TOWN OF TOPSFIELD

INVITATION FOR BIDS

FOR

TOPSFIELD POND STREET CULVERT REPLACEMENT

JULY 21, 2021

KEVIN HARUTUNIAN
TOWN ADMINISTRATOR

Neil Shea, PROJECT MANAGER
IPSWICH RIVER WATERSHED ASSOCIATION
143 COUNTY ROAD
IPSWICH, MA 01938
978-412-8200

Donna Rich, PURCHASING AGENT
8 WEST COMMON STREET
TOPSFIELD, MA 01983
978-887-1504

TOPSFIELD CONSTRUCTION SERVICES
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TOPSFIELD POND STREET CULVERT REPLACEMENT
Advertisement for Bids

Sealed bids for furnishing, constructing and installing the POND STREET CULVERT REPLACEMENT will be received at the Office of the Purchasing Agent, Topsfield Town Hall, 8 W Common Street, Topsfield, MA 01983 until the time specified below at which time the bids will be publicly opened and read.

Specifications and bid forms may be obtained through the town of Topsfield's website at topsfield-ma.gov/purchasing, via email at nshea@ipswichriver.org, or at the COMMBUYS page listed on the Central Register.

Bids will be opened in the Office of the Purchasing Agent on Wednesday August 11th, 2021, at 2:00 p.m. Each Bid must be accompanied by a bid security consisting of a bid bond, cash, or, certified check issued by a responsible bank or trust company in the amount of 5% of the bid price. A performance bond in an amount equal to 100 percent of the total amount of the contract price with a surety company qualified to do business in the Commonwealth of Massachusetts will be required for the faithful performance of the contract, as well as a labor and materials bond in an amount equal to 100 percent of the total contract price.

Pre-Bid Conference and Site Visit will be held at the site on Thursday July 29th at 10:00 a.m.
It is highly encouraged that all prospective bidders have a representative in attendance.

All bids for this project are subject to applicable public bidding laws of Massachusetts, including, but not limited to G.L. c.30, §39M. Each Prospective bidder proposing to bid must be prequalified in accordance with 720 CMR 5.00, "Prequalification of Contractors". Bidders may obtain plans and specifications but may not bid without being listed on the official or waiver contractor lists issued by the MassDOT Prequalification Office. Selection of the contractor will be based upon bidder qualifications, including evidence of past performance in similar projects, and bid price. The contract will be awarded to the bidder deemed by the awarding authority to be the lowest responsible and eligible bidder.

Attention is directed to the minimum wage rates to be paid as determined by the Commissioner of Labor and Workforce Development and the weekly payroll record submittal requirements under the provisions of Massachusetts General Laws, Chapter 149, Section 26 through 27D inclusive.

The bidder agrees that its bid shall be good and may not be withdrawn for a period of 60 days, Saturdays, Sundays and legal holidays excluded, after the opening of the bids. The Town reserves the right to waive any informalities, to accept or reject, in whole or in part any or all bids, or take whatever other action may be deemed to be in the best interest of the Town.

The Town of Topsfield
By: Donna Rich, Purchasing Agent

TOPSFIELD POND STREET CULVERT REPLACEMENT
General Conditions And Requirements

1. The term "Project Manager" as used throughout these Specifications shall mean Neil Shea, Ipswich River Watershed Association.

2. Attention of all bidders is directed to Massachusetts General Laws and to all other applicable sections of the General Laws as most recently amended which govern the award of this Contract.

3. Bidders must satisfy themselves by personal examination of the site of the work, and by such other means as they may wish, as to the actual conditions there existing, the character and requirements of the work, the difficulties attendant upon its execution, and the accuracy of all estimated quantities stated in the Bid, and neither the Project Manager nor the Owner makes any warranty or representation as to any of said matters or as to the accuracy of the methods by which any descriptions 'or estimates have been obtained.

4. The bidder shall submit his bid upon forms furnished by the Town. The bidder shall specify the price in figures and in words, if space for words is provided. All words and figures shall be typewritten or in ink. Any exceptions to the Specifications and/or bid prices shall be submitted in writing at the time the bids are submitted. In case of discrepancy, the amount shown in words will govern.

5. All bid bids shall be signed correctly in ink by the individual or in case of a firm, partnership or corporation, it shall be signed by a person having a legal authority from said firm, partnership or corporation.

6. Each bid shall be in a sealed envelope, clearly marked "**Topsfield Pond Street Culvert Replacement**" with the name and address of the bidder and the time and date of bid opening.

7. Bids will be publicly opened and read at the time and place indicated in the Advertisement for Bid. Bidders or their authorized agents are invited to be present.

8. Each bidder must sign and submit the "Non-Collusion Affidavit", a "Certification of State Tax Compliance, a Signature of Vote, and Statement of Wage Compliance with the bid sheet.

9. Bid forms shall be completely filled in. Bids which are incomplete, conditional, or obscure, or which contain additions not called for will be rejected.

10. Any Bid received after the time and date of opening stated in the "Advertisement for Bid" shall not be opened. Unopened Bids will be returned to the respective Bidders. No award will be made to any bidder who cannot satisfy the Project Manager that he has sufficient ability and experience in this class of work and sufficient capital and

plant to enable him to prosecute and complete the work successfully within the time named. The Town's decision or judgment on these matters will be final, conclusive and binding.

11. The Town may make such investigations as it deems necessary to determine the ability of the bidder to perform the work, and the bidder shall furnish to the Town all such information and data for this purpose as the Town may request. **The Town reserves the right to reject any bid if the evidence submitted by, or investigation of such bidder fails to satisfy the Town, that such bidder is properly qualified to carry out the obligations of the Agreement and to complete the work contemplated therein within the time period set forth in the Bid. The Town reserves the right to reject any bid of a bidder who cannot satisfy the Owner that he has sufficient experience to successfully complete the project.**

12. All applicable Federal, State and Local Laws, ordinance and rules, regulations (including but not limited to any laws, ordinances or regulations relating to the Town of Topsfield, the Massachusetts Highway Department and Department of Environmental Protection) of any authorities shall be binding upon the bidder throughout the pendency of this Contract. The bidder shall be responsible for compliance with any such law, ordinance rule, or regulation, and shall hold the Town and the Project harmless and indemnify same in the event of non-compliance the pendency of this Contract.

13. Withdrawal Of Bids: A bidder may withdraw a bid on a clear showing to the satisfaction of the Town that the bid amount resulted from bona fide clerical or mechanical error of a substantial nature or from other similar unforeseen circumstances. The Town will return the bid deposit. However, in the event of an error in the bid (e.g., clerical error, mathematical error) the Town shall interpret the bid to protect the public interest in securing the lowest responsible bid for the contract.

14. All bids shall be accompanied by a bid deposit in the form of a Bid Bond, duly executed and acknowledged by the bidder, as Principal, and by a surety company qualified to do business in the Commonwealth of Massachusetts, or cash, or a certified check, treasurer's or cashier's check issued by a responsible bank or trust company to the Town of Topsfield. The amount of such bid deposit shall be 5% of the value of the bid total or for each particular bid item where applicable shall be enclosed in the sealed envelope containing the bid. Each such Bid Bond, cash or check may be held by the Town as security for the fulfillment of the bidder's agreements as herein above set forth and as set forth in the bid. Should the bidder fail to fulfill such agreements in his bid, the check or cash shall become the property of the Town, or if a Bid Bond was furnished, the Bid Bond shall become payable to the Town as liquidated damages, otherwise, the bid security shall be returned to the Bidder.

15. A Performance and Payment Bond where applicable in the amount of One Hundred (100%) percent of the annual contract price will be required for the faithful performance of the Contract. The Contractor shall obtain and submit the bonds within ten (10) days after notification of the bid award.

The Town requires a comprehensive General Liability insurance policy of at least One Million Dollars ($1,000,000) Bodily Injury and Property Damage Liability per occurrence, with a Two Million Dollar ($2,000,000) Annual Aggregate Limit; Automobile Liability of at least One Million Dollars ($1,000,000) combined single limit; the aggregate limit of General Liability coverage required above may be provided under an Umbrella Liability policy.

The contractor shall provide a certificate of Worker's Compensation as required by Massachusetts Law.

The successful bidder's Bid Bond shall not be released until such time the Performance and Payment Bonds and Certificate of Insurance have been posted. Within fourteen (14) working days of receipt of acceptable Performance and Payment Bonds and Agreement signed by the party to whom the Agreement was awarded, the Town shall sign the Agreement and return to such party an executed duplicate of the Agreement.

16. At the time of the opening of bids, each bidder will be presumed to have read and to be thoroughly familiar with the Contract Documents (including all addenda). The failure or omission of any bidder to examine any form, instrument or document shall in no way relieve the bidder from any obligation with respect to his bid. Each Bidder shall personally visit the site to thoroughly acquaint himself with the conditions as they exist thereon. Failure of any bidder to thoroughly examine the Bidding and Contract Documents or to visit and examine the site shall in no way relieve him of any obligation with respect to his bid or any responsibility assigned him under the Contract.

17. Direct questions electronically to Mr. Neil Shea, Project Manager, Ipswich River Watershed Association, Email: nshea@ipswichriver.org. Interpretation of the provisions of the Bidding and Contract Documents will be made by the Project Manager upon written request of any bidder, provided that such request is received by the Project Manager at least seven (7) days prior to date of applicable bid opening, and that the Project Manager considers such interpretation to be of sufficient importance.

18. Oral or telephone interpretations will not generally be made, and if made, shall be strictly informal and not legally valid or binding. Such electronically written interpretations shall be in the form of Addenda to the Bidding and Contract Documents. Bidders are urged to communicate all errors and discrepancies found in the Bidding and Contract Documents to the Project Manager. Telephone calls pointing out any such errors or discrepancies will be taken by the Project Manager, but only for the purpose of receiving the information in order that it may be properly processed, and not for interpretation or clarification.

19. Each Bidder must satisfy himself by personal examination of the site of the Work and by such other means as he may wish, as to the actual conditions there existing, the character and requirements of the Work, the difficulties attendant upon its execution, and the accuracy of all estimated quantities stated in the Bid.

20. All information given on the Contract Documents relating to subsurface and other conditions, natural phenomena, existing pipes, and other structures is from the best sources at present available to the Town. All such information is furnished only for the information and convenience of bidders and is not guaranteed.

21. It is agreed and understood that the Town does not warrant or guarantee that the subsurface or other conditions, natural phenomena, existing pipes, or other structures encountered during construction will be the same as those indicated on the Contract Documents.

22. It is agreed further and understood that no Bidder or Contractor shall use or be entitled to use any of the information made available to him or obtained in any examination made by him in any manner as a basis of or ground for any claim or demand against the Town or the Project Manager, arising from or by reason of any variance which may exist between the information made available and the actual subsurface or other conditions, natural phenomena, existing pipes, or other structures actually encountered during the construction work, except as may otherwise be expressly provided for in the Contract Documents.

23. The Contractor shall comply with any and all requirements set out in the following:

- Advertisement for Bid
- General Conditions
- Standard Forms
- Bid - Summary Bid Sheets
- Specifications
- Owner - Contract Agreement
- Minimum Wage Rates

24. The Contractor must provide all necessary equipment to perform the required work in the time allowed as per the terms of this Bid. The Contractor shall furnish and pay the cost of all the necessary materials and furnish and pay for all superintendence, labor, tools, equipment and transportation and perform all work required for and the restoration of the property in strict accordance with this Contract, and any amendments thereto and such supplemental plans and Specifications which may hereafter be approved.

25. The actual performance of work and superintendence shall be performed by the Contractor, but the Town shall, at all times; have access to the premises for the purpose of observing or inspecting the work performed by the Contractor. Town's approval to allow Contractor to assign, sub-contract or sublet any portion or all of this work shall not diminish or reduce Contractor's responsibility to perform under this Contract. Contractor shall have full responsibility for all sub-contractors or assignments under this Contract.

26. In the event the Town is dissatisfied with the progress or performance of the Work in accordance with the Standard of Work or time of completion set forth in the Agreement,

the Town shall give the Contractor or his representative written notice in which the Town shall state the cause of dissatisfaction; provided however, no written notice or opportunity for remedy shall be provided, if the Town finds the site unattended at any time or is violating any major operating conditions established by occupational Safety and Health notice is received by the Contractor or his representatives, the Contractor shall be deemed in default of this Agreement, and shall be paid only for such work as has been completed prior to default. Again, the Contractor shall not be provided a one (1) day remedy period if site is found unattended at any time and the Town shall be entitled to automatically terminate the Contract without notice if afore-said circumstances occurs.

27. In any case, where there is a matter of opinion concerning any portion of the Specifications, work methods, work to be accomplished, or any other matter concerning this Contract, the final decision shall be that of the Town.

28. The Contractor shall indemnify and save harmless the Town and the Town's agents, including the Designer, the Project Manager, and employees from and against all losses and all claims, demands, payments suits, actions recoveries, and judgments of every nature and description brought or recovered against them by reason of any act or omission of the said Contractor, its agent, or employees, in the execution of the work or in guarding the same.

29. Contractor shall not allow any other business interest or operation to interfere with or diminish his ability to perform services required under this Contract with maximum efficiency.

30. All quantities are approximate and do not expressly or by implication agree that the actual quantities will correspond therewith, but the Town reserves the right to increase or decrease the quantity. An increase or decrease in the quantity for any item shall not be regarded as cause for an increase or decrease in the unit prices.

31. Once the bidder has submitted his bid, and said bid is properly received by the Town for consideration and comparison with other bids similarly submitted, the bidder agrees that he may not and will not withdraw his bid for a period of forty-five (45) consecutive calendar days after the actual date of the opening bids.

32. Where applicable, all bid prices shall include the cost of mobilization of equipment and no extra payment will be made for such mobilization or movement of equipment from job to job site.

33. Any qualifications or exceptions to the Specifications must be stated in the Bid or in an accompanying letter with the Bid on the bidder's stationary.

34. The Town may waive any formalities or minor defects or reject any and all bids. Any bid may be withdrawn prior to the above scheduled time for opening of bids or authorized postponement thereof. Any bid received after the time and date specified shall not be considered. Should there be reasons why the Contract cannot be awarded

within the specified period, the time may be extended by mutual agreement between the Town and the bidder.

35. Payroll Records, Labor, Maximum Hours of Employment: Every employee in public work shall lodge, board and trade where and with whom he elects; and no persons or his agents or employees under Contract with the Commonwealth, a county, Town or with a department, board, commission or officer acting therefore, for the doing of public work, shall directly or indirectly require as a condition of employment therein, that the employee shall lodge, board or trade at a particular place or with a particular person (Chapter 149,Section 25 of the General Law).

36. No laborer, workman, mechanic, foreman or inspector working within this Commonwealth, in the employee of the Contractor, Sub-contractor or other persons doing or contracting to do the whole or a part of the work contemplated by this Contract, shall be required or permitted to work more than eight (8) hours in any one day or more than 48 hours in any one week, or more than six (6) days in any one week, except in cases of emergency, or in case any Town subject to Section 149 of the General Laws is a party to such a Contract, more than eight (8) hours in any one day, except as aforesaid. The Owner or the Contractor or any Subcontractor may employ laborers, work-men, mechanics, foreman and inspectors for more than eight (8) hours in any one day in the work to be done or under Contract when in the opinion of the Commissioner of Labor and Industries, public necessity so require. (Chapter 149, Section 34 of the General Laws, as amended).

37. Attention of Bidders is called to Section 148 of Chapter 149 of the General Laws and amendments thereof requiring the weekly payment of employees.

38. Upon request of the Project Manager or the Massachusetts Department of Labor and Industries, the Contractor shall furnish certified copies of any or all payrolls for the Contract, showing the name, address, and occupational classification of each employee on said works, and the hours worked by, and the wages paid each such employee. Such payroll shall also include the rates paid for rented trucks or rental equipment of any kind used on the work. This requirement shall also apply to the work of any Sub-contractor having a Subcontract for any of the work performed on the project. Such records shall be kept in such manner as the Commissioner of Labor and Industries shall prescribe, and shall be open to inspection by the Project Manager or any authorized representative of the Department of Labor and Industries at any reasonable time and as often as may be necessary.

39. Buy American: The Contractor agrees that preference will be given to domestic construction material by the Contractor, Subcontractor, material men, and suppliers in the performance of this Contract.

40. Compliance with Laws: The Contractor shall keep himself fully informed of all existing and future Federal, State and Local Laws, ordinances, rules and regulations affecting those engaged or employed on the Work, the materials and equipment used in

the Work or the conduct of the Work, and of all orders, decrees and other requirements of bodies or tribunals having any jurisdiction or authority over the same. If any discrepancy or inconsistency is discovered in the Drawings, Specifications or other Contract Documents in relation to any such law, ordinance, rule, regulation, order, decree or other requirement, the Contractor shall forthwith report to the Administrator in writing. The Contractor shall at all times observe and comply with, and cause all his agents, servants and employees to observe and comply with all such existing and future laws, ordinances, rules, regulations, orders, decrees and other requirements and he shall protect, indemnify and save harmless the Town, its officers; agents, servants, employees and the Project Manager from and against any and all claims, demands, suits, liabilities, judgments, penalties, losses, damages, costs and expenses, including attorney's fee, arising from or based upon any violation or claimed violation of any such law, ordinance, rule regulation, order, decree or other requirements, whether committed by the Contractor or any of his agents, servants or employees.

41. Applicable provisions of Massachusetts General Laws and Regulations and/or the United States Code and Code of Federal Regulations govern this contract and any provision in violation of the foregoing shall be deemed null, void and of no effect. Where conflict between Code of Federal Regulations and State Laws and Regulations exist, the more stringent requirement shall apply.

Minimum Wage Rates as determined by the Commissioner of Department of Labor and Workforce Development under the provision of the Massachusetts General Laws, Chapter 149, Sections 26 to 27D, as amended, apply to this project. It is the responsibility of the Contractor, before bid opening, to request if necessary, any additional information on Minimum Wage Rates for those trades people who may be employed for the proposed work under this contract.

This project is subject to the Safety and Health Regulations of the U.S. Department of Labor set forth in Title 29 CFR, Part 1926 and to all subsequent amendments, and to the Massachusetts Department of Labor and Industries, Division of Industrial Safety "Rules and Regulations for the Prevention of Accidents in Construction Operations" (Chapter 454 CMR 10.00 et seq.). Contractors shall be familiar with the requirements of these regulations.

42. Massachusetts Sales and Use Tax: Materials and equipment purchased for permanent installation in this project will be exempt from the Massachusetts Sales and Use Tax. The exemption certificate number will be furnished to the Contractor. Each Bidder shall take this exemption into account in calculating his Bid for the Work.

43. Any temporary utility of the Contractor's convenience, other than as stated in the Contract, shall be the Contractor's responsibility and at his own expense.

44. Method of Payment to Contractor: The Town, so long as the Contractor continues to carry on the Work, shall make monthly payments therefore as follows: Each month prior to the completion of the work done to date of the estimate and thereupon the Town shall

deduct such estimate five percent (5%) thereof, and shall pay the balance of such estimate to the Contractor. Thirty (30) days after the satisfactory completion of the Work as determined by the Project Manager, the Town shall pay the Contractor the final amount due and remaining to be paid under this Contract, deducting from said amount and keeping for its own, any expense incurred by the Town on account of defects, omissions or mistakes of the Contractor in his Work. Provided, however, that no final payment shall be made until all liens and claims against the Town and its officers, due to the work, are satisfied.

45. Patented Devices, Materials And Processes: It is mutually understood and agreed that, without exception, contract prices are to include all royalties and costs arising from patents, trademarks and copyrights in any way involved in the work. It is the intent that whenever the Contractor is required or desires to use any design, device, material or process covered by letters patent or copyright, the rights for such use shall be provided for by suitable legal agreement with the patentee or owners.

A copy of this agreement shall be filed with the Project Manager, however, whether or not such agreement is made or filed as noted, the Contractor and the surety in all cases shall indemnify and save harmless the Town from any and all claims for infringement by reason of the use of any such patented design, device, material or process to be involved under the contract.

He, or They, shall indemnify the Town for any cost, expenses and damages which it may be obliged to pay, by reason of any such infringement, at any time during the prosecution or after the completion of the work.

46. A contact person must be designated by the Contractor upon award of the Contract who will be accessible to the Town on a twenty-four hour per day basis for the duration of the construction period.

47. Contractor Parking: The Contractor and his employees and subcontractors and their employees shall park personal vehicles near the Project Area.

48. 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 intention to commence operations affecting such utilities at least one (1) month in advance of the commencement of such operations that may affect their utilities and the Contractor shall at the same time file a copy of such notice with the Project Manager.

49. The Contractor shall make his own investigation to assure that no damage to existing structures, drainage lines, traffic control signals and other utilities will occur as a result of his operations.

50. The Contractor shall notify "Mass. Dig Safe" and procure a DIG SAFE number of each location prior to disturbing ground in any way. "DIG SAFE" Call Center: 1-888-344-7233

Written Bid Requirements:

1. Complete the enclosed forms and return with bid:

    i. Certificate of Tax Compliance
    ii. Certificate of Non-Collusion
    iii. Certificate of Signature
    iv. Statement of Wage Compliance

2. Completed Bid Form in ink

3. Bid Bond in the amount of 5% of contract value

***Note:** The Town of Topsfield is a tax-exempt public entity, and is not required to pay Massachusetts state sales tax for materials and goods. A tax-exempt certificate will be provided to the successful bidder.

CERTIFICATE OF NON-COLLUSION

The undersigned certifies under the penalties of perjury that this bid or bid has been made and submitted in good faith and without collusion or fraud with any other person. As used in this certification, the word "person" shall mean any natural person, business, partnership, corporation, union, committee, club or other organization, entity, or group of individuals.

Date:_____

Name of General Bidder:_____

Signature of Individual or Corporate Officer:_____

Federal Employer ID#:_____

CERTIFICATE OF TAX COMPLIANCE

The undersigned further certifies that pursuant to Massachusetts General Laws, Chapter 62C, Section 49A, that under penalties of perjury that I have filed all State Tax Returns and paid all State Taxes required under the law.

Date:_____

Name of General Bidder:_____

Signature of Individual or Corporate Officer:_____

Federal Employer ID#:_____

CERTIFICATE OF SIGNATURE

(This must be returned with your Bid)

The undersigned, the

_____of
Title

_____, a
Company Name

Massachusetts corporation (the "Company"), does hereby certify on behalf of the Company that _____is the duly elected _____of the Company; can exercise such power and perform such duties as usually accompany such office; and implicit in such power is the authority to submit a bid to the Town of Topsfield, Massachusetts (the "Town") and to execute a contract with the Town should such bid be awarded to the Company.

IN WITNESS WHEREOF, the undersigned affirms under the penalties of perjury and hereunto

sets his/her hand and seal this

_____day of _____20 _____

_____

STATEMENT OF WAGE COMPLIANCE

DATE: _____

I, _____

(Name of Signatory) (Title)

do hereby state:
That I pay or supervise the payment of the persons employed by _____

_____ on the _____ Project,

as the Contractor, subcontractor

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 Section Twenty-seven (27) and Twenty-seven A (27A) of Chapter One Hundred and Forty Nine (149) of the General Laws.

Signature: _____

Title: _____
(Signed under penalties of perjury as provided for under Section 27B of Chapter 149, General Laws.)

BID- SUMMARY BID SHEET

TO: The Town of Topsfield, Massachusetts

A. The undersigned hereby proposes to furnish all labor, materials, equipment and tools incidental thereto; for

Pond Street Culvert Replacement

and to do and complete all work in its entirety in the manner and under the conditions required or provide materials as stated in the Specifications and at the prices listed below and for the time period set forth. The value listed below must match the value on the final page of the bid tabs.

1. Replacement of the culvert at Pond Street per attached specification.

Company Name: _____

Address: _____

By: _____
(Print Name)

Signature: _____

Date: _____

Bid Price:_____

Bid Price in Words:_____

Bid Tabs

ITEM NO.	QTY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE		TOTAL	
			DOLLARS	CENTS	DOLLARS	CENTS
101.	0.05	CLEARING AND GRUBBING AT _____ PER ACRE				
120.1	25	UNCLASSIFIED EXCAVATION AT _____ PER CUBIC YARD				
140.	400	BRIDGE EXCAVATION AT _____ PER CUBIC YARD				
148.01.*	15	DREDGING AND STOCKPILING OF STREAMBED MATERIAL AT _____ PER CUBIC YARD				
150.	50	ORDINARY BORROW AT _____ PER CUBIC YARD				
151.	15	GRAVEL BORROW AT _____ PER CUBIC YARD				
151.2	195	GRAVEL BORROW FOR BACKFILLING STRUCTURES AND PIPES AT _____ PER CUBIC YARD				
156.	55	CRUSHED STONE AT _____ PER TON				
170.	55	FINE GRADING AND COMPACTING AT _____ PER SQUARE YARD				
250.06*	35	6 INCH POLYVINYL CHLORIDE SANITARY SEWER PIPE AT _____ PER FOOT				
402.	8	DENSE GRADED CRUSHED STONE FOR SUB-BASE AT _____ PER CUBIC YARD				
415.1	55	PAVEMENT STANDARD MILLING AT _____ PER SQUARE YARD				
443.	1	WATER FOR ROADWAY DUST CONTROL AT _____ PER THOUSAND GALLONS				

CARRIED FORWARD _____

BROUGHT FORWARD _____

ITEM NO.	QTY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE		TOTAL	
			DOLLARS	CENTS	DOLLARS	CENTS
450.23	10	SUPERPAVE SURFACE COURSE - 12.5 (SSC-12.5) AT _____ PER TON				
450.3	20	SUPERPAVE INTERMEDIATE COURSE - 19.0 (SIC - 19.0) AT _____ PER TON				
452.	15	ASPHALT EMULSION FOR TACK COAT AT _____ PER GALLON				
453.	50	HMA JOINT SEALANT AT _____ PER FOOT				
482.3	50	SAWCUTTING ASPHALT PAVEMENT AT _____ PER FOOT				
620.12	170	GUARDRAIL, TL-2 (SINGLE FACED) AT _____ PER FOOT				
627.1	2	TRAILING ANCHORAGE AT _____ PER EACH				
627.82	2	GUARDRAIL TANGENT END TREATMENT, TL-2 AT _____ PER EACH				
632.2	3	INDIVIDUAL POST REMOVED AND RESET AT _____ PER EACH				
697.2*	60	FLOATING SILT FENCE AT _____ PER FOOT				
698.1*	15	GEOTEXTILE FABRIC FOR STABILIZATION AT _____ PER SQUARE YARD				
748.	1	MOBILIZATION AT _____ PER LUMP SUM				
751.	30	LOAM BORROW AT _____ PER CUBIC YARD				

CARRIED FORWARD _____

BROUGHT FORWARD _____

ITEM O.	QTY	ITEM WITH UNIT BID PRICE WRITTEN IN WORDS	UNIT PRICE		TOTAL	
			DOLLARS	CENTS	DOLLARS	CENTS
765.	205	SEEDING AT _____ PER SQUARE YARD				
767.121*	220	SEDIMENT CONTROL BARRIER AT _____ PER FOOT				
769.	240	PAVEMENT MILLING MULCH UNDER AIL AT _____ PER FOOT				
852	115	SAFETY SIGNING FOR TRAFFIC MENT AT _____ PER SQUARE FOOT				
853.2	50	TEMPORARY BARRIER AT _____ PER FOOT				
859.1*	180	REFLECTORIZED DRUM WITH 'IAL FLASHING LIGHTS AT _____ PER DAY				
904	1	4000 PSI, 3/4 IN., 610 CEMENT CONCRETE AT _____ PER CUBIC YARD				
983.1	95	RIPRAP AT _____ PER TON				
991.1*	1	CONTROL OF WATER - STRUCTURE AT _____ PER LUMP SUM				
995.01*	1	BRIDGE STRUCTURE, BRIDGE NO. _____ AT _____ PER LUMP SUM				
XXX	1	INSTALLATION OF DRY HYDRANT AT _____ PER LUMP SUM				

TOTAL BID PRICE _____

TOTAL BID PRICE IN WORDS: _____

SAMPLE CONTRACT FOR PROJECT

OWNER-CONTRACTOR AGREEMENT

FOR PUBLIC WORKS CONSTRUCTION

THIS AGREEMENT made this ___ day of _____ in the year Two Thousand and Sixteen, between_____, with a usual place of business at _____, hereinafter called the CONTRACTOR, and the Town of Topsfield, acting by its Board of Selectmen with a usual place of business at 8 West Common Street, Topsfield, MA 01983, hereinafter called the OWNER.

The CONTRACTOR and the OWNER, for the consideration hereinafter named, agree as follows:

1. Scope of Work

The Contractor shall furnish all labor, materials, equipment and insurance to perform all work required for the project known as _____, in strict accordance with the Contract Documents and all related Drawings and Specifications. The said Documents, Specifications, Drawings and any GENERAL SUPPLEMENTARY CONDITIONS are incorporated herein by reference and are made a part of this Agreement.

2. Contract Price

The Owner shall pay the Contractor for the performance of this Agreement, subject to additions and deductions provided herein, in current funds, the sum of $_____.

3. Commencement and Completion of Work

It is agreed that time is of the essence of this Agreement. The Contractor shall commence and prosecute the work under this Agreement upon execution hereof and shall complete the work on or before _____.

A. Definition of Term: The Term "Substantial completion" shall mean the date certified by the Owner when construction is sufficiently complete, in accordance with the Contract Documents, so the Owner may occupy the project, or designated portion(s) thereof, for the use for which it is intended.

B. Time as Essential Condition: It is understood and agreed that the commencement of and substantial completion of the work are essential conditions of this Agreement. It is further agreed that time is of the essence for each and every portion of the Contract Documents wherein a definite and certain length of time is

fixed for the performance of any act whatsoever; and where under the Contract Documents any additional time is allowed for the completion of any work, the new time fixed by such extension shall be of the essence of this Agreement. It is understood and agreed that the times for the completion of the work are reasonable, taking into consideration the average climatic range and usual industrial conditions prevailing in this locality.

C. Progress and Completion: Contractor shall commence work promptly upon execution of this Agreement and shall prosecute and complete the work regularly, diligently and uninterruptedly at such a rate of progress as will insure Substantial Completion within the stipulated number of calendar days.

4. Performance of the Work

A. Direction of the Work: The Contractor shall supervise and direct the Work, using his best skills and attention which shall not be less than such state of skill and attention generally rendered by the contracting profession for projects similar to the Project in scope, difficulty and location. The Contractor shall maintain adequate supervisory personnel at the project site during the performance of the Work. He shall be solely responsible for all construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Agreement.

B. Responsibility for the Work: (1) The Contractor shall be responsible to the Owner for the acts and omissions of his employees, Subcontractors and their agents and employees, and other persons performing any of the Work under a contract with the Contractor. This obligation shall also extend to the presence on the Site of suppliers of materials or equipment, their employees, contractors, and agents engaged in the work.

(2) The Contractor shall not be relieved from his obligations to perform the Work in accordance with the Contract Documents either by the activities or duties of the Owner in its administration of the Agreement, or by inspections, tests or approvals required or performed by persons other than the Contractor.

C. Permits and Fees: Unless otherwise expressly provided, the Contractor shall secure and pay for all permits and fees, licenses and inspections necessary for the proper execution and completion of the Work which are customarily secured after execution of the Agreement and which are legally required at the time the bids are received, and the same shall at all times be the property of the Owner and shall be delivered to the Owner upon completion of the Project.

D. Notices, Compliance With Laws: (1) The Contractor shall give all notices and comply with all federal, state and local laws, ordinances, rules, regulations and lawful orders of any public authority bearing on the performance of the Work. The Contractor shall provide the Owner with reproductions of all permits, licenses

and receipts for any fees paid. The Owner represents that it has disclosed to the Contractor all orders and requirements known to the Owner of any public authority particular to this Agreement.

(2) If the Contractor observes that any of the Contract Documents are at variance with applicable laws, statutes, codes and regulations in any respect, he shall promptly notify the Owner in writing, and any necessary changes shall be accomplished by appropriate modification.

(3) If the Contractor performs any Work which he knows or should know is contrary to such laws, ordinances, rules and regulations, and without such notice to the Owner, he shall assume full responsibility therefore and shall bear all costs attributable thereto.

(4) In the performance of the Work, the Contractor shall comply with all applicable federal, state and local laws and regulations including those relating to workplace and employee safety. The Contractor shall notify the Owner immediately of any conditions at the place of the work which violate said laws and regulations and shall take prompt action to correct and eliminate any such violations.

E. Project Superintendent: The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site at all times during the progress of the Work. The superintendent shall represent the Contractor and all communications given to the superintendent shall be as binding as if given to the Contractor. Important communications shall be confirmed in writing. Other communications shall be so confirmed on written request in each case.

F. Progress Schedule: The Contractor, immediately after being awarded the Contract, shall prepare and submit for the Owner's information an estimated progress schedule for the Work. The progress schedule shall be related to the entire Project to the extent required by the Contract Documents, and shall provide for expeditious and practicable execution of the Work.

G. Drawings, Specifications and Submittals: (1) The Contractor shall maintain at the site for the Owner one record copy of all Drawings, Specifications, Addenda, Change Orders and other Modifications, and "As-Built" Drawings and Specifications in good order and marked currently to record all changes made during construction, and approved Shop Drawings, Product Data and Samples. These shall be delivered to the Owner upon completion of the Work.

(2) By approving and submitting Shop Drawings, Product Data and Samples, the Contractor represents that he has determined and verified all materials, field measurements, and field construction criteria related thereto, or will do so, and

that he has checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

(3) The Contractor shall not be relieved of responsibility for any deviation from the requirements of the Contract Documents by the Owner's approval of Shop Drawings, Product Data or Samples unless the Contractor has specifically informed the Owner in writing of such deviation at the time of submission and the Owner has given written approval to the specific deviation. The Contractor shall not be relieved from responsibility for errors or omissions in the Shop Drawings, Product Data or Samples by the Owner's approval thereof.

(4) The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data or Samples, to revisions other than those requested by the Owner on previous submittals.

(5) No portion of the Work requiring submission of a Shop Drawing, Product Data or Sample shall be commenced until the submittal has been approved by the Owner. All such portions of the Work shall be in accordance with approved submittals.

H. Protection of the Work and Owner's Property: The Contractor shall at all times safely guard the Owner's property from injury or loss in connection with this Agreement. He shall at all times safely guard and protect his own work, and that of adjacent property from damage. The Contractor shall replace or make good any such damage, loss or injury. The Contractor shall clean the work area and restore it to its original condition upon completion of the work.

I. Quality of the Work: The Contractor shall perform the work in a good, workmanlike manner. The Contractor hereby guarantees that the entire work constructed by him under the Agreement will meet fully all requirements thereof as to quality of workmanship and materials. The Contractor hereby agrees to make at his own expense any repairs or replacements made necessary by defects in materials or workmanship supplied to him that become evident within one (1) year after the date of the final payment, and to restore to full compliance with the requirements set forth herein any part of the work constructed hereunder, which during said one (1) year period is found to be deficient with respect to any provisions of the Contract Documents. The Contractor also agrees to hold the Owner harmless from claims of any kind arising from damage due to said defects. The Contractor shall make all repairs and replacements promptly upon receipt of written orders for same from the Owner. If the Contractor fails to make the repairs and replacements promptly, the Owner may do the work and the Contractor shall be liable to the Owner for the cost thereof.

J. Warranty: The Contractor guarantees to Owner that all materials incorporated into the work will be new unless otherwise specified or agreed. Prior to final payment, the Contractor shall deliver to the Owner all manufacturers' warranties,

together with such endorsements or assignments as are necessary to ensure to the Owner the full rights and benefits of such warranties.

5. Affirmative Action/Equal Employment Opportunity

The Contractor is directed to comply with all applicable State Laws, Ordinances, Bylaws, and rules and regulations regarding affirmative action/equal employment opportunity requirements. Failure of the Contractor to comply with any such law, rule or regulation shall constitute grounds for the Owner to terminate the Agreement.

6. Site Information Not Guaranteed; Contractor's Investigation

All information given in the Contract Documents relating to subsurface and other conditions, natural phenomena, existing pipes, and other structures is from the best sources at present available to the Owner. All such information is furnished only for the information and convenience of the Contractor and is not guaranteed.

It is agreed and understood that the Owner does not warrant or guarantee that the subsurface or other conditions, natural phenomena, existing pipes, or other structures encountered during construction will be the same as those indicated in the Contract Documents.

Contractor has familiarized himself with the nature and extent of the Contract Documents, work, locality, and with all local conditions and federal, state, and local laws, rules, ordinances, and regulations that in any manner may affect costs, progress, or performance of the work. Contractor has made, or has caused to be made, examinations, investigations, and tests and studies of such reports and related data in addition to those referred to in the paragraph above as he deems necessary for the performance of the work at the Contract Price, within the Contract Time, and in accordance with the other Terms and Conditions of the Contract Documents; and no additional examinations, tests, investigations, reports, and similar data are or will be required by the Contractor for such purposes.

Contractor has correlated the results of all such observations, examinations, investigations, tests, reports, and data with the Contract Documents. Contractor has given the Owner written notice of all conflicts, errors, or discrepancies that he has discovered in the Contract Documents, and the resolution thereof by the Owner is acceptable to the Contractor.

It is further agreed and understood that the Contractor shall not use or be entitled to use any of the information made available to him or obtained in any examination made by him in any manner as a basis of or ground for any claim or demand against the Owner, arising from or by reason of any variance which may exist between the information made available and the actual subsurface conditions or other conditions or structures actually

encountered during the construction work, except as may otherwise be expressly provided for in the Contract Documents.

7. Project Manager

There is a project manager for this project--Neil Shea, Ipswich River Watershed Association. Except as otherwise indicated in the Contract Documents, the Engineer shall be a representative of the Owner and the Contractor shall direct all communications, questions and comments on the work and the performance thereof to the Project Manager. Except as otherwise provided, the Architect/Engineer shall have all the authority of the Owner set forth in the Contract Documents. In general, the Project Manager shall have the authority to review the performance of the work, reject work which is defective or otherwise does not comply with the Contract Documents and to order the Contractor to remedy defective work and take such actions which are necessary to make the work conform to the Contract Documents.

8. Wage Rates

Prevailing Wage Rates as determined by the Commissioner of the Department of Labor and Workforce Development under the provisions of Massachusetts General Laws, Chapter 149, Sections 26 to 27G, as amended, apply to this project. It is the responsibility of the Contractor to provide the Town with certified payrolls and to comply with all requirements of the above-cited statutes.

The schedules of prevailing wage rates are included in the Contract Documents.

9. Payments to the Contractor

A. The Owner shall make payment to the Contractor in accordance with the provisions of Sections 39F and 39G of Chapter 30 of the General Laws of the Commonwealth of Massachusetts. The Contractor shall submit requisitions for payment as required by said provisions and the directions of the Owner.

B. The Contractor's applications for payment shall be subject to approval by the Owner.

C. Changes in the Work: No changes in the work covered by the approved Contract Documents shall be made without prior written approval of the Owner. Charges or credits for the work covered by the approved change shall be determined by one or more, or a combination of the following methods:

(a) Unit bid prices previously approved.

(b) An agreed lump sum.

(c) The actual cost of

(1) Labor.

(2) Materials entering permanently into the work.

(3) The ownership or rental cost of construction equipment during the time of use on the extra work.

(4) Power and consumable supplies for the operation of power and equipment.

(5) Wages to be paid.

To the cost under (c) there shall be added a fixed fee to be agreed upon but not to exceed fifteen percent (15%) of the actual cost of work. The fee shall be compensation to cover the cost of supervision, overhead, bonds, profit and any other general expenses.

D. Claims for Additional Costs: If the Contractor wishes to make a claim for an increase in the Contract Sum, he shall give the Owner written notice thereof within twenty days after the occurrence of the event giving rise to such claim. This notice shall be given by the Contractor before proceeding to execute the Work, except in an emergency endangering life or property. No such claim shall be valid unless so made. Any change in the Contract Sum resulting from such claim shall be authorized by Change Order.

10. Final Payment, Effect

The acceptance of final payment by the Contractor shall constitute a waiver of all claims by the Contractor arising under the Agreement.

11. Contract Documents

The Contract Documents consist of the following, together with this Agreement:

Invitation to Bid
Instructions to Bidders
This Contract Form
Bid Form
Performance Bond
Payment Bond
Non-Collusion Certificate
Tax Compliance Certificate
Clerk's Certificate of Corporate Vote
Certificate of Insurance
General Conditions
Supplementary General Conditions
General Requirements
Specifications and Addenda

Contract Drawings
Schedule of Prevailing Wages

12. Terms Required By Law

This Agreement shall be considered to include all terms required to be included in it by the Massachusetts General Laws, and all other laws, as though such terms were set forth in full herein.

13. Indemnification

The Contractor shall indemnify and hold harmless the Owner from and against any and all claims, damages, losses, and expenses, including attorney's fees, arising out of the performance of this Agreement when such claims, damages, losses, and expenses are caused, in whole or in part, by the acts, errors, or omissions of the Contractor or his employees, agents, subcontractors or representatives.

14. Insurance

The Contractor shall purchase and maintain such insurance as will protect both the Owner and the Contractor from claims which may arise under the Agreement, including operations performed for the named insured by independent contractors and general inspection thereof by the named insured. In addition, the Contractor shall require its subcontractors to maintain such insurance. Coverage shall be provided for:

1. claims under workers' or workmen's compensation, disability benefit and other applicable employee benefit acts;

2. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees;

3. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees;

4. claims for damages insured by usual personal injury liability coverage which are sustained (1) by any person as a result of an offense directly or indirectly related to the employment of such person by the Contractor, or (2) by any other person;

5. claims for damages, including damages to the Work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom;

6. claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle; and
7. claims involving contractual liability applicable to the Contractor's obligations under Article 13.

The limits of liability for coverage required under the preceding paragraph shall be as required by the Owner. **See Attachment A for Town of Topsfield's General Insurance Requirements.**

Failure to provide and continue in force such insurance as aforesaid shall be deemed a material breach of this contract, and may consititute sufficient grounds for immediate termination of the same. All insurance maintained as provided for in the above shall be taken out and maintained at the sole expense of the contractor.

Except for Workmen's Compensation, all liability coverage shall name the Owner as an additional insured and shall provide for 30 days prior written notice to the Town of any modification or termination of coverage provided thereby. The Contractor shall provide the Owner with appropriate certificate(s) of insurance evidencing compliance with this provision prior to the commencement of any work under this Agreement.

15. Notice

All notices required to be given hereunder shall be in writing and delivered to, or mailed first class to, the parties' respective addresses stated above. In the event that immediate notice is required, it may be given by telephone or facsimile, but shall, to the extent possible, be followed by notice in writing in the manner set forth above.

16. Termination

A. Each party shall have the right to terminate this Agreement in the event of a failure of the other party to comply with the terms of the Agreement. Such termination shall be effective upon seven days' notice to the party in default and the failure within that time of said party to cure its default.

B. The Owner shall have the right to terminate the Agreement without cause, upon ten (10) days' written notice to the Contractor. In the event that the Agreement is terminated pursuant to this subparagraph, the Contractor shall be reimbursed in accordance with the Contract Documents for all Work performed up to the termination date, and for all materials or equipment not incorporated in the Work, but delivered and suitably stored at the site. Payment for material or equipment stored at the site shall be conditioned upon submission by the Contractor of bills of sale or such other evidence as is satisfactory to Owner to establish the Owner's title to such material or equipment or otherwise protect the Owner's interests.

17. Miscellaneous

A. Royalties and Patents: The Contractor shall pay all royalties and license fees. He shall defend all suits or claims for infringement of any patent rights and shall save the Owner harmless from loss on account thereof, except that the Owner shall be responsible for all such loss when a particular design, process or the product of a particular manufacturer or manufacturers is specified; but if the Contractor believes or has reason to believe that the design, process or product specified is an infringement of a patent, he shall be responsible for such loss unless he promptly gives such information to the Owner, and thereafter the Owner insists on the use of the design, process or products specified.

B. Assignment: The Contractor shall not assign or transfer any of its rights, duties or obligations under this Agreement without the written approval of the Owner.

C. Governing Law: This Agreement shall be governed by and construed in accordance with the law of the Commonwealth of Massachusetts.

D. Tax Compliance: By its signature hereon, the Contractor certifies that it has complied with all laws of the Commonwealth relating to taxes, reporting of employees and contractors, and withholding and remitting child support.

IN WITNESS WHEREOF, the parties hereto have set their hands and seals, the **OWNER** by its authorized representatives who, however, incur no personal liability by reason of the execution hereof or of anything herein contained, as of the day and year first above written.

CONTRACTOR: (Name)

By:_____
Name:
Title:

OWNER: Town of Topsfield
Select Board

_____
Chair

_____
Vice-Chair & Clerk

_____
Member

_____
Member

_____
Member

In accordance with M.G.L. C.44, Section 31C, this is to certify that an appropriation in the amount of this contract is available therefore and that the Board of Selectmen has been authorized to execute the contract and approve all requisitions and change orders.

By: _____
Town Accountant

Account Name: _____

Account Number: _____

NOTICE OF AWARD

TO: _____
_____
_____

PROJECT Description: _____

The OWNER has considered the BID submitted by you for the above-described WORK in response to its Notice to Contractors for Bids dated _____ 2021 and Information for Bidders.

You are hereby notified that your BID has been accepted for items in the amount of $_____.

You are required to execute the Agreement and furnish the required CONTRACTOR'S Performance BOND, Payment BOND and certificates of insurance within ten (10) calendar days from the date of this Notice to you.

If you fail to execute said Agreement and to furnish said BONDS and certificate of insurance within ten (10) days from the date of this Notice, said OWNER will be entitled to consider all your rights arising out of the OWNER's acceptance of your BID as abandoned and as a forfeiture of your BID BOND. The OWNER will be entitled to such other rights as may be granted by law.

You are required to return an acknowledged copy of this NOTICE OF AWARD to the OWNER.

Dated this day of 2021

_____
Owner

By: _____
ACCEPTANCE OF NOTICE

Receipt of the above NOTICE OF AWARD is hereby acknowledged by
_____
this the _____ day of _____, 2016
By: _____
Employer Identification Number: _____

Certificate of Vote

(Corporations Only)

At a duly authorized meeting of the Board of Directors of the

_____ held on _____ it was VOTED, That

(Name of Corporation) (Date)

_____ _____

(Name) (Officer)

of this company, be and hereby is authorized to execute contracts and bonds in the name and on behalf of said company, and affix its corporate seal hereto; and such execution of any contract or obligation in this company's name on its behalf by such officer under seal of the company, shall be valid and binding upon this company.

I hereby certify that I am the clerk of the above named corporation and that _____ is the duly elected officer as stated above of said company, and that the above vote has not been amended or rescinded and remains in full force and effect as the date of this contract.

_____

_____

(Date) (Clerk)

Corporate Seal

Attachment A

Town of Topsfield
Insurance Requirements

A comprehensive General Liability insurance policy of at least One Million Dollars ($1,000,000) Bodily Injury and Property Damage Liability per occurrence, with a Two Million Dollar ($2,000,000) Annual Aggregate Limit; Automobile Liability of at least One Million Dollars ($1,000,000) combined single limit; the aggregate limit of General Liability coverage required above may be provided under an Umbrella Liability policy.

The contractor shall provide a certificate of Worker's Compensation as required by Massachusetts Law.

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS: That we _____
(Name of Contractor)
a _____ hereinafter called "Principal" and
(Corporation, Partnership, Joint Venture or Individual)

_____of _____, State of _____
(Surety) (City)

_____ hereinafter called the "Surety" and licensed by the State Division of Insurance to do business under the laws of the Commonwealth of Massachusetts, are held and firmly bound to the Town of _____, Massachusetts, hereinafter called "Owner", in the penal sum of _____ Dollars ($_____) in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that whereas the Principal has entered into a certain contract with the Owner (the "Construction Contract"), dated the _____ day of _____, 20___, for the construction described as follows: _____.

NOW, THEREFORE, if the Principal shall well, truly and faithfully perform its duties, all the undertakings, covenants, terms, conditions, and agreements of the Construction Contract during the original term thereof, and any extensions thereof which may be granted by the Owner, with or without notice to the Surety, and if he shall satisfy all claims and demands incurred under the Construction Contract, and shall fully indemnify and save harmless the Owner from all costs and damages which it may suffer by reason of failure to do so, and shall reimburse and repay the Owner all outlay and expense which the Owner may incur in making good any default, then this obligation shall be void; otherwise, this obligation shall remain in full force and effect.

PROVIDED, FURTHER, that the Surety's obligation under this Bond shall arise after
(1) the Owner has declared the Principal in default of the Construction Contract or any provision thereof, or (2) has declared that the Principal has failed, or is otherwise unable or unwilling, to execute the work consistent with, and in conformance to, the Construction Contract (collectively referred to as a "Contractor Default"). The determination of a Contractor Default shall be made solely by the Owner. The Owner need not terminate the Construction Contract to declare a Contractor Default or to invoke its rights under this Bond.

When the Surety's obligation under this Bond arises, the Surety, at its sole expense and at the consent and election of the Owner, shall promptly take one of following steps: (1) arrange for the Principal to perform and complete the work of the Construction Contract; (2) arrange for a contractor other than the Principal to perform and complete the work of the Construction Contract; (3) reimburse the Owner, in a manner and at such time as the Owner shall reasonably decide, for all costs and expenses incurred by the Owner in performing and completing the work of the Construction Contract. Surety will keep Owner reasonably informed of the progress, status and results of any investigation of any claim of the Owner.

If the Surety does not proceed as provided in this Bond with due diligence and all deliberate speed, the Surety shall be deemed to be in default of this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner.

After the Surety's obligation under this Bond arises, the Surety is obligated, to the limit of the amounts of this Bond, for (1) the correction of defective work and completion of the Construction Contract; (2) additional design, professional services, and legal costs, including attorney's fees, resulting from the Contractor Default or from the default of the Surety under this Bond; (3) any additional work beyond the Construction Contract made necessary by the Contractor Default or default of the Surety under this Bond; (4) indemnification obligations of the Principal, if any, as provided in the Construction Contract; and (5) liquidated damages as provided in the Construction Contract, or if no such damages are specified, actual damages and consequential damages resulting from the Contractor Default or any default of the Surety under this Bond.

Any proceeding, legal or equitable, under this Bond shall be instituted in any court of competent jurisdiction in the Commonwealth of Massachusetts.

The Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Construction Contract or to the work to be performed thereunder or the specifications accompanying the same shall in any way affect its obligation on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the Construction Contract or to the work or to the specifications.

IN WITNESS WHEREOF, this instrument is executed in _____ ( ) counterparts, each one of which shall be deemed an original, this the _____ day of _____, 20___.

ATTEST:

_____
Principal

_____ By _____
(Principal Secretary)

_____

_____

_____

(Address-Zip Code)

_____ (SEAL)

Witness as to Principal

_____

_____

(Address-Zip Code)

ATTEST:

_____

Surety

_____ By _____

(Attorney-in-Fact)

_____

_____

(Address-Zip Code)

_____ (SEAL)

Witness as to Surety

_____

_____

(Address-Zip Code)

NOTE: Date of Bond must not be prior to date of Contract. If Contractor is a Partnership, all partners should execute Bond.

180484

PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS: That we _____

_____ a_____
(Name of Contractor) (Corporation, Partnership, Joint Venture or Individual)

hereinafter called "Principal" and _____ of _____,
(Surety)

State of _____hereinafter called the "Surety" and licensed by the State
(City and State)

Division of Insurance to do business under the laws of the Commonwealth of Massachusetts, are held and firmly bound to the Town of _____, Massachusetts, hereinafter called "Owner", in the penal sum of _____ Dollars ($_____) in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that Whereas, the Principal entered into a certain contract with the Owner, dated the _____ day of _____, 20___, for the construction described as follows:

NOW, THEREFORE, if the Principal shall promptly make payment to all persons, firms, subcontractors, and corporations furnishing materials for or performing labor in the prosecution of the work provided for in such contract, and any authorized extension or modification thereof, including all amounts due for materials, lubricants, oil, gasoline, coal and coke, repairs on machinery, equipment and tools, consumed or used in connection with the construction of such work, and all insurance premiums on said work, and for all labor, performed in such work whether by subcontractor or otherwise, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, FURTHER, that the said Surety, for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract or to the work to be performed thereunder or the specifications accompanying the same shall in any way affect its obligation on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of this contract or to the work or to the specifications.

PROVIDED, FURTHER, that no final settlement between the Owner and the Contractor shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

IN WITNESS WHEREOF, this instrument is executed in ____ ( ) counterparts, each one of which shall be deemed an original, this the _____ day of _____, 20__.

ATTEST:

_____
Surety

_____ By _____
(Attorney-in-Fact)

_____

_____
(Address-Zip Code)

_____ (SEAL)
Witness as to Surety

_____

_____
(Address-Zip Code)

NOTE: Date of Bond must not be prior to date of Contract. If Contractor is a Partnership, all partners should execute Bond.

255686/99999/0003

NOTICE TO PROCEED

TO: _____
_____
_____
_____

Date: , 2021
Project: Topsfield, MA
Pond Street Culvert

You are hereby notified to commence WORK in accordance with the Agreement dated _____, 2021, on or before _____, 2021. Services are to be provided as described in the contract documents until _____, 2021.

TOWN OF TOPSFIELD, MA
Owner

By: _____

Title: _____

ACCEPTANCE OF NOTICE
Receipt of the above NOTICE TO PROCEED is hereby acknowledged:

this ___ day of _____, 2021

Name of Firm

By: _____

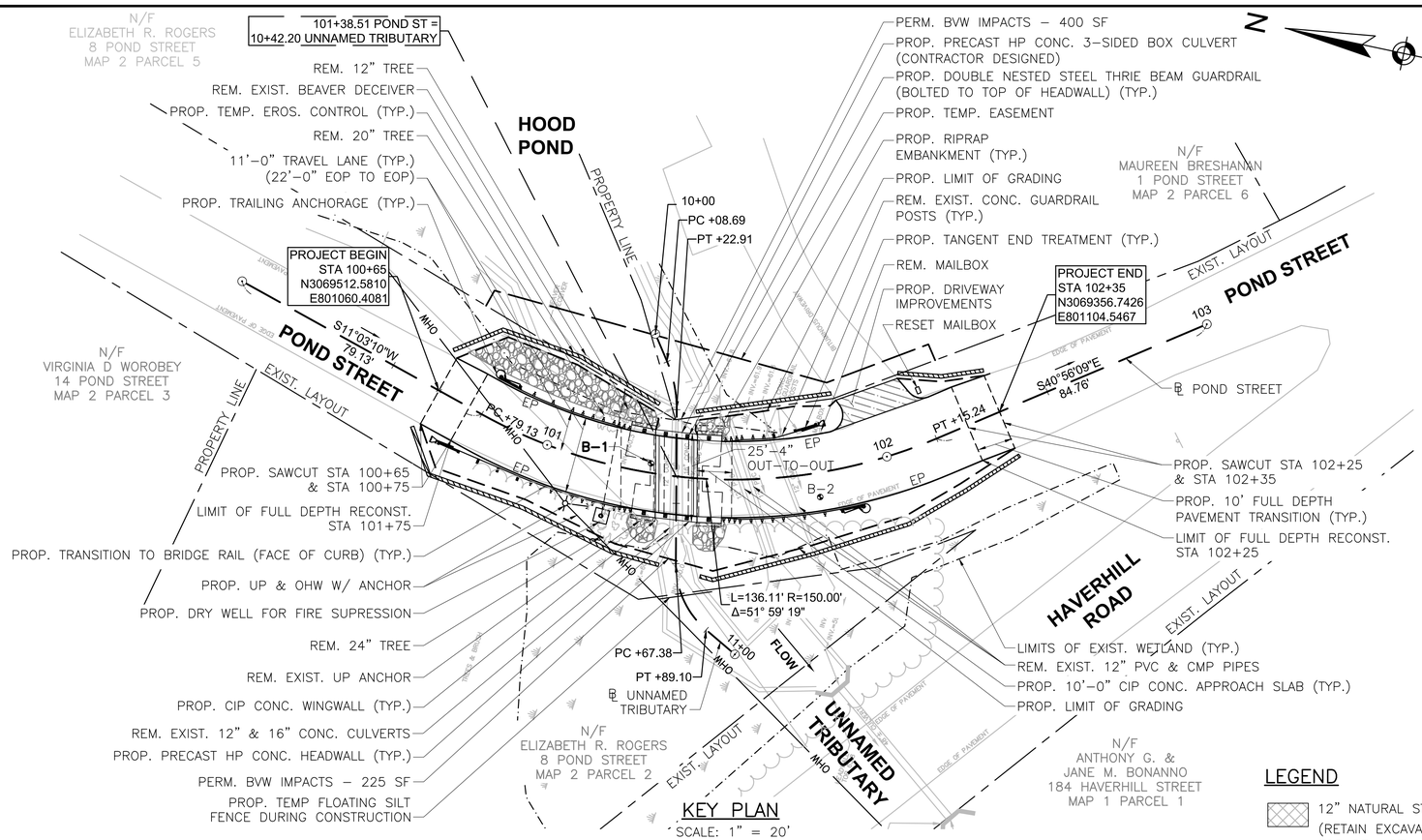
Title: _____

Employer Identification Number _____

cc:

ATTACHEMENT A:

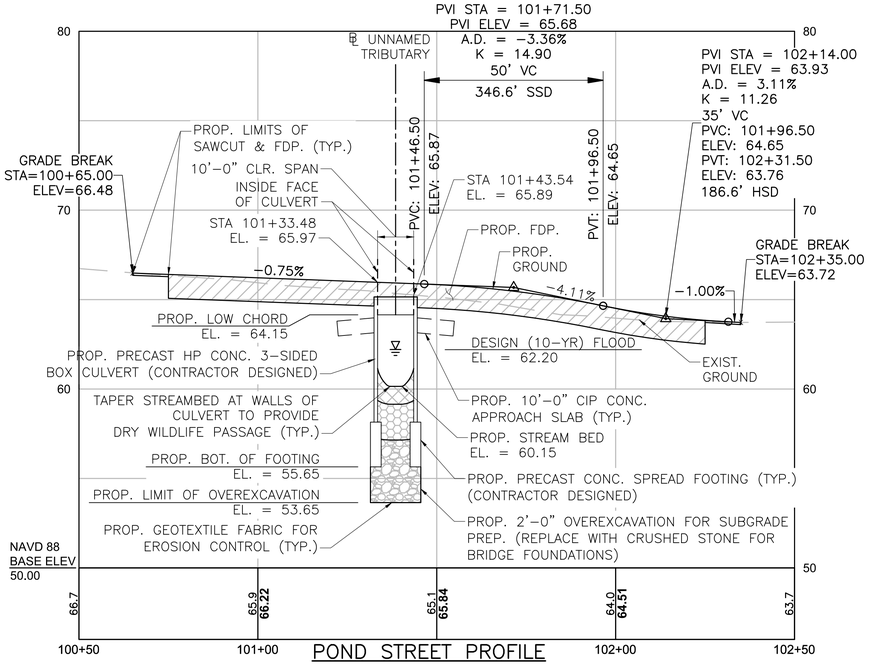
Construction Drawings, prepared by TEC, Inc.



LEGEND

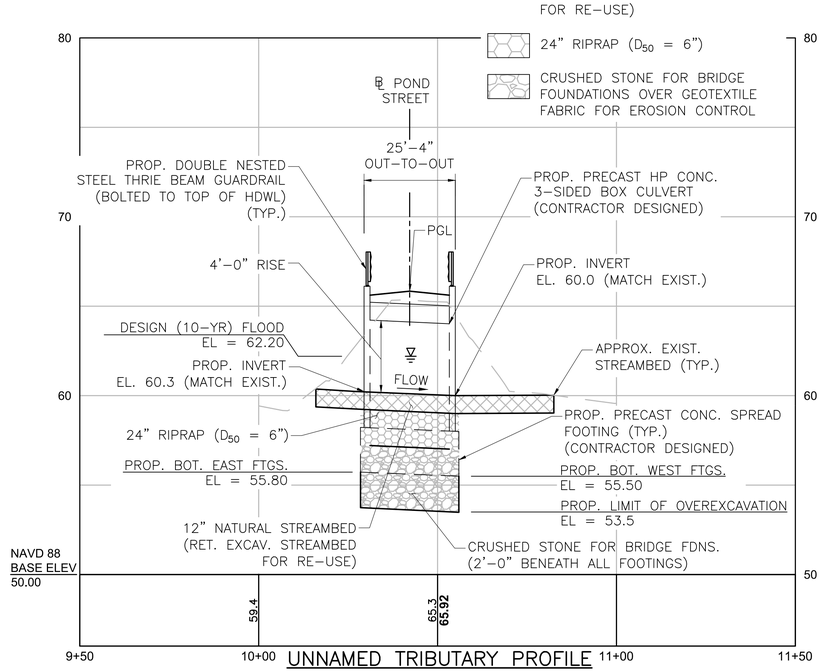
- 12" NATURAL STREAMBED (RETAIN EXCAVATED STREAMBED FOR RE-USE)
- 24" RIPRAP (D_{50} = 6")
- CRUSHED STONE FOR BRIDGE FOUNDATIONS OVER GEOTEXTILE FABRIC FOR EROSION CONTROL

INDEX



POND STREET PROFILE

VERTICAL SCALE: 1" = 4'
HORIZONTAL SCALE: 1" = 20'



UNNAMED TRIBUTARY PROFILE

VERTICAL SCALE: 1" = 4'
HORIZONTAL SCALE: 1" = 20'

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division

CONCEPTUAL DESIGN IS ACCEPTABLE TO MASSDOT FOR CONTRACTING

STATE BRIDGE ENGINEER — DATE: 3/17/2021

ISSUED FOR CONSTRUCTION

JAN 26 2021

ROBERT G. NICCOLI
CIVIL
No. 49071
REGISTERED
PROFESSIONAL ENGINEER
COMMONWEALTH OF MASSACHUSETTS

TEC
The Engineering Corp
146 Dascomb Road
Andover, MA 01810
978-794-1792
169 Ocean Blvd, Unit 3
PO Box 249
Hampton, NH 03842
603-601-8154
www.TheEngineeringCorp.com

MassDOT
Massachusetts Department of Transportation
Highway Division

BRIDGE REPLACEMENT

TOPSFIELD

POND STREET
OVER UNNAMED TRIBUTARY

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION
10 PARK PLAZA BOSTON, MASS

TITLE: — CHIEF ENGINEER

CHAPTER 85 SUBMISSION 1

T1001_TOPSFIELD_(PLAN&PROF).DWG Plotted on 2-Mar-2021 12:50 PM

EXIST GROUND SURFACE
EL = 65.5±

OBSERVED GROUNDWATER (7/1/20)
EL = 60.5±

PROP. BOT. OF FOOTING
(UPSTREAM & EAST WINGWALLS)
EL = 55.8

BORING B–1

JOHN TURNER CONSULTING

LOG OF BORING No. B-1

PROJECT: Pond Street Culvert Replacement — PROJECT NO.: 20-04-064
CLIENT: Ipswich River Watershed Association
PROJECT LOCATION: Topsfield, MA
LOCATION: Refer to Test Boring Location Plan — ELEVATION: EL. 65.49'
DRILLER: Drilex Environmental — LOGGED BY: DPT
DRILLING METHOD: HSA — DATE: 07/01/20
DEPTH TO - WATER> INITIAL: ▽ 5 — AFTER 24 HOURS: ▼

This information pertains only to this boring and should not be interpreted as being indicative of the site.

Depth (feet)	Description	Graphic	Elevation (feet)	Sample No.	Blow Counts	% < #200
0	[ASPHALT} 4.5 inches thick (.33')					
	[FILL] Light brown to gray, Poorly graded Sand (SP-SM) with silt and gravel, medium dense, dry			SS01	8 10 12 14	6
				SS02	13 11 10 10	
5	-becomes black with trace organics at 5 feet (6')			SS03	9 4 6 11	
	[COARSE GLACIAL DEPOSITS] Gray, Poorly graded Sand (SP-SM) with silt and gravel, medium dense, wet			SS04	11 14 16 10	7
10				SS05	5 7 8 9	
15				SS06	4 9 9 12	
20				SS07	3 8 11 14	
25				SS08	6 5 6 11	
	Boring terminated at 27 ft.					
30						
35						

TEST RESULTS
Plastic Limit ⊢⊣ Liquid Limit
Water Content - •
Penetration - ▨
10 20 30 40 50

Figure PAGE 1 of 1

EXIST GROUND SURFACE
EL = 64.2±

OBSERVED GROUNDWATER (7/1/20)
EL = 59.2±

PROP. BOT. OF FOOTING
(DOWNSTREAM & WEST WINGWALLS)
EL = 55.5

BORING B–2

JOHN TURNER CONSULTING

LOG OF BORING No. B-2

PROJECT: Pond Street Culvert Replacement — PROJECT NO.: 20-04-064
CLIENT: Ipswich River Watershed Association
PROJECT LOCATION: Topsfield, MA
LOCATION: Refer to Test Boring Location Plan — ELEVATION: EL. 64.19'
DRILLER: Drilex Environmental — LOGGED BY: DPT
DRILLING METHOD: HSA — DATE: 07/01/20
DEPTH TO - WATER> INITIAL: ▽ 5 — AFTER 24 HOURS: ▼

This information pertains only to this boring and should not be interpreted as being indicative of the site.

Depth (feet)	Description	Graphic	Elevation (feet)	Sample No.	Blow Counts	% < #200
0	[ASPHALT] 4 inches thick (.33')					
	[FILL] Light brown to gray, Poorly graded Sand (SP-SM) with silt and gravel, medium dense, dry			SS01	6 6 6 7	
				SS02	4 8 9 12	
5	[COARSE GLACIAL DEPOSITS] Gray, Poorly graded Sand (SP-SM) with silt and gravel, medium dense, wet			SS03	8 9 10 8	
				SS04	10 5 5 6	
10	-becomes very loose			SS05	1 1 2 7	
15	-becomes medium dense			SS06	3 6 8 8	
20	-becomes light brown to gray, very loose			SS07	1 2 2 3	
25	-becomes medium dense			SS08	2 5 11 11	
	Hard drilling through dense gravel and cobbles. No samples due to running sands. (27')					
30						
35						

TEST RESULTS
Plastic Limit ⊢⊣ Liquid Limit
Water Content - •
Penetration - ▨
10 20 30 40 50

Figure PAGE 1 of 2

COARSE-GRAINED SOILS OVER 50% > No.200 SIEVE SIZE	MORE THAN 1/2 OF COARSE FRACTION > No.4 SIEVE SIZE	GRAVELS WITH OVER 15% FINES	GM Silty gravels, gravel-sand mixtures
			GC Clayey gravels, gravel-sand-clay mixtures
	SANDS	CLEAN SANDS WITH LESS THAN 5% FINES	SW Well-graded sand or gravelly sands, little or no fines
			SP Poorly graded sands or gravelly sands, little or no fines
	MORE THAN 1/2 OF COARSE FRACTION < No.4 SIEVE SIZE	SANDS WITH OVER 15% FINES	SM Silty sand, sand-silt mixtures
			SC Clayey sands, sand-clay mixtures
FINE-GRAINED SOILS OVER 50% < No.200 SIEVE SIZE	SILTS & CLAYS	LIQUID LIMIT 50% OR LESS	ML Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
			CL Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
			OL Organic silts and organic silty clays of low plasticity
	SILTS & CLAYS	LIQUID LIMIT GREATER THAN 50%	MH Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
			CH Inorganic clays of high plasticity, fat clays
			OH Organic clays of medium to high plasticity, organic silty clays, organic silts
HIGHLY ORGANIC SOILS			PT Peat and other highly organic soils

TYPICAL SYMBOLS

Shelby Tube	Auger Cuttings
Standard Split Spoon Sample	3" Split Spoon Sample
Rock Core	Dynamic Cone Penetrometer
Vane Shear	Bulk/Grab Sample
Geoprobe Sample	Sonic or Vibro-Core Sample
Water Table (at time of drilling)	Water Table (after 24 hours)

SOIL MOISTURE MODIFIERS

Term	Description
Dry	Absence of moisture; dusty, dry to touch
Moist	Damp but no visible water
Wet	Visible free water

The descriptor "damp" should not be used (use "moist").
The descriptor "saturated" should not be used (use "wet").

WELL SYMBOLS

Recessed Cover Set in Concrete
Top of Well, Recessed Pipe
Covered Riser
Capped Riser w/ Locking Cover
Pipe Riser
Concrete Seal
Gravel Backfill
Assorted Cuttings
Bentonite Slurry
Bentonite Pellets
Silica Sand, blank PVC
Slotted Pipe w/ Sand
Endcap on Pipe Packed in Sand
Silica Sand, No. Pipe (End Plug)

CLASSIFICATION	RANGE OF GRAIN SIZES: U.S. Standard Sieve Size	Grain Size in Millimeters
BOULDERS	Above 12"	Above 305
COBBLES	12" to 3"	305 to 76.2
GRAVEL coarse	3" to No. 4	76.2 to 4.75
fine	3" to 3/4"	76.2 to 19.1
	3/4" to No. 4	19.1 to 4.75
SAND coarse	No. 4 to No. 200	4.75 to 0.075
medium	No. 4 to No. 10	4.75 to 2.00
fine	No. 10 to No. 40	2.00 to 0.425
	No. 40 to No. 200	0.425 to 0.075
SILT & CLAY	Below No. 200	Below 0.075

RELATIVE DENSITY/CONSISTENCY

Gravel, Sand, and Silt (nonplastic)

N-Value	Relative Density
0 - 4	Very Loose
5 - 10	Loose
11-30	Medium Dense
31 - 50	Dense
51 +	Very Dense

Silt (plastic) and Clay

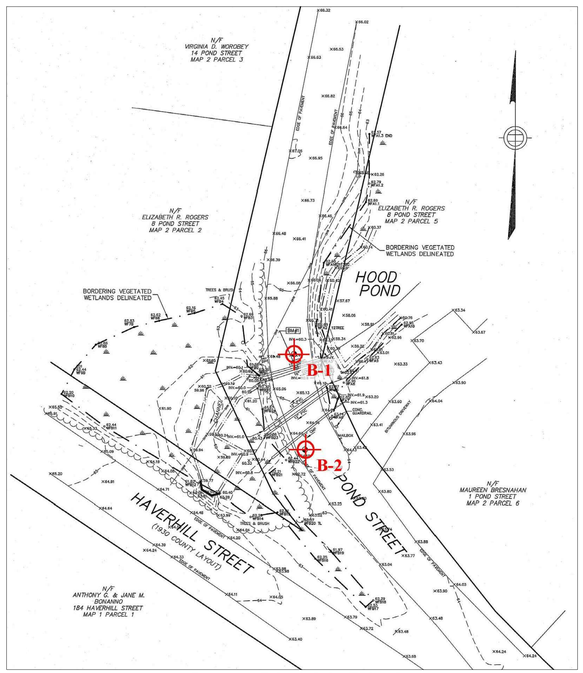
N-Value	Su	Consistency
0 - 2	0 - 250	Very Soft
3 - 4	251 - 500	Soft
5 - 8	501 - 1000	Medium Stiff
9 - 15	1001 - 2000	Stiff
16 - 30	2001 - 4000	Very Stiff
31 +	4001+	Hard

Standard Penetration Testing (SPT) N_{60} based on blows per 12 inches.
WR = Weight of Rods; WH = Weight of Hammer

PERCENT OR PORTIONS OF SOIL

Term	Description
Parting:	> 1/16 in.
Seam:	0.5 in. to 1/16 in.
Layer:	12 in. to 0.5 in.
Stratum:	> 12 in.
Pocket:	Small erratic deposit
Lens:	Lenticular deposit
Occasional:	One or less per foot of thickness
Frequent	More than one per foot of thickness
Varved	Alternating seams or layers of silt and/or clay and sometimes f. sand

USCS CLASSIFICATION



B1 & B2 LOCATIONS

BORING NOTES:

1. LOCATION OF BORINGS SHOWN ON THE PLAN THUS: ✥
2. BORINGS ARE TAKEN FOR PURPOSE OF DESIGN AND SHOW CONDITIONS AT BORING POINTS ONLY, BUT DO NOT NECESSARILY SHOW THE NATURE OF THE MATERIALS TO BE ENCOUNTERED DURING CONSTRUCTION.
3. WATER LEVELS SHOWN ON THE BORING LOGS WERE OBSERVED AT THE TIME OF TAKING BORINGS AND DO NOT NECESSARILY SHOW THE TRUE GROUND WATER LEVEL.
4. FIGURES IN COLUMNS INDICATE NUMBER OF BLOWS REQUIRED TO DRIVE A 1 3/8" I.D. SPLIT SPOON SAMPLER 6" USING A 140 POUND WEIGHT FALLING 30".
5. ALL BORINGS WERE MADE IN JULY OF 2020 BY DRILLEX ENVIRONMENTAL.
6. THE NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988 IS USED THROUGHOUT.

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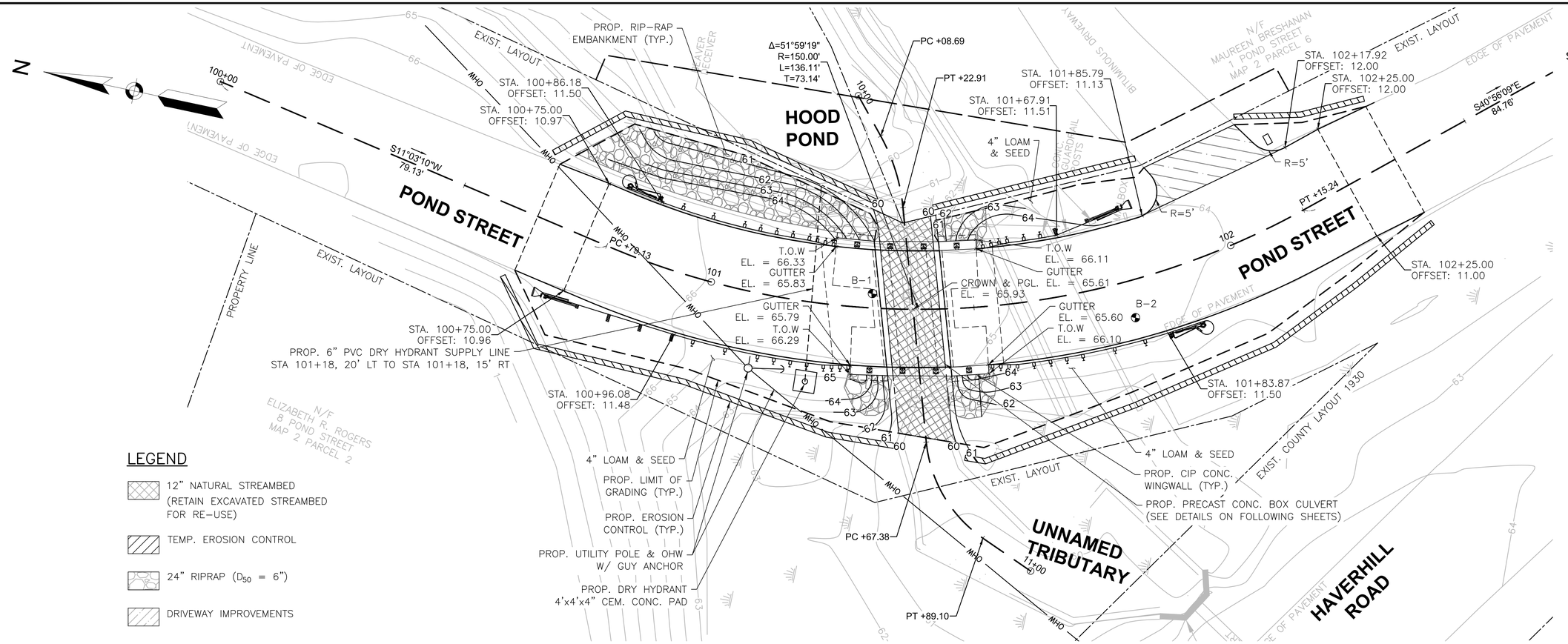
CHAPTER 85 SUBMISSION 1

TOPSFIELD, MA
POND STREET
GRADING PLAN
SHEET 3 OF 10



LEGEND

- 12" NATURAL STREAMBED (RETAIN EXCAVATED STREAMBED FOR RE-USE)
- TEMP. EROSION CONTROL
- 24" RIPRAP (D_{50} = 6")
- DRIVEWAY IMPROVEMENTS

GRADING PLAN
SCALE: 1" = 10'-0"

GENERAL NOTES

DESIGN:
IN ACCORDANCE WITH THE 2017 AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS LRFD BRIDGE DESIGN SPECIFICATIONS WITH CURRENT INTERIM SPECIFICATIONS THROUGH 2019 FOR HL-93 LOADING.

BENCHMARK:
1
MANHOLE RIM
EL = 65.26

ELEVATIONS ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988.

SCALES:
SCALES NOTED ON THE PLANS ARE NOT APPLICABLE TO REDUCED SIZE PRINTS. DIVIDE SCALES BY TWO FOR HALF-SIZE PRINTS (A3).

UNSUITABLE MATERIAL:
ALL UNSUITABLE MATERIAL SHALL BE REMOVED WITHIN THE LIMITS OF THE FOUNDATIONS OF THE STRUCTURE, AS DIRECTED BY THE ENGINEER. UNSUITABLE MATERIAL IS ANTICIPATED AT THE PROPOSED BOTTOM OF FOOTING ELEVATIONS. CONTRACTOR SHALL OVER-EXCAVATE 2-FEET BELOW ALL PROPOSED BEARING LOCATIONS AND REPLACE UNSUITABLE SOILS WITH CRUSHED STONE FOR BRIDGE LOCATIONS.

REINFORCEMENT:
REINFORCING STEEL SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M 31 GRADE 60 EPOXY COATED. UNLESS OTHERWISE NOTED ON THE CONSTRUCTION DRAWINGS, ALL BARS SHALL BE LAPPED AS FOLLOWS:

MODIFICATION CONDITION	#4 BARS	#5 BARS
1. NONE	21"	26"
2. 12" OF CONCRETE BELOW BARS	29"	36"
3. COATED BARS, COVER<3db, OR CLEAR SPACING<6db	31"	39"
4. COATED BARS, ALL OTHER CASES	25"	31"
5. CONDITION 2. AND 3.	35"	44"
6. CONDITION 2. AND 4.	34"	43"

IF THE ABOVE BARS ARE SPACED 6" OR MORE ON CENTER, THE LAP LENGTH SHALL BE 80% OF THE LAP LENGTH GIVEN ABOVE. ALL OTHER BARS SHALL BE LAPPED AS SHOWN ON THE CONSTRUCTION DRAWINGS.

PRECAST ELEMENTS & CONCRETE NOTES:

THE FABRICATOR IS RESPONSIBLE FOR THE DESIGN AND INSTALLATION OF LIFT HOOKS FOR ALL PRECAST ELEMENTS. UNDER NO CIRCUMSTANCES WILL THE REBAR ELEMENTS SHOWN ON THE PLANS BE USED TO LIFT THE PRECAST ELEMENTS. FOR ADDITIONAL REQUIREMENTS, REFER TO THE "PRECAST CONCRETE ELEMENTS" PORTION OF ITEM 995.1 IN THE SPECIAL PROVISIONS.

ALL CONTRACTOR DESIGNED ELEMENTS FOR THE 3-SIDED CULVERT (INCLUDING THE FOOTINGS AND HEADWALLS) SHALL BE PRECAST CONCRETE. ALL WINGWALL ELEMENTS SHALL BE CAST-IN-PLACE CONCRETE. SEE BELOW FOR CONCRETE REQUIREMENTS.

5000 PSI, 3/4 IN, 685 HP: PRECAST CULVERT, PRECAST HEADWALL, AND PRECAST CULVERT FOOTINGS.
4000 PSI, 3/4 IN, 610: CIP WINGWALL FOOTINGS, CIP WINGWALL STEM, AND CONC. PAD FOR DRY HYDRANT
4000 PSI, 1 1/2 IN, 565: CIP APPROACH SLAB

TRAFFIC:
THE BRIDGE WILL BE CLOSED TO VEHICULAR TRAFFIC DURING ALL PHASES OF DEMOLITION AND CONSTRUCTION. VEHICULAR TRAFFIC WILL BE DETOURED AS SHOWN ON THE PLANS.

UTILITIES:
DURING CONSTRUCTION, THE CONTRACTOR SHALL LOCATE AND PROTECT FROM DAMAGE ALL UTILITIES THAT ARE TO REMAIN. CONTRACTOR SHALL COORDINATE WITH UTILITY OWNERS TO SCHEDULE NECESSARY UTILITY AND UTILITY RELOCATIONS.

CONTROL OF WATER SYSTEM:
CONTROL OF WATER SYSTEM SHALL BE DESIGNED BY THE CONTRACTOR AND SUBMITTED TO THE ENGINEER FOR APPROVAL, PER ITEM 991.1. CONTROL OF WATER SYSTEM SHALL BE DESIGNED USING THE 2-YEAR DESIGN FLOOD EVENT ELEVATION OF 61.1. APPROXIMATE LIMITS SHOWN ON THIS PLAN ARE CONCEPTUAL AND THE FINAL LOCATION SHALL BE DETERMINED BY THE CONTRACTOR.

HYDRAULIC DESIGN DATA

DRAINAGE AREA:	2.00 SQUARE MILES
DESIGN FLOOD DISCHARGE:	78 CUBIC FEET PER SECOND
DESIGN FLOOD FREQUENCY:	10 YEARS
DESIGN FLOOD VELOCITY:	6.2 FEET PER SECOND
DESIGN FLOOD ELEVATION:	62.20 FEET
LOWER CHORD ELEVATION:	64.15 FEET (DOWNSTREAM)

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
CONCEPTUAL DESIGN IS ACCEPTABLE TO MASSDOT FOR CONTRACTING

STATE BRIDGE ENGINEER — DATE 3/17/2021

T:\001_TOPSFIELD_(GRADING).DWG Plotted on 2-Mar-2021 12:51 PM

JAN 26 2021
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COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
CONCEPTUAL DESIGN IS ACCEPTABLE TO MASSDOT FOR CONTRACTING

STATE BRIDGE ENGINEER — 3/17/2021 DATE

HOOD POND

POND STREET

N/F
ELIZABETH R. ROGERS
8 POND STREET
MAP 2 PARCEL 5

N/F
MAUREEN BRESHANAN
1 POND STREET
MAP 2 PARCEL 6

TOPSFIELD, MA
POND STREET
PLAN & ELEVATION
SHEET 4 OF 10

N

EXIST. LAYOUT

℄ UNNAMED TRIBUTARY (℄ CULVERT)

WP #1 (NORTHEAST CORNER)

6" APPROACH SLAB SHELF (TYP.)

PROP. TRANSITION TO BRIDGE RAIL (FACE OF CURB) STA 100+86.18, 11.5' LT TO STA 101+22.74, 11.0' LT (SEE MASSDOT CONST. STD. DWG. 400.3.6 FOR DETAILS)

START TRAILING ANCHORAGE (SEE MASSDOT CONST. STANDARDS DRAWING 400.4.1 FOR DETAILS) STA. 100+86.18, 11.5' LT

MHO

PC +79.13

PC +108.69

PT +22.91

PROP. TEMP CONST EASE.

EXIST. DELINEATED WETLAND (BVW 6/19/20)

FACE OF CULVERT HEADWALL AND WINGWALLS (TYP.)

WP #2 (SOUTHEAST CORNER)

PROP. DRIVEWAY IMPROVEMENTS

12" TOE (TYP.)

20" STEM (TYP.)

PT +15.24

TANGENT END TREATMENT STA 101+67.91, 11.51' LT TO STA 101+84.27, 13.01' LT (SEE MASSDOT CONST. STANDARDS DRAWING 400.2.1 FOR DETAILS) (TYP.)

1" PREFORMED FILLER BETWEEN CULVERT AND WINGWALL (TYP.)

101+38.51 POND ST = 10+42.20 UNNAMED TRIBUTARY

INSIDE FACE OF CULVERT (TYP.)

B-1

7'-4" HEEL (TYP.)

℄ POND STREET

12" WALL (TYP.)

Δ=51°59'19" R=150.00' L=136.11' T=73.14'

PROP. TRANSITION TO BRIDGE RAIL (FACE OF CURB) STA 101+51.82, 11.0' RT TO STA 101+83.37, 11.5' RT (SEE MASSDOT CONST. STD. DWG. 400.3.6 FOR DETAILS)

PROP. 6" PVC DRY HYDRANT SUPPLY LINE STA 101+18, 20' LT TO STA 101+18, 15' RT (SEE GRADING PLAN FOR DETAILS)

STA. 101+33.48

STA. 101+43.54

25'-4" OUT-TO-OUT

B-2

MHW

PROP. PRECAST CONC. 3-SIDED BOX CULVERT (TYP.) (CONTRACTOR DESIGNED)

TANGENT END TREATMENT STA. 100+69.59, 12.5' RT TO STA 100+95.86, 11.48' RT

START TRAILING ANCHORAGE STA. 101+83.87, 11.5' RT

EXIST. DELINEATED WETLAND (BVW 6/19/20)

PROP. UP & W/ ANCHOR

PROP. TRANSITION TO BRIDGE RAIL (FACE OF CURB) STA 100+95.86, 11.48' RT TO STA 101+27.56, 11.0' RT (SEE MASSDOT CONST. STD. DWG. 400.3.6 FOR DETAILS)

REM. EXIST. UP

10'-0" CIP CONC. APPROACH SLAB (TYP.)

PRECAST CONC. CULVERT FOOTING (CONTRACTOR DESIGNED) (TYP.)

WP #4, (SOUTHWEST CORNER)

SEE ELEVATION VIEWS FOR GUARDRAIL LAYOUT ALONG POND STREET (TYP.)

PROP. 4'x4'X4" CEM. CONC. PAD FOR DRY HYDRANT

12" COPING AT TOP OF WINGWALL (SEE TOP OF WINGWALL DETAIL, SHEET 6) (TYP.)

WP #3, (NORTHWEST CORNER)

N/F
ELIZABETH R. ROGERS
8 POND STREET
MAP 2 PARCEL 2

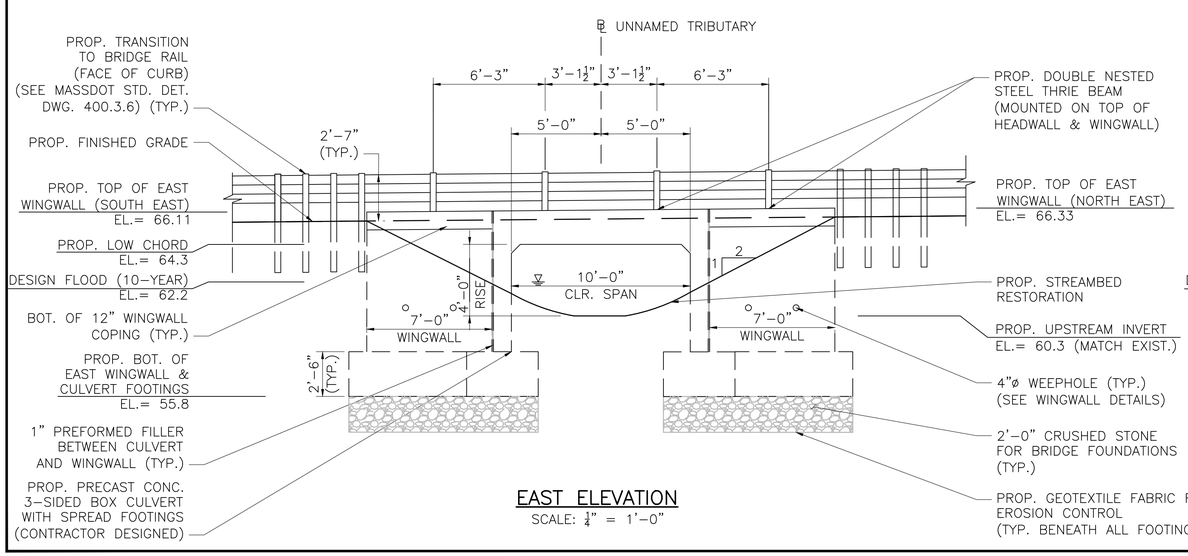
10'-0" CLR. SPAN

7'-0" CIP CONC. WW (TYP.)

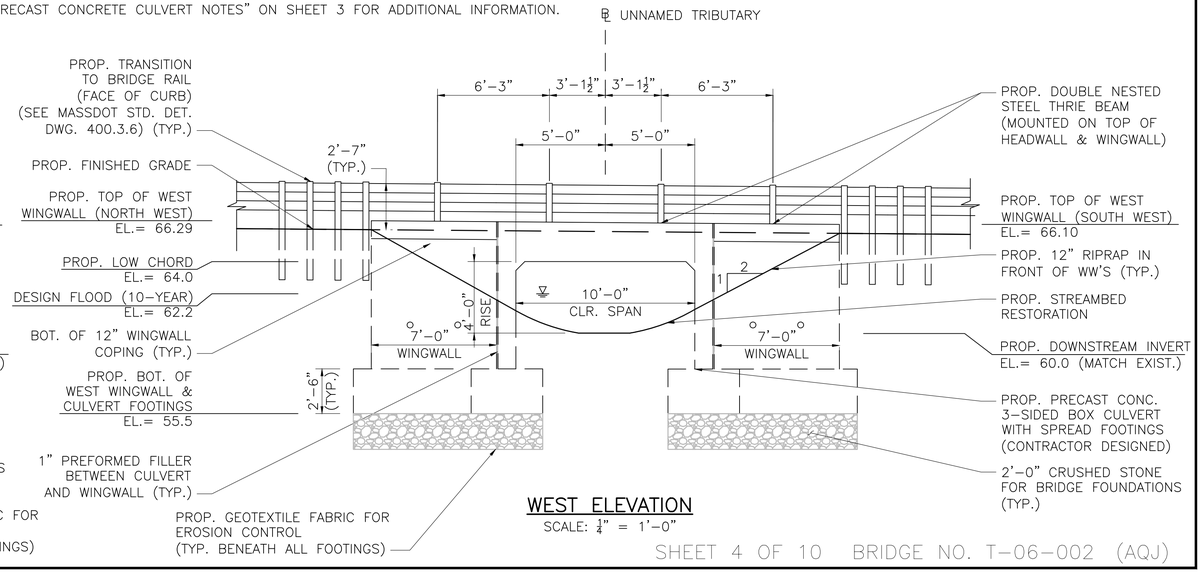
BRIDGE PLAN
SCALE: 1" = 5'-0"

PRECAST CONCRETE CULVERT WORKING POINTS		
WORKING POINT	STATION	OFFSET (ft)
W.P.#1	STA. 101+30.35	12.59 LT
W.P.#2	STA. 101+43.72	12.70 LT
W.P.#3	STA. 101+34.09	12.62 RT
W.P.#4	STA. 101+45.37	12.71 RT

NOTE:
CULVERT FOOTING DIMENSIONS SHOWN ON THIS SHEET ARE CONCEPTUAL AND SHALL BE DESIGNED BY THE CONTRACTOR. REFER TO "PRECAST CONCRETE CULVERT NOTES" ON SHEET 3 FOR ADDITIONAL INFORMATION.



EAST ELEVATION
SCALE: ¼" = 1'-0"



WEST ELEVATION
SCALE: ¼" = 1'-0"

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COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
CONCEPTUAL DESIGN IS ACCEPTABLE TO MASSDOT FOR CONTRACTING

STATE BRIDGE ENGINEER — DATE: 3/17/2021

TRANSVERSE SECTION NOTES:

1. EXISTING CULVERT AND HEADWALLS NOT SHOWN FOR CLARITY. CONTRACTOR IS RESPONSIBLE FOR DEMOLITION OF ALL EXISTING CULVERT INFRASTRUCTURE.
2. CONTRACTOR SHALL SMOOTHLY TRANSITION ALL PROPOSED ELEMENTS INTO THE EXISTING APPROACHES AND EMBANKMENT SLOPES.

PAVEMENT NOTES:

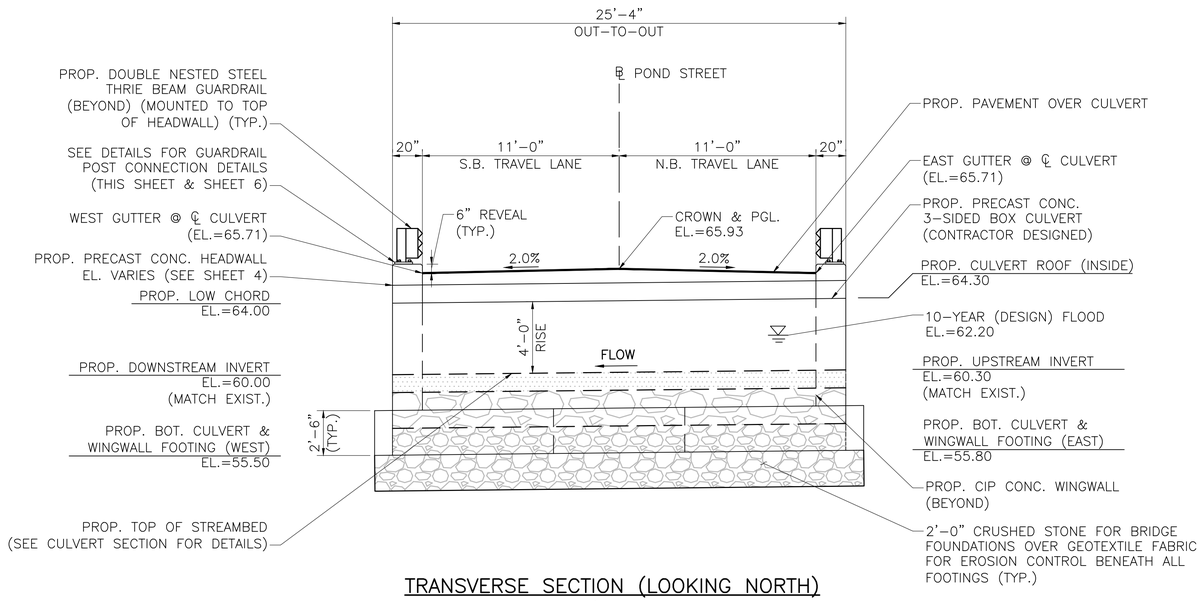
PROPOSED FULL DEPTH PAVEMENT (ROADWAY & DRIVEWAYS):
SURFACE: 1½" SUPERPAVE SURFACE COURSE 12.5 (SSC – 12.5) OVER
2½" SUPERPAVE INTERMEDIATE COURSE 19.0 (SIC – 19.0)

SUBBASE: 4" DENSE GRADED CRUSHED STONE OVER
8" GRAVEL BORROW, TYPE B

PROPOSED PAVEMENT (OVER CULVERT):
SURFACE: 1½" SUPERPAVE SURFACE COURSE 12.5 (SSC – 12.5) OVER
2½" SUPERPAVE INTERMEDIATE COURSE 19.0 (SIC – 19.0) OVER

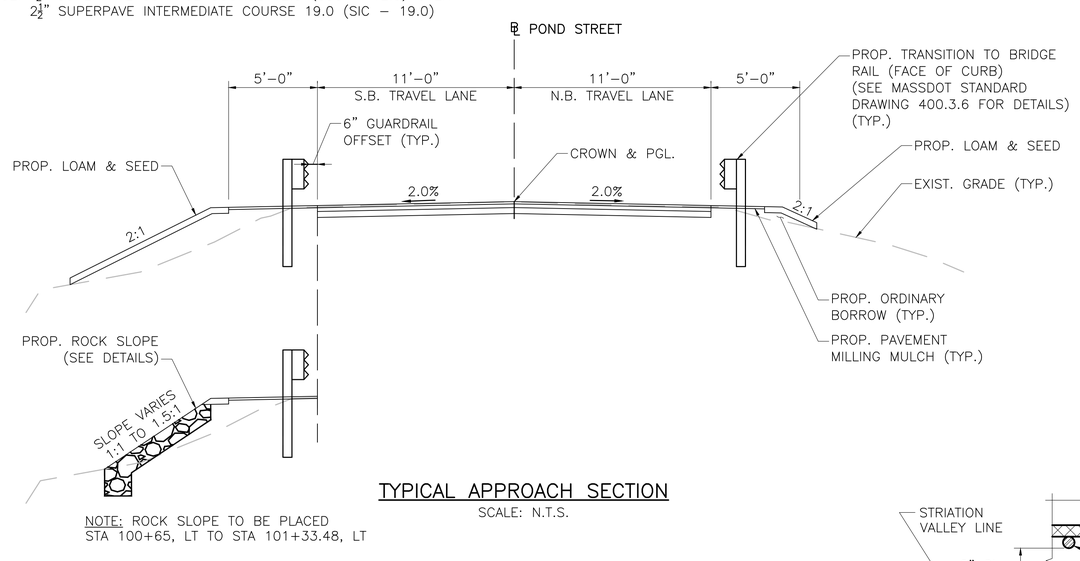
SUBBASE: VARIABLE THICKNESS (UP TO 4¾") DENSE GRADED CRUSHED STONE

PROPOSED PAVEMENT MILLING TRANSITION:
SURFACE: 1½" SUPERPAVE SURFACE COURSE 12.5 (SSC – 12.5) OVER
2½" SUPERPAVE INTERMEDIATE COURSE 19.0 (SIC – 19.0)



TRANSVERSE SECTION (LOOKING NORTH)

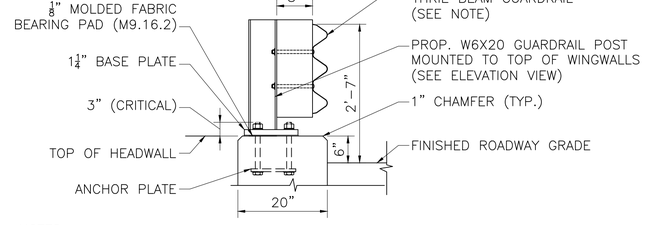
SCALE: ¼" = 1'–0"



TYPICAL APPROACH SECTION

SCALE: N.T.S.

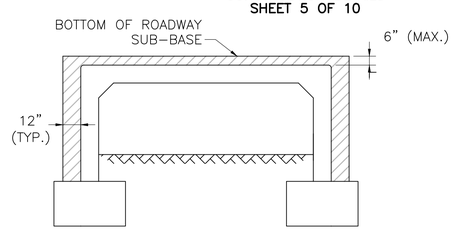
NOTE: ROCK SLOPE TO BE PLACED STA 100+65, LT TO STA 101+33.48, LT



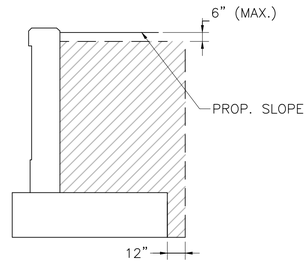
NOTES:
1. REFER TO MASSDOT CONST. STD. DETAILS 400.1.2 AND 400.1.3 FOR ADDITIONAL INFORMATION REGARDING THE THRIE BEAM GUARDRAIL AND HARDWARE DETAILS.
2. SEE BASE PLATE, ANCHOR PLATE AND ANCHOR BOLT DETAILS ON SHEET 6 FOR ADDITIONAL INFORMATION.

GUARDRAIL SECTION THROUGH TOP OF HEADWALL

SCALE: ¾" = 1'–0"



PRECAST CONCRETE BOX CULVERT



C.I.P. CONCRETE WINGWALLS

NOTES:
1. HATCHED AREAS INDICATE THE LIMIT OF GRAVEL BORROW FOR BACKFILLING STRUCTURES AND PIPES.
2. THE BACKFILL PLACED AROUND THE STRUCTURE SHALL BE DEPOSITED ON BOTH SIDES TO APPROXIMATELY THE SAME ELEVATION AT THE SAME TIME.

LIMITS OF GRAVEL BORROW FOR BACKFILLING STRUCTURES AND PIPES

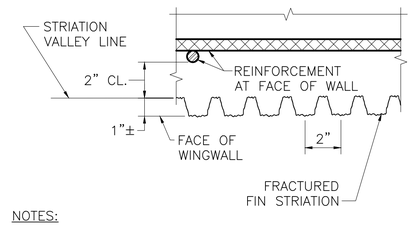
SCALE: N.T.S.

GUARDRAIL NOTES:

1. ALL STEEL CONNECTING BOLTS AND FASTENERS FOR HANDRAIL POSTS, RAILINGS, NUTS AND WASHERS SHALL BE GALVANIZED IN ACCORDANCE WITH AASHTO M232.
2. GUARDRAIL BASE PLATES SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M270 GRADE 50.
3. ANCHOR BOLTS SHALL BE SET WITH TEMPLATES. THE NUT SECURING THE POST BASE PLATE TO THE CONCRETE SHALL BE TIGHTENED TO A SNUG FIT AND GIVEN AND ADDITIONAL 1/8 TURN AFTER STEEL IS IN PLACE.
4. POST FLANGE WELD DOES NOT REQUIRE MAGNETIC PARTICLE TESTING. WELD SHALL BE BACK–GOUGED ON BACK SIDE EXCEPT AT WEB. WELD IS THE SAME ON BOTH FLANGES.
5. W–BEAM DETAILS, EXCEPT ATTACHMENT TO HEADWALLS, SHALL BE STANDARD RELEVANT TO MASSDOT CONSTRUCTION STANDARDS.

PRECAST CONCRETE CULVERT NOTES:

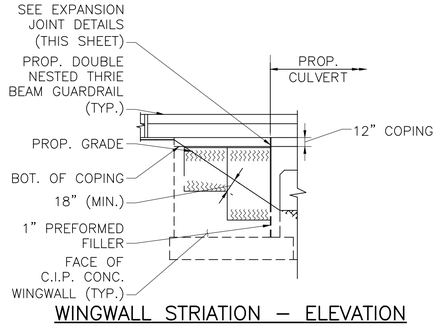
1. CONTRACTOR SHALL SUBMIT PRECAST CONCRETE 3–SIDED BOX CULVERT AND FOOTING DESIGN CALCULATIONS AND SHOP DRAWINGS SEALED BY A PROFESSIONAL ENGINEER REGISTERED IN THE COMMONWEALTH OF MASSACHUSETTS FOR APPROVAL PRIOR TO FABRICATION. PRESCRIBED HYDRAULIC OPENING (4'X10') SHALL BE MAINTAINED.
2. ALL CULVERT AND CULVERT FOOTING CONCRETE SHALL BE 5000PSI, ¾", 685 HP CEMENT CONCRETE.
3. THE CONTRACTOR SHALL APPROVE ALL ELEVATIONS AND DIMENSIONS OF THE SHOP DRAWINGS PRIOR TO FABRICATION. SHOP DRAWINGS AND CALCUALATIONS SHALL BE SUBMITTED TO THE ENGINEER FOR REVIEW AND APPROVAL PRIOR TO FABRICATION.
4. REINFORCEMENT SHALL BE PLACED WITH A MINIMUM OF 1½" COVER. TRANSVERSE REINFORCEMENT SHALL BE PLACED NORMAL TO THE ℄ OF POND STREET.
5. ALL CULVERT REINFORCEMENT SHOWN IS CONCEPTUAL FOR BIDDING PURPOSES. THE CONTRACTOR SHALL SUBMIT DESIGN CALCULATIONS AS PART OF THE SHOP DRAWINGS.
6. DESIGN SHALL BE IN ACCORDANCE WITH THE 2017 AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS WITH CURRENT INTERIM SPECIFICATIONS THROUGH 2019 AND THE MASSDOT LRFD BRIDGE MANUAL PART 1 CHAPTER 3 FOR HL–93 LOADING.
7. A FACTORED BEARING RESISTANCE OF 3.5 KSF SHALL BE USED IN THE DESIGN OF THE CULVERT FOOTING. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE SUBGRADE PREPARATION SUCH THAT THE DESIGN BEARING CAPACITY SHALL BE ACHIEVED. THE CONTRACTOR SHALL NOTIFY THE ENGINEER IF THIS BEARING CAPACITY CANNOT BE MET.
8. AS SPECIFIED THROUGHOUT THE PLANS, THE CONTRACTOR SHALL OVEREXCAVATE 2'–0"" BELOW THE SPECIFIED BOTTOM OF FOOTING ELEVATIONS TO REMOVE ALL UNSUITABLE BEARING MATERIAL. EXCAVATED AREAS SHALL BE REPLACED WITH CRUSHED STONE FOR BRIDGE FOUNDATIONS OVER GEOTEXTILE FABRIC FOR EROSION CONTROL. THIS SHALL OCCUR BENEATH ALL FOOTINGS (CULVERT AND WINGWALLS).



NOTES:
1. THE CONTRACTOR SHALL MAKE SURE THAT THE STRIATION FINS ARE PLUMB AND LINED UP VERTICALLY FROM PANEL TO PANEL FOR THE FULL HEIGHT OF THE WALL.
2. THE HORIZONTAL JOINT MAY BE OMITTED IF THE CONTRACTOR CAN DEMONSTRATE THAT THE FORM LINER PANELS CAN BE INSTALLED END TO END WITHOUT CREATING A VISIBLE SEAM IN THE FINAL CAST CONCRETE.
3. STRIATION DETAILS SHALL ONLY BE INCORPORATED ON THE WINGWALLS.

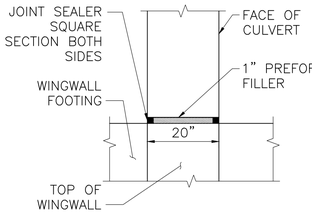
TYPICAL STRIATION DETAIL

SCALE: 3" = 1'–0"



WINGWALL STRIATION – ELEVATION

SCALE: N.T.S.



NOTE:
REINFORCEMENT NOT SHOWN FOR CLARITY.

EXPANSION JOINT DETAILS

SCALE: 1" = 1'–0"

T1001_TOPSFIELD_(DETAILS).DWG Plotted on 2-Mar-2021 12:52 PM
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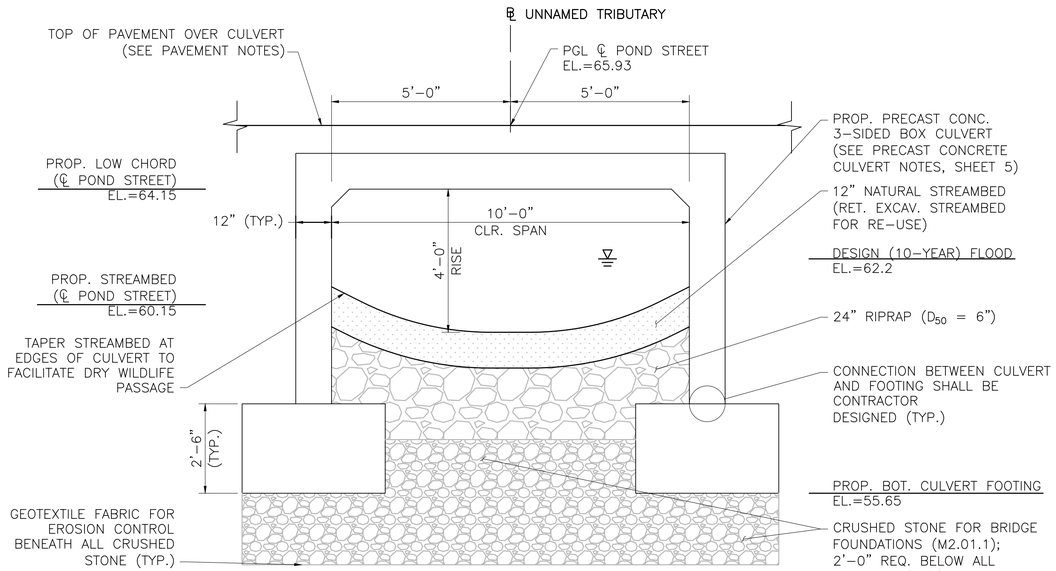
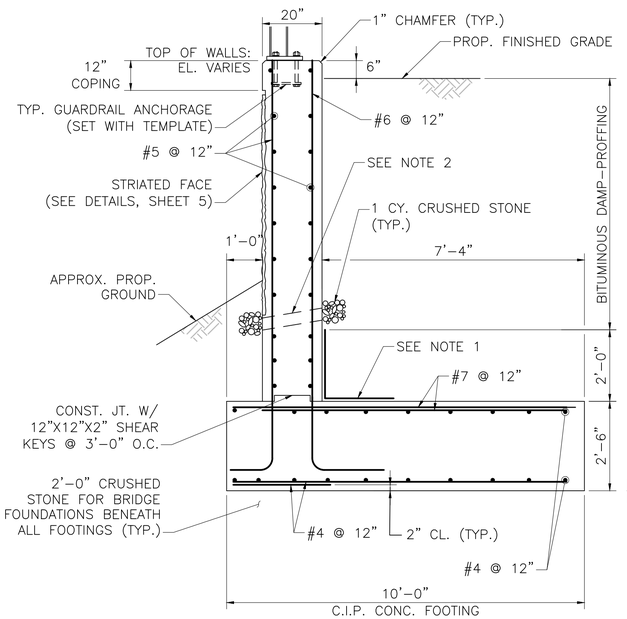
CHAPTER 85 SUBMISSION 1

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
CONCEPTUAL DESIGN IS ACCEPTABLE TO MASSDOT FOR CONTRACTING
STATE BRIDGE ENGINEER — DATE 3/17/2021

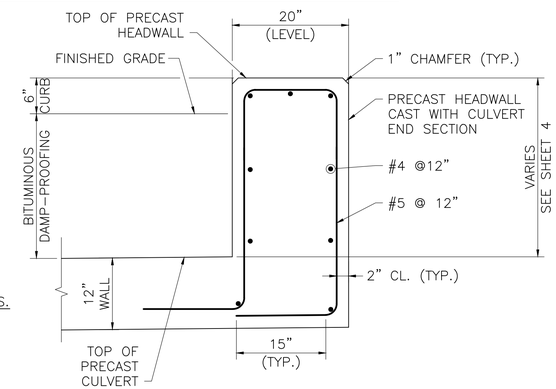
T1001_TOPSFIELD_(DETAILS).DWG Plotted on 2-Mar-2021 12:52 PM



TYPICAL CULVERT SECTION (AT ℄ POND STREET)
SCALE: ½" = 1'–0"



TYPICAL WINGWALL SECTION
SCALE: ½" = 1'–0"



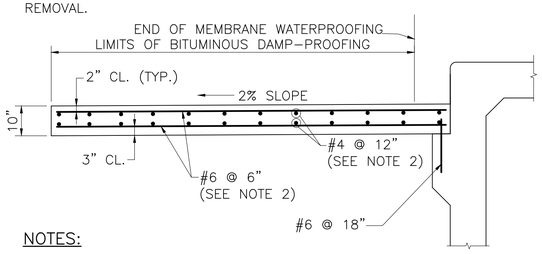
TYPICAL SECTION THROUGH PRECAST HEADWALL
SCALE: 1" = 1'–0"

WINGWALL CONSTRUCTION NOTES:

1. MEMBRANE WATERPROOFING OR OTHER WATERPROOFING PROTECTIVE COURSE, MIN. 2" THICK AS SPECIFIED IN MASSDOT STANDARD SPECIFICATIONS.
2. 4"ø WEEP HOLES AT THIRD POINTS OF WALL LENGTHS (JUST ABOVE PROTECTIVE COURSE). PROVIDE 1 CUBIC YARD OF CRUSHED STONE AT EACH END OF WEEP HOLE.
3. ALL WINGWALL CONCRETE SHALL BE 4000 PSI, ¾ IN, 610 CEMENT CONCRETE.
4. THE FACTORED BEARING PRESSURE = 2.96 KSF, PER AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS STRENGTH 1 LOAD COMBINATION. FACTORED BEARING RESISTANCE = 3.5 KSF. FACTORED BEARING RESISTANCE IS THE PRODUCT OF THE NOMINAL BEARING RESISTANCE AND A RESISTANCE FACTOR OF 0.45.
5. PRE–BED PRECAST ELEMENT WITH NON–SHRINK GROUT WITH THICKNESS MORE THAN SHIM STACK.
6. THE CONTRACTOR SHALL DETERMINE THE SIZE AND SPACING OF THE GROUT PORTS BASED ON THE CDF'S FLOW PROPERTIES AND THE SIZE OF THE FOOTING.

LEVELING BOLT ASSEMBLY NOTES:

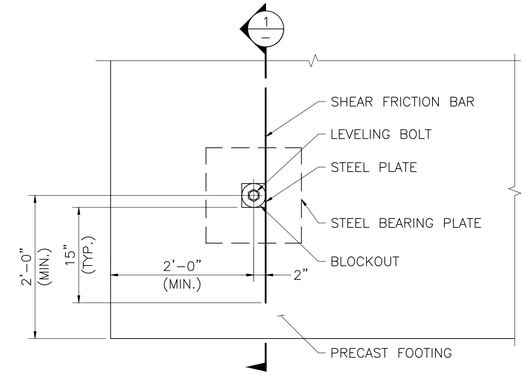
1. THE LEVELING BOLT ASSEMBLY SHOWN IS SCHEMATIC. DESIGN OF THE LEVELING BOLT ASSEMBLY SHALL BE PERFORMED BY THE CONTRACTOR AND SUBMITTED WITH THE ASSEMBLY PLAN TO THE ENGINEER FOR APPROVAL.
2. BOLT SHALL BE REMOVED AFTER THE CONTROLLED DENSITY FILL (NON–EXCAVATABLE) HAS SET.
3. STEEL PLATES SHALL BE AASHTO M 270 GRADE 36 UNCOATED STEEL.
4. BOLTS SHALL BE H.S. AASHTO M 164 AND UNCOATED.
5. REINFORCEMENT SHALL BE WELDABLE LOW–ALLOW ASTM A 706 BARS.
6. GREASE OF OIL NUT AND BOLT THREADS TO FACILITATE LEVELING AND REMOVAL.



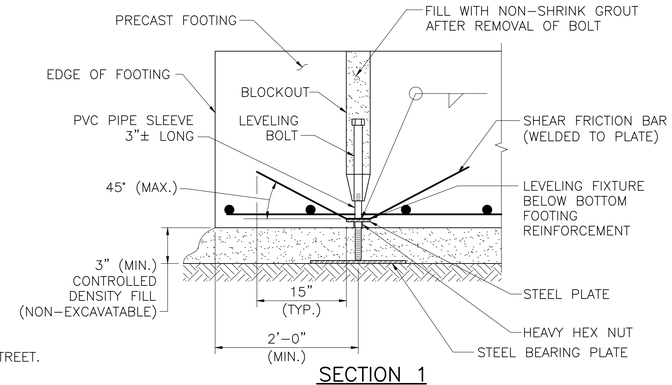
NOTES:

1. APPROACH SLAB TO BE 4000 PSI, 1½ IN, 565 CEMENT CONCRETE.
2. PLACE LONGITUDINAL REINFORCEMENT PARALLEL TO BASE LINE OF POND STREET. PLACE TRANSVERSE REINFORCEMENT PARALLEL TO FRAME ENDS.

APPROACH SLAB DETAILS
SCALE: ½" = 1'–0"

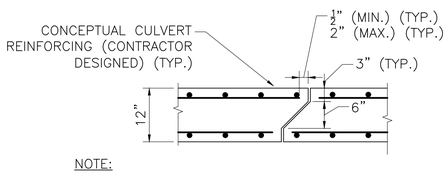


PLAN
SCALE: 1" = 1'–0"



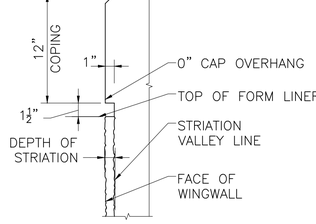
SECTION 1
SCALE: 1" = 1'–0"

LEVELING BOLT ASSEMBLY

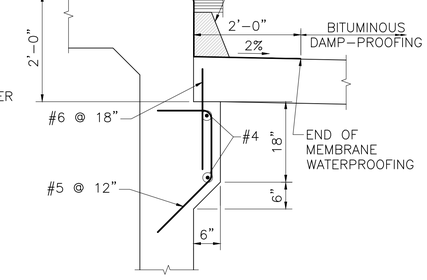


NOTE:
JOINT DIMENSIONS ARE CONCEPTUAL AND SHALL BE CONFIRMED BY THE PRECASTER.

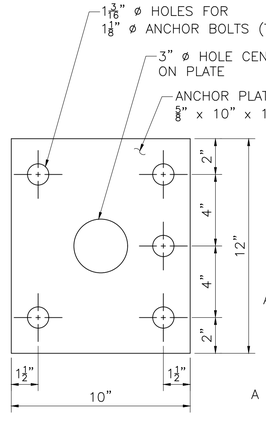
CULVERT JOINT DETAIL
SCALE: ¾" = 1'–0"



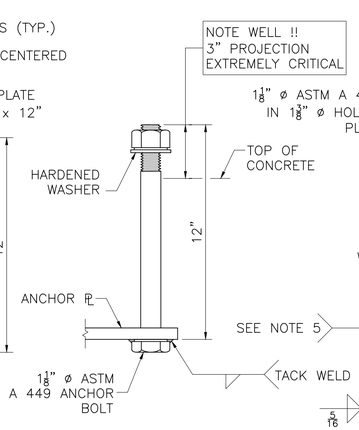
TOP OF WINGWALL DETAIL
SCALE: N.T.S.



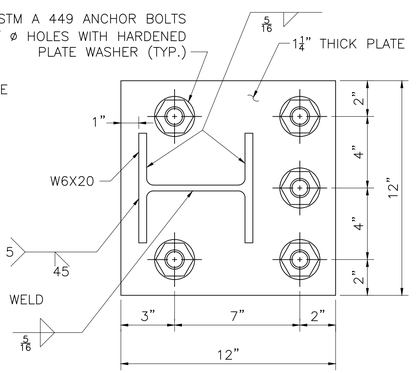
APPROACH SLAB SHELF – DETAILS
SCALE: ¾" = 1'–0"



ANCHOR PLATE
SCALE: 3" = 1'–0"



ANCHOR BOLT
SCALE: 3" = 1'–0"



BASE PLATE
SCALE: 3" = 1'–0"

JAN 26 2021
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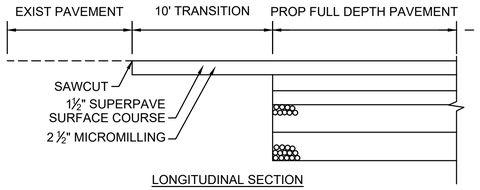
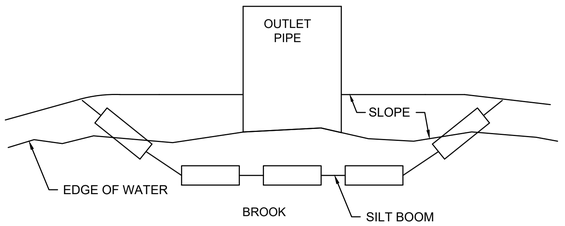
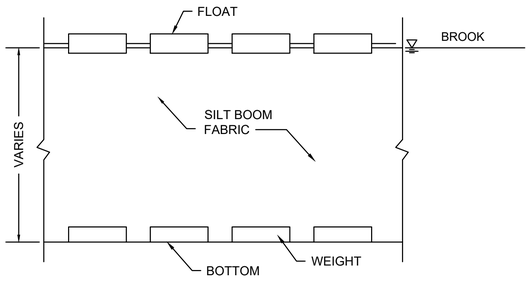


FULL DEPTH PAVEMENT TRANSITION
N.T.S.

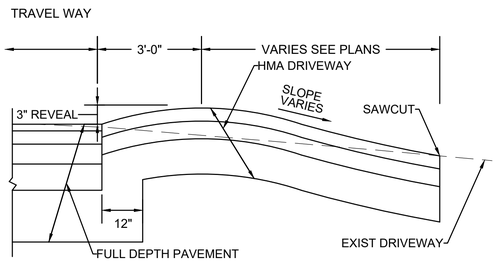


PLAN



PROFILE

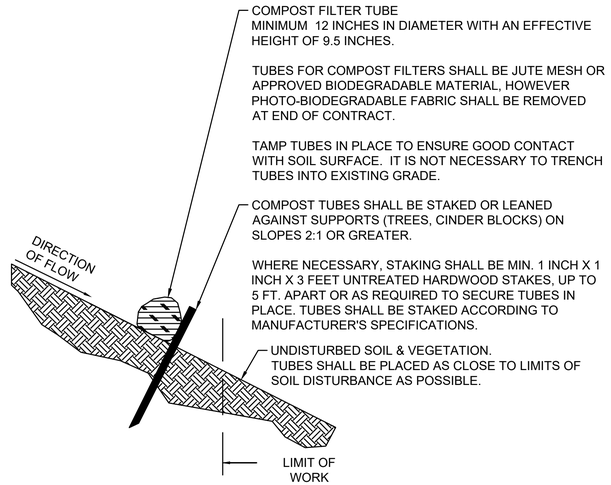
SILT BOOM FENCE
N.T.S.

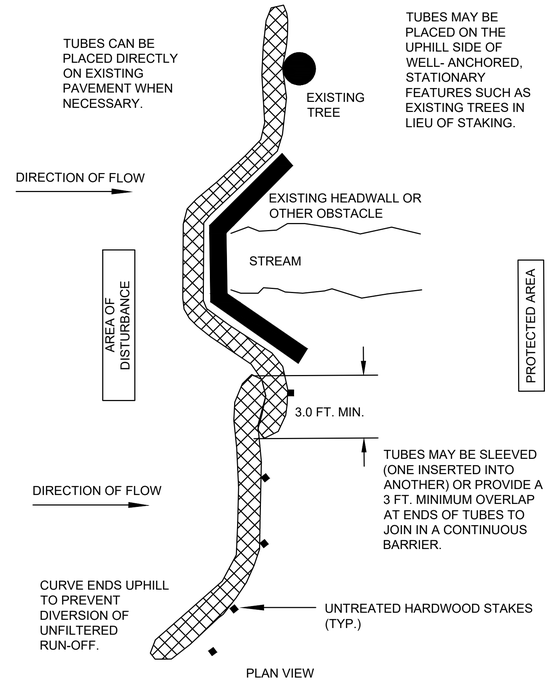


TYPICAL DRIVEWAY SECTION
N.T.S.

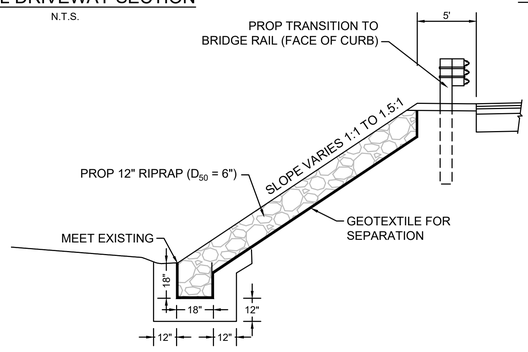
NOTES:

1. PROVIDE A MINIMUM TUBE DIAMETER OF 12 INCHES FOR SLOPES UP TO 50 FEET IN LENGTH WITH A SLOPE RATIO OF 3H:1V OR STEEPER. LONGER SLOPES OF 3H:1V MAY REQUIRE LARGER TUBE DIAMETER OR ADDITIONAL COURSING OF FILTER TUBES TO CREATE A FILTER BERM. REFER TO MANUFACTURER'S RECOMMENDATIONS FOR SITUATIONS WITH LONGER OR STEEPER SLOPES.
2. INSTALL TUBES ALONG CONTOURS AND PERPENDICULAR TO SHEET OR CONCENTRATED FLOW.
3. TUBE LOCATION MAY BE SHIFTED TO ADJUST TO LANDSCAPE FEATURES, BUT SHALL PROTECT UNDISTURBED AREA AND VEGETATION TO MAXIMUM EXTENT POSSIBLE.
4. DO NOT INSTALL IN PERENNIAL, EPHEMERAL OR INTERMITTENT STREAMS.
5. ADDITIONAL TUBES SHALL BE USED AT THE DIRECTION OF THE ENGINEER.
6. ADDITIONAL STAKING SHALL BE USED AT THE DIRECTION OF THE ENGINEER.



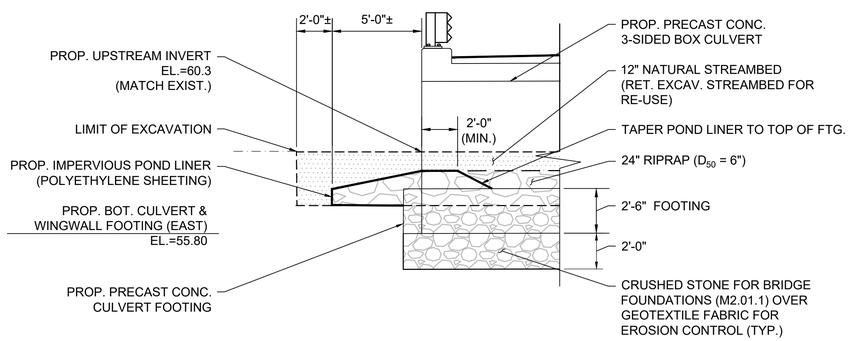


COMPOST FILTER TUBE
N.T.S.

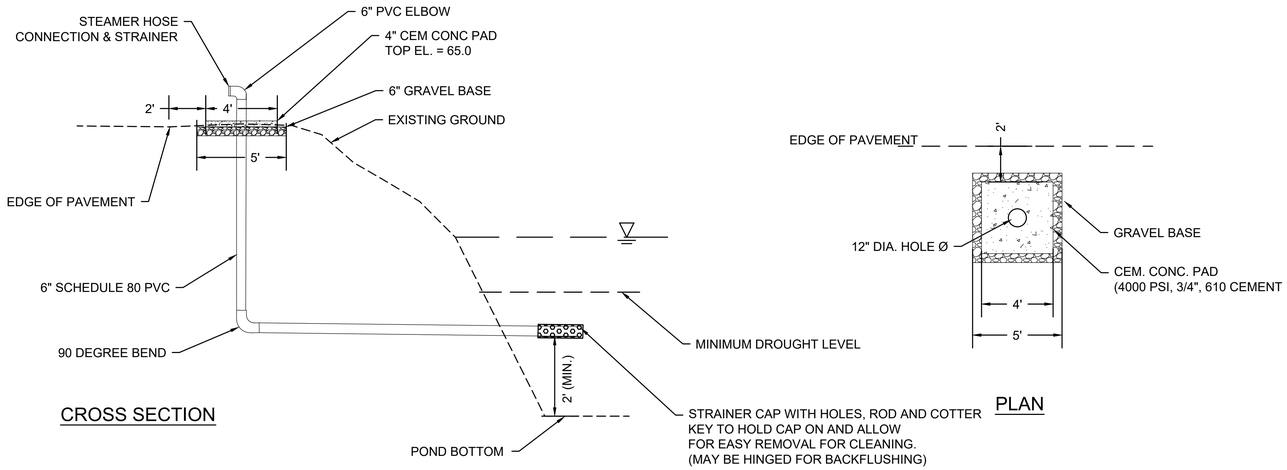


NOTES:
1. MUCK EXCAVATION WITHIN WETLAND BOUNDARIES SHALL BE CONDUCTED IN ACCORDANCE WITH MASSDOT AND MASS DES SPECIFICATIONS AND REGULATIONS.

MODIFIED ROCKFILL SLOPE STABILIZATION
N.T.S.



UPSTREAM BACKFILL/STREAMBED PROTECTION DETAIL
N.T.S.



FIRE SUPPRESSION DRY HYDRANT DETAIL
N.T.S.

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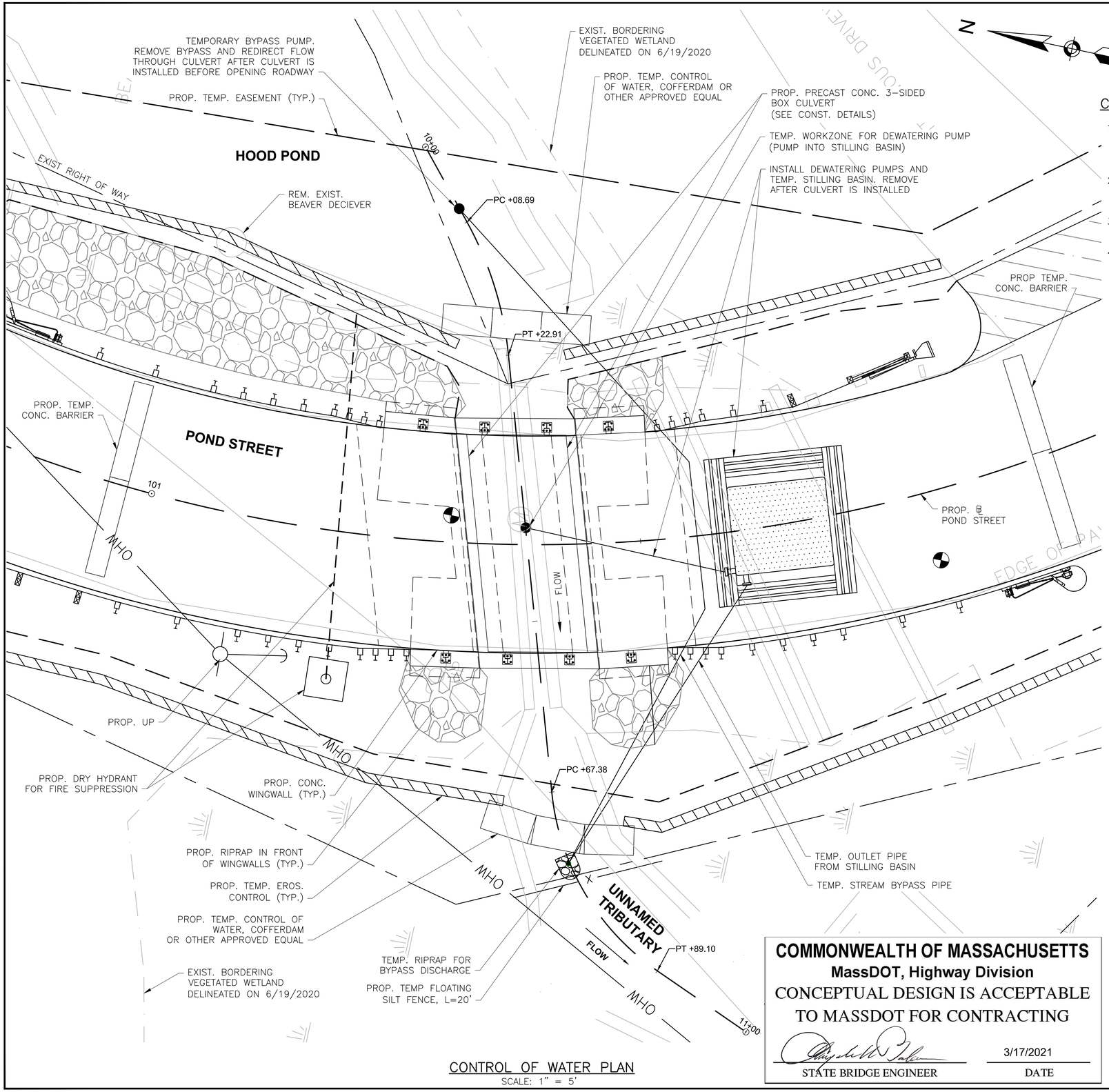
TOPSFIELD, MA
POND STREET
CONTROL OF WATER PLAN
SHEET 8 OF 10



CONTROL OF WATER PLAN
SCALE: 1" = 5'

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
CONCEPTUAL DESIGN IS ACCEPTABLE TO MASSDOT FOR CONTRACTING

STATE BRIDGE ENGINEER — DATE 3/17/2021

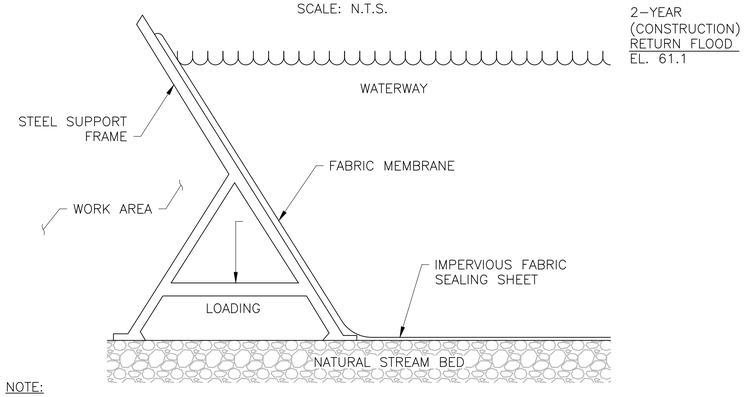
CONTROL OF WATER NOTES

1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE DESIGN OF THE CONTROL OF WATER (C.O.W.) SYSTEM AND SHALL SUBMIT A C.O.W. PLAN TO THE ENGINEER FOR APPROVAL. THE C.O.W. SYSTEM SHOWN IS CONCEPTUAL ONLY. THE C.O.W. SYSTEM SHALL BE DESIGNED TO WITHSTAND THE 2-YEAR FLOOD ELEVATION OF 61.1 (NAVD).
2. POND STEET SHALL BE CLOSED TO VEHICULAR AND PEDESTRIAN TRAFFIC AT THE BRIDGE CROSSING PRIOR TO BEGINNING EXCAVATION. DETOUR SIGNAGE WILL BE INSTALLED IN ACCORDANCE WITH THE MUTCD AND THE TEMPORARY TRAFFIC CONTROL PLANS INCLUDED IN THESE CONSTRUCTION DRAWINGS.
3. C.O.W. SYSTEM SHALL BE INSPECTED DAILY FOR WATER LEAKS OR EROSION AND REPAIRS PROCEDURES SHALL BE IMPLEMENTED ACCORDINGLY.
4. THE CONSTRUCTION SEQUENCE WITH REGARDS TO THE C.O.W. SYSTEM SHALL BE AS FOLLOWS:
   - 4.1. CLOSE THE ROADWAY TO VEHICULAR AND PEDESTRIAN TRAFFIC AT THE BRIDGE CROSSING.
   - 4.2. INSTALL EROSION CONTROLS: TEMPORARY EROSION CONTROL AROUND PROJECT LIMITS TO PROTECT THE UNNAMED TRIBUTARY FROM WORK ZONE SEDIMENT; FLOATING SILT FENCE IN THE UNNAMED TRIBUTARY DOWNSTREAM OF THE PROJECT LIMITS TO TRAP ANY FLOATING DEBRIS/SILT THAT MAY ENTER THE TRIBUTARY.
   - 4.3. INSTALL C.O.W. COFFERDAMS, BYPASS PUMPS, DEWATERING PUMPS, AND TEMPORARY STILLING BASIN.
   - 4.4. PLACE TEMPORARY RIPRAP AT OUTLET FOR BYPASS DISCHARGE.
   - 4.5. DEWATER THE WORK AREA PRIOR TO (AND THROUGHOUT) EXCAVATION TO FACILITATE INSTALLING THE CULVERT, AND WINGWALLS IN THE DRY CONDITION. ALL DEWATERING FLOW SHALL PASS THROUGH THE STILLING BASIN TO REMOVE SEDIMENT PRIOR TO DEPOSITING BACK INTO THE STREAM.
   - 4.6. INSTALL THE THREE-SIDED BOX CULVERT AND WINGWALLS. RESTORE THE STREAMBED IN ACCORDANCE WITH THESE PLANS. INSTALL RIPRAP EMBANKMENT AND LOAM AND SEED WITH EROSION CONTROL BLANKET IN FRONT OF THE WINGWALLS. INSTALL COIR LOGS ALONG UPLAND SIDES OF STREAMBED.
   - 4.7. REDIRECT STREAM FLOW THROUGH THE CULVERT.
   - 4.8. REMOVE THE C.O.W. COFFERDAMS BYPASS PUMPS AND TEMPORARY STILLING BASIN.

NOTE:
DISCHARGE TO SEDIMENTATION BASIN (AS SHOWN) OR TO SILTATION/ DEWATERING BAG SUCH AS FLOGARD DEWATERING BAG MODEL SC-DW1215Z, OR APPROVED EQUAL BY BOXFORD CONSERVATION COMMISSION. SYSTEM SHOWN IS CONCEPTUAL ONLY AND IS TO BE DESIGNED BY CONTRACTOR.

TEMPORARY STILLING AREA

SCALE: N.T.S.



NOTE:
THE STEEL FRAME COFFERDAM SHOWN ABOVE IS SHOWN IN CONCEPT ONLY AS ONE OPTION FOR CONTROL OF WATER. THE CONTRACTOR SHALL DETERMINE THE APPROPRIATE SYSTEM FOR CONTROLLING THE WATER (I.E. BULK SANDBAGS, SHEETING, ETC). THE CONTRACTOR SHALL SUBMIT THEIR PROPOSED CONTROL OF WATER DESIGN TO THE ENGINEER FOR REVIEW AND APPROVAL.

TEMPORARY COATED FABRIC STEEL FRAME COFERDAM

SCALE: N.T.S.

T1001_TOPSFIELD_(C.O.W).DWG Plotted on 2-Mar-2021 12:53 PM
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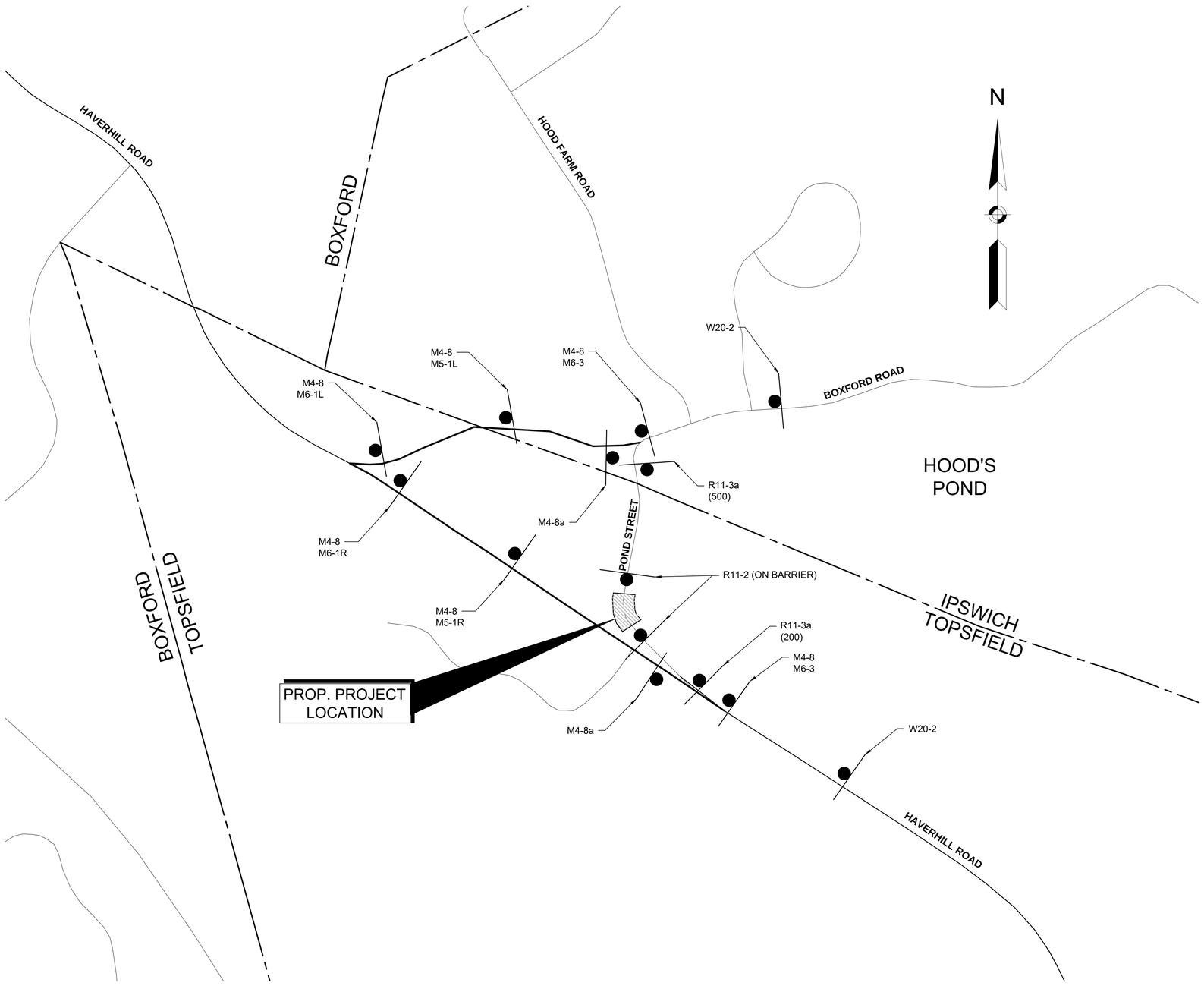

DETOUR PLAN & ADVANCED SIGNAGE
SCHEMATIC FOR POND STREET
SCALE: 1"=200'

GENERAL NOTES:

1. ALL WORK ZONES AND DETOURS ARE ESTABLISHED FOR 24-HOURS A DAY. TEMPORARY CONSTRUCTION SIGNING, BARRICADES, AND ALL OTHER NECESSARY WORK ZONE TRAFFIC CONTROL DEVICES SHALL BE REMOVED FROM THE HIGHWAY OR COVERED WHEN THEY ARE NOT REQUIRED FOR CONTROL OF TRAFFIC.
2. ALL TEMPORARY TRAFFIC CONTROL WORK SHALL CONFORM WITH THE 2009 MANUAL ON UNIFORM TRAFFIC CONTROL (M.U.T.C.D.) AND ALL REVISIONS, UNLESS SUPERCEDED BY THESE PLANS.
3. ALL SIGN LEGENDS, BORDERS, AND MOUNTING SHALL BE IN ACCORDANCE WITH THE M.U.T.C.D.
4. TEMPORARY CONSTRUCTION SIGNING AND ALL OTHER TRAFFIC CONTROL DEVICES SHALL BE IN PLACE PRIOR TO THE START OF ANY WORK.
5. SIGNS AND SIGN SUPPORTS LOCATED ON OR NEAR THE TRAVELED WAY MUST PASS THE CRITERIA SET FORTH IN NCHRP REPORT 350, "RECOMMENDED PROCEDURES FOR THE SAFETY PERFORMANCE EVALUATION OF HIGHWAY FEATURES" AND/OR "MANUAL FOR ASSESSING SAFETY HARDWARE" (MASH).
6. DISTANCES ARE A GUIDE AND MAY BE ADJUSTED IN THE FIELD BY THE ENGINEER.
7. ALL SIGNS SHALL BE MOUNTED ON THEIR OWN STANDARD SIGN SUPPORTS AT THE DISCRETION OF THE CONTRACTOR.
8. ALL DRUMS AND/OR CONES SHALL BE SET 20' O.C. MAX. UNLESS OTHERWISE NOTED OR ADJUSTED BY THE ENGINEER.

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T1001_TMP.DWG Plotted on 2-Mar-2021 12:53 PM

TRAFFIC SIGN SUMMARY

IDENTIFICATION NUMBER	SIZE OF SIGN (INCHES)		LEGEND	TEXT DIMENSIONS (INCHES)			NUMBER OF SIGNS REQUIRED	COLOR			NUMBER OF SUPPORTS REQUIRED	UNIT AREA (S.F.)	AREA IN SQUARE FEET
	WIDTH	HEIGHT		LETTER HEIGHT	VERTICAL SPACING	ARROW RTE. MKR.		BACKGROUND	LEGEND	BORDER			
R11-2	48	30		(1)			2	WHITE	BLACK	BLACK	0 ON BARRIER	10.00	20.00
R11-3a(500)	60	30					1	WHITE	BLACK	BLACK	1	12.50	12.50
R11-3a(200)	60	30					1	WHITE	BLACK	BLACK	1	12.50	12.50
W20-2	36	36					3	ORANGE	BLACK	BLACK	3	9.00	2□.00
M4-8	24	12					□	ORANGE	BLACK	BLACK	□	2.00	14.00
M4-8a	24	18					2	ORANGE	BLACK	BLACK	2	3.00	6.00
M5-1R	21	15					1	WHITE	BLACK	BLACK	0 W/ M4-8	2.19	2.19
M5-1L	21	15					1	WHITE	BLACK	BLACK	0 W/ M4-8	2.19	2.19
M6-1R	21	15					1	WHITE	BLACK	BLACK	0 W/ M4-8	2.19	2.19
M6-1L	21	15					1	WHITE	BLACK	BLACK	0 W/ M4-8	2.19	2.19
M6-2R	21	15					1	WHITE	BLACK	BLACK	0 W/ M4-8	2.19	2.19
M6-3	21	15					2	WHITE	BLACK	BLACK	0 W/ M4-8	2.19	4.38

NOTES:

(1.) CONTRACTOR TO FURNISH SIGNS CONSISTENT WITH 2009 MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS. SEE MANUAL FOR TEXT AND LEGEND DIMENSIONS.

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CHAPTER 85 SUBMISSION 1

ATTACHEMENT B:

Project Special Provisions

ITEM 148.01 DREDGING AND STOCKPILING OF MATERIAL CUBIC YARD

GENERAL

Work under this item shall conform to the relevant provisions of Section 148 of the Standard Specifications and the following:

Dredging of approved native streambed material shall be stockpiled on site at a location determined by the Contractor. The stockpiled material will be reused on site for streambed restoration. The placement of this material shall be included under this Item.

COMPENSATION

Method of Measurement

Item 148.01 shall be measured for payment based on the actual volume of material dredged and stockpiled. Pay limits extend from the bottom of proposed excavation to the top of the existing bank as shown on the plans.

Basis of Payment

Item 148.01 shall be paid for at the Contract Unit Price per Cubic Yard of material dredged and stockpiled as measured above and re-laid for the restoration of the streambed. Said price shall be considered full compensation for all labor, tools, equipment, and materials necessary to dredge, stockpile, and re-lay and replace the existing streambed to the elevations shown on plan.

ITEM 697.2 FLOATING SILT FENCE FOOT

GENERAL

Work under this Item shall include installation, maintenance and removal of temporary floating silt fence to prevent any sediment disturbed during construction from reaching adjacent waterways and further dispersing. The fence shall be installed downstream of the existing culvert, as shown on the plans.

MATERIALS

Floating silt fence shall be made of a woven polypropylene with a minimum 200 lb. tensile strength. The Contractor shall submit to the Engineer, for review and approval, product specifications and technical data provided by the manufacturer, prior to installation. The fence shall be continuously weighted at the bottom to maintain a vertical submerged position. Anchors shall be placed at both ends of the curtain and at intermediate locations, as necessary, to hold the fence securely in place. The fence shall be installed to withstand the forces of the flow of the waterway.

INSTALLATION

Floating silt fence shall be installed before construction begins and earth is disturbed. Silt fences shall be inspected and approved by the Topsfield Conservation Commission Agent after installation and prior to commencement of further construction activities.

The Contractor shall inspect silt fence at least weekly to ensure continuous effectiveness. Fence shall be maintained for effective performance at all times. If any part of the fence becomes damaged or dislodged, construction activities shall be halted until all deficiencies are corrected by the Contractor with no additional compensation. The floating silt fence shall be removed after all construction activities are completed and in such a way that no collected sediment is dispersed into waterways.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 697.2 shall be measured for payment and paid for at the Contract unit price per FOOT of floating silt fence installed. This item shall include full compensation for all labor, equipment, materials, incidentals, satisfactory removal, and maintenance of the floating silt fence throughout the duration of the Contract.

ITEM 698.4 GEOTEXTILE FABRIC FOR PERMANENT EROSION CONTROL SQUARE YARD

GENERAL

The work under this item shall consist of furnishing and placement geotextile fabric for permanent erosion control at the locations shown on the Plans or as directed by the Engineer.

This work shall include the installation of geotextile fabric for all areas beneath riprap embankments and beneath proposed footings. as indicated on the Plans.

A layer of fabric shall be installed beneath all proposed footings - between the natural, undisturbed soil and the proposed crushed stone underlying all footings.

The geotextile fabric shall be handled and installed per the manufacture's recommendations.

MATERIALS

The geotextile fabric shall be a product from the MassDOT Qualified Construction Materials List and conform the MassDOT Standard Specifications section M9.50.0.

The Contractor shall submit proposed fabric to the Engineer for review and approval.

METHODS

Atmospheric exposure of the geotextile fabric to the elements following lay down shall be limited to a maximum of 14 days.

For seams that are sewn in the field, the Contractor shall provide at least a six-foot length of sample sewn seam for the approval of the Engineer before the geotextile fabric is installed. The seams sewn for sampling shall be sewn using the same type of equipment and procedures as will be used for the production seams. If seams are sewn in both the machine and cross machine direction, samples of seams for both directions shall be provided. The seam assembly description shall be submitted by the Contractor along with the seam samples. This description shall include the seam type, stitch type, sewing thread, and stitch density. If the Contractor elects to sew seams instead of overlap, colored thread must be used.

Geotextile shall be placed in intimate contact with soils without wrinkles or folds and shall be anchored on a smooth graded surface approved by the Engineer. The geotextile shall be placed in such a manner that placement of the overlaying materials will not excessively stretch or tear it.

Adjacent geotextile sheets shall be joined by either sewing or overlapping. At roll ends, overlapped seams shall overlap a minimum of 12 inches, except when placed under water, where they shall overlap a minimum of 3 feet. Adjacent rolls shall overlap a minimum of 12 inches.

Care shall be taken during installation to prevent damage to the geotextile as a result of the installation process. Should the geotextile be damaged, a geotextile patch shall be placed over the damaged area extending a minimum of 3 feet beyond the limits of the damage.

ITEM 698.4 (Continued)

Care shall be taken during the placement of any material placed above geotextile fabric to avoid stretching and subsequent tearing of the geotextile. Stones shall not be dropped from a height exceeding 3 feet.

Field monitoring shall be performed to verify that the any material placed above geotextile fabric placement does not damage the geotextile.

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

If during construction, including any time prior to final acceptance of the project by the Engineer, the riprap embankment slopes shall exhibit signs of failure, the slope shall be repaired and the geotextile fabric reinstalled or replaced by the Contractor, as required by the Engineer, at Contractor's expense.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

The work described under this Item shall be measured for payment by the SQUARE YARD complete in place as shown on the Plans or as directed by the Engineer for Item 698.4. Overlapping for seams and joints shall me measured as one layer of fabric. Any embedment or wrapping at the toe or top of slope, applied per manufacturer's installation recommendations or the Engineer direction shall be measured for payment.

Item 698.4 shall be paid for at the Contract unit price per SQUARE YARD, except that for which payment is provided elsewhere, which shall include all labor, equipment, materials and incidentals required to complete the work of this Item as indicated on the Contract Documents, as specified herein and as required by the Engineer.

ITEM 767.121 SEDIMENT CONTROL BARRIER FOOT

GENERAL

The Work under this item shall conform to the relevant provisions of Sections 751 and 767 of the Standard Specifications and Section 670 of the Standard Supplemental 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 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 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;

- Straw tubes/wattles which shall be trenched
- Straw bales which shall be trenched

Additional barriers (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.

Where specified or required by permits, silt fence shall be used in addition to compost filter tubes or straw bales and shall be incidental to the item.

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 stacked, trenched and/or wedged as specified herein and shall be securely in contact with existing soil such that there is no flow beneath the barrier.

Compost Filter Tube
Compost material inside the filter tube shall meet M1.06.0, except for the following: no 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 a knitted mesh with 1/8 – 3/8” openings and made of 100% biodegradable materials (i.e, cotton, hemp or jute).

Compost Filter tubes shall be a minimum of 12 inches in diameter installed. Tubes shall be placed, filled, and stacked in place as required to ensure stability against water flows. All tubes shall be tamped, but not trenched, to ensure good contact with soil.

ITEM 767.121 (Continued)

Where reinforcement is necessary, additional tubes shall be installed as shown on plans.

Straw Bales
Straw bales shall conform to the requirements of section M6.04.3 of the Standard Specifications and the following:

Bales should be a minimum size of 12 x 16 x 36 inches and shall be placed in a single row, lengthwise on the contour, with ends of adjacent bales tightly abutting one another.

The bales shall be trenched and backfilled. The trench shall be excavated with the width of the bale and the length of the proposed barrier to a depth of 4 inches. After the bales are stacked the excavated soil shall be backfilled against the barrier. Backfill soil shall conform to the ground level on the downhill side and shall be built up to 4 inches against the uphill side of the barrier.

Straw Wattle
Straw wattle shall be a minimum of 12 inches in diameter. Straw filling shall conform to the requirements of Section M6.04.3, shall be encased in durable netting, and shall have a density of 3 lb/foot.

Straw wattle shall be trenched in 3 inches deep and staked according to the plans. The wattles shall be sufficiently secure on the upstream side to prevent water flowing underneath the wattle.

Silt Fence
Materials and Installation shall be per Section 670.40 of the Standard Supplemental Specifications and the following:

Silt fence shall be used when specified by Orders of Condition or other permitting.

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 driven 16 inches into the ground 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.

Stakes
Stakes for anchoring Compost Filter Tubes, Straw Wattles, and Straw Bales shall be as shown on the plans and shall be a minimum of 1x1 inch diameter x 4 feet hardwood stakes.

When used with Silt Fence, stakes for Compost Filter Tubes shall be driven 12 inches into the ground, Stakes for Straw Bales shall be driven 16 inches into the ground.

Stakes of other material of equivalent strength may be used if approved by the Engineer.

ITEM 767.121 (Continued)

MAINTENANCE

Maintenance of Sediment Control Barriers shall be per Section 670.40 of the Standard Supplemental Specifications.

The Contractor shall inspect the sediment barrier after each rain event and as specified in relevant permits to ensure that they are working effectively and as intended. Contractor shall be responsible for ensuring that an effective barrier is in place for all phases of the contract.

Barriers that decompose naturally due to weatherization over time 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 water and sediment control, barrier does not necessarily require replacement.

DISMANTLING & REMOVING

Barriers shall be dismantled and/or removed when construction work is complete and when site conditions are sufficiently stable to prevent surface erosion and after receiving permission to do so from the Engineer and the Conservation Commission.

For all instances, all nonbiodegradable material, including photo-biodegradable fabric, plastic netting, nylon twine, and silt fence, shall be removed and disposed off-site by the Contractor regardless of site context.

For naturalized areas, biodegradable, natural fabric and material may be left in place to decompose on-site. Compost filter tubes may be left as they are with stakes removed. Straw bales shall be broken down and spread evenly. All nylon or nonbiodegradable twin shall be removed along with silt fence. Wooden stakes may be left on site, placed neatly and discreetly.

On urban, residential, and other locations where aesthetics is a concern, the following shall apply:

- Filter tube fabric shall be cut and removed, and compost shall be raked to blend evenly (similar to a soil amendment or mulch). Not 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 grasses (i.e., lawn or native grass mix).
- Silt fence, stakes, and other debris shall be removed and disposed off-site. Site shall look neat and clean upon completion.

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 work

ITEM 859.1 REFLECTORIZED DRUMS WITH SEQUENTIAL FLASHING WARNING LIGHTS DAY

Work under this Section consists of furnishing, installing, maintaining in proper operating conditions, and removing reflectorized drums, and any necessary ballast, equipped with sequential flashing warning lights.

MATERIALS

Reflectorized drums shall be listed on the MassDOT Qualified Traffic Control Equipment List.

Reflective sheeting on drums shall meet or exceed ASTM D4956 Type VIII. All drums shall be maintained in a satisfactory manner including the removal of oils, dirt, and debris that may cause reduced retroreflectivity.

The Contractor shall use one of the following sequential flashing warning light systems unless otherwise approved by the Engineer:

1. Empco-Lite LWCSD
2. pi-Lit® Sequential Barricade-Style Lamp; or
3. Unipart Dorman SynchroGUIDE.

Sequential flashing warning lights shall be secured to reflectorized drums per the light manufacturer's specifications.

CONSTRUCTION METHODS

The first ten drums in any merging or shifting taper as designated in the Temporary Traffic Control Plan shall be equipped with sequential flashing warning lights. These lights shall be operating, at a minimum, between dusk and dawn when the taper is deployed.

The successive flashing of the sequential warning lights shall occur from the upstream end of the merging or shifting taper to the downstream end of the taper in order to identify the desired vehicle path. Each warning light in the sequence shall be flashed at a rate of not less than 55, nor more than 75 times per minute.

Warning lights shall be powered off when drums are not deployed in a taper.

METHOD OF MEASUREMENT

A group of ten (10) reflectorized drums with sequential flashing warning lights is considered one (1) unit and will be measured by the day. Each period of up to 24 hours during which this unit is in use will be measured as one day regardless of the number of times that the drums are positioned, repositioned, removed, or returned to service.

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 991.1 **CONTROL OF WATER – POND STREET BRIDGE STRUCTURE** **LUMP SUM**

GENERAL

All work to be done under this Item shall conform to the relevant provisions of Sections 140.60 of the MassDOT Standard Specifications, the Plans and the following:

The work under this Item shall consist of all dewatering necessary to control water during the construction of the proposed culvert and wingwalls. Water shall be diverted and controlled in such a way that the existing culvert is removed and the proposed culvert/wingwall construction is completed completely in the dry.

The control of water system neither shall cause the accumulation of siltation nor any adverse effect to the water or the environment.

The temporary control of water systems shall be non-permanent, and cause no harm to the ecology of the stream, land under water, and surrounding land and shall be comprised bulk sand bags or portable cofferdams or other approved impervious curtains, and dewatering to facilitate construction activities. Operations of control of water shall not adversely affect the quality of the required construction.

As part of the work under this Item, it is the responsibility of the Contractor to determine the need and extent of dewatering required.

Special care shall be given to minimize disturbance to the stream and adjacent banks. All in-stream work shall take place between June and September, in accordance with the general contract documents.

SUBMITTALS

Prior to the commencement of any work at the site, the Contractor shall submit to the Engineer for review and approval, a detailed plan for water control, including the construction of the water control system, and a footing placement sequence plan with a timetable and details specific to each of the phases of construction in relation to the control of water system. The submittal shall include working drawings, calculations, detailing the methods and materials proposed to account for all anticipated loads and construction conditions necessary to permit the work while maintaining a safe work area and protecting property from damage.

Any drawings and calculations prepared as part of the submittal must be prepared and stamped by a Professional Engineer registered in the Commonwealth of Massachusetts.

The Contractor’s attention is directed to the Order of Conditions issued by the Topsfield Conservation Commission included herein, for additional environmental constraints that must be adhered to when designing and installing the control of water system.

The Contractor shall make his/her own evaluation of existing conditions, groundwater level, water flow, the effects of his/her proposed temporary works and construction methods, and shall provide in his/her design for all loads and construction conditions necessary to permit construction of the specified structures

ITEM 991.1 (Continued)

while maintaining public safety, and protecting completed work and all third party property from damage due to his operations.

METHODS

This work shall also include dewatering the work areas as needed to complete demolition and construction in the dry.

The system shall be designed so that there are no adverse effects on the adjacent properties. The control of water system shall be sized in such a way that the system is overtopped with elevated stream water before any adjacent properties are inundated.

Where sandbags are used, the bags shall not decay nor rip or tear during the installation, its service life within the waterway, or during the removal process. The Contractor shall not disturb the streambed in order to avoid migration of silts and sands further downstream. All in-stream work required to install, adjust and remove the control of water system must be performed by hand or by hoisting equipment positioned upland.

Measures to control the discharge of sediment or pollutants into the water resource areas shall include, but not be limited to the following:

1. Site construction areas outside the buffer zones and on relatively flat ground.
2. Management of construction operations involving hazardous materials, such as refueling and maintenance of equipment within the resource areas.
3. Installation and continuous maintenance of water control measures throughout the project.
4. Treatment of all discharge resulting from dewatering activities through a sedimentation/retention tank to control turbidity. At no time shall the discharge from dewatering activities be directly released into a resource area.
5. Perform as much work as possible outside the stream banks.

The locations of any sedimentation/retention tank will be determined by the Contractor based on the selected methods of construction. Placement of the tank shall be in an upland area that is within the existing right of way.

If necessary, a sumping basin shall be constructed to collect any stream waters able to bypass the diversion system that may enter any work areas. The basin shall be equipped with a pump to convey waters to a sedimentation/retention tank. Water shall be pumped across the street to be discharged downstream once passing through the sumping basin and sedimentation/retention tank. No waters pumped from the work areas shall be discharged back to the stream until sediment is filtered using the sedimentation/retention tank.

All dewatering and related water control work shall be conducted in such a manner as to prevent siltation or contamination of the waterway. At a minimum, the sedimentation/retention tank shall be constructed of an earthen berm lined with geotextile fabric and surrounded by staked hay bales. The tank shall meet or exceed the following criteria:

1. The size and location of the tank shall be determined based on the size of the Contractor's pump and the anticipated groundwater levels.
2. The outlet/weir of the sedimentation/retention tank shall not cause erosion of the surrounding area. An approved method of controlling erosion, such as an erosion control blanket, stone,

ITEM 991.1 (Continued)

etc., shall be used at the outlet of the tank.

3. The Contractor shall not allow any sediment within the sedimentation/retention tank to accumulate to a depth of greater than 12 inches at any point in the tank, nor shall the water level be allowed to rise to a height of more than 24 inches.
4. The sedimentation/retention tank shall be designed with a minimum of 18 inches of freeboard, which must be maintained at all times.
5. The Contractor shall inspect the sedimentation/retention tank at least daily when in operation.
6. Damages shall be repaired immediately.
7. The sedimentation/retention outlet shall be cleaned daily.
8. The sediments within the sedimentation/retention tank shall be disposed of as described in the Order of Conditions or as approved by the Engineer.

Upon completion of water control, the materials and equipment used to maintain the control of water system, sumping basin, and sedimentation/retention tank shall become the property of the Contractor and shall be removed by the Contractor from the site. The area affected shall be restored to its natural condition in a manner subject to the Engineer's approval.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

The work described under this Item shall be measured for payment by the LUMP SUM for Item 991.1.

Item 991.1 shall be paid for at the Contract LUMP SUM price, which shall include all labor, tools, equipment, materials, engineering and all incidentals required to complete the work of this Item as indicated on the Contract Documents.

All adjustments and repositioning of water control shall be considered as included under this Item.

ITEM 995.01 POND STREET BRIDGE STRUCTURE LUMP SUM

The work under this Item shall conform to the applicable provisions of Section 995 of the Standard Specifications and the specific requirements stipulated below for component parts of this Item. For those component parts where no specific requirement is stipulated, the 2020 MassDOT Standard Specifications shall apply, except for payment.

Work under this Item shall include all materials, equipment and labor needed to construct the following:

- Three-sided precast concrete culvert
- Cast-in-place concrete wingwalls
- Membrane waterproofing
- Bituminous Damp Proofing

The work does not include any items listed separately in the proposal. Payment for materials shown on the Plans as being part of the bridge structure or which may be incidental to its construction and are not specifically included for payment under another Item shall be considered incidental to the work performed under this Item and shall be included in the unite price of the component of which they are a part.

CAST-IN-PLACE CONCRETE WINGWALLS

CONCRETE

All work to be done under this heading shall conform to the applicable provisions of Section 901 of the Standard Specifications, supplemented and amended as follows:

The concrete to be used for all wingwall elements shall be as follows:

4000 PSI, ¾", 610 cement concrete shall be used for the CIP wingwall footings and CIP wingwall stems.

Included in the work are the furnishing and installing of preformed fillers, joints, joint filler material, and any other items incidental to the furnishing and placing of concrete.

STEEL REINFORCEMENT FOR STRUCTURES – EPOXY COATED

All reinforcing steel shall be epoxy coated Grade 60 unless otherwise noted on the plans. All accessories to support rebar shall be epoxy coated.

THREE-SIDED PRECAST CONCRETE CULVERT

A. General.

The work under this heading consists of fabricating, transporting and installing the three-sided precast concrete culvert (and footings) and includes all necessary labor, materials, and equipment to complete the work as shown on the Plans. The work shall also include the full structural design of the three-sided arch and footings. The work shall conform with the MassDOT Standard, Supplemental, and Interim Specifications and the requirements of the current AASHTO LRFD Bridge Construction Specifications, supplemented by the current relevant provisions of the latest edition

of PCI MNL-116 (The Manual for Quality Control for Plants and Production of Precast and Prestressed Concrete Products), except as noted herein.

QUALITY ASSURANCE

A. General.

Quality Assurance includes all the planned and systematic actions necessary to provide confidence that a product or facility will perform satisfactorily in service. It is an all-encompassing term that includes Quality Control (performed by the Fabricator) and Acceptance (performed by the Engineer). Quality Control is the system used by the Contractor and Fabricator to monitor and assess their production processes at the plant facility and installation activities at the project site to ensure that the final product will meet the specified level of quality. Acceptance includes all factors used by the Engineer to determine the corresponding value for the product. Inspection at the plant facility is intended as a means of evaluation of compliance with contract requirements. Contractor and Fabricator Quality Control activities and Engineer Acceptance activities shall remain independent from one another. Engineer Acceptance activities shall not replace Fabricator Quality Control activities.

B. Fabricator Quality Control.

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

1. Plant.

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

(a) Certification by the National Precast Concrete Association (NPCA) Plant Certification Program or Precast/Prestressed Concrete Institute (PCI) Plant Certification Program, for the applicable types of Precast Concrete Bridge Element(s) being fabricated
(b) MassDOT Prequalification
(c) MassDOT Mix Design Approval

All concrete for a given Precast Concrete Bridge Element shall be produced by a single company and plant, unless otherwise approved by the Engineer.

2. Personnel.

The Fabricator shall provide adequate training for all QC personnel in accordance with NPCA or PCI certification. There shall be sufficient personnel trained and certified to perform the tests listed under Subsection M4.02.13, Part D. At a minimum, the Fabricator's Quality Control Personnel shall maintain the following qualifications and certifications:

(a) QC Manager with an active NETTCP Field Technician or ACI Concrete Field Testing Technician – Grade I certification or higher, and a minimum of 4 years continuous experience in the manufacture of Precast Concrete Bridge Elements for state transportation departments.
(b) A Technician/Inspector having the Precast/Prestressed Concrete Institute (PCI) Technician/Inspector Level I or NorthEast Transportation Training and Certification Program (NETTCP) Precast Concrete Inspector, or higher.

The Contractor shall submit to the Engineer a copy of the Fabricator's Quality Control Personnel required qualifications, as specified above.

3. Laboratory.

The Fabricator shall provide a room of sufficient size to house all equipment and to adequately perform all testing. The room shall have either a separate moisture storage room or curing box for concrete cylinders, and it shall be thermostatically controlled to maintain temperatures consistent with AASHTO T 23. It shall include a desk and file cabinet for proper record keeping, and have good lighting and ventilation. This room shall be kept for testing and quality control and not used for any other purpose. An additional desk and file cabinet shall be provided for exclusive use of the Engineer. No exception from these requirements will be allowed without the express written permission of the Engineer.

4. Testing Equipment.

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

(a) Air Content Meter Type A or B: AASHTO T 152
(b) Air Content Meter Volumetric Method: AASHTO T 196 (Required for Lightweight Concrete)
(c) Slump Cone: AASHTO T 119
(d) Cylinder Molds AASHTO M 205
(e) Concrete Testing Machine: AASHTO T 22
(f) Screening Sieve: AASHTO T 27, AASHTO T 11
(g) Curing Box: AASHTO T 23
(h) Spread Test Base Plate for Self-Consolidating Concrete (SCC): ASTM C1611
(i) All other equipment prescribed by AASHTO and ASTM standards for the tests to be performed by the Fabricator as specified

5. Inspection.

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

6. Temperature Monitoring.

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

(a) Prior to placement of concrete to verify that $T_i \geq 50°F$.
(b) Immediately after placement to verify that $T_i \geq 50°F$ is maintained.

(c) Throughout the entire duration of the curing cycle, at regular intervals not to exceed one hour until 100% Design Strength (f'_c) is attained and concrete has cooled to within 40°F of the ambient temperature surrounding the Precast Concrete Bridge Element.

At a minimum, the temperature measuring devices shall record and report the temperature of the concrete to the nearest 2°F. At least two temperature sensors (thermocouples) shall be positioned to record the maximum and minimum anticipated concrete temperatures. The anticipated minimum temperature shall be measured with one or more thermocouples at a distance no greater than 2 inches from the surface of the thinnest section. The anticipated maximum temperature shall be measured with one or more thermocouples at the center of the thickest section. Proposed temperature measurement locations shall be submitted to the Engineer for approval. Temperature recording devices shall be located within the curing enclosure and calibrated as required by PCI MNL-116 Section 4.18.4. Maximum heat increase and cool down rates shall comply with PCI MNL-116, Section 4.19. The Contractor shall furnish temperature logs recorded at a minimum frequency of once per hour to the Inspector as required, with each post-pour QC inspection report.

7. Sampling and Testing.

At a minimum, the Fabricator shall perform random Quality Control sampling and testing as specified in *Table 1: Quality Control Sampling and Testing*. The Fabricator shall perform additional Quality Control sampling and testing on concrete that has been retempered with admixtures or hold-back water during fabrication. Test Specimens shall conform to the requirements of Section M4.02.13 of the MassDOT Standard and Supplemental Specifications and AASHTO R 60, with the exception of the stripping (80% f'_c) set of cylinders. Stripping (80 % f'_c) cylinders shall be cured in the same location and environment as the Precast Bridge Elements they represent. If approved by the Engineer, compressive strength cylinder match curing equipment, that maintains the same concrete conditions that the corresponding Precast Bridge Element is exposed to, may be utilized in lieu of Stripping (80 % f'_c) field cured cylinders, with the use of thermocouples, controllers, and heaters.

Table 1: Quality Control Sampling and Testing

Quality Characteristic	Test Method	Sample Size	Specification Limit	Lot Size [(c)]	Sublot Size [(d)]	Frequency	Point of Sampling
Slump (in.) [(a)]	AASHTO T 119	Per AASHTO	≤ 8 in. or as approved by the Engineer	Total Quantity of Concrete (cy) produced on a Contract, per Type of Element fabricated, per Mix Design	20 cy	One (1) per Sublot or fraction thereof	Point of Discharge
Air Content (%)	AASHTO T 152	Per AASHTO	5% ≤ % ≤ 8%				
Temperature (°F)	AASHTO T 309	Per AASHTO	50°F ≤ °F ≤ 90°F				
Compressive Strength (psi)	AASHTO T 22 AASHTO T 23	Stripping Cylinders: One (1) set of Three (3) 4 x 8 in.	≥ 80% f'$_c$ at Stripping				
		7-day Cylinders: One (1) set of Three (3) 4 x 8 in.	For Information at 7 days				
		28-day Cylinders: One (1) set of Three (3) 4 x 8 in.	≥ 100% f'$_c$ at 28 days				
		56-day Cylinders: One (1) set of Three (3) 4 x 8 in.	≥ 100% f'$_c$ at 56 days [(b)]				

Notes:

(a) Self-consolidating concrete (SCC) shall meet the requirements of M4.02.17.

(b) 56-day Compressive Strength test specimens shall require testing only when 28-day Compressive Strength test specimens have failed to meet Design Strength (f'$_c$).

(c) Lot shall be defined as a specific quantity of material from a single source, produced or placed by the same controlled process.

(d) Sublot shall be defined as an equal division or part of a Lot from which a sample of material is obtained in order to assess the Quality Characteristics of the Lot.

8. Certificate of Compliance.

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

9. Documentation.

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

(a) Current MassDOT Approved Mix Design Sheet(s) and Approval Letter(s)
(b) PCI or NPCA Certification
(c) Current Qualifications and Certifications for QC Manager(s) and QC Technician(s)
(d) Most current set of Approved Shop Drawings
(e) Approved Placement, Finishing and Curing Plan
(f) Approved Dunnage Plan
(g) Fabricator Certificate of Compliance for each fabricated Precast Concrete Bridge Element
(h) Admixture Manufacturer's Certification of Compliance for each approved Admixture
(i) Completed QC Inspection Report for each fabricated Precast Concrete Bridge Element
(j) Identification Number for each fabricated Precast Concrete Bridge Element
(k) Time and date of casting of each fabricated Precast Concrete Bridge Element
(l) Date of stripping of each fabricated Precast Concrete Bridge Element
(m) Batch Ticket Printout reporting the quantity of concrete produced for each batch of concrete produced
(n) Concrete temperature records for each Precast Concrete Bridge Element fabricated
(o) QC Test Report Forms for each sublot of concrete produced
(p) Non-Conformance Reports (NCRs)
(q) Documentation of Repairs (if applicable)

MATERIALS

A. Materials.

Materials shall meet the following specifications (if applicable):

General	M4.00.00
Portland Cement	M4.01.0
Blended Hydraulic Cements	M4.01.1
Fly Ash	M4.01.2
Cement Concrete	M4.02.00
Cement	M4.02.01
Cement Mortar	M4.02.15
Aggregates	M4.02.02
Lightweight Aggregates	M4.02.03
Water	M4.02.04
Cement Concrete Additives	M4.02.05
Proportioning	M4.02.06

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Mixing and Delivery	M4.02.10
Test Specimens	M4.02.13
Mortar for Filling Keyways	M4.04.0
Slag	AASHTO M 302
High Performance Cement Concrete	M4.06.1
Self-Consolidating Concrete (SCC)	M4.02.17
Controlled Density Fill – Non-Excavatable	M4.08.0
Reinforcing Bars	M8.01.0
Epoxy Coated Reinforcing Bars	M8.01.7
Galvanized Reinforcing Bars	M8.01.8
Welded Wire Reinforcement	M8.01.2
Mechanical Reinforcing Bar Splicer	M8.01.9
Lifting Devices	PCI MNL-116
Corrugated Metal Pipe	AASHTO M 36

1. Cement Concrete Mix Design.

The cement concrete shall be comprised of specified proportions of water and MassDOT approved aggregates, cement, supplementary cementitious materials (SCMs), and admixtures to form a homogenous composition. Cement concrete for Precast Concrete Bridge Elements shall meet the requirements of M4.06.1 High Performance Cement Concrete, with the exception that the "Total Cementitious Content" specified shall be considered the "Maximum Allowable Cementitious Content". When used, self-consolidating concrete (SCC) shall meet the requirements of M4.02.17.

Prior to production of cement concrete, the Fabricator shall report and submit all proposed mix design formulations and its constituent materials to the Engineer for review and approval. All mix design yields shall be designed for 1.0 cubic yards of concrete, with an allowable tolerance of +/- 1.0 %. All liquids incorporated into the proposed mix design(s) shall include both water and admixtures in the liquid mass calculation.

During production of cement concrete, the Fabricator shall not alter the previously approved mix design formulation or its constituent materials. Proposed alterations in source, type, batch quantity, or gradation to any of the constituent materials of the previously approved mix design formulation shall require a new Mix Design submission to the Engineer for review and approval. Fabrication shall not occur without prior mix design approval.

2. Vertical Adjustment Assembly.

Vertical Adjustment Assembly details and material requirements shall be as shown on the plans. Alternate devices may be used provided that they are adjustable and can support the anticipated loads. The design of the leveling devices, with necessary calculations, shall be submitted to the Engineer for approval.

3. Grout.

Grout used for shear keys, vertical adjustment assembly voids, and hand holes shall be in accordance with M4.04.0.

4. Reinforcement.

All reinforcing steel shall be epoxy coated Grade 60 unless otherwise noted on the plans. Mechanical reinforcing bar splicers shall be epoxy coated.

5. Threaded Inserts.

Threaded inserts are permissible to facilitate forming the keyway pours. Threaded inserts shall be hot dip galvanized or made of stainless steel. The number of threaded inserts shall be minimized, and the inserts shall not come in contact with the reinforcing steel.

6. Corrugated Metal Pipe.

Corrugated Metal Pipe to be used for forming voids as specified on the plans shall be fabricated from steel and shall have a protective metallic coating of zinc (galvanizing).

CONSTRUCTION METHODS – PLANT FABRICATION

A. Shop Drawings.

Prior to performing any work under this Section, the Contractor shall receive approval for all shop drawings for the Precast Concrete Bridge Element being worked on and any special Contract requirements, provided that a complete shop drawing package is provided. The Contractor shall not order materials or begin work before receiving approved shop drawings. The Engineer will reject Precast Concrete Bridge Elements that deviate from the approved drawings or are fabricated prior to receiving written approval of the shop drawings. The Contractor shall bear full responsibility and costs for all materials ordered or work performed prior to the approval of the shop drawings or written authorization from the Engineer.

Contractor shall submit scaled shop drawings to the Engineer for review and approval. Design calculations for the precast arch and footings shall not be included in the submittal. The Fabricator's name and address shall appear on each sheet.

Resubmittal of "Approved as Noted" shop drawings is not necessary for minor revisions, provided that the correction can be clearly understood and is unambiguous without possibility of misinterpretation. Shop drawings with questions or comments that require a response and/or additional information from the Fabricator must be resubmitted.

Detailed shop drawings shall be prepared in accordance with the relevant provisions of Subsection 5.02 and shall, at a minimum, contain the following:

(a) Number and type and/or piece mark of the precast concrete bridge element including overall length, width and height.
(b) Skew angle.
(c) Location, size and geometry of all steel reinforcement, including mechanical reinforcing bar splicers to be used for connecting Precast Concrete Bridge Elements together in the field.
(d) Location and details of all inserts, anchors, Vertical Adjustment Assemblies, and any other items required to be cast into the Precast Concrete Bridge Elements (whether detailed on the plans by the Engineer of Record or provided for the Contractor's convenience). Precast Concrete Bridge Elements shall not be fired or drilled into for attachment purposes. All hardware shall be galvanized except as noted.
(e) Locations and details of the lifting devices, including supporting calculations, type and amount of any additional reinforcing required for lifting. The Fabricator shall design all lifting devices based on the no cracking criteria in Chapter 8 of the PCI Design Handbook (7^{th} edition).
(f) The minimum compressive strength required prior to handling the precast concrete bridge element.

The shop drawings shall not include procedures for placement, finishing, and curing of concrete. These details shall be included in the Placement, Finishing and Curing Plan that is to be submitted to the Engineer as described under *Placement, Finishing, and Curing Plan*.

B. Fabrication.

All Precast Concrete Bridge Elements shall be fabricated in accordance with the latest edition of PCI MNL-116 as modified herein.

C. Placement, Finishing and Curing Plan.

At least 30 days prior to start of fabrication, the Contractor shall submit the Fabricator's proposed Placement, Finishing and Curing Plan to the Engineer for approval. This shall be an independent submittal, separate from the fabrication shop drawings and design calculations. The Placement, Finishing and Curing Plan shall include the following:

(a) Method of Mixing
(b) Method of Placement
(c) Method of Consolidation
(d) Method of Finishing
(e) Method of Initial Curing
(f) Method of Intermediate Curing
(g) Method of Final Curing
(h) Moisture Retention Materials and Equipment (water spray equipment, saturated covers, sheet materials, liquid membrane-forming compounds, accelerated curing equipment, etc.)
(i) Cylinder Curing Methods, Location, and Environmental Control (temperature, humidity, etc.)
(j) Temperature Monitoring, Recording, and Reporting

D. Three-Sided Box Culvert and Footings

The Contractor shall submit design computations for the three-sided box culvert and footings to the Engineer for review and approval. The computations shall be prepared in accordance with the latest AASHTO LRFD Bridge Design Specifications, the 2013 MassDOT LRFD Bridge Design Manual, and the Plans using English units and HL-93 live loading. The design computations shall consider all Strength, Extreme Event and Service Limit States as are appropriate for each stage of fabrication, shipment, construction, and for the final in-service condition. Design computations and shop drawings shall be prepared and stamped by a Professional Engineer licensed to practice in the Commonwealth of Massachusetts. The shop drawings shall be prepared and submitted in accordance with the section, Drawings, above.

The dimensions provided on the plans are shown to establish the size of the proposed opening. The width and thickness of each culvert unit may vary depending upon the manufacturer's specifications provided that the opening size is maintained. The Contractor shall be responsible for modifying the dimensions of the elements to compensate for elastic shortening, shrinkage, grade corrections, and other phenomena that make in-process fabricating dimensions different from those shown on the drawings. Approval of the shop drawings shall not relieve the Contractor from responsibility for the correctness of the dimensions shown.

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1. Joints.

The precast reinforced concrete three-sided box culvert shall be produced with grout-filled keyways per the details on the plans, the manufacturer's recommendations, and as approved by the Engineer. The ends shall be manufactured such that when the sections are laid together they will make a continuous line of frames with a smooth interior surface free of appreciable irregularities, and in compliance with the permissible variations.

2. Marking.

The following information shall be clearly marked on the interior of each frame by indentation, waterproof paint, or other approved means:

(a) Frame span and rise
(b) Date of manufacture and lot number
(c) Name and trademark of the manufacturer

E. Reinforcement.

The reinforcing bars shall be installed in accordance with Section 901.62 of the Supplemental Specifications, including tolerances for cover and horizontal spacing of bars. Components of mechanical reinforcing bar splicers shall be set with the tolerances shown on the plans. The reinforcing bars and mechanical reinforcing bar splicers shall be assembled into a rigid cage that will maintain its shape in the form and which will not allow individual reinforcing bars to move during the placement of concrete. This cage shall be secured in the form so that the clearances to all faces of the concrete, as shown on the plans, shall be maintained.

Where reinforcing bars are to protrude from one Precast Concrete Bridge Element in order to mate with reinforcing bar splicers in a second precast concrete element, the fabricator shall set the reinforcing bars and the reinforcing bar splicers with a template in order to ensure proper fit up within the tolerances specified on the plans.

F. Tolerances.

Fabrication shall comply with tolerances specified on the plans. Tolerances for steel reinforcement placement shall be in accordance with 901.62. In the absence of specifications on the plans, tolerances shall comply with the latest version of the PCI MNL 135, Precast Tolerance Manual.

G. Forms.

Concrete shall be cast in rigidly constructed forms, which will maintain the Precast Concrete Bridge Elements within specified tolerances to the shapes, lines and dimensions shown on the approved fabrication drawings. Forms shall be constructed from flat, smooth, non-absorbent material and shall be sufficiently tight to prevent the leakage of the plastic concrete. When wood forms are used, all faces in contact with the concrete shall be laminated or coated with a non-absorbent material. All worn or damaged forms, which cause irregularities on the concrete surface or damage to the concrete during form removal, shall be repaired or replaced before being reused. Any defects or damage of more than "Category 2, Minor Defects" made to the concrete, due to form work, stripping or handling, shall be subject to repair or rejection, as defined in the *Repairs and Replacement* section. If threaded inserts are cast into the elements for support of formwork, the inserts shall be recessed a minimum of 1 inch and shall be plugged after use with a grout of the same color as that of the precast cement concrete.

H. Mixing of Concrete.

The concrete shall be proportioned and mixed in conformance with the Fabricator's approved mix design and M4.02.10 Mixing and Delivery Fabrication shall not occur without prior mix design approval. The Fabricator shall provide copies of batch tickets to the Engineer.

I. 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 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.

J. 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.

K. Finishing of Concrete.

The finish of the Precast Concrete Bridge Elements shall be as indicated on the plans. Where Precast Concrete Bridge Elements have keyways for grout or closure pours, the surfaces of these shear keys shall be abrasive blasted prior to shipment. The Fabricator may utilize a surface retarder with water blast, sandblast, or a combination of both to achieve the desired keyway finish. At a minimum, the profile of the keyway surfaces shall be similar to that of 60 grit sand paper. The exposed reinforcing steel in the precast slab shall be protected from damage during the cleaning of the keyways. Damaged epoxy coating of steel reinforcement shall be repaired, and the reinforcing steel shall be cleaned as directed by the Engineer.

The Fabricator shall permanently mark each precast concrete bridge element with its type and/or piece mark, date of casting, and supplier identification either by stamp markings in fresh concrete, waterproof paint, or other approved means on a surface that will not be exposed after assembly.

L. Exposed Surfaces of Precast Concrete Bridge Elements.

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

M. Exposed Surfaces of Closure Pour Shear Keys.

The closure pour shear key cast in the sides of the beam flanges shall have an exposed aggregate finish. The closure pour reinforcing steel and its coating shall not be damaged by the process for creating

the exposed aggregate surface. Fabricator may utilize a surface retarder with water blast, abrasive blast, or a combination of both to achieve the desired shear key finish. The abrasive blast shall use oil free compressed air. The profile of the shear key surfaces shall be similar to that of 60 grit sand paper.

N. Initial Curing Methods.

After the placement of concrete and prior to concrete finishing, the Fabricator shall initiate initial curing methods when the concrete surface begins to dry, to reduce moisture loss from the surface. Application of one or more of the following initial curing methods shall occur immediately after the bleed water sheen has disappeared.

1. Fogging.

Fogging nozzles shall atomize water into a fog-like mist. The fog spray shall be directed and remain visibly suspended above the concrete surface, to increase the humidity of the air and reduce the rate of evaporation. Water from fogging shall not be worked into the surface during finishing operations and shall be removed or allowed to evaporate prior to finishing.

2. Liquid-applied Evaporation Reducers

Evaporation reducers shall be sprayed onto the freshly placed concrete surface to produce an effective monomolecular film that reduces the risk of plastic-shrinkage cracking and rate of evaporation of the bleed water from the concrete surface. Evaporation reducers shall be applied in accordance with manufacturer's recommendations.

O. Intermediate Curing Methods.

The Fabricator shall initiate intermediate curing methods if concrete finishing has taken place prior to the concrete reaching final set. The freshly finished concrete surface shall be protected from moisture loss, by the continuation of initial curing methods (fogging and evaporation reducers) until final curing methods are applied or by the use of liquid membrane-forming curing compounds (see *Liquid Membrane-Forming Compounds for Curing* section).

P. Final Curing Methods.

The Fabricator shall initiate and apply final curing methods to the concrete immediately after the following conditions are met:

(a) Completion of concrete finishing
(b) Final set of concrete
(c) Concrete has hardened sufficiently enough to prevent surface damage

During fabrication of Precast Concrete Bridge Elements, the Fabricator shall maintain the required concrete temperature ranges throughout the entire duration of the final curing method cycle as specified herein. Controlled and gradual termination of the final curing method shall occur after all specified conditions are met. The concrete temperature shall be reduced at a rate not to exceed 36°F per hour until the concrete temperature is within 20°F of the ambient temperature outside of the final curing method enclosure. The Fabricator shall maintain a minimum concrete temperature of 40°F until 100% f'c is attained (see *Handling and Storage* section below).

ITEM 995.01 (Continued)

1. Water Spray Curing.

All exposed concrete surfaces shall remain moist with a continuous fine spray of water throughout the entire duration of the final curing method cycle (see *Table 4: Final Curing Method Cycle for Water Spray*).

Table 4: Final Curing Method Cycle for Water Spray

Sustained Concrete Temperature	Final Curing Method Cycle Duration	Compressive Strength
50°F ≤ °F ≤ 90°F	≥ Five (5) days	≥ 80% f'_c

2. Saturated Covers for Curing.

All exposed concrete surfaces shall remain moist with a continuous application of saturated covers throughout the entire duration of the final curing method cycle (see *Table 5: Final Curing Method Cycle for Saturated Covers*). Saturated covers shall be allowed to dry thoroughly before removal to provide uniform, slow drying of the concrete surface.

Table 5: Final Curing Method Cycle for Saturated Covers

Sustained Concrete Temperature	Final Curing Method Cycle Duration	Compressive Strength
50°F ≤ °F ≤ 90°F	≥ Three (3) days	≥ 80% f'_c

Saturated covers, such as burlap, cotton mats, and other coverings of absorbent materials shall meet the requirements of AASHTO M 182, Class 3. Saturated covers shall be in good condition, free from holes, tears, or other defects that would render it unsuitable for curing concrete. Saturated covers shall be dried to prevent mildew when storing. Prior to application, saturated covers shall be thoroughly rinsed in water and free of harmful substances that are deleterious or cause discoloration to the concrete. Saturated covers shall have sufficient thickness and proper positioning onto the concrete surface to maximize moisture retention.

Saturated covers shall contain a sufficient amount of moisture to prevent moisture loss from the surface of the concrete. Saturated covers shall be kept continuously moist so that a film of water remains on the concrete surface throughout the entire duration of the final curing method cycle. The Fabricator shall not permit the saturated covers to dry and absorb water from the concrete. Use of polyethylene film (see *Polyethylene Film* section) may be applied over the saturated cover to potentially decrease the need for continuous watering.

3. Sheet Materials for Curing.

All exposed concrete surfaces shall remain moist with a continuous application of curing sheet materials throughout the entire duration of the final curing method cycle (see *Table 6: Final Curing Method Cycle for Curing Sheet Materials*).

Table 6: Final Curing Method Cycle for Sheet Materials

Sustained Concrete Temperature	Final Curing Method Cycle Duration	Compressive Strength
50°F ≤ °F ≤ 90°F	≥ Three (3) days	≥ 80% f'_c

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

(a) Polyethylene Film.

Polyethylene film shall meet the requirements of ASTM C171, consist of a single sheet manufactured from polyethylene resins, be free of visible defects, and have a uniform appearance. Careful considerations shall be taken by the Fabricator to prevent the film from tearing during storage and application, so as to not disrupt the continuity of the film (polyethylene film reinforced with glass or other fibers is more durable and less likely to be torn). The Fabricator shall monitor the application of the film to prevent uneven spots from appearing (mottling) on the concrete surface, due to variations in temperature, moisture content, or both. The Fabricator shall prevent mottling from occurring on the concrete surface by applying additional water under the film or applying a combination of polyethylene film bonded to absorbent fabric to the concrete surface to retain and evenly distribute the moisture. Immediately following final finishing, polyethylene film shall be placed over the surface of the fresh concrete surface, so as to not damage the surface of the concrete and shall be placed and weighted so that it remains in contact with the concrete throughout the entire duration of the final curing method cycle. The film shall extend beyond the edges of the concrete surface. The film shall be placed flat on the concrete surface, avoiding wrinkles, to minimize mottling. Edges of adjacent polyethylene film shall overlap a minimum of 6 inches and be tightly sealed with the use of sand, wood planks, pressure-sensitive tape, mastic, or glue to maintain close contact with the concrete surface, retain moisture, and prevent the formation of air pockets throughout the entire duration of the final curing method cycle.

(b) **White Burlap-Polyethylene Sheeting**

White burlap-polyethylene sheeting shall meet the requirements of ASTM C171, be securely bonded to the burlap so to avoid separation of the materials during handling and curing of the concrete, and be applied in the same manner as the polyethylene film.

(c) Reinforced Impervious Paper.

Reinforced impervious paper shall meet the requirements of ASTM C171, consist of two sheets of kraft paper cemented together with a bituminous adhesive and reinforced with embedded cords or strands of fiber running in both directions, and be white in color. Reinforced impervious paper shall be treated to prevent tearing when wetted and dried.

Reinforced impervious paper can be reused so long as it is effective in retaining moisture on the concrete surface. The Fabricator shall visually inspect the reinforced impervious paper for all holes, tears, and pin holes from deterioration of the paper through repeated use by holding the paper up to the light. The paper shall be discarded and prohibited from use when the moisture is no longer retained.

After the concrete has hardened sufficiently to prevent surface damage, the concrete surface shall be thoroughly wetted prior to the application of the reinforced impervious paper, and be applied in the same manner as the polyethylene film.

4. Liquid Membrane-Forming Compounds for Curing.

All exposed concrete surfaces shall remain moist with a continuous application of liquid membrane-forming compounds throughout the entire duration of the final curing method cycle (see *Table 7: Final Curing Method Cycle for Liquid Membrane-Forming Compounds*).

Table 7: Final Curing Method Cycle for Liquid Membrane-Forming Compounds

Sustained Concrete Temperature	Final Curing Method Cycle Duration	Compressive Strength
50°F ≤ °F ≤ 90°F	≥ Seven (7) days	≥ 80% f'_c

Liquid membrane-forming compounds shall meet the requirements of ASTM C 1315, Type I, Class A and shall exhibit specific properties, such as alkali resistance, acid resistance, adhesion-promoting quality, and resistance to degradation by ultraviolet light, in addition to moisture-retention capabilities. Liquid membrane-forming compounds shall consist of waxes, resins, chlorinated rubber, or other materials to reduce evaporation of moisture from concrete. Liquid membrane-forming compounds shall be applied in accordance with the manufacturer's recommendations.

Liquid membrane-forming compounds shall be applied immediately after the disappearance of the surface water sheen following final finishing. All exposed surfaces shall be wetted immediately after form removal and kept moist to prevent absorption of the compound, allowing the curing membrane to remain on the concrete surface for proper membrane moisture retention. The concrete shall reach a uniformly damp appearance with no free water on the surface prior to the application of the compound.

If patching or finishing repairs are to be performed prior to the application of the compound, the Precast Concrete Bridge Element shall be covered temporarily with saturated covers until the repairs are completed and the compound is applied. Only areas being repaired shall be uncovered during this period. While the saturated covers are removed to facilitate the patching process, the work shall continue uninterrupted. If for any reason the work is interrupted, saturated covers shall be placed onto the uncovered concrete surface, until the work continues and is completed, at which time the curing compound shall be applied to the repaired area.

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

The compound shall be applied in two applications at right angles to each other to ensure uniform and more complete coverage. On very deeply textured surfaces, the surface area to be treated shall be at least twice the surface area of a troweled or floated surface. In such cases, two separate applications may be needed, each at 200 ft^2/gal., with the first being allowed to become tacky before the second is applied.

The curing compound shall be applied by power sprayer, using appropriate wands and nozzles with pressures between 25 and 100 psi. For very small areas such as repairs, the compound shall be applied with a wide, soft-bristled brush or paint roller. The compound shall be stirred or agitated before use and applied uniformly in accordance with the manufacturer's recommended rate. The Fabricator shall verify the application rates are in accordance with the manufacturer's recommended rate.

When the concrete surface is to receive paint, finishes, or toppings that require positive bond to the concrete, it is critical that the curing procedures and subsequent coatings, finishes, or toppings be compatible to achieve the necessary bond

After the termination of the final curing method cycle has occured, liquid membrane-forming compounds shall be removed by blast-cleaning from any concrete surface that is to receive paint, finishes, plastic concrete from secondary pour, grout, or any other toppings that require bonding to the concrete surface. These surfaces shall be further blast-cleaned to remove the cement matrix down to exposed aggregate to ensure proper bonding to the material. The method used to remove the curing compound shall not damage the reinforcement and coating. Compounds are prohibited on any concrete surface that will have a penetrating or coating type treatment such as a sealer, stain, or waterproofing membrane applied to it.

5. Accelerated Curing.

Accelerated curing shall use live steam or radiant heat with moisture in accordance with PCI MNL-116 as modified herein. The concrete temperature shall meet the maximum heat increase and cool down rates as specified herein. Concrete temperature monitoring shall meet the requirements of the *Temperature Monitoring* section. Excessive and fluctuating rates of heating and cooling shall be prohibited. The concrete temperature shall not exceed 158°F at any time. The Fabricator shall meet the following accelerated curing sequencing and requirements.

(a) Initial Delay Period.

The initial delay period shall be defined as the duration immediately following the placement of the concrete and the attainment of initial set of the concrete. The Fabricator shall determine the time of initial set in accordance with AASHTO T 197 specifications. Throughout the entire duration of the preset period, initial curing shall be implemented. The temperature increase period (see *Temperature Increase Period* section) shall not occur until initial set of the concrete is attained. During the initial delay period, the concrete temperature shall meet the following requirements:

i. Concrete temperature rate of increase shall not exceed 10°F per hour.
ii. Total concrete temperature increase shall not exceed 40°F higher than the placement concrete temperature or 100°F, whichever is less

(b) Temperature Increase Period.

The temperature increase period shall be defined as the duration immediately following the completion of the initial delay period (after initial set) and immediately prior to the start of the constant maximum temperature period. Application of steam to the enclosure shall not occur until the initial delay period is complete. After the initial delay period is complete, all exposed concrete surfaces shall be cured in a moist environment where the concrete temperature increases at a rate not to exceed 36°F per hour.

(c) Constant Maximum Temperature Period.

The constant maximum temperature period shall be defined as the duration immediately following the completion of the temperature increase period and immediately prior to the start of the temperature decrease period. After the temperature increase period is complete, all exposed concrete surfaces shall be cured in a moist environment at a controlled and constant elevated temperature throughout the entire duration of the constant maximum temperature period. Termination of the constant maximum temperature period and the start of the termination decrease period shall occur after all specified conditions are met (see *Table 8: Constant Maximum Temperature Period*).

Table 8: Constant Maximum Temperature Period

Sustained Concrete Temperature	Constant Maximum Temperature Period	Compressive Strength
120°F ≤ °F ≤ 158°F	6 hrs ≤ Time ≤ 48 hrs	≥ 80% f'_c

(d) Temperature Decrease Period.

After the constant maximum temperature period is complete, the concrete temperature shall be cured in a moist environment at a controlled and reduced rate not to exceed 36°F per hour until the concrete temperature is within 20°F of the ambient temperature outside of the curing enclosure.

Q. Stripping.

The Fabricator shall not strip forms or handle the Precast Concrete Bridge Element until Quality Control compressive strength cylinders attain a minimum compressive strength of 80% Design Strength (f'_c) or the value indicated on the approved drawings has been achieved. After removal from the form, all exposed concrete surfaces shall continue to be cured in conformance with the *Final Curing Methods* sections until completion.

R. Handling and Storage of Precast Concrete Bridge Elements.

Precast Concrete Bridge Elements may be exposed to temperatures below freezing (32°F) when the chosen curing cycle has been completed, provided that the following conditions are met:

(a) Precast Concrete Bridge Elements are protected from precipitation with polyethylene curing covers until 100% f'_c is attained
(b) Precast Concrete Bridge Elements maintain a minimum concrete temperature of 40°F until 100% f'_c is attained

Precast Concrete Bridge Elements damaged during handling and storage will be repaired or replaced at the Engineer's direction at no cost to the Town. Precast Concrete Bridge Elements shall be lifted at the designated points by approved lifting devices embedded in the concrete and in accordance with proper lifting and handling procedures. Storage areas shall be smooth and well compacted to prevent damage due to differential settlement. Precast Concrete Bridge Elements shall be supported on the ground by means of continuous blocking, in accordance with the approved dunnage plan.

Precast Concrete Bridge Elements shall be loaded on a trailer with blocking as described above, in accordance with the approved dunnage plan. Shock-absorbing cushioning material shall be used at all bearing points during transportation of the Precast Concrete Bridge Elements. Blocking shall be provided at all locations of tie-down straps. Precast Concrete Bridge Elements stored prior to shipment shall be inspected by the Contractor prior to being delivered to the site to identify damage that would be cause for repair or rejection.

S. Repairs and Replacement.

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

ITEM 995.01 (Continued)

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

1. Category 1, Surface Defects.

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

(a) Surface voids or bug holes that are less than 5/8-inch in diameter and less than ¼-inch deep, except when classified as Category 4
(b) Cracks less than or equal to 0.006 inches wide
(c) Cracks less than or equal to 0.125 inches wide on surfaces that will receive a field-cast concrete overlay

2. Category 2, Minor Defects.

Category 2 defects shall be repaired, but an NCR does not need to be filed. Minor defects are defined as the following:

(a) Spalls, honeycombing, surface voids that are less than 2 inches deep and have no dimension greater than 12 inches
(b) Cracks less than or equal to 0.016 inches that will not receive a concrete overlay
(c) Broken or spalled corners that will be covered by field-cast concrete

Minor defects shall be repaired according to PCINE-18-RNPCBE. Cracks shall be sealed according to the PCI Repair Procedure #14 in PCINE-18-RNPCBE.

3. Category 3, Major Defects.

For Category 3 defects, the Fabricator shall prepare an NCR that documents the defect and describes the proposed repair procedure. The NCR shall be submitted to the Engineer for approval prior to performing the repair. Major defects are defined as the following:

(a) Spalls, honeycombing and surface voids that are deeper than 2 inches or have any dimension greater than 12 inches, when measured along a straight line
(b) Concentrated area of defects consisting of four or more Category 2 Defects within a 4-square foot area.
(c) Exposed reinforcing steel
(d) Cracks greater than 0.016 inches and less than or equal to 0.060 inches in width that will not receive a concrete overlay
(e) Bearing area spalls with dimensions not exceeding 3 inches
(f) Cracks, spalls and honeycombing that will be encased in cast in place concrete need not be repaired, but the limits and location of the defects shall be documented with an NCR

Upon approval, defects and cracks shall be repaired according to PCINE-18-RNPCBE and this specification. All repairs shall be completed at the expense of the Contractor.

4. Category 4, Rejectable Defects.

Rejectable defects as determined by the Engineer may be cause for rejection. Fabricator may submit an NCR with a proposed repair procedure, requesting approval. Some rejectable defects are defined as the following:

(a) Surface defects on more than 5% of the surface area which will be exposed to view after installation
(b) Minor defects that in total make up more than 5% of the surface area of the unit
(c) Cracks greater than 0.060 inches in width except as noted in Category 1
(d) Elements fabricated outside of the specified tolerances
(e) MassDOT compressive strength testing that does not meet the specified Design Strength, f'_c

T. Shipping.

Prior to shipment, the Fabricator shall perform the following actions and provide the required documentation to the Engineer:

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

U. Delivery.

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

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

The Contractor shall inspect Precast Concrete Bridge Elements upon receipt at the site. Precast Concrete Bridge Elements damaged during delivery shall be repaired or replaced at the Engineer's direction at no additional cost.

CONSTRUCTION METHODS – FIELD CONSTRUCTION

A. General.

All of the Contractor's field personnel involved in the erection and assembly of the Precast Concrete Bridge Elements shall have knowledge of and follow the approved Erection Procedure.

Prior to installation, the following documentation shall be reviewed and confirmed by the Engineer or designee:

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

Field construction staff shall verify that the Engineer has accepted all Precast Concrete Bridge Elements prior to installation.

B. Erection Procedure

Prior to the erection, the Contractor shall submit an Erection Procedure for approval by the Engineer. This submittal shall include computations and drawings for the transport, hoisting, erection and handling of the Precast Concrete Bridge Elements. The Erection Procedure shall be prepared and stamped by a Professional Engineer registered in the Commonwealth of Massachusetts with working knowledge of the Contractor's equipment, approved shop drawings, and materials to build the bridge. The Erection Procedure shall, at a minimum, include the following:

1. Erection Procedure

The Erection Procedure shall be prepared to conform to the requirements of 960.61, Erection and the applicable sections in Chapter 8 of the PCI Design Handbook (seventh edition) for handling, erection, and bracing requirements. At a minimum, the Erection Procedure shall provide:

(a) Minimum concrete compressive strength for handling the Precast Concrete Bridge Elements.
(b) Concrete stresses during handling, transport, and erection.
(c) Crane capacities, pick radii, sling geometry, and lifting hardware.
(d) Verification that the equipment can handle all pick loads and weights with the required factor of safety.
(e) Evaluation of construction sequence and evaluation of any geometric conflicts in the lifting of the Precast Concrete Bridge Elements and setting them as shown on the plans.
(f) Design of crane supports including verification of subgrade for support.
(g) Location and design of all temporary bracing that will be required during erection.

Non-shrink grout and concrete materials, approved by the Engineer, shall be placed as shown on the plans. Fill joints, keyways, and voids, in strict accordance with the specifications and manufacturer's recommendations and instructions.

For footings once these Precast Concrete Bridge Elements have been set to the correct horizontal and vertical alignment, the void between them and the supporting soil shall be filled with Controlled Density Fill – Non-Excavatable to the limits as shown on the plans. Add additional grout ports in the footings to facilitate the bedding process if required.

Joints shall be filled flush to the top with non-shrink grout, and any vertical misalignment between adjacent elements shall be feathered out on a slope of 1 to 12.

Curing of grout or concrete shall be performed in strict accordance with the specifications and manufacturer's recommendations. Filling shall not be completed in cold weather when either the ambient temperature or the precast member's temperature is below the manufacturer's recommendation. No

localized heating of either the precast members or of the air surrounding the element will be permitted in an attempt to reach application temperatures.

If the joints or voids are not filled within five days after the Precast Bridge Elements are erected, the Contractor shall cover and protect the openings from weather and debris until they are filled.

C. Survey and Layout.

Working points, working lines, and benchmark elevations shall be established prior to placement of all elements. The Contractor is responsible for field survey as necessary to complete the work. The Engineer reserves the right to perform additional independent survey. If discrepancies are found, the Contractor may be required to verify previous survey data.

D. Preparation of Closure Pour Keyways.

Immediately prior to erecting the Precast Concrete Bridge Elements, the closure pour shear keys shall be cleaned at the job site of all dust, dirt, carbonation, laitance, and other potentially detrimental materials which may interfere with the bonding of the closure pour concrete and precast concrete using a high-pressure water blast. The exposed reinforcing steel in the precast concrete shall be protected from damage during the cleaning of the keyways. Damaged epoxy coating of steel reinforcement shall be repaired, and the reinforcing steel shall be cleaned as directed by the Engineer. The surfaces of the shear keys shall be wetted so that the surfaces shall have a Saturated Surface Dry (SSD) condition for at least 24 hours prior to the placement of the closure pour concrete.

E. Erection.

The elements shall be placed in the sequence and according to the methods outlined in the Erection Procedure. As the erection proceeds, the Contractor shall constantly monitor the assembly to ensure that the precast concrete bridge element is within proper horizontal and vertical location and tolerances prior to releasing it from the crane and setting the next unit. The Contractor may use shims to maintain proper setting tolerances.

The concrete elements shall be lifted only by the lifting devices, and the utmost care shall be taken to prevent distortion of the elements during handling, transportation or storage.

Suitable spreaders shall be used during lifting so that only a vertical pull will be made on the lifting device. A non-vertical lifting force may be permitted if prior written approval is given by the Engineer. This approval will be contingent on the Contractor demonstrating by calculations, prepared by a Professional Engineer registered in Massachusetts, that the elements will not be damaged by the non-vertical lifting force and by documentation that the capacity of the lifting devices is adequate for the non-vertical lifting force.

Precast components shall be pre-bed with non-shrink grout thicker than shim stacks prior to placing other precast elements on top of them.

After all Precast Concrete Bridge Elements have been placed, the actual overall dimensions of the structure both horizontal and vertical, as laid out shall not deviate from the nominal dimensions shown on the plans beyond a tolerance of +0 inches and -1 inches. Once the layout of Precast Concrete Bridge Elements has been accepted by the Engineer, the Contractor shall cut all lifting devices off below the surfaces of the elements.

F. Box Culverts, Three-Sided Frames and Arches.

Backfilling operations shall not begin until the following checks have been made:

(a) The frame to footing key joints are grouted as shown on the plans;
(b) The joints between exterior frame bridge elements and wingwall stems are complete as shown on the plans;

(c) All joint seals are properly placed.

Backfill shall be paid for under separate items. The backfilling procedures shall be in accordance with Sections 120, 150, and 170 of the Standard Specifications and Supplemental Specifications modified as follows:

(a) Fill shall be placed and compacted in layers not exceeding one foot in depth;
(b) Dumping of fill shall not be allowed any nearer to the structure than 3.25 feet from a vertical plane extending from the back of the footing;
(c) Backfill shall be placed as symmetrically as possible around the structure with differential depths of backfill on each side of the structure not exceeding 1.5 feet with respect to each other;
(d) Compaction shall be achieved using hand compaction equipment for all fill within one foot of the structure;
(e) The bare structure shall not be crossed by any equipment heavier than that specified by the frame manufacturer. All damage resulting from equipment damage shall be rectified to the satisfaction of the Engineer at no cost to the Town;
(f) Construction equipment will not be permitted atop an uncompleted structure;
(g) Construction equipment whose weight exceeds the design capacity shall not be permitted atop the completed structure under any circumstances;
(h) The use of vibratory rollers for compaction purposes will not be permitted.

A representative of the manufacturer shall be on site at the commencement of the installation, at no cost to the Town, to assist the Contractor. The representative shall offer advisory assistance only and shall not supplant the Contractor's representative, or the Engineer.

G. Filling of Blockouts for Lifting Devices and Threaded inserts.

If the blockouts in the Precast Concrete Bridge Elements where the lifting devices were located will be exposed and visible after assembly is complete, the Contractor shall fill these blockouts with Cement Mortar (M4.02.15) or grout.

SCHEDULE OF BASIS FOR PARTIAL PAYMENT

At the time of bid, the Contractor shall submit on his/her proposal form a schedule of unit prices for the major component Sub-Items that make up Item 995.01 as well as his/her total bridge structure Lump Sum cost. The bridge structure Lump Sum breakdown quantities provided in the proposal form are estimated and not guaranteed. The total of all partial payments to the Contractor shall equal the Lump Sum contract price regardless of the accuracy of the quantities furnished by the Engineer for the individual bridge components. The cost of labor and materials for any Item not listed but required to complete the work shall be considered incidental to Item 995.01 and no further compensation will be allowed.

The schedule on the proposal form applies only to Bridge Structure. Payment for similar materials and construction at locations other than at this bridge structure shall not be included under this Item. Sub-Item numbering is presented for information only in coordination with MassDOT Standard Nomenclature.

ATTACHEMENT C:

Relevant Technical Information

- **Geotechnical Investigation Report (July 31, 2020) – prepared by John Turn Consulting**
- **Hydraulic Memorandum (August 17, 2020) – prepared by Bay Colony Group, Inc.**
- **Wetland Resource Delineation Report (June 16, 2020) – prepared by Biodiversity Consulting, LLC**

JOHN TURNER CONSULTING

GEOTECHNICAL INVESTIGATION REPORT

POND STREET CULVERT REPLACEMENT
Pond Street
Topsfield, Massachusetts

Prepared for:

Ipswich River Watershed Association
143 County Road
Ipswich, Massachusetts 01930

Prepared by:

John Turner Consulting, Inc.
19 Dover Street
Dover, New Hampshire 03885

JTC Project No. 20-04-064

July 31, 2020

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JOHN TURNER
CONSULTING

July 31, 2020

Kaitlyn Shaw
Ipswich River Watershed Association
143 County Road
Ipswich, Massachusetts 01930
kshaw@ipswichriver.org
(978) 412-8200

RE: Geotechnical Investigation Report
Pond Street Culvert Replacement
Pond Street
Topsfield, Massachusetts

Dear Ms. Shaw:

In accordance with our proposal and authorization to proceed, John Turner Consulting, Inc. (JTC) has completed a geotechnical investigation for the above captioned project. Presented herein and attached are the results of the site subsurface investigation, and our recommendations regarding the removal and replacement of the existing culvert, and other geotechnical related concerns or issues.

We appreciate the opportunity to assist you on this venture and we look forward to working with you on this project through its completion. Please do not hesitate to contact us if you have any questions or require additional information.

Sincerely,
JOHN TURNER CONSULTING, INC.

Daniel Thabault, EIT
Geotechnical Staff
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Table of Contents

1.0 INTRODUCTION

John Turner Consulting, Inc. (JTC) is pleased to present this *Geotechnical Investigation Report* for the proposed culvert replacement located on Pond Street in the Town of Topsfield, Massachusetts. JTC conducted geotechnical explorations, laboratory testing, and engineering evaluations in general accordance with our proposed scope of services submitted to the Ipswich River Watershed Association on June 11, 2020. The work was authorized on June 17, 2020.

The purpose of the geotechnical investigation was to obtain information on the subsurface conditions at the site and to provide geotechnical engineering recommendations to support the planning, design, and construction of the proposed development. Geotechnical explorations and laboratory testing services were performed in July of 2020.

This report summarizes available project information, presents the geotechnical exploration and laboratory testing programs, describes the subsurface conditions encountered, and provides geotechnical engineering recommendations to support the planning, design, and construction of the proposed development. The contents of this report are subject to the attached *Limitations*.

2.0 PROJECT INFORMATION

The following subsections provide general descriptions of the site, the regional geologic setting, and the proposed development.

2.1 Site Description

The subject site is located on Pond Street in the Town of Topsfield, Massachusetts, approximately 200 feet north of the intersection with Haverhill Road. The existing culvert connects a small pond on the east side of Pond Street with a small creek on the west side of the street. Pond Street is currently paved with asphalt paving. The street is relatively level to gently sloping to the southeast at the location of the culvert with approximate elevations ranging from EL. 64.0± to EL. 65.5± feet.

2.2 Regional Geologic Setting

JTC's review of the "*Surficial Geologic Map of the Salem Depot – Newburyport East – Wilmington – Rockport 16-quadrangle area in northeast Massachusetts*" (Stone; 2006) indicates that the surficial soils consist of coarse stratified glacial deposits. These deposits consist of a mix of well to poorly sorted sand and gravel.

2.3 Proposed Development

Based on discussions with client, JTC understands that the proposed development involves the removal and replacement of the existing culvert under Pond Street. Further design details have not been developed at this time.

3.0 GEOTECHNICAL EXPLORATIONS

3.1 Subsurface Investigations

JTC subcontracted Drilex Environmental to drill two (2) geotechnical test borings (designated as B-1 and B-2) via a truck-mounted drill rig. JTC directed the drilling, testing, and sampling activities and logged the subsurface conditions encountered at each exploration location. The approximate test boring locations were selected by the client and located in the field based on drill rig access and constraints. The attached *Test Boring Location Plan* depicts the approximate test boring locations.

The test borings B-1 and B-2 were advanced to depths of approximately 27.0 and 35.0 feet, respectively, below the ground surface (bgs) utilizing 4¼-inch inside-diameter continuous-flight hollow-stem-augers. As the borings were advanced, standard penetration tests (SPTs) were conducted at regular intervals and soil samples were obtained via a 2-inch outside-diameter split-spoon samplers driven by a 140-pound safety (SAFE-T) hammer. SPT's were performed in general accordance with ASTM D1586, Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils. No SPT samples were performed below a depth of 27 feet bgs in boring B-2 due to running sands filling the borehole and auger.

Selected soil samples were sealed in moisture-tight containers and returned to JTC's office for further review, classification, and/or geotechnical laboratory testing. Detailed records of the drilling, testing, sampling performed, and the soil, bedrock, and groundwater conditions observed at each test boring location are provided on the attached *Test Boring Logs*.

4.0 GEOTECHNICAL LABORATORY TESTING

JTC selected representative soil samples for geotechnical laboratory testing at our in-house laboratory. The following tests were performed:

- 3 Moisture contents;
- 3 Particle-size analyses;

Geotechnical laboratory testing was performed in general accordance with ASTM procedures. Test results are provided on the attached *Geotechnical Laboratory Testing Reports*.

5.0 SUBSURFACE CONDITIONS

The following subsections describe the site soil, bedrock, and groundwater conditions encountered, based on results of the geotechnical explorations and laboratory testing. Detailed descriptions of the conditions observed at each test boring are provided on the attached *Test Boring Logs*.

5.1 Soil Profile

The primary soil strata are briefly summarized in the table below:

Stratum #	Explorations Where Present	Approximate Depth to Bottom of Stratum (feet bgs)	Material Description	Typical Consistency / Relative Density
1	B-1, B-2	0.33	**Asphalt Pavement**	N/A
2	B-1, B-2	6 , 5	**Existing Fill –** Brown to gray, Poorly graded Sand (SP-SM) with silt and gravel	Medium Dense
3	B-1, B-2	>27, >35	**Coarse Glacial Deposits –** Gray, poorly graded Sand (SP-SM) with silt and gravel, poorly graded Sand (SP-SM) with silt, Gravel and cobbles below 27 feet bgs	Loose to Medium Dense

5.2 Bedrock

Practical refusal to further penetration of the augers was not encountered at the time of drilling. Bedrock is not expected to impact excavation/construction.

5.3 Groundwater

Static groundwater was encountered in both boring explorations at an approximate depth of 5.0 feet bgs. Short-term (i.e., during drilling, upon completion of drilling, and/or a few hours after drilling) water levels observed in test borings should be considered approximate.

JTC estimates that this investigation occurred during a period of seasonally normal groundwater. Site groundwater levels should be expected to fluctuate seasonally and in response to precipitation events, construction activity, site use, and adjacent site use.

6.0 GEOTECHNICAL ANALYSIS & RECOMMENDATIONS

The evaluation of the site and the proposed development was based on the subsurface conditions encountered at the exploration locations, results of geotechnical laboratory testing, provided site plans/grading, and provided structural loading conditions, as described herein.

The Existing Fill materials are not suitable for direct support of foundations. JTC recommends the complete removal of all Fill materials within the footprint of proposed foundations and approximately 5 feet laterally. Subsequently, the proposed culvert and head/wing wall structures can be supported upon shallow foundations bearing on native coarse glacial deposits and/or *Gravel Borrow* or *Crushed Stone* built-up from properly prepared native soil subgrade, provided

that the design and construction recommendations presented herein are satisfied.

6.1 Site Preparation and Grading

Site preparation and grading should be performed in accordance with the following procedures:

- A geotechnical engineer should directly observe site preparation and grading activities;
- If shallow and/or perched groundwater is encountered or anticipated, it should be removed in advance of excavation and continuously maintained at least 2 feet below the bottom of excavation and subsequent construction grade until the backfilling is complete;
- The site soils contain substantial proportions of fine sand and silt and may degrade and/or become unworkable when subjected to construction traffic or other disturbance during wet conditions. As such, site preparations, grading, and earthworks should be performed during a dry season if possible. The Contractor shall be aware of these conditions and must take precautions to minimize subgrade disturbance. Such precautions may include diverting storm run-off away from construction areas, reducing traffic in sensitive areas, minimizing the extent of exposed subgrade if inclement weather is forecast, backfilling excavations and footings as soon as practicable, grading (and compacting) exposed subgrades to promote surface water run-off, and maintaining an effective dewatering program, as necessary. Over-excavation to remove degraded or unworkable subgrade soils should be anticipated and budgeted (cost and schedule);
- Any existing buildings, structures, and/or associated foundations (including footings, foundation walls, etc.) should be completely removed from proposed headwalls footprint (including the footing zone of influence) and replaced/backfilled with properly placed and compacted *Structural Fill* or Crushed Stone;
- Any existing subsurface utilities and underground structures should be completely removed from the footprint of the proposed headwalls and replaced/backfilled with properly placed and compacted *Structural Fill* or Crushed Stone. Any existing subsurface utilities in proposed pavement areas should be removed and/or appropriately abandoned in place (e.g., pressure grouting), as approved by the on-site geotechnical engineer;
- The site should be cleared and stripped of any existing vegetation not designated to remain; as well as pavement, Topsoil, rootmat; loamy/organic-laden Subsoil; and any otherwise unsuitable materials;
- In cut areas, the final foot of excavation should be performed using a smooth-edged cutting bucket (no teeth) to minimize subgrade disturbance;
- Following clearing, stripping, and/or cutting to subgrade, the exposed subgrade soils should be reviewed by a geotechnical engineer;

- Any loose, soft, wet, and/or otherwise unsuitable soils (typically evidenced by rutting, pumping, and/or deflection of the subgrade) should be over-excavated to expose suitable soils, or other remedial measures should be taken, as approved by the on-site geotechnical engineer;
- Any over-excavations should be backfilled with properly placed and compacted *Structural Fill* or Crushed Stone.

- *Gravel Borrow* or *Crushed Stone* should be used for subgrade fill within the culvert base and head/wingwall footing zones of influence. The placement of backfill materials to achieve design subgrades should not begin until the exposed subgrade soils have been directly observed and approved by the on-site geotechnical engineer;
- Backfill materials and placement and compaction requirements are provided in *Appendix B*.

6.2 Culvert Placement, Head/Wingwall Foundations, and Backfilling

Based on the subsurface conditions encountered at the exploration locations and our current understanding and assumptions relative to the replacement/construction project, the following foundation design recommendations are provided:

- The Existing Fill and surficial Alluvial materials are not suitable for direct support of shallow foundations;
- The proposed culvert and head/wingwall spread footings can be supported on native sand or gravel and/or *Gravel Borrow* or *Crushed Stone* built-up from properly prepared native soil subgrade;
- Backfill materials for foundation subgrades shall conform to the MassDOT LRFD Bridge Manual sections 3.2.5, 3.2.6, and 3.2.7 partially excerpted below:
  - 3.2.5 - *Gravel Borrow for Bridge Foundations* (MassHighway M1.03.0a) shall be assumed to have a soil friction angle (Φ) of 37˚. The gravel shall be compacted in accordance with the MassHighway *Standard Specifications for Highways and Bridges*.
  - 3.2.6 *Crushed Stone for Bridge Foundations* (MassHighway M2.01.1) shall be used where water conditions prevent the use of *Gravel Borrow for Bridge Foundations*. De-watering the area and using *Gravel Borrow for Bridge Foundations* (MassHighway M1.03.0a) compacted in the dry, or not de-watering and using Crushed Stone for Bridge Foundations (MassHighway M2.01.1) shall be investigated for feasibility and economy.
  - The pressure on the granular soil below the crushed stone will govern the Bearing Resistance of the crushed stone.
- Backfill material for culverts and/or head/wingwalls shall be in general accordance with

MassHighway Standard Specifications for Highways and Bridges section 150.64 Backfilling for Structures and Pipes. The backfill in back of abutments and wingwalls of bridges shall consist of gravel. The gravel shall meet the specifications of Subsection M1.03.0, Type b. Whenever backfill is placed in back of or over arches, culverts or rigid frames, the fill shall be first placed midway between the ends of the structure. The remainder of the fill shall then be placed to equal depths on both sides of the structure, working equally both ways from the center of the structure toward the ends. This procedure shall continue up to the bottom of the subbase of the roadway.

- The culvert and/or head/wingwall may be designed using an allowable bearing pressure of 1,500 psf. Design bearing pressures may be increased by one-third (⅓) when considering seismic and/or transient loading conditions;
- Head/wingwall foundations should have a minimum effective width (B') of 3 feet;
- Footings and culvert base should be founded at least 4 feet below the lowest adjacent grade to provide adequate frost protection;
- Total post-construction settlements due to applied foundation loads are estimated to be on the order of 1.0 inches or less, based on an effective footing width (B') of 3 feet;
- The design of head/wingwall foundations should consider sliding and overturning due to lateral and/or rotational loads.
    - Resistance to lateral loads can be provided by friction along the base of the structures. The following interface friction angle(s), ϕ, and associated friction factors (=tan ϕ) are recommended for sliding resistance/overturning:

Condition	Friction Angle	Friction Factor
Mass concrete on crushed gravel/stone	30	0.57
Mass concrete on clean/silty fine to medium sand	26	0.50
Formed concrete against Clean Granular Fill	22	0.40

    - Only dead loads should be used in the calculation of available interface friction;
    - Calculation of lateral earth pressures due to retained soils consisting of Existing Fill and/or new *Ordinary Borrow* should be based on a retained soil angle of internal friction of 30 degrees; lateral earth pressures due to retained soils consisting of native poorly graded Sand should be based on a soil angle of internal friction of 31-32 degrees; lateral earth pressures due to retained soils consisting of *Gravel Backfill* for bridge structures should be based on a soil angle of internal friction of 36 degrees;
    - To resist overturning, the net reaction should be located within the middle third (kern) of the footing base.

- The lateral resistance of the head/wingwalls should also accommodate surcharge loads. Uniformly distributed loads should be superimposed along the face of the wall at a magnitude equal to the surcharge pressure multiplied by the appropriate earth pressure coefficient. Surcharge loads should be considered where they are located within a horizontal distance equivalent to 1 times the height of the wall. Any anticipated point or line loads situated behind the wall should be evaluated in accordance with linear elastic theory;
- The area behind the head/wingwalls shall be backfilled with MassHighway's *Gravel Borrow* for Bridge Foundations and a drainage system shall be provided as shown in Chapter 12 of Part II of the MassDOT LRFD Bridge Manual which consists of a 4-inch perforated pvc subdrain wrapped in geotextile fabric. Weep holes should be provided near the base of the exposed head/wing wall (daylight to ground surface/waterway).
- *Ordinary Borrow (MassHighway M1.01.0)* is suitable to restore the remainder of the embankment (i.e., retained soil) back/up to the roadway/pavement subgrade elevation. *Ordinary Borrow* shall consist of a material satisfactory to the Engineer and not specified as gravel borrow, sand borrow, special borrow material or other particular kind of borrow. This material shall have the physical characteristics of soils designated as group A-1, A-2-4 or A-3 under AASHTO-Ml45. It shall have properties such that it may be readily spread and compacted for the formation of embankments;
- The ground surface immediately adjacent to the head/wingwall should be sloped away from the top of the headwall to allow for positive drainage. It is also recommended that the surficial materials adjacent to the top of headwall be relatively impermeable to reduce the volume of precipitation infiltrating into the subgrade. Such impermeable materials include cement concrete, bituminous concrete, and/or vegetated silty/clayey topsoil.

Recommendations for culvert and head/wingwall foundation subgrade preparation and subsequent backfilling are provided as follows:

- A geotechnical engineer or his/her representative should directly observe foundation subgrade preparation activities;
- If shallow and/or perched groundwater is encountered, it must be removed in advance of excavation and continuously maintained at least 2 feet below the bottom of excavation and subsequent construction grade until the backfilling is complete;
- Excavations for shallow foundations must extend into undisturbed medium dense coarse glacial deposits and/or on *Structural Fill* or Crushed Stone built-up from properly prepared native soil subgrade, as described herein;
- The native foundation subgrade soils will be sensitive to moisture and will readily disturb or soften if exposed to wet conditions during construction activities. Therefore, the final foot, at a minimum, of excavation for foundations should be performed using a smooth-

edged cutting bucket (no teeth) to minimize subgrade disturbance. Furthermore, if wet conditions are present or anticipated due to groundwater seepage, perched groundwater, and/or precipitation/stormwater, the foundation subgrade should be protected with a 6-inch (minimum) thick layer of ¾-inch minus Crushed Stone encased in a geotextile fabric (e.g., Mirafi 140N or equal). In this case, the Crushed Stone shall be placed immediately upon exposure of the native foundation subgrade soils and densified with a plate compactor until exhibiting stable conditions. The purpose of the crushed stone is to protect the subgrade soils from disturbance, facilitate construction dewatering (if necessary), and provide a dry/stable subgrade upon which to progress construction;

  - If Undocumented Fill and/or otherwise unsuitable soils/materials are encountered at the foundation subgrade, over-excavations should remove all Fill and/or unsuitable soils within the footing zone of influence, which is defined as the area extending laterally 1 foot from edges of the footing and then outward and downward at a 1H:1.5V (horizontal to vertical) splay of bearing until a suitable native subgrade soil is encountered; and
  - Any over-excavations should be backfilled with properly placed and compacted *Gravel Borrow* or *Crushed Stone* as approved by the on-site geotechnical engineer.

- Prior to setting forms and placing reinforcing steel, a geotechnical engineer should directly observe footing subgrades;
  - Footing subgrades should be level or suitably benched and free of standing water and/or debris;
  - Loose, soft, wet, frozen, or otherwise unsuitable soils should either be re-compacted or over-excavated to a suitable subgrade, as approved by the on-site geotechnical engineer; and
  - Over-excavations should be backfilled with properly placed and compacted *Gravel Borrow* or *Crushed Stone* as approved by the on-site geotechnical engineer.
- Foundation subgrade soils should be protected against physical disturbance, precipitation, and/or frost throughout construction. Surface water run-on/run-off should be diverted away from open foundation excavations. The Contractor shall ultimately be responsible for the means and methods to protect the foundation subgrade during construction.
- Only small plate compactors should be used within 3 feet of the head/wingwall during placement and compaction of head/wingwall backfill.

All work and materials shall conform to the most recent editions of:

- *780 CMR Massachusetts State Building Code*
- AASHTO *Standard Specifications for Highway Bridges*
- MassDOT *LRFD Bridge Manual*
- MassHighway *Standard Specifications for Highways and Bridges*

Where a conflict exists between the aforementioned codes and the geotechnical report, the code shall govern.

6.3 Seismic Considerations

Earthquake loadings must be considered under the requirements of the current edition of the Massachusetts Building Code (MA-Code) which refers to the 2015 edition of the International Building Code (IBC). IBC Table 1613.5.2 is used to establish the site class based on the average soil properties and soil profile. Site class is then used to determine the site coefficient and mapped spectral response for a given structure. Based on the conditions encountered at the test boring locations, the site is classified as:

Site Class D: Stiff Soil Profile.

Liquefaction refers to the loss of strength in saturated cohesionless soils due to the buildup of pore water pressures during cyclic or seismic loading. Based on the conditions encountered at the test boring locations, the soils at this site are not considered to be susceptible to liquefaction.

6.4 Re-Use of Site Soils

Some of the native coarse deposit soils and existing fill soils encountered at the boring locations may be suitable for re-use as *Gravel Borrow* or *Ordinary Borrow*, provided they are appropriately segregated from excessively silty, wet, and/or other debris-laden, unsuitable materials at the time of excavation/construction. These soils should be stockpiled on site and subjected to laboratory testing to demonstrate conformance with the project specifications.

6.5 Construction Monitoring and Quality Control Testing

A qualified geotechnical engineer or representative should be retained to review the site preparation and grading activities and foundation subgrade preparations, at a minimum. Similarly, quality control testing, including in-place field density and moisture tests, should be performed to confirm that the specified compaction is achieved. It is recommended that JTC be retained to provide earthwork construction monitoring and quality control testing services.

Quality control testing recommendations are provided as follows:

- During site grading and foundation subgrade preparation, 3 field density tests should be performed for every 1,000 square feet (per lift) of *Gravel Borrow* or *Crushed Stone* placement, at a minimum. At least 3 tests should be performed on each lift of material even if the lift is less than 1,000 square feet;
- During foundation wall backfilling, 3 field density tests should be performed for every 50 linear feet (per lift) of fill placement, at a minimum. At least 3 tests should be performed on each lift of material even if the lift is less than 50 linear feet;
- During backfilling of utility trenches, at least 1 test should be conducted per 50 linear feet

(per lift) of trench; and

- During site grading and pavement subgrade preparation, 3 field density tests should be performed for every 1,000 square feet (per lift) at a minimum. At least 3 tests should be performed on each lift even if the lift is less than 1,000 square feet.

6.6 Additional Considerations

Additional design recommendations are provided as follows:

- Permanent fill or cut slopes should have a maximum slope of 2.5H:1V (horizontal to vertical) or flatter for dry conditions. Permanent fill or cut slopes should be no steeper than 3H:1V for wet/submerged conditions (e.g., stormwater basin) unless a properly designed surface slope stabilization system (e.g. rip rap, geosynthetics) is provided.

Additional construction considerations/recommendations are provided as follows:

- Safe temporary excavation and/or fill slopes are the responsibility of the Contractor. Excavations should be conducted in accordance with local, state, and federal (OSHA) requirements, at a minimum. If an excavation cannot be properly sloped or benched due to space limitations, adjacent structures, and/or seepage, the Contractor should install an engineered shoring system to support the temporary excavation;
- Subgrade conditions will be influenced by excavation methods, precipitation, stormwater management, groundwater control(s), and/or construction activities. Most of the site soils are poorly-drained, moisture-sensitive, and considered susceptible to disturbance when exposed to wet conditions and construction activities. As such, the Contractor shall be aware of these conditions and must take precautions to minimize subgrade disturbance. Such precautions may include diverting storm run-off away from construction areas, reducing traffic in sensitive areas, minimizing the extent of exposed subgrade if inclement weather is forecast, backfilling excavations and footings as soon as practicable, and maintaining an effective dewatering program, as necessary;
- Proper groundwater control and stormwater management are necessary to maintain site stability. Groundwater should be removed in advance and continuously maintained at least 2 feet below the working construction grade until earthworks and/or backfilling are complete;
- If groundwater seepage and/or wet soils due to shallow groundwater are observed, a ¾-inch minus crushed stone base should be placed atop the exposed subgrade soils. The stone should be immediately placed atop the undisturbed subgrade and then tamped with a plate compactor until exhibiting stable conditions. The stone shall be protected, as required, with a geotextile filter fabric such as Mirafi 140N or equal. The purpose of the stone base is to protect the wet subgrade, facilitate dewatering, and provide a dry/stable base upon which to progress construction; and
- All slopes should be protected from erosion during (and after) construction.

7.0 CLOSING

We trust the contents of this report are responsive to your needs at this time. Should you have any questions or require additional assistance, please do not hesitate to contact our office.

APPENDIX A: LIMITATIONS

Explorations

1. The analyses and recommendations presented in this report are based in part upon the data obtained from widely-spaced subsurface explorations. Subsurface conditions between exploration locations may vary from those encountered at the exploration locations. The nature and extent of variations between explorations may not become evident until construction. If variations appear, it will be necessary to re-evaluate the recommendations of this report.
2. The generalized soil profile described in the text is intended to convey trends in subsurface conditions. The boundaries between strata are approximate and idealized and have been developed by interpretation of widely-spaced explorations and samples; actual strata transitions are probably more gradual. For specific information, refer to the individual test pit and/or boring logs.
3. Water level readings have been made in the test pits and/or test borings under conditions stated on the logs. These data have been reviewed and interpretations have been made in the text of this report. However, it must be noted that fluctuations in the level of the groundwater may occur due to variations in rainfall, temperature, and other factors differing from the time the measurements were made.

Review

4. It is recommended that John Turner Consulting, Inc. be given the opportunity to review final design drawings and specifications to evaluate the appropriate implementation of the geotechnical engineering recommendations provided herein.
5. In the event that any changes in the nature, design, or location of the proposed areas are planned, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed, and conclusions of the report modified or verified in writing by John Turner Consulting, Inc.

Construction

6. It is recommended that John Turner Consulting, Inc. be retained to provide geotechnical engineering services during the installation phases of the work. This is to observe compliance with the design concepts, specifications, and recommendations and to allow design changes in the event that subsurface conditions differ from those anticipated prior to the start of construction.

Use of Report

7. This report has been prepared for the exclusive use of the Ipswich River Watershed Association or specific application to the project located on Pond Street in Topsfield, Massachusetts. All considerations are based on the available information and is in accordance with generally accepted soil and foundation engineering practices. No other warranty, expressed or implied, is made.
8. This report has been prepared for this project by John Turner Consulting, Inc. This report was completed for preliminary design purposes and may be limited in its scope to complete an accurate bid. Contractors wishing a copy of the report may secure it with the understanding that its scope is limited to preliminary geotechnical design considerations.

JOHN TURNER
CONSULTING

APPENDIX B: RECOMMENDED SOIL GRADATION & COMPACTION SPECIFICATIONS

TABLE 1: MassHighway M1.03.0a Gravel Borrow for Bridge Foundations

SIEVE SIZE	PERCENT PASSING BY WEIGHT
½-inch	50 - 85
No. 4	40 - 75
No. 50	8 - 28
No. 200	0 - 10
Maximum size of stone in gravel shall be 6" largest dimension	

TABLE 2: MassHighway M2.01.1 Crushed Stone for Bridge Foundations

SIEVE SIZE	PERCENT PASSING BY WEIGHT
2-inch	100
1½-inch	95 - 100
1-inch	35 - 70
¾-inch	0 - 25

NOTES:

1. For use as structural load support below foundations. Material placed beneath foundations should include the Footing Zone of Influence which is defined as that area extending laterally one foot from the edge of the footing then outward and downward at a 1:1.5 (H:V) splay.
2. The material should be free of construction and demolition debris, frozen soil, organic soil, peat, stumps, brush, trash, and refuse;
3. Materials should not be placed on soft, saturated, or frozen subgrade soils;
4. Materials should be placed in lifts not exceeding 12 inches for heavy vibratory rollers and 8 inches for vibratory plate compactors.
5. Place and compact within ± 3% of optimum moisture content (as applicable).
6. Compact to at least 95% relative compaction per ASTM D1557 (as applicable).
7. The adequacy of the compaction efforts should be verified by field density testing (as applicable).

TABLE 3: MassHighway M1.03.0b Gravel Borrow for Backfill for Bridges

SIEVE SIZE	PERCENT PASSING BY WEIGHT
½-inch	50 - 85
No. 4	40 - 75
No. 50	8 - 28
No. 200	0 - 10
Maximum size of stone in gravel shall be 3" largest dimension	

NOTES:

8. For use as backfill behind unbalanced foundation/retaining/headwalls and wing walls.
9. The material should be free of construction and demolition debris, frozen soil, organic soil, peat, stumps, brush, trash, and refuse;
10. Materials should not be placed on soft, saturated, or frozen subgrade soils;
11. Materials should be placed in lifts not exceeding 12 inches for heavy vibratory rollers and 8 inches for vibratory plate compactors.
12. Only small plate compactors should be used within 3 feet of the head/wingwall during placement and compaction of head/wingwall backfill.
13. Place and compact within ± 3% of optimum moisture content (as applicable).
14. Compact to at least 95% relative compaction per ASTM D1557 (as applicable).
15. The adequacy of the compaction efforts should be verified by field density testing (as applicable).

TABLE 4: MassHighway M1.01.0 Ordinary Borrow

PERMISSIBLE CLASSIFICATIONS UNDER AASHTO M145
A1
A2-4
A-3

NOTES:

1. For use as common/subgrade fill in parking areas and roadway embankments.
2. Ordinary Borrow shall consist of a material satisfactory to the Engineer and not specified as gravel borrow, sand borrow, special borrow material or other particular kind of borrow.
3. It shall have properties such that it may be readily spread and compacted for the formation of embankments.
4. Place in lifts not exceeding 12 inches.
5. Maximum stone size should not exceed ½ the actual lift thickness.
6. Compact to at least 92% relative compaction per ASTM D1557 when placed as subgrade fill in parking areas or roadway embankments.
7. The adequacy of the compaction efforts should be verified by field density testing.

APPENDIX C: RECOMMENDED LATERAL EARTH PRESSURES, DRAINAGE REQUIREMENTS, & FRICTION FACTOR FOR UNBALANCED WALLS

Lateral earth pressures for the structural design and stability analysis of unbalanced foundation walls (basement walls, retaining walls, etc.) are provided herein. The following table outlines the recommended lateral earth pressure coefficients:

WALL CONDITION	LATERAL TRANSLATION (Δ/H)	EARTH PRESSURE COEFFICIENT (K)
restrained	0	Ko = 0.50
no restraint	0.002	Ka = 0.31
no restraint	0.02	Kp = 3.23
seismic	n/a	Keq

where: Δ = movement at top of wall by rotation or lateral translation
H = height of wall

The recommended lateral earth parameters are based upon and/or assume:

1. Rankine earth pressure theory;
2. Retaining wall backfilled with *Clean Granular Fill* (Table 1);
3. Unit weight of backfill less than 135 pcf;
4. **No hydrostatic pressures;**
5. Surcharge loading; Parking areas and roadway will be proximally located to the proposed foundation walls, and where applicable, the walls should be designed with a minimum surcharge load of 250 psf in accordance with the AASHTO *Standard Specification for Highway Bridges*.;
6. A level backfill in front and behind of wall;
7. Dynamic/compaction stresses limited to 200 psf/foot;
8. The top 2 feet should not be considered for passive resistance;
9. Seismic loading shall be applied as required by the *IBC.* Seismic loads shall be a 15% increase from specified values;
10. Use of only small plate compactors within 3 feet of the wall.

The lateral resistance of retaining walls should also accommodate any surcharge loads. Uniformly distributed loads should be superimposed along the face of the wall at a magnitude equal to the surcharge pressure multiplied by the appropriate earth pressure coefficient. Surcharge loads should be considered where they are located within a horizontal distance equivalent to 1 times the height of the wall. Any anticipated point or line loads situated behind the wall should be evaluated in accordance with linear elastic theory.

For frost protection and proper drainage, it is recommended that *Clean Granular Fill* be placed directly behind unbalanced walls. The ground surface immediately adjacent to the unbalanced wall should be sloped away from the building to allow for positive drainage. It is also

recommended that the final surface materials adjacent to the building be relatively impermeable to reduce the volume of precipitation infiltrating into the subgrade. Such impermeable materials include cement concrete, bituminous concrete, and/or vegetated silty/clayey topsoil.

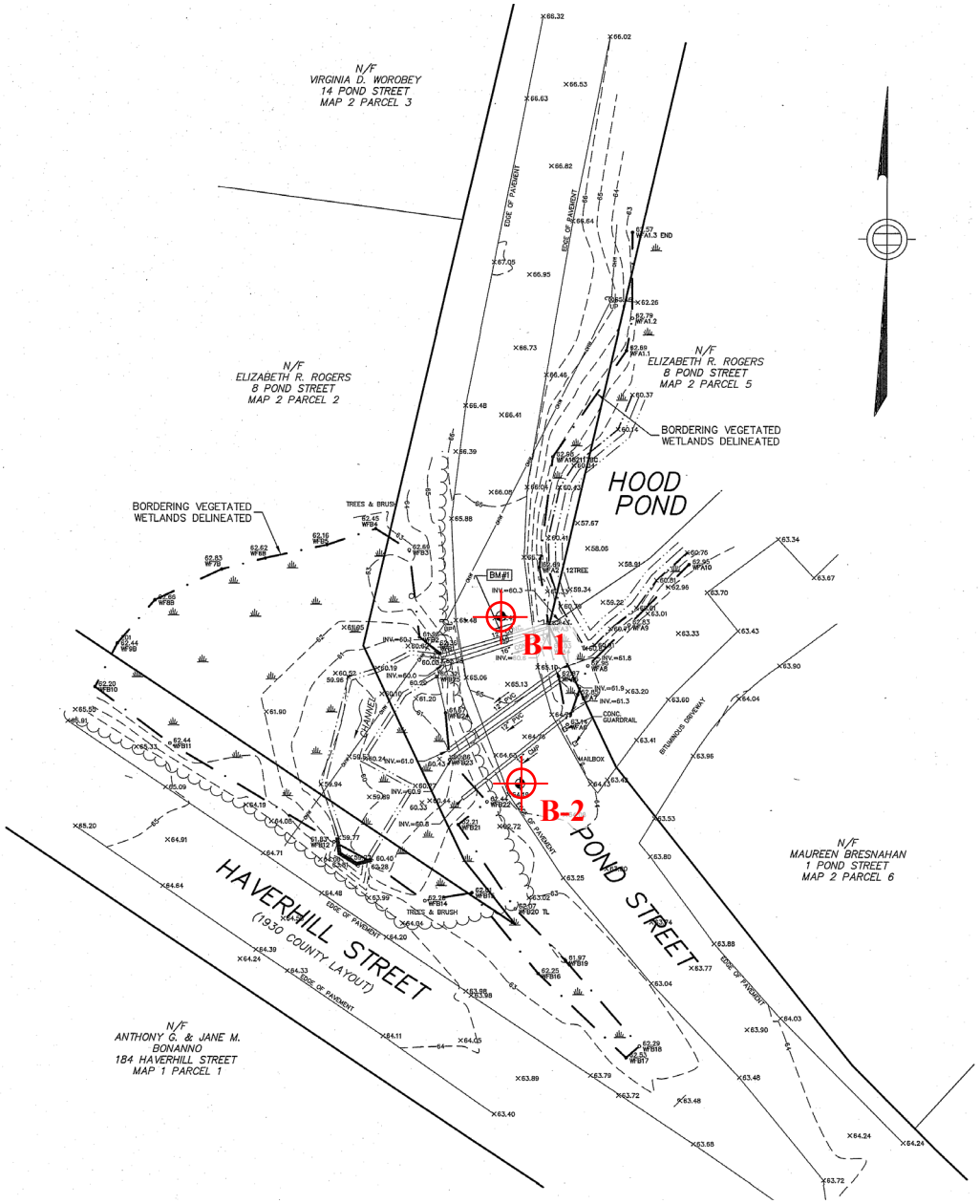
Unbalanced foundation walls (including basement walls) should be provided with adequate footing drains per Section 1805 of the 2015 International Building Code. The perimeter foundation drain should be located at least 4 inches above the bottom of footing elevation and six inches outward from the edge of footing. The drains should not encroach within the Footing Zone of Influence, which is defined as that area extending laterally one foot from the edge of footing then outward and downward at a 1H:1.5V splay. Furthermore, the invert elevation of the drain should be at least 12 inches below the underside of the adjacent floor slab. The drains should consist of minimum 4-inch diameter perforated PVC-SDR 35 drain pipe encased within 10 inches of ¾-inch stone and wrapped with a filter fabric such as Mirafi 140N or equal. **If the unbalanced foundation walls cannot be drained to alleviate hydrostatic forces, then the lateral earth pressure should be increased to include full hydrostatic pressures.** Such earth pressures should be used for deep basements, if necessary.

Any footing and under-slab drains may discharge via gravity to a storm drain line not subject to surcharge. The Civil Engineer should review the discharge of the drains. The drains should be provided with permanent clean-outs at convenient locations to facilitate access to all sections of the system. Roof gutters and other storm collection should not be discharged to the footing/under-slab drains. Any recharge systems, infiltrators, and/or dry wells shall be kept away from the basement to prevent hydrostatic surcharge.

The following interface friction angle(s), ϕ, and associated friction factors (=tan ϕ) are recommended for sliding resistance/overturning:

Condition	Interface Friction Angle	Friction Factor
Mass concrete (base of wall) on crushed gravel/stone	30	0.57
Mass concrete (base of wall) on Glacial Deposits	22	0.40
Formed concrete (wall) against Clean Granular Fill	22	0.40

APPENDIX D: TEST BORING LOCATION PLAN



Notes:

1. Test borings were performed on July 1, 2020 under the direction of JTC.
2. Test boring locations should be considered approximate.
3. Refer to the Test Boring Logs for the subsurface conditions encountered at each boring location.
4. Basemap source: *Existing Conditions Plan*, Scott M. Cerrato (July 26, 2020)
5. Not to scale.

Ipswich River Watershed Association **143 County Road** **Ipswich, Massachusetts 01930**	**Pond Street Culvert Replacement** **Pond Street** **Topsfield, Massachusetts**
JOHN TURNER CONSULTING	**TEST BORING LOCATION PLAN**

APPENDIX E: TEST BORING LOGS & KEY TO SYMBOLS AND DESCRIPTIONS

JOHN TURNER CONSULTING

LOG OF BORING No. B-1

PROJECT: Pond Street Culvert Replacement **PROJECT NO.:** 20-04-064
CLIENT: Ipswich River Watershed Association
PROJECT LOCATION: Topsfield, MA
LOCATION: Refer to Test Boring Location Plan **ELEVATION:** EL. 65.49'
DRILLER: Drilex Environmental **LOGGED BY:** DPT
DRILLING METHOD: HSA **DATE:** 07/01/20
DEPTH TO - WATER> INITIAL: ▽ 5 **AFTER 24 HOURS:** ▽

Depth (feet)	Description	Graphic	Elevation (feet)	Sample No.	Blow Counts	% < #200
0	[ASPHALT} 4.5 inches thick					
	.33					
	[FILL] Light brown to gray, Poorly graded Sand (SP-SM) with silt and gravel, medium dense, dry			SS01	8 10 12 14	6
				SS02	13 11 10 10	
5	-becomes black with trace organics at 5 feet			SS03	9 4 6 11	
	6					
	[COARSE GLACIAL DEPOSITS] Gray, Poorly graded Sand (SP-SM) with silt and gravel, medium dense, wet			SS04	11 14 16 10	7
10				SS05	5 7 8 9	
15				SS06	4 9 9 12	
20				SS07	3 8 11 14	
25				SS08	6 5 6 11	
	Boring terminated at 27 ft.					
30						
35						

TEST RESULTS
Plastic Limit ⊢⊣ Liquid Limit
Water Content - ●
Penetration - ▨
10 20 30 40 50

This information pertains only to this boring and should not be interpreted as being indicative of the site.

JOHN TURNER CONSULTING

LOG OF BORING No. B-2

PROJECT: Pond Street Culvert Replacement **PROJECT NO.:** 20-04-064
CLIENT: Ipswich River Watershed Association
PROJECT LOCATION: Topsfield, MA
LOCATION: Refer to Test Boring Location Plan **ELEVATION:** EL. 64.19'
DRILLER: Drilex Environmental **LOGGED BY:** DPT
DRILLING METHOD: HSA **DATE:** 07/01/20
DEPTH TO - WATER> INITIAL: ▽ 5 **AFTER 24 HOURS:** ▽

Depth (feet)	Description	Graphic	Elevation (feet)	Sample No.	Blow Counts	% < #200
0	[ASPHALT] 4 inches thick (.33)					
	[FILL] Light brown to gray, Poorly graded Sand (SP-SM) with silt and gravel, medium dense, dry			SS01	6 9 6 7	
				SS02	4 8 9 12	
5	▽ (5)					
	[COARSE GLACIAL DEPOSITS] Gray, Poorly graded Sand (SP-SM) with silt and gravel, medium dense, wet			SS03	8 9 10 8	
				SS04	7 10 5 6	
10	-becomes very loose			SS05	1 1 2 7	
15	-becomes medium dense			SS06	3 6 8 8	
20	-becomes light brown to gray, very loose			SS07	1 2 2 3	
25	-becomes medium dense			SS08	2 5 11 11	
	(27) Hard drilling through dense gravel and cobbles. No samples due to running sands.					
30						
35						

TEST RESULTS
Plastic Limit ⊢⊣ Liquid Limit
Water Content - ●
Penetration - ▨
10 20 30 40 50

This information pertains only to this boring and should not be interpreted as being indicative of the site.

JOHN TURNER CONSULTING

LOG OF BORING No. B-2

PROJECT: Pond Street Culvert Replacement **PROJECT NO.:** 20-04-064

CLIENT: Ipswich River Watershed Association

PROJECT LOCATION: Topsfield, MA

LOCATION: Refer to Test Boring Location Plan **ELEVATION:** EL. 64.19'

DRILLER: Drilex Environmental **LOGGED BY:** DPT

DRILLING METHOD: HSA **DATE:** 07/01/20

DEPTH TO - WATER> INITIAL: ▽ 5 **AFTER 24 HOURS:** ▽

Depth (feet)	Description	Graphic	Elevation (feet)	Sample No.	Blow Counts	% < #200	TEST RESULTS
	Boring terminated at 35 ft.						Plastic Limit ⊢⊣ Liquid Limit Water Content - ● Penetration - ▨ 10 20 30 40 50
40							
45							
50							
55							
60							
65							
70							

This information pertains only to this boring and should not be interpreted as being indicative of the site.

MAJOR DIVISIONS			SYMBOLS		TYPICAL NAMES
COARSE-GRAINED SOILS OVER 50% > No.200 SIEVE SIZE	GRAVELS	CLEAN GRAVELS WITH LESS THAN 5% FINES	GW		Well-graded gravels or gravel-sand mixtures, little or no fines
			GP		Poorly graded gravels or gravel-sand mixtures, little or no fines
	MORE THAN 1/2 OF COARSE FRACTION > No.4 SIEVE SIZE	GRAVELS WITH OVER 15% FINES	GM		Silty gravels, gravel-sand mixtures
			GC		Clayey gravels, gravel-sand-clay mixtures
	SANDS	CLEAN SANDS WITH LESS THAN 5% FINES	SW		Well-graded sand or gravelly sands, little or no fines
			SP		Poorly graded sands or gravelly sands, little or no fines
	MORE THAN 1/2 OF COARSE FRACTION < No.4 SIEVE SIZE	SANDS WITH OVER 15% FINES	SM		Silty sand, sand-silt mixtures
			SC		Clayey sands, sand-clay mixtures
FINE-GRAINED SOILS OVER 50% < No.200 SIEVE SIZE	SILTS & CLAYS LIQUID LIMIT 50% OR LESS		ML		Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
			CL		Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
			OL		Organic silts and organic silty clays of low plasticity
	SILTS & CLAYS LIQUID LIMIT GREATER THAN 50%		MH		Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
			CH		Inorganic clays of high plasticity, fat clays
			OH		Organic clays of medium to high plasticity, organic silty clays, organic silts
HIGHLY ORGANIC SOILS			PT		Peat and other highly organic soils

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KEY TO SYMBOLS AND DESCRIPTIONS

TYPICAL SYMBOLS

- Shelby Tube
- Auger Cuttings
- Standard Split Spoon Sample
- 3" Split Spoon Sample
- Rock Core
- Dynamic Cone Penetrometer
- Vane Shear
- Bulk/Grab Sample
- Geoprobe Sample
- Sonic or Vibro-Core Sample
- Water Table (at time of drilling)
- Water Table (after 24 hours)

SOIL MOISTURE MODIFIERS

Term	Description
Dry	Absence of moisture; dusty, dry to touch
Moist	Damp but no visible water
Wet	Visible free water

The descriptor "damp" should not be used (use "moist").
The descriptor "saturated" should not be used (use "wet").

WELL SYMBOLS

- Recessed Cover Set in Concrete
- Top of Well, Recessed Pipe
- Covered Riser
- Capped Riser w/ Locking Cover
- Pipe Riser
- Concrete Seal
- Gravel Backfill
- Assorted Cuttings
- Bentonite Slurry
- Bentonite Pellets
- Silica Sand, blank PVC
- Slotted Pipe w/ Sand
- Endcap on Pipe Packed in Sand
- Silica Sand, No Pipe (End Plug)

CLASSIFICATION	RANGE OF GRAIN SIZES	
	U.S. Standard Sieve Size	Grain Size in Millimeters
BOULDERS	Above 12"	Above 305
COBBLES	12" to 3"	305 to 76.2
GRAVEL	3" to No. 4	76.2 to 4.75
coarse	3" to 3/4"	76.2 to 19.1
fine	3/4" to No. 4	19.1 to 4.75
SAND	No. 4 to No. 200	4.75 to 0.075
coarse	No. 4 to No. 10	4.75 to 2.00
medium	No. 10 to No. 40	2.00 to 0.425
fine	No. 40 to No. 200	0.425 to 0.075
SILT & CLAY	Below No. 200	Below 0.075

RELATIVE DENSITY/CONSISTENCY

Gravel, Sand, and Silt (nonplastic)		Silt (plastic) and Clay		
N-Value	Relative Density	N-Value	Su	Consistency
0 - 4	Very Loose	0 - 2	0 - 250	Very Soft
5 - 10	Loose	3 - 4	251 - 500	Soft
11-30	Medium Dense	5 - 8	501 - 1000	Medium Stiff
31 - 50	Dense	9 - 15	1001 - 2000	Stiff
51 +	Very Dense	16 - 30	2001 - 4000	Very Stiff
		31 +	4001+	Hard

Standard Penetration Testing (SPT) N_{60} based on blows per 12 inches.
WR = Weight of Rods; WH = Weight of Hammer

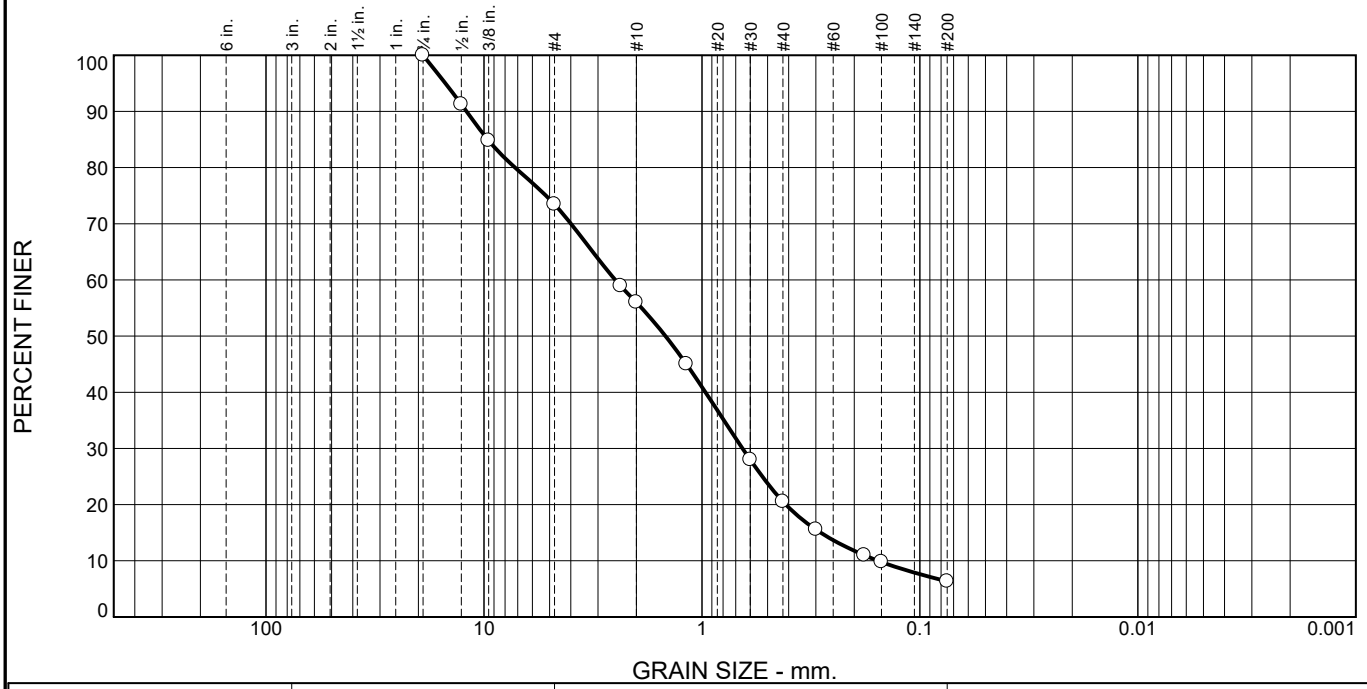
PERCENT OR PORTIONS OF SOIL

Term	Description
Parting:	> 1/16 in.
Seam:	0.5 in. to 1/16 in.
Layer:	12 in. to 0.5 in.
Stratum:	> 12 in.
Pocket:	Small erratic deposit
Lens:	Lenticular deposit
Occasional:	One or less per foot of thickness
Frequent	More than one per foot of thickness
Varved	Alternating seams or layers of silt and/or clay and sometimes f. sand

REFERENCE: UNIFIED SOIL CLASSIFICATION SYSTEM - ASTM D2488-93

APPENDIX F: GEOTECHNICAL LABORATORY TESTING REPORTS

Particle Size Distribution Report



% Cobbles	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	27	17	35	15	6	

Test Results (ASTM C 136 & ASTM C 117)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3/4"	100		
1/2"	91		
3/8"	85		
#4	73		
#8	59		
#10	56		
#16	45		
#30	28		
#40	21		
#50	16		
#80	11		
#100	10		
#200	6		

* (no specification provided)

Material Description

Poorly graded Sand with Silt and Gravel (Fill)

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= **AASHTO (M 145)=**

Coefficients

D_{90}= 12.0216 D_{85}= 9.6101 D_{60}= 2.4991
D_{50}= 1.4698 D_{30}= 0.6517 D_{15}= 0.2851
D_{10}= 0.1553 C_u= 16.09 C_c= 1.09

Remarks

Moisture Content: 7.9%

Date Received: 7/2/20 **Date Tested:** 7-7-20

Tested By: Adam Allen

Checked By: Adam Allen

Title: Lab Mananger

Location: B-1 SS01
Sample Number: 2007VT-058

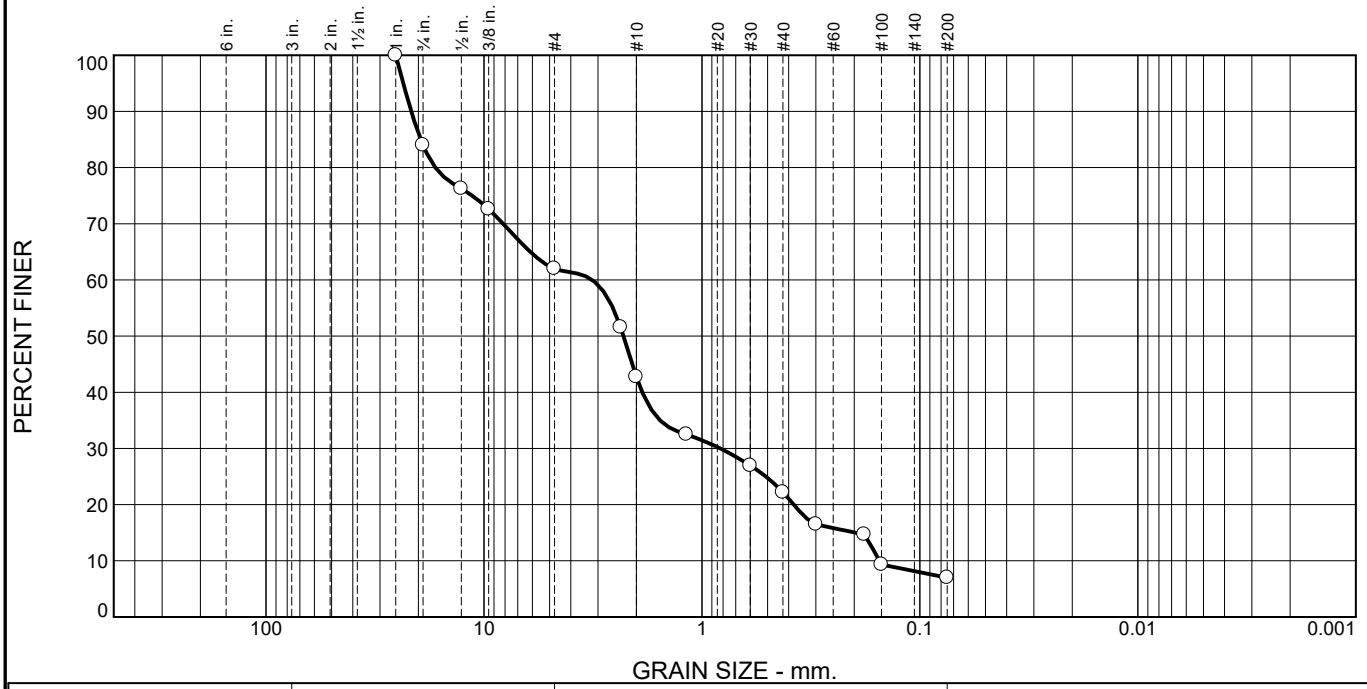
Date Sampled: 7/1/20

JOHN TURNER CONSULTING

Client: IRWA
Project: Pond St Culvert

Project No: 20-04-064 **Figure** 002

Particle Size Distribution Report



% Cobbles	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	16	22	19	21	15	7	

Test Results (ASTM C 136 & ASTM C 117)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100		
3/4"	84		
1/2"	76		
3/8"	73		
#4	62		
#8	52		
#10	43		
#16	32		
#30	27		
#40	22		
#50	16		
#80	15		
#100	9		
#200	7		

* (no specification provided)

Material Description

Poorly graded Sand with Silt and Gravel

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= **AASHTO (M 145)=**

Coefficients

D_{90}= 21.5562 D_{85}= 19.5161 D_{60}= 3.1884
D_{50}= 2.2880 D_{30}= 0.8254 D_{15}= 0.1975
D_{10}= 0.1535 C_u= 20.77 C_c= 1.39

Remarks

Moisture Content: 12.6%

Date Received: 7/2/20 **Date Tested:** 7/7/20

Tested By: Adam Allen

Checked By: Adam Allen

Title: Lab Manager

Location: B-1 SS04
Sample Number: 2007VT-059

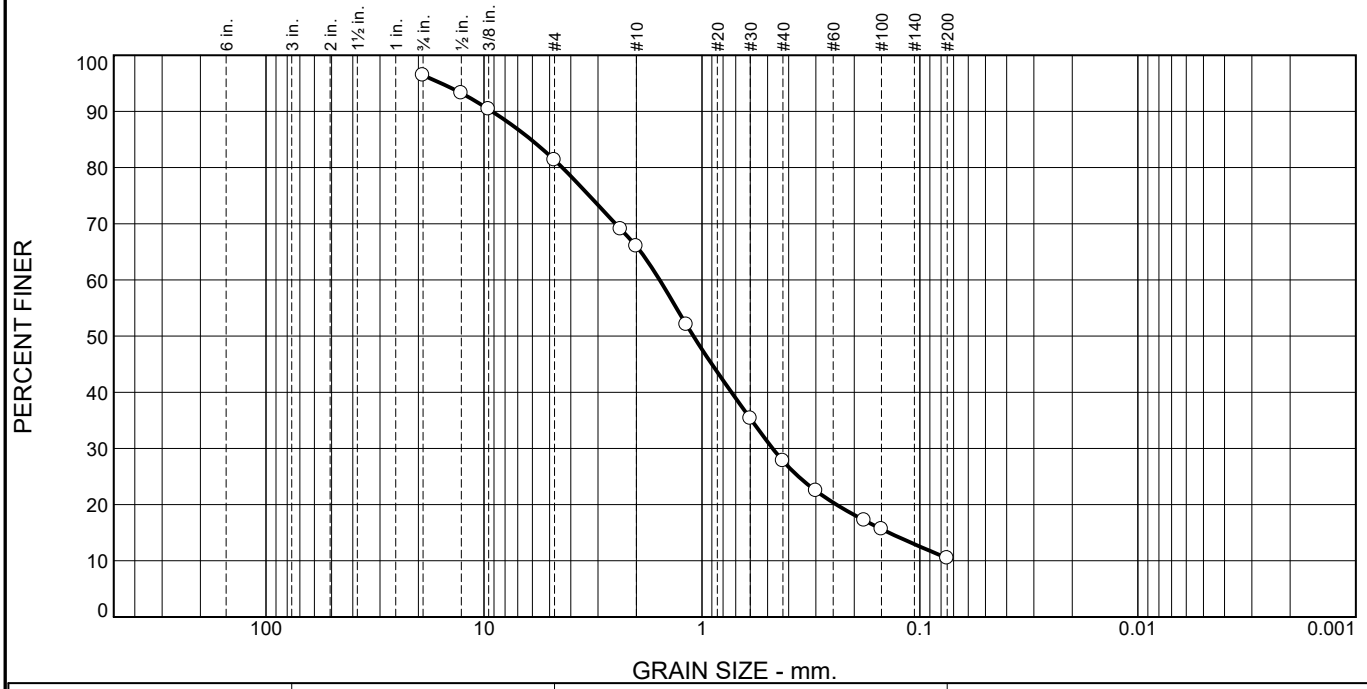
Date Sampled: 7/1/20

JOHN TURNER CONSULTING

Client: IRWA
Project: Pond St Culvert

Project No: 20-04-064 **Figure** 003

Particle Size Distribution Report



% Cobbles	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
		15	15	38	18	10	

Test Results (ASTM C 136 & ASTM C 117)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3/4"	96		
1/2"	93		
3/8"	90		
#4	81		
#8	69		
#10	66		
#16	52		
#30	35		
#40	28		
#50	22		
#80	17		
#100	16		
#200	10		

* (no specification provided)

Material Description

Poorly graded Sand with Silt and Gravel

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= **AASHTO (M 145)=**

Coefficients

D_{90}= 9.1795 D_{85}= 6.0868 D_{60}= 1.5635
D_{50}= 1.0940 D_{30}= 0.4742 D_{15}= 0.1385
D_{10}= C_u= C_c=

Remarks

Moisture Content: 14.4%

Date Received: 7/2/20 **Date Tested:** 7/7/20

Tested By: Adam Allen

Checked By: Adam Allen

Title: Lab Manager

Location: B-2 SS04
Sample Number: 2007VT-057

Date Sampled: 7/1/20

JOHN TURNER CONSULTING

Client: IRWA
Project: Pond St Culvert

Project No: 20-04-064 **Figure** 001

APPENDIX G: SITE PHOTOGRAPHS

JOHN TURNER
CONSULTING

Pond Street Culvert Replacement
Topsfield, Massachusetts

SITE PHOTOGRAPHS

Drill Rig Setup

Culvert and Drill Rig at B-2, Facing South

Sample of Existing Fill

Sample of Sand with Silt and Gravel in B-1

Sample of Sand with Silt and Gravel in B-2

Sample of Sand with Silt

Bay Colony Group, Inc.
Professional Civil Engineers & Land Surveyors

Four School Street
P.O. Box 9136
Foxborough, MA 02035
(508)543-3939
(508)543-8866 fax

MEMORANDUM

August 17, 2020

To: Robert Niccoli, P.E. Deputy Director of Structures, The Engineering Corp.

From: William R. Buckley, Jr., P.E.

RE: Outlet of Hood Pond under Pond Street Topsfield, MA

1.0 Introduction

1.1 Purpose

The purpose of this technical report is to present the results of a study conducted at the culvert conveying the outlet to Hood Pond under Pond Street Topsfield, MA in order to evaluate the hydraulic performance of the existing culvert and to develop an alternative design. This report was prepared in a manner consistent with the Massachusetts Department of Transportation (MassDOT) guidelines for preparation of hydraulic studies at bridge sites modified to account for the preliminary nature of the design.

1.2 Scope

The scope of work for this investigation consisted of review of pertinent hydrologic and hydraulic data for the project site and a detailed hydraulic analysis. Data collected and hydraulic model computer outputs are presented in the appendices of this report. A narrative discussion of the problem statement, engineering methods, as well as results and conclusions of the hydraulic study follow.

1.3 Executive Summary

The Town of Topsfield proposes to replace the existing multi-barrel culvert conveying the outlet to Hood Pond under Pond Street, which is classified as an Urban Local street. The site lies within a National Flood Insurance Program (NFIP) Special Flood Hazard Area (SFHA) as shown on the currently effective National Flood Insurance Rate Map (FIRM) dated 7/3/2012 (Appendix B). Because it lies within a SFHA a "No-Rise" Flood Encroachment Review is necessary for the final design.

2.0 Project Description

2.1 Existing Structure

The subject culvert is located in the Town of Topsfield, MA located within the Pond Street layout adjacent to 1 Pond Street. The Massachusetts State Plane Coordinates (NAD83-feet) are N 3,069,440/E 801,059 (Appendix B). There is no culvert designation and the date of construction is unknown. The culvert consists of: one 12" circular concrete pipe and one 16" circular concrete pipe that are each 33' long, two 12" circular PVC pipes and one 12" circular CMP pipe that are each 40' long. In the model they are numbered 1 through 5 from south to north. None of the pipes have flared-end or headwall structures. The stream flows from north to south to Pye Brook which is about 0.25 mile south of the site. The source of the stream is Hood Pond which lies within Topsfield and Ipswich and its drainage basin is about 2.0 square miles.

There is no evidence of scouring on the upstream or downstream end of the culvert. The culverts are at differing elevations with the northern two culverts (12" concrete and 16" concrete) being partially submerged with no dry passage through them at the time of observation. The southern three culverts are set about 1' higher than the northern culverts and were dry at the time of the survey. The water elevation of Hood Pond was at about elevation 60.6' which is about 0.3' above the invert of the 16" concrete culvert.

The roadway is a two-lane Urban Local roadway approximately 22' wide with no curbing. There is approximately 2.2'-3.4' of cover over the existing pipes to the crown of the roadway. The runoff from the roadway is directed off the roadway into cuts in the pavement on the sides of the road from which points the runoff goes into the stream. The project area was marked by DIGSAFE and there are no underground utilities in the area. (See Conceptual Plan)

2.2 Proposed Action

The principal project action is to upgrade the existing culvert in order to ameliorate the flooding condition that takes place during heavy rain events. The design will be in accordance to the maximum extent practical with the MassDOT LRFD Bridge Manual (Reference 2) and with the Massachusetts Stream Crossing Standard (Reference 6). The horizontal and vertical alignment for the new culvert will remain approximately the same as the northern two culverts (12" concrete & 16" concrete) since they are the structures that are controlling the elevation of the pond during normal flow periods. They are also in an area that has the maximum amount of cover over the pipes since the road elevation is increasing as it goes north from Haverhill Road. We are recommending that the new structure consist of a 10'wide x 4' high open bottom concrete box culvert that will have a natural bottom substrate matching the upstream and downstream condition. The design will pass the 10-year storm in accordance with the MassDOT LRFD Bridge Manual Table 1.3.4-1 with about 2.2' of freeboard within the culvert and no overtopping of the roadway. The design of the structure will be in compliance with the MassDEP Stream Crossing Standards with the main limiting factor being the elevation of the roadway, which limits the height of the proposed culvert to 4', which is less than the optimum standard of 6'. The Openness Ratio will be 0.97 where 0.82 is the minimum standard and 1.62 is the optimum standard. The open bottom will allow the passage of fish and wildlife while

maintaining similar depths of flow and velocity of the upstream and downstream conditions. The span will be 1.25 where 1.2 is suggested and which will be obtained by creating a bench on both sides of the culvert that will allow dry passage for wildlife through the culvert during normal base flow. The invert of the culvert will match the existing 16" culvert which is controlling the water elevation of the pond during normal conditions.

3.0 Data Collection

3.1 Sources and Applications

Reference No.	Title
1	Flood Insurance Rate Map Community Panel Number 25009C0262F, effective date July 3, 2012
2	MassDOT LRFD Bridge Manual, January 2020 Revision
3	US Army Corps of Engineer (USACOE), Hydrologic Engineering Center, HEC-RAS River Analysis System, Version 5.0.7 March, 2019
4	United States Geological Survey (USGS) National Streamflow Statistics (StreamStats), Version 4.3.11
5	US Department of Transportation Federal Highway Administration Hydraulic Engineering Circular No. 18 "Evaluating Scour at Bridges", Fifth Edition, April 2012
6	MassDOT "Design of Bridges and Culverts for Wildlife Passage at Freshwater Streams" December, 2010

4.0 Engineering Methods

4.1 Hydrologic Analysis

The peak flood discharges for the project were developed using the USGS StreamStats program (Reference 4) in accordance with Reference 2 paragraph 1.3.3.3 Hydrologic Analysis. The following is a summary of the discharges at the project site.

Table 1 – Summary of Discharges

Drainage Area (sq. miles)	2-year (cfs)	10-year (cfs)	25-year (cfs)	50-year (cfs)	100-year (cfs)
2.0	36	78	105	127	150

4.2 Hydraulic Analysis

The hydraulic analysis was conducted using the US Army Corps of Engineer (USACOE), Hydrologic Engineering Center, HEC-RAS River Analysis System (Reference 3). HEC-RAS is capable of calculating steady flow water surface profile computations, one- and two-dimensional

unsteady flow simulation, movable boundary sediment transport computations and water quality analysis. For the purposes of this analysis we will be using the steady flow water surface profile module to calculate the water surface profiles for the existing condition and then develop a proposed upgraded design for the project site.

The existing conditions geometry was developed through a combination of field survey conducted by Scott M. Cerrato dated July 26, 2020 and direct observation of the site. Channel and overbank roughness coefficients (Manning's "n") used in the models are 0.03 and 0.1 for the overbanks, 0.03 for the upstream channel, and 0.045 for the downstream channel and these values were based on direct observation and Table 3-1 Manning's "n" Values in the HEC-RAS 5.0 Reference Manual. A normal depth downstream boundary condition slope of 0.0108 was used to determine the initial condition. The entrances to the existing culverts are projecting from the slope. Haverhill Street, a two lane county roadway, is about 70' downstream of the site where a 48" culvert carries the stream under Haverhill Street. We have assumed that the 48" culvert will not create a backflow condition that will impact the project. The existing condition analysis found that weir flow over Pond Street takes place during the 2-year storm event.

The developed conditions were developed using the existing conditions geometry and inserting a 10' wide x 4' high open bottom box culvert with headwalls and wing walls at the same general location as the existing 12" concrete and 16" concrete culverts and removing the other 3 culverts to the south of them. Because the roadway is an Urban Local Street the hydraulic design storm is the 10-year event. The analysis found that the proposed culvert could pass the 10-year event without overtopping the roadway and with 2.2' of freeboard. It will also pass up to the 100-year event without overtopping the roadway. See Table 2 for a summary of the existing and proposed conditions. Detailed data is available in Appendix D.

Table 2 – Summary of Hydraulic Performance

	Return Frequency (years)	Discharge (cfs)	US Water Surface Elevation (ft)	US Velocity (fps)	DS Water Surface Elevation (ft)	DS Velocity (fps)
Existing Culvert	2	36	64.1	6.5-8.3	61.1	7.3-8.8
	10	78	64.4	7.3-8.7	61.5	7.3-8.7
	25	105	64.5	7.5-8.7	61.6	7.5-8.7
	50	127	64.6	7.7-8.7	61.8	7.7-8.7
	100	150	64.7	7.9-8.7	61.9	7.9-8.7
Proposed Open Bottom Box Culvert	2	36	61.4	4.2	60.9	4.0
	10	78	62.2	5.6	61.3	6.2
	25	105	62.6	6.3	61.4	7.0
	50	127	62.9	6.8	61.5	7.4
	100	150	63.2	7.3	61.6	7.8

The elevation of the new culvert was held at elevation 60.3', which is the lowest elevation of the 5 existing pipes under Pond Street and which controls the elevation of Hood Pond. There is currently a beaver deceiver type device currently being used at the inlet. In order to determine if some future device would impact the design, we spoke with Skip Lisle of Beaver Deceivers, LLC. It was his opinion that if some type of device was placed at the inlet it would have no impact on the 10-year design storm because the volume of water would likely sweep it away. Therefore, we have not included in the analysis any impacts from that type of device.

In accordance with the MassDOT LRFD Bridge Manual (Reference 2) the total scour was evaluated for the 25-year frequency storm and the 50-year frequency storm check scour event. The models used are detailed in the Hydraulic Engineering Circular No. 18 (Reference 5) and include contraction scour and abutment scour. We have assumed that the streambed elevation would not measurably degrade over the life of the structure. Using the aforementioned references, we estimate that about 7.7 feet of potential scour could occur along the proposed abutments. The results are listed in Table 3 and Appendix E.

Table 3 – Summary of Calculated Scour

Scour Event	Return Frequency (years)	Discharge (cfs)	Contraction Scour (ft)	Local Abutment Scour (ft)	Total Abutment Scour (ft)
Scour Design Event	25	105	2.2	4.8	7.0
Scour Check Event	50	127	2.5	5.2	7.7

5.0 Conclusions and Recommendations

5.1 Conclusions

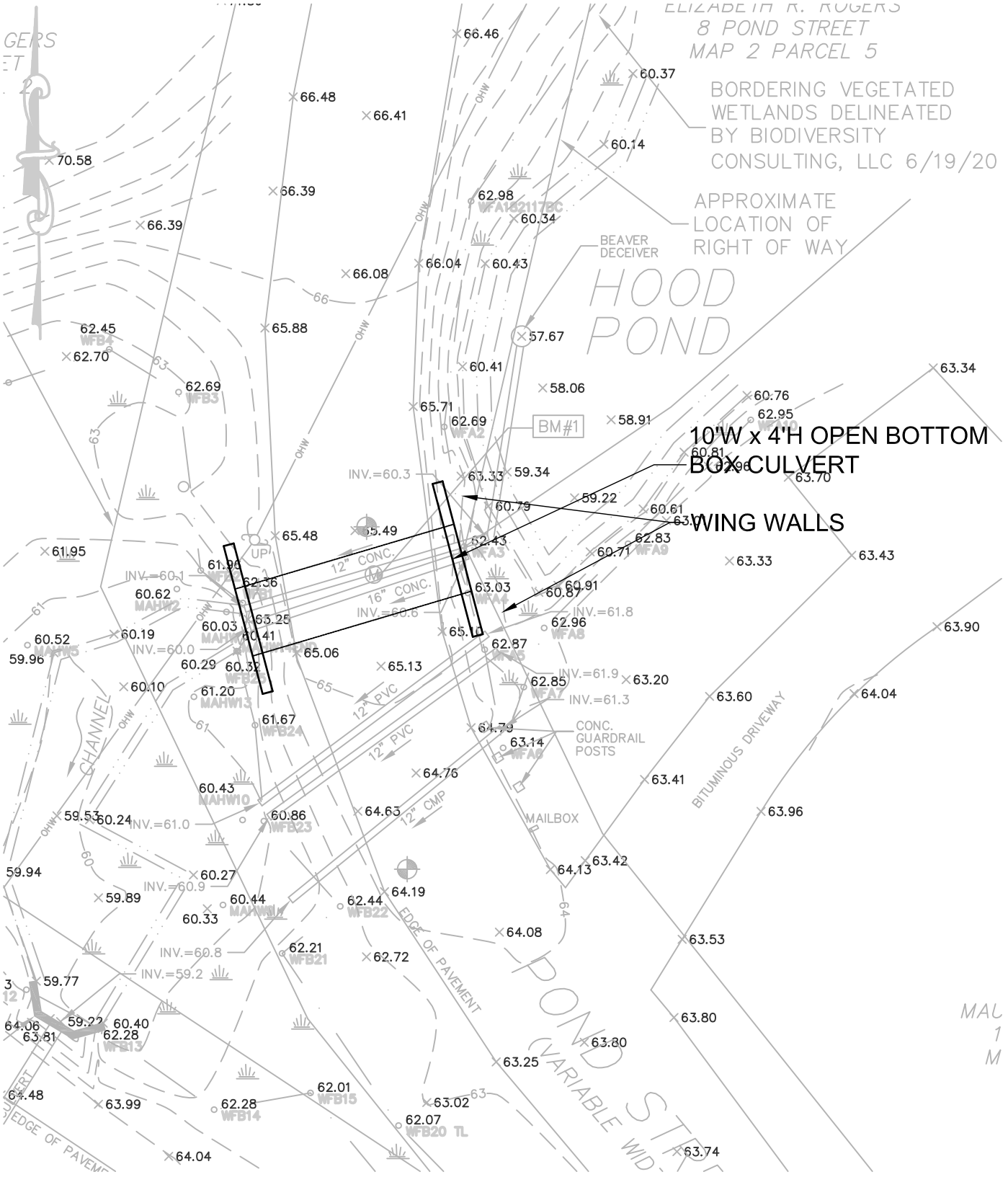
1. Simulations performed with the project hydraulic model indicate that the existing culvert systems will result in runoff overtopping the roadway during the 2-year storm event.
2. The elevation of the existing roadway limits the ability to construct a culvert to the optimum standard as referenced in the MassDEP Stream Crossings Handbook (Reference 6), but the design does meet the general standard to provide fish passage, stream continuity, most wildlife passage and is a significant improvement over the existing condition.
3. The site is within a FEMA SFHA with no base flood elevation and a "no-rise" condition is attained between the pre- and post-development water elevations.

5.2 Recommendations

1. The existing culverts should be removed and replaced with the 10'W x 4'H open bottom precast box culvert with new abutments that extend below the project scour depth. The new culvert should include wing walls and headwalls.
2. The bottom of the culvert shall contain natural streambed material consistent with the material found on the site with a shelf on each side consisting of on-site material and stones that will allow dry wildlife passage.

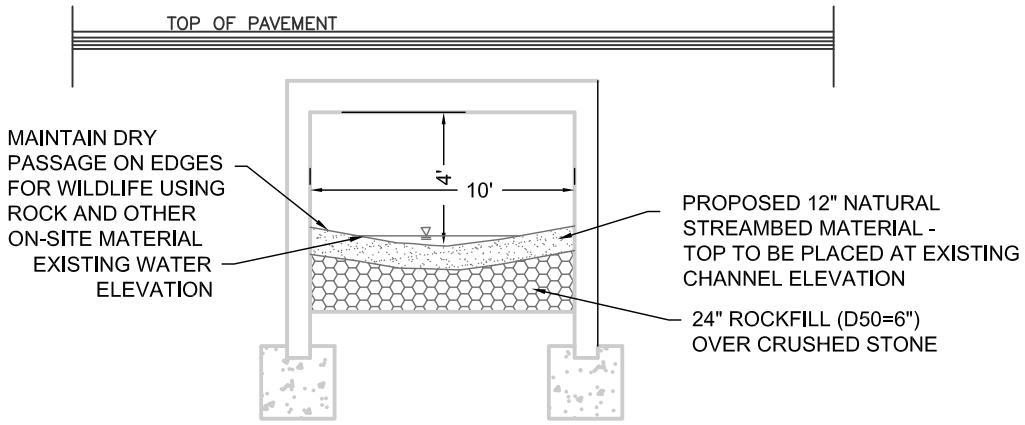
Figures
Conceptual Plan
Conceptual Section

Appendices
A – Photographs
B – FEMA FIRM Community Panel No. 25009C0262F Effective Date: July 3, 2012 Firmette
C – StreamStats Report
D – HEC-RAS Data
E – Scour Calculation Worksheets



BAY COLONY GROUP, INC.
FOUR SCHOOL STREET
FOXBOROUGH, MA 02035
(508) 543-3939

CONCEPTUAL DESIGN
POND STREET CULVERT
TOPSFIELD, MA
AUGUST 18, 2020
SCALE: 1"= 20'



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FOUR SCHOOL STREET
FOXBOROUGH, MA 02035
(508) 543-3939

CULVERT SECTION
POND STREET
TOPSFIELD, MA
AUGUST 18, 2020
NOT TO SCALE

Appendix A – Photographs

2-12” PVC Outlets

12” CMP Inlet

Downstream Channel

16” Concrete Outlet

Appendix B

- FEMA FIRM Community Panel No. 25009C0262F Effective Date: July 3, 2012
- USGS Extract

National Flood Hazard Layer FIRMette

FEMA

70°57'59"W 42°40'23"N

70°57'21"W 42°39'56"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 Cross Sections with 1% Annual Chance / Water Surface Elevation
- Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

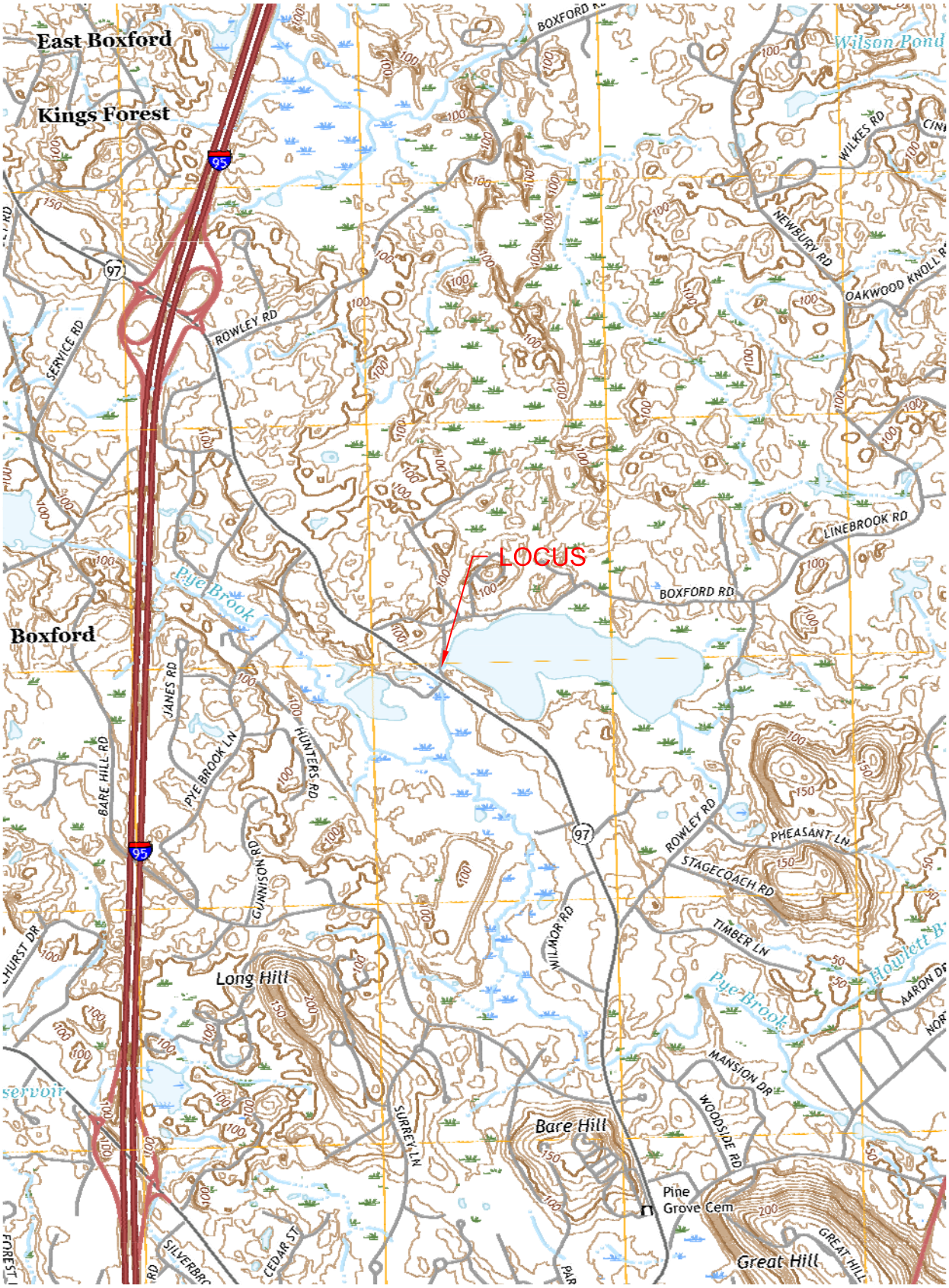
N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 8/17/2020 at 11:59 AM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.



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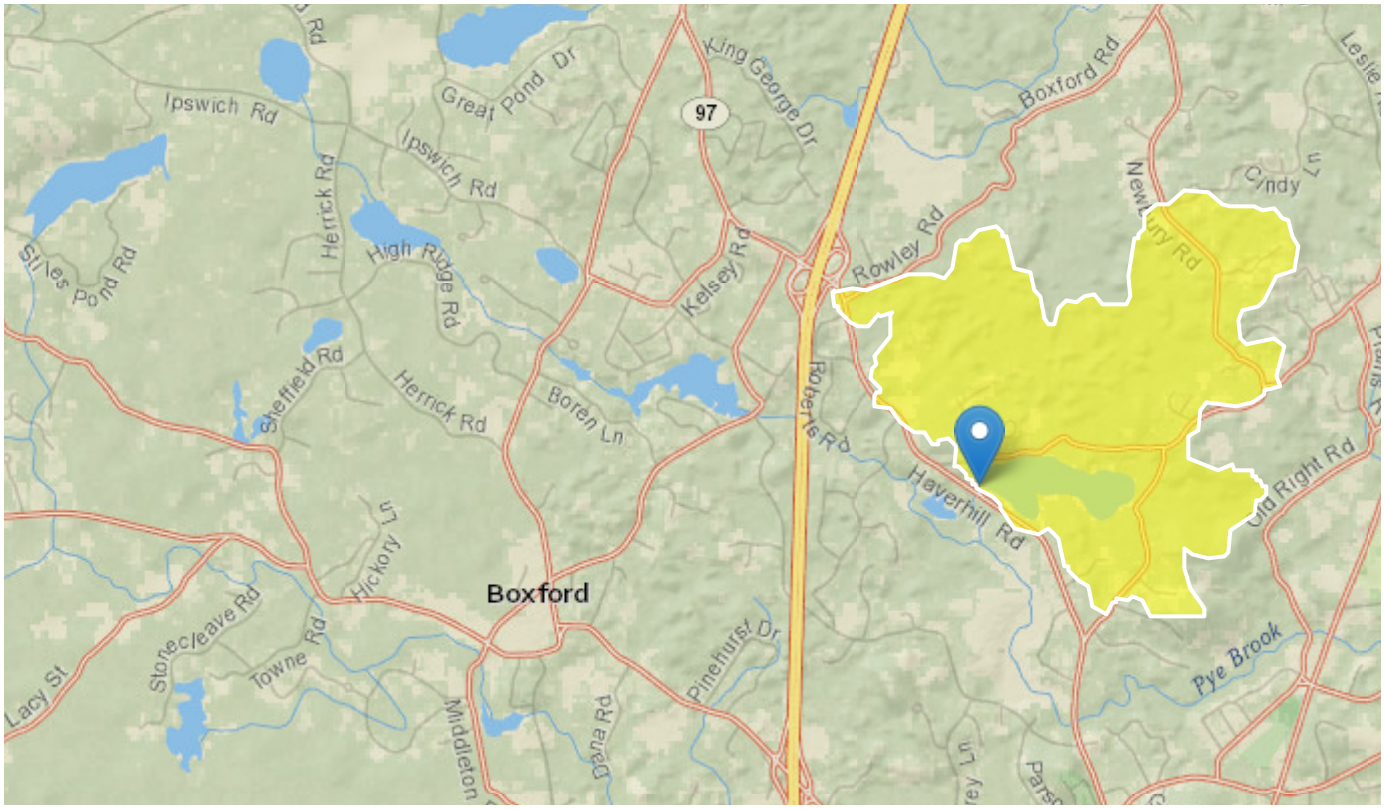
FOXBOROUGH, MA 02035
(508) 543-3939

USGS EXTRACT
GEORGETOWN QUADRANGLE
TOPSFIELD, MA
2012
SCALE: 1:24,000

Appendix C – StreamStats Report

StreamStats Report - Pond Street Topsfield, MA

Region ID: MA
Workspace ID: MA20200907194500777000
Clicked Point (Latitude, Longitude): 42.66950, -70.96129
Time: 2020-09-07 15:45:17 -0400



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	2.01	square miles
ELEV	Mean Basin Elevation	86.9	feet
LC06STOR	Percentage of water bodies and wetlands determined from the NLCD 2006	29.28	percent

Peak-Flow Statistics Parameters[Peak Statewide 2016 5156]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	2.01	square miles	0.16	512
ELEV	Mean Basin Elevation	86.9	feet	80.6	1948
LC06STOR	Percent Storage from NLCD2006	29.28	percent	0	32.3

Peak-Flow Statistics Flow Report[Peak Statewide 2016 5156]

PII: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PII	PIu	SEp
2 Year Peak Flood	36	ft^3/s	18.4	70.5	42.3
5 Year Peak Flood	59.7	ft^3/s	30	119	43.4
10 Year Peak Flood	78.4	ft^3/s	38.5	160	44.7
25 Year Peak Flood	105	ft^3/s	49.8	221	47.1
50 Year Peak Flood	127	ft^3/s	58.4	276	49.4
100 Year Peak Flood	150	ft^3/s	66.8	337	51.8
200 Year Peak Flood	175	ft^3/s	75.7	405	54.1
500 Year Peak Flood	210	ft^3/s	86.6	509	57.6

Peak-Flow Statistics Citations

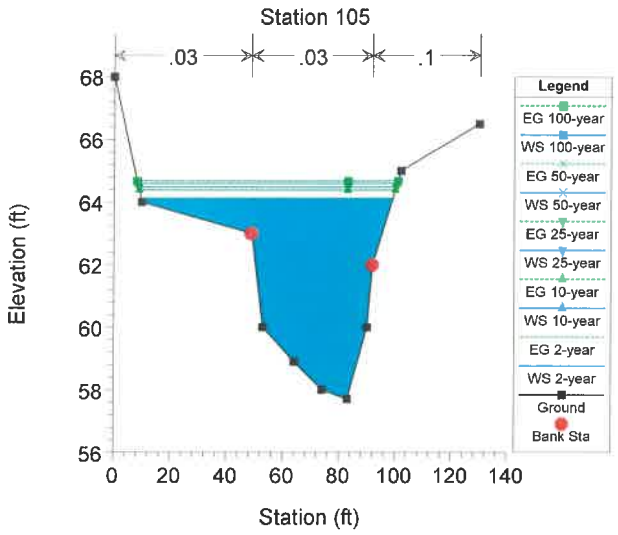
Zarriello, P.J.,2017, Magnitude of flood flows at selected annual exceedance probabilities for streams in Massachusetts: U.S. Geological Survey Scientific Investigations Report 2016–5156, 99 p. (https://dx.doi.org/10.3133/sir20165156)

Appendix D – HEC-RAS Data

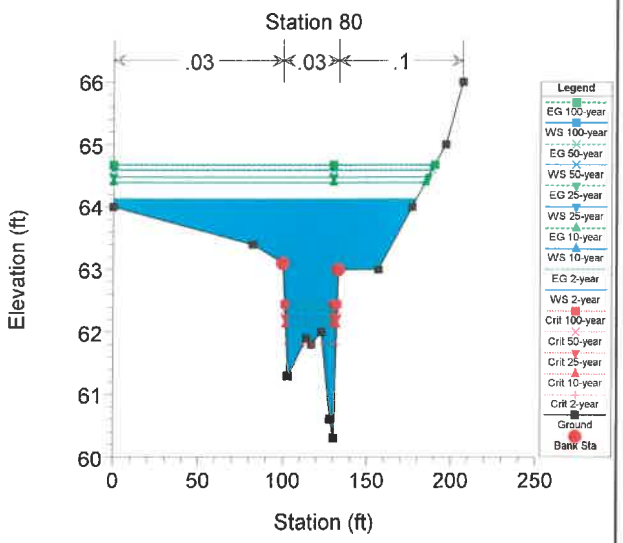
X-Sections Existing Conditions

Reach	River Station	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Pond Street	105	2-year	36.0	57.7	64.13		64.13	0.000001	0.16	251	89	0.01
Pond Street	105	10-year	78.0	57.7	64.40		64.40	0.000005	0.32	275	91	0.02
Pond Street	105	25-year	105.0	57.7	64.48		64.49	0.000008	0.42	283	91	0.03
Pond Street	105	50-year	127.0	57.7	64.60		64.60	0.000011	0.5	293	92	0.04
Pond Street	105	100-year	150.0	57.7	64.68		64.68	0.000014	0.58	301	93	0.04
Pond Street	80	2-year	36.0	60.3	64.13	61.80	64.13	0.000015	0.34	174	180	0.04
Pond Street	80	10-year	78.0	60.3	64.39	62.12	64.40	0.000038	0.58	222	185	0.06
Pond Street	80	25-year	105.0	60.3	64.48	62.24	64.49	0.000058	0.73	238	187	0.08
Pond Street	80	50-year	127.0	60.3	64.59	62.35	64.60	0.000068	0.81	259	189	0.08
Pond Street	80	100-year	150.0	60.3	64.67	62.45	64.68	0.000081	0.91	274	190	0.09
Pond Street	60		Culvert									
Pond Street	45	2-year	36.0	60	61.09	61.02	61.19	0.025722	2.52	14	43	0.77
Pond Street	45	10-year	78.0	60	61.33		61.48	0.020741	3.17	25	45	0.75
Pond Street	45	25-year	105.0	60	61.45		61.64	0.019565	3.47	30	46	0.75
Pond Street	45	50-year	127.0	60	61.54		61.75	0.018665	3.67	35	47	0.75
Pond Street	45	100-year	150.0	60	61.64		61.87	0.017706	3.84	39	47	0.75
Pond Street	0	2-year	36.0	59.4	60.40	60.23	60.46	0.010819	2.07	17	37	0.53
Pond Street	0	10-year	78.0	59.4	60.70	60.44	60.81	0.010806	2.69	29	42	0.57
Pond Street	0	25-year	105.0	59.4	60.84	60.56	60.98	0.010802	2.95	36	44	0.58
Pond Street	0	50-year	127.0	59.4	60.95	60.65	61.11	0.010806	3.13	41	46	0.59
Pond Street	0	100-year	150.0	59.4	61.05	60.73	61.22	0.010813	3.33	45	48	0.6

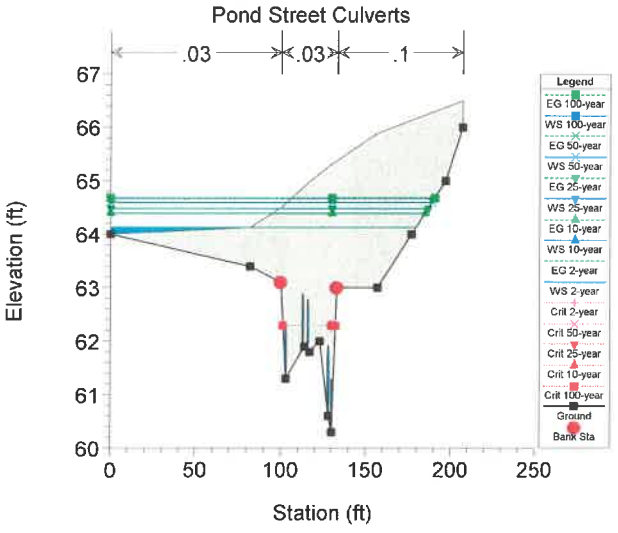
20-0160 Pond Street Topsfield Plan: Existing Plan 8/17/2020



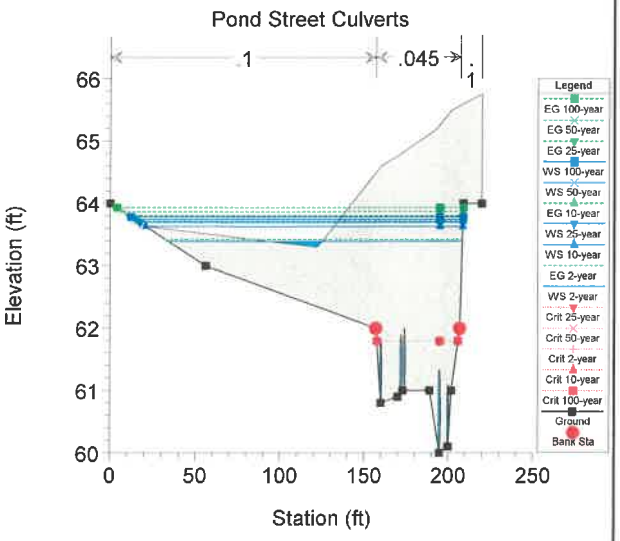
20-0160 Pond Street Topsfield Plan: Existing Plan 8/17/2020



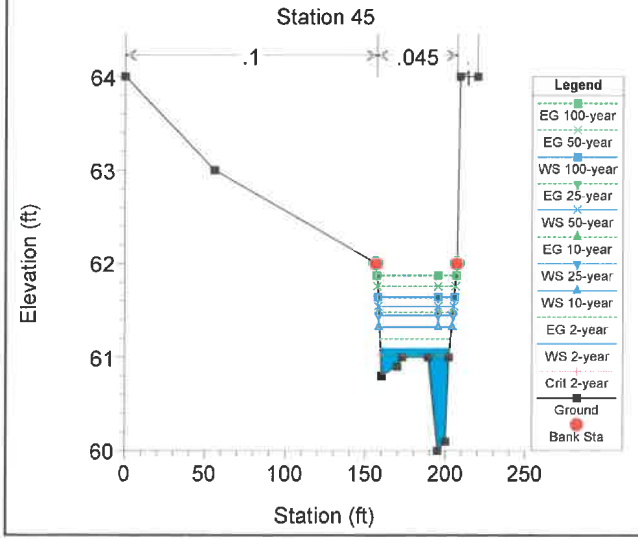
20-0160 Pond Street Topsfield Plan: Existing Plan 8/17/2020



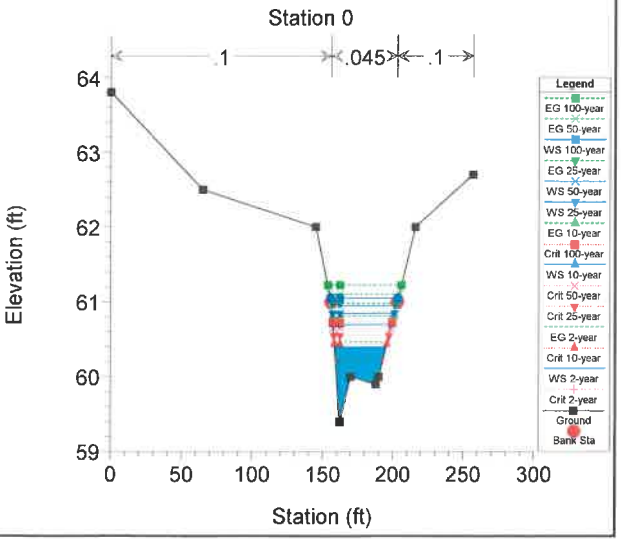
20-0160 Pond Street Topsfield Plan: Existing Plan 8/17/2020



20-0160 Pond Street Topsfield Plan: Existing Plan 8/17/2020

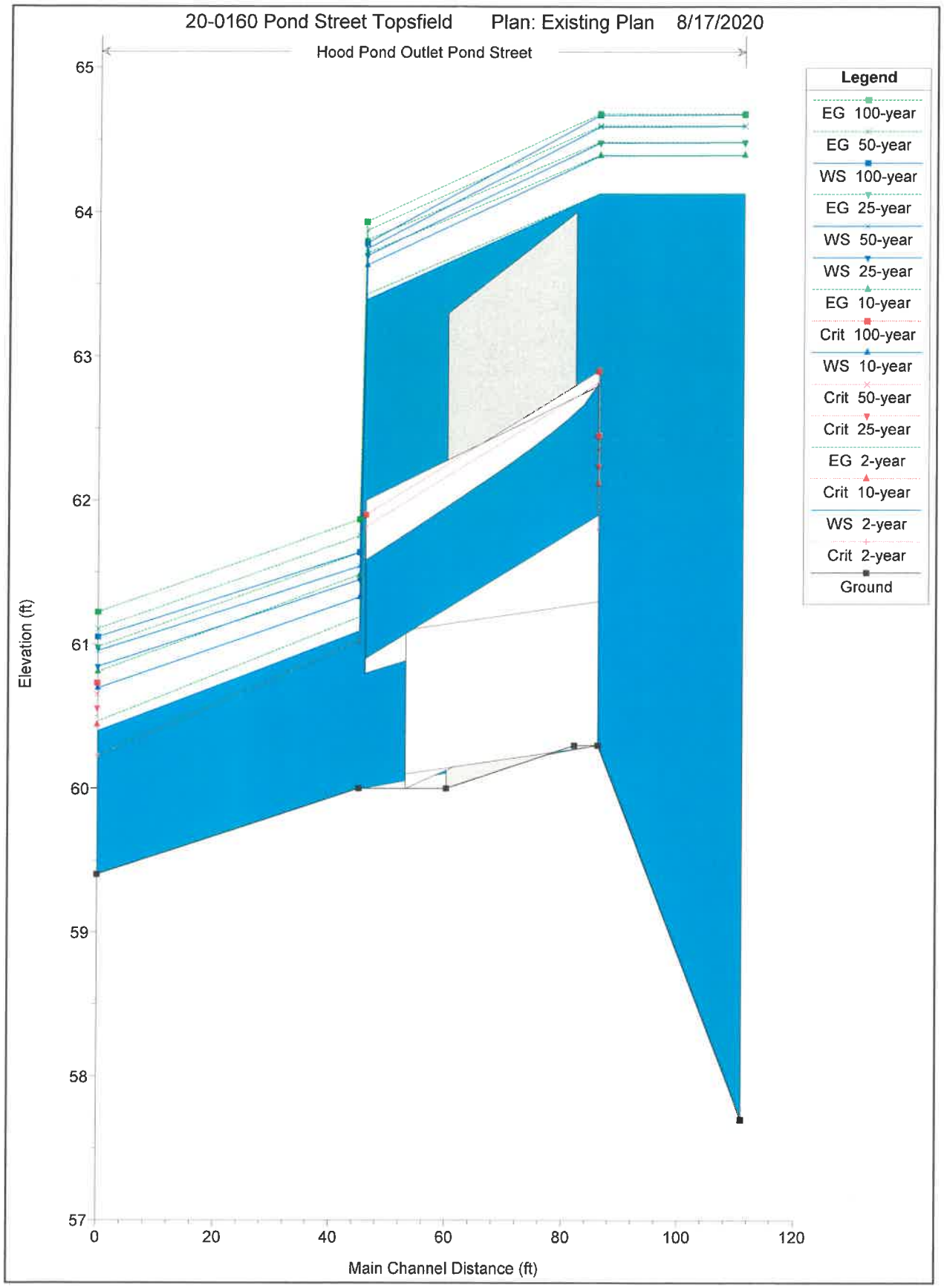


20-0160 Pond Street Topsfield Plan: Existing Plan 8/17/2020



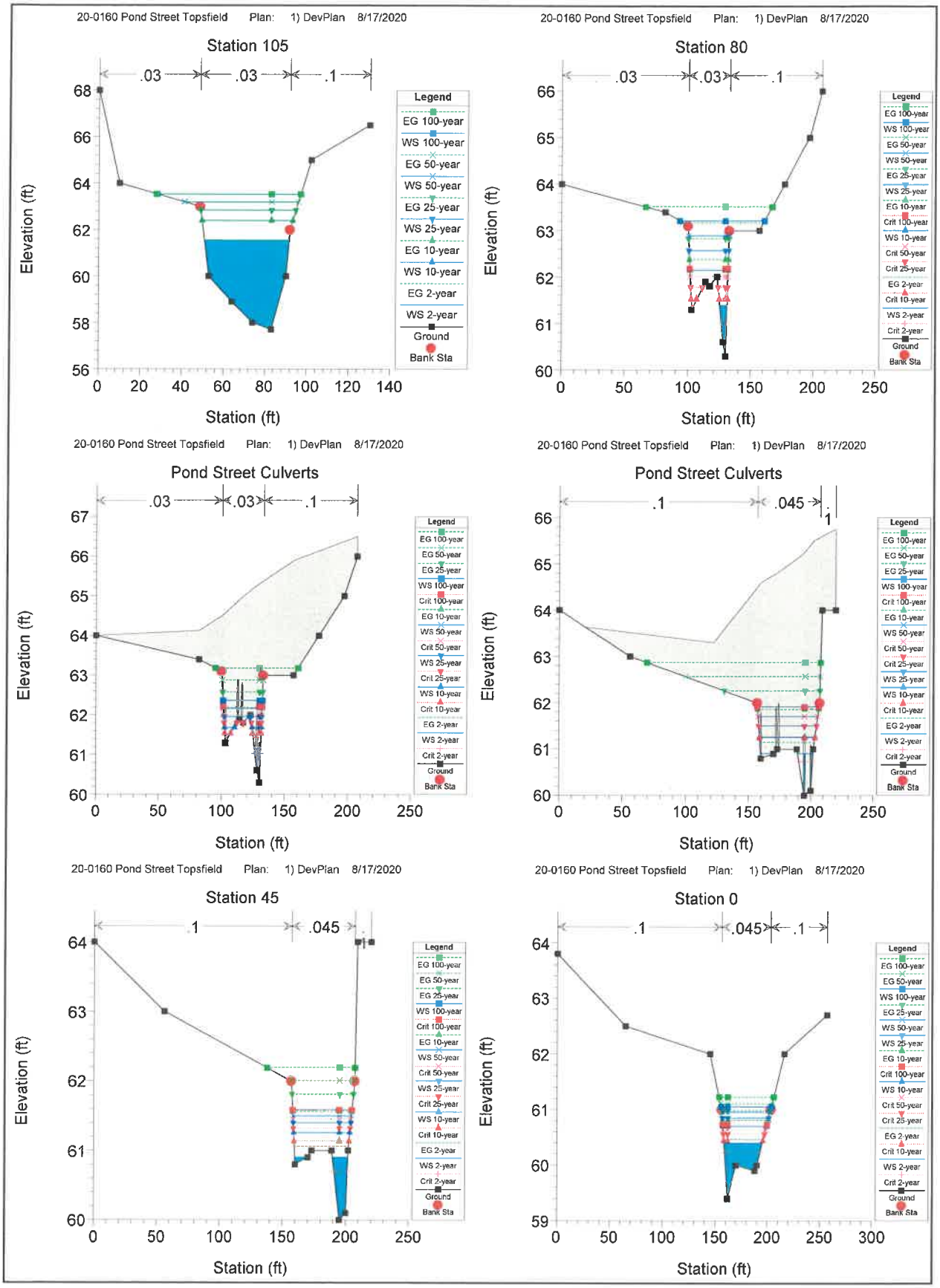
Culverts - Existing Conditions

Reach	River Station	Type	Profile	EG US (ft)	WS US (ft)	Weir Flow Elev (ft)	Weir Flow Q (ft/s)	Flow Q Culvert (ft/s)	Culv Vel US (ft/s)	Culv Vel DS (ft/s)	EG DS (ft)	WS DS (ft)
Pond Street	60	Culvert #1	2-year	64.13	64.13	64.01	5.75	2.17	7.32	7.32	61.19	61.09
Pond Street	60	Culvert #2	2-year	64.13	64.13	64.01	5.03	2.17	6.66	8.75	61.19	61.09
Pond Street	60	Culvert #3	2-year	64.13	64.13	64.01	5.09	2.17	6.47	8.32	61.19	61.09
Pond Street	60	Culvert #4	2-year	64.13	64.13	64.01	11.56	2.17	8.32	8.32	61.19	61.09
Pond Street	60	Culvert #5	2-year	64.13	64.13	64.01	6.40	2.17	8.15	8.15	61.19	61.09
Pond Street	60	Culvert #1	10-year	64.40	64.39	64.01	6.07	42.43	7.73	7.73	61.48	61.33
Pond Street	60	Culvert #2	10-year	64.40	64.39	64.01	5.97	42.43	7.72	7.60	61.48	61.33
Pond Street	60	Culvert #3	10-year	64.40	64.39	64.01	5.74	42.43	7.31	7.31	61.48	61.33
Pond Street	60	Culvert #4	10-year	64.40	64.39	64.01	12.08	42.43	8.70	8.70	61.48	61.33
Pond Street	60	Culvert #5	10-year	64.40	64.39	64.01	6.45	42.43	8.21	8.21	61.48	61.33
Pond Street	60	Culvert #1	25-year	64.49	64.48	64.01	6.17	68.41	7.86	7.86	61.64	61.45
Pond Street	60	Culvert #2	25-year	64.49	64.48	64.01	6.09	68.41	7.87	7.75	61.64	61.45
Pond Street	60	Culvert #3	25-year	64.49	64.48	64.01	5.90	68.41	7.51	7.51	61.64	61.45
Pond Street	60	Culvert #4	25-year	64.49	64.48	64.01	12.02	68.41	8.65	8.65	61.64	61.45
Pond Street	60	Culvert #5	25-year	64.49	64.48	64.01	6.41	68.41	8.16	8.16	61.64	61.45
Pond Street	60	Culvert #1	50-year	64.60	64.59	64.01	6.31	90.69	8.04	8.04	61.75	61.54
Pond Street	60	Culvert #2	50-year	64.60	64.59	64.01	6.25	90.69	8.06	7.96	61.75	61.54
Pond Street	60	Culvert #3	50-year	64.60	64.59	64.01	6.08	90.69	7.74	7.74	61.75	61.54
Pond Street	60	Culvert #4	50-year	64.60	64.59	64.01	12.06	90.69	8.68	8.68	61.75	61.54
Pond Street	60	Culvert #5	50-year	64.60	64.59	64.01	6.44	90.69	8.20	8.20	61.75	61.54
Pond Street	60	Culvert #1	100-year	64.68	64.67	64.01	6.40	112.58	8.15	8.15	61.87	61.64
Pond Street	60	Culvert #2	100-year	64.68	64.67	64.01	6.37	112.58	8.21	8.11	61.87	61.64
Pond Street	60	Culvert #3	100-year	64.68	64.67	64.01	6.18	112.58	7.87	7.87	61.87	61.64
Pond Street	60	Culvert #4	100-year	64.68	64.67	64.01	12.04	112.58	8.67	8.67	61.87	61.64
Pond Street	60	Culvert #5	100-year	64.68	64.67	64.01	6.43	112.58	8.18	8.18	61.87	61.64


20-0160 Pond Street Topsfield Plan: Existing Plan 8/17/2020
Hood Pond Outlet Pond Street
Legend
EG 100-year
EG 50-year
WS 100-year
EG 25-year
WS 50-year
WS 25-year
EG 10-year
Crit 100-year
WS 10-year
Crit 50-year
Crit 25-year
EG 2-year
Crit 10-year
WS 2-year
Crit 2-year
Ground
Elevation (ft)
65
64
63
62
61
60
59
58
57
0
20
40
60
80
100
120
Main Channel Distance (ft)

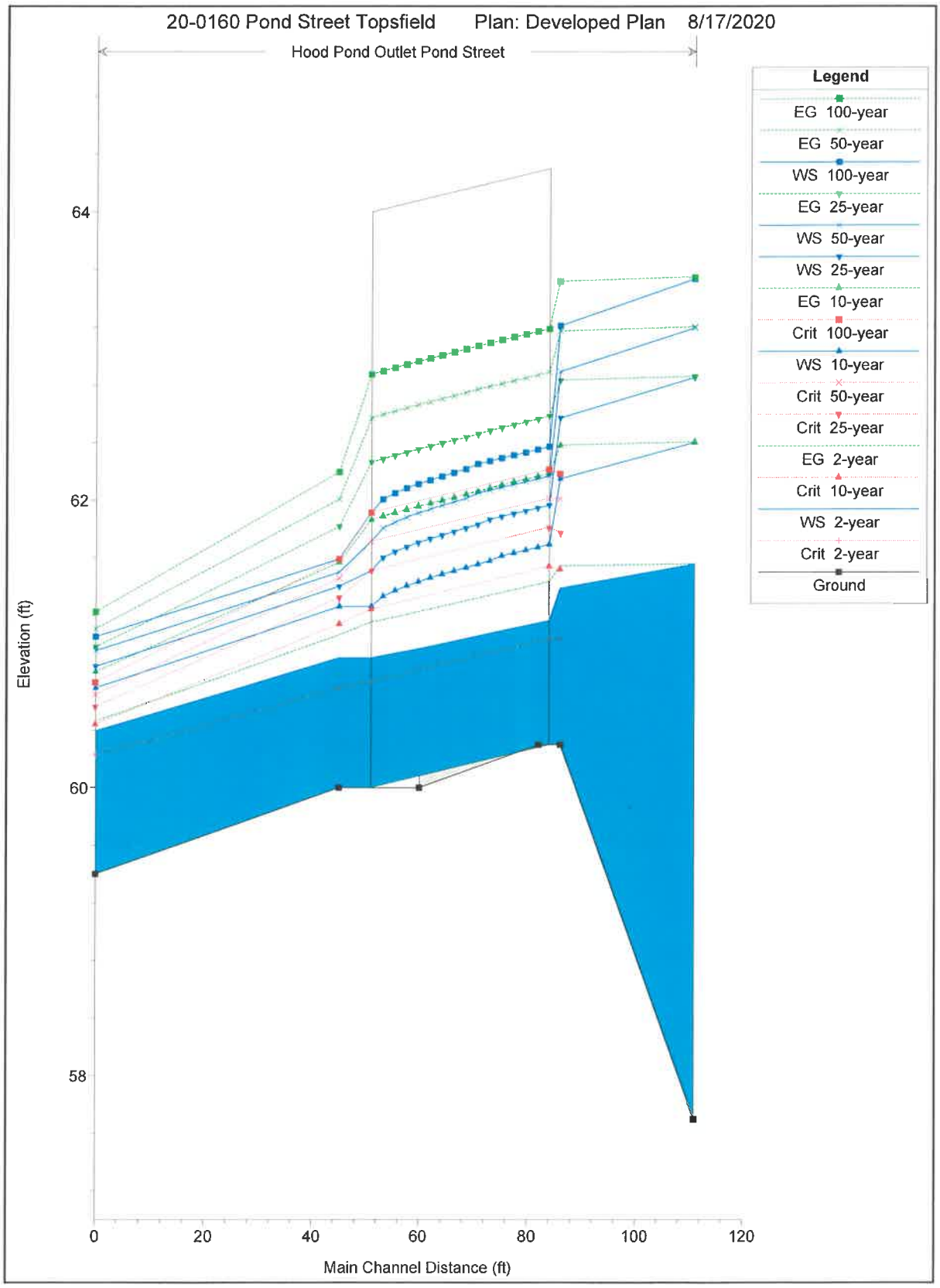
X-Sections Developed Conditions

Reach	River Station	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Pond Street	105	2-year	36.0	57.70	61.56		61.56	0.000012	0.33	109.00	41.00	0.04
Pond Street	105	10-year	78.0	57.70	62.40		62.40	0.000025	0.54	145.00	44.00	0.05
Pond Street	105	25-year	105.0	57.70	62.85		62.86	0.000030	0.64	165.00	46.00	0.06
Pond Street	105	50-year	127.0	57.70	63.20		63.20	0.000033	0.71	182.00	55.00	0.06
Pond Street	105	100-year	150.0	57.70	63.54		63.54	0.000035	0.77	202.00	69.00	0.06
Pond Street	80	2-year	36.0	60.30	61.39	61.03	61.54	0.004503	3.15	11.00	13.00	0.54
Pond Street	80	10-year	78.0	60.30	62.15	61.52	62.38	0.004045	3.86	20.00	33.00	0.54
Pond Street	80	25-year	105.0	60.30	62.57	61.77	62.83	0.003455	4.09	26.00	34.00	0.51
Pond Street	80	50-year	127.0	60.30	62.89	62.01	63.17	0.003157	4.26	30.00	35.00	0.50
Pond Street	80	100-year	150.0	60.30	63.21	62.18	63.51	0.002885	4.42	34.00	68.00	0.48
Pond Street	60		Culvert									
Pond Street	45	2-year	36.0	60.00	60.90	60.69	61.06	0.014084	3.20	11.00	25.00	0.65
Pond Street	45	10-year	78.0	60.00	61.26	61.14	61.57	0.020768	4.44	18.00	46.00	0.82
Pond Street	45	25-year	105.0	60.00	61.40	61.32	61.81	0.023800	5.16	20.00	47.00	0.89
Pond Street	45	50-year	127.0	60.00	61.50	61.46	62.00	0.026245	5.71	22.00	47.00	0.95
Pond Street	45	100-year	150.0	60.00	61.59	61.59	62.19	0.028627	6.23	24.00	48.00	1.00
Pond Street												
Pond Street	0	2-year	36.0	59.40	60.40	60.23	60.46	0.010819	2.07	17.00	37.00	0.53
Pond Street	0	10-year	78.0	59.40	60.70	60.44	60.81	0.010806	2.69	29.00	42.00	0.57
Pond Street	0	25-year	105.0	59.40	60.84	60.56	60.98	0.010802	2.95	36.00	44.00	0.58
Pond Street	0	50-year	127.0	59.40	60.95	60.65	61.11	0.010805	3.13	41.00	46.00	0.59
Pond Street	0	100-year	150.0	59.40	61.05	60.73	61.22	0.010813	3.33	45.00	48.00	0.60


20-0160 Pond Street Topsfield Plan: 1) DevPlan 8/17/2020
Station 105
.03
.03
.1
Elevation (ft)
Station (ft)
Legend
EG 100-year
WS 100-year
EG 50-year
WS 50-year
EG 25-year
WS 25-year
EG 10-year
WS 10-year
EG 2-year
WS 2-year
Ground
Bank Sta
20-0160 Pond Street Topsfield Plan: 1) DevPlan 8/17/2020
Station 80
.03
.03
.1
Elevation (ft)
Station (ft)
Legend
EG 100-year
WS 100-year
EG 50-year
WS 50-year
EG 25-year
WS 25-year
EG 10-year
Crit 100-year
WS 10-year
Crit 50-year
Crit 25-year
EG 2-year
Crit 10-year
WS 2-year
Crit 2-year
Ground
Bank Sta
20-0160 Pond Street Topsfield Plan: 1) DevPlan 8/17/2020
Pond Street Culverts
.03
.03
.1
Elevation (ft)
Station (ft)
Legend
EG 100-year
EG 50-year
EG 25-year
WS 100-year
Crit 100-year
EG 10-year
WS 50-year
Crit 50-year
WS 25-year
Crit 25-year
WS 10-year
Crit 10-year
EG 2-year
WS 2-year
Crit 2-year
Ground
Bank Sta
20-0160 Pond Street Topsfield Plan: 1) DevPlan 8/17/2020
Pond Street Culverts
.1
.045
.1
Elevation (ft)
Station (ft)
Legend
EG 100-year
EG 50-year
EG 25-year
WS 100-year
Crit 100-year
EG 10-year
WS 50-year
Crit 50-year
WS 25-year
Crit 25-year
WS 10-year
Crit 10-year
EG 2-year
WS 2-year
Crit 2-year
Ground
Bank Sta
20-0160 Pond Street Topsfield Plan: 1) DevPlan 8/17/2020
Station 45
.1
.045
Elevation (ft)
Station (ft)
Legend
EG 100-year
EG 50-year
EG 25-year
WS 100-year
Crit 100-year
EG 10-year
WS 50-year
Crit 50-year
WS 25-year
Crit 25-year
WS 10-year
Crit 10-year
EG 2-year
WS 2-year
Crit 2-year
Ground
Bank Sta
20-0160 Pond Street Topsfield Plan: 1) DevPlan 8/17/2020
Station 0
.1
.045
.1
Elevation (ft)
Station (ft)
Legend
EG 100-year
EG 50-year
WS 100-year
EG 25-year
WS 50-year
WS 25-year
EG 10-year
Crit 100-year
WS 10-year
Crit 50-year
Crit 25-year
EG 2-year
Crit 10-year
WS 2-year
Crit 2-year
Ground
Bank Sta

Culvert Developed Conditions

Reach	River Station	Type	Profile	EG US (ft)	WS US (ft)	Weir Flow Elev (ft)	Weir Flow Q (ft/s)	Flow Q Culvert (ft/s)	Culv Vel US (ft/s)	Culv Vel DS (ft/s)	EG DS (ft)	WS DS (ft)
Pond Street	60	Box Culvert	2-year	61.54	61.39	65.11	0	36	4.17	3.99	61.06	60.90
Pond Street	60	Box Culvert	10-year	62.38	62.15	65.11	0	78.3	5.63	6.22	61.57	61.26
Pond Street	60	Box Culvert	25-year	62.83	62.57	65.11	0	105	6.31	6.96	61.81	61.40
Pond Street	60	Box Culvert	50-year	63.17	62.89	65.11	0	127	6.80	7.42	62.00	61.50
Pond Street	60	Box Culvert	100-year	63.51	63.21	65.11	0	150	7.25	7.84	62.19	61.59


20-0160 Pond Street Topsfield Plan: Developed Plan 8/17/2020
Hood Pond Outlet Pond Street
Legend
EG 100-year
EG 50-year
WS 100-year
EG 25-year
WS 50-year
WS 25-year
EG 10-year
Crit 100-year
WS 10-year
Crit 50-year
Crit 25-year
EG 2-year
Crit 10-year
WS 2-year
Crit 2-year
Ground
Elevation (ft)
64
62
60
58
0
20
40
60
80
100
120
Main Channel Distance (ft)

Appendix E – Scour Calculation Worksheets

intertek psi

Professional Service Industries, Inc.
480 Neponset Street, Suite 9C
Canton, MA 02021

Phone: (781) 821-2355
Fax: (781) 821-6276

Report No: MAT:0446516-34-S1
Issue No: 1

Material Test Report

Client: BAY COLONY GROUP **CC:**
4 SCHOOL ST., P.O. BOX 9136
FOXBORO, MA 02035

Project: BAY COLONY GROUP - LAB TESTING
CANTON, MA

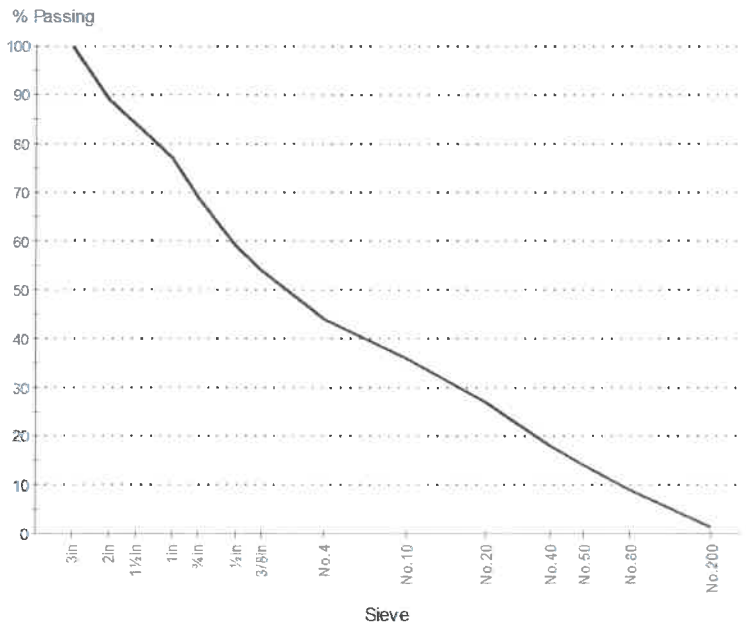
Approved Signatory: Yannick Lastennet (Department Manager)
Date of Issue: 8/25/2020

Sample Details

Sample ID:	0446516-34-S1
Client Sample ID:	
Date Sampled:	08/20/20
Sampled By:	Others
Specification:	No Spec. Sieve
Supplier:	
Source:	
Material:	Sandy Gravel with Organics
Sampling Method:	
General Location:	Upstream Sample - Pond St. Culvert in Topsfield, MA

Sample Description:

Particle Size Distribution



COBBLES	GRAVEL		SAND			FINES (1.3%)	
(0.0%)	Coarse (30.8%)	Fine (25.2%)	Coarse (8.0%)	Medium (17.9%)	Fine (16.8%)	Silt	Clay

Grading: ASTM C 136, ASTM C 117

Drying by: Natural
Date Tested: 8/20/2020
Tested By: Gary Brooks

Sieve Size	% Passing	Limits
3in (75.0mm)	100	
2in (50.0mm)	89	
1½in (37.5mm)	84	
1in (25.0mm)	77	
¾in (19.0mm)	69	
½in (12.5mm)	59	
3/8in (9.5mm)	54	
No.4 (4.75mm)	44	
No.10 (2.0mm)	36	
No.20 (850µm)	27	
No.40 (425µm)	18	
No.50 (300µm)	14	
No.80 (180µm)	9	
No.200 (75µm)	1.3	

D85: 39.7209 **D60:** 13.0345 **D50:** 7.1997
D30: 1.1305 **D15:** 0.3273 **D10:** 0.1994
Cu: 65.38 **Cc:** 0.49

Project Name:	Pond Street Topsfield
Project Location:	Pond Street Topsfield
Project Job Number:	20-0160

MassDOT Modified Froehlich Equation for Abutment Scour

$Y_s/Y_a=2.27\ K_1K_2\ (L'/Y_a)^{0.43}\ Fr^{0.61}$

K_1 = coefficient for abutment shape

K_2 = coefficient for angle of embankment to flow

L' = length of abutment projected normal to flow, ft

Y_a = average depth of flow in the floodplain, ft

A_e = the flow area of the approach cross section obstructed by the embankment, ft^2

Fr = Froude Number

$V_e = Q_e / A_e$, ft/sec

Q_e = the flow obstructed by the abutment and approach embankments, ft^3/sec

Y_s = scour depth, ft

Data Input

Abutment Location:

Y_a = average depth of flow in the floodplain, ft

K_1 = coefficient for abutment shape

K_2 = coefficient for angle of embankment to flow

L' = length of abutment projected normal to flow, ft

Q_e = the flow obstructed by the abutment and approach embankments, ft^3/sec

A_e = the flow area of the approach cross section obstructed by the embankment, ft^2

$V_e = Q_e / A_e$, ft/sec

Fr = Froude Number

	25-yr Frequency	
	Left	**Right**
Y_a	1.8	1.8
K_1	0.82	0.82
K_2	1.0	1.0
L'	10.9	10.9
Q_e	0.1	0.1
A_e	0.1	0.1
V_e	1.0	1.0
Fr	0.510	0.510

	50-yr Frequency	
	Left	**Right**
Y_a	2.1	2.1
K_1	0.82	0.82
K_2	1.0	1.0
L'	10.9	10.9
Q_e	0.1	0.1
A_e	0.1	0.1
V_e	1.0	1.0
Fr	0.500	0.500

Data Output

	Left	Right	
Ys =	4.8	4.8	ft

	Left	Right	
Ys =	5.2	5.2	ft

Bay Colony Group, Inc.
4 School Street
Foxborough, MA 02035

Project Name:	Pond Street Topsfield, MA
Project Location:	Pond Street Topsfield, MA
Project Job Number:	20-0160
Frequency Event:	25-year

Determine Critical Velocity

$V_c = K_u y^{1/6} D^{1/3}$

V_c = Critical velocity above which bed material of D and smaller will be transported, ft/s

y = Average depth of flow upstream of the bridge, ft

D = Particle size for V_c, ft

D_{50} = Particle size in a mixture of which 50% are smaller, ft

K_u = 11.17

Data Input

y =	4.0	ft
D =	0.023621	ft
K_u =	11.17	

Velocity Upstream of Bridge = 0.6 ft/sec

Data Output

V_c = **4.0** ft/sec

Critical velocity V_c is greather than mean velocity V therefore clear water condition

HEC - 18 Scour Equation for Open Bottom Cluverts (Clear Water Condition w/Wing Wall)

$y_{max} = (K_u Q_{Bl}^{0.28}) \{Q/(W_c D_{50}^{1/3})\}^{0.26}$

y_{max} = Flow depth at culvert entrance corner including contraction and local scour, ft

Q_{Bl} = Discharge blocked by road embankment on one side of culvert, ft^3/sec

Q = Discharge through the culvert, ft^3/sec

W_c = width of the culvert, ft

D_{50} = Median diameter of bed material, ft

y_s = Scour at the culvert entrance corner, ft

y_o = Average existing depth in the contracted section, ft

K_u = 0.84

Data Input
4.1
10
105
10.0
0.023621
2.2
1.8
0.84

Data Output

y_{max} =	4.1 ft
$y_s = y_{max} - y_o$ =	**2.2** ft

Project Name:	Pond Street Topsfield, MA
Project Location:	Pond Street Topsfield, MA
Project Job Number:	20-0160
Frequency Event:	50-year

Determine Critical Velocity

$V_c = K_u y^{1/6} D^{1/3}$

V_c = Critical velocity above which bed material of D and smaller will be transported, ft/s

y = Average depth of flow upstream of the bridge, ft

D = Particle size for V_c, ft

D_{50} = Particle size in a mixture of which 50% are smaller, ft

K_u = 11.17

Data Input

y =	5.5	ft
D =	0.023621	ft
K_u =	11.17	

Velocity Upstream of Bridge = 0.8 ft/sec

Data Output

V_c = **4.3** ft/sec

Critical velocity V_C is greather than mean velocity V therefore clear water condition

HEC - 18 Scour Equation for Open Bottom Cluverts (Clear Water Condition w/Wing Wall)

$y_{max} = (K_u Q_{Bl}^{0.28}) \ (Q/(W_C D_{50}^{1/3})^{0.26}$

y_{max} = Flow depth at culvert entrance corner including contraction and local scour, ft

Q_{Bl} = Discharge blocked by road embankment on one side of culvert, ft^3/sec

Q = Discharge through the culvert, ft^3/sec

W_C = width of the culvert, ft

D_{50} = Median diameter of bed material, ft

y_s = Scour at the culvert entrance corner, ft

y_o = Average existing depth in the contracted section, ft

K_u = 0.84

Data Input
4.5
12
127
10.0
0.023621
2.5
2.0
0.84

Data Output

y_{max} =	4.5
$y_s = y_{max} - y_o$ =	2.5

Project Name:	Pond Street Topsfield, MA
Project Location:	Pond Street Topsfield, MA
Project Job Number:	20-0160
Frequency Event:	50-year

Given

D = Culvert dimensions	10' x 4'
A = Culvert area (sf)	40
Pw = Culvert wetted perimeter (ft)	14
S = Culvert slope	0.01
H_d = Height of outlet above bed in pipe diameters	0
Q = Peak discharge (peak flow duration assumed to be 30 minutes)	127
D_{84} = Grain size distribution	39.7209
D_{16} = Grain size distribution	0.3273

Calculate Hydraulic Radius (R_c)

R_c = Area/Wetted Perimeter 2.857

Coefficents of Scour Obtained from Tables 5.1, 5.2 and 5.3 are:

	α	β	θ	C_s	C_h
Depth of scour	2.27	0.39	0.06	1.00	1.00
Width of scour	6.94	0.53	0.08	1.00	1.00
Length of scour	17.10	0.47	0.10	1.00	1.00
Volume of scour	127.08	1.24	0.18	1.00	1.00

Material Standard Deviation

$\sigma = (D_{84}/D_{16})^{0.5}$ 11.02

HEC - 14 Estimating Scour Hole Geometry in a Cohesionless Soil

h_s = Depth of scour (ft)	3
W_s = Width of scour (ft)	10
L_s = Length of scour (ft)	22
V_s = Volume of scour (ft^3)	1601
L_m=Location of maximum scour downstream of culvert (ft)	9

Biodiversity Consulting, LLC 978-857-6826 Topsfield, MA 01983

Wetland Resource Delineation Report
Pond Street over Hoods Pond Outlet Stream
Topsfield, MA
December 17, 2020

The project site is at Pond Street bridge over the Outlet Stream of Hoods Pond in Topsfield. The project location is indicated in Figure 1 below.

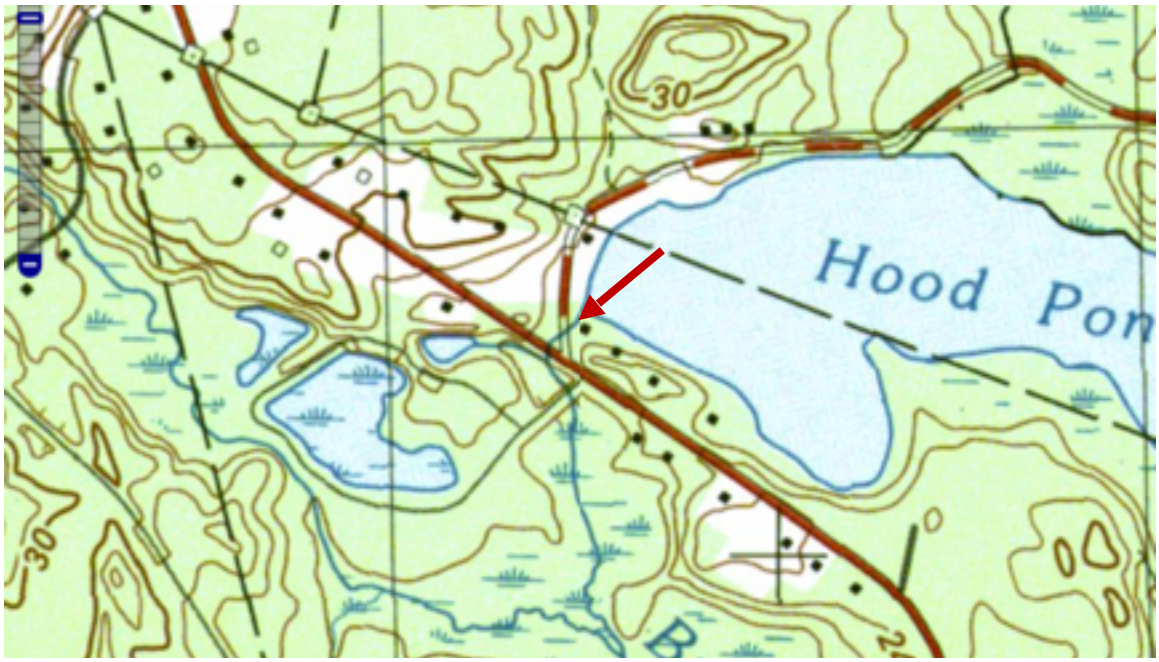


Fig. 1: MassGIS Topo Map

Biodiversity Consulting, LLC (BC) conducted a field inspection of the project area on June 17, 2020, June 19,2020 and December 15, 2020. At these times, wetland resources subject to jurisdiction under the Massachusetts Wetlands Protection Act Regulations (310 CMR 10.00) and the Town of Topsfield Conservation Commission Rules and Regulations were delineated and or assessed for Bankfull width. Numbered sequences of flags were placed in the field to delineate the boundary between upland and wetland resources.

The following is a description of resource areas present:

Riverfront Area

The Hoods Pond Outlet Stream is indicated as a perennial stream on the USGS topographic map of the project site and is therefore presumed under 310 CMR 10.58 to contain a 200-foot Riverfront Area extending horizontally from the limits of mean annual

high water (MHW) under state and local wetland regulations. MHW was identified by changes in slope, changes in vegetation and water marks and undercut banks. It was delineated by flags MHW 1-14 on the downstream banks. During the field survey of the site, that portion of the stream as shown upstream of the Street is an extension of the pond and considered such under state wetlands laws.

Land Under a Waterbody (LUW)

LUW resource was not specifically delineated but includes land beneath the stream to the mean annual low water (MAHW) level and beneath the pond to the delineated Inland Bank. This resource is regulated under both state and local wetland protection regulations.

This project is the restoration of a stream and an important measurement in determining the width of the new bridge is dependent upon the natural "Bankfull" width of the stream. There is no standard method for determining this width other than a direct measurement between Banks and/or the MHW. Streamstats can be used to approximate this width but an actual measurement is required. This site is problematic in determining this width. Under perfect conditions, one would measure this width at least 100 feet upstream and again 100 feet downstream of the proposed restoration. At this site, upstream is a Pond and downstream is another culvert that is back-watered by another culvert that is back-watered by the floodplain of Pye Brook. The only measurable portion of this stream is directly below the culvert under Pond Street. The bottom is sandy and firm, there is observable flow and there are true Banks. Even a few feet further downstream becomes influenced by the backwater flow from the culvert under Route 97/Haverhill Street. So there is no standard way of determining natural Bankfull width for calculating the best design for this new bridge. Streamstat estimates Bankfull width at 18.8' at 1 foot deep. I spent 3 days during varying flow conditions assessing this and I made direct measurements between true Banks of 8.1' and 8" deep which I think is the best assessment of the real conditions at this site..

Inland Bank

Inland Bank is regulated under 310 CMR 10.54 as well as the local wetland bylaw and includes the land that abuts and confines a waterbody. The upper boundary of Bank is defined as the first observable break in slope or the mean annual flood level, whichever is lower, and the lower boundary is the mean annual low flow level.

Within the downstream portion of the Hoods Pond Outlet Stream, the upper boundary of Bank resource was determined to be coincident with the limit of Riverfront Area described above and delineated by flags MHW 1-14.

Upgrade of the culvert the Inland Bank is coincident with an extension of the Pond shore and has some wetland vegetation growing along the bank. Soils and hydrology do not support a BVW delineation for Series A. This Inland bank is delineated by wetland flags A1-A10 and A1.1-1.3.

Bordering Vegetated Wetland

There is a series of wetland flags used to delineate Freshwater wetlands and Bordering Vegetated Wetland. Series B (1-25)marks the BVW adjacent to the Stream down grade

the Pond Street. This resource area was determined by using the DEP delineation method with adjustments to include requirements by the Topsfield Wetlands Bylaw.

Series B is both NW and SE of the Outlet Stream. It is vegetated with Alder Buckthorn, Red Maple, Sweet Pepperbush, Skunk Cabbage, and Sensitive Fern.

DEP Bordering Vegetated Wetland Delineation Field Data Form is attached which provides additional documentation of this wetland boundary. There is a 100-foot Buffer Zone extending horizontally from these flags under both state and local wetland regulations.

Bordering Land Subject to Flooding (BLSF)

BLSF includes land subject to inundation from rising creeks, rivers, streams, and other waterbodies as defined in 310 CMR 10.57 and the Topsfield Wetland Bylaw. Its upper boundary is generally determined by reference to the most current FEMA flood mapping. The FEMA map provided as Figure 2 below is not correct. It erroneously indicates this portion of the Outlet Stream does not contain a Zone A 100-year flood elevation extending from its banks. Where, in fact, we have been told by neighbors and Town officials that this area does flood. No elevation is provided. There is no Buffer Zone associated with this resource under state regulations, but there is under the local wetland regulations.

Fig. 2: FEMA Flood Map

Other Resources

The site is not located within Estimated Habitat of Rare Wetland Wildlife and Priority Habitat and as determined by reference to the most recently available data on MassGIS (Figure 3). Prior notification to the Division of Fisheries and Wildlife – Natural Heritage and Endangered Species Program (NHESP) will not be required prior to commencement of work in this area.

Fig. 3: NHESP Priority Habitat

View downstream of perennial stream.

View upstream for pond shore.

ATTACHEMENT D:

Order of Conditions

TOWN OF TOPSFIELD

Conservation Commission

8 West Common Street, Topsfield, Massachusetts 01983

July 9, 2021

Kevin Harutunian
Town Administrator
Topsfield Town Hall
8 West Common Street
Topsfield, MA 01983

Re: Order of Conditions #307-0807, Pond Street Culvert Replacement

Dear Mr. Harutunian,

Enclosed is the Order of Conditions for the Pond Street Culvert Replacement project, as prepared and presented by the project representatives, including the Special Conditions that must be followed. There is no recording requirement. The project representatives will coordinate further communication as progress towards starting work is made.

If you have any questions or if you need additional information, please contact me at the TCC office, 978-887-1510.

Sincerely,

Heidi Gaffney

Heidi Gaffney
Topsfield Conservation Administrator

Cc: Ipswich River Watershed Association (via email)
Topsfield Highway Department (via email)
DEP-NERO
TCC file

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 5A – Restoration Order of Conditions

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
307-0807
MassDEP File #

Topsfield
City/Town

A. General Information

Please note: this form has been modified with added space to accommodate the Registry of Deeds Requirements

1. From: Topsfield
Conservation Commission

2. This issuance is for (check one):

a. ☒ Restoration Order of Conditions b. ☐ Amended Restoration Order of Conditions

3. To: Applicant:

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.

Kevin
a. First Name

Harutunian
b. Last Name

Town of Topsfield
c. Organization

8 West Common Street
d. Mailing Address

Topsfield
e. City/Town

MA
f. State

01983
g. Zip Code

4. Property Owner (if different from applicant):

a. First Name

b. Last Name

Town of Topsfield
c. Organization

8 West Common Street
d. Mailing Address

Topsfield
e. City/Town

MA
f. State

01983
g. Zip Code

5. Project Location:

Pond Street ROW
a. Street Address

Topsfield
b. City/Town

N/A - Roadway ROW
c. Assessors Map/Plat Number

in area of 1, 3 & 8 Pond St
d. Parcel/Lot Number

Massachusetts Department of Environmental Protection
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A. General Information (cont.)

Latitude and Longitude, if known: 42.669424 (d. Latitude (in decimal)) 70.961261 (e. Longitude (in decimal))

Note: If the Ecological Restoration Project involves work on a stream crossing, baseline photo-points that capture longitudinal views of the crossing inlet, the crossing outlet and the upstream and downstream channel beds during low flow conditions. The latitude and longitude coordinates of the photo-points shall be included in the baseline data.

6. Property recorded at the Registry of Deeds for (attach additional information if more than one parcel):
   - a. County: Southern Essex
   - b. Certificate Number (if registered land):
   - c. Book: N/A Pond St Roadway ROW
   - d. Page:

7. Dates:
   - a. Date Ecological Restoration NOI Filed: 02/24/2021
   - b. Date Public Hearing Closed: 03/24/2021
   - c. Issuance Date: 07/12/2021

8. Final Approved Plans and Other Documents (attach additional plan or document references as needed):
   - a. Plan Title: Notice of Intent Plan, Culvert Replacement, Pond St., Topsfield, Ma, Proposed Impacts
   - b. Prepared By: Michael O'Neill, P.E.
   - c. Signed and Stamped by: Michael O'Neill, P.E. Civil No. 27916
   - d. Final Revision Date: 3/1/2021
   - e. Scale: 1" = 10'
   - f. Additional Plan or Document Title: "Topsfield, MA, Pond St", Sheets 1 - 10, prepared by TEC The Engineering Corp, signed/stamped by Robert G. Niccoli, plotted on 12/11/2020; All documents submitted with the Notice of Intent, including the Operation and Maintenance Plan listed in the schedule of documents
   - g. Date: submitted with NOI

B. Findings

1. Findings pursuant to the Massachusetts Wetlands Protection Act:

Following the review of the Ecological Restoration Notice of Intent described in Section A 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. ☒ Private Water Supply
c. ☒ Groundwater Supply
d. ☒ Flood Control
e. ☒ Storm Damage Prevention
f. ☒ Prevention of Pollution
g. ☐ Land Containing Shellfish
h. ☒ Fisheries
i. ☒ Wildlife Habitat

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B. Findings (cont.)

2. This Commission hereby finds the project, as proposed, is an Ecological Restoration Project for:

☐ Dam Removal

☒ Freshwater Stream Crossing Repair and Replacement

☐ Stream Daylighting

☐ Tidal Restoration

☐ Rare Species Habitat Restoration

☒ Restoring Fish Passageways

Approved subject to:

☒ The following conditions are required in accordance with the Ecological Restoration eligibility criteria 310 CMR 10.13 (1) through (7) and performance standards set forth in the wetlands regulations. This Commission orders that all work shall be performed in accordance with the Ecological Restoration Notice of Intent for the project described in Section A. The General Conditions in Section C and Special Conditions checked in Section D are incorporated into this Restoration Order. To the extent that the following conditions modify or differ from the plans, specifications, or other proposals submitted with the Ecological Restoration Notice of Intent, these conditions shall control.

Denied because:

☐ The proposed work does not meet the eligibility criteria in 310 CMR 10.13(1) through (7). Therefore, work on this project may not go forward unless and until a new Notice of Intent (WPA Form 3 or 3A) is submitted and a Final Order of Conditions (WPA Form 5 or 5A) has been issued. The Commission has determined that following the eligibility criteria have NOT been met.

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B. Findings (cont.)

Inland Resource Area Impacts: Check all that apply below. (For Approvals Only)

Resource Area	Proposed Alteration	Permitted Alteration	Proposed Replacement	Permitted Replacement
4. ☒ Bank	110 a. linear feet	110 b. linear feet	160 c. linear feet	160 d. linear feet
5. ☒ Bordering Vegetated Wetland	34 a. square feet	34 b. square feet	34 c. square feet	34 d. square feet
6. ☒ Land Under Waterbodies and Waterways	76 a. square feet	76 b. square feet	254 c. square feet	254 d. square feet
	e. c/y dredged	f. c/y dredged		
7. ☒ Bordering Land Subject to Flooding	102 a. square feet	102 b. square feet	16 c. square feet	16 d. square feet
Cubic Feet Flood Storage	402.3 e. cubic feet	402.3 f. cubic feet	1169.1 g. cubic feet	1169.1 h. cubic feet
8. ☐ 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. ☒ Riverfront Area	0 a. total sq. feet	0 b. total sq. feet		
Sq ft within 100 ft	0 c. square feet	0 d. square feet	0 e. square feet	0 f. square feet
Sq ft between 100-200 ft	0 g. square feet	0 h. square feet	0 i. square feet	0 j. square feet

Coastal Resource Area Impacts: Check all that apply below. (For Approvals Only)

	Proposed Alteration	Permitted Alteration	Proposed Replacement	Permitted Replacement
10. ☐ Designated Port Areas	Indicate size under Land Under the Ocean, below			
11. ☐ Land Under the Ocean	a. square feet	b. square feet		
	c. c/y dredged	d. c/y dredged		
12. ☐ Barrier Beaches	**Note:** *No armoring of a Coastal Dune or Barrier Beach is permitted.* Indicate size under Coastal Beaches and/or Coastal Dunes below			
13. ☐ Coastal Beaches	a. square feet	b. square feet	c/y c. nourishment	c/y d. nourishment

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B. Findings (cont.)

14. ☐ Coastal Dunes — a. square feet | b. square feet | c. c/y nourishment | d. c/y nourishment

Note: *No armoring of a Coastal Dune or Barrier Beach is permitted.*

15. ☐ Coastal Banks — a. linear feet | b. linear feet

16. ☐ Rocky Intertidal Shores — a. square feet | b. square feet

17. ☐ Salt Marshes — a. square feet | b. square feet | c. square feet | d. square feet

18. ☐ Land Under Salt Ponds — a. square feet | b. square feet | c. c/y dredged | d. c/y dredged

19. ☐ Land Containing Shellfish — a. square feet | b. square feet | c. square feet | d. square feet

20. ☐ 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. ☐ Land Subject to Coastal Storm Flowage — a. square feet | b. square feet

22. ☐ 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

23. ☐ Restoration/Enhancement *:

a. square feet of BVW | b. square feet of salt marsh | c. square feet of other wetland resource areas

24. ☒ Stream Crossing(s):

0 — a. number of new stream crossings

1 — b. number of replacement stream crossings

* 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

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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 Restoration Order of
2. The Restoration 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 Restoration 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 Restoration 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 Restoration 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 Restoration Order.

5. This Restoration 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 Restoration Order.

6. If this Restoration Order constitutes an Amended Restoration Order of Conditions, this Amended Restoration Order of Conditions does not extend the issuance date of the original Final Order of Conditions and the Restoration Order will expire on 7/12/2024 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.

8. This Restoration Order is not final until all administrative appeal periods from this Restoration 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 Restoration 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 Restoration 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 Restoration 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 Restoration Order, which form must be stamped by the Registry of Deeds, prior to the commencement of work.

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C. General Conditions Under Massachusetts Wetlands Protection Act **(cont.)**

10. A sign shall be displayed at the site not less then two square feet or more than three square feet in size bearing the words,

    "Massachusetts Department of Environmental Protection" [or, "MassDEP"]

    "File Number 307-0807 "

11. Where the Department of Environmental Protection is requested to issue a Superseding Restoration 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 Restoration Order at reasonable hours to evaluate compliance with the conditions stated in this Restoration Order, and may require the submittal of any data deemed necessary by the Conservation Commission or Department for that evaluation.

16. This Restoration Order of Conditions shall apply to any successor in interest or successor in control of the property subject to this Restoration Order and to any contractor or other person performing work conditioned by this Restoration Order.

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 Restoration Order.

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C. General Conditions Under Massachusetts Wetlands Protection Act (cont.)

General Conditions for all Ecological Restoration Projects

19. The project shall be conducted in accordance with any preliminary written determination obtained from the Natural Heritage and Endangered Species Program as set forth in 310 CMR 10.11(2) and any time of year restrictions or other conditions recommended in writing by the Division of Marine Fisheries (for projects in coastal Resource Areas) and the Division of Fisheries and Wildlife (for projects in inland Resource Areas) as set forth in 310 CMR 10.11(3), (4) and (5).
20. The applicant shall implement the plan submitted with the Notice of Intent as approved by the Issuing Authority to prevent and control invasive species.
21. If the project involves the dredging of 100 cubic yards or more in a Resource Area or dredging of any amount in an Outstanding Resource Water, the dredging and Dredged Material management shall be performed in accordance with the Water Quality Certification submitted with the Notice of Intent.

22. If the project involves infrastructure, the owner shall operate and maintain the infrastructure in accordance with the operation and maintenance plan submitted with the Notice of Intent as approved by the Issuing Authority. Implementation of the operation and maintenance plan as approved by the Issuing Authority shall be a continuing condition that shall be set forth in the Certificate of Compliance.

23. 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;

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C. General Conditions Under Massachusetts Wetlands Protection Act (cont.)

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;

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 Restoration 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.

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C. General Conditions Under Massachusetts Wetlands Protection Act (cont.)

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.

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 Restoration 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.

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D. Special Conditions for Ecological Restoration Projects

☐ **Dam Removal**

This project involves dam removal and the following special conditions shall apply in addition to the general conditions set forth in 310 CMR 10.14(1):

a) An as-built plan and a written statement from a registered professional engineer or other environmental professional expert in ecological restoration certifying substantial compliance with the design plan and construction specifications approved in the Restoration Order of Conditions shall be submitted to the Issuing Authority within 90 days of completion of the dam removal.

b) The applicant shall monitor the dam removal site during the first two years following completion of the dam removal. Said monitoring shall include a topographic survey of the longitudinal profile and stream cross-sections from downstream of the former dam through the upstream end of the former impoundment. The survey reference point shall comprise a permanent marker or recoverable survey point with known coordinates, such as a fixed point shown on the as-built plan, an existing bench mark, or a new benchmark. That marker should be identified or referenced on the plans and on the as-built plans. The applicant shall establish at least two photo-points for pre- and post-restoration monitoring at the dam removal site. At least one photo-point location shall be chosen to document a view of the dam pre-restoration and to document the same site after the dam is removed. A second location shall be chosen to document a view of the impoundment pre- and post-restoration. Photos shall be taken for two years after the dam removal is completed.

c) The applicant shall submit a report detailing the results of this monitoring within six months of the completion of the two year post-construction monitoring period, or within 30 months after the dam removal is complete whichever is sooner. The report shall include a comparison of post-restoration survey data with pre-restoration survey data as illustrated by the photos taken during the monitoring period.

☒ **Freshwater Stream Crossing Repair and Replacement Projects**

The project involves one or more freshwater crossing repair or replacement and the following special conditions in addition to the general conditions apply:

a) An as-built plan and/or a written statement from a registered professional engineer or other environmental professional expert in ecological restoration certifying substantial compliance with the design plans and construction specifications approved in the Restoration Order of Conditions shall be completed within 90 days of completion of construction. The as-built plan shall include the dimensions of the structure, the invert elevation of the upstream and downstream ends of the structure and the road or other surface elevation above the structure.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
WPA Form 5A – Restoration Order of Conditions
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
307-0807
MassDEP File #

Topsfield
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D. Special Conditions for Ecological Restoration Projects (cont.)

b) The applicant shall monitor the site by collecting sufficient data within 12 months after construction is complete to evaluate the effect of the structure. At a minimum, when a Certificate of Compliance is requested, the applicant shall provide post-construction photo-points that capture longitudinal views of the crossing inlet, the crossing outlet and the upstream and downstream channel beds during low flow conditions. The photo-points shall be located at the same geographic photo-point latitude and longitude coordinates as required in the Notice of Intent per 310 CMR 10.12(1)(n). The applicant shall submit a report to the Issuing Authority detailing the results of this monitoring within 18 months after construction is complete. The report shall include a comparison of the post-restoration data with pre-restoration data.

☐ **Stream Daylighting**

The project involves stream daylighting and the following special conditions in addition to the general conditions apply:

a) An as-built plan and a written statement from a registered professional engineer or other environmental professional expert in ecological restoration certifying substantial compliance with the design plan and construction specifications approved in the Restoration Order of Conditions shall be submitted to the Issuing Authority within 90 days of completion of the project. At a minimum, when a Certificate of Compliance is requested, the applicant shall provide post-construction photo-points that capture longitudinal views of the upstream and downstream channel beds of the daylighted reach during low flow conditions.

b) The applicant shall conduct photo-point monitoring by establishing at least three photo-points for pre- and post-restoration monitoring at the stream daylighting site. One photo-point location shall be chosen to document the upstream end of the site and one photo-point location shall be chosen to document the downstream end of the site. A third photo-point shall be chosen to document conditions in the restored channel. Photos shall be taken during high flow and low (summer) flow of each year during the two years following completion of the project.

c) Within 30 months after the completion of the project, the applicant shall submit a report describing the ecological changes observed at the project site during the two years following completion of the project, as illustrated by the photos.

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D. Special Conditions for Ecological Restoration Projects (cont.)

☐ **Tidal Restoration Projects**

The project involves restoration of tidal influence and the following special conditions in addition to the general conditions apply:

a) If the project is a culvert or bridge replacement or repair project, an as-built plan and a written statement from a registered professional engineer or other environmental professional expert in ecological restoration certifying substantial compliance with the design plans and construction specifications approved in the Restoration Order of Conditions shall be submitted to the Issuing Authority within 90 days of completion of construction. The as-built plan shall include the dimensions of the structure, the invert elevation of the upstream and downstream ends of the structure and the road or other surface elevation above the structure.

b) The applicant shall monitor pre- and post-construction tidal conditions upstream and downstream of the tidal restriction with water level readings measured at an interval no greater than every 10 minutes over a minimum of a one-week period that includes a spring tide. Pre- and post-construction water level readings shall be taken at approximately the same locations and shall be referenced to the same vertical elevation datum. The applicant shall prepare a report detailing the results of this monitoring within 12 months after construction is complete. The report shall include and compare pre- and post-construction tidal elevation monitoring data to assess attainment of the project's predicted post-restoration tidal conditions.

☐ **Rare Species Habitat Restoration**

The project is a Rare Species Habitat Restoration Project and in addition to the general conditions the following special conditions apply:

a) An as-built plan and a written statement from a registered professional engineer or other environmental professional expert in ecological restoration certifying substantial compliance with the design plan, construction specifications, and the Habitat Management Plan submitted with the Notice of Intent as approved in the Restoration Order of Conditions shall be submitted to the Issuing Authority within 90 days of completion of the project.

b) The applicant shall establish at least two photo-points for pre- and post-restoration monitoring at the project site. Photos shall be taken for two years after construction is complete. Within 30 months of completion of the project, the applicant shall submit to the Issuing Authority a report describing the ecological changes observed at the project site as illustrated by the photos.

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D. Special Conditions for Ecological Restoration Projects (cont.)

☒ **Fish Passageway Restoration**

The project involves the repair or replacement of a fish passageway and in addition to the general conditions the following special conditions:

a) The property owner is responsible for maintaining and repairing the fishway in good condition so that it will support safe and efficient fish passage in accordance with an operation and maintenance plan approved by the Division of Marine Fisheries. This requirement is a continuing condition that shall be set forth in the Certificate of Compliance.

b) a post-construction project summary using surveys, a narrative and photographs as needed, that confirm the fishway slope and entrance and exit elevations shall be submitted to and approved by the Division of Marine Fisheries, prior to submittal of a request for a Certificate of Compliance.

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E. Findings Under Municipal Wetlands Bylaw or Ordinance

1. Is a municipal wetlands bylaw or ordinance applicable? ☒ Yes ☐ No

2. The Topsfield Conservation Commission hereby finds (check one that applies):

   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:

   Topsfield General Wetlands Bylaw (1. Municipal Ordinance or Bylaw) Ch. 61 (2. Citation)

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

Massachusetts Department of Environmental Protection
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Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

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F. Signatures

This Restoration Order is valid for three years, unless otherwise specified as a special condition pursuant to General Conditions #4, from the date of issuance.

7/12/2021
1. Date of Issuance

Please indicate the number of members who will sign this form.
This Restoration Order must be signed by a majority of the Conservation Commission.

4
2. Number of Signers

The Restoration Order must be mailed by certified mail (return receipt requested) or hand delivered to the applicant. A copy also must be mailed or hand delivered at the same time to the appropriate Department of Environmental Protection Regional Office and the property owner, if different from applicant.

The electronic signatures below are made in accordance with M.G.L. c.110G and pursuant to the commission's electronic signature authorization vote recorded on 6/18/2020 in ***BOOK 38624 and PAGE 313*** *at the Southern Essex Registry of Deeds.*

Signatures:

/Dodds Shamroth/

/Jennifer DiCarlo/

/Nick Betts/

/Holger Luther/

☒ by hand delivery on

7/12/2021
Date

☐ by certified mail, return receipt requested, on

Date

G. Appeals

The applicant, the owner, any person aggrieved by this Restoration Order, any owner of land abutting the land subject to this Restoration 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 Restoration 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 Restoration 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 Restoration Order of Conditions 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 Restoration Order, or providing written information to the Department prior to issuance of a Superseding Restoration Order.

The request shall state clearly and concisely how the project permitted under the Restoration Order which is being appealed does or does not meet the eligibility criteria in 310 CMR 10.13(1) and the relevant provisions of 310 CMR 10.13(2) through (7). To the extent that the Restoration 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.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 5A – Restoration Order of Conditions

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

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H. Recording Information

Prior to commencement of work, this Restoration Order of Conditions must be 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 Restoration Order shall also be noted in the Registry's Grantor Index under the name of the owner of the land subject to the Restoration Order. In the case of registered land, this Restoration Order shall also be noted on the Land Court Certificate of Title of the owner of the land subject to the Restoration Order of Conditions. The recording information on this page shall be submitted to the Conservation Commission listed below.

Topsfield
Conservation Commission

Detach on dotted line, have stamped by the Registry of Deeds and submit to the Conservation Commission.

To:

Topsfield
Conservation Commission

Please be advised that the Restoration Order of Conditions for the Project at:

Pond Street ROW (culvert @ Hood Pond) — Project Location
307-0807 — MassDEP File Number

Has been recorded at the Registry of Deeds of:

County | Book | Page

For
Property Owner

and has been noted in the chain of title of the affected property in:

Book | Page

In accordance with the Restoration Order of Conditions issued on:

Date

If recorded land, the instrument number identifying this transaction is:

Instrument Number

If registered land, the document number identifying this transaction is:

Document Number

Signature of Applicant

ATTACHMENT TO ORDER OF CONDITIONS
TOWN OF TOPSFIELD CONSERVATION COMMISSION

TCC refers to the Topsfield Conservation Commission
DEP refers to the Massachusetts Department of Environmental Protection
Act refers to the Massachusetts Wetlands Protection Act, M.G.L. Ch. 131, § 40
Bylaw refers to the Topsfield General Wetlands Bylaw, Chapter 62

APPROVED PLANS:

"Notice of Intent Plan, Culvert Replacement, Pond St., Topsfield, MA, Proposed Impacts", Prepared for: Ipswich River Watershed Associates; Prepared by: Michael O'Neill, P.E.; Signed and Stamped by: Michael G. O'Neill, Civil No. 27916; Dated: Revised 3/1/2021.

"Topsfield, MA, Pond Street" Sheets 1 through 10; Prepared by: TEC, Inc., 146 Dascomb Road, Andover, MA 01810; Signed and Stamped by: Robert G. Niccoli, Civil No. 49871; Dated: Plotted on 11-Dec-2020.

ADDITIONAL FINDINGS:

1. No work is proposed within habitats of rare wildlife, *or* certified vernal pools, according to the most recent online Mass GIS OLIVER Natural Heritage Data layer.

2. A copy of the NHESP review was included in the documents submitted with the NOI (#11 of the Schedule of Documents). MA Division of Marine Fisheries (passage) and MA Fish & Wildlife approvals (TOY) were also included (#12 of the Schedule of Documents).

3. Administrator Gaffney made multiple visits to the site.

4. The Notice of Intent for the proposed "replacement of two existing parallel culverts (12" W and 16"W) beneath Pond Street between Hood Pond and Pye Brook with a three-sided concrete culvert (10ft.W x 4ft.H x 25.33ft.L) and the decommissioning of three overflow pipes. Install dry hydrant" was filed on February 24, 2021, under the Massachusetts Wetlands Protection Act, MGL c. 131, §40, and under the Topsfield General Wetlands Bylaw, c. 62.

5. The DEP online comments reads: "should explore soft solution slope stabilization for Hood Pond to eliminate or reduce use of rip-rap". The TCC discussed the comments with the applicant's representatives and the engineer discussed that to do a soft slope and maintain the roadway stabilization would require bringing in fill and other factors that make it infeasible.

6. The hearing was opened on March 10, 2021, at the regularly scheduled Topsfield Conservation Commission meeting held via zoom videoconference. The applicant's representatives presented the project and the commission discussed the proposed culvert replacement. The existing culvert has been in place for approximately 400 years. The proposed replacement will reduce flooding, improve public safety and improve fire protection as well as restore overall ecological integrity of the wetland system. The hearing was continued to March 24, 2021. The TCC continued the discussion and voted to grant a waiver under the Bylaw for the culvert replacement which is necessary to accommodate an overriding public interest. The Commission voted to close the

hearing and voted to issue an Order of Conditions under the Act and the Bylaw as shown on the plans, described in the narrative, as discussed, and with the usual Special Conditions.

7. No Resource Area flags placed for this project are verified with this Order of Conditions. Wetland flags were placed by an independent wetland scientist. It is difficult to determine which flags may be on private property, as such the TCC acknowledges the existence of the resource areas described in the narrative and shown on the plans and has determined that Wetlands Resource Area boundaries need not be verified in order to condition the activities so that the interests of the Act and the Bylaw are protected.

8. This Order of Conditions is issued under the Wetlands Protection Act, M.G.L. Chapter 131, Section 40, and under the Topsfield General Wetlands Bylaw, Chapter 62.

PART A, SPECIAL CONDITIONS PURSUANT TO THE MASSACHUSETTS WETLANDS PROTECTION ACT AND REGULATIONS AND THE TOPSFIELD WETLANDS GENERAL BYLAW AND REGULATIONS:

GENERAL CONDITIONS:

1. This Order of Conditions does not have a recording requirement.

2. **This Order of Conditions (OoC) authorizes the proposed installation/replacement of the Pond Street Culvert within existing roadway and related activities within the Roadway Right-of-Way along Pond Street, Topsfield, as shown on the APPROVED PLANS, as discussed and as described in the NOI and submitted documents filed with the TCC.**

3. It is the responsibility of the Applicants to procure all other applicable federal, state, and local permits and approvals associated with this project. These permits may include but are not necessarily limited to the following:

    a. Section 404 of the Federal Water Pollution Control Act (P.L. 92-500, 86 stat 816), U.S. Army Corps of Engineers.

    b. Water Quality Certification in accordance with the Federal Water Pollution Control under authority of section 27(5) of Chapter 21 of the Massachusetts General Laws as codified in 314 CMR 9.00.

    c. The Town of Topsfield – street opening, any other permits required, etc.

4. Approval of the submitted materials that resulted in this Order of Conditions does not constitute compliance with any laws or regulations other than the Massachusetts Wetlands Protection Act, MGL Chapter 131, § 40 and Wetlands Regulations 310 CMR 10.00, and the Topsfield General Wetlands Bylaw Chapter 62 and Regulations.

5. **In order to allow for the required appeal period, no work approved in this Order may commence until ten (10) business days have lapsed from the date of issuance of this Order.**

6. Pre-activity photos of all work areas within BVW, Buffer Zone, BLSF and/or Riverfront Area are required. Post-activity photos will be required for the Certificate of Compliance.

7. **Any revision to the Plans of Record shall be submitted to the TCC.** If the Commission/Administrator deems changes significant, but not increasing impacts, an amendment to the Order of Conditions shall be required**.** If impacts to Resource Area(s) would be increased, a new Notice of Intent filing shall be required.

8. The TCC holds all contractors and employees performing work authorized by this OoC accountable for compliance with the Order's requirements. You shall include this OoC in all construction contracts dealing with The Project and **you shall ensure that a copy of the OoC is on the site while any activities regulated under this OoC are being performed**. **The applicant and all persons involved with work on the site must read and understand this Order of Conditions.**

9. The TCC and the DEP have the right to inspect and monitor compliance with this OoC until such time as a Certificate of Compliance has been issued.

10. If conditions in this Order of Conditions are in conflict, the stricter condition shall apply.

PRIOR TO CONSTRUCTION/ACTIVITIES:

11. **Prior to the commencement of any activities there shall be a pre-activity conference onsite between the work supervisor(s) and the TCC or Conservation Administrator to review installed sedimentation controls and other pre-activity requirements and to review the work details.** Please call the TCC office at 978-887-1510 at least 72 hours in advance to arrange this meeting. Prior to scheduling the Conference, the following must be completed:

    a. Since activities would take place within a Public Right of Way, there is no recording requirement.

    b. The Applicant(s) shall submit to the TCC **pre-activity photographs of all work/activity areas within BVW, Buffer Zone and/or Riverfront Area**. At a minimum, two photos, taken from opposite sides, showing each proposed activity area, shall be submitted.

    c. The **DEP sign** shall be posted according with DEP General Condition #10.

    d. The **wetland boundaries shall be marked** with stakes or flags in accordance with DEP General Condition #17.

    e. **All water controls and sedimentation/erosion controls shall be installed prior to the pre-activity conference.** A copy of the final Control of Water (C.O.W) design shall be submitted to the Conservation Commission office for review prior to installation of the devices (see sheets 7 & 8 of the plan set).

    f. **Limits of work** are demarcated by the sedimentation barriers, which shall remain in place until all activity is complete and the TCC or the Conservation Administrator has granted authorization for their removal.

    g. There shall be sufficient **sedimentation/erosion controls** onsite for **emergencies**.

    h. A written **construction schedule** of project activities, along with the **names, addresses, business and home phone numbers** of the project supervisor shall be submitted to the TCC prior to the commencement of work.

i. Any and all other required permits shall have been obtained.

j. As a precaution in the case of a fuel or other chemical spill, a spill kit shall be onsite at all times.

DURING CONSTRUCTION/ACTIVITIES:

12. **All contractors and their employees shall be aware of the limit of work boundaries and activity requirements of this Order of Conditions.**

13. **Water control, and erosion and sedimentation control measures shall be employed to prevent discharge of sediments into Resource Areas beyond the sedimentation control/limit of work line.**

    a. Activities shall be scheduled to avoid periods of high groundwater and heavy rain. Any time of year restrictions shall be adhered to. Work is anticipated to be completed during low flow conditions.

    b. All stockpiles of soils existing for more than one day shall be surrounded by appropriate sedimentation controls, and shall be covered.

    c. Construction/activity areas shall be stabilized at the close of each construction day.

14. Any excess soil shall be hauled to an appropriate offsite location, in accordance with the Topsfield Soil Removal Bylaw.

15. NO service of equipment (e.g. fueling, changing, adding or applying lubricants or hydraulic fluid) shall take place within the 100-foot Buffer Zone. Equipment must be maintained to prevent leakage or discharge of pollutants. Overnight storage of equipment shall be within the existing paved roadway.

16. All disturbed areas shall be permanently stabilized within 30 days of final grading, using sufficient topsoil and a rapidly growing cover to assure long-term stabilization. The area shall be sufficiently mulched, and loam and seeding held in place by jute netting where necessary or alternatively hydroseeding may be used.

17. All waste products, refuse, debris, grubbed stumps, slash, excavate, construction materials, etc. shall be contained and ultimately deposited at an approved landfill and shall not be incorporated in any manner into the project site.

18. At no time shall fill or other material be placed, slump into, or fall beyond the limit of work as shown on the approved plans. The applicant shall be responsible for inspecting and maintaining all slopes and shall immediately notify the TCC if slumping, erosion, or encroachment occurs.

19. In the event of any problem that may adversely impact protected interests, emergency control measures shall be implemented immediately, and the TCC shall be notified so that guidance and additional protective measures may be required as is necessary.

20. Any activity that might change the water level, temperature, quality, or hydrology of any wetland resource area is prohibited.

21. Any changes in plans for the activities under this Order of Conditions shall require prior approval of the Topsfield Conservation Commission or its Administrator.

22. The TCC reserves the right to impose additional conditions on this project or this site to mitigate any actual or potential impacts resulting from the work herein permitted.

AFTER **CONSTRUCTION/ACTIVITIES:**

23. Within THIRTY (30) DAYS from completion of the work under this Order of Conditions and after stabilization of soils and sufficient growth of vegetation, the applicant shall request a **Certificate of Compliance** from the Topsfield Conservation Commission. The request shall be made in writing (WPA form 8A is preferred) delivered by hand or by certified mail and, **if there are no deviations from the Approved Plans**, shall include the following:
    a. A professional engineer's written certification that the project was constructed in compliance with the OoC and the approved Plans,

    b. TWO (2) sets of "as-built" plans, signed and stamped by a professional engineer or professional land surveyor,

    c. A set of post-construction photographs showing the work areas (similar locations to pre-activity photographs), and

    d. The Bylaw Regulations fee for a Certificate of Compliance current at the time of application (presently $100.00). *This fee is not applicable to a Town project.*

    If the project deviates from the Plan of Construction, the following shall be submitted:
    a. A professional engineer's or other qualified professional's written identification of all deviations from the approved Plan, and their impacts on the protected interests evaluated,

    b. TWO (2) sets of "as-built" plans, signed and stamped by a professional engineer or professional land surveyor,

    c. A set of post-construction photographs showing the work areas (similar locations to pre-activity photographs), and

    d. The Bylaw Regulations fee for a Certificate of Compliance current at the time of application (presently $100.00). *This fee is not applicable to a Town project.*

    This condition does not authorize any deviation from the Approved Plans without prior notification and written approval of the TCC.

24. After a final inspection has been made for the Certificate of Compliance and/or after permission to remove water controls and sedimentation/erosion controls has been granted, all siltation controls and plastic sedimentation control sock shall be removed and disposed of properly. You may contact the TCC office for information about disposal of any hay bales.

25. **CONTINUING CONDITIONS**: The following conditions shall be in effect during the work activities described in this Order of Conditions and shall remain in effect following the issuance of a Certificate of Compliance:

    a. **Continued Vegetation Required**: The owner shall be responsible for assuring the lasting integrity of vegetative cover on the site in order to prevent erosion, contamination, or other detrimental impact to on-site and off-site resources. Only non-invasive, preferably native, plant species are to be planted within the Buffer Zone Resource Area on this property. Additionally, no plant listed on the Massachusetts Prohibited Plant List may be planted on this property (See https://www.mass.gov/service-details/massachusetts-prohibited-plant-list).

    b. **Fertilizers or Pesticides**: Use of pesticides shall be consistent with product labeling specifications and shall be in compliance with all applicable Federal, State, and Topsfield laws and regulations. It is the responsibility of the landowner/his or her designee(s) to learn and know what plants are invasive and, thus, may be chemically treated in the Buffer Zone, and what laws are relevant (e.g. need for licensed applicator).

    c. **No Chemicals, Oil, or Gas**: There shall be no storage or parking of any equipment that leaks oil or other petroleum products within the Buffer Zone.

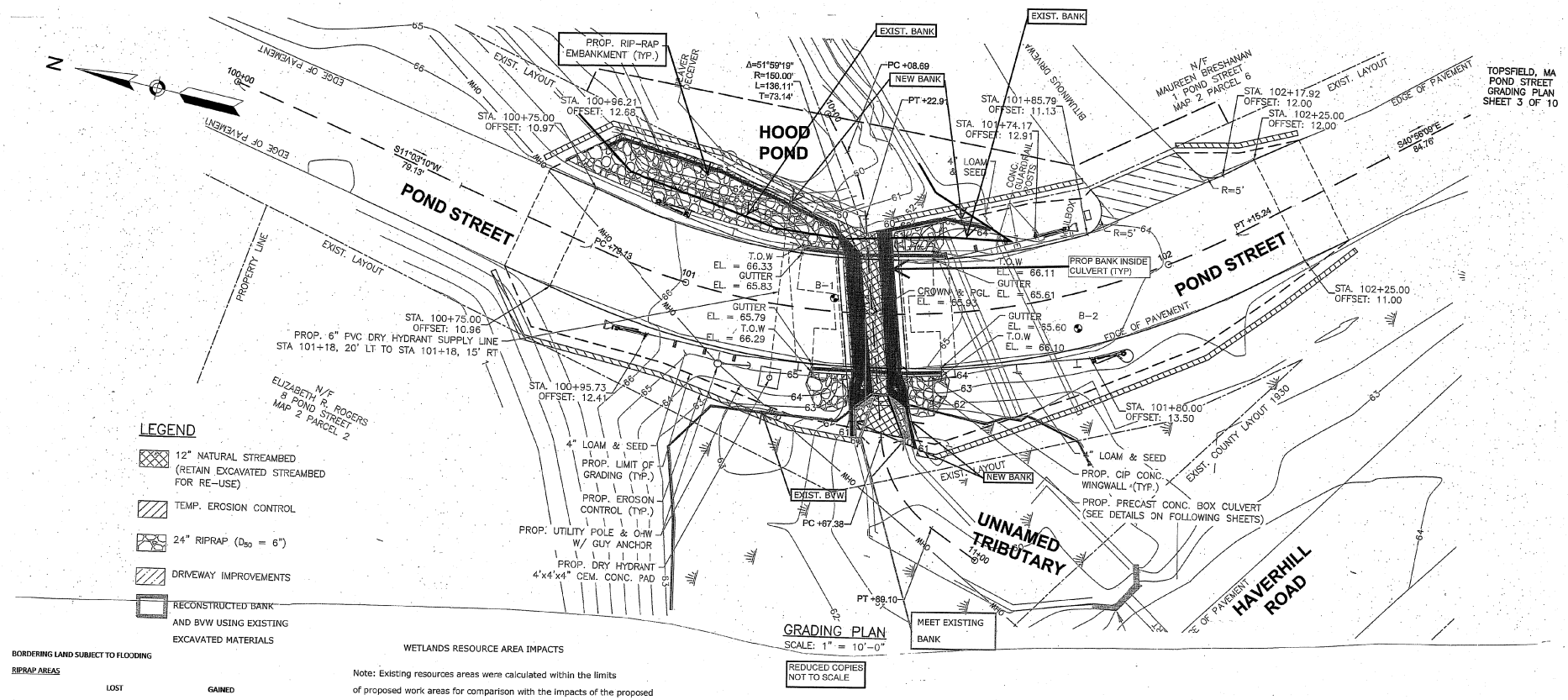
    d. **No Pollutants**: There shall be no discharge or spillage of fuel, oil, or other pollutants into any area of statutory interest including the Buffer Zone. Any accidental spill shall be reported immediately to the TCC and other appropriate authorities.

    e. **Dumping Prohibited**: There shall be no dumping of leaves, grass clippings, brush, or other debris near or into the wetland or stream/body of water.

    f. **Additional Alteration Prohibited**: There shall be no additional alterations of areas under TCC jurisdiction without the required review and permit(s).

    g. **Culvert**: To ensure that the infrastructure will continue to function as designed, the Operation and Maintenance Plan (#13 of the Schedule of Documents) shall be implemented and shall be the responsibility of the property owner(s).

PLAN ATTACHMENT TO ORDER OF CONDITIONS, MA DEP FILE #307-0807, POND STREET CULVERT REPLACEMENT



LEGEND

- 12" NATURAL STREAMBED (RETAIN EXCAVATED STREAMBED FOR RE-USE)
- TEMP. EROSION CONTROL
- 24" RIPRAP (D_{50} = 6")
- DRIVEWAY IMPROVEMENTS
- RECONSTRUCTED BANK AND BVW USING EXISTING EXCAVATED MATERIALS

GRADING PLAN
SCALE: 1" = 10'-0"
REDUCED COPIES NOT TO SCALE

BORDERING LAND SUBJECT TO FLOODING

RIPRAP AREAS

	LOST		GAINED	
Contour El.	Area(sf)	Volume (cy)	Area(sf)	Volume (cy)
60	20		0	
61	22	0.8	0	
62	17.5	0.7	3	0.06
63	22.5	0.7	8	0.2
64	20	0.8	5	0.25
65	0	0.4	0	0.18
TOTAL		3.4		0.69

CULVERT
Invert to Roof (3.7 x 10 x25)/27 Vol Gained 32.4 cy

ROADWAY PAVEMENT OVERLAY
(15 x 20 x 0.12)/27 Vol. Lost 1.3 cy

AREA UPSTREAM OF CULVERT
Vol. Lost 2 cy Vol. Gained 5.7 cy

AREA DOWNSTREAM OF CULVERT
Vol. Lost 2 cy Vol. Gained 4.5 cy

EXISTING PIPES UNDER ROAD
190 lf of 12/16 inch pipe. Vol. Lost 6.2 cy

TOTAL LOST 14.9 cy **TOTAL GAINED 43.3 cy**
NET GAIN IN FLOOD STORAGE 28.4 cy

WETLANDS RESOURCE AREA IMPACTS

Note: Existing resources areas were calculated within the limits of proposed work areas for comparison with the impacts of the proposed work.

EXISTING	PROPOSED
Bank	
90 l.f. on east side of Pond Street	85 l.f.on east side of Pond Street
20 l.f. on west side of Pond Street	28 l.f. on west side of Pond Street
	50 l.f. inside culvert
Total 110 l.f.	Total 163 l.f.
BVW	
0 s.f. on east side of Pond Street	0 s.f. on east side of Pond Street
34 s.f. on west side of Pond Street	34 s.f. Reconstructed as Bank and BVW using excavated BVW materials
Total 34 s.f.	Total 34 s.f.
Land Under Water (LUW)	
20 s.f. on east side of Pond Street	40 s.f. on east side of Pond Street
56 s.f. on west side of Pond Street	64 s.f. on west side of Pond Street
	150 s.f. inside culvert
s.f.	Total 254 s.f.

NOTES:
1.Base Plan obtained from TEC Pond Street Grading Plan sheet 3 0f 10 printed date December 11, 2020.
2. For erosion control details and water control see sheet 8 and 9 of 10, printed date December 11, 2020.
3. Project is entirely within the 100 foot buffer zone on the Hood Pond Bank and the Unnamed Stream's Bordering Vegetated Wetlands.

Revised 3/1/2021 Bordering Land Subject to Flooding Table added

NOTICE OF INTENT PLAN
Culvert Replacement
Pond St., Topsfield, Ma
Proposed Impacts
Date: Feb. 22, 2021
Revised Feb. 24, 2021
Prepared for Ipswich River Watershed Associates
Prepared by Micheal O'Neill P.E.

OPERATION AND MAINTENANCE PLAN
MA DEP FILE #307-0807

LOCATION: POND STREET, TOPSFIELD, MA. 200 FT. NORTH FROM THE INTERSECTION OF POND STREET AND ROUTE 97 (HAVERHILL ROAD)

MANAGED STRUCTURE: CONCRETE CULVERT (10'W x 4'H x 25'L)

GPS COORDINATES: 42.669424 LATITUDE; 70.961261 LONGITUDE

OWNER: TOWN OF TOPSFIELD

MANAGING DEPARTMENT: HIGHWAY DEPARTMENT, TOWN OF TOPSFIELD

COMMENTS: SUBJECT CULVERT SERVES AS THE OUTLET FROM HOOD POND TO AN UNANMMED PERENNIAL TRIBUTARY OF PYE BROOK. THIS OPERATION AND MAINTENANCE PLAN IS DESIGNED TO ACCOMMODATE THE MIGRATORY HABITS OF DIADROMOUS FISH SPECIES AND SUPPORT THE RESTORATION OF ALEWIVES TO HOOD POND.

PLAN: THE INVERT, INTERIOR AND OUTLET OF THE CULVERT WILL BE CLEARED OF ALL DEBRIS BY THE HIGHWAY DEPARTMENT PRIOR TO MARCH 15TH EACH SPRING AND PRIOR TO SEPTEMBER 1ST EACH FALL. MEMBERS OF THE IPSWICH RIVER WATERSHED ASSOCIATION AND TROUT UNLIMITED NOR'EAST OPERATING UNDER A STREAM CHANNEL MAINTENANCE PLAN*, APPROVED BY THE TOPSFIELD CONSERVATION COMMISSION IN OCTOBER 2018, WILL PERIODCIALLY INSPECT THE CULVERT AND ADVISE THE HIGHWAY DEPARTMENT OF ANY ADDITIONAL MAINTANCE WORK THAT MAY BE REQUIRED.

*Presented in furtherance of the attached MA Division of Marine Fisheries Protocol

ATTACHEMENT E:

Prevailing Wage Rates

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: Town of Topsfield

Contract Number:

City/Town: TOPSFIELD

Description of Work: Pond Street Culvert Replacement - Undersized culverts to be replaced with fully designed upgraded crossing.

Job Location: 1 Pond St

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 *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	06/01/2021	$35.95	$12.91	$14.82	$0.00	$63.68
	08/01/2021	$35.95	$13.41	$14.82	$0.00	$64.18
	12/01/2021	$35.95	$13.41	$16.01	$0.00	$65.37
(3 AXLE) DRIVER - EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	06/01/2021	$36.02	$12.91	$14.82	$0.00	$63.75
	08/01/2021	$36.02	$13.41	$14.82	$0.00	$64.25
	12/01/2021	$36.02	$13.41	$16.01	$0.00	$65.44
(4 & 5 AXLE) DRIVER - EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	06/01/2021	$36.14	$12.91	$14.82	$0.00	$63.87
	08/01/2021	$36.14	$13.41	$14.82	$0.00	$64.37
	12/01/2021	$36.14	$13.41	$16.01	$0.00	$65.56
ADS/SUBMERSIBLE PILOT *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2020	$103.05	$9.40	$23.12	$0.00	$135.57
For apprentice rates see "Apprentice- PILE DRIVER"						
AIR TRACK OPERATOR *LABORERS - ZONE 2*	06/01/2021	$35.75	$8.60	$16.64	$0.00	$60.99
	12/01/2021	$36.66	$8.60	$16.64	$0.00	$61.90
	06/01/2022	$37.56	$8.60	$16.64	$0.00	$62.80
	12/01/2022	$38.41	$8.60	$16.64	$0.00	$63.65
	06/01/2023	$39.31	$8.60	$16.64	$0.00	$64.55
	12/01/2023	$40.21	$8.60	$16.64	$0.00	$65.45
For apprentice rates see "Apprentice- LABORER"						
ASBESTOS REMOVER - PIPE / MECH. EQUIPT. *HEAT & FROST INSULATORS LOCAL 6 (BOSTON)*	12/01/2020	$38.10	$12.80	$9.45	$0.00	$60.35
ASPHALT RAKER *LABORERS - ZONE 2*	06/01/2021	$35.25	$8.60	$16.64	$0.00	$60.49
	12/01/2021	$36.16	$8.60	$16.64	$0.00	$61.40
	06/01/2022	$37.06	$8.60	$16.64	$0.00	$62.30
	12/01/2022	$37.91	$8.60	$16.64	$0.00	$63.15
	06/01/2023	$38.81	$8.60	$16.64	$0.00	$64.05
	12/01/2023	$39.71	$8.60	$16.64	$0.00	$64.95
For apprentice rates see "Apprentice- LABORER"						
ASPHALT/CONCRETE/CRUSHER PLANT-ON SITE *OPERATING ENGINEERS LOCAL 4*	06/01/2021	$50.73	$13.75	$15.80	$0.00	$80.28
	12/01/2021	$51.88	$13.75	$15.80	$0.00	$81.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
BACKHOE/FRONT-END LOADER *OPERATING ENGINEERS LOCAL 4*	06/01/2021	$50.73	$13.75	$15.80	$0.00	$80.28
	12/01/2021	$51.88	$13.75	$15.80	$0.00	$81.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
BARCO-TYPE JUMPING TAMPER *LABORERS - ZONE 2*	06/01/2021	$35.25	$8.60	$16.64	$0.00	$60.49
	12/01/2021	$36.16	$8.60	$16.64	$0.00	$61.40
	06/01/2022	$37.06	$8.60	$16.64	$0.00	$62.30
	12/01/2022	$37.91	$8.60	$16.64	$0.00	$63.15
	06/01/2023	$38.81	$8.60	$16.64	$0.00	$64.05
	12/01/2023	$39.71	$8.60	$16.64	$0.00	$64.95
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
BLOCK PAVER, RAMMER / CURB SETTER *LABORERS - ZONE 2*	06/01/2021	$35.75	$8.60	$16.64	$0.00	$60.99
	12/01/2021	$36.66	$8.60	$16.64	$0.00	$61.90
	06/01/2022	$37.56	$8.60	$16.64	$0.00	$62.80
	12/01/2022	$38.41	$8.60	$16.64	$0.00	$63.65
	06/01/2023	$39.31	$8.60	$16.64	$0.00	$64.55
	12/01/2023	$40.21	$8.60	$16.64	$0.00	$65.45
For apprentice rates see "Apprentice- LABORER"						
BOILER MAKER *BOILERMAKERS LOCAL 29*	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

BRICK/STONE/ARTIFICIAL MASONRY (INCL. MASONRY WATERPROOFING) *BRICKLAYERS LOCAL 3 (LYNN)*	02/01/2021	$55.75	$11.39	$22.09	$0.00	$89.23
	08/01/2021	$57.15	$11.39	$22.25	$0.00	$90.79
	02/01/2022	$57.74	$11.39	$22.25	$0.00	$91.38

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *BRICK/PLASTER/CEMENT MASON - Local 3 Lynn*

Effective Date - 02/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$27.88	$11.39	$22.09	$0.00	$61.36
2	60	$33.45	$11.39	$22.09	$0.00	$66.93
3	70	$39.03	$11.39	$22.09	$0.00	$72.51
4	80	$44.60	$11.39	$22.09	$0.00	$78.08
5	90	$50.18	$11.39	$22.09	$0.00	$83.66

Effective Date - 08/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$28.58	$11.39	$22.25	$0.00	$62.22
2	60	$34.29	$11.39	$22.25	$0.00	$67.93
3	70	$40.01	$11.39	$22.25	$0.00	$73.65
4	80	$45.72	$11.39	$22.25	$0.00	$79.36
5	90	$51.44	$11.39	$22.25	$0.00	$85.08

Notes:

Apprentice to Journeyworker Ratio:1:5

BULLDOZER/GRADER/SCRAPER *OPERATING ENGINEERS LOCAL 4*	06/01/2021	$50.19	$13.75	$15.80	$0.00	$79.74
	12/01/2021	$51.33	$13.75	$15.80	$0.00	$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
CAISSON & UNDERPINNING BOTTOM MAN *LABORERS - FOUNDATION AND MARINE*	06/01/2021	$41.82	$8.60	$17.72	$0.00	$68.14
	12/01/2021	$42.83	$8.60	$17.72	$0.00	$69.15
For apprentice rates see "Apprentice- LABORER"						
CAISSON & UNDERPINNING LABORER *LABORERS - FOUNDATION AND MARINE*	06/01/2021	$40.67	$8.60	$17.72	$0.00	$66.99
	12/01/2021	$41.68	$8.60	$17.72	$0.00	$68.00
For apprentice rates see "Apprentice- LABORER"						
CAISSON & UNDERPINNING TOP MAN *LABORERS - FOUNDATION AND MARINE*	06/01/2021	$40.67	$8.60	$17.72	$0.00	$66.99
	12/01/2021	$41.68	$8.60	$17.72	$0.00	$68.00
For apprentice rates see "Apprentice- LABORER"						
CARBIDE CORE DRILL OPERATOR *LABORERS - ZONE 2*	06/01/2021	$35.25	$8.60	$16.64	$0.00	$60.49
	12/01/2021	$36.16	$8.60	$16.64	$0.00	$61.40
	06/01/2022	$37.06	$8.60	$16.64	$0.00	$62.30
	12/01/2022	$37.91	$8.60	$16.64	$0.00	$63.15
	06/01/2023	$38.81	$8.60	$16.64	$0.00	$64.05
	12/01/2023	$39.71	$8.60	$16.64	$0.00	$64.95
For apprentice rates see "Apprentice- LABORER"						
CARPENTER *CARPENTERS -ZONE 2 (Eastern Massachusetts)*	03/01/2021	$43.54	$9.40	$18.95	$0.00	$71.89
	09/01/2021	$44.19	$9.40	$18.95	$0.00	$72.54
	03/01/2022	$44.79	$9.40	$18.95	$0.00	$73.14
	09/01/2022	$45.44	$9.40	$18.95	$0.00	$73.79
	03/01/2023	$46.04	$9.40	$18.95	$0.00	$74.39

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *CARPENTER - Zone 2 Eastern MA*

Effective Date - 03/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$21.77	$9.40	$1.73	$0.00	$32.90
2	60	$26.12	$9.40	$1.73	$0.00	$37.25
3	70	$30.48	$9.40	$13.76	$0.00	$53.64
4	75	$32.66	$9.40	$13.76	$0.00	$55.82
5	80	$34.83	$9.40	$15.49	$0.00	$59.72
6	80	$34.83	$9.40	$15.49	$0.00	$59.72
7	90	$39.19	$9.40	$17.22	$0.00	$65.81
8	90	$39.19	$9.40	$17.22	$0.00	$65.81

Effective Date - 09/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$22.10	$9.40	$1.73	$0.00	$33.23
2	60	$26.51	$9.40	$1.73	$0.00	$37.64
3	70	$30.93	$9.40	$13.76	$0.00	$54.09
4	75	$33.14	$9.40	$13.76	$0.00	$56.30
5	80	$35.35	$9.40	$15.49	$0.00	$60.24
6	80	$35.35	$9.40	$15.49	$0.00	$60.24
7	90	$39.77	$9.40	$17.22	$0.00	$66.39
8	90	$39.77	$9.40	$17.22	$0.00	$66.39

Notes:

% Indentured After 10/1/17; 45/45/55/55/70/70/80/80
Step 1&2 $30.72/ 3&4 $36.75/ 5&6 $55.37/ 7&8 $61.45

Apprentice to Journeyworker Ratio:1:5

CARPENTER WOOD FRAME *CARPENTERS-ZONE 3 (Wood Frame)*	04/01/2021	$23.16	$7.21	$4.80	$0.00	$35.17
	04/01/2022	$23.66	$7.21	$4.80	$0.00	$35.67
	04/01/2023	$24.16	$7.21	$4.80	$0.00	$36.17

All Aspects of New Wood Frame Work

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

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

Effective Date - 04/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$13.90	$7.21	$0.00	$0.00	$21.11
2	60	$13.90	$7.21	$0.00	$0.00	$21.11
3	65	$15.05	$7.21	$0.00	$0.00	$22.26
4	70	$16.21	$7.21	$0.00	$0.00	$23.42
5	75	$17.37	$7.21	$3.80	$0.00	$28.38
6	80	$18.53	$7.21	$3.80	$0.00	$29.54
7	85	$19.69	$7.21	$3.80	$0.00	$30.70
8	90	$20.84	$7.21	$3.80	$0.00	$31.85

Effective Date - 04/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$14.20	$7.21	$0.00	$0.00	$21.41
2	60	$14.20	$7.21	$0.00	$0.00	$21.41
3	65	$15.38	$7.21	$0.00	$0.00	$22.59
4	70	$16.56	$7.21	$0.00	$0.00	$23.77
5	75	$17.75	$7.21	$3.80	$0.00	$28.76
6	80	$18.93	$7.21	$3.80	$0.00	$29.94
7	85	$20.11	$7.21	$3.80	$0.00	$31.12
8	90	$21.29	$7.21	$3.80	$0.00	$32.30

Notes:

% Indentured After 10/1/17; 45/45/55/55/70/70/80/80
Step 1&2 $17.63/ 3&4 $19.95/ 5&6 $27.22/ 7&8 $29.54

Apprentice to Journeyworker Ratio:1:5

CEMENT MASONRY/PLASTERING *BRICKLAYERS LOCAL 3 (LYNN)*	01/01/2020	$49.07	$12.75	$22.41	$0.62	$84.85

Apprentice - *CEMENT MASONRY/PLASTERING - Eastern Mass (Lynn)*

Effective Date - 01/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.54	$12.75	$15.41	$0.00	$52.70
2	60	$29.44	$12.75	$17.41	$0.62	$60.22
3	65	$31.90	$12.75	$18.41	$0.62	$63.68
4	70	$34.35	$12.75	$19.41	$0.62	$67.13
5	75	$36.80	$12.75	$20.41	$0.62	$70.58
6	80	$39.26	$12.75	$21.41	$0.62	$74.04
7	90	$44.16	$12.75	$22.41	$0.62	$79.94

Notes:

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

Apprentice to Journeyworker Ratio:1:3

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
CHAIN SAW OPERATOR *LABORERS - ZONE 2*	06/01/2021	$35.25	$8.60	$16.64	$0.00	$60.49
	12/01/2021	$36.16	$8.60	$16.64	$0.00	$61.40
	06/01/2022	$37.06	$8.60	$16.64	$0.00	$62.30
	12/01/2022	$37.91	$8.60	$16.64	$0.00	$63.15
	06/01/2023	$38.81	$8.60	$16.64	$0.00	$64.05
	12/01/2023	$39.71	$8.60	$16.64	$0.00	$64.95
For apprentice rates see "Apprentice- LABORER"						
CLAM SHELLS/SLURRY BUCKETS/HEADING MACHINES *OPERATING ENGINEERS LOCAL 4*	06/01/2021	$51.73	$13.75	$15.80	$0.00	$81.28
	12/01/2021	$52.88	$13.75	$15.80	$0.00	$82.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
COMPRESSOR OPERATOR *OPERATING ENGINEERS LOCAL 4*	06/01/2021	$33.40	$13.75	$15.80	$0.00	$62.95
	12/01/2021	$34.19	$13.75	$15.80	$0.00	$63.74
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
DELEADER (BRIDGE) *PAINTERS LOCAL 35 - ZONE 2*	01/01/2021	$52.06	$8.25	$22.75	$0.00	$83.06

Apprentice - *PAINTER Local 35 - BRIDGES/TANKS*

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 *LABORERS - ZONE 2*	06/01/2021	$40.82	$8.60	$17.57	$0.00	$66.99
	12/01/2021	$41.83	$8.60	$17.57	$0.00	$68.00
	06/01/2022	$42.83	$8.60	$17.57	$0.00	$69.00
	12/01/2022	$43.83	$8.60	$17.57	$0.00	$70.00
	06/01/2023	$44.83	$8.60	$17.57	$0.00	$71.00
	12/01/2023	$46.08	$8.60	$17.57	$0.00	$72.25
For apprentice rates see "Apprentice- LABORER"						
DEMO: BACKHOE/LOADER/HAMMER OPERATOR *LABORERS - ZONE 2*	06/01/2021	$41.82	$8.60	$17.57	$0.00	$67.99
	12/01/2021	$42.83	$8.60	$17.57	$0.00	$69.00
	06/01/2022	$43.83	$8.60	$17.57	$0.00	$70.00
	12/01/2022	$44.83	$8.60	$17.57	$0.00	$71.00
	06/01/2023	$45.83	$8.60	$17.57	$0.00	$72.00
	12/01/2023	$47.08	$8.60	$17.57	$0.00	$73.25
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
DEMO: BURNERS *LABORERS - ZONE 2*	06/01/2021	$41.57	$8.60	$17.57	$0.00	$67.74
	12/01/2021	$42.58	$8.60	$17.57	$0.00	$68.75
	06/01/2022	$43.58	$8.60	$17.57	$0.00	$69.75
	12/01/2022	$44.58	$8.60	$17.57	$0.00	$70.75
	06/01/2023	$45.58	$8.60	$17.57	$0.00	$71.75
	12/01/2023	$46.83	$8.60	$17.57	$0.00	$73.00
For apprentice rates see "Apprentice- LABORER"						
DEMO: CONCRETE CUTTER/SAWYER *LABORERS - ZONE 2*	06/01/2021	$41.82	$8.60	$17.57	$0.00	$67.99
	12/01/2021	$42.83	$8.60	$17.57	$0.00	$69.00
	06/01/2022	$43.83	$8.60	$17.57	$0.00	$70.00
	12/01/2022	$44.83	$8.60	$17.57	$0.00	$71.00
	06/01/2023	$45.83	$8.60	$17.57	$0.00	$72.00
	12/01/2023	$47.08	$8.60	$17.57	$0.00	$73.25
For apprentice rates see "Apprentice- LABORER"						
DEMO: JACKHAMMER OPERATOR *LABORERS - ZONE 2*	06/01/2021	$41.57	$8.60	$17.57	$0.00	$67.74
	12/01/2021	$42.58	$8.60	$17.57	$0.00	$68.75
	06/01/2022	$43.58	$8.60	$17.57	$0.00	$69.75
	12/01/2022	$44.58	$8.60	$17.57	$0.00	$70.75
	06/01/2023	$45.58	$8.60	$17.57	$0.00	$71.75
	12/01/2023	$46.83	$8.60	$17.57	$0.00	$73.00
For apprentice rates see "Apprentice- LABORER"						
DEMO: WRECKING LABORER *LABORERS - ZONE 2*	06/01/2021	$40.82	$8.60	$17.57	$0.00	$66.99
	12/01/2021	$41.83	$8.60	$17.57	$0.00	$68.00
	06/01/2022	$42.83	$8.60	$17.57	$0.00	$69.00
	12/01/2022	$43.83	$8.60	$17.57	$0.00	$70.00
	06/01/2023	$44.83	$8.60	$17.57	$0.00	$71.00
	12/01/2023	$46.08	$8.60	$17.57	$0.00	$72.25
For apprentice rates see "Apprentice- LABORER"						
DIRECTIONAL DRILL MACHINE OPERATOR *OPERATING ENGINEERS LOCAL 4*	06/01/2021	$50.19	$13.75	$15.80	$0.00	$79.74
	12/01/2021	$51.33	$13.75	$15.80	$0.00	$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
DIVER *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2020	$68.70	$9.40	$23.12	$0.00	$101.22
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER TENDER *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2020	$49.07	$9.40	$23.12	$0.00	$81.59
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER TENDER (EFFLUENT) *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2020	$73.60	$9.40	$23.12	$0.00	$106.12
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER/SLURRY (EFFLUENT) *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2020	$103.05	$9.40	$23.12	$0.00	$135.57
For apprentice rates see "Apprentice- PILE DRIVER"						
DRAWBRIDGE OPERATOR (Construction) *DRAWBRIDGE - SEIU LOCAL 888*	07/01/2020	$26.77	$6.67	$3.93	$0.16	$37.53

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
ELECTRICIAN *ELECTRICIANS LOCAL 103*	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 - 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

Effective Date - 09/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$22.74	$13.00	$0.68	$0.00	$36.42
2	40	$22.74	$13.00	$0.68	$0.00	$36.42
3	45	$25.58	$13.00	$15.15	$0.00	$53.73
4	45	$25.58	$13.00	$15.15	$0.00	$53.73
5	50	$28.42	$13.00	$15.59	$0.00	$57.01
6	55	$31.26	$13.00	$16.04	$0.00	$60.30
7	60	$34.10	$13.00	$16.48	$0.00	$63.58
8	65	$36.95	$13.00	$16.93	$0.00	$66.88
9	70	$39.79	$13.00	$17.37	$0.00	$70.16
10	75	$42.63	$13.00	$17.83	$0.00	$73.46

Notes: :

App Prior 1/1/03; 30/35/40/45/50/55/65/70/75/80

Apprentice to Journeyworker Ratio:2:3***

ELEVATOR CONSTRUCTOR *ELEVATOR CONSTRUCTORS LOCAL 4*	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 - 01/01/2021

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

Effective Date - 01/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$32.81	$16.03	$0.00	$0.00	$48.84
2	55	$36.09	$16.03	$20.21	$0.00	$72.33
3	65	$42.65	$16.03	$20.21	$0.00	$78.89
4	70	$45.93	$16.03	$20.21	$0.00	$82.17
5	80	$52.50	$16.03	$20.21	$0.00	$88.74

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

Apprentice to Journeyworker Ratio:1:1

ELEVATOR CONSTRUCTOR HELPER *ELEVATOR CONSTRUCTORS LOCAL 4*	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 *LABORERS - ZONE 2*	06/01/2021	$35.25	$8.60	$16.64	$0.00	$60.49
	12/01/2021	$36.16	$8.60	$16.64	$0.00	$61.40
	06/01/2022	$37.06	$8.60	$16.64	$0.00	$62.30
	12/01/2022	$37.91	$8.60	$16.64	$0.00	$63.15
	06/01/2023	$38.81	$8.60	$16.64	$0.00	$64.05
	12/01/2023	$39.71	$8.60	$16.64	$0.00	$64.95
For apprentice rates see "Apprentice- LABORER"						
FIELD ENG.INST.PERSON-BLDG,SITE,HVY/HWY *OPERATING ENGINEERS LOCAL 4*	05/01/2021	$45.88	$13.50	$15.70	$0.00	$75.08
	11/01/2021	$46.88	$13.50	$15.70	$0.00	$76.08
	05/01/2022	$48.03	$13.50	$15.70	$0.00	$77.23
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FIELD ENG.PARTY CHIEF-BLDG,SITE,HVY/HWY *OPERATING ENGINEERS LOCAL 4*	05/01/2021	$47.40	$13.50	$15.70	$0.00	$76.60
	11/01/2021	$48.41	$13.50	$15.70	$0.00	$77.61
	05/01/2022	$49.57	$13.50	$15.70	$0.00	$78.77
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FIELD ENG.ROD PERSON-BLDG,SITE,HVY/HWY *OPERATING ENGINEERS LOCAL 4*	05/01/2021	$22.91	$13.50	$15.70	$0.00	$52.11
	11/01/2021	$23.51	$13.50	$15.70	$0.00	$52.71
	05/01/2022	$24.18	$13.50	$15.70	$0.00	$53.38
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
FIRE ALARM INSTALLER *ELECTRICIANS LOCAL 103*	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*ELECTRICIANS LOCAL 103*	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) *OPERATING ENGINEERS LOCAL 4*	06/01/2021	$41.31	$13.75	$15.80	$0.00	$70.86
	12/01/2021	$42.26	$13.75	$15.80	$0.00	$71.81
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FLOORCOVERER *FLOORCOVERERS LOCAL 2168 ZONE I*	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

Apprentice - *FLOORCOVERER - Local 2168 Zone I*

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

Effective Date - 09/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.70	$9.40	$1.79	$0.00	$35.89
2	55	$27.16	$9.40	$1.79	$0.00	$38.35
3	60	$29.63	$9.40	$13.88	$0.00	$52.91
4	65	$32.10	$9.40	$13.88	$0.00	$55.38
5	70	$34.57	$9.40	$15.67	$0.00	$59.64
6	75	$37.04	$9.40	$15.67	$0.00	$62.11
7	80	$39.51	$9.40	$17.46	$0.00	$66.37
8	85	$41.98	$9.40	$17.46	$0.00	$68.84

Notes: Steps are 750 hrs.
% After 09/1/17; 45/45/55/55/70/70/80/80 (1500hr Steps)
Step 1&2 $33.03/ 3&4 $39.64/ 5&6 $59.08/ 7&8 $65.73

Apprentice to Journeyworker Ratio:1:1

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
FORK LIFT/CHERRY PICKER *OPERATING ENGINEERS LOCAL 4* For apprentice rates see "Apprentice- OPERATING ENGINEERS"	06/01/2021	$50.73	$13.75	$15.80	$0.00	$80.28
	12/01/2021	$51.88	$13.75	$15.80	$0.00	$81.43
GENERATOR/LIGHTING PLANT/HEATERS *OPERATING ENGINEERS LOCAL 4* For apprentice rates see "Apprentice- OPERATING ENGINEERS"	06/01/2021	$33.40	$13.75	$15.80	$0.00	$62.95
	12/01/2021	$34.19	$13.75	$15.80	$0.00	$63.74
GLAZIER (GLASS PLANK/AIR BARRIER/INTERIOR SYSTEMS) *GLAZIERS LOCAL 35 (ZONE 2)*	01/01/2021	$41.56	$8.25	$22.75	$0.00	$72.56

Apprentice - *GLAZIER - Local 35 Zone 2*

Effective Date - 01/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$20.78	$8.25	$0.00	$0.00	$29.03
2	55	$22.86	$8.25	$6.16	$0.00	$37.27
3	60	$24.94	$8.25	$6.72	$0.00	$39.91
4	65	$27.01	$8.25	$7.28	$0.00	$42.54
5	70	$29.09	$8.25	$19.39	$0.00	$56.73
6	75	$31.17	$8.25	$19.95	$0.00	$59.37
7	80	$33.25	$8.25	$20.51	$0.00	$62.01
8	90	$37.40	$8.25	$21.63	$0.00	$67.28

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

HOISTING ENGINEER/CRANES/GRADALLS *OPERATING ENGINEERS LOCAL 4*	06/01/2021	$50.73	$13.75	$15.80	$0.00	$80.28
	12/01/2021	$51.88	$13.75	$15.80	$0.00	$81.43

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *OPERATING ENGINEERS - Local 4*

Effective Date - 06/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	$27.90	$13.75	$0.00	$0.00	$41.65
2	60	$30.44	$13.75	$15.80	$0.00	$59.99
3	65	$32.97	$13.75	$15.80	$0.00	$62.52
4	70	$35.51	$13.75	$15.80	$0.00	$65.06
5	75	$38.05	$13.75	$15.80	$0.00	$67.60
6	80	$40.58	$13.75	$15.80	$0.00	$70.13
7	85	$43.12	$13.75	$15.80	$0.00	$72.67
8	90	$45.66	$13.75	$15.80	$0.00	$75.21

Effective Date - 12/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	$28.53	$13.75	$0.00	$0.00	$42.28
2	60	$31.13	$13.75	$15.80	$0.00	$60.68
3	65	$33.72	$13.75	$15.80	$0.00	$63.27
4	70	$36.32	$13.75	$15.80	$0.00	$65.87
5	75	$38.91	$13.75	$15.80	$0.00	$68.46
6	80	$41.50	$13.75	$15.80	$0.00	$71.05
7	85	$44.10	$13.75	$15.80	$0.00	$73.65
8	90	$46.69	$13.75	$15.80	$0.00	$76.24

Notes:

Apprentice to Journeyworker Ratio:1:6

HVAC (DUCTWORK) *SHEETMETAL WORKERS LOCAL 17 - A*	02/01/2021	$51.67	$13.65	$24.57	$2.70	$92.59
	08/01/2021	$53.42	$13.65	$24.57	$2.75	$94.39
	02/01/2022	$55.17	$13.65	$24.57	$2.80	$96.19
For apprentice rates see "Apprentice- SHEET METAL WORKER"						
HVAC (ELECTRICAL CONTROLS) *ELECTRICIANS LOCAL 103*	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) *SHEETMETAL WORKERS LOCAL 17 - A*	02/01/2021	$51.67	$13.65	$24.57	$2.70	$92.59
	08/01/2021	$53.42	$13.65	$24.57	$2.75	$94.39
	02/01/2022	$55.17	$13.65	$24.57	$2.80	$96.19
For apprentice rates see "Apprentice- SHEET METAL WORKER"						
HVAC (TESTING AND BALANCING -WATER) *PIPEFITTERS LOCAL 537 (Local 138)*	03/01/2021	$54.86	$10.95	$19.74	$0.00	$85.55
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
HVAC MECHANIC *PIPEFITTERS LOCAL 537 (Local 138)*	03/01/2021	$54.86	$10.95	$19.74	$0.00	$85.55

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
HYDRAULIC DRILLS *LABORERS - ZONE 2*	06/01/2021	$35.75	$8.60	$16.64	$0.00	$60.99
	12/01/2021	$36.66	$8.60	$16.64	$0.00	$61.90
	06/01/2022	$37.56	$8.60	$16.64	$0.00	$62.80
	12/01/2022	$38.41	$8.60	$16.64	$0.00	$63.65
	06/01/2023	$39.31	$8.60	$16.64	$0.00	$64.55
	12/01/2023	$40.21	$8.60	$16.64	$0.00	$65.45
For apprentice rates see "Apprentice- LABORER"						
INSULATOR (PIPES & TANKS) *HEAT & FROST INSULATORS LOCAL 6 (BOSTON)*	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 *IRONWORKERS LOCAL 7 (LAWRENCE AREA)*	09/16/2020	$44.25	$8.10	$25.10	$0.00	$77.45

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *IRONWORKER - Local 7 Lawrence*

Effective Date - 09/16/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$26.55	$8.10	$25.10	$0.00	$59.75
2	70	$30.98	$8.10	$25.10	$0.00	$64.18
3	75	$33.19	$8.10	$25.10	$0.00	$66.39
4	80	$35.40	$8.10	$25.10	$0.00	$68.60
5	85	$37.61	$8.10	$25.10	$0.00	$70.81
6	90	$39.83	$8.10	$25.10	$0.00	$73.03

Notes:
Structural 1:6; Ornamental 1:4

Apprentice to Journeyworker Ratio:

JACKHAMMER & PAVING BREAKER OPERATOR *LABORERS - ZONE 2*	06/01/2021	$35.25	$8.60	$16.64	$0.00	$60.49
	12/01/2021	$36.16	$8.60	$16.64	$0.00	$61.40
	06/01/2022	$37.06	$8.60	$16.64	$0.00	$62.30
	12/01/2022	$37.91	$8.60	$16.64	$0.00	$63.15
	06/01/2023	$38.81	$8.60	$16.64	$0.00	$64.05
	12/01/2023	$39.71	$8.60	$16.64	$0.00	$64.95
For apprentice rates see "Apprentice- LABORER"						
LABORER *LABORERS - ZONE 2*	06/01/2021	$35.00	$8.60	$16.64	$0.00	$60.24
	12/01/2021	$35.91	$8.60	$16.64	$0.00	$61.15
	06/01/2022	$36.81	$8.60	$16.64	$0.00	$62.05
	12/01/2022	$37.66	$8.60	$16.64	$0.00	$62.90
	06/01/2023	$38.56	$8.60	$16.64	$0.00	$63.80
	12/01/2023	$39.46	$8.60	$16.64	$0.00	$64.70

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *LABORER - Zone 2*

Effective Date - 06/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$21.00	$8.60	$16.64	$0.00	$46.24
2	70	$24.50	$8.60	$16.64	$0.00	$49.74
3	80	$28.00	$8.60	$16.64	$0.00	$53.24
4	90	$31.50	$8.60	$16.64	$0.00	$56.74

Effective Date - 12/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$21.55	$8.60	$16.64	$0.00	$46.79
2	70	$25.14	$8.60	$16.64	$0.00	$50.38
3	80	$28.73	$8.60	$16.64	$0.00	$53.97
4	90	$32.32	$8.60	$16.64	$0.00	$57.56

Notes:

Apprentice to Journeyworker Ratio:1:5

LABORER: CARPENTER TENDER *LABORERS - ZONE 2*	06/01/2021	$35.00	$8.60	$16.64	$0.00	$60.24
	12/01/2021	$35.91	$8.60	$16.64	$0.00	$61.15
	06/01/2022	$36.81	$8.60	$16.64	$0.00	$62.05
	12/01/2022	$37.66	$8.60	$16.64	$0.00	$62.90
	06/01/2023	$38.56	$8.60	$16.64	$0.00	$63.80
	12/01/2023	$39.46	$8.60	$16.64	$0.00	$64.70
For apprentice rates see "Apprentice- LABORER"						
LABORER: CEMENT FINISHER TENDER *LABORERS - ZONE 2*	06/01/2021	$35.00	$8.60	$16.64	$0.00	$60.24
	12/01/2021	$35.91	$8.60	$16.64	$0.00	$61.15
	06/01/2022	$36.81	$8.60	$16.64	$0.00	$62.05
	12/01/2022	$37.66	$8.60	$16.64	$0.00	$62.90
	06/01/2023	$38.56	$8.60	$16.64	$0.00	$63.80
	12/01/2023	$39.46	$8.60	$16.64	$0.00	$64.70
For apprentice rates see "Apprentice- LABORER"						
LABORER: HAZARDOUS WASTE/ASBESTOS REMOVER *LABORERS - ZONE 2*	06/01/2021	$35.09	$8.60	$16.70	$0.00	$60.39
	12/01/2021	$36.00	$8.60	$16.70	$0.00	$61.30
	06/01/2022	$36.90	$8.60	$16.70	$0.00	$62.20
	12/01/2022	$37.75	$8.60	$16.70	$0.00	$63.05
	06/01/2023	$38.65	$8.60	$16.70	$0.00	$63.95
	12/01/2023	$39.55	$8.60	$16.70	$0.00	$64.85
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
LABORER: MASON TENDER *LABORERS - ZONE 2*	06/01/2021	$35.25	$8.60	$16.64	$0.00	$60.49
	12/01/2021	$36.16	$8.60	$16.64	$0.00	$61.40
	06/01/2022	$37.06	$8.60	$16.64	$0.00	$62.30
	12/01/2022	$37.91	$8.60	$16.64	$0.00	$63.15
	06/01/2023	$38.81	$8.60	$16.64	$0.00	$64.05
	12/01/2023	$39.71	$8.60	$16.64	$0.00	$64.95
For apprentice rates see "Apprentice- LABORER"						
LABORER: MULTI-TRADE TENDER *LABORERS - ZONE 2*	06/01/2021	$35.00	$8.60	$16.64	$0.00	$60.24
	12/01/2021	$35.91	$8.60	$16.64	$0.00	$61.15
	06/01/2022	$36.81	$8.60	$16.64	$0.00	$62.05
	12/01/2022	$37.66	$8.60	$16.64	$0.00	$62.90
	06/01/2023	$38.56	$8.60	$16.64	$0.00	$63.80
	12/01/2023	$39.46	$8.60	$16.64	$0.00	$64.70
For apprentice rates see "Apprentice- LABORER"						
LABORER: TREE REMOVER *LABORERS - ZONE 2*	06/01/2021	$35.00	$8.60	$16.64	$0.00	$60.24
	12/01/2021	$35.91	$8.60	$16.64	$0.00	$61.15
	06/01/2022	$36.81	$8.60	$16.64	$0.00	$62.05
	12/01/2022	$37.66	$8.60	$16.64	$0.00	$62.90
	06/01/2023	$38.56	$8.60	$16.64	$0.00	$63.80
	12/01/2023	$39.46	$8.60	$16.64	$0.00	$64.70
This classification applies to the removal of standing trees, and the trimming and removal of branches and limbs when related to public works construction or site clearance incidental to construction . For apprentice rates see "Apprentice- LABORER"						
LASER BEAM OPERATOR *LABORERS - ZONE 2*	06/01/2021	$35.25	$8.60	$16.64	$0.00	$60.49
	12/01/2021	$36.16	$8.60	$16.64	$0.00	$61.40
	06/01/2022	$37.06	$8.60	$16.64	$0.00	$62.30
	12/01/2022	$37.91	$8.60	$16.64	$0.00	$63.15
	06/01/2023	$38.81	$8.60	$16.64	$0.00	$64.05
	12/01/2023	$39.71	$8.60	$16.64	$0.00	$64.95
For apprentice rates see "Apprentice- LABORER"						
MARBLE & TILE FINISHERS *BRICKLAYERS LOCAL 3 - MARBLE & TILE*	02/01/2021	$42.57	$11.39	$20.14	$0.00	$74.10
	08/01/2021	$43.69	$11.39	$20.30	$0.00	$75.38
	02/01/2022	$44.16	$11.39	$20.30	$0.00	$75.85

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *MARBLE & TILE FINISHER - Local 3 Marble & Tile*

Effective Date - 02/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$21.29	$11.39	$20.14	$0.00	$52.82
2	60	$25.54	$11.39	$20.14	$0.00	$57.07
3	70	$29.80	$11.39	$20.14	$0.00	$61.33
4	80	$34.06	$11.39	$20.14	$0.00	$65.59
5	90	$38.31	$11.39	$20.14	$0.00	$69.84

Effective Date - 08/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$21.85	$11.39	$20.30	$0.00	$53.54
2	60	$26.21	$11.39	$20.30	$0.00	$57.90
3	70	$30.58	$11.39	$20.30	$0.00	$62.27
4	80	$34.95	$11.39	$20.30	$0.00	$66.64
5	90	$39.32	$11.39	$20.30	$0.00	$71.01

Notes:

Apprentice to Journeyworker Ratio:1:3

MARBLE MASONS,TILELAYERS & TERRAZZO MECH *BRICKLAYERS LOCAL 3 - MARBLE & TILE*	02/01/2021	$55.77	$11.39	$22.08	$0.00	$89.24
	08/01/2021	$57.17	$11.39	$22.24	$0.00	$90.80
	02/01/2022	$57.74	$11.39	$22.24	$0.00	$91.37

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *MARBLE-TILE-TERRAZZO MECHANIC - Local 3 Marble & Tile*

Effective Date - 02/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$27.89	$11.39	$22.08	$0.00	$61.36
2	60	$33.46	$11.39	$22.08	$0.00	$66.93
3	70	$39.04	$11.39	$22.08	$0.00	$72.51
4	80	$44.62	$11.39	$22.08	$0.00	$78.09
5	90	$50.19	$11.39	$22.08	$0.00	$83.66

Effective Date - 08/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$28.59	$11.39	$22.24	$0.00	$62.22
2	60	$34.30	$11.39	$22.24	$0.00	$67.93
3	70	$40.02	$11.39	$22.24	$0.00	$73.65
4	80	$45.74	$11.39	$22.24	$0.00	$79.37
5	90	$51.45	$11.39	$22.24	$0.00	$85.08

Notes:

Apprentice to Journeyworker Ratio:1:5

MECH. SWEEPER OPERATOR (ON CONST. SITES) *OPERATING ENGINEERS LOCAL 4*	06/01/2021	$50.19	$13.75	$15.80	$0.00	$79.74
	12/01/2021	$51.33	$13.75	$15.80	$0.00	$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
MECHANICS MAINTENANCE *OPERATING ENGINEERS LOCAL 4*	06/01/2021	$50.19	$13.75	$15.80	$0.00	$79.74
	12/01/2021	$51.33	$13.75	$15.80	$0.00	$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
MILLWRIGHT (Zone 2) *MILLWRIGHTS LOCAL 1121 - Zone 2*	01/04/2021	$39.72	$9.40	$20.45	$0.00	$69.57
	01/03/2022	$40.97	$9.40	$20.45	$0.00	$70.82
	01/02/2023	$42.22	$9.40	$20.45	$0.00	$72.07

Apprentice - *MILLWRIGHT - Local 1121 Zone 2*

Effective Date - 01/04/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	$21.85	$9.40	$5.58	$0.00	$36.83
2	65	$25.82	$9.40	$16.90	$0.00	$52.12
3	75	$29.79	$9.40	$17.92	$0.00	$57.11
4	85	$33.76	$9.40	$18.93	$0.00	$62.09

Effective Date - 01/03/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	$22.53	$9.40	$5.58	$0.00	$37.51
2	65	$26.63	$9.40	$16.90	$0.00	$52.93
3	75	$30.73	$9.40	$17.92	$0.00	$58.05
4	85	$34.82	$9.40	$18.93	$0.00	$63.15

Notes: Step 1&2 Appr. indentured after 1/1/2020 receive no pension, but do receive annuity. (Step 1 $5.58, Step 2 $6.50)
Steps are 2,000 hours

Apprentice to Journeyworker Ratio:1:5

MORTAR MIXER *LABORERS - ZONE 2*	06/01/2021	$35.25	$8.60	$16.64	$0.00	$60.49
	12/01/2021	$36.16	$8.60	$16.64	$0.00	$61.40
	06/01/2022	$37.06	$8.60	$16.64	$0.00	$62.30
	12/01/2022	$37.91	$8.60	$16.64	$0.00	$63.15
	06/01/2023	$38.81	$8.60	$16.64	$0.00	$64.05
	12/01/2023	$39.71	$8.60	$16.64	$0.00	$64.95
For apprentice rates see "Apprentice- LABORER"						
OILER (OTHER THAN TRUCK CRANES,GRADALLS) *OPERATING ENGINEERS LOCAL 4*	06/01/2021	$23.40	$13.75	$15.80	$0.00	$52.95
	12/01/2021	$23.98	$13.75	$15.80	$0.00	$53.53
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
OILER (TRUCK CRANES, GRADALLS) *OPERATING ENGINEERS LOCAL 4*	06/01/2021	$28.26	$13.75	$15.80	$0.00	$57.81
	12/01/2021	$28.94	$13.75	$15.80	$0.00	$58.49
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
OTHER POWER DRIVEN EQUIPMENT - CLASS II *OPERATING ENGINEERS LOCAL 4*	06/01/2021	$50.19	$13.75	$15.80	$0.00	$79.74
	12/01/2021	$51.33	$13.75	$15.80	$0.00	$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PAINTER (BRIDGES/TANKS) *PAINTERS LOCAL 35 - ZONE 2*	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 - 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) * * If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used.*PAINTERS LOCAL 35 - ZONE 2*	01/01/2021	$42.96	$8.25	$22.75	$0.00	$73.96

Apprentice - *PAINTER Local 35 Zone 2 - Spray/Sandblast - New*

Effective Date - 01/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$21.48	$8.25	$0.00	$0.00	$29.73
2	55	$23.63	$8.25	$6.16	$0.00	$38.04
3	60	$25.78	$8.25	$6.72	$0.00	$40.75
4	65	$27.92	$8.25	$7.28	$0.00	$43.45
5	70	$30.07	$8.25	$19.39	$0.00	$57.71
6	75	$32.22	$8.25	$19.95	$0.00	$60.42
7	80	$34.37	$8.25	$20.51	$0.00	$63.13
8	90	$38.66	$8.25	$21.63	$0.00	$68.54

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (SPRAY OR SANDBLAST, REPAINT) *PAINTERS LOCAL 35 - ZONE 2*	01/01/2021	$41.02	$8.25	$22.75	$0.00	$72.02

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 Zone 2 - Spray/Sandblast - Repaint*

Effective Date - 01/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$20.51	$8.25	$0.00	$0.00	$28.76
2	55	$22.56	$8.25	$6.16	$0.00	$36.97
3	60	$24.61	$8.25	$6.72	$0.00	$39.58
4	65	$26.66	$8.25	$7.28	$0.00	$42.19
5	70	$28.71	$8.25	$19.39	$0.00	$56.35
6	75	$30.77	$8.25	$19.95	$0.00	$58.97
7	80	$32.82	$8.25	$20.51	$0.00	$61.58
8	90	$36.92	$8.25	$21.63	$0.00	$66.80

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER / TAPER (BRUSH, NEW) *	01/01/2021	$41.56	$8.25	$22.75	$0.00	$72.56

* If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used.*PAINTERS LOCAL 35 - ZONE 2*

Apprentice - *PAINTER - Local 35 Zone 2 - BRUSH NEW*

Effective Date - 01/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$20.78	$8.25	$0.00	$0.00	$29.03
2	55	$22.86	$8.25	$6.16	$0.00	$37.27
3	60	$24.94	$8.25	$6.72	$0.00	$39.91
4	65	$27.01	$8.25	$7.28	$0.00	$42.54
5	70	$29.09	$8.25	$19.39	$0.00	$56.73
6	75	$31.17	$8.25	$19.95	$0.00	$59.37
7	80	$33.25	$8.25	$20.51	$0.00	$62.01
8	90	$37.40	$8.25	$21.63	$0.00	$67.28

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER / TAPER (BRUSH, REPAINT) *PAINTERS LOCAL 35 - ZONE 2*	01/01/2021	$39.62	$8.25	$22.75	$0.00	$70.62

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PAINTER Local 35 Zone 2 - BRUSH REPAINT*

Effective Date - 01/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$19.81	$8.25	$0.00	$0.00	$28.06
2	55	$21.79	$8.25	$6.16	$0.00	$36.20
3	60	$23.77	$8.25	$6.72	$0.00	$38.74
4	65	$25.75	$8.25	$7.28	$0.00	$41.28
5	70	$27.73	$8.25	$19.39	$0.00	$55.37
6	75	$29.72	$8.25	$19.95	$0.00	$57.92
7	80	$31.70	$8.25	$20.51	$0.00	$60.46
8	90	$35.66	$8.25	$21.63	$0.00	$65.54

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PANEL & PICKUP TRUCKS DRIVER *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	06/01/2021	$35.78	$12.91	$14.82	$0.00	$63.51
	08/01/2021	$35.78	$13.41	$14.82	$0.00	$64.01
	12/01/2021	$35.78	$13.41	$16.01	$0.00	$65.20
PIER AND DOCK CONSTRUCTOR (UNDERPINNING AND DECK) *PILE DRIVER LOCAL 56 (ZONE 1)* For apprentice rates see "Apprentice- PILE DRIVER"	08/01/2020	$49.07	$9.40	$23.12	$0.00	$81.59
PILE DRIVER *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2020	$49.07	$9.40	$23.12	$0.00	$81.59

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 *PIPEFITTERS LOCAL 537 (Local 138)*	03/01/2021	$54.86	$10.95	$19.74	$0.00	$85.55

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *PIPEFITTER Local 537 (Local 138)*

Effective Date - 03/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$21.94	$10.95	$8.00	$0.00	$40.89
2	45	$24.69	$10.95	$19.74	$0.00	$55.38
3	60	$32.92	$10.95	$19.74	$0.00	$63.61
4	70	$38.40	$10.95	$19.74	$0.00	$69.09
5	80	$43.89	$10.95	$19.74	$0.00	$74.58

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:**

PIPELAYER *LABORERS - ZONE 2*	06/01/2021	$35.25	$8.60	$16.64	$0.00	$60.49
	12/01/2021	$36.16	$8.60	$16.64	$0.00	$61.40
	06/01/2022	$37.06	$8.60	$16.64	$0.00	$62.30
	12/01/2022	$37.91	$8.60	$16.64	$0.00	$63.15
	06/01/2023	$38.81	$8.60	$16.64	$0.00	$64.05
	12/01/2023	$39.71	$8.60	$16.64	$0.00	$64.95

For apprentice rates see "Apprentice- LABORER"

PLUMBER *PLUMBERS & GASFITTERS LOCAL 12 (Local 138)*	03/01/2021	$56.11	$13.57	$17.26	$0.00	$86.94

Apprentice - *PLUMBER/GASFITTER - Local 12 (Local 138)*

Effective Date - 03/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	$19.64	$13.57	$6.24	$0.00	$39.45
2	40	$22.44	$13.57	$7.08	$0.00	$43.09
3	55	$30.86	$13.57	$9.63	$0.00	$54.06
4	65	$36.47	$13.57	$11.33	$0.00	$61.37
5	75	$42.08	$13.57	$13.03	$0.00	$68.68

Notes:

Steps are 1 yr

Step 4 with lic$65.04, Step5 with lic$72.34

Apprentice to Journeyworker Ratio:1:5

PNEUMATIC CONTROLS (TEMP.) *PIPEFITTERS LOCAL 537 (Local 138)*	03/01/2021	$54.86	$10.95	$19.74	$0.00	$85.55

For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"

PNEUMATIC DRILL/TOOL OPERATOR *LABORERS - ZONE 2*	06/01/2021	$35.25	$8.60	$16.64	$0.00	$60.49
	12/01/2021	$36.16	$8.60	$16.64	$0.00	$61.40
	06/01/2022	$37.06	$8.60	$16.64	$0.00	$62.30
	12/01/2022	$37.91	$8.60	$16.64	$0.00	$63.15
	06/01/2023	$38.81	$8.60	$16.64	$0.00	$64.05
	12/01/2023	$39.71	$8.60	$16.64	$0.00	$64.95

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
For apprentice rates see "Apprentice- LABORER"						
POWDERMAN & BLASTER *LABORERS - ZONE 2*	06/01/2021	$36.00	$8.60	$16.64	$0.00	$61.24
	12/01/2021	$36.91	$8.60	$16.64	$0.00	$62.15
	06/01/2022	$37.81	$8.60	$16.64	$0.00	$63.05
	12/01/2022	$38.66	$8.60	$16.64	$0.00	$63.90
	06/01/2023	$39.56	$8.60	$16.64	$0.00	$64.80
	12/01/2023	$40.46	$8.60	$16.64	$0.00	$65.70
For apprentice rates see "Apprentice- LABORER"						
POWER SHOVEL/DERRICK/TRENCHING MACHINE *OPERATING ENGINEERS LOCAL 4*	06/01/2021	$50.73	$13.75	$15.80	$0.00	$80.28
	12/01/2021	$51.88	$13.75	$15.80	$0.00	$81.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PUMP OPERATOR (CONCRETE) *OPERATING ENGINEERS LOCAL 4*	06/01/2021	$50.73	$13.75	$15.80	$0.00	$80.28
	12/01/2021	$51.88	$13.75	$15.80	$0.00	$81.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PUMP OPERATOR (DEWATERING, OTHER) *OPERATING ENGINEERS LOCAL 4*	06/01/2021	$33.40	$13.75	$15.80	$0.00	$62.95
	12/01/2021	$34.19	$13.75	$15.80	$0.00	$63.74
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
READY-MIX CONCRETE DRIVER *TEAMSTERS 42 - J.G. MacLeallan (Wakefield)*	05/01/2021	$27.00	$7.99	$7.00	$0.00	$41.99
RECLAIMERS *OPERATING ENGINEERS LOCAL 4*	06/01/2021	$50.19	$13.75	$15.80	$0.00	$79.74
	12/01/2021	$51.33	$13.75	$15.80	$0.00	$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
RIDE-ON MOTORIZED BUGGY OPERATOR *LABORERS - ZONE 2*	06/01/2021	$35.25	$8.60	$16.64	$0.00	$60.49
	12/01/2021	$36.16	$8.60	$16.64	$0.00	$61.40
	06/01/2022	$37.06	$8.60	$16.64	$0.00	$62.30
	12/01/2022	$37.91	$8.60	$16.64	$0.00	$63.15
	06/01/2023	$38.81	$8.60	$16.64	$0.00	$64.05
	12/01/2023	$39.71	$8.60	$16.64	$0.00	$64.95
For apprentice rates see "Apprentice- LABORER"						
ROLLER/SPREADER/MULCHING MACHINE *OPERATING ENGINEERS LOCAL 4*	06/01/2021	$50.19	$13.75	$15.80	$0.00	$79.74
	12/01/2021	$51.33	$13.75	$15.80	$0.00	$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
ROOFER (Inc.Roofer Waterproofng &Roofer Damproofg) *ROOFERS LOCAL 33*	02/01/2021	$46.60	$12.28	$17.15	$0.00	$76.03
	08/01/2021	$48.03	$12.28	$17.15	$0.00	$77.46
	02/01/2022	$49.46	$12.28	$17.15	$0.00	$78.89

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *ROOFER - Local 33*

Effective Date - 02/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$23.30	$12.28	$4.31	$0.00	$39.89
2	60	$27.96	$12.28	$17.15	$0.00	$57.39
3	65	$30.29	$12.28	$17.15	$0.00	$59.72
4	75	$34.95	$12.28	$17.15	$0.00	$64.38
5	85	$39.61	$12.28	$17.15	$0.00	$69.04

Effective Date - 08/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.02	$12.28	$4.31	$0.00	$40.61
2	60	$28.82	$12.28	$17.15	$0.00	$58.25
3	65	$31.22	$12.28	$17.15	$0.00	$60.65
4	75	$36.02	$12.28	$17.15	$0.00	$65.45
5	85	$40.83	$12.28	$17.15	$0.00	$70.26

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*	02/01/2021	$46.85	$12.28	$17.15	$0.00	$76.28
	08/01/2021	$48.28	$12.28	$17.15	$0.00	$77.71
	02/01/2022	$49.71	$12.28	$17.15	$0.00	$79.14
For apprentice rates see "Apprentice- ROOFER"						
SHEETMETAL WORKER *SHEETMETAL WORKERS LOCAL 17 - A*	02/01/2021	$51.67	$13.65	$24.57	$2.70	$92.59
	08/01/2021	$53.42	$13.65	$24.57	$2.75	$94.39
	02/01/2022	$55.17	$13.65	$24.57	$2.80	$96.19

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *SHEET METAL WORKER - Local 17-A*

Effective Date - 02/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	42	$21.70	$13.65	$5.89	$0.00	$41.24
2	42	$21.70	$13.65	$5.89	$0.00	$41.24
3	47	$24.28	$13.65	$11.13	$1.48	$50.54
4	47	$24.28	$13.65	$11.13	$1.48	$50.54
5	52	$26.87	$13.65	$12.08	$1.58	$54.18
6	52	$26.87	$13.65	$12.33	$1.59	$54.44
7	60	$31.00	$13.65	$13.70	$1.76	$60.11
8	65	$33.59	$13.65	$14.65	$1.88	$63.77
9	75	$38.75	$13.65	$16.56	$2.08	$71.04
10	85	$43.92	$13.65	$17.96	$2.28	$77.81

Effective Date - 08/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	42	$22.44	$13.65	$5.89	$0.00	$41.98
2	42	$22.44	$13.65	$5.89	$0.00	$41.98
3	47	$25.11	$13.65	$11.13	$1.48	$51.37
4	47	$25.11	$13.65	$11.13	$1.48	$51.37
5	52	$27.78	$13.65	$12.08	$1.58	$55.09
6	52	$27.78	$13.65	$12.33	$1.59	$55.35
7	60	$32.05	$13.65	$13.70	$1.76	$61.16
8	65	$34.72	$13.65	$14.65	$1.88	$64.90
9	75	$40.07	$13.65	$16.56	$2.08	$72.36
10	85	$45.41	$13.65	$17.96	$2.28	$79.30

Notes:

Steps are 6 mos.

Apprentice to Journeyworker Ratio:1:4

SPECIALIZED EARTH MOVING EQUIP < 35 TONS *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	06/01/2021	$36.24	$12.91	$14.82	$0.00	$63.97
	08/01/2021	$36.24	$13.41	$14.82	$0.00	$64.47
	12/01/2021	$36.24	$13.41	$16.01	$0.00	$65.66
SPECIALIZED EARTH MOVING EQUIP > 35 TONS *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	06/01/2021	$36.53	$12.91	$14.82	$0.00	$64.26
	08/01/2021	$36.53	$13.41	$14.82	$0.00	$64.76
	12/01/2021	$36.53	$13.41	$16.01	$0.00	$65.95
SPRINKLER FITTER *SPRINKLER FITTERS LOCAL 550 - (Section B) Zone 2*	03/01/2021	$56.21	$10.00	$21.25	$0.00	$87.46

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *SPRINKLER FITTER - Local 550 (Section B) Zone 2*

Effective Date - 03/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	$19.67	$10.00	$11.99	$0.00	$41.66
2	40	$22.48	$10.00	$12.70	$0.00	$45.18
3	45	$25.29	$10.00	$13.41	$0.00	$48.70
4	50	$28.11	$10.00	$14.13	$0.00	$52.24
5	55	$30.92	$10.00	$14.84	$0.00	$55.76
6	60	$33.73	$10.00	$15.55	$0.00	$59.28
7	65	$36.54	$10.00	$16.26	$0.00	$62.80
8	70	$39.35	$10.00	$16.98	$0.00	$66.33
9	75	$42.16	$10.00	$17.69	$0.00	$69.85
10	80	$44.97	$10.00	$18.40	$0.00	$73.37

Notes: Apprentice entered prior 9/30/10:
40/45/50/55/60/65/70/75/80/85
Steps are 850 hours

Apprentice to Journeyworker Ratio:1:3

STEAM BOILER OPERATOR *OPERATING ENGINEERS LOCAL 4*	06/01/2021	$50.19	$13.75	$15.80	$0.00	$79.74
	12/01/2021	$51.33	$13.75	$15.80	$0.00	$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
TAMPERS, SELF-PROPELLED OR TRACTOR DRAWN *OPERATING ENGINEERS LOCAL 4*	06/01/2021	$50.19	$13.75	$15.80	$0.00	$79.74
	12/01/2021	$51.33	$13.75	$15.80	$0.00	$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
TELECOMMUNICATION TECHNICIAN *ELECTRICIANS LOCAL 103*	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

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *TELECOMMUNICATION TECHNICIAN - Local 103*

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	$14.51	$0.00	$48.57
4	50	$21.06	$13.00	$14.51	$0.00	$48.57
5	55	$23.16	$13.00	$14.84	$0.00	$51.00
6	60	$25.27	$13.00	$15.18	$0.00	$53.45
7	65	$27.37	$13.00	$15.52	$0.00	$55.89
8	70	$29.48	$13.00	$15.85	$0.00	$58.33
9	75	$31.58	$13.00	$16.20	$0.00	$60.78
10	80	$33.69	$13.00	$16.53	$0.00	$63.22

Effective Date - 09/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	45	$19.70	$13.00	$0.59	$0.00	$33.29
2	45	$19.70	$13.00	$0.59	$0.00	$33.29
3	50	$21.89	$13.00	$14.57	$0.00	$49.46
4	50	$21.89	$13.00	$14.57	$0.00	$49.46
5	55	$24.07	$13.00	$14.91	$0.00	$51.98
6	60	$26.26	$13.00	$15.26	$0.00	$54.52
7	65	$28.45	$13.00	$15.59	$0.00	$57.04
8	70	$30.64	$13.00	$15.94	$0.00	$59.58
9	75	$32.83	$13.00	$16.28	$0.00	$62.11
10	80	$35.02	$13.00	$16.63	$0.00	$64.65

Notes:

Apprentice to Journeyworker Ratio:1:1

TERRAZZO FINISHERS *BRICKLAYERS LOCAL 3 - MARBLE & TILE*	02/01/2021	$54.69	$11.39	$22.09	$0.00	$88.17
	08/01/2021	$56.09	$11.39	$22.25	$0.00	$89.73
	02/01/2022	$56.68	$11.39	$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 - 02/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$27.35	$11.39	$22.09	$0.00	$60.83
2	60	$32.81	$11.39	$22.09	$0.00	$66.29
3	70	$38.28	$11.39	$22.09	$0.00	$71.76
4	80	$43.75	$11.39	$22.09	$0.00	$77.23
5	90	$49.22	$11.39	$22.09	$0.00	$82.70

Effective Date - 08/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$28.05	$11.39	$22.25	$0.00	$61.69
2	60	$33.65	$11.39	$22.25	$0.00	$67.29
3	70	$39.26	$11.39	$22.25	$0.00	$72.90
4	80	$44.87	$11.39	$22.25	$0.00	$78.51
5	90	$50.48	$11.39	$22.25	$0.00	$84.12

Notes:

Apprentice to Journeyworker Ratio:1:3

TEST BORING DRILLER *LABORERS - FOUNDATION AND MARINE*	06/01/2021	$42.07	$8.60	$17.72	$0.00	$68.39
	12/01/2021	$43.08	$8.60	$17.72	$0.00	$69.40
For apprentice rates see "Apprentice- LABORER"						
TEST BORING DRILLER HELPER *LABORERS - FOUNDATION AND MARINE*	06/01/2021	$40.79	$8.60	$17.72	$0.00	$67.11
	12/01/2021	$41.80	$8.60	$17.72	$0.00	$68.12
For apprentice rates see "Apprentice- LABORER"						
TEST BORING LABORER *LABORERS - FOUNDATION AND MARINE*	06/01/2021	$40.67	$8.60	$17.72	$0.00	$66.99
	12/01/2021	$41.68	$8.60	$17.72	$0.00	$68.00
For apprentice rates see "Apprentice- LABORER"						
TRACTORS/PORTABLE STEAM GENERATORS *OPERATING ENGINEERS LOCAL 4*	06/01/2021	$50.19	$13.75	$15.80	$0.00	$79.74
	12/01/2021	$51.33	$13.75	$15.80	$0.00	$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
TRAILERS FOR EARTH MOVING EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	06/01/2021	$36.82	$12.91	$14.82	$0.00	$64.55
	08/01/2021	$36.82	$13.41	$14.82	$0.00	$65.05
	12/01/2021	$36.82	$13.41	$16.01	$0.00	$66.24
TUNNEL WORK - COMPRESSED AIR *LABORERS (COMPRESSED AIR)*	06/01/2021	$52.90	$8.60	$18.17	$0.00	$79.67
	12/01/2021	$53.91	$8.60	$18.17	$0.00	$80.68
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - COMPRESSED AIR (HAZ. WASTE) *LABORERS (COMPRESSED AIR)*	06/01/2021	$54.90	$8.60	$18.17	$0.00	$81.67
	12/01/2021	$55.91	$8.60	$18.17	$0.00	$82.68
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - FREE AIR *LABORERS (FREE AIR TUNNEL)*	06/01/2021	$44.97	$8.60	$18.17	$0.00	$71.74
	12/01/2021	$45.98	$8.60	$18.17	$0.00	$72.75
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TUNNEL WORK - FREE AIR (HAZ. WASTE) *LABORERS (FREE AIR TUNNEL)*	06/01/2021	$46.97	$8.60	$18.17	$0.00	$73.74
	12/01/2021	$47.98	$8.60	$18.17	$0.00	$74.75
For apprentice rates see "Apprentice- LABORER"						
VAC-HAUL *TEAMSTERS JOINT COUNCIL NO. 10 ZONE B*	06/01/2021	$36.24	$12.91	$14.82	$0.00	$63.97
	08/01/2021	$36.24	$13.41	$14.82	$0.00	$64.47
	12/01/2021	$36.24	$13.41	$16.01	$0.00	$65.66
WAGON DRILL OPERATOR *LABORERS - ZONE 2*	06/01/2021	$35.25	$8.60	$16.64	$0.00	$60.49
	12/01/2021	$36.16	$8.60	$16.64	$0.00	$61.40
	06/01/2022	$37.06	$8.60	$16.64	$0.00	$62.30
	12/01/2022	$37.91	$8.60	$16.64	$0.00	$63.15
	06/01/2023	$38.81	$8.60	$16.64	$0.00	$64.05
	12/01/2023	$39.71	$8.60	$16.64	$0.00	$64.95
For apprentice rates see "Apprentice- LABORER"						
WASTE WATER PUMP OPERATOR *OPERATING ENGINEERS LOCAL 4*	06/01/2021	$50.73	$13.75	$15.80	$0.00	$80.28
	12/01/2021	$51.88	$13.75	$15.80	$0.00	$81.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
WATER METER INSTALLER *PLUMBERS & GASFITTERS LOCAL 12 (Local 138)*	03/01/2021	$56.11	$13.57	$17.26	$0.00	$86.94
For apprentice rates see "Apprentice- PLUMBER/PIPEFITTER" or "PLUMBER/GASFITTER"						

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.