NOTICE OF PUBLIC HEARING
SUDBURY CONSERVATION COMMISSION

The Sudbury Conservation Commission will hold a public hearing to review the Notice of Intent filing for the construction of the Bruce Freeman Rail Trail within the MBTA Right-of-Way in Sudbury MA, including parking lot at Broadacres on Morse Road, associated stormwater management, connector paths, utilities, and landscaping, within wetland resource areas pursuant to the Wetlands Protection Act. Tim Dexter, Massachusetts Department of Transportation, Applicant. The hearing will be held on Monday, January 10, 2022 at 6:45 pm, via Zoom. Please see the Conservation Commission web page for further information.

https://sudbury.ma.us/conservationcommission/meeting/conservation-commission-meeting-monday-january-10-2022/

SUDBURY CONSERVATION COMMISSION
December 27, 2021

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

massDOT
Massachusetts Department of Transportation
Highway Division

December 22, 2021

Sudbury Conservation Commission
Department of Public Works
275 Old Lancaster Road
Subury, MA 01776

Subject: Notice of Intent, Bruce Freeman Rail Trail, Sudbury, MA, MassDOT Project #608164

Dear Commissioners,

The Massachusetts Department of Transportation, in conjunction with the Town of Sudbury, and the Federal Highway Administration, submits this Notice of Intent for the Commission's review at the next available public hearing on January 10, 2022.

This Request was prepared in accordance with the Massachusetts Wetland Protection Act (MGL c.131 s.40) and implementing Regulations (310 CMR 10.00)

If you need any additional information regarding the subject project, please contact me at (857) 274-8735 or Timothy.Dexter@state.ma.us

Sincerely,

Tim Dexter

Tim Dexter
Wetlands & Wildlife Unit Supervisor
Environmental Services
MassDOT Highway Division

Notice of Intent

Sudbury Bike Path Construction (Bruce Freeman Rail Trail)

MassDOT Project #608164

Massachusetts Department of Transportation, Highway Division

December 22, 2021

FUSS & O'NEILL

190 High Street
Boston, MA 02110

COMMONWEALTH OF MASSACHUSETTS
ERIC M. BERNARDIN
CIVIL
No. 37950
REGISTERED
PROFESSIONAL ENGINEER

Project No. 20200785.A10

FUSS & O'NEILL

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Sudbury-Concord Bike Path Construction
(Bruce Freeman Rail Trail)
MassDOT

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Bureau of Resource Protection - Wetlands

WPA Form 3 – Notice of Intent

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

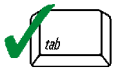
Provided by MassDEP:

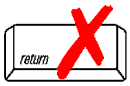
MassDEP File Number

Document Transaction Number

Sudbury
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):

Bruce Freeman Rail Trail — a. Street Address
Sudbury — b. City/Town
01776 — c. Zip Code

Latitude and Longitude:
42.36328 — d. Latitude
-71.42269 — e. Longitude

C10,C11,D10,E09,G09,H08,J08,K08 — f. Assessors Map/Plat Number
5100 — g. Parcel /Lot Number

2. Applicant:

Tim — a. First Name
Dexter — b. Last Name
MassDOT — c. Organization
10 Park Plaza RM 4260 — d. Street Address
Boston — e. City/Town
MA — f. State
02116 — g. Zip Code
857.368.4636 — h. Phone Number
i. Fax Number
timothy.dexter@state.ma.us — j. Email Address

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

Chalita — a. First Name
Belfield — b. Last Name
MassDOT Rail Divison — c. Organization
10 Park Plaza, Suite 4160 — d. Street Address
Boston — e. City/Town
MA — f. State
02116 — g. Zip Code
857-368-8957 — h. Phone Number
i. Fax Number
chalita.belfield@state.ma.us — j. Email address

4. Representative (if any):

Eric — a. First Name
Bernardin — b. Last Name
Fuss & O'Neill, Inc. — c. Company
1550 Main St — d. Street Address
Springfield — e. City/Town
MA — f. State
01103 — g. Zip Code
413.452.0445 — h. Phone Number
i. Fax Number
ebernardin@fando.com — j. Email address

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

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

Massachusetts Department of Environmental Protection
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Provided by MassDEP:

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A. General Information (continued)

6. General Project Description:

Construction of a recreational trail on an inactive railroad right-of-way, parking area, connecting paths, intersection safety improvements & reconstruction

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)

310CMR 10.53(6) Redevelopment for recreational bicycle trail in riverfront area

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)
Middlesex South	
c. Book	**d. Page Number**
13117	113

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

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

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

Massachusetts Department of Environmental Protection
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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	451 (1. linear feet)	317 (2. linear feet)
b. ☒ Bordering Vegetated Wetland	2710 (1. square feet)	3760 (2. square feet)
c. ☒ Land Under Waterbodies and Waterways	1746 (1. square feet); 0 (3. cubic yards dredged)	1,309 (2. square feet)

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
d. ☒ Bordering Land Subject to Flooding	1,736 (1. square feet); 67.5 (3. cubic feet of flood storage lost)	538 (2. square feet); 337 (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	Hop Brook, Pantry Brook, Unamed Tributary to Pantry Brook, Unamed Tributary to Cold Brook	

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: 284951 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.
109626	67704	41922

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

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

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

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

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

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

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

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

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

4. ☐ Restoration/Enhancement

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

a. square feet of BVW

b. square feet of Salt Marsh

5. ☒ Project Involves Stream Crossings

a. number of new stream crossings	b. number of replacement stream crossings
0	5

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C. Other Applicable Standards and Requirements

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

Streamlined Massachusetts Endangered Species Act/Wetlands Protection Act Review

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

   a. ☐ Yes ☒ No

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

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

   2021
   b. Date of map

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

   c. Submit Supplemental Information for Endangered Species Review*

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

         (a) within wetland Resource Area _____ 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 https://www.mass.gov/ma-endangered-species-act-mesa-regulatory-review).
Priority Habitat includes habitat for state-listed plants and strictly upland species not protected by the Wetlands Protection Act.

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

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

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

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

(d) ☐ Vegetation cover type map of site

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

(f) OR Check One of the Following

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

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

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

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

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

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

South Shore - 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@mass.gov

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@mass.gov

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

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

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

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

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

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

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

   b. ACEC

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

   a. ☐ Yes ☒ No

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

   a. ☐ Yes ☒ No

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

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

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

      2. ☒ A portion of the site constitutes redevelopment

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

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

      1. ☐ Single-family house

      2. ☐ Emergency road repair

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

D. Additional Information

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

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

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

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

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

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D. Additional Information (cont'd)

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

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

Plan and Profile of Bruce Freeman Rail Trail in the Town of Sudbury
a. Plan Title

Fuss & O'Neill
b. Prepared By

Eric Bernardin
c. Signed and Stamped by

12/22/2021
d. Final Revision Date

1"=20'
e. Scale

f. Additional Plan or Document Title

g. Date

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

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

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

8. ☐ Attach NOI Wetland Fee Transmittal Form

9. ☒ Attach Stormwater Report, if needed.

E. Fees

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

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

2. Municipal Check Number

3. Check date

4. State Check Number

5. Check date

6. Payor name on check: First Name

7. Payor name on check: Last Name

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

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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.

Tim Dexter 1. Signature of Applicant	12/17/2021 2. Date
Chalita Belfield 3. Signature of Property Owner (if different)	12/20/21 4. Date
E M Berard 5. Signature of Representative (if any)	12/22/2021` 6. Date

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

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

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

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

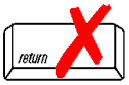
Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

NOI Wetland Fee Transmittal Form

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

A. Applicant Information

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



1. Location of Project:

a. Street Address | b. City/Town

c. Check number | d. Fee amount

2. Applicant Mailing Address:

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

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.

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

B. Fees (continued)

Step 1/Type of Activity	Step 2/Number of Activities	Step 3/Individual Activity Fee	Step 4/Subtotal Activity Fee

Step 5/Total Project Fee: _____

Step 6/Fee Payments:

Total Project Fee: _____ a. Total Fee from Step 5

State share of filing Fee: _____ b. 1/2 Total Fee **less $**12.50

City/Town share of filling Fee: _____ 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.)

Additional Owner:

Henry Hayes Jr.
Town Manager of Sudbury, MA
Flynn Building
278 Old Sudbury Road
Sudbury, MA 01776
townmanager@sudbury.ma.us
(978)-443-0756

2 Introduction

This Notice of Intent (NOI) describes the proposed extension of the Bruce Freeman Rail Trail (BFRT) in Sudbury, MA, also known as Phase 2D of the BFRT, and as Massachusetts Department of Transportation (MassDOT) Project #608164. Fuss & O'Neill respectfully submits this Notice of Intent (NOI) for the applicant, MassDOT pursuant to:

- The Massachusetts Wetland Protection Act, M.G.L .c. 131 § 40 (WPA)
- The WPA regulations (310 CMR 10.00)

As an agency of the Commonwealth providing essential government functions, MassDOT is exempt from municipal wetland bylaws and policies. This includes the following municipal bylaws:

- The Sudbury Wetlands Administration Bylaw (Town Bylaw)
- The Sudbury Wetlands Administration Bylaw Regulations (Town Bylaw Regulations) as amended September 25, 2017

Notwithstanding the exemption to the Town Bylaw, certain criteria of the Town Bylaw were feasible and practicable to meet for this Project. Therefore, for informational purposes, this document quantifies impacts under the Town Bylaw in Section 7 when describing proposed wetland mitigation. The proposed plans show resource area impacts according to WPA jurisdiction, but also show resource area boundaries under the Town Bylaw. Mitigation for impacts to Bordering Vegetative Wetland (BVW) is proposed that accounts for both the permanent impacts to BVW under WPA jurisdiction and permanent impacts to Town Bylaw jurisdictional Isolated Vegetated Wetland (IVW). An invasive plant management strategy is proposed covering an area commensurate with the proposed permanent impacts to 100-foot Buffer Zone.

Additionally, MassDOT is exempt from notifying abutters per the WPA Regulations at 310 CMR 10.05(4). The Town of Sudbury has elected to independently notify abutters of this NOI.

The proposed work (the Project) is inclusive of a new 4.4-mile segment of the Bruce Freeman Rail Trail (BFRT). The BFRT is a planned 25-mile shared-use recreational trail between Lowell and Framingham, Massachusetts utilizing an existing inactive rail corridor right of way (ROW). At present, approximately 14 miles of the BFRT has been constructed in the municipalities of Lowell, Chelmsford, Westford, Carlisle, Acton, and Concord. The BRFT has been planned to be constructed in the following six phases: 1, 2A, 2B, 2C, 2D, and 3. This Project was planned as Phase 2D. Each phase has been designed and permitted separately.

Project development has been a collaborative effort between MassDOT and the Town of Sudbury. The Project is eligible as a "limited project" under 310 CMR 10.58.

Proposed Project activities include:

- A 4.4 mile long and 10-foot-wide paved multi-use recreational path with crushed stone shoulders varying between one to three-foot wide on either side.
- Trailside rest areas that provide bench seating and bicycle racks.
- Regulatory and wayfinding signage along the trail for user safety and navigation. Additional signage to demarcate sensitive environmental areas.

- Cedar rail fencing to protect users from steep slopes and in some instances to screen adjacent properties such as industrial abutters or sensitive environmental areas.
- A new traffic signal at the trail crossing of Hudson Rd, a high intensity activated crosswalk (HAWK) signal at North Rd, and flashing pedestrian beacons at all other road crossings.
- Native tree and vegetative plantings throughout the project. The proposed plantings are mainly parallel to the shared-use path within the rail ROW for screening and to improve the ecological health of the forested corridor.
- A 268-foot long and 10-foot-wide paved shared-use path connection from the main trail to the existing parking area at the Parkinson Parcel. The path connection will travel through the lawn area of Parkinson Parcel to reach the existing parking area.
- A new 9,770 SF paved parking area containing 32 spaces adjacent to the trail at Morse Rd, on a parcel of the former Broadacres Farm. The parking area will include a waterless restroom and a recreational pavilion structure consisting of a gabled roof supported by wood beam columns.
- Conversion of the existing sidewalk from the BFRT crossing at North Rd to Davis Field recreational area into an 8-foot wide shared-use path. This 750ft long shared-use path will connect the BFRT with the existing parking and recreation area at Davis Field in Sudbury.
- The rehabilitation of an existing rail bridge at Hop Brook with a new bridge deck. The existing granite block wall abutments will be repaired and retained.
- The replacement of an existing rail bridge at Pantry Brook. The existing abutment walls will be cut to a lower height and retained. The superstructure of the bridge will be replaced by a concrete arch bridge spanning over the former abutment walls. The design minimizes impacts to Pantry Brook and provides wildlife crossing.
- Repair, replacement, and maintenance of existing culverts underneath the existing rail embankment.
- The construction of one new culvert not located at a stream, as an equalizer pipe for the conveyance of drainage.
- The construction of a wetland replication area at the former Broadacres Farm site.
- Implementation of an Invasive Plant Species Management Strategy as part of the proposed mitigation for the project.
- New grass lined infiltration swales parallel to the trail totaling a cumulative 3,395 linear feet.
- Earthwork, clearing, and grubbing incidental to construction in accordance with the special provisions and plans.

2.1 Project Purpose

The purpose of this project is to provide a non-motorized, fully accessible, 10-foot wide shared-use path through the Town of Sudbury which will serve as a historical, recreational, and alternative transportation resource for residents and visitors of all ages and abilities. The design of the trail seeks to maximize the benefits of the trail for the community and public at large while minimizing and mitigating any impacts to the natural environment.

The Project is proposed to be constructed in a single phase as a new segment of the planned 25-mile BFRT between Lowell and Framingham, Massachusetts along the former Lowell Secondary Track right-of-way (ROW) of Old Colony Rail Road. The ROW is now owned by The Massachusetts Department of Transportation Rail Division. The Town will enter into a long-term lease agreement with the MassDOT Rail Division which will allow the Town to operate and maintain the proposed new trail infrastructure.

The Project also serves the objectives of MassDOT's Healthy Transportation Policy Directive, P-13-0001, which formalized MassDOT's commitment to the implementation of transportation networks that serve all mode choices including walking and bicycling. Under the directive, MassDOT established a statewide goal to triple the distance traveled by walking, bicycling, and transit between 2013 and 2030.

3 Existing Conditions

The Project is located primarily in an inactive rail ROW corridor with a northern terminus at the Sudbury/Concord municipal boundary and a southern terminus at the Massachusetts Central Rail Trail (MCRT) located 100 feet west of the intersection of Union Ave and Station Road in Sudbury. The ROW is owned by MassDOT Rail Division and is 4.4 miles in length and 65 feet wide within the limits described. The rail ROW contains a raised earthen embankment topped with a 16ft wide dense graded and crushed ballast stone rail embankment embedded with wood rail ties. The wood rail ties anchor two steel rails (a single track), except where they have been removed at road crossings.

The rail ROW is predominantly a wooded corridor of mixed oak, white pine, and red maple intermixed with various wetland resource areas including intermittent and perennial streams, bordering vegetated wetlands, isolated vegetated wetlands, vernal pools (certified, eligible, and potential), and floodplain areas.

The surrounding land use of the rail ROW is suburban with adjacent parcels of single-family residential, agricultural use, protected open space, and commercial/industrial use. Generally, the adjacent land use becomes more industrial toward the southern end of the Project corridor.

The rail ROW crosses Hop Brook, a perennial stream, via a rail bridge. The existing bridge deck is structurally unsound and deteriorated. The existing granite block abutment walls are intact enough to allow repair and reuse.

The rail ROW also crosses Pantry Brook, a perennial stream, via a rail bridge. The existing granite block bridge abutment walls are partially collapsed into Pantry Brook.

There are 18 existing hydraulic culverts traversing the rail embankment, not including the two bridges. Site inspections found 6 in need of cleaning, 2 in need of headwall repair, and 3 in need of full replacement. One culvert in need of replacement has collapsed at an unnamed tributary to Hop Brook causing the tributary to cut through the rail embankment.

There are four cement concrete cattle crossings which pass underneath the rail embankment. No longer used for livestock, the passages allow for wildlife crossing.

The rail ROW has 9 at-grade road crossings. From north to south, the road crossings are: the driveway to Fairview Farm, North Rd (Route 117), Pantry Rd, Haynes Rd, Morse Rd, Hudson Rd (Route 27), Old Lancaster Road, Codjer Lane, and the industrial driveway of 71 Union Ave.

There are three parcels adjacent to and outside of the rail ROW where project work is proposed:

1) Davis Field at 195 North Rd is a 29-acre multi-use recreational area on North Rd with an entrance 500 feet east of the rail ROW. Davis Field is owned by the Town of Sudbury. There is an existing sidewalk connection from the rail ROW to the parking area of Davis Field. Davis Field hosts various Town sporting activities and recreational leagues. There is also a trail through conservation land that connects to Davis Field.

2) Broadacres Farm at 82 Morse Rd, a former horse farm on the north side of Morse Rd abutting the rail ROW. The property is owned by the Town of Sudbury. The parcel is currently maintained as a field and was acquired for the purposes of recreation consistent with the proposed design.

3) The Parkinson Parcel is located just north of 36 Hudson Rd (Route 27) abutting the rail ROW. The property is open to the public, is used as a general recreational field, and has an existing parking area.

3.1 Project Locus Area

The Project Locus Area is therefore defined as the combination of:

- The 4.4 mile long and 65ft wide rail ROW owned by the MassDOT Rail Division.
- The limit of work for proposed work outside of the rail ROW on parcels owned by the Town of Sudbury.

The Project Locus Area totals 37.53 acres. Attached Figure 1 shows a locus map of the Project.

3.2 Resource Area Delineation and Determination

Wetland delineations were performed by VHB in December 2015 and June 2016. Vernal pool surveys were conducted in 2015 and 2017 by VHB and in 2018 by Stantec. The delineations were performed in accordance with methods developed by Massachusetts DEP and the U.S. Army Corps of Engineers and with respect to the Wetlands Protection Act.

An amended Order of Resource Area Determination (ORAD), was approved by the Conservation Commission on September 16, 2020. The Amended ORAD and is included in *Appendix B*.

Supplemental wetland delineations were performed by Fuss & O'Neill in March 2020 covering proposed work areas adjacent to:

- The Parkinson Parcel adjacent to 36 Hudson Rd
- Davis Field at 195 North Rd
- Broadacres Farm at 82 Morse Rd

The new delineations were performed in accordance with methods developed by Massachusetts DEP and the U.S. Army Corps of Engineers and with respect to the Wetlands Protection Act . Three reports delineating additional resource areas are included in *Appendix B*.

3.3 Protected Habitats

3.3.1 Priority/Estimated Habitat for State Listed Species

According to the 15th Edition of the Natural Heritage Atlas (August 2021), the Project Locus Area does not intersect or contain any Priority Habitats for State Protected Rare Species or State Estimated Habitats of Rare Wildlife. Figure 2, attached to this report, shows the Project Locus Area with respect to known Priority/Estimated Habitat. The Project Locus Area boundary is directly adjacent to PH 1349 located near the site of Broadacres Farm, 82 Morse Rd.

Appendix D contains a letter written by the Massachusetts Division of Fisheries and Wildlife commenting on the Division's review of the Environmental Notification Form for the Project. The letter states that the Project, as currently proposed, occurs near but not within Estimated Habitat of Rare Wildlife or Priority Habitat as indicated in the Massachusetts Natural Heritage Atlas (15th Edition).

3.3.2 Coldwater Fisheries Resources

There are two designated Coldwater Fisheries Resources (CFRs) within The Project Locus Areas as identified by MassWildlife:

- Hop Brook, identified by Bank Flags #32 and #33 as shown in the proposed plans of *Appendix F.*
- An Unnamed Tributary to Hop Brook, identified by Bank Flag #30 as shown in the proposed plans of *Appendix F.*

3.3.3 Areas of Critical Environmental Concern

According to the latest on-line maps available from MassGIS (Bureau of Geographic Information) in October 2021, the Project Locus Area is not within or near an Areas of Critical Environmental Concern (ACEC).

3.3.4 Vernal Pools and Outstanding Resource Waters

As described in the amended ORAD of *Appendix B*, a total of twenty-two certified, eligible to be certified, or potential vernal pools were identified in the vicinity of the proposed project. A total of 18 of the surveyed potential vernal pools were not found to be eligible for NHESP certification. One vernal pool is currently certified and three are eligible to be certified. The certified and eligible vernal pools are:

- Certified Vernal Pool 13 is located outside of the Project Locus Area, approximately 140ft west of the rail ROW boundary at plan Station 191+00. Vernal Pool 13 is the only Outstanding Resource Water (ORW) near the Project Locus Area. Certified vernal pools are Class B ORWs as defined by MassWildlife.

- Eligible Vernal Pool 4 is located within the rail ROW between plan Station 286+00 to 290+10 on the west side of the trail. Vernal Pool 4 is located within a bordering vegetative wetland area designated by the WF#6-100 flag series.

- Eligible Vernal Pool 11 is located within the rail ROW between plan Station 209+50 to 212+50 on the east side of the trail. Vernal Pool 11 is located within a bordering vegetative wetland area designated by the WF#24 flag series.

- Eligible Vernal Pool 12a is located outside of the Project Locus Area, approximately 150ft west of the rail ROW boundary at plan Station 209+50.

4 Proposed Conditions

4.1 Project Description

This section describes the proposed Project activities. The proposed work is described in the following categories:

- The BFRT shared-use path
- Bridge renovation at Hop Brook
- Bridge renovation at Pantry Brook
- Culvert renovation
- The new parking area
- Shared-use path connections

4.1.1 The Bruce Freeman Rail Trail Shared-Use Path

The Project proposes a 10 foot-wide bituminous asphalt paved shared-use path with shoulders varying in width between 1ft and 3ft made of crushed stone. This 4.4-mile length of shared-use path located within MassDOT Rail Division ROW is proposed to be designated as part of the Bruce Freeman Rail Trail (BFRT). The typical cross sections of the proposed shared-use path vary:

- The most common cross section is 14 feet wide with 2-foot-wide crushed stone shoulders.
- The narrowest path cross section totals 12 feet wide with 1-foot-wide shoulders designed to minimize wetland impacts.
- The widest path cross sections are 16 feet wide including 2-foot-wide crushed stone shoulders ending at a timber fence with an additional 1ft loam & seed shoulder extending outward from underneath the timber fence.

The design of typical cross sections of the shared-use path are included in the proposed plan set attached as *Appendix F*.

The shared-use path includes 18 proposed trailside rest areas, paved pads directly adjacent to the shared-use path. The rest areas vary in dimensions from smaller pads of 8ft wide by 10ft long to larger pads of 15ft wide by 65ft long. The rest areas typically contain one or more benches and bike racks depending on size. The shared-use path also includes two turnaround locations for emergency vehicles, segments where the path surface widens to 24ft for a length of 25ft.

The proposed shared-use path alignment is located on a previously developed and degraded area within the rail ROW. The existing width of dense graded railroad ballast stone beneath the rail tracks is typically 16-feet wide in the corridor.

The side slopes of the trail adjacent to the shoulders are proposed to be graded back to existing contours with loam & native seed. Slopes have been designed to avoid wetland impacts as much as possible by steepening up to a slope of 1.5:1 (horizontal: vertical) when necessary. The proposed trail surface will be

an improvement for small invertebrates, turtles, and other wildlife compared to the existing condition as the vertical impediment of the steel rail tracks will be removed and replaced with a surface at ground level.

The construction of the BFRT shared-use path also includes proposed intersection safety improvements at the nine at-grade crossings with surface roads. At seven of the crossings, safety improvements consist of safety signage, pavement markings, pedestrian activated flashing beacons, and accessibility compliant wheel-chair ramps. Two crossings are proposed to receive additional safety improvements:

•The intersection of Hudson Rd and Peakham Rd is proposed to be reconstructed with a new traffic signal for vehicular traffic which will include an exclusive phase for the proposed BFRT crossing.

•The intersection of North Rd is proposed to have an overhead High-Intensity Activated Crosswalk (HAWK) signal for improved visibility and safety for trail users.

The proposed shared-use path work results in impacts to WPA jurisdictional resource areas including Bank, Bordering Vegetative Wetland (BVW), Land Under Water (LUW), Bordering Land Subject to Flooding (BLSF), Riverfront Area, and Buffer Zone. The proposed shared-use path also incurs impact to Isolated Vegetated Wetlands jurisdictional to 401 Water Quality Certification. Impacts associated with the shared-use path work are described in Section 6.

4.1.2 Bridge Renovation at Hop Brook

The Project proposes to renovate the bridge at Hop Brook for the purpose of providing a recreational non-motorized shared-use path crossing. No access to Hop Brook is proposed, meaning the proposed bridge does not allow fishing, boating, or other recreation access to the waters of Hop Brook. Bridge design plans for the Hop Brook Bridge are included in the proposed plans of *Appendix F.*

- The existing granite block bridge abutments will be repaired, cleaned, and retained. Re-use of the existing abutments at Hop Brook reduced the scope of proposed work within wetland resource areas including excavation, earth work, and dewatering.
- The superstructure supporting the bridge deck and the shared-use path will be replaced on top of the existing abutments.
- The new bridge span will change from an existing 28ft to 27.5ft in length. The width of the bridge deck will change from an existing 14ft to 16ft. The proposed safety rails on the bridge deck are 4ft in height.
- Proposed water control during construction consists of the use of a floating silt fence/turbidity curtain and the redirection of water surrounding the existing bridge abutments.

Impacts associated with the proposed work at Hop Brook Bridge include temporary impacts to Bank, BVW, and LUW, and Riverfront Area. Resource area impacts are described in Section 6.

4.1.3 Bridge Renovation at Pantry Brook

The Project proposes to renovate the bridge at Pantry Brook for the purpose of providing a recreational non-motorized trail crossing. No access to Pantry Brook is proposed, meaning the proposed bridge does not allow fishing, boating, or other recreation access to the waters of Pantry Brook. Bridge design plans for the Pantry Brook Bridge are included in the proposed plans of *Appendix F.*

- The collapsed portions of the existing granite abutments are proposed to be cut and lowered by approximately 11 feet. Retaining the existing abutments in place at a reduced height minimizes excavation and impacts to the stream channel bed, minimizes required dewatering, and allows for wildlife passage along the tops of the lowered abutments.
- A new bridge structure is proposed with footings behind (landward of) the lowered existing abutments to remain. The new bridge superstructure is a cement concrete arch design with cement concrete footings.
- Dumped riprap is proposed landward of the existing abutments to provide scour protection and stabilization. The riprap will transition to modified rockfill at elevation 120', the elevation of the top of the lowered abutments. The modified rockfill will be top-dressed with composted mulch and native seed mix to enhance wildlife crossing for small invertebrates underneath the bridge.
- Proposed water control during construction consists of the use of a floating silt fence/turbidity curtain and the redirection of water surrounding the existing bridge abutments.

Impacts associated with the proposed work at Pantry Brook include permanent and temporary impacts to Bank and BVW, temporary impacts to LUW, and permanent impacts to BLSF in the form of a sizeable cut (gain) in flood storage. Resource area impacts are described in Section 6.

4.1.4 Culvert Renovation

There are 18 existing culvert crossings underneath the rail embankment. Work is proposed at 13 culvert crossings including one new culvert not located at a stream crossing for the conveyance of drainage only. Table 1 shows the proposed culvert work at each location. The plan Station locations refer to the proposed plans of *Appendix F.*

Table 1: Summary of Proposed Culvert Work

Location Number	Plan Station Location	Existing Culvert Description	Proposed Work	Span (ft)	Stream Crossing
1	104+95	15" Reinforced concrete pipe	Remove Debris & Sediment from headwall areas	25 (ex.)	N/A
2	152+33	12" Clay Pipe	Abandon in Place, not hydraulically connected	35 (ex.)	N/A
3	160+06	1.8' H x 2.2' W Box culvert, stacked stone and granite slab	Retain	61 (ex.)	BF#32, Intermittent
4	167+20	0.75' H x 3' W inlet opening, Mortared stone box culvert, record plans describe three 12" clay pipes within culvert, west outlet buried, culvert collapsed	Remove ex. culvert. Replace with 48"diameter reinforced concrete pipe buried 2ft with a natural stream channel bottom. Restore former stream alignment to former culvert location.	22.5 (prop.)	BF#30, Intermittent, Unnamed tributary to Hop Brook
5	197+95	2.5' H x 2.5' W Box culvert, stacked stone and granite slab	Removed vegetation & debris around headwall, Reset stone headwall on west side	27 (ex.)	BF#26, BF#27, Intermittent
6	216+51 to 216+68 (Right)	12" Corrugated Metal Pipe	Remove Ex. culvert. Replace with 15" Reinforced concrete pipe, install concrete headwalls (MassDOT standard headwall 206.40)	17 (prop.)	BF#23, Intermittent
7	226+10	42" Cast Iron Pipe w/ mortared stone headwall	Retain	50.4 (ex.)	BF#21, Intermittent
8	240+88	1.7' H x 2.4'W, Box culvert, stacked stone and granite slab	Remove Debris & Sediment from headwall areas	40.1 (ex.)	BF#18, BF#19, Intermittent
9	247+28	2.5'H x 1.7W', Box culvert, stacked stone and granite slab	Remove Debris & Sediment from headwall areas	24 (ex.)	BF#16, Intermittent
10	273+34	2' Hx2' W, Box culvert, stacked stone and granite slab	Remove Debris & Sediment from headwall areas	42 (ex.)	BF#12, BF#15-14, Intermittent

Location Number	Plan Station Location	Existing Culvert Description	Proposed Work	Span (ft)	Stream Crossing
11	284+44	2.0'H x 2.3'W, Concrete and masonry box culvert	Retain	57 (ex.)	BF#7, BF#8, Intermittent
12	285+36 (Left)	12" Corrugated Metal Pipe	Retain	40.6 (ex.)	BF#6, Intermittent
13	289+92	2.7' H x 2.3' W, Box culvert, stacked stone and granite slab at outlet, concrete headwall at inlet	Remove vegetation & debris within 5' of headwalls	43.2 (ex.)	BF#7, BF#15-6, Intermittent
14	301+34	12" Clay Pipe	Rem. Ex. culvert. Replace with 15" Reinforced concrete pipe	24 (prop.)	BF#15-6, BF#15-7, Intermittent
15	306+72	12" Clay Pipe	Retain ex. culvert pipe. Replace concrete headwalls	25.4 (ex.)	BF#5-200 Series, BF#6-100 Series, Intermittent
16	313+35	2' H x 2.5' W, Box culvert, stacked stone and granite slab	Retain	57 (ex.)	BF#3 perennial
17	327+42	3' H x 3' W, Box culvert, stacked stone and granite slab, partially buried	Remove Debris & Sediment from headwall areas	32 (ex.)	N/A
18	332+66	8" Clay Pipe	Retain	50 (ex.)	BF#2, Intermittent
19	257+48	N/A	New 12" Reinforced Concrete Pipe Culvert, Concrete headwall at east end (MassDOT standard headwall 206.40), 7'x5' area for stones at west pipe end	25 (prop.)	N/A, equalizer pipe, for conveyance of drainage

Proposed work at culverts results in permanent and temporary impacts to BVW, Bank, and LUW. Resource area impacts are described in Section 6.

4.1.5 New Parking Area

A new 32-space parking area is proposed on a Town-owned parcel directly adjacent to the rail ROW. The parcel is part of the former Broadacres farm pastureland and is currently maintained as a grass field. The location is at the northeast quadrant of the intersection of the rail ROW with Morse Rd.

The asphalt paved parking area surface is 9,770 SF in area. A waterless restroom structure, 165 SF in area, and a recreational pavilion structure, 640 SF in area, consisting of a gabled roof supported by wood beam columns are proposed adjacent to the parking area. A shared-use path connection is proposed between the parking area and the BFRT shared-use path, the path is 60 foot long and 10 wide.

Two earthen infiltration basins have been designed adjacent to the proposed parking area to manage stormwater from the parking area. More information regarding the design of the parking area infiltration basins is contained in *Appendix G*. The parking area is located between plan Stations 216+00 and 219+50 in the proposed plans of *Appendix F*.

The proposed work at the parking area is located within the 100-foot Buffer Zone to an intermittent stream. Resource area impacts are described in Section 6.

4.1.6 Shared-Use Path Connections

The Project includes two shared-use path connections designed to connect the BFRT with two existing parking areas for user accessibility:

- A paved shared-use path connection from the BFRT intersection with North Rd to the existing Davis Field parking lot located at 195 North Rd. The path will overlay an existing 5ft wide paved sidewalk. Davis Field is owned by the Town of Sudbury. The path is proposed to be 750ft long and 8ft wide. The path connection intersects the BFRT at plan Station 307+50 in the proposed plans of *Appendix F*.

- A paved shared-use path connection from the BFRT to the existing Parkinson Parcel parking area located adjacent to 36 Hudson Rd. The shared-use path connection is proposed to be located on an existing grass field maintained and owned by the Town. The new path connection is proposed to be 250ft long and 10ft wide. The path connection intersects the BFRT at plan Station 184+50 in the proposed plans of *Appendix F*.

The Davis Field path connection results in impact to 100-foot Buffer Zone to BVW. There are no resource area impacts associated with the Parkinson Parcel path connection.

4.1.7 Wetland Replication Area

An 2,240 SF wetland replication area is proposed outside of the rail ROW corridor at 82 Morse Rd on a parcel owned by the Town of Sudbury. The selected site is part of the former pasture at the Broadacres Farm site. The site contains an existing pond and BVW which the replication area is proposed adjacent to. The location is between 30ft and 145ft west of the rail ROW boundary at plan Station 212+75 in the proposed plans of *Appendix F*. The proposed plans include a Wetland Replication plan sheets detailing the proposed plantings, pgs. 139-140 of the proposed plans.

The proposed wetland is a seasonally saturated, Palustrine Broad-Leaved Deciduous Scrub-Shrub wetland (PSS1E). The wetland is proposed to have hummock-hollow topography and will provide habitat for local amphibian and reptile populations as well as augment existing habitat for a wide range of birds and mammals.

The construction activities include placement of erosion controls, excavation, planting, and seeding. The wetland replication area will result in an impact to the 100-foot Buffer Zone to an existing pond and BVW.

4.1.8 Sequence of Activities

The Project is proposed to be constructed in a single phase under the control and oversight of MassDOT who will provide on-site construction administrative and inspection services during the entire construction duration. The Town will also employ an environmental monitor to oversee construction activities. Long-term operation and maintenance will be the responsibility of the Town.

Although the contractor will have the ability to propose adjusting the sequence of work to optimize scheduling and efficiency, or may perform work simultaneously, a general sequence of construction is as follows:

- Creation of a Storm Water Pollution and Prevention Plan (SWPPP)
- Creation of an Invasive Plant Management Strategy (IPMS)
- Completion of any conditioned pre-construction activities as required by an Order of Conditions
- Establishment of wetland monitoring report protocols with wetland specialist
- Establishment of contractor access and laydown areas
- Work zone safety signage establishment for rail ROW access areas and proposed at-grade intersection improvements
- Removal of vegetation within the limit of work as needed for access and proposed work
- Erosion and sedimentation control installation
- Wetland replication area construction at 82 Morse Rd
- Construction of new parking area at Morse Rd
- Preparation of the existing rail bed for proposed work including rail and tie removal and grading to proposed limits for proposed trail bed
- Work on culverts and drainage improvements
- Bridge reconstruction work

- Construction of connecting shared-use paths to The Parkinson Parcel and Davis Field
- Final grading and paving of the BFRT shared-use path
- Planting of proposed native species trees along the trail as shown on the construction plans
- Intersection safety improvements at at-grade road crossings
- Intersection reconstruction work at Hudson Rd and Peakham Rd
- Restoration of temporary disturbances to wetland resource areas
- Removal of erosion and sedimentation controls

4.1.9 Vegetation Removal

The Project requires removal of existing vegetation, including trees, saplings, shrubs, and herbaceous vegetation within the limits of work as indicated on the construction plans included in *Appendix F*. The design has minimized tree removal to the maximum extent practicable by aligning the shared-use path overlaying the alignment of the existing rail tracks.

Prior to the start of construction, the proposed limits of work and erosion control barriers will be delineated with survey grade equipment and staked, and trees that require removal will be marked. In addition, prior to vegetation removal, the boundaries of wetlands will be clearly marked to help prevent encroachment.

Typical equipment used to clear vegetation includes tree shears, brush mowing units, a skidder bucket and/or manual climbers, a forwarder or tree dump truck, and a chipper with a winch. Hand cutting using chainsaws and brush saws will be used as necessary in sensitive areas.

Work items related to vegetation removal include the following. The contract specifications for each item are included in *Appendix K*.

101 Clearing and Grubbing Standard Specification
101.2 Clearing and Grubbing-Rail Trail
102.511 Tree Protection-Armoring and Pruning
105.40 Tree Removed (Excluding Stump) Diameter Under 24 Inches

5 Alternatives Analysis

The following Alternatives Analysis describes the selection of the Project alignment, the shared-use trail cross section design, and the bridge crossing designs with respect to minimizing environmental impacts and while meeting the Project purpose and need.

Cross Section Design

Trail surface and width were selected to be nearly consistent with other sections of the BFRT. While the shared-use path is proposed to be surfaced with hot mix asphalt, the shoulders have been designed as dense grade crushed stone with native grass buffers. The pavement width is proposed to be 10ft wide, the minimum standard width per MassDOT design guidelines for a bi-directional shared-use trail. Sections of the BFRT in other towns are 12-feet wide, but the abundance of wetland resources adjacent to the Sudbury railroad embankment resulted in the proposal of a 10ft wide path for the Project.

The dense graded crushed stone shoulder varies from 1ft wide to 3ft wide depending on the condition of the slopes and resources adjacent to the path. Adjacent to wetlands, shoulders were narrowed to 1ft which reduced the impacts to BVW by approximately 2,500 square feet. The shoulders not only provide for user safety but facilitate drainage sheet flow to the adjacent grass buffers and slopes, slowing the water flow and enhancing infiltration. Sections of the path with a 3ft wide shoulder design contain a timber guardrail for safety and to discourage off-trail use in nearby sensitive environmental areas. Where proposed, the guardrail necessitates the wider 3ft shoulder for bicycle clear-zone safety.

Alternatives for Shared-use Path Alignment

The preferred alternative to align the path along the already disturbed railroad corridor on the existing railroad ballast avoids impacts to many resources, while new construction would generally have more significant environmental and ROW acquisition consequences for previously unaltered areas. Alternative roadway-associated alignments outside of the railroad corridor were evaluated at the major stream crossing locations to potentially avoid impacts to the Riverfront Areas.

Selected Alternative: Rail Trail along the Lowell Secondary Railroad Line

The need for a shared-use path has been identified by the Town of Sudbury community and region to offer safe off-road recreational and non-vehicular travel. Such paths improve healthy transportation options and reduce roadway congestion and greenhouse gas emissions. The BFRT proposes to convert previously disturbed land into a recreational and healthy transportation facility that can also be used as a shared-use path corridor for continuous non-motorized commuter travel between municipalities.

The preferred alternative was selected because it avoids, minimizes, and mitigates impacts to the environment and other resources while achieving the purpose of the Project. The existing rail ballast provides an ideal foundation for minimizing disturbance of unaltered wetland areas and utilizes an existing continuous ROW owned by MassDOT.

Alternative B: On-Road Project Location

On-road non-motorized multi-use passive recreational trails were examined but were found not feasible while simultaneously ensuring public safety with motorized traffic. This alternative did not realize the

benefit of using existing railroad ROW to create a continuous regional shared-use path. Additionally, this alternative would require significant roadside land easements or purchases and the widening of existing roadway impervious area along with the associated environmental impacts. Standard on-road bike lanes are 5ft wide for each direction of travel. For these reasons, this alternative was dismissed.

Alternative C: Adjacent to Roadway

Alternative partially on-road alignments utilizing a combination of the existing railroad ROW and nearby roadway layouts were considered, but ultimately proved not feasible. Potential avoidance of the two main riverfront areas along the railroad ROW was considered. To avoid the railroad bed crossings of Pantry Brook and Hop Brook, a design of shared-use paths adjacent to roadway alternative was considered, an illustration is included in *Appendix I*.

In order to avoid the railroad ROW crossing of Hop Brook, an alternative of a shared-use path adjacent to the roadways from Old Lancaster Road to Union Avenue to the Project terminus (Option 1) near Station Road, and a variation on this utilizing adjacent conservation land (Option 3) was considered. To avoid the use of the railroad bed crossing of Pantry Brook, an alternative of a shared-use path adjacent to the roadways from Haynes Road to Concord Road to Morse Road (Option 2) was considered.

These adjacent to road non-motorized shared-use paths were examined but were ultimately not feasible, as they would require significant land easements or purchases and along with environmental impacts from the newly developed areas. Options 1-3 do have the benefit of using existing and previously developed railroad ROW to create a continuous regional shared-use path.

Additionally, at the roadway crossings of Pantry Brook and Hop Brook, new bridges or extensions of existing bridges would be required which would result in additional wetland and waterway impacts. There are numerous wetlands adjacent to the roadways that would be impacted if they were widened for adjacent shared-use paths, which commonly have a pavement width of 10-12ft.

Finally, avoiding the restoration of Pantry Brook Bridge on the railroad ROW would avoid minor wetland impacts there, but retaining the failed bridge and abutments collapsing into the stream would not be a desired outcome for the environmental integrity of the stream or human safety. For these reasons, the alternatives considering shared-use paths adjacent to roadways were dismissed.

Alternative D: No Build Scenario

The no-build scenario does not fulfill the overall project purpose of constructing a shared-use recreational trail in order to provide safe pedestrian and bicycle facilities. It also doesn't allow for the rehabilitation of the dilapidated structures and redevelopment and restoration of previously developed impacts. There are no existing facilities that may be designated to meet the Project purpose.

Alternatives for the Rail Trail Section between Stations 293+00 to 305+00

This section of the rail embankment is approximately 1,200 linear feet constrained by close BVW resource areas and more limited railroad embankment than other sections of the corridor. It was identified by the Town prior to the 25 percent design and alternative treatments to avoid and minimize impacts along this section were considered.

Alternatives included reduced path width, reduced shoulder width, and retaining walls. The Americans with Disabilities Act (ADA) and emergency vehicle-accessible path requires the 10-ft-wide trail cross section. It is proposed that the shoulder width will be reduced to 1-foot in this section to avoid additional wetland resource area impacts. The slimmed shoulder reduced the BVW impacts by approximately 2,500 square feet in this area.

While retaining walls were considered in this section and proposed at the 25 percent design stage to avoid and minimize wetland impacts, they are no longer proposed as it was determined that: 1) permanent impacts are largely reduced with the 1-foot shoulder at grade option, 2) temporary impacts are largely equivalent whether the 1-foot shoulder or retaining walls are proposed, and 3) avoiding any change in grade associated with short retaining walls was desirable from a movement of wildlife and habitat perspective.

To avoid and minimize impacts and still achieve the goals of the Project in this challenging section, the proposed path width has been reduced to 10ft wide, the shoulder width has been reduced to 1ft and there will be no retaining walls used. Other alternative treatments were dismissed as they didn't meet project goals or sufficiently reduce wetland impacts.

Bridge Alternatives

Alternatives were evaluated for the proposed renovation of two perennial stream crossings within the Project. At both crossing locations, the existing bridge abutments will be retained at Bank to reduce impacts to Bank and LUW. At Hop Brook, the existing abutments were in good enough condition to repair and retain. At Pantry Brook, the condition of the abutments did not allow for re-use however, retaining the existing abutments in place at a reduced height minimizes excavation and impacts to the stream channel bed, minimizes required dewatering, and allows for wildlife passage along the tops of the lowered abutments.

Pantry Brook Crossing (Bridge S-31-013)

A Pantry Brook Bridge design study was completed per MassDOT standards and resulted in two final alternatives being considered: Alternative 1, a precast concrete buried arch and Alternative 2, steel deck girders with a timber deck. Considerations for structure selection included environmental impacts, constructability, aesthetics, structure depths, bike ride quality, and estimated cost and maintenance. The two alternatives are anticipated to have similar impacts to LUW and bank. Alternative 2 would require larger equipment to deliver and erect the longer steel beams and require more tree clearing to create access for this equipment. Both alternatives satisfy hydraulic requirements and provide wildlife crossing accommodations below the bridge. Based on these factors, Alternative 1 – precast concrete buried arch is the selected alternative for final design.

Hop Brook Crossing (Bridge S-31-007)

With the abutments and wing walls at the Hop Brook crossing of the trail remaining in place and being restored, permanent impacts to the stream and associated wetland resources are avoided. Alternatives for the superstructure at Hop Brook were evaluated per MassDOT standards and included two final options: retaining the existing steel girders with new beams and decking or replacing the existing steel girders with lower profile steel girders and new beams and decking. It was determined that reuse of the existing steel girders would result in a vertical path profile change once the new decking is installed on top. Reuse of the existing steel girders would require modifications to the wing walls of the bridge,

which was not desirable as they would result in environmental impacts, which are otherwise avoided. Therefore, new steel girders with a lower profile and avoidance of environmental impacts are proposed for Hop Brook Bridge.

Alternatives Analysis Summary

The Bruce Freeman Rail Trail project offers an opportunity to convert an inactive degraded railroad corridor into a 4.4-mile-long multimodal transportation and recreational trail in Sudbury, adding an extension to what is planned to be a continuous 25-mile alternative transportation corridor. The selected alternative for the Project avoids, minimizes, and mitigates impacts while achieving the Project purpose and need.

6 Proposed Impacts and Regulatory Compliance

The proposed Project will result in permanent and temporary impacts to WPA jurisdictional wetland resource areas as described in this section. Impacts to resource areas jurisdictional only to Town Bylaw are totaled in Section 7 and presented with the discussion of mitigation.

Table 2 summarizes the overall Project impacts. The impacts to each resource area are described in more detail in the subsections that follow.

Table 2: Summary of Total Resource Area Impacts

Overall WPA Resource Area Impacts	Perm	Temp	Total Impact	Total within Project Locus Area
Bank	134 LF	317 LF	451 LF	5,802 LF
Bordering Vegetative Wetlands (BVW)	1,190 SF	1,520 SF	2,710 SF	185,887 SF
Land Under Water (LUW)	437 SF	1,309 SF	1,746 SF	19,919 SF
Bordering Land Subject to Flooding (BLSF) Area	1,736 SF	-	1,736 SF	78,54 SF
Riverfront Area	65,857 SF	43,769 SF	109,626 SF	284,951 SF
Vernal Pools (WPA Certified or Eligible)	-	-	-	2 VPs in Project Locus 2 VPs outside Project Locus
100ft Buffer Zone	254,639 SF	173,777 SF	428,416 SF	1,122,312 SF
100' Buffer Zone to Certified or Eligible Vernal Pool	14,545 SF	7,531 SF	22,076 SF	66,163 SF
Section 401 & 404 Jurisdictional				
Isolated Vegetated Wetlands (IVW)	303 SF	166 SF	469 SF	14,593 SF

6.1 Bank (310 CMR 10.54)

The Project proposes permanent and temporary impacts to Bank resulting from the proposed work activities described in Section 4. Bank is proposed to be restored in situ at all temporary impact locations. Table 3 sums the proposed impacts to Bank by work activity. Table 4 details the proposed impacts to Bank at each project location.

Table 3: Summary of Impacts to Bank by Work Activity

Work Activity	Permanent Impact (LF)	Temporary Impact (LF)	Total Disturbed (LF)	Replaced (LF)
BFRT Shared-Use Path	0	0	0	0
Bridge Renovation	17	241	258	241
Culvert Renovation	117	76	193	76
Total	134	317	451	317

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Table 4: Summary of Impacts to Bank

Work Activity	Plan Station	East/West of Trail	Name of River/Stream	Permanent Length (Ft.)	Temporary Length (Ft.)	Total Disturbed Length (Ft.)	Replaced Length (Ft.)	Impact Desc.	Resource Desc.	Flag Series
Bridge Renovation	126+26	Under Trail	Hop Brook		49	49	49	Abutment Work Area/Water Control	Perennial Stream (River)	BF#32-100 series
Bridge Renovation	126+50	Under Trail	Hop Brook		84	84	84	Abutment Work Area/Water Control	Perennial Stream (River)	BF#32-200
Culvert Renovation	166+89	West	Unnamed tributary to Hop Brook		5		5	Work Area for Replacement of Collapsed Culvert (South Bank)	Intermittent Stream	BF#30-205 to 206
Culvert Renovation	167+14	East	Unnamed tributary to Hop Brook		3		3	Work Area for Replacement of Collapsed Culvert (North Bank)	Intermittent Stream	BF#30-209 to 210
Culvert Renovation	167+24	West	Unnamed tributary to Hop Brook		8		8	Work Area for Replacement of Collapsed Culvert (North Bank)	Intermittent Stream	BF#30-308
Culvert Renovation	167+19	Under Trail	Unnamed tributary to Hop Brook	53		53		Replacement of Collapsed Culvert (South bank)	Intermittent Stream	BF#30-205 to 210
Culvert Renovation	167+31	Under Trail	Unnamed tributary to Hop Brook	46		46		Replacement of Collapsed Culvert (North bank)	Intermittent Stream	BF#30-105,321,319, 308
Culvert Renovation	216+48 to 216+54	East		6		6		Headwall Installation	Intermittent Stream	BF#23-300, 305
Culvert Renovation	216+46 to 216+51	East			6		6	Work Area for Headwall Installation	Intermittent Stream	BF#23-300-301

Work Activity	Plan Station	East/West of Trail	Name of River/Stream	Permanent Length (Ft.)	Temporary Length (Ft.)	Total Disturbed Length (Ft.)	Replaced Length (Ft.)	Impact Desc.	Resource Desc.	Flag Series
Culvert Renovation	216+46 to 216+51	East			7		7	Work Area for Headwall Installation	Intermittent Stream	BF#23-304-305
Culvert Renovation	216+68 to 216+76	East			8	8	8	Work Area for Headwall Installation	Intermittent Stream	BF#23-216 to 217
Culvert Renovation	216+69 to 216+99	East			6	6	6	Erosion control & Work Area	Intermittent Stream	BF#23-214 to 215
Culvert Renovation	216+68	East		6				Headwall Installation	Intermittent Stream	BF#23-215 to 216
Bridge Renovation	264+30	Under Trail	Pantry Brook	12		12		Dumped Rip Rap (South east bank)	Perennial Stream (River)	PS1-1 series
Bridge Renovation	264+37	Under Trail	Pantry Brook		52	52	52	Abutment Work Area/Water Control (South Bank)	Perennial Stream (River)	PS1-1 series
Bridge Renovation	264+52	Under Trail	Pantry Brook	5		5		Dumped Rip Rap (North East bank)	Perennial Stream (River)	PS1-1A series
Bridge Renovation	264+56	Under Trail	Pantry Brook		56	56	56	Abutment Work Area/Water Control (North Bank)	Perennial Stream (River)	PS1-1A series
Culvert Renovation	301+33	West			6	6	6	Erosion control & work area to replace headwall	Intermittent Stream	BF#15-6 series
Culvert Renovation	306+64	West			15	15	15	Erosion control & work area to replace headwall	Intermittent Stream	BF#15-6 series
Culvert Renovation	306+65	East			9	9	9	Erosion control & work area to replace headwall	Intermittent Stream	BF#15-6 series
Culvert Renovation	306+71	East			3	3	3	Erosion control & work area to replace headwall	Intermittent Stream	BF#15-6 series

Work Activity	Plan Station	East/West of Trail	Name of River/Stream	Permanent Length (Ft.)	Temporary Length (Ft.)	Total Disturbed Length (Ft.)	Replaced Length (Ft.)	Impact Desc.	Resource Desc.	Flag Series
Culvert Renovation	306+72	East		6				Embankment Grading, Loam & Seed	Intermittent Stream	BF#15-6 series
	Total:			134	317	451	317			

Description of Permanent Impacts to Bank

The cumulative permanent impacts to Bank total 134 LF, which is above the 50 LF cumulative project performance standard described in 310 CMR 10.54 (4)(a)(5). Culvert work at a single location makes up for 99 LF of the cumulative total or 73 percent. That location is Culvert 4 in Table 1 of Section 4 at Plan Station 167+20, where an existing culvert has collapsed causing an intermittent stream to wash through the rail embankment. The remaining permanent impacts to Bank cumulatively total 35 LF. Without the existing condition of the collapsed culvert, the cumulative permanent impacts to Bank would be below the performance standard limit of 50 LF.

The proposed permanent Bank impacts are described in more detail below at each location.

Impacts to Bank Caused by Culvert Renovation Work

- The proposed work at Culvert Location 4 will result in permanent impacts to Bank. The existing conditions and proposed work are described in Table 1 of Section 4. A total of 99 LF of permanent impacts to Bank, (53 LF and 46 LF on opposite sides of the stream) The existing culvert at this location is blocked and has collapsed. An intermittent stream designated by jurisdictional sections of the BF#30 flag series, also known as an unnamed tributary to Hop Brook, has cut around the collapsed culvert and washed through the existing rail embankment. The proposed work will replace the collapsed culvert. The work will result in permanent impacts to the Bank as the stream is returned to the replacement culvert in the location of the former culvert. The existing open channel crossing through the washed-out rail embankment will be repaired to a previously filled condition. More information on the proposed culvert design is provided in *Appendix H*. The stream crossing standards of the proposed replacement culvert are described in Section 6.

  Regulatory Compliance: The proposed work is permissible under 310 CMR 10.54(4)(b) which states that:

  > *"Notwithstanding the provisions of 310 CMR 10.54(4)(a), structures may be permitted in or on a Bank when required to prevent flood damage to facilities, buildings and roads constructed prior to the effective date of 310 CMR 10.51 through 10.60 or constructed pursuant to a Notice of Intent filed prior to the effective date of 310 CMR 10.51 through 10.60 (April 1, 1983), including the renovation or reconstruction (but not substantial enlargement) of such facilities, buildings and roads, provided that the following requirements are met:*
  > *1. The proposed protective structure, renovation or reconstruction is designed and constructed using best practical measures so as to minimize adverse effects on the characteristics and functions of the resource area;*
  > *2. The applicant demonstrates that there is no reasonable method of protecting, renovating or rebuilding the facility in question other than the one proposed."*

  The existing rail embankment facility was constructed prior to April 1, 1983. The rail embankment facility is proposed to be renovated by the Project as the structural base of a shared-use path. The work will not substantially enlarge the rail embankment.

The proposed 48-inch diameter culvert has been designed using the best practical measures to minimize adverse effects on the characteristics and functions of the resource area by proposing a minimally invasive structural footprint and limit of grading, proposing a natural stream bottom of 2ft inside the buried pipe, and by proposing that grading of the stream Bank in areas of disturbance will not exceed a ratio of 1 to 1.5 (vertical: horizontal).

Renovating the rail embankment facility by the proposed culvert replacement is the most reasonable method of renovating this pre-existing facility. A larger span crossing would require a more vertical profile of the shared-use path. If the trail profile were increased vertically, it would result in either a larger impact area from expanded limits of grading or vertical structural reinforcement such as a retaining wall, which would introduce a new barrier to wildlife crossing of small invertebrate.

The proposed work is compliant under 310 CMR 10.54(4)(c), as there is no habitat of rare species within the proposed within the proposed work limit.

- Proposed culvert work at Culvert 15 will result in 6 LF of permanent impact to Bank. The existing conditions and proposed work are described in Table 1 of Section 4. Culvert 15 is proposed to have headwalls replaced. The permanent Bank impact occurs at an intermittent stream designated by the BF#6-100 series. The cross section of the rail embankment is narrow with steep side slopes at this location, for this reason, the proposed work could not avoid the impact. The proposed impact is necessary for the maintenance of the culvert and to connect the embankment below the shared-use path back to the proposed replacement culvert headwall.

  Regulatory Compliance: The proposed impact to Bank will fully comply with the general performance standards of 310 CMR 10.54(4)(a) through (c):
  (a)

  1. The physical stability of the Bank will be maintained. The proposed grading will result in a stabilized earthen Bank.
  2. The water carrying capacity of the existing channel within the Bank will not be reduced.
  3. Ground water and surface water quality will not be impaired. A work area surrounding the proposed culvert renovation work has been defined with erosion and sedimentation controls to protect the stream.
  4. The capacity of the Bank to provide breeding habitat, escape cover, and food for fisheries will not be impaired because the proposed loam & native seed treatment at the limit of grading will provide these features.
  5. The capacity of the Bank to provide important wildlife habitat functions will not be impaired. A general wildlife habitat evaluation (WHE) was performed within the Project Locus Area which found that no adverse effect to wildlife habitat within the project wetland resource areas is anticipated.
  6. The proposed work at Culvert 15 consists of headwall replacement to an existing stream crossing. As such, the work has been designed to comply with the Stream Crossing Standards to the maximum extent practicable. Therefore, 10.54(4)(a)(6) does not apply, however the performance standards under 10.54(4)(a) are met based on 10.54(4)(a)(1) through (5).

(b) The proposed work will also have the benefit of preventing future flood damage to the rail embankment facility by repairing the existing damaged headwalls.

(c) The proposed work will not have an adverse effect on specified habitat sites of Rare Species, no such habitat sites exist within the Project Locus Area or near Culvert 15.

- Proposed work at Culvert Location 6 will cause permanent impacts to Bank. The existing conditions and proposed work is described in Table 1 of Section 4 as Culvert Location 6. A total of 12 LF of permanent impact to Bank is proposed. The existing culvert is a partially blocked and damaged 12" corrugated metal pipe with no headwalls. The proposed 15" reinforced concrete pipe culvert will include new headwalls. The culvert span could not be shortened to avoid this impact due to the presence of a shared-use path above the culvert span. The impacted Bank is part of the intermittent stream designated by the BF#23-200 and BF#23-300 flag series. The intermittent stream is in a human made former railroad drainage ditch that parallels the rail embankment and is of degraded quality.

  Regulatory Compliance: The intermittent stream designated by the BF#23-200 and BF#23-300 flag series is unlikely to be significant to the interests specified in 310 CMR 10.54(1). The intermittent stream was originally constructed as a drainage ditch parallel to the tracks of the former railroad. Pursuant to 310 CMR 10.60, a general wildlife habitat evaluation (WHE) was performed within the Project Locus Area which found that no adverse effect to wildlife habitat within the project wetland resource areas is anticipated. The WHE report is provided in *Appendix J*.

  The proposed impact to Bank will fully comply with the general performance standards of 310 CMR 10.54(4)(a) through (c):
  (a)

  1. The physical stability of the Bank will be maintained. The proposed headwalls will maintain the stability of the Bank.
  2. The water carrying capacity of the existing channel within the Bank will not be reduced. The proposed new headwall will not reduce the carrying capacity of the existing channel. The culvert pipe is proposed to be enlarged from 12" to 15".
  3. Ground water and surface water quality will not be impaired. A work area surrounding the proposed culvert renovation work has been defined with erosion and sedimentation controls to protect the stream.
  4. The capacity of the Bank to provide breeding habitat, escape cover, and food for fisheries will not be impaired because the proposed loam & native seed treatment at the limit of grading will provide these features once revegetated.
  5. The capacity of the Bank to provide important wildlife habitat functions will not be impaired. A general wildlife habitat evaluation (WHE) was performed within the Project Locus Area which found that no adverse effect to wildlife habitat within the project wetland resource areas is anticipated.
  6. The proposed work at Culvert 6 is the replacement of an existing stream crossing. As such, the work has been designed to comply with the Stream Crossing Standards to the maximum extent practicable. Therefore, 10.54(4)(a)(6) does not apply,

however the performance standards under 10.54(4)(a) are met based on 10.54(4)(a)(1) through (5).

(b) While the proposed work at Culvert 6 is necessary due to the damaged condition of the existing culvert, the proposed work will also have the benefit of preventing flood damage by adding headwalls and new culvert pipe while also enlarging the culvert from 12" to 15" in diameter.

(c) The proposed work will not have an adverse effect on specified habitat sites of Rare Species, no such habitat sites exist within the Project Locus Area.

Impacts to Bank Caused by Bridge Renovation Work

- A total of 17 LF of permanent impact to Bank is proposed at Pantry Brook resulting from bridge renovation work. The impacts consist of 12 LF of Bank at plan Station 264+30 at the southeast footing of the proposed bridge and 5 LF of Bank at plan Station 264+52 at the northeast footing of the proposed bridge. Pantry Brook is a perennial stream.

  The impacts are caused by the placement of dumped riprap (large angular stones) at the limit of Bank to protect the new bridge footings from scour. While the riprap is proposed to be located mostly behind the lowered existing abutment walls to remain, in two locations the proposed riprap meets the Pantry Brook Bank just outside of the existing bridge abutments. The proposed riprap alters the Bank in two relatively short sections underneath the bridge. The riprap will not cross the Bank, rather it will be placed on the Bank.

  The proposed design retaining the existing abutment walls has reduced the need for excavation and disturbance to existing Bank. Wildlife crossing underneath the bridge will be enhanced by the presence of the lowered existing abutment wall, which may be traversed. Additionally, the riprap will be transitioned to a smaller size modified rockfill with a compost topdressing and seeding at elevation 120' which will be seeded with a native mix. Wildlife may travel on the top of the lowered abutment wall and access the modified rockfill with vegetated covering from the top of the wall.

  Regulatory Compliance: The proposed impact to Bank will fully comply with the general performance standards of 310 CMR 10.54(4)(a) through (c):
  (a)
  1. The physical stability of the Bank will be enhanced by the proposed riprap which will provide scour protection during flooding events.
  2. The water carrying capacity of the existing channel within the bank will not be reduced. The riprap will be at the landward side of the limit of Bank, not on the water side of Bank.
  3. Ground water and surface water quality will not be impaired. A work area surrounding the proposed bridge renovation work has been defined. The bridge plans call for the control of water surrounding the limits of work with the use of a turbidity

curtain. Erosion and sedimentation controls will be deployed on the landward side of the work area.
4. The capacity of the Bank to provide breeding habitat, escape cover, and food for fisheries will not be impaired because the proposed work takes place in a previously developed area. The existing conditions at the abutments of Pantry Brook Bridge consists of collapsed granite blocks at the limit of Bank.
5. The capacity of the Bank to provide important wildlife habitat functions will not be impaired. A general wildlife habitat evaluation (WHE) was performed within the Project Locus Area which found that no adverse effect to wildlife habitat within the project wetland resource areas is anticipated.
6. The proposed bridge renovation is the replacement of an existing stream crossing. As such, the work has been designed to comply with the Stream Crossing Standards to the maximum extent practicable. Therefore, 10.54(4)(a)(6) does not apply, however the performance standards under 10.54(4)(a) are met based on 10.54(4)(a)(1) through (5).

(b) While the Pantry Brook bridge renovation is proposed due to the structural deficiency of the existing bridge, the proposed work will also have the benefit of preventing flood damage. The proposed work at Pantry Brook Bridge will result in a net gain in flood storage capacity by removing at total volume of 78.4 CY (2,116.8 CF) below Base Flood Elevation 123.7' at Pantry Brook. The proposed riprap at Bank will stabilize the landward side of Bank and provide scour protection during flood events.

(c) The proposed work will not have an adverse effect on specified habitat sites of Rare Species, no such habitat sites exist within the Project Locus Area.

Description of Temporary Impacts to Bank

The proposed project will result in 317 LF of temporary impact to bank. Temporary impacts to Bank are proposed to occur due to designated work areas and erosion control throughout the project as indicated in Table 4. The temporary impacts to Bank are proposed to be restored in situ following construction.

Proposed Restoration and Mitigation Measures

- Erosion and sedimentation controls are proposed to be installed to protect stream water quality as shown on the proposed plans
- Work areas surrounding the existing bridge abutments call for the use of turbidity curtains to protect water quality
- Following construction, temporary impacts to Bank will be stabilized and restored in situ using a native seed mix.

6.2 Bordering Vegetated Wetlands (310 CMR 10.55)

The Project proposes permanent and temporary impacts to bordering vegetative wetlands (BVW) resulting from the proposed work activities described in Section 4. BVW is proposed to be restored in situ at all temporary impact locations. Permanent impacts to BVW are proposed to be replicated as part of the wetland replication area described in Section 7. Table 5 sums the proposed impacts to BVW by work activity. Table 6 details the proposed impacts to BVW at each project location.

Table 5: Summary of Impacts to BVW by Work Activity

Work Activity	Permanent Impact (SF)	Temporary Impact (SF)	Total Disturbed (SF)	Restored in Situ (SF)
BFRT Shared-Use Path	1,105	1,223	2,328	1,223
Bridge Renovation	85	259	344	259
Culvert Renovation	0	38	38	38
Total	1,190	1,520	2,710	1,520

Table 6: Summary of Impacts to BVW

Work Activity	Plan Station	East/West of Trail	Name	Permanent Area (SF)	Temporary Area (SF)	Total Disturbed Area (SF)	Restored in situ (SF)	Impact Disc.	Flag Series
BFRT Shared-Use Path	105+10				14	14	14	Erosion Control	WF#36-200 series
BFRT Shared-Use Path	105+10			5		5	0	Embankment Grading, Loam & Seed	WF#36-200 series
Bridge Renovation	126+08				47	47	47	Abutment Work Area/Water Control	WF#40-100 series
Bridge Renovation	263+94 to 264+28		Pantry Brook Area		42	42	42	Erosion Control	WF#14-100 series
Bridge Renovation	264+23		Pantry Brook Area	10		10	0	Dumped Rip Rap	WF#14-100 series
Bridge Renovation	264+34		Pantry Brook Area		35	35	35	Abutment Work Area/Water Control	WF#13-100 series
Bridge Renovation	264+61		Pantry Brook Area		31	31	31	Abutment Work Area/Water Control	WF#13-100 series
Bridge Renovation	264+21 to 264+32		Pantry Brook Area	47		47	0	Dumped Rip Rap	WF#13-100 series
Bridge Renovation	264+19 to 264+37		Pantry Brook Area		29	29	29	Erosion Control	WF#13-100 series

Work Activity	Plan Station	East/West of Trail	Name	Permanent Area (SF)	Temporary Area (SF)	Total Disturbed Area (SF)	Restored in situ (SF)	Impact Disc.	Flag Series
Bridge Renovation	264+67		Pantry Brook Area	15		15	0	Dumped Rip Rap	WF#13-100 series
Bridge Renovation	264+60 to 264+95		Pantry Brook Area		39	39	39	Erosion Control	WF#13-100 series
Bridge Renovation	264+57		Pantry Brook Area	13		13	0	Dumped Rip Rap	WF#14-100 series
Bridge Renovation	264+30 to 264+84		Pantry Brook Area		36	36	36	Erosion Control	WF#14-100 series
BFRT Shared-Use Path	292+44 to 297+14		Challenging BVW Section		503	503	503	Erosion Control	WF#7-100 series
BFRT Shared-Use Path	292+55 to 296+26		Challenging BVW Section	725		725	0	HMA Pavement, Gravel Shoulder, Loam & Seed	WF#7-100 series
BFRT Shared-Use Path	293+18 to 294+15		Challenging BVW Section		88	88	88	Erosion Control	WF#6-100 series
BFRT Shared-Use Path	294+84 to 297+24		Challenging BVW Section		272	272	272	Erosion Control	WF#6-100 series
BFRT Shared-Use Path	295+08 to 297+08		Challenging BVW Section	190		190	0	Embankment Grading, Loam & Seed	WF#6-100 series
BFRT Shared-Use Path	296+55 to 296+76		Challenging BVW Section	2		2	0	Embankment Grading, Loam & Seed	WF#7-100 series

Work Activity	Plan Station	East/West of Trail	Name	Permanent Area (SF)	Temporary Area (SF)	Total Disturbed Area (SF)	Restored in situ (SF)	Impact Disc.	Flag Series
BFRT Shared-Use Path	297+24 to 297+78		Challenging BVW Section		8	8	8	Embankment Grading, Loam & Seed	WF#7-100 series
BFRT Shared-Use Path	301+30		Challenging BVW Section		9	9	9	Erosion Control & Work Area for Headwall Replacement	WF#6-100 series
BFRT Shared-Use Path	301+38		Challenging BVW Section		12	12	12	Erosion Control & Work Area for Headwall Replacement	WF#6-100 series
BFRT Shared-Use Path	301+34		Challenging BVW Section		12	12	12	Erosion Control & Work Area for Headwall Replacement	WF#7-100 series
BFRT Shared-Use Path	302+96 to 303+14		Challenging BVW Section	2		2	0	Embankment Grading, Loam & Seed	WF#7-100 series
BFRT Shared-Use Path	302+69 to 304+91		Challenging BVW Section		214	214	214	Erosion Control	WF#7-100 series
BFRT Shared-Use Path	303+66 to 304+20		Challenging BVW Section	26		26	0	Embankment Grading, Loam & Seed	WF#6-100 series

Work Activity	Plan Station	East/West of Trail	Name	Permanent Area (SF)	Temporary Area (SF)	Total Disturbed Area (SF)	Restored in situ (SF)	Impact Disc.	Flag Series
BFRT Shared-Use Path	303+70 to 304+84		Challenging BVW Section	155		155	0	Gravel Shoulder, Embankment Grading Loam & Seed	WF#7-100 series
BFRT Shared-Use Path	303+39 to 304+29		Challenging BVW Section		91	91	91	Erosion Control	WF#6-100 series
Culvert Renovation	306+55				13	13	13	Erosion Control & Work Area	WF#5-400 series
Culvert Renovation	306+56				25	25	25	Erosion Control & Work Area	WF#5-300 series
	Total:			1,190	1,520	2,710	1,520		

Description of Permanent Impacts to BVW

Overall the proposed Project impacts to BVW total 2,710 square feet with 1,190 SF of permanent impacts and 1,520 SF of temporary impacts. This is below the 5,000 SF threshold of 310 CMR 10.55(4)(b).

The following describes the permanent impacts to BVW caused by the shared-use path construction and bridge renovation work.

Impacts to BVW Caused by Shared-Use Path Construction

- A cumulative total of 1,100 SF of permanent impact to BVW is proposed resulting from construction of the shared-use path between plan Stations 292+55 and 304+84. This 1,400-foot-long section of the rail ROW was described in the Alternatives Analysis as the challenge section due to the proximity of BVW to the existing rail embankment. Within this section, the shared-use path cross section design was narrowed from 14 feet to 12 feet to reduce BVW impacts by approximately 2,500 square feet of permanent impacts. The remaining permanent impacts occur due to the encroachment of the proposed path and shoulders on BVW parallel to the rail embankment. The permanent impacts to BVW are proposed to be replicated as part of the wetland replication area described in Section 7.

- A total of 5 SF of permanent impact to BVW is proposed resulting from construction of the shared-use path at plan Station 105+10 on the west side of the trail. The impact arises from a small encroachment of the trail on adjacent BVW from grading of earth between the shared-use path shoulder and existing ground contour. The permanent impacts to BVW are proposed to be replicated as part of the wetland replication area described in Section 7.

Impacts to BVW Caused by Bridge Renovation

- A cumulative total of 85 SF of permanent impacts to BVW are proposed resulting from bridge renovation work. The impacts occur at Pantry Brook Bridge between plan Stations 263+94 and 264+67. The impacts occur around the four footings of the proposed concrete arch bridge structure where scour protection is proposed that encroaches on surrounding BVW. The scour protection consists of dumped riprap up to until elevation 120' where a transition to modified rock fill with compost top dressing and native seeding is proposed to improve wildlife crossing. The permanent impacts to BVW are proposed to be replicated as part of the wetland replication area described in Section 7.

Description of Temporary Impacts to BVW

The proposed project will result in 1,520 SF of temporary impacts to BVW. The temporary impacts to BVW are proposed to be restored in situ.

Regulatory Compliance: The total proposed permanent and temporary impacts to BVW total 2,710 SF, which is below the 5,000 SF threshold of 310 CMR 10.55(4)(b). Proposed compliance with the performance standards of 310 CMR 10.55(4)(b)(1) though (7) is explained herein:

(b)

1. The surface of the replacement area proposed exceeds the lost area. The permanent impacts to BVW are proposed to be replicated in a wetland replication area exceeding the area of permanent impact as explained in Section 7.

2. Permanent impacts are not proposed to be replicated near the locations of impact within the rail ROW due to the presence of invasive species and the lack of suitable contiguous land area inside the rail ROW that would be conducive for BVW replication without impacting an existing wetland or necessitating the clearing of trees. The proposed wetland replication area is in a grass field that does not require the clearing of trees.

The proposed single replication area sized for the cumulative impacts along the long linear rail ROW will have a greater chance of surviving compared to smaller replication areas distributed throughout the rail ROW.

3. The proposed wetland replication area will not have the same slender horizontal configuration as the impacted areas inside of the Rail ROW. The proposed wetland replication area can accommodate a more compact and rounded area that avoids slenderness to improve the survival of plantings.

4. The replicated BVW will not have a hydraulic connection to the same waterbody as the impacted areas given that suitable land for replication could not be found within the rail ROW, this performance standard could not be met. The wetland replication area will however have a hydraulic connection to an existing BVW that borders an existing pond as described in Section 7.

5. The permanent impacts to BVW to be replicated will not be located within the reach of the same waterbody as the impacted areas given that suitable land for replication could not be found within the rail ROW, this performance standard could not be met. Rather than replicating each small BVW impact area individually at the same water body of impact, the cumulative Project impacts to BVW will be replicated in one location for greater survivability.

6. The Project performance specifications for wetland replication will require that at least 75% of the surface of the replacement or replication areas shall be reestablished with indigenous wetland plant species within two growing seasons and that prior to said vegetative reestablishment any exposed soil in the replacement area shall be temporarily stabilized to prevent erosion in accordance with standard U.S. Soil Conservation Service methods.

7. The replicated BVW will be provided in a manner which is consistent with all other General Performance Standards for each resource area in Part III of 310 CMR 10.00. The proposed wetland replication area is located within the 100-foot Buffer Zone of BVW. The wetland

replication area will improve the existing Buffer Zone which is currently a maintained grass field.

310 CMR 10.55(4)(c) is not relevant, the Project impacts exceed 500 SF.

The project complies with 310 CMR 10.55(4)(d). None of the proposed impacts to BVW occur in an area of specified habitat site of rare or invertebrate species.

The project complies with 310 CMR 10.55.(4)(e). The Project Locus Area does not contain or overlap with any Areas of Critical Environmental Concern.

Proposed Restoration and Mitigation Measures

- Erosion and sedimentation controls will be installed to protect BVW
- Following construction, temporary impacts to BVW will restored
- The alternatives analysis for the Project looked at various cross section design alternatives to minimize BVW impacts while balancing trail user safety (narrowness) and wildlife crossing impacts (vertical profile). The proposed design narrows the path cross section from 14 to 12 feet between Station 292+00 and Station 305+00 to minimize BVW impacts. The narrowed shoulders in this section eliminated approximately 2,500 square feet of BVW impacts.
- A wetland replication area is proposed to replicate the permanent impacts to BVW. The proposed replication area will exceed the amount of permanent BVW impacts as explained in Section 7.

6.3 Land Under Water (310 CMR 10.56)

The Project proposes permanent and temporary impacts to land under water (LUW) resulting from the proposed work activities described in Section 4. LUW is proposed to be restored in situ at all temporary impact locations. Table 7 sums the proposed impacts to LUW by work activity. Table 8 details the proposed impacts to LUW at each project location.

Table 7: Summary of Impacts to LUW by Work Activity

Work Activity	Permanent Impact (SF)	Temporary Impact (SF)	Total Disturbed (SF)	Restored in situ (SF)
Bridge Renovation	0	1,011	1,011	1,011
Culvert Renovation	437	298	735	298
Total	437	1,309	1,746	1,309

Table 8: Summary of Impacts to LUW

Work Activity	Plan Station	East/West of Trail	Name of River/Stream	Perm. Impact Area (SF)	Temp. Impact Area (SF)	Total Disturbed Area (SF)	Replaced Area (SF)	Impact Desc.	Resource Desc.	Flag Series
Bridge Renovation	126+30	Under Trail	Hop Brook		179	179	179	Abutment Work Area, Water Control	Perennial Stream (River)	BF#32-100 Series
Bridge Renovation	126+52	Under Trail	Hop Brook		347	347	347	Abutment Work Area, Water Control	Perennial Stream (River)	BF#32-200 Series
Culvert Renovation	167+18 to 167+33	Under Trail		345		345	59	Repair Culvert	Intermittent Stream	BF#30-105, 308, 320, 321,BF#30-206-210
Culvert Renovation	166+91 to 167+14	West		43		43	0	Repair Culvert	Intermittent Stream	BF#30-205-206
Culvert Renovation	167+14	East		10		10	0	Repair Culvert	Intermittent Stream	BF#30-208-209
Culvert Renovation	167+17	East			52	52	52	Work Area for culvert repair, returned to natural stream bed	Intermittent Stream	BF#30-208-209
Culvert Renovation	167+17	West			102	102	102	Work Area for culvert repair, returned to natural stream bed	Intermittent Stream	BF#30-205-206

Work Activity	Plan Station	East/West of Trail	Name of River/Stream	Perm. Impact Area (SF)	Temp. Impact Area (SF)	Total Disturbed Area (SF)	Replaced Area (SF)	Impact Desc.	Resource Desc.	Flag Series
Culvert Renovation	216+46 to 216+51	East			35	35	35	Work Area for Headwall Installation, erosion control	Intermittent Stream	BF#30-300,305
Culvert Renovation	216+69 to 216+75	East			42	42	42	Work Area for Headwall Installation, erosion control	Intermittent Stream	BF#30-215-216
Culvert Renovation	216+50	East		16		16	0	Headwall Replacement	Intermittent Stream	BF#23-300 to 305
Culvert Renovation	216+65	East		3		3	0	Headwall Replacement	Intermittent Stream	BF#23-215 to 216
Bridge Renovation	264+39	Under Trail	Pantry Brook		254	254	254	Bridge Abutment Work Area/Water Control	Perennial Stream (River)	PS1-1 Series
Bridge Renovation	264+55	Under Trail	Pantry Brook		231	231	231	Bridge Abutment Work Area/Water Control	Perennial Stream (River)	PS1-1A Series
Culvert Renovation	301+33	West			4	4	4	Erosion Control & Work Area	Intermittent Stream	BF#15-6-304, BF#15-6-130
Culvert Renovation	301+33	East			12	12	12	Erosion Control & Work Area	Intermittent Stream	BF#15-7-100 Series

Work Activity	Plan Station	East/West of Trail	Name of River/Stream	Perm. Impact Area (SF)	Temp. Impact Area (SF)	Total Disturbed Area (SF)	Replaced Area (SF)	Impact Desc.	Resource Desc.	Flag Series
Culvert Renovation	306+61	West			29	29	29	Erosion Control & Work Area	Intermittent Stream	BF#5-206 to 209
Culvert Renovation	306+60	West		8		8	0	Replace Headwall	Intermittent Stream	BF#5-207 to 208
Culvert Renovation	306+60	East		8		8	0	Replace Headwall	Intermittent Stream	BF#6-100 to 101
Culvert Renovation	306+61	East			22	22	22	Erosion Control & Work Area	Intermittent Stream	BF#6-102 to 105
Culvert Renovation	306+70	East		4		4	0	Embankment Grading, Headwall replacement	Intermittent Stream	BF#6-101 to 102
	Total:			437	1,309	1,746	1,368			

Description of Permanent Impacts

Overall, the cumulative project impacts to LUW total 1,746 SF with 437 SF of permanent and 1,309 SF of temporary. This total is below the cumulative threshold of 5,000 SF described in 310 CMR 10.56(4)(a)(4).

This following describes the proposed permanent impacts to LUW caused by culvert renovation and bridge renovation work.

Impacts to LUW Caused by Culvert Renovation

- Proposed work at Culvert Location 4 will result in permanent impacts to LUW. The existing conditions and proposed work are described in Table 1 of Section 4. A cumulative total of 398 SF of permanent impact to LUW is proposed from culvert renovation between plan Stations 166+91 and 167+17. The work will result in permanent impact to the existing LUW as the stream is returned to the replacement culvert from the washed out rail embankment. The existing open channel crossing through the washed-out rail embankment will be returned to a previously filled condition. The proposed culvert will have a natural stream bottom which will replace 59 SF of LUW. More information on the proposed culvert design is provided in *Appendix H*.

  Regulatory Compliance: The performance standards of 310 CMR 10.56 (4)(a) through (c) are met as follows:

  (a)

  1. The water carrying capacity of the proposed culvert will be greater than the existing collapsed culvert to be replaced at this location. See the culvert design report in *Appendix H*.
  2. Ground water surface quality will not be impaired by the proposed work. Erosion controls during construction will prevent sediment from entering the stream.
  3. The capacity of said land to provide breeding habitat, escape cover and food for fisheries will not be impaired by the proposed work. The proposed culvert will be located in the same location as the existing collapsed culvert. Proposed clearing surrounding the proposed culvert has been minimized and the grading of slopes has been made more steep to minimize disturbance to surrounding vegetated slopes. The proposed culvert will have a natural stream bottom to replace some habitat.
  4. The proposed culvert will not impair the capacity of the land to provide important wildlife habitat functions. The proposed work will replace an existing collapsed culvert, and therefore will return the stream crossing to a prior condition for wildlife habitat function. The proposed work will not alter above 5, 000 SF of LUW.
  5. The culvert crossing has been designed to meet the Stream Crossing Standards to the maximum extent practicable pursuant to 310 CMR 10.53(8)(a). As such, 310 CMR 10.56(4)(a)(5) is not met, however 310 CMR 10.56 (4)(a) is still met based upon 10.56(4)(a)(1) through (4).

  (b)The location is an intermittent stream and there is no boat channel.

(c) There are no specified habitat sites of rare vertebrate or invertebrate species in the Project Locus Area.

- Proposed work at Culvert Location 15 will result in permanent impact to LUW. The existing condition and proposed work is described in Table 1 of Section 4. A cumulative total of 20 SF of permanent impacts to LUW are proposed resulting from culvert renovation work at plan Stations 306+60 and 306+70. The impacts are caused by the replacement of a damaged culvert headwalls.

  Regulatory Compliance: The performance standards of 310 CMR 10.56 (4)(a) through (c) are met as follows:
  (a)
  1. The water carrying capacity of the defined channel will be negligibly affected by the proposed impact.
  2. Ground water surface quality will not be impaired by the proposed work. Erosion controls during construction will prevent sediment from entering the stream.
  3. The capacity of said land to provide breeding habitat, escape cover and food for fisheries will not be impaired by the proposed work. The proposed culvert will be located in the same location as the existing culvert. The finished grades back to the replacement headwalls will be constructed of loam & native seed for vegetative cover and the restoration of habitat.
  4. The proposed culvert will not impair the capacity of the land to provide important wildlife habitat functions. The proposed work will replace existing headwalls, and therefore will return the stream crossing to a prior condition for wildlife habitat function. The proposed work will not alter above 5, 000 SF of LUW.
  5. Culvert 15 is an existing crossing and has been designed to meet the Stream Crossing Standards to the maximum extent practicable pursuant to 310 CMR 10.53(8)(a). As such, 310 CMR 10.56(4)(a)(5) is not met, however 310 CMR 10.56 (4)(a) is still met based upon 10.56(4)(a)(1) through (4).
  (b)The location is an intermittent stream, there is no boat channel.
  (c) There are no habitat sites of rare or vertebrate or invertebrate species in the Project Locus Area.

- Proposed work at Culvert Location 6 will result in permanent impact to LUW. The existing and proposed conditions are described in Table 1 of Section 4. A cumulative total of 19 SF of permanent impact to LUW is proposed from culvert renovation between plan Stations 216+50 and 216+65. The proposed impact occurs at the intermittent streams designated by the BF#23-200 and BF#23-300 series. The intermittent streams are former drainage ditches parallel to the rail embankment. The existing does not have headwalls. The footprint of the proposed cement concrete headwalls results in the 19 SF of permanent impact to LUW. The culvert span could not be shortened at this location due to the shared-use path above the culvert that must be 10ft minimum in paved width.

  Regulatory Compliance: The performance standards of 310 CMR 10.56 (4)(a) through (c) are met as follows:

(a)

1. The water carrying capacity of the defined channel will be negligibly affected by the proposed impact.
2. Ground and surface water quality will not be impaired by the proposed work. Erosion controls during construction will prevent sediment from entering the stream.
3. The capacity of said land to provide breeding habitat, escape cover and food for fisheries will not be impaired by the proposed work. The proposed culvert will be located in the same location as the existing culvert. The finished grades back to the new headwalls will be constructed of loam & native seed for vegetative cover and the restoration of habitat.
4. The proposed culvert will not impair the capacity of the land to provide important wildlife habitat functions. The location is a degraded drainage ditch parallel to the rail embankment. The proposed work will improve habitat functions by improving a deficient undersized existing culvert. The proposed work will not alter above 5, 000 SF of LUW.
5. The proposed culvert at an existing crossing has been designed to meet the Stream Crossing Standards to the maximum extent practicable pursuant to 310 CMR 10.53(8)(a). As such, 310 CMR 10.56(4)(a)(5) is not met, however 310 CMR 10.56 (4)(a) is still met based upon 10.56(4)(a)(1) through (4). Compliance with the stream crossing standards is described in Section 6.7.

(b)The location is an intermittent stream and there is no boat channel.

(c) There are no specified habitat sites of rare or vertebrate or invertebrate species in the Project Locus Area.

Description of Temporary Impacts

The Project will result in a total of 1,309 square feet of temporary impact to LUW. The temporary impacts to LUW are proposed to be restored in situ. The temporary impacts result from work area allowances at Hop Brook and Pantry Brook, work at Culvert Locations 4, 6, 14, and 15 as described in Table 1 of Section 4. The temporary impacts also occur due to the placement of erosion and sedimentation control during construction encroaching on LUW. This occurs where erosion and sediment controls are placed in the dry streambed of an intermittent stream to prevent sediment from grading above the Bank from entering the stream channel.

Proposed Restoration and Mitigation Measures

- Erosion and sedimentation controls will be installed to protect stream water quality
- Work areas surrounding the existing bridge abutments call for the use of turbidity curtains to protect water quality
- Temporary impacts will be restored in situ following construction.

6.4 Bordering Land Subject to Flooding (310 CMR 10.57)

The Project proposes permanent impacts to Bordering Land Subject to Flooding resulting from the work activities described in Section 4. There are three areas of proposed permanent impact to BLSF: Hop Brook and Mineway Brook each have minor amounts of proposed earthen fill. The proposed fill at Hop Brook and Mineway Brook will be offset by compensatory flood storage of equal volume in the same respective BLSF zones and elevations. At Pantry Brook, the proposed impact is a significant cut to earth below BLSF, resulting in a gain of flood storage volume and requiring no compensatory storage.

Table 9 summarizes the locations of BLSF impact by work activity and impact area. Table 10 summarizes the locations of BLSF impact by elevation and impact volume.

Table 9: Summary of Impact BLSF in Area

Work Activity	BLSF Location & Station	Impact Area Station	Permanent Impact (square feet)	Temporary Impact (square feet)	Total Impact (square feet)	Impact Desc.
BFRT Shared-Use Path	Hop Brook STA 116+00 to 133+30 (East & West of trail) Base Flood Elevation 138.0'	STA 117+18 to 117+97 (West side of trail)	175		175	Grading from trail shoulder to existing ground w/ loam & native seed fill
		Subtotal	175		175	
-	Mineway Brook STA 195+00 to 202+00 (West of trail) Base Flood Elevation 171.9'	-	-		-	No impacts
BFRT Shared-Use Path	Mineway Brook STA 195+00 to 202+00 (East of trail) Base Flood Elevation 174.3'	STA 197+81 to 198+72 (East side of trail)	148		148	Grading from trail shoulder to existing ground w/ loam & native seed fill
BFRT Shared-Use Path		STA 198+86 to 199+07 (East side of trail)	21		21	Grading from trail shoulder to existing ground w/ loam & native seed fill
BFRT Shared-Use Path		STA 200+48 to 201+68 (East side of trail)	240		240	Grading from trail shoulder to existing ground w/ loam & native seed fill
		Subtotal	409		409	

Work Activity	BLSF Location & Station	Impact Area Station	Permanent Impact (square feet)	Temporary Impact (square feet)	Total Impact (square feet)	Impact Desc.
Bridge Renovation	Pantry Brook STA 261+00 to STA 267+00 (East & West of trail) Base Flood Elevation 123.7'	264+00 to 264+37 (South abutment west side of trail)	195		195	Cut and regrade embankment behind existing abutment with loam & native seed, placement of modified rock fill and riprap
Bridge Renovation		264+00 to 264+37 (South abutment east side of trail)	215		215	Cut and regrade embankment behind existing abutment with loam & native seed, placement of modified rock fill and riprap
Bridge Renovation		264+50 to 265+00 (North abutment west side of trail)	264		264	Cut and grade embankment behind existing abutment with loam & native seed, placement of modified rock fill and riprap
Bridge Renovation		264+50 to 265+00 (North abutment east side of trail)	212		212	Cut and regrade embankment behind existing abutment with loam & native seed, placement of modified rock fill and riprap
Bridge Renovation		264+28 to 264+37 (underneath proposed bridge span, south abutment)	130		130	Reduction in height of existing abutment walls, Cut and grade embankments behind existing abutments, placement of modified rock fill and riprap

Work Activity	BLSF Location & Station	Impact Area Station	Permanent Impact (square feet)	Temporary Impact (square feet)	Total Impact (square feet)	Impact Desc.
Bridge Renovation		264+49 to 264+58 (underneath proposed bridge span, North abutment)	136		136	Reduction in height of existing abutment walls, Cut and grade embankments behind existing abutments, placement of modified rock fill and riprap
		Subtotal	1,152		1,152	
	Zone A BLSFSTA 272+60 to 273+65(west side of trail)STA 272+10 to 273+50(east side of trail)STA 283+50 to 284+50(west side of trail)STA 284+55 to 285+95(east side of trial)	-	-	-	-	No impacts
	Tributary A to Cold Brook STA 310+50 to 314+50 (east side of trail) Base Flood Elevation 139.1'	-	-	-	-	No impacts
	Tributary A to Cold Brook STA 312+78 to 314+40 (west side of trail) Base Flood Elevation 140.7"	-	-	-	-	No impacts
		Total	1,736		1,736	

Table 10: Summary of Impact to BLSF by Elevation and Volume

Work Activity	BLSF Location & Station	Elevation (ft)	Fill (CY)	Cut (CY)	Net (+Fill/-Cut) (CY)	Impact Desc.
BFRT Shared-Use Path	Hop Brook STA 117+118 to 117+97 (West side of trail)	138'-137'	0.33	0	0.33	Grading from trail shoulder to existing ground w/ loam & native seed fill
		Hop Brook Subtotal	0.33	0	0.33	
BFRT Shared-Use Path	Mineway Brook STA 197+81 to 198+72 (East side of trail)	174.3'-173.3'	1.21	0	1.21	Grading from trail shoulder to existing ground w/ loam & native seed fill
BFRT Shared-Use Path	Mineway Brook STA 198+86 to STA 199+07	174.3'-173.3'	0.17	0	0.17	Grading from trail shoulder to existing ground w/ loam & native seed fill
BFRT Shared-Use Path	Mineway Brook STA 200+48 to 201+68 (East side of trail)	174.3'-173.3'	0.83	0	0.83	Grading from trail shoulder to existing ground w/ loam & native seed fill
		Mineway Brook Subtotal	2.21	0	2.21	
Bridge Renovation	Pantry Brook 264+00 to 264+37 (South bridge abutment, east and west sides)	123.7'-122.7' 122.7-121.7' 121.7'-120.7' 120.7'-119.7'	0 0 0 0	-8.08 -9.30 -6.53 -2.31	-8.08 -9.30 -6.53 -2.31	Reduction in height of existing abutment walls, Cut and grade embankments behind existing abutments, placement of modified rock fill and riprap

Work Activity	BLSF Location & Station	Elevation (ft)	Fill (CY)	Cut (CY)	Net (+Fill/-Cut) (CY)	Impact Desc.
Bridge Renovation	Pantry Brook 264+50 to 265+00 (North bridge abutment, east and west sides)	123.7'-122.7' 122.7-121.7' 121.7'-120.7' 120.7'-119.7'	0 0 0 0	10.56 -9.84 -7.26 -2.37	-10.56 -9.84 -7.26 -2.37	Reduction in height of existing abutment walls, Cut and grade embankments behind existing abutments, placement of modified rock fill and riprap
Bridge Renovation	Pantry Brook 264+49 to 265+00 (underneath proposed bridge span)	123.7'-122.7' 122.7-121.7' 121.7'-120.7' 120.7'-119.7'	0 0 0 0	-6.41 -6.84 -5.65 -3.20	-6.41 -6.84 -5.65 -3.20	Reduction in height of existing abutment walls, Cut and regrade embankments behind existing abutments, placement of modified rock fill and riprap
		Pantry Brook Subtotal	0	-78.4	-78.4	

Compensatory Storage

At Hop Brook compensatory storage is located between plan Station 119+74 and 120+75 on the west side of the trail. The storage is provided between Elevation 138.0' and 137.0'. The compensatory storage volume area is 259 SF and the volume is 7.1 cubic yards (192 CF).

At Mineway Brook compensatory storage is located between plan Station 199+74 and 200+05 on the east side of the trail. The storage is provided between Elevation 174.3' and 173.3' The compensatory storage volume area is 279 SF and the volume is 5.4 cubic yards (146 CF).

Regulatory Compliance: The proposed work is fully compliant with 310 CMR 10.57(4)(a) through (c) as explained here:

(a)

1. Compensatory storage is proposed to be provided at Hop Brook between plan Station

and at Mineway Brook at the same incremental foot in elevation where fill is proposed to occur as detailed in the above Table 9. The compensatory storage is proposed to be provided with an unrestricted hydraulic connection to the same waterway at which the corresponding fill is proposed.

2. Work within BLSF will not restrict flows so as to cause an increase in flood stage or velocity. The compensatory storage will be provided before the proposed fill occurs. No equipment or stockpiling of materials shall occur within the respective BLSF zones.

3. Less than 5,000 SF of BLSF is proposed to be altered. None of the proposed fill occurs within the 10-year flood plain. No disturbance to vernal pool habitat area is proposed.

(b). There are no proposed impacts to WPA jurisdictional Isolated Land Subject to Flooding in the Project Locus Area

(c). There are no specified habitat sites of rare or vertebrate or invertebrate species in the Project Locus Area.

Proposed Restoration and Mitigation Measures

- Erosion and sedimentation controls will be installed to protect resource areas
- Compensatory storage at Hop Brook and Mineway Brook shall be provided at the same elevations where fill is proposed in each respective BLSF zone. The compensatory storage shall be created before the fill condition is created.

6.5 Riverfront Area (310 CMR 10.58)

There are five WPA jurisdictional Riverfront Areas (RFAs) totaling 284,949 square feet in area within the Project Locus Area. Each of the RFAs are previously disturbed and partially degraded. The RFAs are previously disturbed due to the past construction and operation of the former railroad. The RFAs are partially degraded due to the remaining surface of the 16-foot-wide rail embankment of dense graded crushed ballast stone, wood ties, and steel rails.

Table 11 summarizes the location and total area of RFAs within the Project Locus Area. The amount of existing degraded area is shown for each RFA.

Table 11: Summary of WPA Jurisdictional RFAs

Perennial Stream	Plan Station Range of RFA	0-100ft RFA (SF)	100-200ft RFA (SF)	Total RFA (SF)	Total Existing Degraded Area (SF)	Total Percent Existing Degraded
Hop Brook, BF#32&33	STA 121+35 to STA 134+13	61,132	22,942	84,074	20,448	24%
Hop Brook, BF#32	STA 157+91 to STA 164+89	26,337	19,477	45,814	11,168	24%
Pantry Brook PS1#	STA 254+79 to STA266+53	48,088	29,476	77,564	18,784	24%
Unnamed Tributary to Pantry Brook, BF#12	STA 268+64 to 275+39	18,920	25,320	44,240	10,800	24%
Unnamed Tributary to Cold Brook, BF#3	STA 311+33 to STA 316+40	18,896	14,361	33,257	8,112	24%
Total		173,373	111,576	284,949	69,312	24%

The Project proposes permanent and temporary impacts to Riverfront Area (RFA) resulting from the work activities described in Section 4. Table 12 details the proposed impacts to RFA at each project location with a description of the associated work activity. The construction of the shared-use path accounts for a vast majority of the impacts to RFA with minor impacts associated with bridge renovation.

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Table 12: Summary of Impacts to RFAs

Station	Name of River	0ft-100ft Perm. (SF)	0ft-100ft Temp. (SF)	0ft-100ft Total Disturbed Area (SF)	100ft-200ft Perm. (SF)	100ft-200ft Temp. (SF)	100ft-200ft Total Disturbed Area (SF)	Total Perm. (SF)	Total Temp. (SF)	Total Disturbed Area (SF)	Work Activity	Desc.
121+35 to 134+13	BF-32-100 & BF-32-200, BF-33 series, Hop Brook	14,420	5,850	20,270	4,964	2,832	7,796	19,384	8,682	28,066	BFRT Shared-Use Path	Perm: Paved Path & Crushed Gravel; Temp: Loam & Native Seed, Erosion Control
125+94 to 126+99	BF-32-100 & BF-32-200, BF-33 series, Hop Brook	0	441	441	0	0	0	0	441	441	Bridge Renovation	Clean & repair existing bridge abutments
157+91 to 164+89	BF-32-100 & BF-32-200 series, Hop Brook	6,265	2,943	9,208	4,312	2,275	6,587	10,577	5,218	15,795	BFRT Shared-Use Path	Perm: Paved Path & Crushed Gravel; Temp: Loam & Native Seed
254+79 to 266+53	PS-1 series, Pantry Brook	11,492	11,210	22,702	5,299	6,361	11,660	16,791	17,571	34,362	BFRT Shared-Use Path	Perm: Paved Path & Crushed Gravel; Temp: Loam & Native Seed
264+19 to 264+70	PS-1 series, Pantry Brook	1,412	179	1,591	0	0	0	1,412	179	1,591	Bridge Renovation	New bridge superstructure, duped riprap, modified rock fill
268+64 to 275+39	BF-12 series, Unnamed Tributary to Pantry Brook	4,139	2,718	6,857	5,728	4,233	9,961	9,867	6,951	16,818	BFRT Shared-Use Path	Perm: Paved Path & Crushed Gravel; Temp: Loam & Native Seed
311+33 to 316+40	BF-3 series, unnamed tributary to Cold Brook	4,589	2,046	6,635	3,237	2,681	5,918	7,826	4,727	12,553	BFRT Shared-Use Path	Perm: Paved Path & Crushed Gravel; Temp: Loam & Native Seed
Total		42,317	25,387	67,704	23,540	18,382	41,922	65,857	43,769	109,626		

The Project will also result in temporary impacts to RFA due to earth excavation or fill within the limits of grading or temporary erosion control. The temporary impact areas are proposed to be revegetated with loam and native seed mix. Native tree plantings are also proposed within RFAs, refer to the Construction Plans section of the proposed plans in *Appendix F* for the proposed plant species and proposed locations.

Regulatory Compliance Summary: The proposed work is fully compliant with 310 CMR 10.58(4)(a) through (b) as explained here:

(a) Protection of other Resource Areas.

As described in Section 6.2 (BVW) it is impractical for the project to meet all of the performance standards of 310 CMR 10.55 related to BVW replication near the location of impact and providing a hydraulic connection to the same waterway as the impacted in the rail ROW. The project proposes a single replication area sized for cumulative BVW impacts to improve the survival rate and to ensure the replication area is located in an area distanced from invasive species.

As described in Section 6.4 (BLSF), The Project was designed to fully comply with the performance standards of 310 CMR 10.57.

(b) Protection of Rare Species. The Project will not have any adverse effect on specified habitat of rare species The Project Area Locus does not contain any Priority Habitats for State Protected Rare Species or State Estimated Habitats of Rare Wildlife.

In addition, the proposed work is fully compliant with 310 CMR 10.58(5)(a) through(h)

(5) *Notwithstanding the provisions of 310 CMR 10.58(4)(c) and (d), the issuing authority may allow work to redevelop a previously developed riverfront area, provided the proposed work improves existing conditions. Redevelopment means replacement, rehabilitation or expansion of existing structures, improvement of existing roads, or reuse of degraded or previously developed areas……*

The Project is a redevelopment project. The RFAs in the Project Locus Area are within a previously developed rail corridor which includes a 16ft wide degraded area of dense graded crushed stone ballast, wood ties, and steel tracks. The proposed permanent impact area of the Project within the RFAs consists of a 10ft wide shared-use path surface and 1ft to 3ft wide crushed stone shoulders located within the previously degraded embankment area. The areas of temporary disturbance outside of the path shoulder will be revegetated with native species to restore the RFAs in situ.

(a) *Improvement over existing conditions*. The Project will result in an improvement to the RFAs over existing conditions by reducing the degraded ground cover area in each RFA. Overall The Project will reduce the degraded area by approximately 4.9 percent among all RFAs. Additionally, the removal of the raised vertical rail tracks will improve crossing conditions

for wildlife that may have been impeded such as some species of turtles or the spotted salamander. The trail design will not introduce any new vertical impedances to wildlife crossing.

(b) *Stormwater management*. Stormwater management and erosion controls during construction will comply with all applicable standards. The Stormwater Management Standards (SMS) for The Project apply to the maximum extent practicable for bike paths per 310 CMR 10.05(6)(m)(6).

(c) Within 200-foot riverfront areas, proposed work shall not be located closer to the river than existing conditions or 100 feet, whichever is less…

The trail will be located within the previously degraded area of 16ft wide rail ballast, and therefore will not be located closer to the riverfront than existing conditions. The proposed bridge renovation work will leave the existing bridge abutments in place at lowered heights. The proposed new superstructure at Pantry Brook is located behind (landward of) the existing bridge abutment, therefore it is not closer to the river.

(d) Proposed work, including expansion of existing structures, shall be located outside the riverfront area or toward the riverfront area boundary and away from the river…

The Project is a redevelopment project that proposes reuse of existing degraded and previously developed areas in the RFA. The Project Locus Area is a former linear transportation corridor that currently crosses existing water bodies and their associated RFAs. The Project does not propose expansion of the existing degraded or previously developed areas in the RFA. To the extent feasible, the project has located work outside of the RFAs such as larger rest areas and emergency vehicle turnarounds.

(e) *The area of proposed work shall not exceed the amount of degraded area, provided that the proposed work may alter up to 10% if the degraded area is less than 10% of the riverfront area, except in accordance with 310 CMR 10.58(5)(f) or (g).*

The proposed work shall not exceed the amount of existing degraded area in the RFAs. The existing degraded area within the RFAs is over 10 percent, each totaling approximately 24 percent as shown in Table 11. Therefore the Project is not limited to a degraded area of less than 10 percent. The proposed condition will reduce the existing degraded area within each RFA. The overall degraded area of all RFAs will be reduced by approximately 4.9 percent in the Project Locus Area.

(f) *When an applicant proposes restoration on-site of degraded riverfront area, alteration may be allowed notwithstanding the criteria of 310 CMR 10.58(5)(c), (d), and (e) at a ratio in square feet of at least 1:1 of restored area to area of alteration not conforming to the criteria. Areas immediately along the river shall be selected for restoration. Alteration not conforming to the criteria shall begin at the riverfront area boundary.*

There is a total of 43,769 square feet of proposed temporary RFA disturbance and 65,857 square feet of proposed permanent RFA disturbance associated with the Project. The only

permanent disturbance is the 14 to 16-foot-wide paved shared-use path, which will be within the 16-foot-wide degraded area. All areas of disturbance outside of the paved shared-use path will be restored with native plantings and seed, which meets the criteria of 1:1. In addition, the Project will reduce the amount of existing degraded area by 4.9 percent.

(g) *Riverfront Area Mitigation.*

No RFA mitigation areas are proposed since the proposed degraded area in the RFAs will be less than existing conditions by approximately 4.9 percent and temporarily disturbed areas outside of the proposed permanent impact areas will be revegetated with native species of plantings and seed.

(h) *The issuing authority shall include a continuing condition in the Certificate of Compliance for projects under 310 CMR 10.58(5)(f) or (g) prohibiting further alteration within the restoration or mitigation area, except as may be required to maintain the area in its restored or mitigated condition. Prior to requesting the issuance of the Certificate of Compliance, the applicant shall demonstrate the restoration or mitigation has been successfully completed for at least two growing seasons.*

Proposed plantings within the restored RFA area shall have an establishment period of two growing seasons as defined in the special provisions for the project planting items.

Proposed Restoration and Mitigation Measures

- Erosion and sedimentation controls will be installed to protect the RFAs and waterbodies.
- Temporary impacts to RFA will be restored with loam and native seed mix and native species plantings to improve the RFAs beyond existing condition
- The permanent impacts proposed will reduce the degraded area within the RFAs by an overall 4.9 percent compared to the existing condition.

6.6 100-foot Buffer Zone (310 CMR 10.53 (1))

The Project proposes permanent and temporary impacts to 100ft Buffer Zone resulting from the proposed work activities described in Section 4. The Buffer Zone is proposed to be replanted and seeded at all temporary impact locations. Table 13 sums the proposed impacts to the Buffer Zone by work activity. Table 14 details the proposed impacts to the Buffer Zone at each project location.

Table 13: Summary of Buffer Zone Impacts by Work Activity

Work Activity	Permanent Impact (SF)	Temporary Impact (SF)	Total Disturbed (SF)	Restored in Situ (SF)
BFRT Shared-Use Path/Culvert Renovation	218,437	135,524	353,961	135,524
Bridge Renovation	1,412	620	2,032	620
Shared-Use Path Connection	25,613	20,497	46,110	20,497
New Parking Area	9,177	12,916	22,093	12,916
Wetland Replication Area	0	4,220	4,220	4,220
Total	254,639	173,777	428,416	173,777

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Table 14: Summary of Buffer Zone Impacts

Work Activity	Plan Station	Left/Right of Stationing (LT/RT)	East/West of Trail	Name (WF Number)	Permanent Area (SF)	Temporary Area (SF)	Total Disturbed Area (SF)	Impact Desc.
BFRT Shared-Use Path	102+37 to 108+61	LT/RT	Both	WF-36	9,155	6,078	15,233	Perm. Paved Path & Crushed Gravel. Temp. Loam & Native Seed, Erosion Control
BFRT Shared-Use Path	108+86 to 110+87	LT/RT	Both	WF-37	2,929	1,510	4,439	Perm. Paved Path & Crushed Gravel. Temp. Loam & Native Seed, Erosion Control
BFRT Shared-Use Path	111+90 to 114+23	LT/RT	Both	WF-39	3,168	3,794	6,962	Perm. Paved Path & Crushed Gravel. Temp. Loam & Native Seed
BFRT Shared-Use Path	117+00 to 126+20	LT/RT	Both	WF-35, WF-40, WF-41, BF-32	14,136	6,783	20,919	Perm. Paved Path & Crushed Gravel. Temp. Loam & Native Seed, Erosion Control
Bridge Renovation	126+20 to 126+53	LT/RT	Both	BF-32 (Hop Brook)	0	441	441	Cleaning & Repairing Existing Bridge abutment
BFRT Shared-Use Path	126+53 to 133+14	LT/RT	Both	WF-35, BF-32	10,176	3,716	13,892	Perm. Paved Path & Crushed Gravel. Temp. Loam & Native Seed, Erosion Control
BFRT Shared-Use Path	151+00 to 164+20	LT/RT	Both	WF-32	18,699	14,352	33,051	Perm. Paved Path & Crushed Gravel. Temp. Loam & Native Seed, Erosion Control
BFRT Shared-Use Path	164+48 to 168+32	LT/RT	Both	BF-30	5,407	4,472	9,879	Perm. Paved Path & Crushed Gravel. Temp. Loam & Native Seed, Erosion Control
BFRT Shared-Use Path	195+56 to 201+00	LT/RT	Both	WF-26, WF-27	8,125	4,577	12,702	Perm. Paved Path & Crushed Gravel. Temp. Loam & Native Seed
BFRT Shared-Use Path	206+91 to 215+75	LT/RT	Both	WF-24, WF-25, BF 15-24	11,911	7,586	19,497	Perm. Paved Path & Crushed Gravel. Temp. Loam & Native Seed, Erosion Control
Wetland Replication Area	212+46 to 213+15	LT	West	WF#20336 D405	0	4,220	4,220	Wetland Replication Area, Erosion Control, Loam & Seed Grading to Replication Area
BFRT Shared-Use Path	215+99 to 232+63	LT/RT	Both	WF-24, WF-25, BF 15-24, BF-23, WF-21, WF-23	26,322	17,744	44,066	Perm. Paved Path & Crushed Gravel. Temp. Loam & Native Seed, Erosion Control

Work Activity	Plan Station	Left/Right of Stationing (LT/RT)	East/West of Trail	Name (WF Number)	Permanent Area (SF)	Temporary Area (SF)	Total Disturbed Area (SF)	Impact Desc.
New Parking Area	215+85 to 219+32	RT	East	BF-23 Series	0	12,916	12,916	Temp: Earthen Detention Basins
New Parking Area	215+64 to 217+70	RT	East	BF-23 Series	9,177	0	9,177	Perm: Paved Parking Area and connecting path to Trail, Rip Rap
BFRT Shared-Use Path	234+45 to 249+12	LT/RT	Both	Wf-19, WF-18,Wf-17,WF-16	22,296	14,589	36,885	Perm. Paved Path & Crushed Gravel. Temp. Loam & Native Seed, Erosion Control
BFRT Shared-Use Path	253+50 to 264+24	LT/RT	Both	WF-14, WF-13, WF-12	14,434	13,137	27,571	Perm. Paved Path & Crushed Gravel. Temp. Loam & Native Seed, Erosion Control
Bridge Renovation	264+24 to 264+62	LT/RT	Both	WF14, WF13	1,412	179	1,591	Work at Pantry Brook Bridge. New bridge superstructure, duped riprap, modified rock fill behind existing bridge abutment
BFRT Shared-Use Path	264+62 to 274+93	LT/RT	Both	WF-12, WF-13,WF14	14,897	8,469	23,366	Perm. Paved Path & Crushed Gravel. Temp. Loam & Native Seed, Erosion Control
BFRT Shared-Use Path	275+15 to 284+41	LT/RT	Both	WF-42, Wf-9, WF-8	14,094	7,857	21,951	Perm. Paved Path & Crushed Gravel. Temp. Loam & Native Seed, Erosion Control
BFRT Shared-Use Path	284+54 to 307+50	LT/RT	Both	WF-6, WF-7, WF-5	30,440	14,284	44,724	Perm. Paved Path & Crushed Gravel. Temp. Loam & Native Seed, Erosion Control
BFRT Shared-Use Path	307+71 to 315+79	LT/RT	Both	WF-5,WF-4, WF-3	12,248	6,576	18,824	Perm. Paved Path & Crushed Gravel. Temp. Loam & Native Seed, Erosion Control
Shared-use path connection	320+97 to 335+17	LT/RT	Both	WF-2, WF-1	21,227	17,818	39,045	Perm. Paved Path & Crushed Gravel. Temp. Loam & Native Seed, Erosion Control
Shared-use path connection	1100+29 to 1101+32	LT/RT	Both	WF-5-103, WF-5-115	1,299	472	1,771	Perm. Paved Path & Crushed Gravel. Temp. Loam & Native Seed, Erosion Control
Shared-use path connection	1101+34 to 1103+79	LT/RT	Both	WF#20336	3,087	2,207	5,294	Perm. Paved Path & Crushed Gravel. Temp. Loam & Native Seed, Erosion Control
Total:					254,639	173,777	428,416	

Description of Impacts

The Project Locus Area contains 1,122,312 SF of 100-foot Buffer Zone Area. The Project proposes 254,639 square feet (22.7% of Total Buffer Zone Area) of permanent impact. Permanent impacts are associated with the impervious surface of the paved shared-use path, the New Parking Area at Morse Rd, and the shared-use path connection to Davis Field.

The Project proposes 172,631 square feet (15.4% of Buffer Zone Area) of temporary impacts. Temporary impacts are associated with earth work and grading from the edge of the shared use path shoulder back to existing contours. Temporary impact areas are proposed to be replanted with a native seed mix and native plantings. For plantings see the Construction Plans section of the proposed plans in *Appendix F*.

BFRT Shared-Use Path

A majority of the cumulative impacts to the Buffer Zone occur as a result of the shared-use path construction throughout the rail ROW. The rail ROW is a previously developed with a continuous 16-foot-wide degraded area within. The proposed permanent impacts to Buffer Zone occur within the degraded area of the rail ROW.

New Parking Area

Construction of the New Parking Area at Broadacres Farm results in both permanent and temporary impacts to Buffer Zone. The New Parking Area is within the Buffer Zone of intermittent streams designated by the BF#200 series and BF#300 series. The intermittent streams are remaining drainage ditches from the former railroad. The permanent impacts for the New Parking Area include the new paved parking surface, the shared-use path connection the BFRT, a small waterless restroom, and a pavilion structure. The temporary impacts at the New Parking Area include grass lined infiltration basins for stormwater management.

Shared-Use Path Connection

The proposed shared-use path connection from the BFRT to the existing parking area at Davis Field results in impact to Buffer Zone. The proposed shared-use path connection is within the Buffer Zone of BVW designated by the WF#20336 series and the WF#5-100 series. The permanent impacts to Buffer Zone consist of the additional width of paved path area and proposed crushed stone shoulders. The temporary impacts occur from earthen grading of the proposed path connection back to existing contours with loam & native seed.

Bridge Renovation

The proposed work at Hop Brook Bridge and Pantry Brook Bridge respectively result in impacts to Buffer Zone. The work at Hop Brook will result in temporary impacts to Buffer Zone related to cleaning and repairing the existing bridge abutment wall. The proposed work at Pantry Brook Bridge will result in permanent impacts to the Buffer Zone of the BVW designated as WF# 13 & WF# 14. The permanent impacts occur as a result of scour protection, rip rap and modified rockfill, around the footings of the proposed new bridge. Compost top-dressing on top of the modified rockfill will be seeded with a native mix. Temporary impacts at Pantry Brook Bridge are caused by erosion control installation in the Buffer Zone.

Proposed Wetland Replication Area

The proposed wetland replication area is located on a Town-owned parcel of the former Broadacres Farm site. The location is within the Buffer Zone of BVW designated as the WF#20336 D400 series. The site was previously maintained as pastureland and is now maintained as a grass field. The proposed impact to Buffer Zone is temporary. The proposed wetland replication area will plant and seed the area with a native mix of trees and wetland seed mix, resulting in a loss of Buffer Zone to new BVW, but the creation of new BVW will itself create a new Buffer Zone area of equivalent size at the surrounding field.

Eligible Vernal Pools

There are two locations were permanent impacts to Buffer Zone occur within 100ft of an eligible-to-be-certified vernal pool, however, because the impact areas are previously developed and degraded they are not part of the 100ft habitat area despite being with 100 feet of the eligible vernal pool boundary. The two locations are:

- Work is proposed within 100ft of the boundary of Eligible Vernal Pool 11 as defined in the ORAD of *Appendix B* located at plan station beginning at 208+18. The permanent impact proposed is due to the paved shared use path and crushed stone shoulders. The temporary impact is due to grading back to existing ground. The proposed permanent impact is entirely within the existing degraded area of the 16-foot-wide existing rail embankment. The temporary impact area is within a previously cleared area and will be revegetated with loam & native seed.

- Work is proposed within 100ft of the boundary of Eligible Vernal Pool 4 as defined in the ORAD of *Appendix B* located at plan Station 285+10. The permanent impact is due to the paved shared use path and crushed stone shoulders. The temporary impact is due to grading back to existing ground. The proposed permanent impact is entirely within the existing degraded area of the 16-foot-wide existing rail embankment. The temporary impact area is within a previously cleared area and will be revegetated with loam & native seed.

Regulatory Compliance:

The following paragraphs present a summary of how the Project will fully comply with the General Performance Standards for activities proposed within Buffer Zone per 310 CMR 10.53(1): *The potential for adverse impacts to Resource Areas from work in the Buffer Zone may increase with the extent of the work and the proximity to the Resource Area. The Issuing Authority may consider the characteristics of the Buffer Zone, such as the presence of steep slopes, that may increase the potential for adverse impacts on Resource Areas. Conditions may include limitations on the scope and location of work in the Buffer Zone as necessary to avoid alteration of Resource Areas. The Issuing Authority may require erosion and sedimentation controls during construction, a clear limit of work, and the preservation of natural vegetation adjacent to the Resource Area and/or other measures commensurate with the scope and location of the work within the Buffer Zone to protect the interests of M.G.L. c. 131, § 40. Where a Buffer Zone has already been developed, the Issuing Authority may consider the extent of existing development in its review of subsequent proposed work and, where prior development is extensive, may consider measures such as the restoration of natural vegetation adjacent to a Resource Area to protect the interest of M.G.L. c. 131,*

§ 40. The purpose of preconstruction review of work in the Buffer Zone is to ensure that adjacent Resource Areas are not adversely affected during or after completion of the work.

The Buffer Zone areas are previously developed as a former rail ROW corridor, maintained grass fields at Broadacres Farm, or the existing sidewalk and earthen road embankment on North Rd.

The Project has been designed to contain permanent impacts to Buffer Zone within the existing developed areas to the maximum extent practical. The Project has been designed to minimize clearing and grubbing and vegetation removal in the Buffer Zone to the extent feasible. Erosion and sediment controls will be installed along the limits of work and at wetland boundaries for protection during construction. The planting of native tree species and ground cover along with the proposed use of native seed mix will restore the temporary disturbance areas to Buffer Zone.

Proposed Restoration and Mitigation Measures

- Erosion and sedimentation controls will be installed to protect areas outside the limit of work
- An Invasive Plant Management Strategy (IPMS) will be in place to protect the resource area (see Section 7 for more information)
- Proposed tree plantings of native species will provide restoration to the temporary impact areas of the 100-foot Buffer Zone
- Limits of grading with slopes steeper than 2:1 will be stabilized with erosion matting control or modified rock fill to allow the loam and seed cover to take root
- Post construction, the area outside of the trail maintenance area will be permitted to revegetate and accumulate woody debris for habitat

6.7 Isolated Vegetative Wetland

There are no WPA jurisdictional Isolated Vegetative Wetlands (IVW) in the Project Locus Area. The Amended ORAD of *Appendix B* describes a series of Isolated Vegetated Wetlands in the Project area that do not meet the criteria for Isolated Land Subject to flooding under 310 CMR 10.57. The IVW is however jurisdictional under Section 401/Section 404.

The construction of the BFRT Shared use path results in one impact area location to IVW.

Table 15: Impacts to IVW

Station	East/West of Trail	Name (WF Number)	Permanent Impact Area (SF)	Temporary Impact Area (SF)	Total Impact Area (SF)	Desc.	Flag #
STA 169+18 to 170+43	West	WF#31-100	303		303	Shared-use path, path shoulder, limit of grading	WF#31-100 to 105, WF#31-121 to WF#31-124
STA 169+20 to 170+62	West	WF#31-100		166	166	Erosion Control	WF#31-100 to 105, WF#31-121 to WF#31-125
Total:			303	166	469		

The IVW impact occur just south of Hudson Rd where a former drainage ditch parallels the rail embankment. The proposed trail was designed with a narrowed 1-foot-wide shoulder to minimize impacts to IVW at this location.

6.8 Massachusetts Stream Crossing Standards (310 CMR 10.53(8))

This section describes the stream crossing standards compliance for all proposed stream crossing work including bridges and culverts.

The Project proposes to renovate two inactive rail bridge crossings at two perennial streams, Hop Brook and Pantry Brook. Section 4 describes the proposed bridge renovation work at each location in more detail. Proposed bridge plans are included in the proposed project plans of *Appendix F.*

Culvert renovation work proposes to replace deficient existing culverts at Culvert Locations 4, 6, and 14 as described in Table 1 of Section 4. One new culvert is proposed to as a drainage equalizer pipe, Culvert Location 19, there is no stream crossing at this location.

Regulatory Compliance: Under 310 CMR 10.53(8), the replacement of an existing stream crossing shall demonstrate to the Issuing Authority that the impacts of the crossing have been avoided where possible, and when not possible have been minimized and that mitigation measures have been provided to contribute to the protection of the interests identified in M.G.L. c. 131, § 40. This standard is presumed to be met for the replacement of an existing non-tidal crossing if the work is designed to comply with the Massachusetts Stream Crossing Standards ("the MSC Standards") to the maximum extent practicable.

Compliance with Stream Crossing Standards

Hop Brook Bridge

1. *Type of Crossing* – The Hop Brook Bridge Crossing will remain a bridge crossing consisting of granite block abutments with a new superstructure atop the existing abutment to be retained.

2. *Embedment* – The Hop Brook Bridge Crossing will remain a bridge crossing with an open channel stream bottom.

3. *Crossing Span* –The crossing span will remain as existing, approximately 27ft. The existing abutment walls will be repaired and reused. The design intent is to minimize excavation, wetland, and wildlife impacts.

4. *Height & Openness* – The proposed renovation at Hop Brook Bridge will raise the low chord elevation of the bridge superstructure by less than 0.5 feet. The openness ratio will therefore remain approximately the same as existing, which is 12.9 ft, well above the minimum standard of 0.82 ft.

5. *Substrate* – The proposed renovation at Hop Brook Bridge will maintain the existing natural bottom stream bed at the existing extents.

6. *Water Depth and Velocity* – The water depth and velocity will be maintained as in the existing condition due to the preservation of the existing bridge abutments in their existing locations.

7. *Banks* – Grading of the banks at Hop Brook is not necessary given the reuse of the existing bridge abutments.

Pantry Brook Bridge

1. *Type of Crossing* – The Pantry Brook Bridge Crossing will remain a bridge crossing. The proposed crossing will consist of the existing granite block abutments lowered considerably but retained above the Bank of Pantry Brook. A new cement concrete arch bridge spanning over the existing abutments is proposed to support the BRFT shared-use path.

2. *Embedment* – The Pantry Brook Bridge Crossing will remain a bridge crossing with an open channel stream bottom of the same dimensions as existing.

3. *Crossing Span* –The crossing span is proposed to change from an existing 12-foot span to a proposed 34-foot span. The proposed dumped riprap and modified rockfill at the footings of the cement concrete arch bridge structure will leave a hydraulic opening of approximately 25'-6" in width. The existing abutment walls will be lowered in elevation and retained underneath the proposed new bridge just above the ordinary high-water line. The design intent is to minimize excavation, wetland, and wildlife impacts.

4. *Height & Openness* – The proposed renovation at Pantry Brook Bridge will lower the low chord elevation of the bridge superstructure by approximately 2.5 feet, but widen the crossing as explained in #3. The openness ratio of the proposed Bridge will be 8.5ft, well above the minimum standard of 0.82 ft.

5. *Substrate* – The proposed renovation at Pantry Brook Bridge will maintain the existing natural bottom stream bed at the existing extents.

6. *Water Depth and Velocity* – The water depth and velocity will be maintained as in the existing condition due to the preservation of the existing bridge abutments.

7. *Banks* – Grading above the banks at Pantry Brook has been designed such that slope above bank does not exceed a ratio 1 to 1.5 (vertical: horizontal). The retention of the existing granite blocks is proposed to facilitate wildlife passage.

Culvert Location 4, Where Embankment Washout Exists, Station 167+17

1. *Type of Crossing* – The proposed replacement culvert will be embedded 2 feet thus creating an open bottom culvert.

2. *Embedment* – The proposed replacement culvert will be embedded 2 feet to provide for the long term-stability of the replacement culvert and enhance wildlife crossing.

3. *Crossing Span* – Given the recent erosion which has occurred downstream of the existing crossing, bankfull width was determined to be 7 feet. The proposed replacement culvert does not provide a new span of 1.2 times bankfull width, in order to maintain the approximate vertical profile of the shared-use path and minimize disturbance to the waterway.

4. *Height & Openness* – The openness ratio of the proposed replacement culvert is 0.33 however, the crossing conveys an intermittent stream which does not regularly flow and the elevation differential between the culvert invert and proposed top of grade along the multi-use path at the crossing is less than 4 feet which will allow for the passage of wildlife across the multi-use path.

5. *Substrate* – Substrate to simulate a natural stream bottom will be placed within the 2 ft embedded portion of the replacement culvert. The importing of off-site material will be specified in the special provision for the project.

6. *Water Depth and Velocity* – A new stream channel with similar slope to that of existing will be provided by the new culvert. The proposed velocities through the new culvert will improve conditions and prevent further erosion of the downstream side of the culvert.

7. *Banks* – Grading of the stream bank within areas of disturbance has been designed such that slope of the replaced bank does not exceed a ratio 1 to 1.5 (vertical: horizontal).

Additional information on Culvert Location 4 is included in *Appendix H*.

Culvert Locations 6 and 14

The proposed culvert renovation work at Culvert Locations 6 and 14, as described in Table 1of Section 4, each call for the replacement of a damaged 12" diameter pipe with a 15" diameter reinforced concrete pipe including new cement concrete headwalls.

For each location, the proposed replacement culvert has been proposed with the intent to reduce flooding, erosion, and to maintain the connectivity of existing habitats upstream and downstream of the crossing. The following summarizes how the proposed replacement culverts meet the Stream Crossing Standards to the maximum extent practicable.

1. *Type of Crossing* – Culverts 6 and 14 are proposed to be 15" diameter reinforced concrete pipes. The pipes are not proposed to be buried because the size of the pipe cannot be buried the minimum 2 feet.

2. *Embedment* – The pipes are not proposed to be buried as the size of the pipe, 15" in diameter, cannot be buried the minimum 2 feet.

3. *Crossing Span* –The proposed replacement culverts at Locations 6 and 14 do not provide a new span of 1.2 times bankfull width. Constraints of the vertical profile of the trail limit the ability to substantially raise the vertical alignment of the shared-use path at Culvert Locations 6 and 14 crossing without incurring additional wetland impacts or introducing new vertical barriers such as retaining walls. Proposed grades are also limited for practicality in order to maintain appropriate accessible grades along the shared-use path for all path users. The proposed replacement culverts will however still improve conditions for passage of semi-aquatic and terrestrial wildlife at the crossing by increasing the culvert diameter from 12" to 15".

4. *Height & Openness* – The openness ratio of the proposed replacement culverts is:

    a. At culvert location 6, the openness ratio is 0.07 feet however, the crossing conveys an intermittent stream which does not regularly flow and the elevation differential between the culvert invert and proposed top of grade along the multi-use path at the crossing is less than 4.5 feet with banks sloping no more than 1:1.5 (vertical: horizontal) which will allow for the passage of wildlife over the culvert using the trail surface.
    b. At culvert location 14, the openness ratio is 0.05 feet however, the crossing conveys an intermittent stream which does not regularly flow and the elevation differential between the culvert invert and proposed top of grade along the multi-use path at the crossing is less than 5.5 feet with banks sloping no more than 1:1.5 (vertical: horizontal) which will allow for the passage of wildlife around the culvert. For a culvert of this span, 24ft, a significantly larger open cross-sectional area would be required to achieve the recommended (0.82 ft) openness ratio. The open cross section of the culvert would need to be approximately equivalent to a 5ft diameter pipe. A new culvert of this size would result in a significant vertical alignment change to the BFRT trail surface that is impractical at this location.

5. *Substrate* – At Culvert Locations 6 and 14, the pipes are not proposed to be buried as the size of the proposed pipe, 15" in diameter, cannot be buried the minimum 2 feet.

6. *Water Depth and Velocity* – The replacement culverts will increase openness by enlarging the existing 12" culverts to 15" culverts, water depth and velocity will decrease.

7. *Banks* – Grading at the Banks the replacement culverts has been kept to a minimum to avoid wetland impacts. Grades will not exceed 1 to 1.5 (vertical to horizontal).

6.9 Wildlife Habitat Evaluations (310 CMR 10.60)

According to 310 CMR 10.60(1), to the extent that a proposed project will alter wildlife habitat beyond established thresholds for each respective wetland resource area, such alterations may be permitted only if they will have no adverse effects on wildlife habitat. Table 16 summarizes the proposed habitat disturbances with respect to WPA regulation thresholds.

Table 16: Wildlife Habitat Evaluation Thresholds per Wetland Resource Area

Wetland Resource Area	Appendix A Threshold	Appendix B Threshold	Total Project Disturbance (Perm. +Temp)
Bank	10 percent or 50 linear feet (whichever is less)	When triggered by Appendix A	451 LF
Bordering Vegetated Wetland	Below 5,000 square feet	Above 5,000 square feet	2,710 SF
Land Under Water	10 percent or 5,000 square feet (whichever is less)	When triggered by Appendix A	1,746 SF
Bordering Land Subject to Flooding	10 percent or 5,000 Square Feet (whichever is less), except for work that would adversely affect vernal pool habitat	When triggered by Appendix A or for any impacts to certified or documented vernal pool habitat	1,736 SF
RFA (Previously Developed)	Appendix A and Appendix B are not required for previously developed RFA		

The Project will result in impacts to Bank, BVW, LUW, BLSF, and RFA that are jurisdictional under the WPA. Impacts to BVW, LUW, and BLSF do not exceed the thresholds. Impacts to Bank do exceed the threshold with 451 LF of total disturbed Bank, including 134 LF permanent Bank impacts and 317 LF of temporary Bank impacts. Temporary impacts to Bank are proposed to be restored in Situ post construction. A General Wildlife Habitat Assessment Report was completed by Stantec in April 2020 and is included in *Appendix J*. The report concluded that no adverse effects to wildlife habitat were anticipated from the Project.

Proposed Restoration Measures

- The existing rail tracks will be removed, eliminating an existing vertical barrier to wildlife movement across the rail embankment for small invertebrates and turtles.
- The proposed planting and seeding of temporary impact areas with native trees, seed, and ground cover shrubs will support wildlife habitat by providing nesting, food and roosting areas.
- The repair of the washed-through culvert crossing at Culvert Location 4 will improve connectivity of the Unnamed Tributary to Hop Brook with Hop Brook, both designated as cold water fisheries.

- The creation of a new wetland replication area totaling 2,240 square feet. The proposed wetland replication area will provide habitat for local amphibian and reptile populations as well as augment existing habitat for a wide range of birds and mammals.

7 Mitigation Measures

7.1 Erosion and Sedimentation Control

The following erosion and sedimentation controls are proposed.

- SWPPP

Sedimentation control for the proposed project will be implemented through the National Pollutant Discharge Elimination System (NDPES) required Storm Water Pollution and Protection Plan (SWPPP) which must be prepared by the contractor prior to the commencement of construction. The Plan will include the General Permit conditions and detailed descriptions of controls of erosion and sedimentation to be implemented during construction.

- Sediment Control Barriers

Staked compost filter tubes are proposed for sediment control barriers. The placement of sedimentation control barriers for the Project are shown on the proposed project plans in *Appendix F*. Sediment control barriers are proposed to be syncopated at sensitive wildlife crossings such as certified, eligible or potential vernal pools. The Construction Details section of the proposed plans includes compost filter tube details.

- Matting for Erosion Control & Modified Rock Fill for Slope Stabilization and Vegetation

Matting for erosion control is proposed where grading of swale side slopes adjacent to the proposed trail are at a slope of 2:1 (horizontal: vertical) or steeper. Modified rock fill shall be used as needed on any cut or fill slopes steeper than 2:1 in grade where poor soil conditions exist and matting for erosion control is deemed inadequate as directed by the engineer. Matting for erosion control shall be made from a biodegradable material and use biodegradable stakes or staples. The Construction Details of the proposed plans in Appendix F show typical examples of erosion control matting and modified rock fill.

- Rip Rap and Modified Rockfill with Compost Top Dressing

At the Pantry Brook Bridge, dumped rip rap is proposed between the Bank and the top of the existing abutment walls to be lowered and retained. The dumped riprap is proposed to transition to modified rockfill with compost top dressing planted with a native seed mix above the existing abutment walls. The riprap and modified rockfill will prevent scour and erosion between the Bank of Pantry Brook and the proposed new bridge abutments. The modified rock fill with compost will make a significant improvement for wildlife crossing under the bridge compared to rip rap alone. Yet, the modified rockfill is still massive enough to provide the erosion control and scour protection needed. See the proposed Pantry Brook Bridge plans section provided in *Appendix F.*

- Control of Water at Bridge Structures

The work area for control of water at Hop Brook and Pantry Brook is shown on the environmental impact plan sheets provided in the proposed plans of *Appendix F*. The bridge plans show a suggested water control plan detail consisting of sandbags to redirect water and a floating silt fence/turbidity curtain to prevent sediment from entering the respective streams. The project specification for

7.2 Avoidance and Minimization

Impacts to wetland areas were carefully considered during the alternatives analysis and design and were minimized in the following ways:

- The selected alignment of the path utilizes a previously developed and degraded railroad corridor. As a result, impacts to previously undeveloped areas have been avoided and no new crossings at Hop Brook and Pantry Brook are required. Many of the proposed impacted wetlands adjacent to the trail are remnants from drainage ditches of the former railroad. A general Wildlife Habitat Evaluation was performed within the Project Locus Area which found that no adverse effect to wildlife habitat within the project wetland resource areas are anticipated, the WHE is included in *Appendix J*.

- The existing abutment walls to Hop Brook are proposed to be repaired and cleaned for continued use which will minimize the excavation impact to the Banks of Hop Brook and land under water.

- The proposed new bridge structure at Pantry Brook is proposed to be built around the existing abutment walls, which will be reduced in height but will remain above the existing Bank. By retaining the existing abutment walls at the banks of Pantry Brook, the design minimizes excavation and construction impacts to Pantry Brook and land under water.

- The width of the trail has been kept to a minimum standard 10 feet for a two-way shared-use path that can accommodate emergency vehicles. Previously built sections of the Bruce Freeman Rail Trail have been designed with a paved path surface as wide as 12ft in other locations, which is preferable for path users. Keeping the paved path surface to the minimum width avoided wetland impacts.

- The crushed stone shoulders of the trail have been reduced to 1ft wide from a standard minimum of 2ft in a challenging area of the rail ROW to minimize adjacent wetland area impacts. The section of the trail between plan Stations 293+00 and Station 305+00 has narrowed trail shoulders specifically to minimize impacts to adjacent BVW. This design choice reduced total impacts to BVW by approximately 2,500 square feet in this segment of the proposed path alone. A one-foot wide should was also used between stations 169+18 and 170+43 to minimize impacts to IVW.

7.3 Wetland Replication Area

Determination of Area

Notwithstanding MassDOTs exemption to Town Bylaw, the Town Bylaw jurisdictional resource area impacts have been tabulated for the project for the purpose of informing mitigation.

Table 17 summarizes the Town Bylaw jurisdictional wetland impacts that are would be incurred in addition to WPA jurisdictional impacts already enumerated in this report.

Table 17: Summary of Town Bylaw Jurisdictional Resource Area Impacts

		Additional Impacts Under Town Bylaw		
Town Bylaw Jurisdictional Resource Area	Unit	Perm.	Temp.	Total Impact
Bank	LF	1,313	-	-
0-100ft Sudbury Riverfront Area	SF	58,922	39,569	98,491
100-200ft Sudbury Riverfront Area	SF	33,493	24,038	57,531
Sudbury Riverfront Area	SF	92,415	63,607	156,022
Land Under Water	SF	4,272	-	4,272
Isolated Vegetative Wetlands	SF	303	166	469
Direct impact to Vernal Pools (Potential)	SF	-	-	-
100' AURA to Potential Vernal Pools	SF	67,120	44,906	112,026
Adjacent Upland Resource Areas (AURAs)	SF	9,461	7,210	16,671

For this Project it is feasible for MassDOT to propose a wetland replication area sized to mitigate for permanent impacts to WPA jurisdictional BVW and Town Bylaw jurisdictional IVW at a replication ratio of 1.5:1 (replication area: impact area), which is higher than MassDOT's more typical 1:1 replication ratio.

The wetland replication area has therefore been sized at 2,240 square feet, representing 1.5 times the sum of:

- 1,190 SF of WPA jurisdictional permanent impacts to BVW
- 303 SF of Town Bylaw jurisdictional permanent impacts to IVW

The Replication Site

A wetland replication area is proposed at one location outside of the rail ROW at 82 Morse Rd on a parcel owned by the Town of Sudbury. The selected site is part of the former pasture at the Broadacres Farm site. Adjacent to the proposed replication site, there is an existing BVW area designated by the WF# 20336 D400 flag series. The site contains a pond designated by the WF# 20336 C300 series.

Delineation reports on the wetland replication area site are included in *Appendix B*. The site is a maintained grass field; therefore no clearing of trees is necessary for the replication area.

Access to the wetland replication area will be from the BFRT through an opening in the woods a Station 212+10 on the west side of the trail. This access will require widening to accommodate a 12ft wide passage for construction vehicles. Tree clearing necessary to create passage will be restored with new plantings after completion of the wetland replication area.

The mitigation area will be constructed with oversight from a wetland specialist who must be hired by the contractor per the special provisions of the project, included in *Appendix K*. The proposed wetland is a seasonally saturated, Palustrine Broad-Leaved Deciduous Scrub-Shurb wetland (PSS1E).

The proposed wetland replication plans are included as pages 139-140 of the proposed plans in *Appendix F*. The wetland replication area will feature a hummock and hollow topography. Table 18 lists the proposed plantings.

Table 18: Proposed Wetland Replication Plantings

PLANT LIST					
SYMBOL	QUANTITY	BOTANICAL NAME	COMMON NAME	SIZE	COMMENTS
TREES					
AR	11	ACER RUBRUM	RED MAPLE	4'-6' HT.	10' O.C.
BA	7	BETULA ALLEGHANIENSIS	YELLOW BIRCH	4'-6' HT.	10' O.C.
FP	4	FRAXINUS PENNSYLVANICA	GREEN ASH	4'-6' HT.	10' O.C.
UA	4	ULMUS RUBRA	SLIPPERY ELM	4'-6' HT.	10' O.C.
SHRUBS					
CR	6	CLETHRA ALNIFOLIA	SWEET PEPPERBUSH	2'-3' HT.	10' O.C. GROUPS OF 3
IV	6	ILEX VERTICILLATA	WINTERBERRY HOLLY	2'-3' HT.	10' O.C. GROUPS OF 3
LB	6	LINDERA BENZOIN	SPICEBUSH	2'-3' HT.	10' O.C. GROUPS OF 3
VC	6	VACCINIUM CORYMBOSUM	HIGHBUSH BLUEBERRY	2'-3' HT.	10' O.C. GROUPS OF 3
VD	6	VIBURNUM DENTATUM	NORTHERN ARROWWOOD	2'-3' HT.	10' O.C. GROUPS OF 3
VL	6	VIBURNUM LENTAGO	NANNYBERRY	2'-3' HT.	10' O.C. GROUPS OF 3

The proposed wetland replication area will not have the same horizontal configuration or hydraulic connection as the location of permanent impacts to BVW and IVW due to the slender and widely distributed linear nature of the impacted areas along the proposed trail. The proposed wetland replication area has a more compact shape to improve the survival of plantings.

The choice to create one cumulative wetland replication area on the selected site will also lower the chances of invasive species taking root in the replication area compared to a series of smaller replication sites located within the rail ROW.

The special provision for wetland replication will require that at least 75 percent of the replication area shall be established with indigenous wetland plant species within two growing seasons, the full specification for Inland Wetland Replication is included in *Appendix K*.

7.4 Invasive Plant Management Strategy

The Project includes a package of invasive plant management work activities including the following:

1. Clearing, Grubbing, and Planting

   Work areas within the rail ROW, most typically located between the outer edge of the trail shoulder and the limit of earth work and grading, will be cleared and grubbed then replanted with loam, native seed. In some locations native plants, bushes, and shrubs will be planted. The result of this work activity will be the management of invasive species where the work happens to coincide with a location where invasive species exist.

2. Invasive Plant Management Strategy Plan and Treatment

   The project includes work items for the creation of an Invasive Plant Management Strategy (IPMS) and a separate pay item for the execution of that strategy, the MassDOT standard work item is Herbicide Treatment for Invasive Plants. The MassDOT standard specifications for both items are included in *Appendix K*.

   The project currently proposes 80 hours for formulation of the management strategy and 120 hours of crew time for treatment, where a crew is defined as two workers. The coverage area per hour of crew time will vary by site and treatment type. MassDOT informally estimates a rate for herbicide treatment as 8 hours per acre for a crew. Treatment is recommended two times per year. This yields an estimated rate of 16 crew hours per acre per year. The project proposes 120 crew hours of treatment which translates to 7.5 acres per year using the work rates assumed here.

3. Invasive Plant Management as Part of the Wetland Replication

   The specification for the Inland Wetland Replication work item includes invasive management as part of the lump sum cost of the wetland replication work. This means that the project provides additional invasive management for the wetland replication area separate from the Invasive Plant Management Strategy described in #2 above. The Wetland Replication area is currently proposed as having an area of 2,240 SF or 0.05 Acres, this is also an estimate of the area of invasive management eligible to be performed under the work item.

Notwithstanding MassDOT's exemption from Town Bylaw, the package of invasive plant management proposed by the project is likely already comparable in scale to the Project's permanent impacts to 100-foot Buffer Zone and Town Bylaw Jurisdictional AURA.

Table 19 tabulates the sum of permanent impacts to 100ft Buffer Zone and Town Bylaw AURA.

Table 19: Cumulative Permanent Impacts to Buffer Zone & AURA

Resource Area	Jurisdiction	Perm. Impacts (SF)	Perm. Impacts (Acres)
100ft Buffer Zone	WPA	254,639	5.8
AURA (exclusive of Buffer Zone)	Town Bylaw	9,461	0.2
Total		264,100	6.0

Depending on site conditions and treatment type, the proposed 120 crew hours of invasives management treatment arising from the IPMS could conceivably treat an area equivalent to the 6 acres of permanent Buffer Zone and AURA impacts, thereby serving as a form of mitigation for those impacts.

8 Stormwater Management

Stormwater within the project area ultimately discharges to Hop Brook and Pantry Brook. Hop Brook is a Category 5 water body impaired by excess algal growth, phosphorus, and dissolved oxygen saturation. Pantry brook is a Category 5 water body impaired by fecal coliform. The Project will not contribute nutrient or pollutant runoff to the impaired water bodies as a shared-use path for non-motorized use.

Stormwater management during construction will comply with all applicable standards.

Proposed conditions will comply with 310 CMR 10.05(6)(m)6 which states that:

> *10.05(6)(m) The Stormwater Management Standards (SMS) shall apply to the maximum extent practicable to the following:*
> *6. Footpaths bike paths and other paths for pedestrian and/or nonmotorized vehicle access.*

Impervious Areas and Stormwater Management

Overall, The Project proposes to add 5.99 acres of new impervious area and remove 0.024 acres of impervious area, resulting in a net difference of 5.97 acres of impervious area created in the Project Locus Area which includes the 4.4 mile rail ROW. The proposed impervious areas and stormwater management are summarized as follows:

BFRT Shared-Use Path

The 10 ft wide paved surface of the BFRT will result in new impervious area within the rail ROW. The total impervious area within the rail ROW totals 5.48 acres. The entire rail ROW totals approximately 35 acres.

Stormwater will be managed from the BFRT trail by sheet-flow to the trail shoulders. The typically 2ft wide crushed stone shoulders will trap sediment and aid in infiltration, directing the water flow through the grass buffers for infiltration.

The paved surface is overlaid on the site of an existing 16ft wide compacted crushed stone rail embankment with wood ties embedded near the ground surface. Post development stormwater discharge from the trail will follow existing drainage conveyance patterns.

The end use of the Project will be an existing segment of the BFRT at the northern terminus and the Massachusetts Central Rail Trail (MCRT) at the southern terminus. The trail is designed to shed runoff to the trail shoulders and as such, is neither designed nor anticipated to shed significant runoff into any roads that intersect the trail at 9 locations.

The Project is not anticipated to increase pollutant loads within the Project Locus Area significantly above the existing conditions. The BFRT will be used by pedestrians and bicyclists, which will not

contribute contaminants to the path surface. Other than emergency situations, motor vehicle access along the path will be limited to bi-weekly mowing over the trail shoulders. In addition, the BFRT will not be plowed and/or treated in the winter. Therefore, there will be little to no contaminants on the path surface to be washed off by storm water runoff.

New Parking Area at Morse Rd

The proposed 32 space parking area will create an impervious area of 9,770 SF. The parking area site also includes a paved path connection to the BFRT, a waterless restroom, and a pavilion structure. Bioretention basins are proposed to treat storm water discharge from the parking area. A full stormwater report for the proposed parking area is included in *Appendix G*.

Shared-Use Path Connections

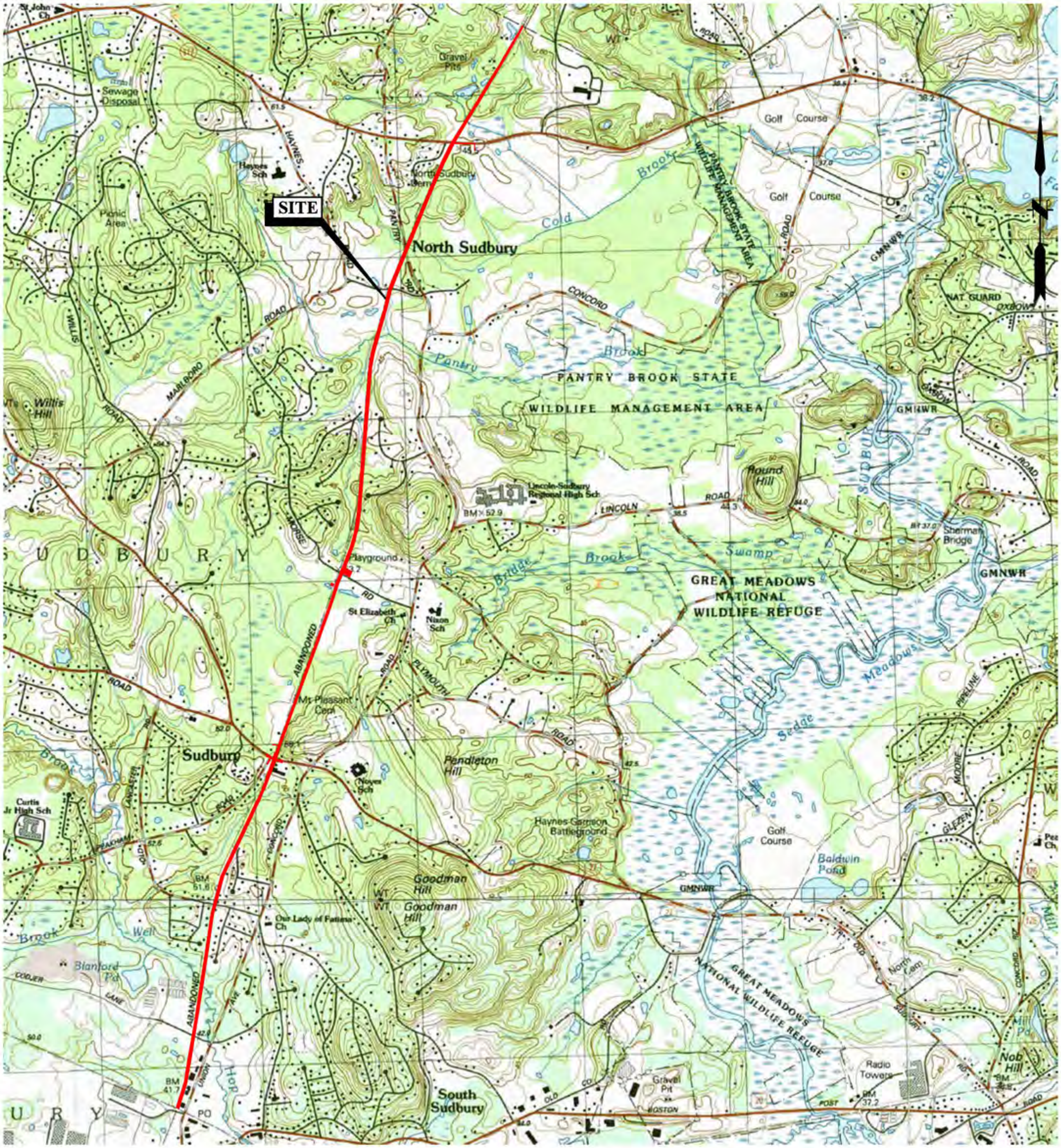
The proposed shared-use path connection to the Parkinson Parcel parking area will result in a new impervious area of 2,614 square feet (0.06 acres). The path connects the BFRT and the crushed stone parking area at the Parkinson Parcel. The path surface will drain by sheet flow to crushed stone shoulders that will trap sediment and aid in infiltration, directing the water flow through the surrounding grass field for infiltration. A negligible flow is expected between the endpoints of the path connection as runoff will be shed from the path shoulders.

The proposed shared-use path connection to the Davis Field parking area will result in a new paved area of 2,178 square feet (0.05 acres) resulting from the widening of an existing 5ft sidewalk to an 8ft shared-use path connection from the BFRT to the parking area at Davis Field. The path surface will drain by sheet flow to crushed stone shoulders that will trap sediment and aid in infiltration, directing the water flow to grass buffer strips next to North Road for infiltration.

Widening at Hudson Rd

Hudson Rd is proposed to be widened by 4ft on the east side of the Peckham Rd intersection. A new paved area of 871 square feet (0.02 acres) results from the proposed widening. A new left-turn lane is proposed utilizing the existing width of pavement reallocated and the new pavement. The intersection currently has one catch basin. The proposed condition replaces that catch basin and adds two additional catch basins. The new deep sump catch basins will improve stormwater treatment at the intersection over the existing condition.

Figures



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QUADRANGLE IMAGES WERE PREPARED FROM MASS GIS DATA RECEIVED FROM OLIVER GIS ON 04/16/2021.
ORIGINAL MAP UNITS IN METERS.

SCALE:	
HORZ.: 1" = 3000'	
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0 1500 3000

GRAPHIC SCALE

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TOWN OF SUDBURY

SITE LOCATION MAP

BRUCE FREEMAN RAIL TRAIL

SUDBURY MASSACHUSETTS

PROJ. No.: 20200785.A10
DATE: 10/27/2021

FIG.1

File Path: J:\DWG\P2020\0785\A10\608164\DWG\Environmental Plans\20200785A10_PERM01.dwg Layout: FIG.1 Plotted: Wed, October 27, 2021 - 2:45 PM User: akeegan
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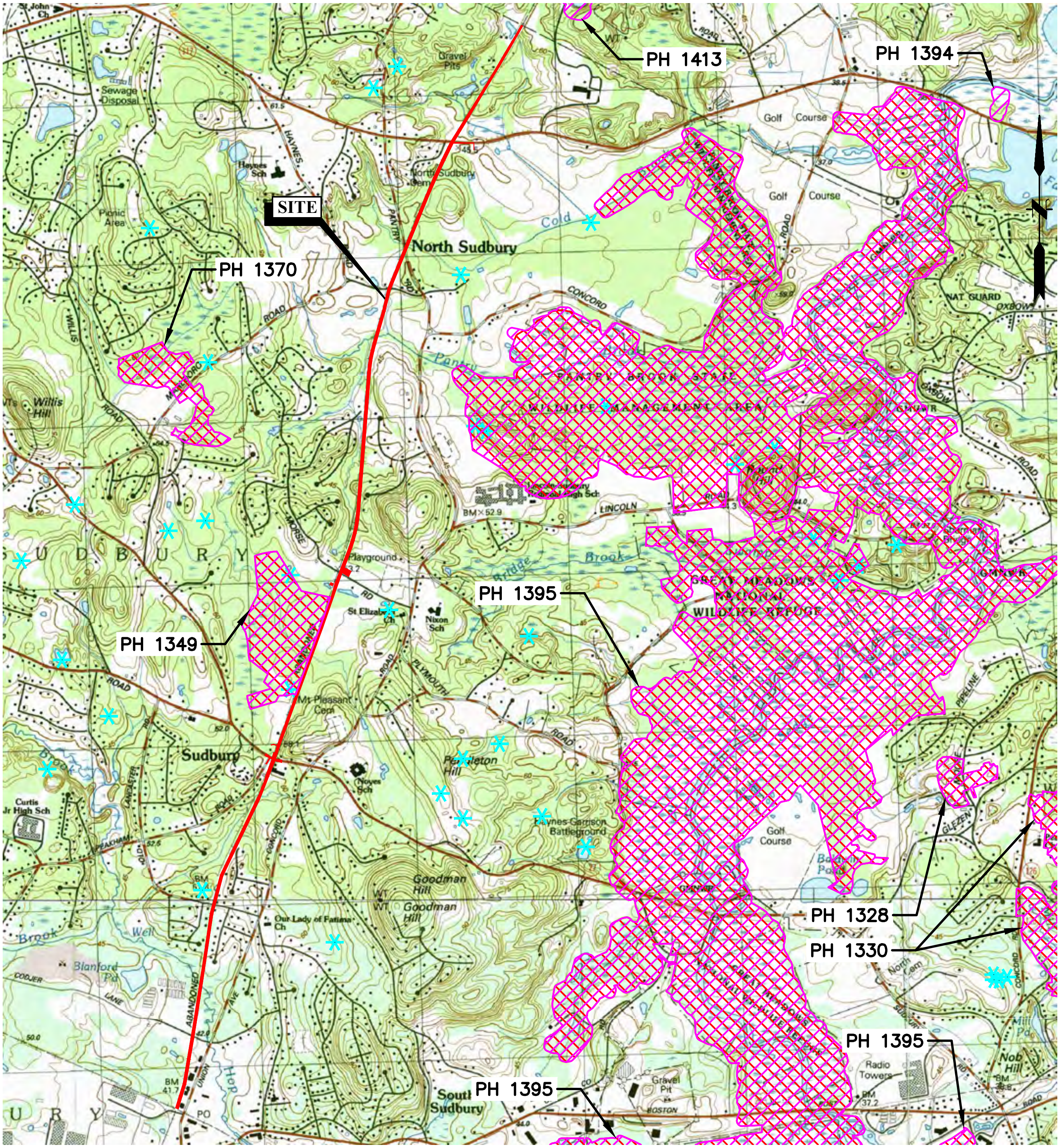

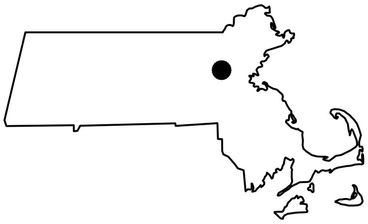

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ORIGINAL MAP UNITS IN METERS.

LEGEND

- NHESP MA PRIORITY HABITATS FOR STATE–PROTECTED RARE SPECIES
- NHESP MA ESTIMATED HABITATS OF RARE WILDLIFE
- NHESP MA CERTIFIED VERNAL POOL

SCALE: HORZ.: 1" = 3000' VERT.: DATUM: HORZ.: VERT.: 0 1500 3000 GRAPHIC SCALE	FUSS & O'NEILL 1550 MAIN STREET, SUITE 400 SPRINGFIELD, MA 01103 413.452.0445 www.fando.com	TOWN OF SUDBURY NHESP MAP BRUCE FREEMAN RAIL TRAIL SUDBURY MASSACHUSETTS	PROJ. No.: 20200785.A10 DATE: 10/27/2021 FIG.2

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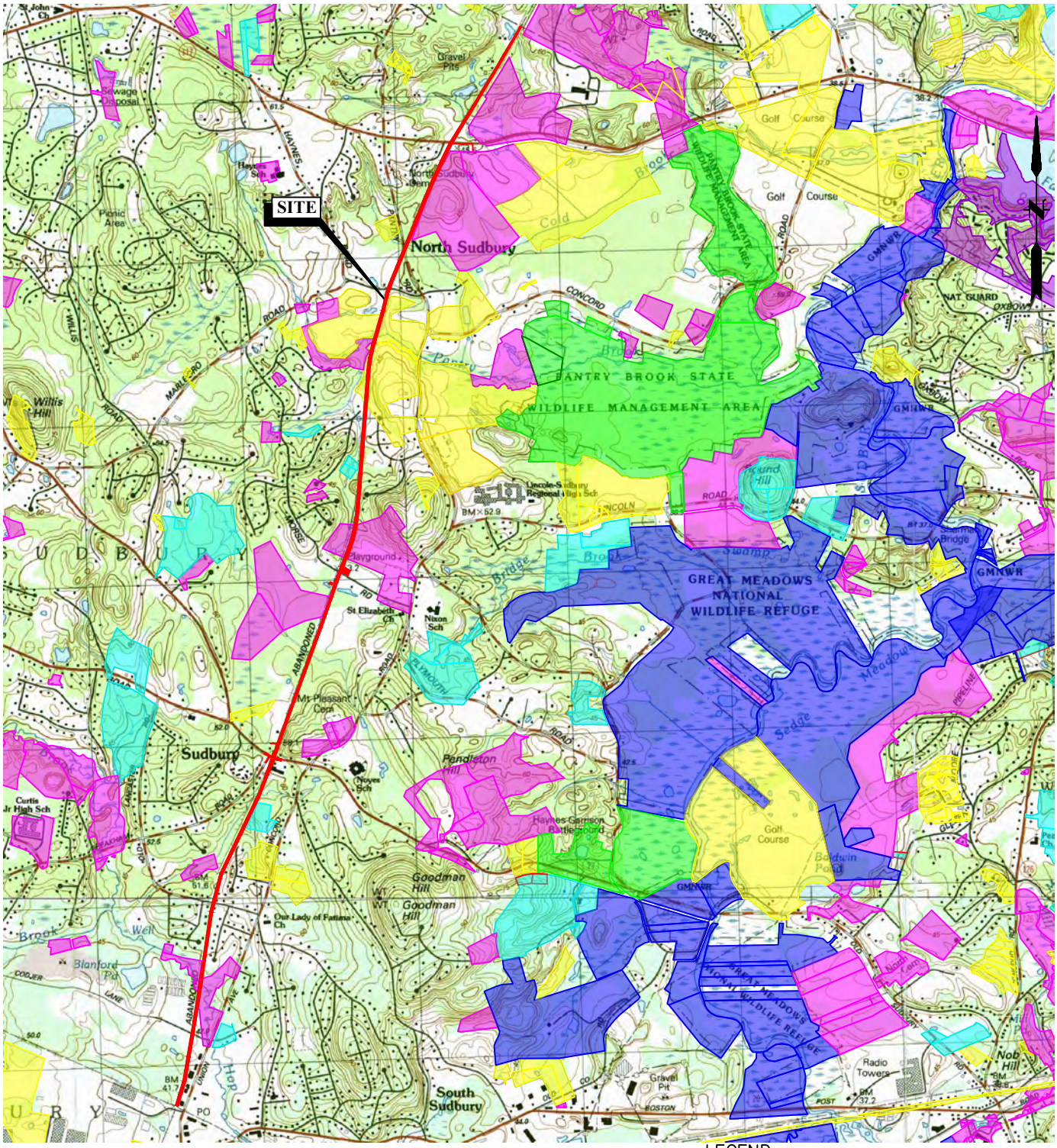

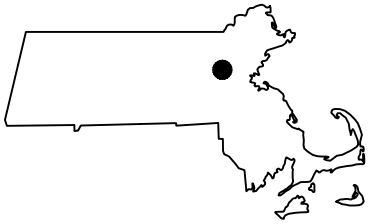

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LEGEND

- PUBLIC NON-PROFIT
- PRIVATE
- FEDERAL
- MUNICIPAL
- LAND TRUST
- DCR-URBAN PARKS RECREATION

SCALE:
HORZ.: 1" = 3000'
VERT.:
DATUM:
HORZ.:
VERT.:
0 1500 3000
GRAPHIC SCALE

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TOWN OF SUDBURY

OPEN SPACE MAP

BRUCE FREEMAN RAIL TRAIL

SUDBURY MASSACHUSETTS

PROJ. No.: 20200785.A10
DATE: 10/27/2021

FIG.3

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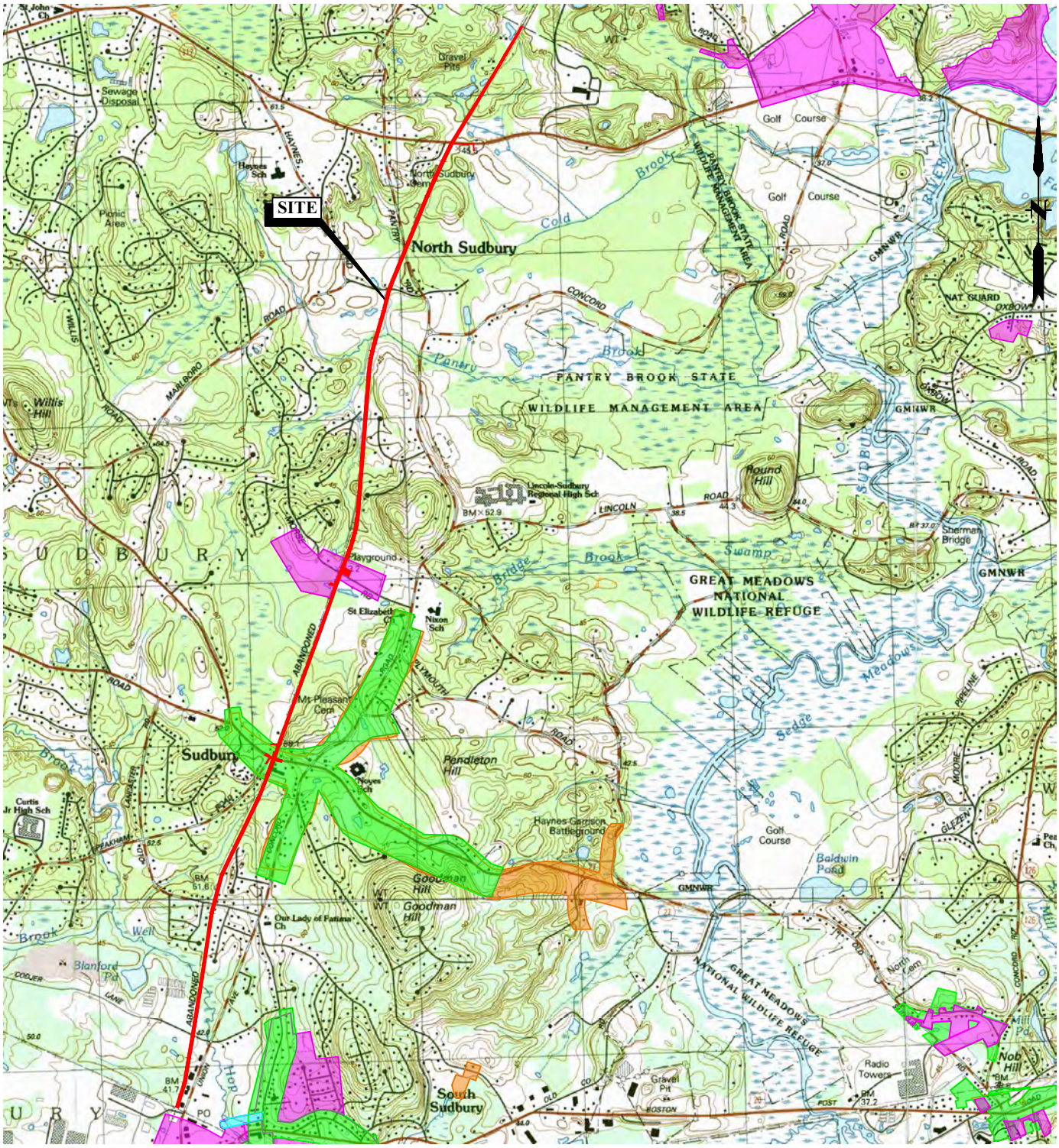

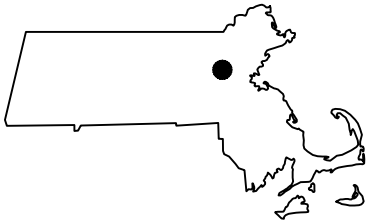

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LEGEND

- NATIONAL REGISTER OF HISTORIC PLACES
- LOCAL HISTORIC DISTRICT
- INVENTORIED PROPERTIES
- NRHP AND LHD

SCALE:
HORZ.: 1" = 3000'
VERT.:
DATUM:
HORZ.:
VERT.:
0 1500 3000
GRAPHIC SCALE

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TOWN OF SUDBURY

HISTORICAL RESOURCES MAP

BRUCE FREEMAN RAIL TRAIL

SUDBURY MASSACHUSETTS

PROJ. No.: 20200785.A10
DATE: 10/27/2021

FIG.4

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LAYER STATE:
MS VIEW:

Appendix A

FEMA Flood Mapping

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) Report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS Report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study Report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study Report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Massachusetts State Plane Mainland Zone (FIPS zone 2001). The **horizontal datum** was NAD 83, GRS 1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These **flood elevations** must be compared to structure and ground **elevations** referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713- 3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was derived from orthophotography provided by MassGIS at a scale of 1:500 from photography dated April 2005.

The **profile baselines** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the **profile baseline**, in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables for multiple streams in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

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For information on **available products** associated with this FIRM visit the **Map Service Center (MSC)** website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

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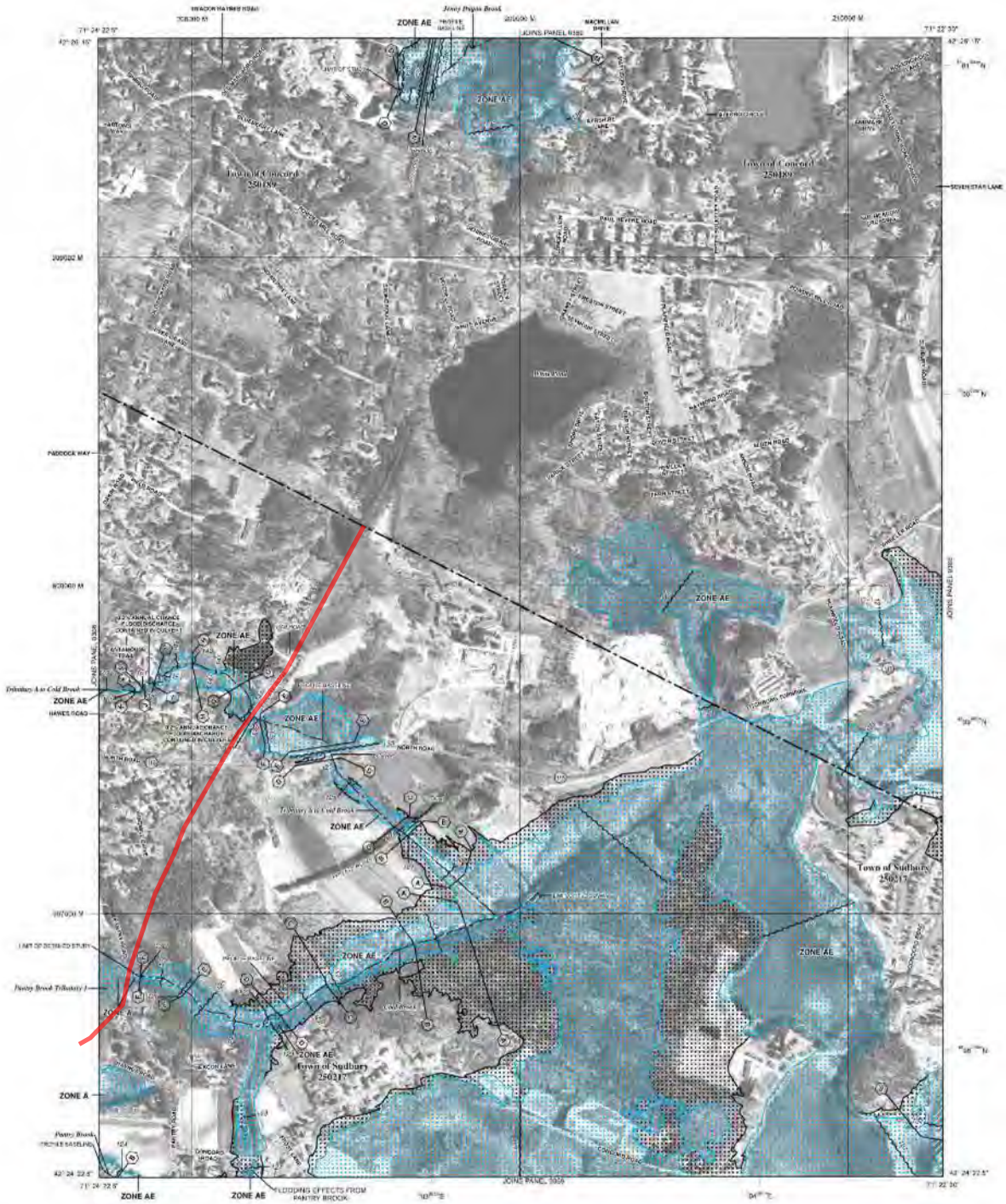

LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

ZONE A — No Base Flood Elevations determined.

ZONE AE — Base Flood Elevations determined.

ZONE AH — Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.

ZONE AO — Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

ZONE AR — Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.

ZONE A99 — Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.

ZONE V — Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.

ZONE VE — Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

OTHER FLOOD AREAS

ZONE X — Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X — Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D — Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% annual chance floodplain boundary

0.2% annual chance floodplain boundary

Floodway boundary

Zone D boundary

CBRS and OPA boundary

Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.

Base Flood Elevation value where uniform within zone; elevation in feet*

(EL 987) — Base Flood Elevation value where variable within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

A — A — Cross section line

23 — 23 — Transect line

97°07'30", 32°22'30" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)

3959000 m — 1000-meter Universal Transverse Mercator grid values, zone 19

5000 ft — Transverse Mercator grid values, Massachusetts State Plane coordinate system (FIPS zone 2001), Lambert Conformal Conic projection

X — Bench mark (see explanation in Map Index section for more information)

DX5510 — Bench mark (see explanation in Map Index section for more information)

M1.5 — River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
July 7, 2014

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

July 7, 2014 - to update corporate limits, to change Base Flood Elevations and Special Flood Hazard Areas, to add roads and road names, and to incorporate previously issued Letters of Map Revision

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'
500 0 1000 FEET
150 0 150 300 METERS

PANEL 0367F

FIRM

FLOOD INSURANCE RATE MAP

MIDDLESEX COUNTY, MASSACHUSETTS
(ALL JURISDICTIONS)

PANEL 367 OF 656
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
CONCORD, TOWN OF	250186	0367	F
SUDBURY, TOWN OF	250217	0367	F

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
25017C0367F
MAP REVISED
JULY 7, 2014

Federal Emergency Management Agency

NATIONAL FLOOD INSURANCE PROGRAM

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) Report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS Report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study Report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study Report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Massachusetts State Plane Mainland Zone (FIPS zone 2001). The **horizontal datum** was NAD 83, GRS 1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

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NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

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Base map information shown on this FIRM was derived from orthophotography provided by MassGIS at a scale of 1:500 from photography dated April 2005.

The **profile baselines** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the **profile baseline**, in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables for multiple streams in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

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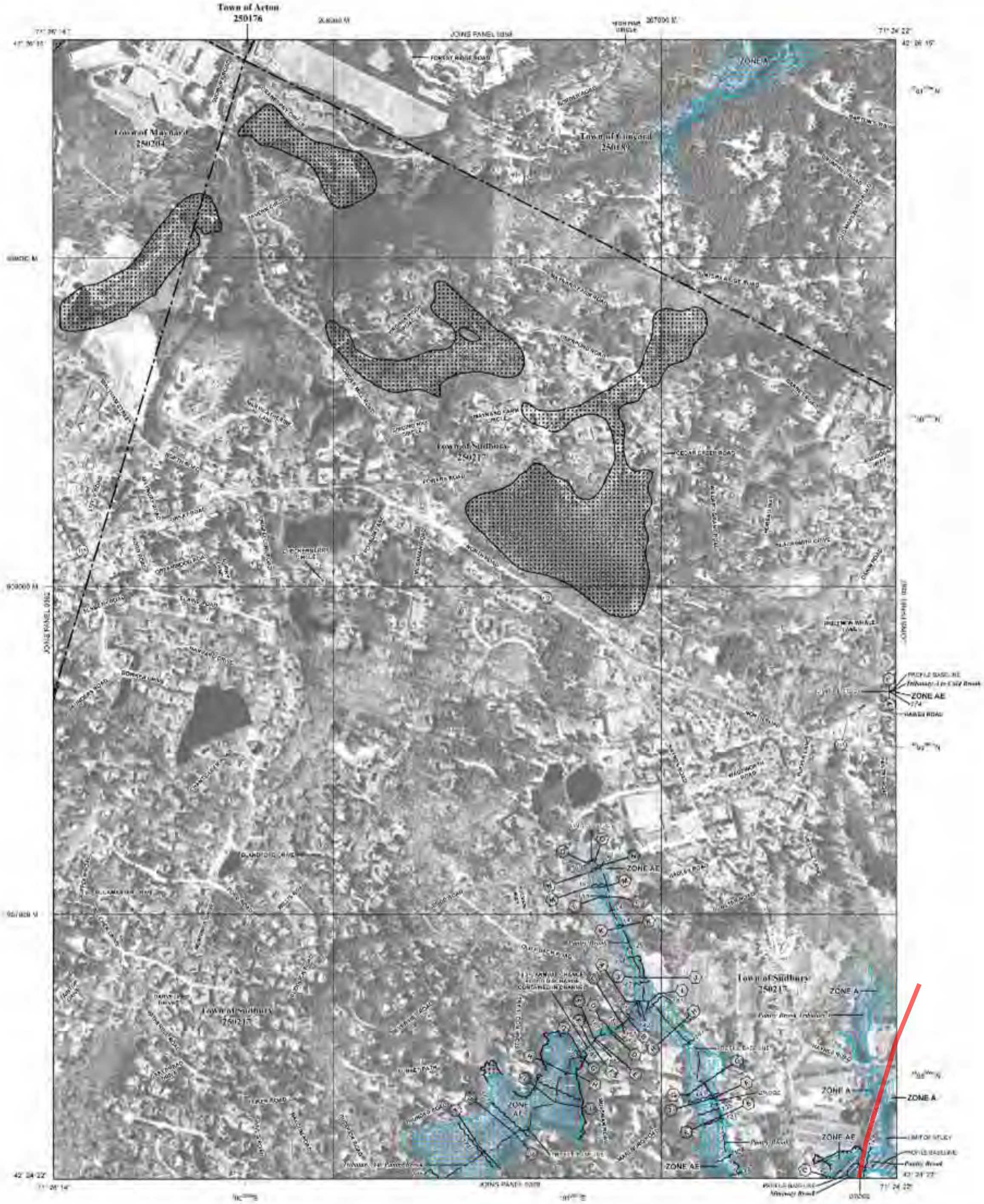

LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

FLOODWAY AREAS IN ZONE AE

OTHER FLOOD AREAS

OTHER AREAS

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

MAP SCALE 1" = 500'

NFIP NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0366F

FIRM

FLOOD INSURANCE RATE MAP

MIDDLESEX COUNTY, MASSACHUSETTS (ALL JURISDICTIONS)

PANEL 366 OF 656

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
25017C0366F

MAP REVISED
JULY 7, 2014

Federal Emergency Management Agency

NOTES TO USERS

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National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

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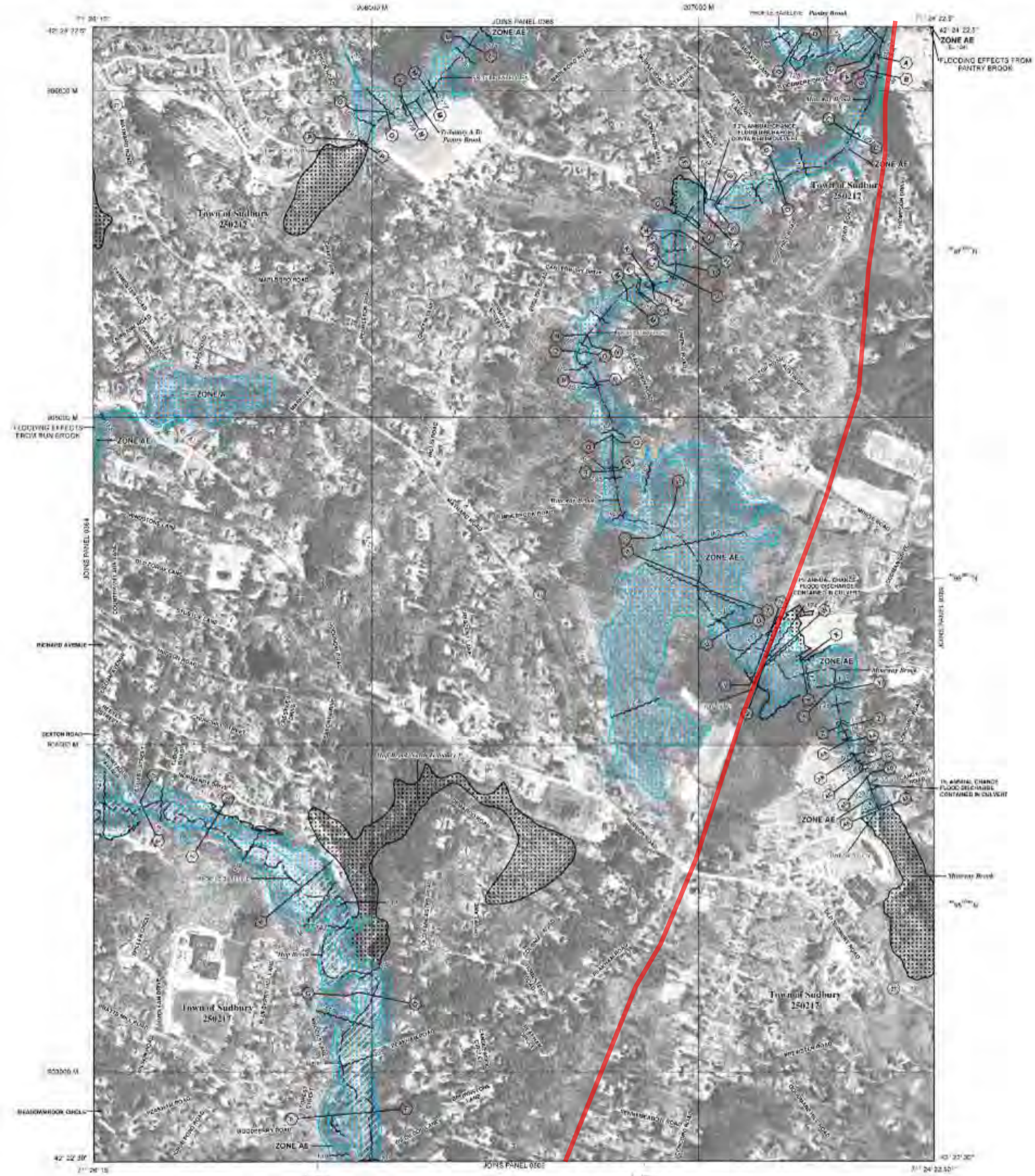

LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

ZONE A
ZONE AE
ZONE AH
ZONE AO
ZONE AR
ZONE A99
ZONE V
ZONE VE

FLOODWAY AREAS IN ZONE AE

OTHER FLOOD AREAS

ZONE X

OTHER AREAS

ZONE X
ZONE D

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

MAP SCALE 1" = 500'

PANEL 0368F

FIRM
FLOOD INSURANCE RATE MAP
MIDDLESEX COUNTY, MASSACHUSETTS (ALL JURISDICTIONS)

PANEL 368 OF 656
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

NATIONAL FLOOD INSURANCE PROGRAM

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
25017C0368F

MAP REVISED
JULY 7, 2014

Federal Emergency Management Agency

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National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

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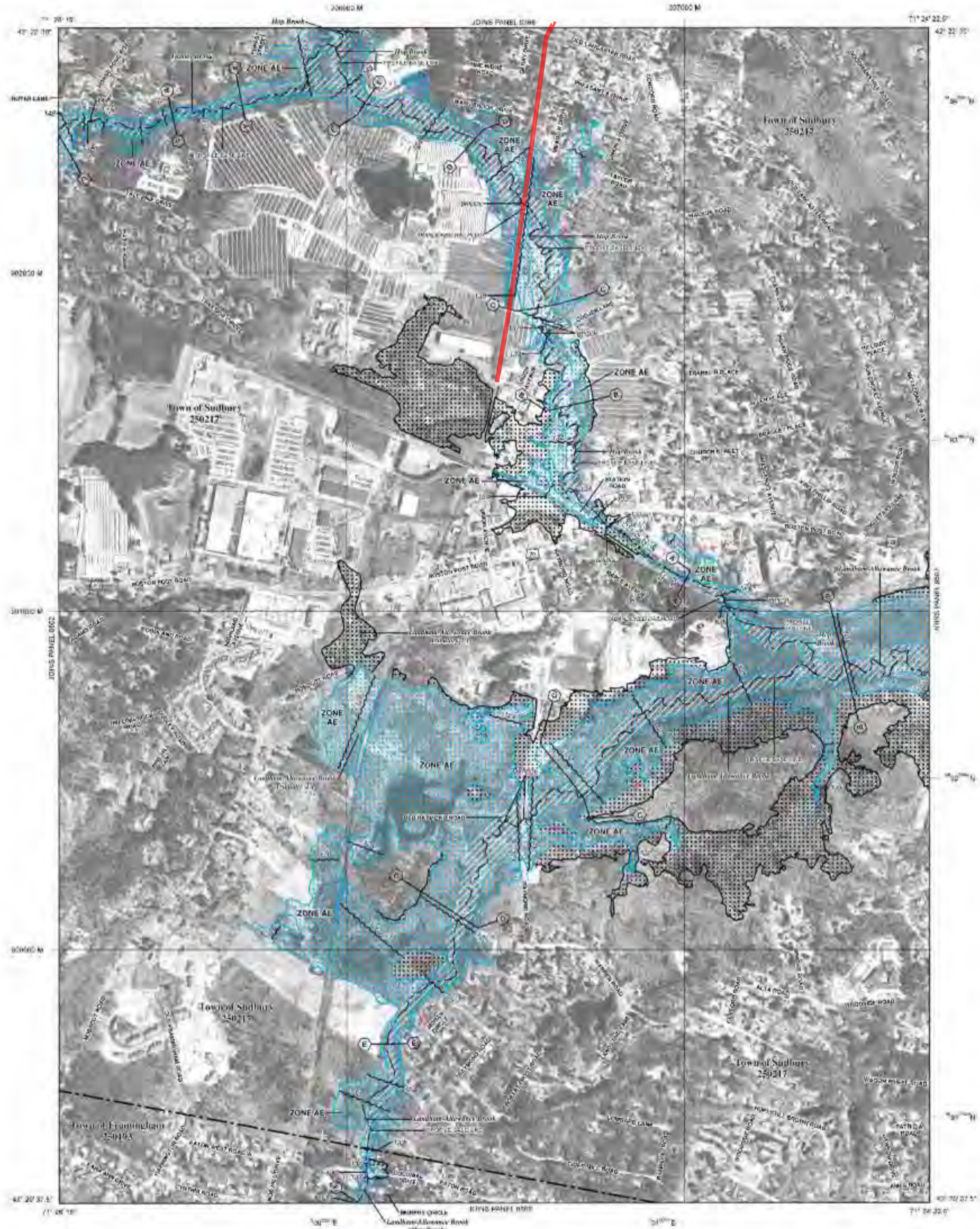


LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

ZONE A
ZONE AE
ZONE AH
ZONE AO
ZONE AR
ZONE A99
ZONE V
ZONE VE

FLOODWAY AREAS IN ZONE AE

OTHER FLOOD AREAS

ZONE X

OTHER AREAS

ZONE X
ZONE D

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
June 4, 2010

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

July 7, 2014 - to update corporate limits, to change Base Flood Elevations and Special Flood Hazard Areas, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

MAP SCALE 1" = 500'

250 0 500 1000 FEET
150 0 150 300 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0506F

FIRM
FLOOD INSURANCE RATE MAP
MIDDLESEX COUNTY, MASSACHUSETTS (ALL JURISDICTIONS)

PANEL 506 OF 656
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
FRAMINGHAM, TOWN OF	250193	0506	F
SUDBURY, TOWN OF	250217	0506	F

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER 25017C0506F

MAP REVISED JULY 7, 2014

Federal Emergency Management Agency

Appendix B

ORAD and Supplemental Delineation Report

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 4B – Order of Resource Area Delineation

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

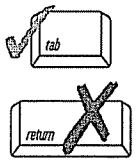
Provided by MassDEP: 301-1193
MassDEP File Number

eDEP Transaction Number

Sudbury
City/Town

A. General Information

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.

From: Sudbury
1. Conservation Commission

2. This Issuance is for (check one):

a. ☒ Order of Resource Area Delineation

b. ☐ Amended Order of Resource Area Delineation

3. Applicant:

Sudbury Town Planning & Community Dev. Dept. (a. First Name) | (b. Last Name)
Town of Sudbury
c. Organization
278 Old Sudbury Rd.
d. Mailing Address
Sudbury (e. City/Town) | MA (f. State) | 01776 (g. Zip Code)

4. Property Owner (if different from applicant):

Executive Office of Transportation and Construction (a. First Name) | (b. Last Name)
Commonwealth of MA
c. Organization
10 Park Plaza, Ssuite 3170
d. Mailing Address
Boston (e. City/Town) | MA (f. State) | 02116 (g. Zip Code)

5. Project Location:

Railroad ROW (a. Street Address) | Sudbury (b. City/Town) | 01776 (c. Zip Code)
(d. Assessors Map/Plat Number) | (e. Parcel/Lot Number)
Latitude and Longitude (in degrees, minutes, seconds): 42d39m065s (f. Latitude) | -71d41m162s (g. Longitude)

6. Dates: July 26, 2016 (a. Date ANRAD filed) | (b. Date Public Hearing Closed) | (c. Date of Issuance)

7. Title and Date (or Revised Date if applicable) of Final Plans and Other Documents:

Proposed Bike Path (a. Title) | May 19, 2016 (b. Date)
(c. Title) | (d. Date)

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 4B – Order of Resource Area Delineation

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

Provided by MassDEP:
301-1193
MassDEP File Number

eDEP Transaction Number

Sudbury
City/Town

B. Order of Delineation

1. The Conservation Commission has determined the following (check whichever is applicable):

a. ☒ **Accurate**: The boundaries described on the referenced plan(s) above and in the Abbreviated Notice of Resource Area Delineation are accurately drawn for the following resource area(s):

1. ☒ Bordering Vegetated Wetlands

2. ☒ Other resource area(s), specifically:

a. bank
subject to receipt of a dated revised plan of the version received by email on Oct. 24, 2016

b. ☐ **Modified**: The boundaries described on the plan(s) referenced above, as modified by the Conservation Commission from the plans contained in the Abbreviated Notice of Resource Area Delineation, are accurately drawn from the following resource area(s):

1. ☐ Bordering Vegetated Wetlands

2. ☐ Other resource area(s), specifically:

a.

c. ☒ **Inaccurate**: The boundaries described on the referenced plan(s) and in the Abbreviated Notice of Resource Area Delineation were found to be inaccurate and cannot be confirmed for the following resource area(s):

1. ☐ Bordering Vegetated Wetlands

2. ☒ Other resource area(s), specifically:

Perennial stream including mean annual high water; vernal pools (including, but not limited to vernal pools protected under the Sudbury Wetlands Bylaw only)

3. ☒ The boundaries were determined to be inaccurate because:

Drought conditions and low groundwater during 2016 did not permit the identification of these resource areas.

C. Findings

This Order of Resource Area Delineation determines that the boundaries of those resource areas noted above, have been delineated and approved by the Commission and are binding as to all decisions rendered pursuant to the Massachusetts Wetlands Protection Act (M.G.L. c.131, § 40) and its regulations (310 CMR 10.00). This Order does not, however, determine the boundaries of any resource area or Buffer Zone to any resource area not specifically noted above, regardless of whether such boundaries are contained on the plans attached to this Order or to the Abbreviated Notice of Resource Area Delineation.

This Order must be signed by a majority of the Conservation Commission. The Order must be sent by certified mail (return receipt requested) or hand delivered to the applicant. A copy also must be mailed or hand delivered at the same time to the appropriate DEP Regional Office (see http://www.mass.gov/eea/agencies/massdep/about/contacts/find-the-massdep-regional-office-for-your-city-or-town.html).

D. Appeals

The applicant, the owner, any person aggrieved by this Order, any owner of land abutting the land subject to this Order, or any ten residents of the city or town in which such land is located, are hereby notified of their right to request the appropriate DEP Regional Office to issue a Superseding Order of Resource Area Delineation. When requested to issue a Superseding Order of Resource Area Delineation, the Department's review is limited to the objections to the resource area delineation(s) stated in the appeal request. The request must be made by certified mail or hand delivery to the Department, with the appropriate filing fee and a completed Request for Departmental Action Fee Transmittal Form, as provided in 310 CMR 10.03(7) within ten business days from the date of issuance of this Order. A copy of the request shall at the same time be sent by certified mail or hand delivery to the Conservation Commission and to the applicant, if he/she is not the appellant.

Any appellants seeking to appeal the Department's Superseding Order of Resource Area Delineation will be required to demonstrate prior participation in the review of this project. Previous participation in the permit proceeding means the submission of written information to the Conservation Commission prior to the close of the public hearing, requesting a Superseding Order or Determination, or providing written information to the Department prior to issuance of a Superseding Order or Determination.

The request shall state clearly and concisely the objections to the Order which is being appealed and how the Order does not contribute to the protection of the interests identified in the Massachusetts Wetlands Protection Act, (M.G.L. c. 131, § 40) and is inconsistent with the wetlands regulations (310 CMR 10.00). To the extent that the Order is based on a municipal bylaw or ordinance, and not on the Massachusetts Wetlands Protection Act or regulations, the Department of Environmental Protection has no appellate jurisdiction.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 4B – Order of Resource Area Delineation

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

Provided by MassDEP:
301-1193
MassDEP File Number

eDEP Transaction Number

Sudbury
City/Town

E. Signatures

Nov. 14, 2016
Date of Issuance

Please indicate the number of members who will sign this form.

6
1. Number of Signers

Signature of Conservation Commission Member

Signature of Conservation Commission Member

Charles Russo
Signature of Conservation Commission Member

Signature of Conservation Commission Member

BRUCE PORTER
Signature of Conservation Commission Member

Signature of Conservation Commission Member

MARK SCOTESE
Signature of Conservation Commission Member

This Order is valid for three years from the date of issuance.

If this Order constitutes an Amended Order of Resource Area Delineation, this Order does not extend the issuance date of the original Final Order, which expires on unless extended in writing by the issuing authority.

This Order is issued to the applicant and the property owner (if different) as follows:

2. ☒ By hand delivery on
NOV. 14, 2016
a. Date

3. ☐ By certified mail, return receipt requested on

a. Date

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
WPA Form 4B - Order of Resource Area Delineation
Massachusetts Wetlands Protection Act M.G.L. c. 131 S40

Provided by MassDEP:
MassDEP File #:301-1193
eDEP Transaction #:1204088
City/Town:SUDBURY

A. General Information

1. Conservation Commission SUDBURY
2. This Issuance is for (Check one):
   a. ☐ Order of Resource Area Delineation
   b. ☑ Amended Order of Resource Area Delineation

3. Applicant Details

a. First Name	TIM	b. Last Name	DEXTER
c. Organization	MASSDOT		
d. Mailing Address	10 Park Plaza, Suite 4260		
e. City/Town	Boston	f. State	MA
g. ZIP	02116		

4. Property Owner (if different from applicant):

a. First Name		b. Last Name	
c. Organization			
d. Mailing Address			
e. City/Town	f. State		g. ZIP

5. Project Location

a. Street Address	RAILROAD ROW		
b. City/Town	SUDBURY	c. Zip	01776
d. Assessors Map/Plat#	RAILROAD ROW	e. Parcel/Lot#	RAILROAD ROW
f. Latitude	42.39499N	g. Longitude	71.40958W

6. Dates

a. Date ANRAD Filed	7/26/2016	b. Date Public Hearing Closed	9/15/2020	c. Date Of Issuance	9/16/2020

7. Final Approved Plans and Other Documents

Plan Title	Plan Prepared By	Plan Signed By	Plan Final Date	Plan Scale
EXISTING CONDITIONS/SURVEY PLAN AT PROPOSED RAIL TRAIL	ATLANTIC ENGINEERING & SURVEY CONSULTANTS, INC.	JOHN PAULSON	7/28/2009	1 INCH = 40 FEET

B. Order of Delineation

1. The Conservation Commission has determined the following (check whichever is applicable)

a. ☑ **Accurate:** The boundaries described on the referenced plan(s) above and in the Abbreviated Notice of Resource Area Delineation are accurately drawn for the following resource area(s):

1. ☑ Bordering Vegetated Wetlands
2. ☑ Other resource area(s), specifically
   a.ISOLATED VEGETATED WETLANDS (NON-JURISDICTIONAL UNDER WPA) VERNAL POOLS

b. ☐ **Modified:** The boundaries described on the plan(s) referenced above, as modified by the Conservation Commission from the plans contained in the Abbreviated Notice of Resource Area Delineation, are accurately drawn from the following resource area(s):

1. ☐ Bordering Vegetated Wetlands

2. ☐ Other resource area(s), specifically
   a.

c. ☐ **Inaccurate::** The boundaries described on the referenced plan(s) and in the Abbreviated Notice of Recource Area Delineation were found to be inaccurate and cannot be confirmed for the following resource area(s):

1. ☐ Bordering Vegetated Wetlands
2. ☐ Other resource area(s), specifically
   a.
3. The boundaries were determined to be inaccurate because:

C. Findings

This Order of Resource Area Delineation determines that the boundaries of those resource areas noted above, have been delineated and approved by the Commission and are binding as to all decisions rendered pursuant to the Massachusetts Wetlands Protection Act (M.G.L. c.131, S 40) and its regulations (310 CMR 10.00). This Order does not, however, determine the boundaries of any resource area or Buffer Zone to any resource area not specifically noted above, regardless of whether such boundaries are contained on the plans attached to this Order or to the Abbreviated Notice of Resource Area Delineation. This Order must be signed by a majority of the Conservation Commission. The Order must be sent by certified mail (return receipt requested) or hand delivered to the applicant. A copy also must be mailed or hand delivered at the same time to the appropriate DEP Regional Office (see http://www.mass.gov/dep/about/region/findyour.htm).

D. Appeals

The applicant, the owner, any person aggrieved by this Order, any owner of land abutting the land subject to this Order, or any ten residents of the city or town in which such land is located, are hereby notified of their right to request the appropriate DEP Regional Office to issue a Superseding Order of Resource Area Delineation. When requested to issue a Superseding Order of Resource Area Delineation, the Department's review is limited to the objections to the resource area delineation(s) stated in the appeal request. The request must be made by certified mail or hand delivery to the Department, with the appropriate filing fee and a completed Request for Departmental Action Fee Transmittal Form, as provided in 310 CMR 10.03(7) within ten business days from the date of issuance of this Order. A copy of the request shall at the same time be sent by certified mail or hand delivery to the Conservation Commission and to the applicant, if he/she is not the appellant. Any appellants seeking to appeal the Department?s Superseding Order of Resource Area Delineation will be required to demonstrate prior participation in the review of this project. Previous participation in the permit proceeding means the submission of written information to the Conservation Commission prior to the close of the public hearing, requesting a Superseding Order or Determination, or providing written information to the Department prior to issuance of a Superseding Order or Determination. The request shall state clearly and concisely the objections to the Order which is being appealed and how the Order does not contribute to the protection of the interests identified in the Massachusetts Wetlands Protection Act, (M.G.L. c. 131, S 40) and is inconsistent with the wetlands regulations (310 CMR 10.00). To the extent that the Order is based on a municipal bylaw or ordinance, and not on the Massachusetts Wetlands Protection Act or regulations, the Department of Environmental Protection has no appellate jurisdiction.

BFRT AMEND

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
WPA Form 4B - Order of Resource Area Delineation
Massachusetts Wetlands Protection Act M.G.L. c. 131 S40

Provided by MassDEP:
MassDEP File #:301-1193
eDEP Transaction #:1204088
City or town:SUDBURY

E. Signatures

1. Date of Original Order 11/16/2016

No. of Signatures required 4

Dave Henkels-Vice Chairman

Richard Morse

Kasey Rogers

Mark Sevier

This Order is valid for three years from the date of issuance.

If this Order constitutes an Amended Order of Resource Area Delineation, this Order does not extend the issuance date of the original Final Order, and the Amended Order will expire on the date of the Original Final Order unless extended in writing by the Department.

This Order is issued to the applicant and the property owner (if different) as follows:

3. ☐ By hand delivery on

a. Date _____

4. ☐ By certified mail, return receipt requested on

a. Date _____

NOTICE OF PUBLIC HEARING
SUDBURY CONSERVATION COMMISSION
Virtual Meeting 6:30 PM

The Sudbury Conservation Commission will hold a public hearing to review an Amendment to the Order of Resource Area Delineation filing (DEP #301-1193) to clarify jurisdictional wetland resource areas subject to the Wetlands Protection Act versus the Sudbury Wetland Administration Bylaw, to classify streams as intermittent or perennial, and to enter into the record the status of vernal pools along the MassDOT Right of Way in Sudbury, MA. MassDOT Highway Division, applicant. The hearing will be held on Monday, June 29, 2020 at 6:30 pm, via remote participation through Zoom. The link to join this Zoom meeting (https://us02web.zoom.us/j/98803339162) as well as copies of the application, may be reviewed on the Conservation Commission web page at: https://sudbury.ma.us/conservationcommission/meeting/conservation-commission-meeting-monday-june-29-2020/. Please contact the Conservation Office with any questions at 978-440-5470.

SUDBURY CONSERVATION COMMISSION
June 15, 2020

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

MassDOT
Massachusetts Department of Transportation
Highway Division

June 15, 2020

Sudbury Conservation Commission
Department of Public Works
275 Old Lancaster Road
Sudbury, MA 01776

Subject: ORAD Amendment Request, Bruce Freeman Rail Trail, Sudbury, MA
DEP File No. 301-1193

Dear Commissioners:

Massachusetts Department of Transportation, Highway Division (MassDOT) submits this Amendment Request for the Order of Resource area Delineation (ORAD) issued by the Sudbury Conservation Commission (DEP File No. 301-1193) to the Town of Sudbury for the Bruce Freeman Rail Trail (BFRT) right-of-way property. The ORAD was recently extended by the Commission for an additional three years and is scheduled to expire in October 2022.

State and local wetland resource areas were approved by the Sudbury Conservation Commission through an ORAD dated November 2016. The ORAD was granted to the applicant, the Town of Sudbury, with permission from the property owner, Massachusetts Department of Transportation (MassDOT), to advance the design of the BFRT. However, the ORAD (and the submitted Abbreviated Notice of Resource Area Delineation (ANRAD) plans themselves) did not distinguish between Sudbury Wetland Administration Bylaw (Bylaw) jurisdictional wetlands and Massachusetts Wetlands Protection Act (WPA) jurisdictional wetlands. Furthermore, due to drought conditions at the time of ANRAD review, the Commission did not accept the classification of intermittent versus perennial streams as presented in the ANRAD application. The referenced ORAD was issued under both the Bylaw and WPA because at the time of filing the Applicant was the Town of Sudbury and not MassDOT. State agencies such as MassDOT are not ordinarily subject to local bylaws. MassDOT is seeking to make these distinctions as defined under the WPA in order to proceed with the permitting phase of the BFRT in an accurate manner and ensure compliance with WPA regulatory performance standards.

MassDOT reviewed the existing conditions plans of the proposed BFRT in Sudbury, MA to confirm the presence (or lack thereof) of Bordering Vegetated Wetlands (BVW), and classify the intermittent and perennial streams, as such terms are defined under the WPA. The results are discussed below.

Subsequent to the ORAD being issued in 2016, additional detailed field investigations of potential vernal pools were conducted by VHB in 2017 and Stantec in 2018 in accordance with MA Natural Heritage and Endangered Species program (NHESP) guidance. MassDOT would like to enter these results into the record and identify those two pools (or portions thereof) that are within the right of way as certifiable vernal pools in accordance with NHESP Guidance.

Isolated Vegetated Wetlands

ANRAD plans were compared with publicly available wetlands information on MassGIS such as MassDEP wetlands, hydrological connection data layers, along with USGS maps, and identified nine distinct wetland flag series to review in the field based on whether they appeared isolated in the landscape or if there was a lack of mapped hydrological connection to another resource area. One additional wetland, WF-36 series, was identified as isolated on the plans and presumed to be correct. On April 1 and May 8, 2020, wetland scientists conducted a field inspection of these identified areas to confirm if the delineated vegetated wetlands are bordering wetlands under the WPA or isolated wetlands only under the Bylaw. Based on the results of the field inspection, MassDOT identified seven (7) vegetated wetland areas that are clearly isolated. See Figure 1 in Attachment A.

The identified freshwater wetland flag series listed in Table 1 should not be considered BVWs under the WPA because they are isolated in the landscape and do not border on a surface water body as required under 310 CMR 10.55. Nor should these flag series be considered Isolated Land Subject to Flooding under the WPA as they do not meet the volume and depth requirements under 310 CMR 10.57.

Waterways

Based on the plan assessment, review of USGS map information, and USGS StreamStats™ analysis, four perennial streams within the BFRT right of way were identified. The remaining bank flag series are to be considered intermittent. Finally, portions of one bank series do not meet the state WPA definition of a stream. See Table 1 and the summary below for further information.

Pursuant to 310 CMR 10.58(2)(a)1c, “a stream shown as intermittent or not shown on the current USGS map or more recent map provided by the Department, that has a watershed size less than one square mile, is intermittent unless the stream has a watershed size of at least ½ (0.50) square mile and has a predicted flow rate greater than or equal to 0.01 cubic feet per second at the 99% flow duration using the USGS Stream Stats method.”

Hop Brook (BF32 & BF33), Pantry Brook (PS1), a tributary to Pantry Brook (BF12), and a tributary to Cold Brook (BF3) are all USGS-mapped perennial and thus have associated 200-foot Riverfront Area under the WPA. Using the USGS Stream Stats program, the remaining streams mapped as intermittent or flagged in the field as identified in the plans were evaluated (see Attachment B). Because none of these streams are mapped as perennial by USGS, and all have watershed sizes of less than ½ square

mile as indicated by the Stream Stats program, none are considered perennial under the WPA regulations. Thus, none of these intermittent streams have associated Riverfront Area.

Portions of bank flag series BF-30 are up gradient of any other resource area according to the 2016 ANRAD existing condition plans (Sheets 17 and 18). This condition was field verified and determined that there was not a freshwater wetland (bordering or otherwise) or surface water body up gradient of these sections. These portions include flags BF 30-106 through BF 30-126, BF 30-132 through BF 30-139, and BF 30-333 through BF 30-321 (one continuous section on the east side of the trail), and flags BF 30-302 through BF 30-320 (one continuous section on west side of trail). While this stream may be considered jurisdictional under the Bylaw, in our opinion it would not be a regulated resource area under the WPA, as these portions do not meet the definition of a stream[1].

Perennial and intermittent streams have been categorized in Table 1 on the next page according to the WPA definitions.

Vernal Pools

The attached reports (Attachment C) have identified three additional certifiable vernal pools: PVP 4, PVP 11 and PVP 12a. Of these, only PVP 4 (associated with WF 6) and PVP 11 (associated with WF 24) appear to be within the BFRT ROW. It is important to note that while several of the IVWs identified in Table 1 were surveyed, no vernal pool species were found within these wetlands according to the survey results.

[1] According to 310 CMR 10.04, a "Stream means a body of running water, including brooks and creeks, which moves in a definite channel in the ground due to a hydraulic gradient, and which flows within, into or out of an Area Subject to Protection under M.G.L. c. 131, § 40. A portion of a stream may flow through a culvert or beneath a bridge. Such a body of running water which does not flow throughout the year (i.e., which is intermittent) is a stream except for that portion **upgradient of all bogs, swamps, wet meadows and marshes."** [emphasis added]

Table 1 – Summary of Recommended Resource Area Classification under the WPA

FLAG SERIES	PLAN SHEET	CLASSIFICATION/STREAM TYPE UNDER WPA	APPROXIMATE AREA (IVW)	COMMENTS
BF36	2	Intermittent		
BF33	8	Perennial		Hop Brook
BF32	7, 8, 16	Perennial		Hop Brook
BF27	24	Intermittent		
BF26	24	Intermittent		
BF15-24	26, 28, 29	Intermittent		
BF23	27	Intermittent		
BF30*	17, 18	Intermittent *Flags BF 30-100 to 105, 30-200-212, 30-300 to 308, 300-13, 30-320 and 30-321 only*		Unnamed tributary to Hop Brook
BF21	29, 30, 31	Intermittent		
BF19	33	Intermittent		
BF 18	33	Intermittent		
BF17	33, 34	Intermittent		Not shown on USGS stream stats
BF16	34	Intermittent		
PS1	35, 36, 37	Perennial		Pantry Brook
BF15-6	47	Intermittent		
BF12	38, 39, 40	Perennial		Unnamed tributary to Pantry Brook
BF8	42, 43, 44, 48	Intermittent		Cold Brook
BF6	42, 43, 44, 48	Intermittent		Cold Brook
BF7	45	Intermittent		Not shown on USGS streamstats
BF5	48	Intermittent		
BF3	51, 52	Perennial		Unnamed tributary to Cold Brook
BF2	54, 55	Intermittent		
WF38	3	Isolated/Non-jurisdictional	1,550 sf	Included in VP survey (PVP ID 16)
WF36	22	Isolated/Non-jurisdictional	3,315 sf	Included in VP survey (PVP ID 15)
WF34	10	Isolated/Non-jurisdictional	~ 3,200 sf	Included in VP survey (PVP ID 14)
WF33	10	Isolated/Non-jurisdictional	1,200 sf	Not included in VP survey
WF31	18	Isolated/Non-jurisdictional	3,250 sf	Not included in VP survey
WF20	31	Isolated/Non-jurisdictional	~1,000 sf	Included in VP survey (PVP ID 10)
WF15	38	Isolated/Non-jurisdictional	850 sf	Not included in VP survey

ORAD Amendment Request Details

MassDOT requests that the Sudbury Conservation Commission revise the jurisdictional status of the previously approved wetland resource area delineation boundary to clarify status under the WPA and issue an amended ORAD to reflect any agreed upon jurisdictional changes under the WPA. Specifically, MassDOT is seeking to specify the Isolated Vegetated Wetlands as listed in Table 1 as non-jurisdictional under the WPA. Furthermore, the classification of intermittent and perennial should be documented in accordance with WPA regulations at 10.58 2(a)1 in the ORAD, as well as classification of the portions of flag series BF30 that do not meet the WPA definition of a stream. MassDOT is also seeking to enter the vernal pool survey results into the record as described.

MassDOT also requests that the ORAD be transferred to MassDOT from the Town of Sudbury to MassDOT as they are the property owner. The proposed activities to construct the BFRT would be analyzed in a separate Notice of Intent prepared by MassDOT as the Applicant under the WPA.

This Request was prepared in accordance with the Massachusetts Wetland Protection Act (MGL c.131 s.40) and implementing Regulations (310 CMR 10.00). This Amendment Request is being submitted for the Commission's review at the next available public hearing on June 29, 2020. If the Commission would like to conduct a site walk prior to that date or has any questions regarding this request, please do not hesitate to contact me at Timothly.Dexter@state.ma.us.

Sincerely,

Tim Dexter

Tim Dexter
Fish & Wildlife Supervisor
MassDOT Highway Division

cc: DEP NERO

Attachments

Attachment A – Figures
Attachment B – Stream Stats results
Attachment C – Vernal Pool Surveys

Attachment A - Figure 1

Isolated Vegetated Wetland Locations

G:\Projects2\MA\Sudbury\4229.44\MXD\Aerial_Locus_20200519.mxd

Data Source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology and Security Services

LEGEND

- IVW/Non-WPA Jurisdictional
- Approximate Route of Bruce Freeman Rail Trail

USGS Hydrography

- Perennial Stream
- Intermittent Stream

DEP Wetlands (2005)

- Hydrologic Connection
- Wetlands
- Open Water

Scale 1:14,400
1 inch = 1,200 feet
0 600 1,200 Feet

Basemap: 2019 Orthoimagery, MassGIS

Locus Map

CONCORD
MAYNARD
LINCOLN
STOW
SUDBURY
WAYLAND
FRAMINGHAM

Haynes Road
Mossman Road
Starview Drive
Woodmere Drive
Ridge Hill Road
Hunt Road
Thompson Drive
Bishop Lane
Juniper Road
Hilltop Road
Willis Road
Mark Lane
Martin Drive
Minebrook Road
Morse Road
Fern Trail
Lincoln Road
Sawmill Lane
Bridge Brook
Codman Drive
Goodnow Road
Crescent Lane
Maynard Road
Clark Road
Newbridge Road
Candy Hill Road
Plympton Road
Bowen Circle
Churchill Street
Hudson Road
Saxony Drive
Hop Brook
Old Lancaster Road
Colonial Road
Peakham Road
Brook Lane
Wildwood Lane
Pennymeadow Road
Brewster Road
Fieldstone Farm Road
Old Sudbury Road
Water Row
Forest Street
Gerry Drive
Plantation Circle
Goodmans Hill Road
Nashoba Road
Walkup Road
Kato Drive
River Road
Dudley Brook
Codjer Lane
Union Avenue
Clark Lane
Indian Ridge Road
Hillside Place
Metacomet Way
Greenhill Road
Walker Farm Road
Old County Road
Massasoit Avenue
Station Road
Boston Post Road
Water Row Road
Wolbach Road

15
20
36
31
33
34
38

Bruce Freeman Rail Trail Sudbury, Massachusetts

Epsilon Associates Inc.

Figure 1
Aerial Locus Map

Attachment B

USGS Stream Stats Results

StreamStats Report

Region ID: MA
Workspace ID: MA20200514184801479000
Clicked Point (Latitude, Longitude): 42.41684, -71.40201
Time: 2020-05-14 14:48:17 -0400

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.000463	square miles
BSLDEM250	Mean basin slope computed from 1:250K DEM	1.56	percent
DRFTPERSTR	Area of stratified drift per unit of stream length	-100000	square mile per mile
MAREGION	Region of Massachusetts 0 for Eastern 1 for Western	0	dimensionless

Low-Flow Statistics Parameters[Statewide Low Flow WRIR00 4135]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.000463	square miles	1.61	149
BSLDEM250	Mean Basin Slope from 250K DEM	1.56	percent	0.32	24.6
DRFTPERSTR	Stratified Drift per Stream Length	-100000	square mile per mile	0	1.29
MAREGION	Massachusetts Region	0	dimensionless	0	1

Low-Flow Statistics Flow Report[Statewide Low Flow WRIR00 4135]

Statistic	Value	Unit

Low-Flow Statistics Citations

Application Version: 4.3.11

StreamStats Report

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Clicked Point (Latitude, Longitude): 42.40107, -71.40860
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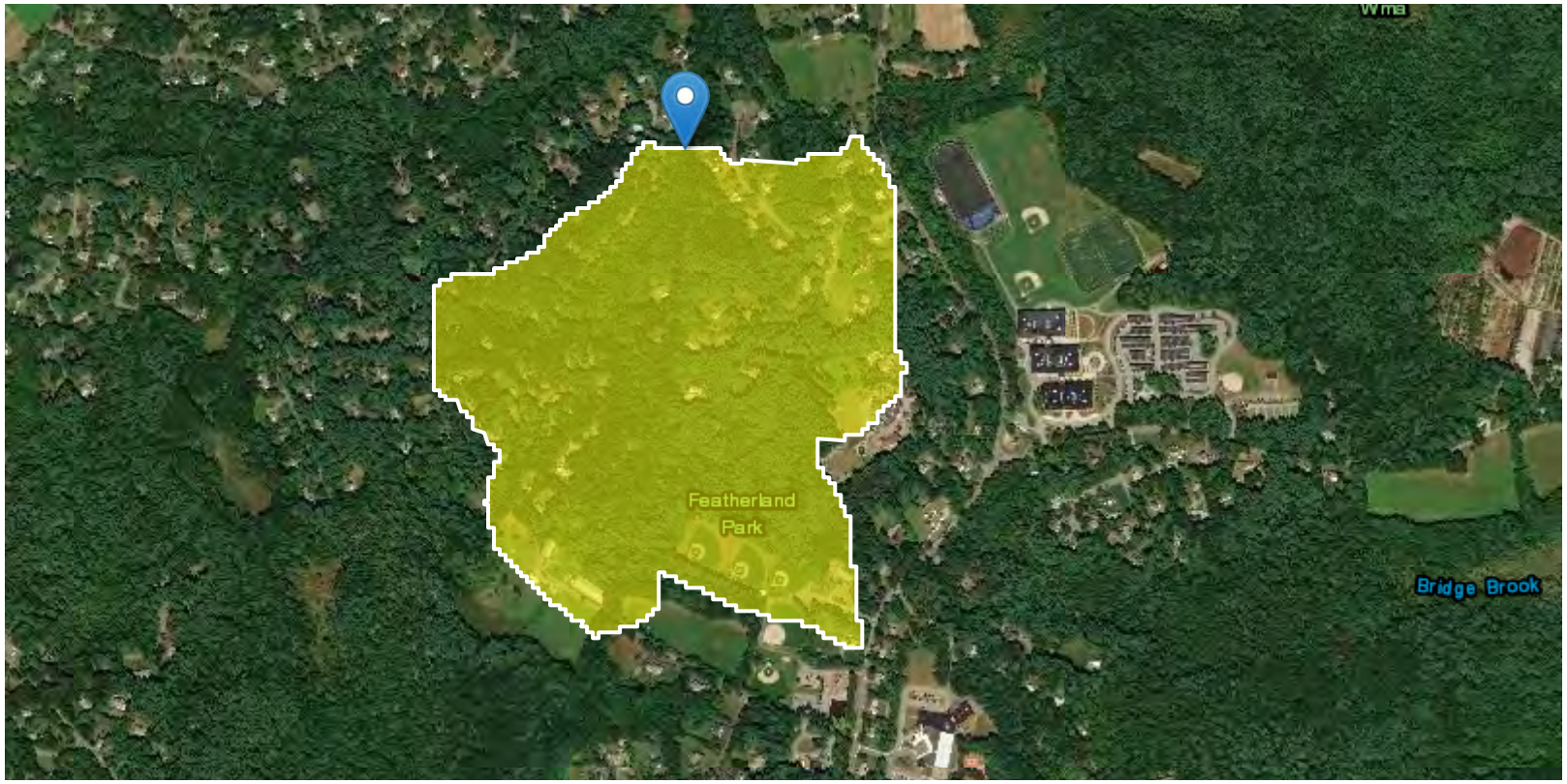

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.22	square miles
BSLDEM250	Mean basin slope computed from 1:250K DEM	4.488	percent
DRFTPERSTR	Area of stratified drift per unit of stream length	0.23	square mile per mile
MAREGION	Region of Massachusetts 0 for Eastern 1 for Western	0	dimensionless

Low-Flow Statistics Parameters[Statewide Low Flow WRIR00 4135]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.22	square miles	1.61	149
BSLDEM250	Mean Basin Slope from 250K DEM	4.488	percent	0.32	24.6
DRFTPERSTR	Stratified Drift per Stream Length	0.23	square mile per mile	0	1.29
MAREGION	Massachusetts Region	0	dimensionless	0	1

Low-Flow Statistics Disclaimers[Statewide Low Flow WRIR00 4135]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors

Low-Flow Statistics Flow Report[Statewide Low Flow WRIR00 4135]

Statistic	Value	Unit
7 Day 2 Year Low Flow	0.0182	ft^3/s
7 Day 10 Year Low Flow	0.00796	ft^3/s

Low-Flow Statistics Citations

Ries, K.G., III,2000, Methods for estimating low-flow statistics for Massachusetts streams: U.S. Geological Survey Water Resources Investigations Report 00-4135, 81 p. (http://pubs.usgs.gov/wri/wri004135/)

Application Version: 4.3.11

StreamStats Report

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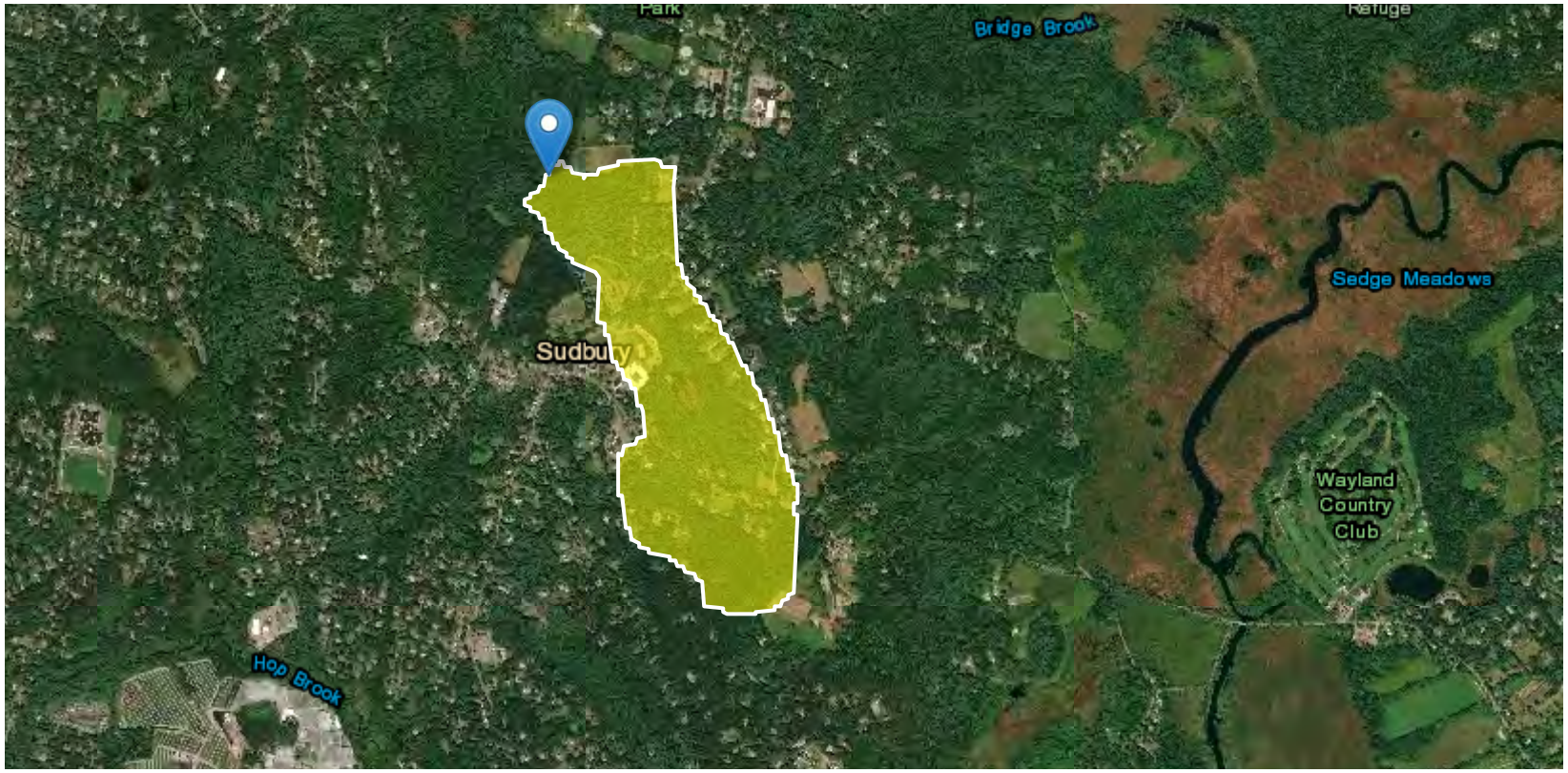

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.31	square miles
BSLDEM250	Mean basin slope computed from 1:250K DEM	3.67	percent
DRFTPERSTR	Area of stratified drift per unit of stream length	0.0607	square mile per mile
MAREGION	Region of Massachusetts 0 for Eastern 1 for Western	0	dimensionless

Low-Flow Statistics Parameters[Statewide Low Flow WRIR00 4135]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.31	square miles	1.61	149
BSLDEM250	Mean Basin Slope from 250K DEM	3.67	percent	0.32	24.6
DRFTPERSTR	Stratified Drift per Stream Length	0.0607	square mile per mile	0	1.29
MAREGION	Massachusetts Region	0	dimensionless	0	1

Low-Flow Statistics Disclaimers[Statewide Low Flow WRIR00 4135]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errorsOne or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors

Low-Flow Statistics Flow Report[Statewide Low Flow WRIR00 4135]

Statistic	Value	Unit
7 Day 2 Year Low Flow	0.0137	ft^3/s
7 Day 10 Year Low Flow	0.00458	ft^3/s

Low-Flow Statistics Citations

Ries, K.G., III,2000, Methods for estimating low-flow statistics for Massachusetts streams: U.S. Geological Survey Water Resources Investigations Report 00-4135, 81 p. (http://pubs.usgs.gov/wri/wri004135/)

Application Version: 4.3.11

StreamStats Report

Region ID: MA
Workspace ID: MA20200514183759447000
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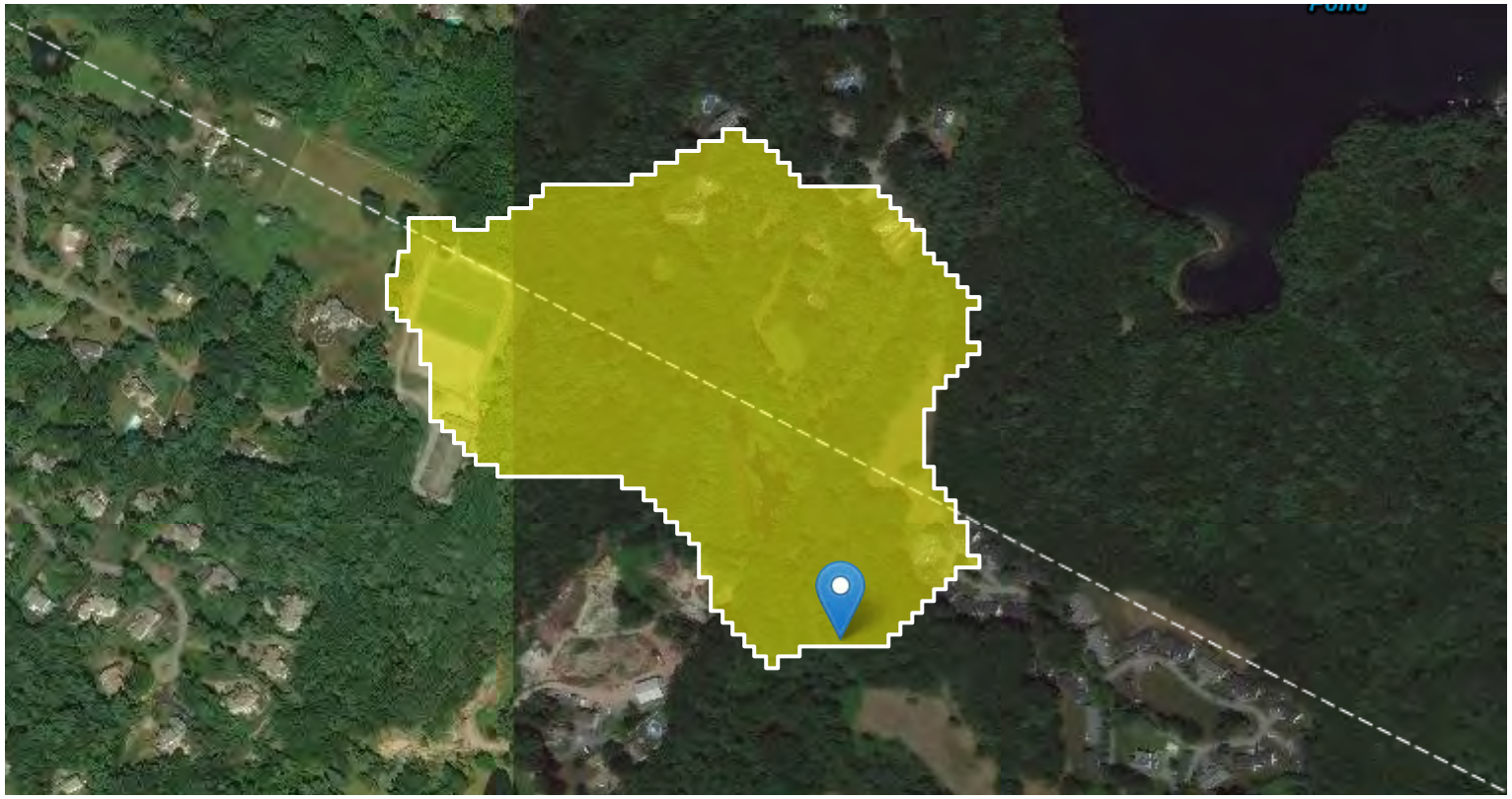
Time: 2020-05-14 14:38:15 -0400



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.0599	square miles
BSLDEM250	Mean basin slope computed from 1:250K DEM	2.973	percent
DRFTPERSTR	Area of stratified drift per unit of stream length	0.0938	square mile per mile
MAREGION	Region of Massachusetts 0 for Eastern 1 for Western	0	dimensionless

Low-Flow Statistics Parameters[Statewide Low Flow WRIR00 4135]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.0599	square miles	1.61	149
BSLDEM250	Mean Basin Slope from 250K DEM	2.973	percent	0.32	24.6
DRFTPERSTR	Stratified Drift per Stream Length	0.0938	square mile per mile	0	1.29
MAREGION	Massachusetts Region	0	dimensionless	0	1

Low-Flow Statistics Disclaimers[Statewide Low Flow WRIR00 4135]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors

Low-Flow Statistics Flow Report[Statewide Low Flow WRIR00 4135]

Statistic	Value	Unit
7 Day 2 Year Low Flow	0.00236	ft^3/s
7 Day 10 Year Low Flow	0.00075	ft^3/s

Low-Flow Statistics Citations

Ries, K.G., III,2000, Methods for estimating low-flow statistics for Massachusetts streams: U.S. Geological Survey Water Resources Investigations Report 00-4135, 81 p. (http://pubs.usgs.gov/wri/wri004135/)

Application Version: 4.3.11

StreamStats Report

Region ID: MA
Workspace ID: MA20200514200930136000
Clicked Point (Latitude, Longitude): 42.36455, -71.42467
Time: 2020-05-14 16:09:46 -0400

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.1	square miles
BSLDEM250	Mean basin slope computed from 1:250K DEM	0.27	percent
DRFTPERSTR	Area of stratified drift per unit of stream length	0.41	square mile per mile
MAREGION	Region of Massachusetts 0 for Eastern 1 for Western	0	dimensionless

Low-Flow Statistics Parameters[Statewide Low Flow WRIR00 4135]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.1	square miles	1.61	149
BSLDEM250	Mean Basin Slope from 250K DEM	0.27	percent	0.32	24.6
DRFTPERSTR	Stratified Drift per Stream Length	0.41	square mile per mile	0	1.29
MAREGION	Massachusetts Region	0	dimensionless	0	1

Low-Flow Statistics Disclaimers[Statewide Low Flow WRIR00 4135]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors

Low-Flow Statistics Flow Report[Statewide Low Flow WRIR00 4135]

Statistic	Value	Unit
7 Day 2 Year Low Flow	0.00504	ft^3/s
7 Day 10 Year Low Flow	0.00125	ft^3/s

Low-Flow Statistics Citations

Ries, K.G., III,2000, Methods for estimating low-flow statistics for Massachusetts streams: U.S. Geological Survey Water Resources Investigations Report 00-4135, 81 p. (http://pubs.usgs.gov/wri/wri004135/)

Application Version: 4.3.11

StreamStats Report

Region ID: MA
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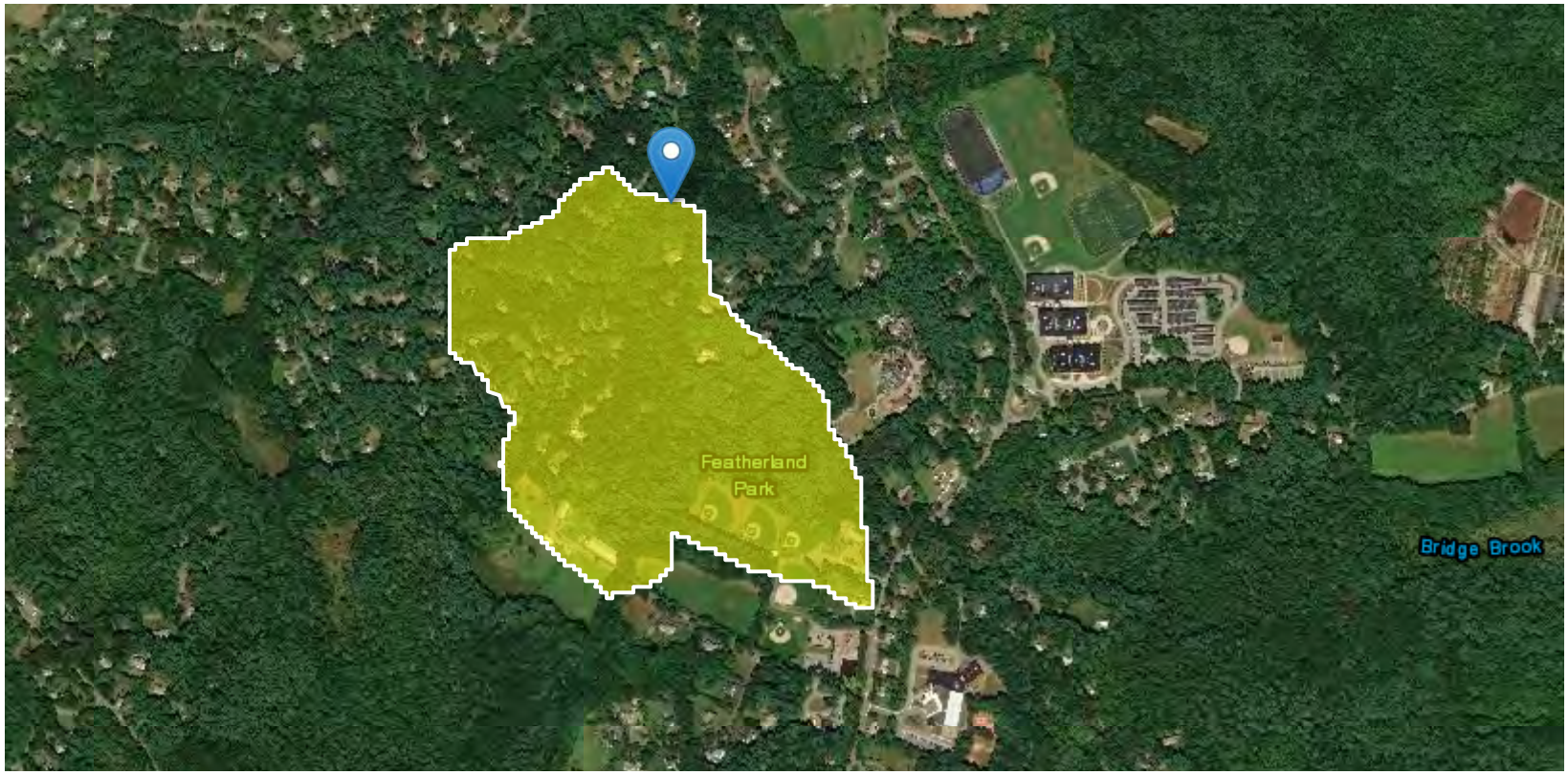

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.15	square miles
BSLDEM250	Mean basin slope computed from 1:250K DEM	4.861	percent
DRFTPERSTR	Area of stratified drift per unit of stream length	0.18	square mile per mile
MAREGION	Region of Massachusetts 0 for Eastern 1 for Western	0	dimensionless

Low-Flow Statistics Parameters[Statewide Low Flow WRIR00 4135]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.15	square miles	1.61	149
BSLDEM250	Mean Basin Slope from 250K DEM	4.861	percent	0.32	24.6
DRFTPERSTR	Stratified Drift per Stream Length	0.18	square mile per mile	0	1.29
MAREGION	Massachusetts Region	0	dimensionless	0	1

Low-Flow Statistics Disclaimers[Statewide Low Flow WRIR00 4135]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors

Low-Flow Statistics Flow Report[Statewide Low Flow WRIR00 4135]

Statistic	Value	Unit
7 Day 2 Year Low Flow	0.0105	ft^3/s
7 Day 10 Year Low Flow	0.00436	ft^3/s

Low-Flow Statistics Citations

Ries, K.G., III,2000, Methods for estimating low-flow statistics for Massachusetts streams: U.S. Geological Survey Water Resources Investigations Report 00-4135, 81 p. (http://pubs.usgs.gov/wri/wri004135/)

Application Version: 4.3.11

StreamStats Report

Region ID: MA
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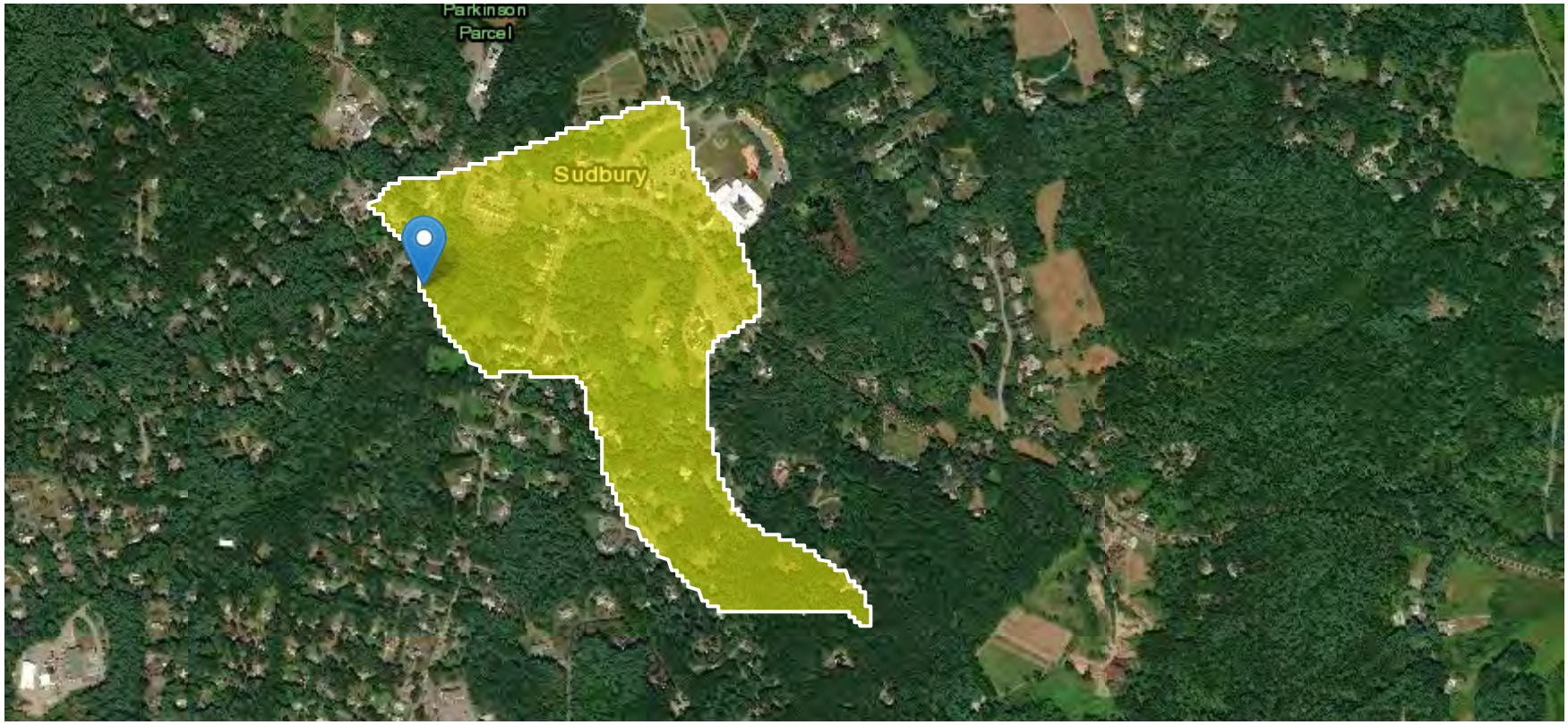

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.16	square miles
BSLDEM250	Mean basin slope computed from 1:250K DEM	2.589	percent
DRFTPERSTR	Area of stratified drift per unit of stream length	0.000877	square mile per mile
MAREGION	Region of Massachusetts 0 for Eastern 1 for Western	0	dimensionless

Low-Flow Statistics Parameters[Statewide Low Flow WRIR00 4135]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.16	square miles	1.61	149
BSLDEM250	Mean Basin Slope from 250K DEM	2.589	percent	0.32	24.6
DRFTPERSTR	Stratified Drift per Stream Length	0.000877	square mile per mile	0	1.29
MAREGION	Massachusetts Region	0	dimensionless	0	1

Low-Flow Statistics Disclaimers[Statewide Low Flow WRIR00 4135]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors

Low-Flow Statistics Flow Report[Statewide Low Flow WRIR00 4135]

Statistic	Value	Unit
7 Day 2 Year Low Flow	0.00395	ft^3/s
7 Day 10 Year Low Flow	0.00102	ft^3/s

Low-Flow Statistics Citations

Ries, K.G., III,2000, Methods for estimating low-flow statistics for Massachusetts streams: U.S. Geological Survey Water Resources Investigations Report 00-4135, 81 p. (http://pubs.usgs.gov/wri/wri004135/)

Application Version: 4.3.11

StreamStats Report

Region ID: MA
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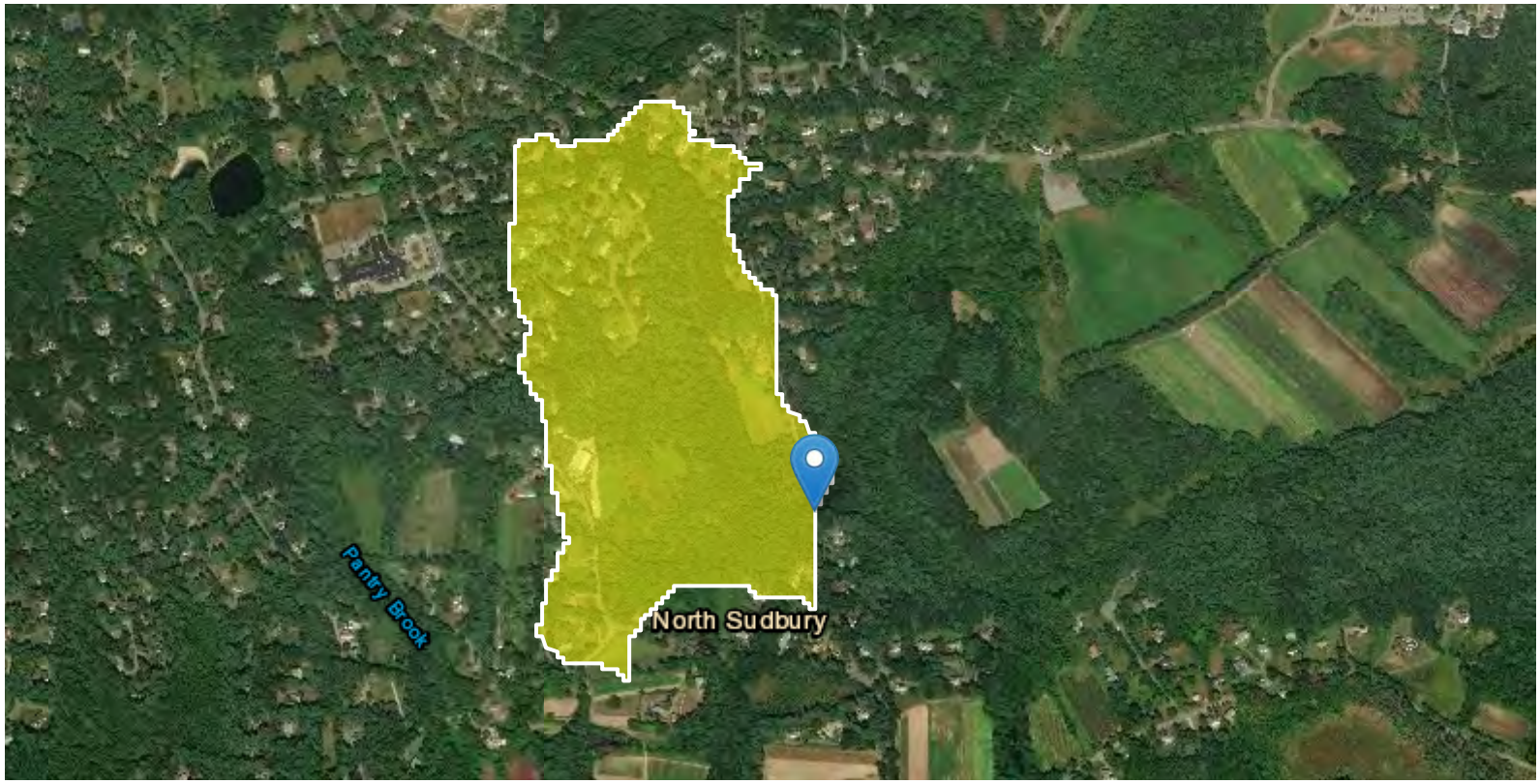

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.16	square miles
BSLDEM250	Mean basin slope computed from 1:250K DEM	1.946	percent
DRFTPERSTR	Area of stratified drift per unit of stream length	0.35	square mile per mile
MAREGION	Region of Massachusetts 0 for Eastern 1 for Western	0	dimensionless

Low-Flow Statistics Parameters[Statewide Low Flow WRIR00 4135]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.16	square miles	1.61	149
BSLDEM250	Mean Basin Slope from 250K DEM	1.946	percent	0.32	24.6
DRFTPERSTR	Stratified Drift per Stream Length	0.35	square mile per mile	0	1.29
MAREGION	Massachusetts Region	0	dimensionless	0	1

Low-Flow Statistics Disclaimers[Statewide Low Flow WRIR00 4135]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors

Low-Flow Statistics Flow Report[Statewide Low Flow WRIR00 4135]

Statistic	Value	Unit
7 Day 2 Year Low Flow	0.0132	ft^3/s
7 Day 10 Year Low Flow	0.00514	ft^3/s

Low-Flow Statistics Citations

Ries, K.G., III,2000, Methods for estimating low-flow statistics for Massachusetts streams: U.S. Geological Survey Water Resources Investigations Report 00-4135, 81 p. (http://pubs.usgs.gov/wri/wri004135/)

Application Version: 4.3.11

StreamStats Report

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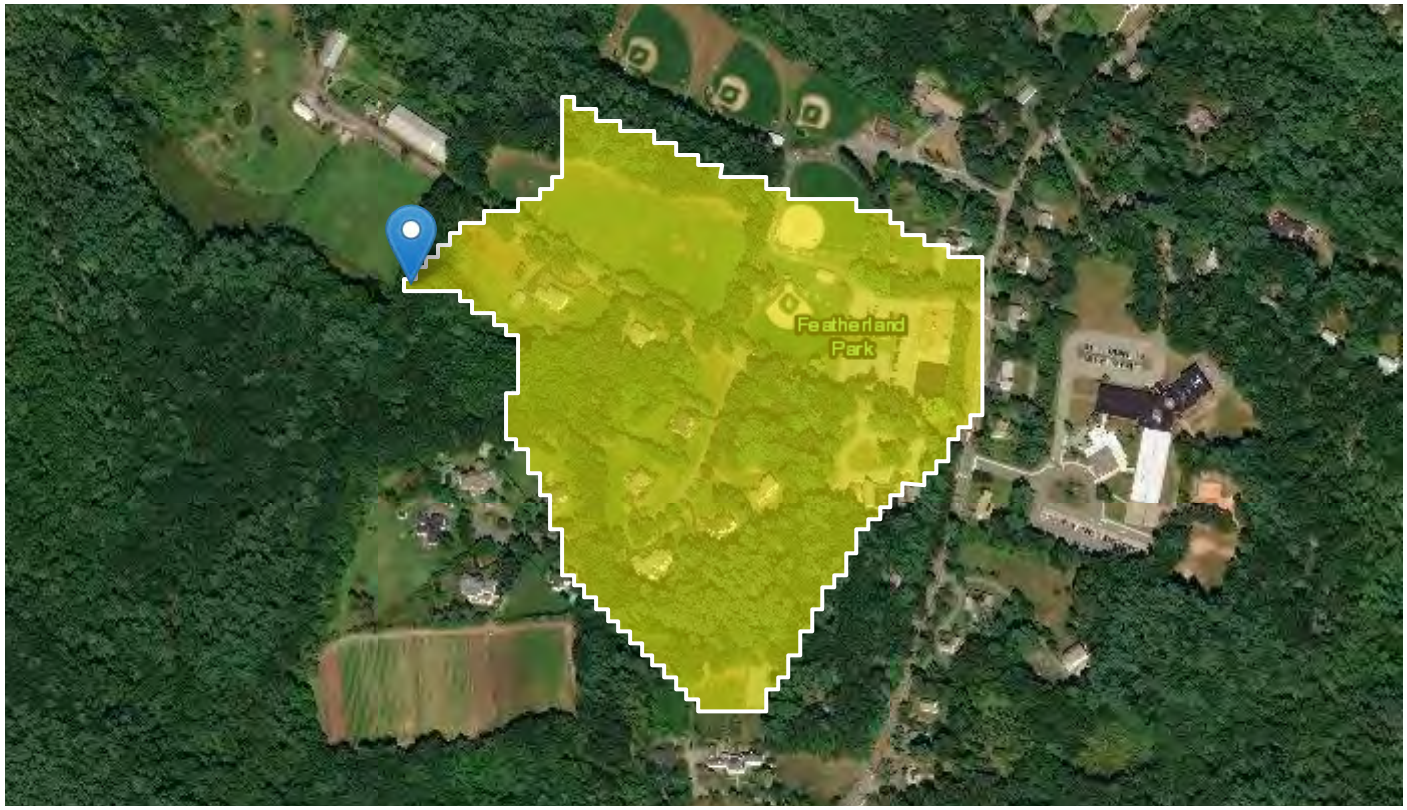

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.0587	square miles
BSLDEM250	Mean basin slope computed from 1:250K DEM	1.79	percent
DRFTPERSTR	Area of stratified drift per unit of stream length	-100000	square mile per mile
MAREGION	Region of Massachusetts 0 for Eastern 1 for Western	0	dimensionless

Low-Flow Statistics Parameters[Statewide Low Flow WRIR00 4135]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.0587	square miles	1.61	149
BSLDEM250	Mean Basin Slope from 250K DEM	1.79	percent	0.32	24.6
DRFTPERSTR	Stratified Drift per Stream Length	-100000	square mile per mile	0	1.29
MAREGION	Massachusetts Region	0	dimensionless	0	1

Low-Flow Statistics Flow Report[Statewide Low Flow WRIR00 4135]

Statistic	Value	Unit

Low-Flow Statistics Citations

Application Version: 4.3.11

StreamStats Report

Region ID: MA
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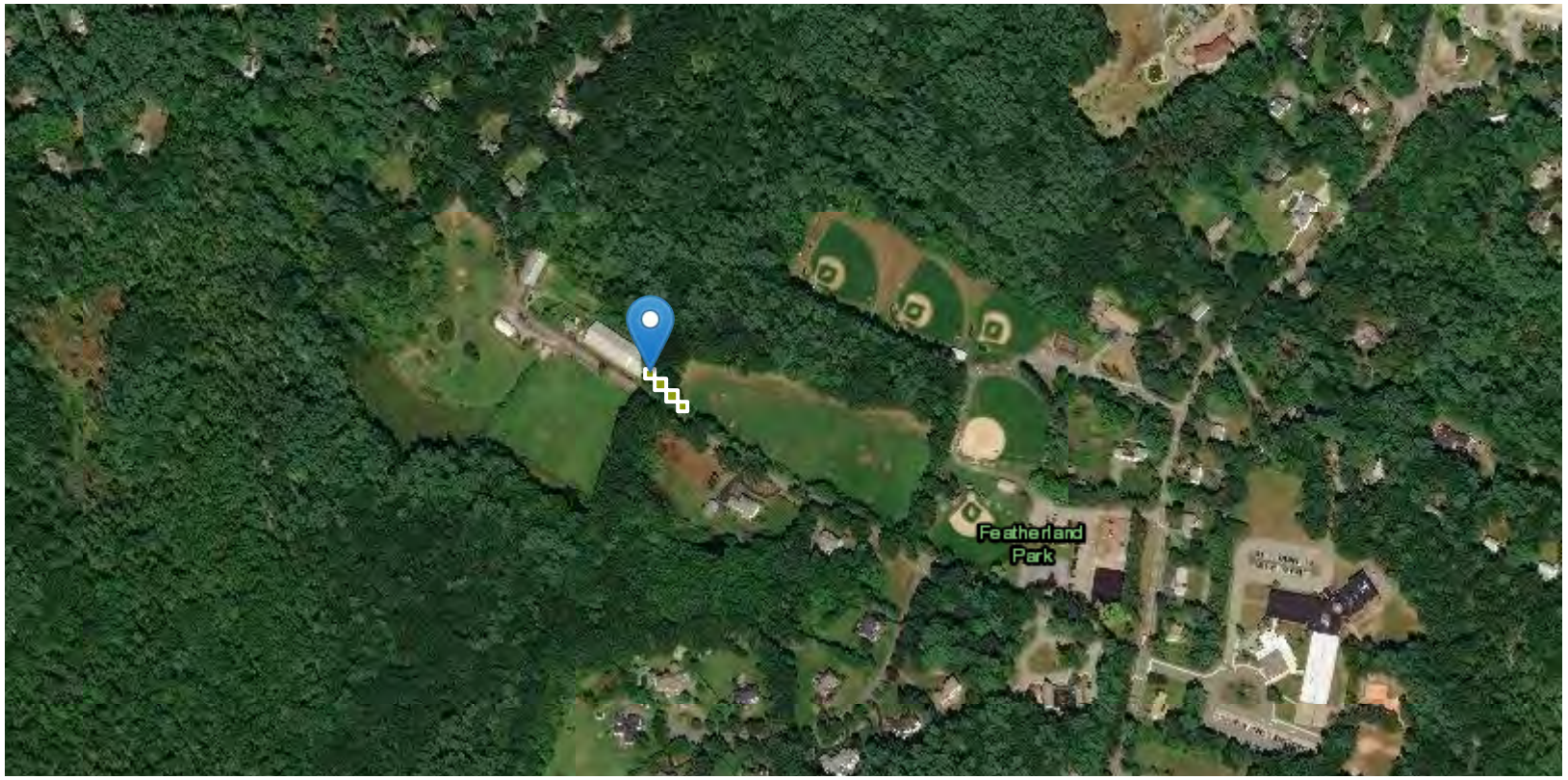


Basin Characteristics

Parameter Code	Parameter Description	Value	Unit

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.000154	square miles
BSLDEM250	Mean basin slope computed from 1:250K DEM		percent
DRFTPERSTR	Area of stratified drift per unit of stream length	-100000	square mile per mile
MAREGION	Region of Massachusetts 0 for Eastern 1 for Western	0	dimensionless

Low-Flow Statistics Parameters[Statewide Low Flow WRIR00 4135]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.000154	square miles	1.61	149
BSLDEM250	Mean Basin Slope from 250K DEM		percent	0.32	24.6
DRFTPERSTR	Stratified Drift per Stream Length	-100000	square mile per mile	0	1.29
MAREGION	Massachusetts Region	0	dimensionless	0	1

Low-Flow Statistics Flow Report[Statewide Low Flow WRIR00 4135]

Statistic	Value	Unit

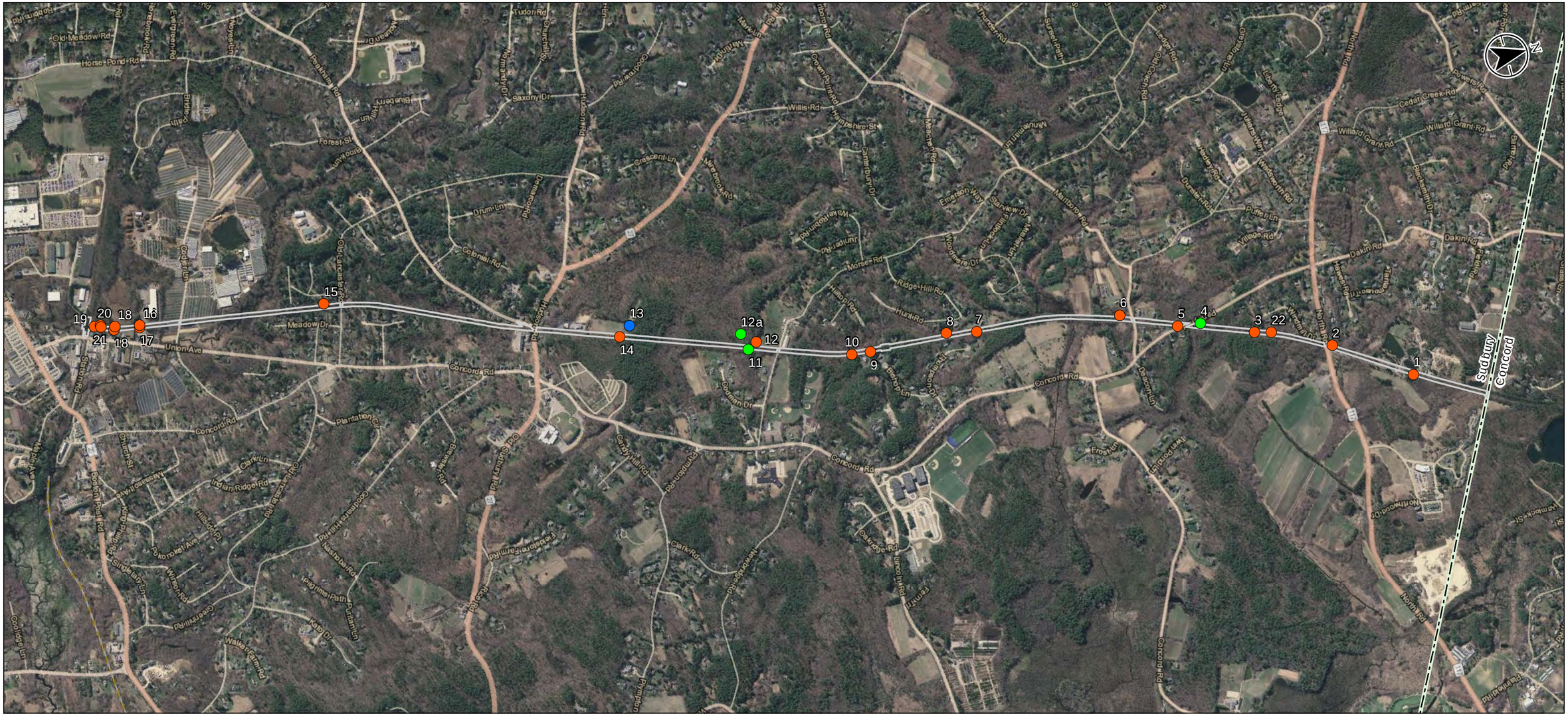
Low-Flow Statistics Citations

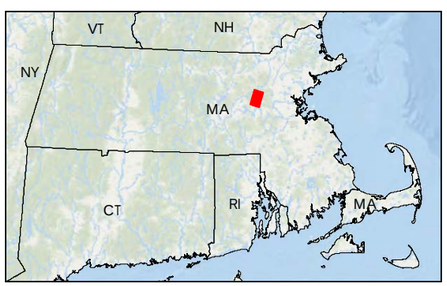
Application Version: 4.3.11

Attachment C

Vernal Pool Investigations

Prepared by VHB and Stantec





Notes
1. Coordinate System: NAD 1983 StatePlane Massachusetts Mainland FIPS 2001
2. Orthoimagery: MassGIS 2013-2014 USGS Color Orthoimagery

Legend

Vernal Pool Location
- NHESP Certified Vernal Pool
- Eligible to be Certified by NHESP
- Not Eligible to be Certified by NHESP

Town Boundary

Subury Rail Trail

Data Sources
1. Vernal pools 1 - 19 were digitized from the Existing Conditions Survey Plan At Proposed Rail Trail in Sudbury Mass., prepared by Atlantic Engineering and Survey Consultants Inc., dated June 30, 2008.
2. Potential Vernal Pools 12a, 20 - 22 were located by Stantec on 4/17/2018 and 4/18/2018.
3. Sudbury Rail Trail provided by MassGIS Sudbury parcel data layer.

0 1,000 2,000 Feet

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Stantec

Project Location
Sudbury, Massachusetts

179410498

Prepared by GC on 2018-05-01
Reviewed by DN on 2018-05-01

Client/Project
Sudbury Rail Trail

Figure No.
1

Title
2018 Potential Vernal Pool Survey

Table 1. Vernal Pool Survey Results: 2015, 2017 & 2018: Bruce Freeman Rail Trail, Sudbury, Massachusetts

2015	VHB		2017	VHB		2018	Stantec	
	Water Depth (in)	**Findings**		**Volume** (>200 cubic ft.)	**Findings**		**Water Depth** (in)	**Findings**
PVP 1	<1	No VP species found.	PVP 1	Yes	No VP species found.	PVP 1	2	No VP species found.
PVP 2	24-48	No VP species found.	PVP 2	Yes	No VP species found.	PVP 2	25	No VP species found.
PVP 3	2-3	No VP species found.	PVP 3	Yes	No VP species found.	PVP 3	8	No VP species found.
PVP 4	6-15	1 wood frog egg mass and 2 spotted salamander egg masses	PVP 4	Yes	12 wood frog egg masses, 100+ wood frog tadpoles, and 1 dead adult wood frog	PVP 4	12	Appx. 20 wood frog egg masses.
PVP 5	2-12	No VP species found. 1 predacious diving bettle observed.	PVP 5	No	No VP species found.	PVP 5	20	No VP species found.
PVP 6	2-6	No VP species found. Direct outlet to adjacent stream	PVP 6	Yes	No VP species found.	PVP 6	12	No VP species found. Pooled area in stream floodplain and fish observed.
PVP 7	6-8	No VP species found. Limited opportunity for egg mass attachment.	PVP 7	No	No VP species found.	PVP 7	11	No VP species found.
PVP 8	2-3	No VP species found. Water was flowing through area instead of ponding due to topography.	PVP 8	Yes	No VP species found. 1 adult green frog found.	PVP 8	0	No VP species found. Stream floodplain with no discernable pool boundary or pooled area.
SVP 9[1]	2-5	No VP species found.	SVP 9[1]	Yes	No VP species found.	SVP 9[1]	24	2 dead salamanders; lead phase of eastern red-backed salamander (NHESP confirmed species identification).
PVP 10	0	No VP species found. Area was dry at time of inspection.	PVP 10	No	No VP species found.	PVP 10	0	No VP species found; area dry at time of inspection.
PVP 11	10-12	8 spotted salamander egg masses. Appx. 5 small (4in) fish swimming near some of the egg masses.	PVP 11	Yes	1 dead adult wood frog.	PVP 11	11	20 mole salamander spermatophores.
PVP 12	12-24	No VP species found. Limited opportunity for egg mass attachment.	PVP 12	Yes	No VP species found. Limited opportunity for egg mass attachment (2015 results).	PVP 12	>12	Farm pond beyond fence noted in 2015 and 2017. Expected to be permanent wetland.
						PVP 12a[2, 4]	10	9 wood frog egg masses.
CVP 13[3]	5-24	15+ spotted salamander egg masses, 15+ blue spotted salamander egg masses, 10+ wood frog egg masses found.	CVP 13[3]	Yes	15+ spotted salamander egg masses, 15+ blue spotted salamander egg masses, 15+ fairy shrimp.	CVP 13[3]	>36	52 spotted salamander egg masses, 73 blue-spotted salamander egg masses, 72 wood frog egg masses, and fairy shrimp.
PVP 14	4-6	No VP species found.	PVP 14	Yes	1 dead adult blue spotted salamander found. No other VP species found.	PVP 14		No VP species found.
PVP 15	4-18	1 wood frog egg mass found. No other signs of VP species.	PVP 15	No	No VP species found. No water present at time of inspection.	PVP 15	18	No VP species found.
PVP 16	2-10	No VP species found (10 wood frog egg masses found on 4/22/15).	PVP 16	Yes	No VP species found.	PVP 16		No VP species found.
PVP 17	0-6	No VP species found. Oil sheen present throughout isolated wetland.	PVP 17	No	No VP species found.	PVP 17	24	1 wood frog egg mass.
PVP 18	0-12	No VP species found.	PVP 18	Yes	No VP species found.	PVP 18	32	Intermitttent spring peeper calls.
PVP 19	0	No VP species found. Area was dry at time of inspection.	PVP 19	Yes	No VP species found.	PVP 19	16	No VP species found.
						PVP 20[4]	6	1 adult gray treefrog.
						PVP 21[4]	16	No VP species found.
						PVP 22[4]	8	No VP species found.

Bold text were identified as eligible for NHESP certification.

Notes:

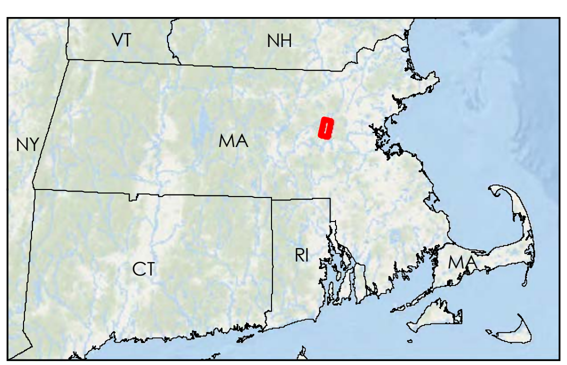
[1] Previously identified as Subdbury Vernal Pool.

[2] Potential Vernal Pool surveyed in 2018 and located south of the PVP 12 surveyed in 2015 and 2017.

[3] Previously Certified by NHESP.

[4] New Potential Vernal Pool identified in 2018.

FIGURES



Legend

- Bruce Freeman Rail Trail
- Town Boundary

Notes

1. Coordinate System: NAD 1983 StatePlane Massachusetts Mainland FIPS 2001
2. Data Sources: Administrative boundaries provided by Bureau of Geographic Information (MassGIS). Bruce Freeman Rail Trail provided by MassGIS Sudbury parcel data layer.
3. Background: Orthoimagery: MassGIS 2013-2014 USGS Color Orthoimagery

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N

Stantec

Project Location
Sudbury, Massachusetts

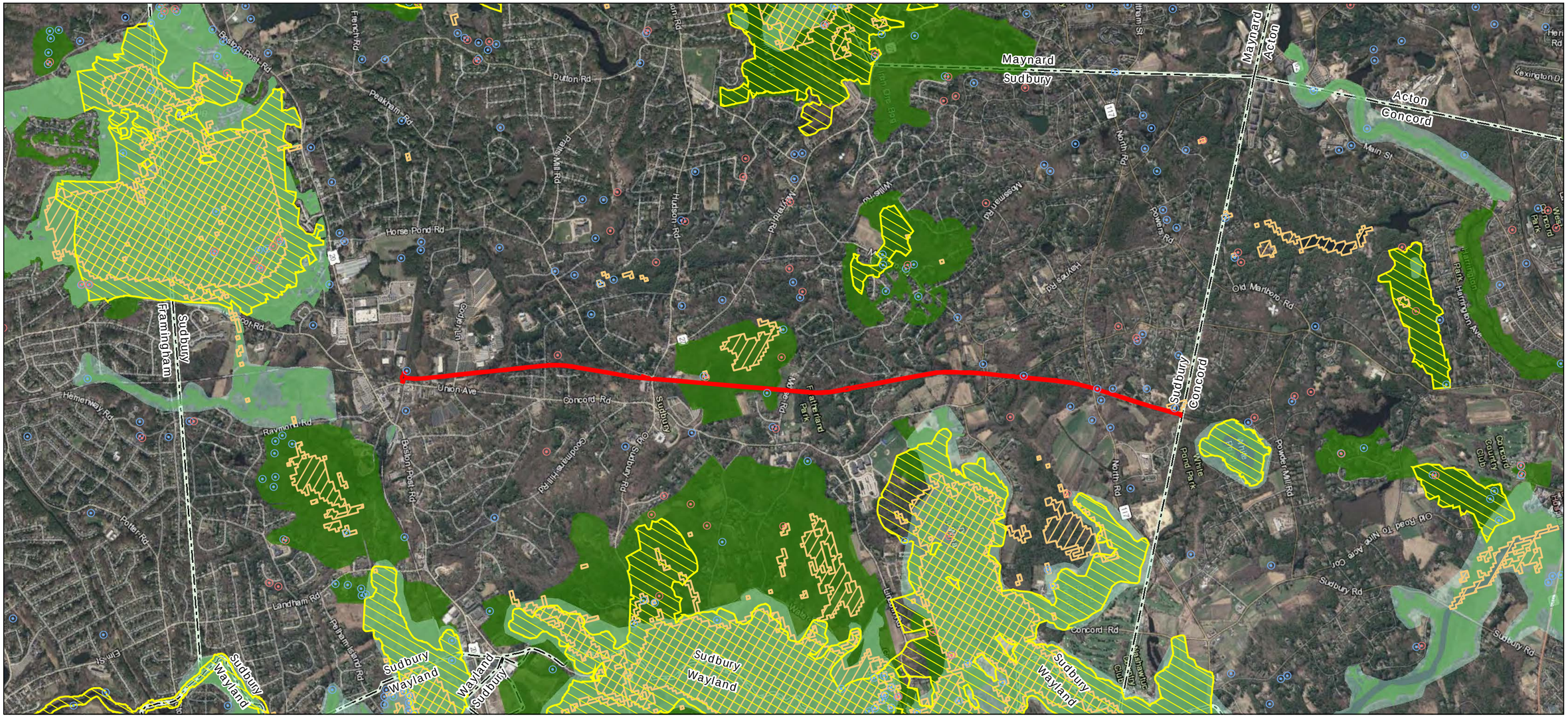
Prepared by REM on 2019-02-20
IR Review by DGN on 2019-02-21

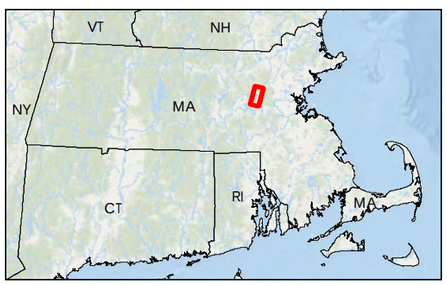
Client/Project 179410498
MassDOT
Bruce Freeman Rail Trail
Sudbury, MA

Figure No.
1

Title
Project Location Map

\\us1241-f01\workgroup\1956\active_Task Owner and other Non-BC1956 Jobs\179410498\03_data\gis_cad\gis\MXDs\SudburyRailTrail_WildlifeHabitatReport\179410498_01_Location.mxd Revised: 2019-04-17 By: rmack





Legend

- Bruce Freeman Rail Trail
- NHESP Potential Vernal Pools
- NHESP Certified Vernal Pools
- NHESP Priority Habitats of Rare Species (August 2017)
- UMass CAPS Habitat of Potential Statewide or Regional Importance
- BioMap2 Core Habitat
- BioMap2 Critical Natural Landscape
- Town Boundary

Feet 0 3,000 6,000

(At original document size of 11x17)
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Notes

1. Coordinate System: NAD 1983 StatePlane Massachusetts Mainland FIPS 2001
2. Data Sources: Administrative boundaries, NHESP data, and BioMap2 habitat and landscape data provided by Bureau of Geographic Information (MassGIS). CAPS habitat data provided by UMass. Bruce Freeman Rail Trail provided by MassGIS Sudbury parcel data layer.
3. Background: Orthoimagery: MassGIS 2013-2014 USGS Color Orthoimagery

Stantec

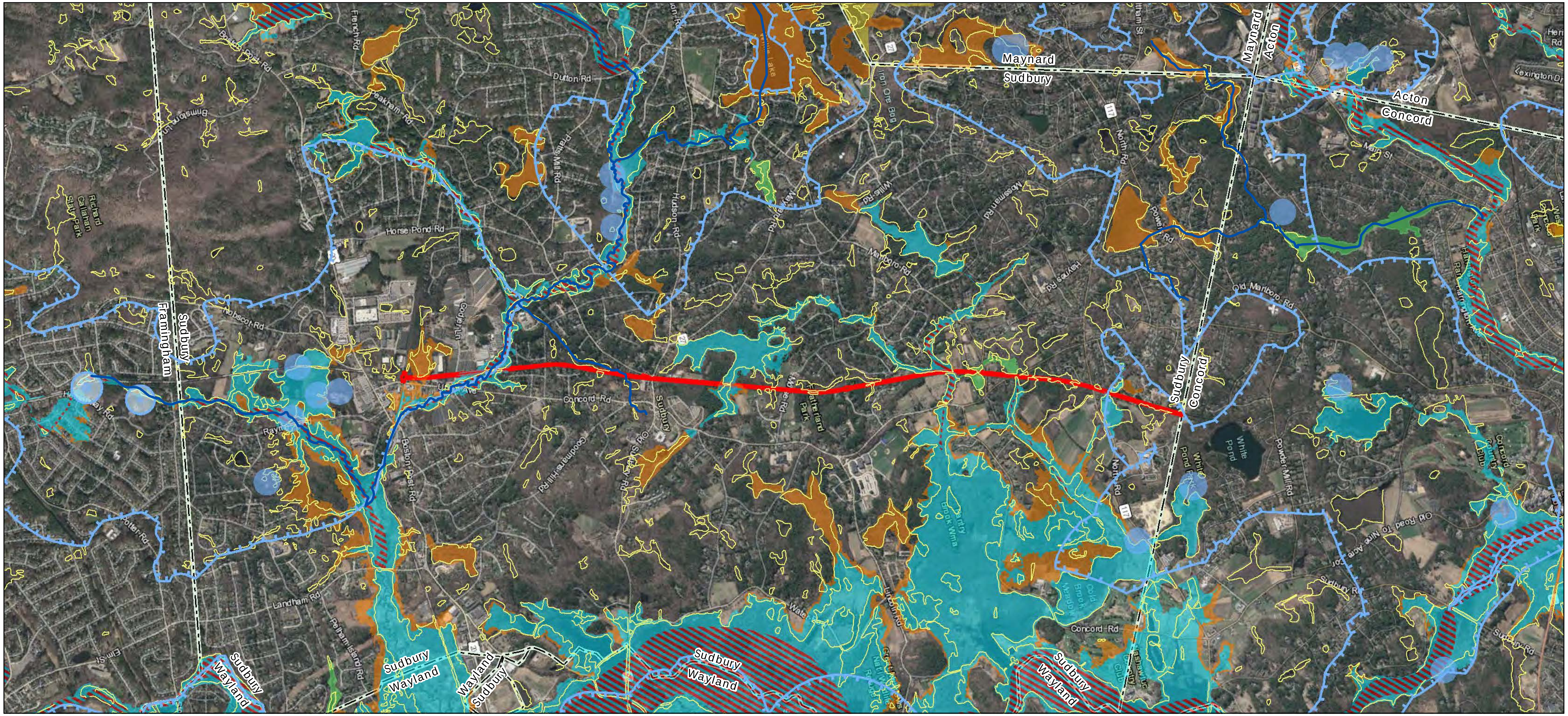
Project Location
Sudbury, Massachusetts

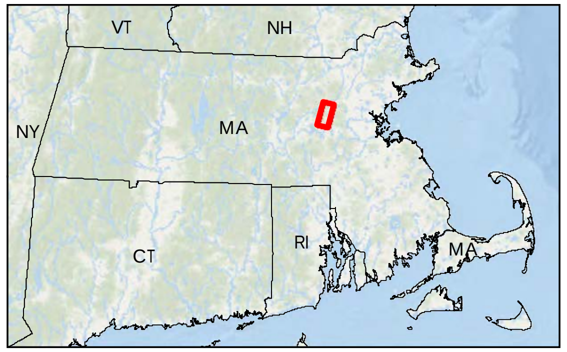
Prepared by REM on 2019-02-20
IR Review by DGN on 2019-02-21

Client/Project 179410498
MassDOT
Bruce Freeman Rail Trail
Sudbury, MA

Figure No.
2a

Title
Natural Resources Data Review
National Heritage Resources





Legend

Bruce Freeman Rail Trail

Apparent Wetland Limit (DEP)

DFW Coldwater Fisheries Resources

FEMA National Flood Hazard Layer

A: 1% Annual Chance of Flooding, no BFE

AE: 1% Annual Chance of Flooding, with BFE

AE: Regulatory Floodway

D: Possible But Undetermined Hazard

X: 0.2% Annual Chance of Flooding

Surface Water Protection Areas

Zone A

Zone B

Zone C

Wellhead Protection Area

IWPAs

Zone Is

Zone IIs

Town Boundary

Feet 0 3,000 6,000

(At original document size of 11x17)
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Notes

1. Coordinate System: NAD 1983 StatePlane Massachusetts Mainland FIPS 2001

2. Data Sources: DFW coldwater fisheries resources, WPAs, DEP apparent wetland limit, SWPAs, FEMA National Flood Hazard layer, and administrative boundaries provided by Bureau of Geographic Information (MassGIS). Bruce Freeman Rail Trail provided by MassGIS Sudbury parcel data layer.

3. Background: Orthoimagery: MassGIS 2013-2014 USGS Color Orthoimagery

Stantec

Project Location
Sudbury, Massachusetts

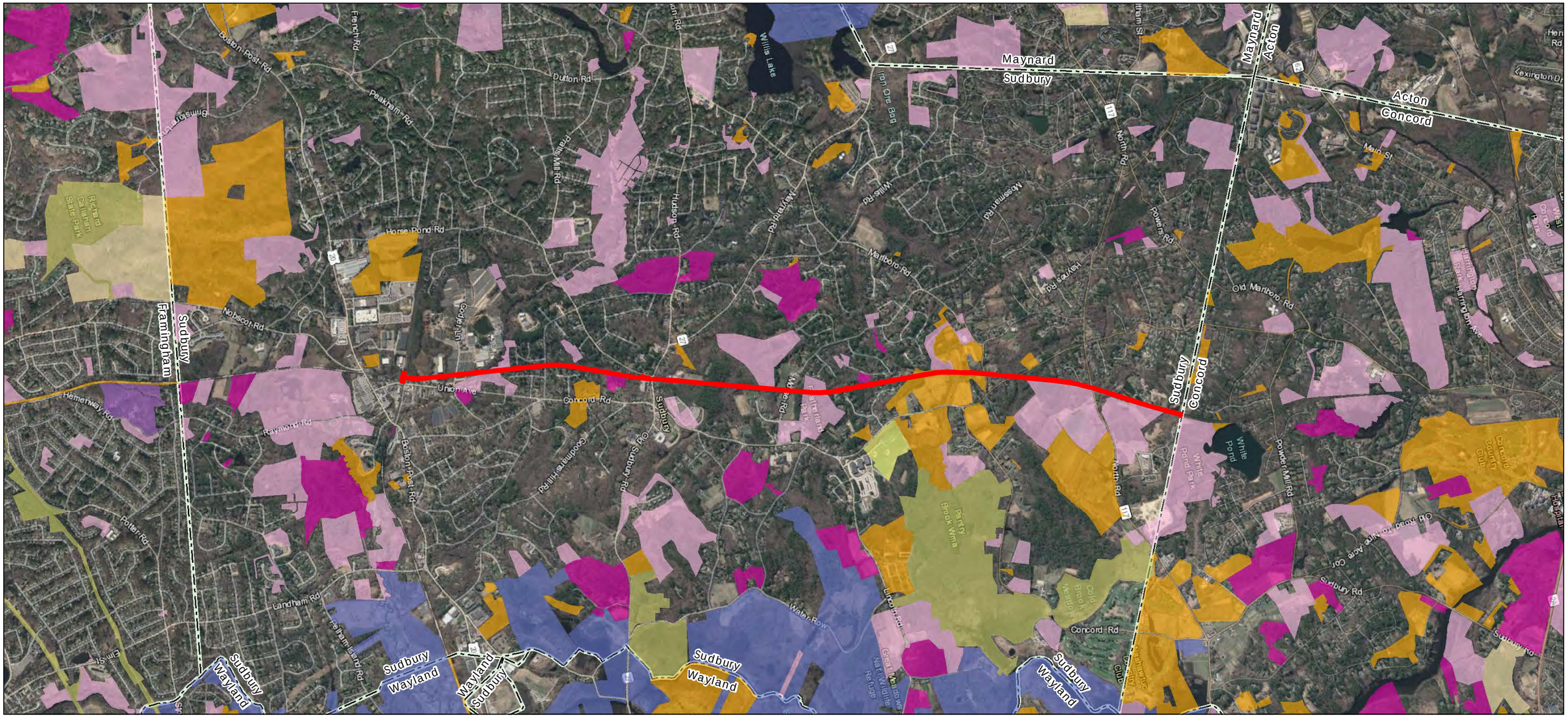
Prepared by REM on 2019-02-20
IR Review by DGN on 2019-02-21

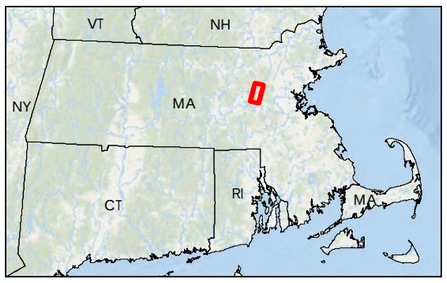
Client/Project 179410498
MassDOT
Bruce Freeman Rail Trail
Sudbury, MA

Figure No.
2b

Title
Natural Resources Data Review MassDEP Resources and FEMA National Flood Hazard

\\us1241-f01\workgroup\1956\active_Task Owner and other Non-BC1956 Jobs\179410498\03_data\gis_cad\gis\MXDs\SudburyRailTrail_WildlifeHabitatReport\179410498_02b_NaturalResourceReview.mxd Revised: 2019-04-17 By: rmack





Legend

- Bruce Freeman Rail Trail
- Town Boundary

Protected and Recreational OpenSpace

- Conservation Organization
- Federal
- Land Trust
- Municipal
- Other
- Private
- Private Non-Profit
- State

Notes

1. Coordinate System: NAD 1983 StatePlane Massachusetts Mainland FIPS 2001
2. Data Sources: Protected and recreational open space and administrative boundaries provided by Bureau of Geographic Information (MassGIS). Bruce Freeman Rail Trail provided by MassGIS Sudbury parcel data layer.
3. Background: Orthoimagery: MassGIS 2013-2014 USGS Color Orthoimagery

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Stantec

Project Location
Sudbury, Massachusetts

Prepared by REM on 2019-02-20
IR Review by DGN on 2019-02-21

Client/Project 179410498
MassDOT
Bruce Freeman Rail Trail
Sudbury, MA

Figure No.
2c

Title
Natural Resources Data Review
Open Space

To: Jodie Kablack – Town of Sudbury Date: May 22, 2015

Project #: 12984.00

From: Meghan Selby, Environmental Scientist Re: Vernal Pool Investigation

Memorandum

This memorandum describes the results of a field investigation that was conducted along the proposed Bruce Freeman Rail Trail (BFRT) corridor on April 24, 2015. The investigation included verifying the presence or absence of egg masses or individuals of obligate vernal pool species within certified and potential vernal pools along the BFRT corridor (Figure 1).

The *Existing Conditions Survey Plan at Proposed Rail Trail in Sudbury, Mass.,* prepared by Atlantic Engineering & Survey Consultants Inc., dated June 30, 2008, was used as the base for the vernal pool investigation (Attachment A). The plan set identified a single certified vernal pool (CVP), numerous potential vernal pools (PVPs), a single Sudbury vernal pool (SVP), and isolated wetlands. In addition to the previously identified areas the field team walked the corridor looking for any additional areas that had vernal pool characteristics. The following lists of vernal pool criteria were used as the basis for documenting areas along the corridor.

The results of the investigation are summarized in Table 1 and described in further detail the following sections.

Vernal Pool Criteria

The March 2009 *Guidelines for the Certification of Vernal Pool Habitat* (Guidelines) defines the Vernal Pool Certification Criteria based on biological and physical evidence.

Biological criteria include:

- Obligate species (wood frog (*Lithobates sylvaticus*), spotted salamander (*Ambystoma maculatum*), blue-spotted salamander (*A. laterale*), Jefferson salamander (*A. jeffersonianum*), and marbled salamander (*A. opacum*)
    - Wood frog chorusing
    - At least 5 pairs of mated wood frogs
    - At least 5 egg masses of either wood frogs or spotted salamanders
    - One egg mass of state-listed blue-spotted or Jefferson salamander
    - Mating adult salamanders
    - Salamander spermatophores
    - Salamander or wood frog larvae
    - Fairy shrimp (*Anostraca: Eubranchipus*)
- Facultative species (spring peeper, gray treefrog, American toad, Folwer's toad) – at least two species must be present.
    - Adult chorusing
    - At least 5 mated pairs
    - Any number of egg masses

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- Tadpoles

Physical criteria include evidence that there is a pool with no permanently flowing outlet (no culvert or stream). The Guidelines defines Vernal Pool Boundary as:

- A distinct and clear topographic break at the edge of a pool or
- The maximum observed or recorded extent of flooding, as evidenced by:
  - Leaf staining or other indicators of hydrology, or
  - The mean annual high water mark as observed in March through early April.

The *Sudbury Wetlands Administration Bylaw Regulations* (Revised August 11, 2014) further defines a vernal pool as:

> *any confined basin or depression not occurring in existing lawns, gardens, landscaped areas, or driveways which, at least in most years, holds water for a minimum of two continuous months during the spring and/or summer, contains at least 200 cubic feet of water at some time during most years, is free of adult predatory fish populations, and provides essential breeding and rearing habitat functions for amphibian, reptile, or other vernal pool community species.*

Results

Results from the investigation are summarized in the following table and described in greater detail in the following section.

Table 1. Vernal Pool Investigation Results Summary

ID	Between Stations	Water Depth (in)	Findings
PVP 1	468.00-468.50	<1	No VP species found.
PVP 2	453.00-457.00	24-48	No VP species found.
PVP 3	440.50-441.50	2-3	No VP species found.
PVP 4*	431.50-435.00	6-15	1 wood frog egg mass and 2 spotted salamander egg masses.
PVP 5*	427.50-429.25	2-12	No VP species found. 1 predacious diving beetle observed.
PVP 6*	418.00-419.00	2-6	No VP species found. Direct outlet to adjacent stream.
PVP 7	393.50-395.50	6-8	No VP species found. Limited opportunity for egg mass attachment.
PVP 8	389.00-390.50	2-3	No VP species found. Water was flowing through area instead of ponding due to topography.
SVP 9	376.50-377.50	2-5	No VP species found.
PVP 10	373.00-374.50	0	No VP species found. Area was dry at time of inspection.

ID	Between Stations	Water Depth (in)	Findings
PVP 11*	384.50-385.50	10-12	8 spotted salamander egg masses. Approx. 5 small (~4in) fish swimming near some of the egg masses.
PVP 12*	354.50-356.00	12-24	No VP species found. Limited opportunity for egg mass attachment.
CVP 13*	336.00-337.00	5-24	15+ blue spotted salamander, 15+ spotted salamander, and 10+ wood frog egg masses found.
PVP 14*	334.00-335.00	4-6	No VP species found.
PVP 15	284.50-286.50	4-18	1 wood frog egg mass found. No other signs of VP species.
PVP 16	254.50-255.50	2-10	No VP species found. (~10 wood frog egg masses found on 4/22/15)
PVP 17	254.50-256.00	0-6	No VP species found. Oil sheen present throughout isolated wetland.
PVP 18	249.00-254.00	0-12	No VP species found.
PVP 19	247.00-248.00	0	No VP species found. Area was dry at time of inspection.

*Areas within mapped priority and estimated habitat as provided by NHESP.

Based on the findings of the April 2015 survey of potential vernal pools along the proposed Bruce Freeman Rail Trail in Sudbury, only Potential Vernal Pools 4, 11, 15, and 16 are eligible for certification as Vernal Pools with the Natural Heritage and Endangered Species Program. Vernal Pool 13 is already certified and was confirmed with by our findings. Although a single wood frog egg mass was observed within Potential Vernal Pool 15, it would not meet NHESP certification requirements.

The following are photographs from the field investigation of each of the pools, and additional site specific notes.

Potential Vernal Pool Area 1 – Between Stations 468.00 and 468.50.

PVP 1 was within a larger wetland complex. The area does not appear to hold enough water long enough for VP species utilization. Water levels were less than 1 inch. No VP species were observed.

Potential Vernal Pool Area 2 – Between Stations 453.00 and 457.00.

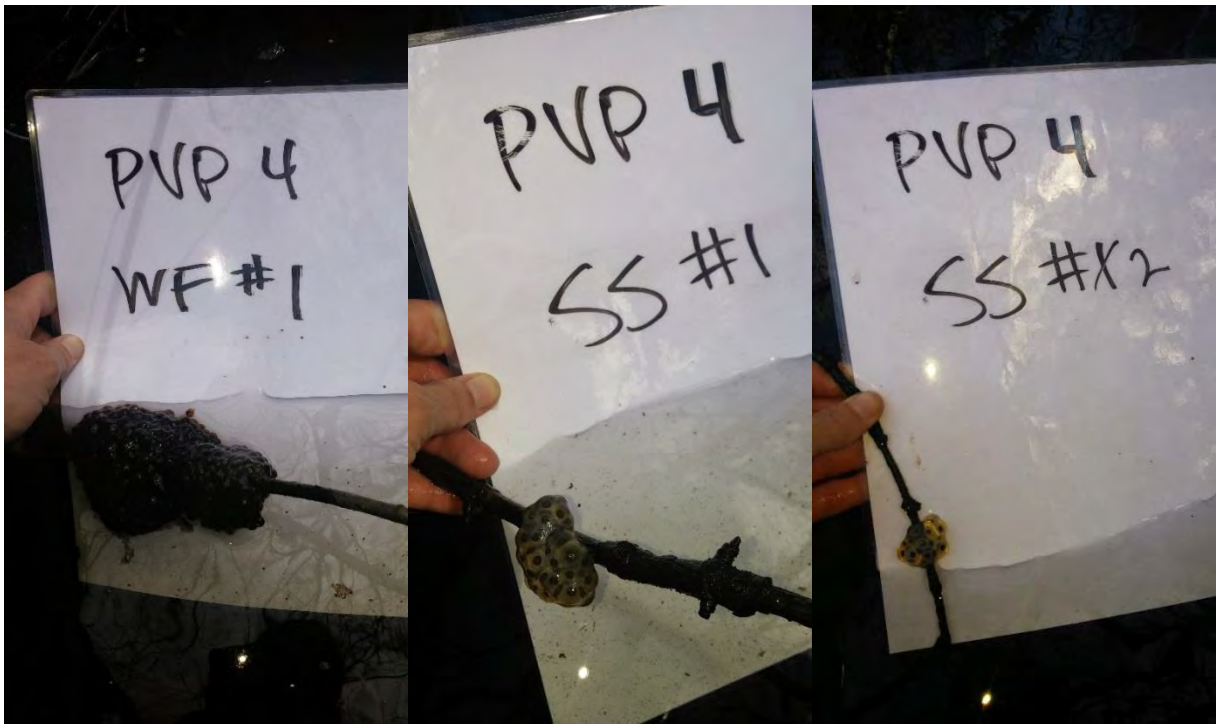
PVP 2 is part of a larger wetland complex. Water levels were to a depth of approximately 2 feet along the outer edge and up to 4 feet within the center of the pool. Despite the abundance of suitable egg laying locations (over hanging branches) no VP species or evidence of species was observed during the investigation.

Potential Vernal Pool Area 3 – Between Stations 440.50 and 441.50.

PVP 3 is a shallow and narrow depression that runs parallel to the rail bed. Water depths were 2-3 inches and no VP species were observed.

Potential Vernal Pool Area 4 – Between Stations 431.50 and 435.00.

PVP 4 is to the east of Pantry Road and on the western limit of the BFRT corridor. The pool had standing water ranging from 6 to 15 inches. High levels of iron were observed within the pool. Numerous branches were positioned along the edge of the pool, creating good egg mass attachment opportunities.



One wood frog and two spotted salamander egg masses were found within PVP 4. This area is within Priority Habitat of Rare Species (PH 617) and Estimated Habitat of Rare Wildlife (EH 543).

Potential Vernal Pool Area 5 – Between Stations 427.50 and 429.25.

PVP 5 is a narrow depression with shallow pockets of water along the fringes and up to 12 inches in the center. No VP species were observed within the pool. Clumps of algae were observed on some branches and within the deeper sections of the water. This area is within Priority Habitat of Rare Species (PH 617) and Estimated Habitat of Rare Wildlife (EH 543).

Potential Vernal Pool Area 6 – Between Stations 418.00 and 419.00.

PVP 6 is a shallow depression adjacent to a stream. Standing water within the depression ranged from 2 to 6 inches. No VP species were observed. This area is within Priority Habitat of Rare Species (PH 617) and Estimated Habitat of Rare Wildlife (EH 543).

Water within the PVP 6 area was actively draining into the adjacent stream at the time of the inspection.

Potential Vernal Pool Area 7 – Between Stations 393.50 and 395.50.

PVP 7 is a shallow depression with standing water ranging from 6 to 8 inches. The depression was approximately 10 feet at its widest point. No VP species were observed.

Potential Vernal Pool Area 8 – Between Stations 389.00 and 390.50.

PVP 8 is a shallow secondary channel adjacent to a well-defined stream. No VP species were observed.

PVP 8 had flowing water ranging from 2 to 3 inches deep before the confluence with the main stream channel.

Sudbury Vernal Pool 9 – Between Stations 376.50 and 377.50.

SVP 9 had approximately 2 to 5 inches of standing water. No permanent outlet was present. No VP species were observed.

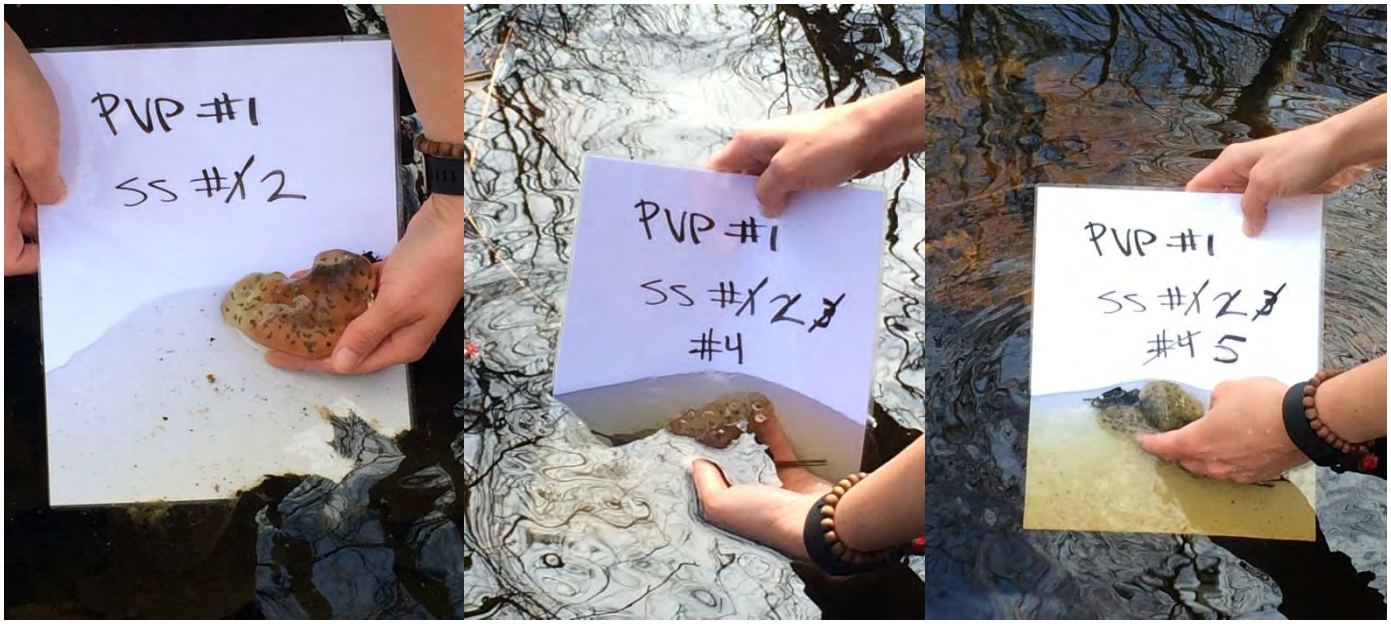
Potential Vernal Pool Area 10 – Between Stations 373.00 and 374.50.

PVP 10 is a channel like depression that runs along rail bed's the toe of slope. The area was dry at the time of inspection. Based on topography within this area it is unlikely that water ponds up for the requisite period of time for VP species to utilization. No VP species were found.

Potential Vernal Pool Area 11 – Between Stations 384.50 and 385.50.

PVP 11 is part of a larger wetland complex. The southern extent of the complex (as pictured above) had standing water between 10 and 12 inches.

The northern extent of the wetland complex (PVP 11) transitions into a wide channel and to the northeast a pond. Small fish approximately 4 inches in length were primarily observed within the larger channel area and a few were found swimming within a few feet of the spotted salamander egg masses.



Eight spotted salamander egg masses were observed within PVP 11. These were localized within the southern extent of the wetland complex. This area is within Priority Habitat of Rare Species (PH 528) and Estimated Habitat of Rare Wildlife (EH 437).

Potential Vernal Pool Area 12 – Between Stations 354.50 and 356.00

PVP 12 is on the western side of the BFRT corridor, across from PVP 11. PVP 12 is a farm pond that has the potential to hold water through most of the year. Water depths were approximately 1 to 2 feet. There were little to no branches within the outer fringe of the pond along the eastern limit (within the ROW easement). No VP species were found. This area is within Priority Habitat of Rare Species (PH 528) and Estimated Habitat of Rare Wildlife (EH 437).

Certified Vernal Pool 13 – Between Stations 336.00 and 337.00.

CVP 13 is approximately 80 by 100 feet and had up to approximately 2 feet of standing water at the time of the inspection. This area is within Priority Habitat of Rare Species (PH 528) and Estimated Habitat of Rare Wildlife (EH 437).

Wood frog (10+), spotted salamander (15+), and blue-spotted salamander (15+) egg masses were found throughout the pool. A number of individual and clusters of 2-5 eggs were also found throughout and on the bottom of the pool.

Potential Vernal Pool Area 14 – Between Stations 334.00 and 335.00.

PVP 14 was holding approximately 4 to 6 inches of standing water at the time of inspection. This area is within Priority Habitat of Rare Species (PH 528) and Estimated Habitat of Rare Wildlife (EH 437). No VP species were found.

Potential Vernal Pool Area 15 – Between Stations 284.50 and 286.50.

PVP 15 is a narrow depression that is coincident with the rail bed's toe of slope. The center of the depression was holding approximately 18 inches of water at the time of inspection. One wood frog egg mass was found. No other VP species were observed.

Potential Vernal Pool Area 16 – Between Stations 254.50 and 255.50.

PVP 16 is within a constructed detention basin. At the time of inspection standing water reached depths of 10 inches in the southern extent and the basin was dry in the northern extent. No VP species were observed. An oil sheen was present on the surface of the water and small piles of snow and associated debris were present. During a flagging event on April 15, 2015 staff heard wood frog chorusing and noted multiple wood frog egg masses within the center of the pool.

Potential Vernal Pool Area 17 – Between Stations 254.50 and 256.00.

PVP 17 is an isolated wetland. The depression was holding up to 6 inches of water in the center. An oil sheen was present within the pool and no VP species were observed.

Potential Vernal Pool Area 18 – Between Stations 249.00 and 254.00.

PVP area 18 is part of a large cattail marsh wetland complex with a stream channel flowing through the center. The stream is carried under the rail road bed through a culvert and connects to a wetland on the eastern side of the alignment. The investigation was limited to the railroad easement and no VP species were found.

Potential Vernal Pool Area 19 – Between Stations 247.00 and 248.00

PVP 19 is an isolated wetland located to the west of the rail alignment. The area was dry at the time of the inspection and no VP species were found.

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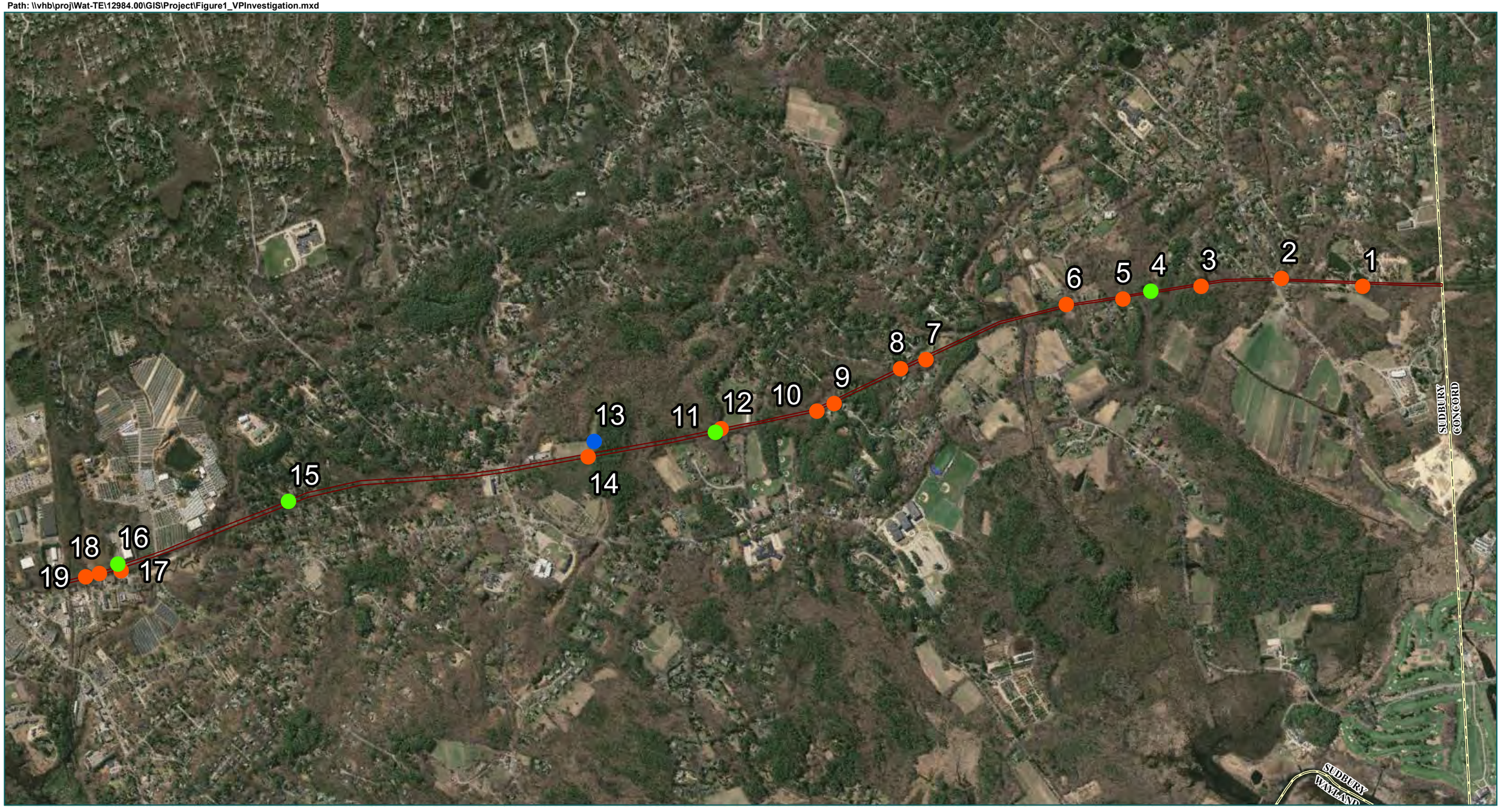

0 1,000 2,000 Feet

Legend

- Certified Vernal Pool
- Eligible to be Certified
- Non-Eligible to be Certified
- Bruce Freeman Rail Trail Corridor

vhb
Engineers | Scientists | Planners | Designers
101 Walnut Street, PO Box 9151, Watertown, MA 02471

Figure 1 – Site Location Map

Bruce Freeman Rail Trail
Sudbury, Massachusetts

Massachusetts Inland Resource Area Delineation Report

Prepared For: Town of Sudbury

Project Location: Bruce Freeman Rail Trail
Broadacre Farm
82 Morse Road, Sudbury, Massachusetts
MassDOT Project No. 608164
Parcels No. F09-0002

Inspection Date(s): December 2, 2020

Regulated Inland Wetland Resource Areas:

- ☒ Bank
- ☒ Land Under Water Bodies and Waterways
- ☐ Riverfront Area
- ☒ Buffer Zone
- ☐ Vernal Pool (Certified and/or Potential)
- ☒ Bordering Vegetated Wetland (BVW)
- ☐ Land Subject to Flooding (BLSF/ILSF)
- ☐ Isolated Vegetated Wetland
- ☐ Estimated Habitats of Rare Wildlife
- ☐ Priority Habitats of Rare Species

Delineated Resource Area Field Numbering Sequence
[as depicted on the attached Resource Areas Map]:

Bank: 20336-C300-C324
Bordering Vegetated Wetland (BVW): D400-441

Inland resource areas were delineated in accordance with applicable local, state and federal statutes, as detailed within the Resource Area Description attachment. This delineation does not constitute an official wetland boundary until such time as it is accepted and approved by local, state or federal regulatory agencies.

The wetlands delineation was conducted by:

Joshua H. Wilson, PWS
Sr. Wetland Scientist/Soil Scientist

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ATTACHMENTS

- Resource Area Description
- DEP Bordering Vegetated Wetland (310 CMR 10.55) Delineation Field Forms
- NRCS Soil Map and Soil Report
- Resource Areas Map

FUSS & O'NEILL

Massachusetts Inland Resource Area Delineation Report
Resource Area Description

Introduction

Fuss & O'Neill Inc. performed a wetland resource area field inspection and delineation at 82 Morse Road in the Town of Sudbury (Parcel #F09/0002). The field inspection and delineation occurred on December 2, 2020. The purpose of the delineation was to locate the jurisdictional limits of areas regulated under the Wetlands Protection Act (M.G.L. c. 131 sec. 40) and associated Wetlands Protection Act Regulations (310 CMR 10).

Bank, Lund Under Water and Waterways (LUWW), and Bordering Vegetated Wetland (BVW) inland wetland resource were identified and delineated during the field investigation. Consecutively numbered flags were placed in the field to demarcate these resource area boundaries. These resource area boundary flags will be located by field survey. The flags and corresponding resource area labels are depicted on the attached *Resource Areas Sketch Map*. Regulated Buffer Zone on the Site is measured horizontally from the boundaries of Bank and/or BVW.

Maps retrieved from MassGIS were used to determine if specific regulated inland wetland resources have been mapped and/or documented on the Site. MassGIS maps depicts Massachusetts Natural Heritage and Endangered Species Program (NHESP) Priority Habitats of Rare Species Along the southern boundary of the site (PH1349). No Certified Vernal Pools, or Bordering Land Subject to Flooding are mapped on or adjacent to the Site. A detailed description of each regulated resource area present on the Site is provided below.

Resource Areas

Bank: Regulatory Framework and Delineation Methodology

Bank is defined under 310 CMR 10.54(2)(c) as "*the portion of the land surface which normally abuts and confines a water body. It occurs between a water body and a vegetated bordering wetland and adjacent flood plain, or, in the absence of these, it occurs between a water body and an upland*." Fuss & O'Neill Inc. performed a delineation of Bank within the area of interest using consecutively numbered flags placed in the field to demarcate the Bank a former pond located on the site.

Bank: Resource Description

Bank was identified in the field by the first observable break in topography between the water body and the adjacent BVW or upland. The waterbody on the property is limited to a former farm pond. The delineated Bank around the pond coincided with the Mean Annual High-Water Line (MAHWL)/bankfull, as defined under 310 CMR 10.58 (2)(a)(2). No evidence of riverine characteristics was noted along the pond bank during the inspection (i.e., no discernible direction of flow, no evidence of scour, etc.).

Land under Water Bodies and Waterways (LUWW)

LUWW is defined under 310 CMR 10.56 (2)(a) as "*the land beneath any creek, river, stream, pond or lake. Said land may be composed of organic muck or peat, fine sediments, rocks or bedrock.*" The boundary of LUWW is defined as the mean annual low water level (310 CMR 10.56 (2)(c). LUWW was not specifically field delineated. For the intents and purposes of this resource area delineation, the delineated Banks of the former farm pond are analogous to the limits of LUWW.

Bordering Vegetated Wetlands (BVW): Regulatory Framework and Delineation Methodology

As stated in 310 CMR (2)(a), "*Bordering Vegetated Wetlands are freshwater wetlands which border on creeks, rivers, streams, ponds and lakes. The types of freshwater wetlands are wet meadows, marshes, swamps and bogs. Bordering Vegetated Wetlands are areas where the soils are saturated and/or inundated such that they support a predominance of wetland indicator plants. The ground and surface water regime and the vegetation community which occur in each type of freshwater wetland are specified in M.G.L. c 131 sec. 40.*"

Fuss & O'Neill Inc. inspected the Site for Bordering Vegetated Wetlands in accordance with methodology provided in the Massachusetts DEP handbook, *Delineating Bordering Vegetated Wetlands under the Massachusetts Wetlands Protection Act*, (March 1995), the 1987 *Corps of Engineers Wetlands Delineation Manual*, and the *Regional Supplement to the Corps of Engineers Wetlands Delineation Manual: Northcentral and Northeast Region* (Version 2.0. January 2012). Data regarding vegetation, soils, and hydrology was gathered to complete the required MassDEP BVW delineation field forms. Wetlands are categorized in accordance with *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin et.al. 1979).

Hydric soil determinations were made in accordance with *Field Indicators for Identifying Hydric Soils in New England* (NEIWPCC, 2004). The Wetland Indicator Status for plant species was ascertained using the USACE *Northcentral and Northeast 2016 Regional Wetland Plant List, Updated May 20, 2020.*

BVW: Resource Area Description

Vegetation

The two BVW delineated on the Site are classified primarily as palustrine emergent/scrub-shrub wetlands. Common vegetation identified within the scrub-shrub BVW includes [common name (*scientific name*, indicator status)]: red maple (*Acer rubrum*, FAC), green ash (*Fraxinus*

pensylvanica, FACW), common winterberry (*Ilex verticillata*, FACW), Tatarian honeysuckle (*Lonicera tatarica*, FACU), tussock sedge (*Carex stricta*, OBL), and skunk cabbage (*Symplocarpus foetidus*, OBL). Portions of the wetland were in a mowed field and did not contain sufficient vegetative growth for classification.

Hydrology

The BVW delineated are adjacent to the former farm pond. Surface water observed at the Site appears to originate primarily from groundwater; it is assumed that a small amount is contributed by runoff and overland sheet flow from precipitation. No streams, channels or other types of connection conveying surface water were found.

Soils

The Natural Resource Conservation Service (NRCS) mapped hydric soil types on the Site include: Wareham loamy fine sand and Raypole silt loam. Upland soils mapped at the site include Windsor loamy sand. Detailed information regarding each of these soil series is included within the NRCS Soil Map and Soil Report attachment. Results of the detailed field analyses of soils on the Site were generally consistent with the published NRCS soil mapping with minor exceptions.

Buffer Zone

Buffer Zone is defined in 310 CRM 10.04 as "*that area of land extending 100 feet horizontally outward from the boundary of any area specified in 310 CMR 10.02(1)(a)*." Buffer Zone within the area of interest is associated with BVW. The buffer zone on the Site contains upland forest and abandoned agricultural fields. Common vegetation within the Buffer Zone includes: red oak (*Quercus rubra*, FACU), red maple, eastern white pine (*Pinus strobus*, FACU), shagbark hickory (*Carya ovata,* UPL), multiflora rose (*Rosa multiflora,* FACU), Tatarian honeysuckle (*Lonicera tatarica,* FACU), silky dogwood, poison ivy (*Toxicodendron radicans,* FAC), fox grape, brambles (*Rubus spp.*), and Asiatic bittersweet (*Celastrus orbiculatus,* UPL).

DEP Bordering Vegetated Wetland (310 CMR 10.55) Delineation Field Forms

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

Applicant: Town of Sudbury Prepared by: Josh Wilson Project location: 82 Morse Rd Sudbury (wetland) 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.

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*
Acer rubrum	50%	50%	Yes	FAC*
Fraxinus pensylvanica	50%	50%	Yes	FACW
Ilex verticillata	30%	75%	Yes	FACW*
Lonceria tatarica	10%	25%	Yes	FACU
Carex stricta	10%	66%	Yes	OBL
Symplocarpus foetidus	5%	33%	Yes	OBL*

* *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: 5 Number of dominant non-wetland indicator plants: 6

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

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

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		
Other indicators of hydrology present		
Sample location is in a BVW	X	

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

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

Applicant: Town of Sudbury Prepared by: Josh Wilson Project location: 82 Morse Rd Sudbury (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.

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*
Dactylis glomerata	30%	35%	Yes	FACU
Elymus repens	30%	35%	Yes	FACU
Phleum pratense	25%	30%	Yes	FACU

* *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: 0 Number of dominant non-wetland indicator plants: 3

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

Section II. Indicators of Hydrology

Hydric Soil Interpretation

1. Soil Survey

Is there a published soil survey for this site? [yes] no
title/date: USDA Web Soil Survey
map number:
soil type mapped: Windsor loamy Sand
hydric soil inclusions:

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

2. Soil Description

Horizon	Depth	Matrix Color	Mottles Color	
Ap	0-12"	10YR2/1		fsl
Bw1	12-18"	2Y3/3		fsl
Bw2	18-24"	5YR6/3	2.5Y6/6	sl

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: >24"
- ❑ 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	____	____
Sample location is in a BVW	____	X

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

NRCS Soil Map and Soil Report

Hydric Rating by Map Unit—Middlesex County, Massachusetts
(20200785.A10 - BFRT, Sudbury, MA)

Map Scale: 1:1,800 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 25 50 100 150

Feet: 0 50 100 200 300

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

MAP LEGEND

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

Soils

Soil Rating Polygons
- Hydric (100%)
- Hydric (66 to 99%)
- Hydric (33 to 65%)
- Hydric (1 to 32%)
- Not Hydric (0%)
- Not rated or not available

Soil Rating Lines
- Hydric (100%)
- Hydric (66 to 99%)
- Hydric (33 to 65%)
- Hydric (1 to 32%)
- Not Hydric (0%)
- Not rated or not available

Soil Rating Points
- Hydric (100%)
- Hydric (66 to 99%)
- Hydric (33 to 65%)
- Hydric (1 to 32%)
- Not Hydric (0%)
- Not rated or not available

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:25,000.

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

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

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

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

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

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

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 21, Sep 2, 2021

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

Date(s) aerial images were photographed: Aug 31, 2020—Oct 22, 2020

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

Hydric Rating by Map Unit

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
32B	Wareham loamy fine sand, 0 to 5 percent slopes	85	3.3	38.4%
33B	Raypol silt loam, 0 to 5 percent slopes	98	3.3	39.2%
255A	Windsor loamy sand, 0 to 3 percent slopes	0	1.9	22.4%
Totals for Area of Interest			**8.5**	**100.0%**

Description

This rating indicates the percentage of map units that meets the criteria for hydric soils. Map units are composed of one or more map unit components or soil types, each of which is rated as hydric soil or not hydric. Map units that are made up dominantly of hydric soils may have small areas of minor nonhydric components in the higher positions on the landform, and map units that are made up dominantly of nonhydric soils may have small areas of minor hydric components in the lower positions on the landform. Each map unit is rated based on its respective components and the percentage of each component within the map unit.

The thematic map is color coded based on the composition of hydric components. The five color classes are separated as 100 percent hydric components, 66 to 99 percent hydric components, 33 to 65 percent hydric components, 1 to 32 percent hydric components, and less than one percent hydric components.

In Web Soil Survey, the Summary by Map Unit table that is displayed below the map pane contains a column named 'Rating'. In this column the percentage of each map unit that is classified as hydric is displayed.

Hydric soils are defined by the National Technical Committee for Hydric Soils (NTCHS) as soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part (Federal Register, 1994). Under natural conditions, these soils are either saturated or inundated long enough during the growing season to support the growth and reproduction of hydrophytic vegetation.

The NTCHS definition identifies general soil properties that are associated with wetness. In order to determine whether a specific soil is a hydric soil or nonhydric soil, however, more specific information, such as information about the depth and duration of the water table, is needed. Thus, criteria that identify those estimated soil properties unique to hydric soils have been established (Federal Register, 2002). These criteria are used to identify map unit components that normally are associated with wetlands. The criteria used are selected estimated soil properties that are described in "Soil Taxonomy" (Soil Survey Staff, 1999) and "Keys to Soil Taxonomy" (Soil Survey Staff, 2006) and in the "Soil Survey Manual" (Soil Survey Division Staff, 1993).

If soils are wet enough for a long enough period of time to be considered hydric, they should exhibit certain properties that can be easily observed in the field. These visible properties are indicators of hydric soils. The indicators used to make onsite determinations of hydric soils are specified in "Field Indicators of Hydric Soils in the United States" (Hurt and Vasilas, 2006).

References:

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18.

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service. U.S. Department of Agriculture Handbook 436.

Soil Survey Staff. 2006. Keys to soil taxonomy. 10th edition. U.S. Department of Agriculture, Natural Resources Conservation Service.

Rating Options

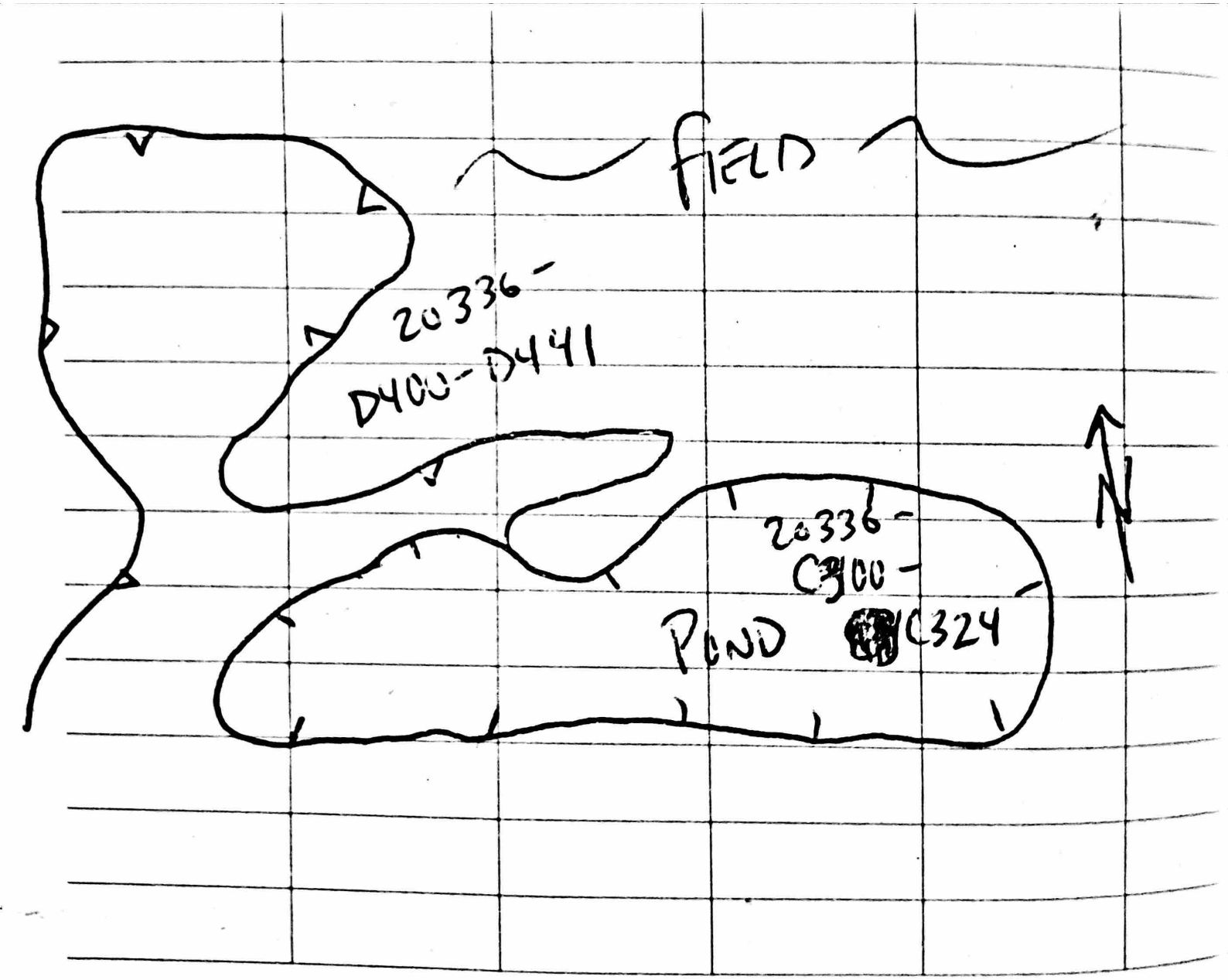
Aggregation Method: Percent Present

Component Percent Cutoff: None Specified

Tie-break Rule: Lower

FUSS & O'NEILL

Resource Areas Map



Resource Area Delineation Sketch
82 Morse Rd, Sudbury, MA
Delineated by: Josh Wilson, Fuss & O'Neill
Delineated: 12/2/2020

Massachusetts Inland Resource Area Delineation Report

Prepared For: Town of Sudbury

Project Location: Bruce Freeman Rail Trail
Davis Field
195 North Rd, Sudbury, Massachusetts
MassDOT Project No. 608164
Parcels No. C10-0500

Inspection Date(s): December 2, 2020

Regulated Inland Wetland Resource Areas:

- ☐ Bank
- ☐ Land Under Water Bodies and Waterways
- ☐ Riverfront Area
- ☒ Buffer Zone
- ☐ Vernal Pool (Certified and/or Potential)
- ☒ Bordering Vegetated Wetland (BVW)
- ☐ Land Subject to Flooding (BLSF/ILSF)
- ☐ Isolated Vegetated Wetland
- ☐ Estimated Habitats of Rare Wildlife
- ☐ Priority Habitats of Rare Species

Delineated Resource Area Field Numbering Sequence
[as depicted on the attached Resource Areas Map]:

Bordering Vegetated Wetland (BVW): E500-E506

Inland resource areas were delineated in accordance with applicable local, state and federal statutes, as detailed within the Resource Area Description attachment. This delineation does not constitute an official wetland boundary until such time as it is accepted and approved by local, state or federal regulatory agencies.

The wetlands delineation was conducted by:

Joshua H. Wilson, PWS
Sr. Wetland Scientist/Soil Scientist

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Maine
California

ATTACHMENTS

- Resource Area Description
- DEP Bordering Vegetated Wetland (310 CMR 10.55) Delineation Field Forms
- NRCS Soil Map and Soil Report
- Resource Areas Map

FUSS & O'NEILL

Massachusetts Inland Resource Area Delineation Report
Resource Area Description

Introduction

Fuss & O'Neill Inc. performed a wetland resource area field inspection and delineation at 195 North Road in the Town of Sudbury (Parcel #C10-0500). The field inspection and delineation occurred on December 2, 2020. The purpose of the delineation was to locate the jurisdictional limits of areas regulated under the Wetlands Protection Act (M.G.L. c. 131 sec. 40) and associated Wetlands Protection Act Regulations (310 CMR 10). For the purposes of this project, the resource delineation effort was focused within 100 feet of the proposed bike trail corridor. All resources on the parcel were not delineated.

Bordering Vegetated Wetland (BVW) inland wetland resource was identified and delineated during the field investigation. Consecutively numbered flags were placed in the field to demarcate these resource area boundaries. These resource area boundary flags will be located by field survey. The flags and corresponding resource area labels are depicted on the attached *Resource Areas Sketch Map*. Regulated Buffer Zone on the Site is measured horizontally from the boundaries of BVW.

Maps retrieved from MassGIS were used to determine if specific regulated inland wetland resources have been mapped and/or documented on the Site. MassGIS maps do not depict Massachusetts Natural Heritage and Endangered Species Program (NHESP) Priority Habitats of Rare Species, Certified Vernal Pools, or Bordering Land Subject to Flooding on the Site. A detailed description of each regulated resource area present on the Site is provided below.

Resource Areas

Bordering Vegetated Wetlands (BVW): Regulatory Framework and Delineation Methodology

As stated in 310 CMR (2)(a), "*Bordering Vegetated Wetlands are freshwater wetlands which border on creeks, rivers, streams, ponds and lakes. The types of freshwater wetlands are wet meadows, marshes, swamps and bogs. Bordering Vegetated Wetlands are areas where the soils are saturated and/or inundated such that they support a predominance of wetland indicator plants. The ground and surface water regime and the vegetation community which occur in each type of freshwater wetland are specified in M.G.L. c 131 sec. 40.*"

Fuss & O'Neill Inc. inspected the Site for Bordering Vegetated Wetlands in accordance with methodology provided in the Massachusetts DEP handbook, *Delineating Bordering Vegetated Wetlands under the Massachusetts Wetlands Protection Act*, (March 1995), the 1987 *Corps of Engineers Wetlands Delineation Manual*, and the *Regional Supplement to the Corps of Engineers Wetlands Delineation Manual: Northcentral and Northeast Region* (Version 2.0. January 2012). Data regarding vegetation, soils, and hydrology was gathered to complete the

required MassDEP BVW delineation field forms. Wetlands are categorized in accordance with *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin et.al. 1979).

Hydric soil determinations were made in accordance with *Field Indicators for Identifying Hydric Soils in New England* (NEIWPCC, 2004). The Wetland Indicator Status for plant species was ascertained using the USACE *Northcentral and Northeast 2016 Regional Wetland Plant List, Updated May 20, 2020.*

BVW: Resource Area Description

Vegetation

The BVW delineated on the Site are classified primarily as palustrine emergent wetlands. Common vegetation identified within the emergent BVW includes [common name (*scientific name*, indicator status)]: cattail (*Typha latifolia*, OBL), purple loosestrife (*Lythrum saliceria*, OBL) and silky dogwood (*Cornus amomum*, FACW). Portions of the wetland were in a mowed field and did not contain sufficient vegetative growth for classification.

Hydrology

The BVW delineated appear to part of an excavated drainage feature. Surface water observed at the Site appears to originate primarily from groundwater; it is assumed that a moderate amount of hydrologic flow is contributed by runoff and overland sheet flow from precipitation. No streams, channels or other types of connection conveying surface water were identified in the area of interest.

Soils

The Natural Resource Conservation Service (NRCS) does not map hydric soil types in the area of interest. Hydric soils in the vicinity of the area of interest include Scarboro muck and Swansea muck. Soils mapped in area of interest are upland soils, specifically, Sudbury fine sandy loam. Detailed information regarding each of these soil series is included within the NRCS Soil Map and Soil Report attachment. Results of the detailed field analyses of soils on the Site were generally consistent with the published NRCS soil mapping except for the BVW delineated in the area of interest. The soil in this delineated area is consistent with the Walpole sandy loam series.

Buffer Zone

Buffer Zone is defined in 310 CRM 10.04 as "*that area of land extending 100 feet horizontally outward from the boundary of any area specified in 310 CMR 10.02(1)(a)*." Buffer Zone within the area of interest is associated with BVW. The buffer zone on the Site contains upland forest

and abandoned agricultural fields. Common vegetation within the Buffer Zone includes red oak (*Quercus rubra*, FACU), red maple (*Acer rubrum*, FACW), sugar maple (*Acer saccharum*, FACU), eastern white pine (*Pinus strobus*, FACU), shagbark hickory (*Carya ovata,* UPL), multiflora rose (*Rosa multiflora,* FACU), Tatarian honeysuckle (*Lonicera tatarica,* FACU), silky dogwood, poison ivy (*Toxicodendron radicans,* FAC), fox grape, brambles (*Rubus spp.*), and Asiatic bittersweet (*Celastrus orbiculatus,* UPL).

DEP Bordering Vegetated Wetland (310 CMR 10.55) Delineation Field Forms

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

Applicant: Town of Sudbury Prepared by: Josh Wilson Project location: 195 North Rd Sudbury (wetland) 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.

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*
Typha latifolia	25%	25%	Yes	OBL
Lythrum saliceria	75%	75%	Yes	OBL
Cornus amomum	50%	100%	Yes	FACW

* *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: 3 Number of dominant non-wetland indicator plants: 0

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

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

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		
Other indicators of hydrology present		
Sample location is in a BVW	X	

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

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

Applicant: Town of Sudbury Prepared by: Josh Wilson Project location: 195 North Rd Sudbury (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.

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*
Mowed field (species not identified)				

* *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

Section II. Indicators of Hydrology

Hydric Soil Interpretation

1. Soil Survey

Is there a published soil survey for this site? [yes] no
title/date: USDA Web Soil Survey
map number:
soil type mapped: Sudbury fine sandy loam
hydric soil inclusions:

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

2. Soil Description

Horizon	Depth	Matrix Color	Mottles Color
Ap	0-12"	10YR3/4	fsl
Bw1	12-15"	10YR5/6	fsl
Bw2	15-24"	2.5Y6/4	sl

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: >24"
- ❑ 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: _____

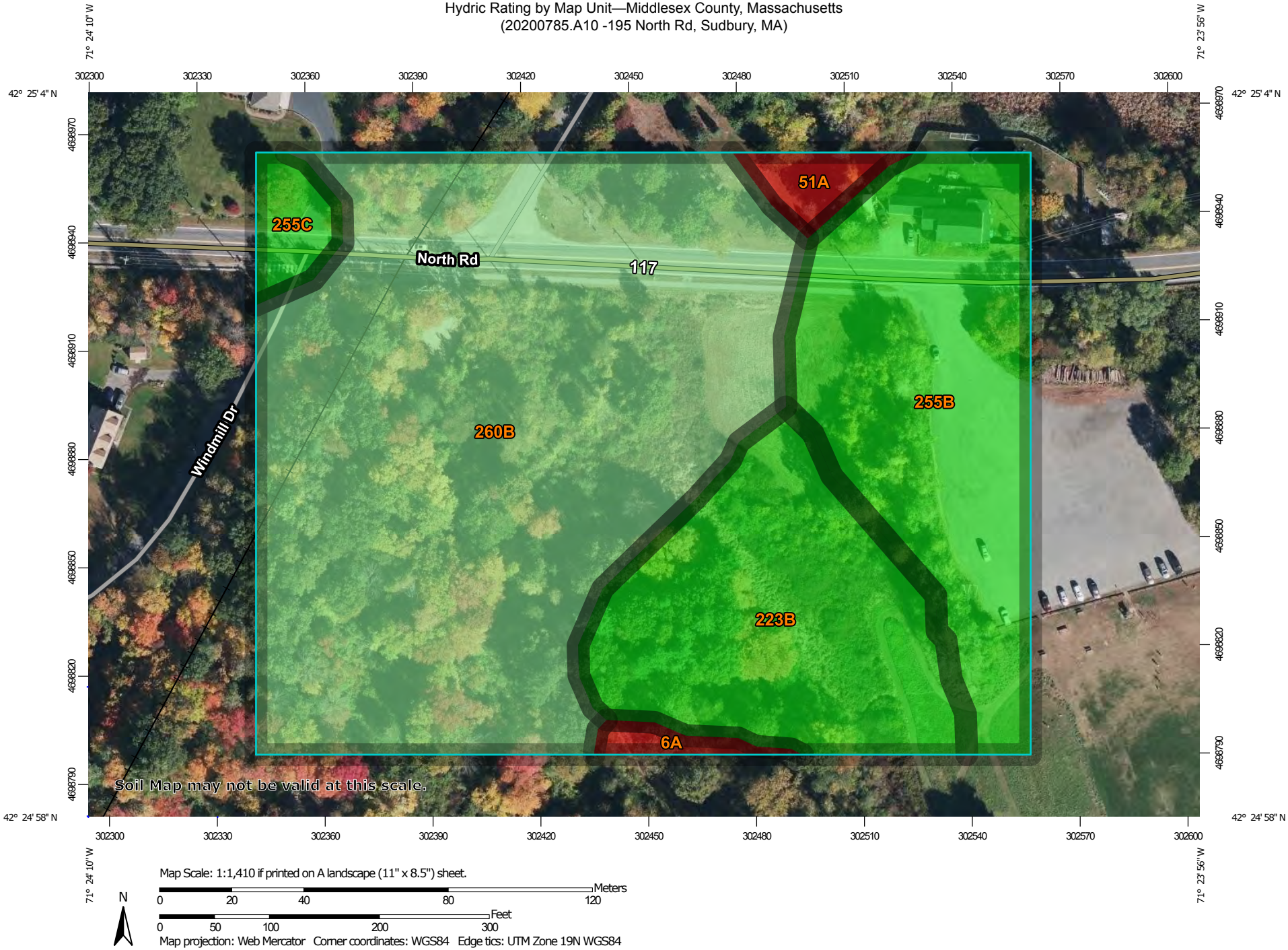
Vegetation and Hydrology Conclusion

	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	____	____
Sample location is in a BVW	____	X

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

NRCS Soil Map and Soil Report

Hydric Rating by Map Unit—Middlesex County, Massachusetts
(20200785.A10 -195 North Rd, Sudbury, MA)



MAP LEGEND

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

Soils

Soil Rating Polygons
- Hydric (100%)
- Hydric (66 to 99%)
- Hydric (33 to 65%)
- Hydric (1 to 32%)
- Not Hydric (0%)
- Not rated or not available

Soil Rating Lines
- Hydric (100%)
- Hydric (66 to 99%)
- Hydric (33 to 65%)
- Hydric (1 to 32%)
- Not Hydric (0%)
- Not rated or not available

Soil Rating Points
- Hydric (100%)
- Hydric (66 to 99%)
- Hydric (33 to 65%)
- Hydric (1 to 32%)
- Not Hydric (0%)
- Not rated or not available

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:25,000.

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

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

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

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

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

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

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 21, Sep 2, 2021

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

Date(s) aerial images were photographed: Aug 31, 2020—Oct 22, 2020

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

Hydric Rating by Map Unit

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
6A	Scarboro mucky fine sandy loam, 0 to 3 percent slopes	100	0.1	0.9%
51A	Swansea muck, 0 to 1 percent slopes	100	0.1	1.7%
223B	Scio very fine sandy loam, 3 to 8 percent slopes	0	1.6	18.3%
255B	Windsor loamy sand, 3 to 8 percent slopes	0	1.9	21.5%
255C	Windsor loamy sand, 8 to 15 percent slopes	0	0.2	2.2%
260B	Sudbury fine sandy loam, 3 to 8 percent slopes	4	4.9	55.5%
Totals for Area of Interest			**8.9**	**100.0%**

Description

This rating indicates the percentage of map units that meets the criteria for hydric soils. Map units are composed of one or more map unit components or soil types, each of which is rated as hydric soil or not hydric. Map units that are made up dominantly of hydric soils may have small areas of minor nonhydric components in the higher positions on the landform, and map units that are made up dominantly of nonhydric soils may have small areas of minor hydric components in the lower positions on the landform. Each map unit is rated based on its respective components and the percentage of each component within the map unit.

The thematic map is color coded based on the composition of hydric components. The five color classes are separated as 100 percent hydric components, 66 to 99 percent hydric components, 33 to 65 percent hydric components, 1 to 32 percent hydric components, and less than one percent hydric components.

In Web Soil Survey, the Summary by Map Unit table that is displayed below the map pane contains a column named 'Rating'. In this column the percentage of each map unit that is classified as hydric is displayed.

Hydric soils are defined by the National Technical Committee for Hydric Soils (NTCHS) as soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part (Federal Register, 1994). Under natural conditions, these soils are either saturated or inundated long enough during the growing season to support the growth and reproduction of hydrophytic vegetation.

The NTCHS definition identifies general soil properties that are associated with wetness. In order to determine whether a specific soil is a hydric soil or nonhydric soil, however, more specific information, such as information about the depth and duration of the water table, is needed. Thus, criteria that identify those estimated soil properties unique to hydric soils have been established (Federal Register, 2002). These criteria are used to identify map unit components that normally are associated with wetlands. The criteria used are selected estimated soil properties that are described in "Soil Taxonomy" (Soil Survey Staff, 1999) and "Keys to Soil Taxonomy" (Soil Survey Staff, 2006) and in the "Soil Survey Manual" (Soil Survey Division Staff, 1993).

If soils are wet enough for a long enough period of time to be considered hydric, they should exhibit certain properties that can be easily observed in the field. These visible properties are indicators of hydric soils. The indicators used to make onsite determinations of hydric soils are specified in "Field Indicators of Hydric Soils in the United States" (Hurt and Vasilas, 2006).

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Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18.

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service. U.S. Department of Agriculture Handbook 436.

Soil Survey Staff. 2006. Keys to soil taxonomy. 10th edition. U.S. Department of Agriculture, Natural Resources Conservation Service.

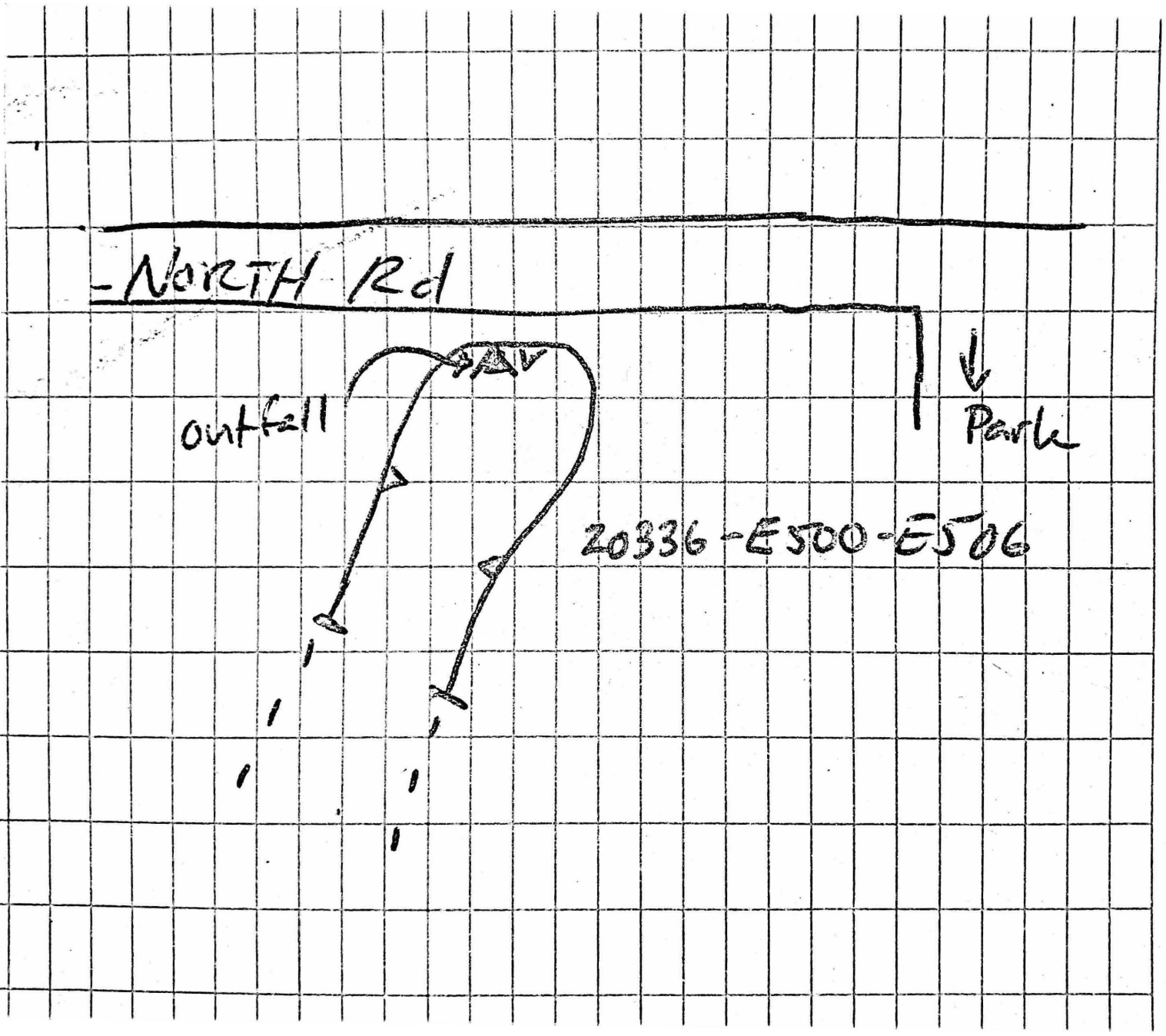
Rating Options

Aggregation Method: Percent Present

Component Percent Cutoff: None Specified

Tie-break Rule: Lower

Resource Areas Map



Resource Area Delineation Sketch
195 North Rd, Sudbury, MA
Delineated by: Josh Wilson, Fuss & O'Neill
Delineated: December 2, 2020

Massachusetts Inland Resource Area Delineation Report

Prepared For: Town of Sudbury

Project Location: Bruce Freeman Rail Trail
0 Hudson Rd, Sudbury, Massachusetts
MassDOT Project No. 608164
Parcels No. G08-0013, G09-0200, G09-0001

Inspection Date(s): December 2, 2020

Regulated Inland Wetland Resource Areas:

- ☐ Bank
- ☐ Land Under Water Bodies and Waterways
- ☐ Riverfront Area
- ☒ Buffer Zone
- ☐ Vernal Pool (Certified and/or Potential)
- ☒ Bordering Vegetated Wetland (BVW)
- ☐ Land Subject to Flooding (BLSF/ILSF)
- ☐ Isolated Vegetated Wetland
- ☐ Estimated Habitats of Rare Wildlife
- ☐ Priority Habitats of Rare Species

Delineated Resource Area Field Numbering Sequence
[as depicted on the attached Resource Areas Map]:

Bordering Vegetated Wetland (BVW): A100-A114; B200-B207

Inland resource areas were delineated in accordance with applicable local, state and federal statutes, as detailed within the Resource Area Description attachment. This delineation does not constitute an official wetland boundary until such time as it is accepted and approved by local, state or federal regulatory agencies.

The wetlands delineation was conducted by:

Joshua H. Wilson, PWS
Sr. Wetland Scientist/Soil Scientist

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Massachusetts
Rhode Island
Vermont
Maine
California

ATTACHMENTS

- Resource Area Description
- DEP Bordering Vegetated Wetland (310 CMR 10.55) Delineation Field Forms
- NRCS Soil Map and Soil Report
- Resource Areas Map

FUSS & O'NEILL

Massachusetts Inland Resource Area Delineation Report
Resource Area Description

Introduction

Fuss & O'Neill Inc. performed a wetland resource area field inspection and delineation off Hudson Road in the Town of Sudbury (Parcels # G08-0013, G09-0200, G09-0001). The field inspection and delineation occurred on December 2, 2020. The purpose of the delineation was to locate the jurisdictional limits of areas regulated under the Wetlands Protection Act (M.G.L. c. 131 sec. 40) and associated Wetlands Protection Act Regulations (310 CMR 10). For the purposes of this project, the resource delineation effort was focused within 100 feet of the proposed bike trail corridor. All resources on the parcel were not delineated.

Bordering Vegetated Wetland (BVW) inland wetland resource was identified and delineated during the field investigation. Consecutively numbered flags were placed in the field to demarcate these resource area boundaries. These resource area boundary flags will be located by field survey. The flags and corresponding resource area labels are depicted on the attached *Resource Areas Sketch Map*. Regulated Buffer Zone on the Site is measured horizontally from the boundaries of BVW.

Maps retrieved from MassGIS were used to determine if specific regulated inland wetland resources have been mapped and/or documented on the Site. MassGIS maps do not depict Massachusetts Natural Heritage and Endangered Species Program (NHESP) Priority Habitats of Rare Species, Certified Vernal Pools, or Bordering Land Subject to Flooding on the Site. A detailed description of each regulated resource area present on the Site is provided below.

Resource Areas

Bordering Vegetated Wetlands (BVW): Regulatory Framework and Delineation Methodology

As stated in 310 CMR (2)(a), "*Bordering Vegetated Wetlands are freshwater wetlands which border on creeks, rivers, streams, ponds and lakes. The types of freshwater wetlands are wet meadows, marshes, swamps and bogs. Bordering Vegetated Wetlands are areas where the soils are saturated and/or inundated such that they support a predominance of wetland indicator plants. The ground and surface water regime and the vegetation community which occur in each type of freshwater wetland are specified in M.G.L. c 131 sec. 40.*"

Fuss & O'Neill Inc. inspected the Site for Bordering Vegetated Wetlands in accordance with methodology provided in the Massachusetts DEP handbook, *Delineating Bordering Vegetated Wetlands under the Massachusetts Wetlands Protection Act*, (March 1995), the 1987 *Corps of Engineers Wetlands Delineation Manual*, and the *Regional Supplement to the Corps of Engineers Wetlands Delineation Manual: Northcentral and Northeast Region* (Version 2.0. January 2012). Data regarding vegetation, soils, and hydrology was gathered to complete the

required MassDEP BVW delineation field forms. Wetlands are categorized in accordance with *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin et.al. 1979).

Hydric soil determinations were made in accordance with *Field Indicators for Identifying Hydric Soils in New England* (NEIWPCC, 2004). The Wetland Indicator Status for plant species was ascertained using the USACE *Northcentral and Northeast 2016 Regional Wetland Plant List, Updated May 20, 2020.*

BVW: Resource Area Description

Vegetation

The BVW delineated on the Site is classified primarily as palustrine forested/scrub-shrub wetlands. Common vegetation identified within the scrub-shrub BVW includes [common name (*scientific name*, indicator status)]: red maple (*Acer rubrum*, FAC), green ash (*Fraxinus pensylvanica*, FACW), common winterberry (*Ilex verticillata*, FACW), Tatarian honeysuckle (*Lonicera tatarica*, FACU), tussock sedge (*Carex stricta*, OBL), and skunk cabbage (*Symplocarpus foetidus*, OBL). Portions of the wetland were in a mowed field and did not contain sufficient vegetative growth for classification.

Hydrology

The BVW delineated appear to be within a landscape depression and drainageway. Surface water observed at the Site appears to originate primarily from groundwater; it is assumed that a moderate amount of hydrologic flow is contributed by runoff and overland sheet flow from precipitation. No streams, channels or other types of connection conveying surface water were identified in the area of interest.

Soils

The Natural Resource Conservation Service (NRCS) does not map hydric soil types in the area of interest. Soils mapped in area of interest are upland soils, specifically, Deerfield loamy fine sand as well Paxton fine sandy loam. Detailed information regarding each of these soil series is included within the NRCS Soil Map and Soil Report attachment. Results of the detailed field analyses of soils on the Site were generally consistent with the published NRCS soil mapping except for the BVW delineated in the area of interest. The soil in this delineated area is consistent with the Ridgebury fine sandy loam series.

Buffer Zone

Buffer Zone is defined in 310 CRM 10.04 as "*that area of land extending 100 feet horizontally outward from the boundary of any area specified in 310 CMR 10.02(1)(a)*." Buffer Zone within the area of interest is associated with BVW. The buffer zone on the Site contains upland forest

DEP Bordering Vegetated Wetland (310 CMR 10.55) Delineation Field Forms

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

Applicant: Town of Sudbury Prepared by: Josh Wilson Project location: 0 Hudson Rd Sudbury (wetland) 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.

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*
Acer rubrum	60%	86%	Yes	FAC*
Fraxinus pensylvanica	10%	14%	No	
Ilex verticillata	40%	89%	Yes	FACW*
Lonceria tatarica	5%	11%	No	
Carex stricta	10%	66%	Yes	OBL
Symplocarpus foetidus	5%	33%	Yes	OBL*

* *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: 5 Number of dominant non-wetland indicator plants: 0

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

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

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		
Other indicators of hydrology present		
Sample location is in a BVW	X	

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

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

Applicant: Town of Sudbury Prepared by: Josh Wilson Project location: 0 Hudson Rd Sudbury (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.

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*
Acer rubrum	7539 sq in	73%	Yes	FACW*
Picea abies	2289 sq in	22%	Yes	NI
Abies balsamea	530 sq in	5%	No	
Fraxinus pensylvanica(s)	20%	66%	Yes	FACW
A. rubrum(s)	5%	17%	No	
A. balsamea(s)	5%	17%	No	

* *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: 2 Number of dominant non-wetland indicator plants: 1

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

Section II. Indicators of Hydrology

Hydric Soil Interpretation

1. Soil Survey

Is there a published soil survey for this site? [yes] no
title/date: USDA Web Soil Survey
map number:
soil type mapped: Paxton fine sandy loamy
hydric soil inclusions:

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

2. Soil Description

Horizon	Depth	Matrix Color	Mottles Color	
Ap	0-8"	10YR2/1		sl
Bw1	8-22"	10YR3/3	10YR2/1	sl
Bw2	22-28"	10YR5/4	10YR6/8	ls

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: >28"
- ❑ 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.

NRCS Soil Map and Soil Report

Hydric Rating by Map Unit—Middlesex County, Massachusetts
(20200785.A10 - Hudson Rd, Sudbury, MA)

Map Scale: 1:1,020 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 15 30 60 90

Feet: 0 45 90 180 270

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

MAP LEGEND

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

Soils

Soil Rating Polygons
- Hydric (100%)
- Hydric (66 to 99%)
- Hydric (33 to 65%)
- Hydric (1 to 32%)
- Not Hydric (0%)
- Not rated or not available

Soil Rating Lines
- Hydric (100%)
- Hydric (66 to 99%)
- Hydric (33 to 65%)
- Hydric (1 to 32%)
- Not Hydric (0%)
- Not rated or not available

Soil Rating Points
- Hydric (100%)
- Hydric (66 to 99%)
- Hydric (33 to 65%)
- Hydric (1 to 32%)
- Not Hydric (0%)
- Not rated or not available

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:25,000.

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

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

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

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

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

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

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 21, Sep 2, 2021

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

Date(s) aerial images were photographed: Aug 31, 2020—Oct 22, 2020

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

Hydric Rating by Map Unit

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
254B	Merrimac fine sandy loam, 3 to 8 percent slopes	0	0.1	2.5%
255A	Windsor loamy sand, 0 to 3 percent slopes	0	0.2	6.8%
256A	Deerfield loamy fine sand, 0 to 3 percent slopes	5	2.4	72.0%
307D	Paxton fine sandy loam, 15 to 25 percent slopes, extremely stony	1	0.6	18.7%
Totals for Area of Interest			**3.4**	**100.0%**

Description

This rating indicates the percentage of map units that meets the criteria for hydric soils. Map units are composed of one or more map unit components or soil types, each of which is rated as hydric soil or not hydric. Map units that are made up dominantly of hydric soils may have small areas of minor nonhydric components in the higher positions on the landform, and map units that are made up dominantly of nonhydric soils may have small areas of minor hydric components in the lower positions on the landform. Each map unit is rated based on its respective components and the percentage of each component within the map unit.

The thematic map is color coded based on the composition of hydric components. The five color classes are separated as 100 percent hydric components, 66 to 99 percent hydric components, 33 to 65 percent hydric components, 1 to 32 percent hydric components, and less than one percent hydric components.

In Web Soil Survey, the Summary by Map Unit table that is displayed below the map pane contains a column named 'Rating'. In this column the percentage of each map unit that is classified as hydric is displayed.

Hydric soils are defined by the National Technical Committee for Hydric Soils (NTCHS) as soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part (Federal Register, 1994). Under natural conditions, these soils are either saturated or inundated long enough during the growing season to support the growth and reproduction of hydrophytic vegetation.

The NTCHS definition identifies general soil properties that are associated with wetness. In order to determine whether a specific soil is a hydric soil or nonhydric soil, however, more specific information, such as information about the depth and duration of the water table, is needed. Thus, criteria that identify those estimated soil properties unique to hydric soils have been established (Federal Register, 2002). These criteria are used to identify map unit components that normally are associated with wetlands. The criteria used are selected estimated soil properties that are described in "Soil Taxonomy" (Soil Survey Staff, 1999) and "Keys to Soil Taxonomy" (Soil Survey Staff, 2006) and in the "Soil Survey Manual" (Soil Survey Division Staff, 1993).

If soils are wet enough for a long enough period of time to be considered hydric, they should exhibit certain properties that can be easily observed in the field. These visible properties are indicators of hydric soils. The indicators used to make onsite determinations of hydric soils are specified in "Field Indicators of Hydric Soils in the United States" (Hurt and Vasilas, 2006).

References:

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18.

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service. U.S. Department of Agriculture Handbook 436.

Soil Survey Staff. 2006. Keys to soil taxonomy. 10th edition. U.S. Department of Agriculture, Natural Resources Conservation Service.

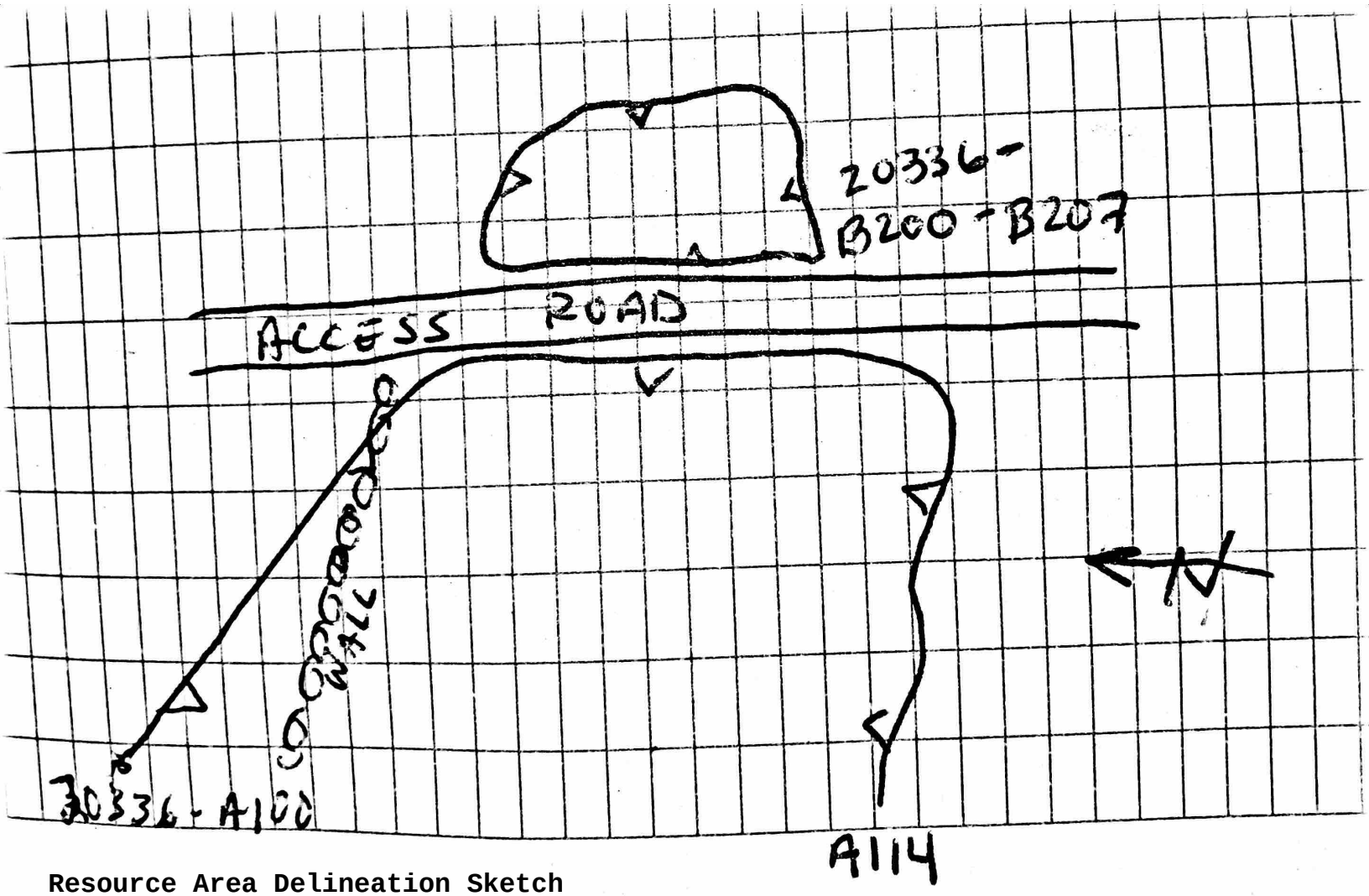
Rating Options

Aggregation Method: Percent Present

Component Percent Cutoff: None Specified

Tie-break Rule: Lower

Resource Areas Map



Resource Area Delineation Sketch
0 Hudson Rd, Sudbury, MA
Delineated by: Josh Wilson, Fuss & O'Neill
Delineated: December 2, 2020

Appendix C

NOI Circulation List

NOI Circulation List

Copies	Recipient
2	Town of Sudbury – Conservation Commission 275 Old Lancaster Road Sudbury, MA 01776
1	DEP-NERO Wetlands Division 205 Lowell Street, Wilmington, MA 01887
1	Natural Heritage and Endangered Species Program Division of Fisheries and Wildlife 1 Rabbit Hill Road Westborough, MA 01581

Not circulated to NHESP, See Letter from NHESP in Appendix D

Appendix D

Agency Correspondence

Strysky, Alexander (EEA)

From: Paulson, David (FWE)
Sent: Tuesday, December 7, 2021 8:06 AM
To: Strysky, Alexander (EEA)
Cc: Cheeseman, Melany (FWE)
Subject: Bruce Freeman Rail Trail ENF (16482/07-23727)

December 7, 2021

Kathleen A. Theoharides, Secretary
Executive Office of Energy and Environmental Affairs
Attention: Alex Strysky, MEPA Office
100 Cambridge St.
Boston, Massachusetts 02114

Project Name:	*Bruce Freeman Rail Trail*
Proponent:	*MassDOT and Town of Sudbury*
Location:	*Sudbury*
Document Reviewed:	*Environmental Notification Form*
EEA No.:	16482
NHESP No.:	07-23727

Dear Secretary Theoharides:

The Natural Heritage & Endangered Species Program of the Massachusetts Division of Fisheries & Wildlife (the Division) has reviewed the Environmental Notification Form for the proposed Bruce Freeman Rail Trail Project and would like to offer the following comments regarding state-listed rare species and their habitats.

Based on a review of the plan that was provided and the information that is currently contained in our database, the Division has determined that this project, as currently proposed, occurs ***near but not within*** Estimated Habitat of Rare Wildlife or Priority Habitat as indicated in the Massachusetts Natural Heritage Atlas (15th Edition).

The project is not required to be reviewed for compliance with the rare wildlife species section of the Massachusetts Wetlands Protection Act Regulations (310 CMR 10.37, 10.59 & 10.58(4)(b)) or the MA Endangered Species Act Regulations (321 CMR 10.18). Any additional work beyond that shown on the submitted plan may require a filing with the Division.

We appreciate the opportunity to comment on this project. If you have any questions about this letter, please contact David Paulson, Senior Endangered Species Review Biologist, at (508) 389-6366 or david.paulson@state.ma.us.

David Paulson
Senior Endangered Species Review Biologist
Massachusetts Division of Fisheries & Wildlife
1 Rabbit Hill Road, Westborough, MA 01581
Temporary Phone: (845)-262-0481 | e: david.paulson@state.ma.us
mass.gov/masswildlife | facebook.com/masswildlife

Important: Our offices are currently closed and all non-essential state employees, including Environmental Review staff, are working remotely. We will respond to your inquiry as quickly as possible. Thank you for your patience. Please visit our website (www.mass.gov/nhesp) for updates.

Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection

One Winter Street Boston, MA 02108 • 617-292-5500

Charles D. Baker
Governor

Karyn E. Polito
Lieutenant Governor

Kathleen A. Theoharides
Secretary

Martin Suuberg
Commissioner

September 16, 2021

Massachusetts Department of Transportation and Town of Sudbury
c/o Eric M. Bernardin, of Fuss and O'Neill,
150 Main Street, Suite 400
Springfield, MA 01103

RE: Jurisdictional Determination / Minor Project Modification: WW04-0000008
Bruce Freeman Rail Trail Crossings at Bridge No. S-31-007 and Bridge No. S-31-013 over the Waters of Hop Brook and Pantry Brook, Sudbury, Middlesex County

Dear Mr. Bernardin:

Enclosed is the Determination of Applicability and approval of a Minor Project Modification for the referenced application issued pursuant to Waterways Regulations 310 CMR 9.06 and 310 CMR 9.22. This Determination may be recorded at the Middlesex County Registry of Deeds and a copy will be maintained in the Department files.

If you have any questions, please contact the Waterways Regulation Program at dep.waterways@mass.gov.

Sincerely,

Daniel J. Padien
Program Chief
Waterways Regulation Program

cc: Beth Suedmeyer, Town of Sudbury
Tim Dexter, Massachusetts Department of Transportation
Sudbury Conservation Commission

Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection

One Winter Street Boston, MA 02108 • 617-292-5500

Charles D. Baker
Governor

Karyn E. Polito
Lieutenant Governor

Kathleen A. Theoharides
Secretary

Martin Suuberg
Commissioner

Jurisdictional Determination: WW04-0000008 Municipality: Sudbury, Middlesex County

DETERMINATION OF APPLICABILITY- 310 CMR 9.00

To: Massachusetts Department of Transportation &
Town of Sudbury
c/o Eric M. Bernardin
1550 Main Street, Suite 400
Springfield, MA 01103

Location of Site: Bruce Freeman Rail Trail
Hop Brook Bridge No. S-31-007
Pantry Brook Bridge No. S-31-013
Sudbury, MA 01776

Pursuant to 310 CMR 9.06, the Department of Environmental Protection Waterways Regulation Program (the "Department") has reviewed and considered your request for a Determination of Applicability and its supporting documentation, and has made the following determination**:**

[X] **The Determination is Positive:** A portion of the above referenced site for which this determination is issued includes lands subject to jurisdiction under M.G.L Chapter 91 and its regulations at 310 CMR 9.00.

[ ] **The Determination is Negative:** A portion of the above referenced site for which this determination is issued includes lands not subject to jurisdiction under M.G.L Chapter 91 and its regulations at 310 CMR 9.00.

Massachusetts Department of Transportation and the Town of Sudbury (the "Applicants") have requested a Determination of Applicability on behalf of to determine whether the replacement of the bridges along the proposed Bruce Freeman Rail Trail crossings over the non-tidal streams of Hop Brook and Pantry Brook in Sudbury in Middlesex County (the "project site") are subject to licensing pursuant to Chapter 91 and the regulations at 310 CMR 9.00. Documentation in support of this request included a cover letter with project descriptions and Figures 1-9 dated May 4, 2021.

The Department determines that the proposed bridge replacements described in the in the application are located within areas subject to Chapter 91 jurisdiction pursuant to the provisions of 9.04(1)(e) and are activities subject to jurisdiction pursuant to 310 CMR 9.05(1)(a). However, the regulations at 310

CMR 9.05(3) further prescribe that certain maintenance, repairs, and minor modifications as described at 310 CMR 9.22 of fill or structures for which a grant or license is presently valid, or which is exempt from licensing pursuant to 310 CMR 9.05(3)(b)-(h) do not require a license.

The Department notes the applicant's assertion on page 1 of the supplemental materials referenced herein:

> *It is also important to note that this Rail Trail will be a linear recreation corridor, and no access to the streams or brooks will be provided. There are no water-dependent uses, such as fishing or walking the shoreline, currently or proposed at these locations.*

Upland areas landward of the Ordinary High-Water Line of Hop Brook and Pantry Brook are not geographic areas subject to jurisdiction of Chapter 91; the current and proposed uses of areas outside of Chapter 91 jurisdiction were not evaluated or considered as part of the Department's review of the Request for Determination of Applicability or the request for Minor Project Modification.

Based on a review of the initial application materials and the supplemental information provided on August 31, 2021, the Department determines that the bridge replacements as proposed therein meet the exemption at 310 CMR 9.05(3)(f) and standards at 310 CMR 9.22(3)(a) and (b) and are therefore authorized as an administrative approval through a Minor Project Modification, provided there is no impact to water-dependent use of the waterways. Please retain this letter as documentation of the Chapter 91 approval for the referenced activities.

This Determination does not relieve the Applicant from complying with all applicable Federal, State, or local statutes, ordinances, by-laws, or regulations.

Issued by the Department of Environmental Protection Waterways Regulation Program.

IN WITNESS WHEREAS, said Department of Environmental Protection have hereunto set their hands this 16 day of September in the year 2021

Daniel J. Padien
Program Chief
Waterways Regulation Program

Encl: Notice of Appeal Rights

NOTICE OF APPEAL RIGHTS

Who has the right to appeal?

The following persons shall have the right to an adjudicatory hearing concerning this decision by the Department to grant or deny a license or permit, in accordance with 310 CMR 9.17(1)**:** (a) an Applicant who has demonstrated property rights in the lands in question, or which is a public agency; (b) any person aggrieved by the decision of the Department to grant a license or permit who has submitted written comments within the public comment period; (c) ten (10) residents of the Commonwealth who, pursuant to M.G.L. Chapter 30A, § 10A, have submitted comments within the public comment period with at least 5 of the 10 residents residing in the municipality(s) in which the license or permitted activity is located. The appeal shall clearly and specifically state the facts and grounds for the appeal and the relief sought, and each appealing resident shall file an affidavit stating the intent to be part of the group and to be represented by its authorized representative; (d) the municipal official in the affected municipality who has submitted written comments within the public comment period; and (e) MassCZM, for any project identified in 310 CMR 9.13(2)(a) for MassCZM participation or, in an Ocean Sanctuary, if it has filed a notice of participation within the public comment period.

How can I request an adjudicatory hearing?

A person requesting an adjudicatory hearing must submit a "Notice of Claim" to the Department, with a copy of the MassDEP Adjudicatory Hearing Fee Transmittal Form and include the details specified below, within twenty-one (21) days of the date of issuance of this decision. The MassDEP Transmittal Form and filing instructions are available at the following website**:** https://www.mass.gov/how-to/file-an-appeal-with-massdeps-office-of-appeals-and-dispute-resolution. The Notice of Claim must be made in writing and sent by certified mail or hand delivery to**:**

MassDEP
Case Administrator
One Winter Street, 2nd Floor
Boston, MA 02108

A copy of the complete Notice of Claim must be sent at the same time by certified mail or hand delivery to: (1) the Applicant, (2) the municipal official of the city or town where the project is located, and (3) the issuing office of the MassDEP, which in this case is located at**:**

MassDEP
Waterways Regulation Program
One Winter Street, 5th Floor
Boston, MA 02108

The MassDEP Adjudicatory Hearing Fee Transmittal Form and a valid check payable to "The Commonwealth of Massachusetts" in the amount of one hundred dollars ($100) must be mailed to**:**

MassDEP
Commonwealth Master Lockbox
P.O. Box 4062
Boston, MA 02211

What information must be included in the hearing request?

Pursuant to 310 CMR 9.17(3), any Notice of Claim requesting an adjudicatory hearing must include the following**:**

(a) the MassDEP Waterways Application File Number;
(b) the complete name, address, fax number and telephone number of the Applicant;
(c) the address of the project;
(d) the complete name, address, fax number, and telephone number of the party filing the request and, if represented by counsel, the name, address, fax number, and phone number of the attorney;

(e) if claiming to be a person aggrieved, the specific facts that demonstrate that the party satisfies the definition of "aggrieved person" found in 310 CMR 9.02;
(f) a clear statement that a formal adjudicatory hearing is being requested;
(g) a clear statement of the facts which are the grounds for the proceedings, the specific objections to the MassDEP's written decision, and the relief sought through the adjudicatory hearing, including specifically the changes desired in the final written decision; and
(h) a statement that a copy of the request has been sent to: the Applicant and the municipal official of the city or town where the project is located.

Dismissal of request
The request for appeal will be dismissed if the filing fee is not paid unless the appellant is exempt or is granted a waiver.

Exemptions
The filing fee is not required if the appellant is a city or town (or municipal agency), county, or district of the Commonwealth of Massachusetts, or a municipal housing authority.

Waiver
The Department may waive the adjudicatory hearing filing fee pursuant to 310 CMR 4.06(2) for a person who shows that paying the fee will create an undue financial hardship. A person seeking a waiver must file an affidavit setting forth the facts believed to support the claim of undue financial hardship together with the hearing request as provided above.

Appendix E

Illicit Impact Statement

FUSS & O'NEILL

Illicit Discharge Statement
Bruce Freeman Rail Tail Construction
Sudbury, MA

No illicit discharges are proposed to enter the redeveloped stormwater system located within the Brue Freeman Rail Trail project area. Inspection procedures outline in the Long-Term Operation and Maintenance Plan will be strictly followed to contaminations do not enter the stormwater system. Illicit discharge detection and elimination procedures will be implemented routinely by visual inspections to prevent illicit discharges into the stormwater system. Town of Sudbury DPW personal are informed of the illicit discharge detection and elimination procedures and that no illicit discharges are allowed to enter the stormwater system.

Appendix F

Proposed Project Plans

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION

PLAN AND PROFILE OF

BRUCE FREEMAN RAIL TRAIL

IN THE TOWN OF

SUDBURY & CONCORD

MIDDLESEX COUNTY

FEDERAL AID PROJECT NO. XXX-XXXX(XXX)X

PERMITTING PLAN SET NOT FOR CONSTRUCTION

100% SUBMITTAL

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	1	316
PROJECT FILE NO.	608164		

TITLE SHEET & INDEX

THE COMMONWEALTH OF MASSACHUSETTS DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES 2021 EDITION, THE OCTOBER 2017 CONSTRUCTION STANDARD DETAILS, THE 2015 OVERHEAD SIGNAL STRUCTURE AND FOUNDATION STANDARD DRAWINGS, MASSDOT TRAFFIC MANAGEMENT PLANS AND DETAIL DRAWINGS, THE LATEST MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS WITH MASSACHUSETTS AMENDMENTS, THE 1990 STANDARD DRAWINGS FOR SIGNS AND SUPPORTS, THE 1968 STANDARD DRAWINGS FOR TRAFFIC SIGNALS AND HIGHWAY LIGHTING, AND THE LATEST EDITION OF THE AMERICAN STANDARD FOR NURSERY STOCK, WILL GOVERN.

INDEX

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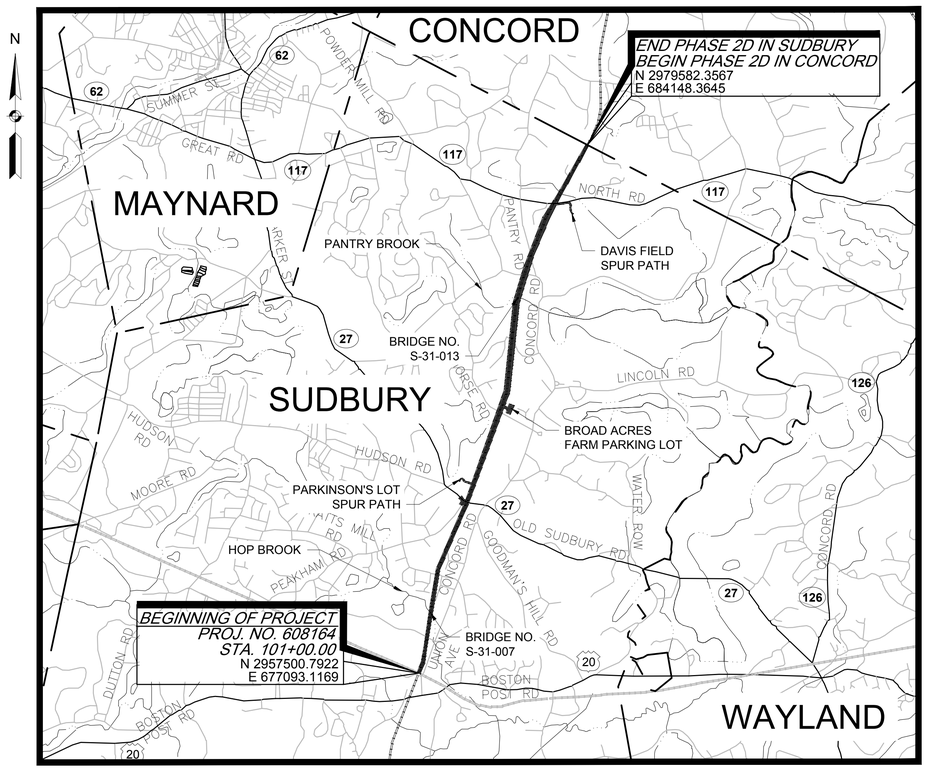
* INDICATES TO BE INCLUDED IN PERMITTING PLANS



0 3000 6000 9000 12000

SCALE: 1" = 3000'

LENGTH OF PROJECT = 23,542.00 FEET = 4.459 MILES

12/22/21

COMMONWEALTH OF MASSACHUSETTS
ERIC M. BERNARDIN
CIVIL
No. 37955
REGISTERED PROFESSIONAL ENGINEER

DATE	DESCRIPTION	REV #
12-22-2021	NOI SUBMISSION	1
5-12-2021	75% DESIGN SUBMISSION	1

FUSS & O'NEILL
190 HIGH STREET
BOSTON, MA 02110
617.282.4675
www.fando.com

massDOT
Massachusetts Department of Transportation
Highway Division

RECOMMENDED FOR APPROVAL

CHIEF ENGINEER — DATE

DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

APPROVED:

DIVISION ADMINISTRATOR — DATE

GENERAL ABBREVIATIONS

ABAN	ABANDON
ADJ	ADJUST
APPROX	APPROXIMATE
A.C.	ASPHALT CONCRETE
ACCM PIPE	ASPHALT COATED CORRUGATED METAL PIPE
BIT.	BITUMINOUS
BC	BOTTOM OF CURB
BD.	BOUND
BL	BASELINE
BLDG	BUILDING
BM	BENCHMARK
BO	BY OTHERS
BOS	BOTTOM OF SLOPE
BR.	BRIDGE
CC	CEMENT CONCRETE
CCM	CEMENT CONCRETE MASONRY
CEM	CEMENT
CI	CURB INLET
CLF	CHAIN LINK FENCE
CL	CENTERLINE
CO.	COUNTY
CONC	CONCRETE
CONT	CONTINUOUS / CONTINUED
CONST	CONSTRUCTION
CR GR	CROWN GRADE
DIA	DIAMETER
DWY	DRIVEWAY
ELEV (or EL.)	ELEVATION
EMB	EMBANKMENT
EOP	EDGE OF PAVEMENT
EQ	EQUAL
EXIST (or EX)	EXISTING
EXC	EXCAVATION
FDN.	FOUNDATION
FDP	FULL DEPTH PAVEMENT
FLDSTN	FIELDSTONE
GAR	GARAGE
GD	GROUND
GRAN	GRANITE
GRAV	GRAVEL
GRD	GUARD
HMA	HOT MIX ASPHALT
HOR	HORIZONTAL
HWY	HIGHWAY
JCT	JUNCTION
LOAM	LOAM BORROW
LSA	LANDSCAPED AREA
LT	LEFT
MAHWL	MEAN AVERAGE HIGH WATER LINE
MAX	MAXIMUM
MB	MAILBOX
MHB	MASSACHUSETTS HIGHWAY BOUND
MIN	MINIMUM
MOD	MODIFIED
MSE	MECHANICALLY STABILIZED EARTH
NERR	NEW ENGLAND RAILROAD
NIC	NOT IN CONTRACT
NO.	NUMBER
NTS	NOT TO SCALE
O.C.	ON CENTER
O.D.	OUTSIDE DIAMETER
P.G.L.	PROFILE GRADE LINE
PREV	PREVIOUS/PREVIOUSLY
PROJ	PROJECT
PROP	PROPOSED
PSB	PLANTABLE SOIL BORROW
PVMT	PAVEMENT
R&D	REMOVE AND DISCARD
R&R	REMOVE AND RESET
R&S	REMOVE AND STACK
RD	ROAD
RDWY	ROADWAY
REB	REBUILD
REM	REMOVE
REMOD	REMODEL
RET	RETAIN
RET WALL	RETAINING WALL
ROW	RIGHT OF WAY
RR	RAILROAD
RT	RIGHT
SB	STONE BOUND
SHLD	SHOULDER
SHLO/S.H.L.O.	STATE HIGHWAY LAYOUT LINE

GENERAL ABBREVIATIONS (CONT)

ST	STREET
STA	STATION
STD	STANDARD
SW	SIDEWALK
TEMP	TEMPORARY
TC	TOP OF CURB
TOS	TOP OF SLOPE
TRANS	TRANSITION
TRM	TURF REINFORCING MAT
TYP	TYPICAL
VAR	VARIES
VERT	VERTICAL
WCR	WHEEL CHAIR RAMP
WP	WORKING POINT
X-SECT	CROSS SECTION

UTILITY ABBREVIATIONS

CB	CATCH BASIN
CBCI	CATCH BASIN WITH CURB INLET
CIP	CAST IRON PIPE
CIT	CHANGE IN TYPE
CMP	CORRUGATED METAL PIPE
CSP	CORRUGATED STEEL PIPE
DI	DROP INLET
DIP	DUCTILE IRON PIPE
FES	FLARED END SECTION
F&C	FRAME AND COVER
F&G	FRAME AND GRATE
GG	GAS GATE
GI	GUTTER INLET
GIP	GALVANIZED IRON PIPE
HDPE	HIGH DENSITY POLYETHYLENE PIPE
HDW	HEADWALL
HYD	HYDRANT
INV	INVERT
LB	LEACH BASIN
LP	LIGHT POLE
MH	MANHOLE
MW	MONITORING WELL
OHW	OVERHEAD WIRE
PVC	POLYVINYLCHLORIDE PIPE
PWW	PAVED WATER WAY
RCP	REINFORCED CONCRETE PIPE
SMH	SEWER MANHOLE
TSV&B	TAPPING SLEEVE VALVE & BOX
UP	UTILITY POLE
WG	WATER GATE
WIP	WROUGHT IRON PIPE
WM	WATER METER/WATER MAIN

ALIGNMENT & GRADING ABBREVIATIONS

CC	CENTER OF CURVE
HP	HIGH POINT
I.T.	INTERSECTION OF TANGENT
LP	LOW POINT
PC	POINT OF CURVATURE
PCC	POINT OF COMPOUND CURVATURE
PI	POINT OF INTERSECTION
PNT	POINT
POC	POINT ON CURVE
POT	POINT ON TANGENT
PRC	POINT OF REVERSE CURVATURE
PT	POINT OF TANGENCY
∠PT	ANGLE POINT
R	RADIUS OF CURVATURE
T	TANGENT DISTANCE OF CURVE
TAN	TANGENT
25.45	SPOT ELEVATION

PROFILE ABBREVIATIONS

AD	ALGEBRAIC DIFFERENCE IN RATES OF GRADE
HSD	HORIZONTAL SIGHT DISTANCE
K	RATE OF VERTICAL CURVATURE
L	LENGTH OF CURVE
PVC	POINT OF VERTICAL CURVATURE
PVCC	POINT OF VERTICAL COMPOUND CURVATURE
PVI	POINT OF VERTICAL INTERSECTION
PVRC	POINT OF VERTICAL REVERSE CURVATURE
PVT	POINT OF VERTICAL TANGENCY
SSD	STOPPING SIGHT DISTANCE
VC	VERTICAL CURVE

TRAFFIC SIGNAL

CAB.	CABINET
CCVE	CLOSED CIRCUIT VIDEO EQUIPMENT
DW	STEADY DON'T WALK
FDW	FLASHING DON'T WALK
FR	FLASHING CIRCULAR RED
⟨FR–	FLASHING RED LEFT ARROW
–FR⟩	FLASHING RED RIGHT ARROW
FY	FLASHING CIRCULAR YELLOW
⟨FY–	FLASHING YELLOW LEFT ARROW
–FY⟩	FLASHING YELLOW RIGHT ARROW
G	STEADY CIRCULAR GREEN
⟨G–	STEADY GREEN LEFT ARROW
–G⟩	STEADY GREEN RIGHT ARROW
GSL	STEADY GREEN SLASH LEFT ARROW
GSR	STEADY GREEN SLASH RIGHT ARROW
⌒ G ⌒	STEADY GREEN VERTICAL ARROW
OL	OVERLAP
PED	PEDESTRIAN
PTZ	PAN, TILT, ZOOM
R	STEADY CIRCULAR RED
⟨R–	STEADY RED LEFT ARROW
–R⟩	STEADY RED RIGHT ARROW
TR SIG	TRAFFIC SIGNAL
TSC	TRAFFIC SIGNAL CONDUIT
W	STEADY WALK
Y	STEADY CIRCULAR YELLOW
⟨Y–	STEADY YELLOW LEFT ARROW
–Y⟩	STEADY YELLOW RIGHT ARROW

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	2	316
PROJECT FILE NO.	608164		

GENERAL NOTES

GENERAL NOTES:

1. EXISTING CONDITIONS AND TOPOGRAPHICAL INFORMATION FROM AN ACTUAL FIELD SURVEY CONDUCTED BY VHB, INC. IN DECEMBER 2015 THROUGH APRIL 2016. SUPPLEMENTARY FIELD SURVEY WAS CONDUCTED BY GCG ASSOCIATES FROM NOVEMBER 2020 THROUGH DECEMBER 2020.
2. THE HORIZONTAL CONTROL IS BASED ON THE MASSACHUSETTS MAINLAND STATE PLANE COORDINATE SYSTEM AND THE NATIONAL GEODETIC SURVEY (NAD83). ALL ELEVATION IS US FEET, REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
3. THE CONTRACTOR SHALL VERIFY ALL EXISTING DIMENSIONS AND GRADES IN THE FIELD BEFORE COMMENCING WORK AND PROMPTLY NOTIFY THE ENGINEER OF ANY DISCREPANCIES.
4. INFORMATION REGARDING THE LOCATION OF EXISTING UTILITIES HAS BEEN BASED UPON AVAILABLE INFORMATION AND MAY BE INCOMPLETE, AND WHERE SHOWN SHOULD BE CONSIDERED APPROXIMATE. NO GUARANTEE TO THE ACCURACY OF THE EXISTING UTILITIES FACILITIES SHOWN IN THIS PROJECT IS EXPRESSED OR IMPLIED UNLESS OTHERWISE NOTED. CONTRACTOR SHALL CONTACT "Mass DIG-SAFE", 1-888-344-7233. CONTRACTOR SHALL MAINTAIN MARKINGS WHERE NEEDED DURING PROJECT. ALL UTILITY LOCATIONS THAT DO NOT MATCH THE VERTICAL OR HORIZONTAL CONTROL SHOWN ON THE PLANS SHALL IMMEDIATELY BE BROUGHT TO THE ATTENTION OF THE ENGINEER FOR RESOLUTION. THE CONTRACTOR SHALL VERIFY LOCATIONS OF UTILITIES AND SERVICE LATERALS PRIOR TO CONSTRUCTION. ANY CONFLICTS WITH LOCATIONS OF LIGHT POLES, TREES, ETC. SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER FOR RESOLUTION PRIOR TO CONSTRUCTION.
5. DRAINAGE ELEVATIONS ARE PROVIDED FOR DESIGN PURPOSES ONLY. THE CONTRACTOR SHALL VERIFY BY TEST PIT, THE LOCATIONS OF EXISTING UTILITIES WHICH MAY CONFLICT WITH THE PROPOSED DRAINAGE DESIGN. ANY FIELD ADJUSTMENTS REQUIRED WILL BE MADE AS APPROVED OR DIRECTED BY THE ENGINEER. ONLY AFTER THE CONTRACTOR VERIFIES ELEVATIONS FOR THE CONSTRUCTABILITY OF THE DRAINAGE SYSTEM SHALL ANY STRUCTURES BE ORDERED. ANY FIELD ADJUSTMENTS TO LINE & GRADE UP TO A DEPTH OF 5' SHALL BE INCLUDED IN THE COST OF THE PIPE. PIPE EXCAVATION GREATER THAN 5' WILL BE PAID UNDER CLASS B TRENCH EXCAVATION.
6. THE CONTRACTOR SHALL VERIFY BY TEST PIT, THE LOCATIONS OF EXISTING UTILITIES WHICH MAY CONFLICT WITH PROPOSED CONDUIT AND SIGNAL EQUIPMENT. ANY FIELD ADJUSTMENTS REQUIRED WILL BE MADE AS APPROVED OR DIRECTED BY THE ENGINEER.
7. WHERE AN EXISTING UTILITY IS FOUND TO CONFLICT WITH THE PROPOSED WORK, THE LOCATION, ELEVATION AND SIZE OF THE UTILITY SHALL BE ACCURATELY DETERMINED WITHOUT DELAY BY THE CONTRACTOR, AND THE INFORMATION FURNISHED TO THE ENGINEER FOR RESOLUTION OF THE CONFLICT.
8. THE CONTRACTOR SHALL ALTER THE MASONRY OF THE TOP SECTION OF ALL EXISTING DRAINAGE AND SEWER STRUCTURES AS NECESSARY FOR CHANGES IN GRADE, AND RESET ALL WATER AND DRAINAGE FRAMES, GRATES AND BOXES TO THE PROPOSED FINISH SURFACE GRADE. REQUIRED NEW MASONRY SHALL BE CLAY BRICK.
9. THE CONTRACTOR SHALL MAKE ALL ARRANGEMENTS FOR THE ALTERATION AND ADJUSTMENT OF GAS, ELECTRIC, TELEPHONE AND ANY OTHER PRIVATE UTILITIES BY THE UTILITY COMPANIES.
10. EXISTING UTILITY POLES WILL BE RELOCATED BY OTHERS IF REQUIRED.
11. PRIOR TO ONSET OF TREE REMOVAL ACTIVITIES, THE CONTRACTOR, RESIDENT ENGINEER AND MASSDOT LANDSCAPE ARCHITECT AND TOWN REPRESENTATIVE SHALL WALK SITE TO IDENTIFY TREES TO BE REMOVED.
12. AREAS OUTSIDE THE LIMITS OF PROPOSED WORK DISTURBED BY THE CONTRACTOR'S OPERATIONS SHALL BE RESTORED BY THE CONTRACTOR TO THEIR ORIGINAL CONDITION AT NO EXPENSE TO THE OWNER.
13. THE TERM "PROPOSED" (PROP) MEANS WORK TO BE CONSTRUCTED USING NEW MATERIALS OR, WHERE APPLICABLE, RE-USING EXISTING MATERIALS IDENTIFIED AS "REMOVE AND RESET" (R&R).
14. JOINTS BETWEEN NEW ASPHALT CONCRETE ROADWAY PAVEMENT AND SAWCUT EXISTING PAVEMENT SHALL BE SEALED WITH BITUMEN AND BACKSANDED.
15. AFTER MILLING OPERATIONS AND PRIOR TO PAVING THE SUPERPAVE INTERMEDIATE OR SURFACES COURSES THE ENGINEER SHALL EVALUATE THE MILLED SURFACE AND SHALL APPLY THE APPROPRIATE REPAIR METHOD IF REQUIRED.
16. EXISTING SIGNS WITHIN THE PROJECT LIMITS SHALL BE RETAINED UNLESS INDICATED OTHERWISE ON THE DRAWINGS.
17. IF SUITABLE, ALL EXISTING GRANITE CURB & EDGING SHALL BE RE-USED IN THE PROPOSED WORK, EXCEPT CURVED STONES OF A DIFFERENT RADIUS THAN PROPOSED CURB.
18. ALL PROPOSED HOT MIX ASPHALT CURB SHALL BE MASSDOT TYPE 3.
19. ALL EXISTING STATE, COUNTY, CITY, AND TOWN LOCATION LINES AND PRIVATE PROPERTY LINES HAVE BEEN ESTABLISHED FROM AVAILABLE INFORMATION AND THEIR EXACT LOCATIONS ARE NOT GUARANTEED.
20. ALL PROPOSED BOUNDS SHALL BE PLACED BY A LICENSED PROFESSIONAL SURVEYOR. THE CONTRACTOR SHALL EXERCISE DUE CARE WHEN WORKING AROUND ALL PROPERTY BOUNDS WHICH ARE TO REMAIN. SHOULD ANY DAMAGE TO A BOUND RESULT FROM THE ACTIONS OF THE CONTRACTOR, THE CONTRACTOR SHALL HAVE THE BOUND REPLACED AND/OR REALIGNED BY A LICENSED PROFESSIONAL SURVEYOR AS DIRECTED BY THE ENGINEER AT NO ADDITIONAL COST.
21. DISPOSAL OF ALL SURPLUS MATERIAL SHALL BE AS APPROVED BY THE ENGINEER AND OWNER.
22. LATERAL DRAIN PIPES SHALL BE INSTALLED WITH A PITCH OF 0.01 FOOT PER FOOT (MINIMUM) UNLESS NOTED OTHERWISE ON THE PLANS.

608164_HD(GENERAL NOTES).DWG Plotted on 22-Dec-2021 10:47 AM

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	3	316
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LEGEND & ABBREVIATIONS

GENERAL SYMBOLS

EXISTING	PROPOSED	DESCRIPTION
JB	JB	JERSEY BARRIER
CB	CB	CATCH BASIN
		CATCH BASIN CURB INLET
FP	FP	FLAG POLE
GP	GP	GAS PUMP
MB	MB	MAIL BOX
		POST SQUARE
		POST CIRCULAR
WELL	WELL	WELL
EHH	EHH	ELECTRIC HANDHOLE
		FENCE GATE POST
GG	GG	GAS GATE
BHL #	BHL #	BORING HOLE
MW #	MW #	MONITORING WELL
TP #	TP #	TEST PIT
		HYDRANT
		LIGHT POLE
CO.BD.		COUNTY BOUND
		GPS POINT
C	C	CABLE MANHOLE
D	D	DRAINAGE MANHOLE
E	E	ELECTRIC MANHOLE
G	G	GAS MANHOLE
M	M	MISC MANHOLE
S	S	SEWER MANHOLE
T	T	TELEPHONE MANHOLE
W	W	WATER MANHOLE
MHB	MHB	MASSACHUSETTS HIGHWAY BOUND
MON		MONUMENT
SB		STONE BOUND
TB		TOWN OR CITY BOUND
		TRAVERSE OR TRIANGULATION STATION
TPL or GUY	TPL or GUY	TROLLEY POLE OR GUY POLE
HTP		TRANSMISSION POLE
UFB	UFB	UTILITY POLE W/ FIREBOX
UPDL	UPDL	UTILITY POLE WITH DOUBLE LIGHT
ULT	ULT	UTILITY POLE W / 1 LIGHT
UP	UP	UTILITY POLE
		BUSH
SIZE & TYPE		TREE
		STUMP
		SWAMP / MARSH
WG	WG	WATER GATE
PM	PM	PARKING METER
		OVERHEAD CABLE/WIRE
		CURBING
100 99		CONTOURS (ON-THE-GROUND SURVEY DATA)
100 99		CONTOURS (PHOTOGRAMMETRIC DATA)
		UNDERGROUND DRAIN PIPE (DOUBLE LINE 24 INCH AND OVER)
		UNDERGROUND ELECTRIC DUCT (DOUBLE LINE 24 INCH AND OVER)
		UNDERGROUND GAS MAIN (DOUBLE LINE 24 INCH AND OVER)
		UNDERGROUND SEWER MAIN (DOUBLE LINE 24 INCH AND OVER)
		UNDERGROUND TELEPHONE DUCT (DOUBLE LINE 24 INCH AND OVER)
		UNDERGROUND WATER MAIN (DOUBLE LINE 24 INCH AND OVER)
		BALANCED STONE WALL
		GUARD RAIL - STEEL POSTS
		GUARD RAIL - WOOD POSTS
x		CHAIN LINK OR METAL FENCE
		WOOD FENCE
		EROSION CONTROL
		DRAINAGE SWALE
		TREE LINE
		SAWCUT LINE
		TOP OR BOTTOM OF SLOPE
		LIMIT OF EDGE OF PAVEMENT OR COLD PLANE AND OVERLAY
		BANK OF RIVER OR STREAM
		BORDER OF WETLAND
		100 FT WETLAND BUFFER
		200 FT RIVERFRONT BUFFER
		STATE HIGHWAY LAYOUT
		TOWN OR CITY LAYOUT
		COUNTY LAYOUT
		RAILROAD SIDELINE
		TOWN OR CITY BOUNDARY LINE
		PROPERTY LINE OR APPROXIMATE PROPERTY LINE
		EASEMENT

TRAFFIC SYMBOLS

EXISTING	PROPOSED	DESCRIPTION
1	1	CONTROLLER PHASE ACTUATED
		TRAFFIC SIGNAL HEAD (SIZE AS NOTED)
		WIRE LOOP DETECTOR (6' x 6' TYP UNLESS OTHERWISE SPECIFIED)
		VIDEO DETECTION CAMERA
		MICROWAVE DETECTOR
		PEDESTRIAN PUSH BUTTON, SIGN (DIRECTIONAL ARROW AS SHOWN) AND SADDLE
	*	EMERGENCY PREEMPTION CONFIRMATION STROBE LIGHT
		VEHICULAR SIGNAL HEAD
		VEHICULAR SIGNAL HEAD, OPTICALLY PROGRAMMED
		FLASHING BEACON
		PEDESTRIAN SIGNAL HEAD, (TYPE AS NOTED OR AS SPECIFIED)
RRSG	RRSG	RAILROAD SIGNAL
OR		SIGNAL POST AND BASE (ALPHA-NUMERIC DESIGNATION NOTED)
	20'	MAST ARM, SHAFT AND BASE (ARM LENGTH AS NOTED)
		HIGH MAST POLE OR TOWER
		SIGN AND POST
		SIGN AND POST (2 POSTS)
	20'	MAST ARM WITH LUMINAIRE
		OPTICAL PRE-EMPTION DETECTOR
		CONTROL CABINET, GROUND MOUNTED
		CONTROL CABINET, POLE MOUNTED
		FLASHING BEACON CONTROL AND METER PEDESTAL
		LOAD CENTER ASSEMBLY
		PULL BOX 12"x12" (OR AS NOTED)
		ELECTRIC HANDHOLE 12"x24" (OR AS NOTED)
		TRAFFIC SIGNAL CONDUIT

PAVEMENT MARKINGS SYMBOLS

EXISTING	PROPOSED	DESCRIPTION
		PAVEMENT ARROW - WHITE
ONLY	ONLY	LEGEND "ONLY" - WHITE
	SL	STOP LINE
	CW	CROSSWALK
	SWL	SOLID WHITE LINE
	SYL	SOLID YELLOW LINE
	BWL	BROKEN WHITE LINE
	BYL	BROKEN YELLOW LINE
	DWL	DOTTED WHITE LINE
	DYL	DOTTED YELLOW LINE
	DWLEx	DOTTED WHITE LINE EXTENSION
	DYLEx	DOTTED YELLOW LINE EXTENSION
	DBWL	DOUBLE WHITE LINE
	DBYL	DOUBLE YELLOW LINE
	3' LDYL W/ 9' GAPS	LONG DASHED YELLOW LINE

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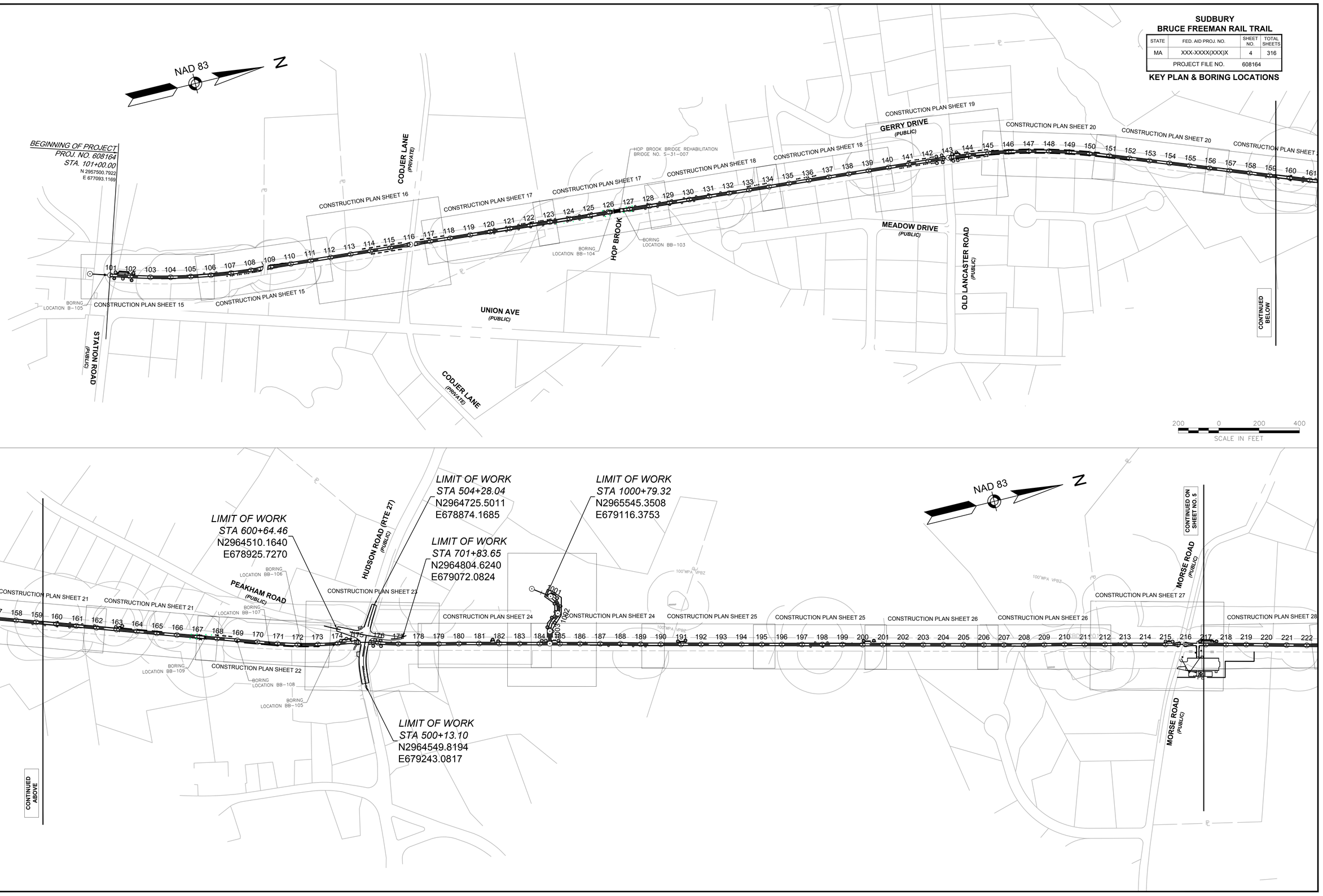
KEY PLAN & BORING LOCATIONS



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MA	XXX-XXXX(XXX)X	5	316
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KEY PLAN & BORING LOCATIONS

NAD 83 N

CONSTRUCTION PLAN SHEET 27
CONSTRUCTION PLAN SHEET 28
CONSTRUCTION PLAN SHEET 29
CONSTRUCTION PLAN SHEET 30
CONSTRUCTION PLAN SHEET 31
CONSTRUCTION PLAN SHEET 32
CONSTRUCTION PLAN SHEET 33
CONSTRUCTION PLAN SHEET 34
CONSTRUCTION PLAN SHEET 35
CONSTRUCTION PLAN SHEET 36
CONSTRUCTION PLAN SHEET 37
CONSTRUCTION PLAN SHEET 38
CONSTRUCTION PLAN SHEET 39
CONSTRUCTION PLAN SHEET 40
CONSTRUCTION PLAN SHEET 41

MORSE ROAD (PUBLIC)
HUNT ROAD
BISHOP LANE
THOMPSON DRIVE
PANTRY BROOK
PANTRY ROAD (PUBLIC)
HAYNES ROAD (PUBLIC)
NORTH ROAD (RTE 117) (PUBLIC)
WINDMILL DRIVE (PUBLIC)

PANTRY BROOK BRIDGE REHABILITATION
BRIDGE NO. S-31-013

100'BZ-AURA

BORING LOCATION BB-102
BORING LOCATION BB-101

CONTINUED ON SHEET NO. 4
CONTINUED ABOVE
CONTINUED BELOW

SUDBURY
CONCORD

PROJ. NO. 608164
LIMIT OF PHASE 2B
STA. 335+50.42
BEGIN PHASE 2D
IN CONCORD
STA. 1+00.00
N 2979582.3567
E 684148.3645

LIMIT OF WORK
STA 1107+63.72
N2976869.2613
E683219.5155

200 0 200 400
SCALE IN FEET

NAD 83 N

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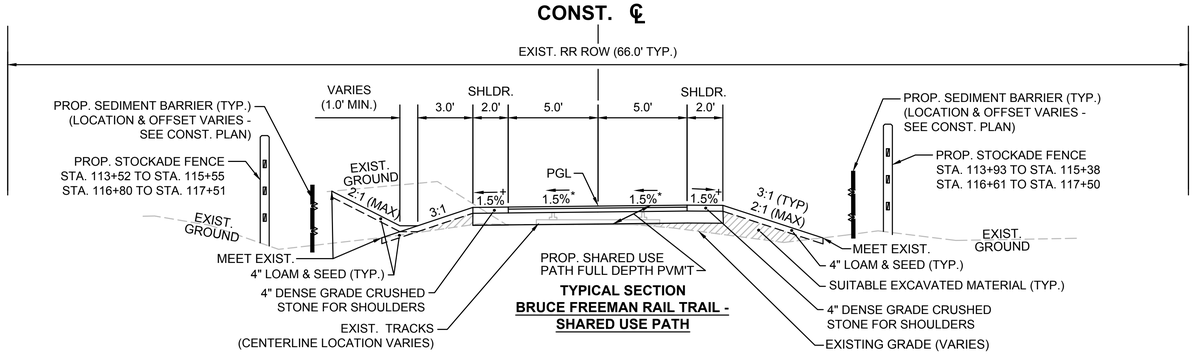


TYPICAL SECTION
BRUCE FREEMAN RAIL TRAIL - SHARED USE PATH

STA. 101+00± TO STA. 103+55±
STA. 104+25± TO STA. 104+80±
STA. 106+70± TO STA. 108+88±
STA. 109+85± TO STA. 114+00±
STA. 116+80± TO STA. 119+75±
STA. 132+25± TO STA. 143+15±
STA. 152+00± TO STA. 158+25±
STA. 165+25± TO STA. 168+90±
STA. 174+60± TO STA. 181+50±

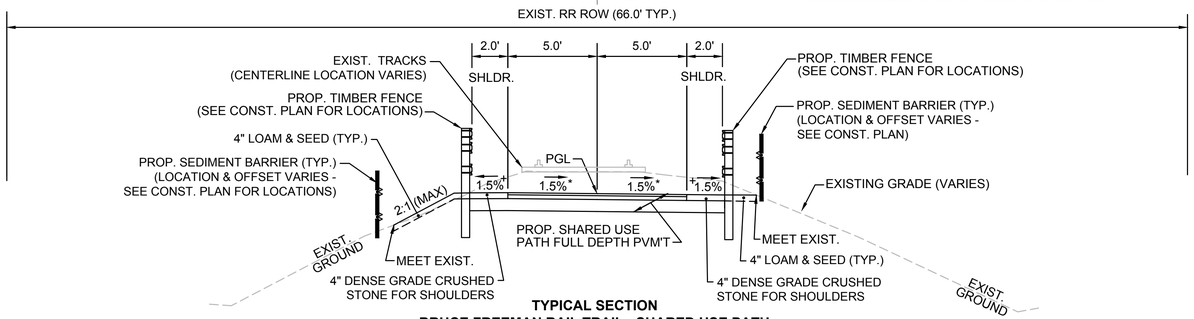
STA. 183+10± TO STA. 184+75±
STA. 190+90± TO STA. 196+75±
STA. 199+15± TO STA. 200+15±
STA. 200+40± TO STA. 212+00±
STA. 222+00± TO STA. 222+25±
STA. 243+57± TO STA. 245+75±
STA. 248+30± TO STA. 250+80±
STA. 258+73± to STA. 261+23±
STA. 270+23± TO STA. 272+23±

STA. 273+73± TO STA. 274+65±
STA. 274+80± TO STA. 275+80±
STA. 279+80± TO STA. 283+75±
STA. 293+25± TO STA. 294+30±
STA. 304+40± TO STA. 305+65±
STA. 307+00± TO STA. 308+15±
STA. 316+28± TO STA. 321+28±
STA. 333+10± TO STA. 334+70±
STA. 335+05± TO STA. 335+50±

*TOLERANCE FOR CONSTRUCTION ±0.5%
N.T.S

+SHOULDERS CAN BE UP TO 6:1 SLOPE TO AVOID CHASING SLOPES & AVOID RESOURCE AREA IMPACTS

SEE CROSS SECTIONS FOR MORE INFORMATION



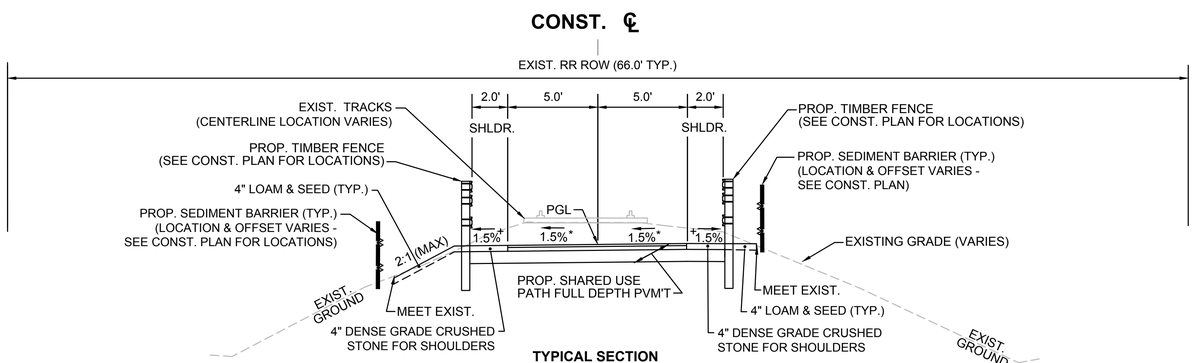
TYPICAL SECTION
BRUCE FREEMAN RAIL TRAIL - SHARED USE PATH
REVERSE SLOPE

STA. 126+50± TO STA. 129+00±
STA. 213+00± TO STA. 221+00±
STA. 325+50± TO STA. 335+50±

*TOLERANCE FOR CONSTRUCTION ±0.5%
N.T.S

+SHOULDERS CAN BE UP TO 6:1 SLOPE TO AVOID CHASING SLOPES & AVOID RESOURCE AREA IMPACTS

SEE CROSS SECTIONS FOR MORE INFORMATION



TYPICAL SECTION
BRUCE FREEMAN RAIL TRAIL - CUT INTO EMBANKMENT

STA. 103+55± TO STA. 104+25±
STA. 104+80± TO STA. 106+70±
STA. 108+88± TO STA. 109+85±
STA. 115+65± TO STA. 116+80±
STA. 119+75± TO STA. 125+50±
STA. 130+00± TO STA. 132+25±
STA. 158+25± TO STA. 163+10±
STA. 173+07± TO STA. 174+30±

+STA. 181+50± TO STA. 183+10±
STA. 184+75± TO STA. 190+90±
STA. 196+75± TO STA. 199+15±
STA. 222+25± TO STA. 229+42±
STA. 230+54± TO STA. 231+95±
STA. 235+60± TO STA. 242+18±
STA. 245+75± TO STA. 248+30±
STA. 261+23± TO STA. 270+23±

STA. 272+23± TO STA. 273+73±
STA. 275+80± TO STA. 279+80±
STA. 285+25± TO STA. 293+25±
STA. 294+30± TO STA. 304+40±
STA. 305+65± TO STA. 306+85±
STA. 308+15± TO STA. 316+28±
STA. 321+28± TO STA. 332+35±

*TOLERANCE FOR CONSTRUCTION ±0.5%
N.T.S

+ SHOULDERS CAN BE UP TO 6:1 SLOPE TO AVOID CHASING SLOPES & AVOID RESOURCE AREA IMPACTS

SEE CROSS SECTIONS FOR MORE INFORMATION

PAVEMENT NOTES:

PROPOSED SHARED-USE PATH

SURFACE: 1-1/2" SUPERPAVE SURFACE COURSE - 9.5 (SSC - 9.5)
INTERMEDIATE: 2-1/2" SUPERPAVE INTERMEDIATE COURSE - 19.0 (SIC - 19.0)
SUBBASE: 4" to 8" GRAVEL BORROW, TYPE b (FOR LEVELING) OVER RESHAPED EXISTING RAILROAD BALLAST

PROPOSED PARKING LOT FULL DEPTH PAVEMENT

SURFACE: 1-1/2" SUPERPAVE SURFACE COURSE (SSC-12.5-P) - OVER
BASE: 2-1/2" SUPERPAVE INTERMEDIATE COURSE (19.0) - OVER
FOUNDATION: 8" GRAVEL BORROW, TYPE b

PROPOSED FULL DEPTH CONSTRUCTION (LESS THAN 4.00' WIDE) - PEAKHAM ROAD & HUDSON ROAD

SURFACE: 1-3/4" SUPERPAVE SURFACE COURSE (12.5 POLYMER) - OVER
INTERMEDIATE: 2-1/2" SUPERPAVE INTERMEDIATE COURSE (19.0) - OVER
BASE: 6" HIGH EARLY STRENGTH CEMENT CONCRETE BASE COURSE 4000psi, 610, 3/4" OVER
SUBBASE: 8" GRAVEL BORROW, TYPE b.

PROPOSED PAVEMENT MILLING & OVERLAY - PEAKHAM ROAD & HUDSON ROAD

1-3/4" PAVEMENT MILLING
1-3/4" SUPERPAVE SURFACE COURSE (SSC - 12.5 - P)

PROPOSED HOT MIX ASPHALT SIDEWALK & DRIVEWAY

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

PROPOSED CEMENT CONCRETE WALK, REST AREA & WHEELCHAIR RAMP

SURFACE: 4" CEMENT CONCRETE AIR ENTRAINED 4000 PSI, 3/4", 610
SUBBASE: 8" GRAVEL BORROW, TYPE b

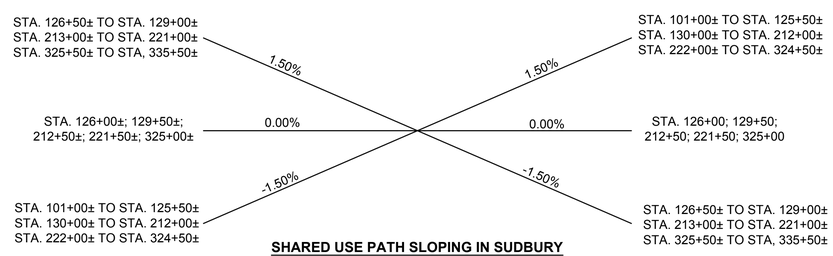
NOTES: EXIST. GRAVEL/BALLAST SUBGROUND MATERIAL DETERMINED BY THE ENGINEER TO BE SUITABLE SHALL REMAIN. THE DEPTH OF THE GRAVEL BORROW WILL BE AS REQUIRED BASED ON THE PROPOSED SUB-BASE ELEVATIONS.

AFTER REMOVAL OF STEEL RAILS AND WOOD TIMBER, ROUGH GRADE AND COMPACT SUBGROUND AREA. THEN PLACE AND COMPACT GRAVEL BORROW SUB-BASE MATERIAL IN MULTIPLE LIFTS.

ASPHALT EMULSION FOR TACK COAT AND HMA JOINT SEALANT SHALL BE APPLIED PER SECTION 450 QA OF THE SPECIAL PROVISIONS.

HMA FOR PATCHING SHALL BE USED FOR ALL PERMANENT, PARTIAL, AND FULL DEPTH PAVEMENT REPAIRS OF UNSOUND PAVEMENT PER SECTION 450 IN AREAS OUTSIDE OF PROP.OSED FULL DEPTH RECLAMATION OR RECONSTRUCTION ROADWAY AREAS.

HMA FOR MISCELLANEOUS WORK SHALL BE USED FOR ALL TEMPORARY CONSTRUCTION, TAPER RAMPS, CURB CUT RAMPS, TEMPORARY TRENCH REPAIR, ETC.



SHARED USE PATH SLOPING IN SUDBURY

NOTE:

1. THE SECTIONS OF PROPOSED ROADWAY NOT COVERED IN THE RANGE OF STATIONS ASSOCIATED WITH THE TYPICAL SECTIONS ARE EITHER IN TRANSITION OR ARE LOCATED AT INTERSECTIONS AND THEREFOR HAVE NOT BEEN SHOWN. REFER TO CROSS SECTION SHEETS FOR MORE DETAILS.

NOTES:

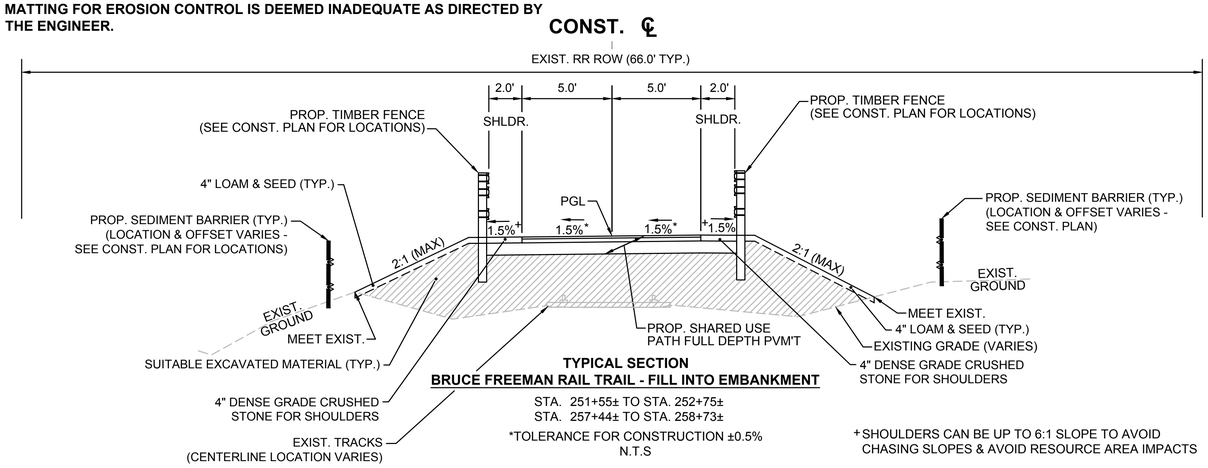
1. **MATTING FOR EROSION CONTROL SHALL BE INSTALLED ON EXISTING SIDE SLOPES THAT ARE 2:1 OR STEEPER THAT ARE NOT WITHIN JUTE MESH WATERWAY AREAS.**
2. **MODIFIED ROCK FILL SHALL BE USED AS NEEDED ON ANY CUT OR FILL SLOPES STEEPER THAN 2:1 WHERE POOR SOIL CONDITIONS EXIST AND MATTING FOR EROSION CONTROL IS DEEMED INADEQUATE AS DIRECTED BY THE ENGINEER.**

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STA.TE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	10	316
PROJECT FILE NO.	608164		

TYPICAL SECTIONS

TYPICAL SECTION
BRUCE FREEMAN RAIL TRAIL - FILL INTO EMBANKMENT



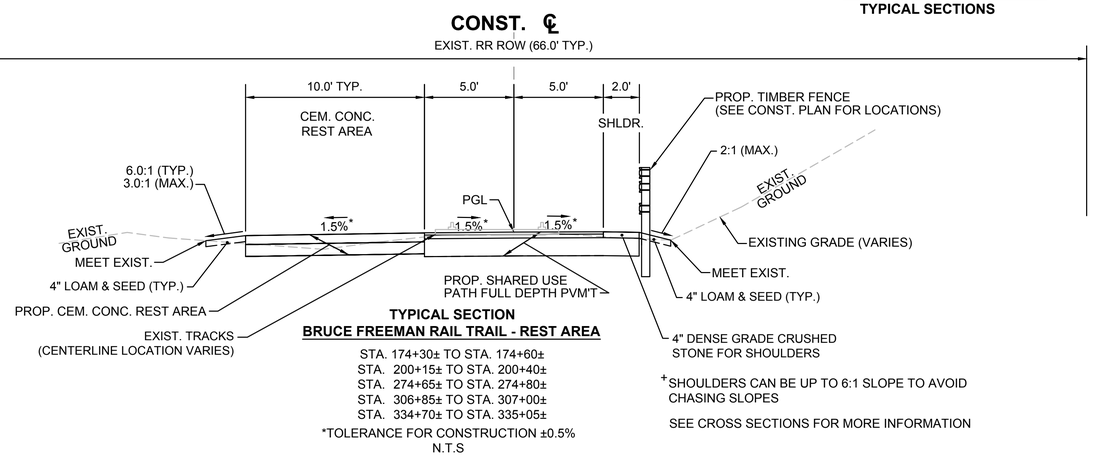
STA. 251+55± TO STA. 252+75±
STA. 257+44± TO STA. 258+73±

*TOLERANCE FOR CONSTRUCTION ±0.5%
N.T.S

+SHOULDERS CAN BE UP TO 6:1 SLOPE TO AVOID CHASING SLOPES & AVOID RESOURCE AREA IMPACTS

SEE CROSS SECTIONS FOR MORE INFORMATION

TYPICAL SECTION
BRUCE FREEMAN RAIL TRAIL - REST AREA



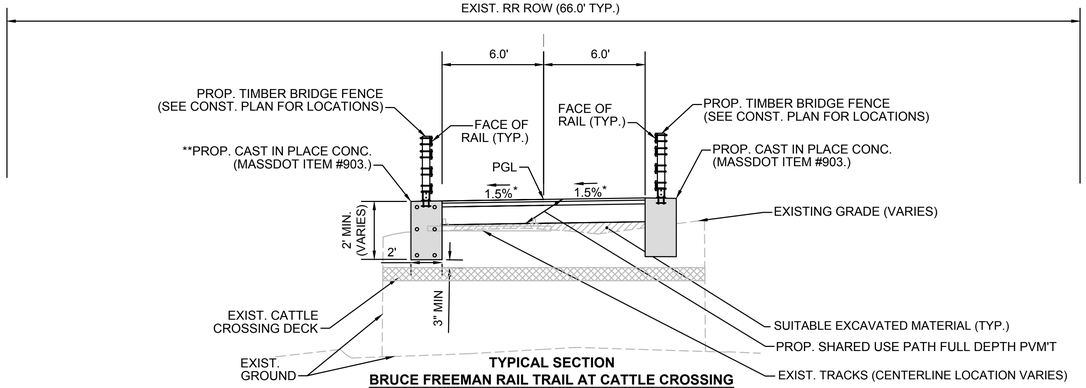
STA. 174+30± TO STA. 174+60±
STA. 200+15± TO STA. 200+40±
STA. 274+65± TO STA. 274+80±
STA. 306+85± TO STA. 307+00±
STA. 334+70± TO STA. 335+05±

*TOLERANCE FOR CONSTRUCTION ±0.5%
N.T.S

+SHOULDERS CAN BE UP TO 6:1 SLOPE TO AVOID CHASING SLOPES

SEE CROSS SECTIONS FOR MORE INFORMATION

TYPICAL SECTION
BRUCE FREEMAN RAIL TRAIL AT CATTLE CROSSING

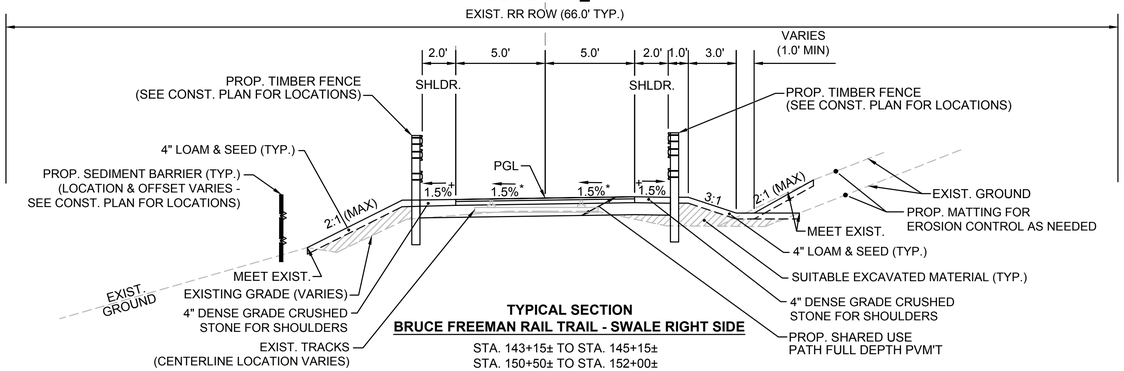


** CONCRETE SHALL EXTEND 2'-0" BEYOND THE CENTERLINE OF THE LAST FENCE POST

STA. 190+50± TO STA. 190+60±
STA. 258+45± TO STA. 258+50±
STA. 269+70± TO STA. 269+85±
STA. 321+60± TO STA. 321+70±

* TOLERANCE FOR CONSTRUCTION ±0.5%
N.T.S

TYPICAL SECTION
BRUCE FREEMAN RAIL TRAIL - SWALE RIGHT SIDE



STA. 143+15± TO STA. 145+15±
STA. 150+50± TO STA. 152+00±
STA. 169+83± TO STA. 173+07±
STA. 229+42± TO STA. 230+54±
STA. 242+18± TO STA. 243+57±
STA. 254+10± TO STA. 257+44±

* TOLERANCE FOR CONSTRUCTION ±0.5%
N.T.S

+SHOULDERS CAN BE UP TO 6:1 SLOPE TO AVOID CHASING SLOPES

SEE CROSS SECTIONS FOR MORE INFORMATION

TYPICAL SECTION
BRUCE FREEMAN RAIL TRAIL - SWALE LEFT SIDE

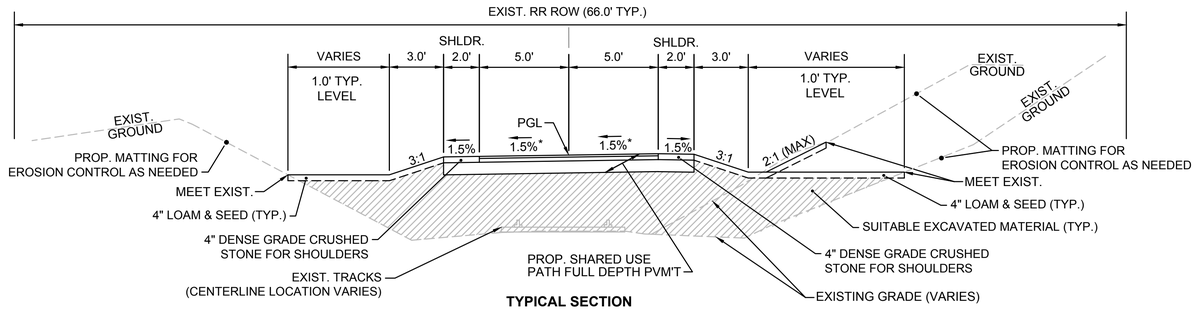
STA. 163+10± TO STA. 165+25±
STA. 168+90± TO STA. 169+35±
STA. 235+35± TO STA. 235+60±

*TOLERANCE FOR CONSTRUCTION ±0.5%
N.T.S

+SHOULDERS CAN BE UP TO 6:1 SLOPE TO AVOID CHASING SLOPES & AVOID RESOURCE AREA IMPACTS

SEE CROSS SECTIONS FOR MORE INFORMATION

TYPICAL SECTION
BRUCE FREEMAN RAIL TRAIL - SWALE BOTH SIDES



STA. 232+70± TO STA. 235+35±
STA. 252+73± TO STA. 254+10±

*TOLERANCE FOR CONSTRUCTION ±0.5%
N.T.S

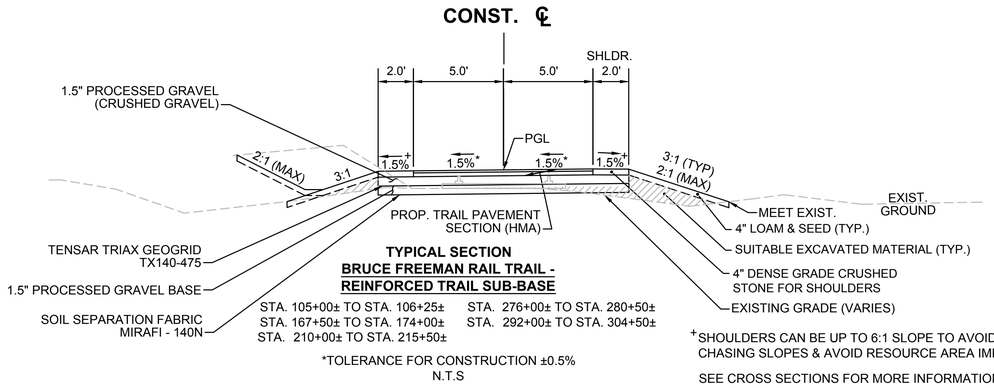
SEE CROSS SECTIONS FOR MORE INFORMATION

SEE SHEET 9 FOR PAVEMENT NOTES

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STA.TE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	11	316
PROJECT FILE NO.	608164		

TYPICAL SECTIONS



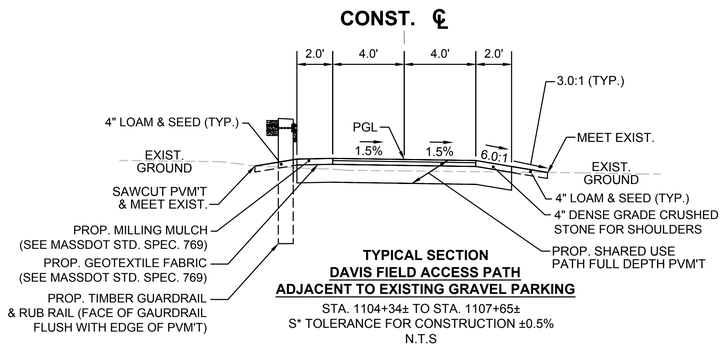
TYPICAL SECTION
BRUCE FREEMAN RAIL TRAIL - REINFORCED TRAIL SUB-BASE

STA. 105+00± TO STA. 106+25± STA. 276+00± TO STA. 280+50±
STA. 167+50± TO STA. 174+00± STA. 292+00± TO STA. 304+50±
STA. 210+00± TO STA. 215+50±

*TOLERANCE FOR CONSTRUCTION ±0.5%
N.T.S

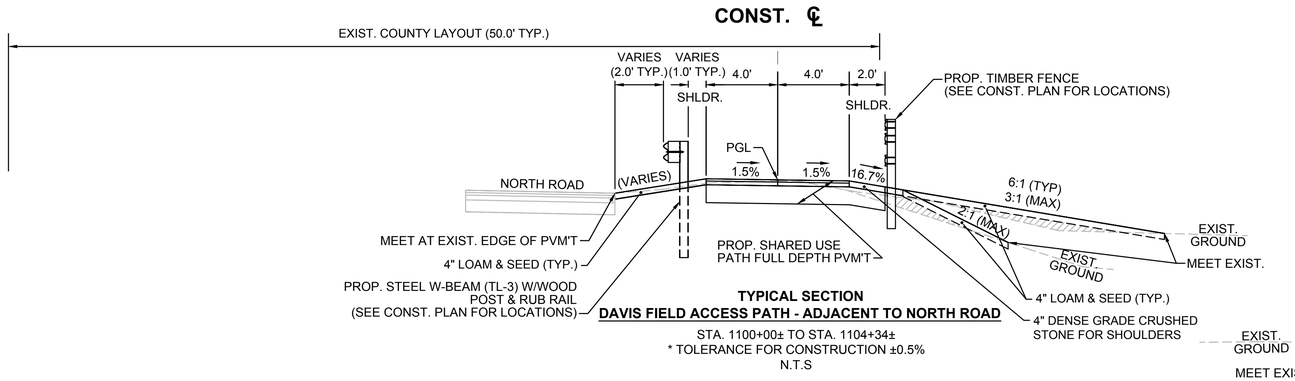
+SHOULDERS CAN BE UP TO 6:1 SLOPE TO AVOID CHASING SLOPES & AVOID RESOURCE AREA IMPACTS

SEE CROSS SECTIONS FOR MORE INFORMATION



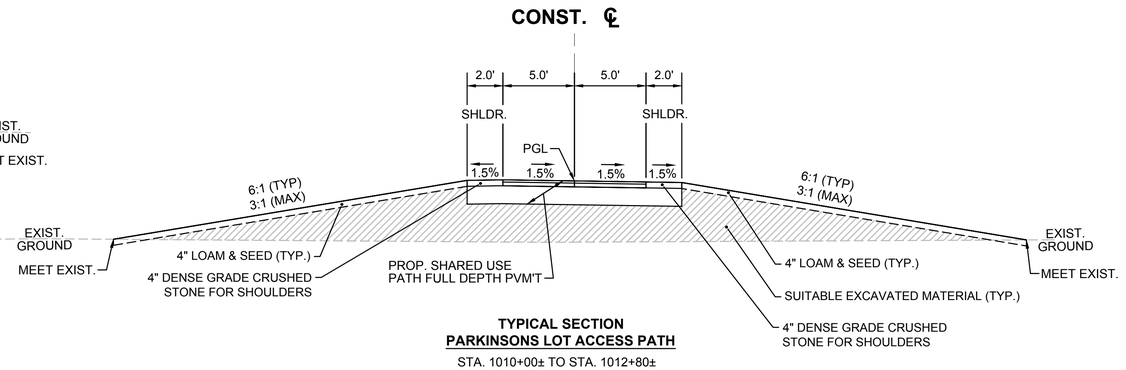
TYPICAL SECTION
DAVIS FIELD ACCESS PATH
ADJACENT TO EXISTING GRAVEL PARKING

STA. 1104+34± TO STA. 1107+65±
S* TOLERANCE FOR CONSTRUCTION ±0.5%
N.T.S



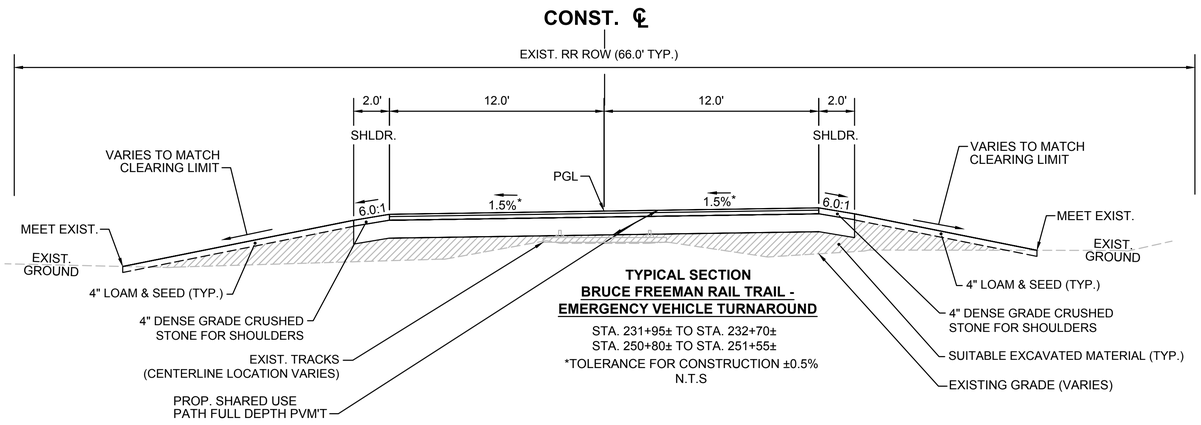
TYPICAL SECTION
DAVIS FIELD ACCESS PATH - ADJACENT TO NORTH ROAD

STA. 1100+00± TO STA. 1104+34±
* TOLERANCE FOR CONSTRUCTION ±0.5%
N.T.S



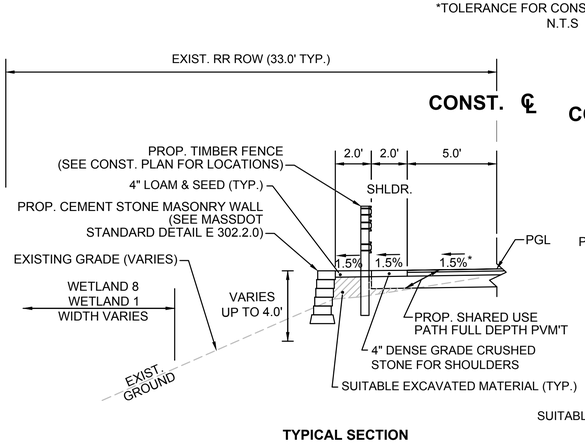
TYPICAL SECTION
PARKINSONS LOT ACCESS PATH

STA. 1010+00± TO STA. 1012+80±
*TOLERANCE FOR CONSTRUCTION ±0.5%
N.T.S



TYPICAL SECTION
BRUCE FREEMAN RAIL TRAIL - EMERGENCY VEHICLE TURNAROUND

STA. 231+95± TO STA. 232+70±
STA. 250+80± TO STA. 251+55±
*TOLERANCE FOR CONSTRUCTION ±0.5%
N.T.S



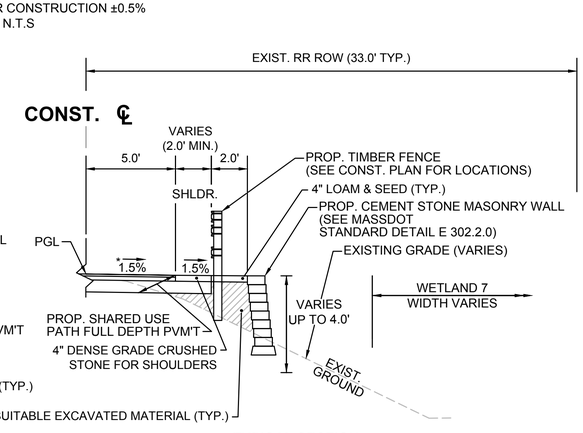
TYPICAL SECTION
BRUCE FREEMAN RAIL TRAIL - WALL SECTION LT

STA. 283+85± TO STA. 284+30±
STA. 283+85± TO STA. 284+30±
STA. 332+35± TO STA. 332+90±

*TOLERANCE FOR CONSTRUCTION ±0.5%
N.T.S

SEE CROSS SECTIONS FOR MORE INFORMATION

SEE GRADING PLANSFOR ELEVATIONS



TYPICAL SECTION
BRUCE FREEMAN RAIL TRAIL - WALL SECTION RT

STA. 284+65± TO STA. 285+25±
*TOLERANCE FOR CONSTRUCTION ±0.5%
N.T.S

SEE CROSS SECTIONS FOR MORE INFORMATION

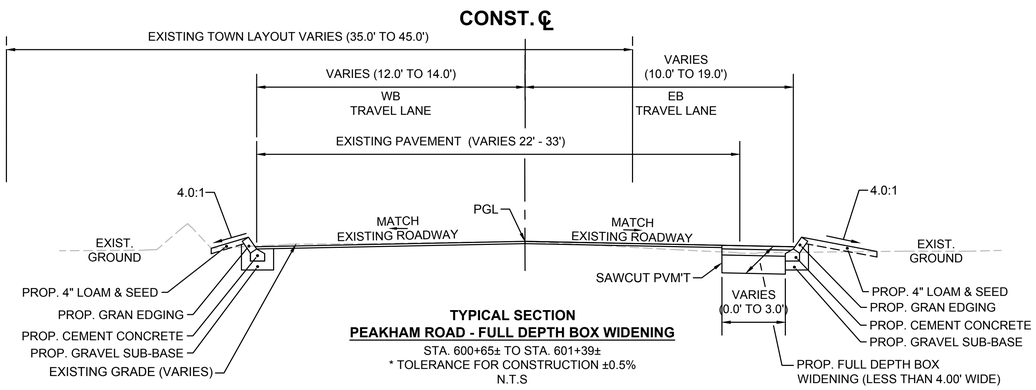
SEE GRADING PLANSFOR ELEVATIONS

SEE SHEET 9 FOR PAVEMENT NOTES

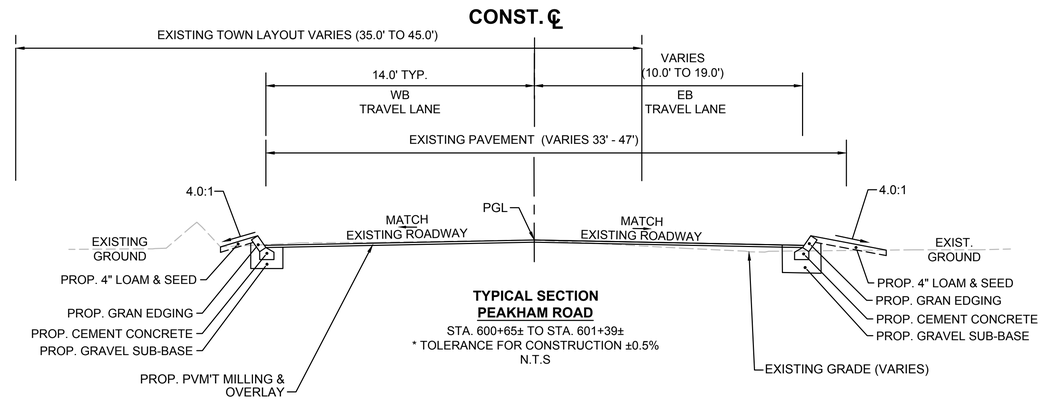
SUDBURY
BRUCE FREEMAN RAIL TRAIL

STA.TE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	12	316
PROJECT FILE NO.	608164		

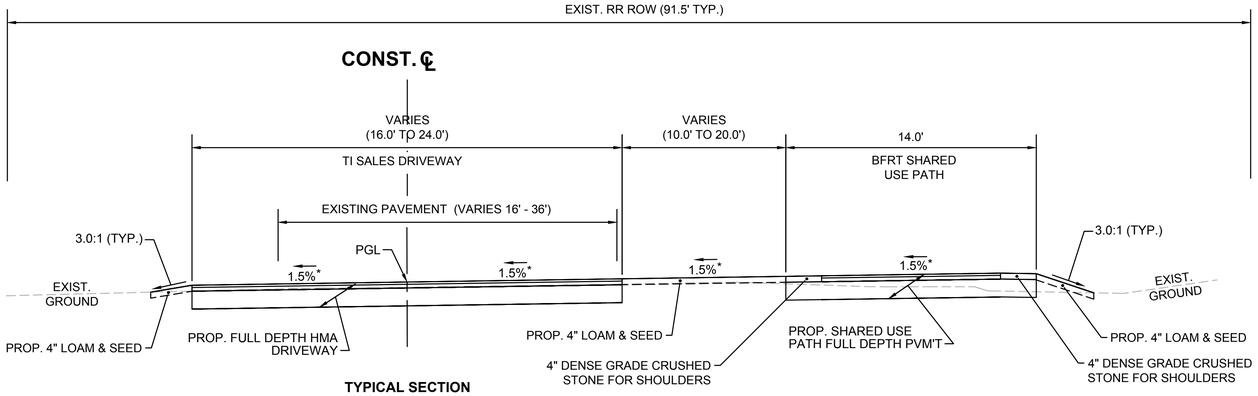
TYPICAL SECTIONS



TYPICAL SECTION
PEAKHAM ROAD - FULL DEPTH BOX WIDENING
STA. 600+65± TO STA. 601+39±
* TOLERANCE FOR CONSTRUCTION ±0.5%
N.T.S



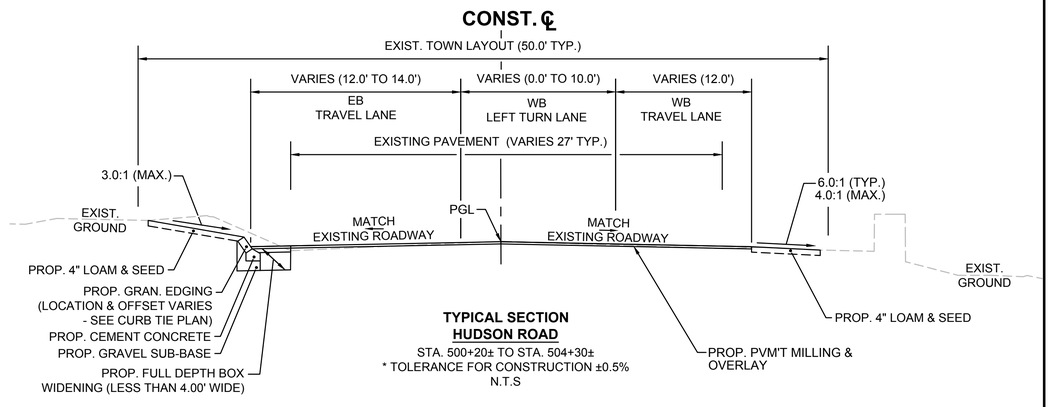
TYPICAL SECTION
PEAKHAM ROAD
STA. 600+65± TO STA. 601+39±
* TOLERANCE FOR CONSTRUCTION ±0.5%
N.T.S



TYPICAL SECTION
TI-SALES
STA. 700+20± TO STA. 701+85±
* TOLERANCE FOR CONSTRUCTION ±0.5%
N.T.S

+SHOULDERS CAN BE UP TO 6:1 SLOPE TO AVOID CHASING SLOPES

SEE CROSS SECTIONS FOR MORE INFORMATION



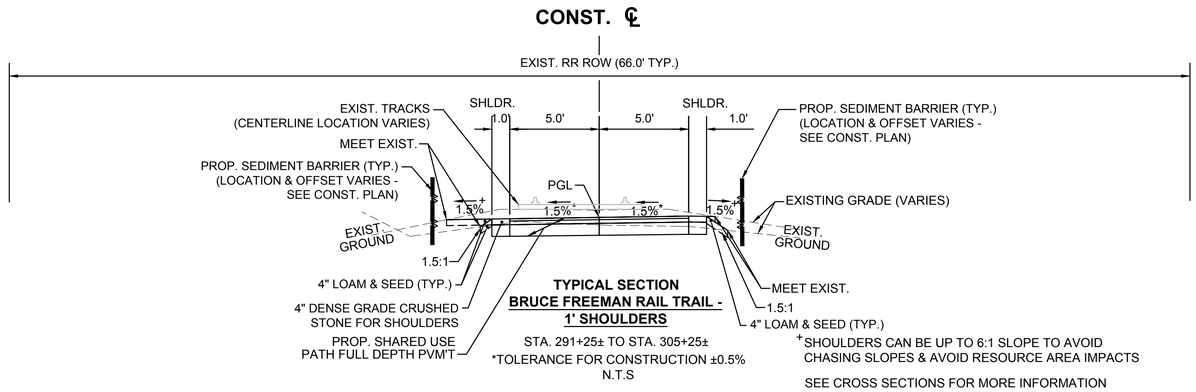
TYPICAL SECTION
HUDSON ROAD
STA. 500+20± TO STA. 504+30±
* TOLERANCE FOR CONSTRUCTION ±0.5%
N.T.S

SEE SHEET 9 FOR PAVEMENT NOTES

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STA.TE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	13	316
PROJECT FILE NO.	608164		

TYPICAL SECTIONS

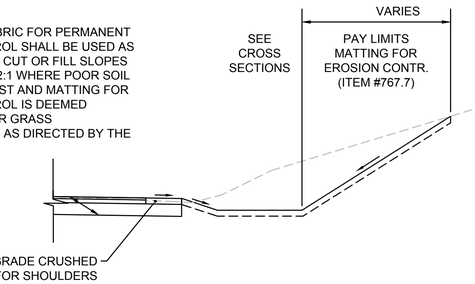


TYPICAL SECTION
BRUCE FREEMAN RAIL TRAIL - 1' SHOULDERS
STA. 291+25± TO STA. 305+25±
*TOLERANCE FOR CONSTRUCTION ±0.5%
N.T.S

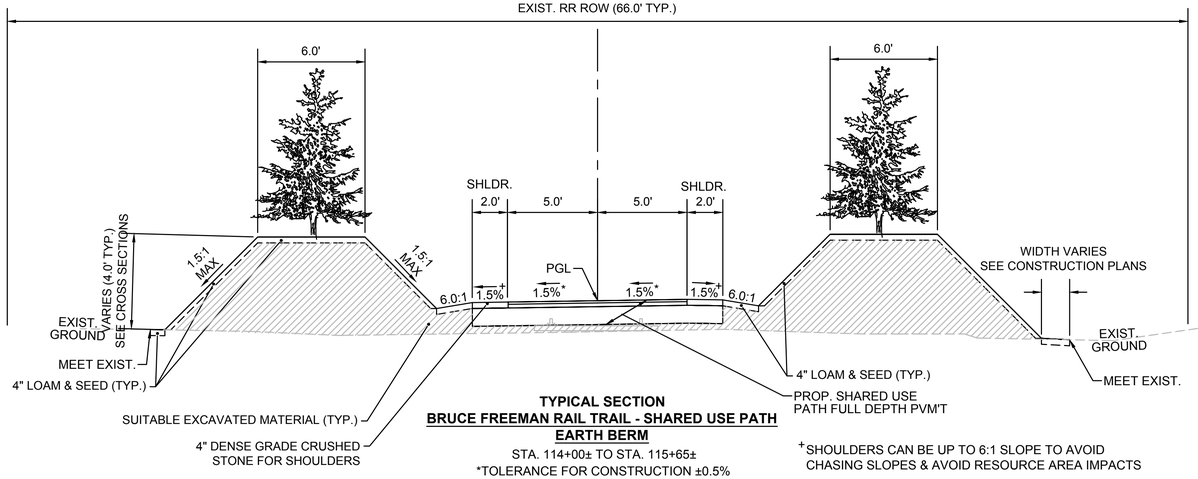
NOTES:

1) MATTING FOR EROSION CONTROL SHALL BE INSTALLED ON SIDE SLOPES THAT ARE 2:1

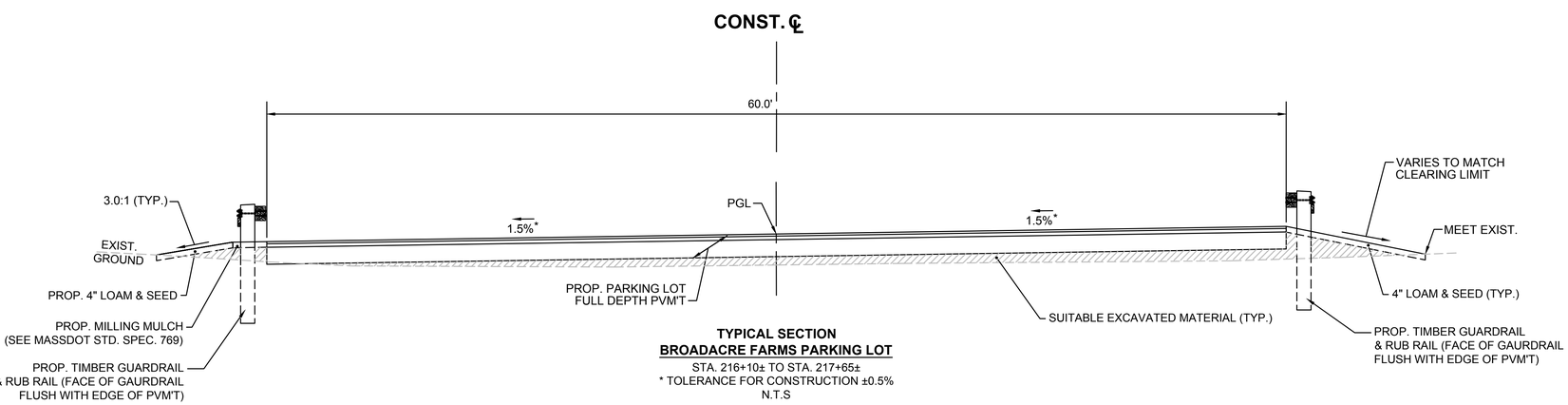
2) GEOTEXTILE FABRIC FOR PERMANENT EROSION CONTROL SHALL BE USED AS NEEDED ON ANY CUT OR FILL SLOPES STEEPER THAN 2:1 WHERE POOR SOIL CONDITIONS EXIST AND MATTING FOR EROSION CONTROL IS DEEMED INADEQUATE FOR GRASS ESTABLISHMENT AS DIRECTED BY THE ENGINEER.



GRASS SWALE WITH JUTE MESH LINING
SCALE: NTS



TYPICAL SECTION
BRUCE FREEMAN RAIL TRAIL - SHARED USE PATH EARTH BERM
STA. 114+00± TO STA. 115+65±
*TOLERANCE FOR CONSTRUCTION ±0.5%
N.T.S



TYPICAL SECTION
BROADACRE FARMS PARKING LOT
STA. 216+10± TO STA. 217+65±
* TOLERANCE FOR CONSTRUCTION ±0.5%
N.T.S

SEE SHEET 9 FOR PAVEMENT NOTES

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	1	316
PROJECT FILE NO.	608164		

ENVIRONMENTAL IMPACT PLANS

Plotted on 22-Dec-2021 11:00 PM

608164_NOI(GENERAL PLANS).DWG

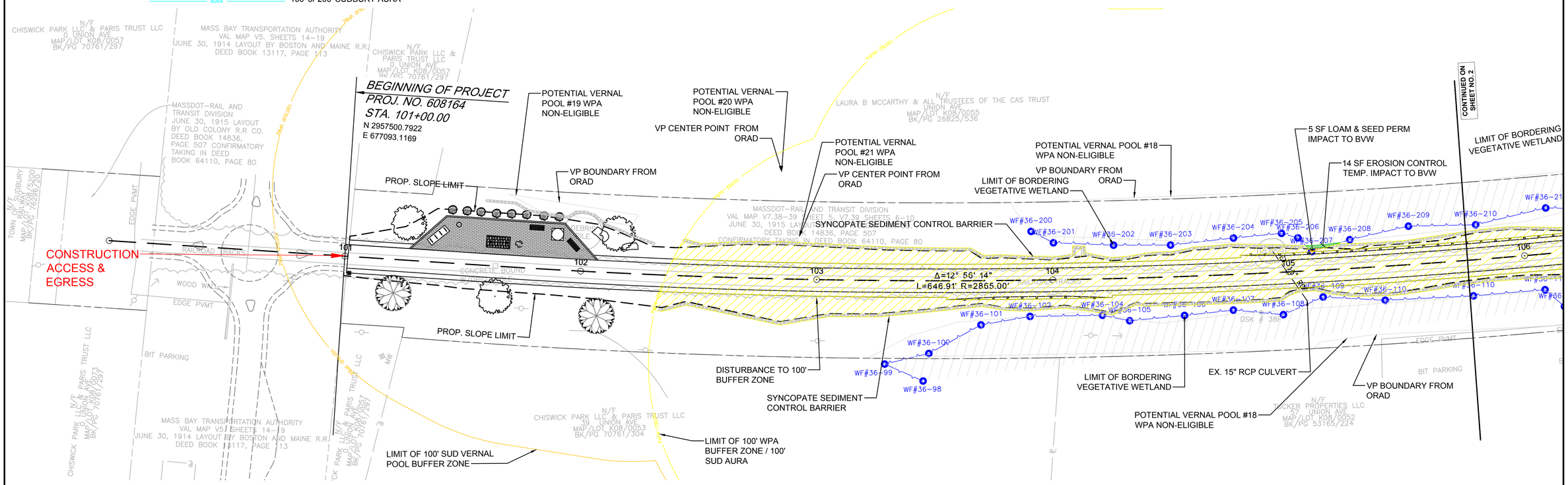
ENVIRONMENTAL IMPACTS LEGEND

LINETYPE	DESCRIPTION
	LIMIT OF BORDERING VEGETATED WETLAND (BVW)
BLSF	EDGE OF BORDERING LAND SUBJECT TO FLOODING
	LIMIT OF BANK
	LIMIT OF FEMA FLOODWAY
BLSF	ZONE A FLOOD LIMIT (NO BFE)
	APPROX. LIMIT OF GRADING
100'WPA BZ	100' WPA BUFFER ZONE
100'WPA BZ-SUD RA	100' WPA BUFFER ZONE/100' SUDBURY AURA
100'BZ-AURA	100' WPA BUFFER ZONE/100' SUDBURY RESOURCE AREA
100'WPA VPBZ	100' WPA VERNAL POOL BUFFER ZONE
100'WPA RA	100' WPA RESOURCE AREA
200'WPA RA	200' WPA RESOURCE AREA
100'SUD RA	100' SUDBURY RESOURCE AREA
200'SUD RA	200' SUDBURY RESOURCE AREA
100'SUD VPBZ	100' SUDBURY VERNAL POOL BUFFER ZONE
AURA	100' or 200' SUDBURY AURA

LINETYPE	DESCRIPTION
	DRIVE SAMPLE BORING LOCATION
	TEST PIT LOCATION

HATCH	DESCRIPTION
	DISTURBANCE TO 100' WPA BUFFER ZONE (100' BZ)
	DISTURBANCE TO WPA 100' RIVERFRONT AREA (100' RA)
	DISTURBANCE TO WPA 200' RIVERFRONT AREA (200' RA)
	DISTURBANCE TO BLSF
	BORDERING VEGETATED WETLAND
	LIMIT OF BANK/LAND UNDER WATER

HATCH	DESCRIPTION
	TEMPORARY DISTURBANCE TO BVW / LUW / IVW
	PERMANENT DISTURBANCE TO BVW / LUW / IVW
	DISTURBANCE TO 100' WPA VERNAL POOL BZ



NOTES:

1.FOR THIS PROJECT, WPA RESOURCE AREAS ARE JURISDICTIONAL. TOWN BYLAW RESOURCE AREA BOUNDARIES ARE SHOWN FOR REFERENCE ONLY.

2. FOR PLANT LIST SEE CONSTRUCTION PLANS

ENVIRONMENTAL IMPACTS LEGEND

LINETYPE	DESCRIPTION
	LIMIT OF BORDERING VEGETATED WETLAND (BVW)
BLSF	EDGE OF BORDERING LAND SUBJECT TO FLOODING
	LIMIT OF BANK
BLSF	LIMIT OF FEMA FLOODWAY
	ZONE A FLOOD LIMIT (NO BFE)
	APPROX. LIMIT OF GRADING
100'WPA BZ	100' WPA BUFFER ZONE
100'WPA BZ - SUD RA	100' WPA BUFFER ZONE/100' SUDBURY AURA
100'BZ - AURA	100' WPA BUFFER ZONE/100' SUDBURY RESOURCE AREA
100'WPA VPBZ	100' WPA VERNAL POOL BUFFER ZONE
100'WPA RA	100' WPA RESOURCE AREA
200'WPA RA	200' WPA RESOURCE AREA
100'SUD RA	100' SUDBURY RESOURCE AREA
200'SUD RA	200' SUDBURY RESOURCE AREA
100'SUD VPBZ	100' SUDBURY VERNAL POOL BUFFER ZONE
AURA	100' or 200' SUDBURY AURA

LINETYPE	DESCRIPTION
	DRIVE SAMPLE BORING LOCATION
	TEST PIT LOCATION

HATCH	DESCRIPTION
	DISTURBANCE TO 100' WPA BUFFER ZONE (100' BZ)
	DISTURBANCE TO WPA 100' RIVERFRONT AREA (100' RA)
	DISTURBANCE TO WPA 200' RIVERFRONT AREA (200' RA)
	DISTURBANCE TO BLSF
	BORDERING VEGETATED WETLAND
	LIMIT OF BANK/LAND UNDER WATER

HATCH	DESCRIPTION
	TEMPORARY DISTURBANCE TO BVW / LUW / IVW
	PERMANENT DISTURBANCE TO BVW / LUW / IVW
	DISTURBANCE TO 100' WPA VERNAL POOL BZ

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	2	316
PROJECT FILE NO.	608164		

ENVIRONMENTAL IMPACT PLANS

608164_NOI\GENERAL PLANS\.DWG Plotted on 22-Dec-2021 11:00 PM

N

CONTINUED ON SHEET NO. 1

& SEED PERM
BVW

SF EROSION CONTROL
MP. IMPACT TO BVW

LIMIT OF BORDERING VEGETATIVE WETLAND

WF#36-209 WF#36-210 WF#36-211 WF#36-212 WF#36-213 WF#36-214 WF#36-215 WF#36-216 WF#36-217 WF#36-218 WF#36-219 E

106 107 108

WF#36-110 WF#36-111 WF#36-112 E

EDGE PVMT

WOOD FENCE

BIT PARKING

BIT PARKING

DISTURBANCE TO 100' BUFFER ZONE

MASSDOT-RAIL AND TRANSIT DIVISION
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BITUMINOUS PARKING LOT

LIMIT OF 100' SUD VERNAL POOL BUFFER ZONE

LIMIT OF 100' WPA BUFFER ZONE

LIMIT OF 100' WPA BUFFER ZONE / 100' SUD AURA

LIMIT OF 100' SUD AURA

LIMIT OF 100' SUD VERNAL POOL BUFFER ZONE

N/F
TUCKER PROPERTIES LLC
57 UNION AVE
MAP/LOT K08/0052
BK/PG 53165/224

N/F
SCOTT A MCLVER
TRUSTEE OF MACOT REALTY TRUST
65 UNION AVE
MAP/LOT K08/0051
BK/PG 63090-389

71 UNION AVE DRIVEWAY (PRIVATE)

EDGE PVMT

BIT DRIVE

POTENTIAL VERNAL POOL #16 WPA NON-ELIGIBLE

LIMIT OF BORDERING VEGETATIVE WETLAND

SYNCOPATE SEDIMENT CONTROL BARRIER

DISTURBANCE TO 100' BUFFER ZONE

WF#37-100 WF#37-101 WF#37-102 WF#37-103 WF#37-104 WF#37-105 WF#37-106 E

109 110 111

N 8° 45' 56" E 1688.31'

WF#38-107 WF#38-106 WF#38-105 WF#38-104 WF#38-103 WF#38-102 WF#38-101 WF#38-100 WF#38-109 E

LIMIT OF ISOLATED VEGETATIVE WETLAND (SUD ONLY)

NO CONSTRUCTION ACCESS & EGRESS

POTENTIAL VERNAL POOL #17 WPA NON-ELIGIBLE

LIMIT OF 100' SUD AURA

SYNCOPATE SEDIMENT CONTROL BARRIER

LIMIT OF 100' SUD VERNAL POOL BUFFER ZONE

LIMIT OF 100' WPA BUFFER ZONE / 100' SUD AURA

WOODED

BITUMINOUS PARKING LOT

EDGE PVMT

MACOT REALTY TRUST
EXIST. 15' EASEMENT
BK/PG 14585/587

N/F
TUCKER PROPERTIES LLC
75 UNION AVE
MAP/LOT K08/0050
BK/PG 53165/230

CONTINUED BELOW

0 20 50 100
SCALE: 1" = 20'

CONTINUED ABOVE

UD AURA

NTROL BARRIER

NAL

N/F
SCOTT A MCLVER
TRUSTEE OF MACOT REALTY TRUST
71 UNION AVE
MAP/LOT K08/0087
BK/PG 63090-389

WOODED

LIMIT OF BORDERING VEGETATIVE WETLAND

WF#39-100 WF#39-101 WF#39-102 WF#39-103 E

112 113 114 115 116 117

N 8° 45' 56" E 1688.31'

RAILROAD TRACKS

DISTURBANCE TO 100' BUFFER ZONE

MASSDOT-RAIL AND TRANSIT DIVISION
VAL MAP V7.38-39 SHEET 5, V7.39 SHEETS 6-10
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FARMLAND

N/F
TUCKER PROPERTIES LLC
75 UNION AVE
MAP/LOT K08/0050
BK/PG 53165/230

LIMIT OF 100' WPA BUFFER ZONE / 100' SUD AURA

NO CONSTRUCTION ACCESS & EGRESS

CODJER LANE (PRIVATE)

EDGE OF BORDERING LAND SUBJECT TO FLOODING (ELEV 138.0)

CODJER LANE (PRIVATE)

CONTINUED ON SHEET NO. 3

175 SF BLSF IMPACT

GRAVEL DRIVE

ROW OF 20"-30" WHITE PINES

BLSF

DISTURBAN
BUFFER ZO

N/F
CAVICCHIO FAMILY REAL ESTATE LLC
0 CODJER LN
MAP/LOT J08/0502
BK/PG 76537/294

0 20 50 100
SCALE: 1" = 20'

N/F
CAVICCHIO FAMILY REAL ESTATE LLC
0 CODJER LN
MAP/LOT J08/0503
BK/PG 76537/294

ENVIRONMENTAL IMPACTS LEGEND

LINETYPE	DESCRIPTION
	LIMIT OF BORDERING VEGETATED WETLAND (BVW)
BLSF	EDGE OF BORDERING LAND SUBJECT TO FLOODING
	LIMIT OF BANK
	LIMIT OF FEMA FLOODWAY
BLSF	ZONE A FLOOD LIMIT (NO BFE)
	APPROX. LIMIT OF GRADING
100'WPA BZ	100' WPA BUFFER ZONE
100'WPA BZ~SUD RA	100' WPA BUFFER ZONE/100' SUDBURY AURA
100'BZ~AURA	100' WPA BUFFER ZONE/100' SUDBURY RESOURCE AREA
100'WPA VPBZ	100' WPA VERNAL POOL BUFFER ZONE
100'WPA RA	100' WPA RESOURCE AREA
200'WPA RA	200' WPA RESOURCE AREA
100'SUD RA	100' SUDBURY RESOURCE AREA
200'SUD RA	200' SUDBURY RESOURCE AREA
100'SUD VPBZ	100' SUDBURY VERNAL POOL BUFFER ZONE
AURA	100' or 200' SUDBURY AURA

LINETYPE	DESCRIPTION
	DRIVE SAMPLE BORING LOCATION
	TEST PIT LOCATION

HATCH	DESCRIPTION
	DISTURBANCE TO 100' WPA BUFFER ZONE (100' BZ)
	DISTURBANCE TO WPA 100' RIVERFRONT AREA (100' RA)
	DISTURBANCE TO WPA 200' RIVERFRONT AREA (200' RA)
	DISTURBANCE TO BLSF
	BORDERING VEGETATED WETLAND
	LIMIT OF BANK/LAND UNDER WATER

HATCH	DESCRIPTION
	TEMPORARY DISTURBANCE TO BVW / LUW / IVW
	PERMANENT DISTURBANCE TO BVW / LUW / IVW
	DISTURBANCE TO 100' WPA VERNAL POOL BZ

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	3	316
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CONTINUED ON SHEET NO. 2

175 SF BLSF IMPACT

PROP. COMPENSATORY STORAGE LOCATION FOR HOP BROOK BLSF

LIMIT OF BORDERING VEGETATIVE WETLAND

EDGE OF BORDERING LAND SUBJECT TO FLOODING (ELEV 138.0)

LIMIT OF 200' RIVER FRONT AREA

CONTINUED BELOW

MASSDOT-RAIL AND TRANSIT DIVISION
VAL MAP V7.38-39 SHEET 5, V7.39 SHEETS 6-10
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INV 12" CPP EL=136.75'
INV 12" CPP EL=135.39'
INV 12" CPP EL=136.49'
INV 12" CPP EL=135.56'
INV 12" CPP EL=136.52'
INV 12" CPP EL=135.70'
INV 12" CPP EL=136.63'
INV 12" CPP EL=135.81'
INV 12" CPP EL=137.17'
INV 12" CPP EL=136.27'

WF#41~113END, WF#41~113, WF#41~112, WF#41~111, WF#41~110, WF#41~109, WF#41~108, WF#41~107, BF#33~109 START

117, 118, 119, 120, 121, 122, 123

N 8° 45' 56" E 1688.31'

20"~30" WHITE PINES

ROW OF 20"~30" WHITE PINES

RAILROAD TRACKS

WF#40~108, WF#40~109, WF#40~110, WF#40~111, WF#40~112, WF#40~113, WF#40~107, WF#40~106, WF#40~105, WF#40~104, WF#40~103, WF#40~102

DISTURBANCE TO 100' BUFFER ZONE

LIMIT OF BORDERING VEGETATIVE WETLAND

EDGE OF BORDERING LAND SUBJECT TO FLOODING (ELEV 138.0)

DISTRUBANCE TO 200' RIVER FRONT AREA

DISTRUBANCE TO 100' RIVER FRONT AREA

LIMIT OF 100' WPA BUFFER ZONE / 100' SUD AURA

N/F CAVICCHIO FAMILY REAL ESTATE LLC 0 CODJER LN MAP/LOT J08/0503 BK/PG 76537/294

N/F CAVICCHIO FAMILY REAL ESTATE LLC 110 CODJER LN MAP/LOT J08/0503 BK/PG 76537/294

0 20 50 100
SCALE: 1" = 20'

N/F CODJER LANE LLC 110 CODJER LN MAP/LOT J08/0004 BK/PG 48795/63

EDGE OF BORDERING LAND SUBJECT TO FLOODING (ELEV 138.0)

LIMIT OF WPA 100' RIVER FRONT AREA

179 SF ABUTMENTWORK AREA TEMP IMPACT TO LUW

HOP BROOK

84 LF ABUTMENT WORK AREA TEMP IMPACT TO BANK

LIMIT OF FEMA FLOODWAY

CONTINUED ON SHEET NO. 4

LIMIT OF BANK

EDGE OF BORDERING LAND SUBJECT TO FLOODING (ELEV 138.0)

CONTINUED ABOVE

LIMIT OF BORDERING VEGETATIVE WETLAND

BF#33~103, BF#33~105, BF#33~102, BF#33~101, BF#33~100, BF#33~106, BF#33~104, BF#33~109 START, WF#41~106, WF#41~105, WF#41~104, WF#41~103, WF#41~102, WF#41~101, WF#41~100START

123, 124, 125, 126, 127, 128

N 8° 45' 56" E 105.05'

WF#40~113, WF#40~114, WF#40~115, WF#40~116, WF#40~117, WF#40~118, WF#40~119, WF#40~102, WF#40~101, WF#40~100START

DISTRUBANCE TO 100' RIVER FRONT AREA

EDGE OF BORDERING LAND SUBJECT TO FLOODING (ELEV 138.0)

47 SF ABUTMENT WORK AREA TEMP IMPACT TO BVW

LIMIT OF BANK

HOP BROOK

347 SF ABUTMENTWORK AREA TEMP IMPACT TO LUW

49 LF ABUTMENT WORK AREA TEMP IMPACT TO BANK

EDGE OF BORDERING LAND SUBJECT TO FLOODING (ELEV 138.0)

DISTRUBANCE TO 100' RIVER FRONT AREA

WF#35~216END, WF#35~215, WF#35~214, WF#35~213, WF#35~212, WF#35~211, WF#35~209, BF#32~204, BF#32~203, BF#32~202, BF#32~201, BF#32~200, BF#33~94, BF#33~99, BF#33~95, BF#33~98, BF#33~93, BF#33~92, BF#33~91, BF#33~87, BF#33~86, BF#33~97, BF#33~96, BF#33~100START

MASSDOT-RAIL AND TRANSIT DIVISION
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N/F TOWN OF SUDBURY (CONSERVATION COMMISSION) UNION AVE MAP/LOT J08/0009 BK/PG 31017/194

0 20 50 100
SCALE: 1" = 20'

ENVIRONMENTAL IMPACTS LEGEND

LINETYPE	DESCRIPTION
	LIMIT OF BORDERING VEGETATED WETLAND (BVW)
	EDGE OF BORDERING LAND SUBJECT TO FLOODING
	LIMIT OF BANK
	LIMIT OF FEMA FLOODWAY
	ZONE A FLOOD LIMIT (NO BFE)
	APPROX. LIMIT OF GRADING
100'WPA BZ	100' WPA BUFFER ZONE
100'WPA BZ - SUD RA	100' WPA BUFFER ZONE/100' SUDBURY AURA
100'BZ - AURA	100' WPA BUFFER ZONE/100' SUDBURY RESOURCE AREA
100'WPA VPBZ	100' WPA VERNAL POOL BUFFER ZONE
100'WPA RA	100' WPA RESOURCE AREA
200'WPA RA	200' WPA RESOURCE AREA
100'SUD RA	100' SUDBURY RESOURCE AREA
200'SUD RA	200' SUDBURY RESOURCE AREA
100'SUD VPBZ	100' SUDBURY VERNAL POOL BUFFER ZONE
AURA	100' or 200' SUDBURY AURA

LINETYPE	DESCRIPTION
	DRIVE SAMPLE BORING LOCATION
	TEST PIT LOCATION

HATCH	DESCRIPTION
	DISTURBANCE TO 100' WPA BUFFER ZONE (100' BZ)
	DISTURBANCE TO WPA 100' RIVERFRONT AREA (100' RA)
	DISTURBANCE TO WPA 200' RIVERFRONT AREA (200' RA)
	DISTURBANCE TO BLSF
	BORDERING VEGETATED WETLAND
	LIMIT OF BANK/LAND UNDER WATER

HATCH	DESCRIPTION
	TEMPORARY DISTURBANCE TO BVW / LUW / IVW
	PERMANENT DISTURBANCE TO BVW / LUW / IVW
	DISTURBANCE TO 100' WPA VERNAL POOL BZ

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	4	316
PROJECT FILE NO.	608164		

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LIMIT OF BANK

EDGE OF BORDERING LAND SUBJECT TO FLOODING (ELEV 138.0)

LIMIT OF BORDERING VEGETATIVE WETLAND

LIMIT OF BANK

MAP/LOT J08/0311
BK/PG 49974/258

LIMIT OF WPA 100' RIVER FRONT AREA

DISTRUBANCE TO 100' RIVER FRONT AREA

DISTRUBANCE TO 200' RIVER FRONT AREA

LIMIT OF 100' WPA BUFFER ZONE/ 100' SUD AURA

CONTINUED BELOW

MASSDOT–RAIL AND TRANSIT DIVISION
VAL MAP V7.38–39 SHEET 5, V7.39 SHEETS 6–10
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N 8° 45' 56" E 1550.13'

128 129 130 131 132 133 134

WF#35–92 WF#35–97 BF#32–215 BF#32–214 WF#35–98 WF#35–99 WF#35–100 WF#35–101 WF#35–102 WF#35–103 WF#35–104 WF#35–105 WF#35–106 WF#35–107 WF#35–108 WF#35–109 BF#32–210 BF#32–211 BF#32–212 BF#32–213 BF#32–206 WF#35–114 BF#32–209 WF#35–110

WF#35–211 WF#35–209 WF#35–208 WF#35–207 WF#35–206 WF#35–204 WF#35–203 WF#35–202 WF#35–201 WF#35–200 WF#35–199 START

EDGE OF BORDERING LAND SUBJECT TO FLOODING (ELEV 138.0)

LIMIT OF BORDERING VEGETATIVE WETLAND

LIMIT OF WPA 200' RIVER FRONT AREA

N/F
DAVID B & CAROLE E PENDLETON
41 MEADOW DR
MAP/LOT J08/0011
BK/PG 32089/419

N/F
GREGORY A GEORGE & CHRISTINE CARLO
39 MEADOW DR
MAP/LOT J08/0116
BK/PG 57353/44

N/F
KEVIN MICHAEL KRAUSS & JODI LUCY
35 MEADOW DR
MAP/LOT J08/0115
BK/PG 58399/177

0 20 50 100
SCALE: 1" = 20'

CONTINUED ABOVE

DISTRUBANCE TO 200' RIVER FRONT AREA

LIMIT OF 200' RIVER FRONT AREA

LIMIT OF 100' WPA BUFFER ZONE/ 100' SUD AURA

N/F
LAWRENCE A WIND & CHRISTINE E TUCKER
4 WASH BROOK RD
MAP/LOT J08/0309
BK/PG 65979/59

LIMIT OF 100' SUD VERNAL POOL BUFFER ZONE

LIMIT OF 100' SUD AURA

LIMIT OF ISOLATED VEGETATIVE WETLAND (SUD ONLY)

N/F
JANE HIGHTOWER RODDY
22 GERRY DR
MAP/LOT J08/0308
BK/PG 28295/180

CONTINUED ON SHEET NO. 5

SYNCOPATE SEDIMENT CONTROL BARRIER

WF#33–TUB END WF#33–107 WF#33–106 WF#33–105 WF#33–104

SYNCOPATE SEDIMENT CONTROL BARRIER

MASSDOT–RAIL AND TRANSIT DIVISION
VAL MAP V7.38–39 SHEET 5, V7.39 SHEETS 6–10
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WF#34–104 WF#34–103 WF#34–102 WF#34–105 WF#34–106 END

LIMIT OF ISOLATTED VEGETATIVE WETLAND (SUD ONLY)

134 135 136 137 138 139 140

N 8° 45' 56" E 1556.13'

N/F
KEVIN MICHAEL KRAUSS & JODI LUCY
35 MEADOW DR
MAP/LOT J08/0115
BK/PG 58399/177

N/F
JAMES C LEU JR & TRACY GEHAN
29 MEADOW DR
MAP/LOT J08/0114
BK/PG 24771/298

N/F
DANIEL P HARTY
25 MEADOW DR
MAP/LOT J08/0113
BK/PG 14674/367

N/F
ALICIA ARKIN
21 MEADOW DR
MAP/LOT J08/0112
BK/PG 70104/288

N/F
MARK J LANZA & MARY ELIZABETH LOUSA
11 MEADOW DR
MAP/LOT J08/0111
BK/PG 45671/478

0 20 50 100
SCALE: 1" = 20'

ENVIRONMENTAL IMPACTS LEGEND

LINETYPE	DESCRIPTION
BLSF	LIMIT OF BORDERING VEGETATED WETLAND (BVW)
BLSF	EDGE OF BORDERING LAND SUBJECT TO FLOODING
	LIMIT OF BANK
	LIMIT OF FEMA FLOODWAY
BLSF	ZONE A FLOOD LIMIT (NO BFE)
	APPROX. LIMIT OF GRADING
100'WPA BZ	100' WPA BUFFER ZONE
100'WPA BZ - SUD RA	100' WPA BUFFER ZONE/100' SUDBURY AURA
100'BZ - AURA	100' WPA BUFFER ZONE/100' SUDBURY RESOURCE AREA
100'WPA VPBZ	100' WPA VERNAL POOL BUFFER ZONE
100'WPA RA	100' WPA RESOURCE AREA
200'WPA RA	200' WPA RESOURCE AREA
100'SUD RA	100' SUDBURY RESOURCE AREA
200'SUD RA	200' SUDBURY RESOURCE AREA
100'SUD VPBZ	100' SUDBURY VERNAL POOL BUFFER ZONE
AURA	100' or 200' SUDBURY AURA

LINETYPE	DESCRIPTION
	DRIVE SAMPLE BORING LOCATION
	TEST PIT LOCATION

HATCH	DESCRIPTION
	DISTURBANCE TO 100' WPA BUFFER ZONE (100' BZ)
	DISTURBANCE TO WPA 100' RIVERFRONT AREA (100' RA)
	DISTURBANCE TO WPA 200' RIVERFRONT AREA (200' RA)
	DISTURBANCE TO BLSF
	BORDERING VEGETATED WETLAND
	LIMIT OF BANK/LAND UNDER WATER

HATCH	DESCRIPTION
	TEMPORARY DISTURBANCE TO BVW / LUW / IVW
	PERMANENT DISTURBANCE TO BVW / LUW / IVW
	DISTURBANCE TO 100' WPA VERNAL POOL BZ

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	5	316
PROJECT FILE NO.	608164		

ENVIRONMENTAL IMPACT PLANS

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LIMIT OF 100' SUD VERNAL POOL BUFFER ZONE

POTENTIAL VERNAL POOL #15
WPA NON-ELIGIBLE

LIMIT OF ISOLATED VEGETATIVE WETLAND (SUD ONLY)

CONTINUED ON SHEET NO. 4

CONTINUED ON SHEET NO. 6

OLD LANCASTER ROAD (PUBLIC)

N/F
ADRIAN G & MELINDA J DAVIES
14 GERRY DR
MAP/LOT J08/0307
BK/PG 38355/267

N/F
CHERYL JONES
233 OLD LANCASTER RD
MAP/LOT J08/0301
BK/PG 33438/39

N/F
CHONG M & WAI-WAI CHO
236 OLD LANCASTER RD
MAP/LOT H08/0011
BK/PG 45903/51

N/F
MARK J LANZA & MARY ELIZABETH LOUSA
1 MEADOW DR
MAP/LOT J08/0111
BK/PG 45671/478

N/F
MICHAEL W KREBS & BARBARA P
223 OLD LANCASTER RD
MAP/LOT J08/0101
BK/PG 13427/420

N/F
JOSHUA R & VICTORIA A BARIBEAU
219 OLD LANCASTER RD
MAP/LOT J08/0102
BK/PG 55651/169

N/F
MARCELLO F SANTANA
226 OLD LANCASTER RD
MAP/LOT H08/0045
BK/PG 75814/51

N/F
MATTHEW P & KENDRA H DOYON
220 OLD LANCASTER RD
MAP/LOT J08/0012
BK/PG 71208/253

WF#33-100
WF#33-101
WF#33-102
WF#33-103
WF#33-104
WF#33-105
WF#33-106

WF#34-100START
WF#34-101
WF#34-102
WF#34-103
WF#34-104
WF#34-105
WF#34-106 END

N 8° 45' 56" E 1556.13'

INV 12" RCP
EL=153.89

CONSTRUCTION ACCESS & EGRESS

RAILROAD TRACKS

SWALE

0 20 50 100
SCALE: 1" = 20'

ENVIRONMENTAL IMPACTS LEGEND

LINETYPE	DESCRIPTION
	LIMIT OF BORDERING VEGETATED WETLAND (BVW)
BLSF	EDGE OF BORDERING LAND SUBJECT TO FLOODING
	LIMIT OF BANK
	LIMIT OF FEMA FLOODWAY
BLSF	ZONE A FLOOD LIMIT (NO BFE)
	APPROX. LIMIT OF GRADING
100'WPA BZ	100' WPA BUFFER ZONE
100'WPA BZ - SUD RA	100' WPA BUFFER ZONE/100' SUDBURY AURA
100'BZ - AURA	100' WPA BUFFER ZONE/100' SUDBURY RESOURCE AREA
100'WPA VPBZ	100' WPA VERNAL POOL BUFFER ZONE
100'WPA RA	100' WPA RESOURCE AREA
200'WPA RA	200' WPA RESOURCE AREA
100'SUD RA	100' SUDBURY RESOURCE AREA
200'SUD RA	200' SUDBURY RESOURCE AREA
100'SUD VPBZ	100' SUDBURY VERNAL POOL BUFFER ZONE
AURA	100' or 200' SUDBURY AURA

LINETYPE	DESCRIPTION
	DRIVE SAMPLE BORING LOCATION
	TEST PIT LOCATION

HATCH	DESCRIPTION
	DISTURBANCE TO 100' WPA BUFFER ZONE (100' BZ)
	DISTURBANCE TO WPA 100' RIVERFRONT AREA (100' RA)
	DISTURBANCE TO WPA 200' RIVERFRONT AREA (200' RA)
	DISTURBANCE TO BLSF
	BORDERING VEGETATED WETLAND
	LIMIT OF BANK/LAND UNDER WATER

HATCH	DESCRIPTION
	TEMPORARY DISTURBANCE TO BVW / LUW / IVW
	PERMANENT DISTURBANCE TO BVW / LUW / IVW
	DISTURBANCE TO 100' WPA VERNAL POOL BZ

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	6	316
PROJECT FILE NO.	608164		

ENVIRONMENTAL IMPACT PLANS

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CONTINUED ON SHEET NO. 5

LIMIT OF 100' WPA BUFFER ZONE/ SUD AURA

CONTINUED BELOW

MASSDOT-RAIL AND TRANSIT DIVISION
VAL MAP V7.38-39 SHEET 5, V7.39 SHEETS 6-10
JUNE 30, 1915 LAYOUT BY OLD COLONY R.R CO.
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145 146 147 148 149 150 151

Δ=16° 09' 23"
L=807.88' R=2865.00'

RAILROAD TRACKS

SWALE

N/F
BRUCE OSTAR
31 PENNYMEADOW RD
MAP/LOT H08/0313
BK/PG 60261/437

N/F
CHRISTOPHER MCCLURE & RHYNE KRISTIN
35 PENNYMEADOW RD
MAP/LOT H08/0312
BK/PG 47285/246

N/F
WILLIAM E JR & ELAINE KNEELAND
43 PENNYMEADOW RD
MAP/LOT H08/0311
BK/PG 12513/278

0 20 50 100
SCALE: 1" = 20'

CONTINUED ABOVE

WF#32-312 WF#32-311 WF#32-310 WF#32-309 WF#32-308 WF#32-306 WF#32-305 WF#32-304 WF#32-303 WF#32-302 WF#32-301 WF#32-300 START

N/F
JAMES C & MELANIE B WEAVER
248 OLD LANCASTER RD
MAP/LOT H08/0008
BK/PG 74050/535

LIMIT OF BORDERING VEGETATIVE WETLAND

CONTINUED ON SHEET NO. 7

STONE WALL

151 152 153 154 155 156

RAILROAD TRACKS

EX 14" CI

N 24° 55' 19" E 766.36'

EX. CULVERT 12" CLAY PIPE

DISTURBANCE TO 100' BUFFER ZONE

LIMIT OF 100' WPA BUFFER ZONE/ SUD AURA

100'BZ - AURA

N/F
JAMES J JR & LISA A NIGRELLI
TRUSTEES OF NIGRELLI NOMINEE
51 PENNYMEADOW RD
MAP/LOT H08/0310
BK/PG 74050/535

N/F
RICHARD J & CLAIRE A WOLLENSAK
60 PENNYMEADOW RD
MAP/LOT H08/0012
BK/PG 13285/445

N/F
WILLIAM E JR & ELAINE KNEELAND
43 PENNYMEADOW RD
MAP/LOT H08/0311
BK/PG 12513/278

0 20 50 100
SCALE: 1" = 20'

ENVIRONMENTAL IMPACTS LEGEND

LINETYPE	DESCRIPTION
	LIMIT OF BORDERING VEGETATED WETLAND (BVW)
BLSF	EDGE OF BORDERING LAND SUBJECT TO FLOODING
	LIMIT OF BANK
	LIMIT OF FEMA FLOODWAY
BLSF	ZONE A FLOOD LIMIT (NO BFE)
	APPROX. LIMIT OF GRADING
100'WPA BZ	100' WPA BUFFER ZONE
100'WPA BZ - SUD RA	100' WPA BUFFER ZONE/100' SUDBURY AURA
100'BZ - AURA	100' WPA BUFFER ZONE/100' SUDBURY RESOURCE AREA
100'WPA VPBZ	100' WPA VERNAL POOL BUFFER ZONE
100'WPA RA	100' WPA RESOURCE AREA
200'WPA RA	200' WPA RESOURCE AREA
100'SUD RA	100' SUDBURY RESOURCE AREA
200'SUD RA	200' SUDBURY RESOURCE AREA
100'SUD VPBZ	100' SUDBURY VERNAL POOL BUFFER ZONE
AURA	100' or 200' SUDBURY AURA

LINETYPE	DESCRIPTION
	DRIVE SAMPLE BORING LOCATION
	TEST PIT LOCATION

HATCH	DESCRIPTION
	DISTURBANCE TO 100' WPA BUFFER ZONE (100' BZ)
	DISTURBANCE TO WPA 100' RIVERFRONT AREA (100' RA)
	DISTURBANCE TO WPA 200' RIVERFRONT AREA (200' RA)
	DISTURBANCE TO BLSF
	BORDERING VEGETATED WETLAND
	LIMIT OF BANK/LAND UNDER WATER

HATCH	DESCRIPTION
	TEMPORARY DISTURBANCE TO BVW / LUW / IVW
	PERMANENT DISTURBANCE TO BVW / LUW / IVW
	DISTURBANCE TO 100' WPA VERNAL POOL BZ

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	7	316
PROJECT FILE NO.	608164		

ENVIRONMENTAL IMPACT PLANS

Plotted on 22-Dec-2021 11:03 PM
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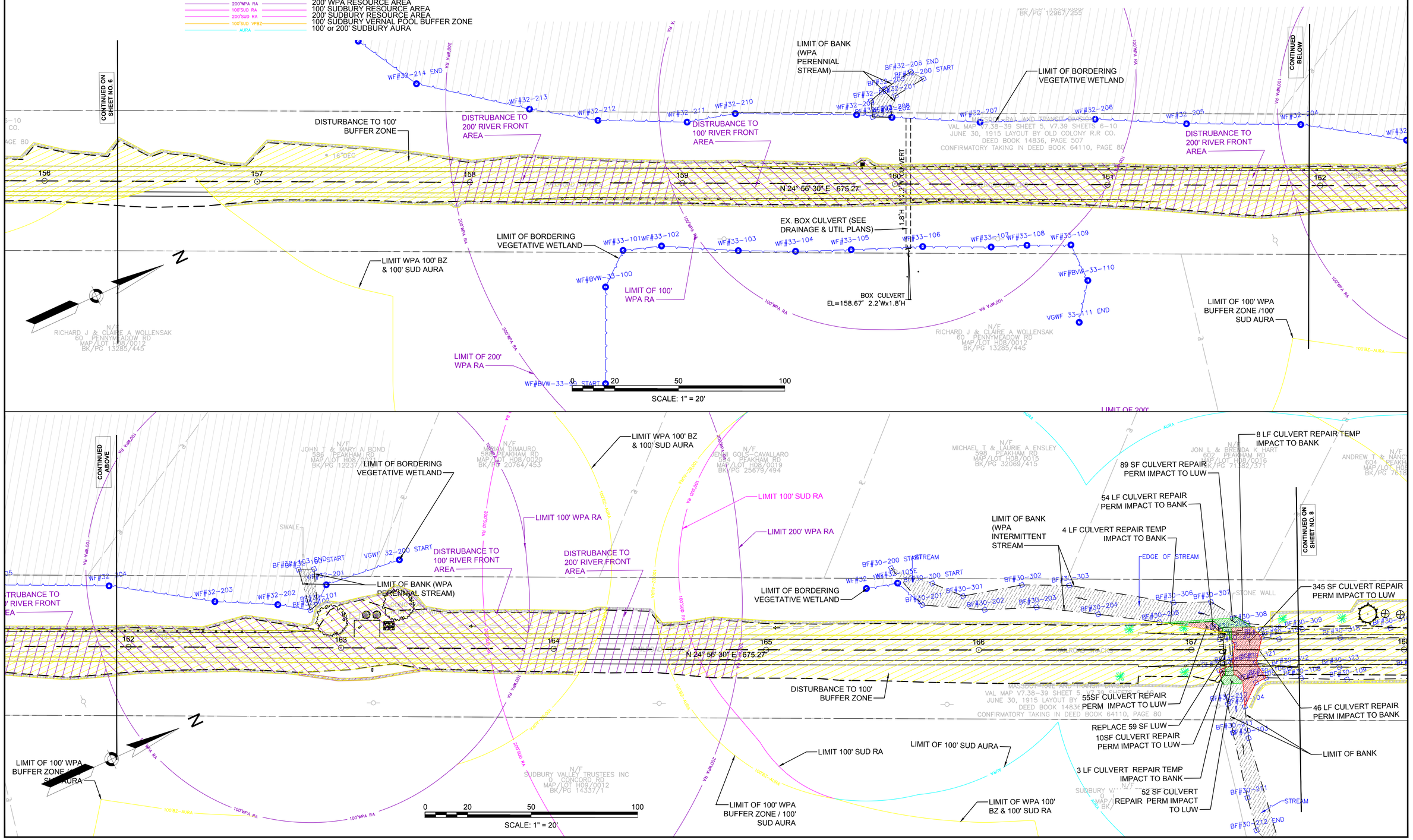

ENVIRONMENTAL IMPACTS LEGEND

LINETYPE	DESCRIPTION
	LIMIT OF BORDERING VEGETATED WETLAND (BVW)
BLSF	EDGE OF BORDERING LAND SUBJECT TO FLOODING
	LIMIT OF BANK
	LIMIT OF FEMA FLOODWAY
BLSF	ZONE A FLOOD LIMIT (NO BFE)
	APPROX. LIMIT OF GRADING
100'WPA BZ	100' WPA BUFFER ZONE
100'WPA BZ - SUD RA	100' WPA BUFFER ZONE/100' SUDBURY AURA
100'BZ - AURA	100' WPA BUFFER ZONE/100' SUDBURY RESOURCE AREA
100'WPA VPBZ	100' WPA VERNAL POOL BUFFER ZONE
100'WPA RA	100' WPA RESOURCE AREA
200'WPA RA	200' WPA RESOURCE AREA
100'SUD RA	100' SUDBURY RESOURCE AREA
200'SUD RA	200' SUDBURY RESOURCE AREA
100'SUD VPBZ	100' SUDBURY VERNAL POOL BUFFER ZONE
AURA	100' or 200' SUDBURY AURA

LINETYPE	DESCRIPTION
	DRIVE SAMPLE BORING LOCATION
	TEST PIT LOCATION

HATCH	DESCRIPTION
	DISTURBANCE TO 100' WPA BUFFER ZONE (100' BZ)
	DISTURBANCE TO WPA 100' RIVERFRONT AREA (100' RA)
	DISTURBANCE TO WPA 200' RIVERFRONT AREA (200' RA)
	DISTURBANCE TO BLSF
	BORDERING VEGETATED WETLAND
	LIMIT OF BANK/LAND UNDER WATER

HATCH	DESCRIPTION
	TEMPORARY DISTURBANCE TO BVW / LUW / IVW
	PERMANENT DISTURBANCE TO BVW / LUW / IVW
	DISTURBANCE TO 100' WPA VERNAL POOL BZ

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	8	316
PROJECT FILE NO.	608164		

ENVIRONMENTAL IMPACT PLANS

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608164_NOI(GENERAL PLANS).DWG

LIMIT OF WPA 100' BZ / 100' SUD RA

8 LF CULVERT REPAIR TEMP IMPACT TO BANK

LIMIT OF 100' SUD AURA

LIMIT OF WPA 100' BUFFER ZONE/ 100' SUD RA

CONTINUED ON SHEET NO. 7.

345 SF CULVERT REPAIR PERM IMPACT TO LUW

LIMIT OF BANK INTERMITTENT STREAM (SUD ONLY)

303 SF PERM IMPACT TO SECTION 401 JURISDICTIONAL IVW

166 SF EROSION CONTROL TEMP IMPACT TO SECTION 401 JURISDICTIONAL IVW

LIMIT OF ISOLATED VEGETATIVE WETLAND (SUD ONLY)

46 LF CULVERT REPAIR PERM IMPACT TO BANK

LIMIT OF BANK

DISTURBANCE TO 100' BUFFER ZONE

LIMIT OF BANK INTERMITTENT STREAM (SUD ONLY)

LIMIT 200' SUD RA

LIMIT OF WPA 100' BUFFER ZONE/100' SUD RA

STREAM

LIMIT OF 100' SUD AURA

PEAKHAM ROAD (PUBLIC)

CONTINUED ON SHEET NO. 9.

LIMIT OF ISOLATED VEGETA WETLAND (SUD ONLY)

N/F JON L & BRENDA K HART 602 PEAKHAM RD MAP/LOT H08/0016 BK/PG 71782/371

N/F ANDREW T & NANCY MACDONALD 604 PEAKHAM RD MAP/LOT H08/0017 BK/PG 76180/304

N/F DAVID P NUSINOW & NICOLE A NEUMAN 610 PEAKHAM RD MAP/LOT H08/0018 BK/PG 72671/130

N/F ANDREW J & STEPHANIE O LEWIS 616 PEAKHAM RD MAP/LOT H09/0001 BK/PG 43412/31

N/F 29 HUDSON ROAD LLC 29 HUDSON RD MAP/LOT H09/0002 BK/PG 58156/562

N/F JAMES & ELIZABETH ANDREWS 293 CONCORD RD MAP/LOT H09/0007 BK/PG 58928/173

MASSDOT-RAIL AND TRANSIT DIVISION VAL MAP V7.38-39 SHEET 5, V7.39 SHEETS 6-10 JUNE 30, 1915 LAYOUT BY OLD COLONY R.R CO. DEED BOOK 14836, PAGE 507 CONFIRMATORY TAKING BOOK 64161, PAGE 8

RAILROAD TRACK

STONE WALL

WOOD FENCE

GRASS

BIT DRIVE

0 20 50 100

SCALE: 1" = 20'

N

ENVIRONMENTAL IMPACTS LEGEND

LINETYPE	DESCRIPTION
	LIMIT OF BORDERING VEGETATED WETLAND (BVW)
BLSF	EDGE OF BORDERING LAND SUBJECT TO FLOODING
	LIMIT OF BANK
	LIMIT OF FEMA FLOODWAY
BLSF	ZONE A FLOOD LIMIT (NO BFE)
	APPROX. LIMIT OF GRADING
100'WPA BZ	100' WPA BUFFER ZONE
100'WPA BZ - SUD RA	100' WPA BUFFER ZONE/100' SUDBURY AURA
100'BZ - AURA	100' WPA BUFFER ZONE/100' SUDBURY RESOURCE AREA
100'WPA VPBZ	100' WPA VERNAL POOL BUFFER ZONE
100'WPA RA	100' WPA RESOURCE AREA
200'WPA RA	200' WPA RESOURCE AREA
100'SUD RA	100' SUDBURY RESOURCE AREA
200'SUD RA	200' SUDBURY RESOURCE AREA
100'SUD VPBZ	100' SUDBURY VERNAL POOL BUFFER ZONE
AURA	100' or 200' SUDBURY AURA

LINETYPE	DESCRIPTION
	DRIVE SAMPLE BORING LOCATION
	TEST PIT LOCATION

HATCH	DESCRIPTION
	DISTURBANCE TO 100' WPA BUFFER ZONE (100' BZ)
	DISTURBANCE TO WPA 100' RIVERFRONT AREA (100' RA)
	DISTURBANCE TO WPA 200' RIVERFRONT AREA (200' RA)
	DISTURBANCE TO BLSF
	BORDERING VEGETATED WETLAND
	LIMIT OF BANK/LAND UNDER WATER

HATCH	DESCRIPTION
	TEMPORARY DISTURBANCE TO BVW / LUW / IVW
	PERMANENT DISTURBANCE TO BVW / LUW / IVW
	DISTURBANCE TO 100' WPA VERNAL POOL BZ

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	9	316
PROJECT FILE NO.	608164		

ENVIRONMENTAL IMPACT PLANS

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N

LIMIT OF 100' SUD AURA

PEAKHAM ROAD (PUBLIC)

HUDSON ROAD (RTE 27) (PUBLIC)

LIMIT OF ISOLATED VEGETATIVE WETLAND (SUD ONLY)

LIMIT OF BANK INTERMITTENT STREAM (SUD ONLY)

LIMIT OF 100' SUD AURA

LIMIT OF 200' SUD AURA

LIMIT OF WPA 100' BZ & 100' SUD RA

LIMIT OF 100' BUFFER ZONE TO BVW/ 100' SUD AURA

CONSTRUCTION ACCESS & EGRESS

CONTINUED ON SHEET NO. 8

CONTINUED ON SHEET NO. 10

WF20336 B200 START
WF#20336 B201
WF#20336 B202
WF20336 B207 END
WF#20336 B206
WF#20336 B205

N/F LINDA LOUISE MURI, TRUSTEE OF LINDA LOUISE MURI MAP/LOT H08/0056 BK/PG 66273/460

N/F LAWRENCE N. TIGHE THE HUDSN ROAD TRUST #2 40 HUDSON RD MAP/LOT G09/0001 BK/PG 33228/333

N/F PENN CENTRAL TRANSPORTATION CO HUDSON RD MAP/LOT G09/0012 BK/PG 7074/339

N/F 29 HUDSON ROAD LLC 29 HUDSON RD MAP/LOT H09/0002 BK/PG 58156/562

N/F MATTHEW S & MOLLY F GILMARTIN 30 HUDSON RD MAP/LOT H09/0068 BK/PG 42175/386

N/F TOWN OF SUDBURY & BOARD OF SELECT BOARD (TOWN CENTER LAND) HUDSON RD MAP/LOT G09/0004 BK/PG 77156/463 & 77156/472

MASSDOT-RAIL AND TRANSIT DIVISION VAL MAP V7.38-39 SHEET 5, V7.39 SHEETS 6-10 JUNE 30, 1915 LAYOUT BY OLD COLONY R.R CO. DEED BOOK 14836, PAGE 507 CONFIRMATORY TAKING IN DEED BOOK 64110, PAGE 80

PC +50.00 | PT +34.93 | PC +99.55 | PT +76.60 | PT +74.28 | PC +02.01 | PC +00.08 | PT +68.84 | PC 145.35 | PT +86.91 | PT +86.91

Δ=10° 57' 17" L=363.27' R=1900.00'

Δ=5° 22' 01" L=98.36' R=1050.00'

OUTLET EL=190.01' 10"CI

INV 10" METAL EL=189.20' METAL EL=189.25'

0 20 50 100
SCALE: 1" = 20'

ENVIRONMENTAL IMPACTS LEGEND

LINETYPE	DESCRIPTION
	LIMIT OF BORDERING VEGETATED WETLAND (BVW)
BLSF	EDGE OF BORDERING LAND SUBJECT TO FLOODING
	LIMIT OF BANK
	LIMIT OF FEMA FLOODWAY
BLSF	ZONE A FLOOD LIMIT (NO BFE)
	APPROX. LIMIT OF GRADING
100'WPA BZ	100' WPA BUFFER ZONE
100'WPA BZ - SUD RA	100' WPA BUFFER ZONE/100' SUDBURY AURA
100'BZ - AURA	100' WPA BUFFER ZONE/100' SUDBURY RESOURCE AREA
100'WPA VPBZ	100' WPA VERNAL POOL BUFFER ZONE
100'WPA RA	100' WPA RESOURCE AREA
200'WPA RA	200' WPA RESOURCE AREA
100'SUD RA	100' SUDBURY RESOURCE AREA
200'SUD RA	200' SUDBURY RESOURCE AREA
100'SUD VPBZ	100' SUDBURY VERNAL POOL BUFFER ZONE
AURA	100' or 200' SUDBURY AURA

LINETYPE	DESCRIPTION
	DRIVE SAMPLE BORING LOCATION
	TEST PIT LOCATION

HATCH	DESCRIPTION
	DISTURBANCE TO 100' WPA BUFFER ZONE (100' BZ)
	DISTURBANCE TO WPA 100' RIVERFRONT AREA (100' RA)
	DISTURBANCE TO WPA 200' RIVERFRONT AREA (200' RA)
	DISTURBANCE TO BLSF
	BORDERING VEGETATED WETLAND
	LIMIT OF BANK/LAND UNDER WATER

HATCH	DESCRIPTION
	TEMPORARY DISTURBANCE TO BVW / LUW / IVW
	PERMANENT DISTURBANCE TO BVW / LUW / IVW
	DISTURBANCE TO 100' WPA VERNAL POOL BZ

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	10	316
PROJECT FILE NO.	608164		

ENVIRONMENTAL IMPACT PLANS

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CONTINUED ON SHEET NO. 9

BIT DRIVE

2 STORY BUILDING "TI–SALES"

GRAVEL

EP

WOOD EDGING

EDGE GRAVEL

GRASS

STONE WALL

CHAIN LINK FENCE

SHRUBS

STUMP

100'BZ – AURA

RAILROAD TRACKS (APPROX. LOCATION)

178 179 180 181 182 183 184

N 19° 48' 11" E 770.84'

RAILROAD TRACKS

CONCRETE BOUND W/DRILL HOLE

MASSDOT–RAIL AND TRANSIT DIVISION
VAL MAP V7.38–39 SHEET 5, V7.39 SHEETS 6–10
JUNE 30, 1915 LAYOUT BY OLD COLONY R.R CO.
DEED BOOK 14836, PAGE 507
CONFIRMATORY TAKING IN DEED BOOK 64110, PAGE 80

BP FOUND

BRICK WALL

N/F
TOWN OF SUDBURY & BOARD OF SELECT BOARD
(TOWN CENTER LAND)
HUDSON RD
MAP/LOT G09/0004
BK/PG 77156/463 & 77156/472

N/F
MATTHEW S & MOLLY F GILMARTIN
30 HUDSON RD
MAP/LOT H09/0068
BK/PG 42175/386

0 20 50 100
SCALE: 1" = 20'

N/F
TOWN OF SUDBURY(TREASURER)
HUDSON RD
MAP/LOT G09/0200
BK/PG 13189/604

PT +90+93

L=56.24'
Δ=45°

1003

S 70° 11'49" E 70.57'

1003461.46

CONTINUED ON SHEET NO. 28

CONTINUED ABOVE

CONTINUED BELOW

CONTINUED ON SHEET NO. 11

184 185 186 187 188 189 190

N 19° 48' 11" E 770.84'

N 20° 48' 11" E 114.60'

5"PINE

RAILROAD TRACKS

LIMIT OF 100' BUFFER ZONE TO SUDBURY VERNAL POOL

SYNCOPATE SEDIMENT CONTROL BARRIER

LIMIT OF ISOLATED VEGETATIVE WETLAND (SUD ONLY)

ISOLATED WETLAND (SURVEYED BY OTHERS)

WF#36–1 WF#36–2 WF#36–3 WF#36–4 WF#36–5 WF#36–6 WF#36–7

BATTERY CAB CONC PAD

VERNAL POOL #14
WPA NON-ELIGIBLE

N/F
TOWN OF SUDBURY & BOARD OF SELECT BOARD
(TOWN CENTER LAND)
PETERS WAY EXT
MAP/LOT G09/0100
BK/PG 77152/566

N/F
TOWN OF SUDBURY
BOARD OF SELECT
(TOWN CENTER
PETERS WAY
MAP/LOT G09/
BK/PG 77152

0 20 50 100
SCALE: 1" = 20'

ENVIRONMENTAL IMPACTS LEGEND

LINETYPE	DESCRIPTION
	LIMIT OF BORDERING VEGETATED WETLAND (BVW)
BLSF	EDGE OF BORDERING LAND SUBJECT TO FLOODING
	LIMIT OF BANK
	LIMIT OF FEMA FLOODWAY
BLSF	ZONE A FLOOD LIMIT (NO BFE)
	APPROX. LIMIT OF GRADING
100'WPA BZ	100' WPA BUFFER ZONE
100'WPA BZ - SUD RA	100' WPA BUFFER ZONE/100' SUDBURY AURA
100'BZ - AURA	100' WPA BUFFER ZONE/100' SUDBURY RESOURCE AREA
100'WPA VPBZ	100' WPA VERNAL POOL BUFFER ZONE
100'WPA RA	100' WPA RESOURCE AREA
200'WPA RA	200' WPA RESOURCE AREA
100'SUD RA	100' SUDBURY RESOURCE AREA
200'SUD RA	200' SUDBURY RESOURCE AREA
100'SUD VPBZ	100' SUDBURY VERNAL POOL BUFFER ZONE
AURA	100' or 200' SUDBURY AURA

LINETYPE	DESCRIPTION
	DRIVE SAMPLE BORING LOCATION
	TEST PIT LOCATION

HATCH	DESCRIPTION
	DISTURBANCE TO 100' WPA BUFFER ZONE (100' BZ)
	DISTURBANCE TO WPA 100' RIVERFRONT AREA (100' RA)
	DISTURBANCE TO WPA 200' RIVERFRONT AREA (200' RA)
	DISTURBANCE TO BLSF
	BORDERING VEGETATED WETLAND
	LIMIT OF BANK/LAND UNDER WATER

HATCH	DESCRIPTION
	TEMPORARY DISTURBANCE TO BVW / LUW / IVW
	PERMANENT DISTURBANCE TO BVW / LUW / IVW
	DISTURBANCE TO 100' WPA VERNAL POOL BZ

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	11	316
PROJECT FILE NO.	608164		

ENVIRONMENTAL IMPACT PLANS

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MAP/LOT G09/0200
BK/PG 13189/604

LIMIT OF 100' BUFFER ZONE TO CERTIFIED VERNAL POOL #13

(JANET HOWE LAND)
CONCORD RD
MAP/LOT G09/0003
BK/PG 24441/588

CONTINUED BELOW

LIMIT OF 200' SU

LIMIT OF 100' ZONE/ SUD A

BRIDGE ABUTMENTS

METAL BRIDGE DECK

RAILROAD TRACKS

190 191 192 193 194 195

N 19° 48' 11" E 1865.81'

WF#36-1

BATTERY ON CONC PAD

BP FOUND

WETLAND
OTHERS)

N/F
TOWN OF SUDBURY &
BOARD OF SELECT BOARD
(TOWN CENTER LAND)
PETERS WAY EXT
MAP/LOT G09/0100
BK/PG 77152/566

WF#36-7

LIMIT OF 100' BUFFER ZONE TO SUDBURY VERNAL POOL

15"PINE

MASSDOT-RAIL AND TRANSIT DIVISION
VAL MAP V7.38-39 SHEET 5, V7.39 SHEETS 6-10
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LIMIT OF 100' WPA BUFFER ZONE / 100' SUD AURA

N/F
TOWN OF SUDBURY & BOARD OF SELECT BOARD
(TOWN CENTER LAND)
CONCORD RD
MAP/LOT G09/0300
BK/PG 77160/394

0 20 50 100
SCALE: 1" = 20'

CONTINUED ABOVE

LIMIT OF 200' SUD RA

LIMIT OF 100' WPA BUFFER ZONE/ SUD AURA

WF#7-120 END

LIMIT OF BORDERING VEGETATIVE WETLAND

DISTURBANCE TO 100' BUFFER ZONE

WF#27-117 WF#27-116 WF#27-115 WF#27-114

MASSDOT-RAIL AND TRANSIT DIVISION
VAL MAP V7.38-39 SHEET 5, V7.39 SHEETS 6-10
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LIMIT OF BANK

BF#27-106 END
BF#27-105 START
STREAM
BOX CULVERT TOP=172.41'
BF#27-101
WF#27-113 WF#27-112 WF#27-111 WF#27-110 WF#27-109

EDGE OF BORDERING LAND SUBJECT TO FLOODING (ELEV 171.9)

WF#27-108 WF#27-107 WF#27-106 WF#27-105 WF#27-104 WF#27-103 WF#27-102 WF#27-200 START

N/F
TOWN OF SUDBURY
(JANET HOWE LAND)
CONCORD RD
MAP/LOT G09/0003
BK/PG 24441/588

CONTINUED ON SHEET NO. 12

195 196 197 198 199 200 201

RAILROAD TRACKS

BOX CULVERT TOP=172.58'
BF#26-105
BF#26-104
BF#26-103
BF#26-102
BF#26-101
BF#26-108
BF#26-107
BF#26-106
BF#26-200 START
BF#26-200 END
STREAM
RAILROAD EASEMENT

N 19° 48' 11" E 1865.81'

WF#26-116 WF#26-115 WF#26-114 WF#26-113 WF#26-112 WF#26-111 WF#26-110 WF#26-109 WF#26-108 WF#26-107 WF#26-106 WF#26-105 WF#26-104 WF#26-103 WF#26-102 WF#26-101

BP FOUND

LIMIT OF 100' WPA BUFFER ZONE / 100' SUD AURA

EDGE OF BORDERING LAND SUBJECT TO FLOODING (ELEV 174.3)

LIMIT OF BANK

148 SF BLSF IMPACT

EX. BOX CULVERT

21 SF BLSF IMPACT

PROP. COMPENSATORY STORAGE LOCATION FOR MINEWAY BROOK BLSF

LIMIT OF BORDERING VEGETATIVE WETLAND

N/F
TOWN OF SUDBURY & BOARD OF SELECT BOARD
(TOWN CENTER LAND)
CONCORD RD
MAP/LOT G09/0300
BK/PG 77160/394

240 SF BLSF IMPACT

LIMIT OF 100' WPA BUFFER ZONE/ SUD AURA

LIMIT OF 100' SUD RA

0 20 50 100
SCALE: 1" = 20'

ENVIRONMENTAL IMPACTS LEGEND

LINETYPE	DESCRIPTION
BLSF	LIMIT OF BORDERING VEGETATED WETLAND (BVW)
	EDGE OF BORDERING LAND SUBJECT TO FLOODING
	LIMIT OF BANK
BLSF	LIMIT OF FEMA FLOODWAY
	ZONE A FLOOD LIMIT (NO BFE)
	APPROX. LIMIT OF GRADING
100'WPA BZ	100' WPA BUFFER ZONE
100'WPA BZ - SUD RA	100' WPA BUFFER ZONE/100' SUDBURY AURA
100'BZ - AURA	100' WPA BUFFER ZONE/100' SUDBURY RESOURCE AREA
100'WPA VPBZ	100' WPA VERNAL POOL BUFFER ZONE
100'WPA RA	100' WPA RESOURCE AREA
200'WPA RA	200' WPA RESOURCE AREA
100'SUD RA	100' SUDBURY RESOURCE AREA
200'SUD RA	200' SUDBURY RESOURCE AREA
100'SUD VPBZ	100' SUDBURY VERNAL POOL BUFFER ZONE
AURA	100' or 200' SUDBURY AURA

LINETYPE	DESCRIPTION
	DRIVE SAMPLE BORING LOCATION
	TEST PIT LOCATION

HATCH	DESCRIPTION
	DISTURBANCE TO 100' WPA BUFFER ZONE (100' BZ)
	DISTURBANCE TO WPA 100' RIVERFRONT AREA (100' RA)
	DISTURBANCE TO WPA 200' RIVERFRONT AREA (200' RA)
	DISTURBANCE TO BLSF
	BORDERING VEGETATED WETLAND
	LIMIT OF BANK/LAND UNDER WATER

HATCH	DESCRIPTION
	TEMPORARY DISTURBANCE TO BVW / LUW / IVW
	PERMANENT DISTURBANCE TO BVW / LUW / IVW
	DISTURBANCE TO 100' WPA VERNAL POOL BZ

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	12	316
PROJECT FILE NO.	608164		

ENVIRONMENTAL IMPACT PLANS

START

CONTINUED ON SHEET NO. 11

DISTURBANCE TO 100' BUFFER ZONE

240 SF BLSF IMPACT

LIMIT OF 100' WPA BUFFER ZONE/ SUD AURA

MIT OF 100' WPA BUFFER ZONE/ SUD AURA

(JANE) HOWE LAND)
CONCORD RD
MAP/LOT G09/0003
BK/PG 24441/588

CONTINUED BELOW

LIMIT OF 10 ZONE/ SUD

201 202 203 204 205 206

RAILROAD TRACKS

N 19° 48' 11" E 1865.81'

MASSDOT-RAIL AND TRANSIT DIVISION
VAL MAP V7.38-39 SHEET 5, V7.39 SHEETS 6-10
JUNE 30, 1915 LAYOUT BY OLD COLONY R.R CO.
DEED BOOK 14836, PAGE 507
CONFIRMATORY TAKING IN DEED BOOK 64110, PAGE 80

N/F
TOWN OF SUDBURY & BOARD OF SELECT BOARD
(TOWN CENTER LAND)
CONCORD RD
MAP/LOT G09/0300
BK/PG 77160/394

N/F
JAMES C & SUSAN M RICHARDS
44 CODMAN DR
MAP/LOT G09/0807
BK/PG 24467/551

0 20 50 100
SCALE: 1" = 20'

WF#25-120

LIMIT OF BUFFER ZONE TO WPA ELIGIBLE VERNAL POOL #12a

N/F
TOWN OF SUDBURY
(CONSERVATION)
WAKE ROBIN RD
MAP/LOT F09/0001
BK/PG 12501/703

WF#25-112

LIMIT100' SUD VP BUFFER ZONE

VERNAL POOL #12
WPA NON-ELIGIBLE

CONTINUED ABOVE

LIMIT OF 100' WPA BUFFER ZONE/ SUD AURA

SYNCOPATE SEDIMENT CONTROL BARRIER

DISTURBANCE TO 100' BUFFER ZONE

LIMIT OF BORDERING VEGETATIVE WETLAND

WF#25-110 WF#25-111

WF#25-108.5 WF#25-108 WF#25-107 WF#25-106 WF#25-105 WF#25-103 WF#25-102

CONTINUED ON SHEET NO. 13

SYNCOPATE SEDIMENT CONTROL BARRIER

DISTURBANCE TO 100' VERNAL POOL BUFFER ZONE

206 207 208 209 210 211 212

RAILROAD TRACKS

N 18° 55' 52" E 139.23'

WF#24-111 WF#24-110 WF#24-109 WF#24-108 WF#24-107 WF#24-106 WF#24-105

LIMIT OF BUFFER ZONE TO WPA ELIGIBLE VERNAL POOL #11

SYNCOPATE SEDIMENT CONTROL BARRIER

WF#24-113 WF#24-112

WF#23-114

LIMIT OF BORDERING VEGETATIVE WETLAND

WF#24-115

WF#24-116 END

MASSDOT-RAIL AND TRANSIT DIVISION
VAL MAP V7.38-39 SHEET 5, V7.39 SHEETS 6-10
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BF#15-24-125 END
BF#15-24-100 START

CONSTRUCTION ACCESS & EGRESS

N/F
JAMES C & SUSAN M RICHARDS
44 CODMAN DR
MAP/LOT G09/0807
BK/PG 24467/551

N/F
WILLIAM P MCMAHON JR
& DINA M MCMAHON-DESORBO
42 CODMAN DR
MAP/LOT G09/0808
BK/PG 61407/511

N/F
CAROL A SHEDD
51 MORSE RD
MAP/LOT F09/0003
BK/PG 37232/274

0 20 50 100
SCALE: 1" = 20'

VERNAL POOL #11 WPA

608164_NOI(GENERAL PLANS).DWG Plotted on 22-Dec-2021 11:05 PM

ENVIRONMENTAL IMPACTS LEGEND

LINETYPE	DESCRIPTION
BLSF	LIMIT OF BORDERING VEGETATED WETLAND (BVW)
BLSF	EDGE OF BORDERING LAND SUBJECT TO FLOODING
	LIMIT OF BANK
	LIMIT OF FEMA FLOODWAY
	ZONE A FLOOD LIMIT (NO BFE)
	APPROX. LIMIT OF GRADING
100'WPA BZ	100' WPA BUFFER ZONE
100'WPA BZ - SUD RA	100' WPA BUFFER ZONE/100' SUDBURY AURA
100'BZ - AURA	100' WPA BUFFER ZONE/100' SUDBURY RESOURCE AREA
100'WPA VPBZ	100' WPA VERNAL POOL BUFFER ZONE
100'WPA RA	100' WPA RESOURCE AREA
200'WPA RA	200' WPA RESOURCE AREA
100'SUD RA	100' SUDBURY RESOURCE AREA
200'SUD RA	200' SUDBURY RESOURCE AREA
100'SUD VPBZ	100' SUDBURY VERNAL POOL BUFFER ZONE
AURA	100' or 200' SUDBURY AURA

LINETYPE	DESCRIPTION
	DRIVE SAMPLE BORING LOCATION
	TEST PIT LOCATION

HATCH	DESCRIPTION
	DISTURBANCE TO 100' WPA BUFFER ZONE (100' BZ)
	DISTURBANCE TO WPA 100' RIVERFRONT AREA (100' RA)
	DISTURBANCE TO WPA 200' RIVERFRONT AREA (200' RA)
	DISTURBANCE TO BLSF
	BORDERING VEGETATED WETLAND
	LIMIT OF BANK/LAND UNDER WATER

HATCH	DESCRIPTION
	TEMPORARY DISTURBANCE TO BVW / LUW / IVW
	PERMANENT DISTURBANCE TO BVW / LUW / IVW
	DISTURBANCE TO 100' WPA VERNAL POOL BZ

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	13	316
PROJECT FILE NO.	608164		

ENVIRONMENTAL IMPACT PLANS

Plotted on 22-Dec-2021 11:05 PM

608164_NOI\GENERAL PLANS\.DWG

LIMIT OF 200' SUD AURA

LIMIT OF 100' WPA BUFFER ZONE/ SUD AURA

LIMIT100' SUD VP BUFFER ZONE

PROP. WETLAND REPLICATION AREA 2,240 SF

PROP. GRADING OF EARTH TO WETLAND REPLICATION AREA

VERNAL POOL #12 WPA NON-ELIGIBLE

CONTINUED ON SHEET NO. 12

LIMIT OF BORDERING VEGETATIVE WETLAND

SYNCOPATE SEDIMENT CONTROL BARRIER

DISTURBANCE TO VERNAL POOL 100' BUFFER

CONSTRUCTION ACCESS & EGRESS

LIMIT OF BUFFER ZONE TO WPA ELIGIBLE VERNAL POOL #11

VERNAL POOL #11 WPA ELIGIBLE

CONSTRUCTION ACCESS & EGRESS

DISTURBANCE TO 100' BUFFER ZONE

35 SF WORK AREA TEMP IMPACT TO LUW

7 LF TEMP IMPACT TO BANK WORK AREA FOR HEADWALL INSTALLATION

DISTURBANCE TO 100' BUFFER ZONE

LIMIT OF 100' WPA BUFFER ZONE/ SUD AURA

8 LF TEMP IMPACT TO BANK FOR WORK AREA AND EROSION CONTROL

6 LF TEMP IMPACT TO BANK FOR WORK AREA AND EROSION CONTROL

3 SF HEADWALL INSTALLATION & CULVERT REPLACEMENT PERM IMPACT TO LUW

42 SF WORK AREA FOR HEADWALL INSTALLATION & EROSION CONTROL TEMP IMPACT TO LUW

6 LF HEADWALL INSTALLATION PERM IMPACT TO BANK

16 SF HEADWALL INSTALLATION & CULVERT REPLACEMENT PERM IMPACT TO LUW

6 LF HEADWALL INSTALLATION PERM IMPACT TO BANK

6 LF TEMP IMPACT TO BANK WORK AREA FOR HEADWALL INSTALLATION

LIMIT OF 100' WPA BZ/ 100' AURA

CONTINUED ON SHEET NO. 14

EX 10"CMP

CULVERT EL=165.62' 10"CP

CULVERT EL=166.78' 12"CMP

CULVERT EL=165.37' 12"RCP

CULVERT EL=166.48' 12"RCP

MORSE ROAD (PUBLIC)

BROADACRES FARM PARKING LOT

TOWN OF SUDBURY & BOARD OF SELECTMEN (BROADACRE FARM HOUSE) 82 MORSE RD MAP/LOT F09/0002 BK/PG 72906/476

N/F CAROL A SHEDD 51 MORSE RD MAP/LOT F09/0003 BK/PG 37232/274

MASSDOT-RAIL AND TRANSIT DIVISION VAL MAP V7.38-39 SHEET 5, V7.39 SHEETS 6-10 JUNE 30, 1915 LAYOUT BY OLD COLONY R.R CO. DEED BOOK 14836, PAGE 507 CONFIRMATORY TAKING IN DEED BOOK 64170, PAGE 80

N 19° 25' 59" E 171.87'

N 19° 49' 56" E 542.87'

LIMIT OF BANK

WOOD FENCE

STONE WALL

EDGE PVMT

RAILROAD TRACKS

0 20 50 100

SCALE: 1" = 20'

ENVIRONMENTAL IMPACTS LEGEND

LINETYPE	DESCRIPTION
	LIMIT OF BORDERING VEGETATED WETLAND (BVW)
BLSF	EDGE OF BORDERING LAND SUBJECT TO FLOODING
	LIMIT OF BANK
	LIMIT OF FEMA FLOODWAY
BLSF	ZONE A FLOOD LIMIT (NO BFE)
	APPROX. LIMIT OF GRADING
100'WPA BZ	100' WPA BUFFER ZONE
100'WPA BZ - SUD RA	100' WPA BUFFER ZONE/100' SUDBURY AURA
100'BZ - AURA	100' WPA BUFFER ZONE/100' SUDBURY RESOURCE AREA
100'WPA VPBZ	100' WPA VERNAL POOL BUFFER ZONE
100'WPA RA	100' WPA RESOURCE AREA
200'WPA RA	200' WPA RESOURCE AREA
100'SUD RA	100' SUDBURY RESOURCE AREA
200'SUD RA	200' SUDBURY RESOURCE AREA
100'SUD VPBZ	100' SUDBURY VERNAL POOL BUFFER ZONE
AURA	100' or 200' SUDBURY AURA

LINETYPE	DESCRIPTION
	DRIVE SAMPLE BORING LOCATION
	TEST PIT LOCATION

HATCH	DESCRIPTION
	DISTURBANCE TO 100' WPA BUFFER ZONE (100' BZ)
	DISTURBANCE TO WPA 100' RIVERFRONT AREA (100' RA)
	DISTURBANCE TO WPA 200' RIVERFRONT AREA (200' RA)
	DISTURBANCE TO BLSF
	BORDERING VEGETATED WETLAND
	LIMIT OF BANK/LAND UNDER WATER

HATCH	DESCRIPTION
	TEMPORARY DISTURBANCE TO BVW / LUW / IVW
	PERMANENT DISTURBANCE TO BVW / LUW / IVW
	DISTURBANCE TO 100' WPA VERNAL POOL BZ

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	14	316
PROJECT FILE NO.	608164		

ENVIRONMENTAL IMPACT PLANS

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CONTINUED ON SHEET NO. 13

CONTINUED BELOW

CONTINUED ABOVE

CONTINUED ON SHEET NO. 15

LIMIT OF BORDERING VEGETATIVE WETLAND

DISTURBANCE TO 100' BUFFER ZONE

LIMIT OF 100' WPA BUFFER ZONE/ SUD AURA

LIMIT OF 100' SUD RA

LIMIT OF 200' SUD RA

LIMIT OF BANK

LIMIT OF 100' SUD VERNAL POOL BUFFER ZONE

SYNCOPATE SEDIMENT CONTROL BARRIER

POTENTIAL VERNAL POOL #10 WPA NON-ELIGIBLE

CULVERT EL=143.46' 42"MP

CULVERT EL=143.90' 42"MP

OUTLET EL=158.62' 30"CMP

OUTLET EL=158.86' 30"CMP

N 20° 23' 17" E 326.06'

N 19° 45' 40" E 69.86'

Δ=15° 15' 54"
L=719.35' R=2700.00'

MASSDOT-RAIL AND TRANSIT DIVISION
VAL MAP V7.38-39 SHEET 5, V7.39 SHEETS 6-10
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TOWN OF SUDBURY(FEATHERLAND PARK & GROUNDS)
(PARK & REC/DPW)
491 CONCORD RD
MAP/LOT F10/0001
BK/PG 9599/151

TOWN OF SUDBURY(BROADACRE FARM)
MORSE RD
MAP/LOT F09/0004
BK/PG 71910/379

TOWN OF SUDBURY(FEATHERLAND PARK)
(PARK & REC)
MORSE RD
MAP/LOT F09/0006
BK/PG 9599/151

BROADACRES FARM PARKING LOT

RAILROAD TRACKS

SCALE: 1" = 20'

ENVIRONMENTAL IMPACTS LEGEND

LINETYPE	DESCRIPTION
	LIMIT OF BORDERING VEGETATED WETLAND (BVW)
	EDGE OF BORDERING LAND SUBJECT TO FLOODING
	LIMIT OF BANK
	LIMIT OF FEMA FLOODWAY
	ZONE A FLOOD LIMIT (NO BFE)
	APPROX. LIMIT OF GRADING
100'WPA BZ	100' WPA BUFFER ZONE
100'WPA BZ - SUD RA	100' WPA BUFFER ZONE/100' SUDBURY AURA
100'BZ - AURA	100' WPA BUFFER ZONE/100' SUDBURY RESOURCE AREA
100'WPA VPBZ	100' WPA VERNAL POOL BUFFER ZONE
100'WPA RA	100' WPA RESOURCE AREA
200'WPA RA	200' WPA RESOURCE AREA
100'SUD RA	100' SUDBURY RESOURCE AREA
200'SUD RA	200' SUDBURY RESOURCE AREA
100'SUD VPBZ	100' SUDBURY VERNAL POOL BUFFER ZONE
AURA	100' or 200' SUDBURY AURA

LINETYPE	DESCRIPTION
	DRIVE SAMPLE BORING LOCATION
	TEST PIT LOCATION

HATCH	DESCRIPTION
	DISTURBANCE TO 100' WPA BUFFER ZONE (100' BZ)
	DISTURBANCE TO WPA 100' RIVERFRONT AREA (100' RA)
	DISTURBANCE TO WPA 200' RIVERFRONT AREA (200' RA)
	DISTURBANCE TO BLSF
	BORDERING VEGETATED WETLAND
	LIMIT OF BANK/LAND UNDER WATER

HATCH	DESCRIPTION
	TEMPORARY DISTURBANCE TO BVW / LUW / IVW
	PERMANENT DISTURBANCE TO BVW / LUW / IVW
	DISTURBANCE TO 100' WPA VERNAL POOL BZ

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	15	316
PROJECT FILE NO.	608164		

ENVIRONMENTAL IMPACT PLANS

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N

LIMIT OF 100' SUD VERNAL POOL BUFFER ZONE

LIMIT OF 200' SUD RA

LIMIT OF BORDERING VEGETATIVE WETLAND

MCCORMICK RD
MAP/LOT F09/0217
BK/PG 990/95

LIMIT OF 100' SUD VERNAL POOL BUFFER ZONE

LIMIT OF 100' WPA BZ / 100' SUD AURA

CONTINUED ON SHEET NO. 14

CONTINUED BELOW

WF#21-109
WF#21-108
WF#21-107
WF#21-106
WF#21-105
WF#21-104
WF#21-103
WF#21-102
WF#21-101

SYNCOPATE SEDIMENT CONTROL BARRIER

SYNCOPATE EROSION CONTROL BARRIER

DISTURBANCE TO 100' BUFFER ZONE

228 229 230 231 232 233 234

RAILROAD TRACKS

Δ=15° 15' 54"
L=719.35' R=2700.00'

N 4° 29' 46" E 1103.93'

WF#22-104
WF#22-103
WF#22-102
WF#22-101
WF#22-100 START
WF#22-108 END

WF#20-104
WF#20-103
WF#20-102
WF#20-101
WF#20-100 START

LIMIT OF BORDERING VEGETATIVE WETLAND

POTENTIAL VERNAL POOL #10 WPA NON-ELIGIBLE

LIMIT OF 100' WPA BZ / 100' SUD AURA

LIMIT OF 200' SUD RA

SYNCOPATE EROSION CONTROL BARRIER

POTENTIAL VERNAL POOL #9 WPA NON-ELIGIBLE

LIMIT OF 100' WPA BUFFER ZONE

LIMIT OF SUD ISOLATED VEGETATIVE WETLAND

LIMIT OF 100' SUD AURA

MASSDOT--RAIL AND TRANSIT DIVISION
VAL MAP V7.38-39 SHEET 5, V7.39 SHEETS 6-10
JUNE 30, 1915 LAYOUT BY OLD COLONY R.R CO.
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N/F
JUSTIN H. & MICHELLE K. GEWANDTER
35 BISHOP LN
MAP/LOT F09/0518
BK/PG 71086/595

N/F
PETER M. & SUSAN W. SALVIA
45 BISHOP LN
MAP/LOT F09/0517
BK/PG 30726/170

0 20 50 100
SCALE: 1" = 20'

N/F
JASON J SANTELLI & SVETLANA SEMENOVA
49 HUNT RD
MAP/LOT F09/0219
BK/PG 1493/4

CONTINUED ABOVE

LIMIT OF 100' WPA BUFFER ZONE/ SUD AURA

WF#19-126
WF#19-125
WF#19-124
WF#19-123
WF#19-122
WF#19-121
WF#19-120
WF#19-119
WF#19-118
WF#19-117
WF#19-116
WF#19-126 END
WF#18-116 END

DISTURBANCE TO 100' BUFFER ZONE

LIMIT OF BORDERING VEGETATIVE WETLAND

234 235 236 237 238 239

RAILROAD TRACKS

N 4° 29' 46" E 1103.93'

WF#18-114
WF#18-113
WF#18-112
WF#18-111
WF#18-110
WF#18-109
WF#18-108

LIMIT OF BORDERING VEGETATIVE WETLAND

LIMIT OF 200' SUD RIVERFRONT AREA

MASSDOT--RAIL AND TRANSIT DIVISION
VAL MAP V7.38-39 SHEET 5, V7.39 SHEETS 6-10
JUNE 30, 1915 LAYOUT BY OLD COLONY R.R CO.
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N/F
MINER A & HELEN H CRARY
TRUSTEES OF THE 1 HUNT ROAD NOMINEE TRUST
1 HUNT RD
MAP/LOT F09/0218
BK/PG 63448/1

N/F
SUDBURY VALLEY TRUSTEES INC
27 HUNT RD
MAP/LOT F09/0126
BK/PG 14501/291

N/F
LOUIS J & ROBIN HERZOG
42 BISHOP LN
MAP/LOT F09/0516
BK/PG 36564/274

N/F
ROBERT D & CAROLINE V WINNEG
34 BISHOP LN
MAP/LOT F09/0515
BK/PG 28083/576

N/F
JON R & SARAH F FREEDMAN
29 THOMPSON DR
MAP/LOT F10/0511
BK/PG 25658/242

0 20 50 100
SCALE: 1" = 20'

ENVIRONMENTAL IMPACTS LEGEND

LINETYPE	DESCRIPTION
BLSF	LIMIT OF BORDERING VEGETATED WETLAND (BVW)
BLSF	EDGE OF BORDERING LAND SUBJECT TO FLOODING
	LIMIT OF BANK
	LIMIT OF FEMA FLOODWAY
	ZONE A FLOOD LIMIT (NO BFE)
	APPROX. LIMIT OF GRADING
100'WPA BZ	100' WPA BUFFER ZONE
100'WPA BZ~SUD RA	100' WPA BUFFER ZONE/100' SUDBURY AURA
100'BZ~AURA	100' WPA BUFFER ZONE/100' SUDBURY RESOURCE AREA
100'WPA VPBZ	100' WPA VERNAL POOL BUFFER ZONE
100'WPA RA	100' WPA RESOURCE AREA
200'WPA RA	200' WPA RESOURCE AREA
100'SUD RA	100' SUDBURY RESOURCE AREA
200'SUD RA	200' SUDBURY RESOURCE AREA
100'SUD VPBZ	100' SUDBURY VERNAL POOL BUFFER ZONE
AURA	100' or 200' SUDBURY AURA

LINETYPE	DESCRIPTION
	DRIVE SAMPLE BORING LOCATION
	TEST PIT LOCATION

HATCH	DESCRIPTION
	DISTURBANCE TO 100' WPA BUFFER ZONE (100' BZ)
	DISTURBANCE TO WPA 100' RIVERFRONT AREA (100' RA)
	DISTURBANCE TO WPA 200' RIVERFRONT AREA (200' RA)
	DISTURBANCE TO BLSF
	BORDERING VEGETATED WETLAND
	LIMIT OF BANK/LAND UNDER WATER

HATCH	DESCRIPTION
	TEMPORARY DISTURBANCE TO BVW / LUW / IVW
	PERMANENT DISTURBANCE TO BVW / LUW / IVW
	DISTURBANCE TO 100' WPA VERNAL POOL BZ

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	16	316
PROJECT FILE NO.	608164		

ENVIRONMENTAL IMPACT PLANS

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608164_NOI(GENERAL PLANS).DWG

N/F SUDBURY VALLEY TRUSTEES INC 27 HUNT RD MAP/LOT E09/0126 BK/PG 14501/291

CONTINUED ON SHEET NO. 15

LIMIT OF BANK

STONE BOX CULVERT 1.7'H x 2.4'W EL=133.81'

TOP OF BANK

BF#19~104 START

BF#19~103 END

BF#19~102

BF#19~101

WF#19~117 WF#19~116 WF#19~115 WF#19~114 WF#19~113 WF#19~112 WF#19~111 WF#19~110 WF#19~109 WF#19~108 WF#19~107 WF#19~106 WF#19~105 WF#19~104 WF#19~103 WF#19~102 WF#19~101

LIMIT OF 100' SUD VERNAL POOL BUFFER ZONE

LIMIT OF BORDERING VEGETATIVE WETLAND

N/F MINER A & HELEN H CRARY TRUSTEES OF THE 1 HUNT ROAD NOMINEE TRUST 1 HUNT RD MAP/LOT E09/0218 BK/PG 63448/1

N/F 11 HUNT RD MAP/LOT E09/0128 BK/PG 12241/378

SYNCOPATE EROSION CONTROL BARRIER

STONE CULVERT 24"H x 20"W EL=129.57'

EX CULVERT

LIMIT OF 100' SUD VP BUFFER ZONE

MASSDOT-RAIL AND TRANSIT DIVISION VAL MAP V7.38-39 SHEET 5, V7.39 SHEETS 6-10 JUNE 30, 1915 LAYOUT BY OLD COLONY R.R CO. DEED BOOK 14836, PAGE 507 CONFIRMATORY TAKING IN DEED BOOK 64110, PAGE 80

239 240 241 242 243 244 245

N 4° 29' 46" E 1103.93'

Δ=0° 58' 57" L=85.74' R=5000.00'

N 5° 28' 43" E 147.53'

N 4° 29' 46" E 48.05'

RAILROAD TRACKS

DISTURBANCE TO 100' BUFFER ZONE

EX. BOX CULVERT

LIMIT OF BORDERING VEGETATIVE WETLAND

STONE BOX CULVERT 1.7'H x 2.4'W EL=133.75'

LIMIT OF BANK

LIMIT OF 100' SUD RIVERFRONT AREA

LIMIT OF 200' SUD RIVERFRONT AREA

SYNCOPATE EROSION CONTROL BARRIER

LIMIT OF100' SUD RIVERFRONT AREA

LIMIT OF100' SUD VP BUFFER ZONE

CONCRETE BOUND W/DRILL HOLE

N/F JON R & SARAH F FREEDMAN 29 THOMPSON DR MAP/LOT F10/0511 BK/PG 25658/242

N/F ROBERT D & CAROLINE V WINNEG 34 BISHOP LN MAP/LOT E09/0515 BK/PG 28083/576

N/F KIRK C & DIANA P NEISON 37 THOMPSON DR MAP/LOT E09/0511 BK/PG 14592/164

N/F CHARLES A JR & RUTHANN WRY 45 THOMPSON DR MAP/LOT E09/0510 BK/PG 28853/357

N/F JEFFREY & TIFFANY BLOOM 53 THOMPSON DR MAP/LOT E09/0509 BK/PG 54638/30

LIMIT OF100' WPA BUFFER ZONE

LIMIT OF 100' WPA BUFFER ZONE / 100' SUD AURA

CONTINUED BELOW

0 20 50 100

SCALE: 1" = 20'

SYNCOPATE EROSION CONTROL BARRIER

STONE CULVERT 24"H x 20"W EL=129.57'

EX CULVERT

LIMIT OF 100' SUD VERNAL POOL BUFFER ZONE

CONTINUED ABOVE

LIMIT OF BANK

LIMIT OF BORDERING VEGETATIVE WETLAND

N/F RICHARD S. ALBEE 6 HUNT RD MAP/LOT E09/0129 BK/PG 20726/208

OUTLET EL=130.73' 16"RCP

EX. BOX CULVERT

EX 16"RCP

WF#17~99 START WF#17~100 START WF#17~101 WF#17~102 WF#17~103 WF#17~104 WF#17~105 WF#17~106 WF#17~107 WF#17~108 WF#17~109 WF#17~110 END

BOX CULVERT EL=130.99' 50"H x 20"W

BF#17~104 START BF#17~103 BF#17~102 BF#17~101 BF#17~100 START

246 247 248 249 250

N 3° 03' 45" E 72.33'

Δ=1° 26' 00" L=100.07' R=4000.00'

N 4° 29' 46" E 1168.84'

DISTURBANCE TO 100' BUFFER ZONE

WF#16~105 WF#16~104 WF#16~103 WF#16~102 WF#16~101 WF#16~100 START WF#16~106 END

TOP OF BANK

BOX CULVERT EL=131.82' 24"H x 24"W

SYNCOPATE EROSION CONTROL BARRIER

LIMIT OF BANK

LIMIT OF BORDERING VEGETATIVE WETLAND

LIMIT OF100' SUD VP BUFFER ZONE

LIMIT OF 100' SUD RIVERFRONT AREA

LIMIT OF 100' WPA BUFFER ZONE / 100' SUD AURA

LIMIT OF 100' WPA BUFFER ZONE/SUD AURA

LIMIT OF 200' SUD RIVERFRONT AREA

POTENTIAL VERNAL POOL #7 WPA NON-ELIGIBLE

CONTINUED ON SHEET NO. 17

N/F ALLAN L WALLACK & DONNA NADINE, TRUSTEE OF THE WALLACK FAMILY 0 THOMPSON DR MAP/LOT E09/0508 BK/PG 60192/340

N/F ALLAN L WALLACK & DONNA NADINE, TRUSTEE OF THE WALLACK FAMILY 67 THOMPSON DR MAP/LOT E09/0507 BK/PG 60192/340

LIMIT OF 100' SUD VERNAL POOL BUFFER ZONE

0 20 50 100

SCALE: 1" = 20'

ENVIRONMENTAL IMPACTS LEGEND

LINETYPE	DESCRIPTION
	LIMIT OF BORDERING VEGETATED WETLAND (BVW)
BLSF	EDGE OF BORDERING LAND SUBJECT TO FLOODING
	LIMIT OF BANK
	LIMIT OF FEMA FLOODWAY
BLSF	ZONE A FLOOD LIMIT (NO BFE)
	APPROX. LIMIT OF GRADING
100'WPA BZ	100' WPA BUFFER ZONE
100'WPA BZ-SUD RA	100' WPA BUFFER ZONE/100' SUDBURY AURA
100'BZ-AURA	100' WPA BUFFER ZONE/100' SUDBURY RESOURCE AREA
100'WPA VPBZ	100' WPA VERNAL POOL BUFFER ZONE
100'WPA RA	100' WPA RESOURCE AREA
200'WPA RA	200' WPA RESOURCE AREA
100'SUD RA	100' SUDBURY RESOURCE AREA
200'SUD RA	200' SUDBURY RESOURCE AREA
100'SUD VPBZ	100' SUDBURY VERNAL POOL BUFFER ZONE
AURA	100' or 200' SUDBURY AURA

LINETYPE	DESCRIPTION
	DRIVE SAMPLE BORING LOCATION
	TEST PIT LOCATION

HATCH	DESCRIPTION
	DISTURBANCE TO 100' WPA BUFFER ZONE (100' BZ)
	DISTURBANCE TO WPA 100' RIVERFRONT AREA (100' RA)
	DISTURBANCE TO WPA 200' RIVERFRONT AREA (200' RA)
	DISTURBANCE TO BLSF
	BORDERING VEGETATED WETLAND
	LIMIT OF BANK/LAND UNDER WATER

HATCH	DESCRIPTION
	TEMPORARY DISTURBANCE TO BVW / LUW / IVW
	PERMANENT DISTURBANCE TO BVW / LUW / IVW
	DISTURBANCE TO 100' WPA VERNAL POOL BZ

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	17	316
PROJECT FILE NO.	608164		

ENVIRONMENTAL IMPACT PLANS

Plotted on 22-Dec-2021 11:08 PM
608164_NOI(GENERAL PLANS).DWG

N/F
MINER A & HELEN H CRARY
TRUSTEES OF THE 1 HUNT ROAD NOMINEE TRUST
1 HUNT RD
MAP/LOT F09/0218
BK/PG 63448/71

CONTINUED ON SHEET NO. 16

LIMIT OF 100' WPA BUFFER ZONE / 100' AURA

FIELDSTONE WALL

MASSDOT-RAIL AND TRANSIT DIVISION
VAL MAP V7.38-39 SHEET 5, V7.39 SHEETS 6-10
JUNE 30, 1915 LAYOUT BY OLD COLONY R.R CO.
DEED BOOK 14836, PAGE 507
CONFIRMATORY TAKING IN DEED BOOK 64110, PAGE 80

DISTRUBANCE TO 100' BUFFER ZONE

DISTRUBANCE TO 200' RIVER FRONT AREA

BK/PG 49200/410

CONTINUED BELOW

LIMIT OF VEGE

250 251 252 253 254 255 256

RAILROAD TRACKS

N 4° 29' 46" E 1168.84'

RRS

13" PINE

CONCRETE BOUND W/DRILL HOLE

DRILL HOLE(FND)

N/F
ALLAN L WALLACK & DONNA NADINE,
TRUSTEE OF THE WALLACK FAMILY
67 THOMPSON DR
MAP/LOT E09/0507
BK/PG 60192/340

N/F
WEST PANTRY BROOK FARM LIMITED PARTNERSHIP
667 CONCORD RD
MAP/LOT E10/0200
BK/PG 49200/410

0 20 50 100
SCALE: 1" = 20'

CONTINUED ABOVE

LIMIT OF BORDERING VEGETATIVE WETLAND

LIMIT OF BORDERING VEGETATIVE WETLAND

DISTRUBANCE TO 100' RIVER FRONT AREA

BRIDGE ABUTMENTS

256 257 258 259 260 261

N 4° 29' 46" E 1168.84'

Δ=11° 56' 05"
L=562.41' R=2700.00'

DISTRUBANCE TO 200' RIVER FRONT AREA

LIMIT OF 200' RIVER FRONT AREA

LIMIT OF 100' WPA BUFFER ZONE / 100' AURA

0 20 50 100
SCALE: 1" = 20'

ENVIRONMENTAL IMPACTS LEGEND

LINETYPE	DESCRIPTION
	LIMIT OF BORDERING VEGETATED WETLAND (BVW)
	EDGE OF BORDERING LAND SUBJECT TO FLOODING
	LIMIT OF BANK
	LIMIT OF FEMA FLOODWAY
	ZONE A FLOOD LIMIT (NO BFE)
	APPROX. LIMIT OF GRADING
100'WPA BZ	100' WPA BUFFER ZONE
100'WPA BZ - SUD RA	100' WPA BUFFER ZONE/100' SUDBURY AURA
100'BZ - AURA	100' WPA BUFFER ZONE/100' SUDBURY RESOURCE AREA
100'WPA VPBZ	100' WPA VERNAL POOL BUFFER ZONE
100'WPA RA	100' WPA RESOURCE AREA
200'WPA RA	200' WPA RESOURCE AREA
100'SUD RA	100' SUDBURY RESOURCE AREA
200'SUD RA	200' SUDBURY RESOURCE AREA
100'SUD VPBZ	100' SUDBURY VERNAL POOL BUFFER ZONE
AURA	100' or 200' SUDBURY AURA

LINETYPE	DESCRIPTION
	DRIVE SAMPLE BORING LOCATION
	TEST PIT LOCATION

HATCH	DESCRIPTION
	DISTURBANCE TO 100' WPA BUFFER ZONE (100' BZ)
	DISTURBANCE TO WPA 100' RIVERFRONT AREA (100' RA)
	DISTURBANCE TO WPA 200' RIVERFRONT AREA (200' RA)
	DISTURBANCE TO BLSF
	BORDERING VEGETATED WETLAND
	LIMIT OF BANK/LAND UNDER WATER

HATCH	DESCRIPTION
	TEMPORARY DISTURBANCE TO BVW / LUW / IVW
	PERMANENT DISTURBANCE TO BVW / LUW / IVW
	DISTURBANCE TO 100' WPA VERNAL POOL BZ

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	18	316
PROJECT FILE NO.	608164		

ENVIRONMENTAL IMPACT PLANS

Plotted on 22-Dec-2021 11:08 PM
608164_NOI(GENERAL PLANS).DWG

CONTINUED ON SHEET NO. 17
CONTINUED BELOW
CONTINUED ABOVE

LIMIT OF BORDERING VEGETATIVE WETLAND
LIMIT OF FEMA FLOODWAY
LIMIT OF BANK
254 SF ABUTMENT WORK AREA TEMP IMPACT TO LUW
35 SF ABUTMENT WORK AREA TEMP IMPACT TO BVW
29 SF EROSION CONTROL TEMP IMPACT TO BVW
47 SF DUMPED RIPRAP & MODIFIED ROCKFILL PERM IMPACT TO BVW
195 SF BLSF IMPACT (CUT)
56 LF ABUTMENT WORK AREA TEMP IMPACT TO BANK
31 SF ABUTMENT WORK AREA CONTROL TEMP IMPACT TO BVW
15 SF DUMPED RIP RAP PERM IMPACT TO BVW
39 SF EROSION CONTROL TEMP IMPACT TO BVW
264 SF BLSF IMPACT (CUT)
EDGE OF BORDERING LAND SUBJECT TO FLOODING (ELEV 123.7)
DISTRUBANCE TO 100' RIVER FRONT AREA
LIMIT OF 100' WPA BUFFER ZONE / 100' SUD AURA
LIMIT OF 200' RIVER FRONT AREA
DISTRUBANCE TO 200' RIVER FRONT AREA
Δ=11° 56' 05"
L=562.41' R=2700.00'
N 16° 25' 51" E 868.04'
PANTRY BROOK
212 SF BLSF IMPACT (CUT)
36 SF EROSION CONTROL TEMP IMPACT TO BVW
13 SF DUMPED RIP RAP PERM IMPACT TO BVW
5 LF DUMPED RIP RAP PERM IMPACT TO BANK
231 SF ABUTMENT WORK AREA TEMP IMPACT TO LUW
42 SF EROSION CONTROL TEMP IMPACT TO BVW
215 SF BLSF IMPACT (CUT)
10 SF DUMPED RIP RAP PERM IMPACT TO BVW
12 LF DUMPED RIP RAP PERM IMPACT TO BANK
52 LF ABUTMENT WORK AREA TEMP IMPACT TO BANK
136 SF BLSF IMPACT (CUT)
LIMIT OF SUDBURY TOWN BYLAW ISOLATED VEGETATIVE WETLAND
ZONE A FLOOD LIMIT (NO BFE)
POTENTIAL VERNAL POOL #6 WPA NON-ELIGIBLE
FIELDSTONE WALL
STONE BRIDGE
STONE CULVERT
MASSDOT-RAIL AND TRANSIT DIVISION VAL MAP V7.38-39 SHEET 5, V7.39 SHEETS 6-10 JUNE 30, 1915 LAYOUT BY OLD COLONY R.R CO. DEED BOOK 14836, PAGE 507 CONFIRMATORY TAKING IN DEED BOOK 64110, PAGE 80
TOWN OF SUDBURY(BARTON FARMS LAND) (CONSERVATION) 298 MARLBORO RD MAP/LOT D09/0204 BK/PG 14547/323
N/F WEST PANTRY BROOK FARM LIMITED PARTNERSHIP 667 CONCORD RD MAP/LOT E10/0200 BK/PG 49200/470
N/F SIENA FARMS LLC MARLBORO RD MAP/LOT E09/0600 BK/PG 62267/528
N/F EILEEN M. & DANIEL A DEPOMPEI TRUSTEES OF THE DEPOMPEI REALTY TRUST 35 HAYNES RD MAP/LOT D09/0207 BK/PG 71975/116
N/F STEPHEN & JOAN VERRILL HAYNES RD MAP/LOT E10/0700 BK/PG 14819/188
0 20 50 100
SCALE: 1" = 20'

ENVIRONMENTAL IMPACTS LEGEND

LINETYPE	DESCRIPTION
BLSF	LIMIT OF BORDERING VEGETATED WETLAND (BVW)
BLSF	EDGE OF BORDERING LAND SUBJECT TO FLOODING
	LIMIT OF BANK
	LIMIT OF FEMA FLOODWAY
BLSF	ZONE A FLOOD LIMIT (NO BFE)
	APPROX. LIMIT OF GRADING
100'WPA BZ	100' WPA BUFFER ZONE
100'WPA BZ - SUD RA	100' WPA BUFFER ZONE/100' SUDBURY AURA
100'BZ - AURA	100' WPA BUFFER ZONE/100' SUDBURY RESOURCE AREA
100'WPA VPBZ	100' WPA VERNAL POOL BUFFER ZONE
100'WPA RA	100' WPA RESOURCE AREA
200'WPA RA	200' WPA RESOURCE AREA
100'SUD RA	100' SUDBURY RESOURCE AREA
200'SUD RA	200' SUDBURY RESOURCE AREA
100'SUD VPBZ	100' SUDBURY VERNAL POOL BUFFER ZONE
AURA	100' or 200' SUDBURY AURA

LINETYPE	DESCRIPTION
	DRIVE SAMPLE BORING LOCATION
	TEST PIT LOCATION

HATCH	DESCRIPTION
	DISTURBANCE TO 100' WPA BUFFER ZONE (100' BZ)
	DISTURBANCE TO WPA 100' RIVERFRONT AREA (100' RA)
	DISTURBANCE TO WPA 200' RIVERFRONT AREA (200' RA)
	DISTURBANCE TO BLSF
	BORDERING VEGETATED WETLAND
	LIMIT OF BANK/LAND UNDER WATER

HATCH	DESCRIPTION
	TEMPORARY DISTURBANCE TO BVW / LUW / IVW
	PERMANENT DISTURBANCE TO BVW / LUW / IVW
	DISTURBANCE TO 100' WPA VERNAL POOL BZ

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	19	316
PROJECT FILE NO.	608164		

ENVIRONMENTAL IMPACT PLANS

608164_NOI(GENERAL PLANS).DWG Plotted on 22-Dec-2021 11:09 PM

N

WF#12-100 START
WF#12-101
WF#12-102
WF#12-103
WF#12-104
WF#12-105
WF#12-106
WF#12-107
WF#12-108
WF#12-109
WF#12-110
WF#12-111
WF#12-112
WF#12-113
WF#12-114
BF#12-100 START
BF#12-111 END
BF#12-101
BF#12-102
BF#12-103
BF#12-104
BF#12-105
BF#12-106
BF#12-107
BF#12-108
WF#14-161
WF#14-162
WF#14-163
WF#14-164
WF#14-165
WF#14-166
WF#14-167
WF#14-168
WF#14-169
WF#14-170 END
BF#14-300
BF#14-301
BF#14-302
BF#14-303
BF#14-304 END
WF#42-100 START
WF#42-101
WF#42-102
WF#42-103
WF#42-104
WF#42-105
WF#42-114
WF#42-115 END

N/F
EILEEN M. & DANIEL A DEPOMPEI
TRUSTEES OF THE DEPOMPEI REALTY TRUST
35 HAYNES RD
MAP/LOT D09/0207
BK/PG 71975/116

N/F
RICHARD J & MICHELLE R VROMAN
34 HAYNES RD
MAP/LOT D10/0024
BK/PG 42291/471

N/F
ARTHUR J & MARGARET A RICHARD
31 HAYNES RD
MAP/LOT D10/0001
BK/PG 24653/464

N/F
STEPHEN & JOAN VERRILL
HAYNES RD
MAP/LOT E10/0700
BK/PG 14819/188

N/F
CHRISTOPHER G & ALISON M BOLAND
24 HAYNES RD
MAP/LOT D10/0101
BK/PG 28689/158

HAYNES ROAD (PUBLIC)

CONTINUED ON SHEET NO. 18
CONTINUED ON SHEET NO. 20

ZONE A FLOOD LIMIT (NO BFE)
LIMIT OF BANK
LIMIT OF BORDERING VEGETATIVE WETLAND
LIMIT OF 100' SUD VERNAL POOL BUFFER ZONE
DISTRUBANCE TO 100' RIVER FRONT AREA
POTENTIAL VERNAL POOL #6 WPA NON-ELIGIBLE
SYNCOPATE EROSION CONTROL BARRIER
LIMIT OF 100' RIVER FRONT AREA
EX. BOX CULVERT (SEE DRAINAGE & UTIL PLANS)
DISTRUBANCE TO 200' RIVER FRONT AREA
LIMIT OF 200' RIVER FRONT AREA
LIMIT OF 100' BUFFER ZONE TO BVW
DISTURBANCE TO 100' BUFFER ZONE
CONSTRUCTION ACCESS & EGRESS
LIMIT OF 100' BUFFER ZONE TO BVW
OUTLET EL=132.86' 12"PVC
OUTLET EL=129.65' 12"RCP
EX. 12"PVC
AREA OF SCATTERED ROCKS AND LEDGE OUTCROPS
FIELDSTONE WALL
STONE WALL
LANDSCAPED AREA
GRAVEL DRIVE
BIT DRIVE
EDGE PVMT
8"PINE 12"DEC
30"DEC 12"DEC

N 16° 25' 51" E 868.04'
Δ=11° 24' 39" 274
L=119.49' R=600.00'
Δ=20° 30' 13" 13
L=39.56' R=110
N 20° 58' 33" E 62.10'
Δ=10° 15' 47"
L=44.78' R=250.00'

272 273 274 275 276 277 278

MASSDOT-RAIL AND TRANSIT DIVISION
VAL MAP V7.38-39 SHEET 5, V7.39 SHEETS 6-10
JUNE 30, 1915 LAYOUT BY OLD COLONY R.R CO.
DEED BOOK 14836, PAGE 507
CONFIRMATORY TAKING IN DEED BOOK 64110, PAGE 80

0 20 50 100
SCALE: 1" = 20'

ENVIRONMENTAL IMPACTS LEGEND

LINETYPE	DESCRIPTION
	LIMIT OF BORDERING VEGETATED WETLAND (BVW)
BLSF	EDGE OF BORDERING LAND SUBJECT TO FLOODING
	LIMIT OF BANK
	LIMIT OF FEMA FLOODWAY
BLSF	ZONE A FLOOD LIMIT (NO BFE)
	APPROX. LIMIT OF GRADING
100'WPA BZ	100' WPA BUFFER ZONE
100'WPA BZ~SUD RA	100' WPA BUFFER ZONE/100' SUDBURY AURA
100'BZ~AURA	100' WPA BUFFER ZONE/100' SUDBURY RESOURCE AREA
100'WPA VPBZ	100' WPA VERNAL POOL BUFFER ZONE
100'WPA RA	100' WPA RESOURCE AREA
200'WPA RA	200' WPA RESOURCE AREA
100'SUD RA	100' SUDBURY RESOURCE AREA
200'SUD RA	200' SUDBURY RESOURCE AREA
100'SUD VPBZ	100' SUDBURY VERNAL POOL BUFFER ZONE
AURA	100' or 200' SUDBURY AURA

LINETYPE	DESCRIPTION
	DRIVE SAMPLE BORING LOCATION
	TEST PIT LOCATION

HATCH	DESCRIPTION
	DISTURBANCE TO 100' WPA BUFFER ZONE (100' BZ)
	DISTURBANCE TO WPA 100' RIVERFRONT AREA (100' RA)
	DISTURBANCE TO WPA 200' RIVERFRONT AREA (200' RA)
	DISTURBANCE TO BLSF
	BORDERING VEGETATED WETLAND
	LIMIT OF BANK/LAND UNDER WATER

HATCH	DESCRIPTION
	TEMPORARY DISTURBANCE TO BVW / LUW / IVW
	PERMANENT DISTURBANCE TO BVW / LUW / IVW
	DISTURBANCE TO 100' WPA VERNAL POOL BZ

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	20	316
PROJECT FILE NO.	608164		

ENVIRONMENTAL IMPACT PLANS

608164_NOI(GENERAL PLANS).DWG Plotted on 22-Dec-2021 11:09 PM

N

N/F
RICHARD J & MICHELLE R VROMAN
34 HAYNES RD
MAP/LOT D10/0024
BK/PG 42291/471

N/F
THOMAS JAY JR & SHERRI ANN LOWERY
38 HAYNES RD
MAP/LOT D09/0024
BK/PG 75057/516

N/F
A SCHOOL FOR SPCL LRNG INC
38 HAYNES RD
MAP/LOT D09/0400
BK/PG 12741/409

100'BZ~AURA

LIMIT OF 100' BUFFER ZONE TO BVW

LIMIT OF 100' WPA BUFFER ZONE / 100' AURA

LIMIT OF 200' SUD RA

LIMIT OF BORDERING VEGETATIVE WETLAND

CONTINUED ON SHEET NO. 19

CONTINUED ON SHEET NO. 21

DISTURBANCE TO 100' BUFFER ZONE

AREA OF SCATTERED ROCKS AND LEDGE OUTCROPS

276 277 278 279 280 281 282

Δ=10° 15' 47"
L=44.78' R=250.00'

N 20° 58' 33" E 621.40'

WF#42-103 WF#42-104 WF#42-105 WF#42-106 WF#42-107 WF#42-108 WF#42-109 WF#42-110 WF#42-111 WF#42-112 WF#42-113 WF#42-114 WF#42-115 END

100' START

WF#8-114 END WF#8-113 WF#8-112 WF#8-111 WF#8-110 WF#8-109 WF#8-108

WF#9-114 END WF#9-100 START WF#9-113 WF#9-112 WF#9-111

MASSDOT—RAIL AND TRANSIT DIVISION
VAL MAP V7.38-39 SHEET 5, V7.39 SHEETS 6-10
JUNE 30, 1915 LAYOUT BY OLD COLONY R.R CO.
DEED BOOK 14836, PAGE 507
CONFIRMATORY TAKING IN DEED BOOK 64110, PAGE 80

LIMIT OF BORDERING VEGETATIVE WETLAND

EDGE PVMT

BIT PVMT

SYNCOPATE EROSION CONTROL BARRIER

LIMIT OF 100' SUD VP BUFFER ZONE

LIMIT OF BORDERING VEGETATIVE WETLAND

POTENTIAL VERNAL POOL #5 WPA NON-ELIGIBLE

LIMIT OF 100' WPA BUFFER ZONE / 100' AURA

UCTION
& EGRESS

2"DEC
OUTLET
EL=132.86' 12"PVC

N/F
ARTHUR J & MARGARET A RICHARD
31 HAYNES RD
MAP/LOT D10/0001
BK/PG 24653/464

N/F
ARTHUR J & MARGARET A RICHARD
31 HAYNES RD
MAP/LOT D10/0001
BK/PG 24653/464

N/F
ARTHUR J & MARGARET A RICHARD
31 HAYNES RD
MAP/LOT D10/0001
BK/PG 24653/464

WOODED

0 20 50 100

SCALE: 1" = 20'

ENVIRONMENTAL IMPACTS LEGEND

LINETYPE	DESCRIPTION
	LIMIT OF BORDERING VEGETATED WETLAND (BVW)
BLSF	EDGE OF BORDERING LAND SUBJECT TO FLOODING
	LIMIT OF BANK
	LIMIT OF FEMA FLOODWAY
BLSF	ZONE A FLOOD LIMIT (NO BFE)
	APPROX. LIMIT OF GRADING
100'WPA BZ	100' WPA BUFFER ZONE
100'WPA BZ - SUD RA	100' WPA BUFFER ZONE/100' SUDBURY AURA
100'BZ - AURA	100' WPA BUFFER ZONE/100' SUDBURY RESOURCE AREA
100'WPA VPBZ	100' WPA VERNAL POOL BUFFER ZONE
100'WPA RA	100' WPA RESOURCE AREA
200'WPA RA	200' WPA RESOURCE AREA
100'SUD RA	100' SUDBURY RESOURCE AREA
200'SUD RA	200' SUDBURY RESOURCE AREA
100'SUD VPBZ	100' SUDBURY VERNAL POOL BUFFER ZONE
AURA	100' or 200' SUDBURY AURA

LINETYPE	DESCRIPTION
	DRIVE SAMPLE BORING LOCATION
	TEST PIT LOCATION

HATCH	DESCRIPTION
	DISTURBANCE TO 100' WPA BUFFER ZONE (100' BZ)
	DISTURBANCE TO WPA 100' RIVERFRONT AREA (100' RA)
	DISTURBANCE TO WPA 200' RIVERFRONT AREA (200' RA)
	DISTURBANCE TO BLSF
	BORDERING VEGETATED WETLAND
	LIMIT OF BANK/LAND UNDER WATER

HATCH	DESCRIPTION
	TEMPORARY DISTURBANCE TO BVW / LUW / IVW
	PERMANENT DISTURBANCE TO BVW / LUW / IVW
	DISTURBANCE TO 100' WPA VERNAL POOL BZ

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	21	316
PROJECT FILE NO.	608164		

ENVIRONMENTAL IMPACT PLANS

608164_NOI\GENERAL PLANS\.DWG Plotted on 22-Dec-2021 11:09 PM

N

BF#6-110 BF#6-109 BF#6-108 BF#6-107 BF#6-106 BF#6-105 BF#6-104 BF#6-103 BF#6-102 BF#6-101 BF#6-100 START BF#6-105 END

WF#8-111 WF#8-110 WF#8-109 WF#8-108 WF#8-107 WF#8-106 WF#8-105 WF#8-104 WF#8-103 WF#8-102 WF#8-101 WF#8-100 START

WF#6-171 WF#6-170 WF#6-169 WF#6-168 WF#6-167

WF#9-114 END WF#9-100 START WF#9-101 WF#9-102 WF#9-103 WF#9-104 WF#9-105 WF#9-106 WF#9-107 WF#9-108 WF#9-109 WF#9-110 WF#9-111 WF#9-112 WF#9-113

BF#7-100 START WF#7-100 START BF#7-101 BF#7-102 BF#7-103 BF#7-104 BF#7-106 BF#7-107 BF#7-108 BF#7-109 END

WF#7-102 START WF#7-103 WF#7-104 WF#7-105 WF#7-106 WF#7-107 WF#7-108 WF#7-110 WF#7-111 WF#7-112

CONTINUED ON SHEET NO. 20

CONTINUED ON SHEET NO. 22

LIMIT OF BORDERING VEGETATIVE WETLAND

DISTURBANCE TO 100' BUFFER ZONE

SYNCOPATE EROSION CONTROL BARRIER

CONC HEADWALL EL=129.14

HEADWALL EL=132.72' 12"CMP

HEADWALL EL=132.06' 12"CMP

EX. 12"CMP

EXISTING CULVERT

EX. CULVERT

ZONE A FLOOD LIMIT (NO BFE)

LIMIT OF 100' BUFFER ZONE TO WPA ELIGIBLE VERNAL POOL #4

LIMIT OF 100' SUD RA

LIMIT OF 200' SUD RA

VERNAL POOL #4
ELIGIBLE VERNAL POOL SURVEYED BY OTHERS

DISTURBANCE TO 100' BUFFER TO VERNAL POOL

DISTURBANCE TO 100' BUFFER ZONE

CONSTRUCTION ACCESS & EGRESS

EX. BOX CULVERT
CULVERT
EL=132.60' 2.4'H x 2.2'W

LIMIT OF BANK

POTENTIAL VERNAL POOL #5 WPA NON-ELIGIBLE

LIMIT OF 100' SUD VERNAL POOL BUFFER ZONE

ZONE A FLOOD LIMIT (NO BFE)

PANTRY ROAD (PUBLIC)

282 283 284 285 286 287

Δ=7° 45' 30"
L=67.70' R=500.00'
N 20° 58' 33" E 621.40'

N 20° 59' 52" E 516.76'

N/F
A SCHOOL FOR SPCL LRNG INC
98 HAYNES RD
MAP/LOT D09/0400
BK/PG 12741/109

N/F
RAMI ALWAN & JENNIE M BRANNEN
PANTRY RD
MAP/LOT D10/0013
BK/PG 69023/195

N/F
ARTHUR J & MARGARET A RICHARD
33 HAYNES RD
MAP/LOT D10/0001
BK/PG 24653/464

N/F
PAUL J II & JOANNE H MARCOUX
70 PANTRY RD
MAP/LOT D10/0001
BK/PG 43235/306

N/F
MEGHAN E GODER & DANIEL E REISER
76 PANTRY RD
MAP/LOT D10/0400
BK/PG 71149/479

MASSDOT-RAIL & TRANSIT DIVISION
VALUE MAP V7-38-39 SHEETS 5, V7-39 SHEETS 6 - 10
JUNE 30, 1915 LAYOUT BY OLD COLONY R.R CO.
DEED BOOK 14836, PAGE 507
CONFIRMATORY TAKING IN DEED BOOK 64110, PAGE 80

0 20 50 100
SCALE: 1" = 20'

ENVIRONMENTAL IMPACTS LEGEND

LINETYPE	DESCRIPTION
	LIMIT OF BORDERING VEGETATED WETLAND (BVW)
	EDGE OF BORDERING LAND SUBJECT TO FLOODING
	LIMIT OF BANK
	LIMIT OF FEMA FLOODWAY
	ZONE A FLOOD LIMIT (NO BFE)
	APPROX. LIMIT OF GRADING
100'WPA BZ	100' WPA BUFFER ZONE
100'WPA BZ - SUD RA	100' WPA BUFFER ZONE/100' SUDBURY AURA
100'BZ - AURA	100' WPA BUFFER ZONE/100' SUDBURY RESOURCE AREA
100'WPA VPBZ	100' WPA VERNAL POOL BUFFER ZONE
100'WPA RA	100' WPA RESOURCE AREA
200'WPA RA	200' WPA RESOURCE AREA
100'SUD RA	100' SUDBURY RESOURCE AREA
200'SUD RA	200' SUDBURY RESOURCE AREA
100'SUD VPBZ	100' SUDBURY VERNAL POOL BUFFER ZONE
AURA	100' or 200' SUDBURY AURA

LINETYPE	DESCRIPTION
	DRIVE SAMPLE BORING LOCATION
	TEST PIT LOCATION

HATCH	DESCRIPTION
	DISTURBANCE TO 100' WPA BUFFER ZONE (100' BZ)
	DISTURBANCE TO WPA 100' RIVERFRONT AREA (100' RA)
	DISTURBANCE TO WPA 200' RIVERFRONT AREA (200' RA)
	DISTURBANCE TO BLSF
	BORDERING VEGETATED WETLAND
	LIMIT OF BANK/LAND UNDER WATER

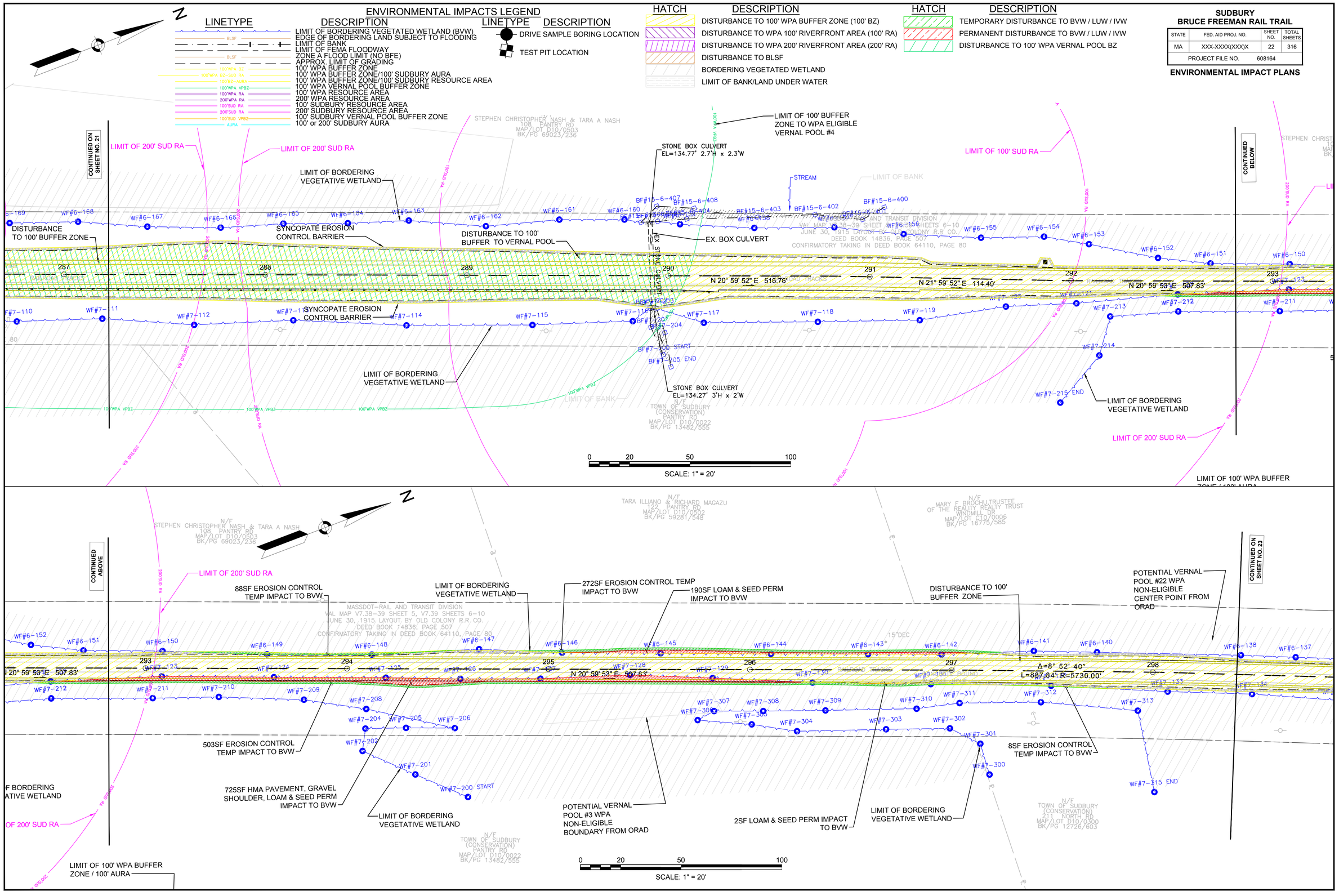
HATCH	DESCRIPTION
	TEMPORARY DISTURBANCE TO BVW / LUW / IVW
	PERMANENT DISTURBANCE TO BVW / LUW / IVW
	DISTURBANCE TO 100' WPA VERNAL POOL BZ

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	22	316
PROJECT FILE NO.	608164		

ENVIRONMENTAL IMPACT PLANS

Plotted on 22-Dec-2021 11:10 PM
608164_NOI(GENERAL PLANS).DWG



ENVIRONMENTAL IMPACTS LEGEND

LINETYPE	DESCRIPTION
	LIMIT OF BORDERING VEGETATED WETLAND (BVW)
BLSF	EDGE OF BORDERING LAND SUBJECT TO FLOODING
	LIMIT OF BANK
	LIMIT OF FEMA FLOODWAY
BLSF	ZONE A FLOOD LIMIT (NO BFE)
	APPROX. LIMIT OF GRADING
100'WPA BZ	100' WPA BUFFER ZONE
100'WPA BZ~SUD RA	100' WPA BUFFER ZONE/100' SUDBURY AURA
100'BZ~AURA	100' WPA BUFFER ZONE/100' SUDBURY RESOURCE AREA
100'WPA VPBZ	100' WPA VERNAL POOL BUFFER ZONE
100'WPA RA	100' WPA RESOURCE AREA
200'WPA RA	200' WPA RESOURCE AREA
100'SUD RA	100' SUDBURY RESOURCE AREA
200'SUD RA	200' SUDBURY RESOURCE AREA
100'SUD VPBZ	100' SUDBURY VERNAL POOL BUFFER ZONE
AURA	100' or 200' SUDBURY AURA

LINETYPE	DESCRIPTION
	DRIVE SAMPLE BORING LOCATION
	TEST PIT LOCATION

HATCH	DESCRIPTION
	DISTURBANCE TO 100' WPA BUFFER ZONE (100' BZ)
	DISTURBANCE TO WPA 100' RIVERFRONT AREA (100' RA)
	DISTURBANCE TO WPA 200' RIVERFRONT AREA (200' RA)
	DISTURBANCE TO BLSF
	BORDERING VEGETATED WETLAND
	LIMIT OF BANK/LAND UNDER WATER

HATCH	DESCRIPTION
	TEMPORARY DISTURBANCE TO BVW / LUW / IVW
	PERMANENT DISTURBANCE TO BVW / LUW / IVW
	DISTURBANCE TO 100' WPA VERNAL POOL BZ

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	23	316
PROJECT FILE NO.	608164		

ENVIRONMENTAL IMPACT PLANS

N

LIMIT OF 100' WPA BUFFER ZONE / 100' AURA

LIMIT OF 100' SUD RA

LIMIT OF 200' SUD RA

91SF EROSION CONTROL TEMP IMPACT TO BVW

26SF LOAM & SEED PERM IMPACT TO BVW

CONTINUED ON SHEET NO. 22

CONTINUED ON SHEET NO. 24

6LF EROSION CONTROL TO REPLACE HEADWALL TEMP IMPACT TO BANK

4SF EROSION CONTROL & WORK AREA TO REPLACE HEADWALL TEMP IMPACT TO LUW

STONE HEADWALL EL=143.52' 12"CLAY

LIMIT OF BANK

12SF WORK AREA TO REPLACE HEADWALL TEMP IMPACT TO BVW

9SF EROSION CONTROL & WORK AREA TO REPLACE HEADWALL TEMP IMPACT TO BVW

DISTURBANCE TO 100' BUFFER ZONE

LIMIT OF BORDERING VEGETATIVE WETLAND

N/F
MARY F. BROCHU,TRUSTEE
OF THE REALITY REALTY TRUST
WINDMILL DR
MAP/LOT C10/0006
BK/PG 16775/585

POTENTIAL VERNAL POOL #22 WPA NON-ELIGIBLE CENTER POINT FROM RAD

298 299 300 301 302 303 304

Δ=8° 52' 40"
L=887.84' R=5730.00'

MASSDOT-RAIL AND TRANSIT DIVISION
VAL MAP V7.38-39 SHEET 5, V7.39 SHEETS 6-10
JUNE 30, 1915 LAYOUT BY OLD COLONY R.R CO.
DEED BOOK 14836, PAGE 507
CONFIRMATORY TAKING IN DEED BOOK 64110, PAGE 80

2SF LOAM & SEED PERM IMPACT TO BVW

214SF EROSION CONTROL TEMP IMPACT TO BVW

LIMIT OF BORDERING VEGETATIVE WETLAND

155SF GRAVEL SHOULDER, LOAM & SEED PERM IMPACT TO BVW

PATH

12SF EROSION CONTROL & WORK AREA TO REPLACE HEADWALL TEMP IMPACT TO LUW

STONE HEADWALL EL=142.94' 12"CLAY

EX. CULVERT TO BE REPLACED

LIMIT OF BANK

N/E
TOWN OF SUDBURY
(CONSERVATION)
211 NORTH RD
MAP/LOT D10/0350
BK/PG 12726/603

LIMIT OF 100' WPA BUFFER ZONE / 100' AURA

LIMIT OF 200' SUD RA

0 20 50 100

SCALE: 1" = 20'

ENVIRONMENTAL IMPACTS LEGEND

LINETYPE	DESCRIPTION
	LIMIT OF BORDERING VEGETATED WETLAND (BVW)
BLSF	EDGE OF BORDERING LAND SUBJECT TO FLOODING
	LIMIT OF BANK
	LIMIT OF FEMA FLOODWAY
BLSF	ZONE A FLOOD LIMIT (NO BFE)
	APPROX. LIMIT OF GRADING
100'WPA BZ	100' WPA BUFFER ZONE
100'WPA BZ~SUD RA	100' WPA BUFFER ZONE/100' SUDBURY AURA
100'BZ~AURA	100' WPA BUFFER ZONE/100' SUDBURY RESOURCE AREA
100'WPA VPBZ	100' WPA VERNAL POOL BUFFER ZONE
100'WPA RA	100' WPA RESOURCE AREA
200'WPA RA	200' WPA RESOURCE AREA
100'SUD RA	100' SUDBURY RESOURCE AREA
200'SUD RA	200' SUDBURY RESOURCE AREA
100'SUD VPBZ	100' SUDBURY VERNAL POOL BUFFER ZONE
AURA	100' or 200' SUDBURY AURA

LINETYPE	DESCRIPTION
	DRIVE SAMPLE BORING LOCATION
	TEST PIT LOCATION

HATCH	DESCRIPTION
	DISTURBANCE TO 100' WPA BUFFER ZONE (100' BZ)
	DISTURBANCE TO WPA 100' RIVERFRONT AREA (100' RA)
	DISTURBANCE TO WPA 200' RIVERFRONT AREA (200' RA)
	DISTURBANCE TO BLSF
	BORDERING VEGETATED WETLAND
	LIMIT OF BANK/LAND UNDER WATER

HATCH	DESCRIPTION
	TEMPORARY DISTURBANCE TO BVW / LUW / IVW
	PERMANENT DISTURBANCE TO BVW / LUW / IVW
	DISTURBANCE TO 100' WPA VERNAL POOL BZ

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	24	316
PROJECT FILE NO.	608164		

ENVIRONMENTAL IMPACT PLANS

608164_NOI(GENERAL PLANS).DWG Plotted on 22-Dec-2021 11:11 PM

LIMIT OF 200' BUFFER ZONE / 100' SUD RA
LIMIT OF 100' SUD RA
LIMIT OF 100' WPA BUFFER ZONE / 100' AURA
INV 12" RCP EL=146.22'
8 SF REPLACE HEADWALL PERM IMPACT TO LUW
15LF WORK AREA TO REPLACE HEADWALL TEMP IMPACT TO BANK
LIMIT OF 100' SUD VERNAL POOL BUFFER ZONE
LIMIT OF 100' BUFFER ZONE / 100' SUD RA
29SF WORK AREA AND EROSION CONTROL TO REPLACE HEADWALL TEMP IMPACT TO LUW
EROSION CONTROL EMP IMPACT TO BVW
SEED PERM ACT TO BVW
13SF EROSION CONTROL & WORK AREA TEMP IMPACT TO BVW
LIMIT OF BORDERING VEGETATIVE WETLAND
LIMIT OF BANK
25SF EROSION CONTROL & WORK AREA TO REPLACE HEADWALL TEMP IMPACT TO BVW
CONC HEADWALL EL=145.20' 12"CI
DISTURBANCE TO 100' BUFFER ZONE
EX. CULVERT
8SF REPLACE HEADWALL PERM IMPACT TO LUW
22SF WORK AREA & EROSION CONTROL TO REPLACE HEADWALL TEMP IMPACT TO LUW
CONC HEADWALL EL=144.40' 12"CI
155SF GRAVEL SHOULDER, LOAM & SEED PERM IMPACT TO BVW
4SF LOAM & SEED PERM IMPACT TO LUW
9LF WORK AREA & EROSION CONTROL TEMP IMPACT TO BANK
3LF WORK AREA & EROSION CONTROL TEMP IMPACT TO BANK
6LF LOAM & SEED PERM IMPACT TO BANK
CONSTRUCTION ACCESS & EGRESS
SYNCOPATE EROSION CONTROL BARRIER
CONTINUED ON SHEET NO. 23
CONTINUED ON SHEET NO. 25
LIMIT OF 100' BUFFER ZONE / 100' SUD RA
LIMIT OF 200' SUD RA

SCALE: 1" = 20'

ENVIRONMENTAL IMPACTS LEGEND

LINETYPE	DESCRIPTION
BLSF	LIMIT OF BORDERING VEGETATED WETLAND (BVW)
BLSF	EDGE OF BORDERING LAND SUBJECT TO FLOODING
	LIMIT OF BANK
	LIMIT OF FEMA FLOODWAY
	ZONE A FLOOD LIMIT (NO BFE)
	APPROX. LIMIT OF GRADING
100'WPA BZ	100' WPA BUFFER ZONE
100'WPA BZ - SUD RA	100' WPA BUFFER ZONE/100' SUDBURY AURA
100'BZ - AURA	100' WPA BUFFER ZONE/100' SUDBURY RESOURCE AREA
100'WPA VPBZ	100' WPA VERNAL POOL BUFFER ZONE
100'WPA RA	100' WPA RESOURCE AREA
200'WPA RA	200' WPA RESOURCE AREA
100'SUD RA	100' SUDBURY RESOURCE AREA
200'SUD RA	200' SUDBURY RESOURCE AREA
100'SUD VPBZ	100' SUDBURY VERNAL POOL BUFFER ZONE
AURA	100' or 200' SUDBURY AURA

LINETYPE	DESCRIPTION
	DRIVE SAMPLE BORING LOCATION
	TEST PIT LOCATION

HATCH	DESCRIPTION
	DISTURBANCE TO 100' WPA BUFFER ZONE (100' BZ)
	DISTURBANCE TO WPA 100' RIVERFRONT AREA (100' RA)
	DISTURBANCE TO WPA 200' RIVERFRONT AREA (200' RA)
	DISTURBANCE TO BLSF
	BORDERING VEGETATED WETLAND
	LIMIT OF BANK/LAND UNDER WATER

HATCH	DESCRIPTION
	TEMPORARY DISTURBANCE TO BVW / LUW / IVW
	PERMANENT DISTURBANCE TO BVW / LUW / IVW
	DISTURBANCE TO 100' WPA VERNAL POOL BZ

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	25	316
PROJECT FILE NO.	608164		

ENVIRONMENTAL IMPACT PLANS

Plotted on 22-Dec-2021 11:11 PM

608164_NOI(GENERAL PLANS).DWG

N

N/F JOHN C & DORIS NORMAN NORTH RD MAP/LOT C10/0013 BK/PG 13793/342

CONTINUED ON SHEET NO. 24

POTENTIAL VERNAL POOL #2 WPA NON-ELIGIBLE

LIMIT OF BANK

EDGE OF WATER

LIMIT OF BORDERING VEGETATIVE WETLAND

LIMIT OF 100' SUD RA

LIMIT OF 100' SUD VERNAL POOL BUFFER ZONE

EDGE OF BORDERING LAND SUBJECT TO FLOODING (ELEV 140.7)

LIMIT OF BANK

CULVERT (UNDER WATER) EL=136.43' 2'Hx2.5'W

EX. CULVERT (SEE DRAINAGE & UTIL PLAN)

DISTRUBANCE TO 100' RIVER FRONT AREA

CONTINUED BELOW

LIMIT OF 100' RIVER

MASSDOT-RAIL AND TRANSIT DIVISION VAL MAP V7.38-39 SHEET 5, V7.39 SHEETS 6-10 JUNE 30, 1915 LAYOUT BY OLD COLONY R.R CO. DEED BOOK 14836, PAGE 507 CONFIRMATORY TAKING IN DEED BOOK 64110, PAGE 80

310 311 312 313 314 315

N 32° 25' 44" E 1901.85'

LIMIT OF 100' SUD RA

LIMIT OF 200' RIVER FRONT AREA

DISTRUBANCE TO 200' RIVER FRONT AREA

SYNCOPATE EROSION CONTROL BARRIER

EDGE OF BORDERING LAND SUBJECT TO FLOODING (ELEV 139.1)

LIMIT OF BORDERING VEGETATIVE WETLAND

LIMIT OF 100' SUD VP BUFFER ZONE

CULVERT (BLOCKED & BURIED) EL=133.21' 2'Hx2.5'W

INV 24" RCP EL=134.49' 24"RCP

EXISTING 24"RCP

INV 24" RCP EL=134.29' 24"RCP

LIMIT OF BANK

LIMIT OF 100' RIVERFRONT AREA

LIMIT OF 100' WPA BUFFER ZONE / SUD AURA

LIMIT OF 100' WPA BUFFER ZONE / 100' AURA

0 20 50 100

SCALE: 1" = 20'

N/F FAIRVIEW DEVELOPMENT CORP NORTH RD MAP/LOT C10/0009 BK/PG 11659/136

N/F FAIRVIEW DEVELOPMENT CORP 9 NORTH RD MAP/LOT C10/0401 BK/PG 9512/83

LIMIT OF 100' WPA BUFFER ZONE / 100' AURA

LIMIT OF 100' WPA RIVER FRONT AREA

LIMIT OF 200' WPA RIVER FRONT AREA

DISTRUBANCE TO 200' RIVER FRONT AREA

DISTRUBANCE TO 100' RIVER FRONT AREA

CONTINUED ABOVE

315 316 317 318 319 320 321

N 32° 25' 44" E 1901.85'

MASSDOT-RAIL AND TRANSIT DIVISION VAL MAP V7.38-39 SHEET 5, V7.39 SHEETS 6-10 JUNE 30, 1915 LAYOUT BY OLD COLONY R.R CO. DEED BOOK 14836, PAGE 507 CONFIRMATORY TAKING IN DEED BOOK 64110, PAGE 80

LIMIT OF 200' RIVER FRONT AREA

LIMIT OF 100' WPA BUFFER ZONE / 100' AURA

0 20 50 100

SCALE: 1" = 20'

FAIRVIEW FARMS DRIVEWAY *(PRIVATE)*

CONTINUED ON SHEET NO. 26

NO CONSTRUCTION ACCESS & EGRESS

ENVIRONMENTAL IMPACTS LEGEND

LINETYPE	DESCRIPTION
BLSF	LIMIT OF BORDERING VEGETATED WETLAND (BVW)
BLSF	EDGE OF BORDERING LAND SUBJECT TO FLOODING
	LIMIT OF BANK
	LIMIT OF FEMA FLOODWAY
	ZONE A FLOOD LIMIT (NO BFE)
	APPROX. LIMIT OF GRADING
100'WPA BZ	100' WPA BUFFER ZONE
100'WPA BZ - SUD RA	100' WPA BUFFER ZONE/100' SUDBURY AURA
100'BZ - AURA	100' WPA BUFFER ZONE/100' SUDBURY RESOURCE AREA
100'WPA VPBZ	100' WPA VERNAL POOL BUFFER ZONE
100'WPA RA	100' WPA RESOURCE AREA
200'WPA RA	200' WPA RESOURCE AREA
100'SUD RA	100' SUDBURY RESOURCE AREA
200'SUD RA	200' SUDBURY RESOURCE AREA
100'SUD VPBZ	100' SUDBURY VERNAL POOL BUFFER ZONE
AURA	100' or 200' SUDBURY AURA

LINETYPE	DESCRIPTION
	DRIVE SAMPLE BORING LOCATION
	TEST PIT LOCATION

HATCH	DESCRIPTION
	DISTURBANCE TO 100' WPA BUFFER ZONE (100' BZ)
	DISTURBANCE TO WPA 100' RIVERFRONT AREA (100' RA)
	DISTURBANCE TO WPA 200' RIVERFRONT AREA (200' RA)
	DISTURBANCE TO BLSF
	BORDERING VEGETATED WETLAND
	LIMIT OF BANK/LAND UNDER WATER

HATCH	DESCRIPTION
	TEMPORARY DISTURBANCE TO BVW / LUW / IVW
	PERMANENT DISTURBANCE TO BVW / LUW / IVW
	DISTURBANCE TO 100' WPA VERNAL POOL BZ

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	26	316
PROJECT FILE NO.	608164		

ENVIRONMENTAL IMPACT PLANS

608164_NOI(GENERAL PLANS).DWG Plotted on 22-Dec-2021 11:12 PM

FAIRVIEW FARMS DRIVEWAY *(PRIVATE)*

N/F FAIRVIEW DEVELOPMENT CORP 206 NORTH RD MAP/LOT C10/0401 BK/PG 9512/83

CONTINUED ON SHEET NO. 25

BODY OF WATER
OWNER DID NOT ALLOW DELINEATION

POND

LIMIT OF 100' WPA BUFFER ZONE / 100' AURA

LIMIT OF 100' BUFFER TO SUD VP

DISTURBANCE TO 100' BUFFER ZONE

SYNCOPATE EROSION CONTROL BARRIER

BUSH

WOODS

EDGE PVMT

EDGE PVMT

321 322 323 324 325 326

RAILROAD TRACKS

BRIDGE ABUTMENTS

MASSDOT–RAIL AND TRANSIT DIVISION
VAL MAP V7.38–39 SHEET 5, V7.39 SHEETS 6–10
JUNE 30, 1915 LAYOUT BY OLD COLONY R.R CO.
DEED BOOK 14836, PAGE 507
CONFIRMATORY TAKING IN DEED BOOK 64110, PAGE 80

N 32° 25' 44" E 1901.85'

CONTINUED BELOW

N/F FAIRVIEW DEVELOPMENT CORP 206 NORTH RD MAP/LOT C10/0400 BK/PG 45910/223

SYNCOPATE EROSION CONTROL BARRIER

LIMIT OF BORDERING VEGETATIVE WETLAND

WF#2–135 WF#2–134 WF#2–133 WF#2–132 WF#2–131 WF#2–130 WF#2–129 WF#2–128 WF#2–127 WF#2–126 WF#2–125 WF#2–124 WF#2–123

STONE BOUND WITH DRILL HOLE (FND)

LIMIT OF 100' SUD VERNAL POOL BUFFER ZONE

WF#2–136

POTENTIAL VERNAL POOL #1 WPA NON-ELIGIBLE

WF#2–137 END

N/F TOWN OF SUDBURY(FROST FARM HOUSE) 148 NORTH RD MAP/LOT C11/0301 BK/PG 21736/272

0 20 50 100
SCALE: 1" = 20'

N/F FAIRVIEW DEVELOPMENT CORP 206 NORTH RD MAP/LOT C10/0400 BK/PG 45910/223

CONTINUED ABOVE

LIMIT OF 100' WPA BUFFER ZONE / 100' AURA

LIMIT OF 200' SUD RA

DISTURBANCE TO 100' BUFFER ZONE

N/F BRUCE D & JEFFREY F MAURER 0 NORTH RD MAP/LOT C10/0402 BK/PG 45910/223

LIMIT OF BORDERING VEGETATIVE WETLAND

WF#2–112 END

LIMIT OF 100' SUD RA

DISTURBANCE TO 100' BUFFER ZONE

EDGE OF WATER

WF#1–111 WF#1–110 WF#1–109 WF#1–108 WF

CONTINUED ON SHEET NO. 27

326 327 328 329 330 331 332

Δ=3° 03' 32"
L=305.92' R=5730.00'

N 29° 22' 11" E 576.21'

EX. CULVERT

STONE BOUND WITH DRILL HOLE (FND)

MASSDOT–RAIL AND TRANSIT DIVISION
VAL MAP V7.38–39 SHEET 5, V7.39 SHEETS 6–10
JUNE 30, 1915 LAYOUT BY OLD COLONY R.R CO.
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LIMIT OF BORDERING VEGETATIVE WETLAND

WF#2–126 WF#2–125 WF#2–124 WF#2–123 WF#2–122 WF#2–121 WF#2–120 WF#2–119 WF#2–118 WF#2–117 WF#2–116 WF#2–115 WF#2–114 WF#2–113 WF#2–111 WF#2–110 WF#2–109 WF#2–108 WF#2–107 WF#2–106 WF#2–105

BF#2–205 BF#2–204 BF#2–203 BF#2–206 BF#2–202 BF#2–201 BF#2–207 BF#2–208 END BF#2–208 START

LIMIT OF BANK

N/F TOWN OF SUDBURY(FROST FARM HOUSE) 148 NORTH RD MAP/LOT C11/0301 BK/PG 21736/272

0 20 50 100
SCALE: 1" = 20'

ENVIRONMENTAL IMPACTS LEGEND

LINETYPE	DESCRIPTION
	LIMIT OF BORDERING VEGETATED WETLAND (BVW)
BLSF	EDGE OF BORDERING LAND SUBJECT TO FLOODING
	LIMIT OF BANK
	LIMIT OF FEMA FLOODWAY
BLSF	ZONE A FLOOD LIMIT (NO BFE)
	APPROX. LIMIT OF GRADING
100'WPA BZ	100' WPA BUFFER ZONE
100'WPA BZ - SUD RA	100' WPA BUFFER ZONE/100' SUDBURY AURA
100'BZ - AURA	100' WPA BUFFER ZONE/100' SUDBURY RESOURCE AREA
100'WPA VPBZ	100' WPA VERNAL POOL BUFFER ZONE
100'WPA RA	100' WPA RESOURCE AREA
200'WPA RA	200' WPA RESOURCE AREA
100'SUD RA	100' SUDBURY RESOURCE AREA
200'SUD RA	200' SUDBURY RESOURCE AREA
100'SUD VPBZ	100' SUDBURY VERNAL POOL BUFFER ZONE
AURA	100' or 200' SUDBURY AURA

LINETYPE	DESCRIPTION
	DRIVE SAMPLE BORING LOCATION
	TEST PIT LOCATION

HATCH	DESCRIPTION
	DISTURBANCE TO 100' WPA BUFFER ZONE (100' BZ)
	DISTURBANCE TO WPA 100' RIVERFRONT AREA (100' RA)
	DISTURBANCE TO WPA 200' RIVERFRONT AREA (200' RA)
	DISTURBANCE TO BLSF
	BORDERING VEGETATED WETLAND
	LIMIT OF BANK/LAND UNDER WATER

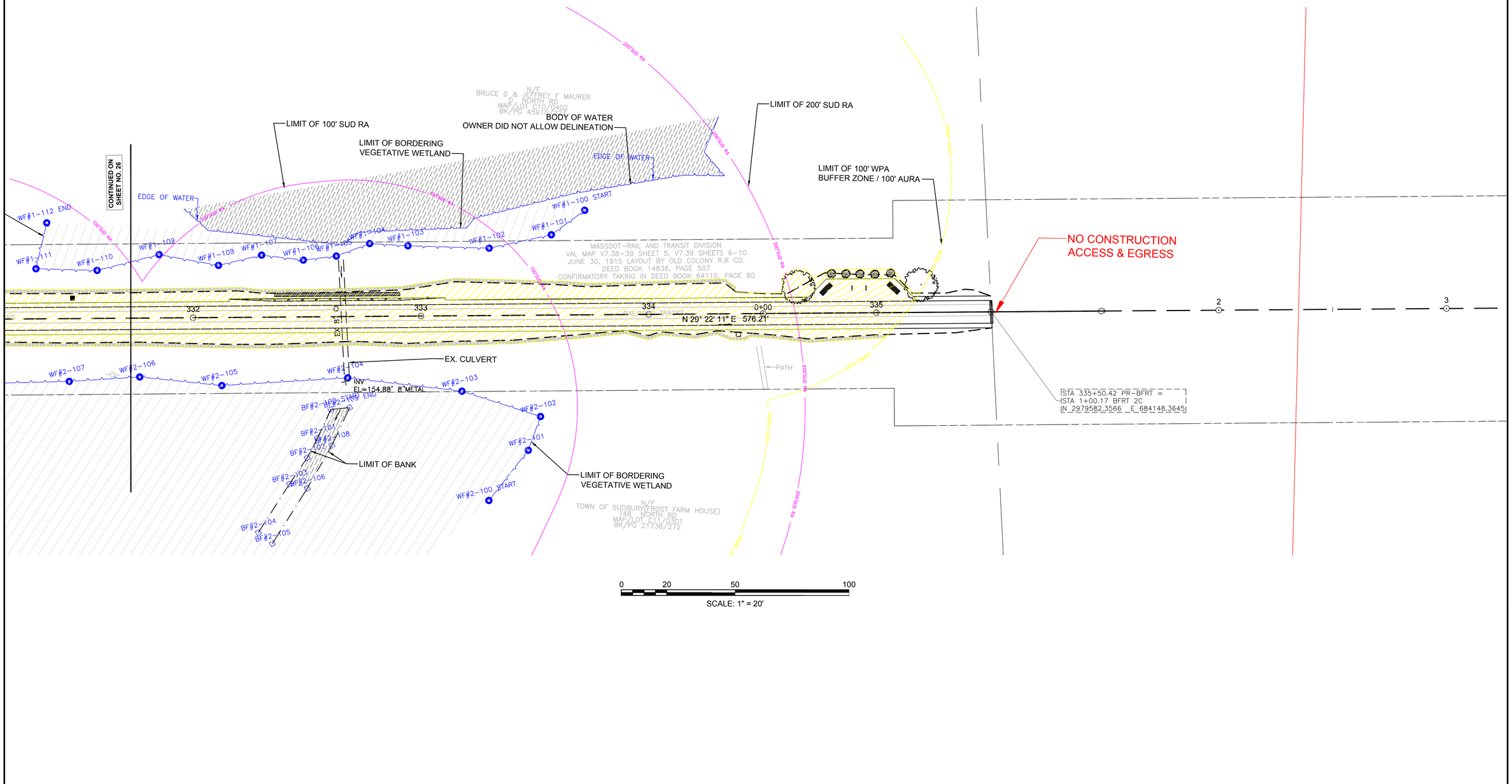
HATCH	DESCRIPTION
	TEMPORARY DISTURBANCE TO BVW / LUW / IVW
	PERMANENT DISTURBANCE TO BVW / LUW / IVW
	DISTURBANCE TO 100' WPA VERNAL POOL BZ

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	27	316
PROJECT FILE NO.	608164		

ENVIRONMENTAL IMPACT PLANS

608164_NOI(GENERAL PLANS).DWG Plotted on 22-Dec-2021 11:12 PM



ENVIRONMENTAL IMPACTS LEGEND

LINETYPE	DESCRIPTION
	LIMIT OF BORDERING VEGETATED WETLAND (BVW)
BLSF	EDGE OF BORDERING LAND SUBJECT TO FLOODING
	LIMIT OF BANK
	LIMIT OF FEMA FLOODWAY
BLSF	ZONE A FLOOD LIMIT (NO BFE)
	APPROX. LIMIT OF GRADING
100'WPA BZ	100' WPA BUFFER ZONE
100'WPA BZ - SUD RA	100' WPA BUFFER ZONE/100' SUDBURY AURA
100'BZ - AURA	100' WPA BUFFER ZONE/100' SUDBURY RESOURCE AREA
100'WPA VPBZ	100' WPA VERNAL POOL BUFFER ZONE
100'WPA RA	100' WPA RESOURCE AREA
200'WPA RA	200' WPA RESOURCE AREA
100'SUD RA	100' SUDBURY RESOURCE AREA
200'SUD RA	200' SUDBURY RESOURCE AREA
100'SUD VPBZ	100' SUDBURY VERNAL POOL BUFFER ZONE
AURA	100' or 200' SUDBURY AURA

LINETYPE	DESCRIPTION
	DRIVE SAMPLE BORING LOCATION
	TEST PIT LOCATION

HATCH	DESCRIPTION
	DISTURBANCE TO 100' WPA BUFFER ZONE (100' BZ)
	DISTURBANCE TO WPA 100' RIVERFRONT AREA (100' RA)
	DISTURBANCE TO WPA 200' RIVERFRONT AREA (200' RA)
	DISTURBANCE TO BLSF
	BORDERING VEGETATED WETLAND
	LIMIT OF BANK/LAND UNDER WATER

HATCH	DESCRIPTION
	TEMPORARY DISTURBANCE TO BVW / LUW / IVW
	PERMANENT DISTURBANCE TO BVW / LUW / IVW
	DISTURBANCE TO 100' WPA VERNAL POOL BZ

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	28	316
PROJECT FILE NO.	608164		

ENVIRONMENTAL IMPACT PLANS

608164_NOI(GENERAL PLANS).DWG Plotted on 22-Dec-2021 11:12 PM

N

N/F
TOWN OF SUDBURY
0 HUDSON RD
G09-0200
BOOK 13189 PAGE 604

N/F
TOWN OF SUDBURY(TREASURER)
HUDSON RD
MAP/LOT G09/0200
BK/PG 13189/604

CONTINUED ON SHEET NO. 16

MASSDOT-RAIL AND TRANSIT DIVISION
VAL MAP V7.38-39 SHEET 5, V7.39 SHEETS 6-10
JUNE 30, 1915 LAYOUT BY OLD COLONY R.R CO.
DEED BOOK 14836, PAGE 507
CONFIRMATORY TAKING IN DEED BOOK 64110, PAGE 80

RAILROAD TRACKS

N 19°

186
185
184
183

Δ=114° 20' 20"
L=139.69' R=70.00'
1002
PRC +34.65
Δ=45° 57' 29"
L=56.24' R=70.12'
1003
PT +90.89
S 70° 11' 49" E 70.57'
1003+61.46
PC +94.96
1001
N 41° 30' 12" E 94.96'
1000+00

CONCRETE BOUND W/DRILL HOLE
BP FOUND

PARKINSON'S LOT

GRAVEL PARKING
EDGE GRAVEL
STONE WALL
EDGE OF TREES
CHAIN LINK FENCE
GRASS
EP

N/F
LAWRENCE W TIGHE, TRUSTEE OF THE HUDSON RD TRUST #1
36 HUDSON RD
MAP/LOT G09/0002
BK/PG 30665/361

0 20 50 100
SCALE: 1" = 20'

ENVIRONMENTAL IMPACTS LEGEND

LINETYPE	DESCRIPTION
	LIMIT OF BORDERING VEGETATED WETLAND (BVW)
BLSF	EDGE OF BORDERING LAND SUBJECT TO FLOODING
	LIMIT OF BANK
BLSF	LIMIT OF FEMA FLOODWAY
	ZONE A FLOOD LIMIT (NO BFE)
	APPROX. LIMIT OF GRADING
100'WPA BZ	100' WPA BUFFER ZONE
100'WPA BZ - SUD RA	100' WPA BUFFER ZONE/100' SUDBURY AURA
100'BZ - AURA	100' WPA BUFFER ZONE/100' SUDBURY RESOURCE AREA
100'WPA VPBZ	100' WPA VERNAL POOL BUFFER ZONE
100'WPA RA	100' WPA RESOURCE AREA
200'WPA RA	200' WPA RESOURCE AREA
100'SUD RA	100' SUDBURY RESOURCE AREA
200'SUD RA	200' SUDBURY RESOURCE AREA
100'SUD VPBZ	100' SUDBURY VERNAL POOL BUFFER ZONE
AURA	100' or 200' SUDBURY AURA

LINETYPE	DESCRIPTION
	DRIVE SAMPLE BORING LOCATION
	TEST PIT LOCATION

HATCH	DESCRIPTION
	DISTURBANCE TO 100' WPA BUFFER ZONE (100' BZ)
	DISTURBANCE TO WPA 100' RIVERFRONT AREA (100' RA)
	DISTURBANCE TO WPA 200' RIVERFRONT AREA (200' RA)
	DISTURBANCE TO BLSF
	BORDERING VEGETATED WETLAND
	LIMIT OF BANK/LAND UNDER WATER

HATCH	DESCRIPTION
	TEMPORARY DISTURBANCE TO BVW / LUW / IVW
	PERMANENT DISTURBANCE TO BVW / LUW / IVW
	DISTURBANCE TO 100' WPA VERNAL POOL BZ

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	29	316
PROJECT FILE NO.	608164		

RESOURCE AREA IMPACTS

Plotted on 22-Dec-2021 11:13 PM
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N

NORTH ROAD (RTE 117)
(PUBLIC)

BROKEN BIT DRIVE

LIMIT OF 100' WPA BUFFER ZONE / 100' AURA

CONSTRUCTION ACCESS & EGRESS

CONTINUED BELOW

CONTINUED ON SHEET NO. 24

LIMIT OF 200' SUD RA

LIMIT OF BORDERING VEGETATIVE WETLAND

4SF LOAM & SEED PERM IMPACT TO LUW

WF#20336 E500 START
WF#20336 E501
WF#20336 E502
WF#20336 E503
WF#20336 E504
WF#20336 E505

1100+00
1101
1102
1103
1104
1105
1106
1107
1108

S 87° 38' 12" E 411.40'

CB RIM=143.52' INV=140.77'

CB RIM=143.49'

PC +11.40
PC +83.93
PT +54.49
PT +83.06
+20.11 4.00' L

Δ=86° 17' 00" L=109.08' R=72.00'
Δ=16° 03' 34" L=68.76' R=245.30'
Δ=48° 01' 17" L=99.14' R=118.28'
S 14° 24' 46" E 29.44'
S 1° 38' 48" W 65.25'
S 62° 26' 03" E 91.93'

N/F AURORA LOAN SERVICES LLC 196 NORTH RD C10-0008 BOOK 56812 PAGE 427

N/F TOWN OF SUDBURY DAVIS FIELD 195 NORTH RD C10-0500 BOOK 12913 PAGE 150

"DAVIS FARM"

DAVIS FIELD PARKING LOT

SCALE: 1" = 20'

FENCING DETAILS

TIMBER FENCE (THREE-RAIL) 103+55 RT TO STA. 104+25 RT
TIMBER FENCE (THREE-RAIL) 104+80 LT TO STA. 107+15 LT

HIGHWAY GUARD DETAILS

NONE

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

NONE

DRAINAGE DETAILS

NONE

NOTES:

1. REMOVE AND DISCARD ALL EXISTING RAILS LOCATED WITHIN THE PROJECT LIMITS. COST FOR R&D SHALL BE PAID UNDER ITEM 129.5 TRACK EXCAVATION.
2. SEE TYPICAL SECTIONS FOR FORMATION OF SHARED USE PATH SHOULDERS AND MATERIAL SPECIFICATIONS
3. ALL EXISTING STRUCTURES WITHIN CURB RAMP AREAS SHALL BE ADJUSTED TO BE FLUSH WITH CURB RAMP SURFACE.
4. ALL TREES WITHIN SLOPE LIMITS/CLEARING LIMITS SHALL BE REMOVED UNLESS OTHERWISE NOTED ON PLANS. PAYMENT FOR TREE REMOVALS IN THESE ARES SHALL BE PAID FOR UNDER CLEARING & GRUBBING ITEM PER STANDARD SPECIFICATIONS.
5. ALL TREES OUTSIDE OF SLOPE LIMITS/CLEARING LIMITS SHALL BE RETAINED.
6. PROPOSED PLANTINGS MAY REQUIRE FIELD ADJUSTMENT DUE TO FINAL FIELD CONDITIONS. MASSDOT LANDSCAPE ARCHITECT SHALL APPROVE ALL LOCATIONS PRIOR TO PLANTING.

LEGEND:

PROPOSED WHEELCHAIR RAMP DETAIL # — X#

PLANT QUANTITY AND SPECIES — X / XX

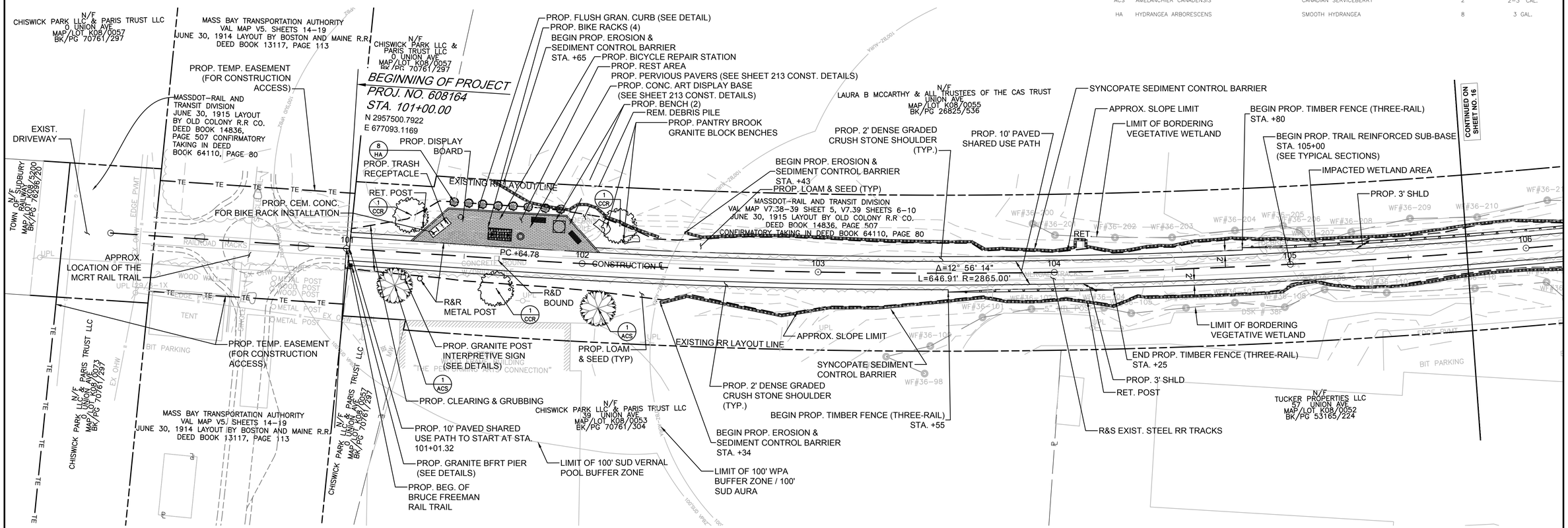
SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	15	316
PROJECT FILE NO.	608164		

CONSTRUCTION PLANS

PLANT LIST

KEY	BOTANICAL NAME	COMMON NAME	QTY.	SIZE
	ORNAMENTAL MIX			
CCR	CERCIS CANADENSIS	REDBUD	3	2–3" CAL.
ACS	AMELANCHIER CANADENSIS	CANADIAN SERVICEBERRY	2	2–3" CAL.
HA	HYDRANGEA ARBORESCENS	SMOOTH HYDRANGEA	8	3 GAL.



PROJECT SUMMARY PLANT LIST

KEY	BOTANICAL NAME	COMMON NAME	QTY.	SIZE
	VISUAL SCREEN MIX			
JV	JUNIPERUS VIRGINIANA	EASTERN RED CEDAR		4–5' HT.
VT	VILBURUM TRILOBUM	HIGHBUSH CRANBERRY		3 GAL.
IG	ILEX GLABRA	INKBERRY		3 GAL.
PS	PINUS STROBUS	EASTERN WHITE PINE		4–5' HT.
AC	ABIES CONCOLOR	WHITE FIR		5–6' HT.
RM	RHODODENDRON MAXIMUM	ROSEBAY RHODODENDRON		3 GAL.
	EROSION CONTROL MIX			
SS	CAREX STRICTA	TUSSOCK SEDGE		PLUG
CS	CORNUS SERICEA. & SALIX SSP	DOGWOOD AND WILLOW		1 GAL.

PROJECT SUMMARY PLANT LIST (continued)

KEY	BOTANICAL NAME	COMMON NAME	QTY.	SIZE
	ORNAMENTAL MIX			
CCR	CERCIS CANADENSIS	REDBUD		2–3" CAL.
ACS	AMELANCHIER CANADENSIS	CANADIAN SERVICEBERRY		2–3" CAL.
HA	HYDRANGEA ARBORESCENS	SMOOTH HYDRANGEA		3 GAL.
	SHADE TREES			
AS	ACER SACCHARUM	SUGAR MAPLE		2–3" CAL.
TA	TILIA AMERICANA	AMERICAN LINDEN		2–3" CAL.
QR	QUERCUS RUBRA	NORTHERN RED OAK		2–3" CAL.
BN	BETULA NIGRA	RIVER BIRCH		2"2.5" CAL.
	SEED MIX			
	LOW UPLAND SEED MIX		26,340 SQ. FT.	1 LB/ 2,500 SQ. FT
	WETLAND/ BASIN MIX (SEASONALLY FLOODED)		440 SQ. FT	1 LB/ 2,500 SQ. FT

FOR PROFILE SEE SHEET NO. 47

FENCING DETAILS

TIMBER FENCE (THREE-RAIL) STA. 104+80 LT TO STA. 107+15 LT
TIMBER FENCE (THREE-RAIL) STA. 108+88 RT TO STA. 109+30 RT
TIMBER FENCE (THREE-RAIL) STA. 109+00 LT TO STA. 109+85 LT

HIGHWAY GUARD DETAILS

NONE

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

NONE

DRAINAGE DETAILS

NONE

PLANT LIST

KEY	BOTANICAL NAME	COMMON NAME	QTY.	SIZE
	VISUAL SCREEN MIX			
JV	JUNIPERUS VIRGINIANA	EASTERN RED CEDAR	5	4–5' HT.
VT	VILBURUM TRILOBUM	HIGHBUSH CRANBERRY	29	3 GAL.
IG	ILEX GLABRA	INKBERRY	25	3 GAL.
PS	PINUS STROBUS	EASTERN WHITE PINE	6	4–5' HT.
AC	ABIES CONCOLOR	WHITE FIR	5	5–6' HT.

LEGEND:

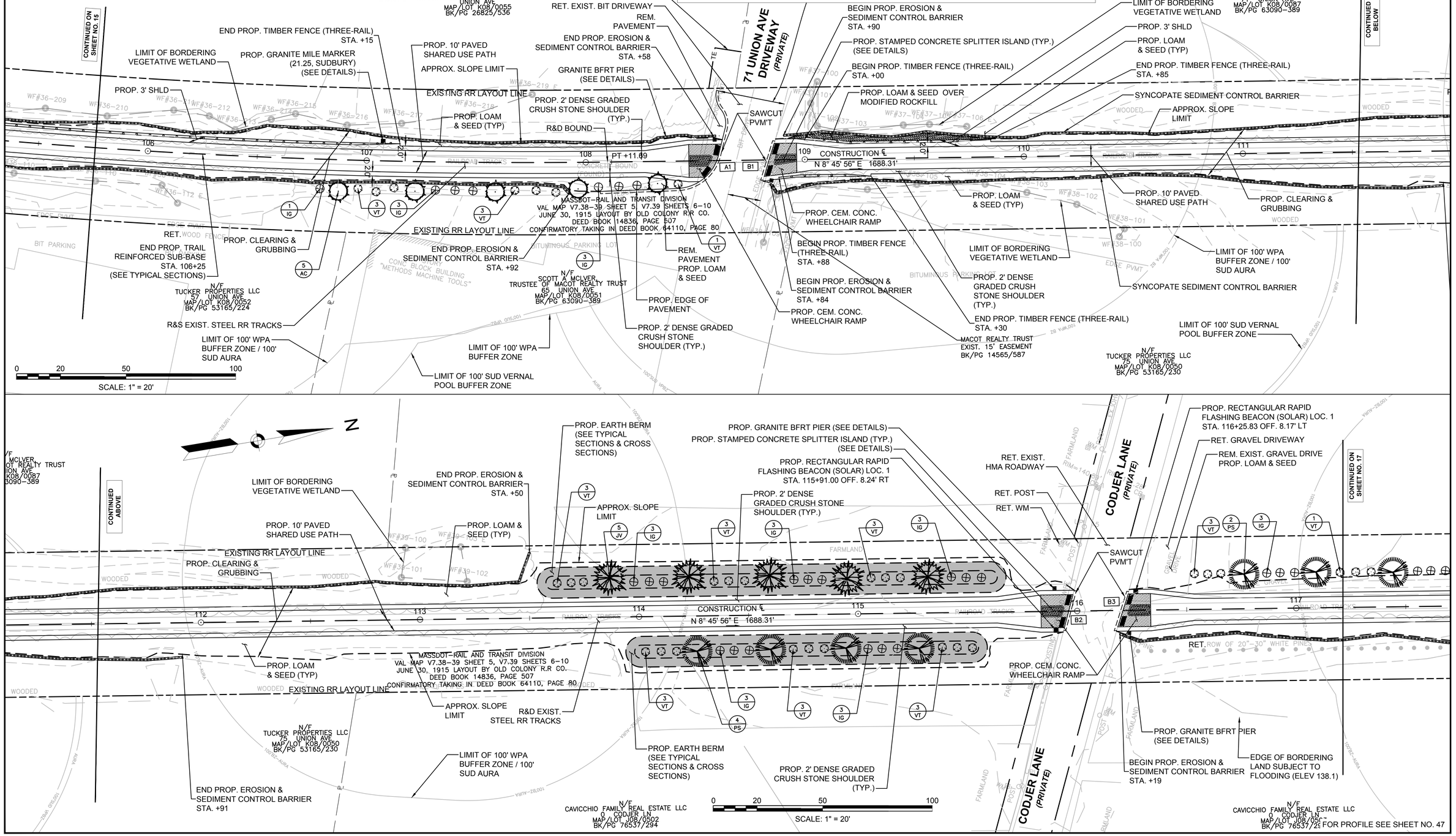
PROPOSED WHEELCHAIR RAMP DETAIL # — X#

PLANT QUANTITY AND SPECIES — X / XX

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	16	316
PROJECT FILE NO.	608164		

CONSTRUCTION PLANS



FENCING DETAILS

TIMBER FENCE (THREE-RAIL) STA. 119+75 LT TO STA. 132+25 LT
TIMBER FENCE (THREE-RAIL) STA. 119+75 RT TO STA. 130+75 RT

HIGHWAY GUARD DETAILS

NONE

WATER SUPPLY ALTERATIONS

NONE

TRAFFIC SIGNAL CONDUIT

NONE

DRAINAGE DETAILS

NONE

PLANT LIST

KEY	BOTANICAL NAME	COMMON NAME	QTY.	SIZE
	VISUAL SCREEN MIX			
VT	VILBURUM TRILOBUM	HIGHBUSH CRANBERRY	8	3 GAL.
IG	ILEX GLABRA	INKBERRY	9	3 GAL.
PS	PINUS STROBUS	EASTERN WHITE PINE	6	4–5' HT.
	EROSION CONTROL MIX			
SS	CAREX STRICTA	TUSSOCK SEDGE	8	PLUG
CS	CORNUS SERICEA & SALIX SSP	DOGWOOD AND WILLOW	5	1 GAL.

LEGEND:

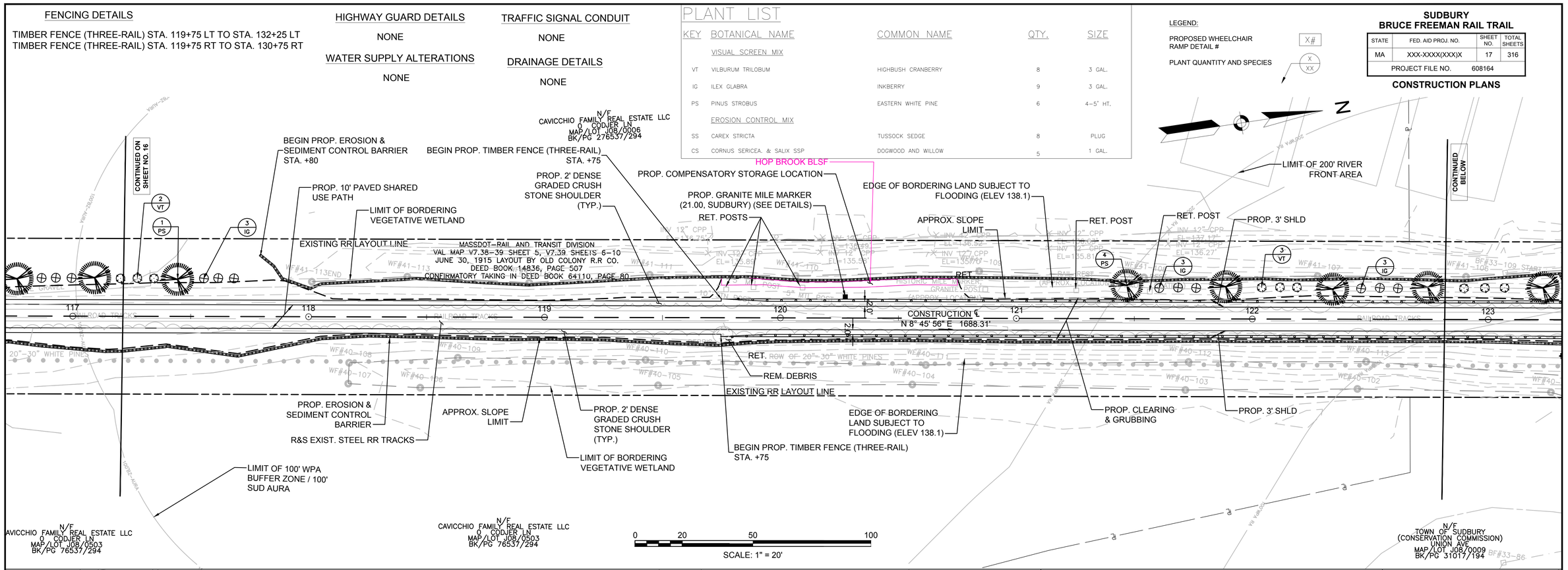
PROPOSED WHEELCHAIR RAMP DETAIL # — X#

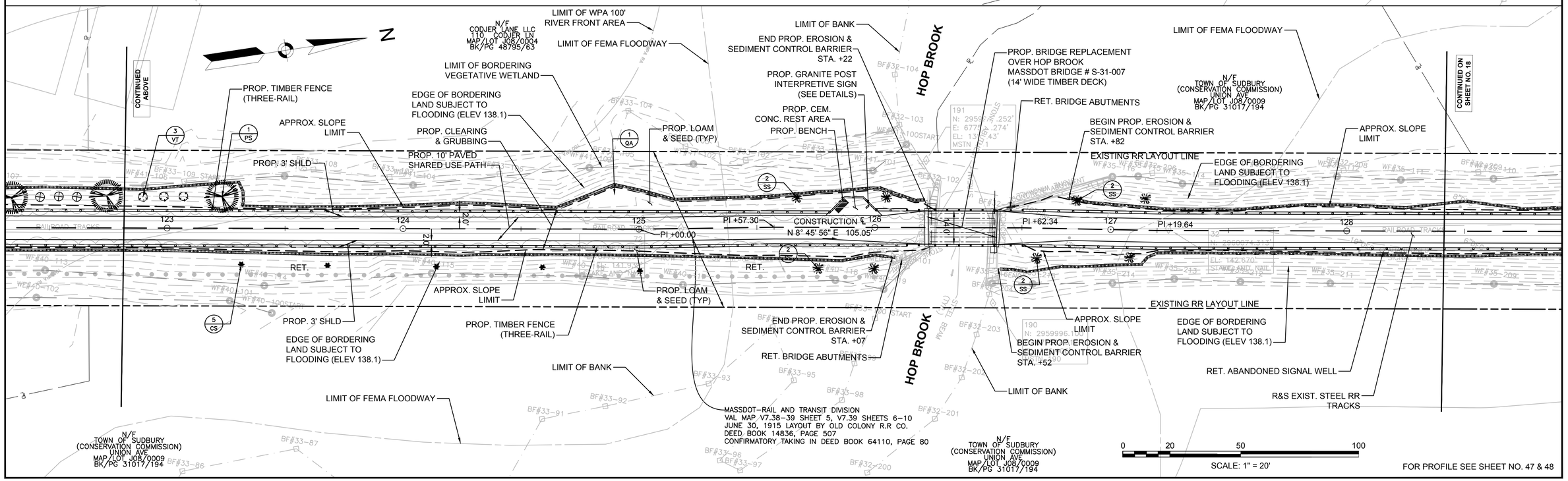
PLANT QUANTITY AND SPECIES — X / XX

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	17	316
PROJECT FILE NO.	608164		

CONSTRUCTION PLANS





FENCING DETAILS

TIMBER FENCE (THREE-RAIL) STA. 119+75 LT TO STA. 132+25 LT
TIMBER FENCE (THREE-RAIL) STA. 119+75 RT TO STA. 130+75 RT

HIGHWAY GUARD DETAILS

NONE

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

NONE

DRAINAGE DETAILS

NONE

PLANT LIST

KEY	BOTANICAL NAME	COMMON NAME	QTY.	SIZE
	VISUAL SCREEN MIX			
VT	VILBURUM TRILOBUM	HIGHBUSH CRANBERRY	12	3 GAL.
IG	ILEX GLABRA	INKBERRY	6	3 GAL.
AC	ABIES CONCOLOR	WHITE FIR	8	5-6' HT.

LEGEND:

PROPOSED WHEELCHAIR RAMP DETAIL # — X#

PLANT QUANTITY AND SPECIES — X / XX

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	18	316
PROJECT FILE NO.	608164		

CONSTRUCTION PLANS

FOR PROFILE SEE SHEET NO. 48

608164_HD(CONSTRUCTION PLANS).DWG Plotted on 22-Dec-2021 11:00 AM

FENCING DETAILS

NONE

HIGHWAY GUARD DETAILS

NONE

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

NONE

DRAINAGE DETAILS

NONE

PLANT LIST

KEY	BOTANICAL NAME	COMMON NAME	QTY.	SIZE
	VISUAL SCREEN MIX			
VT	VILBURUM TRILOBUM	HIGHBUSH CRANBERRY	27	3 GAL.
IG	ILEX GLABRA	INKBERRY	24	3 GAL.
PS	PINUS STROBUS	EASTERN WHITE PINE	10	4–5' HT.
AC	ABIES CONCOLOR	WHITE FIR	8	5–6' HT.
	ORNAMENTAL MIX			
CCR	CERCIS CANADENSIS	REDBUD	8	2–3" CAL.
HA	HYDRANGEA ARBORESCENS	SMOOTH HYDRANGEA	6	3 GAL.

LEGEND:

PROPOSED WHEELCHAIR RAMP DETAIL # — X#

PLANT QUANTITY AND SPECIES — X / XX

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	19	316
PROJECT FILE NO.	608164		

CONSTRUCTION PLANS

608164_HD(CONSTRUCTION PLANS).DWG Plotted on 22-Dec-2021 11:00 AM

N

100'SUD VPBZ

AURA

N/F
ADRIAN G & MELINDA J DAVIES
14 GERRY DR
MAP/LOT J08/0307
BK/PG 38355/267

N/F
CHERYL JONES
233 OLD LANCASTER RD
MAP/LOT J08/0301
BK/PG 33438/39

LIMIT OF 100' SUD AURA

LIMIT OF 100' SUD VERNAL POOL BUFFER ZONE

END PROP. EROSION & SEDIMENT CONTROL BARRIER STA. +77

PROP. GRANITE BFRT PIER (SEE CONST. DETAILS)

PROP. CEM. CONC. WHEELCHAIR RAMP

PROP. STAMPED CONCRETE SPLITTER ISLAND (TYP.) (SEE CONST. DETAILS)

R&S EXIST. STEEL RR TRACKS

APPROX. SLOPE LIMIT

RET. TREE

PROP. LOAM & SEED (TYP)

RET. TREE

LIMIT OF BORDERING VEGETATIVE WETLAND

PROP. 10' PAVED SHARED USE PATH

RET. TREES

EXISTING RR LAYOUT LINE

CONSTRUCTION ℄
N 8° 45' 56" E 1556.13'

PC +78.77

EXISTING RR LAYOUT LINE

PROP. CLEARING & GRUBBING

PROP. 3' DENSE GRADED CRUSH STONE SHOULDER (TYP.)

PROP. LOAM & SEED (TYP)

LIMIT OF 100' BUFFER ZONE TO BVW

PROP. RECTANGULAR RAPID FLASHING BEACON (SOLAR) LOC. 2 STA. 142+75.50 OFF. 6.01' RT

END PROP. EROSION & SEDIMENT CONTROL BARRIER STA. +72

CONTINUED ON SHEET NO. 18

OLD LANCASTER ROAD (PUBLIC)

1971 TOWN LAYOUT

N/F
CHONG M & WAI-WAI CHO
236 OLD LANCASTER RD
MAP/LOT H08/0011
BK/PG 45905/51

PROP. 2' DENSE GRADED CRUSH STONE SHOULDER (TYP.)

PROP. RECTANGULAR RAPID FLASHING BEACON (SOLAR) LOC. 1 STA. 143+08.85 OFF. 6.02' LT

PROP. HMA WALK

PROP. CEM. CONC. WHEELCHAIR RAMP

PROP. BIKE RACK

PROP. CEM. CONC. REST AREA (236 SF)

PROP. BENCH

PROP. MODIFIED ROCK FOR SWALE END (10'X4') (PAID UNDER ITEM #986)

PROP. LOAM & SEED (TYP)

CONTINUED ON SHEET NO. 20

BEGIN PROP. GRASSED SWALE STA. +50

APPROX. SLOPE LIMIT

PROP. MODIFIED ROCK FOR SWALE END (14'X5') (PAID UNDER ITEM #986)

PROP. GRANITE BFRT PIER (SEE DETAILS)

PROP. HMA WALK

MATCH EXIST. HMA WALK

BEGIN PROP. EROSION & SEDIMENT CONTROL BARRIER STA. +00

PROP. SWALE WIDTH VARIES 1' TO 8' (SEE CROSS SECTIONS)

PROP. 2' DENSE GRADED CRUSH STONE SHOULDER (TYP.)

N/F
MARK J LANZA & MARY ELIZABETH LOUSA
11 MEADOW DR
MAP/LOT J08/0111
BK/PG 45671/478

N/F
MICHAEL W KREBS & BARBARA P
223 OLD LANCASTER RD
MAP/LOT J08/0101
BK/PG 13427/420

N/F
JOSHUA R & VICTORIA A BARIBEAU
219 OLD LANCASTER RD
MAP/LOT J08/0102
BK/PG 55651/169

N/F
MARCELLO C SANTANA
226 OLD LANCASTER RD
MAP/LOT H08/0045
BK/PG 75814/51

N/F
MATTHEW P & KENDRA H DOYON
220 OLD LANCASTER RD
MAP/LOT J08/0012
BK/PG 71208/253

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY (MBTA)
VAL MAP 8, BK 3 SHEET 5, V7.39, SHEETS 6–10
JUNE 30, 1911 LAYOUT BY OLD COLONY R.R. CO.
DEED BOOK 14836, PAGE 507
CONFIRMATORY TAKING IN DEED BOOK 64110, PAGE 80

0 20 50 100

SCALE: 1" = 20'

FOR PROFILE SEE SHEET NO. 48

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	20	316
PROJECT FILE NO.	608164		

CONSTRUCTION PLANS

608164_HD\CONSTRUCTION PLANS\.DWG Plotted on 22-Dec-2021 11:00 AM

HIGHWAY GUARD DETAILS

NONE

TRAFFIC SIGNAL CONDUIT

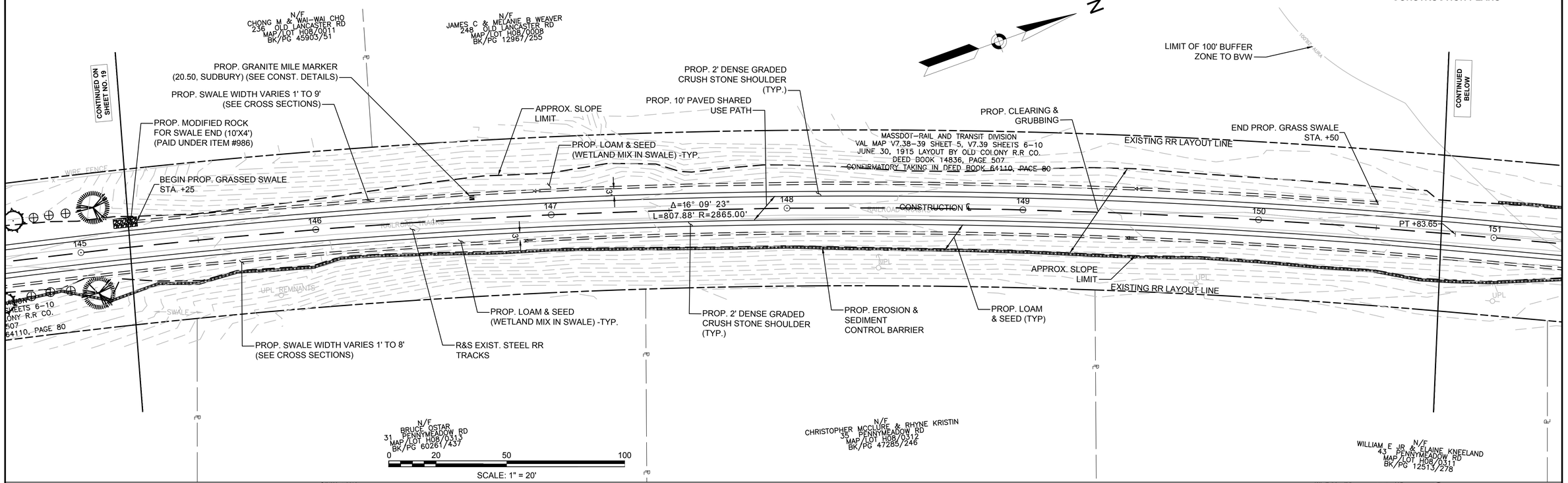
NONE

WATER SUPPLY ALTERATIONS

NONE

DRAINAGE DETAILS

NONE



FOR PROFILE SEE SHEET NO. 48 & 49

FENCING DETAILS

TIMBER FENCE (THREE-RAIL) STA. 159+25 LT TO STA. 162+90 LT
TIMBER FENCE (THREE-RAIL) STA. 158+25 RT TO STA. 161+25 RT
TIMBER FENCE (THREE-RAIL) STA. 166+75 RT TO STA. 167+50 RT
TIMBER FENCE (THREE-RAIL) STA. 166+75 RT TO STA. 167+50 RT

HIGHWAY GUARD DETAILS

NONE

WATER SUPPLY ALTERATIONS

SHEET 176

TRAFFIC SIGNAL CONDUIT

NONE

DRAINAGE DETAILS

SHEET 176

PLANT LIST

KEY	BOTANICAL NAME	COMMON NAME	QTY.	SIZE
	EROSION CONTROL MIX			
SS	CAREX STRICTA	TUSSOCK SEDGE	6	PLUG
	ORNAMENTAL MIX			
CCR	CERCIS CANADENSIS	REDBUD	2	2–3" CAL.
HA	HYDRANGEA ARBORESCENS	SMOOTH HYDRANGEA	2	5 GAL.

LEGEND:

PROPOSED WHEELCHAIR RAMP DETAIL # — X#

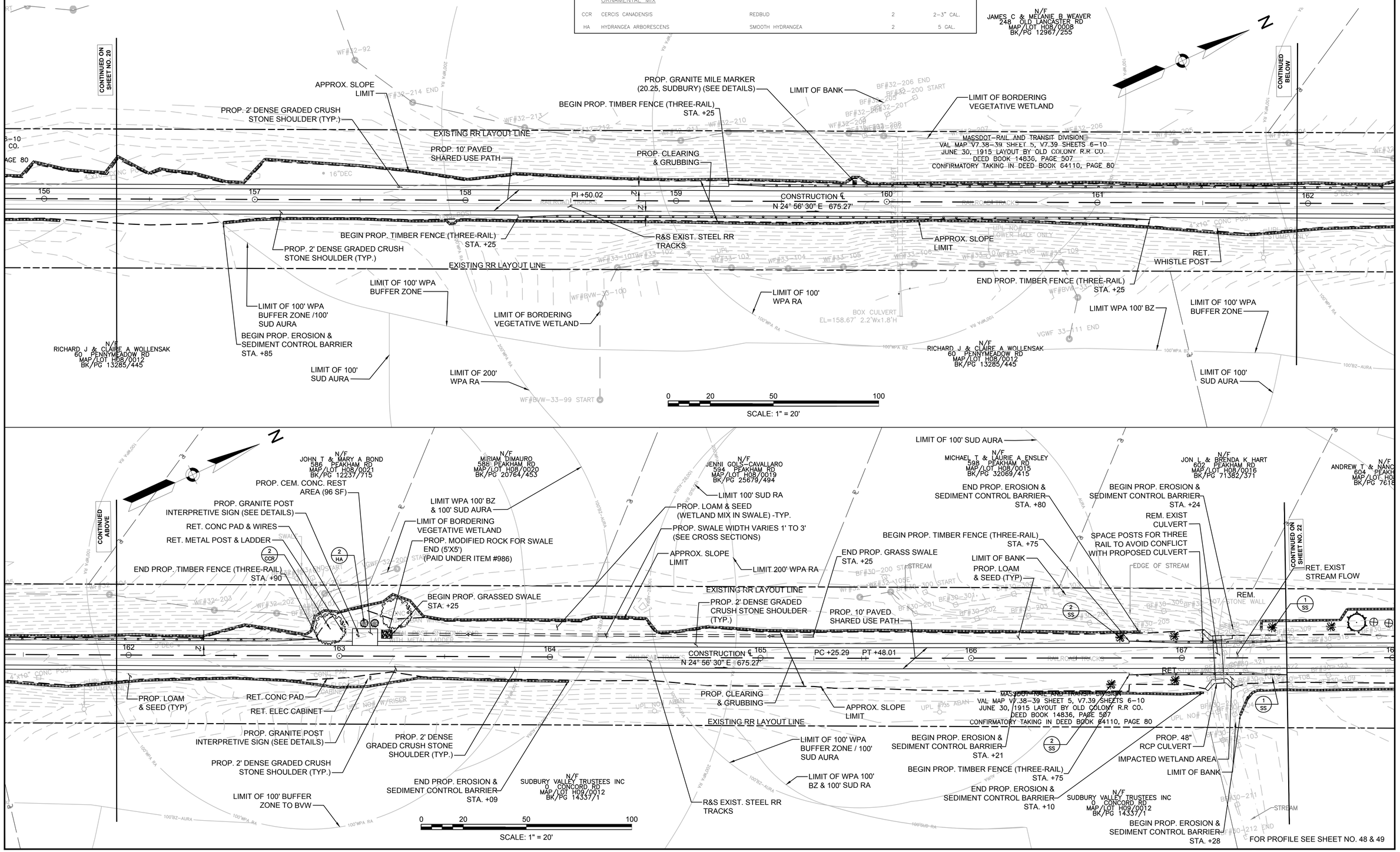
PLANT QUANTITY AND SPECIES — X / XX

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	21	316
PROJECT FILE NO.	608164		

CONSTRUCTION PLANS

Plotted on 22-Dec-2021 11:01 AM
608164_HD(CONSTRUCTION PLANS).DWG



FENCING DETAILS

TIMBER FENCE (THREE-RAIL) STA. 166+75 RT TO STA. 167+50 RT
TIMBER FENCE (THREE-RAIL) STA. 166+75 LT TO STA. 167+50 LT

HIGHWAY GUARD DETAILS

NONE

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

NONE

DRAINAGE DETAILS

NONE

PLANT LIST

KEY	BOTANICAL NAME	COMMON NAME	QTY.	SIZE
	VISUAL SCREEN MIX			
VT	VILBURUM TRILOBUM	HIGHBUSH CRANBERRY	3	3 GAL.
IG	ILEX GLABRA	INKBERRY	6	3 GAL.
PS	PINUS STROBUS	EASTERN WHITE PINE	2	4–5' HT.
AC	ABIES CONCOLOR	WHITE FIR	2	5–6' HT.
	EROSION CONTROL MIX			
SS	CAREX STRICTA	TUSSOCK SEDGE	2	PLUG

LEGEND:

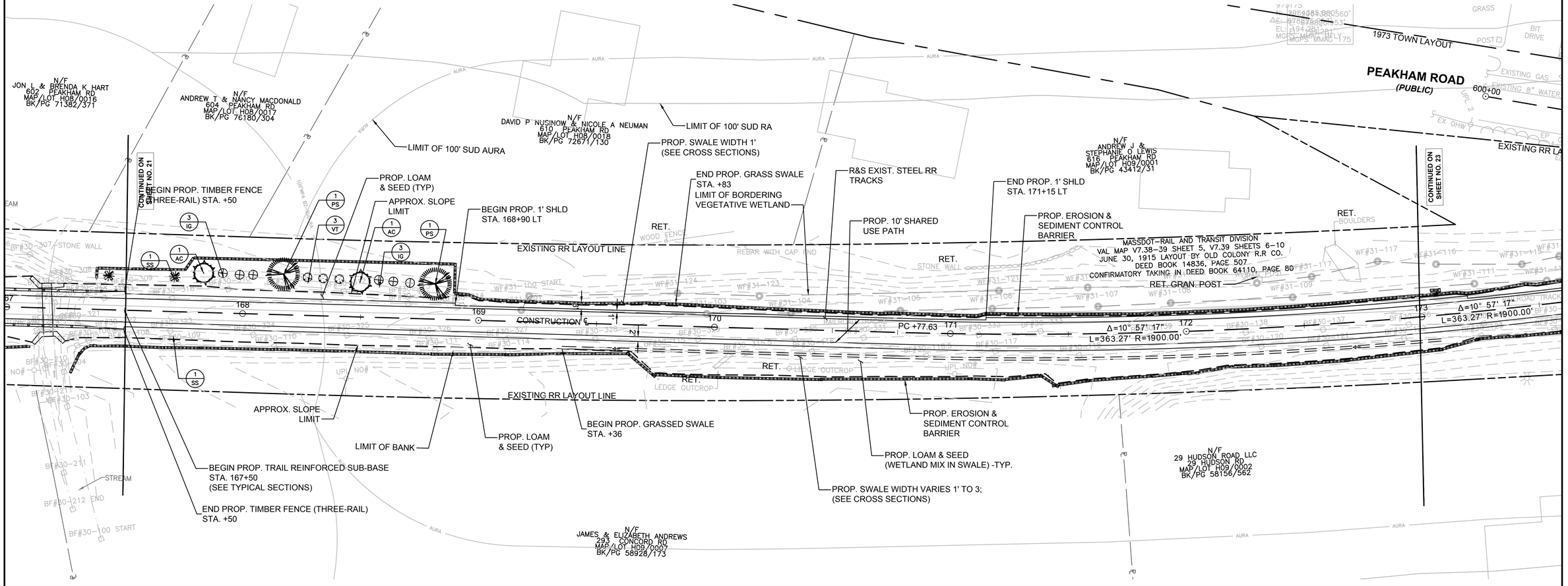
PROPOSED WHEELCHAIR RAMP DETAIL # — X#

PLANT QUANTITY AND SPECIES — X / XX

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	22	316
PROJECT FILE NO.	608164		

CONSTRUCTION PLANS



FOR PROFILE SEE SHEET NO. 50

FENCING DETAILS

NONE

HIGHWAY GUARD DETAILS

NONE

TRAFFIC SIGNAL CONDUIT

SEE SHEET 158

WATER SUPPLY ALTERATIONS

SEE SHEET 178

DRAINAGE DETAILS

SEE SHEET 178

LEGEND:

PROPOSED WHEELCHAIR RAMP DETAIL # X#

PLANT QUANTITY AND SPECIES X/XX

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	23	316
PROJECT FILE NO.	608164		

CONSTRUCTION PLANS

Plotted on 22-Dec-2021 11:01 AM

608164_HD(CONSTRUCTION PLANS).DWG

N

LIMIT OF WORK
STA 600+65.46
N2964510.9945
E678926.2831

LIMIT OF WORK
STA 504+26.44
N2964724.5314
E678875.4345

LIMIT OF WORK
STA 500+28.85
N2964552.0831
E679227.4914

PEAKHAM ROAD *(PUBLIC)*

HUDSON ROAD (RTE 27) *(PUBLIC)*

1973 TOWN LAYOUT

1941 COUNTY LAYOUT

1941 COUNTY LAYOUT ALT.

TRUSTEE OF LINDA LOUISE MURI
623 PEAKHAM RD
MAP/LOT H09/0056
BK/PG 66273/460

N/F
NICHOLAS A TRITOS & ROANNA M LONDON
46 HUDSON RD
MAP/LOT G08/0013
BK/PG 45390/280

N/F
TOWN OF SUDBURY(TREASURER)
HUDSON RD
MAP/LOT G09/0200
BK/PG 13189/604

N/F
LAWRENCE W TIGHE
THE HUDSN ROAD TRUST #2
40 HUDSON RD
MAP/LOT G09/0001
BK/PG 33228/333

N/F
PENN CENTRAL TRANSPORTATION CO
HUDSON RD
MAP/LOT G09/0012
BK/PG 7074/339

N/F
29 HUDSON ROAD LLC
29 HUDSON RD
MAP/LOT H09/0002
BK/PG 58156/562

N/F
MATTHEW S & MOLLY F GILMARTIN
30 HUDSON RD
MAP/LOT H09/0068
BK/PG 42175/386

N/F
TOWN OF SUDBURY & BOARD OF SELECT BOARD
(TOWN CENTER LAND)
HUDSON RD
MAP/LOT G09/0004
BK/PG 77156/463 & 77156/472

MASSDOT–RAIL AND TRANSIT DIVISION
VAL MAP V7.38–39 SHEET 5, V7.39 SHEETS 6–10
JUNE 30, 1915 LAYOUT BY OLD COLONY R.R CO.
DEED BOOK 14836, PAGE 507
CONFIRMATORY TAKING IN DEED BOOK 64110, PAGE 80

176
N: 2964776.585'
E: 678916.038'
EL: 187.067'
MSTN 176

STA 502+69.89 HUDSON RD ALIGN =
STA 602+13.49 PEAKHAM CL
N 2964636.5520 E 679004.6687

LIMIT OF 100' BUFFER ZONE TO BVW/ 100' SUD AURA

RET. EXISTING SECONDARY STEEL RAIL SIDING CONTRACTOR TO EXCLUDE PROPOSED LOAM AND SEED AROUND EXISTING RAIL (APPROX. STA 176+16 TO 181+50)

CONTINUED ON SHEET NO. 24

CONTINUED ON SHEET NO. 22

FOR PROFILE SEE SHEET NO. 50

PROP. FULL DEPTH BOX WIDENING
R&D ROW OF BOULDERS (INCLUDED IN ITEM #120)
SAWCUT PVM'T MEET EXIST WALK
PROP. TEMPORARY EASEMENT
BEGIN PROP. GRAN. EDGING - TYPE SB
PROP. HMA WALK
PROP. CEM. CONC. WHEELCHAIR RAMP
SAWCUT PVM'T MEET EXIST WALK
END PROP. GRAN. EDGING TYPE SB
PROP. FULL DEPTH PVM'T RECONSTRUCTION
PROP. PVM'T MILL & OVERLAY
LIMIT OF 100' SUD AURA
PROP. FULL DEPTH BOX WIDENING
BEGIN PROP. GRAN. EDGING - TYPE SB
BEGIN PROP. GRAN EDGING - TYPE SB
600+00
END PROP. EROSION & SEDIMENT CONTROL BARRIER
STA. +64
BEGIN PROP. SHLD 1' STA. 173+30 LT
EXISTING RR LAYOUT LINE
PROP. HYDRATION STATION
PROP. DISPLAY BOARD
PROP. TRASH RECEPTACLE
PROP. GRANITE MILE MARKER (20.00, SUDBURY) (SEE DETAILS)
PROP. BENCH
PROP. BIKE RACKS (2)
PROP. NON-MOTORIZED TRAFFIC COUNTING STATION (SEE SPECIAL PROVISIONS)
APPROX. SLOPE LIMIT
PROP. 3' SHLD
END PROP. SHLD 1' STA. 173+85 LT
PROP. LOAM & SEED (TYP)
END PROP. GRASS SWALE STA. +07
END PROP. TRAIL REINFORCED SUB-BASE STA. 174+00 (SEE TYPICAL SECTIONS)
PROP. GRANITE BFRT PIER (SEE DETAILS)
REM. EXIST BIT WALK
PROP. CEM. CONC. WHEELCHAIR RAMP
LIMIT OF 100' SUD AURA
LIMIT OF 100' SUD RA
PROP. LIMIT OF WORK
PROP. HMA DRIVEWAY
BEGIN GRAN. CURB
APPROX. SLOPE LIMIT
PROP. TEMPORARY EASEMENT
PROP. LOAM & SEED
R&R GRAN. EDGING
PROP. FULL DEPTH PVM'T RECONSTRUCTION
RET. STONE MASONRY WALL
SAWCUT PVM'T
END GRAN. EDGING
LIMIT 200' SUD RA
PROP. PVM'T MILL & OVERLAY
BEGIN PROP. GRAN. EDGING - TYPE SB
END PROP. GRAN EDGING - TYPE SB
PROP. PVM'T MILL & OVERLAY
PROP. LOAM & SEED
PROP. EDGE OF PAVEMENT
PROP. HMA WALK
SAWCUT PVM'T MATCH EXIST. WALK
R&R GRAN. EDGING
END GRAN. EDGING
PROP. HMA DRIVEWAY
PROP. TEMPORARY EASEMENT
PROP. LOAM & SEED
R&R GRAN. EDGING
PROP. FULL DEPTH PVM'T RECONSTRUCTION
RET. STONE MASONRY WALL
SAWCUT PVM'T
END GRAN. EDGING
LIMIT 200' SUD RA
END PROP. GRAN CURB - TYPE SB TRANSITION TO EXISTING GROUND
REM. TREE
RET.
RET. BOULDER
REM. ROW OF BOULDER
RET. SIGN
RET. F.P.
END PROP. GRAN. EDGING - TYPE SB
EXISTING RR LAYOUT LINE
R&D EXIST. PVM'T
PROP. LOAM & SEED
REM. EXIST. ISLAND
SAWCUT PVM'T
PROP. HMA DRIVE
PROP. 2' DENSE GRADED CRUSH STONE SHOULDER (TYP.)
APPROX. SLOPE LIMIT
SAWCUT PVM'T MATCH EXIST.
PROP. LOAM & SEED (TYP)
RET. BOULDERS
RET. MB
RET. TREES
RET. GRAN. EDGING
PROP. PVM'T MILL& OVERLAY
RET. SWALE
RET. GRAN. EDGING
PROP. STAMPED CONCRETE SPLITTER ISLAND (TYP.) (SEE DETAILS)
PROP. CEM. CONC. WHEELCHAIR RAMP
PROP. GRANITE BFRT PIER (SEE DETAILS)
RET. TREE
REM. BOULDER
PROP. 10' PAVED SHARED USE PATH
EXISTING RR LAYOUT LINE
R&S EXIST. STEEL RR TRACKS
PROP. GRANITE POST INTERPRETIVE SIGN (SEE DETAILS)
PROP. 2' DENSE GRADED CRUSH STONE SHOULDER (TYP.)
PROP. CLEARING & GRUBBING
APPROX. SLOPE LIMIT

PC +11.19
PT +34.93
PC +40.91
PT +97.57
PC +51.95
PRC +98.76
PT +97.11
PC +02.01
PT +74.28
PC +00.08
PT +86.91
PT +68.84
PC +45.35
PT +76.60
PC +99.55
602+13.49
700+00
702+00
Δ=10° 57' 17"
L=363.27' R=1900.00'
Δ=5° 22' 01"
L=98.36' R=1050.00'

PLANT LIST

KEY	BOTANICAL NAME	COMMON NAME	QTY.	SIZE
	ORNAMENTAL MIX			
CCR	CERCIS CANADENSIS	REDBUD	6	2–3" CAL.
HA	HYDRANGEA ARBORESCENS	SMOOTH HYDRANGEA	4	3 GAL.

0 20 50 100
SCALE: 1" = 20'

FENCING DETAILS

TIMBER FENCE (THREE-RAIL) STA. 186+50 RT TO STA. 190+90 RT

HIGHWAY GUARD DETAILS

NONE

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

NONE

DRAINAGE DETAILS

NONE

PLANT LIST

KEY	BOTANICAL NAME	COMMON NAME	QTY.	SIZE
	ORNAMENTAL MIX			
CCR	CERCIS CANADENSIS	REDBUD	3	2–3" CAL.
ACS	AMELANCHIER CANADENSIS	CANADIAN SERVICEBERRY	2	2–3" CAL.
HA	HYDRANGEA ARBORESCENS	SMOOTH HYDRANGEA	3	3 GAL.

LEGEND:

PROPOSED WHEELCHAIR RAMP DETAIL # — X#

PLANT QUANTITY AND SPECIES — X / XX

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	24	316
PROJECT FILE NO.	608164		

CONSTRUCTION PLANS

N/F
LAWRENCE W TIGHE, TRUSTEE OF THE HUDSON RD TRUST #1
36 HUDSON RD
MAP/LOT G09/0002
BK/PG 30663/361

LIMIT OF 100' BUFFER ZONE TO BVW/ 100' SUD AURA

EXIST. PARKING LOT & RETAINING WALL TO REMAIN

APPROX. SLOPE LIMIT

RET. EXISTING SECONDARY STEEL RAIL SIDING CONTRACTOR TO EXCLUDE PROPOSED LOAM AND SEED AROUND EXISTING RAIL (APPROX. STA 176+16 TO 181+50)

PROP. NPS INTERPRETIVE SIGN (SEE DETAILS)

PROP. CEM. CONC. REST AREA (160 SF)

PROP. 2' DENSE GRADED CRUSH STONE SHOULDER (TYP.)

PROP. BIKE RACK

PROP. LOAM & SEED (TYP)

PROP. 10' PAVED SHARED USE PATH

EXISTING RR LAYOUT LINE

CONSTRUCTION ℄
N 19° 48' 11" E 770.84'

PI +22.94

PI +37.53

PROP. LOAM & SEED (TYP)

PROP. 2' DENSE GRADED CRUSH STONE SHOULDER (TYP.)

APPROX. SLOPE LIMIT

R&S EXIST. STEEL RR TRACKS

MASSDOT–RAIL AND TRANSIT DIVISION
VAL MAP V7.38–39 SHEET 5, V7.39 SHEETS 6–10
JUNE 30, 1915 LAYOUT BY OLD COLONY R.R CO.
DEED BOOK 14836, PAGE 507
CONFIRMATORY TAKING IN DEED BOOK 64110, PAGE 80

N/F
TOWN OF SUDBURY & BOARD OF SELECT BOARD
(TOWN CENTER LAND)
HUDSON RD
MAP/LOT G09/0004
BK/PG 77156/463 & 77156/472

N/F
MATTHEW S & MOLLY F GILMARTIN
30 HUDSON RD
MAP/LOT H09/0068
BK/PG 42175/386

0 20 50 100
SCALE: 1" = 20'

N/F
TOWN OF SUDBURY(TREASURER)
HUDSON RD
MAP/LOT G09/0200
BK/PG 13189/604

PT +90.89

L=56.24'
Δ=45°

S 70° 11'49" E 70.57'

1003+61.46

CONTINUED ON SHEET NO. 23

CONTINUED BELOW

CONTINUED ON SHEET NO. 42

CONTINUED ON SHEET NO. 25

CONTINUED ABOVE

PROP. CLEARING & GRUBBING

PROP. BENCH

PROP. GRANITE MILE MARKER (19.75, SUDBURY) (SEE DETAILS)

RET. WHISTLE POST

SYNCOPATE SEDIMENT CONTROL BARRIER

BEGIN PROP. TIMBER FENCE (THREE-RAIL) STA. +50

BEGIN PROP. EROSION & SEDIMENT CONTROL BARRIER STA. +69

STA 184+50.00 PR–BFRT =
STA 1003+61.46 PARKINSON LOT ACCESS PATH
N 2965478.2038 E 679349.5819

N/F
TOWN OF SUDBURY & BOARD OF SELECT BOARD
(TOWN CENTER LAND)
PETERS WAY EXT
MAP/LOT G09/0100
BK/PG 77152/566

ISOLATED WETLAND (SURVEYED BY OTHERS)

LIMIT OF BORDERING VEGETATIVE WETLAND

FOR PROFILE SEE SHEET NO. 50

608164_HD(CONSTRUCTION PLANS).DWG Plotted on 22-Dec-2021 11:01 AM

FENCING DETAILS

TIMBER FENCE (THREE-RAIL) STA. 186+50 RT TO STA. 190+90 RT
TIMBER FENCE (THREE-RAIL) STA. 190+15 LT TO STA. 190+90 LT
TIMBER FENCE (THREE-RAIL) STA. 196+75 RT TO STA. 198+70 RT
TIMBER FENCE (THREE-RAIL) STA. 196+75 LT TO STA. 199+15 LT

HIGHWAY GUARD DETAILS

NONE

WATER SUPPLY ALTERATIONS

NONE

TRAFFIC SIGNAL CONDUIT

NONE

DRAINAGE DETAILS

NONE

PLANT LIST

KEY	BOTANICAL NAME	COMMON NAME	QTY.	SIZE
	ORNAMENTAL MIX			
ACS	AMELANCHIER CANADENSIS	CANADIAN SERVICEBERRY	4	2–3" CAL.
HA	HYDRANGEA ARBORESCENS	SMOOTH HYDRANGEA	10	3 GAL.

LEGEND:

PROPOSED WHEELCHAIR RAMP DETAIL # — X#

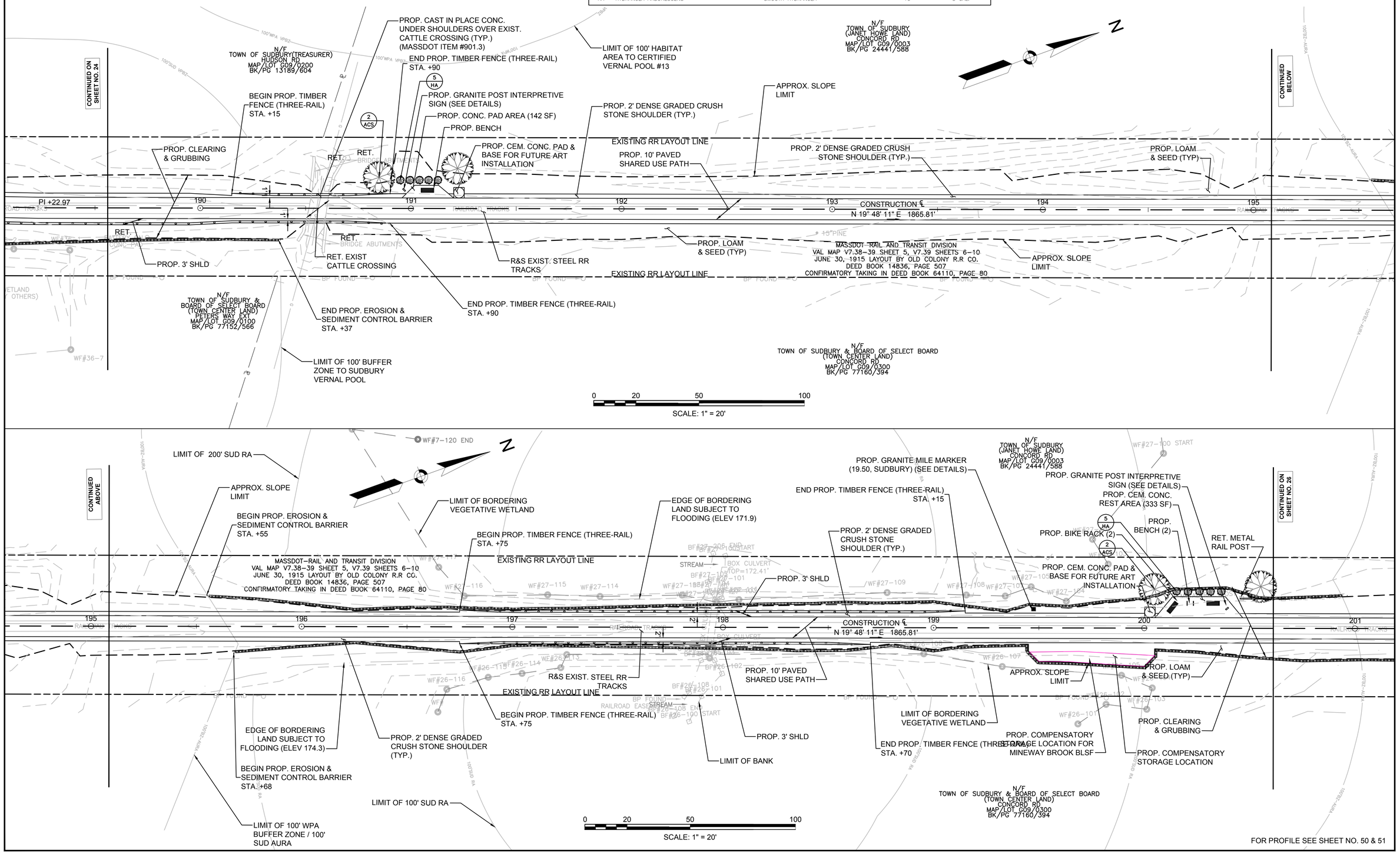
PLANT QUANTITY AND SPECIES — X / XX

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	25	316
PROJECT FILE NO.	608164		

CONSTRUCTION PLANS

608164_HD(CONSTRUCTION PLANS).DWG Plotted on 22-Dec-2021 11:02 AM



SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	26	316
PROJECT FILE NO.	608164		

CONSTRUCTION PLANS

LEGEND:

PROPOSED WHEELCHAIR RAMP DETAIL # X#

HIGHWAY GUARD DETAILS

NONE

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

NONE

DRAINAGE DETAILS

NONE

START

CONTINUED ON SHEET NO. 25

CONTRACTOR TO PLACE TWO SEGMENTS OF EXIST. RAIL RESTS FOR RETENTION AND HISTORIC INTERPRETATION. COST FOR RESETTING AND HANDLING RAIL TO BE INCLUDED UNDER ITEM #129.5 TRACK EXC.

RET. METAL RAIL POST

END PROP. EROSION & SEDIMENT CONTROL BARRIER STA. +94

PROP. CLEARING & GRUBBING

APPROX. SLOPE LIMIT

PROP. 10' PAVED SHARED USE PATH

EXISTING RR LAYOUT LINE

RET. CONC. POST

PROP. 2' DENSE GRADED CRUSH STONE SHOULDER (TYP.)

END PROP. EROSION & SEDIMENT CONTROL BARRIER STA. +46

EDGE OF BORDERING LAND SUBJECT TO FLOODING (ELEV 174.3)

LIMIT OF 100' WPA BUFFER ZONE / 100' SUD AURA

N/F
TOWN OF SUDBURY & BOARD OF SELECT BOARD
(TOWN CENTER LAND)
CONCORD RD
MAP/LOT G09/0300
BK/PG 77160/394

N/F
TOWN OF SUDBURY
(JANET HOWE LAND)
CONCORD RD
MAP/LOT G09/0003
BK/PG 24441/588

201 202 203 204 205 206

RAILROAD TRACKS

CONSTRUCTION ℄
N 19° 48' 11" E 1865.81'

PROP. 2' DENSE GRADED CRUSH STONE SHOULDER (TYP.)

PROP. LOAM & SEED (TYP)

MASSDOT–RAIL AND TRANSIT DIVISION
VAL MAP V7.38–39 SHEET 5, V7.39 SHEETS 6–10
JUNE 30, 1915 LAYOUT BY OLD COLONY R.R CO.
DEED BOOK 14836, PAGE 507
CONFIRMATORY TAKING IN DEED BOOK 64110, PAGE 80

EXISTING RR LAYOUT LINE

PROP. CLEARING & GRUBBING

R&S EXIST. STEEL RR TRACKS

APPROX. SLOPE LIMIT

CONTINUED BELOW

N/F
JAMES C & SUSAN M RICHARDS
44 CODMAN DR
MAP/LOT G09/0807
BK/PG 24467/551

0 20 50 100
SCALE: 1" = 20'

CONTINUED ABOVE

BEGIN PROP. EROSION & SEDIMENT CONTROL BARRIER STA. +93

LIMIT OF 100' WPA BUFFER ZONE / 100' AURA

N/F
TOWN OF SUDBURY
(CONSERVATION)
0 WAKE ROBIN RD
MAP/LOT F09/0001
BK/PG 12501/703

BEGIN PROP. TRAIL REINFORCED SUB-BASE STA. 210+00 (SEE TYPICAL SECTIONS)

SYNCOPATE SEDIMENT CONTROL BARRIER

LIMIT OF BORDERING VEGETATIVE WETLAND

182
N: 2967982.909'
E: 680252.270'
EL: 171.730'
MSTN 182

CONTINUED ON SHEET NO. 27

PROP. 2' DENSE GRADED CRUSH STONE SHOULDER (TYP.)

APPROX. SLOPE LIMIT

206 207 208 209 210 211 212

RAILROAD TRACKS

PC +88.78

PT +49.64

CONSTRUCTION ℄
N 18° 55' 52" E 139.23'

PT +49.97

PI +81.68

PROP. 10' PAVED SHARED USE PATH

PROP. CLEARING & GRUBBING

APPROX. SLOPE LIMIT

PROP. LOAM & SEED (TYP)

SYNCOPATE SEDIMENT CONTROL BARRIER

EXISTING RR LAYOUT LINE

BEGIN PROP. EROSION & SEDIMENT CONTROL BARRIER STA. +98

PROP. 2' DENSE GRADED CRUSH STONE SHOULDER (TYP.)

LIMIT OF BORDERING VEGETATIVE WETLAND

PC +88.86

R&S EXIST. STEEL RR TRACKS

MASSDOT–RAIL AND TRANSIT DIVISION
VAL MAP V7.38–39 SHEET 5, V7.39 SHEETS 6–10
JUNE 30, 1915 LAYOUT BY OLD COLONY R.R CO.
DEED BOOK 14836, PAGE 507
CONFIRMATORY TAKING IN DEED BOOK 64110, PAGE 80

R&D BOUND

PROP. CLEARING & GRUBBING

N/F
JAMES C & SUSAN M RICHARDS
44 CODMAN DR
MAP/LOT G09/0807
BK/PG 24467/551

N/F
WILLIAM P MCMAHON JR
& DINA M MCMAHON–DESORBO
42 CODMAN DR
MAP/LOT G09/0808
BK/PG 61407/511

N/F
CAROL A SHEDD
51 MORSE RD
MAP/LOT F09/0003
BK/PG 37232/274

0 20 50 100
SCALE: 1" = 20'

FOR PROFILE SEE SHEET NO. 51

608164_HD(CONSTRUCTION PLANS).DWG Plotted on 22-Dec-2021 11:02 AM

NOTES:

1. PROP. MILLING MULCH TO BE PLACED UNDER GUARDRAIL (SEE TYPICAL SECTIONS & MASSDOT STD. SPEC. ITEM 769.)

FENCING DETAILS

TIMBER FENCE (THREE-RAIL)
STA. 216+25 RT TO STA. 216+53 RT
TIMBER FENCE (THREE-RAIL)
STA. 216+89 RT TO STA. 217+00 RT

HIGHWAY GUARD DETAILS

TIMBER GUARDRAIL STA. 216+09 RT TO STA. 216+53 RT
TIMBER GUARDRAIL STA. 216+68 RT TO STA. 217+64 RT
TIMBER GUARDRAIL STA. 216+01 RT TO STA. 216+52 RT
TIMBER GUARDRAIL STA. 216+68 RT TO STA. 217+64 RT

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

SHEET 182

DRAINAGE DETAILS

SHEET 182

LEGEND:

PROPOSED WHEELCHAIR RAMP DETAIL #

PLANT QUANTITY AND SPECIES

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	27	316
PROJECT FILE NO.	608164		

CONSTRUCTION PLANS

Plotted on 22-Dec-2021 11:02 AM
608164_HD(CONSTRUCTION PLANS).DWG

PLANT LIST

KEY	BOTANICAL NAME	COMMON NAME	QTY.	SIZE
	VISUAL SCREEN MIX			
	ORNAMENTAL MIX			
CCR	CERCIS CANADENSIS	REDBUD	2	2–3" CAL.
ACS	AMELANCHIER CANADENSIS		1	2–3" CAL.
HA	HYDRANGEA ARBORESCENS	SMOOTH HYDRAGEA	15	3 GAL.
	SHADE TREES			
TA	TILIA AMERICANA	AMERICAN LINDEN	1	2–3" CAL.
QR	QUERCUS RUBRA	NORTHERN RED OAK	2	2–3" CAL.
BN	BETULA NIGRA	RIVER BIRCH	2	2–2.5" CAL.

SCALE: 1" = 20'

FENCING DETAILS

TIMBER FENCE (THREE-RAIL) STA. 222+25 LT TO STA. 231+73 LT
TIMBER FENCE (THREE-RAIL) STA. 224+23 RT TO STA. 228+73 RT

HIGHWAY GUARD DETAILS

NONE

WATER SUPPLY ALTERATIONS

NONE

PLANT LIST

KEY	BOTANICAL NAME	COMMON NAME	QTY.	SIZE
	ORNAMENTAL MIX			
ACS	AMELANCHIER	CANADENSIS	1	2–3" CAL.
HA	HYDRANGEA ARBORESCENS	SMOOTH HYDRAGEA	2	3 GAL.
	SHADE TREES			
AS	ACER SACCHARUM	SUGAR MAPLE	1	2–3" CAL.

TRAFFIC SIGNAL CONDUIT

NONE

DRAINAGE DETAILS

NONE

LEGEND:

PROPOSED WHEELCHAIR RAMP DETAIL #

PLANT QUANTITY AND SPECIES

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	28	316
PROJECT FILE NO.	608164		

CONSTRUCTION PLANS

608164_HD(CONSTRUCTION PLANS).DWG Plotted on 22-Dec-2021 11:03 AM

FENCING DETAILS

TIMBER FENCE (THREE-RAIL) STA. 222+25 LT TO STA. 231+73 LT
TIMBER FENCE (THREE-RAIL) STA. 224+23 RT TO STA. 228+73 RT
TIMBER FENCE (THREE-RAIL) STA. 236+90 LT TO STA. 243+45 LT
TIMBER FENCE (THREE-RAIL) STA. 236+90 RT TO STA. 241+73 RT

HIGHWAY GUARD DETAILS

NONE

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

NONE

DRAINAGE DETAILS

NONE

LEGEND:

PROPOSED WHEELCHAIR RAMP DETAIL # — X#

PLANT QUANTITY AND SPECIES — X / XX

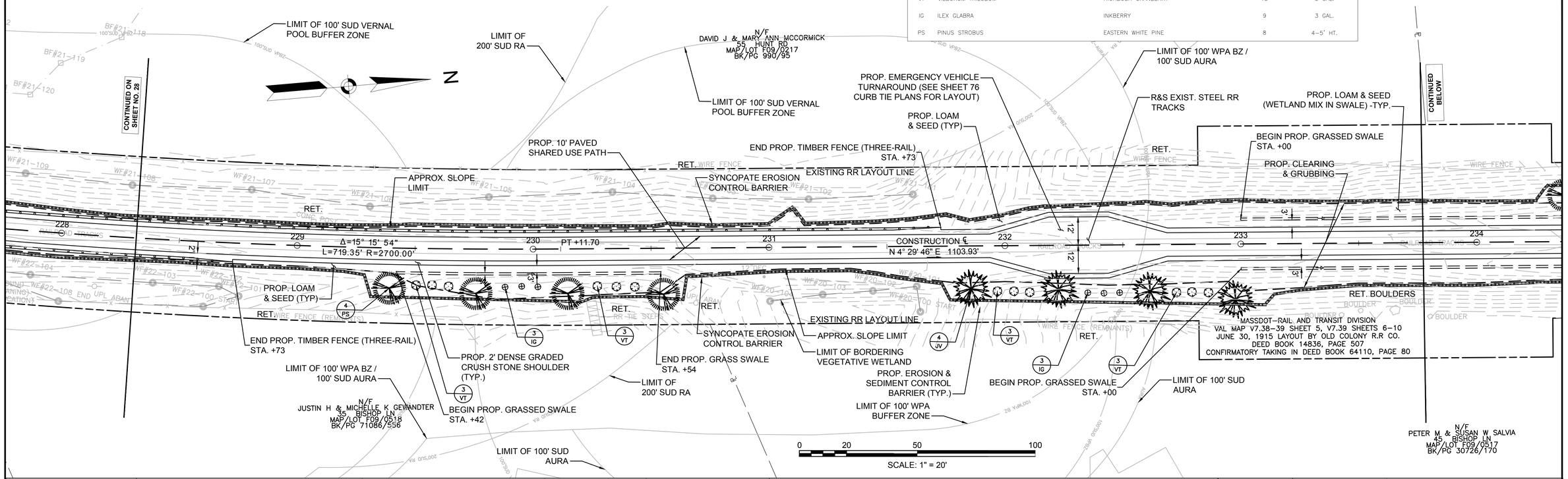
PLANT LIST

KEY	BOTANICAL NAME	COMMON NAME	QTY.	SIZE
	VISUAL SCREEN MIX			
JV	JUNIPERUS VIRGINIANA	EASTERN RED CEDAR	4	4–5' HT.
VT	VILBURUM TRILOBUM	HIGHBUSH CRANBERRY	18	3 GAL.
IG	ILEX GLABRA	INKBERRY	9	3 GAL.
PS	PINUS STROBUS	EASTERN WHITE PINE	8	4–5' HT.

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	29	316
PROJECT FILE NO.	608164		

CONSTRUCTION PLANS



FENCING DETAILS

TIMBER FENCE (THREE-RAIL) STA. 236+90 LT TO STA. 243+45 LT
TIMBER FENCE (THREE-RAIL) STA. 236+90 RT TO STA. 241+73 RT
TIMBER FENCE (TWO-RAIL) STA. 245+75 LT TO STA. 248+30 LT
TIMBER FENCE (TWO-RAIL) STA. 245+75 RT TO STA. 248+30 RT

HIGHWAY GUARD DETAILS

NONE

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

NONE

DRAINAGE DETAILS

NONE

PLANT LIST

KEY	BOTANICAL NAME	COMMON NAME	QTY.	SIZE
	VISUAL SCREEN MIX			
VT	VILBURUM TRILOBUM	HIGHBUSH CRANBERRY	18	3 GAL.
IG	ILEX GLABRA	INKBERRY	15	3 GAL.
PS	PINUS STROBUS	EASTERN WHITE PINE	9	4–5' HT.
AC	ABIES CONCOLOR	WHITE FIR	4	5–6' HT.
	ORNAMENTAL MIX			
ACS	AMELANCHIER	CANADENSIS	2	2–3" CAL.
HA	HYDRANGEA ARBORESCENS	SMOOTH HYDRAGEA	4	3 GAL.

LEGEND:

PROPOSED WHEELCHAIR RAMP DETAIL # — X#

PLANT QUANTITY AND SPECIES — X / XX

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	30	316
PROJECT FILE NO.	608164		

CONSTRUCTION PLANS

N/F
SUDBURY VALLEY TRUSTEES INC
27 HUNT RD
MAP/LOT E09/0126
BK/PG 14501/291

N/F
GERALD WHITE KIMBER & MEREDITH KIMBER
19 HUNT RD
MAP/LOT E09/0127
BK/PG 65711/237

N/F
JOAN M SCHOW
11 HUNT RD
MAP/LOT E09/0128
BK/PG 12241/378

N/F
MINER A & HELEN H CRARY
TRUSTEES OF THE 1 HUNT ROAD NOMINEE TRUST
1 HUNT RD
MAP/LOT E09/0218
BK/PG 63448/1

N/F
JON R & SARAH F FREEDMAN
29 THOMPSON DR
MAP/LOT F10/0511
BK/PG 25658/242

N/F
ROBERT D & CAROLINE V WINNEG
34 BISHOP LN
MAP/LOT F09/0515
BK/PG 28083/576

N/F
KIRK C & DIANE P NEISON
37 THOMPSON DR
MAP/LOT E09/0511
BK/PG 14592/464

N/F
CHARLES A JR & RUTHANN WRY
45 THOMPSON DR
MAP/LOT E09/0510
BK/PG 28853/357

N/F
JEFFREY & TIFFANY BLOOM
53 THOMPSON DR
MAP/LOT E09/0509
BK/PG 54638/30

N/F
RICHARD S ALBEE
5 HUNT RD
MAP/LOT E09/0129
BK/PG 20726/208

N/F
ALLAN L WALLACK & DONNA NADINE, TRUSTEE OF THE WALLACK FAMILY
0 THOMPSON DR
MAP/LOT E09/0508
BK/PG 60192/340

N/F
ALLAN L WALLACK & DONNA NADINE, TRUSTEE OF THE WALLACK FAMILY
67 THOMPSON DR
MAP/LOT E09/0507
BK/PG 60192/340

CONTINUED ON SHEET NO. 29

CONTINUED BELOW

CONTINUED ABOVE

CONTINUED ON SHEET NO. 31

STONE BOX CULVERT 1.7'H x 2.4'W

STONE CULVERT 24"H x 20"W EL=129.57'

24"D x 20"W EL=129.73'

EX CULVERT

OUTLET EL=130.73' 16"RCP

EX 16"RCP

BOX CULVERT EL=131.82' 24"H x 24"W

PROP. REST AREA (192 SF)
PROP. PERVIOUS PAVERS (SEE SHEET 213 CONST. DETAILS)
PROP. 10' PAVED SHARED USE PATH
PROP. 3' SHLD
APPROX. SLOPE LIMIT
PROP. EROSION & SEDIMENT CONTROL BARRIER
RET.
EXISTING RR LAYOUT LINE
PROP. BIKE RACK
PROP. BENCH
LIMIT OF BORDERING VEGETATIVE WETLAND
PROP. 2' DENSE GRADED CRUSH STONE SHOULDER (TYP.)
PROP. LOAM & SEED (TYP)
SYNCOPATE EROSION CONTROL BARRIER
MASSDOT–RAIL AND TRANSIT DIVISION
VAL MAP V7.38–39 SHEET 5, V7.39 SHEETS 6–10
JUNE 30, 1915 LAYOUT BY OLD COLONY R.R CO.
DEED BOOK 14836, PAGE 507
CONFIRMATORY TAKING IN DEED BOOK 64110, PAGE 80
END PROP. TIMBER FENCE (THREE-RAIL) STA. +45
6–10 R CO. PAGE 80
239 240 241 242 243 244 245
PC +15.63 Δ=0° 58' 57" L=85.74' R=5000.00'
PT +01.37
CONSTRUCTION ℄ N 5° 28' 43" E 147.53'
PC +48.91
PT +34.65 N 4° 29' 46" E 48.05'
PC +82.70
N 4° 29' 46" E 1103.93'
END PROP. TIMBER FENCE (THREE-RAIL) STA. +73
REM. TREE
BEGIN PROP. GRASSED SWALE STA. +18
REM. METAL POST
APPROX. SLOPE LIMIT
PROP. LOAM & SEED (WETLAND MIX IN SWALE) -TYP.
SYNCOPATE EROSION CONTROL BARRIER
END PROP. GRASS SWALE STA. +57
R&S EXIST. STEEL RR TRACKS
LIMIT OF BORDERING VEGETATIVE WETLAND
UPL ABAN CONCRETE BOUND W/DRILL HOLE
RET. WIRE FENCE
RET. WIRE FENCE (REMNANTS)
LIMIT OF 100' SUD VERNAL POOL BUFFER ZONE
LIMIT OF 100' WPA BUFFER ZONE / 100' SUD AURA
100'SUD VPBZ
200'SUD RA
100'SUD RA
100'BZ–AURA

0 20 50 100
SCALE: 1" = 20'

PROP. CLEARING & GRUBBING
BEGIN PROP. TIMBER FENCE (THREE-RAIL) STA. +75
PROP. 10' PAVED SHARED USE PATH
END PROP. TIMBER FENCE (THREE-RAIL) STA. +30
SYNCOPATE EROSION CONTROL BARRIER
RET. FENCE
PROP. 2' DENSE GRADED CRUSH STONE SHOULDER (TYP.)
246 247 248 249 250
PT +57.75
PC +30.09 Δ=1° 26' 00" L=100.07' R=4000.00'
N 3° 03' 45" E 72.33'
PT +30.16
CONSTRUCTION ℄ N 4° 29' 46" E 1168.84'
RET. DIRT PATH
APPROX. SLOPE LIMIT
RET. WIRE FENCE (REMNANTS)
MASSDOT–RAIL AND TRANSIT DIVISION
VAL MAP V7.38–39 SHEET 5, V7.39 SHEETS 6–10
JUNE 30, 1915 LAYOUT BY OLD COLONY R.R CO.
DEED BOOK 14836, PAGE 507
CONFIRMATORY TAKING IN DEED BOOK 64110, PAGE 80
EXISTING RR LAYOUT LINE
SYNCOPATE EROSION CONTROL BARRIER
END PROP. TIMBER FENCE (THREE-RAIL) STA. +30
APPROX. SLOPE LIMIT
PROP. 2' DENSE GRADED CRUSH STONE SHOULDER (TYP.)
LIMIT OF 100' SUD VERNAL POOL BUFFER ZONE
LIMIT OF 100' WPA BUFFER ZONE / 100' SUD AURA
LIMIT OF BORDERING VEGETATIVE WETLAND
CONCRETE BOUND W/DRILL HOLE
UPL ABAN

0 20 50 100
SCALE: 1" = 20'

FOR PROFILE SEE SHEET NO. 53

608164_HD(CONSTRUCTION PLANS).DWG Plotted on 22-Dec-2021 11:04 AM

FENCING DETAILS

TIMBER FENCE (THREE-RAIL) STA. 258+22 RT TO STA. 258+72 RT
TIMBER FENCE (THREE-RAIL) STA. 258+22 LT TO STA. 258+72 LT

NOTES:
1. ANY GRANITE ABUTMENT BLOCKS NOT BEING MODIFIED OR LEFT IN PLACE AS PART OF THE BRIDGE REPLACEMENT (SEE BRIDGE PLANS) SHALL BE REMOVED AND STACKED AT THE SUDBURY DPW YARD. THE CONTRACTOR SHALL ALSO TAKE SEVEN OF THE GRANITE BLOCKS AND REMOVE AND RESET AS FOLLOWS: TWO BLOCKS TO BE RESET AS BENCHES AT APPROX. STA. 102+08 LT AND APPROX. STA. 102+20 LT, THREE BLOCKS TO BE RESET AS BENCHES AT APPROX. STA. 216+77 RT. APPROX. FIVE TO SEVEN BLOCKS TO BE RESET AS A HISTORIC INTERPRETATION AT APPROX. STA. 260+89 RT. PAYMENT FOR R&R GRANITE ABUTMENT BLOCKS SHALL BE MADE UNDER ITEM 707.4

HIGHWAY GUARD DETAILS

NONE

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

NONE

DRAINAGE DETAILS

SHEET 186

PLANT LIST

KEY	BOTANICAL NAME	COMMON NAME	QTY.	SIZE
	VISUAL SCREEN MIX			
VT	VILBURUM TRILOBUM	HIGHBUSH CRANBERRY	6	3 GAL.
IG	ILEX GLABRA	INKBERRY	6	3 GAL.
PS	PINUS STROBUS	EASTERN WHITE PINE	1	4-5' HT.
AC	ABIES CONCOLOR	WHITE FIR	2	5-6' HT.

LEGEND:
PROPOSED WHEELCHAIR RAMP DETAIL # — X#
PLANT QUANTITY AND SPECIES — X / XX

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	31	316
PROJECT FILE NO.	608164		

CONSTRUCTION PLANS

N/F
MINER A & HELEN H CRARY
TRUSTEES OF THE 1 HUNT ROAD NOMINEE TRUST
1 HUNT RD
MAP/LOT F09/0218
BK/PG 63448/71

N/F
WEST PANTRY BROOK FARM LIMITED PARTNERSHIP
667 CONCORD RD
MAP/LOT E10/0200
BK/PG 49200/410

N/F
ALLAN L WALLACK & DONNA NADINE,
TRUSTEE OF THE WALLACK FAMILY
67 THOMPSON DR
MAP/LOT E09/0507
BK/PG 60192/340

CONTINUED ON SHEET NO. 30

CONTINUED BELOW

CONTINUED ABOVE

CONTINUED ON SHEET NO. 32

END PROP. EROSION & SEDIMENT CONTROL BARRIER STA. +27
APPROX. SLOPE LIMIT
PROP. EMERGENCY VEHICLE TURNAROUND (SEE SHEET 78 CURB TIE PLANS FOR LAYOUT)
RET. FENCE
PROP. GRANITE MILE MARKER (18.50, SUDBURY) (SEE DETAILS)
PROP. 10' PAVED SHARED USE PATH
BEGIN PROP. GRASSED SWALE STA. +73
PROP. 2' DENSE GRADED CRUSH STONE SHOULDER (TYP.)
LIMIT OF 200' RIVER FRONT AREA
PROP. SWALE WIDTH VARIES 5' TO 8' (SEE CROSS SECTIONS)
END PROP. GRASS SWALE STA. +10
BEGIN PROP. EROSION & SEDIMENT CONTROL BARRIER STA. +32
PROP. LOAM & SEED (TYP)
PROP. CLEARING & GRUBBING
PROP. LOAM & SEED (WETLAND MIX IN SWALE) -TYP.
EXISTING RR LAYOUT LINE
RET. WOOD FENCE
RET. WIRE FENCE
MASSDOT-RAIL AND TRANSIT DIVISION
VAL MAP V7.38-39 SHEET 5, V7.39 SHEETS 6-10
JUNE 30, 1915 LAYOUT BY OLD COLONY R.R CO.
DEED BOOK 14836, PAGE 507
CONFIRMATORY TAKING IN DEED BOOK 64110, PAGE 80
CONSTRUCTION ℄
N 4° 29' 46" E 1168.84'
RAILROAD TRACKS
WATERWAY TRACKS
RRS
250 251 252 253 254 255 256
12' 12'
UPL ABAN
13 PINE
DRILL HOLE(FND)
WIRE FENCE (REMNANTS)
CONCRETE BOUND W/DRILL HOLE
PROP. LOAM & SEED (TYP)
END PROP. EROSION & SEDIMENT CONTROL BARRIER STA. +65
PROP. 2' DENSE GRADED CRUSH STONE SHOULDER (TYP.)
RET. TREE
R&S EXIST. STEEL RR TRACKS
BEGIN PROP. GRASSED SWALE STA. +73
RET. METAL POST
LIMIT OF 100' WPA BUFFER ZONE / 100' AURA
APPROX. SLOPE LIMIT
PROP. LOAM & SEED (WETLAND MIX IN SWALE) -TYP.
PROP. SWALE WIDTH VARIES 5' TO 11' (SEE CROSS SECTIONS)
METAL FENCE POST
100'BZ-AURA
200'WPA RA
WF#13-140 WF#13-139 WF#13-138 WF#13-137 WF#13-136

0 20 50 100
SCALE: 1" = 20'

END PROP. EROSION & SEDIMENT CONTROL BARRIER STA. +44
BEGIN PROP. EROSION & SEDIMENT CONTROL BARRIER STA. +52
END PROP. TIMBER FENCE (THREE-RAIL) STA. +72
LIMIT OF BORDERING VEGETATIVE WETLAND
RET. EXIST CATTLE CROSSING
BEGIN PROP. TIMBER FENCE (THREE-RAIL) STA. +22
APPROX. SLOPE LIMIT
PROP. MODIFIED ROCK FOR SWALE END (14'X5') (PAID UNDER ITEM #986)
PROP. NPS INTERPRETIVE SIGN (SEE DETAILS)
PROP. CONC. PAD (112 SF)
PROP. 2' DENSE GRADED CRUSH STONE SHOULDER (TYP.)
PC +99.00
Δ=11° 56' 05"
L=562.41' R=2700.00'
END PROP. TIMBER FENCE (THREE-RAIL) STA. +72
PROP. CAST IN PLACE CONC. UNDER SHOULDERS OVER EXIST. CATTLE CROSSING (TYP.) (MASSDOT ITEM #901.3.)
APPROX. SLOPE LIMIT
R&R PANTRY BROOK GRANITE ABUTMENT BLOCKS (x5) (SEE CONSTRUCTION DETAIL)
PROP. GRANITE POST INTERPRETIVE SIGN
PROP. 2' DENSE GRADED CRUSH STONE SHOULDER (TYP.)
END PROP. GRASS SWALE STA. +44
PROP. LOAM & SEED (WETLAND MIX IN SWALE) -TYP.
LIMIT OF 200' RIVER FRONT AREA
PROP. SWALE WIDTH VARIES 5' TO 11' (SEE CROSS SECTIONS)
BEGIN PROP. TIMBER FENCE (THREE-RAIL) STA. +22
LIMIT OF 100' WPA BUFFER ZONE / 100' AURA
EXISTING RR LAYOUT LINE
RET. WIRE FENCE
RET. BRIDGE ABUTMENTS
MASSDOT-RAIL AND TRANSIT DIVISION
VAL MAP V7.38-39 SHEET 5, V7.39 SHEETS 6-10
JUNE 30, 1915 LAYOUT BY OLD COLONY R.R CO.
DEED BOOK 14836, PAGE 507
CONFIRMATORY TAKING IN DEED BOOK 64110, PAGE 80
CONSTRUCTION ℄
N 4° 29' 46" E 1168.84'
RAILROAD TRACKS
256 257 258 259 260 261
37'
6"DEC
100'WPA RA
100'BZ-AURA
200'WPA RA
WF#13-137 WF#13-136 WF#13-135 WF#13-134 WF#13-133 WF#13-132 WF#13-131 WF#13-130 WF#13-129 WF#13-128 WF#13-127 WF#13-126 WF#13-125 WF#13-124 WF#13-123 WF#13-122 WF#13-121 WF#13-120 WF#13-119 WF#13-118

0 20 50 100
SCALE: 1" = 20'

FOR PROFILE SEE SHEET NO. 53 & 54

FENCING DETAILS

TIMBER FENCE (THREE-RAIL) STA. 262+25 LT TO STA. 266+25 LT
TIMBER FENCE (THREE-RAIL) STA. 264+00 RT TO STA. 268+75 RT
TIMBER FENCE (THREE-RAIL) STA. 269+52 LT TO STA. 270+02 LT
TIMBER FENCE (THREE-RAIL) STA. 269+52 RT TO STA. 270+02 RT

HIGHWAY GUARD DETAILS

NONE

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

NONE

DRAINAGE DETAILS

NONE

PLANT LIST

KEY	BOTANICAL NAME	COMMON NAME	QTY.	SIZE
	EROSION CONTROL MIX			
SS	CAREX STRICTA	TUSSOCK SEDGE	8	PLUG

LEGEND:

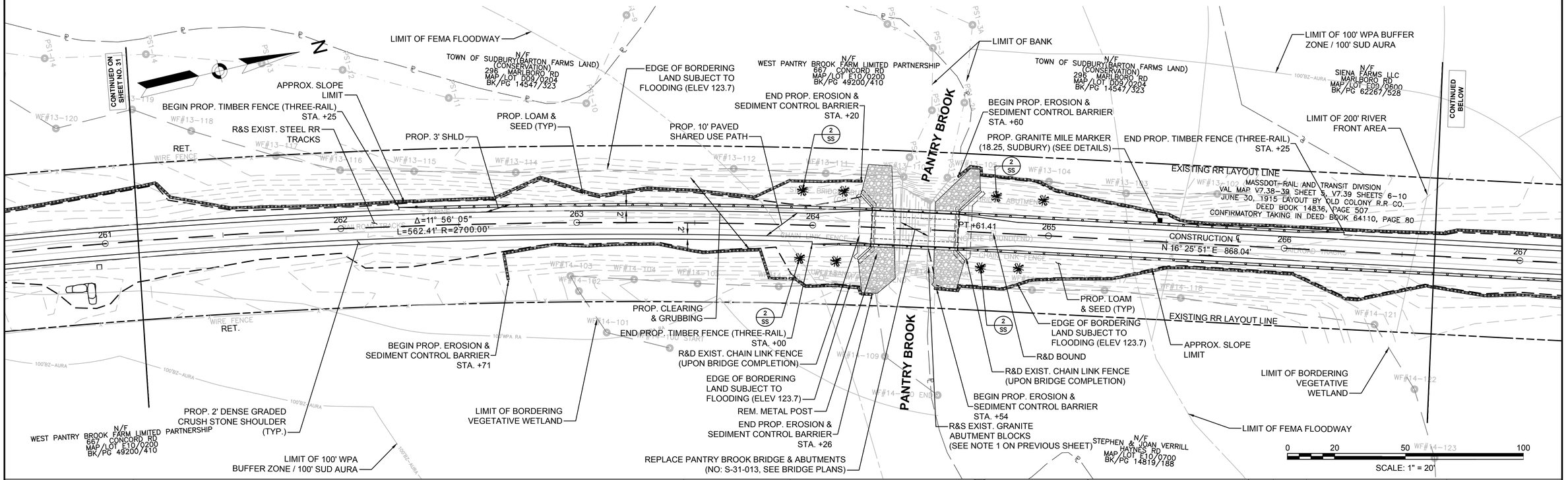
PROPOSED WHEELCHAIR RAMP DETAIL # — X#

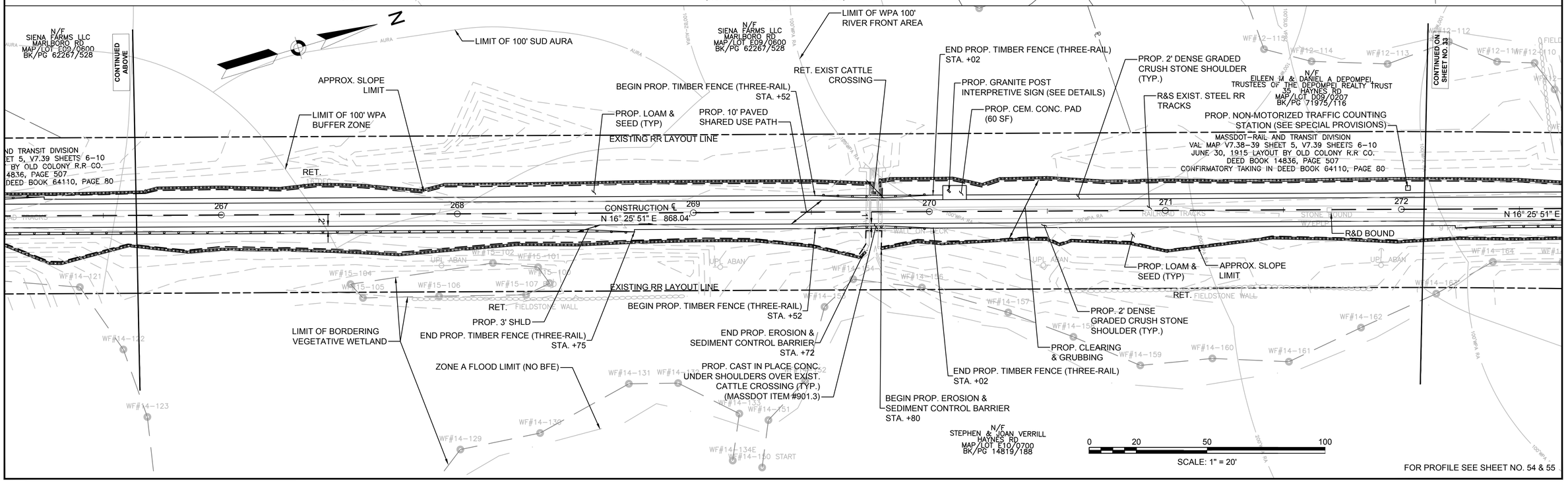
PLANT QUANTITY AND SPECIES — X / XX

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	32	316
PROJECT FILE NO.	608164		

CONSTRUCTION PLANS





FENCING DETAILS

TIMBER FENCE (THREE-RAIL) STA. 272+23 RT TO STA. 273+73 RT

HIGHWAY GUARD DETAILS

NONE

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

NONE

DRAINAGE DETAILS

NONE

PLANT LIST

KEY	BOTANICAL NAME	COMMON NAME	QTY.	SIZE
	VISUAL SCREEN MIX			
VT	VILBURUM TRILOBUM	HIGHBUSH CRANBERRY	6	3 GAL.
IG	ILEX GLABRA	INKBERRY	6	3 GAL.
PS	PINUS STROBUS	EASTERN WHITE PINE	1	4–5' HT.
AC	ABIES CONCOLOR	WHITE FIR	1	5–6' HT.
	ORNAMENTAL MIX			
CCR	CERCIS CANADENSIS	REDBUD	6	2–3" CAL.
HA	HYDRANGEA ARBORESCENS	SMOOTH HYDRAGEA	4	3 GAL.

LEGEND:

PROPOSED WHEELCHAIR RAMP DETAIL # — X#

PLANT QUANTITY AND SPECIES — X / XX

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	33	316
PROJECT FILE NO.	608164		

CONSTRUCTION PLANS

608164_HD\CONSTRUCTION PLANS\.DWG Plotted on 22-Dec-2021 11:05 AM

N

HAYNES ROAD (PUBLIC)

1830 TOWN LAYOUT

CONSTRUCTION ℄ Δ=11° 24' 39" L=119.49' R=600.00' PC +29.45 PT +88.50

Δ=30° 13' 13" L=39.56' R=75.00' PRC +48.94

Δ=10° 15' 47" L=44.78' R=250.00' PC +03.01 PRC +47.79

N 16° 25' 51" E 868.04'

N 20° 58' 33" E 62.10'

PC +10.25 PT +40.91

PT +92.57

EXISTING RR LAYOUT LINE

N/F
EILEEN M. & DANIEL A. DEPOMPEI
TRUSTEES OF THE DEPOMPEI REALTY TRUST
35 HAYNES RD
MAP/LOT D09/0207
BK/PG 71975/116

N/F
RICHARD J & MICHELLE R VROMAN
34 HAYNES RD
MAP/LOT D10/0024
BK/PG 42291/471

N/F
ARTHUR J & MARGARET A RICHARD
31 HAYNES RD
MAP/LOT D10/0001
BK/PG 24653/464

N/F
STEPHEN & JOAN VERRILL
HAYNES RD
MAP/LOT E10/0700
BK/PG 14819/188

N/F
CHRISTOPHER G & ALISON M BOLAND
24 HAYNES RD
MAP/LOT D10/0101
BK/PG 28689/158

MASSDOT–RAIL AND TRANSIT DIVISION
VAL MAP V7.38–39 SHEET 5, V7.39 SHEETS 6–10
JUNE 30, 1915 LAYOUT BY OLD COLONY R.R CO.
DEED BOOK 14836, PAGE 507
CONFIRMATORY TAKING IN DEED BOOK 64110, PAGE 80

CONTINUED ON SHEET NO. 32

CONTINUED ON SHEET NO. 34

LIMIT OF BORDERING VEGETATIVE WETLAND
LIMIT OF 100' SUD VERNAL POOL BUFFER ZONE
ZONE A FLOOD LIMIT (NO BFE)
SYNCOPATE EROSION CONTROL BARRIER
END PROP. EROSION & SEDIMENT CONTROL BARRIER STA. +32
PROP. 10' PAVED SHARED USE PATH
PROP. CLEARING & GRUBBING
PROP. 2' DENSE GRADED CRUSH STONE SHOULDER (TYP.)
PROP. LOAM & SEED (TYP)
PROP. GRANITE BFRT PIER (SEE DETAILS)
PROP. BENCH
PROP. CEM. CONC. REST AREA APPROX. (310 SF)
PROP. BIKE RACKS (2)
RET. 2 MAILBOXES
RET. EXIST. HMA ROADWAY
PROP. RECTANGULAR RAPID FLASHING BEACON (SOLAR) LOC. 4 STA. 275+19.78 OFF. 6.00' LT
PROP. STAMPED CONCRETE SPLITTER ISLAND (TYP.) (SEE DETAILS)
PROP. GRANITE BFRT PIER (SEE DETAILS)
RET. METAL POST
RET.
LIMIT OF 100' BUFFER ZONE TO BVW
APPROX. SLOPE LIMIT
PROP. 10' PAVED SHARED USE PATH
PROP. CEM. CONC. WHEELCHAIR RAMP
EXISTING RR LAYOUT LINE
PROP. GRANITE POST INTERPRETIVE SIGN (SEE DETAILS)
RET. METAL POST
END PROP. EROSION & SEDIMENT CONTROL BARRIER STA. +36
SAWCUT PVM'T
RET. BOUND
APPROX. SLOPE LIMIT
PROP. 3' SHLD
END PROP. TIMBER FENCE (THREE-RAIL) STA. +73
SYNCOPATE EROSION CONTROL BARRIER
BEGIN PROP. TIMBER FENCE (THREE-RAIL) STA. +23
ZONE A FLOOD LIMIT (NO BFE)
LIMIT OF BORDERING VEGETATIVE WETLAND
PROP. RECTANGULAR RAPID FLASHING BEACON (SOLAR) LOC. 4 STA. 274+88.57 OFF. 6.01' RT
APPROX. 110' OF TREE TRIMMING TO PROVIDE 320' OF SIGHT DISTANCE FOR NORTHBOUND TRAIL USERS TO CENTER OF WEST BOUND TRAVEL LANE
PROP. TEMP EASEMENT
LIMIT OF 100' BUFFER ZONE TO BVW
BEGIN PROP. TRAIL REINFORCED SUB-BASE STA. 210+00 (SEE TYPICAL SECTIONS)
PROP. LOAM & SEED (TYP)
R&S EXIST. STEEL RR TRACKS
BEGIN PROP. EROSION & SEDIMENT CONTROL BARRIER STA. +21
LIMIT OF 100' BUFFER ZONE TO BVW

0 20 50 100
SCALE: 1" = 20'

FOR PROFILE SEE SHEET NO. 54 & 55

FENCING DETAILS

NONE

HIGHWAY GUARD DETAILS

NONE

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

NONE

DRAINAGE DETAILS

NONE

LEGEND:

PROPOSED WHEELCHAIR RAMP DETAIL # — X#

PLANT QUANTITY AND SPECIES — X / XX

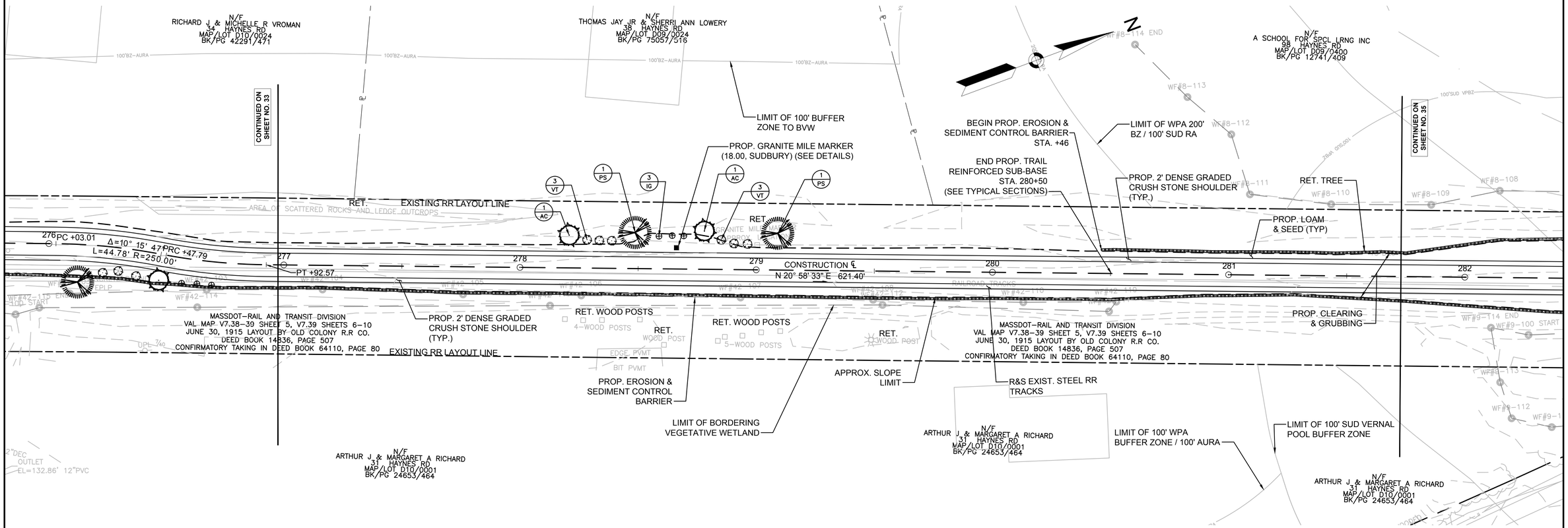
SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	34	316
PROJECT FILE NO.	608164		

CONSTRUCTION PLANS

PLANT LIST

KEY	BOTANICAL NAME	COMMON NAME	QTY.	SIZE
	VISUAL SCREEN MIX			
VT	VILBURUM TRILOBUM	HIGHBUSH CRANBERRY	6	3 GAL.
IG	ILEX GLABRA	INKBERRY	3	3 GAL.
PS	PINUS STROBUS	EASTERN WHITE PINE	2	4–5' HT.
AC	ABIES CONCOLOR	WHITE FIR	2	5–6' HT.



FOR PROFILE SEE SHEET NO. ## AND ##

608164_HD\CONSTRUCTION PLANS\.DWG Plotted on 22-Dec-2021 11:05 AM

FENCING DETAILS

TIMBER FENCE (THREE-RAIL) STA. 283+73 LT TO STA. 284+28 LT
TIMBER FENCE (THREE-RAIL) STA. 284+65 RT TO STA. 291+25 RT

HIGHWAY GUARD DETAILS

STEEL W-BEAM GUARDRAIL (TL-2) W/ WOOD POST STA. 284+28 LT TO STA. 284+46 LT
STEEL W-BEAM GUARDRAIL (TL-2) W/ WOOD POST STA. 284+75 LT TO STA. 285+18 LT
STEEL W-BEAM GUARDRAIL (TL-2) W/ WOOD POST STA. 284+51 RT TO STA. 284+63 RT

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

NONE

DRAINAGE DETAILS

NONE

PLANT LIST

KEY	BOTANICAL NAME	COMMON NAME	QTY.	SIZE
	ORNAMENTAL MIX			
CCR	CERCIS CANADENSIS	REDBUD	4	2–3" CAL.
HA	HYDRANGEA ARBORESCENS	SMOOTH HYDRAGEA	4	3 GAL.

LEGEND:

PROPOSED WHEELCHAIR RAMP DETAIL #

PLANT QUANTITY AND SPECIES

X#

X
XX

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	35	316
PROJECT FILE NO.	608164		

CONSTRUCTION PLANS

608164_HD\CONSTRUCTION PLANS\.DWG Plotted on 22-Dec-2021 11:05 AM

N/F
A SCHOOL FOR SPCL LRNG INC
38 HAYNES RD
MAP/LOT D09/0400
BK/PG 12741/409

N/F
RAMI ALWAN & JENNIE M BRANNEN
PANTRY RD
MAP/LOT D10/0013
BK/PG 69023/195

N/F
ARTHUR J & MARGARET A RICHARD
31 HAYNES RD
MAP/LOT D10/0001
BK/PG 24653/464

N/F
PAUL J II & JOANNE H MARCOUX
76 PANTRY RD
MAP/LOT D10/0401
BK/PG 43235/308

N/F
MEGHAN E GODER & DANIEL E REISER
78 PANTRY RD
MAP/LOT D10/0400
BK/PG 71149/479

PANTRY ROAD
(PUBLIC)

CONTINUED ON SHEET NO. 34

CONTINUED ON SHEET NO. 36

LIMIT OF BANK

APPROX. SLOPE LIMIT

LIMIT OF BORDERING VEGETATIVE WETLAND

PROP. 10' PAVED SHARED USE PATH

PROP. CLEARING & GRUBBING

SYNCOPATE EROSION CONTROL BARRIER

BEGIN PROP. CEMENTED STONE MASONRY WALL STA. +27

END PROP. TIMBER FENCE (THREE-RAIL) STA. +28
PROP. TRAILING ANCHORAGE TO ABUT STEEL W-BEAM GUARDRAIL

BEGIN PROP. CEMENTED STONE MASONRY WALL STA. +85

BEGIN PROP. TIMBER FENCE (THREE-RAIL) EXISTING MBTA ROW STA. +73

BEGIN PROP. STEEL W-BEAM GUARDRAIL, TL-2 W/ WOOD POST

BEGIN PROP. STEEL W-BEAM GUARDRAIL, TL-2 W/ WOOD POST
PROP. TANGENT END TREATMENT

END PROP. STEEL W-BEAM GUARDRAIL, TL-2 W/ WOOD POST
PROP. TRANSITION TO NCHRP 350 GUARDRAIL

END PROP. EROSION & SEDIMENT CONTROL BARRIER STA. +43

R&D EXIST. GUARDRAIL

RET. CULVERT

GRANITE BFRT PIER (SEE DETAILS)

RET. EXIST HMA ROADWAY

END PROP. STEEL W-BEAM GUARDRAIL, TL-2 W/ WOOD POST
PROP. TRANSITION TO NCHRP 350 GUARDRAIL

ZONE A FLOOD LIMIT (NO BFE)

LIMIT OF WPA 100' BZ / 100' SUD RA

RET. EXIST. GUARDRAIL

PROP. BIKE RACK

PROP. BENCH

PROP. CEM. CONC. REST AREA (242 SF)

PROP. 2' DENSE GRADED CRUSH STONE SHOULDER (TYP.)

EXISTING RR LAYOUT LINE

BEGIN PROP. EROSION & SEDIMENT CONTROL BARRIER STA. +19

PROP. CEM. CONC. WHEELCHAIR RAMP

SYNCOPATE EROSION CONTROL BARRIER

PROP. 2' DENSE GRADED CRUSH STONE SHOULDER (TYP.)

EXISTING RR LAYOUT LINE

PROP. LIMIT OF TREE TRIMMING

LIMIT OF BORDERING VEGETATIVE WETLAND

END PROP. EROSION & SEDIMENT CONTROL BARRIER STA. +56

RET. EXIST. GUARDRAIL

PROP. RECTANGULAR RAPID FLASHING BEACON (SOLAR) LOC. 5
STA. 284+23.37 OFF. 6.03' RT

LIMIT OF WPA 100' BZ / 100' SUD RA

BEGIN PROP. EROSION & SEDIMENT CONTROL BARRIER STA. +51

BEGIN PROP. STEEL W-BEAM GUARDRAIL, TL-2 W/ WOOD POST
PROP. TRANSITION TO NCHRP 350 GUARDRAIL

LIMIT OF 200' SUD RA

ZONE A FLOOD LIMIT (NO BFE)

BEGIN PROP. CEMENTED STONE MASONRY WALL STA. +65

BEGIN PROP. TIMBER FENCE (THREE-RAIL) STA. +65

END PROP. STEEL W-BEAM GUARDRAIL, TL-2 W/ WOOD POST STA. +63

PROP. CEM. CONC. WHEELCHAIR RAMP

GRANITE BFRT PIER (SEE DETAILS)

PROP. RECTANGULAR RAPID FLASHING BEACON (SOLAR) LOC. 5
STA. 284+71.30 OFF. 6.00' LT

END PROP. CEMENTED STONE MASONRY WALL STA. +22

LIMIT OF BORDERING VEGETATIVE WETLAND

R&S EXIST. STEEL RR TRACKS

APPROX. SLOPE LIMIT

MASSDOT–RAIL AND TRANSIT DIVISION
VAL MAP V7.38–39 SHEET 5, V7.39 SHEETS 6–10
JUNE 30, 1915 LAYOUT BY OLD COLONY R.R CO.
DEED BOOK 14836, PAGE 507
CONFIRMATORY TAKING IN DEED BOOK 64110, PAGE 80

PC +13.96 Δ=7° 45' 30"
PT +81.67
L=67.70' R=500.00'
N 20° 58' 33" E 621.40'

PC +21.54
PT +81.22
PT +66.76
CONSTRUCTION ℄
N 20° 59' 52" E 516.76'

0 20 50 100
SCALE: 1" = 20'

FOR PROFILE SEE SHEET NO. 54 & 55

FENCING DETAILS

TIMBER FENCE (THREE-RAIL) STA. 284+68 RT TO STA. 288+00 RT
TIMBER FENCE (THREE-RAIL) STA. 284+65 RT TO STA. 290+25 RT

HIGHWAY GUARD DETAILS

NONE

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

NONE

DRAINAGE DETAILS

NONE

LEGEND:

PROPOSED WHEELCHAIR RAMP DETAIL # X#

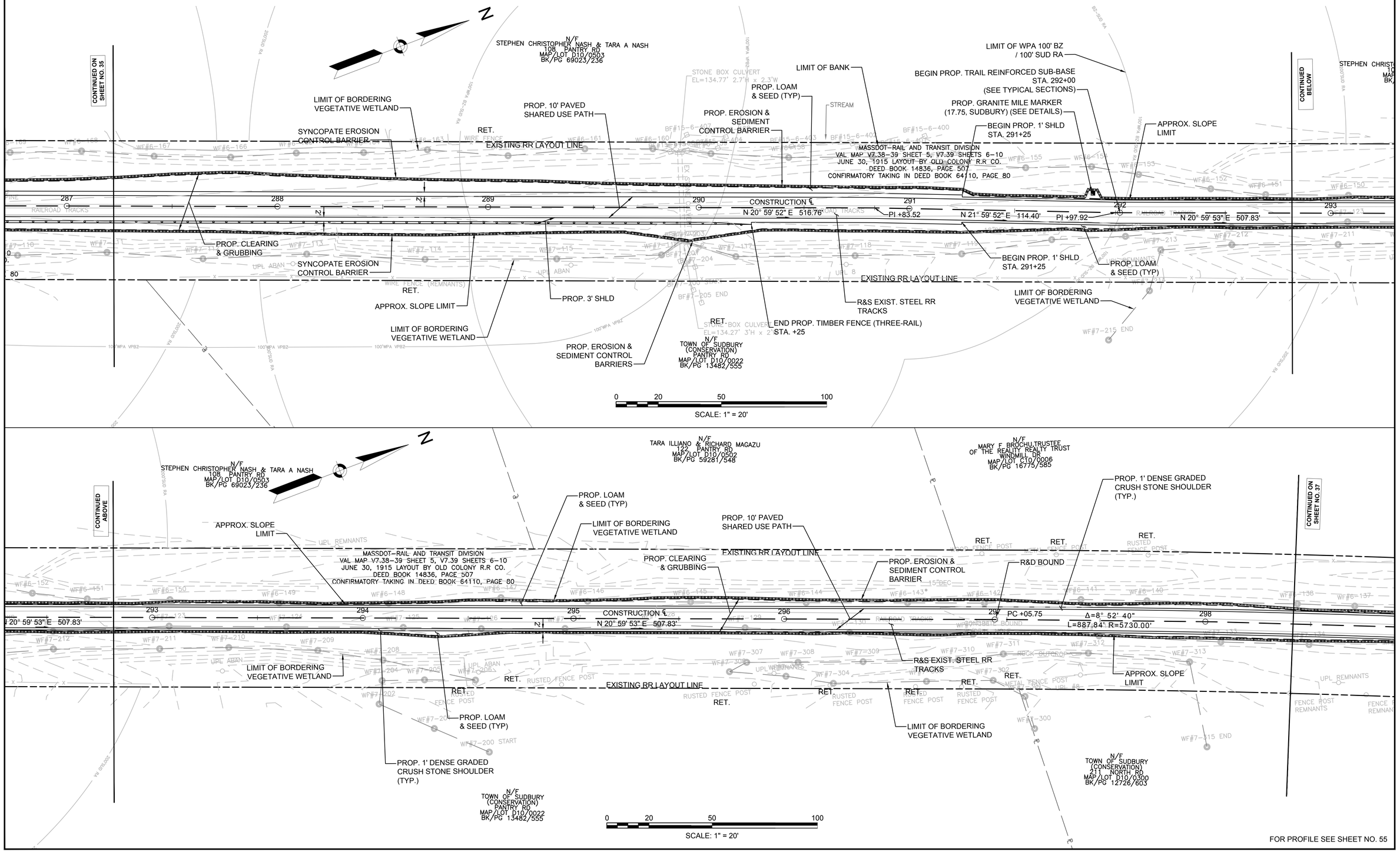
SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	36	316
PROJECT FILE NO.	608164		

CONSTRUCTION PLANS

Plotted on 22-Dec-2021 11:05 AM

608164_HD\CONSTRUCTION PLANS\.DWG



FENCING DETAILS	HIGHWAY GUARD DETAILS	TRAFFIC SIGNAL CONDUIT	WATER SUPPLY ALTERATIONS	DRAINAGE DETAILS
NONE	NONE	NONE	NONE	SEE SHEET 192

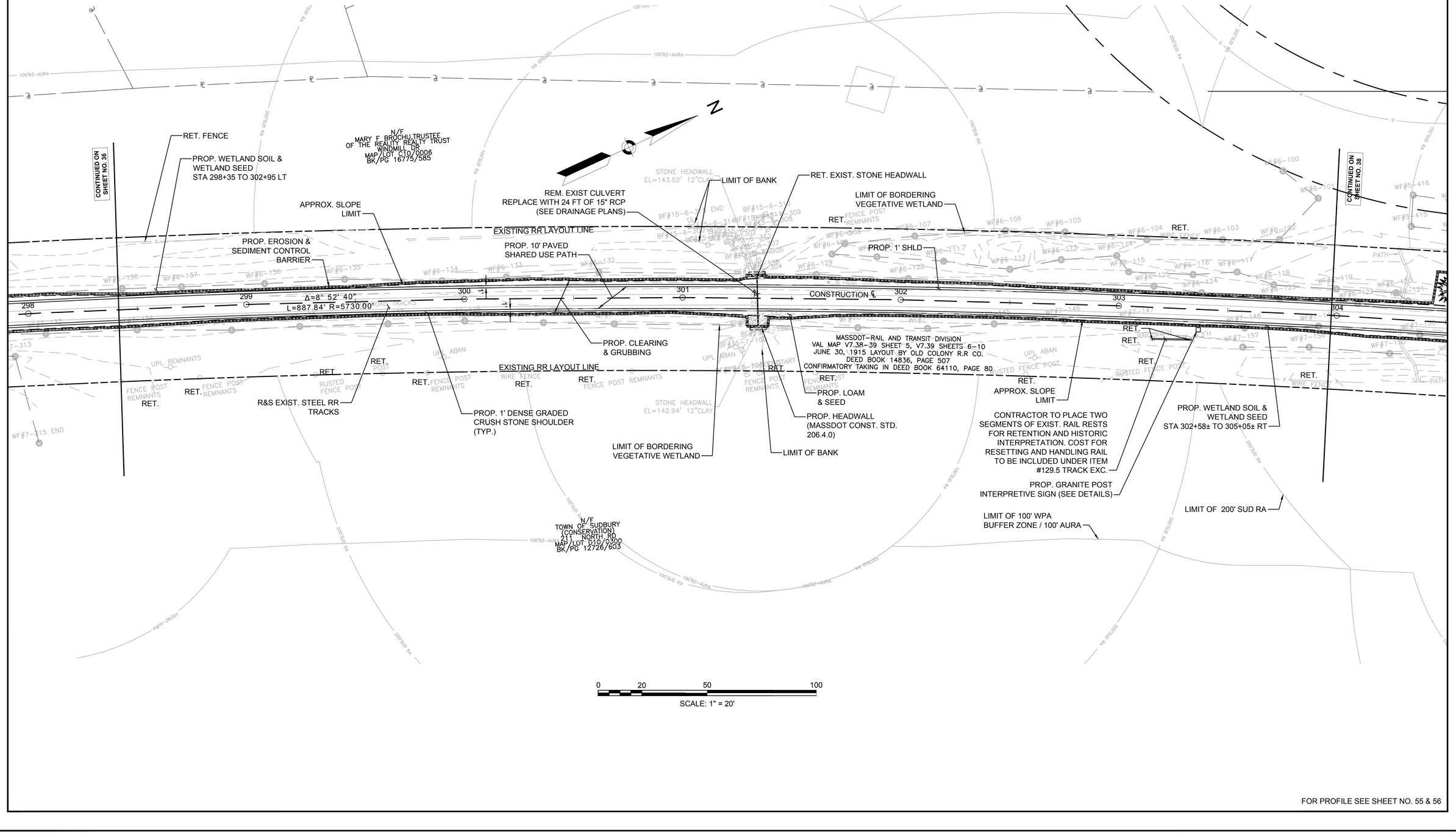
LEGEND:

PROPOSED WHEELCHAIR RAMP DETAIL # X#

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	37	316
PROJECT FILE NO.	608164		

CONSTRUCTION PLANS



FOR PROFILE SEE SHEET NO. 55 & 56

FENCING DETAILS

TIMBER FENCE (THREE-RAIL) STA. 308+79 LT TO STA. 309+79 LT
TIMBER FENCE (THREE-RAIL) STA. 308+16 RT TO STA. 315+79 RT

HIGHWAY GUARD DETAILS

NONE

TRAFFIC SIGNAL CONDUIT

SEE SHEET 160

WATER SUPPLY ALTERATIONS

NONE

DRAINAGE DETAILS

SEE SHEET 193

LEGEND:

PROPOSED WHEELCHAIR RAMP DETAIL # — X#

PLANT QUANTITY AND SPECIES — X / XX

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	38	316
PROJECT FILE NO.	608164		

CONSTRUCTION PLANS

PLANT LIST

KEY	BOTANICAL NAME	COMMON NAME	QTY.	SIZE
	VISUAL SCREEN MIX			
JV	JUNIPERUS VIRGINIANA	EASTERN RED CEDAR	4	4–5' HT.
VT	VILBURUM TRILOBUM	HIGHBUSH CRANBERRY	6	3 GAL.
IG	ILEX GLABRA	INKBERRY	3	3 GAL.
	ORNAMENTAL MIX			
CCR	CERCIS CANADENSIS	REDBUD	2	2–3" CAL.
ACS	AMELANCHIER CANADENSIS	SMOOTH HYDRAGEA	1	2–3" CAL.
HA	HYDRANGEA ARBORESCENS		4	3 GAL.

LIMIT OF 200' BUFFER ZONE / 100' SUD RA
LIMIT OF 100' SUD RA
LIMIT OF 100' WPA BUFFER ZONE / 100' AURA
N/F J POPE BRADFORD 10 WINDMILL DR MAP/LOT C10/0201 BK/PG 46785/241
1925 COUNTY LAYOUT
NORTH ROAD (RTE 117) (PUBLIC)
STONE MASONRY RETAINING WALL
N/F DOREEN SCALZI 220 NORTH RD MAP/LOT C10/0015 BK/PG 63763/338
CB RIM=149.34' INV=146.69'
INV 12" RCP EL=146.22'
EXISTING TOWN LO
LIMIT OF BORDERING VEGETATIVE WETLAND
LIMIT OF BANK
WINDMILL DRIVE (PUBLIC)
END PROP. EROSION & SEDIMENT CONTROL BARRIER STA. +13
PROP. DISPLAY BOARD
PROP. BENCH
PROP. REST AREA (387 SF)
PROP. PERVIOUS PAVERS (SEE DETAILS)
SAWCUT & MEET EXIST
PROP. HMA WALK
GRANITE BFRT PIER (SEE DETAILS)
LIMIT OF 100' SUD RA
LIMIT OF 100' BUFFER ZONE / 100' SUD RA
LIMIT OF BORDERING VEGETATIVE WETLAND
BEGIN PROP. EROSION & SEDIMENT CONTROL BARRIER STA. +71
PROP. STAMPED CONCRETE SPLITTER ISLAND (TYP.) (SEE DETAILS)
PROP. 2' DENSE GRADED CRUSH STONE SHOULDER (TYP.)
BEGIN PROP. TIMBER FENCE (THREE-RAIL) STA. +79
N/F JOHN C & DORIS NORMAN NORTH RD MAP/LOT C10/0013 BK/PG 13793/342
CONTINUED ON SHEET NO. 39
PROP. GRANITE MILE MARKER (17.50, SUDBURY) (SEE DETAILS)
PROP. 10' PAVED SHARED USE PATH
PROP. BIKE RACK
PROP. LOAM & SEED (TYP.)
APPROX. SLOPE LIMIT
2'WIDE STREAM
EXISTING RR LAYOUT LINE
PROP. CLEARING & GRUBBING
PROP. CEM. CONC. WHEELCHAIR RAMP
PROP. 3' SHLD
PROP. LOAM & SEED
RET. EXIST HMA ROADWAY
PROP. HMA DRIVEWAY
BEGIN PROP. TIMBER FENCE (THREE-RAIL) STA. +16
GRANITE BFRT PIER (SEE DETAILS)
BEGIN PROP. EROSION & SEDIMENT CONTROL BARRIER STA. +88
LIMIT OF BORDERING VEGETATIVE WETLAND
CONSTRUCTION ℄
R&S EXIST. STEEL RR TRACKS
END PROP 1' SHLD
BEGIN PROP. 2' SHLD
REM. EXIST. CONC. HEADWALL
PROP. HEADWALL (MASSDOT CONST STD. 206.4.0)
IMPACTED WETLAND AREA
PROP. CEM. CONC. WHEELCHAIR RAMP
END PROP. EROSION & SEDIMENT CONTROL BARRIER STA. +38
PROP. PERM. EASEMENT
END PROP. TRAIL REINFORCED SUB-BASE STA. 304+50 (SEE TYPICAL SECTIONS)
PROP. EROSION & SEDIMENT CONTROL BARRIERS
LIMIT OF BORDERING VEGETATIVE WETLAND
N/F TOWN OF SUDBURY (CONSERVATION) CONCORD RD MAP/LOT D10/0018 BK/PG 12754/314
LIMIT OF BANK
PROP. 8' HMA SHARED USE PATH
REM. BIT APRON
CONTINUED ON SHEET NO. 43
1976 COUNTY LAYOUT ALT.
NORTH ROAD (RTE 117) (PUBLIC)
N/F FAIRVIEW DEVELOPMENT CORP NORTH RD MAP/LOT C10/0009 BK/PG 11659/136
N/F JOHN C & DORIS NORMAN NORTH RD MAP/LOT C10/0010 BK/PG 13793/342
N/F TOWN OF SUDBURY (CONSERVATION) CONCORD RD MAP/LOT D10/0018 BK/PG 12754/314
LIMIT OF 100' BUFFER ZONE / 100' SUD RA
LIMIT OF 100' SUD RA
PCC +93.59
PCC +38.07
PRC +05
PT +14.74
N 32° 25' 44" E 1901.85'
+44.97
0 20 50 100
SCALE: 1" = 20'
FOR PROFILE SEE SHEET NO. 56

FENCING DETAILS

TIMBER FENCE (THREE-RAIL) STA. 308+79 LT TO STA. 309+79 LT
TIMBER FENCE (THREE-RAIL) STA. 313+29 LT TO STA. 316+29 LT
TIMBER FENCE (THREE-RAIL) STA. 308+16 RT TO STA. 315+79 RT

HIGHWAY GUARD DETAILS

NONE

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

NONE

DRAINAGE DETAILS

NONE

LEGEND:

PROPOSED WHEELCHAIR RAMP DETAIL # — X#

PLANT QUANTITY AND SPECIES — X / XX

PLANT LIST

KEY	BOTANICAL NAME	COMMON NAME	QTY.	SIZE
	VISUAL SCREEN MIX			
VT	VILBURUM TRILOBUM	HIGHBUSH CRANBERRY	9	3 GAL.
IG	ILEX GLABRA	INKBERRY	9	3 GAL.
PS	PINUS STROBUS	EASTERN WHITE PINE	4	4–5' HT.
AC	ABIES CONCOLOR	WHITE FIR	3	5–6' HT.
	EROSION CONTROL MIX			
SS	CAREX STRICTA	TUSSOCK SEDGE	8	PLUG
CS	CORNUS SERICEA. & SALIX SSP	DOGWOOD AND WILLOW	6	1 GAL.
	ORNAMENTAL MIX			
CCR	CERCIS CANADENSIS	REDBUD	3	2–3" CAL.

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	39	316
PROJECT FILE NO.	608164		

CONSTRUCTION PLANS

N/F JOHN C & DORIS NORMAN NORTH RD MAP/LOT C10/0013 BK/PG 13793/342

CONTINUED ON SHEET NO. 38

SYNCOPATE EROSION CONTROL BARRIER

END PROP. TIMBER FENCE (THREE-RAIL) STA. +79

APPROX. SLOPE LIMIT

PROP. 2' DENSE GRADED CRUSH STONE SHOULDER (TYP.)

PROP. LOAM & SEED (TYP)

LIMIT OF BORDERING VEGETATIVE WETLAND

PROP. CLEARING & GRUBBING

LIMIT OF 100' WPA BUFFER ZONE / 100' AURA

PROP. EROSION & SEDIMENT CONTROL BARRIER

PROP. 10' PAVED SHARED USE PATH

LIMIT OF 100' SUD RA

EDGE OF BORDERING LAND SUBJECT TO FLOODING (ELEV 140.7)

EDGE OF WATER

MASSDOT–RAIL AND TRANSIT DIVISION
VAL MAP V7.38–39 SHEET 5, V7.39 SHEETS 6–10
JUNE 30, 1915 LAYOUT BY OLD COLONY R.R CO.
DEED BOOK 14836, PAGE 507
CONFIRMATORY TAKING IN DEED BOOK 64110, PAGE 80

EXISTING RR LAYOUT LINE

RET. WIRE FENCE

CONSTRUCTION ℄
N 32° 25' 44" E 1901.85'

RAILROAD TRACKS

R&S EXIST. STEEL RR TRACKS

APPROX. SLOPE LIMIT

PROP. 3' SHLD

SYNCOPATE EROSION CONTROL BARRIER

PROP. TIMBER FENCE (THREE-RAIL)

LIMIT OF 200' RIVER FRONT AREA

EDGE OF BORDERING LAND SUBJECT TO FLOODING (ELEV 139.1)

LIMIT OF BORDERING VEGETATIVE WETLAND

PROP. EROSION & SEDIMENT CONTROL BARRIER

LIMIT OF 200' SUD RA

LIMIT OF 100' WPA RIVER FRONT AREA

BEGIN PROP. TIMBER FENCE (THREE-RAIL) STA. +29

LIMIT OF BANK

CULVERT (TONDER WATER) 24" RCP EL=134.49' 24"RCP

EXISTING 24" RCP

INV 24" RCP EL=134.29' 24"RCP

CULVERT (TONDER WATER) 24" RCP (BURIED) EL=133.49' 24"RCP

PROP. LOAM & SEED

APPROX. SLOPE LIMIT

LIMIT OF 100' WPA BUFFER ZONE / 100' AURA

CONTINUED BELOW

N/F JOHN C & DORIS NORMAN NORTH RD MAP/LOT C10/0012 BK/PG 13793/342

N/F FAIRVIEW DEVELOPMENT CORP NORTH RD MAP/LOT C10/0009 BK/PG 11659/136

0 20 50 100
SCALE: 1" = 20'

N/F JOHN C & DORIS NORMAN NORTH RD MAP/LOT C10/0012 BK/PG 13793/342

CONTINUED ABOVE

LIMIT OF 100' WPA BUFFER ZONE / 100' AURA

LIMIT OF 200' WPA RIVER FRONT AREA

END PROP. TIMBER FENCE (THREE-RAIL) STA. +29

PROP. LOAM & SEED

PROP. 3' SHLD

END PROP. EROSION & SEDIMENT CONTROL BARRIER STA. +03

APPROX. SLOPE LIMIT

PROP. 2' DENSE GRADED CRUSH STONE SHOULDER (TYP.)

PROP. 10' PAVED SHARED USE PATH

N/F FAIRVIEW DEVELOPMENT CORP NORTH RD MAP/LOT C10/0401 BK/PG 9512/83

PROP. GRANITE MILE MARKER (17.25, SUDBURY) (SEE DETAILS)

EXISTING RR LAYOUT LINE

RET.

BEGIN PROP. EROSION & SEDIMENT CONTROL BARRIER STA. +65

RET. PRIVATE CROSSING

PROP. CEM. CONC. WHEELCHAIR RAMP

PROP. GRANITE BFRT PIER (SEE DETAILS)

FAIRVIEW FARMS DRIVEWAY (PRIVATE)

CONTINUED ON SHEET NO. 40

CONSTRUCTION ℄
N 32° 25' 44" E 1901.85'

RAILROAD TRACKS

MASSDOT–RAIL AND TRANSIT DIVISION
VAL MAP V7.38–39 SHEET 5, V7.39 SHEETS 6–10
JUNE 30, 1915 LAYOUT BY OLD COLONY R.R CO.
DEED BOOK 14836, PAGE 507
CONFIRMATORY TAKING IN DEED BOOK 64110, PAGE 80

R&S EXIST. STEEL RR TRACKS

EXISTING RR LAYOUT LINE

RET. TREE

PROP. 2' DENSE GRADED CRUSH STONE SHOULDER (TYP.)

PROP. CLEARING & GRUBBING

END PROP. EROSION & SEDIMENT CONTROL BARRIER STA. +00

PROP. LOAM & SEED (TYP)

APPROX. SLOPE LIMIT

PROP. CLEARING & GRUBBING

SAWCUT PVM'T

PROP. GRANITE BFRT PIER (SEE DETAILS)

LIMIT OF 200' RIVER FRONT AREA

END PROP. TIMBER FENCE (TWO-RAIL) STA. +79

N/F FAIRVIEW DEVELOPMENT CORP NORTH RD MAP/LOT C10/0009 BK/PG 11659/136

0 20 50 100
SCALE: 1" = 20'

FOR PROFILE SEE SHEET NO. 56

FENCING DETAILS

TIMBER FENCE (THREE-RAIL) STA. 321+25 LT TO STA. 324+79 LT
TIMBER FENCE (THREE-RAIL) STA. 321+25 RT TO STA. 322+00 RT
TIMBER FENCE (THREE-RAIL) STA. 322+79 RT TO STA. 329+79 RT

HIGHWAY GUARD DETAILS

NONE

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

NONE

DRAINAGE DETAILS

NONE

PLANT LIST

KEY	BOTANICAL NAME	COMMON NAME	QTY.	SIZE
	VISUAL SCREEN MIX			
VT	VILBURUM TRILOBUM	HIGHBUSH CRANBERRY	12	3 GAL.
IG	ILEX GLABRA	INKBERRY	12	3 GAL.
PS	PINUS STROBUS	EASTERN WHITE PINE	5	4–5' HT.
AC	ABIES CONCOLOR	WHITE FIR	4	5–6' HT.
	ORNAMENTAL MIX			
ACS	AMELANCHIER	CANADENSIS	2	2–3" CAL.

LEGEND:

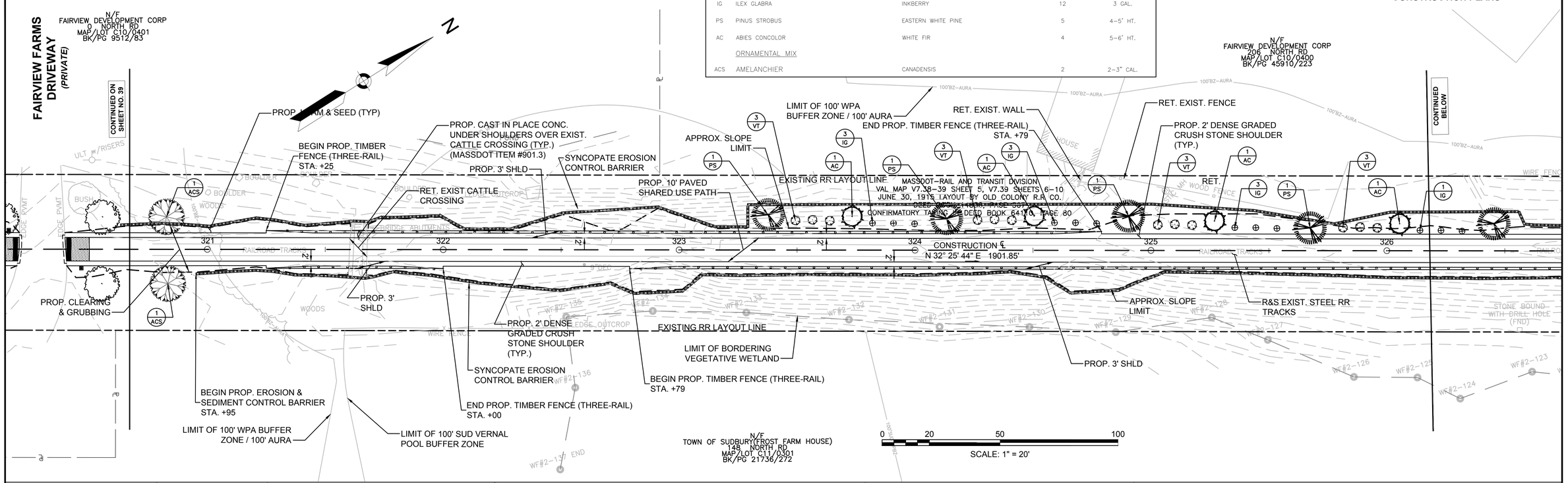
PROPOSED WHEELCHAIR RAMP DETAIL # — X#

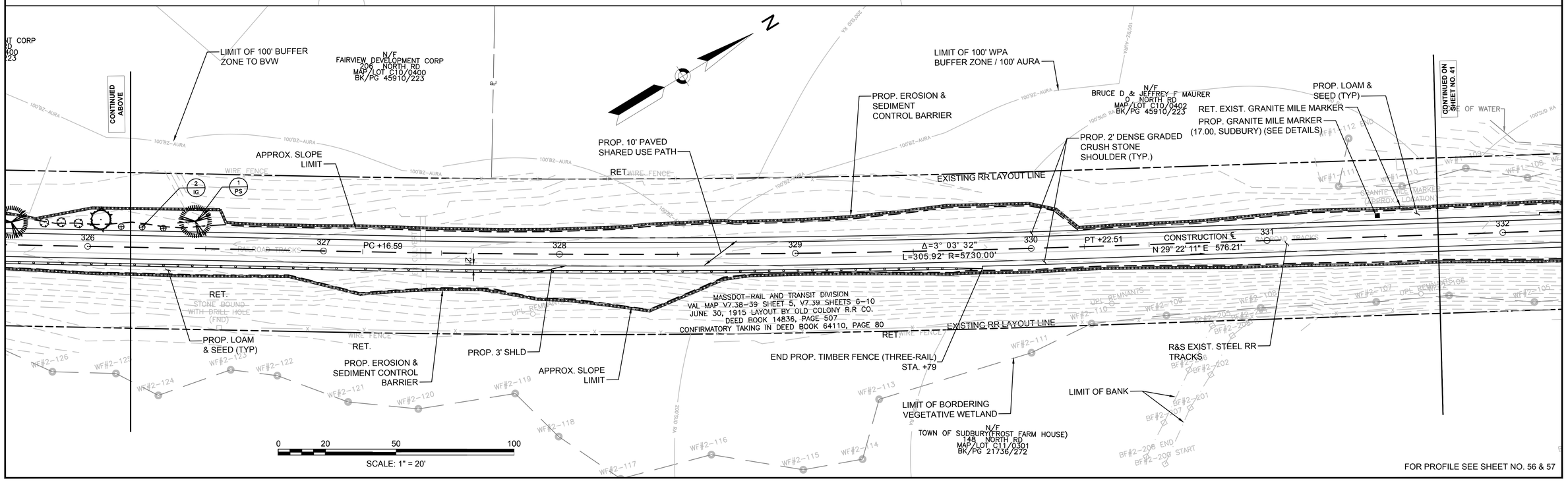
PLANT QUANTITY AND SPECIES — X / XX

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	40	316
PROJECT FILE NO.	608164		

CONSTRUCTION PLANS





FOR PROFILE SEE SHEET NO. 56 & 57

FENCING DETAILS

TIMBER FENCE (THREE-RAIL) STA. 332+16 LT TO STA. 333+11 LT

HIGHWAY GUARD DETAILS

NONE

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

NONE

DRAINAGE DETAILS

NONE

PLANT LIST

KEY	BOTANICAL NAME	COMMON NAME	QTY.	SIZE
	ORNAMENTAL MIX			
CCR	CERCIS CANADENSIS	REDBUD	2	2–3" CAL.
HA	HYDRANGEA ARBORESCENS	SMOOTH HYDRAGEA	5	3 GAL.

LEGEND:

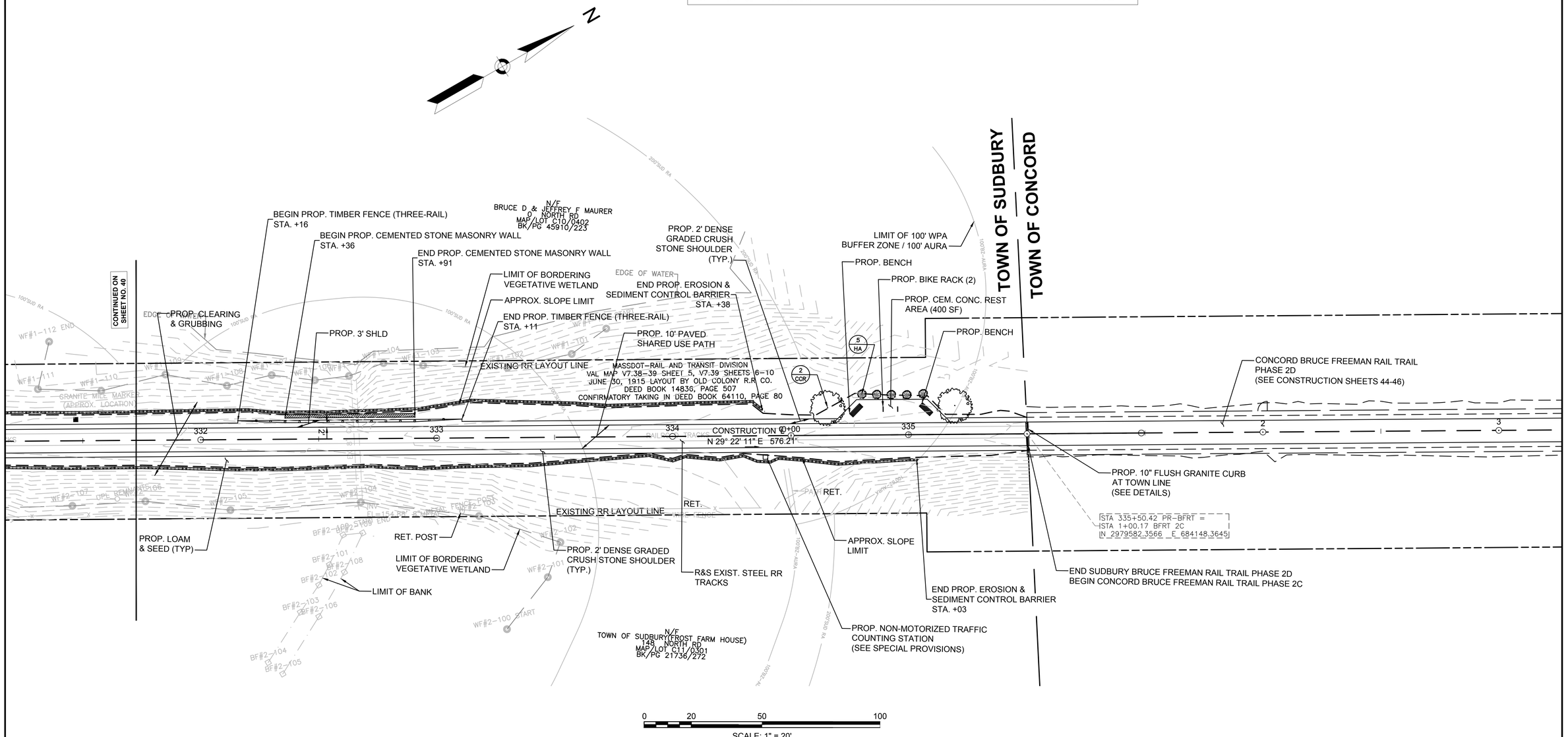
PROPOSED WHEELCHAIR RAMP DETAIL # — X#

PLANT QUANTITY AND SPECIES — X / XX

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	41	316
PROJECT FILE NO.	608164		

CONSTRUCTION PLANS



FOR PROFILE SEE SHEET NO. 57

608164_HD(CONSTRUCTION PLANS).DWG Plotted on 22-Dec-2021 11:07 AM

FENCING DETAILS	HIGHWAY GUARD DETAILS	TRAFFIC SIGNAL CONDUIT	WATER SUPPLY ALTERATIONS	DRAINAGE DETAILS
NONE	NONE	NONE	NONE	NONE

PLANT LIST

KEY	BOTANICAL NAME	COMMON NAME	QTY.	SIZE
	ORNAMENTAL MIX			
CCR	CERCIS CANADENSIS	REDBUD	5	2-3" CAL.
ACS	AMELANCHIER	CANADENSIS	4	2-3" CAL.
HA	HYDRANGEA ARBORESCENS	SMOOTH HYDRAGEA	5	3 GAL.

LEGEND:

PROPOSED WHEELCHAIR RAMP DETAIL # — X#

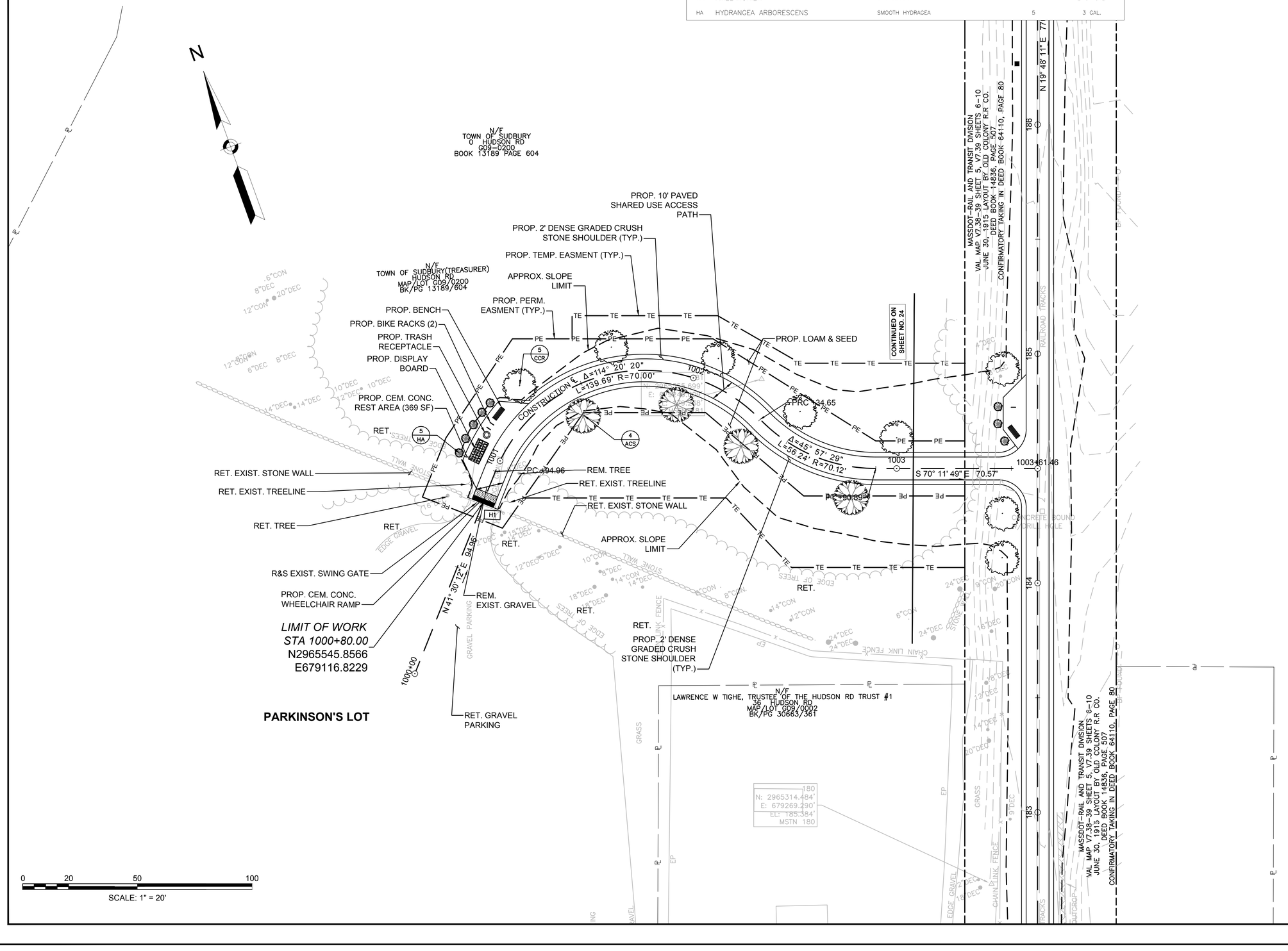
PLANT QUANTITY AND SPECIES — X / XX

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	42	316
PROJECT FILE NO.	608164		

CONSTRUCTION PLANS

608164_HD(CONSTRUCTION PLANS).DWG Plotted on 22-Dec-2021 11:07 AM



FOR PROFILE SEE SHEET NO. 58

FENCING DETAILS

TIMBER FENCE (THREE-RAIL) STA. 1102+10 RT TO STA. 1103+20 RT

HIGHWAY GUARD DETAILS

STEEL W-BEAM (TL-2) W/WOOD POST & RUB RAIL
STA. 1100+51 LT TO STA. 1105+84 LT
TIMBER GUARDRAIL W/ RUB RAIL
STA. 1106+00 LT TO STA. 1107+27 LT

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

SEE SHEET 198

DRAINAGE DETAILS

SEE SHEET 198

LEGEND:

PROPOSED WHEELCHAIR RAMP DETAIL # — X#

PLANT QUANTITY AND SPECIES — X / XX

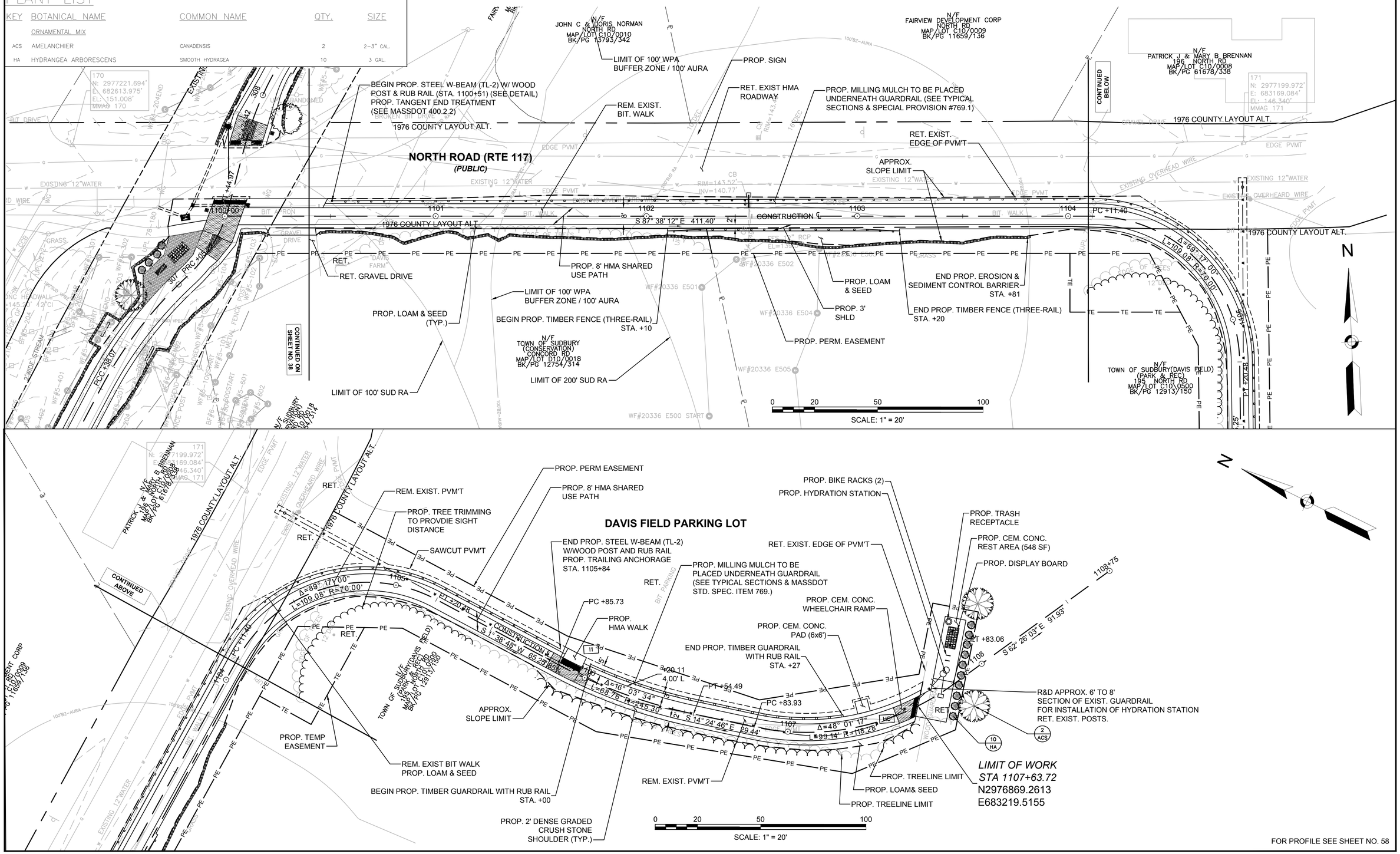
SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	43	316
PROJECT FILE NO.	608164		

CONSTRUCTION PLANS

PLANT LIST

KEY	BOTANICAL NAME	COMMON NAME	QTY.	SIZE
	ORNAMENTAL MIX			
ACS	AMELANCHIER	CANADENSIS	2	2–3" CAL.
HA	HYDRANGEA ARBORESCENS	SMOOTH HYDRAGEA	10	3 GAL.



FOR PROFILE SEE SHEET NO. 58

608164_HD(CONSTRUCTION PLANS).DWG Plotted on 22-Dec-2021 11:07 AM

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	47	316
PROJECT FILE NO.	608164		

PROFILES

608164_HD\PROFILES.DWG Plotted on 22-Dec-2021 11:11 AM

BEGINNING OF PROJECT
PROJ. NO. 608164
STA. 101+00.00
N 2957500.7922
E 677093.1169

GRADE BREAK STA = 101+00.00
ELEV = 137.19

PROP GRADE
EXIST GRADE
MCRT
0.70%

HIGH POINT ELEV = 138.45
HIGH POINT STA = 102+91.04
PVI STA = 103+00.00
PVI ELEV = 138.59
A.D. = -1.99%
K = 30.12
60' VC
262.68
PVC: 102+70 ELEV: 138.38
PVT: 103+30 ELEV: 138.20

-1.29%

LOW POINT ELEV = 136.17
LOW POINT STA = 105+03.37
PVI STA = 105+00.00
PVI ELEV = 136.00
A.D. = 2.33%
K = 25.79
60' VC
PVC: 104+70 ELEV: 136.39
PVT: 105+30 ELEV: 136.31

1.03%

GRADE BREAK STA = 107+00.00
ELEV = 138.06

0.70%

71 UNION AVE.
DRIVEWAY

GRADE BREAK STA = 108+51.65
ELEV = 139.13
GRADE BREAK STA = 108+83.67
ELEV = 139.18

0.72%
0.45%
2.57%

LOW POINT ELEV = 137.78
LOW POINT STA = 109+66.77
PVI STA = 109+50.00
PVI ELEV = 137.48
A.D. = 3.61%
K = 22.13
80' VC
PVC: 109+10 ELEV: 138.51
PVT: 109+90 ELEV: 137.90

1.05%

PVI STA = 111+00.00
PVI ELEV = 139.05
A.D. = 0.95%
K = 63.15
60' VC
PVC: 110+70 ELEV: 138.74
PVT: 111+30 ELEV: 139.65

GRADE BREAK STA = 108+68.68
ELEV = 139.25

BRUCE FREEMAN RAIL TRAIL

CONTINUED BELOW

EXISTING ELEV.
PROPOSED ELEV.

NAVD 88
BASE ELEV
110.00

100+00	101+00	102+00	103+00	104+00	105+00	106+00	107+00	108+00	109+00	110+00	111+00
137.3	137.2 / 137.19	137.3 / 137.54	137.2 / 137.89	137.4 / 138.24	137.4 / 138.44	137.5 / 137.94	137.4 / 137.29	137.4 / 136.65	137.5 / 136.17	137.7 / 136.52	137.9 / 137.03	138.2 / 137.55	138.3 / 138.06	138.4 / 138.42	138.6 / 138.76	139.1 / 139.12	138.5 / 138.76	138.7 / 137.84	139.0 / 138.00	139.0 / 138.53	139.2 / 139.13	139.1 / 140.05

Temp. Benchmark #6
Twisted Nail Set 1" up in Utility Pole
Elevation = 138.27'
Sta. 100+12.26, 25.35' RT

Temp. Benchmark #7
Geodetic Survey Disk 38F
Elevation = 135.85'
Sta. 104+87.43, 16.56' RT

Temp. Benchmark #8
Lag Screw Set 2' up in 18" Tree
Elevation = 140.44'
Sta. 110+33.40, 13.05' RT

FOR CONSTRUCTION PLANS SEE SHEET NO. 15, 16 & 17

HOR. SCALE IN FEET
40 0 40 80
8 0 8 16
VER. SCALE IN FEET

CONTINUED ON SHEET NO. 48

ELEV: 137.90

PVI STA = 111+00.00
PVI ELEV = 139.05
A.D. = 0.95%
K = 63.15
60' VC
PVC: 110+70 ELEV: 138.74
PVT: 111+30 ELEV: 139.65

1.05%
2.00%

HIGH POINT ELEV = 142.15
HIGH POINT STA = 112+80
PVI STA = 112+60.00
PVI ELEV = 142.25
A.D. = -2.40%
K = 25.00
60' VC
223.13
PVC: 112+30 ELEV: 141.65
PVT: 112+90 ELEV: 142.13

-0.40%

GRADE BREAK STA = 115+96.07
ELEV = 140.91
GRADE BREAK STA = 116+22.21
ELEV = 140.89

1.24%
1.39%

FLOODPLAIN ELEV 138.1

GRADE BREAK STA = 116+09.14
ELEV = 141.07

CODJER LANE

-0.50%

FLOODPLAIN ELEV 138.1

GRADE BREAK STA = 118+50.00
ELEV = 139.75

EXIST GRADE
PROP GRADE
0.15%

BRUCE FREEMAN RAIL TRAIL

CONTINUED ABOVE

EXISTING ELEV.
PROPOSED ELEV.

NAVD 88
BASE ELEV
110.00

10+00	111+00	112+00	113+00	114+00	115+00	116+00	117+00	118+00	119+00	120+00	121+00	122+00	123+00
139.0 / 138.00	139.0 / 138.53	139.2 / 139.13	139.1 / 140.05	139.3 / 141.05	139.4 / 141.97	139.5 / 142.09	139.6 / 141.89	140.0 / 141.89	139.7 / 141.49	139.9 / 141.29	140.1 / 141.09	141.0 / 140.96	140.5 / 140.75	140.4 / 140.50	140.4 / 140.25	140.5 / 140.00	140.6 / 139.75	140.7 / 139.83	140.8 / 139.90	140.9 / 139.98	141.1 / 140.05	141.3 / 140.13	141.4 / 140.20	141.4 / 140.28	141.4 / 140.35	141.5 / 140.43

Temp. Benchmark #8
Lag Screw Set 2' up in 18" Tree
Elevation = 140.44'
Sta. 110+33.40, 13.05' RT

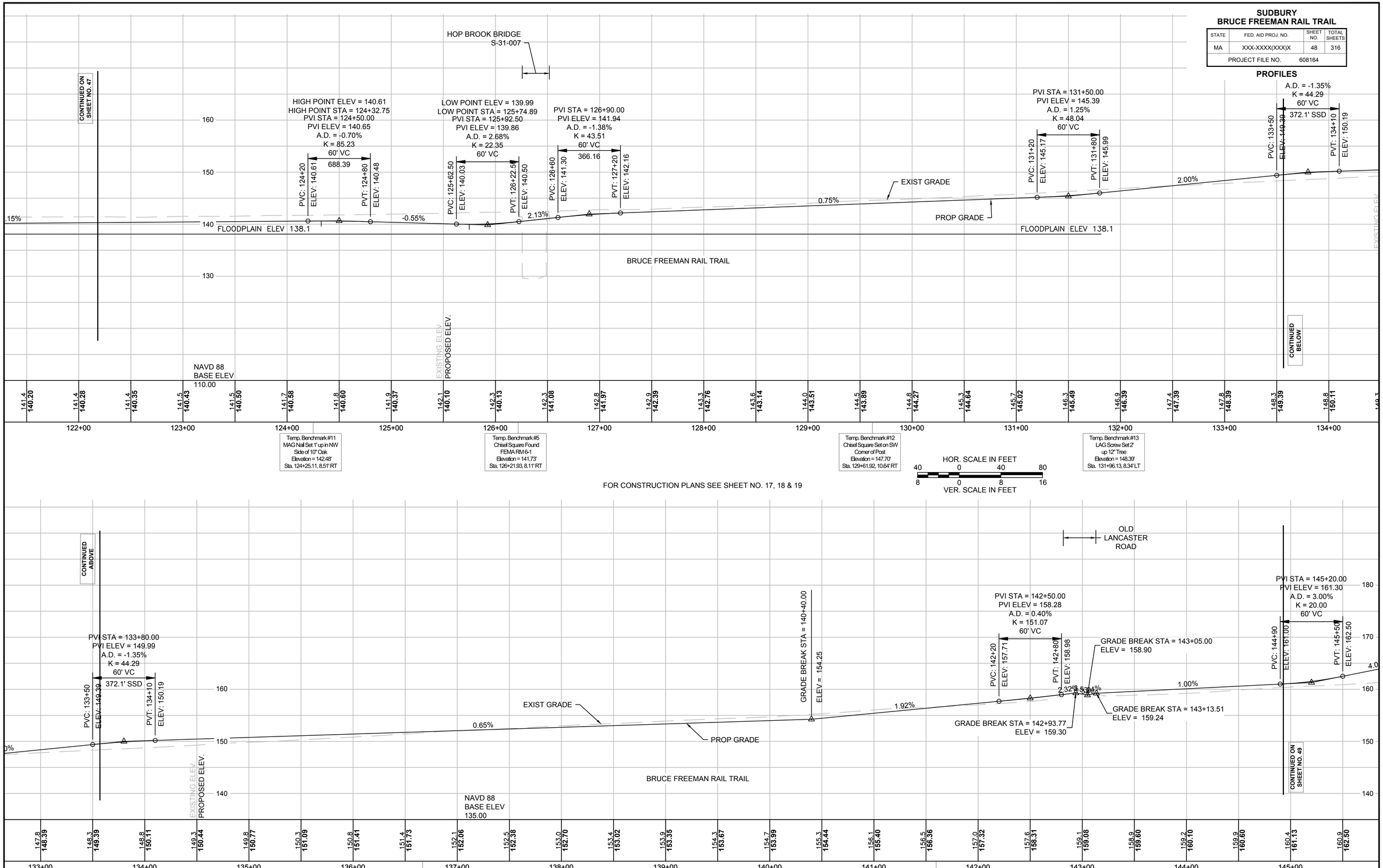
Temp. Benchmark #9
Spike 1" up Utility Pole 15
Elevation = 142.40'
Sta. 116+04.61, 38.71' LT

Temp. Benchmark #10
X-Cut on Metal Post
Elevation = 141.71'
Sta. 119+88.84, 13.04' RT

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	48	316
PROJECT FILE NO.	608164		

PROFILES



FOR CONSTRUCTION PLANS SEE SHEET NO. 17, 18 & 19

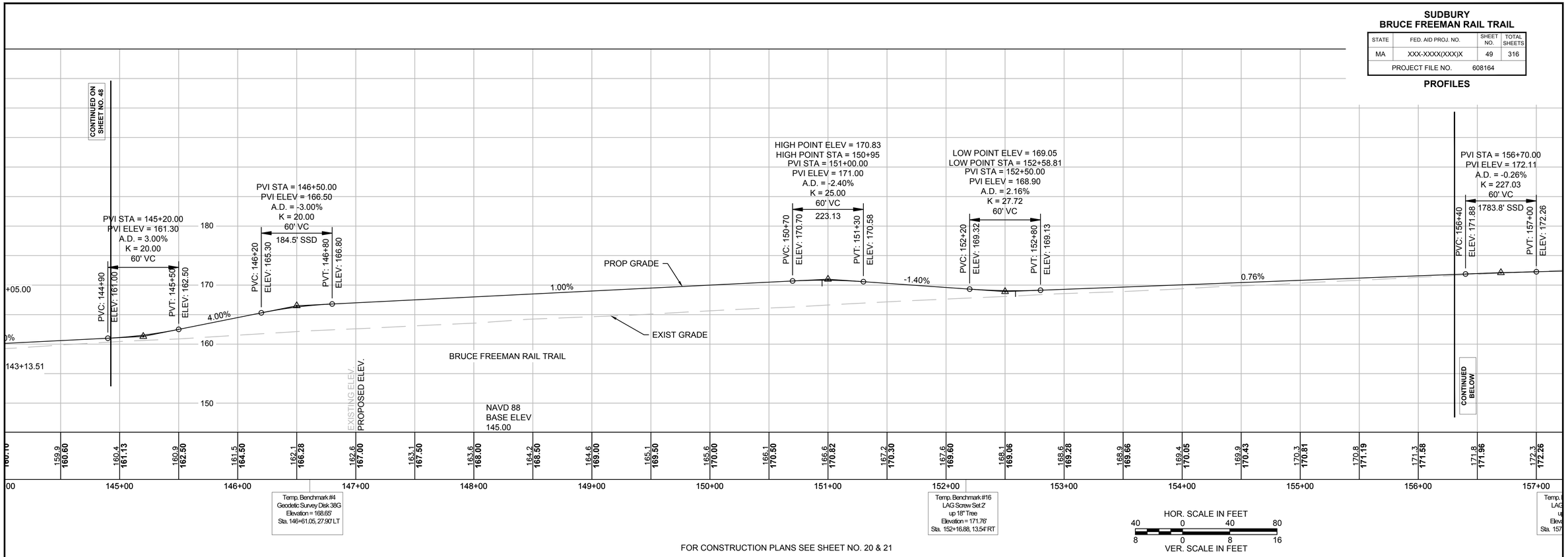
HOR. SCALE IN FEET
40 0 40 80
VER. SCALE IN FEET
8 0 8 16

SUDBURY
BRUCE FREEMAN RAIL TRAIL

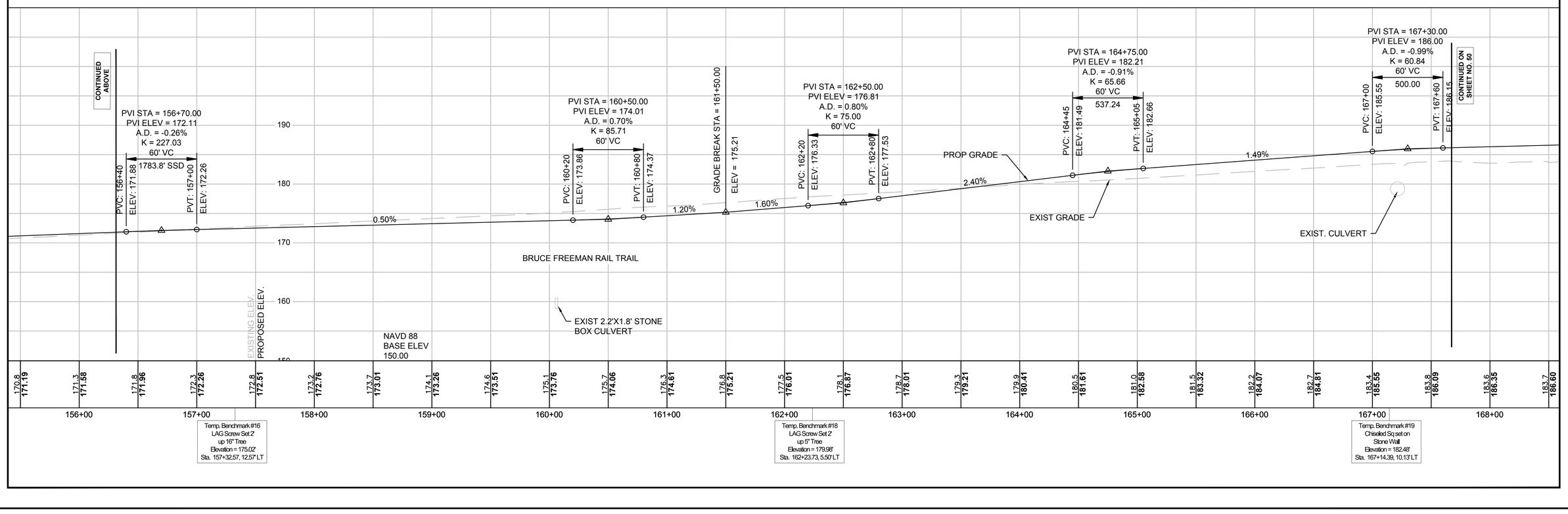
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	49	316
PROJECT FILE NO.	608164		

PROFILES

608164_HD\PROFILES\.DWG Plotted on 22-Dec-2021 11:11 AM



FOR CONSTRUCTION PLANS SEE SHEET NO. 20 & 21



SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	50	316
PROJECT FILE NO.	608164		

PROFILES

608164_HD(PROFILES).DWG Plotted on 22-Dec-2021 11:11 AM

HUDSON ROAD

PVI STA = 167+39.00
PVI ELEV = 186.09
A.D. = -0.99%
K = 60.84
60' VC
500.00

PVC: 167+00
ELEV: 185.55

PVT: 167+60
ELEV: 186.15

CONTINUED SHEET NO. 49

PVI STA = 172+00.00
PVI ELEV = 188.35
A.D. = 1.00%
K = 59.93
60' VC

PVC: 171+70
ELEV: 188.20

PVT: 172+30
ELEV: 188.80

PVI STA = 174+20.00
PVI ELEV = 191.65
A.D. = -1.00%
K = 59.93
60' VC
493.00

PVC: 173+90
ELEV: 191.20

PVT: 174+50
ELEV: 191.80

PROP GRADE

EXIST GRADE

BRUCE FREEMAN RAIL TRAIL

0.50%
1.50%
0.50%
-5.00%
-1.50%
2.52%
3.00%
-0.70%

GRADE BREAK STA = 174+92.00
ELEV = 192.01

GRADE BREAK STA = 175+02.00
ELEV = 191.86

GRADE BREAK STA = 175+10.00
ELEV = 191.46

GRADE BREAK STA = 175+35.50
ELEV = 192.11

GRADE BREAK STA = 175+53.00
ELEV = 191.58

CONTINUED BELOW

VERT

200
190
180
170

EXISTING ELEV.
PROPOSED ELEV.

NAVD 88
BASE ELEV
150.00

167+00	168+00	169+00	170+00	171+00	172+00	173+00	174+00	175+00	176+00	177+00	178+00	179+00
183.4 / 185.55	183.8 / 186.09	183.6 / 186.35	183.7 / 186.60	184.3 / 186.85	184.9 / 187.10	186.2 / 187.35	186.7 / 187.60	187.3 / 187.85	186.7 / 188.10	186.9 / 188.43	187.3 / 189.10	187.6 / 189.85	188.3 / 190.60	189.9 / 191.34	190.3 / 191.80	191.4 / 191.89	191.7 / 191.67	191.0 / 191.25	190.2 / 190.90	189.6 / 190.55	189.2 / 190.20	188.9 / 189.84	188.4 / 189.49	188.0 / 189.14	187.5 / 188.79

Temp. Benchmark #19
Chiseled Sq set on
Stone Wall
Elevation = 182.48'
Sta. 167+14.39, 10.13' LT

Temp. Benchmark #20
Chiseled Sq set on
Boulder
Elevation = 190.04'
Sta. 172+54.34, 24.71' LT

Temp. Benchmark #2246
Drill Hole set in Bolt Over
Fire Hydrant's Main Outlet
Elevation = 191.27'
Sta. 175+03.09, 35.32' RT

Temp. Benchmark #21
LAG Screw set 2'
up 10" Tree
Elevation = 190.30'
Sta. 177+93.51, 10.98' RT

HOR. SCALE IN FEET
40 0 40 80
VER. SCALE IN FEET
8 0 8 16

FOR CONSTRUCTION PLANS SEE SHEET NO. 21, 22, 23 & 24

CONTINUED ABOVE

PARKINSON'S LOT
ACCESS PATH

PROP GRADE

EXIST GRADE

-0.70%

BRUCE FREEMAN RAIL TRAIL

CONTINUED ON SHEET NO. 51

200
190
180
170
160

EXISTING ELEV.
PROPOSED ELEV.

NAVD 88
BASE ELEV
155.00

179+00	180+00	181+00	182+00	183+00	184+00	185+00	186+00	187+00	188+00	189+00	190+00	191+00
188.4 / 189.49	188.0 / 189.14	187.5 / 188.79	187.0 / 188.44	186.6 / 188.08	186.2 / 187.73	185.9 / 187.38	185.5 / 187.03	185.2 / 186.68	184.9 / 186.33	184.6 / 185.97	184.3 / 185.62	183.9 / 185.27	183.6 / 184.92	183.1 / 184.57	182.9 / 184.22	182.6 / 183.86	182.2 / 183.51	181.9 / 183.16	181.6 / 182.81	181.2 / 182.46	180.8 / 182.10	180.5 / 181.75	180.2 / 181.40	180.0 / 181.05	179.5 / 180.70

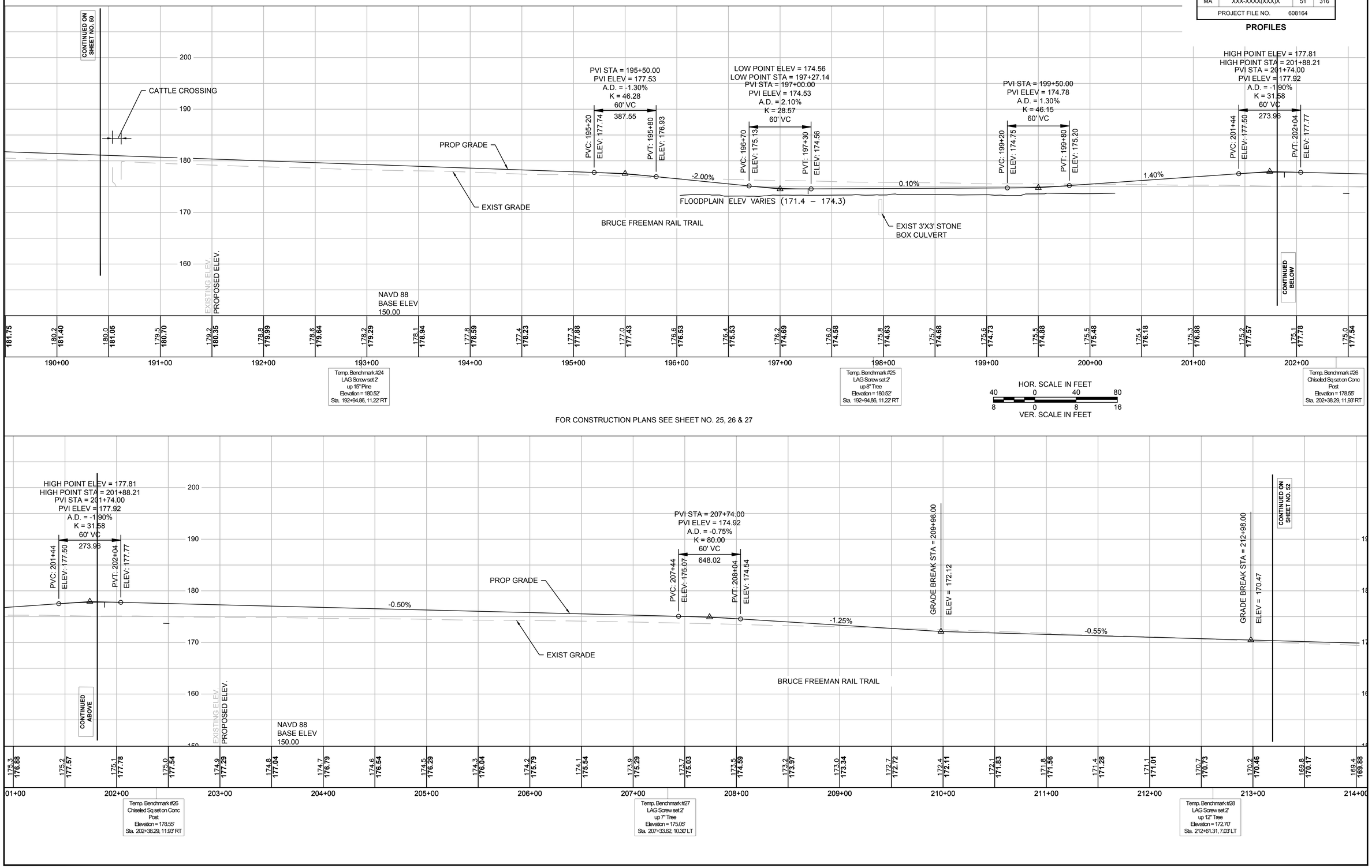
Temp. Benchmark #22
LAG Screw set 2'
up 9" Tree
Elevation = 190.30'
Sta. 182+99.09, 11.95' LT

Temp. Benchmark #23
LAG Screw set 2'
up 5" Pine
Elevation = 183.80'
Sta. 188+05.41, 2.53' LT

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	51	316
PROJECT FILE NO.	608164		

PROFILES

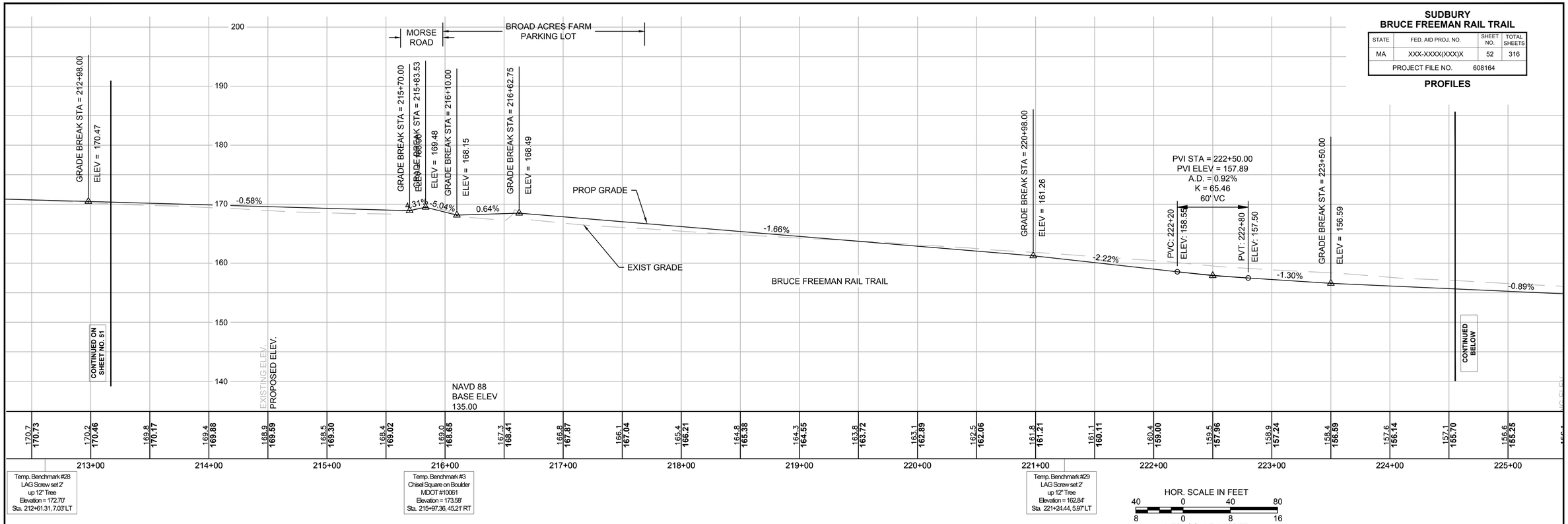


FOR CONSTRUCTION PLANS SEE SHEET NO. 25, 26 & 27

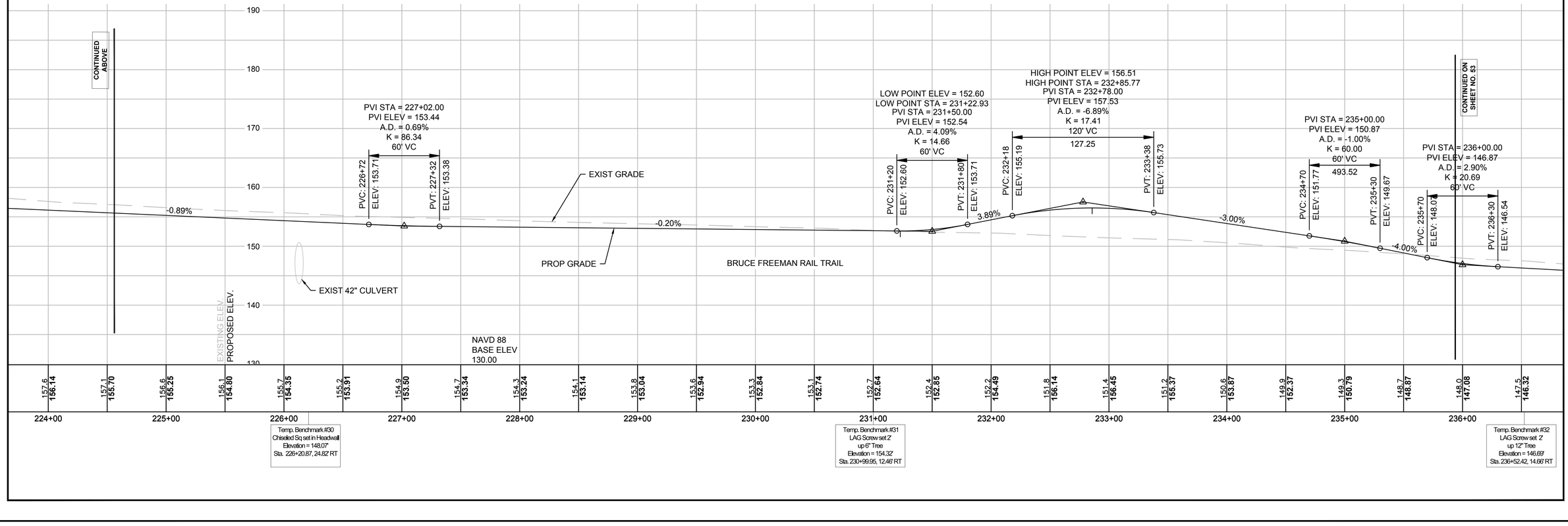
SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	52	316
PROJECT FILE NO.	608164		

PROFILES



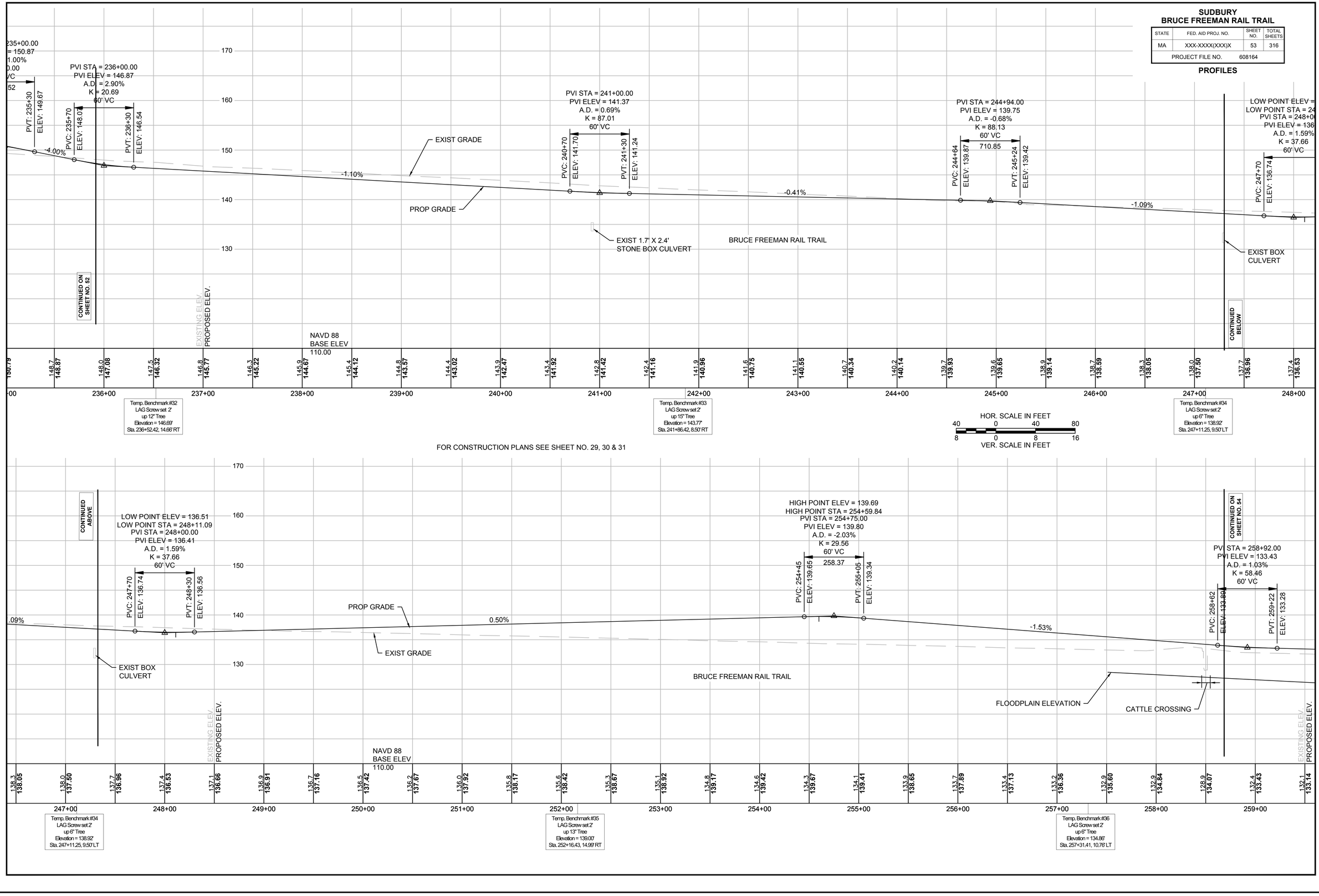
FOR CONSTRUCTION PLANS SEE SHEET NO. 27, 28 & 29



SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	53	316
PROJECT FILE NO.	608164		

PROFILES



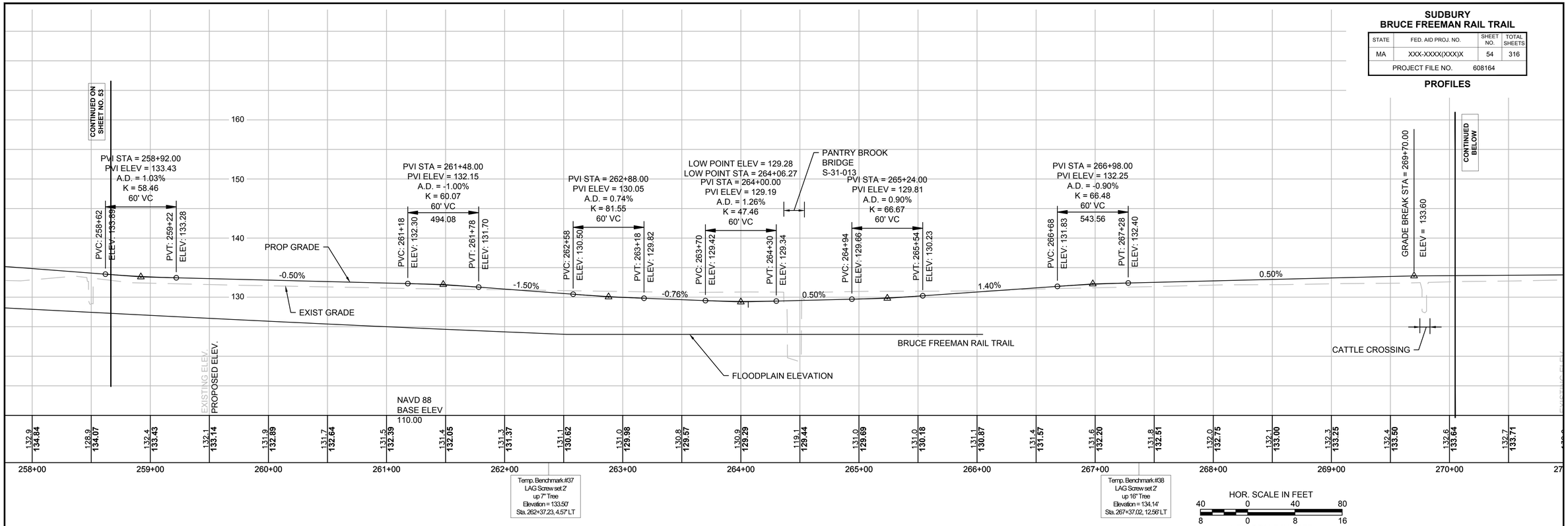
FOR CONSTRUCTION PLANS SEE SHEET NO. 29, 30 & 31

SUDBURY
BRUCE FREEMAN RAIL TRAIL

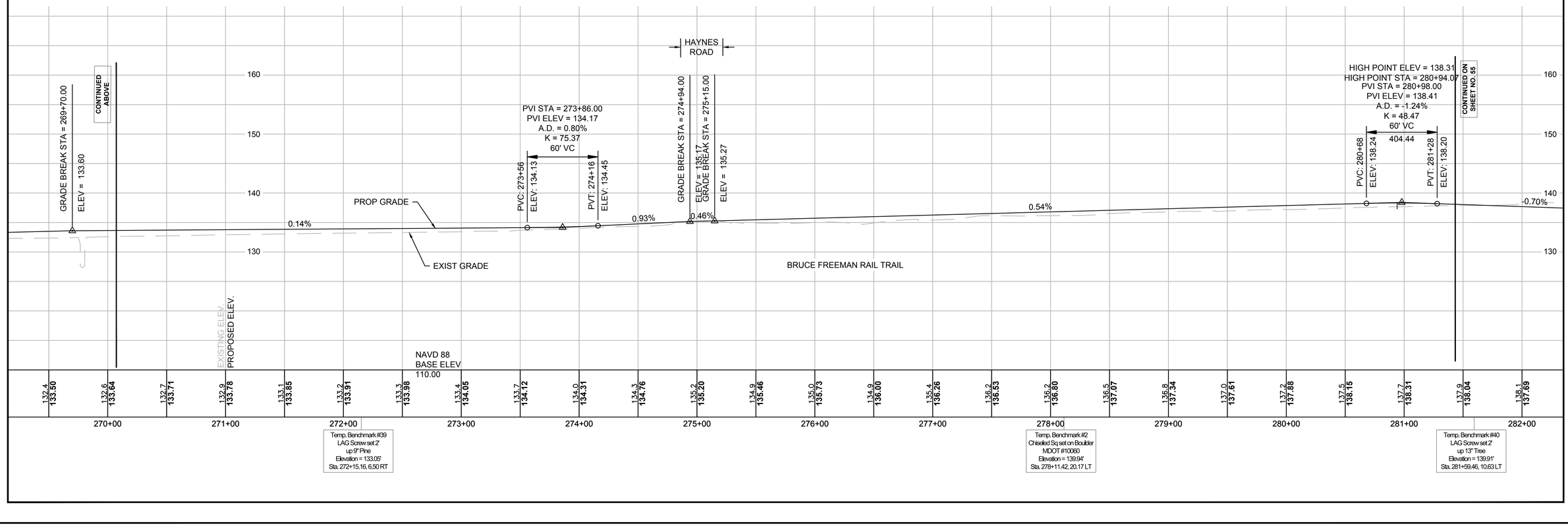
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	54	316
PROJECT FILE NO.	608164		

PROFILES

608164_HD(PROFILES).DWG Plotted on 22-Dec-2021 11:12 AM



FOR CONSTRUCTION PLANS SEE SHEET NO. 31, 32, 33 & 34

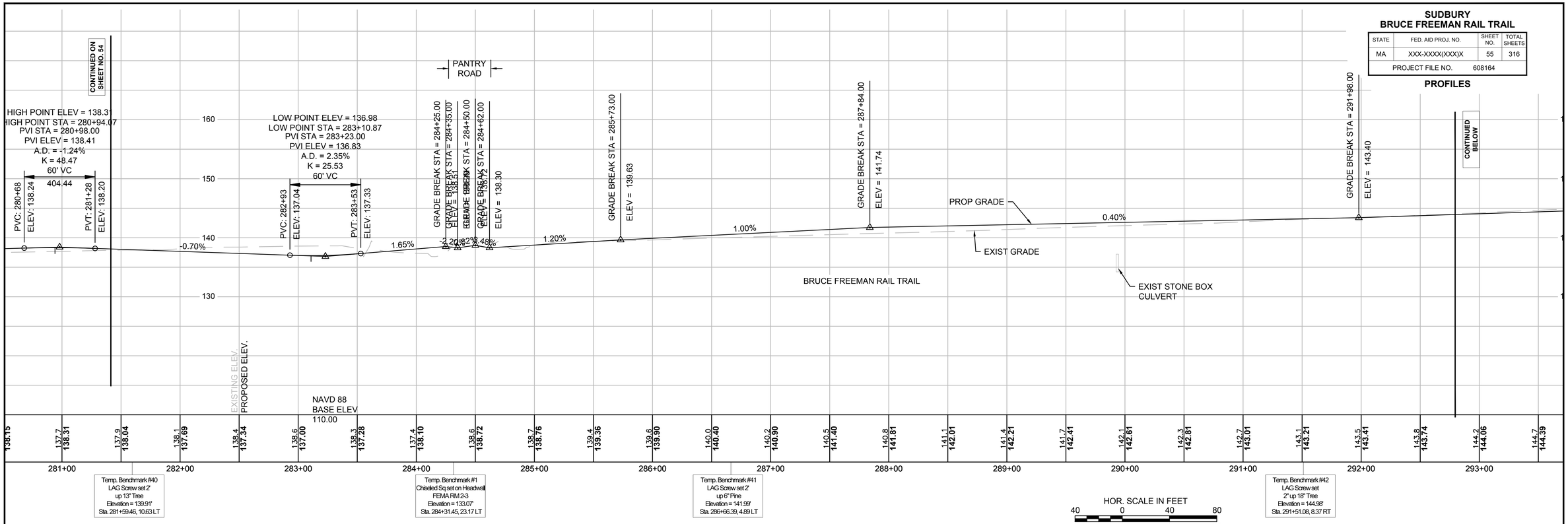


SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	55	316
PROJECT FILE NO.	608164		

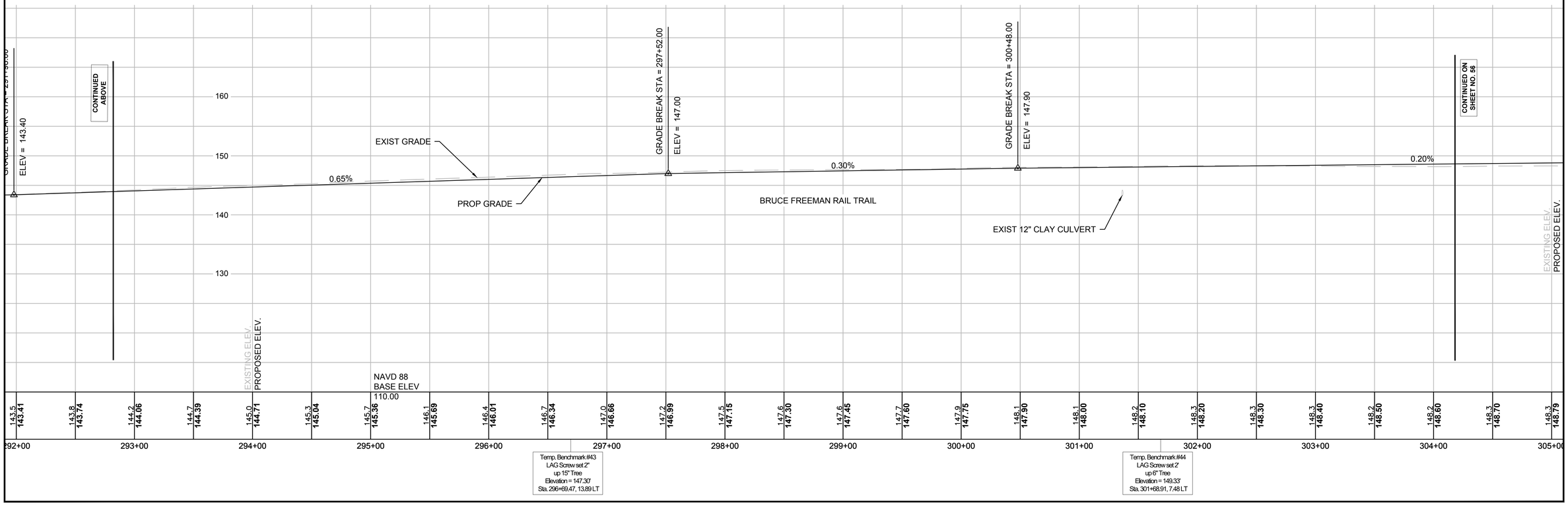
PROFILES

608164_HD(PROFILES).DWG Plotted on 22-Dec-2021 11:12 AM



FOR CONSTRUCTION PLANS SEE SHEET NO. 34, 35, 36 & 37

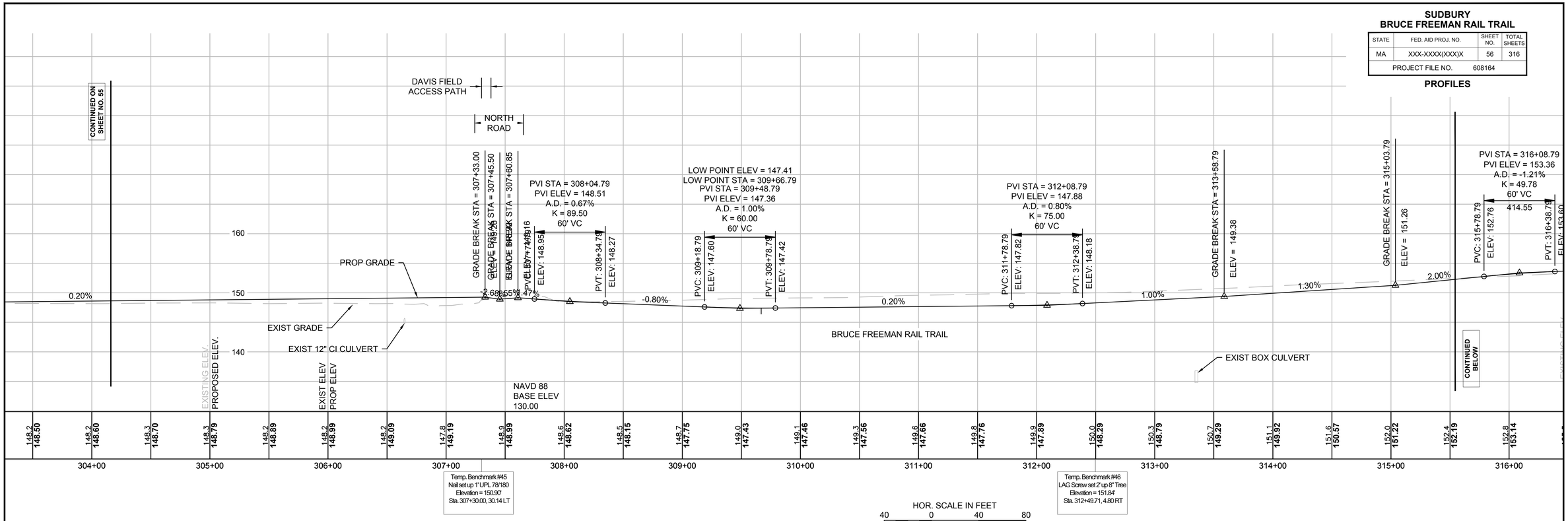
HOR. SCALE IN FEET
40 0 40 80
VER. SCALE IN FEET
8 0 8 16



SUDBURY
BRUCE FREEMAN RAIL TRAIL

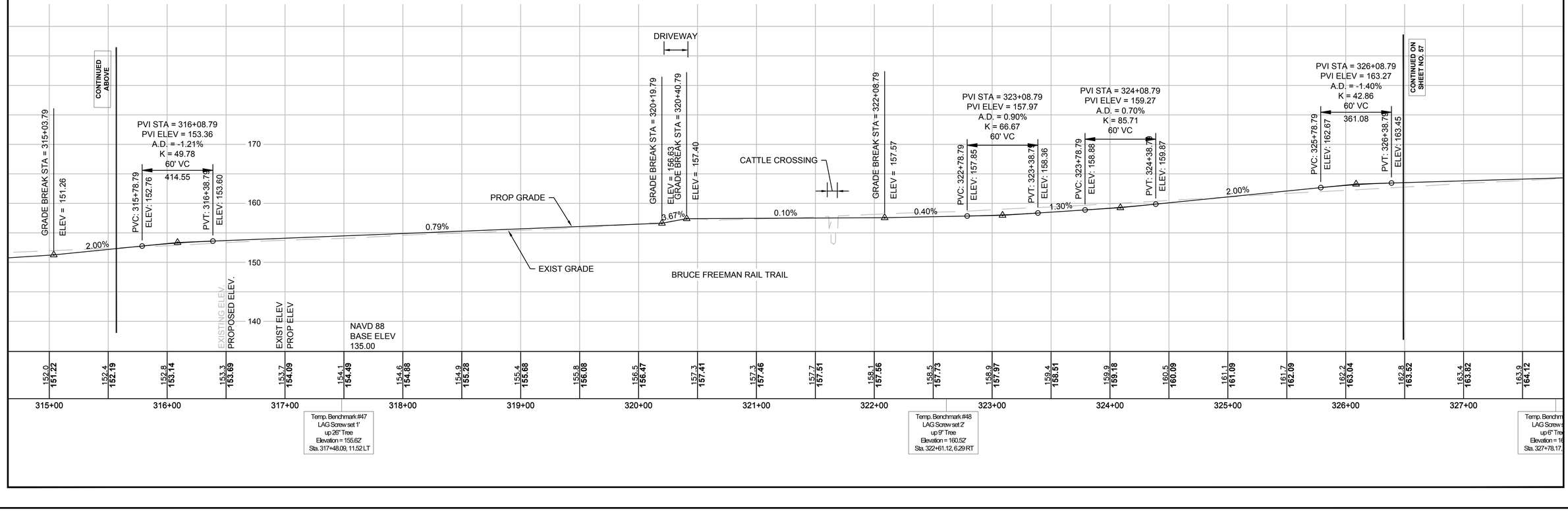
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	56	316
PROJECT FILE NO.	608164		

PROFILES



HOR. SCALE IN FEET
40 0 40 80
8 0 8 16
VER. SCALE IN FEET

FOR CONSTRUCTION PLANS SEE SHEET NO. 37, 38, 39 & 40

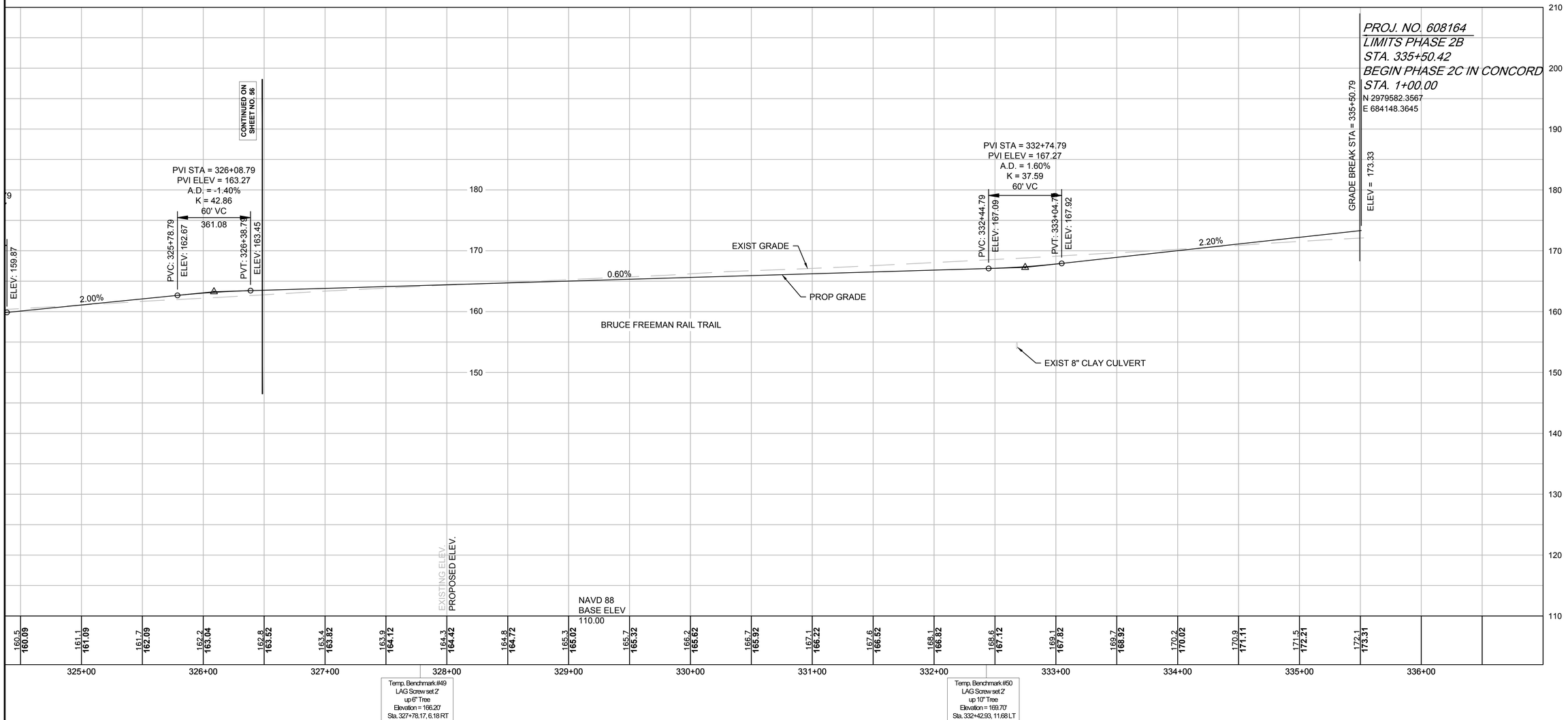


SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	57	316
PROJECT FILE NO.	608164		

PROFILES

608164_HD(PROFILES).DWG Plotted on 22-Dec-2021 11:13 AM



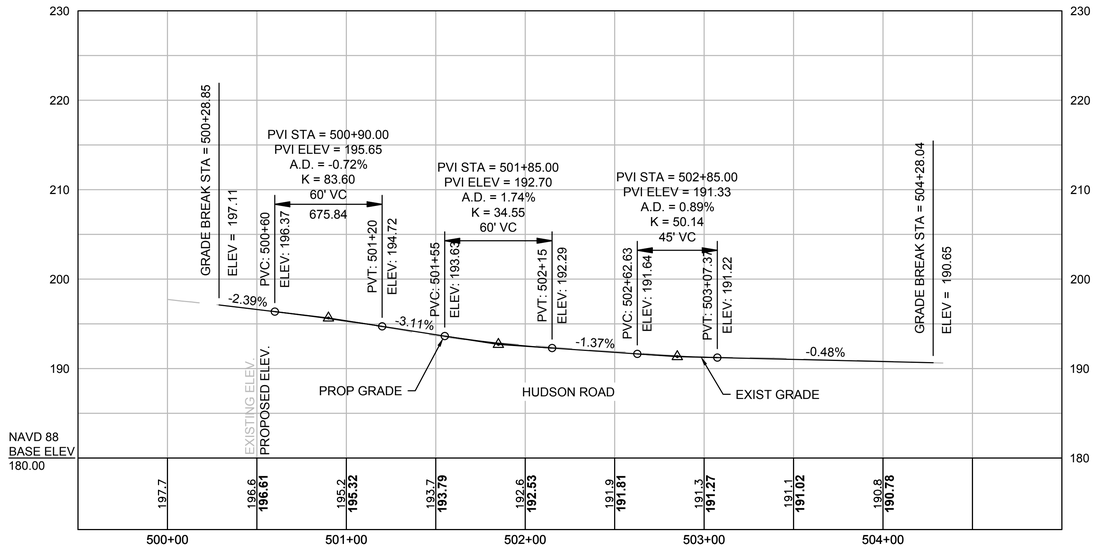
HOR. SCALE IN FEET
40 0 40 80
8 0 8 16
VER. SCALE IN FEET

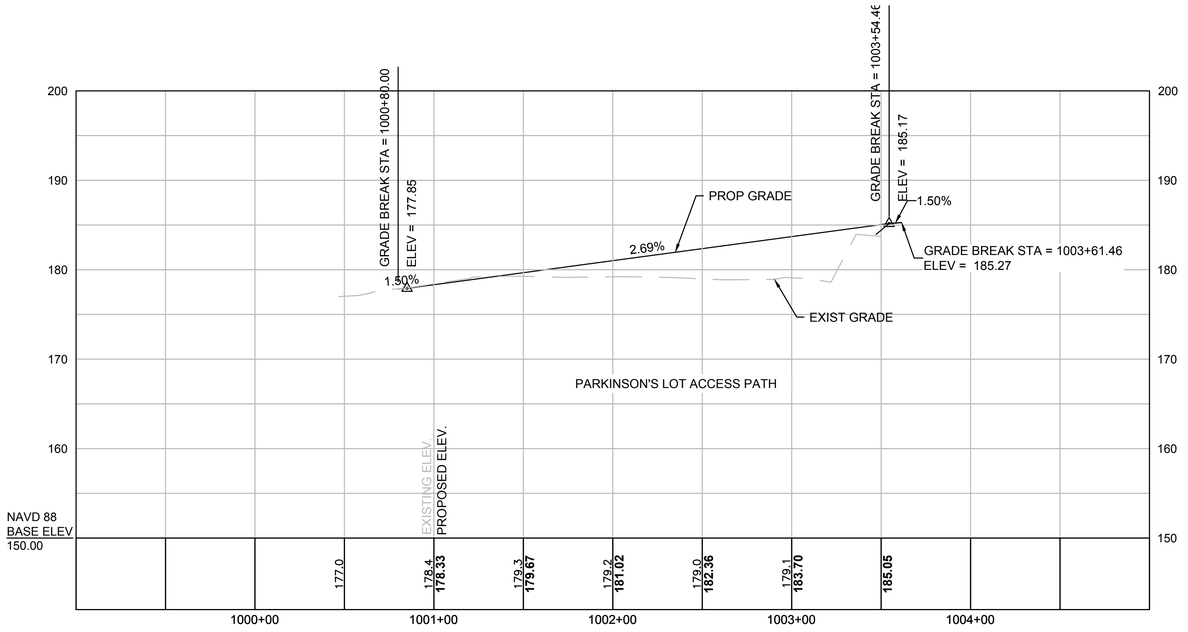
FOR CONSTRUCTION PLANS SEE SHEET NO. 40 & 41

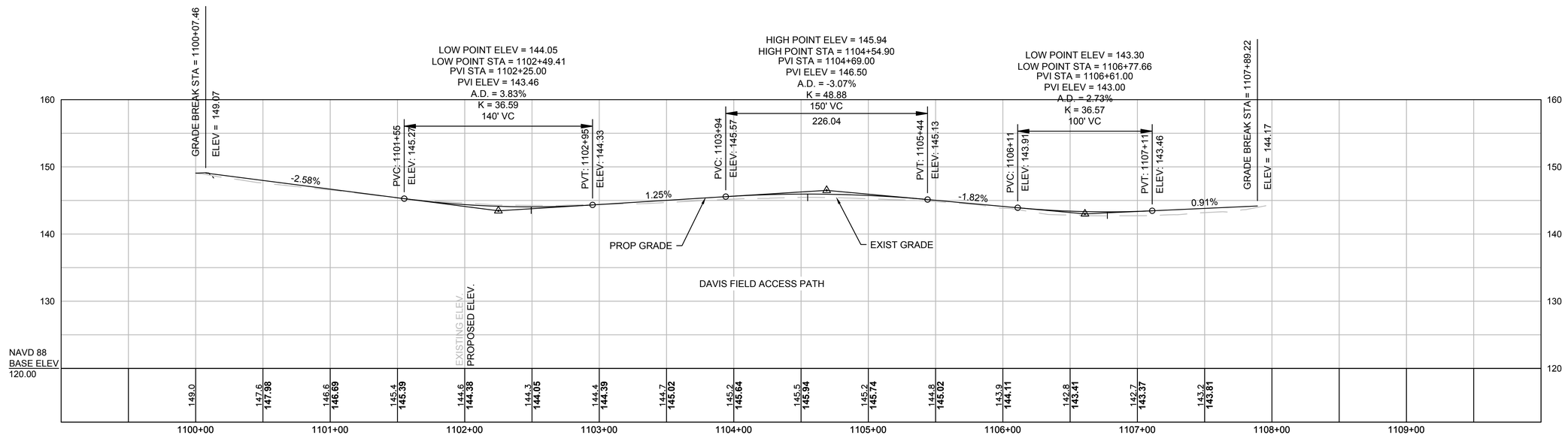
SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	58	316
PROJECT FILE NO.	608164		

PROFILES







HOR. SCALE IN FEET
40 0 40 80
8 0 8 16
VER. SCALE IN FEET

FOR CONSTRUCTION PLANS SEE SHEET NO. 42 & 43

608164_HD(PROFILES).DWG Plotted on 22-Dec-2021 11:13 AM

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	94	316
PROJECT FILE NO.	608164		

GRADING PLANS

608164_HD(GRADING PLANS).DWG Plotted on 22-Dec-2021 11:17 AM

BEGINNING OF PROJECT
PROJ. NO. 608164
STA. 101+00.00
N 2957500.7922
E 677093.1169

N/F CHISWICK PARK LLC & PARIS TRUST LLC
0 UNION AVE
MAP/LOT K08/0057
BK/PG 70761/297

MASS BAY TRANSPORTATION AUTHORITY
VAL MAP V5, SHEETS 14–19
JUNE 30, 1914 LAYOUT BY BOSTON AND MAINE R.R.
DEED BOOK 13117, PAGE 113

MASSDOT–RAIL AND TRANSIT DIVISION
JUNE 30, 1915 LAYOUT BY OLD COLONY R.R CO.
DEED BOOK 14836, PAGE 507 CONFIRMATORY TAKING IN DEED BOOK 64110, PAGE 80

33
N: 2957462.315'
E: 677078.820'
EL: 137.030'
MRRS

EXISTING RR LAYOUT LINE

N/F LAURA B MCCARTHY & ALL TRUSTEES OF THE CAS TRUST
UNION AVE
MAP/LOT K08/0055
BK/PG 26825/536

36
N: 2957795.962'
E: 677200.899'
EL: 137.410'
MRRS

CONTINUED BELOW

N/F TOWN OF SUDBURY
RAILWAY
MAP/LOT K08/5200
BK/PG 46226/26

EDGE PVMT
RAILROAD TRACKS
WOOD WALL
TENT
BIT PARKING
SINGLE RAIL
DOUBLE RAIL
METAL POST
WOOD POST

BENCHMARK: #9
TWISTED NAIL SET 1' UP UPL
EL=138.27'

2 STORY
WOOD FRAME BUILDING
"THE PERFORMING ARTS CONNECTION"

N/F CHISWICK PARK LLC & PARIS TRUST LLC
39 UNION AVE
MAP/LOT K08/0053
BK/PG 70761/304

MASSDOT–RAIL AND TRANSIT DIVISION
VAL MAP V7:38–39 SHEET 5, V7.39 SHEETS 6–10
JUNE 30, 1915 LAYOUT BY OLD COLONY R.R CO.
DEED BOOK 14836, PAGE 507
CONFIRMATORY TAKING IN DEED BOOK 64110, PAGE 80

BENCHMARK: #7
GEODETIC SURVEY DISK 38F FND
EL=135.85'

N/F TUCKER PROPERTIES LLC
57 UNION AVE
MAP/LOT K08/0052
BK/PG 53165/224

0 20 50 100
SCALE: 1" = 20'

37
N: 2958018.588'
E: 677254.404'
EL: 138.040'
MRRS

38
N: 2958224.312'
E: 677293.950'
EL: 139.120'

71 UNION AVE (DRIVEWAY)

CONTINUED ABOVE

CONTINUED ON SHEET NO. 95

EXISTING RR LAYOUT LINE

PC +64.78
PT +11.69
1.53%
2.57%

BIT PARKING
WOOD FENCE
CONC BLOCK BUILDING
"METHODS MACHINE TOOLS"
BITUMINOUS PARKING LOT
WOODED

N/F SCOTT A MCLVER
TRUSTEE OF MACOT REALTY TRUST
71 UNION AVE
MAP/LOT K08/0087
BK/PG 63090–389

N/F SCOTT A MCLVER
TRUSTEE OF MACOT REALTY TRUST
65 UNION AVE
MAP/LOT K08/0051
BK/PG 63090–389

BENCHMARK: #8
LAG SCREW SET 2' UP 18"TREE
EL=140.44'

N/F TUCKER PROPERTIES LLC
75 UNION AVE
MAP/LOT K08/0050

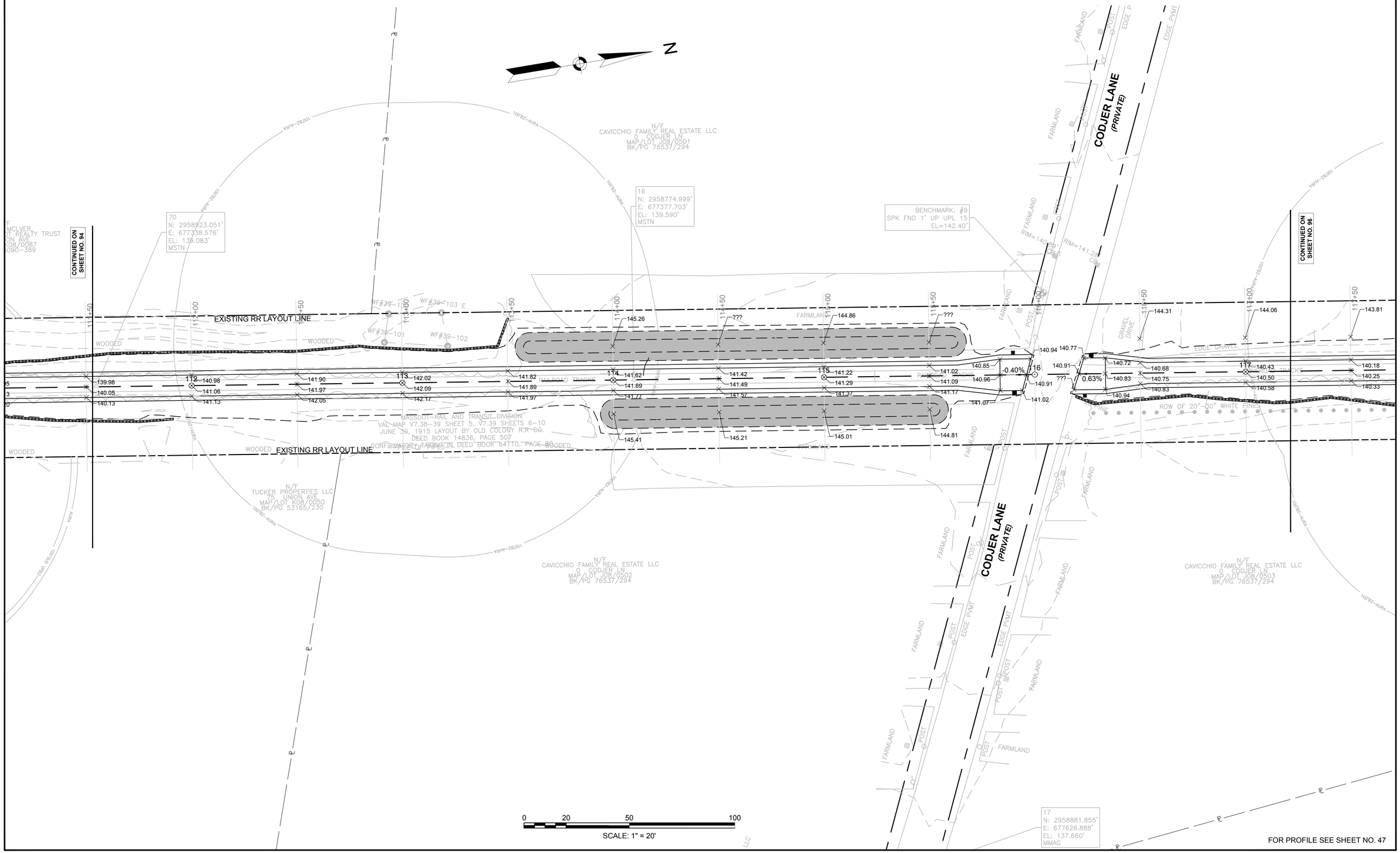
0 20 50 100
SCALE: 1" = 20'

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	95	316
PROJECT FILE NO.	608164		

GRADING PLANS

608164_HD\GRADING PLANS\.DWG Plotted on 22-Dec-2021 11:17 AM



SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	96	316
PROJECT FILE NO. 608164			

GRADING PLANS

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	97	316
PROJECT FILE NO.	608164		

GRADING PLANS

608164_HD(GRADING PLANS).DWG Plotted on 22-Dec-2021 11:18 AM

CONTINUED ON SHEET NO. 96

CONTINUED BELOW

CONTINUED ABOVE

CONTINUED ON SHEET NO. 98

EXISTING RR LAYOUT LINE

EXISTING RR LAYOUT LINE

WIRE FENCE

WIRE FENCE

RAILROAD TRACKS

RAILROAD TRACKS

MASSDOT-RAIL AND TRANSIT DIVISION
VAL MAP V7.38-39 SHEET 5, V7.39 SHEETS 6-10
JUNE 30, 1915 LAYOUT BY OLD COLONY R.R CO.
DEED BOOK 14836, PAGE 507
CONFIRMATORY TAKING IN DEED BOOK 64110, PAGE 80

MASSDOT-RAIL AND TRANSIT DIVISION
VAL MAP V7.38-39 SHEET 5, V7.39 SHEETS 6-10
JUNE 30, 1915 LAYOUT BY OLD COLONY R.R CO.
DEED BOOK 14836, PAGE 507
CONFIRMATORY TAKING IN DEED BOOK 64110, PAGE 80

31
N: 2960273.082'
E: 677605.272'
EL: 144.190'
MIPE

30
N: 2960507.816'
E: 677642.357'
EL: 146.448'
MIPE

29
N: 2960745.914'
E: 677683.047'
EL: 148.888'
MIPE

28
N: 2961029.110'
E: 677723.108'
EL: 152.069'
MIPE

27
N: 2961295.
E: 677768.
EL: 154.5
MIPE

WASH BROOK RD
MAP/LOT J08/0002
BK/PG 12668/388

N/F
MICHAEL & JEAN CUNNINGHAM
3 WASH BROOK RD
MAP/LOT J08/0311
BK/PG 49974/258

N/F
LAWRENCE A WIND & CHRISTINE E TUCKER
4 WASH BROOK RD
MAP/LOT J08/0309
BK/PG 65979/59

N/F
JANE HIGHTOWER RODDY
22 GERRY DR
MAP/LOT J08/0308
BK/PG 28295/180

N/F
DAVID B & CAROLE E PENDLETON
41 MEADOW DR
MAP/LOT J08/0011
BK/PG 32089/419

N/F
GREGORY A GEORGE & CHRISTINE CARLO
39 MEADOW DR
MAP/LOT J08/0116
BK/PG 57353/44

N/F
KEVIN MICHAEL KRAUSS & JODI LUCY
35 MEADOW DR
MAP/LOT J08/0115
BK/PG 58399/177

N/F
KEVIN MICHAEL KRAUSS & JODI LUCY
35 MEADOW DR
MAP/LOT J08/0115
BK/PG 58399/177

N/F
JAMES C LEU JR & TRACY GEHAN
29 MEADOW DR
MAP/LOT J08/0114
BK/PG 24771/298

N/F
DANIEL P HARTY
25 MEADOW DR
MAP/LOT J08/0113
BK/PG 14674/367

N/F
ALICIA ARKIN
17 MEADOW DR
BK/PG 70124/

N/F
MARK J LANZA & MARY ELIZABETH LOUSA
11 MEADOW DR
MAP/LOT J08/0111
BK/PG 45671/478

BENCHMARK: #12
CHISEL SQUARE SET ON
SW COR. OF POST
EL=147.70'

BENCHMARK: #13
LAG SCREW SET 2' UP 12"TREE
EL=148.39'

BENCHMARK: #14
LAG SCREW SET 2' UP 8"TREE
EL=153.56'

	128	129	130	131	132	133	134
	142.85	143.21	143.59	144.19	144.57	144.94	145.41	146.32	147.32	148.32	149.32	150.04
	142.76	143.14	143.51	144.27	144.64	145.02	145.49	146.39	147.39	148.39	149.39	150.11
	142.69	143.06	143.44	144.34	144.72	145.09	145.56	146.47	147.47	148.47	149.47	150.18

	134	135	136	137	138	139	140
	149.32	150.04	150.37	150.69	151.01	151.34	151.66	151.98	152.30	152.63	152.95	153.27	153.60	153.
	149.39	150.11	150.44	150.77	151.09	151.41	151.73	152.05	152.38	152.70	153.02	153.35	153.67	153.
	149.47	150.18	150.52	150.84	151.16	151.49	151.81	152.13	152.45	152.78	153.10	153.42	153.74	154.

SCALE: 1" = 20'

SCALE: 1" = 20'

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	98	316
PROJECT FILE NO.	608164		

GRADING PLANS

608164_HD\GRADING PLANS\.DWG Plotted on 22-Dec-2021 11:18 AM

N

BENCHMARK: #66-11
PK FOUND 1" UP IN UP
EL=158.55'

2
N: 2961684.439'
E: 677666.655'
EL: 156.229'
MMAG

27
N: 2961298.692'
E: 677768.067'
EL: 154.519'
MIPE

3
N: 2961644.458'
E: 677817.347'
EL: 159.339'
MMAG

BENCHMARK: #15
LAG NAIL SET 2' UP 10"TREE
EL=158.72'

OLD LANCASTER ROAD
(PUBLIC)
1971 TOWN LAYOUT

EXISTING RR LAYOUT LINE

N/F
CHERYL JONES
233 OLD LANCASTER RD
MAP/LOT J08/0301
BK/PG 33438/39

N/F
ADRIAN G & MELINDA J DAVIES
14 GERRY DR
MAP/LOT J08/0307
BK/PG 38355/267

N/F
CHONG M & WAI-WAI CHO
236 OLD LANCASTER RD
MAP/LOT J08/0011
BK/PG 45903/31

N/F
MARK J LANZA & MARY ELIZABETH LOUSA
11 MEADOW DR
MAP/LOT J08/0111
BK/PG 45671/478

N/F
MICHAEL W KREBS & BARBARA P
223 OLD LANCASTER RD
MAP/LOT J08/0101
BK/PG 13427/420

N/F
MARCELLO C SANTANA
226 OLD LANCASTER RD
MAP/LOT H08/0045
BK/PG 75814/51

N/F
JOSHUA R & VICTORIA A BARIBEAU
219 OLD LANCASTER RD
MAP/LOT J08/0102
BK/PG 55651/169

N/F
MATTHEW P & KENDRA H DOYON
220 OLD LANCASTER RD
MAP/LOT J08/0012
BK/PG 71208/253

RAILROAD LAND
VAL MAP V7.38-39 SHEET 6, V7.39 SHEETS 6-10
JUNE 30, 1915 LAYOUT BY OLD COLONY R.R. CO.
DEED BOOK 14835, PAGE 507
CONFIRMATORY TAKING IN DEED BOOK 64110, PAGE 80

PC +75.77
1.92%
3.33%

SEE TYPICAL SECTIONS & CROSS SECTIONS FOR FORMATION OF SWALES (TYP.)

CONTINUED ON SHEET NO. 97
CONTINUED ON SHEET NO. 99

0 20 50 100
SCALE: 1" = 20'

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	99	316
PROJECT FILE NO.	608164		

GRADING PLANS

608164_HD(GRADING PLANS).DWG Plotted on 22-Dec-2021 11:18 AM

CONTINUED ON SHEET NO. 98

SEE TYPICAL SECTIONS & CROSS SECTIONS FOR FORMATION OF SWALES (TYP.)

N/F
CHONG M & WAI-WAI CHO
236 OLD LANCASTER RD
MAP/LOT H08/0011
BK/PG 45903/51

N/F
JAMES C & MELANIE B WEAVER
248 OLD LANCASTER RD
MAP/LOT H08/0008
BK/PG 12967/255

BENCHMARK: #4
GEODETIC SURVEY DISK 38G FND
EL=168.65'

MASSDOT-RAIL AND TRANSIT DIVISION
VAL MAP V7.38-39 SHEETS 5, V7.39 SHEETS 5-10
JUNE 30, 1915 LAYOUT BY OLD COLONY R.R CO.
DEED BOOK T4836, PAGE 507
CONFIRMATORY TAKING IN DEED BOOK 64110, PAGE 80

EXISTING RR LAYOUT LINE

42
N: 2962297.138'
E: 678008.767'
EL: 165.774'
MRRS

CONTINUED BELOW

100'BZ-AURA

WIRE FENCE

RAILROAD TRACKS

SWALE

41
N: 2961940.959'
E: 677885.396'
EL: 161.734'
MRRS

PT +83.66

N/F
BRUCE OSTAR
31 PENNYMEADOW RD
MAP/LOT H08/0313
BK/PG 60261/437

N/F
CHRISTOPHER MCCLURE & RHYNE KRISTIN
35 PENNYMEADOW RD
MAP/LOT H08/0312
BK/PG 72285/246

N/F
WILLIAM E JR & ELAINE KNEELAND
43 PENNYMEADOW RD
MAP/LOT H08/0311
BK/PG 12513/278

0 20 50 100
SCALE: 1" = 20'

CONTINUED ABOVE

WF#32-312
WF#32-311
WF#32-310
WF#32-309
WF#32-308
WF#32-307
WF#32-306
WF#32-305
WF#32-304
WF#32-303
WF#32-302
WF#32-301
WF#32-300 START

73
N: 2962548.067'
E: 678126.508'
EL: 168.309'
MSTN POL

N/F
JAMES C & MELANIE B WEAVER
248 OLD LANCASTER RD
MAP/LOT H08/0008
BK/PG 12967/255

MASSDOT-RAIL AND TRANSIT DIVISION
VAL MAP V7.38-39 SHEETS 6-10
JUNE 30, 1915 LAYOUT BY OLD COLONY R.R CO.
DEED BOOK 14836, PAGE 507
CONFIRMATORY TAKING IN DEED BOOK 64110, PAGE 80

CONTINUED ON SHEET NO. 100

STONE WALL

RAILROAD TRACKS

ROCK OUTCROP

BENCHMARK: #16
LAG SCREW SET 2' UP 18 TREE
EL=171.76'

100'BZ-AURA

74
N: 2962818.356'
E: 678253.312'
EL: 171.057'
MSTN POL

N/F
JAMES J JR & LISA A NIGRELLI
TRUSTEES OF NIGRELLI NOMINEE
51 PENNYMEADOW RD
MAP/LOT H08/0310
BK/PG 74050/535

N/F
RICHARD J & CLAIRE A WOLLENSAK
60 PENNYMEADOW RD
MAP/LOT H08/0012
BK/PG 13285/445

N/F
WILLIAM E JR & ELAINE KNEELAND
43 PENNYMEADOW RD
MAP/LOT H08/0311
BK/PG 12513/278

0 20 50 100
SCALE: 1" = 20'

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	100	316
PROJECT FILE NO.	608164		

GRADING PLANS

CONTINUED ON SHEET NO. 99

CONTINUED BELOW

EXISTING RR LAYOUT LINE

EXISTING RR LAYOUT LINE

156 171.50 171.58 171.65
157 171.88 171.96 172.03
158 172.19 172.26 172.33
159 172.44 172.51 172.58
160 172.69 172.76 172.83
161 172.94 PI +50.02 173.01 173.08
162 173.19 173.26 173.33
163 173.44 173.51 173.58
164 173.69 173.77 173.83
165 173.99 174.07 174.13
166 174.34 174.62 174.68
167 175.15 175.22 175.28
168 175.55 176.02 176.07

156 175.22 175.28
157 175.95 176.02 176.07
158 176.81 176.88 176.93
159 177.95 178.03 178.07
160 179.15 179.23 179.27
161 180.35 180.42 180.47
162 181.54 181.62 181.68
163 182.51 182.58 182.65
164 183.25 PC +25.29 PT +49.01 183.40
165 184.00 184.07 184.14
166 184.74 184.81 184.89
167 185.48 185.56 185.63
168 186.02 186.09 186.17

BENCHMARK: #17
LAG SCREW SET 2' UP 16"TREE
EL=175.02'

BENCHMARK: #18
LAG SCREW SET 2' UP 5"TREE
EL=179.98'

BENCHMARK: #19
CHISELED SQ SET ON STONE WALL
EL=182.48'

43
N: 2963115.491'
E: 678392.726'
EL: 174.184'
MRRS

76
N: 2963557.304'
E: 678597.577'
EL: 179.827'
MSTN POL

75
N: 2963333.821'
E: 678493.956'
EL: 176.858'
MSTN POL

44
N: 2963770.197'
E: 678696.352'
EL: 182.334'
MRRS

BOX CULVERT
EL=158.67' 2.2'Wx1.8'H

N/F
JAMES C & MELANIE B WEAVER
248 OLD LANCASTER RD
MAP/LOT H08/0008
BK/PG 12967/255

N/F
RICHARD J & CLAIRE A WOLLENSAK
60 PENNYMEADOW RD
MAP/LOT H08/0012
BK/PG 13285/445

N/F
SUDBURY VALLEY TRUSTEES INC
0 CONCORD RD
MAP/LOT H09/0012
BK/PG 14337/1

MASSDOT RAIL AND TRANSIT DIVISION
VAL MAP V7.38-39 SHEET 5, V7.39 SHEETS 6-10
JUNE 30, 1915 LAYOUT BY OLD COLONY R.R CO.
DEED BOOK 14836, PAGE 507
CONFIRMATORY TAKING IN DEED BOOK 64110, PAGE 80

0 20 50 100
SCALE: 1" = 20'

CONTINUED ABOVE

CONTINUED ON SHEET NO. 101

SEE TYPICAL SECTIONS & CROSS SECTIONS FOR FORMATION OF SWALES (TYP.)

0 20 50 100
SCALE: 1" = 20'

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	101	316
PROJECT FILE NO.	608164		

GRADING PLANS

608164_HD\GRADING PLANS\.DWG Plotted on 22-Dec-2021 11:19 AM

N/F
JON L & BRENDA K HART
602 PEAKHAM RD
MAP/LOT H08/0016
BK/PG 71382/371

N/F
ANDREW T & NANCY MACDONALD
604 PEAKHAM RD
MAP/LOT H08/0017
BK/PG 76180/304

N/F
DAVID P NUSINOW & NICOLE A NEUMAN
610 PEAKHAM RD
MAP/LOT H08/0018
BK/PG 72671/130

N/F
ANDREW J & STEPHANIE O LEWIS
616 PEAKHAM RD
MAP/LOT H09/0001
BK/PG 43412/31

N/F
29 HUDSON ROAD LLC
29 HUDSON RD
MAP/LOT H09/0002
BK/PG 58156/562

N/F
JAMES & ELIZABETH ANDREWS
293 CONCORD RD
MAP/LOT H09/0007
BK/PG 58928/173

CONTINUED ON SHEET NO. 100

CONTINUED ON SHEET NO. 102

EXISTING RR LAYOUT LINE

1973 TOWN LAYOUT

PEAK

EXISTING RR LA

45
N: 2964154.656'
E: 678868.400'
EL: 186.844'
MRRS

BENCHMARK: #20
CHISELED SQ SET ON BOULDER
EL=190.04'

MASSDOT-RAIL AND TRANSIT DIVISION
VAL MAP V7.38-39 SHEET 5, VZ 39 SHEETS 6-10
JUNE 30, 1915 LAYOUT BY OLD COLONY R.R CO.
DEED BOOK 14836, PAGE 502
CONFIRMATORY TAKING IN DEED BOOK 64110, PAGE 88

PC +77.63

STONE WALL
WOOD FENCE
REBAR WITH CAP FND
BOULDERS
LEDGE OUTCROP
STREAM
RAILROAD TRACKS
GRASS
POST
BIT DRIVE
EXISTING GAS L
EXISTING S
EP
AURA
WWW

0 20 50 100
SCALE: 1" = 20'

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	102	316
PROJECT FILE NO.	608164		

GRADING PLANS

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N

HUDSON ROAD (RTE 27) (PUBLIC)

PEAKHAM ROAD (PUBLIC)

1941 COUNTY LAYOUT ALT.

1973 TOWN LAYOUT

EXISTING RR LAYOUT LINE

PC +99.55
PT +76.60
PC +11.19
PT +34.93
PC +51.95
PT +57.72
PC +02.01
PT +74.28
PC +00.08
PT +86.91
PC +45.35
PT +68.84
PRC +40.01
PRC +98.76
PT +97.15

-2.75%
0.71%
-1.50%

CONTINUED ON SHEET NO. 101

CONTINUED ON SHEET NO. 103

N/F
LINDA LOUISE MURI
TRUSTEE OF LINDA LOUISE MURI
623 PEAKHAM RD
MAP/LOT H09/0056
BK/PG 66273/460

N/F
A TRITOS & ROANNA M LONDO
46 HUDSON RD
MAP/LOT G09/0013
BK/PG 45390/280

N/F
TOWN OF SUDBURY(TREASURER)
HUDSON RD
MAP/LOT G09/0200
BK/PG 13189/604

N/F
LAWRENCE W TIGHE
THE HUDSN ROAD TRUST #2
40 HUDSON RD
MAP/LOT G09/R001
BK/PG 33228/333

N/F
PENN CENTRAL TRANSPORTATION CO
HUDSON RD
MAP/LOT G09/0012
BK/PG 7074/339

N/F
29 HUDSON ROAD LLC
29 HUDSON RD
MAP/LOT H09/0002
BK/PG 58156/562

N/F
MATTHEW S & MOLLY F GILMARTIN
30 HUDSON RD
MAP/LOT H09/0068
BK/PG 42175/386

N/F
MATTHEW S & MOLLY F GILMARTIN
30 HUDSON RD
MAP/LOT H09/0068
BK/PG 42175/356

N/F
TOWN OF SUDBURY & BOARD OF SELECT BOARD
(TOWN CENTER LAND)
HUDSON RD
MAP/LOT G09/0004
BK/PG 77156/463 & 77156/472

MASSDOT-RAIL AND TRANSIT DIVISION
VAL MAP 17.38-39 SHEET 5-17.39 SHEETS 6-10
JUNE 30, 1915 LAYOUT BY OLD COLONY R.R CO.
DEED BOOK 14836, PAGE 507
CONFIRMATORY TAKING IN DEED BOOK 64110, PAGE 80

BENCHMARK: #2246
DRILL HOLE SET IN HYD BOMO
EL=191.27'

BENCHMARK: #21
LAG SCREW SET 2' UP 10"TREE
EL=190.30'

5
N: 2964579.704'
E: 679028.414'
EL: 191.924'
MSTN

77
N: 2964681.292'
E: 679064.471'
EL: 190.941'
MSTN POL

WF#20336 A110
WF#20336 B200 START
WF#20336 B207 END
WF#20336 B201
WF#20336 B202
WF#20336 B206
WF#20336 B205

0 20 50 100
SCALE: 1" = 20'

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	103	316
PROJECT FILE NO.	608164		

GRADING PLANS

608164_HD\GRADING PLANS\.DWG Plotted on 22-Dec-2021 11:19 AM

N/F
LAWRENCE W TIGHE, TRUSTEE OF THE HUDSON RD TRUST #1
38 HUDSON RD
MAP/LOT G09/0002
BK/PG 30663/361

N/F
TOWN OF SUDBURY & BOARD OF SELECT BOARD
(TOWN CENTER LAND)
HUDSON RD
MAP/LOT G09/0004
BK/PG 77156/463 & 77156/472

N/F
MATTHEW S & MOLLY F GILMARTIN
30 HUDSON RD
MAP/LOT H09/0068
BK/PG 42175/386

N/F
TOWN OF SUDBURY(TREASURER)
HUDSON RD
MAP/LOT G09/0200
BK/PG 13189/604

N/F
TOWN OF SUDBURY & BOARD OF SELECT BOARD
(TOWN CENTER LAND)
PETERS WAY EXT
MAP/LOT G09/0100
BK/PG 77152/566

N/F
TOWN OF SUDB
BOARD OF SELEC
(TOWN CENTER
PETERS WAY
MAP/LOT G09/
BK/PG 77152

MASSDOT-RAIL AND TRANSIT DIVISION
VAL MAP V7.38-39 SHEET 5, V7.39 SHEETS 6-10
JUNE 30, 1915 LAYOUT BY OLD COLONY R.R CO.
DEED BOOK 14836, PAGE 507
CONFIRMATORY TAKING IN DEED BOOK 64110, PAGE 80

46
N: 2964937.772'
E: 679155.525'
EL: 188.164'
MPE

79
N: 2965173.980'
E: 679240.746'
EL: 186.102'
MSTN POL

80
N: 2965292.587'
E: 679283.539'
EL: 185.405'
MSTN POL

81
N: 2965640.534'
E: 679408.927'
EL: 182.812'
MSTN POL

82
N: 2965867.616'
E: 679490.715'
EL: 181.103'
MSTN POL

BENCHMARK: #22
LAG SCREW SET 2' UP 9"TREE
EL=187.34'

BENCHMARK: #23
LAG SCREW SET 2' UP 5"PINE
EL=183.80'

CONTINUED ON SHEET NO. 102

CONTINUED BELOW

CONTINUED ON SHEET NO. 121

CONTINUED ABOVE

CONTINUED ON SHEET NO. 104

EXISTING RR LAYOUT LINE

EXISTING RR LAYOUT LINE

EXISTING RR LAYOUT LINE

PI +22.94

PI +37.53

PI +08.37

PI +22.97

PT +90.89

PT +90.89

1003+61.46

1.50%

0 20 50 100
SCALE: 1" = 20'

0 20 50 100
SCALE: 1" = 20'

ISOLATED WETLAND
(SURVEYED BY OTHERS)

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	104	316
PROJECT FILE NO.	608164		

GRADING PLANS

608164_HD(GRADING PLANS).DWG Plotted on 22-Dec-2021 11:20 AM

CONTINUED ON SHEET NO. 103

CONTINUED BELOW

N/F TOWN OF SUDBURY(TREASURER) HUDSON RD MAP/LOT G09/0200 BK/PG 13189/604

N/F TOWN OF SUDBURY (JANET HOWE LAND) CONCORD RD MAP/LOT G09/0003 BK/PG 24441/588

48 N: 2966722.573' E: 679522.573' EL: 179.494' MRRS

83 N: 2966443.498' E: 679698.099' EL: 177.433' MSTN POL

BENCHMARK: #24 LAG SCREW SET 2' UP 15"PINE EL=180.52'

EXISTING RR LAYOUT LINE

PI +22.97

BRIDGE ABUTMENTS

STEEL I-BEAM METAL BRIDGE DECK

RAILROAD TRACKS

15"PINE

MASSDOT-RAIL AND TRANSIT DIVISION VAL MAP V7.38-39 SHEET 5, V7.39 SHEETS 6-10 JUNE 30, 1915 LAYOUT BY OLD COLONY R.R CO. DEED BOOK 14836, PAGE 507 CONFIRMATORY TAKING IN DEED BOOK 64110, PAGE 80

N/F TOWN OF SUDBURY & BOARD OF SELECT BOARD (TOWN CENTER LAND) PETERS WAY EXT MAP/LOT G09/0100 BK/PG 77152/566

N/F TOWN OF SUDBURY & BOARD OF SELECT BOARD (TOWN CENTER LAND) CONCORD RD MAP/LOT G09/0300 BK/PG 77160/394

WF#36-7

WF#7-120 END

0 20 50 100

SCALE: 1" = 20'

CONTINUED ABOVE

CONTINUED ON SHEET NO. 105

84 N: 2966692.362' E: 679787.724' EL: 176.110' MSTN POL

49 N: 2966871.297' E: 679852.152' EL: 175.554' MRRS

WF#27-100 START

WF#27-102

WF#27-103

WF#27-105

WF#27-104

WF#27-109

WF#27-108

WF#27-107

WF#27-106

WF#27-117

WF#27-116

WF#27-115

WF#27-114

WF#27-113

WF#27-112

WF#27-111

WF#27-110

BF#27-206 END

BF#27-205 START

BF#27-204

BF#27-203

BF#27-202

BF#27-201

STREAM

BOX CULVERT TOP=172.41'

EXISTING RR LAYOUT LINE

MASSDOT-RAIL AND TRANSIT DIVISION VAL MAP V7.38-39 SHEET 5, V7.39 SHEETS 6-10 JUNE 30, 1915 LAYOUT BY OLD COLONY R.R CO. DEED BOOK 14836, PAGE 507 CONFIRMATORY TAKING IN DEED BOOK 64110, PAGE 80

MINEWAY BROOK

BENCHMARK: #25 LAG SCREW SET 2' UP 8"TREE EL=174.89'

WF#26-116

WF#26-115

WF#26-114

WF#26-113

WF#26-112

WF#26-111

WF#26-110

WF#26-109

WF#26-108

WF#26-107

WF#26-106

WF#26-105

WF#26-104

WF#26-103

WF#26-102

WF#26-101

BF#26-206 END

BF#26-205 START

BF#26-204

BF#26-203

BF#26-202

BF#26-201

N/F TOWN OF SUDBURY & BOARD OF SELECT BOARD (TOWN CENTER LAND) CONCORD RD MAP/LOT G09/0300 BK/PG 77160/394

0 20 50 100

SCALE: 1" = 20'

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	105	316
PROJECT FILE NO.	608164		

GRADING PLANS

608164_HD\GRADING PLANS\.DWG Plotted on 22-Dec-2021 11:20 AM

START

CONTINUED ON SHEET NO. 104

N

83
N: 2967158.841'
E: 680171.886'
EL: 175.157'
MSTN POL

N/F
TOWN OF SUDBURY
(JANET HOWE LAND)
CONCORD RD
MAP/LOT G09/0003
BK/PG 24441/588

50
N: 2967446.659'
E: 680059.723'
EL: 174.364'
MRRS

CONTINUED BELOW

EXISTING RR LAYOUT LINE

MEAS RAIL ROOT

175.70

1	176.11		176.81		177.50		177.71		177.46		177.21		176.96		176.71		176.46		176.21		175.96		175.71		175.46
8	176.18	RAILROAD TRACKS	176.88	201	177.58		177.78	202	177.54		177.29	203	177.04	RAILROAD TRACKS	176.79	204	176.54		176.29	205	176.04		175.79	206	175.54
6	176.26		176.96		177.65		177.86		177.61		177.36		177.11		176.86		176.61		176.36		176.11		175.86		175.61

CONC. POST

MASSDOT-RAIL AND TRANSIT DIVISION
VAL MAP V7.38-39 SHEET 5, V7.39 SHEETS 6-10
JUNE 30, 1915 LAYOUT BY OLD COLONY R.R CO.
DEED BOOK 14836, PAGE 507
CONFIRMATORY-TAKING IN DEED BOOK 64110, PAGE 80

EXISTING RR LAYOUT LINE

BENCHMARK: #26
CHISELED SQ SET ON CONC POST
EL=178.55'

N/F
TOWN OF SUDBURY & BOARD OF SELECT BOARD
(TOWN CENTER LAND)
CONCORD RD
MAP/LOT G09/0300
BK/PG 77160/394

0 20 50 100
SCALE: 1" = 20'

N/F
JAMES C & SUSAN M RICHARDS
44 CODMAN DR
MAP/LOT G09/0807
BK/PG 24467/551

CONTINUED ABOVE

BENCHMARK: #27
LAG SCREW SET 2' UP 7"TREE
EL=175.05'

86
N: 2967756.688'
E: 680171.009'
EL: 173.283'
MSTN POL

51
N: 2967872.934'
E: 680212.734'
EL: 172.486'
MRRS

CONTINUED ON SHEET NO. 106

EXISTING RR LAYOUT LINE

206	175.71		175.46		175.21		174.96		174.52		173.89		173.27		172.64		172.03		171.78		171.48		171.21		170.93
	175.79		175.54	207	175.29		175.03	PC +88.78	174.59	PT +49.64	173.97	209	173.34		172.72	PC +89.86	172.11	PT +49.97	171.86	211	171.56	PI +81.68212	171.28	PI +81.68212	171.01
	175.86	RAILROAD TRACKS	175.61		175.36		175.11		174.66		174.04		173.42		172.79		172.18		171.90		171.63	CONCRETE BOUND	171.35		171.08

MASSDOT-RAIL AND TRANSIT DIVISION
VAL MAP V7.38-39 SHEET 5, V7.39 SHEETS 6-10
JUNE 30, 1915 LAYOUT BY OLD COLONY R.R CO.
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WF#24-116 END

BF#15-24-100 START

BF#15-24-125 END

N/F
JAMES C & SUSAN M RICHARDS
44 CODMAN DR
MAP/LOT G09/0807
BK/PG 24467/551

N/F
WILLIAM P MCMAHON JR
& DINA M MCMAHON-DESORBO
42 CODMAN DR
MAP/LOT G09/0808
BK/PG 61407/511

N/F
TOWN OF SUDBURY
(CONSERVATION)
WAKE ROBIN RD
MAP/LOT F09/0001
BK/PG 12501/703

0 20 50 100
SCALE: 1" = 20'

N/F
CAROL A SHEDD
51 MORSE RD
MAP/LOT F09/0003
BK/PG 37232/274

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	106	316
PROJECT FILE NO.	608164		

GRADING PLANS

608164_HD(GRADING PLANS).DWG Plotted on 22-Dec-2021 11:20 AM

N

MORSE ROAD (PUBLIC)

1830 TOWN LAYOUT

EXISTING RR LAYOUT LINE

MASSDOT-RAIL AND TRANSIT DIVISION
VAL MAP V7.38-39 SHEET 5, V7.39 SHEETS 6-10
JUNE 30, 1915 LAYOUT BY OLD COLONY R.R CO.
DEED BOOK 14836, PAGE 507
CONFIRMATORY TAKING IN DEED BOOK 54110, PAGE 80

N/F
TOWN OF SUDBURY & BOARD OF SELECTMEN
(BROADACRE FARM HOUSE)
82 MORSE RD
MAP/LOT F09/0002
BK/PG 72906/476

N/F
CAROL A SHEDD
51 MORSE RD
MAP/LOT F09/0003
BK/PG 37232/274

N/F
TOWN OF SUDBURY(BROADACRE FARM)
MORSE RD
MAP/LOT F09/0004
BK/PG 71910/379

CONTINUED ON SHEET NO. 105

CONTINUED ON SHEET NO. 107

BENCHMARK: #28
SCREW SET 2' UP 12"TREE
EL=172.70'

87
N: 2968150.177'
E: 680312.978'
EL: 170.345'
MSTN BOL

10
N: 2968439.769'
E: 680417.689'
EL: 168.979'
MSTN

9
N: 2968271.964'
E: 680588.479'
EL: 175.205'

BENCHMARK: #3
CHISEL SQUARE ON BOULDER
MOOT #10061
EL=173.58'

BROADACRES FARM PARKING LOT

PI +81.68
PI +53.55

0 20 50 100
SCALE: 1" = 20'

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	107	316
PROJECT FILE NO.	608164		

GRADING PLANS

608164_HD(GRADING PLANS).DWG Plotted on 22-Dec-2021 11:21 AM

CONTINUED ON SHEET NO. 106

CONTINUED BELOW

CONTINUED ABOVE

CONTINUED ON SHEET NO. 108

TW 173.76
BW 168.01
TW 173.87
BW 167.74
TW 173.68
BW 167.23
TW 170.33
BW 167.10

BENCHMARK: #29
LAG SCREW SET 2' UP 12"TREE
EL=162.84'

EXISTING RR LAYOUT LINE

PI +22.49
PC 2292.35

52
N: 2968861.407'
E: 680569.100'
EL: 162.589'
MRRS

53
N: 2969196.838'
E: 680688.833'
EL: 157.805'
MRRS

54
N: 2969570.516'
E: 680780.344'
EL: 154.740'

BENCHMARK: #30
CHISELED SQ SET IN STONE HEADWALL
EL=148.07'

CULVERT
EL=143.46' 42" MP

CULVERT
EL=143.90' 42" MP

OUTLET
EL=158.62' 30"CMP

OUTLET
EL=158.86' 30"CMP

STONE BOUND
(FOUND LEANING)
(APPROX. LOCATION)

MASSDOT-RAIL AND TRANSIT DIVISION
VAL MAP V7.38-39 SHEETS 5-10
JUNE 30, 1915 LAYOUT BY OLD COLONY R.R CO.
DEED BOOK 14836, PAGE 507
CONFIRMATORY TAKING IN DEED BOOK 64110, PAGE 80

TOWN OF SUDBURY & BOARD OF SELECTMEN
(BROADACRE FARM HOUSE)
82 MORSE RD
MAP/LOT F09/0002
BK/PG 72906/476

TOWN OF SUDBURY(FEATHERLAND PARK)
(PARK & REC)
MORSE RD
MAP/LOT F09/0006
BK/PG 9599/151

TOWN OF SUDBURY(BROADACRE FARM)
MORSE RD
MAP/LOT F09/0004
BK/PG 71910/379

TOWN OF SUDBURY(FEATHERLAND PARK & GROUNDS)
(PARK & REC/DPW)
491 CONCORD RD
MAP/LOT F10/0001
BK/PG 9599/151

TRUSTEES OF JEAN & ARTHUR P. WONG TRUST
MAP/LOT F10/0001
BK/PG 66497/316

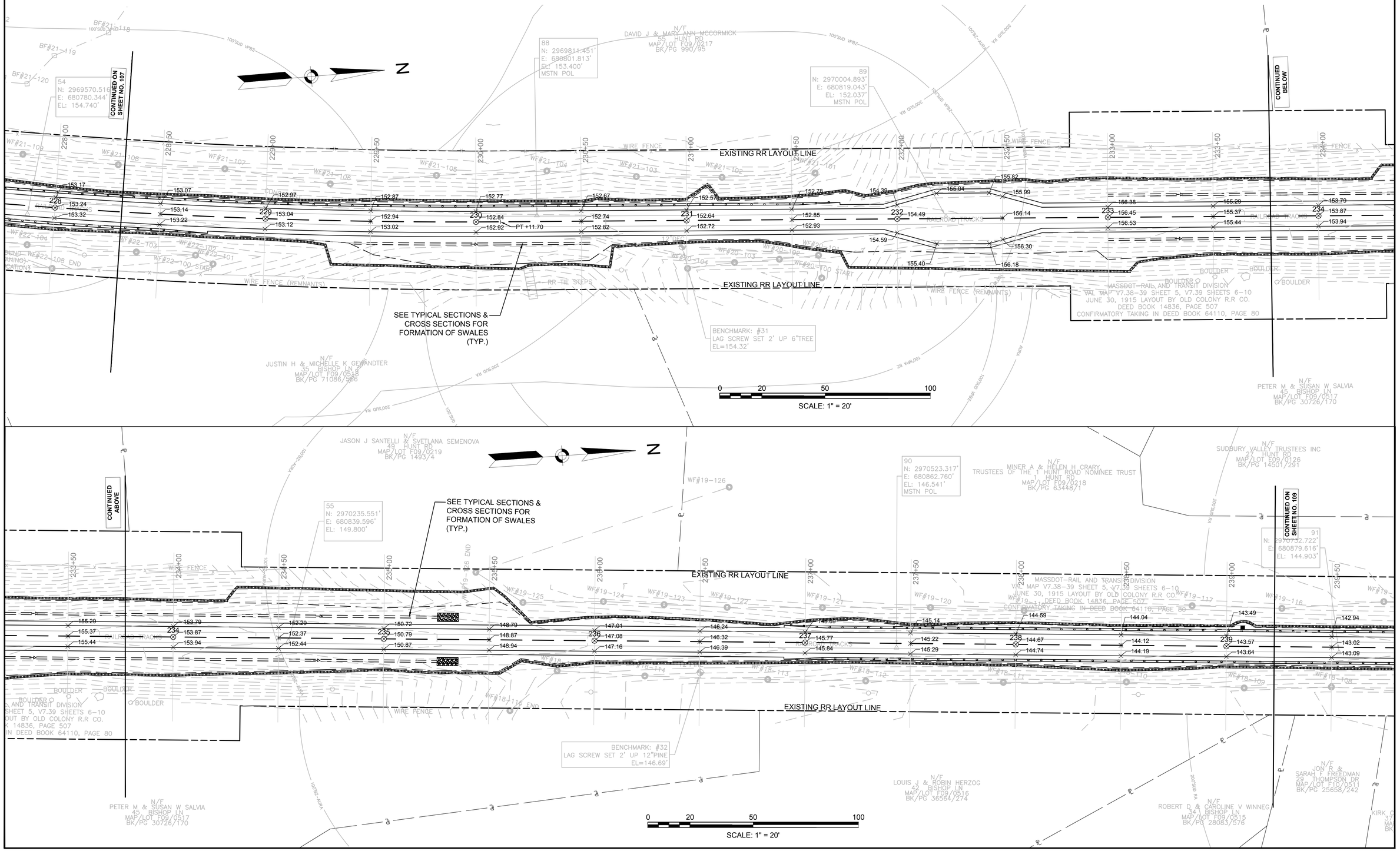
0 20 50 100
SCALE: 1" = 20'

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	108	316
PROJECT FILE NO.	608164		

GRADING PLANS

608164_HD(GRADING PLANS).DWG Plotted on 22-Dec-2021 11:21 AM



SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	109	316
PROJECT FILE NO.	608164		

GRADING PLANS

N/F
SUDBURY VALLEY TRUSTEES INC
27 HUNT RD
MAP/LOT E09/0126
BK/PG 14501/291

N/F
GERALD WHITE KIMBER & MEREDITH KIMBER
19 HUNT RD
MAP/LOT E09/0127
BK/PG 65711/237

N/F
JOAN M SCHOW
11 HUNT RD
MAP/LOT E09/0128
BK/PG 12241/378

N/F
MINER A & HELEN H CRARY
TRUSTEES OF THE 1 HUNT ROAD NOMINEE TRUST
1 HUNT RD
MAP/LOT E09/0218
BK/PG 63448/1

N/F
JON R & SARAH F FREEDMAN
29 THOMPSON DR
MAP/LOT E10/0511
BK/PG 25658/242

N/F
ROBERT D & CAROLINE V WINNEG
34 BISHOP LN
MAP/LOT E09/0515
BK/PG 28083/576

N/F
KIRK C & DIANE P NEISON
37 THOMPSON DR
MAP/LOT E09/0511
BK/PG 14592/464

N/F
CHARLES A JR & RUTHANN WRY
45 THOMPSON DR
MAP/LOT E09/0510
BK/PG 28853/357

N/F
JEFFREY & TIFFANY BLOOM
53 THOMPSON DR
MAP/LOT E09/0509
BK/PG 54638/30

N/F
RICHARD S ALBEE
HUNT RD
MAP/LOT E09/0129
BK/PG 20726/208

N/F
ALLAN L WALLACK & DONNA NADINE,
TRUSTEE OF THE WALLACK FAMILY
0 THOMPSON DR
MAP/LOT E09/0508
BK/PG 60192/340

N/F
ALLAN L WALLACK & DONNA NADINE,
TRUSTEE OF THE WALLACK FAMILY
67 THOMPSON DR
MAP/LOT E09/0507
BK/PG 60192/340

CONTINUED ON SHEET NO.108

CONTINUED ABOVE

CONTINUED BELOW

CONTINUED ON SHEET NO.110

EXISTING RR LAYOUT LINE

EXISTING RR LAYOUT LINE

EXISTING RR LAYOUT LINE

EXISTING RR LAYOUT LINE

SEE TYPICAL SECTIONS & CROSS SECTIONS FOR FORMATION OF SWALES (TYP.)

MASSDOT-RAIL AND TRANSIT DIVISION
VAL MAP V7.38-39 SHEET 5, V7.39 SHEETS 6-10
JUNE 30, 1915 LAYOUT BY OLD COLONY R.R CO.
DEED BOOK 14836, PAGE 507
CONFIRMATORY TAKING IN DEED BOOK 64110, PAGE 80

STONE BOX CULVERT
1.7'H x 2.4'W
EL=133.81'

STONE BOX CULVERT
1.7'H x 2.4'W
EL=133.75'

BOX CULVERT
EL=131.82' 24"H x 24"W

OUTLET
EL=130.73' 16"RCP

EX 16"RCP

STONE CULVERT
24"H x 20"W
EL=129.57'

24"H x 20"W
EL=129.73'

EX CULVERT

BENCHMARK: #33
LAG SCREW SET 2' UP 15"TREE
EL=143.77'

BENCHMARK: #34
LAG SCREW SET 2' UP 6"PINE
EL=138.92'

91
N: 2970732.722'
E: 680879.616'
EL: 144.903'

92
N: 2971187.
E: 680
EL: 141.982'
MSTN POL

56
N: 2971224.293'
E: 680919.191'
EL: 139.755'
MRRS

57
N: 2971631.122'
E: 680946.511'
EL: 137.150'
MRRS

93
N: 2971489.982'
E: 680937.034'
EL: 137.981'
MSTN

CONCRETE BOUND W/DRILL HOLE

WIRE FENCE

WIRE FENCE (REMNANTS)

RAILROAD TRACKS

DIRT PATH

TOE OF BANK

TOP OF BANK

0 20 50 100
SCALE: 1" = 20'

0 20 50 100
SCALE: 1" = 20'

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	110	316
PROJECT FILE NO.	608164		

GRADING PLANS

CONTINUED ON SHEET NO. 109

CONTINUED BELOW

CONTINUED ABOVE

CONTINUED ON SHEET NO. 111

EXISTING RR LAYOUT LINE

SEE TYPICAL SECTIONS & CROSS SECTIONS FOR FORMATION OF SWALES (TYP.)

BENCHMARK: #35
LAG SCREW SET 2' UP 13"TREE
EL=139.00'

BENCHMARK: #36
LAG SCREW SET 2' UP 6"TREE
EL=134.86'

94
N: 2971900.542'
E: 680967.619'
EL: 135.972'
MSTN

95
N: 2972123.996'
E: 680985.126'
EL: 134.924'
MSTN

96
N: 2972622.513'
E: 681027.303'
EL: 132.548'
MSTN

58
N: 2972365.820'
E: 681004.071'
EL: 133.745'
MIPE

58
N: 297
E: 681
EL: 13
MIPE

59
N: 2972853.671'
E: 681048.226'
EL: 131.830'
MRRS

0 20 50 100
SCALE: 1" = 20'

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	111	316
PROJECT FILE NO.	608164		

GRADING PLANS

Plotted on 22-Dec-2021 11:22 AM

608164_HD\GRADING PLANS\.DWG

N

CONTINUED ON SHEET NO. 110

BENCHMARK: #37
LAG SCREW SET 2' UP 7"PINE
EL=133.50'

60
N: 2973129.133'
E: 681104.042'
EL: 130.920'
MRRS

98
N: 2973228.466'
E: 681133.936'
EL: 130.880'
MSTN

PANTRY BROOK

CONTINUED BELOW

EXISTING RR LAYOUT LINE

SEE BRIDGE PLANS

EXISTING RR LAYOUT LINE

0 20 50 100
SCALE: 1" = 20'

CONTINUED ABOVE

99
N: 2973505.214'
E: 681214.547'
EL: 131.880'
MSTN

BENCHMARK: #38
LAG SCREW SET 2' UP 16"TREE
EL=134.14'

61
N: 2973781.215'
E: 681294.940'
EL: 132.820'
MRRS

CONTINUED ON SHEET NO. 112

EXISTING RR LAYOUT LINE

EXISTING RR LAYOUT LINE

BENCHMARK: #39
LAG SCREW SET
EL=135.05'

0 20 50 100
SCALE: 1" = 20'

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	112	316
PROJECT FILE NO.	608164		

GRADING PLANS

608164_HD\GRADING PLANS\.DWG Plotted on 22-Dec-2021 11:22 AM

N

HAYNES ROAD (PUBLIC)

1830 TOWN LAYOUT

EXISTING RR LAYOUT LINE

CONTINUED ON SHEET NO. 111

CONTINUED ON SHEET NO. 113

N/F
EILEEN M. & DANIEL A. DEPOMPEI
TRUSTEES OF THE DEPOMPEI REALTY TRUST
35 HAYNES RD
MAP/LOT D09/0207
BK/PG 71975/116

N/F
RICHARD J. & MICHELLE R. VROMAN
34 HAYNES RD
MAP/LOT D10/0024
BK/PG 42291/471

N/F
ARTHUR J. & MARGARET A. RICHARD
31 HAYNES RD
MAP/LOT D10/0001
BK/PG 24653/464

N/F
STEPHEN & JOAN VERRILL
HAYNES RD
MAP/LOT E10/0700
BK/PG 14819/188

N/F
CHRISTOPHER G. & ALISON M. BOLAND
24 HAYNES RD
MAP/LOT D10/0101
BK/PG 28689/158

MASSDOT-RAIL AND TRANSIT DIVISION
VAL MAP V7.38 39 SHEET 5, V7.39 SHEETS 6-10
JUNE 30, 1915 LAYOUT BY OLD COLONY R.R CO.
DEED BOOK 14836, PAGE 507
CONFIRMATORY TAKING IN DEED BOOK 64110, PAGE 80

BENCHMARK: #3297
SPIKE SET 1" UP IN UP
EL=136.20'

BENCHMARK: #39
LAG SCREW SET 2" UP 9"PINE
EL=135.05'

100
N: 2974051.944'
E: 681378.850'
EL: 133.507'
MSTN

62
N: 2974234.807'
E: 681435.526'
EL: 135.370'
MSTN

14
N: 2974235.175'
E: 681430.688'
EL: 135.355'
MSTN

101
N: 2974467.089'
E: 681525.562'
EL: 136.137'
MSTN

PC +29.45
PT +40.91
PC +10.25
PC +03.01
PRC +47.79
PT +92.57
PRC +48.94
PT +88.50

1.50%
1.48%
1.52%

FIELDSTONE WALL
METAL POST (APPROX LOCATION)
AREA OF SCATTERED ROCKS AND LEDGE OUTCROPS
LANDSCAPED AREA
EDGE PVMT
BIT DRIVE
GRAVEL DRIVE
CB RIM=133.92'
8"PINE
12"DEC OUTLET EL=132.86' 12"PVC
OUTLET EL=129.65' 12"RCP
EX 12"PVC
100'BZ-AURA
200'WPA RA
100'WPA RA
100'SUD VPBZ

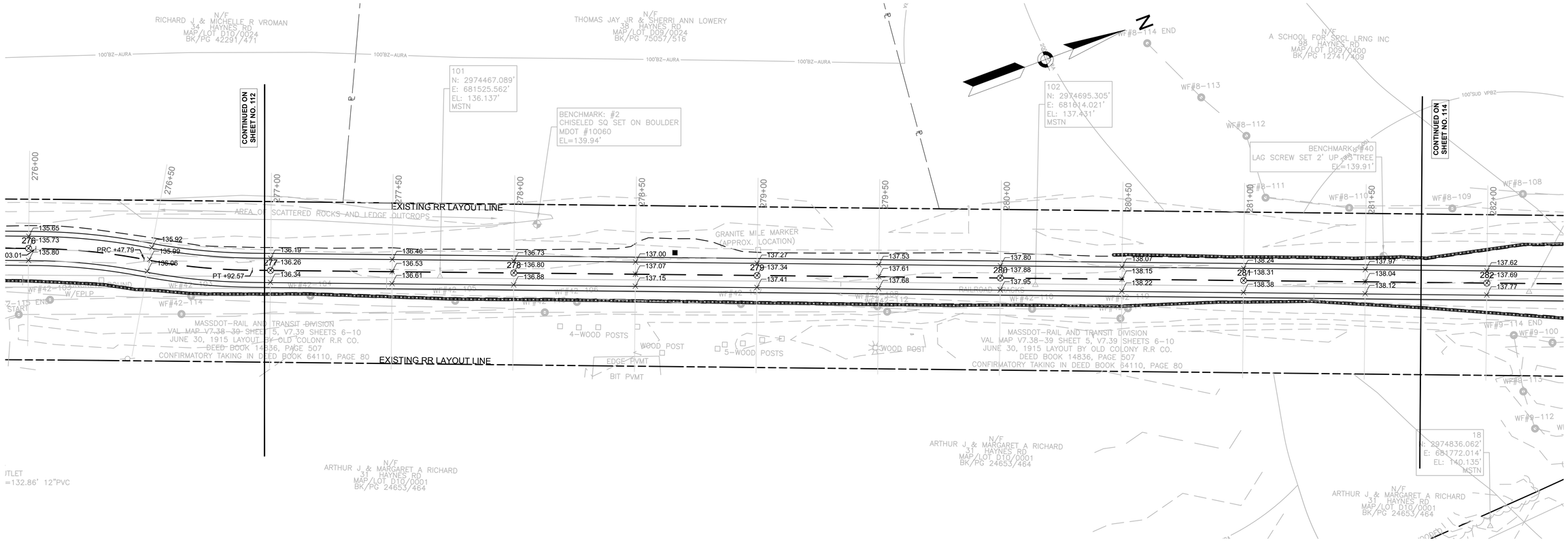
0 20 50 100
SCALE: 1" = 20'

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	113	316
PROJECT FILE NO.	608164		

GRADING PLANS

608164_HD\GRADING PLANS\.DWG Plotted on 22-Dec-2021 11:22 AM

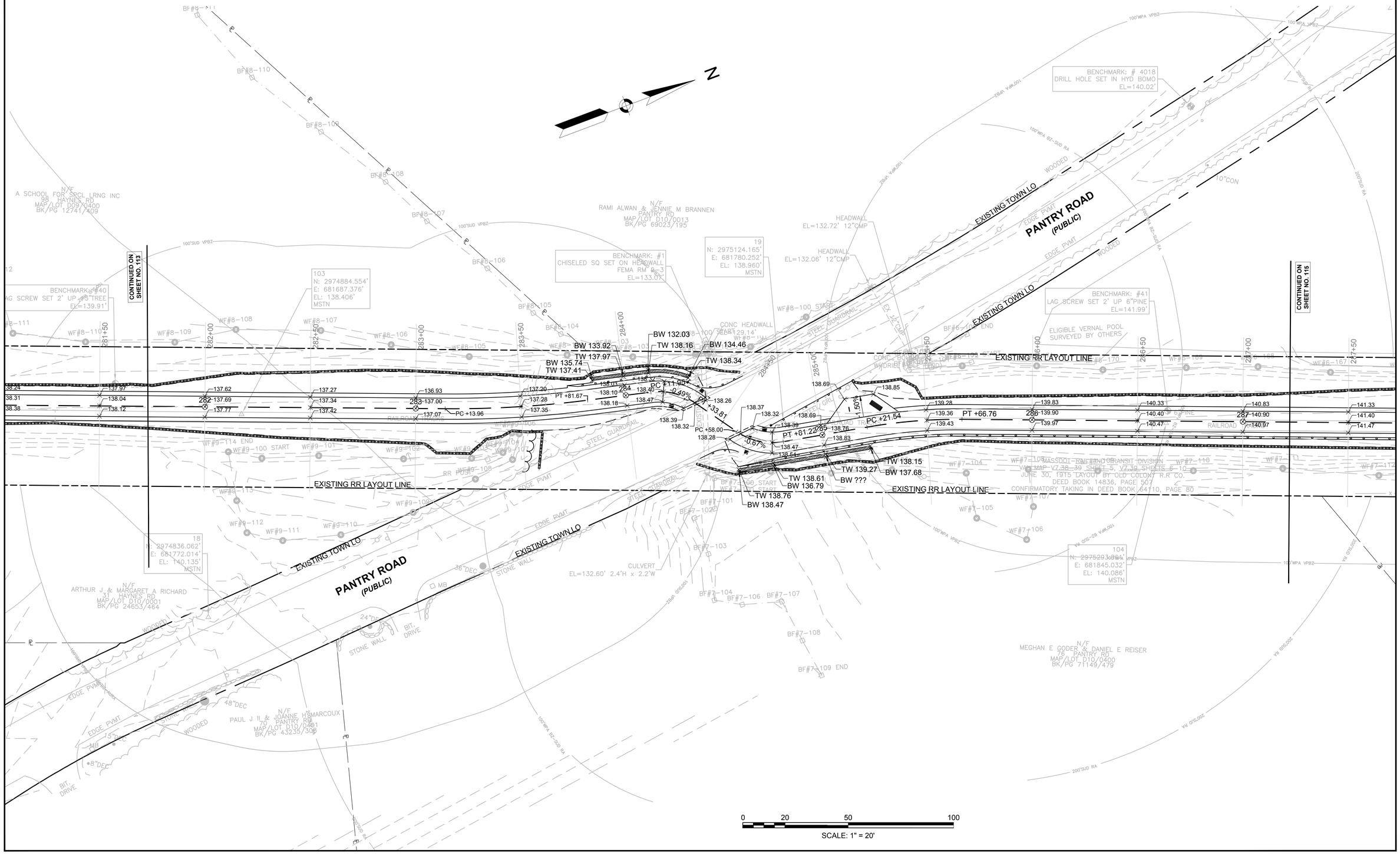


SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	114	316
PROJECT FILE NO.	608164		

GRADING PLANS

608164_HD\GRADING PLANS\.DWG Plotted on 22-Dec-2021 11:23 AM

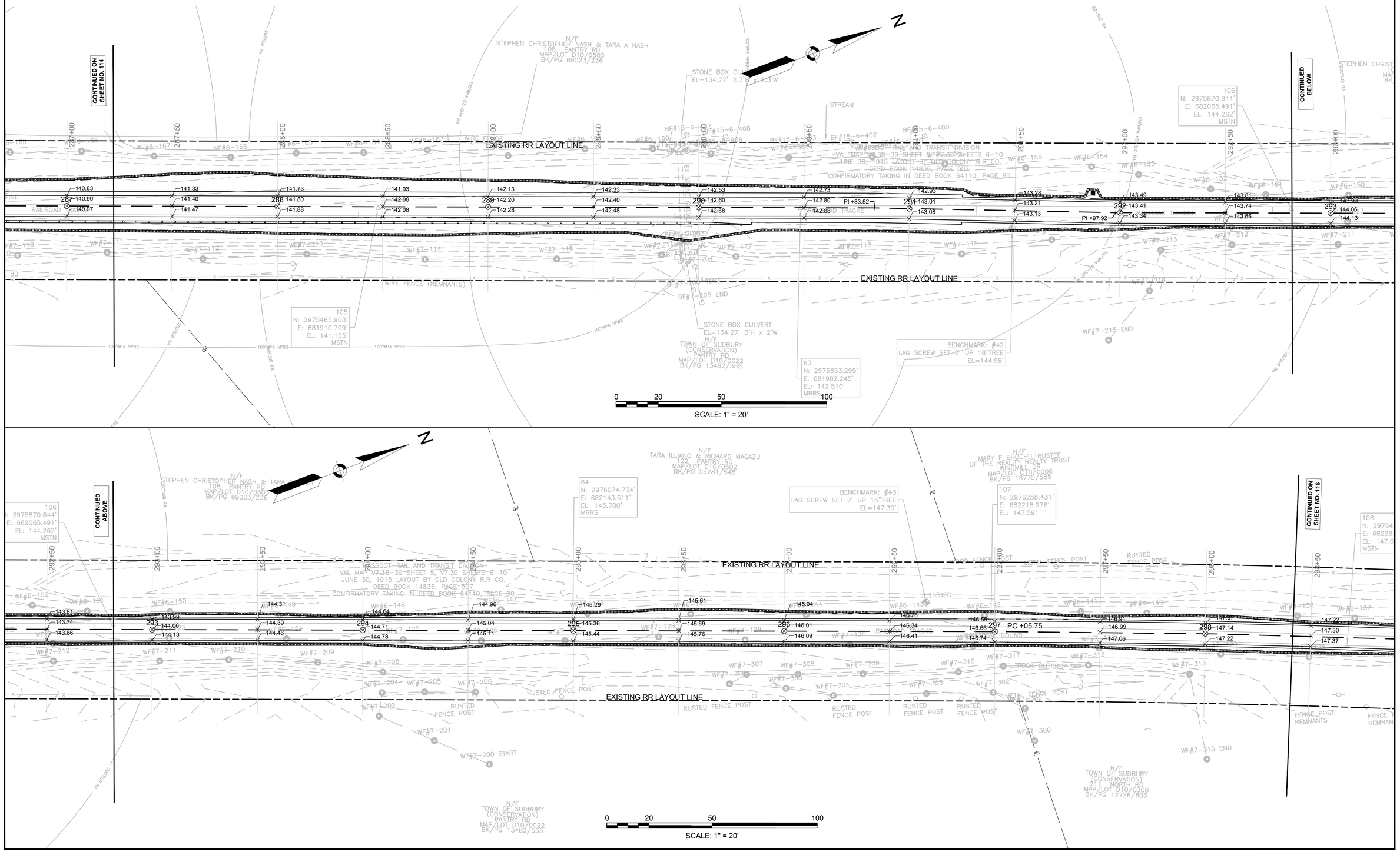


SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	115	316
PROJECT FILE NO.	608164		

GRADING PLANS

608164_HD(GRADING PLANS).DWG Plotted on 22-Dec-2021 11:23 AM

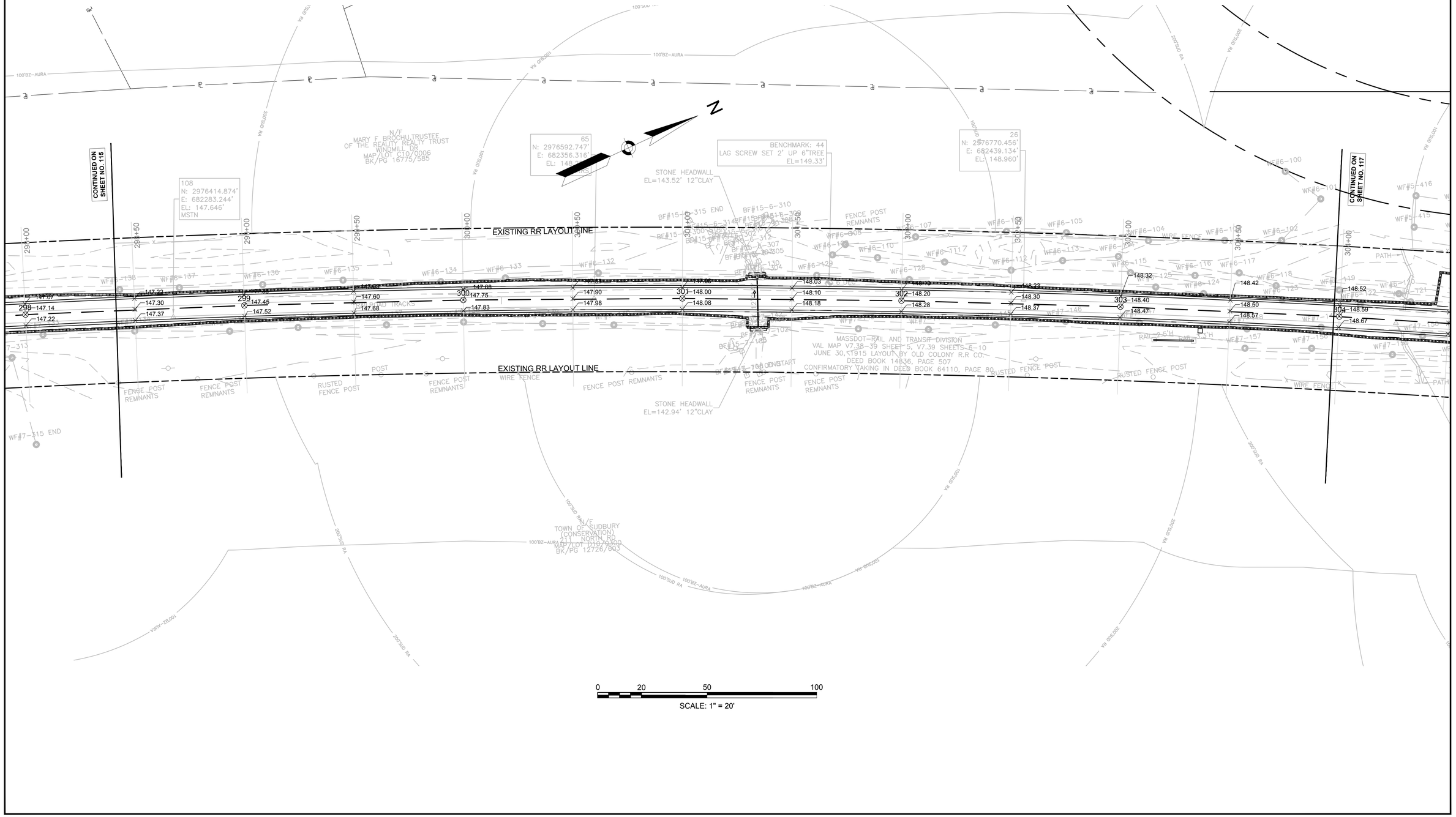


SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	116	316
PROJECT FILE NO.	608164		

GRADING PLANS

608164_HD\GRADING PLANS\.DWG Plotted on 22-Dec-2021 11:23 AM



SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	117	316
PROJECT FILE NO. 608164			

GRADING PLANS

608164_HD(GRADING PLANS).DWG   Plotted on 22-Dec-2021 11:23 AM

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	118	316
PROJECT FILE NO.	608164		

GRADING PLANS

608164_HD\GRADING PLANS\.DWG Plotted on 22-Dec-2021 11:24 AM

N/F JOHN C & DORIS NORMAN NORTH RD MAP/LOT C10/0013 BK/PG 13793/342

CONTINUED ON SHEET NO. 117

111 N: 2977523.427' E: 682884.110' EL: 144.551' MSTN

BENCHMARK: #46 LAG SCREW SET 2' UP 9"TREE EL=151.84'

66 N: 2977693.962' E: 682993.029' EL: 150.500' MRRS

N/F JOHN C & DORIS NORMAN NORTH RD MAP/LOT C10/0012 BK/PG 13793/342

CONTINUED BELOW

112 N: 2977843.836' E: 683088.310' EL: 152.198' MSTN

110 N: 2977340.853' E: 682767.502' EL: 143.610' MSTN

EXISTING RR LAYOUT LINE

MASSPOT–RAIL AND TRANSIT DIVISION VAL MAP V7.38–39 SHEET 5, V7.39 SHEETS 6–10 JUNE 30, 1915 LAYOUT BY OLD COLONY R.R CO. DEED BOOK 14836, PAGE 507 CONFIRMATORY TAKING IN DEED BOOK 64710, PAGE 80

CULVERT (UNDER WATER) EL=136.43' 2'Hx2.5'W

CULVERT (BLOCKED & BURIED) EL=133.21' 2'Hx2.5'W

INV 24" RCP EL=134.49' 24"RCP

INV 24" RCP EL=134.29' 24"RCP

EXISTING 24"RCP

RAILROAD TRACKS

WIRE FENCE

EDGE PVMT

N/F FAIRVIEW DEVELOPMENT CORP NORTH RD MAP/LOT C10/0009 BK/PG 11659/136

N/F FAIRVIEW DEVELOPMENT CORP 9 NORTH RD MAP/LOT C10/0401 BK/PG 9512/83

0 20 50 100

SCALE: 1" = 20'

113 N: 2978010.662' E: 683194.369' EL: 153.880' MSTN

BENCHMARK: #47 LAG SCREW SET 1' UP 26"TREE EL=155.62'

114 N: 2978177.854' E: 683300.660' EL: 155.517' MSTN

FAIRVIEW FARM DRIVEWAY

CONTINUED ABOVE

CONTINUED ON SHEET NO. 119

1.54%

0.68%

WOODS

BUSH

BOULDER

6"PINE

15"DEC

4"DEC

34"DEC

28"DEC

26"DEC

3"PINE

4"PINE

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	119	316
PROJECT FILE NO.	608164		

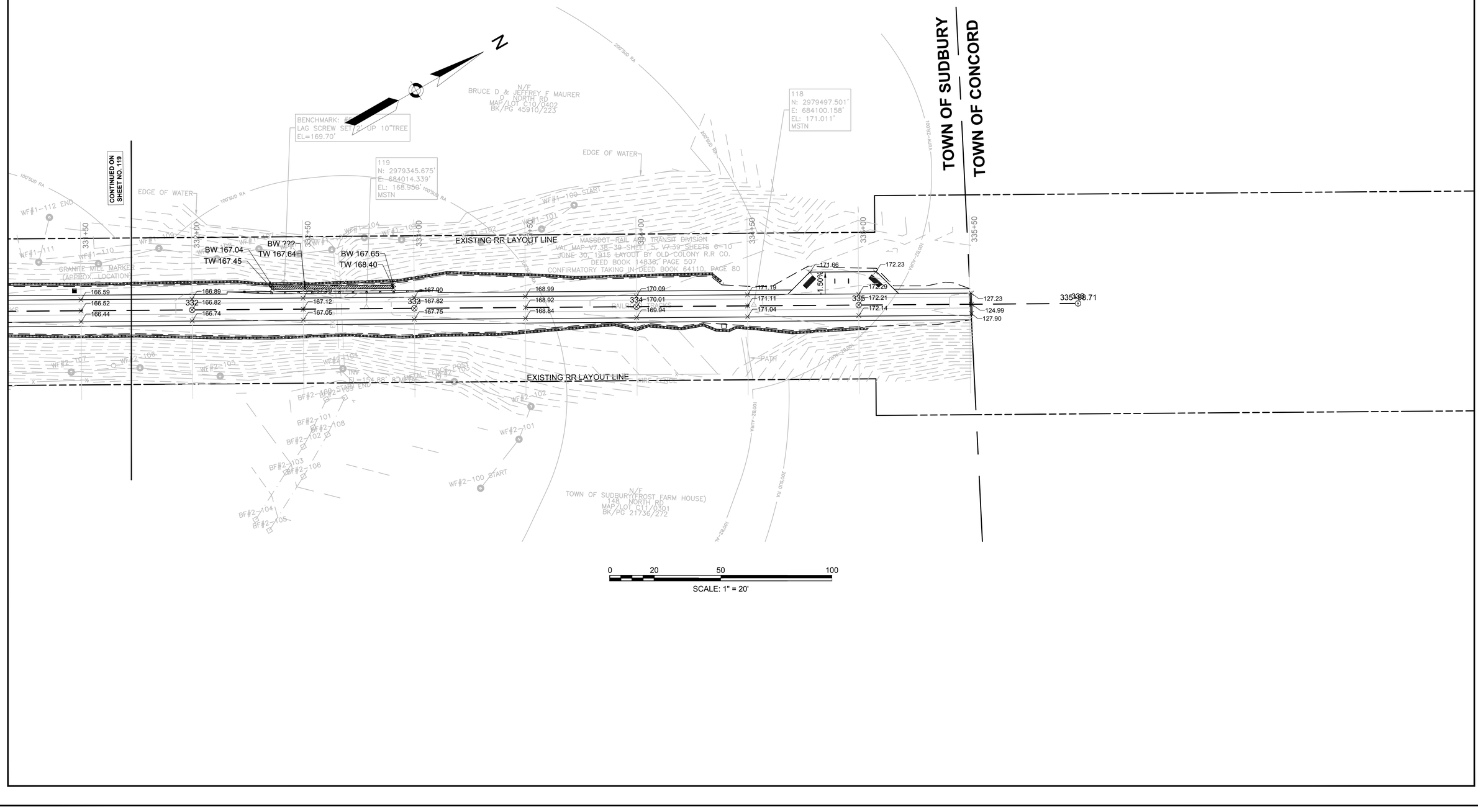
GRADING PLANS

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	120	316
PROJECT FILE NO.	608164		

GRADING PLANS

608164_HD\GRADING PLANS\.DWG Plotted on 22-Dec-2021 11:24 AM

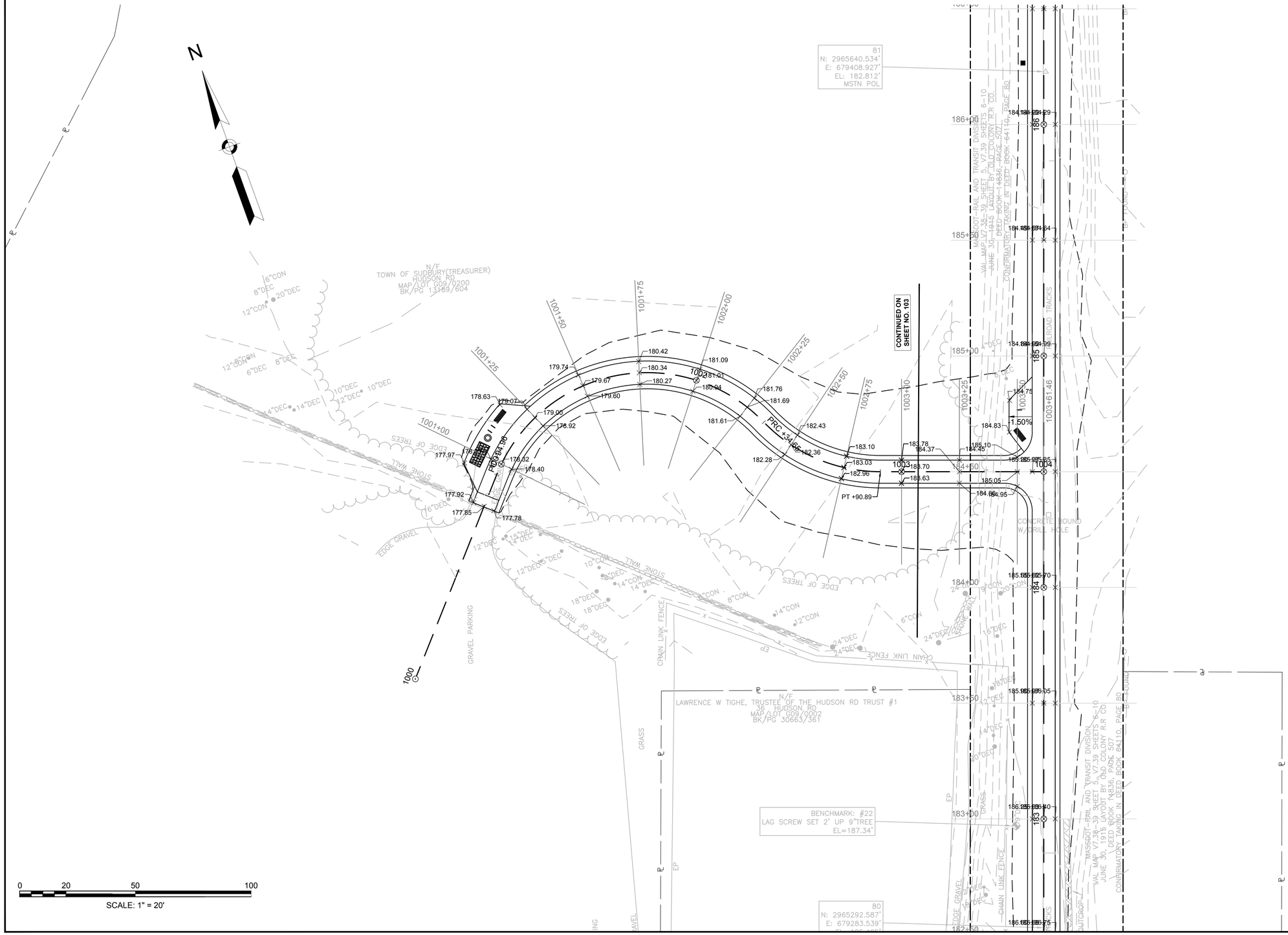


SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	121	316
PROJECT FILE NO.	608164		

GRADING PLANS

608164_HD(GRADING PLANS).DWG Plotted on 22-Dec-2021 11:25 AM



SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	122	316
PROJECT FILE NO.	608164		

GRADING PLANS

608164_HD(GRADING PLANS).DWG Plotted on 22-Dec-2021 11:25 AM

NORTH ROAD (RTE 117)
(PUBLIC)

1976 COUNTY LAYOUT ALT.

EXISTING

EXISTING RR LAYOUT LINE

BROKEN BIT DRIVE

GRAVEL DRIVE

EDGE PVMT

BIT PARKING

CONTINUED BELOW

CONTINUED ON SHEET NO. 38

CONTINUED ABOVE

BENCHMARK: #45
NAIL SET 1" UP UPL 78/180
EL=150.90'

22
N: 2977171.396'
E: 683002.970'
EL: 144.540'
MRRS

CB
RIM=143.49'
INV=140.77'

CB
RIM=143.52'
INV=140.77'

"DAVIS FARM"

GRASS

CONC. PAD TO BE 1% CROSS SLOPE EACH WAY SET AT EXISTING GROUND ELEVATION

N/F
JOHN C & DORIS NORMAN
NORTH RD
MAP/LOT C10/0010
BK/PG 13793/342

N/F
FAIRVIEW DEVELOPMENT CORP
NORTH RD
MAP/LOT C10/0009
BK/PG 11659/136

N/F
PATRICK J & MARY B BRENNAN
195 NORTH RD
MAP/LOT C10/0008
BK/PG 61678/338

N/F
TOWN OF SUDBURY
(CONSERVATION)
CONCORD RD
MAP/LOT D10/0018
BK/PG 12754/314

N/F
TOWN OF SUDBURY(DAVIS FIELD)
(PARK & REC)
195 NORTH RD
MAP/LOT D10/0500
BK/PG 12913/150

100' WETLANDS BUFFER ZONE

WF#20336 E500 START
WF#20336 E501
WF#20336 E502
WF#20336 E503
WF#20336 E504
WF#20336 E505

PC +74.74
PT +14.74
PCC +39.16
PRC +44.97
PC +83.93
PT +54.49
PC +85.73
PT +20.48
PC +11.40
PT +83.08

0 20 50 100
SCALE: 1" = 20'

N

DRAINAGE AND UTL NOTES:

1. HEADWALL RIM ELEVATIONS REFER TO THE CENTER AND TOP OF CONCRETE.
2. PROP. CONCRETE HEADWALLS SHALL CONFORM TO MASSDOT DETAIL E 206.4.0
3. PROP STONE FOR PIPE ENDS SHALL MATCH THE GENERAL DIMENSIONS SHOWN ON MASSDOT DETAIL E 206.7.0. THEY MAY BE ADJUSTED ACCORDINGLY BASED ON FIELD CONDITIONS AND AS DIRECTED BY THE RESIDENT ENGINEER.
4. ALL CATCH BASIN FRAME AND GRATES TO BE MASSDOT CASCADE TYPE.

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	170	316
PROJECT FILE NO.	608164		

DRAINAGE & UTILITY PLANS

608164_HD\DRAINAGE & UTILITY PLANS\.DWG Plotted on 22-Dec-2021 11:31 AM

BEGINNING OF PROJECT
PROJ. NO. 608164
STA. 101+00.00
N 2957500.7922
E 677093.1169

EXISTING RR LAYOUT LINE

RET. EXIST. CULVERT
CONTRACTOR TO REMOVE DEBRIS & SEDIMENT FROM OPENINGS
(PAID FOR UNDER ITEM #227.31)

PROP. TRAPAZOIDAL AQUATIC EXCLUSIONARY FENCING
(SEE SPECIAL PROVISIONS)

CONTINUED BELOW

100+00 101 102 PC +64.78 103 104 105 106

RET. UPL

EXISTING RR LAYOUT LINE

BENCHMARK: #7
GEODETIC SURVEY DISK "38" FND
EL=135.65'

0 20 50 100
SCALE: 1" = 20'

CONTINUED ABOVE

71 UNION AVE DRIVEWAY (PRIVATE)

EXISTING RR LAYOUT LINE

106 107 108 PT +11.69 109 110 111

EXISTING RR LAYOUT LINE

BENCHMARK: #8
LAG SCREW SET 2' UP 18"TREE
EL=140.44'

CONTINUED ON SHEET NO. 171

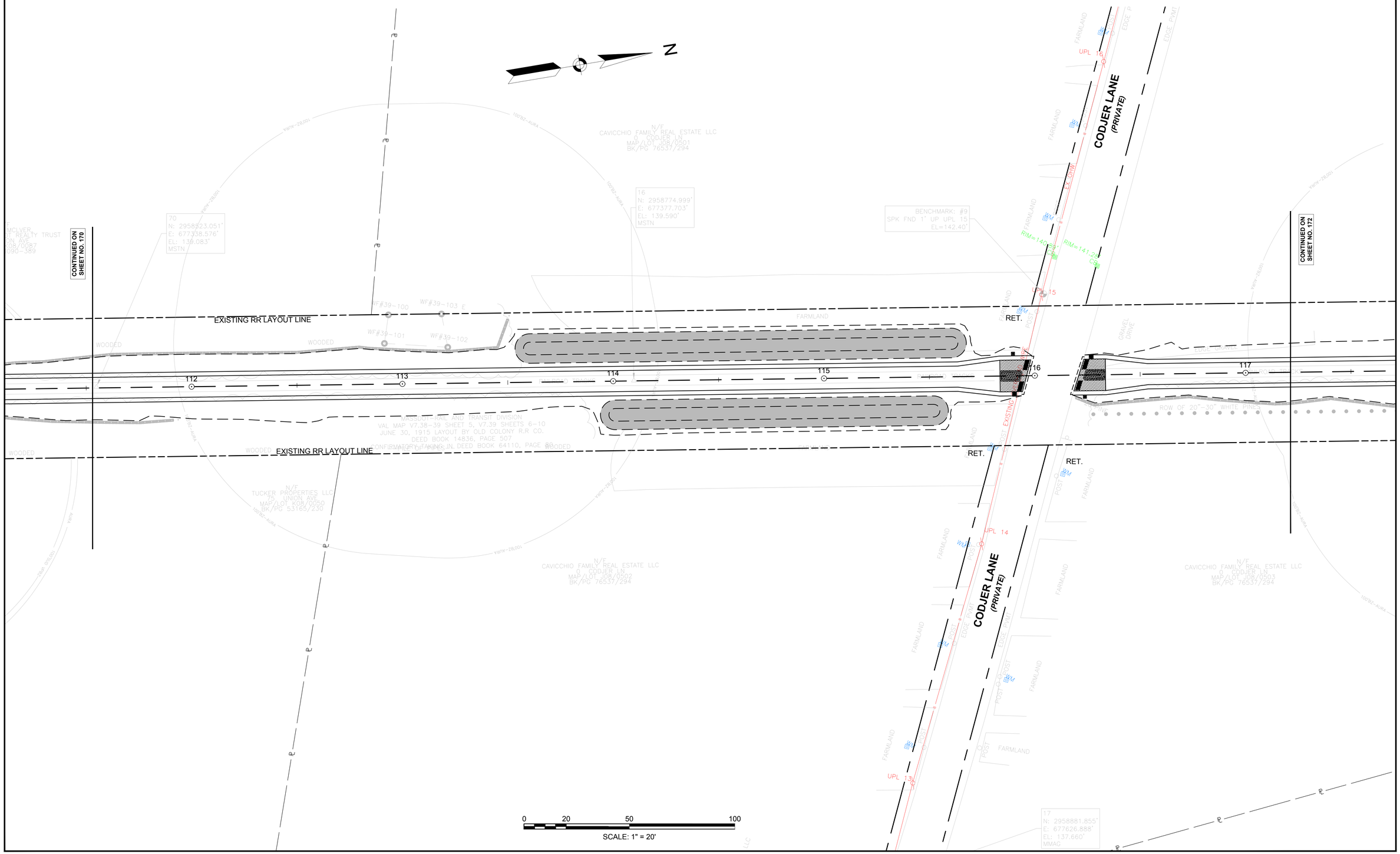
0 20 50 100
SCALE: 1" = 20'

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	171	316
PROJECT FILE NO.	608164		

DRAINAGE & UTILITY PLANS

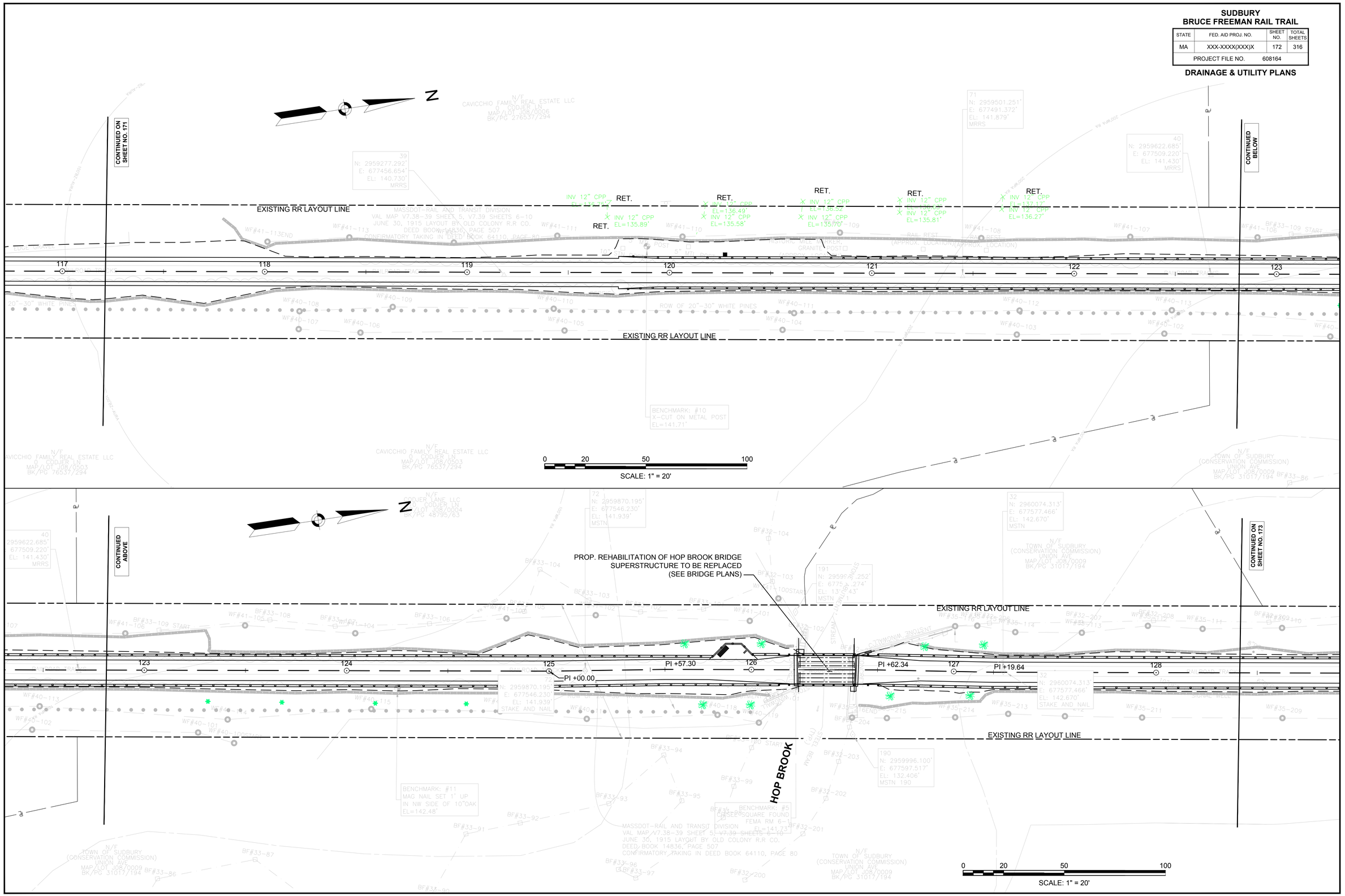
608164_HD\DRAINAGE & UTILITY PLANS\.DWG Plotted on 22-Dec-2021 11:31 AM



SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	172	316
PROJECT FILE NO.	608164		

DRAINAGE & UTILITY PLANS



SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	173	316
PROJECT FILE NO.	608164		

DRAINAGE & UTILITY PLANS

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	174	316
PROJECT FILE NO.	608164		

DRAINAGE & UTILITY PLANS

608164_HD\DRAINAGE & UTILITY PLANS\.DWG Plotted on 22-Dec-2021 11:31 AM

N

OLD LANCASTER ROAD (PUBLIC)

1971 TOWN LAYOUT

CONTINUED ON SHEET NO. 173

CONTINUED ON SHEET NO. 175

EXISTING RR LAYOUT LINE

BENCHMARK: #66-11
PK FOUND 1" UP IN UP
EL=158.55'

BENCHMARK: #15
LAG NAIL SET 2' UP 10"TREE
EL=158.72'

RET. UTL. POLE

PC +75.77

RET.

RET. ELEC. CABINET

RET. UTL. POLE

RET. UTL. POLE

RET. CB

PROP. STONE FOR PIPE ENDS (10'x4')
(PAID UNDER ITEM #258)

BEGIN PROP. GR
STA +25.02

BEGIN PROP. GRASS SWALE
STA +29.06

PROP. STONE FOR PIPE ENDS (14'x5')
(PAID UNDER ITEM #258)

PROP. GRASS SWALE
(SEE CROSS SECTIONS)

27
N: 2961298.692'
E: 677768.067'
EL: 154.519'
MIPE

2
N: 2961684.439'
E: 677666.655'
EL: 156.229'
MMAG

3
N: 2961644.458'
E: 677817.347'
EL: 159.339'
MMAG

N/F
CHERYL JONES
233 OLD LANCASTER RD
MAP/LOT J08/0301
BK/PG 33438/39

N/F
ADRIAN G. & MELINDA J. DAVIES
14 GERRY DR
MAP/LOT J08/0307
BK/PG 38355/267

N/F
CHONG M & WAI-WAI CHO
236 OLD LANCASTER RD
MAP/LOT J08/0011
BK/PG 45903/51

N/F
MARK J LANZA & MARY ELIZABETH LOUSA
11 MEADOW DR
MAP/LOT J08/0111
BK/PG 45671/478

N/F
MICHAEL W. KREBS & BARBARA P
223 OLD LANCASTER RD
MAP/LOT J08/0101
BK/PG 13427/420

N/F
JOSHUA R & VICTORIA A BARIBEAU
219 OLD LANCASTER RD
MAP/LOT J08/0102
BK/PG 55651/169

N/F
MARCELLO C SANTANA
226 OLD LANCASTER RD
MAP/LOT J08/0046
BK/PG 75814/51

N/F
MATTHEW P & KENDRA H DOYON
220 OLD LANCASTER RD
MAP/LOT J08/0012
BK/PG 71206/253

0 20 50 100
SCALE: 1" = 20'

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	175	316
PROJECT FILE NO.	608164		

DRAINAGE & UTILITY PLANS

608164_HD\DRAINAGE & UTILITY PLANS\.DWG Plotted on 22-Dec-2021 11:32 AM

CONTINUED ON SHEET NO. 174

PROP. STONE FOR PIPE ENDS (10'x4')
(PAID UNDER ITEM #258)

PROP. GRASS SWALE
(SEE CROSS SECTIONS)

N/F
CHONG M & WAL-WAI CHO
236 OLD LANCASTER RD
MAP/LOT H08/0011
BK/PG 45903/51

N/F
JAMES C & MELANIE B WEAVER
248 OLD LANCASTER RD
MAP/LOT H08/0008
BK/PG 12967/255

BENCHMARK: #4
GEODETIC SURVEY DISK 38G FND
EL=168.65'

MASSDOT-RAIL AND TRANSIT DIVISION
VAL MAP V7.38-39 SHEET 5, V7.39 SHEETS 6-10
JUNE 30, 1915 LAYOUT BY OLD COLONY R.R CO.
DEED BOOK 14836, PAGE 507
CONFIRMATORY TAKING IN DEED BOOK 64110, PAGE 80

EXISTING RR LAYOUT LINE

145 146 147 148 149 150 151

PT +83.65

RET. UPL

UPL REMNANTS

RET.

SWALE

PROP. GRASS SWALE
(SEE CROSS SECTIONS)

END PROP. GRASS SWALE
STA +50.02

CONTINUED BELOW

41
N: 2961940.959'
E: 677885.396'
EL: 161.734'
MRRS

42
N: 2962297.138'
E: 678008.767'
EL: 165.774'
MRRS

N/F
BRUCE OSTAR
31 PENNYMEADOW RD
MAP/LOT H08/0313
BK/PG 60261/437

N/F
CHRISTOPHER MCCLURE & RHYNE KRISTIN
35 PENNYMEADOW RD
MAP/LOT H08/0312
BK/PG 47285/246

N/F
WILLIAM E JR & ELAINE KNEELAND
43 PENNYMEADOW RD
MAP/LOT H08/0311
BK/PG 12513/278

0 20 50 100
SCALE: 1" = 20'

CONTINUED ABOVE

12" CI (RECORD)
ABANDON IN PLACE

N/F
JAMES C & MELANIE B WEAVER
248 OLD LANCASTER RD
MAP/LOT H08/0008
BK/PG 12967/255

MASSDOT-RAIL AND TRANSIT DIVISION
VAL MAP V7.38-39 SHEET 5, V7.39 SHEETS 6-10
JUNE 30, 1915 LAYOUT BY OLD COLONY R.R CO.
DEED BOOK 14836, PAGE 507
CONFIRMATORY TAKING IN DEED BOOK 64110, PAGE 80

WF#32-300 START
WF#32-301
WF#32-302
WF#32-303
WF#32-304
WF#32-305
WF#32-306
WF#32-307
WF#32-308
WF#32-309
WF#32-310
WF#32-311
WF#32-312

PT +83.65

151 152 153 154 155 156

RET. UPL

END PROP. GRASS SWALE
STA +00.01

RET. UTL. POLE

RET. UTL. POLE

CONTINUED ON SHEET NO. 176

73
N: 2962548.067'
E: 678126.508'
EL: 168.309'
MSTN POL

74
N: 2962818.356'
E: 678253.312'
EL: 171.057'
MSTN POL

BENCHMARK: #16
LAG SCREW SET 2' UP 18 TREE
EL=171.76'

N/F
JAMES J JR & LISA A NIGRELLI
TRUSTEES OF NIGRELLI NOMINEE
51 PENNYMEADOW RD
MAP/LOT H08/0310
BK/PG 74050/535

N/F
WILLIAM E JR & ELAINE KNEELAND
43 PENNYMEADOW RD
MAP/LOT H08/0311
BK/PG 12513/278

N/F
RICHARD J & CLAIRE A WOLLENSAK
60 PENNYMEADOW RD
MAP/LOT H08/0012
BK/PG 13285/445

0 20 50 100
SCALE: 1" = 20'

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	176	316
PROJECT FILE NO.	608164		

DRAINAGE & UTILITY PLANS

CONTINUED ON SHEET NO. 175

CONTINUED BELOW

RET. CULVERT

EXISTING RR LAYOUT LINE

156 157 158 PI +50.02 159 160 161 162

EXISTING RR LAYOUT LINE

RET. UTL. POLE

UPL NO# LOWER HALF ONLY

RET. UTL. POLE

UPL NO# STUMP ONLY

RET. UTL. POLE

BOX CULVERT
EL=158.67' 2.2'Wx1.8'H

1.8'H

BENCHMARK: #17
LAG SCREW SET 2' UP 16"TREE
EL=175.02'

N: 2963115.391'
E: 678392.726'
EL: 174.184'
MRRS

N/F
RICHARD J & CLAIRE A WOLLENSAK
60 PENNYMEADOW RD
MAP/LOT H09/0012
BK/PG 13285/445

N/F
JAMES C & MELANIE B WEAVER
248 OLD LANCASTER RD
MAP/LOT H08/0008
BK/PG 12967/255

N/F
MASSDOT-RAIL AND TRANSIT DIVISION
VAL MAP V7.38-39 SHEET 5, V7.39 SHEETS 6-10
JUNE 30, 1915 LAYOUT BY OLD COLONY R.R CO.
DEED BOOK 14836, PAGE 507
CONFIRMATORY TAKING IN DEED BOOK 64110, PAGE 80

0 20 50 100
SCALE: 1" = 20'

CONTINUED ABOVE

RET. CONC. PAD
RET. ABAN. WIRES

RET. METAL POST
RET. CONC. PAD

PROP. STONE FOR PIPE ENDS (10'x4')
(PAID UNDER ITEM #258)

BEGIN PROP. GRASS SWALE
STA +25.01

PROP. GRASS SWALE
(SEE CROSS SECTIONS)

EXISTING RR LAYOUT LINE

END PROP. GRASS SWALE
STA +24.96

162 163 164 165 PC +25.29 PT +48.01 166 167

UPL NO# STUMP ONLY

UPL NO# W/RISER

RET. UTL. POLE

RET. ELEC. CABINET

RET. CONC. PAD

UPL NO# ABAN

RET. UTL. POLE

EXISTING RR LAYOUT LINE

UPL #35 ABAN

RET. UTL. POLE

HW-09
STA:167+16.69 OFF:10.27L
INV=179.40 (HW-08)

R&D EXIST. CULVERT

PROP. HEADWALL
(MASSDOT CONST. STD. 206.60)

22 LF - 48" RCP
S=0.000'

PROP. HEADWALL
(MASSDOT CONST. STD. 206.60)

UPL NO# STUMP

RET. UTL. POLE

HW-08
STA:167+18.06 OFF:11.79R
INV=179.40 (HW-09)

CONTINUED ON SHEET NO. 177

BENCHMARK: #18
LAG SCREW SET 2' UP 5"TREE
EL=179.98'

N: 2963557.304'
E: 678597.577'
EL: 179.827'
MSTN POL

BENCHMARK: #19
CHISELED SQ SET ON STONE WALL
EL=182.48'

N: 2963770.197'
E: 678696.352'
EL: 182.334'
MRRS

N/F
JOHN T & MARY A BOND
586 PEAKHAM RD
MAP/LOT H08/0021
BK/PG 12237/315

N/F
MIRIAM DIMAURO
586 PEAKHAM RD
MAP/LOT H09/0020
BK/PG 20764/453

N/F
JENNI GOLSON CAVALLARO
594 PEAKHAM RD
MAP/LOT H08/0019
BK/PG 25679/494

N/F
MICHAEL T & LAURIE A ENSLEY
598 PEAKHAM RD
MAP/LOT H08/0015
BK/PG 32069/415

N/F
JON L & BRENDA K HART
602 PEAKHAM RD
MAP/LOT H08/0016
BK/PG 71382/371

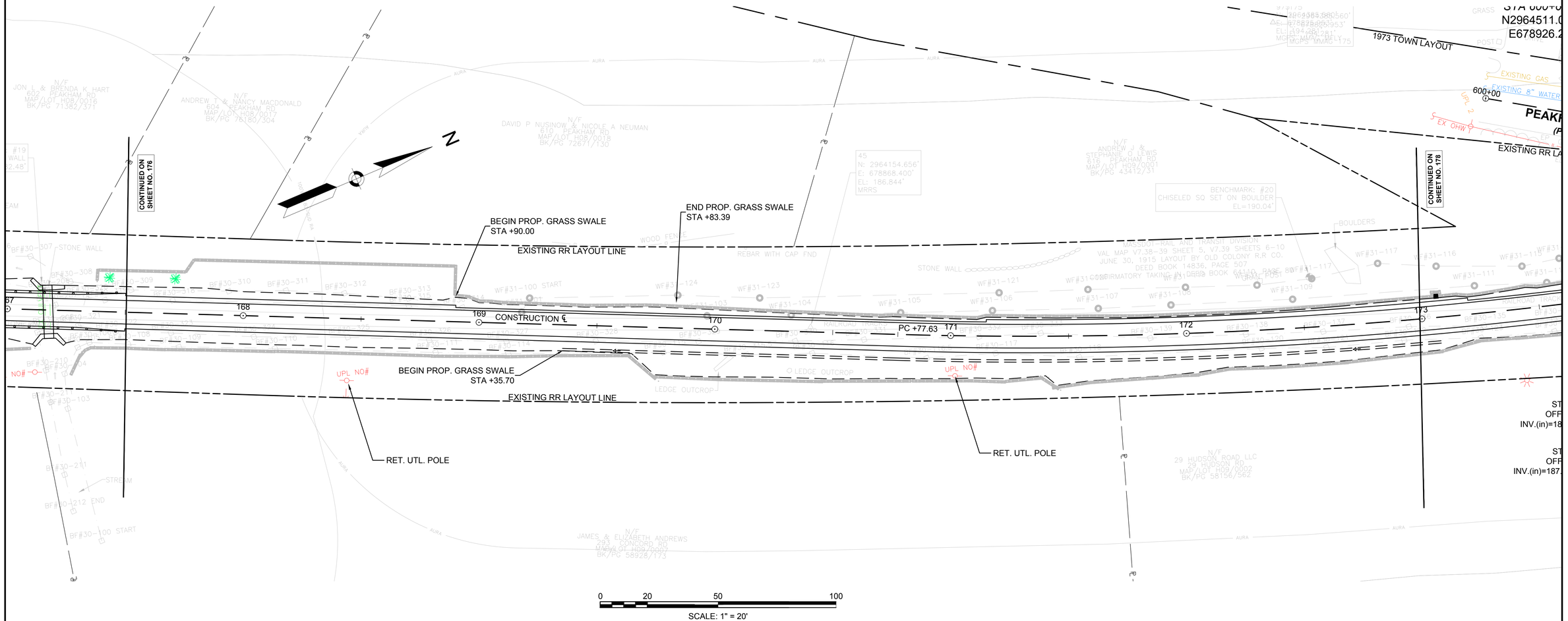
N/F
SUDBURY VALLEY TRUSTEES INC
0 CONCORD RD
MAP/LOT H09/0012
BK/PG 14357/71

0 20 50 100
SCALE: 1" = 20'

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	177	316
PROJECT FILE NO.	608164		

DRAINAGE & UTILITY PLANS



608164_HD\DRAINAGE & UTILITY PLANS\.DWG Plotted on 22-Dec-2021 11:32 AM

NOTE:

1. ALL EXISTING UNDERGROUND UTILITIES ARE TO BE RETAINED.

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	178	316
PROJECT FILE NO.	608164		

DRAINAGE & UTILITY PLANS

Plotted on 22-Dec-2021 11:32 AM

608164_HD\DRAINAGE & UTILITY PLANS\.DWG

N

PROP. CB
PROP. F&G
CB-02
STA:175+05.20
OFFSET:10.15 L
RIM=191.48
INV.(out)=188.59 (DMH-01)

PROP. CB
PROP. F&G
CB-01
STA:174+86.75
OFFSET:24.26 L
RIM=383.19
INV.(out)=188.26 (FE-01)

LIMIT OF WORK
STA 504+26.44
N2964724.5314
E678875.4345

PROP. 1" CORPORATION STOP

PROP. WATER SERVICE
1" COPPER (TYPE K)

LIMIT OF WORK
STA 600+65.46
N2964511.0042
E678926.2687

1973 TOWN LAYOUT

1941 COUNTY LAYOUT ALT.

HUDSON ROAD (RTE 27)
(PUBLIC)

PEAKHAM ROAD
(PUBLIC)

EXISTING RR LAYOUT LINE

CONTINUED ON SHEET NO. 177

CONTINUED ON SHEET NO. 179

PROP. CURB STOP

RET. UTL. POLE

PROP. HYDRATION STATION

REM. CB
R&S F&G

39 LF - 12" RCP
S=0.017'

25 LF - 12" RCP
S=0.014'

9 LF - 12" RCP
S=0.089'

40 LF - 12" RCP
S=0.016'

RET. RIP RAP

END PROP. GRASS SWALE
STA +07.23

FE-01
STA:174+67.95
OFFSET:11.68 R
INV.(in)=187.58 (CB-01)

FE-02
STA:174+68.24
OFFSET:16.19 R
INV.(in)=187.47 (DMH-01)

REM. EX. 10" CMP

REM. EXIST.
CULVERT.

PROP. DMH
PROP. F&C
DMH-01
STA:175+08.30
OFFSET:16.31 R
RIM=193.15
INV.(in)=188.82 (GI-01)
INV.(in)=188.21 (CB-02)
INV.(out)=188.10 (FE-02)

PROP. GI
PROP. F&G
GI-01
STA:175+11.69
OFFSET:26.94 R
RIM=192.48
INV.(out)=189.81 (DMH-01)

RET. L.P.

RET. EXIST. CULVERT
CONTRACTOR TO REMOVE DEBRIS &
SEDIMENT FROM OPENINGS
(PAID FOR UNDER ITEM #227.31)

PROP. TEST PIT - WATER
& PROP. DRAINAGE

RET. CEM. CONC. OUTLET

RET. UTL. POLE

RET. WM

RET. ANCHOR

LIMIT OF WORK
STA 701+83.65
N2964804.6240
E679072.0824

LIMIT OF WORK
STA 500+28.85
N2964552.0831
E679227.4914

0 20 50 100

SCALE: 1" = 20'

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	179	316
PROJECT FILE NO.	608164		

DRAINAGE & UTILITY PLANS

608164_HD\DRAINAGE & UTILITY PLANS\.DWG Plotted on 22-Dec-2021 11:32 AM

EXISTING RR LAYOUT LINE

178 179 PI +22.94 180 PI +37.53 181 182 183 184

CONTINUED ON SHEET NO. 178

CONTINUED BELOW

PT=1089.89

1003461.46

EXISTING GAS

CB
RIM=180.49'
FULL OF DEBRIS
TOP OF DEBRIS=177.49'

46
N: 2964937.772'
E: 679155.525'
EL: 188.164'
MSTN: 179

179
N: 2965067.878'
E: 679181.824'
EL: 185.887'
MSTN: 179

80
N: 2965292.587'
E: 679283.539'
EL: 185.405'
MSTN: POL

BENCHMARK: #22
LAG SCREW SET 2' UP 9"TREE
EL=187.34'

N: 2965314.484'
E: 679269.290'
EL: 185.384'
MSTN: 180

N/F
LAWRENCE W TIGHE, TRUSTEE OF THE HUDSON RD TRUST #1
36 HUDSON RD
MAP/LOT: G09/0002
BK/PG 30665/361

N/F
TOWN OF SUDBURY & BOARD OF SELECT BOARD
(TOWN CENTER LAND)
HUDSON RD
MAP/LOT: G09/0004
BK/PG 77156/463 & 77156/472

79
N: 2965173.980'
E: 679240.746'
EL: 186.102'
MSTN: POL

N/F
MATTHEW S. & MOLLY F. GILMARTIN
30 HUDSON RD
MAP/LOT: H09/0068
BK/PG 42175/566

MASSDOT-RAIL AND TRANSIT DIVISION
VAL MAP V7.38-39 SHEET 5, V7.39 SHEETS 6-10
JUNE 30, 1915 LAYOUT BY OLD COLONY R.R CO.
DEED BOOK 14836, PAGE 507
CONFIRMATORY TAKING IN DEED BOOK 64110, PAGE 80

2 STORY BUILDING "H-SALES"

STONE WALL
CHAIN LINK FENCE
BIT DRIVE
GRAVEL
EDGE GRAVEL
WOOD EDGING
GRASS
SHRUBS
STUMP
BOULDERS
BRICK WALL
LEDGE OUTCROP
RAILROAD TRACKS
CONCRETE BOUND W/DRILL HOLE
HYDRANT
LEVER OF DERAIL MECHANISM (APPROX. LOCATION)
INTERLOCKING SWITCH AND SIGNAL CASE (APPROX. LOCATION)

0 20 50 100
SCALE: 1" = 20'

EXISTING RR LAYOUT LINE

184 185 186 187 188 PI +08.37 189 PI +22.97 190

CONTINUED ABOVE

CONTINUED ON SHEET NO. 197

CONTINUED ON SHEET NO. 180

1003461.46

PT=1089.89

81
N: 2965640.534'
E: 679408.927'
EL: 182.812'
MSTN: POL

82
N: 2965867.616'
E: 679490.715'
EL: 181.103'
MSTN: POL

BENCHMARK: #23
LAG SCREW SET 2' UP 5"PINE
EL=183.80'

N/F
TOWN OF SUDBURY(TREASURER)
HUDSON RD
MAP/LOT G09/0200
BK/PG 13189/604

N/F
TOWN OF SUDBURY & BOARD OF SELECT BOARD
(TOWN CENTER LAND)
PETERS WAY EXT
MAP/LOT G09/0100
BK/PG 77152/566

MASSDOT-RAIL AND TRANSIT DIVISION
VAL MAP V7.38-39 SHEET 5, V7.39 SHEETS 6-10
JUNE 30, 1915 LAYOUT BY OLD COLONY R.R CO.
DEED BOOK 14836, PAGE 507
CONFIRMATORY TAKING IN DEED BOOK 64110, PAGE 80

ISOLATED WETLAND (SURVEYED BY OTHERS)
WF#36-4
WF#36-6
WF#36-7

4'x10' CONC POST
CONCRETE BOUND W/DRILL HOLE
RAILROAD TRACKS

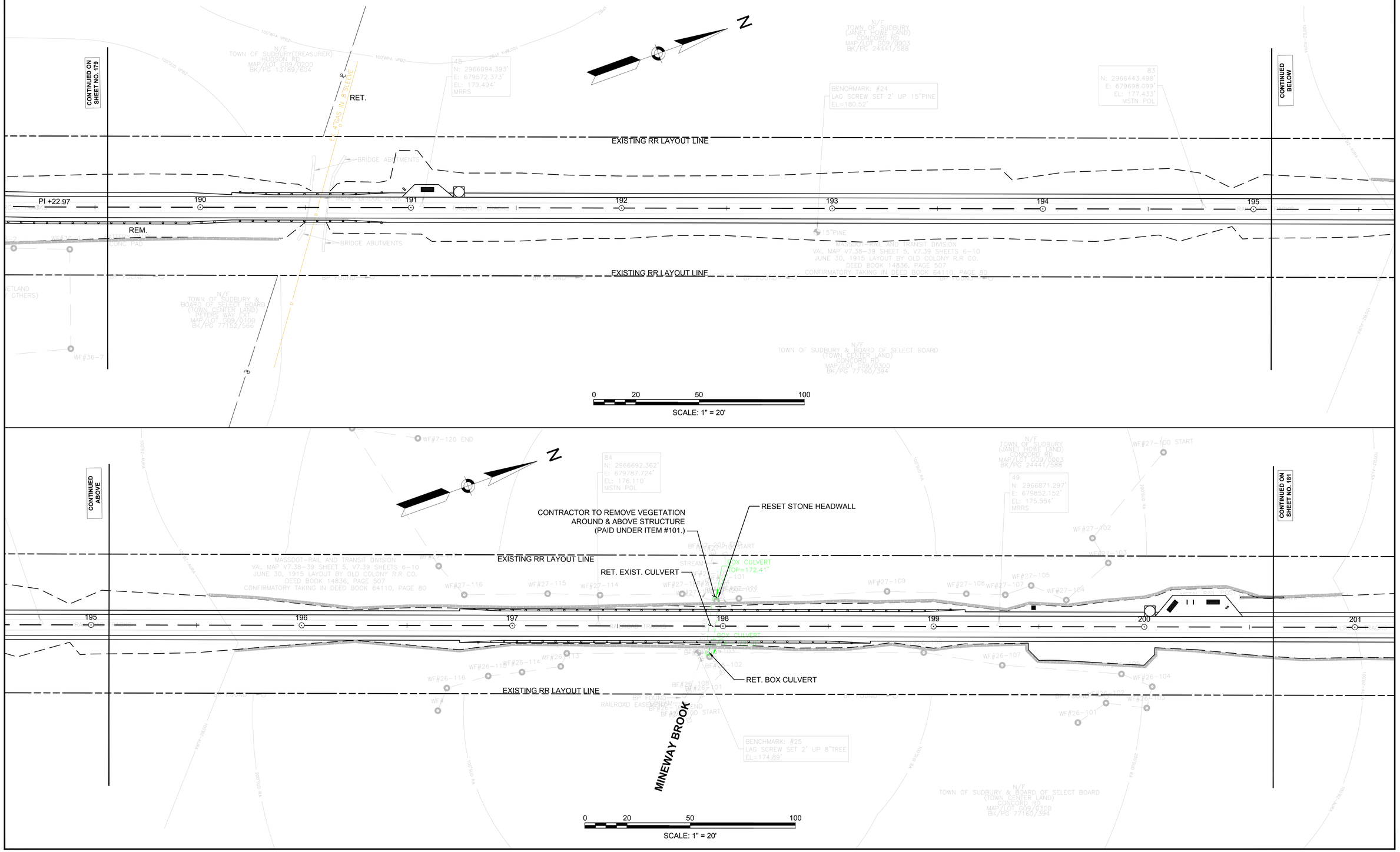
0 20 50 100
SCALE: 1" = 20'

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	180	316
PROJECT FILE NO.	608164		

DRAINAGE & UTILITY PLANS

608164_HD\DRAINAGE & UTILITY PLANS\.DWG Plotted on 22-Dec-2021 11:32 AM



SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	181	316
PROJECT FILE NO.	608164		

DRAINAGE & UTILITY PLANS

START

CONTINUED ON SHEET NO. 180

CONTINUED BELOW

N/F
TOWN OF SUDBURY
(JANES HOME LAND)
CONCORD RD
MAP/LOT C09/0003
BK/PG 24441/586

85
N: 2967158.846'
E: 679955.889'
EL: 175.157'
MSTN POL

50
N: 2967446.659'
E: 680059.723'
EL: 174.364'
MRRS

EXISTING RR LAYOUT LINE

201 202 203 204 205 206

CONC. POST

MASSDOT-RAIL AND TRANSIT DIVISION
VAL MAP V7.38-39 SHEET 5, V7.39 SHEETS 6-10
JUNE 30, 1915 LAYOUT BY OLD COLONY R.R CO.
DEED BOOK 14836, PAGE 507
CONFIRMATORY TAKING IN DEED BOOK 64110, PAGE 80

EXISTING RR LAYOUT LINE

BENCHMARK: #26
CHISELED SQ SET ON CONC POST
EL=178.55'

N/F
TOWN OF SUDBURY & BOARD OF SELECT BOARD
(TOWN CENTER LAND)
CONCORD RD
MAP/LOT G09/0300
BK/PG 77160/594

N/F
JAMES C & SUSAN M RICHARDS
44 CODMAN DR
MAP/LOT C09/0807
BK/PG 24467/551

0 20 50 100
SCALE: 1" = 20'

CONTINUED ABOVE

BENCHMARK: #27
LAG SCREW SET 2' UP 7"TREE
EL=175.05'

86
N: 2967756.688'
E: 680171.009'
EL: 173.283'
MSTN POL

N/F
TOWN OF SUDBURY
(CONSERVATION)
WAKE ROBIN RD
MAP/LOT F09/0001
BK/PG 12501/703

51
N: 2967872.934'
E: 680212.734'
EL: 172.488'
MRRS

182
N: 2967982.909'
E: 680252.270'
EL: 171.730'
MSTN 182

CONTINUED ON SHEET NO. 182

CBDH 201

EXISTING RR LAYOUT LINE

206 207 208 209 210 211 212

PC +88.78
PT +49.64
PT +49.97
PI +81.68
PC +88.86

RAILROAD TRACKS

MASSDOT-RAIL AND TRANSIT DIVISION
VAL MAP V7.38-39 SHEET 5, V7.39 SHEETS 6-10
JUNE 30, 1915 LAYOUT BY OLD COLONY R.R CO.
DEED BOOK 14836, PAGE 507
CONFIRMATORY TAKING IN DEED BOOK 64110, PAGE 80

EXISTING RR LAYOUT LINE

N/F
JAMES C & SUSAN M RICHARDS
44 CODMAN DR
MAP/LOT C09/0807
BK/PG 24467/551

N/F
WILLIAM P MCMAHON JR
& DINA M MCMAHON-DESORBO
42 CODMAN DR
MAP/LOT G09/0808
BK/PG 61407/511

N/F
CAROL A SHEDD
81 MORSE RD
MAP/LOT F09/0003
BK/PG 37232/274

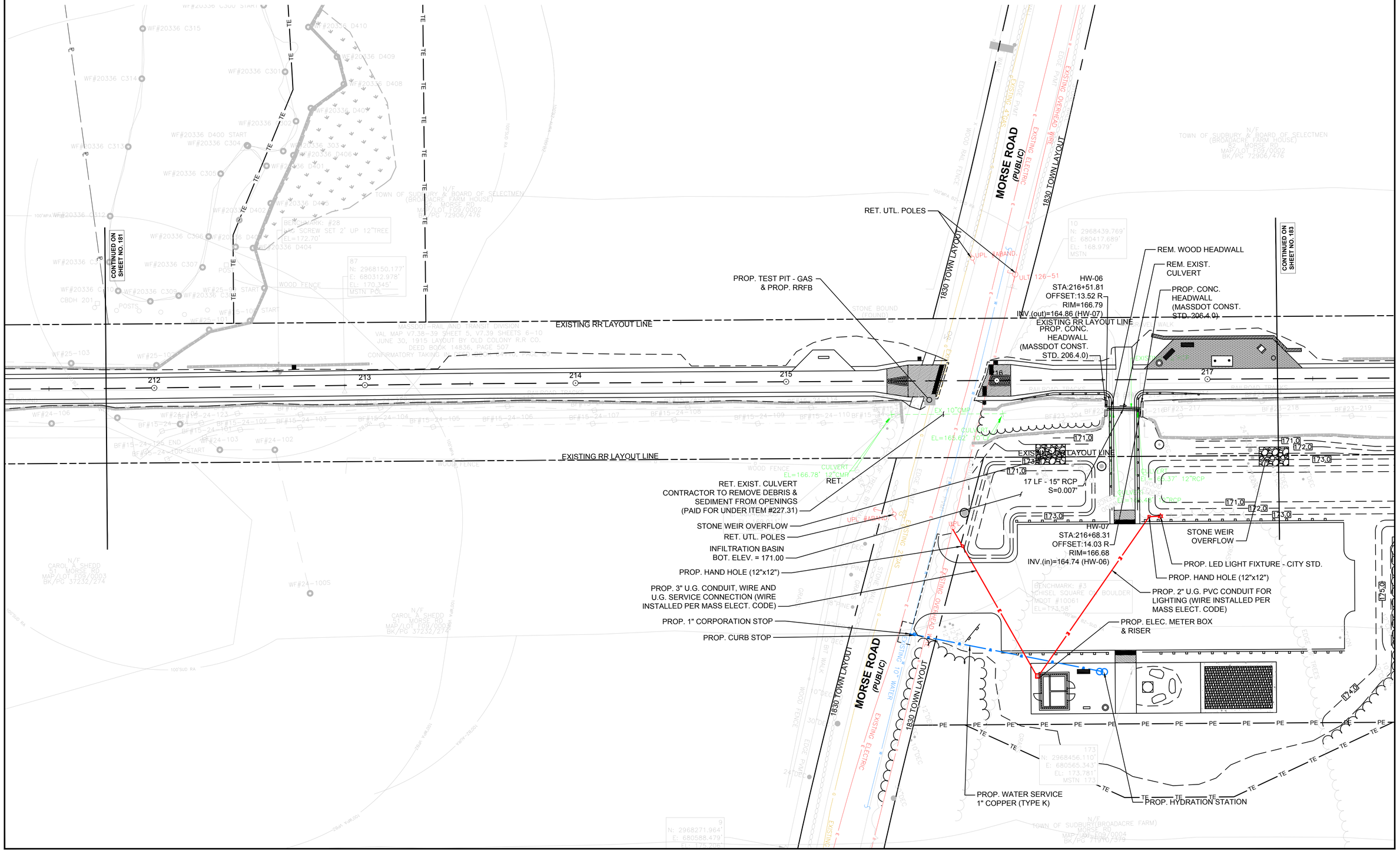
0 20 50 100
SCALE: 1" = 20'

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	182	316
PROJECT FILE NO.	608164		

DRAINAGE & UTILITY PLANS

608164_HD\DRAINAGE & UTILITY PLANS\.DWG Plotted on 22-Dec-2021 11:33 AM



SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	183	316
PROJECT FILE NO.	608164		

DRAINAGE & UTILITY PLANS

CONTINUED ON SHEET NO. 182

CONTINUED BELOW

EXISTING RR LAYOUT LINE

PI +96.42

PI +22.49

PC +92.35

EX. 30"CMP

RET. EXIST. PIPE

OUTLET EL=158.62' 30"CMP

OUTLET EL=158.86' 30"CMP

INFILTRATION BASIN BOT. ELEV. = 171.00

SCALE: 1" = 20'

CONTINUED ABOVE

RET. EXIST CULVERT

CULVERT EL=143.46' 42"MP

CULVERT EL=143.90' 42"MP

RET. UPL ABAN

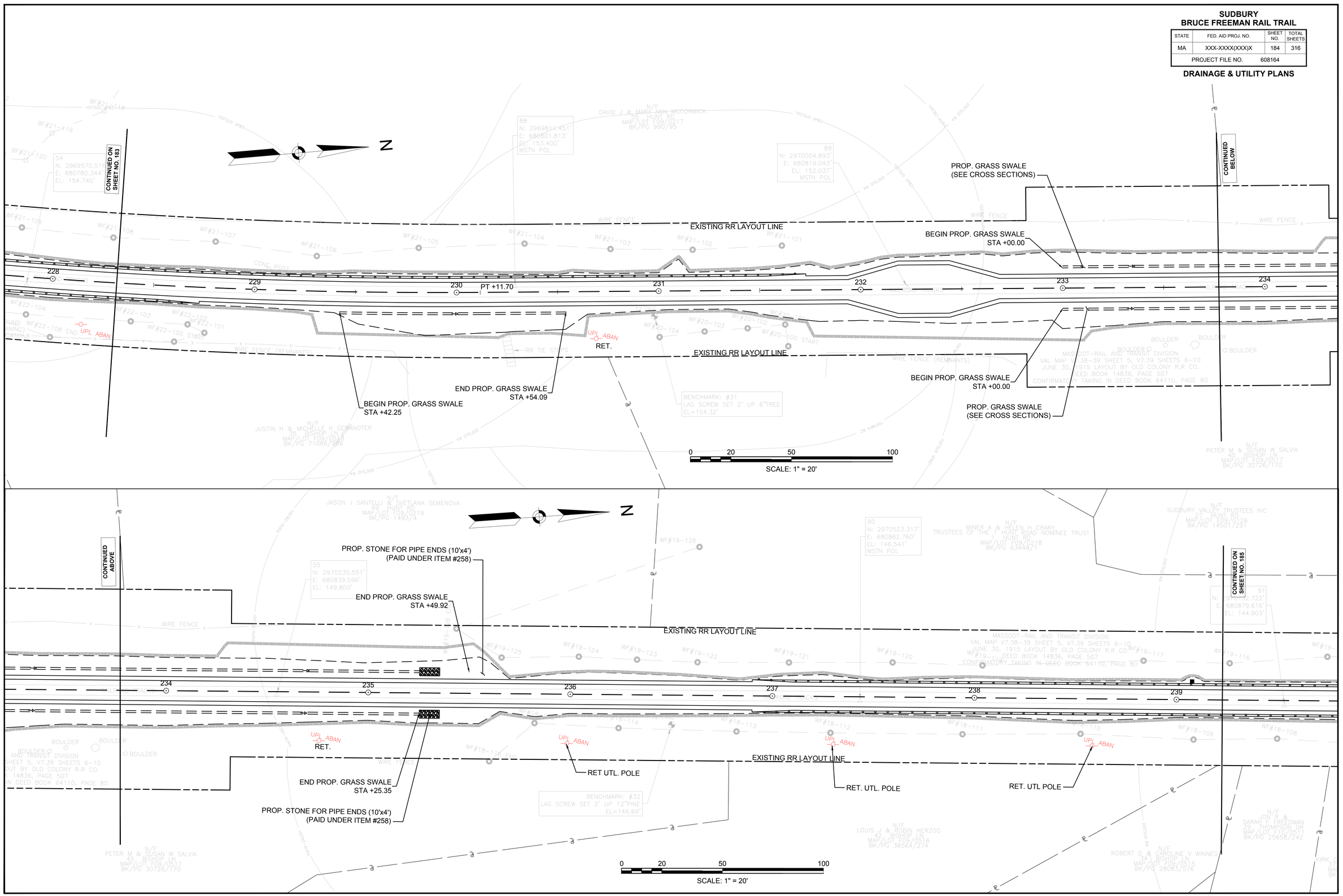
CONTINUED ON SHEET NO. 184

SCALE: 1" = 20'

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	184	316
PROJECT FILE NO.	608164		

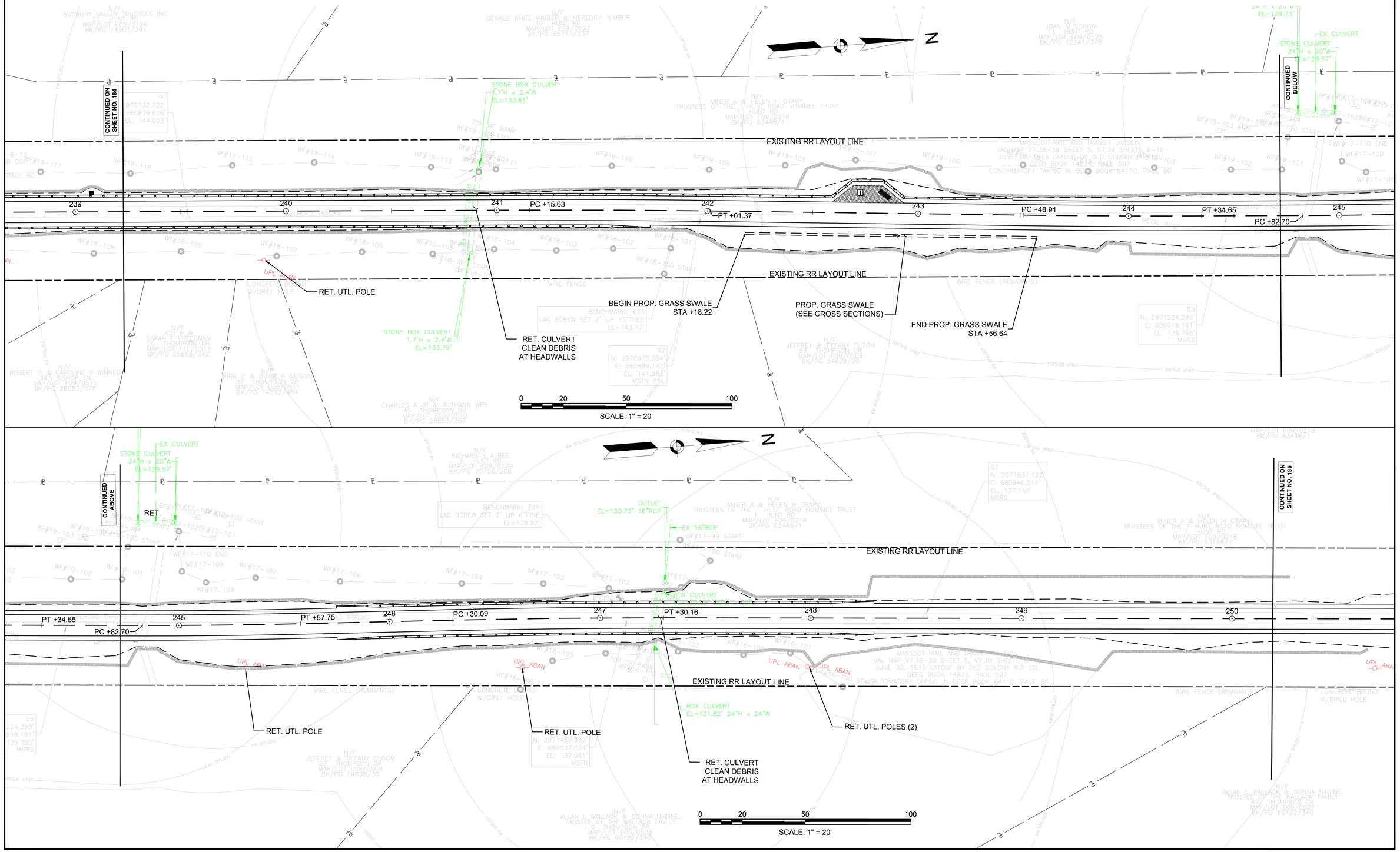
DRAINAGE & UTILITY PLANS



SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	185	316
PROJECT FILE NO.	608164		

DRAINAGE & UTILITY PLANS



SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	186	316
PROJECT FILE NO.	608164		

DRAINAGE & UTILITY PLANS

Plotted on 22-Dec-2021 11:34 AM

608164_HD\DRAINAGE & UTILITY PLANS\.DWG

CONTINUED ON SHEET NO. 185

CONTINUED BELOW

BEGIN PROP. GRASS SWALE
STA +72.89

END PROP. GRASS SWALE
STA +09.91

EXISTING RR LAYOUT LINE

250 251 252 253 254 255 256

EXISTING RR LAYOUT LINE

RET. UTL. POLE

RET. UTL. POLE

BEGIN PROP. GRASS SWALE
STA +72.89

PROP. GRASS SWALE
(SEE CROSS SECTIONS)

RET. UTL. POLE

0 20 50 100

SCALE: 1" = 20'

CONTINUED ABOVE

CONTINUED ON SHEET NO. 187

PROP. STONE FOR PIPE ENDS (7'x5')
(PAID UNDER ITEM #258)

EXISTING RR LAYOUT LINE

256 257 258 259 260 261

25 LF - 12" RCP
S=0.013 FT/FT

PC +99.00

EXISTING RR LAYOUT LINE

RET. UTL. POLE

END PROP. GRASS SWALE
STA +44.17

HW-01
STA:257+47.92
OFFSET:10.00 R
RIM=134.56
INV.(out)=132.89 (STRUCTURE - (49))

PROP. CONC. HEADWALL
(MASSDOT CONST. STD.
206.4.0)

0 20 50 100

SCALE: 1" = 20'

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	187	316
PROJECT FILE NO.	608164		

DRAINAGE & UTILITY PLANS

CONTINUED ON SHEET NO. 186

PROP. BRIDGE REPLACEMENT
(SEE BRIDGE PLANS)

PANTRY BROOK

CONTINUED BELOW

EXISTING RR LAYOUT LINE

261 262 263 264 PT #61.41 265 266 267

RET.
UPL/ ABAN

EXISTING RR LAYOUT LINE

PROP. RIP RAP (TYP.)

PANTRY BROOK

0 20 50 100
SCALE: 1" = 20'

CONTINUED ABOVE

EXISTING RR LAYOUT LINE

267 268 269 270 271 272

UPL ABAN

RET. UTL. POLE

UPL ABAN

RET. UTL. POLE

UPL ABAN

RET. UTL POLE

UPL ABAN

RET. UTL. POLE

EXISTING RR LAYOUT LINE

CONTINUED ON SHEET NO. 188

0 20 50 100
SCALE: 1" = 20'

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	188	316
PROJECT FILE NO.	608164		

DRAINAGE & UTILITY PLANS

608164_HD\DRAINAGE & UTILITY PLANS\.DWG Plotted on 22-Dec-2021 11:34 AM

N

CONTINUED ON SHEET NO. 187

CONTINUED ON SHEET NO. 189

RET. EXIST. CULVERT
CONTRACTOR TO REMOVE DEBRIS & SEDIMENT FROM OPENINGS
(PAID FOR UNDER ITEM #227.31)

RET. UTL. POLE

RET. GAS GATE

RET. GAS VENT

EXISTING RR LAYOUT LINE

1830 TOWN LAYOUT

HAYNES ROAD
(PUBLIC)

REM . UTL. POLE
REM. ELEC. METER

RET. UTL. POLE

UPL 30/5 w/RISERS

UPL 6 w/TRANS

EXISTING RR LAYOUT LINE

272 273 274 275 276 277 278

PC +29.45

PRC +48.94

PT +88.50

PT +40.91

PC +03.01

PRC +47.79

PC +10.25

PT +92.57

UPL ABAN

RET. UTL. POLE

UPL ABAN

RET. UTL. POLE

UPL 7/40

RET. UTL. POLE

EXISTING RR LAYOUT LINE

1830 TOWN LAYOUT

1830 TOWN LAYOUT

HAYNES ROAD
(PUBLIC)

EXISTING 4"GAS

EXISTING OVERHEAD WIRE

EXISTING 12"WATER

OUTLET
EL=132.86' 12"PVC

EX. 12"PVC

CB
RIM=133.92'

OUTLET
EL=129.65' 12"RCP

UPL#4A w/RISERS

UPL 4

GG

BENCHMARK: #39
LAG SCREW SET 2' UP 9"PINE
EL=135.05'

BENCHMARK: #3297
SPIKE SET 1' UP IN UP
EL=136.20'

100
N: 2974051.944'
E: 681378.850'
EL: 133.507'
MSTN

101
N: 2974467.089'
E: 681525.562'
EL: 136.137'
MSTN

62
N: 2974234.807'
E: 681435.526'
EL: 135.370'
MSTN

14
N: 2974235.175'
E: 681430.686'
MSTN

N/F
DANIEL A DEPOMPEI
A DEPOMPEI REALTY TRUST
HAYNES RD
LOT D09/0207
BK/PG 71975/116

N/F
EILEEN M. & DANIEL A. DEPOMPEI
TRUSTEES OF THE DEPOMPEI REALTY TRUST
35 HAYNES RD
MAP/LOT D09/0207
BK/PG 71975/116

N/F
RICHARD J. & MICHELLE R. VROMAN
34 HAYNES RD
MAP/LOT D10/0024
BK/PG 42291/471

N/F
STEPHEN & JOAN VERRILL
HAYNES RD
MAP/LOT E10/0700
BK/PG 14819/188

N/F
CHRISTOPHER G. & ALISON M. BOLAND
42 HAYNES RD
MAP/LOT D10/0101
BK/PG 28689/158

N/F
ARTHUR J. & MARGARET A. RICHARD
31 HAYNES RD
MAP/LOT D10/0001
BK/PG 24653/464

MASSDOT-RAIL AND TRANSIT DIVISION
VAL MAP V7.38-39 SHEET 5, V7.39 SHEETS 6-10
JUNE 30, 1915 LAYOUT BY OLD COLONY R.R CO.
DEED BOOK 14836, PAGE 507
CONFIRMATORY TAKING IN BOOK 64110, PAGE 80

AREA OF SCATTERED ROCKS AND LEDGE OUTCROPS

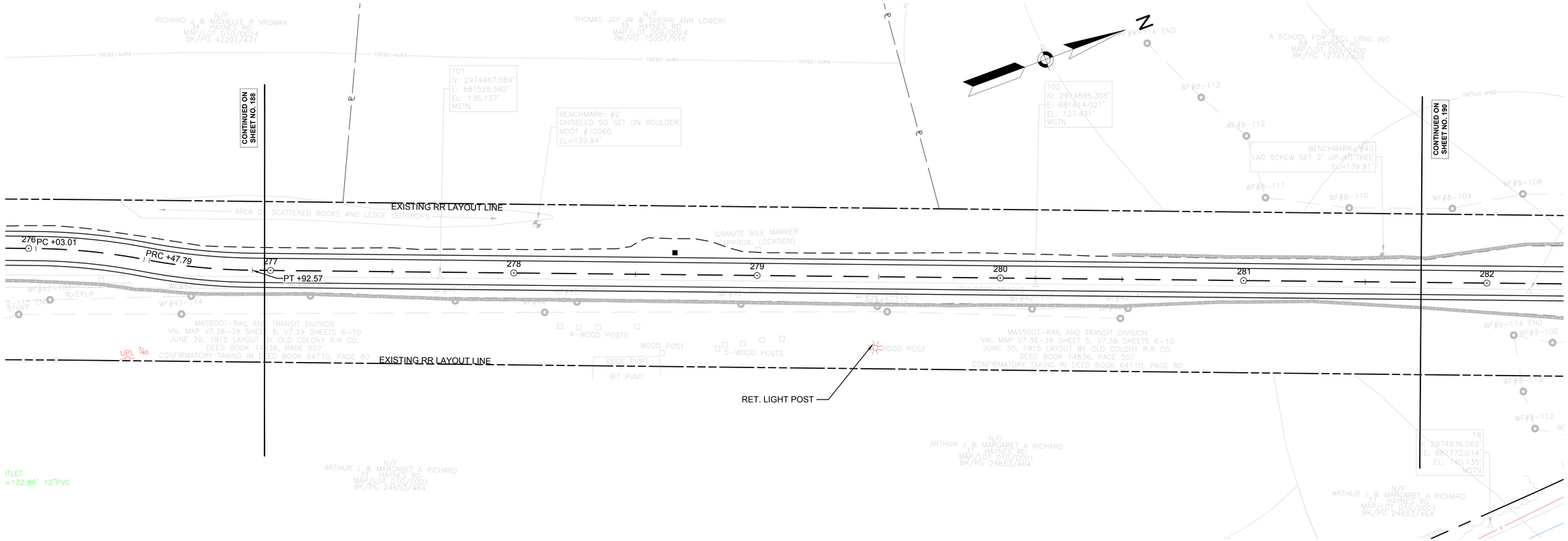
0 20 50 100
SCALE: 1" = 20'

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	189	316
PROJECT FILE NO.	608164		

DRAINAGE & UTILITY PLANS

608164_HD\DRAINAGE & UTILITY PLANS\.DWG Plotted on 22-Dec-2021 11:34 AM

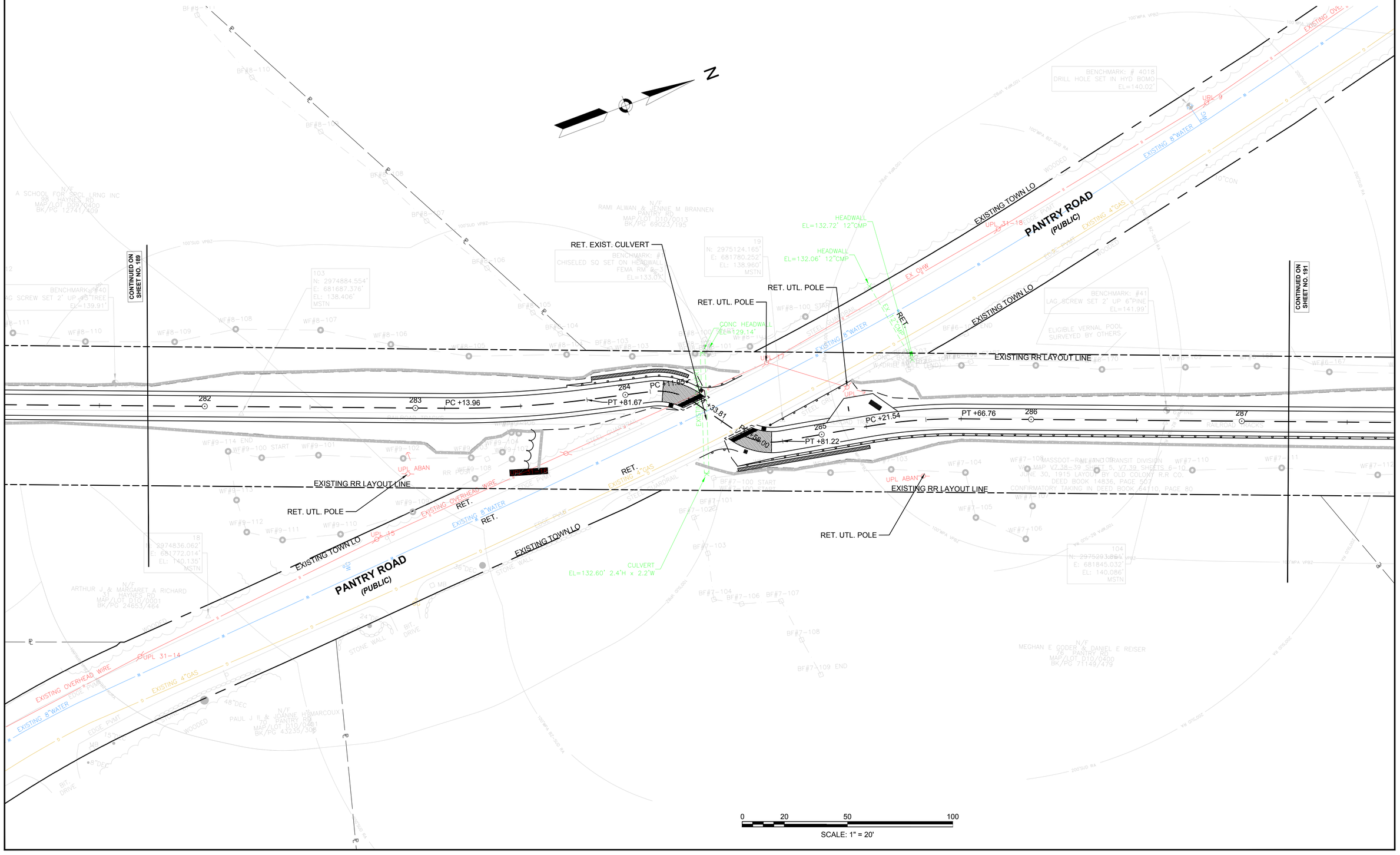


SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	190	316
PROJECT FILE NO.	608164		

DRAINAGE & UTILITY PLANS

608164_HD\DRAINAGE & UTILITY PLANS\.DWG Plotted on 22-Dec-2021 11:34 AM



SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	191	316
PROJECT FILE NO.	608164		

DRAINAGE & UTILITY PLANS

CONTINUED ON SHEET NO. 190

RET. EXIST. CULVERT
CLEAR VEGETATION
WITHIN 5' OF HEADWALLS

STONE BOX CULVERT
EL=134.77' 2.7'H x 2.3'W

EXISTING RR LAYOUT LINE

STONE BOX CULVERT
EL=134.27' 3'H x 2'W

PI +83.52

PI +97.92

UPL ABAN

UPL ABAN

UPL ABAN

UPL REMNANTS

RET. UTL. POLE

RET. UTL. POLE

RET. UTL. POLE

RET. UTL. POLE

EXISTING RR LAYOUT LINE

STREAM

WIRE FENCE (REMNANTS)

STEPHEN CHRISTOPHER NASH & TARA A NASH
108 PANTRY RD
MAP/LOT D10/0503
BK/PG 69023/236

TOWN OF SUDBURY
(CONSERVATION)
PANTRY RD
MAP/LOT D10/0022
BK/PG 13482/555

MASSDOT-RAIL AND TRANSIT DIVISION
VAL MAP V7.38-39 SHEET 5, V7.39 SHEETS 6-10
JUNE 30, 1915 LAYOUT BY OLD COLONY R.R CO.
DEED BOOK 14836, PAGE 507
CONFIRMATORY TAKING IN DEED BOOK 64110, PAGE 80

105
N: 2975465.903'
E: 681910.709'
EL: 141.155'
MSTN

106
N: 2975870.844'
E: 682065.491'
EL: 144.262'
MSTN

63
N: 2975653.295'
E: 681982.245'
EL: 142.510'
MRRS

BENCHMARK: #42
LAG SCREW SET 2" UP 18"TREE
EL=144.98'

0 20 50 100
SCALE: 1" = 20'

CONTINUED BELOW

CONTINUED ABOVE

RET.
UPL REMNANTS

EXISTING RR LAYOUT LINE

PC +05.75

UPL ABAN

UPL ABAN

UPL REMNANTS

UPL REMNANTS

RET. UTL. POLE

RET. UTL. POLE

RET. UTL. POLE

RET. UTL. POLE

EXISTING RR LAYOUT LINE

STEPHEN CHRISTOPHER NASH & TARA A NASH
108 PANTRY RD
MAP/LOT D10/0503
BK/PG 69023/236

TARA ILLIANO & RICHARD MAGAZU
122 PANTRY RD
MAP/LOT D10/0502
BK/PG 59281/548

MARY F BROCHU,TRUSTEE
OF THE REALITY REALTY TRUST
WINDMILL DR
MAP/LOT D10/0006
BK/PG 16775/585

TOWN OF SUDBURY
(CONSERVATION)
PANTRY RD
MAP/LOT D10/0022
BK/PG 13482/555

TOWN OF SUDBURY
(CONSERVATION)
211 NORTH RD
MAP/LOT D10/0300
BK/PG 12726/603

MASSDOT-RAIL AND TRANSIT DIVISION
VAL MAP V7.38-39 SHEET 5, V7.39 SHEETS 6-10
JUNE 30, 1915 LAYOUT BY OLD COLONY R.R CO.
DEED BOOK 14836, PAGE 507
CONFIRMATORY TAKING IN DEED BOOK 64110, PAGE 80

64
N: 2976074.734'
E: 682143.511'
EL: 145.780'
MRRS

BENCHMARK: #43
LAG SCREW SET 2" UP 15"TREE
EL=147.30'

106
N: 2975870.844'
E: 682065.491'
EL: 144.262'
MSTN

107
N: 2976258.431'
E: 682218.976'
EL: 147.591'

0 20 50 100
SCALE: 1" = 20'

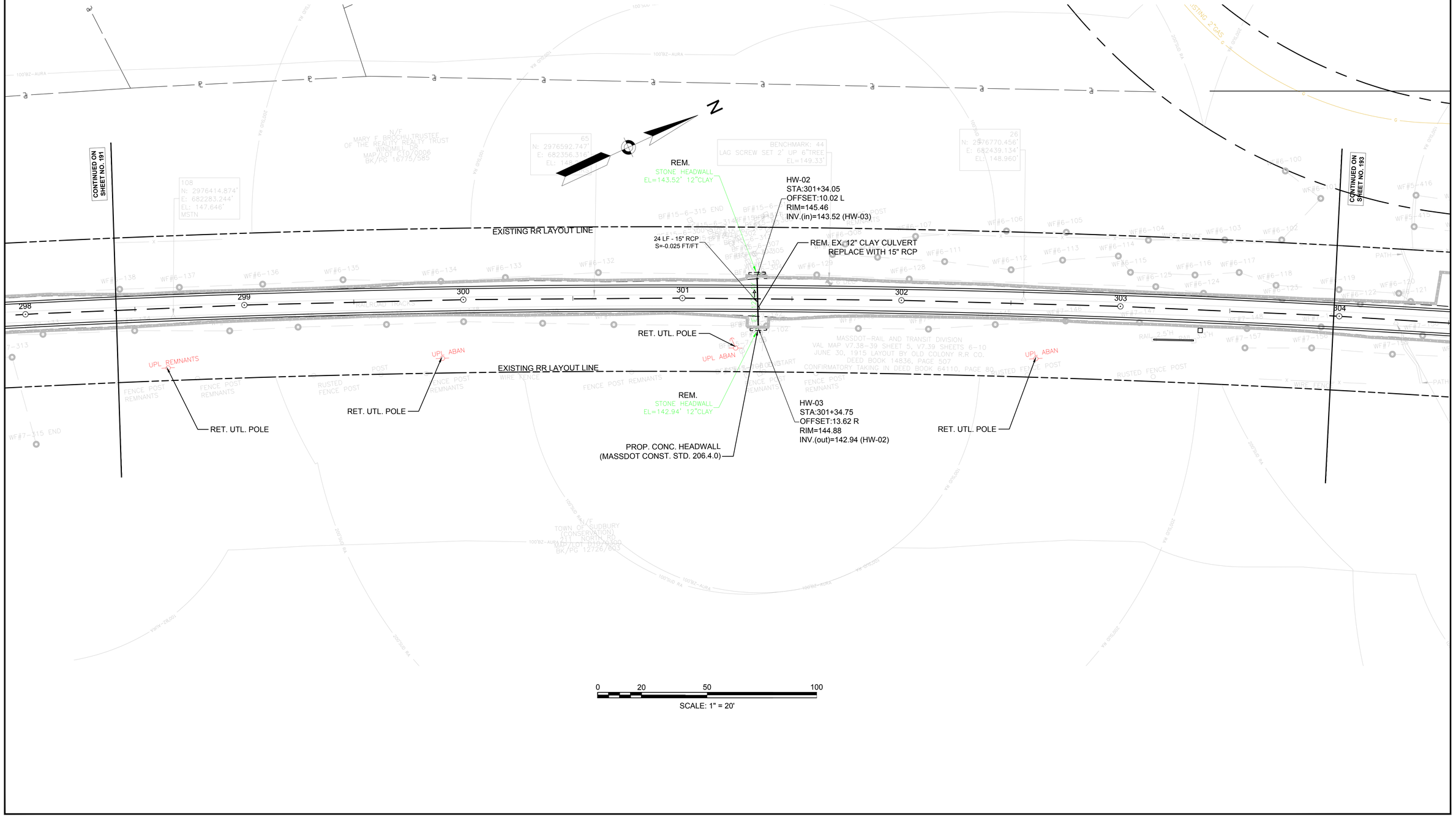
CONTINUED ON SHEET NO. 192

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	192	316
PROJECT FILE NO.	608164		

DRAINAGE & UTILITY PLANS

608164_HD\DRAINAGE & UTILITY PLANS\.DWG Plotted on 22-Dec-2021 11:35 AM



SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	193	316
PROJECT FILE NO.	608164		

DRAINAGE & UTILITY PLANS

608164_HD\DRAINAGE & UTILITY PLANS\.DWG Plotted on 22-Dec-2021 11:35 AM

N

1925 COUNTY LAYOUT

CB
RIM=149.34'
INV=146.69'

INV 12" RCP
EL=146.22'

EXISTING TOWN LO

EXISTING 2"GAS

WINDMILL DRIVE
(PUBLIC)

EXISTING 8"WATER

EX OHW

EXISTING OVERHEARD WIRE

EXISTING 12"WATER

EXISTING GAS

1925 COUNTY LAYOUT

NORTH ROAD (RTE 111)
(PUBLIC)

RET. UTL. POLE

RET. HYDRANT

RET. UTL. POLE

RET. WG

RET. UTL. POLE & GUY

CONTINUED ON SHEET NO. 192

CONTINUED ON SHEET NO. 194

REM.
CONC. HEADWALL
EL=145.20' 12"CI

PROP. CONC. HEADWALL
(MASSDOT CONST. STD. 206.4.0)

EXISTING RR LAYOUT LINE

HW-04
STA:306+62.41
OFFSET:12.72 L
RIM=146.87

PCC +38.07

PCC +93.59

PRC +06.41

PT +44.97

PT +14.74

304 305 306 307 308 309 310

REM.
CONC. HEADWALL
EL=144.40' 12"CI

RET. EXIST. CULVERT
CONTRACTOR TO REMOVE DEBRIS &
SEDIMENT FROM OPENINGS
(PAID FOR UNDER ITEM #227.31)

HW-05
STA:306+64.73
OFFSET:11.01 R
RIM=146.07

PROP. CONC. HEADWALL
(MASSDOT CONST. STD. 206.4.0)

REM. UTL. POLE & GUY

RET. WG

RET. UTL. POLE

CONTINUED ON SHEET NO. 196

1976 COUNTY LAYOUT ALT.

1925 COUNTY LAYOUT ALT.

PROP. F&G
PROP. CB
CB-04
STA:1102+48.50
OFFSET:10.02 L
RIM=143.80

0 20 50 100
SCALE: 1" = 20'

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	194	316
PROJECT FILE NO.	608164		

DRAINAGE & UTILITY PLANS

CONTINUED ON SHEET NO. 193

N/F
JOHN C. & DORIS NORMAN
NORTH RD
MAP/LOT C10/0013
BK/PG 13793/342

111
N: 2977523.427'
E: 682884.110'
EL: 144.551'
MSTN

BENCHMARK: #46
LAG SCREW SET 2' UP 8"TREE
EL=151.84'

66
N: 2977693.962'
E: 682993.029'
EL: 150.500'
MRRS

RET. EXIST. CULVERT
CONTRACTOR TO REMOVE DEBRIS & SEDIMENT FROM OPENINGS
(PAID FOR UNDER ITEM #227.31)

CULVERT (UNDER WATER)
EL=136.43' 2'Hx2.5'W

EXISTING RR LAYOUT LINE

MASSDOT-RAIL AND TRANSIT DIVISION
VAL MAP V7.38-39 SHEET 5, V7.39 SHEETS 6-10
JUNE 30, 1915 LAYOUT BY OLD COLONY R.R CO.
DEED BOOK 14836, PAGE 507
CONFIRMATORY TAKING IN DEED BOOK 64110, PAGE 80

310 311 312 313 314 315

CULVERT (BLOCKED & BURIED)
EL=133.21' 2'Hx2.5'W

EXISTING RR LAYOUT LINE

110
N: 2977340.853'
E: 682767.502'
EL: 143.610'
MSTN

INV 24" RCP
EL=134.49' 24"RCP

RET. EXISTING 24"RCP

INV 24" RCP
EL=134.29' 24"RCP

0 20 50 100
SCALE: 1" = 20'

N/F
FAIRVIEW DEVELOPMENT CORP
NORTH RD
MAP/LOT C10/0009
BK/PG 11659/136

CONTINUED BELOW

112
N: 2977843.836'
E: 683088.310'
EL: 152.198'
MSTN

CONTINUED ABOVE

113
N: 2978010.662'
E: 683194.369'
EL: 153.880'
MSTN

BENCHMARK: #47
LAG SCREW SET 1' UP 26"TREE
EL=155.62'

114
N: 2978177.854'
E: 683300.660'
EL: 155.517'
MSTN

CONTINUED ON SHEET NO. 195

RET. ULT #6 RISERS

EXISTING RR LAYOUT LINE

315 316 317 318 319 320 321

RET. UPL OLD
UPL #6
RET.

EXISTING RR LAYOUT LINE

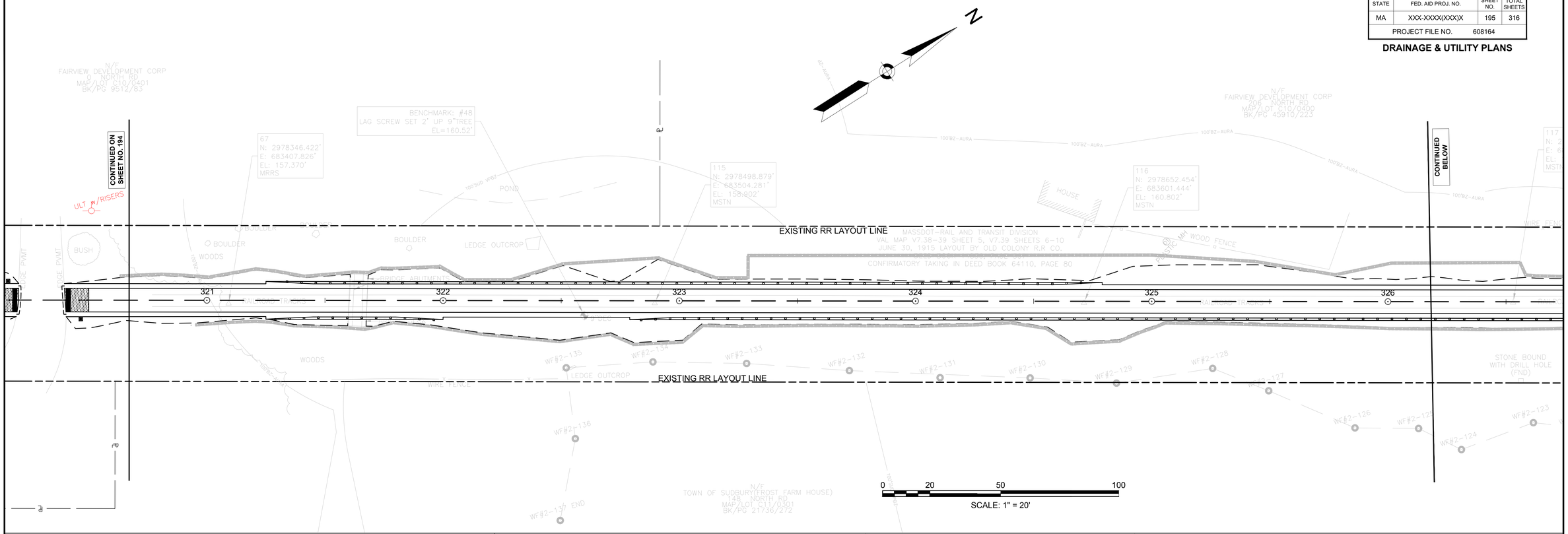
0 20 50 100
SCALE: 1" = 20'

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	195	316
PROJECT FILE NO.	608164		

DRAINAGE & UTILITY PLANS

608164_HD\DRAINAGE & UTILITY PLANS\.DWG Plotted on 22-Dec-2021 11:35 AM

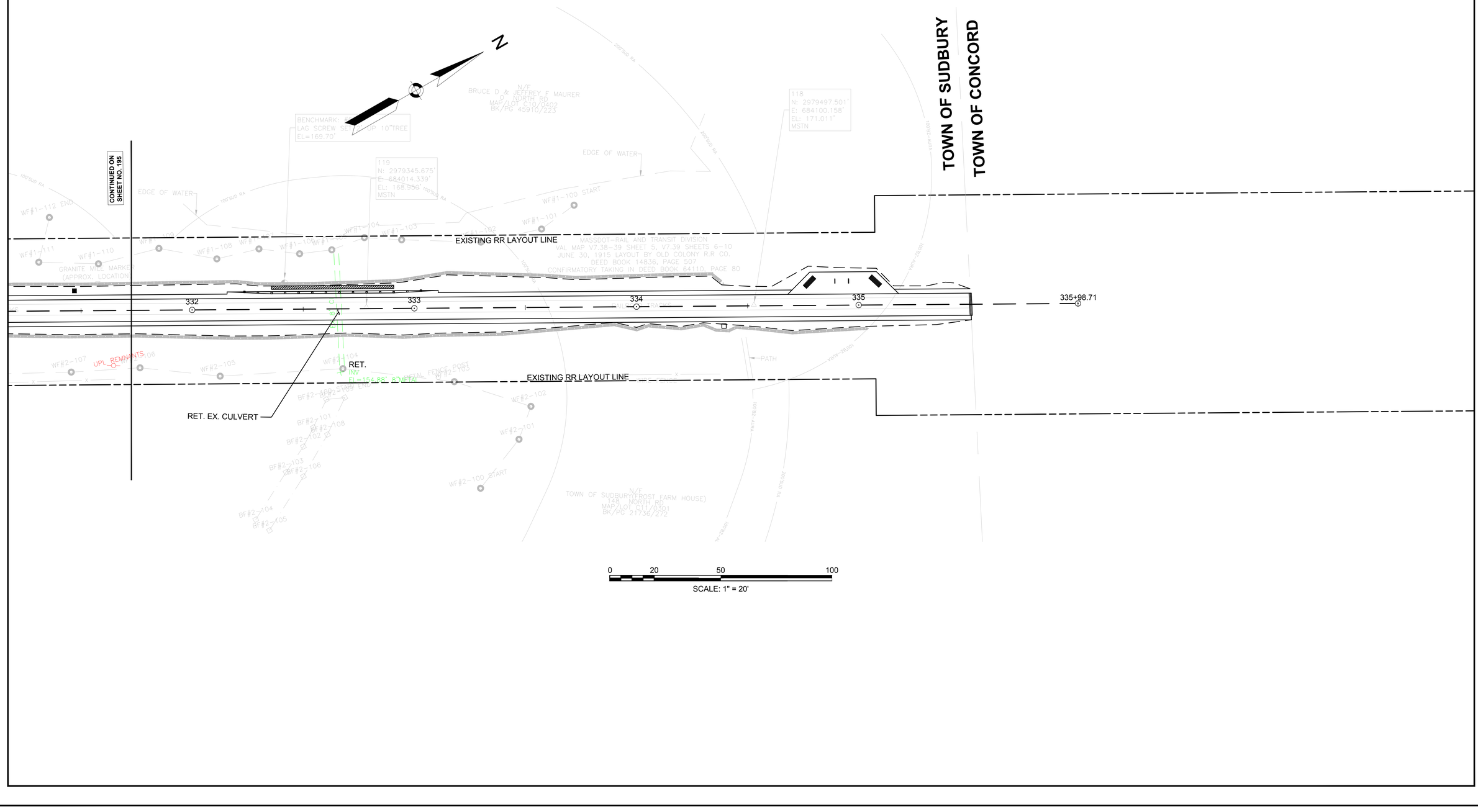


SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	196	316
PROJECT FILE NO.	608164		

DRAINAGE & UTILITY PLANS

608164_HD\DRAINAGE & UTILITY PLANS\.DWG Plotted on 22-Dec-2021 11:35 AM



SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	197	316
PROJECT FILE NO. 608164			

DRAINAGE & UTILITY PLANS

608164_HD\DRAINAGE & UTILITY PLANS\.DWG Plotted on 22-Dec-2021 11:35 AM

N

0 20 50 100

SCALE: 1" = 20'

LIMIT OF WORK
STA 1000+80.00
N2965545.8569
E679116.8231

1000+00

1001

PC +94.96

1002

PRC +34.65

PT 1003+50.89

1003+61.46

CONTINUED ON SHEET NO. 179

81
N: 2965640.534'
E: 679408.927'
EL: 182.812'
MSTN: POL

180
N: 2965314.484'
E: 679269.290'
EL: 185.384'
MSTN: 180

BENCHMARK: #22
2" UP @ TREE
EL=187.34'

80
N: 2965292.587'
E: 679283.539'

N/F
TOWN OF SUDBURY(TREASURER)
HUDSON RD
MAP/LOT 609/0200
BK/PG 13189/604

N/F
LAWRENCE W TIGHE, TRUSTEE OF THE HUDSON RD TRUST #1
36 HUDSON RD
MAP/LOT 609/0002
BK/PG 30663/361

MASSDOT-RAIL AND TRANSIT DIVISION
VAL MAP V7.38-39 SHEET 5, V7.39 SHEETS 6-10
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186
185
184
183

TE PE EP GRASS GRAVEL PARKING CHAIN LINK FENCE EDGE OF TREES STONE WALL EDGE GRAVEL CONCRETE BOUND W/DRILL HOLE

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	198	316
PROJECT FILE NO.	608164		

DRAINAGE & UTILITY PLANS

NORTH ROAD (RTE 117)
(PUBLIC)
E 117)
1976 COUNTY LAYOUT ALT.
EXISTING RR LAYOUT LINE
EXISTING
PT +14.74
PT +44.97
PRC +04.42
PCC +38.07
1100+00
1101
1102
1103
1104
1105
1106
PC +11.40
PT +20.48
PROP. F&G
PROP. CB
CB-04
STA:1102+48.50
OFFSET:10.02 L
RIM=143.80
RET. CB
REM. CB
R&S F&G
CB
RIM=143.52
INV=140.77
RET.
RET.
RET. UTL POLE
& GUY WIRE
RET. UTL POLE
PROP. 6" - 12" RCP
CONTRACTOR TO MATCH
EXIST. RCP
EXISTING 4"GAS
EXISTING 12"WATER
EXISTING OVERHEAD WIRE
CONTINUED ON SHEET NO. 193
CONTINUED BELOW
N
0 20 50 100
SCALE: 1" = 20'

PROP. 1" CORPORATION STOP
PROP. CURB STOP
PROP. WATER SERVICE
1" COPPER (TYPE K)
1976 COUNTY LAYOUT ALT.
CONTINUED ABOVE
RET.
RET.
RET.
EXISTING OVERHEAD WIRE
EXISTING 4"GAS
EXISTING 12"WATER
1104
1105
1106
1107
1108
1108+75
PC +11.40
PT +20.48
PC +85.73
PT +54.49
PC +83.93
PT +83.06
RET. UTL. POLE
PROP. HYDRATION STATION
R&D APPROX. 6' TO 8'
SECTION OF EXIST. GUARDRAIL
FOR INSTALLATION OF HYDRATION STATION
RET. EXIST. POSTS.
PROP. HYDRATION STATION SUMP PIT
(APPROX. LOCATION)
SEE CONST. DETAILS
LIMIT OF WORK
STA 1107+63.72
N2976869.2613
E683219.5155
N
0 20 50 100
SCALE: 1" = 20'

608164_HD(DRAINAGE & UTILITY PLANS).DWG Plotted on 22-Dec-2021 11:36 AM

WETLAND REPLICATION PLAN NOTES

GENERAL NOTES

1. THE CONTRACTOR SHALL MAKE ALL NECESSARY CONSTRUCTION NOTIFICATIONS AND APPLY FOR AND OBTAIN ALL NECESSARY PERMITS PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL ALSO PAY ALL FEES AND POST ALL BONDS ASSOCIATED WITH THE SAME, AND COORDINATE WITH THE ENGINEER AND ARCHITECT AS REQUIRED.
2. CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR JOB SITE SAFETY AND ALL CONSTRUCTION MEANS AND METHODS.
3. LIMIT OF WORK SHALL BE EROSION CONTROL BARRIERS, LIMIT OF GRADING AND SITE PROPERTY LINES AND/OR AS INDICATED ON DRAWINGS.
4. ANY ALTERATION TO THESE DRAWINGS MADE IN THE FIELD DURING CONSTRUCTION SHALL BE RECORDED BY THE CONTRACTOR ON RECORD DOCUMENTS.
5. ANY AREA OUTSIDE THE LIMIT OF WORK THAT IS DISTURBED SHALL BE RESTORED TO ITS ORIGINAL CONDITION AT NO COST TO OWNER.
6. EXISTING TREES AND SHRUBS OUTSIDE THE LIMITS OF GRADING SHALL BE REMOVED ONLY UPON PRIOR APPROVAL OF THE OWNER.
7. FOR DRAWING LEGIBILITY, ALL EXISTING TOPOGRAPHIC FEATURES, EXISTING UTILITIES, PROPERTY BOUNDARIES, EASEMENTS, ETC. MAY NOT BE SHOWN ON ALL DRAWINGS. REFER TO ALL REFERENCED DRAWINGS AND OTHER DRAWINGS IN THIS SET FOR ADDITIONAL INFORMATION.
8. THE CONTRACTOR SHALL BE RESPONSIBLE FOR COMPLIANCE WITH ALL PERMIT CONDITIONS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR SUBMITTINC, SECURING AND COMPLIANCE WITH THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) CONSTRUCTION GENERAL PERMIT, AS ADMINISTERED BY THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY.

EROSION CONTROL AND SEDIMENTATION NOTES

1. CONTRACTOR SHALL MAINTAIN ANY EROSION CONTROL MEASURES DURING THE ENTIRE CONSTRUCTION PERIOD.
2. ANY SEDIMENT TRACKED ONTO THE PUBLIC RIGHT-OF-WAYS SHALL BE SWEPT AT THE END OF EACH WORKING DAY.
3. ALL DEBRIS GENERATED DURING SITE PREPARATION ACTIVITIES SHALL BE LEGALLY DISPOSED OF OFF SITE.
4. SITE ELEMENTS TO REMAIN MUST BE PROTECTED FOR DURATION OF PROJECT.
5. ADDITIONAL EROSION CONTROL MEASURES SHALL BE IMPLEMENTED AS CONDITIONS WARRANT OR AS DIRECTED BY THE OWNER OR OWNER'S REPRESENTATIVE (E.G., PROFESSIONAL ENGINEER, WETLAND SCIENTITST, CERTIFIED ECOLOGICAL RESTORATION PRACTIONER).
6. THE WETLAND REPLICATION SITE WILL BE ACCESSED FROM THE BRUCE FREEMAN RAIL TRAIL. ALL POINTS OF CONSTRUCTION EGRESS OR INGRESS SHALL BE MAINTAINED TO PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC ROADS.
7. EXTREME CARE SHALL BE EXERCISED SO AS TO PREVENT ANY UNSUITABLE MATERIAL FROM ENTERING WETLAND LOCATED OUTSIDE THE LIMIT OF WORK AND OFF PROPERTY.
8. ADDITIONAL EROSION CONTROLS SHALL BE LOCATED AS CONDITIONS WARRANT OR AS DIRECTED BY THE OWNER OR THEIR REPRESENTATIVE.

LAYOUT AND MATERIALS NOTES

1. ALL LINES AND DIMENSIONS ARE PARALLEL OR PERPENDICULAR TO THE LINES FROM WHICH THEY ARE MEASURED UNLESS OTHERWISE INDICATED.
2. CONTRACTOR SHALL REPORT SIGNIFICANT CONFLICTS TO THE OWNER AND THE ENGINEER FOR RESOLUTION.
3. THE CONTRACTOR SHALL NOTIFY THE ENGINEER OF ANY DISCREPANCIES BETWEEN SITE PLAN DIMENSIONS AND BUILDING PLANS BEFORE PROCEEDING WITH ANY PORTION OF SITE WORK WHICH MAY BE AFFECTED SO THAT PROPER ADJUSTMENTS TO THE SITE LAYOUT CAN BE MADE IF NECESSARY.
4. PROTECT EXISTING PROPERTY MONUMENTS AND ABUTTING PROPERTIES DURING CONSTRUCTION ACTIVITIES.

GRADING, DRAINAGE AND UTILITY NOTES

1. UNDERGROUND UTILITIES WERE COMPILED FROM AVAILABLE RECORD PLANS OF UTILITY COMPANIES AND PUBLIC AGENCIES, ARE APPROXIMATE AND ASSUMED. BEFORE COMMENCING SITE WORK IN ANY AREA, CONTACT "DIG SAFE" AT 1-888-344-7233 AND THE OWNER TO ACCURATELY LOCATE UNDERGROUND UTILITIES. ANY DAMAGE TO EXISTING UTILITIES OR STRUCTURES SHALL BE THE CONTRACTOR'S RESPONSIBILITY. NO EXCAVATION SHALL BE DONE UNTIL UTILITY COMPANIES AND THE OWNER ARE PROPERLY NOTIFIED IN ADVANCE.
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING THAT THE PROPOSED IMPROVEMENTS SHOWN ON THE PLANS DO NOT CONFLICT WITH ANY KNOWN EXISTING OR OTHER PROPOSED IMPROVEMENTS. IF ANY CONFLICTS ARE DISCOVERED, THE CONTRACTOR SHALL NOTIFY THE OWNER AND THE ENGINEER PRIOR TO INSTALLATION OF ANY PORTION OF THE SITE WORK WHICH WOULD BE AFFECTED.
3. ALL WORK PERFORMED AND ALL MATERIALS FURNISHED SHALL CONFORM WITH THE LINES, GRADES AND OTHER SPECIFIC REQUIREMENTS OR SPECIFICATIONS FOR THE PROJECT AS SHOWN ON THE PLANS.
4. THE CONTRACTOR SHALL VERIFY EXISTING GRADES IN THE FIELD AND REPORT ANY DISCREPANCIES IMMEDIATELY TO THE ENGINEER OR CERTIFIED ECOLOGICAL RESTORATION PROACTITIONER. THE CONTRACTOR SHALL MAKE ALL ARRANGEMENTS FOR THE ALTERATION AND ADJUSTMENT OF ANY OTHER PRIVATE UTILITIES BY THE UTILITY COMPANIES, AS REQUIRED. WHERE AN EXISTING UTILITY IS FOUND TO CONFLICT WITH THE PROPOSED WORK, THE LOCATION, ELEVATION AND SIZE OF THE UTILITY SHALL BE ACCURATELY DETERMINED WITHOUT DELAY BY THE CONTRACTOR, AND THE INFORMATION FURNISHED TO THE OWNER AND ENGINEER FOR RESOLUTION.
5. THE CONTRACTOR SHALL REMOVE ALL EROSION CONTROL BARRIERS AFTER REVEGETATION OF DISTURBED AREAS AND AFTER APPROVAL OF THE CONSERVATION COMMISSION AND WETLAND SPECIALIST OR CERTIFIED ECOLOGICAL RESTORATION PROACTITIONER.
6. PITCH EVENLY BETWEEN SPOT GRADES.

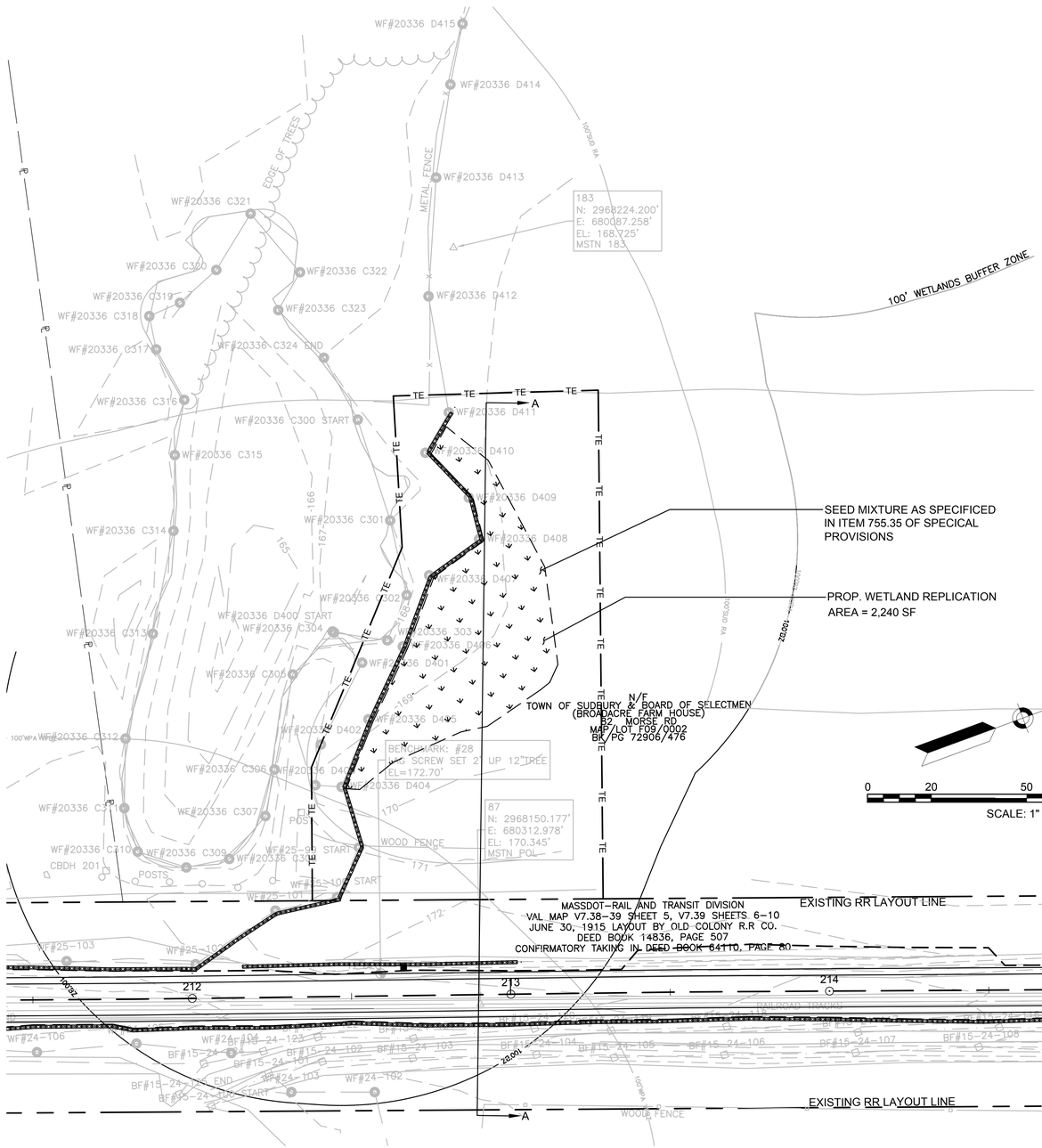
WETLAND CONSTRUCTION NOTES

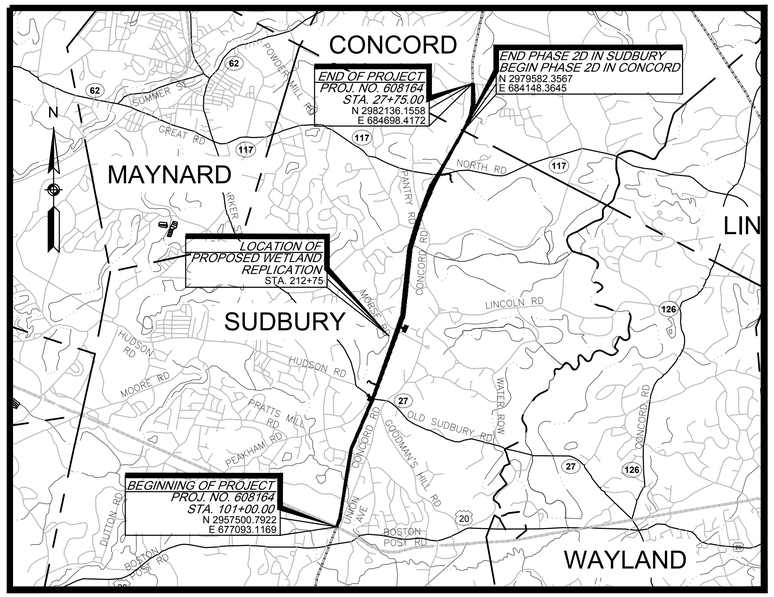
1. A PRECONSTRUCTION MEETING SHALL BE HELD BEFORE INITIATING CONSTRUCTION. THE PRECONSTRUCTION MEETING SHALL BE ATTENDED BY THE DESIGNATED PROFESSIONAL WETLAND SCIENTIST, SITE ENGINEER, CONSTRUCTION GENERAL MANAGER, SITE CONTRACTOR, LANDSCAPE CONTRACTOR, AND ANY OTHER CONTRACTOR INVOLVED IN THE REPLICATION ACTIVITY.
2. WETLAND REPLICATION SHALL BE CONDUCTED IN ACCORDANCE WITH THESE DRAWINGS, SPECIAL PROVISIONS AND REQUIREMENTS OUTLINED IN THE ORDER OF CONDITIONS AS ISSUED BY THE TOWN OF SUDBURY CONSERVATION COMMISSION.
3. ALL EXISTING WETLAND DELINEATION WITHIN 100 FEET OF THE WORK AREA WILL BE RE-FLAGGED EVERY 25 FEET.
4. EROSION CONTROLS SHALL BE INSTALLED PER EROSION CONTROL PLAN, REPAIRED AND MAINTAINED THROUGHOUT THE CONSTRUCTION PERIOD OF WETLAND MITIGATION AND UNTIL THE SITE IS FULLY STABILIZED BY VEGETATION (SEED MIX). EROSION CONTROLS SHALL THEN BE REMOVED FROM THE SITE.
5. A WETLAND SCIENTIST OR CERTIFIED ECOLOGICAL RESTORATION PRACTITIONER SHALL BE ON SITE TO MONITOR PLANTING AND GRADING OF THE WETLAND REPLICATION AREA TO ENSURE COMPLIANCE WITH APPROVED PLANS.
6. INVASIVE NON-NATIVE PLANT SPECIES IN OR IMMEDIATELY ADJACENT TO REPLICATION AREA SHALL BE IDENTIFIED AND TAGGED FOR ERADICATION OR REMOVAL. REMOVED INVASIVE PLANT MATERIAL SHALL BE DISPOSED OF AT AN APPROVED OFF-SITE LOCATION.
7. HERBICIDE SELECTION AND TIMING FOR INVASIVE SPECIES CONTROL SHALL BE APPROVED BY A PROFESSIONAL WETLAND SCIENTIST OR OTHER QUALIFIED PROFESSIONAL.
8. HERBICIDE APPLICATION FOR INVASIVE SPECIES CONTROL SHALL BE PERFORMED BY A PROFESSIONAL CERTIFIED BY THE STATE OF MASSACHUSETTS. DOCUMENTATION OF CERTIFICATION SHALL BE SUBMITTED TO THE SITE CONSTRUCTION GENERAL MANAGER.
9. GRADING AND PLANTINGS WILL NOT BE CONDUCTED DURING PERIODS OF HIGH WATER. CONSTRUCTION OF THE REPLICATION AREA WILL CONTINUE UNINTERUPTED TO AVOID EROSION AND THE SILTATION OF WETLANDS.
10. COMPACTION OF SOILS IN THE WETLAND REPLICATION AREA SHALL BE MINIMIZED TO THE MAXIMUM EXTENT PRACTICABLE BY THE USE OF LOW-GROUND PRESSURE MACHINERY.
11. SHOULD COMPACTION OCCUR, SOILS SHALL BE TILLED OR DISKED IN TWO DIRECTIONS TO RE-FRACTURE A MINIMUM OF TWELVE (12) INCHES BELOW FINISHED GRADE.
12. BURIED ORGANIC WETLAND SOILS ENCOUNTERED DURING EXCAVATION MAY BE LEFT IN PLACE. IF TEMPORARY STOCKPILING OF WETLAND SOIL IS NECESSARY, MATERIAL MUST BE COVERED TO PREVENT LEACHING, MOISTURE LOSS AND SEDIMENT TRANSPORT.
13. GRADING LINES DEPICTED ON THE PLAN ARE DRAWN SMOOTHLY. ACTUAL SURFACE GRADES ACROSS WETLAND 'FLOOR' SHALL REFLECT HUMMOCK AND HOLLOW TOPOGRAPHY OF NATURAL WETLANDS.
14. THE SUBGRADE OF WETLAND REPLACEMENT AREAS WILL BE GRADED A MINIMUM OF ONE FOOT BELOW THE ADJACENT WETLANDS. NO GRADING WILL BE PERMITTED WITHIN THE EXISTING WETLAND AREAS EXCEPT TO CUT OPENIINGS IN BERMS TO ESTABLISH HYDRAULIC CONDUCTIVITY BETWEEN THE REPLACEMENT WETLAND AND THE WETLAND REPLICATION.
15. FINAL SUB-GRADES SHALL BE REVIEWED AND APPROVED BY A PROFESSIONAL WETLAND SCIENTIST OR CERTIFIED ECOLOGICAL RESTORATION PRACTITIONER AFTER REVIEW OF SEASONAL, LOCAL HIGH GROUNDWATER MONITORING DATA AND FIELD CONDITIONS. MODIFICATIONS OF FINAL GRADES MAY BE MADE IN THE FIELD AS DIRECTED BY A PROFESSIONAL WETLAND SCIENTIST OR CERTIFIED ECOLOGICAL RESTORATION PRACTITIONER.
16. A TWELVE-INCH LAYER OF NATURAL ORGANIC SOIL OR MIXTURE OF EQUAL PARTS OF GOOD QUALITY TOPSOIL AND CLEAN LEAF COMPOST WILL BE PLACED IN THE BOTTOM OF THE REPLACEMENT AREA. SOIL AND COMPOST SHOULD BE CERTIFIED FREE OF INVASIVE PLANT SEEDS OR OTHER ARTIFICIAL MATERIAL.
17. SIDE SLOPES OF NON-WETLAND (UPLAND) AREAS SHALL BE GRADED WITH A MINIMUM OF FOUR INCHES OF THE SOIL MIXTURE AS DESCRIBED ABOVE.
18. NO SOIL AMENDMENT OR FERTILIZER SHALL BE APPLIED OR ADDED UNLESS DIRECTED BY A PROFESSIONAL WETLAND SCIENTIST.
19. WHERE CALLED FOR, REPLICATION AREAS SHALL BE SEEDED IMMEDIATELY FOLLOWING PLACEMENT AND FINAL GRADING INCLUDING MICROTOPOGRAPHY. SPRING SEEDING SHOULD OCCUR AFTER THE GROUND THAWS AND BEFORE JUNE 30. FALL SEEDING SHOULD OCCUR AFTER OCTOBER 15 AND BEFORE THE SOIL FREEZES.
20. ALL WETLAND AREAS SHALL BE SEEDED USING NEW ENGLAND WETMIX. SEE SPECIAL PROVISIONS FOR VENDORS. WETLAND SEEDING SHALL OCCUR AT A RATE OF ONE POUND (1 LB) PER TWO-THOUSAND FIVE-HUNDRED SQUARE FEET (2,500 SF).
21. UPLAND AREAS SHALL BE SEEDED USING NEW ENGLAND CONSERVATION/WILDLIFE MIX OR APPROVED EQUIVALENT. SEE SPECIAL PROVISIONS FOR VENDORS. WETLAND SEEDING SHALL OCCUR AT A RATE OF ONE POUND (1 LB) PER ONE-THOUSAND SEVEN-HUNDRED FIFTY SQUARE FEET (1,750 SF). THE AREA SHALL BE MULCHED WITH TWO INCHES OF CLEAN LEAF COMPOST OR STRAW.
22. SEED SHALL BE FRESH, RECLEANED SEED OF THE LATEST CROP. SEED SHALL BE DELIVERED TO THE SITE IN THE ORIGINAL CONTAINERS WHICH SHALL BEAR THE VENDOR'S GUARANTEE OF ANALYSIS.
23. DEVIATIONS FROM THE PLANTING SCHEDULE AND/OR APPROVED PLANTING LIST MUST BE APPROVED IN ADVANCE BY A PROFESSIONAL WETLAND SCIENTIST OR CERTIFIED ECOLOGICAL RESTORATION PRACTITIONER.
24. THE LANDSCAPE CONTRACTOR SHALL CLEAN UP AND REMOVE ANY DEBRIS FROM THE SITE CAUSED BY THE LANDSCAPE CONTRACTOR.
25. PLANT LISTS MAY BE ALTERED BASED ON FIELD CONDITIONS AS DIRECTED BY A PROFESSIONAL WETLAND SCIENTIST OR CERTIFIED ECOLOGICAL RESTORATION PRACTITIONER.
26. ALL PLANT MATERIALS SHALL CARRY A FULL GUARANTEE FOR A PERIOD OF ONE YEAR FROM THE DATE OF ACCEPTANCE TO INCLUDE PROMPT TREATMENT OR REMOVAL AND REPLACEMENT OF ANY PLANTS FOUND TO BE IN AN UNHEALTHY CONDITION BY THE LANDSCAPE ARCHITECT. ALL REPLACEMENTS SHALL BE OF THE SAME KINDS AND SIZE OF PLANTS SPECIFIED IN THE PLANT LIST.
27. WETLAND REPLICATION AREAS WILL BE INSPECTED ANNUALLY FOR THE FIRST TWO YEARS FOLLOWING PLANTING TO IDENTIFY INVASIVE SPECIES AND A REPORT DETAILING TO RELATIVE SUCCESS OF THE MITIGATION PLAN IN TERMS OF BOTH THE HEALTH AND SURVIVAL OF WETLAND PLANTINGS SHALL BE PREPARED.
28. DURING AND AFTER THE FIRST AND SECOND GROWING SEASON, THE SUCCESS OF THE VEGETATIVE GROWTH WILL BE REVIEWED AND EVALUATED. ADDITIONAL VEGETATION WILL BE PLANTED AS NECESSARY TO REPLACE STRESSED OR MISSING VEGETATION AND TO ACHIEVE THE 75% VEGETATIVE DENSITY SPECIFIED IN THE SPECIAL PROVISIONS.

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	202	316
PROJECT FILE NO.	608164		

WETLAND REPLICATION PLANS





LEGEND

WETLAND REPLICATION AREA (SEASONALLY FLOODED)

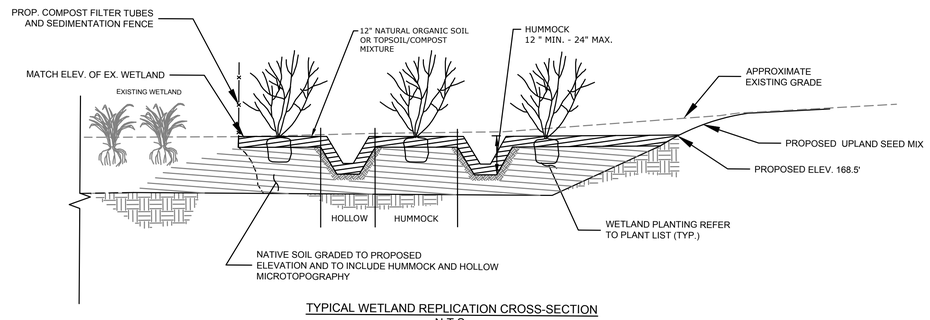
4000 0 4000 8000

SCALE IN FEET

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	203	316
PROJECT FILE NO.	608164		

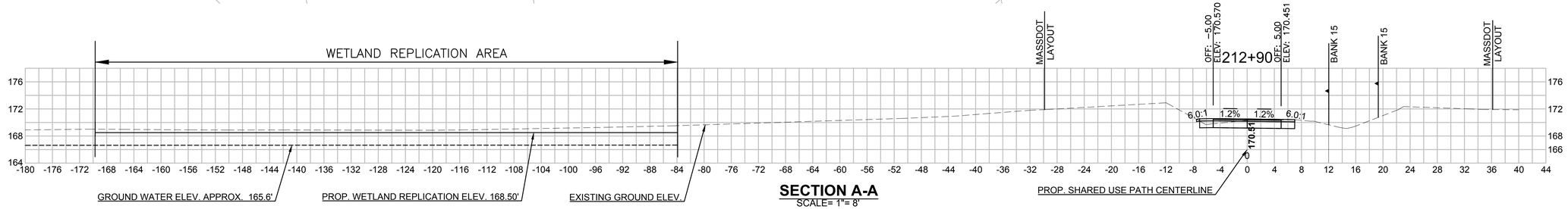
WETLAND REPLICATION PLANS



TYPICAL WETLAND REPLICATION CROSS-SECTION
N.T.S.

PLANT LIST

SYMBOL	QUANTITY	BOTANICAL NAME	COMMON NAME	SIZE	COMMENTS
TREES					
AR	11	ACER RUBRUM	RED MAPLE	4'-6' HT.	10' O.C.
BA	7	BETULA ALLEGHANIENSIS	YELLOW BIRCH	4'-6' HT.	10' O.C.
FP	4	FRAXINUS PENNSYLVANICA	GREEN ASH	4'-6' HT.	10' O.C.
UA	4	ULMUS RUBRA	SLIPPERY ELM	4'-6' HT.	10' O.C.
SHRUBS					
CR	6	CLETHRA ALNIFOLIA	SWEET PEPPERBUSH	2'-3' HT.	10' O.C. GROUPS OF 3
IV	6	ILEX VERTICILLATA	WINTERBERRY HOLLY	2'-3' HT.	10' O.C. GROUPS OF 3
LB	6	LINDERA BENZOIN	SPICEBUSH	2'-3' HT.	10' O.C. GROUPS OF 3
VC	6	VACCINIUM CORYMBOSUM	HIGHBUSH BLUEBERRY	2'-3' HT.	10' O.C. GROUPS OF 3
VD	6	VIBURNUM DENTATUM	NORTHERN ARROWWOOD	2'-3' HT.	10' O.C. GROUPS OF 3
VL	6	VIBURNUM LENTAGO	NANNYBERRY	2'-3' HT.	10' O.C. GROUPS OF 3

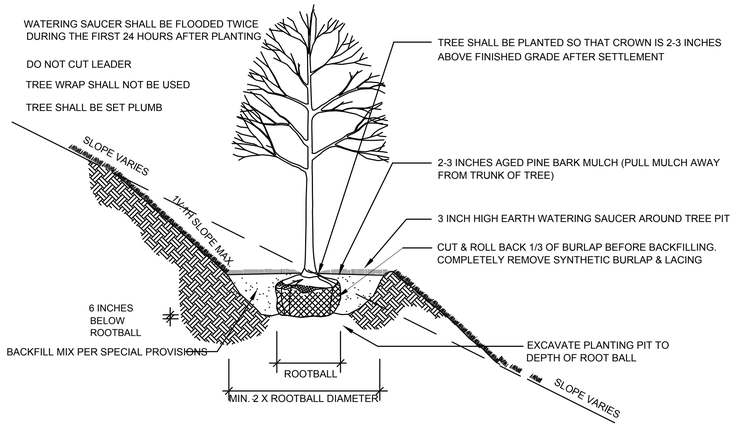


SECTION A-A
SCALE= 1"= 8'

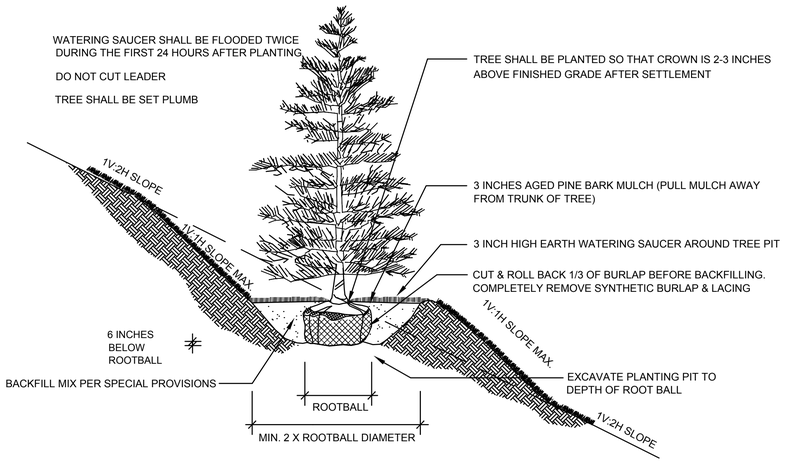
SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	204	316
PROJECT FILE NO.	608164		

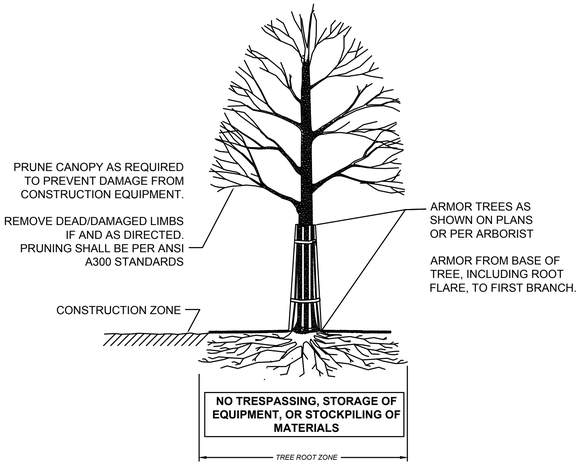
CONSTRUCTION DETAILS



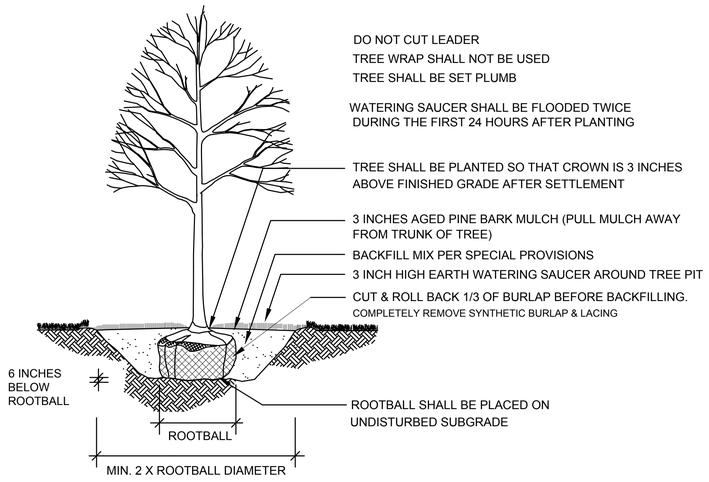
1 DECIDUOUS TREE PLANTING (SLOPE)
SCALE: N.T.S.



2 EVERGREEN TREE PLANTING (SLOPE)
SCALE: N.T.S.

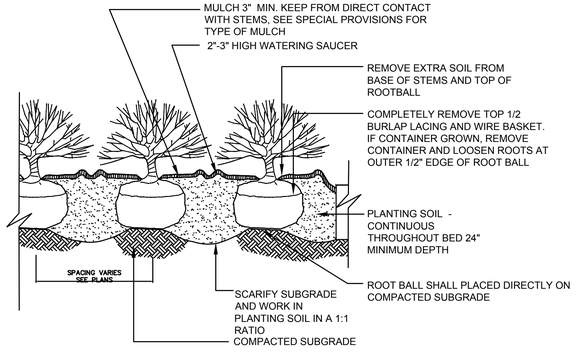


3 INDIVIDUAL TREE PROTECTION
SCALE: N.T.S.



4 DECIDUOUS TREE PLANTING
SCALE: N.T.S.

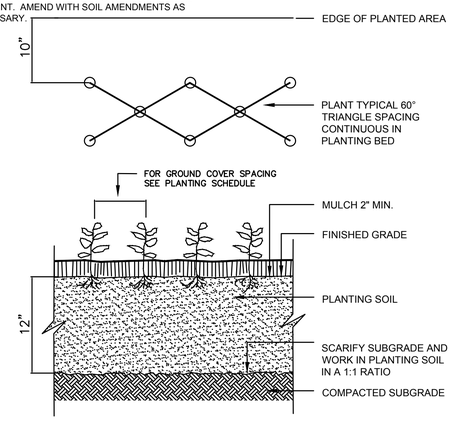
NOTES:
1. TOPSOIL SHALL HAVE A PH RANGE OF 5.5 TO 7 WITH A MINIMUM 2 PERCENT ORGANIC MATERIAL CONTENT. AMEND WITH SOIL AMENDMENTS AS NECESSARY.
2. NO PRUNING OR CUTTING UNLESS DIRECTED BY THE ENGINEER.
3. SAUCER SHALL BE FLOODED TWICE DURING THE FIRST 24 HOURS AFTER PLANTING.
4. PLANTS SHALL BE SET PLUMB AND PLANTED SO THAT THE TOP OF THE ROOTBALL IS 1"-2" ABOVE FINISHED GRADE.
5. COORDINATE PLANTING WITH RESIDENT ENGINEER PRIOR TO INSTALLATION.



5 SHRUB AND PERENNIAL PLANTING
SCALE: N.T.S.

NOTES:

TOPSOIL SHALL HAVE A PH RANGE OF 5.5 TO 7 WITH A MINIMUM 2 PERCENT ORGANIC MATERIAL CONTENT. AMEND WITH SOIL AMENDMENTS AS NECESSARY.

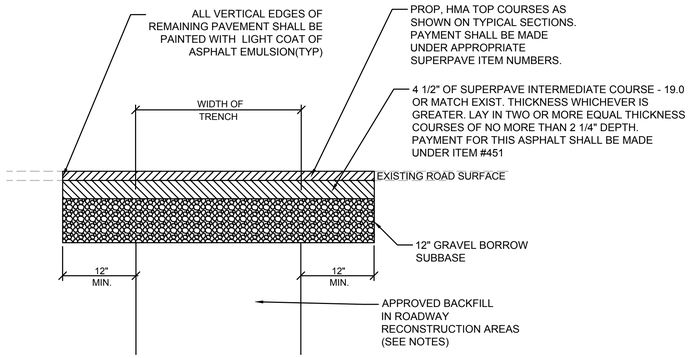


6 GROUNDCOVER PLANTING
SCALE: N.T.S.

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	205	316
PROJECT FILE NO.	608164		

CONSTRUCTION DETAILS



NOTES:
OVERLAY AREAS:THE TRENCH SHALL BE REPAIRED TO THE TOP OF THE BASE COURSE. THE TOP COURSES SHALL BE PLACED WITH OVERLAY OF THE ROADWAY

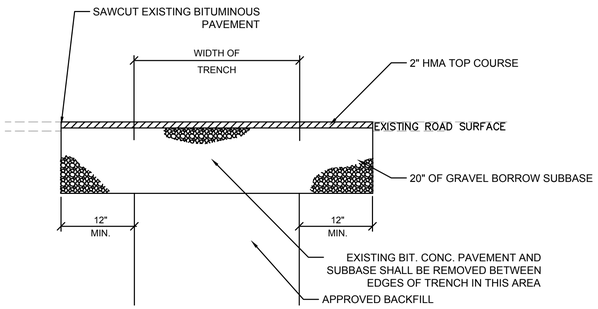
ROADWAY TRENCHING OUTSIDE OF FULL DEPTH AND OVERLAY: THE TRENCH SHALL BE REPAIRED WITH TOP COURSES INSTALLED WITH THE BASE COURSE.

CONTROLLED DENSITY FILL MAY BE USED IN LIEU OF APPROVED BACKFILL IN PAVEMENT MILLING AND OVERLAY AREAS. **USE OF CONTROLLED DENSITY FILL TO BACKFILL TRENCHES SHALL BE APPROVED BY THE TOWN OF SUDBURY PRIOR TO PLACEMENT.**

PERMANENT ASHPALT SHALL BE PAID FOR UNDER ITEM #451.

7 PERMANENT PAVEMENT TRENCH REPAIR IN ROADWAYS

SCALE: N.T.S.

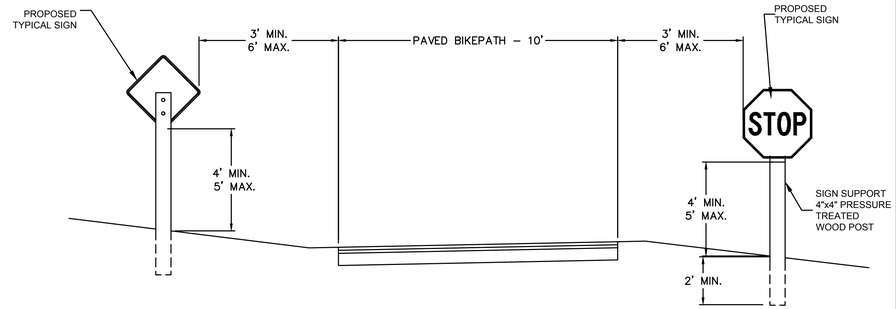


NOTES:
THE TEMPORARY PAVEMENT TRENCH REPAIR SHALL BE USED DURING THE TIME BETWEEN COMPLETION OF THE UTILITY CONSTRUCTION AND CONSTRUCTION OF THE PROPOSED ROADWAY PAVEMENT STRUCTURE OR PERMANENT PAVEMENT TRENCH REPAIR.

TEMPORARY ASPHALT SHALL BE PAID FOR UNDER ITEM #472

8 TEMPORARY PAVEMENT TRENCH REPAIR

SCALE: N.T.S.

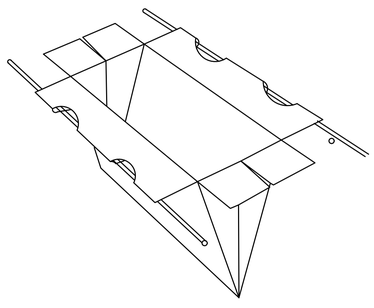


9 SHARED–USE PATH TYPICAL SIGN PLACEMENT

SCALE: N.T.S.

NOTES:
1. ALL HARDWARE SHALL BE GALVANIZED.

2. WOOD POSTS SHALL BE PAID FOR UNDER ITEM 847.11*.

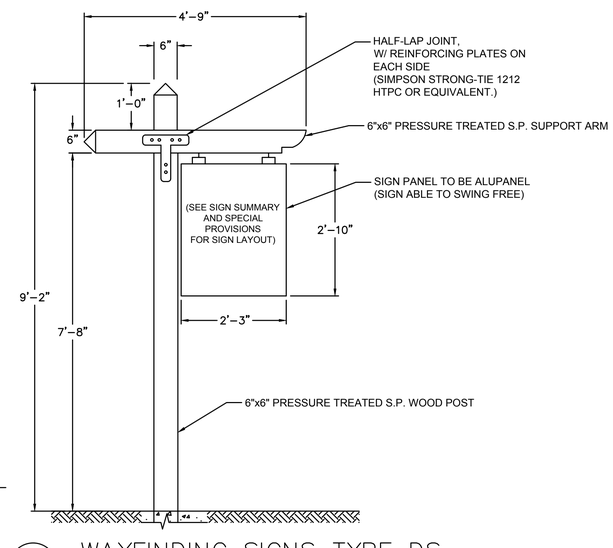


NOTES:

1. SIZED TO FIT ANY SIZE OR SHAPE CATCH BASIN.
2. ALL SEAMS DOUBLE STITCHED.
3. PERMEABILITY - REGULAR FLOW SILTSACK - 40 gal./min./sq. ft.
   HI - FLOW SILTSACK - 200 gal./min./sq. ft.

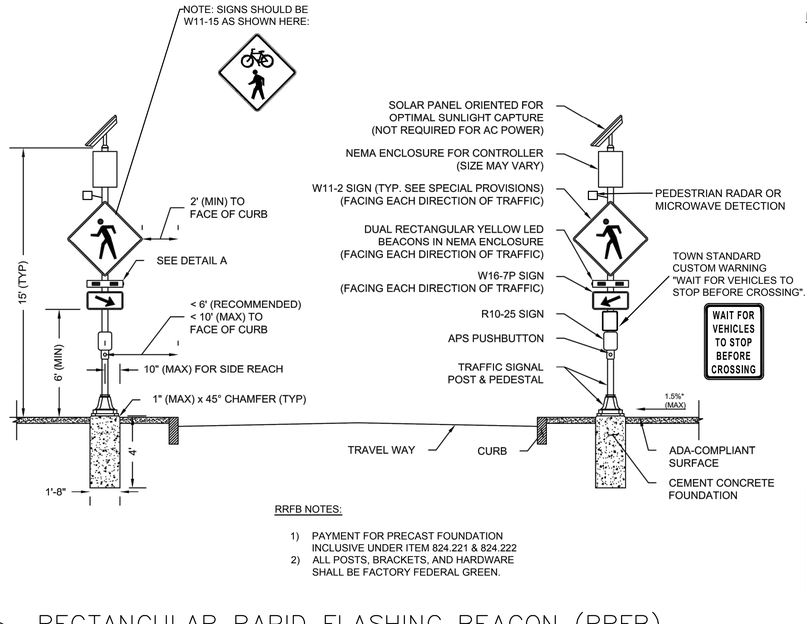
10 CATCH BASIN SILT SACK

SCALE: N.T.S.



XX WAYFINDING SIGNS TYPE DS

SCALE: N.T.S.



RRFB NOTES:

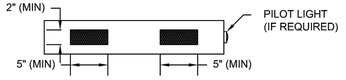
1) PAYMENT FOR PRECAST FOUNDATION INCLUSIVE UNDER ITEM 824.221 & 824.222
2) ALL POSTS, BRACKETS, AND HARDWARE SHALL BE FACTORY FEDERAL GREEN.

NOTES:
1. CROSSWALK AND ADA-COMPLIANT RAMPS NOT SHOWN. SEE PLANS FOR LOCATIONS.
2. REFER TO THE SPECIAL PROVISIONS FOR SIGN DIMENSIONS.
3. ALL CONDUIT, PULL BOXES, SERVICE CONNECTIONS, AND EQUIPMENT GROUNDING REQUIRED FOR AC POWER IS NOT SHOWN IN THIS DETAIL AND SHALL BE PAID FOR SEPARATELY UNDER THEIR RESPECTIVE PAY ITEMS.
4. ACCESS TO ALL PEDESTRIAN ACTUATED CONTROLS SHALL BE ADA/AAB COMPLIANT.
5. *0.5% CONSTRUCTION TOLERANCE FOR CROSS-SLOPE.
6. ALL RRFB'S SHALL HAVE BOTH BUTTONS AND DETECTION INSTALLED.

MAJOR ITEMS LIST

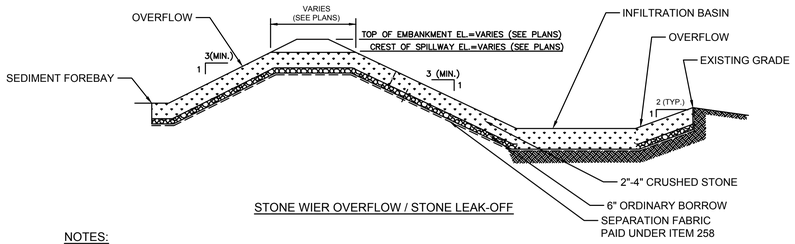
- 2 CEMENT CONCRETE FOUNDATIONS PER 812.30.1
- 2 15' TRAFFIC SIGNAL POSTS & PEDESTALS
- 2 APS PUSHBUTTON SYSTEMS
- 4 DUAL RECTANGULAR YELLOW LED BEACONS IN NEMA ENCLOSURES
- 2 R10-25 SIGNS
- 4 W11-2 SIGNS
- 2 W16-7PR SIGNS
- 2 W16-7PL SIGNS
- 2 SOLAR PANEL SYSTEMS (NOT REQUIRED FOR AC POWER)
- 2 NEMA ENCLOSURES FOR ALL COMPONENTS NEEDED TO MEET FUNCTIONAL REQUIREMENTS PER SPECIAL PROVISIONS
- 2 BATTERY SYSTEMS (NOT REQUIRED FOR AC POWER)
- 2 TOWN STANDARD CUSTOM WARNING SIGNS PLUS ALL MOUNTING AND SUPPORTING HARDWARE AND WIRING NECESSARY TO COMPLETE A WORKING SYSTEM.
- 2 PEDESTRIAN RADAR OR MICROWAVE DETECTION

DETAIL A: DUAL YELLOW BEACON



11 RECTANGULAR RAPID FLASHING BEACON (RRFB)

SCALE: N.T.S.



STONE WIER OVERFLOW / STONE LEAK-OFF

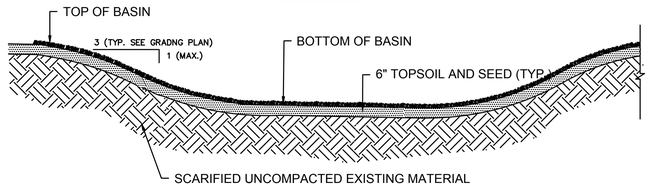
NOTES:

1. IMPERVIOUS MATERIAL FOR USE IN BASIN EMBANKMENT AREAS AND WHERE SHOWN ON THE PLANS SHALL BE COMPOSED OF CLAYS, SILTY CLAYS, OR CLAYEY SILTS. THE SOIL SHALL BE FREE OF RUBBISH, ICE, VEGETATIVE MATTER, LOAM, OR OTHER DEBRIS AND HAVE THE FOLLOWING GRADATION AS DEFINED BY A STANDARD SIEVE TEST (ASTM D422):

MIN. PERCENT PASSING (BY WT.)	SEIVE SIZE
100	3.5"
80-100	3/4"
40-90	No. 4
30-85	No. 40
25-75	No. 200

2. PERVIOUS BACKFILL MATERIAL FOR USE IN FILL AREAS ASSOCIATED WITH BASIN EMBANKMENTS SHALL BE COMPOSED OF ORDINARY BORROW MATERIAL (ITEM 150.) OR EXCAVATED MATERIAL FROM THE SITE DEEMED RE-USEABLE BY THE ENGINEER. SATISFACTORY ON-SITE MATERIAL SHALL HAVE SOIL CLASSIFICATION GROUPS OF GW, GP, GM, SW, SP, AND SM ACCORDING TO ASTM D 2487, OR A COMBINATION OF THESE GROUPS AND SHALL BE FREE OF ROCK OR GRAVEL LARGER THAN 3 INCHES (75 MM) IN ANY DIMENSION, DEBRIS, WASTE, FROZEN MATERIALS, VEGETATION, AND OTHER DELETERIOUS MATTER.

EMBANKMENT

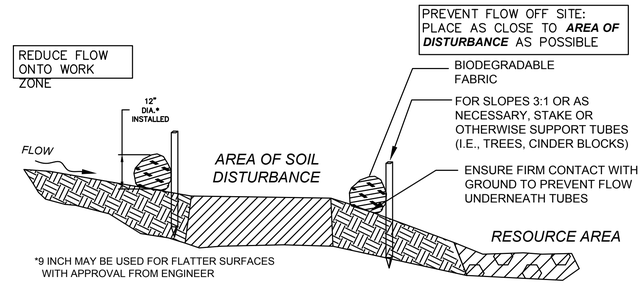


SECTION

12 INFILTRATION BASIN

SCALE: N.T.S.

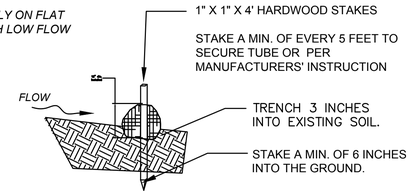
COMPOST FILTER TUBE



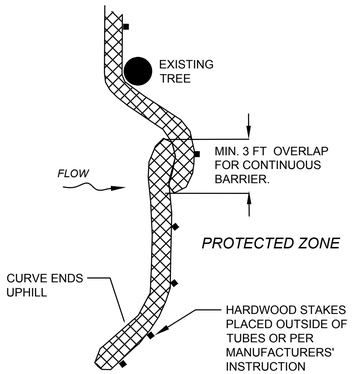
*9 INCH MAY BE USED FOR FLATTER SURFACES WITH APPROVAL FROM ENGINEER

12 INCH STRAW WATTLE

TO BE USED ONLY ON FLAT SURFACES WITH LOW FLOW



SECTION



PLACE TUBE ALONG CONTOURS AND PERPENDICULAR TO FLOW.

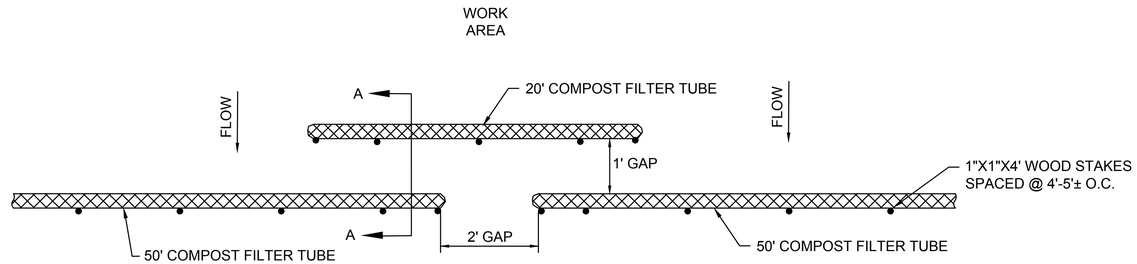
ADJUST LOCATION AS REQUIRED FOR OPTIMUM EFFECTIVENESS. DO NOT INSTALL IN WATERWAYS.

PLACE STAKES AS NEEDED TO SECURE TUBES IN PLACE.

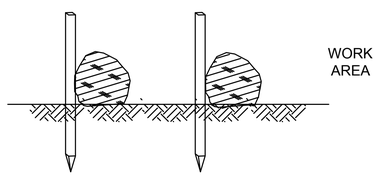
PLAN VIEW

13 SEDIMENT BARRIERS – COMPOST FILTER TUBES

SCALE: N.T.S.



PLAN



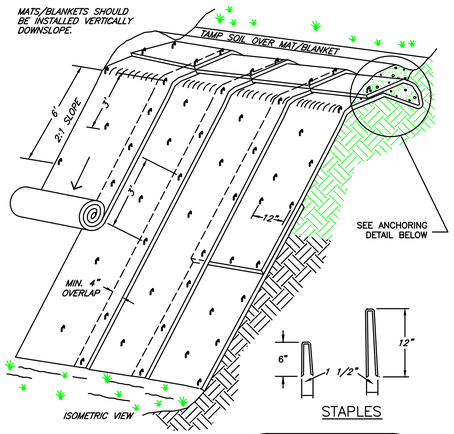
SECTION A-A

NOTES:

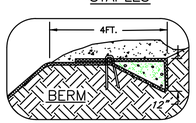
1. SYNCOPATED COMPOST FILTER TUBES SHALL BE USED WHEN BORDERING VERNAL POOLS AS SHOWN ON THE PLANS.

SYNCOPATED COMPOST FILTER TUBES

SCALE: N.T.S.



TYPICAL SLOPE SOIL STABLIZATION



ANCHORING DETAIL

NOTES:

1. MATTING FOR EROSION CONTROL MUST BE MADE FROM 100% BIODEGRADEABLE MATERIAL.

2. STAPLES OR STAKES MAY BE USED TO SECURE THE MATTING. THE STAPLES OR STAKES MUST BE MADE FROM A 100% BIODEGRADEABLE MATERIAL.

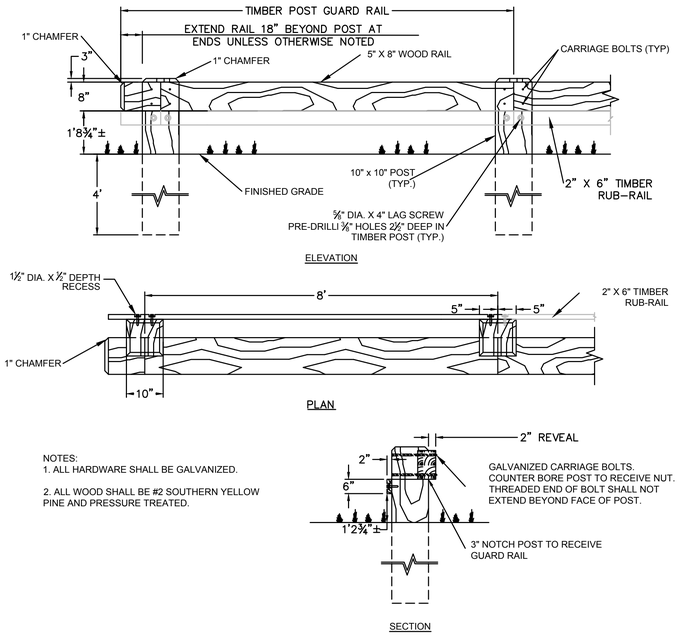
MATTING FOR EROSION CONTROL

SCALE: N.T.S.

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	207	316
PROJECT FILE NO.	608164		

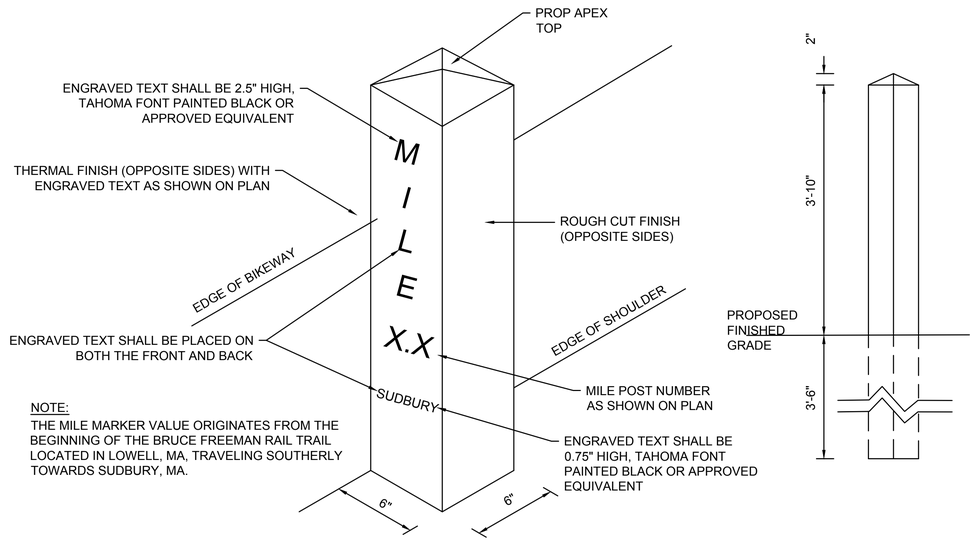
CONSTRUCTION DETAILS



NOTES:
1. ALL HARDWARE SHALL BE GALVANIZED.

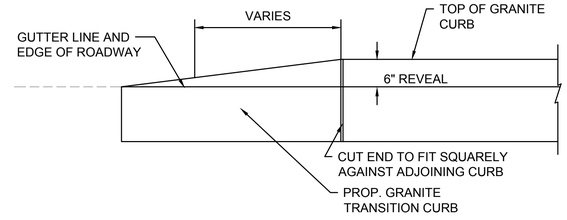
2. ALL WOOD SHALL BE #2 SOUTHERN YELLOW PINE AND PRESSURE TREATED.

16 TIMBER POST GUARDRAIL
SCALE: N.T.S.



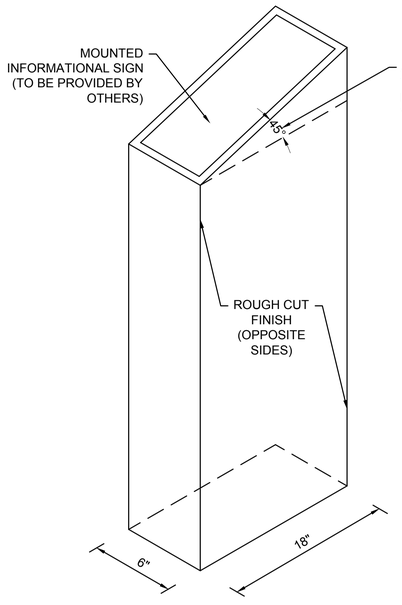
NOTE:
THE MILE MARKER VALUE ORIGINATES FROM THE BEGINNING OF THE BRUCE FREEMAN RAIL TRAIL LOCATED IN LOWELL, MA, TRAVELING SOUTHERLY TOWARDS SUDBURY, MA.

17 GRANITE MILE MARKER
SCALE: N.T.S.

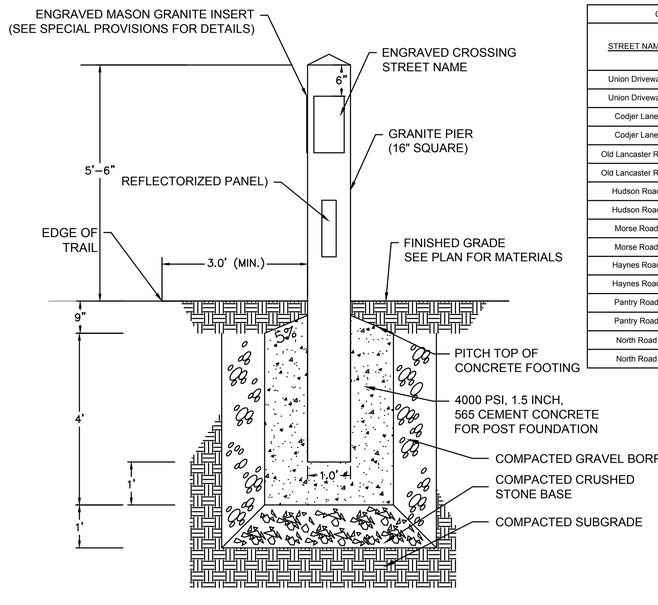


TO BE USED AT ALL LOCATIONS WHERE VERTICAL GRANITE CURB ENDS

XX TRANSITION CURB DETAIL
SCALE: N.T.S.

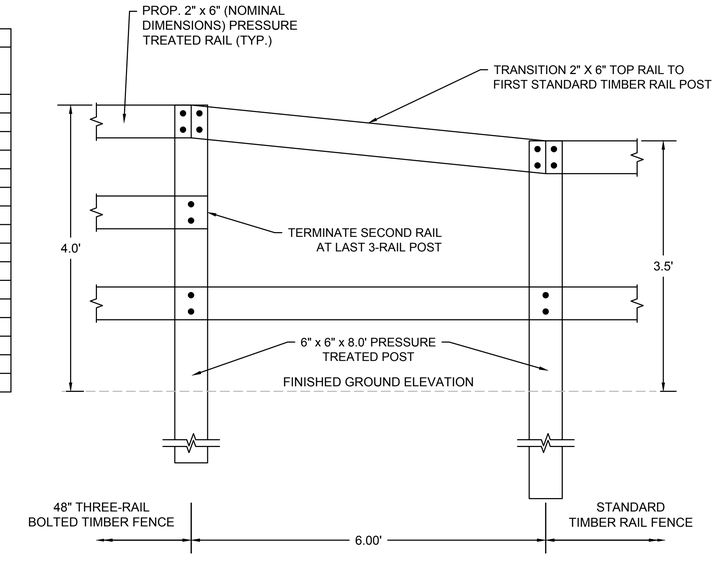


19 GRANITE POST INTERPRETIVE SIGN
SCALE: N.T.S.



GRANITE PIER LOCATIONS			
STREET NAME	STATION	OFFSET	SIDE
Union Driveway	108+41	9'	LT
Union Driveway	108+85	9'	RT
Codjer Lane	115+90	11'	LT
Codjer Lane	116+24	10'	RT
Old Lancaster Road	142+76	11'	LT'
Old Lancaster Road	143+15	11'	RT
Hudson Road	174+84	11'	LT
Hudson Road	175+55	11'	RT
Morse Road	215+63	11'	LT
Morse Road	215+94	11'	RT
Haynes Road	274+90	11'	LT
Haynes Road	275+20	11'	RT
Pantry Road	284+34	7'	LT
Pantry Road	284+66	7'	RT
North Road	307+40	9'	LT
North Road	307+84	11'	RT

20 GRANITE BRUCE FREEMAN RAIL TRAIL PIER
SCALE: N.T.S.

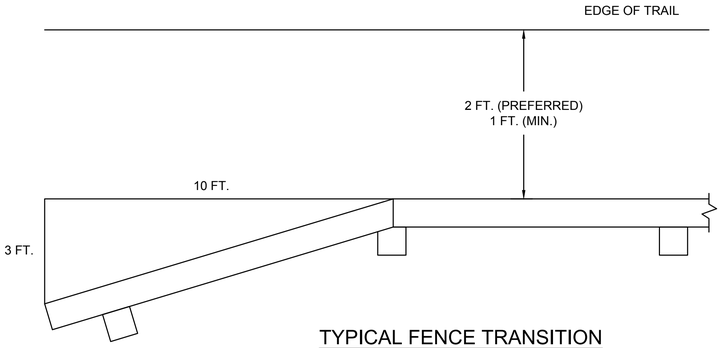


21 48" THREE-RAIL BOLTED TIMBER FENCE TRANSITION TO STANDARD TIMBER RAIL FENCE
SCALE: N.T.S.

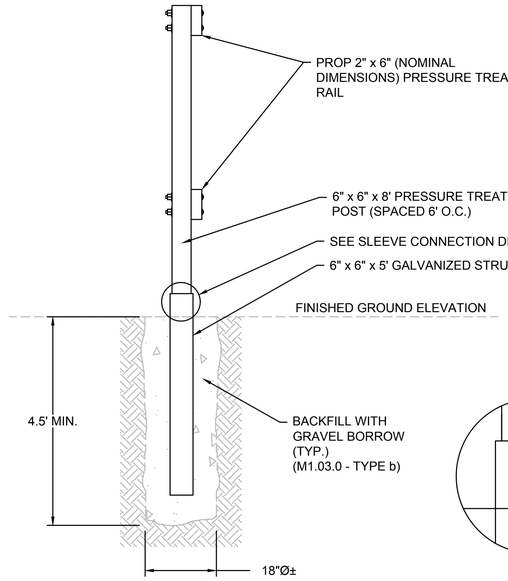
SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	208	316
PROJECT FILE NO.	608164		

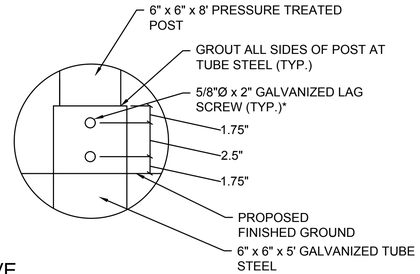
CONSTRUCTION DETAILS



TYPICAL FENCE TRANSITION
AT FENCE APPROACHES
N.T.S.



TIMBER FENCE (TWO-RAIL) FENCE TUBE STEEL SLEEVE
(FOR USE IN SATURATED LOCATIONS AND THROUGH WEST CONCORD CENTER)
N.T.S.

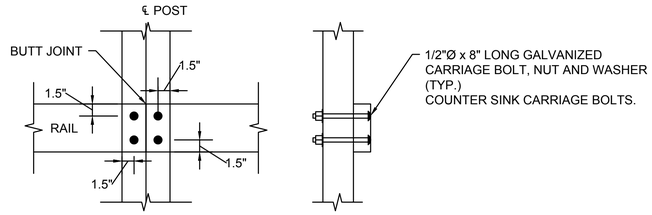


*SAME SCREWS OPPOSITE SIDE.

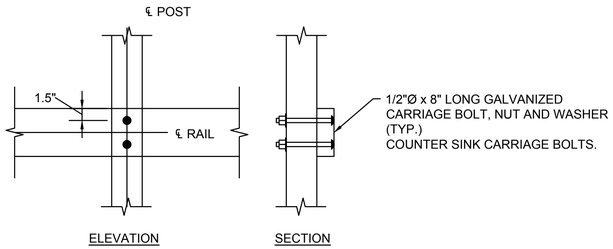
SLEEVE CONNECTION DETAIL
N.T.S.

NOTES:

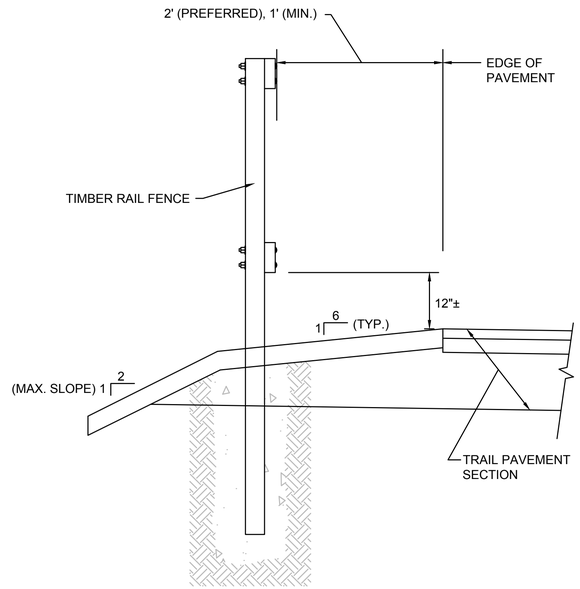
1. TIMBER PRESERVATIVES SHALL BE USED ON ALL WOOD TIMBER.
2. ALL CUT ENDS SHALL BE PAINTED WITH PRESERVATIVE IN THE FIELD PER MANUFACTURERS DIRECTION.



BUTT JOINT CONNECTION
N.T.S.



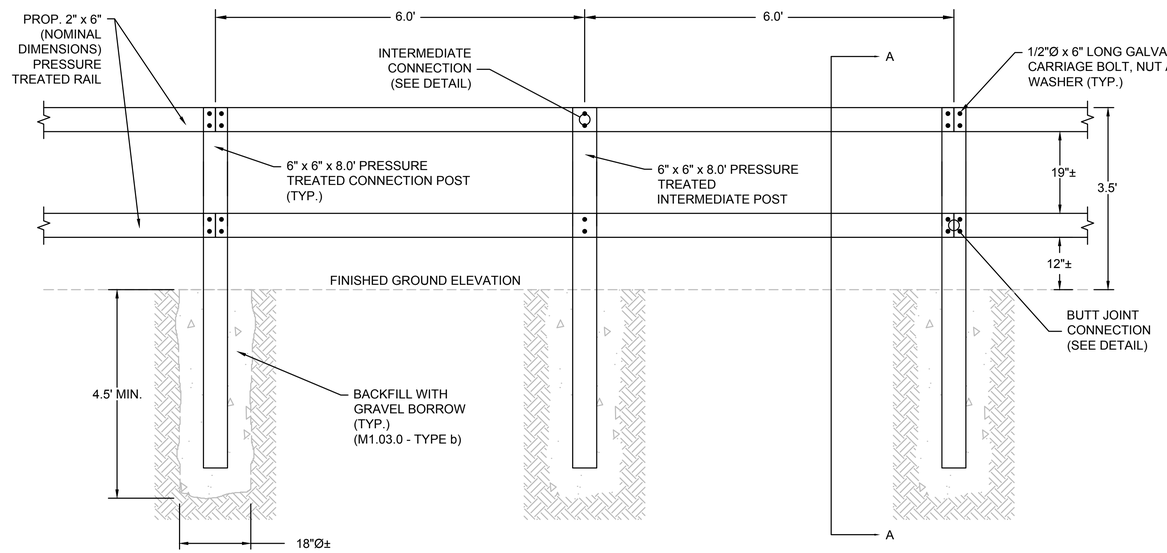
INTERMEDIATE CONNECTION
N.T.S.



SECTION A-A

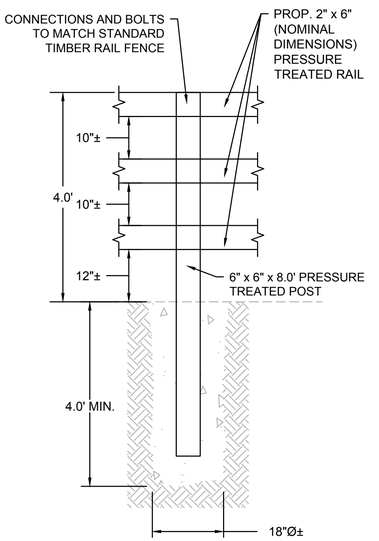
SUGGESTED TIMBER RAIL FENCE CONSTRUCTION SEQUENCE

1. AUGER OR DIG POST HOLE TO REQUIRED DIMENSIONS.
2. IF GROUND IS SATURATED, USE TUBE STEEL SLEEVE. SEE DETAIL ON THIS SHEET.
3. BACKFILL BOTTOM 6"± OF HOLE WITH GRAVEL AND COMPACT THOROUGHLY.
4. SET POST AND HOLD PLUMB DURING BACKFILLING.
5. BACKFILL WITH GRAVEL IN 12" LIFTS. COMPACT EACH LIFT THOROUGHLY.
6. CLAMP RAILS TO POSTS AND FIELD DRILL BOLT HOLES.
7. SET BOLTS, WASHERS AND NUTS.



TIMBER FENCE (TWO RAIL) ELEVATION
N.T.S.

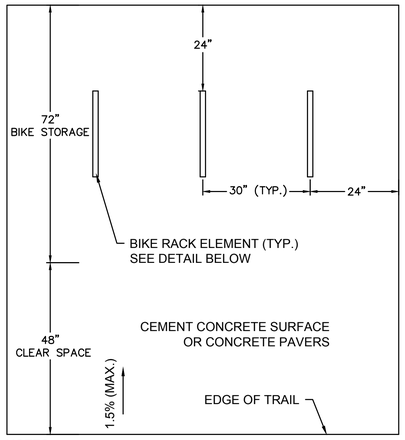
NOTES:
1. FOR RADII LESS THAN 165', USE CONNECTION POSTS SET AT 6.0' O.C. AND SHORTEN RAILS ACCORDINGLY.



48" THREE-RAIL BOLTED
TIMBER FENCE ELEVATION
N.T.S.

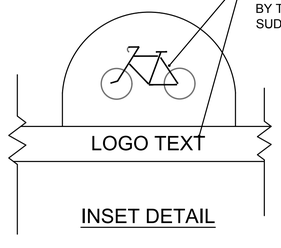
22 TIMBER FENCE (TWO-RAIL)

SCALE: N.T.S.
SEE PLANS FOR LOCATIONS



NOTES:
- SEE PLANS FOR QUANTITY OF BIKE RACK ELEMENTS

BICYCLE RACK PLACEMENT



INSET DETAIL

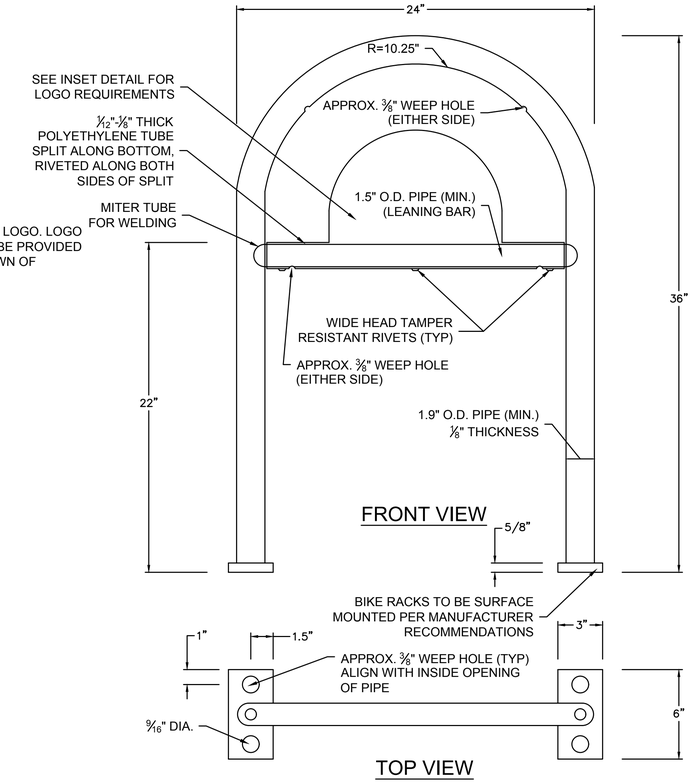
NOTES:

1. EACH BIKE RACK SHALL INCLUDE A LASER-CUT LOGO. LOGO DETAIL TO BE PROVIDED BY THE TOWN OF SUDBURY.

2. DIMENSIONS ARE APPROXIMATE AND WILL BE DETERMINED IN COORDINATION WITH THE MANUFACTURER. BIKE RACK ELEMENTS TO BE OF THE INVERTED "U".

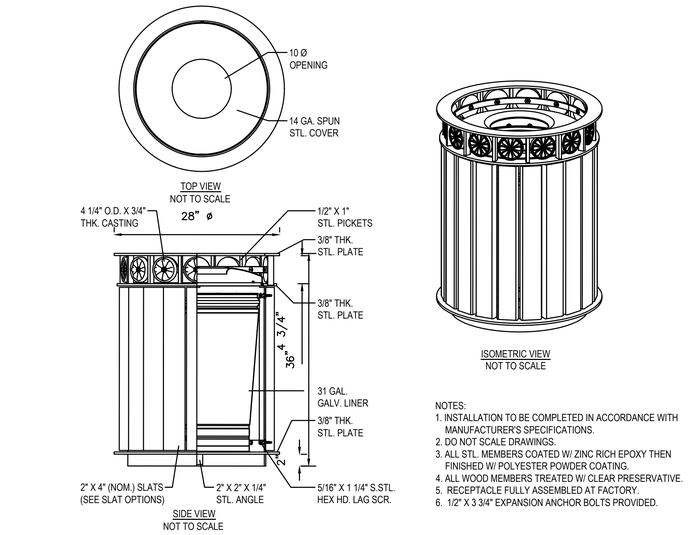
3. EACH BIKE RACK SHALL ACCOMMODATE TWO BICYCLES.

4. ALL POSTS AND HARDWARE SHALL BE FACTORY COATED FEDERAL GREEN (SEE SPECIAL PROVISIONS)



25 BICYCLE RACK

SCALE: N.T.S.



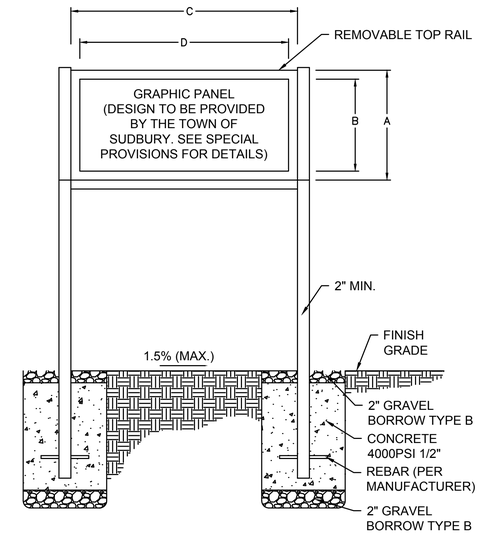
NOTES:
1. INSTALLATION TO BE COMPLETED IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS.
2. DO NOT SCALE DRAWINGS.
3. ALL STL. MEMBERS COATED W/ ZINC RICH EPOXY THEN FINISHED W/ POLYESTER POWDER COATING.
4. ALL WOOD MEMBERS TREATED W/ CLEAR PRESERVATIVE.
5. RECEPTACLE FULLY ASSEMBLED AT FACTORY.
6. 1/2" X 3 3/4" EXPANSION ANCHOR BOLTS PROVIDED.

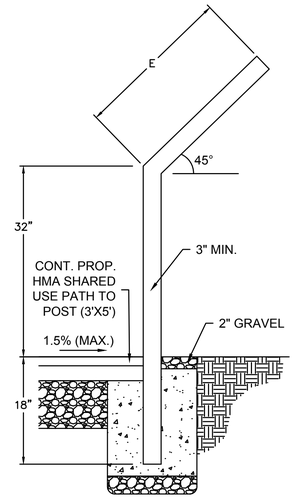
23 TRASH RECEPTACLE

SCALE: N.T.S.

NOTE:

INTERPRETATIVE PANEL SHALL BE SQUARE METAL POSTS AND IS INTENDED TO MATCH THE MASSACHUSETTS DCR STANDARDS.

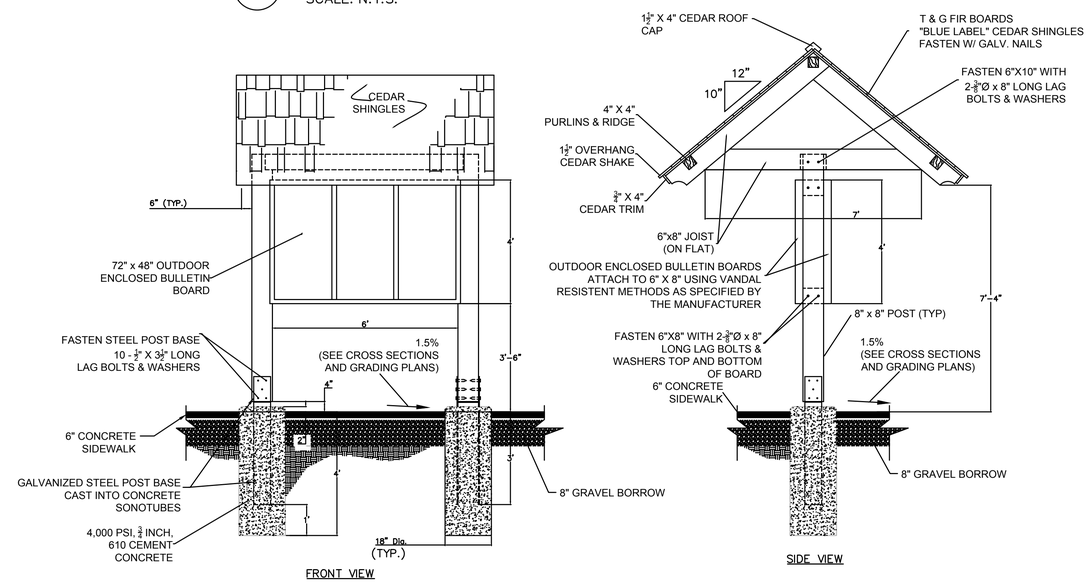




DIMENSION TABLE					
SIGN TYPE	HEIGHT		WIDTH		DEPTH
	A	B	C	D	E
26" x 38"	26"	23"	38"	35"	26.5"

24 INTERPRETIVE SIGN

SCALE: N.T.S.



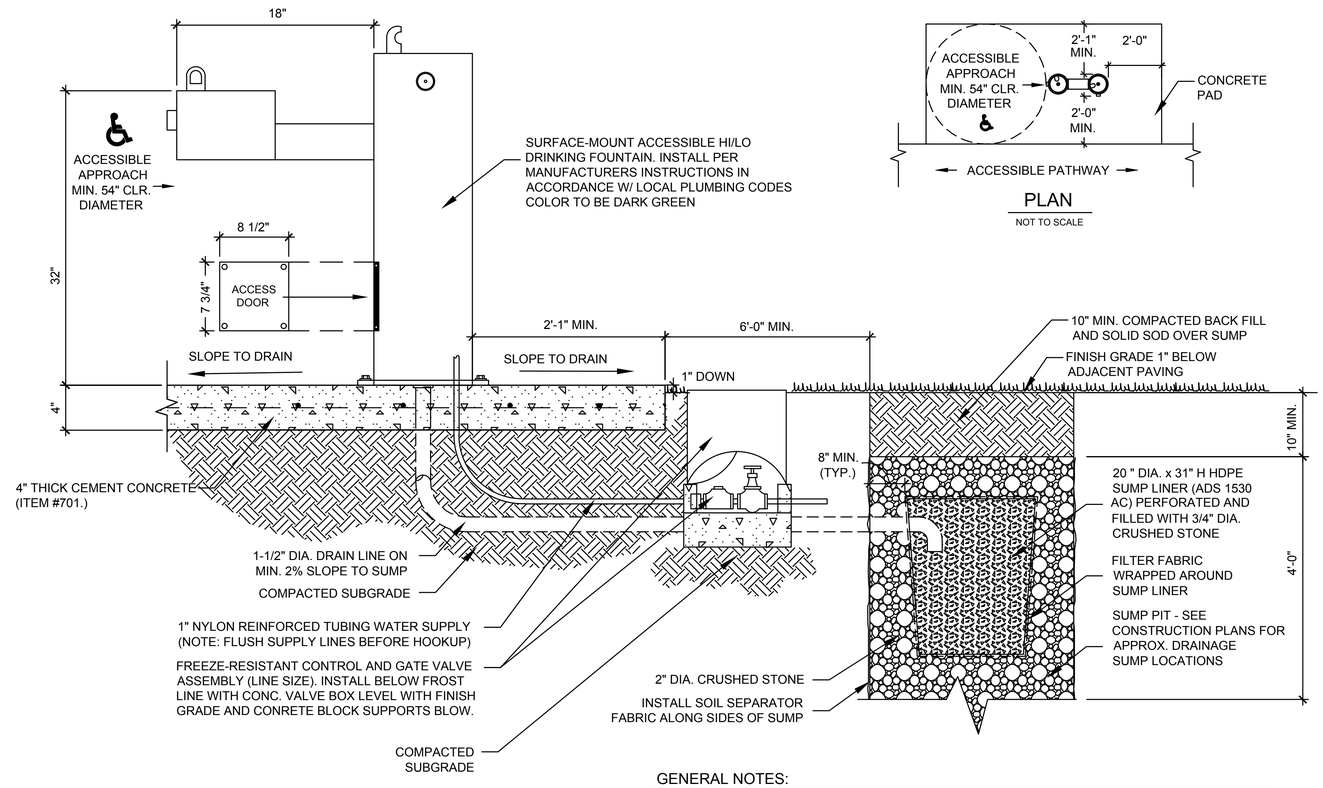
26 DISPLAY BOARD

SCALE: N.T.S.

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	210	316
PROJECT FILE NO.	608164		

CONSTRUCTION DETAILS

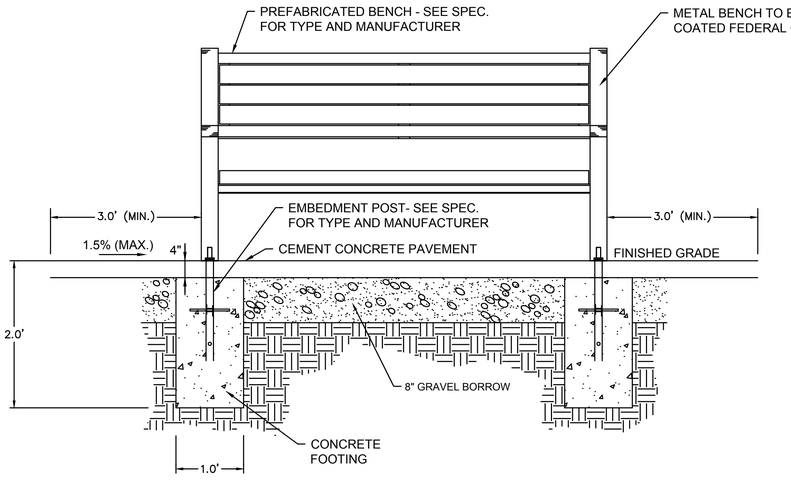


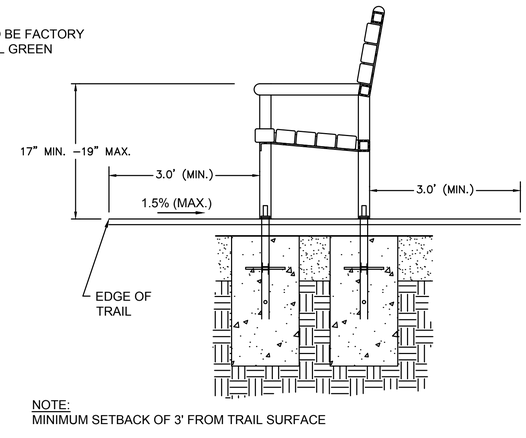
GENERAL NOTES:

1. DRINKING FOUNTAIN MUST BE INSTALLED ADJACENT TO AN ACCESSIBLE ROUTE.
2. SPECIFIED DRINKING FOUNTAIN TO BE IN ACCORDANCE W/ MAAB ACCESSIBILITY STANDARDS.
3. BASED ON PROJECT SPECIFICATIONS, MODEL MAY INCLUDE DOG BOWL AND/OR JUG FILLER. REFERENCE MANUFACTURER'S PRODUCT CATALOG FOR ACCESSORY ITEMS.

27 HYDRATION STATION

SCALE: N.T.S.

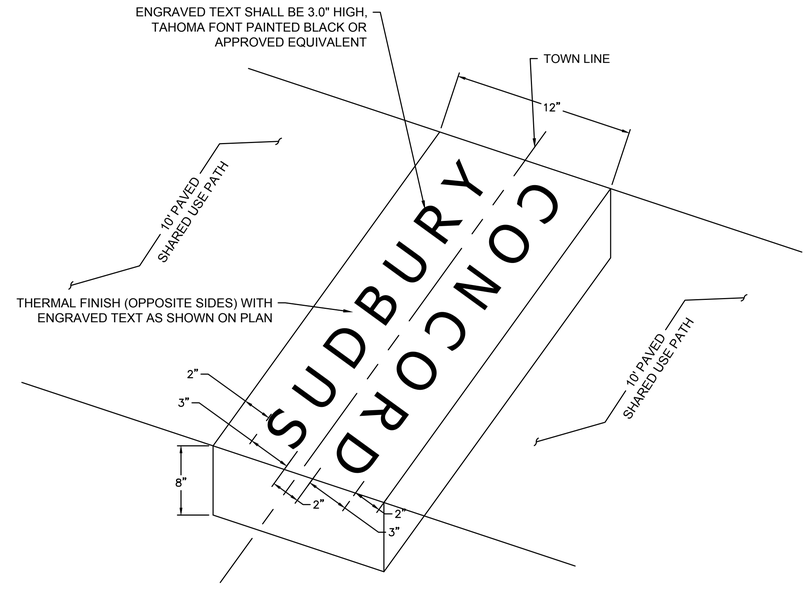




NOTE:
MINIMUM SETBACK OF 3' FROM TRAIL SURFACE

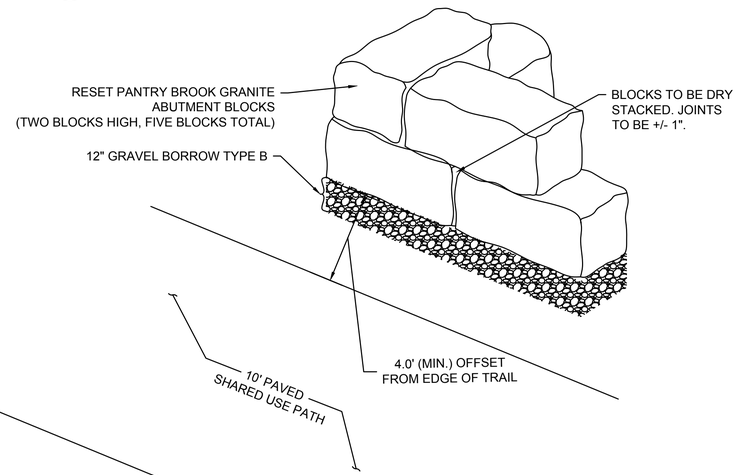
29 BENCH

SCALE: N.T.S.



28 GRANITE TOWN LINE MARKER

SCALE: N.T.S.



30 PANTRY BROOK ABUTMENT BLOCKS RESET STA. 260+89

SCALE: N.T.S.

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	211	316
PROJECT FILE NO.	608164		

CONSTRUCTION DETAILS

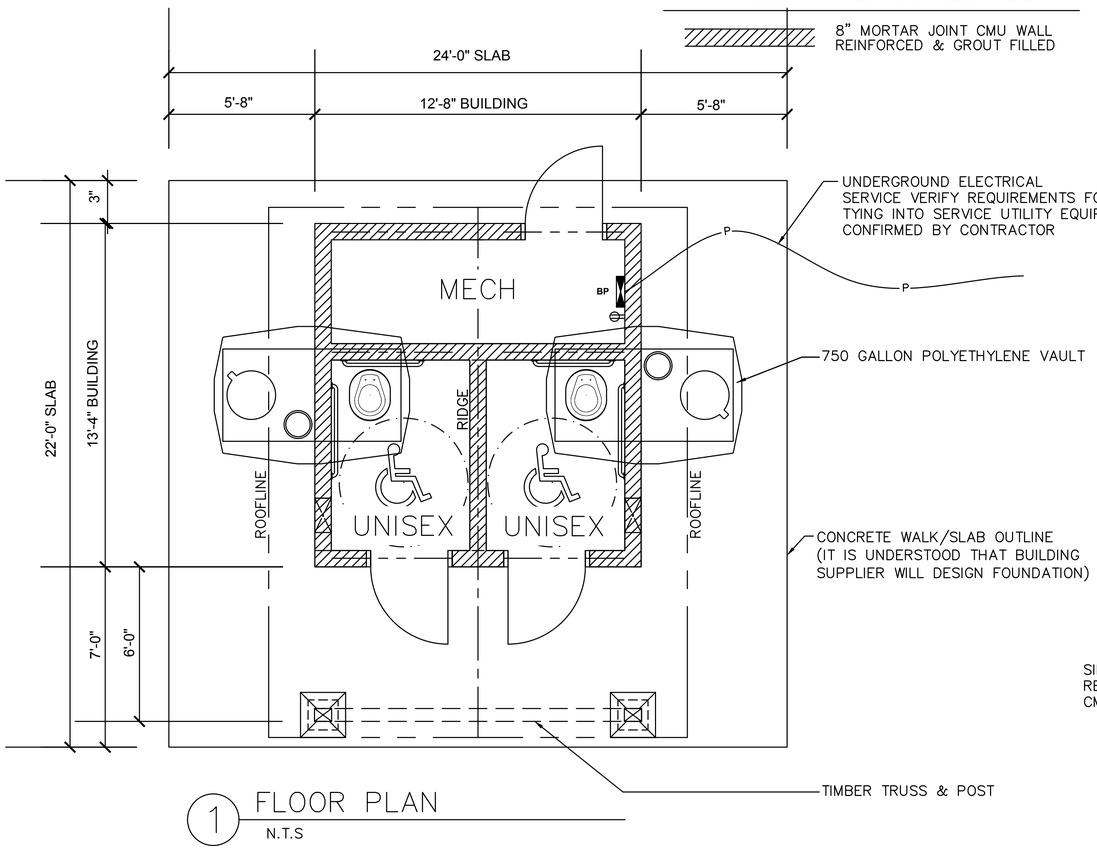
LEGEND		
SYMBOL	DESCRIPTION	AREA/ QUANTITY
———	GABLE WINDOW	6
	16" x 24" EXTERIOR WALL VENT LOCATED IN CMU WALL	2
	EXTERIOR WALL LIGHTS	3
	INTERIOR CEILING LIGHTS	3

NOTE:

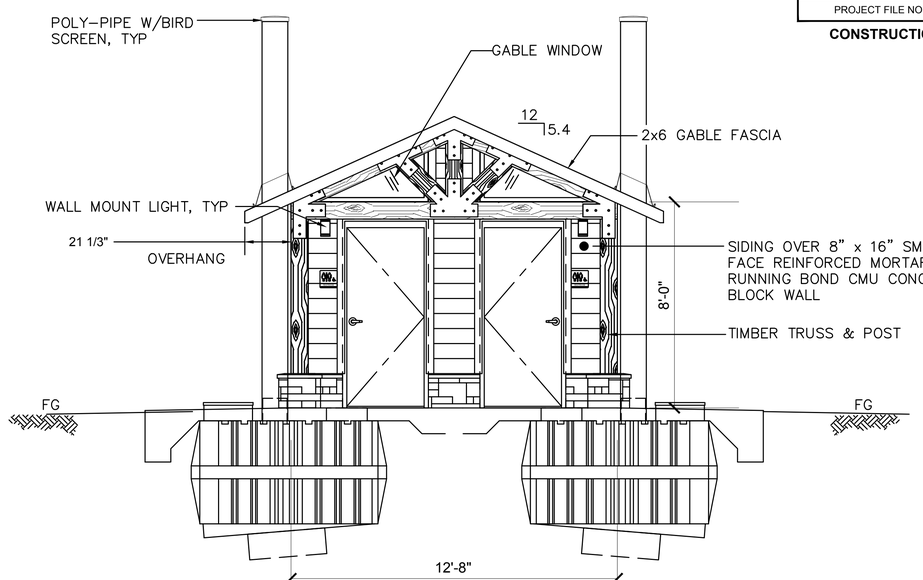
THESE PLAN VIEW AND ELEVATION DRAWINGS ARE A PRELIMINARY ARCHITECTURAL REPRESENTATION OF THE BUILDING. ALL DIMENSIONS, FEATURES AND COMPONENTS SHOWN ON THESE PRELIMINARY DRAWINGS MAY OR MAY NOT BE PART OF THE QUOTE.

WALL TYPE SCHEDULE

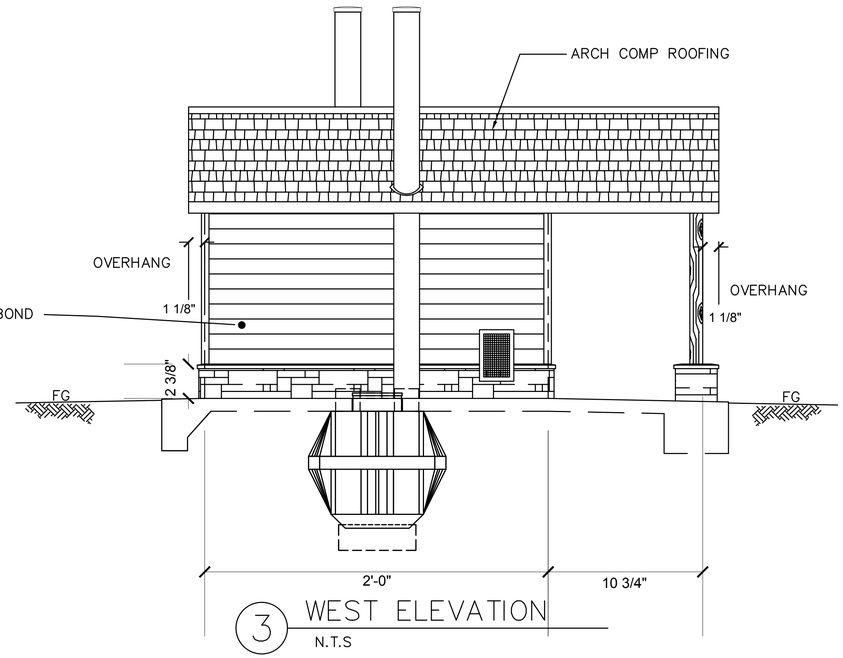
8" MORTAR JOINT CMU WALL REINFORCED & GROUT FILLED



1 FLOOR PLAN
N.T.S



2 SOUTH ELEVATION
N.T.S



3 WEST ELEVATION
N.T.S

31 PRE–ENGINEERED VAULTED WATERLESS BATHROOM FACILITY
SCALE: N.T.S.

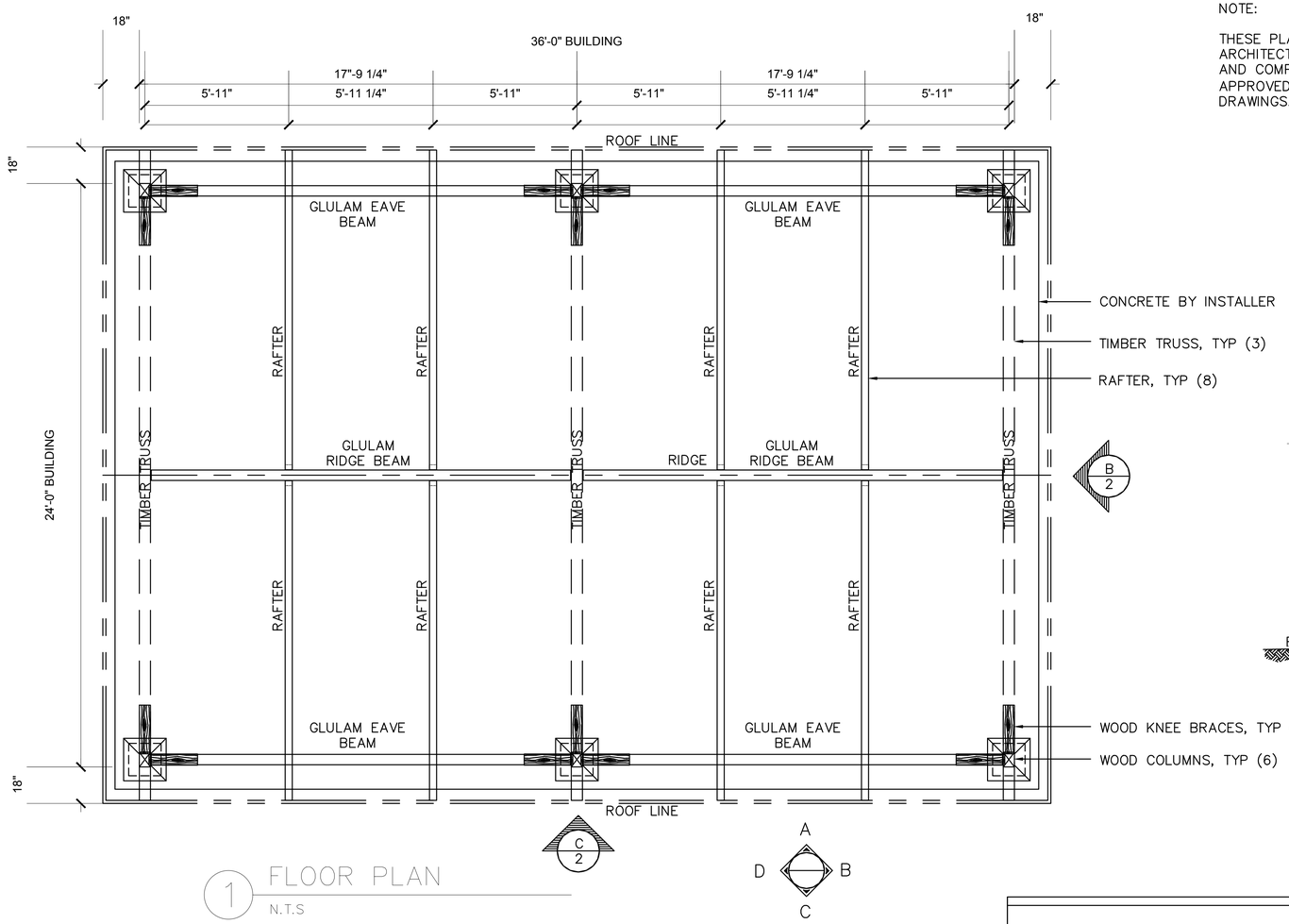
SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	212	316
PROJECT FILE NO.	608164		

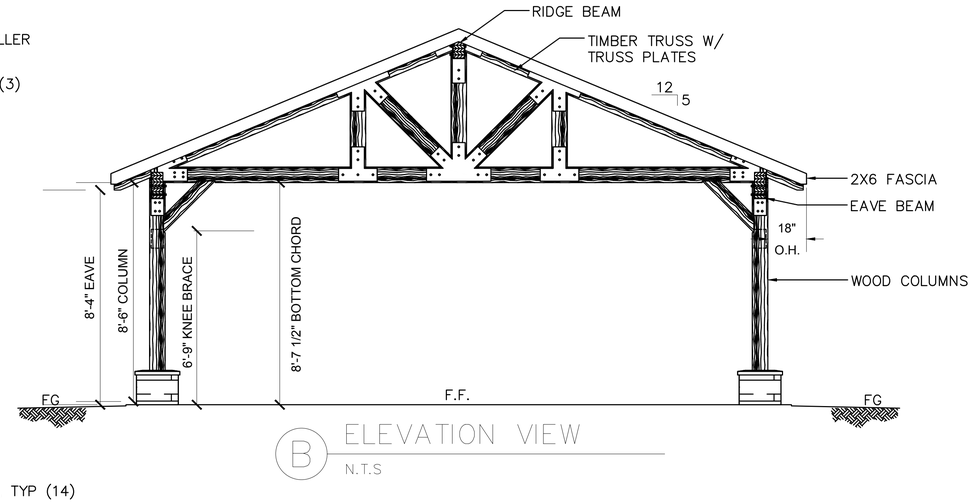
CONSTRUCTION DETAILS

NOTE:

THESE PLAN VIEW AND ELEVATION DRAWINGS ARE A PRELIMINARY ARCHITECTURAL REPRESENTATION OF THE BUILDING. ALL DIMENSIONS, FEATURES AND COMPONENTS SHOWN ON THESE PRELIMINARY DRAWINGS SHALL BE APPROVED BY THE TOWN DURING CONSTRUCTION/SUBMISSION OF SHOP DRAWINGS.

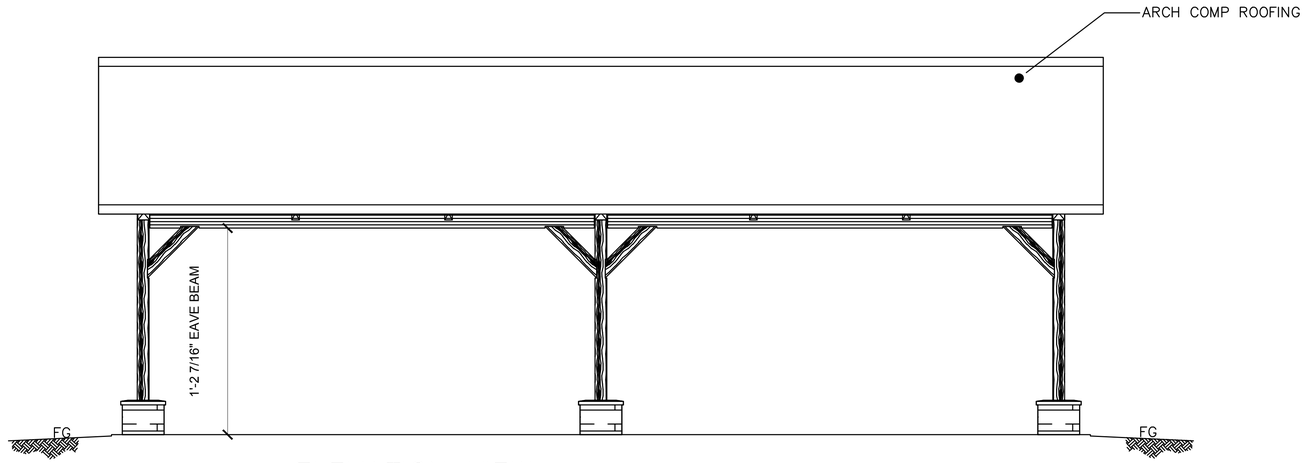


1 FLOOR PLAN
N.T.S



B ELEVATION VIEW
N.T.S

LEGEND		
SYMBOL	DESCRIPTION	AREA/ QUANTITY
	WOOD TRUSS	3
	GLU-LAM BEAMS	6



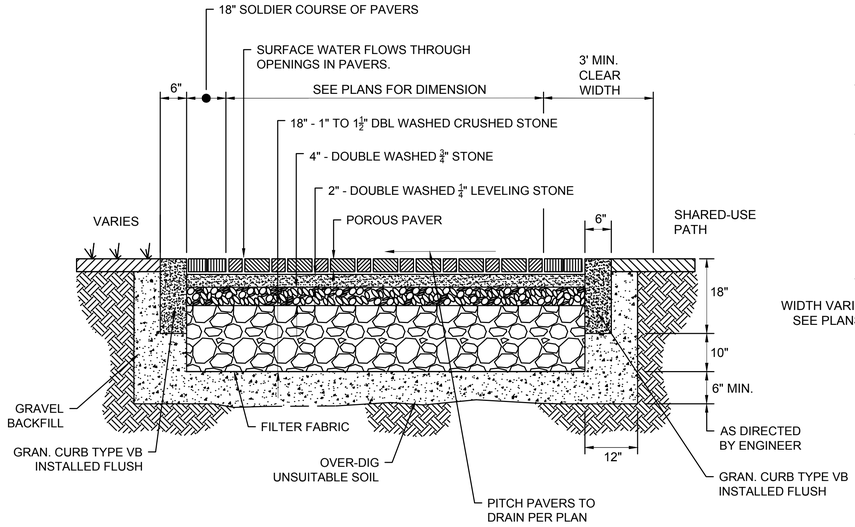
C ELEVATION VIEW
N.T.S

32 PRE-ENGINEERED PAVILION
SCALE: N.T.S.

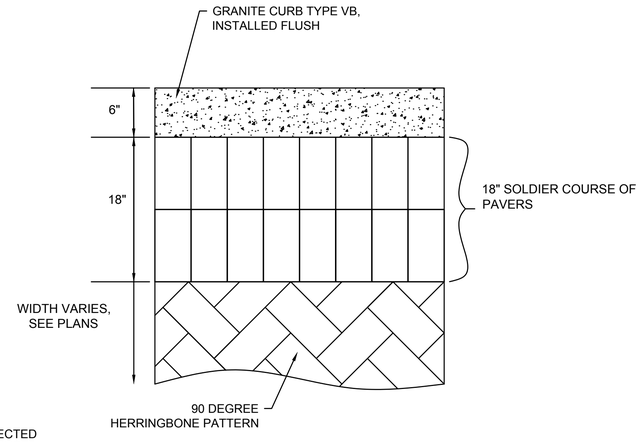
SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	213	316
PROJECT FILE NO.	608164		

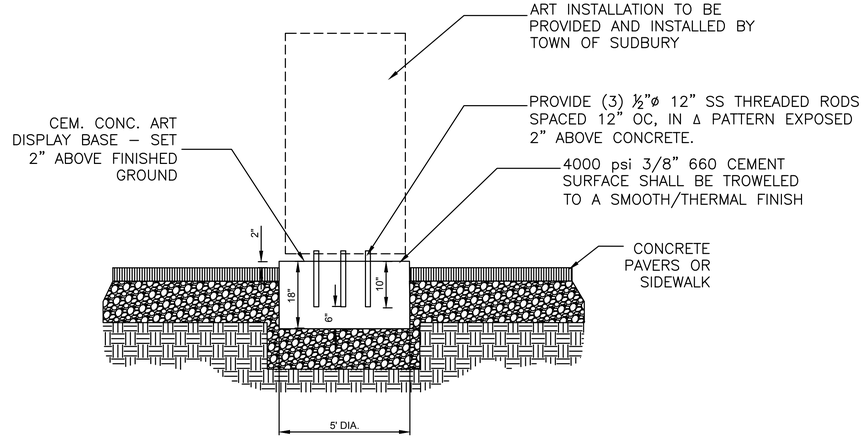
CONSTRUCTION DETAILS



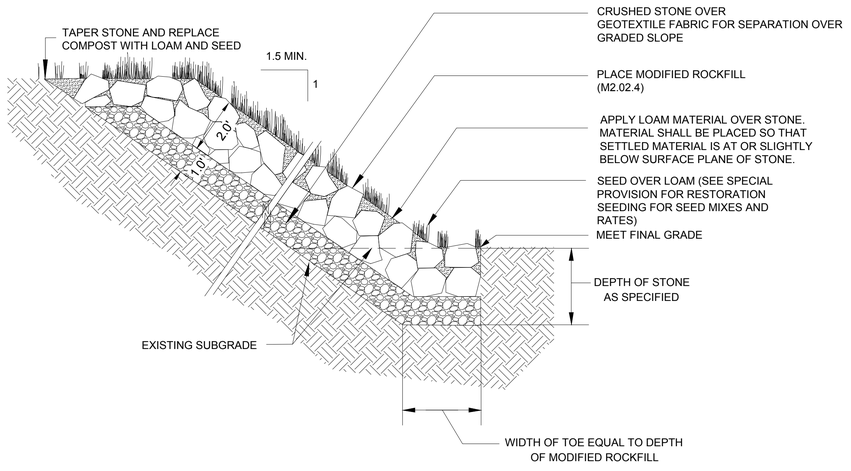
33 PERVIOUS PAVER TYPICAL SECTION
SCALE: N.T.S.



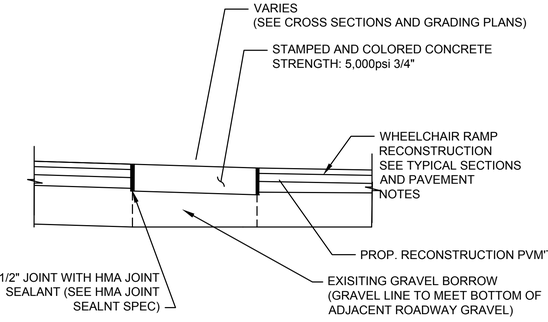
PAVER LAYOUT DETAIL
NOT TO SCALE



34 CONCRETE ART DISPLAY BASE
SCALE: N.T.S.



15 LOAM AND SEED OVER MODIFIED ROCKFILL
SCALE: N.T.S.

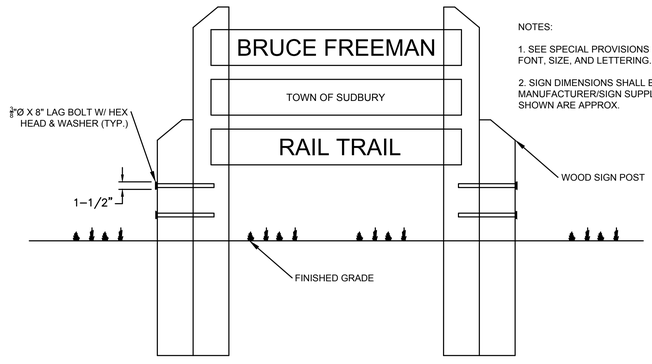


NOTES:
1) MEDIANS SHALL BE INSTALLED IN A SINGLE CONCRETE POUR WITH NO CONSTRUCTION (COLD) JOINTS IN THE CONCRETE.

2) SAWN CONTRACTION JOINTS SHALL BE INSTALLED EVERY 20' (MAXIMUM). SEE SPECIAL PROVISIONS FOR MATERIALS AND METHOD OF JOINT INSTALLATION.

3) A 2" TOOLED EDGE SHALL BE INSTALLED TO MAKE A SMOOTH TRANSITION TO THE ADJACENT PAVEMENT

35 STAMPED & COLORED CONCRETE MEDIAN – COLONIAL RED
SCALE: N.T.S.



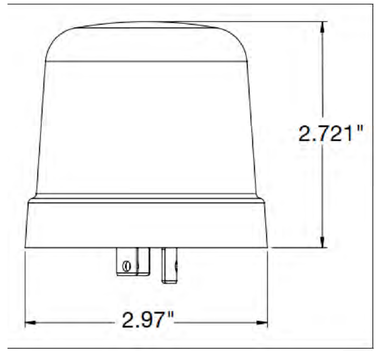
NOTES:

1. SEE SPECIAL PROVISIONS FOR SIGN STYLE, FONT, SIZE, AND LETTERING.

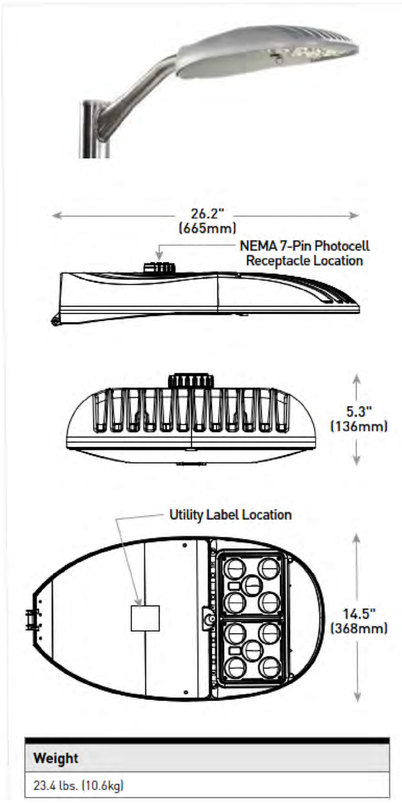
2. SIGN DIMENSIONS SHALL BE PROVIDED BY MANUFACTURER/SIGN SUPPLIER. DIMENSIONS SHOWN ARE APPROX.

14 BRUCE FREEMAN RAIL TRAIL ENTRANCE SIGN
SCALE: N.T.S.

120–277 VOLT ELECTRIC PHOTO CONTROL
LOCKING TYPE MOUNTING



LED STREET/AREA LUMINARE

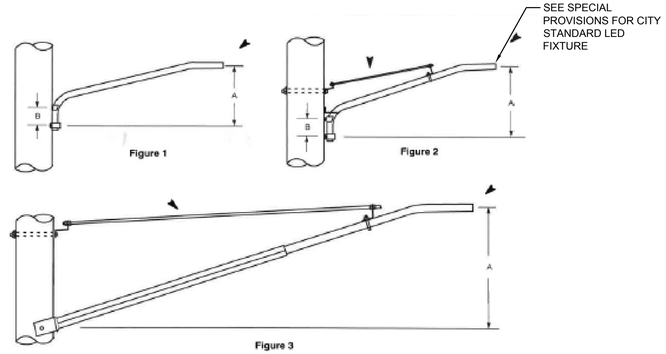


Weight
23.4 lbs. (10.6kg)

NOTES:

1. TO BE INSTALLED PER CITY STANDARD
2. HORIZONTAL TENSION MOUNTING
3. DIE CAST ALUMINUM HOUSING
4. INPUT VOLTAGE 120V – 277V
5. TO MEET ANSI C136.31–2001 AND 3G BRIDGE AND OVERPASS VIBRATION STANDARDS
6. TO DELIVER UP TO 23,800 LUMENS
7. WITH EFFICACY UP TO 139 LPW
8. CCT: 2700K, 3000K, 4000K, 5000K, 5700K

36 LED STREET/AREA LUMINARE (CITY STANDARD)
SCALE: N.T.S.



Bracket Size	Bracket Style Figure No.	Approximate Dimensions in Inches A	Approximate Dimensions in Inches B	Item Number	DTR 21.112 Pageback Variations
1 1/4" x 4'	1	18–19	11	511567	A thru C
1 1/4" x 6'	2	24–30	8–11	511568	D thru F
1 1/4" x 8'	2	19–31	8–13	511569	G thru I
1 1/4" x 10'	2	35–48	12–13	511570	J thru L
1 1/4" x 12'	3	40–43	—	511571	M thru O
1 1/4" x 16'	3	56–58	—	511572	P thru R
2" x 20'	3	67–73	—	511573	S thru U
2" x 8'	2	30	9	511496	V thru X

Notes
1. Dimensions shown do not necessarily apply to brackets purchased before 1967.
2. Variations shown depend on application.

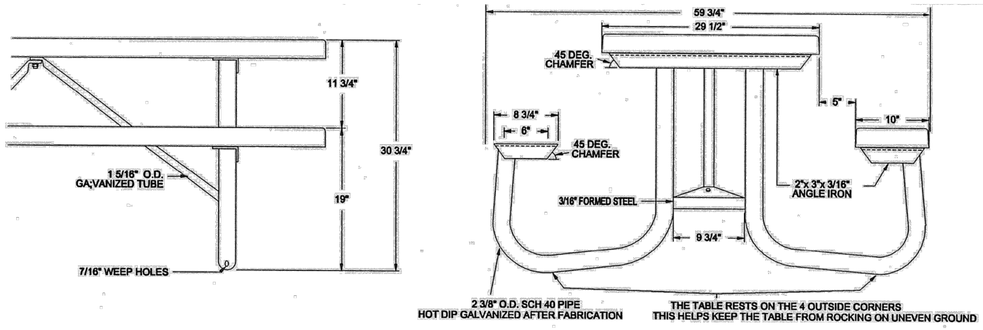
ORIGINAL 09/78	AREA AND MUNICIPAL – GALVANIZED STEEL STREET LIGHT BRACKET FOR WOOD POLES			
APPROVED 09/12/16	EVERSOURCE ENERGY	DESIGN & APPLICATION STANDARD	DTR 21.111	9

37 HIGHWAY LIGHTING FIXTURE ARM
SCALE: N.T.S.

SUDBURY
BRUCE FREEMAN RAIL TRAIL

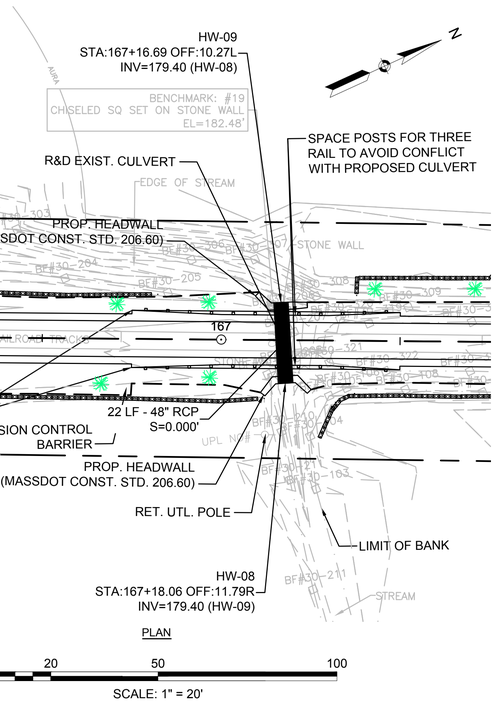
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	215	316
PROJECT FILE NO.	608164		

CONSTRUCTION DETAILS

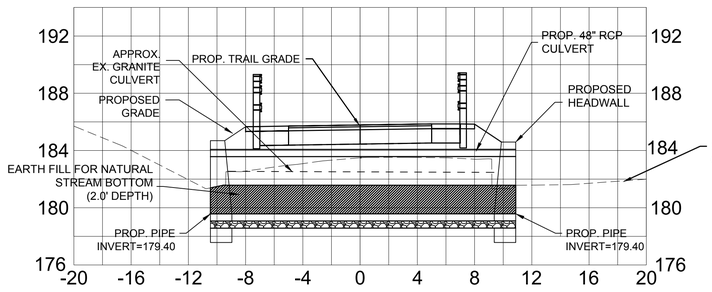


38 PICNIC TABLE

SCALE: AS NOTED

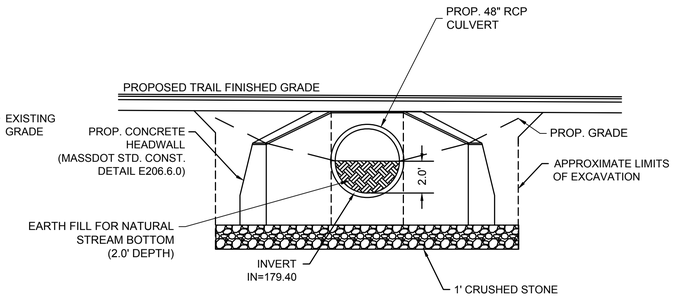


PLAN



PROFILE

SCALE: 1" = 8' (HORIZONAL)
1" = 8' (VERTICAL)



SECTION

SCALE: NTS

39 CONCRETE CULVERT REPLACEMENT – STA 167+17

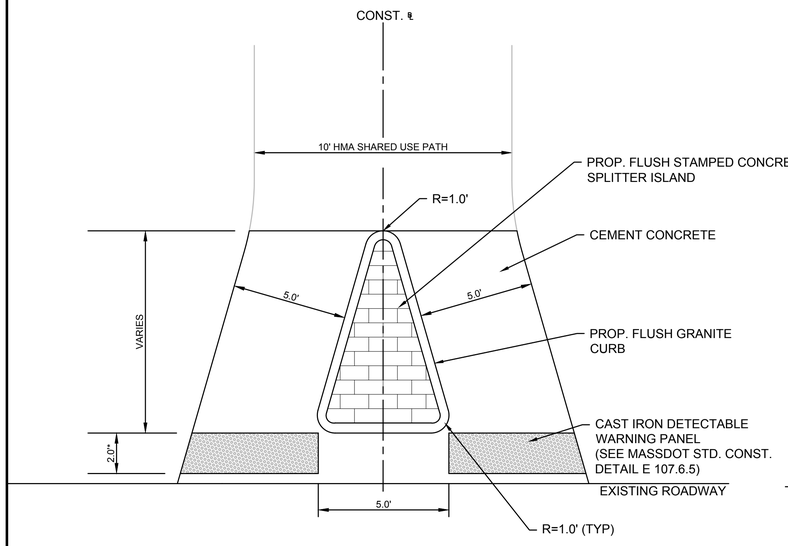
SCALE: AS NOTED

NOTES:
1. ALL RAMPS ARE TO BE CONSTRUCTED WITH 6" THICKNESS OF CEMENT CONCRETE.
2. DETECTABLE WARNING PANELS SHALL BE MADE OF CAST IRON AND OTHERWISE CONFORM TO TOWN STANDARDS.

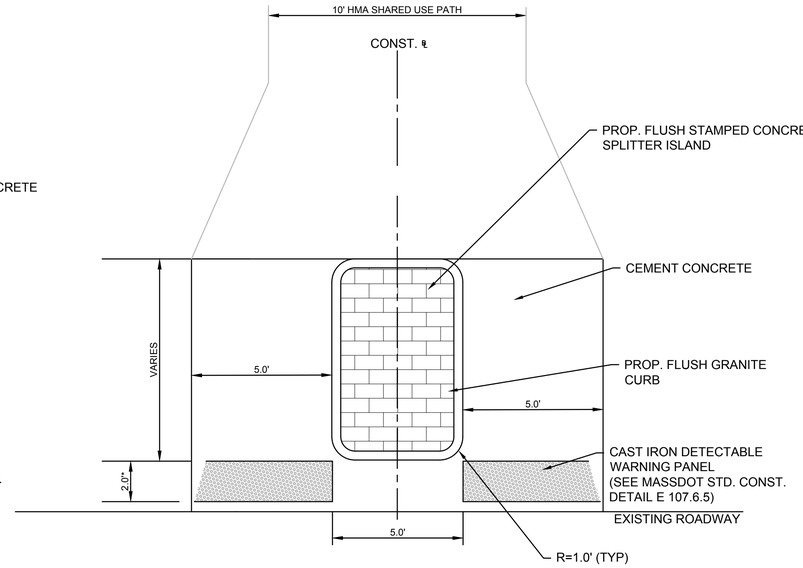
SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	218	316
PROJECT FILE NO.	608164		

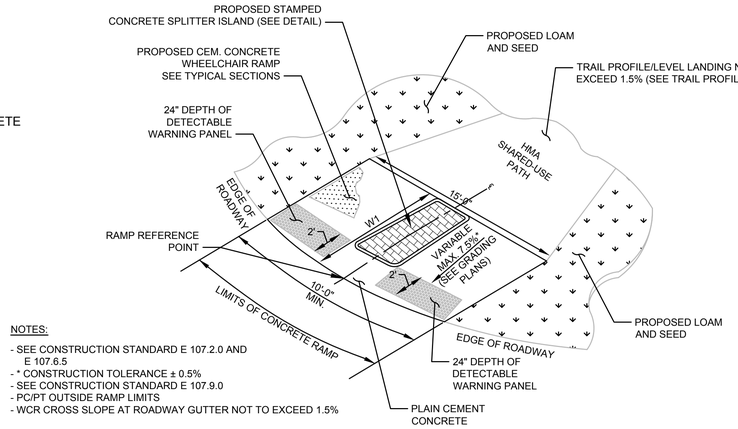
WHEELCHAIR RAMP DETAILS



CEMENT CONCETE RAIL TRAIL ENTRANCE WITH SPLITTER ISLAND
N.T.S.



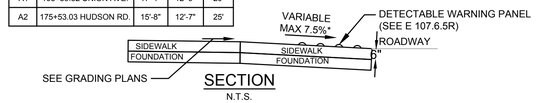
CEMENT CONCETE RAIL TRAIL ENTRANCE WITH SPLITTER ISLAND
N.T.S.



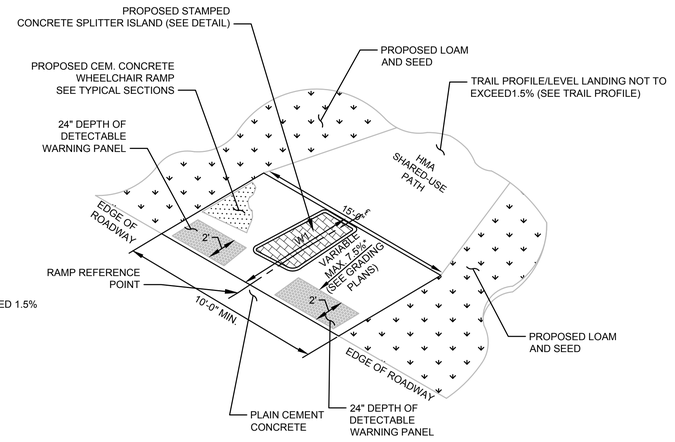
NOTES:
- SEE CONSTRUCTION STANDARD E 107.2.0 AND E 107.6.5
- * CONSTRUCTION TOLERANCE ± 0.5%
- SEE CONSTRUCTION STANDARD E 107.9.0
- PC/PT OUTSIDE RAMP LIMITS
- WCR CROSS SLOPE AT ROADWAY GUTTER NOT TO EXCEED 1.5%

TYPE A SHARED USE PATH
ENTRANCE/EXIT RAMP ON CORNER RADIUS
N.T.S.

WCR#	RAMP REFERENCE POINT: STATION/ ROADWAY	WIDTH OF RAMP ENTRANCE (10'-0" MIN.)	LENGTH OF PRIMARY RAMP (W1)	CORNER RADIUS
A1	108+59.82 UNION AVE.	17'-1"	12'-9"	20'
A2	175+53.03 HUDSON RD.	15'-8"	12'-7"	25'



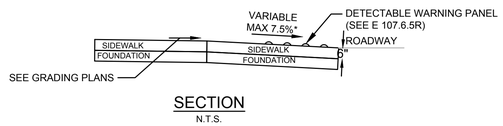
SECTION
N.T.S.



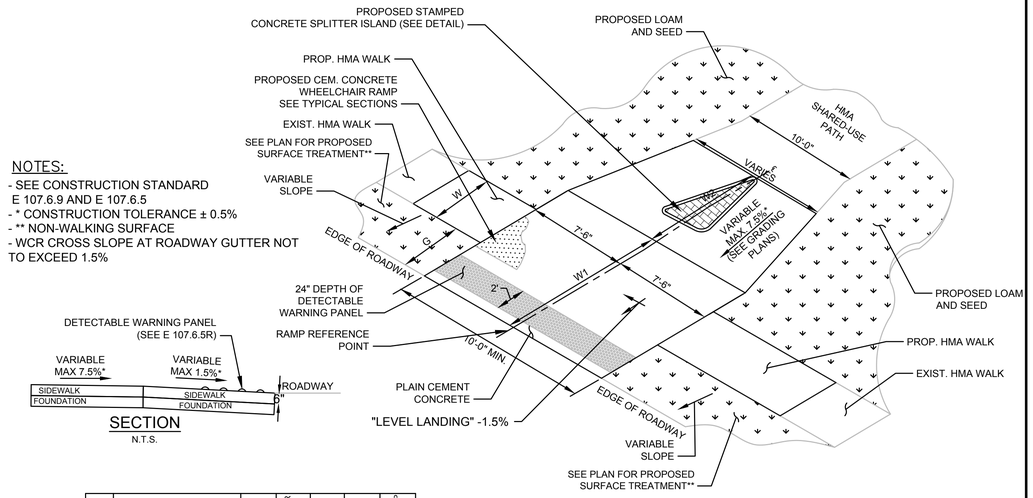
NOTES:
- SEE CONSTRUCTION STANDARD E 107.2.0 AND E 107.6.5
- * CONSTRUCTION TOLERANCE ± 0.5%
- SEE CONSTRUCTION STANDARD E 107.9.0
- PC/PT OUTSIDE RAMP LIMITS
- WCR CROSS SLOPE AT ROADWAY GUTTER NOT TO EXCEED 1.5%

WCR#	RAMP REFERENCE POINT: STATION/ ROADWAY	WIDTH OF RAMP ENTRANCE (10'-0" MIN.)	LENGTH OF PRIMARY RAMP (W1)
B1	108+83.74 UNION AVE.	16'-5"	12'-7"
B2	115+96.13 CODJER LN.	15'-10"	12'-8"
B3	116+20.92 CODJER LN.	15'-1"	12'-7"
B4	142+82.00 OLD LANCASTER RD.	16'-2"	12'-7"
B5	215+94.04 MORSE RD.	16'-0"	12'-7"
B6	274+94.44 HAYNES RD.	15'-0"	12'-3"
B7	275+15.00 HAYNES RD.	15'-0"	12'-9"
B8	307+75.00 NORTH RD.	15'-7"	12'-7"

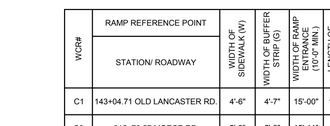
TYPE B SHARED USE PATH
ENTRANCE/EXIT RAMP
N.T.S.



SECTION
N.T.S.



NOTES:
- SEE CONSTRUCTION STANDARD E 107.6.9 AND E 107.6.5
- * CONSTRUCTION TOLERANCE ± 0.5%
- ** NON-WALKING SURFACE
- WCR CROSS SLOPE AT ROADWAY GUTTER NOT TO EXCEED 1.5%



SECTION
N.T.S.

WCR#	RAMP REFERENCE POINT: STATION/ ROADWAY	WIDTH OF SIDEWALK (W)	WIDTH OF BUFFER STRIP (G)	WIDTH OF RAMP ENTRANCE (10'-0" MIN.)	LENGTH OF PRIMARY RAMP (W1)	LENGTH OF SECONDARY RAMP (W2)
C1	143+04.71 OLD LANCASTER RD.	4'-6"	4'-7"	15'-00"	11'-00"	10'-00"
C2	215+73.57 MORSE RD.	5'-0"	5'-6"	15'-11"	15'-9"	10'-00"
C3	307+48.47 NORTH RD.	8'-0"	4'-4"	15'-6"	19'-0"	10'-0"

TYPE C SHARED USE PATH
ENTRANCE/EXIT RAMP
N.T.S.

608164_HD(CONSTRUCTION DETAILS).DWG Plotted on 22-Dec-2021 11:44 AM

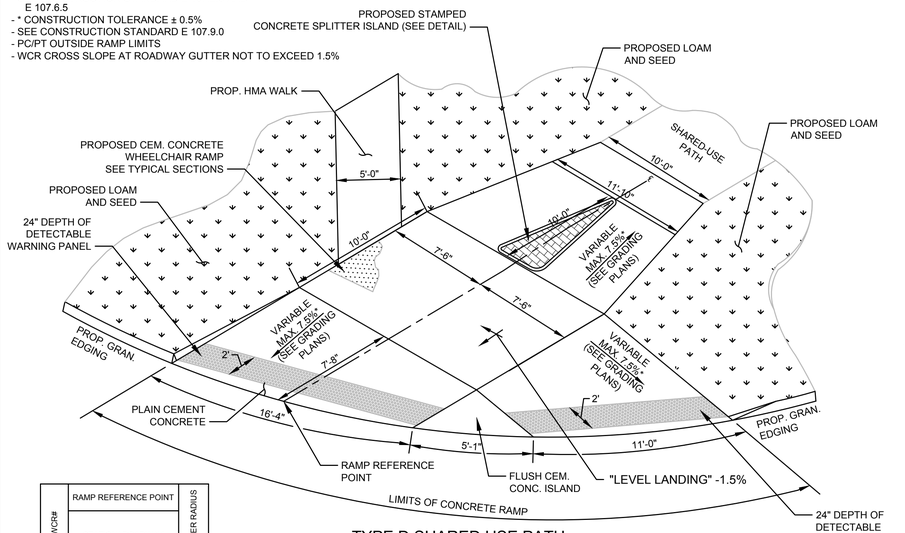
NOTES:
1. ALL RAMPS ARE TO BE CONSTRUCTED WITH 6" THICKNESS OF CEMENT CONCRETE.
2. DETECTABLE WARNING PANELS SHALL BE MADE OF CAST IRON AND OTHERWISE CONFORM TO TOWN STANDARDS.

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	219	316
PROJECT FILE NO.	608164		

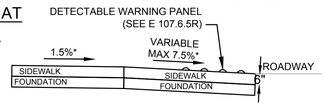
WHEELCHAIR RAMP DETAILS

NOTES:
- SEE CONSTRUCTION STANDARD E 107.2.0 AND E 107.6.5
- * CONSTRUCTION TOLERANCE ± 0.5%
- SEE CONSTRUCTION STANDARD E 107.9.0
- PC/PT OUTSIDE RAMP LIMITS
- WCR CROSS SLOPE AT ROADWAY GUTTER NOT TO EXCEED 1.5%

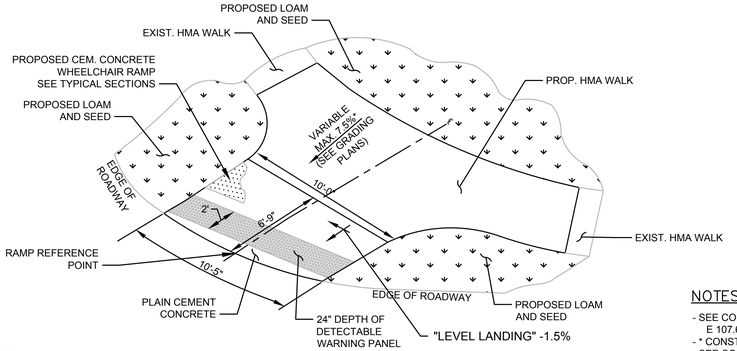


WCR#	RAMP REFERENCE POINT: STATION/ ROADWAY	CORNER RADIUS
D1	175+09.54 HUDSON RD	40'

TYPE D SHARED USE PATH ENTRANCE/EXIT RAMP ON CORNER RADIUS AT PEAKHAM/HUDSON ROAD INTERSECIOTN
N.T.S.



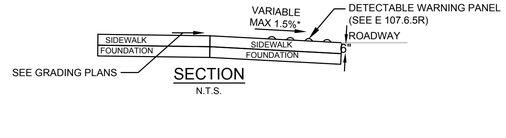
SECTION
N.T.S.



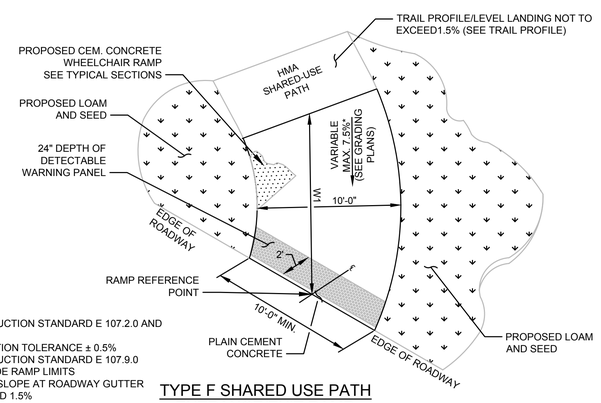
NOTES:
- SEE CONSTRUCTION STANDARD E 107.2.0 AND E 107.6.5
- * CONSTRUCTION TOLERANCE ± 0.5%
- SEE CONSTRUCTION STANDARD E 107.9.0
- PC/PT OUTSIDE RAMP LIMITS
- WCR CROSS SLOPE AT ROADWAY GUTTER NOT TO EXCEED 1.5%

TYPE E WHEELCHAIR RAMP ON CORNER RADIUS AT PEAKHAM/HUDSON ROAD INTERSECTION
N.T.S.

WCR#	RAMP REFERENCE POINT: STATION/ ROADWAY	RAMP REFERENCE POINT: OFFSET	WIDTH OF RAMP ENTRANCE (10'-0" MIN.)	LENGTH OF PRIMARY RAMP (W1)	CORNER RADIUS
E1	601+76.54 PEAKHAM RD.	20.43'	10'-5"	6'-10"	40'



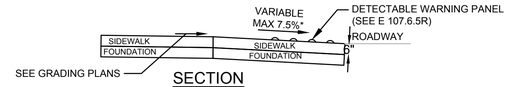
SECTION
N.T.S.



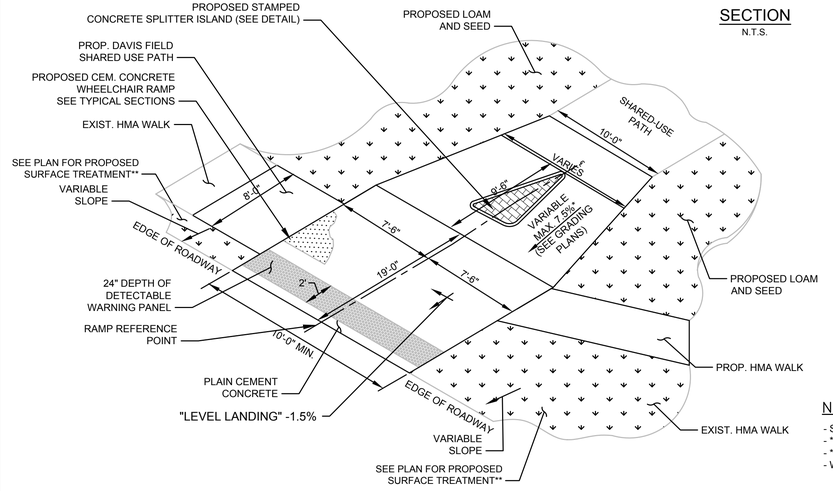
NOTES:
- SEE CONSTRUCTION STANDARD E 107.2.0 AND E 107.6.5
- * CONSTRUCTION TOLERANCE ± 0.5%
- SEE CONSTRUCTION STANDARD E 107.9.0
- PC/PT OUTSIDE RAMP LIMITS
- WCR CROSS SLOPE AT ROADWAY GUTTER NOT TO EXCEED 1.5%

TYPE F SHARED USE PATH ENTRANCE/EXIT RAMP
N.T.S.

WCR#	RAMP REFERENCE POINT: STATION/ ROADWAY	WIDTH OF RAMP ENTRANCE (10'-0" MIN.)	LENGTH OF PRIMARY RAMP (W1)
F1	284+33.98 PANTRY RD.	10'-0"	15'-11"
F2	284+60.04 PANTRY RD.	10'-0"	15'-7"

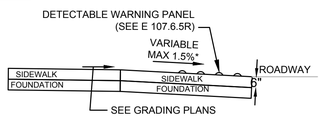


SECTION
N.T.S.

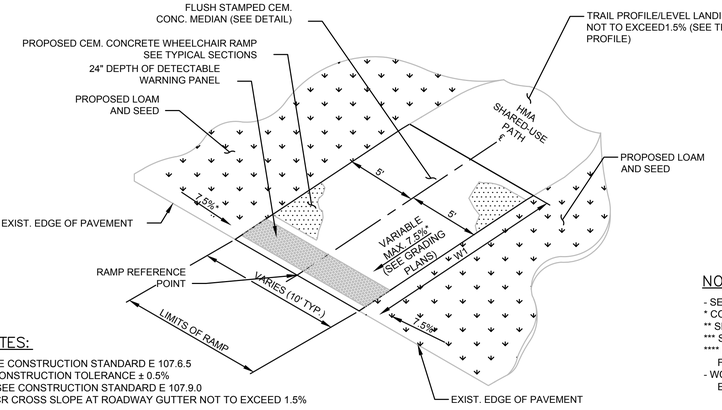


NOTES:
- SEE CONSTRUCTION STANDARD E 107.6.9 AND E 107.6.5
- * CONSTRUCTION TOLERANCE ± 0.5%
- ** NON-WALKING SURFACE
- WCR CROSS SLOPE AT ROADWAY GUTTER NOT TO EXCEED 1.5%

TYPE G SHARED USE PATH ENTRANCE/EXIT RAMP AT NORTH ROAD STA. 307+48
N.T.S.



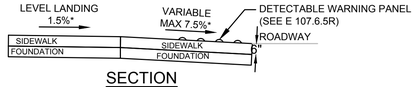
SECTION
N.T.S.



NOTES:
- SEE CONSTRUCTION STANDARD E 107.6.5
- * CONSTRUCTION TOLERANCE ± 0.5%
- ** SEE CONSTRUCTION STANDARD E 107.9.0
- WCR CROSS SLOPE AT ROADWAY GUTTER NOT TO EXCEED 1.5%

TYPE H WHEELCHAIR RAMP SHARED-USE PATH ENTRANCE/EXIT
N.T.S.

WCR#	RAMP REFERENCE POINT: STATION/ ROADWAY	RAMP REFERENCE POINT: OFFSET	WIDTH OF RAMP ENTRANCE (10'-0" MIN.)	LENGTH OF PRIMARY RAMP (W1)
H1	1000+80.00 PARKINSON'S LOT	-	10'-0"	5'-0"
H2	216+60.31 BROADACRES FARM	51'-94"	10'-0"	6'-6"
H3	320+20.22 FAIRVIEW FARMS DRIVEWAY	-	10'-0"	10'-0"
H4	320+40.01 FAIRVIEW FARMS DRIVEWAY	-	10'-0"	10'-0"
H5	1107+63.72 DAVIS FIELD	-	10'-2"	11'-3"
H6	216+60.31 BROADACRES FARM	118'-43"	10'-0"	6'-0"



SECTION
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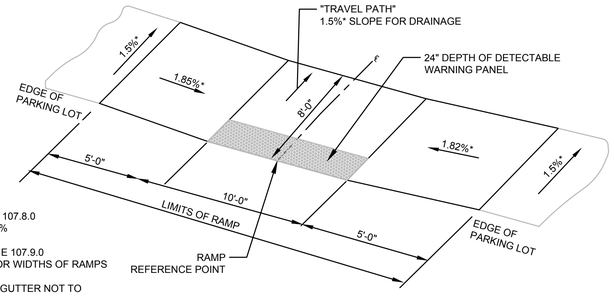
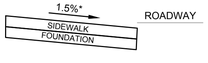


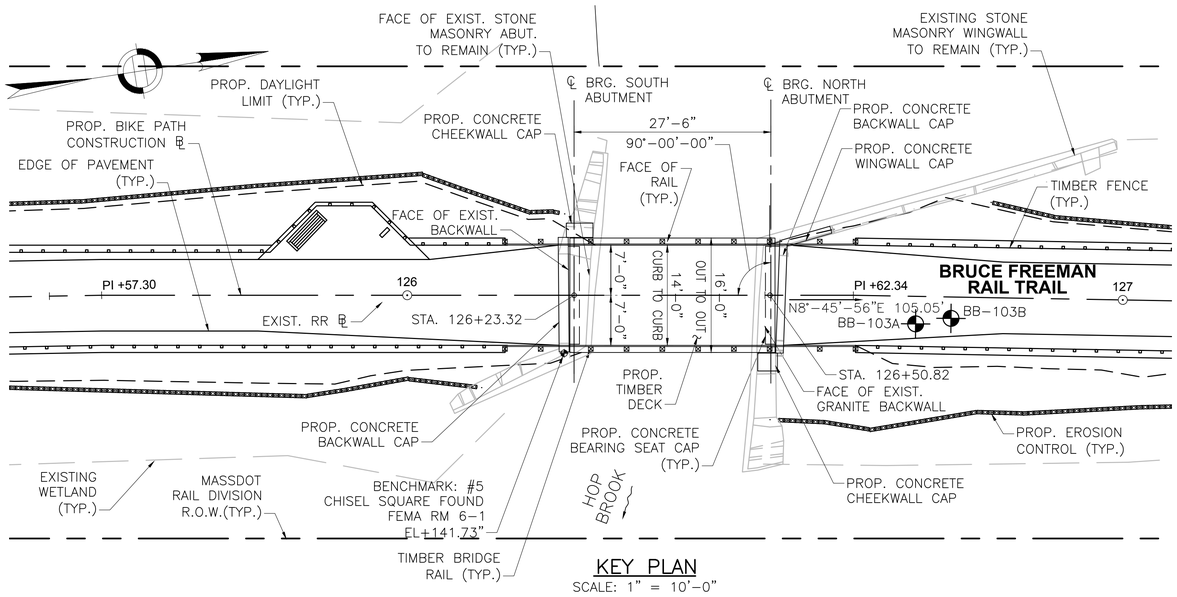
NOTES:
- SEE CONSTRUCTION STANDARD E 107.8.0
- * CONSTRUCTION TOLERANCE ± 0.5%
- ** SIDEWALK ENDS
- *** SEE CONSTRUCTION STANDARD E 107.9.0
- **** MAX. 4" HEIGTH OF DR. RAMP FOR WIDTHS OF RAMPS FROM 2-4'
- WCR CROSS SLOPE AT ROADWAY GUTTER NOT TO EXCEED 1.5%

TYPE I WHEELCHAIR RAMP SHARED-USE PATH ENTRANCE/EXIT AT DAVIS FIELD PARKING LOT
N.T.S.

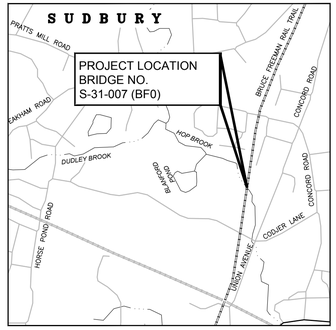
WCR#	DRIVEWAY REFERENCE POINT: STATION/ ROADWAY	DRIVEWAY REFERENCE POINT: OFFSET
1-1	1105+91.63 DAVIS FIELD	4.00' LT



SECTION
N.T.S.



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



LOCUS PLAN
SCALE: 1" = 1200'

SUDBURY
BRUCE FREEMAN RAIL TRAIL OVER HOP BROOK

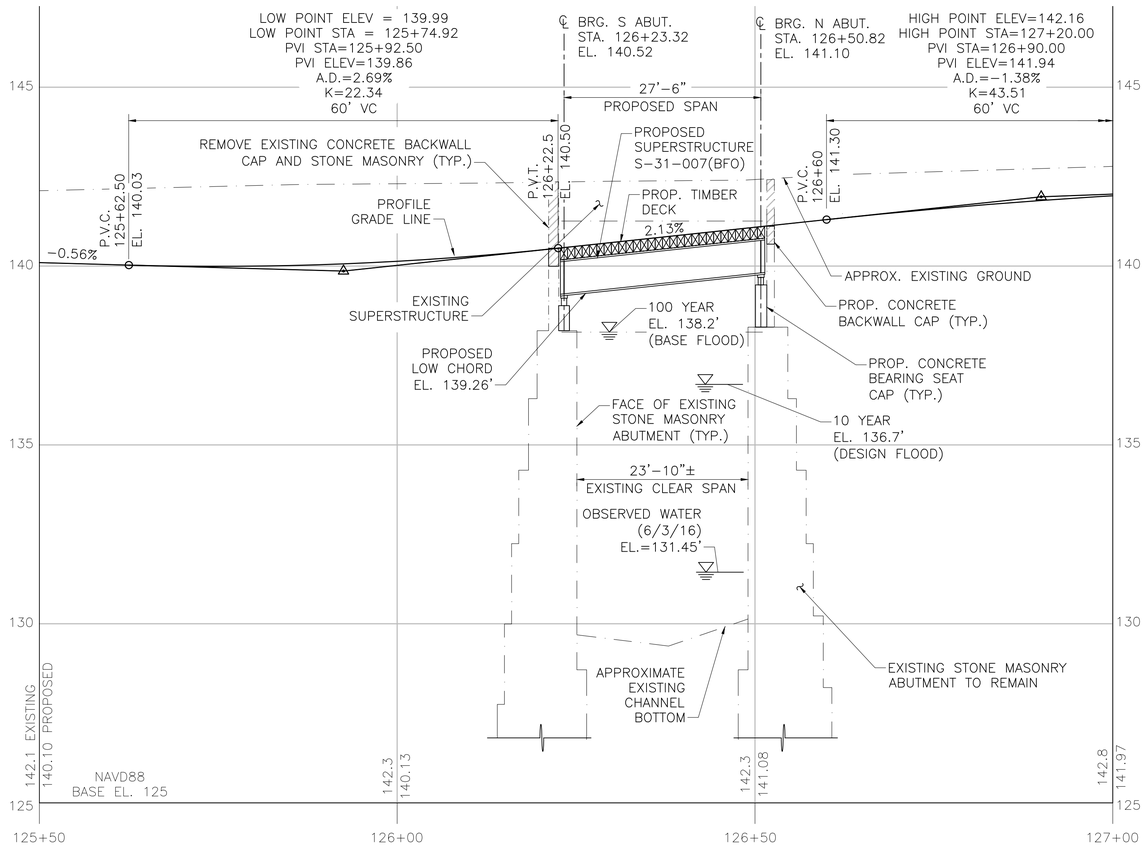
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	220	316
PROJECT FILE NO.	608164		

KEY PLAN & PROFILE

ESTIMATED QUANTITIES:
(NOT GUARANTEED)

ITEM NO.:	ITEM:	QUANTITY:	
114.1	DEMOLITION OF SUPERSTRUCTURE OF BRIDGE NO. S-31-007	1	LS
127.1	REINFORCED CONCRETE EXCAVATION	3	CY
140.	BRIDGE EXCAVATION	5	CY
144.	CLASS B ROCK EXCAVATION	5	CY
151.2	GRAVEL BORROW FOR BACKFILLING STRUCTURES AND PIPES	2	CY
482.20	HOT POURED JOINT SEALER	29	FT
690.	STONE MASONRY WALL REMOVED AND REBUILT IN CEMENT MORTAR	6	CY
690.91	MASONRY REPOINTING	65	SY
991.1	CONTROL OF WATER - STRUCTURE NO. S-31-007	1	LS
995.	BRIDGE SUPERSTRUCTURE, BRIDGE NO. S-31-007	1	LS

INDEX



PROFILE ALONG BIKE PATH
HORIZONTAL SCALE: 1" = 10'-0"
VERTICAL SCALE: 1" = 2'-0"

PROFILE ALONG HOP BROOK
HORIZONTAL SCALE: 1" = 10'-0"
VERTICAL SCALE: 1" = 2'-0"

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION

P.E. STAMP SIGNATURE

FUSS & O'NEILL
1550 MAIN STREET, SUITE 400
SPRINGFIELD, MA 01103
413.452.0445
www.fando.com

MassDOT Massachusetts Department of Transportation Highway Division

PROPOSED SUPERSTRUCTURE REPLACEMENT
SUDBURY
BRUCE FREEMAN RAIL TRAIL OVER HOP BROOK
MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION
10 PARK PLAZA BOSTON, MASS

TITLE: _____ CHIEF ENGINEER

608164_BR1(S-31-007)(FIRST SHEET).DWG Plotted on 22-Dec-2021 11:54 AM
2nd Structural Submittal (S2) 10-January-2022

SUDBURY
BRUCE FREEMAN RAIL TRAIL OVER HOP BROOK

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	221	316
PROJECT FILE NO.	608164		

GENERAL NOTES

GENERAL NOTES:

DESIGN:

IN ACCORDANCE WITH THE 2020 AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS LRFD BRIDGE DESIGN SPECIFICATIONS WITH CURRENT INTERIM SPECIFICATIONS THROUGH 2021 AND THE 2009 LRFD GUIDE SPECIFICATIONS FOR THE DESIGN OF PEDESTRIAN BRIDGES FOR H–10 VEHICULAR AND 90 PSF PEDESTRIAN LOADINGS.

MASSDOT BENCH MARK:

BM #5 CHISEL SQUARE FOUND
FEMA RM 6–1
ELEV. = 141.73'

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

DATE:

TO BE PLACED ON THE FACE OF THE NORTHEAST AND SOUTHWEST PROPOSED CONCRETE CHEEKWALL CAPS. A DETAIL SHOWING SIZE AND CHARACTER OF NUMERIALS WILL BE FURNISHED. THE DATE USED SHALL BE THE LATEST YEAR OF CONTRACT COMPLETION AS OF THE DATE THE FIRST CONCRETE CHEEKWALL CAP IS CONSTRUCTED. BOTH CONCRETE CHEEKWALL CAPS SHALL FEATURE THE SAME DATE.

SURVEY NOTEBOOKS:

SURVEY PERFORMED BY VANASSE HANGEN BRUSTLIN, INC FIELD NOTEBOOKS SHALL BE OBTAINED FROM FUSS AND O'NEILL, INC. SPRINGFIELD, MA.

SCALES:

SCALES NOTED ON THE PLANS ARE NOT APPLICABLE TO REDUCED SIZE PRINTS. DIVIDE SCALES BY 2 FOR HALF–SIZE PRINTS (A3).

UNSUITABLE MATERIAL:

ALL UNSUITABLE MATERIAL SHALL BE REMOVED WITHIN THE LIMITS OF THE OF THE PROPOSED STRUCTURE, AS DIRECTED BY THE ENGINEER.

DIMENSIONS:

ALL DIMENSIONS SHOWN ON PLANS ARE FOR STRUCTURES AT 68° F, UNLESS OTHERWISE NOTED.

EXISTING CONSTRUCTION:

DIMENSIONS SHOWN ARE TAKEN FROM SURVEY, VARIOUS FIELD MEASUREMENTS, AND GEOTECHNICAL EXPLORATION AND ARE NOT GUARANTEED. THE CONTRACTOR SHALL DETERMINE AND ESTABLISH ALL DIMENSIONS AND DETAILS NECESSARY FOR COMPLETION OF ALL WORK BY FIELD MEASUREMENT AND SURVEY. THE CONTRACTOR SHALL BE RESPONSIBLE AND NOT ORDER ANY MATERIAL OR COMMENCE ANY FABRICATION UNTIL HE HAS MADE THE REQUIRED MEASUREMENTS ON THE ACTUAL STRUCTURE AND THE EXTENT OF THE PROPOSED WORK HAS BEEN APPROVED BY THE ENGINEER. EXISTING BRIDGE PLANS ARE NOT AVAILABLE FOR REFERENCE.

TIMBER:

ALL STRUCTURAL TIMBER FOR DECKING SHALL BE PRESSURE TREATED MIXED SOUTHERN PINE GRADE 1 OR APPROVED EQUAL.

CONCRETE:

4,000 PSI, ¾ INCH, 610 CEMENT CONCRETE SHALL BE PROVIDED FOR THE BEARING SEATS, WINGWALL CAPS, BACKWALL RESTORATION, AND CHEEK WALLS.

4,000 PSI 1½ INCH, 565 CEMENT CONCRETE SHALL BE PROVIDED FOR CONCRETE ENCASEMENT OF THE FIRST RAIL POST OFF THE BRIDGE IF MINIMUM EMBEDMENT OF POST CANNOT BE MET.

REINFORCEMENT:

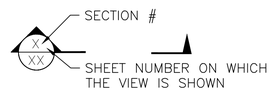
REINFORCING STEEL SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M 31 GRADE 60. UNLESS OTHERWISE NOTED ON THE CONSTRUCTION DRAWINGS, ALL BARS SHALL BE LAPPED AS FOLLOWS:

MODIFICATION CONDITION	#4 BARS	#5 BARS	#6 BARS
1. NONE	16"	19"	23"
2. 12" OF CONCRETE BELOW BAR	20"	25"	30"
3. EPOXY COATED BARS, COVER < $3d_b$, OR CLEAR SPACING < $6d_b$	23"	29"	34"
4. COATED BARS, ALL OTHER CASES	18"	23"	27"
5. CONDITION 2. AND 3.	26"	32"	39"
6. CONDITION 2. AND 4.	24"	30"	36"

ALL OTHER BARS SHOULD BE LAPPED AS SHOWN ON THE CONSTRUCTION DRAWINGS.

ALL REINFORCEMENT IN CONCRETE BACKWALL, BEARING SEAT, CHEEKWALL, AND WINGWALL CAPS SHALL BE EPOXY COATED.

SECTION MARK:



TRAFFIC DATA	ROADWAY OVER	ROADWAY UNDER
DESIGN YEAR	N/A	
AVERAGE DAILY TRAFFIC – PRESENT	N/A	
AVERAGE DAILY TRAFFIC – DESIGN YEAR	N/A	
DESIGN HOURLY VOLUME	N/A	
DIRECTIONAL DISTRIBUTION	N/A	
TRUCK PERCENTAGE – AVERAGE DAY	N/A	
TRUCK PERCENTAGE – PEAK HOUR	N/A	
DESIGN SPEED	18 MPH	
DIRECTIONAL DESIGN HOURLY VOLUME	N/A	

SEISMIC DESIGN CRITERIA	
DESIGN RETURN PERIOD:	1,000
DESIGN SPECTRA	
As	0.11
SDs	0.23
SD1	0.09
SITE CLASS	D
SEISMIC DESIGN CATEGORY (SDC)	A

HYDRAULIC DESIGN DATA	
DRAINAGE AREA (SQ. MILES)	14.7
DESIGN FLOOD DISCHARGE (C.F.S)	452
DESIGN FLOOD FREQUENCY (YEARS)	10
DESIGN FLOOD VELOCITY (F.P.S)	2.66
DESIGN FLOOD ELEVATION (FEET, NAVD)	136.7
BASE (100–YEAR) FLOOD DATA	
BASE FLOOD DISCHARGE (C.F.S)	881
BASE FLOOD ELEVATION (FEET, NAVD)	138.2
DESIGN AND CHECK SCOUR DATA	
DESIGN SCOUR FLOOD EVENT RETURN FREQUENCY (YEARS)	25
DESIGN FLOOD ABUTMENT SCOUR DEPTH (FEET)	N/A
DESIGN FLOOD PIER SCOUR DEPTH (FEET)	N/A
CHECK SCOUR FLOOD EVENT RETURN FREQUENCY (YEARS)	50
CHECK FLOOD ABUTMENT SCOUR DEPTH (FEET)	N/A
CHECK FLOOD PIER SCOUR DEPTH (FEET)	N/A
FLOOD OF RECORD	
DISCHARGE (C.F.S.)	N/A
FREQUENCY (IF KNOWN, YEARS)	N/A
MAXIMUM ELEVATION (FEET, NAVD)	N/A
DATE (MM/YYYY)	N/A
HISTORY OF ICE FLOES	N/A
EVIDENCE OF SCOUR AND EROSION	N/A

DATE	DESCRIPTION
MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
USE ONLY PRINTS OF LATEST DATE	

SUDBURY
BRUCE FREEMAN RAIL TRAIL OVER HOP BROOK

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	222	316
PROJECT FILE NO.	608164		

BORING LOGS

LOG OF TEST BORING

JACOBS

PROJECT	Bruce Freeman Rail Trail					BORING NO.	BB-103A
LOCATION	Sudbury, MA						SHEET 1 OF 1
OWNER	MASSDOT						
JOB NUMBER	E2X81800						
INSPECTOR	S. Ramesh	CONTRACTOR	NEBC	DRILLER	S. Cooley	ELEVATION	142.5
METHOD OF DRILLING		GROUNDWATER READINGS		DRILL RIG	Acker Soil Scout	DATUM	NAVD 88
0.0	Split Spoon Sample	DATE/TIME	DEPTH(ft)	REMARKS	SPT HAMMER 140 lb R&C Safety	GRID N	2960021
10.0	Terminated	09-03-2019 /		None Encountered		COORD E	677573
						DATE START	9/3/19
						DATE END	9/3/19

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
140	0	2 3 2 2	5	S1	0 - 2	24/10		FILL	S1: (0-4") Topsoil. Dry, black, medium SAND, trace Gravel. (4-10") Dry, brown, fine SAND, trace Silt.	
	5	1 3 3 4	6	S2	2 - 4	24/12			S2: Dry, loose, brown, medium to coarse SAND, little Gravel.	
		3 3 3 3	6	S3	4 - 6	24/16			S3: Dry, loose, brown, fine to medium SAND, some Silt.	
135		3 4 3 3	7	S4	6 - 8	24/17			S4: Dry, loose, brown, fine to coarse SAND, little Silt.	
		2 8 50/5"	50/5"	S5	8 - 9.4	17/12			S5: Dry, very dense, brown, medium to coarse SAND, little Gravel, trace Silt.	
	10	50/0"	50/0"	S6	10 - 10	0/0		10	Bottom of Borehole at 10 feet.	1 2
130	15									
125	20									
120	25									
115	30									
110	35									

Page 1: 0-35 feet. Each subsequent page displays 40 feet.

NOTES

1. Boring terminated at 10' due to an obstruction.
2. Boring offset 5' north and continued. See boring log BB-103B.

133.1

LOG OF TEST BORING

JACOBS

PROJECT	Bruce Freeman Rail Trail					BORING NO.	BB-103B
LOCATION	Sudbury, MA						SHEET 1 OF 2
OWNER	MASSDOT						
JOB NUMBER	E2X81800						
INSPECTOR	S. Ramesh	CONTRACTOR	NEBC	DRILLER	S. Cooley	ELEVATION	142.5
METHOD OF DRILLING		GROUNDWATER READINGS		DRILL RIG	Acker Soil Scout	DATUM	NAVD 88
0.0	Split Spoon Sample	DATE/TIME	DEPTH(ft)	REMARKS	SPT HAMMER 140 lb R&C Safety	GRID N	2960026
14.0	Wash Boring w/ 3" Casing	09-04-2019 / 7:07 am	9.4	During Drilling (In Casing)		COORD E	677573
31.5	NX Rock Core					DATE START	9/3/19
41.5	Terminated					DATE END	9/4/19

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
140	0								Drill through.	
	5									
135										
	10	3 3 1 3	4	S6	10 - 12	24/18			S6: Wet, medium stiff, brownish black SILT and fine SAND, trace roots.	
130		4 5 8 9	13	S7	12 - 14	24/22			S7: Similar to S6.	
	15	2 6 7 11	13	S8	14 - 16	24/15			S8: Wet, black, non-plastic SILT, some fine Sand, trace wood chips, faint organic odor in sample.	1
125		14 14 15 17	29	S9	16 - 18	24/21		SILT	S9: Wet, very stiff, brown, non-plastic SILT, trace fine Sand.	
		21 12 11 12	23	S10	18 - 20	24/16			S10: Similar to S9.	
120	20							24		
	25	64 24 24 14	48	S11	24 - 26	24/16		GRAVEL	S11: Wet, dense, gray, fine to coarse GRAVEL, little medium to coarse Sand.	
115		26 41 44 50/5"	85	S12	29 - 30.9	23/14			S12: Wet, very dense, gray, medium to coarse SAND and fine GRAVEL, little non-plastic Silt.	
	30	RQD=94		RC-1	31.5 - 36.5	60/57		31.5	RC-1: Coring time: 3.5, 3, 3.5, 3.5, 3 (mins/ft) Wet, gray, fine grained, slightly weathered, mildly fractured METAVOLCANIC ROCK.	
110	35									

Page 1: 0-35 feet. Each subsequent page displays 40 feet.

NOTES

1. Some likely wash recovered in sample.

LOG OF TEST BORING

JACOBS

PROJECT	Bruce Freeman Rail Trail					BORING NO.	BB-103B
LOCATION	Sudbury, MA						SHEET 2 OF 2
OWNER	MASSDOT						
JOB NUMBER	E2X81800						

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
105	40	RQD=78		RC-2	36.5 - 41.5	60/60		METAVOLCANIC ROCK	RC-2: Coring time: 3, 4, 3.5, 2.5, 4 (mins/ft) Similar to RC-1.	
								41.5	Bottom of Borehole at 41.5 feet.	
100	45									
95	50									
90	55									
85	60									
80	65									
75	70									
70										

Page 1: 0-35 feet. Each subsequent page displays 40 feet.

NOTES

BORING NOTES:

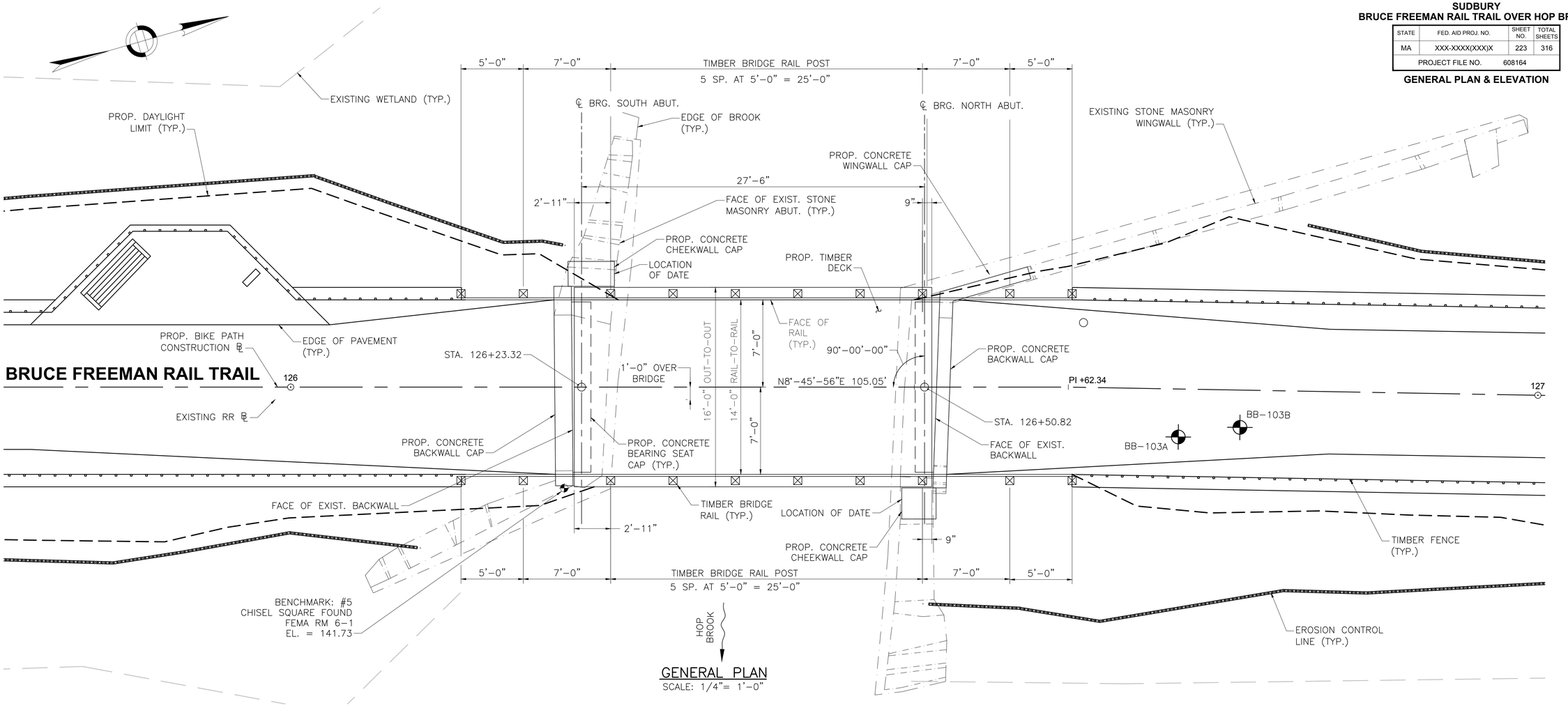
1. LOCATION OF BORINGS SHOWN ON THE PLANS THUS: ⊕ BB–#
2. BORINGS ARE TAKEN FOR PURPOSE OF DESIGN AND SHOW CONDITIONS AT BORING POINTS ONLY, BUT DO NOT NECESSARILY SHOW THE NATURE OF THE MATERIALS TO BE ENCOUNTERED DURING CONSTRUCTION.
3. WATER LEVELS SHOWN ON THE BORING LOGS WERE OBSERVED AT THE TIME OF TAKING BORINGS AND DO NOT NECESSARILY SHOW THE TRUE GROUND WATER LEVEL.
4. FIGURES IN COLUMNS INDICATE NUMBER OF BLOWS REQUIRED TO DRIVE A $1\frac{3}{8}$" I.D. SPLIT SPOON SAMPLER 6" USING A 140 POUND WEIGHT FALLING 30".
5. BORING SAMPLES ARE STORED AT A STORAGE FACILITY LOCATED ON ROUTE 114 (219 WINTHRUP AVE.) IN LAWRENCE, MA. THE CONTRACTOR MAY EXAMINE THE SOIL AND ROCK SAMPLES BY CONTACTING THE MASSDOT GEOTECHNICAL SECTION AT 10 PARK PLAZA, BOSTON, MA.
6. ALL BORINGS WERE MADE IN SEPTEMBER 2019.
7. BORINGS WERE MADE BY NEW ENGLAND BORING CONTRACTOR, INC., P.O. BOX 165, DERRY, NH 03038.
8. THE NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988 IS USED THROUGHOUT.

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

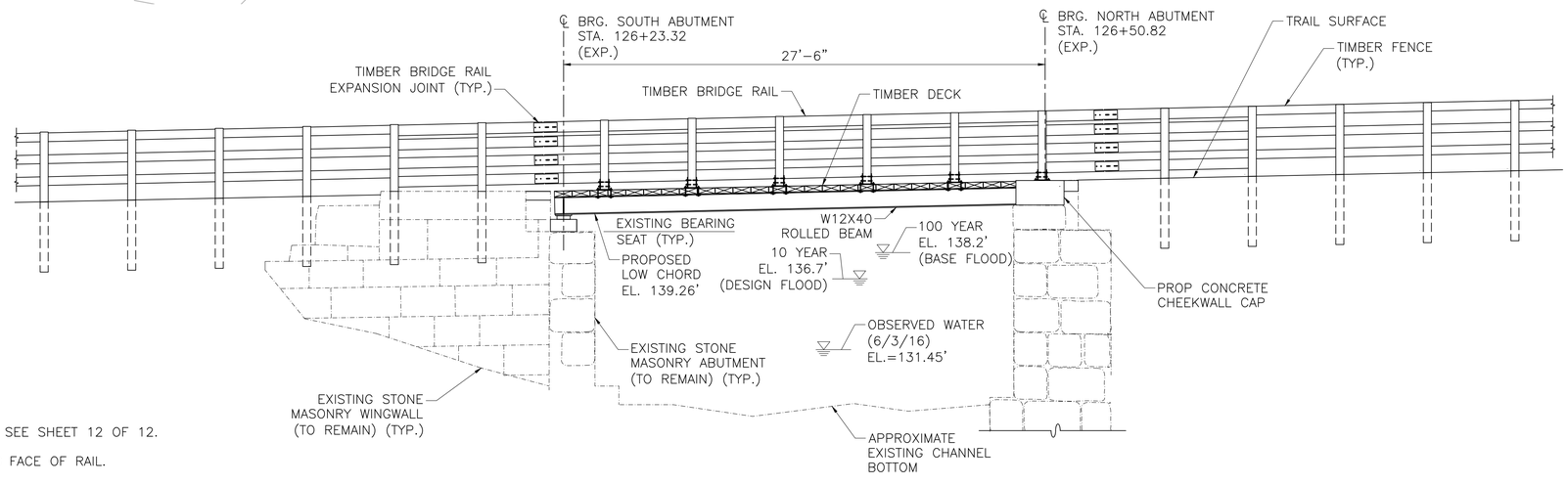
SUDBURY
BRUCE FREEMAN RAIL TRAIL OVER HOP BROOK

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	223	316
PROJECT FILE NO.	608164		

GENERAL PLAN & ELEVATION



GENERAL PLAN
SCALE: 1/4"= 1'–0"



EAST BRIDGE ELEVATION
SCALE: 1/4"=1'–0"

NOTE:
DECK END PLATE NOT SHOWN FOR CLARITY. SEE SHEET 11 FOR PLATE DETAILS.

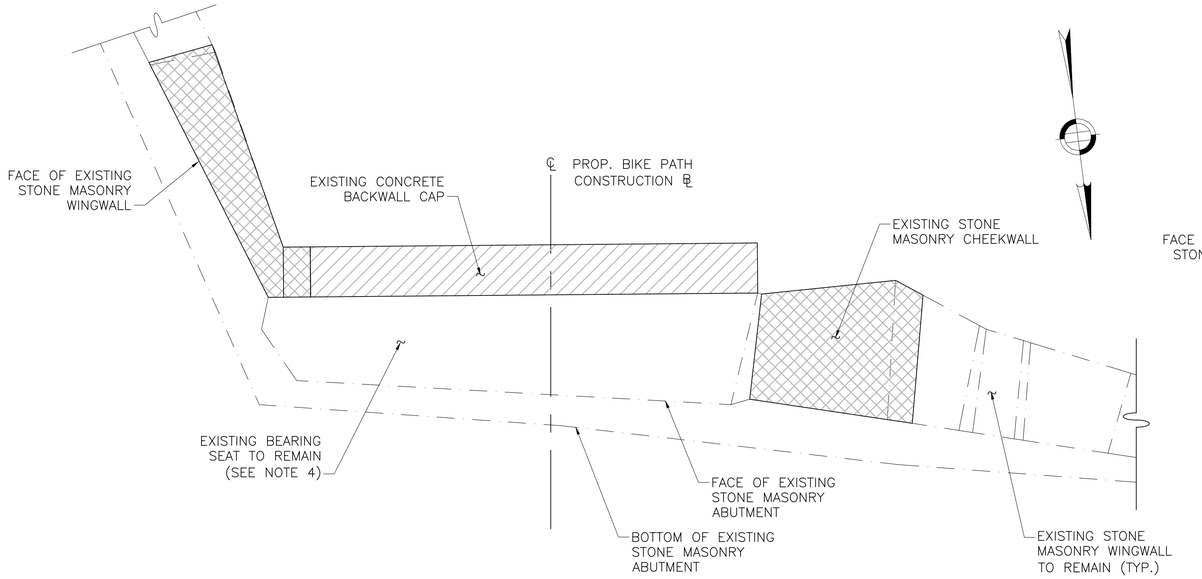
NOTES:
1. FOR TIMBER BRIDGE RAIL DETAILS, SEE SHEET 12 OF 12.
2. RAIL POSTS ARE MEASURED ALONG FACE OF RAIL.

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

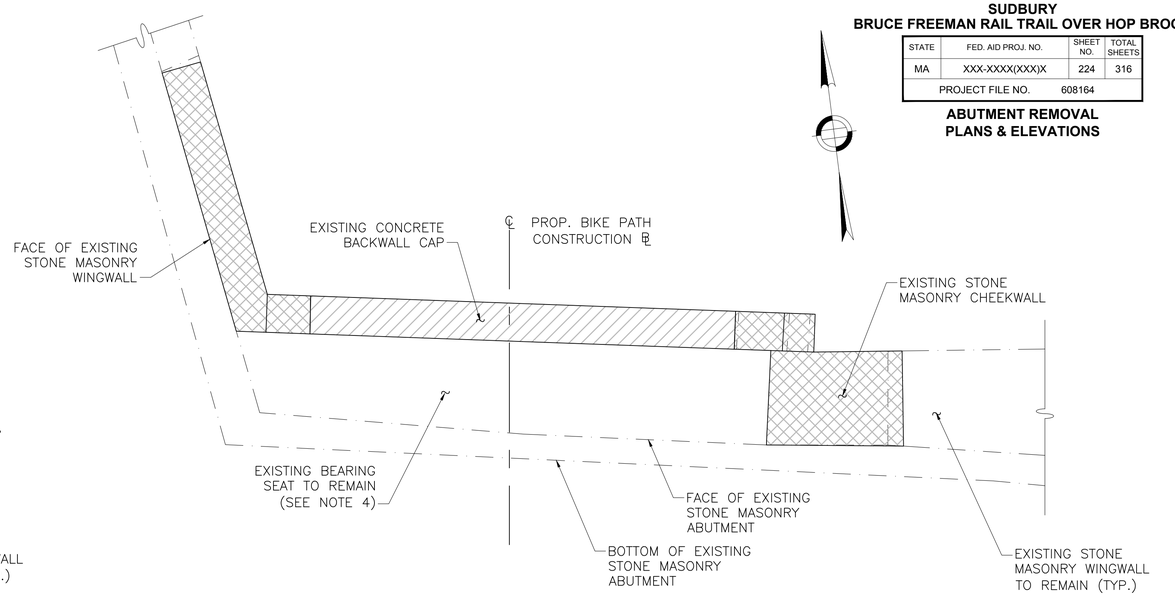
SUDBURY
BRUCE FREEMAN RAIL TRAIL OVER HOP BROOK

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	224	316
PROJECT FILE NO.	608164		

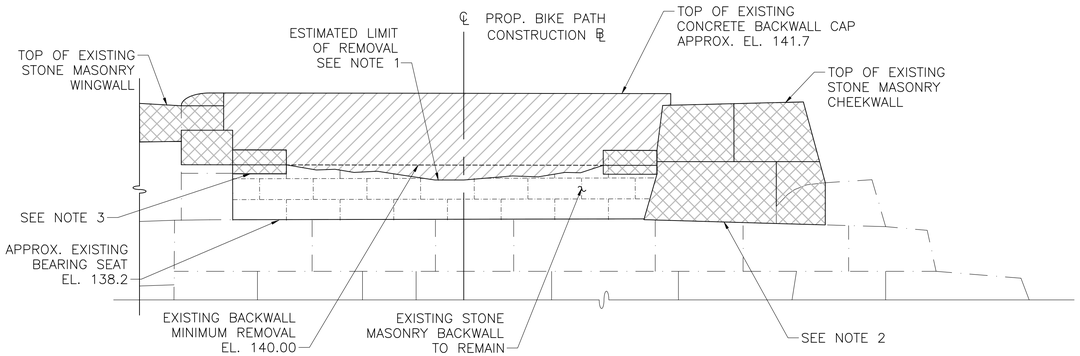
ABUTMENT REMOVAL PLANS & ELEVATIONS



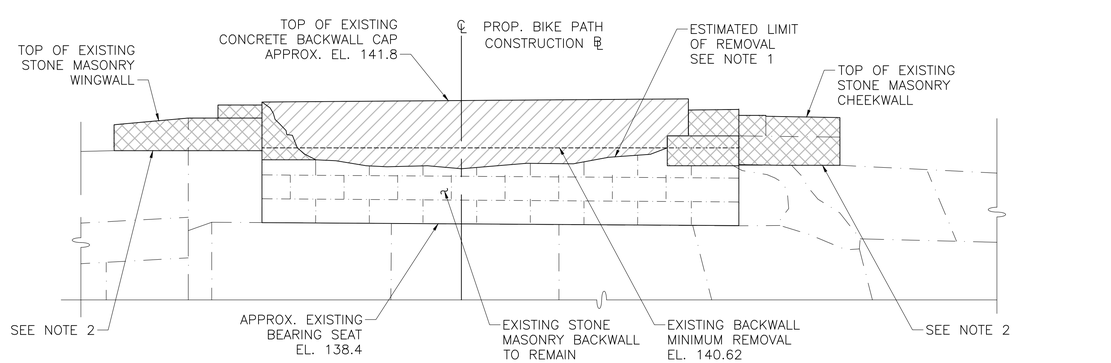
SOUTH ABUTMENT REMOVAL PLAN
SCALE: 1/2"=1'-0"



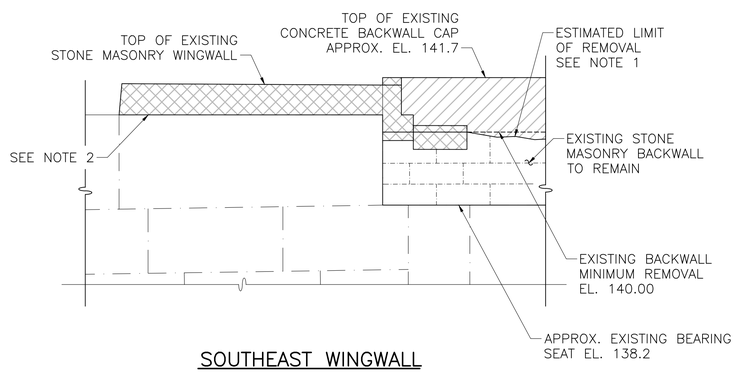
NORTH ABUTMENT REMOVAL PLAN
SCALE: 1/2"=1'-0"



SOUTH ABUTMENT AND SOUTHWEST WINGWALL REMOVAL ELEVATION
SCALE: 1/2"=1'-0"



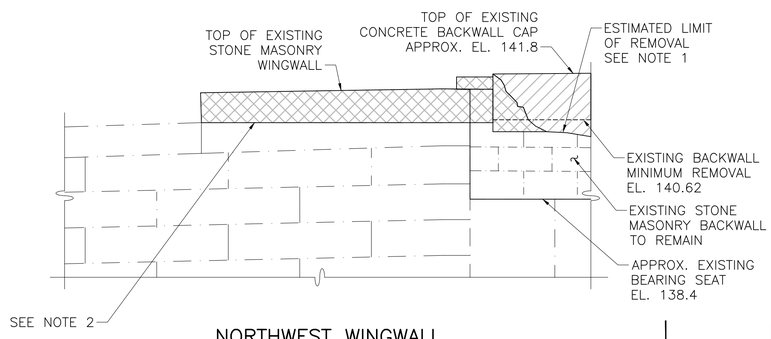
NORTH ABUTMENT AND NORTHEAST WINGWALL REMOVAL ELEVATION
SCALE: 1/2"=1'-0"



SOUTHEAST WINGWALL REMOVAL ELEVATION
SCALE: 1/2"=1'-0"

EXISTING SUBSTRUCTURE REMOVAL NOTES:

1. BOTTOM OF EXISTING CONCRETE BACKWALL CAP VARIES. REMOVAL LIMITS SHALL EXTEND TO AT LEAST THE MINIMUM REMOVAL ELEVATION AS SHOWN ON THIS SHEET. FINAL REMOVAL LIMITS SHALL BE DETERMINED BY THE ENGINEER. PAYMENT FOR EXISTING CONCRETE BACKWALL REMOVAL SHALL BE INCLUDED IN ITEM 127.1, "REINFORCED CONCRETE EXCAVATION".
2. FINAL EXISTING STONE MASONRY CHEEKWALL AND WINGWALL REMOVAL LIMITS SHALL BE DETERMINED BY THE ENGINEER. PAYMENT FOR EXISTING STONE MASONRY REMOVAL, INCLUDING STONE MASONRY PORTIONS OF THE EXISTING ABUTMENT BACKWALLS, SHALL BE INCLUDED UNDER ITEM 144, "CLASS B ROCK EXCAVATION".
3. WHEN THE HORIZONTAL JOINT IN THE STONE FALLS BELOW THE MINIMUM REMOVAL ELEVATION, THE STONES OR PORTIONS OF STONES SHALL BE REMOVED BY MECHANICAL METHODS. WITH APPROVAL OF THE ENGINEER, THE ENTIRE STONE SHALL BE REMOVED AND REPLACED WITH 4,000 PSI, ¾ INCH, 610 CEMENT CONCRETE IN LIEU OF MECHANICAL METHODS.
4. THE EXISTING ABUTMENT BEARING SEATS SHALL BE BLAST CLEANED OF EFFLORESCENCE AND DEBRIS AS DIRECTED BY THE ENGINEER. PAYMENT SHALL BE INCIDENTAL TO ITEM 995.



NORTHWEST WINGWALL REMOVAL ELEVATION
SCALE: 1/2"=1'-0"

LEGEND

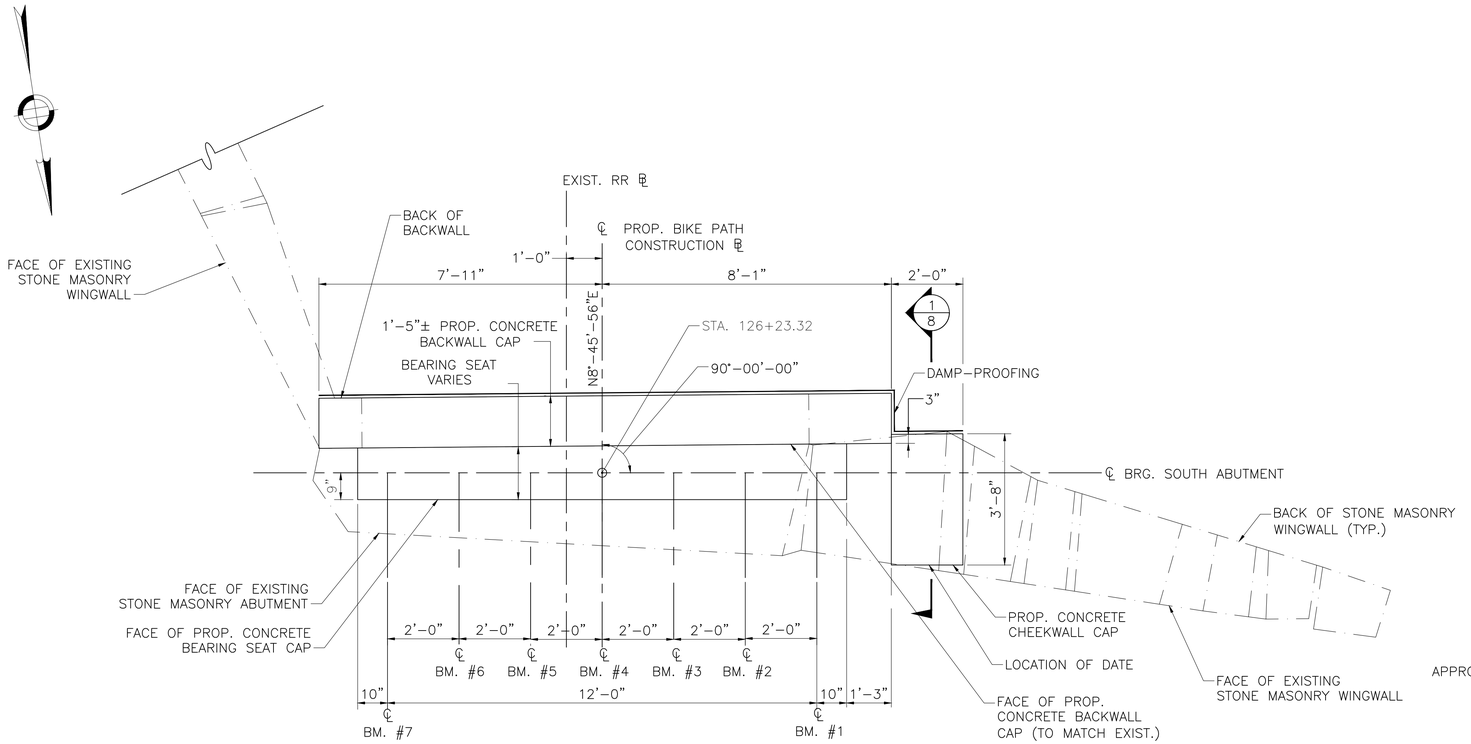
- CONCRETE REMOVAL LIMITS
- MASONRY REMOVAL LIMITS

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

SUDBURY
BRUCE FREEMAN RAIL TRAIL OVER HOP BROOK

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	225	316
PROJECT FILE NO.	608164		

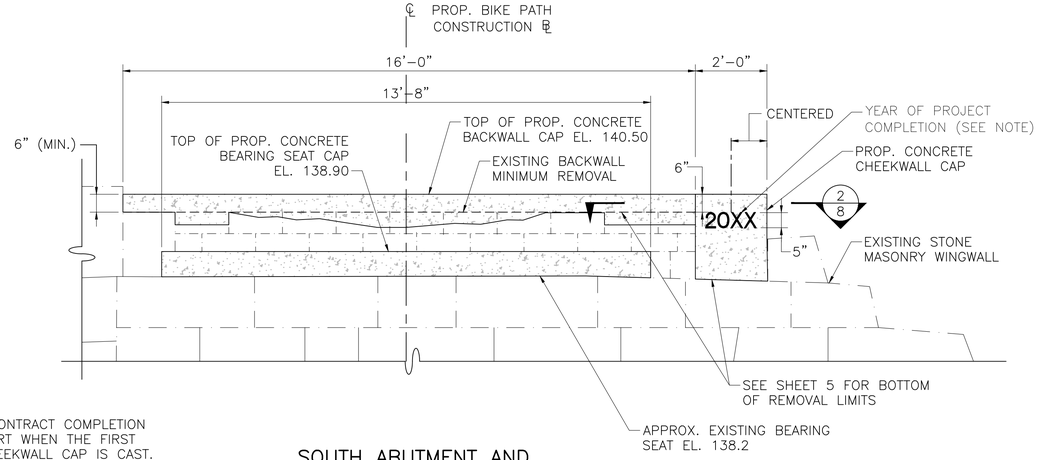
SOUTH ABUTMENT PLAN & ELEVATION



SOUTH ABUTMENT PLAN
SCALE: 1/2"=1'–0"

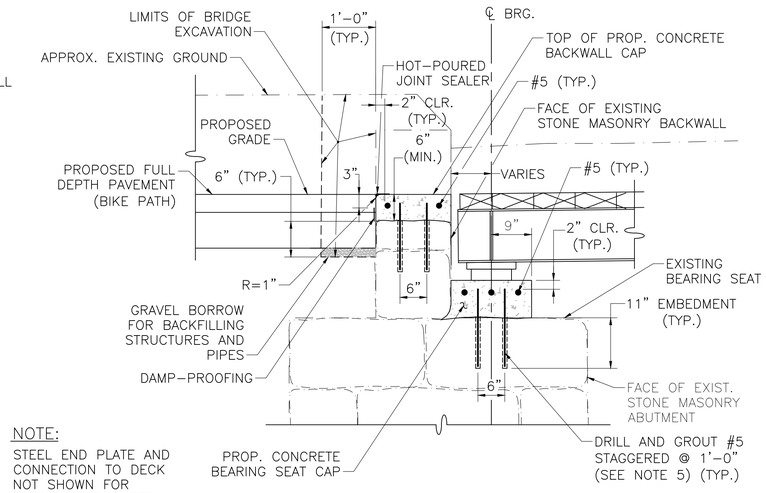
NOTES:

1. BEARING SEAT ELEVATION IS GIVEN AT ℄ BEARING.
2. BACKWALL ELEVATION IS GIVEN AT FACE OF BACKWALL.
3. SEE SHEET 8 FOR EXISTING ABUTMENT REPAIR NOTES.
4. SEE SHEET 8 FOR REINFORCING IN PROPOSED CHEEKWALL CAPS.
5. USE APPROVED NON–SHRINK GROUT WITH MINIMUM COMPRESSIVE STRENGTH F'c OF 6,200 PSI. SEE SPECIAL PROVISIONS FOR ADDITIONAL REQUIREMENTS UNDER ITEM 995.
6. ALL CONCRETE SHALL BE 4000 PSI, ¾ INCH, 610 CEMENT CONCRETE.



NOTE:
USE LATEST CONTRACT COMPLETION YEAR IN EFFORT WHEN THE FIRST CONCRETE CHEEKWALL CAP IS CAST. USE THE YEAR FOR BOTH CONCRETE CHEEKWALL CAPS.

SOUTH ABUTMENT AND SOUTHWEST WINGWALL ELEVATION
SCALE: 1/2"=1'–0"



NOTE:
STEEL END PLATE AND CONNECTION TO DECK NOT SHOWN FOR CLARITY. SEE SHEET 11.

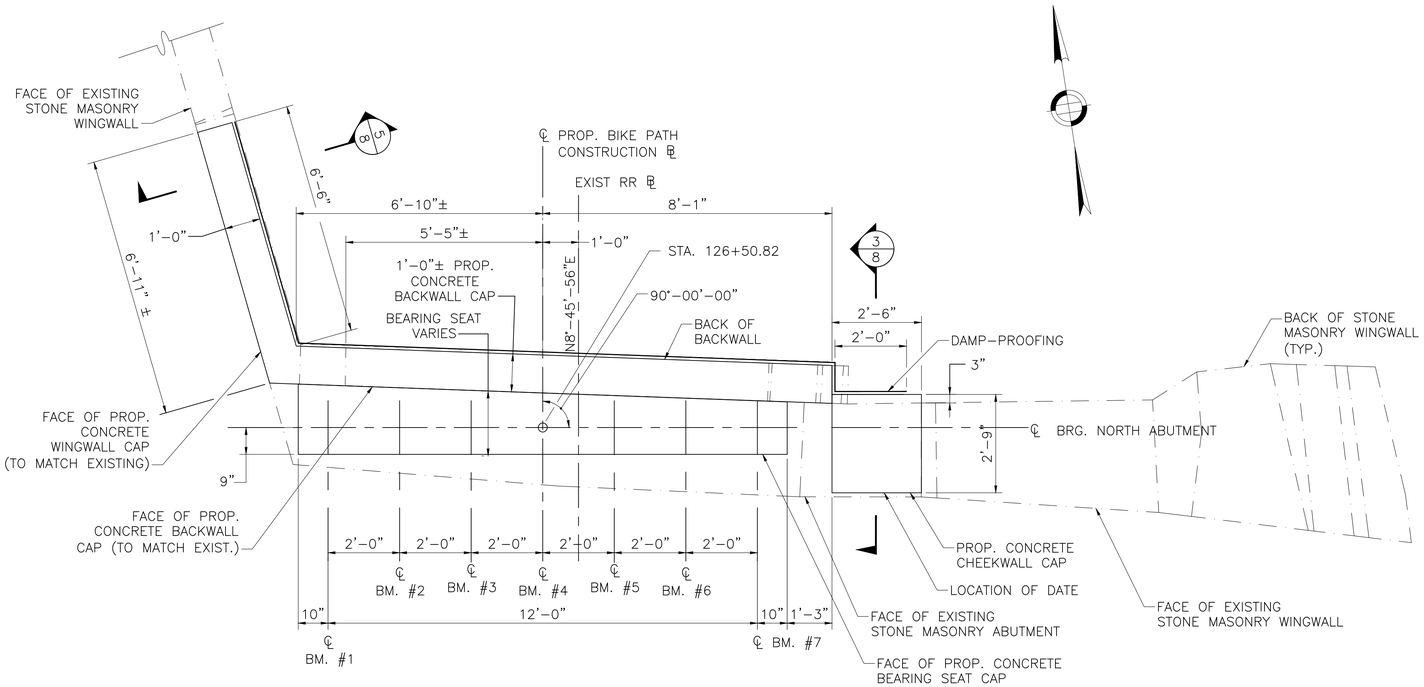
TYPICAL ABUTMENT SECTION
SCALE: 3/4"=1'–0"

DATE	DESCRIPTION
MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
USE ONLY PRINTS OF LATEST DATE	

SUDBURY
BRUCE FREEMAN RAIL TRAIL OVER HOP BROOK

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	226	316
PROJECT FILE NO.	608164		

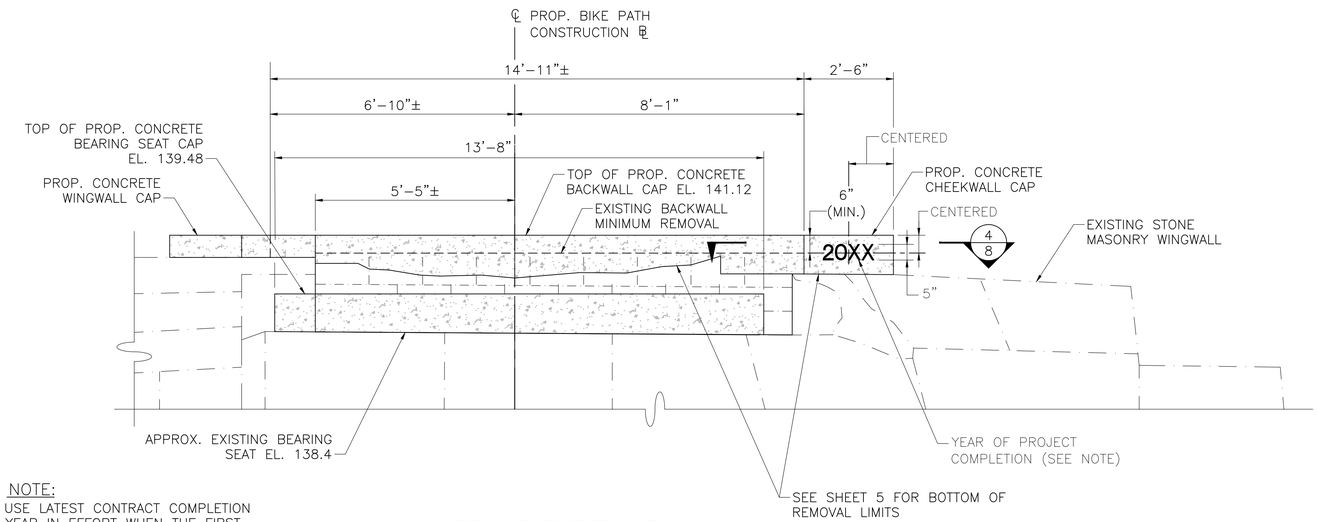
NORTH ABUTMENT PLAN & ELEVATION



NORTH ABUTMENT PLAN
SCALE: 1/2"=1'-0"

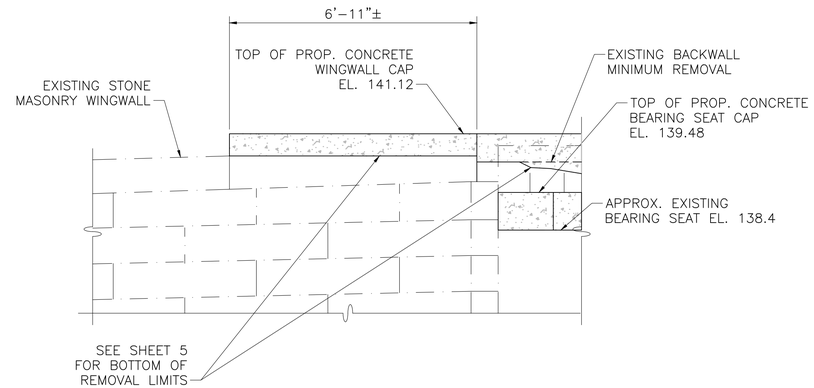
NOTES:

1. BEARING SEAT ELEVATION IS GIVEN AT ℄ BEARING.
2. BACKWALL ELEVATION IS GIVEN AT FACE OF BACKWALL.
3. SEE SHEET 8 FOR EXISTING ABUTMENT REPAIR NOTES.
4. SEE SHEET 8 FOR REINFORCING IN PROPOSED CHEEKWALL CAPS
5. USE APPROVED NON-SHRINK GROUT WITH MINIMUM COMPRESSIVE STRENGTH F'c OF 6,200 PSI. SEE SPECIAL PROVISIONS FOR ADDITIONAL REQUIREMENTS UNDER ITEM 995.
6. SEE SHEET 6 FOR TYPICAL ABUTMENT SECTION.
7. ALL CONCRETE SHALL BE 4000 PSI, ¾ INCH, 610 CEMENT CONCRETE.



NOTE:
USE LATEST CONTRACT COMPLETION YEAR IN EFFORT WHEN THE FIRST CONCRETE CHEEKWALL CAP IS CAST. USE THIS YEAR FOR BOTH CONCRETE CHEEKWALL CAPS.

NORTH ABUTMENT AND NORTHEAST WINGWALL ELEVATION
SCALE: 1/2"=1'-0"



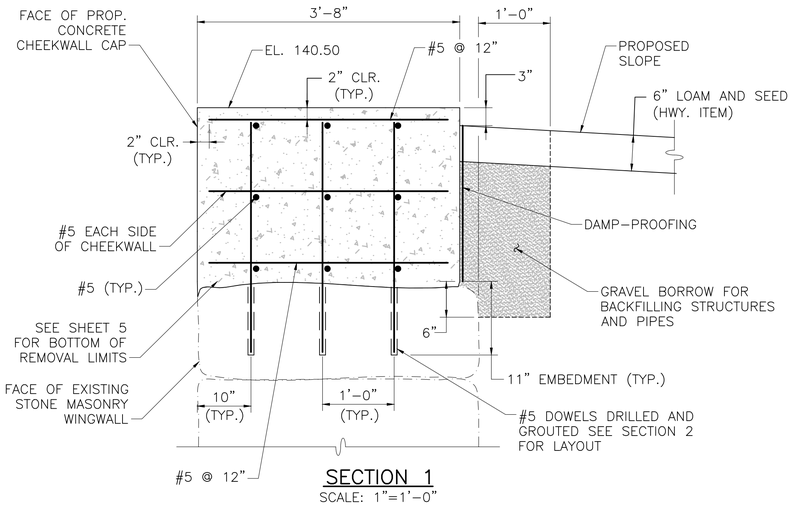
NORTHWEST WINGWALL ELEVATION
SCALE: 1/2"=1'-0"

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

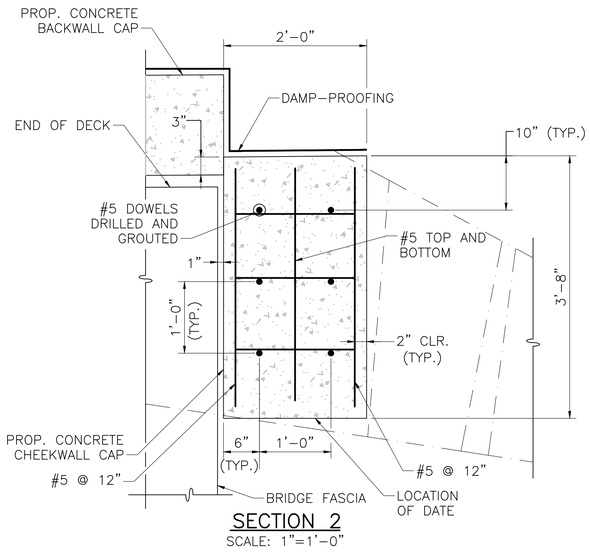
SUDBURY
BRUCE FREEMAN RAIL TRAIL OVER HOP BROOK

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	227	316
PROJECT FILE NO.	608164		

SUBSTRUCTURE DETAILS



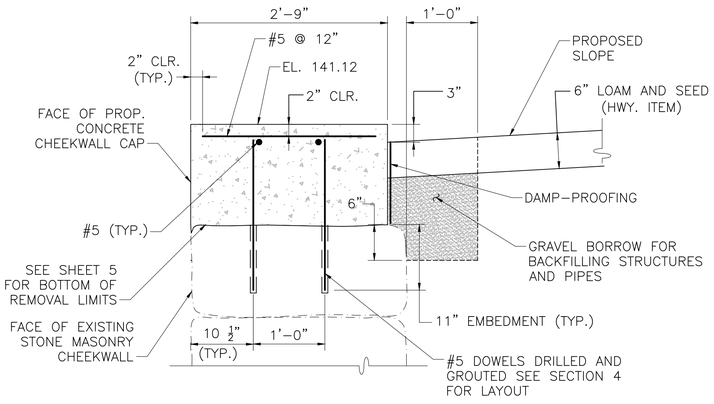
SECTION 1
SCALE: 1"=1'-0"



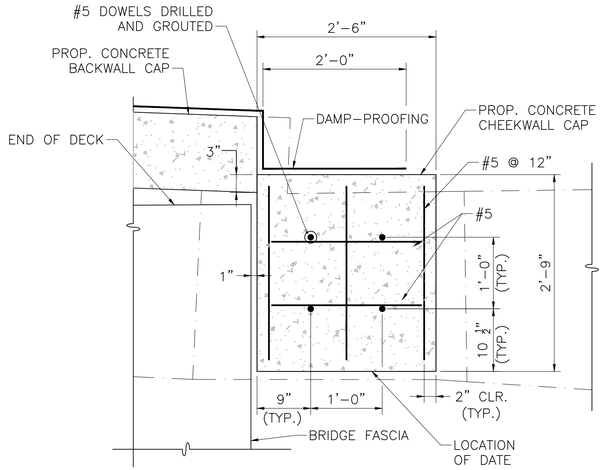
SECTION 2
SCALE: 1"=1'-0"

EXISTING ABUTMENT REPAIR NOTES:

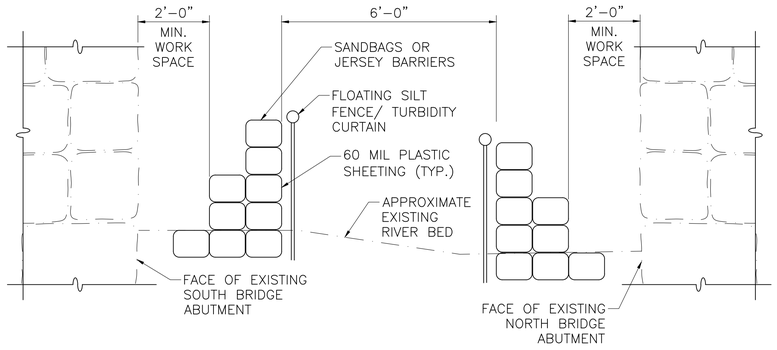
1. THE NORTH EXISTING STONE MASONRY ABUTMENT HAS A MISSING STONE IN THE FACE. THE CONTRACTOR SHALL REBUILD ANY COLLAPSED PORTIONS OF THE EXISTING WALL ALONG THE LENGTH OF THE ABUTMENT AND WINGWALLS BELOW THE LIMITS OF REMOVAL. THE COST TO REBUILD THE WALL AS REQUIRED SHALL BE INCLUDED IN ITEM 690, "STONE MASONRY WALL REMOVED AND REBUILT IN CEMENT MORTAR".
2. REPOINTING OF THE EXISTING STONE MASONRY ABUTMENTS SHALL BE REQUIRED PRIOR TO SUPERSTRUCTURE WORK. MASONRY REPOINTING AREAS SHALL BE DETERMINED IN THE FIELD BY THE ENGINEER. THE COST TO REPOINT SHALL BE INCLUDED IN ITEM 690.91, "MASONRY REPOINTING".
3. ANY WATER CONTROL REQUIRED TO REMOVE, REPAIR, REBUILD, OR REPOINT THE EXISTING ABUTMENTS SHALL BE INCLUDED UNDER ITEM 991.1, "CONTROL OF WATER".
4. THE CONFIGURATION OF THE EXISTING ABUTMENT STONE WALLS AND THE ELEVATION OF THE BOTTOM OF THE EXISTING ABUTMENTS SHOWN ON THE PLANS ARE APPROXIMATE.



SECTION 3
SCALE: 1"=1'-0"



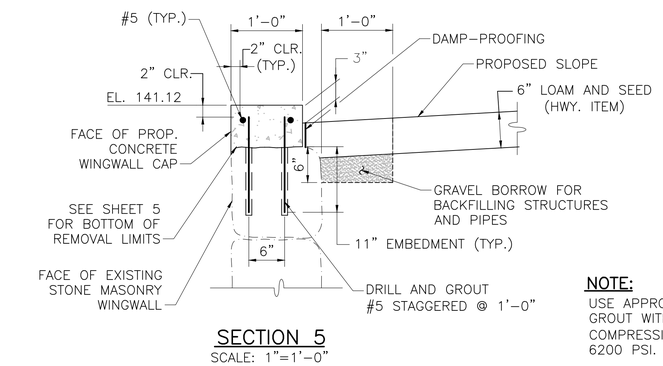
SECTION 4
SCALE: 1"=1'-0"



SUGGESTED WATER CONTROL PLAN
SCALE: 1/2"=1'-0"

NOTES:

1. WORK IN THE WATER SHALL BE PERFORMED DURING LOW FLOW SEASON AS DEFINED IN THE SPECIAL PROVISION FOR ITEM 991.1 AND THE FLOW SHALL BE MAINTAINED THROUGH THE USE OF TEMPORARY WATER CONTROL.
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR SIZING THE BARRIER TO HANDLE THE RIVER FLOW. THE BARRIER SHALL BE OF ADEQUATE SIZE TO DELIVER THE WATER AT THE DISCHARGE END TO THE RIVER WITHOUT DISTURBING THE EXISTING BANKS OR RIVERBED FLOW. THE BARRIER HEIGHT SHALL BE SIZED TO MAINTAIN 1' OF FREEBOARD OVER THE 2-YEAR FLOOD.
3. IN THE EVENT OF HIGH FLOW RATES, THE CONTRACTOR SHALL BE RESPONSIBLE TO DEVELOP AND IMPLEMENT A REASONABLE MEANS NECESSARY TO HANDLE THE ADDITIONAL FLOWS TO PROTECT THE SURROUNDING AREA, AS APPROVED BY THE ENGINEER AND SHALL BE INCEDENTAL TO ITEM 991.1" "CONTROL OF WATER – STRUCTURE NO. S-31-007".



SECTION 5
SCALE: 1"=1'-0"

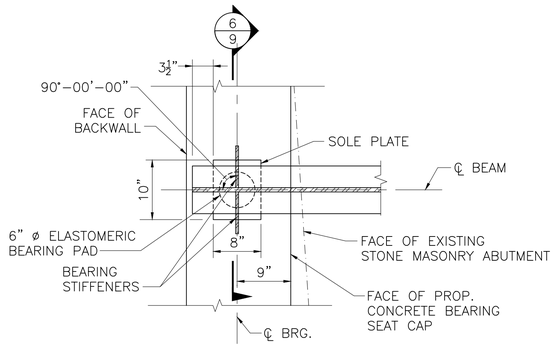
NOTE:
USE APPROVED NON-SHRINK GROUT WITH MINIMUM COMPRESSIVE STRENGTH F'c OF 6200 PSI.

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

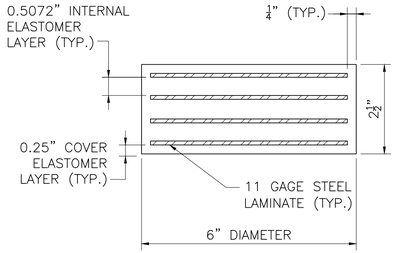
SUDBURY
BRUCE FREEMAN RAIL TRAIL OVER HOP BROOK

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	228	316
PROJECT FILE NO.	608164		

BEARING DETAILS



PLAN
SCALE: 1" = 1'–0"



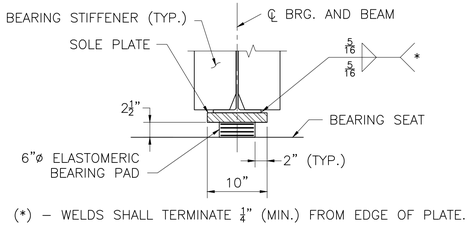
NOTES:

1. ELASTOMER SHALL HAVE A SHEAR MODULUS OF 0.160 KSI.
2. STEEL LAMINATES SHALL CONFORM TO ASTM A 1011 GRADE 36.
3. THE COMPRESSIVE DESIGN LOAD ON THE BEARING PAD IS 8 KIPS. THE COMPRESSIVE DESIGN STRESS IS THE RESULT OF DIVIDING THE COMPRESSIVE DESIGN LOAD BY THE AREA OF THE PAD AND IS EQUAL TO 0.28 KSI.
4. ELASTOMERIC BEARING PAD SHALL NOT BE VULCANIZED TO THE SOLE PLATE.
5. ELASTOMER SHALL HAVE A HARDNESS OF 60 DUROMETER.

ELASTOMERIC BEARING PAD
6" = 1'–0"

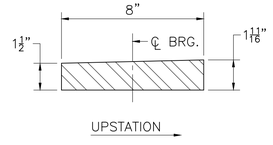
BEARING NOTES:

1. STEEL SOLE PLATES SHALL CONFORM TO AASHTO M 270 GRADE 36 AND SHALL BE HOT–DIP GALVANIZED.
2. CENTER THE ELASTOMERIC PAD UNDER THE SOLE PLATE DURING BEAM ERECTION.
3. BEAMS SHALL BE ERECTED WHEN THE AMBIENT TEMPERATURE IS BETWEEN 50 °F AND 77 °F. IF BEAMS ARE ERECTED AT OTHER AMBIENT TEMPERATURES, THEY WILL HAVE TO BE JACKED AND THE ELASTOMERIC BEARINGS RECENTERED WHEN THE TEMPERATURE RETURNS TO THAT RANGE.

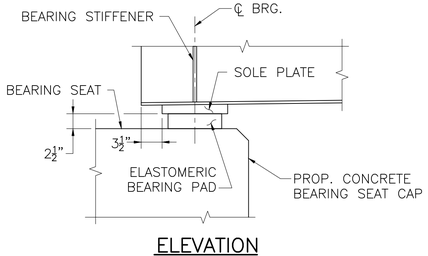


(*) – WELDS SHALL TERMINATE ¼" (MIN.) FROM EDGE OF PLATE.

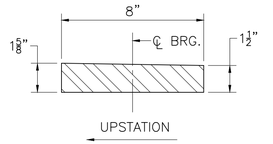
SECTION 6
SCALE: 1" = 1'–0"



SOUTH ABUTMENT SOLE PLATE DETAIL
SCALE: 3" = 1'–0"

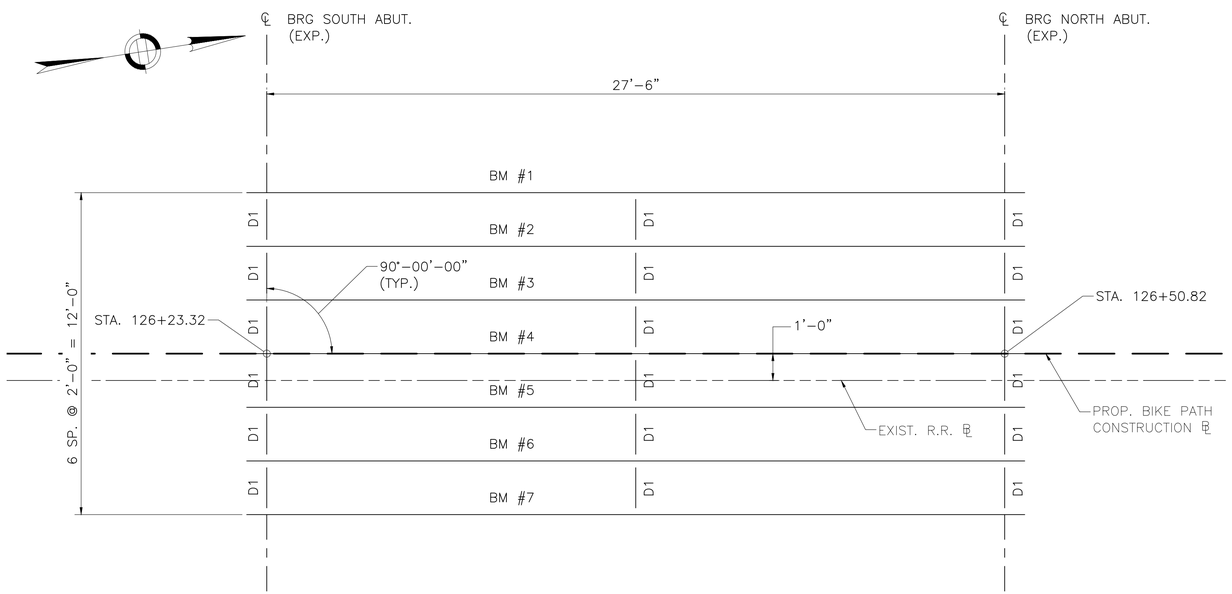


ELEVATION
SCALE: 1" = 1'–0"



NORTH ABUTMENT SOLE PLATE DETAIL
SCALE: 3" = 1'–0"

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	



FRAMING PLAN
SCALE: $\frac{3}{8}$" = 1'–0"

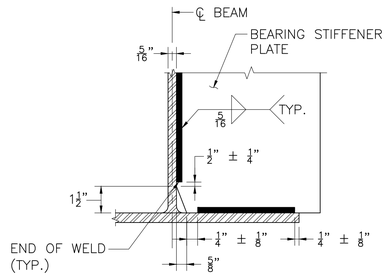
SUDBURY
BRUCE FREEMAN RAIL TRAIL OVER HOP BROOK

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	229	316
PROJECT FILE NO.	608164		

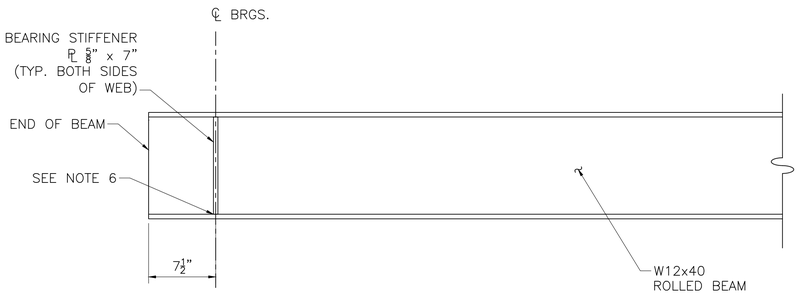
FRAMING PLAN &
STRUCTURAL STEEL DETAILS

NOTES:

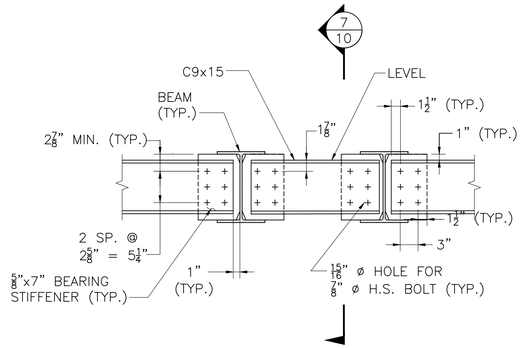
1. D1 = C9x15 (TYPICAL DIAPHRAGM)
2. THE MAIN LOAD CARRYING MEMBERS ARE BM #1 THROUGH BM #7. ALL BEAMS SHALL BE W12x40.
3. ALL STEEL SHALL CONFORM TO AASHTO M270 GRADE 50 HOT–DIP GALVANIZED.
4. ALL BEARING STIFFENERS SHALL BE PLUMB.
5. ENDS OF BEAMS SHALL BE FABRICATED SO THAT UNDER FULL DEAD LOAD THE ENDS OF THE BEAMS WILL PLUMB.
6. BEARING STIFFENER PLATES AT BOTTOM FLANGE SHALL BE MILLED FOR TIGHT FIT AND WELDED WITH $\frac{5}{16}$" FILLET WELDS, BOTH SIDES OF PLATE.



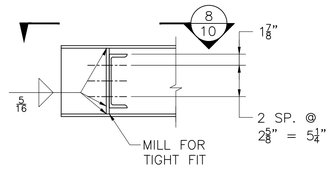
CLIP DETAIL
NOT TO SCALE



BEAM ELEVATION
SCALE: 1$\frac{1}{2}$" = 1'–0"



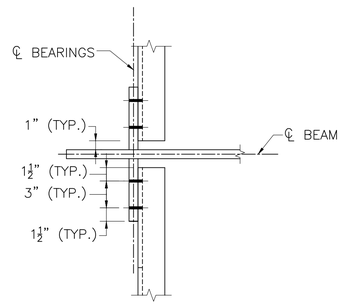
ELEVATION VIEW



SECTION 7

NOTE:
SEE CLIP DETAIL ON THIS SHEET.

DIAPHRAGM D1
SCALE: 1" = 1'–0"



SECTION 8
SCALE: 1$\frac{1}{2}$" = 1'–0"

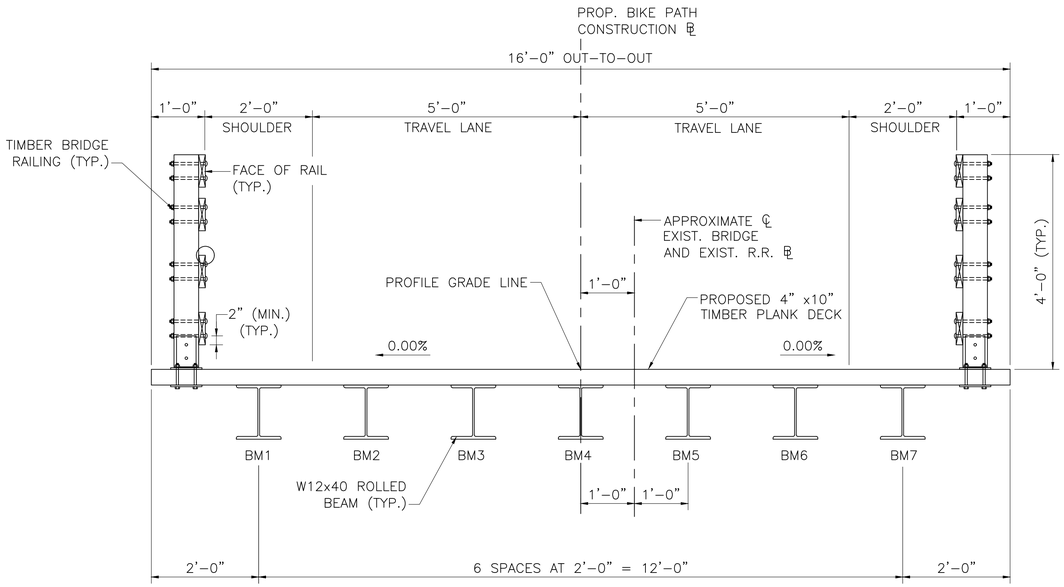
CAMBER TABLE (INCHES)											
	SPAN NO. 1										
	S. ABUT.	0.1L	0.2L	0.3L	0.4L	0.5L	0.6L	0.7L	0.8L	0.9L	N. ABUT.
STEEL DL DEFLECTION	0.00	0.02	0.03	0.05	0.06	0.06	0.06	0.05	0.03	0.02	0.00
NONCOMP. DEFLECTION	0.00	0.03	0.05	0.06	0.07	0.07	0.07	0.06	0.05	0.03	0.00
ADDITIONAL CAMBER	0.00	0.07	0.14	0.21	0.28	0.34	0.28	0.21	0.14	0.07	0.00
TOTAL CAMBER	0.00	0.12	0.22	0.32	0.41	0.47	0.41	0.32	0.22	0.12	0.00

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

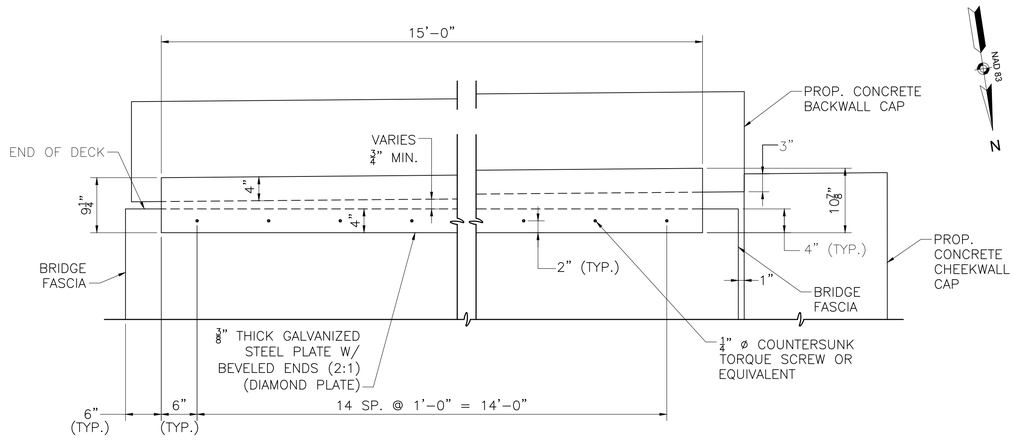
SUDBURY
BRUCE FREEMAN RAIL TRAIL OVER HOP BROOK

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	230	316
PROJECT FILE NO.	608164		

DECK DETAILS & TYPICAL SECTION

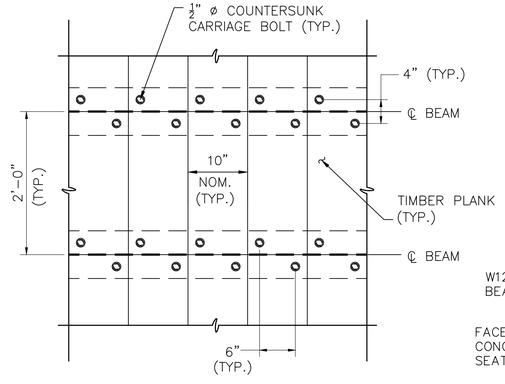


TYPICAL BRIDGE SECTION
SCALE: 3/4"=1'–0"



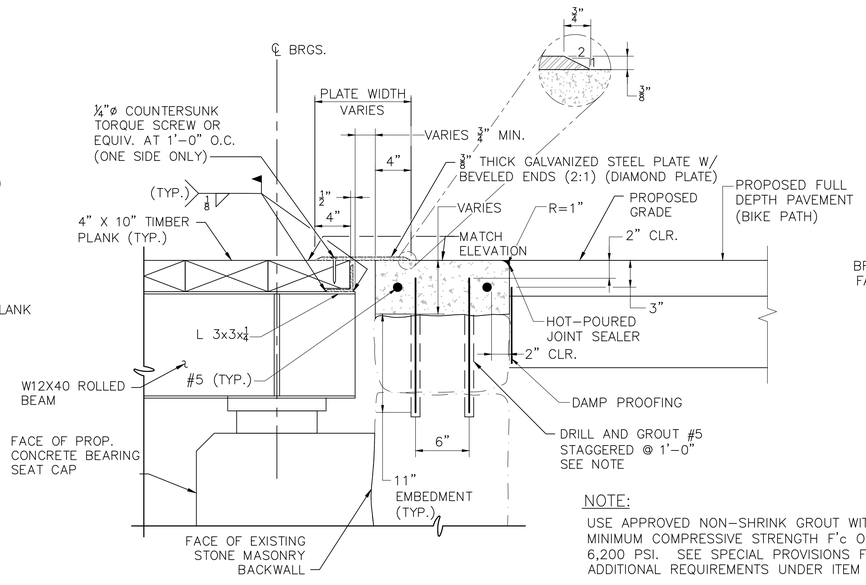
SOUTH DECK END PLATE DETAIL
SCALE: 1" = 1'–0"

NOTE:
BEAMS AND BEARING SEAT NOT SHOWN FOR CLARITY.



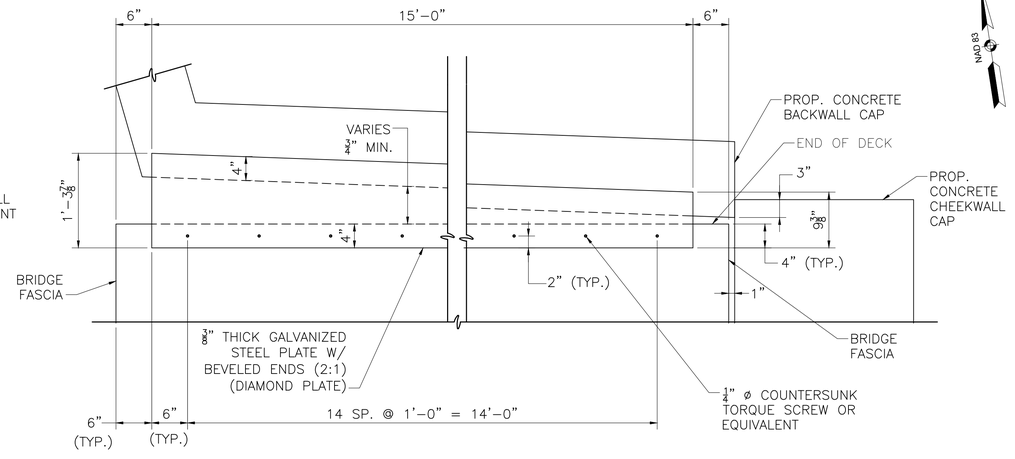
NOTE:
CONNECTION SHOULD BE CENTERED ON PLANKS AND BEAMS.

DECK CONNECTION DETAIL
SCALE: 1" = 1'–0"



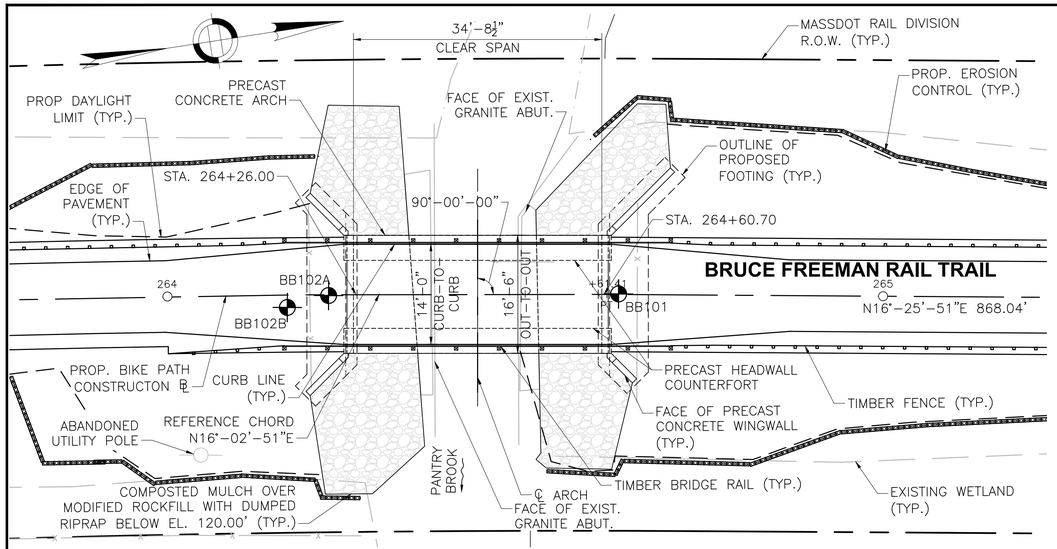
TYPICAL ABUTMENT END DETAIL
SCALE: 1½" = 1'–0"

NOTE:
USE APPROVED NON–SHRINK GROUT WITH MINIMUM COMPRESSIVE STRENGTH F'c OF 6,200 PSI. SEE SPECIAL PROVISIONS FOR ADDITIONAL REQUIREMENTS UNDER ITEM 995



NORTH DECK END PLATE DETAIL
SCALE: 1" = 1'–0"

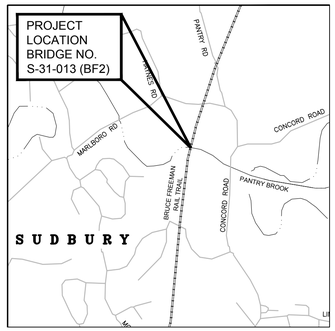
MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	



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

CURVE DATA

PI = 261+81.23
Δ = 11°-56'-04.85"
R = 2700.00
T = 282.23
L = 562.41
E = 14.71



LOCUS PLAN
SCALE: 1" = 1200'

SUDBURY
BRUCE FREEMAN RAIL TRAIL OVER PANTRY BROOK

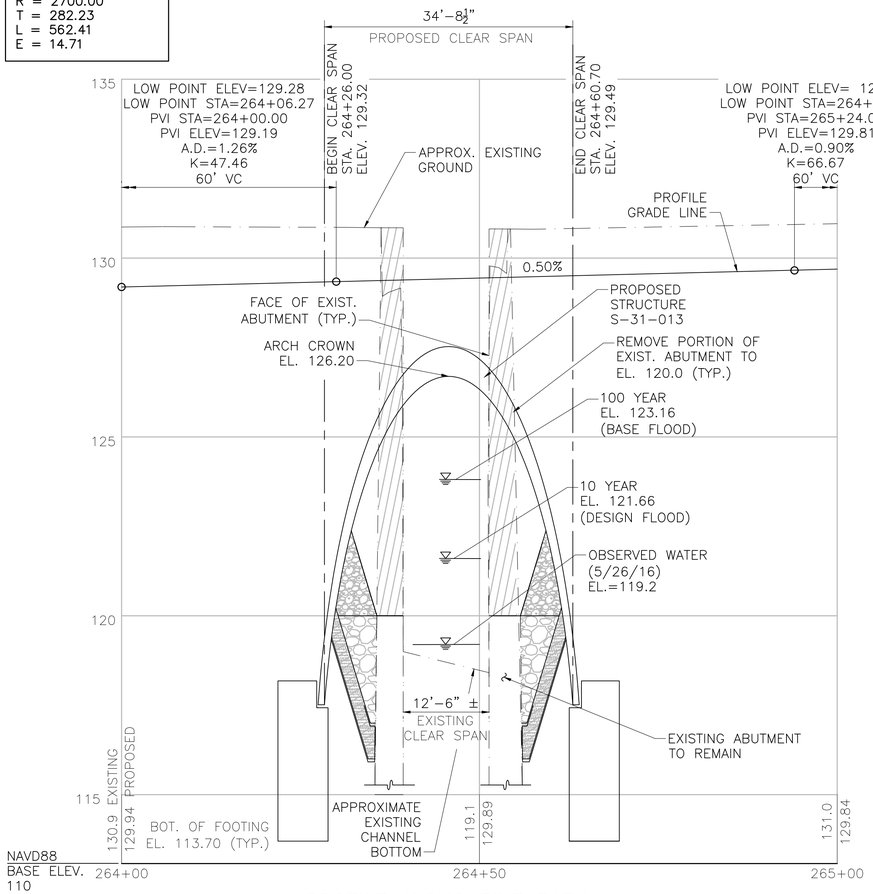
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	232	316
PROJECT FILE NO.	608164		

KEY PLAN & PROFILE

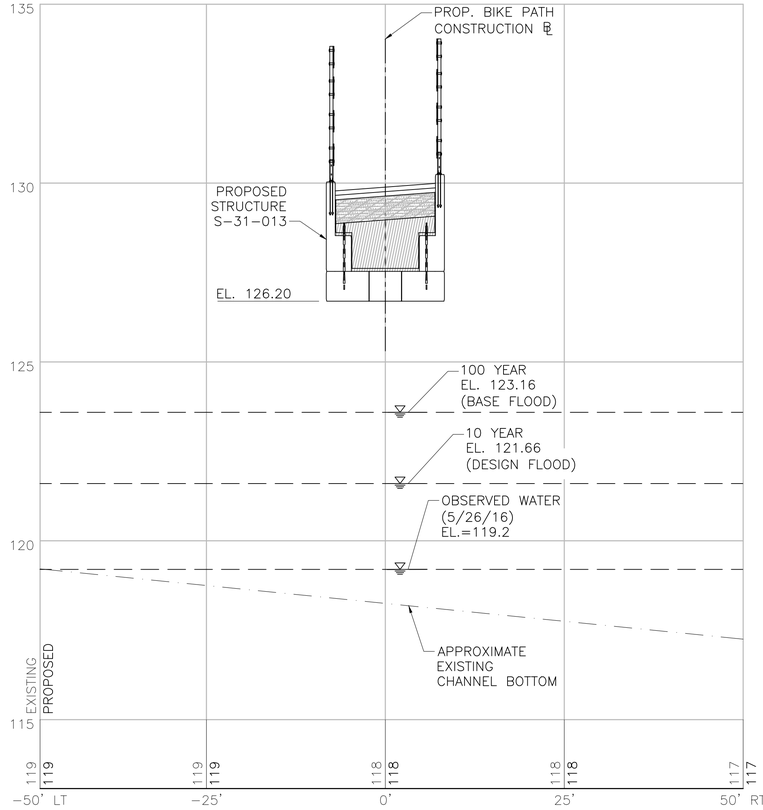
ESTIMATED QUANTITIES:
(NOT GUARANTEED)

ITEM NO.:	ITEM:	QUANTITY:	
114.1	DEMOLITION OF SUPERSTRUCTURE OF BRIDGE NO. S-31-013	1	LS
140.	BRIDGE EXCAVATION	360	CY
143.	CHANNEL EXCAVATION	255	CY
151.2	GRAVEL BORROW FOR BACKFILLING STRUCTURES AND PIPES	270	CY
156.	CRUSHED STONE	85	TON
156.1	CRUSHED STONE FOR BRIDGE FOUNDATIONS	55	TON
665.	CHAIN LINK FENCE REMOVED AND STACKED	55	FT
690.	STONE MASONRY WALL REMOVED AND REBUILT IN CEMENT MORTAR	10	CY
690.91	MASONRY REPOINTING	10	SY
690.92	MASONRY REMOVED AND STOCKPILED	1	LS
698.4	GEOTEXTILE FABRIC FOR PERMANENT EROSION CONTROL	215	SY
707.4	PANTRY BROOK BLOCKS REMOVED AND RELOCATED	1	LS
767.78	COMPOSTED MULCH OVER MODIFIED ROCK	120	SY
983.	DUMPED RIPRAP	60	TON
986.	MODIFIED ROCKFILL	145	TON
991.2	CONTROL OF WATER – STRUCTURE NO. S-31-013	1	LS
995.01	BRIDGE STRUCTURE, BRIDGE NO. S-31-013	1	LS

INDEX



PROFILE ALONG BIKE PATH
HORIZONTAL SCALE: 1" = 10'-0"
VERTICAL SCALE: 1" = 2'-0"



PROFILE ALONG PANTRY BROOK
HORIZONTAL SCALE: 1" = 10'-0"
VERTICAL SCALE: 1" = 2'-0"

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION

P.E.
STAMP
SIGNATURE

FUSS & O'NEILL
1550 MAIN STREET, SUITE 400
SPRINGFIELD, MA 01103
413.452.0445
www.fando.com

MassDOT Massachusetts Department of Transportation Highway Division

PROPOSED BRIDGE

SUDBURY

BRUCE FREEMAN RAIL TRAIL
OVER PANTRY BROOK

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

TITLE: _____ CHIEF ENGINEER

SHEET 1 OF 10 SHEETS BRIDGE NO. S-31-013 (BF2)

608164_BR1(S-31-013)(FIRST SHEET).DWG Plotted on 22-Dec-2021 11:43 AM

2nd Structural Submittal (S2) 10-January-2022

SUDBURY
BRUCE FREEMAN RAIL TRAIL OVER PANTRY BROOK

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	233	316
PROJECT FILE NO.	608164		

GENERAL NOTES

GENERAL NOTES:

DESIGN:

IN ACCORDANCE WITH THE 2020 AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS LRFD BRIDGE DESIGN SPECIFICATIONS WITH CURRENT INTERIM SPECIFICATIONS THROUGH 2021 AND THE 2009 LRFD GUIDE SPECIFICATIONS FOR THE DESIGN OF PEDESTRIAN BRIDGES FOR H–10 VEHICULAR AND 90 PSF PEDESTRIAN LOADINGS.

MASSDOT BENCH MARK:

BM #37 LAG SCREW SET 2' UP 7" PINE
ELEV. = 133.50'

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

DATE:

TO BE PLACED ON THE UPSTREAM AND DOWNSTREAM HEADWALL FACES. A DETAIL SHOWING SIZE AND CHARACTER OF NUMERIALS WILL BE FURNISHED. THE DATE USED SHALL BE THE LATEST YEAR OF CONTRACT COMPLETION AS OF THE DATE THE FIRST HEADWALL IS CONSTRUCTED. BOTH HEADWALLS SHALL FEATURE THE SAME DATE.

SURVEY NOTEBOOKS:

SURVEY PERFORMED BY VANASSE HANGEN BRUSTLIN, INC. FIELD NOTEBOOKS SHALL BE OBTAINED FROM FUSS AND O'NEILL, INC., SPRINGFIELD, MA.

SCALES:

SCALES NOTED ON THE PLANS ARE NOT APPLICABLE TO REDUCED SIZE PRINTS. DIVIDE SCALES BY 2 FOR HALF–SIZE PRINTS (A3).

FOUNDATIONS:

FOUNDATIONS MAY BE ALTERED, IF NECESSARY, TO SUIT CONDITIONS ENCOUNTERED DURING CONSTRUCTION, WITH THE APPROVAL OF THE ENGINEER.

UNSUITABLE MATERIAL:

ALL UNSUITABLE MATERIAL SHALL BE REMOVED WITHIN THE LIMITS OF THE FOUNDATIONS OF THE STRUCTURE, AS DIRECTED BY THE ENGINEER.

EXISTING CONSTRUCTION:

DIMENSIONS SHOWN ARE TAKEN FROM SURVEY, VARIOUS FIELD MEASUREMENTS, AND GEOTECHNICAL EXPLORATION AND ARE NOT GUARANTEED. THE CONTRACTOR SHALL DETERMINE AND ESTABLISH ALL DIMENSIONS AND DETAILS NECESSARY FOR COMPLETION OF ALL WORK BY FIELD MEASUREMENT AND SURVEY. THE CONTRACTOR SHALL BE RESPONSIBLE AND NOT ORDER ANY MATERIAL OR COMMENCE ANY FABRICATION UNTIL HE HAS MADE THE REQUIRED MEASUREMENTS ON THE ACTUAL STRUCTURE AND THE EXTENT OF THE PROPOSED WORK HAS BEEN APPROVED BY THE ENGINEER. EXISTING BRIDGE PLANS ARE NOT AVAILABLE FOR REFERENCE.

CONCRETE:

5,000 PSI, ¾ INCH, 685 HP CEMENT CONCRETE SHALL BE PROVIDED FOR ALL PRECAST CONCRETE INCLUDING ARCHES, HEADWALLS, WINGWALLS, AND FOOTINGS.

IF CAST–IN–PLACE CONCRETE IS USED FOR FOOTINGS, CONCRETE SHALL BE 4000 PSI, 1½" INCH, 565 CEMENT CONCRETE.

REINFORCEMENT:

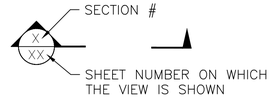
REINFORCING STEEL SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M 31 GRADE 60. UNLESS OTHERWISE NOTED ON THE CONSTRUCTION DRAWINGS, ALL BARS SHALL BE LAPPED AS FOLLOWS:

MODIFICATION CONDITION	#4 BARS	#5 BARS	#6 BARS
1. NONE	16"	19"	23"
2. 12" OF CONCRETE BELOW BAR	20"	25"	30"
3. EPOXY COATED BARS, COVER < $3d_b$, OR CLEAR SPACING < $6d_b$	23"	29"	34"
4. COATED BARS, ALL OTHER CASES	18"	23"	27"
5. CONDITION 2. AND 3.	26"	32"	39"
6. CONDITION 2. AND 4.	24"	30"	36"

ALL OTHER BARS SHOULD BE LAPPED AS SHOWN ON THE CONSTRUCTION DRAWINGS.

ALL REINFORCEMENT SHALL BE EPOXY COATED.

SECTION MARK:



TRAFFIC DATA		
	ROADWAY OVER	ROADWAY UNDER
DESIGN YEAR	N/A	
AVERAGE DAILY TRAFFIC – PRESENT	N/A	
AVERAGE DAILY TRAFFIC – DESIGN YEAR	N/A	
DESIGN HOURLY VOLUME	N/A	
DIRECTIONAL DISTRIBUTION	N/A	
TRUCK PERCENTAGE – AVERAGE DAY	N/A	
TRUCK PERCENTAGE – PEAK HOUR	N/A	
DESIGN SPEED	18 MPH	
DIRECTIONAL DESIGN HOURLY VOLUME	N/A	

SEISMIC DESIGN CRITERIA	
DESIGN RETURN PERIOD:	1,000
DESIGN SPECTRA	
As	0.11
SDs	0.23
SD1	0.09
SITE CLASS	D
SEISMIC DESIGN CATEGORY (SDC)	A

HYDRAULIC DESIGN DATA	
DRAINAGE AREA (SQ. MILES)	2.5
DESIGN FLOOD DISCHARGE (C.F.S)	155
DESIGN FLOOD FREQUENCY (YEARS)	10
DESIGN FLOOD VELOCITY (F.P.S)	2.88
DESIGN FLOOD ELEVATION (FEET, NAVD)	121.66
BASE (100–YEAR) FLOOD DATA	
BASE FLOOD DISCHARGE (C.F.S)	240
BASE FLOOD ELEVATION (FEET, NAVD)	123.16
DESIGN AND CHECK SCOUR DATA	
DESIGN SCOUR FLOOD EVENT RETURN FREQUENCY (YEARS)	25
DESIGN FLOOD ABUTMENT SCOUR DEPTH (FEET)	0.6
DESIGN FLOOD PIER SCOUR DEPTH (FEET)	N/A
CHECK SCOUR FLOOD EVENT RETURN FREQUENCY (YEARS)	50
CHECK FLOOD ABUTMENT SCOUR DEPTH (FEET)	0.7
CHECK FLOOD PIER SCOUR DEPTH (FEET)	N/A
FLOOD OF RECORD	
DISCHARGE (C.F.S.)	N/A
FREQUENCY (IF KNOWN, YEARS)	N/A
MAXIMUM ELEVATION (FEET, NAVD)	N/A
DATE (MM/YYYY)	N/A
HISTORY OF ICE FLOES	N/A
EVIDENCE OF SCOUR AND EROSION	YES

DATE	DESCRIPTION
MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
USE ONLY PRINTS OF LATEST DATE	

608164_BR2(S-31-013)NOTES.DWG Plotted on 22-Dec-2021 11:44 AM
2nd Structural Submittal (S2) 10-January-2022

SUDBURY
BRUCE FREEMAN RAIL TRAIL OVER PANTRY BROOK

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	234	316
PROJECT FILE NO.	608164		

BORING LOGS

LOG OF TEST BORING

JACOBS

PROJECT	Bruce Freeman Rail Trail			BORING NO.	BB-101
LOCATION	Sudbury, MA				SHEET 1 OF 2
OWNER	MASSDOT				
JOB NUMBER	E2X81800				

INSPECTOR	S. Ramesh	CONTRACTOR	NEBC	DRILLER	B. Cross	ELEVATION	131
METHOD OF DRILLING		GROUNDWATER READINGS		DRILL RIG	Mobile B-53	DATUM	NAVD 88
0.0	Split Spoon Sample	DATE/TIME	DEPTH(ft)	REMARKS	SPT HAMMER	140 lb Auto	GRID N 2973226
4.0	Wash Boring w/ 4" Casing	08-19-2019 / 8:18 am	9.3	During Drilling (In Casing)			COORD E 681132
51.0	NX Rock Core						DATE START 8/16/19
55.0	Terminated						DATE END 8/19/19

▽ 121.7

BOT. OF FTG. EL. 113.70

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
130		2 5 6	11	S1	0 - 2	24/10		FILL	S1: (0-5") Top Soil Dry, medium dense, brown, medium to coarse SAND, trace Gravel.	
		5 6 7	13	S2	2 - 4	24/18			S2: Dry, medium dense, brown, medium SAND, little Gravel, little Silt.	
125	5	5 5 5	10	S3	4 - 6	24/4			S3: Wet, medium dense, brown, medium SAND, some Silt.	
		5 6 7 6	13	S4	6 - 8	24/12			S4: Similar to S3.	
		6 8 7 7	15	S5	8 - 10	24/20			S5: Wet, medium dense, brown, medium to coarse SAND, some Silt, trace Gravel.	
120	10	4 4 4 4	8	S6	10 - 12	24/10		10 SILT	S6: Wet, medium stiff, brown SILT, some fine to medium Sand.	
		1 2 2 3	4	S7	12 - 14	24/6		14	S7: Wet, medium stiff, brown SILT and fine SAND.	
115	15	WOH WOH 1 2	1	S8	14 - 16	24/24		PEAT 16	S8: Wet, blackish brown, fine grained PEAT, trace Gravel.	
		2 2 10 12	12	S9	16 - 18	24/7		SAND	S9: Wet, medium dense, blackish brown SAND and Organic Silt, trace Gravel.	
110	20	7 12 9 10	21	S10	18 - 20	24/24			S10: Wet, medium dense, medium SAND, little Silt, trace Gravel.	
		7 22 24 16	46	S11	24 - 26	24/14		24	S11: Wet, dense, fine GRAVEL and coarse Sand, little Silt.	
105	25							GRAVEL		
		47 46 55 37	101	S12	29 - 31	24/18			S12: Wet, very dense, fine to coarse GRAVEL, trace Silt, trace coarse Sand.	1
100	30									
		50/5"	50/5"	S13	34 - 34.3	5/4			S13: Wet, very dense, coarse GRAVEL, trace Silt.	
	35									

Page 1: 0-35 feet. Each subsequent page displays 40 feet.

NOTES

1. Hard drilling at 32'.

LOG OF TEST BORING

JACOBS

PROJECT	Bruce Freeman Rail Trail	BORING NO.	BB-101
LOCATION	Sudbury, MA		SHEET 2 OF 2
OWNER	MASSDOT		
JOB NUMBER	E2X81800		

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
95										2
	40	21 29 50 31	79	S14	39 - 41	24/9		39 SILT	S14: Wet, hard SILT, trace fine Sand, trace Gravel.	
90										
	45	30 68/4"	68/4"	S15	44 - 44.8	10/5			S15: Wet, hard SILT, some fine Gravel, little fine to coarse Sand, trace Clay.	
85										
		70/2"	70/2"	S16	49 - 49.2	2/2		49 SAND	S16: Wet, very dense, coarse SAND, weathered rock fragments.	
	50							52		
80		RQD=42		RC-1	51 - 55	48/46		GRANODIORITE	RC-1: Coring time: 12, 9, 9, 10 (mins/ft) Pinkish gray, hard, moderately weathered GRANODIORITE, fractures dipping at 30 degree angle. Clay seam noted between 42 to 43".	3
	55							55	Bottom of Borehole at 55 feet.	
75										
	60									
70										
	65									
65										
	70									
60										

Page 1: 0-35 feet. Each subsequent page displays 40 feet.

NOTES

2. Boulders encountered between 36 and 39'.
3. Outer barrel of core bit broke in the borehole during drilling at 55'. Could not continue boring any further.

BORING NOTES:

1. LOCATION OF BORINGS SHOWN ON THE PLANS THUS: ⌖ BB–#
2. BORINGS ARE TAKEN FOR PURPOSE OF DESIGN AND SHOW CONDITIONS AT BORING POINTS ONLY, BUT DO NOT NECESSARILY SHOW THE NATURE OF THE MATERIALS TO BE ENCOUNTERED DURING CONSTRUCTION.
3. WATER LEVELS SHOWN ON THE BORING LOGS WERE OBSERVED AT THE TIME OF TAKING BORINGS AND DO NOT NECESSARILY SHOW THE TRUE GROUND WATER LEVEL.
4. FIGURES IN COLUMNS INDICATE NUMBER OF BLOWS REQUIRED TO DRIVE A 1 3/8" I.D. SPLIT SPOON SAMPLER 6" USING A 140 POUND WEIGHT FALLING 30".
5. BORING SAMPLES ARE STORED AT A STORAGE FACILITY LOCATED ON ROUTE 114 (219 WINTHROP AVE.) IN LAWRENCE, MA. THE CONTRACTOR MAY EXAMINE THE SOIL AND ROCK SAMPLES BY CONTRACTING THE MASSDOT GEOTECHNICAL SECTION AT 10 PARK PLAZA, BOSTON, MA.
6. ALL BORINGS WERE MADE IN AUGUST 2019.
7. BORINGS WERE MADE BY NEW ENGLAND BORING CONTRACTOR, INC., P.O. BOX 165, DERRY, NH 03038.
8. THE NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988 IS USED THROUGHOUT.

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

SUDBURY
BRUCE FREEMAN RAIL TRAIL OVER PANTRY BROOK

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	235	316
PROJECT FILE NO.	608164		

BORING LOGS

BORING NOTES:

SEE SHEET 3 FOR BORING NOTES.

LOG OF TEST BORING

JACOBS

PROJECT	Bruce Freeman Rail Trail	BORING NO.	BB-102A
LOCATION	Sudbury, MA		SHEET 1 OF 1
OWNER	MASSDOT		
JOB NUMBER	E2X81800		

INSPECTOR	S. Ramesh	CONTRACTOR	NEBC		DRILLER	B. Cross	ELEVATION	131	
METHOD OF DRILLING		GROUNDWATER READINGS			DRILL RIG	Mobile B-53	DATUM	NAVD 88	
0.0	Split Spoon Sample	DATE/TIME	DEPTH(ft)	REMARKS	SPT HAMMER	140 lb Auto	GRID	N	2973187
4.0	Wash Boring w/ 4" Casing	08-20-2019 / 1:36 pm	11.5	Upon Completion (Casing pulled)			COORD	E	681121
							DATE START		8/20/19
							DATE END		8/20/19

▽ 119.5

BOT. OF FTG. EL. 113.70

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
130	0	2 4 6 5	10	S1	0 - 2	24/17		FILL	S1: (0-12") Dry, black, medium SAND, trace Gravel, roots (topsoil). (12-17") Dry, brown, fine to medium SAND, trace Silt.	
		4 4 7 5	11	S2	2 - 4	24/15			S2: Dry, medium dense, brown, fine to medium SAND,little Silt, trace Gravel.	
125	5	4 2 4 3	6	S3	4 - 6	24/9			S3: Wet, loose, brown, fine SAND, some Silt, trace Gravel.	
		5 6 5 6	11	S4	6 - 8	24/10			S4: Wet, medium dense, brown, fine SAND and SILT.	
		6 7 5 6	12	S5	8 - 10	24/5			S5: Wet, medium dense, fine to coarse SAND, some Silt, trace Gravel.	
120	10	2 3 1 1	4	S6	10 - 12	24/4		10 SILT	S6: Wet, medium stiff, brown, SILT, some fine to medium Sand, trace Clay, trace Gravel.	
		1 2 3 3	5	S7	12 - 14	24/23		12 PEAT	S7: Wet, blackish brown, fine grained PEAT.	
115	15	5 8 11 12	19	S8	14 - 16	24/19		SAND	S8: Wet, medium dense, brownish gray, medium to coarse SAND, some Silt.	
		5 20 21 16	41	S9	16 - 18	24/15			S9: Wet, dense, brown, medium to coarse SAND, trace Silt, trace fine Gravel.	
110	20	11 13 16 20	29	S10	18 - 20	24/19			S10: Wet, medium dense, grayish brown, medium to coarse SAND, little Silt.	
105	25	15 14 19 10	33	S11	24 - 26	24/5		24 SILT 26	S11: Wet, hard, gray SILT, little fine Sand, little fine Gravel.	1
									Bottom of Borehole at 26 feet.	2
100	30									
	35									

Page 1: 0-35 feet. Each subsequent page displays 40 feet.

NOTES

1. Boring terminated at 26' due to an obstruction.
2. Boring offset 6' south and continued. See boring log BB-102B.

LOG OF TEST BORING

JACOBS

PROJECT	Bruce Freeman Rail Trail	BORING NO.	BB-102B
LOCATION	Sudbury, MA		SHEET 1 OF 2
OWNER	MASSDOT		
JOB NUMBER	E2X81800		

INSPECTOR	S. Ramesh	CONTRACTOR	NEBC		DRILLER	B. Cross	ELEVATION	131	
METHOD OF DRILLING		GROUNDWATER READINGS			DRILL RIG	Mobile B-53	DATUM	NAVD 88	
0.0	Wash Boring w/ 3" Casing	DATE/TIME	DEPTH(ft)	REMARKS	SPT HAMMER	140 lb Auto	GRID	N	2973181
30.0	Wash Boring w/ 4" Casing	08-21-2019 / 8:34 am	10.8	During Drilling (In Casing)			COORD	E	681121
52.0	NX Rock Core	08-22-2019 / 9:02 am	11.9	During Drilling (In Casing)			DATE START		8/21/19
62.8	Terminated	08-23-2019 / 9:06 am	11.8	During Drilling (In Casing)			DATE END		8/23/19

▽ 119.5

BOT. OF FTG. EL. 113.70

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
									Drill through.	
130	0									
125	5									
120	10									
115	15									
110	20									
105	25									
100	30	55/4"	55/4"	S12	29.5 - 29.8	4/3			S12: Wet, very dense, gray, fine to coarse GRAVEL, trace coarse Sand.	
	35	24	52	S13	34 - 36	24/10			S13: Wet, very dense, gray GRAVEL and SAND, little Silt.	

Page 1: 0-35 feet. Each subsequent page displays 40 feet.

NOTES

LOG OF TEST BORING

JACOBS

PROJECT	Bruce Freeman Rail Trail	BORING NO.	BB-102B
LOCATION	Sudbury, MA		SHEET 2 OF 2
OWNER	MASSDOT		
JOB NUMBER	E2X81800		

ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N-VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES
95	40	31 21 33						GRAVEL		
		30 53/4"	53/4"	S14	39 - 39.8	10/5			S14: Wet, very dense, gray, fine to coarse GRAVEL, little coarse Sand, trace Silt.	
90	45	18 25 34 41	59	S15	44 - 46	24/21		44 SILT	S15: Wet, hard, gray SILT, some Clay, trace fine Sand, trace Gravel.	
85	50	16 37 45 50/4"	82	S16	49 - 50.8	22/22			S16: Wet, hard, gray SILT, some Clay, trace fine to coarse Sand, little Gravel.	
80	55	RQD=57		RC-1	52 - 55.8	46/46		52 GRANODIORITE	RC-1: Coring time: 4.5, 5, 4.5, 11 (mins/ft) Wet, gray, pink grained, moderately to severely weathered, coarse grained GRANODIORITE.	
75	60	RQD=55		RC-2	55.8 - 60.8	60/60			RC-2: Coring time: 6, 5, 3.5, 2.5, 2 (mins/ft) Similar to RC-1.	
70	65	RQD=73		RC-3	60.8 - 62.8	24/24			RC-3: Coring time: 2, 3.5 (mins/ft) Similar to RC-1.	
65	70							62.8	Bottom of Borehole at 62.8 feet.	
60										

Page 1: 0-35 feet. Each subsequent page displays 40 feet.

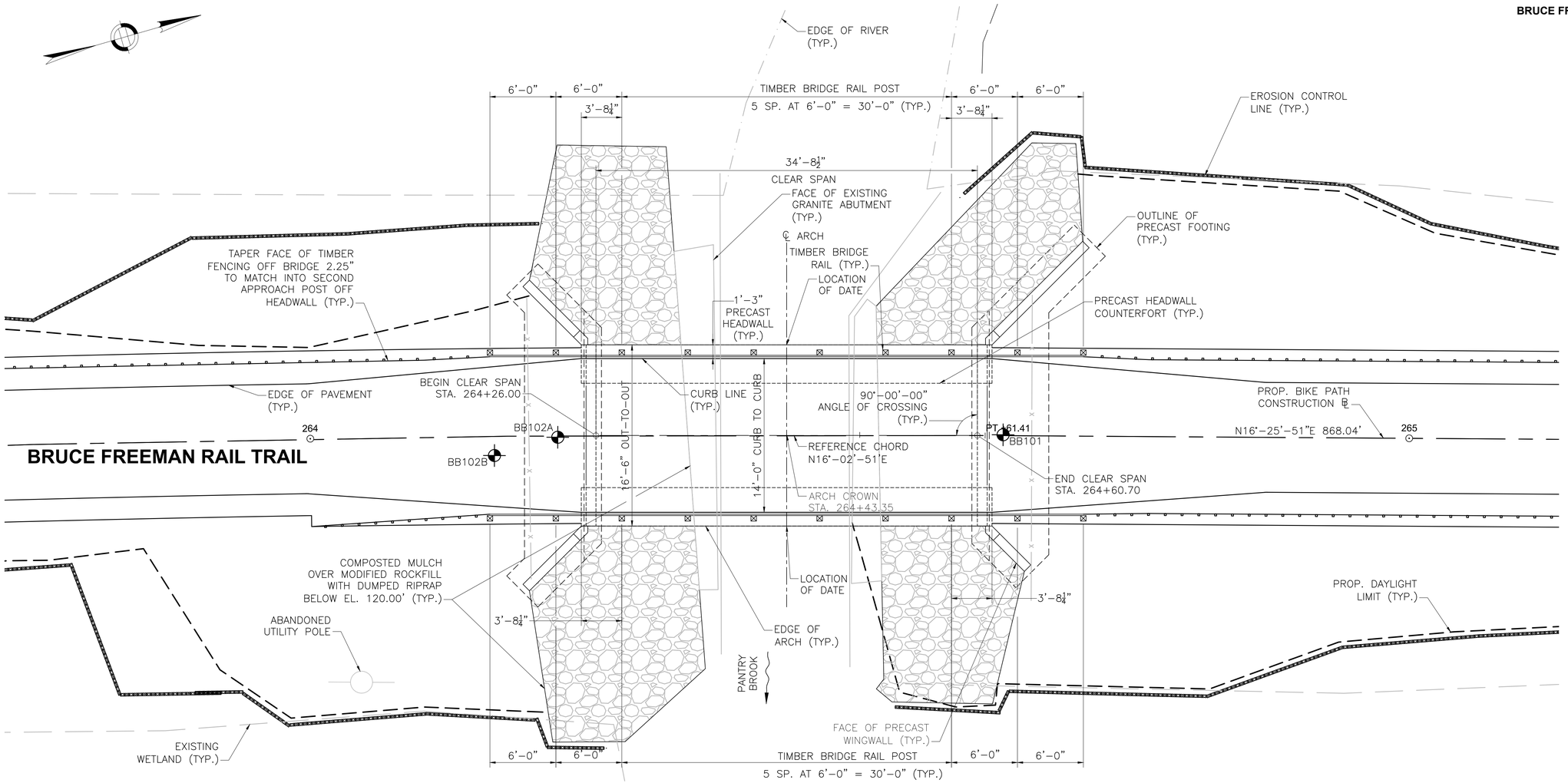
NOTES

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

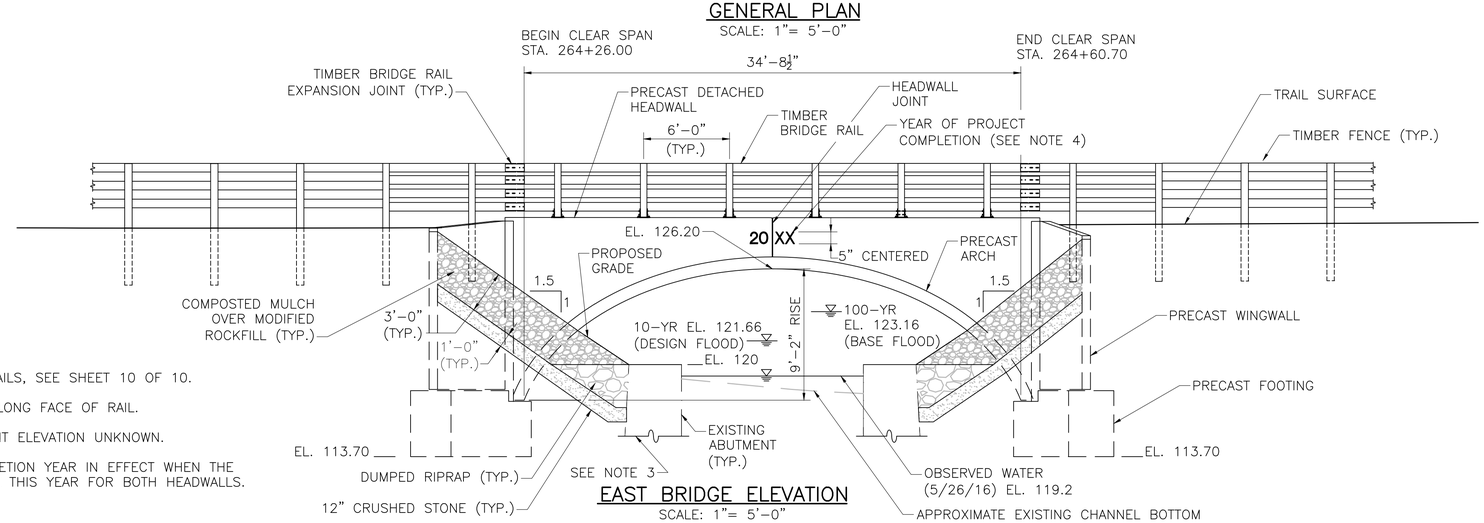
SUDBURY
BRUCE FREEMAN RAIL TRAIL OVER PANTRY BROOK

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	236	316
PROJECT FILE NO.	608164		

GENERAL PLAN & ELEVATION



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



EAST BRIDGE ELEVATION
SCALE: 1"= 5'-0"

NOTES:

1. FOR TIMBER BRIDGE RAIL DETAILS, SEE SHEET 10 OF 10.
2. RAIL POSTS ARE MEASURED ALONG FACE OF RAIL.
3. BOTTOM OF EXISTING ABUTMENT ELEVATION UNKNOWN.
4. USE LATEST CONTRACT COMPLETION YEAR IN EFFECT WHEN THE FIRST HEADWALL IS CAST, USE THIS YEAR FOR BOTH HEADWALLS.

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

608164_BR5(S-31-013)(GENPLAN).DWG Plotted on 22-Dec-2021 11:45 AM

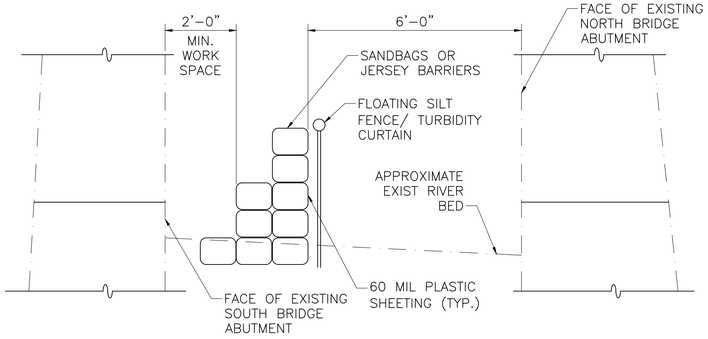
2nd Structural Submittal (S2) 10-January-2022

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	237	316
PROJECT FILE NO.	608164		

EARTHWORK DETAILS

EXISTING ABUTMENT REPAIR NOTES:

1. REMOVE TOPS OF EXISTING STONE MASONRY ABUTMENTS TO ELEVATION 120' OR TO THE NEAREST LONGITUDINAL STONE JOINT, PROVIDED THE JOINT LIES ABOVE THE RIVERBED OR AS DIRECTED BY THE ENGINEER. THE COST TO REMOVE THE EXISTING STONES SHALL BE INCLUDED IN ITEM 690.92, "MASONRY REMOVED AND STOCKPILED". SEVEN (7) OF THESE GRANITE BLOCKS SHALL BE SET ASIDE FOR RE-USE AS BENCHES AND HISTORIC DISPLAY ALONG THE TRAIL. REMOVAL AND RESETTING OF THESE 7 BLOCKS SHALL BE PAID FOR SEPARATELY UNDER ITEM 707.4. SEE SPECIAL PROVISION. ALL REMAINING STONES ARE TO BE DELIVERED TO THE TOWN OF SUDBURY PUBLIC WORKS DIVISION.
2. THE SOUTH EXISTING STONE MASONRY ABUTMENT HAS PARTIALLY COLLAPSED. THE CONTRACTOR SHALL REBUILD ANY COLLAPSED PORTIONS OF THE EXISTING WALL ALONG THE LENGTH OF THE ABUTMENT AND WINGWALLS BELOW THE LIMITS OF REMOVAL. THE COST TO REBUILD THE WALL AS REQUIRED SHALL BE INCLUDED IN ITEM 690, "STONE MASONRY WALL REMOVED AND REBUILT IN CEMENT MORTAR".
3. REPOINTING OF THE EXISTING STONE MASONRY ABUTMENTS SHALL BE REQUIRED AFTER THE TOP OF THE EXISTING ABUTMENTS HAVE BEEN REMOVED BUT PRIOR TO EXCAVATION OPERATIONS. THE COST TO REPOINT SHALL BE INCLUDED IN ITEM 690.91, "MASONRY REPOINTING".
4. ANY WATER CONTROL REQUIRED TO REMOVE, REPAIR, REBUILD, SHORE, OR REPOINT THE EXISTING ABUTMENTS SHALL BE INCLUDED UNDER ITEM 991.2, "CONTROL OF WATER – STRUCTURE NO. S-31-013".
5. THE CONFIGURATION OF THE EXISTING ABUTMENT STONE WALLS AND THE ELEVATION OF THE BOTTOM OF THE EXISTING ABUTMENTS SHOWN ON THE PLANS ARE APPROXIMATE. THE CONTRACTOR SHALL ENSURE THE EXISTING ABUTMENT STONE WALLS ARE NOT UNDERMINED OR IN ANY WAY COMPROMISED DURING EXCAVATION OPERATIONS. TEMPORARY SHORING OF THE EXISTING ABUTMENT WALLS MAY BE REQUIRED TO COMPLETE EXCAVATION OPERATIONS. THE COST FOR TEMPORARY SHORING SHALL BE INCLUDED IN ITEM 995.01, "BRIDGE STRUCTURE, BRIDGE NO. S-31-013".

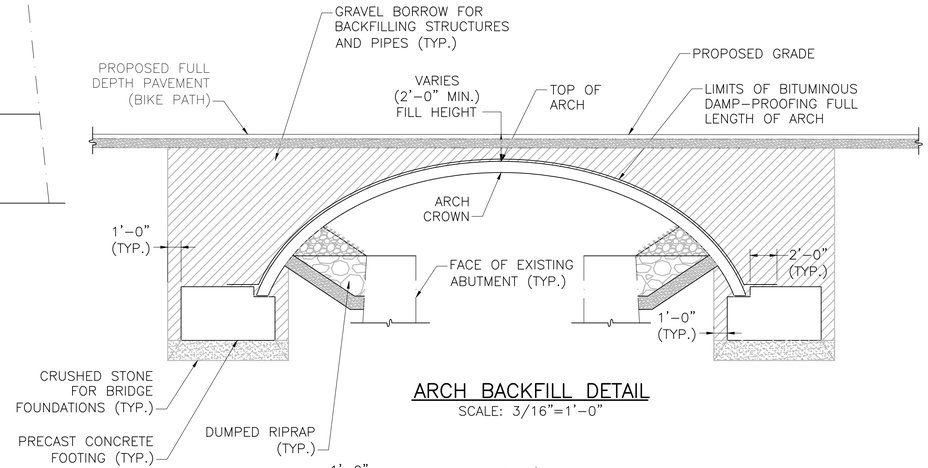


SUGGESTED WATER CONTROL PLAN

SCALE: 1"=1'-0"

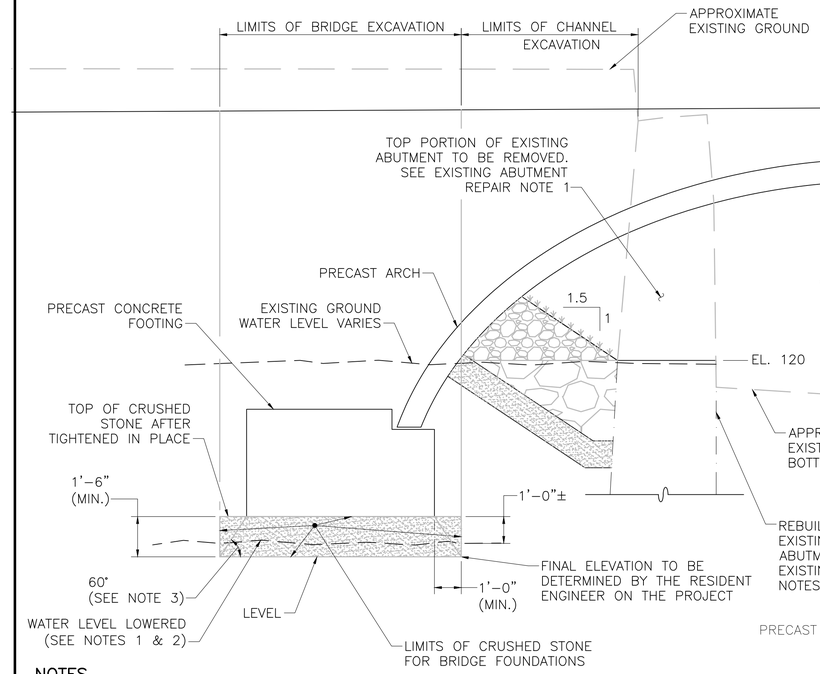
NOTES:

1. WORK IN THE WATER SHALL BE PERFORMED DURING LOW FLOW SEASON AS DEFINED IN THE SPECIAL PROVISION FOR ITEM 991.2 AND THE FLOW SHALL BE MAINTAINED THROUGH THE USE OF TEMPORARY WATER CONTROL.
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR SIZING THE BARRIER TO HANDLE THE RIVER FLOW. THE BARRIER SHALL BE OF ADEQUATE SIZE TO DELIVER THE WATER AT THE DISCHARGE END TO THE RIVER WITHOUT DISTURBING THE EXISTING BANKS OR RIVERBED FLOW. THE BARRIER HEIGHT SHALL BE SIZED TO MAINTAIN 1' OF FREEBOARD OVER THE 2-YEAR FLOOD.
3. IN THE EVENT OF HIGH FLOW RATES, THE CONTRACTOR SHALL BE RESPONSIBLE TO DEVELOP AND IMPLEMENT A REASONABLE MEANS NECESSARY TO HANDLE THE ADDITIONAL FLOWS TO PROTECT THE SURROUNDING AREA, AS APPROVED BY THE ENGINEER AND SHALL BE INCIDENTAL TO ITEM 991.2 "CONTROL OF WATER – STRUCTURE NO. S-31-013".
4. WATER CONTROL SHALL BE PHASED. EXISTING CLEAR SPAN IS NOT SUFFICIENT TO ACCOMMODATE SAND BAGS IN FRONT OF BOTH ABUTMENTS SIMULTANEOUSLY WHILE ALLOWING ADEQUATE FLOW.



ARCH BACKFILL DETAIL

SCALE: 3/16"=1'-0"

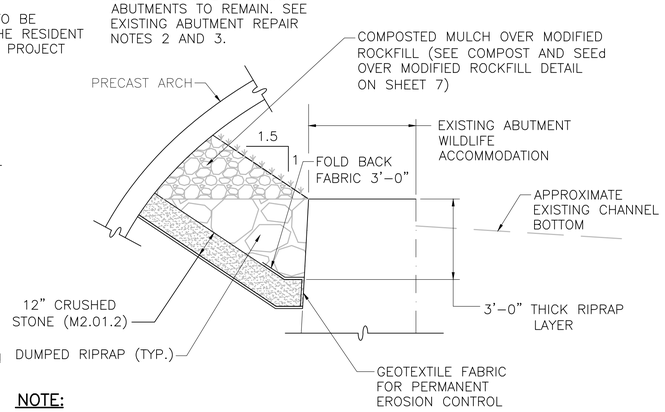


NOTES

1. LOWER WATER LEVEL AS MUCH AS POSSIBLE WITHOUT DISTURBING THE GRANULAR SOIL (SIDES AND BOTTOM) AND TIGHTEN THE CRUSHED STONE IN PLACE (SEE STANDARD SPEC).
2. WATER CONTROL REQUIREMENTS:
   1. THE CONTRACTOR SHALL SUBMIT THE WATER CONTROL PLAN FOR APPROVAL PRIOR TO REMOVAL OF THE TOPS OF THE EXISTING ABUTMENTS AND WINGWALLS AND PLACEMENT OF THE PRECAST ARCH FOOTINGS.
   2. EXCAVATED FOOTING AREA SHALL CONTINUE TO BE DEWATERED UNTIL THE PRECAST CONCRETE FOOTINGS ARE FULLY INSTALLED.
   3. RIPRAP, MODIFIED ROCK FILL AND COMPOSTED MULCH SHALL BE PLACED IN THE DRY AFTER DEWATERING ALL AREAS.
3. SUPPORT OF EXCAVATION MAY BE REQUIRED BEHIND THE PROPOSED FOOTING TO COMPLETE EXCAVATION OPERATIONS. THE COST FOR SUPPORT OF EXCAVATION SHALL BE INCLUDED IN ITEM 995.01, "BRIDGE STRUCTURE, BRIDGE NO. S-31-013".

LIMITS OF CRUSHED STONE FOR BRIDGE FOUNDATIONS

SCALE: 3/8"=1'-0"



NOTE:

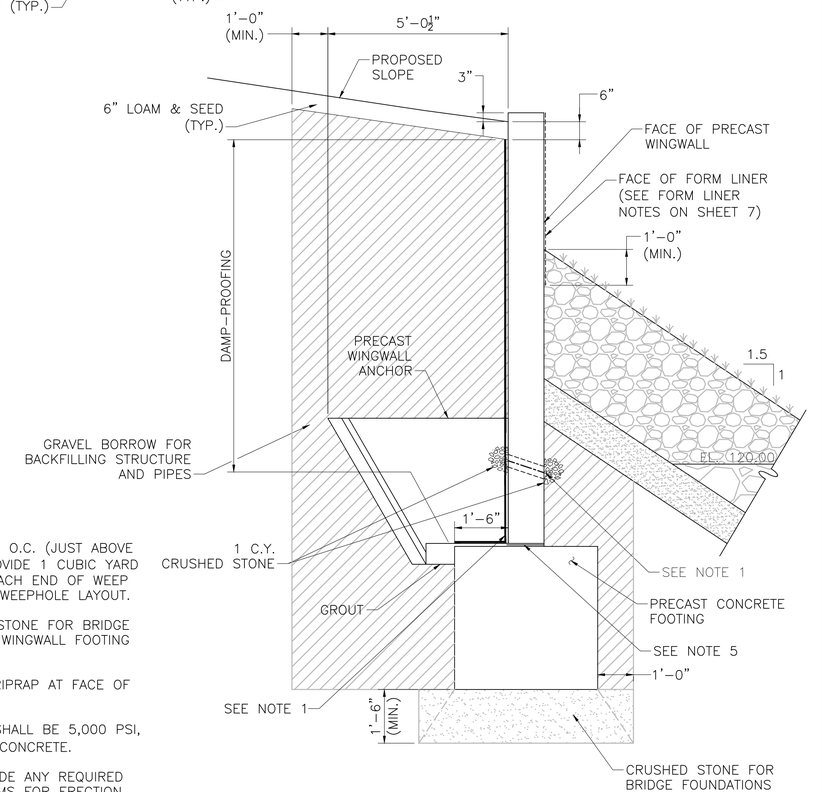
EXCAVATION BETWEEN THE BACK FACE OF THE EXISTING ABUTMENT TO THE VERTICAL LIMIT OF EXCAVATION FOR CRUSHED STONE FOR BRIDGE FOUNDATIONS AND DOWN TO THE BOTTOM OF CRUSHED STONE (M2.01.2) SHALL BE PAID FOR UNDER ITEM 143, "CHANNEL EXCAVATION".

RIPRAP DETAIL

SCALE: 3/8"=1'-0"

NOTES:

1. 4" ø WEEP HOLES 10'-0" O.C. (JUST ABOVE PROTECTIVE COURSE). PROVIDE 1 CUBIC YARD OF CRUSHED STONE AT EACH END OF WEEP HOLE. SEE SHEET 9 FOR WEEPHOLE LAYOUT.
2. SEE LIMITS OF CRUSHED STONE FOR BRIDGE FOUNDATIONS DETAIL FOR WINGWALL FOOTING REQUIREMENTS.
3. SEE RIPRAP DETAIL FOR RIPRAP AT FACE OF WINGWALL REQUIREMENTS.
4. ALL PRECAST CONCRETE SHALL BE 5,000 PSI, ¾ INCH, 685 HP CEMENT CONCRETE.
5. CONTRACTOR SHALL PROVIDE ANY REQUIRED LEVELING SCREWS OR SHIMS FOR ERECTION.



WINGWALL BACKFILL DETAIL

SCALE: 1/2"=1'-0"

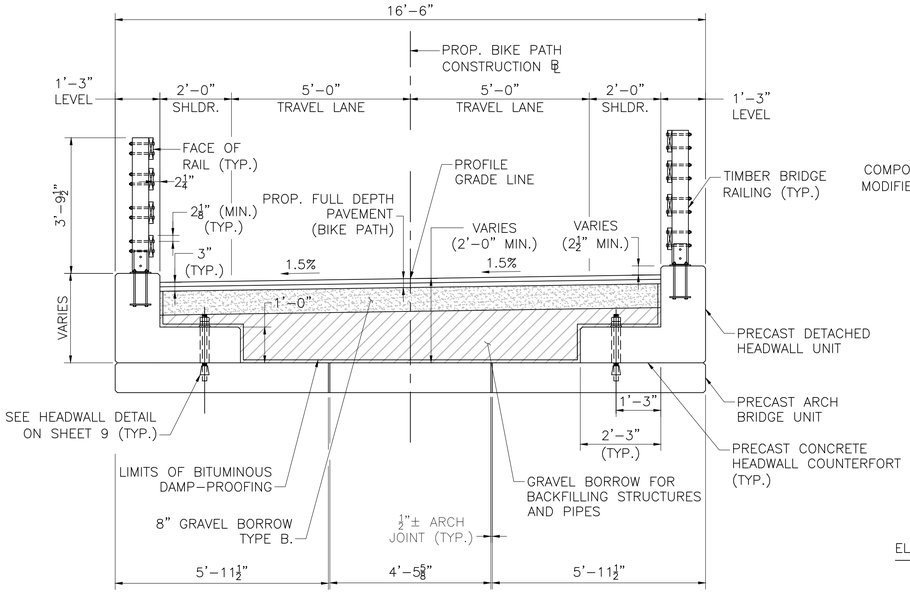
MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

608164_BR6(S-31-013)(EARTHWORKS).DWG Plotted on 22-Dec-2021 11:45 AM
2nd Structural Submittal (S2) 10-January-2022

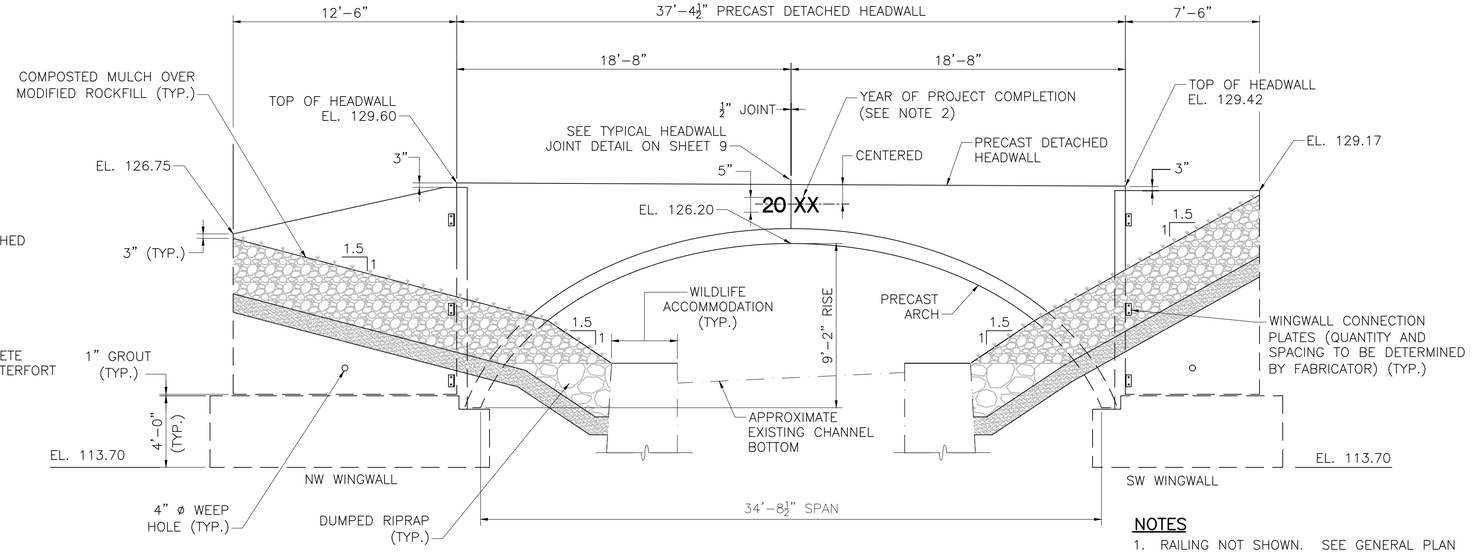
SUDBURY
BRUCE FREEMAN RAIL TRAIL OVER PANTRY BROOK

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	238	316
PROJECT FILE NO.	608164		

TYPICAL SECTIONS & ELEVATIONS

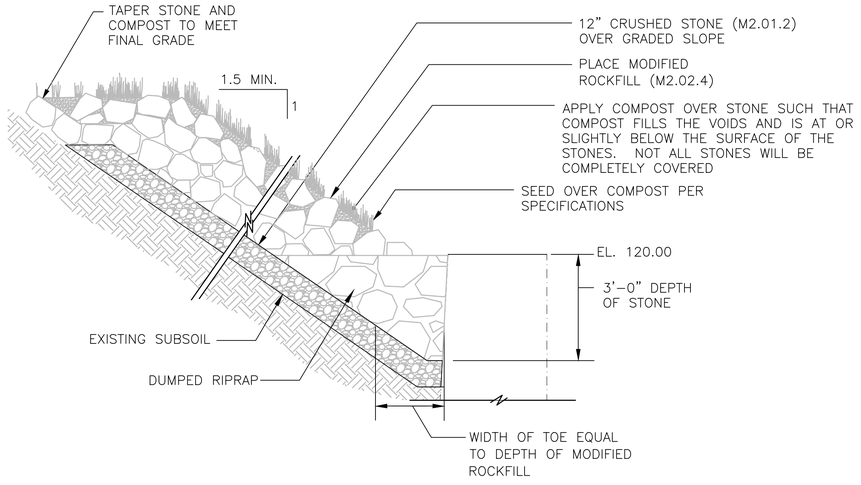


TRANSVERSE SECTION
SCALE: 1/2"=1'–0"



UPSTREAM ELEVATION
SCALE: 1/4"=1'–0"

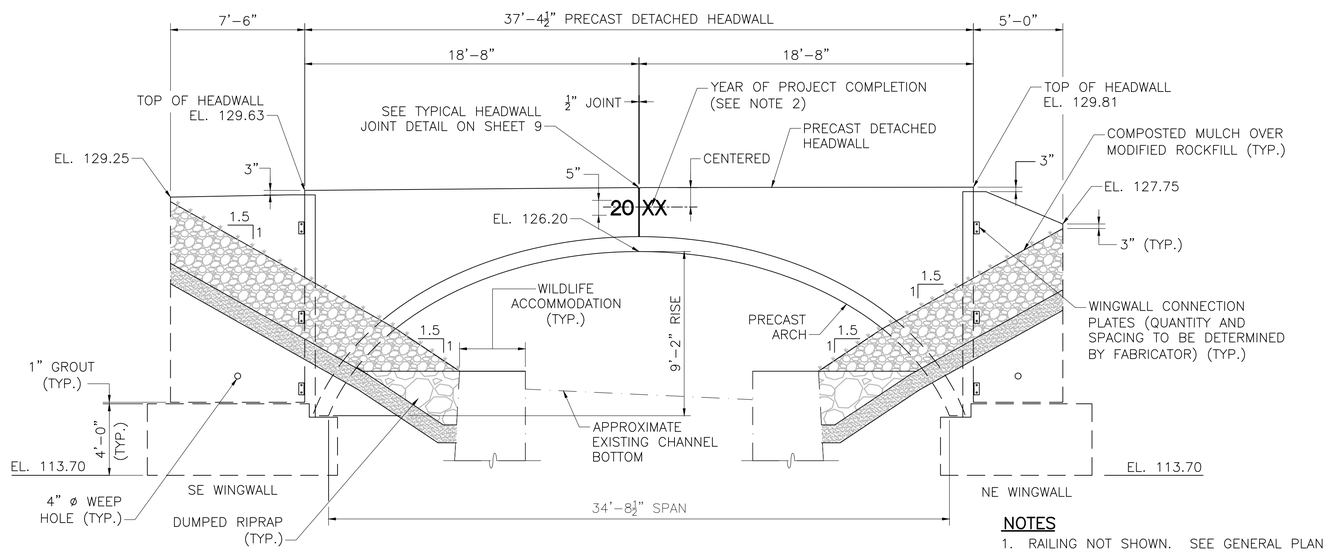
NOTES
1. RAILING NOT SHOWN. SEE GENERAL PLAN ON SHEET 5 FOR POST LOCATIONS.
2. USE LATEST CONTRACT COMPLETION YEAR IN EFFORT WHEN THE FIRST HEADWALL IS CAST, USE THIS YEAR FOR BOTH HEADWALLS.



COMPOST AND SEED OVER MODIFIED ROCKFILL
SCALE: 3/8"=1'–0"

WINGWALL AND HEADWALL FORM LINER NOTES:

1. EXPOSED FACES OF HEADWALLS AND WINGWALLS SHALL HAVE A PATTERNED FORM LINER AND SHALL EXTEND A MINIMUM OF 1' BELOW THE PROPOSED GRADE AT THE FACE OF THE WALL.
2. THE FORM LINER PATTERN SHALL BE CUSTOMROCK #1302 – RANDOM RUNNING BOND STONE OR APPROVED EQUAL AND SHALL BE STAINED TO SIMULATE THE APPEARANCE OF THE EXISTING MASONRY ABUTMENTS. THE COST OF THE FORM LINER SHALL BE INCLUDED UNDER ITEM 995.01, "BRIDGE STRUCTURE BRIDGE, NO. S–31–013." SEE SPECIAL PROVISION FOR ADDITIONAL INFORMATION.



DOWNSTREAM ELEVATION
SCALE: 1/4"=1'–0"

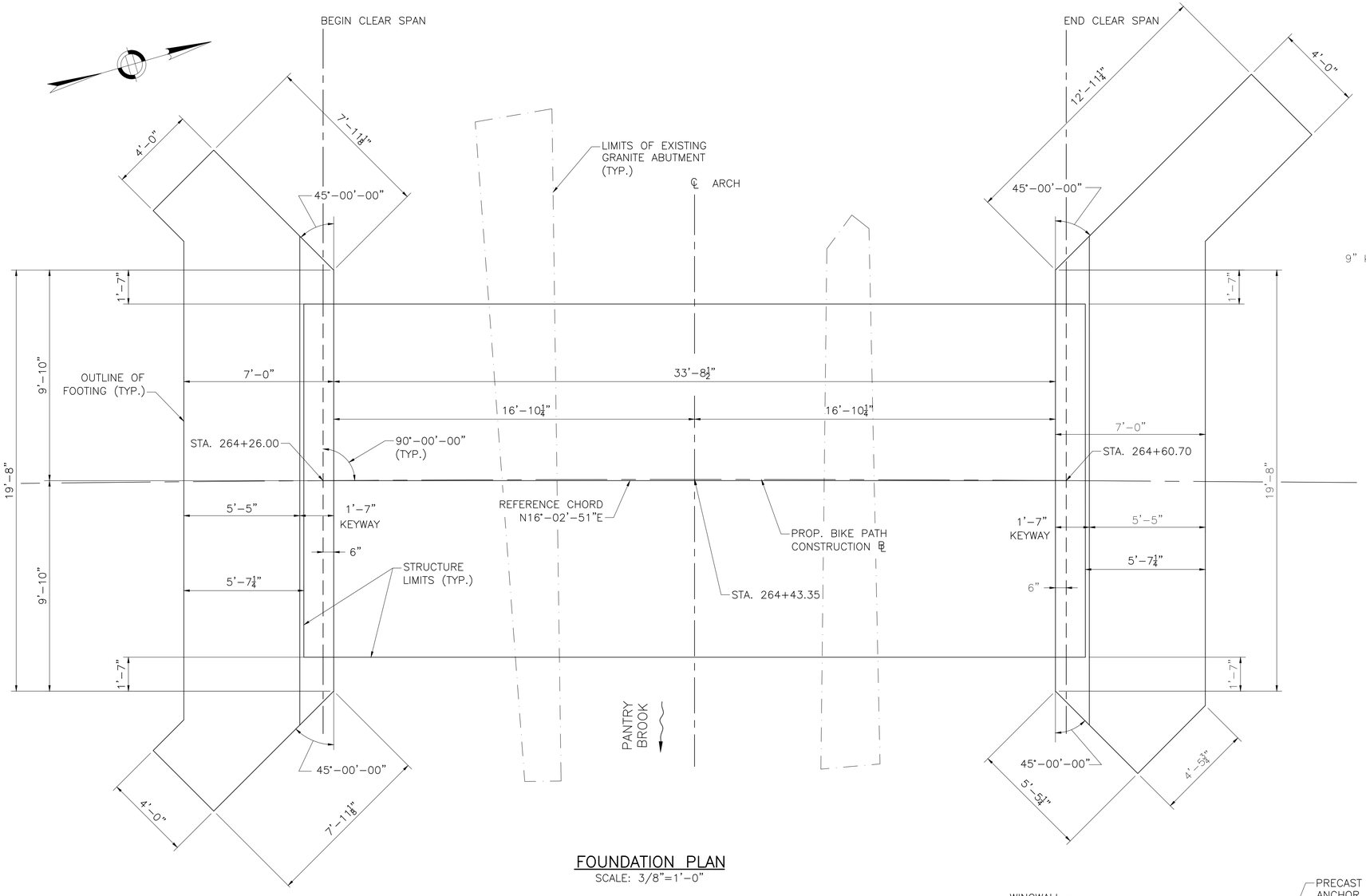
NOTES
1. RAILING NOT SHOWN. SEE GENERAL PLAN ON SHEET 5 FOR POST LOCATIONS.
2. USE LATEST CONTRACT COMPLETION YEAR IN EFFORT WHEN THE FIRST HEADWALL IS CAST, USE THIS YEAR FOR BOTH HEADWALLS.

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

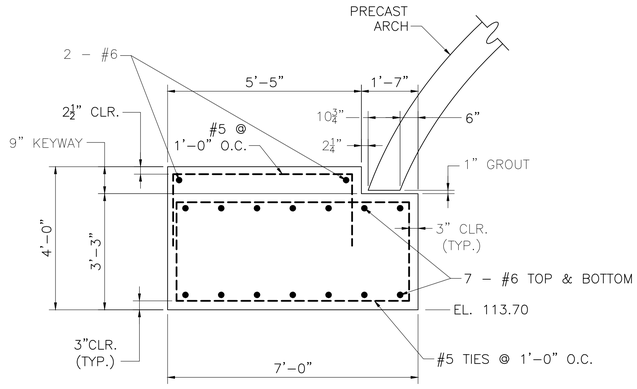
SUDBURY
BRUCE FREEMAN RAIL TRAIL OVER PANTRY BROOK

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	239	316
PROJECT FILE NO.	608164		

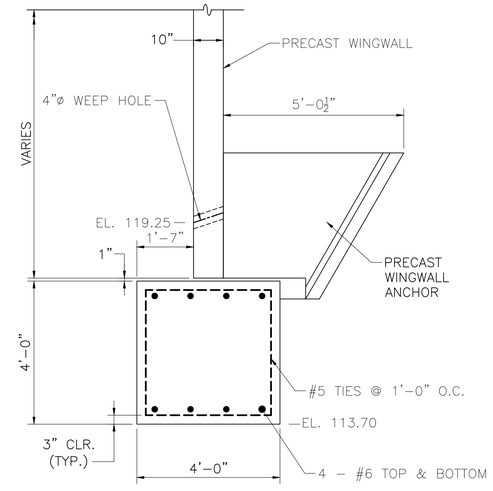
FOUNDATION PLAN & DETAILS



FOUNDATION PLAN
SCALE: 3/8"=1'-0"



PRECAST FOOTING SECTION
SCALE: 1/2"=1'-0"



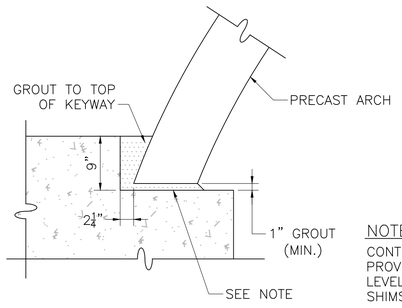
WINGWALL FOOTING SECTION
SCALE: 1/2"=1'-0"

NOTES:

1. THE PRECAST CONCRETE STRIP FOOTING IS PER CONTRACTOR DESIGN. THEREFORE, THE FACTORED BEARING PRESSURE WILL BE DETERMINED BY THE CONTRACTOR. SLIDING AND OVERTURNING OF THE PRECAST STRIP FOOTING SHALL ALSO BE CHECKED IN THE CONTRACTOR'S DESIGN USING THE INFORMATION PROVIDED IN THE GEOTECHNICAL REPORT.
2. FACTORED BEARING RESISTANCE:

FOOTING WIDTH (FT)	ECCENTRICITY (FT)	FACTORED BEARING RESISTANCE (KSF)
4	1.33	5.2
6	2.00	5.7
8	2.67	6.1

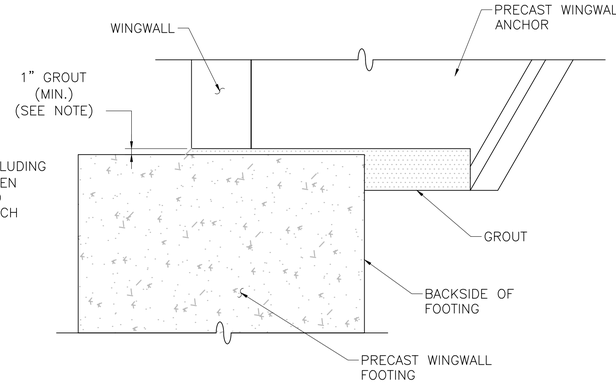
3. FACTORED BEARING RESISTANCE IS THE PRODUCT OF THE NOMINAL BEARING RESISTANCE AND A RESISTANCE FACTOR OF 0.45.



NOTE:
CONTRACTOR SHALL PROVIDE ANY REQUIRED LEVELING SCREWS OR SHIMS FOR ERECTION.

ARCH TYPICAL KEY DETAIL
SCALE: 1"=1'-0"

NOTE:
FILL ENTIRE KEYWAY INCLUDING NOMINAL 1" VOID BETWEEN BOTTOM OF KEYWAY AND BOTTOM OF PRECAST ARCH LEG WITH GROUT.



WINGWALL TYPICAL GROUT DETAIL
SCALE: 1"=1'-0"

NOTES:

1. MINIMUM 1" NON-SHRINK GROUT CONFORMING TO M4.04.0 UNDER WINGWALL LEG AND ANCHOR STEM.
2. AREA BETWEEN WINGWALL FOOTING AND ANCHOR SHALL BE GROUTED SOLID BEFORE BACKFILL.

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
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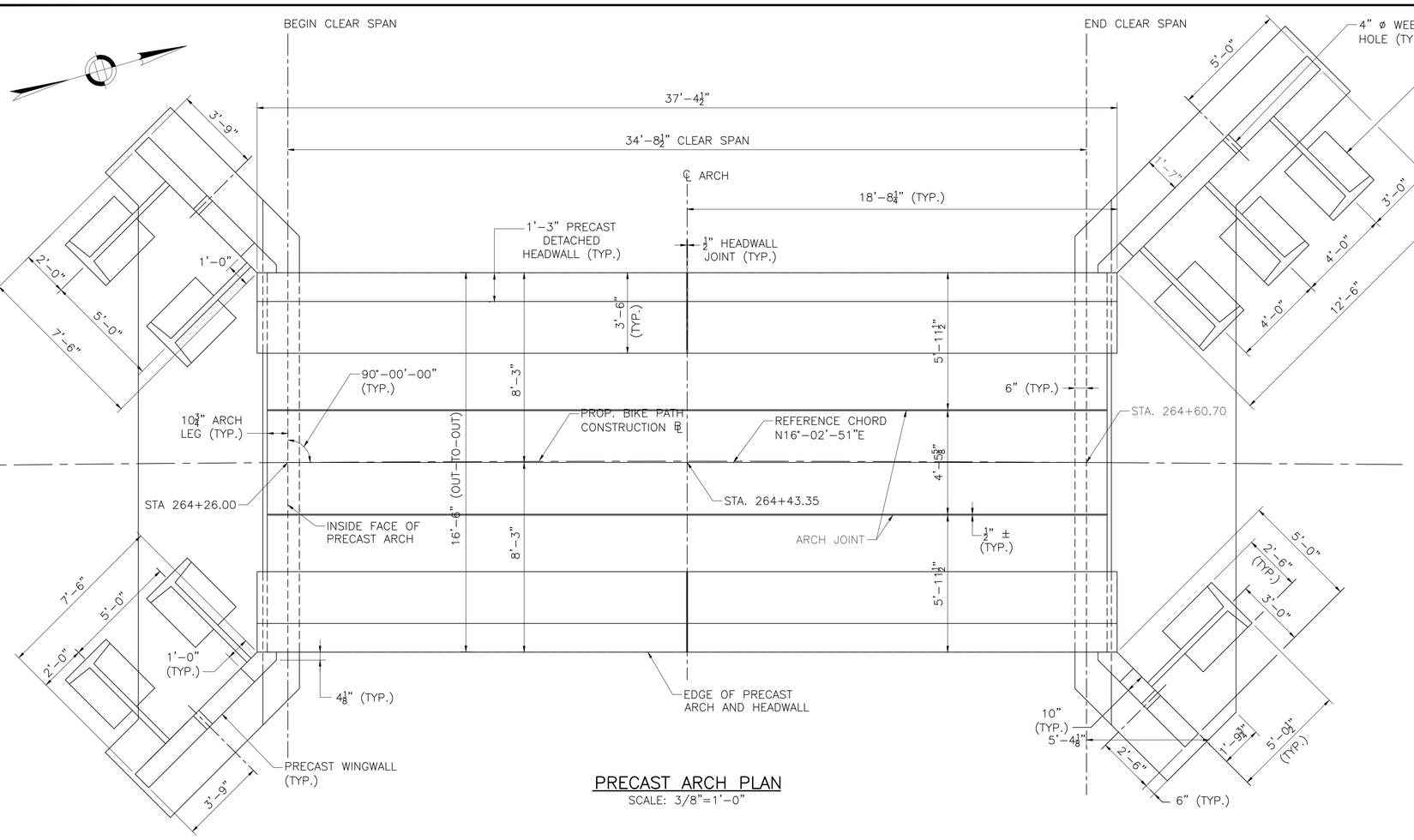
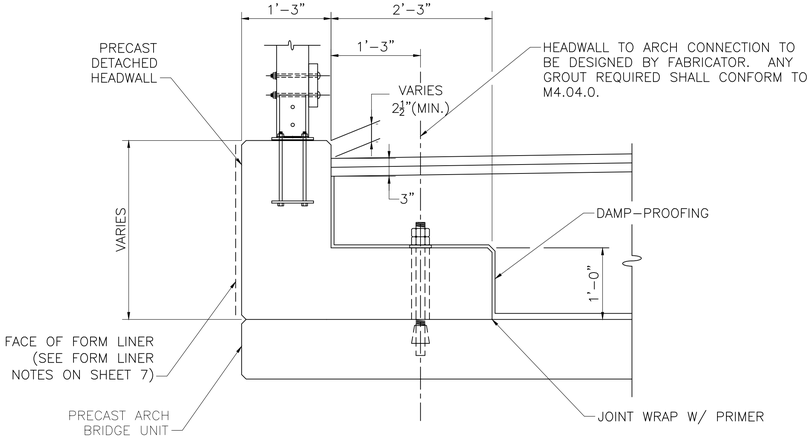
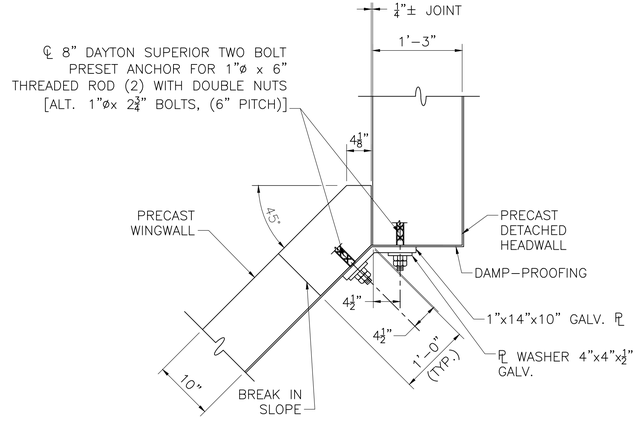


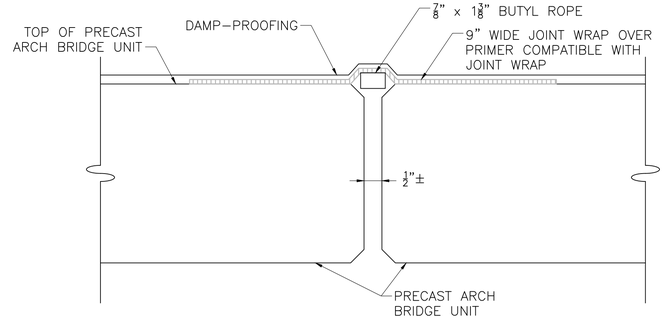
PRECAST ARCH PLAN
SCALE: 3/8"=1'-0"



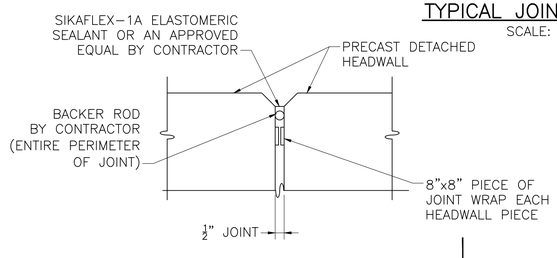
HEADWALL DETAIL
SCALE: 1"=1'-0"



WINGWALL TO HEADWALL JOINT DETAIL
SCALE: 1"=1'-0"



TYPICAL JOINT SEAL DETAIL
SCALE: 3"=1'-0"



TYPICAL HEADWALL JOINT DETAIL
SCALE: 1"=1'-0"

SUDBURY
BRUCE FREEMAN RAIL TRAIL OVER PANTRY BROOK

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	240	316
PROJECT FILE NO.	608164		

PRECAST ARCH DETAILS & NOTES

PRECAST CONCRETE ELEMENT NOTES:

1. THE CONTRACTOR SHALL SUBMIT DESIGN CALCULATIONS FOR THE ARCH BRIDGE ELEMENTS, INCLUDING THE HEADWALL CONNECTION TO THE ARCH AND THE ARCH FOOTINGS, IN ACCORDANCE WITH THE LATEST AASHTO LRFD DESIGN SPECIFICATIONS AND THE MASSACHUSETTS DEPARTMENT OF TRANSPORTATION'S LRFD BRIDGE DESIGN MANUAL FOR H10 TRUCK LOADING AND PEDESTRIAN LOADING FOR APPROVAL OF THE ENGINEER. THE DESIGN COMPUTATIONS SHALL CONSIDER ALL LOADINGS AS APPROPRIATE DURING FABRICATION, SHIPMENT, ERECTION, CONSTRUCTION, AND AFTER COMPLETION OF CONSTRUCTION BASED ON THESE CONSTRUCTION DRAWINGS. THE RAIL POST ANCHORAGE SPACING SHALL BE DETAILED ON SHOP DRAWINGS FOR REVIEW AND APPROVAL BY THE ENGINEER.
2. THE ARCH DIMENSIONS PROVIDED ARE SHOWN TO ESTABLISH THE SIZE OF THE PROPOSED OPENING OF 141 SQUARE FEET. THE WIDTHS AND THICKNESSES OF EACH ARCH UNIT MAY VARY DEPENDING UPON THE MANUFACTURER'S SPECIFICATIONS. AN ARCH TYPE STRUCTURE SHALL BE REQUIRED. THE CONTRACTOR, AT NO ADDITIONAL COMPENSATION, HAS THE OPTION TO PROPOSE AN ALTERNATE ARCH DESIGN WITH THE SAME OR LARGER OPENING AREA.
3. THE PRECAST FOOTING DESIGN DETAILED HEREIN WAS BASED ON THE GEOMETRY OF THE ARCH SHOWN. SEE FACTORED BEARING RESISTANCES BY SIZE ON SHEET 8. THE FABRICATOR SHALL PREPARE AND THE CONTRACTOR SHALL SUBMIT THE FINAL DESIGN OF THE FOOTING FOR APPROVAL BY THE ENGINEER.
4. THE CONTRACTOR, AT NO ADDITIONAL COMPENSATION, HAS THE OPTION TO PROVIDE CAST-IN-PLACE CONCRETE FOOTINGS, AND SHALL SUBMIT THE FINAL DESIGN OF THE CAST-IN-PLACE CONCRETE FOOTINGS.
5. THE PRECAST ELEMENTS ARE TO BE PARALLEL AND ALIGNED WITH THE REFERENCE LINE AS SHOWN ON THESE CONSTRUCTION DRAWINGS.
6. A MINIMUM OF 4 FEET COVER TO THE BOTTOM OF FOOTING SHALL BE PROVIDED.
7. THE FABRICATOR IS RESPONSIBLE FOR THE DESIGN AND INSTALLATION OF LIFT HOOKS FOR ALL PRECAST ELEMENTS. PLANS PROVIDING SPACING AND LOCATION OF LIFTING DEVICES AND HANDLING STRESS CALCULATIONS SHALL BE PROVIDED TO THE ENGINEER FOR REVIEW AND APPROVAL PRIOR TO FABRICATION OF THE PRECAST ELEMENTS.
8. SHOP DRAWINGS AND DESIGN CALCULATIONS SHALL BE SIGNED AND SEALED BY A PROFESSIONAL ENGINEER REGISTERED IN THE COMMONWEALTH OF MASSACHUSETTS.
9. PRECAST CONCRETE ELEMENTS SHALL CONFORM TO THE APPLICABLE PARTS OF SECTION 901 OF THE SPECIFICATIONS.
10. ALL TOLORANCES FOR JOINTS BETWEEN PRECAST ELEMENTS SHALL BE DETERMINED BY THE CONTRACTOR AND SHALL BE IN ACCORDANCE WITH PCI REQUIREMENTS.

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

608164_BR9(S-31-013)(PRECAST).DWG Plotted on 22-Dec-2021 11:46 AM
2nd Structural Submittal (S2) 10-January-2022

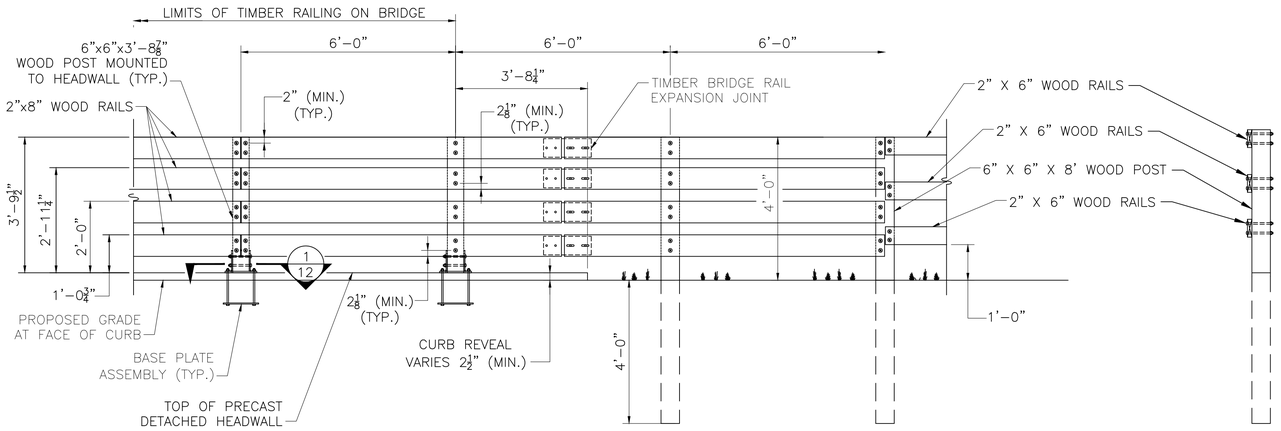
SUDBURY
BRUCE FREEMAN RAIL TRAIL OVER PANTRY BROOK

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	241	316
PROJECT FILE NO.	608164		

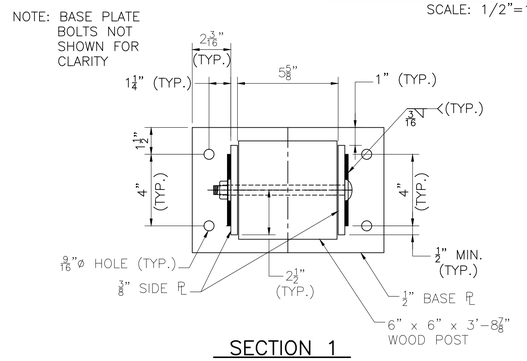
TIMBER BRIDGE RAIL DETAILS

RAILING NOTES:

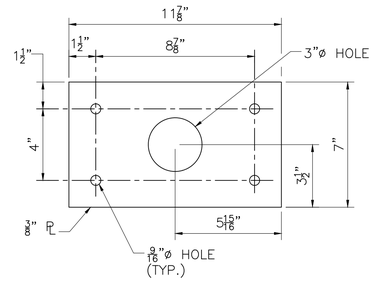
1. RAIL CONNECTION PLATES AND RAIL EXPANSION JOINT PLATES SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M270 GRADE 50.
2. ALL STEEL PLATES AND FASTENERS SHALL BE GALVANIZED.
3. THE NUT SECURING THE POST BASE PLATE TO THE HEADWALL SHALL BE TIGHTENED TO A SNUG FIT AND GIVEN AN ADDITIONAL $\frac{1}{8}$ TURN AFTER STEEL IS IN PLACE.
4. CONNECTION BOLTS SHALL BE ASTM A325 TYPE 1.
5. ALL WOOD RAILS SHALL BE CONNECTED TO A MINIMUM OF 2 WOOD POSTS.
6. BOLTS IN SLOTTED HOLES SHALL UTILIZED LOCK NUTS AND BE FINGER TIGHT TO BE ALLOW MOVEMENT BETWEEN STEEL PLATE AND TIMBER RAIL.



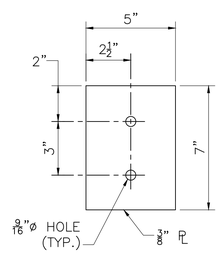
TIMBER BRIDGE RAIL ELEVATION
SCALE: 1/2"=1'-0"



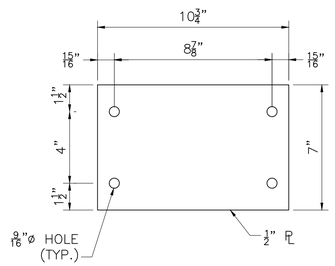
SECTION 1
SCALE: 3"=1'-0"



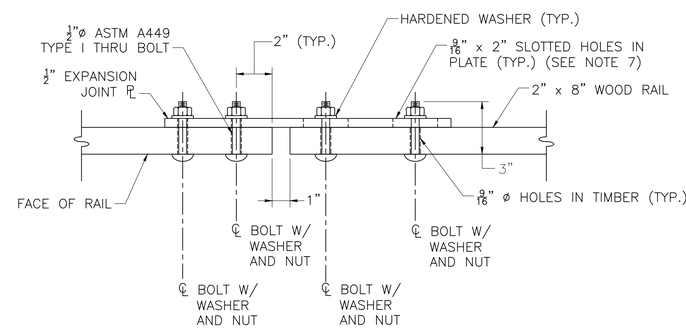
ANCHOR PLATE
SCALE: 3"=1'-0"



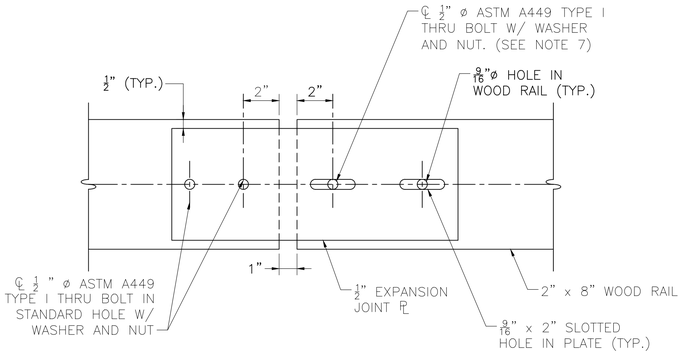
SIDE PLATE
SCALE: 3"=1'-0"



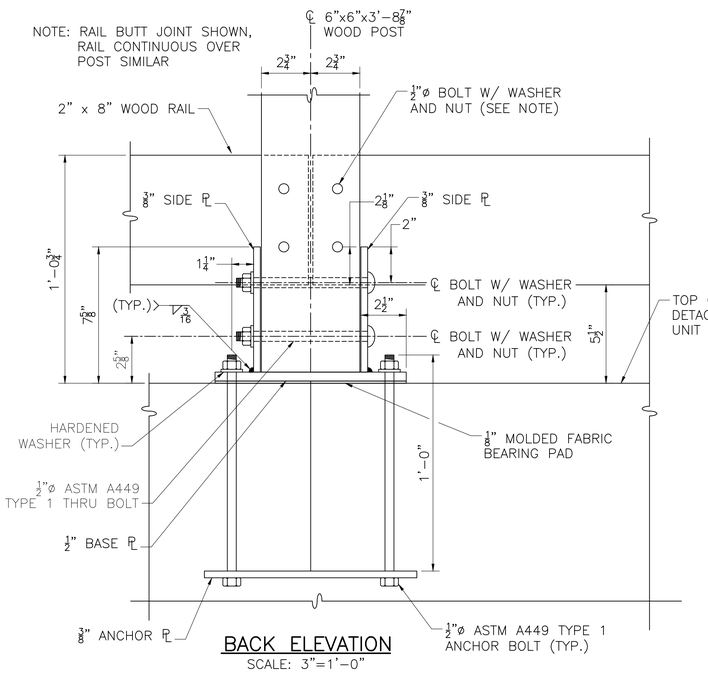
BASE PLATE
SCALE: 3"=1'-0"



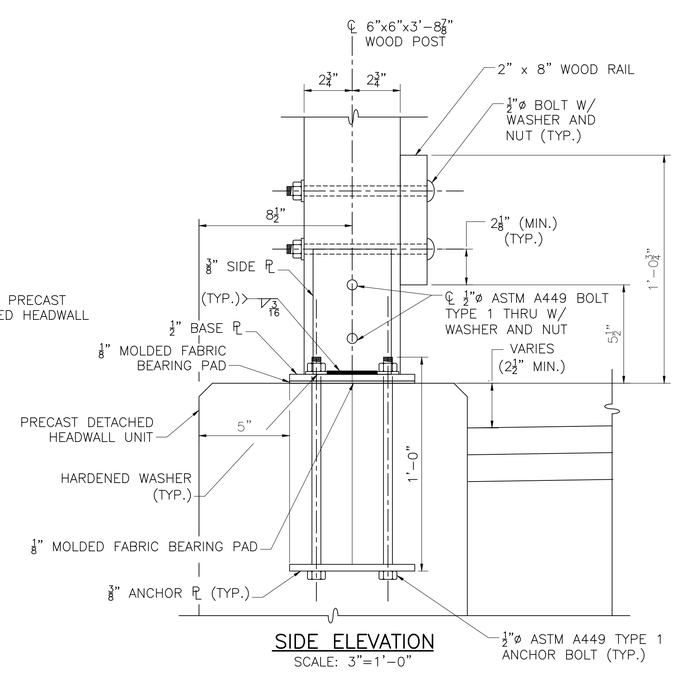
TOP EXPANSION JOINT VIEW
SCALE: 3"=1'-0"



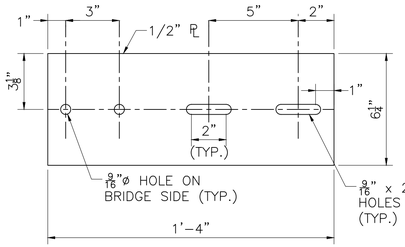
BACK EXPANSION JOINT ELEVATION
SCALE: 3"=1'-0"



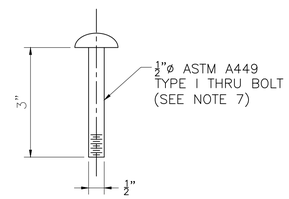
BACK ELEVATION
SCALE: 3"=1'-0"



SIDE ELEVATION
SCALE: 3"=1'-0"



EXPANSION JOINT PLATE
SCALE: 3"=1'-0"



EXPANSION JOINT BOLTS
SCALE: 6"=1'-0"

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

608164_BR10(S-31-013)(RAIL).DWG Plotted on 22-Dec-2021 11:46 AM
2nd Structural Submittal (S2) 10-January-2022

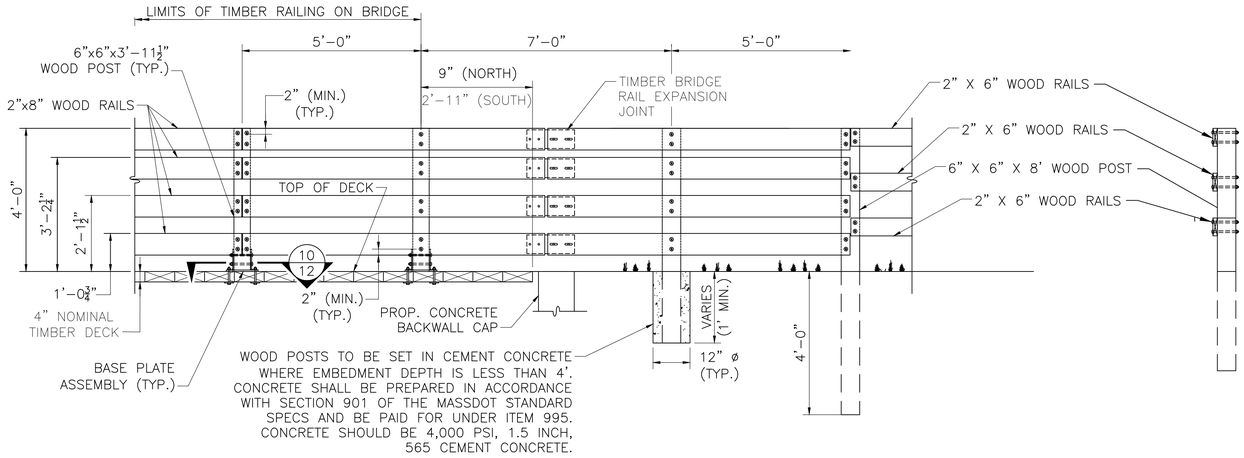
SUDBURY
BRUCE FREEMAN RAIL TRAIL OVER HOP BROOK

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	231	316
PROJECT FILE NO.	608164		

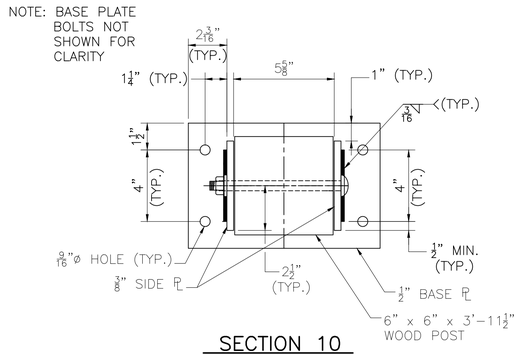
TIMBER BRIDGE RAIL DETAILS

RAILING NOTES:

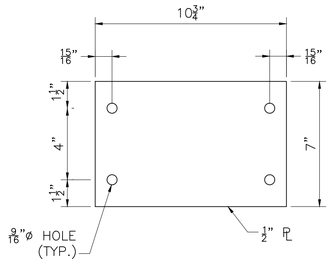
1. RAIL CONNECTION PLATES AND RAIL EXPANSION JOINT PLATES SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M270 GRADE 50.
2. ALL STEEL PLATES AND FASTENERS SHALL BE GALVANIZED.
3. THE NUT SECURING THE POST BASE PLATE TO THE TIMBER DECK SHALL BE TIGHTENED TO A SNUG FIT AND GIVEN AN ADDITIONAL $\frac{1}{8}$ TURN AFTER STEEL IS IN PLACE.
4. CONNECTION BOLTS SHALL BE ASTM A325 TYPE 1.
5. ℄ RAIL POSTS SHALL NOT FALL WITHIN 2" OF EDGE OF PLANK. ADJUST RAIL SPACING TO BE NOT MORE THAN 5'–0" SPACING ON BRIDGE TO ACCOMMODATE 2" EDGE DISTANCE LIMIT. HOLD 7' SPACING BETWEEN LAST POST ON THE BRIDGE AND FIRST POST OFF THE BRIDGE.
6. ALL WOOD RAILS SHALL BE CONNECTED TO A MINIMUM OF TWO WOOD POSTS.
7. BOLTS IN SLOTTED HOLES SHALL UTILIZED LOCK NUTS AND BE FINGER TIGHT TO BE ALLOW MOVEMENT BETWEEN STEEL PLATE AND TIMBER RAIL.



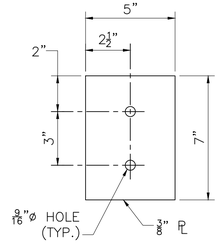
TIMBER BRIDGE RAIL ELEVATION
SCALE: 1/2"=1'–0"



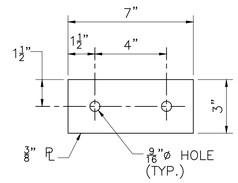
SECTION 10
SCALE: 3"=1'–0"



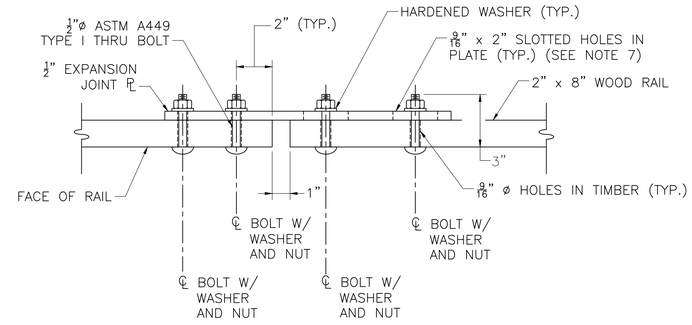
BASE PLATE
SCALE: 3"=1'–0"



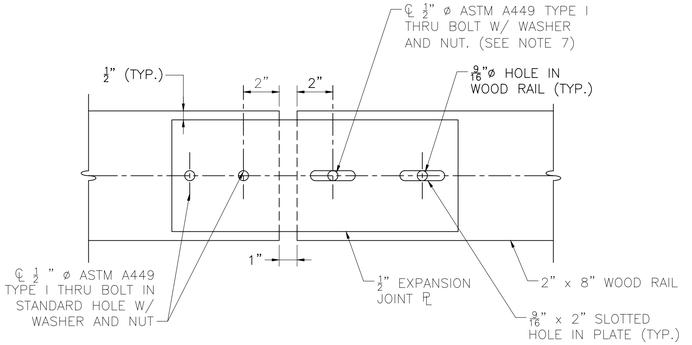
SIDE PLATE
SCALE: 3"=1'–0"



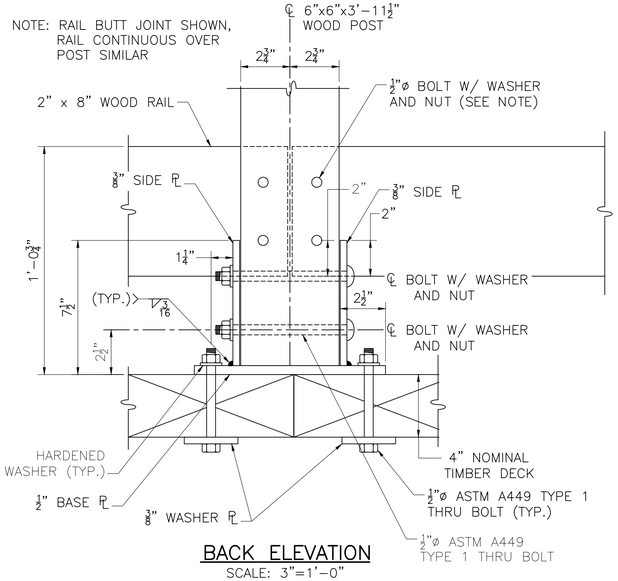
WASHER PLATE
SCALE: 3"=1'–0"



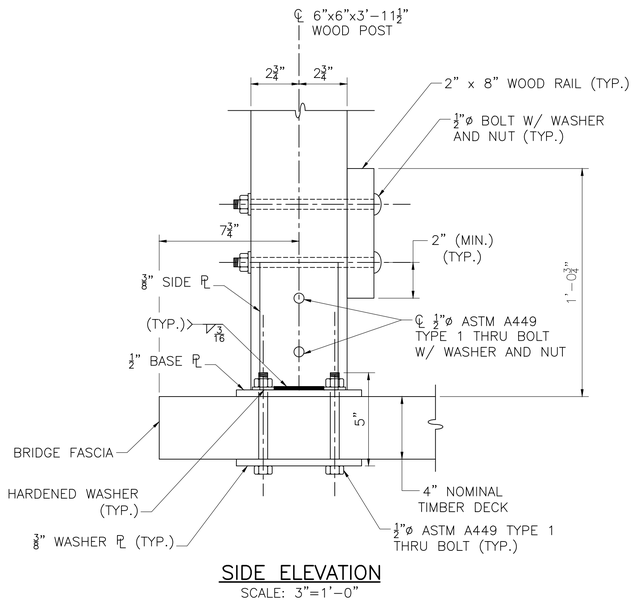
TOP EXPANSION JOINT VIEW
SCALE: 3"=1'–0"



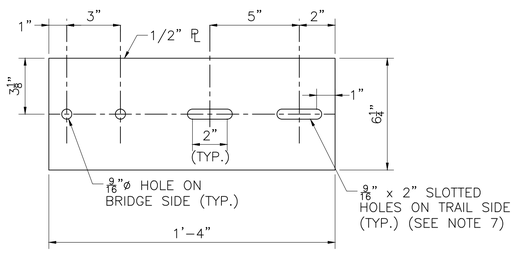
BACK EXPANSION JOINT ELEVATION
SCALE: 3"=1'–0"



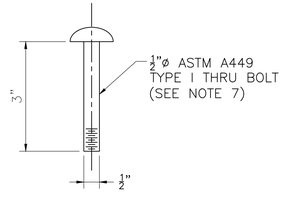
BACK ELEVATION
SCALE: 3"=1'–0"



SIDE ELEVATION
SCALE: 3"=1'–0"



EXPANSION JOINT PLATE
SCALE: 3"=1'–0"



EXPANSION JOINT BOLTS
SCALE: 6"=1'–0"

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

608164_BR14(S-31-007)(RAIL).DWG Plotted on 22-Dec-2021 11:56 AM

2nd Structural Submittal (S2) 10-January-2022

SUDBURY
BRUCE FREEMAN RAIL TRAIL

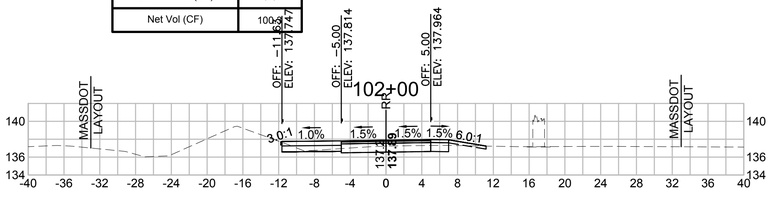
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	242	316
PROJECT FILE NO. 608164			

CROSS SECTIONS

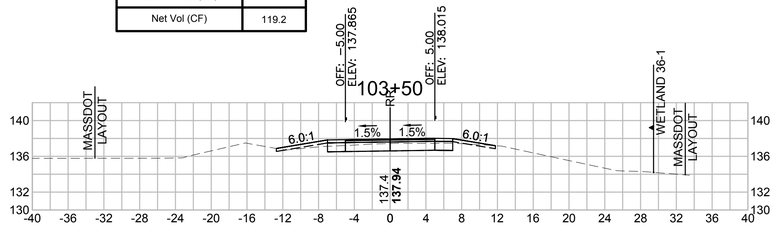
22-Dec-2021

608164_XSEC(CROSS SECTION LAYOUTS).DWG

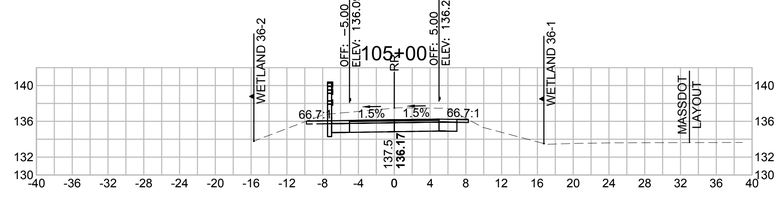
Total Volume at Station 102+00.00	
Cut Area (SF)	9.488
Fill Area (SF)	0.350
Cut Vol (CF)	37.071
Fill Vol (CF)	0.4
Cum Cut Vol (CF)	100.898
Cum Fill Vol (CF)	0.6
Net Vol (CF)	100.5



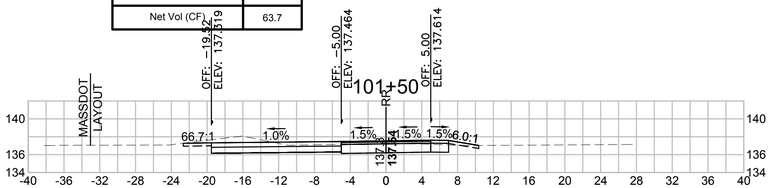
Total Volume at Station 103+50.00	
Cut Area (SF)	11.445
Fill Area (SF)	0.994
Cut Vol (CF)	13.330
Fill Vol (CF)	5.7
Cum Cut Vol (CF)	137.088
Cum Fill Vol (CF)	17.9
Net Vol (CF)	119.2



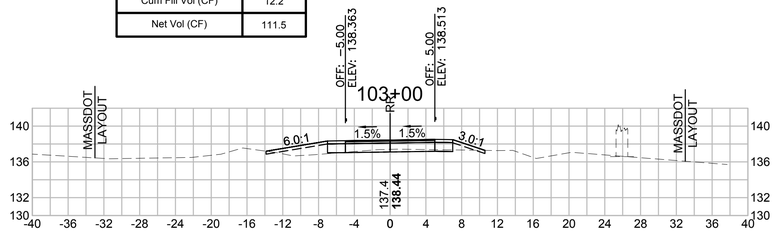
Total Volume at Station 105+00.00	
Cut Area (SF)	37.599
Fill Area (SF)	0.000
Cut Vol (CF)	64.912
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	270.355
Cum Fill Vol (CF)	20.5
Net Vol (CF)	249.9



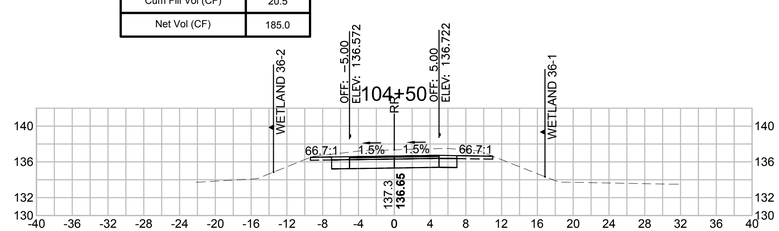
Total Volume at Station 101+50.00	
Cut Area (SF)	30.547
Fill Area (SF)	0.131
Cut Vol (CF)	46.057
Fill Vol (CF)	0.1
Cum Cut Vol (CF)	63.828
Cum Fill Vol (CF)	0.1
Net Vol (CF)	63.7



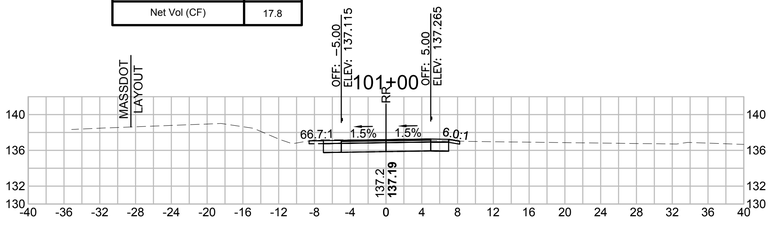
Total Volume at Station 103+00.00	
Cut Area (SF)	2.951
Fill Area (SF)	5.186
Cut Vol (CF)	8.405
Fill Vol (CF)	8.1
Cum Cut Vol (CF)	123.759
Cum Fill Vol (CF)	12.2
Net Vol (CF)	111.5



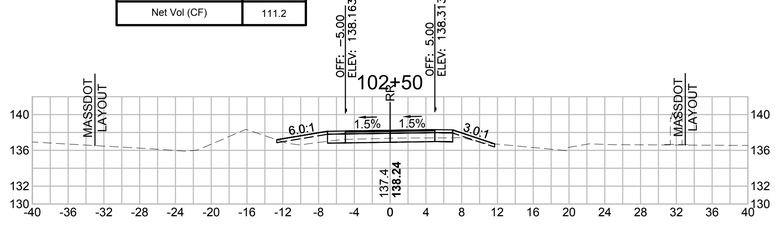
Total Volume at Station 104+50.00	
Cut Area (SF)	32.506
Fill Area (SF)	0.000
Cut Vol (CF)	43.929
Fill Vol (CF)	0.8
Cum Cut Vol (CF)	205.443
Cum Fill Vol (CF)	20.5
Net Vol (CF)	185.0



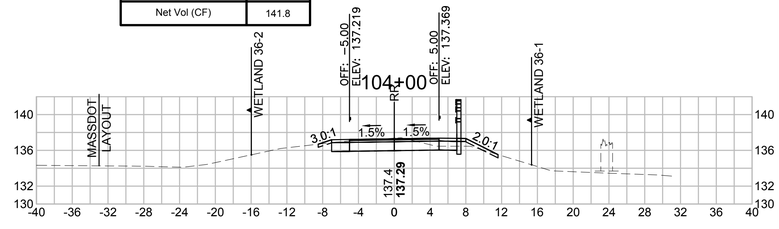
Total Volume at Station 101+00.00	
Cut Area (SF)	19.193
Fill Area (SF)	0.000
Cut Vol (CF)	17.772
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	17.771
Cum Fill Vol (CF)	0.0
Net Vol (CF)	17.8



Total Volume at Station 102+50.00	
Cut Area (SF)	6.126
Fill Area (SF)	3.521
Cut Vol (CF)	14.458
Fill Vol (CF)	3.6
Cum Cut Vol (CF)	115.355
Cum Fill Vol (CF)	4.2
Net Vol (CF)	111.2



Total Volume at Station 104+00.00	
Cut Area (SF)	14.937
Fill Area (SF)	0.878
Cut Vol (CF)	24.428
Fill Vol (CF)	1.7
Cum Cut Vol (CF)	161.515
Cum Fill Vol (CF)	19.7
Net Vol (CF)	141.8



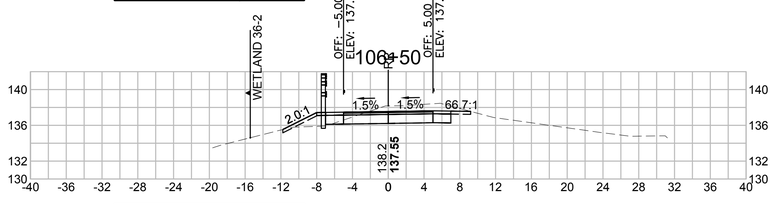
SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	243	316
PROJECT FILE NO. 608164			

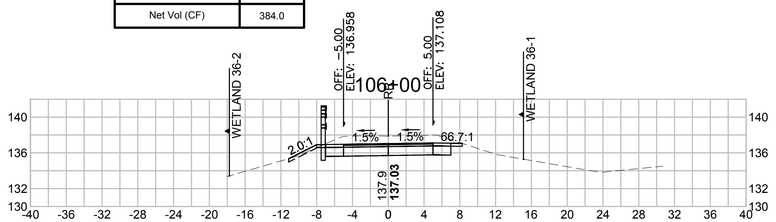
CROSS SECTIONS

608164_XSEC(CROSS SECTION LAYOUTS).DWG 22-Dec-2021

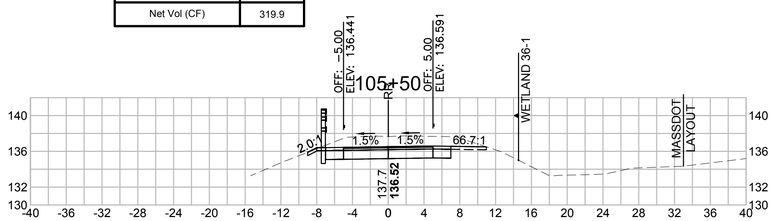
Total Volume at Station 106+50.00	
Cut Area (SF)	22.438
Fill Area (SF)	2.741
Cut Vol (CF)	49.607
Fill Vol (CF)	2.5
Cum Cut Vol (CF)	454.076
Cum Fill Vol (CF)	23.0
Net Vol (CF)	431.1



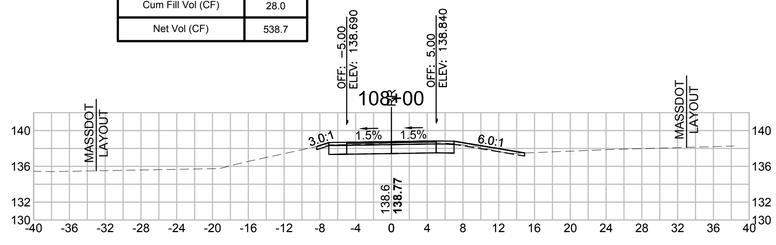
Total Volume at Station 106+00.00	
Cut Area (SF)	31.138
Fill Area (SF)	0.000
Cut Vol (CF)	64.066
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	404.469
Cum Fill Vol (CF)	20.5
Net Vol (CF)	384.0



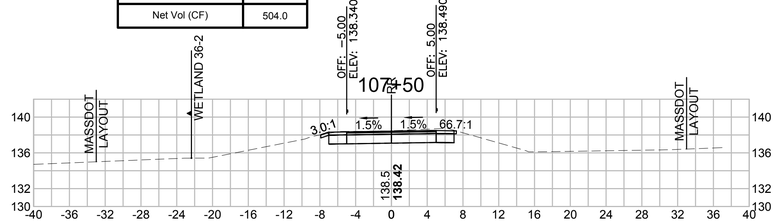
Total Volume at Station 105+50.00	
Cut Area (SF)	38.054
Fill Area (SF)	0.000
Cut Vol (CF)	70.049
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	340.403
Cum Fill Vol (CF)	20.5
Net Vol (CF)	319.9



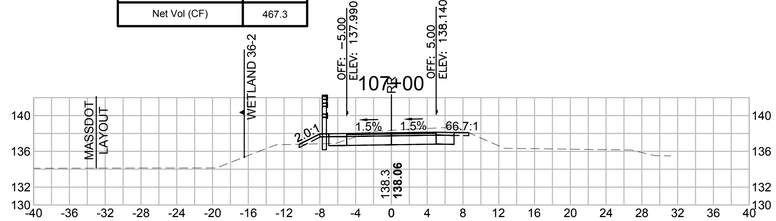
Total Volume at Station 108+00.00	
Cut Area (SF)	17.189
Fill Area (SF)	0.008
Cut Vol (CF)	34.694
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	566.731
Cum Fill Vol (CF)	28.0
Net Vol (CF)	538.7



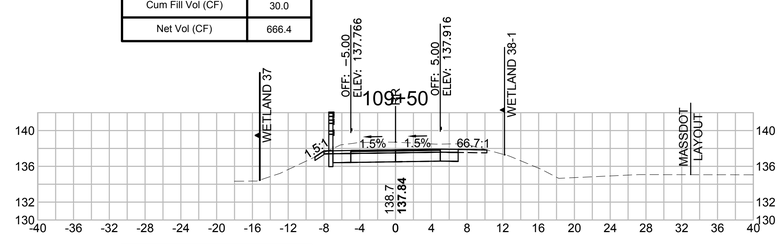
Total Volume at Station 107+50.00	
Cut Area (SF)	20.280
Fill Area (SF)	0.000
Cut Vol (CF)	37.982
Fill Vol (CF)	1.2
Cum Cut Vol (CF)	532.037
Cum Fill Vol (CF)	28.0
Net Vol (CF)	504.0



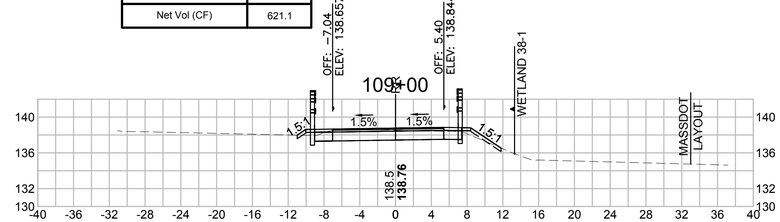
Total Volume at Station 107+00.00	
Cut Area (SF)	20.740
Fill Area (SF)	1.333
Cut Vol (CF)	39.980
Fill Vol (CF)	3.8
Cum Cut Vol (CF)	494.056
Cum Fill Vol (CF)	26.8
Net Vol (CF)	467.3



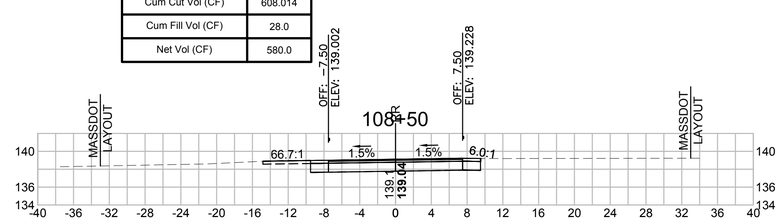
Total Volume at Station 109+50.00	
Cut Area (SF)	31.928
Fill Area (SF)	0.000
Cut Vol (CF)	46.306
Fill Vol (CF)	1.0
Cum Cut Vol (CF)	696.427
Cum Fill Vol (CF)	30.0
Net Vol (CF)	666.4



Total Volume at Station 109+00.00	
Cut Area (SF)	18.081
Fill Area (SF)	1.072
Cut Vol (CF)	42.109
Fill Vol (CF)	1.0
Cum Cut Vol (CF)	650.122
Cum Fill Vol (CF)	29.0
Net Vol (CF)	621.1



Total Volume at Station 108+50.00	
Cut Area (SF)	27.396
Fill Area (SF)	0.000
Cut Vol (CF)	41.283
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	608.014
Cum Fill Vol (CF)	28.0
Net Vol (CF)	580.0



SUDBURY
BRUCE FREEMAN RAIL TRAIL

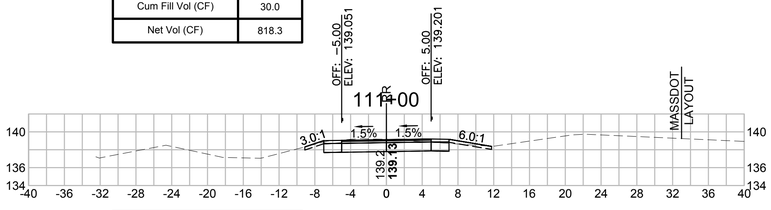
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	244	316
PROJECT FILE NO. 608164			

CROSS SECTIONS

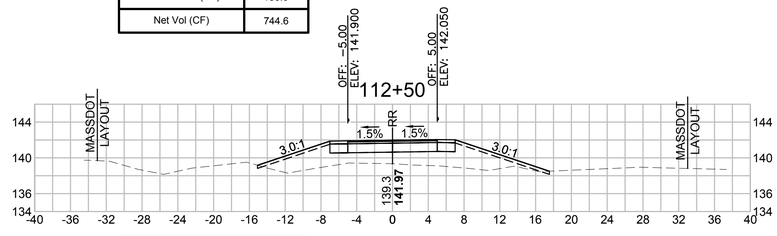
22-Dec-2021

608164_XSEC(CROSS SECTION LAYOUTS).DWG

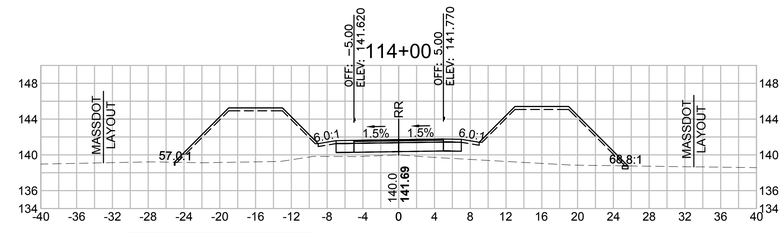
Total Volume at Station 111+00.00	
Cut Area (SF)	18.055
Fill Area (SF)	0.000
Cut Vol (CF)	40.035
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	848.287
Cum Fill Vol (CF)	30.0
Net Vol (CF)	818.3



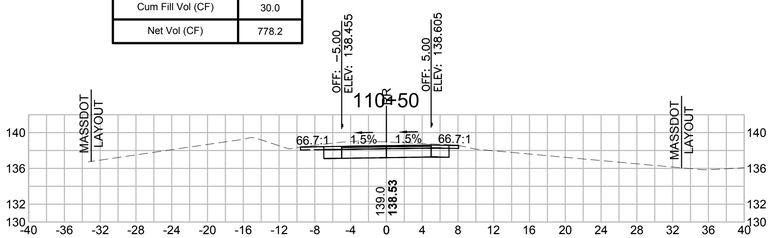
Total Volume at Station 112+50.00	
Cut Area (SF)	0.390
Fill Area (SF)	43.694
Cut Vol (CF)	0.714
Fill Vol (CF)	63.5
Cum Cut Vol (CF)	874.526
Cum Fill Vol (CF)	130.0
Net Vol (CF)	744.6



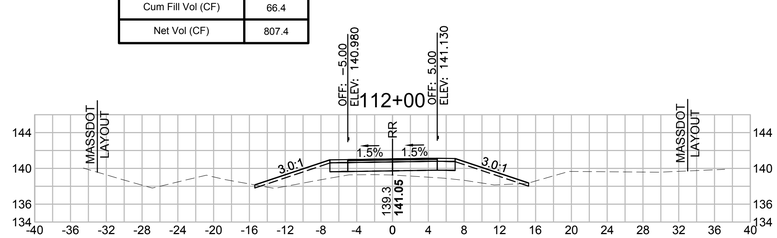
Total Volume at Station 114+00.00	
Cut Area (SF)	0.282
Fill Area (SF)	148.843
Cut Vol (CF)	0.599
Fill Vol (CF)	160.4
Cum Cut Vol (CF)	876.451
Cum Fill Vol (CF)	436.6
Net Vol (CF)	439.8



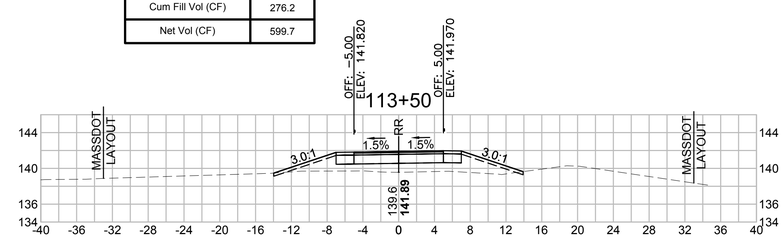
Total Volume at Station 110+50.00	
Cut Area (SF)	25.183
Fill Area (SF)	0.000
Cut Vol (CF)	52.790
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	808.252
Cum Fill Vol (CF)	30.0
Net Vol (CF)	778.2



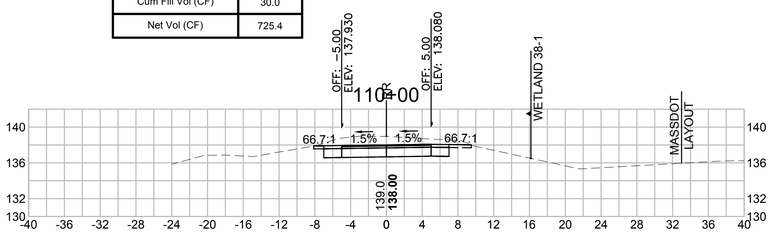
Total Volume at Station 112+00.00	
Cut Area (SF)	0.381
Fill Area (SF)	24.924
Cut Vol (CF)	4.581
Fill Vol (CF)	29.7
Cum Cut Vol (CF)	873.812
Cum Fill Vol (CF)	66.4
Net Vol (CF)	807.4



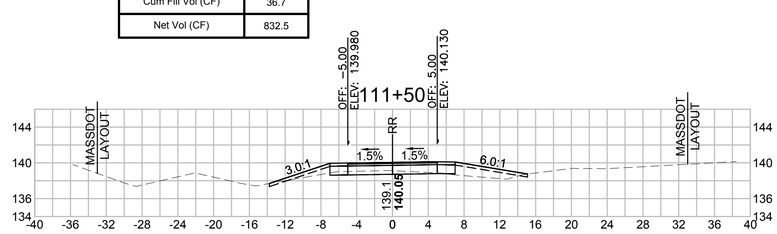
Total Volume at Station 113+50.00	
Cut Area (SF)	0.364
Fill Area (SF)	24.397
Cut Vol (CF)	0.652
Fill Vol (CF)	64.2
Cum Cut Vol (CF)	875.853
Cum Fill Vol (CF)	276.2
Net Vol (CF)	599.7



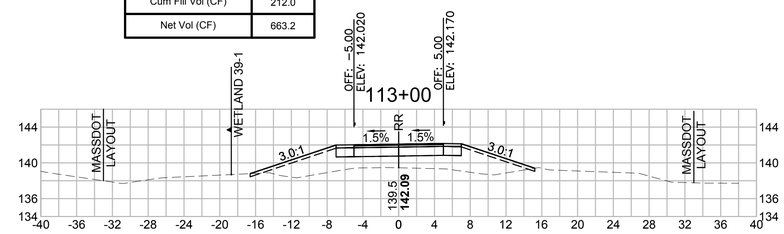
Total Volume at Station 110+00.00	
Cut Area (SF)	31.830
Fill Area (SF)	0.000
Cut Vol (CF)	59.036
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	755.462
Cum Fill Vol (CF)	30.0
Net Vol (CF)	725.4



Total Volume at Station 111+50.00	
Cut Area (SF)	4.565
Fill Area (SF)	7.194
Cut Vol (CF)	20.945
Fill Vol (CF)	6.7
Cum Cut Vol (CF)	869.232
Cum Fill Vol (CF)	36.7
Net Vol (CF)	832.5



Total Volume at Station 113+00.00	
Cut Area (SF)	0.340
Fill Area (SF)	44.923
Cut Vol (CF)	0.676
Fill Vol (CF)	82.1
Cum Cut Vol (CF)	875.201
Cum Fill Vol (CF)	212.0
Net Vol (CF)	663.2



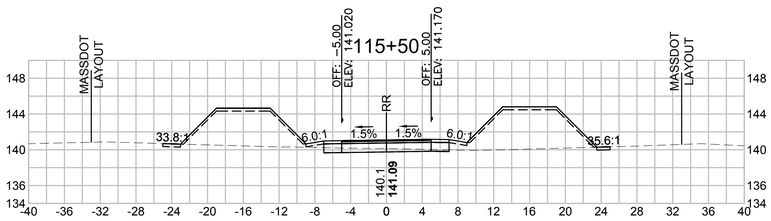
SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	245	316
PROJECT FILE NO. 608164			

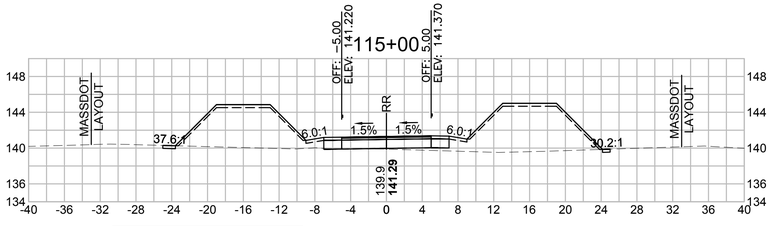
CROSS SECTIONS

608164_XSEC(CROSS SECTION LAYOUTS).DWG 22-Dec-2021

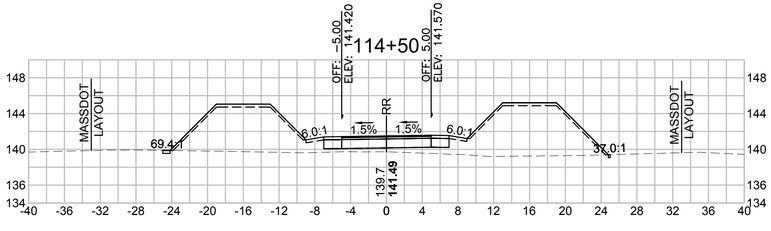
Total Volume at Station 115+50.00	
Cut Area (SF)	6.410
Fill Area (SF)	62.442
Cut Vol (CF)	6.873
Fill Vol (CF)	157.1
Cum Cut Vol (CF)	885.341
Cum Fill Vol (CF)	1072.8
Net Vol (CF)	-187.5



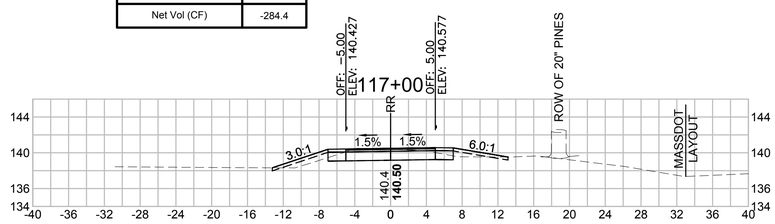
Total Volume at Station 115+00.00	
Cut Area (SF)	1.012
Fill Area (SF)	107.174
Cut Vol (CF)	1.347
Fill Vol (CF)	220.3
Cum Cut Vol (CF)	878.468
Cum Fill Vol (CF)	915.8
Net Vol (CF)	-37.3



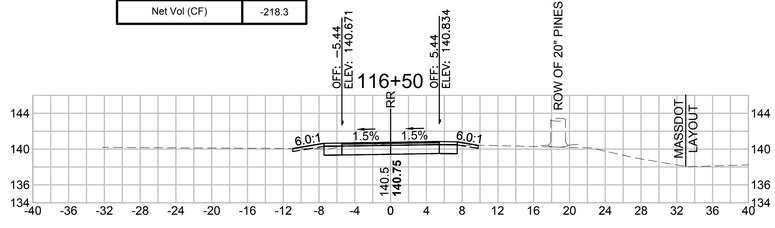
Total Volume at Station 114+50.00	
Cut Area (SF)	0.442
Fill Area (SF)	130.746
Cut Vol (CF)	0.671
Fill Vol (CF)	258.9
Cum Cut Vol (CF)	877.122
Cum Fill Vol (CF)	695.5
Net Vol (CF)	181.6



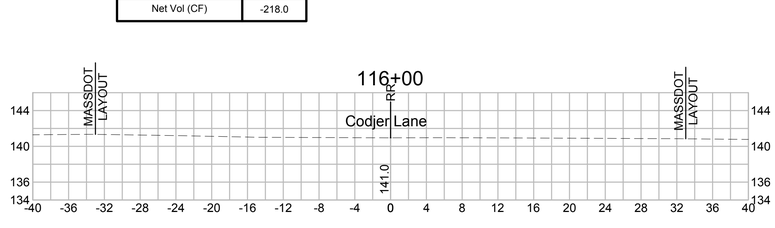
Total Volume at Station 117+00.00	
Cut Area (SF)	14.722
Fill Area (SF)	62.885
Cut Vol (CF)	27.869
Fill Vol (CF)	94.0
Cum Cut Vol (CF)	976.067
Cum Fill Vol (CF)	1260.5
Net Vol (CF)	-284.4



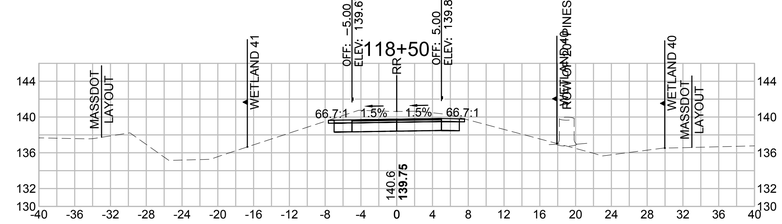
Total Volume at Station 116+50.00	
Cut Area (SF)	15.376
Fill Area (SF)	38.671
Cut Vol (CF)	35.580
Fill Vol (CF)	35.8
Cum Cut Vol (CF)	948.198
Cum Fill Vol (CF)	1166.5
Net Vol (CF)	-218.3



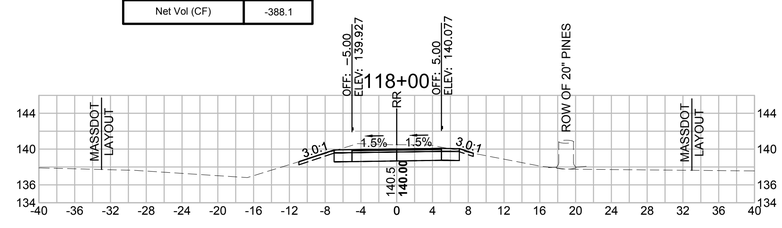
Total Volume at Station 116+00.00	
Cut Area (SF)	23.050
Fill Area (SF)	0.000
Cut Vol (CF)	27.278
Fill Vol (CF)	57.8
Cum Cut Vol (CF)	912.618
Cum Fill Vol (CF)	1130.6
Net Vol (CF)	-218.0



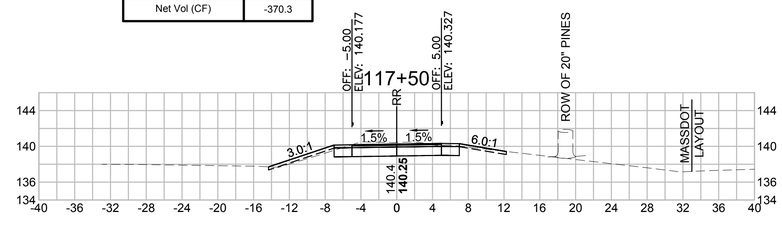
Total Volume at Station 118+50.00	
Cut Area (SF)	29.627
Fill Area (SF)	0.000
Cut Vol (CF)	50.928
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	1099.492
Cum Fill Vol (CF)	1436.6
Net Vol (CF)	-337.1



Total Volume at Station 118+00.00	
Cut Area (SF)	25.374
Fill Area (SF)	0.000
Cut Vol (CF)	41.181
Fill Vol (CF)	59.0
Cum Cut Vol (CF)	1048.565
Cum Fill Vol (CF)	1436.6
Net Vol (CF)	-388.1



Total Volume at Station 117+50.00	
Cut Area (SF)	19.101
Fill Area (SF)	63.669
Cut Vol (CF)	31.318
Fill Vol (CF)	117.2
Cum Cut Vol (CF)	1007.384
Cum Fill Vol (CF)	1377.7
Net Vol (CF)	-370.3



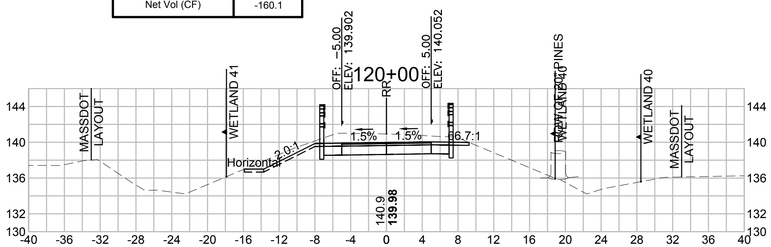
SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	246	316
PROJECT FILE NO. 608164			

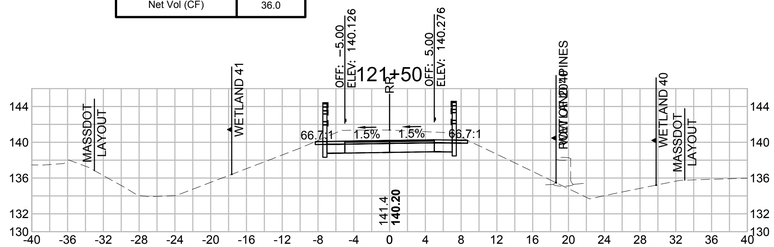
CROSS SECTIONS

608164_XSEC(CROSS SECTION LAYOUTS).DWG 22-Dec-2021

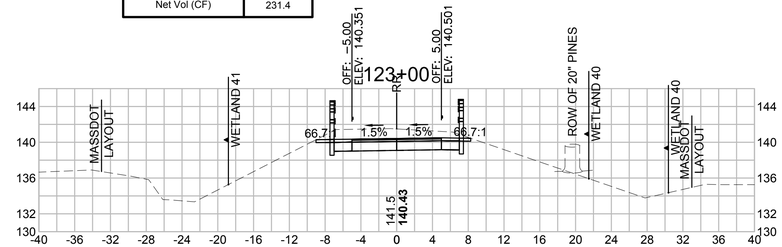
Total Volume at Station 120+00.00	
Cut Area (SF)	35.161
Fill Area (SF)	0.000
Cut Vol (CF)	63.024
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	1276.482
Cum Fill Vol (CF)	1436.6
Net Vol (CF)	-160.1



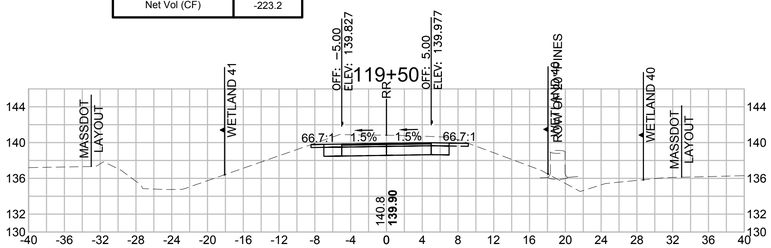
Total Volume at Station 121+50.00	
Cut Area (SF)	35.322
Fill Area (SF)	0.000
Cut Vol (CF)	65.465
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	1472.639
Cum Fill Vol (CF)	1436.6
Net Vol (CF)	36.0



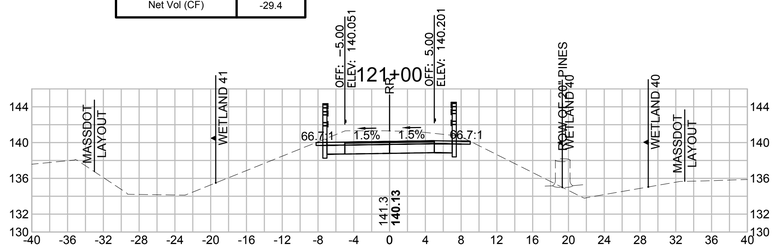
Total Volume at Station 123+00.00	
Cut Area (SF)	34.476
Fill Area (SF)	0.000
Cut Vol (CF)	64.981
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	1667.972
Cum Fill Vol (CF)	1436.6
Net Vol (CF)	231.4



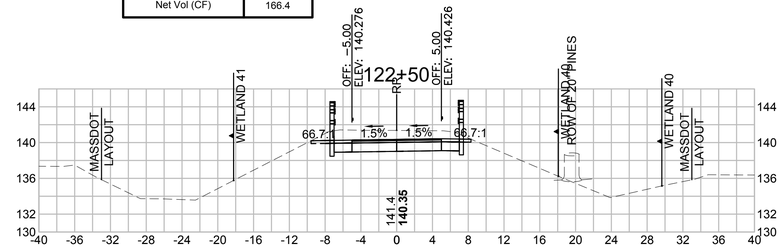
Total Volume at Station 119+50.00	
Cut Area (SF)	32.904
Fill Area (SF)	0.000
Cut Vol (CF)	58.501
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	1213.459
Cum Fill Vol (CF)	1436.6
Net Vol (CF)	-223.2



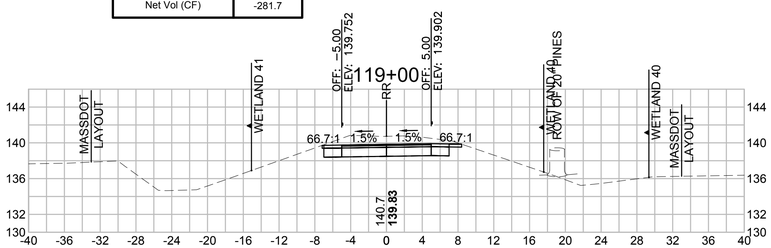
Total Volume at Station 121+00.00	
Cut Area (SF)	35.379
Fill Area (SF)	0.000
Cut Vol (CF)	65.448
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	1407.175
Cum Fill Vol (CF)	1436.6
Net Vol (CF)	-29.4



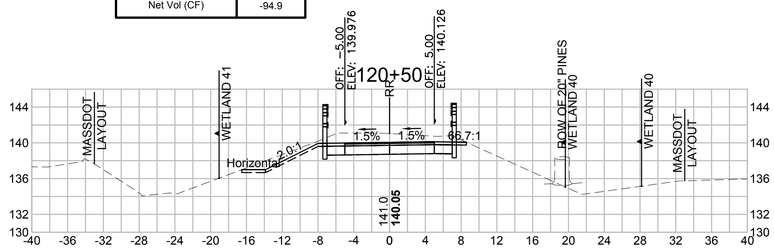
Total Volume at Station 122+50.00	
Cut Area (SF)	35.703
Fill Area (SF)	0.000
Cut Vol (CF)	65.353
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	1602.992
Cum Fill Vol (CF)	1436.6
Net Vol (CF)	166.4



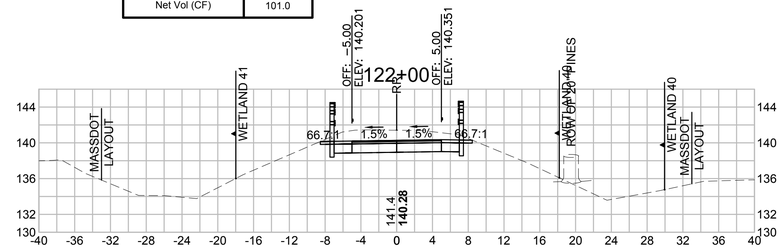
Total Volume at Station 119+00.00	
Cut Area (SF)	30.276
Fill Area (SF)	0.000
Cut Vol (CF)	55.467
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	1154.958
Cum Fill Vol (CF)	1436.6
Net Vol (CF)	-281.7



Total Volume at Station 120+50.00	
Cut Area (SF)	35.305
Fill Area (SF)	0.000
Cut Vol (CF)	65.246
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	1341.728
Cum Fill Vol (CF)	1436.6
Net Vol (CF)	-94.9



Total Volume at Station 122+00.00	
Cut Area (SF)	34.878
Fill Area (SF)	0.000
Cut Vol (CF)	65.001
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	1537.639
Cum Fill Vol (CF)	1436.6
Net Vol (CF)	101.0



SUDBURY
BRUCE FREEMAN RAIL TRAIL

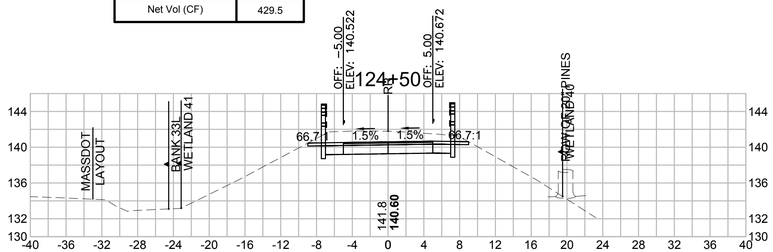
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	247	316
PROJECT FILE NO. 608164			

CROSS SECTIONS

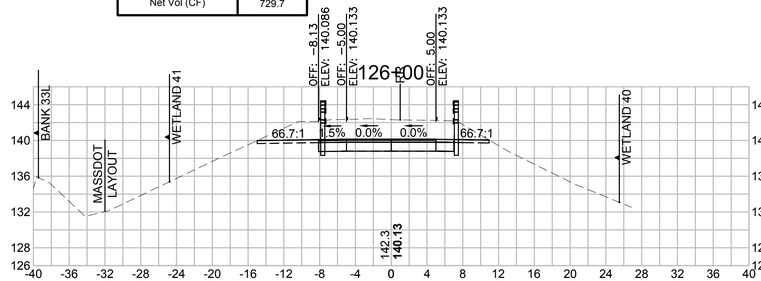
22-Dec-2021

608164_XSEC(CROSS SECTION LAYOUTS).DWG

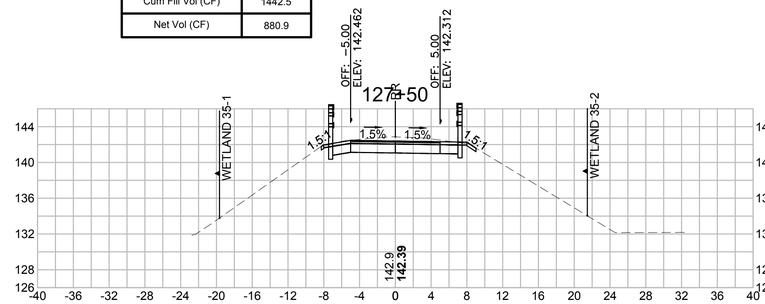
Total Volume at Station 124+50.00	
Cut Area (SF)	37.090
Fill Area (SF)	0.000
Cut Vol (CF)	68.327
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	1866.161
Cum Fill Vol (CF)	1436.6
Net Vol (CF)	429.5



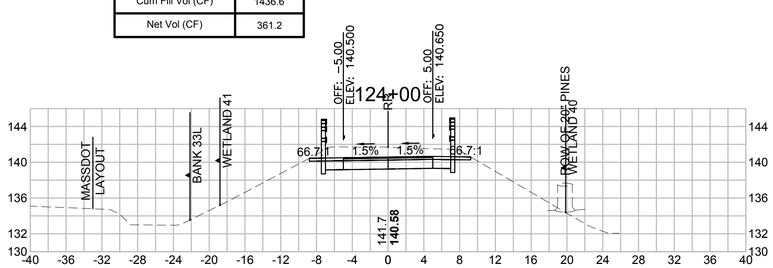
Total Volume at Station 126+00.00	
Cut Area (SF)	58.889
Fill Area (SF)	0.000
Cut Vol (CF)	111.503
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	2166.314
Cum Fill Vol (CF)	1436.6
Net Vol (CF)	729.7



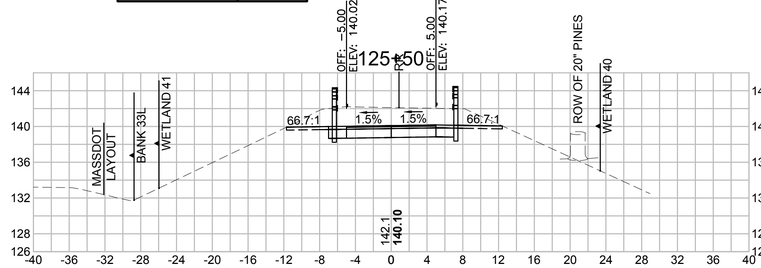
Total Volume at Station 127+50.00	
Cut Area (SF)	22.655
Fill Area (SF)	0.000
Cut Vol (CF)	46.169
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	2323.380
Cum Fill Vol (CF)	1442.5
Net Vol (CF)	880.9



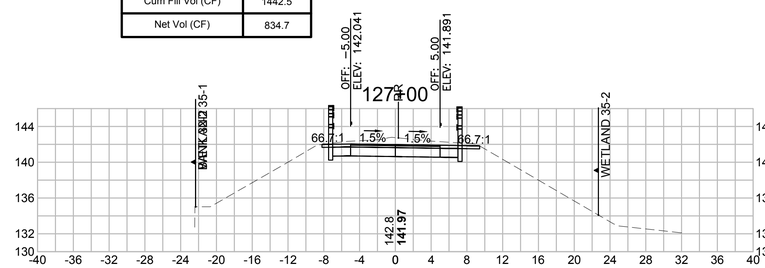
Total Volume at Station 124+00.00	
Cut Area (SF)	36.702
Fill Area (SF)	0.000
Cut Vol (CF)	65.962
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	1797.835
Cum Fill Vol (CF)	1436.6
Net Vol (CF)	361.2



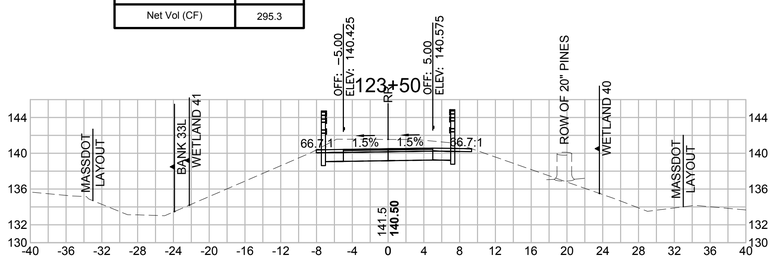
Total Volume at Station 125+50.00	
Cut Area (SF)	61.534
Fill Area (SF)	0.000
Cut Vol (CF)	105.642
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	2054.812
Cum Fill Vol (CF)	1436.6
Net Vol (CF)	618.2



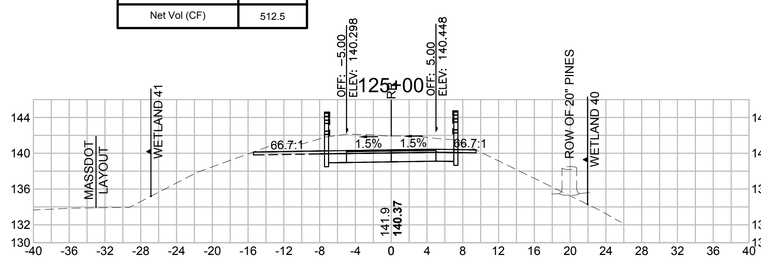
Total Volume at Station 127+00.00	
Cut Area (SF)	27.206
Fill Area (SF)	0.000
Cut Vol (CF)	40.781
Fill Vol (CF)	2.9
Cum Cut Vol (CF)	2277.211
Cum Fill Vol (CF)	1442.5
Net Vol (CF)	834.7



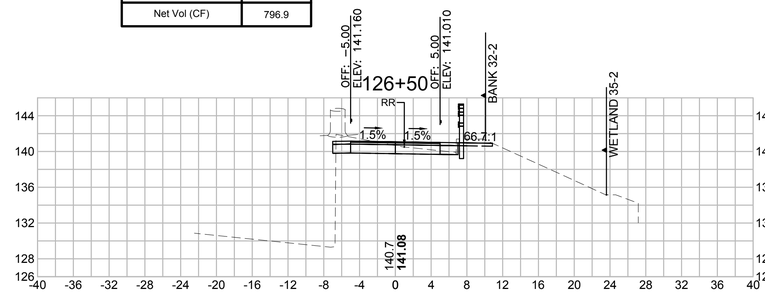
Total Volume at Station 123+50.00	
Cut Area (SF)	34.537
Fill Area (SF)	0.000
Cut Vol (CF)	63.901
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	1731.873
Cum Fill Vol (CF)	1436.6
Net Vol (CF)	295.3



Total Volume at Station 125+00.00	
Cut Area (SF)	52.560
Fill Area (SF)	0.000
Cut Vol (CF)	83.010
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	1949.170
Cum Fill Vol (CF)	1436.6
Net Vol (CF)	512.5



Total Volume at Station 126+50.00	
Cut Area (SF)	16.837
Fill Area (SF)	3.166
Cut Vol (CF)	70.117
Fill Vol (CF)	2.9
Cum Cut Vol (CF)	2236.430
Cum Fill Vol (CF)	1439.6
Net Vol (CF)	796.9



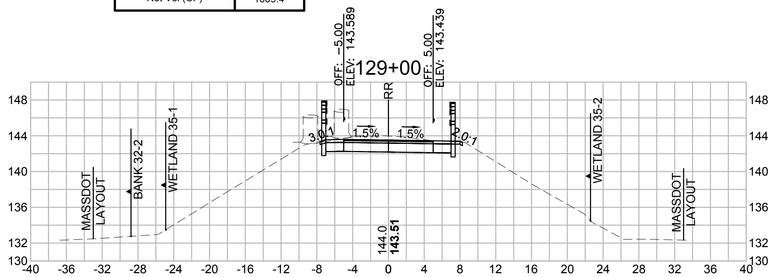
SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	248	316
PROJECT FILE NO. 608164			

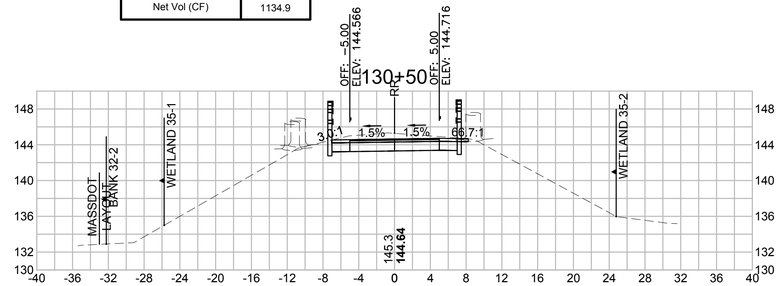
CROSS SECTIONS

608164_XSEC(CROSS SECTION LAYOUTS).DWG 22-Dec-2021

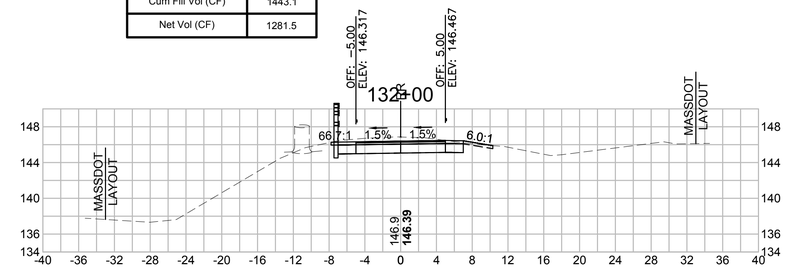
Total Volume at Station 129+00.00	
Cut Area (SF)	22.380
Fill Area (SF)	0.000
Cut Vol (CF)	42.336
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	2451.904
Cum Fill Vol (CF)	1442.5
Net Vol (CF)	1009.4



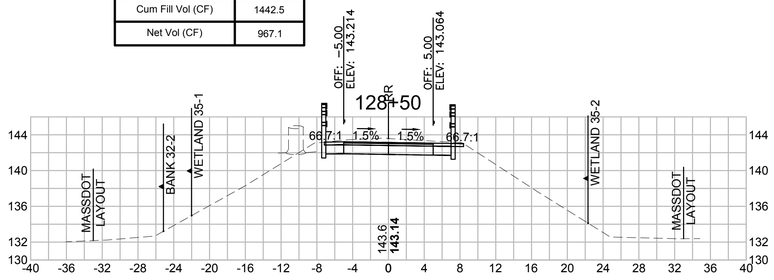
Total Volume at Station 130+50.00	
Cut Area (SF)	24.796
Fill Area (SF)	0.000
Cut Vol (CF)	43.308
Fill Vol (CF)	0.3
Cum Cut Vol (CF)	2578.048
Cum Fill Vol (CF)	1443.1
Net Vol (CF)	1134.9



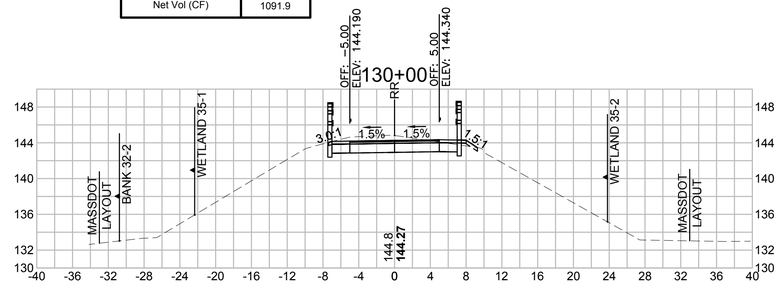
Total Volume at Station 132+00.00	
Cut Area (SF)	23.474
Fill Area (SF)	0.000
Cut Vol (CF)	47.577
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	2724.614
Cum Fill Vol (CF)	1443.1
Net Vol (CF)	1281.5



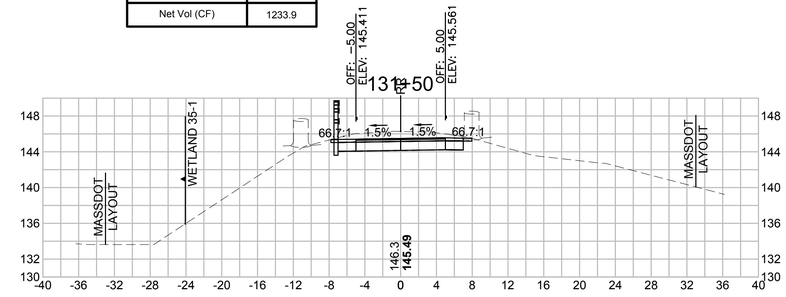
Total Volume at Station 128+50.00	
Cut Area (SF)	23.343
Fill Area (SF)	0.000
Cut Vol (CF)	43.413
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	2409.569
Cum Fill Vol (CF)	1442.5
Net Vol (CF)	967.1



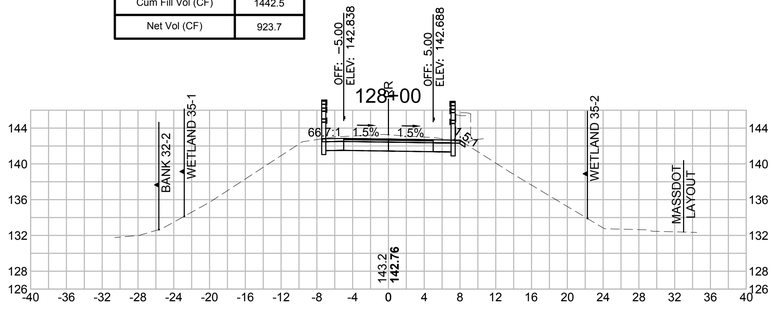
Total Volume at Station 130+00.00	
Cut Area (SF)	21.976
Fill Area (SF)	0.307
Cut Vol (CF)	41.232
Fill Vol (CF)	0.3
Cum Cut Vol (CF)	2534.740
Cum Fill Vol (CF)	1442.9
Net Vol (CF)	1091.9



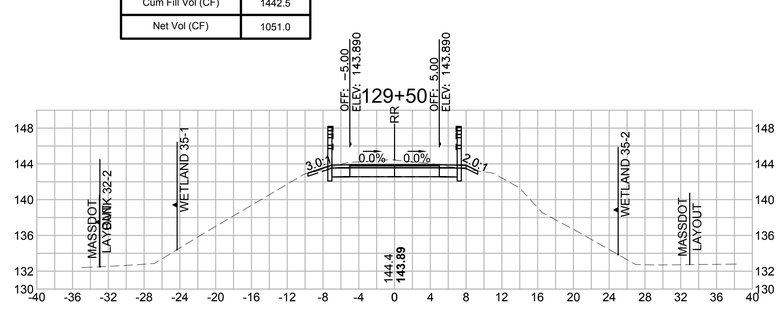
Total Volume at Station 131+50.00	
Cut Area (SF)	27.909
Fill Area (SF)	0.000
Cut Vol (CF)	50.937
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	2677.037
Cum Fill Vol (CF)	1443.1
Net Vol (CF)	1233.9



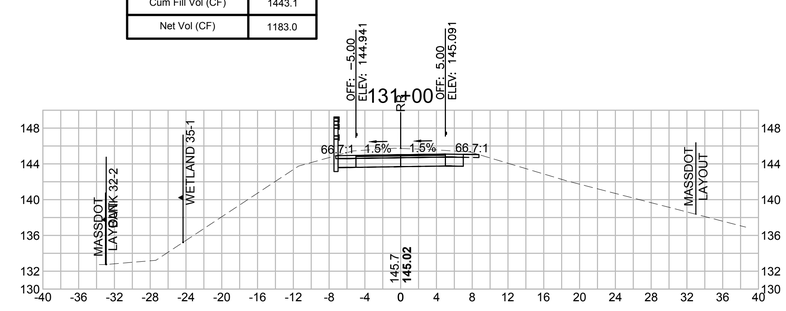
Total Volume at Station 128+00.00	
Cut Area (SF)	23.543
Fill Area (SF)	0.000
Cut Vol (CF)	42.777
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	2366.156
Cum Fill Vol (CF)	1442.5
Net Vol (CF)	923.7



Total Volume at Station 129+50.00	
Cut Area (SF)	22.554
Fill Area (SF)	0.046
Cut Vol (CF)	41.606
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	2493.509
Cum Fill Vol (CF)	1442.5
Net Vol (CF)	1051.0



Total Volume at Station 131+00.00	
Cut Area (SF)	27.102
Fill Area (SF)	0.000
Cut Vol (CF)	48.054
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	2626.101
Cum Fill Vol (CF)	1443.1
Net Vol (CF)	1183.0



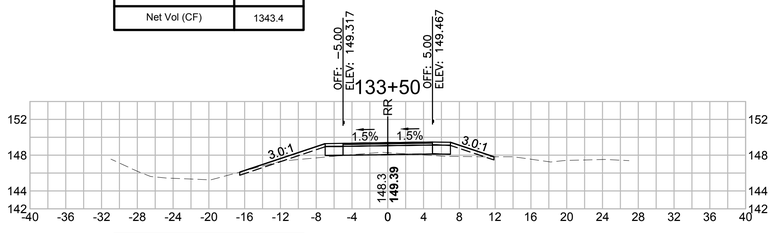
SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	249	316
PROJECT FILE NO. 608164			

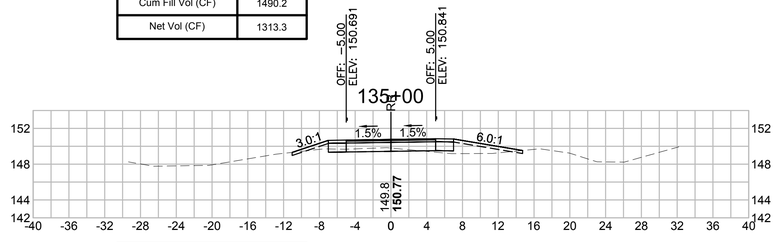
CROSS SECTIONS

608164_XSEC(CROSS SECTION LAYOUTS).DWG 22-Dec-2021

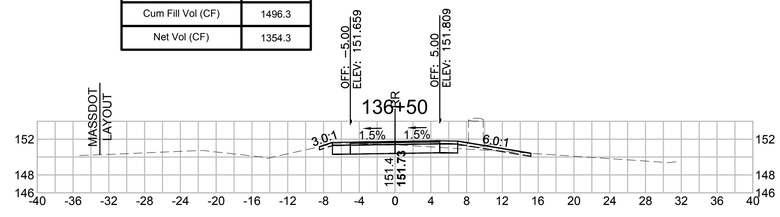
Total Volume at Station 133+50.00	
Cut Area (SF)	2.104
Fill Area (SF)	5.934
Cut Vol (CF)	10.399
Fill Vol (CF)	6.9
Cum Cut Vol (CF)	2795.223
Cum Fill Vol (CF)	1451.8
Net Vol (CF)	1343.4



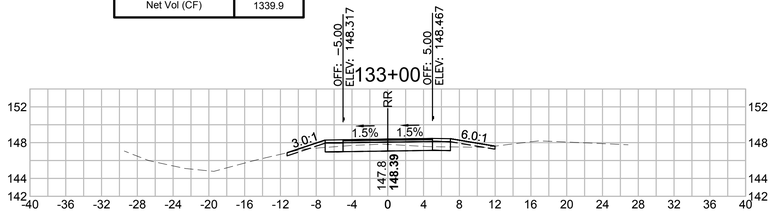
Total Volume at Station 135+00.00	
Cut Area (SF)	3.376
Fill Area (SF)	1.345
Cut Vol (CF)	4.433
Fill Vol (CF)	4.9
Cum Cut Vol (CF)	2803.574
Cum Fill Vol (CF)	1490.2
Net Vol (CF)	1313.3



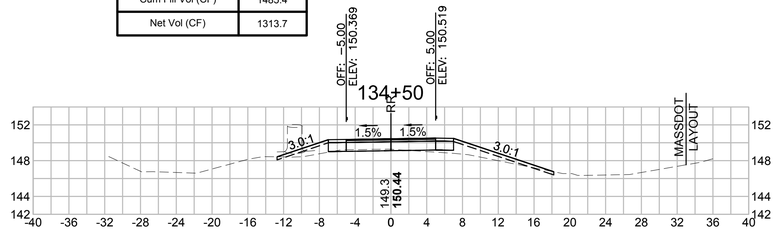
Total Volume at Station 136+50.00	
Cut Area (SF)	13.783
Fill Area (SF)	1.120
Cut Vol (CF)	21.161
Fill Vol (CF)	2.3
Cum Cut Vol (CF)	2850.628
Cum Fill Vol (CF)	1496.3
Net Vol (CF)	1354.3



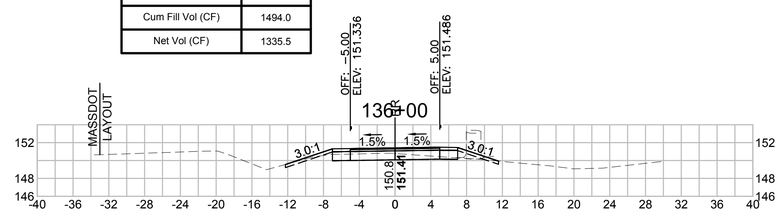
Total Volume at Station 133+00.00	
Cut Area (SF)	9.126
Fill Area (SF)	1.521
Cut Vol (CF)	23.463
Fill Vol (CF)	1.6
Cum Cut Vol (CF)	2784.824
Cum Fill Vol (CF)	1444.9
Net Vol (CF)	1339.9



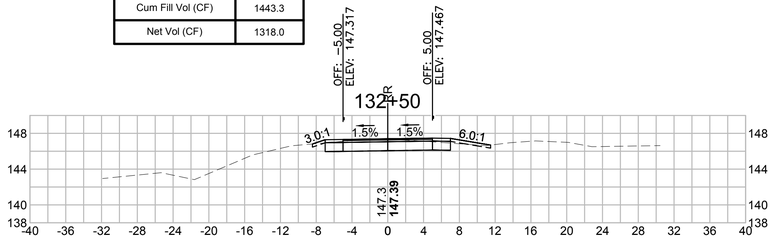
Total Volume at Station 134+50.00	
Cut Area (SF)	1.412
Fill Area (SF)	3.898
Cut Vol (CF)	1.639
Fill Vol (CF)	15.8
Cum Cut Vol (CF)	2799.141
Cum Fill Vol (CF)	1485.4
Net Vol (CF)	1313.7



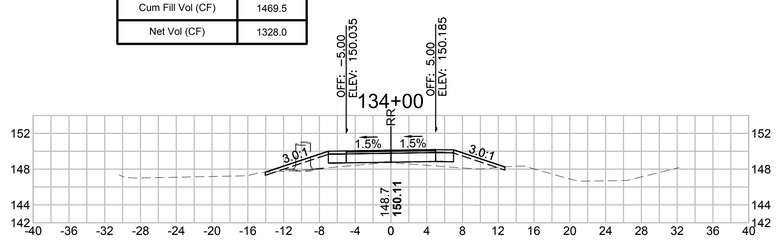
Total Volume at Station 136+00.00	
Cut Area (SF)	9.071
Fill Area (SF)	1.398
Cut Vol (CF)	15.584
Fill Vol (CF)	1.9
Cum Cut Vol (CF)	2829.467
Cum Fill Vol (CF)	1494.0
Net Vol (CF)	1335.5



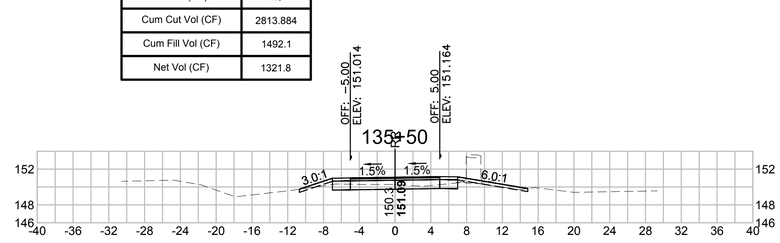
Total Volume at Station 132+50.00	
Cut Area (SF)	16.213
Fill Area (SF)	0.195
Cut Vol (CF)	36.748
Fill Vol (CF)	0.2
Cum Cut Vol (CF)	2761.361
Cum Fill Vol (CF)	1443.3
Net Vol (CF)	1318.0



Total Volume at Station 134+00.00	
Cut Area (SF)	0.358
Fill Area (SF)	13.218
Cut Vol (CF)	2.281
Fill Vol (CF)	17.7
Cum Cut Vol (CF)	2797.503
Cum Fill Vol (CF)	1469.5
Net Vol (CF)	1328.0



Total Volume at Station 135+50.00	
Cut Area (SF)	7.759
Fill Area (SF)	0.630
Cut Vol (CF)	10.311
Fill Vol (CF)	1.8
Cum Cut Vol (CF)	2813.884
Cum Fill Vol (CF)	1492.1
Net Vol (CF)	1321.8



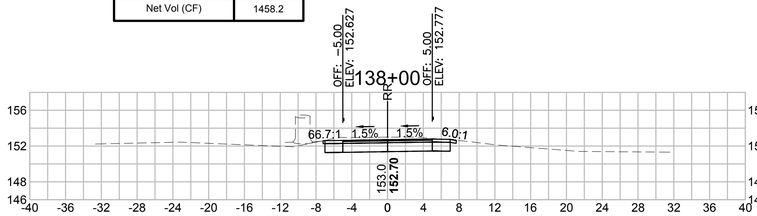
SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	250	316
PROJECT FILE NO. 608164			

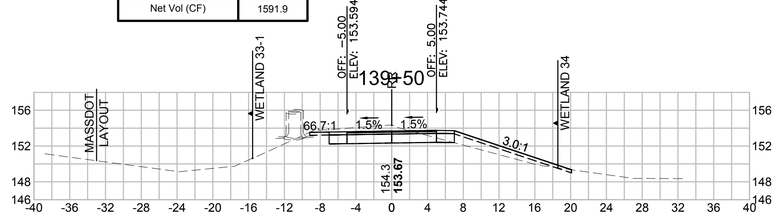
CROSS SECTIONS

608164_XSEC(CROSS SECTION LAYOUTS).DWG 22-Dec-2021

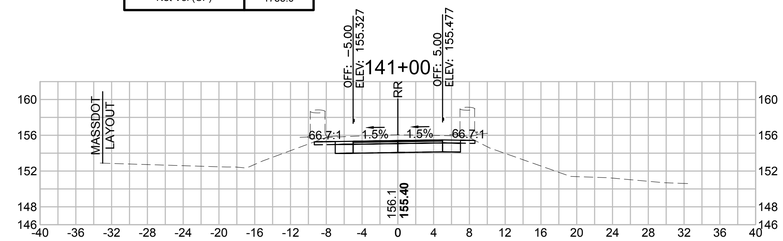
Total Volume at Station 138+00.00	
Cut Area (SF)	22.037
Fill Area (SF)	0.000
Cut Vol (CF)	39.805
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	2956.172
Cum Fill Vol (CF)	1498.0
Net Vol (CF)	1458.2



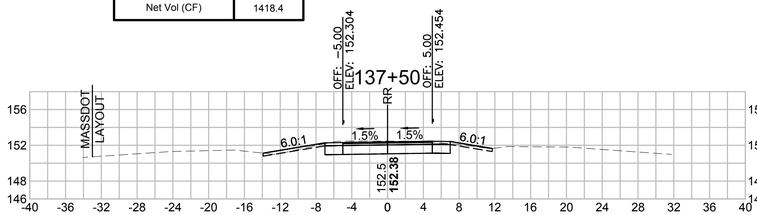
Total Volume at Station 139+50.00	
Cut Area (SF)	20.464
Fill Area (SF)	0.000
Cut Vol (CF)	43.359
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	3089.860
Cum Fill Vol (CF)	1498.0
Net Vol (CF)	1591.9



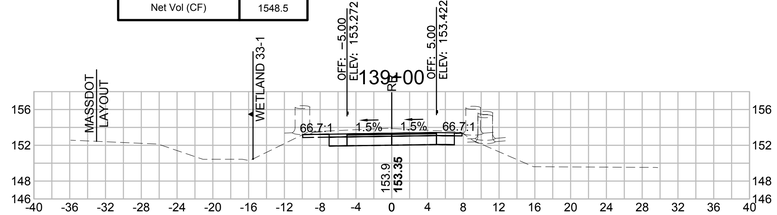
Total Volume at Station 141+00.00	
Cut Area (SF)	29.263
Fill Area (SF)	0.000
Cut Vol (CF)	58.810
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	3252.955
Cum Fill Vol (CF)	1498.0
Net Vol (CF)	1755.0



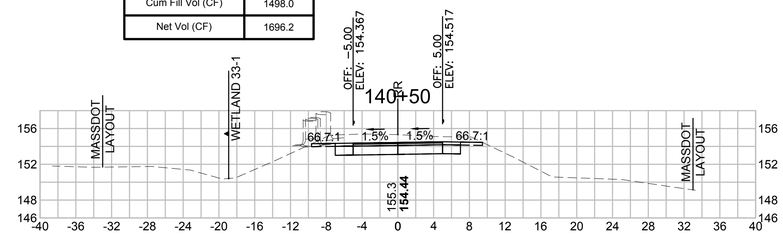
Total Volume at Station 137+50.00	
Cut Area (SF)	20.952
Fill Area (SF)	0.033
Cut Vol (CF)	36.189
Fill Vol (CF)	0.3
Cum Cut Vol (CF)	2916.368
Cum Fill Vol (CF)	1497.9
Net Vol (CF)	1418.4



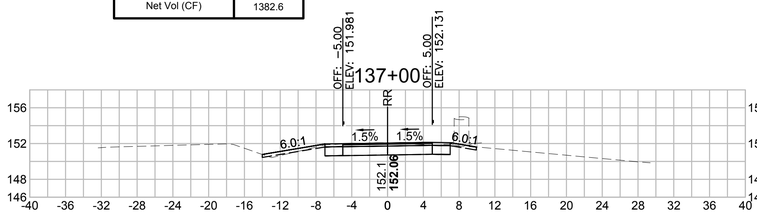
Total Volume at Station 139+00.00	
Cut Area (SF)	26.364
Fill Area (SF)	0.000
Cut Vol (CF)	47.168
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	3046.501
Cum Fill Vol (CF)	1498.0
Net Vol (CF)	1548.5



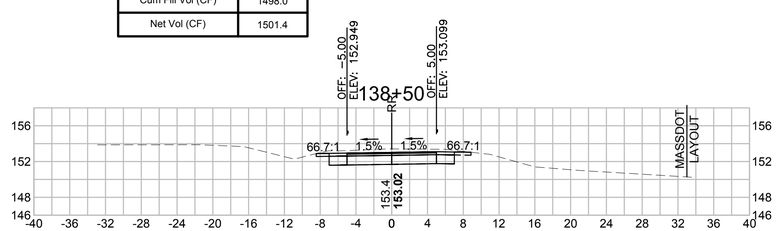
Total Volume at Station 140+50.00	
Cut Area (SF)	34.252
Fill Area (SF)	0.000
Cut Vol (CF)	58.527
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	3194.145
Cum Fill Vol (CF)	1498.0
Net Vol (CF)	1696.2



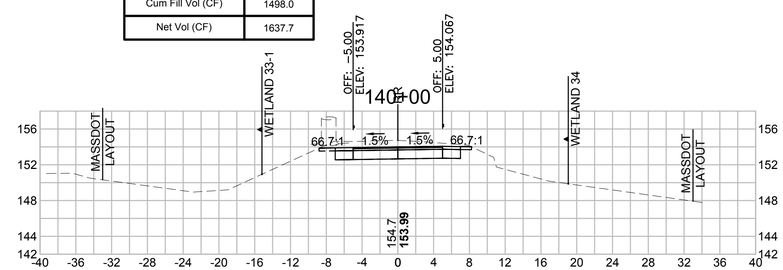
Total Volume at Station 137+00.00	
Cut Area (SF)	18.132
Fill Area (SF)	0.314
Cut Vol (CF)	29.552
Fill Vol (CF)	1.3
Cum Cut Vol (CF)	2880.179
Cum Fill Vol (CF)	1497.6
Net Vol (CF)	1382.6



Total Volume at Station 138+50.00	
Cut Area (SF)	24.577
Fill Area (SF)	0.000
Cut Vol (CF)	43.162
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	2999.334
Cum Fill Vol (CF)	1498.0
Net Vol (CF)	1501.4



Total Volume at Station 140+00.00	
Cut Area (SF)	28.956
Fill Area (SF)	0.000
Cut Vol (CF)	45.760
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	3135.619
Cum Fill Vol (CF)	1498.0
Net Vol (CF)	1637.7



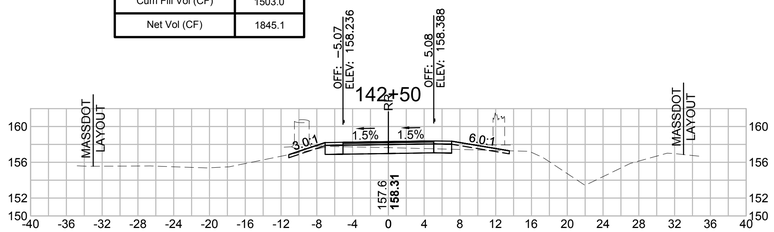
SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	251	316
PROJECT FILE NO. 608164			

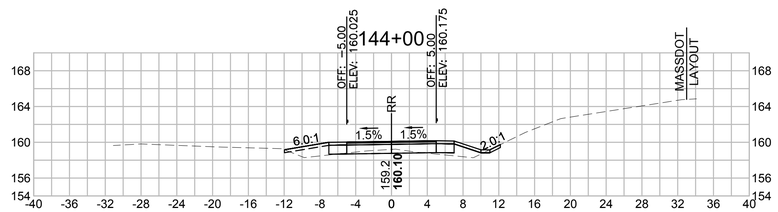
CROSS SECTIONS

608164_XSEC(CROSS SECTION LAYOUTS).DWG 22-Dec-2021

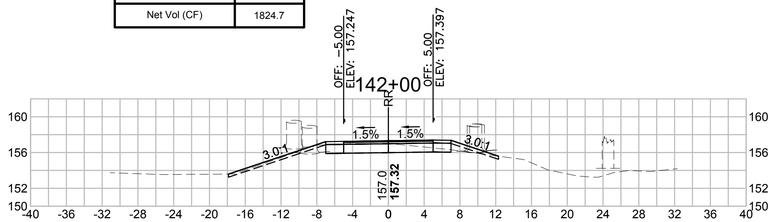
Total Volume at Station 142+50.00	
Cut Area (SF)	10.105
Fill Area (SF)	1.261
Cut Vol (CF)	22.725
Fill Vol (CF)	2.3
Cum Cut Vol (CF)	3348.100
Cum Fill Vol (CF)	1503.0
Net Vol (CF)	1845.1



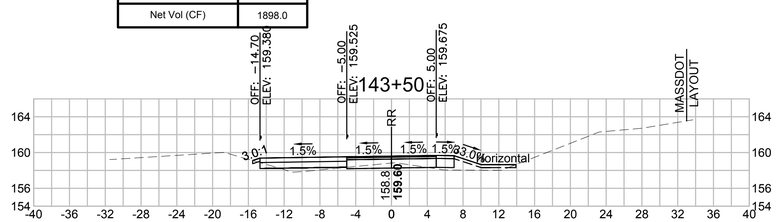
Total Volume at Station 144+00.00	
Cut Area (SF)	3.029
Fill Area (SF)	6.893
Cut Vol (CF)	6.559
Fill Vol (CF)	12.5
Cum Cut Vol (CF)	3414.913
Cum Fill Vol (CF)	1522.9
Net Vol (CF)	1892.0



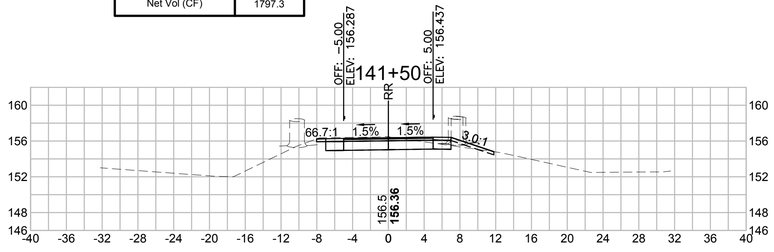
Total Volume at Station 142+00.00	
Cut Area (SF)	14.437
Fill Area (SF)	1.258
Cut Vol (CF)	29.347
Fill Vol (CF)	1.9
Cum Cut Vol (CF)	3325.375
Cum Fill Vol (CF)	1500.7
Net Vol (CF)	1824.7



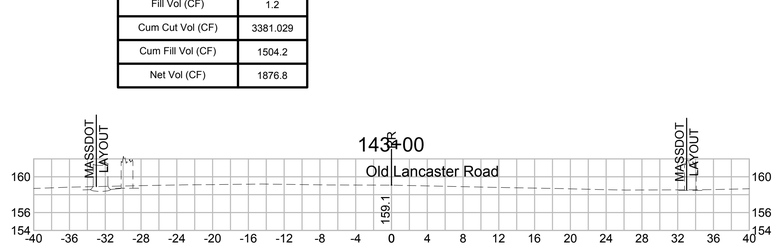
Total Volume at Station 143+50.00	
Cut Area (SF)	4.054
Fill Area (SF)	6.653
Cut Vol (CF)	27.326
Fill Vol (CF)	6.2
Cum Cut Vol (CF)	3408.354
Cum Fill Vol (CF)	1510.3
Net Vol (CF)	1898.0



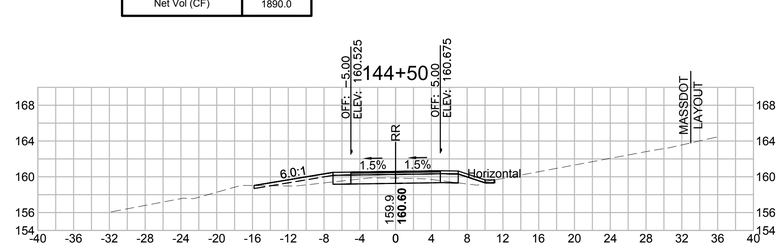
Total Volume at Station 141+50.00	
Cut Area (SF)	17.257
Fill Area (SF)	0.838
Cut Vol (CF)	43.074
Fill Vol (CF)	0.8
Cum Cut Vol (CF)	3296.029
Cum Fill Vol (CF)	1498.7
Net Vol (CF)	1797.3



Total Volume at Station 143+00.00	
Cut Area (SF)	25.458
Fill Area (SF)	0.000
Cut Vol (CF)	32.929
Fill Vol (CF)	1.2
Cum Cut Vol (CF)	3381.029
Cum Fill Vol (CF)	1504.2
Net Vol (CF)	1876.8



Total Volume at Station 144+50.00	
Cut Area (SF)	6.791
Fill Area (SF)	5.125
Cut Vol (CF)	9.093
Fill Vol (CF)	11.1
Cum Cut Vol (CF)	3424.005
Cum Fill Vol (CF)	1534.0
Net Vol (CF)	1890.0



SUDBURY
BRUCE FREEMAN RAIL TRAIL

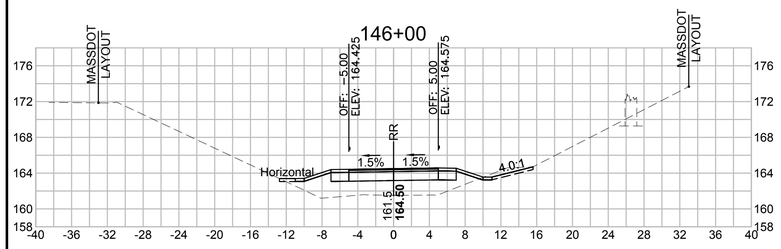
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	252	316
PROJECT FILE NO. 608164			

CROSS SECTIONS

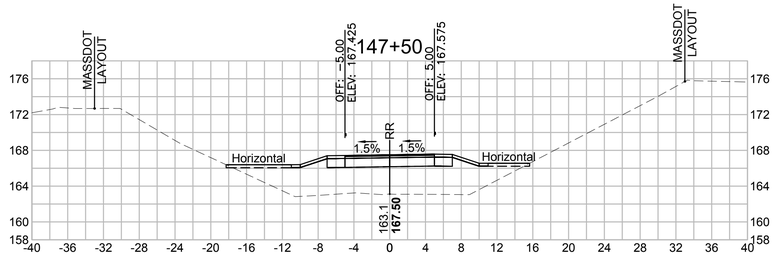
22-Dec-2021

608164_XSEC(CROSS SECTION LAYOUTS).DWG

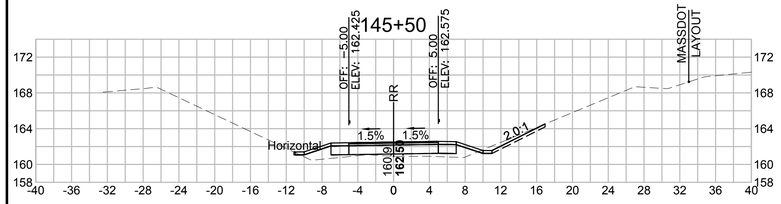
Total Volume at Station 146+00.00	
Cut Area (SF)	3.780
Fill Area (SF)	31.945
Cut Vol (CF)	7.5
Fill Vol (CF)	37.6
Cum Cut Vol (CF)	3454.7
Cum Fill Vol (CF)	1593.4
Net Vol (CF)	1861.4



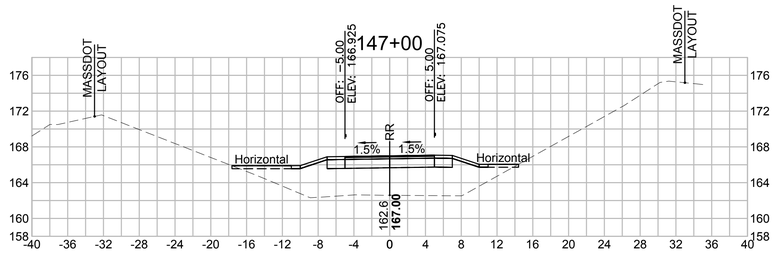
Total Volume at Station 147+50.00	
Cut Area (SF)	0.222
Fill Area (SF)	84.139
Cut Vol (CF)	0.4
Fill Vol (CF)	149.8
Cum Cut Vol (CF)	3459.3
Cum Fill Vol (CF)	1974.3
Net Vol (CF)	1485.0



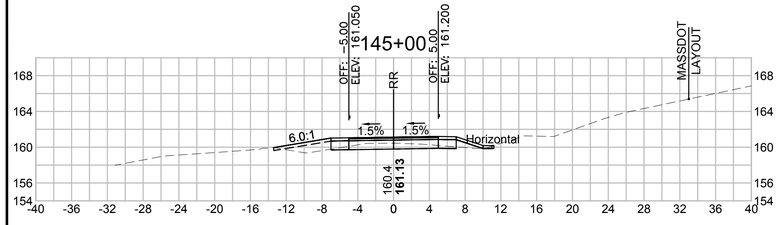
Total Volume at Station 145+50.00	
Cut Area (SF)	4.316
Fill Area (SF)	8.617
Cut Vol (CF)	10.5
Fill Vol (CF)	12.5
Cum Cut Vol (CF)	3447.3
Cum Fill Vol (CF)	1555.8
Net Vol (CF)	1891.4



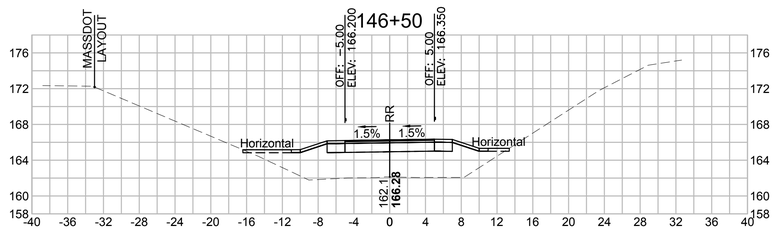
Total Volume at Station 147+00.00	
Cut Area (SF)	0.237
Fill Area (SF)	77.656
Cut Vol (CF)	0.4
Fill Vol (CF)	136.7
Cum Cut Vol (CF)	3458.9
Cum Fill Vol (CF)	1824.5
Net Vol (CF)	1634.4



Total Volume at Station 145+00.00	
Cut Area (SF)	6.999
Fill Area (SF)	4.897
Cut Vol (CF)	12.8
Fill Vol (CF)	9.3
Cum Cut Vol (CF)	3436.8
Cum Fill Vol (CF)	1543.3
Net Vol (CF)	1893.5



Total Volume at Station 146+50.00	
Cut Area (SF)	0.213
Fill Area (SF)	69.990
Cut Vol (CF)	3.7
Fill Vol (CF)	94.4
Cum Cut Vol (CF)	3458.4
Cum Fill Vol (CF)	1687.7
Net Vol (CF)	1770.7



SUDBURY
BRUCE FREEMAN RAIL TRAIL

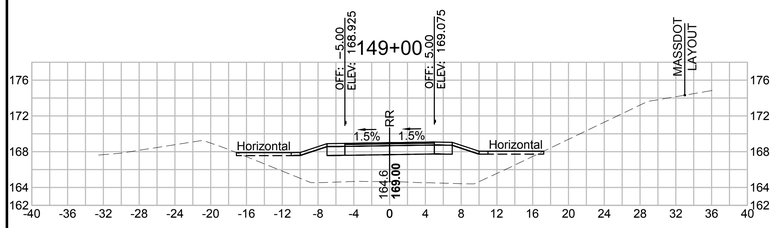
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	253	316
PROJECT FILE NO. 608164			

CROSS SECTIONS

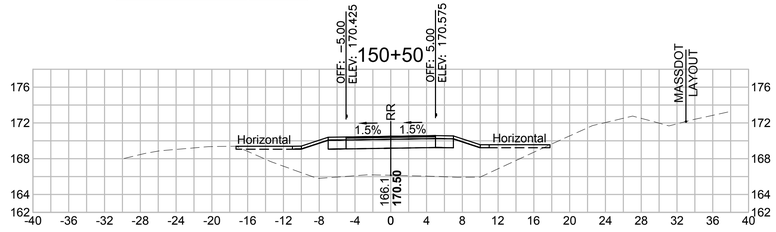
22-Dec-2021

608164_XSEC(CROSS SECTION LAYOUTS).DWG

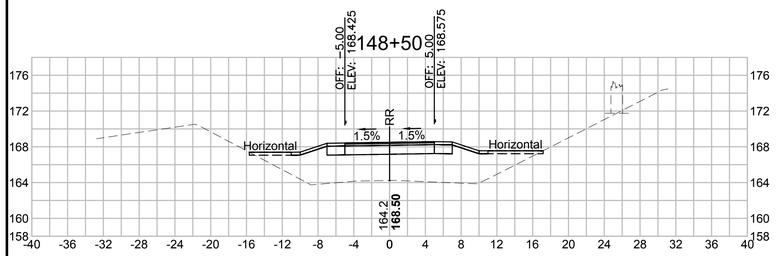
Total Volume at Station 149+00.00	
Cut Area (SF)	0.249
Fill Area (SF)	82.781
Cut Vol (CF)	0.4
Fill Vol (CF)	153.1
Cum Cut Vol (CF)	3460.5
Cum Fill Vol (CF)	2447.5
Net Vol (CF)	1013.0



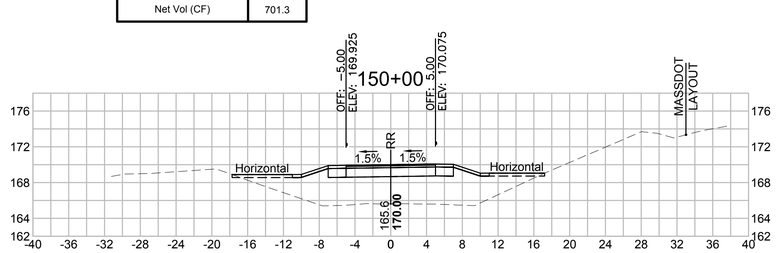
Total Volume at Station 150+50.00	
Cut Area (SF)	0.610
Fill Area (SF)	84.824
Cut Vol (CF)	0.8
Fill Vol (CF)	155.0
Cum Cut Vol (CF)	3462.3
Cum Fill Vol (CF)	2915.1
Net Vol (CF)	547.2



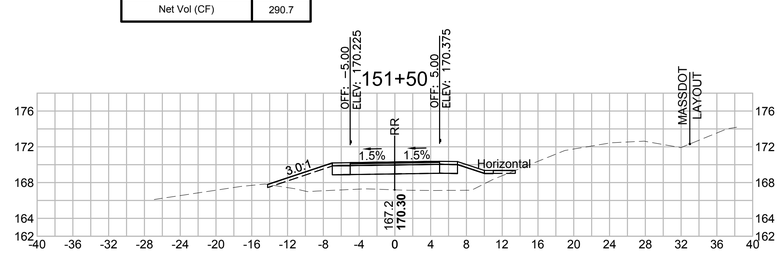
Total Volume at Station 148+50.00	
Cut Area (SF)	0.210
Fill Area (SF)	82.557
Cut Vol (CF)	0.4
Fill Vol (CF)	159.3
Cum Cut Vol (CF)	3460.1
Cum Fill Vol (CF)	2294.4
Net Vol (CF)	1165.7



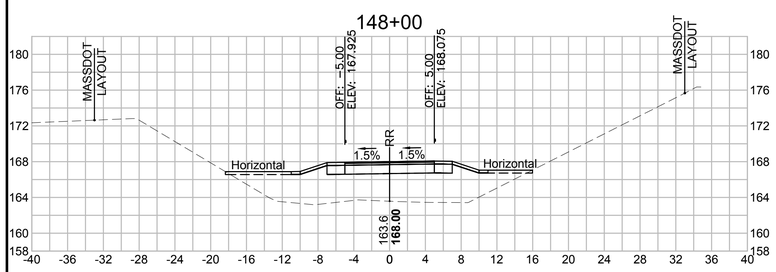
Total Volume at Station 150+00.00	
Cut Area (SF)	0.269
Fill Area (SF)	82.543
Cut Vol (CF)	0.5
Fill Vol (CF)	156.2
Cum Cut Vol (CF)	3461.5
Cum Fill Vol (CF)	2760.1
Net Vol (CF)	701.3



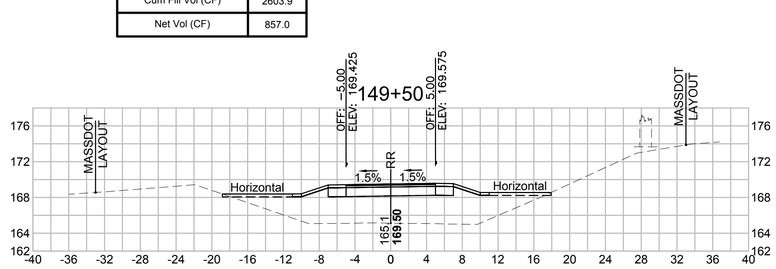
Total Volume at Station 151+50.00	
Cut Area (SF)	0.259
Fill Area (SF)	42.987
Cut Vol (CF)	0.4
Fill Vol (CF)	109.5
Cum Cut Vol (CF)	3463.5
Cum Fill Vol (CF)	3172.8
Net Vol (CF)	290.7



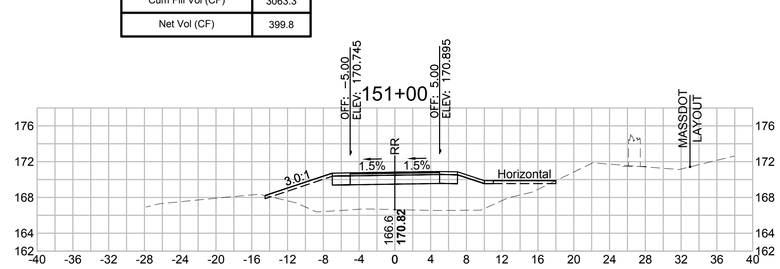
Total Volume at Station 148+00.00	
Cut Area (SF)	0.199
Fill Area (SF)	89.527
Cut Vol (CF)	0.4
Fill Vol (CF)	160.8
Cum Cut Vol (CF)	3459.7
Cum Fill Vol (CF)	2135.1
Net Vol (CF)	1324.6



Total Volume at Station 149+50.00	
Cut Area (SF)	0.280
Fill Area (SF)	86.165
Cut Vol (CF)	0.5
Fill Vol (CF)	156.4
Cum Cut Vol (CF)	3461.0
Cum Fill Vol (CF)	2603.9
Net Vol (CF)	857.0



Total Volume at Station 151+00.00	
Cut Area (SF)	0.219
Fill Area (SF)	75.223
Cut Vol (CF)	0.8
Fill Vol (CF)	148.2
Cum Cut Vol (CF)	3463.1
Cum Fill Vol (CF)	3063.3
Net Vol (CF)	399.8



SUDBURY
BRUCE FREEMAN RAIL TRAIL

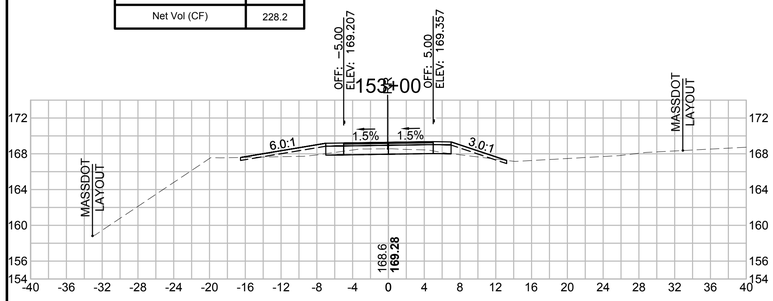
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	254	316
PROJECT FILE NO. 608164			

CROSS SECTIONS

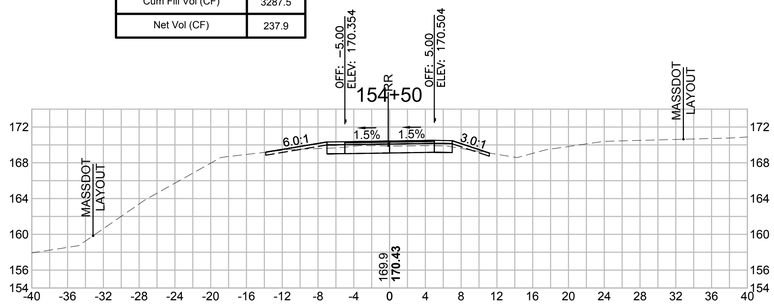
22-Dec-2021

608164_XSEC(CROSS SECTION LAYOUTS).DWG

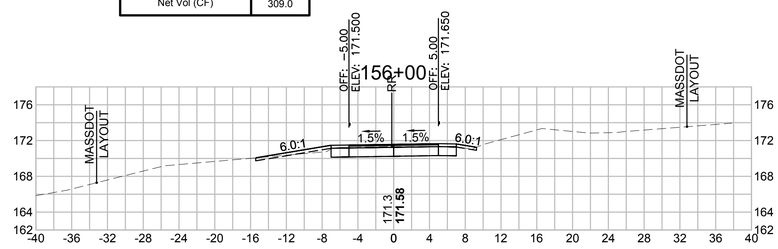
Total Volume at Station 153+00.00	
Cut Area (SF)	6.879
Fill Area (SF)	5.832
Cut Vol (CF)	10.3
Fill Vol (CF)	8.4
Cum Cut Vol (CF)	3478.7
Cum Fill Vol (CF)	3250.6
Net Vol (CF)	228.2



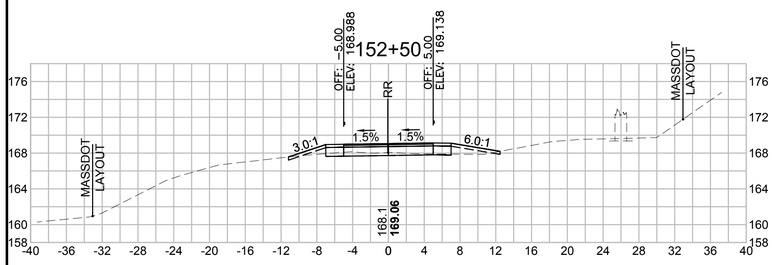
Total Volume at Station 154+50.00	
Cut Area (SF)	11.824
Fill Area (SF)	0.877
Cut Vol (CF)	18.9
Fill Vol (CF)	7.7
Cum Cut Vol (CF)	3525.3
Cum Fill Vol (CF)	3287.5
Net Vol (CF)	237.9



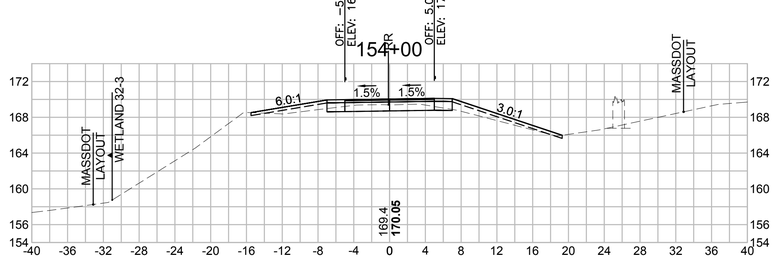
Total Volume at Station 156+00.00	
Cut Area (SF)	15.407
Fill Area (SF)	0.672
Cut Vol (CF)	27.4
Fill Vol (CF)	0.7
Cum Cut Vol (CF)	3599.2
Cum Fill Vol (CF)	3290.2
Net Vol (CF)	309.0



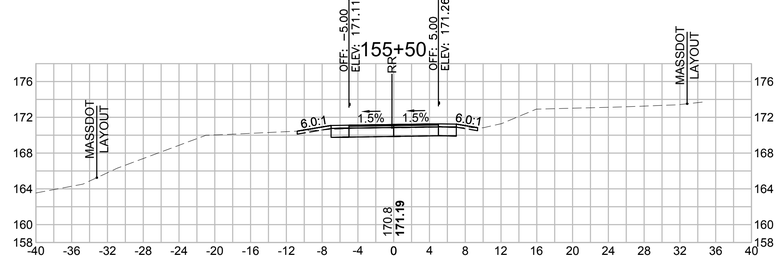
Total Volume at Station 152+50.00	
Cut Area (SF)	4.291
Fill Area (SF)	3.199
Cut Vol (CF)	4.3
Fill Vol (CF)	16.3
Cum Cut Vol (CF)	3468.4
Cum Fill Vol (CF)	3242.2
Net Vol (CF)	226.2



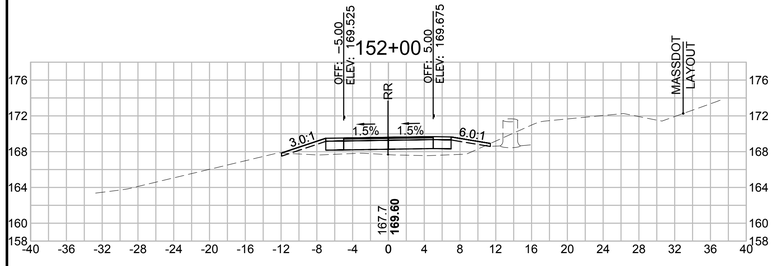
Total Volume at Station 154+00.00	
Cut Area (SF)	8.619
Fill Area (SF)	7.408
Cut Vol (CF)	14.6
Fill Vol (CF)	15.3
Cum Cut Vol (CF)	3506.4
Cum Fill Vol (CF)	3279.8
Net Vol (CF)	226.6



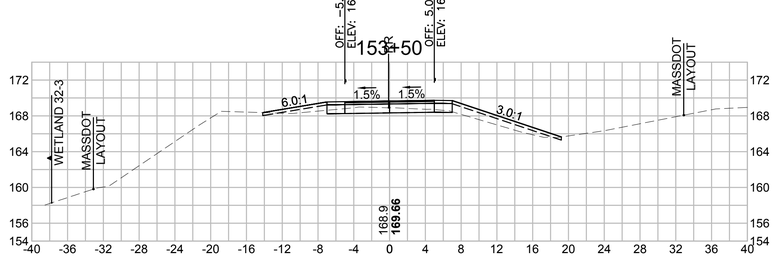
Total Volume at Station 155+50.00	
Cut Area (SF)	14.224
Fill Area (SF)	0.060
Cut Vol (CF)	24.3
Fill Vol (CF)	0.6
Cum Cut Vol (CF)	3571.7
Cum Fill Vol (CF)	3289.5
Net Vol (CF)	282.2



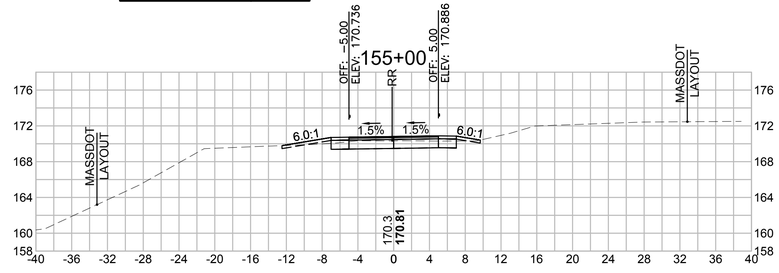
Total Volume at Station 152+00.00	
Cut Area (SF)	0.363
Fill Area (SF)	14.405
Cut Vol (CF)	0.6
Fill Vol (CF)	53.1
Cum Cut Vol (CF)	3464.1
Cum Fill Vol (CF)	3225.9
Net Vol (CF)	238.2



Total Volume at Station 153+50.00	
Cut Area (SF)	7.183
Fill Area (SF)	9.162
Cut Vol (CF)	13.0
Fill Vol (CF)	13.9
Cum Cut Vol (CF)	3491.7
Cum Fill Vol (CF)	3264.4
Net Vol (CF)	227.3



Total Volume at Station 155+00.00	
Cut Area (SF)	12.039
Fill Area (SF)	0.631
Cut Vol (CF)	22.1
Fill Vol (CF)	1.4
Cum Cut Vol (CF)	3547.4
Cum Fill Vol (CF)	3288.8
Net Vol (CF)	258.6



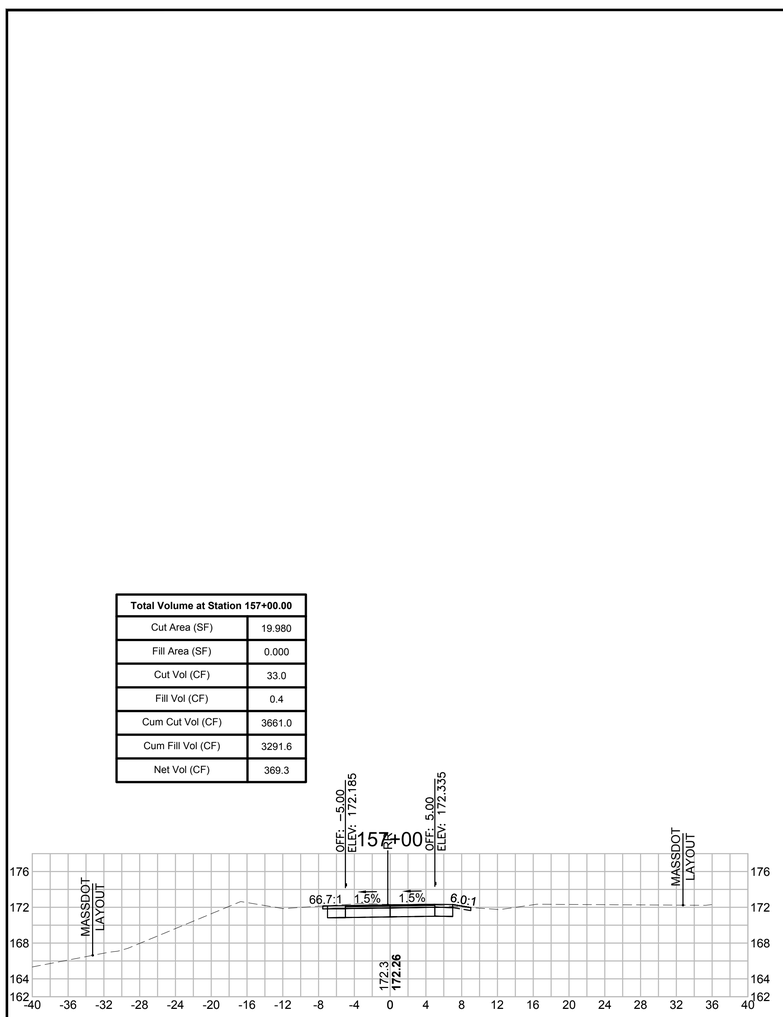
SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	255	316
PROJECT FILE NO. 608164			

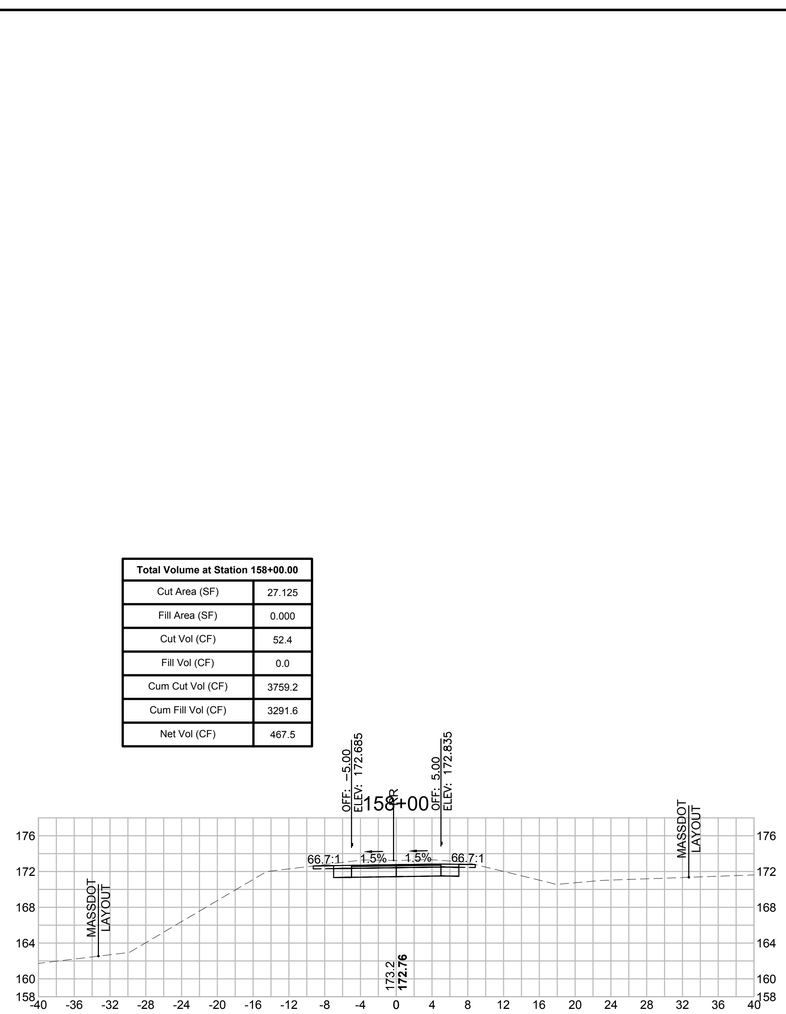
CROSS SECTIONS

608164_XSEC(CROSS SECTION LAYOUTS).DWG 22-Dec-2021

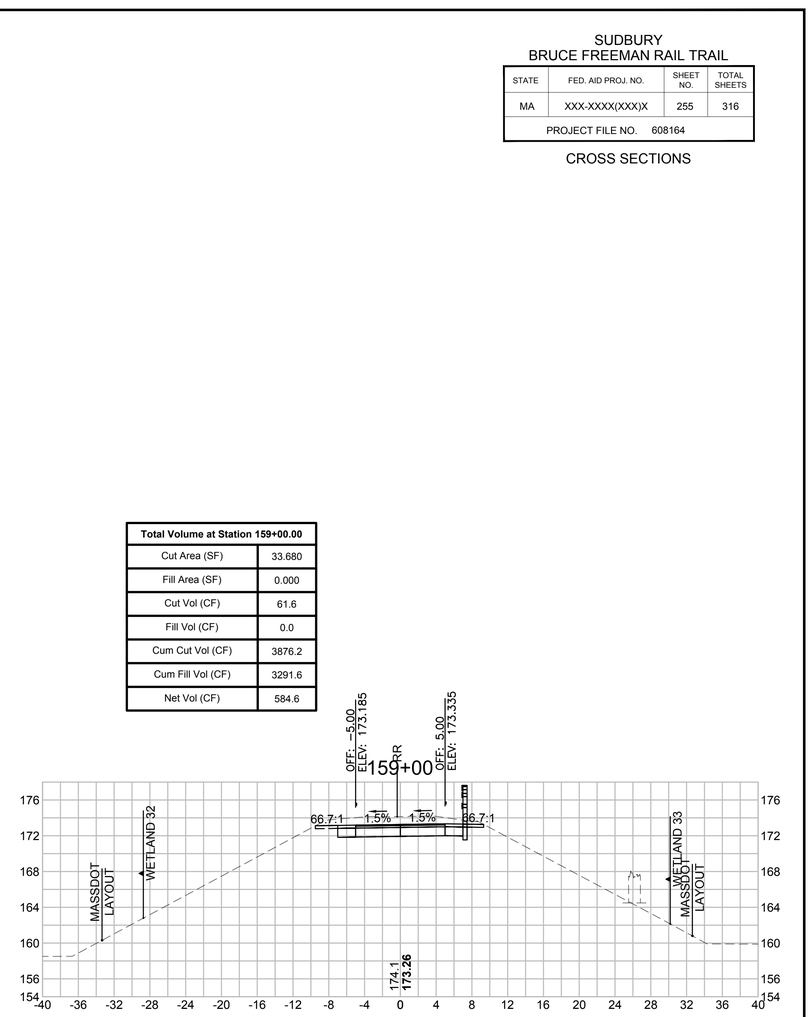
Total Volume at Station 157+00.00	
Cut Area (SF)	19.980
Fill Area (SF)	0.000
Cut Vol (CF)	33.0
Fill Vol (CF)	0.4
Cum Cut Vol (CF)	3661.0
Cum Fill Vol (CF)	3291.6
Net Vol (CF)	369.3



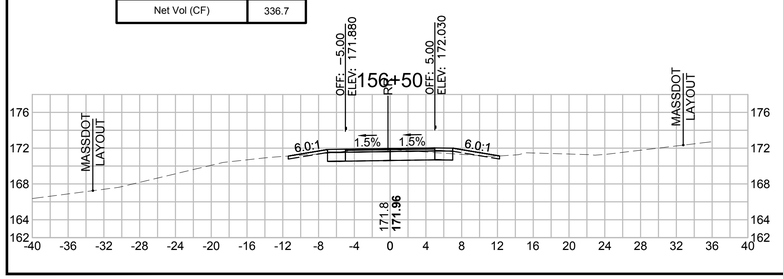
Total Volume at Station 158+00.00	
Cut Area (SF)	27.125
Fill Area (SF)	0.000
Cut Vol (CF)	52.4
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	3759.2
Cum Fill Vol (CF)	3291.6
Net Vol (CF)	467.5



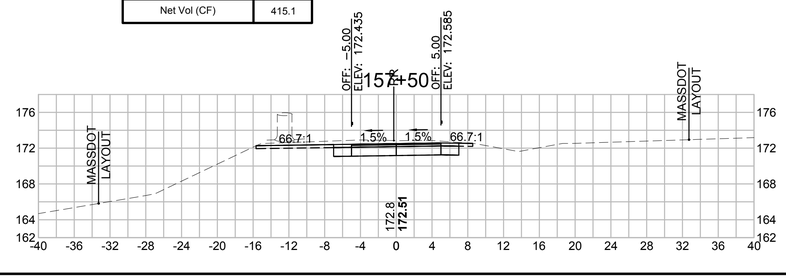
Total Volume at Station 159+00.00	
Cut Area (SF)	33.680
Fill Area (SF)	0.000
Cut Vol (CF)	61.6
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	3876.2
Cum Fill Vol (CF)	3291.6
Net Vol (CF)	584.6



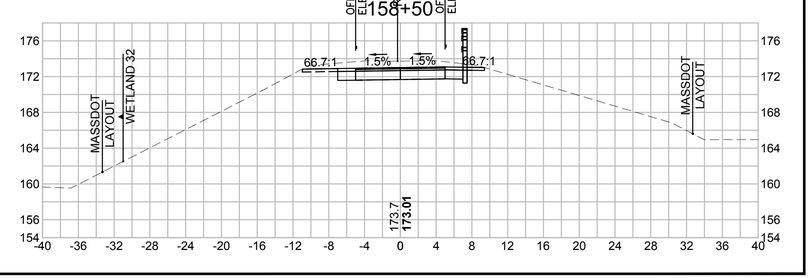
Total Volume at Station 156+50.00	
Cut Area (SF)	15.684
Fill Area (SF)	0.452
Cut Vol (CF)	28.8
Fill Vol (CF)	1.0
Cum Cut Vol (CF)	3627.9
Cum Fill Vol (CF)	3291.2
Net Vol (CF)	336.7



Total Volume at Station 157+50.00	
Cut Area (SF)	29.473
Fill Area (SF)	0.000
Cut Vol (CF)	45.8
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	3706.8
Cum Fill Vol (CF)	3291.6
Net Vol (CF)	415.1



Total Volume at Station 158+50.00	
Cut Area (SF)	32.796
Fill Area (SF)	0.000
Cut Vol (CF)	55.5
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	3814.6
Cum Fill Vol (CF)	3291.6
Net Vol (CF)	523.0



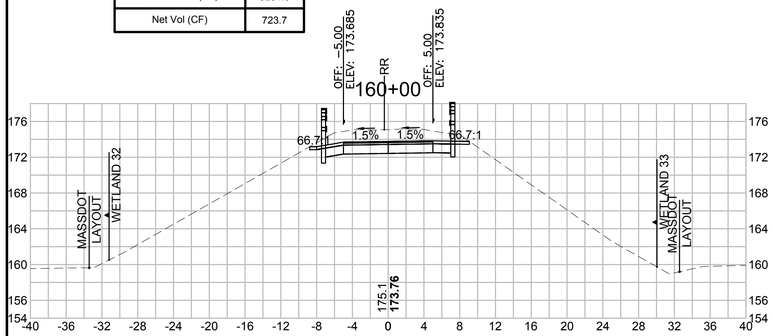
SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	256	316
PROJECT FILE NO. 608164			

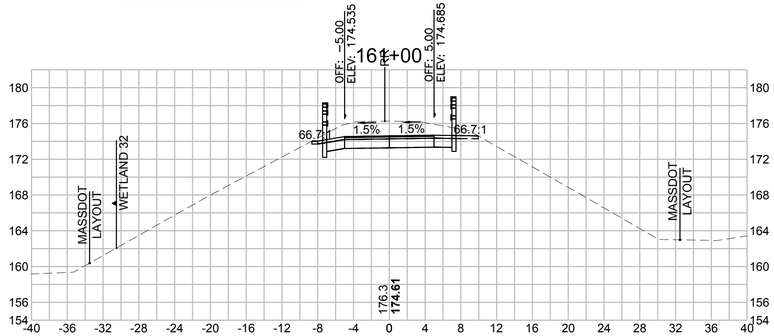
CROSS SECTIONS

608164_XSEC(CROSS SECTION LAYOUTS).DWG 22-Dec-2021

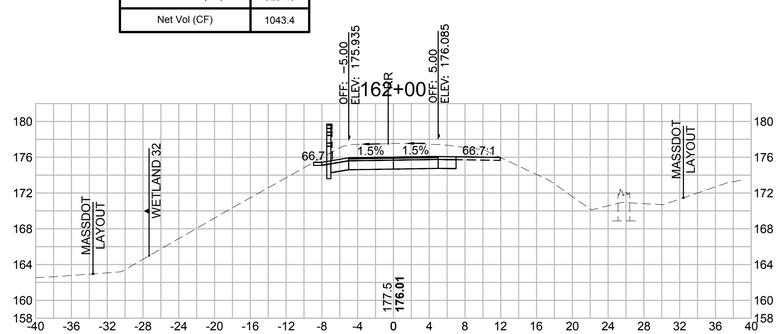
Total Volume at Station 160+00.00	
Cut Area (SF)	39.189
Fill Area (SF)	0.000
Cut Vol (CF)	72.1
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	4015.4
Cum Fill Vol (CF)	3291.6
Net Vol (CF)	723.7



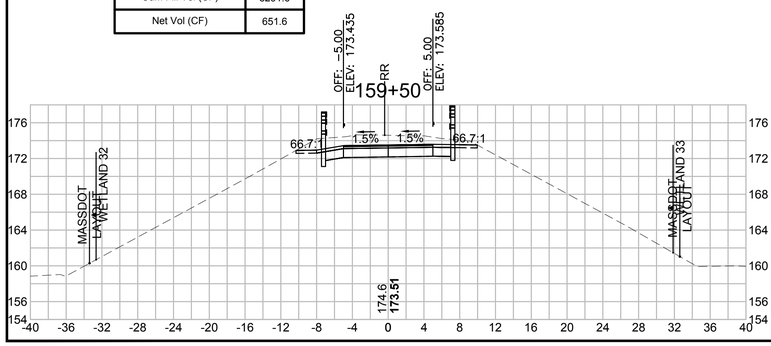
Total Volume at Station 161+00.00	
Cut Area (SF)	42.411
Fill Area (SF)	0.000
Cut Vol (CF)	76.6
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	4165.5
Cum Fill Vol (CF)	3291.6
Net Vol (CF)	873.9



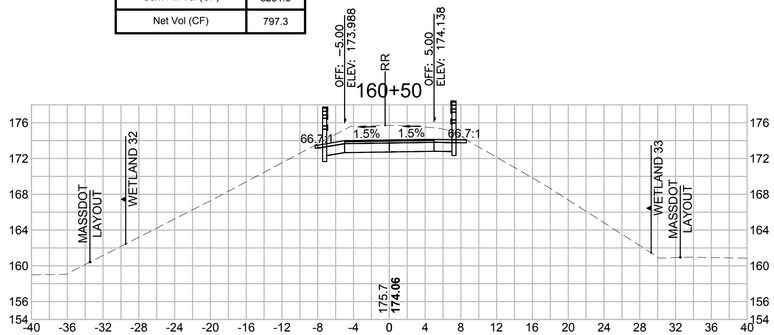
Total Volume at Station 162+00.00	
Cut Area (SF)	45.471
Fill Area (SF)	0.000
Cut Vol (CF)	86.2
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	4335.0
Cum Fill Vol (CF)	3291.6
Net Vol (CF)	1043.4



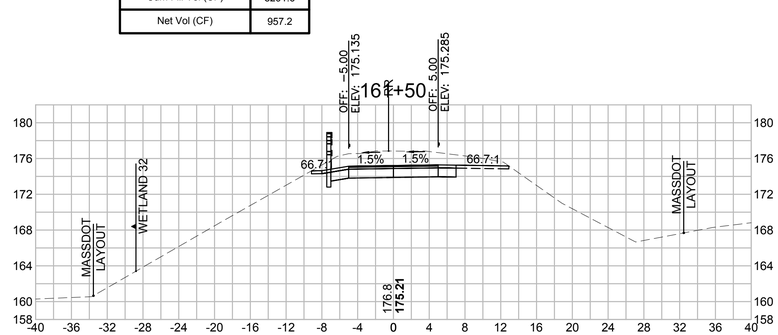
Total Volume at Station 159+50.00	
Cut Area (SF)	38.715
Fill Area (SF)	0.000
Cut Vol (CF)	67.0
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	3943.2
Cum Fill Vol (CF)	3291.6
Net Vol (CF)	651.6



Total Volume at Station 160+50.00	
Cut Area (SF)	40.277
Fill Area (SF)	0.000
Cut Vol (CF)	73.6
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	4088.9
Cum Fill Vol (CF)	3291.6
Net Vol (CF)	797.3



Total Volume at Station 161+50.00	
Cut Area (SF)	47.585
Fill Area (SF)	0.000
Cut Vol (CF)	83.3
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	4248.8
Cum Fill Vol (CF)	3291.6
Net Vol (CF)	957.2



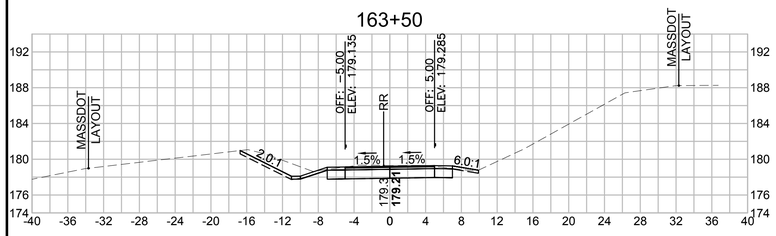
SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	257	316
PROJECT FILE NO. 608164			

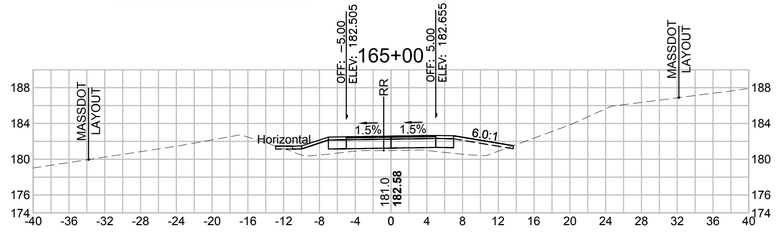
CROSS SECTIONS

608164_XSEC(CROSS SECTION LAYOUTS).DWG 22-Dec-2021

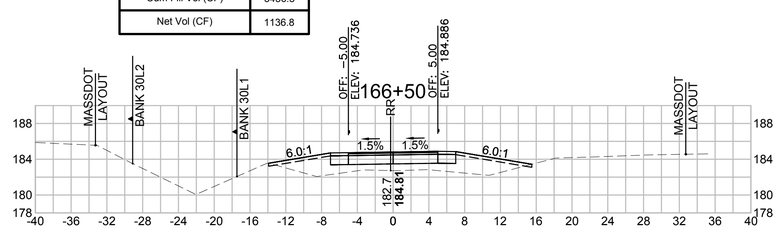
Total Volume at Station 163+50.00	
Cut Area (SF)	29.921
Fill Area (SF)	0.000
Cut Vol (CF)	53.9
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	4525.9
Cum Fill Vol (CF)	3293.6
Net Vol (CF)	1232.3



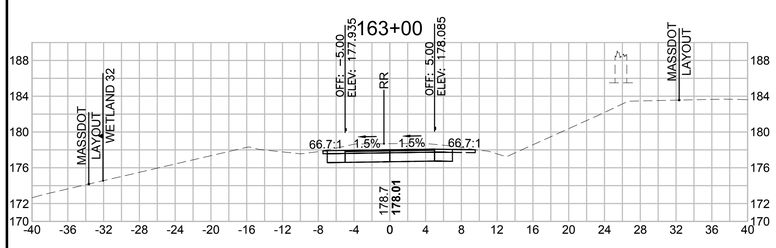
Total Volume at Station 165+00.00	
Cut Area (SF)	0.275
Fill Area (SF)	16.030
Cut Vol (CF)	2.3
Fill Vol (CF)	19.8
Cum Cut Vol (CF)	4591.8
Cum Fill Vol (CF)	3321.5
Net Vol (CF)	1270.3



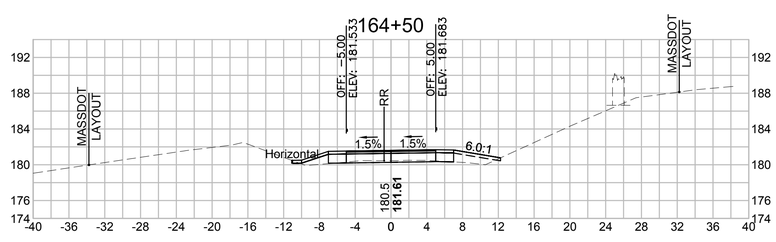
Total Volume at Station 166+50.00	
Cut Area (SF)	0.260
Fill Area (SF)	29.086
Cut Vol (CF)	0.5
Fill Vol (CF)	51.7
Cum Cut Vol (CF)	4593.2
Cum Fill Vol (CF)	3456.5
Net Vol (CF)	1136.8



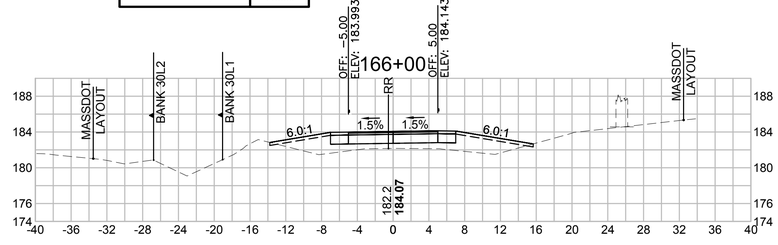
Total Volume at Station 163+00.00	
Cut Area (SF)	28.289
Fill Area (SF)	0.000
Cut Vol (CF)	60.5
Fill Vol (CF)	1.0
Cum Cut Vol (CF)	4472.0
Cum Fill Vol (CF)	3293.6
Net Vol (CF)	1178.4



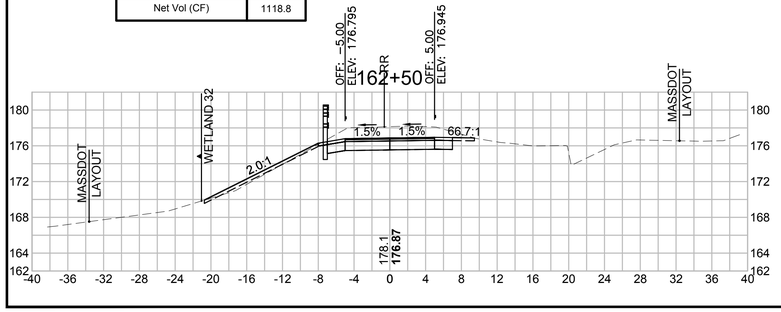
Total Volume at Station 164+50.00	
Cut Area (SF)	2.214
Fill Area (SF)	5.362
Cut Vol (CF)	19.0
Fill Vol (CF)	6.5
Cum Cut Vol (CF)	4589.5
Cum Fill Vol (CF)	3301.7
Net Vol (CF)	1287.8



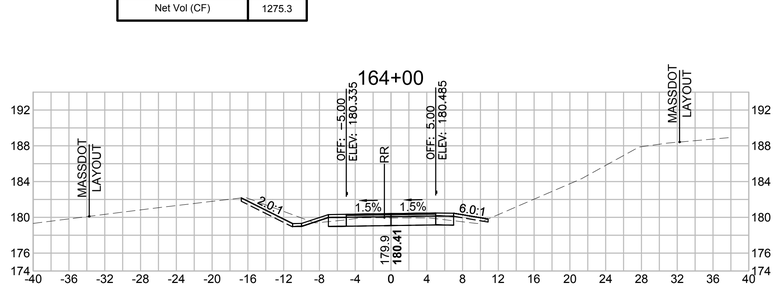
Total Volume at Station 166+00.00	
Cut Area (SF)	0.263
Fill Area (SF)	26.726
Cut Vol (CF)	0.5
Fill Vol (CF)	46.6
Cum Cut Vol (CF)	4592.8
Cum Fill Vol (CF)	3404.8
Net Vol (CF)	1188.0



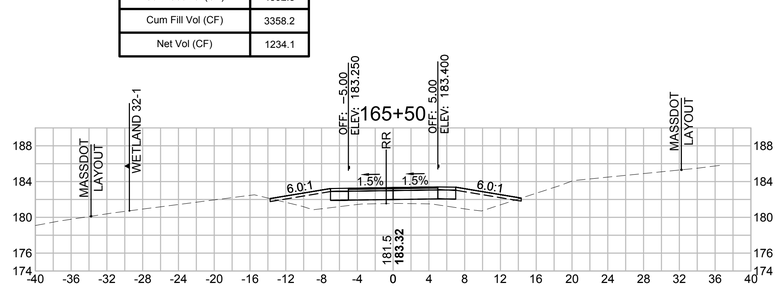
Total Volume at Station 162+50.00	
Cut Area (SF)	37.075
Fill Area (SF)	1.063
Cut Vol (CF)	76.4
Fill Vol (CF)	1.0
Cum Cut Vol (CF)	4411.4
Cum Fill Vol (CF)	3292.6
Net Vol (CF)	1118.8



Total Volume at Station 164+00.00	
Cut Area (SF)	18.294
Fill Area (SF)	1.706
Cut Vol (CF)	44.6
Fill Vol (CF)	1.6
Cum Cut Vol (CF)	4570.5
Cum Fill Vol (CF)	3295.2
Net Vol (CF)	1275.3



Total Volume at Station 165+50.00	
Cut Area (SF)	0.254
Fill Area (SF)	23.589
Cut Vol (CF)	0.5
Fill Vol (CF)	36.7
Cum Cut Vol (CF)	4592.3
Cum Fill Vol (CF)	3358.2
Net Vol (CF)	1234.1



SUDBURY
BRUCE FREEMAN RAIL TRAIL

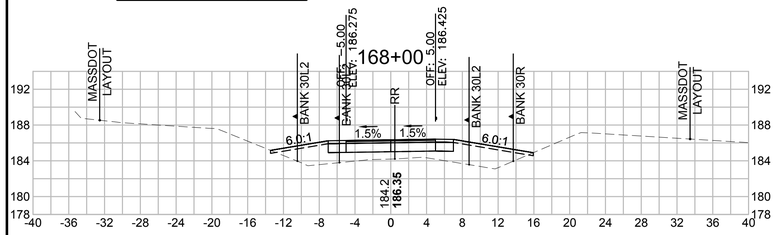
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	258	316
PROJECT FILE NO. 608164			

CROSS SECTIONS

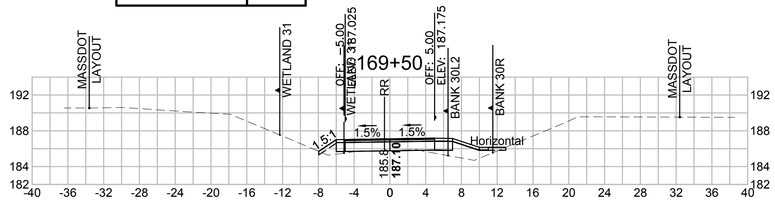
22-Dec-2021

608164_XSEC(CROSS SECTION LAYOUTS).DWG

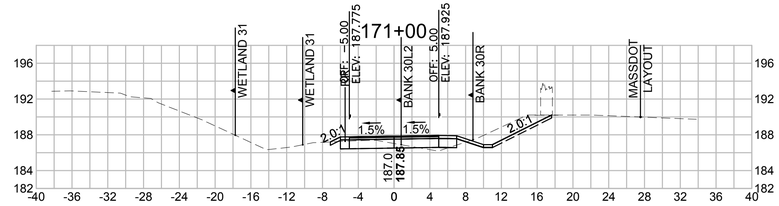
Total Volume at Station 168+00.00	
Cut Area (SF)	0.149
Fill Area (SF)	28.474
Cut Vol (CF)	0.3
Fill Vol (CF)	58.4
Cum Cut Vol (CF)	4594.2
Cum Fill Vol (CF)	3626.5
Net Vol (CF)	967.7



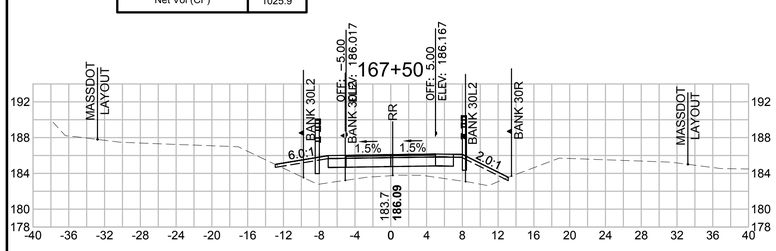
Total Volume at Station 169+50.00	
Cut Area (SF)	0.403
Fill Area (SF)	8.035
Cut Vol (CF)	0.5
Fill Vol (CF)	21.7
Cum Cut Vol (CF)	4595.4
Cum Fill Vol (CF)	3745.3
Net Vol (CF)	850.1



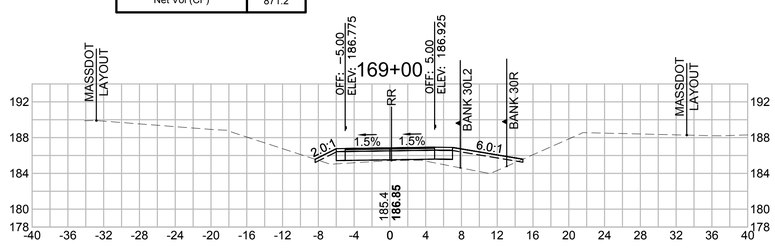
Total Volume at Station 171+00.00	
Cut Area (SF)	18.314
Fill Area (SF)	1.100
Cut Vol (CF)	29.6
Fill Vol (CF)	4.1
Cum Cut Vol (CF)	4656.8
Cum Fill Vol (CF)	3769.4
Net Vol (CF)	887.5



Total Volume at Station 167+50.00	
Cut Area (SF)	0.144
Fill Area (SF)	34.639
Cut Vol (CF)	0.3
Fill Vol (CF)	58.4
Cum Cut Vol (CF)	4594.0
Cum Fill Vol (CF)	3568.0
Net Vol (CF)	1025.9

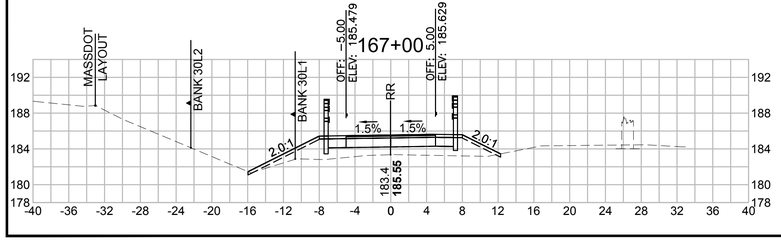


Total Volume at Station 169+00.00	
Cut Area (SF)	0.176
Fill Area (SF)	15.367
Cut Vol (CF)	0.3
Fill Vol (CF)	42.5
Cum Cut Vol (CF)	4594.9
Cum Fill Vol (CF)	3723.7
Net Vol (CF)	871.2

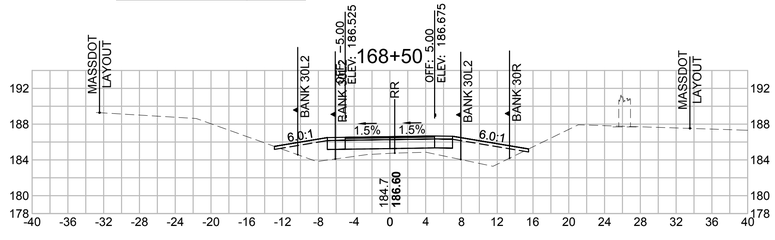


Total Volume at Station 170+50.00	
Cut Area (SF)	13.656
Fill Area (SF)	3.305
Cut Vol (CF)	22.0
Fill Vol (CF)	7.8
Cum Cut Vol (CF)	4627.2
Cum Fill Vol (CF)	3765.3
Net Vol (CF)	861.9

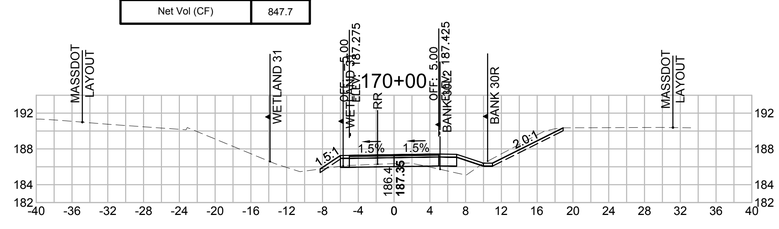
Total Volume at Station 167+00.00	
Cut Area (SF)	0.182
Fill Area (SF)	28.381
Cut Vol (CF)	0.4
Fill Vol (CF)	53.2
Cum Cut Vol (CF)	4593.7
Cum Fill Vol (CF)	3509.7
Net Vol (CF)	1084.0



Total Volume at Station 168+50.00	
Cut Area (SF)	0.194
Fill Area (SF)	30.567
Cut Vol (CF)	0.3
Fill Vol (CF)	54.7
Cum Cut Vol (CF)	4594.5
Cum Fill Vol (CF)	3681.1
Net Vol (CF)	913.4



Total Volume at Station 170+00.00	
Cut Area (SF)	10.138
Fill Area (SF)	5.098
Cut Vol (CF)	9.8
Fill Vol (CF)	12.2
Cum Cut Vol (CF)	4605.2
Cum Fill Vol (CF)	3757.5
Net Vol (CF)	847.7



SUDBURY
BRUCE FREEMAN RAIL TRAIL

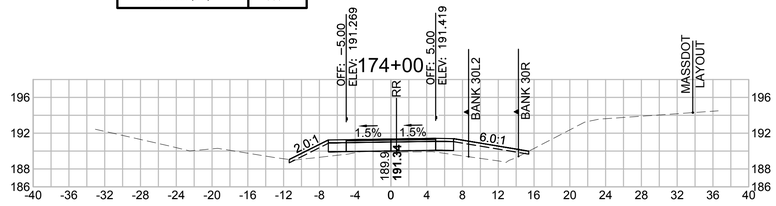
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	259	316
PROJECT FILE NO. 608164			

CROSS SECTIONS

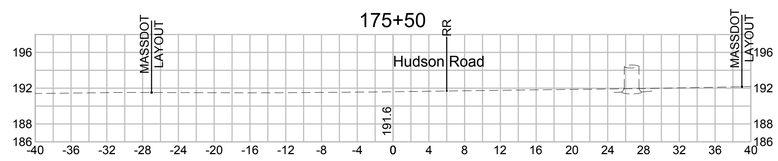
608164_XSEC(CROSS SECTION LAYOUTS).DWG 22-Dec-2021

Total Volume at Station 172+50.00	
Cut Area (SF)	14.444
Fill Area (SF)	1.856
Cut Vol (CF)	28.7
Fill Vol (CF)	2.4
Cum Cut Vol (CF)	4754.0
Cum Fill Vol (CF)	3775.4
Net Vol (CF)	978.6

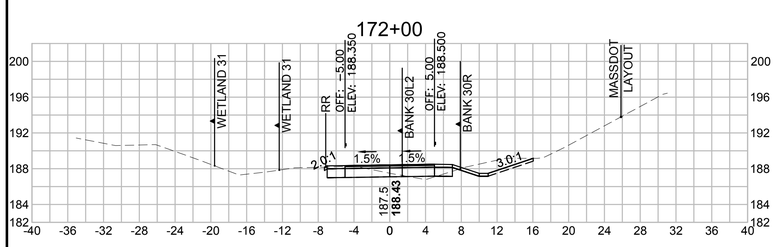
Total Volume at Station 174+00.00	
Cut Area (SF)	0.192
Fill Area (SF)	14.826
Cut Vol (CF)	2.1
Fill Vol (CF)	23.5
Cum Cut Vol (CF)	4784.1
Cum Fill Vol (CF)	3821.0
Net Vol (CF)	963.1



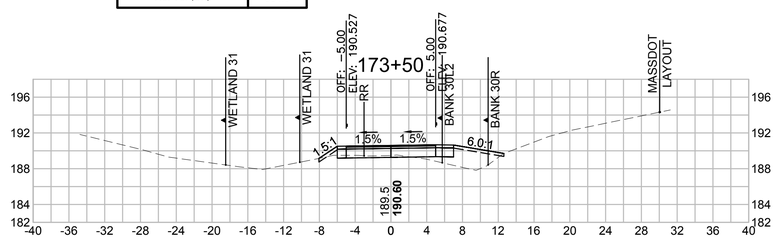
Total Volume at Station 175+50.00	
Cut Area (SF)	62.333
Fill Area (SF)	0.000
Cut Vol (CF)	78.3
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	4888.0
Cum Fill Vol (CF)	3839.9
Net Vol (CF)	1048.0



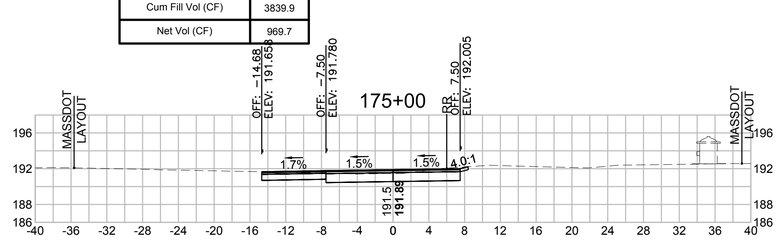
Total Volume at Station 172+00.00	
Cut Area (SF)	16.508
Fill Area (SF)	0.728
Cut Vol (CF)	33.4
Fill Vol (CF)	1.6
Cum Cut Vol (CF)	4725.3
Cum Fill Vol (CF)	3773.0
Net Vol (CF)	952.4



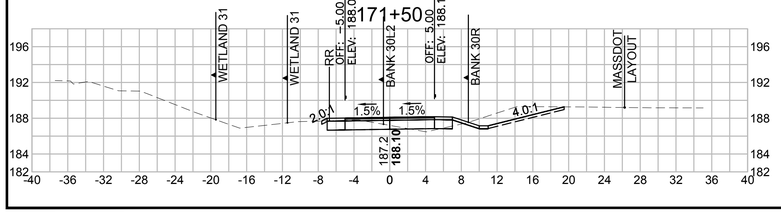
Total Volume at Station 173+50.00	
Cut Area (SF)	2.056
Fill Area (SF)	10.538
Cut Vol (CF)	8.3
Fill Vol (CF)	15.1
Cum Cut Vol (CF)	4782.0
Cum Fill Vol (CF)	3797.5
Net Vol (CF)	984.5



Total Volume at Station 175+00.00	
Cut Area (SF)	22.279
Fill Area (SF)	0.000
Cut Vol (CF)	23.0
Fill Vol (CF)	2.6
Cum Cut Vol (CF)	4809.6
Cum Fill Vol (CF)	3839.9
Net Vol (CF)	969.7

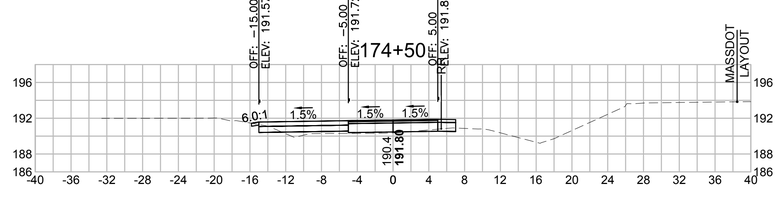


Total Volume at Station 171+50.00	
Cut Area (SF)	19.590
Fill Area (SF)	1.028
Cut Vol (CF)	35.1
Fill Vol (CF)	2.0
Cum Cut Vol (CF)	4691.9
Cum Fill Vol (CF)	3771.3
Net Vol (CF)	920.6



Total Volume at Station 173+00.00	
Cut Area (SF)	6.878
Fill Area (SF)	5.789
Cut Vol (CF)	19.7
Fill Vol (CF)	7.1
Cum Cut Vol (CF)	4773.7
Cum Fill Vol (CF)	3782.4
Net Vol (CF)	991.3

Total Volume at Station 174+50.00	
Cut Area (SF)	2.543
Fill Area (SF)	2.778
Cut Vol (CF)	2.5
Fill Vol (CF)	16.3
Cum Cut Vol (CF)	4786.6
Cum Fill Vol (CF)	3837.3
Net Vol (CF)	949.3



SUDBURY
BRUCE FREEMAN RAIL TRAIL

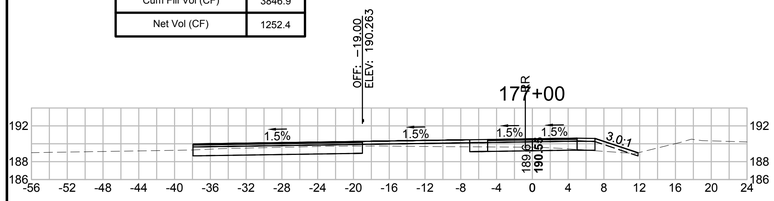
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	260	316
PROJECT FILE NO. 608164			

CROSS SECTIONS

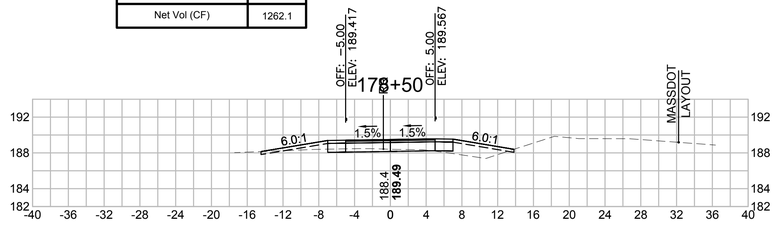
22-Dec-2021

608164_XSEC(CROSS SECTION LAYOUTS).DWG

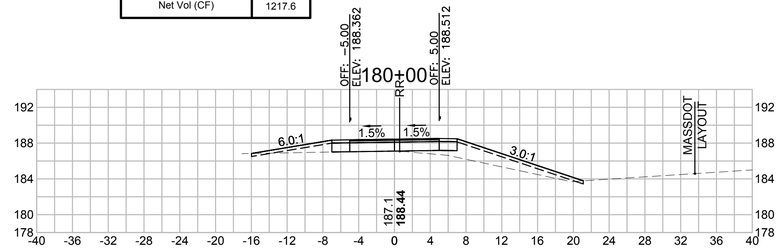
Total Volume at Station 177+00.00	
Cut Area (SF)	19.799
Fill Area (SF)	5.793
Cut Vol (CF)	47.2
Fill Vol (CF)	6.1
Cum Cut Vol (CF)	5099.3
Cum Fill Vol (CF)	3846.9
Net Vol (CF)	1252.4



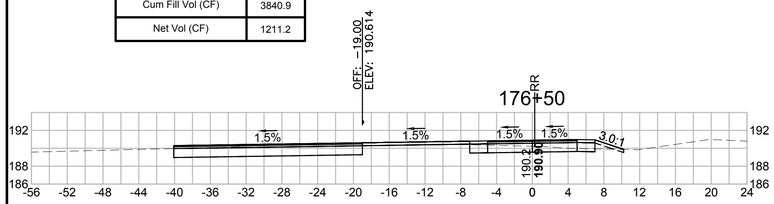
Total Volume at Station 178+50.00	
Cut Area (SF)	3.681
Fill Area (SF)	7.922
Cut Vol (CF)	8.2
Fill Vol (CF)	12.3
Cum Cut Vol (CF)	5140.4
Cum Fill Vol (CF)	3878.3
Net Vol (CF)	1262.1



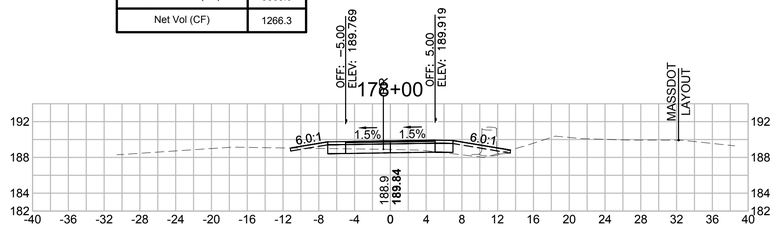
Total Volume at Station 180+00.00	
Cut Area (SF)	0.612
Fill Area (SF)	17.955
Cut Vol (CF)	2.2
Fill Vol (CF)	23.7
Cum Cut Vol (CF)	5153.1
Cum Fill Vol (CF)	3935.6
Net Vol (CF)	1217.6



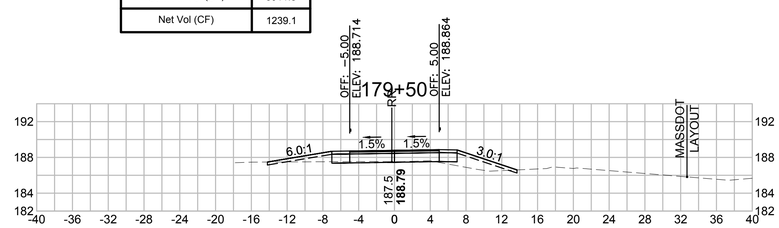
Total Volume at Station 176+50.00	
Cut Area (SF)	31.157
Fill Area (SF)	0.745
Cut Vol (CF)	67.6
Fill Vol (CF)	0.8
Cum Cut Vol (CF)	5052.1
Cum Fill Vol (CF)	3840.9
Net Vol (CF)	1211.2



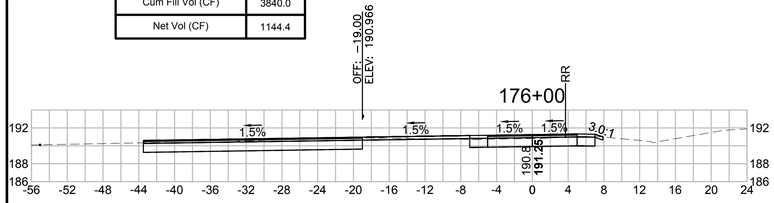
Total Volume at Station 178+00.00	
Cut Area (SF)	5.136
Fill Area (SF)	5.376
Cut Vol (CF)	9.7
Fill Vol (CF)	9.3
Cum Cut Vol (CF)	5132.2
Cum Fill Vol (CF)	3865.9
Net Vol (CF)	1266.3



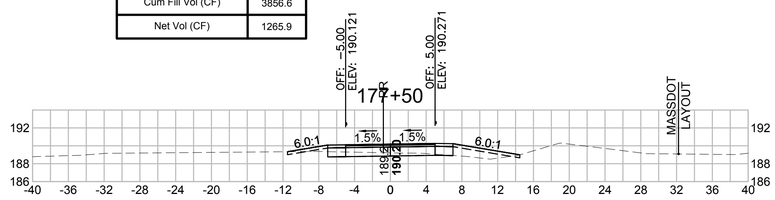
Total Volume at Station 179+50.00	
Cut Area (SF)	1.767
Fill Area (SF)	7.651
Cut Vol (CF)	4.4
Fill Vol (CF)	16.7
Cum Cut Vol (CF)	5150.9
Cum Fill Vol (CF)	3911.8
Net Vol (CF)	1239.1



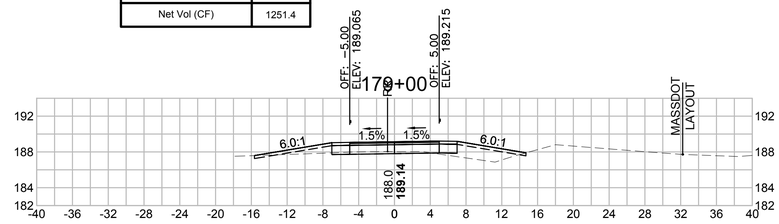
Total Volume at Station 176+00.00	
Cut Area (SF)	41.902
Fill Area (SF)	0.153
Cut Vol (CF)	96.5
Fill Vol (CF)	0.1
Cum Cut Vol (CF)	4984.5
Cum Fill Vol (CF)	3840.0
Net Vol (CF)	1144.4



Total Volume at Station 177+50.00	
Cut Area (SF)	5.318
Fill Area (SF)	4.679
Cut Vol (CF)	23.3
Fill Vol (CF)	9.7
Cum Cut Vol (CF)	5122.5
Cum Fill Vol (CF)	3856.6
Net Vol (CF)	1265.9



Total Volume at Station 179+00.00	
Cut Area (SF)	2.951
Fill Area (SF)	10.353
Cut Vol (CF)	6.1
Fill Vol (CF)	16.9
Cum Cut Vol (CF)	5146.5
Cum Fill Vol (CF)	3895.2
Net Vol (CF)	1251.4



SUDBURY
BRUCE FREEMAN RAIL TRAIL

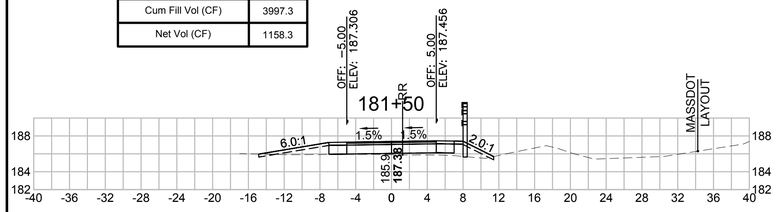
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	261	316
PROJECT FILE NO. 608164			

CROSS SECTIONS

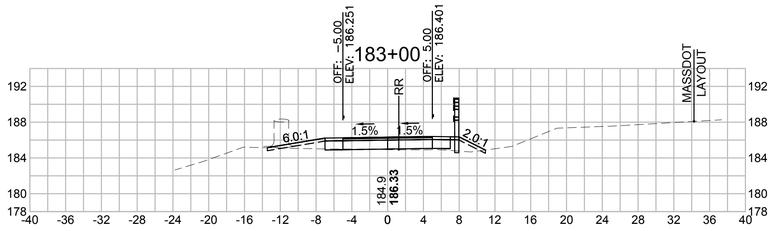
22-Dec-2021

608164_XSEC(CROSS SECTION LAYOUTS).DWG

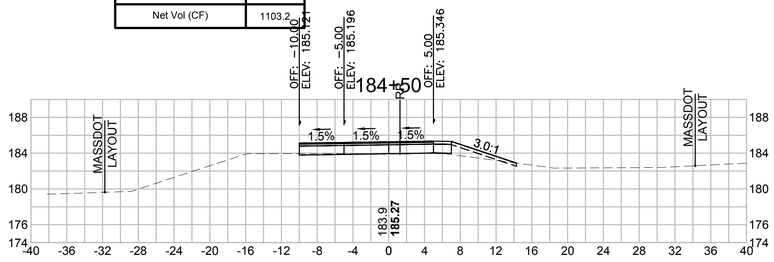
Total Volume at Station 181+50.00	
Cut Area (SF)	0.392
Fill Area (SF)	8.638
Cut Vol (CF)	0.8
Fill Vol (CF)	19.0
Cum Cut Vol (CF)	5155.6
Cum Fill Vol (CF)	3997.3
Net Vol (CF)	1158.3



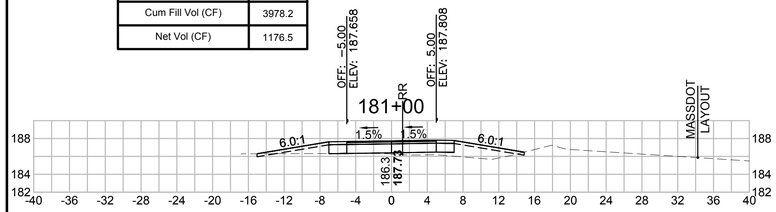
Total Volume at Station 183+00.00	
Cut Area (SF)	0.791
Fill Area (SF)	5.820
Cut Vol (CF)	2.0
Fill Vol (CF)	10.3
Cum Cut Vol (CF)	5160.5
Cum Fill Vol (CF)	4032.4
Net Vol (CF)	1128.1



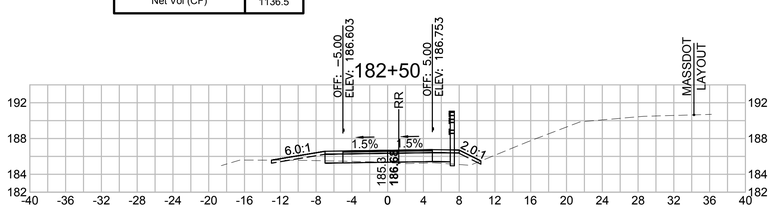
Total Volume at Station 184+50.00	
Cut Area (SF)	1.145
Fill Area (SF)	3.314
Cut Vol (CF)	2.0
Fill Vol (CF)	8.8
Cum Cut Vol (CF)	5166.3
Cum Fill Vol (CF)	4063.0
Net Vol (CF)	1103.2



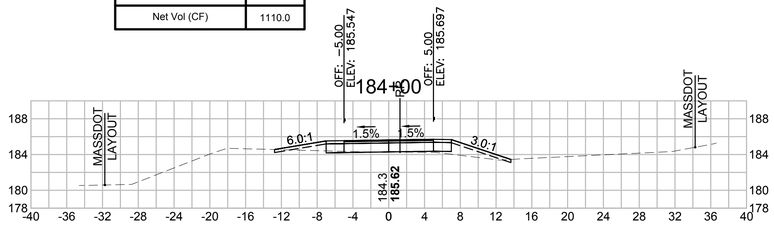
Total Volume at Station 181+00.00	
Cut Area (SF)	0.498
Fill Area (SF)	11.923
Cut Vol (CF)	0.8
Fill Vol (CF)	18.5
Cum Cut Vol (CF)	5154.8
Cum Fill Vol (CF)	3978.2
Net Vol (CF)	1176.5



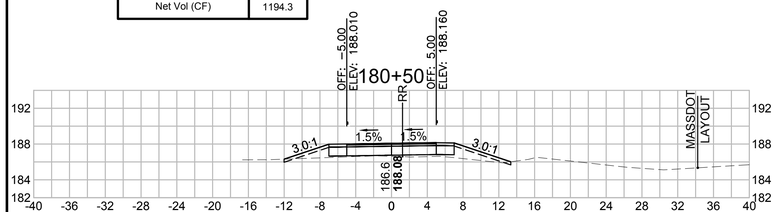
Total Volume at Station 182+50.00	
Cut Area (SF)	1.337
Fill Area (SF)	5.296
Cut Vol (CF)	1.9
Fill Vol (CF)	10.9
Cum Cut Vol (CF)	5158.6
Cum Fill Vol (CF)	4022.1
Net Vol (CF)	1136.5



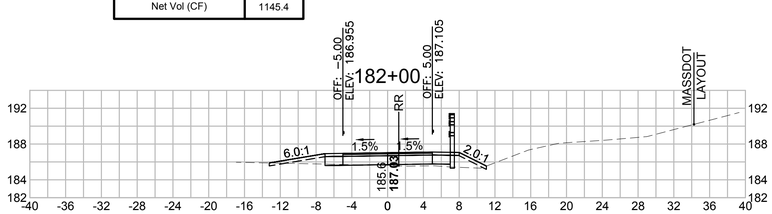
Total Volume at Station 184+00.00	
Cut Area (SF)	1.053
Fill Area (SF)	6.216
Cut Vol (CF)	2.0
Fill Vol (CF)	11.1
Cum Cut Vol (CF)	5164.2
Cum Fill Vol (CF)	4054.2
Net Vol (CF)	1110.0



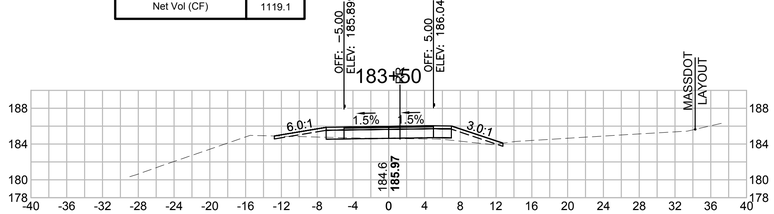
Total Volume at Station 180+50.00	
Cut Area (SF)	0.335
Fill Area (SF)	8.098
Cut Vol (CF)	0.9
Fill Vol (CF)	24.1
Cum Cut Vol (CF)	5154.0
Cum Fill Vol (CF)	3959.7
Net Vol (CF)	1194.3



Total Volume at Station 182+00.00	
Cut Area (SF)	0.744
Fill Area (SF)	6.447
Cut Vol (CF)	1.1
Fill Vol (CF)	14.0
Cum Cut Vol (CF)	5156.6
Cum Fill Vol (CF)	4011.2
Net Vol (CF)	1145.4



Total Volume at Station 183+50.00	
Cut Area (SF)	1.072
Fill Area (SF)	5.768
Cut Vol (CF)	1.7
Fill Vol (CF)	10.7
Cum Cut Vol (CF)	5162.2
Cum Fill Vol (CF)	4043.1
Net Vol (CF)	1119.1



SUDBURY
BRUCE FREEMAN RAIL TRAIL

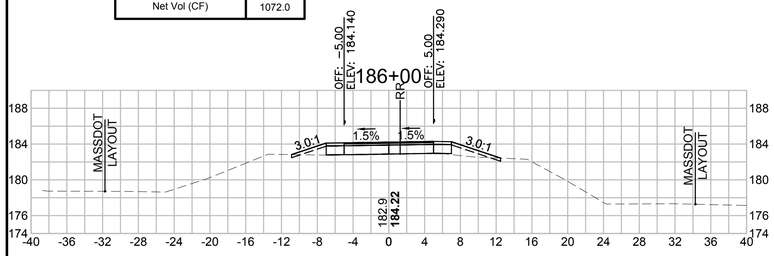
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	262	316
PROJECT FILE NO. 608164			

CROSS SECTIONS

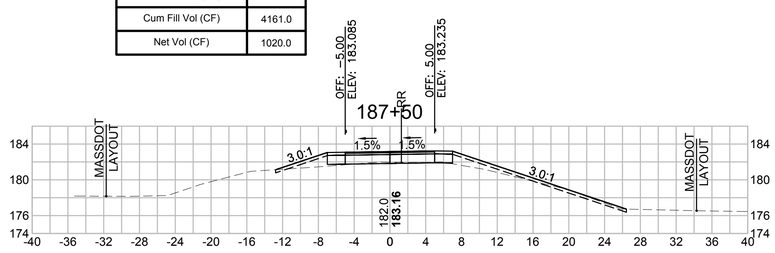
22-Dec-2021

608164_XSEC(CROSS SECTION LAYOUTS).DWG

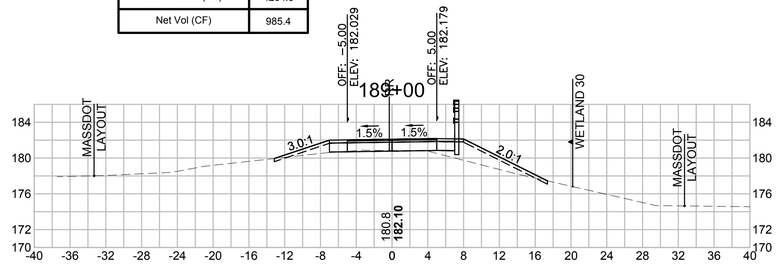
Total Volume at Station 186+00.00	
Cut Area (SF)	0.462
Fill Area (SF)	4.352
Cut Vol (CF)	1.6
Fill Vol (CF)	10.0
Cum Cut Vol (CF)	5173.7
Cum Fill Vol (CF)	4101.7
Net Vol (CF)	1072.0



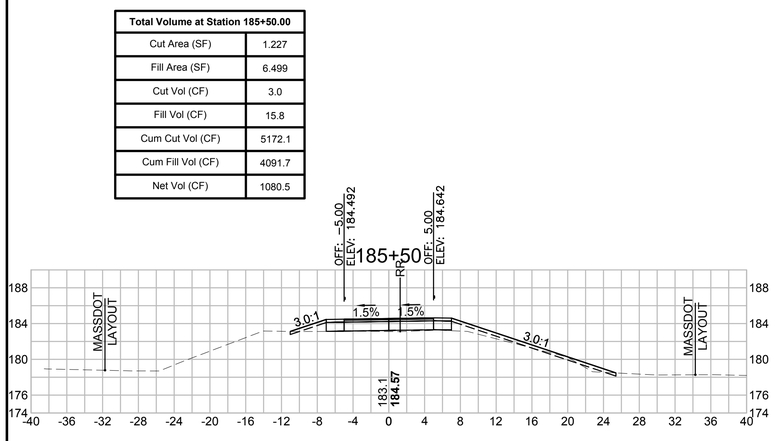
Total Volume at Station 187+50.00	
Cut Area (SF)	3.419
Fill Area (SF)	7.150
Cut Vol (CF)	4.6
Fill Vol (CF)	16.3
Cum Cut Vol (CF)	5181.0
Cum Fill Vol (CF)	4161.0
Net Vol (CF)	1020.0



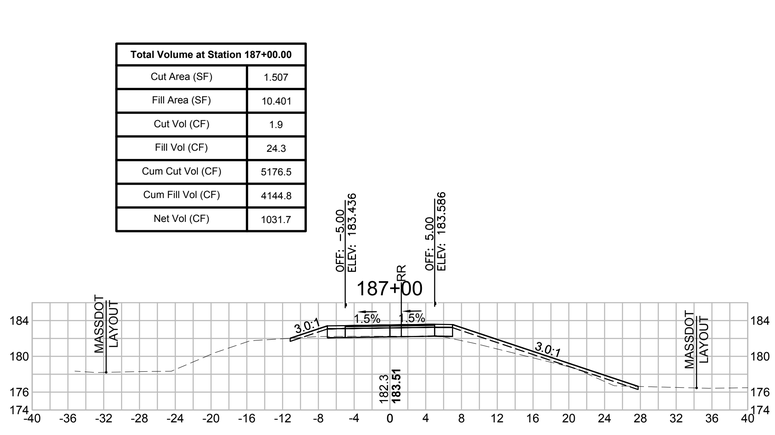
Total Volume at Station 189+00.00	
Cut Area (SF)	1.251
Fill Area (SF)	13.957
Cut Vol (CF)	2.2
Fill Vol (CF)	19.4
Cum Cut Vol (CF)	5190.3
Cum Fill Vol (CF)	4204.9
Net Vol (CF)	985.4



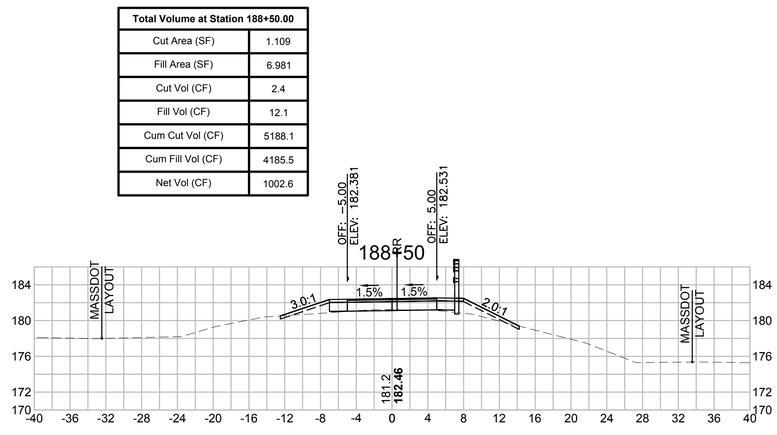
Total Volume at Station 185+50.00	
Cut Area (SF)	1.227
Fill Area (SF)	6.499
Cut Vol (CF)	3.0
Fill Vol (CF)	15.8
Cum Cut Vol (CF)	5172.1
Cum Fill Vol (CF)	4091.7
Net Vol (CF)	1080.5



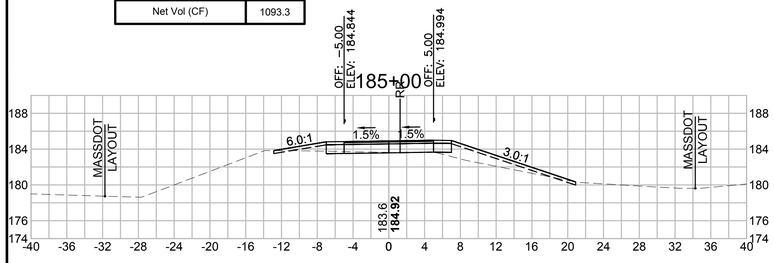
Total Volume at Station 187+00.00	
Cut Area (SF)	1.507
Fill Area (SF)	10.401
Cut Vol (CF)	1.9
Fill Vol (CF)	24.3
Cum Cut Vol (CF)	5176.5
Cum Fill Vol (CF)	4144.8
Net Vol (CF)	1031.7



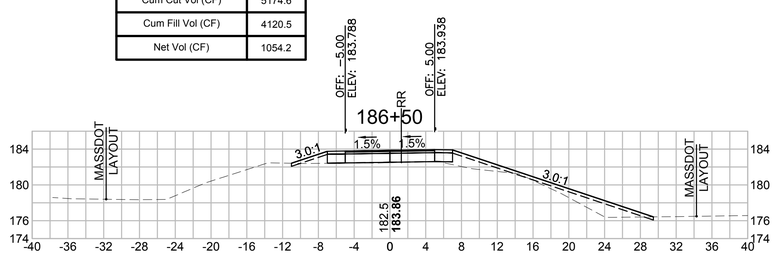
Total Volume at Station 188+50.00	
Cut Area (SF)	1.109
Fill Area (SF)	6.981
Cut Vol (CF)	2.4
Fill Vol (CF)	12.1
Cum Cut Vol (CF)	5188.1
Cum Fill Vol (CF)	4185.5
Net Vol (CF)	1002.6



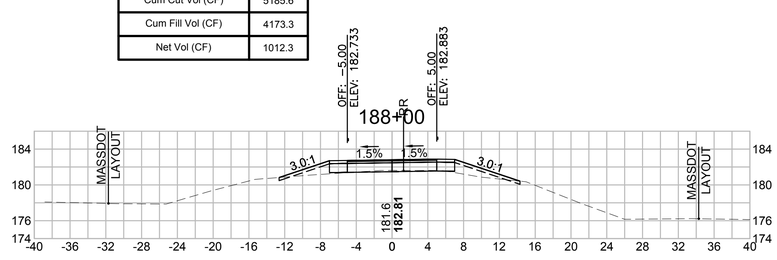
Total Volume at Station 185+00.00	
Cut Area (SF)	1.999
Fill Area (SF)	10.564
Cut Vol (CF)	2.9
Fill Vol (CF)	12.9
Cum Cut Vol (CF)	5169.2
Cum Fill Vol (CF)	4075.9
Net Vol (CF)	1093.3



Total Volume at Station 186+50.00	
Cut Area (SF)	0.508
Fill Area (SF)	15.875
Cut Vol (CF)	0.9
Fill Vol (CF)	18.7
Cum Cut Vol (CF)	5174.6
Cum Fill Vol (CF)	4120.5
Net Vol (CF)	1054.2



Total Volume at Station 188+00.00	
Cut Area (SF)	1.534
Fill Area (SF)	6.123
Cut Vol (CF)	4.6
Fill Vol (CF)	12.3
Cum Cut Vol (CF)	5185.6
Cum Fill Vol (CF)	4173.3
Net Vol (CF)	1012.3



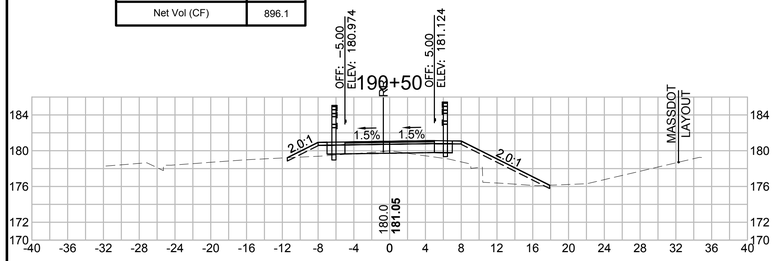
SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	263	316
PROJECT FILE NO. 608164			

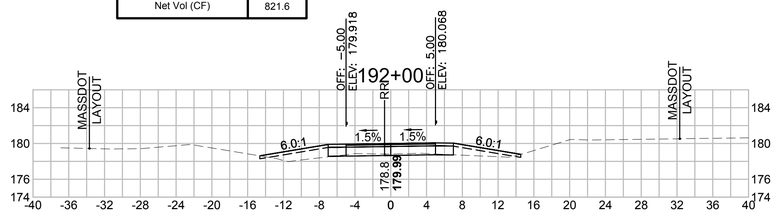
CROSS SECTIONS

608164_XSEC(CROSS SECTION LAYOUTS).DWG 22-Dec-2021

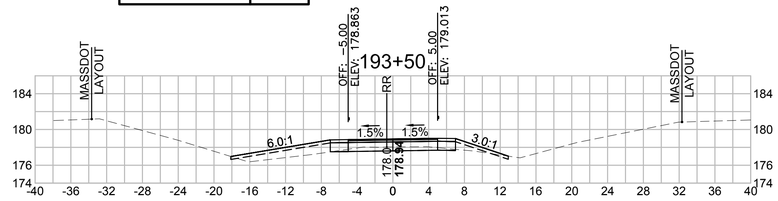
Total Volume at Station 190+50.00	
Cut Area (SF)	1.044
Fill Area (SF)	21.744
Cut Vol (CF)	1.9
Fill Vol (CF)	36.0
Cum Cut Vol (CF)	5196.5
Cum Fill Vol (CF)	4300.4
Net Vol (CF)	896.1



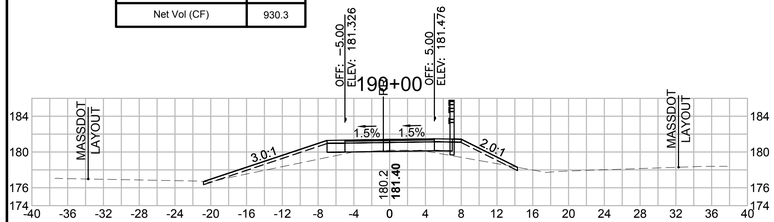
Total Volume at Station 192+00.00	
Cut Area (SF)	2.351
Fill Area (SF)	8.757
Cut Vol (CF)	4.1
Fill Vol (CF)	20.9
Cum Cut Vol (CF)	5207.4
Cum Fill Vol (CF)	4385.8
Net Vol (CF)	821.6



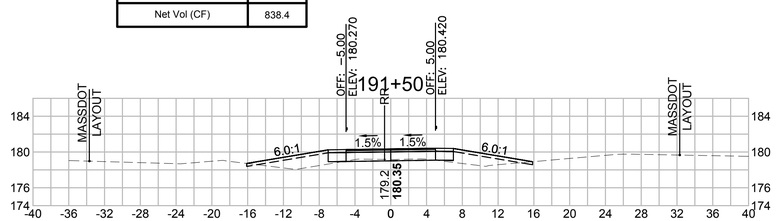
Total Volume at Station 193+50.00	
Cut Area (SF)	5.195
Fill Area (SF)	9.553
Cut Vol (CF)	8.1
Fill Vol (CF)	20.9
Cum Cut Vol (CF)	5227.7
Cum Fill Vol (CF)	4443.1
Net Vol (CF)	784.6



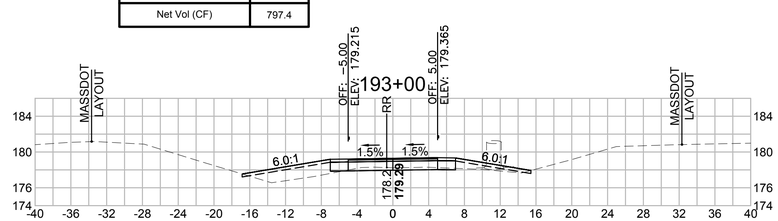
Total Volume at Station 190+00.00	
Cut Area (SF)	0.993
Fill Area (SF)	17.137
Cut Vol (CF)	2.1
Fill Vol (CF)	31.2
Cum Cut Vol (CF)	5194.6
Cum Fill Vol (CF)	4264.4
Net Vol (CF)	930.3



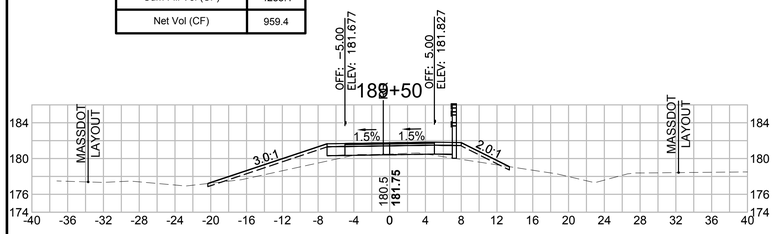
Total Volume at Station 191+50.00	
Cut Area (SF)	2.027
Fill Area (SF)	13.777
Cut Vol (CF)	3.9
Fill Vol (CF)	28.6
Cum Cut Vol (CF)	5203.3
Cum Fill Vol (CF)	4364.9
Net Vol (CF)	838.4



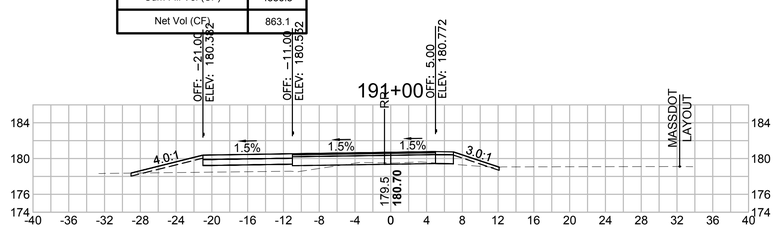
Total Volume at Station 193+00.00	
Cut Area (SF)	3.586
Fill Area (SF)	13.067
Cut Vol (CF)	6.7
Fill Vol (CF)	20.2
Cum Cut Vol (CF)	5219.6
Cum Fill Vol (CF)	4422.2
Net Vol (CF)	797.4



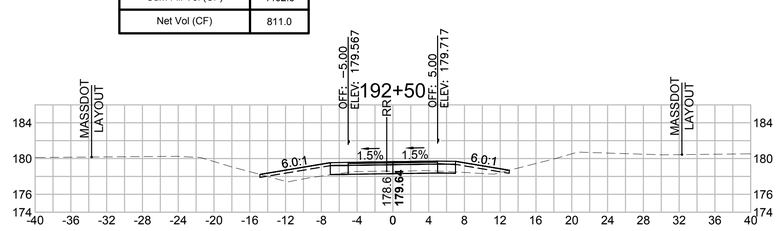
Total Volume at Station 189+50.00	
Cut Area (SF)	1.247
Fill Area (SF)	16.603
Cut Vol (CF)	2.3
Fill Vol (CF)	28.3
Cum Cut Vol (CF)	5192.6
Cum Fill Vol (CF)	4233.1
Net Vol (CF)	959.4



Total Volume at Station 191+00.00	
Cut Area (SF)	2.143
Fill Area (SF)	17.079
Cut Vol (CF)	3.0
Fill Vol (CF)	35.9
Cum Cut Vol (CF)	5199.5
Cum Fill Vol (CF)	4336.3
Net Vol (CF)	863.1



Total Volume at Station 192+50.00	
Cut Area (SF)	3.617
Fill Area (SF)	8.735
Cut Vol (CF)	5.5
Fill Vol (CF)	16.2
Cum Cut Vol (CF)	5212.9
Cum Fill Vol (CF)	4402.0
Net Vol (CF)	811.0



SUDBURY
BRUCE FREEMAN RAIL TRAIL

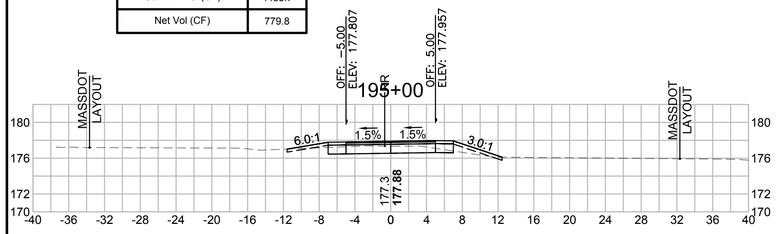
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	264	316
PROJECT FILE NO. 608164			

CROSS SECTIONS

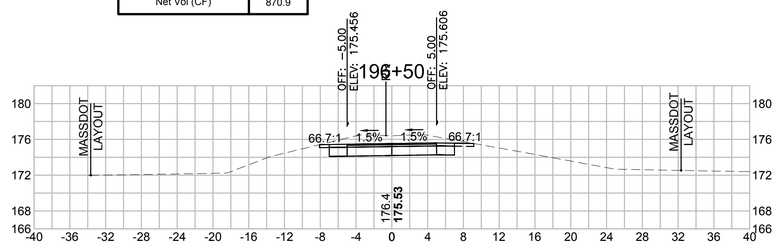
22-Dec-2021

608164_XSEC(CROSS SECTION LAYOUTS).DWG

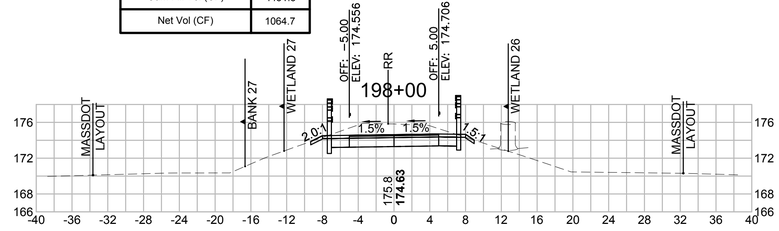
Total Volume at Station 195+00.00	
Cut Area (SF)	10.625
Fill Area (SF)	1.877
Cut Vol (CF)	15.3
Fill Vol (CF)	11.2
Cum Cut Vol (CF)	5265.5
Cum Fill Vol (CF)	4485.7
Net Vol (CF)	779.8



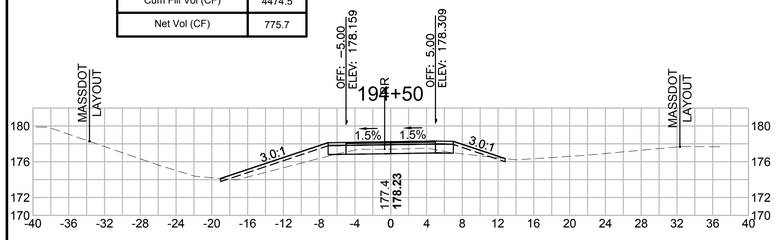
Total Volume at Station 196+50.00	
Cut Area (SF)	31.301
Fill Area (SF)	0.000
Cut Vol (CF)	47.3
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	5362.5
Cum Fill Vol (CF)	4491.6
Net Vol (CF)	870.9



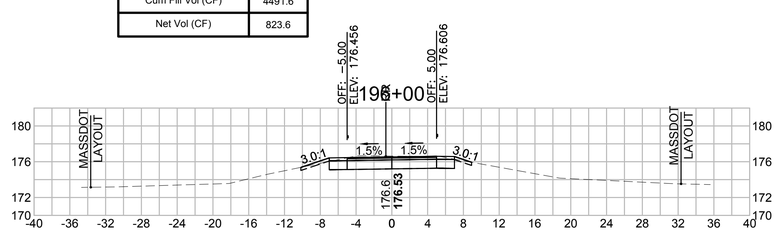
Total Volume at Station 198+00.00	
Cut Area (SF)	32.247
Fill Area (SF)	0.000
Cut Vol (CF)	62.7
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	5556.3
Cum Fill Vol (CF)	4491.6
Net Vol (CF)	1064.7



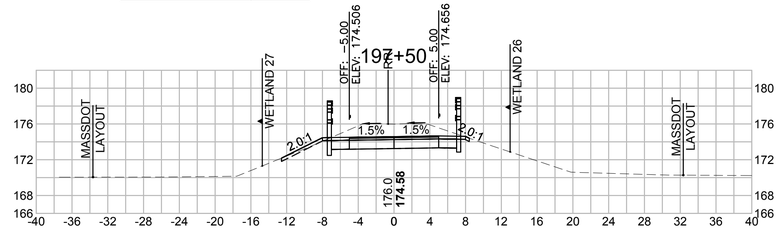
Total Volume at Station 194+50.00	
Cut Area (SF)	5.936
Fill Area (SF)	10.223
Cut Vol (CF)	11.6
Fill Vol (CF)	16.0
Cum Cut Vol (CF)	5250.2
Cum Fill Vol (CF)	4474.5
Net Vol (CF)	775.7



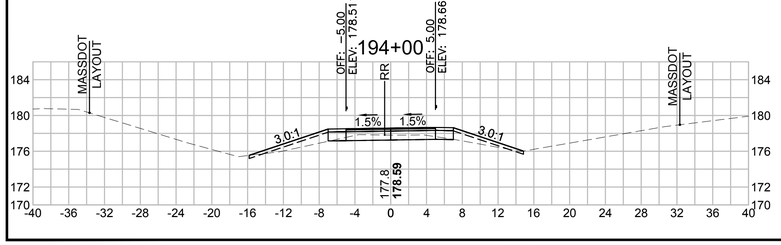
Total Volume at Station 196+00.00	
Cut Area (SF)	19.737
Fill Area (SF)	0.012
Cut Vol (CF)	29.1
Fill Vol (CF)	2.1
Cum Cut Vol (CF)	5315.2
Cum Fill Vol (CF)	4491.6
Net Vol (CF)	823.6



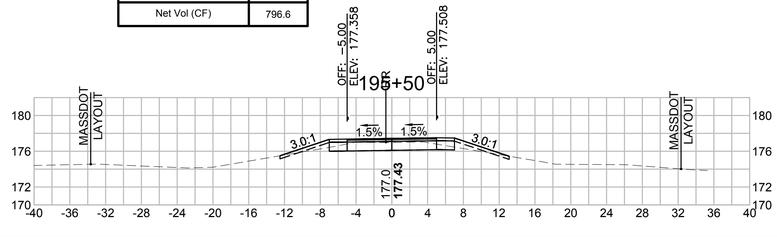
Total Volume at Station 197+50.00	
Cut Area (SF)	35.520
Fill Area (SF)	0.012
Cut Vol (CF)	67.5
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	5493.6
Cum Fill Vol (CF)	4491.6
Net Vol (CF)	1001.9



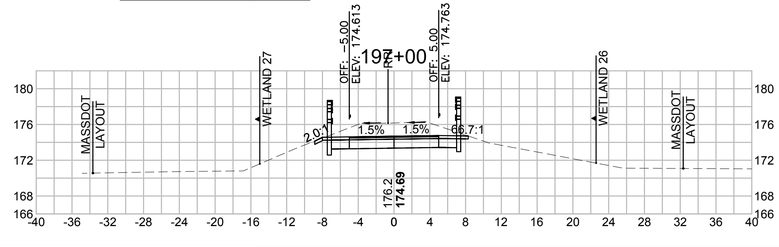
Total Volume at Station 194+00.00	
Cut Area (SF)	6.552
Fill Area (SF)	7.062
Cut Vol (CF)	10.9
Fill Vol (CF)	15.4
Cum Cut Vol (CF)	5238.6
Cum Fill Vol (CF)	4458.5
Net Vol (CF)	780.1



Total Volume at Station 195+50.00	
Cut Area (SF)	11.672
Fill Area (SF)	2.250
Cut Vol (CF)	20.6
Fill Vol (CF)	3.8
Cum Cut Vol (CF)	5286.1
Cum Fill Vol (CF)	4489.5
Net Vol (CF)	796.6



Total Volume at Station 197+00.00	
Cut Area (SF)	37.377
Fill Area (SF)	0.000
Cut Vol (CF)	63.6
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	5426.1
Cum Fill Vol (CF)	4491.6
Net Vol (CF)	934.4



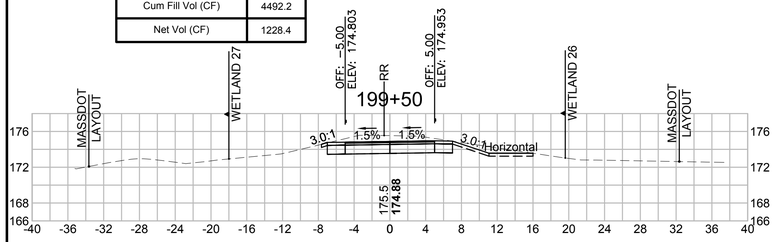
SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	265	316
PROJECT FILE NO. 608164			

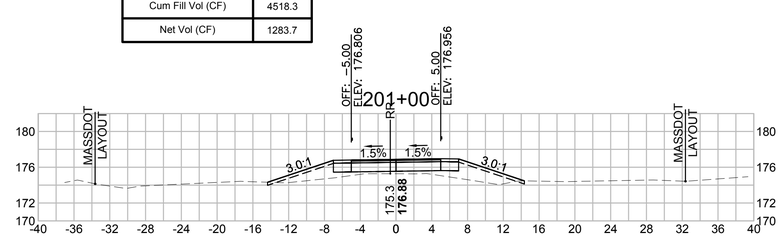
CROSS SECTIONS

608164_XSEC(CROSS SECTION LAYOUTS).DWG 22-Dec-2021

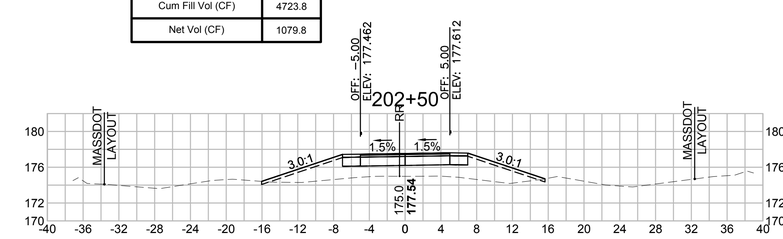
Total Volume at Station 199+50.00	
Cut Area (SF)	28.820
Fill Area (SF)	0.000
Cut Vol (CF)	52.5
Fill Vol (CF)	0.1
Cum Cut Vol (CF)	5720.6
Cum Fill Vol (CF)	4492.2
Net Vol (CF)	1228.4



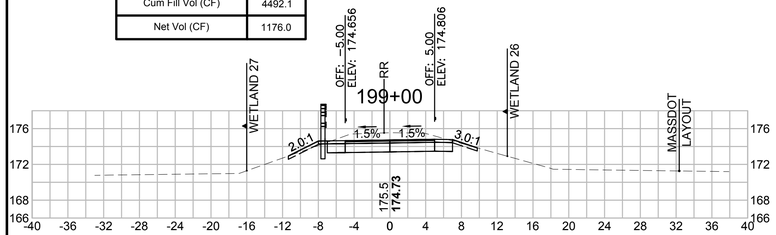
Total Volume at Station 201+00.00	
Cut Area (SF)	0.342
Fill Area (SF)	18.524
Cut Vol (CF)	6.7
Fill Vol (CF)	20.8
Cum Cut Vol (CF)	5801.9
Cum Fill Vol (CF)	4518.3
Net Vol (CF)	1283.7



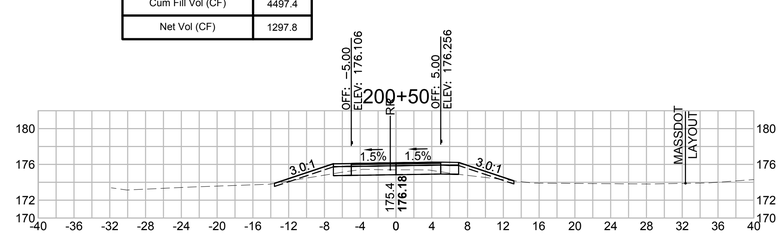
Total Volume at Station 202+50.00	
Cut Area (SF)	0.271
Fill Area (SF)	40.025
Cut Vol (CF)	0.5
Fill Vol (CF)	76.3
Cum Cut Vol (CF)	5803.6
Cum Fill Vol (CF)	4723.8
Net Vol (CF)	1079.8



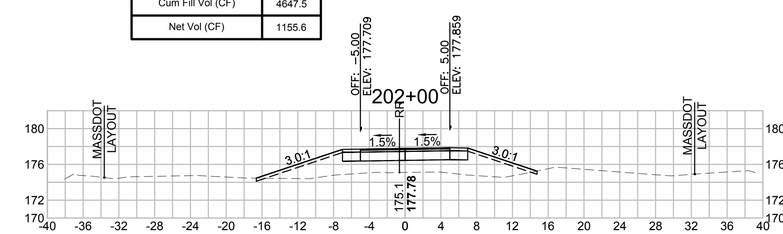
Total Volume at Station 199+00.00	
Cut Area (SF)	27.859
Fill Area (SF)	0.092
Cut Vol (CF)	53.9
Fill Vol (CF)	0.3
Cum Cut Vol (CF)	5668.1
Cum Fill Vol (CF)	4492.1
Net Vol (CF)	1176.0



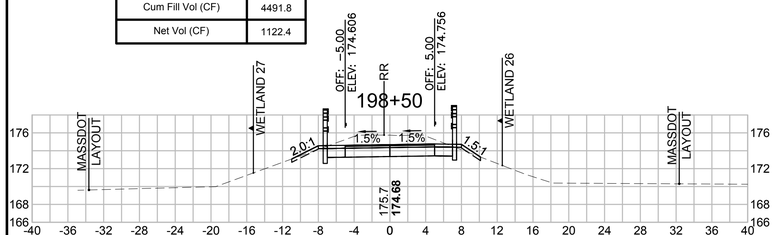
Total Volume at Station 200+50.00	
Cut Area (SF)	6.947
Fill Area (SF)	3.966
Cut Vol (CF)	27.2
Fill Vol (CF)	4.5
Cum Cut Vol (CF)	5795.2
Cum Fill Vol (CF)	4497.4
Net Vol (CF)	1297.8



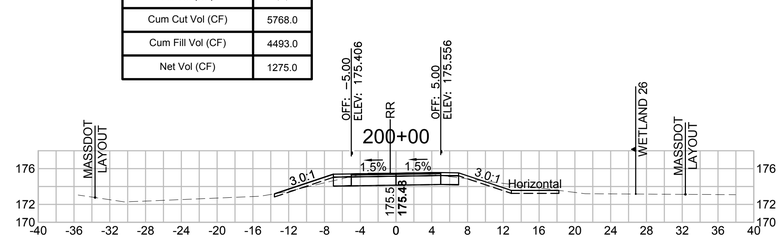
Total Volume at Station 202+00.00	
Cut Area (SF)	0.293
Fill Area (SF)	42.344
Cut Vol (CF)	0.5
Fill Vol (CF)	75.6
Cum Cut Vol (CF)	5803.0
Cum Fill Vol (CF)	4647.5
Net Vol (CF)	1155.6



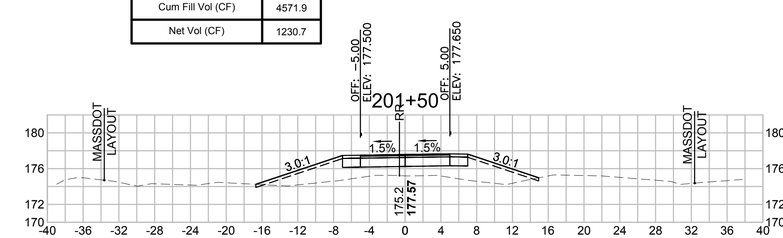
Total Volume at Station 198+50.00	
Cut Area (SF)	30.312
Fill Area (SF)	0.190
Cut Vol (CF)	57.9
Fill Vol (CF)	0.2
Cum Cut Vol (CF)	5614.2
Cum Fill Vol (CF)	4491.8
Net Vol (CF)	1122.4



Total Volume at Station 200+00.00	
Cut Area (SF)	22.409
Fill Area (SF)	0.868
Cut Cut Vol (CF)	47.4
Fill Vol (CF)	0.8
Cum Cut Vol (CF)	5768.0
Cum Fill Vol (CF)	4493.0
Net Vol (CF)	1275.0



Total Volume at Station 201+50.00	
Cut Area (SF)	0.275
Fill Area (SF)	39.345
Cut Vol (CF)	0.6
Fill Vol (CF)	53.6
Cum Cut Vol (CF)	5802.5
Cum Fill Vol (CF)	4571.9
Net Vol (CF)	1230.7



SUDBURY
BRUCE FREEMAN RAIL TRAIL

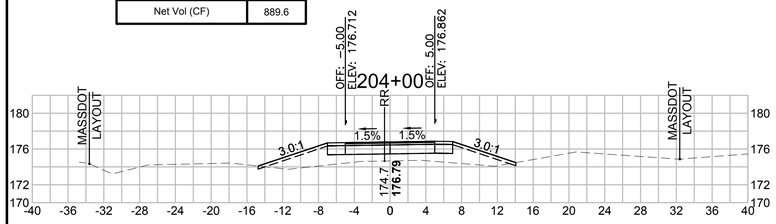
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	266	316
PROJECT FILE NO. 608164			

CROSS SECTIONS

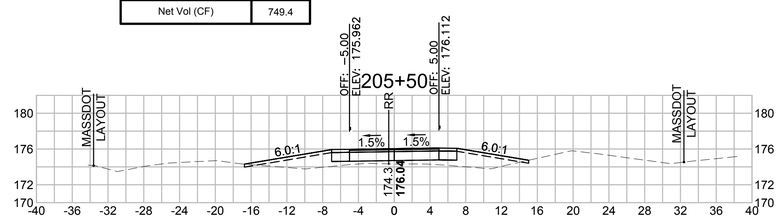
22-Dec-2021

608164_XSEC(CROSS SECTION LAYOUTS).DWG

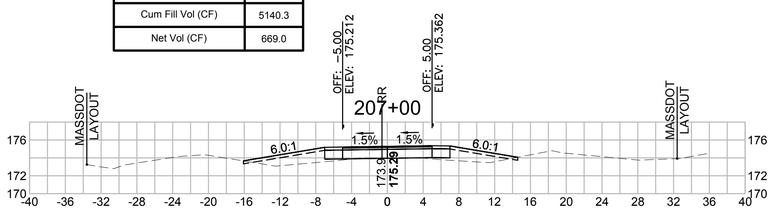
Total Volume at Station 204+00.00	
Cut Area (SF)	0.258
Fill Area (SF)	28.304
Cut Vol (CF)	0.5
Fill Vol (CF)	56.4
Cum Cut Vol (CF)	5805.3
Cum Fill Vol (CF)	4915.7
Net Vol (CF)	889.6



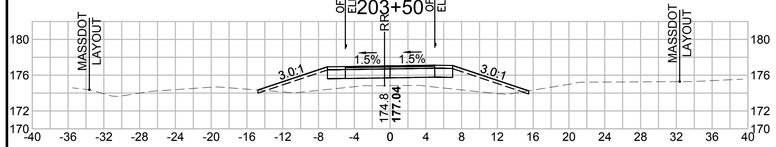
Total Volume at Station 205+50.00	
Cut Area (SF)	0.375
Fill Area (SF)	21.699
Cut Vol (CF)	0.7
Fill Vol (CF)	41.8
Cum Cut Vol (CF)	5807.1
Cum Fill Vol (CF)	5057.7
Net Vol (CF)	749.4



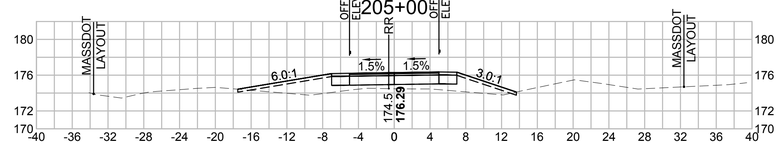
Total Volume at Station 207+00.00	
Cut Area (SF)	0.486
Fill Area (SF)	13.526
Cut Vol (CF)	0.8
Fill Vol (CF)	23.9
Cum Cut Vol (CF)	5809.3
Cum Fill Vol (CF)	5140.3
Net Vol (CF)	669.0



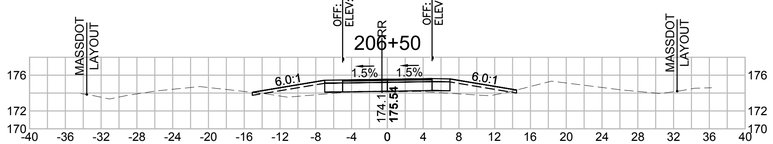
Total Volume at Station 203+50.00	
Cut Area (SF)	0.272
Fill Area (SF)	32.630
Cut Vol (CF)	0.6
Fill Vol (CF)	64.3
Cum Cut Vol (CF)	5804.9
Cum Fill Vol (CF)	4859.3
Net Vol (CF)	945.6



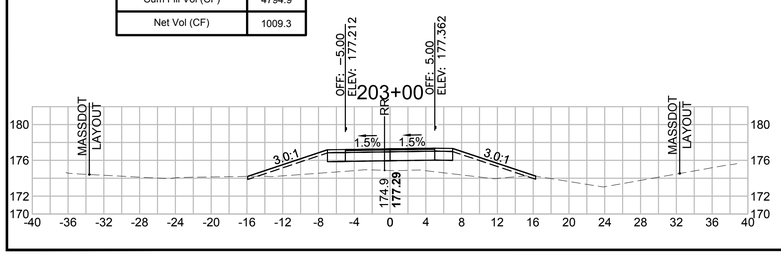
Total Volume at Station 205+00.00	
Cut Area (SF)	0.335
Fill Area (SF)	23.445
Cut Vol (CF)	0.6
Fill Vol (CF)	47.8
Cum Cut Vol (CF)	5806.4
Cum Fill Vol (CF)	5015.9
Net Vol (CF)	790.6



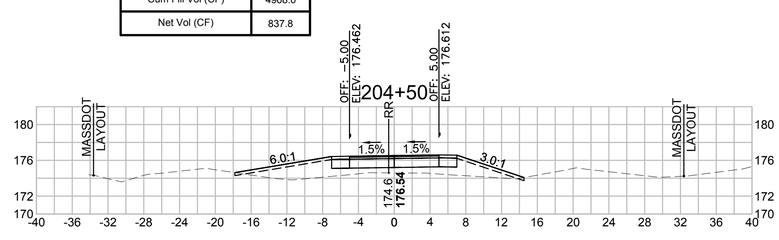
Total Volume at Station 206+50.00	
Cut Area (SF)	0.406
Fill Area (SF)	12.314
Cut Vol (CF)	0.7
Fill Vol (CF)	25.0
Cum Cut Vol (CF)	5808.4
Cum Fill Vol (CF)	5116.4
Net Vol (CF)	692.1



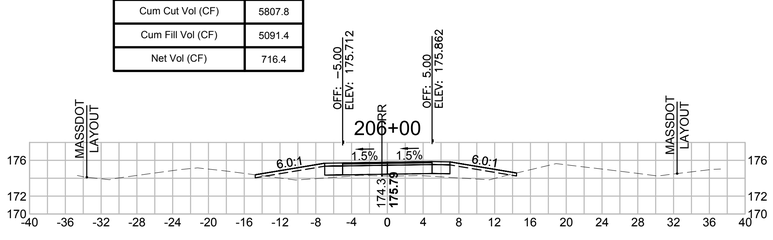
Total Volume at Station 203+00.00	
Cut Area (SF)	0.424
Fill Area (SF)	36.854
Cut Vol (CF)	0.6
Fill Vol (CF)	71.2
Cum Cut Vol (CF)	5804.2
Cum Fill Vol (CF)	4794.9
Net Vol (CF)	1009.3



Total Volume at Station 204+50.00	
Cut Area (SF)	0.298
Fill Area (SF)	28.213
Cut Vol (CF)	0.5
Fill Vol (CF)	52.3
Cum Cut Vol (CF)	5805.9
Cum Fill Vol (CF)	4968.0
Net Vol (CF)	837.8



Total Volume at Station 206+00.00	
Cut Area (SF)	0.331
Fill Area (SF)	14.701
Cut Vol (CF)	0.7
Fill Vol (CF)	33.7
Cum Cut Vol (CF)	5807.8
Cum Fill Vol (CF)	5091.4
Net Vol (CF)	716.4



SUDBURY
BRUCE FREEMAN RAIL TRAIL

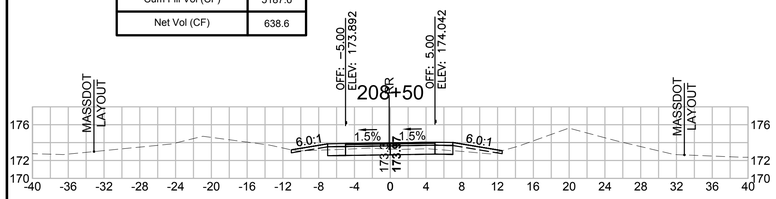
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	267	316
PROJECT FILE NO. 608164			

CROSS SECTIONS

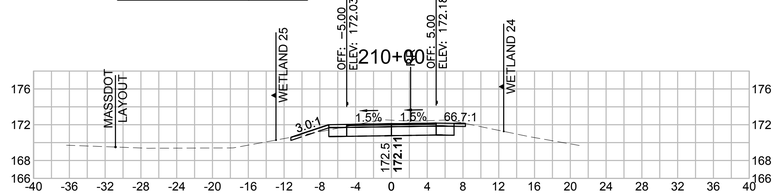
22-Dec-2021

608164_XSEC(CROSS SECTION LAYOUTS).DWG

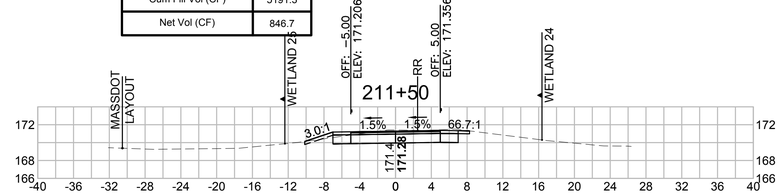
Total Volume at Station 208+50.00	
Cut Area (SF)	9.191
Fill Area (SF)	2.229
Cut Vol (CF)	11.7
Fill Vol (CF)	8.2
Cum Cut Vol (CF)	5826.3
Cum Fill Vol (CF)	5187.6
Net Vol (CF)	638.6



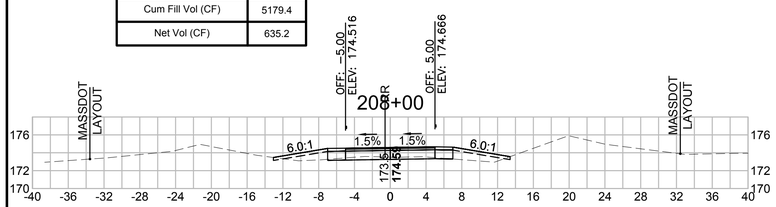
Total Volume at Station 210+00.00	
Cut Area (SF)	21.922
Fill Area (SF)	0.211
Cut Vol (CF)	37.4
Fill Vol (CF)	0.2
Cum Cut Vol (CF)	5915.7
Cum Fill Vol (CF)	5190.5
Net Vol (CF)	725.2



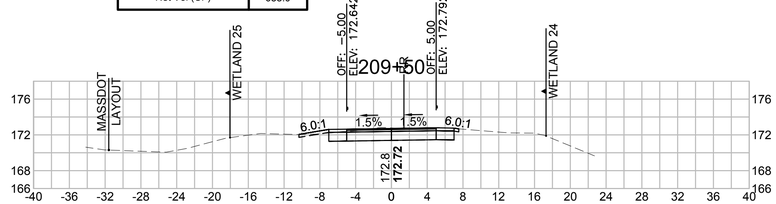
Total Volume at Station 211+50.00	
Cut Area (SF)	18.770
Fill Area (SF)	0.179
Cut Vol (CF)	38.1
Fill Vol (CF)	0.3
Cum Cut Vol (CF)	6038.0
Cum Fill Vol (CF)	5191.3
Net Vol (CF)	846.7



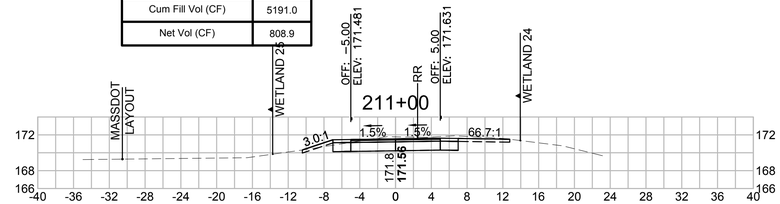
Total Volume at Station 208+00.00	
Cut Area (SF)	3.446
Fill Area (SF)	6.676
Cut Vol (CF)	4.0
Fill Vol (CF)	16.4
Cum Cut Vol (CF)	5814.6
Cum Fill Vol (CF)	5179.4
Net Vol (CF)	635.2



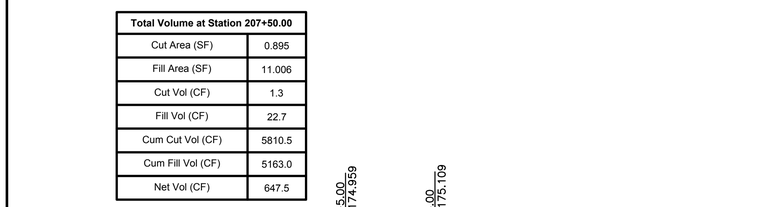
Total Volume at Station 209+50.00	
Cut Area (SF)	18.433
Fill Area (SF)	0.029
Cut Vol (CF)	30.3
Fill Vol (CF)	0.3
Cum Cut Vol (CF)	5878.3
Cum Fill Vol (CF)	5190.3
Net Vol (CF)	688.0



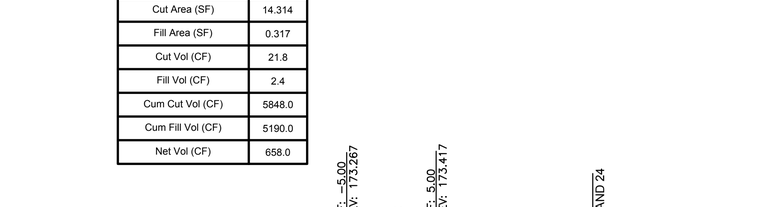
Total Volume at Station 211+00.00	
Cut Area (SF)	22.329
Fill Area (SF)	0.185
Cut Vol (CF)	42.3
Fill Vol (CF)	0.2
Cum Cut Vol (CF)	5999.9
Cum Fill Vol (CF)	5191.0
Net Vol (CF)	808.9



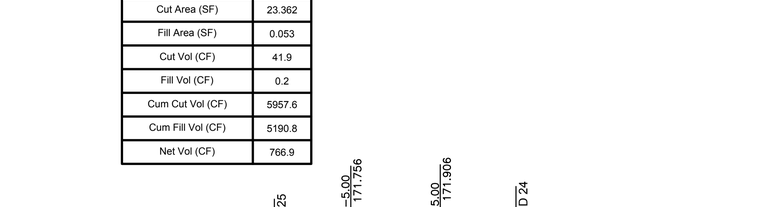
Total Volume at Station 207+50.00	
Cut Area (SF)	0.895
Fill Area (SF)	11.006
Cut Vol (CF)	1.3
Fill Vol (CF)	22.7
Cum Cut Vol (CF)	5810.5
Cum Fill Vol (CF)	5163.0
Net Vol (CF)	647.5



Total Volume at Station 209+00.00	
Cut Area (SF)	14.314
Fill Area (SF)	0.317
Cut Vol (CF)	21.8
Fill Vol (CF)	2.4
Cum Cut Vol (CF)	5848.0
Cum Fill Vol (CF)	5190.0
Net Vol (CF)	658.0



Total Volume at Station 210+50.00	
Cut Area (SF)	23.362
Fill Area (SF)	0.053
Cut Vol (CF)	41.9
Fill Vol (CF)	0.2
Cum Cut Vol (CF)	5957.6
Cum Fill Vol (CF)	5190.8
Net Vol (CF)	766.9



SUDBURY
BRUCE FREEMAN RAIL TRAIL

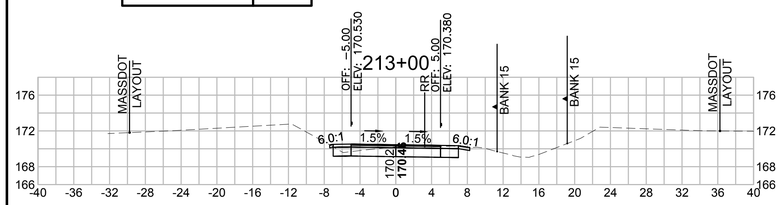
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	268	316
PROJECT FILE NO. 608164			

CROSS SECTIONS

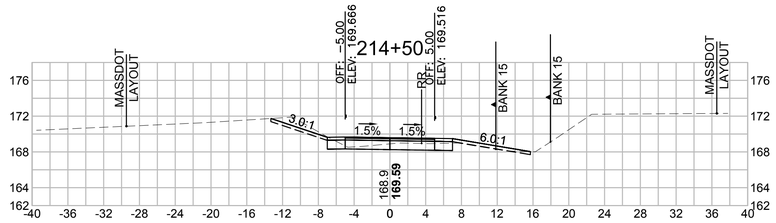
22-Dec-2021

608164_XSEC(CROSS SECTION LAYOUTS).DWG

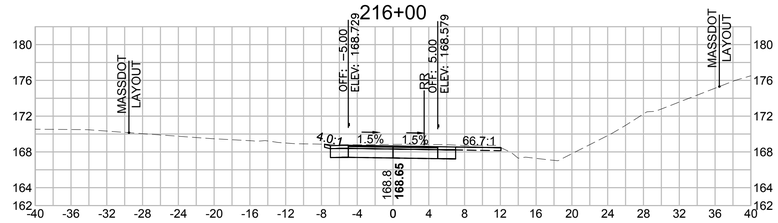
Total Volume at Station 213+00.00	
Cut Area (SF)	14.065
Fill Area (SF)	0.000
Cut Vol (CF)	28.4
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	6132.3
Cum Fill Vol (CF)	5191.5
Net Vol (CF)	940.8



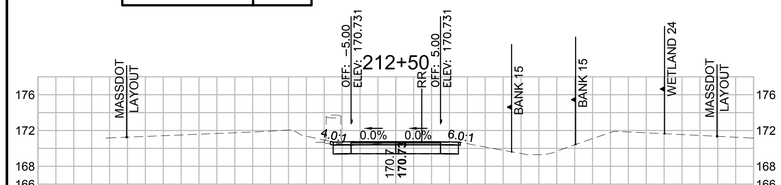
Total Volume at Station 214+50.00	
Cut Area (SF)	14.677
Fill Area (SF)	0.356
Cut Vol (CF)	33.4
Fill Vol (CF)	0.3
Cum Cut Vol (CF)	6233.3
Cum Fill Vol (CF)	5191.9
Net Vol (CF)	1041.4



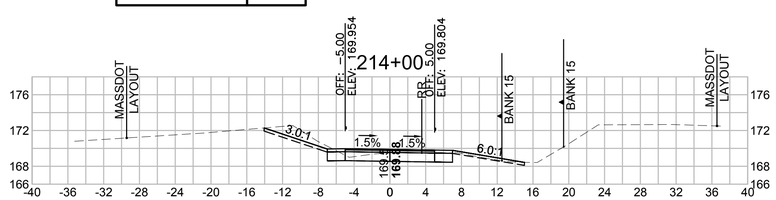
Total Volume at Station 216+00.00	
Cut Area (SF)	24.110
Fill Area (SF)	0.000
Cut Vol (CF)	30.6
Fill Vol (CF)	0.1
Cum Cut Vol (CF)	6300.0
Cum Fill Vol (CF)	5192.6
Net Vol (CF)	1107.4



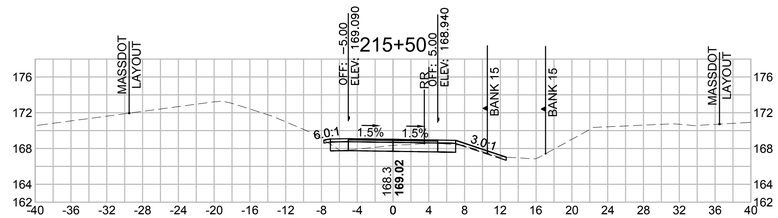
Total Volume at Station 212+50.00	
Cut Area (SF)	16.643
Fill Area (SF)	0.000
Cut Vol (CF)	32.0
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	6103.9
Cum Fill Vol (CF)	5191.5
Net Vol (CF)	912.3



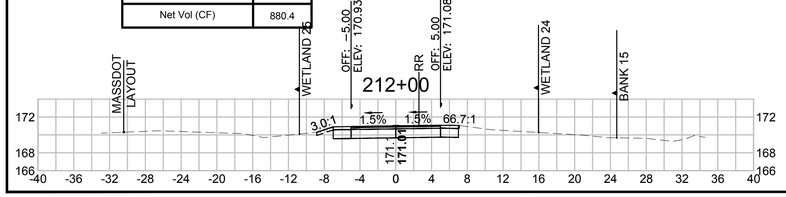
Total Volume at Station 214+00.00	
Cut Area (SF)	21.365
Fill Area (SF)	0.000
Cut Vol (CF)	37.2
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	6199.9
Cum Fill Vol (CF)	5191.5
Net Vol (CF)	1008.4



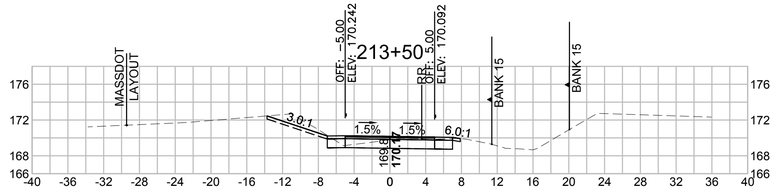
Total Volume at Station 215+50.00	
Cut Area (SF)	8.933
Fill Area (SF)	0.083
Cut Vol (CF)	15.4
Fill Vol (CF)	0.2
Cum Cut Vol (CF)	6269.4
Cum Fill Vol (CF)	5192.5
Net Vol (CF)	1076.9



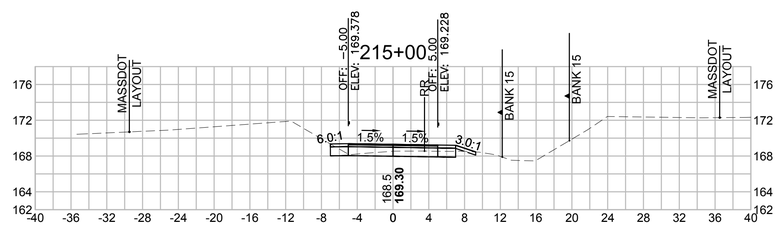
Total Volume at Station 212+00.00	
Cut Area (SF)	17.865
Fill Area (SF)	0.014
Cut Vol (CF)	33.9
Fill Vol (CF)	0.2
Cum Cut Vol (CF)	6071.9
Cum Fill Vol (CF)	5191.5
Net Vol (CF)	880.4



Total Volume at Station 213+50.00	
Cut Area (SF)	18.793
Fill Area (SF)	0.000
Cut Vol (CF)	30.4
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	6162.7
Cum Fill Vol (CF)	5191.5
Net Vol (CF)	971.2



Total Volume at Station 215+00.00	
Cut Area (SF)	7.704
Fill Area (SF)	0.152
Cut Vol (CF)	20.7
Fill Vol (CF)	0.5
Cum Cut Vol (CF)	6254.0
Cum Fill Vol (CF)	5192.3
Net Vol (CF)	1061.7



SUDBURY
BRUCE FREEMAN RAIL TRAIL

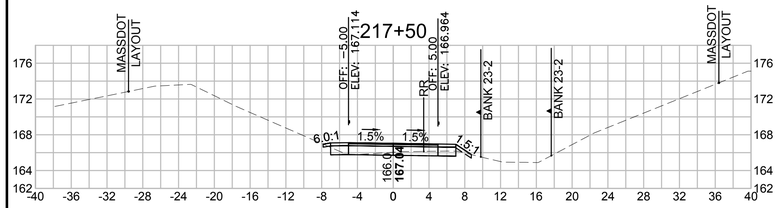
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	269	316
PROJECT FILE NO. 608164			

CROSS SECTIONS

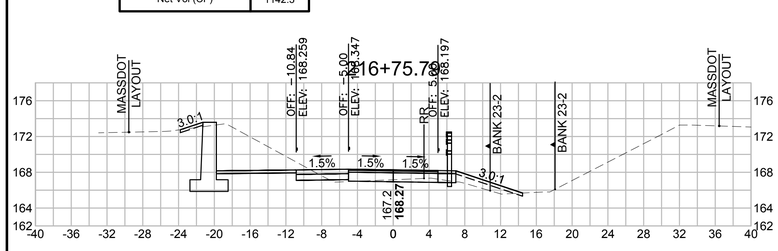
22-Dec-2021

608164_XSEC(CROSS SECTION LAYOUTS).DWG

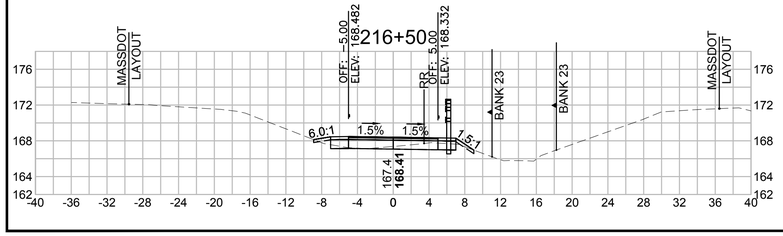
Total Volume at Station 217+50.00	
Cut Area (SF)	5.141
Fill Area (SF)	0.179
Cut Vol (CF)	24.1
Fill Vol (CF)	1.9
Cum Cut Vol (CF)	6360.3
Cum Fill Vol (CF)	5195.7
Net Vol (CF)	1164.6



Total Volume at Station 216+75.79	
Cut Area (SF)	12.376
Fill Area (SF)	1.177
Cut Vol (CF)	8.6
Fill Vol (CF)	0.8
Cum Cut Vol (CF)	6336.2
Cum Fill Vol (CF)	5193.9
Net Vol (CF)	1142.3



Total Volume at Station 216+50.00	
Cut Area (SF)	5.672
Fill Area (SF)	0.482
Cut Vol (CF)	27.6
Fill Vol (CF)	0.4
Cum Cut Vol (CF)	6327.6
Cum Fill Vol (CF)	5193.1
Net Vol (CF)	1134.5



SUDBURY
BRUCE FREEMAN RAIL TRAIL

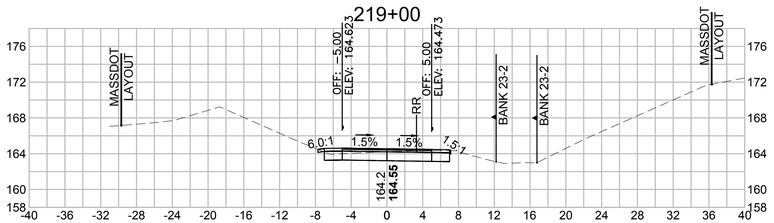
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	270	316
PROJECT FILE NO. 608164			

CROSS SECTIONS

22-Dec-2021

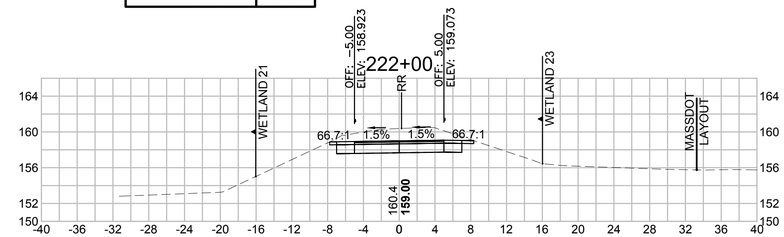
608164_XSEC(CROSS SECTION LAYOUTS).DWG

Total Volume at Station 219+00.00	
Cut Area (SF)	13.950
Fill Area (SF)	0.005
Cut Vol (CF)	22.5
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	6410.4
Cum Fill Vol (CF)	4199.9
Net Vol (CF)	2210.5

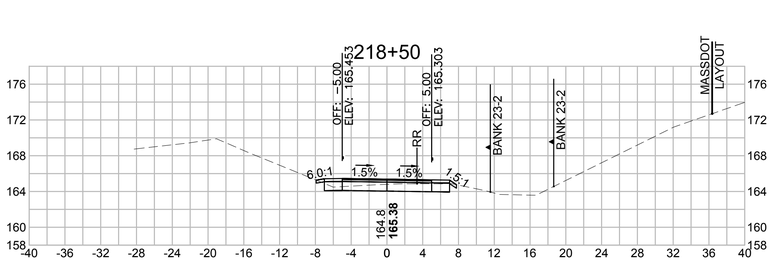


Total Volume at Station 220+50.00	
Cut Area (SF)	20.886
Fill Area (SF)	0.009
Cut Vol (CF)	38.0
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	6513.2
Cum Fill Vol (CF)	4199.9
Net Vol (CF)	2313.3

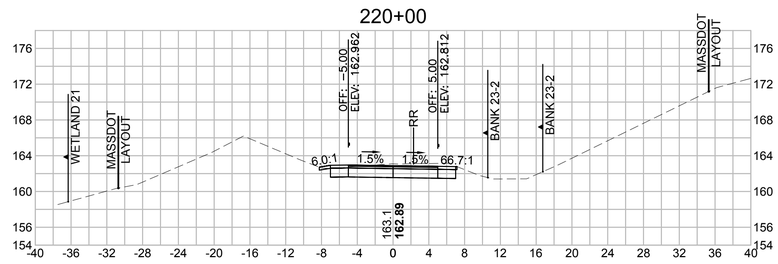
Total Volume at Station 222+00.00	
Cut Area (SF)	36.279
Fill Area (SF)	0.043
Cut Vol (CF)	60.3
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	6666.8
Cum Fill Vol (CF)	4199.9
Net Vol (CF)	2466.9



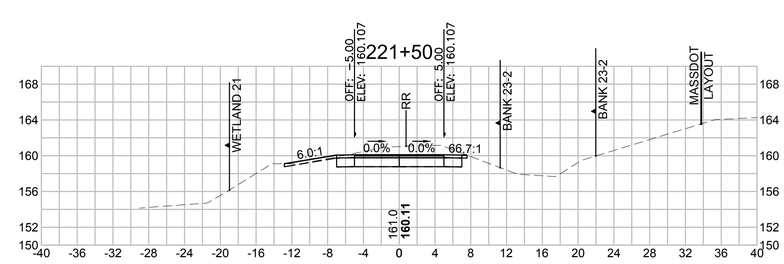
Total Volume at Station 218+50.00	
Cut Area (SF)	10.300
Fill Area (SF)	0.030
Cut Vol (CF)	17.8
Fill Vol (CF)	0.1
Cum Cut Vol (CF)	6387.9
Cum Fill Vol (CF)	4199.8
Net Vol (CF)	2188.1



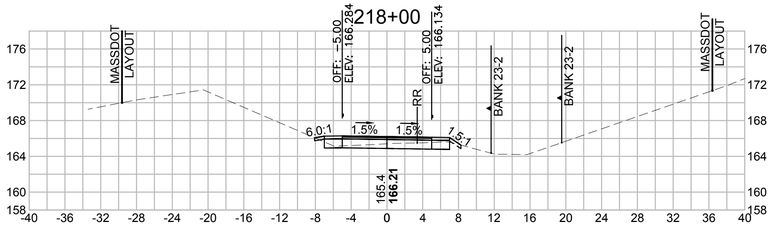
Total Volume at Station 220+00.00	
Cut Area (SF)	20.136
Fill Area (SF)	0.001
Cut Vol (CF)	35.3
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	6475.2
Cum Fill Vol (CF)	4199.9
Net Vol (CF)	2275.3



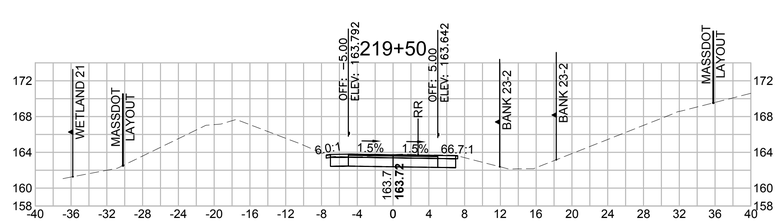
Total Volume at Station 221+50.00	
Cut Area (SF)	28.856
Fill Area (SF)	0.000
Cut Vol (CF)	50.3
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	6606.5
Cum Fill Vol (CF)	4199.9
Net Vol (CF)	2406.6



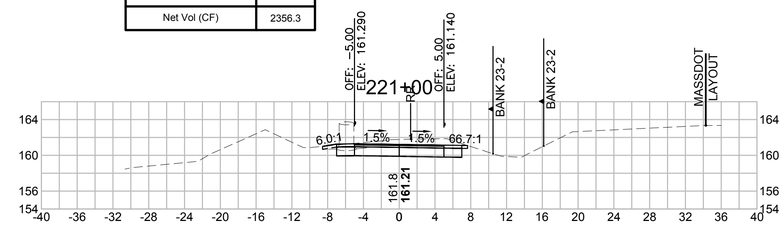
Total Volume at Station 218+00.00	
Cut Area (SF)	8.908
Fill Area (SF)	0.096
Cut Vol (CF)	13.0
Fill Vol (CF)	1.0
Cum Cut Vol (CF)	6370.1
Cum Fill Vol (CF)	4199.7
Net Vol (CF)	2170.4



Total Volume at Station 219+50.00	
Cut Area (SF)	17.969
Fill Area (SF)	0.000
Cut Vol (CF)	29.6
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	6439.9
Cum Fill Vol (CF)	4199.9
Net Vol (CF)	2240.1



Total Volume at Station 221+00.00	
Cut Area (SF)	25.513
Fill Area (SF)	0.000
Cut Vol (CF)	43.0
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	6556.2
Cum Fill Vol (CF)	4199.9
Net Vol (CF)	2356.3



SUDBURY
BRUCE FREEMAN RAIL TRAIL

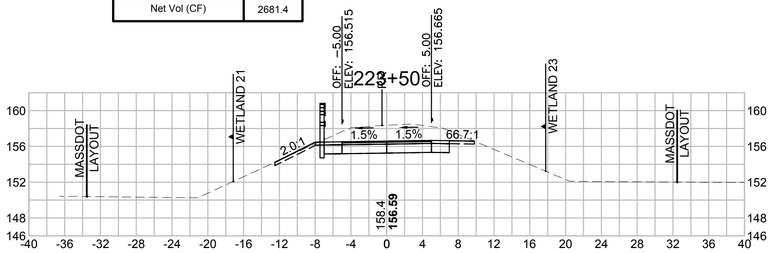
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	271	316
PROJECT FILE NO. 608164			

CROSS SECTIONS

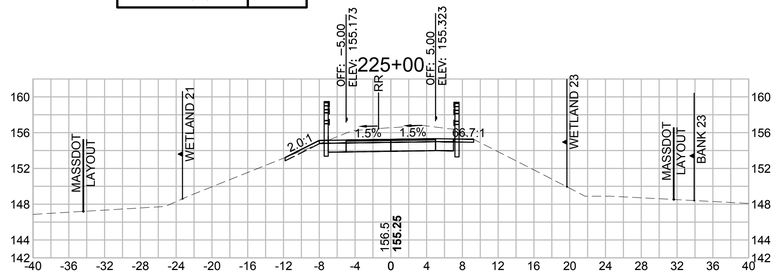
22-Dec-2021

608164_XSEC(CROSS SECTION LAYOUTS).DWG

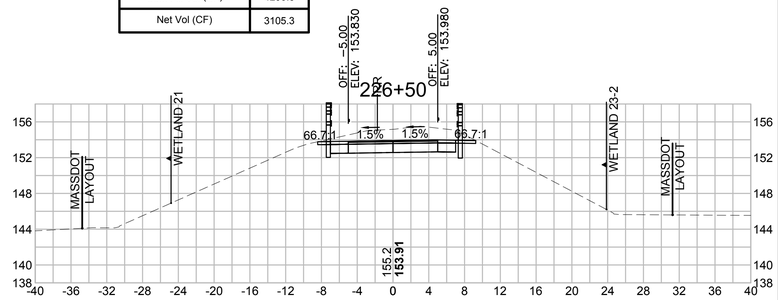
Total Volume at Station 223+50.00	
Cut Area (SF)	43.892
Fill Area (SF)	0.000
Cut Vol (CF)	76.7
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	6881.8
Cum Fill Vol (CF)	4200.5
Net Vol (CF)	2681.4



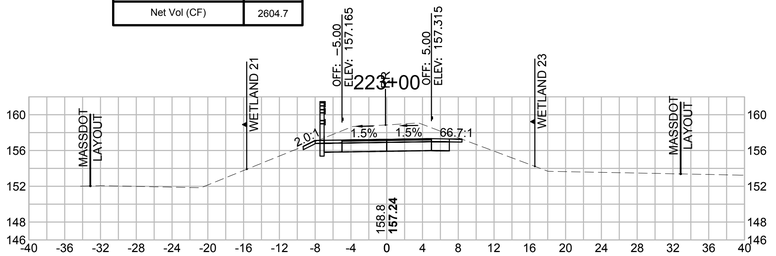
Total Volume at Station 225+00.00	
Cut Area (SF)	37.322
Fill Area (SF)	0.005
Cut Vol (CF)	69.9
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	7097.1
Cum Fill Vol (CF)	4200.5
Net Vol (CF)	2896.6



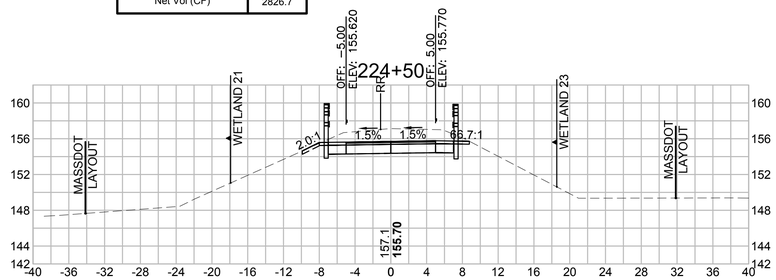
Total Volume at Station 226+50.00	
Cut Area (SF)	37.298
Fill Area (SF)	0.000
Cut Vol (CF)	68.5
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	7305.7
Cum Fill Vol (CF)	4200.5
Net Vol (CF)	3105.3



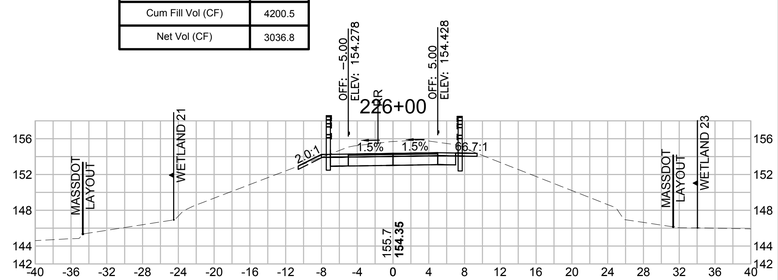
Total Volume at Station 223+00.00	
Cut Area (SF)	38.930
Fill Area (SF)	0.000
Cut Vol (CF)	70.4
Fill Vol (CF)	0.2
Cum Cut Vol (CF)	6805.1
Cum Fill Vol (CF)	4200.5
Net Vol (CF)	2604.7



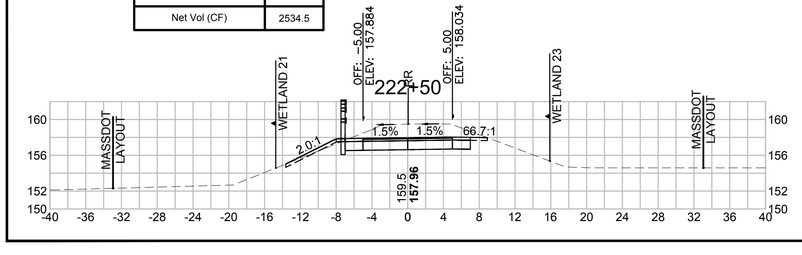
Total Volume at Station 224+50.00	
Cut Area (SF)	38.133
Fill Area (SF)	0.000
Cut Vol (CF)	70.0
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	7027.2
Cum Fill Vol (CF)	4200.5
Net Vol (CF)	2826.7



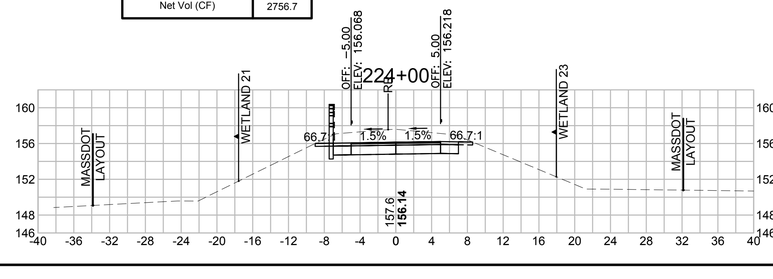
Total Volume at Station 226+00.00	
Cut Area (SF)	36.682
Fill Area (SF)	0.000
Cut Vol (CF)	69.8
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	7237.2
Cum Fill Vol (CF)	4200.5
Net Vol (CF)	3036.8



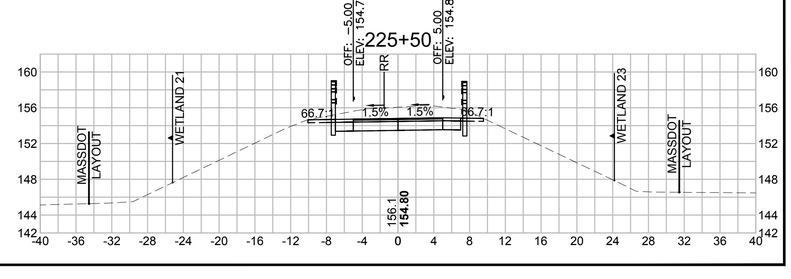
Total Volume at Station 222+50.00	
Cut Area (SF)	37.086
Fill Area (SF)	0.261
Cut Vol (CF)	67.9
Fill Vol (CF)	0.3
Cum Cut Vol (CF)	6734.7
Cum Fill Vol (CF)	4200.2
Net Vol (CF)	2534.5



Total Volume at Station 224+00.00	
Cut Area (SF)	37.492
Fill Area (SF)	0.000
Cut Vol (CF)	75.4
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	6957.2
Cum Fill Vol (CF)	4200.5
Net Vol (CF)	2756.7



Total Volume at Station 225+50.00	
Cut Area (SF)	38.695
Fill Area (SF)	0.000
Cut Vol (CF)	70.4
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	7167.4
Cum Fill Vol (CF)	4200.5
Net Vol (CF)	2967.0



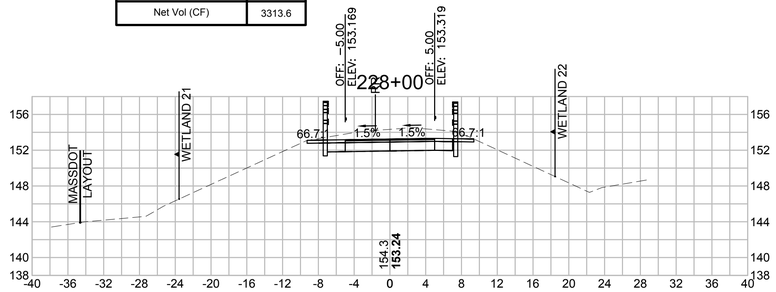
SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	272	316
PROJECT FILE NO. 608164			

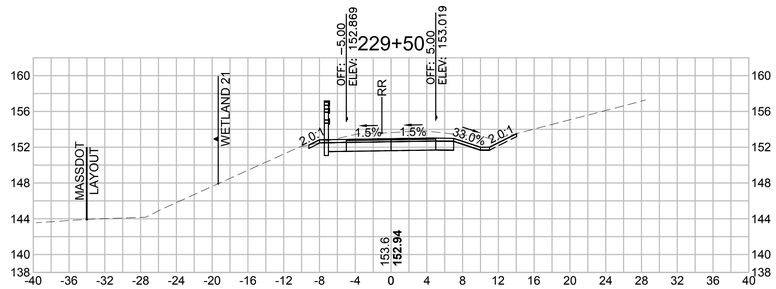
CROSS SECTIONS

608164_XSEC(CROSS SECTION LAYOUTS).DWG 22-Dec-2021

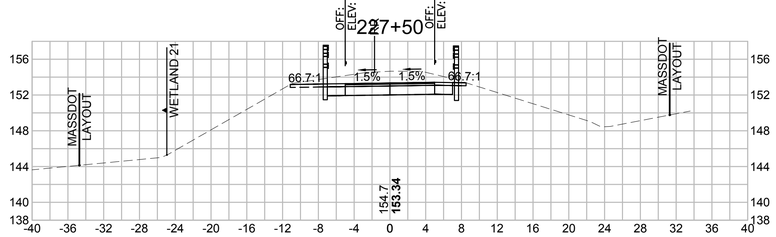
Total Volume at Station 228+00.00	
Cut Area (SF)	34.618
Fill Area (SF)	0.000
Cut Vol (CF)	66.5
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	7514.1
Cum Fill Vol (CF)	4200.5
Net Vol (CF)	3313.6



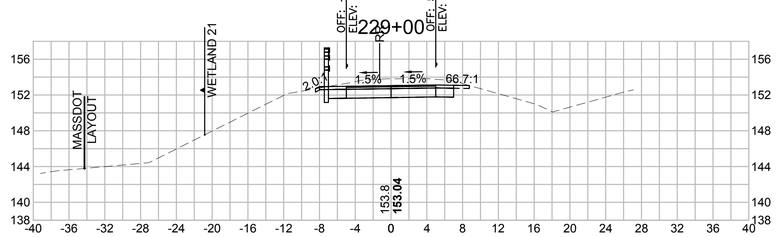
Total Volume at Station 229+50.00	
Cut Area (SF)	34.762
Fill Area (SF)	0.000
Cut Vol (CF)	58.5
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	7686.5
Cum Fill Vol (CF)	4200.5
Net Vol (CF)	3486.0



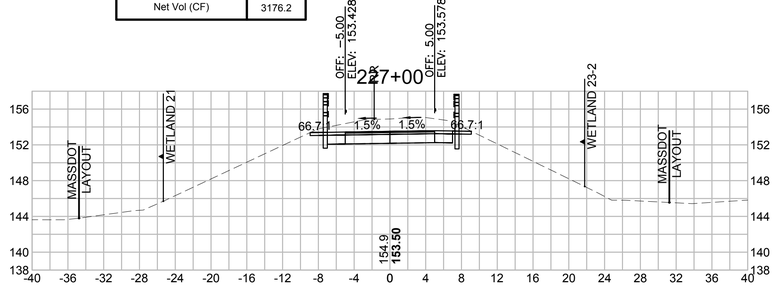
Total Volume at Station 227+50.00	
Cut Area (SF)	37.191
Fill Area (SF)	0.000
Cut Vol (CF)	70.9
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	7447.6
Cum Fill Vol (CF)	4200.5
Net Vol (CF)	3247.1



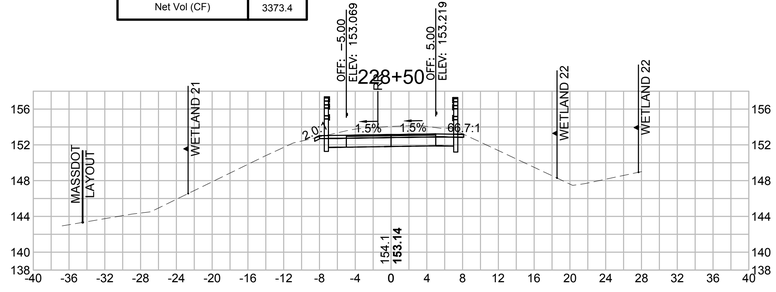
Total Volume at Station 229+00.00	
Cut Area (SF)	28.437
Fill Area (SF)	0.000
Cut Vol (CF)	54.1
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	7628.0
Cum Fill Vol (CF)	4200.5
Net Vol (CF)	3427.5



Total Volume at Station 227+00.00	
Cut Area (SF)	39.361
Fill Area (SF)	0.000
Cut Vol (CF)	71.0
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	7376.7
Cum Fill Vol (CF)	4200.5
Net Vol (CF)	3176.2



Total Volume at Station 228+50.00	
Cut Area (SF)	29.980
Fill Area (SF)	0.000
Cut Vol (CF)	59.8
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	7573.9
Cum Fill Vol (CF)	4200.5
Net Vol (CF)	3373.4



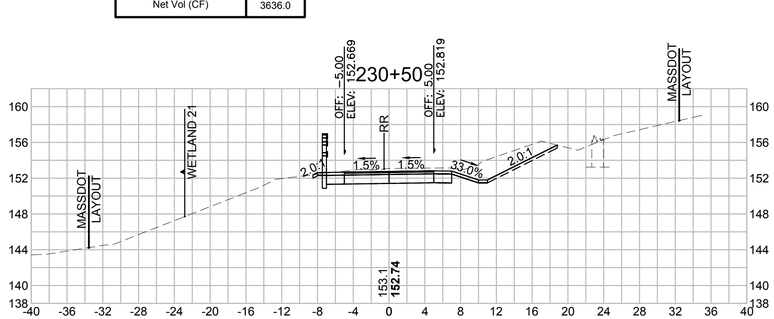
SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	273	316
PROJECT FILE NO. 608164			

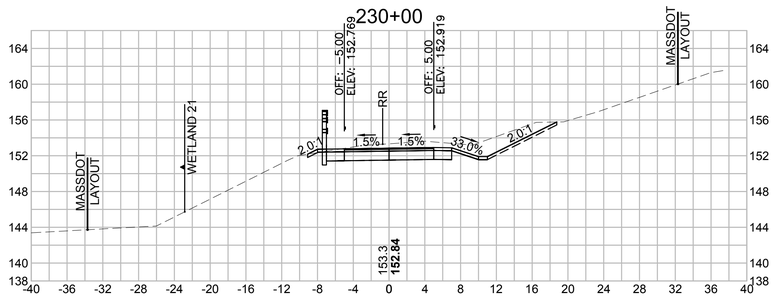
CROSS SECTIONS

608164_XSEC(CROSS SECTION LAYOUTS).DWG 22-Dec-2021

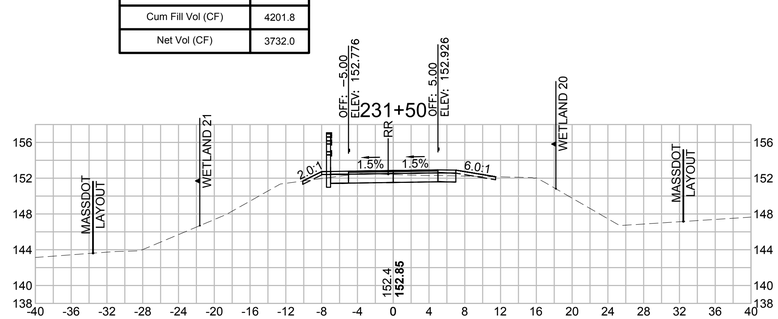
Total Volume at Station 230+50.00	
Cut Area (SF)	42.910
Fill Area (SF)	0.000
Cut Vol (CF)	79.0
Fill Vol (CF)	0.2
Cum Cut Vol (CF)	7836.9
Cum Fill Vol (CF)	4200.9
Net Vol (CF)	3636.0



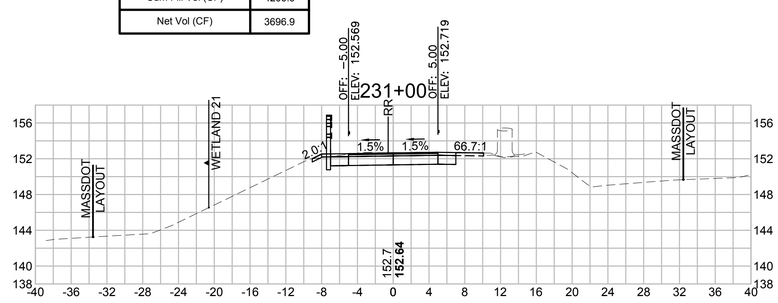
Total Volume at Station 230+00.00	
Cut Area (SF)	42.357
Fill Area (SF)	0.240
Cut Vol (CF)	71.4
Fill Vol (CF)	0.2
Cum Cut Vol (CF)	7757.9
Cum Fill Vol (CF)	4200.7
Net Vol (CF)	3557.2



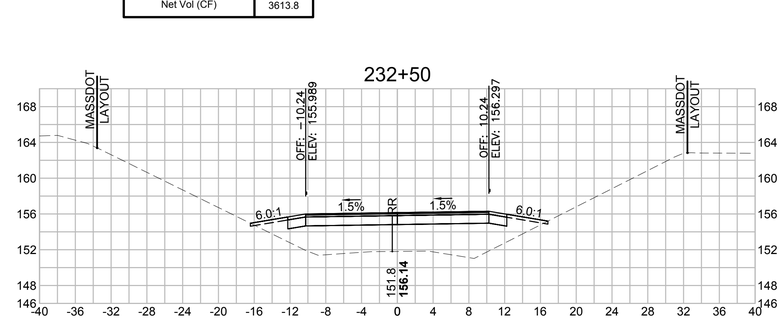
Total Volume at Station 231+50.00	
Cut Area (SF)	15.865
Fill Area (SF)	0.944
Cut Vol (CF)	35.9
Fill Vol (CF)	0.9
Cum Cut Vol (CF)	7933.8
Cum Fill Vol (CF)	4201.8
Net Vol (CF)	3732.0



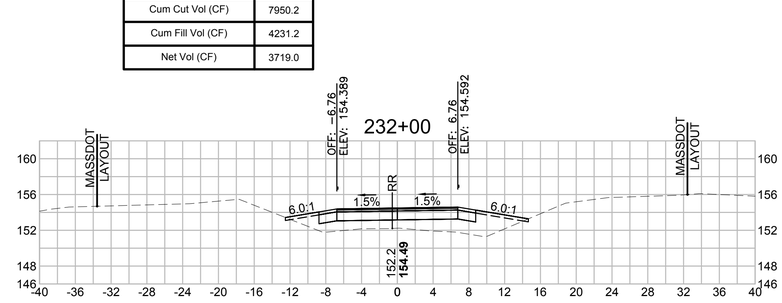
Total Volume at Station 231+00.00	
Cut Area (SF)	22.956
Fill Area (SF)	0.022
Cut Vol (CF)	61.0
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	7897.8
Cum Fill Vol (CF)	4200.9
Net Vol (CF)	3696.9



Total Volume at Station 232+50.00	
Cut Area (SF)	0.170
Fill Area (SF)	84.794
Cut Vol (CF)	1.8
Fill Vol (CF)	107.0
Cum Cut Vol (CF)	7952.0
Cum Fill Vol (CF)	4338.2
Net Vol (CF)	3613.8



Total Volume at Station 232+00.00	
Cut Area (SF)	1.819
Fill Area (SF)	30.775
Cut Vol (CF)	16.4
Fill Vol (CF)	29.4
Cum Cut Vol (CF)	7950.2
Cum Fill Vol (CF)	4231.2
Net Vol (CF)	3719.0



SUDBURY
BRUCE FREEMAN RAIL TRAIL

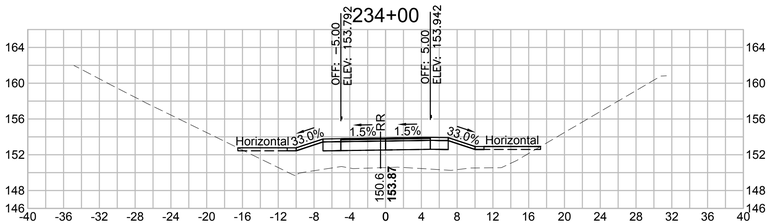
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	274	316
PROJECT FILE NO. 608164			

CROSS SECTIONS

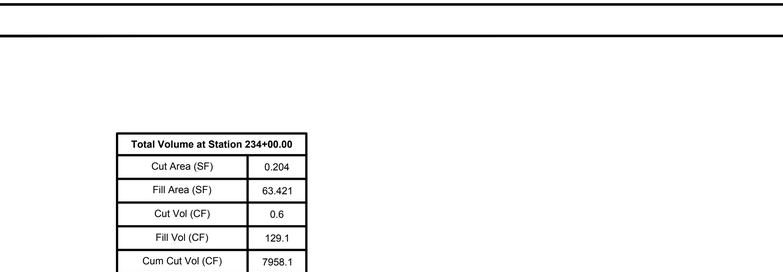
22-Dec-2021

608164_XSEC(CROSS SECTION LAYOUTS).DWG

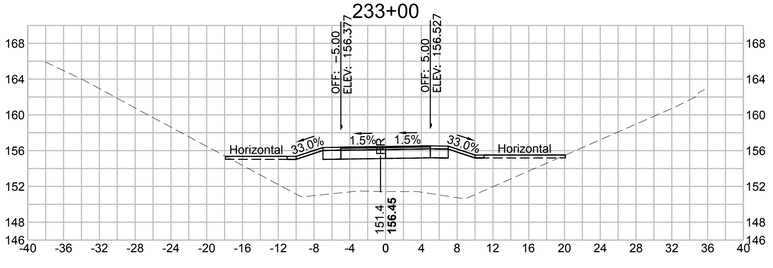
Total Volume at Station 234+00.00	
Cut Area (SF)	0.204
Fill Area (SF)	63.421
Cut Vol (CF)	0.6
Fill Vol (CF)	129.1
Cum Cut Vol (CF)	7958.1
Cum Fill Vol (CF)	4806.5
Net Vol (CF)	3151.6



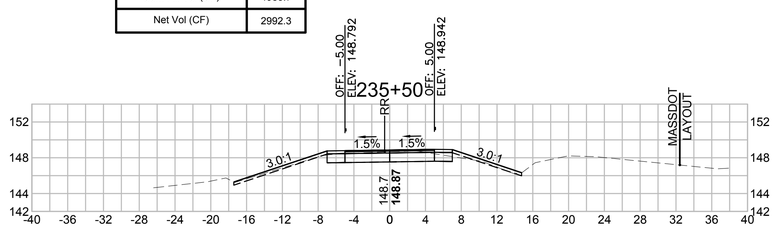
Total Volume at Station 233+50.00	
Cut Area (SF)	0.426
Fill Area (SF)	76.015
Cut Vol (CF)	2.9
Fill Vol (CF)	165.5
Cum Cut Vol (CF)	7957.5
Cum Fill Vol (CF)	4677.4
Net Vol (CF)	3280.1



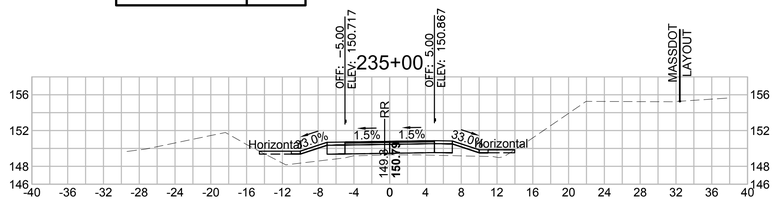
Total Volume at Station 233+00.00	
Cut Area (SF)	2.660
Fill Area (SF)	102.746
Cut Vol (CF)	2.6
Fill Vol (CF)	173.6
Cum Cut Vol (CF)	7954.6
Cum Fill Vol (CF)	4511.8
Net Vol (CF)	3442.8



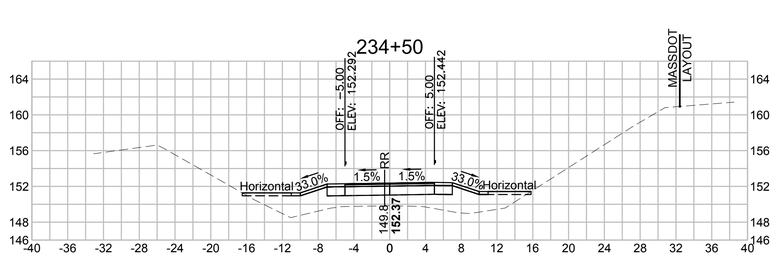
Total Volume at Station 235+50.00	
Cut Area (SF)	16.354
Fill Area (SF)	0.584
Cut Vol (CF)	16.3
Fill Vol (CF)	14.4
Cum Cut Vol (CF)	7976.0
Cum Fill Vol (CF)	4983.7
Net Vol (CF)	2992.3



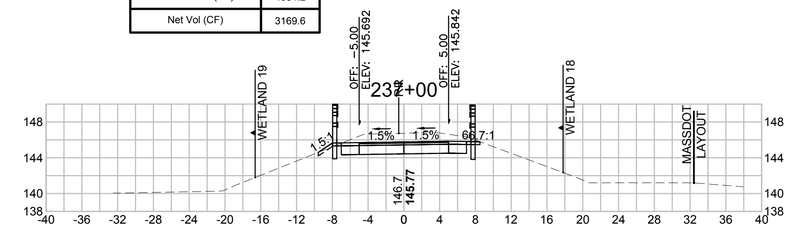
Total Volume at Station 235+00.00	
Cut Area (SF)	1.240
Fill Area (SF)	14.979
Cut Vol (CF)	1.3
Fill Vol (CF)	59.0
Cum Cut Vol (CF)	7959.7
Cum Fill Vol (CF)	4969.3
Net Vol (CF)	2990.5



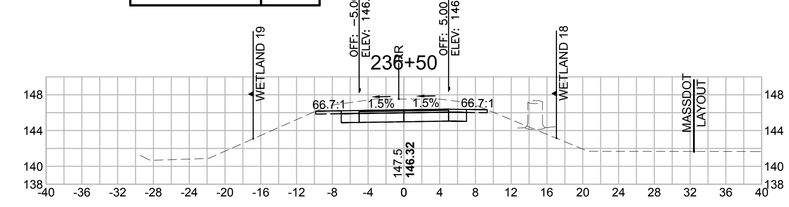
Total Volume at Station 234+50.00	
Cut Area (SF)	0.181
Fill Area (SF)	48.716
Cut Vol (CF)	0.4
Fill Vol (CF)	103.8
Cum Cut Vol (CF)	7958.4
Cum Fill Vol (CF)	4910.3
Net Vol (CF)	3048.1



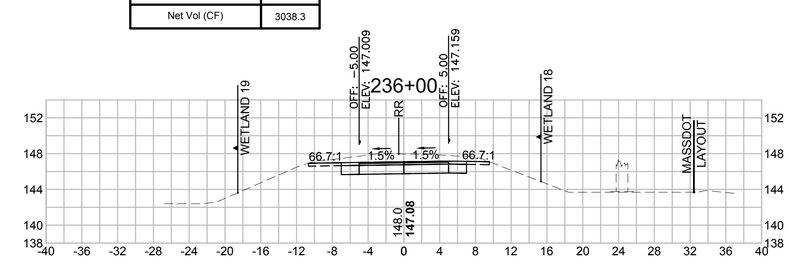
Total Volume at Station 237+00.00	
Cut Area (SF)	31.543
Fill Area (SF)	0.012
Cut Vol (CF)	64.5
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	8153.8
Cum Fill Vol (CF)	4984.2
Net Vol (CF)	3169.6



Total Volume at Station 236+50.00	
Cut Area (SF)	38.158
Fill Area (SF)	0.000
Cut Vol (CF)	66.7
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	8089.3
Cum Fill Vol (CF)	4984.2
Net Vol (CF)	3105.0



Total Volume at Station 236+00.00	
Cut Area (SF)	33.891
Fill Area (SF)	0.000
Cut Vol (CF)	46.5
Fill Vol (CF)	0.5
Cum Cut Vol (CF)	8022.6
Cum Fill Vol (CF)	4984.2
Net Vol (CF)	3038.3



SUDBURY
BRUCE FREEMAN RAIL TRAIL

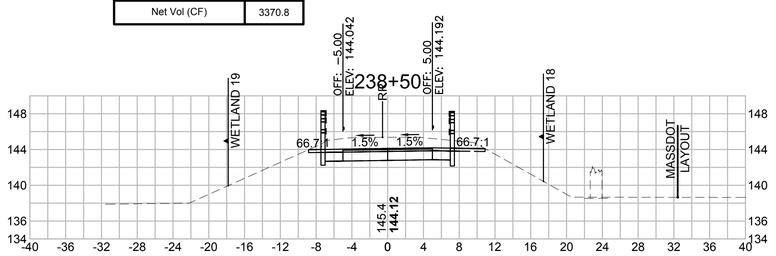
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	275	316
PROJECT FILE NO. 608164			

CROSS SECTIONS

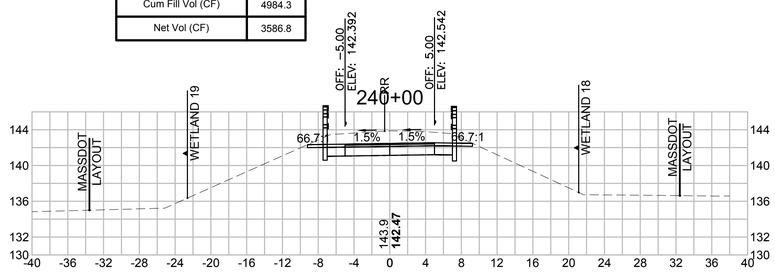
22-Dec-2021

608164_XSEC(CROSS SECTION LAYOUTS).DWG

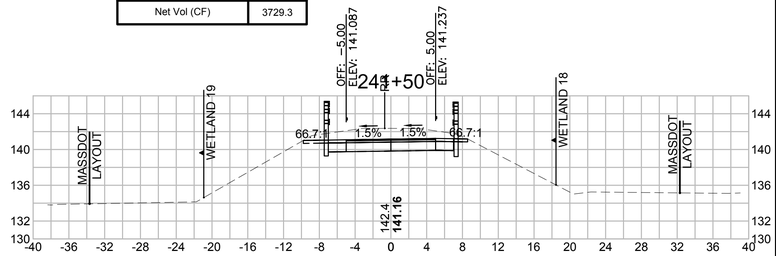
Total Volume at Station 238+50.00	
Cut Area (SF)	40.123
Fill Area (SF)	0.000
Cut Vol (CF)	72.8
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	8355.0
Cum Fill Vol (CF)	4984.3
Net Vol (CF)	3370.8



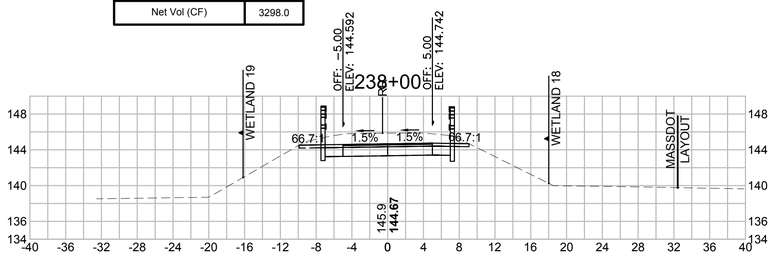
Total Volume at Station 240+00.00	
Cut Area (SF)	39.826
Fill Area (SF)	0.000
Cut Vol (CF)	72.7
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	8571.1
Cum Fill Vol (CF)	4984.3
Net Vol (CF)	3586.8



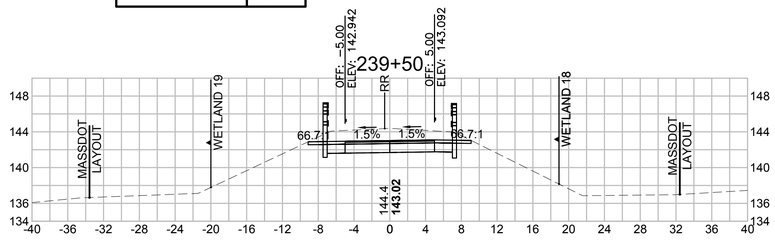
Total Volume at Station 241+50.00	
Cut Area (SF)	36.860
Fill Area (SF)	58.543
Cut Vol (CF)	66.2
Fill Vol (CF)	60.7
Cum Cut Vol (CF)	8780.8
Cum Fill Vol (CF)	5051.5
Net Vol (CF)	3729.3



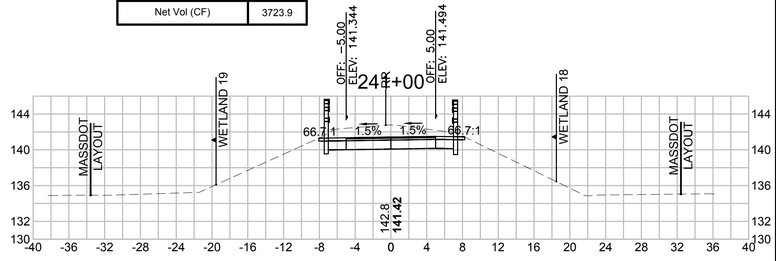
Total Volume at Station 238+00.00	
Cut Area (SF)	38.481
Fill Area (SF)	0.000
Cut Vol (CF)	67.4
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	8282.2
Cum Fill Vol (CF)	4984.3
Net Vol (CF)	3298.0



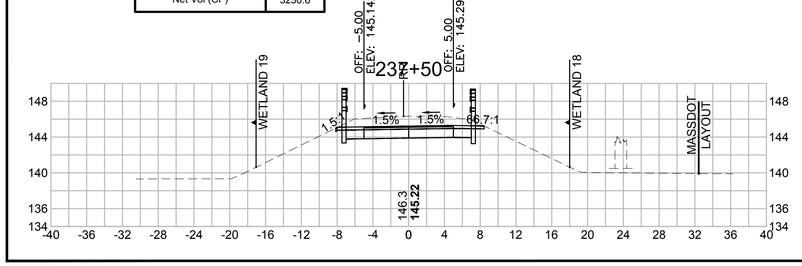
Total Volume at Station 239+50.00	
Cut Area (SF)	38.714
Fill Area (SF)	0.000
Cut Vol (CF)	71.0
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	8498.3
Cum Fill Vol (CF)	4984.3
Net Vol (CF)	3514.1



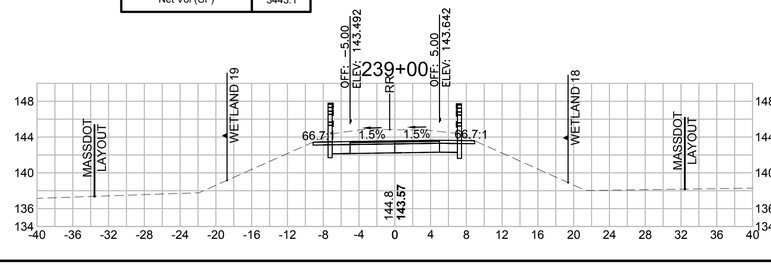
Total Volume at Station 241+00.00	
Cut Area (SF)	34.587
Fill Area (SF)	7.031
Cut Vol (CF)	69.4
Fill Vol (CF)	6.5
Cum Cut Vol (CF)	8714.6
Cum Fill Vol (CF)	4990.8
Net Vol (CF)	3723.9



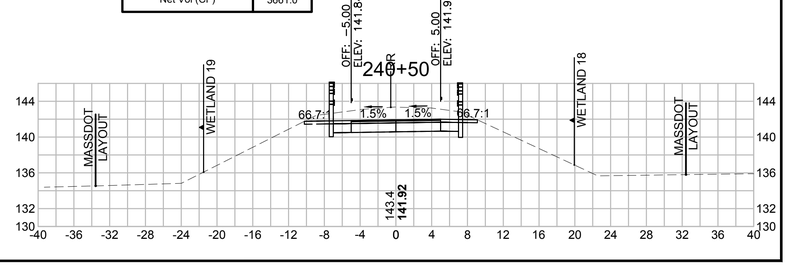
Total Volume at Station 237+50.00	
Cut Area (SF)	34.340
Fill Area (SF)	0.000
Cut Vol (CF)	61.0
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	8214.8
Cum Fill Vol (CF)	4984.3
Net Vol (CF)	3230.6



Total Volume at Station 239+00.00	
Cut Area (SF)	37.978
Fill Area (SF)	0.000
Cut Vol (CF)	72.3
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	8427.3
Cum Fill Vol (CF)	4984.3
Net Vol (CF)	3443.1



Total Volume at Station 240+50.00	
Cut Area (SF)	40.318
Fill Area (SF)	0.000
Cut Vol (CF)	74.2
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	8645.3
Cum Fill Vol (CF)	4984.3
Net Vol (CF)	3661.0



SUDBURY
BRUCE FREEMAN RAIL TRAIL

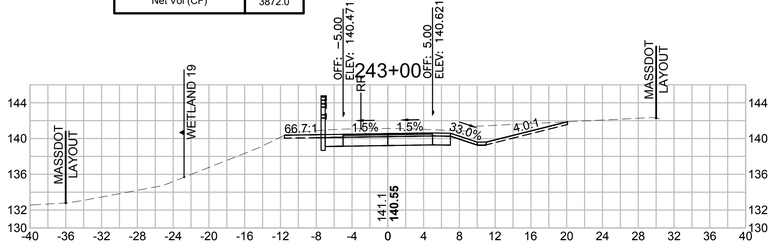
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	276	316
PROJECT FILE NO. 608164			

CROSS SECTIONS

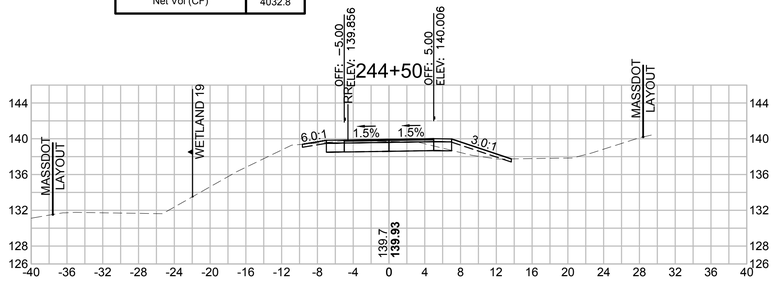
22-Dec-2021

608164_XSEC(CROSS SECTION LAYOUTS).DWG

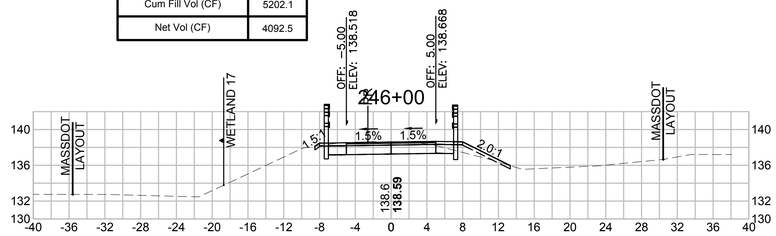
Total Volume at Station 243+00.00	
Cut Area (SF)	46.014
Fill Area (SF)	9.458
Cut Vol (CF)	95.3
Fill Vol (CF)	18.8
Cum Cut Vol (CF)	9038.0
Cum Fill Vol (CF)	5166.0
Net Vol (CF)	3872.0



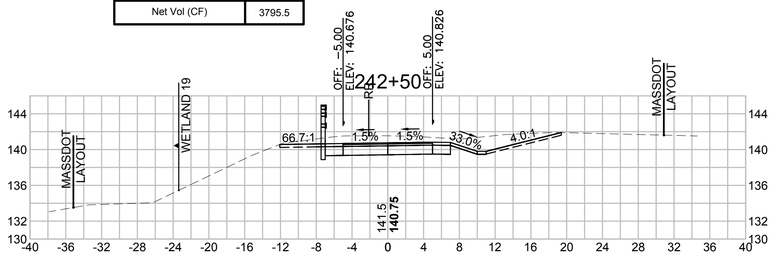
Total Volume at Station 244+50.00	
Cut Area (SF)	14.460
Fill Area (SF)	3.195
Cut Vol (CF)	32.6
Fill Vol (CF)	3.1
Cum Cut Vol (CF)	9210.7
Cum Fill Vol (CF)	5177.9
Net Vol (CF)	4032.8



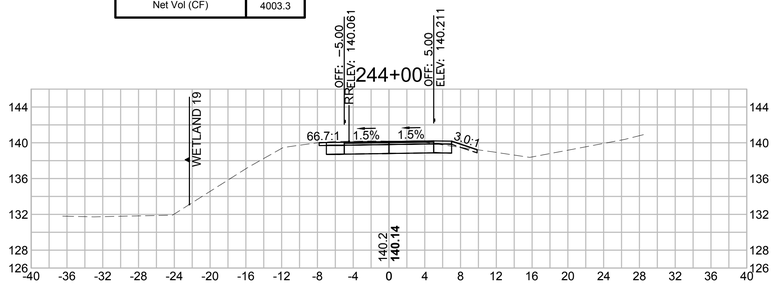
Total Volume at Station 246+00.00	
Cut Area (SF)	17.273
Fill Area (SF)	2.105
Cut Vol (CF)	27.2
Fill Vol (CF)	10.7
Cum Cut Vol (CF)	9294.6
Cum Fill Vol (CF)	5202.1
Net Vol (CF)	4092.5



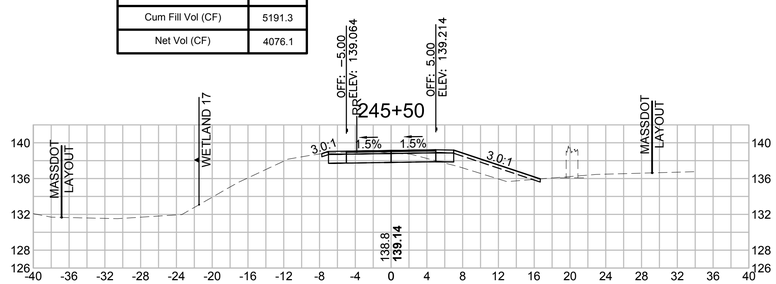
Total Volume at Station 242+50.00	
Cut Area (SF)	56.932
Fill Area (SF)	10.847
Cut Vol (CF)	90.3
Fill Vol (CF)	25.8
Cum Cut Vol (CF)	8942.7
Cum Fill Vol (CF)	5147.2
Net Vol (CF)	3795.5



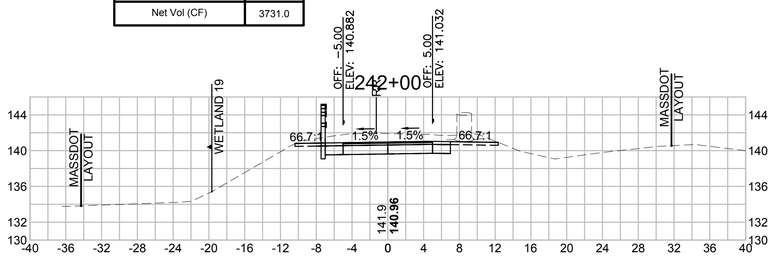
Total Volume at Station 244+00.00	
Cut Area (SF)	20.739
Fill Area (SF)	0.105
Cut Vol (CF)	58.3
Fill Vol (CF)	0.1
Cum Cut Vol (CF)	9178.1
Cum Fill Vol (CF)	5174.8
Net Vol (CF)	4003.3



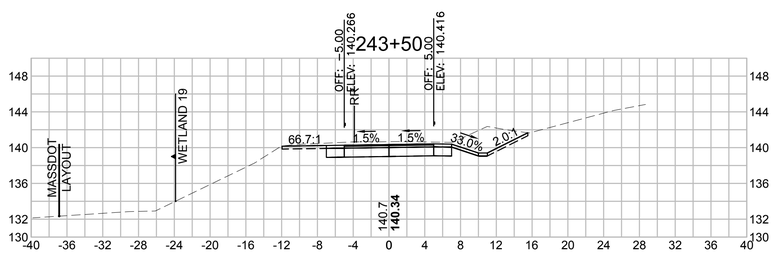
Total Volume at Station 245+50.00	
Cut Area (SF)	12.126
Fill Area (SF)	9.499
Cut Vol (CF)	27.3
Fill Vol (CF)	9.6
Cum Cut Vol (CF)	9267.4
Cum Fill Vol (CF)	5191.3
Net Vol (CF)	4076.1



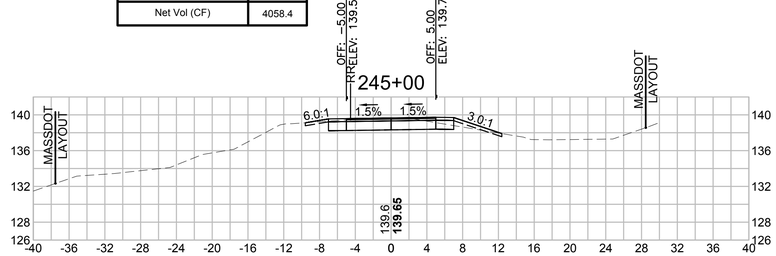
Total Volume at Station 242+00.00	
Cut Area (SF)	40.540
Fill Area (SF)	16.985
Cut Vol (CF)	71.7
Fill Vol (CF)	69.9
Cum Cut Vol (CF)	8852.5
Cum Fill Vol (CF)	5121.4
Net Vol (CF)	3731.0



Total Volume at Station 243+50.00	
Cut Area (SF)	42.264
Fill Area (SF)	0.003
Cut Vol (CF)	81.7
Fill Vol (CF)	8.8
Cum Cut Vol (CF)	9119.8
Cum Fill Vol (CF)	5174.7
Net Vol (CF)	3945.0



Total Volume at Station 245+00.00	
Cut Area (SF)	17.312
Fill Area (SF)	0.900
Cut Vol (CF)	29.4
Fill Vol (CF)	3.8
Cum Cut Vol (CF)	9240.1
Cum Fill Vol (CF)	5181.7
Net Vol (CF)	4058.4



SUDBURY
BRUCE FREEMAN RAIL TRAIL

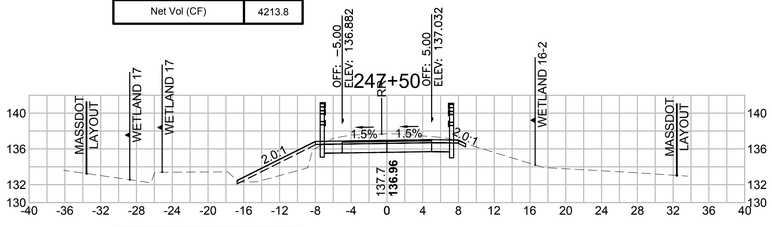
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	277	316
PROJECT FILE NO. 608164			

CROSS SECTIONS

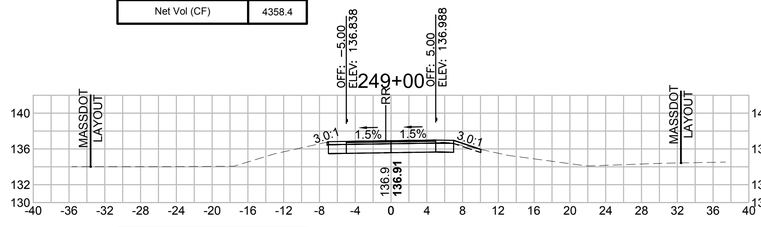
22-Dec-2021

608164_XSEC(CROSS SECTION LAYOUTS).DWG

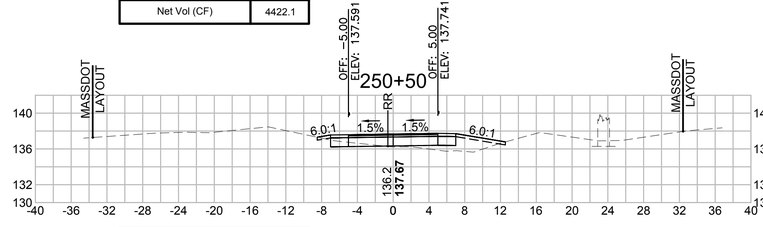
Total Volume at Station 247+50.00	
Cut Area (SF)	27.970
Fill Area (SF)	10.437
Cut Vol (CF)	51.2
Fill Vol (CF)	9.7
Cum Cut Vol (CF)	9427.5
Cum Fill Vol (CF)	5213.7
Net Vol (CF)	4213.8



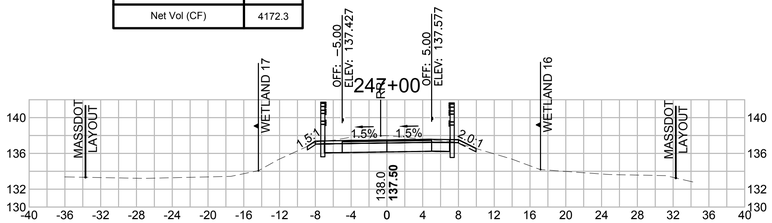
Total Volume at Station 249+00.00	
Cut Area (SF)	19.014
Fill Area (SF)	0.000
Cut Vol (CF)	41.9
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	9581.8
Cum Fill Vol (CF)	5223.4
Net Vol (CF)	4358.4



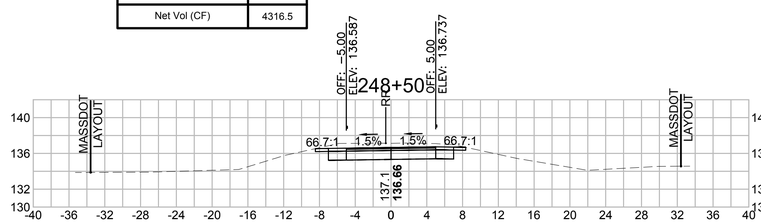
Total Volume at Station 250+50.00	
Cut Area (SF)	18.871
Fill Area (SF)	7.482
Cut Vol (CF)	25.1
Fill Vol (CF)	8.6
Cum Cut Vol (CF)	9656.0
Cum Fill Vol (CF)	5233.9
Net Vol (CF)	4422.1



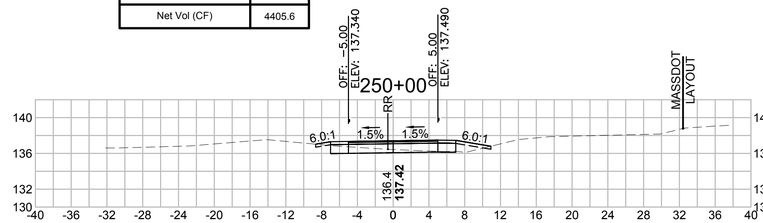
Total Volume at Station 247+00.00	
Cut Area (SF)	27.272
Fill Area (SF)	0.011
Cut Vol (CF)	45.5
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	9376.3
Cum Fill Vol (CF)	5204.0
Net Vol (CF)	4172.3



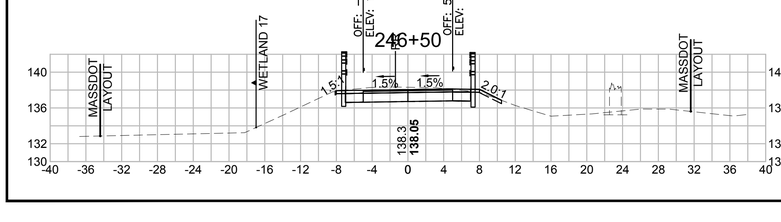
Total Volume at Station 248+50.00	
Cut Area (SF)	26.248
Fill Area (SF)	0.000
Cut Vol (CF)	55.4
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	9539.9
Cum Fill Vol (CF)	5223.4
Net Vol (CF)	4316.5



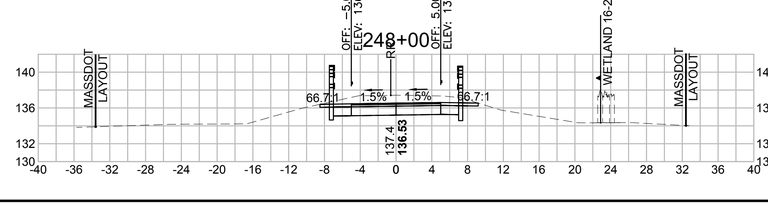
Total Volume at Station 250+00.00	
Cut Area (SF)	8.194
Fill Area (SF)	1.778
Cut Vol (CF)	19.6
Fill Vol (CF)	1.8
Cum Cut Vol (CF)	9630.9
Cum Fill Vol (CF)	5225.4
Net Vol (CF)	4405.6



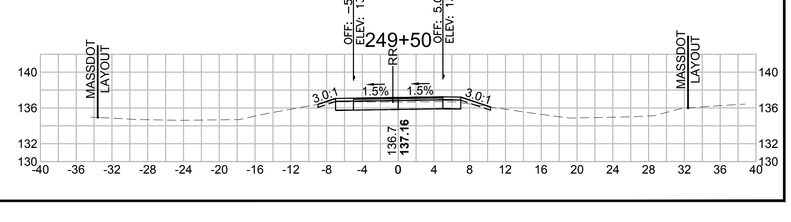
Total Volume at Station 246+50.00	
Cut Area (SF)	21.860
Fill Area (SF)	0.001
Cut Vol (CF)	36.2
Fill Vol (CF)	1.9
Cum Cut Vol (CF)	9330.8
Cum Fill Vol (CF)	5204.0
Net Vol (CF)	4126.8



Total Volume at Station 248+00.00	
Cut Area (SF)	33.601
Fill Area (SF)	0.000
Cut Vol (CF)	57.0
Fill Vol (CF)	9.7
Cum Cut Vol (CF)	9484.5
Cum Fill Vol (CF)	5223.4
Net Vol (CF)	4261.1



Total Volume at Station 249+50.00	
Cut Area (SF)	12.926
Fill Area (SF)	0.194
Cut Vol (CF)	29.6
Fill Vol (CF)	0.2
Cum Cut Vol (CF)	9611.4
Cum Fill Vol (CF)	5223.5
Net Vol (CF)	4387.8



SUDBURY
BRUCE FREEMAN RAIL TRAIL

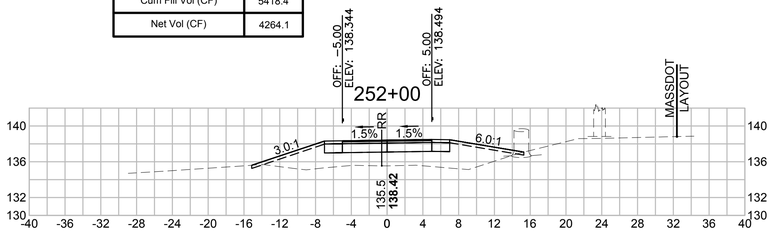
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	278	316
PROJECT FILE NO. 608164			

CROSS SECTIONS

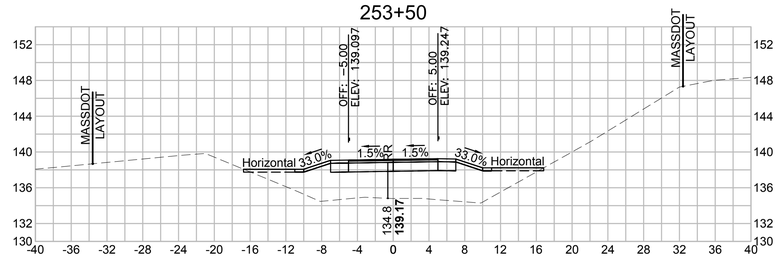
22-Dec-2021

608164_XSEC(CROSS SECTION LAYOUTS).DWG

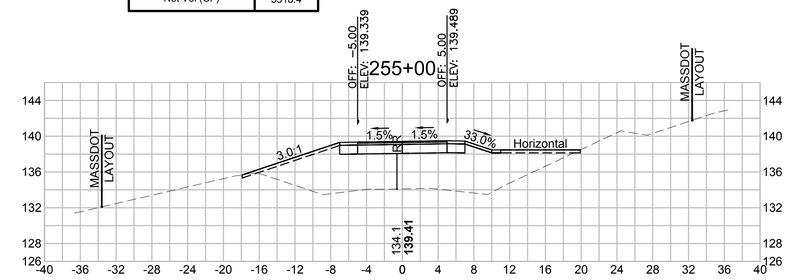
Total Volume at Station 252+00.00	
Cut Area (SF)	0.630
Fill Area (SF)	45.112
Cut Vol (CF)	3.5
Fill Vol (CF)	76.7
Cum Cut Vol (CF)	9682.5
Cum Fill Vol (CF)	5418.4
Net Vol (CF)	4264.1



Total Volume at Station 253+50.00	
Cut Area (SF)	0.229
Fill Area (SF)	83.655
Cut Vol (CF)	0.5
Fill Vol (CF)	144.9
Cum Cut Vol (CF)	9685.4
Cum Fill Vol (CF)	5773.2
Net Vol (CF)	3912.2

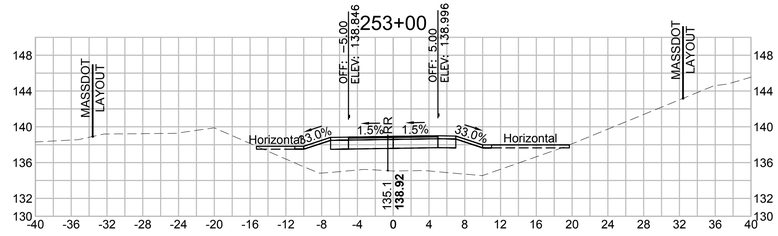


Total Volume at Station 255+00.00	
Cut Area (SF)	0.858
Fill Area (SF)	119.067
Cut Vol (CF)	1.0
Fill Vol (CF)	219.6
Cum Cut Vol (CF)	9687.2
Cum Fill Vol (CF)	6368.8
Net Vol (CF)	3318.4

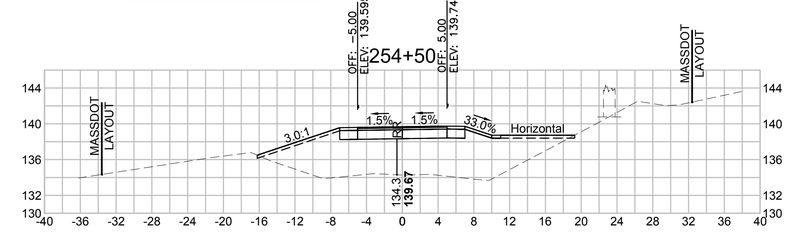


Total Volume at Station 251+50.00	
Cut Area (SF)	3.142
Fill Area (SF)	37.729
Cut Vol (CF)	4.2
Fill Vol (CF)	67.9
Cum Cut Vol (CF)	9679.0
Cum Fill Vol (CF)	5341.7
Net Vol (CF)	4337.3

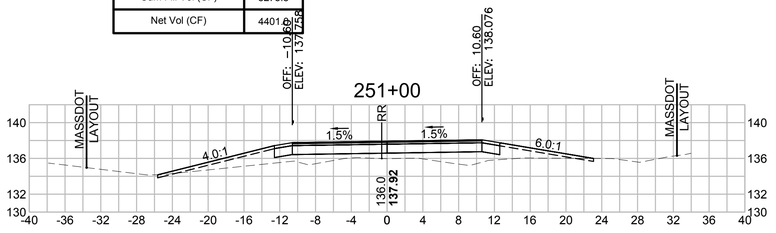
Total Volume at Station 253+00.00	
Cut Area (SF)	0.259
Fill Area (SF)	72.794
Cut Vol (CF)	1.1
Fill Vol (CF)	117.8
Cum Cut Vol (CF)	9684.9
Cum Fill Vol (CF)	5628.3
Net Vol (CF)	4056.6



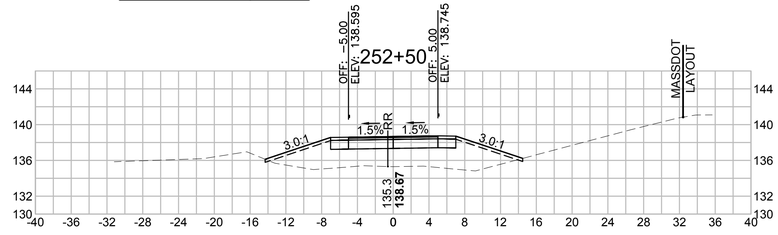
Total Volume at Station 254+50.00	
Cut Area (SF)	0.182
Fill Area (SF)	118.086
Cut Vol (CF)	0.4
Fill Vol (CF)	204.0
Cum Cut Vol (CF)	9686.2
Cum Fill Vol (CF)	6149.2
Net Vol (CF)	3537.0



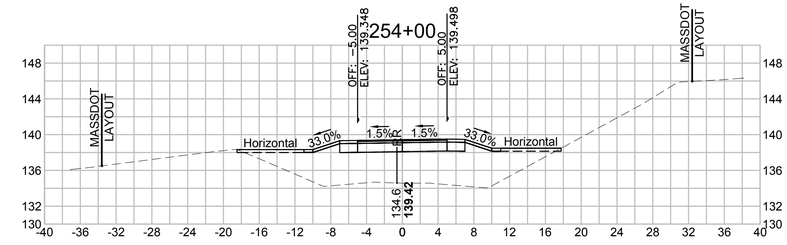
Total Volume at Station 251+00.00	
Cut Area (SF)	1.399
Fill Area (SF)	35.563
Cut Vol (CF)	18.8
Fill Vol (CF)	39.9
Cum Cut Vol (CF)	9674.8
Cum Fill Vol (CF)	5273.8
Net Vol (CF)	4401.0



Total Volume at Station 252+50.00	
Cut Area (SF)	0.898
Fill Area (SF)	54.414
Cut Vol (CF)	1.4
Fill Vol (CF)	92.2
Cum Cut Vol (CF)	9683.9
Cum Fill Vol (CF)	5510.5
Net Vol (CF)	4173.4



Total Volume at Station 254+00.00	
Cut Area (SF)	0.232
Fill Area (SF)	102.202
Cut Vol (CF)	0.4
Fill Vol (CF)	172.1
Cum Cut Vol (CF)	9685.8
Cum Fill Vol (CF)	5945.3
Net Vol (CF)	3740.6



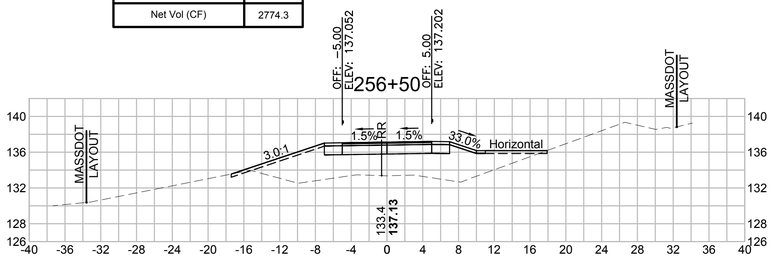
SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	279	316
PROJECT FILE NO. 608164			

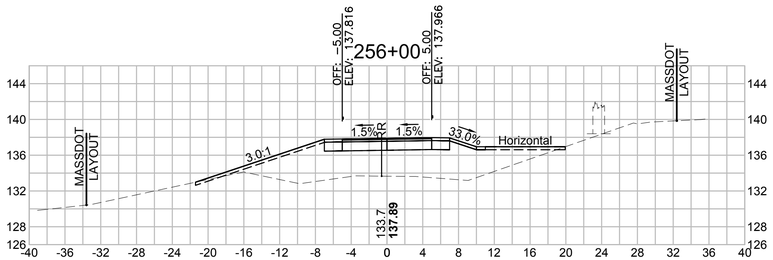
CROSS SECTIONS

608164_XSEC(CROSS SECTION LAYOUTS).DWG 22-Dec-2021

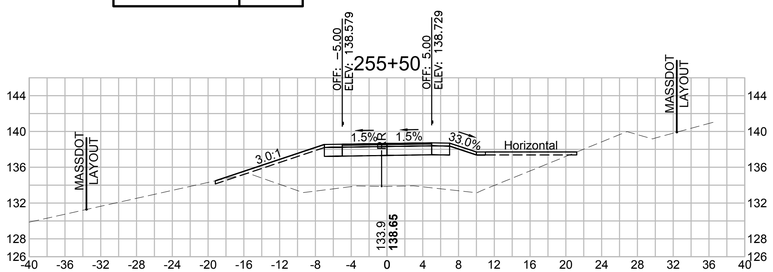
Total Volume at Station 256+50.00	
Cut Area (SF)	0.588
Fill Area (SF)	72.871
Cut Vol (CF)	1.2
Fill Vol (CF)	152.0
Cum Cut Vol (CF)	9691.7
Cum Fill Vol (CF)	6917.4
Net Vol (CF)	2774.3



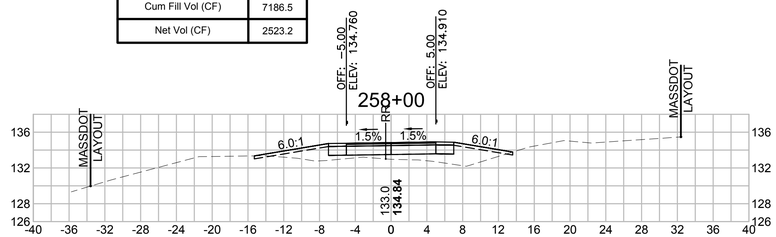
Total Volume at Station 256+00.00	
Cut Area (SF)	0.663
Fill Area (SF)	91.311
Cut Vol (CF)	1.6
Fill Vol (CF)	185.4
Cum Cut Vol (CF)	9690.5
Cum Fill Vol (CF)	6765.4
Net Vol (CF)	2925.2



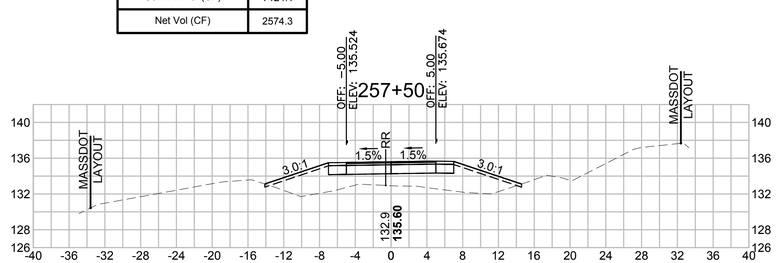
Total Volume at Station 255+50.00	
Cut Area (SF)	1.054
Fill Area (SF)	108.950
Cut Vol (CF)	1.8
Fill Vol (CF)	211.1
Cum Cut Vol (CF)	9688.9
Cum Fill Vol (CF)	6579.9
Net Vol (CF)	3109.0



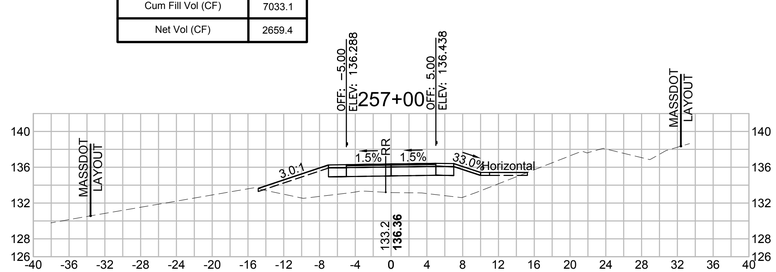
Total Volume at Station 258+00.00	
Cut Area (SF)	6.007
Fill Area (SF)	21.248
Cut Vol (CF)	11.3
Fill Vol (CF)	62.4
Cum Cut Vol (CF)	9709.7
Cum Fill Vol (CF)	7186.5
Net Vol (CF)	2523.2



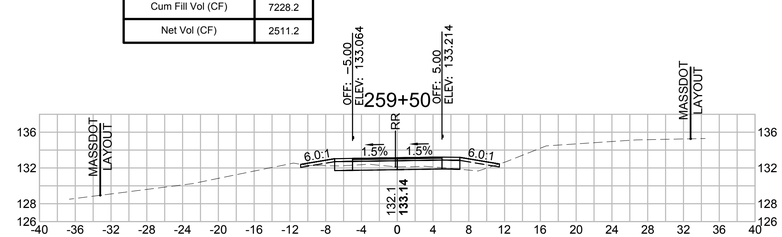
Total Volume at Station 257+50.00	
Cut Area (SF)	6.216
Fill Area (SF)	46.159
Cut Vol (CF)	6.0
Fill Vol (CF)	91.0
Cum Cut Vol (CF)	9698.4
Cum Fill Vol (CF)	7124.1
Net Vol (CF)	2574.3



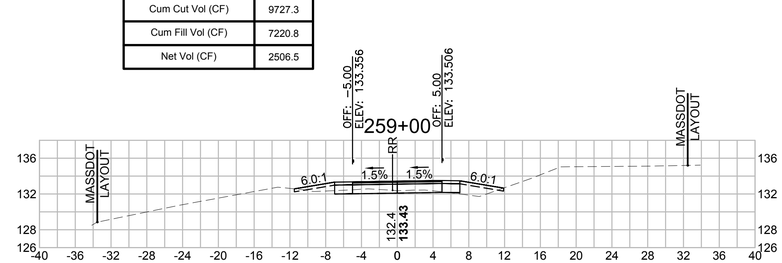
Total Volume at Station 257+00.00	
Cut Area (SF)	0.231
Fill Area (SF)	52.096
Cut Vol (CF)	0.8
Fill Vol (CF)	115.7
Cum Cut Vol (CF)	9692.4
Cum Fill Vol (CF)	7033.1
Net Vol (CF)	2659.4



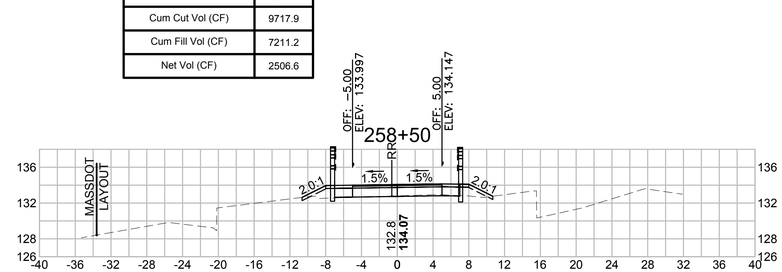
Total Volume at Station 259+50.00	
Cut Area (SF)	5.628
Fill Area (SF)	3.161
Cut Vol (CF)	12.0
Fill Vol (CF)	7.4
Cum Cut Vol (CF)	9739.3
Cum Fill Vol (CF)	7228.2
Net Vol (CF)	2511.2



Total Volume at Station 259+00.00	
Cut Area (SF)	7.382
Fill Area (SF)	4.819
Cut Vol (CF)	9.4
Fill Vol (CF)	9.5
Cum Cut Vol (CF)	9727.3
Cum Fill Vol (CF)	7220.8
Net Vol (CF)	2506.5



Total Volume at Station 258+50.00	
Cut Area (SF)	2.779
Fill Area (SF)	5.474
Cut Vol (CF)	8.1
Fill Vol (CF)	24.7
Cum Cut Vol (CF)	9717.9
Cum Fill Vol (CF)	7211.2
Net Vol (CF)	2506.6



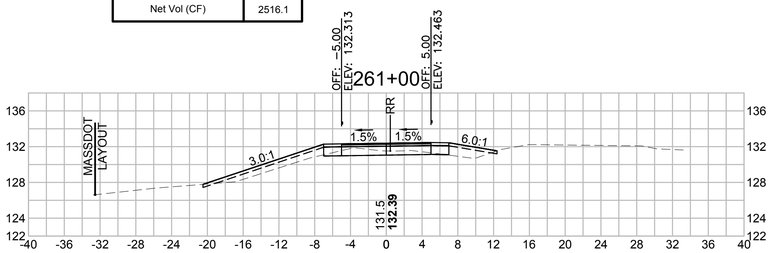
SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	280	316
PROJECT FILE NO. 608164			

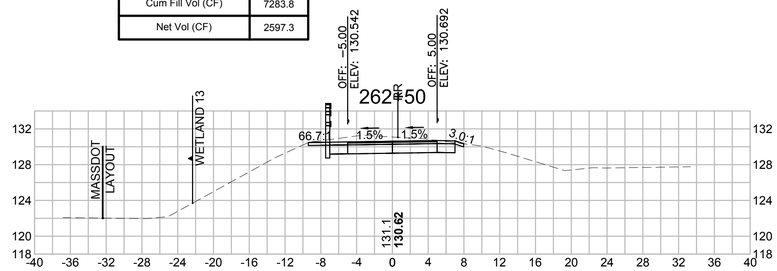
CROSS SECTIONS

608164_XSEC(CROSS SECTION LAYOUTS).DWG 22-Dec-2021

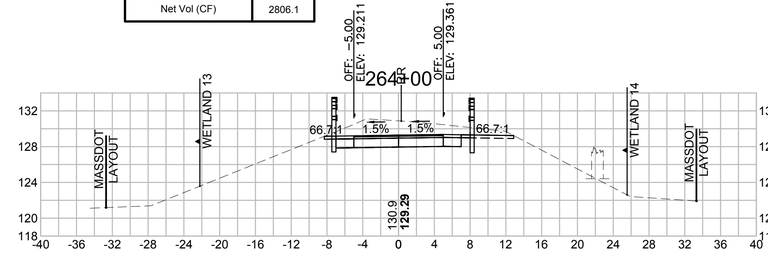
Total Volume at Station 261+00.00	
Cut Area (SF)	6.614
Fill Area (SF)	10.801
Cut Vol (CF)	11.9
Fill Vol (CF)	16.6
Cum Cut Vol (CF)	9776.3
Cum Fill Vol (CF)	7260.3
Net Vol (CF)	2516.1



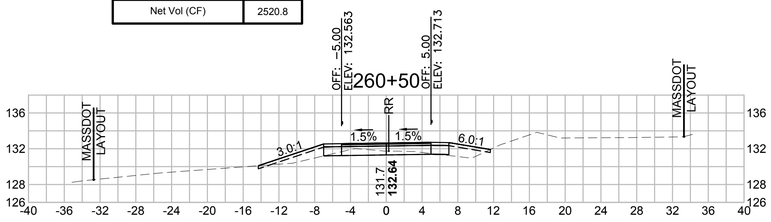
Total Volume at Station 262+50.00	
Cut Area (SF)	34.753
Fill Area (SF)	0.000
Cut Vol (CF)	53.7
Fill Vol (CF)	0.9
Cum Cut Vol (CF)	9881.2
Cum Fill Vol (CF)	7283.8
Net Vol (CF)	2597.3



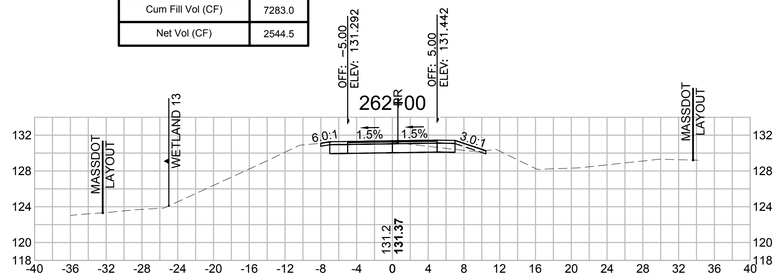
Total Volume at Station 264+00.00	
Cut Area (SF)	44.515
Fill Area (SF)	2.235
Cut Vol (CF)	77.6
Fill Vol (CF)	2.1
Cum Cut Vol (CF)	10092.1
Cum Fill Vol (CF)	7286.0
Net Vol (CF)	2806.1



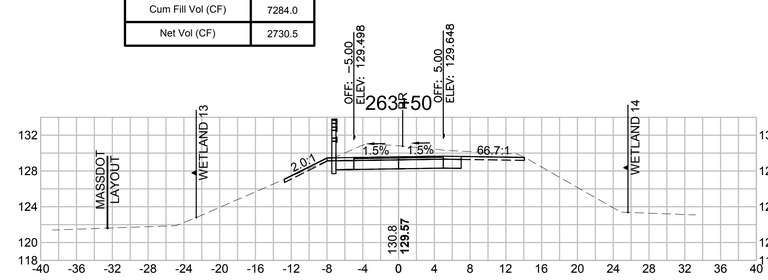
Total Volume at Station 260+50.00	
Cut Area (SF)	6.241
Fill Area (SF)	7.127
Cut Vol (CF)	12.8
Fill Vol (CF)	9.6
Cum Cut Vol (CF)	9764.4
Cum Fill Vol (CF)	7243.7
Net Vol (CF)	2520.8



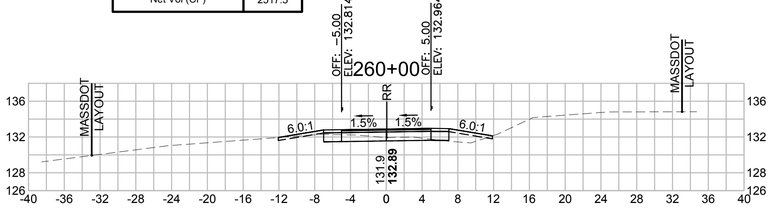
Total Volume at Station 262+00.00	
Cut Area (SF)	23.243
Fill Area (SF)	0.932
Cut Vol (CF)	33.3
Fill Vol (CF)	6.8
Cum Cut Vol (CF)	9827.5
Cum Fill Vol (CF)	7283.0
Net Vol (CF)	2544.5



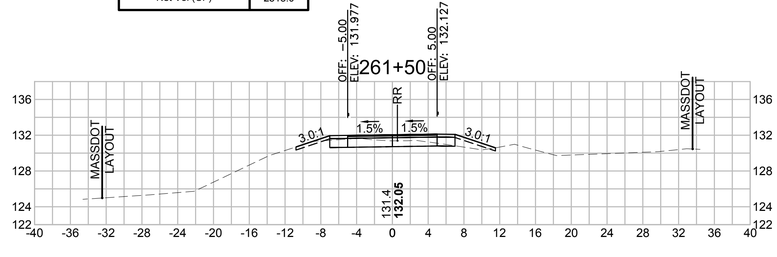
Total Volume at Station 263+50.00	
Cut Area (SF)	39.330
Fill Area (SF)	0.000
Cut Vol (CF)	68.8
Fill Vol (CF)	0.1
Cum Cut Vol (CF)	10014.5
Cum Fill Vol (CF)	7284.0
Net Vol (CF)	2730.5



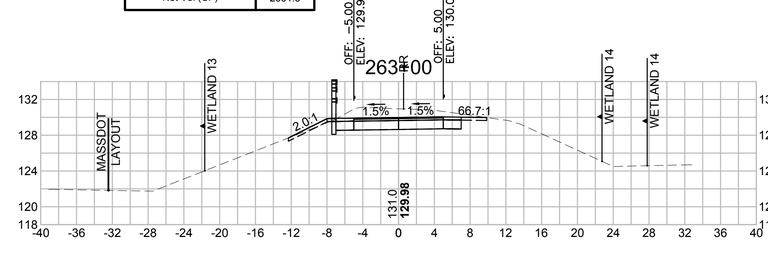
Total Volume at Station 260+00.00	
Cut Area (SF)	7.630
Fill Area (SF)	3.238
Cut Vol (CF)	12.3
Fill Vol (CF)	5.9
Cum Cut Vol (CF)	9751.6
Cum Fill Vol (CF)	7234.1
Net Vol (CF)	2517.5



Total Volume at Station 261+50.00	
Cut Area (SF)	12.670
Fill Area (SF)	6.395
Cut Vol (CF)	17.9
Fill Vol (CF)	15.9
Cum Cut Vol (CF)	9794.2
Cum Fill Vol (CF)	7276.2
Net Vol (CF)	2518.0



Total Volume at Station 263+00.00	
Cut Area (SF)	34.961
Fill Area (SF)	0.066
Cut Vol (CF)	64.5
Fill Vol (CF)	0.1
Cum Cut Vol (CF)	9945.7
Cum Fill Vol (CF)	7283.9
Net Vol (CF)	2661.8



SUDBURY
BRUCE FREEMAN RAIL TRAIL

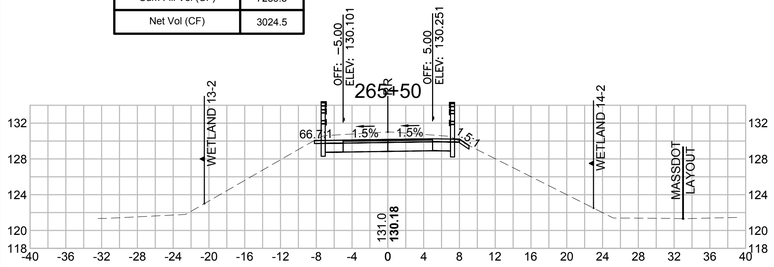
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	281	316
PROJECT FILE NO. 608164			

CROSS SECTIONS

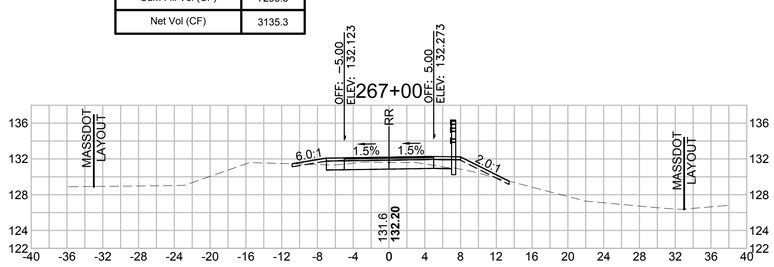
22-Dec-2021

608164_XSEC(CROSS SECTION LAYOUTS).DWG

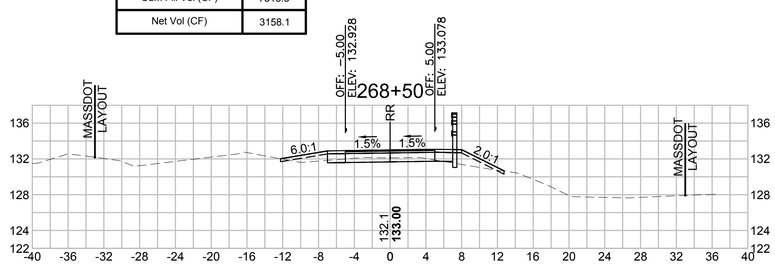
Total Volume at Station 265+50.00	
Cut Area (SF)	28.952
Fill Area (SF)	0.000
Cut Vol (CF)	61.6
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	10314.0
Cum Fill Vol (CF)	7289.5
Net Vol (CF)	3024.5



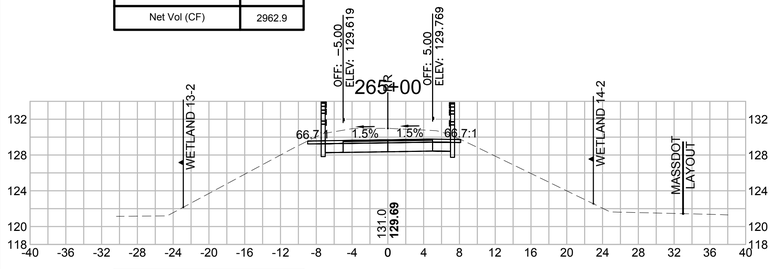
Total Volume at Station 267+00.00	
Cut Area (SF)	9.594
Fill Area (SF)	3.254
Cut Vol (CF)	28.3
Fill Vol (CF)	4.9
Cum Cut Vol (CF)	10431.6
Cum Fill Vol (CF)	7296.3
Net Vol (CF)	3135.3



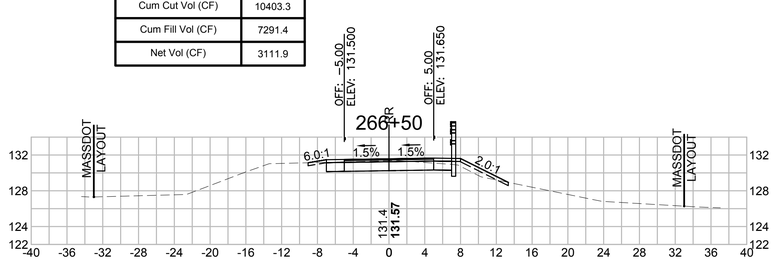
Total Volume at Station 268+50.00	
Cut Area (SF)	6.922
Fill Area (SF)	5.881
Cut Vol (CF)	14.0
Fill Vol (CF)	8.7
Cum Cut Vol (CF)	10477.0
Cum Fill Vol (CF)	7318.8
Net Vol (CF)	3158.1



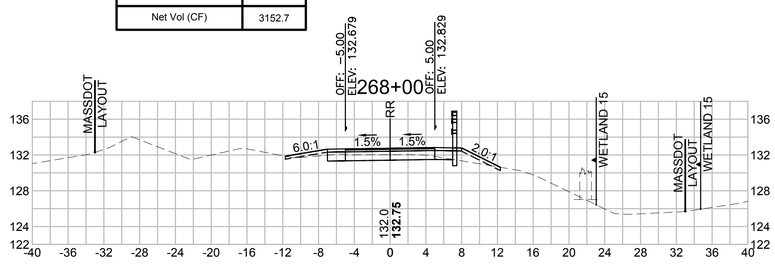
Total Volume at Station 265+00.00	
Cut Area (SF)	37.581
Fill Area (SF)	0.000
Cut Vol (CF)	76.9
Fill Vol (CF)	0.7
Cum Cut Vol (CF)	10252.4
Cum Fill Vol (CF)	7289.5
Net Vol (CF)	2962.9



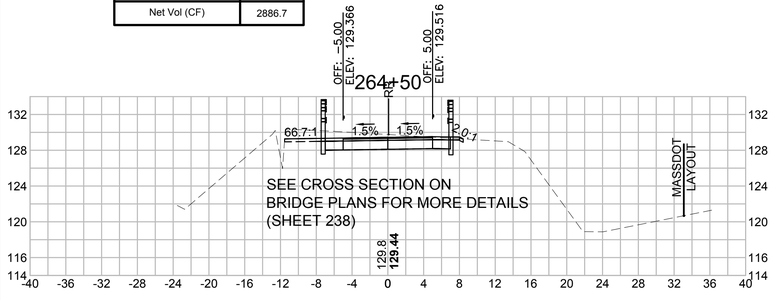
Total Volume at Station 266+50.00	
Cut Area (SF)	20.963
Fill Area (SF)	2.079
Cut Vol (CF)	41.0
Fill Vol (CF)	1.9
Cum Cut Vol (CF)	10403.3
Cum Fill Vol (CF)	7291.4
Net Vol (CF)	3111.9



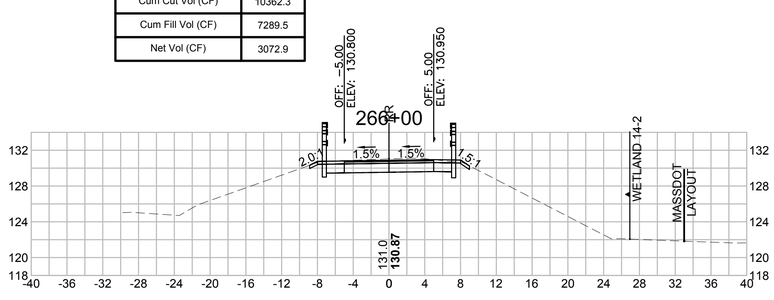
Total Volume at Station 268+00.00	
Cut Area (SF)	8.250
Fill Area (SF)	3.461
Cut Vol (CF)	15.0
Fill Vol (CF)	7.0
Cum Cut Vol (CF)	10462.9
Cum Fill Vol (CF)	7310.2
Net Vol (CF)	3152.7



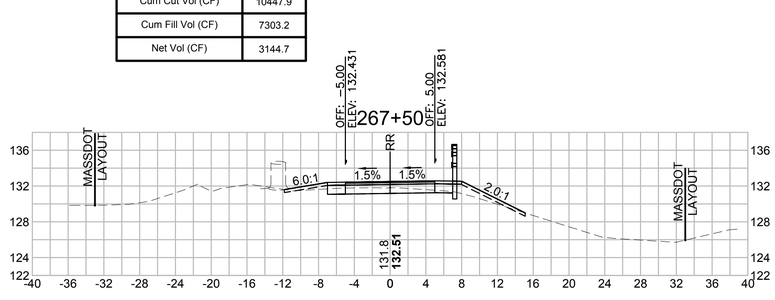
Total Volume at Station 264+50.00	
Cut Area (SF)	45.493
Fill Area (SF)	0.745
Cut Vol (CF)	83.3
Fill Vol (CF)	2.8
Cum Cut Vol (CF)	10175.5
Cum Fill Vol (CF)	7288.8
Net Vol (CF)	2886.7



Total Volume at Station 266+00.00	
Cut Area (SF)	23.271
Fill Area (SF)	0.000
Cut Vol (CF)	48.4
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	10362.3
Cum Fill Vol (CF)	7289.5
Net Vol (CF)	3072.9



Total Volume at Station 267+50.00	
Cut Area (SF)	7.984
Fill Area (SF)	4.106
Cut Vol (CF)	16.3
Fill Vol (CF)	6.8
Cum Cut Vol (CF)	10447.9
Cum Fill Vol (CF)	7303.2
Net Vol (CF)	3144.7



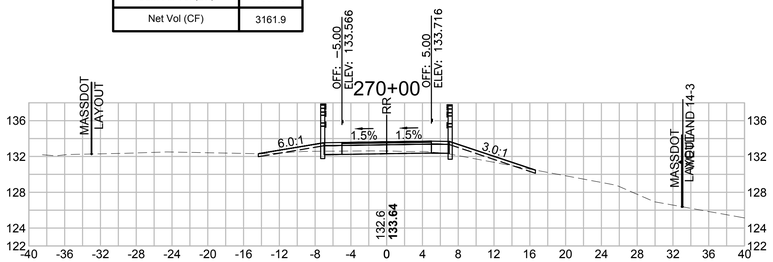
SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	282	316
PROJECT FILE NO. 608164			

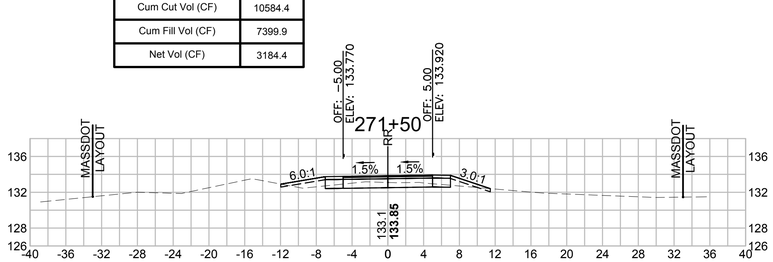
CROSS SECTIONS

608164_XSEC(CROSS SECTION LAYOUTS).DWG 22-Dec-2021

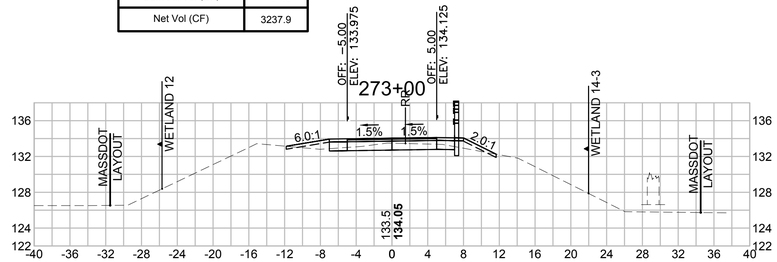
Total Volume at Station 270+00.00	
Cut Area (SF)	16.801
Fill Area (SF)	5.138
Cut Vol (CF)	26.2
Fill Vol (CF)	14.4
Cum Cut Vol (CF)	10531.0
Cum Fill Vol (CF)	7369.0
Net Vol (CF)	3161.9



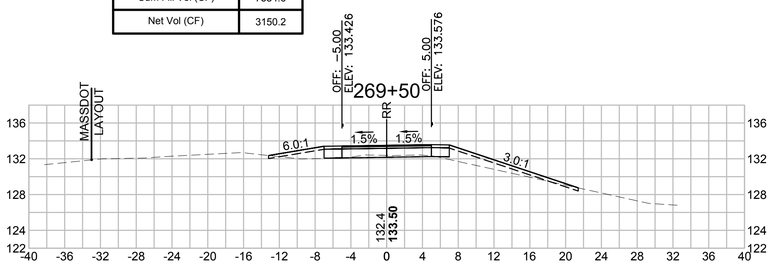
Total Volume at Station 271+50.00	
Cut Area (SF)	15.888
Fill Area (SF)	3.101
Cut Vol (CF)	19.2
Fill Vol (CF)	10.0
Cum Cut Vol (CF)	10584.4
Cum Fill Vol (CF)	7399.9
Net Vol (CF)	3184.4



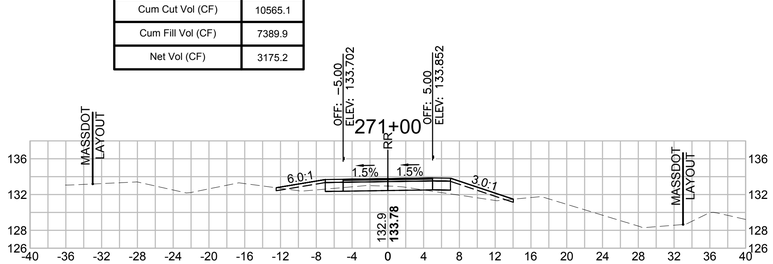
Total Volume at Station 273+00.00	
Cut Area (SF)	8.276
Fill Area (SF)	3.215
Cut Vol (CF)	16.3
Fill Vol (CF)	8.6
Cum Cut Vol (CF)	10661.9
Cum Fill Vol (CF)	7424.0
Net Vol (CF)	3237.9



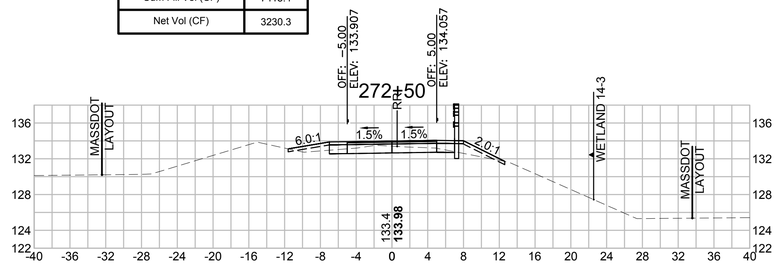
Total Volume at Station 269+50.00	
Cut Area (SF)	11.450
Fill Area (SF)	10.431
Cut Vol (CF)	16.0
Fill Vol (CF)	20.0
Cum Cut Vol (CF)	10504.8
Cum Fill Vol (CF)	7354.6
Net Vol (CF)	3150.2



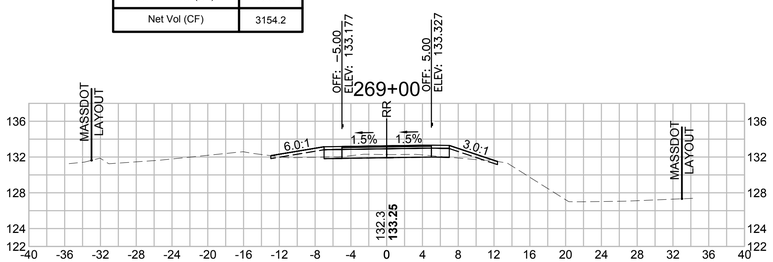
Total Volume at Station 271+00.00	
Cut Area (SF)	4.887
Fill Area (SF)	7.726
Cut Vol (CF)	11.6
Fill Vol (CF)	11.6
Cum Cut Vol (CF)	10565.1
Cum Fill Vol (CF)	7389.9
Net Vol (CF)	3175.2



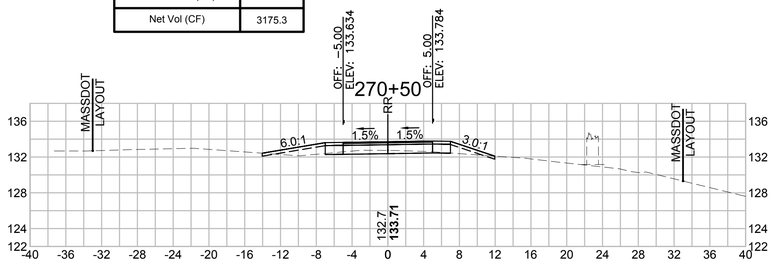
Total Volume at Station 272+50.00	
Cut Area (SF)	9.303
Fill Area (SF)	6.077
Cut Vol (CF)	27.6
Fill Vol (CF)	9.1
Cum Cut Vol (CF)	10645.7
Cum Fill Vol (CF)	7415.4
Net Vol (CF)	3230.3



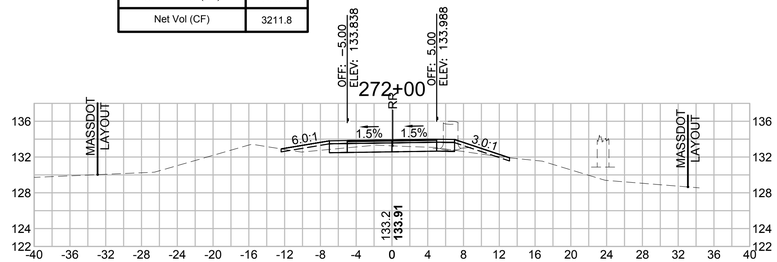
Total Volume at Station 269+00.00	
Cut Area (SF)	5.848
Fill Area (SF)	11.181
Cut Vol (CF)	11.8
Fill Vol (CF)	15.8
Cum Cut Vol (CF)	10488.8
Cum Fill Vol (CF)	7334.6
Net Vol (CF)	3154.2



Total Volume at Station 270+50.00	
Cut Area (SF)	7.611
Fill Area (SF)	4.837
Cut Vol (CF)	22.6
Fill Vol (CF)	9.2
Cum Cut Vol (CF)	10553.6
Cum Fill Vol (CF)	7378.3
Net Vol (CF)	3175.3



Total Volume at Station 272+00.00	
Cut Area (SF)	20.499
Fill Area (SF)	3.749
Cut Vol (CF)	33.7
Fill Vol (CF)	6.3
Cum Cut Vol (CF)	10618.1
Cum Fill Vol (CF)	7406.3
Net Vol (CF)	3211.8



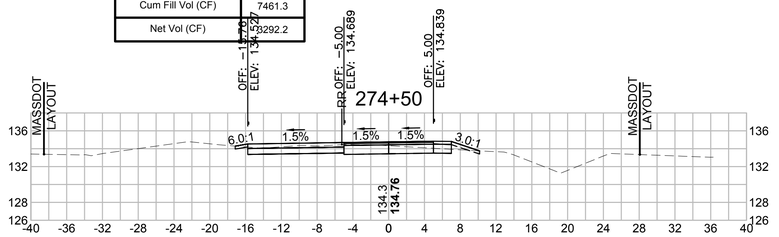
SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	283	316
PROJECT FILE NO. 608164			

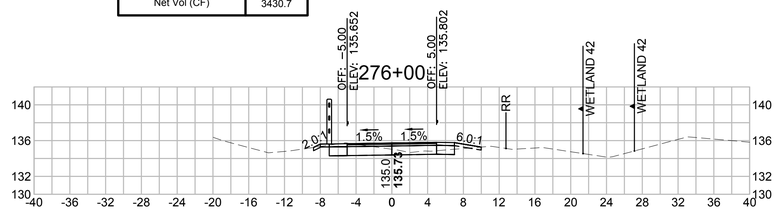
CROSS SECTIONS

608164_XSEC(CROSS SECTION LAYOUTS).DWG 22-Dec-2021

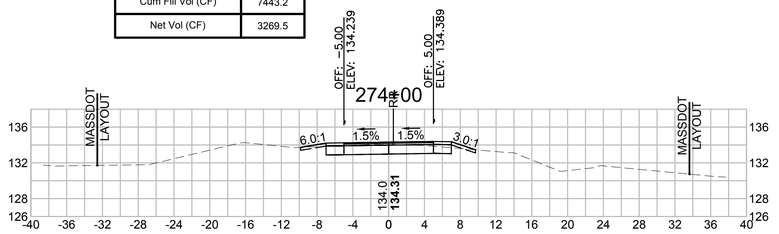
Total Volume at Station 274+50.00	
Cut Area (SF)	24.549
Fill Area (SF)	6.144
Cut Vol (CF)	40.8
Fill Vol (CF)	18.1
Cum Cut Vol (CF)	10753.5
Cum Fill Vol (CF)	7461.3
Net Vol (CF)	3292.2



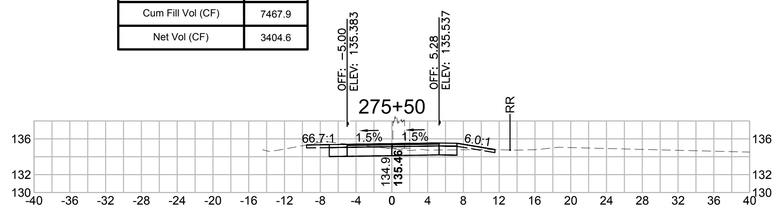
Total Volume at Station 276+00.00	
Cut Area (SF)	12.654
Fill Area (SF)	0.620
Cut Vol (CF)	27.6
Fill Vol (CF)	1.5
Cum Cut Vol (CF)	10900.1
Cum Fill Vol (CF)	7469.4
Net Vol (CF)	3430.7



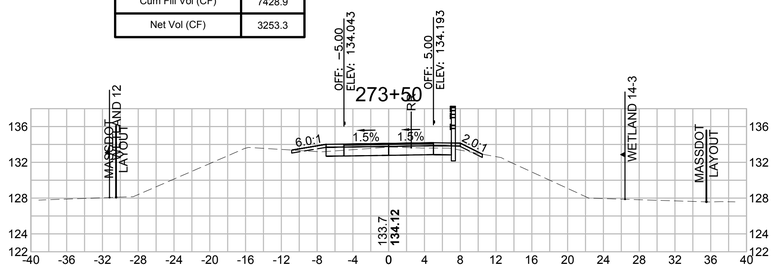
Total Volume at Station 274+00.00	
Cut Area (SF)	19.468
Fill Area (SF)	13.388
Cut Vol (CF)	30.6
Fill Vol (CF)	14.3
Cum Cut Vol (CF)	10712.7
Cum Fill Vol (CF)	7443.2
Net Vol (CF)	3269.5



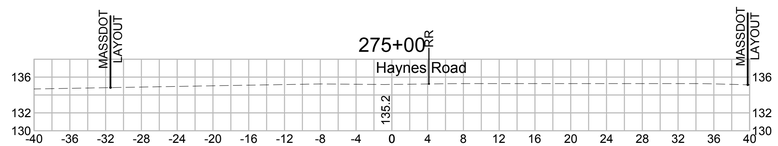
Total Volume at Station 275+50.00	
Cut Area (SF)	17.120
Fill Area (SF)	1.005
Cut Vol (CF)	56.1
Fill Vol (CF)	0.9
Cum Cut Vol (CF)	10872.5
Cum Fill Vol (CF)	7467.9
Net Vol (CF)	3404.6



Total Volume at Station 273+50.00	
Cut Area (SF)	13.567
Fill Area (SF)	2.075
Cut Vol (CF)	20.2
Fill Vol (CF)	4.9
Cum Cut Vol (CF)	10682.2
Cum Fill Vol (CF)	7428.9
Net Vol (CF)	3253.3



Total Volume at Station 275+00.00	
Cut Area (SF)	43.439
Fill Area (SF)	0.000
Cut Vol (CF)	63.0
Fill Vol (CF)	5.7
Cum Cut Vol (CF)	10816.4
Cum Fill Vol (CF)	7467.0
Net Vol (CF)	3349.5



SUDBURY
BRUCE FREEMAN RAIL TRAIL

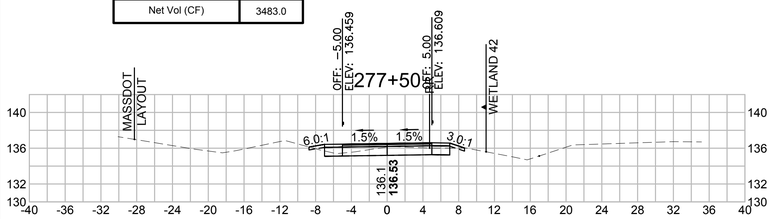
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	284	316
PROJECT FILE NO. 608164			

CROSS SECTIONS

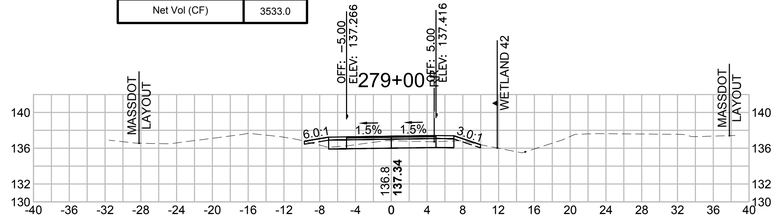
22-Dec-2021

608164_XSEC(CROSS SECTION LAYOUTS).DWG

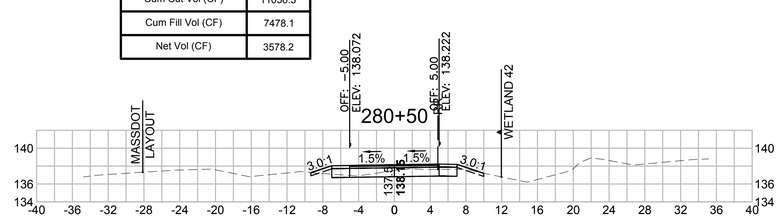
Total Volume at Station 277+50.00	
Cut Area (SF)	9.978
Fill Area (SF)	0.269
Cut Vol (CF)	15.8
Fill Vol (CF)	0.3
Cum Cut Vol (CF)	10953.4
Cum Fill Vol (CF)	7470.4
Net Vol (CF)	3483.0



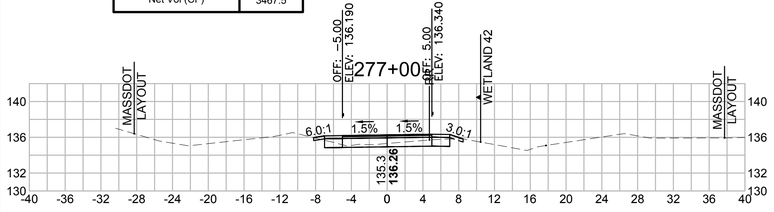
Total Volume at Station 279+00.00	
Cut Area (SF)	9.292
Fill Area (SF)	0.846
Cut Vol (CF)	17.6
Fill Vol (CF)	1.2
Cum Cut Vol (CF)	11006.6
Cum Fill Vol (CF)	7473.6
Net Vol (CF)	3533.0



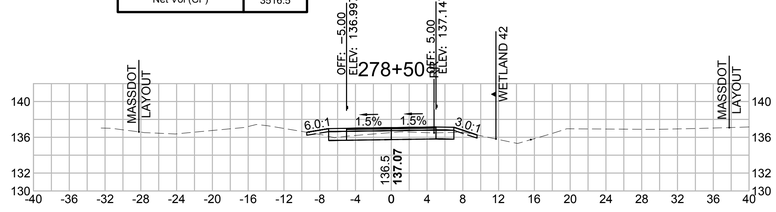
Total Volume at Station 280+50.00	
Cut Area (SF)	8.526
Fill Area (SF)	0.500
Cut Vol (CF)	15.8
Fill Vol (CF)	1.5
Cum Cut Vol (CF)	11056.3
Cum Fill Vol (CF)	7478.1
Net Vol (CF)	3578.2



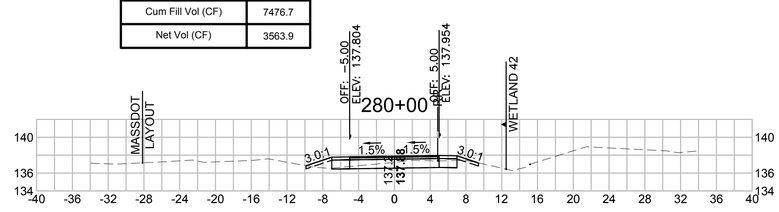
Total Volume at Station 277+00.00	
Cut Area (SF)	7.093
Fill Area (SF)	0.066
Cut Vol (CF)	16.2
Fill Vol (CF)	0.1
Cum Cut Vol (CF)	10937.6
Cum Fill Vol (CF)	7470.1
Net Vol (CF)	3467.5



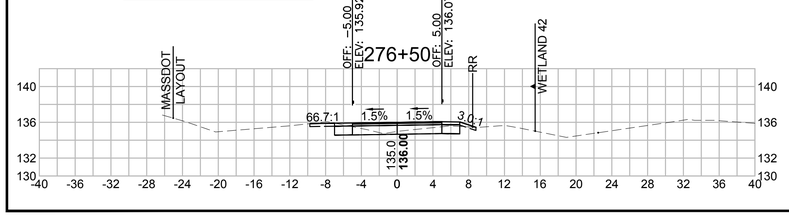
Total Volume at Station 278+50.00	
Cut Area (SF)	9.760
Fill Area (SF)	0.426
Cut Vol (CF)	17.7
Fill Vol (CF)	1.0
Cum Cut Vol (CF)	10988.9
Cum Fill Vol (CF)	7472.4
Net Vol (CF)	3516.5



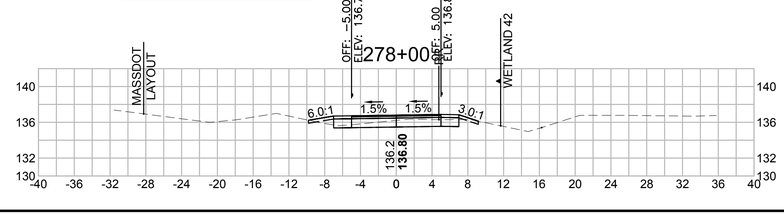
Total Volume at Station 280+00.00	
Cut Area (SF)	8.550
Fill Area (SF)	1.082
Cut Vol (CF)	16.6
Fill Vol (CF)	1.7
Cum Cut Vol (CF)	11040.5
Cum Fill Vol (CF)	7476.7
Net Vol (CF)	3563.9



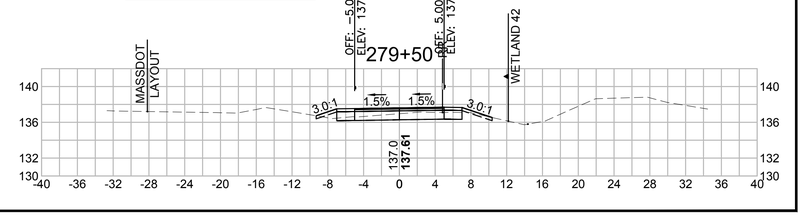
Total Volume at Station 276+50.00	
Cut Area (SF)	10.381
Fill Area (SF)	0.043
Cut Vol (CF)	21.3
Fill Vol (CF)	0.6
Cum Cut Vol (CF)	10921.4
Cum Fill Vol (CF)	7470.0
Net Vol (CF)	3451.4



Total Volume at Station 278+00.00	
Cut Area (SF)	9.312
Fill Area (SF)	0.703
Cut Vol (CF)	17.9
Fill Vol (CF)	0.9
Cum Cut Vol (CF)	10971.3
Cum Fill Vol (CF)	7471.3
Net Vol (CF)	3499.9



Total Volume at Station 279+50.00	
Cut Area (SF)	9.420
Fill Area (SF)	0.707
Cut Vol (CF)	17.3
Fill Vol (CF)	1.4
Cum Cut Vol (CF)	11023.9
Cum Fill Vol (CF)	7475.0
Net Vol (CF)	3548.9



SUDBURY
BRUCE FREEMAN RAIL TRAIL

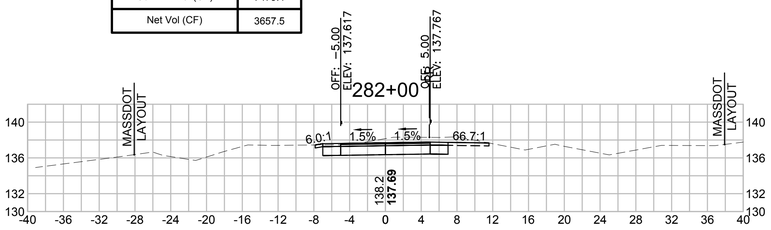
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	285	316
PROJECT FILE NO. 608164			

CROSS SECTIONS

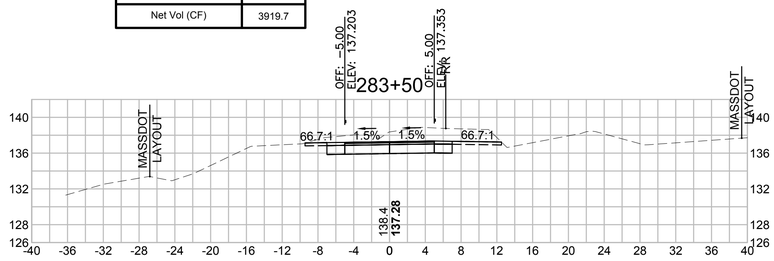
22-Dec-2021

608164_XSEC(CROSS SECTION LAYOUTS).DWG

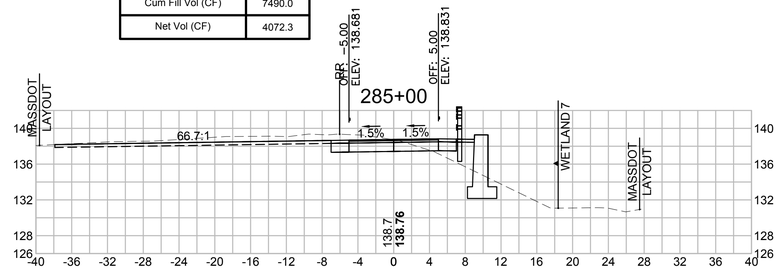
Total Volume at Station 282+00.00	
Cut Area (SF)	28.258
Fill Area (SF)	0.000
Cut Vol (CF)	40.9
Fill Vol (CF)	0.1
Cum Cut Vol (CF)	11136.9
Cum Fill Vol (CF)	7479.4
Net Vol (CF)	3657.5



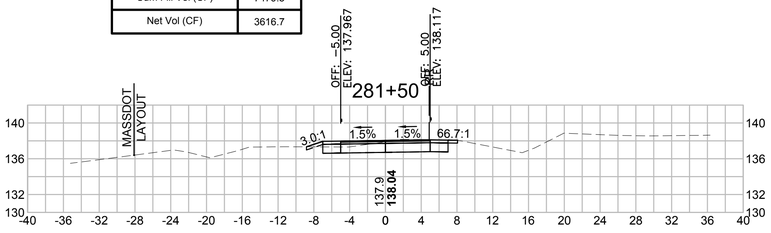
Total Volume at Station 283+50.00	
Cut Area (SF)	59.185
Fill Area (SF)	0.222
Cut Vol (CF)	105.4
Fill Vol (CF)	0.2
Cum Cut Vol (CF)	11399.3
Cum Fill Vol (CF)	7479.6
Net Vol (CF)	3919.7



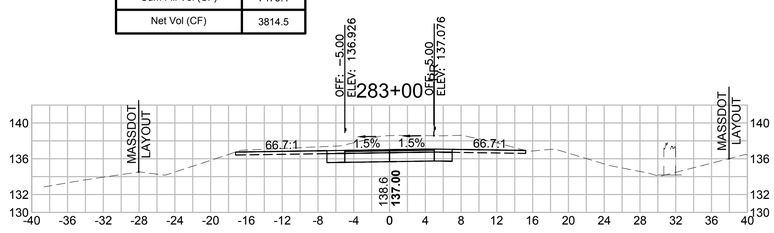
Total Volume at Station 285+00.00	
Cut Area (SF)	51.764
Fill Area (SF)	6.023
Cut Vol (CF)	47.9
Fill Vol (CF)	5.6
Cum Cut Vol (CF)	11562.3
Cum Fill Vol (CF)	7490.0
Net Vol (CF)	4072.3



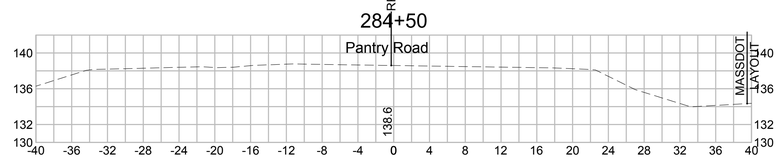
Total Volume at Station 281+50.00	
Cut Area (SF)	15.927
Fill Area (SF)	0.106
Cut Vol (CF)	23.2
Fill Vol (CF)	0.4
Cum Cut Vol (CF)	11096.0
Cum Fill Vol (CF)	7479.3
Net Vol (CF)	3616.7



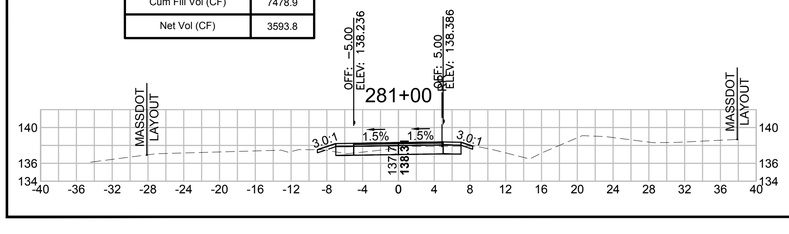
Total Volume at Station 283+00.00	
Cut Area (SF)	54.652
Fill Area (SF)	0.000
Cut Vol (CF)	90.7
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	11293.9
Cum Fill Vol (CF)	7479.4
Net Vol (CF)	3814.5



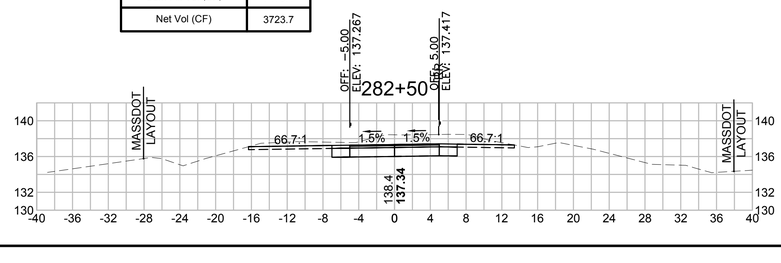
Total Volume at Station 284+50.00	
Cut Area (SF)	0.000
Fill Area (SF)	0.000
Cut Vol (CF)	30.1
Fill Vol (CF)	2.3
Cum Cut Vol (CF)	11514.3
Cum Fill Vol (CF)	7484.4
Net Vol (CF)	4030.0



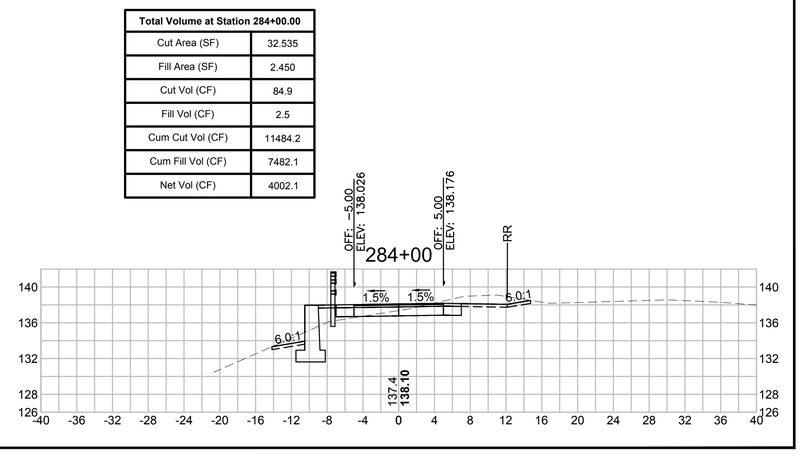
Total Volume at Station 281+00.00	
Cut Area (SF)	9.182
Fill Area (SF)	0.352
Cut Vol (CF)	16.4
Fill Vol (CF)	0.8
Cum Cut Vol (CF)	11072.7
Cum Fill Vol (CF)	7478.9
Net Vol (CF)	3593.8



Total Volume at Station 282+50.00	
Cut Area (SF)	43.320
Fill Area (SF)	0.000
Cut Vol (CF)	66.3
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	11203.2
Cum Fill Vol (CF)	7479.4
Net Vol (CF)	3723.7



Total Volume at Station 284+00.00	
Cut Area (SF)	32.535
Fill Area (SF)	2.450
Cut Vol (CF)	84.9
Fill Vol (CF)	2.5
Cum Cut Vol (CF)	11484.2
Cum Fill Vol (CF)	7482.1
Net Vol (CF)	4002.1



SUDBURY
BRUCE FREEMAN RAIL TRAIL

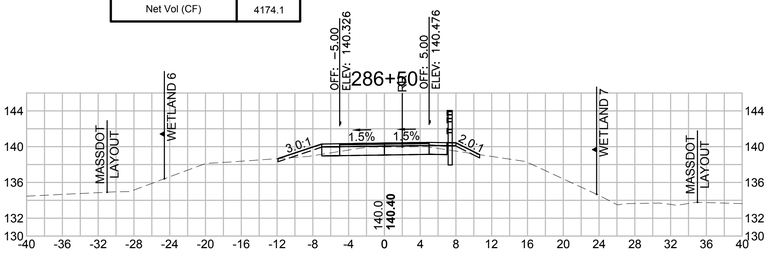
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	286	316
PROJECT FILE NO. 608164			

CROSS SECTIONS

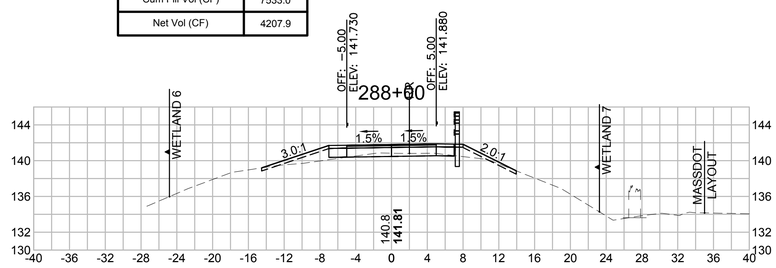
22-Dec-2021

608164_XSEC(CROSS SECTION LAYOUTS).DWG

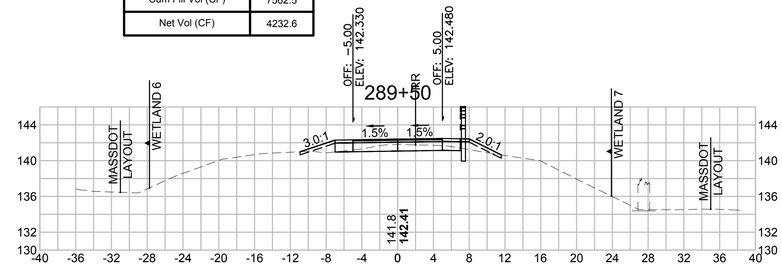
Total Volume at Station 286+50.00	
Cut Area (SF)	10.652
Fill Area (SF)	2.537
Cut Vol (CF)	22.5
Fill Vol (CF)	3.7
Cum Cut Vol (CF)	11680.7
Cum Fill Vol (CF)	7506.5
Net Vol (CF)	4174.1



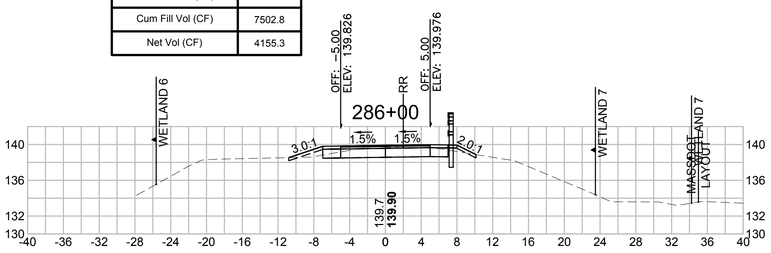
Total Volume at Station 288+00.00	
Cut Area (SF)	10.395
Fill Area (SF)	6.320
Cut Vol (CF)	22.4
Fill Vol (CF)	11.9
Cum Cut Vol (CF)	11740.9
Cum Fill Vol (CF)	7533.0
Net Vol (CF)	4207.9



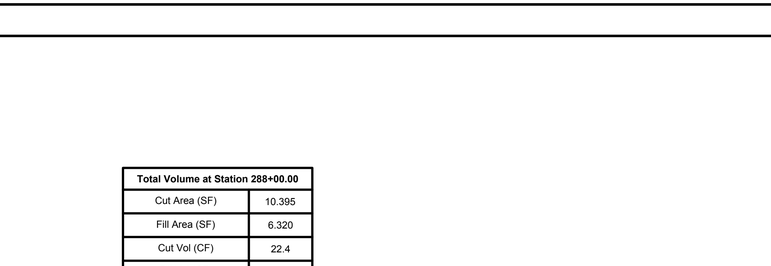
Total Volume at Station 289+50.00	
Cut Area (SF)	7.485
Fill Area (SF)	3.349
Cut Vol (CF)	12.2
Fill Vol (CF)	7.5
Cum Cut Vol (CF)	11795.2
Cum Fill Vol (CF)	7562.5
Net Vol (CF)	4232.6



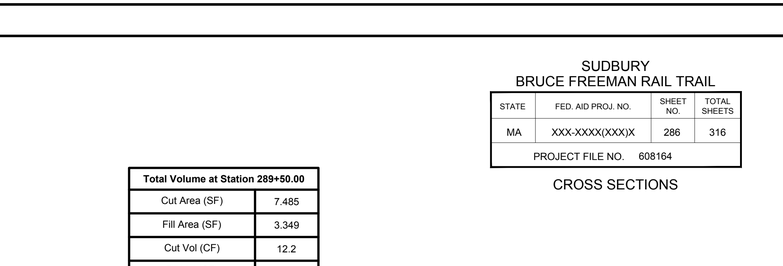
Total Volume at Station 286+00.00	
Cut Area (SF)	13.658
Fill Area (SF)	1.480
Cut Vol (CF)	30.3
Fill Vol (CF)	4.3
Cum Cut Vol (CF)	11658.2
Cum Fill Vol (CF)	7502.8
Net Vol (CF)	4155.3



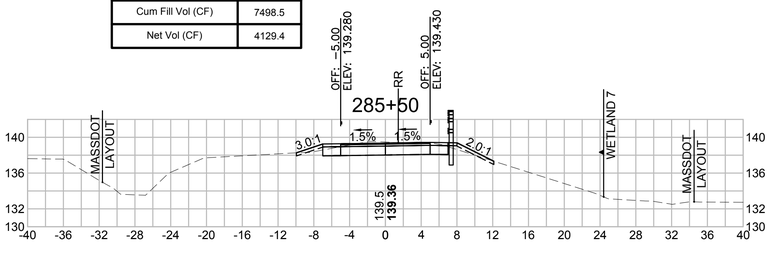
Total Volume at Station 287+50.00	
Cut Area (SF)	13.780
Fill Area (SF)	6.505
Cut Vol (CF)	20.4
Fill Vol (CF)	9.1
Cum Cut Vol (CF)	11718.5
Cum Fill Vol (CF)	7521.1
Net Vol (CF)	4197.4



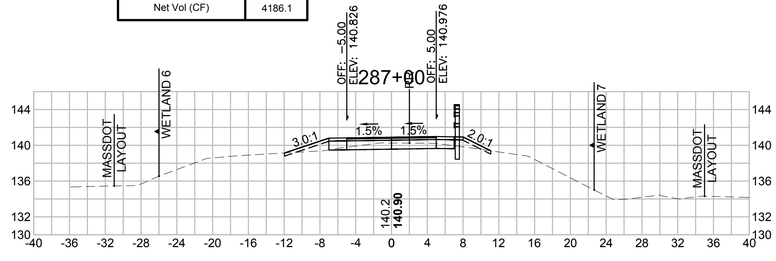
Total Volume at Station 289+00.00	
Cut Area (SF)	5.738
Fill Area (SF)	4.803
Cut Vol (CF)	18.9
Fill Vol (CF)	10.3
Cum Cut Vol (CF)	11782.9
Cum Fill Vol (CF)	7555.0
Net Vol (CF)	4227.9



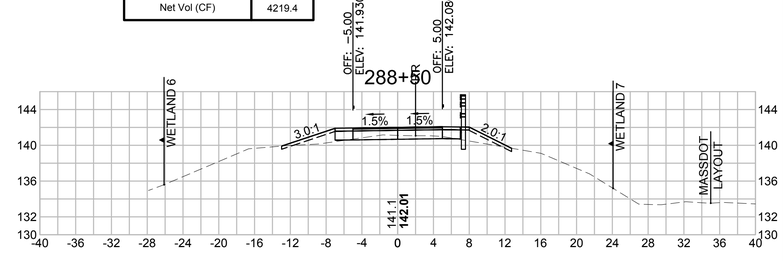
Total Volume at Station 285+50.00	
Cut Area (SF)	19.066
Fill Area (SF)	3.194
Cut Vol (CF)	65.6
Fill Vol (CF)	8.5
Cum Cut Vol (CF)	11627.9
Cum Fill Vol (CF)	7498.5
Net Vol (CF)	4129.4



Total Volume at Station 287+00.00	
Cut Area (SF)	8.206
Fill Area (SF)	3.343
Cut Vol (CF)	17.5
Fill Vol (CF)	5.4
Cum Cut Vol (CF)	11698.1
Cum Fill Vol (CF)	7512.0
Net Vol (CF)	4186.1



Total Volume at Station 288+50.00	
Cut Area (SF)	14.651
Fill Area (SF)	6.327
Cut Vol (CF)	23.2
Fill Vol (CF)	11.7
Cum Cut Vol (CF)	11764.1
Cum Fill Vol (CF)	7544.7
Net Vol (CF)	4219.4



SUDBURY
BRUCE FREEMAN RAIL TRAIL

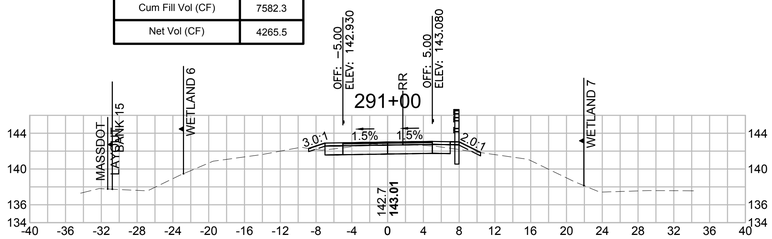
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	287	316
PROJECT FILE NO. 608164			

CROSS SECTIONS

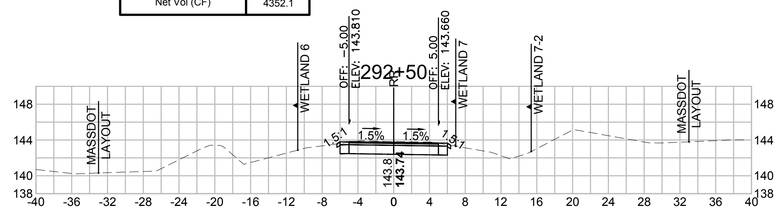
22-Dec-2021

608164_XSEC(CROSS SECTION LAYOUTS).DWG

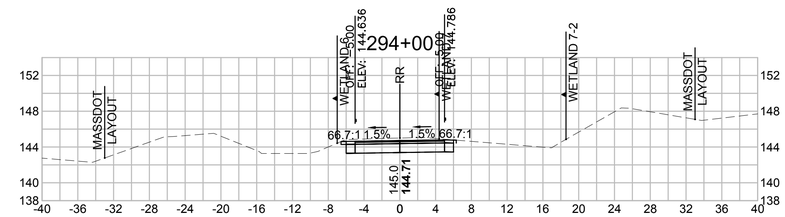
Total Volume at Station 291+00.00	
Cut Area (SF)	13.191
Fill Area (SF)	1.057
Cut Vol (CF)	21.9
Fill Vol (CF)	2.3
Cum Cut Vol (CF)	11847.9
Cum Fill Vol (CF)	7582.3
Net Vol (CF)	4265.5



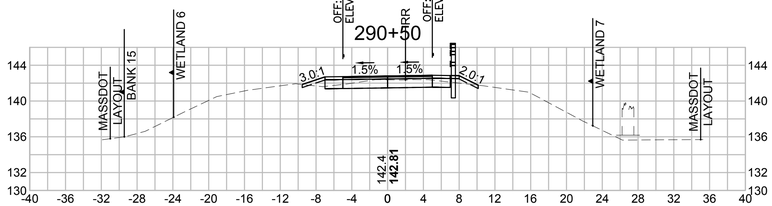
Total Volume at Station 292+50.00	
Cut Area (SF)	16.886
Fill Area (SF)	0.000
Cut Vol (CF)	30.7
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	11935.4
Cum Fill Vol (CF)	7583.3
Net Vol (CF)	4352.1



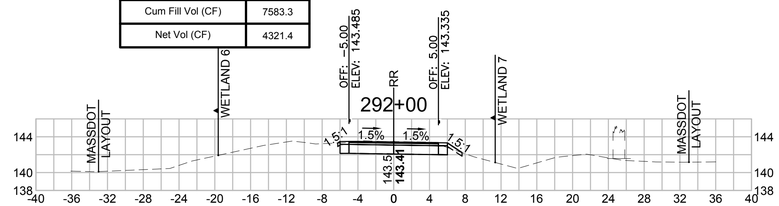
Total Volume at Station 294+00.00	
Cut Area (SF)	19.091
Fill Area (SF)	0.000
Cut Vol (CF)	35.8
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	12038.2
Cum Fill Vol (CF)	7583.3
Net Vol (CF)	4454.8



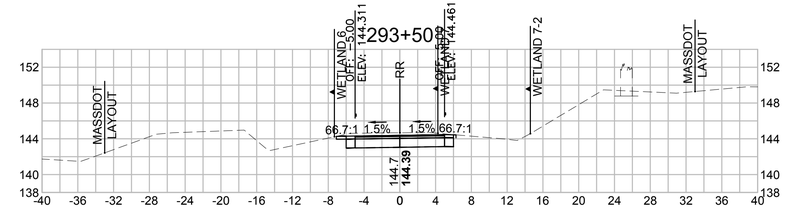
Total Volume at Station 290+50.00	
Cut Area (SF)	10.501
Fill Area (SF)	1.398
Cut Vol (CF)	16.8
Fill Vol (CF)	7.9
Cum Cut Vol (CF)	11825.9
Cum Fill Vol (CF)	7580.1
Net Vol (CF)	4245.9



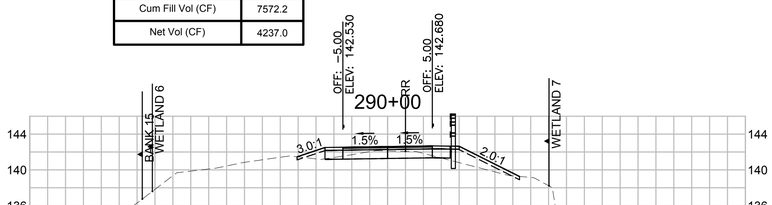
Total Volume at Station 292+00.00	
Cut Area (SF)	16.290
Fill Area (SF)	0.024
Cut Vol (CF)	29.9
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	11904.7
Cum Fill Vol (CF)	7583.3
Net Vol (CF)	4321.4



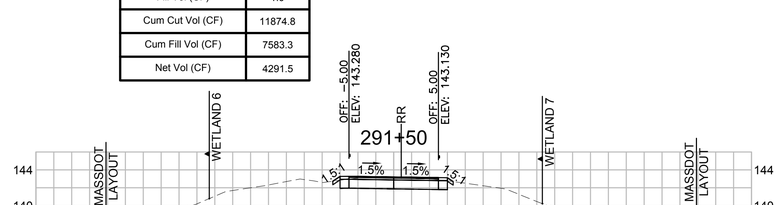
Total Volume at Station 293+50.00	
Cut Area (SF)	19.542
Fill Area (SF)	0.000
Cut Vol (CF)	34.7
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	12002.4
Cum Fill Vol (CF)	7583.3
Net Vol (CF)	4419.1



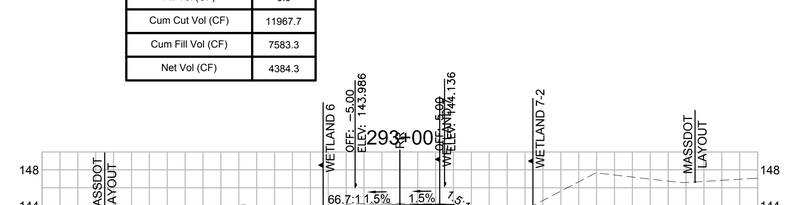
Total Volume at Station 290+00.00	
Cut Area (SF)	7.605
Fill Area (SF)	7.084
Cut Vol (CF)	14.0
Fill Vol (CF)	9.7
Cum Cut Vol (CF)	11809.1
Cum Fill Vol (CF)	7572.2
Net Vol (CF)	4237.0



Total Volume at Station 291+50.00	
Cut Area (SF)	15.952
Fill Area (SF)	0.001
Cut Vol (CF)	27.0
Fill Vol (CF)	1.0
Cum Cut Vol (CF)	11874.8
Cum Fill Vol (CF)	7583.3
Net Vol (CF)	4291.5



Total Volume at Station 293+00.00	
Cut Area (SF)	17.971
Fill Area (SF)	0.000
Cut Vol (CF)	32.3
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	11967.7
Cum Fill Vol (CF)	7583.3
Net Vol (CF)	4384.3



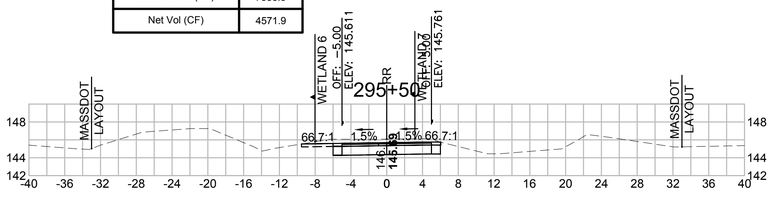
SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	288	316
PROJECT FILE NO. 608164			

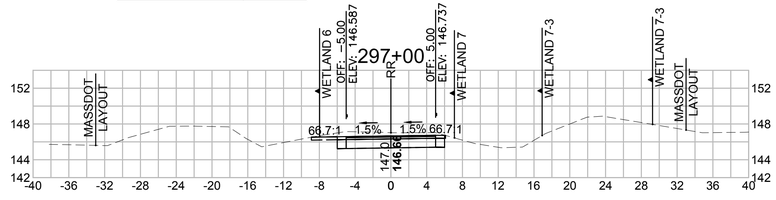
CROSS SECTIONS

608164_XSEC(CROSS SECTION LAYOUTS).DWG 22-Dec-2021

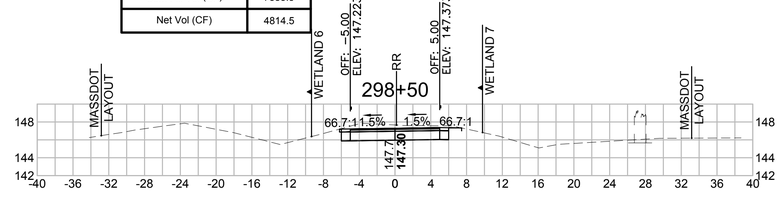
Total Volume at Station 295+50.00	
Cut Area (SF)	22.788
Fill Area (SF)	0.000
Cut Vol (CF)	41.1
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	12155.3
Cum Fill Vol (CF)	7583.3
Net Vol (CF)	4571.9



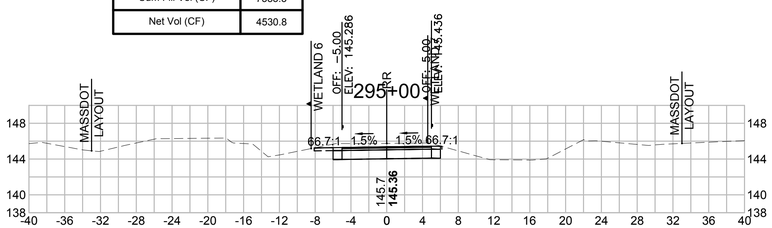
Total Volume at Station 297+00.00	
Cut Area (SF)	22.246
Fill Area (SF)	0.000
Cut Vol (CF)	41.3
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	12280.0
Cum Fill Vol (CF)	7583.3
Net Vol (CF)	4696.7



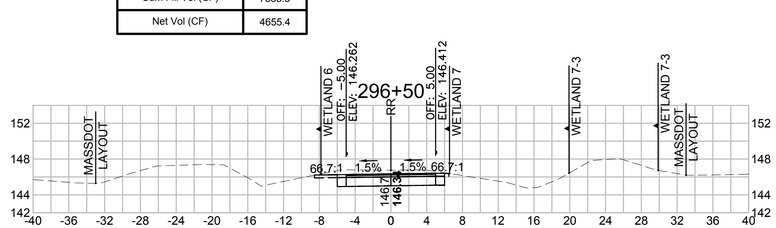
Total Volume at Station 298+50.00	
Cut Area (SF)	20.555
Fill Area (SF)	0.000
Cut Vol (CF)	39.5
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	12397.8
Cum Fill Vol (CF)	7583.3
Net Vol (CF)	4814.5



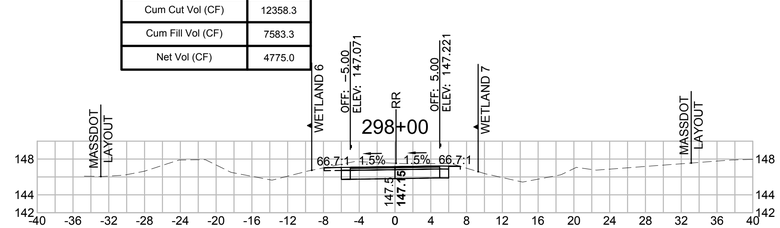
Total Volume at Station 295+00.00	
Cut Area (SF)	21.649
Fill Area (SF)	0.000
Cut Vol (CF)	39.1
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	12114.1
Cum Fill Vol (CF)	7583.3
Net Vol (CF)	4530.8



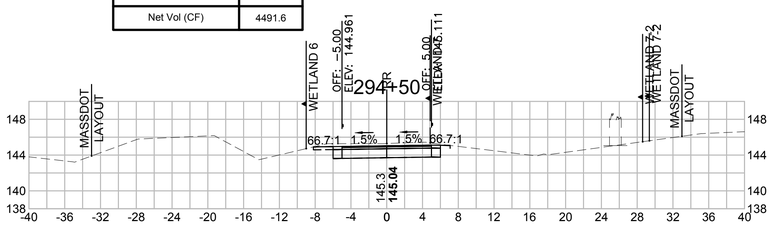
Total Volume at Station 296+50.00	
Cut Area (SF)	22.352
Fill Area (SF)	0.000
Cut Vol (CF)	41.5
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	12238.7
Cum Fill Vol (CF)	7583.3
Net Vol (CF)	4655.4



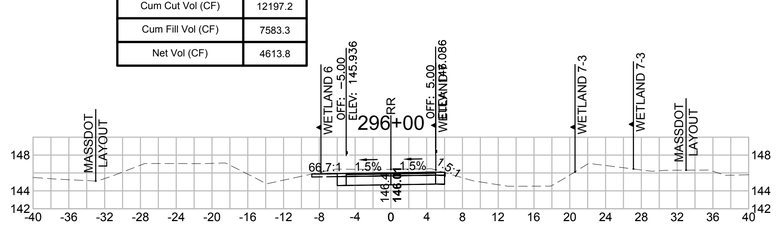
Total Volume at Station 298+00.00	
Cut Area (SF)	22.100
Fill Area (SF)	0.000
Cut Vol (CF)	39.1
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	12358.3
Cum Fill Vol (CF)	7583.3
Net Vol (CF)	4775.0



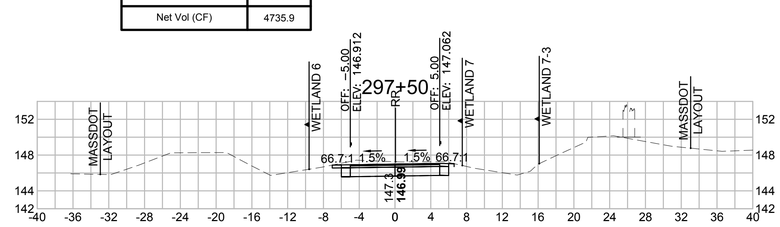
Total Volume at Station 294+50.00	
Cut Area (SF)	20.627
Fill Area (SF)	0.000
Cut Vol (CF)	36.8
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	12075.0
Cum Fill Vol (CF)	7583.3
Net Vol (CF)	4491.6



Total Volume at Station 296+00.00	
Cut Area (SF)	22.498
Fill Area (SF)	0.000
Cut Vol (CF)	41.9
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	12197.2
Cum Fill Vol (CF)	7583.3
Net Vol (CF)	4613.8



Total Volume at Station 297+50.00	
Cut Area (SF)	20.129
Fill Area (SF)	0.000
Cut Vol (CF)	39.2
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	12319.2
Cum Fill Vol (CF)	7583.3
Net Vol (CF)	4735.9



SUDBURY
BRUCE FREEMAN RAIL TRAIL

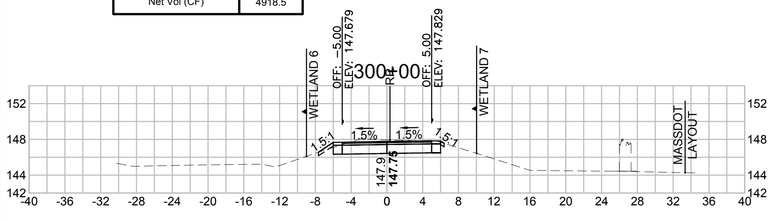
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	289	316
PROJECT FILE NO. 608164			

CROSS SECTIONS

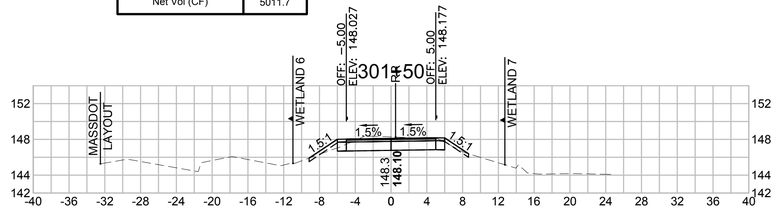
22-Dec-2021

608164_XSEC(CROSS SECTION LAYOUTS).DWG

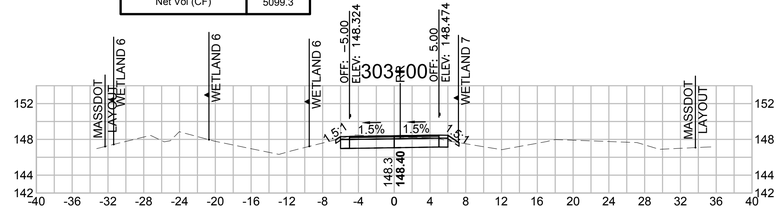
Total Volume at Station 300+00.00	
Cut Area (SF)	17.154
Fill Area (SF)	0.043
Cut Vol (CF)	32.7
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	12501.9
Cum Fill Vol (CF)	7583.4
Net Vol (CF)	4918.5



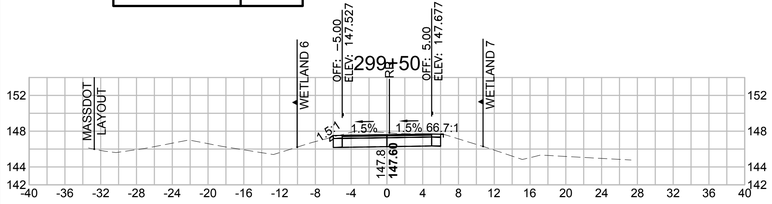
Total Volume at Station 301+50.00	
Cut Area (SF)	16.144
Fill Area (SF)	0.556
Cut Vol (CF)	30.8
Fill Vol (CF)	0.6
Cum Cut Vol (CF)	12595.9
Cum Fill Vol (CF)	7584.2
Net Vol (CF)	5011.7



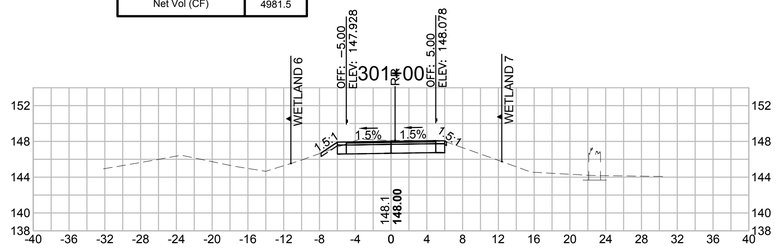
Total Volume at Station 303+00.00	
Cut Area (SF)	14.693
Fill Area (SF)	0.053
Cut Vol (CF)	28.2
Fill Vol (CF)	0.1
Cum Cut Vol (CF)	12684.3
Cum Fill Vol (CF)	7585.0
Net Vol (CF)	5099.3



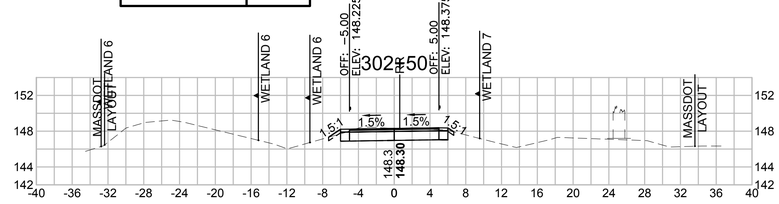
Total Volume at Station 299+50.00	
Cut Area (SF)	18.190
Fill Area (SF)	0.000
Cut Vol (CF)	34.6
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	12469.1
Cum Fill Vol (CF)	7583.3
Net Vol (CF)	4885.8



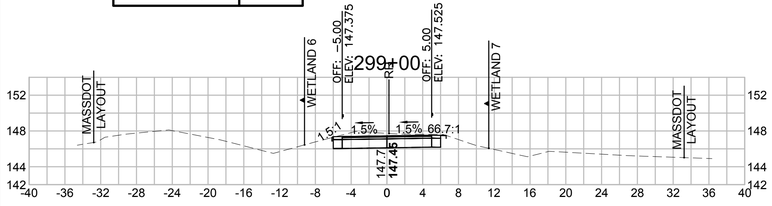
Total Volume at Station 301+00.00	
Cut Area (SF)	17.105
Fill Area (SF)	0.042
Cut Vol (CF)	31.6
Fill Vol (CF)	0.1
Cum Cut Vol (CF)	12565.1
Cum Fill Vol (CF)	7583.6
Net Vol (CF)	4981.5



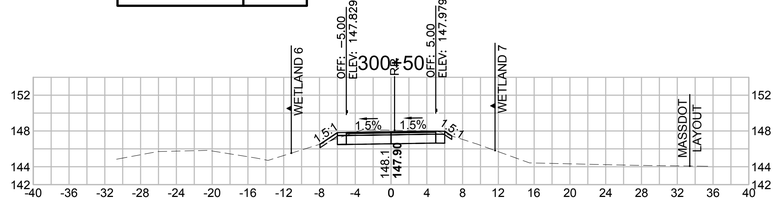
Total Volume at Station 302+50.00	
Cut Area (SF)	15.798
Fill Area (SF)	0.017
Cut Vol (CF)	29.9
Fill Vol (CF)	0.1
Cum Cut Vol (CF)	12656.0
Cum Fill Vol (CF)	7584.9
Net Vol (CF)	5071.1



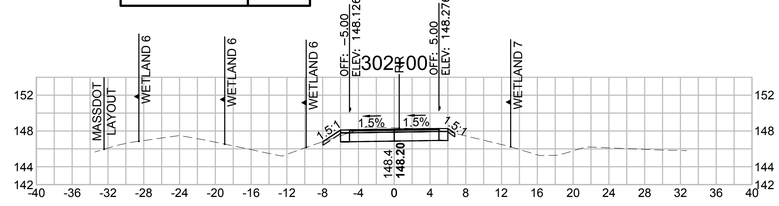
Total Volume at Station 299+00.00	
Cut Area (SF)	19.134
Fill Area (SF)	0.000
Cut Vol (CF)	36.7
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	12434.6
Cum Fill Vol (CF)	7583.3
Net Vol (CF)	4851.2



Total Volume at Station 300+50.00	
Cut Area (SF)	17.029
Fill Area (SF)	0.093
Cut Vol (CF)	31.7
Fill Vol (CF)	0.1
Cum Cut Vol (CF)	12533.5
Cum Fill Vol (CF)	7583.5
Net Vol (CF)	4950.0



Total Volume at Station 302+00.00	
Cut Area (SF)	16.496
Fill Area (SF)	0.094
Cut Vol (CF)	30.2
Fill Vol (CF)	0.6
Cum Cut Vol (CF)	12626.1
Cum Fill Vol (CF)	7584.8
Net Vol (CF)	5041.3



SUDBURY
BRUCE FREEMAN RAIL TRAIL

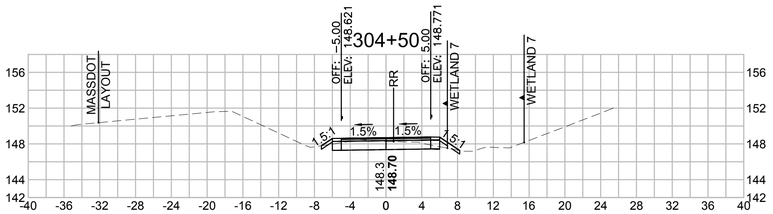
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	290	316
PROJECT FILE NO. 608164			

CROSS SECTIONS

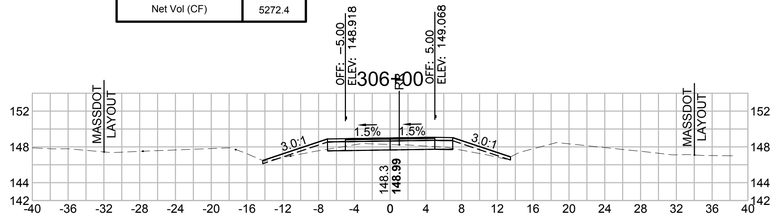
22-Dec-2021

608164_XSEC(CROSS SECTION LAYOUTS).DWG

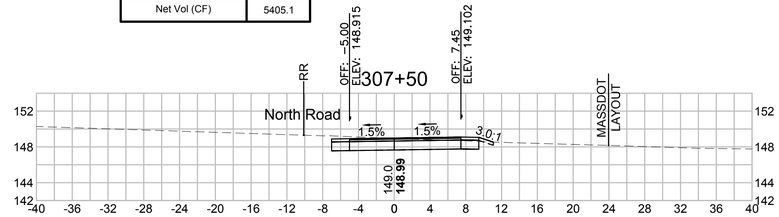
Total Volume at Station 304+50.00	
Cut Area (SF)	12.695
Fill Area (SF)	0.527
Cut Vol (CF)	22.7
Fill Vol (CF)	0.5
Cum Cut Vol (CF)	12755.8
Cum Fill Vol (CF)	7585.6
Net Vol (CF)	5170.2



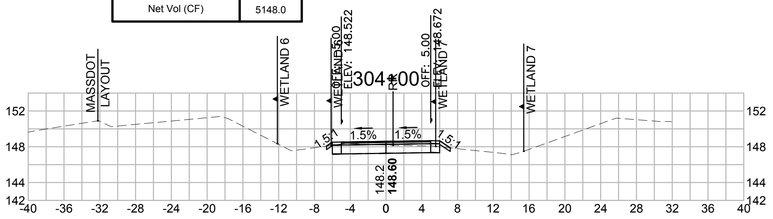
Total Volume at Station 306+00.00	
Cut Area (SF)	18.518
Fill Area (SF)	4.761
Cut Vol (CF)	41.9
Fill Vol (CF)	8.9
Cum Cut Vol (CF)	12872.3
Cum Fill Vol (CF)	7600.0
Net Vol (CF)	5272.4



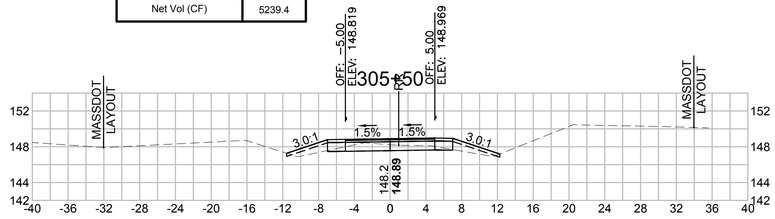
Total Volume at Station 307+50.00	
Cut Area (SF)	79.732
Fill Area (SF)	0.024
Cut Vol (CF)	101.4
Fill Vol (CF)	12.3
Cum Cut Vol (CF)	13043.7
Cum Fill Vol (CF)	7638.6
Net Vol (CF)	5405.1



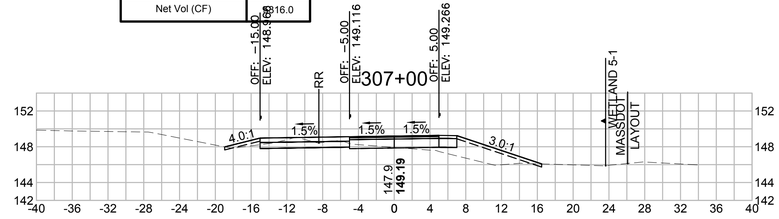
Total Volume at Station 304+00.00	
Cut Area (SF)	11.791
Fill Area (SF)	0.064
Cut Vol (CF)	23.1
Fill Vol (CF)	0.1
Cum Cut Vol (CF)	12733.1
Cum Fill Vol (CF)	7585.1
Net Vol (CF)	5148.0



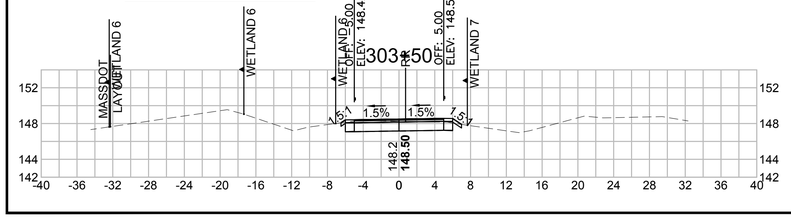
Total Volume at Station 305+50.00	
Cut Area (SF)	26.728
Fill Area (SF)	4.848
Cut Vol (CF)	43.8
Fill Vol (CF)	4.7
Cum Cut Vol (CF)	12830.5
Cum Fill Vol (CF)	7591.1
Net Vol (CF)	5239.4



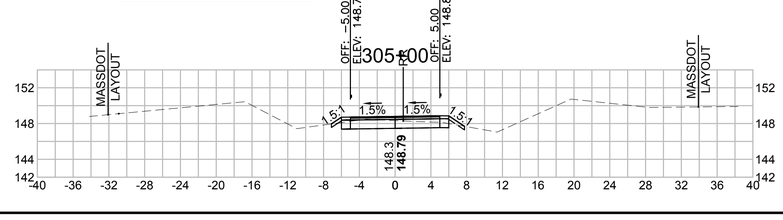
Total Volume at Station 307+00.00	
Cut Area (SF)	29.756
Fill Area (SF)	13.211
Cut Vol (CF)	40.2
Fill Vol (CF)	17.1
Cum Cut Vol (CF)	12942.4
Cum Fill Vol (CF)	7626.4
Net Vol (CF)	5316.0



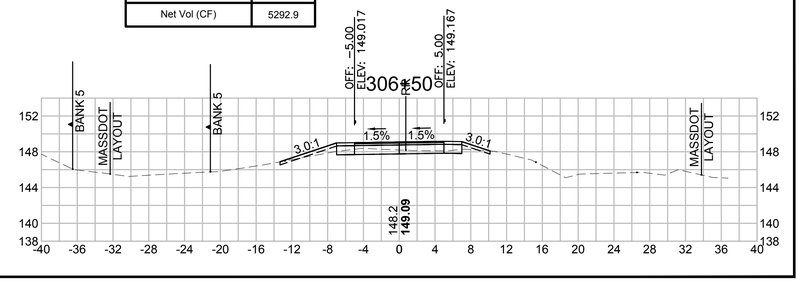
Total Volume at Station 303+50.00	
Cut Area (SF)	13.145
Fill Area (SF)	0.011
Cut Vol (CF)	25.8
Fill Vol (CF)	0.1
Cum Cut Vol (CF)	12710.0
Cum Fill Vol (CF)	7585.0
Net Vol (CF)	5125.0



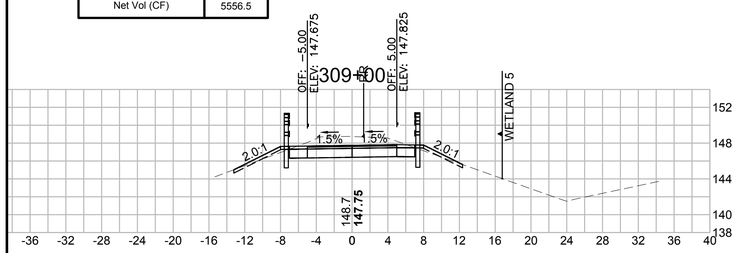
Total Volume at Station 305+00.00	
Cut Area (SF)	20.597
Fill Area (SF)	0.254
Cut Vol (CF)	30.8
Fill Vol (CF)	0.7
Cum Cut Vol (CF)	12786.6
Cum Fill Vol (CF)	7586.4
Net Vol (CF)	5200.3



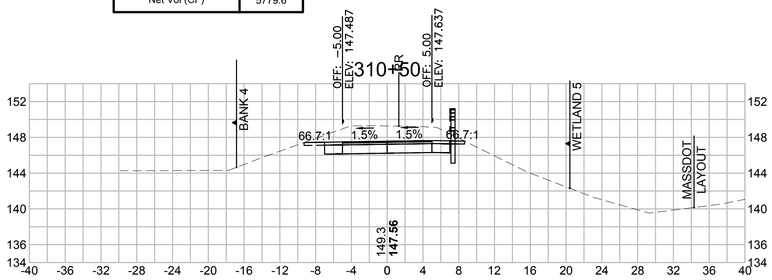
Total Volume at Station 306+50.00	
Cut Area (SF)	13.675
Fill Area (SF)	5.256
Cut Vol (CF)	29.8
Fill Vol (CF)	9.3
Cum Cut Vol (CF)	12902.2
Cum Fill Vol (CF)	7609.3
Net Vol (CF)	5292.9



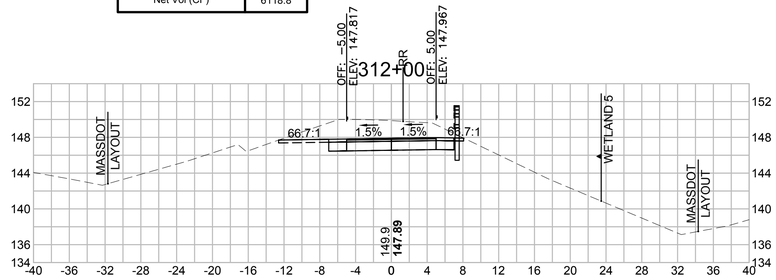
Total Volume at Station 309+00.00	
Cut Area (SF)	28.856
Fill Area (SF)	1.518
Cut Vol (CF)	50.9
Fill Vol (CF)	1.5
Cum Cut Vol (CF)	13226.5
Cum Fill Vol (CF)	7670.0
Net Vol (CF)	5556.5



Total Volume at Station 310+50.00	
Cut Area (SF)	47.202
Fill Area (SF)	0.000
Cut Vol (CF)	87.8
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	13461.4
Cum Fill Vol (CF)	7681.9
Net Vol (CF)	5779.6



Total Volume at Station 312+00.00	
Cut Area (SF)	59.214
Fill Area (SF)	0.123
Cut Vol (CF)	118.2
Fill Vol (CF)	0.1
Cum Cut Vol (CF)	13801.1
Cum Fill Vol (CF)	7682.3
Net Vol (CF)	6118.8



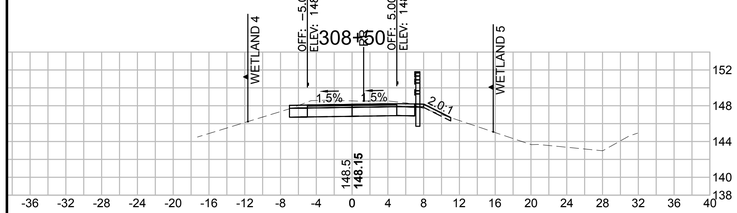
SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	291	316
PROJECT FILE NO. 608164			

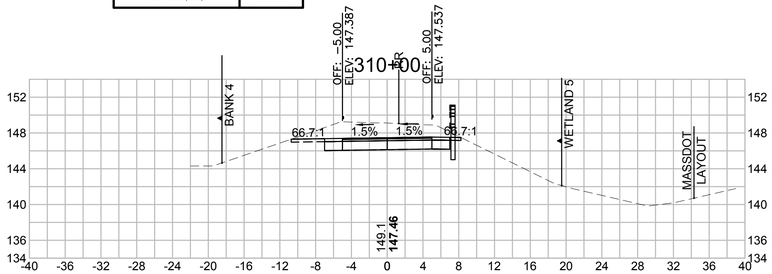
CROSS SECTIONS

608164_XSEC(CROSS SECTION LAYOUTS).DWG 22-Dec-2021

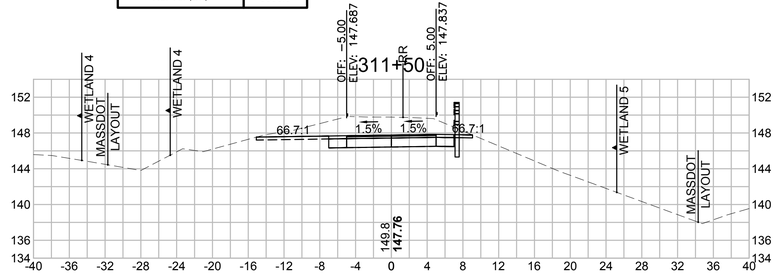
Total Volume at Station 308+50.00	
Cut Area (SF)	26.103
Fill Area (SF)	0.096
Cut Vol (CF)	41.1
Fill Vol (CF)	15.0
Cum Cut Vol (CF)	13175.6
Cum Fill Vol (CF)	7668.5
Net Vol (CF)	5507.1



Total Volume at Station 310+00.00	
Cut Area (SF)	47.665
Fill Area (SF)	0.000
Cut Vol (CF)	82.3
Fill Vol (CF)	5.2
Cum Cut Vol (CF)	13373.6
Cum Fill Vol (CF)	7681.9
Net Vol (CF)	5691.7

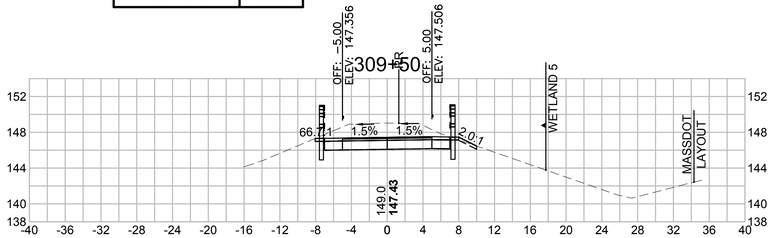


Total Volume at Station 311+50.00	
Cut Area (SF)	68.474
Fill Area (SF)	0.000
Cut Vol (CF)	120.6
Fill Vol (CF)	0.2
Cum Cut Vol (CF)	13682.8
Cum Fill Vol (CF)	7682.2
Net Vol (CF)	6000.6

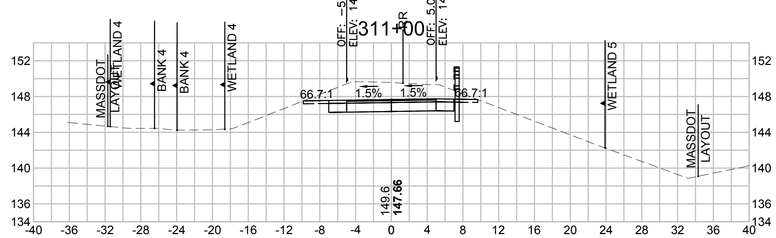


Total Volume at Station 308+00.00	
Cut Area (SF)	18.272
Fill Area (SF)	16.066
Cut Vol (CF)	90.7
Fill Vol (CF)	14.9
Cum Cut Vol (CF)	13134.5
Cum Fill Vol (CF)	7653.5
Net Vol (CF)	5481.0

Total Volume at Station 309+50.00	
Cut Area (SF)	41.186
Fill Area (SF)	5.665
Cut Vol (CF)	64.9
Fill Vol (CF)	6.7
Cum Cut Vol (CF)	13291.3
Cum Fill Vol (CF)	7676.6
Net Vol (CF)	5614.7



Total Volume at Station 311+00.00	
Cut Area (SF)	61.726
Fill Area (SF)	0.185
Cut Vol (CF)	100.9
Fill Vol (CF)	0.2
Cum Cut Vol (CF)	13562.3
Cum Fill Vol (CF)	7682.0
Net Vol (CF)	5880.3



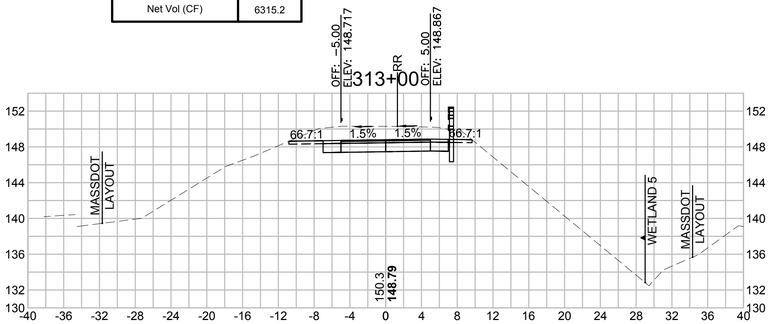
SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	292	316
PROJECT FILE NO. 608164			

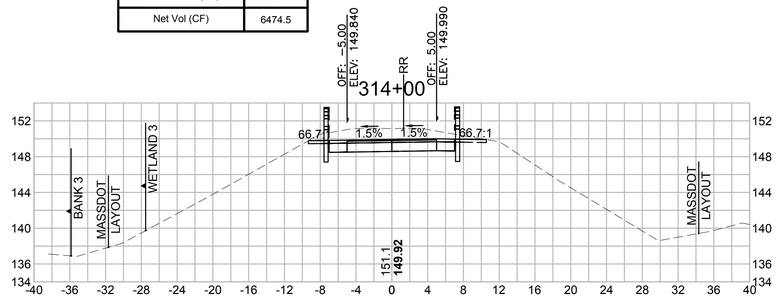
CROSS SECTIONS

608164_XSEC(CROSS SECTION LAYOUTS).DWG 22-Dec-2021

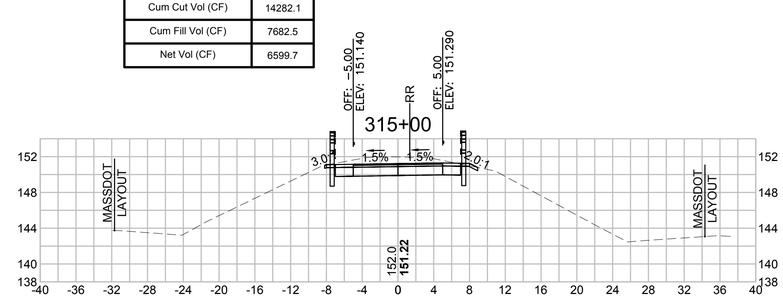
Total Volume at Station 313+00.00	
Cut Area (SF)	46.228
Fill Area (SF)	0.000
Cut Vol (CF)	92.3
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	13997.7
Cum Fill Vol (CF)	7682.4
Net Vol (CF)	6315.2



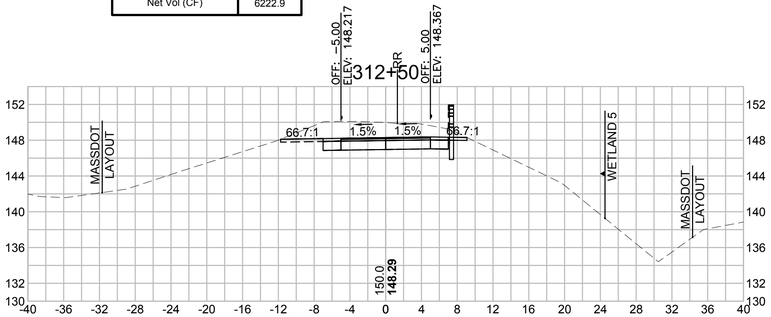
Total Volume at Station 314+00.00	
Cut Area (SF)	38.540
Fill Area (SF)	0.000
Cut Vol (CF)	76.1
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	14157.0
Cum Fill Vol (CF)	7682.5
Net Vol (CF)	6474.5



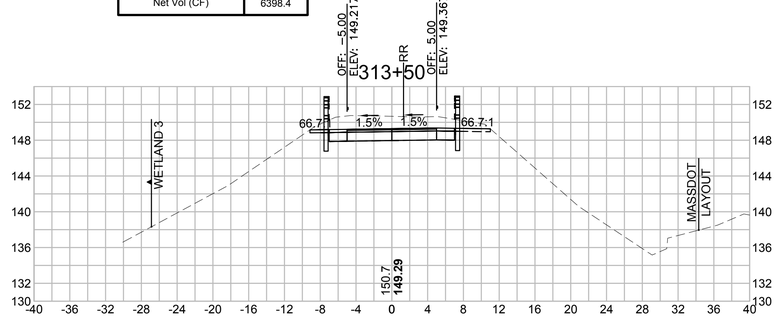
Total Volume at Station 315+00.00	
Cut Area (SF)	29.539
Fill Area (SF)	0.000
Cut Vol (CF)	58.4
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	14282.1
Cum Fill Vol (CF)	7682.5
Net Vol (CF)	6599.7



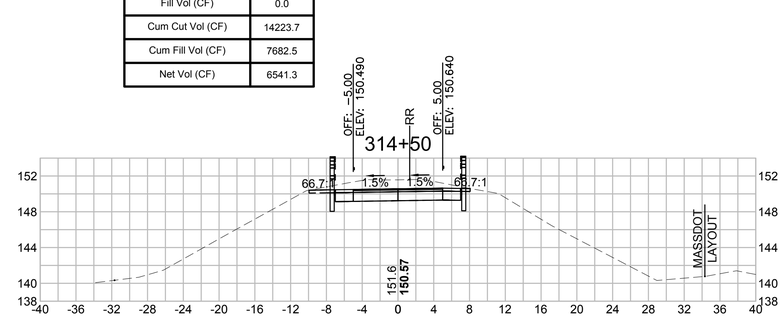
Total Volume at Station 312+50.00	
Cut Area (SF)	53.434
Fill Area (SF)	0.000
Cut Vol (CF)	104.3
Fill Vol (CF)	0.1
Cum Cut Vol (CF)	13905.4
Cum Fill Vol (CF)	7682.4
Net Vol (CF)	6222.9



Total Volume at Station 313+50.00	
Cut Area (SF)	43.650
Fill Area (SF)	0.018
Cut Vol (CF)	83.2
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	14080.9
Cum Fill Vol (CF)	7682.5
Net Vol (CF)	6398.4



Total Volume at Station 314+50.00	
Cut Area (SF)	33.549
Fill Area (SF)	0.000
Cut Vol (CF)	66.7
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	14223.7
Cum Fill Vol (CF)	7682.5
Net Vol (CF)	6541.3



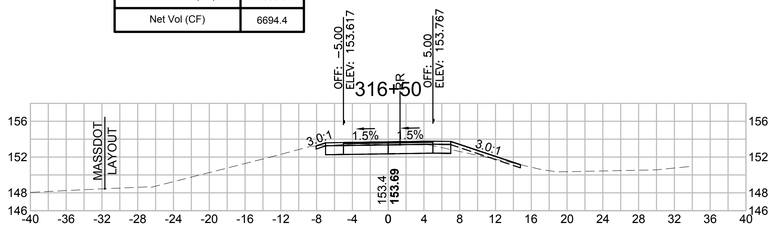
SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	293	316
PROJECT FILE NO. 608164			

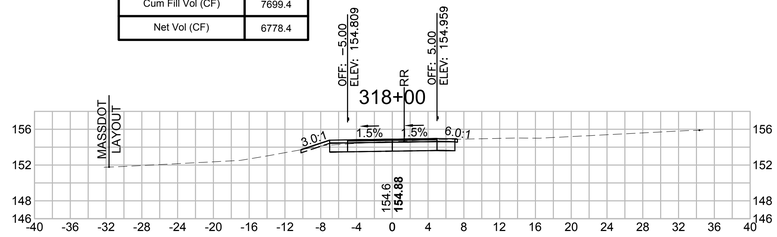
CROSS SECTIONS

608164_XSEC(CROSS SECTION LAYOUTS).DWG 22-Dec-2021

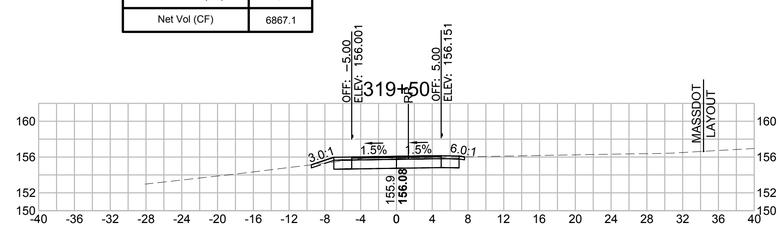
Total Volume at Station 316+50.00	
Cut Area (SF)	18.222
Fill Area (SF)	1.292
Cut Vol (CF)	30.0
Fill Vol (CF)	5.5
Cum Cut Vol (CF)	14391.3
Cum Fill Vol (CF)	7696.9
Net Vol (CF)	6694.4



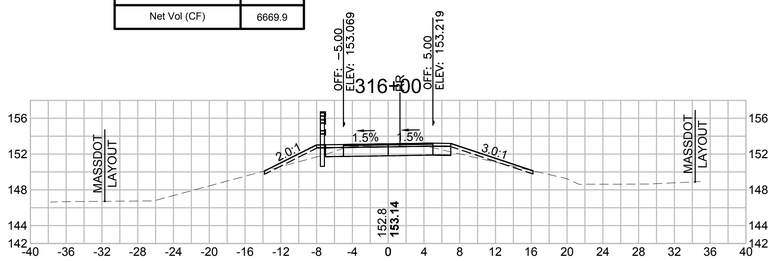
Total Volume at Station 318+00.00	
Cut Area (SF)	15.594
Fill Area (SF)	0.080
Cut Vol (CF)	28.5
Fill Vol (CF)	0.1
Cum Cut Vol (CF)	14477.7
Cum Fill Vol (CF)	7699.4
Net Vol (CF)	6778.4



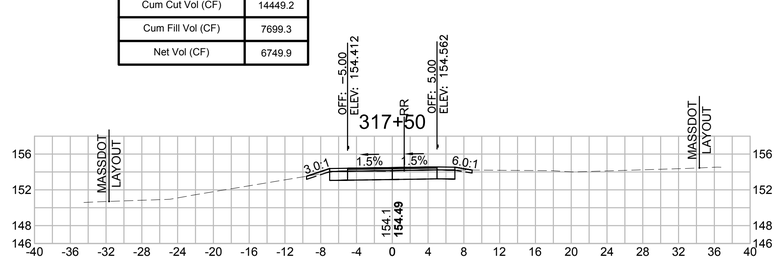
Total Volume at Station 319+50.00	
Cut Area (SF)	24.589
Fill Area (SF)	0.078
Cut Vol (CF)	36.6
Fill Vol (CF)	1.8
Cum Cut Vol (CF)	14571.8
Cum Fill Vol (CF)	7704.7
Net Vol (CF)	6867.1



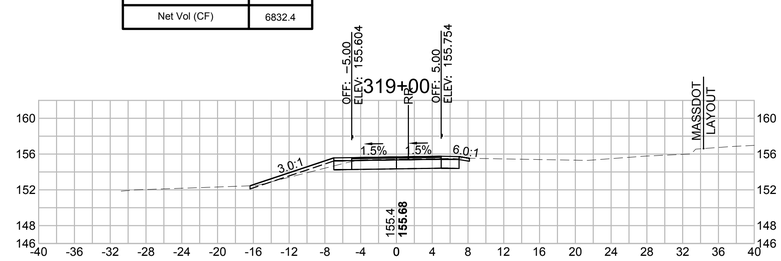
Total Volume at Station 316+00.00	
Cut Area (SF)	14.228
Fill Area (SF)	4.661
Cut Vol (CF)	32.5
Fill Vol (CF)	6.6
Cum Cut Vol (CF)	14361.2
Cum Fill Vol (CF)	7691.4
Net Vol (CF)	6669.9



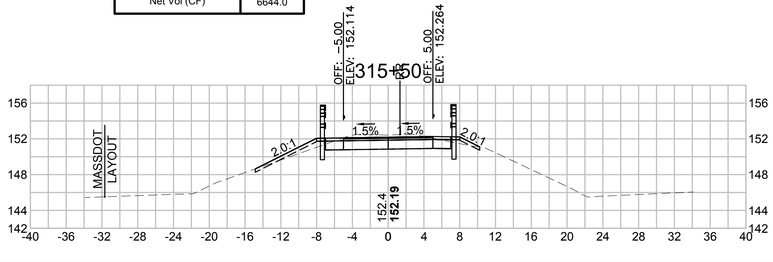
Total Volume at Station 317+50.00	
Cut Area (SF)	15.227
Fill Area (SF)	0.021
Cut Vol (CF)	27.6
Fill Vol (CF)	0.6
Cum Cut Vol (CF)	14449.2
Cum Fill Vol (CF)	7699.3
Net Vol (CF)	6749.9



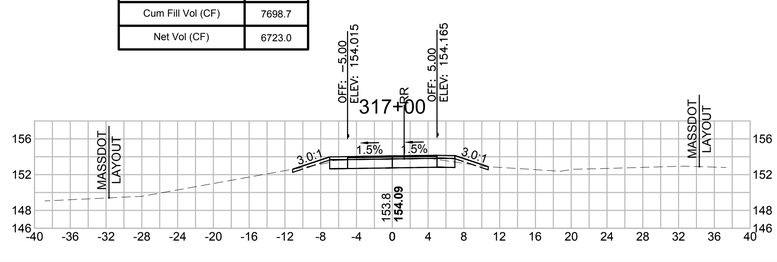
Total Volume at Station 319+00.00	
Cut Area (SF)	14.916
Fill Area (SF)	1.909
Cut Vol (CF)	28.4
Fill Vol (CF)	2.6
Cum Cut Vol (CF)	14535.2
Cum Fill Vol (CF)	7702.8
Net Vol (CF)	6832.4



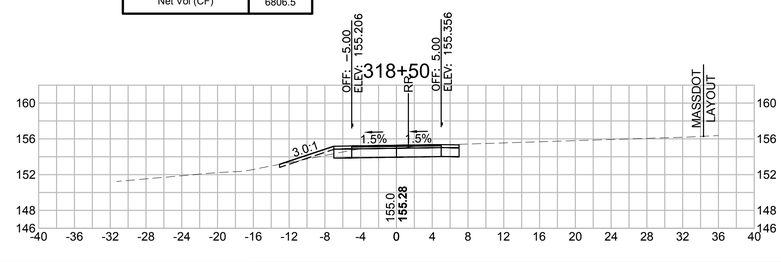
Total Volume at Station 315+50.00	
Cut Area (SF)	20.826
Fill Area (SF)	2.479
Cut Vol (CF)	46.6
Fill Vol (CF)	2.3
Cum Cut Vol (CF)	14328.8
Cum Fill Vol (CF)	7684.8
Net Vol (CF)	6644.0



Total Volume at Station 317+00.00	
Cut Area (SF)	14.546
Fill Area (SF)	0.634
Cut Vol (CF)	30.3
Fill Vol (CF)	1.8
Cum Cut Vol (CF)	14421.6
Cum Fill Vol (CF)	7698.7
Net Vol (CF)	6723.0



Total Volume at Station 318+50.00	
Cut Area (SF)	15.772
Fill Area (SF)	0.874
Cut Vol (CF)	29.0
Fill Vol (CF)	0.9
Cum Cut Vol (CF)	14506.8
Cum Fill Vol (CF)	7700.3
Net Vol (CF)	6806.5



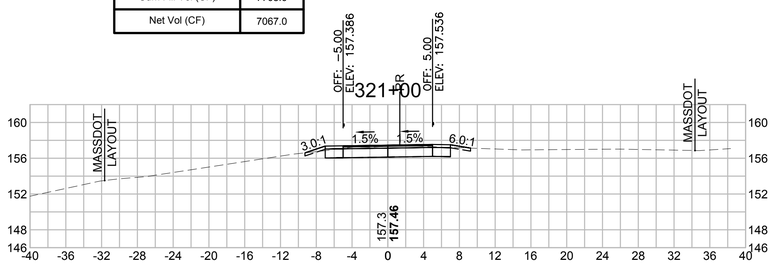
SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	294	316
PROJECT FILE NO. 608164			

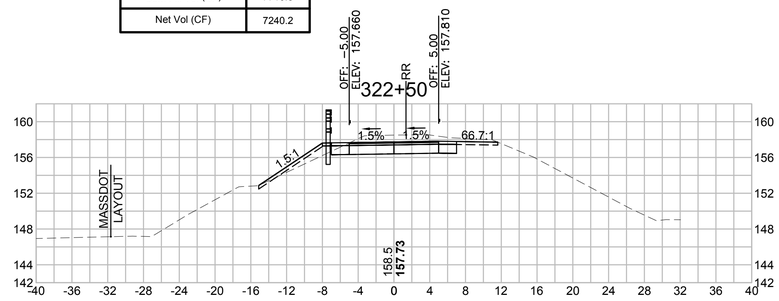
CROSS SECTIONS

608164_XSEC(CROSS SECTION LAYOUTS).DWG 22-Dec-2021

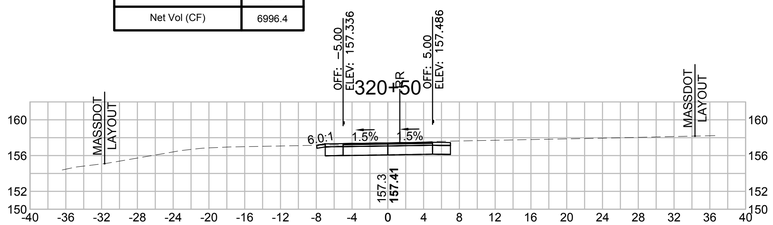
Total Volume at Station 321+00.00	
Cut Area (SF)	27.350
Fill Area (SF)	0.294
Cut Vol (CF)	70.9
Fill Vol (CF)	0.3
Cum Cut Vol (CF)	14772.0
Cum Fill Vol (CF)	7705.0
Net Vol (CF)	7067.0



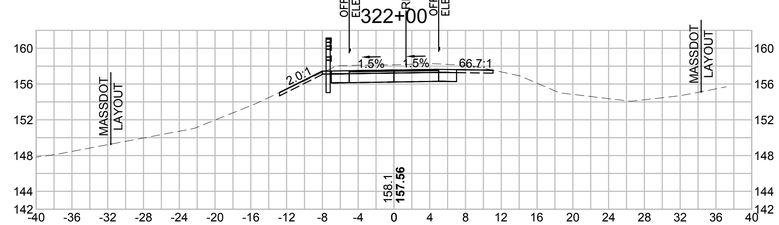
Total Volume at Station 322+50.00	
Cut Area (SF)	37.507
Fill Area (SF)	3.438
Cut Vol (CF)	71.9
Fill Vol (CF)	5.7
Cum Cut Vol (CF)	14957.0
Cum Fill Vol (CF)	7716.8
Net Vol (CF)	7240.2



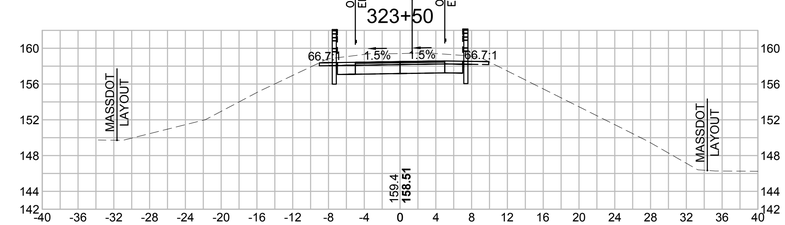
Total Volume at Station 320+50.00	
Cut Area (SF)	49.185
Fill Area (SF)	0.000
Cut Vol (CF)	76.1
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	14701.1
Cum Fill Vol (CF)	7704.7
Net Vol (CF)	6996.4



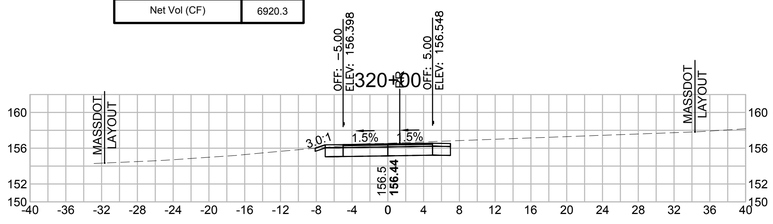
Total Volume at Station 322+00.00	
Cut Area (SF)	40.113
Fill Area (SF)	2.705
Cut Vol (CF)	62.5
Fill Vol (CF)	4.2
Cum Cut Vol (CF)	14885.1
Cum Fill Vol (CF)	7711.1
Net Vol (CF)	7174.0



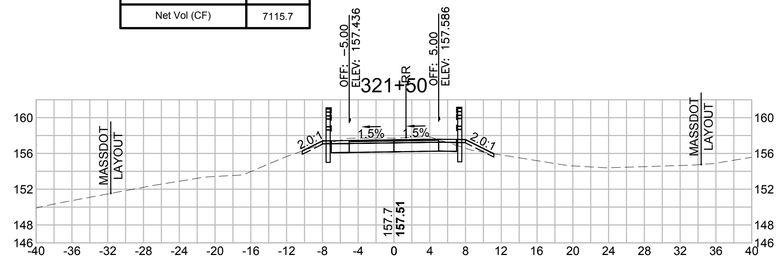
Total Volume at Station 323+50.00	
Cut Area (SF)	45.108
Fill Area (SF)	0.000
Cut Vol (CF)	66.2
Fill Vol (CF)	10.1
Cum Cut Vol (CF)	15082.3
Cum Fill Vol (CF)	7740.3
Net Vol (CF)	7342.0



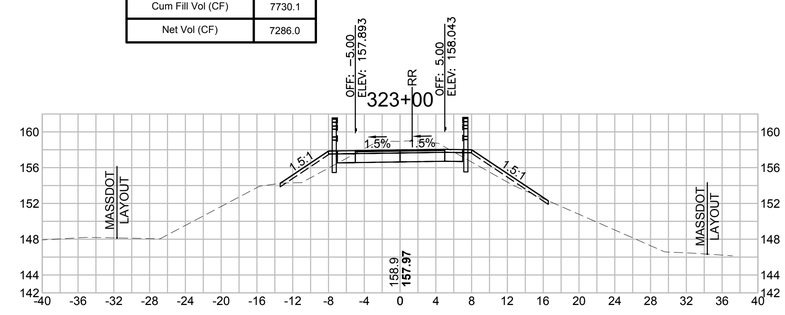
Total Volume at Station 320+00.00	
Cut Area (SF)	32.967
Fill Area (SF)	0.000
Cut Vol (CF)	53.3
Fill Vol (CF)	0.1
Cum Cut Vol (CF)	14625.1
Cum Fill Vol (CF)	7704.7
Net Vol (CF)	6920.3



Total Volume at Station 321+50.00	
Cut Area (SF)	27.361
Fill Area (SF)	1.779
Cut Vol (CF)	50.7
Fill Vol (CF)	1.9
Cum Cut Vol (CF)	14822.7
Cum Fill Vol (CF)	7706.9
Net Vol (CF)	7115.7



Total Volume at Station 323+00.00	
Cut Area (SF)	26.338
Fill Area (SF)	10.961
Cut Vol (CF)	59.1
Fill Vol (CF)	13.3
Cum Cut Vol (CF)	15016.1
Cum Fill Vol (CF)	7730.1
Net Vol (CF)	7286.0



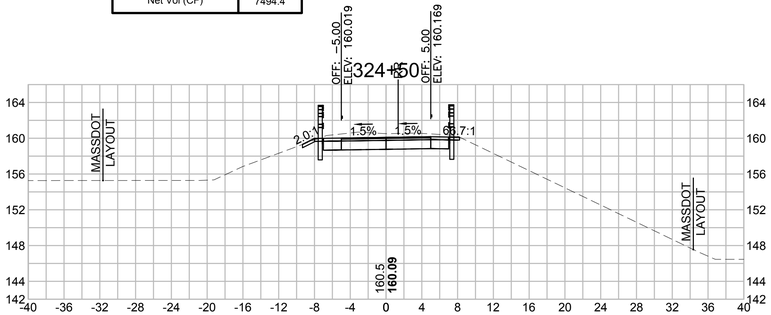
SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	295	316
PROJECT FILE NO. 608164			

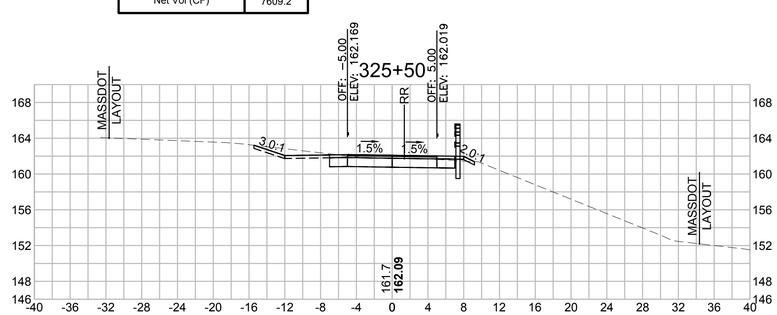
CROSS SECTIONS

608164_XSEC(CROSS SECTION LAYOUTS).DWG 22-Dec-2021

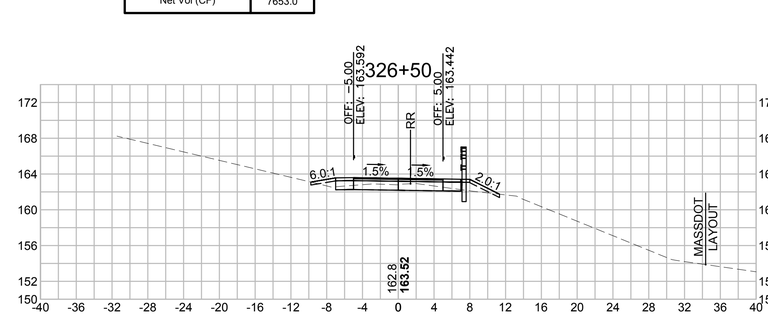
Total Volume at Station 324+50.00	
Cut Area (SF)	35.553
Fill Area (SF)	0.000
Cut Vol (CF)	71.8
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	15234.6
Cum Fill Vol (CF)	7740.3
Net Vol (CF)	7494.4



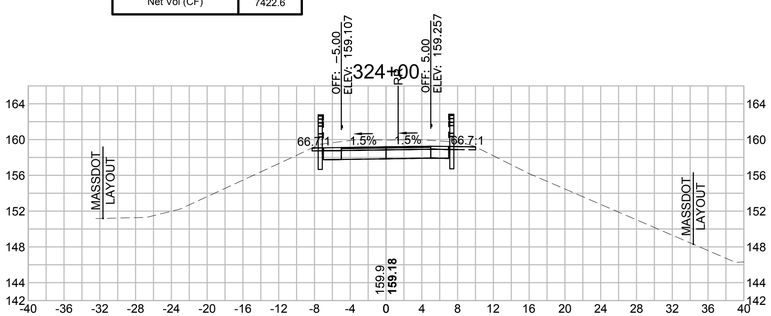
Total Volume at Station 325+50.00	
Cut Area (SF)	21.576
Fill Area (SF)	0.211
Cut Vol (CF)	51.3
Fill Vol (CF)	0.5
Cum Cut Vol (CF)	15350.2
Cum Fill Vol (CF)	7741.0
Net Vol (CF)	7609.2



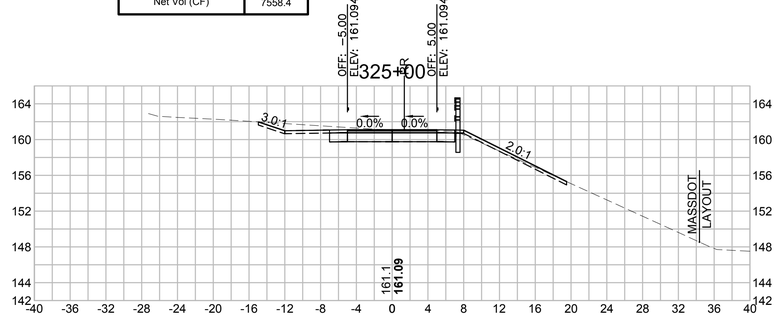
Total Volume at Station 326+50.00	
Cut Area (SF)	10.360
Fill Area (SF)	2.731
Cut Vol (CF)	18.9
Fill Vol (CF)	3.4
Cum Cut Vol (CF)	15398.4
Cum Fill Vol (CF)	7745.4
Net Vol (CF)	7653.0



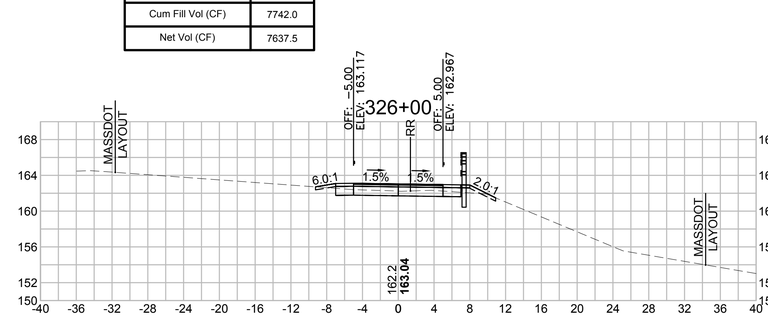
Total Volume at Station 324+00.00	
Cut Area (SF)	41.953
Fill Area (SF)	0.000
Cut Vol (CF)	80.6
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	15162.9
Cum Fill Vol (CF)	7740.3
Net Vol (CF)	7422.6



Total Volume at Station 325+00.00	
Cut Area (SF)	33.840
Fill Area (SF)	0.281
Cut Vol (CF)	64.3
Fill Vol (CF)	0.3
Cum Cut Vol (CF)	15298.9
Cum Fill Vol (CF)	7740.5
Net Vol (CF)	7558.4



Total Volume at Station 326+00.00	
Cut Area (SF)	10.046
Fill Area (SF)	0.925
Cut Vol (CF)	29.3
Fill Vol (CF)	1.1
Cum Cut Vol (CF)	15379.5
Cum Fill Vol (CF)	7742.0
Net Vol (CF)	7637.5



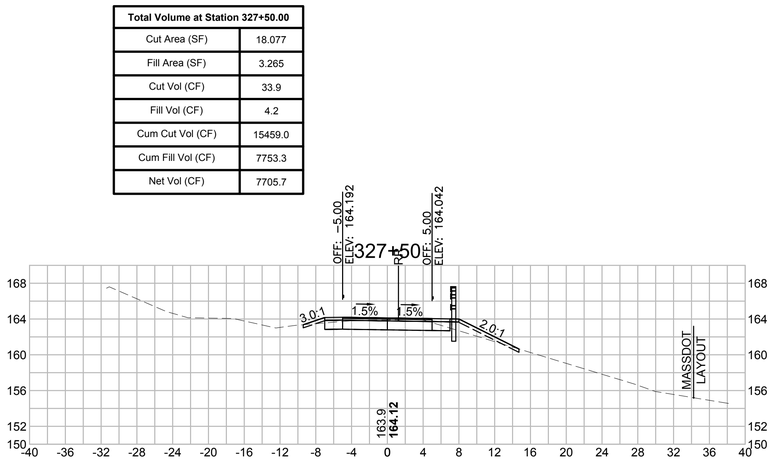
SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	296	316
PROJECT FILE NO. 608164			

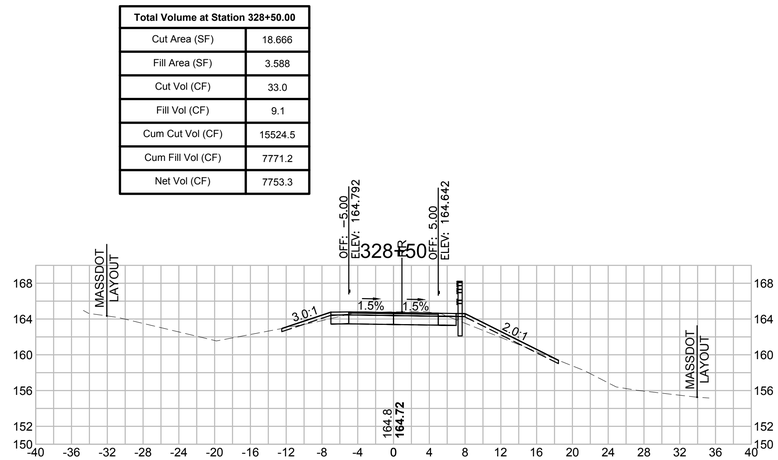
CROSS SECTIONS

608164_XSEC(CROSS SECTION LAYOUTS).DWG 22-Dec-2021

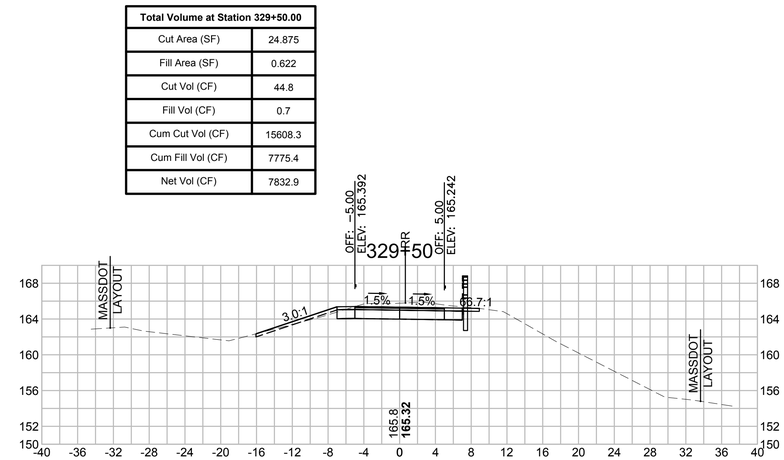
Total Volume at Station 327+50.00	
Cut Area (SF)	18.077
Fill Area (SF)	3.265
Cut Vol (CF)	33.9
Fill Vol (CF)	4.2
Cum Cut Vol (CF)	15459.0
Cum Fill Vol (CF)	7753.3
Net Vol (CF)	7705.7



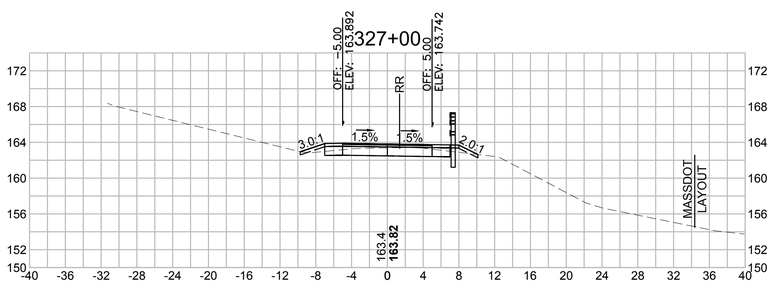
Total Volume at Station 328+50.00	
Cut Area (SF)	18.666
Fill Area (SF)	3.588
Cut Vol (CF)	33.0
Fill Vol (CF)	9.1
Cum Cut Vol (CF)	15524.5
Cum Fill Vol (CF)	7771.2
Net Vol (CF)	7753.3



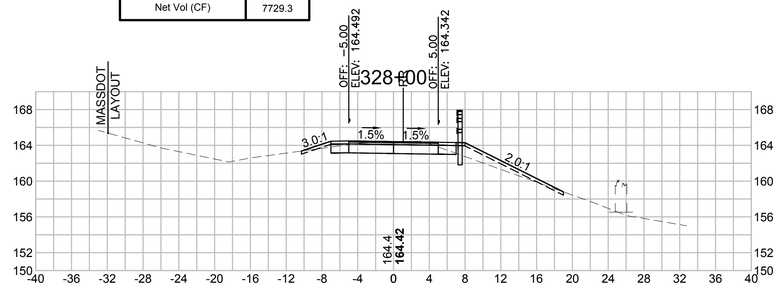
Total Volume at Station 329+50.00	
Cut Area (SF)	24.875
Fill Area (SF)	0.622
Cut Vol (CF)	44.8
Fill Vol (CF)	0.7
Cum Cut Vol (CF)	15608.3
Cum Fill Vol (CF)	7775.4
Net Vol (CF)	7832.9



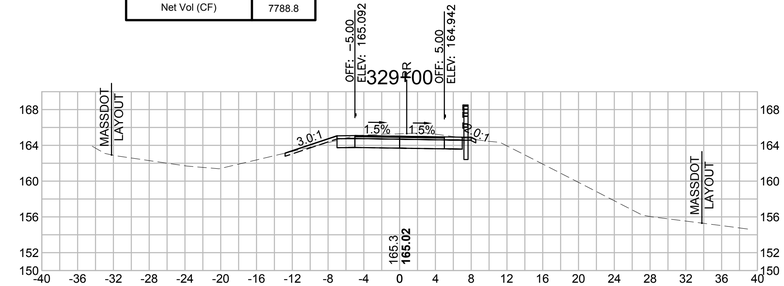
Total Volume at Station 327+00.00	
Cut Area (SF)	18.500
Fill Area (SF)	1.258
Cut Vol (CF)	26.7
Fill Vol (CF)	3.7
Cum Cut Vol (CF)	15425.1
Cum Fill Vol (CF)	7749.1
Net Vol (CF)	7676.0



Total Volume at Station 328+00.00	
Cut Area (SF)	16.999
Fill Area (SF)	6.252
Cut Vol (CF)	32.5
Fill Vol (CF)	8.8
Cum Cut Vol (CF)	15491.5
Cum Fill Vol (CF)	7762.1
Net Vol (CF)	7729.3



Total Volume at Station 329+00.00	
Cut Area (SF)	23.511
Fill Area (SF)	0.168
Cut Vol (CF)	39.1
Fill Vol (CF)	3.5
Cum Cut Vol (CF)	15563.5
Cum Fill Vol (CF)	7774.7
Net Vol (CF)	7788.8



SUDBURY
BRUCE FREEMAN RAIL TRAIL

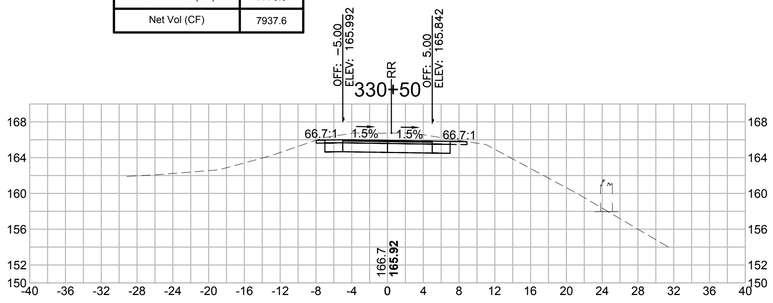
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	297	316
PROJECT FILE NO. 608164			

CROSS SECTIONS

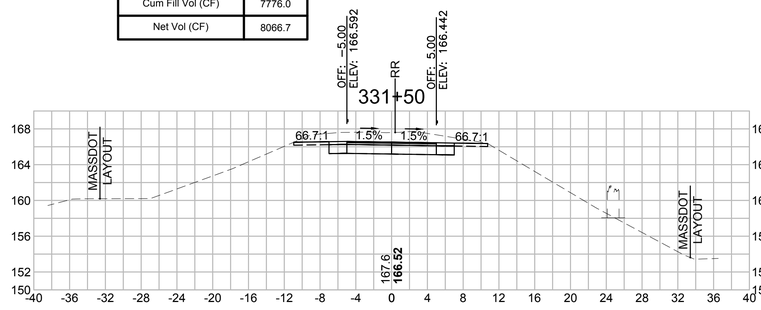
22-Dec-2021

608164_XSEC(CROSS SECTION LAYOUTS).DWG

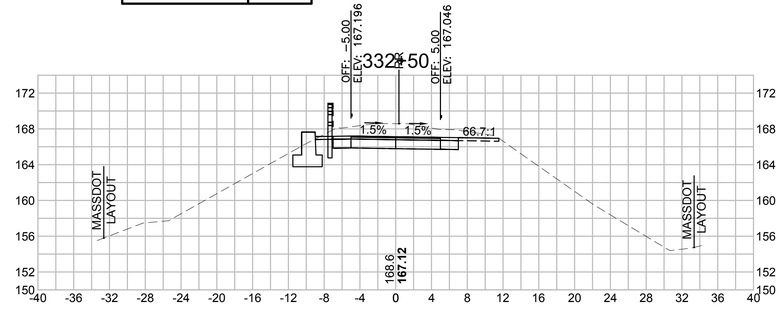
Total Volume at Station 330+50.00	
Cut Area (SF)	31.474
Fill Area (SF)	0.000
Cut Vol (CF)	55.7
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	15713.6
Cum Fill Vol (CF)	7776.0
Net Vol (CF)	7937.6



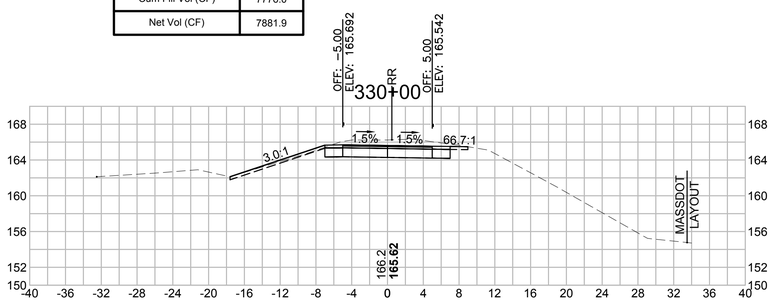
Total Volume at Station 331+50.00	
Cut Area (SF)	39.244
Fill Area (SF)	0.000
Cut Vol (CF)	68.2
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	15842.8
Cum Fill Vol (CF)	7776.0
Net Vol (CF)	8066.7



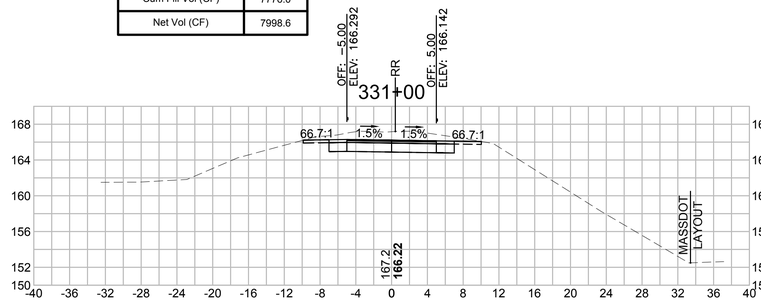
Total Volume at Station 332+50.00	
Cut Area (SF)	49.165
Fill Area (SF)	0.634
Cut Vol (CF)	85.6
Fill Vol (CF)	0.6
Cum Cut Vol (CF)	16004.8
Cum Fill Vol (CF)	7776.6
Net Vol (CF)	8228.2



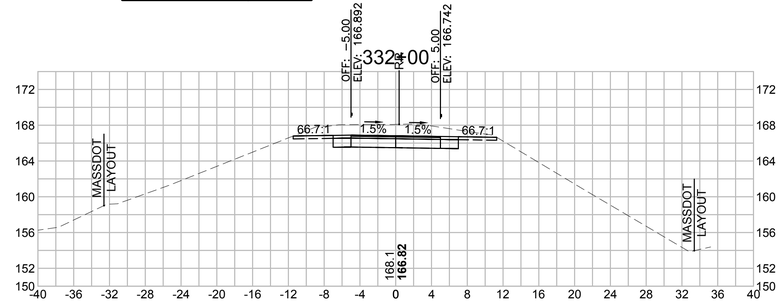
Total Volume at Station 330+00.00	
Cut Area (SF)	28.671
Fill Area (SF)	0.000
Cut Vol (CF)	49.6
Fill Vol (CF)	0.6
Cum Cut Vol (CF)	15657.9
Cum Fill Vol (CF)	7776.0
Net Vol (CF)	7881.9



Total Volume at Station 331+00.00	
Cut Area (SF)	34.386
Fill Area (SF)	0.000
Cut Vol (CF)	61.0
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	15774.6
Cum Fill Vol (CF)	7776.0
Net Vol (CF)	7998.6



Total Volume at Station 332+00.00	
Cut Area (SF)	43.286
Fill Area (SF)	0.000
Cut Vol (CF)	76.4
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	15919.2
Cum Fill Vol (CF)	7776.0
Net Vol (CF)	8143.2



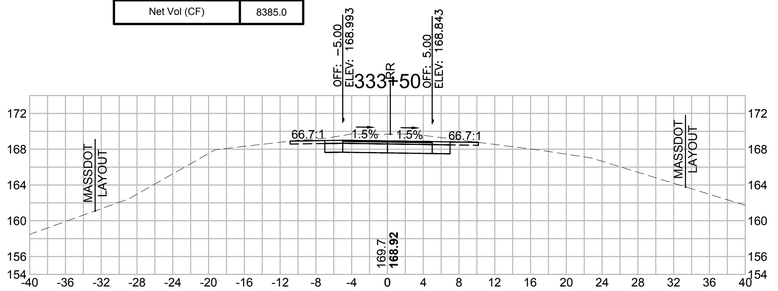
SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	298	316
PROJECT FILE NO. 608164			

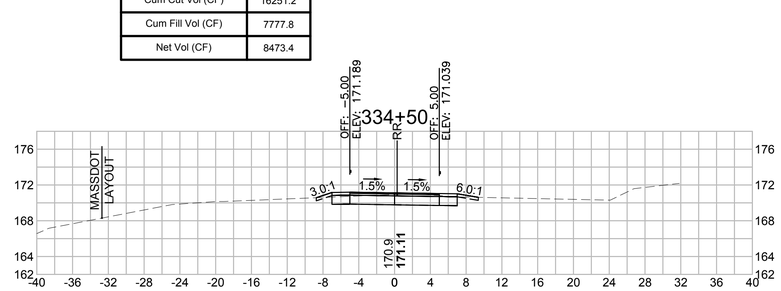
CROSS SECTIONS

608164_XSEC(CROSS SECTION LAYOUTS).DWG 22-Dec-2021

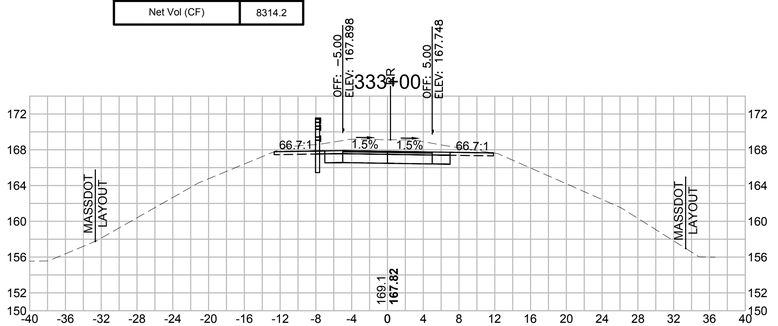
Total Volume at Station 333+50.00	
Cut Area (SF)	31.997
Fill Area (SF)	0.000
Cut Vol (CF)	70.8
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	16162.2
Cum Fill Vol (CF)	7777.3
Net Vol (CF)	8385.0



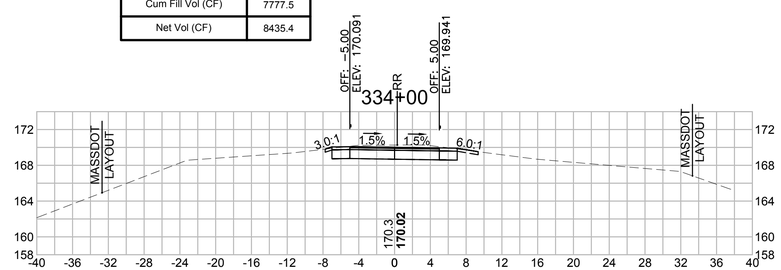
Total Volume at Station 334+50.00	
Cut Area (SF)	18.660
Fill Area (SF)	0.046
Cut Vol (CF)	38.3
Fill Vol (CF)	0.3
Cum Cut Vol (CF)	16251.2
Cum Fill Vol (CF)	7777.8
Net Vol (CF)	8473.4



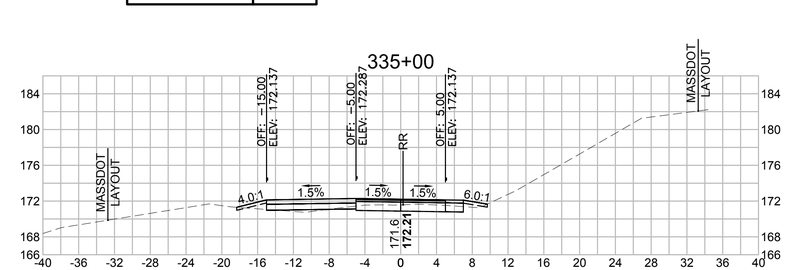
Total Volume at Station 333+00.00	
Cut Area (SF)	44.440
Fill Area (SF)	0.040
Cut Vol (CF)	86.7
Fill Vol (CF)	0.6
Cum Cut Vol (CF)	16091.4
Cum Fill Vol (CF)	7777.2
Net Vol (CF)	8314.2



Total Volume at Station 334+00.00	
Cut Area (SF)	22.718
Fill Area (SF)	0.248
Cut Vol (CF)	50.7
Fill Vol (CF)	0.2
Cum Cut Vol (CF)	16212.9
Cum Fill Vol (CF)	7777.5
Net Vol (CF)	8435.4



Total Volume at Station 335+00.00	
Cut Area (SF)	9.103
Fill Area (SF)	2.279
Cut Vol (CF)	25.7
Fill Vol (CF)	2.2
Cum Cut Vol (CF)	16276.9
Cum Fill Vol (CF)	7779.9
Net Vol (CF)	8497.0

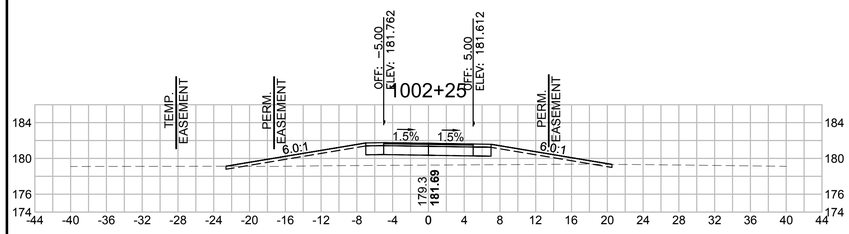


SUDBURY
BRUCE FREEMAN RAIL TRAIL

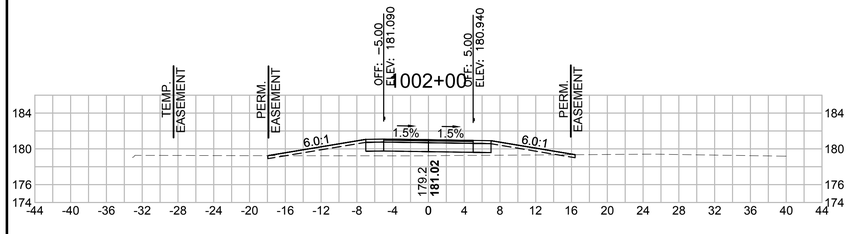
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	299	316
PROJECT FILE NO. 608164			

CROSS SECTIONS
PARKINSON'S LOT ACCESS PATH

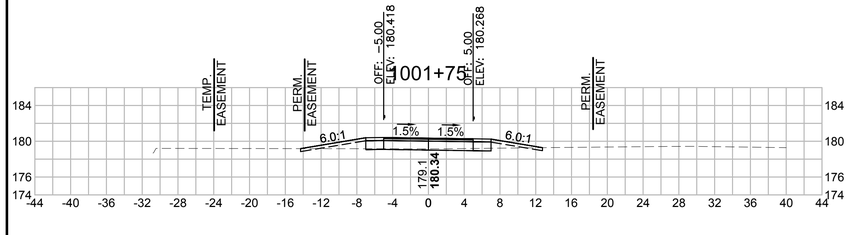
608164_XSEC(CROSS SECTION LAYOUTS).DWG 22-Dec-2021



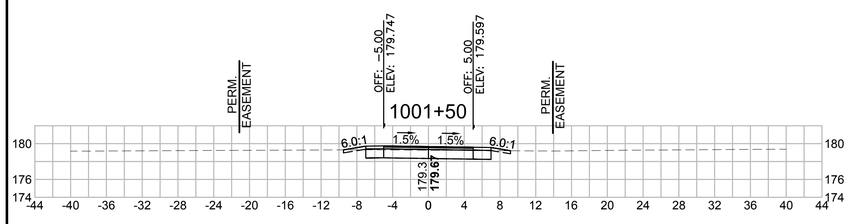
Total Volume at Station 1002+25.00	
Cut Area (SF)	7.878
Fill Area (SF)	41.517
Cut Vol (CF)	8.8
Fill Vol (CF)	27.4
Cum Cut Vol (CF)	120.8
Cum Fill Vol (CF)	39.0
Net Vol (CF)	81.8



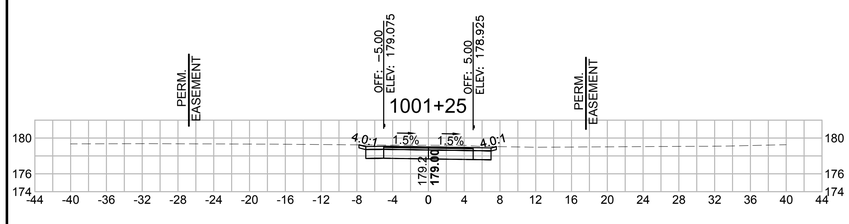
Total Volume at Station 1002+00.00	
Cut Area (SF)	11.225
Fill Area (SF)	17.705
Cut Vol (CF)	13.4
Fill Vol (CF)	9.9
Cum Cut Vol (CF)	112.0
Cum Fill Vol (CF)	11.6
Net Vol (CF)	100.4



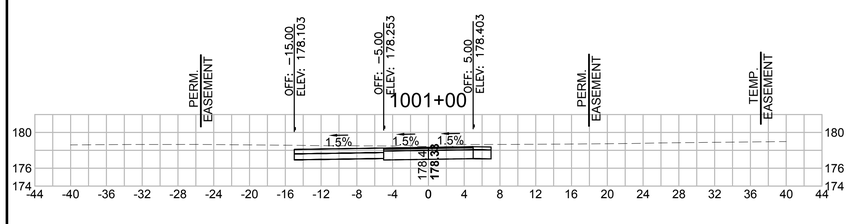
Total Volume at Station 1001+75.00	
Cut Area (SF)	17.683
Fill Area (SF)	3.690
Cut Vol (CF)	22.5
Fill Vol (CF)	1.7
Cum Cut Vol (CF)	98.6
Cum Fill Vol (CF)	1.7
Net Vol (CF)	96.9



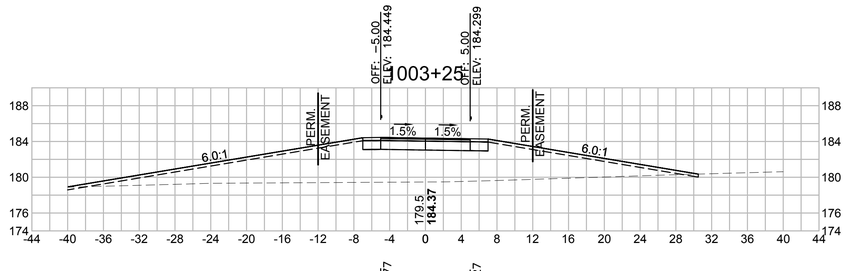
Total Volume at Station 1001+50.00	
Cut Area (SF)	30.927
Fill Area (SF)	0.016
Cut Vol (CF)	33.7
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	76.1
Cum Fill Vol (CF)	0.0
Net Vol (CF)	76.1



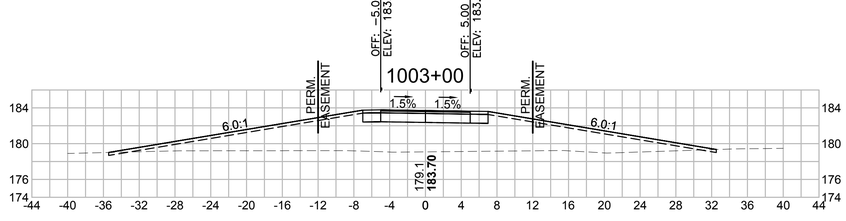
Total Volume at Station 1001+25.00	
Cut Area (SF)	41.878
Fill Area (SF)	0.000
Cut Vol (CF)	42.4
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	42.4
Cum Fill Vol (CF)	0.0
Net Vol (CF)	42.4



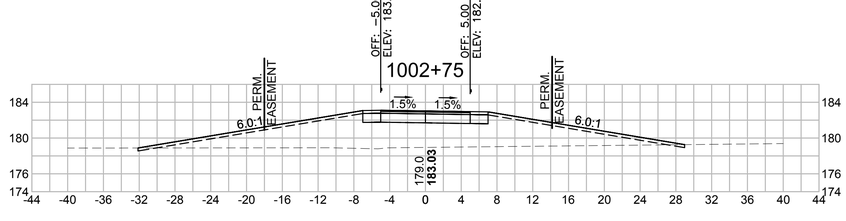
Total Volume at Station 1001+00.00	
Cut Area (SF)	49.693
Fill Area (SF)	0.000
Cut Vol (CF)	0.0
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	0.0
Cum Fill Vol (CF)	0.0
Net Vol (CF)	0.0



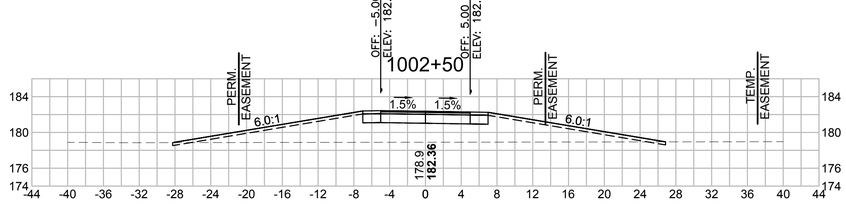
Total Volume at Station 1003+25.00	
Cut Area (SF)	1.211
Fill Area (SF)	166.250
Cut Vol (CF)	1.0
Fill Vol (CF)	146.5
Cum Cut Vol (CF)	131.9
Cum Fill Vol (CF)	464.6
Net Vol (CF)	-332.6



Total Volume at Station 1003+00.00	
Cut Area (SF)	0.999
Fill Area (SF)	150.119
Cut Vol (CF)	1.3
Fill Vol (CF)	124.4
Cum Cut Vol (CF)	130.9
Cum Fill Vol (CF)	318.1
Net Vol (CF)	-187.2



Total Volume at Station 1002+75.00	
Cut Area (SF)	1.852
Fill Area (SF)	118.624
Cut Vol (CF)	3.0
Fill Vol (CF)	95.2
Cum Cut Vol (CF)	129.6
Cum Fill Vol (CF)	193.7
Net Vol (CF)	-64.1



Total Volume at Station 1002+50.00	
Cut Area (SF)	4.605
Fill Area (SF)	86.940
Cut Vol (CF)	5.8
Fill Vol (CF)	59.5
Cum Cut Vol (CF)	126.6
Cum Fill Vol (CF)	98.5
Net Vol (CF)	28.1

SUDBURY
BRUCE FREEMAN RAIL TRAIL

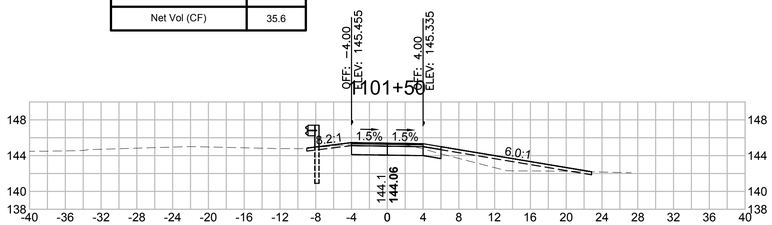
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	300	316
PROJECT FILE NO. 608164			

CROSS SECTIONS
DAVIS FIELD ACCESS PATH

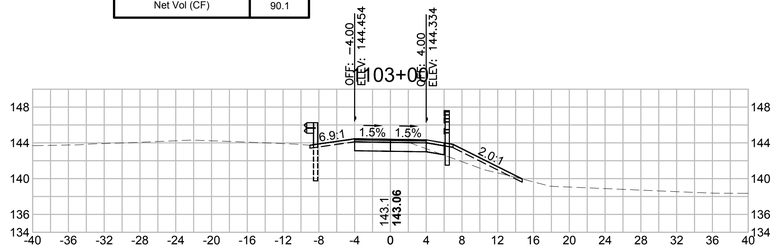
22-Dec-2021

608164_XSEC(CROSS SECTION LAYOUTS).DWG

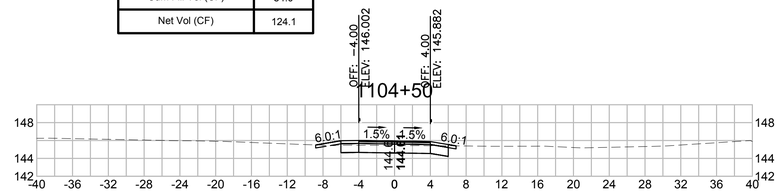
Total Volume at Station 1101+50.00	
Cut Area (SF)	12.344
Fill Area (SF)	9.860
Cut Vol (CF)	23.6
Fill Vol (CF)	9.1
Cum Cut Vol (CF)	45.0
Cum Fill Vol (CF)	9.5
Net Vol (CF)	35.6



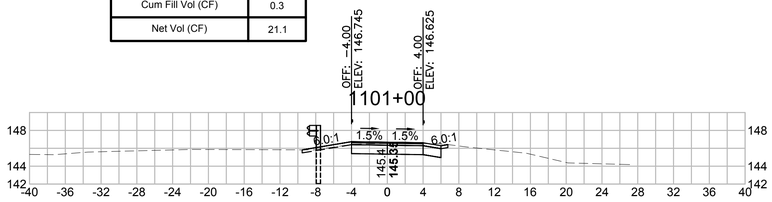
Total Volume at Station 1103+00.00	
Cut Area (SF)	11.283
Fill Area (SF)	5.526
Cut Vol (CF)	22.2
Fill Vol (CF)	7.1
Cum Cut Vol (CF)	124.4
Cum Fill Vol (CF)	34.4
Net Vol (CF)	90.1



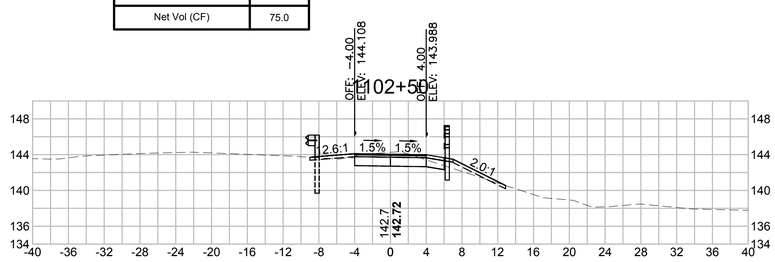
Total Volume at Station 1104+50.00	
Cut Area (SF)	10.903
Fill Area (SF)	0.099
Cut Vol (CF)	19.2
Fill Vol (CF)	0.3
Cum Cut Vol (CF)	178.0
Cum Fill Vol (CF)	54.0
Net Vol (CF)	124.1



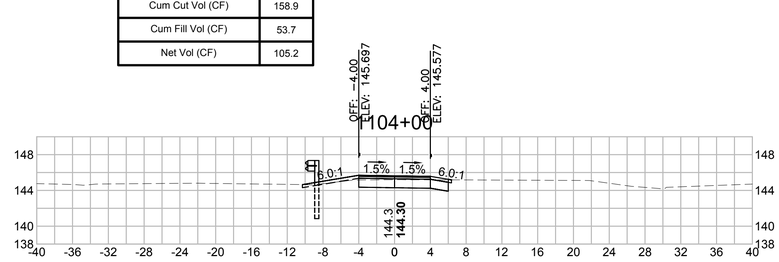
Total Volume at Station 1101+00.00	
Cut Area (SF)	13.171
Fill Area (SF)	0.000
Cut Vol (CF)	21.4
Fill Vol (CF)	0.3
Cum Cut Vol (CF)	21.4
Cum Fill Vol (CF)	0.3
Net Vol (CF)	21.1



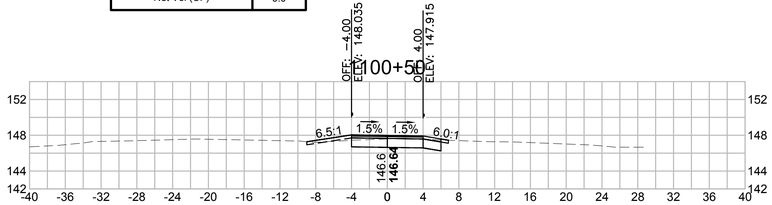
Total Volume at Station 1102+50.00	
Cut Area (SF)	12.683
Fill Area (SF)	2.123
Cut Vol (CF)	28.8
Fill Vol (CF)	5.3
Cum Cut Vol (CF)	102.2
Cum Fill Vol (CF)	27.3
Net Vol (CF)	75.0



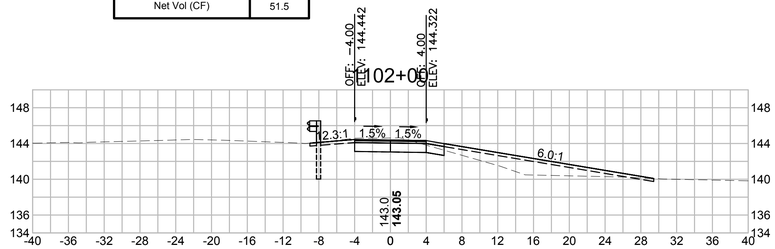
Total Volume at Station 1104+00.00	
Cut Area (SF)	9.816
Fill Area (SF)	0.185
Cut Vol (CF)	16.5
Fill Vol (CF)	7.2
Cum Cut Vol (CF)	158.9
Cum Fill Vol (CF)	53.7
Net Vol (CF)	105.2



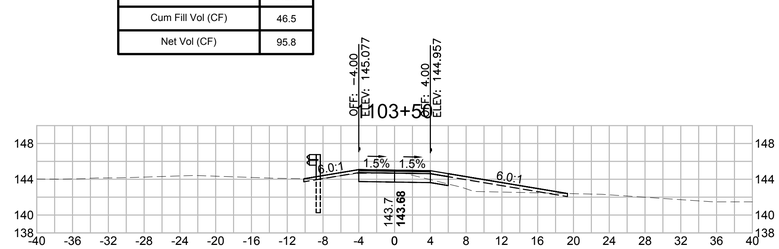
Total Volume at Station 1100+50.00	
Cut Area (SF)	9.964
Fill Area (SF)	0.368
Cut Vol (CF)	0.0
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	0.0
Cum Fill Vol (CF)	0.0
Net Vol (CF)	0.0



Total Volume at Station 1102+00.00	
Cut Area (SF)	18.374
Fill Area (SF)	3.620
Cut Vol (CF)	28.4
Fill Vol (CF)	12.5
Cum Cut Vol (CF)	73.5
Cum Fill Vol (CF)	22.0
Net Vol (CF)	51.5



Total Volume at Station 1103+50.00	
Cut Area (SF)	8.037
Fill Area (SF)	7.586
Cut Vol (CF)	17.9
Fill Vol (CF)	12.1
Cum Cut Vol (CF)	142.3
Cum Fill Vol (CF)	46.5
Net Vol (CF)	95.8



SUDBURY
BRUCE FREEMAN RAIL TRAIL

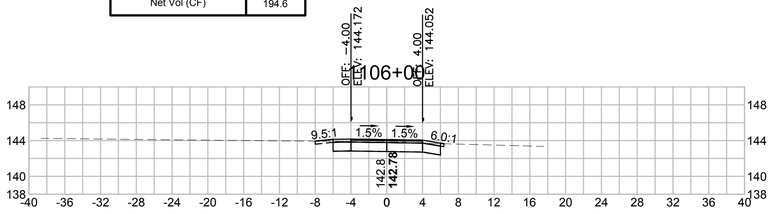
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	301	316
PROJECT FILE NO. 608164			

CROSS SECTIONS
DAVIS FIELD ACCESS PATH

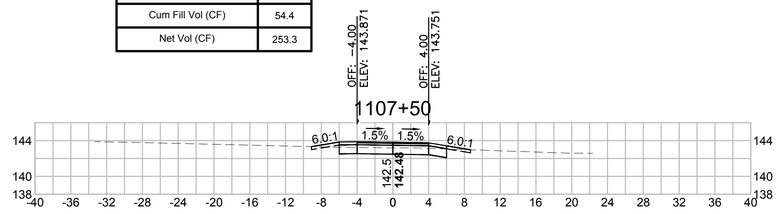
22-Dec-2021

608164_XSEC(CROSS SECTION LAYOUTS).DWG

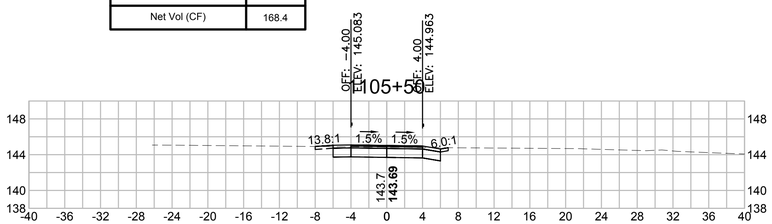
Total Volume at Station 1106+00.00	
Cut Area (SF)	13.425
Fill Area (SF)	0.000
Cut Vol (CF)	26.2
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	248.7
Cum Fill Vol (CF)	54.1
Net Vol (CF)	194.6



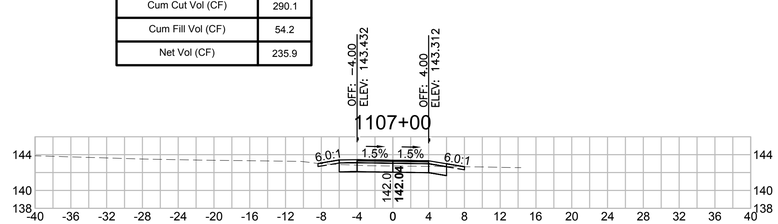
Total Volume at Station 1107+50.00	
Cut Area (SF)	9.520
Fill Area (SF)	0.169
Cut Vol (CF)	17.6
Fill Vol (CF)	0.2
Cum Cut Vol (CF)	307.6
Cum Fill Vol (CF)	54.4
Net Vol (CF)	253.3



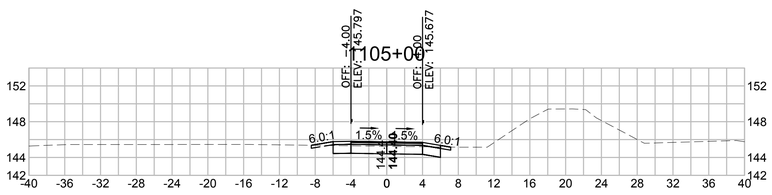
Total Volume at Station 1105+50.00	
Cut Area (SF)	14.923
Fill Area (SF)	0.000
Cut Vol (CF)	24.1
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	222.5
Cum Fill Vol (CF)	54.1
Net Vol (CF)	168.4



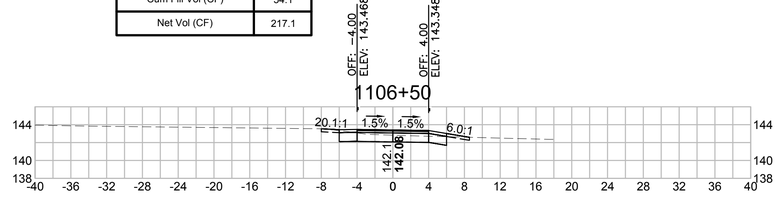
Total Volume at Station 1107+00.00	
Cut Area (SF)	9.448
Fill Area (SF)	0.063
Cut Vol (CF)	18.8
Fill Vol (CF)	0.1
Cum Cut Vol (CF)	290.1
Cum Fill Vol (CF)	54.2
Net Vol (CF)	235.9



Total Volume at Station 1105+00.00	
Cut Area (SF)	11.073
Fill Area (SF)	0.028
Cut Vol (CF)	20.3
Fill Vol (CF)	0.1
Cum Cut Vol (CF)	198.4
Cum Fill Vol (CF)	54.1
Net Vol (CF)	144.3



Total Volume at Station 1106+50.00	
Cut Area (SF)	10.901
Fill Area (SF)	0.002
Cut Vol (CF)	22.5
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	271.2
Cum Fill Vol (CF)	54.1
Net Vol (CF)	217.1



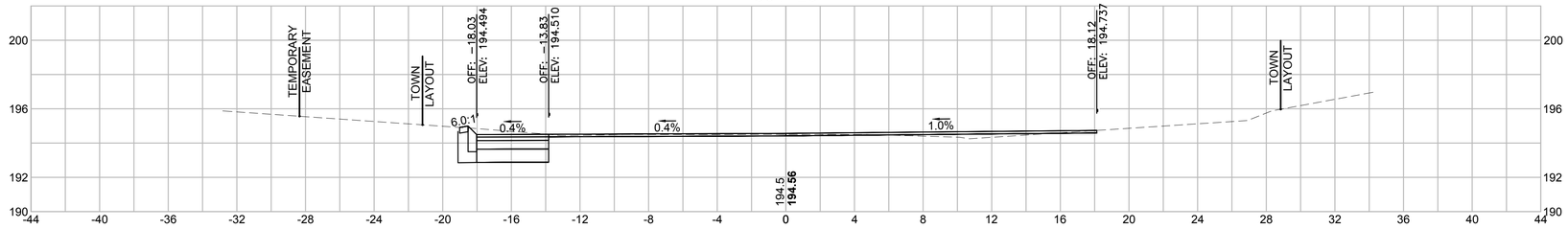
SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	302	316
PROJECT FILE NO. 608164			

CROSS SECTIONS
HUDSON ROAD

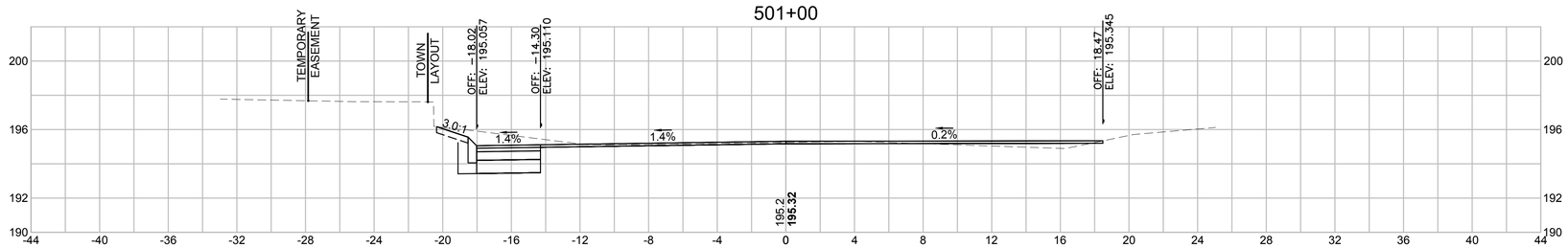
608164_XSEC(HUDSON ROAD).DWG 22-Dec-2021

501+25



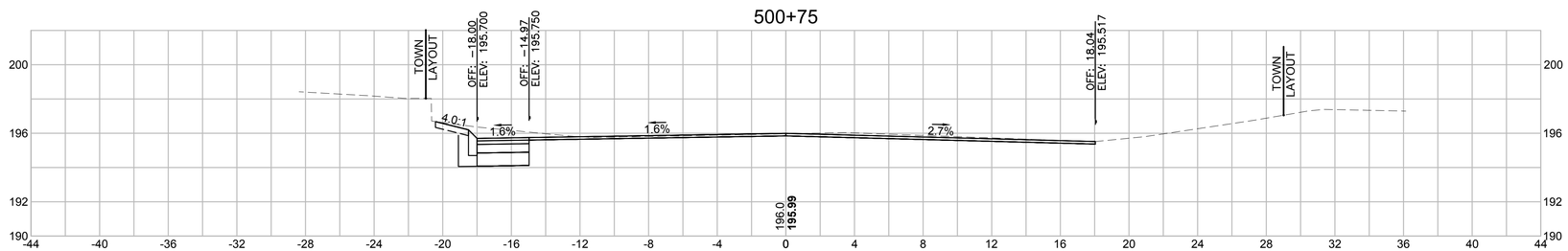
Total Volume at Station 501+25.00	
Cut Area (SF)	19.339
Fill Area (SF)	1.373
Cut Vol (CF)	18.8
Fill Vol (CF)	1.3
Cum Cut Vol (CF)	43.3
Cum Fill Vol (CF)	2.0
Net Vol (CF)	41.3

501+00



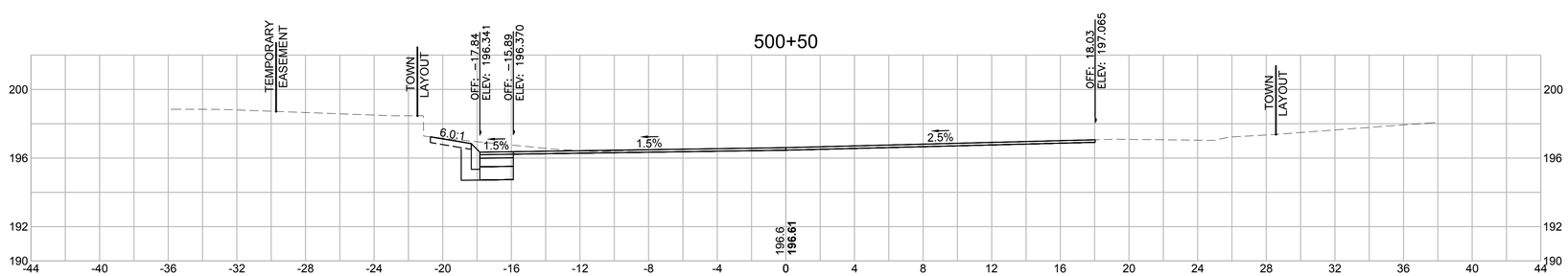
Total Volume at Station 501+00.00	
Cut Area (SF)	21.351
Fill Area (SF)	1.499
Cut Vol (CF)	15.0
Fill Vol (CF)	0.7
Cum Cut Vol (CF)	24.4
Cum Fill Vol (CF)	0.7
Net Vol (CF)	23.7

500+75



Total Volume at Station 500+75.00	
Cut Area (SF)	11.018
Fill Area (SF)	0.000
Cut Vol (CF)	9.5
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	9.5
Cum Fill Vol (CF)	0.0
Net Vol (CF)	9.5

500+50



Total Volume at Station 500+50.00	
Cut Area (SF)	9.404
Fill Area (SF)	0.000
Cut Vol (CF)	0.0
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	0.0
Cum Fill Vol (CF)	0.0
Net Vol (CF)	0.0

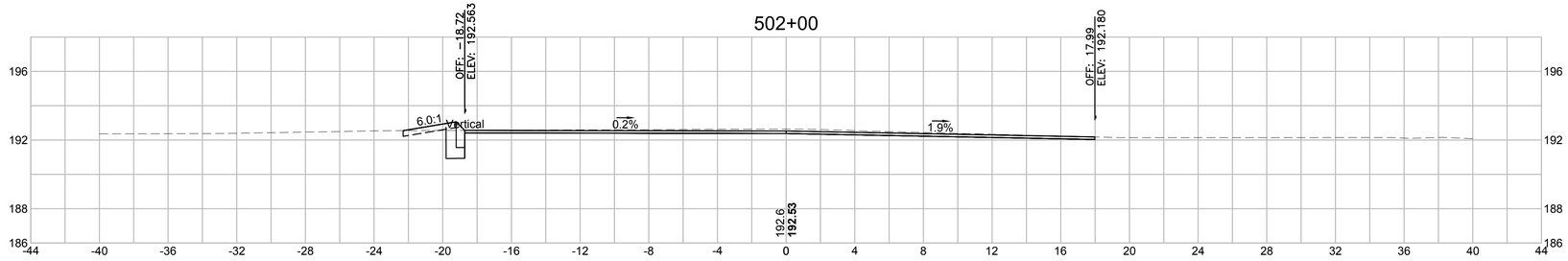
SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	303	316
PROJECT FILE NO. 608164			

CROSS SECTIONS
HUDSON ROAD

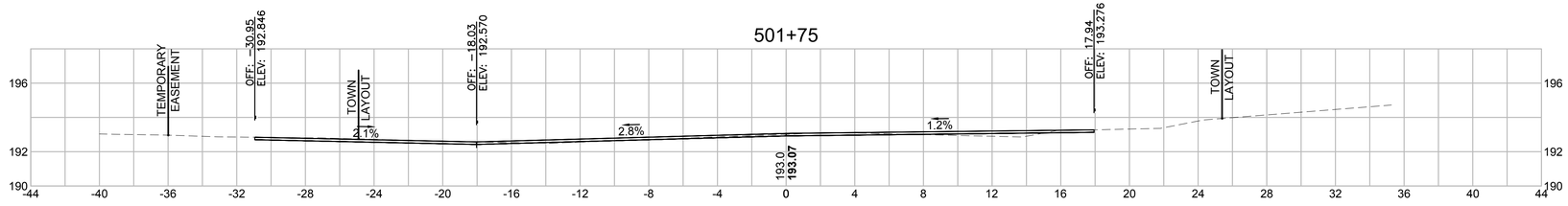
608164_XSEC(HUDSON ROAD).DWG 22-Dec-2021

502+00



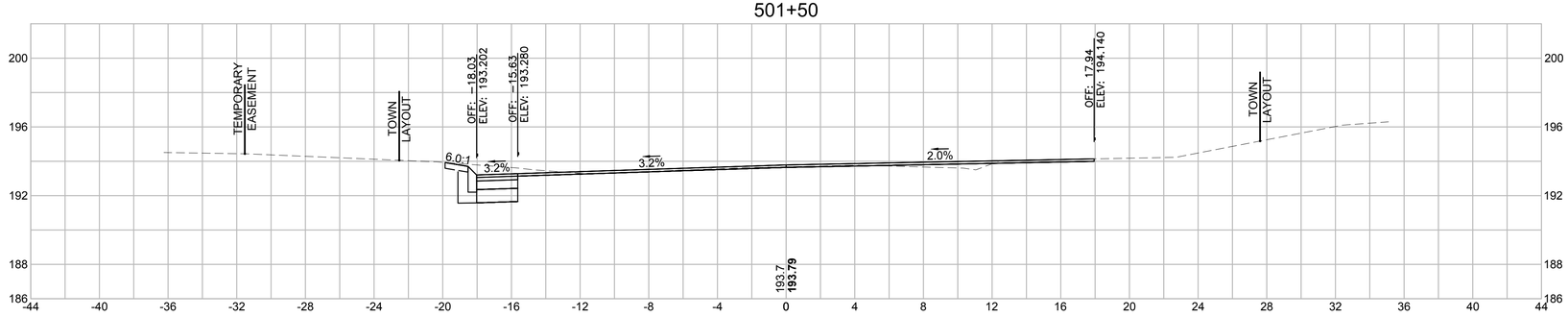
Total Volume at Station 502+00.00	
Cut Area (SF)	22.126
Fill Area (SF)	0.086
Cut Vol (CF)	11.4
Fill Vol (CF)	0.9
Cum Cut Vol (CF)	85.2
Cum Fill Vol (CF)	5.4
Net Vol (CF)	79.8

501+75



Total Volume at Station 501+75.00	
Cut Area (SF)	2.528
Fill Area (SF)	1.892
Cut Vol (CF)	11.4
Fill Vol (CF)	1.4
Cum Cut Vol (CF)	73.8
Cum Fill Vol (CF)	4.5
Net Vol (CF)	69.3

501+50



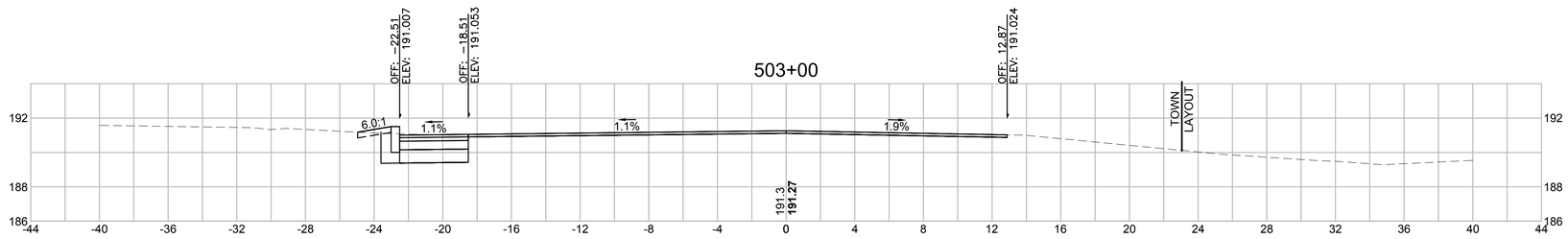
Total Volume at Station 501+50.00	
Cut Area (SF)	22.022
Fill Area (SF)	1.027
Cut Vol (CF)	19.1
Fill Vol (CF)	1.1
Cum Cut Vol (CF)	62.4
Cum Fill Vol (CF)	3.1
Net Vol (CF)	59.3

SUDBURY
BRUCE FREEMAN RAIL TRAIL

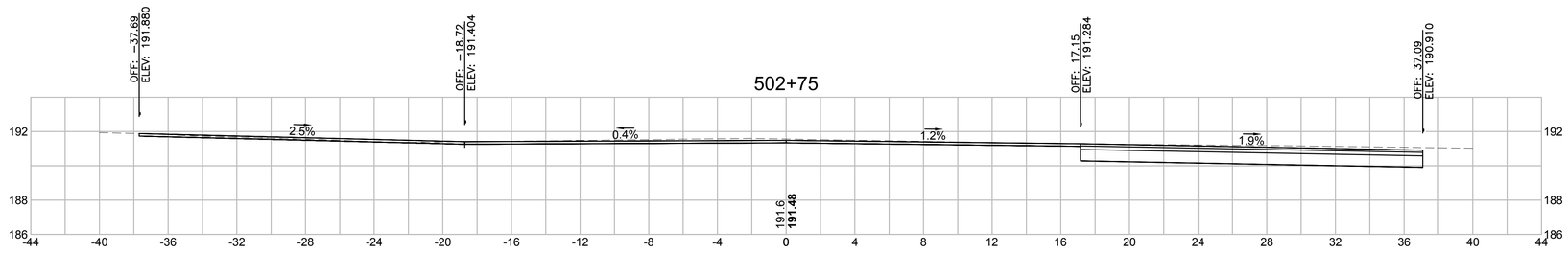
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	304	316
PROJECT FILE NO. 608164			

CROSS SECTIONS
HUDSON ROAD

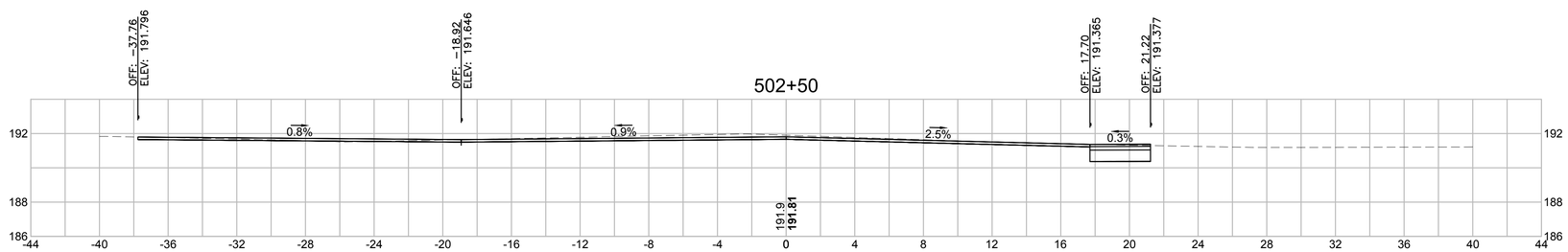
608164_XSEC(HUDSON ROAD).DWG 22-Dec-2021



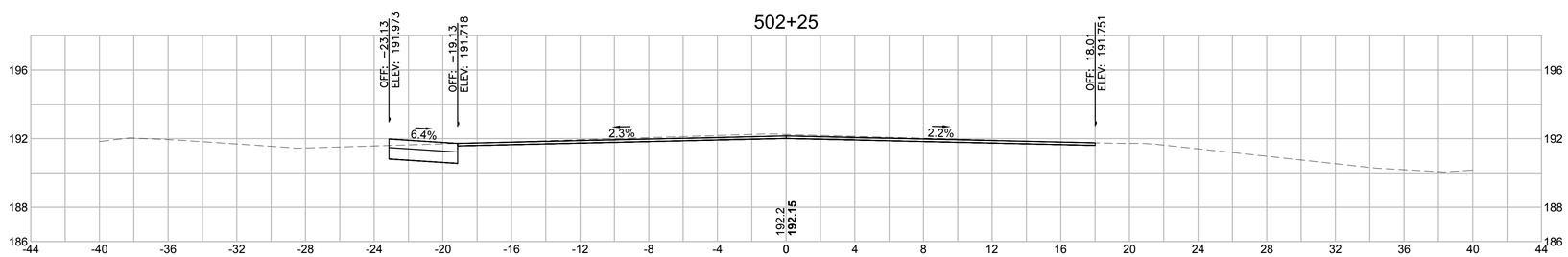
Total Volume at Station 503+00.00	
Cut Area (SF)	29.184
Fill Area (SF)	5.560
Cut Vol (CF)	29.8
Fill Vol (CF)	2.8
Cum Cut Vol (CF)	175.3
Cum Fill Vol (CF)	8.8
Net Vol (CF)	166.4



Total Volume at Station 502+75.00	
Cut Area (SF)	35.160
Fill Area (SF)	0.535
Cut Vol (CF)	26.6
Fill Vol (CF)	0.2
Cum Cut Vol (CF)	145.5
Cum Fill Vol (CF)	6.0
Net Vol (CF)	139.5



Total Volume at Station 502+50.00	
Cut Area (SF)	22.276
Fill Area (SF)	0.000
Cut Vol (CF)	16.9
Fill Vol (CF)	0.2
Cum Cut Vol (CF)	118.9
Cum Fill Vol (CF)	5.8
Net Vol (CF)	113.1



Total Volume at Station 502+25.00	
Cut Area (SF)	14.164
Fill Area (SF)	0.336
Cut Vol (CF)	16.8
Fill Vol (CF)	0.2
Cum Cut Vol (CF)	102.0
Cum Fill Vol (CF)	5.6
Net Vol (CF)	96.4

SUDBURY
BRUCE FREEMAN RAIL TRAIL

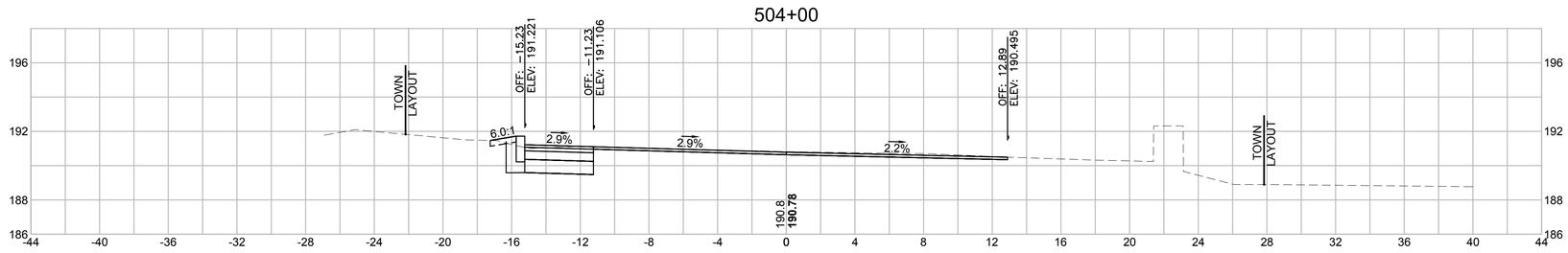
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	305	316
PROJECT FILE NO. 608164			

CROSS SECTIONS
HUDSON ROAD

22-Dec-2021

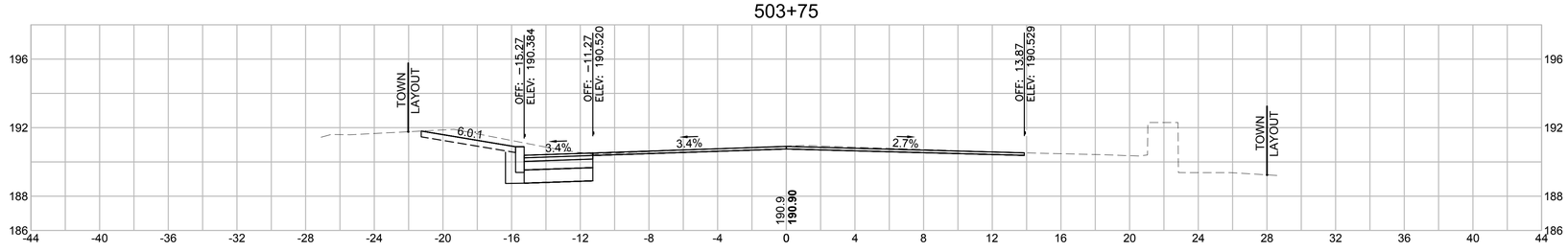
608164_XSEC(HUDSON ROAD).DWG

504+00



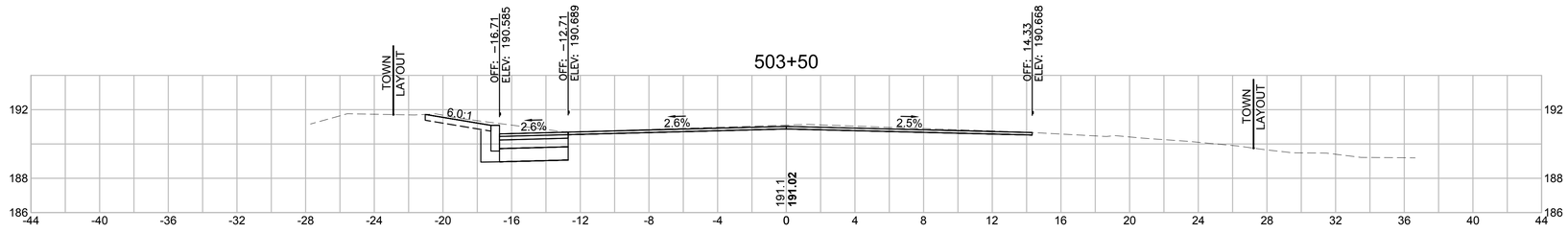
Total Volume at Station 504+00.00	
Cut Area (SF)	9.026
Fill Area (SF)	0.055
Cut Vol (CF)	16.0
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	239.4
Cum Fill Vol (CF)	13.8
Net Vol (CF)	225.6

503+75



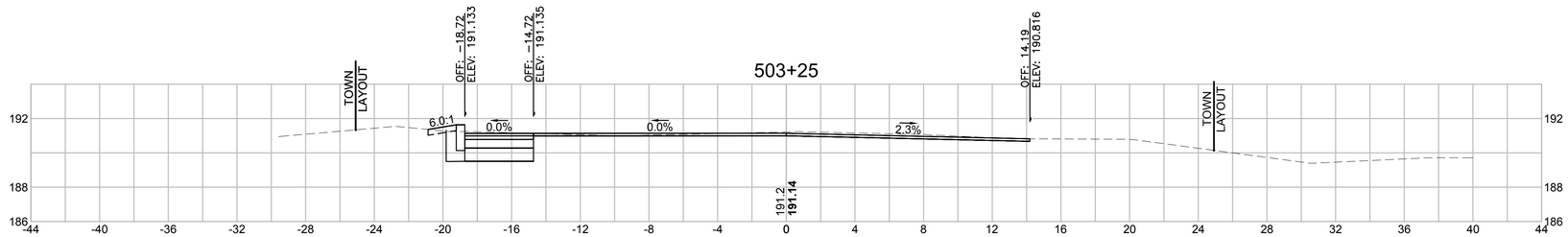
Total Volume at Station 503+75.00	
Cut Area (SF)	25.454
Fill Area (SF)	0.000
Cut Vol (CF)	17.7
Fill Vol (CF)	0.2
Cum Cut Vol (CF)	223.4
Cum Fill Vol (CF)	13.8
Net Vol (CF)	209.6

503+50



Total Volume at Station 503+50.00	
Cut Area (SF)	12.869
Fill Area (SF)	0.405
Cut Vol (CF)	11.4
Fill Vol (CF)	1.2
Cum Cut Vol (CF)	205.7
Cum Fill Vol (CF)	13.6
Net Vol (CF)	192.1

503+25



Total Volume at Station 503+25.00	
Cut Area (SF)	11.807
Fill Area (SF)	2.169
Cut Vol (CF)	19.0
Fill Vol (CF)	3.6
Cum Cut Vol (CF)	194.2
Cum Fill Vol (CF)	12.4
Net Vol (CF)	181.8

SUDBURY
BRUCE FREEMAN RAIL TRAIL

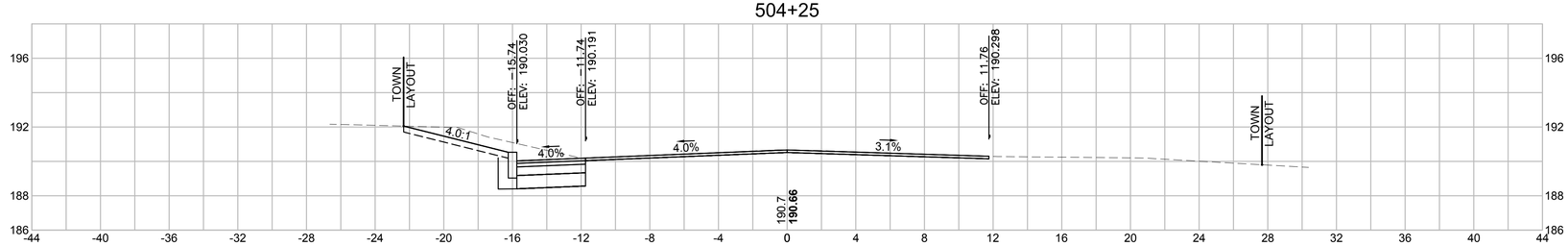
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	306	316
PROJECT FILE NO. 608164			

CROSS SECTIONS
HUDSON ROAD

22-Dec-2021

608164_XSEC(HUDSON ROAD).DWG

504+25



Total Volume at Station 504+25.00	
Cut Area (SF)	15.866
Fill Area (SF)	0.000
Cut Vol (CF)	11.5
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	250.9
Cum Fill Vol (CF)	13.8
Net Vol (CF)	237.1

Appendix G

Stormwater Report & Checklist

Stormwater Management Report
Broadacres Farm Parking Lot
(Part of the Bruce Freeman Rail Trail Project)

Owner
Town of Sudbury
322 Concord Road
Sudbury, MA 01776

May 7, 2021

FUSS & O'NEILL

1550 Main Street, Suite 400
Springfield, MA 01089

Project No. 20200785.A10

FUSS & O'NEILL

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Stormwater Management Report
Broadacres Farm Parking Lot

Table of Contents

Stormwater Management Report
Broadacres Farm Parking Lot

1 Executive Summary

The Town of Sudbury is proposing to construct a parking lot on Town-owned property off of Morse Road and adjacent to the proposed Bruce Freeman Rail Trail in Sudbury, Massachusetts. The project includes a new parking lot containing 32 parking spaces, approximately 9,770 square feet in size, with a walkway connection to the west to provide connectivity to the new trail. A pavilion, restrooms, and other amenities will be located to the east of the new parking area.

The proposed stormwater basins were designed in accordance with the guidelines of the Massachusetts Stormwater Handbook (Stormwater Handbook). Existing and proposed hydrologic conditions for the developed area were evaluated to ensure stormwater peak discharges are maintained or reduced as a result of the proposed development for the 2-, 10-, 25-, and 100-year storm events. Maintenance or reduction in stormwater peak discharges was achieved through the utilization of two proposed stormwater bioretention basins with pretreatment forebays.

2 Project Description

2.1 Existing Conditions

The project site is located off Morse Road, in Sudbury, Massachusetts, as shown on *Figure 1*, Site Location Map. The proposed parking lot improvements are part of a 9.5 acre site owned by the Town of Sudbury. The existing site is undeveloped and mostly grass and wooded.

Existing grades allow stormwater to sheet flow to a swale adjacent to the former railroad right-of-way to the west of the site. The existing site does not contain any stormwater management systems. Existing conditions information is included with the plans located in *Appendix A*.

Soil types at the site consist of Windsor Loamy Sands, which are hydrologic soil group (HSG) type A soils with high permeability. Soil mapping generated from the Natural Resources Conservation Service (NRCS) website is provided in *Appendix B*. Soil boring and test pits were completed at the site as part of an overall soil investigation by Schofield Brothers, LLC in 2018. Based on the test pits conducted in the area of the proposed parking lot, groundwater elevations are estimated at elevation to be 3.5' to 9' below the grade. All recharge volumes are designed to be above the 2' separation from groundwater. Test pit information has been included in *Appendix C*.

2.2 Proposed Conditions

The proposed development includes the construction of a new parking lot to contain 32 parking spaces, approximately 9,770 square feet in size, with a walkway connection to the west to provide connectivity to the new trail. A pavilion, restrooms, and other amenities will be located to the east of the new parking area. Proposed conditions are depicted on the plans located in *Appendix A*.

On-site stormwater management systems have been designed to maintain existing stormwater flow patterns and meet the requirements of the stormwater management standards (Standards) outlined in the

Stormwater Handbook. The systems have been designed to maintain or reduce peak flows between pre- and post-development conditions. Post-construction stormwater runoff from the new parking area will be directed to two (2) bioretention basins with forebay pre-treatment areas along the west side of the proposed parking lot which will ultimately discharge to the existing drainage swales along the railroad right-of-way.

The proposed bioretention basins provide storage greater than that required of the Massachusetts Stormwater Handbook. Water quality volume calculations are included in *Appendix G*. Total Suspended Solids (TSS) removal provided by the bioretention basins with pretreatment forebays is 90%. TSS Removal calculations are provided in *Appendix H*. Groundwater recharge is also provided by the proposed basins and calculations indicate that both of the proposed bioretention basins areas will drawdown in approximately 10 hours. Groundwater recharge and drawdown calculations are provided in *Appendix I*.

3 Hydrologic Analysis

Peak flows for existing and proposed conditions were determined using the Natural Resources Conservation Service (NRCS) Technical Release 20 and Technical Release 55 (TR-55) hydrologic methods. The hydrologic analyses for existing and proposed conditions were completed using a computer software program, HydroCAD version 10.00-20, to determine peak runoff flow rates and total runoff volumes for each of the watersheds. Runoff curve numbers were developed based on a combination of land cover use and existing site soil types acquired from the NRCS website. Time of concentration runs were developed based on the methods in the NRCS TR55 manual.

Peak flows for the 2-, 10-, 25-, and 100-year frequency storm events were determined by using a 24-hour type III storm, standard for the New England area. Rainfall depths were obtained from published rainfall information in the Town of Sudbury Stormwater Regulations.

3.1 Existing Watershed Summary

Stormwater from the site is generally conveyed by sheet flow and shallow concentrated flow to the design point described above. Two (2) subcatchment areas have been established for the pre-development, existing conditions, and watershed modeling. *Figure 2* illustrates existing conditions, pre-development watershed areas, and time of concentration (Tc) paths. A schematic watershed diagram showing discharge point and the breakdown of the ground cover characteristics for each watershed area can be found in the pre-development hydrological analysis provided in *Appendix D*.

3.2 Proposed Watershed Summary

The proposed development has been designed to maintain overall existing drainage patterns directing post-construction stormwater runoff to two (2) bioretention basins with pretreatment forebays located to the west of the proposed parking lot which then discharge to the existing drainage swales within the railroad right-of-way. Two (2) subcatchment areas have been established for the post-development, proposed conditions, watershed modeling. *Figure 3* illustrates proposed conditions, post-development watershed areas, and Tc paths. A schematic watershed diagram showing discharge points and a

breakdown of the ground cover characteristics for each watershed area can be found in the post-development hydrological analysis provided in *Appendix E*.

3.3 Hydrologic Analysis Results

Proposed Best Management Practices (BMPs) have been designed to approximately maintain peak flows for the site from pre to post-development conditions. A summary of the pre- and post-development peak flows at the site for the 2-year, 10-year, 25-year, 50-year, and 100-year storm events are summarized in *Table 1* below.

Table 1
Peak Discharge Summary

Design Year Storm Event	Existing Peak Flows (cfs)	Proposed Peak Flows (cfs)	Change in Peak Flows (cfs)
2-year (3.2")	0.01	0.00	-0.01
10-year (4.8")	0.07	0.02	-0.05
25-year (6.0")	0.28	0.09	-0.19
100-year (8.6")	1.21	1.21	0.00

4 Soil Erosion and Sedimentation Control

Soil erosion and sedimentation control plans, including construction phasing, construction details and notes are provide on the plans located in *Appendix A*. Soil erosion and sedimentation control details and procedures are consistent with the "Massachusetts Erosion and Sediment Control Guideline for Urban and Suburban Areas," and with state, local, and federal requirements.

Erosion and sedimentation controls used on the site during construction will include construction entrances pads, silt fence, straw bales, and water for dust control. Additional erosion and sediment controls will be utilized as required. Silt fence and straw bales will be placed down-gradient of disturbed areas and up-gradient of resource areas. A construction entrance will be installed at the entrance of the site at Morse Road. Water will be applied to exposed soils to provide dust control as needed.

Prior to the start of construction the Contractor will be required to obtain coverage under the National Pollutant Discharge Elimination System (NPDES) Construction General Permit and prepare a formal Stormwater Pollution Prevention Plan (SWPPP), further specifying the details of construction phasing, limits of soil disturbance, erosion and sediment controls and other stabilization measures, stockpile locations, construction waste management procedures, and hazardous materials storage procedures during construction activities.

5 Construction Sequence

The Contractor will be responsible for finalizing the proposed construction sequencing for construction of the project, however construction sequencing shall generally be as follows:

1. Install erosion & sedimentation control measures.

2. Clear and grub project area.
3. Construct stormwater bioretention basins and rough grade site.
4. Install base materials for parking lot and building pads.
5. Install asphalt paving and construction buildings.
6. Loam and seed disturbed areas.
7. Clean site and remove any accumulated sediment from stormwater basins.
8. Remove erosion & sedimentation controls upon site stabilization.

6 Massachusetts Stormwater Handbook Standards

The following is a description of how the proposed project conforms to the Standards outlined in the Stormwater Handbook. The Stormwater Management Checklist is included in *Appendix F*.

LID Measures

Standard 1: No Untreated Discharge or Erosion to Wetlands

Perimeter erosion controls will be installed during construction to protect resource areas from sedimentation until construction is completed and the site is stabilized.

There are no new untreated conveyances proposed. Proposed conveyances have been designed to ensure no erosion will occur to existing resource areas. Post-construction stormwater flows and water quality will be managed by two (2) new bioretention basins which ultimately discharge into the existing drainage swales along the railroad right-of-way, mimicking existing drainage patterns at the site.

Standard 2: Peak Rate Attenuation

Post-development discharge rates will be maintained or reduced in post-development conditions. Stormwater Hydrologic Analyses have been provided in *Appendix D* and *Appendix E* and a summary of pre- verses post-development peak discharge rates have been provided in *Table 1* under Section 3.3. Mitigation of post-development peak runoff flows are achieved through stormwater storage provided by the two (2) proposed bioretention basins.

Standard 3: Stormwater Recharge

The proposed design has not accounted for on-site groundwater recharge, although given the presence of HSG type A soils within the project area, it is presumed that some groundwater recharge takes place in both existing and post-construction conditions.

Each of the bioretention basins have been designed to drawdown within 72 hours. Calculations for groundwater recharge and 72 hour drawdown can be found in *Appendix I.*

Standard 4: Water Quality

Water quality treatment and removal of suspended solids will be provided by the new bioretention basins with pretreatment forebays and during overland flow to the existing swales and within the existing swales. Water quality volume calculations are included in *Appendix G.* TSS Removal calculations are included in *Appendix H*.

Standard 5: Land Uses with Higher Potential Pollutant Loads

This project does not include areas which would be classified as having higher potential pollutant loading as the proposed parking area will have low intensity use and as the trail is anticipated to see 275 users per day.

Standard 6: Critical Areas

This project does not contain any critical areas as defined by the Massachusetts Stormwater Handbook.

Standard 7: Redevelopment

The proposed project is not considered a redevelopment project per the Stormwater Handbook.

Standard 8: Construction Period Controls

It is anticipated that there will be no proposed pollution created during the construction of the proposed development. General erosion and sedimentation controls will be implemented and maintained in accordance with local, state, and federal requirements until construction is complete and disturbed areas have been stabilized.

Prior to the start of construction the Contractor will be required to obtain coverage under the NPDES Construction General Permit and prepare a formal SWPPP, further specifying the details of construction phasing, limits of soil disturbance, erosion and sediment controls and other stabilization measures, stockpile locations, construction waste management procedures, and hazardous materials storage procedures during construction activities.

Standard 9: Operation and Maintenance Plan

A suggested Construction Operation and Maintenance (O&M) Plan has been developed for the development of the site and is included in *Appendix J*. The contractor shall be responsible for construction operation and maintenance of the site.

A suggested Long Term O&M Plan, which includes recommended maintenance activities and schedule of maintenance as outlined within the Stormwater Handbook, is included in *Appendix K*. The owner will be responsible for long term operation and maintenance of the site.

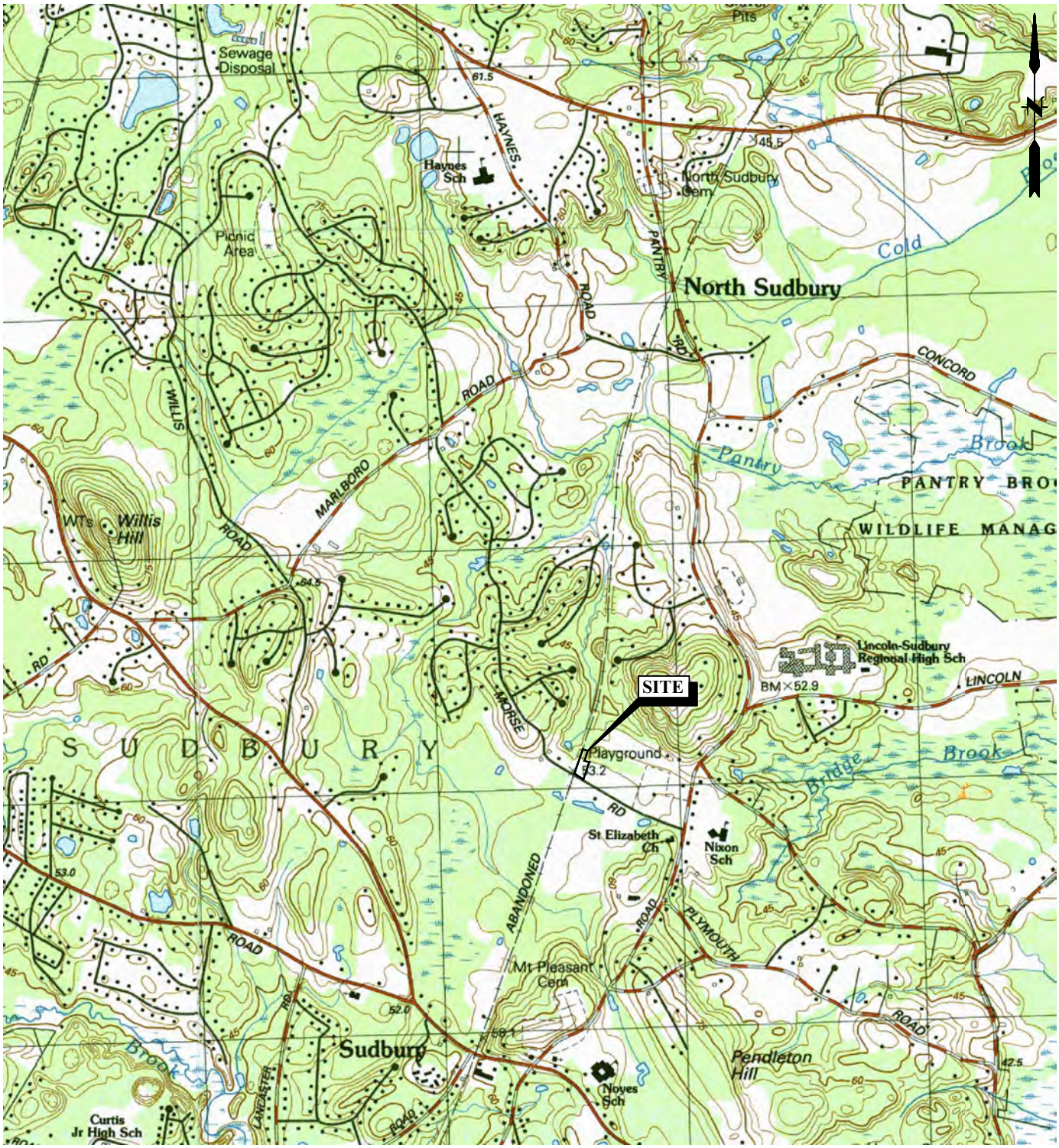
Standard 10: Illicit Discharge to Drainage System

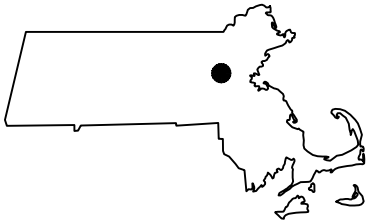
The project does not include any proposed illicit discharges to Stormwater Management Systems as defined in the Stormwater Handbook.

7 Summary

This Stormwater Management Report demonstrates the proposed stormwater management system for proposed parking lot improvements at the Broadacres Farm site, have been designed to mitigate or reduce post-construction stormwater flows from the site and meet the requirements of the Massachusetts Stormwater Standards.

Figures





MAP REFERENCE

THIS MAP WAS PREPARED FROM THE FOLLOWING USGS TOPOGRAPHIC QUADRANGLE IMAGES: q209902, q209906, q213902, AND q213906. QUADRANGLE IMAGES WERE PREPARED FROM MASS GIS DATA RECEIVED FROM OLIVER GIS ON 4/16/2021.
ORIGINAL MAP UNITS IN METERS.

SCALE:
HORZ.: 1" = 2000'
VERT.:
DATUM:
HORZ.:
VERT.:
0 2000 1000
GRAPHIC SCALE

FUSS & O'NEILL
1550 MAIN STREET, SUITE 400
SPRINGFIELD, MA 01103
413.452.0445
www.fando.com

TOWN OF SUDBURY

SITE LOCATION MAP

BROADACRES FARM PARKING LOT
(PART OF BRUCE FREEMAN RAIL TRAIL PROJECT)

SUDBURY MASSACHUSETTS

PROJ. No.: 20200785.A10
DATE: 05/12/2021

FIG.1

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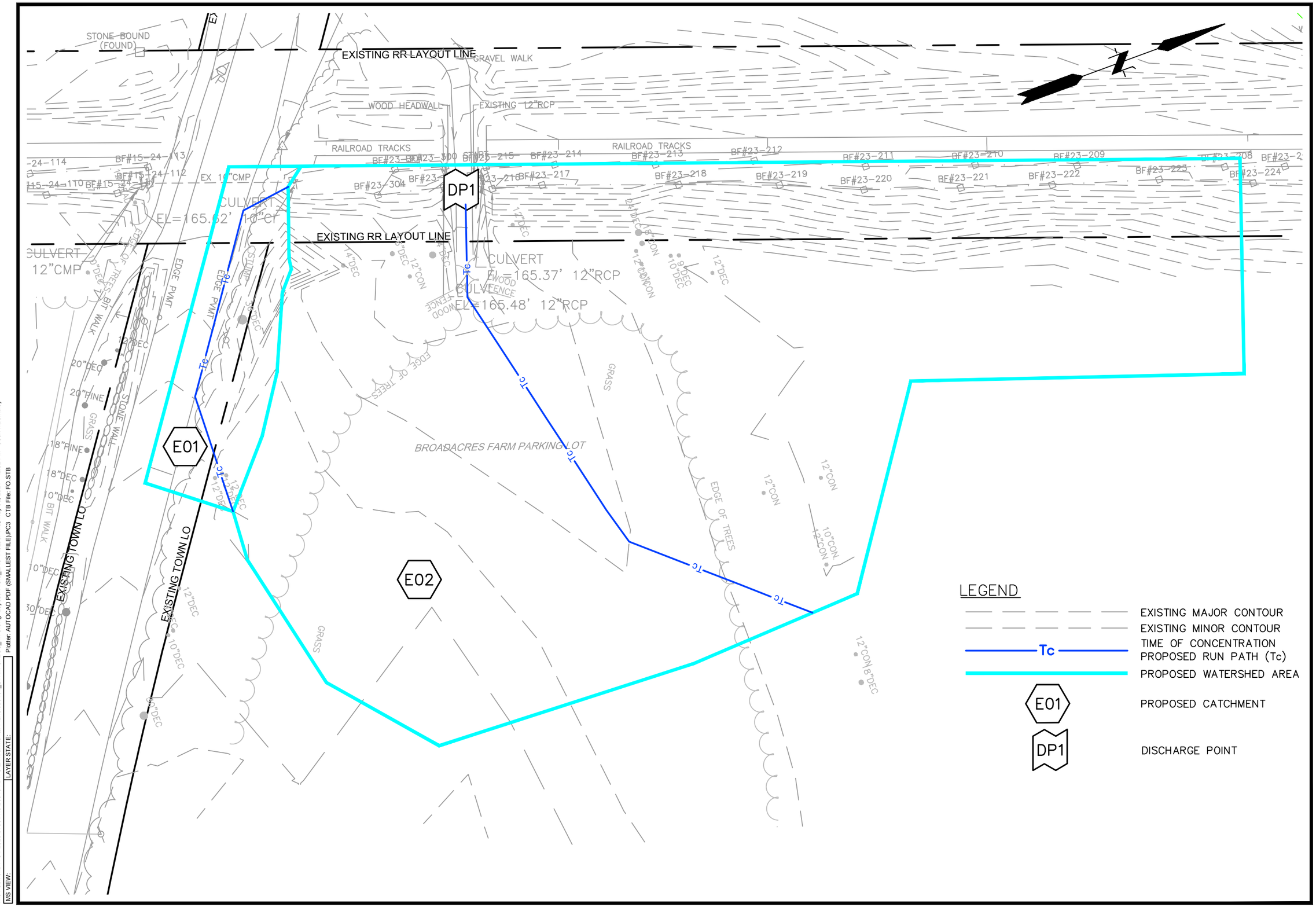

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GRAPHIC SCALE

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TOWN OF SUDBURY

EXISTING WATERSHED MAPPING

BROADACRES FARM PARKING LOT
(PART OF BRUCE FREEMAN RAIL TRAIL PROJECT)

MASSACHUSETTS

SUDBURY

PROJ. No.: 20200785.A10
DATE: 05/06/2021

FIG. 2

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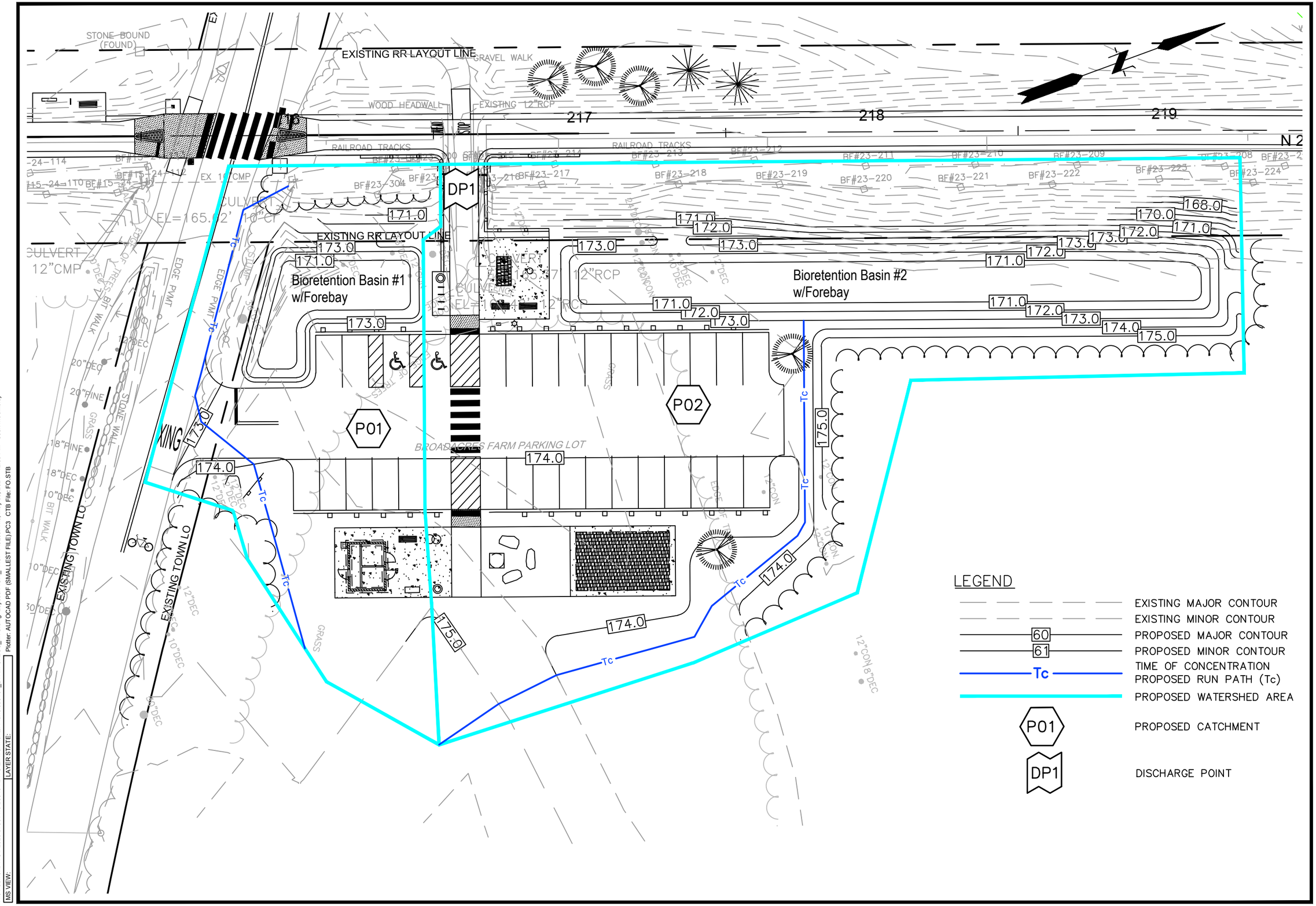

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VERT.: NAVD 1988
GRAPHIC SCALE 0 15 30

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TOWN OF SUDBURY
PROPOSED WATERSHED MAPPING
BROADACRES FARM PARKING LOT
(PART OF BRUCE FREEMAN RAIL TRAIL PROJECT)
SUDBURY, MASSACHUSETTS

PROJ. No.: 20200785.A10
DATE: 05/06/2021

FIG. 3

Appendix A

Plans (bound separately)

Appendix B

NRCS Web Soil Mapping

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

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

Custom Soil Resource Report for Middlesex County, Massachusetts

May 7, 2021

Preface

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

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

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

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

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

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

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Contents

How Soil Surveys Are Made

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

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

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

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

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

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

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

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

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

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

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

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

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

Soil Map

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

Custom Soil Resource Report
Soil Map

MAP LEGEND

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

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

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:25,000.

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

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

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

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

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

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

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 20, Jun 9, 2020

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

Date(s) aerial images were photographed: Jul 28, 2019—Aug 15, 2019

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
255A	Windsor loamy sand, 0 to 3 percent slopes	8.0	60.7%
255B	Windsor loamy sand, 3 to 8 percent slopes	4.6	35.3%
654	Udorthents, loamy	0.5	4.0%
Totals for Area of Interest		**13.1**	**100.0%**

Map Unit Descriptions

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

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

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

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

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

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

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

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

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

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

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

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

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

Middlesex County, Massachusetts

255A—Windsor loamy sand, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2svkg
Elevation: 0 to 990 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Windsor, loamy sand, and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Windsor, Loamy Sand

Setting

Landform: Dunes, deltas, outwash terraces, outwash plains
Landform position (three-dimensional): Tread, riser
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Parent material: Loose sandy glaciofluvial deposits derived from granite and/or loose sandy glaciofluvial deposits derived from schist and/or loose sandy glaciofluvial deposits derived from gneiss

Typical profile

O - 0 to 1 inches: moderately decomposed plant material
A - 1 to 3 inches: loamy sand
Bw - 3 to 25 inches: loamy sand
C - 25 to 65 inches: sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water capacity: Low (about 3.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: A
Ecological site: F144AY022MA - Dry Outwash
Hydric soil rating: No

Minor Components

Deerfield, loamy sand

Percent of map unit: 10 percent
Landform: Outwash plains, terraces, deltas
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, talf
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Hinckley, loamy sand

Percent of map unit: 5 percent
Landform: Deltas, outwash plains, eskers, kames
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope, crest, head slope, rise
Down-slope shape: Convex
Across-slope shape: Convex, linear
Hydric soil rating: No

255B—Windsor loamy sand, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2svkf
Elevation: 0 to 1,210 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Windsor, loamy sand, and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Windsor, Loamy Sand

Setting

Landform: Outwash plains, dunes, outwash terraces, deltas
Landform position (three-dimensional): Tread, riser
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Parent material: Loose sandy glaciofluvial deposits derived from granite and/or loose sandy glaciofluvial deposits derived from schist and/or loose sandy glaciofluvial deposits derived from gneiss

Typical profile

O - 0 to 1 inches: moderately decomposed plant material
A - 1 to 3 inches: loamy sand

Bw - 3 to 25 inches: loamy sand
C - 25 to 65 inches: sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water capacity: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: A
Ecological site: F144AY022MA - Dry Outwash
Hydric soil rating: No

Minor Components

Hinckley, loamy sand

Percent of map unit: 10 percent
Landform: Outwash plains, eskers, kames, deltas
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope, crest, head slope, rise
Down-slope shape: Convex
Across-slope shape: Linear, convex
Hydric soil rating: No

Deerfield, loamy sand

Percent of map unit: 5 percent
Landform: Outwash plains, terraces, deltas
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, talf
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

654—Udorthents, loamy

Map Unit Setting

National map unit symbol: vr1l
Elevation: 0 to 3,000 feet
Mean annual precipitation: 32 to 50 inches
Mean annual air temperature: 45 to 50 degrees F

Frost-free period: 110 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Udorthents, loamy, and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udorthents, Loamy

Setting

Parent material: Loamy alluvium and/or sandy glaciofluvial deposits and/or loamy glaciolacustrine deposits and/or loamy marine deposits and/or loamy basal till and/or loamy lodgment till

Properties and qualities

Depth to restrictive feature: More than 80 inches
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Minor Components

Udorthents, sandy

Percent of map unit: 10 percent
Hydric soil rating: No

Udorthents, wet substratum

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

Urban land

Percent of map unit: 5 percent
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear

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FUSS & O'NEILL

Appendix C

Test Pit Information
(Schofield Brothers LLC)

Location Address or Lot No. Broadacre Farm – Morse Road, Sudbury, MA 01776

On-site Witnessed Review

Deep Hole Number 18-01 Date: 3/23/2018 Time: A.M. Weather 40°, overcast

Location (identify on site plan) see attached sketch

Land Use Farm Land Slope (%) 0-3 Surface Stones None

Vegetation Grass

Landform Outwash Plain

Position on landscape (sketch on the back)

Distances from:

Open Water Body	see sketch	Feet	Drainageway	see sketch	Feet
Possible Wet Area	see sketch	Feet	Property Line	see sketch	Feet
Drinking Water Well	see sketch	Feet	Other		

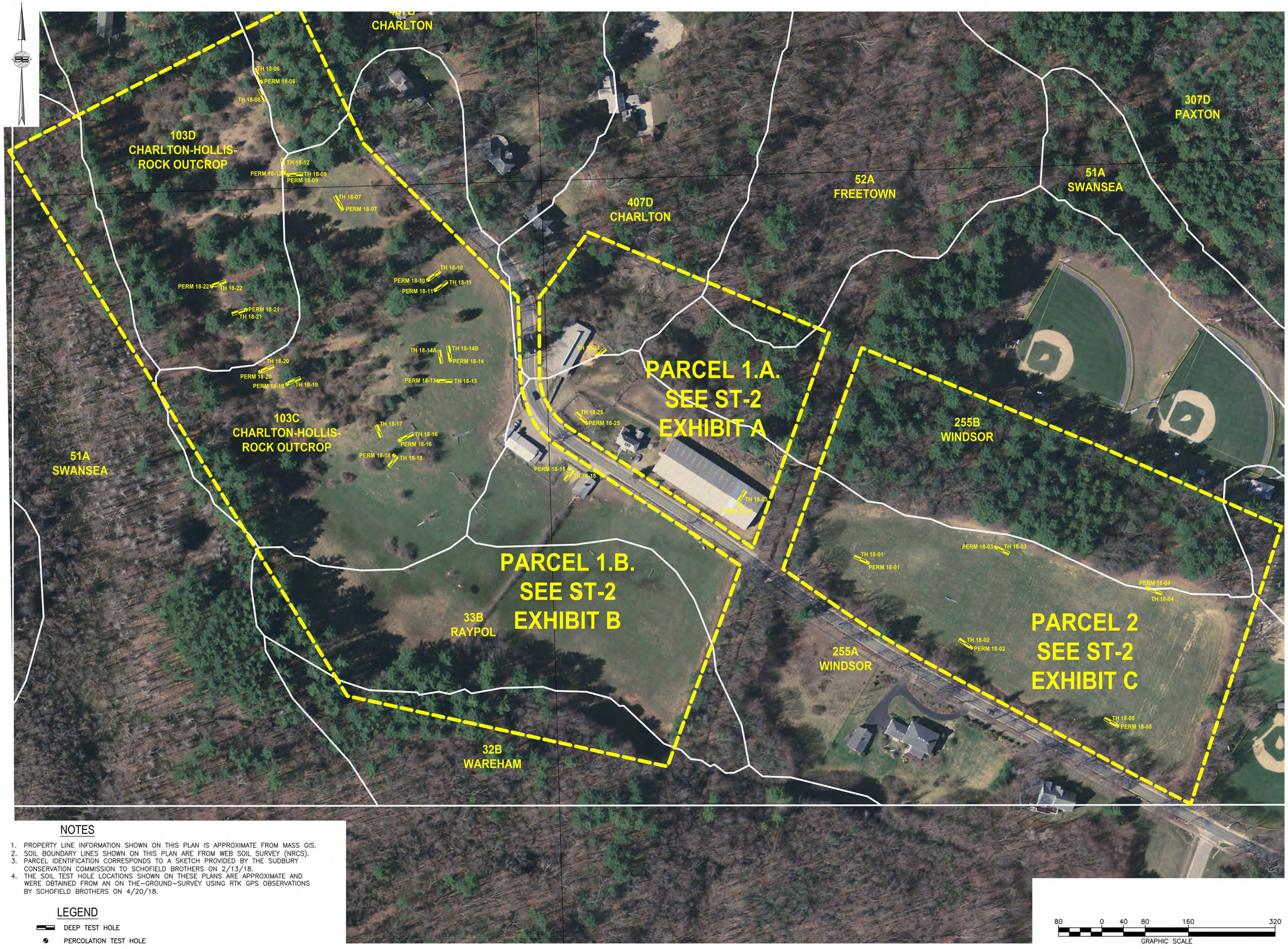
DEEP OBSERVATION HOLE LOG

Depth from Surface (inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0 – 10"	A	Fine Sandy Loam	10 YR 3/2	None Observed	Massive-Friable
10 – 19"	B_w	Fine Sandy Loam	10 YR 5/6	None Observed	Massive-Friable
19 – 104"	C	Sand (Fine)	2.5 Y 5/2	>5% @ 43"	Loose-Single Grained

Parent Material (geologic) Loose Sandy Glaciofluvial Deposits Depth to Bedrock: None Observed (Cave-ins)

Depth to Groundwater: Standing Water in the Hole: @ 104" Weeping from Pit Face: @ 75"

Estimated Seasonal High Ground Water: @ 43" based on soil morphology



NOTES

1. PROPERTY LINE INFORMATION SHOWN ON THIS PLAN IS APPROXIMATE FROM MASS GIS.
2. SOIL BOUNDARY LINES SHOWN ON THIS PLAN ARE FROM WEB SOIL SURVEY (NRCS).
3. PARCEL IDENTIFICATION CORRESPONDS TO A SKETCH PROVIDED BY THE SUDBURY CONSERVATION COMMISSION TO SCHOFIELD BROTHERS ON 2/13/18.
4. THE SOIL TEST HOLE LOCATIONS SHOWN ON THESE PLANS ARE APPROXIMATE AND WERE OBTAINED FROM AN ON THE-GROUND-SURVEY USING RTK GPS OBSERVATIONS BY SCHOFIELD BROTHERS ON 4/20/18.

LEGEND

- DEEP TEST HOLE
- PERCOLATION TEST HOLE

80 0 40 80 160 320
GRAPHIC SCALE

SOIL TEST LOCATION PLAN

BROADACRES FARM - MORSE ROAD
SUDBURY, MASSACHUSETTS 01776

ASSESSORS: **PARCEL ID: F09-0002** (SHOWN AS PARCEL 1.A. & 1.B. ON THIS PLAN)
PARCEL ID: F09-0004 (SHOWN AS PARCEL 2 ON THIS PLAN)

PREPARED FOR:

TOWN OF SUDBURY
CONSERVATION
COMMISSION

275 OLD LANCASTER ROAD
SUDBURY, MASSACHUSETTS 01776

SCHOFIELD BROTHERS LLC
ENGINEERING ◆ SURVEYING ◆ PLANNING ◆ GIS
1071 WORCESTER ROAD
FRAMINGHAM, MA 01701
508-879-0030
www.schofieldbros.com

NO.	APP	DATE	DESCRIPTION

DATE: **MAY 11, 2018**

SCALE: **1" = 80'**

DRAFTED:	CHECKED:	APPROVED:
JAL	BEC	

SOIL TEST HOLE LOCATION PLAN: OVERALL LAYOUT

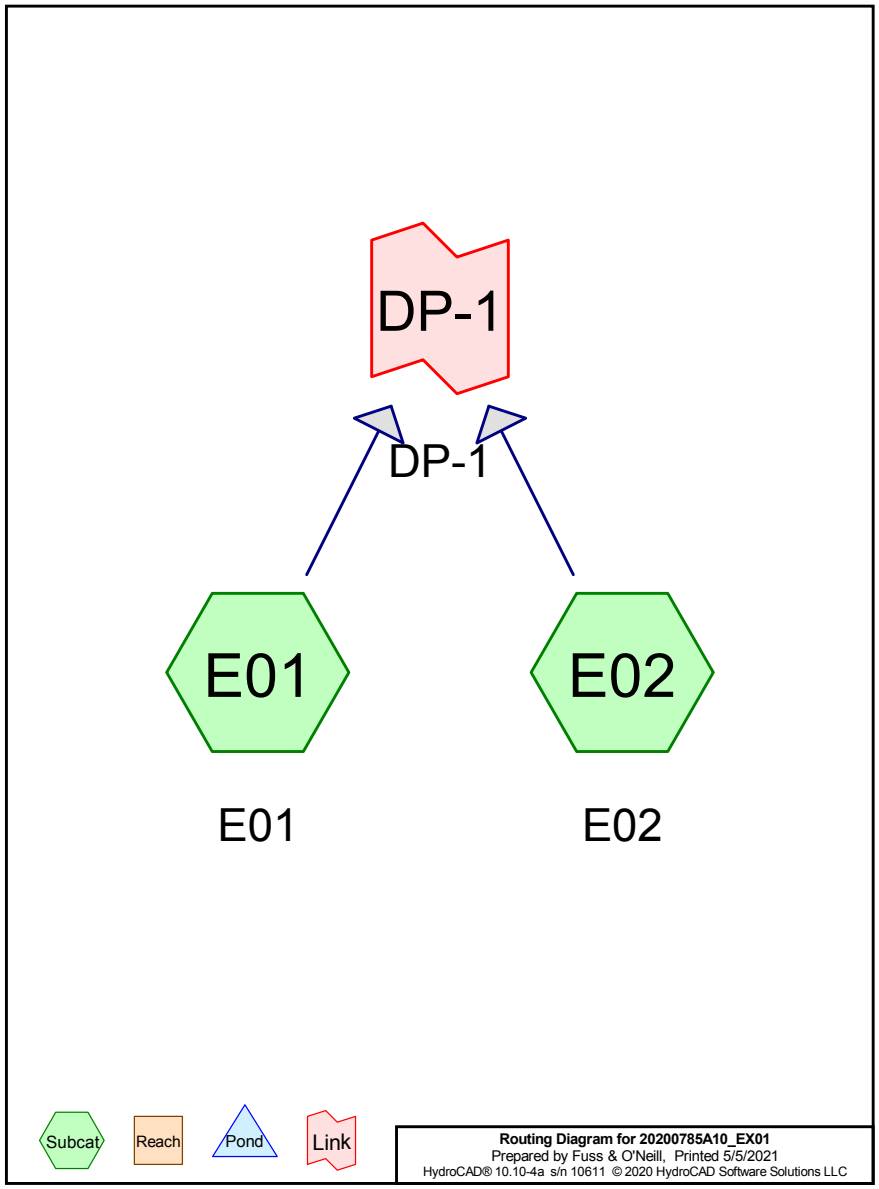
SHEET: **1 OF 2**
PROJECT NO.: **25291**

ST-1

G:\Carlson Jobs\25291\Correspondence\To Client\2018-05-11 (To Sudbury)\25291-Soil Test Hole Location Plan.dwg

Appendix D

Pre-Development Hydrological Analysis



Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	Type III 24-hr		Default	24.00	1	3.20	2
2	10-Year	Type III 24-hr		Default	24.00	1	4.80	2
3	25-Year	Type III 24-hr		Default	24.00	1	6.00	2
4	100-Year	Type III 24-hr		Default	24.00	1	8.60	2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
17,820	49	50-75% Grass cover, Fair, HSG A (E01, E02)
147	96	Gravel surface, HSG A (E02)
1,004	98	Paved parking, HSG A (E01)
30,433	36	Woods, Fair, HSG A (E01, E02)
49,404	**42**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
49,404	HSG A	E01, E02
0	HSG B	
0	HSG C	
0	HSG D	
0	Other	
49,404		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Subcatch Numbers
17,820	0	0	0	0	17,820	50-75% Grass cover, Fair	
147	0	0	0	0	147	Gravel surface	
1,004	0	0	0	0	1,004	Paved parking	
30,433	0	0	0	0	30,433	Woods, Fair	
49,404	**0**	**0**	**0**	**0**	**49,404**	**TOTAL AREA**	

Time span=0.00-80.00 hrs, dt=0.05 hrs, 1601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E01: E01 Runoff Area=3,515 sf 28.56% Impervious Runoff Depth=0.28"
Flow Length=125' Tc=7.0 min CN=56 Runoff=0.01 cfs 82 cf

Subcatchment E02: E02 Runoff Area=45,889 sf 0.00% Impervious Runoff Depth=0.01"
Flow Length=222' Tc=19.7 min CN=41 Runoff=0.00 cfs 27 cf

Link DP-1: DP-1 Inflow=0.01 cfs 109 cf
Primary=0.01 cfs 109 cf

Total Runoff Area = 49,404 sf Runoff Volume = 109 cf Average Runoff Depth = 0.03"
97.97% Pervious = 48,400 sf 2.03% Impervious = 1,004 sf

Summary for Subcatchment E01: E01

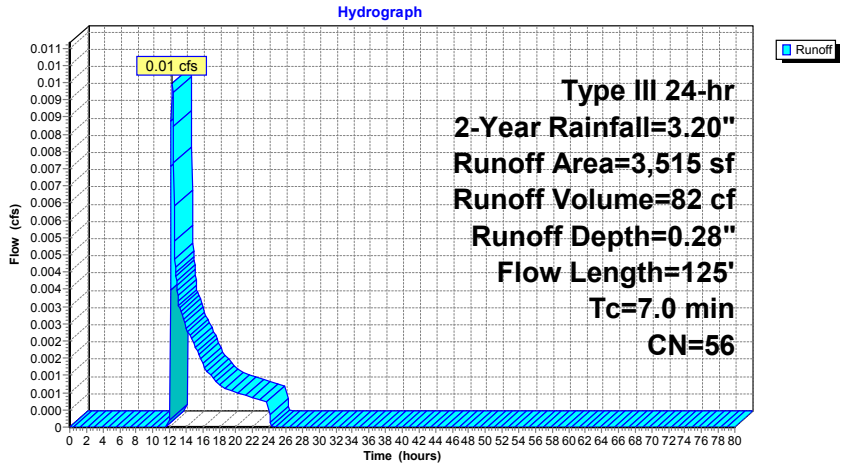
Runoff = 0.01 cfs @ 12.32 hrs, Volume= 82 cf, Depth= 0.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
571	49	50-75% Grass cover, Fair, HSG A
1,004	98	Paved parking, HSG A
1,940	36	Woods, Fair, HSG A
3,515	56	Weighted Average
2,511		71.44% Pervious Area
1,004		28.56% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	33	0.0670	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.6	8	0.1250	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.8	59	0.0169	1.16		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
0.0	8	0.1250	7.18		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.1	17	0.1760	2.94		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.0	125	Total			

Subcatchment E01: E01



Summary for Subcatchment E02: E02

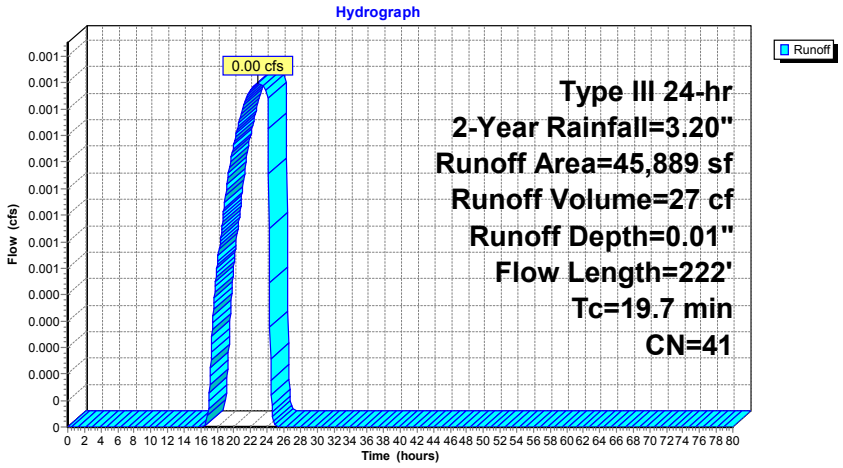
Runoff = 0.00 cfs @ 22.89 hrs, Volume= 27 cf, Depth= 0.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
17,249	49	50-75% Grass cover, Fair, HSG A
28,493	36	Woods, Fair, HSG A
147	96	Gravel surface, HSG A
45,889	41	Weighted Average
45,889		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.2	49	0.0196	0.07		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.20"
5.5	51	0.0224	0.16		**Sheet Flow, Sheet** Grass: Short n= 0.150 P2= 3.20"
1.7	88	0.0160	0.89		**Shallow Concentrated Flow, Shallow 1** Short Grass Pasture Kv= 7.0 fps
0.3	34	0.1324	1.82		**Shallow Concentrated Flow, Shallow 2** Woodland Kv= 5.0 fps
19.7	222	Total			

Subcatchment E02: E02

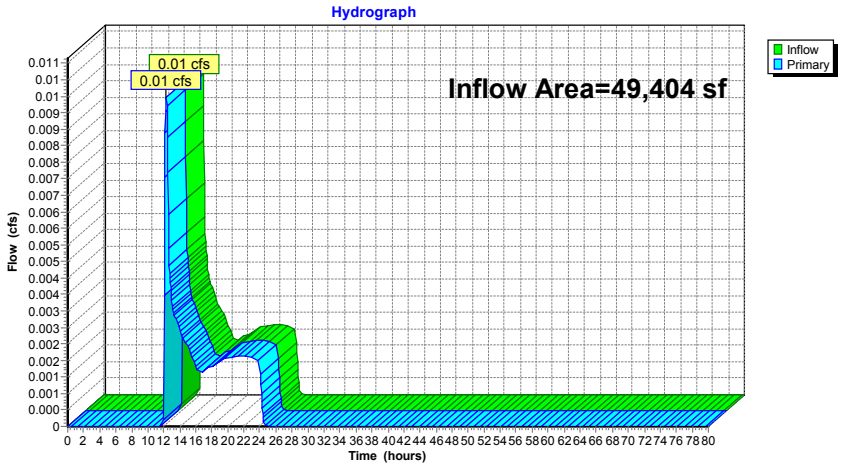


Summary for Link DP-1: DP-1

Inflow Area = 49,404 sf, 2.03% Impervious, Inflow Depth = 0.03" for 2-Year event
Inflow = 0.01 cfs @ 12.32 hrs, Volume= 109 cf
Primary = 0.01 cfs @ 12.32 hrs, Volume= 109 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Link DP-1: DP-1



Time span=0.00-80.00 hrs, dt=0.05 hrs, 1601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E01: E01 Runoff Area=3,515 sf 28.56% Impervious Runoff Depth=0.94"
Flow Length=125' Tc=7.0 min CN=56 Runoff=0.07 cfs 275 cf

Subcatchment E02: E02 Runoff Area=45,889 sf 0.00% Impervious Runoff Depth=0.23"
Flow Length=222' Tc=19.7 min CN=41 Runoff=0.05 cfs 866 cf

Link DP-1: DP-1 Inflow=0.07 cfs 1,141 cf
Primary=0.07 cfs 1,141 cf

Total Runoff Area = 49,404 sf Runoff Volume = 1,141 cf Average Runoff Depth = 0.28"
97.97% Pervious = 48,400 sf 2.03% Impervious = 1,004 sf

Summary for Subcatchment E01: E01

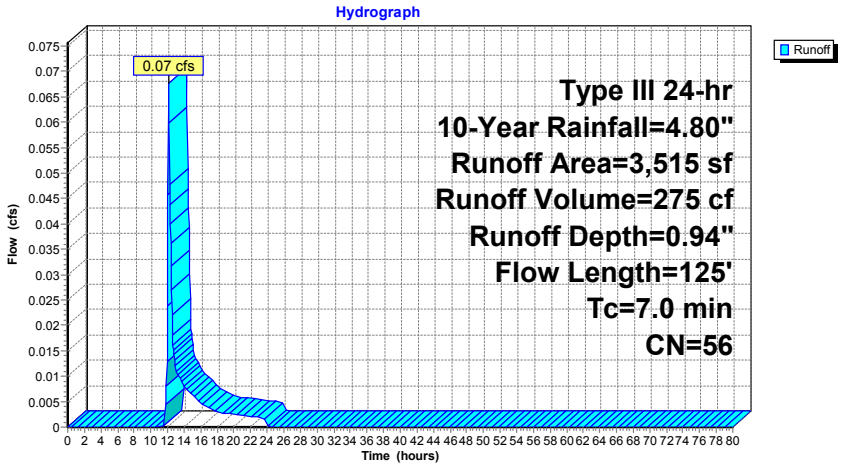
Runoff = 0.07 cfs @ 12.12 hrs, Volume= 275 cf, Depth= 0.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (sf)	CN	Description
571	49	50-75% Grass cover, Fair, HSG A
1,004	98	Paved parking, HSG A
1,940	36	Woods, Fair, HSG A
3,515	56	Weighted Average
2,511		71.44% Pervious Area
1,004		28.56% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	33	0.0670	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.6	8	0.1250	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.8	59	0.0169	1.16		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
0.0	8	0.1250	7.18		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.1	17	0.1760	2.94		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.0	125	Total			

Subcatchment E01: E01



Summary for Subcatchment E02: E02

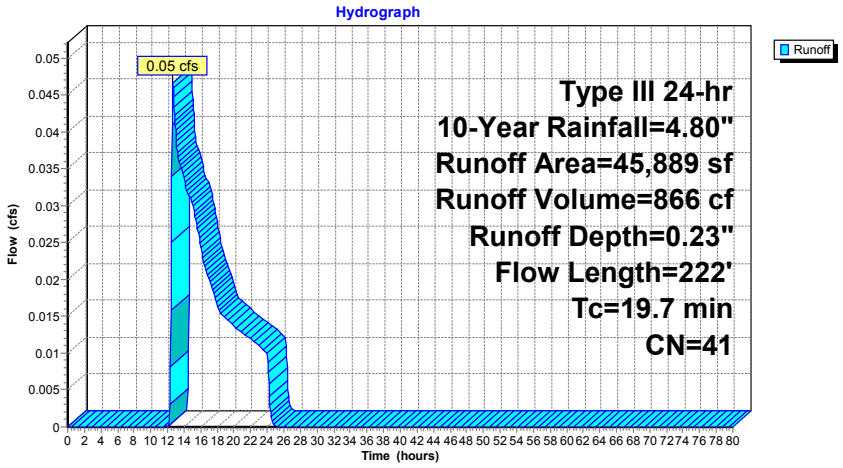
Runoff = 0.05 cfs @ 12.66 hrs, Volume= 866 cf, Depth= 0.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (sf)	CN	Description
17,249	49	50-75% Grass cover, Fair, HSG A
28,493	36	Woods, Fair, HSG A
147	96	Gravel surface, HSG A
45,889	41	Weighted Average
45,889		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.2	49	0.0196	0.07		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.20"
5.5	51	0.0224	0.16		**Sheet Flow, Sheet** Grass: Short n= 0.150 P2= 3.20"
1.7	88	0.0160	0.89		**Shallow Concentrated Flow, Shallow 1** Short Grass Pasture Kv= 7.0 fps
0.3	34	0.1324	1.82		**Shallow Concentrated Flow, Shallow 2** Woodland Kv= 5.0 fps
19.7	222	Total			

Subcatchment E02: E02

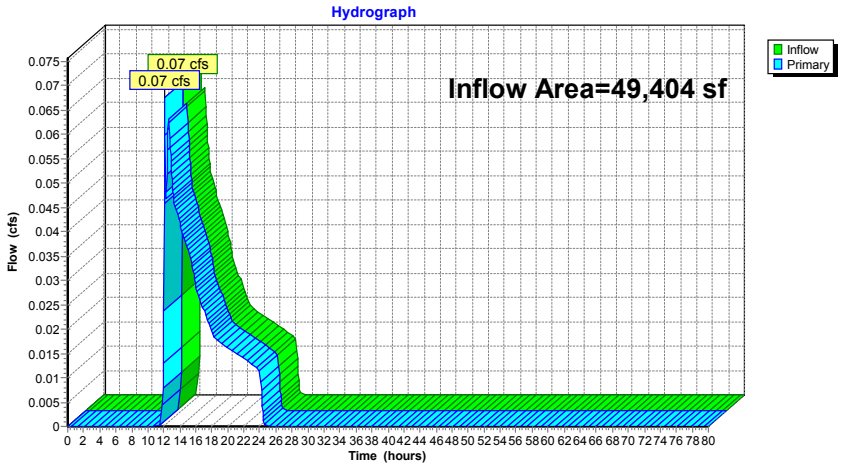


Summary for Link DP-1: DP-1

Inflow Area = 49,404 sf, 2.03% Impervious, Inflow Depth = 0.28" for 10-Year event
Inflow = 0.07 cfs @ 12.12 hrs, Volume= 1,141 cf
Primary = 0.07 cfs @ 12.12 hrs, Volume= 1,141 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Link DP-1: DP-1



Time span=0.00-80.00 hrs, dt=0.05 hrs, 1601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E01: E01 Runoff Area=3,515 sf 28.56% Impervious Runoff Depth=1.60"
Flow Length=125' Tc=7.0 min CN=56 Runoff=0.13 cfs 468 cf

Subcatchment E02: E02 Runoff Area=45,889 sf 0.00% Impervious Runoff Depth=0.56"
Flow Length=222' Tc=19.7 min CN=41 Runoff=0.23 cfs 2,128 cf

Link DP-1: DP-1 Inflow=0.28 cfs 2,596 cf
Primary=0.28 cfs 2,596 cf

Total Runoff Area = 49,404 sf Runoff Volume = 2,596 cf Average Runoff Depth = 0.63"
97.97% Pervious = 48,400 sf 2.03% Impervious = 1,004 sf

Summary for Subcatchment E01: E01

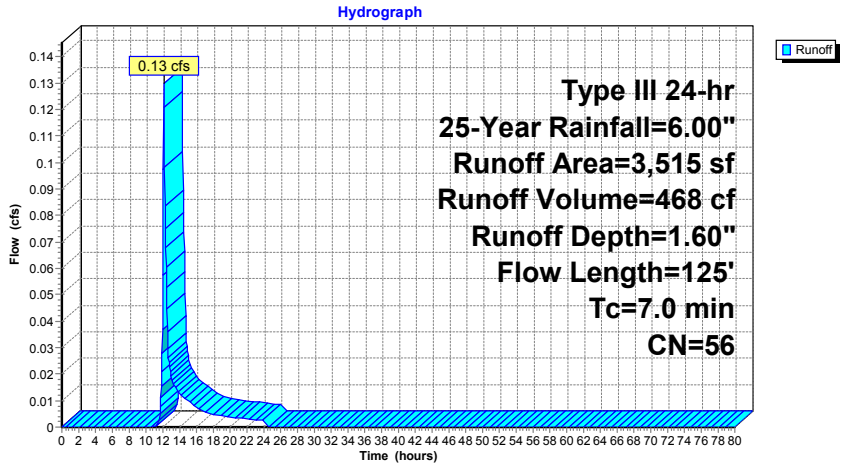
Runoff = 0.13 cfs @ 12.12 hrs, Volume= 468 cf, Depth= 1.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.00"

Area (sf)	CN	Description
571	49	50-75% Grass cover, Fair, HSG A
1,004	98	Paved parking, HSG A
1,940	36	Woods, Fair, HSG A
3,515	56	Weighted Average
2,511		71.44% Pervious Area
1,004		28.56% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	33	0.0670	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.6	8	0.1250	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.8	59	0.0169	1.16		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
0.0	8	0.1250	7.18		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.1	17	0.1760	2.94		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.0	125	Total			

Subcatchment E01: E01



Summary for Subcatchment E02: E02

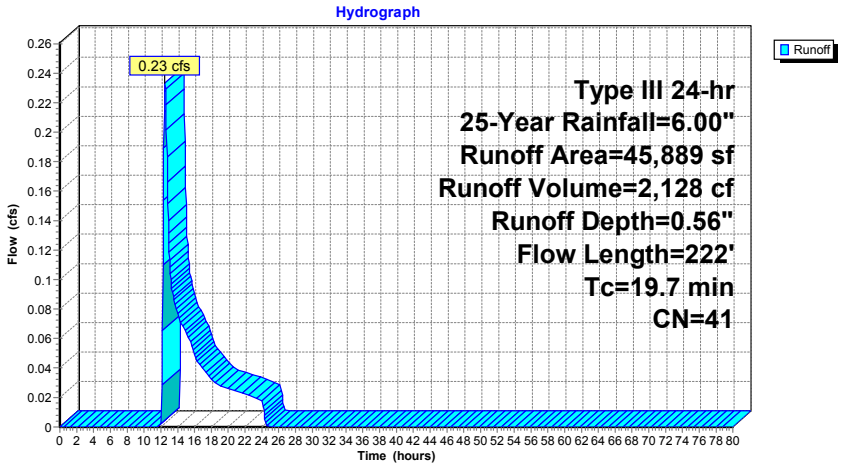
Runoff = 0.23 cfs @ 12.50 hrs, Volume= 2,128 cf, Depth= 0.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.00"

Area (sf)	CN	Description
17,249	49	50-75% Grass cover, Fair, HSG A
28,493	36	Woods, Fair, HSG A
147	96	Gravel surface, HSG A
45,889	41	Weighted Average
45,889		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.2	49	0.0196	0.07		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.20"
5.5	51	0.0224	0.16		**Sheet Flow, Sheet** Grass: Short n= 0.150 P2= 3.20"
1.7	88	0.0160	0.89		**Shallow Concentrated Flow, Shallow 1** Short Grass Pasture Kv= 7.0 fps
0.3	34	0.1324	1.82		**Shallow Concentrated Flow, Shallow 2** Woodland Kv= 5.0 fps
19.7	222	Total			

Subcatchment E02: E02

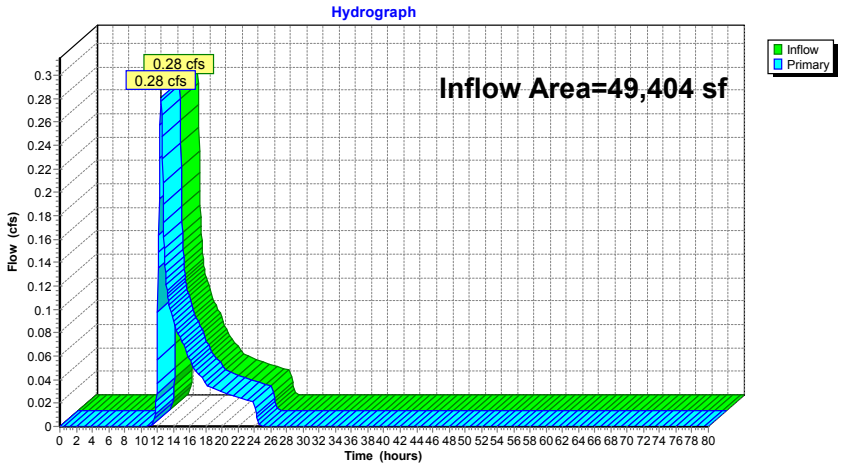


Summary for Link DP-1: DP-1

Inflow Area = 49,404 sf, 2.03% Impervious, Inflow Depth = 0.63" for 25-Year event
Inflow = 0.28 cfs @ 12.46 hrs, Volume= 2,596 cf
Primary = 0.28 cfs @ 12.46 hrs, Volume= 2,596 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Link DP-1: DP-1



Time span=0.00-80.00 hrs, dt=0.05 hrs, 1601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E01: E01 Runoff Area=3,515 sf 28.56% Impervious Runoff Depth=3.32"
Flow Length=125' Tc=7.0 min CN=56 Runoff=0.29 cfs 972 cf

Subcatchment E02: E02 Runoff Area=45,889 sf 0.00% Impervious Runoff Depth=1.63"
Flow Length=222' Tc=19.7 min CN=41 Runoff=1.06 cfs 6,225 cf

Link DP-1: DP-1 Inflow=1.21 cfs 7,197 cf
Primary=1.21 cfs 7,197 cf

Total Runoff Area = 49,404 sf Runoff Volume = 7,197 cf Average Runoff Depth = 1.75"
97.97% Pervious = 48,400 sf 2.03% Impervious = 1,004 sf

Summary for Subcatchment E01: E01

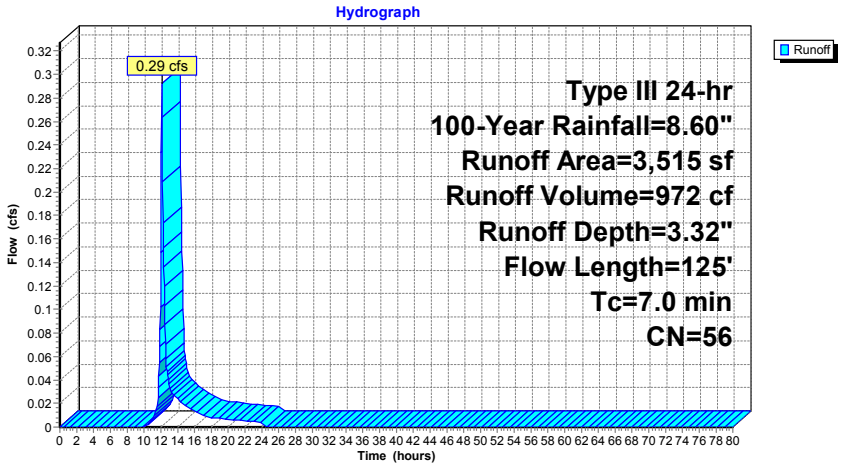
Runoff = 0.29 cfs @ 12.11 hrs, Volume= 972 cf, Depth= 3.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.60"

Area (sf)	CN	Description
571	49	50-75% Grass cover, Fair, HSG A
1,004	98	Paved parking, HSG A
1,940	36	Woods, Fair, HSG A
3,515	56	Weighted Average
2,511		71.44% Pervious Area
1,004		28.56% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	33	0.0670	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.6	8	0.1250	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.8	59	0.0169	1.16		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
0.0	8	0.1250	7.18		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.1	17	0.1760	2.94		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.0	125	Total			

Subcatchment E01: E01



Summary for Subcatchment E02: E02

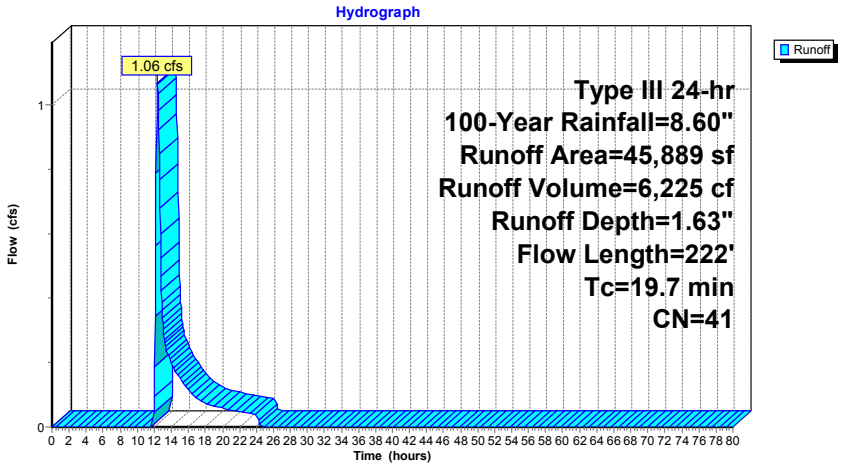
Runoff = 1.06 cfs @ 12.34 hrs, Volume= 6,225 cf, Depth= 1.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.60"

Area (sf)	CN	Description
17,249	49	50-75% Grass cover, Fair, HSG A
28,493	36	Woods, Fair, HSG A
147	96	Gravel surface, HSG A
45,889	41	Weighted Average
45,889		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.2	49	0.0196	0.07		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.20"
5.5	51	0.0224	0.16		**Sheet Flow, Sheet** Grass: Short n= 0.150 P2= 3.20"
1.7	88	0.0160	0.89		**Shallow Concentrated Flow, Shallow 1** Short Grass Pasture Kv= 7.0 fps
0.3	34	0.1324	1.82		**Shallow Concentrated Flow, Shallow 2** Woodland Kv= 5.0 fps
19.7	222	Total			

Subcatchment E02: E02

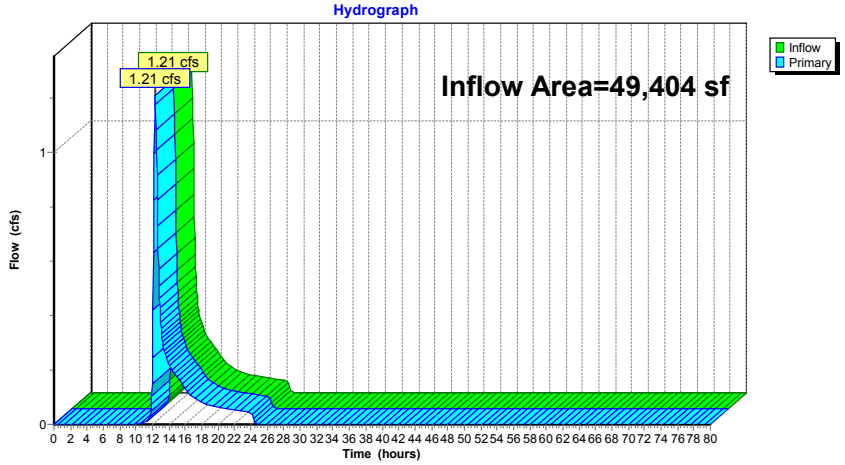


Summary for Link DP-1: DP-1

Inflow Area = 49,404 sf, 2.03% Impervious, Inflow Depth = 1.75" for 100-Year event
Inflow = 1.21 cfs @ 12.32 hrs, Volume= 7,197 cf
Primary = 1.21 cfs @ 12.32 hrs, Volume= 7,197 cf, Atten= 0%, Lag= 0.0 min

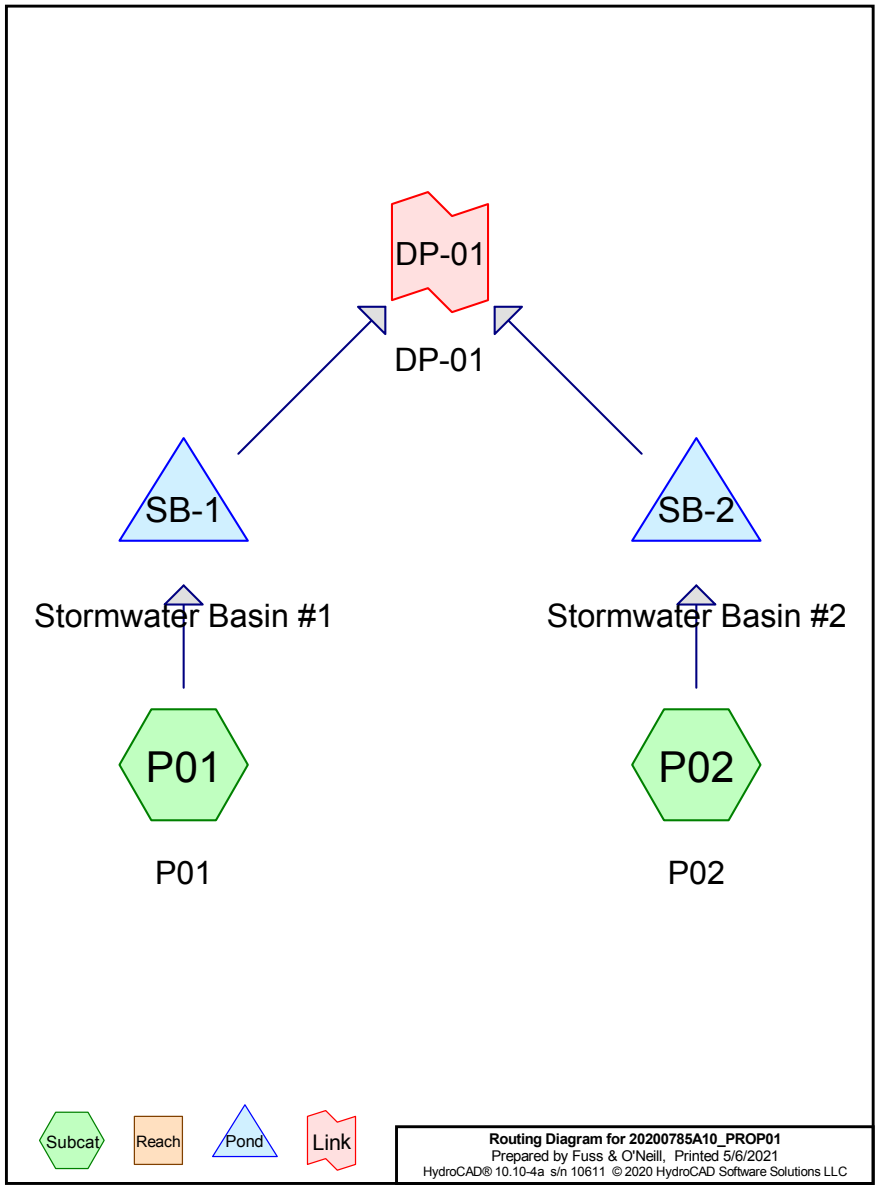
Primary outflow = Inflow, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Link DP-1: DP-1



Appendix E

Post-Development Hydrological Analysis



Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	Type III 24-hr		Default	24.00	1	3.20	2
2	10-Year	Type III 24-hr		Default	24.00	1	4.80	2
3	25-Year	Type III 24-hr		Default	24.00	1	6.00	2
4	100-Year	Type III 24-hr		Default	24.00	1	8.60	2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
16,059	49	50-75% Grass cover, Fair, HSG A (P01, P02)
16,134	98	Paved parking, HSG A (P01, P02)
5,821	98	Water Surface, 0% imp, HSG A (P02)
1,849	98	Water Surface, HSG A (P01)
9,541	36	Woods, Fair, HSG A (P01, P02)
49,404	**70**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
49,404	HSG A	P01, P02
0	HSG B	
0	HSG C	
0	HSG D	
0	Other	
49,404		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Subcatch Numbers
16,059	0	0	0	0	16,059	50-75% Grass cover, Fair	
16,134	0	0	0	0	16,134	Paved parking	
1,849	0	0	0	0	1,849	Water Surface	
5,821	0	0	0	0	5,821	Water Surface, 0% imp	
9,541	0	0	0	0	9,541	Woods, Fair	
49,404	**0**	**0**	**0**	**0**	**49,404**	**TOTAL AREA**	

Time span=0.00-60.00 hrs, dt=0.05 hrs, 1201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P01: P01 Runoff Area=13,249 sf 53.56% Impervious Runoff Depth=0.98"
Flow Length=180' Tc=10.9 min CN=73 Runoff=0.28 cfs 1,085 cf

Subcatchment P02: P02 Runoff Area=36,155 sf 30.11% Impervious Runoff Depth=0.78"
Flow Length=220' Tc=15.4 min CN=69 Runoff=0.49 cfs 2,349 cf

Pond SB-1: Stormwater Basin #1 Peak Elev=171.87' Storage=1,085 cf Inflow=0.28 cfs 1,085 cf
Outflow=0.00 cfs 0 cf

Pond SB-2: Stormwater Basin #2 Peak Elev=171.59' Storage=2,349 cf Inflow=0.49 cfs 2,349 cf
Outflow=0.00 cfs 0 cf

Link DP-01: DP-01 Inflow=0.00 cfs 0 cf
Primary=0.00 cfs 0 cf

Total Runoff Area = 49,404 sf Runoff Volume = 3,434 cf Average Runoff Depth = 0.83"
63.60% Pervious = 31,421 sf 36.40% Impervious = 17,983 sf

Summary for Subcatchment P01: P01

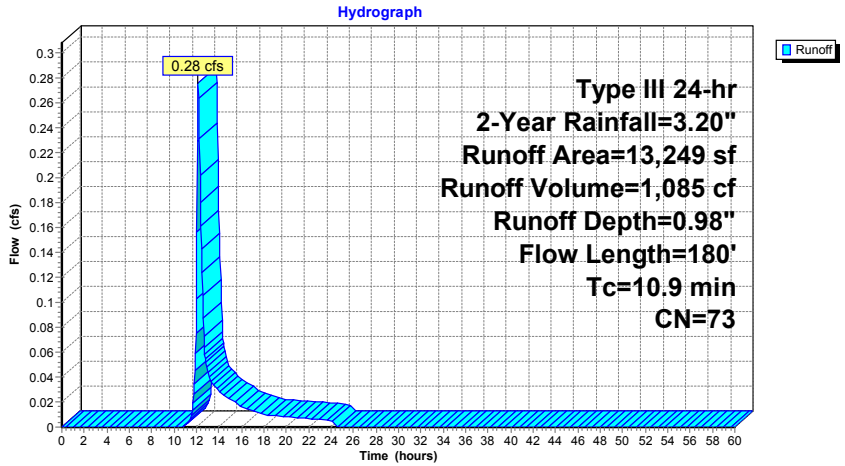
Runoff = 0.28 cfs @ 12.17 hrs, Volume= 1,085 cf, Depth= 0.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
4,298	49	50-75% Grass cover, Fair, HSG A
5,247	98	Paved parking, HSG A
1,855	36	Woods, Fair, HSG A
1,849	98	Water Surface, HSG A
13,249	73	Weighted Average
6,153		46.44% Pervious Area
7,096		53.56% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.2	65	0.0077	0.11		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.3	35	0.0570	1.70		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
0.3	63	0.0400	4.06		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.1	17	0.1900	3.05		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
10.9	180	Total			

Subcatchment P01: P01



Summary for Subcatchment P02: P02

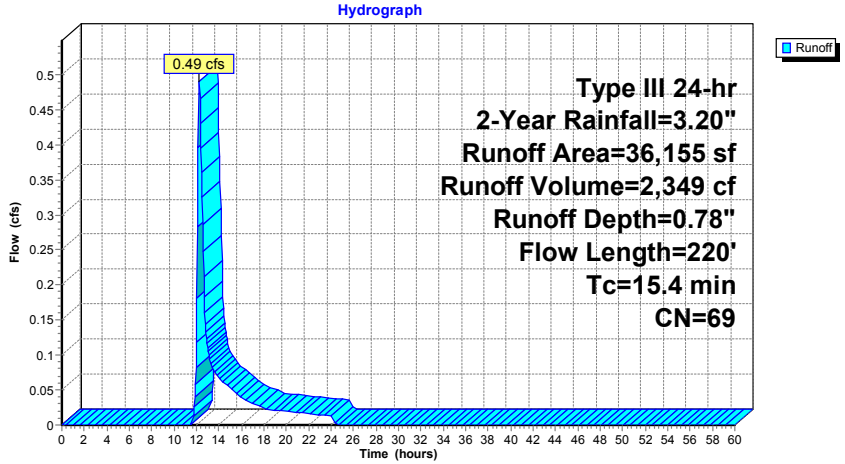
Runoff = 0.49 cfs @ 12.25 hrs, Volume= 2,349 cf, Depth= 0.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
11,761	49	50-75% Grass cover, Fair, HSG A
7,686	36	Woods, Fair, HSG A
10,887	98	Paved parking, HSG A
5,821	98	Water Surface, 0% imp, HSG A
36,155	69	Weighted Average
25,268		69.89% Pervious Area
10,887		30.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.8	100	0.0125	0.14		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
3.6	120	0.0063	0.56		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
15.4	220	Total			

Subcatchment P02: P02



Summary for Pond SB-1: Stormwater Basin #1

Inflow Area = 13,249 sf, 53.56% Impervious, Inflow Depth = 0.98" for 2-Year event
Inflow = 0.28 cfs @ 12.17 hrs, Volume= 1,085 cf
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Peak Elev= 171.87' @ 24.65 hrs Surf.Area= 1,479 sf Storage= 1,085 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

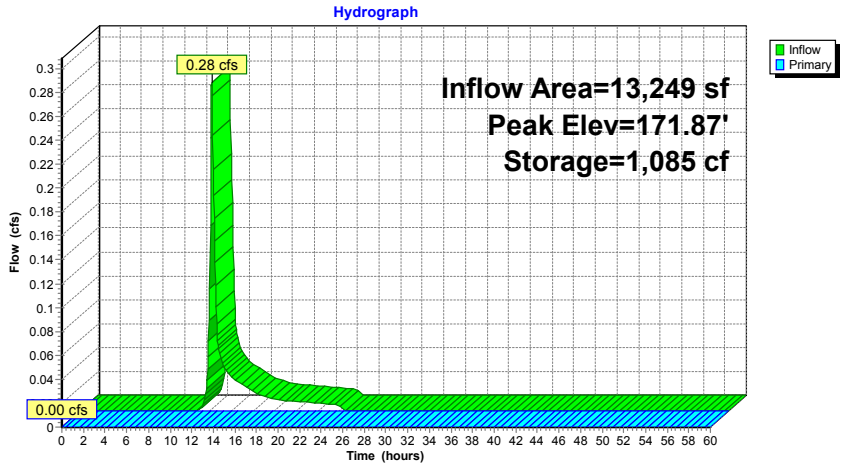
Volume	Invert	Avail.Storage	Storage Description
#1	171.00'	2,975 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
171.00	1,004	0	0
172.00	1,548	1,276	1,276
173.00	1,849	1,699	2,975

Device	Routing	Invert	Outlet Devices
#1	Primary	172.50'	**10.0' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=171.00' (Free Discharge)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond SB-1: Stormwater Basin #1



Summary for Pond SB-2: Stormwater Basin #2

Inflow Area = 36,155 sf, 30.11% Impervious, Inflow Depth = 0.78" for 2-Year event
Inflow = 0.49 cfs @ 12.25 hrs, Volume= 2,349 cf
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Peak Elev= 171.59' @ 24.95 hrs Surf.Area= 4,439 sf Storage= 2,349 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

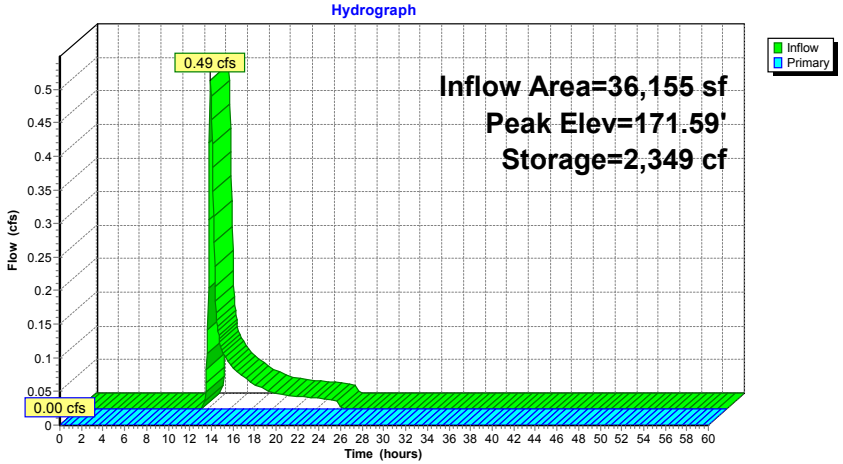
Volume	Invert	Avail.Storage	Storage Description
#1	171.00'	10,274 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
171.00	3,462	0	0
172.00	5,106	4,284	4,284
173.00	6,873	5,990	10,274

Device	Routing	Invert	Outlet Devices
#1	Primary	172.50'	**10.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=171.00' (Free Discharge)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond SB-2: Stormwater Basin #2

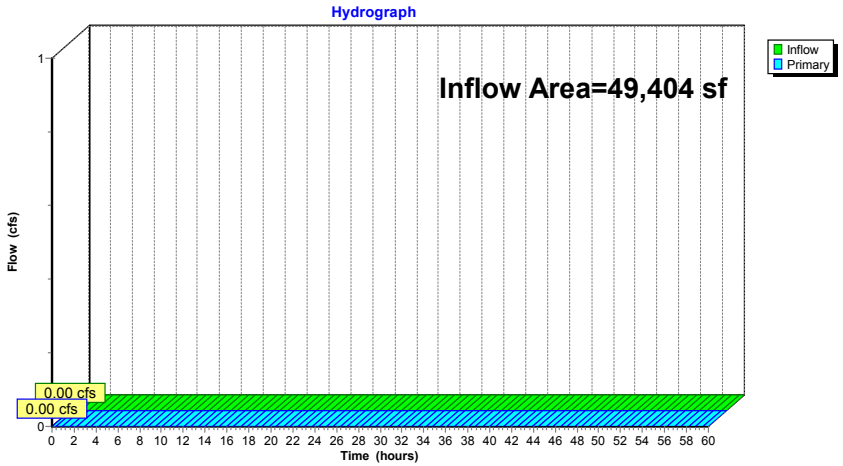


Summary for Link DP-01: DP-01

Inflow Area = 49,404 sf, 36.40% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs

Link DP-01: DP-01



Time span=0.00-60.00 hrs, dt=0.05 hrs, 1201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P01: P01 Runoff Area=13,249 sf 53.56% Impervious Runoff Depth=2.12"
Flow Length=180' Tc=10.9 min CN=73 Runoff=0.63 cfs 2,346 cf

Subcatchment P02: P02 Runoff Area=36,155 sf 30.11% Impervious Runoff Depth=1.81"
Flow Length=220' Tc=15.4 min CN=69 Runoff=1.27 cfs 5,463 cf

Pond SB-1: Stormwater Basin #1 Peak Elev=172.50' Storage=2,095 cf Inflow=0.63 cfs 2,346 cf
Outflow=0.02 cfs 258 cf

Pond SB-2: Stormwater Basin #2 Peak Elev=172.22' Storage=5,463 cf Inflow=1.27 cfs 5,463 cf
Outflow=0.00 cfs 0 cf

Link DP-01: DP-01 Inflow=0.02 cfs 258 cf
Primary=0.02 cfs 258 cf

Total Runoff Area = 49,404 sf Runoff Volume = 7,809 cf Average Runoff Depth = 1.90"
63.60% Pervious = 31,421 sf 36.40% Impervious = 17,983 sf

Summary for Subcatchment P01: P01

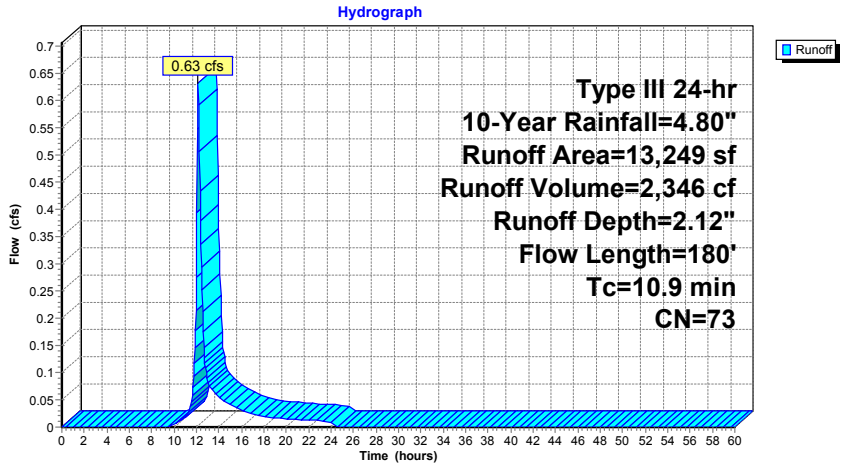
Runoff = 0.63 cfs @ 12.16 hrs, Volume= 2,346 cf, Depth= 2.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (sf)	CN	Description
4,298	49	50-75% Grass cover, Fair, HSG A
5,247	98	Paved parking, HSG A
1,855	36	Woods, Fair, HSG A
1,849	98	Water Surface, HSG A
13,249	73	Weighted Average
6,153		46.44% Pervious Area
7,096		53.56% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.2	65	0.0077	0.11		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.3	35	0.0570	1.70		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
0.3	63	0.0400	4.06		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.1	17	0.1900	3.05		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
10.9	180	Total			

Subcatchment P01: P01



Summary for Subcatchment P02: P02

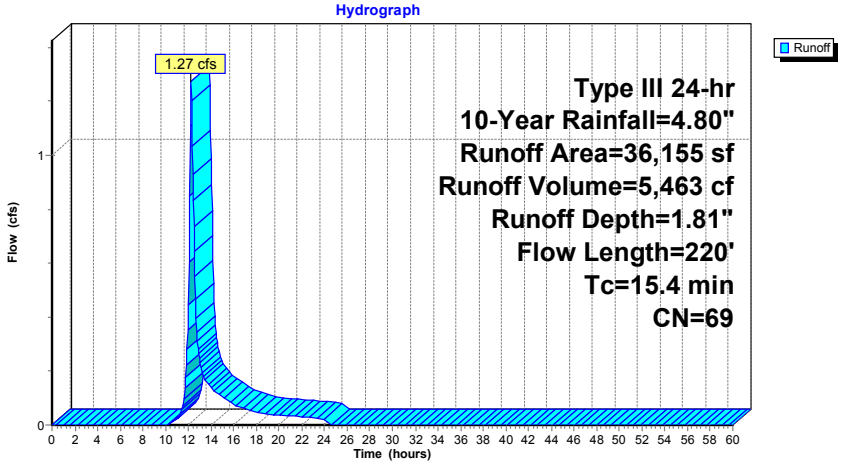
Runoff = 1.27 cfs @ 12.22 hrs, Volume= 5,463 cf, Depth= 1.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (sf)	CN	Description
11,761	49	50-75% Grass cover, Fair, HSG A
7,686	36	Woods, Fair, HSG A
10,887	98	Paved parking, HSG A
5,821	98	Water Surface, 0% imp, HSG A
36,155	69	Weighted Average
25,268		69.89% Pervious Area
10,887		30.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.8	100	0.0125	0.14		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
3.6	120	0.0063	0.56		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
15.4	220	Total			

Subcatchment P02: P02



Summary for Pond SB-1: Stormwater Basin #1

Inflow Area = 13,249 sf, 53.56% Impervious, Inflow Depth = 2.12" for 10-Year event
Inflow = 0.63 cfs @ 12.16 hrs, Volume= 2,346 cf
Outflow = 0.02 cfs @ 19.29 hrs, Volume= 258 cf, Atten= 97%, Lag= 427.8 min
Primary = 0.02 cfs @ 19.29 hrs, Volume= 258 cf

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Peak Elev= 172.50' @ 19.29 hrs Surf.Area= 1,700 sf Storage= 2,095 cf

Plug-Flow detention time= 590.1 min calculated for 258 cf (11% of inflow)
Center-of-Mass det. time= 432.8 min (1,279.4 - 846.6)

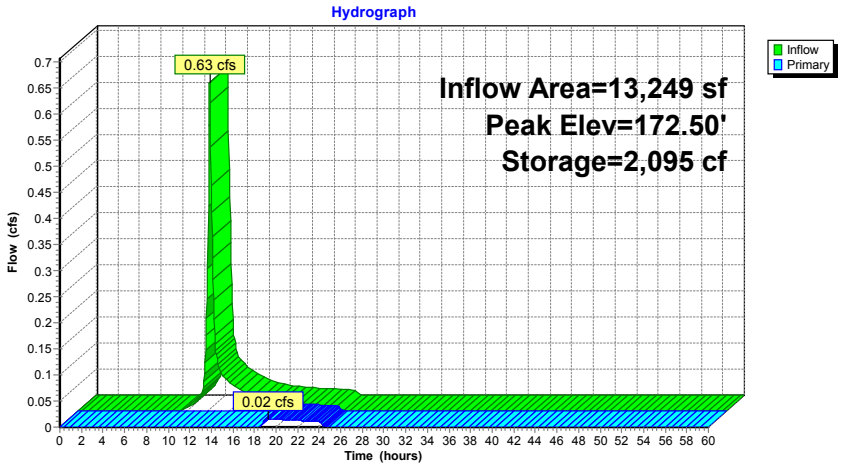
Volume	Invert	Avail.Storage	Storage Description
#1	171.00'	2,975 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
171.00	1,004	0	0
172.00	1,548	1,276	1,276
173.00	1,849	1,699	2,975

Device	Routing	Invert	Outlet Devices
#1	Primary	172.50'	**10.0' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=0.01 cfs @ 19.29 hrs HW=172.50' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 0.01 cfs @ 0.17 fps)

Pond SB-1: Stormwater Basin #1



Summary for Pond SB-2: Stormwater Basin #2

Inflow Area = 36,155 sf, 30.11% Impervious, Inflow Depth = 1.81" for 10-Year event
Inflow = 1.27 cfs @ 12.22 hrs, Volume= 5,463 cf
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Peak Elev= 172.22' @ 24.95 hrs Surf.Area= 5,499 sf Storage= 5,463 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

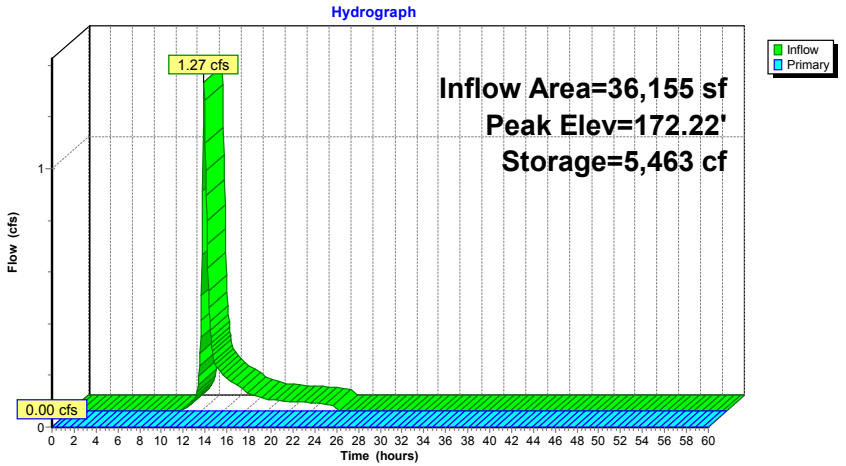
Volume	Invert	Avail.Storage	Storage Description
#1	171.00'	10,274 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
171.00	3,462	0	0
172.00	5,106	4,284	4,284
173.00	6,873	5,990	10,274

Device	Routing	Invert	Outlet Devices
#1	Primary	172.50'	**10.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=171.00' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond SB-2: Stormwater Basin #2

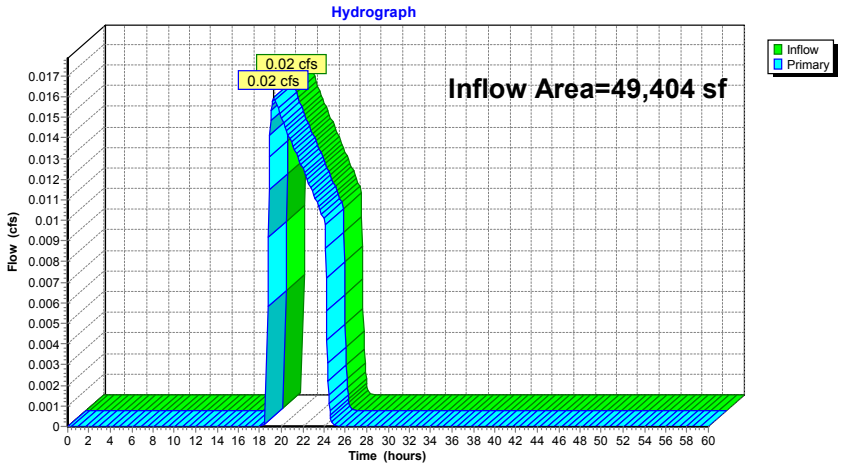


Summary for Link DP-01: DP-01

Inflow Area = 49,404 sf, 36.40% Impervious, Inflow Depth = 0.06" for 10-Year event
Inflow = 0.02 cfs @ 19.29 hrs, Volume= 258 cf
Primary = 0.02 cfs @ 19.29 hrs, Volume= 258 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs

Link DP-01: DP-01



Time span=0.00-60.00 hrs, dt=0.05 hrs, 1201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P01: P01 Runoff Area=13,249 sf 53.56% Impervious Runoff Depth=3.09"
Flow Length=180' Tc=10.9 min CN=73 Runoff=0.93 cfs 3,410 cf

Subcatchment P02: P02 Runoff Area=36,155 sf 30.11% Impervious Runoff Depth=2.71"
Flow Length=220' Tc=15.4 min CN=69 Runoff=1.95 cfs 8,173 cf

Pond SB-1: Stormwater Basin #1 Peak Elev=172.52' Storage=2,128 cf Inflow=0.93 cfs 3,410 cf
Outflow=0.09 cfs 1,322 cf

Pond SB-2: Stormwater Basin #2 Peak Elev=172.51' Storage=7,146 cf Inflow=1.95 cfs 8,173 cf
Outflow=0.06 cfs 1,115 cf

Link DP-01: DP-01 Inflow=0.09 cfs 2,437 cf
Primary=0.09 cfs 2,437 cf

Total Runoff Area = 49,404 sf Runoff Volume = 11,583 cf Average Runoff Depth = 2.81"
63.60% Pervious = 31,421 sf 36.40% Impervious = 17,983 sf

Summary for Subcatchment P01: P01

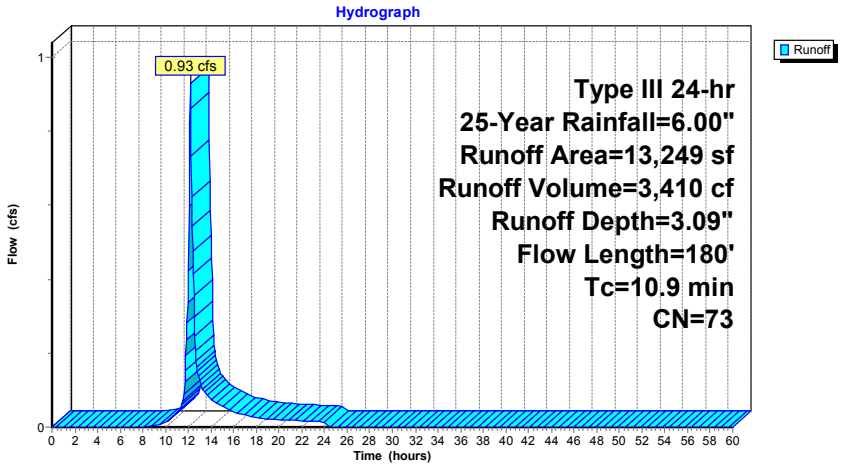
Runoff = 0.93 cfs @ 12.16 hrs, Volume= 3,410 cf, Depth= 3.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.00"

Area (sf)	CN	Description
4,298	49	50-75% Grass cover, Fair, HSG A
5,247	98	Paved parking, HSG A
1,855	36	Woods, Fair, HSG A
1,849	98	Water Surface, HSG A
13,249	73	Weighted Average
6,153		46.44% Pervious Area
7,096		53.56% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.2	65	0.0077	0.11		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.3	35	0.0570	1.70		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
0.3	63	0.0400	4.06		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.1	17	0.1900	3.05		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
10.9	180	Total			

Subcatchment P01: P01



Summary for Subcatchment P02: P02

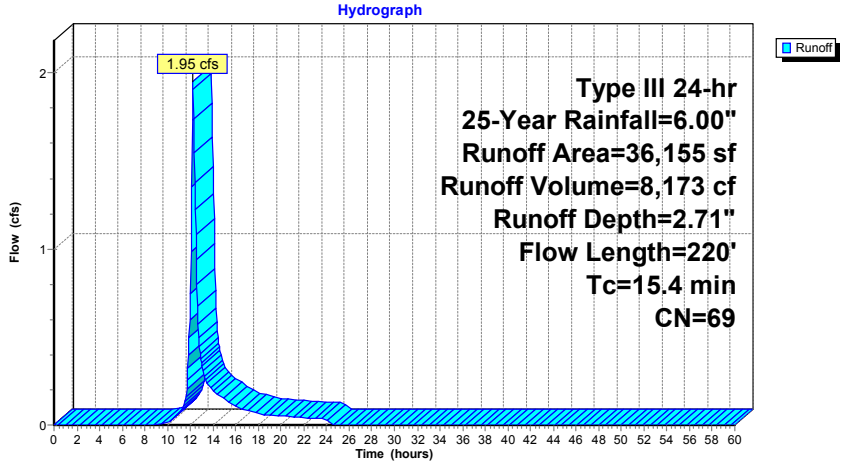
Runoff = 1.95 cfs @ 12.22 hrs, Volume= 8,173 cf, Depth= 2.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.00"

Area (sf)	CN	Description
11,761	49	50-75% Grass cover, Fair, HSG A
7,686	36	Woods, Fair, HSG A
10,887	98	Paved parking, HSG A
5,821	98	Water Surface, 0% imp, HSG A
36,155	69	Weighted Average
25,268		69.89% Pervious Area
10,887		30.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.8	100	0.0125	0.14		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
3.6	120	0.0063	0.56		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
15.4	220	Total			

Subcatchment P02: P02



Summary for Pond SB-1: Stormwater Basin #1

Inflow Area = 13,249 sf, 53.56% Impervious, Inflow Depth = 3.09" for 25-Year event
Inflow = 0.93 cfs @ 12.16 hrs, Volume= 3,410 cf
Outflow = 0.09 cfs @ 13.51 hrs, Volume= 1,322 cf, Atten= 90%, Lag= 81.3 min
Primary = 0.09 cfs @ 13.51 hrs, Volume= 1,322 cf

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Peak Elev= 172.52' @ 13.51 hrs Surf.Area= 1,706 sf Storage= 2,128 cf

Plug-Flow detention time= 304.3 min calculated for 1,321 cf (39% of inflow)
Center-of-Mass det. time= 179.8 min (1,015.5 - 835.7)

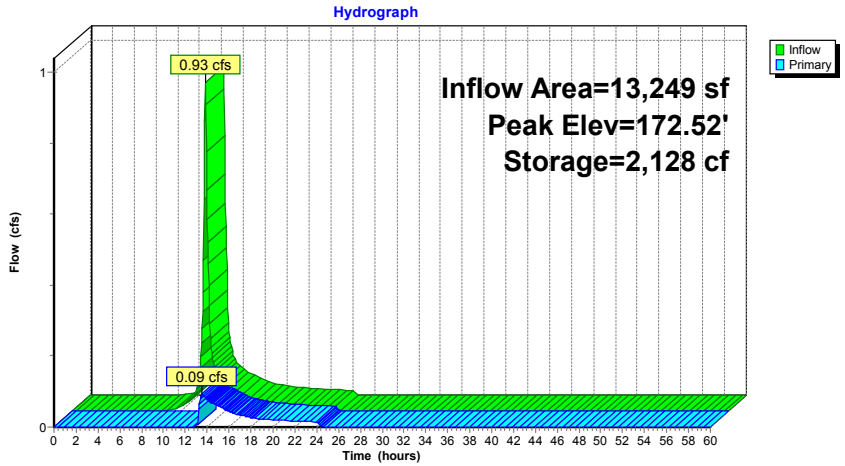
Volume	Invert	Avail.Storage	Storage Description
#1	171.00'	2,975 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
171.00	1,004	0	0
172.00	1,548	1,276	1,276
173.00	1,849	1,699	2,975

Device	Routing	Invert	Outlet Devices
#1	Primary	172.50'	**10.0' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=0.09 cfs @ 13.51 hrs HW=172.52' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 0.09 cfs @ 0.37 fps)

Pond SB-1: Stormwater Basin #1



Summary for Pond SB-2: Stormwater Basin #2

Inflow Area = 36,155 sf, 30.11% Impervious, Inflow Depth = 2.71" for 25-Year event
Inflow = 1.95 cfs @ 12.22 hrs, Volume= 8,173 cf
Outflow = 0.06 cfs @ 19.18 hrs, Volume= 1,115 cf, Atten= 97%, Lag= 417.9 min
Primary = 0.06 cfs @ 19.18 hrs, Volume= 1,115 cf

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Peak Elev= 172.51' @ 19.18 hrs Surf.Area= 6,015 sf Storage= 7,146 cf

Plug-Flow detention time= 568.4 min calculated for 1,114 cf (14% of inflow)
Center-of-Mass det. time= 416.0 min (1,265.4 - 849.3)

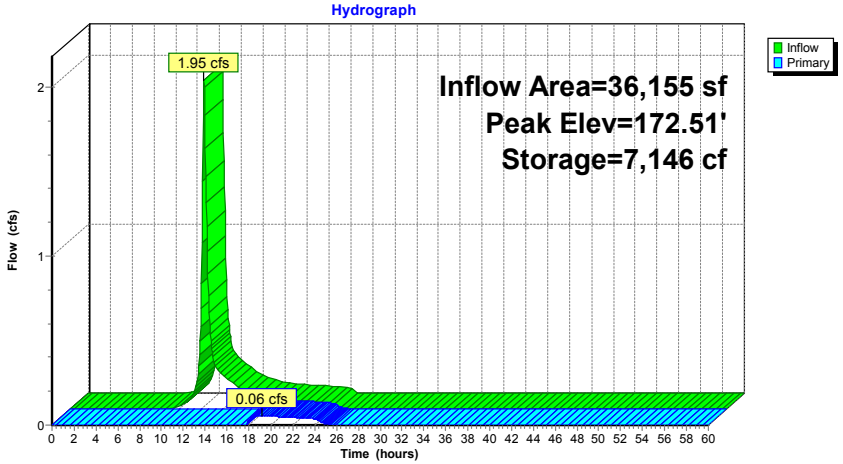
Volume	Invert	Avail.Storage	Storage Description
#1	171.00'	10,274 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
171.00	3,462	0	0
172.00	5,106	4,284	4,284
173.00	6,873	5,990	10,274

Device	Routing	Invert	Outlet Devices
#1	Primary	172.50'	**10.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Primary OutFlow Max=0.05 cfs @ 19.18 hrs HW=172.51' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 0.05 cfs @ 0.33 fps)

Pond SB-2: Stormwater Basin #2

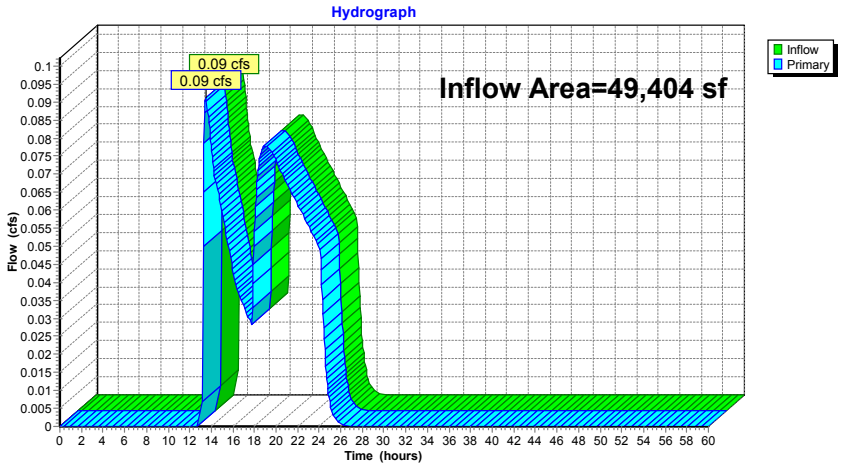


Summary for Link DP-01: DP-01

Inflow Area = 49,404 sf, 36.40% Impervious, Inflow Depth = 0.59" for 25-Year event
Inflow = 0.09 cfs @ 13.51 hrs, Volume= 2,437 cf
Primary = 0.09 cfs @ 13.51 hrs, Volume= 2,437 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs

Link DP-01: DP-01



Time span=0.00-60.00 hrs, dt=0.05 hrs, 1201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P01: P01 Runoff Area=13,249 sf 53.56% Impervious Runoff Depth=5.35"
Flow Length=180' Tc=10.9 min CN=73 Runoff=1.60 cfs 5,901 cf

Subcatchment P02: P02 Runoff Area=36,155 sf 30.11% Impervious Runoff Depth=4.86"
Flow Length=220' Tc=15.4 min CN=69 Runoff=3.53 cfs 14,655 cf

Pond SB-1: Stormwater Basin #1 Peak Elev=172.63' Storage=2,305 cf Inflow=1.60 cfs 5,901 cf
Outflow=1.10 cfs 3,814 cf

Pond SB-2: Stormwater Basin #2 Peak Elev=172.60' Storage=7,680 cf Inflow=3.53 cfs 14,655 cf
Outflow=0.88 cfs 7,597 cf

Link DP-01: DP-01 Inflow=1.21 cfs 11,411 cf
Primary=1.21 cfs 11,411 cf

Total Runoff Area = 49,404 sf Runoff Volume = 20,556 cf Average Runoff Depth = 4.99"
63.60% Pervious = 31,421 sf 36.40% Impervious = 17,983 sf

Summary for Subcatchment P01: P01

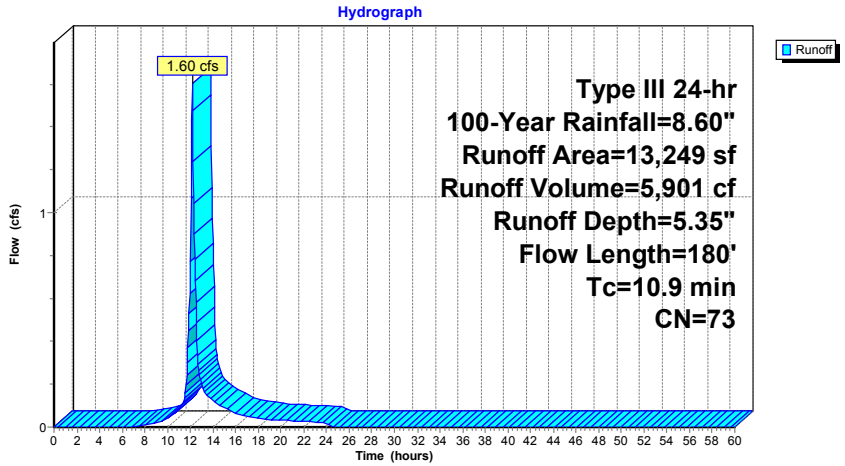
Runoff = 1.60 cfs @ 12.15 hrs, Volume= 5,901 cf, Depth= 5.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.60"

Area (sf)	CN	Description
4,298	49	50-75% Grass cover, Fair, HSG A
5,247	98	Paved parking, HSG A
1,855	36	Woods, Fair, HSG A
1,849	98	Water Surface, HSG A
13,249	73	Weighted Average
6,153		46.44% Pervious Area
7,096		53.56% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.2	65	0.0077	0.11		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.3	35	0.0570	1.70		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
0.3	63	0.0400	4.06		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.1	17	0.1900	3.05		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
10.9	180	Total			

Subcatchment P01: P01



Summary for Subcatchment P02: P02

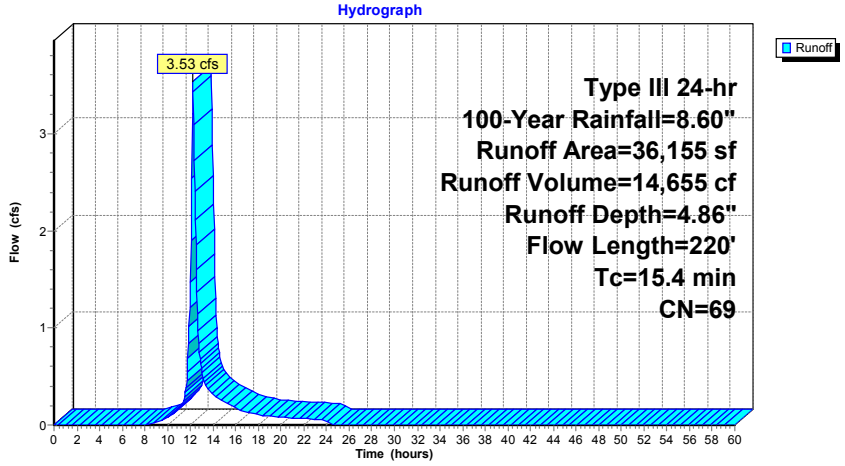
Runoff = 3.53 cfs @ 12.21 hrs, Volume= 14,655 cf, Depth= 4.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.60"

Area (sf)	CN	Description
11,761	49	50-75% Grass cover, Fair, HSG A
7,686	36	Woods, Fair, HSG A
10,887	98	Paved parking, HSG A
5,821	98	Water Surface, 0% imp, HSG A
36,155	69	Weighted Average
25,268		69.89% Pervious Area
10,887		30.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.8	100	0.0125	0.14		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
3.6	120	0.0063	0.56		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
15.4	220	Total			

Subcatchment P02: P02



Summary for Pond SB-1: Stormwater Basin #1

Inflow Area = 13,249 sf, 53.56% Impervious, Inflow Depth = 5.35" for 100-Year event
Inflow = 1.60 cfs @ 12.15 hrs, Volume= 5,901 cf
Outflow = 1.10 cfs @ 12.31 hrs, Volume= 3,814 cf, Atten= 31%, Lag= 9.2 min
Primary = 1.10 cfs @ 12.31 hrs, Volume= 3,814 cf

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Peak Elev= 172.63' @ 12.31 hrs Surf.Area= 1,737 sf Storage= 2,305 cf

Plug-Flow detention time= 176.8 min calculated for 3,814 cf (65% of inflow)
Center-of-Mass det. time= 75.4 min (895.4 - 820.0)

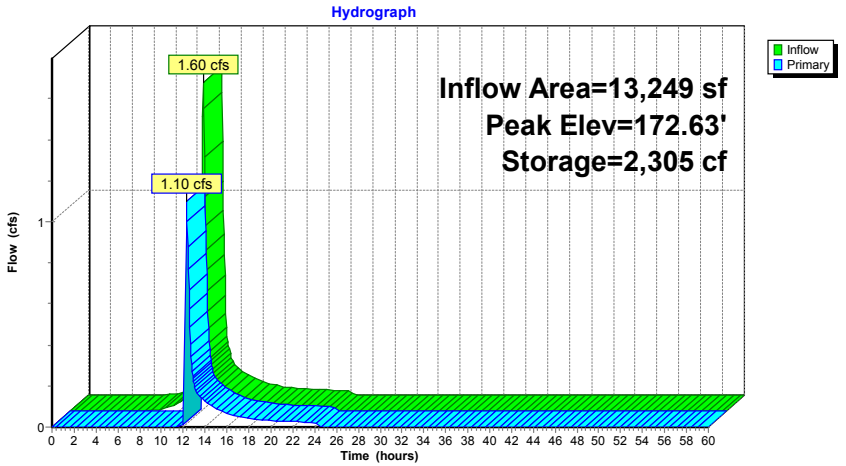
Volume	Invert	Avail.Storage	Storage Description
#1	171.00'	2,975 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
171.00	1,004	0	0
172.00	1,548	1,276	1,276
173.00	1,849	1,699	2,975

Device	Routing	Invert	Outlet Devices
#1	Primary	172.50'	**10.0' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=1.08 cfs @ 12.31 hrs HW=172.63' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 1.08 cfs @ 0.86 fps)

Pond SB-1: Stormwater Basin #1



Summary for Pond SB-2: Stormwater Basin #2

Inflow Area = 36,155 sf, 30.11% Impervious, Inflow Depth = 4.86" for 100-Year event
Inflow = 3.53 cfs @ 12.21 hrs, Volume= 14,655 cf
Outflow = 0.88 cfs @ 12.74 hrs, Volume= 7,597 cf, Atten= 75%, Lag= 31.5 min
Primary = 0.88 cfs @ 12.74 hrs, Volume= 7,597 cf

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Peak Elev= 172.60' @ 12.74 hrs Surf.Area= 6,170 sf Storage= 7,680 cf

Plug-Flow detention time= 242.1 min calculated for 7,597 cf (52% of inflow)
Center-of-Mass det. time= 127.1 min (959.5 - 832.4)

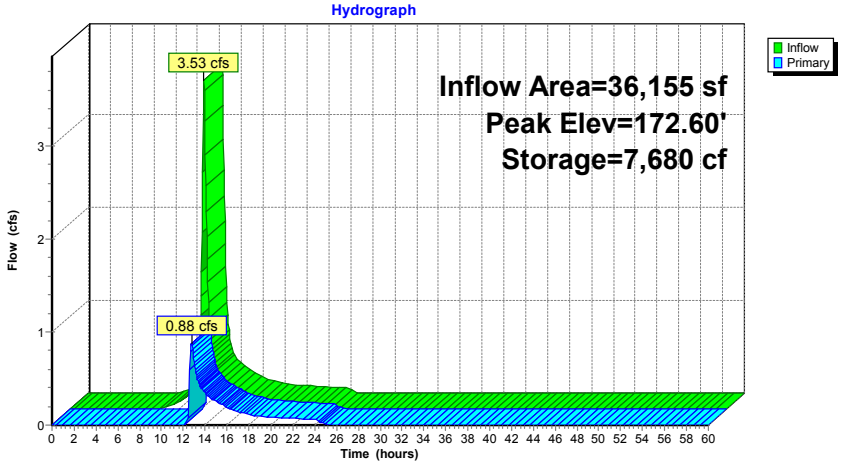
Volume	Invert	Avail.Storage	Storage Description
#1	171.00'	10,274 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
171.00	3,462	0	0
172.00	5,106	4,284	4,284
173.00	6,873	5,990	10,274

Device	Routing	Invert	Outlet Devices
#1	Primary	172.50'	**10.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Primary OutFlow Max=0.88 cfs @ 12.74 hrs HW=172.60' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 0.88 cfs @ 0.86 fps)

Pond SB-2: Stormwater Basin #2

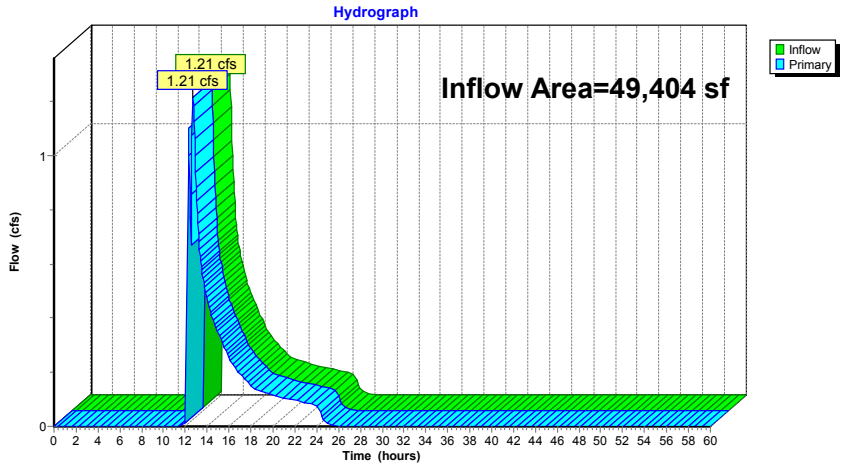


Summary for Link DP-01: DP-01

Inflow Area = 49,404 sf, 36.40% Impervious, Inflow Depth = 2.77" for 100-Year event
Inflow = 1.21 cfs @ 12.70 hrs, Volume= 11,411 cf
Primary = 1.21 cfs @ 12.70 hrs, Volume= 11,411 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs

Link DP-01: DP-01



Appendix F

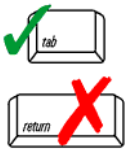
Stormwater Management Checklist

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

Checklist for Stormwater Report

A. Introduction

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



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

The Stormwater Report must include:

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

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

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

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

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

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

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

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

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

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

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

Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature

E M Bernardin 12/22/2021

Signature and Date

Checklist

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

☐ New development

☐ Redevelopment

☒ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

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

☒ No disturbance to any Wetland Resource Areas

☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)

☐ Reduced Impervious Area (Redevelopment Only)

☐ Minimizing disturbance to existing trees and shrubs

☐ LID Site Design Credit Requested:

- ☐ Credit 1
- ☐ Credit 2
- ☐ Credit 3

☒ Use of "country drainage" versus curb and gutter conveyance and pipe

☒ Bioretention Cells (includes Rain Gardens)

☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)

☐ Treebox Filter

☐ Water Quality Swale

☐ Grass Channel

☐ Green Roof

☐ Other (describe): _____

Standard 1: No New Untreated Discharges

☒ No new untreated discharges

☐ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth

☐ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

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

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

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

Standard 3: Recharge

☒ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

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

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

☐ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

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

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

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

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

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

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

☐ Solid Waste Landfill pursuant to 310 CMR 19.000

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

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

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

Standard 4: Water Quality

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

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

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

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

☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.

☒ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted ***prior to*** the discharge of stormwater to the post-construction stormwater BMPs.

☐ The NPDES Multi-Sector General Permit does ***not*** cover the land use.

☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.

☐ All exposure has been eliminated.

☐ All exposure has ***not*** been eliminated and all BMPs selected are on MassDEP LUHPPL list.

☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

☐ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.

☐ Critical areas and BMPs are identified in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

☐ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:

- ☐ Limited Project
- ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
- ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
- ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
- ☐ Bike Path and/or Foot Path
- ☐ Redevelopment Project
- ☐ Redevelopment portion of mix of new and redevelopment.

☐ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.

☐ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
- Construction Period Operation and Maintenance Plan;
- Names of Persons or Entity Responsible for Plan Compliance;
- Construction Period Pollution Prevention Measures;
- Erosion and Sedimentation Control Plan Drawings;
- Detail drawings and specifications for erosion control BMPs, including sizing calculations;
- Vegetation Planning;
- Site Development Plan;
- Construction Sequencing Plan;
- Sequencing of Erosion and Sedimentation Controls;
- Operation and Maintenance of Erosion and Sedimentation Controls;
- Inspection Schedule;
- Maintenance Schedule;
- Inspection and Maintenance Log Form.

☒ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has ***not*** been included in the Stormwater Report but will be submitted ***before*** land disturbance begins.

☐ The project is ***not*** covered by a NPDES Construction General Permit.

☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.

☒ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:

- ☒ Name of the stormwater management system owners;
- ☒ Party responsible for operation and maintenance;
- ☒ Schedule for implementation of routine and non-routine maintenance tasks;
- ☒ Plan showing the location of all stormwater BMPs maintenance access areas;
- ☐ Description and delineation of public safety features;
- ☐ Estimated operation and maintenance budget; and
- ☒ Operation and Maintenance Log Form.

☐ The responsible party is ***not*** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:

- ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
- ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

☐ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☐ An Illicit Discharge Compliance Statement is attached;

☒ NO Illicit Discharge Compliance Statement is attached but will be submitted ***prior to*** the discharge of any stormwater to post-construction BMPs.

Appendix G

Water Quality Treatment Calculations

FUSS & O'NEILL

Project: Broadacres Farm Parking Lot
Sudbury, MA

Date: 5/7/21

REQUIRED WATER QUALITY VOLUME (V_{WQ})

V_{WQ}= (Dwq/12 inches/foot)*(Impervious Area)
Dwq= 0.5

Stormwater Basin #1

Impervious Area Contributing=
7,096 SF

***REQUIRED V_{WQ}=**	**296 CF**
PROVIDED WQV STORAGE=	**2,086** CF

Stormwater Basin #1

Impervious Area Contributing=
10,887 SF

***REQUIRED V_{WQ}=**	**454 CF**
PROVIDED WQV STORAGE=	**7,058 CF**

Appendix H

TSS Removal Calculations

INSTRUCTIONS:
1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Version 1, Automated: Mar. 4, 2008

Location: Bioretention Basin #1 w/Forebay Pre-treatment

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Bioretention Area	**0.90**	**1.00**	**0.90**	**0.10**
	0.00	**0.10**	**0.00**	**0.10**
	0.00	**0.10**	**0.00**	**0.10**
	0.00	**0.10**	**0.00**	**0.10**
	0.00	**0.10**	**0.00**	**0.10**

Total TSS Removal = **90%**

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: **Broadacres Farm Parking Lot**
Prepared By: **VAH**
Date: **5/7/2021**

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed

1. From MassDEP Stormwater Handbook Vol. 1

INSTRUCTIONS:
1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Version 1, Automated: Mar. 4, 2008

Location: Bioretention Basin #2 w/Forebay Pre-treatment

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Bioretention Area	**0.90**	**1.00**	**0.90**	**0.10**
	0.00	**0.10**	**0.00**	**0.10**
	0.00	**0.10**	**0.00**	**0.10**
	0.00	**0.10**	**0.00**	**0.10**
	0.00	**0.10**	**0.00**	**0.10**

Total TSS Removal = **90%**

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: **Broadacres Farm Parking Lot**
Prepared By: **VAH**
Date: **5/7/2021**

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed

1. From MassDEP Stormwater Handbook Vol. 1

Appendix I

Groundwater Recharge Calculations & 72 Hour Drawdown

FUSS & O'NEILL

BIORETENTION BASIN #1

REQUIRED RECHARGE VOLUME

Rv = F * IMPERVIOUS AREA

F= 0.6 INCH Soil A

Contributing to Infiltration Basin #1
Receives Stormwater From Catch P8D, P15, P17A & P17B

Total Impervious=	7,096	SF
Impervious Soil A=	7,096	SF

Infiltration Basin #1 Rv= 355 CF

Stormwater Infiltration Basin #1 Design

Provided Storage Volume= 2,086 CF > 355 CF
(Per HydroCAD, at lowest outlet el. 172.5)

72 HOUR DRAWDOWN

$$\text{Time drawdown} = \frac{Rv}{(K)(\text{Bottom Area})}$$

Rv= storage volume of basin*
Soil a K= 2.41 inch/hour

Bottom Area of System=	1,004	SF	(at elevation 171)
System Storage=	2,086	CF	storage volume per HyrdoCAD
T drawdown=	10	hours	< 72 hours

FUSS & O'NEILL

BIORETENTION BASIN #2

REQUIRED RECHARGE VOLUME

Rv = F * IMPERVIOUS AREA

F= 0.6 INCH Soil A

Contributing to Infiltration Basin #1
Receives Stormwater From Catch P8D, P15, P17A & P17B

Total Impervious=	10,887	SF
Impervious Soil A=	10,887	SF

Infiltration Basin #1 Rv= 544 CF

Stormwater Infiltration Basin #1 Design

Provided Storage Volume= 7,058 CF > 544 CF
(Per HydroCAD, at lowest outlet el. 172.5)

72 HOUR DRAWDOWN

$$\text{Time drawdown} = \frac{Rv}{(K)(\text{Bottom Area})}$$

Rv= storage volume of basin*
Soil A K= 2.41 inch/hour

Bottom Area of System=	3,462	SF	(at elevation 171)
System Storage=	7,058	CF	storage volume per HyrdoCAD
T drawdown=	10	hours	< 72 hours

Appendix J

Construction Operation and Maintenance Plan

M E M O R A N D U M

TO: Town of Sudbury

FROM: Fuss & O'Neill, Inc.

DATE: May 7, 2021

RE: Construction Operation and Maintenance Plan
Broadacres Farm Parking Lot
Sudbury, MA

This suggested Construction Operation and Maintenance Plan (O&M) is for the construction of the Broadacres Farm Parking Lot located off Morse Road in Sudbury, Massachusetts. This O&M Plan has been prepared in accordance with the Massachusetts Stormwater Handbook.

Property Owner: Town of Sudbury
322 Concord Road
Sudbury, MA 01776

Responsible Party: Site Contractor

The contractor shall be responsible for the operation and maintenance of the site during construction. Construction includes construction of a new parking lot to access the rail trail and related site amenities. A suggested operation and maintenance activities plan and proposed schedule for during construction are as follows:

1. No earthwork activities shall commence until erosion and sedimentation control measures are installed. Erosion and sedimentation controls shall be installed as shown on the drawings.

2. Areas left exposed to erosion for more than seven days shall be rough graded and temporarily stabilized. Areas disturbed but inactive for more than thirty days shall be temporarily seeded.

3. Erosion and sedimentation controls shall be maintained until successful establishment of ground cover.

4. No staging of materials or lay down areas shall be located within the resource areas.

5. Paved areas shall be kept free of sediment and shall be cleaned periodically as required by construction activities.

6. Temporary soil stockpiles shall be located within areas consisting of formerly paved or developed surfaces and will be moved as necessary to accommodate ongoing work.

7. Sediment stockpiles shall have a side slope of no greater than 2:1. Stockpiles shall be rough graded or maintain a roughened surface to prevent erosion. Stockpiles that are not to be used within 7 days shall be seeded after formation of stockpile as to prevent erosion. Compost filter tube barrier and silt fence shall be installed around stockpile area approximately 10 feet from toe of slope.

8. The contractor is responsible to inspect and repair erosion and sedimentation control measures as required to prevent damage or sedimentation.

9. Upon completion of construction and establishment of permanent ground cover, remove and dispose of temporary erosion control measures. Clean sediment and debris from temporary measures and from permanent stormwater management systesms.

Inspections shall be completed a minimum of every seven (7) calendar days and within 24 hours of the end of a storm event of 0.25 inches or greater. Attached is an example Construction Inspection and Maintenance Report Form.

FUSS & O'NEILL

CONSTRUCTION INSPECTION AND MAINTENANCE REPORT FORM

Broadacres Farm Parking Lot
Sudbury, MA

To be completed every 7 calendar days and within 24 hours of the end of a storm event of 0.25 inches or greater

Inspector: _____ Date: _____

Inspector's Title and Qualifications: _____
_____

Summary of Previous 7-day Rainfall:

Date	Friday Date	Saturday Date	Sunday Date	Monday Date	Tuesday Date	Wednesday Date	Thursday Date
Total Daily Rainfall (in.)							

Stabilization Measures:

Area	Disturbed (Yes/No)	Stabilized (Yes/No)	Stabilized With	Condition
Paved Parking Lot and Access Driveway				
Bioretention Basin #1				
Bioretention Basin #1				
Adjacent Areas within Work Site				

Bioretention Basin #1

Depth of Infiltration Basin	Condition of Side Slopes	Evidence of Overtopping of Embankments	Condition of Outfall

Bioretention Basin #1

Depth of Infiltration Basin	Condition of Side Slopes	Evidence of Overtopping of Embankments	Condition of Outfall

FUSS & O'NEILL

CONSTRUCTION INSPECTION AND MAINTENANCE REPORT FORM

Broadacres Farm Parking Lot
Sudbury, MA

Construction Site & Adjacent Areas:

General condition: _____

_____

_____

Maintenance Required for Silt Fence: _____

_____

_____

Is sediment being tracked on to road? _____

_____

_____

Maintenance required? _____

_____

Changes Required to the Pollution Prevention Plan:

_____

_____

Reasons for Changes:

_____

_____

_____

Certification:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signature: _____ Date: _____

Appendix K

Long Term Operation and Maintenance Plan

FUSS & O'NEILL

M E M O R A N D U M

TO: Town of Sudbury

FROM: Fuss & O'Neill, Inc.

DATE: May 7, 2021

RE: Long Term Operation and Maintenance Plan
Broadacres Farm Parking Lot
Sudbury, MA

This Long Term Operation and Maintenance Plan (O&M) is for the long term operation of the Broadacres Farm Parking Lot located off Morse Road in Sudbury, Massachusetts. This Long Term O&M Plan has been prepared in accordance with the Massachusetts Stormwater Handbook.

Property Owner and Responsible Party:

Town of Sudbury
322 Concord Road
Sudbury, MA 01776

It will be the responsibility of the Owner to comply with this Long Term Operation and Maintenance Plan. The owner is responsible for all financing, maintenance and emergency repairs. Should the property or any portion of the property be transferred to another owner, that new owner will be notified of the presence of this Long Term Operation and Maintenance Plan and be held responsible for the implementation of this plan and financing as it pertains to their property.

Operation and Maintenance Plan

The post construction operation and maintenance plan outlined hereafter provides recommendations for periodic inspection and maintenance activities for the stormwater management system. This Long-Term Operation and Maintenance Plan will ensure that the stormwater management system functions as designed throughout the life of the system.

- Paved surfaces will be swept twice annually, April and October, to remove sand and debris.

- Sediment forebays shall be inspected monthly. This will include checking for signs of riling and gullying. Also this will include checking for the accumulation of sediments and pollutants. Sediment forebays shall be cleaned at least four time per year and when sediment depth is between 3 to 6 inches. When mowing grasses, keep the grass height no greater than six inches.

- Bioretention basins shall be inspected after every major storm event for the first three months and a minimum twice a year thereafter. Basin shall be inspected for, but not limited to, evidence of differential settlement, cracking, erosion, leakage in the embankments, tree growth on the embankments, condition of riprap, and sediment accumulation and the health of the turf.

Upper-stage, side slopes, embankments, and emergency spillways shall be mowed at least twice a year. Trash and debris shall be removed at least twice a year and accumulated sediment shall be removed at least twice a year from the basin.

Snow Removal and Storage
Snow removal and storage shall be performed when needed as follows:

- Snow shall be plowed to snow storage areas located off the perimeter of the parking lots and loading area. No snow shall be stored within the infiltration basins.

- De-icing chemicals may only be used on pedestrian surfaces. All other paved surfaces may have sand applied.

- Excess snow shall be removed from site or stockpiled only within the paved areas on the site.

Location and Access of Stormwater Management System
All components of the stormwater management system are located within project site area. Access to the site will be provided via Morse Road.

Records of Maintenance and Repair Activities
The responsible parties shall keep records of installation, maintenance and repairs of the stormwater management facilities. These records shall be retained for the most recent five years on site and be provided to the Conservation Commission annually and upon request. An example Operation and Maintenance Log Form is attached.

Attachments:

O&M Log Form

FUSS & O'NEILL

Operation and Maintenance Log Form

Project/Location: Broadacres Farm Parking Lot, Sudbury, MA

"As Built" Plans Available? _____

Date/Time: _____

Days since Previous Rainfall and Rainfall Amount: _____

Inspector: _____

Maintenance Item	Satisfactory	Unsatisfactory	Comments
1. Parking Lot and Paved Areas			
• Evidence of erosion			
Action to be Taken:			
Date to be Completed by:			
2. Sediment Forebays			
• Forebay is free of debris, litter and waste.			
• Grass height is between 3 and 6 inches.			
• Depth of sediments is less than half of the basin.			
Action to be Taken:			
Date to be Completed by:			
3. Bioretention Basins			
• Vegetation coverage adequate			
• Undesirable vegetative growth			
• Undesirable woody vegetation			
• Mowing performed as necessary			
• Embankment in good repair			
• No evidence of erosion			
• Standing water or wet spots			
• Sediment and/or trash accumulation			
• Other (specify)			
Action to be Taken:			
Date to be Completed by:			

Source: Adapted from Watershed Management Institute, Inc. 1997. *Operation, Maintenance, and Management of Stormwater Management Systems.* In cooperation with U.S. Environmental Protection Agency, Office of Water. Washington, D.C.

Appendix H

Culvert Design Report

Culvert Design Report
Bruce Freeman Rail Trail Project
Crossing at unnamed Tributary to Hop Brook

Owner

Town of Sudbury

322 Concord Road

Sudbury, MA 01776

May 20, 2021

FUSS & O'NEILL

1550 Main Street, Suite 400

Springfield, MA 01089

Project No. 20200785.A10

Table of Contents

Culvert Design Report
Bruce Freeman Rail Trail Project
Crossing at unnamed Tributary to Hop Brook

Table of Contents

Culvert Design Report
Bruce Freeman Rail Trail Project
Crossing at unnamed Tributary to Hop Brook

1 Introduction

This Culvert Design Report discusses the design methods used in sizing the proposed replacement culvert at approximately Station 167+20 along the Bruce Freeman Rail Trail in Sudbury, Massachusetts. The existing culvert is a stacked stone and granite culvert box culvert which conveys water from an unnamed intermittent stream tributary to Hop Brook. The replacement culvert proposed is a new 4 ft diameter reinforced concrete pipe, embedded 2 feet to provide a natural stream channel bottom within the new culvert.

The proposed replacement culvert will provide greater hydraulic capacity through the crossing and has been sized to safely convey the 25-year 24-hour precipitation event and to meet Massachusetts River and Stream Crossing Standards (Stream Crossing Standards) to the maximum extent practicable.

2 Project Description

2.1 Existing Conditions

The existing culvert crossing is located at approximately Station 167+20 of the proposed Bruce Freeman Rail Trail in Sudbury, Massachusetts which consists of a stacked stone and granite culvert box culvert which conveys water from an unnamed intermittent stream tributary to Hop Brook under the railroad tracks. The culvert is blocked on the downstream side and erosion has occurred on the downstream side of the culvert as a result of this blockage. The existing culvert is approximately 18 feet in length with an opening on the upstream side approximately 30 inches wide and 9 inches tall above the existing streambed on the upstream side. The location of the existing culvert is shown on the Plans included in Appendix A. Photographs of the existing culvert are included in Appendix B.

Using the StreamStats tool provided by United States Geological Survey (USGS), the drainage area contributing to the stream at this location is approximately 0.16 square miles in size. A copy of the StreamStats report is included as Appendix C.

2.2 Proposed Conditions

The proposed Bruce Freeman Rail Trail Project includes the construction of approximately 4.4 miles of multi-use path along the former rail road tracks. The proposed culvert replacement is a part of this project. The proposed replacement culvert will be a 4 ft diameter reinforced concrete pipe embedded 2 feet within the ground to allow for placement of a natural stream bottom through the culvert. Proposed conditions information is shown on the Plans included in *Appendix A*.

3 Hydraulic Analysis

The existing culvert was modeled using Bentley's CulvertMaster® program. This modeling indicates that this existing culvert is not adequately sized to convey the 25-year 24-hour precipitation without overtopping the railroad tracks which is evident based on the existing condition of the culvert and downstream erosion which has occurred. If the existing culvert was fully open to provide open flow through the structure, velocities are estimated to be approximately 17.65 feet per second. A copy of the CulvertMaster® report and existing culvert modeling is included in Appendix D.

The proposed new culvert was modeled using a different program, Federal Highway Administration's HY-8 Culvert Hydraulic Analysis Program, which is a more appropriate modeling software for embedded pipe culverts than CulvertMaster®. Input data used included:

- Peak flow data from StreamStats;
- Channel type and size;
- Invert information;
- Culvert shape, material, diameter, embedment depth, Manning's *n*, length, and culvert configuration; and,
- Roadway profile information.

Modeling of the proposed new culvert through the HY-8 Program, indicates that the proposed culvert will both safely convey the 25-year 24-hour precipitation event without overtopping the new multi-use path as well as reduce velocities to approximately 7 feet per second. The reduction of velocity is deemed beneficial for the area and should reduce further erosion of the downstream side of the culvert.

A copy of the HY-8 Culvert Analysis Program modeling report is included in Appendix E.

4 Massachusetts River & Stream Crossing Standards

The proposed replacement culvert has been designed with the intent to reduce downstream flooding and the potential for erosion and preserve existing habitats both upstream and downstream of the crossing. The following summarizes how the proposed replacement culvert meets the goals of the Stream Crossing Standards to the maximum extent practicable.

1. Type of Crossing – The proposed replacement culvert will be embedded 2 feet within the surrounding area to allow for placement of a natural stream bottom within the culvert.

2. Embedment – The proposed replacement culvert will be embedded 2 feet to provide for the long term stability of the replacement culvert.

3. Crossing Span – Given the recent erosion which has occurred downstream of the existing crossing, bankfull width was determined to be 7 feet based on upstream stream conditions. While, the proposed replacement culvert does not provide a new span of 1.2 times bankfull

width, existing conditions horizontally within the 60 ft railroad right-of-way limits the project's ability to substantially raise grades in the area. Proposed grades are also limited in order to maintain appropriate accessible grade along the multi-use path for pedestrians and bicyclist traffic. The proposed replacement crossing will however still improve conditions for passage of semi-aquatic and terrestrial wildlife at the crossing.

4. Height & Openness – The openness ratio of the proposed replacement culvert is 0.33 however, the crossing conveys an intermittent stream which does not regularly flow and the elevation differential between the culvert invert and proposed top of grade along the multi-use path at the crossing is less than 4 feet which will allow for the passage of wildlife across the multi-use path.

5. Substrate – Substrate to simulate a natural stream bottom will be placed within the 2 ft embedded portion of the replacement culvert.

6. Water Depth and Velocity – A new stream channel with similar slope to that of existing will be provided by the new culvert. The proposed velocities through the new culvert will improve conditions and prevent further erosion of the downstream side of the culvert.

7. Banks – Grading of the stream bank within areas of disturbance has been designed such that slope of the replaced bank does not exceed a ratio 1 to 1.5 (vertical: horizontal).

Appendix A

Plans

FENCING DETAILS

TIMBER FENCE (THREE-RAIL) STA. 158+25 LT TO STA. 163+10 LT
TIMBER FENCE (THREE-RAIL) STA. 158+25 RT TO STA. 161+25 RT

HIGHWAY GUARD DETAILS

NONE

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

SHEET 178

DRAINAGE DETAILS

SHEET 178

LEGEND:

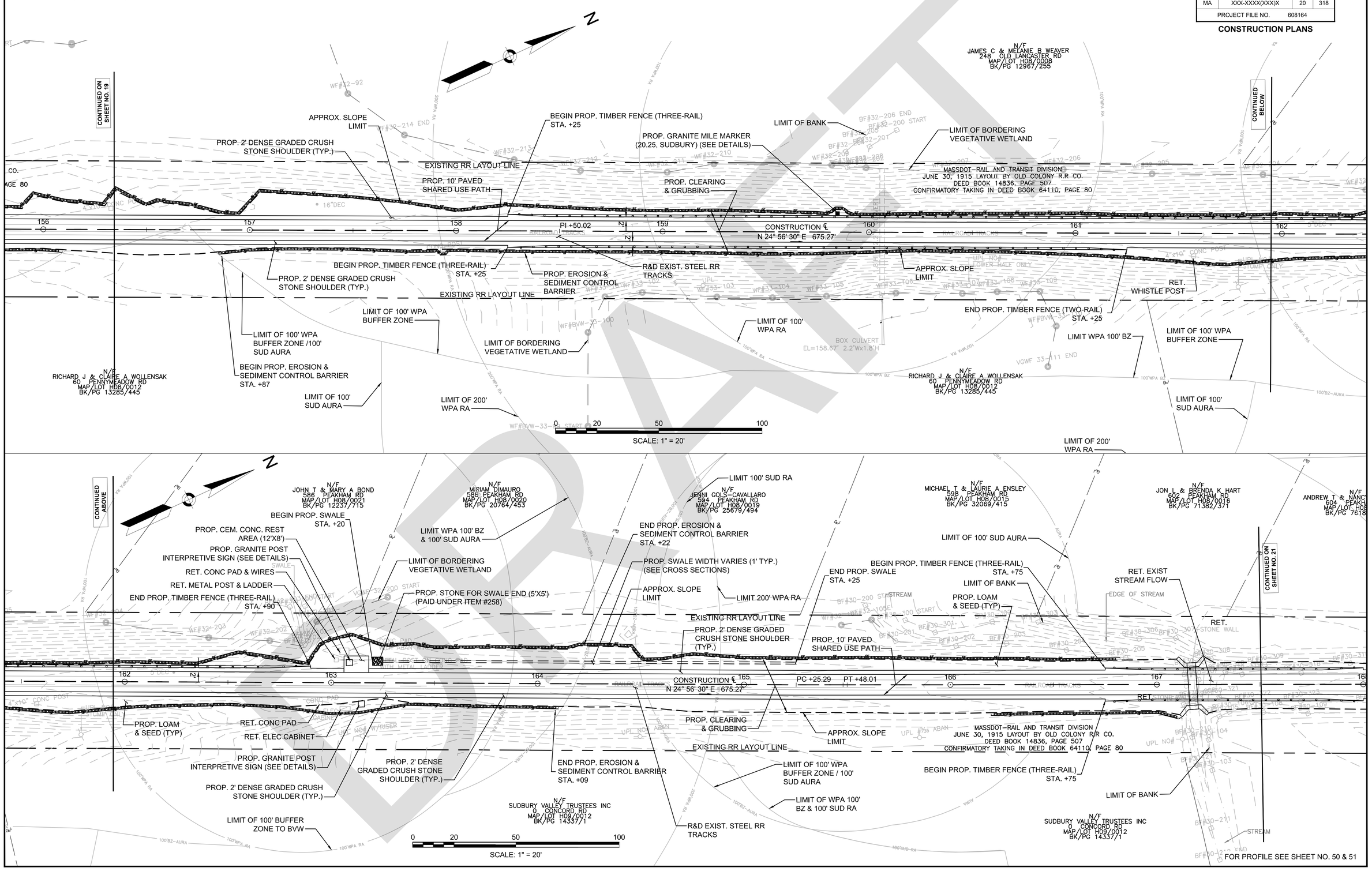
PROPOSED WHEELCHAIR RAMP DETAIL # X#

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	20	318
PROJECT FILE NO.	608164		

CONSTRUCTION PLANS

Plotted on 12-May-2021 8:18 AM
608164_HD(CONSTRUCTION PLANS).DWG



FENCING DETAILS

TIMBER FENCE (THREE-RAIL) STA. 166+75 RT TO STA. 168+00 RT
TIMBER FENCE (THREE-RAIL) STA. 166+75 LT TO STA. 168+00 LT

HIGHWAY GUARD DETAILS

NONE

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

NONE

DRAINAGE DETAILS

NONE

LEGEND:

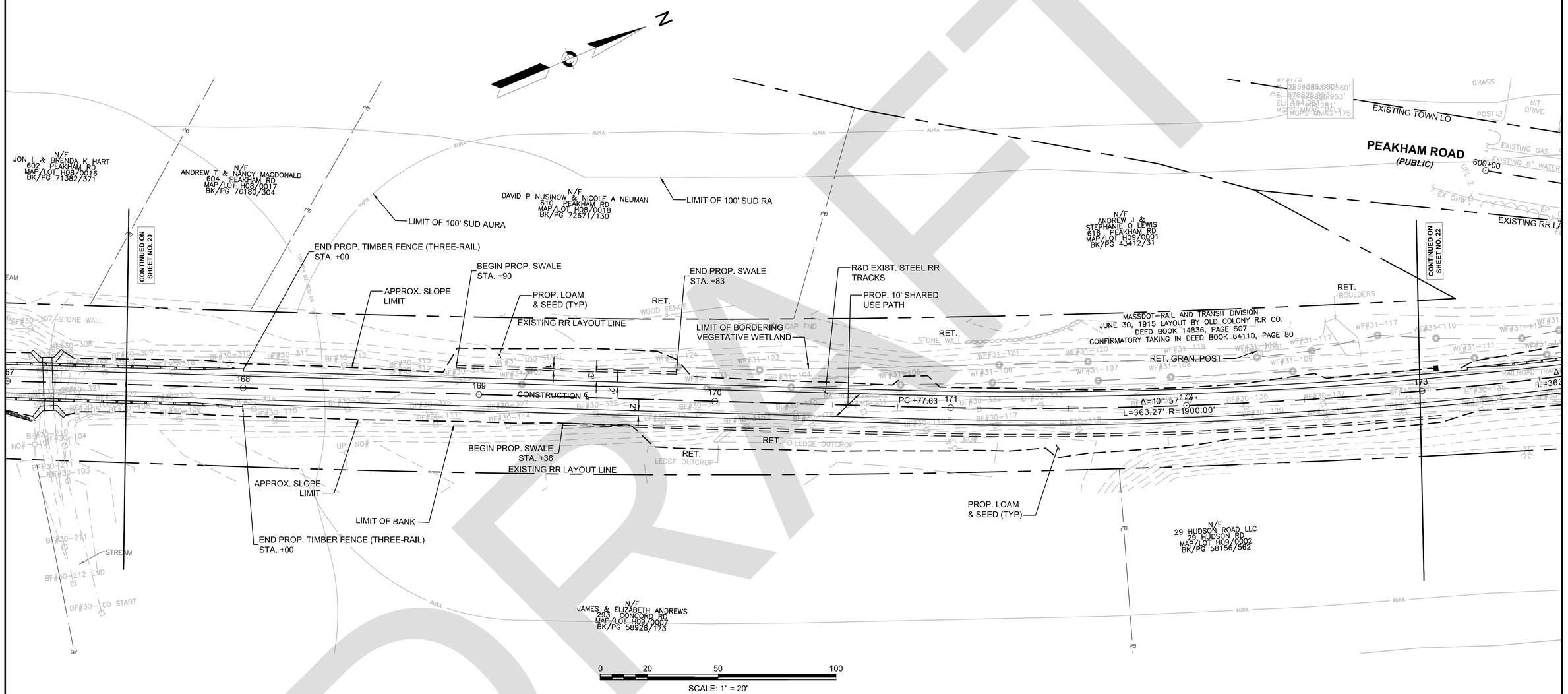
PROPOSED WHEELCHAIR RAMP DETAIL # X#

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	21	318
PROJECT FILE NO.	608164		

CONSTRUCTION PLANS

608164_HD(CONSTRUCTION PLANS).DWG Plotted on 12-May-2021 8:18 AM



FOR PROFILE SEE SHEET NO. 52

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	178	318
PROJECT FILE NO.	608164		

DRAINAGE & UTILITY PLANS

CONTINUED ON SHEET NO. 177

CONTINUED BELOW

RET. CULVERT

EXISTING RR LAYOUT LINE

156 157 158 PI +50.02 159 160 161 162

EXISTING RR LAYOUT LINE

RET. UTL. POLE

UPL

BOX CULVERT
EL=158.67' 2.2'Wx1.8'H

UPL NO# LOWER HALF ONLY

RET. UTL. POLE

UPL NO# STUMP ONLY

RET. UTL. POLE

BENCHMARK: #17
LAG SCREW SET 2' UP 16"TREE
EL=175.02'

N/F
RICHARD J & CLAIRE A WOLLENSAK
60 PENNYMEADOW RD
MAP/LOT H08/0012
BK/PG 13285/445

N/F
JAMES C & MELANIE B WEAVER
248 OLD LANCASTER RD
MAP/LOT H08/0008
BK/PG 12967/255

N/F
SUDBURY-RAIL AND TRANSIT DIVISION
JUNE 30, 1915 LAYOUT BY OLD COLONY R.R CO.
DEED BOOK 14836, PAGE 507
CONFIRMATORY TAKING IN DEED BOOK 64110, PAGE 80

0 20 50 100
SCALE: 1" = 20'

CONTINUED ABOVE

RET. CONC. PAD
RET. ABAN. WIRES

RET. METAL POST
RET. CONC. PAD

PROP. STONE FOR PIPE ENDS (10'x4')
(PAID UNDER ITEM #258)

BEGIN PROP. GRASS SWALE
STA +25.01

PROP. GRASS SWALE
(SEE CROSS SECTIONS)

EXISTING RR LAYOUT LINE

END PROP. GRASS SWALE
STA +24.96

162 163 164 165 PC +25.29 PT +48.01 166 167

UPL NO# STUMP ONLY

UPL NO# W/RISER

RET. UTL. POLE

RET. ELEC. CABINET

RET. CONC. PAD

UPL NO# ABAN

RET. UTL. POLE

EXISTING RR LAYOUT LINE

UPL NO# ABAN

RET. UTL. POLE

HW-09
STA:167+16.69 OFF:10.27L
INV=179.40 (HW-08)

R&D EXIST. CULVERT

PROP. HEADWALL
(MASSDOT CONST. STD. 206.60)

22 LF - 48" RCP
S=0.000'

UPL NO#

PROP. HEADWALL
(MASSDOT CONST. STD. 206.60)

RET. UTL. POLE

HW-08
STA:167+18.06 OFF:11.79R
INV=179.40 (HW-09)

CONTINUED ON SHEET NO. 179

N/F
JOHN T & MARY A BOND
586 PEAKHAM RD
MAP/LOT H08/0021
BK/PG 12237/315

N/F
MIRIAM DIMAURO
568 PEAKHAM RD
MAP/LOT H08/0020
BK/PG 20764/453

N/F
DENNI GOLSTEIN CAVALLARO
574 PEAKHAM RD
MAP/LOT H08/0019
BK/PG 25679/494

N/F
MICHAEL T & LAURIE A ENSLEY
508 PEAKHAM RD
MAP/LOT H08/0015
BK/PG 32069/415

N/F
JON L & BRENDA K HART
602 PEAKHAM RD
MAP/LOT H08/0016
BK/PG 71382/371

N/F
SUDBURY VALLEY TRUSTEES INC
0 CONCORD RD
MAP/LOT H09/0012
BK/PG 14357/1

0 20 50 100
SCALE: 1" = 20'

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	179	318
PROJECT FILE NO.	608164		

DRAINAGE & UTILITY PLANS

CONTINUED ON SHEET NO. 178

CONTINUED ON SHEET NO. 180

BEGIN PROP. GRASS SWALE STA +90.00

END PROP. GRASS SWALE STA +83.39

EXISTING RR LAYOUT LINE

CONSTRUCTION ℄

PC +77.63

BEGIN PROP. GRASS SWALE STA +35.70

EXISTING RR LAYOUT LINE

RET. UTL. POLE

RET. UTL. POLE

EXISTING TOWN LO

EXISTING GAS

EXISTING 8" WATER

EX. OHW

EXISTING RR LA

600+00

INV.

N/F JON L & BRENDA K HART 602 PEAKHAM RD MAP/LOT H08/0016 BK/PG 71382/371

N/F ANDREW & NANCY MACDONALD 604 PEAKHAM RD MAP/LOT H08/0017 BK/PG 76180/304

N/F DAVID P NUSINOW & NICOLE A NEUMAN 610 PEAKHAM RD MAP/LOT H08/0018 BK/PG 72671/130

N/F ANDREW J & STEPHANIE O LEWIS 616 PEAKHAM RD MAP/LOT H09/0001 BK/PG 43412/31

N/F 29 HUDSON ROAD LLC 29 HUDSON RD MAP/LOT H09/0002 BK/PG 58156/562

N/F JAMES & ELIZABETH ANDREWS 293 CONCORD RD MAP/LOT H09/0007 BK/PG 58928/173

BENCHMARK: #20 CHISELED SQ SET ON BOULDER EL=190.04'

MASSACHUSETTS BAY TRANSIT DIVISION JUNE 30, 1915 LAYOUT BY OLD COLONY R.R CO. DEED BOOK 14836, PAGE 507 CONFIRMATORY TAKING IN DEED BOOK 64110, PAGE 80

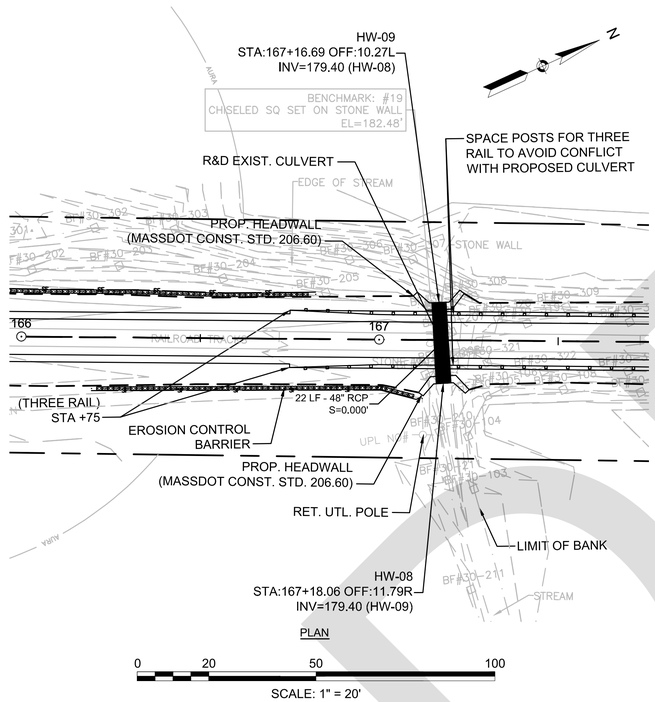
0 20 50 100

SCALE: 1" = 20'

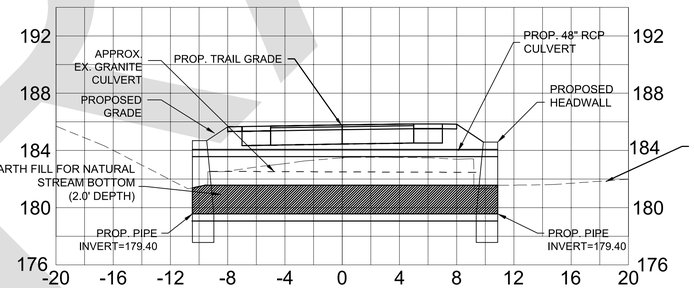
SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	216	318
PROJECT FILE NO.	608164		

CONSTRUCTION DETAILS

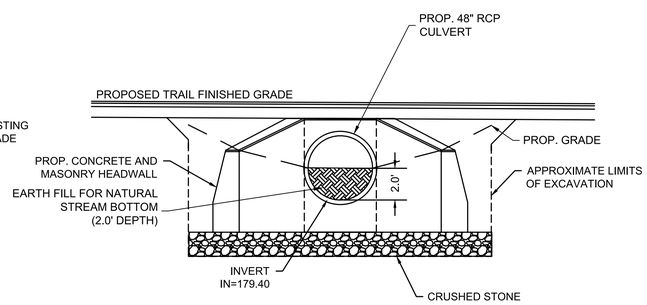


PLAN



PROFILE

SCALE: 1" = 8' (HORIZONAL)
1" = 8' (VERTICAL)



SECTION

SCALE: NTS

40 CONCRETE CULVERT REPLACEMENT – STA 167+17

SCALE: AS NOTED

Appendix B

Site Photographs

FUSS & O'NEILL

SITE PHOTOGRAPHS
Bruce Freeman Rail Trail Project
Crossing at unnamed Tributary to Hop Brook
Sudbury, MA

Photo 1: Upstream side of culvert

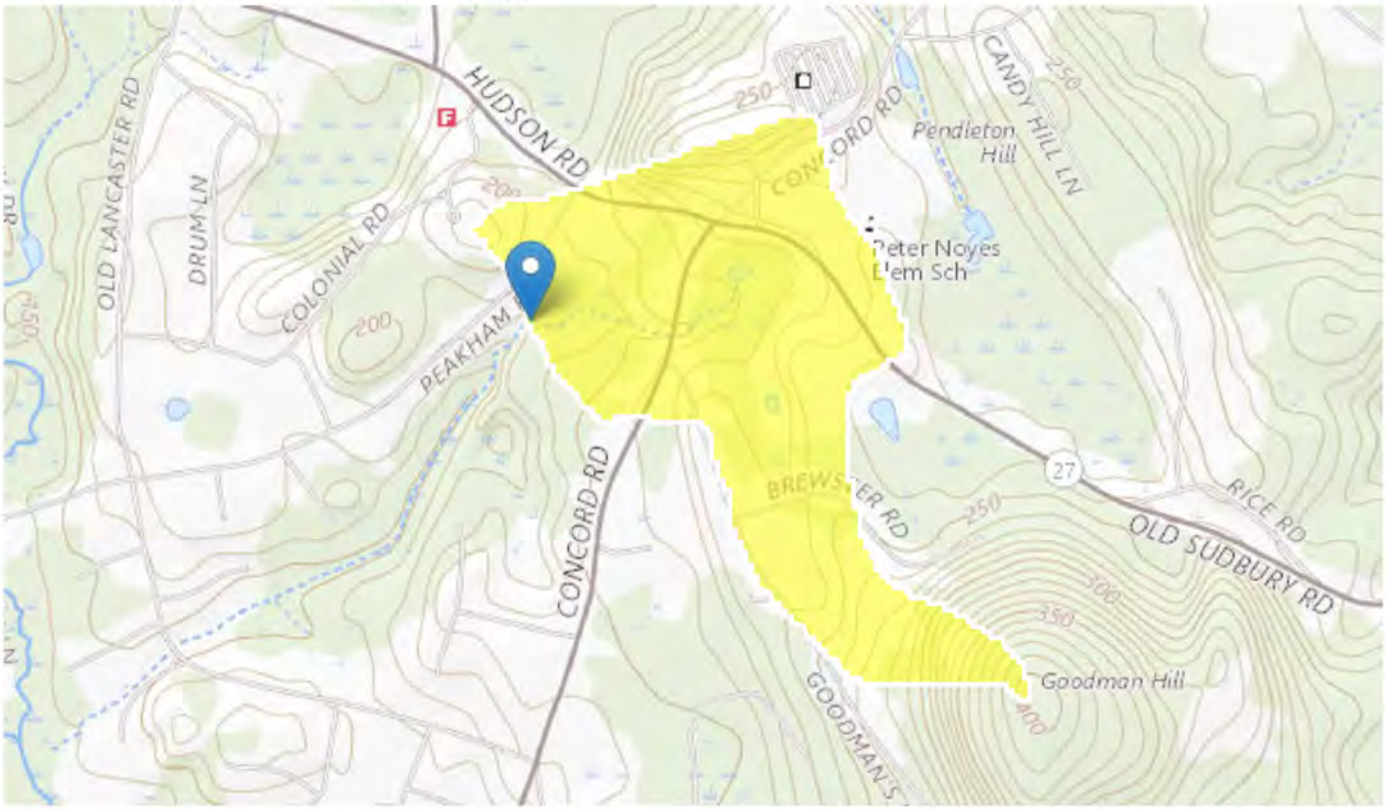
Photo 2: Downstream side of culvert

Appendix C

USGS StreamStats Report

StreamStats Report

Region ID: MA
Workspace ID: MA20210407130130576000
Clicked Point (Latitude, Longitude): 42.38096, -71.41649
Time: 2021-04-07 09:01:46 -0400



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.16	square miles
ELEV	Mean Basin Elevation	232	feet
LC06STOR	Percentage of water bodies and wetlands determined from the NLCD 2006	1.12	percent
BSLDEM250	Mean basin slope computed from 1:250K DEM	2.589	percent
DRFTPERSTR	Area of stratified drift per unit of stream length	0.000877	square mile per mile

Parameter Code	Parameter Description	Value	Unit
MAREGION	Region of Massachusetts 0 for Eastern 1 for Western	0	dimensionless
BSLDEM10M	Mean basin slope computed from 10 m DEM	5.769	percent
PCTSNDGRV	Percentage of land surface underlain by sand and gravel deposits	0.15	percent
FOREST	Percentage of area covered by forest	31.22	percent
ACRSDFT	Area underlain by stratified drift	0.00027	square miles
CAT1ROADS	Length of interstates lmtd access highways and ramps for lmtd access highways, includes cloverleaf interchanges (USGS Ntl Transp Dataset)	0	miles
CAT2ROADS	Length of sec hwy or maj connecting roads; main arteries & hwys not lmtd access, usually in the US Hwy or State Hwy systems (USGS Ntl Transp Dataset)	0	miles
CAT3ROADS	Length of local connecting roads; roads that collect traffic from local roads & connect towns, subdivisions & neighborhoods (USGS Nat Transp Dataset)	0.64	miles
CAT4ROADS	Length of local roads; generally paved street, road, or byway that usually have single lane of traffic in each direction (USGS Ntnl Transp Dataset)	1	miles
CENTROIDX	Basin centroid horizontal (x) location in state plane coordinates	207259.2	meters
CENTROIDY	Basin centroid vertical (y) location in state plane units	903306.7	meters
CROSCOUNT1	Number of intersections between streams and roads, where the roads are interstate, limited access highway, or ramp (CAT1ROADS)	0	dimensionless
CROSCOUNT2	Number of intersections between streams and roads, where the roads are secondary highway or major connecting road (CAT2ROADS)	0	dimensionless
CROSCOUNT3	Number of intersections between streams and roads, where roads are local conecting roads (CAT3ROADS)	1	dimensionless
CROSCOUNT4	Number of intersections between streams and roads, where roads are local roads (CAT4ROADS)	0	dimensionless

Parameter Code	Parameter Description	Value	Unit
CRSDFT	Percentage of area of coarse-grained stratified drift	0.15	percent
CSL10_85	Change in elevation divided by length between points 10 and 85 percent of distance along main channel to basin divide - main channel method not known	182	feet per mi
LAKEAREA	Percentage of Lakes and Ponds	0	percent
LC11DEV	Percentage of developed (urban) land from NLCD 2011 classes 21-24	66.5	percent
LC11IMP	Average percentage of impervious area determined from NLCD 2011 impervious dataset	22.2	percent
LFPLENGTH	Length of longest flow path	0.88	miles
MAXTEMPC	Mean annual maximum air temperature over basin area, in degrees Centigrade	15.2	feet per mi
OUTLETX	Basin outlet horizontal (x) location in state plane coordinates	206875	feet
OUTLETY	Basin outlet vertical (y) location in state plane coordinates	903385	feet
PRECPRIS00	Basin average mean annual precipitation for 1971 to 2000 from PRISM	46.9	inches
STRMTOT	total length of all mapped streams (1:24,000-scale) in the basin	0.31	miles
WETLAND	Percentage of Wetlands	3.2	percent

Peak-Flow Statistics Parameters [Peak Statewide 2016 5156]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.16	square miles	0.16	512
ELEV	Mean Basin Elevation	232	feet	80.6	1948
LC06STOR	Percent Storage from NLCD2006	1.12	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
50-percent AEP flood	10.5	ft^3/s	5.25	21	42.3
20-percent AEP flood	18	ft^3/s	8.86	36.6	43.4
10-year 10-percent AEP flood	24.1	ft^3/s	11.6	50.3	44.7
25-year 4-percent AEP flood	33.1	ft^3/s	15.3	71.6	47.1
2-percent AEP flood	40.7	ft^3/s	18.2	91.2	49.4
100-year 1-percent AEP flood	48.8	ft^3/s	21.1	113	51.8
0.5-percent AEP flood	57.8	ft^3/s	24.2	138	54.1
0.2-percent AEP flood	70.8	ft^3/s	28.2	178	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)

Low-Flow Statistics Parameters [Statewide Low Flow WRIR00 4135]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.16	square miles	1.61	149
BSLDEM250	Mean Basin Slope from 250K DEM	2.589	percent	0.32	24.6
DRFTPERSTR	Stratified Drift per Stream Length	0.000877	square mile per mile	0	1.29
MAREGION	Massachusetts Region	0	dimensionless	0	1

Low-Flow Statistics Disclaimers [Statewide Low Flow WRIR00 4135]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors

Low-Flow Statistics Flow Report [Statewide Low Flow WRIR00 4135]

Statistic	Value	Unit
7 Day 2 Year Low Flow	0.00395	ft^3/s

Statistic	Value	Unit
7 Day 10 Year Low Flow	0.00102	ft^3/s

Low-Flow Statistics Citations

Ries, K.G., III,2000, Methods for estimating low-flow statistics for Massachusetts streams: U.S. Geological Survey Water Resources Investigations Report 00-4135, 81 p. (http://pubs.usgs.gov/wri/wri004135/)

Flow-Duration Statistics Parameters [Statewide Low Flow WRIR00 4135]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.16	square miles	1.61	149
DRFTPERSTR	Stratified Drift per Stream Length	0.000877	square mile per mile	0	1.29
MAREGION	Massachusetts Region	0	dimensionless	0	1
BSLDEM250	Mean Basin Slope from 250K DEM	2.589	percent	0.32	24.6

Flow-Duration Statistics Disclaimers [Statewide Low Flow WRIR00 4135]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors

Flow-Duration Statistics Flow Report [Statewide Low Flow WRIR00 4135]

Statistic	Value	Unit
50 Percent Duration	0.147	ft^3/s
60 Percent Duration	0.084	ft^3/s
70 Percent Duration	0.0377	ft^3/s
75 Percent Duration	0.0261	ft^3/s
80 Percent Duration	0.0178	ft^3/s
85 Percent Duration	0.0116	ft^3/s
90 Percent Duration	0.00692	ft^3/s
95 Percent Duration	0.00343	ft^3/s
98 Percent Duration	0.00204	ft^3/s

Statistic	Value	Unit
99 Percent Duration	0.00132	ft^3/s

Flow-Duration Statistics Citations

Ries, K.G., III,2000, Methods for estimating low-flow statistics for Massachusetts streams: U.S. Geological Survey Water Resources Investigations Report 00-4135, 81 p. (http://pubs.usgs.gov/wri/wri004135/)

August Flow-Duration Statistics Parameters [Statewide Low Flow WRIR00 4135]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.16	square miles	1.61	149
BSLDEM250	Mean Basin Slope from 250K DEM	2.589	percent	0.32	24.6
DRFTPERSTR	Stratified Drift per Stream Length	0.000877	square mile per mile	0	1.29
MAREGION	Massachusetts Region	0	dimensionless	0	1

August Flow-Duration Statistics Disclaimers [Statewide Low Flow WRIR00 4135]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors

August Flow-Duration Statistics Flow Report [Statewide Low Flow WRIR00 4135]

Statistic	Value	Unit
August 50 Percent Duration	0.0124	ft^3/s

August Flow-Duration Statistics Citations

Ries, K.G., III,2000, Methods for estimating low-flow statistics for Massachusetts streams: U.S. Geological Survey Water Resources Investigations Report 00-4135, 81 p. (http://pubs.usgs.gov/wri/wri004135/)

Bankfull Statistics Parameters [Bankfull Statewide SIR2013 5155]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.16	square miles	0.6	329
BSLDEM10M	Mean Basin Slope from 10m DEM	5.769	percent	2.2	23.9

Bankfull Statistics Disclaimers [Bankfull Statewide SIR2013 5155]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors

Bankfull Statistics Flow Report [Bankfull Statewide SIR2013 5155]

Statistic	Value	Unit
Bankfull Width	7.05	ft
Bankfull Depth	0.545	ft
Bankfull Area	3.77	ft^2
Bankfull Streamflow	7.92	ft^3/s

Bankfull Statistics Citations

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

Probability Statistics Parameters [Perennial Flow Probability]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.16	square miles	0.01	1.99
PCTSNDGRV	Percent Underlain By Sand And Gravel	0.15	percent	0	100
FOREST	Percent Forest	31.22	percent	0	100
MAREGION	Massachusetts Region	0	dimensionless	0	1

Probability Statistics Flow Report [Perennial Flow Probability]

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

Statistic	Value	Unit	PC
Probability Stream Flowing Perennially	0.567	dim	71

Probability Statistics Citations

Bent, G.C., and Steeves, P.A.,2006, A revised logistic regression equation and an automated procedure for mapping the probability of a stream flowing perennially in Massachusetts: U.S. Geological Survey Scientific Investigations Report 2006–5031, 107 p. (http://pubs.usgs.gov/sir/2006/5031/pdfs/SIR_2006-5031rev.pdf)

Application Version: 4.5.1
StreamStats Services Version: 1.2.22
NSS Services Version: 2.1.1

Appendix D

Existing Culvert Analysis
CulvertMaster®

Culvert Calculator Report
Existing at STA 167+20

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	180.92	ft	Headwater Depth/Height	18.40	
Computed Headwater Eleva	193.97	ft	Discharge	33.10	cfs
Inlet Control HW Elev.	193.97	ft	Tailwater Elevation	0.00	ft
Outlet Control HW Elev.	191.41	ft	Control Type	Inlet Control	

Grades					
Upstream Invert	180.17	ft	Downstream Invert	180.17	ft
Length	18.00	ft	Constructed Slope	0.000000	ft/ft

Hydraulic Profile					
Profile	PressureProfile		Depth, Downstream	0.75	ft
Slope Type	N/A		Normal Depth	N/A	ft
Flow Regime	N/A		Critical Depth	0.75	ft
Velocity Downstream	17.65	ft/s	Critical Slope	0.125151	ft/ft

Section					
Section Shape	Box		Mannings Coefficient	0.013	
Section Material	Concrete		Span	2.50	ft
Section Size	Box 30 x 9		Rise	0.75	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	191.41	ft	Upstream Velocity Head	4.84	ft
Ke	0.70		Entrance Loss	3.39	ft

Inlet Control Properties					
Inlet Control HW Elev.	193.97	ft	Flow Control	Submerged	
Inlet Type	0° wingwall flares		Area Full	1.9	ft²
K	0.06100		HDS 5 Chart	8	
M	0.75000		HDS 5 Scale	3	
C	0.04230		Equation Form	1	
Y	0.82000				

FUSS & O'NEILL

Appendix E

Proposed Culvert Analysis
FHWA HY-8 Program

HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 30 cfs

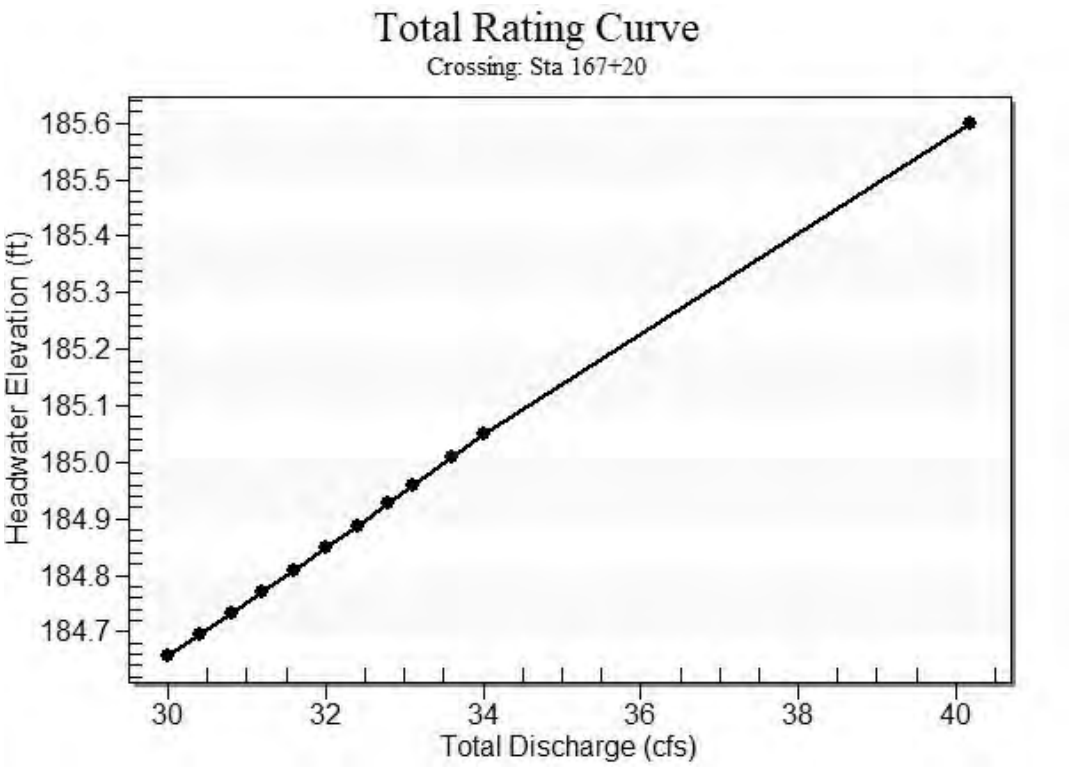
Design Flow: 33.1 cfs

Maximum Flow: 34 cfs

Table 1 - Summary of Culvert Flows at Crossing: Sta 167+20

Headwater Elevation (ft)	Total Discharge (cfs)	BFRT Culvert #32 Sta 167+20 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
184.66	30.00	30.00	0.00	1
184.70	30.40	30.40	0.00	1
184.73	30.80	30.80	0.00	1
184.77	31.20	31.20	0.00	1
184.81	31.60	31.60	0.00	1
184.85	32.00	32.00	0.00	1
184.89	32.40	32.40	0.00	1
184.93	32.80	32.80	0.00	1
184.96	**33.10 25-year storm event**	**33.10**	**0.00**	**1**
185.01	33.60	33.60	0.00	1
185.05	34.00	34.00	0.00	1
185.60	38.80	38.80	0.00	Overtopping

Rating Curve Plot for Crossing: Sta 167+20



Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
30.00	30.00	184.66	2.559	2.532	7-M2c	2.000	1.196	1.196	0.995	6.716	5.044
30.40	30.40	184.70	2.596	2.560	7-M2c	2.000	1.206	1.206	1.001	6.756	5.062
30.80	30.80	184.73	2.633	2.589	7-M2c	2.000	1.216	1.216	1.006	6.795	5.078
31.20	31.20	184.77	2.671	2.618	7-M2c	2.000	1.227	1.227	1.012	6.835	5.096
31.60	31.60	184.81	2.709	2.647	7-M2c	2.000	1.237	1.237	1.018	6.874	5.112
32.00	32.00	184.85	2.748	2.676	7-M2c	2.000	1.247	1.247	1.024	6.914	5.128
32.40	32.40	184.89	2.787	2.705	7-M2c	2.000	1.257	1.257	1.029	6.953	5.146
32.80	32.80	184.93	2.827	2.735	7-M2c	2.000	1.267	1.267	1.035	6.992	5.161
33.10 25-year storm event	**33.10**	**184.96**	**2.858**	**2.757**	**7-M2c**	**2.000**	**1.275**	**1.275**	**1.039**	**7.021**	**5.173**
33.60	33.60	185.01	2.909	2.795	7-M2c	2.000	1.287	1.287	1.046	7.070	5.194
34.00	34.00	185.05	2.951	2.826	7-M2c	2.000	1.296	1.296	1.052	7.113	5.209

Table 2 - Culvert Summary Table: BFRT Culvert #32 Sta 167+20

****

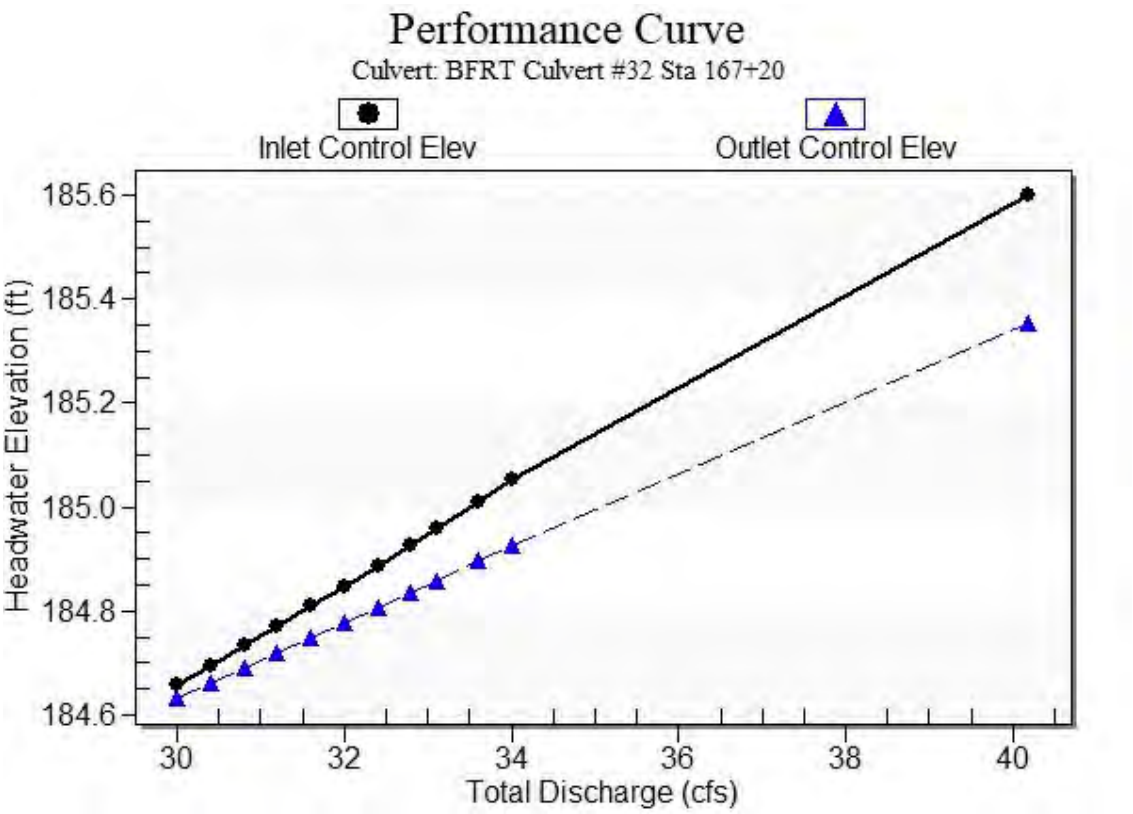
Straight Culvert

Inlet Elevation (invert): 182.10 ft, Outlet Elevation (invert): 182.00 ft

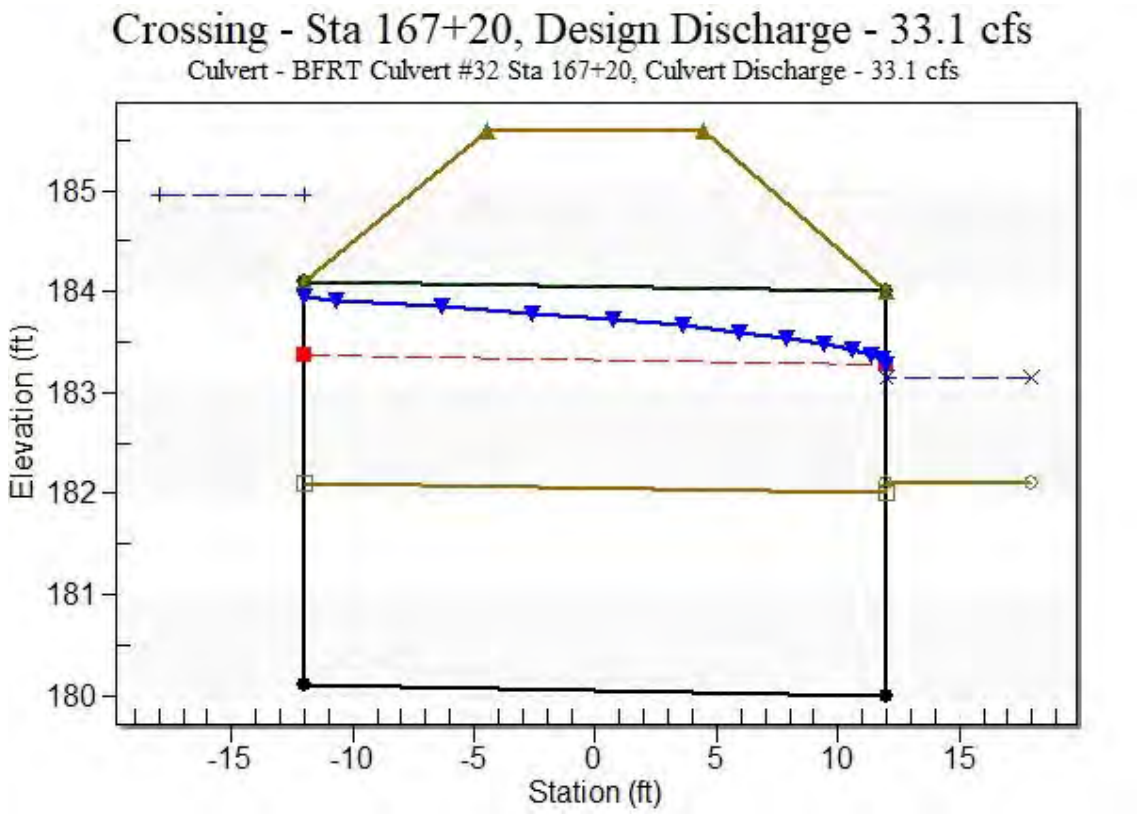
Culvert Length: 24.00 ft, Culvert Slope: 0.0042

****

Culvert Performance Curve Plot: BFRT Culvert #32 Sta 167+20



Water Surface Profile Plot for Culvert: BFRT Culvert #32 Sta 167+20



Site Data - BFRT Culvert #32 Sta 167+20

Site Data Option: Culvert Invert Data

Inlet Station: -12.00 ft

Inlet Elevation: 180.10 ft

Outlet Station: 12.00 ft

Outlet Elevation: 180.00 ft

Number of Barrels: 1

Culvert Data Summary - BFRT Culvert #32 Sta 167+20

Barrel Shape: Circular

Barrel Diameter: 4.00 ft

Barrel Material: Smooth HDPE

Embedment: 24.00 in

Barrel Manning's n: 0.0120 (top and sides)

Manning's n: 0.0350 (bottom)

Culvert Type: Straight

Inlet Configuration: Thin Edge Projecting

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: Sta 167+20)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
30.00	183.09	0.99	5.04	0.25	1.15
30.40	183.10	1.00	5.06	0.25	1.15
30.80	183.11	1.01	5.08	0.25	1.15
31.20	183.11	1.01	5.10	0.25	1.15
31.60	183.12	1.02	5.11	0.25	1.15
32.00	183.12	1.02	5.13	0.26	1.15
32.40	183.13	1.03	5.15	0.26	1.16
32.80	183.14	1.04	5.16	0.26	1.16
33.10 25-year storm event	**183.14**	**1.04**	**5.17**	**0.26**	**1.16**
33.60	183.15	1.05	5.19	0.26	1.16
34.00	183.15	1.05	5.21	0.26	1.16

Tailwater Channel Data - Sta 167+20

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 2.00 ft

Side Slope (H:V): 4.00 (_:1)

Channel Slope: 0.0040

Channel Manning's n: 0.0130

Channel Invert Elevation: 182.10 ft

Roadway Data for Crossing: Sta 167+20

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 60.00 ft

Crest Elevation: 185.60 ft

Roadway Surface: Paved

Roadway Top Width: 9.00 ft

Appendix I

Alternatives Analysis Supporting Documents

ALTERNATIVE ROUTES

LEGEND

- Railroad Alignment
- Alternative Route 1
- Alternative Route 3
- FEMA Flood
- NHESP Habitat
- Delineated Wetlands (Survey)
- DEP Wetlands (GIS)

N

UNION AVE

STATION RD

CODJER LN

OLD LANCASTER RD

0 200 400 600 800

SCALE: 1" = 200'

N

PANTRY BROOK

HAYNES RD

PANTRY RD

MORSE RD

CONCORD RD

WS#19-126

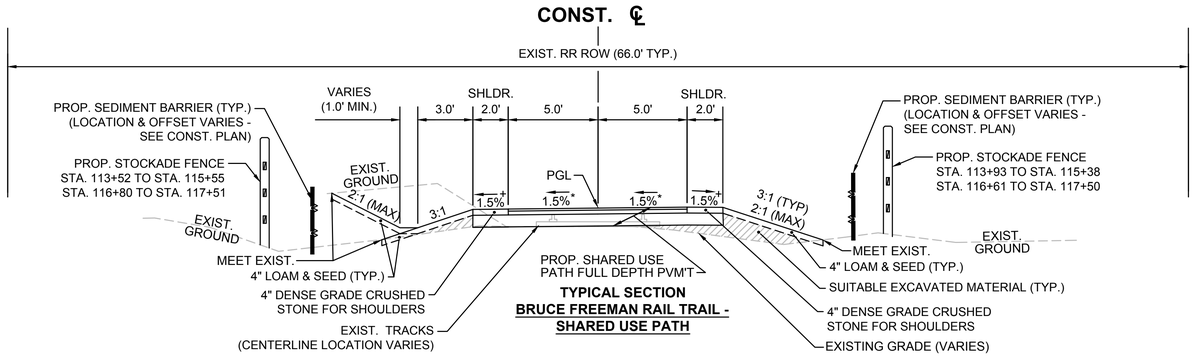
0 200 400 600 800

SCALE: 1" = 200'

ALTERNATIVE ROUTES

LEGEND

- Railroad Alignment
- Alternative Route 2
- FEMA Flood
- NHESP Habitat
- Delineated Wetlands (Survey)
- DEP Wetlands (GIS)



TYPICAL SECTION
BRUCE FREEMAN RAIL TRAIL - SHARED USE PATH

STA. 101+00± TO STA. 103+55±
STA. 104+25± TO STA. 104+80±
STA. 106+70± TO STA. 108+88±
STA. 109+85± TO STA. 115+37±
STA. 116+80± TO STA. 119+75±
STA. 132+25± TO STA. 143+15±
STA. 152+00± TO STA. 158+25±
STA. 165+25± TO STA. 168+90±
STA. 174+60± TO STA. 181+50±

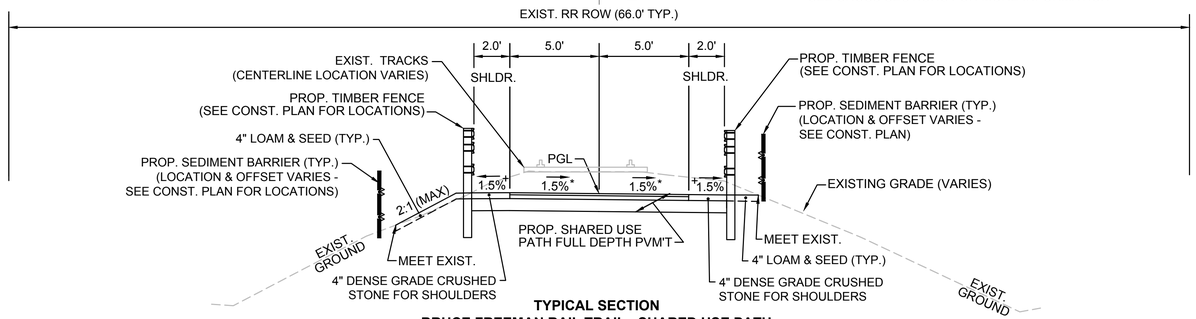
STA. 183+10± TO STA. 184+75±
STA. 190+90± TO STA. 196+75±
STA. 199+15± TO STA. 200+15±
STA. 200+40± TO STA. 212+00±
STA. 222+00± TO STA. 222+25±
STA. 243+57± TO STA. 245+75±
STA. 248+30± TO STA. 250+80±
STA. 258+73± to STA. 261+23±
STA. 270+23± TO STA. 272+23±

STA. 273+73± TO STA. 274+65±
STA. 274+80± TO STA. 275+80±
STA. 279+80± TO STA. 283+75±
STA. 293+25± TO STA. 294+30±
STA. 304+40± TO STA. 305+65±
STA. 307+00± TO STA. 308+15±
STA. 316+28± TO STA. 321+28±
STA. 333+10± TO STA. 334+70±
STA. 335+05± TO STA. 335+50±

*TOLERANCE FOR CONSTRUCTION ±0.5%
N.T.S

+SHOULDERS CAN BE UP TO 6:1 SLOPE TO AVOID CHASING SLOPES & AVOID RESOURCE AREA IMPACTS

SEE CROSS SECTIONS FOR MORE INFORMATION



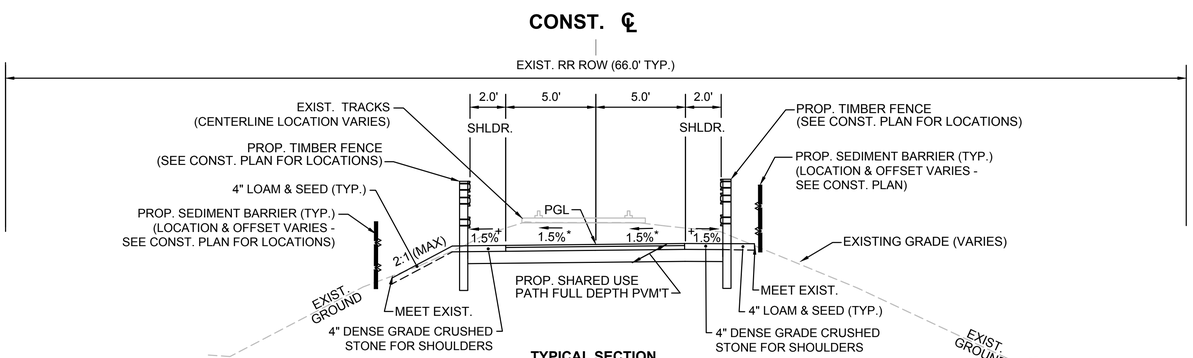
TYPICAL SECTION
BRUCE FREEMAN RAIL TRAIL - SHARED USE PATH
REVERSE SLOPE

STA. 126+50± TO STA. 129+00±
STA. 213+00± TO STA. 221+00±
STA. 325+50± TO STA. 335+50±

*TOLERANCE FOR CONSTRUCTION ±0.5%
N.T.S

+SHOULDERS CAN BE UP TO 6:1 SLOPE TO AVOID CHASING SLOPES & AVOID RESOURCE AREA IMPACTS

SEE CROSS SECTIONS FOR MORE INFORMATION



TYPICAL SECTION
BRUCE FREEMAN RAIL TRAIL - CUT INTO EMBANKMENT

STA. 103+55± TO STA. 104+25±
STA. 104+80± TO STA. 106+70±
STA. 108+88± TO STA. 109+85±
STA. 115+37± TO STA. 116+80±
STA. 119+75± TO STA. 125+50±
STA. 130+00± TO STA. 132+25±
STA. 158+25± TO STA. 163+10±
STA. 173+07± TO STA. 174+30±

+STA. 181+50± TO STA. 183+10±
STA. 184+75± TO STA. 190+90±
STA. 196+75± TO STA. 199+15±
STA. 222+25± TO STA. 229+42±
STA. 230+54± TO STA. 231+95±
STA. 235+60± TO STA. 242+18±
STA. 245+75± TO STA. 248+30±
STA. 261+23± TO STA. 270+23±

STA. 272+23± TO STA. 273+73±
STA. 275+80± TO STA. 279+80±
STA. 285+25± TO STA. 293+25±
STA. 294+30± TO STA. 304+40±
STA. 305+65± TO STA. 306+85±
STA. 308+15± TO STA. 316+28±
STA. 321+28± TO STA. 332+35±

*TOLERANCE FOR CONSTRUCTION ±0.5%
N.T.S

+ SHOULDERS CAN BE UP TO 6:1 SLOPE TO AVOID CHASING SLOPES & AVOID RESOURCE AREA IMPACTS

SEE CROSS SECTIONS FOR MORE INFORMATION

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STA.TE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	9	318
PROJECT FILE NO.	608164		

TYPICAL SECTIONS

PAVEMENT NOTES:

PROPOSED SHARED-USE PATH

SURFACE: 1-1/2" SUPERPAVE SURFACE COURSE - 9.5 (SSC - 9.5)
INTERMEDIATE: 2-1/2" SUPERPAVE INTERMEDIATE COURSE - 19.0 (SIC - 19.0)
SUBBASE: 4" to 8" GRAVEL BORROW, TYPE b (FOR LEVELING) OVER RESHAPED EXISTING RAILROAD BALLAST

PROPOSED PARKING LOT FULL DEPTH PAVEMENT

SURFACE: 1-1/2" SUPERPAVE SURFACE COURSE (SSC-12.5-P) - OVER
BASE: 2-1/2" SUPERPAVE INTERMEDIATE COURSE (19.0) - OVER
FOUNDATION: 8" GRAVEL BORROW, TYPE b

PROPOSED FULL DEPTH CONSTRUCTION (LESS THAN 4.00' WIDE) - PEAKHAM ROAD & HUDSON ROAD

SURFACE: 1-3/4" SUPERPAVE SURFACE COURSE (12.5 POLYMER) - OVER
INTERMEDIATE: 2-1/2" SUPERPAVE INTERMEDIATE COURSE (19.0) - OVER
BASE: 6" CEMENT CONCRETE BASE COURSE 4000psi, 610, 3/4" OVER
SUBBASE: 8" GRAVEL BORROW, TYPE b.

PROPOSED PAVEMENT MILLING & OVERLAY - PEAKHAM ROAD & HUDSON ROAD

1-3/4" PAVEMENT MILLING
1-3/4" SUPERPAVE SURFACE COURSE (SSC - 12.5 - P)

PROPOSED HOT MIX ASPHALT SIDEWALK & DRIVEWAY

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

PROPOSED CEMENT CONCRETE WALK, REST AREA & WHEELCHAIR RAMP

SURFACE: 4" CEMENT CONCRETE AIR ENTRAINED 4000 PSI, 3/4", 610
SUBBASE: 8" GRAVEL BORROW, TYPE b

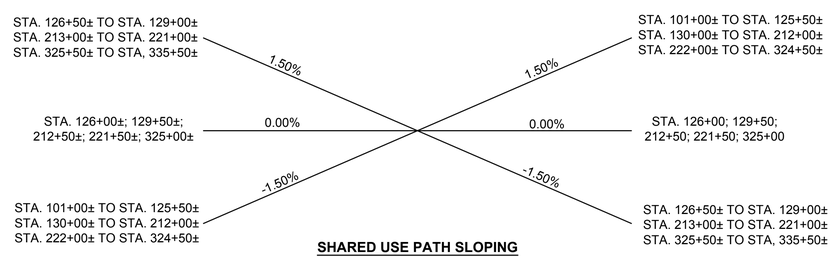
NOTES: EXIST. GRAVEL/BALLAST SUBGROUND MATERIAL DETERMINED BY THE ENGINEER TO BE SUITABLE SHALL REMAIN. THE DEPTH OF THE GRAVEL BORROW WILL BE AS REQUIRED BASED ON THE PROPOSED SUB-BASE ELEVATIONS.

AFTER REMOVAL OF STEEL RAILS AND WOOD TIMBER, ROUGH GRADE AND COMPACT SUBGROUND AREA. THEN PLACE AND COMPACT GRAVEL BORROW SUB-BASE MATERIAL IN MULTIPLE LIFTS.

ASPHALT EMULSION FOR TACK COAT AND HMA JOINT SEALANT SHALL BE APPLIED PER SECTION 450 QA OF THE SPECIAL PROVISIONS.

HMA FOR PATCHING SHALL BE USED FOR ALL PERMANENT, PARTIAL, AND FULL DEPTH PAVEMENT REPAIRS OF UNSOUND PAVEMENT PER SECTION 450 IN AREAS OUTSIDE OF PROP.OSED FULL DEPTH RECLAMATION OR RECONSTRUCTION ROADWAY AREAS.

HMA FOR MISCELLANEOUS WORK SHALL BE USED FOR ALL TEMPORARY CONSTRUCTION, TAPER RAMPS, CURB CUT RAMPS, TEMPORARY TRENCH REPAIR, ETC.



SHARED USE PATH SLOPING

NOTE:

1. THE SECTIONS OF PROPOSED ROADWAY NOT COVERED IN THE RANGE OF STATIONS ASSOCIATED WITH THE TYPICAL SECTIONS ARE EITHER IN TRANSITION OR ARE LOCATED AT INTERSECTIONS AND THEREFOR HAVE NOT BEEN SHOWN. REFER TO CROSS SECTION SHEETS FOR MORE DETAILS.

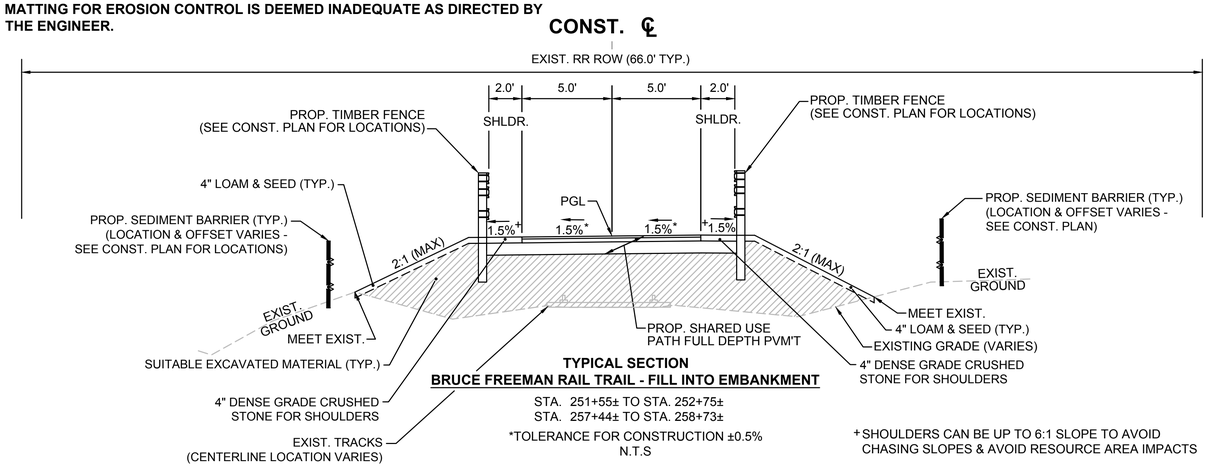
NOTES:

1. **MATTING FOR EROSION CONTROL SHALL BE INSTALLED ON EXISTING SIDE SLOPES THAT ARE 2:1 OR STEEPER THAT ARE NOT WITHIN JUTE MESH WATERWAY AREAS.**
2. **MODIFIED ROCK FILL SHALL BE USED AS NEEDED ON ANY CUT OR FILL SLOPES STEEPER THAN 2:1 WHERE POOR SOIL CONDITIONS EXIST AND MATTING FOR EROSION CONTROL IS DEEMED INADEQUATE AS DIRECTED BY THE ENGINEER.**

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STA.TE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	10	318
PROJECT FILE NO.	608164		

TYPICAL SECTIONS



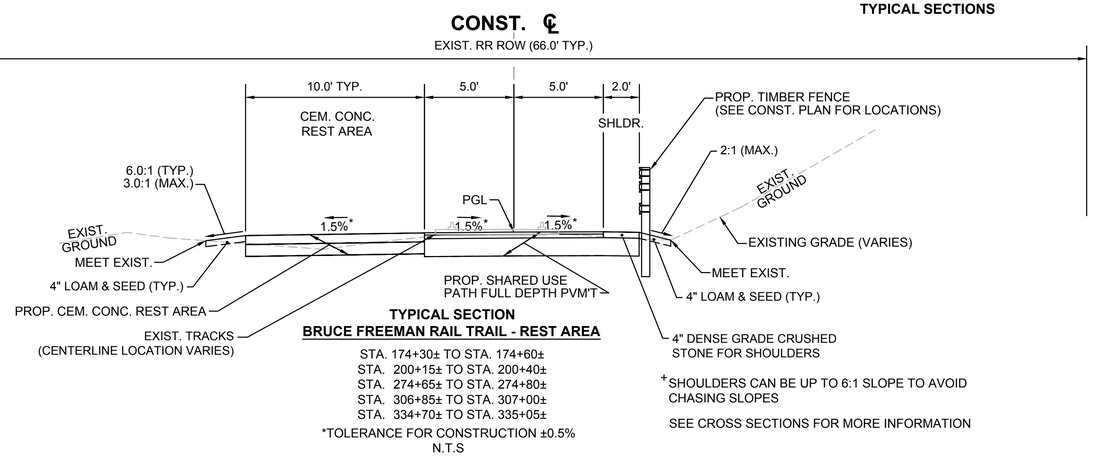
TYPICAL SECTION
BRUCE FREEMAN RAIL TRAIL - FILL INTO EMBANKMENT

STA. 251+55± TO STA. 252+75±
STA. 257+44± TO STA. 258+73±

*TOLERANCE FOR CONSTRUCTION ±0.5%
N.T.S

+SHOULDERS CAN BE UP TO 6:1 SLOPE TO AVOID CHASING SLOPES & AVOID RESOURCE AREA IMPACTS

SEE CROSS SECTIONS FOR MORE INFORMATION



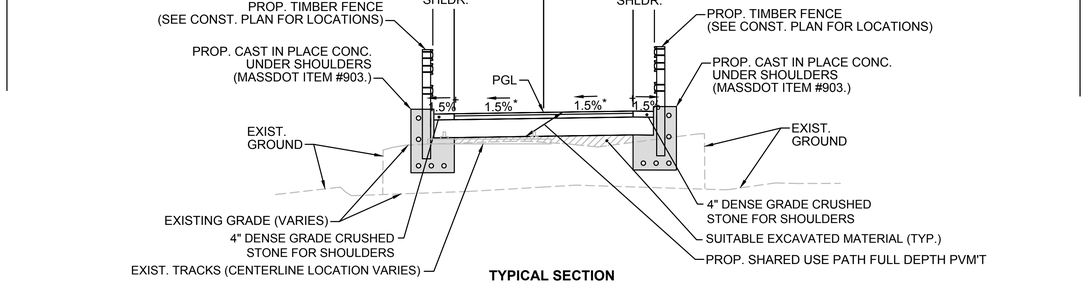
TYPICAL SECTION
BRUCE FREEMAN RAIL TRAIL - REST AREA

STA. 174+30± TO STA. 174+60±
STA. 200+15± TO STA. 200+40±
STA. 274+65± TO STA. 274+80±
STA. 306+85± TO STA. 307+00±
STA. 334+70± TO STA. 335+05±

*TOLERANCE FOR CONSTRUCTION ±0.5%
N.T.S

+SHOULDERS CAN BE UP TO 6:1 SLOPE TO AVOID CHASING SLOPES

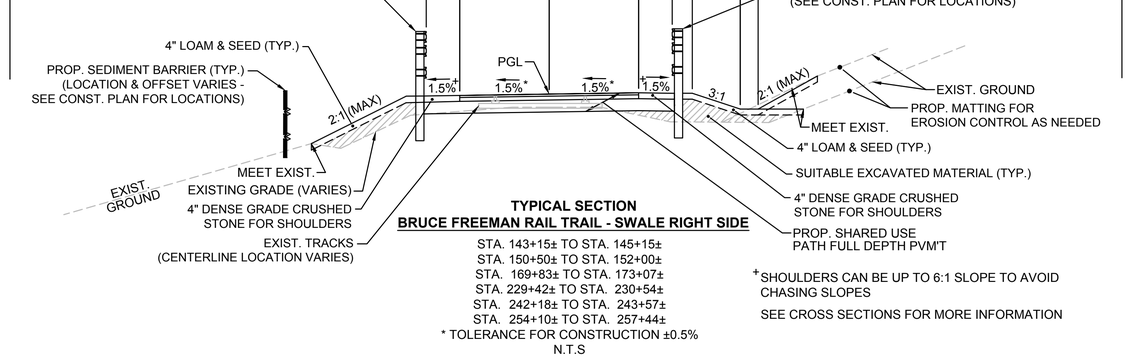
SEE CROSS SECTIONS FOR MORE INFORMATION



TYPICAL SECTION
BRUCE FREEMAN RAIL TRAIL AT CATTLE CROSSING

STA. 190+50± TO STA. 190+60±
STA. 258+45± TO STA. 258+50±
STA. 269+70± TO STA. 269+85±
STA. 321+60± TO STA. 321+70±

* TOLERANCE FOR CONSTRUCTION ±0.5%
N.T.S



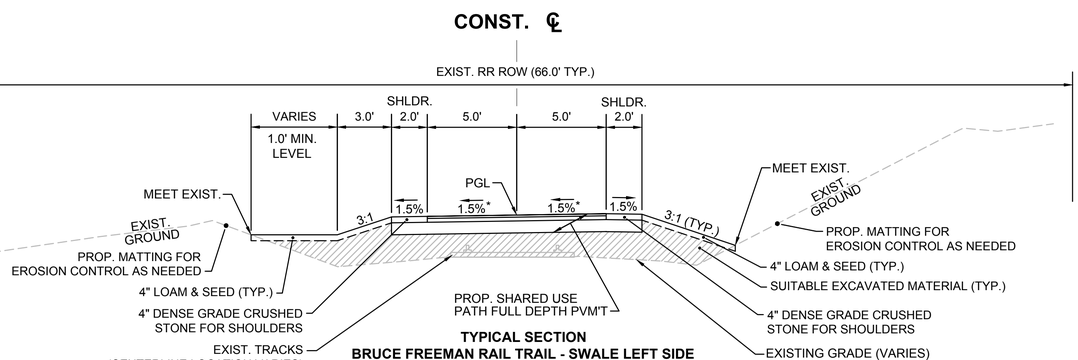
TYPICAL SECTION
BRUCE FREEMAN RAIL TRAIL - SWALE RIGHT SIDE

STA. 143+15± TO STA. 145+15±
STA. 150+50± TO STA. 152+00±
STA. 169+83± TO STA. 173+07±
STA. 229+42± TO STA. 230+54±
STA. 242+18± TO STA. 243+57±
STA. 254+10± TO STA. 257+44±

* TOLERANCE FOR CONSTRUCTION ±0.5%
N.T.S

+SHOULDERS CAN BE UP TO 6:1 SLOPE TO AVOID CHASING SLOPES

SEE CROSS SECTIONS FOR MORE INFORMATION



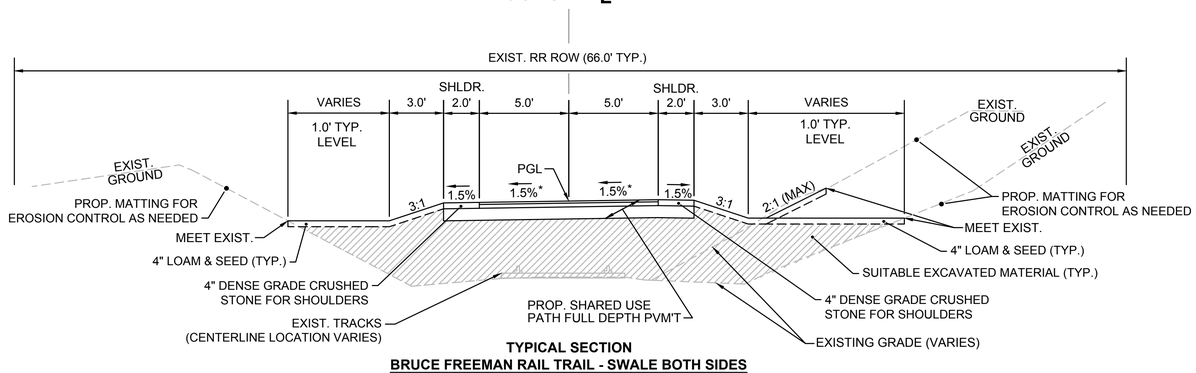
TYPICAL SECTION
BRUCE FREEMAN RAIL TRAIL - SWALE LEFT SIDE

STA. 163+10± TO STA. 165+25±
STA. 168+90± TO STA. 169+35±
STA. 235+35± TO STA. 235+60±

*TOLERANCE FOR CONSTRUCTION ±0.5%
N.T.S

+SHOULDERS CAN BE UP TO 6:1 SLOPE TO AVOID CHASING SLOPES & AVOID RESOURCE AREA IMPACTS

SEE CROSS SECTIONS FOR MORE INFORMATION



TYPICAL SECTION
BRUCE FREEMAN RAIL TRAIL - SWALE BOTH SIDES

STA. 232+70± TO STA. 235+35±
STA. 252+73± TO STA. 254+10±

*TOLERANCE FOR CONSTRUCTION ±0.5%
N.T.S

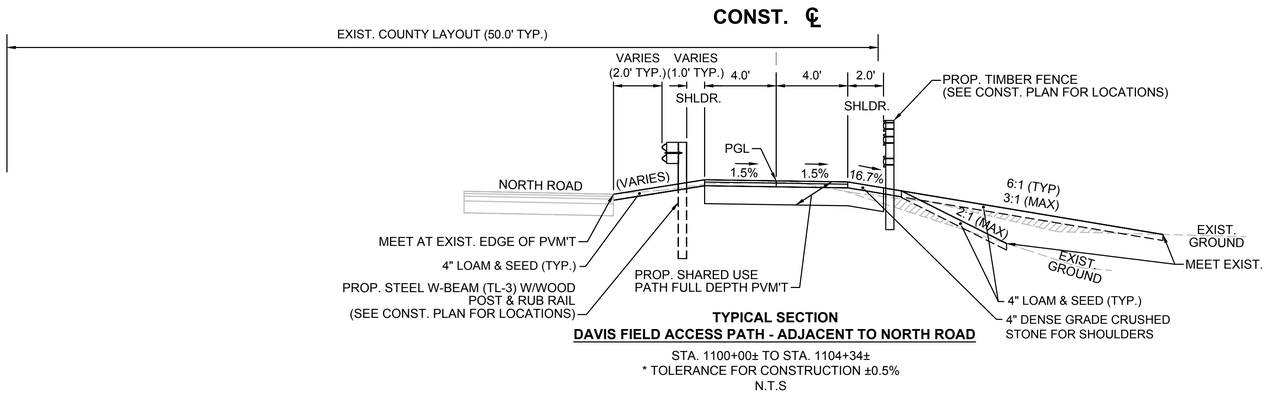
SEE CROSS SECTIONS FOR MORE INFORMATION

SEE SHEET 9 FOR PAVEMENT NOTES

SUDBURY
BRUCE FREEMAN RAIL TRAIL

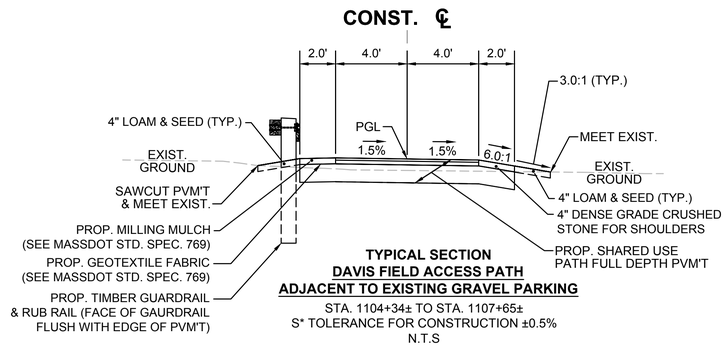
STA.TE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	11	318
PROJECT FILE NO.	608164		

TYPICAL SECTIONS



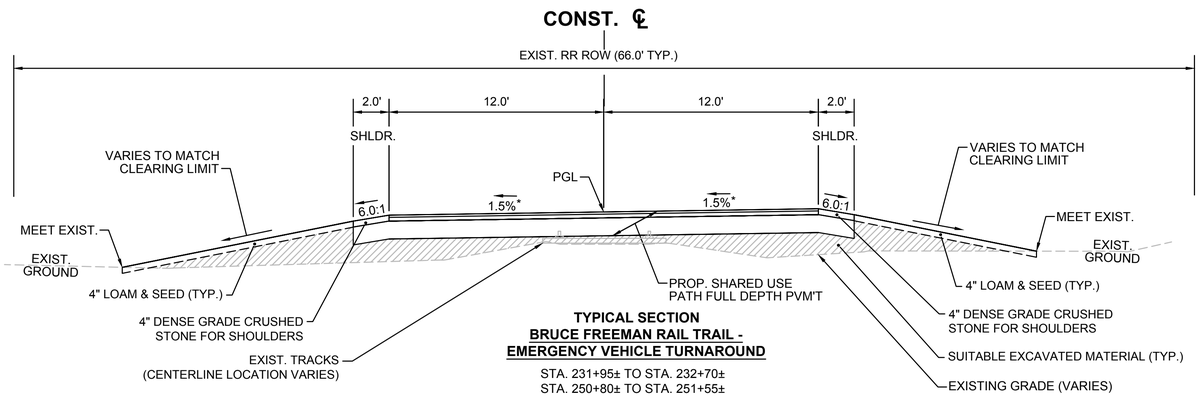
TYPICAL SECTION
DAVIS FIELD ACCESS PATH - ADJACENT TO NORTH ROAD

STA. 1100+00± TO STA. 1104+34±
* TOLERANCE FOR CONSTRUCTION ±0.5%
N.T.S



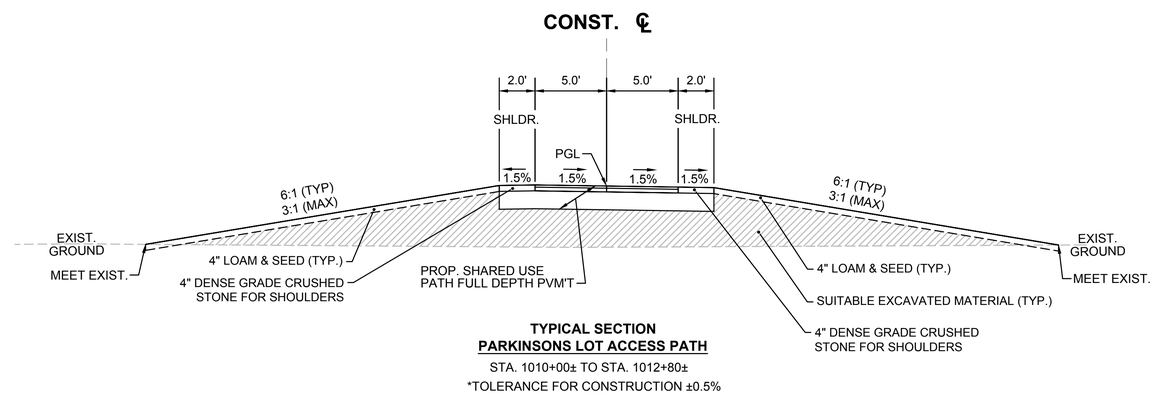
TYPICAL SECTION
DAVIS FIELD ACCESS PATH
ADJACENT TO EXISTING GRAVEL PARKING

STA. 1104+34± TO STA. 1107+65±
S* TOLERANCE FOR CONSTRUCTION ±0.5%
N.T.S



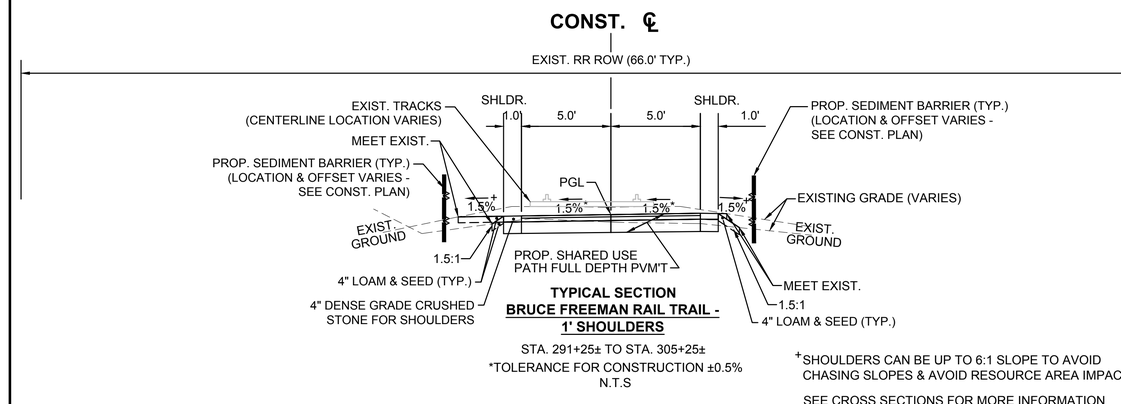
TYPICAL SECTION
BRUCE FREEMAN RAIL TRAIL -
EMERGENCY VEHICLE TURNAROUND

STA. 231+95± TO STA. 232+70±
STA. 250+80± TO STA. 251+55±
*TOLERANCE FOR CONSTRUCTION ±0.5%
N.T.S



TYPICAL SECTION
PARKINSONS LOT ACCESS PATH

STA. 1010+00± TO STA. 1012+80±
*TOLERANCE FOR CONSTRUCTION ±0.5%
N.T.S

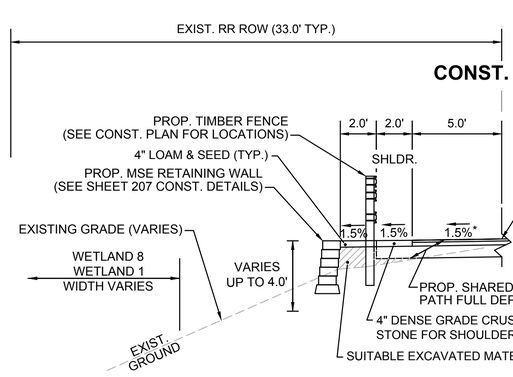


TYPICAL SECTION
BRUCE FREEMAN RAIL TRAIL -
1' SHOULDERS

STA. 291+25± TO STA. 305+25±
*TOLERANCE FOR CONSTRUCTION ±0.5%
N.T.S

+SHOULDERS CAN BE UP TO 6:1 SLOPE TO AVOID CHASING SLOPES & AVOID RESOURCE AREA IMPACTS

SEE CROSS SECTIONS FOR MORE INFORMATION



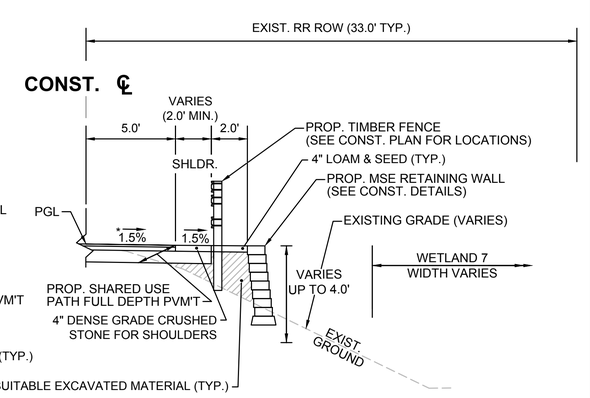
TYPICAL SECTION
BRUCE FREEMAN RAIL TRAIL - WALL SECTION LT

STA. 283+85± TO STA. 284+30±
STA. 283+85± TO STA. 284+30±
STA. 332+35± TO STA. 332+90±

*TOLERANCE FOR CONSTRUCTION ±0.5%
N.T.S

SEE CROSS SECTIONS FOR MORE INFORMATION

SEE GRADING PLANSFOR ELEVATIONS



TYPICAL SECTION
BRUCE FREEMAN RAIL TRAIL - WALL SECTION RT

STA. 284+65± TO STA. 285+25±
*TOLERANCE FOR CONSTRUCTION ±0.5%
N.T.S

SEE CROSS SECTIONS FOR MORE INFORMATION

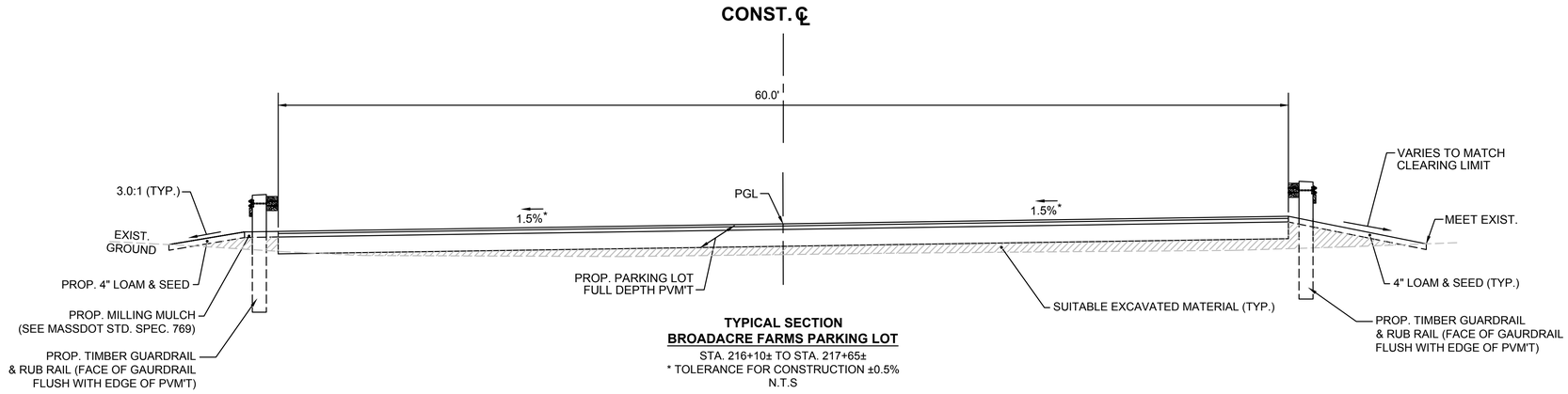
SEE GRADING PLANSFOR ELEVATIONS

SEE SHEET 9 FOR PAVEMENT NOTES

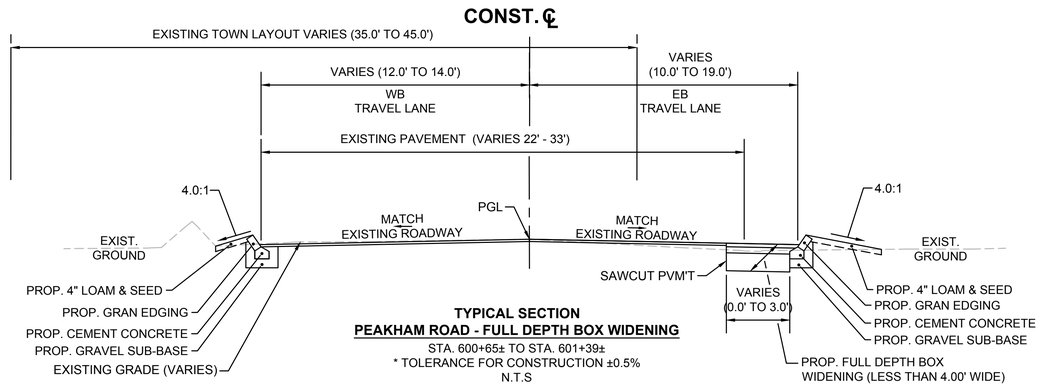
SUDBURY
BRUCE FREEMAN RAIL TRAIL

STA.TE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	12	318
PROJECT FILE NO.	608164		

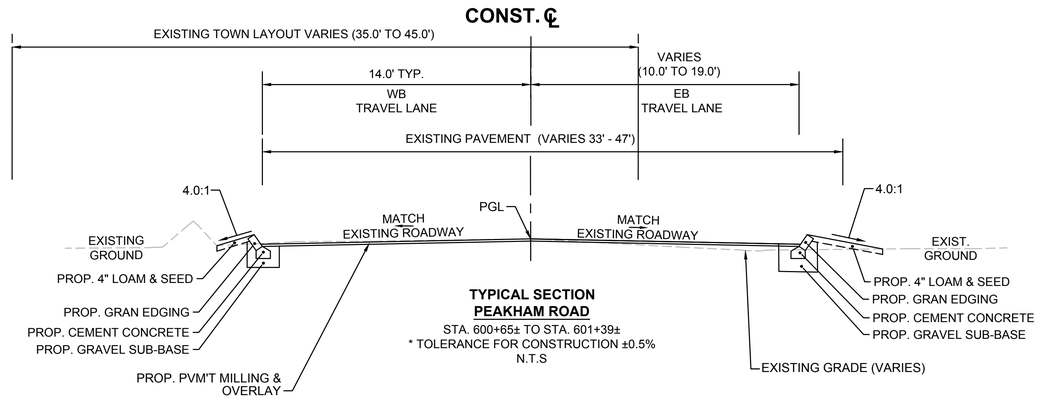
TYPICAL SECTIONS



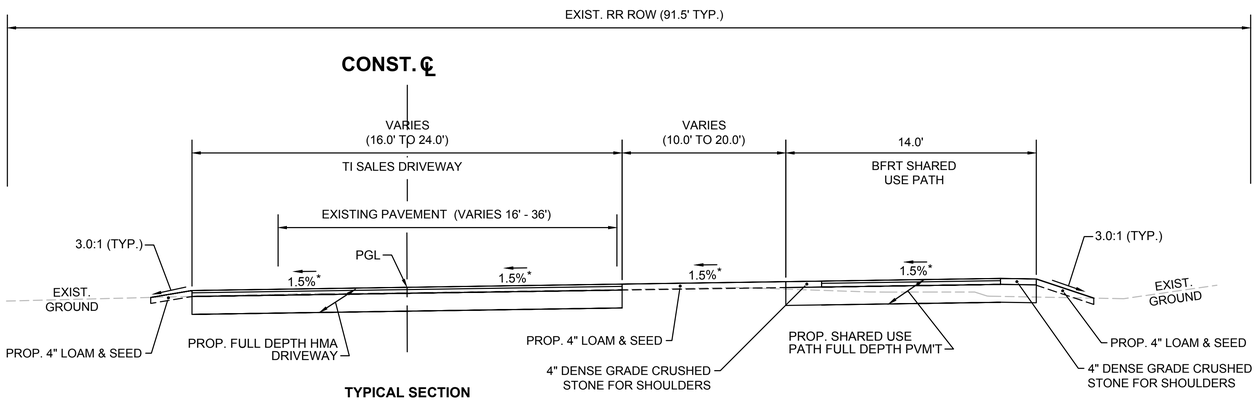
TYPICAL SECTION
BROADACRE FARMS PARKING LOT
STA. 216+10± TO STA. 217+65±
* TOLERANCE FOR CONSTRUCTION ±0.5%
N.T.S



TYPICAL SECTION
PEAKHAM ROAD - FULL DEPTH BOX WIDENING
STA. 600+65± TO STA. 601+39±
* TOLERANCE FOR CONSTRUCTION ±0.5%
N.T.S



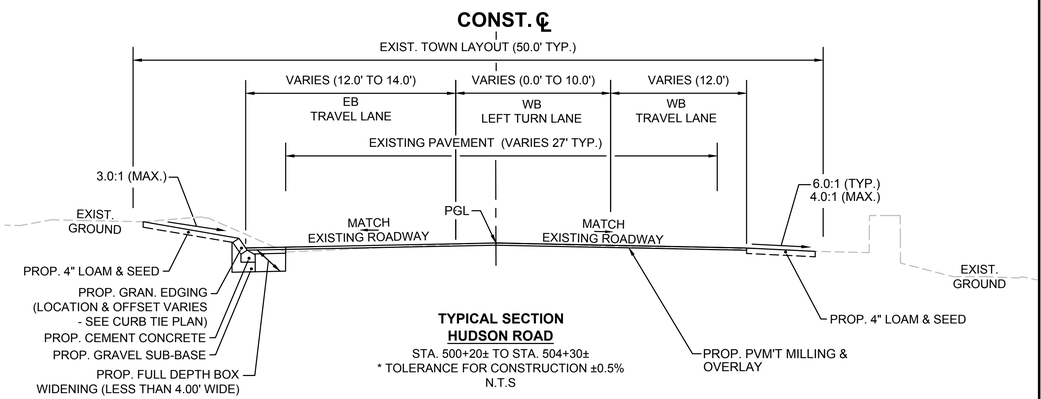
TYPICAL SECTION
PEAKHAM ROAD
STA. 600+65± TO STA. 601+39±
* TOLERANCE FOR CONSTRUCTION ±0.5%
N.T.S



TYPICAL SECTION
TI-SALES
STA. 700+20± TO STA. 701+85±
* TOLERANCE FOR CONSTRUCTION ±0.5%
N.T.S

+SHOULDERS CAN BE UP TO 6:1 SLOPE TO AVOID CHASING SLOPES

SEE CROSS SECTIONS FOR MORE INFORMATION



TYPICAL SECTION
HUDSON ROAD
STA. 500+20± TO STA. 504+30±
* TOLERANCE FOR CONSTRUCTION ±0.5%
N.T.S

SEE SHEET 9 FOR PAVEMENT NOTES

Appendix J

General Wildlife Habitat Evaluation

General Wildlife Habitat Assessment Report

Bruce Freeman Rail Trail
Sudbury, Massachusetts

Wildlife Habitat Assessment Relative to the 25% Design Submittal dated November 2016

April 8, 2020

Prepared for:

Massachusetts Department of Transportation

Prepared by:

Stantec Consulting Services Inc.

Table of Contents

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

1.0 INTRODUCTION

On behalf of the Massachusetts Department of Transportation (MassDOT), Stantec Consulting Services Inc. (Stantec) performed a general wildlife habitat assessment for the proposed Bruce Freeman Rail Trial (BFRT; Project) located in Sudbury, Massachusetts, between the driveway to Chiswick Park off Union Avenue north to the Concord town line. The approximately 4.6-mile-long trail is proposed along the former Lowell Secondary Track of the Old Colony Rail Road that operated between Lowell and Framingham, Massachusetts (Figure 1). The right of way (ROW) is presently owned by MassDOT. In light of recent efforts in neighboring towns to rehabilitate the former railroad ROW as a rail trail, the Town of Sudbury (Town) is considering rehabilitation of the ROW in Sudbury to interconnect with trails in adjacent towns (Fay, Spofford, and Thorndike 2006).

The wildlife habitat assessment described herein considered the proposed impacts per 25% Design Submittal dated November 16, 2017, to wetland resource areas subject to the Massachusetts Wetlands Protection Act regulations (310 CMR; WPA) and relative to the guidance of the 2006 *Massachusetts Wildlife Habitat Protection Guidance for Inland Wetlands* (Guidance)[1] developed by the Massachusetts Department of Environmental Protection (MassDEP). Stantec Certified Wildlife Biologists (CWB), Daniel Nein and Rodney Kelshaw, performed the wildlife habitat assessment following review and approval of professional qualifications by the Sudbury Conservation Commission.

The assessment included a desktop review of publicly available natural resource data, including Massachusetts Geographic Information Systems (MassGIS), prior to the field survey and a wildlife habitat field assessment conducted October 1–2, 2018. MassDOT Environmental Services staff participated in the field assessment on October 1, 2018.

2.0 METHODOLOGY

Methodology is described below for the data review and field survey associated with the general wildlife habitat assessment at the Project.

2.1 EXISTING DATA REVIEW

Stantec reviewed publicly available natural resource data from MassGIS to evaluate the potential presence or absence of resources and to identify specific areas of potential unique ecological value to target during the field assessment. The MassGIS data review included federal and state wetlands and waterways, open space, aerial photography, Areas of Critical Environmental Concern, Federal Emergency Management Agency (FEMA) flood zones, Coldwater Fisheries Resources, Massachusetts Natural Heritage and Endangered Species data, University of Massachusetts (UMass), and surface and wellhead drinking water supplies. The UMass Conservation Assessment and Prioritization System (CAPS) data for the Town was also reviewed. This wildlife habitat assessment also considered the results

[1] MassDEP. 2006 *Massachusetts Wildlife Habitat Protection Guidance for Inland Wetlands* is available at: http://umasscaps.org/pdf/wldhab.pdf.

of the previous wildlife habitat assessment performed by Call of the Wild Consulting in 2009 (Call of the Wild 2009) and vernal pool surveys performed by Stantec and other consultants between 2015 and 2018 (Stantec 2018), the results of which are summarized herein.

2.1.1 25% Design Submittal and Preliminary Resource Area Impacts

The existing data review also considered the 25% Design Submittal prepared by Vanasse Hangen Brustlin, Inc. (VHB) dated November 17, 2016 (Appendix A), and the associated wetland resource area impact tables for floodplain, Bordering Vegetated Wetland (BVW), and Bank dated September 25, 2017 (Appendix B).

2.2 FIELD ASSESSMENT

Following the completion of the existing data review, Stantec CWBs performed the field assessment along the full length of the proposed BFRT in Sudbury to evaluate general wildlife habitat and potential for Project adverse effect relative to the Guidance. The Guidance was referenced to determine each wetland resource area to assess, followed by a determination of the impact being above or below the "significance" threshold to identify the appropriate field data form (i.e., Guidance's Appendix A or B). The results of field form for each wetland resource area were used to assess whether or not the Project will adversely affect wildlife habitat.

Based on the preliminary wetland resource area impact calculations prepared by VHB (Appendix B) and our interpretation of the Guidance, Appendix A of the Guidance was used as the field data form when evaluating wetland resource areas where impact was proposed based on the 25% Design Submittal. Appendix A provides a simplified evaluation of small-scale alterations to ensure protection for certain "important habitat features" and identify projects that warrant detailed wildlife habitat evaluations (i.e., Appendix B of the Guidance). Appendix A also was deemed applicable based on the localized nature of proposed impacts based on the 25% Design Submittal. The following is a summary of the proposed wetland resource area impacts that triggered Appendix A of the Guidance.

- The Project proposes 4,681 square feet (sf; 3,670 sf temporary/1,011 sf permanent) of impact to BVW. Appendix A applies when impacts are below 5,000 sf to BVW.
- The Project proposes 1,752 linear ft (lf; 1705 lf temporary/47 lf permanent) of impact to Bank. Appendix A applies when impacts are above 50 lf to Bank.
- The Project proposes to fill approximately 3 cubic yards and cut approximately 73 cubic yards of floodplain/Bordering Land Subject to Flooding. The proposed impacts do not trigger Appendix A, but localized Bank habitat can be important to wildlife, so the wildlife habitat assessment evaluated where impact is proposed to this resource.
- Impacts to Previously Developed Riverfront Areas does not require a wildlife habitat assessment per the Guidance; however, Riverfront can be important to wildlife, so the wildlife habitat assessment considered these areas associated with Hop Brook, the unnamed tributary to Hop Brook, and Pantry Brook.

Stantec assessed the ROW for the following important habitat features outlined in Appendix A of the Guidance:

- Habitat for state-listed species
- Sphagnum hummocks and pools suitable as nesting habitat for four-toed salamanders
- Trees with large cavities (>18" diameter at entrance)
- Existing beaver, mink, or otter dens
- Areas within 100 feet of existing beaver, mink or otter dens
- Existing nest trees for birds that traditionally reuse nests (bald eagle, osprey, great blue heron)
- Land containing freshwater mussel beds
- Wetland and waterbodies know to contain open water in winter that may serve as waterfowl winter habitat
- Turtle nesting areas
- Vertical sandy banks (bank swallows, rough-winged swallows or kingfishers)

In addition to the above habitat features, the Guidance identifies the following habitat characteristics to evaluate when not commonly encountered in the surrounding area:

- stream bed riffle zones,
- springs,
- gravel stream bottoms (trout and salmon nesting substrate,
- plunge pools (deep holes) in rivers or streams, and;
- medium to large, flat rock substrates in streams.

The activities identified in Appendix A of the Guidance, if proposed within resources areas, that would trigger a detailed wildlife habitat evaluation include:

- Activities located in mapped "Habitat of Potential Regional or Statewide Importance"
- Activities affecting certified or documented vernal pool habitat, including habitat within 100 feet of a certified or documented vernal pool when within another jurisdictional resource area
- Activities in Bank, Land Under Water, Bordering Land Subject to Flooding (presumed significant) where alterations are more than twice the size of thresholds
- Activities affecting vegetated wetlands >5000 sf occurring in source areas other than Bordering Vegetated Wetland
- Activities affecting the sole connecter between habitats >50 acres in size

- Installation of structures that prevent animal movement
- Activities for the purpose of bank stabilization using hard structure solutions that significantly affect ability of stream channel to shift and meander, or disrupt continuity in cover that would inhibit animal passage, and
- Dredging (>5,000 sf)

The evaluation not only considered Appendix A of the Guidance but additional evidence of wildlife use and potential wildlife habitat not identified on Appendix A and general design recommendations that would avoid, minimize, and mitigate impacts, where deemed applicable, to general wildlife habitat interests protected under the WPA.

3.0 RESULTS

The results of the existing data review and field assessment at the Project are presented below.

3.1 EXISTING DATA REVIEW

The BFRT is proposed along an existing ROW in a suburb of Greater Boston where adjacent primary land uses include residential, commercial / industrial, and open space available for conservation and recreation. Several of these larger open space parcels are owned by the Town and occur near the northern extent of the Project. Commercial / industrial uses primarily occur in the southern extent of the ROW, located south of Codjer Lane and near the Hudson Road (Route 27) and North Road (Route 117) road crossings. The ROW crosses several perennial or intermittent waterways, including Hop Brook and Pantry Brook. We understand the determination of whether a stream is perennial or not may be ongoing and is being performed by others. Wetland areas are present in lower lying areas along the ROW, some of which are associated with riparian areas.

Table 1 below summarizes the natural resource desktop data review and identifies resources within, or immediately adjacent to, the ROW. It is noteworthy that unique ecological communities and high value wildlife habitat requiring regulatory review are not present within or proximal to the Project; these include:

- Critical Habitat for federally listed species,
- Priority or Estimated Habitat for state-listed species or BioMap2 Critical Natural Landscape, or
- Area of Critical Environmental Concern.

Table 1. Existing Natural Resource Data Review, Bruce Freeman Rail Trail, Sudbury, Massachusetts

Resource Type Within or Immediately Adjacent* to Project	Yes	No
NHESP BioMap2 Core Habitat Core Habitat 1920 (mapped for Species of Conservation Concern)	X	
NHESP Critical Natural Landscape		X
NHESP Priority/Estimated Habitat for state listed species		X
NHESP Potential Vernal Pool (8 PVPs) PVPs 24213, 24206, 24192, 24191, 24159, 24158, 24157, 24155	X	
NHESP Certified Vernal Pool CVP 1428 between Route 27 & Morse Road CVP 2504 between Route 27 & Old Lancaster Road	X	
NHESP Natural Community		X
Area of Critical Environmental Concern		X
Critical Habitat for federally listed species		X
UMass CAPS Habitat of Potential Regional or Statewide Significance	X	
MassWildlife Coldwater Fisheries Resource Hop Brook Unnamed Tributary to Hop Brook	X	
Protected Open Space	X	
MassDEP wetlands	X	
Bicycle Trails	X	
Surface Water Protection Area (Zone A, B, or C)		X
Zone II Wellhead Protection Area	X	
Interim Wellhead Protection Area		X
FEMA National Flood Hazard Area	X	

Notes:
Data is derived from MassGIS with the exception of CAPS data from UMass and Critical Habitat data from USFWS.
* For the purposes of the data review, immediately adjacent is considered as present within 500 feet of the Project ROW.

BioMap2 Core Habitat[2] (for Species of Conservation Concern) as mapped by the NHESP occurs between Hudson Road (Route 27) and Morse Road (Figure 2a). The Project is not mapped as BioMap2 Critical Natural Landscape, which can overlap with BioMap2 Core Habitat. BioMap2 is intended as a strategic conservation planning tool designed by the by the Massachusetts Department of Fish and Game and Massachusetts Nature Conservancy in 2010 to guide strategic biodiversity conservation to focus land protection and stewardship on areas most critical for ensuring long-term persistence of rare and native species and their habitats, exemplary natural communities, and a diversity of ecosystems and includes

[2] BioMap2 Core Habitat consists of 1,242,000 acres that are critical for the long-term persistence of rare species and other Species of Conservation Concern, as well as a wide diversity of natural communities and intact ecosystems across the Commonwealth. It includes habitats of rare, vulnerable or uncommon species; Priority Natural Communities; high quality wetland, vernal pool, aquatic, and coastal habitats; and intact forest ecosystems.

the habitats and species of conservation concern identified in the State Wildlife Action Plan. When the NHESP updated Priority Habitat of Rare Species and Estimated Habitat of Rare Wildlife mapping in 2017 for the 14th Edition of the Natural Heritage Atlas, which are regulatory maps used for review under Massachusetts Endangered Species Act (MESA and WPA, respectively), the Project was not mapped within or proximal to either habitat. It is possible that the BioMap2 Core Habitat from 2010 overlapping the Project was due to the inclusion of NHESP Priority Habitat mapping that predated the 14th Edition of the Natural Heritage Atlas.

Two generally small areas, which are adjacent to but not within the Project, have been modeled by the UMass Conservation and Assessment Prioritization System (CAPS) [3] and are mapped as Habitat of Potential Regional or Statewide Importance[4]. The first is the existing CVP noted above and surrounding forest immediately west of the ROW between Hudson Road and Morse Road, and second is small open water wetland/PVP and shoreline area immediately west of the ROW near the Sudbury-Concord town line (Figure 2a). When areas modeled by CAPS occur within jurisdiction of the WPA, they are subject to the Guidance.

Hop Brook and an unnamed tributary to Hop Brook are designated as Coldwater Fisheries Resources by Massachusetts Division of Fisheries and Wildlife (MassWildlife) (Figure 2b). Wellhead Protection Areas, Zone IIs, occur at the northern and southern extents of the ROW (Figure 2b). The nearest Surface Water Protection Areas associated with Cambridge Reservoir and surrounding waterbodies of the Charles River Watershed are located in the adjacent towns of Lincoln, Weston, and Waltham. FEMA Floodzones can be generally associated with low-lying areas at waterway crossings and wetlands.

There are two National Wildlife Refuges (NWR) (2,480 acres), one state Wildlife Management Area (WMA, 411 acres), two State Forests (~1,630 acres), one municipal state forest (289 acres) and multiple other open space parcels located within 5 miles of the Project. The boundaries of the Pantry Brook State Park WMA and Great Meadows NWR are located approximately 1,100 feet and 2,100 feet east of the ROW, respectively (Figure 2c). The boundary of the Marlborough-Sudbury State Forest, Callahan State Forest, Memorial Forest, and Assabet River NWR are located approximately 2 miles west or southwest of the ROW. Non-federal or state protected open space within a mile of the ROW includes Mineway Brook Corridor, Brues Woods, Gray Reservation, and Emmons Conservation Restriction (Figure 2c). Using data publicly available through MassGIS, greater than 30% and more than 25,000 acres of the land area within a 5-mile buffer of the ROW is currently protected open space.

Mapped vernal pool habitat (Potential or Certified Vernal Pools, PVP and CVP, respectively) are present in low density and scattered along and generally proximal to the ROW. At a landscape scale, vernal pools are more common in other parts of Sudbury and nearby towns. Several PVPs are generally present in the northern extent of the ROW and two CVPs have been identified in the southern extent of the ROW (Figure 2a). Under WPA, vernal pool habitat protection includes the vernal pool and the 100-foot zone around the vernal pool when located within a wetland resource area.

[3] CAPS is an ecosystem-based (coarse-filter) approach for assessing the ecological integrity of lands and waters and subsequently identifying and prioritizing land for habitat and biodiversity conservation.
[4] Areas representing the 40% of the landscape with the highest potential wildlife habitat value as measured by CAPS, and applicable to the MassDEP Guidance when within the jurisdiction of WPA.

The ROW is mapped as a Bicycle Trail, which is a MassGIS data layer representing trails where bicycles are a permitted use and corridors with conversion potential. The mapping in Sudbury connects with the Bicycle Trail mapping in adjacent towns of Concord and Framingham. The Massachusetts Department of Conservation and Recreation created this data layer for the purpose of regional planning and mapping.

Call of the Wild Consulting performed a wildlife habitat assessment between 2007 and 2008 in response to the Town's request for a comprehensive four-season wildlife habitat assessment (Call of the Wild 2009). Wildlife habitat assessment results, evidence of species use, and recommendations were provided in 2009.

3.2 FIELD ASSESSMENT RESULTS

A two-day field survey was conducted on October 1–2, 2018 to evaluate general wildlife habitat conditions, wildlife use, and direct observations of wildlife species within and near delineated wetland resource areas within the ROW that may be adversely affected by the Project. MassDOT Environmental Services staff participated in the field assessment on October 1, 2018. Stantec's wildlife habitat assessment was subsequent to the wetland delineation conducted by VHB in 2015-2016 that supported development of the 25% Project Design Submittal. This evaluation is based on the 25% Project Design Submittal and proposed impacts at this early stage should continue to be evaluated as the Project design advances in an effort to further avoid and minimize the possibility of adverse effect to not only general wildlife habitat, but the other interests protected under the WPA.

As noted in Section 3.1, the ROW traverses a suburban setting with adjacent areas of protected open space, past/current agricultural use, and commercial/industrial businesses. Representative and dominant ecological communities which were observed adjacent to the ROW included variants of the Mixed Oak Forest/Woodland, White Pine-Oak Forest, and Red Maple Swamp as described in the *Classification of Natural Communities of Massachusetts* (Swain 2016). These communities are widespread and considered common and secure in Massachusetts. The encroachment of commercial and residential land uses within the ROW has occurred over time. The ROW is approximately 65 feet wide for most of its length and is predominantly a wooded corridor passing through multiple wetland areas, including vegetated wetlands, perennial/intermittent streams, and associated floodplain. Wetland areas are previously disturbed or presumed to be an artifact or, at a minimum, influenced hydrologically by the original ROW construction. The vegetated wetlands where temporary or permanent impacts are proposed generally occur at the toe of slope or near the edge of the rail bed. A further description of the wetland resource areas can be found in the VHB wetland report.

Within the ROW, the existing railbed (i.e., the earthen area containing the tracks and ties), is of variable width as a result of adjacent cut and fill slopes among other variables. The track, wooden ties, and ballast are visible along the ground surface over much of the ROW. A buildup of a shallow duff and/or soil layer over areas of ballast has occurred over time, allowing the colonization of some rooted native species; however, the dominant species are predominately invasive plant species within the ROW. It can be inferred that the initial construction of the rail bed involved the use of off-site and on-site fill material, which may have created depressions or lower lying areas and additionally caused soil compaction.

Portions of the ROW less frequented by pedestrian foot traffic in the northern section are heavily overgrown with dense shrubbery and vines. Overall, invasive species are common throughout, including: glossy buckthorn (*Frangula alnus*), Oriental bittersweet (*Celastrus orbiculatus*), and honeysuckle (*Lonicera spp.*), with occasional occurrences of winged euonymus (*Euonymus alatus*) and Japanese barberry (*Berberis thunbergii*), and with common reed (*Phragmites australis*) frequent in wetland resource areas.

3.2.1 Wildlife Observations

The mosaic of the wooded corridor interfacing with seasonal and permanent wetlands and small waterways represents habitat for a variety of wildlife species and their uses (e.g., foraging, breeding, shelter, nesting), including representative and regionally common species expected for a suburban or urban area. However, less common or rare species are also documented from nearby state WMAs and NWFs and possibly other open space or protected areas noted in section 3.1. For example, Blanding's turtle (*Emydoidea blandingii*), state-listed and candidate for federal listing, and spotted turtle (*Clemmys guttata*), previously state-listed, are known inhabitants at Great Meadows NWF. The closest NHESP documented occurrence of a state-listed rare species to the Project is blue-spotted salamander (*Ambystoma laterale*) observed at the previously certified CVP 1428 located just beyond 100 feet west of station 336+00, which is further described below in the Vernal Pool Survey section as CVP #13. Direct observations of wildlife species presence within the ROW primarily included common or generalist species typical of a suburban and forested landscape such as the conditions present at the Project and those in areas of eastern Massachusetts and the region. No state-listed or federally listed species were observed within the ROW during the assessment.

Mammals

Evidence of the wildlife species at the Project in part included mammals such as white-tailed deer (*Odocoileus virginianus)*, coyote (*Canis latrans*), raccoon (*Procyon lotor*), gray squirrel (*Sciurus carolinensis*), eastern chipmunk (*Tamias striatus*), and red squirrel (*Tamiasciurus hudsonicus*). Open portions of the ROW provide ease of travel for mammalian species, while overgrown areas provide cover or shelter in addition to functioning as a potential travel corridor.

Evidence of prior beaver (*Castor canadensis*) activity (>5 years) within the ROW was noted in three areas and included stumps of hardwood species with evidence of beaver chew near the existing Hop Brook crossing. Inactive heavily deteriorated bank dens in the embankment close to the toe of slope at stations 264+00 near Pantry Brook and 477+00 near the open wetland modeled by CAPS were likely historically used by beaver or possibly river otter (*Lontra canadensis*). Within the ROW, including areas of proposed wetland impact, there were no observations of evidence of recent or current use by beaver, American mink (*Neovison vison*), or river otter. Riparian and open water habitat that would be considered suitable to support these species is limited at the Project, with the most likely exception of Hop Brook and Pantry Brook.

The presence of small mammal populations and additional larger mammals such as grey fox (*Urocyon cinereoargenteus*), raccoon, and other species using the ROW and adjacent areas, as reported by the Call of the Wild 2009, is anticipated given available suitable habitat to support these species.

A potential bat roost tree was identified near station 171+30 where an impact is proposed within a wetland resource area; however, potential roost trees were observed beyond the ROW and broader potential bat roost habitat, including mature trees, is expected to be common on the landscape. The spread of White Nose Syndrome has detrimentally impacted bat populations in the northeast United States.

Birds

Representative avian species such as red-tailed hawk (*Buteo jamaicensis*), American crow (*Corvus brachyrhynchos*), blue jay (*Cyanocitta cristata*), turkey (*Meleagris gallopavo*), black-capped chickadee (*Penthestes atricapillus*), gray catbird (*Dumetella carolinensis*), nuthatches (*Sitta* sp.), and several woodpeckers (*Picoides* sp.) were also observed at the Project. A pair of mallard ducks (*Anas plathrhynchos*) were observed in the open water wetland near the Sudbury/Concord town line. This area was modeled by CAPS and represents a small open water habitat for waterfowl and other bird species that is anticipated to freeze annually during winter months, unlike other larger open water habitats less likely to freeze in nearby WMAs and NWFs. Additional avian species anticipated to use the ROW and adjacent landscape include neotropical migrants and resident species typical of suburban forested and partially fragmented landscapes. The ROW provides an open corridor for avian travel and foraging, while overgrown areas provide increased cover, shelter, and nesting habitat, although these habitats are primarily located outside of jurisdictional areas. These types of habitats are not limited to the ROW and are expected to be abundant in the surrounding landscape.

Fisheries and Mussels

Hop Brook and an unnamed tributary to Hop Brook are designated as Coldwater Fisheries Resources by MassWildlife. Attributes of Coldwater Fisheries Resources include high water quality, natural flow regimes, cold water temperatures (less than 68°F), largely intact riparian area, and watershed connectivity. Hop Brook, the unnamed tributary to Hop Brook and additional potential perennial and intermittent streams were evaluated for the presence of fisheries and mussel habitat, including the habitat features and considerations identified in Appendix A.

The in-stream conditions at the existing Hop Brook crossing and nearby unnamed tributary to Hop Brook indicate a perennial condition with a sand and sparse gravel streambed with moderate shoreline and submerged aquatic vegetation. Habitat conditions are anticipated to support coldwater species where the ROW crosses these waterways. Species such as brook trout (*Salvelinus fontinalis*), dace (*Rhinichthys* spp.), and white suckers (*Catostomus commersonii*) may be present in small densities and are examples of species that would need to be documented to designate the waterway as a Coldwater Fisheries Resource by MassWildlife.

In-stream conditions at the Pantry Brook crossing include a higher percentage of muck/organic material in the substrate. Water quality is not expected to be as high in this area compared to Hop Brook and high water quality is needed to support coldwater species; however, habitat could support some warmwater species.

Conditions at and near each perennial waterway crossing did not appear suitable (e.g., substrate, depth) for mussel beds, nor was there evidence of the predation of mussels, such as empty shells, which is also an indication of species presence.

There is the potential for mussel beds, and plunge pools and gravel dominated substrates suitable for fish spawning to be present further up or downstream of the areas assessed for the Project. The designation of Coldwater Fisheries Resources for waterways at the Project indicates suitable conditions are present for coldwater fish species, which might also be suitable for some mussel species.

Vernal Pool Species

A vernal pool survey at the Project was conducted by Stantec in April 2018 (Stantec 2018) and evaluated eligibility under the NHESP 2009 *Guidelines for the Certification of Vernal Pool Habitat* and the Sudbury Wetlands Administration Bylaw Regulations (Bylaw) revised September 25, 2017. The results of the 2018 survey identified three vernal pools eligible for NHESP certification (PVP 4, PVP 11, and PVP 12a). CVP 13[5] continues to meet NHESP certification requirements, and PVP 9[6], PVP 17, and PVP 20 may meet criteria as a vernal pool under the Town's Bylaw. Amphibian species observed during the spring survey included: wood frog (*Lithobates sylvaticus*), spotted salamander (*Ambystoma maculatum*), red-backed salamander *(Plethodon cinereus)*, gray treefrog (*Hyla versicolor*), blue-spotted salamander (CVP 13; NHESP CVP# 1428), and spring peeper (*Pseudacris crucifer*).

There was no evidence of turtle nesting (i.e., shell fragments or nests excavated by mammals) or measurable areas of suitable turtle nesting habitat with the ROW or immediate vicinity observed during the 2018 vernal pool survey or wildlife habitat assessment.

4.0 EVALUATION OF ADVERSE EFFECT

The results of the data review and the results of the field survey were used to assess whether or not the Project will result in an adverse effect to wildlife habitat subject to the WPA. None of the important habitat features or other thresholds identified in Appendix A of the MassDEP guidance were observed within or proximal to wetland resource areas where temporary or permanent Project impacts are proposed. Additionally, no other high value habitats or species particularly sensitive to the construction of a rail trail were observed. The trail is not expected to be a barrier to wildlife usage patterns near the Project or at the landscape level, as most species would shift habitat usage patterns, as needed, to carry out their life cycles during construction and post-construction. Therefore, potential habitat impact within jurisdiction of the WPA is generally localized, temporary, occurring previously disturbed area, and would occur to habitat that is not considered critical; or limiting at the Project or the local landscape. As a result, no adverse effect to wildlife habitat within wetland resource areas is anticipated based on the 25% Design

[5] Obligate vernal pools species observed in 2018 included fairy shrimp (*Eubranchipus* spp.) and blue-spotted salamander (*Ambystoma laterale*) egg masses.
[6] The NHESP confirmed Stantec's 2018 identification of two dead salamanders as the lead phase for eastern red-backed salamander.

Submittal. As the Project design develops further, recommendations are provided below for consideration in consultation with the Sudbury Conservation Commission and other resource agencies, as appropriate.

5.0 ADDITIONAL DESIGN CONSIDERATIONS AND RECOMMENDATIONS

The following additional recommendations relative to the protection of wildlife habitat should be considered as Project planning and design continues.

1. Locate the Project limit of disturbance within existing ROW to the greatest extent practical, including staging areas, construction access, parking, and scenic vistas.

2. Avoid or minimize tree clearing where possible. For example, the forested habitat surrounding high value or productive vernal pools (e.g., certified or certifiable by NHESP), particularly the 100-foot zone surrounding the boundary of the pool breeding habitat.

3. Implement Best Management Practices (BMPs) to avoid/minimize potential impacts to wetland resources areas that support wildlife habitat. For example, avoidance and minimization of erosion and sedimentation into wetland resource areas, use of clean heavy machinery at Project to limit/avoid introduction of invasive non-native plant species, avoidance of machinery refueling in buffer zones, and general housekeeping (including final site cleanup).

4. Establish a robust erosion and sedimentation control program per MassDEP Erosion and Sedimentation Control Guidelines and guidance from the Sudbury Conservation Commission, including monitoring and timely maintenance throughout construction due to the proximity of limits of work near some wetland resource areas.

5. Use plantings and seed from native plant species during restoration of disturbed areas. The selection of species for plantings should consider enhancing or replacing wildlife habitat use (e.g., fruiting shrubs, pollinator habitat, evergreen species for cover, etc.).

6. Incorporate minimum Massachusetts Stream Crossing Standards at perennial waterway crossings to the maximum extent practical. Consider these standards in additional areas that may provide high value wildlife habitat (e.g., intermittent stream). In the case of Hop Brook, the reuse/rehabilitation of the existing bridge to span the brook is being considered for the design.

7. Consider maintaining or creating wildlife crossing passage at strategic locations underneath the trail (e.g., existing cattle crossing used by wildlife, new crossing where amphibians migrate from the forest to high value vernal pools close to the ROW).

8. If scenic vistas or additional parking are proposed, cite these in areas that avoid and minimize the potential impact to wildlife habitat and wildlife behavior.

9. Monitoring of Priority and Estimated Habitat mapping by the NHESP for the potential presence of state-listed species near or at the Project as environmental permitting continues.

10. Avoid or minimize installation of physical barriers that would create impassable conditions across the trail for some smaller wildlife species.

11. Consider leash and waste clean-up rules for pets at the Project.

12. Strategically girdling trees (e.g., cottonwood) that are located a safe distance from the ROW (to avoid creating hazard tree to humans). This management practice would increase the number of standing dead trees that could offer natural cavities and crevices for wildlife (e.g., roosting bats, nesting birds and waterfowl, small mammal dens).

13. Beneficially reuse trees and brush cleared during on-site site preparation to create new or enhance existing brush piles near the ROW to serve as wildlife habitat (e.g., refugia for small mammals, amphibians, and reptiles; and nesting habitat for songbirds).

14. Avoid and minimize effects of temporary construction and permanent lighting to the maximum extent practical to minimize the potential for the disruption of wildlife behavior. If permanent lighting is proposed, use full cutoff lens to direct lighting downward toward the trail surface to avoid and minimize the secondary effect to adjacent wildlife habitat.

15. Consider strategically locating signage along the trail (e.g., trail heads or parking areas) to educate trial users about wildlife and wetland ecology.

6.0 REFERENCES

Call of The Wild Consulting. 2009. Comprehensive Four-Season Wildlife Habitat Evaluation Phase II Bruce Freeman Rail Trail Project. Prepared for Sudbury Conservation Commission.

Fay, Spofford, & Thorndike, 2006. Bruce Freeman Rail Trail Environmental & Engineering Assessment. Prepared for Town of Sudbury, Massachusetts.

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Swain, P. 2016. Classification of the Natural Communities of Massachusetts. Version 2.0. Natural Heritage & Endangered Species Program, Massachusetts Division of Fisheries and Wildlife. Westborough, Massachusetts.

Appendix K

Specifications

Item

101&101.2 Clearing and Grubbing
102.3 Herbicide Treatment for Invasive Plants
102.33 Invasive Plant Management Strategy
102.511 Tree Protection
105.40 Tree Removed (Excluding Stump) Diameter Under 24 Inches
105.45 Supplemental Borrow for Native Material
755.35 Inland Wetland Replication
755.45 Wetland Restoration
755.75 Wetland Specialist
755.76 Wetland Monitoring Reports
755.77 Matting for Erosion Control
767.78 Composted Mulch for Modified Rock Fill
767.121 Sediment Control Barrier
991.1 Control of Water

SECTION 100: EARTHWORK, GRADING, DEMOLITION, RODENT CONTROL AND BORINGS

SUBSECTION 101: CLEARING AND GRUBBING

DESCRIPTION

101.20: General

This work shall consist of clearing, grubbing, cutting, removal and disposal of all vegetation and debris from areas as shown on the plans or designated by the Engineer. The work shall also include the preservation from injury or defacement of all vegetation and objects designated by the Engineer to remain.

CONSTRUCTION METHODS

101.60: General

The burning of trees, brush, stumps, etcetera, will not be permitted. The Contractor shall provide other satisfactory methods of disposal without additional compensation.

The Contractor shall obtain written permission of the Engineer before storing debris within the Right-of-Way. Any clearing operations beyond the limits set by the Engineer shall be done with the approval of the Engineer and at the Contractor's expense. All such areas shall be restored to a condition acceptable to the Engineer including necessary mulching, seeding, and planting without additional compensation.

The Engineer shall be provided with notarized copies of agreements between the Contractor and owners of land used as disposal or storage areas.

When fencing is installed outside normal clearing areas, every reasonable effort shall be made to preserve trees or shrubs whose removal is not essential to the installation of the fencing.

Acceptable material obtained on the project may be used to produce wood chip mulch. The Contractor shall use an approved chipper and ¼-in. knife setting as described under M6.04.3: Wood Chip Mulch. Material obtained from Elm trees shall not be accepted for use.

Wood chips produced on the project shall be stockpiled within the location and used where and as directed.

Except for materials used for making wood chip mulch, the Contractor shall make all arrangements and negotiations necessary for the satisfactory disposal of trees, shrubs, stumps, roots, dead wood and other litter, in areas outside the Right-of-Way and in such manner that no condition or accumulation of material shall be permitted to disfigure or mar the finished landscape.

101.61: Clearing and Grubbing

The stumps of all trees, brush and major roots shall be grubbed and removed in all excavation areas and under all embankments where the original ground level is within 3 ft of the subgrade or slope of embankments.

All trees, stumps, and brush shall be cut off within 6 in. of the ground in embankment areas where the original ground level is more than 3 ft below the subgrade or slope of embankments.

Trees and shrubs that are specifically designated by the Engineer not to be cut, removed, destroyed or trimmed shall be saved from harm and injury.

All damage done to trees by the Contractor's operation and all branches of trees extending within the roadway shall be trimmed as directed to provide the minimum vertical clearance including selective trimming of such trees as directed.

101.62: Tree Trimming and Selective Clearing and Thinning

A. General.

The work under this item shall consist of the removal of hazardous growth and dead, dying or diseased plant material; the removal of groups and individual plants which interfere with the growth of more desirable types of trees and the clearing away of lesser growth that may obscure outstanding trees, tree groups, or scenic views. Any part of tree trunks or base of plant material located on the Location Lines shall be considered within the State Highway Limits.

Densely wooded areas shall be thinned to provide space for healthy growth by eliminating thinner, weaker trees and the reduction of number of varieties.

The desired appearance to be attained in certain areas of heavy growth may require three or more operations. First, the obvious dead, dying and diseased trees and undergrowth shall be cut and cleared out of the area. This work includes removal of any previously fallen trees, branches, uprooted stumps and other debris as directed. Next, the area is to be thinned out, as directed, by removing the less desirable trees and brush which interfere with the growth of the better plant material. Finally, clear out lesser growth which may obscure outstanding trees, tree groups or scenic views.

Tree up-branching and shaping under this item will be restricted to trees which have limbs and branches restricting sight distance, extending over roadways, shoulders, turn outs, etc. Up-branching or trimming will be required to produce the minimum vertical clearance directed by the Engineer.

B. Prosecution of Work.

(Supplementing Subsection 8.03: Prosecution of Work)

All trimming and pruning shall conform to ANSI A300 *For Tree Care Operations - Tree, Shrub, and Other Woody Plant Management - Standard Practices.*

Recognized tree surgery practices include among many others, the fact that all limbs and branches which require removal and all stubs regardless of age must be cut flush either to a union with the next larger sound limb or branch or flush to the trunk of the tree.

The cutting shall be performed by arborists with the ISA Tree Worker Climber Specialist certification. Care shall be exercised by the Contractor to prevent injury to trees and shrubs designed to be preserved. Any injury to limbs, bark or roots of such plants shall be repaired by the Contractor, as directed, or the plants replaced without additional compensation for such repair or replacement. Injury to limbs, bark or roots of such plants shall be repaired or the plants replaced by

the Contractor, at the discretion of the Engineer, without additional compensation for such repair or replacement.

C. Cutting and Treatment of Stumps and Stubble.

Standing trees, undesirable brush and existing stumps to be removed shall be cut flush with the ground and a 2-in. tolerance permitted and the resulting stumps or stubble.

The Contractor shall use all necessary precautions to prevent injury to crops or damage to other desirable growth on private abutting property, as well as to those within the Right-of-Way, and shall assume full responsibility for any damage.

D. Disposal of Cuttings.

The Contractor may dispose of cut material by processing into a wood chip mulch as described in M6.04.3: Wood Chip Mulch and spreading uniformly throughout the cleared and thinned areas as directed by the Engineer.

101.63: Disposition of Trees, Stumps and Brush

All trees, tree stumps, including trunk base, root flare and attached root mass and brush to be cleared shall be subject to the regulations and requirements of state and local authorities governing the disposal of such materials. Trees, stumps and brush shall be chipped to 1-in. maximum chip dimension and spread to a depth not to exceed 4 in., in a location approved by the Engineer, at no additional compensation.

The trees, stumps and brush including cuttings, shall not be stored on site for more than 24 hours unless chipped.

If the existing ground in the area is disturbed by any of the work or equipment, the Contractor shall rough-grade and loam and seed if necessary the disturbed areas without additional compensation.

The Contractor shall be responsible for ensuring that any and all plant pests on site shall not be carried off site and shall be either destroyed or otherwise contained on site. Plant pests shall include invasive plants, noxious weeds, insect pests, and plant diseases (including infected plant tissue). Method of destruction or containment shall be approved by the Engineer. If invasive or contaminated material cannot be either destroyed or contained on site, contractor shall submit plans for disposal for approval by the Engineer. For current list of plant pests and applicable management procedures see the following on-line references:

Invasive Plants: http://www.massnrc.org/mipag/docs/MIPAG_FINDINGS_FINAL_042005.pdf
Plant Pests: http://www.massnrc.org/pests/factsheets.htm#commodity

COMPENSATION

101.80: Method of Measurement

Both Clearing and Clearing and Grubbing shall be measured by the horizontal plane area and will be the number of acres within the limiting stations of the project and/or as designated by the Engineer and the outside limits of measurement shall extend to a point 5 ft beyond the top or bottom of slopes, excluding existing roadway and shoulder surfaces, streams or bodies of water.

Areas outside of the limits specified above, when cleared and grubbed in connection with the construction of fences and noise barriers shall be computed on the basis of a 10-ft width multiplied by the total length installed, and when done in connection with excavating ditches or trenches the width shall be limited to 5 ft beyond the outer edges of the excavation.

Measurement of selective clearing and thinning will be based on the actual number of acres which receive the required attention. Approximate locations will be shown on the plans or detail sheets and as designated in the field by the Engineer.

Trees and stumps, regardless of size, that fall within an area to be cleared and grubbed or selectively cleared and thinned shall not be measured separately for payment.

Only trees that have a shortest diameter of at least 9 in. and less than 2 ft shall be included in Item 103. Trees Removed (Diameter Under 2 feet). Only trees that have a shortest diameter of 2 ft or more shall be included in the Item 104. Trees Removed (Diameter 2 feet and Over).

Tree trimming shall be measured along the length of the tree trimming operation. Sections along the length of the tree trimming operation where no trees are required to be trimmed for a length of 30 ft or more shall be subtracted from the total length of the tree trimming operation.

The item of Stumps Removed shall include the removal and satisfactory disposal of all tree stumps which remain in their original position and measure 9 in. or more in shortest diameter at the cutoff point, where the trees have been previously removed by others. A stump shall not be construed as a tree under these specifications unless the trunk extends over 6 ft above the average ground.

Trees or stumps to be removed which have the shortest diameter specified for payment will be measured in place by the following procedure:

Where the tree consists of a single trunk extending more than a 3 ft vertical height above the average natural ground line, the shortest diameter shall be measured at the 3-ft level above the average elevation of the original ground.

Any tree whose main trunk separates into multiple trunks or which has limbs or branches growing out from the main trunk below the 3-ft level defined hereinbefore shall have its shortest diameter measured at the lowest point on the main trunk where multiple growth or branching out begins.

The shortest diameter of a stump shall be measured at the cutoff except that where multiple growth begins below cutoff, the shortest diameter shall be measured at the main trunk where multiple growth begins.

Measurement for payment under the respective items shall be such that any individual growth to be classed as a tree stump shall be measured in a manner to limit payment to one single tree or stump at each particular location of the individual growth. When multiple trunks with a common root system are separated at ground level each separate trunk shall be considered as an individual growth under these specifications.

The quantity of trees or stumps to be paid for will be the number actually removed by the Contractor in the completed and accepted work as determined by count.

101.81: Basis of Payment

Clearing and Grubbing will be paid at the contract unit price per acre and shall include the removal of all brush, trees, stumps and roots within the designated area. No separate payment will be made for any individual trees or stumps removed within the area.

Clearing will be paid at the contract unit price per acre and shall include the removal of all brush undergrowth and trees, within the designated area. No separate payment will be made for any individual trees removed within the area.

Selective Clearing and Thinning will be paid at the contract unit price per acre and shall include the removal of all trees as directed, brush, dead, dying and diseased trees, previously fallen trees, branches, uprooted stumps and other debris within the designated area. No separate payment will be made for any individual trees or stumps removed within the area.

When clearing or clearing and grubbing work is not included in the proposal as a payment item, payment for any such work will be included in the excavation or borrow items.

Individual trees to be removed will be paid for at the contract unit price per each and shall include the stump and major root systems. Only trees having a shortest diameter of 9 in. and over as defined in 101.80: Method of Measurement shall be measured for payment.

Tree Trimming will be paid for at the contract unit price per foot.

Stumps to be removed, as defined in 101.80: Method of Measurement, will be paid at the contract unit price per each and shall include the major root system.

The contract unit price shall include the cost of all arrangements and methods required to protect from harm all existing overhead or underground installations.

No payment shall be allowed for preparation and spreading of wood chips.

101.82: Payment Items

101.	Clearing and Grubbing	Acre
101.1	Clearing	Acre
102.	Selective Clearing and Thinning	Acre
102.1	Tree Trimming	Foot
103.	Tree Removed (Diameter Under 2 feet)	Each
104.	Tree Removed (Diameter 2 feet and Over)	Each
105.	Stump Removed	Each

SUBSECTION 112: DEMOLITION OF BUILDINGS, STRUCTURES AND BRIDGES

DESCRIPTION

112.20: General

The work to be done consists of demolishing completely such buildings and structures as are listed in the Proposal.

ITEM 101.2 CLEARING AND GRUBBING – RAIL TRAIL ACRE

Work under this item shall conform to the relevant provisions under Subsection 101: Clearing and Grubbing in the Commonwealth of Massachusetts Department of Transportation Standard Specification 2021 Edition.

The contractor shall only be paid for clearing and grubbing from slope limit to slope limit as shown on plans. The contractor shall not be paid for any clearing and grubbing outside slope limit.

ITEM 102.3 HERBICIDE TREATMENT FOR INVASIVE PLANTS HOUR

Work under this item consists of controlling invasive plants within the project limits. An Invasive Plant Management Strategy (IPMS) for their control shall be submitted to the Engineer for review and approval and the IPMS shall be implemented on site. The IPMS shall be measured and paid for under Item 102.33, Invasive Plant Management Strategy.

Work under this item shall be coordinated with work and schedule for Clearing and Grubbing, Mowing, Tree Removal, Planting, and Wetland Mitigation items.

Herbicide shall be applied during daytime hours only.

Payment is per hour on site and shall be compensation for a minimum crew of 2 licensed applicators, 2 back-pack sprayers and mist-blowers, a properly equipped spray truck with spray hoses, and a tank with sufficient capacity for a full day of work.

The overall intent is to improve the habitat value of the site, protect proposed landscape restoration, improve future maintenance operations, and attempt to prevent future spread both on-site and to adjacent sites.

Measures to prevent the introduction of invasive plant species to the site and to correct their introduction as a result of construction-related activities shall be covered under the Standard Specifications, Division I - Sections 7.01(D) Plant Pest Control and 7.13 Protection and Restoration of Property as amended in these Special Provisions.

Plant species targeted for management under this item shall be as determined in the field per the site walk and as specified in the IPMS.

The definition of invasive plant species shall be as described by Massachusetts Invasive Plant Advisory Group (MIPAG): “non-native species that have spread into native or minimally managed plant systems in Massachusetts, causing economic or environmental harm by developing self-sustaining populations and becoming dominant and/or disruptive to those systems.”

Control of invasive plants shall begin immediately with the initiation of construction activities and prior to any clearing or site disturbance. Treatment areas shall include stockpile locations and may, upon approval of the Engineer, extend outside the project limit. Treatment shall be done each consecutive year for the duration of the contract unless specified otherwise in the IMPS or unless directed otherwise by the MassDOT invasive species contact. Work shall be done during the growing season from May – October unless otherwise specified in the IPMS.

Areas identified for vegetation control measures shall be as shown on the plans and as determined in the field by the Engineer and a MassDOT Landscape Architect. Contact at MassDOT Landscape Design Section is Tara Mitchell at (857) 368 -9177 or

tara.mitchell@state.ma.us.

SUBMITTALS

No work shall begin without approval of the submittals.

Within 15 business days prior to the site walk, the Contractor shall submit all qualifications to the Engineer for approval by MassDOT Landscape Design.

Submittals include the following items.

Qualifications

1. Company must provide proof of qualifications by providing the following:
    a. Narrative describing company, its expertise and experience with invasive plant control.
    b. Demonstrate experience with herbicide treatment as part of restorations and in sensitive areas
    c. Describe company's technical qualifications and past performance.

2. Company must meet licensing requirements:
    a. All crew applicators must have a Massachusetts Commercial Applicator License (CORE).
    b. At least one or more applicator must have ROW certification if required for specific project.
    c. Company must provide name(s) of applicator(s) and Applicator License/Certification number for all contractor crew leaders working on the project.
    d. Company must provide documentation of any warnings, penalties or fines received in the last three (3) years.

3. Company must provide proof of experience with invasive plant control and include following:
    a. At least five (5) references from prior invasive plant control work completed in last five (5) years. Provide contact information including address, phone number and email.
    b. Provide a summary of each of these projects including nature of the problem, specific invasive vegetation treated, dates and period of treatment, methodologies used, and summary of success or not in terms of meeting performance objectives. Include summary of equipment used.
    c. Photo documentation of these projects.
    d. GPS coordinates of project locations, if available.

4. Crew leader must have expertise with invasive plant control and provide the following:
    3.Have held Core license for at least five (5) years.
    4.Resume listing five (5) or more years of experience applying pesticides with the company or with another company specializing in vegetation management

The following companies are pre-approved by MassDOT Landscape Design Section:

Groundscapes Express, Inc. ***SWCA Environmental Consultants***

P.O. Box 737
Wrentham, MA 02093
Contact: John Engwer
Phone: 508-384-7140

Polatin Ecological Services, LLC
Old Blake Farm
334 Mountain Road
Gill, MA 01351
Contact: Chris Polatin
Phone: 413-367-5292

Native Habitat Restoration
P.O. Box 334
Stockbridge, MA 01262
Contact: Jess M. Toro : 413-358-7400
Sari Hoy: 413-394-0277

Solitude Lake Management
590 Lake Street
Shrewsbury, MA 01545
Contact: Keith Gazaille
Phone: 888-480-5253

15 Research Drive
Contact: Scott Fisher
Phone: 413-658.2056
Amherst, MA 01002

Vegetation Control Service, Inc.
2342 Main St.
Athol, MA 01331
Contact: Andrew Powers
Phone: 800-323-7706

New England Wild Flower Society
180 Hemenway Road
Framingham, MA 01701
Contact: Ted Elliman
508-877-7630 x 3203

Invasive Plant Management Strategy (IPMS)

At least thirty (30) days prior to proposed treatment the IPMS shall be submitted for approval by the Engineer and MassDOT Landscape Architect. All chemicals, methods and work shall be consistent with the IPMS. The IPMS shall be as described under Item 102.33.

Follow-Up Treatment

Depending on treatment results after the first year, the IPMS may be amended for the second year to address additional concerns or adjust to conditions. Treatment shall be adjusted accordingly.

Herbicide Use Report

Within two (2) weeks after each application, the Contractor shall provide to the Engineer a completed and signed MassDOT Herbicide Use Report. Where applicable, the Contractor shall provide the name/s of the associated water body/bodies affected by potential discharge, per the requirements of Sections 7.1 and 7.2 of the USEPA Pesticide General Permit for the Discharges

from the Application of Pesticides.

Photo Documentation

Digital photos with date and time stamp shall be provided with IPMS and follow-up reporting. Photos shall show existing conditions and post-treatment conditions.

MATERIALS

All proposed herbicides shall be as approved in the IPMS. Herbicides shall be labeled for the method of treatment and shall meet all federal, state and local regulation requirements. Application rates will depend on herbicide proposed and shall be per the manufacturer's label for specific application.

CONSTRUCTION METHODS

All methods used shall be as approved in the IPMS.

Prior to the start of any work, Contractor shall walk the site with the Engineer and the MassDOT Landscape Architect. The purpose of the site inspection is to identify limits of work, mark locations of areas designated for treatment, and mark individual plants targeted for treatment or removal according to the IPMS. Contractor shall be responsible for marking delineated areas and plants to be preserved, removed, or otherwise treated. Fencing or other materials needed for marking and delineating protected areas shall be incidental to this item.

Herbicide Applications

All herbicide application shall conform to Massachusetts Pesticide Laws and Regulations per the Massachusetts Department of Agricultural Resources (MDAR) Pesticide Bureau.

Mixing, applying and/or disposing of herbicides shall always be in accordance with instructions on their labels and all applicable federal, state, and local regulations. Mixing shall not occur within sensitive areas, wetlands, or buffer zones.

Contractor shall not spray 2 hours prior to precipitation, during rain, or during windy conditions. The Contractor shall be responsible for monitoring weather conditions and adjusting the work schedule as appropriate for the herbicide and application method to be used.

Targeted vegetation shall be identified and marked prior to treatment. Plants treated by foliar spray, injection or glove application or other methods that leave standing vegetation, as opposed to cut-stump application, shall remain clearly marked for identification through the contract period.

Desirable vegetation shall be protected from both spray and other physical damage.

Contractor is responsible for any damage to vegetation not designated for removal or treatment.

Vegetation damaged shall be restored. Cost of replacement plants and/or restoration shall be borne by the Contractor.

Contractor shall ensure that the public does not enter a work area while herbicide application or spraying is underway.

Disposal Of Invasive Plant Material

All material to be cleared shall become the property of the Contractor. The satisfactory disposal of all cleared plant material (seeds, roots, woody vegetation, associated soils, etc.) shall be the Contractor's responsibility.

The Contractor shall take measures to prevent viable plant material from leading to further infestations (seeds, roots, woody material, etc.) while stockpiled, in transit, or at final disposal locations. All precautions shall be taken to avoid contamination of natural landscapes with invasive plants or invasive plant material.

Chipping, shredding, or on-site burning of plant material shall not be permitted unless written approval is given as part of the Invasive Plant Management Strategy.

For plant material taken to an incinerating facility per the IPMS, a receipt from that facility shall be submitted to the Engineer as proof of disposal.

Where feasible, it is preferable to dispose of plants on site or to bury them on site with on-going monitoring for re-sprouting. Disposal locations and methods must be approved and included in the IPMS. Site work such as grading and seeding to stabilize and restore disposal area shall be incidental to this item.

Contractor shall be responsible for treating areas of re-growth due to improper disposal.

MONITORING

After initial herbicide treatment, all treated plants and areas shall be monitored through visual observation and re-treated as necessary and appropriate throughout the season and for the duration of the contract per the management proposal and schedule for control submitted by Contract. Monitoring shall be incidental paid for under Item 102.33, Invasive Plant Management Strategy.

MEASURE OF SUCCESS

The expectation is a minimum of 85-95 percent control achieved after the first treatment, depending on plants targeted and extent of population, and based on the expectations laid out in the IPMS. The expectation for the contract duration is 95-100% eradication by the end of the treatment period, unless otherwise specified in the IPMS.

METHOD OF MEASUREMENT

Item 102.3 will be measured for payment by the Hour of crew time spent on the project doing actual work. A crew shall be defined as a minimum of two licensed applicators each equipped with (at minimum) back-pack sprayer and mist blower. The crew shall also have a properly equipped spray truck with hoses and a tank with sufficient capacity for a full day of work.

BASIS OF PAYMENT

Item 102.3 will be paid at the contract unit price per Hour, which price shall include all labor, materials, equipment, tools and all incidentals required to complete the work.

Payment will be based upon time spent on the project doing actual work and shall not include travel time to and from the Contractor's place of business and shall also not include time for investigative field trips.

The Invasive Plant Management Strategy will be paid for under Item 102.33.

ITEM 102.33 INVASIVE PLANT MANAGEMENT STRATEGY HOUR

This item consists of providing an Invasive Plant Management Strategy (IPMS) for the control of invasive plants on the project site and shall be coordinated with Item 102.3 Control of Invasive Plants Existing on Site. The IPMS shall be submitted to the Engineer for review and approval and the IPMS shall be implemented on site.

Invasive plant control treatment on site shall be as described under Item 102.3 Control of Invasive Plants Existing on Site and shall be compensated per that Item.

Work under this item shall be coordinated with work and schedule for Clearing and Grubbing, Mowing, Tree Removal, Planting, and Wetland Mitigation items.

SUBMITTALS

Task Summary: for measurement of payment, the contractor shall submit the total sum and a breakdown of hours for the following tasks performed, which shall include at least: Site Walk/s, IPMS Written Reports, Site Monitoring if required, and Final Report if required.

Invasive Plant Management Strategy (IPMS)

Prior to the start of any invasive plant control treatment, submit in writing an IPMS proposal and Schedule of Control for approval by the Engineer and MassDOT Landscape Architect at least thirty (30) days prior to proposed treatment. All chemicals and methods proposed shall be consistent with applicable Massachusetts Wetlands Protection Act Order of Conditions.

The IPMS shall include the following:

1. Description of treatment areas including identification of targeted invasive plant species, locations, approximate size of areas and digital photos with time/date stamp. Delineate treatment areas with polygons outlining their perimeter or locations of individual plants. A free-hand sketch drawn on construction plans or an aerial photo can be used to show locations.
2. Note coordination as required with items for clearing, clearing and grubbing, tree removal, mowing, planting, and wetland mitigation.
3. Proposed methods of treatment for each species or areas including manual removal, cutting, or herbicide treatment and proposed application rate.
4. If herbicides are proposed, submit product label including application methods and rates (entire MSDS information need not be submitted if available online).
5. Proposed time of treatment based on target plant species and construction schedule.
6. Method for disposing of invasive plant material including stems, trunks, branches, roots, associated soils, etc.
7. General monitoring schedule.

8. Preliminary re-treatment schedule. Re-treatment shall be based on assessment of initial results and time of year.
9. Proposed performance metrics, or measure of treatment success, which shall be agreed upon by MassDOT.
10. Expected end date of contract and last treatment.

Note: The IPMS is critical for identifying pre-construction conditions as well as strategies for minimizing import or spread of invasive plants. Failure to provide approved IPMS may jeopardize this item, in which case, the contractor will be responsible for control of invasive plants found on site at no cost to the contract.

Follow-Up Treatment Schedule

Depending on treatment results after the first year, the IPMS may be amended for the following year/s to address additional concerns or adjust to conditions. A follow-up treatment schedule shall follow the same format as outlined above and submitted to the Engineer and MassDOT Landscape Architect for approval at least thirty (30) days prior to proposed treatment.

Reporting

Within two (2) weeks after each application, the Contractor shall provide to the Engineer a completed and signed MassDOT Herbicide Use Report. Where applicable, the Contractor shall provide the name/s of the associated water body/bodies affected by potential discharge, per the requirements of Sections 7.1 and 7.2 of the USEPA Pesticide General Permit for the Discharges from the Application of Pesticides.

Final Report

A final report documenting status of invasive control at the end of the project may be required for regulatory purposes or for instances where control will be continued by other means. Report shall include photo documentation, notation on a plan or aerial image of area treated, summary of treatment performed, and control achieved.

Photo Documentation

Digital photos with date and time stamp shall be provided with IPMS and follow-up reporting.

METHOD OF MEASUREMENT

Item 102.33 will be measured for payment by the Hour. The basis for measurement shall be per the completion of tasks as approved under the Task Summary submittal.

BASIS OF PAYMENT

Item 102.33 will be paid at the contract unit price per Hour, which price shall include all labor,

materials, equipment, tools and all incidentals required to complete the work.

Payment shall not include travel time to and from the Contractor's place of business.

ITEM 102.511 TREE PROTECTION – ARMORING & PRUNING EACH

The work under this item shall conform to the relevant provisions of Sections 771 and shall be for furnishing and installing temporary tree trunk protection and for limb pruning to prevent injury to the tree from construction equipment and activities.

Trunk armoring is for instances where construction activity (the use of heavy equipment) comes close enough to potentially damage the tree trunk or limbs. It is to be used where shown on the plans and as directed by the Engineer.

REFERENCES

If requested, the Contractor shall provide to the Engineer one copy of the latest edition of the American National Standards Institute (ANSI) A300 Standard Practices for Tree, Shrub, and Other Woody Plant Maintenance: Part 1-Pruning and Part 5-Construction Management Standard. Provision of reference shall be incidental to this item.

MATERIALS

Trunk armoring shall be such that it prevents damage to the trunk from construction equipment. Selected material shall be such that installation and removal will not damage the trunk.

Acceptable materials include 2x4 wood cladding with wire or metal strapping, or, for instances when duration of construction activities is less than three months, corrugated plastic pipe mounted with duct tape. Height of cladding shall be from base of tree (including root flare) to the bottom of the first branch or as recommended by the Arborist. Material and methods shall be approved by the Engineer.

Other materials or methods may be acceptable if approved by MassDOT Landscape Design or an Arborist.

METHODS OF WORK

Prior to construction activities, the Engineer, the Contractor, the Town Tree Warden, and the Arborist,(if specified), shall review trees noted on the plans to be protected. Final decision as to trees armored and/or pruned shall be per the Engineer.

Care shall be taken to avoid damage to the bark during installation and removal of armoring. Trunk armoring shall be replaced and maintained such that it is effective for as long as required and shall be removed immediately upon completion of work activities adjacent to trees.

Pruning of limbs shall conform to the techniques and standards of the most recent ANSI A300 standards.

DAMAGES & PENALTIES

In the event that trees designated for protection under this item are damaged, including root damage from unapproved trespassing onto the root zone, the Contractor shall, at his own expense obtain an Arborist. The Arborist shall be approved by MassDOT.

If, based on the recommendations of the Arborist, the Engineer determines that damages can be remedied by corrective measures, such as repairing trunk or limb injury, soil compaction remediation, pruning, and/or watering, the damage will be repaired as soon as possible within the appropriate season for such work and according to industry standards.

If the Engineer determines that damages are irreparable, the Contractor shall pay for the damages in the amount of $500.00 per diameter inch at breast height (DBH) per tree.

Additionally, if the Engineer determines that the damages are such that the tree is sufficiently compromised as to pose a future safety hazard, the tree shall be removed. Tree removal will include clean up of all wood parts, grinding of the stump to a depth sufficient to plant a replacement tree or plant, removal of all chips from the stump site, and filling the resulting hole with topsoil.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 102.511 will be measured and paid at the contract unit price per each. This will include full compensation for all labor, equipment, materials, and incidentals for the satisfactory completion of the work and the subsequent removal and satisfactory disposal of the protective materials upon completion of the contract.

In the event of tree damage, cost of Arborist services, of remediation measures, and/or tree removal will be borne by the Contractor.

Payment under this item will be scheduled throughout the length of contract:

- 40% of value shall be paid upon installation of trunk armoring and completion of pruning work, if required.
- 60% shall be paid at the end of construction operations that would damage the tree and after protection materials have been removed and properly disposed of by the Contractor. In the event of repairable damages, payment shall be made after the completion of remediation measures.

In the event of irreparable damage due to lack of proper protective measures being take there will be no compensation in addition to the $500.00 per diameter inch penalty.

ITEM 105.40 TREE REMOVED (EXCLUDING STUMP) DIAMETER UNDER 24 INCHES EA

Work under this Item shall consist of the removal and satisfactory disposal of trees and stumps as directed by the Engineer and shall conform to the relevant provisions of Section 101 of the Standard Specifications and the following:

Partial payment in the amount of 75% of the unit bid price for the item will be paid for a tree removed by topping with its stump remaining when, in the judgment of the Engineer, heavy snow cover or other impediment would make complete removal specified under the item impracticable. The remaining 25% of the unit bid price shall be paid upon complete removal of the item at a later date. Topping shall consist of reducing a tree by removal and the satisfactory disposal of all limbs, branches, and the main trunk to a point below the main branching system.

Basis Of Payment

All work under this contract will be paid for at the unit bid prices under the respective items, which price shall constitute full compensation for all labor, tools, materials, equipment, and other incidental work necessary to satisfactorily complete the items.

ITEM 105.45 **SUPPLEMENTAL BORROW FOR NATIVE MATERIAL** **CUBIC YARD**

The purpose of Item 105.45 is to furnish and install additional borrow material, if needed, to supplement a shortage of native materials for streambed/bank restoration as described in Item 983.521 Streambed/Bank Restoration.

The work to be done under Item 105.45 shall conform to the relevant provisions of Sections 140, 150, 170, 751, 753, 983 of the Standard Specifications and the following:

MATERIALS

The supplemental borrow for native material shall be locally sourced, rounded river stone, that matches the composition of the native streambed. The following gradation may be used as a guide.

Supplemental Borrow for Native Material Gradation

Stone/Sieve Size	% Finer
12 inches	100
6 inches	30-75
No. 4	4-30
No. 200	4-6

The supplemental borrow for native material shall be approved by the Engineer prior to material installation.

Prior to placement of the supplemental material, the Contractor shall obtain approval from the Engineer regarding the suitability of the actual material used. For the Engineer's review, the Contractor shall provide two samples, at 30 lb minimum each, of the supplemental borrow material with any amendments incorporated, to the Engineer. The Contractor shall also submit a sieve analysis of the material to the Engineer. In the event that the submitted material is not acceptable, the Contractor shall re-sample, re-test, and re-submit materials at his own expense until the Engineer accepts the submitted materials.

If supplemental borrow materials are used, the Contractor shall **notify** the Engineer 24 hours in advance of installation of the supplemental borrow materials so that the Engineer can observe the amount of supplemental borrow material installed.

Supplemental borrow material shall not be mixed with native materials, but must be handled separately and installed separately for measurement and payment purposes. Supplemental borrow materials are to be used when stockpiled native materials have been exhausted.

PAYMENT

Method of Measurement and Basis of Payment

This Item will not be measured for payment if there are any stockpiled suitable native materials which may be used for streambed/bank restoration. This Item will only be measured for payment when there is no stockpile or when there is a shortage of suitable native materials for streambed/bank restoration.

The work to be done under this Item shall be paid for at the Contract Unit Price per Cubic Yard of supplemental borrow material, complete and in place, used to meet the grades and limits to the neat lines shown on the plans or as directed. Said price shall be considered full compensation for all labor, tools, equipment, materials and incidental costs necessary to include supplemental borrow material for native materials. Incidental to the work of this Section shall be any tools, labor, equipment, and materials needed to complete the work of this Section, including: stacking, screening, sorting, placement, incorporation of soil amendments to make the supplemental borrow suitable, and sampling, testing and submission.

CITEM 755.35 INLAND WETLAND REPLICATION AREA Lump Sum

The work under this item shall conform to the relevant provisions of Sections 120, 770, 771 of the Standard Specifications and the following:

Work under this item shall include furnishing material and the construction and maintenance of inland wetland replication areas as shown on the drawings and as required by the Engineer. Inland Wetland Replication Area shall hereafter be referred to as Replication Area. All work shall be in coordination with an approved Wetland Specialist as specified under that item.

Wetland Restoration work shall be as specified and compensated under that item. Construction of tidal wetlands shall be as specified under the appropriate item for tidal wetland mitigation.

The Replication Area shall be constructed prior to wetland impacts unless otherwise approved by the Engineer, specified herein, or specified in permit conditions and approvals. Construction schedule shall be appropriate to planting and seeding season (see below). Changes to this schedule will require written approval from the Engineer.

DESCRIPTION OF WORK

Construction of the Replication Area shall be completed as shown on the drawings at the following location(s):

Area/s A at Station: **212+74 70LT** Area = **2,240** sf.

Replication Area shall be constructed to meet the requirements of all associated permits and certifications, including relevant performance standards of the Massachusetts Wetlands Protection Act (MGL C. 131, s40), Section 401 Water Quality Certification, and Section 404, U.S. Army Corps of Engineers Permit.

The Contractor is responsible for protection and preservation of natural areas adjacent to the Replication Area both within and outside the project limits and for the duration of the Contract; including but not limited to damage to soils or vegetation due to erosion, sedimentation, compaction, trampling, vehicles, storage of materials, or other negligence shall be repaired to the satisfaction of the Engineer and at the Contractor's expense.

The Wetland Specialist overseeing the Wetland Replication construction work shall not be from the same company as that which is performing planting, seeding, or participating in any aspect of the Wetland Replication construction.

Any deviation from the methodology described in the Final Plan of Record for the Wetland Replication Area or other mitigation must be approved in writing by regulatory approval and implemented in accordance with the provisions described under Plan Changes and Amendments.

SUBMITTALS - DOCUMENTS

Request for Conditional Acceptance: As specified below, a letter requesting Conditional Acceptance of the work and the site conditions shall be submitted to the Engineer.

Request for Certificate of Compliance (Partial or Full): As specified below, shall be submitted to the Engineer for distribution to appropriate regulatory agencies.

Request for Final Acceptance: As specified below, a letter requesting Final Acceptance of the work and the site conditions shall be submitted to the Engineer.

Monitoring Reports: Reports shall be submitted to the Engineer as specified below. Reports shall be compensated under Item 755.75 and 755.76.

SUBMITTALS - MATERIAL

Soil and Amendments

No soil, compost, or other soil amendment imported to the work site shall contain seeds, roots, stems, or other viable parts of invasive plants or other noxious plants.

At least sixty (60) days prior to installation and prior to ordering, the Contractor shall submit for approval sources of soil, compost, and amendments. Submittal shall include the supplier and location of the source. Off-site sources shall be identified and available for inspection by the Wetland Specialist prior to transport of material to the site to verify that they are likely to be free of invasive plant species, including all viable plant parts.

Samples of tested and approved wetland soil and soil amendments for soil texture, organic carbon content or other routine soil analysis parameters (e.g., pH, Cation Exchange Capacity, Percent Base Saturation) and Soil Organic Matter Analysis will be required if requested by the Engineer. The grab samples shall be collected by the Contractor or Wetland Specialist from multiple representative locations in the wetland topsoil mix following the "Umass Soil and Plant Tissue Testing Laboratory Sampling and Collection Protocols" (or equivalent certification paperwork provided by the soil supplier). The lab analysis shall be provided to the Engineer along with written certification from the Contractor or Wetland Specialist that the wetland topsoil was collected per the referenced protocol and meets the desired specification. The analysis and written certification of same shall be provided to the Engineer prior to placing the wetland topsoil in the Replication Area.

Seed Mix

Certificate of Materials from the supplier shall be submitted 30 days prior to seeding and must be approved prior to ordering materials. Seed species listed on the certificate shall include ecotype region (i.e., *Asclepias incarnata*, PA Ecotype).

Seed tag from the bag of seed used shall be submitted to the Engineer at the time of seeding. Seed tag shall include ecotype region and species, guaranteed percentages of purity, weed content and germination of the seed, and the net weight. Seed tag shall match the Certificate of Materials, include the name of the supplier, and date material was sent.

Bill of lading or notarized Certificate of Compliance from the Supplier serving as proof of purchase shall be submitted if requested by the Engineer. Document shall include date of sale, quantity, lot

number, and address of Supplier. This shall match the seed tag. Notary shall not work for either the contractor or seed supplier.

Plant Certification

Plant Certification shall be per the applicable requirements of Subsection 771, PLANTING TREES, SHRUBS AND GROUNDCOVER, of the Standard Specifications. The nursery source shall certify the provenance or origin of all plants.

Other Material: Submittals shall be per the respective item.

MATERIALS

Sediment Control Barrier and Erosion Prevention Measures
Sediment control barriers shall be per Item 767.121.

Erosion prevention measures for disturbed areas adjacent to the Replication Area shall include but not necessarily be limited to compost filter tubes, erosion control matting, seeding, and/or combinations thereof as approved by the Engineer.

Sediment controls and erosion prevention devices and measures shall be compensated under the respective items.

Wetland Soil

Soil appropriate for the Replication Area may be either hydric soil excavated from the impacted wetland, a manufactured mix of compost and on-site borrow, or a combination thereof, as approved by the Engineer.

Hydric soil from the impacted wetland area may be spread on the surface of the constructed Replication Area as an inoculant or can be placed in a bulk fashion in a roughly 1:1 ratio of area and depth. Soil shall be handled such that the original soil structure is preserved and shall not be compacted, screened, or otherwise processed.

Hydric soil from the impacted wetland that is infested with invasive plant species identified on the Massachusetts Invasive Plant Advisory Group (MIPAG) shall not be used in the Replication Area unless approved by the Wetland Specialist and Engineer. To the extent possible, infested soil shall be disposed of within the project limits in an upland area outside of regulated areas and as approved by the Invasive Plant Management Strategy item (if in the contract) or by the Engineer.

A manufactured mix suitable for wetlands shall consist of on-site borrow from the proposed Replication Area (if approved by the Wetland Specialist and Engineer) thoroughly mixed with compost to achieve a target organic carbon content of 10-12% (up to 21% percent organic matter) by dry weight. The organic material used for mixing shall be well or partially decomposed. Clean leaf compost is the preferred soil amendment to achieve these standards though other materials may be used if approved by the Wetland Specialist and Engineer. Note that "clean" refers both to a negligible amount (<1%) of physical contaminants such as plastic and to the lack of chemical contaminants that might pose a hazard to plants or animals. Off-site borrow may be used for mixing if approved in advance by the Engineer.

No soil or soil amendment shall be brought on site without approval of the material source by the Wetland Specialist and the Engineer. Soils used in the replacement area shall be free of rocks greater than 4 inches in diameter.

Plants

Plant material shall conform to the applicable requirements of Section 771, PLANTING TREES, SHRUBS AND GROUNDCOVER, of the latest edition of the Standard Specifications and as amended below.

Plants shall be native species, not cultivars. To the extent possible, plants shall originate from the applicable EPA Level III Ecoregion.

- Plant species and sizes to be included in the Replication Area shall be as specified on the plans.

Requests for substitutions shall be submitted in writing to the Engineer for review by the Wetland Specialist, MassDOT Landscape Architect, and, if required, the relevant regulatory agency at least thirty (30) days prior to planting. All proposed substitutes shall be in conformance with the requirements herein and suitable for the site conditions.

Transplanting and plant material collected from the wild is prohibited unless approved in writing by the Engineer. Plants shall be selected from certified nurseries that have been inspected by state and/or federal agencies.

Seed Mix

Seeding shall conform to the MassDOT Standard Specifications Section M6, ROADSIDE DEVELOPMENT MATERIALS.

All wetland areas shall be seeded using New England Wetmix or approved equal. Wetland seeding shall occur at a rate of one pound (1LB) per two-thousand five-hundred square feet (2,500 SF)

Upland areas shall be seeded using New England Conservation/Wildlife Mix or Approved Equivalent. Upland seeding shall occur at a rate of one point (1LB) per one-thousand seven-hundred fifty square feet (1,750 SF). The area shall be mulched with two inches of clean leaf compost or straw.

Seed Vendors:

New England Wetland Plants, Inc. 14 Pearl Lane South Hadley, MA 01075 (413)548-8000 https://newp.com/	Ernst Conservation Seeds 8884 Mercer Pike Meadville, PA 16335 800-873-3321 https://www.ernstseed.com/	Vermont Wetland Plant Supply 29 Old Foundry Rd Orwell, VT 05760 802-948-2553 https://www.vermontwetlandplants.com/

Fertilizers shall not be used unless directed by a professional wetland scientist

Water

The Contractor shall provide water and all equipment required at no extra cost. Water shall be suitable for irrigation and free from ingredients harmful to plants and wildlife. Water from the adjacent water bodies or waterways shall not be utilized. It is the Contractor's responsibility to correct injury or damage due to the lack of water, too much water, or use of contaminated water.

Mulch/Compost Blanket for Seeding

Hydromulch shall be per the manufacturer's recommendations and shall be wood fiber or straw mulch only. Mulch shall be incidental to seeding.

Compost Blanket may be used in lieu of mulch for seeding. Compost Blanket shall meet the material and submittal requirements of that Item and shall be applied as specified below. Compost Blanket shall be compensated under that item.

CONSTRUCTION METHODS & SEQUENCE

SITE PROTECTION MEASURES

Minimizing Damage
The Contractor shall plan and execute operations in a manner minimizing the amount of excavated and exposed fill or other foreign materials that could be washed or otherwise carried into Replication Area and nearby resource areas.

Construction of and access to the Replication Area shall minimize damage to existing vegetation and soils as specified herein. Damage to soils or vegetation shall be repaired to the satisfaction of the Engineer and at the Contractor's expense. If required for soil remediation, tilling and the addition of compost shall be at the Contractor's expense.

Wetland topsoil shall be deposited and graded in the Replication Area in a manner that minimizes travel and subsequent compaction of the subgrade (including any specified pit and mound topography) to the extent practicable, including use of track mounted excavators as appropriate. Should soils be compacted, they shall be loosened by a method such as disking, spring-tooth harrowing and/or rototilling. The Contractor shall use boards, timber or composite mats, or other approved materials as necessary, to protect existing and/or new wetlands from compaction due to heavy foot traffic or if equipment is required to travel over wetland soil. All labor and materials required for protection and preservation of site shall be incidental to this item.

Stockpiling of Soil

Stockpiling of soil, including hydric soil for replication, shall be at least 100 feet from the edge of the bordering and isolated vegetated wetlands and inland banks, unless approved otherwise by the Engineer. Stockpiled soils shall be securely stabilized and contained. Any areas of exposed soil or stockpiles within and adjacent to the Replication Area that will remain inactive for more than 7

calendar days shall be sown with a mix of rapid germinating annual grasses (e.g., annual rye) covered with a layer of straw mulch applied at a rate of 90 pounds per 1,000 square feet. As necessary, the mulch shall be anchored with a tacking coat (non-tar) applied by a hydro seeder or other method recommended by the Wetland Specialist in consultation with the Engineer. In the event that there is excess borrow, it shall be disposed of under Excavation, Item 120.1.

Sediment Barriers

Placement: Sediment barriers shall be installed along the downslope perimeter of the Replication Area beginning and ending in the surrounding upland so that no excavated material or disturbed soil can enter adjacent wetlands or waters. Where construction work is immediately upgradient of the wetland, barriers shall be located so as to protect the Replication Area until slopes are stabilized. Sediment barriers shall be in place and approved by the Engineer prior to excavation work. No work shall take place outside the barriers.

Maintenance: The Contractor shall ensure that all sediment barriers function as intended and at all times per the specifications of those respective items.

Existing Trees to Remain

Tree protection shall be per the relevant specifications and as shown on the plans or as required by the Engineer. To protect root systems of existing trees to remain, the limits of the Replication Area may be adjusted, but, the total area of replication required by the permits shall not be reduced. Access route may be adjusted as required.

Trees to be retained as snags (upright dead or dying trees left for wildlife habitat) within or adjacent to the Replication Area shall be as shown on the plans or as directed by the Wetland Specialist or Landscape Architect during the initial site walk. Trees to remain as snags shall be clearly marked prior to clearing. Trees that pose a potential fall hazard (i.e., are near a roadway) should have limbs and trunk cut such that the tree does not pose a fall hazard.

Coarse woody debris in the form of cut trees, stumps, logs, and brush shall be incorporated as shown on the plans or as directed by the Wetland Specialist or Landscape Architect. On site material shall be selected and marked by the Wetland Specialist, retained on the project site, and placed as specified below under Incorporation of Coarse Woody Debris.

All trees, stumps, or brush not specified to remain shall be removed and shall not be stockpiled in the wetland resource areas while awaiting disposal.

Work shall be coordinated with Clearing or Tree Removal Item and compensated under that Item.

PRE-WETLAND CONSTRUCTION SITE WALK

Delineating the Replication Area and Access Route. The Contractor shall stake out the Replication Area boundaries and the intended access route and set grade stakes for approval by the Wetland Specialist and Engineer. Following staking and demarcation of areas, the Engineer and Wetland Specialist shall approve or modify as necessary the limits of work, the access route, final location and configuration of replication, grade stake elevations, proposed location of sediment barriers, and review proposed construction methods.

As part of the delineation and approval process, the Wetland Specialist shall mark trees to be converted to snags, select course woody debris to be retained for re-use, and select rocks or other elements to be used for habitat features.

Invasive Plants: As part of the initial site walk, the wetland to be impacted and the proposed replication site shall be inspected for the presence of invasive plants. If invasive plants are found they shall be addressed as described herein under Invasive Plants.

SOIL WORK

Final grades in the Replication Area shall meet the target elevations as shown on the Plans or as adjusted by the Wetland Specialist to achieve the desired hydrology and micro-habitat. If adjustments are required, a Request for Information (RFI) shall be submitted to the Engineer for approval. Adjustments shall be documented and included in the As-Built plans (if required) and/or other applicable required documents.

Excavation & Grading

When required by permits, the Wetland Specialist shall notify MADEP and the ACOE (as applicable) at least 72 hours prior to excavation.

Soil in the proposed wetland areas that must be removed for grades to conform to the proposed elevations shall be stripped and disposed of, or, if suitable for reuse, be stockpiled in an approved location. Stockpiled soils shall be kept wet and not allowed to dry out. Procedures for maintaining appropriate moisture levels shall be documented by the Wetland Specialist and provided to the Engineer and the Contractor.

Replication area shall be excavated as shown on the drawings. Where replication area is adjacent to existing reference wetland, finish grade of replication shall generally match existing grades and micro-topography, notwithstanding any deviations that are necessary to achieve the desired hydrology and habitat in the Replication Area.

Prior to placement of backfill, scarify subgrade to a depth of 4 to 6 inches.

Placement of Wetland Soil

Following excavation, scarification, and grading of sub-grade, and after the sub-grade elevations are approved by the Wetland Specialist, suitable soil previously removed or an evenly mixed organic/mineral soil created on-site shall be spread to the design depth and thickness over the proposed wetland areas as shown on the plans and as directed by the Wetland Specialist.

Vehicles used to transport soil from offsite shall be washed or cleaned with air pressure to prevent exotic or invasive seeds or root fragments from contaminating the Replication Area.

Final Grading

The finished grade of the Replication Area shall be at an elevation that will provide an unrestricted hydrologic connection between the Replication Area and adjacent resource areas. The hydrologic connection should be in keeping with restoring the intended function of the replacement wetland relative to the impacted reference wetland. The Contractor shall verify that this elevation is not at a level that could negatively alter the hydrology of an adjacent wetland. Microtopography in the form of hummocks, pits and mounds shall be as shown on the plans or as adjusted by the Wetland Specialist. Final elevations and grading of wetland soil shall be approved by the Wetland Specialist and the Engineer.

To avoid compaction once soil has been placed, no heavy equipment shall travel across placed soil and no work shall occur in wet or moist soil. Soil that is compacted due to construction activities shall be replaced with soil as specified herein and at the Contractor's expense.

RESTORING VEGETATION

Incorporation of Coarse Woody Material

If specified within this Contract or if directed by the Wetland Specialist or Landscape Architect during the initial site walk, woody debris shall be incorporated into the Replication Area and/or adjacent upland buffer. Material shall be placed as shown on the plans or as directed following placement of wetland soil and prior to application of compost and/or seed. Woody material shall cover a minimum of 5-20 percent of the Replication Area, depending on whether it is a meadow or woodland wetland and how much wood is available from construction clearing. Where trees are cut for construction purposes, logs of a minimum length of 8 feet must comprise a minimum of 50% of the woody material left on site. Brush shall be included along with logs and stumps as directed. Woody material shall be placed in a deliberate and naturalistic manner.

Planting

Following placement of wetland soil and approval of final grade and conditions, Replication Area shall be planted. Planting shall conform to SECTION 771 PLANTING TREES, SHRUBS AND GROUNDCOVER of the Division I Standard Specifications and as amended below.

Planting Season shall be May 15-June 15 and September 1-November 1 unless otherwise specified in applicable permit conditions.

Prior to planting, the Wetland Specialist shall approve the condition of the plant material and the method of installation and shall oversee the planting work. Replication Area shall be planted in the dry. Plants shall be placed according to the planting details and within the range of target elevations and at the spacing shown on the Plans or, if spacing is not indicated on the Plans, at the direction of the Wetland Specialist. Unless otherwise noted on the Plans, final plant locations shall be determined on site and located with regard to expected hydrology, plant growth characteristics, habitat desired, and water protection.

Plant material shall be installed as soon as possible after delivery. Plants stored on-site prior to installation shall be stored in the shade and watered twice daily up until time of installation. Plants showing signs of stress or compromised health may be rejected by the Engineer or Wetland Specialist and shall be replaced at the Contractor's expense.

Plant material shall be furnished and installed as indicated including all labor, materials, plants, equipment, incidentals, re-setting of plants (frost heaves, etc), irrigation, re-planting and clean up. If previously approved species are not available at the time of planting, the Wetland Specialist may propose substitutions relative to species, size, and quantities for review and approval by the MassDOT Landscape Architect. Upon approval by MassDOT, substitutions shall be approved by the regulating authority, if and as necessary. Provisions shall be made for a growth warranty of at least two (2) calendar years from the date of Conditional Acceptance as described below or as required by permits.

Seeding

Following placement of wetland soil and planting (if included), the Replication Area shall be seeded using one of the following methods:

- Broadcast by hand or with a hand-held spreader followed by application of straw mulch. If necessary, seed shall be lightly raked to insure good seed-to-soil contact.
- Hydro-seeded with hydro mulch per the Standard Specifications and per the manufacturer's directions.
- Hand broadcast seed with Compost Blanket pneumatically applied at the same time to ensure light cover of soil topdressing over seed.

If spring conditions are drier than usual, supplemental watering may be required. If sowing during the summer months, supplemental watering will likely be required until germination.

If required, seeding limits for different seed mixes shall be determined by the Wetland Specialist.

PLANT ESTABLISHMENT AND INVASIVE MANAGEMENT

Plants shall be watered as necessary to maintain healthy establishment. Plants that fail by September 1 after spring planting or by May 15 after fall planting shall be replaced within the immediate or next planting period and at the Contractor's expense.

Seeding that fails to established according to the conditions of acceptance below shall be over-seeded as required by the Engineer. Washouts and channels shall be repaired and stabilized prior to overseeding. Excessive weed growth shall be pulled out by the roots or, with approval from the Engineer, cut prior to over-seeding. Soil repair and weed control are incidental to this item.

Invasive Plants: Corrective measures shall be taken to remove or treat invasive plant species in the Replication Areas. Invasive plants shall include those listed as invasive by Massachusetts Invasive Plant Advisory Group (MIPAG) and the US Army Corp of Engineer's New England District's Compensatory Mitigation Guidance

If chemical treatment of invasive plants is necessary, the strategy for treatment shall be as determined under Item 102.3 Invasive Plant Management Strategy. That strategy shall be coordinated with the Wetland Specialist and all applicable permits and permitting agencies. Chemical application under 102.33 Invasive Plant Management On-site shall be compensated under that item and shall be for the duration of the contract only.

CONDITIONAL ACCEPTANCE OF WORK

Conditional Acceptance shall indicate approval of the wetland construction work and agreement that work has been done according to plan or modified as approved.

Upon completion of construction, the Contractor shall submit a Request for Conditional Acceptance that includes a brief narrative from the Wetland Specialist demonstrating that the wetland replication construction work was done according to plans (or how modified) and meets required permit conditions. The narrative shall include, photo-documentation of pre-construction conditions as well as soil work, planting, and seeding. Seed tags shall be submitted as part of the Request for Conditional Acceptance.

Upon receipt of a Request for Conditional Acceptance, the Engineer, the Wetland Specialist, and regulatory representative (if required) shall assess the Replication Area and surrounding areas. At a minimum, the following conditions shall be included in the narrative and reviewed as part of the on-site assessment of whether:

- The final finished target elevations have been met and maintained relative to the approved plans and reference wetland. Areas that are too high or too low should be identified along with suggested corrective measures.
- Hydrology meets performance standards.
- Specified seed mix has been seeded. If inspected 30 or more days after seeding, seeded species in the wetland and adjacent upland shall show signs of good germination and healthy growth.
- Planted woody and herbaceous species meet specifications and are establishing well.
- Soils are stabilized and there is no sediment in the wetland and no channeling of slopes.
- There are no invasive plants visible in the replication area.

Upon approval that the work meets the above conditions, MassDOT will issue a letter of Conditional Acceptance. If the Wetland Replication work is not approved, MassDOT will issue a rejection letter requiring corrective actions. The Wetland Specialist shall recommend corrective actions. Work not approved shall be addressed by the Contractor at no extra cost.

Wetland Specialist shall be compensated under Item 755.75.

Erosion of adjacent slopes or the flow of sediments into the wetland between Conditional and Final Acceptance shall be immediately addressed by the Contractor.

REQUEST FOR CERTIFICATE OF COMPLIANCE

If required, a request for a Certificate of Compliance (Partial or Full) pursuant to the Massachusetts Wetlands Protection Act regulations shall be prepared and submitted to MassDOT within 30 days following Conditional Acceptance.

The Request for Certificate of Compliance shall include the following:

- A brief narrative of the work on company letterhead signed by the Wetland Specialist. Narrative shall be prepared as a MS Word document and shall include substantive

explanation that demonstrates compliance with EACH relevant permit condition. Narrative shall note variations from the originally permitted design.

- As-built Drawings signed by the Contractor's PE registered in the Commonwealth of Massachusetts. As-built drawings shall show hydrologic conditions, status of plantings and seeding, and shall include a narrative and minimum of 4 photographs documenting site conditions. Plans should note variations from the originally permitted design.

  When required, drawings shall meet the Army Corp of Engineer's New England District's Compensatory Replication Guidance, including: scale in the range of 1"=20' to 1" = 100', contours at 1' intervals, spot elevations for intermediate elevations, and polygons outlining each Replication Area, and, as applicable, plant community types. The As-built Drawings shall be provided to the Engineer electronically in Portable Document Format (PDF). If requested by the Engineer, the Drawings shall be provided in printed paper format (11" x 17" sheets, unless otherwise directed). Drawings must be scalable.

- Other documents as required.

FINAL ACCEPTANCE OF WORK

Following one full growing season, the Contractor shall submit a Request for Final Acceptance. Submittal shall include a brief narrative of conditions. Upon receiving the Request, the Engineer, Contractor, Wetland Specialist and regulatory representative (if required) shall assess the Replication Area. Final Acceptance will initiate the start of the Wetland Monitoring Period.

The following conditions shall be inspected and approved for acceptance and payment.

- Hydrology is functioning as intended.
- The desired seeded species are establishing well and cover at least 95 percent of the Replication Area, excluding areas of open water areas or planned bare soil.
- No sediments have entered the wetland.
- Adjacent slopes are stabilized with desirable vegetation.
- All planted species (if included) are living and establishing well.
- There are no visible invasive plants.
- Silt fence and non-biodegradable sediment barrier materials have been removed.

If the mitigation work does not meet the above condition and is not approved, MassDOT will issue a rejection letter requiring corrective action. The Wetland Specialist shall recommend corrective actions. Work not approved will be addressed by the Contractor at no extra cost.

Wetland Specialist shall be compensated under Item 755.75.

MONITORING REPORTS FOR REGULATORY COMPLIANCE

Post wetland construction Monitoring Reports shall be completed and submitted by the Wetland Specialist as specified and compensated under Item 755.76 Wetland Monitoring Reports.

Generally, the following conditions shall be met upon each inspection:

- Hydrology is functioning as intended.

- The desired seeded species are establishing well and cover 95 percent of the area, excluding areas of open water areas or planned bare soil.
- No sediments have entered into wetland.
- Adjacent slopes are stabilized with desirable vegetation.
- All planted species (if included) are living and establishing well.
- There are no visible invasive plants.

If, at the end of the required monitoring period, the requirements have not been met and success of the wetland replication area has not been achieved as determined by the Monitoring Reports, the Contractor shall provide corrective measures. All costs associated with corrective measures and plant replacement shall be incidental to this item with no additional compensation.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 755.35 will be paid for at the Contract unit price per Lump Sum, which price shall include all labor, materials, equipment, submittals, maintenance, all required soil, site preparation, grading, wetland seeding, planting, mulching, watering, monitoring wells, as-built plans, Request for Certificate of Compliance, and all incidental costs necessary to complete the work as required.

Payment shall be as follows:

- 60% upon Conditional Acceptance.
- 20% after receipt and acceptance of Certificate of Compliance by the Engineer and once all permit construction requirements have been met and approved.
- 20% upon Final Acceptance.

Excavation will be paid under Item 120.1
Sediment Control Barrier will be paid under Item 767.121
Wetland Specialist will be paid under Item 755.75
Wetland Monitoring Reports for follow-up monitoring will be paid under Item 755.76

ITEM 755.45 WETLAND RESTORATION SQUARE YARD

DESCRIPTION

The work under this item shall conform to the relevant provisions of Subsections 120, 751, 765, 767, and 771 of the Standard Specifications and the following:

The work under this item shall include all labor and furnishing of materials to complete the work specified herein to protect and restore existing inland wetland areas that will be temporarily impacted as shown on the drawings and as required by the Engineer.

Inland Wetland Replication work shall be as specified and compensated under that item. Tidal wetland mitigation shall be as specified under the appropriate item for tidal wetlands.

Restoration Area shall be constructed to meet the requirements of all associated permits and certifications, including relevant performance standards of the Massachusetts Wetlands Protection Act (MGL C. 131, s40), Section 401 Water Quality Certification, and Section 404, U.S. Army Corps of Engineers General Permit.

All work shall be in coordination with an approved Wetland Specialist. Wetland Specialist qualifications and requirements shall be per Item 755.75, Wetland Specialist.

SUBMITTALS – DOCUMENTS

Request for Conditional Acceptance: As specified below, a letter requesting Conditional Acceptance of the work and the site conditions shall be submitted to the Engineer.

Request for Certificate of Compliance (Partial or Full): If applicable, request for a Certificate of Compliance shall be submitted to the Engineer for distribution to appropriate regulatory agencies as specified below.

Monitoring Reports: Reports shall be submitted to the Engineer as specified below. Reports shall be compensated under Item 755.76 Wetland Monitoring Reports.

ASSOCIATED ITEMS AND MATERIALS

Geotextile Fabric for Temporary Soil Protection shall be as specified under that item.

Erosion Control Matting shall be as specified under that item.

Compost shall be in accordance with Subsection 751 and M1.06.0 Organic Soil Additives of the Standard Specifications. Compost shall not contain seeds, roots, stems, or other viable parts of invasive plants or other noxious plants. Off-site sources shall be identified and available for inspection prior to transport of material to the site to verify that they are likely to be free of invasive plant species, including all viable plant parts.

Compost Blanket shall be as specified under that item.

Seed Mix

Required submittals include:

- Certificate of Materials from the supplier shall be submitted and approved 30 days prior to ordering seed. Seed species listed on the certificate shall include ecotype region (i.e., *Asclepias incarnata*, PA Ecotype).

- Seed tag from the bag of seed used shall be submitted to the Engineer at the time of seeding. Seed tag shall include ecotype region and species, guaranteed percentages of purity, weed content and germination of the seed, and the net weight. Seed tag shall match the Certificate of Materials, include the name of the supplier, and date material was sent.

- Bill of lading or a notarized Certificate of Compliance from the Supplier serving as proof of purchase shall be submitted if requested by the Engineer. Document shall include date of sale, quantity, lot number, and address of Supplier. This shall match the seed tag. Notary shall not work for either the contractor or seed supplier.

Seed mix shall be:

Seeding shall conform to the MassDOT Standard Specifications Section M6, ROADSIDE DEVELOPMENT MATERIALS.

All wetland areas shall be seeded using New England Wetmix or approved equal. Wetland seeding shall occur at a rate of one pound (1LB) per two-thousand five-hundred square feet (2,500 SF)

Upland areas shall be seeded using New England Conservation/Wildlife Mix or Approved Equivalent. Upland seeding shall occur at a rate of one point (1LB) per one-thousand seven-hundred fifty square feet (1,750 SF). The area shall be mulched with two inches of clean leaf compost or straw.

Seed vendors:

New England Wetland Plants, Inc. 14 Pearl Lane South Hadley, MA 01075 (413)548-8000 https://newp.com/	Ernst Conservation Seeds 8884 Mercer Pike Meadville, PA 16335 800-873-3321 https://www.ernstseed.com/	Vermont Wetland Plant Supply 29 Old Foundry Rd Orwell, VT 05760 802-948-2553 https://www.vermontwetlandplants.com/

Fertilizers shall not be used.

Straw mulch or hydromulch shall be per Section M6 of the Standard Specifications.

Water

The Contractor shall provide water and all equipment required at no extra cost. Water shall be suitable for irrigation and free from ingredients harmful to plants and wildlife. Water from the adjacent water bodies or waterways shall not be utilized. It is the Contractor's responsibility to correct injury or damage due to the lack of water, too much water, or use of contaminated water.

CONSTRUCTION METHODS & SEQUENCE

Site Protection Prior to Impacts

Prior to any land work, as part of the initial site-walk, the Wetland Specialist shall photo-document the site and provide a summary report of existing conditions as outlined under Item 755.75 Wetland Specialist.

Where and as required vegetation shall be cut flush and area surveyed to establish pre-construction elevations.

Following the cutting and surveying, separation fabric or timber matting shall be placed as required to protect soil and vegetation from compaction, contamination, and/or other damages. Fabric and timber mats shall be placed as specified under the respective items and the Engineer shall approval placement.

Restoration Upon Completion of Roadway Construction Work

Sediment Barriers

If required for sediment control during Restoration work (i.e, tilling is required to restore soil), sediment barriers shall be installed along the downslope perimeter of the Restoration Area beginning and ending in the surrounding upland so that no disturbed soil can enter adjacent wetlands or waters. Sediment barriers shall be in place and approved by the Engineer prior to any soil disturbance. No work shall take place outside the barriers.

Removal of Fill and Grading

Fill and fabric or mats shall be removed and disposed of as specified under the respective items.

If required, grades shall be restored to pre-construction elevations as shown in the baseline survey or as required by the Engineer and Wetland Specialist to restore hydrologic functions. Final elevations shall be approved by the Engineer prior to soil preparation and seeding. Grading shall be incidental to this item.

Following approval of grading to elevations required, soil shall be prepared and seeded as follows.

Soil Scarification

Compacted soil shall be scarified with equipment approved by the Engineer. Upon approval of soil scarification, the area shall be seeded with mulch as specified below. Seeding shall

immediately follow soil preparation.

Seeding with Mulch
Upon approval of prepared soil, area shall be seeded. Seeding may be hand broadcast with straw mulch applied or hydroseeded per the Standard Specifications and per the manufacturer's directions. Hydromulch shall be straw or wood fiber only and shall be per the manufacturer's recommendations.

Seed tags shall be submitted at time of seeding.

SEED ESTABLISHMENT

Seeding that fails to established according to the conditions of acceptance below shall be over-seeded as required by the Engineer. Washouts and channels shall be repaired and stabilized prior to overseeding. Excessive weed growth shall be pulled out by the roots or, with approval from the Engineer, cut prior to over-seeding. Soil repair and weed control are incidental to this item.

CONDITIONAL ACCEPTANCE OF WORK
Conditional Acceptance shall indicate approval of the wetland restoration work and agreement that work has been done according to plan or modified as approved.

Upon completion of construction, the Contractor shall submit a Request for Conditional Acceptance that includes a brief narrative (if applicable to project) demonstrating that the wetland restoration work was done according to plans (or how modified) and meets required permit conditions (if applicable). The narrative shall include, photo-documentation of pre-construction conditions as well as soil work, planting, and seeding. Seed tags shall be submitted as part of the Request for Conditional Acceptance.

Upon receipt of a Request for Conditional Acceptance, the Engineer, the Wetland Specialist, and regulatory representative (if required) shall assess the Restoration Area and the surrounding areas. At a minimum, the following conditions shall be included in the narrative and reviewed as part of the on-site assessment of whether:

- The target elevations have been restored per the survey or adjusted per the Engineer. Areas that are too high or too low should be identified along with suggested corrective measures.
- Soil compaction has been mitigated.
- Soils are stabilized and there is no sediment in the wetland and no channeling of slopes.
- Specified seed mix has been seeded and seeded species in the wetland and adjacent upland show signs of good germination and healthy growth.
- There are no invasive plants visible in the restored wetland area.
- sediment barrier materials have been removed.

Upon approval that the work meets the above conditions, MassDOT will issue a letter of Conditional Acceptance. If the Wetland Restoration work is not approved, MassDOT will issue a

rejection letter requiring corrective actions. Work not approved shall be addressed by the Contractor at no extra cost.

Erosion of adjacent slopes or the flow of sediments into the wetland between Conditional and Final Acceptance shall be immediately addressed by the Contractor.

FINAL ACCEPTANCE OF WORK

Following one full growing season, the Contractor shall submit a Request for Final Acceptance. Submittal shall include a brief narrative of conditions. Upon receiving the Request, the Engineer, Wetland Specialist and regulatory representative (if required) shall assess the Restoration Area. Final Acceptance will initiate the start of the Monitoring Period (if required).

The following conditions shall be inspected and approved for acceptance and payment:

- The desired seeded species are establishing well and cover 100 percent of the restoration area, excluding areas of open water, large boulders or planned bare soil.
- No sediments have entered the wetland.
- Adjacent slopes are stabilized with desirable vegetation.

If the restoration work is not approved, MassDOT will issue a rejection letter requiring corrective action. All costs associated with corrective measures and plant replacement shall be incidental to this item with no additional compensation. Work not approved shall be addressed by the Contractor at no extra cost.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 755.45 will be paid for at the Contract unit price per Square Yard, which price shall include all labor, materials, compost and amendments, seed, mulch, equipment, submittals, maintenance, grading, and incidental costs necessary to complete the work as required.

Payment shall be as follows:

- 50% upon completion of soil preparation and seeding
- 25% upon Conditional Acceptance
- 25% upon Final Acceptance or approval of the Engineer

Excavation of temporary fill will be paid under Item 120.1
Geotextile Fabric for Temporary Soil Protection will be paid under Item 698.31
Sediment Control Barrier will be paid under Item 767.121
Compost Blanket will be paid under Item 751.72
Timber Mat will be paid under Item 767.91.
Wetland Specialist will be paid under Item 755.75.

ITEM 755.75 WETLAND SPECIALIST HOUR

Designer:

- **Customize sections in RED text for the project. Remove red text when complete.**
- **Other revisions should only be made in coordination with Environmental Services or the Landscape Design Section.**
- **Specification should be modified as necessary to include, or not, oversight for Wetland Restoration (755.45) if required by permits. Coordinate with Wetland Restoration item.**
- **Specification must be modified for tidal wetland work.**
- **GREEN text is only required for Variance Projects. Remove for non-variance projects unless applicable to the Mitigation.**

Work under this Item shall be for services of a Wetland Scientist, Wetland Ecologist, Restoration Ecologist, or other professional with similar qualifications hereafter referred to as the "Wetland Specialist."

"Wetland Mitigation" shall be used herein for applicable wetland work. For this project, applicable wetland work is for: Item 755.35 Inland Wetland Replication Area (creation of a new wetland) and/or Item 755.45 Wetland Restoration (restoration after temporary impacts).

The Wetland Specialist shall demonstrate knowledge and expertise to coordinate and oversee all work associated with the Wetland Mitigation as defined herein, as shown on the Plans, as required by permits, and as specified under the relevant Wetland Mitigation items.

Regulatory monitoring reports following Final Acceptance of the Wetland Mitigation shall be per Item 755.76, Wetland Monitoring Reports.

For all onsite work, the Wetland Specialist shall sign in and sign out with the Engineer.

The Wetland Specialist shall not be from the same company as the company responsible for planting, seeding, and/or maintaining the wetland.

QUALIFICATIONS

The Wetland Specialist shall have a minimum of five (5) years of experience with construction and monitoring of wetland mitigation areas similar in size, type, and complexity to the Contract mitigation. When required by permits, at least ten (10) years of experience may be required. The Wetland Specialist shall be thoroughly versed in the Commonwealth of Massachusetts Wetlands Protection Act (MGL C.131, s.40), U.S. Army Corps of Engineers New England District Compensatory Mitigation Guidance, and all other relevant regulations of the Massachusetts Department of Environmental Protection and the U.S. Army Corps of Engineers New England District.

QUALIFICATIONS

Within sixty (60) days following the Notice to Proceed, the Contractor shall provide proof of qualifications for the Wetland Specialist to the Engineer for approval. Submittals shall include, but not be limited to, the following:

- Resume of the individual on-site implementing the Wetland Specialist work. If the Wetland Specialist changes over the course of the project, the new individual shall submit resume and qualifications for approval 30 days prior to doing any work on-site.
- Resume of any personnel working on-site in place of the Wetland Specialist. Individual shall be approved prior to work on-site.
- Narrative describing the company, its expertise, technical qualifications and experience with wetland construction.
- At least three (3) references from prior work of a similar nature completed in the last five (5) years and by the individuals who will perform the work. Provide contact information for each reference including address, phone number and email.
- A summary of each reference project including nature of the work, project size, dates, and period of construction and monitoring, methodologies used, and summary of success (or not) in terms of meeting performance objectives. Summary shall include a minimum of one before and one after photo for each project.

SUBMITTALS – DOCUMENTATION AND REPORTS

Wetland Construction Oversight

Wetland Specialist shall provide documentation of pre-existing conditions and wetland construction as specified below and as part of fulfilling the Scope of Work described below. Documentation shall include photos that are clear and legible. Photos are incidental to this item.

- ***Site Walk Prior to Disturbance and Construction of Wetlands:*** Provide brief assessment with photos, including documentation of the existing wetlands to be impacted (both permanent and temporary), proposed wetland replication area, and reference/model wetland areas (typically an adjacent undisturbed wetland or the existing wetland to be impacted). Photos of existing wetlands that will be temporarily impacted shall include a view from at least 3 angles.
- ***Excavation and Grading:*** Documentation shall include minimum of two photos of the excavated wetland and two photos after final grading prior to planting and seeding. For restoration areas, photos shall show soil preparation (i.e, tilling and grading), if applicable.
- ***Approval of Subgrades:*** The Wetland Specialist shall inspect the sub-grade of the Replication Area to ensure that proper hydrology is likely to be established and shall provide the Engineer with written confirmation and photographs upon completion of subgrade excavation work. Written confirmation shall include recommended field adjustments, based on field observations, to achieve the desired hydrology and designed wetland system.
- ***Planting and Seeding:*** Provide assessment and photos of vegetation upon completion of planting and seeding work.
- ***Data logger output from Monitoring Wells*** shall be submitted with reports, if applicable and requested. **[Delete if wells are not required for the project.]**

For Variance projects, the Wetland Specialist shall submit bi-weekly reports to the Environmental Monitor during active construction of wetland mitigation areas and bi-monthly reports during the off-season on the above activities.

Wetland construction documentation and reports shall be submitted with Request for Conditional Acceptance and for the Order of Conditions, Water Quality Certifications, and other regulatory permits as required. **[Amend to specify what is required for Permits].**

Requests for Acceptance of Work & Regulatory Compliance

The Wetland Specialist shall submit the following documents if and as specified herein and under Item the relevant Wetland Mitigation items:

- Request for Conditional Acceptance.
- Request for Certificate of Compliance (Partial or Full) when applicable.
- Request for Final Acceptance.

SCOPE OF WORK

In the event of discrepancies with the applicable permits, the Wetland Specialist shall submit a Request for Information (RFI) to the Engineer.

General

The Wetland Specialist shall be responsible for the following:

- Review and have a comprehensive knowledge of the environmental permits relevant to the specific mitigation work being done so as to ensure compliance throughout the duration of the contract.
- Identify and inform the Contractor and Engineer of unique site conditions which may require adjustments to the schedule, design, or construction methods. For example, wildlife nesting, illegal dumping, or rare species.
- Identify and inform the Contractor and Engineer of any sediment or erosion control problems observed within mitigation areas.
- Advise so as to avoid impacts to adjacent areas and regulated wetland resources.
- Participate in necessary meetings as required by permits and when requested by the Engineer.

Inspections & Construction Oversight

The Wetland Specialist shall be responsible for, but not limited to, the following:

- Pre-Construction Site Walk
    - Following surveying, flagging, and staking of all relevant boundaries and elevations by the Contractor, the Wetland Specialist shall walk the site with the Engineer and the Contractor to review existing and proposed conditions, recommend changes if necessary, and approve the following: location and boundaries of the Mitigation Area, target elevations and grades, location of tree

protection associated with the Mitigation Area, and final layout and limits of clearing for access route.
    - Select and mark snags, logs, and woody material to be retained for incorporation into the Wetland Mitigation, as appropriate.
    - Note invasive plants in and adjacent to Wetland Mitigation.
    - Provide summary report if and as specified under Wetland Mitigation items.
- Excavation, Soil Placement, Grading for Replication Areas
    - Approve excavated depth and grading for appropriate wetland hydrology, subsoil preparation, and finished grade of placed wetland soil.
    - Adjust grades as required and approve microtopography. If grades need to be adjusted, submit an RFI to the Engineer.
    - If requested by the Engineer, the Wetland Specialist shall inspect stockpiled wetland soil for moisture content and signs of undesirable weeds.
- Soil Protection and Restoration Measures for Restoration Areas
    - Review and approve methods of soil protection and restoration if required.
    - Confirm decompaction will adequately restore appropriate wetland hydrology. If decompaction measures need to be adjusted, submit an RFI to the Engineer.
- Re-vegetation of Mitigation Area
    - Locate woody material to be re-used.
    - Verify seed used complies with specifications and site conditions, determine limits for wetland seeding based on elevations, approve seeding and mulching methods, and collect seed tags to submit with Request for Conditional Acceptance.
    - Review planting methods (if applicable) prior to installation and oversee layout of wetland plants.

Conditional Acceptance

Upon completion of construction of the wetland, as part of the Request for Conditional Acceptance, the Wetland Specialist shall provide a brief narrative demonstrating that the wetland construction work was done according to plans (or how modified) and meets the conditions required for acceptance as specified under the Wetland Mitigation items. Submittal shall include a report and photo documention of pre-construction conditions, construction work, seeding, planting, and other work as specified under the Wetland Mitigation items. Photos of completed Wetland Restoration areas shall include the same views as the pre-construction reference photos.

Upon receipt of a Request for Conditional Acceptance, the Engineer, the Wetland Specialist and regulatory representative (if required) shall assess the Wetland Mitigation and surrounding area to ensure that it meets the conditions specified under the Wetland Mitigation items.

Upon approval, MassDOT will issue a letter of Conditional Acceptance. If the Wetland Mitigation work is not approved, MassDOT will issue a rejection letter requiring corrective action. The Wetland Specialist shall recommend corrective actions.

Request for Certificate of Compliance

If required, a Request for Certificate of Compliance shall be prepared and submitted to the Engineer immediately following Conditional Acceptance. Request shall be as specified under the relevant Wetland Mitigation items.

Request for Final Acceptance

Following one full growing season, the Wetland Specialist shall provide a brief narrative of the status of the Wetland Mitigation to be submitted with the Request for Final Acceptance.

Upon receipt of the Request, the Engineer, the Wetland Specialist and regulatory representative (if required) shall assess the Wetland Mitigation and surrounding area to ensure that it meets the conditions specified under the relevant Wetland Mitigation items.

If the Wetland Mitigation is not approved, MassDOT will issue a rejection letter requiring corrective action. The Wetland Specialist shall recommend corrective actions.

METHOD OF MEASUREMENT

Item 755.75 Wetland Specialist shall be measured per hour for on-site service provided by the Wetland Specialist.

Work shall include all inspections, photos, submittals, and associated tasks for construction and restoration oversight, narratives for Conditional and Final Acceptance, Request for Certificate of Compliance (Partial or Full) if required, documentation required for permits, and all other work specified above. Payment shall not include travel time or time spent off-site on reports. Decimal Pay Limits will be 0.25 hours.

BASIS OF PAYMENT

Item 755.75 Wetland Specialist shall be paid at the Contractor bid price for each hour, or fraction thereof, spent on-site to perform the work as described above. Reports and photo documentation are required for payment.

Post wetland construction reports shall be per Item 755.76, Wetland Monitoring Reports.

ITEM 755.76 WETLAND MONITORING REPORTS LUMP SUM

Designer:

- **Text should be customized for the project where highlighted. Other revisions should only be made in coordination with Environmental Services or the Landscape Design Section.**
- **Specifications needs to be modified as necessary to include oversight for Wetland Restoration if required by permits. Coordinate with Wetland Restoration item.**
- **Specification must be modified for tidal wetland work.**
- **GREEN text is only required for Variance Projects. Remove green text for non-Variance projects unless applicable to the Mitigation. Amend special provision language as necessary to meet Variance requirements**.

Work under this item shall be for the submittal of Wetland Monitoring Reports following the completion of wetland construction and shall include all inspections, photos, and other work required to complete those reports as specified herein.

"Wetland Mitigation" shall be used herein for applicable wetland work, whether Wetland Replication (creation of a new wetland) and/or Wetland Restoration (restoration after temporary impacts).

The Contractor shall retain the services of a Wetland Scientist, Wetland Ecologist, Restoration Ecologist, or other professional with similar qualifications, hereafter referred to as the "Wetland Specialist," to complete the Wetland Monitoring reports. Wetland Specialist shall meet requirements specified under Item 755.75 Wetland Specialist.

All on-site Wetland Specialist services required to complete the construction and revegetation of the wetland replication, including preparation and submission of monitoring reports during construction, shall be per Item 755.75 Wetland Specialist.

SCOPE OF WORK

Post-Construction Wetland Monitoring Reports

Final Acceptance of the wetland construction work as specified under item 755.35 and/or 755.45 shall initiate the beginning of the Monitoring Period.

Inspections and reports shall be performed to ensure compliance with mitigation requirements defined under the relevant Wetland Mitigation items and with all applicable environmental permits. Monitoring reports shall cover the following:

- Identification of all plant species present
- Percent cover for each plant species and overall percent surface area cover by indigenous wetland plant species for replication area and upland
- Description of the viability, health, and vigor of installed plants as well as volunteer plant species within the replication areas
- Description of remedial measures taken to ensure criteria are met
- Depth to apparent water table and/or depth of surface inundation, both as measured from the soil surface and data loggers, as appropriate.
- A conclusion regarding the success of the wetland mitigation area relative to the performance standards at 310 CMR 10.55(4)(b) (unless varied), the design plans, and

performance criteria established by MADEP in the variance conditions (when applicable), and the reference wetland.

- Recommendation for a corrective plan of action if needed.

Variance projects shall also cover the following:

- Data shall be collected for at least five (5) distinct observation plots distributed to ensure all plant communities are represented and multiple plots are located in the largest plant communities
- Each sampling event shall include groundwater data obtained at groundwater monitoring wells that have been installed in the wetland mitigation area
- Color photo documentation with photos for each sampling event at each observation well and observation plot

Reports shall be submitted to the Engineer as a digital copy in Portable Document Format (PDF) unless otherwise requested. Hard copies shall be provided as requested by the Engineer. All reports shall be marked with the applicable permit numbers and identifying information as required in the permits. Reports shall include photo documentation of the wetland/s being monitored and shall include a minimum of 3 views from different orientations. Views shall be labeled.

Spring Reports, when required, shall be submitted to the Engineer by July 1 for dispersal to the appropriate permitting agencies.

End of Year Reports (which may serve as the Fall Report) shall be based on inspections that occur prior to October 15th. Reports shall be submitted to the Engineer no later than November 1 of each year.

Monitoring Reports shall be as follows for XX years: **[Select/amend as required for permits. If monitoring is required beyond 2 years after expected close of construction contract, please coordinate with MassDOT Environmental].**

- MassDEP: # Reports - (note if spring and/or 1 end of year).
- ACOE: # Reports (note if spring and/or 1 end of year).
- Conservation Commission: # Reports (note if spring and/or 1 end of year).
- Other: # Reports (note if spring and/or 1 end of year).

BASIS OF PAYMENT AND METHOD OF MEASUREMENT

Item 755.76 Wetland Monitoring Reports and associated inspections shall be at the Contract unit price per Lump Sum and shall include all labor, materials, equipment, and all incidental costs required to complete the work. Lump Sum will be paid in equal installments of the Lump Sum divided by the number of reports submitted. Payment shall be upon submittal and acceptance of each report, based on the following schedule: **[Complete/modify as applicable.]**

- Year 1 = xx Reports
- Year 2 = xx Reports

ITEM 767.7 MATTING FOR EROSION CONTROL SQUARE YARD

The work under these items shall conform to the relevant provisions of Section 120, 170, 280, and 767 of the Standard Specifications and the following:

This work consists of constructing temporary installations to control erosion, enhance vegetation establishment, and survivability on slopes, channels, and includes installing rolled erosion control products.

Matting for Erosion Control

Furnish a temporary rolled erosion control product with the necessary longevity and performance properties to effectively control erosion and assist in the establishment of vegetation under the anticipated immediate site conditions.

MATERIALS

Matting for Erosion Control - Erosion Control Blanket

A temporary degradable rolled erosion control product composed of processed natural or polymer fibers mechanically, structurally or chemically bound together to form a continuous matrix to provide erosion control and facilitate vegetation establishment.

Erosion Control Blankets & Open Weave Textiles – An erosion control blanket composed of processed slow degrading natural or polymer fibers mechanically bound together between two slow degrading synthetic or natural fiber nettings to form a continuous matrix or an open weave textile composed of processed slow degrading natural or polymer yarns or twines woven into a continuous matrix.

Maximum Gradient = 1:1 (H:V)
C Factor >/= 0.25 @ 1:1
Minimum Tensile Strength = 100 lbs/ft (1.45 kN/m)

ITEM 767.7 (Continued)

METHOD OF CONSTRUCTION

Installation Guide for Rolled Erosion Control Products (RECPs) Including Mulch Control Erosion Control Blankets (ECBs), and Turf Reinforcement Mats (TRMs) This document is intended to provide general guidelines for the installation of RECPs and does not supersede manufacture's guidelines. The following sections summarize the general, accepted procedures for installation of RECPs and provide basic guidance for slope and channel installations. Detailed design/installation information should be obtained from the manufacturer.

General Procedure.

Prepare a stable and firm soil surface free of rocks and other obstructions. Apply soil amendments as necessary to prepare seedbed. Place fertilizer, water, and seed in accordance with manufacturer, local/state regulations, or engineer/specifiers requirements. Typically, RECPs are unrolled parallel to the primary direction of flow. Ensure the product maintains intimate contact with the soil surface over the entirety of the installation. Do not stretch or allow material to bridge over surface inconsistencies. Staple/stake RECPs to soil such that each staple/stake is flush with underlying soil. Install anchor trenches, seams and terminal ends as specified.

Install RECPs after application of seed, fertilizer, mulches (if necessary) and other necessary soil amendments, unless soil in-filling of the TRM is required. For TRMs if soil in-filling, install TRM, apply seed, and other soil amendments lightly brush or rake 0.3 to 0.7 in. (8 to 18 mm) of topsoil into TRM matrix to fill the product thickness. If in-filling with a hydraulically-applied matrix or medium is required; install TRM, then install hydraulically-applied matrix or medium at the manufacturer's suggested application rate.

Anchor Trenches, Seams and Terminal Ends

Upslope Anchor – utilize one of the methods detailed below for initial anchoring of RECPs Staples. Install the RECPs 3 ft. (900 mm) beyond the shoulder of the slope onto flat final grade. Secure roll end with a single row of stakes/staples on 1 ft. (300-mm) centers.

Anchor trench.

Excavate a 6 in. by 6 in. (150 mm by 150 mm) anchor trench. Extend the upslope terminal end of the RECPs 3 ft. (900 mm) past the anchor trench. Use stakes or staples to fasten the product into the bottom of the anchor trench on 1 ft. (300 mm) centers. Backfill the trench and compact the soil into the anchor trench. Apply seed and any necessary soil amendments to the compacted soil and cover with remaining 1 ft. (300 mm) terminal end of the RECPs. Fold product over compacted soil in anchor trench to overlap downslope material. Secure terminal end of RECPs with a single row of stakes or staples on 1 ft. (300 mm) centers.

ITEM 767.7 (Continued)

Staple check

Construct a stake/staple check slot along the top edge of the RECPs by installing two rows of staggered stakes/staples 4 in. (100 mm) apart on 4 in. (100 mm) centers. Single net product anchor trench. Excavate a 6 in. by 6 in. (150 mm by 150 mm) anchor trench. Position roll such that the leading end of the roll is downslope and upside down. Apply seed and necessary soil amendments. Extend product 1 ft. downslope of anchor trench and place material in anchor trench (upside down). Secure terminal end and material in anchor trench with staples at 1 ft. intervals. Fill anchor trench with soil and compact. Apply seed and necessary soil amendments to fill placed in anchor trench. Move remaining roll over and downslope of anchor trench and proceed unrolling RECP downslope (since roll was initially reversed, folding material over anchor trench will result in the net side up, and rolling correctly downslope over the anchor trench).

Seams

Utilize one of the methods detailed below for seaming of RECPs

Adjacent seams. Overlap edges of adjacent RECPs by 2 to 4 in. (50 to 100 mm) or by abutting products as defined by manufacturer. Use a sufficient number of stakes or staples to prevent seam or abutted rolls from separating. Consecutive rolls. Shingle and overlap consecutive rolls 2 to 6 in. (50 to 150 mm) in the direction of flow. Secure staples through seam at 1 ft. (300 mm) intervals. Check seam. Construct a stake/staple check seam along the top edge of RECPs for slope application and at specified intervals in a channel by installing two staggered rows of stakes/staples 4 in. (100 mm) apart on 4 in. (100 mm) centers. Slope interruption check slot. Excavate a trench measuring 6 in. wide by 6 in. deep (150 x 150 mm). Secure product to the bottom of the trench. Fold product over upslope material and fill and compact the trench on the downslope side of check slot and seed fill. Continue rolling material downslope over trench.

Terminal Ends

Utilize one of the methods detailed below for all terminal ends of RECPs Staples. Install the RECPs 3 ft. (900 mm) beyond the end of the channel and secure end with a single row of stakes/staples on 1 ft. (300-mm) centers. Stakes/staples for securing RECPS to the soil are typically 6 in. (150 mm) long.

Anchor trench. Excavate a 6 in. by 6 in. (150 mm by 150 mm) anchor trench. Extend the terminal end of the RECPs 3 ft. (900 mm) past the anchor trench. Use stakes or staples to fasten the product into the bottom of the anchor trench on 1 ft. (300 mm) centers. Backfill the trench and compact the soil into the anchor trench. Apply seed and any necessary soil amendments to the compacted soil and cover with remaining 1 ft. (300 mm) terminal end of the RECPs. Secure terminal end of RECPs with a single row of stakes or staples on 1 ft. (300 mm) centers.

Check slot

ITEM 767.7 (Continued)

Construct a stake/staple check slot along the terminal end of the RECPs by installing two rows of staggered stakes/staples 4 in. (100 mm) apart on 4 in. (100 mm) centers.

Erosion Control Blanket (Matting for Erosion Control) Installations

At the top of slope, anchor the RECPs according to the method detailed above. Securely fasten all RECPs to the soil by installing stakes/staples at a minimum rate of 1.3/yd2 (1.5/m2) within the body of the blanket. Use stake/staple patterns and densities as recommended by the manufacturer. For adjacent and consecutive rolls of RECPs follow seaming instructions detailed above. The terminal end of the RECPs installation must be anchored using the methods detailed above.

Turf Reinforcement Mat (Jute Mesh Waterway and Geotextile Fabric For Permanent Erosion Control) Installations

Construct an anchor trench at the beginning of the channel across its entire width according to above. Follow the manufacturer's installation guidelines in constructing additional anchor trenches or stake/staple check slots at intervals along the channel reach and at the terminal end of the channel, according to the above respectively. Unroll RECPs down the center of the channel in the primary water flow direction. Securely fasten all RECPs to the soil by installing stakes/staples at a minimum rate of 1.7/yd^2 (1.5/m^2). Significantly higher anchor rates and longer stakes/staples may be necessary in sandy, loose, or wet soils and in severe applications. For adjacent and consecutive rolls of RECPs follow seaming instructions detailed above. All terminal ends of the RECPs must be anchored using the methods detailed in above.

Ensure sufficient staples to resist uplift from hydraulics, wind, mowers, and foot traffic. Use stake/staple patterns and densities as recommended by the manufacturer.

Repair any damaged areas immediately by restoring soil to finished grade, re-applying soil amendments and seed, and replacing the RECPs.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Matting for Erosion Control will be measured, complete in place, by the square yard.

Jute Mesh (Waterways) and Matting for Erosion Control will be paid for at the contract unit price per square yard which price shall include all labor, materials, equipment and incidental costs required to complete the work. No separate payment will be made for fabric, fertilizer, or staples/stakes, but all costs in connection therewith shall be included in the Contract unit price bid. Loam and seeding will be paid for separately under loam borrow and seeding items.

ITEM 767.78 COMPOSTED MULCH OVER MODIFIED ROCK SQUARE YARD

GENERAL

The purpose of this item is to provide compost mulch for mixing with seed, to be placed on designated rip rap slopes in areas where establishment of vegetation in the rock slope is desired. This item shall conform to the requirements of Section 767 and 765 of the Standard Specifications and the following.

MATERIALS

Composted mulch

Composted Mulch shall be an aged organic substance meeting the requirements of M1.06.0 of the Supplemental Standard Specifications. No manure, bio-solids, kiln dried wood, or construction debris shall be allowed.

Organic matter content shall be between 20-100% (dry weight basis) as determined by ASTM D2974 (method A) Standard Test Methods for Moisture, Ash and Organic Matter of Peat and Other Organic Soils.

Moisture content shall be <15% by dry weight (<60% by wet weight) as measured by ASTM D2216 Standard Test Method for Laboratory Determination of Water Content of Soil and Rock and ASTM D2974 (cited above).

Particle size as measured by sieving shall be as follows:

Sieve Size	%Passing
2 in	100%
¾ in	70-100%
#4	30-75%
#20	20-40%

Soluble salts shall be <5.0 mmhos/cm (dS/m). The pH shall be between 5.5 and 8.0.

Seed

Seed shall be a native mix as specified under the native seed item.

CONSTRUCTION METHODS

Methods of installation shall be reviewed and approved by the Engineer prior to placement of material.

Placement of compost mulch shall be as shown on the plans and as directed by the Engineer. Compost mulch material shall be applied pneumatically. Material shall be placed so that settled material is at or slightly below the surface plane of the stone. Contractor shall ensure that there will be adequate quantity, including adjustment for settlement.

Seeding shall be done at the same time as compost topsoil is being applied and shall be by broadcast method as specified under the seeding item and such that a very thin blanket of material covers the seed.

COMPENSATION

Compost Mulch for Modified Rock will be measured and paid for at the Contract unit price per Square Yard which price shall include all labor, materials, equipment, site preparation, and all incidental costs required to complete the work.

Seed shall be compensated at the bid price per the seeding item.

ITEM 767.121 SEDIMENT CONTROL BARRIER FOOT

The work under this item shall conform to the relevant provisions of Sections 751 and 767 of the Standard Specifications and Section 670 of the Standard Supplemental Specifications and shall include the furnishing and placement of a sediment control barrier. Sediment Control Barrier shall be installed prior to disturbing upslope soil.

The purpose of the sediment control barrier is to slow runoff velocity and filter suspended sediments from storm water flow. Sediment barrier may be used to contain stockpile sediments, to break slope length, and to slow or prevent up gradient water or water off road surfaces from flowing into a work zone. Contractor shall be responsible for ensuring that barriers fulfill the intent of adequately controlling siltation and runoff.

Twelve-inch diameter (after installation) compost filter tubes are intended to be the primary sedimentation control barrier.

For small areas of disturbance with minimal slope and slope length, the Engineer may approve the following sediment control methods;

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

Additional barriers (adding depth or height) shall be used at specific locations of concentrated flow such as at gully points, steep slopes, or identified failure points in the sediment capture line.

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

MATERIALS AND CONSTRUCTION

Prior to initial placement of barriers, the Contractor and the Engineer shall review locations specified on the plans to ensure that the placement will provide maximum effectiveness.

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

Compost Filter Tube

Compost material inside the filter tube shall meet M1.06.0, except for the following: no manure or bio-solids shall be used; no kiln-dried wood or construction debris shall be allowed; material shall pass through a 2-inch sieve; and the C:N ratio shall be disregarded.

Outer tube fabric shall be a knitted mesh with 1/8 - 3/8” openings and made of 100% biodegradable materials (i.e., cotton, hemp or jute).

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

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

Straw Bales

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

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

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

Straw Wattle

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

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

Stakes

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

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

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

MAINTENANCE

Maintenance of Sediment Control Barriers shall be per Section 670.40 of the Standard Supplemental Specifications or per the Stormwater Pollution Prevention Plan (SWPPP).

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

Barriers that decompose naturally due to weatherization over time such that they no longer provide the function required shall be repaired or replaced as directed. If the resulting berm of compost within the fabric tube is sufficiently intact and continues to provide water and sediment

control, barrier does not necessarily require replacement.

DISMANTLING & REMOVING

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

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

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

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

- Filter tube fabric shall be cut and removed, and compost shall be raked to blend evenly (similar to a soil amendment or mulch). Not more than a 2-inch depth shall be left on soil substrate.
- Straw bales shall be removed and disposed off-site by the Contractor. Areas of trenching shall be raked smooth and disturbed soils stabilized with a seed mix matching adjacent grasses (i.e., lawn or native grass mix).
- Silt fence, stakes, and other debris shall be removed and disposed off-site. Site shall look neat and clean upon completion.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 767.121 will be measured and paid for at the contract unit price per foot of sediment control barrier which price shall include all labor, equipment, materials, maintenance, dismantling, removal, restoration of soil, and all incidental costs required to complete the work.

Silt fence, when used in conjunction with compost filter tubes or straw bales, will be incidental to this item.

Additional barrier, such as double or triple stacking of compost filter tubes, if requested by Engineer shall be paid for per foot of tube installed.

Barriers that have been driven over or otherwise damage by construction activities shall be repaired or replaced as directed by the Engineer at the Contractors expense.

ITEM 991.1 CONTROL OF WATER – STRUCTURE NO. S-31-007 LUMP SUM
ITEM 991.2 CONTROL OF WATER – STRUCTURE NO. S-31-013 LUMP SUM
ITEM 991.3 CONTROL OF WATER – STRUCTURE NO. PRECAST CONCRETE CULVERT 48 X 48 INCHES LUMP SUM

The work to be performed under this Item shall include all pumping, sandbagging, earth, and other measures, inclusive of optional sheeting if deemed practical, necessary for sufficient water control to accomplish headwall and culvert installation, repairs, repointing, and rebuilding of the stone masonry abutments and wingwalls. Also, this Item includes all water pollution prevention including sediment control and flood prevention of the excavated areas at the structure for demolition, reconstruction, and riprap placement necessary to complete the bridge superstructure replacement.

The Work under this Item shall conform to the relevant provisions of Subsection 140 of the Standard Specifications and these Special Provisions.

The Contractor's attention is directed to the section of these Special Provisions that addresses the Contractor's obligations for Sedimentation and Erosion Control for this project.

CONSTRUCTION METHODS

As part of the work under this Item, it is the responsibility of the Contractor to determine the means and method to maintain the required channel opening for fish and water flow, dewatering techniques and sedimentation controls needed to control water and sediment for the required operations. Prior to commencing construction, the Contractor shall submit Plans showing the methods and materials he/she proposes to use for the Engineer's approval. The submittal shall include a hydraulic calculation showing the proposed methods do not result in flood impact to improvements on surrounding properties due to storm flows. The Plans and hydraulic calculations shall be prepared and stamped by a Professional Engineer registered in the Commonwealth of Massachusetts.

The design submittal must consider a minimum 2 year flood elevation for the cross-section in each stage of construction (see Bridge Manual Part I 1.3.3.3E). A minimum of 1 foot of freeboard shall be provided with the 2 year flood elevation for water control purposes. The 2 year flood elevation that is indicated on the Plans is based on the particular cross-section shown for each stage of construction. Any deviation of the location of the water control system from the Plans will require a determination of a new 2 year flood elevation for the design.

The Contractor shall use such equipment and shall perform his/her operations in such a manner that boiling or other disturbances of the soil in the foundation area will be prevented. He/She shall keep the area being excavated dry by such means that water will be prevented from entering from the adjacent soils and adversely affecting the stability of the foundation material or supporting soils.

All dewatering and related earthwork shall be conducted in such a manner as to prevent siltation

or contamination of the waterway.

The Contractor shall provide the means of removing all sediment from water pumped from channel excavation or water entering the bridge excavation via ground water or from surface flow; this shall include the use of sedimentation basins, check dams, sedimentation fences or tanks as required in these Special Provisions under Sedimentation and Erosion Control listed below.

All temporary support of excavation that protrudes into the soil that supports the bridge structure shall be left in place. Supporting soil shall be defined as all soil directly below the footing contained within a series of planes that originate at the perimeter of the bottom of the footing and project down and away from the footing at an angle of 45 degrees from the horizontal.

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

- Rigorous management of construction operations involving potentially hazardous materials, such as, refueling and maintenance of construction equipment.

- Formulation of contingency plans to control accidental spillage from potentially hazardous materials.

- Sighting of construction staging areas outside of the buffer zones on relatively flat ground.

- Scheduling of work within the resource areas to avoid periods of high flood (e.g., spring floods) and inclement weather.

- Installation and continuous maintenance of staked hay bales and filter fences to prevent sediment migration into adjacent downstream resource areas. Placement of erosion controls shall be as shown on the plans, as specified herein, or as directed by the Engineer, so as to accomplish maximum control of project related sediment mobilization. Additional erosion control measures shall be employed as necessary to prevent erosion and sedimentation of the streambed. These measures shall be maintained for the duration of the contract.

- All discharge resulting from dewatering activities shall be directed to temporary settling tanks/basins located as necessary to control turbidity (see below). At no time shall said discharge be directly released into adjacent resource areas.

The pumping discharge shall not be allowed to enter directly into Hop Brook or Pantry Brook. The water from the work areas shall be pumped to a settling tank. The tank shall be constructed to allow for the pumped water to pass through the tank with sediments settling out before discharging to an area enclosed by hay bales. The tank can be constructed of concrete, fiberglass or any other material that will meet the following:

1. Approximately 70 percent sedimentation trapping efficiency shall be achieved with a typical tank to ensure that the tanks are adequately sized to prevent overtopping from dewatering and to provide the required filtering.
2. The outlet from the settling tank shall not cause erosion of the surrounding area. An approved method of controlling erosion, such as an erosion control blanket, stone, etc., shall be used at the outlet of the tank.

The settling tanks shall be maintained as follows:

1. Inspect at least twice daily during dewatering operations.
2. Repair any damage immediately.
3. Clean tank outlet daily. Remove any debris immediately.
4. Remove sediments when deposits reach 8 inches below the outlet invert.
5. Dispose sediments outside of wetland areas at a location approved by the Engineer.
6. The Contractor shall inspect hay bales that surround the outlet daily and shall immediately replace any that are damaged.

The approximate location of the settling tanks shall be shown on the Contractor's Plans as part of the submittal for the Engineer's approval.

Pumping shall be conducted in a manner which will not adversely affect the work within the excavation.

The Contractor shall provide and maintain ample pumps, pipes and other devices to promptly and continually remove and dispose of water from the excavation areas. The size and configuration of pumps and pipes shall be selected by the Contractor.

The Contractor is advised that the effectiveness of the water control method used will vary based on the field conditions and the time at which the actual excavation work is being performed. The Engineer has the right to order the Contractor to stop all excavation operations when in his judgment the Contractor's water control operations are failing to produce adequate results or are posing a threat to the environment.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Payment for all water control work, including design for flood prevention of excavated areas, water pollution prevention and dewatering operation, all necessary tools, material, installation, and removal of all temporary measures necessary for the measures outlined above, shall be included in the Contract LUMP SUM Price for this Item.

Payment under this Item is a partial progressive payment of the Lump Sum Contract Bid Price of this Item and shall be made based upon the following percentages: 50% upon completion of the installation of the water control system to the satisfaction and approval of the Engineer, and 50% upon the removal and satisfactory disposal of the water control system from the project site at the completion of the work.

Appendix L

Notification to Abutters
(MassDOT exempt, Town will attach for municipal use)