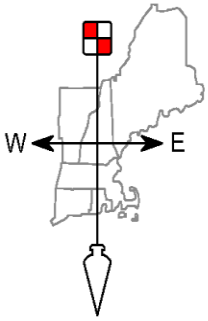
MADEP Notice of Intent Application

MassDOT Bridge #M-28-030 (C6N)
Chestnut Hill Loop Road
Montague, MA

Prepared for:
Stantec Consulting Services Inc.
5 Dartmouth Drive, Suite 101
Auburn, NH 03032

June 2020

Surveying ⌖ Engineering ⌖ Land Planning ⌖ Permitting ⌖ Septic Designs



FIELDSTONE
LAND CONSULTANTS, PLLC

206 Elm Street, Milford NH 03055
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June 1, 2020

Massachusetts Department of Environmental Protection
Western Regional Office
State House West, 4th Floor
436 Dwight Street
Springfield, MA 01103

RE: Project Narrative (WPA Form 3 – Notice of Intent)
Massachusetts Wetlands Protection Act M.G.l. c. 131, section 40
MassDOT Bridge #M-28-030 (C6N)
Chestnut Hill Loop Road
Montague, MA 01351

The project proposes the replacement of an existing bridge crossing where Chestnut Hill Brook passes under Chestnut Hill Loop Road in the Town of Montague, Massachusetts. The crossing is approximately 200-feet (ft.) east of the intersection of Chestnut Hill Loop Road, Chestnut Hill Road West, and Chestnut Hill Road East. The existing crossing is a cast in place concrete deck structure set on rubble rock that is approximately 18-ft long with no headwalls and has a clear span of roughly 10-ft. The width of the roadway over Chestnut Hill Brook is 16-ft, and the open area of the stream crossing is 42 square feet (sq ft), more or less. The existing concrete slab rubble and mortar rock abutments are collapsing on the westerly side of the crossing.

Chestnut Hill Loop Road is a Town of Montague-maintained rural road with light to moderate traffic. Chestnut Hill Loop Road is classified as a rural local road or rural collector, based on MassDOT criteria. The existing land uses in the vicinity of Chestnut Hill Loop Road are primarily undeveloped forested areas and residential homes. According to USGS StreamStats, Chestnut Hill Brook has a tributary watershed area of approximately 0.94 square miles (601.6 acres). Downstream of Chestnut Hill Loop Road crossing, Chestnut Hill Brook discharges into minor waterbodies until it reaches the Connecticut River. There is a severe stream channel radial curve at the inlet and outlet of the existing crossing which is the result of rerouting the stream channel during construction of the original crossing. The stream bed/substrate is generally natural material with well-graded gravel and sand. The stream channel is gentle sloping at approximately 1%, with flat areas and ponding locations observed.

The proposed structure for the crossing is a single span 3-sided rigid frame structure with a proposed span of 12-feet and a length of 26-feet between the inlet and outlet of the bridge. The low chord height of the replacement single span precast concrete stream crossing is approximately 4.3-feet above the average riverbed bottom and has an open area of nearly 50 sq ft. A 12-ft span is proposed in order to operate within existing right-of-way constraints, reduce impact to the abutting property owner and to accommodate local budgetary constraints. An alternative analysis spreadsheet accompanies this application and addresses multiple criteria for the replacement stream crossing.

The widening of the bridge and installation of stream channel armoring. The proposed bridge opening will convey approximately 522 cubic feet per second (CFS) and will result in a more continuous laminar stormwater flow, reducing the upstream 100-Year storm event and mitigates downstream erosion. The project also proposes armament of the stream bank along the severe radial curve to minimize erosional and sedimentation hazards. The open-bottom/natural substrate associated with the crossing will improve terrestrial passage for low-flow aquatic organisms and improve connectivity between the upstream and downstream habitats. Bridge replacement is necessary to rectify existing unsafe structural conditions and will incorporate improved crossing with wildlife enhancement features in design and construction.

Resource delineation was done in accordance with Massachusetts Wetland Protection Act and US Army Corps of Engineers Wetland Delineation Manual 1987 and applicable regional supplements. BVW was delineated primarily with vegetation alone, however, given the proximity to perennial stream there were other factors present such as flood scour marks and drift lines, top of bank area and soils that were incorporated and supported the delineation.

Sincerely,

Christopher A. Guida. CSS, CWS
Certified Soil & Wetland Scientist

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

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

Provided by MassDEP:

MassDEP File Number

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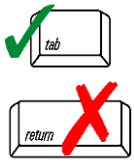
Montague
City/Town

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):

Chestnut Hill Loop Road — a. Street Address
Montague — b. City/Town
01351 — c. Zip Code

Latitude and Longitude:
42.52189 N — d. Latitude
72.47784 W — e. Longitude

f. Assessors Map/Plat Number
g. Parcel /Lot Number

2. Applicant:

Walter — a. First Name
Ramsey — b. Last Name
Town of Montague — c. Organization
1 Avenue A — d. Street Address
Turners Falls — e. City/Town
MA — f. State
01376 — g. Zip Code
413-863-3200 — h. Phone Number
i. Fax Number
j. Email Address

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

a. First Name
b. Last Name
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):

Christopher — a. First Name
Guida — b. Last Name
Fieldstone Land Consultants, PLLC — c. Company
206 Elm Street — d. Street Address
Milford — e. City/Town
NH — f. State
03055 — g. Zip Code
(603) 672-5456 — h. Phone Number
(603) 413-5456 — i. Fax Number
CAGuida@FieldstoneLandConsultants.com — j. Email address

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

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

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A. General Information (continued)

6. General Project Description:

Replacement of 3 sided culvert along Chestnut Hill Loop Road

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)

K. Routine maintenance and repair of road drainage structures including culverts

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:

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	140 (1. linear feet)	95 (2. linear feet)
b. ☒ Bordering Vegetated Wetland	6,920 (1. square feet)	3575 (2. square feet)
c. ☒ Land Under Waterbodies and Waterways	2,818 (1. square feet)	2,330 (2. square feet)
	(3. cubic yards dredged)	

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
d. ☐ Bordering Land Subject to Flooding	(1. square feet)	(2. square feet)
	(3. cubic feet of flood storage lost)	(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	Chestnut Hill Brook (inland) (1. Name of Waterway (if available) - **specify coastal or inland**)	

2. Width of Riverfront Area (check one):

☐ 25 ft. - Designated Densely Developed Areas only

☐ 100 ft. - New agricultural projects only

☒ 200 ft. - All other projects

3. Total area of Riverfront Area on the site of the proposed project: 10,355 square feet

4. Proposed alteration of the Riverfront Area:

a. total square feet	b. square feet within 100 ft.	c. square feet between 100 ft. and 200 ft.
10,355	10,355	0

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

0
a. number of new stream crossings

1
b. number of replacement stream crossings

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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

   3/26/20
   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 _____ percentage/acreage

         (b) outside 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

* Some projects **not** in Estimated Habitat may be located in Priority Habitat, and require NHESP review (see http://www.mass.gov/eea/agencies/dfg/dfw/natural-heritage/regulatory-review/). Priority Habitat includes habitat for state-listed plants and strictly upland species not protected by the Wetlands Protection Act.

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

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

(c) ☐ MESA filing fee (fee information available at http://www.mass.gov/dfwele/dfw/nhesp/regulatory_review/mesa/mesa_fee_schedule.htm). 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, http://www.mass.gov/dfwele/dfw/nhesp/regulatory_review/mesa/mesa_exemptions.htm; 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 - Cohasset 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@state.ma.us

North Shore - Hull to New Hampshire border:

Division of Marine Fisheries -
North Shore Office
Attn: Environmental Reviewer
30 Emerson Avenue
Gloucester, MA 01930
Email: DMF.EnvReview-North@state.ma.us

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.

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

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

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

b. ACEC

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

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.

STREAM DIVERSION AND EROSION CONTROL PLAN
a. Plan Title

Stantec
b. Prepared By

Brian Ruoff, P.E.
c. Signed and Stamped by

3/24/20
d. Final Revision Date

1" = 20'
e. Scale

Part of entire Bridge Replacement Plan Set
f. Additional Plan or Document Title

3/24/20
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
3. Signature of Property Owner (if different)	4. Date
5. Signature of Representative (if any)	6. Date 6/1/20

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.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

NOI Wetland Fee Transmittal Form

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

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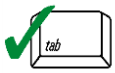

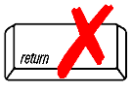

A. Applicant Information

1. Location of Project:

a. Street Address	b. City/Town
Chestnut Hill Loop Road	Montague
c. Check number	**d. Fee amount**
N/A	0.00

2. Applicant Mailing Address:

a. First Name	b. Last Name
Walter	Ramsey

c. Organization: Town of Montague

d. Mailing Address: 1 Avenue A

e. City/Town	f. State	g. Zip Code
Turners Falls	MA	01376

h. Phone Number	i. Fax Number	j. Email Address
413-863-3200		planner@montague-ma.gov

3. Property Owner (if different):

a. First Name	b. Last Name

c. Organization

d. Mailing Address

e. City/Town	f. State	g. Zip Code

h. Phone Number	i. Fax Number	j. Email Address

B. Fees

To calculate filing fees, refer to the category fee list and examples in the instructions for filling out WPA Form 3 (Notice of Intent).

Fee should be calculated using the following process & worksheet. ***Please see Instructions before filling out worksheet.***

Step 1/Type of Activity: Describe each type of activity that will occur in wetland resource area and buffer zone.

Step 2/Number of Activities: Identify the number of each type of activity.

Step 3/Individual Activity Fee: Identify each activity fee from the six project categories listed in the instructions.

Step 4/Subtotal Activity Fee: Multiply the number of activities (identified in Step 2) times the fee per category (identified in Step 3) to reach a subtotal fee amount. Note: If any of these activities are in a Riverfront Area in addition to another Resource Area or the Buffer Zone, the fee per activity should be multiplied by 1.5 and then added to the subtotal amount.

Step 5/Total Project Fee: Determine the total project fee by adding the subtotal amounts from Step 4.

Step 6/Fee Payments: To calculate the state share of the fee, divide the total fee in half and subtract $12.50. To calculate the city/town share of the fee, divide the total fee in half and add $12.50.

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Bureau of Resource Protection - Wetlands

NOI Wetland Fee Transmittal Form

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

B. Fees (continued)

Step 1/Type of Activity	Step 2/Number of Activities	Step 3/Individual Activity Fee	Step 4/Subtotal Activity Fee
Category 4 - f) Bridge	1	0.00	0.00

Step 5/Total Project Fee: 0.00

Step 6/Fee Payments:

Total Project Fee:	0.00 (a. Total Fee from Step 5)
State share of filing Fee:	0.00 (b. 1/2 Total Fee **less $**12.50)
City/Town share of filling Fee:	0.00 (c. 1/2 Total Fee **plus** $12.50)

C. Submittal Requirements

a.) Complete pages 1 and 2 and send with a check or money order for the state share of the fee, payable to the Commonwealth of Massachusetts.

Department of Environmental Protection
Box 4062
Boston, MA 02211

b.) **To the Conservation Commission:** Send the Notice of Intent or Abbreviated Notice of Intent; a **copy** of this form; and the city/town fee payment.

To MassDEP Regional Office (see Instructions): Send a copy of the Notice of Intent or Abbreviated Notice of Intent; a **copy** of this form; and a **copy** of the state fee payment. (E-filers of Notices of Intent may submit these electronically.)

MONTAGUE BOARD OF ASSESSORS
ONE AVENUE A, TURNERS FALLS, MA 01376
413-863-3200 X214
Fax 413-863-3228

Paul J. Emery, Chairman
Teresa A. Miner
Ann M. Cenzano

Karen M. Tonelli
Director of Assessing

Certification of Abutters List

TO: Christopher Guida – FieldStone Land Consultants

Date: May 7, 2020

Owner: town road

RE: Subject Parcel(s): Town Road – Chestnut Hill Loop Road Montague MA
Subject Address:

I hereby certify that the attached list reflects the names and addresses of abutters within 100' of the subject parcel(s) based upon the current assessment data to the best of my knowledge.

Parcel ID	Name	Mail Address
53-0-032	Layla Hazen & Christopher Trevethan	102 East Chestnut Hill Rd Montague MA 01351
53-0-033	Amy Bauman 2007 Trust c/o Amy Bauman, Glenn Hinson	113 East Main St Durham NC 27701
53-0-058	Patrick & Anne Williamson	P.O.Box 71 Plainfield MA 01070
53-0-030	Mark & Karen Mariani	91 East Chestnut Road Montague MA 01351

Karen M. Tonelli, M.A.A.
Director of Assessing

FIELDSTONE
LAND CONSULTANTS, PLLC
Surveying ⌖ Engineering
Land Planning ⌖ Septic Designs
206 Elm Street, Milford, NH 03055 - Phone: 603-672-5456 - Fax: 603-413-5456
www.FieldstoneLandConsultants.com

May 13, 2020

RE: NOI Hearing Notice for Town of Montague

To Whom It May Concern,

Pursuant to MGL Chapter 131, section 40, the Montague Conservation Commission will hold a **public hearing** at 630 pm on June 11, 2020 to review the **Notice of Intent** from Town of Montague for the replacement of an existing bridge on Chestnut Hill Loop Road.

Please contact me if you should have any questions at 603-672-5456.

Thank you,

Christopher A. Guida, C.W.S., C.S.S
Wetland & Soil Scientist/Principal

2300.00

7018 2290 0000 3287 1312

U.S. Postal Service™
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For delivery information, visit our website at *www.usps.com®*.
MONTAGUE, MA 01351

OFFICIAL USE

Certified Mail Fee	$3.55
Extra Services & Fees (check box, add fee as appropriate)	$2.85
☒ Return Receipt (hardcopy)	$0.00
☐ Return Receipt (electronic)	$0.00
☐ Certified Mail Restricted Delivery	$0.00
☐ Adult Signature Required	$0.00
☐ Adult Signature Restricted Delivery	$
Postage	$0.55
Total Postage and Fees	$6.95

0055 98

Postmark Here
MAY 14 2020
05/14/2020

Sent To: Mack + Karen Mariani
Street and Apt. No., or PO Box No.: 91 East Chestnut Road
City, State, ZIP+4®: Montague MA 01351

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

7018 2290 0000 3284 8956

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PLAINFIELD, MA 01070

OFFICIAL USE

Certified Mail Fee	$3.55
Extra Services & Fees (check box, add fee as appropriate)	$2.85
☒ Return Receipt (hardcopy)	$0.00
☐ Return Receipt (electronic)	$0.00
☐ Certified Mail Restricted Delivery	$0.00
☐ Adult Signature Required	$0.00
☐ Adult Signature Restricted Delivery	$
Postage	$0.55
Total Postage and Fees	$6.95

0055 98

Postmark Here
MAY 14 2020
05/14/2020

Sent To: Patrick + Anne Williamson
Street and Apt. No., or PO Box No.: PO Box 71
City, State, ZIP+4®: Plainfield MA 01070

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

7018 2290 0000 3287 1305

U.S. Postal Service™
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For delivery information, visit our website at *www.usps.com®*.
DURHAM, NC 27701

OFFICIAL USE

Certified Mail Fee	$3.55
Extra Services & Fees (check box, add fee as appropriate)	$2.85
☒ Return Receipt (hardcopy)	$0.00
☐ Return Receipt (electronic)	$0.00
☐ Certified Mail Restricted Delivery	$0.00
☐ Adult Signature Required	$0.00
☐ Adult Signature Restricted Delivery	$
Postage	$0.55
Total Postage and Fees	$6.95

0055 98

Postmark Here
MAY 14 2020
05/14/2020

Sent To: Amy Bauman 2007 Trust
Street and Apt. No., or PO Box No.: 113 East Main St
City, State, ZIP+4®: Durham NC 27701

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

7018 2290 0000 3284 8949

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CERTIFIED MAIL® RECEIPT
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For delivery information, visit our website at *www.usps.com®*.
MONTAGUE, MA 01351

OFFICIAL USE

Certified Mail Fee	$3.55
Extra Services & Fees (check box, add fee as appropriate)	$2.85
☒ Return Receipt (hardcopy)	$0.00
☐ Return Receipt (electronic)	$0.00
☐ Certified Mail Restricted Delivery	$0.00
☐ Adult Signature Required	$0.00
☐ Adult Signature Restricted Delivery	$
Postage	$0.55
Total Postage and Fees	$6.95

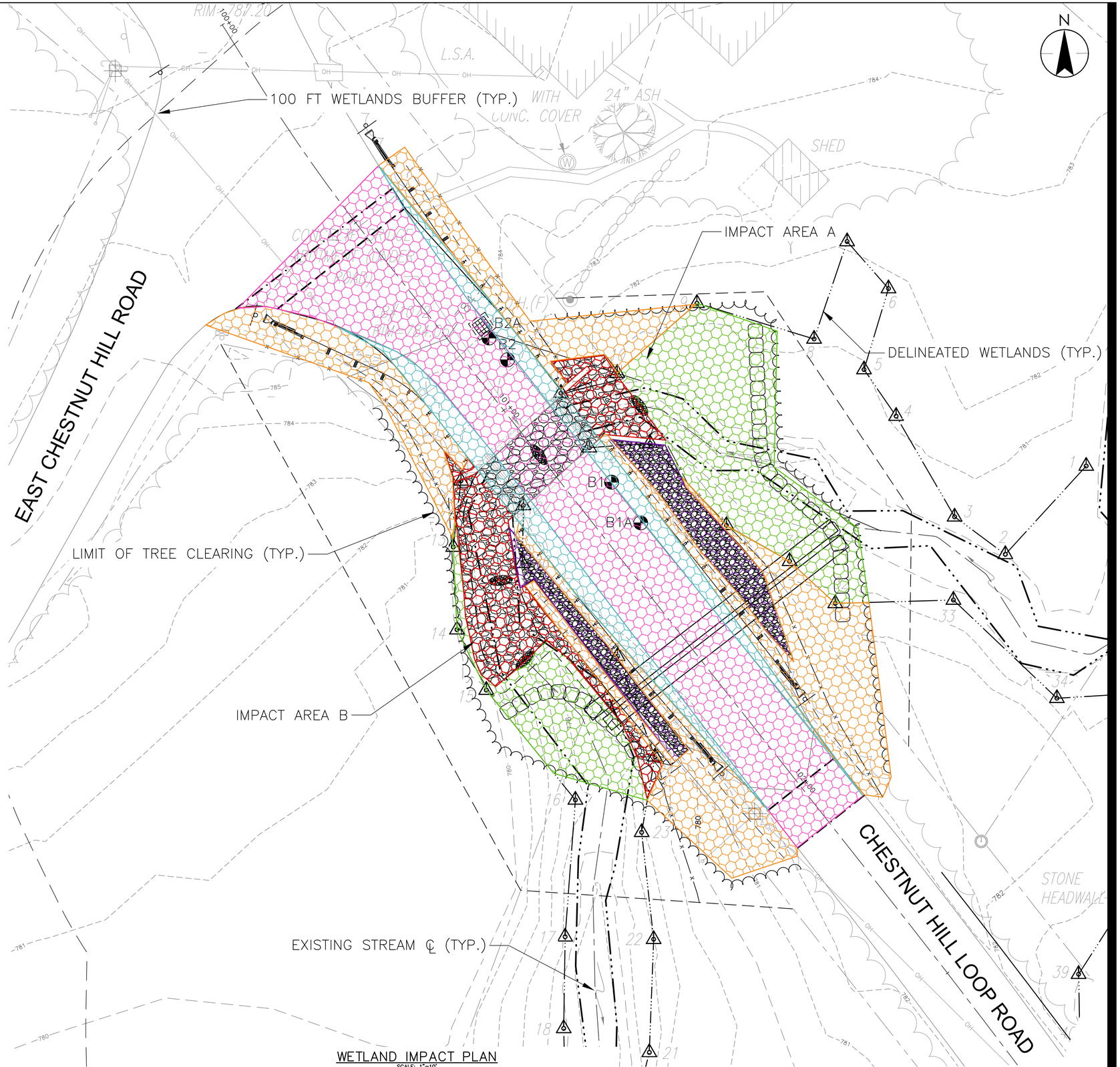
0055 98

Postmark Here
MAY 14 2020
05/14/2020

Sent To: Cpt 1/2 Hazen + Christopher Trevethen
Street and Apt. No., or PO Box No.: 102 East Chestnut Hill Rd
City, State, ZIP+4®: Montague, MA 01351

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

WETLAND IMPACT SUMMARY					
AREA	LOCATION	PERMANENT	LEGEND	TEMPORARY	LEGEND
A	WETLAND	210 SF		1390 SF	
B	WETLAND	625 SF		590 SF	
BUFFER IMPACTS	IMPERVIOUS	830 SF		3,065 SF	
BUFFER IMPACTS	VEGETATED	3,145 SF		520 SF	
	TOTAL	4,790 SF		5,565 SF	



WETLAND IMPACT PLAN
SCALE: 1"=10'
0 10' 20'

N

Stantec

Stantec Consulting Services Inc.
5 Dartmouth Drive, Suite 200
Auburn NH 03032 U.S.A.
Tel. 603.669.8672
Fax. 603.669.7636
www.stantec.com

Consultants

Notes

Revision	By	Appd.	YY.MM.DD
1 85% DRAWINGS FOR PERMITTING	EEB	BMR	20.02.14

Issued

File Name: 13356-10-WETLAND IMPACT PLAN.dwg	EEB	JDT	BMR	20.02.25
	Dwn.	Chkd.	Dsgn.	YY.MM.DD

Permit-Seal

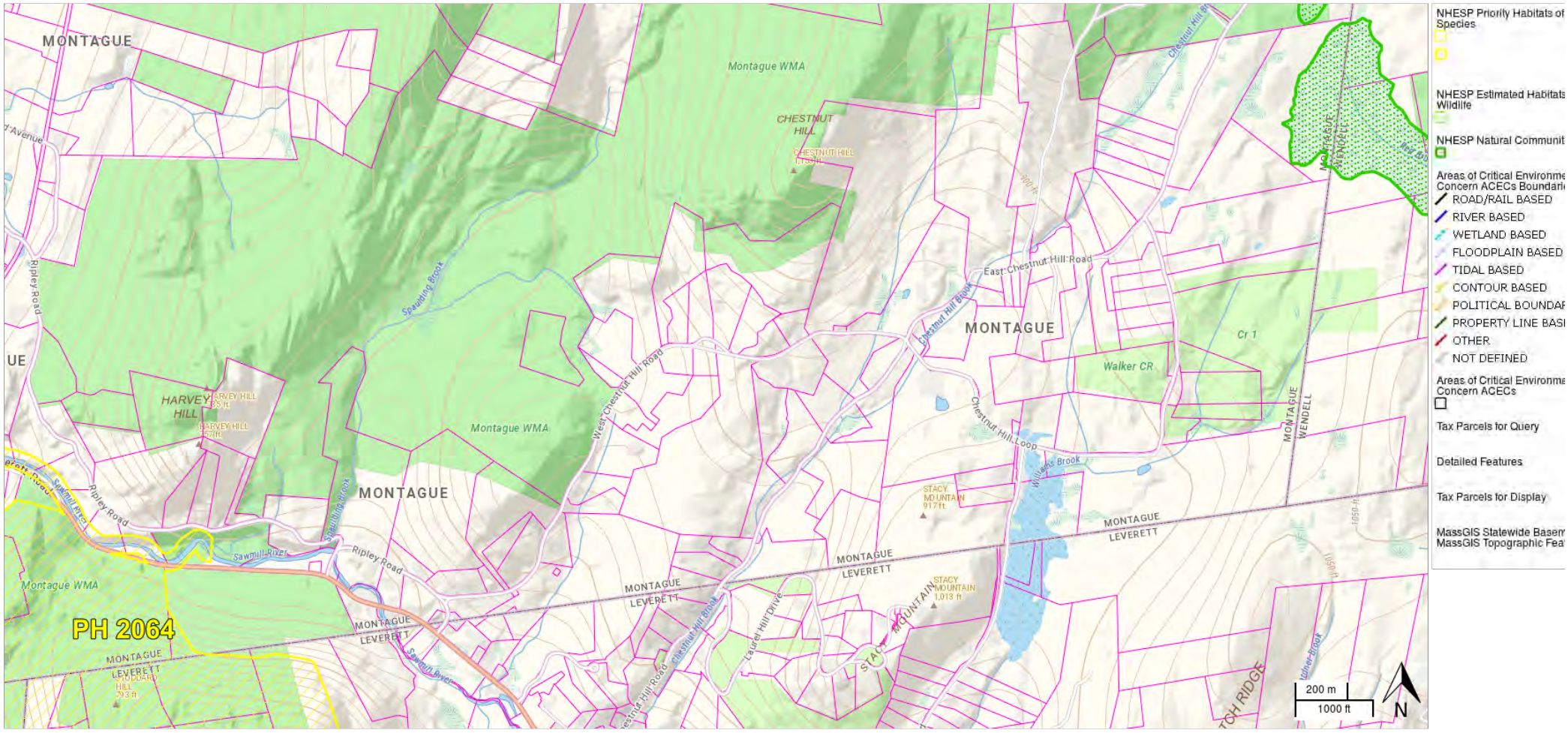
Client/Project
TOWN OF MONTAGUE
MASSACHUSETTS

CHESTNUT HILL LOOP BRIDGE REPLACEMENT
MASSDOT BRIDGE NO. M-28-030

Title
WETLAND IMPACT PLAN

Project No.	Scale	
195113356	AS NOTED	
Drawing No.	Sheet	Revision
ENV-1	1 of 1	0

CHESTNUT HILL LOOP ROAD - CULVERT REPLACEMENT



MassDEP Wetlands Program: Sample 310 CMR 10.24(10) and 10.53(8) Replacement Stream Crossing Evaluation Worksheet

Evaluation Criteria	**Alternative 1: Replace in-kind** **10.0' wide x 4.5' tall (open dimensions)**	**Alternative 2: Meet General Performance Standards for Bank and LUWW[1]** **15.0' wide x 4.5' tall (open dimensions)**	**Alternative 3: Meet minimum applicable Stream Crossing Standards[2]** **12.0' wide x 5.1' tall (open dimensions)**
1) potential for downstream flooding	None anticipated	None anticipated	None anticipated
2) upstream and downstream habitat	There is currently limited habitat connectivity in the stream channel due to the narrow, collapsing existing bridge opening.	A widening of the bridge will result in velocities being reduced to more reasonable levels that are more conducive to habitat connectivity.	A widening of the bridge will result in velocities being reduced to more reasonable levels that are more conducive to habitat connectivity.
3) potential for erosion and head-cutting	There are currently signs of upstream sedimentation deposits due to flooding due to the existing backup due to the limited bridge opening.	The widening of the bridge will result in shallower more creating a stream flow continuity that will result is less sediment deposits in the wetlands from flooding up stream of the bridge, velocities being reduced and a better connectivity of the stream channel, with armoring that will mitigate downstream scour, upstream flooding and associated bank erosion.	The widening of the bridge will result in shallower more creating a stream flow continuity that will result is less sediment deposits in the wetlands from flooding up stream of the bridge, velocities being reduced and a better connectivity of the stream channel, with armoring that will mitigate downstream scour, upstream flooding and associated bank erosion.
4) stream stability	There are currently signs of erosion outside of the limits of the stream due to the stormwater backup up stream of the bridge.	The widening of the bridge will mitigate stormwater backup and will result is reduced velocities at the bridge outlet.	The widening of the bridge will mitigate stormwater backup and will result is reduced velocities at the bridge outlet.
5) habitat fragmentation caused by the crossing	There is currently limited habitat connectivity due to the narrow, failing bridge and upstream storm water backup	The proposed terrestrial passage shelf and the widening of the bridge will result in a more conducive habitat connectivity.	The proposed terrestrial passage shelf and the widening of the bridge will result in a more conducive habitat connectivity.

MassDEP Wetlands Program: Sample 310 CMR 10.24(10) and 10.53(8) Replacement Stream Crossing Evaluation Worksheet

Evaluation Criteria	**Alternative 1: Replace in-kind** **10.0' wide x 4.5' tall (open dimensions)**	**Alternative 2: Meet General Performance Standards for Bank and LUWW[1]** **15.0' wide x 4.5' tall (open dimensions)**	**Alternative 3: Meet minimum applicable Stream Crossing Standards[2]** **12.0' wide x 5.1' tall (open dimensions)**
6) amount of stream mileage made accessible	There is currently limited habitat connectivity due to the high velocities and erosion created by the hydrologic restrictions of the existing bridge opening.	The proposed terrestrial passage shelf, low flow fish channel and reduced velocities from the widening of the bridge will result in habitat accessibility between the upstream crossing and the project area. This will result in an increased overall continuity up stream, through, and downstream of the bridge crossing.	The proposed terrestrial passage shelf, low flow fish channel and reduced velocities from the widening of the bridge will result in habitat accessibility between the upstream crossing and the project area. This will result in an increased overall continuity up stream, through, and downstream of the bridge crossing.
7) storm flow conveyance	The existing bridge opening can convey approximately 360 CFS.	This bridge opening can convey approximately 595 CFS.	This bridge opening can convey approximately 522 CFS.
8) engineering design constraints	Existing ROW limits, existing adjacent properties, wetlands, wetlands buffer impacts.	Existing ROW limits, existing adjacent properties, wetlands, wetlands buffer impacts.	Existing ROW limits, existing adjacent properties, wetlands, wetlands buffer impacts.
9) hydrologic constraints	The existing bridge has limited conveyance due to its existing dimensions and failing condition that result storm water impoundment up stream of the existing bridge crossing.	The widening of the bridge will result in a more continuous, laminar storm water flow that mitigates stormwater impoundment up stream of the bridge crossing.	The widening of the bridge will result in a more continuous, laminar storm water flow that mitigates stormwater impoundment up stream of the bridge crossing.

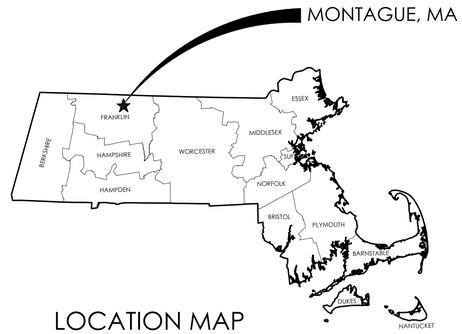
MassDEP Wetlands Program: Sample 310 CMR 10.24(10) and 10.53(8) Replacement Stream Crossing Evaluation Worksheet

Evaluation Criteria	**Alternative 1: Replace in-kind** **10.0' wide x 4.5' tall (open dimensions)**	**Alternative 2: Meet General Performance Standards for Bank and LUWW[1]** **15.0' wide x 4.5' tall (open dimensions)**	**Alternative 3: Meet minimum applicable Stream Crossing Standards[2]** **12.0' wide x 4.5' tall (open dimensions)**
10) impacts to wetlands that would occur	The least impacts to the wetlands due to the installation of the bridge and scour protection measures. Future impacts to the wetlands are possible due to continued stormwater impoundment up stream of the bridge and erosion down stream of the bridge.	The greatest impacts to the wetlands due to the installation of the bridge and scour protection measures.	The same impacts as alternative#1 while mitigating future impacts to the wetlands.
11) potential to affect property and infrastructure	The upstream area currently impounds water at the crossing. The impoundment creates sedimentation deposits upstream of the crossing and channel erosion downstream of the crossing.	The widening of the bridge and installation of stream channel armoring reduces the upstream 100-Year storm event storm water impoundment eliminating elevation upstream, mitigates upstream flooding and downstream erosion.	The widening of the bridge and installation of stream channel armoring reduces the upstream 100-Year storm event storm water impoundment eliminating elevation upstream, mitigates upstream flooding and downstream erosion.
12) cost of replacement	$325,000	$450,000 This anticipated cost exceeds the Town's available funding from MassDOT for the project.	$375,000

[1] Bank Standards at 310 CMR 10.54 and LUWW Standards at 310 CMR 10.56 (LUWW = Land Under Water Bodies & Waterways)

[2] Per the *Massachusetts River & Stream Crossing Standards* (March 1, 2011, Revised March 8, 2012), Page 18, Item #2 - If it is not possible to meet all of the applicable standards, replacement crossings should be designed to avoid or mitigate the following problems: (1) Inlet drops; (2) Outlet drops; (3) Flow contraction that produces significant turbulence; (4) Tailwater armoring; (5) Tailwater scour pools; (6) Physical barriers to fish and wildlife passage.

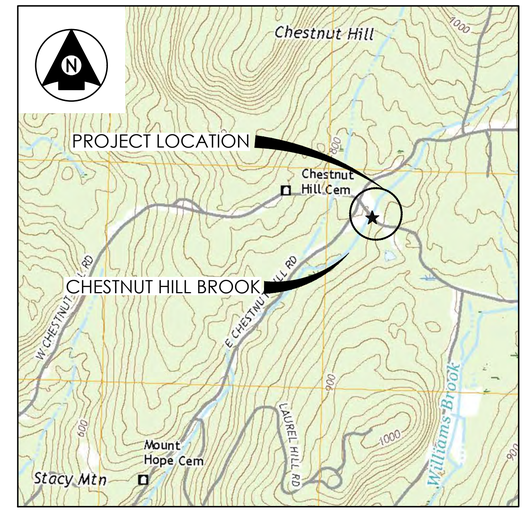
Stantec



LOCATION MAP

TOWN OF MONTAGUE, MASSACHUSETTS

CHESTNUT HILL LOOP BRIDGE REPLACEMENT MASSDOT BRIDGE #M-28-030 (C6N)



VICINITY MAP
SCALE: 1"=1000'

INDEX OF SHEETS

MARCH 2020

Project Number: 195113356

BRYAN M. RUOFF
No. 49280
REGISTERED PROFESSIONAL ENGINEER
COMMONWEALTH OF MASSACHUSETTS

100% PLANS FOR BIDDING
DO NOT REVISE
MARCH 2020

SELECT BOARD
RICHARD KUKLEWICZ, CHAIR
MICHAEL NELSON, VICE CHAIR
CHRISTOPHER BOUTWELL, CLERK

TOWN ADMINISTRATOR
STEVEN ELLIS

TOWN PLANNER
WALTER RAMSEY

HIGHWAY SUPERINTENDENT
TOM BERGERON

Set No. __

ORIGINAL SHEET - ARCH D - PLOTTED ON 3/24/2020

GENERAL NOTES

1. THE MASSACHUSETTS HIGHWAY DEPARTMENT STANDARD SPECIFICATIONS FOR HIGHWAY AND BIRDGES, DATED 2020, THE 2017 CONSTRUCTION STANDARD DETAILS, THE 1996 CONSTRUCTION AND TRAFFIC STANDARD DETAILS (AS RELATED TO TRAFFIC STANDARD DETAILS ONLY) THE 1990 STANDARD DRAWINGS FOR SIGNS AND SUPPORTS, THE 2009 "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS", THE AMERICAN STANDARD FOR NURSERY STOCK (ANSI Z–60.1–1986), AND THE 1968 STANDARD DRAWINGS FOR TRAFFIC SIGNALS AND HIGHWAY LIGHTING DETAILS WILL GOVERN.

2. ALL PRECAUTIONS SHALL BE TAKEN TO PREVENT SILTATION OR POLLUTION INTO THE STREAM. ALL WATER PUMPED FROM EXCAVATION AREA SHALL BE CLARIFIED PRIOR TO BEING ALLOWED TO MIX WITH THE STREAM FLOW. APPLICABLE STATE REGULATORY WATER QUALITY STANDARDS SHALL BE MAINTAINED AT ALL TIMES.

3. IN–STREAM CONSTRUCTION SHALL OCCUR ONLY WITHIN THE TIMEFRAME OUTLINED IN THE PROJECT PERMITS. IF THE CONTRACTOR PROPOSES TO PERFORM IN STREAM WORK OUTSIDE OF THIS TIMEFRAME, THE CONTRACTOR SHALL OBTAIN WRITTEN APPROVAL FROM THE ENGINEER AND FROM THE APPROPRIATE REGULATING ENTITIES PRIOR TO PERFORMING THE WORK.

4. THE CONTRACTOR SHALL PREPARE AND SUBMIT A TEMPORARY STREAM DIVERSION PLAN TO CARRY THE STREAM DURING CONSTRUCTION. THE PLAN SHALL DEPICT MEASURES PROPOSED TO PREVENT EROSION AND SEDIMENTATION AND SHALL MAINTAIN STREAM WATER QUALITY. THE CONTRACTOR SHALL SUBMIT TO THE OWNER/ENGINEER A PROPOSED WATER DIVERSION AND DEWATERING PLAN PLAN DESIGNED AND STAMPED BY A PROFESSIONAL ENGINEER REGISTERED IN THE COMMONWEALTH OF MASSACHUSETTS FOR REVIEW AND APPROVAL PRIOR TO THE START OF CONSTRUCTION.

5. CONTRACTOR SHALL NOTIFY DIG–SAFE (1–888–344–7233 OR 811) A MINIMUM OF 72 HOURS PRIOR TO BEGINNING CONSTRUCTION. THE CONTRACTOR SHALL REPAIR, AT HIS/HER OWN EXPENSE, ANY UTILITIES DAMAGED BY HIS/HER OPERATIONS..

6. ALL ELEVATIONS AND LOCATIONS OF EXISTING UTILITY AND DRAINAGE STRUCTURES SHALL BE VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO UTILIZATION OF THE DESIGN ELEVATIONS ON THE PLAN.

7. WORK HOURS SHALL BE 8:00 AM TO 5:00 PM, MONDAY THROUGH FRIDAY UNLESS OTHERWISE APPROVED BY THE OWNER.

8. ALL CONSTRUCTION WARNING SIGNS MUST BE ERECTED PRIOR TO MOBILIZATION

9. MINIMUM ACCEPTABLE STANDARDS FOR ALL CONSTRUCTION MATERIALS AND METHODS SHALL BE IN ACCORDANCE WITH THE LATEST REVISION OF THE MASSDOT STANDARD SPECIFICATIONS.

10. ALL PERMANENT AND TEMPORARY TRAFFIC CONTROL SIGNS SHALL MEET THE CURRENT EDITION OF THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD).

    A. PERMANENT CONSTRUCTION SIGNS SHALL CONFORM TO MASSDOT AND MUTCD STANDARDS.

    B. TEMPORARY CONSTRUCTION SIGNS USED FOR LANE CLOSURES AND TRAFFIC CONTROL SHALL CONFORM TO MASSDOT AND MUTCD STANDARDS.

10. THE CONTRACTOR MUST COORDINATE ALL WORK WITH THE OWNER, THE TOWN OF MONTAGUE, ALL UTILITY COMPANIES, THE ENGINEER AND ALL ABUTTERS. WORK SHALL NOT PROCEED WITHOUT WRITTEN APPROVAL FROM THE TOWN OF MONTAGUE.

11. BACKFILL OF THE TRENCHES SHALL BE COMPACTED TO 95% MAX. DRY DENSITY UNDER ALL PAVED AREAS, GRAVEL SHOULDERS AREAS, AND UNDER STRUCTURES AND 92% MAX. DRY DENSITY UNDER OTHER AREAS IN ACCORDANCE WITH MASSDOT STANDARD SPECIFICATIONS.

12. THE CONTRACTOR SHALL TAKE ALL NECESSARY MEASURES AND SHALL PROVIDE ALL NECESSARY CONTINUOUS BARRIERS OF SUFFICIENT TYPE, SIZE AND STRENGTH TO PREVENT ACCESS TO ALL OPEN EXCAVATIONS DURING AND AT THE COMPLETION OF EACH DAY'S WORK.

13. SHORING AND STABILIZATION OF EXCAVATION SIDEWALLS DURING EXCAVATION SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR AND NO ADDITIONAL COMPENSATION WILL BE ALLOWED. THE CONTRACTOR SHALL SUBMIT TO THE ENGINEER A DEWATERING AND SHORING PLAN DESIGNED AND STAMPED BY A PROFESSIONAL ENGINEER REGISTERED IN THE COMMONWEALTH OF MASSACHUSETTS FOR REVIEW AND APPROVAL PRIOR TO CONSTRUCTION.

14. ALL DRAINAGE STRUCTURES AND ROAD CONSTRUCTION SHALL BE SUBJECT TO FINAL INSPECTION BY MASSDOT, THE ENGINEER AND THE TOWN PRIOR TO ACCEPTANCE BY THE TOWN OF MONTAGUE.

15. THE CONTRACTOR SHALL BE RESPONSIBLE TO COORDINATE THE TIMELY RELOCATION OR INSTALLATION OF UTILITIES WITH THE AFFECTED UTILITY COMPANIES, THE TOWN OF MONTAGUE AND THE ENGINEER.

16. ALL CLEARING LIMITS MUST BE LAID OUT BY THE CONTRACTOR AND REVIEWED AND CONFIRMED APPROPRIATE BY THE ENGINEER PRIOR TO BEGINNING ANY CLEARING OPERATIONS. NO CLEARING BEYOND THE LIMITS SHOWN ON THE PLANS WILL BE ALLOWED.

17. CLEARING AND GRUBBING ALL AREAS INDICATED FOR PROPOSED CONSTRUCTION ON THE PLANS. THIS SHALL INCLUDE ALL EXISTING TREES, SHRUBS AND PLANTINGS. TREES & SHRUBS SHALL BE RETAINED ONLY WHERE SPECIFICALLY NOTED ON THE PLANS OR AS DIRECTED BY THE ENGINEER.

18. THE CONTRACTOR SHALL PROVIDE A MINIMUM OF 6" TOPSOIL AND SEED OVER ALL DISTURBED UNPAVED AREAS UNLESS OTHERWISE SPECIFIED.

19. IN FILL AREAS, TOPSOIL SHALL BE REMOVED FOR A DEPTH OF 6" (MINIMUM) OR AS DIRECTED BY THE ENGINEER. SUBGRADE AREAS SHALL BE COMPACTED PRIOR TO THE PLACEMENT OF FILL MATERIAL. IF EXISTING TOPSOIL DEPTH EXCEEDS 6", THE CONTRACTOR SHALL NOTIFY THE OWNER/ENGINEER TO OBSERVE AND VERIFY THE DEPTH OF TOPSOIL TO BE REMOVED AS DIRECTED BY THE OWNER. TOPSOIL OBTAINED FROM ONSITE LOCATIONS SHALL BE TESTED PER MASSDOT REQUIREMENTS PRIOR TO EXCAVATION AND REMOVAL TO STOCKPILE.

20. AN EROSION CONTROL MATTING SHALL BE USED ON ALL SLOPES 3 TO 1 OR STEEPER IMMEDIATELY FOLLOWING SEEDING.

21. THE INTENT OF THE GRADING IS GENERALLY SHOWN ON THE GRADING AND CROSS–SECTION PLANS. ROADWAYS SHALL BE CONSTRUCTED TO THE DESIGN ELEVATIONS INDICATED ON THE ROADWAY PROFILES AND THE CROSS–SECTIONS.

22. THE CONTRACTOR SHALL NOTIFY THE HOMEOWNERS ONE WEEK PRIOR TO MOBILIZATION.

23. BLASTING, IF REQUIRED, SHALL BE PERFORMED BY A LICENSED BLASTING CONTRACTOR MEETING MASSDOT AND TOWN OF MONTAGUE REQUIREMENTS.

24. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING ALL DIMENSIONS OF VARIOUS ITEMS OF WORK AT THE PROJECT SITE.

25. THE CONTRACTOR SHALL SUBMIT HIS/HER PROPOSED CONSTRUCTION SCHEDULE TO THE OWNER AND THE ENGINEER FOR APPROVAL TWO (2) WEEKS PRIOR TO THE START OF CONSTRUCTION. REVISED AND UPDATED CONSTRUCTION SCHEDULES SHALL BE PROVIDED BY THE CONTRACTOR BI–WEEKLY FOR THE DURATION OF CONSTRUCTION.

26. THE CONTRACTOR SHALL MEET THE REQUIREMENTS OF THE EPA NPDES PHASE II PROGRAM IF APPLICABLE AT THE TIME OF CONSTRUCTION OF THIS PROJECT.

27. THE CONTRACTOR SHALL SUBMIT SHOP DRAWINGS FOR ALL CONSTRUCTION ITEMS AND METHODS FOR REVIEW AND APPROVAL BY THE ENGINEER PRIOR TO THEIR USE ON THE PROJECT.

28. THE CONTRACTOR SHALL GRADE ALL TEMPORARY SIDE SLOPES AT NO STEEPER THAN 4H:1V UNLESS TEMPORARY ROADSIDE BARRIERS ARE PROVIDED. THE CONTRACTOR SHALL GRADE SIDE SLOPES TO NOT CREATE ADDITIONAL WETLAND IMPACT BEYOND WHAT IS APPROVED FOR THE PROJECT BY PERMIT.

29. ANY CHANGES TO THE APPROVED PLAN SHALL BE SUBMITTED IN WRITING TO THE OWNER/ENGINEER FOR REVIEW AND APPROVAL PRIOR TO PROCEEDING. ALL PROPOSED CHANGES SHALL BE SUBMITTED TO MASSDOT IN THE FORM OF AS BUILTS FOR THEIR RECORDS.

30. THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING AS BUILT RECORDS OF ALL INSTALLED ASPECTS OF THE PROJECT, INCLUDING ALL INDIVIDUAL BRIDGE SECTIONS, ELEVATIONS, STATIONING, AND LOCATIONS OF INSTALLED FEATURES.

31. THE CONTRACTOR IS RESPONSIBLE FOR MAINTAINING AND PROTECTING EXISTING FEATURES AND STRUCTURES WITHIN THE PROJECT AREA. IN THE EVENT OF DAMAGE DURING CONSTRUCTION ANY REPAIRS OR REPLACEMENT SHALL BE COMPLETED AT THE CONTRACTOR'S EXPENSE AS DETERMINED BY THE ENGINEER.

32. DATE: THE YEAR "2021" OR THE YEAR OF FABRICATION, IF DIFFERENT SHALL BE CAST INTO THE OUTSIDE FACE OF THE HEADWALLS IN FIVE INCH (5") BLOCK LETTERS.

33. THE CONTRACTOR SHALL DISPOSE OF ANY DEMOLITION DEBRIS, CONSTRUCTION DEBRIS, STUMPS, WOOD WASTES, CONTAMINATED SOILS, HAZARDOUS MATERIALS AND OTHER SPECIAL WASTES IN STRICT ACCORDANCE WITH ALL APPLICABLE LAWS AND REGULATIONS.

HYDRAULIC DESIGN DATA

Hydraulic Design Data	
Draining Area:	0.94 Sq Miles
Design Flood Discharge:	136 CFS
Design Flood Frequency:	10-Year w/ 2-feet Freeboard
Design Flood Velocity:	4.95 Ft/s
Design Flood Elevation:	778.83
Design Flood Datum:	NAVD88
Base 100-Year Flood Data	
Base Flood Discharge:	286 CFS
Base Flood Elevation:	779.88
Base Flood Datum:	NAVD88
Design and Check Scour Data	
Design Scour Flood Event Frequency:	25-Year
Check Scour Flood Event Frequency:	50-Year
Flood of Record	
Discharge:	Unknown
Frequency:	Unknown
Maximum Elevation:	Unknown
Date:	Unknown
Other	
History of Ice Flows:	None Documented in NBIS database
Evidence of Scour:	None Documented in NBIS database

SEISMIC DATA

1. DESIGN RETURN PERIOD: 1,000–YEARS
2. A_S = 0.072
3. S_{DS} = 0.160
4. S_{D1} = 0.068
5. SITE CLASS: C
6. SEISMIC DESIGN CATEGORY (SDC) : A

TRAFFIC CONTROL

1. THE TRAFFIC CONTROL PLANS ARE SCHEMATIC ONLY AND SHOULD BE USED AS A REFERENCE. THE CONTRACTOR SHALL DEVELOP AND IMPLEMENT A SITE SPECIFIC TRAFFIC CONTROL PLAN FOR ROAD CLOSURES PER THE LATEST VERSION OF THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD). THE CONTRACTOR SHALL ALLOW THE CONSTRUCTION ENGINEER 14 CALENDAR DAYS TO REVIEW AND ACCEPT THE PROPOSED PLANS BEFORE THEY ARE TO BE IMPLEMENTED. NO WORK SHALL COMMENCE UNTIL THE TRAFFIC CONTROL PLAN HAS BEEN APPROVED. DEVELOPMENT AND IMPLEMENTATION OF TRAFFIC CONTROL PLAN SHALL BE IN ACCORDANCE WITH ITEM 852.

2. SIGNS SHALL BE INSTALLED AS NOT TO OBSTRUCT EXISTING SIGNS OR IMPEDE EXISTING SIGHT DISTANCE FOR ROADS OR DRIVEWAYS.

3. ALL SIGNS AND OTHER TRAFFIC CONTROL DEVICES SHALL BE IN ACCORDANCE WITH THE CURRENT EDITION OF THE MUTCD PUBLISHED BY THE FEDERAL HIGHWAY ADMINISTRATION (FHWA).

4. ORANGE SOLID SUBSTRATE CONSTRUCTION SIGNS SHALL HAVE RETROREFLECTIVE SHEETING EQUAL TO OR EXCEEDING "AMERICAN SOCIETY FOR TESTING AND MATERIALS" (ASTM) TYPE VII, VIII OR IX REQUIREMENTS, UNLESS OTHERWISE NOTED.

5. ROLL UP SIGNS SHALL HAVE RETROREFLECTIVE SHEETING EQUAL TO OR EXCEEDING ASTM TYPE VI.

6. CONSTRUCTION SIGNS SHALL BE ERECTED BEFORE MOBILIZATION AND SHALL BE COVERED UNTIL WORK COMMENCES, DURING PERIODS OF INACTIVITY OR UPON COMPLETION OF THE WORK. EACH SIGN SHALL BE ERECTED IN A NEAT AND WORKMANLIKE MANNER. SIGNS SHALL BE REMOVED UPON COMPLETION OF THE WORK UPON THE ACCEPTANCE OF THE ENGINEER.

7. FIXED SIGNS SHALL BE SET SECURELY IN THE GROUND. THE BOTTOM OF A SIGN SHALL BE AT LEAST SEVEN FEET ABOVE THE EDGE OF PAVEMENT. THE NEAREST EDGE OF A SIGN SHALL BE AT LEAST SIX FEET OUTSIDE THE SHOULDER POINT OR FOUR FEET OUTSIDE THE FACE OF GUARDRAIL.

8. PORTABLE SIGNS SHALL BE PLACED ON THE EDGE OF THE ACCESS DRIVE AND A ONE FOOT MINIMUM ABOVE TRAVELED WAY. ALL VEGETATION THAT INTERFERES WITH VISIBILITY OF THE SIGNS SHALL BE REMOVED. WHEN PLACED BEHIND GUARDRAIL, THE BOTTOM OF THE SIGN FACE SHALL BE ABOVE THE TOP OF THE GUARDRAIL. REMOVAL OF SUCH VEGETATION SHALL BE SUBSIDIARY TO THE TRAFFIC CONTROL.

9. WHERE SIGN INSTALLATIONS ARE NOT PROTECTED BY GUARDRAIL OR OTHER APPROVED TRAFFIC BARRIERS, ALL SIGN STANDS AND POST INSTALLATIONS SHALL BE "NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM" (NCHRP) REPORT 350 COMPLIANT. NO SIGN POSTS SHALL EXTEND OVER THE TOP OF THE SIGN INSTALLED ON SAID POST(S). WHEN ANCHORS ARE INSTALLED, STUB SHALL NOT BE GREATER THAN FOUR INCHES ABOVE EXISTING GROUND.

10. THE NUMBER OF CHANNELIZING DEVICES AND OTHER TRAFFIC CONTROL DEVICES SHOWN ON THE TRAFFIC CONTROL PLANS ARE FOR ILLUSTRATIVE PURPOSES ONLY, THE ACTUAL NUMBER REQUIRED ARE TO BE DETERMINED BASED ON INDIVIDUAL DETOUR CONDITIONS (TAPERS, SPEED LIMITS, LENGTH OF DETOUR, CURVE, ETC.).

PROJECT LOCATION: CHESTNUT HILL LOOP ROAD BRIDGE OVER THE CHESTNUT HILL BROOK TO THE EAST OF THE INTERSECTION OF W. CHESTNUT HILL ROAD, E. CHESTNUT HILL ROAD, AND CHESTNUT HILL ROAD.

PROJECT DESCRIPTION: PART A:

A TEMPORARY ROADWAY CLOSURE WILL BE IMPLEMENTED THROUGHOUT THE REMOVAL OF THE EXISTING BRIDGE AND INSTALLATION OF THE PROPOSED PRECAST REPLACEMENT CONCRETE STRUCTURE.

PART B:

THIS WORK INCLUDES ROAD RECONSTRUCTION FOR APPROXIMATELY 135 LINEAR FEET ALONG CHESTNUT HILL LOOP ROAD.

11. THE MASSACHUSETTS HIGHWAY DEPARTMENT STANDARD SPECIFICATIONS FOR HIGHWAY AND BIRDGES, DATED 2020, THE 2017 CONSTRUCTION STANDARD DETAILS, THE 1996 CONSTRUCTION AND TRAFFIC STANDARD DETAILS (AS RELATED TO TRAFFIC STANDARD DETAILS ONLY) THE 1990 STANDARD DRAWINGS FOR SIGNS AND SUPPORTS, THE 2009 "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS", THE AMERICAN STANDARD FOR NURSERY STOCK (ANSI Z–60.1–1986), AND THE 1968 STANDARD DRAWINGS FOR TRAFFIC SIGNALS AND HIGHWAY LIGHTING DETAILS WILL GOVERN.

PAVEMENT NOTES

TACK COAT SHALL BE APPLIED TO ALL BASE COURSE PAVEMENT THAT IS SUBJECTED TO WEATHER EXPOSURE OR VEHICULAR TRAFFIC FOR MORE THAN 48 HOURS

FULL DEPTH CONSTRUCTION

SURFACE COURSE	4" HOT MIX ASPHALT PAVEMENT – MODIFIED, PLACED IN TWO LAYERS, 1 ½" SUPERPAVE 9.5 MM SURFACE COURSE MATERIAL OVER 2 ½" SUPERPAVE 12.5 MM BASE COURSE
SUB–BASE	6" DENSE–GRADED CRUSHED GRAVEL OVER 12" GRAVEL BORROW TYPE B
TACK COAT	APPLY ASPHALT EMULSION RS–1 (M3.03.0) TO THE MILLED SURFACE AND TO THE FACE OF SAWCUT PRIOR TO PAVING.

RESURFACING

COLD–PLANING	REMOVE 1 ½" BITUMINOUS CONCRETE PAVEMENT
SURFACE COURSE	PLACE 1 ½" SUPERPAVE 9.5 MM SURFACE COURSE – MODIFIED, TOP COURSE MATERIAL
TACK COAT	APPLY $\frac{1}{20}$ GALLON BITUMEN (RS–1) PER SQUARE YARD FOR TACK COAT OVER EXISTING ROADWAY

STRUCTURAL NOTES

1. NO CONCRETE SHALL BE PLACED IN WATER OR ON FROZEN GROUND.
2. DESIGN LOADING: HL–93 IN ACCORDANCE WITH THE 2017 AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS.
3. SPECIFICATIONS: LATEST VERSION OF THE AASHTO AND MASSDOT STANDARD SPECIFICATIONS AS AMENDED
4. ALL FINISHED EXCAVATIONS SHALL BE VERIFIED AND APPROVED BY THE ENGINEER PRIOR TO PRECAST SECTION DELIVERY.
5. CONCRETE: PRECAST RIGID FRAME, WINGWALLS, AND OTHER PRECAST COMPONENTS SHALL BE A MINIMUM OF 5000 PSI @ 28 DAYS.
6. UNLESS SPECIFICALLY NOTED, ALL CONCRETE SHALL BE REINFORCED WITH EPOXY COATED REBAR.
7. REINFORCING STEEL SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M31 GRADE 60. UNLESS OTHERWISE NOTED ON THE CONSTRUCTION DRAWINGS, ALL BARS SHALL BE LAPPED TO SATISFY HL–93 LOADING AS SPECIFIED IN THE 2017 AASHTO BRIDGE DESIGN SPECIFICATIONS.

   UNLESS OTHERWISE NOTED, ALL BARS SHALL BE LAPPED AS FOLLOWS:

   MODIFICATION CONDITIONS:

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

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

8. IF THE REINFORCING BARS ARE SPACED 6" OR MORE ON CENTER, THE LAP LENGTH SHALL BE 80% OF THE LAP LENGTH GIVEN ABOVE. ALL OTHER BARS SHALL BE LAPPED AS SHOWN ON THE PLANS
9. CONCRETE COVER OVER REINFORCING BARS SHALL BE 2" UNLESS OTHERWISE NOTED.
10. SCHEDULE WITH THE SHOP DRAWING ALL NECESSARY ACCESSORIES TO HOLD REINFORCING SECURELY IN POSITION. MINIMUM REQUIREMENTS SHALL BE: HIGH CHAIRS = 48" ON CENTERS; SLAB BOLSTERS = 42" ON CENTERS; SUPPORT BARS FOR HIGH CHAIRS = #5.
11. ALL BARS, EXCEPT AS OTHERWISE NOTED, SHALL BE RUN CONTINUOUSLY AROUND CORNERS, LAPPED AT NECESSARY SPLICES, AND HOOKED AT DISCONTINUOUS ENDS. ALL REINFORCING SHALL COMPLY WITH SUBSECTION 4.2.2.10 OF MASSDOTS BRIDGE MANUAL.
12. ALL REINFORCING SHALL BE INSPECTED AND APPROVED BY THE ENGINEER PRIOR TO CONCRETE DELIVERY.
13. RIGID FRAME, WINGWALLS, CURB, HEADWALL REINFORCING: GRADE 60 EPOXY COATED; ALL OTHER REINFORCING STEEL: AASHTO M31 (ASTM A615) GRADE 60.
14. CONCRETE PROTECTIVE COVERING FOR MAIN REINFORCEMENT SHALL BE THE FOLLOWING, UNLESS SHOWN OTHERWISE:

    A. FORMED SURFACES IN DIRECT CONTACT WITH SOIL OR EXPOSED TO WEATHER = 2 INCHES.
    B. FOOTING BOTTOMS = 3 INCHES.

15. ALL EXPOSED PRECAST CONCRETE EDGES TO HAVE 1 1/2" CHAMFER UNLESS OTHERWISE NOTED.
16. CAST IN PLACE CONCRETE TO BE 5,000 PSI, 5±% AIR, 4" MAX SLUMP, 642 LBS TYPE II CEMENT
17. FOR PRE–FABRICATED STRUCTURES, THE CONTRACTOR SHALL SUBMIT THE FABRICATORS DESIGN CALCULATIONS AND SHOP DRAWINGS TO THE DESIGNER OF RECORD FOR REVIEW AND ACCEPTANCE PRIOR TO PROCEEDING..
18. CHAPTER 85 SECTION 35 REVIEW AND APPROVAL IN ACCORDANCE AND COMPLIANCE WITH THE REQUIREMENTS OF CHAPTER 85 SECTION 35 OF THE MASSACHUSETTS GENERAL LAWS, THE CONTRACTOR SHALL SUBMIT TO THE MASSACHUSETTS DEPARTMENT OF TRANSPORTATION ALL CONSTRUCTION DRAWINGS DESIGN AND CALCULATIONS THAT SHALL BE USED TO FABRICATE AND CONSTRUCT THE STRUCTURE DENOTED ON THESE PLANS FOR REVIEW AND APPROVAL. THIS APPROVAL SHALL CONSTITUTE THE FINAL APPROVAL AS STIPULATED BY CHAPTER 85 SECTION 35 OF THE MASSACHUSETTS GENERAL LAWS.
19. FOR THE DESIGN OF SPREAD FOOTINGS BEARING SOIL THE FOLLOWING BEARING RESISTANCES SHALL BE USED:

    FACTORED BEARING RESISTANCE
    STRENGTH I: 9.0 KSF
    SERVICE I: 7.0 KSF

    FOR THE STRENGTH CONDITION THE FACTORED BEARING RESISTANCE IS THE PRODUCT OF THE NOMINAL BEARING RESISTANCE AND A RESISTANCE FACTOR OF 0.45. FOR THE SERVICE CONDITION THE FACTORED BEARING RESISTANCE IS BASED ON A MAXIMUM SETTLEMENT OF 1 INCH AND A RESISTANCE FACTOR OF 1.0.

MISCELLANEOUS

1. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS PRIOR TO BRIDGE SUBMITTAL AND/OR MOBILIZATION.
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL SHORING AND BRACING AND SHALL DISCUSS HIS METHODS WITH THE ENGINEER PRIOR TO THE START OF WORK.
3. DO NOT SCALE FROM DRAWINGS.

LIST OF ABBREVIATIONS

AL	ALUMINUM	EL	ELEVATION	NTS	NOT TO SCALE	TOS	TOP OF SLAB
B	BOTTOM	EW	EACH WAY	OC	ON CENTER	TOW	TOP OF WALL
BM	BEAM	H	HORIZONTAL	T	TOP	V	VERTICAL
CJ	CONSTRUCTION JOINT	HP	HIGH POINT	TOC	TOP OF CONCRETE		
EF	EACH FACE	LG	LARGE	TOF	TOP OF FOOTING		

THREE SIDED RIGID FRAME BRIDGE STRUCTURE

1. THE RIGID FRAME BRIDGE STRUCTURE INCLUDING THE WINGWALLS SHALL BE PRECAST CONCRETE. THE FOOTINGS SHALL BE PRECAST CONCRETE. THE DESIGN OF THIS BRIDGE SHALL BE THE RESPONSIBILITY OF THE FABRICATOR AND SHALL BE STAMPED BY A PROFESSIONAL ENGINEER REGISTERED IN THE COMMONWEALTH OF MASSACHUSETTS.

   THE DESIGN CRITERIA FOLLOWS:

   A. STRUCTURE SHALL BE DESIGNED FOR AN AASHTO HL–93 LIVE LOAD.
   B. DIMENSIONS OF BRIDGE ELEMENTS ON THE PLANS REPRESENT REQUIRED MINIMUM.

2. THE RIGID FRAME BRIDGE STRUCTURE SLAB THICKNESS AND LEG THICKNESS SHALL NOT BE MODIFIED AND SHALL BE PROVIDED AS SHOWN ON THE PLANS.
3. THE CONTRACTOR SHALL SUBMIT DESIGN CALCULATIONS, PREPARED IN ACCORDANCE WITH THE LATEST AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS AND THE MASSDOT BRIDGE MANUAL, WHILE USING ENGLISH UNITS FOR HL–93 LOADING FOR APPROVAL BY THE OWNER/ENGINEER. THE DESIGN COMPUTATIONS SHALL CONSIDER ALL LOADING AS APPROPRIATE DURING FABRICATION, SHIPMENT, ERECTION, CONSTRUCTION AND COMPLETION OF CONSTRUCTION BASED UPON THESE CONSTRUCTION DRAWINGS. THE DESIGN, CALCULATIONS AND DRAWINGS SHALL BE PREPARED AND STAMPED BY A PROFESSIONAL ENGINEER REGISTERED IN THE COMMONWEALTH OF MASSACHUSETTS.
4. AFTER RIGID FRAME STRUCTURE SECTIONS HAVE BEEN SET IN THEIR FINAL POSITION ALL RIGID FRAME STRUCTURE JOINTS AND ALL LIFTING HOLES SHALL BE FILLED WITH AN OVERHEAD AND VERTICAL CEMENTITIOUS CONCRETE REPAIR MATERIAL APPROVED BY THE OWNER/ENGINEER. THE REPAIR MATERIAL SHALL BE CURED AS SPECIFIED BY THE MANUFACTURER.
5. THE ENTIRE TOP AND SIDES OF THE RIGID FRAME STRUCTURE SHALL BE COVERED WITH MEMBRANE PROCEEDING FROM OUTLET TO INLET. THE MEMBRANE SHEETS SHALL OVERLAP THE EDGES OF THE STRUCTURE BY 1 FOOT ON EACH SIDE AS SHOWN IN THE PLANS. THE MEMBRANE SHALL EXTEND 4" VERTICALLY UP THE FACE OF THE INLET AND OUTLET CURB. MEMBRANE WATERPROOFING SHALL BE CONSIDERED SUBSIDIARY TO THE COST OF THE PRECAST CONCRETE STRUCTURE.
6. ALL WINGWALLS AND RIGID FRAME SURFACES TO RECEIVE (2) TWO COATS OF ADVANCED CHEMICAL TECHNOLOGIES SIL–ACT ATS–100LV OR MASSDOT APPROVED EQUAL.

100% PLANS FOR BIDDING
DO NOT REVISE
MARCH 2020

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Consultants

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

DISTRICT II BRIDGE ENGINEER — DATE

Notes

Revision	By	Appd.	YY.MM.DD
2 FINAL DRAWINGS FOR BIDDING	BMR	RL	20.03.12
1 85% DRAWINGS FOR PERMITTING	BMR	RL	20.02.14

Issued	By	Appd.	YY.MM.DD
File Name: 13356-02-NOTES.dwg	AJG	BMR	RL	18.06.15
	Dwn.	Chkd.	Dsgn.	YY.MM.DD

Permit-Seal

Client/Project
TOWN OF MONTAGUE
MASSACHUSETTS

CHESTNUT HILL LOOP BRIDGE REPLACEMENT
MASSDOT BRIDGE NO. M-28-030 (C6N)

Title
GENERAL NOTES

Project No.	Scale	Revision
195113356	AS NOTED	
Drawing No.	Sheet	
G-001	2 of 17	0

REFERENCES

1. THE EXISTING CONDITIONS SITE PLAN THAT SERVES AS THE BASIS FOR THESE DRAWINGS ARE THE RESULT OF A TOPOGRAPHIC SURVEY PERFORMED BY FIELDSTONE LAND CONSULTANTS, PLCC IN OCTOBER 2019 AND IS BASED ON THE NAVD 1988 DATUM AND IS OF MASSACHUSETTS STATE PLANE.
2. WETLANDS WERE INVESTIGATED AND DELINEATED BY CHRISTOPHER GUIDA, LICENSED WETLANDS SCIENTIST FOR FIELDSTONE LAND CONSULTANTS, PLCC IN OCTOBER 2019.
3. SOIL BORINGS SHOWN ON THE PLANS WERE PERFORMED BY SEABOARD GEOTECHNICAL & ENVIRONMENTAL DRILLING SERVICES ON AUGUST 16, 2019 AND WERE OBSERVED BY STANTEC.
4. THE CHESTNUT HILL LOOP BRIDGE OVER CHESTNUT HILL BROOK SPANS OUTSIDE OF THE FLOOD PLAIN OVERLAY ZONE AND 100-YEAR FLOOD HAZARD AREA, AND IS DETERMINED AS ZONE B FROM THE FEMA FLOOD INSURANCE STUDY AND FIRM COMMUNITY MAP 250122 0010 C, FOR MONTAGUE, MA IN FRANKLIN COUNTY, EFFECTIVE DATE FEBRUARY 12,1982. ZONE B IS DESCRIBED AS AREAS BETWEEN LIMITS OF THE 100-YEAR FLOOD AND 500-YEAR FLOOD; OR CERTAIN AREAS SUBJECT TO 100-YEAR FLOODING WITH AVERAGE DEOTHS LESS THAN ONE SQUARE MILE; OR AREAS PROTECTED BY LEVEES FROM THE BASE BY FEMA.
5. GEOTECHNICAL REPORT, COMPLETED BY STANTEC, DATED MARCH 12, 2020.
6. HYDRAULIC REPORT, COMPLETED BY STANTEC, DATED MARCH 12, 2020.

ENVIRONMENTAL PROTECTION

1. ALL WORK SHALL BE PERFORMED IN CONFORMANCE WITH MASSDEP ORDER OF CONDITIONS# (PERMIT PENDING) AND USACOE GENERAL PERMIT# (PERMIT PENDING).
2. THE CONTRACTOR'S RESPONSIBILITIES SHALL INCLUDE THE FOLLOWING:
   A. MINIMIZE THE POTENTIAL ADVERSE ENVIRONMENTAL IMPACTS ASSOCIATED WITH CONSTRUCTION ACTIVITY.
   B. ESTABLISH AND MAINTAIN TEMPORARY EROSION CONTROL MEASURES DURING CONSTRUCTION SUCH AS STRAW BALES, SILT FENCE, ETC.
   C. PROVIDE PERMANENT EROSION CONTROL MEASURES SUCH AS PLANTINGS, MULCH AND PERMANENT GRASS COVER OVER ALL DISTURBED AREAS AS INDICATED IN THE CONTRACT DRAWINGS.
3. PREVENTIVE MEASURES SHALL BE TAKEN TO AVOID SPILLAGE OF PETROLEUM PRODUCTS AND OTHER POLLUTANTS. THE CONTRACTOR SHALL MAINTAIN CONTINGENCY ACTION PLANS FOR PROMPT REMEDIAL ACTION IN THE EVENT SPILLAGE SHOULD OCCUR.
4. DURING THE PROGRESS OF THE WORK, THE CONTRACTOR SHALL KEEP THE PROJECT SITE CLEAR OF DEBRIS RESULTING FROM HIS OPERATIONS AND SHALL REMOVE SURPLUS AND WASTE MATERIALS FROM THE SITE AS SOON AS POSSIBLE.
5. ALL ABANDONED OR USELESS OBJECTS INCLUDING CONSTRUCTION DEBRIS, EQUIPMENT, SUPPLIES, PERSONAL PROPERTY AND RUBBISH SHALL BE CONSIDERED TO BE THE PROPERTY OF THE CONTRACTOR AND SHALL BE REMOVED FROM THE SITE AND DISPOSED OF LEGALLY AND PROPERLY AT THE CONTRACTOR'S EXPENSE.
6. GOOD HOUSEKEEPING:
   THE FOLLOWING GOOD HOUSEKEEPING PRACTICES WILL BE FOLLOWED ONSITE DURING THE CONSTRUCTION PROJECT.
   A. ONLY ENOUGH PRODUCT REQUIRED TO COMPLETE THE JOB WILL BE PERMITTED ONSITE;
   B. ALL MATERIALS STORED ONSITE WILL BE STORED IN A NEAT, ORDERLY MANNER IN THEIR APPROPRIATE CONTAINERS AND, IF POSSIBLE, UNDER A ROOF OR OTHER ENCLOSURE;
   C. PRODUCTS WILL BE KEPT IN THEIR ORIGINAL CONTAINERS WITH THE ORIGINAL MANUFACTURER'S LABEL;
   D. SUBSTANCES WILL NOT BE MIXED WITH ONE ANOTHER UNLESS RECOMMENDED BY THE MANUFACTURER;
   E. WHENEVER POSSIBLE, ALL OF A PRODUCT WILL BE USED UP BEFORE DISPOSING OF THE CONTAINER;
   F. MANUFACTURER'S RECOMMENDATIONS FOR PROPER USE AND DISPOSAL WILL BE FOLLOWED.
7. HAZARDOUS PRODUCTS:
   THESE PRACTICES ARE USED TO REDUCE THE RISKS ASSOCIATED WITH HAZARDOUS MATERIALS.
   A. PRODUCTS WILL BE KEPT IN ORIGINAL CONTAINERS UNLESS THEY ARE NOT RESEALABLE;
   B. ORIGINAL LABELS AND MATERIAL SAFETY DATA WILL BE RETAINED; THEY CONTAIN IMPORTANT PRODUCT INFORMATION;
   C. IF SURPLUS PRODUCT MUST BE DISPOSED OF, MANUFACTURER'S OR LOCAL AND STATE RECOMMENDED METHODS FOR PROPER DISPOSAL WILL BE FOLLOWED.
8. PRODUCT SPECIFIC PRACTICES:
   THE FOLLOWING PRODUCT SPECIFIC PRACTICES WILL BE FOLLOWED ON SITE:
   PETROLEUM PRODUCTS:
   ALL ONSITE VEHICLES WILL BE MONITORED FOR LEAKS AND RECEIVE REGULAR PREVENTATIVE MAINTENANCE TO REDUCE THE CHANCE OF LEAKAGE. PETROLEUM PRODUCTS WILL BE STORED IN TIGHTLY SEALED CONTAINERS WHICH ARE CLEARLY LABELED. ANY ASPHALT SUBSTANCES USED ONSITE WILL BE APPLIED ACCORDING TO THE MANUFACTURER'S RECOMMENDATIONS.
   FERTILIZERS:
   FERTILIZERS USED WILL BE APPLIED ONLY IN THE MINIMUM AMOUNTS RECOMMENDED BY THE MANUFACTURER. ONCE APPLIED, FERTILIZER WILL BE WORKED IN THE SOIL TO LIMIT EXPOSURE TO STORM WATER. STORAGE WILL BE IN A COVERED SHED. THE CONTENTS OF ANY PARTIALLY USED BAGS OF FERTILIZER WILL BE TRANSFERRED TO A SEALABLE PLASTIC BIN TO AVOID SPILLS.
   PAINTS:
   ALL CONTAINERS WILL BE TIGHTLY SEALED AND STORED WHEN NOT REQUIRED FOR USE. EXCESS PAINT WILL NOT BE DISCHARGED TO THE STORM SEWER BUT WILL BE PROPERLY DISPOSED OF ACCORDING TO MANUFACTURER'S INSTRUCTIONS OR STATE AND LOCAL REGULATIONS.
9. SPILL CONTROL PRACTICES:
   IN ADDITION TO THE GOOD HOUSEKEEPING AND MATERIAL MANAGEMENT PRACTICES DISCUSSED IN THE PREVIOUS SECTIONS OF THIS PLAN, THE FOLLOWING PRACTICES WILL BE FOLLOWED FOR SPILL PREVENTION AND CLEANUP:
   A. MANUFACTURER'S RECOMMENDED METHODS FOR SPILL CLEANUP WILL BE CLEARLY POSTED AND SITE PERSONNEL WILL BE MADE AWARE OF THE PROCEDURES AND THE LOCATION OF THE INFORMATION AND CLEANUP SUPPLIES.
   B. MATERIALS AND EQUIPMENT NECESSARY FOR SPILL CLEANUP WILL BE KEPT IN THE MATERIAL STORAGE AREA ONSITE. EQUIPMENT AND MATERIALS WILL INCLUDE BUT NOT BE LIMITED TO BROOMS, DUST PANS, MOPS, RAGS, GLOVES, GOGGLES, KITTY LITTER, SAND, SAWDUST, AND PLASTIC AND METAL TRASH CONTAINERS SPECIFICALLY FOR THIS PURPOSE.
   C. ALL SPILLS WILL BE CLEANED UP IMMEDIATELY AFTER DISCOVERY.
   D. THE SPILL AREA WILL BE KEPT WELL VENTILATED AND PERSONNEL WILL WEAR APPROPRIATE PROTECTIVE CLOTHING TO PREVENT INJURY FROM CONTACT WITH A HAZARDOUS SUBSTANCE.
   E. SPILLS OF TOXIC OR HAZARDOUS MATERIAL WILL BE REPORTED TO THE APPROPRIATE STATE OR LOCAL GOVERNMENT AGENCY, REGARDLESS OF SIZE.
   F. THE SPILL PREVENTION PLAN WILL BE ADJUSTED TO INCLUDE MEASURES TO PREVENT THIS TYPE OF SPILL FROM REOCCURRING AND HOW TO CLEAN UP THE SPILL IF THERE IS ANOTHER ONE. A DESCRIPTION OF THE SPILL, WHAT CAUSED IT, AND THE CLEANUP MEASURES WILL ALSO BE INCLUDED.
   G. THE SITE SUPERINTENDENT RESPONSIBLE FOR THE DAY-TO-DAY SITE OPERATIONS WILL BE THE SPILL PREVENTION AND CLEANUP COORDINATOR. THEY WILL DESIGNATE AT LEAST THREE OTHER SITE PERSONNEL WHO WILL EACH RECEIVE SPILL PREVENTION AND CLEANUP TRAINING. THESE INDIVIDUALS WILL EACH BECOME RESPONSIBLE FOR A PARTICULAR PHASE OF PREVENTION AND CLEANUP. THE NAMES OF RESPONSIBLE SPILL PERSONNEL WILL BE POSTED IN THE MATERIAL STORAGE AREA AND IN THE OFFICE TRAILER ONSITE.

ENVIRONMENTAL PROTECTION (CONT)

10. ALL CONSTRUCTION DEBRIS AND WASTE MATERIALS SHALL BE COLLECTED AND STORED IN SECURE DUMPSTERS OR APPROVED ENCLOSURE AND REMOVED FROM THE SITE ON A WEEKLY BASIS. NO CONSTRUCTION WASTE SHALL BE BURIED ON SITE. PORTABLE TOILET SANITARY WASTE FACILITIES WILL BE PROVIDED DURING CONSTRUCTION AND MAINTAINED/DISPOSED OF ON A REGULAR BASIS IN ACCORDANCE WITH CITY AND STATE REGULATIONS.
11. RECORDS KEEPING:
    A LIST OF CONSTRUCTION ITEMS AND OTHER PRODUCTS USED ON THIS PROJECT SHALL BE KEPT ON RECORD WITH THE PROJECT PLANS AT THE CONSTRUCTION FIELD OFFICE. ALL CHEMICALS, PETROLEUM PRODUCTS AND OTHER MATERIALS USED DURING CONSTRUCTION SHALL BE STORED IN A SECURE AREA, AND PRECAUTIONS USED TO PREVENT POTENTIAL SOURCES OF CONTAMINATION OR POLLUTION. ANY SPILL OF THESE TYPES OF SUBSTANCES SHALL BE CLEANED UP AND DISPOSED OF IN A LEGAL MANNER AS SPECIFIED BY STATE REGULATIONS AND THE MANUFACTURER. IF ANY SPILL OCCURS IN AMOUNTS EQUAL TO OR EXCEEDING THE REPORTABLE QUANTITY AS DEFINED BY THE EPA, THE CONTRACTOR SHALL TAKE THE FOLLOWING STEPS:
    A. NOTIFY THE NATIONAL RESPONSE CENTER IMMEDIATELY AT (800) 424-8802; IN WASHINGTON, D.C., CALL (202) 426-2675.
    B. WITHIN 14 DAYS, SUBMIT A WRITTEN DESCRIPTION OF THE RELEASE TO THE EPA REGIONAL OFFICE PROVIDING THE DATE AND CIRCUMSTANCES OF THE RELEASE AND THE STEPS TO BE TAKEN TO PREVENT ANOTHER RELEASE.
    C. MODIFY THE POLLUTION PREVENTION PLAN TO INCLUDE THE INFORMATION LISTED ABOVE.
12. THE CONTRACTOR SHALL PROVIDE DEBRIS CATCHES PER MASSDOT STANDARDS DURING DEMOLITION ACTIVITIES IN ORDER TO PREVENT ANY DEBRIS FROM ENTERING THE STREAM.

RESTORATION NOTES

TOPSOILING:

TOPSOIL IS REQUIRED ON ANY AREA WHERE IT IS NECESSARY TO ESTABLISH A VEGETATIVE COVER. IF THERE IS INSUFFICIENT NATURALLY OCCURRING TOPSOIL, ADDITIONAL TOPSOIL SHALL BE PROVIDED TO A MINIMUM FINISHED DEPTH OF SIX INCHES (6")

1. LOAM, SANDY LOAM, OR SILTY LOAM SHALL BE USED FOR TOPSOIL MATERIAL.
2. THE MATERIAL SHALL BE FRIABLE AND FREE OF TREE ROOTS, WEEDS, STONES (GREATER THAN TWO INCHES) AND ANY OTHER DEBRIS. SOIL WHICH HAS BEEN TREATED WITH HERBICIDE IS UNACCEPTABLE.
3. THE MATERIAL SHALL BE TAKEN FROM THE NATURAL SURFACE LAYERS ("A" HORIZON) OF SOILS CAPABLE OF PRODUCING GOOD YIELDS OF CULTIVATED CROPS OR STRAW.
4. AREAS WHERE TOPSOIL HAS BEEN REMOVED SHALL BE PROTECTED AGAINST EROSION.
5. TOPSOIL SHALL NOT BE STOCKPILED WHERE IT WILL INTERFERE WITH ANY DRAINAGE COURSE OR WITHIN TWENTY-FIVE FEET OF A WETLAND RESOURCE AREA.
6. TOPSOIL SHALL NOT BE COLLECTED OR SPREAD WHILE IT IS WET OR FROZEN.
7. SUBSURFACES SHALL BE SCARIFIED OR OTHERWISE TILLED TO FACILITATE BONDING OF SOIL LAYERS.
8. TOPSOIL SHALL BE UNIFORMLY SPREAD TO PROVIDE A MINIMUM FINISHED DEPTH OF SIX (6) INCHES AFTER SETTLEMENT.

RESTORATION NOTES (CONTINUED)

SEEDING

UNLESS OTHERWISE INDICATED OR DIRECTED BY THE OWNER, GROUND COVER WILL BE ESTABLISHED BY HYDROSEEDING. THE LOCATIONS DEFINED AS LAWN AREAS, SLOPE AREAS WILL BE VERIFIED WITH THE OWNER PRIOR TO HYDROSEEDING.

SEED MIXTURE – SEE MASSDOT STANDARD SPECIFICATION M6.03.0 – SEED.

SITE PREPARATIONS

1. ACCORDING TO SOIL TEST TO PH 6.5 OR IN THE ABSENCE OF A SOIL TEST, APPLY LIME AT THE RATE OF 2-3 TONS OF GROUND LIMESTONE PER ACRE (100-150 LBS. PER 1000 S.F.
2. FERTILIZE ACCORDING TO SOIL TEST OR AT A RATE OF 1000 LBS. PER ACRE OF 5-10-10 FERTILIZER.
3. WORK UP A SEEDBED 1" TO 2" DEEP, THOROUGHLY INCORPORATING THE LIME AND FERTILIZER INTO THE SOIL.
4. SEED DURING THE PERIOD AUGUST 10 TO SEPTEMBER 15, OR IN THE SPRING BY MAY 20 FOR PERMANENT COVER. SEEDING AT OTHER TIMES SHALL BE CONSIDERED A TEMPORARY COVER.
5. APPLY SEED UNIFORMLY ACCORDING TO DIRECTIONS BY HYDRAULIC APPLICATION (HYDROSEEDING).
6. THE SEEDED AREA IS TO BE PROTECTED FROM EQUIPMENT, TRAMPLING AND OTHER DESTRUCTIVE ACTIVITY.

EROSION CONTROL NOTES

1. ALL EROSION CONTROL MEASURES SHALL BE IN ACCORDANCE WITH "MASSACHUSETTS EROSION AND SEDIMENT CONTROL GUIDELINES FOR URBAN AND SUBURBAN AREAS" LATEST EDITION.
2. ALL EROSION CONTROL BARRIERS SHALL BE ERECTED BEFORE THE START OF EARTHWORK OPERATIONS. EROSION CONTROL BARRIERS SHALL BE REMOVED UPON ACCEPTANCE OF THE PROJECT.
3. THE INTENT OF THIS PROJECT IS TO CONTROL SEDIMENT AT THE SOURCE SUCH AS EARTHCUTS AND EXPOSED SURFACES. ALL EXPOSED SURFACES SHALL BE STABILIZED IMMEDIATELY UPON COMPLETION OF WORK.
4. IN ORDER TO PREVENT UNNECESSARY EROSION OF NEWLY GRADED SLOPES AND UNNECESSARY SILTATION OF DRAINAGEWAYS, THE CONTRACTOR SHALL PERFORM LOAMING, HYDROSEEDING, AND MULCHING AS SOON AS HE HAS SATISFACTORILY COMPLETED A UNIT OR PORTION OF THE PROJECT, SUCH AS EMBANKMENTS OR CUTS, A SECTION OF PAVEMENT OR DRAINAGEWAYS.
5. STRAW MULCH OR OTHER APPROVED METHODS SHALL BE USED TO CONTROL EROSION OF NEWLY GRADED AREAS. ALL CUT AND FILL SLOPES SHALL BE SEEDED AND MULCHED WITHIN 72 HOURS AFTER THEIR CONSTRUCTION.
6. THE CONTRACTOR SHALL PROVIDE A MINIMUM OF 6" OF TOPSOIL AND HYDROSEED ALL DISTURBED AND UNPAVED SURFACES (AND SURFACES NOT DESIGNATED FOR GRAVEL OR PAVEMENT) WITHIN THE LIMIT OF WORK.
7. THE CONTRACTOR SHALL MAINTAIN THE CRUSHED STONE CONSTRUCTION ENTRANCE (75' MIN.) AND SHALL CLEAN AND REMOVE ANY SAND, SOIL, OR DEBRIS CARRIED ON ALL PAVED ROADWAYS BY TRUCKS LEAVING THE SITE AT THE END OF EACH DAYS WORK. WHEN REQUESTED BY THE ENGINEER, THE CONTRACTOR SHALL PROVIDE STREET SWEEPING OF EXISTING PAVED ROADWAYS TO REMOVE CONSTRUCTION RELATED DEBRIS AT NO ADDITIONAL COMPENSATION.
8. THE CONTRACTOR SHALL INSPECT, CLEAN, AND PROPERLY MAINTAIN (INCLUDING REPLACING AS NECESSARY) ALL EROSION CONTROL MEASURES DAILY DURING THE PROJECT.
9. NO CUT AREA SHALL BE LEFT UNPROTECTED FROM EROSION FOR A PERIOD OF MORE THAN 3 WEEKS. PROTECTION SHALL BE BY SEEDING, EROSION CONTROL MATTING, OR OTHER ACCEPTABLE METHODS.
10. NO DISTURBED AREA SHALL BE LEFT UNPROTECTED FROM EROSION OVER THE WINTER SEASON. THE WINTER SEASON IS HEREBY DEFINED AS THE THE PERIOD FROM NOVEMBER 1 TO APRIL 1. THIS SHALL NOT RESTRICT WORK FROM TAKING PLACE OVER THE WINTER MONTHS BUT THE CONTRACTOR/OWNER SHALL NOT ALLOW AN AREA GREATER THAN 5,000 S.F. TO BE LEFT UNPROTECTED.
11. SILT FENCE WITH STRAW BALES SHALL BE SECURED WITH A MINIMUM OF TWO STAKES PER BALE AND PROVIDED AT ALL DRAINAGEWAYS AND PIPE OUTLETS AS INDICATED ON THE CONSTRUCTION DRAWINGS.
12. THE CONTRACTOR SHALL PROVIDE DEBRIS CATCHES PER MASSDOT STANDARDS DURING DEMOLITION ACTIVITIES IN ORDER TO PREVENT ANY DEBRIS FROM ENTER THE STREAM.
13. TEMPORARY STABILIZATION – TOPSOIL STOCKPILES AND DISTURBED AREAS OF THE CONSTRUCTION SITE THAT WILL NOT BE REDISTURBED FOR 21 DAYS OR MORE MUST BE STABILIZED BY THE 14TH DAY AFTER THE LAST DISTURBANCE. THE TEMPORARY SEED SHALL BE ANNUAL RYE APPLIED AT THE RATE OF 1.1 LBS PER 1,000 SQUARE FEET. PRIOR TO SEEDING, A MINIMUM OF 2 TONS PER ACRE OF AGRICULTURAL LIMESTONE AND 500 LBS PER ACRE OF 10-2-20 FERTILIZER SHALL BE APPLIED. AFTER SEEDING, EACH AREA SHALL BE MULCHED WITH 1.5 TONS PER ACRE OF STRAW MULCH. MULCH TO BE ANCHORED IN PLACE WHERE NECESSARY.
14. THE CONTRACTOR IS RESPONSIBLE TO MAINTAIN RECORDS OF CONSTRUCTION ACTIVITIES, INCLUDING DATES OF MAJOR GRADING ACTIVITIES, DATES WHEN CONSTRUCTION ACTIVITIES HAVE TEMPORARILY CEASED ON A PORTION OF THE SITE, DATES WHEN WORK IS COMPLETED ON A PORTION OF THE SITE, AND DATES WHEN STABILIZATION MEASURES ARE INITIATED ONSITE.

GENERAL SYMBOLS

EXISTING	PROPOSED	
	10+00 N00° 00' 00"E	ASPHALT CURB (AS NOTED)
10+00 N00° 00' 00"E		BASE LINE, SURVEY LINE OR CONSTRUCTION BASELINE
B-1	P-1	BORINGS AND PROBES
CB (DR, GI, LB)		CATCH BASIN
		CENTERLINE OF ALIGNMENT
		CITY, TOWN, OR COUNTY LAYOUT LINE (R.O.W.)
		EASEMENT
		EDGE OF GRAVEL
		EDGE OF GRAVEL OR TRAIL
		EDGE OF PAVEMENT
		EDGE OF RIVER
		EDGE OF WETLANDS
47		WETLANDS FLAG (& FLAG #)
		GUARDRAIL (AS SPECIFIED)
		MAILBOX
		PROPERTY LINE
		RIP RAP (AS SPECIFIED)
		ROAD R.O.W.
		SIGN AND POST
		SILT FENCE AND STRAW BALES
		STONE CHECK DAMS
		TEST PIT
		TREE LINE
UPOLE		UTILITY POLE
		GRAVEL SHOULDER
		PROPOSED PAVEMENT SAW CUT
		LIMIT OF WORK

ALIGNMENT & GRADING

BVCE	BEGINNING OF VERTICAL CURVE ELEVATION
BVCS	BEGINNING OF VERTICAL CURVE STATION
EVCE	END OF VERTICAL CURVE ELEVATION
EVCS	END OF VERTICAL CURVE STATION
LVC	LENGTH OF VERTICAL CURVE
PVC	POINT OF VERTICAL CURVE
PVI	POINT OF VERTICAL INTERSECTION
PCC	POINT OF COMPOUND CURVE
PRC	POINT OF REVERSE CURVE
PC	POINT OF CURVE
PT	POINT OF TANGENT
CC	CENTER OF CURVE
PNT	POINT
∠PT	ANGLE POINT
200.35	SPOT GRADE

UTILITIES

CIT	CHANGE IN TYPE
F&G	FRAME AND GRATE
F&C	FRAME AND COVER
RCP	REINFORCED CONCRETE PIPE
VCP	VITRIFIED CLAY PIPE
PVC	POLY-VINYL-CHLORIDE PIPE
ACCMP	ASPHALT COATED CORRUGATED METAL PIPE
CIP	CAST IRON PIPE
DIP	DUCTILE IRON PIPE
HYD	HYDRANT
CAP	CORRUGATED ALUMINUM PIPE
INV	INVERT ELEVATION
PWW	PAVED WATER WAY
UP	UTILITY POLE
TSV & B	TAPPING SLEEVE, VALVE AND BOX
COND	CONDUIT
OHE	OVER HEAD ELECTRIC
MJ	MECHANICAL JOINT

GENERAL

PROP.	PROPOSED	VGC	VERTICAL GRANITE CURB
MIN.	MINIMUM	G.C.	GRANITE CURB
MAX.	MAXIMUM	G.E.	GRANITE EDGING
RET.	RETAINING	C.C.	CONCRETE CURB
REM.	REMOVE	B.B.	BITUMINOUS BERM
REMOD.	REMODEL	B.C.	BITUMINOUS CURB
ABAN.	ABANDON	P.S.B.	PLANTABLE SOIL BORROW
ADJ.	ADJUST	N.I.C.	NOT IN CONTRACT
EXIST.	EXISTING	N.T.S.	NOT TO SCALE
R&R	REMOVE & RESET	TYP	TYPICAL
R&S	REMOVE & STACK	APPROX.	APPROXIMATE
FDN.	FOUNDATION	CLF	CHAIN LINK FENCE
ELEV.	ELEVATION	LP	LOW POINT
O.C.	ON CENTER	E.R.	EDGE OF ROAD
P.G.L.	PROFILE GRADE LINE	E.P.,E.O.P.	EDGE OF PAVEMENT
E.T.W.	EDGE OF TRAVEL WAY	CONST.	CONSTRUCTION
TOW	TOP OF WALL	LF	LINEAR FEET
BOW	BOTTOM OF WALL	PTH	PLANIMETER TO HERE
ROW	RIGHT OF WAY	BIT.	BITUMINOUS
BS	BOTTOM OF SLOPE	CEM.	CEMENT
TS	TOP OF SLOPE	CONC.	CONCRETE
H.E.S.	HIGH EARLY STRENGTH	N.I.C.	NOT IN CONTRACT
STA	STATION	R&D	REMOVE AND DELIVER TO TOWN
S	SLOPE	CL	CENTERLINE

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Notes

Revision	By	Appd.	YY.MM.DD
2 FINAL DRAWINGS FOR BIDDING	BMR	RL	20.03.12
1 85% DRAWINGS FOR PERMITTING	BMR	RL	20.02.14

Issued	By	Appd.	YY.MM.DD
File Name: 13356-02-NOTES.dwg	EEB Dwn.	BMR Chkd.	RL Dsgn.	19.10.07 YY.MM.DD

Permit-Seal

COMMONWEALTH OF MASSACHUSETTS
BRYAN M. RUOFF
No. 49220
REGISTERED PROFESSIONAL ENGINEER

Client/Project
TOWN OF MONTAGUE
MASSACHUSETTS

CHESTNUT HILL LOOP BRIDGE REPLACEMENT
MASSDOT BRIDGE NO. M-28-030 (C6N)

Title
NOTES AND LEGEND

Project No.	Scale	
195113356	AS NOTED	
Drawing No.	Sheet	Revision
G-002	3 of 17	0

BOREHOLE LOG — B-1

CLIENT: Town of Montague
LOCATION: Chestnut Hill Loop, Montague, MA
EXPLORATION DATE: 8/16/2019 to 8/16/2019 — WATER LEVEL NOT OBSERVED
PROJECT No. 195113356
EXPLORATION No. B-1
DATUM: NAVD88

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	TYPE	NUMBER	RECOVERY	SPT blows / 6"	SPT N-Value	FID Reading
	782.0				in.			
0		3" Asphalt Pavement				5		
		Roadway Gravel	SS	1		1	3	
	780.0					2		
	779.4	Auger grinding on cobble/boulder.	SS	2		5 100/7"	--	
		Split spoon refusal at 2.6 feet.						
5								
10								
15								
20								

Undrained Shear Strength - tsf (1 2 3 4)
Water Content & Atterberg Limits (WP W L W)
Dynamic Penetration Test, blows/foot ★
Standard Penetration Test, blows/foot ●
10 20 30 40 50 60 70 80 90

Driller: Seaboard Drilling; Supervisor: Seth Potter
Drill Rig: Truck Mounted Mobile Drill B-53 With Autohammer

△ Unconfined Compression Test
□ Field Vane Test ■ Remolded
✖ Pocket Penetrometer / Torvane

BOREHOLE LOG — B-2

CLIENT: Town of Montague
LOCATION: Chestnut Hill Loop, Montague, MA
EXPLORATION DATE: 8/16/2019 to 8/16/2019 — WATER LEVEL 4'
PROJECT No. 195113356
EXPLORATION No. B-2
DATUM: NAVD88

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	TYPE	NUMBER	RECOVERY	SPT blows / 6"	SPT N-Value	FID Reading
	784.0				in.			
0		3" Pavement, 3" road gravel				4		
		Loose, light brown fine sand, trace silt	SS	1	18"	3	6	
		-SAND DEPOSIT-				3		
	782.0	Medium dense, light brown fine sand, little silt				2		
			SS	2	17"	5	15	
	780.0					10		
5		Dense, light brown fine to coarse sand with fine gravel, little silt				17		
			SS	3	15"	12 15	34	
	778.0	Medium dense, light brown fine to coarse sand with fine gravel, little silt				19 14		
		-GLACIAL TILL-	SS	4	18"	10 13	26	
	776.0					13 11		
		Dense, black weathered rock				16		
			SS	5	19"	12	34	
	774.0	Very dense, black weathered rock				22 13		
10		-WEATHERED ROCK-	SS	6	3"	50/5"	N/A	
	772.2	Auger refusal in probable bedrock at 11.8 feet.						
15								
20								

Undrained Shear Strength - tsf (1 2 3 4)
Water Content & Atterberg Limits (WP W L W)
Dynamic Penetration Test, blows/foot ★
Standard Penetration Test, blows/foot ●
10 20 30 40 50 60 70 80 90

Driller: Seaboard Drilling; Supervisor: Seth Potter
Drill Rig: Truck Mounted Mobile Drill B-53 With Autohammer

△ Unconfined Compression Test
□ Field Vane Test ■ Remolded
✖ Pocket Penetrometer / Torvane

BOREHOLE LOG — B-1A

CLIENT: Town of Montague
LOCATION: Chestnut Hill Loop, Montague, MA
EXPLORATION DATE: 8/16/2019 to 8/16/2019 — WATER LEVEL 4'
PROJECT No. 195113356
EXPLORATION No. B-1A
DATUM: NAVD88

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	TYPE	NUMBER	RECOVERY	SPT blows / 6"	SPT N-Value	FID Reading
	782.0				in.			
0						2		
	780.0	Loose, brown medium to fine sand				2		
		-SAND DEPOSIT-	SS	1	11"	3	5	
	778.0	Dense, fractured Rock				7		
5			SS	2	14"	16 23	46	
	776.0					23 27		
		Dense, light brown fine sand, medium to coarse sand, some silt	SS	3	14"	26 25	47	
	774.0	Medium dense, light brown to black weathered rock trace silt				22 20		
		-GLACIAL TILL-	SS	4	17"	8 17	29	
10	772.0	Medium dense light brown fine to medium sand, little silt, trace fine gravel				12 9		
			SS	5	18"	8 10	24	
	770.0	Very dense, black weathered rock				14 17		
			SS	6	14"	19 25	N/A	
	768.0	Very dense, gray weathered rock				50/4"		
15			SS	7	16"	24 46	96	
	766.0	Very dense, gray weathered rock				50/2"		
		-WEATHERED ROCK-	SS	8	4"	50/4"	N/A	
	764.0	Very dense, gray weathered rock						
	763.0		SS	9	6"	35 50/2"	N/A	
20		Auger refusal in probable bedrock at 19 feet.						

Undrained Shear Strength - tsf (1 2 3 4)
Water Content & Atterberg Limits (WP W L W)
Dynamic Penetration Test, blows/foot ★
Standard Penetration Test, blows/foot ●
10 20 30 40 50 60 70 80 90

Driller: Seaboard Drilling; Supervisor: Seth Potter
Drill Rig: Truck Mounted Mobile Drill B-53 With Autohammer

△ Unconfined Compression Test
□ Field Vane Test ■ Remolded
✖ Pocket Penetrometer / Torvane

BOREHOLE LOG — B-2A

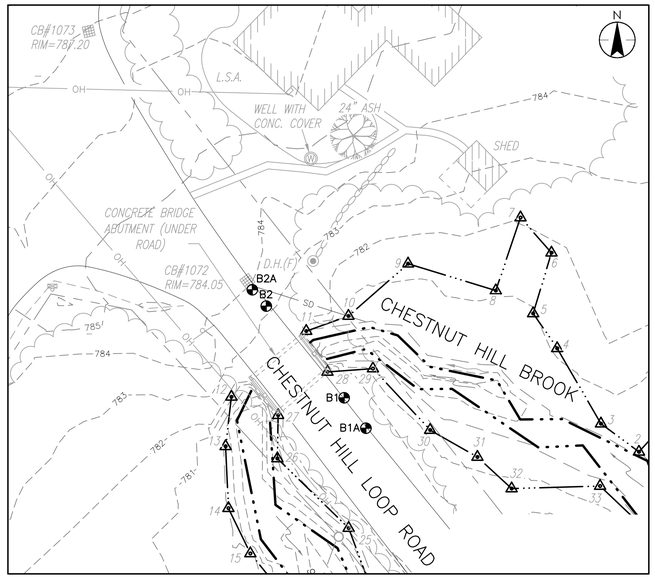
CLIENT: Town of Montague
LOCATION: Chestnut Hill Loop, Montague, MA
EXPLORATION DATE: 8/16/2019 to 8/16/2019 — WATER LEVEL Not Observed
PROJECT No. 195113356
EXPLORATION No. B-2A
DATUM: NAVD88

DEPTH (ft)	ELEVATION (ft)	MATERIAL DESCRIPTION	TYPE	NUMBER	RECOVERY	SPT blows / 6"	SPT N-Value	FID Reading
	784.0				in.			
0								
5								
10	774.0	Boring terminated at 10 feet on refusal on probable bedrock.						
15								
20								

Undrained Shear Strength - tsf (1 2 3 4)
Water Content & Atterberg Limits (WP W L W)
Dynamic Penetration Test, blows/foot ★
Standard Penetration Test, blows/foot ●
10 20 30 40 50 60 70 80 90

Driller: Seaboard Drilling; Supervisor: Seth Potter
Drill Rig: Truck Mounted Mobile Drill B-53 With Autohammer

△ Unconfined Compression Test
□ Field Vane Test ■ Remolded
✖ Pocket Penetrometer / Torvane



BOREHOLE LOCATIONS

SCALE: 1"=20'
0 20' 40'

BORING AND PROBE NOTES

1. LOCATION OF BORINGS ARE INDICATED ON KEY PLAN THUS: B-1
2. BORINGS ARE TAKEN FOR PURPOSE OF DESIGN AND SHOW CONDITIONS AT BORING POINTS ONLY, BUT DO NOT NECESSARILY SHOW THE NATURE OF THE MATERIALS TO BE ENCOUNTERED DURING CONSTRUCTION.
3. WATER LEVELS SHOWN ON THE BORING LOGS WERE OBSERVED AT THE TIME OF TAKING BORINGS AND DO NOT NECESSARILY SHOW THE TRUE GROUND WATER LEVEL.
4. FIGURES IN COLUMNS INDICATE NUMBER OF BLOWS REQUIRED TO DRIVE A 1⅜" ID SPLIT SPOON SAMPLER 6" WITH A 140 LB MASS FALLING 30", CONFORMING TO ASTM D1586.
5. SOIL BORINGS WERE PERFORMED USING A HOLLOW STEM AUGER (HSA) TO THE NOTED APPROXIMATE ELEVATIONS AT REFUSAL ON PROBABLE BEDROCK:
   - B-1: EL. = 779.4
   - B-2: EL. = 772.2
   - B-1A: EL.= 763.0
   - B-2A: EL.= 774.0
6. ALL BORINGS AND PROBES WERE PERFORMED ON AUGUST, 16 201 BY SEABOARD GEOTECHNICAL & ENVIRONMENTAL DRILLING OF CHICOPEE, MA. AND INSPECTED BY STANTEC
7. ALL BORING AND PROBE DEPTHS REPORTED IN FEET IN THE FIELD.
8. BORING AND PROBE DEPTHS HAVE BEEN CONVERTED TO ELEVATIONS BY THE ENGINEER AND ARE APPROXIMATE.
9. THE NORTH AMERICAN VERTICAL DATUM (NAVD) 1988 IS USED THROUGHOUT.
10. SAMPLES ARE STORED AT STANTEC'S AUBURN, NEW HAMPSHIRE OFFICE AND ARE AVAILABLE FOR INSPECTION.

100% PLANS FOR BIDDING
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MARCH 2020

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Notes

Revision	By	Appd.	YY.MM.DD
2 FINAL DRAWINGS FOR BIDING	BMR	RL	20.03.12
1 85% DRAWINGS FOR PERMITTING	BMR	RL	20.02.14

Issued	By	Appd.	YY.MM.DD
File Name: 13356-03-BORINGS.dwg	AJG Dwn.	BMR Chkd.	RL Dsgn.	18.06.15 YY.MM.DD

Permit-Seal

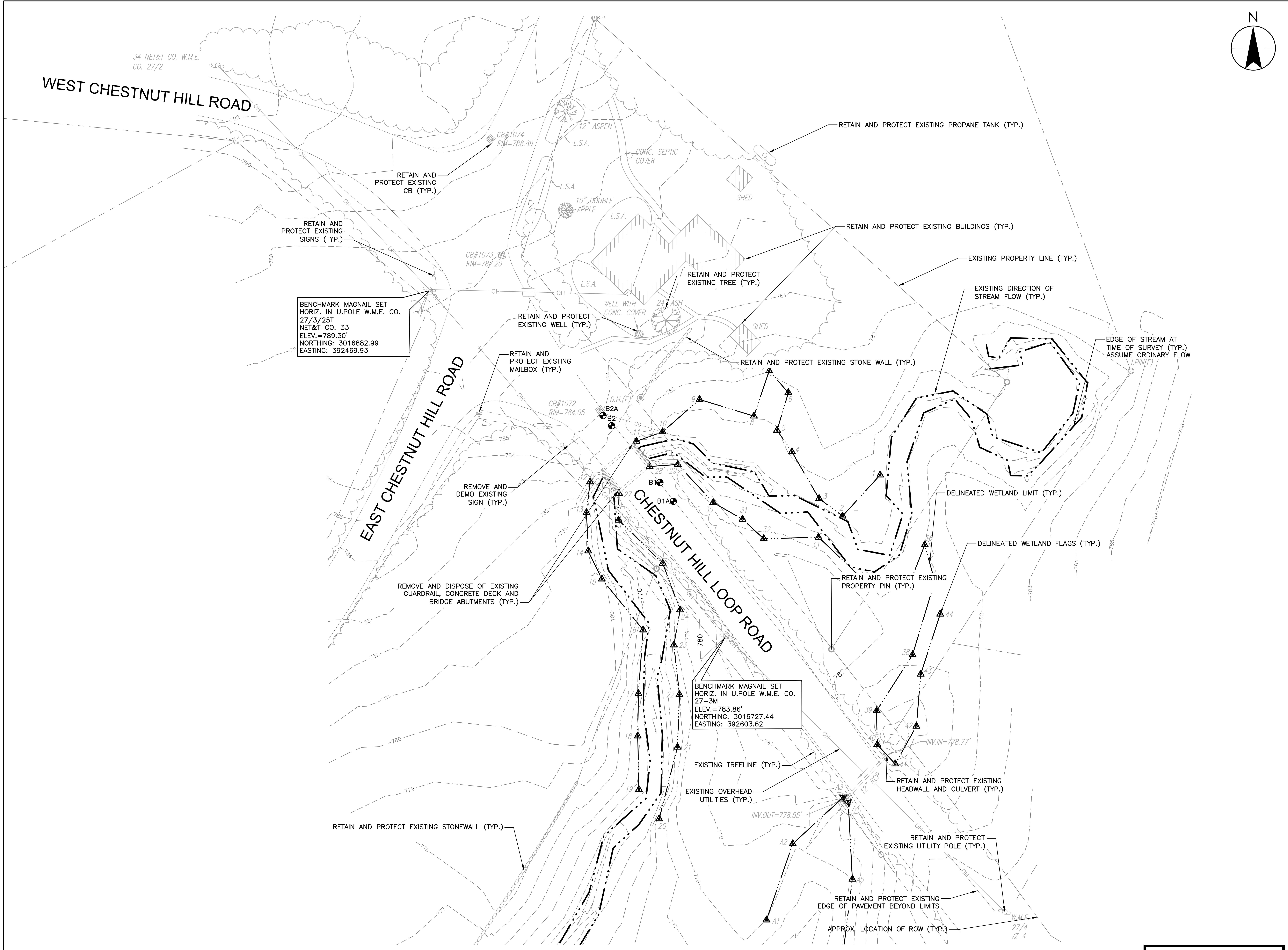
COMMONWEALTH OF MASSACHUSETTS
BRYAN M. RUOFF
No. 49221
REGISTERED PROFESSIONAL ENGINEER

Client/Project
TOWN OF MONTAGUE
MASSACHUSETTS

CHESTNUT HILL LOOP BRIDGE REPLACEMENT
MASSDOT BRIDGE NO. M-28-030 (C6N)

Title
BOREHOLE LOCATIONS AND BOREHOLE LOGS

Project No.	Scale	
195113356	AS NOTED	
Drawing No.	Sheet	Revision
C-100	4 of 17	0



N
WEST CHESTNUT HILL ROAD
EAST CHESTNUT HILL ROAD
CHESTNUT HILL LOOP ROAD
34 NET&T CO. W.M.E.
CO. 27/2
12" ASPEN
L.S.A.
CONC. SEPTIC COVER
SHED
10" DOUBLE APPLE
WELL WITH CONC. COVER
24" ASH
CB#1074 RIM=788.89
CB#1073 RIM=787.20
CB#1072 RIM=784.05
D.H.(F)
B2A
B2
B1
B1A
INV.IN=778.77'
INV.OUT=778.55'
12" RCP
W.M.E. 27/4 VZ 4
RETAIN AND PROTECT EXISTING PROPANE TANK (TYP.)
RETAIN AND PROTECT EXISTING CB (TYP.)
RETAIN AND PROTECT EXISTING SIGNS (TYP.)
RETAIN AND PROTECT EXISTING BUILDINGS (TYP.)
EXISTING PROPERTY LINE (TYP.)
RETAIN AND PROTECT EXISTING TREE (TYP.)
BENCHMARK MAGNAIL SET HORIZ. IN U.POLE W.M.E. CO. 27/3/25T NET&T CO. 33 ELEV.=789.30' NORTHING: 3016882.99 EASTING: 392469.93
RETAIN AND PROTECT EXISTING WELL (TYP.)
EXISTING DIRECTION OF STREAM FLOW (TYP.)
EDGE OF STREAM AT TIME OF SURVEY (TYP.) ASSUME ORDINARY FLOW
RETAIN AND PROTECT EXISTING MAILBOX (TYP.)
RETAIN AND PROTECT EXISTING STONE WALL (TYP.)
REMOVE AND DEMO EXISTING SIGN (TYP.)
DELINEATED WETLAND LIMIT (TYP.)
DELINEATED WETLAND FLAGS (TYP.)
RETAIN AND PROTECT EXISTING PROPERTY PIN (TYP.)
REMOVE AND DISPOSE OF EXISTING GUARDRAIL, CONCRETE DECK AND BRIDGE ABUTMENTS (TYP.)
BENCHMARK MAGNAIL SET HORIZ. IN U.POLE W.M.E. CO. 27-3M ELEV.=783.86' NORTHING: 3016727.44 EASTING: 392603.62
EXISTING TREELINE (TYP.)
EXISTING OVERHEAD UTILITIES (TYP.)
RETAIN AND PROTECT EXISTING HEADWALL AND CULVERT (TYP.)
RETAIN AND PROTECT EXISTING STONEWALL (TYP.)
RETAIN AND PROTECT EXISTING UTILITY POLE (TYP.)
RETAIN AND PROTECT EXISTING EDGE OF PAVEMENT BEYOND LIMITS
APPROX. LOCATION OF ROW (TYP.)

EXISTING CONDITIONS AND DEMOLITION PLAN

SCALE: 1" = 20'

0 20' 40'

100% PLANS FOR BIDDING

DO NOT REVISE

MARCH 2020

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Notes

1. THIS PLAN IS A REVISIT OF A TOPOGRAPHIC SURVEY PERFORMED BY FIELDSTONE LAND CONSULTANTS, PLLC IN SEPTEMBER 2019 AND ARE BASED ON THE NAVD88 DATUM
2. WETLANDS WERE DELINEATED BY CHRIS GUIDA OF FIELDSTONE LAND CONSULTANTS, PLLC IN SEPTEMBER 2019.

Revision	By	Appd.	YY.MM.DD

Issued	By	Appd.	YY.MM.DD
2 FINAL DRAWINGS FOR BIDDING	BMR	RL	20.03.12
1 85% DRAWINGS FOR PERMITTING	BMR	RL	20.02.14

File Name: 13356-04-EXISTING.dwg	AJG	BMR	RL	18.06.15
	Dwn.	Chkd.	Dsgn.	YY.MM.DD

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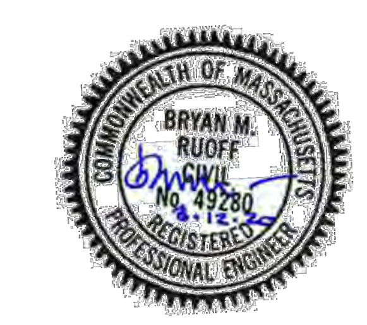


Client/Project

TOWN OF MONTAGUE
MASSACHUSETTS

CHESTNUT HILL LOOP BRIDGE REPLACEMENT
MASSDOT BRIDGE NO. M-28-030 (C6N)

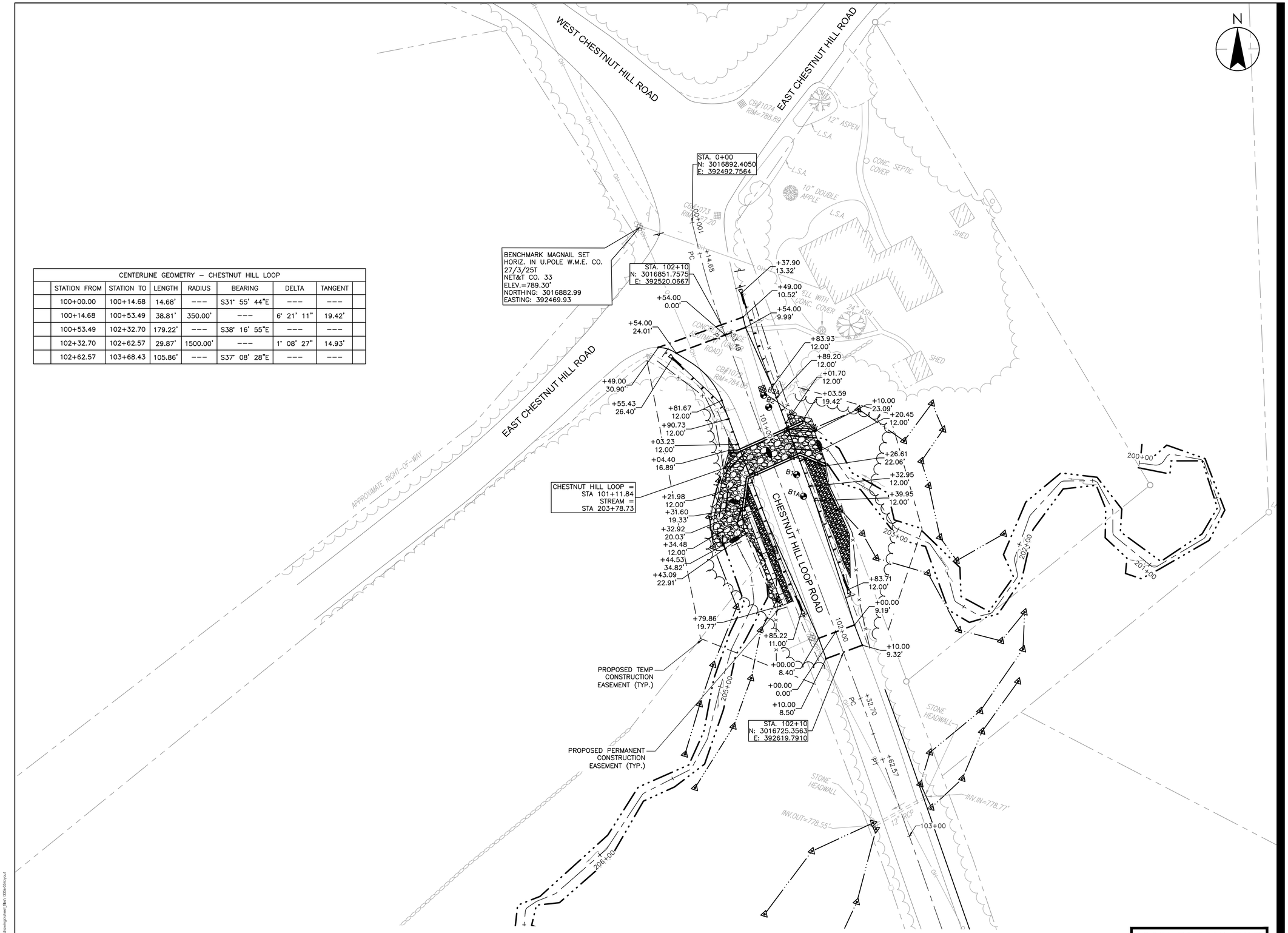
Title

EXISTING CONDITIONS
AND DEMOLITION PLAN

Project No.	Scale	
195113356	AS NOTED	
Drawing No.	Sheet	Revision
C-101	5 of 17	0

ORIGINAL SHEET - ARCH D

CENTERLINE GEOMETRY – CHESTNUT HILL LOOP							
STATION FROM	STATION TO	LENGTH	RADIUS	BEARING	DELTA	TANGENT	
100+00.00	100+14.68	14.68'	---	S31° 55' 44"E	---	---	
100+14.68	100+53.49	38.81'	350.00'	---	6° 21' 11"	19.42'	
100+53.49	102+32.70	179.22'	---	S38° 16' 55"E	---	---	
102+32.70	102+62.57	29.87'	1500.00'	---	1° 08' 27"	14.93'	
102+62.57	103+68.43	105.86'	---	S37° 08' 28"E	---	---	



LAYOUT PLAN
SCALE: 1"=20'
0 20' 40'

100% PLANS FOR BIDDING
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MARCH 2020

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Issued	By	Appd.	YY.MM.DD
File Name: 13356-05-LAYOUT.dwg	AJG Dwn.	BMR Chkd.	RL Dsgn.	18.06.15 YY.MM.DD

Permit-Seal

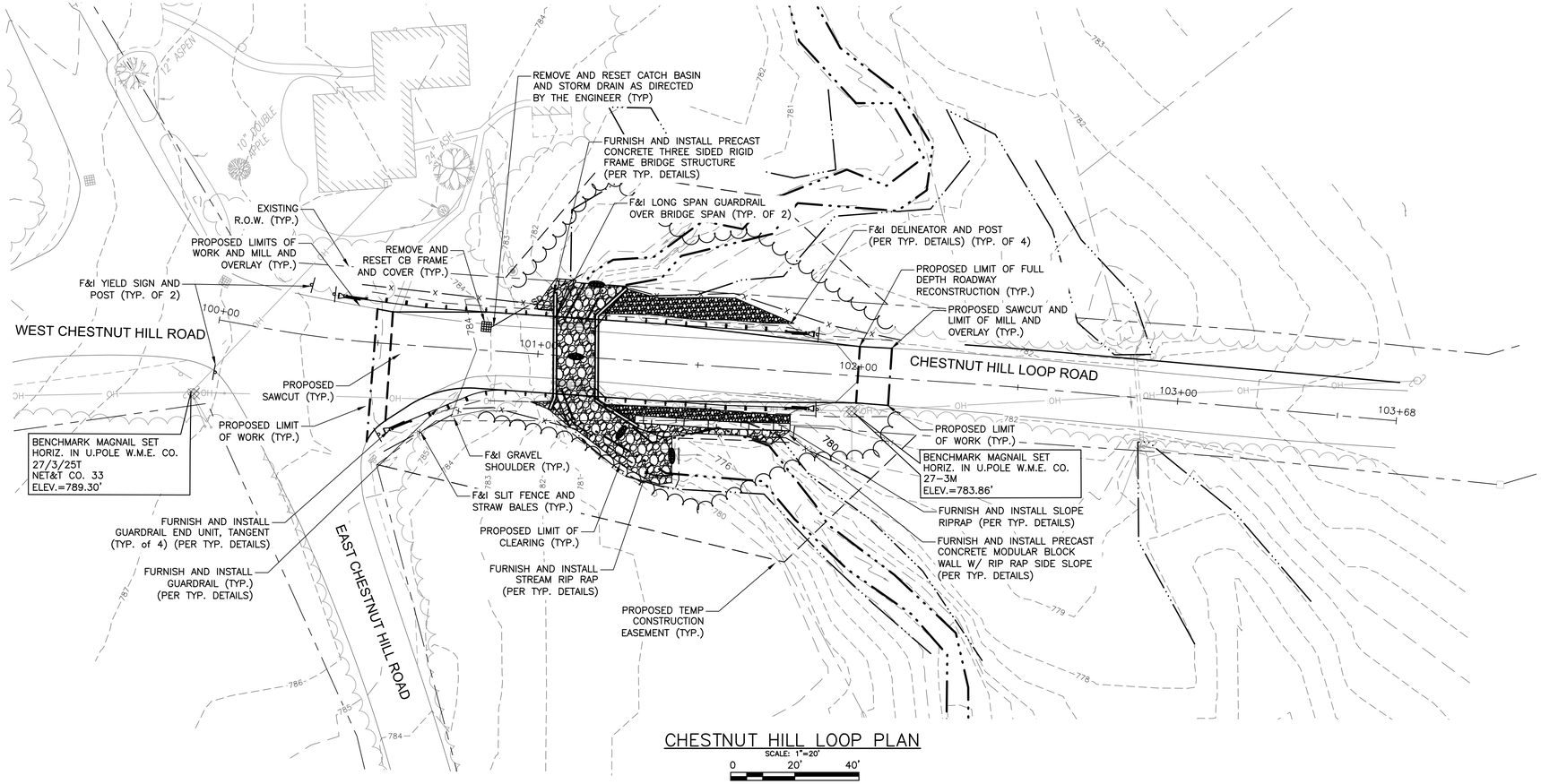
COMMONWEALTH OF MASSACHUSETTS
BRYAN M. RUOFF
No. 47281
REGISTERED PROFESSIONAL ENGINEER

Client/Project
TOWN OF MONTAGUE
MASSACHUSETTS

CHESTNUT HILL LOOP BRIDGE REPLACEMENT
MASSDOT BRIDGE NO. M-28-030 (C6N)

Title
LAYOUT PLAN

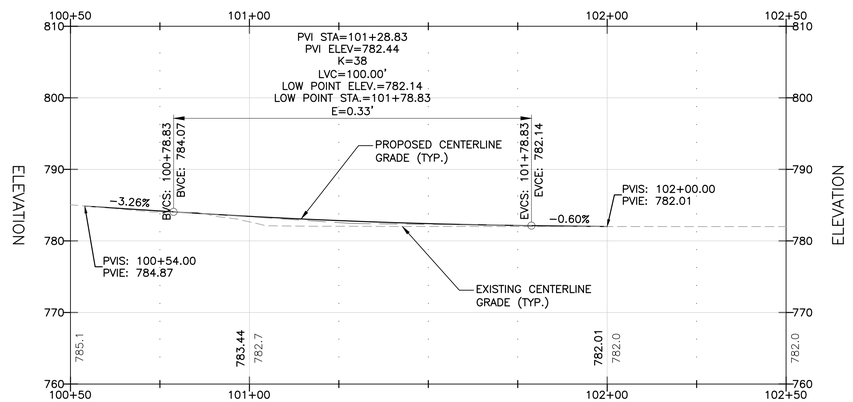
Project No.	Scale	
195113356	AS NOTED	
Drawing No.	Sheet	Revision
C-200	6 of 17	0



CHESTNUT HILL LOOP PLAN

SCALE: 1"=20'

0 20' 40'



CHESTNUT HILL LOOP PROFILE

HORIZONTAL SCALE: 0 20' 40'

VERTICAL SCALE: 0 10' 20'

100% PLANS FOR BIDDING

DO NOT REVISE

MARCH 2020

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Notes

Revision	By	Appd.	YY.MM.DD
2 FINAL DRAWINGS	BMR	RL	20.03.12
1 85% DRAWINGS FOR PERMITTING	BMR	RL	20.02.14

Issued By Appd. YY.MM.DD

File Name: 13356-07-CHESTNUT HILL LOOP PLAN AND PROFILE.dwg	Dwn. AJG	Chkd. BMR	Dsgn. RL	YY.MM.DD 18.06.15

Permit-Seal

COMMONWEALTH OF MASSACHUSETTS
BRYAN M. RUOFF
No. 49280
REGISTERED PROFESSIONAL ENGINEER

Client/Project

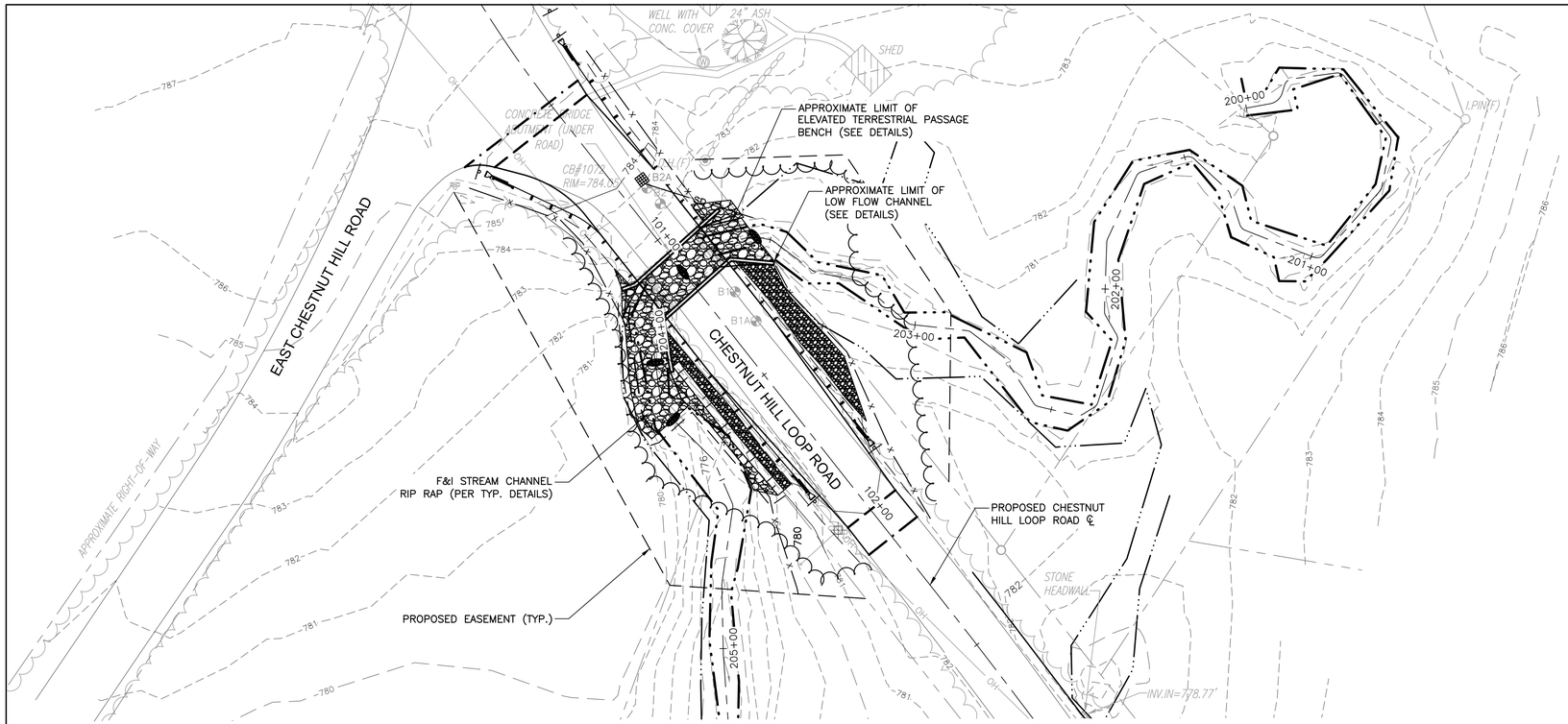
TOWN OF MONTAGUE
MASSACHUSETTS

CHESTNUT HILL LOOP BRIDGE REPLACEMENT
MASSDOT BRIDGE NO. M-28-030 (C6N)

Title

CHESTNUT HILL LOOP PLAN AND PROFILE

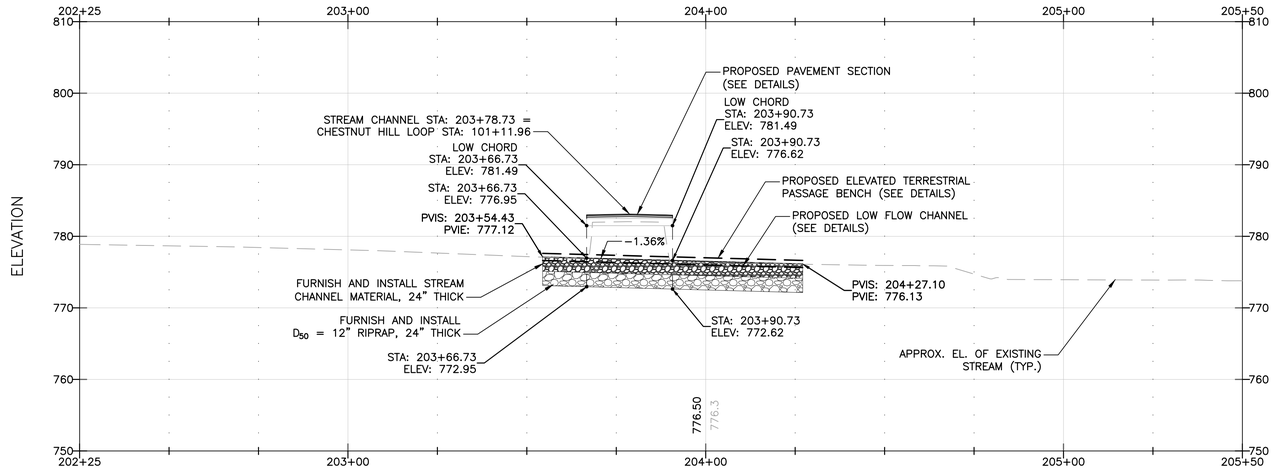
Project No.	Scale	
195113356	AS NOTED	
Drawing No.	Sheet	Revision
C-201	7 of 17	0



CHESTNUT HILL BROOK PLAN

SCALE: 1"=20'

0 20' 40'



CHESTNUT HILL BROOK PROFILE

HORIZONTAL SCALE: 0 10' 20'

VERTICAL SCALE: 0 5' 10'

100% PLANS FOR BIDDING
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1 85% DRAWINGS FOR PERMITTING	BMR	RL	20.02.14

Issued	By	Appd.	YY.MM.DD
File Name:13356-07-CHESTNUT HILL BROOK PROFILE.dwg AJG	BMR	RL	18.06.15
	Dwn.	Chkd.	Dsgn. YY.MM.DD

Permit-Seal

COMMONWEALTH OF MASSACHUSETTS BRYAN M. RUOFF CIVIL No. 49291 REGISTERED PROFESSIONAL ENGINEER

Client/Project

TOWN OF MONTAGUE
MASSACHUSETTS

CHESTNUT HILL LOOP BRIDGE REPLACEMENT
MASSDOT BRIDGE NO. M-28-030 (C6N)

Title

CHESTNUT HILL BROOK PLAN AND PROFILE

Project No.	Scale	
195113356	AS NOTED	
Drawing No.	Sheet	Revision
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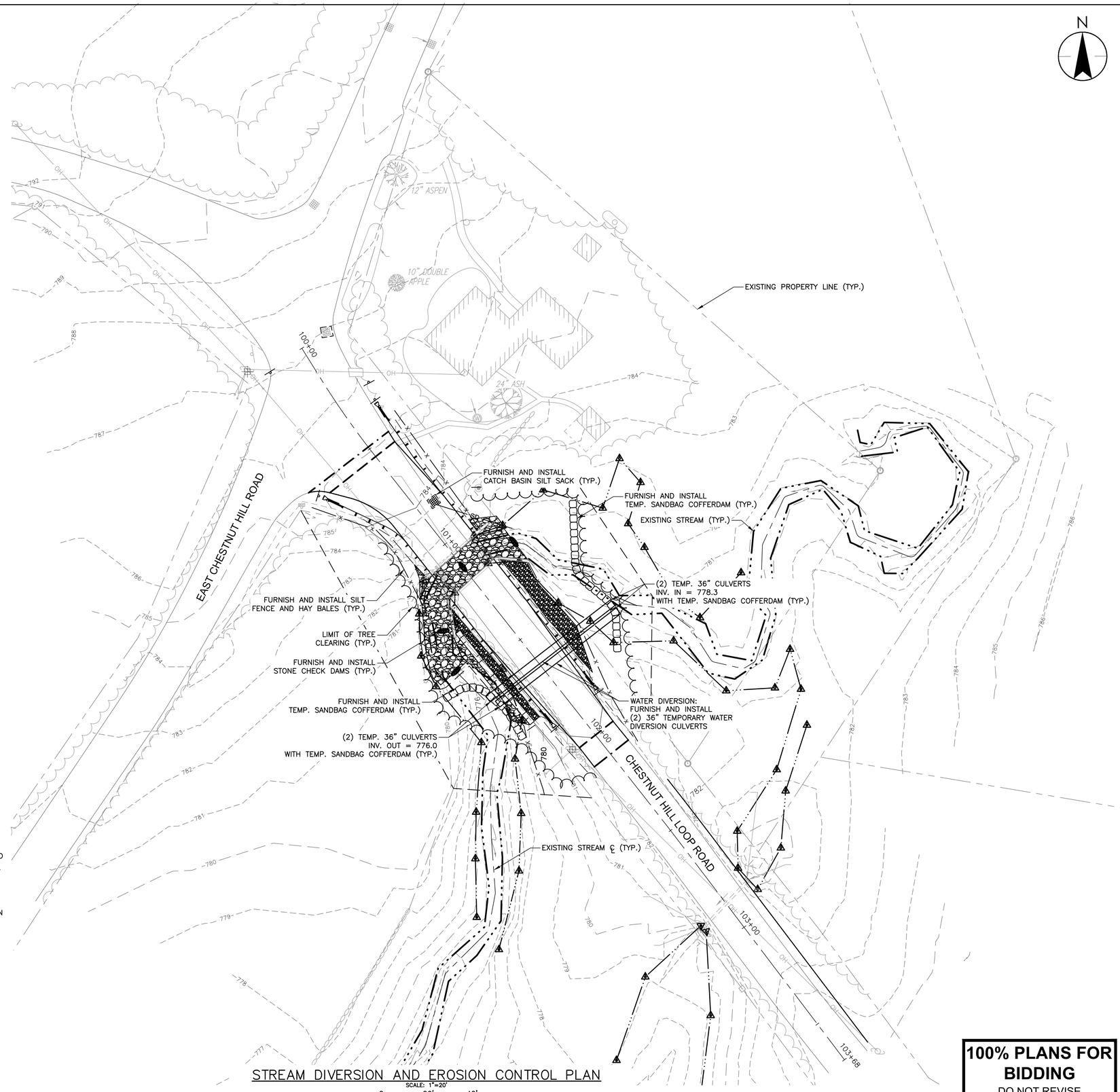

STREAM DIVERSION AND EROSION CONTROL PLAN

SCALE: 1"=20'

0 20' 40'

NOTES:

1. THE TEMP. BYPASS SHOWN IS CONCEPTUAL ONLY. THE ACTUAL TYPE AND MATERIALS USED WILL BE DETERMINED BY THE SELECTED CONTRACTOR AND MAY INCLUDE SANDBAGS AND PLASTIC SHEETING OR OTHER MATERIALS AS NECESSARY TO MAINTAIN A SUITABLY DRY WORK AREA.
2. IF DEWATERING OF THE WORK AREA WITHIN THE COFFERDAM BECOMES NECESSARY, A PUMP WILL BE DEPLOYED AND WATER WILL BE DISCHARGED TO AN APPROPRIATELY SIZED SEDIMENT BASIN OR SEDIMENT BAG LOCATED IN A VEGETATED AREA OF UPLANDS.
3. DEBRIS SHIELDING WILL BE IN PLACE PRIOR TO REMOVAL OF SUPERSTRUCTURE.
4. THE TEMPORARY CULVERTS ARE SHOWN TO THE SIDE OF THE STREAM CHANNEL, HOWEVER AS PART OF THE CONSTRUCTION OF THE PROPOSED BRIDGE STRUCTURE AND RIPRAP THE TEMPORARY CULVERT LOCATION AND ASSOCIATED SANDBAG COFFERDAMS MAY NEED TO BE SHIFTED TO FACILITATE THE CONSTRUCTION. NO ADDITIONAL PAYMENT SHALL BE MADE FOR THE RELOCATION OR MAINTENANCE OF THE BYPASS CULVERT.
5. THE CONTRACTOR SHALL SUBMIT TO THE ENGINEER A PROPOSED WATER DIVERSION AND DEWATERING PLAN PLAN DESIGNED AND STAMPED BY A PROFESSIONAL ENGINEER REGISTERED IN THE COMMONWEALTH OF MASSACHUSETTS FOR REVIEW AND APPROVAL PRIOR TO CONSTRUCTION, MEETING THE FOLLOWING CRITERIA:
   A. 58.2 CFS (2-YEAR STORM)
   B. MAXIMUM 85% CULVERT/BYPASS CAPACITY
6. INVERT ELEVATIONS ARE APPROXIMATE AND SHALL BE CONFIRMED/PROVIDED BY THE CONTRACTOR AS REQUIRED.

100% PLANS FOR BIDDING
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MARCH 2020

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2 FINAL DRAWINGS FOR BIDDING	BMR	RL	20.03.12
1 85% DRAWINGS FOR PERMITTING	BMR	RL	20.02.14

Issued	By	Appd.	YY.MM.DD
File Name: 13356-09-WATER DIVERSION.dwg	RDN Dwn.	BMR Chkd.	RL Dsgn.	18.06.15 YY.MM.DD

Permit-Seal

COMMONWEALTH OF MASSACHUSETTS
BRYAN M. RUDOFF
CIVIL
NO. 49289
REGISTERED PROFESSIONAL ENGINEER

Client/Project
TOWN OF MONTAGUE
MASSACHUSETTS

CHESTNUT HILL LOOP BRIDGE REPLACEMENT
MASSDOT BRIDGE NO. M-28-030 (C6N)

Title
STREAM DIVERSION AND EROSION CONTROL PLAN

Project No.	Scale	
195113356	AS NOTED	
Drawing No.	Sheet	Revision
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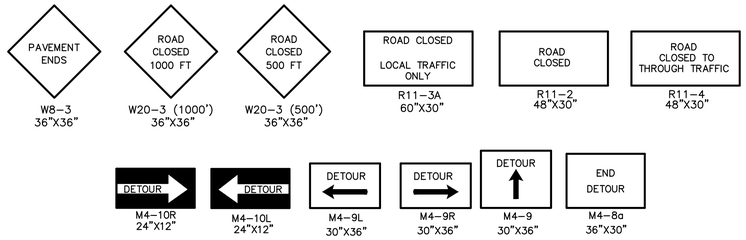
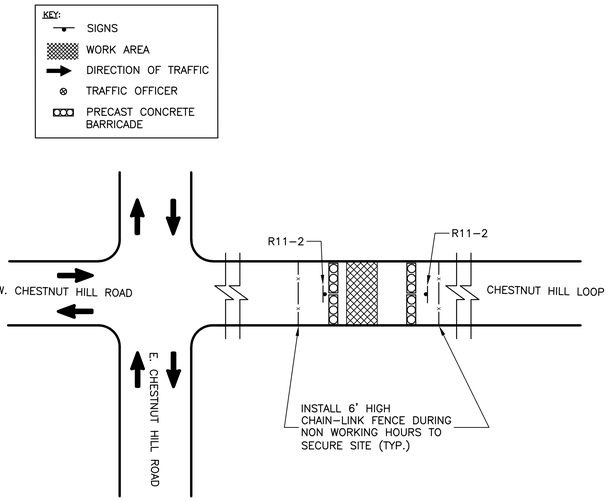


PROPOSED CONSTRUCTION DETOUR SIGNS

NOT TO SCALE

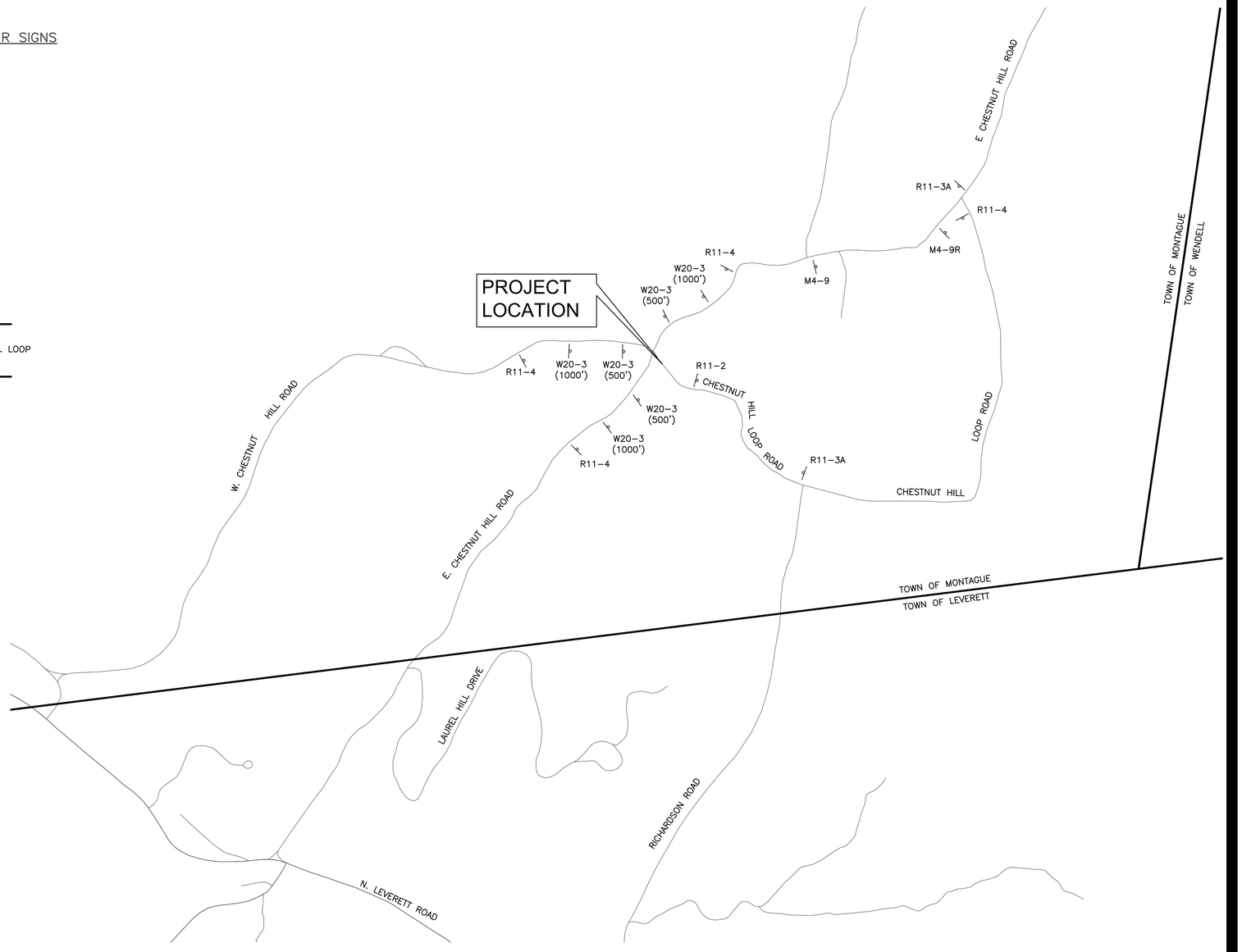


TYPICAL ROAD CLOSURE FOR CONSTRUCTION

NOT TO SCALE

NOTES:

1. CHESTNUT HILL LOOP TO THE EAST OF THE INTERSECTION BETWEEN E. CHESTNUT HILL ROAD AND W. CHESTNUT HILL ROAD, SHALL BE CLOSED TOO ALL THROUGH TRAFFIC FOR THE DURATION OF THE PROPOSED CONSTRUCTION, IMPLEMENTATION, AND THE DURATION OF THE ROAD CLOSURE SHALL BE APPROVED BY THE TOWN OF MONTAGUE, MA. THE CONTRACTOR SHALL SUBMIT A TRAFFIC CONTROL PLAN, SCHEDULE AND SEQUENCE OF WORK TO THE ENGINEER FOR APPROVAL PRIOR TO PERFORMING ANY WORK ASSOCIATED WITH THE PROJECT. ALL WORK WHICH CAN BE PERFORMED WITHOUT CLOSURE OF THE ROADWAY SHALL BE PERFORMED PRIOR TO CONSIDERATION OF ANY CLOSURE OF THE ROADWAY. TWO WAY TRAFFIC SHALL BE RESTORED AT THE END OF THE PROJECT.
2. CHESTNUT HILL LOOP CAN BE CLOSED TO THRU TRAFFIC FOR A MAXIMUM OF 60 CALENDAR DAYS.
3. ALL SIGNS SHALL BE BLACK LEGEND ON A REFLECTIVE ORANGE BACKGROUND AND IN ACCORDANCE WITH MASSDOT AND MUTCD STANDARDS. ALL CONSTRUCTION SIGNS SHALL BE ATTACHED TO THEIR OWN INDEPENDENT SUPPORTS.
4. THE LOCATION AND MESSAGE OF READER BOARD SIGNS SHALL BE APPROVED BY THE ENGINEER AND MASSDOT PRIOR TO THE START OF CONSTRUCTION.
5. THE CONTRACTOR SHALL CONTACT THE TOWN OF MONTAGUE AT LEAST THREE (3) WEEKS PRIOR TO IMPLEMENTING THE ROAD CLOSURE. THE CONTRACTOR SHALL PROVIDE ALL SIGNAGE, BARRICADES, POLICE DETAILS AS REQUIRED FOR TRAFFIC CONTROL.
6. ALL POLICE DETAILS REQUIRED FOR TRAFFIC CONTROL SHALL BE SCHEDULED, COORDINATED AND PAID BY THE CONTRACTOR.



TRAFFIC DETOUR PLAN

SCALE: 1"=600'

0 600' 1200'

100% PLANS FOR BIDDING

DO NOT REVISE

MARCH 2020

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Notes

1. THIS PLAN PROVIDES A SUGGESTED TRAFFIC CONTROL PLAN. THE CONTRACTOR SHALL SUBMIT FOR REVIEW AND APPROVAL A TRAFFIC MANAGEMENT PLAN FOR TRAFFIC CONTROL TO THE ENGINEER AND OWNER.

Revision	By	Appd.	YY.MM.DD
2 FINAL DRAWINGS FOR BIDDING	BMR	RL	20.03.12
1 85% DRAWINGS FOR PERMITTING	BMR	RL	20.02.14
Issued	By	Appd.	YY.MM.DD
File Name: 13356-08-DETOUR PLAN.dwg	AJG Dwn.	BMR Chkd.	RL Dsgn. 18.06.15 YY.MM.DD

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COMMONWEALTH OF MASSACHUSETTS
BRYAN M. RUDOFF
No. 49280
REGISTERED PROFESSIONAL ENGINEER

Client/Project

TOWN OF MONTAGUE
MASSACHUSETTS

CHESTNUT HILL LOOP BRIDGE REPLACEMENT
MASSDOT BRIDGE NO. M-28-030 (C6N)

Title

TRAFFIC DETOUR PLAN

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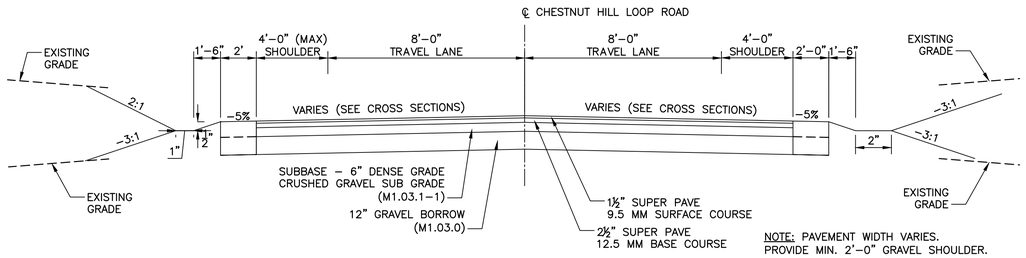
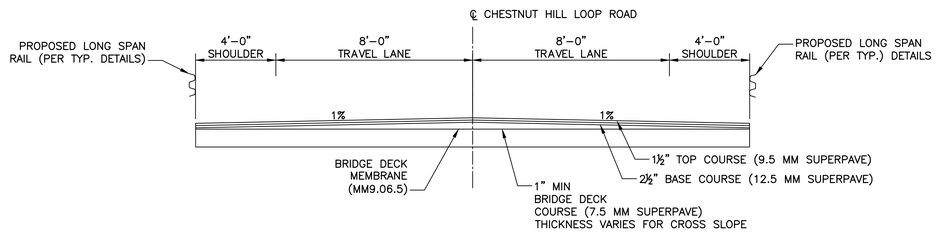
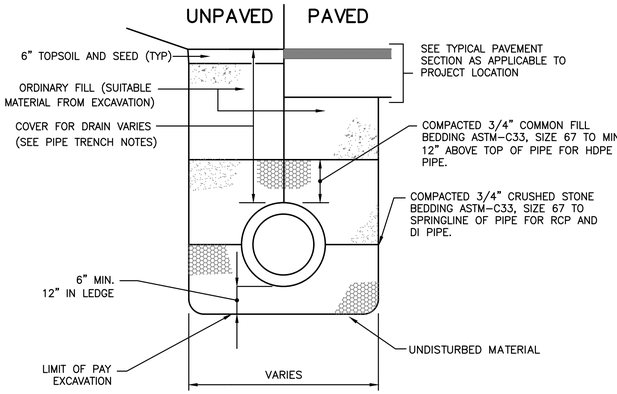


NOTE: PAVEMENT WIDTH VARIES. PROVIDE MIN. 2'–0" GRAVEL SHOULDER.

1 TYPICAL ROADWAY SECTION
NTS



2 TYPICAL BRIDGE SECTION
NTS

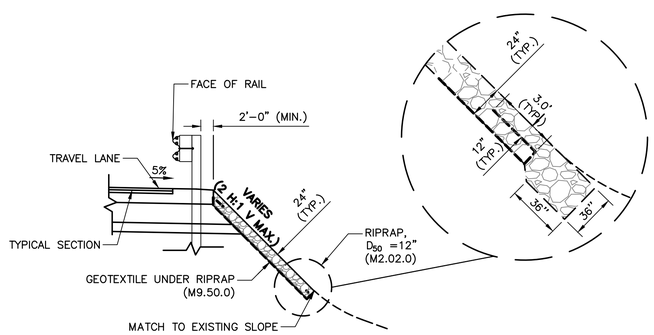


*	PIPE DIA.	TRENCH WIDTH
	UP TO 12"	36"
	12" TO 24"	I.D. PLUS 24"

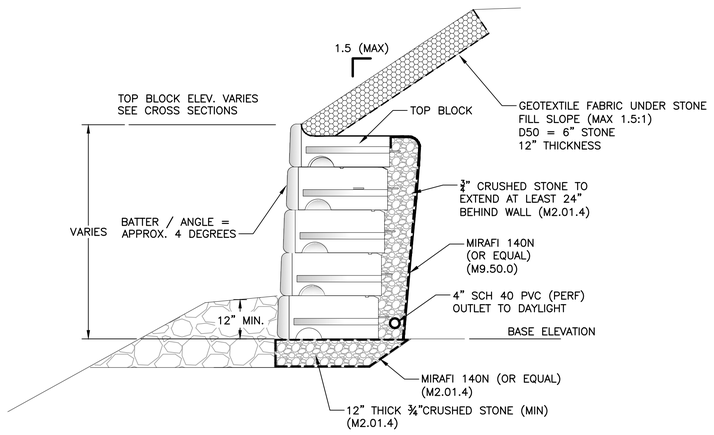
4 TYPICAL PIPE TRENCH
NTS

PIPE TRENCH NOTES:

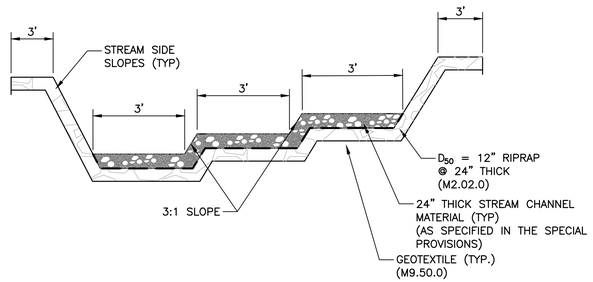
1. SUITABLE MATERIAL: IN ROADS, ROAD SHOULDERS, WALKWAYS AND TRAVELED WAYS, SUITABLE MATERIAL FOR TRENCH BACKFILL SHALL BE THE NATURAL MATERIAL EXCAVATED DURING THE COURSE OF CONSTRUCTION, SHALL EXCLUDE DEBRIS, PIECES OF PAVEMENT, ORGANIC MATTER, TOP SOIL, ALL WET OR SOFT MUCK, PEAT OR CLAY, ALL EXCAVATED LEDGE MATERIAL AND ALL ROCKS OVER SIX INCHES IN THE LARGEST DIMENSION, OR ANY MATERIAL WHICH, AS DETERMINED BY THE TOWN OF BERNARDSTON, MA DEPARTMENT OF ENGINEERING, WILL NOT PROVIDE SUFFICIENT SUPPORT OR MAINTAIN THE COMPLETED CONSTRUCTION IN A STABLE CONDITION. SUITABLE MATERIAL SHALL BE PLACED IN 12" LIFTS AND THOROUGHLY COMPACTED FOR NO ADDITIONAL COST.
2. BACKFILL OF THE TRENCHES SHALL BE COMPACTED TO TO 95% MAX. DRY DENSITY UNDER ALL PAVED AREAS AND 92% MAX. DRY DENSITY UNDER OTHER AREAS IN ACCORDANCE WITH MASSDOT STANDARD SPECIFICATIONS.
3. PLASTIC DRAIN PIPE (HDPE) SHALL BE ADS N–12 (CORRUGATED EXTERIOR/SMOOTH INTERIOR) OR EQUAL MEETING AASHTO M–252 AND H–20 LOADING.
4. SHORING AND STABILIZING OF TRENCH SIDEWALLS DURING EXCAVATION SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR. NO ADDITIONAL COMPENSATION WILL BE ALLOWED FOR ANY TRENCH EXCAVATION BEYOND THE LIMITS OF PAY EXCAVATION INDICATED INCLUDING ROCK EXCAVATION.
5. FOR TRENCH EXCAVATION IN ROCK AS DETERMINED BY THE ENGINEER, ALLOWABLE PAY LIMIT FOR TRENCH WIDTH SHALL BE AS DEFINED IN TABLE.
6. DI WATER MAIN SHALL BE CLASS 52 MECHANICAL JOINT.



5 TYPICAL RIPRAP SLOPE SECTION
NTS



3 MODULAR BLOCK RETAINING WALL DETAIL
NTS



6 RIPRAP STREAM DETAIL
NTS

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1 85% DRAWINGS FOR PERMITTING	BMR	RL	20.02.14
Issued	**By**	**Appd.**	**YY.MM.DD**
File Name: 13356-12-DETAILS.dwg	AJG	BMR	RL 18.06.15
	Dwn.	Chkd.	Dsgn. YY.MM.DD

Permit-Seal

COMMONWEALTH OF MASSACHUSETTS
BRYAN M. RUDOFF
No. 49269
REGISTERED PROFESSIONAL ENGINEER

Client/Project
TOWN OF MONTAGUE
MASSACHUSETTS

CHESTNUT HILL LOOP BRIDGE REPLACEMENT
MASSDOT BRIDGE NO. M-28-030 (C6N)

Title
CONSTRUCTION DETAILS

Project No.	Scale	
195113356	AS NOTED	
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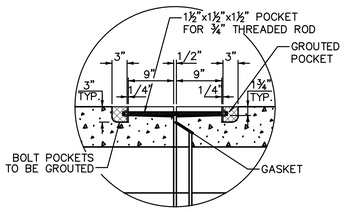
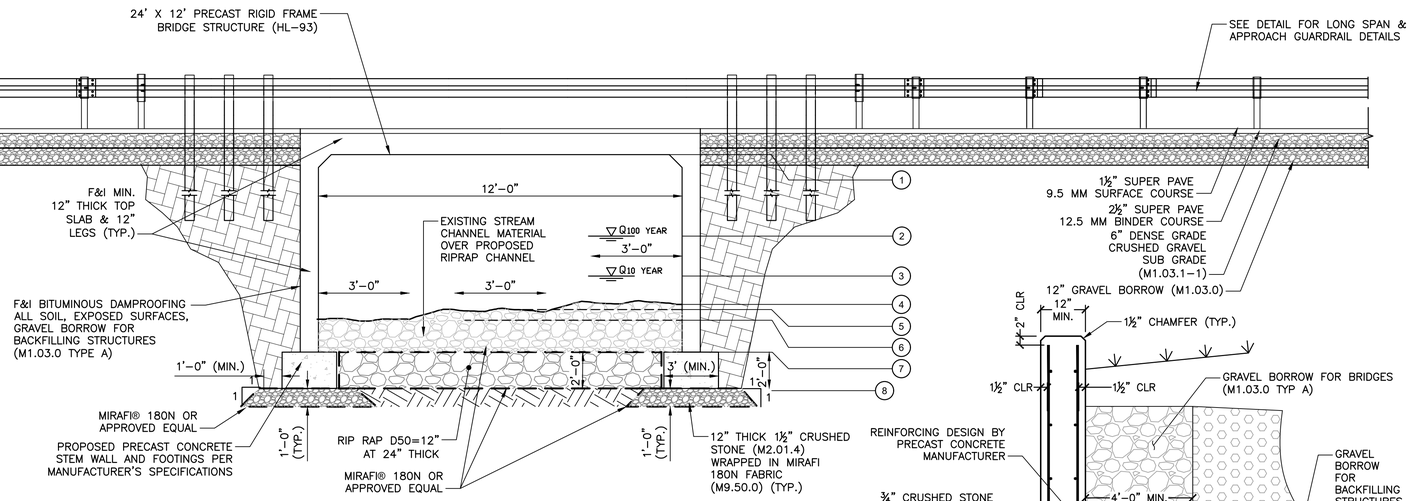
ORIGINAL SHEET - ARCH D



1 PERMANENT CLOSURE DETAIL
NTS

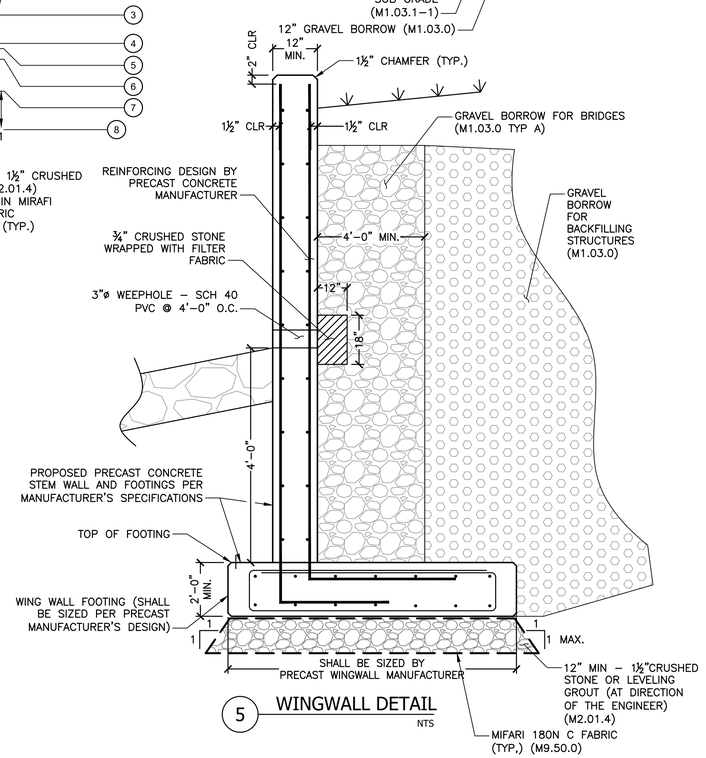
MINIMUM AND MAXIMUM STONE SIZES, INCHES						
D15		D50		D85		D100
MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MAX.
8.0	12.0	11.0	14.0	13.5	18.0	24.0

2 RIPRAP GRADATION CHART
NTS

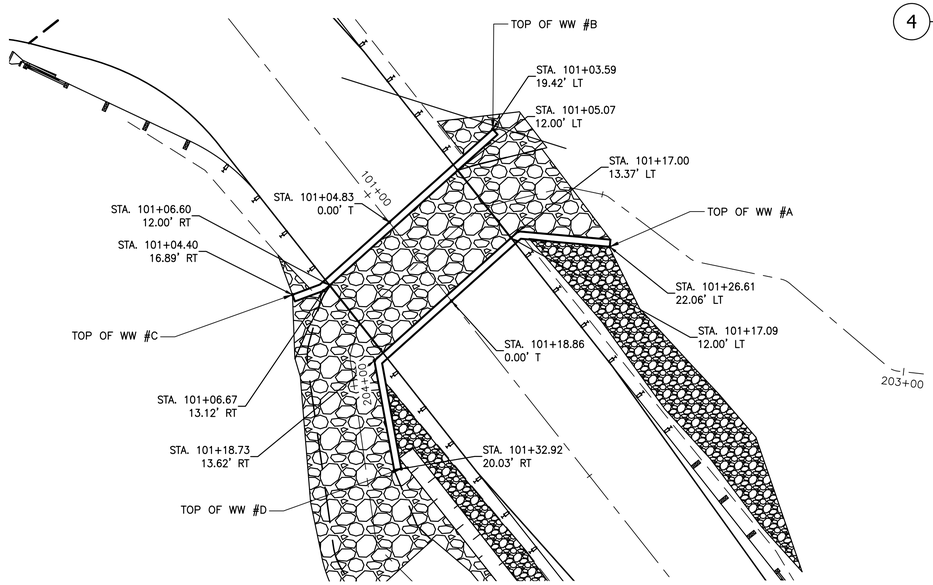


STRUCTURE ELEVATION LEGEND			
ITEM	DESCRIPTION	INLET ELEVATION	OUTLET ELEVATION
1	LOW CHORD	781.49	781.49
2	100 YEAR FLOOD ELEVATION	779.88	779.47
3	10 YEAR FLOOD ELEVATION	778.83	778.62
4	TERRESTRIAL PASSAGE BENCH	777.04	776.54
5	AVERAGE STREAM BED ELEVATION	776.54	776.04
6	BOTTOM OF LOW FLOW CHANNEL	776.04	775.54
7	TOP OF FOOTING	773.50	773.50
8	BOTTOM OF FOOTING	771.50	771.50

4 TYPICAL BRIDGE/ROADWAY PROFILE
NTS

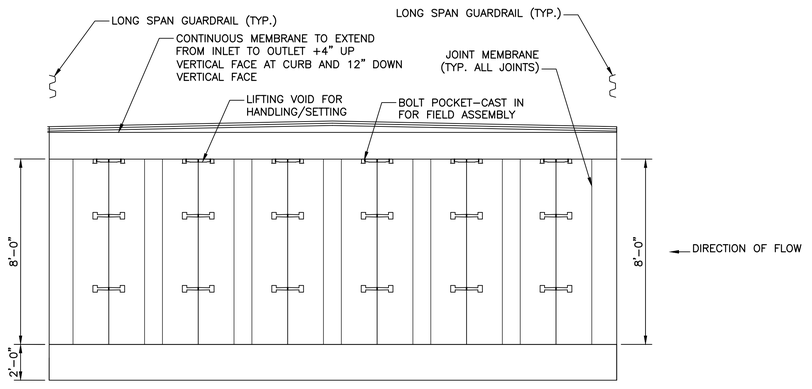


5 WINGWALL DETAIL
NTS



WINGWALL ID #	LENGTH	TOP OF WW (EL)	TOP OF FOOTING (EL)	ANGLE (°)
A	12'-6"	780.10	773.50	132.9
B	7'-6"	782.10	773.50	0.0
C	4'-1"	782.10	773.50	163.6
D	15'-0"	780.00	773.50	122.6

3 BRIDGE LAYOUT DETAIL
Scale: 1" = 20'



6 BRIDGE PROFILE VIEW
NTS

100% PLANS FOR BIDDING
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MARCH 2020

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

DISTRICT II BRIDGE ENGINEER — DATE

Notes

1. CHAPTER 85 SECTION 35 REVIEW AND APPROVAL IN ACCORDANCE AND COMPLIANCE WITH THE REQUIREMENTS OF CHAPTER 85 SECTION 35 OF THE MASSACHUSETTS GENERAL LAWS, THE CONTRACTOR SHALL SUBMIT TO THE MASSACHUSETTS DEPARTMENT OF TRANSPORTATION ALL CONSTRUCTION DRAWINGS DESIGN AND CALCULATIONS THAT SHALL BE USED TO FABRICATE AND CONSTRUCT THE STRUCTURE DENOTED ON THESE PLANS FOR REVIEW AND APPROVAL. THIS APPROVAL SHALL CONSTITUTE THE FINAL APPROVAL AS STIPULATED BY CHAPTER 85 SECTION 35 OF THE MASSACHUSETTS GENERAL LAWS.
2. FOR THE DESIGN OF SPREAD FOOTINGS BEARING SOIL THE FOLLOWING BEARING RESISTANCES SHALL BE USED:
   FACTORED BEARING RESISTANCE
   STRENGTH I: 9.0 KSF
   SERVICE I: 7.0 KSF
   FOR THE STRENGTH CONDITION THE FACTORED BEARING RESISTANCE IS THE PRODUCT OF THE NOMINAL BEARING RESISTANCE AND A RESISTANCE FACTOR OF 0.45. FOR THE SERVICE CONDITION THE FACTORED BEARING RESISTANCE IS BASED ON A MAXIMUM SETTLEMENT OF 1 INCH AND A RESISTANCE FACTOR OF 1.0.

Revision	By	Appd.	YY.MM.DD
1 85% DRAWINGS FOR PERMITTING	BMR	RL	20.02.14

Issued	By	Appd.	YY.MM.DD
File Name: 13356-12-DETAILS.dwg	AJG Dwn.	BMR Chkd.	RL Dsgn.	18.06.15 YY.MM.DD

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COMMONWEALTH OF MASSACHUSETTS
BRYAN M. RUOFF
No. 49280
REGISTERED PROFESSIONAL ENGINEER

Client/Project
TOWN OF MONTAGUE
MASSACHUSETTS

CHESTNUT HILL LOOP BRIDGE REPLACEMENT
MASSDOT BRIDGE NO. M-28-030 (C6N)

Title
BRIDGE DETAILS

Project No.	Scale	
195113356	AS NOTED	
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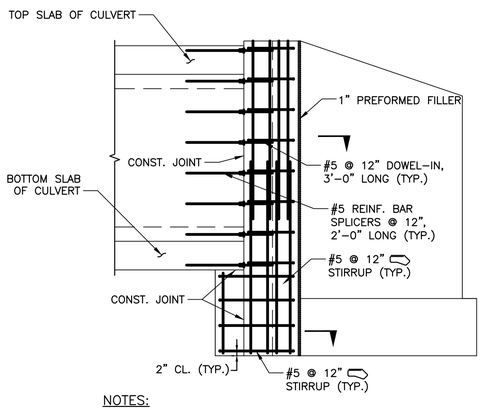
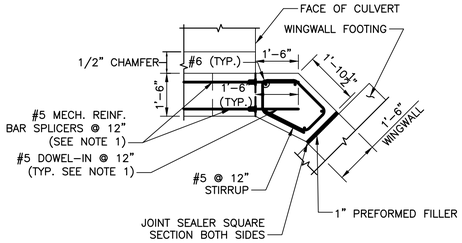


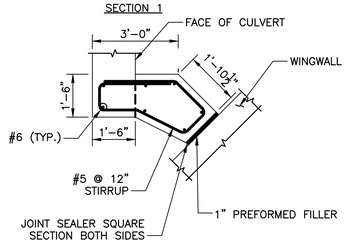
NOTES:

1. CULVERT AND REINFORCEMENT ARE NOT SHOWN FOR CLARITY.

1 WINGWALL CONNECTION SECTION
NTS



SECTION 1

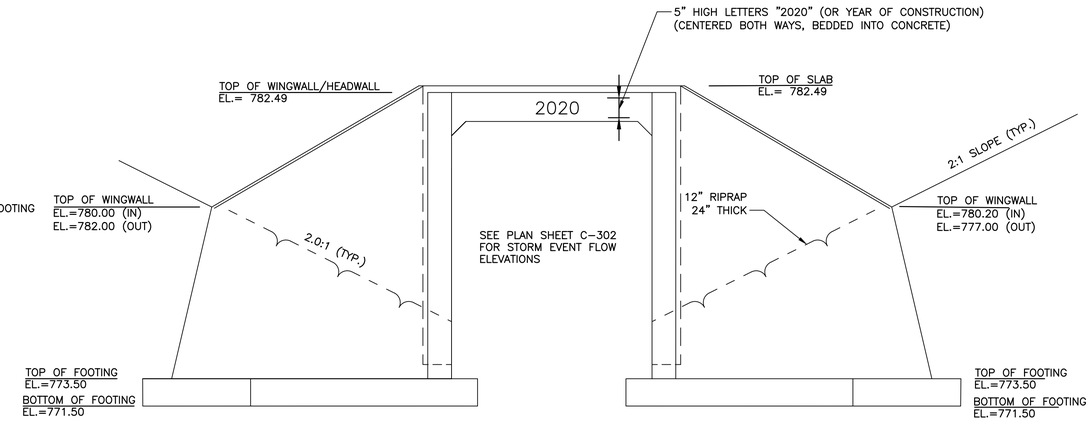


SECTION 2

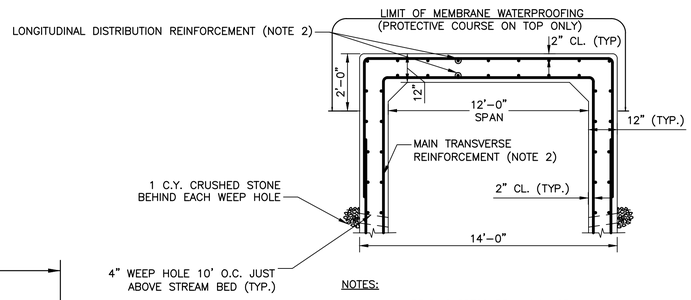
NOTES:

1. THE CONTRACTOR MAY SUBSTITUTE #5 DOWELS. 3'-0" LONG, FOR #5 THREADED SPLICE ANCHORS AND THREADED REBARS
2. CULVERT AND WINGWALL REINFORCEMENT IS NOT SHOWN FOR CLARITY

2 WINGWALL INTERFACE DETAIL
NTS



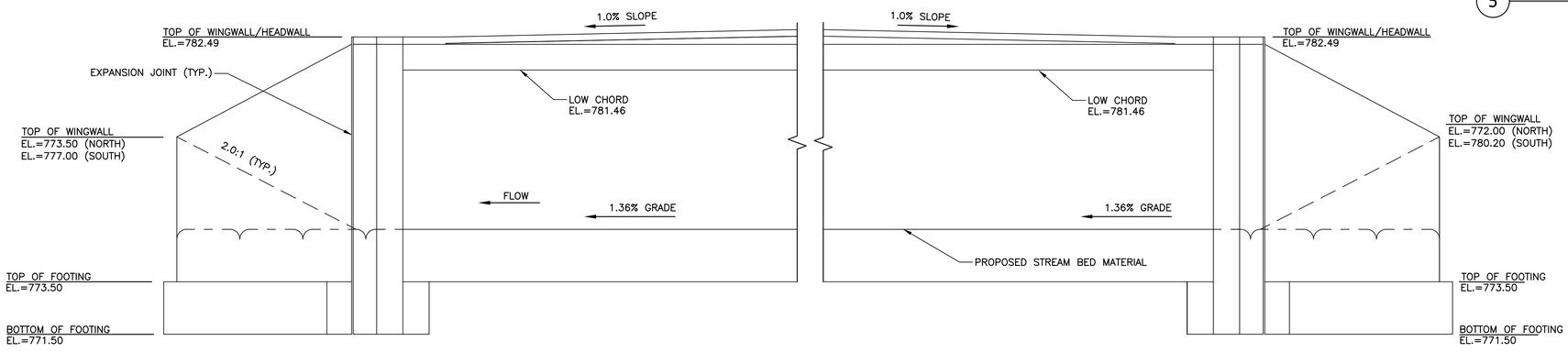
3 3-SIDED RIGID FRAME ELEVATION DETAIL
NTS



NOTES:

1. MAXIMUM BEARING PRESSURE = 9.0 KSF.
2. TRANSVERSE REINFORCING SHALL BE PLACED NORMAL TO THE ℄ OF THE CULVERT.

5 SECTION THROUGH 3-SIDED RIGID FRAME
NTS



NOTES:

1. EXPANSION JOINTS 70'-0" O.C., MAX.
2. CONSTRUCTION JOINT 25'-0" O.C., MAX.

4 3-SIDED RIGID FRAME LONGITUDINAL SECTION
NTS

100% PLANS FOR BIDDING
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MARCH 2020

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

DISTRICT II BRIDGE ENGINEER | DATE

Notes

Revision	By	Appd.	YY.MM.DD
2 FINAL DRAWINGS FOR BIDDING	BMR	RL	20.03.12
1 85% DRAWINGS FOR PERMITTING	BMR	RL	20.02.14

Issued | By | Appd. | YY.MM.DD

File Name: 13356-12-STRUCTURALDETAILS.dwg | Dwn. AJG | Chkd. BMR | Dsgn. RL | 18.06.15 YY.MM.DD

Permit-Seal

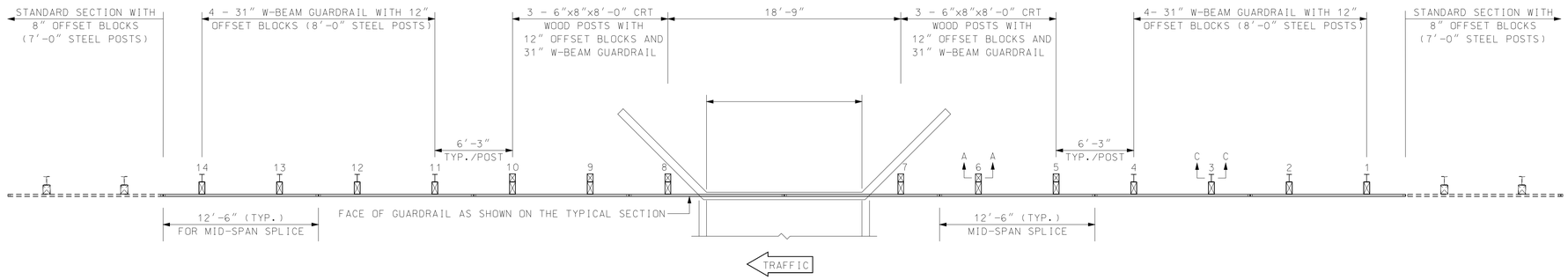
COMMONWEALTH OF MASSACHUSETTS
BRYAN M. RIDOFF
No. 49280
REGISTERED PROFESSIONAL ENGINEER

Client/Project
TOWN OF MONTAGUE
MASSACHUSETTS

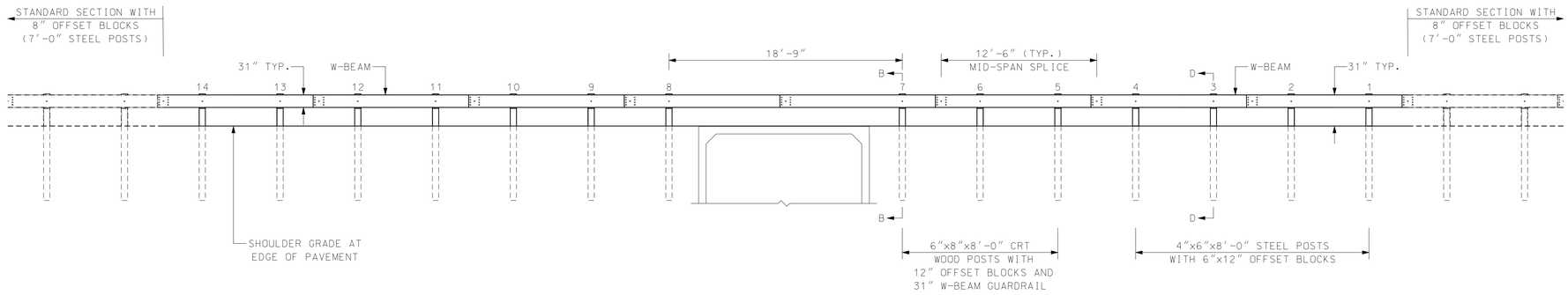
CHESTNUT HILL LOOP BRIDGE REPLACEMENT
MASSDOT BRIDGE NO. M-28-030 (C6N)

Title
STRUCTURAL DETAILS

Project No.	Scale	
195113356	AS NOTED	
Drawing No.	Sheet	Revision
C-303	13 of 17	0



PLAN



ELEVATION

31" W-BEAM GUARDRAIL
LONGSPAN (18'-9")

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Notes

1. REFERENCE FHWR APPROVAL LETTER HSSD (B-189) MIDWEST GUARDRAIL SYSTEM CMGS FOR LONG SPAN APPLICATION.
2. 2-31" W-BEAM GUARDRAIL WITH 12" OFFSET BLOCKS (8-10" WITH STEEL POSTS) SHALL BE USED AT NORTHWEST END SECTION LOCATION.

Revision	By	Appd.	YY.MM.DD
2 FINAL DRAWINGS FOR BIDDING	BMR	RL	20.03.12
1 85% DRAWINGS FOR PERMITTING	BMR	RL	20.02.14
Issued	**By**	**Appd.**	**YY.MM.DD**
File Name: 13356-11-RAIL.dwg	AJG Dwn.	BMR Chkd.	RL Dsgn.	18.06.15 YY.MM.DD

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COMMONWEALTH OF MASSACHUSETTS
BRYAN M. RUOFF
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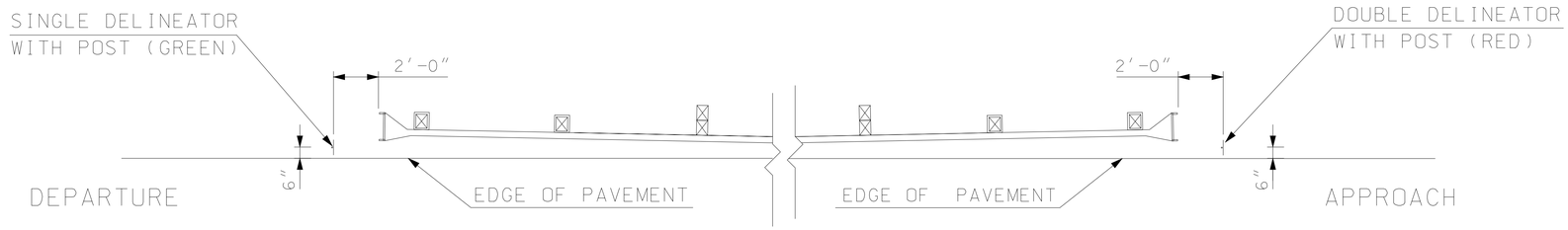
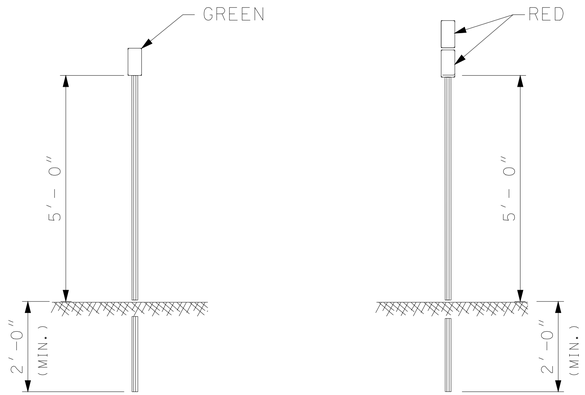
TOWN OF MONTAGUE
MASSACHUSETTS

CHESTNUT HILL LOOP BRIDGE REPLACEMENT
MASSDOT BRIDGE NO. M-28-030 (C6N)

Title
LONG SPAN GUARDRAIL DETAILS

Project No.	Scale	
195113356	AS NOTED	
Drawing No.	Sheet	Revision
C-304	14 of 17	0

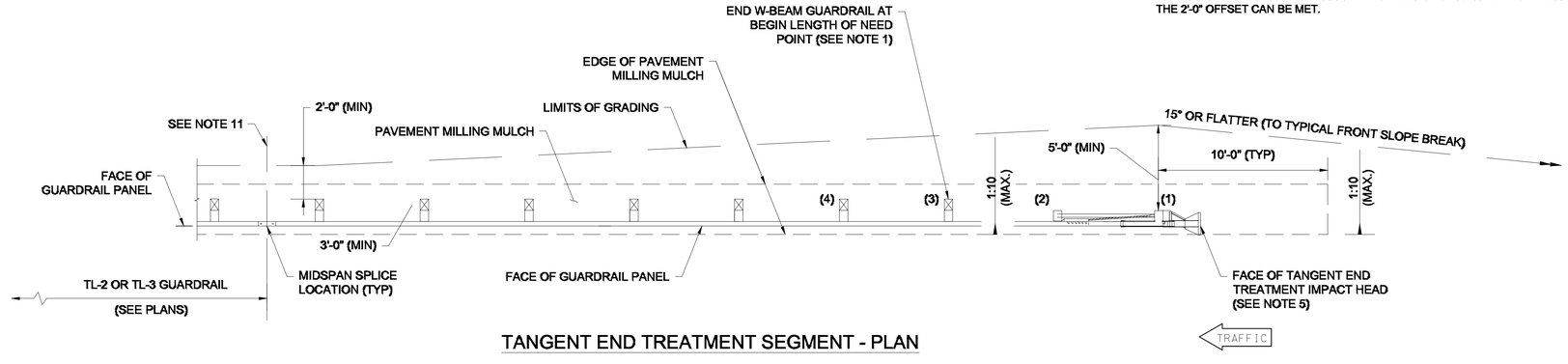




TYPICAL INSTALLATION

NOTES:

1. INSTALL GUARDRAIL AT STATION AND OFFSET SHOWN IN THE PLANS. THE END OF THE GUARDRAIL SHOWN IN THE PLANS CORRESPONDS WITH THE BEGIN LENGTH OF NEED POINT FOR THE END TREATMENT (SHOWN AT POST 3 IN THESE STANDARDS, BUT MAY VARY BY MANUFACTURER).
2. PROPRIETARY END TREATMENTS MAY VARY IN SIZE AND SHAPE FROM WHAT IS DEPICTED IN THESE STANDARDS. HOWEVER, THE MAXIMUM SLOPES AND MINIMUM OFFSETS DIMENSIONED FROM THE POSTS SHOWN HEREIN SHALL STILL APPLY.
3. END TREATMENT TEST LEVEL AND TYPE (TANGENT OR FLARED) SHALL BE SPECIFIED IN THE PLANS.
4. CONSTRUCT TANGENT AND FLARED END TREATMENTS IN ACCORDANCE WITH THE MANUFACTURER'S UNIQUE DRAWING DETAILS, PROCEDURES, AND SPECIFICATIONS.
5. AT THE DISCRETION OF THE ENGINEER, THE FACE OF THE TANGENT END TREATMENT IMPACT HEAD MAY BE OFFSET UP TO 2'-0" FROM THE PROJECTED FACE OF GUARDRAIL TO MINIMIZE NUISANCE HITS. THE OFFSET SHALL OCCUR OVER THE ENTIRE LENGTH OF THE END TREATMENT UNLESS OTHERWISE SPECIFIED BY THE MANUFACTURER.
6. LATERAL OFFSET OF FLARED END TREATMENT SHALL BE DETERMINED BY THE DESIGN ENGINEER FOLLOWING THE METHODOLOGY FOUND IN THE *ROADSIDE DESIGN GUIDE* AND SHOULD FALL WITHIN THE ALLOWABLE TOLERANCES SPECIFIED BY THE MANUFACTURER. LATERAL OFFSET SHALL BE MEASURED FROM THE EDGE OF TRAVELED WAY TO THE FACE OF THE GUARDRAIL AT POST #3.
7. END TREATMENTS SHALL NOT TERMINATE CURVED W-BEAM SEGMENTS.
8. END TREATMENT IMPACT HEAD DELINEATION SHALL CONFORM TO 601.63.
9. INSTALL GRADING AS SHOWN HEREIN UNDER SEPARATE PAY ITEMS.
10. SEE 400.2.2 FOR APPROACH TERMINAL GEOMETRY FOR GUARDRAIL INSTALLED ADJACENT TO CURB AND DOUBLE FACED GUARDRAIL.
11. MAINTAIN 2'-0" (MIN) OFFSET TO FRONT SLOPE BREAK DOWNSTREAM OF MIDSPAN SPLICE LOCATION AT ALL TIMES. IF, DOWNSTREAM OF THE SPLICE, GRADING CONSTRAINTS INHIBIT THIS MINIMUM OFFSET THEN USE DEEP STEEL POSTS AND TRANSITION TO A SLOPE BREAK CONDITION DESIGN PER THE DETAIL IN 400.1.5 UNTIL THE 2'-0" OFFSET CAN BE MET.



TANGENT END TREATMENT SEGMENT - PLAN

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Permit-Seal

COMMONWEALTH OF MASSACHUSETTS
BRYAN M. RUOFF
CIVIL
No. 47250
REGISTERED PROFESSIONAL ENGINEER

Client/Project
TOWN OF MONTAGUE
MASSACHUSETTS

CHESTNUT HILL LOOP BRIDGE REPLACEMENT
MASSDOT BRIDGE NO. M-28-030 (C6N)

Title
GUARDRAIL DETAILS

Project No.	Scale	
195113356	AS NOTED	
Drawing No.	Sheet	Revision
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GENERAL NOTES AND SPECIFICATIONS FOR EROSION CONTROL

1. The contractor is responsible for water control during all phases of construction. No work shall be performed in flowing water. Streams shall be temporarily dammed by use of sand bags or other suitable means. The diversion shall be accomplished by temporary culverts or by pumping. Dewatering of the work area shall be discharged to an appropriately sized dewatering basin surrounded erosion and sediment controls.

2. This plan is to be used as a guideline only. Additional erosion and sediment controls may be dictated by field conditions.

3. The Contractor is responsible for complying with all local, state, and federal regulations.

4. Temporary Stabilization:
All disturbed areas shall have temporary or permanent stabilization within 14 days of initial disturbance. After this time any disturbance shall be stabilized by the end of the day, with the following exceptions:
(1) Stabilization is not required if work is to continue in the area in the next 24 hours and there is no precipitation forecast for the next 24 hours.
(2) Stabilization is not required if the work is in a self–contained excavation with a depth of 2 feet or mare.
Temporary Stabilization Measures may include but are not limited to:
(1) Hay or straw mulch with a thickness of at least 2 inches.
(2) Soil tracking with tracked equipment. Should be limited to small areas with slopes less than 100 feet long (less than 50 feet with slopes steeper than 3:1)
(3) A combination of the above.
(4) Erosion Control matting.

5. Materials may include but are not limited to:
A. Mulch material: Select mulch material for erosion control that will best meet the site conditions from the following.
(1) Hay or straw – Shall be dry, free of mold and weed seeds. Hay or straw can be used on disturbed areas that will not be reworked for 7 to 30 days.
(2) Wood Chips – Shall be dry, free of soil and other foreign material.
(3) Rolled Erosion Control Products (RECP) – Shall be dry, and shall be made of straw or hay, coconut and related fibers, wood excelsior, jute, polypropylene, nylon, or an approved combination of different materials.
B. Mulch Anchoring: When mulch must be held in place, the following mulch anchoring material shall be used:
(1) Mulch Netting (Paper, twine, plastic, or plastic and wood fiber).
D. Lime: Ground limestone containing not less than 95% total carbonates (calcium or magnesium).
E. Temporary Seed Mixture: When it is impractical to establish permanent protective vegetation on disturbed earth by October 15, use "Conservation Mix" or the following seed mixture. Disturbed areas that will not be reworked for 30 days or more shall also receive temporary seed and mulch.

Kind of Seed:	% By Weight
Annual Ryegrass	50
Perennial Ryegrass	50

Apply seed mixture at 50 pounds per acre.
F. Permanent Seed Mixture: (Not for Wetland Restoration):
(1) For MassDOT slopes and shoulders restoration of growth: Shall normally be used on loam areas. This seed shall conform to the following:

Slopes and Shoulders

Kind of Seed:	Proportion	Germination Minimum	Purity Minimum
Creeping Red Chewings, and/or Hard Fescue	50%	85%	95%
Tall Fescue	35%	85%	95%
Perrenial Rye	5%	90%	98%
Red Top	5%	85%	92%
Dutch White Clover	5%	85%	96%

6. Seeding and Mulching:
A. All areas shall be seeded and mulched within 48 hours of final grading.
B. Soil samples may be sent to the county extension service for analysis to determine the proper seed mixture and fertilizer requirements.
C. The following procedures shall be followed for temporary seeding:
(1) Apply seed mixture at a rate of 50 pounds per acre and additional 3–4 lbs. per 1000 square feet for sloped areas of 45% and greater evenly in two intersecting directions. Rake lightly.
(2) Apply mulch material within 24 hours after seeding in accordance with the following:
(A) Hay or Straw: Application rate – 75 to 100 pounds per 1000 square feet. Spread by hand or with machine. Anchor on slopes and where subject to blowing or slipping.
(B) Wood Chips – Application rate – Two to six inches deep. Use for tree and shrub planting.
(3) Anchor mulch on all slopes exceeding 5% and other areas as required using the following method:
(A) Mulch Netting: Spread over loose mulch and pin to the soil in accordance with the manufacturer's instructions.

4. Seeding and Mulching (CONTINUED):
D. When temporary seeding cannot be accomplished to have established or visible growth by October 15, the disturbed areas shall be covered with 6 inches of mulch and anchored or erosion control blankets for the duration of the winter.

5. Maintenance of Erosion Control Structures:
A. Stone check dams shall be replaced when they become clogged with soil particles or as directed by the owner/representative.
B. When the sediment accumulation reaches a depth of 12 inches behind the silt fence, it shall be disposed of.
C. Repair all damages caused by soil erosion or construction equipment at or before the end of each working day.
D. Stone stabilized construction entrances shall be inspected to ensure tracking of sediments onto public right–of–ways or streets is not occurring. Maintenance may include periodic top dressing with additional aggregate to ensure a minimum thickness of eight inches.
E. All measures shall be removed within 30 days of stabilization.

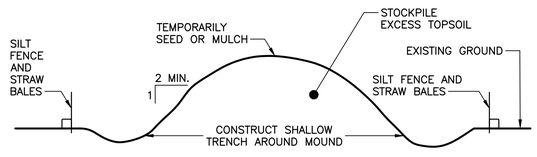
6. Wetland Restoration and seeding notes
(1) Hydric soils shall be translocated from impacted wetland, as practicable, for use in restoration after base grading is completed.
(2) Topsoil shall be placed to a minimum depth of 6 inches in the replication area when establishing the final grades.
(3) Prior seeding, soils shall be shallowly harrowed/raked (i.e., to a depth < 4 inches) by hand.
(4) Seed shall be applied in early spring or mid fall.
(5) Planting and seeding shall not occur when ground is frozen, snow covered, inundated or otherwise unsuitable.
(6) Seed shall be applied over exposed soils at a minimum rate of 1 pound per 2500 square feet.
(7) A light coating of straw shall be used to cover exposed/seeded soils.

7. Winter Erosion Control
A. All erosion control features such as silt fence must be in place prior to the ground freezing.
B. All disturbed areas of the site shall be seeded and mulched from October 15 to May 1 regardless of whether final grading has been finished. Work may continue through this period if the following winter erosion controls are implemented.
(1) Oat seeds shall be substituted for any other temporary annual grass seeds.
(2) All exposed earth shall be mulched with 6 inches of hay or straw. Slopes over 5% shall have an additional covering of staked jute mat or its equivalent.
C. The following maintenance items should be performed specifically for the various erosion control devices:
(1) Diversion Dike:
(A) Minimum inspection frequency – Weekly.
(B) Remove any flow blockage caused by ice or sediment.
(2) Mulch:
(A) Minimum inspection frequency – Daily.
(B) Replace mulch on any area where original mulch cover has been lost.
(3) Silt Fence:
(A) Minimum inspection frequency – Weekly.
(B) Clean and remove any collected sediment before predicted thaws or rainy periods.
(4) Stone Check Dam:
(A) Minimum inspection frequency – Weekly.
(B) Remove and replace clogged stone.

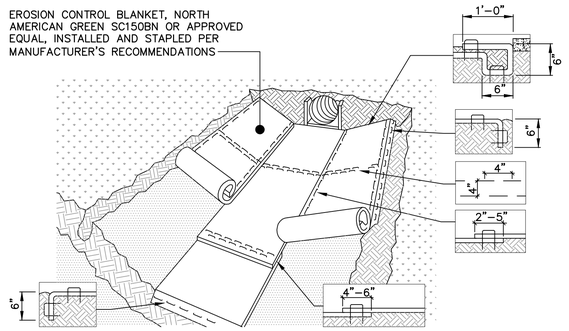
PROPOSED WETLAND SEED MIX

Botanical Name	Common Name	Indicator
Carex lurida	Lurid Sedge	OBL
Carex scoparia	Blunt Broom Sedge	FACW
Verbena hastata	Blue Vervain	FACW
Carex lupulina	Hop Sedge	OBL
Scirpus atrovirens	Green Bulrush	OBL
Panicum rigidulum	Redtop Panic Grass	FACW+
Deschampsia cespitosa	Tufted Hairgrass	FACW
Bidens aristosa	Tickseed Sunflower/Bur Marigold	FACW
Eleocharis palustris	Creeping Spike Rush	OBL
Juncus effusus	Soft Rush	FACW+
Carex crinita	Fringed Sedge	OBL
Mimulus ringens	Square Stemmed Monkey Flower	OBL
Aster puniceus	Swamp Aster	OBL
Eupatorium perfoliatum	Boneset	FACW
Glyceria canadensis	Rattlesnake Grass	OBL
Asclepias incarnata	Swamp Milkweed	OBL
Helenium autumnale	Common Sneezeweed	FACW+
Penthorum sedoides	Ditch Stonecrop	OBL

NOTE: "NEW ENGLAND WETMIX" FROM NEW ENGLAND WETLAND PLANTS, INC. APPLICATION RATE = 1 LB PER 2,500 SF. SEED MIX MAY BE MODIFIED DEPENDING UPON SEED AVAILABILITY WITH THE APPROVAL OF THE DESIGNATED WETLAND SCIENTIST. THE DESIGN CRITERIA AND ECOLOGICAL FUNCTION OF THE MIX SHALL REMAIN UNCHANGED.

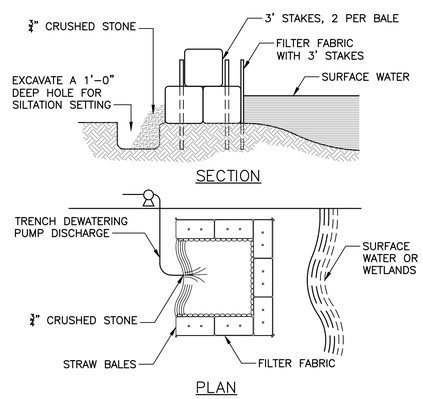


4 TYPICAL TOPSOIL STOCKPILE MOUND DETAIL
NOT TO SCALE



NOTES:
1. TO BE USED ON SLOPES 3 HORIZONTAL TO 1 VERTICAL OR STEEPER.
2. PREPARE SOIL INCLUDING APPLICATION OF LIME, FERTILIZER AND SEED PRIOR TO INSTALLING BLANKET

1 EROSION CONTROL BLANKET DETAIL
NOT TO SCALE



2 DEWATERING BASIN DETAIL
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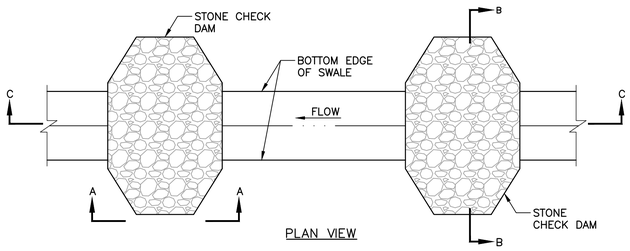
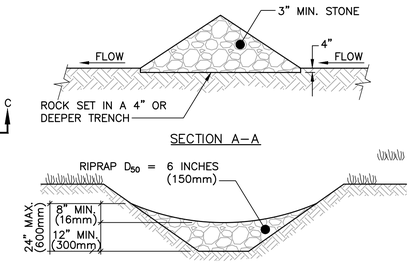
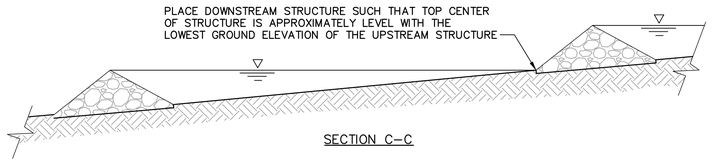


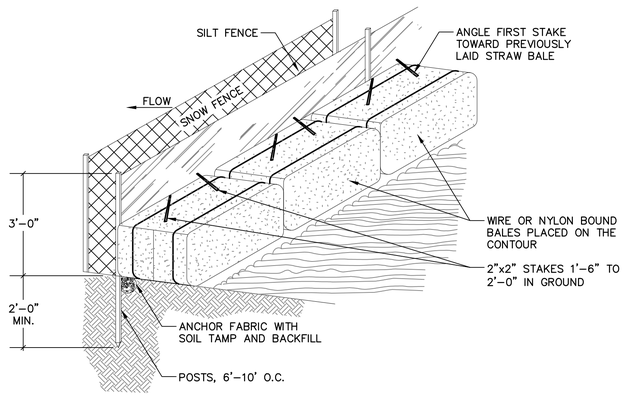




DITCH GRADE (G)	CHECK DAM SPACING(S)
0.02 FT/FT (M/M)	67.0 FT (20.5 M)
0.03 FT/FT (M/M)	44.5 FT (13.6 M)
0.04 FT/FT (M/M)	33.4 FT (10.2 M)
0.05 FT/FT (M/M)	26.7 FT (8.2 M)
0.06 FT/FT (M/M)	22.3 FT (6.8 M)

DO NOT USE CHECK DAMS BELOW 2% OR ABOVE 6% DITCH GRADES

3 STONE CHECK DAM DETAIL
NOT TO SCALE



5 SILT FENCE & STRAW BALE DETAIL
NOT TO SCALE

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Issued	**By**	**Appd.**	**YY.MM.DD**
File Name: 13356-13-EROSION CONTROL DETAILS.dwg	Dwn.	Chkd.	Dsgn.
	BMR	RL	18.06.15

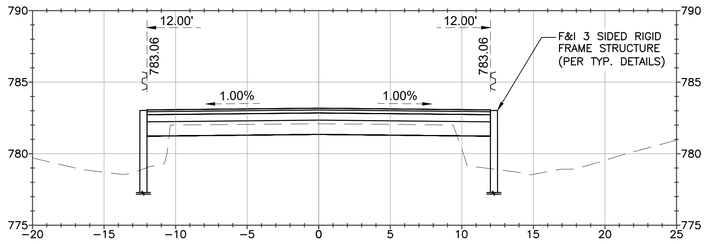
Permit-Seal

COMMONWEALTH OF MASSACHUSETTS
BRYAN M. RUOFF
No. 49280
REGISTERED PROFESSIONAL ENGINEER

Client/Project
TOWN OF MONTAGUE
MASSACHUSETTS
CHESTNUT HILL LOOP BRIDGE REPLACEMENT
MASSDOT BRIDGE NO. M-28-030 (C6N)

Title
EROSION AND SEDIMENTATION CONTROL DETAILS

Project No. 195113356
Scale AS NOTED
Drawing No. C-400
Sheet 16 of 17
Revision 0



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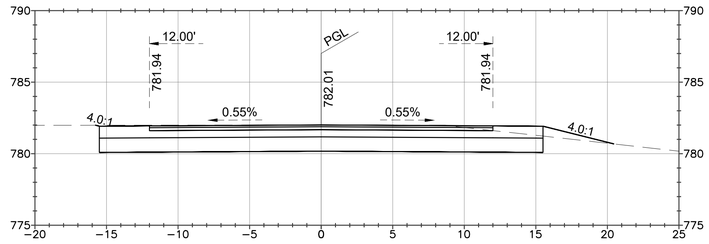

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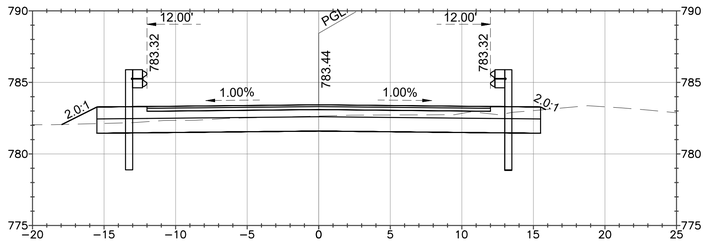

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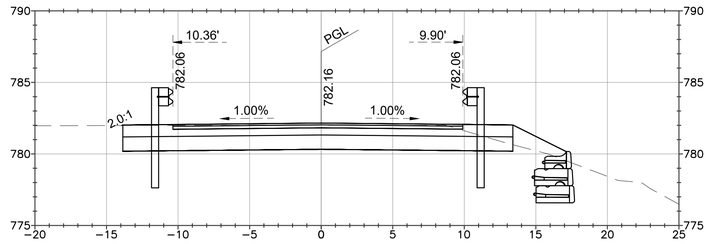

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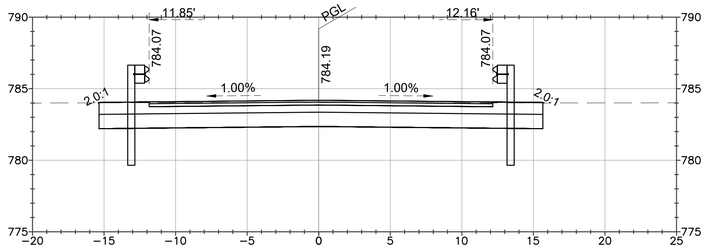

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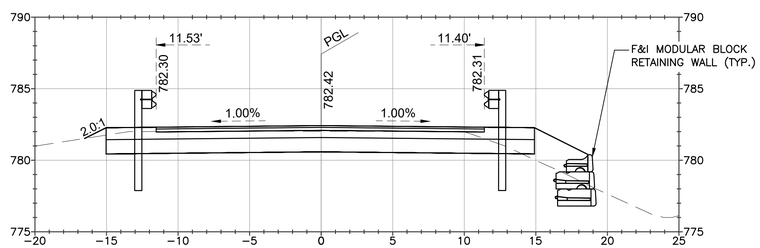

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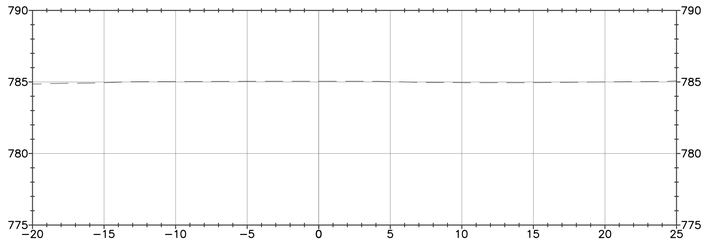

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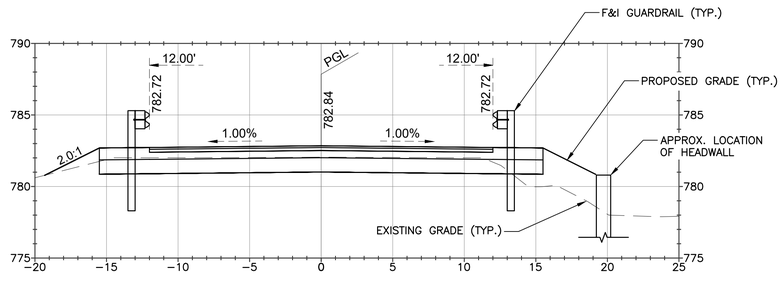


101+25.00

100% PLANS FOR BIDDING
DO NOT REVISE
MARCH 2020

Stantec

Stantec Consulting Services Inc.
5 Dartmouth Drive, Suite 101
Auburn NH 03032 U.S.A.
Tel. 603.669.8672
Fax. 603.669.7636
www.stantec.com

Consultants

Notes

Revision	By	Appd.	YY.MM.DD
2 FINAL DRAWINGS FOR BIDDING	BMR	RL	20.03.12
1 85% DRAWINGS FOR PERMITTING	BMR	RL	20.02.14

Issued	By	Appd.	YY.MM.DD
File Name: 13356_Model.dwg	AJG Dwn.	BMR Chkd.	RL Dsgn. 18.06.15 YY.MM.DD

Permit-Seal

COMMONWEALTH OF MASSACHUSETTS
BRYAN M. RUOFF
No. 47251
REGISTERED PROFESSIONAL ENGINEER

Client/Project
TOWN OF MONTAGUE
MASSACHUSETTS

CHESTNUT HILL LOOP BRIDGE REPLACEMENT
MASSDOT BRIDGE NO. M-28-030 (C6N)

Title
CHESTNUT HILL LOOP ROAD
CROSS SECTIONS

Project No.	Scale	
195113356	AS NOTED	
Drawing No.	Sheet	Revision
XS-301	17 of 17	0

Hydrologic, Hydraulic and Scour Protection Report

Bridge Replacement
Chestnut Hill Loop Bridge Over
Chestnut Hill Brook
Montague, Massachusetts
MassDOT Bridge#M-28-030 (BRI)

Stantec

Prepared for:
Town of Montague,
Massachusetts

Prepared by:
Stantec Consulting Services Inc.
5 Dartmouth Drive, Suite 200
Auburn, New Hampshire

February 12, 2020

Table of Contents

LIST OF TABLES

LIST OF APPENDICES

1.0 Executive Summary

This report presents information on the hydrologic, hydraulic, FEMA floodway analysis, scour, and scour countermeasure analyses that were performed as part of the proposed replacement of the existing bridge crossing where Chestnut Hill Brook passes under Chestnut Hill Loop Road, in the Town of Montague, Massachusetts. The proposed bridge location and its tributary watershed are shown in the figure in APPENDIX A.

2.0 Project Description

This section summarizes the existing structure, waterway crossing, highway classification, MassDOT design requirements, land use within the area of the proposed crossing replacement, and the existing land uses in the area.

2.1 EXISTING BRIDGE SYSTEM

The existing crossing is a cast in place concrete deck structure set on rubble rock that is approximately 18-feet long structure with no headwalls and has a clear span of approximately 10.0 feet (ft). The internal height between the invert of the streambed and the bottom chord of existing structure varies between 4.0 ft and 4.3 ft. The width of the roadway over Mill Brook is 16 ft, and the open area of the stream crossing is approximately 42 square feet (sq ft). The existing concrete slab rubble and mortar rock abutments are collapsing on the westerly side of the crossing.

Fieldstone Land Services, Inc of Milford, NH prepared a topographic plan of the existing stream crossing and adjacent area. A plan of the topographic survey and surveyed stream channel cross sections are included as APPENDIX B to this report. All elevations presented on the plans, included in the summaries of this report and in the HEC-RAS models are based on a NAVD88 datum.

The proposed structure for the crossing is a single span 3-sided rigid frame structure with a proposed span of 12-feet and a length of 26-feet between the inlet and outlet of the bridge. The height of low chord the proposed replacement single span precast concrete stream crossing is approximately 4.3-feet above the average riverbed bottom and has an open area of approximately 50 sq ft.

2.2 CROSSED WATERWAY

According to USGS StreamStats, Chestnut Hill Brooke has a tributary watershed area of approximately 0.94 square miles (sq mi), See APPENDIX C, upstream of the Chestnut Hill Loop Road crossing. Chestnut Hill Brook discharges into minor water bodies until it reaches the Connecticut River. Upstream of proposed crossing replacement, the stream meanders through a defined channel through forested land. There is a severe stream channel radial curve at the inlet and outlet of the crossing in existing conditions that appears to be the previous re-routing of the stream is improved by expanding the width of the crossing opening for the proposed 3-sided rigid frame. Downstream of this existing outlet the flows meander though existing

wetlands at gradual slopes of on average of 1% with areas of negative slopes, flat areas and ponding locations observed.

2.3 HIGHWAY CONVEYED

Chestnut Hill Loop Road is an un-numbered, Town of Montague maintained rural, road with light to moderate traffic. Chestnut Hill Loop Road is classified as a rural local road or rural collector, based on MassDOT criteria. The design criteria for a Chestnut Hill Loop is the following:

- Bridge sizing for a 10-year design flood event, with 2-feet of freeboard.
- Scour design for a 25-year design flood event, checked for the 50-year design flood event.
- Scour analysis and scour protection designed for the 25-year design flood, checked to the 50-year design flood, using HEC-RAS and the MassDOT Modified Froehlich equation.

2.4 LAND USES IN THE VICINITY OF THE BRIDGE

The existing land uses on Chestnut Hill Loop Road are primarily undeveloped wooded areas and residential homes. Immediately adjacent to the project, on the Northern side of the stream crossing, is an existing single-family residence and existing four-way road intersection.

The existing crossing under Chestnut Hill Loop Road is approximately 200 feet East of the intersection of Chestnut Hill Road West, Chestnut Hill Road East and Chestnut Hill Loop Road.

2.5 SPECIAL SITE CONSIDERATIONS

2.5.1 National Flood Insurance Program

The Chestnut Hill Loop Road bridge spans over a National Flood Insurance Program (NFIP) Special Flood Hazard Area (SFHA) Zone B, which is described as areas between limits of the 100-year flood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one square mile; or areas protected by levees from the base by FEMA, a regulated floodway in the 1982 Town of Montague NFIP Flood Insurance Study (FIS). See APPENDIX B for The Town of Montague Floodway Map in proximity to this location.

2.5.2 Bankful Width

Bankful width is a criterion that relates to the design of a replacement stream crossing at the subject bridge as potential criteria for bridge and culvert replacement, these criteria require that the structure width be 1.2-times the bankfull width of the waterway being crossed. The bankfull width of Chestnut Hill Brook at the crossing in existing wetlands was determined using field measurements by Stantec and determined to be approximately 12-feet. A replacement stream crossing with a span of 1.2-times the bankfull width would require an opening width of span of 15-feet.

The existing stream channel is variable for an extended distance upstream of the crossing. Immediately downstream from the crossing there is an existing bend and ponding areas, prior to the channel becoming redefined approximately 30' downstream.

The proposed crossing is sized to satisfy the requirements of the 1.2 times bankfull width requirement.

3.0 Data Collection

3.1 DATA SOURCES AND APPLICATIONS

An on-the ground topographic survey was performed by Fieldstone Land Consultants in 2019 to provide the existing geometric data and bridge system information for the HEC-RAS existing conditions model. Stantec performed a field inspection to supplement the data that was obtained from the survey to confirm the dimensions of the crossing, the bankfull width, the stream channel material and gradation and the stream channel limits, and the appropriate manning's friction coefficient for the existing stream channel and side slopes.

The stream material was observed as being a non-plastic soil with similar gradation to a 5-inch minus granular material comparable to a well graded gravel with sand. It should be noted that this location is the most conservative material sample location, the stream channel up and downstream from the proposed crossing contains existing natural streambed material is a well-graded gravel with sand and mixed in stone with stone size diameters generally ranging between 6 and 12-inches, as shown in the stream channel pictures in APPENDIX D.

4.0 Engineering Methods

4.1 HYDROLOGIC ANALYSES

There are no developed FEMA FIS peak discharge flow rates for the crossing of Chestnut Hill Brook at Chestnut Hill Loop Road. The peak discharge rates, from the USGS Streamstats, were utilized for analysis for the bridge sizing and to determine the existing and proposed 10, 25, 50 and 100-flood elevation comparison. The 2-year storm event was utilized to size the temporary bypass.

Hydrologic statistics were developed using peak flow regression equations for the Western Region of Massachusetts developed by the U.S. Geological Survey (USGS)[1]. Input parameters were obtained from the Massachusetts StreamStats (StreamStats) software system. Input parameters for the Western Region regression equations include 1) tributary drainage area, 2) Tributary channel slope and 3) storage.

A tributary drainage of 0.94 square miles (601.6 acres) was obtained for Chestnut Hill Brook at the downstream side of the bridge was obtained using the Massachusetts StreamStats online software utility (http://water.usgs.gov/osw/streamstats/massachusetts.html). Storage was not considered limits of the

tributary watershed. Estimated peak flows for return-interval events (years) are provided in cubic feet per second (cfs).

Table 1: Peak Discharges from USGS StreamStats Website

Return-Interval Event/Peak Discharge (cfs)					
2-Year	10-Year	25-Year	50-Year	100-Year	500-Year
58.2	**136**	**190**	**236**	**286**	**424**

The peak discharges obtained using the USGS regression equations were selected for subsequent analysis.

4.2 HYDRAULIC ANALYSES

Hydraulic analyses of the existing and proposed stream crossings were performed using a one-dimensional; steady-state numerical model developed using the U.S. Army Corps of Engineers Hydrologic Engineer Center River Analysis System (HEC-RAS) software, version 5.0.1.

Two HEC-RAS models were developed for the analysis of the Chestnut Hill Loop Road Crossing. All elevations in the HEC-RAS models have elevations based on the NAVD88 datum. As previously indicated, there is no available HEC-2 data for the existing crossing from FEMA.

The first HEC-RAS hydraulic model that was developed is an existing conditions model that is based on the existing 10 foot bridge span. This model utilizes the surveyed existing conditions, bridge inspection data and Stantec's supplemental measured information for the channel and side slopes, including manning's friction coefficient for the side slopes and stream bed material, bank station offsets and additional required information for the existing conditions model. The model's cumulative reach length, manning's friction coefficient numbers, station locations and station offsets match in existing and proposed condition to provide a direct comparison between the existing conditions and the proposed conditions as influenced by the proposed structure and the regrading of the stream channel.

The second HEC-RAS hydraulic model that was developed is a proposed conditions that is model based on a proposed 12-foot wide opening. The proposed conditions model was created by editing the existing conditions model to account for proposed stream channel and channel side slopes alterations expected as a result of the proposed project. This model uses the existing conditions model for locations where the proposed model extends outside of the proposed improvements. A summary of the hydraulic performance of the bridge for the pre-and post-bridge replacement conditions based on the described models is summarized in Table 2. In addition to the 12-foot proposed crossing model a model was run for a proposed 10-foot and 16-foot crossing.

Table 2 : Pre and Post Bridge Replacement Hydraulic Performance Summary

Project Alternative	FEMA Flood Event (years)	Discharge (CFS)	WSEL (feet, NAVD88)	Velocity (ft/s)
Existing Conditions	10	136	779.12	7.49
	25	190	779.60	8.30
	50	236	779.94	8.97
	100	286	780.29	9.58
Proposed Conditions	10	136	778.83	4.95
	25	190	779.28	5.78
	50	236	779.59	6.44
	100	286	779.88	7.14

A summary of the results of the existing and proposed conditions models are summarized in Table 3 for the 100-year peak water elevations at all the stations contained within the model. The stations immediately upstream and downstream of the Chestnut Hill Loop Road crossing are highlighted. The full results of these models are available in APPENDIX E

Table 3 : 100-Year Storm Event Surface Water Elevation Comparison

Station	Existing Cond. Elevation (ft)	Proposed Cond. Elevation (ft)	Pre-Post Delta Elevation (ft)
577	782.52	782.15	- 0.37
539	782.52	782.21	- 0.31
481	782.39	781.89	- 0.50
429	782.20	780.69	- 1.61
370	780.29	779.88	- 0.41
370	779.57	779.47	- 0.10
310	778.39	778.39	0.00
210	776.43	776.43	0.00

The Existing and Proposed HEC-RAS models were executed with mixed flow modelling to allow for calculation of subcritical and/or supercritical flow regimes. The HEC-RAS model results indicate that the modeled flow passes through the existing stream crossings in the 100-year storm event without overtopping the roadway with 1.6' of freeboard. The HEC-RAS model results for the existing and proposed stream

crossing indicate that supercritical flow would occur immediately downstream from during the 10, 25, 50, and 100-year return-interval peak discharges.

The HEC-RAS model comparison of the existing and proposed conditions, at all station cross sections within the limits of the model, provide a 'no rise' in elevation for the proposed stream crossing during the 100-year flood event.

4.3 SCOUR SAFETY/STABILITY ANALYSES

Scour protection was designed based upon MassDOT criteria for rural local road or rural collector minor roads. The design storm event for rip rap sizing and scour analysis is the 25-year storm event with a scour analysis check of the 50-year storm event. Because there is an existing scour hole at the downstream face of the existing crossing limit of scour calculations were performed for the proposed crossing based on existing streambed material test results, as well as the abutment scour calculations and scour protection calculations required by MassDOT.

4.3.1 Scour Protection Calculations

Scour and scour protection was calculated based on the following methodology:

- HEC-23 Design Guideline#4 for Rip Rap Revetment
- HEC-23 Design Guideline#14 for Rip Rap at Bridge Abutments
- HEC-23 Design Guideline for Rip Rap for Bottomless Culverts
- HEC-14 Design Guideline #5 Scour Calculation for Culvert Outlets
- MassDOT Modified Froehlich Equation for Scour Analysis

All criteria were modelled for both inlet and outlet flow velocities and flow depths, to identify the worst-case scenarios for rip rap sizing. The calculations for the rip rap sizing equations are summarized in APPENDIX F as part of this report. A summary of these calculated minimum D50 rip rap sizes are listed in Table 4, based on these design criteria's:

Table 4 : 25-Year Flood Event Storm Scour Protection – D50 Rip Rap Sizing

	Design Criteria/Stone Sizing		
	HEC 23 Guideline#4 (inches)	HEC 23 Guideline#14 (inches)	HEC-23 Bottomless Culverts (inches)
D50 Rip Rap	**9**	**6**	**11**

Required scour protection rip rap sizing was checked to the 50-year storm event. The results of those calculations are included in Table 5. During the 50-year storm event the required rip rap size increases due to the increased outlet velocities during that storm event.

Table 5 : 50-Year Flood Event Storm Scour Protection – D50 Rip Rap Sizing

Design Criteria/Stone Sizing			
	HEC 23 Guideline#4 (inches)	HEC 23 Guideline#14 (inches)	HEC-23 Bottomless Culverts (inches)
D50 Rip Rap	**12**	**6**	**13**

4.3.2 Abutment Scour Calculations

The calculations for the abutment scour analysis, based on the MassDOT Modified Froehlich Equation are provided in APPENDIX F as part of this report. The summarized results of our Modified Froehlich scour analysis calculations are listed in Table 6, below:

Table 6 : Modified Froehlich Abutment Scour Analysis

Summary of Calculated Scour Depths (Feet)				
	Left Abutment (25-Year Flood Event)	Left Abutment (50-Year Flood Event)	Right Abutment (25-Year Flood Event)	Right Abutment (50-Year Flood Event)
Scour Depth:	**6.69**	**6.93**	**4.90**	**5.45**

4.3.3 Outlet Scour Calculations

The calculations for the culvert scour analysis based on HEC RAS#14, Chapter 5 are provided in APPENDIX F, as part of this report. The summarized results of our outlet scour analysis calculations are listed in Tables 7 and 8, below.

Table 7 : 25-Year Flood Calculated Outlet Scour

Summary of 25-Year Flood Event Calculated Scour Depths (Feet)				
	Depth of Scour (feet)	Width of Scour (feet)	Length of Scour (feet)	Volume of Scour (Cubic Feet)
Calculated Values	**4.66**	**12.92**	**31.02**	**3202.06**

Table 8 : 50-Year Flood Calculated Outlet Scour

Summary of 50-Year Flood Event Calculated Scour Depths (Feet)				
	Depth of Scour (feet)	Width of Scour (feet)	Length of Scour (feet)	Volume of Scour (Cubic Feet)
Calculated Values	**5.07**	**14.32**	**34.14**	**4,269.23**

Rip rap is proposed to fill in the existing scour hole noted on site and extend to 55-feet beyond the crossing outlet at an approximate width of 26-feet to 35-feet. The proposed rip rap downstream is sufficient to provide scour protection for the outlet of the crossing.

5.0 Conclusions and Recommendations

5.1 CONCLUSIONS

The HEC-RAS model results indicate that the modeled flow passes through the existing stream crossings without overtopping the roadway. The HEC-RAS model results for the proposed stream crossing indicate that supercritical flow would occur immediately downstream during the 10, 25, 50, and 100-year return-interval peak discharges.

The proposed 12-foot opening meets the MASSDOT requirements to provide more than 2-feet of freeboard below the low chord to pass the 10-year return-interval peak discharge, see Table 9 for the Peak Stormwater elevations for the FEMA design flood events. Freeboard was evaluated using the HEC-RAS model which did not predict overtopping of the roadway for the existing or proposed stream crossing at the 100-year return-interval peak discharge.

Table 9: Peak Stormwater Elevation

	USGS Storm Event/Peak Elevation (ft)				
	Low Chord	10-Year	25-Year	50-Year	100-Year
Existing	780.86	779.12	779.60	779.94	780.29
Proposed	781.49	778.83	779.28	779.59	779.88
Delta	**0.63**	**- 0.29**	**- 0.32**	**- 0.35**	**- 0.41**

The comparison between model results for the existing and proposed crossing demonstrated that the proposed crossing:

- Decreases the 100-year floodway elevation at the Chestnut Hill Loop Road crossing.
- Decreases or provides an unchanged surface water elevation for the modelled limits, from the upstream limit of the survey to the downstream limit approximately 500-feet down stream.
- Reduces the stream crossing inlet and outlet velocities and potential scour.

5.2 RECOMENDATIONS

The following scour protection measures are proposed for the project based on the scour calculations and hydraulic analysis:

- Install angular rock rip rap material with a D50 of 12-inches, to a depth of 24-inches with a Mirafi 180-N filter fabric installed under rip rap. This thickness is greater than the required 1.5-times D50 stone size and the D100 stone size. Install 2-feet of stream channel material over the proposed rip rap for the limits of the ordinary high-water level in the stream channel, with gradation and placement as detailed on the plans and in the specifications.

- The gradation of the armor material shall comply with the gradation chart provided on the plans which is consistent with MassDOT requirements.

- The existing scour hole will be filled, and rip rap protect will be placed in the channel extending a minimum 14-feet wide and 35-feet downstream from the outlet face of the crossing as shown on the proposed plans.

- Rip rap shall be placed on all disturbed channel and side slope areas. Rip rap shall be provided in the channel and on all channel horizontal side slopes which exceeds the minimum required horizontal side slope protection distance of 2-times the full channel flow depth (4.5-feet).

- Replace the existing bridge slab and rubble abutments with a pre-cast concrete 3-sided rigid frame with precast concrete headwalls and wing walls.

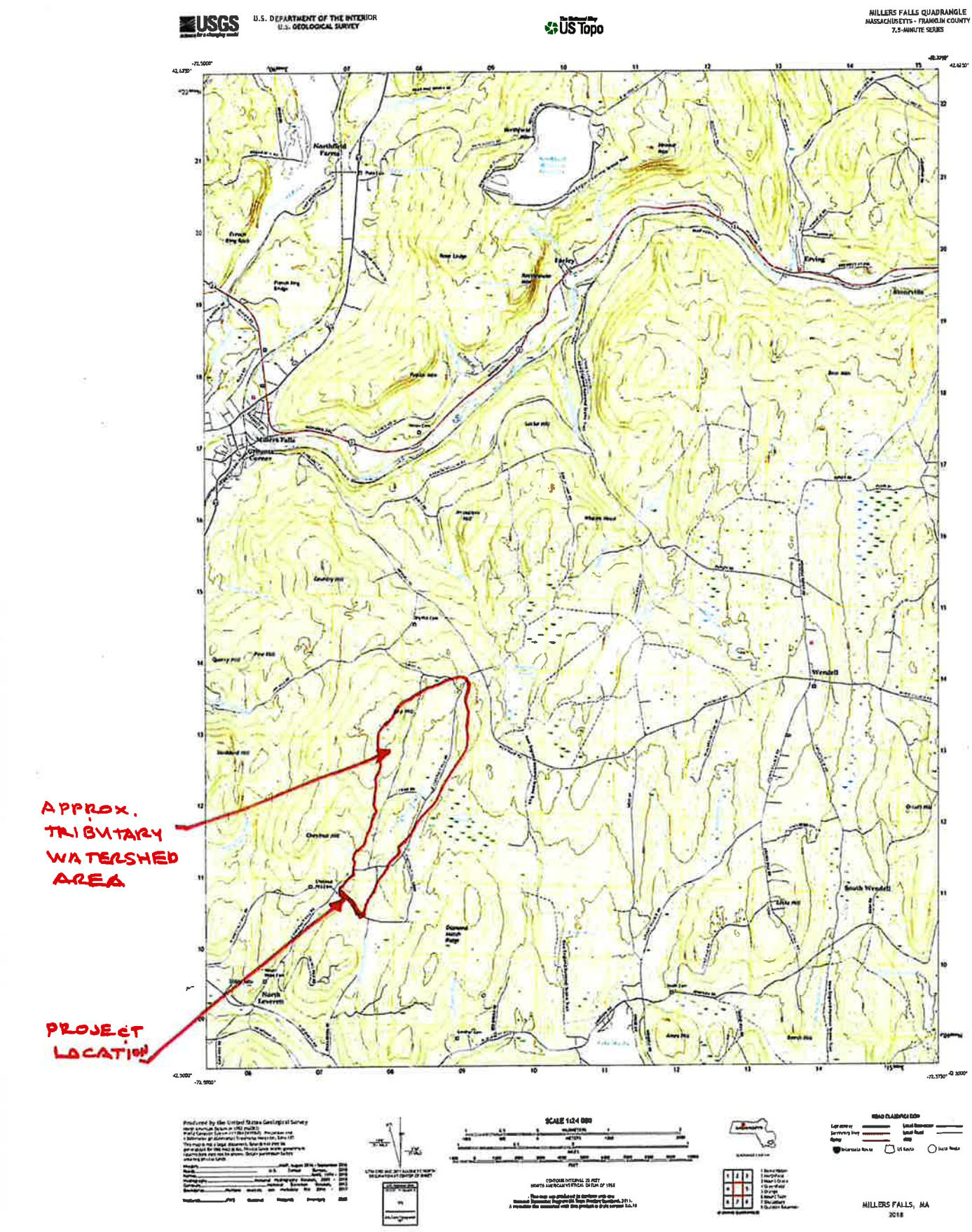
5.3 HYDRAULIC DATA

Table 10 is a summary of the historical data, hydraulic data and MassDOT requirements for the Chestnut Hill Loop (existing condition) bridge. It should be noted that although the design flood event is a 10-year storm with 2-feet of freeboard the proposed crossing was sized based on a combination of factures including ensuring a 'no rise' condition for the 100-year storm events, minimizing wetland and wetland buffer impacts and providing the maximum hydraulic benefit possible within the allowable costs to the Town of Montague.

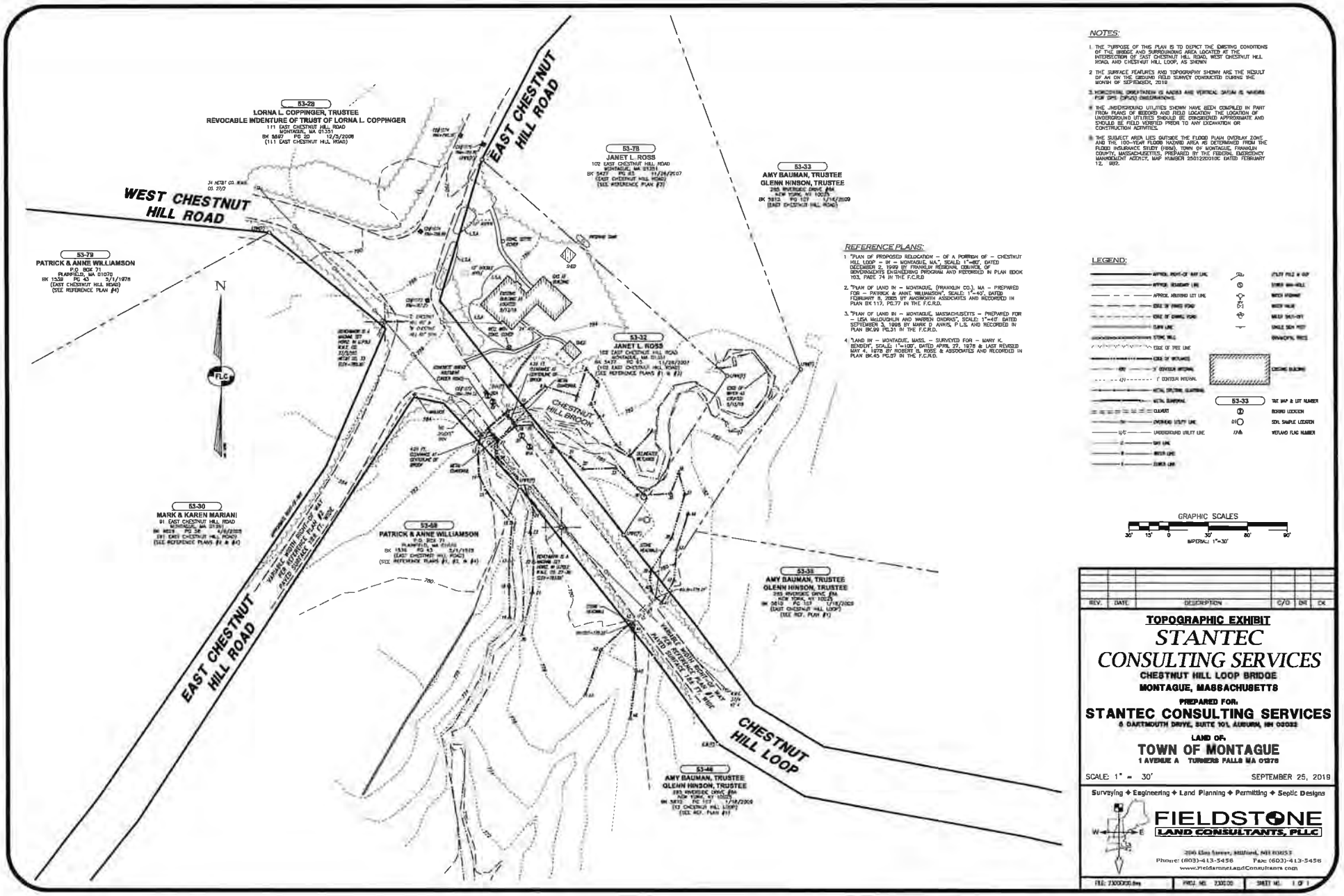
Table 10 : Hydraulic Data Table

Hydraulic Design Data:	
Drainage Area:	0.94 Sq Miles
Design Flood Discharge:	136 CFS
Design Flood Frequency:	10-Yr Storm w/ 2-ft freeboard
Design Flood Velocity:	4.95 FT/S
Design Flood Elevation:	778.83 (NAVD88)
FEMA Base 100-Year Flood Data:	
Base Flood Discharge	286 CFS
Base Flood Elevation	779.88 (NAVD88)
Design and Check Scour Data:	
Design Scour Flood Event Frequency	25-Year
Check Scour Flood Event Frequency	50-Year
Flood of Record:	
Discharge	Unknown
Frequency	Unknown
Maximum Elevation	Unknown
Date	Unknown
Other:	
History of Ice Flows:	None Documented in NBIS database.
Evidence of Scour:	None Documented in NHIS database.

Appendix A – CROSSING SITE CATCHMENT


USGS
U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY
US Topo
MILLERS FALLS QUADRANGLE
MASSACHUSETTS - FRANKLIN COUNTY
7.5-MINUTE SERIES
Northfield Farms
Millers Falls
Erving
Wendell
South Wendell
North Leverett
APPROX. TRIBUTARY WATERSHED AREA
PROJECT LOCATION
SCALE 1:24 000
MILLERS FALLS, MA
2018

Appendix B – EXISTING CONDITIONS TOPOGRAPHICAL SURVEY



NOTES:

1. THE PURPOSE OF THIS PLAN IS TO DEPICT THE EXISTING CONDITIONS OF THE BRIDGE AND SURROUNDING AREA LOCATED AT THE INTERSECTION OF EAST CHESTNUT HILL ROAD, WEST CHESTNUT HILL ROAD, AND CHESTNUT HILL LOOP, AS SHOWN
2. THE SURFACE FEATURES AND TOPOGRAPHY SHOWN ARE THE RESULT OF AN ON THE GROUND FIELD SURVEY CONDUCTED DURING THE MONTH OF SEPTEMBER, 2018
3. HORIZONTAL ORIENTATION IS NADB3 AND VERTICAL DATUM IS NAVD88 PER GPS (GPS/RTK) OBSERVATIONS.
4. THE UNDERGROUND UTILITIES SHOWN HAVE BEEN COMPILED IN PART FROM PLANS OF RECORD AND FIELD LOCATION. THE LOCATION OF UNDERGROUND UTILITIES SHOULD BE CONSIDERED APPROXIMATE AND SHOULD BE FIELD VERIFIED PRIOR TO ANY EXCAVATION OR CONSTRUCTION ACTIVITIES.
5. THE SUBJECT AREA LIES OUTSIDE THE FLOOD PLAIN OVERLAY ZONE AND THE 100-YEAR FLOOD HAZARD AREA AS DETERMINED FROM THE FLOOD INSURANCE STUDY (FIRM), TOWN OF MONTAGUE, FRANKLIN COUNTY, MASSACHUSETTES, PREPARED BY THE FEDERAL EMERGENCY MANAGEMENT AGENCY, MAP NUMBER 25011C0201D DATED FEBRUARY 12, 1992.

REFERENCE PLANS:

1. "PLAN OF PROPOSED RELOCATION – OF A PORTION OF – CHESTNUT HILL LOOP – IN – MONTAGUE, MA.", SCALE: 1"=80', DATED DECEMBER 2, 1999 BY FRANKLIN REGIONAL COUNCIL OF GOVERNMENTS ENGINEERING PROGRAM AND RECORDED IN PLAN BOOK 103, PAGE 74 IN THE F.C.R.D
2. "PLAN OF LAND IN – MONTAGUE, (FRANKLIN CO.), MA – PREPARED FOR – PATRICK & ANNE WILLIAMSON", SCALE: 1"=40', DATED FEBRUARY 8, 2825 BY AMESMITH ASSOCIATES AND RECORDED IN PLAN BK 117, PG.77 IN THE F.C.R.D.
3. "PLAN OF LAND IN – MONTAGUE, MASSACHUSETTS – PREPARED FOR – LISA McLOUGHLIN AND WARREN ONDRAS", SCALE: 1"=40' DATED SEPTEMBER 3, 1998 BY MARK D. ANNIS, P.L.S. AND RECORDED IN PLAN BK.99 PG.31 IN THE F.C.R.D.
4. "LAND IN – MONTAGUE, MASS. – SURVEYED FOR – MARY K. BENSON", SCALE: 1"=100', DATED APRIL 27, 1978 & LAST REVISED MAY 4, 1978 BY ROBERT B. ROSE & ASSOCIATES AND RECORDED IN PLAN BK.45 PG.97 IN THE F.C.R.D.

LEGEND:

GRAPHIC SCALES

30' 15' 0 30' 60' 90'

IMPERIAL: 1"=30'

REV.	DATE	DESCRIPTION	C/D	DR	CK

TOPOGRAPHIC EXHIBIT

STANTEC CONSULTING SERVICES

CHESTNUT HILL LOOP BRIDGE

MONTAGUE, MASSACHUSETTS

PREPARED FOR:

STANTEC CONSULTING SERVICES

8 DARTMOUTH DRIVE, SUITE 101, AUBURN, NH 03032

LAND OF:

TOWN OF MONTAGUE

1 AVENUE A TURNERS FALLS MA 01376

SCALE: 1" = 30' SEPTEMBER 25, 2019

Surveying ◆ Engineering ◆ Land Planning ◆ Permitting ◆ Septic Designs

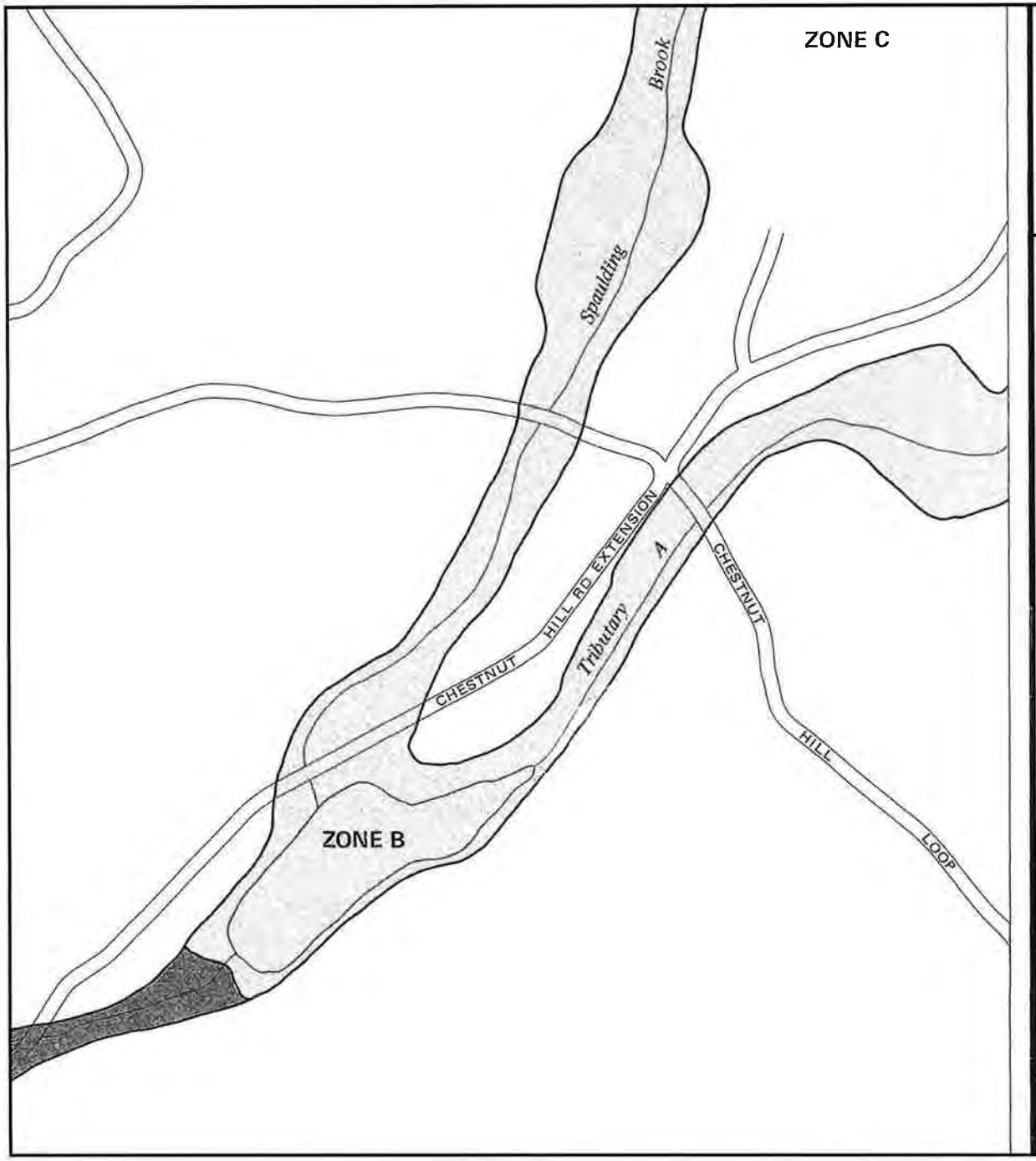
FIELDSTONE LAND CONSULTANTS, PLLC

206 Elm Street, Milford, NH 03055

Phone: (603)-413-5456 Fax: (603)-413-5456

www.FieldstoneLandConsultants.com

FILE: 7XXXXX.dwg | PROJ. NO. XXXXX | SHEET NO. 1 OF 1



N

APPROXIMATE SCALE

400 0 400 FEET

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

TOWN OF
MONTAGUE,
MASSACHUSETTS
FRANKLIN COUNTY

PANEL 10 OF 11
(SEE MAP INDEX FOR PANELS NOT PRINTED)

COMMUNITY-PANEL NUMBER
250122 0010 C

MAP REVISED:

FEBRUARY 12, 1982

federal emergency management agency
federal insurance administration

Appendix C – USGS STREAM FLOW STATISTICS

StreamStats Report

Region ID: MA
Workspace ID: MA20190821182718834000
Clicked Point (Latitude, Longitude): 42.52168, -72.47758
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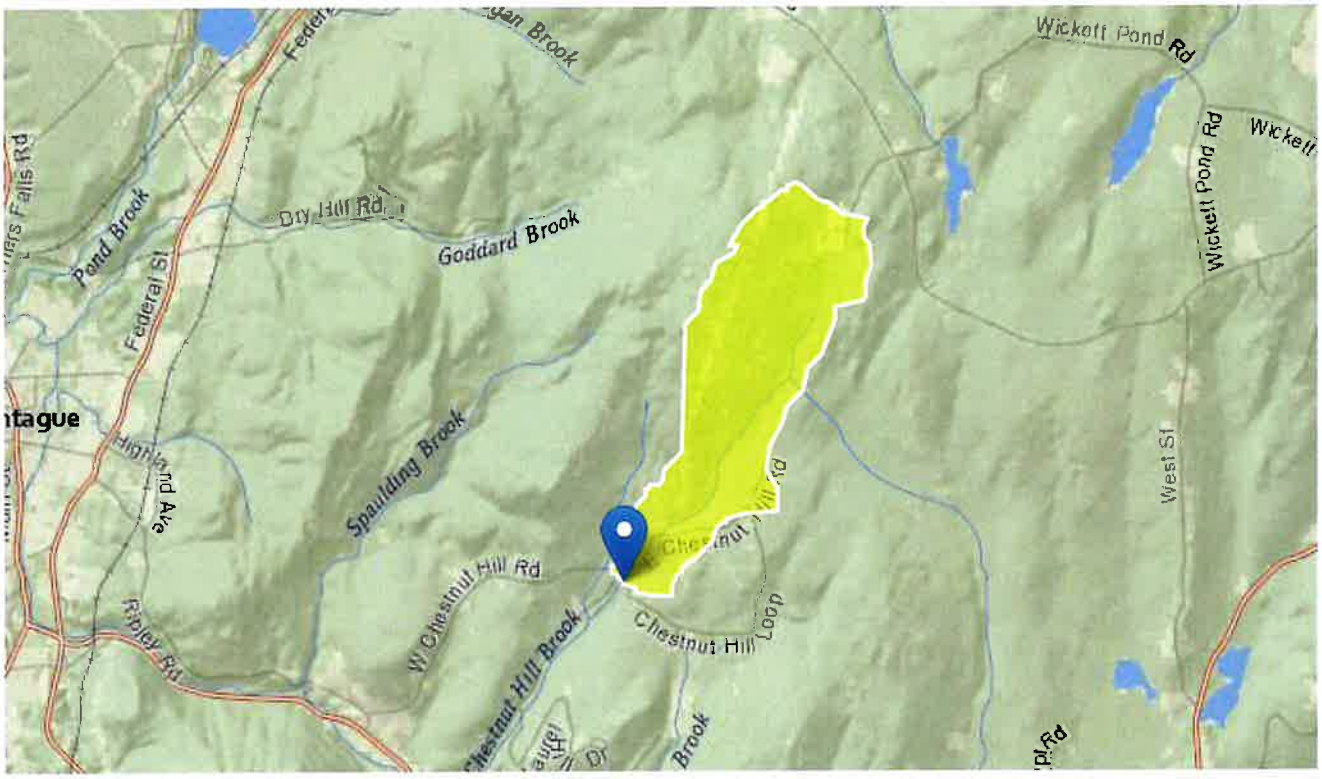


Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.94	square miles
ELEV	Mean Basin Elevation	1070	feet
LC06STOR	Percentage of water bodies and wetlands determined from the NLCD 2006	3.21	percent

Peak-Flow Statistics Parameters[Peak Statewide 2016 5156]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.94	square miles	0.16	512
ELEV	Mean Basin Elevation	1070	feet	80.6	1948
LC06STOR	Percent Storage from NLCD2006	3.21	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	58.2	ft^3/s	28.8	118	42.3
5 Year Peak Flood	101	ft^3/s	48.9	207	43.4
10 Year Peak Flood	136	ft^3/s	64.6	287	44.7
25 Year Peak Flood	190	ft^3/s	86.7	416	47.1
50 Year Peak Flood	236	ft^3/s	104	535	49.4
100 Year Peak Flood	286	ft^3/s	122	671	51.8
200 Year Peak Flood	342	ft^3/s	141	828	54.1
500 Year Peak Flood	424	ft^3/s	183	981	57.6

Peak-Flow Statistics Citations

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

Appendix D – SITE PHOTOS

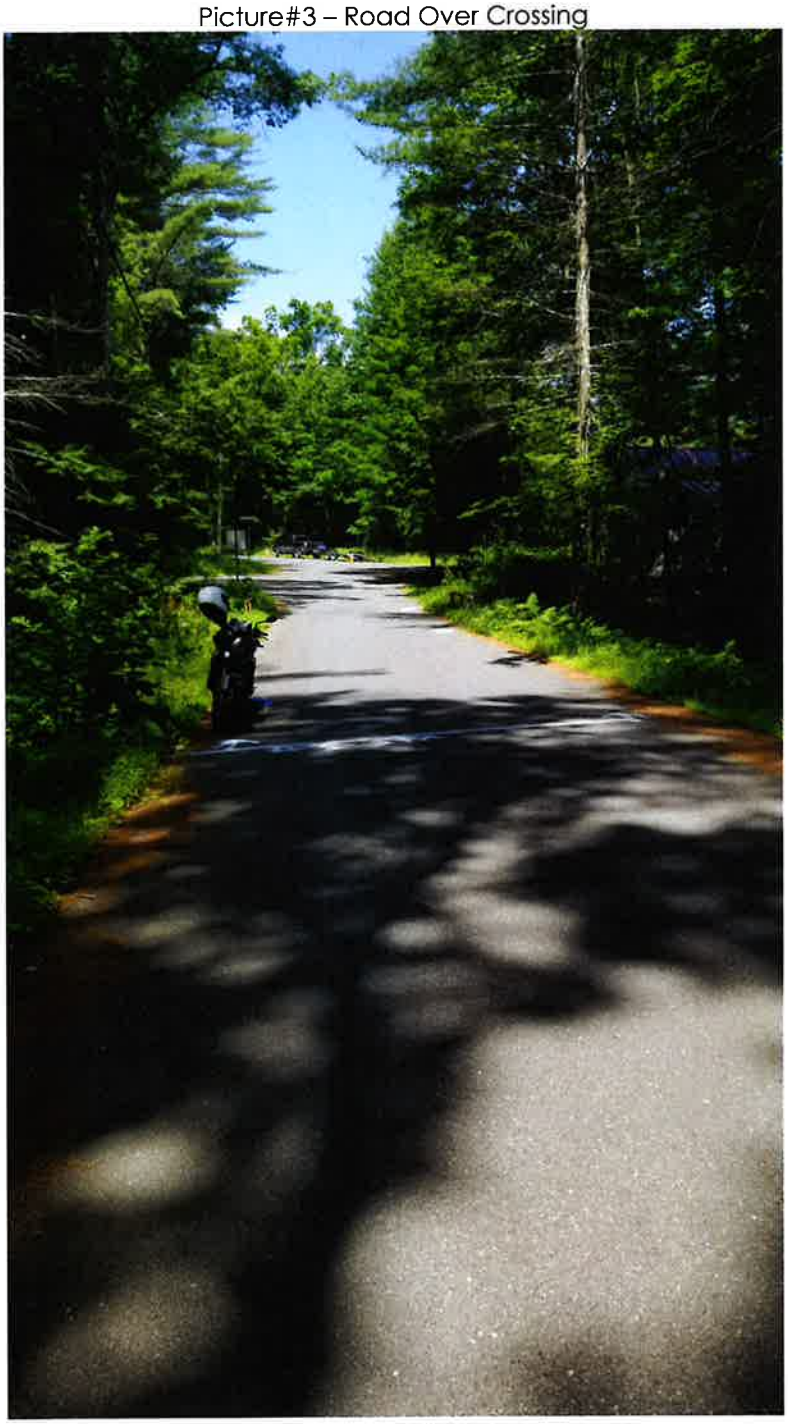
Field Pictures
Chestnut Hill Loop Road over Chestnut Hill Brooke
MassDOT Bridge #M-28-030 (BRI)
Montague, MA

Picture#1 – On Bridge Crossing Facing Up Stream

Picture#2 – On Bridge Facing Down Stream

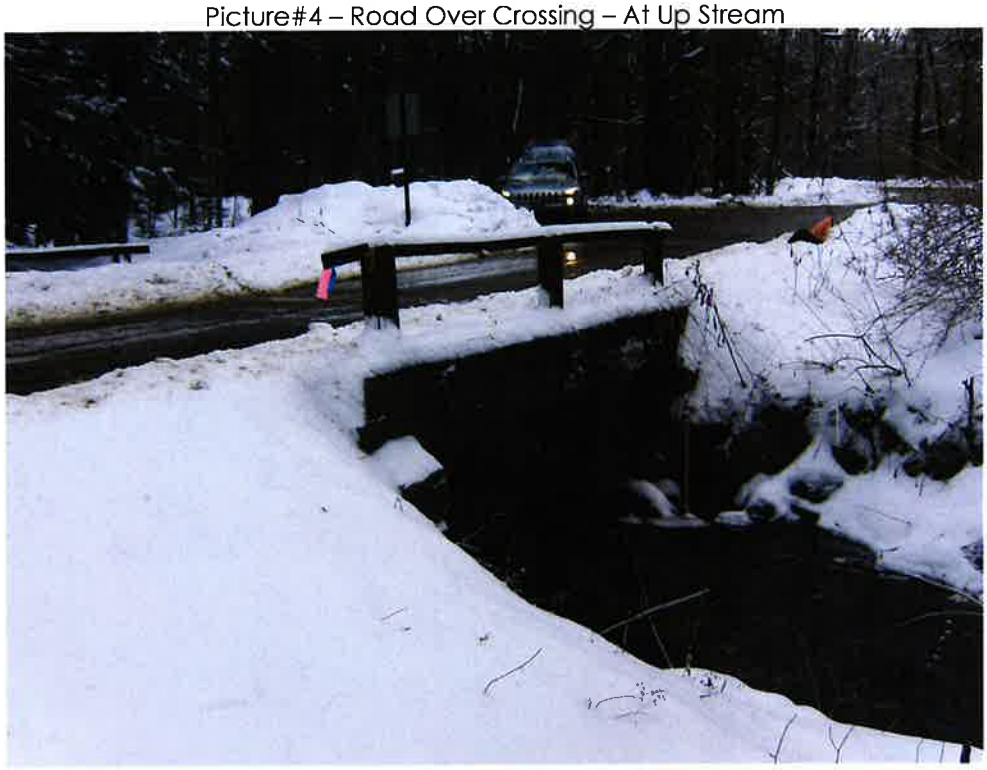
Field Pictures
Chestnut Hill Loop Road over Chestnut Hill Brooke
MassDOT Bridge #M-28-030 (BRI)
Montague, MA

Picture#3 – Road Over Crossing



Field Pictures
Chestnut Hill Loop Road over Chestnut Hill Brooke
MassDOT Bridge #M-28-030 (BRI)
Montague, MA

Picture#4 – Road Over Crossing – At Up Stream



Picture#5 – Road Over Crossing Facing Away from Intersection

Field Pictures
Chestnut Hill Loop Road over Chestnut Hill Brooke
MassDOT Bridge #M-28-030 (BRI)
Montague, MA

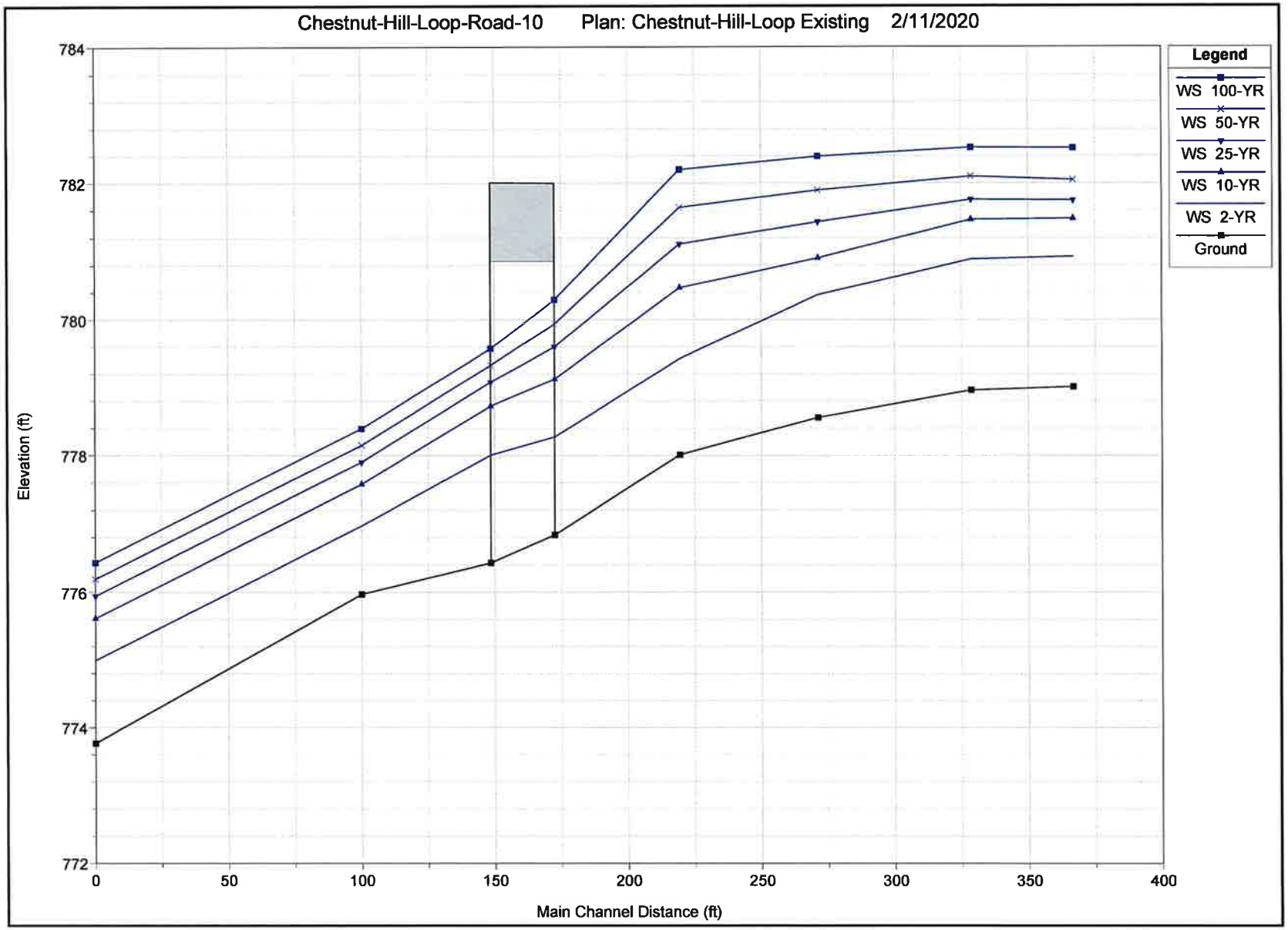
Picture#6 – Face of Bridge Up Stream

Field Pictures
Chestnut Hill Loop Road over Chestnut Hill Brooke
MassDOT Bridge #M-28-030 (BRI)
Montague, MA

Picture#7 – Existing Guardrail Up Stream

Appendix E – HYDRAULIC COMPUTATIONS

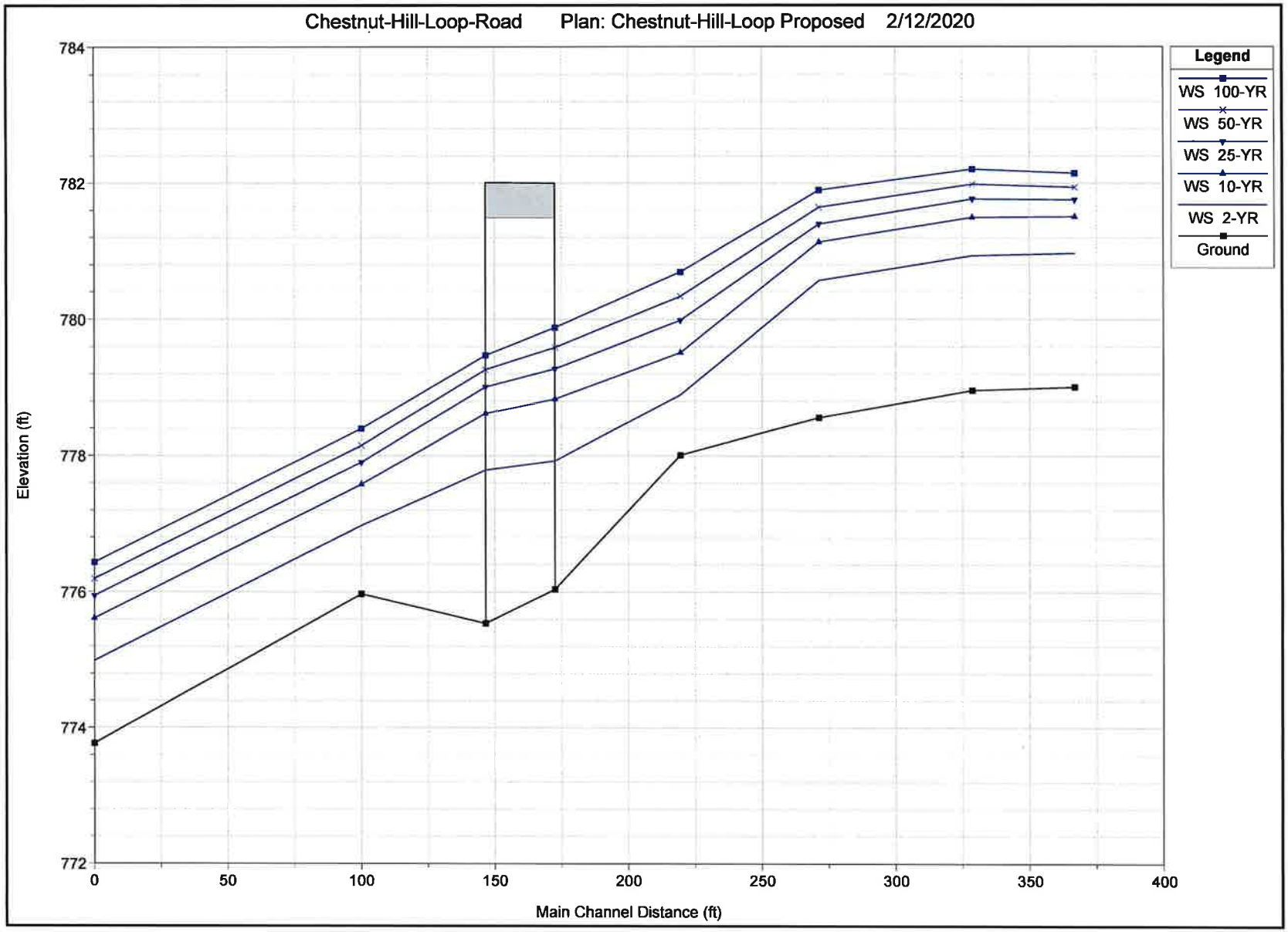
EXISTING CONDITIONS HEC-RAS MODEL RESULTS


Chestnut-Hill-Loop-Road-10 Plan: Chestnut-Hill-Loop Existing 2/11/2020
Legend
WS 100-YR
WS 50-YR
WS 25-YR
WS 10-YR
WS 2-YR
Ground
Elevation (ft)
784
782
780
778
776
774
772
0
50
100
150
200
250
300
350
400
Main Channel Distance (ft)

HEC-RAS Plan: Chestnut-Hil River: River 1 Reach: Reach 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	577	2-YR	58.20	779.01	780.93	780.33	781.00	0.004454	2.28	27.72	26.65	0.38
Reach 1	577	10-YR	136.00	779.01	781.48	780.80	781.66	0.008578	3.64	44.32	34.08	0.50
Reach 1	577	25-YR	190.00	779.01	781.75	781.03	782.00	0.007880	4.34	53.88	38.86	0.55
Reach 1	577	50-YR	230.00	779.01	782.05	781.26	782.35	0.007644	4.76	70.29	80.03	0.57
Reach 1	577	100-YR	286.00	779.01	782.52	781.51	782.70	0.004093	3.97	116.43	100.00	0.43
Reach 1	539	2-YR	58.20	778.96	780.69		780.91	0.001074	1.52	58.24	60.75	0.20
Reach 1	539	10-YR	136.00	778.96	781.47		781.52	0.001526	2.19	95.20	67.20	0.25
Reach 1	539	25-YR	190.00	778.96	781.76		781.82	0.001760	2.55	115.05	70.99	0.28
Reach 1	539	50-YR	236.00	778.96	782.10		782.16	0.001634	2.66	141.92	97.99	0.27
Reach 1	539	100-YR	286.00	778.96	782.52		782.58	0.001241	2.54	184.32	100.00	0.24
Reach 1	481	2-YR	58.20	778.56	780.36	780.36	780.70	0.036905	4.66	12.50	18.85	1.01
Reach 1	481	10-YR	136.00	778.56	780.91	780.90	781.26	0.028059	4.81	30.54	53.71	0.93
Reach 1	481	25-YR	190.00	778.56	781.44		781.62	0.008357	3.64	63.97	67.86	0.55
Reach 1	481	50-YR	236.00	778.56	781.89		782.02	0.004125	3.10	95.77	71.13	0.40
Reach 1	481	100-YR	286.00	778.56	782.39		782.48	0.002290	2.71	142.95	100.00	0.31
Reach 1	429	2-YR	58.20	778.01	779.43	778.90	779.57	0.006851	3.02	19.26	15.10	0.47
Reach 1	429	10-YR	136.00	778.01	780.47	779.51	780.69	0.005212	3.78	37.92	25.75	0.45
Reach 1	429	25-YR	190.00	778.01	781.11	779.86	781.33	0.003911	3.87	59.51	41.88	0.40
Reach 1	429	50-YR	236.00	778.01	781.64	780.14	781.83	0.002916	3.74	85.71	56.12	0.36
Reach 1	429	100-YR	286.00	778.01	782.20	780.48	782.36	0.002189	3.59	125.79	94.56	0.32
Reach 1	370		Bridge									
Reach 1	310	2-YR	58.20	775.97	776.97	776.97	777.36	0.033424	4.98	11.68	15.29	1.01
Reach 1	310	10-YR	136.00	775.97	777.58	777.58	778.18	0.029082	6.22	21.85	18.30	1.00
Reach 1	310	25-YR	190.00	775.97	777.90	777.90	778.62	0.027716	6.78	28.01	19.78	1.00
Reach 1	310	50-YR	236.00	775.97	778.15	778.15	778.94	0.026854	7.15	33.02	20.98	1.00
Reach 1	310	100-YR	286.00	775.97	778.39	778.39	779.26	0.026183	7.46	38.33	22.36	1.00
Reach 1	210	2-YR	58.20	773.77	774.99	774.66	775.15	0.010001	3.16	18.48	19.96	0.57
Reach 1	210	10-YR	136.00	773.77	775.61	775.20	775.91	0.010001	4.38	32.26	24.53	0.62
Reach 1	210	25-YR	190.00	773.77	775.94	775.49	776.32	0.010004	4.98	40.79	27.25	0.64
Reach 1	210	50-YR	236.00	773.77	776.19	775.72	776.63	0.010002	5.41	47.88	30.35	0.65
Reach 1	210	100-YR	286.00	773.77	776.43	775.94	776.93	0.010009	5.81	55.57	33.71	0.66

PROPOSED CONDITIONS HEC-RAS MODEL RESULTS


Chestnut-Hill-Loop-Road Plan: Chestnut-Hill-Loop Proposed 2/12/2020
Legend
WS 100-YR
WS 50-YR
WS 25-YR
WS 10-YR
WS 2-YR
Ground
Elevation (ft)
784
782
780
778
776
774
772
0
50
100
150
200
250
300
350
400
Main Channel Distance (ft)

HEC-RAS Plan: Prop River: River 1 Reach: Reach 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	577	2-YR	58.20	779.01	780.97	780.33	781.04	0.003981	2.21	26.76	26.89	0.37
Reach 1	577	10-YR	136.00	779.01	781.51	780.80	781.68	0.006238	3.58	45.20	34.47	0.49
Reach 1	577	25-YR	190.00	779.01	781.75	781.03	782.00	0.007569	4.33	54.23	38.94	0.55
Reach 1	577	50-YR	236.00	779.01	781.94	781.26	782.27	0.008615	4.96	62.60	57.09	0.60
Reach 1	577	100-YR	286.00	779.01	782.15	781.51	782.53	0.009206	5.40	79.66	100.00	0.63
Reach 1	539	2-YR	58.20	778.96	780.93		780.95	0.000949	1.45	61.00	61.16	0.19
Reach 1	539	10-YR	136.00	778.96	781.50		781.54	0.001443	2.15	97.12	67.56	0.25
Reach 1	539	25-YR	190.00	778.96	781.77		781.83	0.001730	2.53	115.77	71.13	0.28
Reach 1	539	50-YR	236.00	778.96	781.98		782.06	0.001677	2.78	131.45	73.99	0.29
Reach 1	539	100-YR	286.00	778.96	782.21		782.29	0.002009	3.03	152.77	99.66	0.31
Reach 1	481	2-YR	58.20	778.56	780.57		780.79	0.023719	4.11	17.12	26.74	0.82
Reach 1	481	10-YR	136.00	778.56	781.13	780.94	781.33	0.015367	4.12	43.67	63.25	0.71
Reach 1	481	25-YR	190.00	778.56	781.40	781.13	781.60	0.012283	4.28	61.35	67.59	0.65
Reach 1	481	50-YR	236.00	778.56	781.65	781.29	781.84	0.009476	4.21	78.39	69.33	0.59
Reach 1	481	100-YR	286.00	778.56	781.89		782.08	0.007759	4.20	95.89	71.15	0.55
Reach 1	429	2-YR	58.20	778.01	778.89	778.89	779.30	0.034904	5.09	11.43	14.33	1.01
Reach 1	429	10-YR	136.00	778.01	779.52	779.51	780.19	0.030422	6.60	20.60	15.23	1.00
Reach 1	429	25-YR	190.00	778.01	779.98	779.86	780.70	0.023030	6.81	28.05	16.82	0.90
Reach 1	429	50-YR	236.00	778.01	780.33	780.14	781.09	0.019502	7.01	34.68	22.54	0.85
Reach 1	429	100-YR	286.00	778.01	780.69	780.48	781.46	0.016296	7.12	44.27	31.12	0.80
Reach 1	370		Bridge									
Reach 1	310	2-YR	58.20	775.97	776.97	776.97	777.36	0.033424	4.98	11.68	15.29	1.01
Reach 1	310	10-YR	136.00	775.97	777.58	777.58	778.18	0.029092	6.22	21.85	18.30	1.00
Reach 1	310	25-YR	190.00	775.97	777.90	777.90	778.62	0.027716	6.78	28.01	19.78	1.00
Reach 1	310	50-YR	236.00	775.97	778.15	778.15	778.94	0.026854	7.15	33.02	20.98	1.00
Reach 1	310	100-YR	286.00	775.97	778.39	778.39	779.26	0.026183	7.46	38.33	22.36	1.00
Reach 1	210	2-YR	58.20	773.77	774.99	774.66	775.15	0.010001	3.16	18.48	19.96	0.57
Reach 1	210	10-YR	136.00	773.77	775.61	775.20	775.91	0.010001	4.38	32.26	24.53	0.62
Reach 1	210	25-YR	190.00	773.77	775.94	775.49	776.32	0.010004	4.98	40.79	27.25	0.64
Reach 1	210	50-YR	236.00	773.77	776.19	775.72	776.63	0.010002	5.41	47.88	30.35	0.65
Reach 1	210	100-YR	286.00	773.77	776.43	775.94	776.93	0.010009	5.81	55.57	33.71	0.66

Plan: Prop River 1 Reach 1 RS: 370 Profile: 2-YR

E.G. US. (ft)	779.30	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	778.89	E.G. Elev (ft)	778.11	777.91
Q Total (cfs)	58.20	W.S. Elev (ft)	777.92	777.79
Q Bridge (cfs)	58.20	Crit W.S. (ft)	777.44	776.94
Q Weir (cfs)		Max Chl Dpth (ft)	1.88	2.25
Weir Sta Lft (ft)		Vel Total (ft/s)	3.50	2.78
Weir Sta Rgt (ft)		Flow Area (sq ft)	16.61	20.97
Weir Submerg		Froude # Chl	0.45	0.33
Weir Max Depth (ft)		Specif Force (cu ft)	18.70	24.21
Min El Weir Flow (ft)	782.02	Hydr Depth (ft)	1.38	1.75
Min El Prs (ft)	781.49	W.P. Total (ft)	14.93	15.66
Delta EG (ft)	1.94	Conv. Total (cfs)	588.8	841.4
Delta WS (ft)	1.92	Top Width (ft)	12.01	12.01
BR Open Area (sq ft)	59.42	Frctn Loss (ft)		
BR Open Vel (ft/s)	3.50	C & E Loss (ft)		
BR Sluice Coef		Shear Total (lb/sq ft)	0.68	0.40
BR Sel Method	Energy only	Power Total (lb/ft s)	2.38	1.11

Plan: Prop River 1 Reach 1 RS: 370 Profile: 10-YR

E.G. US. (ft)	780.19	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	779.52	E.G. Elev (ft)	779.21	778.92
Q Total (cfs)	136.00	W.S. Elev (ft)	778.83	778.62
Q Bridge (cfs)	136.00	Crit W.S. (ft)	778.13	777.63
Q Weir (cfs)		Max Chl Dpth (ft)	2.79	3.08
Weir Sta Lft (ft)		Vel Total (ft/s)	4.95	4.39
Weir Sta Rgt (ft)		Flow Area (sq ft)	27.48	30.96
Weir Submerg		Froude # Chl	0.52	0.44
Weir Max Depth (ft)		Specif Force (cu ft)	53.25	59.36
Min El Weir Flow (ft)	782.02	Hydr Depth (ft)	2.29	2.58
Min El Prs (ft)	781.49	W.P. Total (ft)	16.74	17.31
Delta EG (ft)	2.01	Conv. Total (cfs)	1262.7	1505.8
Delta WS (ft)	1.94	Top Width (ft)	12.00	12.00
BR Open Area (sq ft)	59.42	Frctn Loss (ft)	0.25	0.65
BR Open Vel (ft/s)	4.95	C & E Loss (ft)	0.04	0.09
BR Sluice Coef		Shear Total (lb/sq ft)	1.19	0.91
BR Sel Method	Energy only	Power Total (lb/ft s)	5.88	4.00

Plan: Prop River 1 Reach 1 RS: 370 Profile: 25-YR

E.G. US. (ft)	780.70	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	779.98	E.G. Elev (ft)	779.80	779.45
Q Total (cfs)	190.00	W.S. Elev (ft)	779.28	779.01
Q Bridge (cfs)	190.00	Crit W.S. (ft)	778.53	778.02
Q Weir (cfs)		Max Chl Dpth (ft)	3.24	3.47
Weir Sta Lft (ft)		Vel Total (ft/s)	5.78	5.33
Weir Sta Rgt (ft)		Flow Area (sq ft)	32.85	35.62
Weir Submerg		Froude # Chl	0.57	0.51
Weir Max Depth (ft)		Specif Force (cu ft)	79.98	85.22
Min El Weir Flow (ft)	782.02	Hydr Depth (ft)	2.74	2.97
Min El Prs (ft)	781.49	W.P. Total (ft)	17.64	18.09
Delta EG (ft)	2.09	Conv. Total (cfs)	1642.0	1847.5
Delta WS (ft)	2.08	Top Width (ft)	12.00	12.00
BR Open Area (sq ft)	59.42	Frctn Loss (ft)	0.31	0.75
BR Open Vel (ft/s)	5.78	C & E Loss (ft)	0.04	0.08
BR Sluice Coef		Shear Total (lb/sq ft)	1.56	1.30
BR Sel Method	Energy only	Power Total (lb/ft s)	9.00	6.93

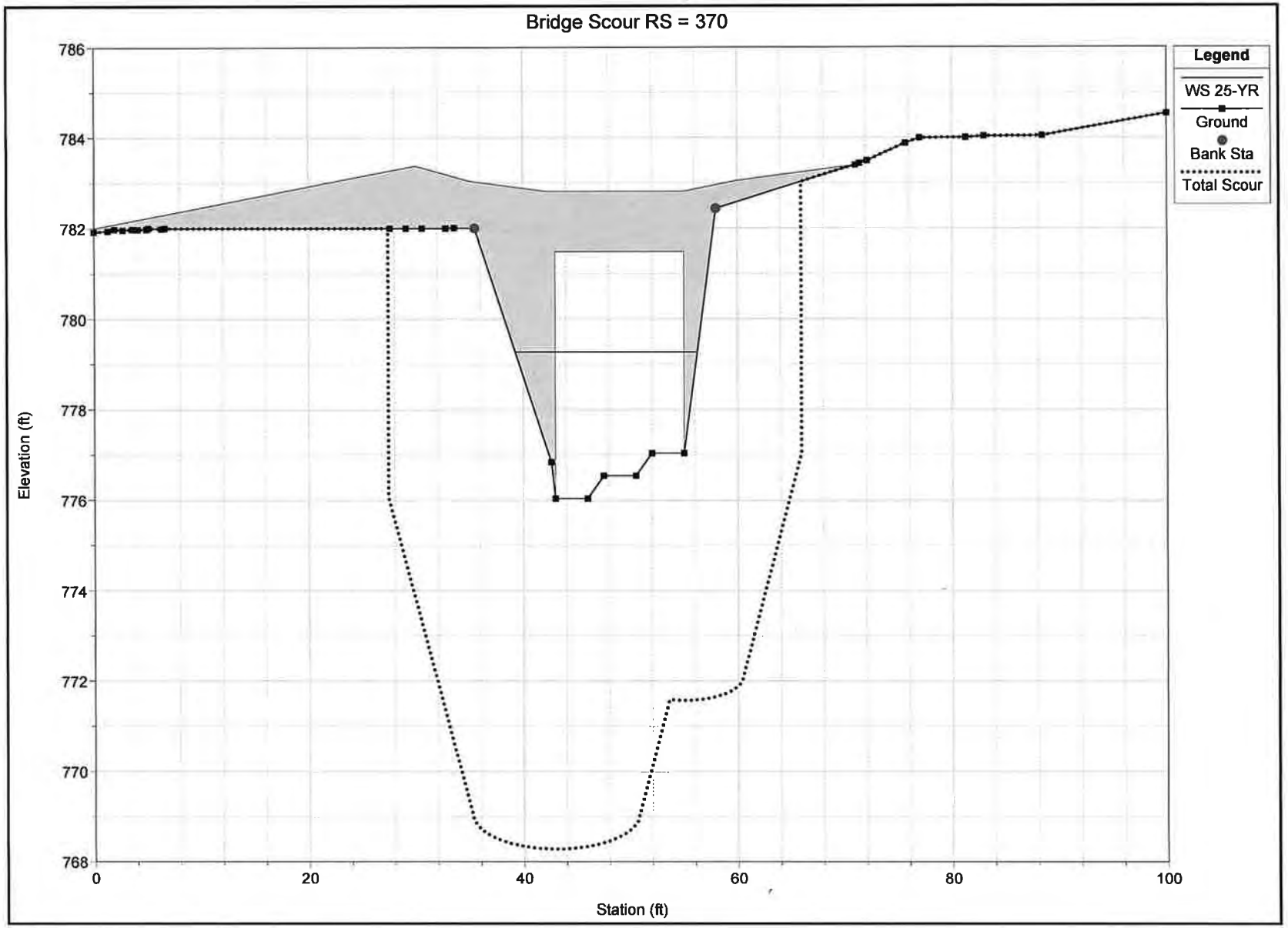
Plan: Prop River 1 Reach 1 RS: 370 Profile: 50-YR

E.G. US. (ft)	781.09	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	780.33	E.G. Elev (ft)	780.24	779.84
Q Total (cfs)	236.00	W.S. Elev (ft)	779.59	779.26
Q Bridge (cfs)	236.00	Crit W.S. (ft)	778.83	778.33
Q Weir (cfs)		Max Chl Dpth (ft)	3.55	3.72
Weir Sta Lft (ft)		Vel Total (ft/s)	6.44	6.10
Weir Sta Rgt (ft)		Flow Area (sq ft)	36.62	38.69
Weir Submerg		Froude # Chl	0.60	0.56
Weir Max Depth (ft)		Specif Force (cu ft)	104.00	107.97
Min El Weir Flow (ft)	782.02	Hydr Depth (ft)	3.05	3.22
Min El Prs (ft)	781.49	W.P. Total (ft)	18.25	18.61
Delta EG (ft)	2.15	Conv. Total (cfs)	1923.4	2081.0
Delta WS (ft)	2.19	Top Width (ft)	12.00	12.00
BR Open Area (sq ft)	59.42	Frctn Loss (ft)	0.36	0.84
BR Open Vel (ft/s)	6.44	C & E Loss (ft)	0.03	0.06
BR Sluice Coef		Shear Total (lb/sq ft)	1.89	1.67
BR Sel Method	Energy only	Power Total (lb/ft s)	12.15	10.18

Plan: Prop River 1 Reach 1 RS: 370 Profile: 100-YR

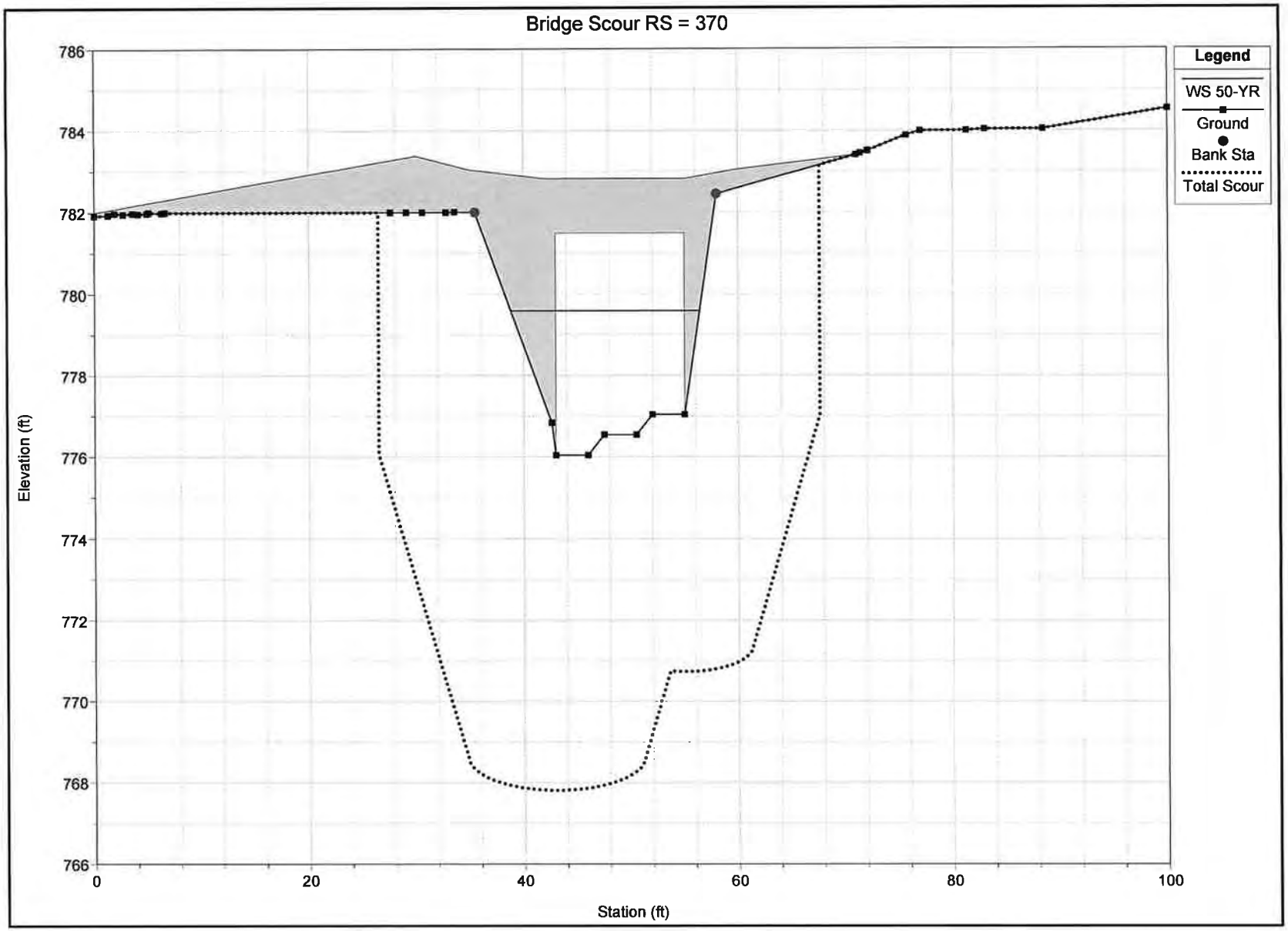
E.G. US. (ft)	781.46	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	780.69	E.G. Elev (ft)	780.67	780.22
Q Total (cfs)	286.00	W.S. Elev (ft)	779.88	779.47
Q Bridge (cfs)	286.00	Crit W.S. (ft)	779.15	778.65
Q Weir (cfs)		Max Chl Dpth (ft)	3.84	3.93
Weir Sta Lft (ft)		Vel Total (ft/s)	7.14	6.94
Weir Sta Rgt (ft)		Flow Area (sq ft)	40.07	41.22
Weir Submerg		Froude # Chl	0.64	0.62
Weir Max Depth (ft)		Specif Force (cu ft)	131.20	133.32
Min El Weir Flow (ft)	782.02	Hydr Depth (ft)	3.34	3.43
Min El Prs (ft)	781.49	W.P. Total (ft)	18.84	19.03
Delta EG (ft)	2.20	Conv. Total (cfs)	2188.2	2278.2
Delta WS (ft)	2.30	Top Width (ft)	12.00	12.00
BR Open Area (sq ft)	59.42	Frctn Loss (ft)	0.43	0.93
BR Open Vel (ft/s)	7.14	C & E Loss (ft)	0.02	0.04
BR Sluice Coef		Shear Total (lb/sq ft)	2.27	2.13
BR Sel Method	Energy only	Power Total (lb/ft s)	16.19	14.78

Appendix F – SCOUR COMPUTATIONS


Bridge Scour RS = 370
Legend
WS 25-YR
Ground
Bank Sta
Total Scour
Elevation (ft)
Station (ft)
786
784
782
780
778
776
774
772
770
768
0
20
40
60
80
100

Abutment Scour

		Left	Right
Input Data			
	Station at Toe (ft):	42.99	55.00
	Toe Sta at appr (ft):	58.59	68.50
	Abutment Length (ft):	26.18	31.50
	Depth at Toe (ft):	3.93	2.94
	K1 Shape Coef:	1.00 - Vertical abutment	
	Degree of Skew (degrees):	90.00	90.00
	K2 Skew Coef:	1.00	1.00
	Projected Length L' (ft):	26.18	31.50
	Avg Depth Obstructed Ya (ft):	1.12	0.60
	Flow Obstructed Qe (cfs):	92.67	41.12
	Area Obstructed Ae (sq ft):	29.33	18.88
Results			
	Scour Depth Ys (ft):	7.78	5.47
	Qe/Ae = Ve:	3.16	2.18
	Froude #:	0.53	0.50
	Equation:	Froehlich	Froehlich


Bridge Scour RS = 370
Legend
WS 50-YR
Ground
Bank Sta
Total Scour
Elevation (ft)
Station (ft)
786
784
782
780
778
776
774
772
770
768
766
0
20
40
60
80
100

Abutment Scour

		Left	Right
Input Data			
	Station at Toe (ft):	42.99	55.00
	Toe Sta at appr (ft):	58.59	68.50
	Abutment Length (ft):	27.93	31.50
	Depth at Toe (ft):	4.28	3.29
	K1 Shape Coef:	1.00 - Vertical abutment	
	Degree of Skew (degrees):	90.00	90.00
	K2 Skew Coef:	1.00	1.00
	Projected Length L' (ft):	27.93	31.50
	Avg Depth Obstructed Ya (ft):	1.29	0.85
	Flow Obstructed Qe (cfs):	110.03	60.21
	Area Obstructed Ae (sq ft):	36.06	26.72
Results			
	Scour Depth Ys (ft):	8.25	6.31
	Qe/Ae = Ve:	3.05	2.25
	Froude #:	0.47	0.43
	Equation:	Froehlich	Froehlich

SCOUR COUNTER MEASURE CALCULATIONS

Project: 195113356
Date: 2/12/2020
Designed By: BMR

Culvert Outlet Scour Analysis

Chestnut Hill Loop Rd over Chestnut Hill Brook
Montague, MA

Stantec

Equations: **HEC-RAS 23 Guideline#4 for Rip Rap Revertment:**

$D_{30} = Y\ (S_F \times C_S \times C_V \times C_T) \times [V_{DES}/(v(K_i \times (S_g\text{-}1) \times g \times Y)]^{\wedge}2.5$

$V_{DES} = V_{AVG} \times (1.74 - 0.52 \times \log R_c/W)$

$D_{50} = 1.2 \times D_{30}$

Note:
This spreadsheet is based on the Army National Guard HEC-RAS 23 Guideline#4 for Rip Rap Revertment.

Design Storm: **25 Year USGS**

														RIP RAP Stone Size			
Location (STA./STRUCT.)	FLOW (CFS)	V_{AVG} (FT/S)	Rc (FT)	W (FT)	V_{DES} (FT/S)	Y (FT)	S_F	C_S	C_V	C_T	Ki	Sg	g (FT/S^2)	Stone Size (D30 - FEET)	Stone Size (D30 - INCHES)	Stone Size (D50 -FEET)	Stone Size (D50 - INCHES)
Bridge Inlet	190	5.33	60.00	12.00	7.34	3.24	1.20	0.38	1.25	1.00	0.73	2.65	32.20	0.63	8	0.76	9

Check Storm: **50 Year USGS**

														RIP RAP Stone Size			
Location (STA./STRUCT.)	FLOW (CFS)	V_{AVG} (FT/S)	Rc (FT)	W (FT)	V_{DES} (FT/S)	Y (FT)	S_F	C_S	C_V	C_T	Ki	Sg	g (FT/S^2)	Stone Size (D30 - FEET)	Stone Size (D30 - INCHES)	Stone Size (D50 -FEET)	Stone Size (D50 - INCHES)
Bridge Inlet	236	6.10	60.00	12.00	8.40	3.60	1.20	0.38	1.25	1.00	0.73	2.65	32.20	0.86	10	1.03	12

Project: 195113356
Date: 2/12/2020
Designed By: BMR

Culvert Outlet Scour Analysis

Chestnut Hill Loop Rd over Chestnut Hill Brook
Montague, MA

Stantec

Equations:

HEC-RAS 23 Guideline#14 for Rip Rap at Bridge Abutments:

$D_{50} = Y \times (K/(S_{g-1})) \times ((V^2)/(g \times Y))$

IF $V/(g \times y)^{1/2} < 0.80$

$D_{50} = Y \times (K/(S_{g-1})) \times ((V^2)/((g \times Y)^{0.14})$

IF $V/(g \times y)^{1/2} > 0.80$

Note:
This spreadsheet is based on the Army National Guard
HEC-RAS 23 Guideline#14 for Rip Rap at Bridge Abutments.

Design Storm: **25 Year** **USGS**

								RIP RAP Stone Size	
Location (STA./STRUCT.)	FLOW (CFS)	Fr	V (FT/S)	Y (FT)	K	Sg	g (FT/S^2)	Stone Size (D50 -FEET)	Stone Size (D50 - INCHES)
BridgeOutlet	190	0.50	5.33	3.47	0.69	2.65	32.20	0.48	6

Check Storm: **50 Year** **USGS**

								RIP RAP Stone Size	
Location (STA./STRUCT.)	FLOW (CFS)	Fr	V (FT/S)	Y (FT)	K	Sg	g (FT/S^2)	Stone Size (D50 -FEET)	Stone Size (D50 - INCHES)
Bridge Outlet	236	0.56	6.10	3.72	0.69	2.65	32.20	0.48	6

Project: 195113356
Date: 2/12/2020
Designed By: BMR

Culvert Outlet Scour Analysis
Chestnut Hill Loop Rd over Chestnut Hill Brook
Montague, MA

Stantec

Equations: **HEC-RAS 23 Guideline for Bottomless Culverts**

$D_{50} = (K_r \times Y_o)/(S_{g-1}) \times ((V_{AC}^2)/(g \times Y_o))^{0.33}$

Note:
This spreadsheet is based on the Army National Guard
HEC-RAS 23 Guideline for Rip Rap for Bottomless Culverts.

Design Storm: **25 Year** **USGS**

							RIP RAP Stone Size	
Location (STA./STRUCT.)	FLOW (CFS)	VAC (FT/S)	YO (FT)	Kr	Sg	g (FT/S^2)	Stone Size (D50 -FEET)	Stone Size (D50 - INCHES)
Bridge Inlet	190	5.33	3.47	0.68	2.65	32.20	0.91	11

Check Storm: **50 Year** **USGS**

							RIP RAP Stone Size	
Location (STA./STRUCT.)	FLOW (CFS)	VAC (FT/S)	YO (FT)	Kr	Sg	g (FT/S^2)	Stone Size (D50 -FEET)	Stone Size (D50 - INCHES)
Bridge Inlet	236	6.10	3.72	0.68	2.65	32.20	1.04	13

MASSDOT MODIFIED FROEHLICH EQUATION

ABUTMENT SCOUR CALCULATION

Project: 195113356
Date: 2/12/2020
Designed By: BMR

Abutment Scour Analysis
Chestnut Hill Loop Rd over Chestnut Hill Brook
Montague, MA

Stantec

Equations: **MASSDOT Modified Froehlich Equation**

$Y_s = Y_a \times 2.27 \times K_1 \times K_2 \times (L' \times Y_a)^{0.43} \times (Fr)^{0.61}$

Note:
This spreadsheet is based on the MASSDOT modified Froehlich Equation
The HEC RAS calculated Abutment Scour is basd on the HEC-RAS model

Design Storm: **25 Year** **USGS**

Location (STA./STRUCT.)	FLOW (CFS)	Y_a (FEET)	K_1	K_2	L' (FEET)	Fr	Scour Depth: HEC RAS Scour (FEET)	Scour Depth: Abutment Scour (FEET)
Left Abutment	190	1.12	1.00	1.00	26.18	0.53	7.78	6.69
Right Abutment	190	0.60	1.00	1.00	31.50	0.50	5.47	4.90

Check Storm: **50 Year** **USGS**

Location (STA./STRUCT.)	FLOW (CFS)	Y_a (FEET)	K_1	K_2	L' (FEET)	Fr	Scour Depth: HEC RAS Scour (FEET)	Scour Depth: Abutment Scour (FEET)
Left Abutment	236	1.29	1.00	1.00	27.93	0.47	8.25	6.93
Right Abutment	236	0.85	1.00	1.00	31.50	0.43	6.31	5.45

ESTIMATING SCOUR AT OUTLET USING:

"HYDRAULIC DESIGN OF ENERGY DISSIPATERS FOR CULVERTS AND CHANNELS : HYDRAULIC ENGINEERING CIRCULAR (HEC) NO. 14, CHAPTER 5

Project: 195113356
Date: 2/12/2020
Designed By: BMR

Culvert Outlet Scour Analysis
Chestnut Hill Loop Rd over Chestnut Hill Brook
Montague, MA

Stantec

Equations: **HEC No. 14 Chapter 5**

$[h_s/R_c, W_s/R_c, L_s/R_c, V_s/R_c3] = C_sC_h(\alpha/\sigma\text{^}(1/3))x(Q/\sqrt{g}(R_c^{2.5}))\text{^}\beta x(t/316)\text{^}\theta$

Note:
This spreadsheet is based on the Army National Guard
For the Cohesionless Soils Calculation from HEC RAS 14 Chapter 5 Outlet Scour Analysis.

Design Storm: **25 Year** **USGS** **PI** Non-Plastic D_{84}= 52.93 mm D_{14}= 1.97 mm

Location (STA./STRUCT.)	Q (CFS)	Flow Depth (FEET)	Rc (FEET)	σ $\sqrt{(D_{84}/D_{16})}$	C_s	C_h	α	β	θ	g (FT/S^2)	t (MINUTES)	Depth Scour (FEET)
Bridge Outlet	190	3.47	4.70	5.18	1.00	1.00	2.27	0.39	0.06	32.20	30.00	4.66

Location (STA./STRUCT.)	Q (CFS)	Flow Depth (FEET)	Rc (FEET)	σ $\sqrt{(D_{84}/D_{16})}$	C_s	C_h	α	β	θ	g (FT/S^2)	t (MINUTES)	Width Scour (FEET)
Bridge Outlet	190	3.47	4.70	5.18	1.00	1.00	6.94	0.53	0.08	32.20	30.00	12.92

Location (STA./STRUCT.)	Q (CFS)	Flow Depth (FEET)	Rc (FEET)	σ $\sqrt{(D_{84}/D_{16})}$	C_s	C_h	α	β	θ	g (FT/S^2)	t (MINUTES)	Length of Scour (FEET)
Bridge Outlet	190	3.47	4.70	5.18	1.00	1.00	17.10	0.47	0.10	32.20	30.00	31.02

Location (STA./STRUCT.)	Q (CFS)	Flow Depth (FEET)	Rc (FEET)	σ $\sqrt{(D_{84}/D_{16})}$	C_s	C_h	α	β	θ	g (FT/S^2)	t (MINUTES)	Volume of Scour (CUBIC FEET)
Bridge Outlet	190	3.47	4.70	5.18	1.00	1.00	127.08	1.24	0.18	32.20	30.00	3202.06

Project: 195113356
Date: 2/12/2020
Designed By: BMR

Culvert Outlet Scour Analysis
Chestnut Hill Loop Rd over Chestnut Hill Brook
Montague, MA

Stantec

Equations: **HEC No. 14 Chapter 5**

$[h_s/R_c, W_s/R_c, L_s/R_c, V_s/R_c3] = C_sC_h(\alpha/\sigma\text{^}(1/3))x(Q/\sqrt{g}(R_c^{2.5}))\text{^}\beta x(t/316)\text{^}\theta$

Note:
This spreadsheet is based on the Army National Guard
For the Cohesionless Soils Calculation from HEC RAS 14 Chapter 5 Outlet Scour Analysis.

Design Storm: **50 Year** **USGS** **PI** Non-Plastic D_{84}= 52.93 mm D_{14}= 1.97 mm

Location (STA./STRUCT.)	Q (CFS)	Flow Depth (FEET)	Rc (FEET)	σ $\sqrt{(D_{84}/D_{16})}$	C_s	C_h	α	β	θ	g (FT/S^2)	t (MINUTES)	Depth Scour (FEET)
Bridge Outlet	236	3.72	4.87	5.18	1.00	1.00	2.27	0.39	0.06	32.20	30.00	5.07

Location (STA./STRUCT.)	Q (CFS)	Flow Depth (FEET)	Rc (FEET)	σ $\sqrt{(D_{84}/D_{16})}$	C_s	C_h	α	β	θ	g (FT/S^2)	t (MINUTES)	Width Scour (FEET)
Bridge Outlet	236	3.72	4.87	5.18	1.00	1.00	6.94	0.53	0.08	32.20	30.00	14.32

Location (STA./STRUCT.)	Q (CFS)	Flow Depth (FEET)	Rc (FEET)	σ $\sqrt{(D_{84}/D_{16})}$	C_s	C_h	α	β	θ	g (FT/S^2)	t (MINUTES)	Length of Scour (FEET)
Bridge Outlet	236	3.72	4.87	5.18	1.00	1.00	17.10	0.47	0.10	32.20	30.00	34.14

Location (STA./STRUCT.)	Q (CFS)	Flow Depth (FEET)	Rc (FEET)	σ $\sqrt{(D_{84}/D_{16})}$	C_s	C_h	α	β	θ	g (FT/S^2)	t (MINUTES)	Volume of Scour (CUBIC FEET)
Bridge Outlet	236	2.38	3.89	5.18	1.00	1.00	127.08	1.24	0.18	32.20	30.00	4269.23

U1

MassDEP Bordering Vegetated Wetland (310 CMR 10.55) Delineation Field Data Form

Applicant: TOWN OF MONTAGUE Prepared by: C.GUIDA Project location: CHESTNUT HILL LOOP RD. - UPLAND DEP File #:

Check all that apply:

- ☐ Vegetation alone presumed adequate to delineate BVW boundary: fill out Section I only
- ☒ Vegetation and other indicators of hydrology usedto delineateBVW boundary: fill out Sections I and II
- ☐ Method other than dominance test used (attach additional information)

Section I. UPLAND

Vegetation	Observation Plot Number:		Transect Number:	Date of Delineation:
A. Sample Layer & Plant Species (by common/scientific name)	B. Percent Cover (or basal Area)	C. Percent Dominance	D. Dominant Plant (yes or no)	E. Wetland Indicator Category*
E. HEMLOCK			U1	FAC. UPLAND 9/3/19
E. WHITE PINE				FAC. UPLAND
MOUNTAIN LAUREL				FAC. UPLAND
SUGAR MAPLE				FAC. UPLAND

* *Use an asterisk to mark wetland indicator plants: plant species listed in the Wetlands Protection Act (MGL c.131, s.40); plants in the genus Sphagnum; plants listed as FAC, FAC+, FACW-, FACW, FACW+, or OBL; or plants with physiological or morphological adaptations. If any plants are identified as wetland indicator plants due to physiological or morphological adaptations, describe the adaptation next to the asterisk.*

Vegetation conclusion: UPLAND

Number of dominant wetland indicator plants: 0 Number of dominant non-wetland indicator plants: ALL

Is the number of dominant wetland plants equal to or greater than the number of dominant non-wetland plants? yes (no)

If vegetation alone is presumed adequate to delineate the BVW boundary, submit this form with the Request for Determination of Applicability or Notice of Intent

U1 CHESTNUT HILL looped - MONTAGUE BRIDGE REPLACEMENT U1

Section II. Indicators of Hydrology

Hydric Soil Interpretation

1. Soil Survey

Is there a published soil survey for this site? yes no
title/date:
map number:
soil type mapped:
hydric soil inclusions:

Are field observations consistent with soil survey? yes no
Remarks:

2. Soil Description

Horizon	Depth	Matrix Color	Mottles Color
A	4"	10yr 3/3 dbl	NONE
B	20"	10yR 5/6 yb lcs	NONE

Remarks:

SANDY UPLAND SOIL

3. Other:

Conclusion: Is soil hydric? yes (no)

Other Indicators of Hydrology: (check all that apply & describe)

- ❑ Site Inundated: _____
- ❑ Depth to free water in observation hole: _____
- ❑ Depth to soil saturation in observation hole: _____
- ❑ Water marks: _____
- ❑ Drift lines: _____
- ❑ Sediment Deposits: _____
- ❑ Drainage patterns in BVW: _____
- ❑ Oxidized rhizospheres: _____
- ❑ Water-stained leaves: _____
- ❑ Recorded Data (streams, lake, or tidal gauge; aerial photo; other): _____
- ❑ Other: _____

Vegetation and Hydrology Conclusion

	Yes	No
Number of wetland indicator plants ≥ # of non-wetland indicator plants	____	X
Wetland hydrology present:		
Hydric soil present	____	X
Other indicators of hydrology present	____	X
Sample location is in a BVW	____	X

Submit this form with the Request for Determination of Applicability or Notice of Intent.

W1

MassDEP Bordering Vegetated Wetland (310 CMR 10.55) Delineation Field Data Form

Applicant: TOWN OF MONTAGUE Prepared by: C. GUIDA Project location: CHESTNUT HILL DEP File #:
Coop Rd - WET

Check all that apply:

- ☐ Vegetation alone presumed adequate to delineate BVW boundary: fill out Section I only
- ☒ Vegetation and other indicators of hydrology usedto delineateBVW boundary: fill out Sections I and II
- ☐ Method other than dominance test used (attach additional information)

Section I.

Vegetation	Observation Plot Number:		Transect Number:	Date of Delineation: 9/3/19
A. Sample Layer & Plant Species (by common/scientific name)	B. Percent Cover (or basal Area)	C. Percent Dominance	D. Dominant Plant (yes or no)	E. Wetland Indicator Category*
American Elm				FAC. WET
RED MAPLE				FAC,
YELLOW BIRCH				FAC,
Cinnamon Fern				FAC. WET
Jewelweed				FAC. WET
Highbush Blueberry				FAC. WET

* *Use an asterisk to mark wetland indicator plants: plant species listed in the Wetlands Protection Act (MGL c.131, s.40); plants in the genus Sphagnum; plants listed as FAC, FAC+, FACW-, FACW, FACW+, or OBL; or plants with physiological or morphological adaptations. If any plants are identified as wetland indicator plants due to physiological or morphological adaptations, describe the adaptation next to the asterisk.*

Vegetation conclusion:

Number of dominant wetland indicator plants: Number of dominant non-wetland indicator plants:

Is the number of dominant wetland plants equal to or greater than the number of dominant non-wetland plants? (yes) no

If vegetation alone is presumed adequate to delineate the BVW boundary, submit this form with the Request for Determination of Applicability or Notice of Intent

WI MONTAGUE CHESTNUT HILL Looped. WI 9/3/19

Section II. Indicators of Hydrology

Hydric Soil Interpretation

1. Soil Survey

Is there a published soil survey for this site? yes no
title/date:
map number:
soil type mapped:
hydric soil inclusions:

Are field observations consistent with soil survey? yes no
Remarks:

2. Soil Description

Horizon	Depth	Matrix Color	Mottles Color
A/O	8"	10yR 3/2 Dg loamy SAND	
B		2.5y 4/2 gray Sand	- Depleted Matrix

Remarks:

3. Other:

Conclusion: Is soil hydric? yes no

Other Indicators of Hydrology: (check all that apply & describe)

- ☐ Site Inundated: _____
- ☐ Depth to free water in observation hole: _____
- ☐ Depth to soil saturation in observation hole: _____
- ☒ Water marks: _____
- ☒ Drift lines: _____
- ☐ Sediment Deposits: _____
- ☒ Drainage patterns in BVW: _____
- ☒ Oxidized rhizospheres: _____
- ☒ Water-stained leaves: _____
- ☐ Recorded Data (streams, lake, or tidal gauge; aerial photo; other): _____
- ☐ Other: _____

Vegetation and Hydrology Conclusion

	Yes	No
Number of wetland indicator plants ≥ # of non-wetland indicator plants	X	
Wetland hydrology present:		
Hydric soil present	X	
Other indicators of hydrology present	X	
Sample location is in a BVW	X	

Submit this form with the Request for Determination of Applicability or Notice of Intent.