feet	e. cubic feet	f. cubic feet
9. <input checked="" type="checkbox"/> Riverfront Area	72,220 a. total sq. feet	72,220 b. total sq. feet		
Sq ft within 100 ft	60,280 c. square feet	60,280 d. square feet	e. square feet	f. square feet
Sq ft between 100-200 ft	11,940 g. square feet	11,940 h. square feet	i. square feet	j. square feet



Massachusetts Department of Environmental Protection
 Bureau of Resource Protection - Wetlands
WPA Form 5 – Order of Conditions
 Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
 141-0534
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 eDEP Transaction #
 Dedham
 City/Town

B. Findings (cont.)

Coastal Resource Area Impacts: Check all that apply below. (For Approvals Only)

	Proposed Alteration	Permitted Alteration	Proposed Replacement	Permitted Replacement
10. <input type="checkbox"/> Designated Port Areas	Indicate size under Land Under the Ocean, below			
11. <input type="checkbox"/> Land Under the Ocean	a. square feet	b. square feet		
	c. c/y dredged	d. c/y dredged		
12. <input type="checkbox"/> Barrier Beaches	Indicate size under Coastal Beaches and/or Coastal Dunes below			
13. <input type="checkbox"/> Coastal Beaches	a. square feet	b. square feet	c. nourishment cu yd	d. nourishment cu yd
14. <input type="checkbox"/> Coastal Dunes	a. square feet	b. square feet	c. nourishment cu yd	d. nourishment cu yd
15. <input type="checkbox"/> Coastal Banks	a. linear feet	b. linear feet		
16. <input type="checkbox"/> Rocky Intertidal Shores	a. square feet	b. square feet		
17. <input type="checkbox"/> Salt Marshes	a. square feet	b. square feet	c. square feet	d. square feet
18. <input type="checkbox"/> Land Under Salt Ponds	a. square feet	b. square feet		
	c. c/y dredged	d. c/y dredged		
19. <input type="checkbox"/> Land Containing Shellfish	a. square feet	b. square feet	c. square feet	d. square feet
20. <input type="checkbox"/> Fish Runs	Indicate size under Coastal Banks, Inland Bank, Land Under the Ocean, and/or inland Land Under Waterbodies and Waterways, above			
	a. c/y dredged	b. c/y dredged		
21. <input type="checkbox"/> Land Subject to Coastal Storm Flowage	a. square feet	b. square feet		
22. <input type="checkbox"/> Riverfront Area	a. total sq. feet	b. total sq. feet		
Sq ft within 100 ft	c. square feet	d. square feet	e. square feet	f. square feet
Sq ft between 100-200 ft	g. square feet	h. square feet	i. square feet	j. square feet



Massachusetts Department of Environmental Protection
 Bureau of Resource Protection - Wetlands
WPA Form 5 – Order of Conditions
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Provided by MassDEP:
 141-0534
 MassDEP File #
 eDEP Transaction #
 Dedham
 City/Town

B. Findings (cont.)

* #23. If the project is for the purpose of restoring or enhancing a wetland resource area in addition to the square footage that has been entered in Section B.5.c (BVW) or B.17.c (Salt Marsh) above, please enter the additional amount here.

23. Restoration/Enhancement *:
- a. square feet of BVW _____ b. square feet of salt marsh _____
24. Stream Crossing(s):
- a. number of new stream crossings _____ b. number of replacement stream crossings _____

C. General Conditions Under Massachusetts Wetlands Protection Act

The following conditions are only applicable to Approved projects.

1. Failure to comply with all conditions stated herein, and with all related statutes and other regulatory measures, shall be deemed cause to revoke or modify this Order.
2. The Order does not grant any property rights or any exclusive privileges; it does not authorize any injury to private property or invasion of private rights.
3. This Order does not relieve the permittee or any other person of the necessity of complying with all other applicable federal, state, or local statutes, ordinances, bylaws, or regulations.
4. The work authorized hereunder shall be completed within three years from the date of this Order unless either of the following apply:
 - a. The work is a maintenance dredging project as provided for in the Act; or
 - b. The time for completion has been extended to a specified date more than three years, but less than five years, from the date of issuance. If this Order is intended to be valid for more than three years, the extension date and the special circumstances warranting the extended time period are set forth as a special condition in this Order.
 - c. If the work is for a Test Project, this Order of Conditions shall be valid for no more than one year.
5. This Order may be extended by the issuing authority for one or more periods of up to three years each upon application to the issuing authority at least 30 days prior to the expiration date of the Order. An Order of Conditions for a Test Project may be extended for one additional year only upon written application by the applicant, subject to the provisions of 310 CMR 10.05(11)(f).
6. If this Order constitutes an Amended Order of Conditions, this Amended Order of Conditions does not extend the issuance date of the original Final Order of Conditions and the Order will expire on _____ unless extended in writing by the Department.
7. Any fill used in connection with this project shall be clean fill. Any fill shall contain no trash, refuse, rubbish, or debris, including but not limited to lumber, bricks, plaster, wire, lath, paper, cardboard, pipe, tires, ashes, refrigerators, motor vehicles, or parts of any of the foregoing.



Massachusetts Department of Environmental Protection
 Bureau of Resource Protection - Wetlands

WPA Form 5 – Order of Conditions

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
 141-0534

MassDEP File #

eDEP Transaction #

Dedham

City/Town

C. General Conditions Under Massachusetts Wetlands Protection Act

8. This Order is not final until all administrative appeal periods from this Order have elapsed, or if such an appeal has been taken, until all proceedings before the Department have been completed.
9. No work shall be undertaken until the Order has become final and then has been recorded in the Registry of Deeds or the Land Court for the district in which the land is located, within the chain of title of the affected property. In the case of recorded land, the Final Order shall also be noted in the Registry’s Grantor Index under the name of the owner of the land upon which the proposed work is to be done. In the case of the registered land, the Final Order shall also be noted on the Land Court Certificate of Title of the owner of the land upon which the proposed work is done. The recording information shall be submitted to the Conservation Commission on the form at the end of this Order, which form must be stamped by the Registry of Deeds, prior to the commencement of work.
10. A sign shall be displayed at the site not less than two square feet or more than three square feet in size bearing the words,

“Massachusetts Department of Environmental Protection” [or, “MassDEP”]

“File Number 141-0534”
11. Where the Department of Environmental Protection is requested to issue a Superseding Order, the Conservation Commission shall be a party to all agency proceedings and hearings before MassDEP.
12. Upon completion of the work described herein, the applicant shall submit a Request for Certificate of Compliance (WPA Form 8A) to the Conservation Commission.
13. The work shall conform to the plans and special conditions referenced in this order.
14. Any change to the plans identified in Condition #13 above shall require the applicant to inquire of the Conservation Commission in writing whether the change is significant enough to require the filing of a new Notice of Intent.
15. The Agent or members of the Conservation Commission and the Department of Environmental Protection shall have the right to enter and inspect the area subject to this Order at reasonable hours to evaluate compliance with the conditions stated in this Order, and may require the submittal of any data deemed necessary by the Conservation Commission or Department for that evaluation.
16. This Order of Conditions shall apply to any successor in interest or successor in control of the property subject to this Order and to any contractor or other person performing work conditioned by this Order.



Massachusetts Department of Environmental Protection
 Bureau of Resource Protection - Wetlands
WPA Form 5 – Order of Conditions
 Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
 141-0534

 MassDEP File #

 eDEP Transaction #
 Dedham

 City/Town

C. General Conditions Under Massachusetts Wetlands Protection Act (cont.)

17. Prior to the start of work, and if the project involves work adjacent to a Bordering Vegetated Wetland, the boundary of the wetland in the vicinity of the proposed work area shall be marked by wooden stakes or flagging. Once in place, the wetland boundary markers shall be maintained until a Certificate of Compliance has been issued by the Conservation Commission.

18. All sedimentation barriers shall be maintained in good repair until all disturbed areas have been fully stabilized with vegetation or other means. At no time shall sediments be deposited in a wetland or water body. During construction, the applicant or his/her designee shall inspect the erosion controls on a daily basis and shall remove accumulated sediments as needed. The applicant shall immediately control any erosion problems that occur at the site and shall also immediately notify the Conservation Commission, which reserves the right to require additional erosion and/or damage prevention controls it may deem necessary. Sedimentation barriers shall serve as the limit of work unless another limit of work line has been approved by this Order.

19. The work associated with this Order (the "Project")
 - (1) is subject to the Massachusetts Stormwater Standards
 - (2) is NOT subject to the Massachusetts Stormwater Standards

If the work is subject to the Stormwater Standards, then the project is subject to the following conditions:

- a) All work, including site preparation, land disturbance, construction and redevelopment, shall be implemented in accordance with the construction period pollution prevention and erosion and sedimentation control plan and, if applicable, the Stormwater Pollution Prevention Plan required by the National Pollution Discharge Elimination System Construction General Permit as required by Stormwater Condition 8. Construction period erosion, sedimentation and pollution control measures and best management practices (BMPs) shall remain in place until the site is fully stabilized.

- b) No stormwater runoff may be discharged to the post-construction stormwater BMPs unless and until a Registered Professional Engineer provides a Certification that:
 - i.* all construction period BMPs have been removed or will be removed by a date certain specified in the Certification. For any construction period BMPs intended to be converted to post construction operation for stormwater attenuation, recharge, and/or treatment, the conversion is allowed by the MassDEP Stormwater Handbook BMP specifications and that the BMP has been properly cleaned or prepared for post construction operation, including removal of all construction period sediment trapped in inlet and outlet control structures;
 - ii.* as-built final construction BMP plans are included, signed and stamped by a Registered Professional Engineer, certifying the site is fully stabilized;
 - iii.* any illicit discharges to the stormwater management system have been removed, as per the requirements of Stormwater Standard 10;



Massachusetts Department of Environmental Protection
 Bureau of Resource Protection - Wetlands

WPA Form 5 – Order of Conditions

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
 141-0534

MassDEP File #

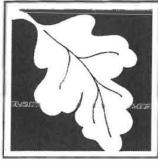
eDEP Transaction #

Dedham

City/Town

C. General Conditions Under Massachusetts Wetlands Protection Act (cont.)

- iv. all post-construction stormwater BMPs are installed in accordance with the plans (including all planting plans) approved by the issuing authority, and have been inspected to ensure that they are not damaged and that they are in proper working condition;
- v. any vegetation associated with post-construction BMPs is suitably established to withstand erosion.
- c) The landowner is responsible for BMP maintenance until the issuing authority is notified that another party has legally assumed responsibility for BMP maintenance. Prior to requesting a Certificate of Compliance, or Partial Certificate of Compliance, the responsible party (defined in General Condition 18(e)) shall execute and submit to the issuing authority an Operation and Maintenance Compliance Statement ("O&M Statement) for the Stormwater BMPs identifying the party responsible for implementing the stormwater BMP Operation and Maintenance Plan ("O&M Plan") and certifying the following:
 - i.) the O&M Plan is complete and will be implemented upon receipt of the Certificate of Compliance, and
 - ii.) the future responsible parties shall be notified in writing of their ongoing legal responsibility to operate and maintain the stormwater management BMPs and implement the Stormwater Pollution Prevention Plan.
- d) Post-construction pollution prevention and source control shall be implemented in accordance with the long-term pollution prevention plan section of the approved Stormwater Report and, if applicable, the Stormwater Pollution Prevention Plan required by the National Pollution Discharge Elimination System Multi-Sector General Permit.
- e) Unless and until another party accepts responsibility, the landowner, or owner of any drainage easement, assumes responsibility for maintaining each BMP. To overcome this presumption, the landowner of the property must submit to the issuing authority a legally binding agreement of record, acceptable to the issuing authority, evidencing that another entity has accepted responsibility for maintaining the BMP, and that the proposed responsible party shall be treated as a permittee for purposes of implementing the requirements of Conditions 18(f) through 18(k) with respect to that BMP. Any failure of the proposed responsible party to implement the requirements of Conditions 18(f) through 18(k) with respect to that BMP shall be a violation of the Order of Conditions or Certificate of Compliance. In the case of stormwater BMPs that are serving more than one lot, the legally binding agreement shall also identify the lots that will be serviced by the stormwater BMPs. A plan and easement deed that grants the responsible party access to perform the required operation and maintenance must be submitted along with the legally binding agreement.
- f) The responsible party shall operate and maintain all stormwater BMPs in accordance with the design plans, the O&M Plan, and the requirements of the Massachusetts Stormwater Handbook.



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 5 – Order of Conditions

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

141-0534

MassDEP File #

eDEP Transaction #

Dedham

City/Town

C. General Conditions Under Massachusetts Wetlands Protection Act (cont.)

- g) The responsible party shall:
 - 1. Maintain an operation and maintenance log for the last three (3) consecutive calendar years of inspections, repairs, maintenance and/or replacement of the stormwater management system or any part thereof, and disposal (for disposal the log shall indicate the type of material and the disposal location);
 - 2. Make the maintenance log available to MassDEP and the Conservation Commission ("Commission") upon request; and
 - 3. Allow members and agents of the MassDEP and the Commission to enter and inspect the site to evaluate and ensure that the responsible party is in compliance with the requirements for each BMP established in the O&M Plan approved by the issuing authority.
- h) All sediment or other contaminants removed from stormwater BMPs shall be disposed of in accordance with all applicable federal, state, and local laws and regulations.
- i) Illicit discharges to the stormwater management system as defined in 310 CMR 10.04 are prohibited.
- j) The stormwater management system approved in the Order of Conditions shall not be changed without the prior written approval of the issuing authority.
- k) Areas designated as qualifying pervious areas for the purpose of the Low Impact Site Design Credit (as defined in the MassDEP Stormwater Handbook, Volume 3, Chapter 1, Low Impact Development Site Design Credits) shall not be altered without the prior written approval of the issuing authority.
- l) Access for maintenance, repair, and/or replacement of BMPs shall not be withheld. Any fencing constructed around stormwater BMPs shall include access gates and shall be at least six inches above grade to allow for wildlife passage.

Special Conditions (if you need more space for additional conditions, please attach a text document):

See attached Special Conditions

- 20. For Test Projects subject to 310 CMR 10.05(11), the applicant shall also implement the monitoring plan and the restoration plan submitted with the Notice of Intent. If the conservation commission or Department determines that the Test Project threatens the public health, safety or the environment, the applicant shall implement the removal plan submitted with the Notice of Intent or modify the project as directed by the conservation commission or the Department.



Massachusetts Department of Environmental Protection
 Bureau of Resource Protection - Wetlands
WPA Form 5 – Order of Conditions
 Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
 141-0534
 MassDEP File #
 eDEP Transaction #
 Dedham
 City/Town

D. Findings Under Municipal Wetlands Bylaw or Ordinance

1. Is a municipal wetlands bylaw or ordinance applicable? Yes No
2. The Dedham hereby finds (check one that applies):
 Conservation Commission
 - a. that the proposed work cannot be conditioned to meet the standards set forth in a municipal ordinance or bylaw, specifically:

1. Municipal Ordinance or Bylaw _____ 2. Citation _____

Therefore, work on this project may not go forward unless and until a revised Notice of Intent is submitted which provides measures which are adequate to meet these standards, and a final Order of Conditions is issued.

- b. that the following additional conditions are necessary to comply with a municipal ordinance or bylaw:
Stormwater Management and Wetlands Bylaws Ch. 246 &
 1. Municipal Ordinance or Bylaw _____ 271
3. The Commission orders that all work shall be performed in accordance with the following conditions and with the Notice of Intent referenced above. To the extent that the following conditions modify or differ from the plans, specifications, or other proposals submitted with the Notice of Intent, the conditions shall control.

The special conditions relating to municipal ordinance or bylaw are as follows (if you need more space for additional conditions, attach a text document):
See attached Special Conditions



Massachusetts Department of Environmental Protection
 Bureau of Resource Protection - Wetlands
WPA Form 5 – Order of Conditions
 Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
 141-0534
 MassDEP File #
 eDEP Transaction #
 Dedham
 City/Town

E. Signatures

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



This Order is valid for three years, unless otherwise specified as a special condition pursuant to General Conditions #4, from the date of issuance.

July 24, 2018
 1. Date of Issuance

Please indicate the number of members who will sign this form. This Order must be signed by a majority of the Conservation Commission.

2. Number of Signers

The Order must be mailed by certified mail (return receipt requested) or hand delivered to the applicant. A copy must be mailed, hand delivered or filed electronically at the same time with the appropriate MassDEP Regional Office.

Signatures:


 Laura Bugay, Vice Chairman


 Frederick Civian, Chairman


 Stephanie Badner

Andrew Tittler


 Sean Mahley


 Michelle Kayserman

by hand delivery on

by certified mail, return receipt requested, on

July 24, 2018
 Date

 Date

F. Appeals

The applicant, the owner, any person aggrieved by this Order, any owner of land abutting the land subject to this Order, or any ten residents of the city or town in which such land is located, are hereby notified of their right to request the appropriate MassDEP Regional Office to issue a Superseding Order of Conditions. The request must be made by certified mail or hand delivery to the Department, with the appropriate filing fee and a completed Request for Departmental Action Fee Transmittal Form, as provided in 310 CMR 10.03(7) within ten business days from the date of issuance of this Order. A copy of the request shall at the same time be sent by certified mail or hand delivery to the Conservation Commission and to the applicant, if he/she is not the appellant.

Any appellants seeking to appeal the Department's Superseding Order associated with this appeal will be required to demonstrate prior participation in the review of this project. Previous participation in the permit proceeding means the submission of written information to the Conservation Commission prior to the close of the public hearing, requesting a Superseding Order, or providing written information to the Department prior to issuance of a Superseding Order.

The request shall state clearly and concisely the objections to the Order which is being appealed and how the Order does not contribute to the protection of the interests identified in the Massachusetts Wetlands Protection Act (M.G.L. c. 131, § 40), and is inconsistent with the wetlands regulations (310 CMR 10.00). To the extent that the Order is based on a municipal ordinance or bylaw, and not on the Massachusetts Wetlands Protection Act or regulations, the Department has no appellate jurisdiction.

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Contractor COVID-19 Guidelines

Compliance Checklist:

Contract Number: _____ City/Town: _____

Contract Description: _____

Contractor Name: _____

- | YES | NO | N/A | |
|--------------------------|--------------------------|--------------------------|--|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 1. Has the <u>COVID-19 Guidelines and Procedures for all Construction Sites and Workers at all Public Work</u> bulletin been posted in a location for workers to observe? |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 2. Have all required PPE been made available to all on site personnel? Have all personnel been instructed on the best practices for the use of PPE prior to the start of the work shift? |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 3. Have handwashing instructions been posted on the project site? |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 4. For site specific project locations have wash stations been installed?

(NOTE: For various location/district wide projects wash stations are not required. For those projects the contractor must provide disinfecting wipes and liquid hand sanitizer) |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 5. Has a procedure been established for workers to certify their health to their supervisor prior to the start of each shift, and identified the responsible person on site to manage this provision? |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 6. Has signage been posted to prohibit unauthorized visitors to enter the MassDOT and contractor field offices? |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 7. Have jobsite cleaning and decontamination procedures been established? Have these been shared with contractor/subcontractor employees? |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 8. Have jobsite cleaning and decontamination procedures been established for all areas of the site including trailers, gates, equipment, vehicles, etc. and have they been posted at each entry point to the site, and throughout the project site? |



Contractor COVID-19 Guidelines

Compliance Checklist:

- | YES | NO | N/A | |
|--------------------------|--------------------------|--------------------------|---|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 9. Has a "No Congregation" policy been put into effect that states that individuals must implement social distancing by maintaining a minimum distance of 6-feet from other individuals? |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 10. Are all meetings being held via electronic means, and any required on-site meetings being done following social distancing practices including limiting attendance to 10 persons? |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 11. Are individual crew meetings/tailgate talks being held outdoors and following social distancing requirements? |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 12. Are all restroom and porta-potty stations being sanitized consistent with guidance, and are these locations provided with soap, hand sanitizers and paper towels? |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 13. Have all field office common areas been cleaned in the last 24 hours; and soap, hand sanitizer, and paper towels provided? |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 14. Have workers been instructed to bring food from home and practice appropriate hygiene while eating on lunch and at breaks including social distancing? |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 15. Have employees been instructed about appropriate personal hygiene and about staying home when either they or a family member is feeling sick? |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 16. Are all employees driving to the work site/ parking area in a single occupant vehicle? |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 17. Are all employees utilizing the proper PPE for conditions where required social distancing is not achievable? This includes those cases where workers are in the same vehicle to perform work activities (i.e. traffic setups). |



Contractor COVID-19 Guidelines

Compliance Checklist:

I hereby certify that the responses indicated on this document are accurate and that all the necessary actions have taken place on this day to comply with the COVID-19 Guidelines as issued by MassDOT

Name: _____

Signature:

Name: _____ Date: _____

Printed:

Position: _____

Printed:

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DOCUMENT B00420

PROPOSAL

DEDHAM

For: **Roadway Reconstruction and Related Work
along a Section of Elm Street and /Rustcraft Road**

COMMONWEALTH OF MASSACHUSETTS

LOCATION

The work referred to herein is in the Town of **DEDHAM** in Norfolk County, in the Commonwealth of Massachusetts, and is shown by the locus map (Document 00331) in the Proposal Pamphlet, the work locations extend as follows:

Elm Street/Rustcraft Road

Begin – Station 9+28.00

End – Station 56+43.00

The contract prices shall include the furnishing of all materials (except as otherwise herein specified), the performing of all the labor requisite or proper, the providing of all necessary machinery, tools, apparatus and other means of construction, the doing of all the abovementioned work in the manner set forth, described and shown in the specifications and on the drawings for the work, and in the form of contract, and the completion thereof within **610 CALENDAR DAYS** upon receipt of a Notice to Proceed, except that if the proposed completion date falls between December 1st and March 15th then the same number of days beyond December 1st will be extended after March 15th.

The Work of this project is described by the following Items and quantities.

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Project # 607901		Contract #		
Location : DEDHAM				
Description : DEDHAM- PEDESTRIAN IMPROVEMENTS ALONG ELM STREET & RUSTCRAFT ROAD CORRIDORS				
ITEM #	QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE	AMOUNT
100.	1	SCHEDULE OF OPERATIONS - FIXED PRICE \$12,000 AT Twelve Thousand Dollars LUMP SUM	\$12,000.00	\$12,000.00
101.	0.15	CLEARING AND GRUBBING AT _____ PER ACRE		
102.2	1	TREE TRIMMING AT _____ LUMP SUM		
102.3	32	CONTROL OF INVASIVE PLANTS EXISTING ON SITE AT _____ PER HOUR		
102.33	8	INVASIVE PLANT MANAGEMENT STRATEGY AT _____ PER HOUR		
102.511	6	TREE PROTECTION – ARMORING & PRUNING AT _____ EACH		
102.521	80	TREE AND PLANT PROTECTION FENCE AT _____ PER FOOT		
103.	7	TREE REMOVED - DIAMETER UNDER 24 INCHES AT _____ EACH		
120.	2,200	EARTH EXCAVATION AT _____ PER CUBIC YARD		

Project # 607901		Contract #		
Location : DEDHAM				
Description : DEDHAM- PEDESTRIAN IMPROVEMENTS ALONG ELM STREET & RUSTCRAFT ROAD CORRIDORS				
ITEM #	QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE	AMOUNT
121.	55	CLASS A ROCK EXCAVATION AT _____ PER CUBIC YARD		
141.1	80	TEST PIT FOR EXPLORATION AT _____ PER CUBIC YARD		
142.	160	CLASS B TRENCH EXCAVATION AT _____ PER CUBIC YARD		
146.	4	DRAINAGE STRUCTURE REMOVED AT _____ EACH		
150.1	50	SPECIAL BORROW AT _____ PER CUBIC YARD		
151.	2,000	GRAVEL BORROW AT _____ PER CUBIC YARD		
156.	200	CRUSHED STONE AT _____ PER TON		
170.	5,700	FINE GRADING AND COMPACTING - SUBGRADE AREA AT _____ PER SQUARE YARD		
180.01	1	ENVIRONMENTAL HEALTH AND SAFETY PROGRAM AT _____ LUMP SUM		

Project # 607901		Contract #		
Location : DEDHAM				
Description : DEDHAM- PEDESTRIAN IMPROVEMENTS ALONG ELM STREET & RUSTCRAFT ROAD CORRIDORS				
ITEM #	QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE	AMOUNT
180.02	48	PERSONAL PROTECTION LEVEL C UPGRADE AT _____ PER HOUR		
180.03	120	LICENSED SITE PROFESSIONAL SERVICES AT _____ PER HOUR		
181.11	80	DISPOSAL OF UNREGULATED SOIL AT _____ PER TON		
181.12	80	DISPOSAL OF REGULATED SOIL - IN-STATE FACILITY AT _____ PER TON		
181.13	45	DISPOSAL OF REGULATED SOIL - OUT-OF-STATE FACILITY AT _____ PER TON		
181.14	25	DISPOSAL OF HAZARDOUS WASTE AT _____ PER TON		
182.1	1	INSPECTION AND TESTING FOR ASBESTOS AT _____ LUMP SUM		
182.2	20	REMOVAL OF ASBESTOS AT _____ PER FOOT		
183.1	10,000	TREATMENT OF CONTAMINATED GROUNDWATER AT _____ PER GALLON		

Project # 607901		Contract #		
Location : DEDHAM				
Description : DEDHAM- PEDESTRIAN IMPROVEMENTS ALONG ELM STREET & RUSTCRAFT ROAD CORRIDORS				
ITEM #	QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE	AMOUNT
183.2	1,000	DISPOSAL OF GRANULAR ACTIVATED CARBON AT _____ PER POUND		
184.1	2	DISPOSAL OF TREATED WOOD PRODUCTS AT _____ PER TON		
201.	17	CATCH BASIN AT _____ EACH		
201.6	2	ALTERNATE TYPE CATCH BASIN AT _____ EACH		
202.	9	MANHOLE AT _____ EACH		
202.15	2	MANHOLE - 5 FOOT DIAMETER AT _____ EACH		
204.	4	GUTTER INLET AT _____ EACH		
220.	34	DRAINAGE STRUCTURE ADJUSTED AT _____ EACH		
220.2	10	DRAINAGE STRUCTURE REBUILT AT _____ PER FOOT		

Project # 607901		Contract #		
Location : DEDHAM				
Description : DEDHAM- PEDESTRIAN IMPROVEMENTS ALONG ELM STREET & RUSTCRAFT ROAD CORRIDORS				
ITEM #	QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE	AMOUNT
220.3	3	DRAINAGE STRUCTURE CHANGE IN TYPE AT _____ EACH		
220.5	2	DRAINAGE STRUCTURE REMODELED AT _____ EACH		
220.6	10	SANITARY STRUCTURE REBUILT AT _____ PER FOOT		
220.7	27	SANITARY STRUCTURE ADJUSTED AT _____ EACH		
222.3	47	FRAME AND GRATE (OR COVER) MUNICIPAL STANDARD AT _____ EACH		
223.1	20	FRAME AND GRATE (OR COVER) REMOVED AND STACKED AT _____ EACH		
225.52	15	TRAP AND HOOD MUNICIPAL STANDARD AT _____ EACH		
227.22	1	SLUICE STRUCTURE AT _____ EACH		
227.3	35	REMOVAL OF DRAINAGE STRUCTURE SEDIMENT AT _____ PER CUBIC YARD		

Project # 607901		Contract # 113676		
Location : DEDHAM				
Description : Roadway Reconstruction and Related Work along a Section of Elm Street and Rustcraft Road				
ITEM #	QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE	AMOUNT
227.31	1,250	REMOVAL OF DRAINAGE PIPE SEDIMENT AT _____ PER FOOT		
228.	1	INFILTRATION BASIN AT _____ LUMP SUM		
① 234.12	800	12 INCH DRAINAGE PIPE - OPTION AT _____ PER FOOT		
① 235.12	2	12 INCH DRAINAGE PIPE FLARED END - OPTION AT _____ EACH		
238.10	400	10 INCH DUCTILE IRON PIPE AT _____ PER FOOT		
263.	65	LEACHING CHAMBER AT _____ PER FOOT		
309.	70	DUCTILE IRON FITTINGS FOR WATER PIPE AT _____ PER POUND		
347.1	25	1 INCH COPPER TUBING TYPE K AT _____ PER FOOT		
347.2	25	2 INCH COPPER TUBING TYPE K AT _____ PER FOOT		

① Item 241.12 is deleted

Proposal No. 607901-113676

Project # 607901		Contract # 113676		
Location : DEDHAM				
Description : Roadway Reconstruction and Related Work along a Section of Elm Street and Rustcraft Road				
ITEM #	QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE	AMOUNT
358.	50	GATE BOX ADJUSTED AT _____ EACH		
359.1	5	MWRA STUCTURE ADJUSTED AT _____ EACH		
381.	2	SERVICE BOX AT _____ EACH		
381.3	10	SERVICE BOX ADJUSTED AT _____ EACH		
384.	1	CURB STOP AT _____ EACH		
390.01	400	SPRINKLER SYSTEM MODIFIED AT _____ PER FOOT		
402.1	140	DENSE GRADED CRUSHED STONE FOR SUB-BASE AT _____ PER TON		
415.1	10,300	PAVEMENT STANDARD MILLING AT _____ PER SQUARE YARD		
431.	800	HIGH EARLY STRENGTH CEMENT CONCRETE BASE COURSE AT _____ PER SQUARE YARD		

Proposal No. 607901-113676

Project # 607901		Contract # 113676		
Location : DEDHAM				
Description : Roadway Reconstruction and Related Work along a Section of Elm Street and Rustcraft Road				
ITEM #	QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE	AMOUNT
440.	8,500	CALCIUM CHLORIDE FOR ROADWAY DUST CONTROL AT _____ PER POUND		
443.	20	WATER FOR ROADWAY DUST CONTROL AT _____ PER 1000 GALLONS		
450.23	2,170	SUPERPAVE SURFACE COURSE - 12.5 (SSC - 12.5) AT _____ PER TON		
450.31	160	SUPERPAVE INTERMEDIATE COURSE - 12.5 (SIC -12.5) AT _____ PER TON		
450.42	150	SUPERPAVE BASE COURSE - 37.5 (SBC - 37.5) AT _____ PER TON		
451.	300	HMA FOR PATCHING AT _____ PER TON		
452.	1,350	ASPHALT EMULSION FOR TACK COAT AT _____ PER GALLON		
453.	16,000	HMA JOINT SEALANT AT _____ PER FOOT		
470.	20	HOT MIX ASPHALT BERM AT _____ PER TON		

Proposal No. 607901-113676

Project # 607901		Contract # 113676		
Location : DEDHAM				
Description : Roadway Reconstruction and Related Work along a Section of Elm Street and Rustcraft Road				
ITEM #	QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE	AMOUNT
470.2	35	HOT MIX ASPHALT BERM, TYPE A - MODIFIED AT _____ PER FOOT		
472.	180	TEMPORARY ASPHALT PATCHING AT _____ PER TON		
504.	4,400	GRANITE CURB TYPE VA4 - STRAIGHT AT _____ PER FOOT		
504.1	290	GRANITE CURB TYPE VA4 - CURVED AT _____ PER FOOT		
509.	300	GRANITE TRANSITION CURB FOR PEDESTRIAN CURB RAMPS - STRAIGHT AT _____ PER FOOT		
509.1	150	GRANITE TRANSITION CURB FOR PEDESTRIAN CURB RAMPS - CURVED AT _____ PER FOOT		
514.	11	GRANITE CURB INLET - STRAIGHT AT _____ EACH		
570.3	400	HOT MIX ASPHALT CURB TYPE 3 AT _____ PER FOOT		
580.	1,200	CURB REMOVED AND RESET AT _____ PER FOOT		

Proposal No. 607901-113676

Project # 607901		Contract # 113676		
Location : DEDHAM				
Description : Roadway Reconstruction and Related Work along a Section of Elm Street and Rustcraft Road				
ITEM #	QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE	AMOUNT
620.12	870	GUARDRAIL, TL-2 (SINGLE FACED) AT _____ PER FOOT		
620.32	130	GUARDRAIL - CURVED, TL-2 (SINGLE FACED) AT _____ PER FOOT		
627.1	3	TRAILING ANCHORAGE AT _____ EACH		
627.82	3	GUARDRAIL TANGENT END TREATMENT, TL-2 AT _____ EACH		
630.2	835	HIGHWAY GUARD REMOVED AND DISCARDED AT _____ PER FOOT		
670.	60	FENCE REMOVED AND RESET AT _____ PER FOOT		
697.1	36	SILT SACK AT _____ EACH		
698.4	105	GEOTEXTILE FABRIC FOR PERMANENT EROSION CONTROL AT _____ PER SQUARE YARD		
701.	3,100	CEMENT CONCRETE SIDEWALK AT _____ PER SQUARE YARD		

Proposal No. 607901-113676

Project # 607901		Contract # 113676		
Location : DEDHAM				
Description : Roadway Reconstruction and Related Work along a Section of Elm Street and Rustcraft Road				
ITEM #	QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE	AMOUNT
701.1	260	CEMENT CONCRETE SIDEWALK AT DRIVEWAYS AT _____ PER SQUARE YARD		
701.2	200	CEMENT CONCRETE PEDESTRIAN CURB RAMP AT _____ PER SQUARE YARD		
702.	150	HOT MIX ASPHALT SIDEWALK OR DRIVEWAY AT _____ PER TON		
707.81	1	BOLLARD REMOVED AND RESET AT _____ EACH		
711.	1	BOUND REMOVED AND RESET AT _____ EACH		
740.	20	ENGINEERS FIELD OFFICE AND EQUIPMENT (TYPE A) AT _____ PER MONTH		
748.	1	MOBILIZATION AT _____ LUMP SUM		
751.	250	LOAM BORROW AT _____ PER CUBIC YARD		
751.72	1,900	COMPOST TOPDRESSING AT _____ PER SQUARE YARD		

Proposal No. 607901-113676

Project # 607901		Contract # 113676		
Location : DEDHAM				
Description : Roadway Reconstruction and Related Work along a Section of Elm Street and Rustcraft Road				
ITEM #	QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE	AMOUNT
751.8	50	LOAMY SAND BORROW AT _____ PER CUBIC YARD		
755.35	1	INLAND WETLAND REPLICATION AREA AT _____ LUMP SUM		
755.75	24	WETLAND SPECIALIST AT _____ PER HOUR		
755.76	1	WETLAND MONITORING REPORTS AT _____ LUMP SUM		
756.	1	NPDES STORMWATER POLLUTION PREVENTION PLAN AT _____ LUMP SUM		
765.01	1,850	HYDROSEEDING AT _____ PER SQUARE YARD		
765.441	750	LOW GROWING UPLAND MIX AT _____ PER SQUARE YARD		
765.442	2,100	ROADSIDE RIVERBANK - PART SHADE MIX AT _____ PER SQUARE YARD		
767.121	3,450	SEDIMENT CONTROL BARRIER AT _____ PER FOOT		

Project # 607901		Contract # 113676		
Location : DEDHAM				
Description : Roadway Reconstruction and Related Work along a Section of Elm Street and Rustcraft Road				
ITEM #	QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE	AMOUNT
767.31	80	STRAW MULCH AT _____ PER SQUARE YARD		
767.6	40	AGED PINE BARK MULCH AT _____ PER CUBIC YARD		
769.	965	PAVEMENT MILLING MULCH UNDER GUARD RAIL AT _____ PER FOOT		
770.1	60	WATER QUALITY (GRASS) SWALE AT _____ PER SQUARE YARD		
776.563	5	MAPLE - RED 1.5-2 INCH CALIPER AT _____ EACH		
788.013	3	ALDER SHRUB - SPECKLED 2 GALLON AT _____ EACH		
789.633	9	BLUEBERRY - HIGHBUSH 2-3 FEET AT _____ EACH		
790.719	6	DOGWOOD - SILKY 2-3 FEET AT _____ EACH		
794.735	19	SUMMERSWEET SHRUB 24-30 INCH AT _____ EACH		

Proposal No. 607901-113676

Project # 607901		Contract # 113676		
Location : DEDHAM				
Description : Roadway Reconstruction and Related Work along a Section of Elm Street and Rustcraft Road				
ITEM #	QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE	AMOUNT
795.009	7	VIBURNUM - ARROWWOOD 18-24 INCHES AT _____ EACH		
795.157	5	WINTERBERRY - FEMALE 24-30 INCH AT _____ EACH		
795.433	10	WILLOW - PUSSY 2-3 FEET AT _____ EACH		
804.3	250	3 INCH ELECTRICAL CONDUIT TYPE NM - PLASTIC -(UL) AT _____ PER FOOT		
811.31	6	PULL BOX 12 X 12 INCHES - SD2.031 AT _____ EACH		
813.811	1	ELECTRIC SERVICE RISER - STA 16+03 LT AT _____ EACH		
813.812	1	ELECTRIC SERVICE RISER - STA 24+86 RT AT _____ EACH		
824.211	1	RECTANGULAR RAPID FLASHING BEACON (AC POWER), LOCATION 1 AT _____ LUMP SUM		
824.212	1	RECTANGULAR RAPID FLASHING BEACON (AC POWER), LOCATION 2 AT _____ LUMP SUM		

Proposal No. 607901-113676

Project # 607901		Contract # 113676		
Location : DEDHAM				
Description : Roadway Reconstruction and Related Work along a Section of Elm Street and Rustcraft Road				
ITEM #	QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE	AMOUNT
824.213	1	RECTANGULAR RAPID FLASHING BEACON (AC POWER), LOCATION 3 AT _____ LUMP SUM		
824.451	1	FLASHING WARNING BEACON LOCATION 1 AT _____ LUMP SUM		
824.452	1	FLASHING WARNING BEACON LOCATION 2 AT _____ LUMP SUM		
824.51	1	FLASHING WARNING BEACON REMOVED AND STACKED AT _____ LUMP SUM		
832.	350	WARNING-REGULATORY AND ROUTE MARKER - ALUM. PANEL (TYPE A) AT _____ PER SQUARE FOOT		
841.2	1	SUPPORTS FOR GUIDE SIGN (D6-5 INCH TUBULAR POST) STEEL AT _____ EACH		
847.1	95	SIGN SUP (N/GUIDE)+RTE MKR W/1 BRKWAY POST ASSEMBLY - STEEL AT _____ EACH		
848.1	6	SIGN SUP (N/GUIDE)+RTE MKR W/2 BRKWAY POST ASSEMBLIES-STEEL AT _____ EACH		
850.41	75	ROADWAY FLAGGER AT _____ PER HOUR		

Proposal No. 607901-113676

Project # 607901		Contract # 113676		
Location : DEDHAM				
Description : Roadway Reconstruction and Related Work along a Section of Elm Street and Rustcraft Road				
ITEM #	QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE	AMOUNT
851.1	120	TRAFFIC CONES FOR TRAFFIC MANAGEMENT AT _____ PER DAY		
852.	525	SAFETY SIGNING FOR TRAFFIC MANAGEMENT AT _____ PER SQUARE FOOT		
852.11	800	TEMPORARY PEDESTRIAN BARRICADE AT _____ PER FOOT		
852.12	4	TEMPORARY PEDESTRIAN CURB RAMP AT _____ EACH		
853.1	4	PORTABLE BREAKAWAY BARRICADE TYPE III AT _____ EACH		
854.016	27,400	TEMPORARY PAVING MARKINGS - 6 INCH (PAINTED) AT _____ PER FOOT		
854.036	475	TEMPORARY PAVING MARKINGS - 6 INCH (TAPE) AT _____ PER FOOT		
856.	240	ARROW BOARD AT _____ PER DAY		
856.12	120	PORTABLE CHANGEABLE MESSAGE SIGN AT _____ PER DAY		

Proposal No. 607901-113676

Project # 607901		Contract # 113676		
Location : DEDHAM				
Description : Roadway Reconstruction and Related Work along a Section of Elm Street and Rustcraft Road				
ITEM #	QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE	AMOUNT
859.	18,000	REFLECTORIZED DRUM AT _____ PER DAY		
859.1	1,000	REFLECTORIZED DRUMS WITH SEQUENTIAL FLASHING WARNING LIGHTS AT _____ PER DAY		
864.04	1,000	PAVEMENT ARROWS AND LEGENDS REFL. WHITE (THERMOPLASTIC) AT _____ PER SQUARE FOOT		
866.106	9,400	6 INCH REFLECTORIZED WHITE LINE (THERMOPLASTIC) AT _____ PER FOOT		
866.112	2,200	12 INCH REFLECTORIZED WHITE LINE (THERMOPLASTIC) AT _____ PER FOOT		
867.106	9,400	6 INCH REFLECTORIZED YELLOW LINE (THERMOPLASTIC) AT _____ PER FOOT		
867.112	100	12 INCH REFLECTORIZED YELLOW LINE (THERMOPLASTIC) AT _____ PER FOOT		
874.	10	STREET NAME SIGN AT _____ EACH		
874.45	6	MISCELLANEOUS SIGNS REMOVED AND RESET AT _____ EACH		

Project # 607901		Contract # 113676		
Location : DEDHAM				
Description : Roadway Reconstruction and Related Work along a Section of Elm Street and Rustcraft Road				
ITEM #	QUANTITY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE	AMOUNT
874.51	1	MISCELLANEOUS SIGNS REMOVED AND DISCARDED AT _____ LUMP SUM		
986.	90	MODIFIED ROCKFILL AT _____ PER TON		
988.01	60	SEDIMENT FOREBAY PAVING AT _____ PER SQUARE FOOT		
Total Qty:		161,333.15		

①

DOCUMENT B00853

SCHEDULE OF PARTICIPATION BY DISADVANTAGED BUSINESS ENTERPRISES (DBES)

PRIME BIDDER: _____

DATE OF BID OPENING: _____ PROJECT NO: 607901

FEDERAL AID PROJECT NO: CMQ-003S(160)X

PROJECT LOCATION: DEDHAM

Name, Address, and Phone Number(s) of DBE	Name of Activity	(a)† DBE Contractor Activity Amount <i>Construction Work</i>	(b) DBE Other Business Amount <i>Services, Supplies, Material</i>	(c) Total amount eligible for credit under rules in Section 6 of Document 00719 - DBE Special Provisions
Total Bid Amount	TOTALS:	\$	\$	\$
\$	DBE Percentage of Total Bid:	%	%	%

† Column (a) must be at least one-half of the DBE participation goal. Attach additional sheets as necessary.

Is MassDOT Document B00855 (Joint Check Approval) being submitted for any of the above? Yes No
 Not Known at This Time

Will any of the contractors listed above be using a third party (i.e. manufacturer) to deliver materials or perform any portion of work by a third party? Yes No

CERTIFICATION: I HEREBY DECLARE, TO THE BEST OF MY KNOWLEDGE, THAT I HAVE READ THE SPECIAL PROVISIONS FOR PARTICIPATION BY DISADVANTAGED BUSINESS ENTERPRISES - DOCUMENT 00719. BOTH THIS SCHEDULE AND THE RELEVANT AND ACCOMPANYING LETTER(S) OF INTENT ARE IN FULL COMPLIANCE WITH THE PROVISIONS OF, AND IN ACCORDANCE WITH, TITLE 49 CODE OF FEDERAL REGULATIONS, PART 26 (49 CFR Part 26).

SIGNATURE: _____ DATE: _____

NAME AND TITLE (PRINT): _____

EMAIL ADDRESS: _____ TEL NO: _____

*** END OF DOCUMENT ***

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**DISADVANTAGED BUSINESS ENTERPRISES (DBE) PARTICIPATION
LETTER OF INTENT**

(To be completed by the DBE – Page 2 of 2)

DATE OF BID OPENING: _____

PROJECT NUMBER: 607901

FEDERAL AID PROJECT NUMBER: CMQ-003S(160)X

PROJECT LOCATION: DEDHAM

PRIME BIDDER: _____

DBE COMPANY NAME: _____

<u>Item number</u> if applicable	<u>NAICS</u> <u>Code</u>	<u>Description of Activity</u> with notations such as Services, or Brokerage, Installation Only, Material Only, or Complete	<u>Quantity</u>	<u>Unit Price</u>	<u>Amount</u>
TOTAL AMOUNT:					

Please give full explanations, attach additional sheets if necessary.

I HEREBY VERIFY THAT _____ WILL SOLELY
(DBE company name)
PERFORM THE WORK, OR PROVIDE THE SERVICES OR MATERIALS, AS DESCRIBED ABOVE.

DBE AUTHORIZED SIGNATURE: _____

NAME AND TITLE (PRINT): _____

TELEPHONE NUMBER: _____ FAX NUMBER: _____

EMAIL ADDRESS: _____

DOCUMENT B00855

DBE JOINT CHECK ARRANGEMENT APPROVAL FORM

(to be submitted by Prime Contractor)

Contract No: 113676 **Project No:** 607901 **Federal Aid No:** CMQ-003S(160)X

Location: DEDHAM

Project Description: Roadway Reconstruction and Related Work along a Section of Elm Street and Rustcraft Road

We have received the attached request for the use of a joint check arrangement from _____, a DBE on the above- referenced Contract and _____, a Material Supplier/Vendor for the subject Contract. The DBE has complied with the requirements of 49 CFR Part 26.55(c)(1). In particular, the DBE has:

- a written agreement with the material supplier/vendor;
- applied for credit with the subject material supplier and has supplied the vendor's response;
- shown that it will place all orders to the subject material supplier/vendor;
- made and retains all decision-making responsibilities concerning the materials; and
- provided a Joint Check Agreement that is acceptable to MassDOT;

As the Contractor for the Project, we agree to issue joint checks (made payable to the Material Supplier/Vendor and the DBE) for payment of sums due pursuant to invoices from the Supplier/Vendor and DBE.

Contractor:

Company Name

Signature
Duly Authorized

Printed Name

Date

Title

Subcontractor:

Company Name

Signature
Duly Authorized

Printed Name

Date

Title

*** END OF DOCUMENT ***

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DOCUMENT B00856

JOINT VENTURE AFFIDAVIT

(All Firms)

- All Information Requested By This Schedule Must Be Answered. Additional Sheets May Be Attached.
- If, there is any change in the information submitted, the Joint Venture parties must inform MassDOT Pre-Qualifications Office (and, if one of the companies is a DBE, the Director of Contract Compliance, Office of Civil Rights) *prior* to such change, in writing, either directly or through the Prime Contractor if the Joint Venture is a subcontractor.
- If the Joint Venture Entity will be the bidder on a prime Contract, it must bid and submit all required documents (insurance, worker’s compensation, bonds, etc.) in the name of the Joint Venture Entity.

I. Name of Joint Venture: _____

Type of Entity if applicable (Corp., LLC): _____ Filing State: _____

Address of joint venture: _____

Phone No(s) for JV Entity: _____ E-mail: _____

Contact Person(s) _____

Tax ID/EIN of Joint Venture: _____ Vendor Code: _____

II. Identify each firm or party to the Joint Venture:

Name of Firm: _____

Address: _____

Phone: _____ E-mail: _____

Contact person(s) _____

Name of Firm: _____

Address: _____

Phone: _____ E-mail: _____

Contact Person(s) _____

III. Describe the role(s) of the each party to the Joint Venture:

- IV. Attach a copy of the Joint Venture Agreement.** The proposed Joint Venture Agreement should include specific details including, but not limited to: (1) the contributions of capital and equipment; (2) work items to be performed by each company’s forces, (3) work items to be performed under the supervision of any DBE Venturer; (4) the commitment of management, supervisory and operative personnel employed by the DBE to be dedicated to the performance of the Project; and (5) warranty, guaranty, and indemnification clauses.

V. Attach any applicable Corporate or LLC Votes, Authorizations, etc.

VI. Ownership of the Joint Venture:

A. What is the percentage(s) of each company's ownership in the Joint Venture?

ownership percentage(s): _____

ownership percentage(s): _____

B. Specify percentages for each of the following (provide narrative descriptions and other detail as applicable):

1. Sharing of profit and loss: _____

2. Capital contributions:

(a) Dollar amounts of initial contribution: _____

(b) Dollar amounts of anticipated on-going contributions: _____

(c) Contributions of equipment (specify types, quality and quantities of equipment to be provided by each firm): _____

4. Other applicable ownership interests, including ownership options or other agreements, which restrict or limit ownership and/or control:

5. Provide copies of all other written agreements between firms concerning bidding and operation of this Project or projects or contracts.

6. Identify all current contracts and contracts completed during the past two (2) years by either of the Joint Venture partners to this Joint Venture:

VII. Control of and Participation in the Joint Venture. Identify by name and firm those individuals who are, or will be, responsible for and have the authority to engage in the following management functions and policy decisions. (Indicate any limitations to their authority such as dollar limits and co-signatory requirements.):

A. Joint Venture check signing:

B. Authority to enter Contracts on behalf of the Joint Venture:

C. Signing, co-signing and/or collateralizing loans:

D. Acquisition of lines of credit:

E. Acquisition and indemnification of payment and performance bonds:

F. Negotiating and signing labor agreements:

G. Management of contract performance. *(Identify by name and firm only):*

1. Supervision of field operations: _____
2. Major purchases: _____
3. Estimating: _____
4. Engineering: _____

VIII. Financial Controls of Joint Venture:

A. Which firm and/or individual will be responsible for keeping the books of account?

B. Identify the "Managing Partner," if any, and describe the means and measure of their compensation:

C. What authority does each firm have to commit or obligate the other to insurance and bonding companies, financing institutions, suppliers, subcontractors, and/or other parties participating in the performance of this Contract or the work of this Project?

IX. Personnel of Joint Venture: State the approximate number of personnel (by trade) needed to perform the Joint Venture's work under this Contract. Indicate whether they will be employees of the majority firm, DBE firm, or the Joint Venture.

	Firm 1 (number)	Firm 2 (number)	Joint Venture (number)
Trade			
Professional			
Administrative/Clerical			
Unskilled Labor			

Will any personnel proposed for this Project be employees of the Joint Venture?: _____

If so, who: _____

A. Are any proposed Joint Venture employees currently employed by either firm?

Employed by Firm 1: _____ Employed by firm 2 _____

B. Identify by name and firm the individual who will be responsible for Joint Venture hiring: _____

X. Additional Information. Please state any material facts and additional information pertinent to the control and structure of this Joint Venture.

XI. AFFIDAVIT OF JOINT VENTURE PARTIES. The undersigned affirm that the foregoing statements and attached documents are correct and include all material information necessary to identify and explain the terms and operations of our Joint Venture and the intended participation of each firm in the undertaking. Further, the undersigned covenant and agree to provide to MassDOT current, complete and accurate information regarding actual Joint Venture work, payments, and any proposed changes to any provisions of the Joint Venture, or the nature, character of each party to the Joint Venture. We understand that any material misrepresentation will be grounds for terminating any Contract awarded and for initiating action under Federal or State laws concerning false statements.

Firm 1

Firm 2

Signature
Duly Authorized

Signature
Duly Authorized

Printed Name and Title

Printed Name and Title

Date

Date

*** END OF DOCUMENT ***