IMPROVING COMMUNITIES TOGETHER

February 22, 2024

Haverhill Conservation Commission
Haverhill City Hall
4 Summer Street, Room 300
Haverhill, MA 01830

Re: Notice of Intent – Rosemont Street Bridge
Rosemont Street Bridge over Little River
Haverhill, Massachusetts

Dear Commissioners:

BETA Group, Inc. is submitting this Notice of Intent (NOI) on the behalf of the City of Haverhill for the replacement of the Rosemont Street Bridge (the Project) in Haverhill, Massachusetts. The Town of Haverhill is anticipating that activities associated with the bridge replacement and roadway reconstruction will result in minor temporary impacts to Little River, a perennial stream. Project benefits will include replacement of the current deteriorating bridge, roadway stabilization, installation of a wildlife crossing under the bridge, and scour protection installation.

The purpose of the Project is to address the safety, structural, and operational deficiencies of the current Bridge that have been identified in inspections completed by the Massachusetts Department of Transportation (MassDOT). The Bridge deck is exhibiting extensive areas of spalling, cracking, and exposed steel reinforcement. Concrete encasements on the steel beams and rails have large areas of spalling concrete, exposing the steel beam and rails, which have areas of 100% section loss and areas of heavy rusting. The concrete Bridge railing is non-standard with extensive deterioration, spalls, and posts that are undermined and failed. The abutments exhibit areas of scaling, exposed & rusting steel reinforcement, water abrasion, cracking, and areas of delamination. The stone wingwalls have failed due to areas of undermining and erosion.

The existing 16’-8” single span Bridge is proposed to be demolished and replaced with a new 35’-11” single span Bridge pursuant to the results of the hydraulic analysis (Appendix B) and has been designed to meet the Massachusetts Stream Crossing Standards fully. In addition, the Project includes a combination of mill and overlay and full depth reclamation, installation of granite curbing, and installation of guardrails. Utilities (i.e., natural gas and sewer) will be bypassed using a temporary utility bridge south of the Bridge to accommodate construction, as necessary.

Work associated with the Project will take place within Areas Subject to Protection and Jurisdiction under the Massachusetts Wetlands Protection Act (M.G.L. ch.131 s.40) and its Regulations at 310 CMR 10.00 (the Act), as well as the City of Haverhill Wetlands Protection Ordinance (Chapter 253 – the Ordinance). Resource Area impacts required for the bridge demolition and replacement include temporary and/or permanent alteration to inland Bank, Land Under Water, Bordering Vegetated Wetlands, Bordering Land Subject to Flooding, Riverfront Area, the 100-foot buffer zone (Act), 25-foot no-disturbance zone (Local), and 50-foot no-build zone (Local), however, the Project will result in extensive resource area restoration and a net increase in resource areas present at the site. The enclosed narrative describes the Project’s impacts and the general means and methods of the bridge replacement. The Project has been designed to meet the Resource Areas Performance Standards to the maximum extent practicable as a Limited Project, and will meet the Massachusetts Stream Crossing Standards fully.

This NOI has been concurrently submitted to the Massachusetts Department of Environmental Protection (MassDEP) Northeast Regional Office (NERO) and the Natural Heritage and Endangered Species Program (NHESP) for review under the Massachusetts Endangered Species Act. As a municipal project, this filing is not subject to fees under the Act or Ordinance. Abutters have been notified via Certified Mailing in accordance with the Act and Ordinance.

We trust that the following application provides adequate information to facilitate the issuance of an Order of Conditions. Should you have any additional questions prior to the hearing, please do not hesitate to contact us.

Very truly yours,
BETA Group, Inc.

Jonathan Niro
Senior Project Scientist

Laura Krause
Senior Project Manager

cc: John Pettis, P.E. – City Engineer for City of Haverhill
Christopher Jones, P.E. – BETA Group, Inc.
MassDEP NERO, Division of Wetlands
NHESP – Regulatory Review

Job No: 18.06155.00

Haverhill, Massachusetts

Rosemont Street Bridge Replacement

Rosemont Street Bridge over Little River

February 2024

NOTICE OF INTENT

BETA
89 Shrewsbury Street
Suite 300
Worcester, MA 01604
508.756.1600
www.BETA-Inc.com

Rosemont Street Bridge Replacement

Haverhill, Massachusetts

Rosemont Street Bridge over Little River

NOTICE OF INTENT

Prepared by: BETA GROUP, INC.
Prepared for: The City of Haverhill

February 2024

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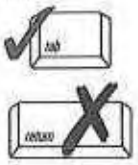
Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
MassDEP File Number
Document Transaction Number
Haverhill
City/Town

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



Note: Before completing this form consult your local Conservation Commission regarding any municipal bylaw or ordinance.

A. General Information

1. Project Location (**Note:** electronic filers will click on button to locate project site):

Rosemont Street Bridge — a. Street Address
Haverhill — b. City/Town
01832 — c. Zip Code

Latitude and Longitude:
42.805317 — d. Latitude
-71.108566 — e. Longitude

N/A Roadway — f. Assessors Map/Plat Number
N/A — g. Parcel /Lot Number

2. Applicant:

John — a. First Name
Pettis III, P.E. — b. Last Name
The City of Haverhill - City Engineer — c. Organization
4 Summer Street, Room 300 — d. Street Address
Haverhill — e. City/Town
MA — f. State
01830-5885 — g. Zip Code
978-374-2335 — h. Phone Number
i. Fax Number
jpettis@cityofhaverhill.com — j. Email Address

3. Property owner (required if different from applicant): ☐ Check if more than one owner

a. First Name
b. Last Name
The City of Haverhill — c. Organization
d. Street Address
e. City/Town
f. State
g. Zip Code
h. Phone Number
i. Fax Number
j. Email address

4. Representative (if any):

Laura — a. First Name
Krause — b. Last Name
BETA Group Inc. — c. Company
89 Shrewsbury Street, Suite 300 — d. Street Address
Worcesetr — e. City/Town
MA — f. State
01604 — g. Zip Code
774-258-1230 — h. Phone Number
i. Fax Number
lkrause@beta-inc.com — j. Email address

5. Total WPA Fee Paid (from NOI Wetland Fee Transmittal Form):

Fee Exempt — a. Total Fee Paid
Fee Exempt — b. State Fee Paid
Fee Exempt — c. City/Town Fee Paid

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

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A. General Information (continued)

6. General Project Description:

Removal and replaecment of the Rosemont Street Bridge over Little River, a perrenial stream. The Project qualifies as a limited project under 310 CMR 10.53(8). The existing 16'-8" single span Bridge is proposed to be demolished and replaced with a new 35'-11" single span Bridge pursuant to the results of the hydraulic analysis.

7a. Project Type Checklist: (Limited Project Types see Section A. 7b.)

1. ☐ Single Family Home
2. ☐ Residential Subdivision
3. ☐ Commercial/Industrial
4. ☐ Dock/Pier
5. ☐ Utilities
6. ☐ Coastal engineering Structure
7. ☐ Agriculture (e.g., cranberries, forestry)
8. ☒ Transportation
9. ☐ Other

7b. Is any portion of the proposed activity eligible to be treated as a limited project (including Ecological Restoration Limited Project) subject to 310 CMR 10.24 (coastal) or 310 CMR 10.53 (inland)?

1. ☒ Yes ☐ No

If yes, describe which limited project applies to this project. (See 310 CMR 10.24 and 10.53 for a complete list and description of limited project types)

310 CMR 10.53(8) - replacemernt of an existing stream crossing
2. Limited Project Type

If the proposed activity is eligible to be treated as an Ecological Restoration Limited Project (310 CMR10.24(8), 310 CMR 10.53(4)), complete and attach Appendix A: Ecological Restoration Limited Project Checklist and Signed Certification.

8. Property recorded at the Registry of Deeds for:

N/A - Roadway
a. County

b. Certificate # (if registered land)

c. Book

d. Page Number

B. Buffer Zone & Resource Area Impacts (temporary & permanent)

1. ☐ Buffer Zone Only – Check if the project is located only in the Buffer Zone of a Bordering Vegetated Wetland, Inland Bank, or Coastal Resource Area.
2. ☒ Inland Resource Areas (see 310 CMR 10.54-10.58; if not applicable, go to Section B.3, Coastal Resource Areas).

Check all that apply below. Attach narrative and any supporting documentation describing how the project will meet all performance standards for each of the resource areas altered, including standards requiring consideration of alternative project design or location.

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B. Buffer Zone & Resource Area Impacts (temporary & permanent) (cont'd)

For all projects affecting other Resource Areas, please attach a narrative explaining how the resource area was delineated.

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
a. ☒ Bank	129 (perm), 41 (temp) 1. linear feet	119 2. linear feet
b. ☒ Bordering Vegetated Wetland	347 (temp) 1. square feet	2. square feet
c. ☒ Land Under Waterbodies and Waterways	309 (temp) 1. square feet	593 2. square feet
	88 3. cubic yards dredged	

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
d. ☒ Bordering Land Subject to Flooding	6631 (temp) 1. square feet	2. square feet
	3. cubic feet of flood storage lost	262.18 4. cubic feet replaced
e. ☐ Isolated Land Subject to Flooding	1. square feet	
	2. cubic feet of flood storage lost	3. cubic feet replaced
f. ☒ Riverfront Area	Little River 1. Name of Waterway (if available) - **specify coastal or inland**	

2. Width of Riverfront Area (check one):

☐ 25 ft. - Designated Densely Developed Areas only

☐ 100 ft. - New agricultural projects only

☒ 200 ft. - All other projects

3. Total area of Riverfront Area on the site of the proposed project: 11,716 square feet

4. Proposed alteration of the Riverfront Area:

5223 (temp) 6493 (redev)	5223 (temp) 6493 (redev)	0 c. square feet between 100 ft. and 200 ft.

5. Has an alternatives analysis been done and is it attached to this NOI? ☒ Yes ☐ No

6. Was the lot where the activity is proposed created prior to August 1, 1996? ☒ Yes ☐ No

3. ☐ Coastal Resource Areas: (See 310 CMR 10.25-10.35)

Note: for coastal riverfront areas, please complete **Section B.2.f.** above.

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B. Buffer Zone & Resource Area Impacts (temporary & permanent) (cont'd)

Check all that apply below. Attach narrative and supporting documentation describing how the project will meet all performance standards for each of the resource areas altered, including standards requiring consideration of alternative project design or location.

Online Users: Include your document transaction number (provided on your receipt page) with all supplementary information you submit to the Department.

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
a. ☐ Designated Port Areas	Indicate size under Land Under the Ocean, below	
b. ☐ Land Under the Ocean	1. square feet 2. cubic yards dredged	
c. ☐ Barrier Beach	Indicate size under Coastal Beaches and/or Coastal Dunes below	
d. ☐ Coastal Beaches	1. square feet	2. cubic yards beach nourishment
e. ☐ Coastal Dunes	1. square feet	2. cubic yards dune nourishment

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
f. ☐ Coastal Banks	1. linear feet	
g. ☐ Rocky Intertidal Shores	1. square feet	
h. ☐ Salt Marshes	1. square feet	2. sq ft restoration, rehab., creation
i. ☐ Land Under Salt Ponds	1. square feet 2. cubic yards dredged	
j. ☐ Land Containing Shellfish	1. square feet	
k. ☐ Fish Runs	Indicate size under Coastal Banks, inland Bank, Land Under the Ocean, and/or inland Land Under Waterbodies and Waterways, above 1. cubic yards dredged	
l. ☐ Land Subject to Coastal Storm Flowage	1. square feet	

4. ☐ Restoration/Enhancement

If the project is for the purpose of restoring or enhancing a wetland resource area in addition to the square footage that has been entered in Section B.2.b or B.3.h above, please enter the additional amount here.

a. square feet of BVW _____ b. square feet of Salt Marsh _____

5. ☒ Project Involves Stream Crossings

a. number of new stream crossings _____ b. number of replacement stream crossings 1

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C. Other Applicable Standards and Requirements

☐ This is a proposal for an Ecological Restoration Limited Project. Skip Section C and complete Appendix A: Ecological Restoration Limited Project Checklists – Required Actions (310 CMR 10.11).

Streamlined Massachusetts Endangered Species Act/Wetlands Protection Act Review

1. Is any portion of the proposed project located in **Estimated Habitat of Rare Wildlife** as indicated on the most recent Estimated Habitat Map of State-Listed Rare Wetland Wildlife published by the Natural Heritage and Endangered Species Program (NHESP)? To view habitat maps, see the *Massachusetts Natural Heritage Atlas* or go to http://maps.massgis.state.ma.us/PRI_EST_HAB/viewer.htm.

a. ☒ Yes ☐ No

If yes, include proof of mailing or hand delivery of NOI to:

Natural Heritage and Endangered Species Program
Division of Fisheries and Wildlife
1 Rabbit Hill Road
Westborough, MA 01581

2021
b. Date of map

If *yes*, the project is also subject to Massachusetts Endangered Species Act (MESA) review (321 CMR 10.18). To qualify for a streamlined, 30-day, MESA/Wetlands Protection Act review, please complete Section C.1.c, and include requested materials with this Notice of Intent (NOI); *OR* complete Section C.2.f, if applicable. *If MESA supplemental information is not included with the NOI, by completing Section 1 of this form, the NHESP will require a separate MESA filing which may take up to 90 days to review (unless noted exceptions in Section 2 apply, see below).*

c. Submit Supplemental Information for Endangered Species Review*

1. ☒ Percentage/acreage of property to be altered:

(a) within wetland Resource Area — 0.5 acres (percentage/acreage)

(b) outside Resource Area — 0 - all work is in a resource area (percentage/acreage)

2. ☒ Assessor's Map or right-of-way plan of site

2. ☒ Project plans for entire project site, including wetland resource areas and areas outside of wetlands jurisdiction, showing existing and proposed conditions, existing and proposed tree/vegetation clearing line, and clearly demarcated limits of work **

(a) ☒ Project description (including description of impacts outside of wetland resource area & buffer zone)

(b) ☒ Photographs representative of the site

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* Some projects **not** in Estimated Habitat may be located in Priority Habitat, and require NHESP review (see https://www.mass.gov/ma-endangered-species-act-mesa-regulatory-review).
Priority Habitat includes habitat for state-listed plants and strictly upland species not protected by the Wetlands Protection Act.

** MESA projects may not be segmented (321 CMR 10.16). The applicant must disclose full development plans even if such plans are not required as part of the Notice of Intent process.

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C. Other Applicable Standards and Requirements (cont'd)

(c) ☒ MESA filing fee (fee information available at https://www.mass.gov/how-to/how-to-file-for-a-mesa-project-review).
Make check payable to "Commonwealth of Massachusetts - NHESP" and ***mail to NHESP*** at above address

*Projects altering **10 or more acres** of land, also submit:*

(d) ☐ Vegetation cover type map of site

(e) ☐ Project plans showing Priority & Estimated Habitat boundaries

(f) OR Check One of the Following

1. ☐ Project is exempt from MESA review.
Attach applicant letter indicating which MESA exemption applies. (See 321 CMR 10.14, https://www.mass.gov/service-details/exemptions-from-review-for-projectsactivities-in-priority-habitat; the NOI must still be sent to NHESP if the project is within estimated habitat pursuant to 310 CMR 10.37 and 10.59.)

2. ☐ Separate MESA review ongoing. a. NHESP Tracking # b. Date submitted to NHESP

3. ☐ Separate MESA review completed.
Include copy of NHESP "no Take" determination or valid Conservation & Management Permit with approved plan.

3. For coastal projects only, is any portion of the proposed project located below the mean high water line or in a fish run?

a. ☒ Not applicable – project is in inland resource area only b. ☐ Yes ☐ No

If yes, include proof of mailing, hand delivery, or electronic delivery of NOI to either:

South Shore - Bourne to Rhode Island border, and the Cape & Islands:

Division of Marine Fisheries -
Southeast Marine Fisheries Station
Attn: Environmental Reviewer
836 South Rodney French Blvd.
New Bedford, MA 02744
Email: dmf.envreview-south@mass.gov

North Shore - Plymouth to New Hampshire border:

Division of Marine Fisheries -
North Shore Office
Attn: Environmental Reviewer
30 Emerson Avenue
Gloucester, MA 01930
Email: dmf.envreview-north@mass.gov

Also if yes, the project may require a Chapter 91 license. For coastal towns in the Northeast Region, please contact MassDEP's Boston Office. For coastal towns in the Southeast Region, please contact MassDEP's Southeast Regional Office.

c. ☒ Is this an aquaculture project? d. ☐ Yes ☒ No

If yes, include a copy of the Division of Marine Fisheries Certification Letter (M.G.L. c. 130, § 57).

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C. Other Applicable Standards and Requirements (cont'd)

Online Users: Include your document transaction number (provided on your receipt page) with all supplementary information you submit to the Department.

4. Is any portion of the proposed project within an Area of Critical Environmental Concern (ACEC)?

   a. ☐ Yes ☒ No If yes, provide name of ACEC (see instructions to WPA Form 3 or MassDEP Website for ACEC locations). **Note:** electronic filers click on Website.

   b. ACEC

5. Is any portion of the proposed project within an area designated as an Outstanding Resource Water (ORW) as designated in the Massachusetts Surface Water Quality Standards, 314 CMR 4.00?

   a. ☐ Yes ☒ No

6. Is any portion of the site subject to a Wetlands Restriction Order under the Inland Wetlands Restriction Act (M.G.L. c. 131, § 40A) or the Coastal Wetlands Restriction Act (M.G.L. c. 130, § 105)?

   a. ☐ Yes ☒ No

7. Is this project subject to provisions of the MassDEP Stormwater Management Standards?

   a. ☒ Yes. Attach a copy of the Stormwater Report as required by the Stormwater Management Standards per 310 CMR 10.05(6)(k)-(q) and check if:

      1. ☐ Applying for Low Impact Development (LID) site design credits (as described in Stormwater Management Handbook Vol. 2, Chapter 3)

      2. ☒ A portion of the site constitutes redevelopment

      3. ☐ Proprietary BMPs are included in the Stormwater Management System.

   b. ☐ No. Check why the project is exempt:

      1. ☐ Single-family house

      2. ☐ Emergency road repair

      3. ☐ Small Residential Subdivision (less than or equal to 4 single-family houses or less than or equal to 4 units in multi-family housing project) with no discharge to Critical Areas.

D. Additional Information

☐ This is a proposal for an Ecological Restoration Limited Project. Skip Section D and complete Appendix A: Ecological Restoration Notice of Intent – Minimum Required Documents (310 CMR 10.12).

Applicants must include the following with this Notice of Intent (NOI). See instructions for details.

Online Users: Attach the document transaction number (provided on your receipt page) for any of the following information you submit to the Department.

1. ☒ USGS or other map of the area (along with a narrative description, if necessary) containing sufficient information for the Conservation Commission and the Department to locate the site. (Electronic filers may omit this item.)

2. ☒ Plans identifying the location of proposed activities (including activities proposed to serve as a Bordering Vegetated Wetland [BVW] replication area or other mitigating measure) relative to the boundaries of each affected resource area.

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D. Additional Information (cont'd)

3. ☒ Identify the method for BVW and other resource area boundary delineations (MassDEP BVW Field Data Form(s), Determination of Applicability, Order of Resource Area Delineation, etc.), and attach documentation of the methodology.

4. ☒ List the titles and dates for all plans and other materials submitted with this NOI.

Rosemont Street Over Little River, Bridge No. H-12-023 (7 Sheets)
a. Plan Title

BETA Group, Inc.
b. Prepared By

Chris Jones, PE
c. Signed and Stamped by

Feburary 19, 2024
d. Final Revision Date

Varies as Noted
e. Scale

NOI Narrative, Stormwater Report
f. Additional Plan or Document Title

2/22/2024
g. Date

5. ☒ If there is more than one property owner, please attach a list of these property owners not listed on this form.

6. ☒ Attach proof of mailing for Natural Heritage and Endangered Species Program, if needed.

7. ☐ Attach proof of mailing for Massachusetts Division of Marine Fisheries, if needed.

8. ☐ Attach NOI Wetland Fee Transmittal Form

9. ☒ Attach Stormwater Report, if needed.

E. Fees

1. ☒ Fee Exempt: No filing fee shall be assessed for projects of any city, town, county, or district of the Commonwealth, federally recognized Indian tribe housing authority, municipal housing authority, or the Massachusetts Bay Transportation Authority.

Applicants must submit the following information (in addition to pages 1 and 2 of the NOI Wetland Fee Transmittal Form) to confirm fee payment:

2. Municipal Check Number

3. Check date

4. State Check Number

5. Check date

6. Payor name on check: First Name

7. Payor name on check: Last Name

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F. Signatures and Submittal Requirements

I hereby certify under the penalties of perjury that the foregoing Notice of Intent and accompanying plans, documents, and supporting data are true and complete to the best of my knowledge. I understand that the Conservation Commission will place notification of this Notice in a local newspaper at the expense of the applicant in accordance with the wetlands regulations, 310 CMR 10.05(5)(a).

I further certify under penalties of perjury that all abutters were notified of this application, pursuant to the requirements of M.G.L. c. 131, § 40. Notice must be made by Certificate of Mailing or in writing by hand delivery or certified mail (return receipt requested) to all abutters within 100 feet of the property line of the project location.

1. Signature of Applicant

2. Date: 2/21/24

3. Signature of Property Owner (if different)

4. Date

5. Signature of Representative (if any): Laura Krause

6. Date: 2/19/2024

For Conservation Commission:
Two copies of the completed Notice of Intent (Form 3), including supporting plans and documents, two copies of the NOI Wetland Fee Transmittal Form, and the city/town fee payment, to the Conservation Commission by certified mail or hand delivery.

For MassDEP:
One copy of the completed Notice of Intent (Form 3), including supporting plans and documents, one copy of the NOI Wetland Fee Transmittal Form, and a **copy** of the state fee payment to the MassDEP Regional Office (see Instructions) by certified mail or hand delivery.

Other:
If the applicant has checked the "yes" box in any part of Section C, Item 3, above, refer to that section and the Instructions for additional submittal requirements.

The original and copies must be sent simultaneously. Failure by the applicant to send copies in a timely manner may result in dismissal of the Notice of Intent.

HCC LOCAL APPLICATION FORM 3 – NOTICE OF INTENT

City of Haverhill Conservation Commission

HCC Local Application Form 3
Notice of Intent

A. STATUTE APPLICABILITY

This application is being filed with the Commission in accordance with the following (check all that apply):

- ☒ Massachusetts Wetlands Protection Act, M.G.L. Chapter 131, Section 40
- ☒ Haverhill Municipal Ordinance Chapter 253

B. GENERAL INFORMATION

Applicant The City of Haverhill – City Engineer – John Pettis III, P.E.
Property Owner The City of Haverhill
Representative Beta Group Inc. – Laura Krause
Location (Street Address) N/A – Roadway – Rosemont Street Bridge
Assessor's Parcel Identification N/A – Roadway – Rosemont Street Bridge

C. APPLICATION CHECKLIST

The Commission requires the submittal of this original, completed Form; one (1) paper copy of site plans; and one (1) paper copy of all other materials. Additionally, the Commission requires the submittal of individual PDFs of this Form and all listed application materials. If practical, related items may be combined into a single PDF. PDFs should not mix larger format sheets (e.g. site plans) with smaller sheets (e.g. letters). These submittal requirements also apply to supplemental information provided during the public hearing. The following materials shall be submitted with this form:

- ☑ Completed, current WPA Form 3, 3A, or 4 and NOI Wetland Fee Transmittal Form
- ☑ Project Narrative with description of resource areas & delineation methodology and demonstration of compliance with pertinent Performance Standards
- ☑ Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan
- ☑ Site Plans clearly describing the location and nature of the work, including such information as site boundaries, wetlands, topography, existing and proposed conditions, vegetation cover, soils, erosion & sedimentation controls, Title 5 compliance, flood storage calculations…(24" x 36" max. sheet size)
- ☑ MassDEP Bordering Vegetated Wetland Delineation Field Data Forms, as appropriate (used USACE forms instead)
- N/A ☐ Wetland Resource Area Impact Mitigation Plan prepared in accordance with MA Inland Wetland Replication Guidelines, if applicable
- ☑ Demonstration of compliance with MA River & Stream Crossing Standards, if applicable (The HCC applies the General Standards to all resource area crossings for wildlife passage.)
- N/A ☐ Simplified or Detailed Wildlife Habitat Evaluation (Appendix A or B), if applicable (See "MA Wildlife Habitat Protection Guidance for Inland Wetlands")
- ☑ Demonstration of compliance with MA Stormwater Management Standards, including but not limited to
  - ☑ Stormwater Report with pertinent calculations based on NOAA Atlas 14 rainfall data
  - ☑ Checklist for Stormwater Report
  - ☑ Long-Term Pollution Prevention Plan
  - ☑ Operation and Maintenance Plan
  - ☑ Illicit Discharge Compliance Statement

- ☑ 8½" x 11" sections of the following maps with project location clearly identified
  - ☑ USGS Quadrangle
  - ☑ MassGIS Orthophoto
  - ☑ City of Haverhill Parcel ID Map, also identifying properties within 300' of subject property
  - ☑ NRCS Soils Map and Resource Report
  - ☑ FEMA Flood Insurance Rate Map, if applicable
  - ☑ MA NHESP Estimated Habitats of Rare Wildlife and Priority Habitats of Rare Species, if applicable
  - N/A ☐ MassDEP/UMass-Amherst Habitat of Potential Regional or Statewide Importance, if applicable
  - ☑ Proof of NOI filing with the MA Natural Heritage & Endangered Species Program, if applicable
  - by inspector at receipt ☐ Appropriate Filing Fees, payable to the City of Haverhill, under the Act and Ordinance
  - ☐ Other: Hydraulic Analysis Report

D. LOCAL PERMIT DOCUMENTATION

In accordance with 310 CMR 10.05(4)(e), list all obtainable permits, variances, and approvals required by local ordinance with respect to the proposed activity and status of same: Local Wetland Bylaw Review only - Haverhill Conservation Commission.

E. APPLICATION CERTIFICATION

I have read the Department of Environmental Protection's "Instructions for Completing Application" and the City's Municipal Ordinance under Chapter 253, with all applicable regulations and policies, for the filing of this application with the Haverhill Conservation Commission and agree to its terms and conditions, as amended. I understand the submitted NOI, its plans, and all its supporting materials are public records and may be uploaded to the City's website for public review. As required by the Commission, the wetland resource area(s) are flagged, the corners of proposed structures are staked, and the centerline of proposed roadway(s) and/or driveway(s) are marked, as appropriate, to facilitate site inspections by Commissioners and Conservation Staff.

Signed: _____ (APPLICANT) 2/21/24 (DATE)

F. SITE ACCESS ACKNOWLEDGEMENT

I hereby grant the Haverhill Conservation Commission and its officials permission to enter upon my property at N/A – roadway (STREET ADDRESS AND ASSESSOR'S PARCEL ID) to review the filed Notice of Intent and future site conditions for compliance with the issued Order of Conditions. The sole purpose of this acknowledgement is to allow the Commission and its officials to perform their duties under the Massachusetts Wetlands Protection Act and the City's wetlands protection ordinance.

Signed: _____ (PROPERTY OWNER) Representative 2/21/24 (DATE)

H. LOCAL ORDINANCE FEE CALCULATION FORM

ACTIVITY	LOCAL ORDINANCE FEE	# of Activities or Measurement	Subtotal
*Abbrev. Notice of Resource Area Delineation (ANRAD)			
Single Family House Project	$1/linear foot, first 100'; $0.50/lf, second 100'; $0.10/lf, each additional foot		
All Other Projects	***$1/linear foot, first 1000'; $0.50/lf, second 1000'; $0.10/lf, each additional foot		
%*Notices of Intent (NOI)			
Category 1 Activity	$100		
Category 2 Activity	$250		
Category 3 Activity	$525		
Category 4 Activity	$725		
Category 5 Activity	$2/foot		
Category 6 Activity - If no ANRAD was filed for the project site, then a local Cat. 6 fee must be paid in accordance with the ANRAD fee schedule	See ANRAD fee schedule		
Resource Area Alterations			
Buffer Zone, 75'-100' from resource area boundary	$0.05 / square foot		
Buffer Zone, 35'-75' from resource area boundary	$0.10 / square foot		
Buffer Zone, 0'-35' from resource area boundary	$0.25 / square foot		
Bordering Vegetated Wetland	$0.50 / square foot		
Bank	$5 / linear foot		
Land Under Water	$0.50 / square foot		
Land Subject to Flooding	$0.05 / square foot		
Riverfront Area	$0.05 / square foot		
Riverfront Area with the watershed of a potable water supply	$0.50 / square foot		
Land within 100' of a Certified Vernal Pool	$0.25 / square foot		
Local-only Jurisdictional Resource Area	$0.25 / square foot		
Land within 200' of a potable water supply	$0.50 / square foot		
		ADVERTISING FEE*	$45
		LOCAL ORDINANCE FEE TOTAL	
		For filings resulting from enforcement action, double the Local Ordinance Fee Total	

NOTES:

*Application is subject to an additional $45 Local Advertising Fee payable to the City of Haverhill prior to **EACH** advertising

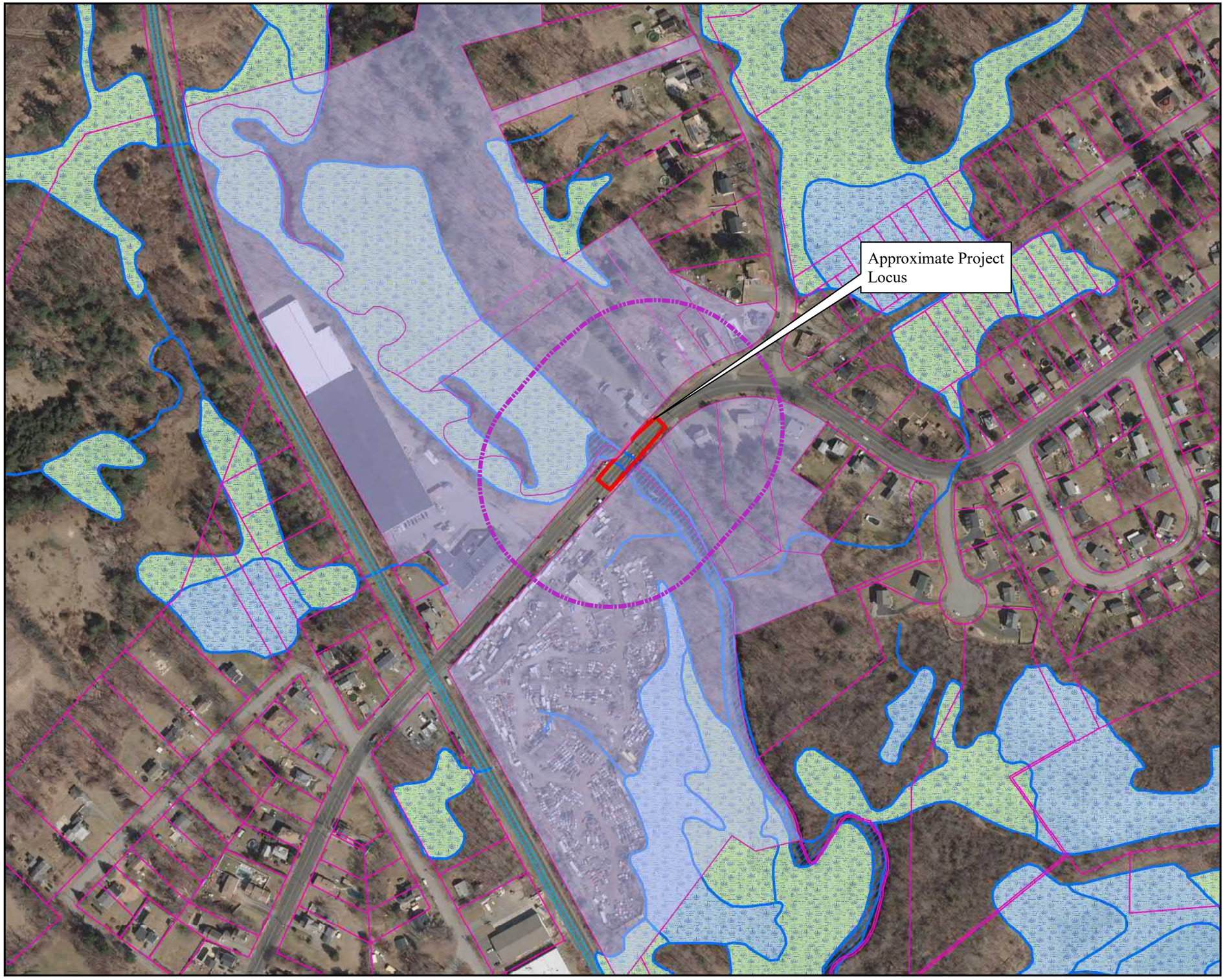
***Local Ordinance Fee maximum of $100 for applications exceeding 1000'. Commission requires review by outside consultant under M.G.L. Ch. 44, sec. 53G for projects exceeding 1000'. Applicant shall post escrow in accordance with HCC Rules for Hiring Outside Consultants. Cap passed by a 5-0 vote of the Commission on March 7, 2019.

%Local Ordinance Fees for RDA, NOI, & RMOC increase 50% when project is also proposed within a Riverfront Area

Local Ordinance Fees passed by a 7 – 0 vote of the Commission on October 28, 2010, effective January 1, 2011

CERTIFIED ABUTTER LIST

300-ft Abutters Figure
Rosemont Street Bridge
Haverhill, MA



MassDEP Wetland Resources Legend

- Marsh/Bog
- Wooded marsh
- Open Water

Legend

- Rosemont Street Bridge Abutters
- 300-ft Abutters
- Tax Parcels

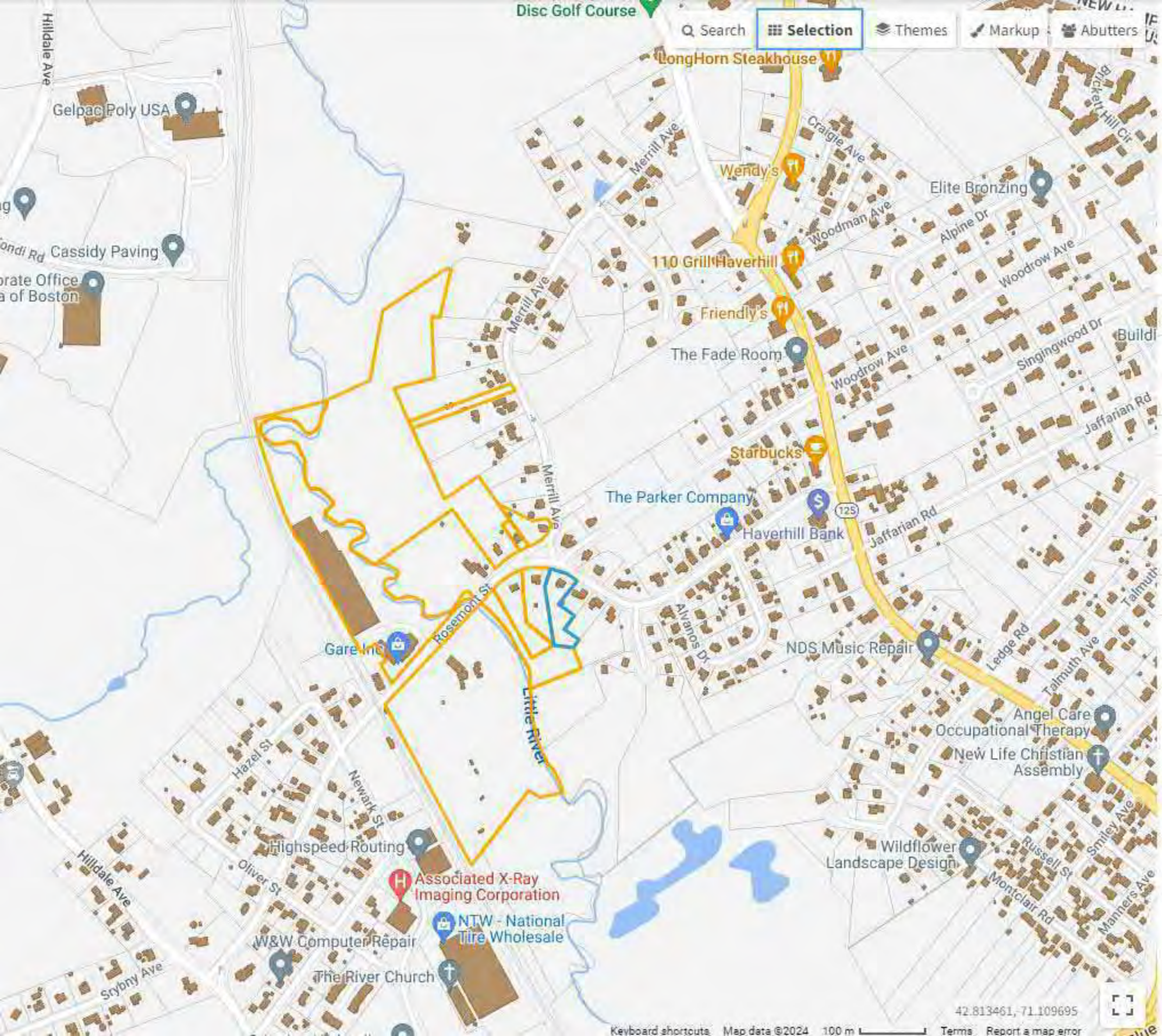
N
W E
S

0 250 500 Feet

1 inch = 250 feet

Data Source: MassGIS USGS Color Ortho Imagery (2014), MassDEP Wetlands (1:12000) (2009), NHESP Potential Vernal Pools (2000), NHESP Certified Vernal Pools, NHESP Priority Habitats of Rare Species (2008), NHESP Estimated Habitats of Rare Species (2008), Areas of Critical Environmental Concern (2009), FEMA National Flood Hazard Layer (2014),

BETA
IMPROVING COMMUNITIES TOGETHER



Selection (9)

Choose Selection Mode

Click | Draw | Edit

Download Selected | More

- 128 ROSEMONT ST
- 122 ROSEMONT ST
- 100 ROSEMONT ST
- 154 ROSEMONT ST
- 151 MERRILL AVE
- 117 ROSEMONT ST
- 121 ROSEMONT ST
- ROSEMONT ST
- 165 ROSEMONT ST

ParcelID	StreetNum	StreetName	Owner1	BillingAddress	City	State	Zip
541-622-1	165	ROSEMONT ST	PEQUOT ACQUISITIONS CO INC	165 ROSEMONT ST	HAVERHILL	MA	01832
541-623-1	154	ROSEMONT ST	DIPIRRO THOMAS	29 NORTH AV	PLAISTOW	NH	03865
636-1-12-1	100	ROSEMONT ST	CHAKAR MANAL S	100 ROSEMONT ST	HAVERHILL	MA	01830
636-1-12-2	122	ROSEMONT ST	ALLEN FAMILY TRUST	122 ROSEMONT STREET	HAVERHILL	MA	01830
636-1-12-3	128	ROSEMONT ST	ROBERGEAU JOANA BOSQUET	128 ROSEMONT ST	HAVERHILL	MA	01830
636-1-12-3C		ROSEMONT ST	ESSEX COUNTY GREENBELT ASSOC INC	82 EASTERN AV	ESSEX	MA	01929
637-3-1	151	MERRILL AVE	DEMATTEO JESSICA J-ETAL	151 MERRILL AV	HAVERHILL	MA	01830
637-3-3	121	ROSEMONT ST	PAONE JO-DEE B	121 ROSEMONT ST	HAVERHILL	MA	01830
637-3-3A	117	ROSEMONT ST	CREVATIS PAUL J-ETUX	117 ROSEMONT ST	HAVERHILL	MA	01830
637-3-5-1	135	ROSEMONT ST	GILLERT MICHAEL-ETUX	135 ROSEMONT ST	HAVERHILL	MA	01830
637-3-5-2	133	ROSEMONT ST	LYNCH DEBRA M	133 ROSEMONT STREET	HAVERHILL	MA	01830
637-3-5-3	129	ROSEMONT ST	BERRADI MOHCINE	129 ROSEMONT ST, UNIT 1	HAVERHILL	MA	01830

2024 JAN 22 PM3:28
HAV ASSESSOR

BOARD OF ASSESSORS
CITY OF HAVERHILL
4 SUMMER STREET • RM 115
HAVERHILL, MA 01830-5843

541-622-1
PEQUOT ACQUISITIONS CO INC
165 ROSEMONT ST
HAVERHILL, MA 01832

541-623-1
DIPIRRO THOMAS
29 NORTH AV
PLAISTOW, NH 03865

636-1-12-1
CHAKAR MANAL S
100 ROSEMONT ST
HAVERHILL, MA 01830

636-1-12-2
ALLEN FAMILY TRUST
122 ROSEMONT STREET
HAVERHILL, MA 01830

636-1-12-3
ROBERGEAU JOANA BOSQUET
128 ROSEMONT ST
HAVERHILL, MA 01830

636-1-12-3C
ESSEX COUNTY GREENBELT ASSOC INC
82 EASTERN AV
ESSEX, MA 01929

636-2-26-97
DOMINGOS KRYSTAL MARIE-ETUX
97 ROSEMONT ST
HAVERHILL, MA 01830

637-3-1
DEMATTEO JESSICA J-ETAL
151 MERRILL AV
HAVERHILL, MA 01830

637-3-3
PAONE JO-DEE B
121 ROSEMONT ST
HAVERHILL, MA 01830

637-3-3A
CREVATIS PAUL J-ETUX
117 ROSEMONT ST
HAVERHILL, MA 01830

637-3-5-1
GILLERT MICHAEL-ETUX
135 ROSEMONT ST
HAVERHILL, MA 01830

637-3-5-2
LYNCH DEBRA M
133 ROSEMONT STREET
HAVERHILL, MA 01830

637-3-5-3
BERRADI MOHCINE
129 ROSEMONT ST, UNIT 1
HAVERHILL, MA 01830

G. AFFIDAVIT OF SERVICE FOR ABUTTER NOTIFICATION

I, Anna Haznar, hereby certify under the pains and penalties of perjury that on
(NAME OF PERSON MAKING AFFIDAVIT)
2/21/2024 I gave notification to all abutters pursuant to the requirements of the second
(DATE)
paragraph of Massachusetts General Laws Chapter 131, Section 40, the DEP Guide to Abutter Notification dated April 8, 1994, and Haverhill Municipal Ordinance Chapter 253, Section 5 in connection with the following matter:

A Notice of Intent filed under the Massachusetts Wetlands Protection Act and said ordinance by City of Haverhill. with the Haverhill Conservation Commission on
(NAME OF APPLICANT)
2/22/2024 for property located at N/A – Rosemont Street Bridge
(DATE) (STREET ADDRESS AND ASSESSOR'S PARCEL ID)

The list of the abutters to whom the Abutter Notification Form sent, with their addresses and Assessor's parcel identification information that corresponds with the submitted map section, are attached to this application.

Signed: Anna Haznar 2/21/2024
(NAME OF PERSON MAKING AFFIDAVIT) (DATE)

ABUTTER NOTIFICATION FORM

In accordance with the second paragraph of Massachusetts General Laws Chapter 131, Section 40 (the Wetlands Protection Act) and Haverhill Municipal Ordinance Chapter 253, Section 5, you are hereby notified of the following:

1. The name of the applicant is John Pettis III, P.E.
2. Brief Project Description: The removal and replacement of the Rosemont Street Bridge carrying Rosemont Street over Little River in accordance with the City's Municipal Small Bridge Program Application and MassDOT requirements. Limited Project 310 CMR 10.53(8).
3. The applicant has filed a Notice of Intent ("NOI") with the Haverhill Conservation Commission seeking permission to remove, fill, dredge or alter an Area Subject to Protection Under the Wetlands Protection Act and/or Haverhill Municipal Ordinance Chapter 253 and/or to perform work within the buffer zone of such an Area.
4. The address of the lot where the activity is proposed is N/A – Rosemont Street Bridge
   (INCLUDE ASSESSOR'S MAP/BLOCK/LOT)
5. Copies of the NOI may be examined at *the Haverhill Conservation Department Office* between the hours of *8am and 4pm* from *Monday through Friday*. Contact information is below. You may also find helpful application materials on the "Projects Under Review" section of the Commission's website.
6. Copies of the NOI may be obtained from either (check one) the applicant ___, or the applicant's representative X by calling this telephone number (774) 258 - 1230 between the hours of 8 AM and 4 PM on the following days of the week Monday - Friday
7. Information regarding the *date, time, and place* of the public hearing may be obtained from the *Haverhill Conservation Department Office* between the hours of *8am and 4pm* from *Monday through Friday*. Contact information is below. You may also consult the "Agenda" section of the Commission's website.

NOTE: Notice of the public hearing, including its date, time and place, will be published at least five (5) days in advance in the *Haverhill Gazette newspaper*.

NOTE: Notice of the public hearing, including its date, time, and place, will be posted in Haverhill City Hall not less than forty-eight (48) hours in advance.

NOTE: You may contact the Haverhill Conservation Department for more information about this application, the Wetlands Protection Act, and Haverhill Municipal Ordinance Chapter 253. Please note the Department has only one staff person; every effort will be made to assist you in a timely manner.

Website: http://www.cityofhaverhill.org/departments/conservation_commission/index.php.
Email: conservation@cityofhaverhill.com
Phone: 978.374.2334

NOTE: For additional information about this application and the Act, you may contact the MA Department of Environmental Protection Northeast Regional Office Service Center.

Website: http://www.mass.gov/eea/agencies/massdep/about/contacts/northeast-region.html
Phone: 978.694.3200

NARRATIVE

1.0 INTRODUCTION

On behalf of the City of Haverhill (the Applicant), BETA Group, Inc. respectfully submits this Notice of Intent (NOI) application for the replacement of the Rosemont Street Bridge (the Bridge), Bridge No. H-12-024, over Little River (a perennial stream) in Haverhill, Massachusetts (the Site). The overall Project limits include a 90-foot stretch of Rosemont Street, the Rosemont Street Bridge and portions of the underlying stream channel (the Site).

The purpose of the Project is to address the safety, structural, and operational deficiencies of the current Bridge that have been identified in inspections completed by the Massachusetts Department of Transportation (MassDOT). The Bridge deck is exhibiting extensive areas of spalling, cracking, and exposed steel reinforcement. Concrete encasements on the steel beams and rails have large areas of spalling concrete exposing the steel beam and rails which have areas of 100% section loss and areas of heavy rusting. The concrete Bridge railing is non-standard with extensive deterioration, spalls, and posts that are undermined and failed. The abutments exhibit areas of scaling, exposed & rusting steel reinforcement, water abrasion, cracking, and areas of delamination. The stone wingwalls have failed due to areas of undermining and erosion.

The existing 16'-8" single span Bridge is proposed to be demolished and replaced with a new 35'-11" single span Bridge pursuant to the results of the hydraulic analysis (Appendix B) and has been designed to meet the Massachusetts Stream Crossing Standards fully. In addition, the Project includes a combination of mill and overlay and full depth reclamation, installation of granite curbing, and installation of guardrails. Utilities (i.e., natural gas and sewer) will be bypassed using a temporary utility bridge to accommodate construction, as necessary.

Resource Areas at and adjacent to the Site that are Subject to Protection or Jurisdiction under the Massachusetts Wetlands Protection Act (M.G.L. ch. 131 §40) and its regulations at 310 CMR 10.00 (the Act) and the Haverhill Wetland Ordinance (Chapter 253 - Ordinance) include the following:

- Bank (Inland);
- Bordering Vegetated Wetland (BVW);
- Land Under Water (LUW);
- Bordering Land Subject to Flooding (BLSF);
- Riverfront Area (RA);
- 0-25-foot No Disturbance Zone (Ordinance); and,
- 25-50-foot No Build Zone (Ordinance).

Temporary and/or permanent impacts related to construction of the bridge will occur within inland Bank, LUW, BVW, BLSF, RA, the 100-foot Buffer Zone to BVW/Bank, and both the 25-foot No Disturbance Zone and the 50-foot No Build Zone. While there are no specific local Performance Standards for the locally-protected restrictive buffer zones, the Applicant is requesting the Commission allow the unavoidable work to occur in the 25-foot No Disturbance Zone and the 50-foot No Build Zone.

Given the nature of bridge replacement work, there are no feasible alternatives that avoid the impacts described herein. The Project has been designed to minimize impacts and restore altered areas following the structure replacement. During construction, erosion and sedimentation controls, as well as in-water controls will be installed and maintained to prevent migration of sediment into Resource Areas. Post-construction restoration activities include regrading and stabilizing Banks with a native seed mix, construction of wildlife passage, restoring LUW with simulated streambed material, and restoring BVW

with soil amendments (as needed) and a native wetland seed mix. The Project is being filed under the Limited Project provision found in the WPA Regulations at 310 CMR 10.53(8)[1].

The Project requires additional Environmental Permits and Reviews. Specifically:

- Work below Ordinary High Water Mark (OHWM) of the Little River requires US Army Corps of Engineers (USACE) Authorization under the Massachusetts General Permits. The Project requires a Pre-Construction Notification Form (PCN) as work will require removal of trees within the range of the Norther Long-eared Bat. The PCN was submitted to the USACE on February 12, 2024.
- The Project included re-construction of a Bridge over a Navigable Water of the Commonwealth. Accordingly, a Water-Dependent Chapter 91 License will be required. The Chapter 91 License Application will be submitted subsequent to the NOI.
- Due to the presence of mapped habitat within the limit of work, a MESA checklist has been submitted to the Massachusetts Division of Fisheries & Wildlife for review.

The Project does not require dredging over 100 cubic yards or impacts greater than 5,000 square feet of impacts to Waters of the Commonwealth, therefore the Project's Order of Conditions will serve as the 401 Water Quality Certification. In addition, the Project is not Subject Massachusetts Environmental Policy Act (MEPA) Review.

2.0 Site Description

2.1 Project Locus

The Project is located along the Bridge over the Little River within and adjacent to the Rosemont Street right-of-way in Haverhill, Massachusetts, as well as on private property adjacent to the Bridge (the Site). A list of private property ownership information is included below in Table 1.

Table 1: Private Property Ownership

Address	Assessor ID	Owner	Legal Reference
129 Rosemont Street	637-3-5	Mohcine Berradi	Book 40257, Page 51
133 Rosemont Street	637-3-5	Debra M. Lynch	Book 24531, Page 560
135 Rosemont Street	637-3-5	Michael Gillert et ux.	Book 23744, Page 251
165 Rosemont Street	541-622-1	Pequot Acquisitions Co. Inc.	Book 7168, Page 55
n/a	636-1-12-3C	Essex Country Greenbelt Assoc. Inc.	Book 22184, Page 561
154 Rosemont Street	541-623-1	Thomas Dipirro	Book 14275, Page 300

[1] 310 CMR 10.53(8) states, "Any person proposing the replacement of an existing stream crossing shall demonstrate to the Issuing Authority that the impacts of the crossing have been avoided where possible, and when not possible have been minimized and that mitigation measures have been provided to contribute to the protection of the interests identified in M.G.L. c. 131, § 40."

The Site includes a 90-foot stretch of Rosemont Street, inclusive of the Bridge, the adjacent roadway, and the Little River. The Bridge is located approximately 700 feet northwest of the intersection of Griffin Street and Rosemont Street. Surrounding land use primarily consist of low-density residential development and commercial businesses. The Little River flows from north to south under the Bridge.

The existing Bridge (Bridge No. H-12-024) was constructed in 1934 and has a span length of 16'-8" and a width of 32'-3" and carries a roadway with no sidewalks present along the structure. The Bridge consists of concrete encased steel stringers and steel rails supported by concrete abutments and concrete/stone masonry wingwalls. There is no documentation or plans on record for the original construction of this bridge; therefore, all existing conditions data is sourced from field reconnaissance.

Inspection of the Rosemont Street Bridge completed by MassDOT identified that the bridge deck, superstructure, and substructure are structurally deficient. The existing concrete Bridge railings are no longer functional and have been undermined by deck slab spalling which has required placement of jersey barriers along either side of the Bridge in front of the original railings. Both abutments exhibit vertical cracks and spalling, exposed longitudinal reinforcing bars show surface rusting, and the stone wingwalls have failed due to areas of undermining and erosion.

2.2 WETLAND RESOURCE AREAS

A Site inspection was conducted by a BETA Wetland Scientist on November 21, 2023 to review/confirm previously delineated resource area boundaries, and refresh flagging/extend boundaries of existing Resource Areas within and in the immediate vicinity of the Site[2]. Resource Area boundaries were identified and delineated in accordance with the methods developed by the Massachusetts Department of Environmental Protection's *Delineating Bordering Vegetated Wetlands Under the Massachusetts Wetlands Protection Act*, dated 2022, as well as definitions set forth in the Act.

Existing Resource Areas identified onsite include Bank, LUW, BLSF, BVW and RA measured from the delineated Bank/Mean Annual High Water (MAHW) mark. Existing Resource Areas delineated within, or immediately adjacent to the limit of work include inland Bank (to Little River – B1 and B2 Bank series), BVW (WF1 series), and RA as measured from the Mean Annual High Water (to Little River - MAHW1 Series). A complete description of areas Subject to Protection under the Act and the Ordinance is included in Appendix A – Resource Area Boundary Delineation Report.

The Rosemont Street Bridge is located within the 100-year floodplain associated with the Little River designated as a Special Flood Hazard Area (SFHA) Zone AE as determined by the FEMA Flood Insurance Rate Map (FIRM) No. 25009C0086F dated July 3, 2012. The Base Flood Elevation (BFE) determined by FEMA is 34.8 feet on the upstream side and 31.0 feet on the downstream side of the Bridge (NAVD88). During completion of the Hydraulic Study (Appendix I), BETA identified an incorrect high chord elevation depicted in the FEMA Flood Insurance Study (FIS). Data collected in the field indicates that the actual high chord elevation is 2.22 feet lower than the elevation indicated on the FEMA FIS, and the low chord elevation as documented in the field is 32.6 feet (NAVD88). As a result, the actual base flood elevation (BFE) for the Site was adjusted to 34 feet (NAVD88) to account for this discrepancy, as determined by and documented in the existing conditions hydraulic model (Appendix B – Table 4.2).

[2] To minimize the need for supplemental survey, areas where the previously delineated boundaries were surveyed by conventional methods were generally maintained on the plans with the original flagging (rather than replacing with the new delineation). Areas where resource area boundaries required extension or revision were located with GPS and the boundaries were updated on the plans. For this reason, the flag numbering on the plans may differ from the flags in the field.

2.3 BUFFER ZONES

The WPA applies a 100-foot buffer zone to BVW/Bank and the City of Haverhill Wetland Ordinance applies a 25-foot No Disturbance Zone and a 50-foot No Build Zone. Buffer zones at the Site within the limit of work primarily consist of previously developed areas including the Rosemont Street roadway and riprap embankments, with areas of vegetated slopes. Adjacent Resource Areas will be protected from work within buffer zones via the installation of erosion and sedimentation controls as described in Section 4.1.

2.4 NHESP-HABITAT AND OTHER SENSITIVE AREAS

According to the latest MassGIS data, the Project is located partially within and adjacent to both Natural Heritage and Endangered Species Program (NHESP) mapped Priority Habitat of Rare Species (PH2143) and Estimated Habitat of Rare Wildlife (EH1356). Due to the presence of mapped habitat within the limit of work, a MESA checklist has been submitted to the Massachusetts Division of Fisheries & Wildlife for review. The Project Area is ***not*** located within an Area of Critical Environmental Concern (ACEC), along a Coldwater Fishery, within 200 feet of mapped Certified or Potential Vernal Pools, or within groundwater or surface water protection zones associated with a public water supply.

According to the Official Species List dated December 20, 2023, provided by the U.S. Fish and Wildlife Service (USFWS) through the Information for Planning and Consultation (IPaC) system,the Project is located within areas mapped as potential habitat for the monarch butterfly (*Danaus plexippus*), a candidate species, and the Northern Long-eared Bat (*Myotis septentrionalis*), an endangered species. Although potential habitat is mapped, there are no critical habitats mapped in the vicinity of the Project. Tree clearing required for the Project is anticipated to be minimal due to the surrounding land uses, and the Project impacts will be reviewed by the USFWS during the USACE Review.

3.0 WORK DESCRIPTION

The existing Bridge will be replaced with a single-span Bridge on spread footings. The Bridge will have a span length of 35’-11” feet and the hydraulic opening will be increased from 16’-8” wide to 32’-0” wide. Splayed wingwalls constructed of precast concrete blocks will be located at each of the four corners of the bridge. The channel bottom material under the bridge will be either natural or simulated streambed material designed to replicate the nearby LUW material as closely as possible. Restored Banks adjacent to the Bridge will consist of dumped riprap with compost placed into the voids followed by an application of a native seed mixture and installation of erosion control blanket. The rip rap will also provide necessary scour protection, primarily in the northeast quadrant. The top of the restored Banks will be set approximately one (1) foot higher than the OHWM to allow for dry wildlife passage during normal flows.

In order to perform this work, cofferdams and pumps will be used to create dry working conditions, and associated impacts to Bank, LUW, and BVW resulting from water control activities will be restored as discussed in this NOI application. Utilities including gas and sewer will be bypassed as necessary to accommodate construction.

Roadway improvements are also proposed following the construction of the bridge and include guardrail installation, granite curbing installation, and pavement rehabilitation. In addition, roadway widening will be performed to establish a uniform 30-foot-wide roadway with two 4-foot-wide shoulders and two 11-foot-wide travel lanes. Work is also proposed northeast of the Bridge to restore areas of private property that may be impacted during construction.

In summary, specific work proposed as part of the Project includes:

- Installation of erosion and sediment controls;
- Vegetative clearing and grubbing, including tree removal northeast of the bridge;
- Installation of temporary water controls around each abutment (i.e., cofferdams);
- Removal of the existing Bridge;
- Installation of the new bridge, including wingwalls and abutments;
- Construction of designated wildlife passageways on either side of the bridge abutments along the tops of Banks;
- Installation of new bridge barriers;
- Installation of a temporary utility bridge to carry utilities, including sewer and gas lines, during construction;
- Installation of guardrails and new curbing;
- Minor widening of the Rosemont Street roadway;
- Mill and overlay, and portions of full depth construction of Rosemont Street;
- Restoration of LUW using a simulated streambed material, Bank with native seed, BVW with soil decompaction and native seed, and Riverfront Area through removal of the temporary utility bridge and stabilization of graded areas with a native seed mix; and
- Loam and seed of disturbed areas.

3.1 Work within Protected Resource Areas

Work is proposed within Resource Areas Subject to Protection and Jurisdiction under the Act including Bank, BVW, LUW, BLSF, RA and Buffer Zones. Impacts to Resource Areas are unavoidable due to the nature of the bridge replacement work, however the Project has been designed to ensure the minimization of impacts and proposes Resource Area restoration following construction.

Table 1 provides total impact calculations of each resource area as well as temporary and permanent impacts.

Table 1: Resource Area Impacts

	Resource Area Impacts				
Impacts	Bank (lf)	BVW (sf)	LUW (sf)	BLSF (sf)	RA (sf)
Temporary	41	347	309	6631	5223
Permanent	129	-	-	-	-
Redevelopment					6493
Restoration	119	-	593	-	-

3.1.1 Bank (To Perennial Stream) – 310 CMR 10.54

Proposed work includes permanent and temporary impacts to the Banks of the Little River. Permanent impacts are associated with the demolition of the existing concrete bridge abutments that comprise the Bank under the Bridge, which will be relocated and restored as part of the installation of the new Bridge. Temporary impacts are associated with the installation of erosion controls and water controls. The proposed Bank impacts and restoration are as follows:

- **129 linear feet (lf) of permanent alteration:** These impacts are associated with removal of the existing bridge abutments and wingwalls and regrading to establish new Banks. While Banks will

be restored, they will be restored in a new configuration to accommodate a new channel width and wildlife passage shelves; therefore, the associated impacts are considered permanent.

- **41 lf of temporary alteration**: These impacts are associated with activities required to regrade the stream embankment to reestablish the Banks along the River following construction. Temporary impacts will also result from installation of erosion controls and work required to install the proposed water control system.
- **119 lf of restoration**: Bank restoration is proposed in areas where the Banks will be reestablished and relocated under the Bridge to accommodate the new channel width. The top of Banks will be located approximately one (1) foot above the OHWM to serve as dry passage for wildlife under the Bridge. Stone placed to restore Bank will be covered with compost and erosion controls blankets, and a native seed mix will be applied to support long-term stabilization.

Portions of the Bank north of the Bridge will be regraded to restore existing conditions and tie into the new Bank under the Bridge following the construction of the new Bridge, prior to the removal of water controls. Areas where Bank will be regraded, or where Bank was disturbed, will be stabilized with erosion control blankets and the application of a native seed mix.

3.1.2 Bordering Vegetated Wetland – 310 CMR 10.55

The Project proposes 347 square feet (sf) of temporary impacts to BVW northeast of the Bridge resulting from cofferdam installation. The cofferdam is necessary to allow for an open cut excavation at a maximum slope of 1.5H:1V at the northeast quadrant of the bridge. Following the completion of excavation, excavated hydric soils will be placed back into the impacted BVW and existing grade will be reestablished. Should the reuse of onsite hydric soils be determined to be infeasible, a manufactured blend of compost and topsoil will be imported. Manufactured hydric soils should achieve a target organic content of 10-12% by weight and should be free of rocks greater than 4 inches in diameter. The area will then be seeded with a native wetland seed mixture to provide permanent stabilization.

3.1.3 Land Under Water – 310 CMR 10.56

As part of the Project, a total of 309 sf of LUW will be temporarily impacted and 88 cubic yards (cy) of material will be dredged. Dredging is proposed to establish a stream width that mimics the natural upstream and downstream reaches of the Little River. Temporary impacts are associated with the installation of temporary water controls to support the protection of downstream water quality, establishment of a dry work environment, and regrading and reestablishment of a natural streambed.

Temporary LUW impact areas will be restored in place with natural streambed material that has been designed to closely match the upstream and downstream substrate following the guidance for streambed creation outlined in the Massachusetts River and Stream Crossing Standards. This will be accomplished by placing courses of riprap and crushed stone within the Little River and then establishing a course of streambed materials that mimics the upstream and downstream reaches of the Little River.

LUW impacts will be minimized by establishing a clear limit of work through installation of water controls. In addition, any water pumped from the work area will be directed to a dewatering system or to a settling tank to remove silt or sediment prior to discharge to the Little River or upland areas.

3.1.4 Bordering Land Subject to Flooding - 310 CMR 10.57(a)

A 100-year floodplain and a Regulatory Floodway are associated with Little River (Zone AE) and extend throughout the limits of the Project (Figure 3). During completion of the Hydraulic Study (Appendix B), the existing BFE was calculated to be 33.95 feet (NAVD88). The FEMA maps, however, depict the following BFEs:

- Upstream = 34.8 feet
- Downstream = 31.0 feet,

Based on the engineering evaluation, Elevation 34 was used upstream and downstream as the boundary of BLSF as a conservative measure.

Total BLSF impacts associated with the Project are 6,631 sf resulting from demolition of the existing bridge, construction of the wingwalls, grubbing and grading, installation of riprap, removal of existing pavement, reconstruction of portions of the roadway, restoration, and installation of erosion controls.

Of the total BLSF impact area, approximately 4,177 sf is previously developed, meaning they are within the existing roadway or areas of existing maintained vegetation; all impacts are temporary. Minor areas of BLSF will be cut and filled as a result of the Project. Because the Project will remove the existing hydraulic restriction at Rosemont Street, the BFE will be lowered at the Bridge to 30.5 feet (see Appendix B – Hydraulic Report). Table 2 shows the current and proposed storage at each elevation interval on the south and north sides of the Rosemont Street Bridge:

Table 2: Existing and Proposed Storage

Elevation	South Side of Rosemont Street Bridge Cubic yard (CY)		North Side of Rosemont Street Bridge Cubic yard (CY)	
	Existing	**Proposed**	**Existing**	**Proposed**
33-34	44.67	46.67	16.34	29.04
32-33	27.22	39.74	13.76	27.23
31-32	20.22	34.42	11.34	25.17
31-30	15.15	30.44	9.12	23.29
30-29	11.15	27.13	7.18	21.99
29-28	8.06	24.24	5.54	20.71
28-27	5.7	21.73	4.25	19.34
27-26	3.92	18.29	3.36	17.01
26-25	2.5	11.44	2.71	11.6
25-24	1.62	7.86	2.33	8.64
24-23	0.97	4.88	2.02	5.7
23-22	0.51	2.79	1.62	2.85
22-21	0.02	1.54	0.6	0.32
	Existing Storage	**Proposed Storage**	**Change in Storage**	
Total	221.88	484.06	262.18	

Upon completion of the grading activities, the temporarily impacted BLSF surfaces will be restored to existing conditions through placement of loam and spreading of a native seed mix.

3.1.5 RIVERFRONT AREA – 310 CMR 10.58

Work associated with the Project will result in approximately 11,716 sf of temporary RA alteration within the 100' Inner Riparian Zone. Due to the location of the Project unavoidable impacts to RA will occur including, vegetation clearing, installation of erosion controls, resurfacing of the roadway, replacement of guardrail, installation of utilities, placement of railroad ties, installation of riprap, staging/stockpiling and placing of loam and seed. Of the 11,716 sf of RA alteration:

- 5,223 sf of impacts are temporary, resulting from installation of erosion controls, clearing required to access the stream, regrading of the slopes along the roadway, as well as placing riprap, loam and seed on the side slope adjacent to the bridge. These areas will be stabilized with loam and a native seed mix, as discussed in Section 4.4.
- 6,493 sf of impacts are permanent, resulting from repaving of areas that are currently paved within the roadway, as well as adjacent driveway aprons.

Impacts will be minimized by providing erosion controls to prevent impacts beyond the limits of work shown on the Project Plans. All disturbed areas of RA along the roadway will be stabilized following construction with loam and a native Upland Seed Mix.

3.2 WORK IN BUFFER ZONES

Work will occur within the 100-ft Buffer Zone to BVW/Bank, and locally protected 25-foot No Disturbance Zone and 50-foot No Build Zone. Proposed work within Buffer Zone includes vegetation clearing, installation of erosion controls, installation of riprap, loam and seed, creation of construction access, stockpiling construction materials and all roadway re-paving activities. Measures to prevent additional impacts to Resource Areas include installation and maintenance of erosion controls and replanting disturbed areas within the Buffer Zone. The Buffer Zone will be stabilized with loam and a native Upland Seed Mix.

4.0 MITIGATION MEASURES

The Project was designed to avoid, minimize, and mitigate impacts to wetland resource areas, wildlife habitat, and other sensitive areas. Due to the nature of a bridge replacement project, avoidance of impacts is infeasible; however, they have been minimized to the extent feasible. Impacts to resource areas required to construct the Project will be mitigated through proposed restoration of temporary impact areas with seed mixes and materials that will mimic naturalized conditions, use of best management practices for dewatering and water control that will maintain water quality, establishing wildlife passage shelves under the Bridge, and installation of erosion controls.

4.1 EROSION AND SEDIMENTATION CONTROLS

Best Management Practices for erosion and sedimentation control will be adhered to for all phases of construction to minimize erosion, sedimentation, and impacts to resource areas. Specific locations of erosion control measures are shown on the plan enclosed in Appendix C.

Erosion control measures will be implemented along the limit of work, downgradient of the disturbed areas during construction to minimize water quality impacts to adjoining resource areas. Erosion and sedimentation barriers will include 12-inch compost filter tube staked in place, use of inlet protection measures for roadway catch basins, and installation of cofferdams to minimize turbidity increases.

Temporarily impacted areas will be stabilized upon completion of the Project with loam and seed and erosion control blankets. Erosion controls will remain in place and in proper working order until the site

is completely stabilized. A stockpile of erosion control materials will be kept onsite for emergency and routine replacement.

4.2 WATER CONTROL

Construction of the Rosemont Street Bridge will require implementation and maintenance of temporary water controls surrounding the abutments of the Bridge where in-water activities are occurring. This is necessary so activities can be completed in a dry condition and minimize sedimentation to the River. Water control measures will be designed by the contractor; however, they will be required to maintain flow within the channel for the duration of construction and will be required to prevent harm to the ecology of the River, land under water, and surrounding land. Submittal and approval of a Water Control Plan is required for the proposed construction of this bridge. It is, however, anticipated that water control at this bridge will consist of a sheet-metal cofferdams under the Bridge around the abutments, and a sand bag cofferdam downgradient of the proposed scour protection in the northeast bridge quadrant. Upon construction completion, the temporary sheet-metal cofferdams will be left in place, but will be cut two feet below the mudline.

Dewatering of the work area will be completed to avoid an increase in turbidity over the baseline conditions. The Contractor will be responsible for developing an acceptable dewatering plan that will protect water quality during construction. This plan will be submitted to the Engineer for approval prior to implementation and can be submitted to the Commission for approval as well. It is anticipated that the work area will be dewatered via pumping to a settling tank or dewatering system that filters the water prior to discharge back to the stream.

A final construction sequence and water control / dewatering plan can be submitted to the Haverhill Conservation Commission for review and approval prior to commencing work.

4.3 RESOURCE AREA RESTORATION

4.3.1 BANK RESTORATION

Temporary impacts to Bank at the Site will be restored using three methods. The Bank northeast of the bridge will be restored using modified rock fill to stabilize the Bank. The modified rock fill will be top-dressed with loam and seed to create wildlife habitat and to fully stabilize the Bank, the proposed seed mix will consist of a Roadside Riverbank Part Shade Seed Mix. Banks in the northwest, southeast, and southwest quadrants will be regraded and restored with the same native Roadside Riverbank Part Shade Seed Mix. The Bank under the bridge will be restored by installing new bridge abutments and regrading a wildlife passage area.

4.3.2 BVW RESTORATION

Temporary BVW impacts will be fully restored following the completion of the Project. Once the cofferdam is removed from the wetland, the area will be restored with a Wetland Seed Mix, and organic soils if necessary, and will be monitored for at least two (2) growing seasons to ensure at least 75% coverage.

A qualified Wetland Scientist will oversee restoration of this wetland area and shall forward all inspection reports to the Haverhill Conservation Commission. It is anticipated that the proposed wetland restoration plan will sufficiently restore the vegetation, soils, and hydrology of the BVW to pre-construction conditions.

4.3.3 LUW RESTORATION

After the existing bridge is replaced, the streambed profile upstream, downstream, and under the bridge will be reconstructed with a simulated streambed material that will mimic the existing streambed based on sampling to be conducted by the contractor. The proposed subsurface material will be completed by placing a layer of 12" crushed stone, covered by a layer of 24" riprap, with a final layer of 24" simulated streambed material.

4.3.4 BLSF AND RA RESTORATION

Following the completion of bridge construction and grading of the slopes adjacent to the bridge wingwalls, the temporarily impacts BLSF and RA loam will be placed and planted with a native seed mix to restore the wildlife habitat function of these resource areas.

4.4 STORMWATER MANAGEMENT

According to the Massachusetts Stormwater Management Standards (310 CMR 10.05(6)(k-q)), the proposed work constitutes a Redevelopment Project[3] because the work will substantially occur within an existing paved roadway. Redevelopment projects are required to meet Standards 1 and 7 through 10 fully; and Standards 2 through 6 only to the maximum extent practicable (Appendix D – Stormwater Management Checklist and Narrative).

Replacing the Bridge will result in a slight increase in impervious area within the Project limits (approximately 600 sf) that will not have a significant impact to the volume and rate of stormwater runoff. A paved curb cut with rip rap scour protection is proposed at the existing low point on the south side of the roadway where stormwater runoff is currently discharged. This work will reduce erosion from the discharge and continue redirected concentrated stormwater flows away from the Little River. Erosion and sedimentation controls will be installed around any areas to be used for ancillary Bridge replacement work, including but not limited to construction staging.

5.0 ALTERNATIVES ANALYSIS

Due to the nature of the Project, there are no practicable and substantially equivalent economic alternatives to the proposed Project with less adverse effects on Resource Areas. Failure to replace the Bridge will result in Project goals not being met and the structural condition of the Bridge will continue to deteriorate. The Bridge is currently beyond its usable life; therefore, existing structural issues cannot be rectified with only repair work. The Project will minimize and mitigate impacts to Resource Areas as described in this narrative.

6.0 REGULATORY COMPLIANCE

The Rosemont Street Bridge Replacement Project will take place within Areas Subject to Protection under the Act and Ordinance including Bank, BVW, LUW, BLSF, and RA. As a bridge replacement project, the proposed work is subject to the Limited Project provisions of 310 CMR 10.53(8). However, the Project has been designed to comply with the applicable Performance Standards to the maximum extent practicable

[3] Per Chapter 1, Volume 1 of the MA Stormwater Standards Handbook, redevelopment projects are defined to include "Maintenance and improvement of existing roadways, including widening less than a single lane, [and] correcting substandard intersections".

and will meet the Massachusetts Stream Crossing Standards fully. The Project, as proposed, results in the following impacts and restoration:

Table 3: Resource Area Impacts

	Resource Area Impacts				
Impacts	Bank (lf)	BVW (sf)	LUW (sf)	BLSF (sf)	RA (sf)
Temporary	41	347	309	6631	5223
Permanent	129	-	-	-	-
Redevelopment					6493
Restoration	119	-	593	-	-

6.1 MASSACHUSETTS STREAM CROSSING STANDARDS

The Project has been designed to fully comply with the Massachusetts Stream Crossing Standards[4] as follows:

Table 4: Stream Crossing Standards Compliance

Stream Information and Standards	Proposed Project
Standard 1 **Crossing Type**	Span Bridge – **Optimal Standard Met**
Standard 2 **Embedment > 2 feet**	Embedment not required, due to spn - **Met**
Standard 3 **Crossing Span >1.2*BFW**	BFW = 24.65' 1.2*24.65' = 29.58' Span = 35.92' 35.92' > 29.58' **Dry passage for wildlife is proposed upgradient of the restored bank on both sides under the bridge – Optimal Standard Met**
Standard 4 **Openness Ratio > 0.82**	$\frac{35.917' \, x \, 10'}{33'}$ = 10.88 10.88 > 0.82 **Met**
Standard 5 **Substrate Type**	Simulated natural substrate will be used to restore streambed **Met**
Standard 6 **Water Depth and Velocity**	The Project will result in a decrease in water depths and a decrease in velocity during 25/50/100-year storm events at the location of the Bridge. **Met – proposed water depths and velocity are comparable to existing conditions upstream and downstream of the culvert. See Appendix B– Hydraulic Analysis and Scour Report.**

[4] These standards reference a publication entitled *Massachusetts River and Stream Crossing Standards*; produced by the River and Stream Continuity Partnership; last revised 3/1/11 and corrected on 3/18/12.

6.2 MASSACHUSETTS WETLANDS PROTECTION ACT AND REGULATIONS

The Project has been designed to comply with General Performance Standards for Bank, BVW, and LUW fully and for BLSF and RA to the maximum extent practicable, as a Limited Project under the provision of 310 CMR 10.53(8).

6.2.1 INLAND BANK PERFORMANCE STANDARDS – 310 CMR 10.54(4)

In accordance with 310 CMR 10.54(4)(a)6, the Project has also been designed to fully meet the Massachusetts Stream Crossing Standards, therefore the Project is presumed to meets the performance standards at 310 CMR 10.54(4)(a).

Proposed work on Bank, however, will fully comply with the Performance Standards set forth in 310 CMR 10.54(4)(a)1-6[5], as work will not permanently affect the stability of the Bank, impair the water carrying capacity of the existing channel within the Bank, impair ground or surface water quality, or permanently exceed thresholds for wildlife habitat impairment at the stream crossing. The Project aims to increase the stability of the Bank without impacting water quality or the carrying capacity of the stream by restoring the Bank fully after any disturbance by using modified rock fill, loam and seed, erosion control blankets, and the abutment of the bridge.

Regrading and placement of modified rockfill topped with organic material and seed will improve long-term physical stability of Bank. Although placement of cofferdams will temporarily impact the carrying capacity of the channel, these impacts will be mitigated through maintaining flow within the channel, and the Bank boundary will be restored following construction completion. Proposed Bank stabilization methods will replicate the herbaceous cover currently found on the Bank and is anticipated to provide the same functions as the existing Bank upon completion. The Project will also increase wildlife habitat adjacent to the stream by providing a wildlife crossing under the new bridge and plantings of a native seed mix in all disturbed areas.

6.2.2 BORDERING VEGETATED WETLAND PERFORMANCE STANDARDS – 310 CMR 10.55(4)

Work within BVW will fully meet the Performance Standards at 310 CMR 10.55(4)(a)[6]. Temporarily impacted BVW (347 square feet) will be restored in place with a native seed mix (Appendix E), therefore the Project will not destroy or otherwise impair this area. The restored wetland will be monitored following construction to ensure function is restored.

6.2.3 LAND UNDER WATER PERFORMANCE STANDARDS – 310 CMR 10.56(4)

The Project has been designed to fully meet the LUW Performance Standards at 310 CMR 10.56(4)(a)5, as the Project fully meets the Massachusetts Stream Crossing Standards. Therefore, the Project is presumed to meets the performance standards at 310 CMR 10.56(4)(a).

Proposed dredging for this Project does not exceed the 100 CY threshold that triggers the requirement of receiving a Water Quality Certification. In addition, the Project meets the performance standards at 310 CMR 10.56(4)(a)1-4 fully as work will not impair ground or surface water quality due to the installation of

[5] Work on a Bank shall not impair: the physical stability of Bank; the water carrying capacity of the existing channel within the Bank; ground water and surface water quality; the capacity of Bank to provide breeding habitat, escape cover and food for fisheries, and; the capacity of the Bank to provide important wildlife functions.

[6] Where the presumption set forth in 310 CMR 10.55(3) is not overcome, any proposed work in a Bordering Vegetated Wetland shall not destroy or otherwise impair any portion of said area.

water controls such as cofferdams, or permanently exceed thresholds for wildlife habitat impairment within the Little River.

The LUW substrate will be restored to existing grade and the lower boundary of Bank will be restored so there is a continuous Bank from upstream to downstream of the bridge, improving the water carrying capacity of the channel. The proposed substrate under the new culvert will simulate a streambed material and will provide both water quality and fisheries benefits. This substrate will trap settled solids and provide cover for aquatic species. The 593 square feet of LUW temporarily impacted is less than 5,000 square feet and/or 10% of the total LUW at the Site and is therefore presumed to not negatively impact the wildlife habitat functions of LUW.

6.2.4 BLSF Performance Standards – 310 CMR 10.57(4)(a)

Work within BLSF will meet the performance standards at 310 CMR 10.57(4)(a)(1, 2 and 3). The Project proposes to widen the streambank within BLSF to comply with the Stream Crossing Standards and will result in a lower 100-year flood elevation, as documented in Appendix B. Further, as described in Table 2, the Project will increase flood storage at the site by 262 cubic yards due to the proposed grading. Accordingly, no compensatory storage is required. In addition, the Project activities within BLSF will not permanently restrict flows so as to cause an increase in flood stage or velocity, as documented in Appendix B.

The Project will not result in adverse effects on wildlife habitat nor impair the capacity of the Site to provide important wildlife habitat, as the majority of the work proposed within BLSF is temporary or within the existing paved roadway. A wildlife passageway is proposed under the bridge, and planting of a native seed mix is proposed, both of these construction activities will improve wildlife habitat at the Site.

6.2.5 Riverfront Area Performance Standards – 310 CMR 10.58(4) and 310 CMR 10.58(5)

The Project entails RA impacts to both degraded and non-degraded portions of RA. All impacts to degraded RA will meet the RA redevelopment provisions found at 310 CMR 10.58(5). Degraded areas at the Site include the Rosemont Street roadway and Rosemont Street Bridge. Work in these areas will be performed within the footprint of the degraded area and will not result in development closer to the stream except for minor temporary work – totaling 6,493 sf. As described in Section 4.5 - Stormwater Management, the Massachusetts Stormwater Management Standards will also be met as applicable.

Work within non-degraded portions of RA will result in impacts totaling less than 5,000 square feet and 10% of the RA at the Site. Work within the non-degraded RA include installation of cofferdams, placement of riprap for Bank stabilization, and planting of native seed for restoration within the 100-foot Inner Riparian Zone. The majority of the impacts are temporary and all Performance Standards for Bank, BVW, LUW and BLSF will be met as described in Sections 6.2.1 through 6.2.4. Temporarily impacted RA will be restored and vegetated following completion of the Project.

In accordance with 310 CMR 10.58(4):

a. The Project meets the General Performance Standards for all resource areas within RA.
b. The Project is located within mapped Rare and Endangered Species Habitat, and has been submitted to NHESP for review.
c. There are no practicable or substantially equivalent alternatives that would result in less adverse effects on the interest of the Act.
d. The Project does not have a significant adverse impact of the RA:
    1. Rosemont Street has existed since before 1996. Impacts to RA are temporary (5,223 sf), as impacted areas will be restored with a native seed mix. The work will not impair the RA's

capacity to provide wildlife habitat, erosion controls are proposed to protect surface water quality, and stormwater will be managed according to the Standards.

Vegetation removal is proposed within 100 feet of the stream for construction and modified rock fill placement for slope stabilization. Clearing has been minimized and trees outside the limit of clearing will be protected. Overall, the area surrounding the stream to the east provides a greater than 100-foot undisturbed vegetated buffer.

2-4. The Project is not within a 25-foot RA, does not propose a septic system, and does not propose a commercial structure, so these Performance Standards are not applicable.

6.3 City of Haverhill Wetland Protection Ordinance – Chapter 253

The City of Haverhill has a Wetlands Protection Ordinance with unique definitions that expand the protections provided by the Massachusetts Wetland Protection Act. Specifically, the Project proposes work within the locally protected restrictive buffer zones.

6.3.1 No Build Zone/ No Disturbance Zone

The ordinance defines a 25-foot No Disturbance Zone and 50-foot No Build Zone. Work is proposed within the 25-foot No Disturbance Zone and 50-foot No Build Zone. While there are no performance standards for these areas within the Ordinance, the Applicant is requesting the Commission approve this water-dependent project within these zones. Work proposed to occur within this area includes access to the waterway to install a cofferdam, this will entail vegetation clearing, including clearing of trees. This area will be restored after construction by using modified rock fill to stabilize the slopes, where the modified rock fill will be top-dressed with loam and a native seed mix to create wildlife habitat and stabilize the slope. Work within this area is unavoidable and necessary to provide the contractor with enough space to construct a bridge that meets current MassDOT Standards.

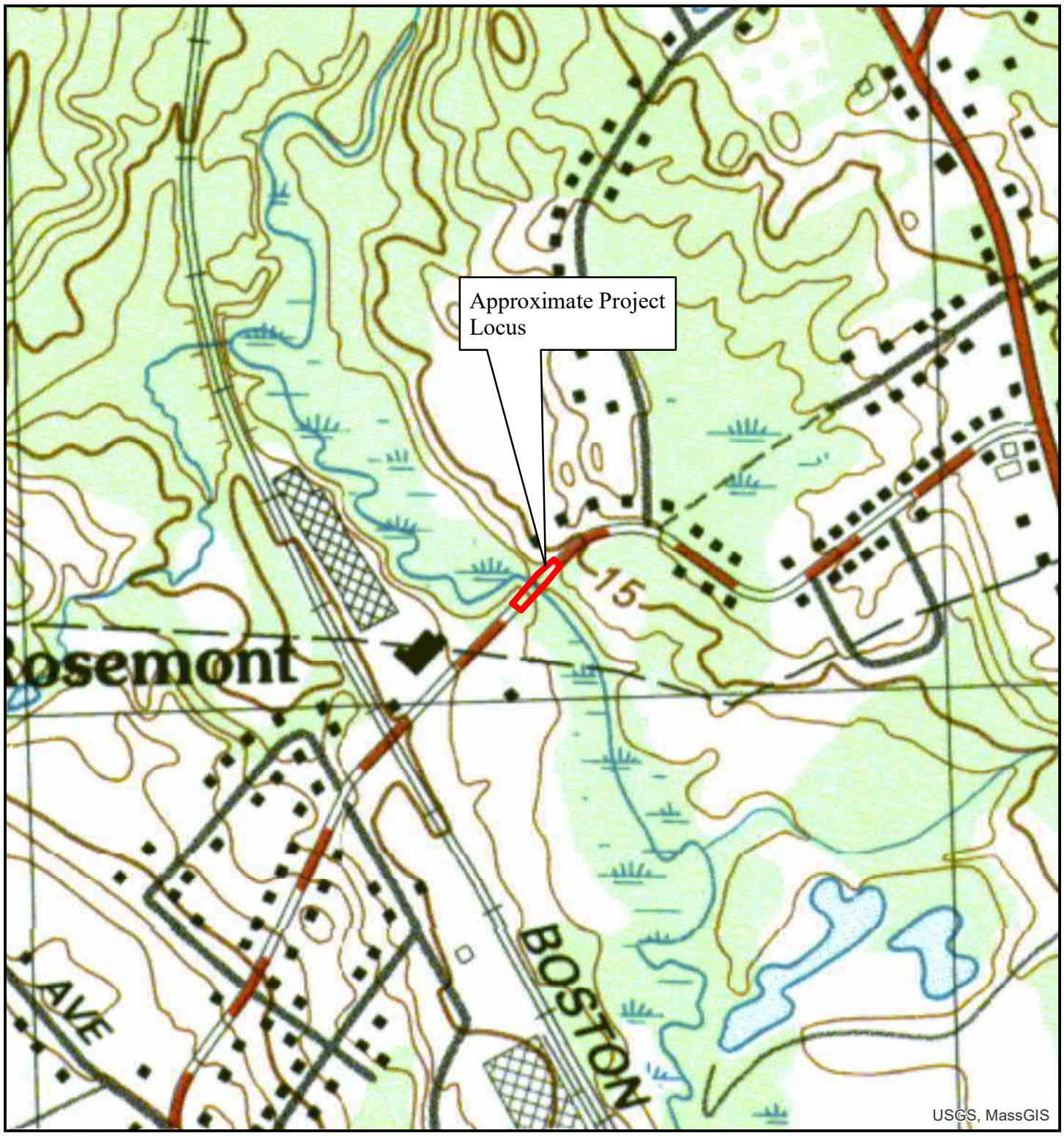
7.0 Summary

The proposed Rosemont Street Bridge Replacement Project will replace a deteriorating bridge with a single span bridge that will fully meet the MA Stream Crossing Standards, while enhancing public safety for the residents of Haverhill. The Project is being filled as a limited project under the provision within the WPA Regulations at 310 CMR 10.53(3)8. The Project has been designed to meet the performance standards for resource areas set forth in the Act and the WPA Regulations at 310 CMR 10.00 to the maximum extent practicable.

Notable improvements to the existing environmental conditions will be realized through improving wildlife migration, improving streamflow, mitigating the existing hydraulic restriction, and planting native species within the Site. By planting native species and installing a wildlife passage area, the Project will maintain habitat connectivity and enhance the wildlife habitat function within the onsite resource areas following completion of construction.

On behalf of the Town of Haverhill, the Project Team respectfully requests that the Haverhill Conservation Commission find the proposed measures adequately protective of the interests of the Act in an Order of Conditions approving the work as described in the Notice of Intent and accompanying plans.

FIGURES



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N
W E
S

0 500 1,000 Feet

1 inch = 500 feet

Figure 1
Site Locus
Rosemont Street Bridge
Haverhill, MA

Data Source: MassGIS USGS Topographic Quadrangle Images (2001)

Figure 2
Wetland Resources Map
Rosemont Street Bridge
Haverhill, MA

MassDEP Wetland Resources Legend
- Marsh/Bog
- Wooded marsh
- Open Water

Water Protections Legend
- MA DFW Coldwater Fisheries Resources
- Zone A
- Zone B
- Zone C
- MassDEP IWPA
- MassDEP Zone I
- MassDEP Zone II
- Outstanding Resource Water

Railway Legend
- Active Rail Service
- Right-of-way used for Hiking and Biking
- Right-of-way, never built or used for rail
- Abandoned Service ROW in Public Interest
- Abandoned or Out of Service
- Unknown

N
W E
S

0 250 500 Feet

1 inch = 250 feet

Data Source: MassGIS USGS Color Ortho Imagery (2014), MassDEP Wetlands (1:12000) (2009), NHESP Potential Vernal Pools (2000), NHESP Certified Vernal Pools, NHESP Priority Habitats of Rare Species (2008), NHESP Estimated Habitats of Rare Species (2008), Areas of Critical Environmental Concern (2009), FEMA National Flood Hazard Layer (2014),

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Figure 3
Environmental Resources Map
Rosemont Street Bridge
Haverhill, MA

Approximate Project Locus

Environmental Resources Legend

- NHESP Certified Vernal Pool
- NHESP Potential Vernal Pool
- Area of Critical Environmental Concern (ACEC)
- NHESP Estimated Habitats of Rare Wildlife
- NHESP Priority Habitats of Rare Species

Railway Legend

- Active Rail Service
- Right-of-way used for Hiking and Biking
- Right-of-way, never built or used for rail
- Abandoned Service ROW in Public Interest
- Abandoned or Out of Service
- Unknown

N
W E
S

0 250 500 Feet

1 inch = 250 feet

Data Source: MassGIS USGS Color Ortho Imagery (2014), MassDEP Wetlands (1:12000) (2009), NHESP Potential Vernal Pools (2000), NHESP Certified Vernal Pools, NHESP Priority Habitats of Rare Species (2008), NHESP Estimated Habitats of Rare Species (2008), Areas of Critical Environmental Concern (2009), FEMA National Flood Hazard Layer (2014),

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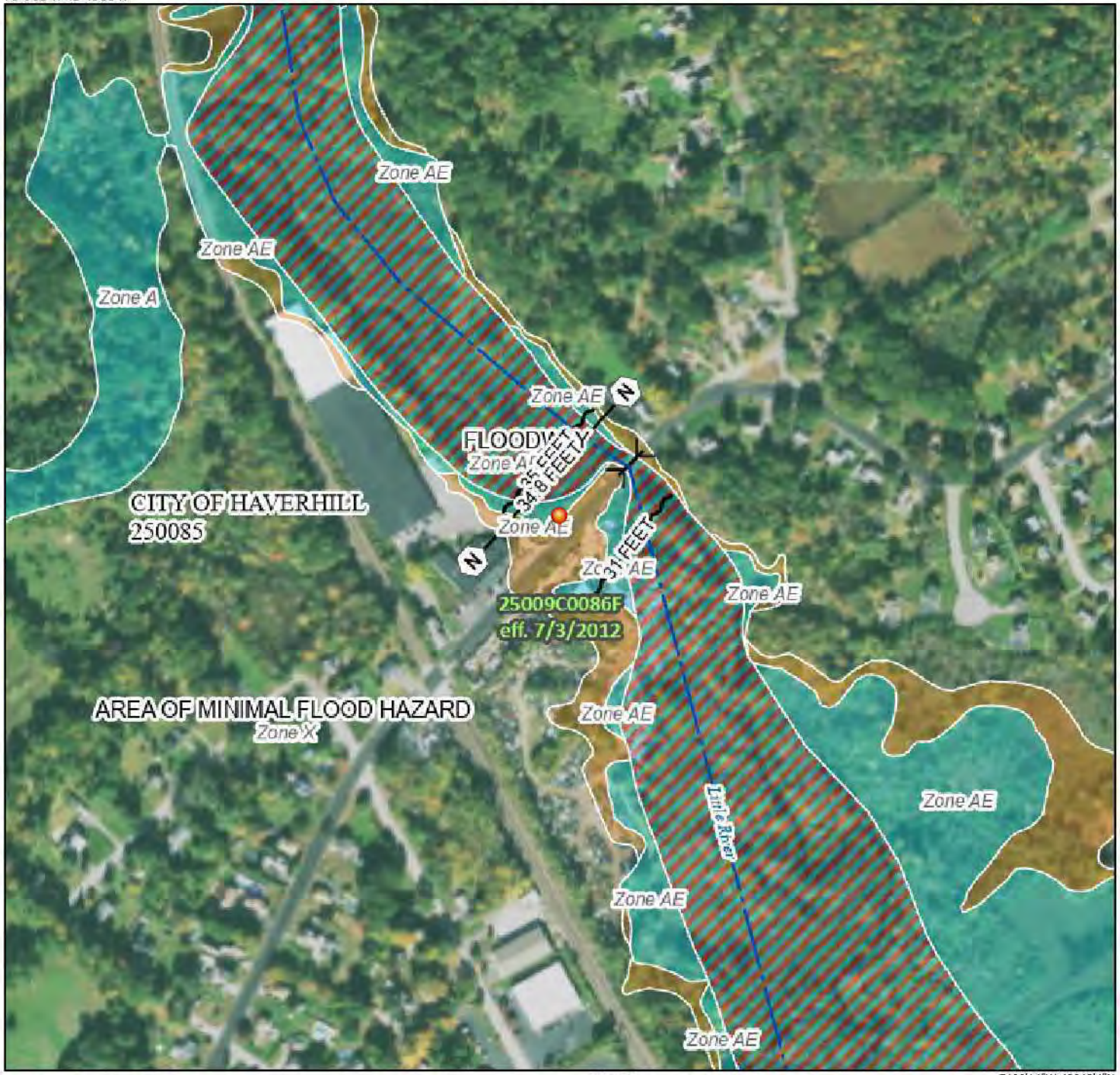
National Flood Hazard Layer FIRMette

FEMA

71°6'52"W 42°48'31"N



71°6'14"W 42°48'4"N

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

1:6,000

Basemap Imagery Source: USGS National Map 2023

Legend

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

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

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

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

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

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

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

N

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

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

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 11/21/2023 at 7:50 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.

Photographic Documentation

Photo 1

View of the northern side of the Rosemont Street Bridge—facing southeast.

Photo 2

View of the southern side of the Rosemont Street Bridge—facing northwest.

PHOTOGRAPHIC DOCUMENTATION

Rosemont Street Bridge Restoration

Haverhill, Massachusetts

Photographs Documented November 21, 2023

Photo 3

View of the current conditions of the deteriorating pavement and guard rail on the northern side of the Rosemont Street Bridge.

Photo 4

View of the *B2-99 Series* Bank south of the Rosemont Street Bridge—facing north.

PHOTOGRAPHIC DOCUMENTATION

Rosemont Street Bridge Restoration

Haverhill, Massachusetts

Photographs Documented November 21, 2023

Photo 5

View of the *B3/B4 Series* intermittent stream—facing north.

Photo 6

Typical view of the *WF1 Series* wetland—facing north.

PHOTOGRAPHIC DOCUMENTATION

Rosemont Street Bridge Restoration

Haverhill, Massachusetts

Photographs Documented November 21, 2023

APPENDIX A – Resource Area Delineation Report

Resource Area Boundary Delineation
Rosemont Street Bridge
Haverhill, Massachusetts

February 9, 2024

On November 21, 2023, BETA Group, Inc. (BETA) Wetland Scientists performed Wetland Resource Area delineations and a bankfull width analysis associated with the bridge spanning Little River along Rosemont Street in Haverhill, Massachusetts (the Site). This report describes Wetland Resource Areas Subject to Protection under the Massachusetts Wetlands Protection Act (M.G.L. Chapter 131 Section 40 - the Act), the federal Clean Water Act CFR (33 U.S.C. §1251 et seq (1972)), the Massachusetts Clean Waters Act (MGL Chapter 21 Section 26-53), and the City of Haverhill Wetlands Protection Ordinance (Haverhill The Code, Chapter 253, §253-1 - §253-12 – the Ordinance) that exist on and within proximity to the Site and the methodology used to delineate their boundaries.

Site Description

The Site consists of the area including and immediately surrounding the bridge spanning Little River along Rosemont Street and its associated public right-of-way (ROW) where it crosses Little River. The Site is bounded to the north and south by Little River, to the east by residential properties, and to the west by commercial properties and a Massachusetts Bay Transit Authority (MBTA) rail line (Figure 2 – Wetland and Water Resources Map and Figure 3 – Wildlife Habitat Map). Improvements at the Site consist of the Little River bridge (the Bridge), a two-lane bituminous concrete roadway, metal guardrails, and jersey barriers.

According to the USDA Natural Resources Conservation Service – Soil Survey, mapped soil on and in the vicinity of the Site is classified as Montauk fine sandy loam and Saco variant silt loam. Field observations performed by BETA generally confirmed the soil type. The Custom Soil Resource Report for Essex County, Massachusetts, Northern Part is attached.

State Jurisdictional Resource Areas identified within and adjacent to the Site include Inland Bank (to both perennial and intermittent streams), Bordering Vegetated Wetland (BVW), Land Under Water (LUW), Bordering Land Subject to Flooding (BLSF), and Riverfront Area (RA). The MassGIS database was used as the initial step in identifying critical areas on or within proximity to the Site. Table 1 (below) describes selected environmentally critical categories as determined through MassGIS.

Table 1. Selected MassGIS Environmental Data Layers *(Source: MassGIS)*

Mapped Resource On or Within Proximity to Site	Yes	No
Area of Critical Environmental Concern		✓
NHESP Certified Vernal Pool		✓
NHESP Potential Vernal Pool		✓
Coldwater Fisheries Resource		✓
NHESP Estimated Habitat of Rare Wildlife	✓	
NHESP Priority Habitat of Rare Species	✓	
Outstanding Resource Waters		✓
FEMA Flood Zones	✓	
Surface Water Protection Area (Zones A and B)		✓
Interim Wellhead Protection Area		✓
Zone II Wellhead Protection Area		✓

Mapped Resource On or Within Proximity to Site	Yes	No
Wild and Scenic River		✓
Dam		✓

Jurisdictional Habitat – Massachusetts Endangered Species Act

The Site is partially located within Natural Heritage and Endangered Species Program (NHESP)-mapped Estimated Habitat of Rare Wildlife (EH 1356) and Priority Habitat of Rare Species (PH 2143). These areas are Subject to Jurisdiction under the Massachusetts Endangered Species Act (M.G.L. ch.131A – MESA); accordingly, any work proposed within NHESP-mapped habitat requires a submission to NHESP pursuant to MESA.

Jurisdictional Wetland Resource Areas – Massachusetts Wetlands Protection Act

A Site visit was conducted by BETA Wetland Scientists on November 21, 2023, to identify and delineate Jurisdictional Resource Areas present at, and adjacent to, the Site. Resource Area boundaries were identified and delineated in accordance with methods developed by the Massachusetts Department of Environmental Protection's *Delineating Bordering Vegetated Wetlands Under the Massachusetts Wetlands Protection Act: Second Edition*, dated September 2022, as well as definitions set forth in the Wetland Regulations, 310 CMR 10.00. Several Areas Subject to Protection under the Act exist on or adjacent to the Site and are described below.

Inland Bank (to perennial and intermittent streams) – 310 CMR 10.54

According to 310 CMR 10.54(2), the definition of a Bank is the portion of the land surface which normally abuts and confines a water body, occurring between a water body and a vegetated bordering wetland and adjacent floodplain, or, in the absence of these, it occurs between a water body and an upland. The upper boundary of a Bank is the first observable break in the slope or the mean annual flood level, whichever is lower.

BETA identified and delineated Bank associated with one (1) perennial stream (Little River) and one (1) unnamed intermittent stream. Bank was delineated in the field using blue flagging as described below in Table 2.

Table 2: Bank Boundary Description

Flag Series	Waterbody	Description / Notes
B1 / B2 Series *B1-92 to B1-112* & *B2-93 to B2-113*	Little River	The southern (*B1 Series*) and northern (*B2 Series*) Banks associated with Little River (the River) were delineated along the first observable break in slope as follows: South of the Bridge, the River is confined by steep Banks consisting of muck and sandy soil. Banks are generally consistent with the mean annual flood level / Mean Annual High Water (MAHW) mark except where MAHW evidence was observed upgradient of the *B1 Series* Bank (flags MAHW1-100 to MAHW1-106). The *B1 Series* Bank (flags B1-92 to B1-99) is vegetated with various sedges (*Carex* spp.), winterberry (*Ilex verticillata*), honeysuckle (*Lonicera* spp.), speckled alder (*Alnus incana*), and Asiatic bittersweet (*Celastrus orbiculatus*). The *B2 Series* Bank (flags B2-93 to B2-99) is vegetated with lawn grass (*Poa* spp.), red maple (*Acer rubrum*), and speckled alder. The channel south of the Bridge is between 30.9 and 33.9 feet wide with a mixed muck and sand

Flag Series	Waterbody	Description / Notes
		substrate. The water within the channel was approximately 2 feet deep at the time of the delineation. North of the Rosemont Street Bridge, the Banks consist of an abrupt break in slope coincident with the mean annual flood level / MAHW mark. The *B1 Series* (flags B1-100 to B1-112) and *B2 Series* (flags B2-100 to B2-113) Both Banks are vegetated with silky dogwood (*Cornus amomum*), soft rush (*Juncus effusus*), privet (*Ligustrum* spp.), giant goldenrod (*Solidago gigantea*), and black cherry (*Prunus serotina*). Channel width within this portion of the River is between 15.5 and 18.0 feet wide with a sandy substrate interspersed with cobbles and anthropogenic debris. The water within the channel was approximately 3.5 feet deep at the time of the delineation. According to StreamStats, the bankfull width (BFW) for the River immediately upstream of the Site is 49.3 feet (attached Little River StreamStats Report); however, this portion of the River is not reflective of natural conditions due to the influence of the Bridge on stream hydraulics. BETA conducted measurements of the channel width in the vicinity of the Site at five (5) different transects – three (3) measurements were taken upstream of the Bridge and two (2) measurements were taken downstream of the Bridge (Figure 5 – Rosemont Street Bankfull Width Sketch). Based on these measurements, the average bankfull width outside of the influence of the Bridge is **16.9 feet** upstream and **32.4 feet** downstream. The River is depicted as perennial on United States Geologic Survey (USGS) topographic maps and is therefore considered perennial under the Act.
B3 / B4 Series *B3-100* to *102* and *B4-100* to *102*	Unnamed tributary to Little River	The eastern (*B3 Series*) and western (*B4 Series*) Banks of the unnamed intermittent stream that flows south into the River were delineated along the first observable break in slope, which is coincident with the mean annual flood level / MAHW. The Banks consist of poorly defined mucky slopes vegetated with various rushes (*Juncus* spp.), various goldenrods (*Solidago* spp.), and stilt grass (*Microstegium vimineum*). The *B3 / B4 Series* stream is approximately 1.5 feet wide and 6 inches in depth with a muck substrate. This stream is not depicted on USGS topographic maps or the USGS StreamStats application; therefore, it is presumed to be intermittent.

<u>Bordering Vegetated Wetlands (BVW) – 310 CMR 10.55</u>

According to 310 CMR 10.55(2), the definition of BVW are freshwater wetlands which border on creeks, rivers, streams, ponds and lakes and are areas where the soils are saturated and/or inundated such that they support a predominance of wetland indicator plants. The boundary of BVW is the line within which 50% or more of the vegetation community consists of wetland indicator plants and saturated or inundated conditions exist.

BETA identified one (1) area of BVW within or adjacent to the Site. US Army Corp of Engineers' *Vegetated Wetland Boundary Delineation Field Data Sheets* documenting BETA's observed evidence of hydrology,

soils, and hydrophytic vegetation at specific data plots are attached. Areas of BVW were delineated in the field using pink flagging as described below in Table 3.

Table 3: BVW Boundary Descriptions

Flag Series	Location	Description / Notes
WF1 Series *Flags* *WF1-100* to *104*	North of Little River, east of the unnamed tributary	The *WF1 Series* BVW is a scrub shrub wetland located at the toe of a slope north of the River and east of the unnamed tributary. The attached U.S. Army Corp of Engineers Field Data Sheets describe observations of hydrology, hydrophytic vegetation, and hydric soils made at a specific data plot.

Land Under Water – 310 CMR 10.56

According to 310 CMR 10.56(2), the definition of Land Under Water (LUW) is the land beneath any creek, river, stream, pond or lake and may be composed of organic muck or peat, fine sediments, rocks or bedrock. The boundary of Land Under Water is the mean annual low water level. LUW exists on the Site below the delineated Bank of the River and the unnamed intermittent stream. These boundaries were not flagged in the field.

Bordering Land Subject to Flooding – 310 CMR 10.57

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Number 25009C0086F dated July 3, 2012, the Rosemont Street Bridge lies within a Zone AE Flood Hazard with a Base Flood Elevation (BFE) ranging from 34.8 feet (NAVD88) immediately upstream of the Rosemont Street Bridge and 31.0 feet (NAVD88) downstream of the bridge. In addition, the River is associated with a Regulatory Floodway. Any work within BLSF (i.e., areas with a 0.1% annual chance of flooding) is Subject to Jurisdiction under the Act.

Riverfront Area – 310 CMR 10.58

According to 310 CMR 10.58(2), RA is defined as the area of land between a river's MAHW line, and a parallel line measured 200' away horizontally. A River is any natural flowing body of water that empties to any ocean, lake, pond, or other River flowing throughout the year and is shown as perennial on the current United States Geological Survey or more recent map provided by the Department, or has a watershed size of at least 0.50 square miles and a predicted flow rate greater than or equal to 0.01 cubic feet per second at the 99% flow duration using the USGS Stream Stats Method.

The Little River is a River with an associated 200-foot RA measured from the MAHW boundary. The MAHW boundary at the Site coincides with the delineated Bank boundary except where present above the *B1 Series* Bank southeast of the Bridge (flags MAHW1-100 to MAHW1-106). The RA should be measured 200 feet horizontally from the following flags:

- MAHW1-100 to MAHW1-106;
- B2-93 to B2-113;
- B1-100 to B1-112;
- B3-100 to B3-102; and
- B4-100 to B4-102.

Jurisdictional Wetland Resource Areas – City of Haverhill Ordinance

The Ordinance provides definitions that differ from the Act as follows:

Bank

The Ordinance defines the upper boundary of Bank to be the first observable break in slope or the mean annual flood level, whichever is higher.

Bank was delineated along the first observable break in slope which was largely coincident with the mean annual flood level / MAHW mark with the exception of the *MAHW1 Series* MAHW mark. Therefore, the Ordinance Bank is delineated with the following flags:

- MAHW1-100 to MAHW1-106;
- B2-93 to B2-113;
- B1-100 to B1-112;
- B3-100 to B3-102; and
- B4-100 to B4-102.

Isolated Wetland

The Ordinance defines an Isolated Wetland as a wetland of at least 5,000 square feet with no visible inlet or outlet. No Isolated Wetlands were identified on or within proximity to the Site.

Land Subject to Inundation of Groundwater

The Ordinance defines Land Subject to Inundation of Groundwater as an area where the groundwater table is high enough to allow for groundwater to exist as standing and / or draining water. No areas meeting the Ordinance's definition of Land Subject to Inundation of Groundwater were identified on or within proximity to the Site.

Rare Species

The Ordinance defines rare species to include all vertebrate, invertebrate, and plant species listed as endangered, threatened, or of special concern by the Massachusetts Division of Fisheries and Wildlife regardless of whether the site has been previously identified as habitat.

Both NHESP Priority Habitat of Rare Species and Estimated Habitat of Rare Wildlife are located north of the Bridge; therefore, it is presumed that these areas would be jurisdictional under the Ordinance per the definition of Rare Species.

Resource Areas

The Ordinance defines Resource Areas to include all areas subject to protection in the "Purpose" section of the Ordinance. This definition is inclusive of isolated wetlands, areas deemed to be of recreational and / or aesthetic value, and areas of erosion and sediment control.

Ordinance-specific Resource Areas were not identified at or within proximity to the Site.

Sensitive Wetland Area

The Ordinance defines a Sensitive Wetland Area as the following:

- A wetland within the primary recharge area of a public or potential public drinking water supply,
- Within 200 feet of any identified private drinking water supply well,
- Within 100 feet of any standing or flowing water,
- Within 100 feet of any wetland, and

- Within 100 feet of any agricultural area presently in use or planned to be used within one year of spraying.

The *WF1 Series* Wetland is considered a Sensitive Wetland Area due to its location within 100 feet of the River.

Vegetated Wetland

The Ordinance states that, should the vegetation of a potential vegetated wetland be altered, the presence of hydric soils can be used to delineate a vegetated wetland.

The *WF1 Series* BVW was delineated through the identification of hydrophytic vegetation, evidence of hydrology, and the presence of hydric soils.

Jurisdictional Wetland Resource Areas – Federal Clean Water Act (Section 404)

The streams and wetlands located at the Site are "waters of the United States," and are therefore subject to the federal Clean Water Act, 33 U.S.C. §1251 et seq (1972). The boundary to "waters of the United States" is the vegetated wetlands boundary, or, in the absence of vegetated wetlands, is the Ordinary High Water Mark (OHWM) for non-tidal rivers and streams, as specified at 33 CFR §328.4.

According to 33 CFR §328.3(c)(4), vegetated wetlands are defined as "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions." One (1) vegetated wetland was delineated at the Site along the River. At this location, the vegetated wetland is the extent of federal jurisdiction, while the OHWM is the limit of federal jurisdictional at all other locations as delineated with the following flags:

- MAHW1-100 to MAHW1-106;
- B2-93 to B2-101;
- B1-100 to B1-112;
- B3-100 to B3-102; and
- B4-100 to B4-102.

Work requiring filling below the boundary of OHWM or vegetated wetland is Subject to Jurisdiction under Section 404 of the Clean Water Act.

Jurisdictional Wetland Resource Areas – Massachusetts Clean Waters Act (Section 401)

The limit of jurisdiction under Massachusetts Clean Waters Act (Section 401), as specified in 314 CMR 9.00, is the limit of Section 404 jurisdiction under the federal Clean Water Act at this Site. Exceedances of the jurisdictional threshold under 314 CMR 9.00 require filing for a Water Quality Certification under Section 401.

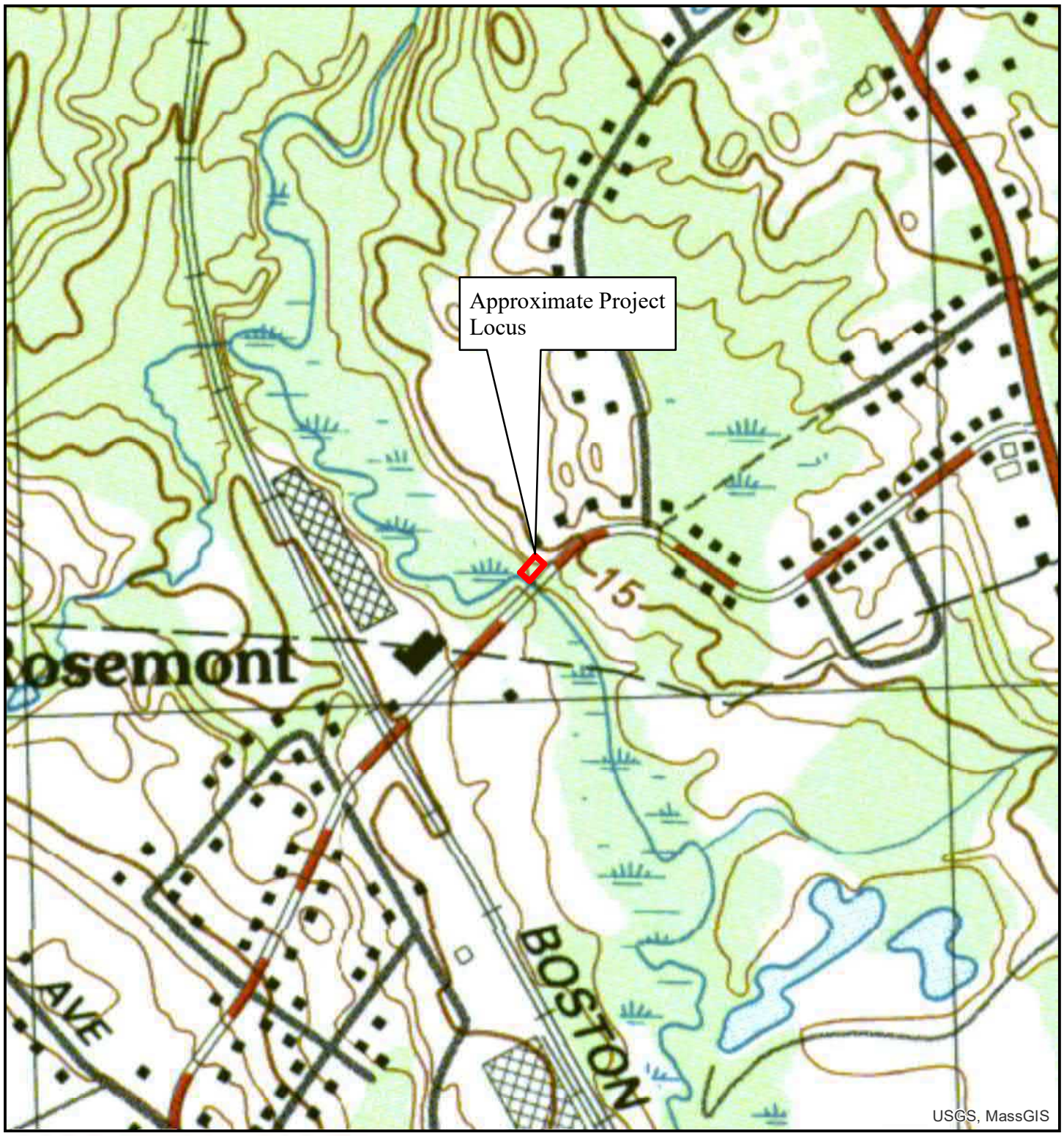
Findings and Recommendations

BETA has identified Areas Subject to Protection and / or Jurisdiction under the Massachusetts Wetlands Protection Act, the federal Clean Water Act, the Massachusetts Clean Waters Act, and the City of Haverhill's Wetlands Protection Ordinance on or within 100 feet of the Site and have delineated the boundaries of Bank, BVW/vegetated wetland, and MAHW/OHWM that exist on or within proximity to the Site. In order to definitively determine the extent of Conservation Commission jurisdiction, Army Corps jurisdiction, and MassDEP jurisdiction, the boundary flags would need to be located and depicted on a to-scale plan of the Site.

If you have any questions or need further assistance, please do not hesitate to call us.

Attachments: Figure 1 – Site Locus
Figure 2 – Wetland and Water Resources Map
Figure 3 – Wildlife Habitat Map
Figure 4 – FEMA FIRMette
Figure 5 – Bankfull Width Sketch
Photographic Documentation
U.S. Army Corp of Engineers' *Vegetated Wetland Boundary Delineation Field Data Sheets*
Custom Soil Report for Essex County, Massachusetts Northern Part
Little River StreamStats Report

Job No: 18.06155.00



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N
W E
S

0 500 1,000 Feet

1 inch = 500 feet

Figure 1
Site Locus
Rosemont Street Bridge Restoration
Haverhill, MA

Data Source: MassGIS USGS Topographic Quadrangle Images (2001)

Figure 2
Wetland and Water Resources Map
Rosemont Street Bridge Restoration
Haverhill, MA

MassDEP Wetland Resources Legend

- Marsh/Bog
- Wooded marsh
- Open Water
- NFHL 100 Year Flood Zone

Water Protections Legend

- MA DFW Coldwater Fisheries Resources
- Zone A
- Zone B
- Zone C
- MassDEP IWPA
- MassDEP Zone I
- MassDEP Zone II
- Outstanding Resource Water

N
W E
S

0 250 500 Feet

1 inch = 250 feet

Data Source: MassGIS USGS Color Ortho Imagery (2014), MassDEP Wetlands (1:12000) (2009), NHESP Potential Vernal Pools (2000), NHESP Certified Vernal Pools, NHESP Priority Habitats of Rare Species (2008), NHESP Estimated Habitats of Rare Species (2008), Areas of Critical Environmental Concern (2009), FEMA National Flood Hazard Layer (2014),

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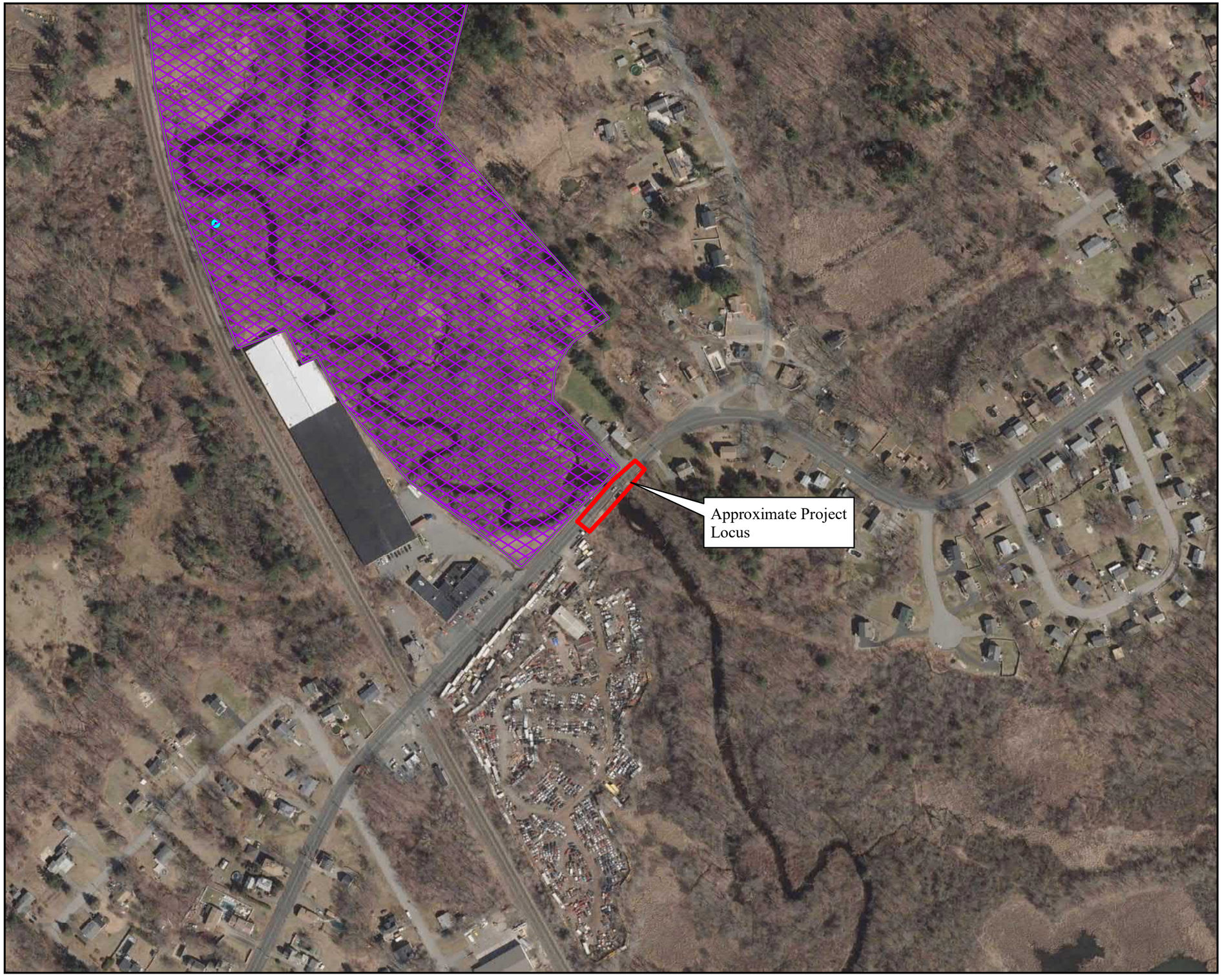
Figure 3
Wildlife Habitat Map
Rosemont Street Bridge Restoration
Haverhill, MA



Widlife Habitat Legend

- NHESP Certified Vernal Pool
- NHESP Potential Vernal Pool
- NHESP Estimated Habitats of Rare Wildlife
- NHESP Priority Habitats of Rare Species
- Area of Critical Environmental Concern (ACEC)
- MA DFW Coldwater Fisheries Resources

N
W E
S

0 250 500 Feet

1 inch = 250 feet

Data Source: MassGIS USGS Color Ortho Imagery (2014), MassDEP Wetlands (1:12000) (2009), NHESP Potential Vernal Pools (2000), NHESP Certified Vernal Pools, NHESP Priority Habitats of Rare Species (2008), NHESP Estimated Habitats of Rare Species (2008), Areas of Critical Environmental Concern (2009), FEMA National Flood Hazard Layer (2014),

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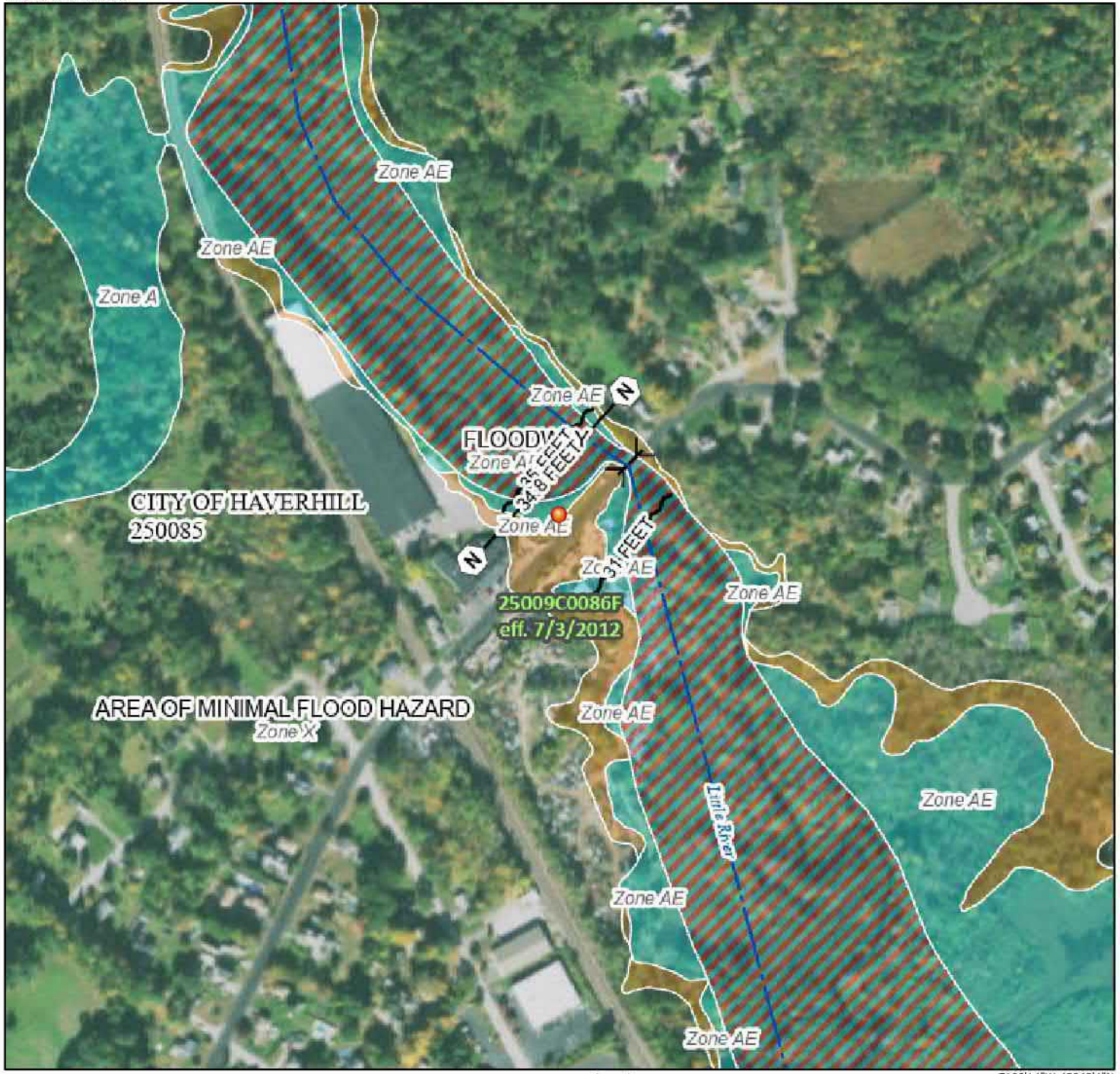
National Flood Hazard Layer FIRMette

FEMA

71°6'52"W 42°48'31"N



71°6'14"W 42°48'4"N

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

1:6,000

Basemap Imagery Source: USGS National Map 2023

Legend

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

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

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

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

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

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

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

N

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

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

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 11/21/2023 at 7:50 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.

Figure 5. Rosemont Street Bankfull Width Sketch — November 21, 2023

Photo 1

View of the *B1-100 Series* Bank north of the Rosemont Street Bridge—facing southeast.

Photo 2

View of the *B2-100 Series* Bank north of the Rosemont Street Bridge—facing northwest.

PHOTOGRAPHIC DOCUMENTATION

Rosemont Street Bridge Restoration

Haverhill, Massachusetts

Photographs Documented November 21, 2023

Photo 3

View of the *B1-99 Series* Bank and the upgradient Mean Annual High Water (MAHW) mark south of the Rosemont Street Bridge—facing southwest.

Photo 4

View of the *B2-99 Series* Bank south of the Rosemont Street Bridge—facing north.

PHOTOGRAPHIC DOCUMENTATION

Rosemont Street Bridge Restoration

Haverhill, Massachusetts

Photographs Documented November 21, 2023

Photo 5

View of the *B3/B4 Series* intermittent stream—facing north.

Photo 6

Typical view of the *WF1 Series* wetland—facing north.

PHOTOGRAPHIC DOCUMENTATION

Rosemont Street Bridge Restoration

Haverhill, Massachusetts

Photographs Documented November 21, 2023

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Rosemont Street Bridge City/County: Essex County Sampling Date: 11/21/2023

Applicant/Owner: Haverhill Department of Public Works State: MA Sampling Point: WF1-102 Up

Investigator(s): Tyler Drew and Anna Haznar Section, Township, Range: Haverhill

Landform (hillside, terrace, etc.): Hillside Local relief (concave, convex, none): Convex Slope %: 5%

Subregion (LRR or MLRA): LRR R, MLRA 144A Lat: 42.80576 Long: -71.10875 Datum: WGS84

Soil Map Unit Name: Saco Variant Silt Loam NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No X	**Is the Sampled Area**
Hydric Soil Present?	Yes ____	No X	**within a Wetland?** **Yes** ____ **No** X
Wetland Hydrology Present?	Yes ____	No X	If yes, optional Wetland Site ID: ____

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): ____
Water Table Present?	Yes ____	No X	Depth (inches): ____
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches): ____

Wetland Hydrology Present? **Yes** ____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: WF1-102 Up

Tree Stratum (Plot size: 30' radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Carya ovata*	20	Yes	FACU
2. *Quercus rubra*	10	Yes	FACU
3. *Quercus alba*	10	Yes	FACU
4.			
5.			
6.			
7.			
	40	=Total Cover	
Sapling/Shrub Stratum (Plot size: 15' radius)			
1. *Rosa multiflora*	10	Yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
	10	=Total Cover	
Herb Stratum (Plot size: 5' radius)			
1. *Hemerocallis fulva*	60	Yes	UPL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	60	=Total Cover	
Woody Vine Stratum (Plot size: 15' radius)			
1.			
2.			
3.			
4.			
		=Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	50	x 4 =	200
UPL species	60	x 5 =	300
Column Totals:	110 (A)		500 (B)

Prevalence Index = B/A = 4.55

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ___ **No** X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: WF1-102 Up

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 3/2	100						Sandy loam
6-16	10YR 3/4	100						Coarse sand

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ High Chroma Sands (S11) (**LRR K, L)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) (**LRR K, L**)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** ____ **No** X

Remarks:

This data form is revised from Northcentral and Northeast Regional Supplement Version 2.0 to include the NRCS Field Indicators of Hydric Soils, Version 7.0, 2015 Errata. (http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_051293.docx)

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: Rosemont Street Bridge City/County: Essex County Sampling Date: 11/21/2023

Applicant/Owner: Haverhill Department of Public Works State: MA Sampling Point: WF1-102 Wet

Investigator(s): Tyler Drew and Anna Haznar Section, Township, Range: Haverhill

Landform (hillside, terrace, etc.): Terrace Local relief (concave, convex, none): None Slope %: 0%

Subregion (LRR or MLRA): LRR R, MLRA 144A Lat: 42.80573 Long: -71.10878 Datum: WGS84

Soil Map Unit Name: Saco Variant Silt Loam NWI classification: PFO1/SS1C

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area**
Hydric Soil Present?	Yes X	No ____	**within a Wetland?** **Yes** X **No** ____
Wetland Hydrology Present?	Yes X	No ____	If yes, optional Wetland Site ID: WF1

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- X Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): ____
Water Table Present?	Yes X	No ____	Depth (inches): 6
Saturation Present? (includes capillary fringe)	Yes X	No ____	Depth (inches): 0

Wetland Hydrology Present? **Yes** X **No** ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: WF1-102 Wet

Tree Stratum (Plot size: 30' radius)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	=Total Cover		
Sapling/Shrub Stratum (Plot size: 15' radius)			
1. *Euthamia caroliniana*	20	Yes	FAC
2. *Cornus sericea*	15	Yes	FACW
3. *Juncus effusus*	10	Yes	OBL
4. *Lysimachia ciliata*	5	No	FACW
5.			
6.			
7.			
	50 =Total Cover		
Herb Stratum (Plot size: 5' radius)			
1. *Eutrochium purpureum*	20	Yes	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	20 =Total Cover		
Woody Vine Stratum (Plot size: 15' radius)			
1.			
2.			
3.			
4.			
	=Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	10	x 1 =	10
FACW species	20	x 2 =	40
FAC species	40	x 3 =	120
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	70 (A)		170 (B)

Prevalence Index = B/A = 2.43

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: WF1-102 Wet

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 3/2	90	5YR 4/6	10	C	PL/M		Silt loam, high organic matter (OM)
4-16	10YR 3/1	80	5YR 4/6	20	C	PL/M		Silt loam

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- X Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ High Chroma Sands (S11) (**LRR K, L)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- X Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) (**LRR K, L**)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (F22)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** ____

Remarks:

This data form is revised from Northcentral and Northeast Regional Supplement Version 2.0 to include the NRCS Field Indicators of Hydric Soils, Version 7.0, 2015 Errata. (http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_051293.docx)

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Essex County, Massachusetts, Northern Part

November 30, 2023

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map

Map Scale: 1:674 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 5 10 20 30

Feet
0 30 60 120 180

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Essex County, Massachusetts, Northern Part
Survey Area Data: Version 19, Sep 10, 2023

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 22, 2022—Jun 5, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
301C	Montauk fine sandy loam, 8 to 15 percent slopes, very stony	0.0	1.2%
718A	Saco variant silt loam, frequently ponded, 0 to 1 percent slopes, frequently flooded	0.8	98.8%
Totals for Area of Interest		**0.8**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The

delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Essex County, Massachusetts, Northern Part

301C—Montauk fine sandy loam, 8 to 15 percent slopes, very stony

Map Unit Setting

National map unit symbol: 2w80w
Elevation: 0 to 1,120 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Montauk, very stony, and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Montauk, Very Stony

Setting

Landform: Hills, recessionial moraines, ground moraines, drumlins
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex, linear
Across-slope shape: Convex
Parent material: Coarse-loamy over sandy lodgment till derived from gneiss, granite, and/or schist

Typical profile

Oe - 0 to 2 inches: moderately decomposed plant material
A - 2 to 6 inches: fine sandy loam
Bw1 - 6 to 28 inches: fine sandy loam
Bw2 - 28 to 36 inches: sandy loam
2Cd - 36 to 74 inches: gravelly loamy sand

Properties and qualities

Slope: 8 to 15 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: 20 to 43 inches to densic material
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 1.42 in/hr)
Depth to water table: About 18 to 37 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 5.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: C
Ecological site: F144AY007CT - Well Drained Dense Till Uplands
Hydric soil rating: No

Minor Components

Scituate, very stony
Percent of map unit: 6 percent
Landform: Ground moraines, hills, drumlins
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Canton, very stony
Percent of map unit: 5 percent
Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Ridgebury, very stony
Percent of map unit: 4 percent
Landform: Depressions, ground moraines, hills, drainageways
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Head slope, base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

718A—Saco variant silt loam, frequently ponded, 0 to 1 percent slopes, frequently flooded

Map Unit Setting
National map unit symbol: 2zvfd
Elevation: 0 to 230 feet
Mean annual precipitation: 45 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition
Saco variant and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Saco Variant

Setting
Landform: Alluvial flats
Landform position (two-dimensional): Toeslope

Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Friable coarse-silty alluvium over sandy and gravelly alluvium

Typical profile

H1 - 0 to 5 inches: silt loam
H2 - 5 to 20 inches: silt loam
H3 - 20 to 60 inches: sand

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: 18 to 40 inches to strongly contrasting textural stratification
Drainage class: Very poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 0 to 2 inches
Frequency of flooding: Frequent
Frequency of ponding: Frequent
Available water supply, 0 to 60 inches: Low (about 4.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6w
Hydrologic Soil Group: B/D
Ecological site: F144AY016MA - Very Wet Low Floodplain
Hydric soil rating: Yes

Minor Components

Rumney

Percent of map unit: 5 percent
Landform: Alluvial flats
Hydric soil rating: Yes

Limerick

Percent of map unit: 5 percent
Landform: Alluvial flats
Hydric soil rating: Yes

Swansea

Percent of map unit: 5 percent
Landform: Bogs
Hydric soil rating: Yes

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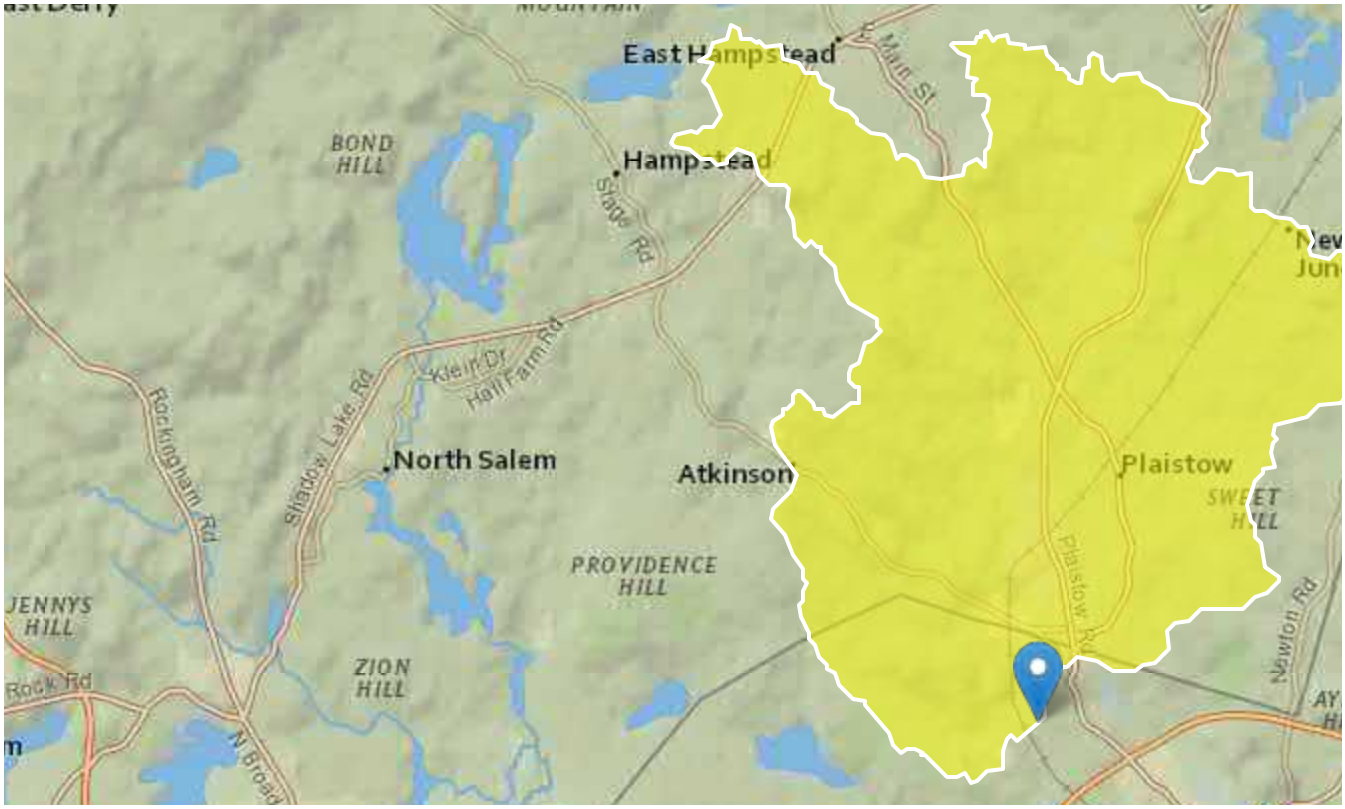
United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

Little River StreamStats Report

Region ID: MA
Workspace ID: MA20231130134824800000
Clicked Point (Latitude, Longitude): 42.80530, -71.10888
Time: 2023-11-30 08:48:46 -0500



Collapse All

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
BSLDEM10M	Mean basin slope computed from 10 m DEM	5.651	percent
DRNAREA	Area that drains to a point on a stream	22.7	square miles

Bankfull Statistics

Bankfull Statistics Parameters [Bankfull Statewide SIR2013 5155]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	22.7	square miles	0.6	329
BSLDEM10M	Mean Basin Slope from 10m DEM	5.651	percent	2.2	23.9

Bankfull Statistics Parameters [Appalachian Highlands D Bieger 2015]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	22.7	square miles	0.07722	940.1535

Bankfull Statistics Parameters [New England P Bieger 2015]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	22.7	square miles	3.799224	138.999861

Bankfull Statistics Parameters [USA Bieger 2015]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	22.7	square miles	0.07722	59927.7393

Bankfull Statistics Flow Report [Bankfull Statewide SIR2013 5155]

PIL: Lower 90% Prediction Interval, PIU: Upper 90% Prediction Interval, ASEp: Average Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	ASEp
Bankfull Width	49.3	ft	21.3
Bankfull Depth	2.26	ft	19.8
Bankfull Area	111	ft^2	29
Bankfull Streamflow	328	ft^3/s	55

Bankfull Statistics Flow Report [Appalachian Highlands D Bieger 2015]

Statistic	Value	Unit
Bieger_D_channel_width	55.5	ft

Statistic	Value	Unit
Bieger_D_channel_depth	2.75	ft
Bieger_D_channel_cross_sectional_area	155	ft^2

Bankfull Statistics Flow Report [New England P Bieger 2015]

Statistic	Value	Unit
Bieger_P_channel_width	60.6	ft
Bieger_P_channel_depth	2.73	ft
Bieger_P_channel_cross_sectional_area	170	ft^2

Bankfull Statistics Flow Report [USA Bieger 2015]

Statistic	Value	Unit
Bieger_USA_channel_width	37.2	ft
Bieger_USA_channel_depth	2.34	ft
Bieger_USA_channel_cross_sectional_area	92.3	ft^2

Bankfull Statistics Flow Report [Area-Averaged]

PIL: Lower 90% Prediction Interval, PIU: Upper 90% Prediction Interval, ASEp: Average Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	ASEp
Bankfull Width	49.3	ft	21.3
Bankfull Depth	2.26	ft	19.8
Bankfull Area	111	ft^2	29
Bankfull Streamflow	328	ft^3/s	55
Bieger_D_channel_width	55.5	ft	
Bieger_D_channel_depth	2.75	ft	
Bieger_D_channel_cross_sectional_area	155	ft^2	
Bieger_P_channel_width	60.6	ft	
Bieger_P_channel_depth	2.73	ft	
Bieger_P_channel_cross_sectional_area	170	ft^2	
Bieger_USA_channel_width	37.2	ft	

Statistic	Value	Unit	ASEp
Bieger_USA_channel_depth	2.34	ft	
Bieger_USA_channel_cross_sectional_area	92.3	ft^2	

Bankfull Statistics Citations

Bent, G.C., and Waite, A.M.,2013, Equations for estimating bankfull channel geometry and discharge for streams in Massachusetts: U.S. Geological Survey Scientific Investigations Report 2013–5155, 62 p., (http://pubs.usgs.gov/sir/2013/5155/)

Bieger, Katrin; Rathjens, Hendrik; Allen, Peter M.; and Arnold, Jeffrey G.,2015, Development and Evaluation of Bankfull Hydraulic Geometry Relationships for the Physiographic Regions of the United States, Publications from USDA-ARS / UNL Faculty, 17p. (https://digitalcommons.unl.edu/usdaarsfacpub/1515?utm_source=digitalcommons.unl.edu%2Fusdaarsfacpub%2F1515&utm_medium=PDF&utm_campaign=PDFCoverPages)

Application Version: 4.18.1
StreamStats Services Version: 1.2.22
NSS Services Version: 2.2.1

APPENDIX B – Hydraulic and Scour Analysis Report

Town of Haverhill, MA

Rosemont Street Bridge over Little River

Bridge No. H-12-024

January 2023

HYDRAULIC AND SCOUR ANALYSIS REPORT

BETA
701 George Washington Hwy
Lincoln, Rhode Island 02865
401.333.2382
www.BETA-Inc.com

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1.0 EXECUTIVE SUMMARY

Bridge No. H-12-024 carries Rosemont Street over Little River in Haverhill, MA. The existing Rosemont Street Bridge is a single span bridge with a 16' clear span on an east–west alignment. The bridge was constructed in 1934. The superstructure is comprised of (12) concrete encased steel stringers, and (6) concrete encased I-beams supported by concrete/stone masonry abutments. The wingwalls and abutments are constructed of poured concrete and stone masonry. The roadway width is approximately 32'-3" with a non-standard concrete bridge railing on both sides.

Per the Routine Inspection Report prepared by MassDOT, the overall condition of the bridge is Structurally Deficient (Condition Rating of 4) for the deck and superstructure and a rating of Fair (Condition Rating of 5) for the substructure. The bridge deck is exhibiting extensive areas of spalling, cracking, and exposed steel reinforcement. Concrete encasement on the steel beams and rails have large areas of spalling concrete exposing the steel beam and rails which have areas of 100% section loss and areas of heavy rusting. The concrete bridge railing is non-standard with extensive deterioration, spalls, and posts that are undermined and failed. The abutments exhibit areas of scaling, exposed, and rusting steel reinforcement, water abrasion, cracking, and areas of delamination. The stone wingwalls have failed due to areas of undermining and erosion.

Rosemont Street over Little River is classified as a Major Rural Collector Roadway. The minimum hydraulic design for this bridge is a 25-year flood return frequency and a minimum scour design of 50-year frequency with a 100-year scour countermeasure and check frequency.

The FEMA flood profile attached in Appendix B shows an incorrect bridge high chord elevation of approximately 35.75 feet. The surveyed high chord is 33.53 feet at the lowest point on the bridge profile, approximately 120 feet west of the centerline of the bridge opening. The surveyed roadway elevations were usied in the existing and proposed model.

The existing low chord elevation was determined to be 32.60 feet from field survey. Under existing conditions, the computed maximum water surface elevation of Little River during the 25-year design storm is 30.35 feet, 2.25 feet below the low chord elevation of the superstructure. Under existing conditions, the 50-year and 100-year models show overtopping of the roadway. The FEMA FIS profiles do not show overtopping during the 50-year and 100-year design storms due to incorrect bridge elevation.

The proposed bridge will consist of cast-in-place abutments and wingwalls founded on spread footings/pile cap and a 35'-11" span structure comprised of Next 24F deck beams, with an 8" reinforced concrete deck, and 3" superpave wearing surface. The bridge's hydraulic opening will be increased from 16'-8" wide to 32'-0". The hydraulic low chord of the proposed bridge, including the relocated hanging sewer pipe, will be sloped from an elevation of 30.84 feet to 31.39 feet, 1.76 feet lower than the existing superstructure's low chord.

Under proposed conditions the computed maximum water surface elevation during the 25-year storm is 29.61 feet, 1.22 feet below the low chord elevation. The structure will not operate in pressure flow condition until the 500-year storm event which also overtops the bridge. The Local Abutment Scour for the 50-year storm is predicted at 4.61 feet for the left abutment and 2.71 feet for the right abutment. The Local Abutment Scour for the 100-year storm is predicted at 5.08 feet for the left abutment and 2.57 feet for the right abutment The contraction scour within the channel for the 50-year and 100-year storms are predicted at 3.20 feet and 3.64 feet, respectively.

2.0 PROJECT DESCRIPTION

2.1 EXISTING BRIDGE/CULVERT SYSTEM

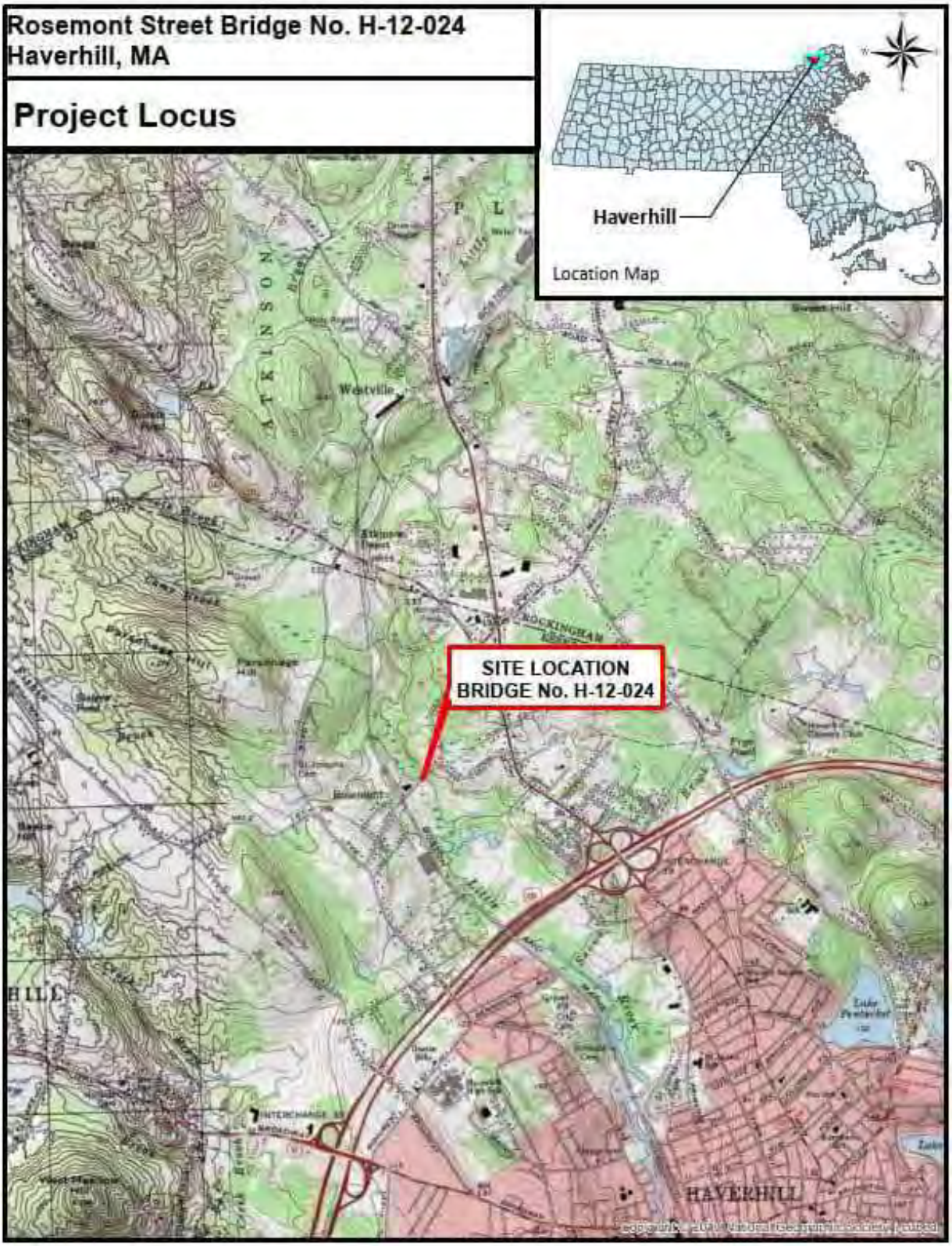
The Rosemont Street Bridge (No. H-12-024) crosses over Little River in Haverhill, Massachusetts with the following characteristics:

- The existing Rosemont Street Bridge is a single span bridge with a 16'-8" clear span on an east–west alignment over Little River that flows from North to South.
- Constructed in 1934
- The superstructure is comprised of concrete encased steel stringers and steel rails. The wingwalls and abutments are constructed of poured concrete and stone masonry.
- The roadway width is approximately 32'-3" with a non-standard concrete bridge railing on both sides.
- The riding surface is hot mix asphalt with guardrail on both sides.
- The bridge is one lane in each direction.
- A MassDOT Routine Inspection Report dated May 2018.

2.2 CROSSED WATERWAY AT THE BRIDGE LOCATION

The Little River is tributary to the Merrimack River and flows from north to south, passing under the Rosemont Street Bridge. The hydraulic opening at the existing bridge is approximately 16 feet wide. The Little River is fed upstream from the North by multiple tributaries including Fishin Brook (approximately 1300' upstream from the bridge) and others that span 22.7 sq. miles, crossing the state border into East Hampstead and Newton, NH.

Figure 2.1 – Project Locus



2.3 HIGHWAY CONVEYED

- This segment of Rosemont Street has a functional classification as a Major Rural Collector Roadway.
- The roadway can generally be considered a one-lane road in each direction between Hilldale Avenue and Main Street (Rte 125).
- The proposed bridge out-to-out width is 32'-10" with a CT-TL2 safety curb width of 17" on both sides and a 30'-0" roadway. The roadway consists of (2) 15'-0" travel lanes.
- The roadway will be tapered to match the width of existing approach roadways immediately beyond the bridge.

2.4 LAND USE IN VICINITY OF THE BRIDGE

The land use in the vicinity of the bridge is a mix of low/medium density residential as well as industrial/business park.

2.5 SPECIAL SITE CONSIDERATIONS

The Rosemont Street Bridge is located within the National Flood Insurance Program (NFIP) Special Flood Hazard Area (SFHA) Zone AE delineation determined for the Little River by the Flood Insurance Rate Map (FIRM) No. 25009C0086F dated July 3, 2011. The base flood elevation determined for this Zone AE is 34.8 feet on the upstream side and 31.0 feet on the downstream side of the bridge.

A narrow band of bordering vegetated wetlands is located along the banks of Little River adjacent to the Northwest corner of the existing bridge. The wetland resource areas of Bordering Vegetated Wetlands, Inland Bank, and Bordering Land Subject to Flooding are all under the jurisdiction of the Haverhill Conservation Commission and are all subject to protection under the MA Wetlands Protection Act and the Town of Haverhill Wetland Protection Bylaws. Impacts to these areas will be minimized, to the extent possible.

3.0 DATA COLLECTION

3.1 DATA SOURCES

Table 3.1 – Data Sources

Data Type	Source	Details
Rosemont Street Survey	Lighthouse Land Surveying, LLC (2018)	
Type Study Analysis	BETA Group, Inc. (2019)	
Rehabilitation of Rosemont Street Bridge over Little River (Bridge No. H-12-024) Plan Set (25% Submission)	BETA Group, Inc. (September 2022)	
USGS Map	MassGIS (2012)	
Aerial Mapping	Nearmap (2022)	
FEMA Flood Insurance Rate Map for Essex County	FEMA (2011)	Little River FIRM Map No. 25009C00866F
StreamStats Report	USGS (2022)	Workspace IDs: MA20190227195157602000
Web Soil Survey	USDA-NRCS (2022)	

Technical References

The analysis sites the following references:

- Federal Highway Administration (2012) “Evaluating Scour at Bridges”, Hydraulic Engineering Circular No. 18 (HEC-18), Fifth Edition, U.S. Department of Transportation. April 2012
- LRFD Bridge Manual - 2013 Edition. (January 2020 Revision). Retrieved from https://www.mass.gov/info-details/part-i-design-guidelines
- United States Army Corps of Engineers (2019) “HEC-RAS River Analysis System – Version 5.0.7”, Hydrologic Engineering Center, US Army Corps of Engineers, Davis CA.
- United States Department of Agriculture (1986) “Urban Hydrology for Small Watersheds”, Technical Release 55, National Resources Conservation Service, Conservation Engineering Division, June 1986.
- Zarriello, P.J., 2017, Magnitude of flood flows at selected annual exceedance probabilities for streams in Massachusetts: U.S. Geological Survey Scientific Investigations Report 2016-5156, 54 p., https://doi.org/10.3133/sir20165156.

3.2 DATA APPLICATION

Surface elevations were derived from MassGIS contours supplemented with survey from Lighthouse Land Surveying, LLC (2018). These elevations were used for the channel cross sections. No record plans of the existing bridge are available; therefore, the bridge geometry was derived from the BETA Group, Inc.'s Rehabilitation of Rosemont Street Bridge over Little River (Bridge No. H-12-024) 25% Plan Set (December 2022) and the BETA Group, Inc. Type Study Analysis (2019). Survey limits end at station 590 upstream of the bridge. Channel geometry was assumed upstream of that section to approximate water surface elevation outside of the surveyed sections and locate where the proposed water surface profile merges with the existing water surface profile.

The design flows at the bridge were estimated using the FEMA FIS and USGS StreamStats Peak-Flow Statistics Flow Reports for the Little River at Rosemount Street in Haverhill, MA. The Little River is fed upstream from the North by multiple tributaries including Fishin Brook (approximately 1700' upstream from the bridge) and others that span 22.7 sq. miles crossing the state border into East Hampstead and Newton, NH. The flow from the Fishin Brook was accounted for in the model by combining the flows at the nearest cross section. Table 3.2 below summarizes the flows input for the HEC-RAS model.

Table 3.2 – StreamStats Flow Input

Frequency		Little River Flow (cfs) (From FEMA FIS) XS 6950 to XS 5535	Little River Flow (cfs) (From Streamstats) XS 5535 to XS 2268	Little River Flow (cfs) (From Streamstats) XS 2268 to XS 0
25	0.04	863	986	1150
50	0.02	1065	1198	1380
100	0.01	1275	1419	1630

The Little River flows into the Merrimack River approximately 2.75 miles downstream of the Rosemont Street Bridge. The downstream water surface elevations published in the FEMA Essex County Flood Insurance Study were not utilized in the HEC-RAS Model due to discrepancy between FEMA and Survey Rosemont Street Bridge elevation. The high chord of the bridge in the FEMA model is approximately 35.75 feet, compared with the surveyed high chord elevation of 33.53 feet at the lowest point on the bridge profile, approximately 120 feet west of the centerline of the bridge opening. The Little River FEMA FIS profiles are included for reference (See Appendix B).

4.0 ENGINEERING METHODS

4.1 HYDROLOGIC ANALYSIS

As specified in Section 1.3.4 of the MassDOT LRFD Bridge Manual, a Major Rural Collector Roadway is subject to a 25-year hydraulic design flood return frequency. Due to the lack of FEMA flow data for the Little River at Rosemont Street, the USGS StreamStats Peak-Flow Report flows were utilized in the HEC-RAS model for discharges at the bridge.

Table 4.1 contains a summary of the discharges used in the analysis.

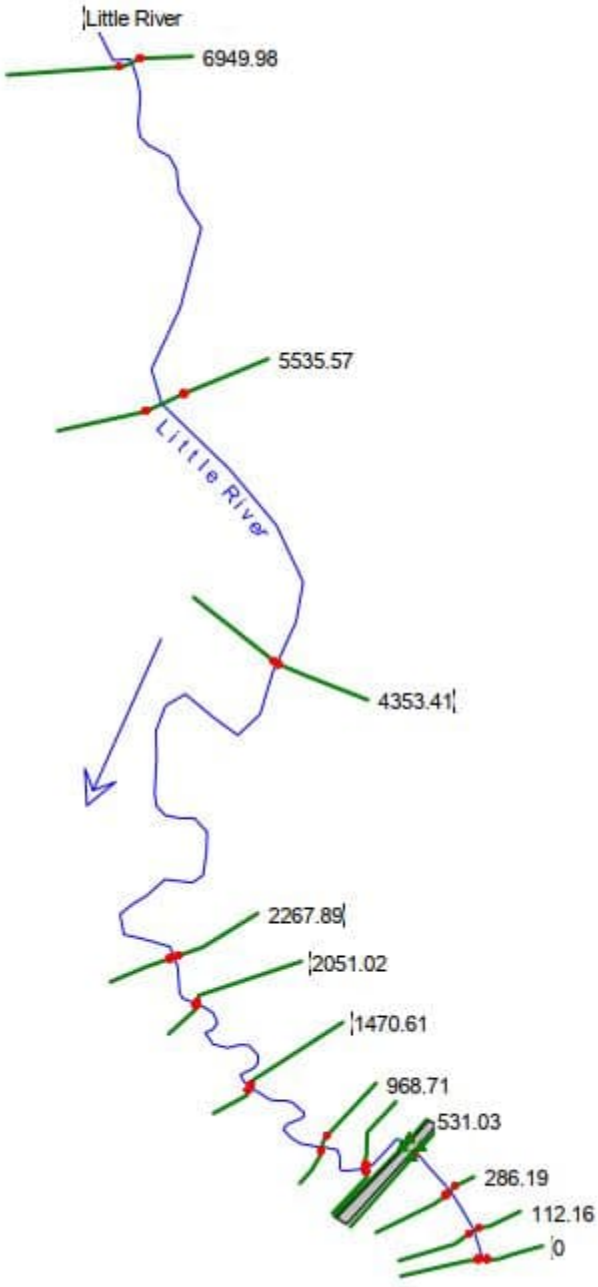
Table 4.1 – Summary of Discharges

	Drainage Area	Peak Discharge (cfs)		
	(Sq. Miles)	25 Yr	50 Yr	200 Yr
Little River	22.7	1,150	1,380	1,630

4.2 HYDRAULIC ANALYSIS

A steady flow analysis was performed using USACE HEC-RAS 6.3.1. The limits of the model are approximately 6,000 feet upstream and 500 feet downstream and include the river embankment and the geometry of the bridge structure. The downstream boundary condition was set to normal depth with a river bed slope of 0.001. No upstream boundary condition was set due to the subcritical flow condition within the river channel. An overview of the HEC-RAS model is shown in Figure 4.1.

Figure 4.1 – HEC-RAS Model Overview



The proposed bridge is designed with different a different hydraulic opening than the existing bridge; therefore an existing and proposed conditions model were created in HEC-RAS for comparison. In accordance with Sections 1.3.2.1 through 1.3.2.3 of the LRFD Bridge Manual, the proposed bridge design was analyzed and compared to the existing bridge geometry to ensure there will be no increase in flood water surface elevations caused by the bridge.

The horizontal datum is NAD83 Massachusetts State Plane Coordinates and the vertical datum is the North American Vertical Datum of 1988 (NAVD88).

Fourteen cross sections were taken along the river alignment. The river channel was generated from the MassGIS Contours and Lighthouse Land Surveying, LLC survey. Based on field assessment, the roughness coefficients were taken as n=0.04 for the main channel and n = 0.07 for the riverbanks on both the upstream and downstream sides of the bridge.

Based on survey, GIS data, and field observation the river flows in a southern direction through the existing hydraulic opening perpendicular to the bridge; therefore, a skew angle was not used for the HEC-RAS model.

The bridge structure is represented by two cross sections, taken at the upstream and downstream faces of the structure. The geometry for the existing conditions was generated from field observation, Lighthouse Survey, LLC survey, and BETA Group, Inc.'s Type Study Analysis. The geometry for the proposed conditions was generated from BETA Group, Inc.'s Type Study Analysis and the BETA Group, Inc.'s 'Rehabilitation of Rosemont Street Bridge over Little River (Bridge No. H-12-024)' 25% Plan Set. The upstream and downstream existing conditions cross sections can be seen in Figure 4.2 and the proposed conditions cross sections can be seen in Figure 4.3.

As referenced in section 1.3.4 of the LRFD Bridge Manual, a Major Rural Collector Roadway should be modelled using the 25-year hydraulic design flood. A 25-year storm was run for both existing and proposed conditions in HEC-RAS. The profile and cross sections for the existing conditions are shown in Figure 4.4 and Figure 4.5, and the proposed conditions are shown in Figure 4.6 and Figure 4.7.

Figure 4.2 – Rosemont Street Bridge: Existing HEC-RAS Bridge Cross Sections

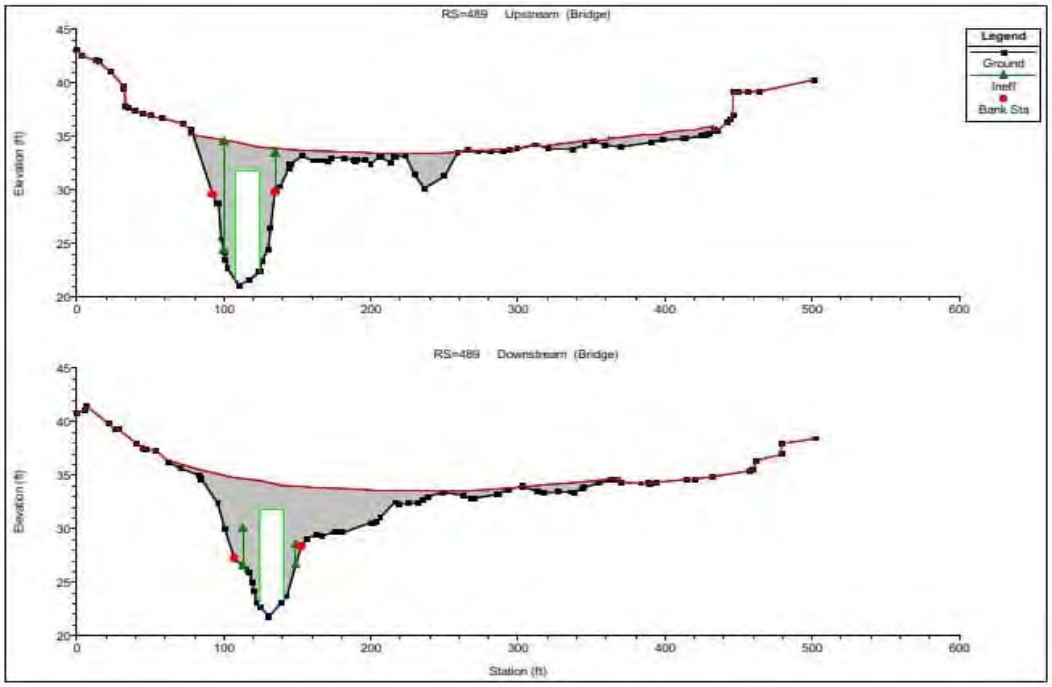


Figure 4.3 – Rosemont Street Bridge: Proposed HEC-RAS Bridge Cross Sections

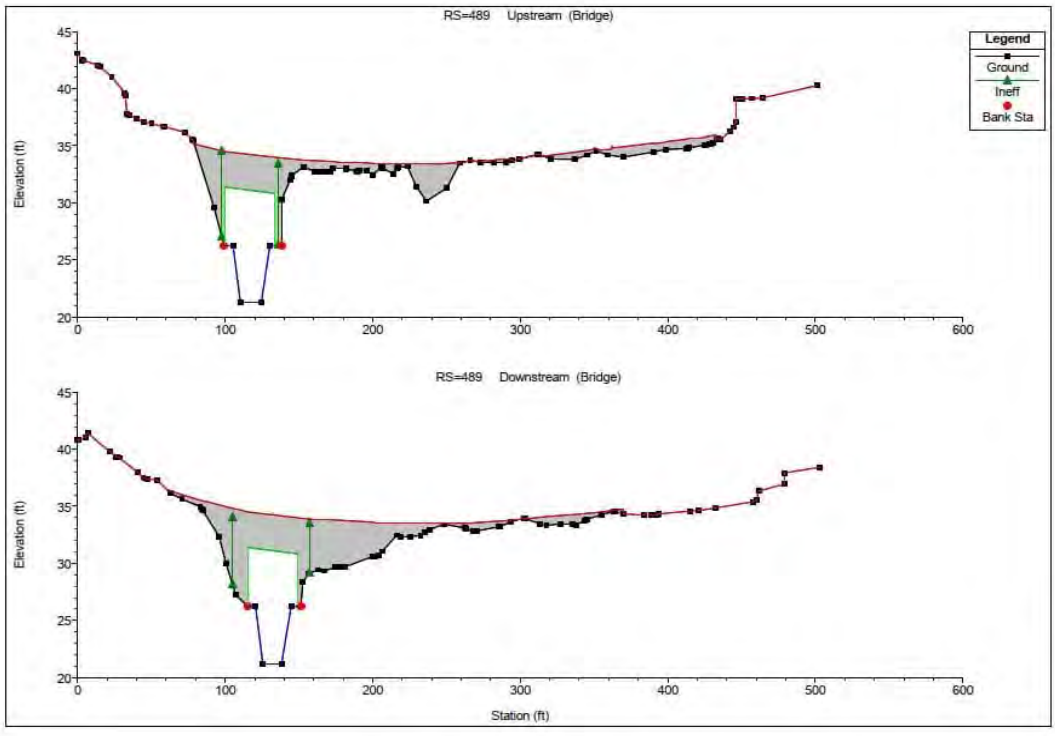


Figure 4.4 – Existing 25-Year Flood Profile

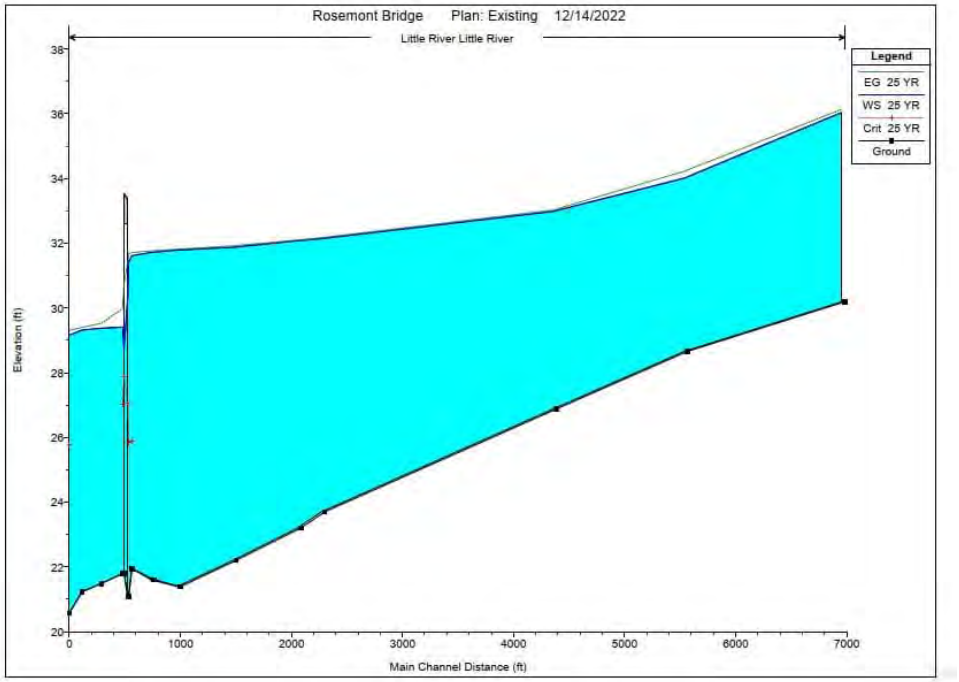


Figure 4.5 – Existing 25-Year Flood Cross Section at Bridge

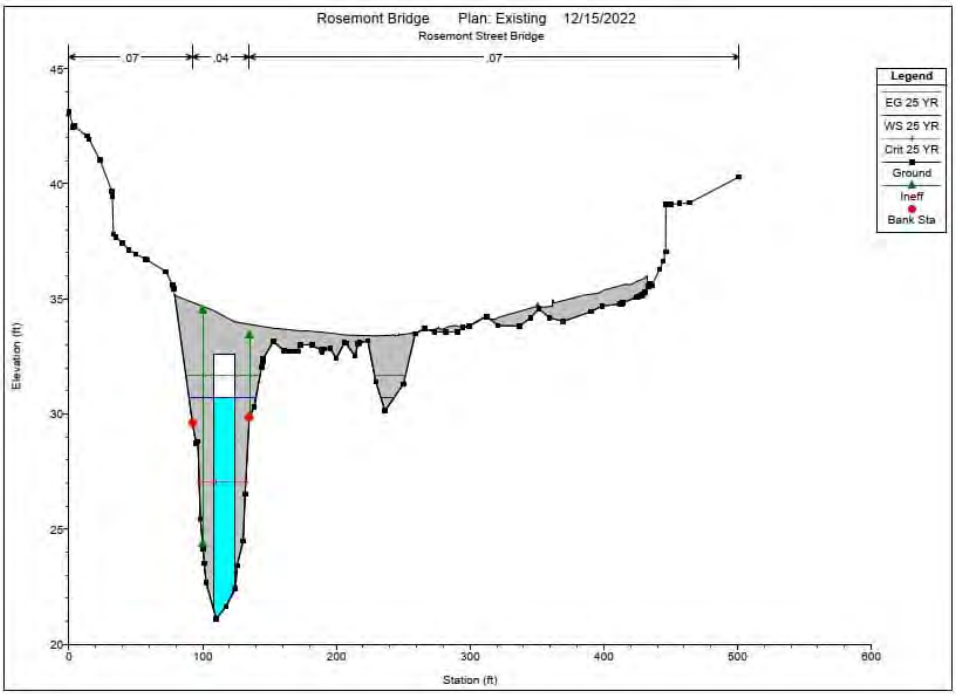


Figure 4.6 – Proposed 25-Year Flood Profile

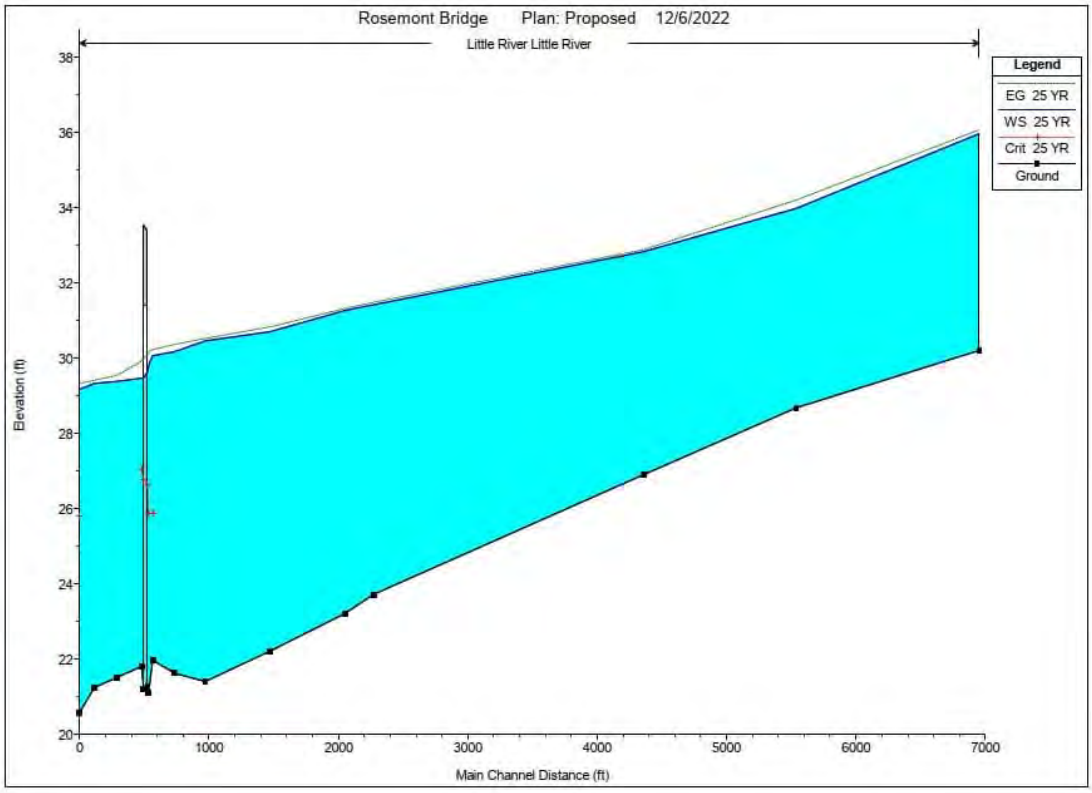
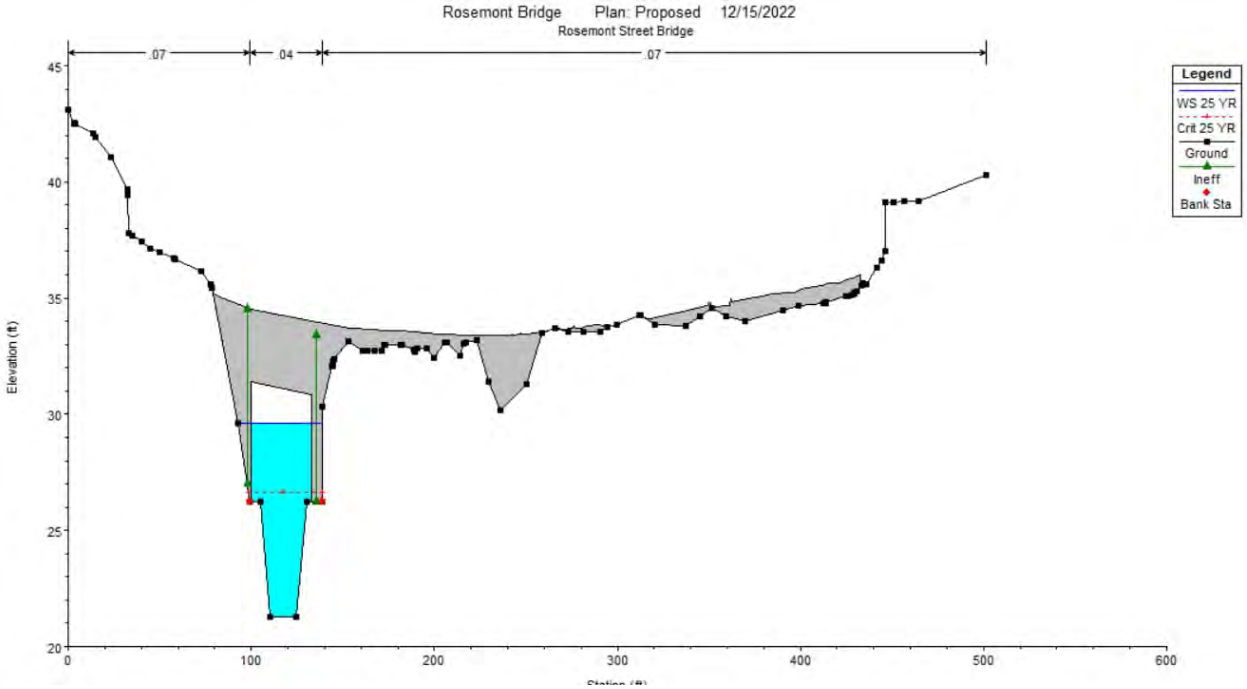


Figure 4.7 – Proposed 25-Year Flood Cross Section at Bridge



The results of the model indicate that the water surface elevation is 30.35 feet under existing conditions and approximately 29.61 feet for the proposed bridge at the upstream face of the Rosemont Street Bridge. Under existing conditions, the low chord elevation is approximately 32.60 at its lowest, which is 2.25 feet above the 25 year flood elevation. Under proposed conditions, the low chord elevation of the bridge is approximately 30.83 feet at its lowest, which is 1.22 feet above the 25-year flood elevation.

Both the existing and proposed structures operate without pressure flow during the 25-year flood event. Table 4.2 summarizes the existing and proposed hydraulic performance at the upstream section of the structure. The results of the hydraulic analysis for the 25-year storm can be found in Appendix C.

Table 4.2 – Hydraulic Performance at Bridge Bounding Section (Sta 489)

	Return Period (Years)	Flow (cfs)	Water Surface Elevation (Ft, NAVD 88)	Maximum Channel Velocity (fps)
Existing Conditions	25	1,150	30.35	11.38
	50	1,380	33.68	8.03
	100	1,630	33.95	7.90
Proposed Conditions	25	1,150	29.61	5.74
	50	1,380	30.08	6.42
	100	1,630	30.53	7.13

As shown in Table 4-2, the proposed bridge does not cause an increase in flood water surface elevations and thus meets the "No-Rise" criteria in Section 1.3.2.3 of the LRFD Bridge Manual.

4.3 Scour Safety/Stability Analysis

In accordance with the MassDOT LRFD Bridge Manual guidance for an Urban Principal Arterial Roadway, the scour was analyzed for a 50-year storm event and checked for the 100-year storm event. See Appendix D for scour computations. Scour countermeasures, including rip-rap armoring were designed for the 100-year storm event.

4.3.1 Long-Term Aggregate/Degradation

There is insufficient data available to determine a long-term aggradation and degradation rate, therefore, no aggradation/degradation was annalyzed.

4.3.2 Contraction Scour

Contraction Scour was calculated using Laursen's equation as recommended in HEC-18. HEC-RAS data was used to determine whether the channel is in a live-bed or clear-water condition. For the 50-year and 100-year design storms, the channel operates in a live-bed condition. As the abutments were located within the channel, no LOB or ROB contraction scour was calculated. A summary of the predicted contraction scour is summarized in Table 4.3.

Table 4.3 – Contraction Scour

	50 Yr	100 Yr
	Channel	Channel
	Live	Live
Ys (ft)	3.20’	3.64’

Since the bridge opening will not operate under pressure during the 50-year and 100-year storms, pressure flow contraction scour was not calculated.

4.3.3 Local Abutment Scour

The local abutment scour was analyzed using the MassDOT modified Froehlich Equation. A summary of the results can be seen in Table 4.4.

Table 4.4– Local Abutment Scour

	50 Yr		100 Yr	
	Left Abutment	Right Abutment	Left Abutment	Right Abutment
Ys (ft)	4.61’	2.71’	5.08’	2.57’

4.3.4 Local Pier Scour

The proposed bridge does not have piers.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 CONCLUSIONS

The proposed bridge will have a different hydraulic opening as compared to the existing bridge, the structure meets the hydraulic design criteria established in Sections 1.3.2.1 through 1.3.2.3 of the LRFD Bridge Manual.

These criteria include that the proposed bridge:

1. Will not cause significant changes to the waterway's existing flood regime.
2. Shall be designed without causing any increase in the waterway's base flood elevation profile.

5.2 RECOMMENDATIONS

The proposed improvements should maintain the geometry shown in BETA Group, Inc.'s Rehabilitation of Rosemont Street Bridge over Little River (Bridge No. H-12-024) 25% Plan Set (December 2022) and as modeled in HEC-RAS. If design plans change, the hydraulic and scour analysis should be reevaluated. In order to counter the predicted abutment and contraction scour at the bridge, the proposed improvements shall include a layer of 1.0' D50 dumped rip-rap along the channel bed and embankments.

5.3 HYDRAULIC DATA TABLES

Table 5.1 – Hydraulic Data Tables

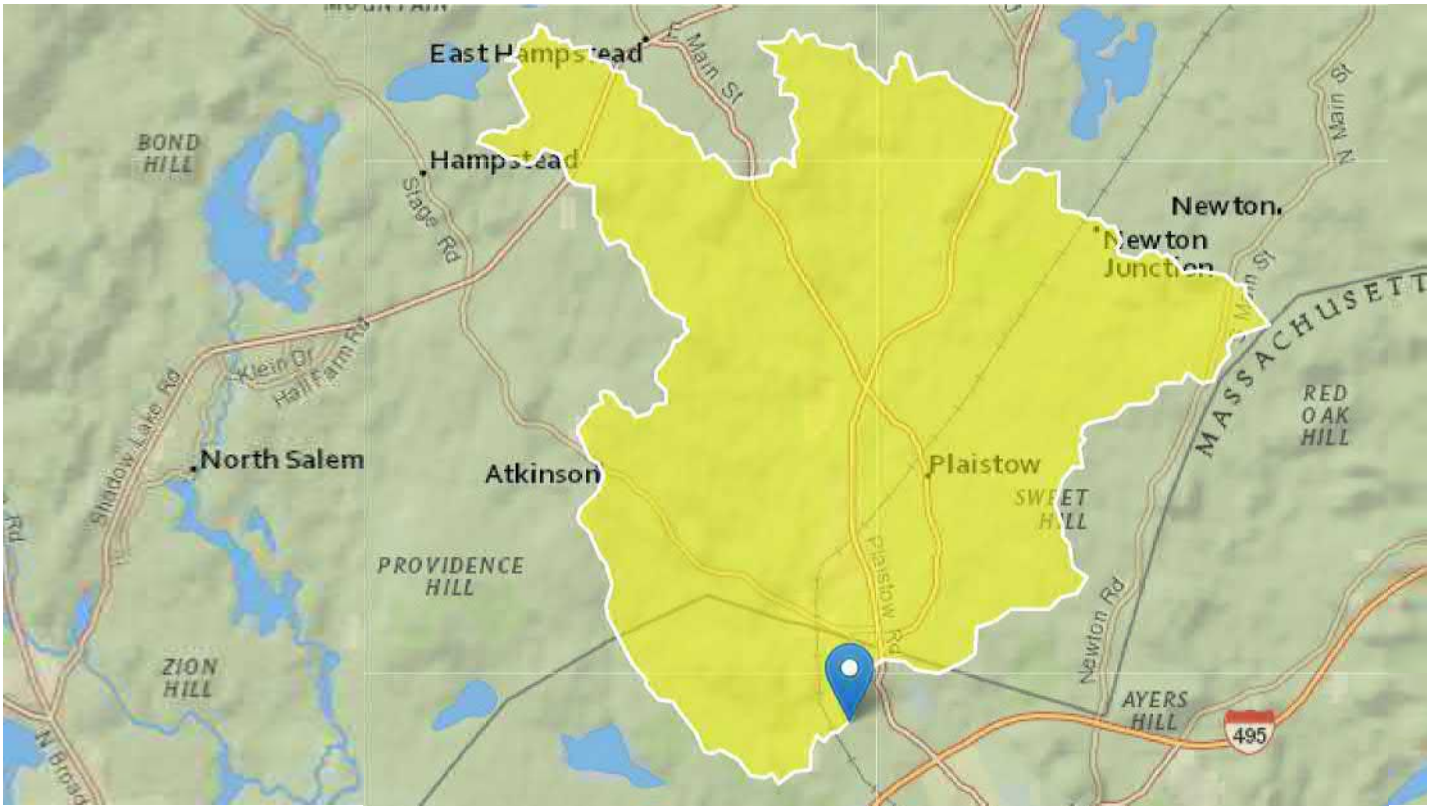
HYDRAULIC DESIGN DATA	
Drainage Area	22.7 Square Miles
Design Flood Discharge	1,150 cfs
Design Flood Frequency	25-Year
Design Flood Velocity	5.74 ft/s
Design Flood Elevation	29.61 Ft NAVD88
BASE (100-YEAR) FLOOD DATA	
Base Flood Discharge	1,630 cfs
Base Flood Elevation	30.53 Ft NAVD88
DESIGN AND CHECK SCOUR DATA	
Design Scour Flood Event Return Frequency	50-Year
Check Scour Flood Event Return Frequency	100-Year
FLOOD OF RECORD	
Discharge	N/A
Frequency	N/A
Maximum Elevation	N/A
Date	Unknown

APPENDIX A

STREAMSTATS PEAK FLOW REPORTS

Rosemont St Bridge - StreamStats Report

Region ID: MA
Workspace ID: MA20190227195157602000
Clicked Point (Latitude, Longitude): 42.80531, -71.10855
Time: 2019-02-27 14:52:13 -0500



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	22.7	square miles
ELEV	Mean Basin Elevation	164	feet
LC06STOR	Percentage of water bodies and wetlands determined from the NLCD 2006	10.95	percent

Peak-Flow Statistics Parameters [Peak Statewide 2016 5156]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	22.7	square miles	0.16	512
ELEV	Mean Basin Elevation	164	feet	80.6	1948

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
LC06STOR	Percent Storage from NLCD2006	10.95	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	419	ft^3/s	215	817	42.3
5 Year Peak Flood	675	ft^3/s	341	1330	43.4
10 Year Peak Flood	871	ft^3/s	431	1760	44.7
25 Year Peak Flood	1150	ft^3/s	551	2410	47.1
50 Year Peak Flood	1380	ft^3/s	641	2990	49.4
100 Year Peak Flood	1630	ft^3/s	730	3620	51.8
200 Year Peak Flood	1890	ft^3/s	824	4330	54.1
500 Year Peak Flood	2260	ft^3/s	960	5320	57.6

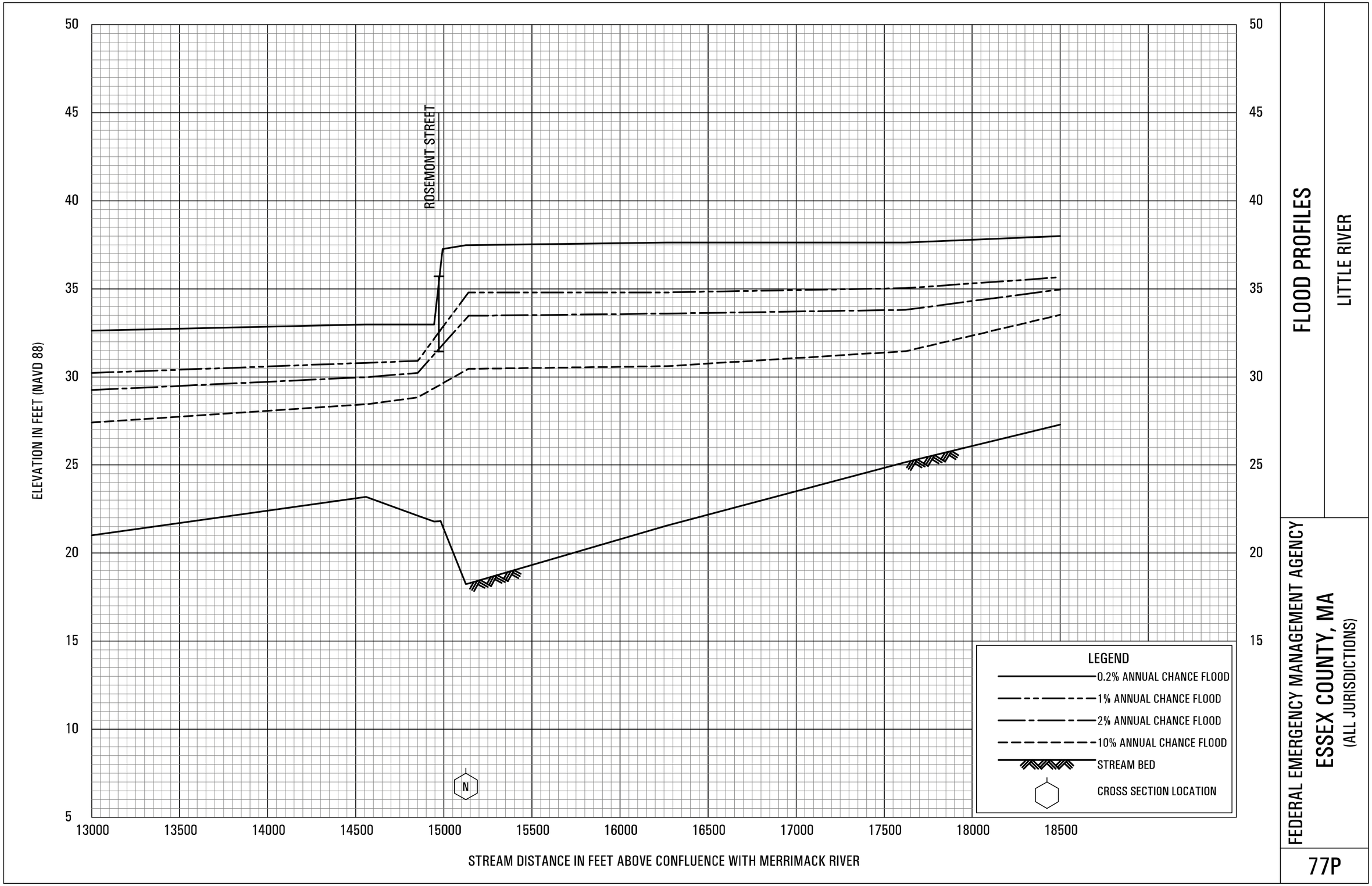
Peak-Flow Statistics Citations

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)

Application Version: 4.3.0

APPENDIX B

FEMA ESSEX COUNTY FLOOD INSURANCE STUDY



FLOOD PROFILES

LITTLE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

ESSEX COUNTY, MA

(ALL JURISDICTIONS)

77P

APPENDIX C

HYDRAULIC COMPUTATIONS

HEC-RAS HEC-RAS 6.3.1 September 2022
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X      X   X     X  X    X
X     X  X        X           X   X    X    X   X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
X     X  X        X           X  X     X    X        X
X     X  X        X    X      X   X    X    X        X
X     X  XXXXXX    XXXX       X    X   X    X   XXXXX
```

PROJECT DATA
Project Title: Rosemont Bridge
Project File : RosemontBridge_1.prj
Run Date and Time: 12/14/2022 2:47:30 PM

Project in English units

Project Description:
CRS Info=<SpatialReference> <CoordinateSystem Code="2249"
Unit="US_survey_Foot" AcadCode="MA83F" /></SpatialReference>

PLAN DATA

Plan Title: Proposed
Plan File : z:\6100s\6155 - Haverill - Rosemont St
Bridge\Engineering\Modeling\HECRAS\RosemontBridge_1.p05

Geometry Title: ProposedConditions
Geometry File : z:\6100s\6155 - Haverill - Rosemont St
Bridge\Engineering\Modeling\HECRAS\RosemontBridge_1.g03

Flow Title   : LittleRiver
Flow File   : z:\6100s\6155 - Haverill - Rosemont St
Bridge\Engineering\Modeling\HECRAS\RosemontBridge_1.f01

Plan Summary Information:
Number of: Cross Sections =   14   Multiple Openings =   0
Culverts   =   0   Inline Structures =   0

Bridges = 1 Lateral Structures = 0

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculation tolerance = 0.01
Maximum number of iterations = 20
Maximum difference tolerance = 0.3
Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: LittleRiver
Flow File : z:\6100s\6155 - Haverill - Rosemont St Bridge\Engineering\Modeling\HECRAS\RosemontBridge_1.f01

Flow Data (cfs)

River	Reach	RS	10 YR	25 YR	50 YR	100 YR	500 YR	2 YR
Little River	Little River	6949.98	660	863	1065	1275	1865	419
Little River	Little River	5535.57	750	986	1198	1419	2020	419
Little River	Little River	2267.89	871	1150	1380	1630	2260	419

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Little River	Little River	10 YR	Normal S = 0.001	
Little River	Little River	25 YR	Normal S = 0.001	
Little River	Little River	50 YR		

```
 Normal S = 0.001
  Little River    Little River    100 YR
 Normal S = 0.001
  Little River    Little River    500 YR
 Normal S = 0.001
  Little River    Little River    2 YR
 Normal S = 0.001
```

```
GEOMETRY DATA

Geometry Title: ProposedConditions
Geometry File : z:\6100s\6155 - Haverill - Rosemont St
Bridge\Engineering\Modeling\HECRAS\RosemontBridge_1.g03

CROSS SECTION


RIVER: Little River
REACH: Little River       RS: 6949.98

INPUT
Description:
Station Elevation Data    num=      32
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0    68.23.679993   68.254.799988   68.2315.07996      6833.45996   64.62
67.77997      59   90.06   51.6699.62994   49.51  101.44      49127.1299   42.27
  128.68   41.97  146.16      39  193.25   33.72  193.93   33.65  217.25   30.19
   243.5   30.19  268.49    36.2  280.05   38.83  282.74   38.84  296.91   38.86
  300.28   38.86  312.67   38.89  378.85      39  386.49   40.15  456.02      49
  468.42   49.56   518.5    51.8  548.22   53.16   586.4   54.94  625.97   56.91
  681.54   58.82  701.66      59

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .07  193.25     .04  280.05     .07

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        193.25  280.05          1414.41 1414.41 1414.41             .1       .3

CROSS SECTION


RIVER: Little River
REACH: Little River       RS: 5535.57

INPUT
```

Description:
Station Elevation Data num= 37

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	7328.60999		6866.27997	62.83	74.88	61.52	93.19		59
95.87	58.96	115.58	57.74	124.9	57.25	151.69	55.73	265.67	49.04
266.83	49	279.27	46.95	326.37	39	339.45	37.66	401.21	31.32
422.44	29	426.61	28.66	433.83	28.66	436.93	29	495.31	38.83
496.08	39	498.26	39.48	537.71	47.95	538.86	48.13	539.79	48.24
544.76	49	546.21	49.02	611.16	51.18	660.82	52.69	683.05	53.47
696.44	53.97	798.43	58.22	809.96	58.73	811.59	58.75	820.07	58.88
822.31	58.89	834.11	59						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	339.45	.04	495.31	.07

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
339.45	495.31	1182.16	1182.16 1182.16	.1	.3

CROSS SECTION

RIVER: Little River
REACH: Little River RS: 4353.41

INPUT
Description:
Station Elevation Data num= 43

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	7768.16998		71.0190.20996	69.14	101.07	68	102.35		67.99
106.67	67.96	139.85	67.74	142.93	67.73	160.44	67.61	164.99	67.59
165.66	67.57	173.79	67.61	248.44	60.53	253.38	60.07	255.23	59.95
258.45	59.67	263.81	59	268.08	57.78	273.57	56.1	299.73	49
321.43	41.54	329.62	39	362.91	29.01	362.93	29	365.61	26.88
367.93	26.97	376.37	26.88	380.69	29	382.16	29	388.72	29.01
415.49	29.02	433.63	29.04	464.69	29.01	485.73	29	523.67	29
555.06	35.9	570.49	39	663.91	45.22	684.17	46.52	714.11	49
726.29	49.01	758.77	49.05	764.3	49.05				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	362.91	.04	380.69	.07

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
362.91	380.69	2085.52	2085.52 2085.52	.1	.3

CROSS SECTION

RIVER: Little River

REACH: Little River RS: 2267.89

INPUT
Description:
Station Elevation Data num= 43

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	4537.33002	41.74	65.5	3971.91998	37.8575.15002	37.66			
80.71002	37.41	100.41	35.08	156.32	29.55	170.94	29.52	177.87	29.49
188.19	29.55	191.9	29.57	194.31	29.58	196.35	29.58	206.67	29.55
211.93	29.61	216.44	29.64	242.33	29.79	244.59	29.81	311.35	29.16
325.88	29.08	329.62	29	338.17	29	343.25	27.71	343.35	27.7
353.35	23.7	355.35	23.7	357.4	23.71	366.14	27.2	367.4	27.7
371.05	29	399.17	29.24	416.61	29.37	435.93	29.23	445.32	29.15
461.61	29	512.84	29	546.73	38.24	549.66	39	560.26	40.99
591.93	46.84	602.88	49	610.51	49				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	338.17	.04	371.05	.07

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
338.17	371.05	196	216.87	237	.1	.3

CROSS SECTION

RIVER: Little River
REACH: Little River RS: 2051.02

INPUT
Description:
Station Elevation Data num= 28

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	4936.65002	41.13	45.37	3959.46002	36.25	90.38	30.44		
95.25	29.5898.58002	29	245.24	29	276.94	29.13	288.03	29.18	
312.79	29.3	324.98	29.36	362.37	29.19	373.82	29.17	404.22	27.75
419.08	27.72	429.38	27.2	429.39	27.2	433.98	23.52	434.38	23.2
438.38	23.2	443.41	27.2	453.29	29	458.09	29.9	459.43	30
527.58	39	527.65	39	594.39	48				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	429.39	.04	443.41	.07

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
429.39	443.41	564	580.41	594	.1	.3

CROSS SECTION

RIVER: Little River
REACH: Little River RS: 1470.61

INPUT
Description:
Station Elevation Data num= 39

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	5938.26001		52.1154.26001		49.2457.41003		4984.72003		40.69
90.06	3998.85001		37.13	141.22	29	232.82	29	236.6	29.01
242.84	29.01	245.99	29.02	261.83	29.04	275.98	29.07	286.63	29.07
289.92	29.08	292.02	29.08	340.51	29.02	360.54	29.02	364.86	29.01
394.58	29.01	396.18	29	406.7	29	417.89	26.2	417.9	26.2
427.88	22.2	431.89	22.2	441.89	26.2	441.98	26.21	459.5	29
459.66	29	459.92	29.14	460.24	29.28	461.7	30	478.12	39
484.87	41.63	495.49	45.97	504.07	49	602.13	49		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	417.9	.04	441.98	.07

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
417.9	441.98	494	501.9	507	.1	.3

CROSS SECTION

RIVER: Little River
REACH: Little River RS: 968.71

INPUT
Description:
Station Elevation Data num= 33

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	406.809998		3942.89001		32.5963.17001		29	220.19	29
246.04	29.02	250.38	29.02	270.62	27.08	271.05	27.04	271.46	27.01
271.58	27	271.78	26.98	303.28	24.74	308.07	24.17	308.08	24.17
315.61	22.03	315.86	21.95	316.94	21.39	319.86	21.66	330.19	22.6
330.3	22.62	332.57	26.98	332.59	26.99	346.46	26.45	351.42	26.25
352.27	26.54	380.14	33.19	405.03	39	405.79	39	406.67	39.01
414.3	39.33	474.72	41.87	480.16	42.1				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	270.62	.04	332.57	.07

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
270.62	332.57	231	239.57	244	.1	.3

CROSS SECTION

RIVER: Little River
REACH: Little River RS: 729.14

INPUT
Description:
Station Elevation Data num= 37

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	42.28	23.51001	39	32.87	36.52	40.26001	34.53	51.48001	31.37
62.33002	29	209.18	29	245.92	26.74	261.11	26.75	270.42	26.54
280.34	26.31	287.2	22.49	288.84	21.92	290.5	21.61	292.56	21.95
299.4	23.09	302.39	24.44	306.36	26.38	322.61	32.59	328.3	33.71
341.21	33.73	351.75	33.98	368.96	34.61	384.85	34.56	387.05	34.61
415.04	35.3	426.35	35.45	446.62	35.43	446.87	35.41	449.77	35.35
453.2	35.8	455.83	36.35	455.9	39.17	461.44	39.16	469.86	39.21
473.48	39.22	512.88	40.4						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	280.34	.04	306.36	.07

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
280.34	306.36	98.29	168.24	8.89	.1	.3

CROSS SECTION

RIVER: Little River
REACH: Little River RS: 580

INPUT
Description:
Station Elevation Data num= 53

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	38.43	5.18	38.43	5.6	38.38	7.29	37.88	9.15	37.21
15.09	33.83	21.56	30.04	30.73	26.02	35.25	24.78	37.82	24.55
43.14	24.84	47	23.22	48.29	22.83	49.39	22.71	64.05	22.11
68.03	21.95	76.6	23.4	79.48	24.12	84.61	24.96	91.65	28.46
94.32	28.96	98.22	29.39	100.87	29.67	105.65	29.68	119.75	30.37
162.88	30.25	197.58	31.69	205.35	33.01	209.18	33.19	225.74	34
237.03	33.99	240.13	34.08	259.52	34.08	262.83	33.91	268.95	33.9
284.2	34.59	285.56	34.63	286.2	34.65	287.08	34.65	300	34.44
309.24	34.29	319.93	34.51	339.58	35.08	345.46	35.11	363.34	35.12
366.36	35.19	367.18	35.2	367.93	35.22	368.03	35.34	368.3	35.29
369.09	35.33	370.97	35.21	436.7	35.21				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	43.14	.04	84.61	.07

```
Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         43.14   84.61            36.75   29.86   13.12             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0   24.45    34.5       F
   98.02   436.7    33.4       F

CROSS SECTION


RIVER: Little River
REACH: Little River       RS: 531.03

INPUT
Description:
Station Elevation Data    num=     109
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0   43.133.160004   42.483.380005   42.533.900024   42.5113.42001   42.08
   14.94   41.94   23.19   41.05   32.16   39.66   32.44   39.4533.30002    37.8
35.15002   37.69   39.91   37.4244.83002   37.1350.15002   36.9557.48001   36.73
57.70001   36.7357.74002   36.7258.58002   36.69   72.63   36.1877.52002    35.6
78.35001   35.4492.45001   29.6195.10001   28.7496.45001    28.898.36002   25.44
  100.29   24.15  101.26   23.51  102.54   22.68  110.22    21.1  110.55   21.12
  117.41   21.63  124.27    22.4  124.59   22.43  125.71   23.41  130.33   24.49
  131.77   26.52  134.82   29.87   138.5   30.31  144.14   32.07  144.39   32.04
  144.89   32.28  145.09   32.37  145.18   32.39  152.91   33.16  160.88   32.75
  163.48   32.73  167.28   32.73  171.16   32.72  172.85      33  172.93   33.01
  181.84   33.01  182.01   32.97  188.54   32.79  189.12    32.7  190.57   32.82
  190.72   32.82  195.62   32.84  199.99   32.42  205.92   33.09  206.19    33.1
  206.54   33.09  206.82   33.08  207.11   33.07  213.86   32.54  216.14   33.05
   217.3    33.1  223.44   33.19  229.56   31.41  236.42   30.15  250.19    31.3
  258.93   33.49  266.11   33.71  273.28   33.57  281.82   33.55  290.48   33.55
  294.64   33.77  299.52   33.83   311.9   34.24  312.35   34.25  312.64   34.24
  320.71   33.84  337.22   33.82  345.35   34.19   351.5   34.57  359.45   34.19
  369.73   34.02  390.54   34.45  398.68   34.69  412.49   34.78  413.64    34.8
  414.03   34.83  424.74   35.07   425.3   35.08   425.9   35.09  428.33   35.15
  429.23   35.19  429.63   35.21  430.83    35.3  433.35   35.54  434.04   35.66
     436   35.58  441.77   36.29  444.47   36.64  446.38   37.05  446.44   39.12
   450.5   39.12   456.7   39.15  464.17   39.18  501.14    40.3

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .0796.45001     .04  134.82     .07

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
      96.45001  134.82            52.58   52.58   52.58             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0   97.76    34.5       F
  135.79  501.14    33.4       F
```

BRIDGE

RIVER: Little River
REACH: Little River RS: 489

INPUT
Description: Rosemont Street Bridge
Distance from Upstream XS = 8
Deck/Roadway Width = 33
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 83

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
-16	41		-15.62	40.97		-13.68	40.91	
-5.48	40.27		-2.24	40		-2.15	39.99	
-2.11	39.99		3.03	39.61		19.02	38.44	
19.48	38.41		30.92	37.7		39.9	37.13	
49.3	36.59		50.68	36.52		69.48	35.55	
80.85	35.12		81.79	35.09		99.89	34.5	
99.89	34.5	31.39	133.13	34	30.84	133.13	34	
154.02	33.71		156.22	33.71		173.79	33.61	
177.79	33.59		177.9	33.59		180.8	33.6	
189.34	33.55		194.48	33.52		202.21	33.47	
203.36	33.45		203.86	33.47		204.59	33.44	
218.39	33.39		218.73	33.39		219.08	33.4	
220.99	33.4		228.92	33.39		242.28	33.42	
242.9	33.47		243.56	33.39		246.61	33.43	
246.84	33.49		247.11	33.44		250.85	33.47	
258.43	33.53		262.76	33.51		267.75	33.71	
268.03	33.61		275.77	33.71		276.46	33.79	
277.23	33.68		280.6	33.7		283.44	33.79	
288.99	33.84		298.43	33.71		311.01	34.03	
316.52	34.1		317.25	34.1		318.92	34.11	
320.17	34.18		335.77	34.44		343.21	34.57	
348.95	34.66		350.47	34.82		352.25	34.63	
361.44	34.68		362.05	34.97		362.58	34.82	
365	34.86		382.33	35.12		384.72	35.16	
395.33	35.23		396.11	35.23		400.6	35.4	
403.21	35.43		411.64	35.56		415.02	35.63	
420.42	35.62		421.63	35.66		425.45	35.78	
429.86	35.88		432.76	36				

Upstream Bridge Cross Section Data
Station Elevation Data num= 102

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	43.13	3.160004	42.48	3.380005	42.53	3.900024	42.51	13.42001	42.08
14.94	41.94	23.19	41.05	32.16	39.66	32.44	39.45	33.30002	37.8
35.15002	37.69	39.91	37.42	44.83002	37.13	50.15002	36.95	57.48001	36.73

57.70001	36.73	57.74002	36.72	58.58002	36.69	72.63	36.18	77.52002	35.6		
78.35001	35.44	92.45	29.61	92.45001	29.61	99.35	26.22	105.36	26.22		
110.45	21.26	124.59	21.26	130.33	26.22	138.49	26.22	138.5	26.22		
138.5	30.31	144.14	32.07	144.39	32.04	144.89	32.28	145.09	32.37		
145.18	32.39	152.91	33.16	160.88	32.75	163.48	32.73	167.28	32.73		
171.16	32.72	172.85	33	172.93	33.01	181.84	33.01	182.01	32.97		
188.54	32.79	189.12	32.7	190.57	32.82	190.72	32.82	195.62	32.84		
199.99	32.42	205.92	33.09	206.19	33.1	206.54	33.09	206.82	33.08		
207.11	33.07	213.86	32.54	216.14	33.05	217.3	33.1	223.44	33.19		
229.56	31.41	236.42	30.15	250.19	31.3	258.93	33.49	266.11	33.71		
273.28	33.57	281.82	33.55	290.48	33.55	294.64	33.77	299.52	33.83		
311.9	34.24	312.35	34.25	312.64	34.24	320.71	33.84	337.22	33.82		
345.35	34.19	351.5	34.57	359.45	34.19	369.73	34.02	390.54	34.45		
398.68	34.69	412.49	34.78	413.64	34.8	414.03	34.83	424.74	35.07		
425.3	35.08	425.9	35.09	428.33	35.15	429.23	35.19	429.63	35.21		
430.83	35.3	433.35	35.54	434.04	35.66	436	35.58	441.77	36.29		
444.47	36.64	446.38	37.05	446.44	39.12	450.5	39.12	456.7	39.15		
464.17	39.18	501.14	40.3								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	99.35	.04	138.49	.07

Bank Sta: Left Right Coeff Contr. Expan.

99.35	138.49	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	97.76	34.5	F
135.79	501.14	33.4	F

Downstream Deck/Roadway Coordinates

num= 61

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
-7	41.01		-6.34	40.95		3.3	40.24	
9.86	39.72		16.85	39.14		17.4	39.12	
18.21	39.03		28.03	38.23		28.22	38.22	
32.78	38.29		51.74	36.94		52.62	36.84	
63.68	36.33		65.33	36.3		65.99	36.3	
66.04	36.23		66.49	36.22		68.49	36.13	
75.15	35.85		79.09	35.68		81.44	35.6	
82.06	35.58		86.43	35.43		89.67	35.33	
89.83	35.33		90.76	35.3		105.15	34.83	
106.24	34.79		108.05	34.74		115.76	34.5	
115.76	34.5	31.39	149	34	30.84	149	34	
151.54	33.94		152.07	33.94		152.75	33.93	
159.64	33.85		163.71	33.82		164.1	33.82	
168.89	33.81		169.51	33.8		194.83	33.64	
199.76	33.61		202.14	33.6		207.02	33.6	
224.78	33.57		235.05	33.56		241.68	33.54	
264.78	33.53		272.06	33.59		282.58	33.67	

```
  290.54   33.76           296.6   33.83          303.32   33.89
  306.73   33.95          317.63   34.09          335.26   34.28
   348.8   34.44          352.03   34.47          355.49   34.52
  369.77   34.75

Downstream Bridge Cross Section Data
Station Elevation Data    num=      89
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0   40.81     .23    40.8     .48   40.79     .61   40.82    5.14   41.03
    6.87   41.42   21.49   39.82   26.29   39.36   27.04   39.31   28.36   39.27
   40.46   38.01   44.32   37.54   45.77   37.44   46.96    37.4   53.89   37.32
   62.79   36.17    70.7   35.64   82.96   34.99   84.26   34.76   84.88   34.63
   96.01   32.36  100.73   29.99  107.06   27.22  115.42   26.22   120.5   26.22
  125.57   21.21  138.19   21.19  144.83   26.22  151.42   26.22   152.7   28.37
  156.55   29.07  163.07   29.43  167.05   29.33  174.58   29.67  178.57   29.68
  181.18   29.68  200.29   30.58  201.82   30.56  202.09   30.58  204.19    30.7
  206.43   31.07  216.36   32.47  218.78   32.29  225.63   32.35  232.41   32.46
  235.17    32.7  238.58   32.93  248.05   33.39  248.16    33.4  262.71   33.09
  263.05   33.08   263.2   33.08   268.3   32.81  268.34   32.86  270.26   32.84
  285.18   33.21  286.32   33.24  286.48   33.24  293.81   33.65  302.99   33.96
  303.41   33.95  313.31   33.46  317.84   33.33  317.87   33.33  326.98   33.46
  335.72   33.42  338.02   33.36  343.23   33.76  344.66   33.86  345.47   33.88
  354.78   34.23  362.92   34.56  363.55   34.57  364.51   34.53  370.05   34.33
  383.82   34.23  388.49   34.27  389.58    34.2  393.19   34.22  393.75   34.32
   415.3   34.58  420.68   34.61  432.13   34.84  457.52    35.4  459.97   35.53
   461.7   36.34  479.35   36.97  479.43   37.93  502.74   38.41

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .07  115.42     .04  151.42     .07

Bank Sta: Left   Right    Coeff Contr.   Expan.
        115.42  151.42             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0     105      34       F
     157  502.74    33.5       F

Upstream Embankment side slope              =         horiz. to 1.0 vertical
Downstream Embankment side slope            =         horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins         =
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Bridge Coefficient Sets =  1

Low Flow Methods and Data
       Energy
```

```
Selected Low Flow Methods = Energy

High Flow Method
       Pressure and Weir flow
           Submerged Inlet Cd          =
           Submerged Inlet + Outlet Cd =      .8
           Max Low Cord                =

Additional Bridge Parameters
       Add Friction component to Momentum
       Do not add Weight component to Momentum
       Class B flow critical depth computations use critical depth
           inside the bridge at the upstream end
       Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION


RIVER: Little River
REACH: Little River       RS: 478.45

INPUT
Description:
Station Elevation Data    num=      99
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0   40.81  .22998    40.8  .47998   40.79 .609985   40.825.139984   41.03
6.869995   41.4221.48999   39.8226.28998   39.3627.03998   39.3128.35999   39.27
40.45999   38.0144.31998   37.5445.76999   37.4446.95999    37.453.88998   37.32
62.78998   36.1770.69998   35.6482.95999   34.9984.25998   34.76   84.88   34.63
96.00998   32.36  100.73   29.99  107.06   27.22  115.49    26.2  117.56   25.98
  118.98   24.92  120.66   24.21   122.2   23.09  125.17   22.65  127.15   22.05
  130.89   21.79  135.71   21.92  138.75   23.04  142.87   23.69  145.12   27.24
  145.69   28.69  146.08   28.59  146.66    28.7  146.87   28.69   152.7   28.37
  156.55   29.07  163.07   29.43  167.05   29.33  174.58   29.67  178.57   29.68
  181.18   29.68  200.29   30.58  201.82   30.56  202.09   30.58  204.19    30.7
  206.43   31.07  216.36   32.47  218.78   32.29  225.63   32.35  232.41   32.46
  235.17    32.7  238.58   32.93  248.05   33.39  248.16    33.4  262.71   33.09
  263.05   33.08   263.2   33.08   268.3   32.81  268.34   32.86  270.26   32.84
  285.18   33.21  286.32   33.24  286.48   33.24  293.81   33.65  302.99   33.96
  303.41   33.95  313.31   33.46  317.84   33.33  317.87   33.33  326.98   33.46
  335.72   33.42  338.02   33.36  343.23   33.76  344.66   33.86  345.47   33.88
  354.78   34.23  362.92   34.56  363.55   34.57  364.51   34.53  370.05   34.33
  383.82   34.23  388.49   34.27  389.58    34.2  393.19   34.22  393.75   34.32
   415.3   34.58  420.68   34.61  432.13   34.84  457.52    35.4  459.97   35.53
   461.7   36.34  479.35   36.97  479.43   37.93  502.74   38.41

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .07  107.06     .04  145.69     .07
```

```
Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        107.06  145.69           203.38  192.26  164.53             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0     105      34       F
     157  502.74    33.5       F

CROSS SECTION


RIVER: Little River
REACH: Little River       RS: 286.19

INPUT
Description:
Station Elevation Data    num=      26
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0   40.41     .31    40.5     .71   40.58     .76    40.6   33.55   34.94
   36.61   34.42   38.05   34.24   39.08   34.09    80.8   26.79  80.801   26.79
   86.23   22.47   103.9   21.49  120.55   22.38  121.08   22.43  121.25   22.43
  123.23   24.74  125.59   26.68  136.18   26.79  185.83   27.23  187.24      29
  232.82      29  233.61   29.01  272.31   30.34  333.34   32.43  424.29   35.38
  424.57   35.38

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .07    80.8     .04  125.59     .07

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          80.8  125.59           174.03  174.03  174.03             .1       .3

CROSS SECTION


RIVER: Little River
REACH: Little River       RS: 112.16

INPUT
Description:
Station Elevation Data    num=      27
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0   33.0982.10999   27.6183.64999   27.5183.73999    27.583.95999    27.5
83.95999   27.4983.98999   27.49  127.05   26.75  167.05   25.62  167.23   25.62
  167.25    25.6  167.27    25.6  171.13   23.57  186.73   21.27  186.86   21.23
  187.04   21.24   199.4   22.75  199.41   22.76  200.77    24.7  211.37   26.74
  277.57   27.25  297.39   26.99  347.65   28.79   352.9      29   353.5      29
  406.67    30.6   494.5   33.23

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
```

```
       0     .07  167.05     .04  211.37     .07

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        167.05  211.37              122     115     102             .1       .3

CROSS SECTION


RIVER: Little River
REACH: Little River       RS: 0

INPUT
Description:
Station Elevation Data    num=      31
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0   37.45  111.57   34.65  112.02   34.64  118.08    34.5  165.02   33.52
   165.8   33.49   169.5   33.35  169.95   33.35  199.17      33  204.94   32.89
  206.57   32.43  214.19   30.31  214.46    30.3  220.23   23.78  225.16   22.37
  231.82   20.57  240.42   20.87  240.67   20.88   240.7   20.88  241.14   21.16
  247.59   25.79  248.16   26.22  248.45   26.44  287.02    26.6  302.07   26.61
  329.43   26.63  342.98   26.64  416.82      29  439.64   29.68  453.78   30.15
  543.63   33.38

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .07  214.19     .04  248.16     .07

Bank Sta: Left   Right    Coeff Contr.   Expan.
        214.19  248.16             .1       .3



SUMMARY OF MANNING'S N VALUES

River:Little River

      Reach          River Sta.       n1        n2        n3

 Little River         6949.98            .07       .04       .07
 Little River         5535.57            .07       .04       .07
 Little River         4353.41            .07       .04       .07
 Little River         2267.89            .07       .04       .07
 Little River         2051.02            .07       .04       .07
 Little River         1470.61            .07       .04       .07
 Little River         968.71             .07       .04       .07
 Little River         729.14             .07       .04       .07
 Little River         580                .07       .04       .07
 Little River         531.03             .07       .04       .07
 Little River         489          Bridge
 Little River         478.45             .07       .04       .07
```

Little River	286.19	.07	.04	.07
Little River	112.16	.07	.04	.07
Little River	0	.07	.04	.07

SUMMARY OF REACH LENGTHS

River: Little River

Reach	River Sta.	Left	Channel	Right
Little River	6949.98	1414.41	1414.41	1414.41
Little River	5535.57	1182.16	1182.16	1182.16
Little River	4353.41	2085.52	2085.52	2085.52
Little River	2267.89	196	216.87	237
Little River	2051.02	564	580.41	594
Little River	1470.61	494	501.9	507
Little River	968.71	231	239.57	244
Little River	729.14	98.29	168.24	8.89
Little River	580	36.75	29.86	13.12
Little River	531.03	52.58	52.58	52.58
Little River	489	Bridge		
Little River	478.45	203.38	192.26	164.53
Little River	286.19	174.03	174.03	174.03
Little River	112.16	122	115	102
Little River	0			

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Little River

Reach	River Sta.	Contr.	Expan.
Little River	6949.98	.1	.3
Little River	5535.57	.1	.3
Little River	4353.41	.1	.3
Little River	2267.89	.1	.3
Little River	2051.02	.1	.3
Little River	1470.61	.1	.3
Little River	968.71	.1	.3
Little River	729.14	.1	.3
Little River	580	.3	.5
Little River	531.03	.3	.5
Little River	489	Bridge	
Little River	478.45	.3	.5

Little River	286.19	.1	.3
Little River	112.16	.1	.3
Little River	0	.1	.3

APPENDIX D

SCOUR COMPUTATIONS

Contraction Scour

Parameters	50-Year Channel	100-Year Channel
K_u	11.17	11.17
y_1 (ft)	7.67	8.26
D_{50} (ft)	0.0064	0.0064
V_c (fps)	2.91	2.95
V_0 (fps)	3.76	4.07
V_c - V_0	-0.85	-1.12
Routine:	**LIVE**	**LIVE**

Notes:
11.17 (Constant)
Average Depth of flow upstream of the bridge (ft)
Particle Size (ft)
Critical Velocity (ft/s)
Velocity in Approach Section (ft/s)
Clear = $V_C > V_0$; Live = $V_C < V_0$

Critical Velocity:

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

Abutments are in Channel so only Channel Scour calucaltions are needed.

Live-Bed Routine

Parameters	50-Year Channel	100-Year Channel	Live Notes
Q_1 (cfs)	1,196.75	1,395.01	Flow in upstream channel (cfs)
Q_2 (cfs)	1,380.00	1,630.00	Flow in contracted channel (cfs)
W_1 (ft)	41.47	41.47	Bottom width of upstream main channel (ft)
W_2 (ft)	33.24	33.24	Bottom width of main channel in contracted section (ft)
K_1	0.640	0.640	Exponent from Table
y_0 (ft)	6.78	7.23	Existing depth in contracted section before scour (ft)
y_2 (ft)	9.98	10.87	Average depth in contracted section (ft)
$Y_s = y_2 - y_0$ (ft)	3.20	3.64	Average contraction scour depth (ft)
Contraction Scour Y_s =	**3.20**	**3.64**	

Live-Bed Routine:

$$\frac{y_2}{y_1} = \left(\frac{Q_2}{Q_1}\right)^{6/7} \left(\frac{W_1}{W_2}\right)^{K_1}$$

$$y_s = y_2 - y_0$$

Abutment Scour

Parameters	50-Year Left Abutment	50-Year Right Abutment	100-Year Left Abutment	100-Year Right Abutment
Y_a (ft)	4.20	1.13	4.59	1.53
K_1	0.82	0.82	0.82	0.82
K_2	1.00	1.00	1.00	1.00
L' (ft)	22.51	15.00	23.60	15.00
Fr	0.13	0.24	0.13	0.17
Y_s (ft)	**4.61**	**2.71**	**5.08**	**2.57**

L' (Right) appears much larger in cross sections due to 90 degree turn. 15' is a more reasonable assumption of the flow that is actually blocked by the abutment

Modified Froehlich's Equation:

$$Y_S = 2.27\, Y_a\, K_1\, K_2 \left(\frac{L'}{Y_a}\right)^{0.43} Fr^{0.61}$$

Q_e (cfs)	142.12	154.73	177.09	193.53
A_e (sf)	94.81	104.76	108.32	163.25
V_e (fps)	1.499	1.48	1.635	1.19
Fr	0.13	0.24	0.13	0.17

Unmodified Froehlich:*	8.81	3.84	9.67	4.10

*For Check Only

RIP-RAP Sizing - 100 Year Countermeasure

$$D_{50} = \left(\frac{K}{S_a - 1}\right) \frac{V^2}{gy}$$

	4.25	K	1.02
	0.23	V	7.13
D50=	0.98 ft	Ss	2.65
		g	32.2
		y	6.88

APPENDIX E

GEOTECHNICAL REPORT

Preliminary Geotechnical Recommendations
Rosemont Street Bridge,
Haverhill, Massachusetts

GEI Consultants, Inc.
GEI Project 1801408
April 9, 2019

Site and Project Description

The site is located where Rosemont Street crosses over the Little River in Haverhill, Massachusetts (Figs. 1 and 2). A sewer pump station is located close to the bridge.

We understand that the City of Haverhill plans to replace the existing bridge with a new single-span replacement bridge that will be supported on new abutments just outside the existing abutments. The existing abutments and wingwalls will be demolished. The roadway grades will remain roughly the same.

Geotechnical Data

Northern Drill Service Inc. of Northborough, Massachusetts drilled 2 borings (BB-1 and BB-2) November 1 and November 5, 2018. The locations of the borings are shown in Fig. 2. We also obtained four sediment samples, by hand, from the banks and channel of the Little River on January 18, 2019.

The soil layers encountered in the borings are described below in order of increasing depth. The approximate layer boundaries are shown in the subsurface profile in Fig. 3. Conditions are known only at the boring locations and conditions between borings may differ from those indicated below and shown in the profile.

Asphalt: All the borings were drilled in Rosemont Street, which is paved with about 6 inches of asphalt.

Fill: Fill was encountered below the pavement in both borings to depths of about 13.5 to 16 feet below the ground surface. The fill generally consisted of fine to coarse sand, with some fine to coarse gravel and trace inorganic silt. BB-2 encountered numerous boulders in the fill layer from a depth of 5 feet to 16 feet and some fine sand with some organic material at a depth of about 19 feet. SPT N-values in the fill ranged from 13 to more than 100 blows per foot, indicating a loose to very dense soil. The large range of the N-values indicates the variability of both the density and gradation of the fill. Some of the higher N-values were likely the result of the sampler encountering coarse gravel, cobbles, or boulders.

Lean Clay: Gray lean clay with trace fine to coarse sand was encountered below the fill in BB-2. The lean clay layer was 3 feet thick. The N-value obtained in the lean clay was 2 blows per foot, indicating a soft clay.

Bedrock: Bedrock was encountered below the fill and clay at depths of 13 feet in BB-1 and 22 feet in BB-2. The bedrock was classified as black, fine-grained, hard, fresh, siltstone in BB-1 and black, coarse-grained, hard, fresh, schist in BB-2 (Berwick Formation). Core recovery ranged from 95 to 100 percent. The Rock Quality Designation (RQD) ranged from 56 to 100 percent, with four out of five values greater than 80 percent, indicating fairly intact bedrock.

Groundwater Levels

Depth to groundwater was measured in boring BB-1 at a depth of 4.5 feet below ground surface after drilling (~El. 29.5) and in BB-2 at a depth of 7.9 feet below ground surface after drilling (~El. 27). Borings were drilled with water and were typically completed in a day, so the water level measurements may not represent stabilized values. We expect the groundwater elevation to be similar to, or slightly higher than, the water level in the river or about El. 25.

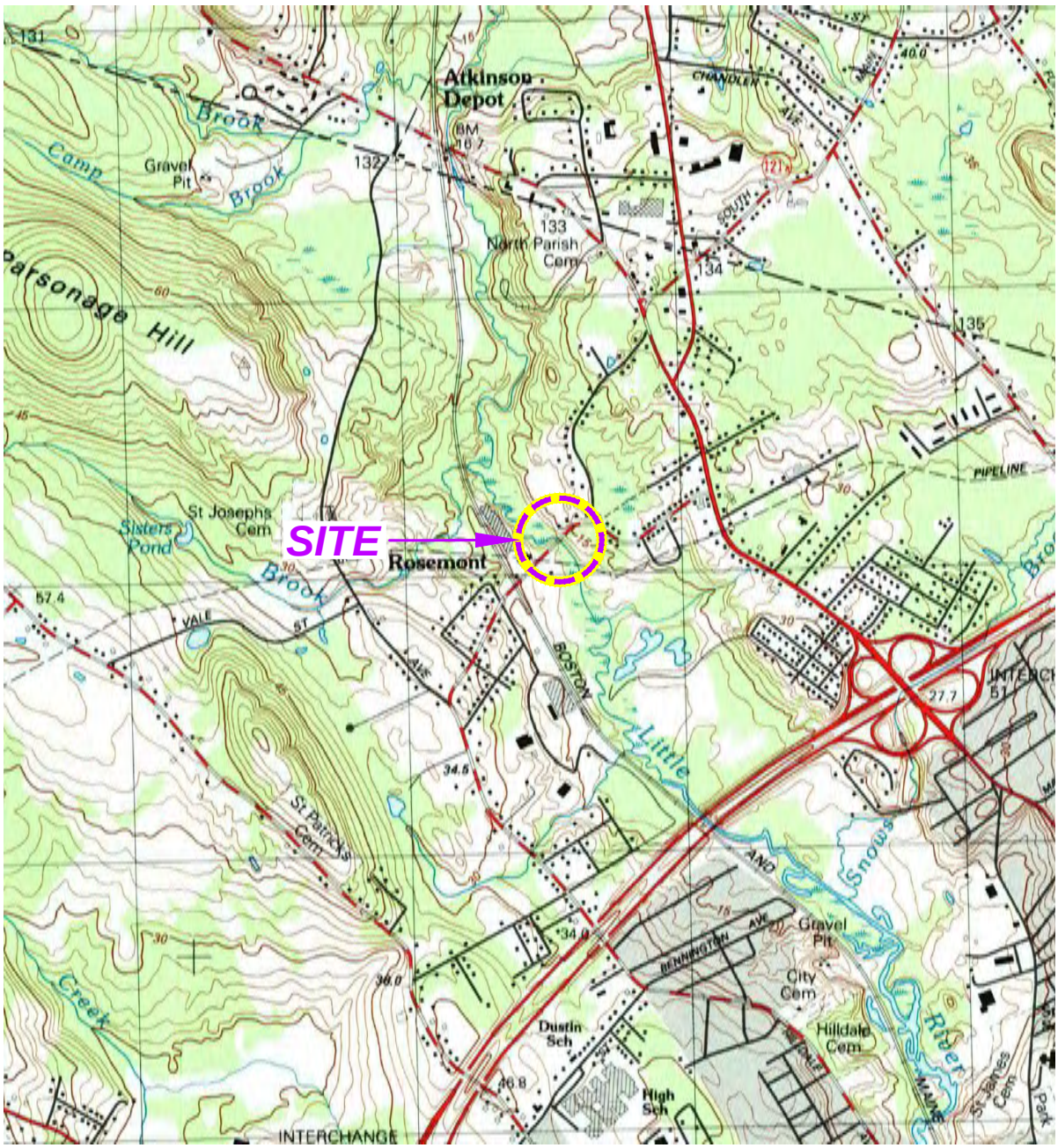
Recommended Foundation Types

At the northeast abutment (BB-1) bedrock was encountered close to the proposed bearing elevation of the new abutment. Therefore, we recommend that the northeast abutment be founded on spread footings bearing on rock. Some rock removal may be required to construct the new abutment at the proposed bearing elevation.

At the southeast abutment, bedrock was encountered about 6 to 8 feet below the proposed abutment bearing elevation. Supporting the abutment on a spread footing bearing on rock would require excavating about 10 to 12 feet below the groundwater table in a sheeted and braced excavation. Therefore, we recommend that the southeast abutment be founded on short driven piles driven to the top of rock or on short drilled piles drilled into rock. The pile supported foundation will still require excavation support and dewatering to reach the proposed bottom of pile cap elevation, but a significantly lesser amount than to found the abutment directly on rock.

For both options, raising the elevation of the footing or pile cap could reduce potential construction difficulties.

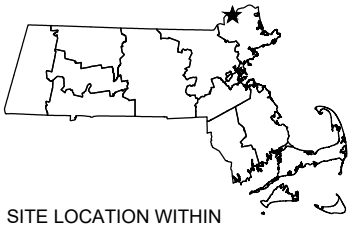
Figs. 1, 2, and 3 attached.



0 1000 2000 4000 6000

SCALE, FEET

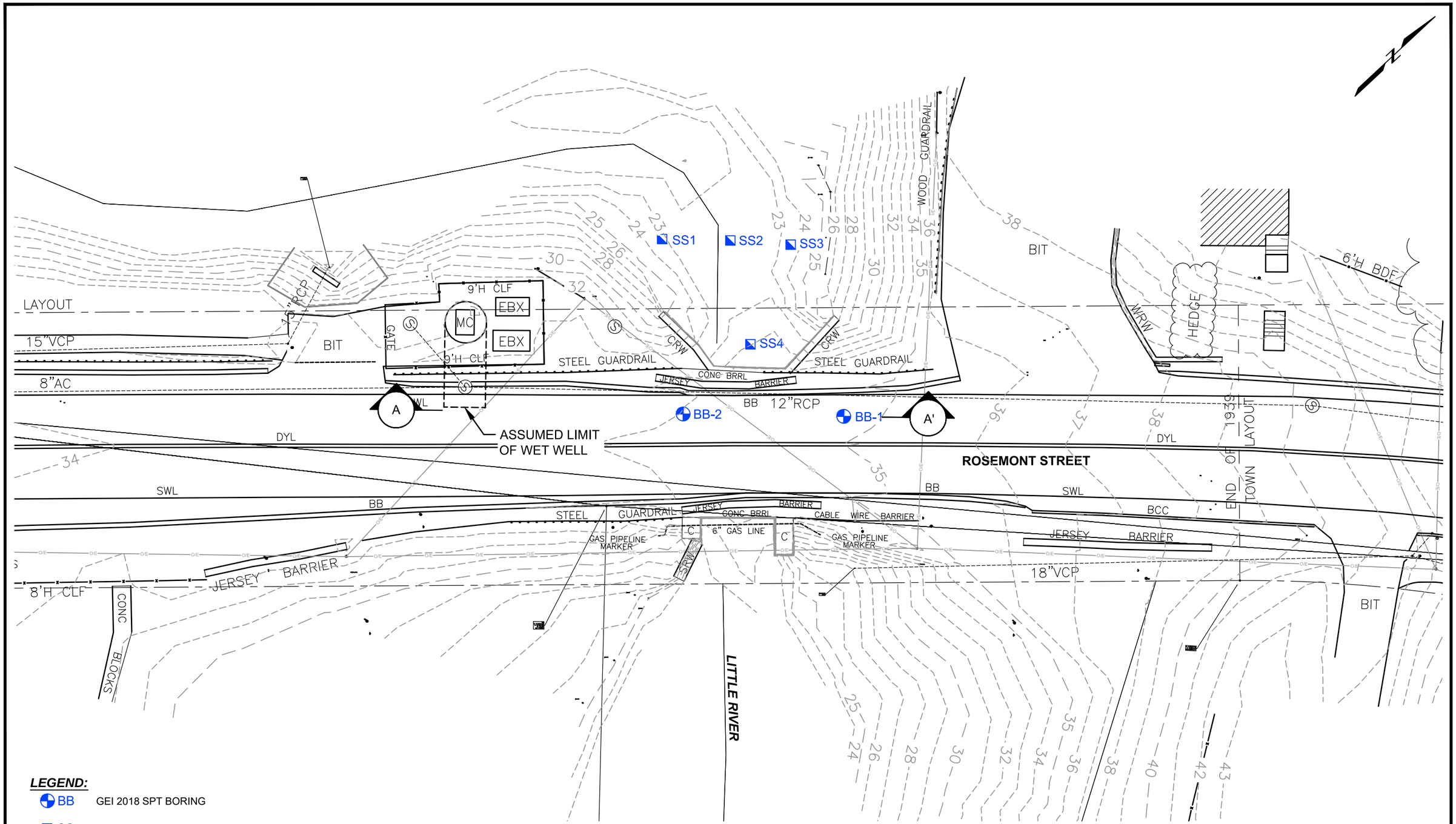
Image from U.S.G.S. Topographic 7.5 Minute Series
Haverhill, Massachusetts - New Hampshire, 1987.
Datum is National Geodetic Vertical Datum (NGVD).
Elevations are in Meters
Contour Interval is 3 Meters.



SITE LOCATION WITHIN MASSACHUSETTS

Rosemont Street Bridge Replacement Rosemont Street Over Little River Haverhill, Massachusetts	GEI Consultants	SITE LOCATION MAP
BETA Group, Inc. Norwood, Massachusetts	Project 1801408	February 2019 Fig. 1

B:\Working\BETA GROUP\1801408 Rosemont St. Bridge Replacement\00_CAD\Figures\Site Location Map



LEGEND:

- BB — GEI 2018 SPT BORING
- SS — GEI 2019 SEDIMENT SAMPLE
- A — A' — CROSS SECTION LOCATION, SEE FIG. 4

SOURCE:

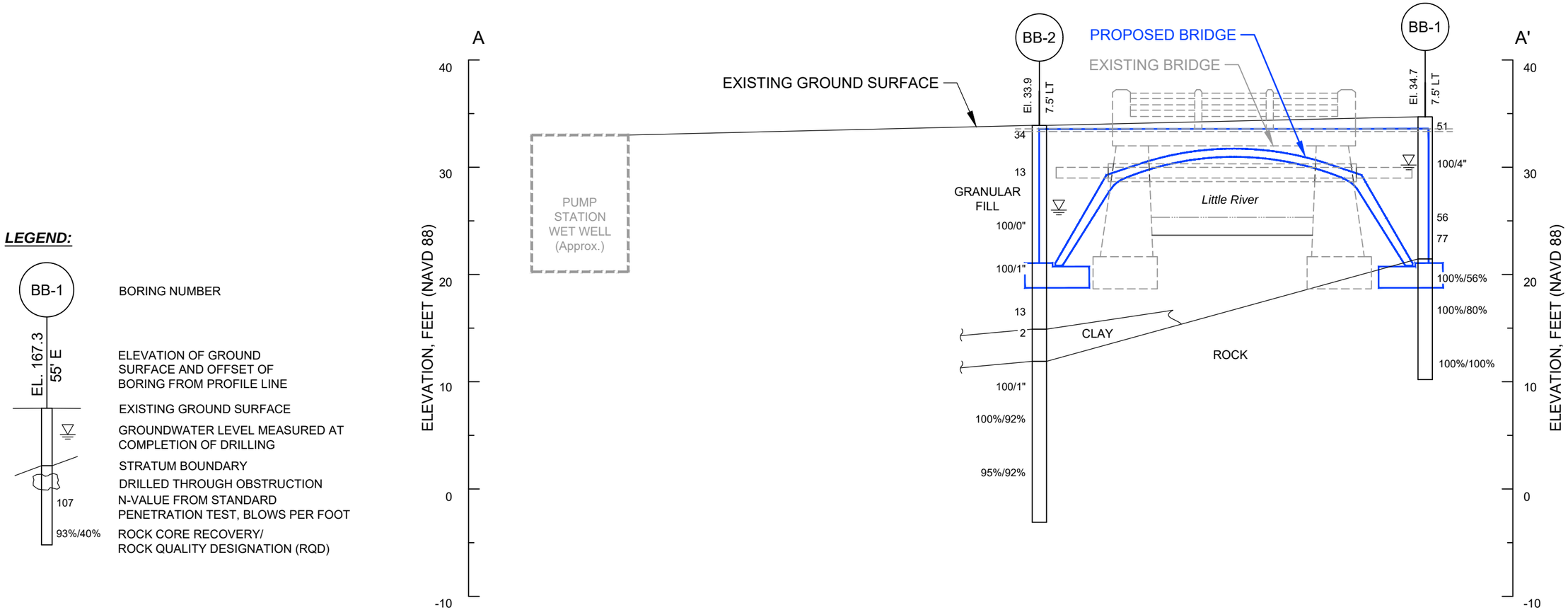
1. BASE PLAN PROVIDED BY BETA GROUP ON 1/31/2019.

0 20 40

SCALE: 1" = 20'

Rosemont Street Bridge Replacement Rosemont Street Over Little River Haverhill, Massachusetts	GEI Consultants	SITE PLAN
BETA Group, Inc. Norwood, Massachusetts	Project 1801408	April 2019 Fig. 2

\\geiconsulta B:\Working\BETA GROUP\1801408 Rosemont St. Bridge Replacement\00_CAD\Figures\1801408-03.dwg - 4/8/2019



LEGEND:

BORING NUMBER

ELEVATION OF GROUND SURFACE AND OFFSET OF BORING FROM PROFILE LINE

EXISTING GROUND SURFACE

GROUNDWATER LEVEL MEASURED AT COMPLETION OF DRILLING

STRATUM BOUNDARY

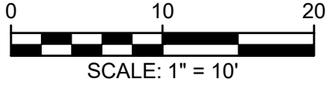
DRILLED THROUGH OBSTRUCTION

N-VALUE FROM STANDARD PENETRATION TEST, BLOWS PER FOOT

ROCK CORE RECOVERY/ ROCK QUALITY DESIGNATION (RQD)

NOTES:

1. BORING LOCATIONS ARE SHOWN IN FIG. 3.
2. GROUNDWATER LEVELS MAY VARY AT OTHER LOCATIONS AND AT OTHER TIMES.
3. BOUNDARIES BETWEEN SOIL STRATA MAY BE TRANSITIONAL. THE STRATA BOUNDARIES MAY VARY FROM THE INTERPOLATIONS SHOWN.
4. EXISTING AND PROPOSED BRIDGE GEOMETRY AND ESTIMATED LOCATION OF WET WELL PROVIDED BY BETA GROUP ON APRIL 4, 2019.



Rosemont Street Bridge Replacement
Rosemont Street Over Little River
Haverhill, Massachusetts

BETA Group, Inc.
Norwood, Massachusetts

GEI Consultants

CROSS SECTION
A - A'

Project 1801408 | April 2019 | Fig. 3

BORING INFORMATION

LOCATION: NE Abutment
GROUND SURFACE EL. (ft): 24.7
VERTICAL DATUM:
TOTAL DEPTH (ft): 24.5
LOGGED BY: K. Gleichauf
DATE START/END: 11/2/2018 - 11/5/2018
DRILLING COMPANY: Northern Drill Service, Inc.
DRILLER NAME: C. Beirholm
RIG TYPE: Mobile B-57

BORING

BB-1

DRILLING INFORMATION

HAMMER TYPE: Automatic
AUGER I.D./O.D.: NA / NA
DRILLING METHOD: Driven casing and washed with rotary tooling.
WATER LEVEL DEPTHS (ft): ▼ 4.5 11/5/2018
CASING I.D./O.D.: 4 inch/ NA
DRILL ROD O.D.:
CORE BARREL TYPE:
CORE BARREL I.D./O.D. NA / NA

ABBREVIATIONS:
Pen. = Penetration Length
Rec. = Recovery Length
RQD = Rock Quality Designation = Length of Sound Cores>4 in / Pen.,%
WOR = Weight of Rods
WOH = Weight of Hammer
S = Split Spoon Sample
C = Core Sample
U = Undisturbed Sample
SC = Sonic Core
DP = Direct Push Sample
HSA = Hollow-Stem Auger
Qp = Pocket Penetrometer Strength
Sv = Pocket Torvane Shear Strength
LL = Liquid Limit
PI = Plasticity Index
PID = Photoionization Detector
I.D./O.D. = Inside Diameter/Outside Diameter
NA, NM = Not Applicable, Not Measured
Blows per 6 in.: 140-lb hammer falling 30 inches to drive a 2-inch-O.D. split spoon sampler.

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Sample Information: Depth (ft)	Sample Information: Pen./ Rec. (in)	Sample Information: Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		S1	0.5 to 2	18/10	9-30-21	~6" asphalt surface	GRANULAR FILL	S1: Dry, very dense, brown, FINE TO COARSE SAND, some fine to medium gravel, trace nonplastic fines.
20	5	S2	4 to 5.3	16/6	7-5-100/4"			S2: Wet, very dense, brown, FINE TO COARSE SAND, some fine to medium gravel, some nonplastic fines.
	10	S3	9 to 11	24/8	9-17-39-29			S3: Wet, very dense, brown, FINE TO COARSE SAND AND GRAVEL, some nonplastic fines. Gravel is fractured by spoon.
		S4	11 to 13	24/9	57-35-42-22			S4: Wet, very dense, brown, FINE TO COARSE SAND, some fine to coarse gravel, trace nonplastic fines.
10	15	C1	14.5 to 17.5	36/36	56	Casing driven to refusal at 13.25 ft. Core Times: 2-3-9 Advanced rollerbit to 14.5 ft., rock chips in wash, driller notes irregular advancement, possible rock fractures from blasting.	ROCK	C1: BERWICK FORMATION , very hard, black with white layers spaced about 2" at 15 degrees. Joints spaced 1-9" at 15-75 degrees, slight to no weathering. Most joints are along bedding planes.
	20	C2	17.5 to 22.5	60/60	80	Core Times: 3-3-4-5-9		C2: BERWICK FORMATION, Similar to C1.
		C3	22.5 to 24.5	24/24	100	Core Times: 4-7		C3: BERWICK FORMATION, Similar to C1.

NOTES:

PROJECT NAME: Rosemont Street Bridge Replacement
CITY/STATE: Haverhill, MA
GEI PROJECT NUMBER: 1801408

GEI Consultants

LOCATION: NE Abutment
GROUND SURFACE EL. (ft): 24.7 **DATE START/END:** 11/2/2018 - 11/5/2018
VERTICAL DATUM: **DRILLING COMPANY:** Northern Drill Service, Inc.

BORING BB-1

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Sample Information: Depth (ft)	Sample Information: Pen./ Rec. (in)	Sample Information: Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
0	25							End Boring at 24.5 ft. Backfilled with cuttings and gravel, topped with cold patch.
	30							
-10	35							
	40							
-20	45							
	50							
-30	55							

NOTES:

PROJECT NAME: Rosemont Street Bridge Replacement
CITY/STATE: Haverhill, MA
GEI PROJECT NUMBER: 1801408

GEI Consultants

BORING INFORMATION

LOCATION: SW Abutment
GROUND SURFACE EL. (ft): 33.9
VERTICAL DATUM:
TOTAL DEPTH (ft): 37.0
LOGGED BY: K. Gleichauf
DATE START/END: 11/1/2018 - 11/2/2018
DRILLING COMPANY: Northern Drill Service, Inc.
DRILLER NAME: C. Beirholm
RIG TYPE: Mobile B-57

BORING

BB-2

DRILLING INFORMATION

HAMMER TYPE: Automatic
AUGER I.D./O.D.: NA / NA
DRILLING METHOD: Driven casing and washed with rotary tooling.
WATER LEVEL DEPTHS (ft): ▼ 7.9 11/2/2018 ▼ 7.6 11/1/2018
CASING I.D./O.D.: 4 inch/ NA
DRILL ROD O.D.:
CORE BARREL TYPE:
CORE BARREL I.D./O.D. NA / NA

ABBREVIATIONS:
Pen. = Penetration Length
Rec. = Recovery Length
RQD = Rock Quality Designation = Length of Sound Cores>4 in / Pen.,%
WOR = Weight of Rods
WOH = Weight of Hammer
S = Split Spoon Sample
C = Core Sample
U = Undisturbed Sample
SC = Sonic Core
DP = Direct Push Sample
HSA = Hollow-Stem Auger
Qp = Pocket Penetrometer Strength
Sv = Pocket Torvane Shear Strength
LL = Liquid Limit
PI = Plasticity Index
PID = Photoionization Detector
I.D./O.D. = Inside Diameter/Outside Diameter
NA, NM = Not Applicable, Not Measured
Blows per 6 in.: 140-lb hammer falling 30 inches to drive a 2-inch-O.D. split spoon sampler.

Elev. (ft)	Depth (ft)	Sample No.	Sample Depth (ft)	Pen./ Rec. (in)	Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
		S1	0.5 to 2	18/10	10-15-19	~6" asphalt surface	GRANULAR FILL	S1: Moist, dense, brown, FINE TO COARSE SAND, some fine to coarse gravel, trace nonplastic fines.
30	5	S2	4 to 5.8	22/5	10-9-4-100/4"	Possible cobble 3.5-4 ft. Split spoon bent while driving S2. Casing driven to refusal at 5 ft. drilled ahead through cobbles and bent drive shoe while trying to advance casing. Casing spun to 9 ft.		S2: Wet, medium dense, dark brown, FINE TO COARSE SAND AND GRAVEL, some nonplastic fines. Gravel stuck in tip is fractured by spoon. Spoon bent, possibly wedged between blocks
	10	S3	9 to 9	0/0	100/0"			S3: Small piece of fractured gravel in tip, appears similar to granite blocks visible on abutment slopes.
20	15	S4	13 to 13.6	7/3	18-100/1"	Advanced rollerbit through obstruction, broke through at 13 ft.		S4: Wet, very dense, gray, FINE TO COARSE GRAVEL, some fine to coarse sand, trace nonplastic fines. Gravel is fractured by spoon.
		S5	17 to 19	24/0	6-5-8-8	Advanced rollerbit through obstruction, broke through at 16 ft.		S5: No recovery. S5 (Redrive): Wet, medium dense, gray, FINE TO COARSE SAND, trace fine to coarse gravel, trace nonplastic fines. (0-7) coarse sand, (7-15) fine sand with some organic material (wood and sticks).
	20	S6	19 to 21	24/15	1-1-1-1	Redrove 3" spoon for 15" recovery.	CLAY	S6: Wet, very soft, gray, LEAN CLAY, trace fine to coarse sand.
						Rig chatter at 22 ft, driller notes gravel.	W. ROCK	

NOTES:

PROJECT NAME: Rosemont Street Bridge Replacement
CITY/STATE: Haverhill, MA
GEI PROJECT NUMBER: 1801408

GEI Consultants

LOCATION: SW Abutment
GROUND SURFACE EL. (ft): 33.9 **DATE START/END:** 11/1/2018 - 11/2/2018
VERTICAL DATUM: **DRILLING COMPANY:** Northern Drill Service, Inc.

BORING BB-2

Elev. (ft)	Depth (ft)	Sample Information: Sample No.	Sample Information: Depth (ft)	Sample Information: Pen./ Rec. (in)	Sample Information: Blows per 6 in. or RQD	Drilling Remarks/ Field Test Data	Layer Name	Soil and Rock Description
	25	S7	24 to 25.1	13/6	18-44-100/1"			S7: Wet, very dense, gray, FINE TO MEDIUM GRAVEL, some fine to coarse sand, trace nonplastic fines. Possible weathered bedrock.
		C1	27 to 32	60/60	92	Core Times: 3-4-3-4-4 Advanced rollerbit to 27 ft. through rock.	ROCK	C1: BERWICK FORMATION: very hard, fine-grained, black with white coarse rectangular crystals, small pyrite crystals visible throughout. Joints spaced 2-16" at 0-60 degrees, slightly to non weathered.
	30							
0		C2	32 to 37	60/57	92	Core Times: 3-3-3-3-4		C2: BERWICK FORMATION: Similar to C1. Joints spaced 1-15" at 0-30 degrees, slightly to non weathered.
	35							
								End boring at 37 ft. Backfilled with cuttings and gravel, topped with cold patch.
	40							
-10								
	45							
	50							
-20								
	55							

NOTES:

PROJECT NAME: Rosemont Street Bridge Replacement
CITY/STATE: Haverhill, MA
GEI PROJECT NUMBER: 1801408

GEI Consultants

APPENDIX F

SITE PHOTOS

ROSEMONT STREET BRIDGE - VIEWING NORTH - FROM EXISTING SOUTHERLY APPROACH

LITTLE RIVER—UPSTREAM FACE – (FROM BRIDGE DECK)

NORTHWEST WINGWALL - UPSTREAM FACE (FROM BRIDGE DECK)

SOUTHWEST WINGWALL - UPSTREAM FACE (FROM BRIDGE DECK)

SOUTHEAST ABUTMENT - DOWNSTREAM FACE (FROM BRIDGE DECK)

EROSION OF BRIDGE DECK - VIEWING SOUTH –
(FROM EXISTING BRIDGE DECK)

APPENDIX C – Project Plans (Bound Separately)

CITY OF HAVERHILL, MASSACHUSETTS

ROSEMONT STREET OVER LITTLE RIVER
BRIDGE NO. H-12-024 (CFF)

FEBRUARY 2024

CITY COUNCIL

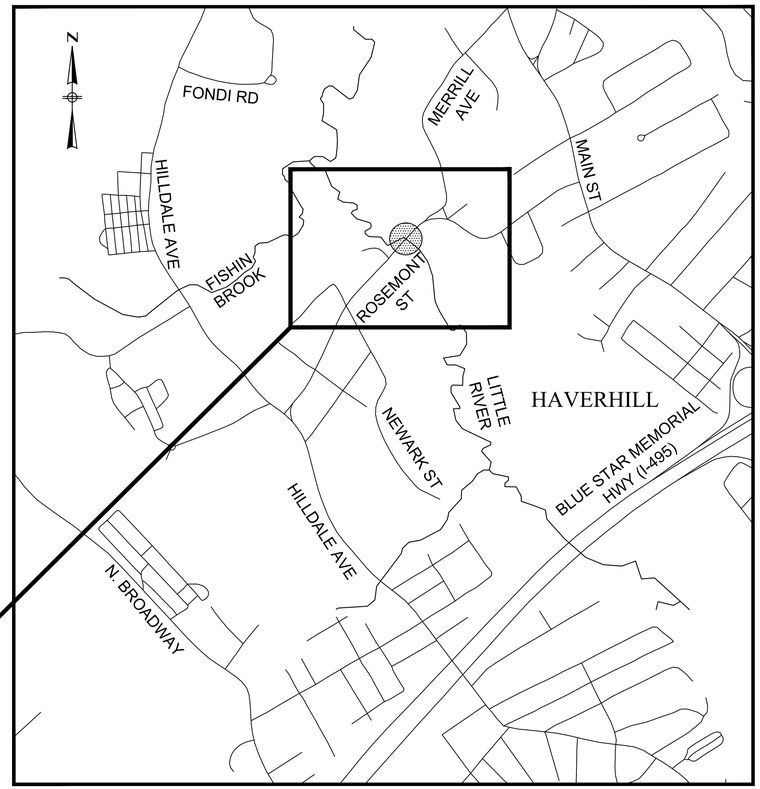
TIMOTHY J. JORDAN, PRESIDENT
JOHN A. MICHITSON, VICE PRESIDENT
MELINDA E. BARRETT, COUNCILLOR
JOSEPH J. BEVILACQUA, COUNCILLOR
THOMAS J. SULLIVAN, COUNCILLOR
MELISSA LEWANDOWSKI, COUNCILLOR
MICHAEL S. MCGONAGLE, COUNCILLOR
CATHERINE P. ROGERS, COUNCILLOR
SHAUN P. TOOHEY, COUNCILLOR

CITY MAYOR

JAMES J. FIORENTINI

DEPARTMENT OF PUBLIC WORKS

ROBERT E. WARD, DIRECTOR
JOHN H. PETTIS III, CITY ENGINEER



LOCATION MAP
NOT TO SCALE

PLAN INDEX

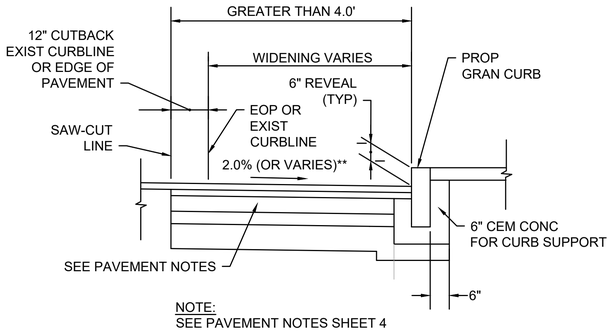
SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	CONSTRUCTION DETAILS
3	CONSTRUCTION PLAN & TYPICAL SECTION
4	BRIDGE GENERAL PLAN & ELEVATION
5	DREDGING LIMITS
6	IMPACTS PLAN
7	BORDERING LANDS SUBJECT TO FLOODING PLAN

PREPARED BY:

BETA
www.BETA-Inc.com

COMMONWEALTH OF MASSACHUSETTS
CHRISTOPHER W. JONES
STRUCTURAL
No. 41025
REGISTERED PROFESSIONAL ENGINEER

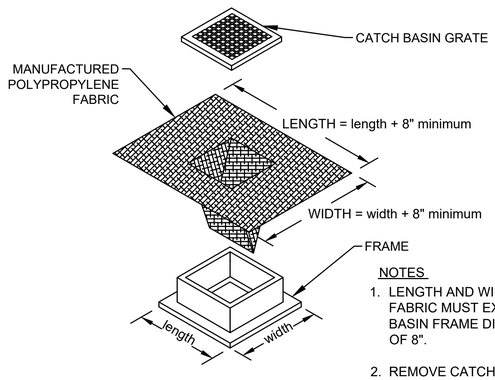
Christopher W. Jones — 2/19/2024
REGISTERED PROFESSIONAL — DATE



NOTE:
SEE PAVEMENT NOTES SHEET 4

DETAIL FOR BOX WIDENING GREATER THAN 4.0'

NOT TO SCALE



NOTES

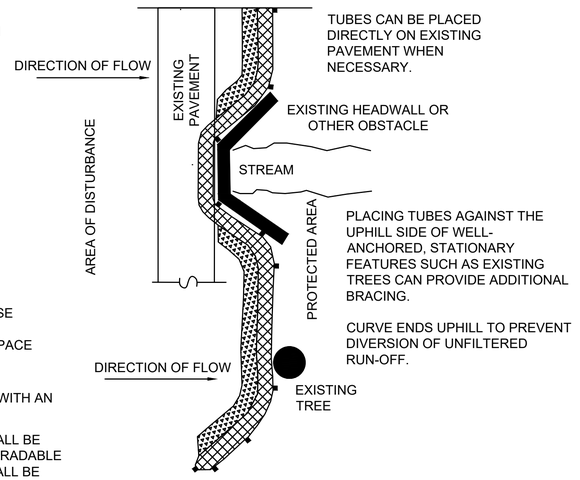
1. LENGTH AND WIDTH OF POLYPROPYLENE FABRIC MUST EXCEED EXISTING CATCH BASIN FRAME DIMENSIONS BY A MINIMUM OF 8".
2. REMOVE CATCH BASIN GRATE AND INSTALL POLYPROPYLENE FABRIC OVER CATCH BASIN FRAME. REPLACE CATCH BASIN GRATE TO SECURE POLYPROPYLENE FABRIC IN PLACE.

CATCH BASIN EROSION CONTROL PROTECTION (TYP)

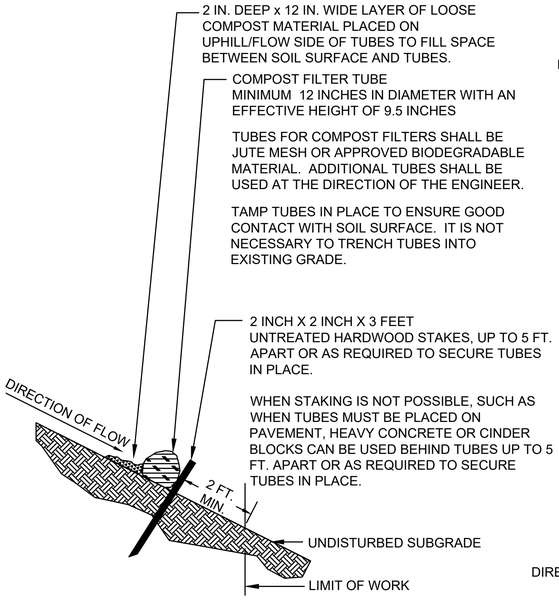
NOT TO SCALE

GENERAL NOTES:

1. PROVIDE A MINIMUM TUBE DIAMETER OF 12 INCHES (300mm) FOR SLOPES UP TO 50 FEET (15.24m) 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. DO NOT INSTALL IN PERENNIAL, EPHEMERAL OR INTERMITTENT STREAMS.
4. CONFIGURE TUBES AROUND EXISTING SITE FEATURES TO MINIMIZE SITE DISTURBANCE AND MAXIMIZE CAPTURE AREA OF STORMWATER RUN-OFF.

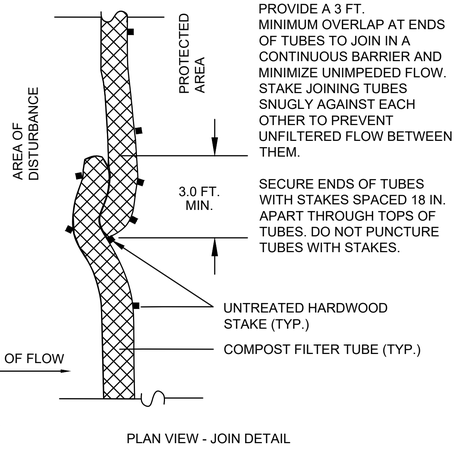


PLAN VIEW

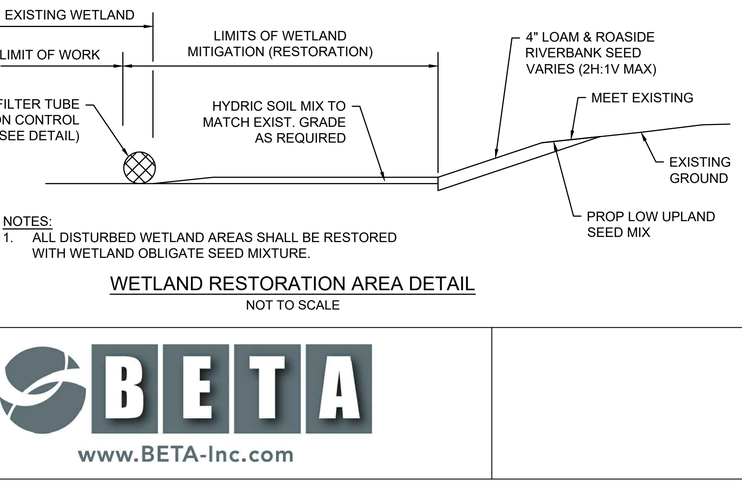


SINGLE COMPOST FILTER TUBE DETAIL FOR EROSION CONTROL

NOT TO SCALE

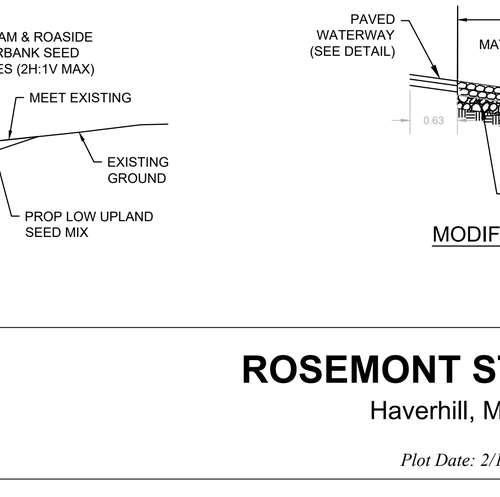


PLAN VIEW - JOIN DETAIL



PERMANENT TRENCH PATCH DETAIL IN MILLED AREAS

NOT TO SCALE



RIPRAP DETAIL FOR SLOPE STABILIZATION

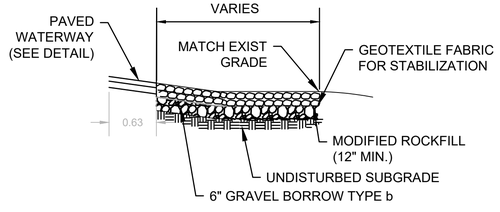
NOT TO SCALE

NOTES:

1. ALL DISTURBED WETLAND AREAS SHALL BE RESTORED WITH WETLAND OBLIGATE SEED MIXTURE.

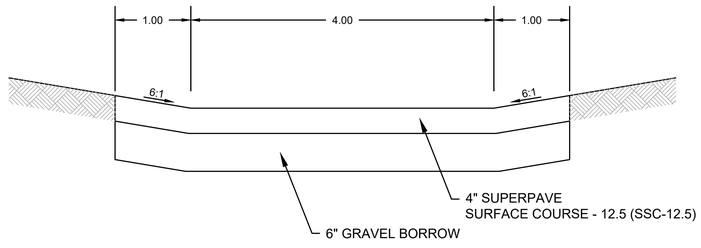
WETLAND RESTORATION AREA DETAIL

NOT TO SCALE



MODIFIED ROCKFILL DETAIL

NOT TO SCALE



HMA PAVED WATERWAY

NOT TO SCALE

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ROSEMONT STREET BRIDGE

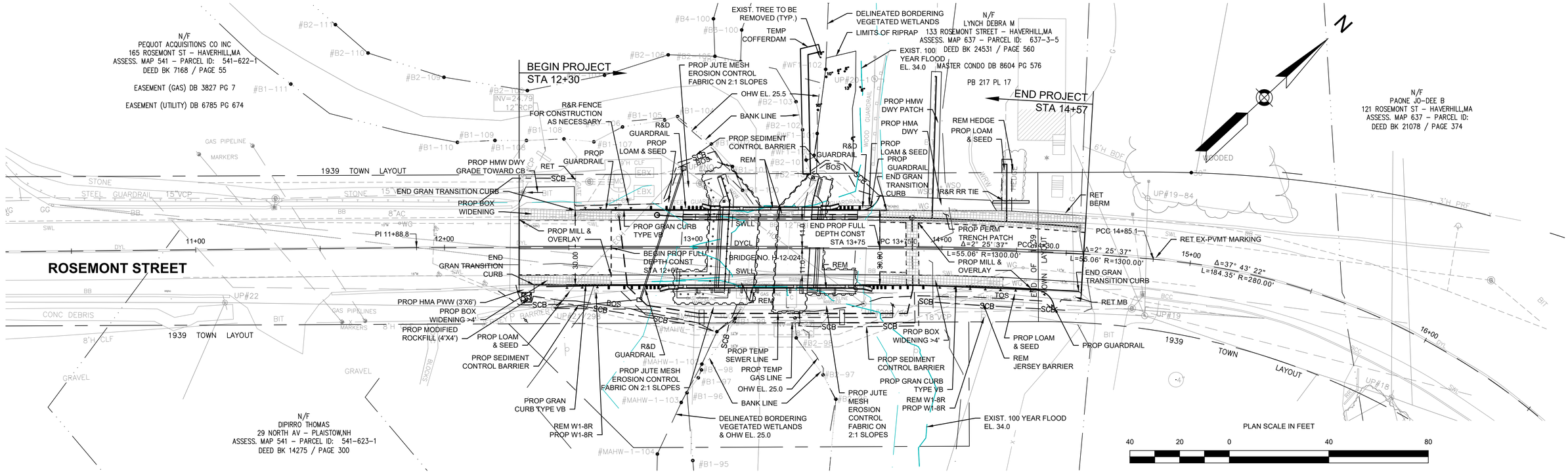
Haverhill, Massachusetts

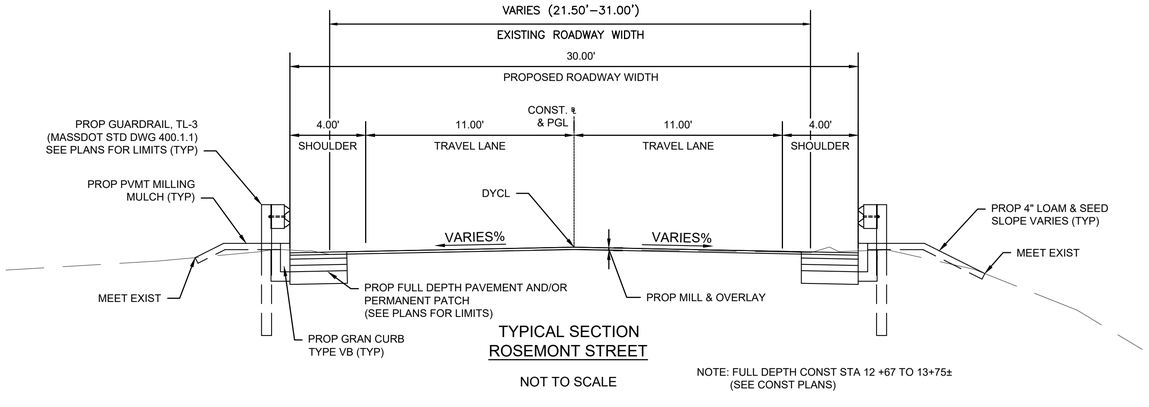
Plot Date: 2/19/2024 11:20 AM

Figure No. 2
Not to Scale

CONSTRUCTION DETAILS

O:\6100S\6155 - HAVERILL - ROSEMONT ST BRIDGE\DRAWING FILES\PLANSETHD\6155_GEN NOTES-DETAILS).DWG





TYPICAL SECTION
ROSEMONT STREET

NOT TO SCALE

NOTE: FULL DEPTH CONST STA 12 +67 TO 13+75± (SEE CONST PLANS)

NOTE:

1. THE COORDINATES, IN FEET, ARE BASED UPON MASSACHUSETTS STATE PLANE - MAINLAND ZONE NAD83 (2011) EPOCH 2010.00 - US FEET. THE VERTICAL DATUM IS REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (GEOID 12B) - US FEET.

PAVEMENT NOTES

FULL DEPTH PAVEMENT & BOX WIDENING >4' (PERMANENT PATCH)

SURFACE COURSE:	1-1/2" SUPERPAVE SURFACE COURSE - 12.5 (SSC-12.5) OVER ASPHALT EMULSION FOR TACK COAT (RS-1H) OVER
INTERMEDIATE COURSE:	2 1/2" SUPERPAVE INTERMEDIATE COURSE - 19.0 (SIC-19.0) OVER ASPHALT EMULSION FOR TACK COAT (RS-1H) OVER
BASE COURSE:	4" SUPERPAVE BASE COURSE - 37.5 (SBC-37.5) OVER
SUB-BASE:	4" DENSE GRADED CRUSHED STONE FOR SUB-BASE OVER 8" GRAVEL BORROW TYPE b FOR SUB-BASE OVER SUBGRADE

NOTE: SUBGRADE SHALL MEET STANDARD SPECIFICATIONS FOR HIGHWAY AND BRIDGES, SECTION 120,150 AND 170

PROP HMA BRIDGE WEARING COURSE

SURFACE COURSE:	1-1/2" SUPERPAVE BRIDGE SURFACE COURSE - 12.5 (SSC-B-12.5) OVER ASPHALT EMULSION FOR TACK COAT (RS-1H) OVER
INTERMEDIATE COURSE:	1-1/2" SUPERPAVE BRIDGE PROTECTIVE COURSE 12.5 (SPC-B-12.5) OVER SPRAY APPLIED MEMBRANE WATERPROOFING

PAVEMENT MILLING AND OVERLAY

SURFACE COURSE:	1-1/2" SUPERPAVE SURFACE COURSE - 12.5 (SSC-12.5) ASPHALT EMULSION FOR TACK COAT (RS-1H) OVER
PAVEMENT MILLING:	1-1/2" PAVEMENT MICROMILLING

HMA DRIVEWAYS AND HMA DRIVEWAY PATCH

SURFACE:	1-1/2" SUPERPAVE SURFACE COURSE 9.5 (SSC-9.5) OVER 2-1/2" SUPERPAVE INTERMEDIATE COURSE 12.5 (SIC-12.5) OVER
FOUNDATION:	8" GRAVEL BORROW, TYPE b

PAVEMENT NOTES

1. ALL HMA FOR PATCHING. ASPHALT EMULSION FOR TACK COAT AND HMA JOINT SEALANT SHALL BE INSTALLED PER SECTION 450.

ROSEMONT STREET CONSTRUCTION BASELINE DATA

NUMBER	STARTING STATION	NORTHING	EASTING	CURVE DATA	LINE DATA	ENDING STATION	NORTHING	EASTING
L1	10+00.00	3118537.5041	761020.4655		N42°17'12"E 188.75'	11+88.75	3118677.1428	761147.4670
L2	11+88.75	3118677.1428	761147.4670		N42°52'57"E 186.20'	13+74.95	3118813.5810	761274.1756
C2	13+74.95	3118813.5810	761274.1756	R=1300.00' Δ=2°25'37" L=55.06' T=27.54'		14+30.02	3118853.1239	761312.4900
C3	14+30.02	3118853.1239	761312.4900	R=1300.00' Δ=2°25'37" L=55.06' T=27.54'		14+85.08	3118891.0089	761352.4444
C4	14+85.08	3118891.0089	761352.4444	R=280.00' Δ=37°43'22" L=184.35' T=95.65'		16+69.43	3118962.9140	761518.5890

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ROSEMONT STREET BRIDGE

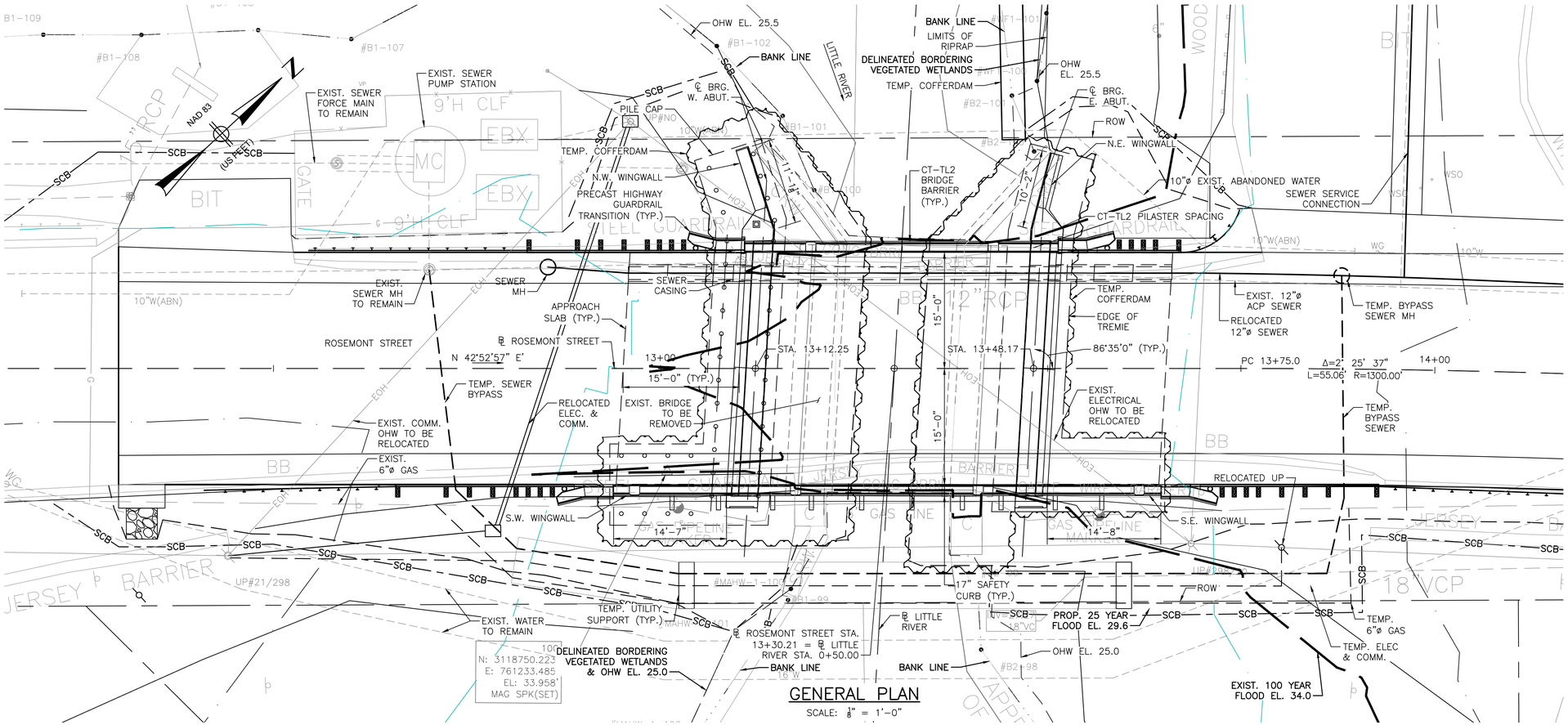
Haverhill, Massachusetts

Plot Date: 2/19/2024 11:22 AM

Figure No. 3
Scale: 1" = 20'

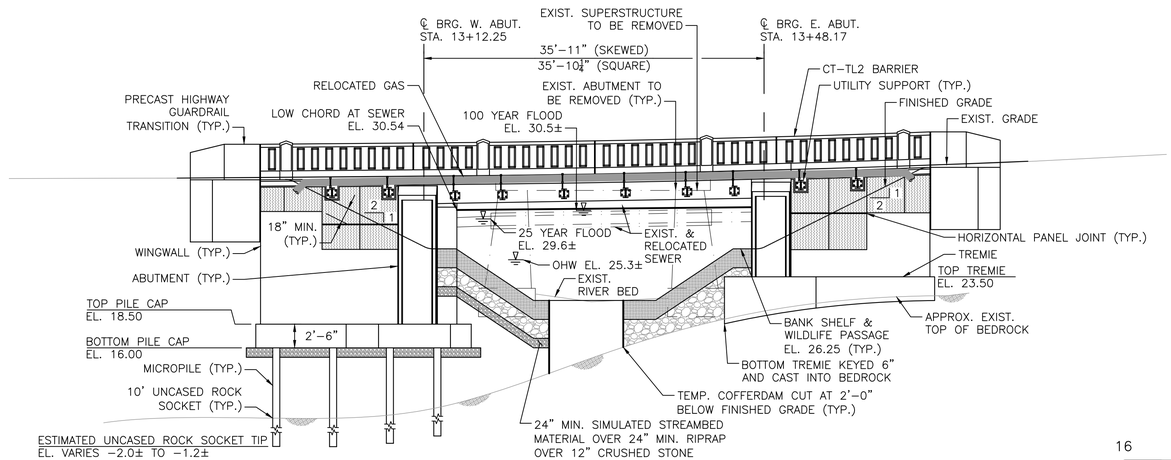
CONSTRUCTION PLAN & TYPICAL SECTION

O:\6100S\6155 - HAVERILL - ROSEMONT ST BRIDGE\DRAWING FILES\PLANSET\ENVIRONMENTAL PERMITTING\EV(CONSTPLANSEC).DWG



GENERAL PLAN

SCALE: 1/8" = 1'-0"



GENERAL ELEVATION

SCALE: 1/8" = 1'-0"

PLAN SCALE IN FEET

16 8 0 16 32

NOTES:

1. THE COORDINATES, IN FEET, ARE BASED UPON MASSACHUSETTS STATE PLANE – MAINLAND ZONE NAD83 (2011) EPOCH 2010.00 – US FEET. THE VERTICAL DATUM IS REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (GEOID 12B) – US FEET.

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ROSEMONT STREET BRIDGE

Haverhill, Massachusetts

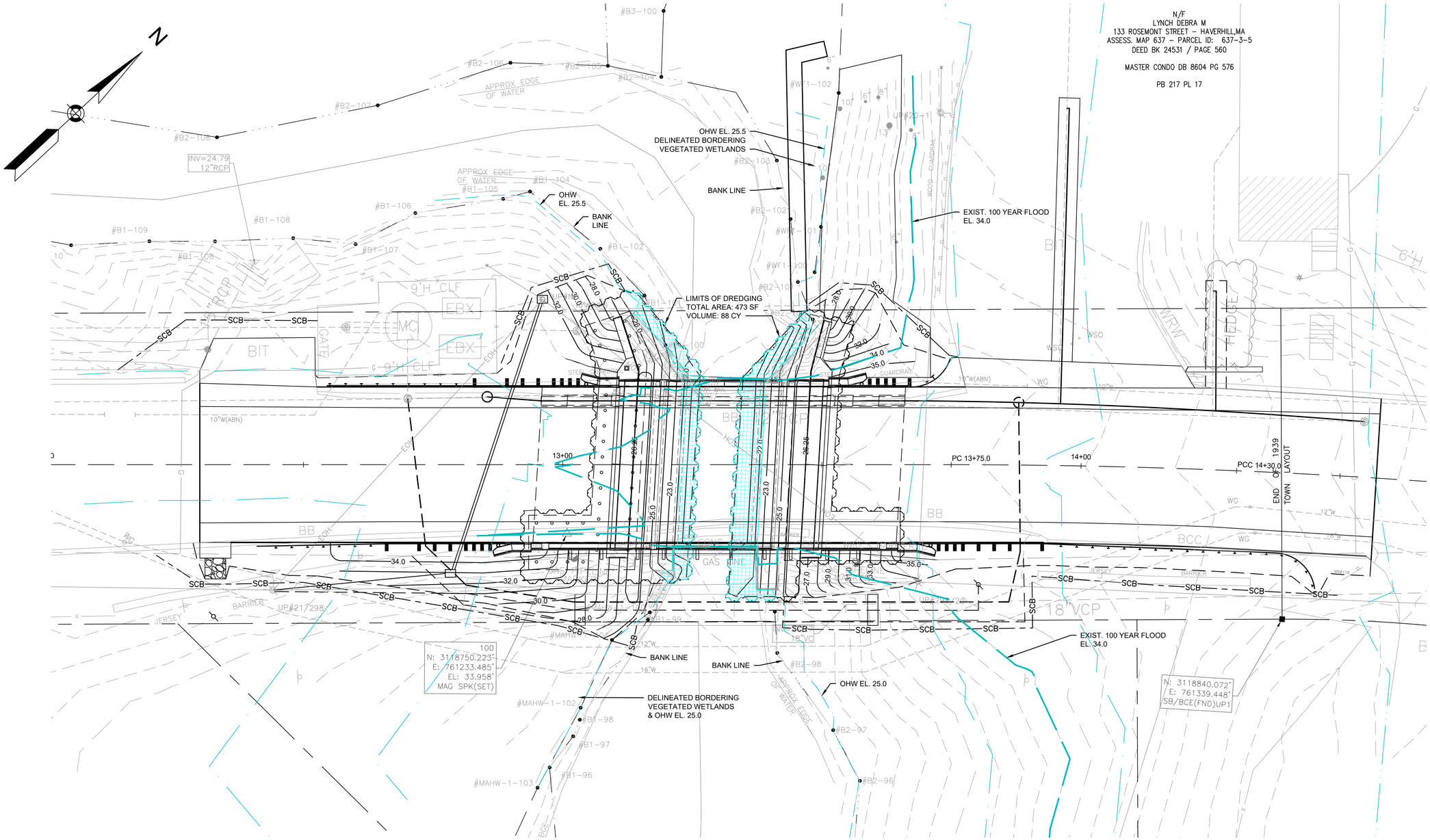
Plot Date: 2/19/2024 11:23 AM

Figure No. 4

Scale: 1/8" = 1'-0"

BRIDGE GENERAL PLAN & ELEVATION

O:\6100S\6155 - HAVERILL - ROSEMONT ST BRIDGE\DRAWING FILES\PLANSET\ENVIRONMENTAL PERMITTING\EV(GENPLANELEV).DWG



NOTE:

1. THE COORDINATES, IN FEET, ARE BASED UPON MASSACHUSETTS STATE PLANE - MAINLAND ZONE NAD83 (2011) EPOCH 2010.00 - US FEET. THE VERTICAL DATUM IS REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (GEOID 12B) - US FEET.

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ROSEMONT STREET BRIDGE

Haverhill, Massachusetts

Plot Date: 2/19/2024 11:24 AM

Figure No. 5
Scale: 1" = 10'

DREDGING LIMITS

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IMPACT LEGEND AND SUMMARY			
		QUANTITY	UNITS
	TEMPORARY BANK IMPACT	41	LF
	PERMANENT BANK IMPACT	129	LF
	BANK RESTORATION	119	LF
	WILDLIFE PASSAGE	296	SF
	TEMPORARY WETLAND IMPACT	347	SF
	TEMPORARY LAND UNDER WATER IMPACT	309	SF
	LAND UNDER WATER RESTORATION	593	SF
	TEMPORARY RIVERFRONT IMPACT	5223	SF
	REDEVELOPMENT AREA	6493	SF

N/F
LYNCH DEBRA M
133 ROSEMONT STREET – HAVERHILL,MA
ASSESS. MAP 637 – PARCEL ID: 637-3-5
DEED BK 24531 / PAGE 560

MASTER CONDO DB 8604 PG 576

PB 217 PL 17

EXIST. TREE TO BE REMOVED (TYP.)
TEMP COFFERDAM
OHW EL. 25.5
DELINEATED BORDERING VEGETATED WETLANDS
TEMPORARY WETLAND IMPACT AREA: 347 SF
BANK LINE
LIMITS OF RIPRAP
TEMPORARY RIVERFRONT IMPACT AREA: 3072 SF
EXIST. 100 YEAR FLOOD EL. 34.0
NHESP ESTIMATED AND PRIORITY HABITAT BOUNDARY
OHW EL. 25.5
BANK LINE
TEMP COFFERDAM (TYP.)
TEMPORARY BANK IMPACT 12 LF
TEMPORARY BANK IMPACT 29 LF
WILDLIFE PASSAGE AREA: 158 SF
TEMPORARY LUW IMPACT AREA: 169 SF
TEMPORARY LUW IMPACT AREA: 140 SF
TEMPORARY RIVERFRONT IMPACT AREA: 2151 SF
REDEVELOPMENT AREA: 2709 SF
WILDLIFE PASSAGE AREA: 138 SF
REDEVELOPMENT AREA: 3784 SF
BANK RESTORATION 59 LF
PERMANENT BANK IMPACT 65 LF
BANK RESTORATION 60 LF
PERMANENT BANK IMPACT 64 LF
LUW RESTORATION AREA: 309 SF
LUW RESTORATION AREA: 284 SF
50' NO-BUILD ZONE
25' NO-BUILD NO-DISTURBANCE ZONE
25' NO-BUILD NO-DISTURBANCE ZONE
50' NO-BUILD ZONE
100' BANK BUFFER/100' RIVERFRONT AREA
PROPERTY LINE OR ROW (TYP.)
PROP GRADING (TYP.)
BANK LINE
DELINEATED BORDERING VEGETATED WETLANDS & OHW EL. 25.0
BANK LINE
OHW EL. 25.0
TEMP UTILITY BRIDGE
EXIST. 100 YEAR FLOOD EL. 34.0
LITTLE RIVER
APPROX EDGE OF WATER
PCC 13+75.0
PCC 14+30.0
END OF 1939 TOWN LAYOUT
18"VCP
GAS LINE

NOTES:

1. THE COORDINATES, IN FEET, ARE BASED UPON MASSACHUSETTS STATE PLANE - MAINLAND ZONE NAD83 (2011) EPOCH 2010.00 - US FEET. THE VERTICAL DATUM IS REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (GEOID 12B) - US FEET.
2. ALL WORK WITHIN THE RIVERFRONT AREA IS WITHIN THE INNER 100' RIPARIAN ZONE.

PLAN SCALE IN FEET
20 10 0 20 40

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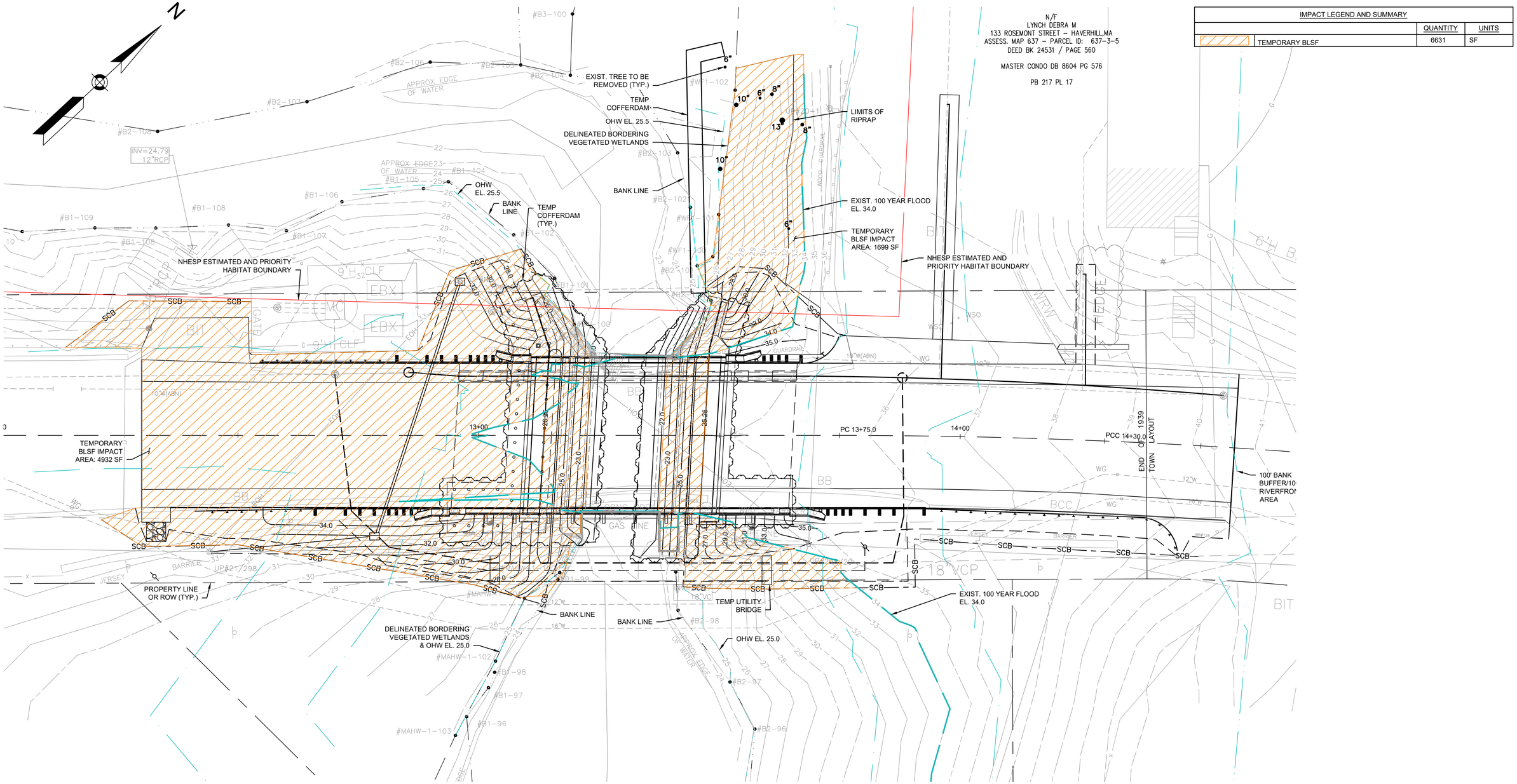
ROSEMONT STREET BRIDGE
Haverhill, Massachusetts

Plot Date: 2/19/2024 11:24 AM

Figure No. 6
Scale: 1" = 10'
IMPACTS PLAN



NOTES:

1. THE COORDINATES, IN FEET, ARE BASED UPON MASSACHUSETTS STATE PLANE - MAINLAND ZONE NAD83 (2011) EPOCH 2010.00 - US FEET. THE VERTICAL DATUM IS REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (GEOID 12B) - US FEET.
2. ALL WORK WITHIN THE RIVERFRONT AREA IS WITHIN THE INNER 100' RIPARIAN ZONE.

PLAN SCALE IN FEET

20 10 0 20 40

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ROSEMONT STREET BRIDGE

Haverhill, Massachusetts

Plot Date: 2/19/2024 11:24 AM

Figure No. 7
Scale: 1" = 10'

BORDERING LANDS SUBJECT TO FLOODING PLAN

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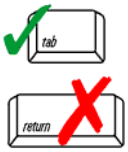
APPENDIX D – Stormwater Checklist Narrative

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

A. Introduction

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the Massachusetts Stormwater Handbook. The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.[1] This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8[2]
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

[1] The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

[2] For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature

02/05/24

Signature and Date

Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

☐ New development

☒ Redevelopment

☐ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

- ☐ No disturbance to any Wetland Resource Areas
- ☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)
- ☐ Reduced Impervious Area (Redevelopment Only)
- ☒ Minimizing disturbance to existing trees and shrubs
- ☐ LID Site Design Credit Requested:
  - ☐ Credit 1
  - ☐ Credit 2
  - ☐ Credit 3
- ☐ Use of “country drainage” versus curb and gutter conveyance and pipe
- ☐ Bioretention Cells (includes Rain Gardens)
- ☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)
- ☐ Treebox Filter
- ☐ Water Quality Swale
- ☐ Grass Channel
- ☐ Green Roof
- ☐ Other (describe): _____

Standard 1: No New Untreated Discharges

- ☒ No new untreated discharges
- ☐ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth
- ☐ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.

☐ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.

☐ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

☐ Soil Analysis provided.

☐ Required Recharge Volume calculation provided.

☐ Required Recharge volume reduced through use of the LID site Design Credits.

☐ Sizing the infiltration, BMPs is based on the following method: Check the method used.

☐ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

☐ Runoff from all impervious areas at the site discharging to the infiltration BMP.

☐ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:

☒ Site is comprised solely of C and D soils and/or bedrock at the land surface

☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000

☐ Solid Waste Landfill pursuant to 310 CMR 19.000

☒ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

☐ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.

☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

[1] 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

☐ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.

☐ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
- Provisions for storing materials and waste products inside or under cover;
- Vehicle washing controls;
- Requirements for routine inspections and maintenance of stormwater BMPs;
- Spill prevention and response plans;
- Provisions for maintenance of lawns, gardens, and other landscaped areas;
- Requirements for storage and use of fertilizers, herbicides, and pesticides;
- Pet waste management provisions;
- Provisions for operation and management of septic systems;
- Provisions for solid waste management;
- Snow disposal and plowing plans relative to Wetland Resource Areas;
- Winter Road Salt and/or Sand Use and Storage restrictions;
- Street sweeping schedules;
- Provisions for prevention of illicit discharges to the stormwater management system;
- Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
- Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
- List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.

☐ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.

☐ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:

- ☐ is within the Zone II or Interim Wellhead Protection Area
- ☐ is near or to other critical areas
- ☐ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
- ☐ involves runoff from land uses with higher potential pollutant loads.

☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.

☐ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

☐ The BMP is sized (and calculations provided) based on:

- ☐ The ½" or 1" Water Quality Volume or
- ☐ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.

☐ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.

☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.

☐ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted ***prior to*** the discharge of stormwater to the post-construction stormwater BMPs.

☐ The NPDES Multi-Sector General Permit does ***not*** cover the land use.

☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.

☐ All exposure has been eliminated.

☐ All exposure has ***not*** been eliminated and all BMPs selected are on MassDEP LUHPPL list.

☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

☐ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.

☐ Critical areas and BMPs are identified in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

☒ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:

- ☒ Limited Project
- ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
- ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
- ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
- ☐ Bike Path and/or Foot Path
- ☒ Redevelopment Project
- ☐ Redevelopment portion of mix of new and redevelopment.

☒ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.

☐ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
- Construction Period Operation and Maintenance Plan;
- Names of Persons or Entity Responsible for Plan Compliance;
- Construction Period Pollution Prevention Measures;
- Erosion and Sedimentation Control Plan Drawings;
- Detail drawings and specifications for erosion control BMPs, including sizing calculations;
- Vegetation Planning;
- Site Development Plan;
- Construction Sequencing Plan;
- Sequencing of Erosion and Sedimentation Controls;
- Operation and Maintenance of Erosion and Sedimentation Controls;
- Inspection Schedule;
- Maintenance Schedule;
- Inspection and Maintenance Log Form.

☐ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has ***not*** been included in the Stormwater Report but will be submitted ***before*** land disturbance begins.

☒ The project is ***not*** covered by a NPDES Construction General Permit.

☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.

☐ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

☐ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:

- ☐ Name of the stormwater management system owners;
- ☐ Party responsible for operation and maintenance;
- ☐ Schedule for implementation of routine and non-routine maintenance tasks;
- ☐ Plan showing the location of all stormwater BMPs maintenance access areas;
- ☐ Description and delineation of public safety features;
- ☐ Estimated operation and maintenance budget; and
- ☐ Operation and Maintenance Log Form.

☐ The responsible party is ***not*** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:

- ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
- ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

☐ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☒ An Illicit Discharge Compliance Statement is attached;

☐ NO Illicit Discharge Compliance Statement is attached but will be submitted ***prior to*** the discharge of any stormwater to post-construction BMPs.

STORMWATER MANAGEMENT CHECKLIST NARRATIVE
ROSEMONT STREET BRIDGE REPLACEMENT HAVERHILL, MA

This narrative is prepared for the replacement of the Rosemont Street Bridge (Bridge No. H-12-024) over Little River in Haverhill, Massachusetts, conducted in accordance with the City's Municipal Small Bridge Program Application and MassDOT requirements. The existing bridge is in poor condition and the proposed structure will address safety and operational deficiencies of the current bridge. The overall Project limits include the Rosemont Street Bridge as well as Rosemont Street from approximately 100' south of the bridge centerline to approximately 125' north of the bridge centerline (the "Project").

The following is a narrative outlining the Stormwater Management Standards and their relation to the proposed Project. The Project is considered a Redevelopment Project under the Massachusetts Stormwater Management Standards per the definition at 310 CMR 10.04 under the following category: *Maintenance and improvement of existing roadways, including widening less than a single lane, adding shoulders, correcting substandard intersections, improving existing drainage systems and repaving."*

LID Measures:

Low Impact Development (LID) techniques utilized along portions of the project consist of minimizing disturbance to existing trees and shrubs.

Standard 1: No New Untreated Discharges

No new discharges to Wetland Resource Areas are proposed as part of the project and existing drainage patterns will be maintained. A paved waterway with rip rap scour protection will be added at the low point on the south side of the roadway where stormwater runoff is currently discharged – **complies with Standard.**

Standard 2: Peak Rate Attenuation

This project includes a minor net increase in impervious surface (600± sq. ft.) and will not have a significant impact to the volume and rate of stormwater runoff from the project area. The project is limited by right-of-way constraints, private features in proximity to the project roadways, wetland resource areas, areas of steep topography, the presence of utilities, and the anticipation of soils with poor infiltrative capacity. As such, opportunities to attenuate peak discharge rates and runoff volume are limited. No adverse impacts to the surrounding area or capacity of the existing closed drainage system are anticipated – **project complies to the maximum extent practicable.**

Standard 3: Recharge

As noted in Standard 2, there are only minor increases to impervious area proposed as part of the project and there are several constraints that severely limit the opportunity for additional stormwater improvements. Soils in the project area are mapped in Hydrologic Soil Group (HSG) C and B/D and are not anticipated to be well suited for infiltration. As noted in the Stormwater Management Standards, where sites are comprised of HSG C and D soils, proponents are only required to infiltrate to the maximum extent practicable. Stormwater runoff from the south side of the roadway will be directed overland into a wooded area where slopes are generally mild, which will provide some recharge – **project complies to the maximum extent practicable.**

Standard 4: Water Quality

As noted in Standard 2, there are only minor increases to impervious proposed as part of the project and there are several constraints that severely limit the opportunity for additional stormwater improvements. Stormwater flows from the south side of the roadway will be directed overland into a wooded area where slopes are generally mild, which will provide some pollutant removal via pavement disconnection – **project complies to the maximum extent practicable.**

Standard 5: Land Uses with Higher Potential Pollutant Loads (LUHPPLs)

The Project does not propose Land Uses with Higher Potential Pollutant Loads – **Standard not applicable.**

Standard 6: Critical Areas

The project will not include discharges to any critical areas – **Standard not applicable**.

Standard 7: Redevelopment

The project is classified as a redevelopment under the first definition "*Maintenance and improvement of existing roadways, including widening less than a single lane, adding shoulders, correcting substandard intersections, improving existing drainage systems and repaving."* Standards 1, 8, 9, and 10 are met and Standards 2, 3, and 4 are met to the maximum extent practicable. Standards 5 and 6 are not applicable to this project.

Standard 8: Construction Period Pollution Prevention and Erosion and Sediment Control

The project will not disturb greater than one acre; therefore, filing a Notice of Intent with EPA and developing a Stormwater Pollution Prevention Plan (SWPPP) is not required. The Project will provide erosion and sedimentation controls as shown on the Project Plans, which will be maintained in good working order until stabilization at the Site is achieved. Erosion and sedimentation control measures are also summarized in the attached Notice of Intent – **complies with Standard.**

Standard 9: Long Term Operation and Maintenance Plan

Drainage infrastructure within the project limits consists of a single existing catch basin and a proposed paved waterway with rip-rap outlet protection. These features will be maintained in in accordance with standard operations of the Department of Public Works – **complies with Standard.**

Standard 10: Prohibition of Illicit Discharges

There are currently no known illicit discharges within the project limits and new illicit discharges are prohibited – **complies with Standard.**