

NOTICE OF PUBLIC HEARING SUDBURY CONSERVATION COMMISSION

The Sudbury Conservation Commission will review the Notice of Intent filing under the Wetlands Protection Act and Wetlands Bylaw for replacement of the Dudley Brook Culvert under Washington Drive within wetland resource areas, at Washington Drive, Sudbury MA. Dan Nason, Director of DPW, applicant. The hearing will be held virtually on Monday, June 7, 2021, at 6:45pm, via Zoom. Please see the Conservation Commission web page for further information.

 $\underline{https://sudbury.ma.us/conservationcommission/meeting/conservation-commission-meeting-monday-june-7-2021/}$

SUDBURY CONSERVATION COMMISSION May 24, 2021

EcoTec, Inc.



ENVIRONMENTAL CONSULTING SERVICES 102 Grove Street Worcester, MA 01605-2629 508-752-9666 / Fax: 508-752-9494

NOTICE OF INTENT

Dudley Brook Culvert Replacement Washington Drive Sudbury, MA

May, 2021

TABLE OF CONTENTS

- 1. eDEP WPA Form 3 (Notice of Intent)
- 2. Abutters List
- Technical Memorandum by Woodard & Curran, Inc. (including project description, alternatives analysis, wetland report, USGS & other map figures)
- 4. Project Plans

Massachusetts Department of Environmental

Protection

Bureau of Resource Protection - Wetlands

WPA Form 3 - Notice of Intent

 $Mass a chusetts \ Wetlands \ Protection \ Act \ M.G.L. \ c. \ 131, \ \S 40$

Provided by MassDEP: MassDEP File #:

eDEP Transaction #:1280913 City/Town:SUDBURY

A.General Information

1. Project Location:

a. Street Address WASHINGTON DRIVE

 b. City/Town
 SUDBURY
 c. Zip Code
 01776

 d. Latitude
 42.36195N
 e. Longitude
 71.45075W

 f. Map/Plat #
 N/A
 g.Parcel/Lot #
 N/A

2. Applicant:

☐ Individual ☐ Organization

a. First Name DANIEL b.Last Name NASON c. Organization TOWN OF SUDBURY DEPT. OF PUBLIC WORKS

d. Mailing Address 275 OLD LANCASTER ROAD

e. City/Town SUDBURY f. State MA g. Zip Code 01776

h. Phone Number 978-443-2209 i. Fax j. Email nasond@sudbury.ma.us

3.Property Owner:

more than one owner

a. First Name DANIEL b. Last Name NASON c. Organization TOWN OF SUDBURY DEPT. OF PUBLIC WORKS

d. Mailing Address 275 OLD LANCASTER ROAD

e. City/Town SUDBURY f.State MA g. Zip Code 01776

h. Phone Number 978-443-2209 i. Fax j.Email nasond@sudbury.ma.us

4. Representative:

a. First Name ARTHUR b. Last Name ALLEN

c. Organization ECOTEC, INC. d. Mailing Address 102 GROVE ST.

d. Mailing Address
e. City/Town

102 GROVE STREET
WORCESTER
f. State

e. City/Town WORCESTER f. State g. Zip Code 01605

h.Phone Number 508-752-9666 i.Fax j.Email aallen@ecotecinc.com

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

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

6.General Project Description:

REPLACEMENT OF DUDLEY BROOK CULVERT UNDER WASHINGTON DRIVE.

7a.Project Type:

Single Family Home
 Residential Subdivision
 Limited Project Driveway Crossing
 Commercial/Industrial

5. ☐ Dock/Pier 6. ☐ Utilities

7. ☐ Coastal Engineering Structure 8. ☐ Agriculture (eg., cranberries, forestry)

9. **☑** Transportation 10. **☐** Other

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

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 #: eDEP Transaction #:1280913

City/Town:SUDBURY

1. ▼ Yes □ No If yes, des	cribe which limited project app	plies to this project:	
2. Limited Project 310 CMR	10.53(3)(F); MAINTENANO	CE AND IMPROVEMENT OF EXISTI	NG PUBLIC ROADWAY
3.Property recorded at the Reg	istry of Deeds for:		
a.County:	b.Certificate:	c.Book: d.	Page:
SOUTHERN MIDDLESEX	N/A	N/A N	'A
B. Buffer Zone & Resou B.Buffer Zone & Resource Are			
☐ This is a Buffer Zone only Inland Bank, or Coastal Resou		s located only in the Buffer Zone of a Boro	dering Vegetated Wetland,
2.Inland Resource Areas: (See	e 310 CMR 10.54 - 10.58, if r	not applicable, go to Section B.3. Coastal	Resource Areas)
Resource Area		Size of Proposed Alteration Pro	posed Replacement (if any)
a. ▼ Bank		190 1. linear feet	1682. linear feet
b. ☐ Bordering Vegetated Wet	land	1. square feet	2. square feet
c. ✓ Land under Waterbodies	and Waterways	77 1. Square feet	0 2. square feet
		0 3. cubic yards dredged	2. square reet
d. W Bordering Land Subject t	to Flooding	4136 1. square feet	4096 2. square feet 36
		3. cubic feet of flood storage lost	4. cubic feet replaced
e. Isolated Land Subject to	Flooding	1. square feet	·
		2. cubic feet of flood storage lost	3. cubic feet replaced
f. V Riverfront Area		Dudley Brook 1. Name of Waterway (if any)	
2. Width of Riverfront Are	a (check one)	☐ 25 ft Designated Densely De☐ 100 ft New agricultural proje☐ 200 ft All other projects	
3. Total area of Riverfront	Area on the site of the propos	ed project	4136 square feet
4. Proposed Alteration of t	he Riverfront Area:		
4136 a. total square feet	4136 b. square feet within 100 ft.	0 c. square feet between 100 ft. and 200 ft.	

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WPA Form 3 - Notice of Intent Massachusetts Wetlands Protection Act M.G.L. c. 131 840

Project Involves Streams Crossings

Provided by MassDEP: MassDEP File #: eDEP Transaction #:1280913 City/Town:SUDBURY

•	ysis been done and is it attached ctivity is proposed created prior		✓ Yes □ No
3.Coastal Resource Areas: (S	ee 310 CMR 10.25 - 10.35)		
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 Beaches	Indicate size under Coastal I	Beaches and/or Coatstal Dunes, be	elow
d. Coastal Beaches	1. square feet	2. cubic yards beach n	ourishment
e. ☐ Coastal Dunes	1. square feet	2. cubic yards dune no	purishment
f. □ Coastal Banks	1. linear feet		
g. □ Rocky Intertidal Shores	1. square feet		
h. ☐ Salt Marshes	1. square feet	2. sq ft restoration, rel	hab, crea.
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 E Under Waterbodies and Wat	Banks, Inland Bank, Land Under thereways, above	he Ocean, and/or inland Land
	cubic yards dredged		
l. ☐ Land Subject to Coastal Storm Flowage	1. square feet		
4.Restoration/Enhancement			
☐ Restoration/Replacement			
	e of restoring or enhancing a wo 3.h above, please entered the ac	etland resource area in addition to dditional amount here.	the square footage that has been
a. square feet of BVW	b.	square feet of Salt Marsh	
5.Projects Involves Stream Cro	ossings		

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 #: eDEP Transaction #:1280913 City/Town:SUDBURY

If the project involves Stream Crossings, please enter the number of new stream crossings/number of replacement stream crossings.

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

C. Other Applicable Standards and Requirements

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 of Endangered Species program (NHESP)?
 - 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

b. Date of map:11/3/2020

If yes, the project is also subject to Massachusetts Endangered Species Act (MESA) review (321 CMR 10.18)....

- c. Submit Supplemental Information for Endangered Species Review * (Check boxes as they apply)
 - 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
- 3. Project plans for entire project site, including wetland resource areas and areas outside of wetland 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
- c. MESA filing fee (fee information available at: http://www.mass.gov/eea/agencies/dfg/dfw/natural-heritage/regulatory-review/mass-endangered-species-act-mesa/mesa-fee-schedule.html)

Make check payable to "Natural Heritage & Endangered Species Fund" 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
- d. OR Check One of the following
 - 1. □ Project is exempt from MESA review. Attach applicant letter indicating which MESA exemption applies. (See 321 CMR 10.14, http://www.mass.gov/eea/agencies/dfg/dfw/laws-regulations/cmr/321-cmr-1000-massachusetts-endangered-species-act.html#10.14; 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 Number
 - b. Date submitted to NHESP

Bureau of Resource Protection - Wetlands

WPA Form 3 - Notice of Intent

2.

3.

4.

5.

6.

Provided by MassDEP: MassDEP File #: eDEP Transaction #:1280913 City/Town:SUDBURY

3. ☐ Separate MESA review completed. Include copy of NHESP "no Take" determination or valid Conserv	ation & Management Permit with approved plan.
* Some projects not in Estimated Habitat may be located in Priority	Habitat, and require NHESP review
For coastal projects only, is any portion of the proposed project locate a. ✓ Not applicable - project is in inland resource area only b. ☐ Yes ☐ No	ed below the mean high waterline or in a fish run?
If yes, include proof of mailing or hand delivery of NOI to either:	
South Shore - Cohasset to Rhode Island, and the Cape & Islands:	North Shore - Hull to New Hampshire:
Division of Marine Fisheries -	Division of Marine Fisheries -
Southeast Marine Fisheries Station	North Shore Office
Attn: Environmental Reviewer	Attn: Environmental Reviewer
836 S. Rodney French Blvd	30 Emerson Avenue
New Bedford, MA 02744	Gloucester, MA 01930
If yes, it may require a Chapter 91 license. For coastal towns in the N For coastal towns in the Southeast Region, please contact MassDEP's	· · ·
Is any portion of the proposed project within an Area of Critical Environment	
□Yes ▼ No	If yes, provide name of ACEC (see instructions to WPA Form 3 or DEP Website for ACEC locations). Note: electronic filers click on Website.
b. ACEC Name	
Is any portion of the proposed project within an area designated as an Massachusetts Surface Water Quality Standards, 314 CMR 4.00? a. □ Yes ▼ No	Outstanding Resource Water (ORW) as designated in the
Is any portion of the site subject to a Wetlands Restriction Order under 40A) or the Coastal Wetlands Restriction Act (M.G.L.c. 130, § 105) a. ☐ Yes ☑ No	
Is this project subject to provisions of the MassDEP Stormwater Mar	nagement Standards?
a. ☐ Yes, Attach a copy of the Stormwater Report as required by th 10.05(6)(k)-(q) and check if:	-
 Applying for Low Impact Development (LID) site design cre Vol.2, Chapter 3) 	dits (as described in Stormwater Management Handbook
2. A portion of the site constitutes redevelopment	
3. Proprietary BMPs are included in the Stormwater Manageme	nt System
b. ▼ No, Explain why the project is exempt:	

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 #: eDEP Transaction #:1280913 City/Town:SUDBURY

2	
۷.	Emergency Road Repair
	Efficigency 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

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 by regular mail delivery.

- 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
- F [BVW] replication area or other mitigating measure) relative to the boundaries of each affected resource area.
- 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.

a. Plan Title:

ENGINEER'S
TECHNICAL
MEMORANDUM & CURRAN
PLANS
ECOTEC WETLAND
EVALUATION
REPORT WITH DATA
FORMS

b. Plan Prepared By:
c. Plan Signed/Stamped By:
c. Plan Signed/Stamped By:
c. Revised Final Date:
e. Scale:

May, 2021

February 3, 2021

- 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.

Page 6 of 7 * ELECTRONIC COPY

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 #: eDEP Transaction #:1280913 City/Town:SUDBURY

E. Fees	
tribe housing authority, municipal housing authority, or	• •
Applicants must submit the following information (in addition	on 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. Payer name on check: First Name	7. Payer name on check: Last Name
	egulations, 310 CMR 10.05(5)(a). notified of this application, pursuant to the requirements of M.G.L. c. 131, § 40. nd delivery or certified mail (return receipt requested) to all abutters within 100 feet 2. Date
3. Signature of Property Owner(if different)	4. Date
Arthur Allen	5/21/2021
5. Signature of Representative (if any)	6. Date
For Conservation Commission:	
Two copies of the completed Notice of Intent (Form 3), including Form, and the city/town fee payment, to the Conservation Commi	g supporting plans and documents, two copies of the NOI Wetland Fee Transmittal ission by certified mail or hand delivery.
For MassDEP:	

Other:

If the applicant has checked the "yes" box in Section C, Items 1-3, above, refer to that section and the Instructions for additional submittal

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.

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.

Bureau of Resource Protection - Wetlands

WPA Form 3 - Notice of Wetland FeeTransmittal Form

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

Provided by MassDEP: MassDEP File #: eDEP Transaction #:1280913 City/Town:SUDBURY

A. Applicant Information

1. Applicant:							
a. First Name	DANIEL		b.Last Name	NASON			
c. Organization	TOWN OF SUI	TOWN OF SUDBURY DEPT. OF PUBLIC WORKS					
d. Mailing Address	275 OLD LANG	CASTER F	ROAD				
e. City/Town	SUDBURY	f. State	MA	g. Zip Code	01776		
h. Phone Number	9784432209	i. Fax		j. Email	nasond@	sudbury.ma.us	
2.Property Owner:(if differer	nt)						
a. First Name	DANIEL		b. Last Name	NASON			
c. Organization	TOWN OF SUI	DBURY D	EPT. OF PUBLIC	WORKS			
d. Mailing Address	275 OLD LANG	CASTER F	ROAD				
e. City/Town	SUDBURY	f.State	MA	g. Zip Code	01776		
h. Phone Number	9784432209	i. Fax		j.Email	nasond@	sudbury.ma.us	
3. Project Location:							
a. Street Address	WASHIN	GTON DR	IVE	b. City/7	Γown	SUDBURY	

Are you exempted from Fee? \square (YOU HAVE SELECTED 'YES')

Note: Fee will be exempted if you are one of the following:

- City/Town/County/District
- Municipal Housing Authority
- Indian Tribe Housing Authority
- MBTA

State agencies are only exempt if the fee is less than \$100

B. Fees

Activity Type	Activity Number	Activity Fee	RF Multiplier	Sub Total
	City/Town s	share of filling fee	State share of filing fee \$0.00	Total Project Fee \$0.00

Abutters	abutters_owner1	abutters_owner2	abutters_address	abutters_a	abutters_town	abutters_state	abutters_zip	abutters_bookpage	abutters_location
K05-0416	MACKEEN J MICHAEL & JANE E		47 WASHINGTON DR		SUDBURY	MA	01776	40757-432	47 WASHINGTON DR
K05-0417	MYERS CHRISTIAN BOYD & LINDY		39 WASHINGTON DR		SUDBURY	MA	01776	75881-519	39 WASHINGTON DR
K05-0418	HUME SCOTT D &	HUME YILVA DALING	31 WASHINGTON DR		SUDBURY	MA	01776	64984-55	31 WASHINGTON DR
K05-0433	PARKS ROBERT F & EMILY C		34 WASHINGTON DR		SUDBURY	MA	01776	51283-110	34 WASHINGTON DR
K05-0434	NEGRELI WENES		46 WASHINGTON DR		SUDBURY	MA	01776	75733-512	46 WASHINGTON DR

TECHNICAL MEMORANDUM

TO: Arthur Allen, EcoTec, Inc.

PREPARED BY: Dan Pasquale & Kevin Trainor, Woodard & Curran

REVIEWED BY: Scott Salvucci, Woodard & Curran

DATE: May 24, 2021

RE: Washington Drive Culvert Replacement (#65) – Hydraulic Analysis

1. INTRODUCTION

The purpose of this memorandum is to summarize Woodard & Curran's hydraulic evaluation of an existing culvert carrying a tributary to Dudley Brook (the Brook), a mapped perennial stream, beneath Washington Drive in Sudbury, MA. This memorandum is intended to support development of a Notice of Intent to file an application with the Conservation Commission for authorization to replace the existing culvert. The existing cast-in-place concrete outlet control structure (which sends flow from the pond south of Washington Drive to the culvert) and the corrugated metal pipe forming the culvert are deteriorating. Woodard & Curran recommends replacing the existing outlet control structure with a new precast concrete structure and replacing the existing culvert pipe with new High Density Polyethylene (HDPE) pipe. Please refer to Figures 1 and 2 for Site Location Map and Project Area.

2. EXISTING CONDITIONS EVALUATION

2.1 Survey

An existing conditions survey of the site was performed by Chappell Engineering Associates in November 2020. The existing culvert conveys flow from south to north beneath Washington Drive. Flow enters the culvert from a pond south of Washington Drive through an outlet control structure at the upstream end of the crossing. The outlet control structure consists of a rectangular cast-in-place concrete compound weir. Three vertical sides of the structure are concrete, and the fourth side has removable wooden boards which control the pond's water surface elevation. The present height of the removable boards is set below the three concrete sides of the structure, and the top of the uppermost board functions as a low-flow weir into the structure. Under high-flow conditions, water exceeds the height of the vertical grooves holding the boards and flows through a grate in the top of the structure. The existing culvert consists of corrugated metal and reinforced concrete pipes of diameters varying from 12" to 36". A manhole located south of Washington Drive adjacent to a private driveway provides maintenance access to the culvert. The upstream and downstream headwalls are within drainage easements on private residential properties adjacent to the Washington Drive Right-of-Way (ROW). Survey is included as Attachment A.

2.2 Wetland Resource Evaluation

A wetland resource evaluation was performed by EcoTec, Inc. on November 4, 2020 to evaluate the presence of resource areas within the project area. Wetland flags were delineated for the boundary of bordering vegetated wetlands (BVW) associated with the downstream wetland complex, labeled A1–A7. The bank of the pond upstream of the crossing was delineated with boundary flags labeled B1-B8. Stream bank flags were delineated for the boundary of the Mean Annual High-water Line (MAHWL) along the eastern and western banks of the Brook downstream of the Washington Drive crossing, labeled RA1-RA5. The Wetland Resource Evaluation is included as Attachment B.

1

2.3 Dudley Brook Pond/Channel Conditions



The Brook collects in a pond on the south (upstream) side of the Washington Drive crossing, and the Washington Drive right-of-way forms an embankment that impounds the pond. Single-family residential properties border the east and west sides of the pond, and light commercial properties are located south of the pond. Downstream of the Washington Drive crossing, the channel flows as a perennial stream through conservation marshland and forested areas and converges with the main channel of Dudley Brook before reaching the next downstream crossing at Bent Road. The channel slope downstream of the culvert within the surveyed area is approximately 0.16%.

There appears to be a small scour hole approximately 7 feet downstream of the culvert outlet where pooling occurs during higher flows. The channel width measured using bank flags ranges from 12 feet to 17 feet at the widest point of the scour hole area. The overall slope of the existing pipe culvert is set at approximately 2.0%. No provisions for wildlife passage are present.

2.4 FEMA FIRM Review

Review of the FEMA flood maps indicates that the pond upstream of the crossing and Dudley Brook downstream of the crossing are within a Zone AE as mapped on FEMA FIRM Panel 25017C0502F. The Brook is shown on flood elevation profile 191P (labeled as "Tributary A to Dudley Brook") from FEMA Flood Insurance Study (FIS) number 25017CV004C, dated 7/6/2016. Based on the profile, the 1% annual chance flood elevation is approximately 159.80 at the crossing. The FIRMette showing the project area is included as Attachment C.

2.5 USGS Hydrology Review

The Washington Drive culvert conveys a tributary of Dudley Brook which begins south of Boston Post Road (US Route 20). The contributing area is primarily forested with limited development, except for the residences and businesses immediately surrounding the pond upstream of the culvert crossing. Tributary A to Dudley Brook is defined by StreamStats, and USGS regression equations were used to obtain flows that informed Woodard & Curran's hydrologic and hydraulic analysis. The StreamStats report for this location is included as Attachment D.

2.6 Hydrologic & Hydraulic Analysis

Woodard & Curran performed a hydraulic analysis of the Washington Drive crossing using hydrology data obtained from the FEMA FIS covering the Dudley Brook area. 10% annual-chance, 2% annual-chance, and 1% annual-chance peak flow events were simulated for the existing system and a replacement scenario. Peak flow values from the FIS were compared to the flows obtained from StreamStats, and Woodard & Curran determined that the FIS flows were most appropriate for use in the analysis. The peak flow values from the FIS were located at US Route 20—just upstream of the pond. Additionally, the FIS contained tailwater elevations for the downstream end of the model domain associated with each peak flow event, allowing for model calibration that considered downstream effects. The two existing catch basins near the crossing collect flow from an approximately 4-acre catchment area, and runoff entering the catch basins was accounted for in the model. The culvert was simulated using the Environmental Protection Agency (EPA) Storm Water Management Model, version 5.1.015 (SWMM5) on the PCSWMM v7.3.3095 platform based on field survey data. The boundary conditions simulated are summarized in Table 2-1 below.

Table 2-1: Washington Drive Culvert Boundary Conditions (Note: flow and tailwater elevation values from FEMA FIS 25017CV001C and 25017CV004C, dated 7/6/2016)



Peak Flow Event	Flow (cfs)	Downstream Tailwater Elevation (NAVD 88)
10% Annual-Chance	30	153.00
2% Annual-Chance	50	154.30
1% Annual-Chance	60	154.60

3. DESIGN CONSIDERATIONS

The purpose of this project is to improve the structural integrity of the culvert, pond outlet structure, and roadway, while maintaining or improving the hydraulic capacity of the pond outlet structure and culvert where possible. Based on conversations with the Town, the existing adjustable height boards that set the pond elevation upstream of Washington Drive have not been previously adjusted, and the Town prefers to keep the current top-of-board elevation as the pond elevation.

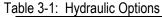
Next to the existing culvert, two catch basins are situated on the north and south edges of the Washington Drive roadway at the roadway sag near the culvert crossing. The catch basins are connected to each other by a 12-inch pipe crossing the roadway. The survey indicated that flow between the catch basins is from south to north and that the catch basin discharge pipe ties into the Brook at the culvert headwall, however, the catch basin discharge pipe was not found in the field during the site survey.

The design considerations of the culvert replacement concentrated on maintaining or improving on existing flood conditions for the 10-year, 50-year, and 100-year storm events. Hydraulic performance, potential for downstream flooding; effect on upstream, downstream, and riparian habitat; potential for erosion and overall effect on stream stability were taken into consideration. The following replacement scenario was evaluated:

- Replacement of existing adjustable height weir/grate outlet structure with a new fixed height precast
 concrete outlet control structure. The proposed structure would have a 3.5-foot long low-flow weir
 below a 3-foot by 2.8-foot rectangular grate opening at the top of the structure. The elevation of the
 proposed weir crest would match the current elevation of the wooden boards in place on the existing
 pond outlet structure. The top of the proposed grate would be set 4-inches above the weir crest, similar
 to the elevation of the existing grate.
- Replacement of the existing culvert manhole with a new drain manhole (DMH) located north of the roadway within the Washington Drive ROW.
- Replacement of the existing catch basins next to the culvert with new precast concrete deep sump
 catch basins. The new catch basins would connect to the existing RCP pipe that connects the existing
 catch basins, and the northern catch basin would connect to the new DMH with HDPE pipe.
- Replacement of existing culvert pipe of variable diameter and material with a new pipe culvert
 consisting of a 24-inch HDPE pipe from the pond outlet structure to the new DMH and 30-inch HDPE
 pipe from the new DMH to the Brook outlet, matching existing culvert inlet/outlet invert elevations and
 overall pipe slope.

Design considerations also included utility and roadway elevation constraints. Existing invert elevations were assumed to remain unchanged where possible to avoid conflicts with other existing underground utilities.

3.1 Hydraulic Analysis Results





Scenario	Description	10% Approximate Max Upstream Water Level (feet NAVD88)	2% Approximate Max Upstream Water Level (feet NAVD88)	1% Approximate Max Upstream Water Level (feet NAVD88)
1: Existing Conditions	Compound weir outlet structure, 12-inch/36-inch CMP/RCP culvert	159.16	159.43	159.55
2: Proposed Conditions	Fixed height compound weir outlet structure, 24-inch/30-inch HDPE pipe culvert	157.78	159.12	159.27

3.2 Results Discussion

The existing culvert uses four different sizes of pipe as it crosses under Washington Drive. The proposed condition eliminates this complexity, reducing the amount of hydraulic energy loss experienced as water flows through the culvert. As a result, water surface elevations upstream of the crossing during the 10%, 2%, and 1% annual-chance peak flow events would be reduced during proposed conditions. Roadway overtopping is expected for the 2% and 1% annual-chance peak flow events, but overtopping is not anticipated during the 10% event under proposed conditions. The low-flow weir allows discharges from the pond during smaller rain events to closely match existing low-flow discharges, reducing the potential for erosion and maintaining the stability of riverine ecosystems downstream of the crossing.

The two existing catch basins will be replaced with precast concrete deep-sump cast basins meeting the Massachusetts Stormwater Handbook recommended sump depth of 4-feet. Since the existing catch basins each have sumps of approximately 20-inches, the new catch basins would provide improved water quality treatment for local area runoff.

3.3 Anticipated Impacts to Adjacent Upland Resource Areas (AURAs)

The Town of Sudbury Wetlands Administration Bylaw (Article XXII) and its associated Sudbury Wetlands Administration Bylaw Regulations (revised September 25, 2017) establishes jurisdictional Adjacent Upland Resource Areas (AURAs). The Bylaw defines AURAs as land within 100-feet of wetland resource areas, within 200-feet of top of bank, and with varying extent when adjacent to vernal pools, ponds <10,000 square feet in area, or isolated land subject to flooding. The proposed culvert replacement will take place within 100-feet of Bordering Vegetated Wetlands, considered to be an AURA under the Bylaw.

The project was designed to minimize the amount of disruption and alteration to the AURAs within the project limits of work. The roadway above the rebuilt crossing will be replaced in the same footprint as the existing roadway. Hydraulic analysis predicted that the new pipe culvert will preserve or improve flood conditions at the crossing. The proposed deep-sump catch basins will be installed in the same location as the existing catch

basins. Except for incidental earthwork needed to facilitate installation of the culvert outlet flared end section, existing grading and drainage patterns will be preserved. Temporary land disturbances will be stabilized and restored to existing conditions. A native New England Conservation/Wildlife seed mix will be applied to temporarily disturbed areas within the AURAs. The blend of species will provide a permanent cover of grasses, forbs, wildflowers, and legumes to control soil erosion and enhance wildlife habitat.



A slight net increase in impervious area (approximately 6 square feet) associated with the upstream headwall is proposed. The new headwall will reduce the potential for erosion of the embankment at the inlet end of the culvert. The Washington Drive culvert has been prioritized by the Town for replacement, and there is no reasonable alternative that would reduce or eliminate the temporary and permanent impacts associated with the project. Anticipated resource area impacts are presented in Figure 4.

4. CONCEPTUAL SEQUENCE OF CONSTRUCTION

Plans depicting erosion control measures, proposed grading, and other features for the project are currently under development. It is expected that the culvert replacement will occur in two phases to allow one-way traffic in alternating directions during construction. The anticipated sequence of construction is as follows:

- 1. Install temporary erosion/sedimentation and flow control measures, including cofferdam, flow diffuser, and/or flow diversion;
- 2. Protection of existing utilities, including water, natural gas, and electricity/telecommunications;
- 3. Remove and dispose of the existing culvert and headwall on the northerly half of Washington Drive to approximately the roadway centerline, maintaining alternating one-way traffic with flaggers;
- 4. Install new culvert, headwall, drain manhole, and northern catch basin;
- 5. Reconstruct road to approximate centerline;
- 6. Remove and dispose of the existing culvert and pond outlet structure on the southerly half of Washington Drive to approximately the roadway centerline, maintaining alternating one-way traffic with flaggers;
- 7. Install new culvert, pond outlet structure, and southern catch basin;
- 8. Stabilize side slopes:
- 9. Install erosion control matting, loam, and seed on all disturbed areas; and
- 10. Remove temporary erosion and sedimentation control measures and flow control measures.

5. ATTACHMENTS

Figures



Figure 2 – Project Area & Conceptual Hydraulic Model

Figure 3 – Replacement Culvert Concept

Figure 4 – Resource Area Impact Figure

Attachments

Attachment A – Existing Conditions Survey

Attachment B – Wetland Resource Evaluation

Attachment C – FEMA FIRMETTE

Attachment D - StreamStats Report

Attachment E – Culvert Analysis Report

Attachment F – Seed Mix Specifications

6. REFERENCES

Environmental Protection Agency Storm Water Management Model User's Manual, Version 5.1. Revised September 2015.

Extreme Precipitation in New York & New England, Northeast Regional Climate Center, Intensity Frequency Duration Tables obtained March 2021.

Concord River HUC 8 LiDAR FY 2010, Middlesex County, Massachusetts CID 25017C, Worcester County, Massachusetts CID 25027C. Federal Emergency Management Agency. DEM generated from LiDAR by MassGIS. Accessed electronically December 2020.

USGS StreamStats Peak-Flow Statistics. Accessed electronically November 2020.

FEMA FIRM Panel 25017C0502F, Effective July 7, 2014.

FEMA Flood Insurance Study 25017CV001C and 25017CV004C Middlesex County, Massachusetts, Revised July 6, 2016.



Figure 1: Site Location Map

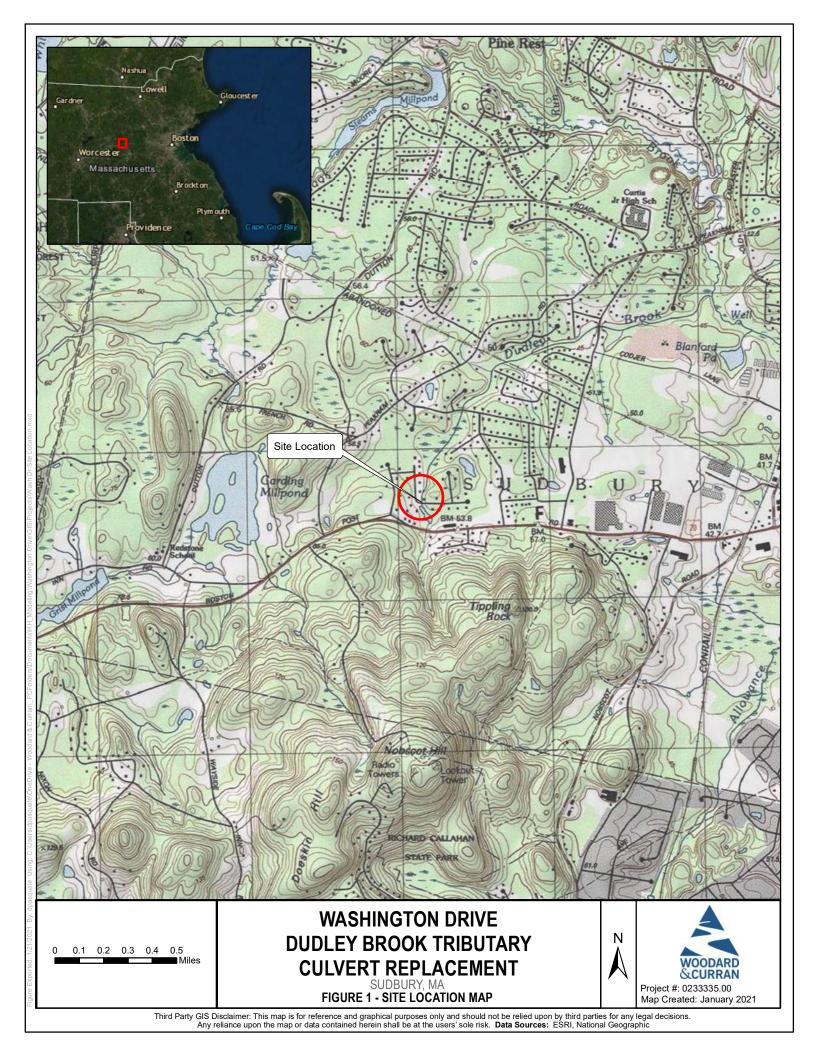




Figure 2: Project Area & Conceptual Hydraulic Model

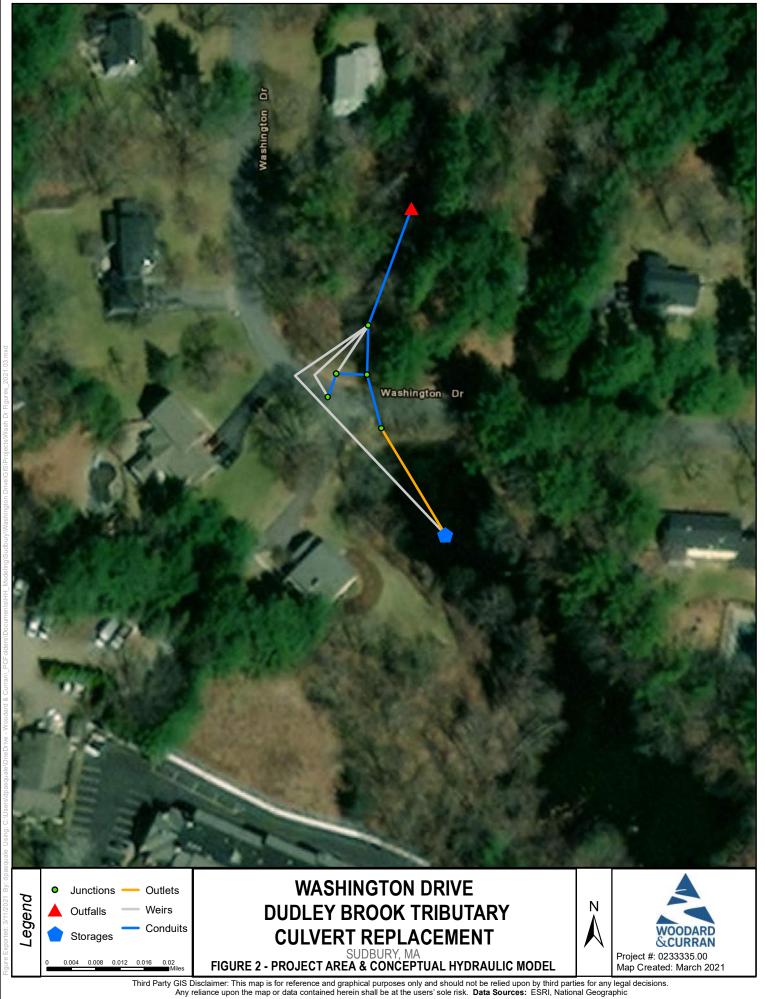
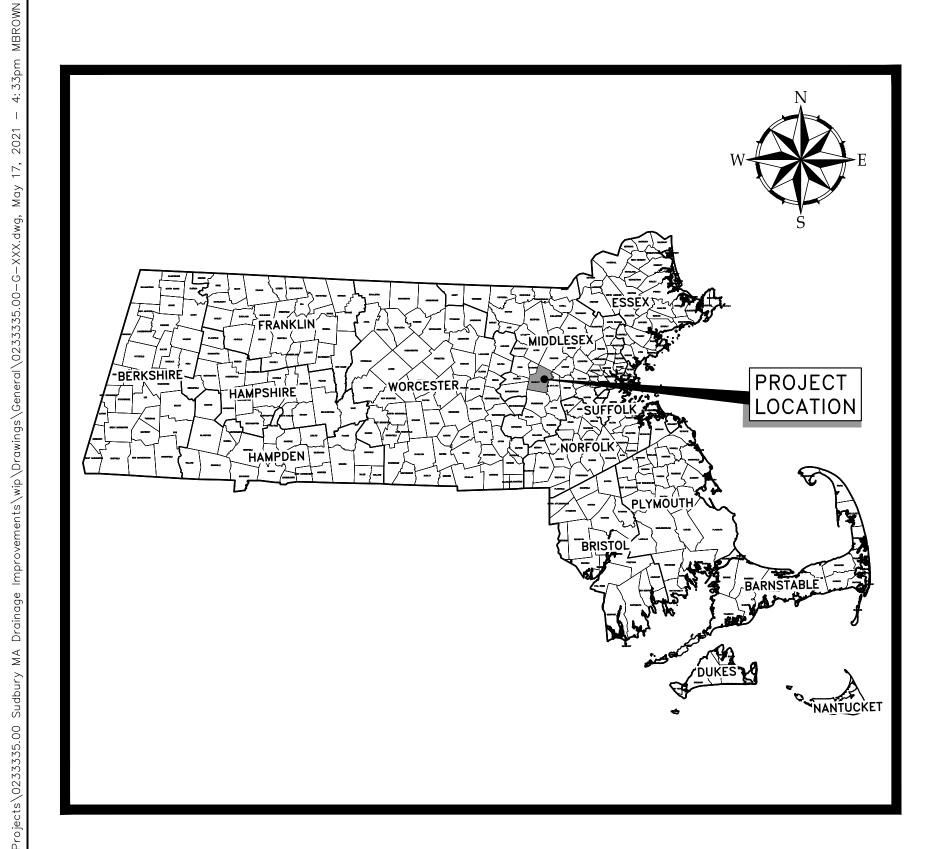




Figure 3: Replacement Culvert Concept

TOWN OF SUDBURY, MA PUBLIC WORKS DEPARTMENT

WASHINGTON DRIVE CULVERT REPLACEMENT



PROJECT LOCATION MAP

PROJECT NO. 0233335.00 MAY 2021

NOTICE OF INTENT
NOT FOR CONSTRUCTION







GENERAL NOTES:

- 1. EXISTING CONDITIONS ARE BASED ON A SURVEY PERFORMED BY CHAPPELL ENGINEERING ASSOCIATES.
- 2. CHAPPELL ENGINEERING ASSOCIATES IS LOCATED AT THE FOLLOWING ADDRESS: 201 BOSTON POST ROAD WEST, SUITE 101
- MARLBOROUGH, MA 01752 (508) 481-7400 EXT. 18
- 3. THE HORIZONTAL DATUM DEPICTED ON THE MAPS HEREON IS BASED ON THE MASSACHUSETTS STATE PLANE COORDINATE SYSTEM, MAINLAND ZONE, REFERENCED TO THE NORTH AMERICAN DATUM OF 1983. THE VERTICAL DATUM IS BASED ON THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88).
- 4. ANY PROPERTY AND RIGHT OF WAY LOCATIONS THAT MAY BE SHOWN HEREON ARE APPROXIMATE AND DO NOT REPRESENT A PROPERTY BOUNDARY SURVEY.
- 5. WOODARD & CURRAN ASSUMES NO RESPONSIBILITY FOR DAMAGES INCURRED AS A RESULT OF UTILITIES OMITTED OR INACCURATELY SHOWN.
- 6. COORDINATE CONSTRUCTION ACTIVITY WITH UTILITY COMPANIES. EMERGENCY SERVICES AND TOWN. CONTRACTOR SHALL NOTIFY ALL UTILITIES PRIOR TO COMMENCING WORK, ALLOWING SUFFICIENT TIME TO LOCATE AND MARK THE LOCATION OF BURIED UTILITIES. CONTRACTOR SHALL CONTACT "DIG SAFE", TELEPHONE 811, PRIOR TO EXCAVATION.
- 7. RESTORE ALL AREAS DISTURBED BY CONTRACTOR'S OPERATIONS TO ORIGINAL FINISH (GRAVEL, PAVEMENT, GRASS, ETC.) UNLESS NOTED OTHERWISE ON THE PLANS. RESTORATION OF PAVED SURFACES, GRAVEL SURFACES, DRIVEWAYS, AND LAWNS DAMAGED BY CONSTRUCTION ACTIVITIES SHALL BE PERFORMED AT NO ADDITIONAL COST TO OWNER. ANY CURB DAMAGED BY CONSTRUCTION ACTIVITIES SHALL BE REPLACED IN KIND AND SHALL CONFORM TO TOWN OF SUDBURY AND MASSACHUSETTS DOT SPECIFICATIONS AT NO ADDITIONAL COST TO OWNER.
- 8. PROPERLY PROTECT AND DO NOT DISTURB PROPERTY IRONS AND MONUMENTS. IF DISTURBED, THE PROPERTY MONUMENT SHALL BE RESET AT THE CONTRACTOR'S EXPENSE BY A LICENSED LAND SURVEYOR ACCEPTABLE TO THE TOWN.
- 9. EXISTING FACILITIES (I.E. TREES, POLES, LIGHT POSTS, CATCH BASINS, STONE FROM CULVERT, ETC.) SHALL BE REMOVED AND PROTECTED DURING CONSTRUCTION. THE TOWN RETAINS RIGHT TO KEEP ANY AND ALL REMOVED FACILITIES. CONTRACTOR SHALL DISPOSE OF ANY REMOVED FACILITY AT THE REQUEST OF THE TOWN AT NO ADDITIONAL COST TO OWNER.
- 10. ALL TREES NOT NOTED TO BE REMOVED OR RELOCATED SHALL BE PROTECTED BY CONTRACTOR DURING CONSTRUCTION.
- 11. DO NOT PARK, IMPEDE ACCESS TO, OR STORE EQUIPMENT BEYOND LIMIT OF WORK, UNLESS PERMISSION HAS BEEN GRANTED IN WRITING BY TOWN AND/OR LAND OWNER.
- 12. RESTRICT ACCESS TO SITE THROUGH THE USE OF APPROPRIATE SIGNAGE, BARRIERS, FENCES, ETC. SITE SHALL BE LEFT WITH APPROPRIATE SAFETY MEASURES IN PLACE DURING NON-WORKING HOURS. SITE SAFETY IS THE RESPONSIBILITY OF CONTRACTOR, DURING BOTH WORKING AND NON-WORKING
- 13. CONTRACTOR IS RESPONSIBLE FOR OBTAINING ALL NECESSARY CONSTRUCTION PERMITS INCLUDING "PERMIT TO CONSTRUCT WITHIN A PUBLIC WAY" FROM THE TOWN. PERMIT APPLICATIONS SHALL BE SUBMITTED WITH ADEQUATE TIME SO AS NOT TO DELAY CONSTRUCTION.
- 14. ALL WORK ASSOCIATED WITH THE PROJECT SHALL BE COMPLETED IN ACCORDANCE WITH THE TOWN OF SUDBURY BYLAW AND LOCAL REGULATIONS AND MASSACHUSETTS DOT STANDARD SPECIFICATIONS.
- 15. UPON COMPLETION OF CONSTRUCTION, A COMPLETE SET OF "RECORD" DRAWINGS SHALL BE SUBMITTED TO THE TOWN ENGINEER. THESE DRAWINGS SHALL BE SUBMITTED IN BOTH DIGITAL AND HARD COPY
- FORMAT AS DEFINED IN THE SPECIFICATIONS PRIOR TO PAYMENT OF FINAL RETAINAGE. 16. PROTECTION OF EXISTING UTILITIES DURING CONSTRUCTION SHALL BE PROVIDED AT NO ADDITIONAL
- 17. CONTRACTOR SHALL BE RESPONSIBLE FOR SWEEPING WASHINGTON DRIVE EVERY FRIDAY AND AS NECESSARY DURING THE DURATION OF THE WORK.
- 18. PRIOR TO CONSTRUCTION, CONTRACTOR SHALL ATTEND A PRE-CONSTRUCTION MEETING HELD AT THE PROJECT SITE WITH THE CONTRACTOR, ENGINEER, OWNER, AND CONSERVATION OFFICE TO REVIEW THE CONSTRUCTION SCHEDULE AND SEQUENCING, ORDER OF CONDITIONS, STOCKPILE LOCATIONS AND CRITICAL ASPECTS OF THE PROJECT.
- 19. PRIOR TO THE START OF WORK, CONTRACTOR SHALL CONFIRM EXISTING WETLAND FLAGS ARE IN PLACE AND SHALL BE MAINTAINED DURING CONSTRUCTION. MISSING FLAGS SHALL BE RESET PRIOR TO CONSTRUCTION. AN AUTOCAD FILE OF THE WETLAND FLAG LOCATIONS SHALL BE PROVIDED FOR CONTRACTOR'S USE IN RESETTING WETLAND FLAGS.
- 20. NO EQUIPMENT IS TO CROSS OR ENTER WETLAND RESOURCE AREAS AT ANY TIME UNLESS THE LOCATION OF DISTURBANCE IS MARKED ON THE PLANS REFERENCED IN THE ORDER OF CONDITIONS AND FLAGGED IN THE FIELD (DEP FILE #XXX-XXXX).
- 21. ALL DISTURBED UPLAND AREAS SHALL BE BROUGHT TO FINAL GRADE AND SHALL BE PERMANENTLY STABILIZED WITHIN 30 DAYS AFTER DISTURBANCE. BARE GROUND AND DISTURBED AREAS THAT CANNOT BE PERMANENTLY VEGETATED WITHIN 30 DAYS SHALL BE TEMPORARY STABILIZED BY AN APPROVED METHOD.
- 22. CONTRACTOR SHALL DEMARCATE CONSTRUCTION EQUIPMENT AND MATERIAL STORAGE AREAS PRIOR TO
- 23. THE CONSTRUCTION SITE SHALL BE MAINTAINED IN CLEAN CONDITIONS AT ALL TIMES AND CONSTRUCTION REFUSE AND DEBRIS SHALL BE DISPOSED OF PROMPTLY AND IN A LEGAL MANNER.
- 24. STORING, SERVICING, OR CLEANING OF TRUCKS OR EQUIPMENT SHALL BE PERFORMED IN AN UPLAND AREA AT A HORIZONTAL DISTANCE GREATER THAN 100 FEET FROM THE WETLAND RESOURCE AREAS.
- 25. THE CONTRACTOR, SITE ENGINEER, OR OTHER INDIVIDUAL IN CHARGE OF WORK ON THE SITE SHALL HAVE A COPY OF THE ORDER OF CONDITIONS AT ALL TIMES (DEP FILE #XXX-XXXX).
- 26. CONTRACTOR SHALL REFER TO SPECIFICATION XXX MASSACHUSETTS COVID ORDER AND CONSTRUCTION GUIDELINES AND EXECUTE CONSTRUCTION IN COMPLIANCE WITH APPLICABLE SOCIAL DISTANCING
- 27. WETLAND DELINEATION WAS PREPARED BY ECOTEC, INC. 102 GROVE STREET, WORCESTER, MA 01605. THE WETLAND RESOURCE EVALUATION REPORT IS DATED XX XX, 2021 AND WETLAND FIELD INSPECTION WAS CONDUCTED ON NOVEMBER 4, 2020.

EROSION CONTROL NOTES:

- EROSION CONTROL DEVICES SHALL REMAIN IN PLACE. UNTIL ALL DISTURBED SURFACES HAVE BEEN STABILIZED WITH FINAL VEGETATION COVER OR THE COMMISSION HAS AUTHORIZED THEIR REMOVAL.
- 2. EROSION CONTROL MEASURES AND BARRIERS SHALL BE MONITORED DAILY AND MAINTAINED, OR REINFORCED AS NECESSARY TO ENSURE AND PREVENT EROSION AND SILTATION OF SOILS TO WETLAND RESOURCE AREAS. ADDITIONAL FILTER FABRIC AND STRAW WATTLES SHALL BE STORED ON SITE FOR
- 3. DURING ALL PHASES OF CONSTRUCTION, ALL DISTURBED OR EXPOSED AREAS OUTSIDE THE ROADWAY SHALL BE BROUGHT TO FINISHED GRADE AND EITHER A) LOAMED AND SEEDED FOR PERMANENT STABILIZATION, IN ACCORDANCE WITH U.S. SOIL CONSERVATION SERVICE PROCEDURES, OR B) STABILIZED IN ANOTHER WAY APPROVED BY THE COMMISSION. AREAS THAT CANNOT BE PERMANENTLY STABILIZED WITHIN 30 DAYS OF DISTURBANCE SHALL BE STABILIZED WITH HAY, STRAW, MULCH OR ANY OTHER PROTECTIVE COVERING AND/OR METHOD APPROVED BY THE U.S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE OR BY OTHER TEMPORARY MEASURES ACCEPTABLE TO THE COMMISSION.
- 4. PROJECT IS SUBJECT TO THE CONDITIONS SET FORTH IN PERMITS ISSUED BY THE US ARMY CORPS OF ENGINEERS, SUDBURY CONSERVATION COMMISSION, AND MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION, SPECIFICALLY RELATED TO LIMITS OF IMPACT, EROSION CONTROL MEASURES, RESTORATION ACTIVITIES, AND TIMEFRAME RESTRICTIONS. CONTRACTOR SHALL READ PERMIT DOCUMENTS FULLY AND CARRY OUT WORK IN ACCORDANCE WITH PERMIT DOCUMENTS. COPIES OF PERMIT DOCUMENTS ARE APPENDED TO THE PROJECT SPECIFICATIONS.
- 5. AN ADEQUATE STOCKPILE OF EROSION AND SEDIMENTATION CONTROL MATERIALS SHALL BE ON SITE AT ALL TIMES FOR EMERGENCY OR ROUTINE REPLACEMENT.
- 6. ANY DAMAGE CAUSED AS A DIRECT RESULT OF CONSTRUCTION TO THE WETLAND RESOURCE AREAS SHALL BE REPAIRED, RESTORED AND/OR REPLACED. SEDIMENTATION OR EROSION SHALL BE CONSIDERED DAMAGÉ TO THE WETLAND RESOURCE AREAS. IF SEDIMENTATION REACHES THESE AREAS. THE CONSERVATION COMMISSION SHALL BE CONTACTED AND A PLAN FOR THE PROPOSED RESTORATION SHALL BE SUBMITTED FOR APPROVAL.
- 7. THE SILT FENCE AND STRAW BALES MUST BE INSPECTED PRIOR TO THE START OF ANY WORK OR A \$100 PER DAY FINE WILL BE LEVIED ON THE CONTRACTOR.

DEWATERING NOTES

SCOURING OF SOIL.

- 1. LOCATE DISCHARGE SITE ON FLAT UPLAND AREAS AS FAR AWAY AS POSSIBLE FROM STREAMS, WETLANDS, OTHER RESOURCES AND POINTS OF CONCENTRATED FLOW.
- 2. NEVER DISCHARGE TO AREAS THAT ARE BARE OR NEWLY VEGETATED.
- 3. DIRT BAG MATERIAL BASED ON PARTICLE SIZE IN DIRTY WATER, I.E., FOR COARSE PARTICLES A WOVEN MATERIAL; FOR SILTS/CLAYS A NON-WOVEN MATERIAL.
- 4. DO NOT OVER PRESSURIZE DIRT BAG OR USE BEYOND CAPACITY.
- 5. CHANNELS DUG FOR DISCHARGING WATER FROM THE EXCAVATED AREA NEED TO BE STABLE. IF FLOW VELOCITIES CAUSE EROSION WITHIN THE CHANNEL THEN A DITCH LINING SHOULD BE USED.
- 6. BUCKETED WATER SHOULD BE DISCHARGED IN A STABLE MANNER TO THE SEDIMENT REMOVAL AREA. A SPLASH PAD OF RIPRAP UNDERLAIN WITH GEOTEXTILE MAY BE NECESSARY TO PREVENT
- 7. DEWATERING IN PERIODS OF INTENSE, HEAVY RAIN, WHEN THE INFILTRATIVE CAPACITY OF THE SOIL IS EXCEEDED, SHOULD BE AVOIDED.
- 8. INSTALL DIVERSION DITCHES OR BERMS TO MINIMIZE THE AMOUNT OF CLEAN STORMWATER RUNOFF ALLOWED INTO THE EXCAVATED AREA.
- 9. DURING THE ACTIVE DEWATERING PROCESS, INSPECTION OF THE DEWATERING FACILITY SHOULD BE REVIEWED FREQUENTLY. SPECIAL ATTENTION SHOULD BE PAID TO THE BUFFER AREA FOR ANY SIGN OF EROSION AND CONCENTRATION OF FLOW THAT MAY COMPROMISE THE BUFFER AREA. OBSERVE WHERE POSSIBLE THE VISUAL QUALITY OF THE EFFLUENT AND DETERMINE IF ADDITIONAL TREATMENT CAN BE PROVIDED.
- 10. EROSION CONTROL REQUIRED AROUND DEWATERING DISCHARGE SEDIMENT CONTROL DEVICE.

ABBREVIATIONS

DTL.

E.O.P.

EXIST.

N.T.S.

UNDERGROUND ELECTRICAL

FINISH FLOOR

NOT TO SCALE

PLUS OR MINUS

OVERHEAD

OVERHEAD ELECTRIC

A.G.	ABOVE GROUND			
BIT	BITUMINOUS			
B/W	BETWEEN			
BVW	BORDERING VEGETATED WETLAND			
СВ	CATCH BASIN			SHEET INDEX
CBDH	CONCRETE BOUND DRILL HOLE			
CI CMP	CAST IRON CORRUGATED METAL PIPE CONCRETE	G-00	00	COVER SHEET
CONC		G-00	01	GENERAL NOTES & LEGEND
		C-10	00	EXISTING CONDITIONS PLAN
D	STORM DRAIN	C-10)1	EROSION CONTROL & DEMOLITION PLAN
DI	DUCTILE IRON	C-10)2	SITE PLAN & PROFILE
DIA. DIP	DIAMETER DUCTILE IRON PIPE	C-20	00	CIVIL DETAILS 1
DMH	DRAIN MANHOLE	C-20	01	CIVIL DETAILS 2
DOT	DEPARTMENT OF TRANSPORTATION			<u> </u>

ELECTRIC HAND HOLE ELEVATION RESOURCE AREA LEGEND EDGE OF PAVEMENT EXISTING

FT	FOOT/FEET		
G GS	GAS MAIN GAS SERVICE	BORDERING VEGETATED WETLAND (BVW)	
GALV. GRAN.	GALVANIZED GRANITE	EDGE OF WATER (SURVEYED)	
HDPE HDPP HYD	HIGH DENSITY POLYETHYLENE HIGH DENSITY POLYPROPYLENE HYDRANT	FLAGGED MEAN ANNUAL HIGH-WATER LINE (MAHWL) OF DUDLEY BROOK (PERENNIAL STREAM)	
		FLAGGED BOUNDARY OF POND BANK	
INV.	INVERT		
LF	LINEAR FEET	COFFERDAM	CD
MASSDEP	MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION	LIMIT OF WORK	LW
MADOT	MASSACHUSETTS DEPARTMENT OF TRANSPORTATION		
MAX.	MAXIMUM	SEDIMENT BARRIER	—
MB MIN.	MAILBOX MINIMUM		
MON	MONUMENT	TURBIDITY CURTAIN	
N.I.C. NO.	NOT IN CONTRACT NUMBER	NOTE:	
NR	NO REFUSAL	PROPOSED CULVERT IS WITHIN THE 0-100' RIVERFRONT	Γ AREA (INNER RIPARIAN ZONE), 100'

TO FLOODING (BLSF).

FEMA FLOOD ZONE BOUNDARY

LINE TYPES & HATCHES

BVW BUFFER ZONE (ADJACENT UPLAND RESOURCE AREA), AND BORDERING LAND SUBJECT

LLS PROP. PT. PVC	LICENSED LAND SURVEYOR PROPOSED POINT POLYVINYL CHLORIDE	<u>DESCRIPTION</u>	EXISTING	<u>PROPOSED</u>
R.O.W. RCP REINF. REQ'D RPP	RIGHT-OF-WAY REINFORCED CONCRETE PIPE REINFORCED REQUIRED RIBBED PLASTIC PIPE	CONTOUR (2' INTERVAL)	LINE — — — — — — — — — — — — — — — — — — —	
S S SBDH SMH SCH STA.	SLOPE (FT./FT.) SEWER STONE BOUND DRILL HOLE SEWER MANHOLE SCHEDULE STATION	EDGE OF PAVEMENT STORM DRAIN LINE UNDERGROUND GAS WATER LINE	——————————————————————————————————————	
TOWN TYP.	TOWN OF SUDBURY TYPICAL	GUARDRAIL	TT	
UNO UP	UNLESS NOTED OTHERWISE UTILITY POLE	LIMIT OF WORK		LW
VC VIT.	VITRIFIED CLAY VITRIFIED CLAY	SEDIMENT BARRIER/COFFERI SEDIMENT BARRIER/SILTSOX		
W W	WEST WATER	SAWCUT	A) SILI I LINOL	
W/ W WS	WITH WATERMAIN WATER SERVICE	RETAINING WALL		
WV	WATER VALVE	STONE WALL	.000000000000000	

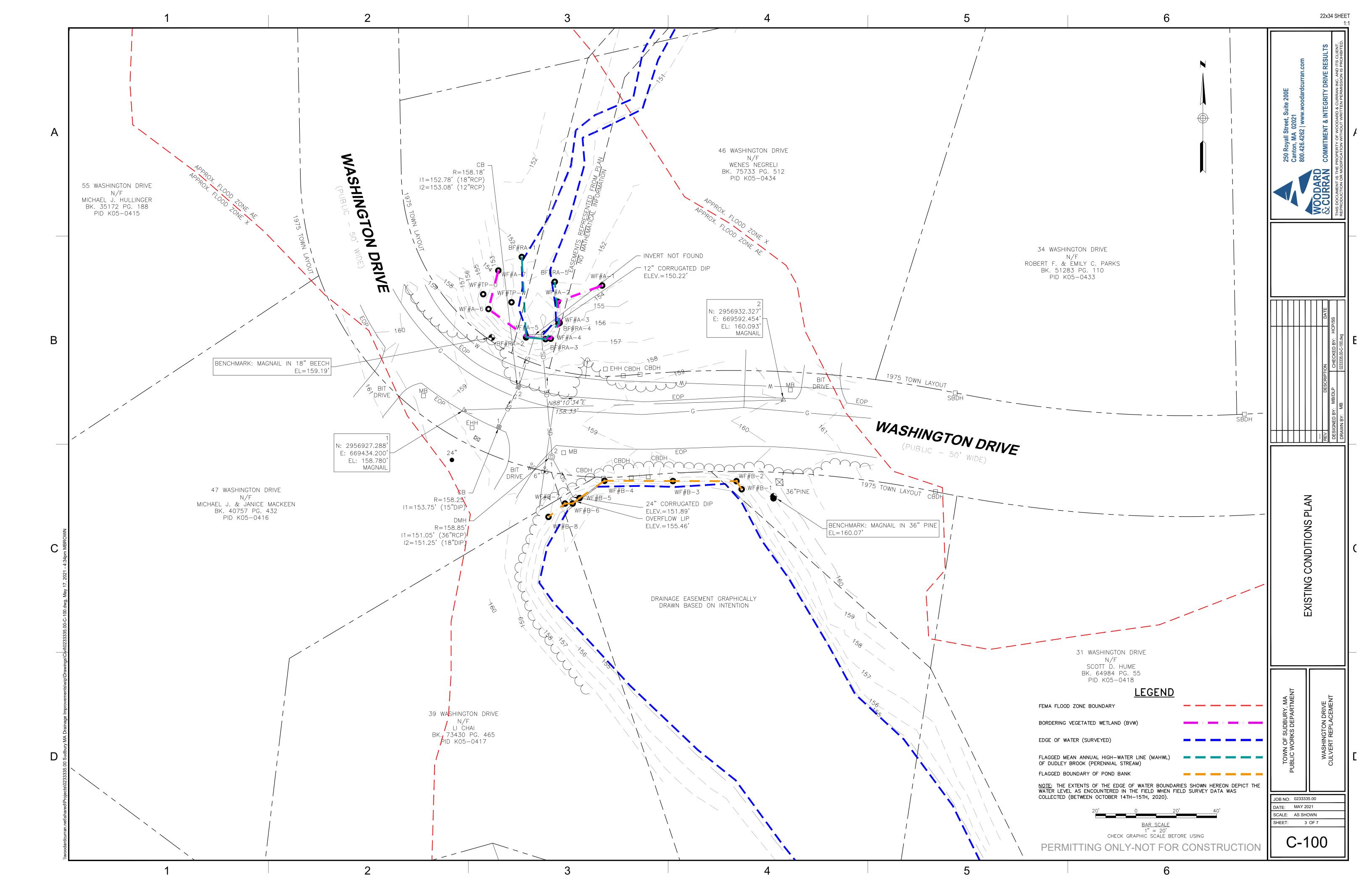
<u>31MB0</u>	<u></u>	MENAF	
DESCRIPTION	EXISTING		
UTILITY POLE		BITUMINOUS PAVEMENT	
CATCH BASIN			
WETLAND FLAG LOCATION	₩F#B-X	MILL AND OVERLAY	
BENCHMARK	•	DAVENENT TO DE DEMOVED	
MANHOLE		PAVEMENT TO BE REMOVED	
TREE	24"		

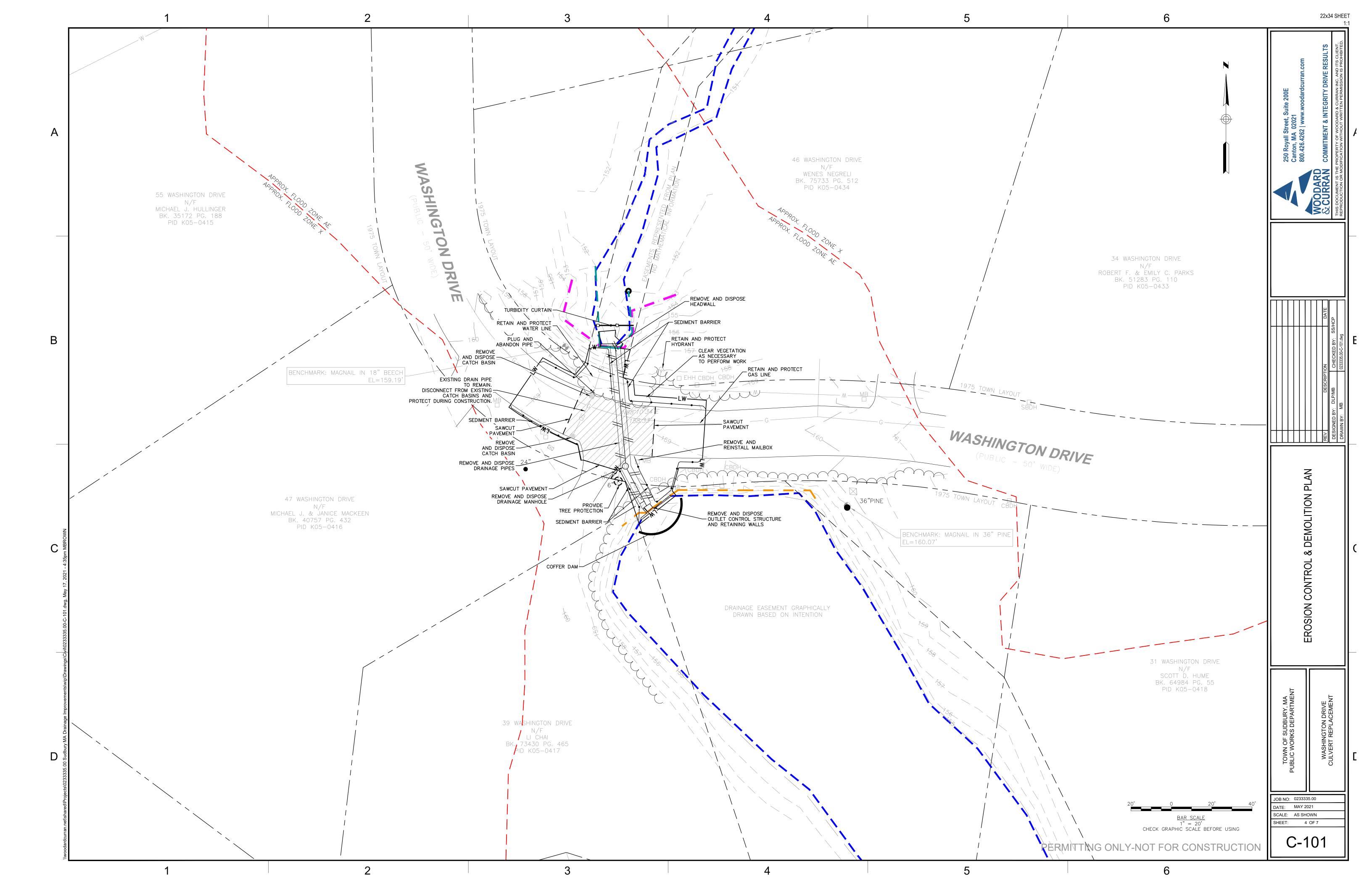
PERMITTING ONLY-NOT FOR CONSTRUCTION

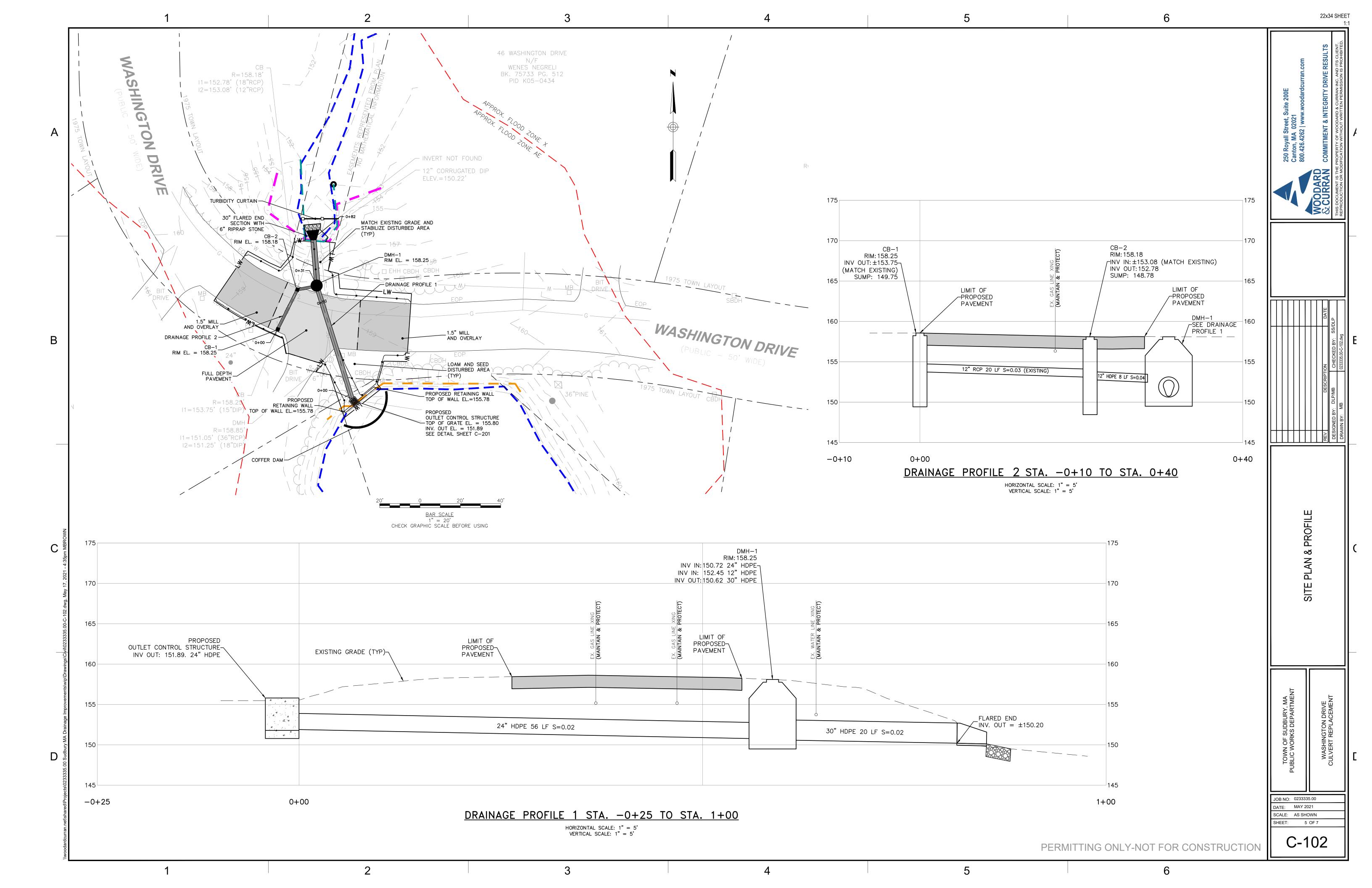
SCH STA. TOWN TYP. UNO UP WAIER VALVE STONE WALL SYMBOLS RIPRAP

IOB NO: 0233335.00 DATE: MAY 2021 SCALE: AS SHOWN HEET: 2 OF 7

22x34 SHEET







22x34 SHEE1 **GENERAL** 1. FOUNDATION COURSE FOR PRECAST CONCRETE STRUCTURES SHALL BE PLACED ON A COMPACTED LAYER **EROSION AND SEDIMENT CONTROL NOTES** OF APPROVED CRUSHED STONE HAVING A MINIMUM COMPACTED THICKNESS OF EIGHT (8) INCHES. 48" HIGH DENSITY ORANGE POLYETHYLENE 2. ALL PRECAST CONCRETE STRUCTURES SHALL BE DESIGNED TO ACCOMMODATE AN HS-20 DESIGN LOAD. SAFETY FENCE Temporary Erosion Control ZIP TIES 3. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO FURNISH AND CONSTRUCT THE PROPER SIZE TO SECURE -STRUCTURE INCLUDING THE NECESSARY OPENINGS TO ACCOMMODATE THE WORK AS SHOWN ON THE FENCE TO DRAWINGS OR AS ORDERED BY THE ENGINEER (AOBE), AT NO ADDITIONAL COST TO THE OWNER. Timing, Activity, and Location Dates For Use POST 4. ALL REQUIRED PATCHING FOR DRAINAGE STRUCTURES SHALL BE COMPLETED WITH NON-SHRINKING CEMENT Before soil disturbance, install downhill of areas to be BOTTOM OF 2"X2" Sedimentation Barrier MORTAR GROUT WITH MINIMUM 1,000 PSI COMPRESSIVE STRENGTH IN (1) DAY AND 5,000 PSI COMPRESSIVE disturbed and around material stockpiles FENCE TO BE WOODEN STRENGTH IN (28) DAYS AS TESTED PER ASTM C109 AND ASTM C-707. PATCHING PRODUCTS INCLUDE FLUSH WITH -STAKES OR Before soil disturbance, install uphill of areas to be "DURAGROUT" BY L & M CONST. CHEMICAL CO., "FIVE STAR GROUT" BY U.S. GROUT COMPANY OR GROUND Up-slope Diversion ALL 66" STEEL disturbed and material stockpiles. APPROVED EQUAL. SURFACE CHANNEL 5. PIPES SHALL BE CUT FLUSH WITH THE INSIDE WALL OF THE STRUCTURE. FINISHED Environmental, Inc. High Flow Siltsack, Siltsaver Inlet Filter. Catch Basin Protection ALL GRADE or equal, installed per manufacturer's requirements. 6. MINIMUM COMPRESSIVE STRENGTH OF CONCRETE 4,000 PSI. (SURFACE SEDIMENTATION BARRIER During dry weather, apply water and calcium chloride to VARIES) ALL Dust Control 7. PRECAST CONCRETE STRUCTURE LIFT HOLES SHALL BE PLUGGED AND MORTARED. (SEE DETAIL) control dust. 1. STOCKPILES SHALL BE SURROUNDED BY SEDIMENTATION BARRIER. 8. STRUCTURES SHALL CONFORM TO CURRENT ASTM AND OSHA REQUIREMENTS April 15 to Oct. 15 Temporary Seeding Soil stockpiles that are not covered and disturbed areas that will not be disturbed again within 14 days. If grass 2. STOCKPILES SHALL HAVE A MAXIMUM 2:1 (H: V) SIDE SLOPE. growth provides less than 95% soil coverage by Nov. 1, 9. PRECAST CONCRETE STRUCTURE JOINTS SHALL CONFORM TO THE CURRENT ASTM DESIGNATION C-443. apply mulch and anchor with erosion control blanket. 10. PRECAST CONCRETE STRUCTURES SHALL COMPLY WITH ASTM STANDARD C-478. MANHOLE JOINTS SHALL 3. REPAIR OR REPLACE DAMAGED SEDIMENTATION BARRIER DUE TO CONSTRUCTION On all areas of exposed soil prior to rain events apply April 15 to Sept. 15 ACTIVITIES OR STOCKPILE MITIGATION. COMPLY WITH ASTM STANDARD C-443. 100-150 lbs (2.5 bales) per 1,000 sq ft. by mechanical 4. STOCKPILE SHALL BE LOCATED IN AREAS AS SHOWN ON THE DRAWINGS OR APPROVED BY THE ENGINEER. Winter Mulch On all areas of exposed soil prior to precipitation apply 150 1. FOR PRECAST CONCRETE MANHOLES FIVE (5) FEET OR LESS IN HEIGHT, TOP CONE SECTION SHALL BE to 170 lbs. mulch (4 bales) per 1,000 sq. ft. by REPLACED WITH PRECAST REINFORCED CONCRETE SLAB (6" MIN. THICKNESS) WITH OPENING OF mechanical blower. Erosion control blanket may be used a TEMPORARY SOIL STOCK PILE AREA SUFFICIENT SIZE TO ACCOMMODATE MANHOLE CASTING. a substitute for winter mulch. 2. FOR MANHOLES 10 FEET OR MORE IN DEPTH, MANHOLE DIAMETER SHALL BE FIVE (5) FEET. On all areas of exposed soil, apply 150 to 170 lbs. mulch (4 bales) per 1,000 sq. ft. and anchor with netting <u>at the</u> 3. TERMINAL MANHOLE FLOORS SHALL BE SLOPED TOWARD OUTFALL PIPE. end of each working day. Erosion control blanket may be used as a substitute for winter mulch. CATCH BASINS AND OUTLET CONTROL STRUCTURES Inspect the erosion and sedimentation control measures Until site is permanently nspections daily, and after rainfall of half inch or greater in a 1. STEPS WILL NOT BE REQUIRED IN CATCH BASINS LESS THAN FOUR (4) FEET IN DEPTH. STEPS WILL BE 24-hour period, and maintain and repair as necessary. REQUIRED IN CATCH BASINS FOUR (4) FEET OR GREATER IN DEPTH. DEPTHS FOR CATCH BASINS SHALL BE MEASURED FROM FINISHED GRADE TO INSIDE BOTTOM OF STRUCTURE (INCLUDING SUMP AS APPLICABLE). 2. STEPS SHALL BE LOCATED WITHIN STRUCTURE TO AVOID PLACEMENT OVER PIPES. Permanent Erosion Control: 3. WHEN STEPS ARE REQUIRED, STEPS SHALL COMPLY WITH THE SAME REQUIREMENTS OF ASTM STANDARD 1. MAINTAIN TENSION ACROSS FULL HEIGHT AND LENGTH OF FENCE. Timing, Activity, and Location Dates For Use C-478, ARTICLE 13 ENTITLED "MANHOLE STEPS & LADDERS". 2. PROVIDE PERIODIC INSPECTION AND MAINTENANCE OF FENCE. Pavement — Base Course When no frost is in Install only in areas shown on the plan, shortly after 4. PROVIDE REINFORCED CONCRETE TOP SLAB FOR OVERSIZED CATCH BASIN WITH PROPER SIZE OPENING TO Final Course pavement base is brought to final grade. Install near ACCOMMODATE INSTALLATION OF CASTING (FRAME & GRATE). 3. FENCE SHALL BE HIGH DENSITY ORANGE POLYETHYLENE SAFETY FENCE completion of project. AS MANUFACTURED BY EROSION RUNNER® OR APPROVED EQUAL. 5. FOR ALL STRUCTURES GREATER THAN 10 FEET IN DEPTH, STRUCTURES SHALL PROVIDE MINIMUM INSIDE April 15 to Sept. 15 On final grade areas, within 7 days of grade preparation, Permanent Seeding DIMENSIONS OF 4 FEET X 4 FEET. prepare topsoil, followed by seed and mulch application. Sept. 16 to April 15 On final grade areas, with prepared topsoil. Apply seed at PLASTIC CONSTRUCTION SAFETY FENCE PRECAST CONCRETE STRUCTURE NOTES double the specified rate on bare soil, and follow with an Dormant Seeding application of winter mulch. N.T.S. NOT TO SCALE April 15 to Nov. 1 Install with final landscaping. Ground Cover, Trees, STAKE ON 10' LINEAL SPACING Permanent Mulch Install with final landscaping. 2"x2" WOODEN STAKE— COMPOST SILTSOCK Inspections: PREPARE SOIL BEFORE INSTALLING ROLLED EROSION CONTROL PRODUCTS (RECP's), INCLUDING ANY NECESSARY APPLICATION OF (12" TYP.) LIME, FERTILIZER, AND SEED AS WELL AS REMOVING ANY PROTRUDING ROCKS, STUMPS OR ROOTS. DURING THE GROWING SEASON AREA TO BE Regular inspections of all erosion and sedimentation controls shall be made at least (APRIL 15 — SEPTEMBER 15) USE RECP'S ON SLOPES HAVING A GRADE GREATER THAT 15%, OR ANYWHERE WHERE HAY MULCH PROTECTED weekly and prior to and following storm events. Minimum inspections shall be made HAS PROVEN TO BE INEFFECTIVE AT CONTROLLING SHEET EROSION. RECP'S ARE A MANUFACTURED COMBINATION OF MULCH AND as listed in the table below NETTING DESIGNED TO PREVENT EROSION AND RETAIN SOIL MOISTURE. FOR OVER WINTER PROTECTION, APPLY RECP'S ON SLOPES WORK AREA Inspected Item WORK AREA PROTECTED BEGIN AT THE TOP OF THE SLOPE BY ANCHORING THE RECP'S IN A 6" DEEP X 6" WIDE TRENCH WITH APPROXIMATELY 12" OF WATER FLOW Thin mulch or inadequate application. Wind movement. Mulched Surfaces RECP'S EXTENDED BEYOND THE UP-SLOPE PORTION OF THE TRENCH. ANCHOR THE RECP'S WITH A ROW OF STAPLES/STAKES Seeded Surfaces Poor seed germination. Loss of mulch. Development of APPROXIMATELY 12" APART IN THE BOTTOM OF THE TRENCH (USE OF METAL STAPLES IS PROHIBITED). BACKFILL AND COMPACT - HDPE PIPE FLARED END THE TRENCH AFTER STAPLING. APPLY SEED TO COMPACTED SOIL AND FOLD REMAINING 12" PORTION OF RECP's BACK OVER SECTION AND OPTIONAL SEED AND COMPACTED SOIL. SECURE RECP'S OVER COMPACTED SOIL WITH A ROW OF STAPLES/STAKES SPACED APPROXIMATELY Sediment build—up to one half the height of the barrier. |Sediment Barrie COMPOST SILTSOCK TRASH GUARD ndermining of the barrier. Supporting stakes loose, toppled, 12" APART ACROSS THE WIDTH OF THE RECP's. or unmarked. Breaks in barrier. HDPE -ROLL THE RECP'S (A.) DOWN OR (B.) HORIZONTALLY ACROSS THE SLOPE. RECP'S WILL UNROLL WITH APPROPRIATE SIDE AGAINST Discharge is to stabilized area. Erosion or breaks in barrier. THE SOIL SURFACE. ALL RECP'S MUST BE SECURELY FASTENED TO SOIL SURFACE BY PLACING STAPLES/STAKES IN APPROPRIATE Supporting stakes loose, toppled or unmarked. LOCATIONS AS SHOWN IN THE STAPLE PATTERN GUIDE. WHEN USING THE DOT SYSTEM, STAPLES/STAKES SHOULD BE PLACED THROUGH EACH OF THE COLORED DOTS CORRESPONDING TO THE APPROPRIATE STAPLE PATTERN. Catch Basin Protection Sediment build—up and structure blockages. Slow flow/Ponding water. Breaks in fabric or voids in barrier. BASE ROCK BELOW 4. THE EDGES OF PARALLEL RECP'S MUST BE STAPLED WITH APPROXIMATELY 2" - 5" OVERLAP DEPENDING ON RECP'S TYPE. Sedimentation of roadways. Off-site dust complaints Site Roadways STORM PIPE FOR 6' WHEN STAKING IS NOT POSSIBLE, HEAVY CONCRETE OF OUTFALL PIPE CONSECUTIVE RECP'S SPLICED DOWN THE SLOPE MUST BE PLACED END OVER END (SHINGLE STYLE) WITH AN APPROXIMATE 3" BLOCKS SHALL BE USED BEHIND THE SEDIMENT CONTROL MORTAR PAD TO SEAL BELOW PIPE -- APPROVED COMPACTED OVERLAP. STAPLE THROUGH OVERLAPPED AREA, APPROXIMATELY 12" APART ACROSS ENTIRE RECP's WIDTH. NOTE: *IN LOOSE TO HELP STABILIZE DURING RAINFALL/RUNOFF EVENTS. JOINT BETWEEN CONCRETE FLARED END SUBGRADE SOIL CONDITIONS, THE USE OF STAPLE OR STAKE LENGTHS GREATER THAN 6" MAY BE NECESSARY TO PROPERLY SECURE THE SECTION AND CONCRETE PIPE SECTION RECP's. PROPOSED SEDIMENTATION BARRIER - SILTSOCK RIPRAP APRON SECTION A-A 6. UNTIL GRASS HAS GOOD COVERAGE, INSPECT PERIODICALLY AND AFTER EACH RAINSTORM TO CHECK FOR EROSION. IMMEDIATELY NOT TO SCALE REPAIR AND ADD MORE MULCH UNTIL GRASSES ARE FIRMLY ESTABLISHED. DO NOT MOW THE FIRST YEAR. 7. EROSION CONTROL MATTING AND GROUND FASTENERS SHALL BE 100% BIODEGRADABLE. MATCH SURROUNDING FILTER FABRIC BENEATH FILTER GRADE BAG AND SEDIMENTATION BARRIER EROSION CONTROL MATTING HAND-PLACED -SIDE SLOPE STONE RIPRAP SEDIMENTATION SEE PLANS FOR BARRIER RIPRAP SIZE 1. GEOTEXTILE FABRIC OR FILTER MATERIAL SHALL BE PLACED BETWEEN RIPRAP AND SOIL. FILTER BAG--OUTLET PIPE **DEWATERING NOTES** 1. LOCATE DISCHARGE SITE ON FLAT UPLAND AREAS AS FAR AWAY AS POSSIBLE FROM STREAMS, WETLANDS, OTHER RESOURCES AND POINTS OF CONCENTRATED DIRTY WATER FROM PUMP FLOW ≻0% GRADE FLOW. OPENING & STRAF 2. DOWNGRADIENT RECEIVING AREA MUST BE WELL VEGETATED OR OTHERWISE STABLE FROM EROSION, I.E. FOREST FLOOR OR COARSE GRAVEL/STONE. CLOSURE MA TME 3. NEVER DISCHARGE TO AREAS THAT ARE BARE OR NEWLY VEGETATED. 10**'**± 15' JBURY, DEPAR1 HDPE FLARED END SECTION -4. DIRT BAG MATERIAL BASED ON PARTICLE SIZE IN DIRTY WATER, I.E., FOR COARSE PARTICLES A WOVEN MATERIAL; FOR SILTS/CLAYS A NON-WOVEN MATERIAL. 5. DO NOT OVER PRESSURIZE DIRT BAG OR USE BEYOND CAPACITY PUMP DISCHARGE HOSE (4" MAX) 6. CHANNELS DUG FOR DISCHARGING WATER FROM THE EXCAVATED AREA NEED TO BE STABLE. IF FLOW VELOCITIES CAUSE EROSION WITHIN THE CHANNEL THEN A DITCH LINING SHOULD BE USED. EXTEND STONE CHANNEL D TO MEET EXISTING/ 7. BUCKETED WATER SHOULD BE DISCHARGED IN A STABLE MANNER TO THE SEDIMENT REMOVAL AREA. A SPLASH PAD OF RIPRAP UNDERLAIN WITH GEOTEXTILE PROPOSED GRADE MAY BE NECESSARY TO PREVENT SCOURING OF SOIL. 8. DEWATERING IN PERIODS OF INTENSE, HEAVY RAIN, WHEN THE INFILTRATIVE CAPACITY OF THE SOIL IS EXCEEDED, SHOULD BE AVOIDED. FINISH GRADE OR <u>PLAN</u> 9. INSTALL DIVERSION DITCHES OR BERMS TO MINIMIZE THE AMOUNT OF CLEAN STORMWATER RUNOFF ALLOWED INTO THE EXCAVATED AREA. UNDISTURBED OB NO: 0233335.00 GROUND 10. DURING THE ACTIVE DEWATERING PROCESS, INSPECTION OF THE DEWATERING FACILITY SHOULD BE REVIEWED FREQUENTLY. SPECIAL ATTENTION SHOULD BE PAID ATE: MAY 2021 RIPRAP APRON OUTLET PROTECTION AT TO THE BUFFER AREA FOR ANY SIGN OF EROSION AND CONCENTRATION OF FLOW THAT MAY COMPROMISE THE BUFFER AREA. OBSERVE WHERE POSSIBLE THE CALE: AS SHOWN **SECTION** VISUAL QUALITY OF THE EFFLUENT AND DETERMINE IF ADDITIONAL TREATMENT CAN BE PROVIDED. FLARED END IEET: 6 OF 7 11. EROSION CONTROL REQUIRED AROUND DEWATERING DISCHARGE SEDIMENT CONTROL DEVICE. NOT TO SCALE DEWATERING DISCHARGE SEDIMENT CONTROL DEVICE C-200 PERMITTING ONLY-NOT FOR CONSTRUCTION

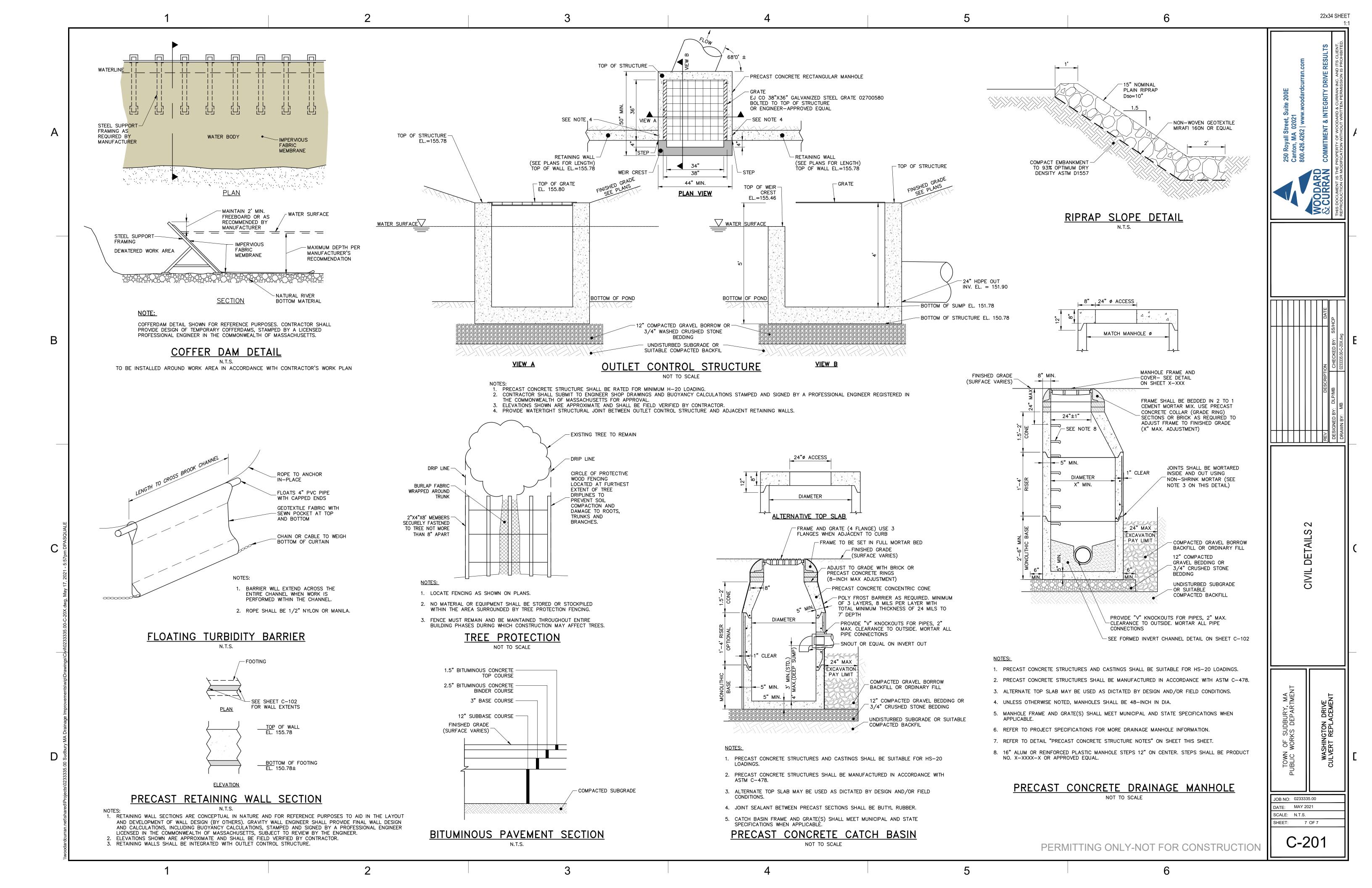
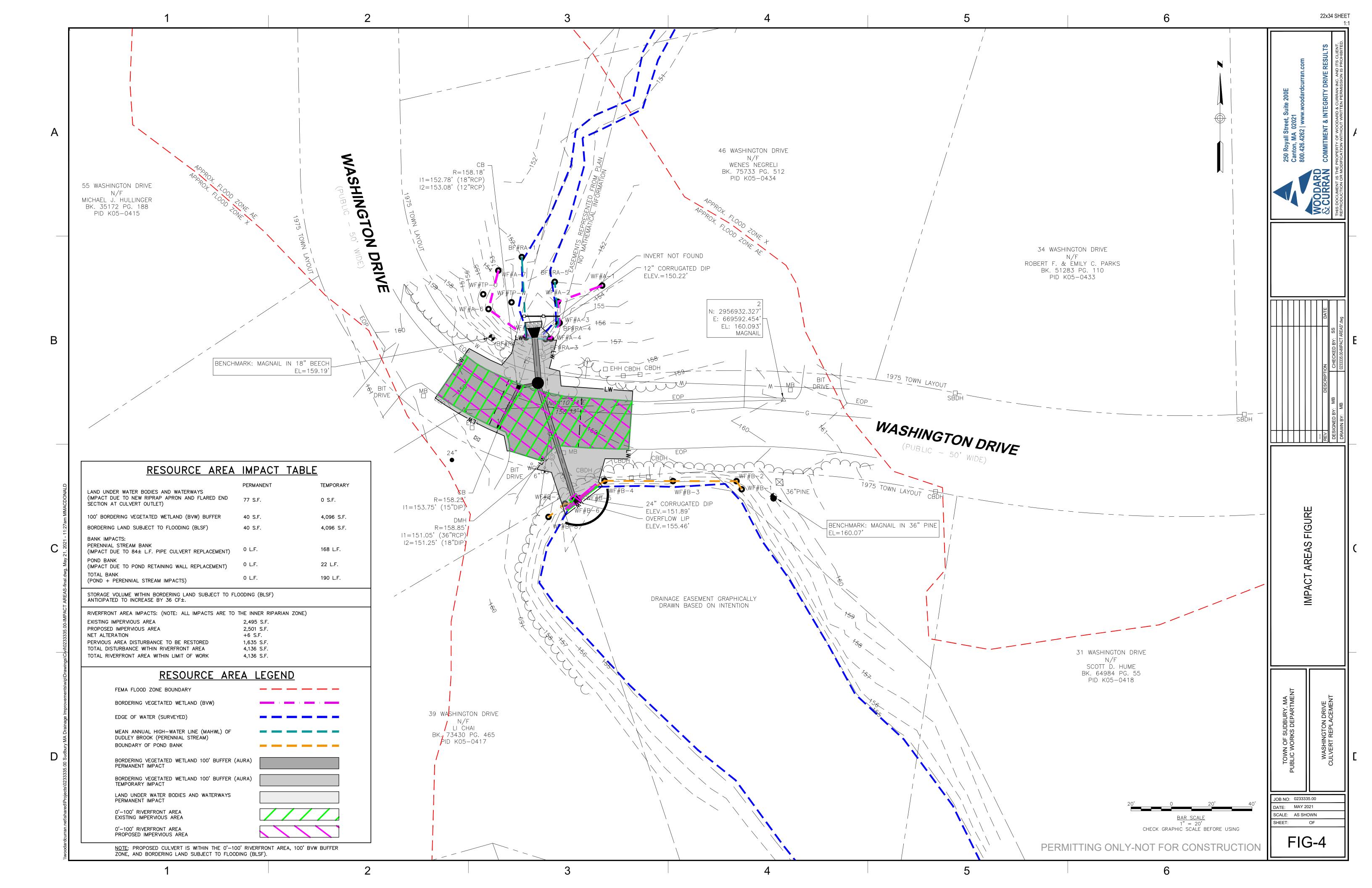


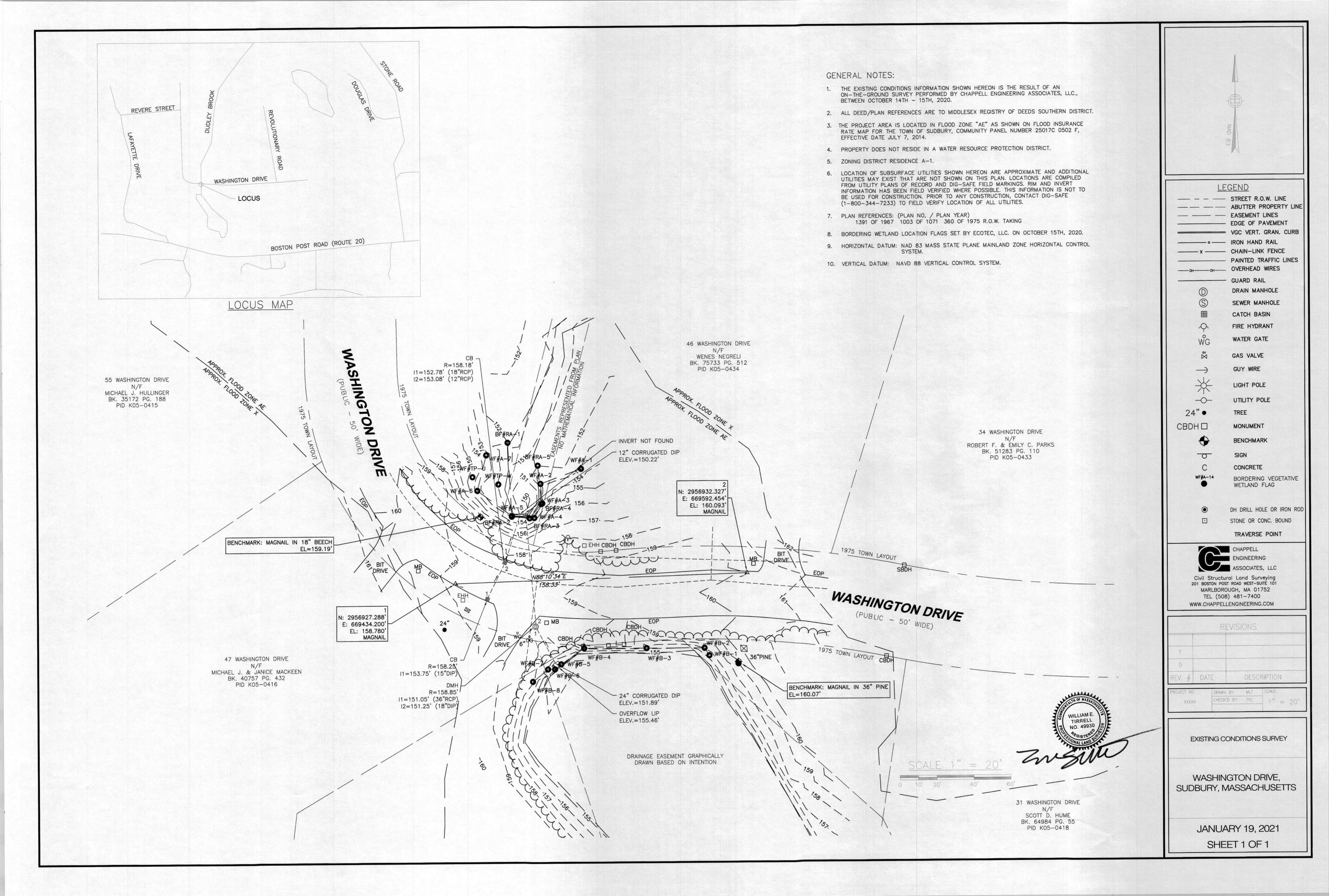


Figure 4: Resource Area Impact Figure



ATTACHMENT A: EXISTING CONDITIONS SURVEY





ATTACHMENT B: WETLAND RESOURCE EVALUATION



EcoTec, Inc.

ENVIRONMENTAL CONSULTING SERVICES 102 Grove Street Worcester, MA 01605-2629

508-752-9666 – Fax: 508-752-9494

December 5, 2020

Scott Salvucci, P.E. Woodard & Curran, Inc. 980 Washington St., Suite 325 Dedham, MA 02026

RE: Wetland Resource Evaluation, Washington Drive Culvert, Sudbury, MA

Dear Scott:

On November 4, 2020, EcoTec, Inc. inspected the above-referenced property for the presence of wetland resources as defined by: (1) the Massachusetts Wetlands Protection Act (M.G.L. Ch. 131, § 40; the "Act") and its implementing regulations (310 CMR 10.00 *et seq.*; the "Regulations"); and (2) the U.S. Clean Water Act (i.e., Section 404 and 401 wetlands). Arthur Allen, CPSS, CWS conducted the inspection.

The subject site consists of the vicinity of an existing culvert and a mapped, perennial stream (AKA: Dudley Brook) that flows under Washington Drive and into a pond. The upland portions of the site consist of a public roadway and vegetated road shoulder slopes. The wetland resources observed on the site are described below.

Methodology

The site was inspected, and areas suspected to qualify as wetland resources were identified. The boundary of Bordering Vegetated Wetlands was delineated in the field in accordance with the definition set forth in the regulations at 310 CMR 10.55(2)(c). Section 10.55(2)(c) states that "The boundary of Bordering Vegetated Wetlands is the line within which 50% or more of the vegetational community consists of wetland indicator plants and saturated or inundated conditions exist." The methodology used to delineate Bordering Vegetated Wetlands is further described in: (1) the BVW Policy "BVW: Bordering Vegetated Wetlands Delineation Criteria and Methodology," issued March 1, 1995; and (2) "Delineating Bordering Vegetated Wetlands Under the Massachusetts Wetlands Protection Act: A Handbook," produced by the Massachusetts Department of Environmental Protection, dated March 1995. The plant taxonomy used in this report is based on the National List of Plant Species that Occur in Wetlands: Massachusetts (Fish and Wildlife Service, U.S. Department of the Interior, 1988). Federal wetlands were presumed to have boundaries conterminous with the delineated Bordering Vegetated Wetlands. One set of DEP Bordering Vegetated Wetland Delineation Field Data Forms completed for observation plots located in the wetlands and uplands near flag A-6 is attached. The table below provides the Flag Numbers, Flag Type, and Wetland Types and Locations for the delineated wetland resources.

Flag Numbers	Flag Type	Wetland Types and Locations
A-1 to A-7	Blue Flags	Boundary of Bordering Vegetated Wetlands located
(Test Plots at A-6)		on the north side of Washington Drive that is
		associated with Dudley Brook. Flags Connect to
		stream culvert outfall.
B-1 to B-8	Blue Flags	Boundary of Pond Bank located on the south side of Washington Drive that is associated with an impoundment of Dudley Brook. Flags connect to outlet structure.
RA-1 to RA-5	Red Flags	Mean Annual High-water Line (MAHWL) of Dudley Brook on the north side of Washington Drive.

Findings

Wetland A consists of a wooded swamp that is associated with a mapped, perennial stream (AKA: Dudley Brook). Wetland B consists of a narrow fringe of wooded swamp associated with a pond. Plant species observed include red maple (Acer rubrum) and American elm (Ulmus americana) trees and/or saplings; poison ivy (Toxicodendron radicans) climbing woody vines; highbush blueberry (Vaccinium corymbosum), common winterberry (Ilex verticillata), arrowwood (Viburnum dentatum), withe-rod (Viburnum cassinoides), swamp rose (Rosa palustris), speckled alder (Alnus rugosa), silky dogwood (Cornus amomum), glossy buckthorn (Rhamnus frangula), sweet pepper-bush (Clethra alnifolia), swamp azalea (Rhododendron viscosum), and American elderberry (Sambucus canadensis) shrubs; and sheep-laurel (Kalmia angustifolia), bristly blackberry (Rubus hispidus), cinnamon fern (Osmunda cinnamomea), royal fern (Osmunda regalis), sensitive fern (Onoclea sensibilis), subarctic lady fern (Athyrium filix-femina), marsh fern (Thelypteris thelypteroides), Massachusetts fern (Thelypteris simulata), spinulose woodfern (Dryopteris spinulosa), skunk-cabbage (Symplocarpus foetidus), swamp Jack-in-thepulpit (Arisaema triphyllum), spotted touch-me-not (Impatiens capensis) and sphagnum moss (Sphagnum sp.) ground cover. Evidence of wetland hydrology, including hydric soils, high groundwater, saturated soils, pore linings, evidence of flooding, and drainage patterns, was observed within the delineated wetland. These vegetated wetlands border a perennial stream and a pond; accordingly, the vegetated wetlands would be regulated as Bordering Vegetated Wetlands and the pond and stream would be regulated as Bank and Land Under Water Bodies and Waterways under the Act. A 100-foot Buffer Zone extends horizontally outward from the edge of Bordering Vegetated Wetlands under the Act.

Bordering Land Subject to Flooding is an area that floods due to a rise in floodwaters from a bordering waterway or water body. Where flood studies have been completed, the boundary of Bordering Land Subject to Flooding is based upon flood profile data prepared by the National Flood Insurance Program. Section 10.57(2)(a)3. states that "The boundary of Bordering Land Subject to Flooding is the estimated maximum lateral extent of flood water which will theoretically result from the statistical 100-year frequency storm." The project engineer should evaluate the most recent National Flood Insurance Program flood profile data to confirm the location and elevation of Bordering Land Subject to Flooding on the site. Bordering Land Subject

Wetland Resource Evaluation, Washington Drive Culvert, Sudbury, MA December 5, 2020 Page 3.

to Flooding would occur in areas where the 100-year flood elevation is located outside of or upgradient of the delineated Bordering Vegetated Wetlands boundary. Bordering Land Subject to Flooding does not have a Buffer Zone under the Act.

The Massachusetts Rivers Protection Act amended the Act to establish an additional wetland resource area: Riverfront Area. Based upon a review of the current USGS Map (attached), a stream that is shown as perennial is located within the A-series delineated wetland. As such, the stream would be designated perennial under the Massachusetts Wetlands Protection Act regulations. Unless this perennial designation is overcome, Riverfront Area is presumed to extend 200 feet horizontally upgradient from the mean annual high-water line of the stream. Section 10.58(2)(a)2. states that the "Mean annual high-water line of a river is the line that is apparent from visible markings or changes in the character of soils or vegetation due to prolonged presence of water and that distinguishes between predominantly aquatic and predominantly terrestrial land. Field indicators of bankfull conditions shall be used to determine the mean annual high-water line. Bankfull field indicators include but are not limited to: changes in slope, changes in vegetation, stain lines, top of pointbars, changes in bank materials, or bank undercuts." Section 10.58(2)(a)2.a. states that "In most rivers, the first observable break in slope is coincident with bankfull conditions and the mean annual high-water line." The mean annual high-water line of the stream was delineated in the field with flag series RA based upon the above-referenced regulation. Furthermore, based upon a review of the current USGS Map and observations made during the site inspection, there are no other mapped or unmapped streams located within 200 feet of the site. Accordingly, except as noted above, Riverfront Area would not occur on the site. Riverfront Area does not have a Buffer Zone under the Act, but may overlap other wetland resources and their Buffer Zones.

The Regulations require that no project may be permitted that will have any adverse effect on specified habitat sites of rare vertebrate or invertebrate species, as identified by procedures set forth at 310 CMR 10.59. Based upon a review of the *Massachusetts Natural Heritage Atlas*, 14th edition, Priority Habitats and Estimated Habitats from the NHESP Interactive Viewer, valid from August 1, 2017, and Certified Vernal Pools from MassGIS, there are no Estimated Habitats [for use with the Act and Regulations (310 CMR 10.00 *et seq.*)], Priority Habitats [for use with Massachusetts Endangered Species Act (M.G.L. Ch. 131A; "MESA") and MESA Regulations (321 CMR 10.00 *et seq.*)], or Certified Vernal Pools on or in the immediate vicinity of the site. A copy of this map is attached.

The reader should be aware that the regulatory authority for determining wetland jurisdiction rests with local, state, and federal authorities. A brief description of my experience and qualifications is attached. If you have any questions, please feel free to contact me at any time.

Cordially, ECOTEC, INC.

MILL

EcoTec, Inc.

Wetland Resource Evaluation, Washington Drive Culvert, Sudbury, MA December 5, 2020 Page 4.

Arthur Allen, CWS, CPSS Vice President

Attachments (5, 8 pages)

AA/NOI/Sudbury Washington EcoTec Wet Report 2.3.2021

EcoTec, Inc.



ENVIRONMENTAL CONSULTING SERVICES

102 Grove Street Worcester, MA 01605-2629 508-752-9666 / Fax: 508-752-9494

Arthur Allen, CPSS, CWS, CESSWI Vice President Soil & Wetland Scientist

Arthur Allen is the Vice President of EcoTec, Inc. and has been a senior environmental scientist there since 1995. His work with EcoTec has involved wetland delineation, wildlife habitat evaluation, environmental permitting (federal, state and local), environmental monitoring, expert testimony, peer reviews, contaminated site assessment and the description, mapping and interpretation of soils. His clients have included private landowners, developers, major corporations and regulatory agencies. Prior to joining EcoTec, Mr. Allen mapped and interpreted soils in Franklin County, MA for the U.S.D.A. Natural Resources Conservation Service (formerly Soil Conservation Service) and was a research soil scientist at Harvard University's Harvard Forest. Since 1994, Mr. Allen has assisted the Massachusetts Department of Environmental Protection and the Massachusetts Association of Conservation Commissions as an instructor in the interpretation of soils for wetland delineation and for the Title V Soil Evaluator program.

Mr. Allen has a civil service rating as a soil scientist, an undergraduate degree in Natural Resource Studies and a graduate certificate in Soil Studies. His work on the Franklin County soil survey involved interpretation of landscape-soil-water relationships, classifying soils and drainage, and determining use and limitation of the soil units that he delineated. As a soil scientist at the Harvard Forest, Mr. Allen was involved in identifying the legacies of historical land-use in modern soil and vegetation at a number of study sites across southern New England. He has a working knowledge of the chemical and physical properties of soil and water and how these properties interact with the plants that grow on a given site. While at Harvard Forest he authored and presented several papers describing his research results which were later published. In addition to his aforementioned experience, Mr. Allen was previously employed by the Trustees of Reservations as a land manager and by the Town of North Andover, MA as a conservation commission intern.

Education:

1993-Graduate Certificate in Soil Studies, University of New Hampshire 1982-Bachelor of Science in Natural Resource Studies, University of Massachusetts

Professional Affiliations:

Certified Professional Soil Scientist (ARCPACS CPSS #22529)

New Hampshire Certified Wetland Scientist (#19)

Registered Professional Soil Scientist - Society of Soil Scientists of SNE [Board Member (2000-2006)]

Certified Erosion, Sediment & Stormwater Inspector (#965)

Massachusetts Approved Soil Evaluator (#13764)

Massachusetts Arborists Association-Certified Arborist (1982 – 1998)

New England Hydric Soils Technical Committee member

Massachusetts Association of Conservation Commissions member

Society of Wetland Scientists member

Refereed Publications:

Soil Science and Survey at Harvard Forest. A.Allen. In: Soil Survey Horizons. Vol. 36, No. 4, 1995, pp. 133-142. Controlling Site to Evaluate History: Vegetation Patterns of a New England Sand Plain. G.Motzkin, D.Foster, A.Allen, J.Harrod, & R.Boone. In: Ecological Monographs 66(3), 1996, pp. 345-365. Vegetation Patterns in Heterogeneous Landscapes: The Importance of History and Environment. G.Motzkin, P.Wilson, D.R.Foster & A.Allen. In: Journal of Vegetation Science 10, 1999, pp. 903-920.

nt_	Prepared by: EcoTec, Inc	Project Location:	Wolbach Rd., Sudbury	DEP File #		
Vegetation	Number: TPU	Transect #	A-6	Date of Delin: 11/4/2020		
ple layer and plant species gest to smallest % cover by la	yer)	Percent Cover (or basal area)	Percent Dominance	Dominant Plant?	Wetland Indicator Category	
White Pine	Pinus strobus			10.0 YES	FACU	
Red Maple	Acer rubrum	90		90.0 YES	FAC *	
American Elm	Ulmus americana	30		100.0 YES	FACW- *	
Tartarian Honeysuckle	Lonicera tatarica	20		80.0 YES	FACU	
Black Cherry	Prunus serotina	5		20.0 YES	FACU	
Periwinkle	Vinca minor	50		100.0 YES	NL	
	Ple layer and plant species gest to smallest % cover by la White Pine Red Maple American Elm Tartarian Honeysuckle Black Cherry	ple layer and plant species gest to smallest % cover by layer) White Pine Pinus strobus Red Maple Acer rubrum American Elm Ulmus americana Tartarian Honeysuckle Lonicera tatarica Black Cherry Prunus serotina	Vegetation Number: TPU Transect # ple layer and plant species gest to smallest % cover by layer) Percent Cover (or basal area) White Pine Red Maple Pinus strobus Acer rubrum 10 American Elm Ulmus americana 30 Tartarian Honeysuckle Lonicera tatarica 20 Black Cherry Prunus serotina 5	Number: TPU Transect # A-6	Number: TPU Transect # A-6 Date of Del ple layer and plant species gest to smallest % cover by layer) White Pine Pinus strobus 10 10.0 YES Red Maple Acer rubrum 90 90.0 YES American Elm Ulmus americana 30 100.0 YES Tartarian Honeysuckle Lonicera tatarica 20 80.0 YES Black Cherry Prunus serotina 5 20.0 YES	

Vegetation Conclusions			
Number of dominant wetland indicator plants	2	Number of dominant non-wetland indicator plants	4
Is the number of dominant wetland plants equal or greater than the numbe	r of domi	nant non-wetland plants? NO	

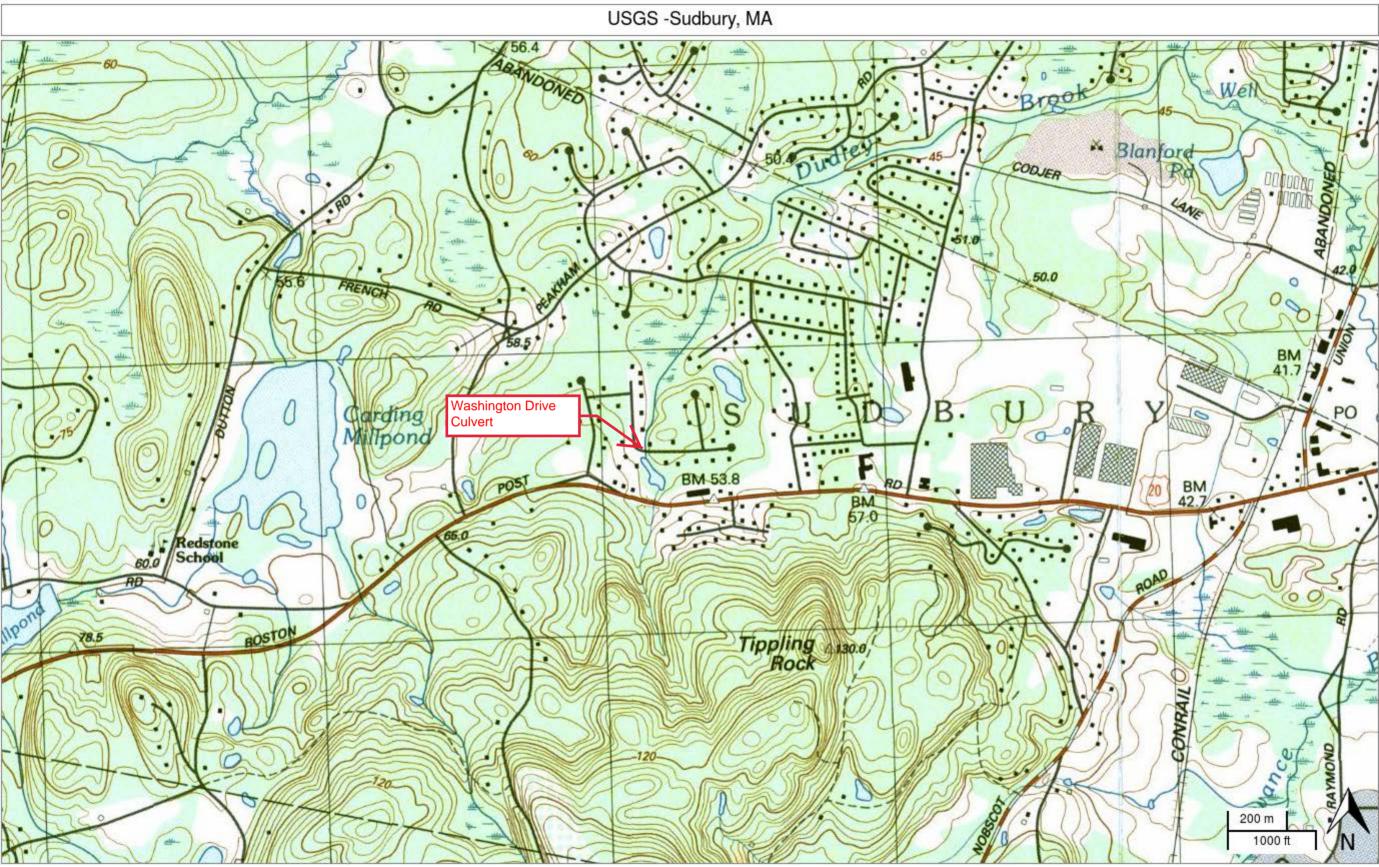
Applicant	Prepared by: EcoTec, Inc	Project Location: Wolbach Rd., Sudbury	DEP File #
Section II. Indicators of Hydrology	Number: TPU	Transect # A-6	Date of Delin: 11/4/2020

1. Soil Sui	vey			Other I	Indicators of hydrology (check all that apply):
Is there a	published soil survey for title/date map number soil type mapped hydric soil inclusions observarions consistent w				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 BVWs Oxidized rhizospheres Water stained leaves Recorded data (stream, lake, or tidal gauge; aerial photo; other):
2. Soil De Horizon Litter O A Bw	Depth (inches) 2 1-0 1-12 12-16	Matrix Color 10YR 2/2 10YR 4/6	Mottle Color		Other: Vegetation and Hydrology Conclusion
Remarks	Sandy loams				Yes No Number of wetland indicator plants ≥ number of non-wetland indicator plants Wetland hydrology present: Hydric soil present □ ✓
3. Other	sion: Is the soil h	ydric?	No		Other indicators of hydrology present Sample Location is in a BVW

Applicant		Prepared by: EcoTec, Inc	Project Location:	Wolbach Rd., Sudbury	DEP File #		
Section I.	Vegetation	Number: TPW	Transect #	A-6	Date of Delin: 11/4/2020		
	nple layer and plant species gest to smallest % cover by la	yer)	Percent Cover (or basal area)	Percent Dominance	Dominant Plant?	Wetland Indicator Category	
Tree	American Elm	Ulmus americana	10		10.0 YES	FACW-	*
	Red Maple	Acer rubrum	90		90.0 YES	FAC	*
Sapling	American Elm	Ulmus americana			100.0 YES	FACW-	*
Shrub	Winterberry	Ilex verticillata	10		100.0 YES	FACW+	*
Ground	 Jewelweed	Impatiens capensis	80		80.0 YES	FACW	*
	Skunk Cabbage	Symplocarpus foetidus	20		20.0 YES	OBL	*
			_				
Vine							

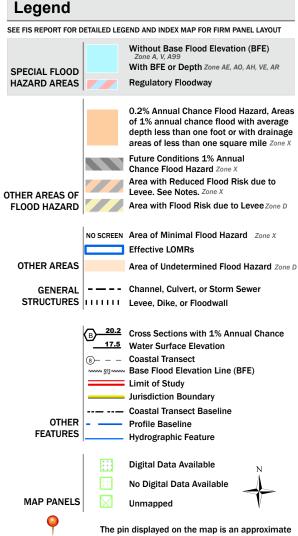
Vegetation Conclusions			
Number of dominant wetland indicator plants	6	Number of dominant non-wetland indicator plants	0
Is the number of dominant wetland plants equal or greater than th	ne number of dominant n	on-wetland plants? YES	

		0 0		•	•		
Applicant Prepared by: EcoTec, Inc Project Loc		Project Location: Wolbach Rd., Sudbury	DEP F	ile#			
Section II.	Indicators of Hydrology	Number:	TPW		Transect # A-6	Date of Del	in: 11/4/2020
1. Soil Survey Is there a published soil survey for this sittile/date map number soil type mapped hydric soil inclusions Are field observarions consistent with so Remarks: 2. Soil Description Horizon Depth (inches) Mate		his site?	is site? n soil survey?		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 BVWs Oxidized rhizospheres Water stained leaves Recorded data (stream, lake, or tidal gauge) Other:	/): 6" 0"	
Litter Oa	2 0-14	10YR 2/1					
Cu	O I .	101112,1			Vegetation and Hydrology Conclusion		
Remarks	Oa-Muck				Number of wetland indicator plants ≥ number of non-wetland indicator plants	Yes ☑	No
3. Other					Wetland hydrology present: Hydric soil present Other indicators of hydrology present	. V	
Conclu	sion: Is the soil h	ydric?	Yes		Sample Location is in a BVW	V	



National Flood Hazard Layer FIRMette



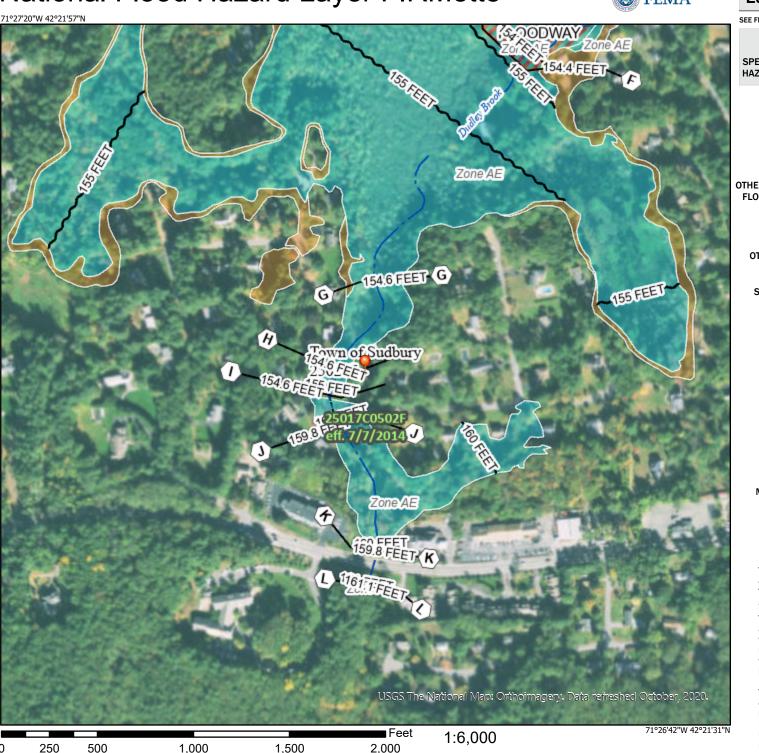


point selected by the user and does not represent an authoritative property location.

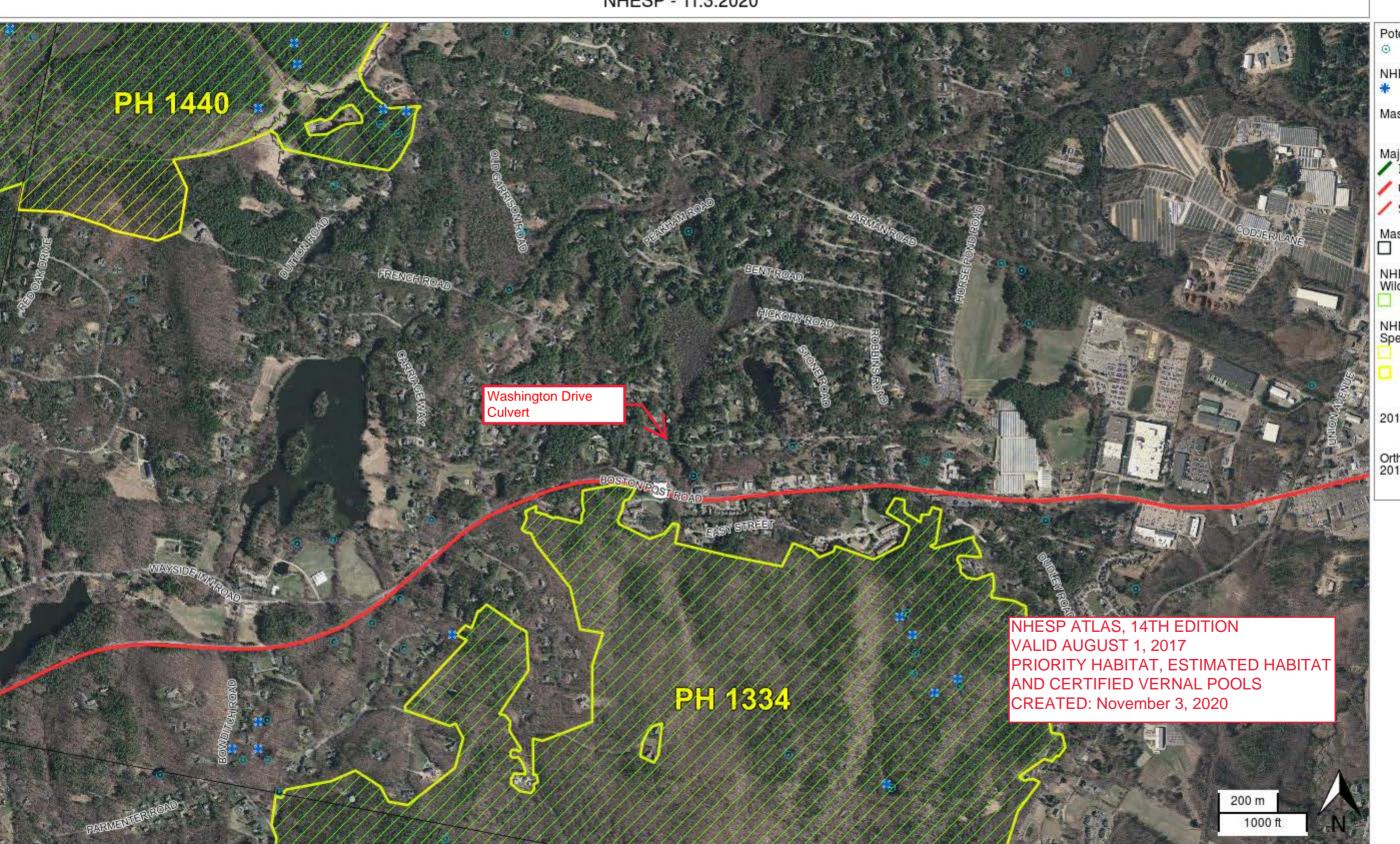
This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 11/3/2020 at 5:38 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

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



NHESP - 11.3.2020



Potential Vernal Pools

NHESP Certified Vernal Pools

MassDOT Roads Street Names

Major MassDOT Routes

Interstate Highways

/ US Roads

/ State

Massachusetts Towns

NHESP Estimated Habitats of Rare Wildlife

NHESP Priority Habitats of Rare Species



2013-2014 Color Orthos (USGS)

Orthos 2019 2019 Color Orthos (USGS)

ATTACHMENT C: FEMA FIRMETTE



National Flood Hazard Layer FIRMette

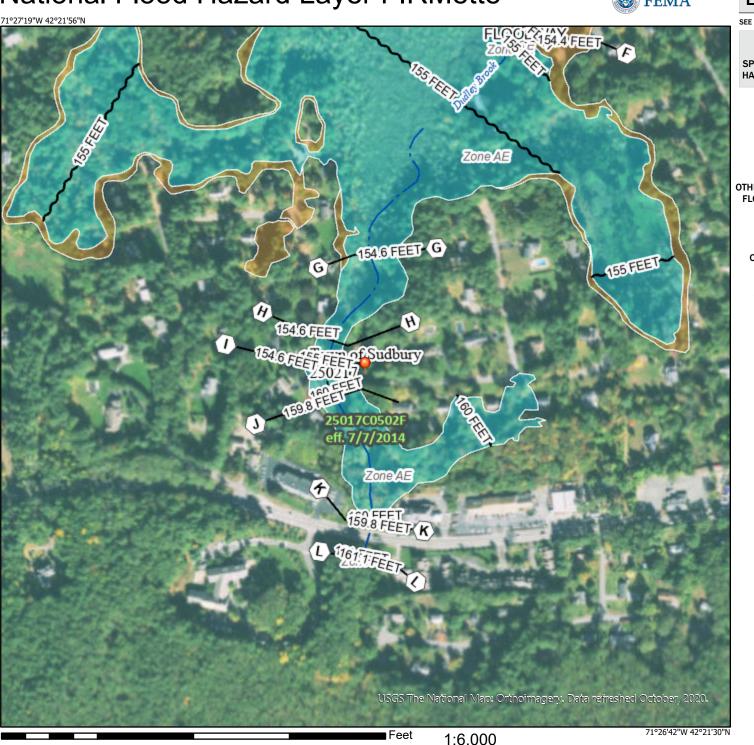
250

500

1,000

1,500

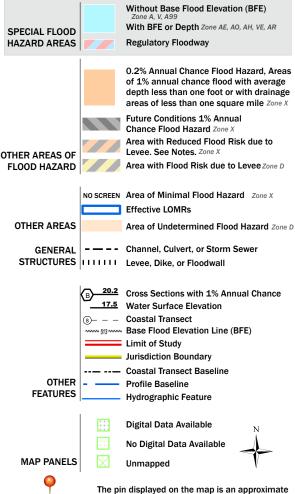




2,000

Legend

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



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

point selected by the user and does not represent

an authoritative property location.

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 10/26/2020 at 1:11 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

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

ATTACHMENT D: USGS STREAMSTATS REPORT



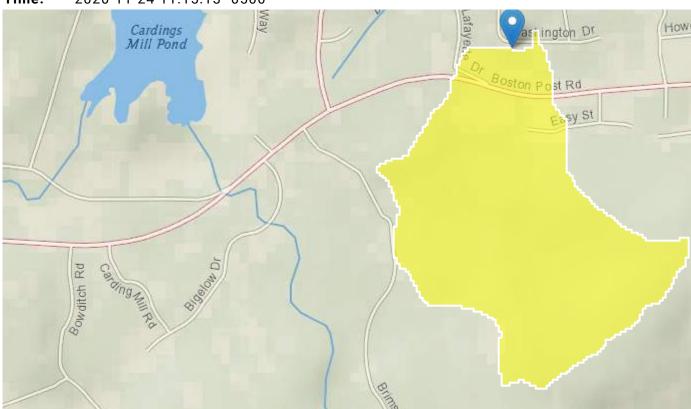
Sudbury, MA - Washington Drive

Region ID: MA

Workspace ID: MA20201124161455298000

Clicked Point (Latitude, Longitude): 42.36172, -71.45053

Time: 2020-11-24 11:15:13 -0500



Basin Characteristics					
Parameter Code	Parameter Description	Value	Unit		
DRNAREA	Area that drains to a point on a stream	0.27	square miles		
ELEV	Mean Basin Elevation	282	feet		
LC06STOR	Percentage of water bodies and wetlands determined from the NLCD 2006	0.4	percent		
BSLDEM10M	Mean basin slope computed from 10 m DEM	10.986	percent		
PCTSNDGRV	Percentage of land surface underlain by sand and gravel deposits	11.1	percent		
FOREST	Percentage of area covered by forest	91.78	percent		

Parameter Code	Parameter Description	Value	Unit
MAREGION	Region of Massachusetts 0 for Eastern 1 for Western	0	dimensionless

Peak-Flow Statistics Parameters[Peak Statewide 2016 5156]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.27	square miles	0.16	512
ELEV	Mean Basin Elevation	282	feet	80.6	1948
LC06STOR	Percent Storage from NLCD2006	0.4	percent	0	32.3

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

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

Statistic	Value	Unit	PII	Plu	SEp
2 Year Peak Flood	16.7	ft^3/s	8.39	33.2	42.3
5 Year Peak Flood	28.4	ft^3/s	14	57.4	43.4
10 Year Peak Flood	37.9	ft^3/s	18.3	78.6	44.7
25 Year Peak Flood	51.9	ft^3/s	24.1	112	47.1
50 Year Peak Flood	63.7	ft^3/s	28.6	142	49.4
100 Year Peak Flood	76.4	ft^3/s	33.2	176	51.8
200 Year Peak Flood	90.4	ft^3/s	38.1	215	54.1
500 Year Peak Flood	111	ft^3/s	44.5	277	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)

Bankfull Statistics Parameters[Bankfull Statewide SIR2013 5155]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.27	square miles	0.6	329
BSLDEM10M	Mean Basin Slope from 10m DEM	10.986	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	9.69	ft
Bankfull Depth	0.691	ft
Bankfull Area	6.59	ft^2
Bankfull Streamflow	19.3	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	0.27	square miles	0.01	1.99
PCTSNDGRV	Percent Underlain By Sand And Gravel	11.1	percent	0	100
FOREST	Percent Forest	91.78	percent	0	100
MAREGION	Massachusetts Region	0	dimensionless	0	1

Probability Statistics Flow Report[Perennial Flow Probability]

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

Statistic	Value	Unit	PC
Probability Stream Flowing Perennially	0.377	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)

USGS Data Disclaimer: Unless otherwise stated, all data, metadata and related materials are considered to satisfy the quality standards relative to the purpose for which the data were collected. Although these data and associated metadata have been reviewed for accuracy and completeness and approved for release by the U.S. Geological Survey (USGS), no warranty expressed or implied is made regarding the display or utility of the data for other purposes, nor on all computer systems, nor shall the act of distribution constitute any such warranty.

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Application Version: 4.4.0

ATTACHMENT E: CULVERT ANALYSIS REPORT



PCSWMM Report

WashingtonDrive Model WashingtonDriveProposed_2021.02.23.inp

Table of Contents

Summaries

Summary 1:	Options	3
Summary 2:	Model inventory	4
Summary 3:	Model complexity	5
Summary 4:	Flow routing continuity	5
Graphs		
Figure 1: Po	nd	6

Summary 1: Options

Name	WashingtonDriveProposed_2021.02.23
Flow Units	CFS
Infiltration method	MODIFIED_GREEN_AMPT
Flow routing method	Dynamic Wave
Link offsets defined by	Depth
Allow ponding	No
Skip steady flow periods	No
Inertial dampening	Partial
Define supercritical flow by	Both
Force Main Equation	H-W
Variable time step	On
Adjustment factor (%)	75
Conduit lengthening (s)	0
Minimum surface area (ft²)	12.566
Starting date	Nov-23-2020 12:00:00 AM
Ending date	Nov-23-2020 01:00:00 AM
Duration of simulation (hours)	1
Antecedent dry days (days)	0
Rain interval (h:mm)	n/a
Report time step (h:mm:ss)	00:01:00
Wet time step (h:mm:ss)	00:05:00
Dry time step (h:mm:ss)	01:00:00
Routing time step (s)	0.25
Minimum time step used (s)	0.25
Average time step used (s)	0.25
Minimum conduit slope	0
Ignore rainfall/runoff	No
Ignore snow melt	No
Ignore groundwater	No
Ignore flow routing	No
Ignore water quality	No
Report average results	No

Summary 2: Model inventory

Name	WashingtonDriveProposed_2021.02.23
Raingages	0
Subcatchments	0
Aquifers	0
Snowpacks	0
RDII hydrographs	0
Junction nodes	5
Outfall nodes	1
Flow divider nodes	0
Storage unit nodes	1
Conduit links	5
Pump links	0
Orifice links	0
Weir links	3
Outlet links	1
Treatment units	0
Transects	1
Control rules	o
Pollutants	0
Land Uses	0
Control Curves	0
Diversion Curves	0
Pump Curves	0
Rating Curves	4
Shape Curves	0
Storage Curves	
Tidal Curves	0
Weir Curves	0
Time Series	0
Time Patterns	0

Summary 3: Model complexity

Name	WashingtonDriveProposed_2021.02.23
Subcatchments	n/a
Groundwater	n/a
Aquifers	n/a
Snowpacks	n/a
RDII hydrographs	n/a
Junction nodes	18
Outfall nodes	2
Flow divider nodes	n/a
Storage unit nodes	9
Conduit links	29
Pump links	n/a
Orifice links	n/a
Weir links	15
Outlet links	3
Transect	5
Pollutants	n/a
Land Uses	n/a
Model complexity (total uncertain input parameters)	81

Summary 4: Flow routing continuity

Name	WashingtonDriveProposed_2021.02.23
Dry weather inflow (MG)	0.000
Wet weather inflow (MG)	0.000
Groundwater inflow (MG)	0.000
RDII inflow (MG)	0.000
External inflow (MG)	1.960
External outflow (MG)	1.847
Flooding loss (MG)	0.000
Evaporation loss (MG)	0.000
Exfiltration loss (MG)	0.000
Initial stored volume (MG)	0.078
Final stored volume (MG)	0.193
Continuity error (%)	-0.068

Figure 1: Pond

ATTACHMENT F: SEED MIX SPECIFICATIONS



Attachment: Seed Specifications

New England Conservation/Wildlife Mix

The New England Conservation/Wildlife Mix provides a permanent cover of grasses, forbs, wildflowers, legumes and grasses to provide both good erosion control and wildlife habitat value. This mix is designed to be a no maintenance seeding, and it is appropriate for cut and fill slopes, detention basins, and disturbed areas adjacent to commercial and residential projects.

Application Rate: 25 LBS/ACRE (1750 SQ. FT./LB)

Price: \$30.00/LB**

Species *: Big Bluestem (Andropogon gerardii), Switchgrass (Panicum virgatum), Little Bluestem (Schizachyrium scoparium), Canada Wild Rye (Elymus canadensis), Fox Sedge (Carex vulpinoidea), Partridge Pea (Chamaecrista fasciculata), Fringed Bromegrass (Bromus ciliatus), Pennsylvania Smartweed (Polygonum pensylvanicum), Common Milkweed (Asclepias syriaca), Showy Tick-Trefoil (Desmodium canadense), New England Aster (Aster novae-angliae), Flat-top Aster (Aster umbellatus), Nodding Bur-Marigold (Bidens cernua).

New England Erosion Control/Restoration Mix for Detention Basins and Moist Sites

The New England Erosion Control/Restoration Mix contains a selection of native grasses and wildflowers designed to colonize generally moist, recently disturbed sites where quick growth of vegetation is desired to stabilize the soil surface. It is an excellent seed mix for ecologically appropriate restorations on moist sites that require quick stabilization as well as long-term establishment of native vegetation. This mix is particularly appropriate for detention basis that do not normally hold standing water. The plants in this mix can tolerate infrequent inundation, but not constant flooding.

Seeding: The mix may be applied by hydroseeding, by mechanical spreader, or on small sites it can be spread by hand. When applying on bare soil, rake the soil to create grooves, apply seed, then lightly rake over. In New England, the best results are obtained with a Spring or early Fall seeding. Summer and late Fall seeding will benefit with a light mulching of weed-free straw to conserve moisture. Late Fall and Winter dormant seeding require a slight increase in the seeding rate. Fertilization is not required unless the soils are particularly infertile.

Application Rate: 35 LBS/ACRE (1250 SQ. FT./LB.)

Price: \$26.00/LB**

Species *: Switchgrass (*Panicum virgatum*), Virginia Wild Rye (*Elymus virginicus*), Creeping Red Fescue (*Festuca rubra*), Fox Sedge (*Carex vulpinoidea*), Creeping Bentgrass (*Agrostis stolonifera*), Soft Rush (*Juncus effusus*), New England Aster (*Aster novae-angliae*), Grass-leaved Goldenrod (*Euthamia graminifolia*), Nodding Bur Marigold (*Bidens cernua*), Green Bulrush (*Scirpus atrovirens*), Joe-Pye Weed (*Eupatorium maculatum*), Boneset (*Eupatorium perfoliatum*), Blue Vervain (*Verbena hastata*).