FUSS & O'NEILL
1250 Hancock Street, Suite 815N
Quincy, MA 02169
617.282.4675
www.fando.com

Notice of Intent
Carlisle Fire Station

66 Westford Street, Carlisle, Massachusetts

Prepared For:

Town of Carlisle Fire Department

Carlisle, MA

02/02/2026

FUSS & O'NEILL
108 Myrtle Street, Suite 502
Quincy, MA 02171
617.282.4675
www.fando.com

February 2, 2026

Town of Carlisle Conservation Commission
66 Westford Street
Carlisle, MA 01741

RE: Notice of Intent
Carlisle Fire Station
66 Westford Street, Carlisle, Massachusetts

Dear Members of the Conservation Commission:

On behalf of the Town of Carlisle, Fuss & O'Neill is submitting this Notice of Intent (NOI) under the Massachusetts Wetlands Protection Act ("MAWPA": M.G.L. c 131 § 40) and Town of Carlisle Non-Zoning Wetland Bylaw and associated regulations for the Carlisle Fire Station Additions and Alterations Project located at 66 Westford Street in Carlisle, Massachusetts. The proposed project includes the renovation of the existing Fire Station along with a building addition. Additional improvements include parking lots, sidewalks, stormwater infrastructure, utilities, and landscaping. The proposed project will occur within the 100-ft Buffer Zone of Inland Bank, which is protected under the MAWPA and Carlisle Non-Zoning Wetland Bylaw.

The enclosed NOI application package includes the WPA Form 3 along with the supporting project narrative, figures, project plans, stormwater report, and abutter notice information. This project is being submitted to MassDEP through the online eDEP portal.

If you have any questions, please feel free to contact me at (617) 379-5881 or josue.valdez@fando.com. Thank you for your consideration of this NOI and we look forward to discussing this project at the February 26, 2026 Public Hearing.

Sincerely,

Josue Valdez, PE
Senior Civil Engineer

Copy: MassDEP Division of Wetlands and Waterways Northeast Regional Office (NERO)
Meghan Sullivan, Town of Carlisle

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WPA Form 3 – Notice of Intent

FUSS & O'NEILL

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Provided by MassDEP:

MassDEP File Number

Document Transaction Number

Carlisle
City/Town

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

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

A. General Information

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

a. Street Address	b. City/Town	c. Zip Code
66 Westford Street	Carlisle	01741

Latitude and Longitude: d. Latitude: 42.52924 e. Longitude: -71.35225

f. Assessors Map/Plat Number: 21
g. Parcel /Lot Number: 0-1

2. Applicant:

a. First Name: Bryan
b. Last Name: Sorrows
c. Organization: Carlisle Fire Department
d. Street Address: 80 Westford Street P.O. Box 575
e. City/Town: Carlisle
f. State: MA
g. Zip Code: 01741
h. Phone Number: 978-369-2888
i. Fax Number:
j. Email Address: chief@carlislefdma.org

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

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

4. Representative (if any):

a. First Name: Josue
b. Last Name: Valdez
c. Company: Fuss & O'Neill
d. Street Address: 1250 Hancock Street, Suite 815N
e. City/Town: Quincy
f. State: MA
g. Zip Code: 02169
h. Phone Number: 617-379-5881
i. Fax Number:
j. Email address: Josue.valdez@fando.com

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

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

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A. General Information (continued)

6. General Project Description:

The proposed project includes the renovation of the existing Fire Station along with a building addition. Additional improvements include parking lots, sidewalks, stormwater infrastructure, utilities, and landscaping.

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

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

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

1. ☐ Yes ☒ No   If yes, describe which limited project applies to this project. (See 310 CMR 10.24 and 10.53 for a complete list and description of limited project types)

2. Limited Project Type

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

8. Property recorded at the Registry of Deeds for:

Middlesex	
a. County	b. Certificate # (if registered land)
2125	553
c. Book	d. Page Number

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

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

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

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

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

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
a. ☐ Bank	1. linear feet	2. linear feet
b. ☐ Bordering Vegetated Wetland	1. square feet	2. square feet
c. ☐ Land Under Waterbodies and Waterways	1. square feet	2. square feet
	3. cubic yards dredged	

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

2. Width of Riverfront Area (check one):

☐ 25 ft. - Designated Densely Developed Areas only

☐ 100 ft. - New agricultural projects only

☐ 200 ft. - All other projects

3. Total area of Riverfront Area on the site of the proposed project: ______ square feet

4. Proposed alteration of the Riverfront Area:

a. total square feet | b. square feet within 100 ft. | c. square feet between 100 ft. and 200 ft.

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

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

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

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

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

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

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

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

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

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

a. square feet of BVW

b. square feet of Salt Marsh

5. ☐ Project Involves Stream Crossings

a. number of new stream crossings

b. number of replacement stream crossings

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C. Other Applicable Standards and Requirements

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

Streamlined Massachusetts Endangered Species Act/Wetlands Protection Act Review

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

a. ☐ Yes ☒ No

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

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

August, 2021
b. Date of map

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

c. Submit Supplemental Information for Endangered Species Review*

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

(a) within wetland Resource Area ______________________
percentage/acreage

(b) outside Resource Area ______________________
percentage/acreage

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

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

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

(b) ☐ Photographs representative of the site

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

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

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

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

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

(d) ☐ Vegetation cover type map of site

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

(f) OR Check One of the Following

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

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

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

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

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

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

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

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

North Shore - Plymouth to New Hampshire border:

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

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

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

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

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

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

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

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

b. ACEC

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

a. ☐ Yes ☒ No

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

a. ☐ Yes ☒ No

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

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

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

2. ☒ A portion of the site constitutes redevelopment

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

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

1. ☐ Single-family house

2. ☐ Emergency road repair

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

D. Additional Information

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

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

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

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

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

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D. Additional Information (cont'd)

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

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

Carlisle Fire Department Additions and Alterations
a. Plan Title

Fuss & O'Neill
b. Prepared By

c. Signed and Stamped by

2/2/2026
d. Final Revision Date

as noted
e. Scale

USGS Topographic Map (Figure 1)
f. Additional Plan or Document Title

1/29/2025
g. Date

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

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

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

8. ☒ Attach NOI Wetland Fee Transmittal Form

9. ☒ Attach Stormwater Report, if needed.

E. Fees

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

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

2. Municipal Check Number

3. Check date

4. State Check Number

5. Check date

6. Payor name on check: First Name

7. Payor name on check: Last Name

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F. Signatures and Submittal Requirements

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

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

Bryan Sorrows — 1/30/2026

1. Signature of Applicant — 2. Date

3. Signature of Property Owner (if different) — 4. Date

1/30/2026

5. Signature of Representative (if applicable) — 6. Date

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

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

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

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

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NOI Wetland Fee Transmittal Form

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

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

A. Applicant Information

1. Location of Project:

66 Westford Street	Carlisle
a. Street Address	b. City/Town
Fee Exempt – Municipal Project	
c. Check number	d. Fee amount

2. Applicant Mailing Address:

Bryan		Sorrows	
a. First Name		b. Last Name	
Carlisle Fire Department			
c. Organization			
80 Westford Street P.O. Box 575			
d. Mailing Address			
Carlisle		MA	01741
e. City/Town		f. State	g. Zip Code
978-369-2888		chief@carlislefdma.org	
h. Phone Number	i. Fax Number	j. Email Address	

3. Property Owner (if different):

a. First Name		b. Last Name	
c. Organization			
d. Mailing Address			
e. City/Town		f. State	g. Zip Code
h. Phone Number	i. Fax Number	j. Email Address	

B. Fees

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

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

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

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

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

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

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

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

B. Fees (continued)

Step 1/Type of Activity	Step 2/Number of Activities	Step 3/Individual Activity Fee	Step 4/Subtotal Activity Fee
Fee Exempt – Municipal Project			

Step 5/Total Project Fee: ____________

Step 6/Fee Payments:

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

C. Submittal Requirements

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

Department of Environmental Protection
Box 4062
Boston, MA 02211

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

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

1 Introduction

On behalf of the Town of Carlisle, this Notice of Intent has been prepared for the Carlisle Volunteer Fire Station Renovation in Carlisle, Massachusetts. A NOI is required as the proposed project will result in alterations to the 100-foot Buffer Zone of Bordering Vegetated Wetland (BVW) and Inland Bank.

1.1 Purpose and Need

The purpose of this project is to renovate and expand the existing fire station located at 66 Westford Street in Carlisle, Massachusetts in order to provide essential operations that meet industry standards and best practices.

2 Existing Environment

2.1 Project Locus

The Project Locus, as defined in 310 CMR 10.04, includes the 54-acre Carlisle Parcel No. 21-0-1 at 66 Westford Street. This parcel is owned by the Town. Land cover primarily consists of upland forest, forested wetlands, an intermittent stream and public hiking trails. The Carlisle Fire Department is located at the southern tip of the parcel, on approximately 0.32 acres. The Town Hall and a portion of its driveway are also located at the southeastern edge of the parcel. The Project Locus is depicted on the USGS Topographic Map included as *Figure 1* in this report.

The Project Locus is bounded to the north by natural forested wetlands, to the south by Rockland Road, a private residence, and Westford Street and the east by the Carlisle Town Hall.

2.1.1 Project Site

The Project Site (i.e., limits of work; further defined in 310 CMR 10.04) consists of previously developed areas associated with the existing Carlisle Fire Department building, parking areas, and landscaped areas. There is currently no stormwater management system located in the existing site development. The Project Locus includes the 100-foot Buffer Zone to BVW and Inland Bank. The Buffer Zone is composed of existing paved parking lots and driveways, regularly mowed areas, and forested areas that surround the Fire Department. Refer to the Permitting Plans in *Appendix A* for the locations of the Project Site.

2.2 Methodology of Resource Area Investigation

Wetland resource areas were delineated by Fuss & O'Neill on July 10, 2025, in conformance with local, state, and federal regulations and guidelines including:

- Massachusetts Wetlands Protection Act ("MAWPA"; M.G.L. c. 131, § 40), its implementing regulations set forth at 310 CMR 10.00
- Massachusetts Department of Environmental Protection (MassDEP) Delineating Bordering Vegetated Wetlands Under the Massachusetts Wetlands Protection Act (September 2022)

- US Army Corps of Engineers Wetlands Delineation Manual, Technical Report Y-87-1 (January 1987)
- Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region (January 2012)
- Carlisle Non-Zoning Wetlands Bylaw

Refer to *Appendix B* for the Wetland Delineation Report.

To confirm wetland boundaries, an Abbreviated Notice of Resource Area Delineation (ANRAD) was submitted to the Carlisle Conservation Commission on January 12, 2026. The ANRAD is included in *Appendix E*.

2.3 Description of Wetland Resources Areas

The following wetland resource areas subject to jurisdiction under MAWPA and the Carlisle Non-Zoning Wetlands Bylaw were identified within the Project Site or within 100 feet of the Project Site.

- Inland Bank
- Bordering Vegetated Wetlands (BVW)
- Land Under Water Bodies and Waterways (LUWW)
- NHESP Certified Vernal Pools

2.3.1 Inland Bank

Inland Bank (Bank 1) is associated with an intermittent stream located on the eastern side of the project site. This stream flows to the north through a cross culvert and into the main portion of Wetland A, which is also mapped as a Certified Vernal Pool. Common vegetation along the Bank included native species such as red maple (*Acer rubrum*), white pine (*Pinus strobus*), lowbush blueberry (*Vaccinium angustifolium*), but also the following invasive species: multiflora rose (*Rosa multiflora*) and glossy buckthorn (*Frangula alnus*).

2.3.2 Bordering Vegetated Wetlands and Land Under Water Bodies and Waterways

One BVW (Wetland A) was identified as bordering and surrounding the Carlisle Fire Department. Wetland A can best be described as a palustrine emergent wetland (PEM) / palustrine shrub wetland (PSS). The upgradient extent of the wetland originates east of the Carlisle Fire Department parking lot in a low-lying swale that transitions to Bank 1. Common vegetation within Wetland A included sensitive fern (*Onoclea sensibilis*) and poison ivy (*Toxicodendron radicans*). Other species noted within Wetland A include glossy buckthorn (*Frangula alnus*), skunk cabbage (*Symplocarpus foetidus*), jewel weed (*Impatiens capensis*), apple (*Malus sp*.), white pine (*Pinus strobus*), red maple (*Acer rubrum*), barberry (*Berberis thunbergii*), and multiflora rose (*Rosa multiflora*). LUWW is present within the intermittent stream to the east of the project site.

2.4 Rare Species

According to the MassMapper NHESP Atlas, 15th edition, effective August 2021, the Project Site is **not** located within the limits of mapped Estimated Habitats of Rare Wildlife or Priority Habitats of Rare Species.

3 Proposed Project

The proposed project includes the renovation and expansion of the existing Fire Station along with a building addition. Additional improvements include parking lots, sidewalks, stormwater infrastructure, utilities, and landscaping.

3.1 Construction Period Protective Measures

3.1.1 New Carlisle Fire Department

The existing fire station building and apparatus bays will be renovated. A building addition is also proposed consisting of two new apparatus bays, lobby, bunk rooms, day room, training room, and other fire response spaces. The proposed Carlisle Fire Department will provide the town of Carlisle with a new state-of-the-art, modern Fire Facility that meets program and operational needs, allows for future growth and helps cultivate lasting community relationships. Refer to *Appendix A* for a project overview and renderings.

3.1.1.1 Associated Infrastructure

In addition to the new building, the project also includes the construction of the associated parking lots, sidewalks, stormwater infrastructure, utilities, and landscaping. The project will result in creating 33 new parking spaces at the fire station, including electric vehicle charging parking spaces. Fencing, retaining walls, and timber guard rails will be constructed along the northwestern and northeastern side of the property. In addition to the site improvements mentioned above, the project also includes a new stormwater management system and utility services. The improvements are shown in more detail on the Permitting Plans included as *Appendix A*.

3.1.1.2 Stormwater Management

The proposed Stormwater Management System is a significant improvement over existing conditions. Currently, there is no stormwater management system on the property so untreated stormwater flows directly into adjacent wetland areas and onto Rockland Road. The Stormwater Management system consists of five (5) deep sump catch basins which surround the proposed fire station, two (2) water quality units, and two (2) subsurface infiltration systems. Prior to the proposed project, there are no known BMP's on site. As a result, stormwater management for the proposed project will greatly improve. In total, there are five (5) deep sump catch basins surrounding the proposed fire station. The subsurface infiltration systems are located under the driveway to the west and east of the proposed fire station. Finally, the water quality units convey all of the stormwater runoff prior to discharging into the subsurface infiltration system.

Through these BMPs, reduction in stormwater peak discharge and stormwater treatment are achieved. The proposed BMPs have been sized to accommodate the 100-year design storm without overtopping. The new Stormwater management System significantly improves water quality of runoff on site when compared to existing conditions.

Additional information, including description and supporting calculations for the design of the stormwater system are further detailed in the Permitting Plans included as *Appendix A* and the Stormwater Report in *Appendix C.*

3.2 Construction Sequence

A detailed construction sequence is shown on the Permitting Plans included in *Appendix A.* This construction sequence is subject to change based on construction methods, weather, or due to other unforeseen circumstances. Any changes to the sequence of construction shall be addressed in the Stormwater Pollution Prevention Plan (SWPPP). This is prepared as required under the Environmental Protection Agency (EPA) National Pollutant Discharge Eliminate System (NPDES) General Permit for Discharge from Construction Activities.

3.3 Post Construction Restoration

As the 100-ft Buffer Zone within the Project area is already significantly disturbed, post-construction restoration will be limited. Landscaping will include topsoil and seed, a conservation seed mix and the planting of shrubs and shade trees. The landscaping plan and additional information is further detailed in the permitting plans included in *Appendix A*.

3.4 Soil Erosion and Sedimentation Control

As described in the Stormwater Report in *Appendix C*, soil erosion and sedimentation control details and narratives for construction periods are provided on the site plans. Soil erosion and sedimentation control details and procedures are consistent with the "Massachusetts Erosion and Sediment Control Guideline for Urban and Suburban Areas."

Construction period erosion and sedimentation controls will include a construction entrance, two (2) soil stockpile areas, a staging/layout area, compost filter socks, silt fence, catch basin inlet protection, and erosion control blankets. Additional erosion and sediment controls will be utilized as required. Perimeter sediment controls will be placed down-gradient of disturbed areas. Water will be applied to exposed soils to provide dust control as needed.

Soil disturbance, stabilization measures, stockpile locations, construction waste management procedures, and hazardous materials storage procedures shall be recorded and maintained as part of the Stormwater Pollution Prevention Plan (SWPPP). This is prepared as required under the EPA NPDES General Permit for Discharge from Construction Activities.

Waste materials generated from construction activities will include excavated soil, trees, brush, stumps, pavement, building debris, and utilities. All excavation debris and other waste will be transported to an approved disposal facility. If required, materials may be temporarily stockpiled within designated staging areas. Details and procedures are provided on the site plans and are included in the SWPPP.

Construction materials, including site and building materials, will be present on-site during various stages of construction. All materials will be temporarily stored within designated staging or lay-down areas and will be transported to the site as needed. Construction vehicle fueling will take place on site. Staging areas will be located within the limit of work, and drip lines of existing trees to remain.

4 Avoidance and Minimization Measures

Table 4-1 below describes measures included in the design to avoid and minimize impacts to wetland resource areas and Buffer Zone.

Table 4-1 Avoidance and Minimization Measures

Avoidance Measures	Description
Maintain work outside of Bank, BVW, and LUWW.	No work is proposed within Bank, BVW, or LUWW, which was delineated within the vicinity of the proposed project.
Design for no increase in impervious area wetland resource areas and Buffer Zone.	The project does not result in an increase in impervious area within Bank, BVW, or LUWW. The project will require an increase of 16,210 sq. ft. of impervious surface area within the Buffer Zone. Construction will be occurring within previously disturbed areas and impacts have been reduced to the maximum extent practicable.
Minimization Measures	**Description**
Perform work within existing developed footprint to the maximum extent practicable.	Redevelopment was prioritized within portions of existing asphalt parking areas.
Minimize limits of work.	Limit area of disturbance only to areas necessary for construction and access.
Design limits of work to remain outside of the 100-foot Buffer Zone to the maximum extent practicable.	Most construction activities will occur within the previously disturbed 100-ft Buffer Zone, as Wetland A and Bank 1 surround the Project Site on the north, east, and west sides. Impacts to the 100-ft Buffer Zone will be reduced to the maximum extent practicable.
Minimize tree removal in Buffer Zone and BLSF to maximum extent practicable.	Tree removal is only proposed where necessary for grading and construction. Where possible, trees are preserved.
Design stormwater management system in compliance with the MA Stormwater Handbook.	The proposed Project conforms with Standard 1, 4, 5, 6, 7, 8, 9 and 10 of the Massachusetts Stormwater handbook Standards. Standard 3 was not met due to the subsurface soil conditions. The proposed Project exceeds

Table 4-1 Avoidance and Minimization Measures

	Standard 2 in that peak run-off rates will decrease when compared to pre-development conditions during the 2-, 10-, 25-, and 100-year storm events. TSS removal efficiency will increase from 80% to 97%. Refer to the Stormwater Report in *Appendix C* for descriptions of how the project complies with the stormwater standards.
Design stormwater system to reduce erosion especially within areas of steep slopes.	Stormwater best management practices (BMPs) have been implemented to mitigate increases in peak runoff rates and provide stormwater treatment.
Implement erosion and sediment control plan.	A comprehensive erosion and sediment control plan is proposed and shown on page CE1.01 in the Permitting Plans in *Appendix A* . Refer to *Section 3.4* above for additional information.

5 Impacts and Regulatory Compliance

5.1 Impacts

The proposed project will result in impacts to the 100-foot Buffer Zone. No impacts are anticipated to Bank, BVW, LUWW, or Riverfront Area. If required by the Conservation Commission, trees proposed for removal within the 100-foot Buffer Zone will be surveyed. However, the Applicant respectfully requests a wavier from this requirement as mitigation plantings have been designed to maximize planting areas available within the constrained site, while also maintaining site aesthetics. Impacts have been avoided and minimized to the maximum extent practicable as described in *Table 4-1* of this NOI.

5.2 Buffer Zone

53,000 sf of impacts to Buffer Zone result from the additions and alterations to the Carlisle fire station, including the renovated building, the asphalt pavement driveway that surrounds the fire station, new parking spots, and the installation of a fence, timber guard rail and retaining wall at the west/northwest and northeast corner of the Project area. Impacts have been avoided and minimized to the maximum extent practicable as described in *Table 4-1* of this NOI.

5.3 Local Wetland Bylaw

A portion of the proposed activities will occur within a resource area or other area (i.e., Buffer Zone) subject to jurisdiction under the Carlisle Non-Zoning Wetland Bylaw. The Buffer Zone impacts are described in *Section 5* of this NOI. Section 5.1 specifies criteria where proposed work may be allowed. The section below states the criteria in italics font.

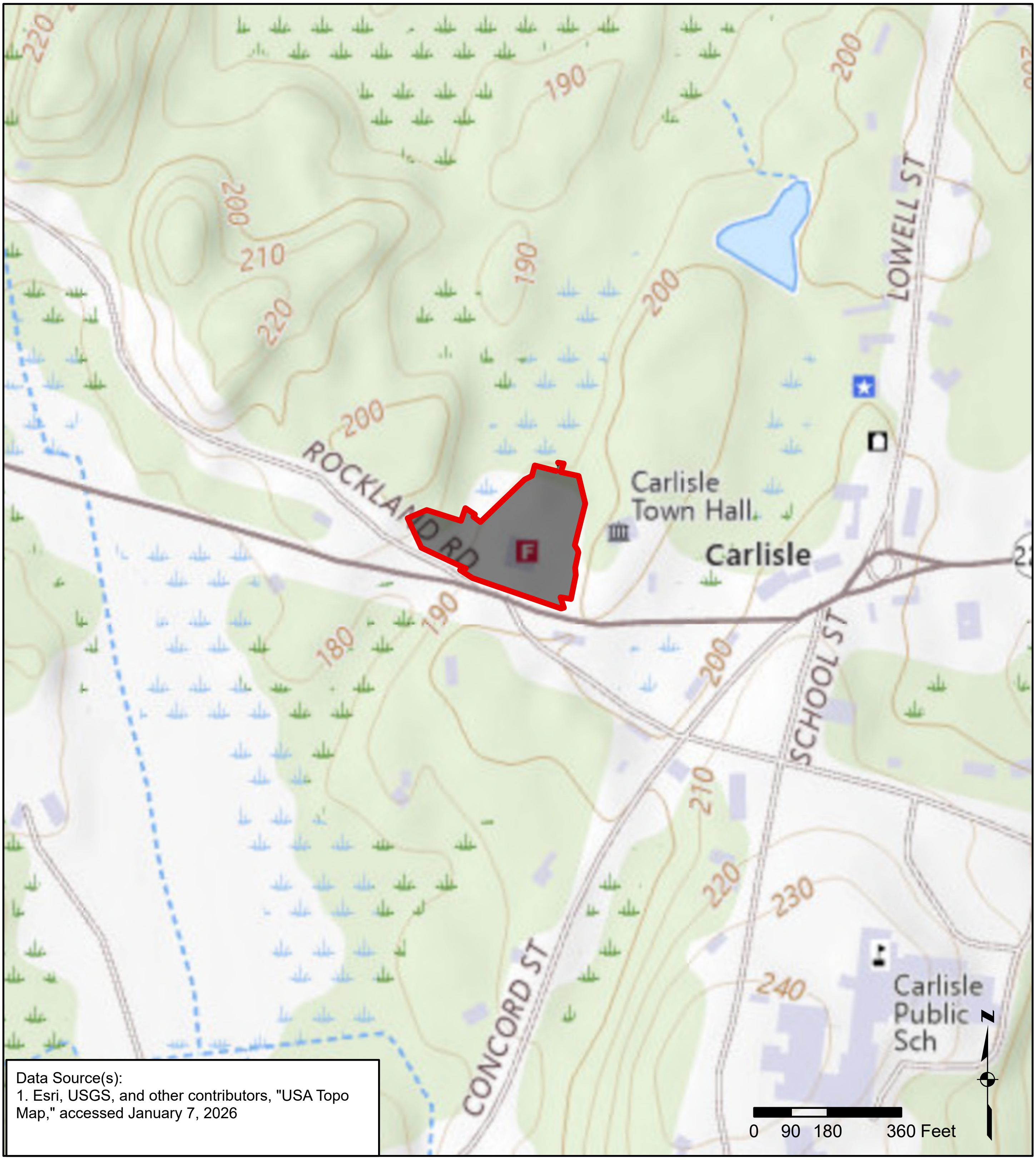
The provisions of this Bylaw shall not apply to work performed in the course of maintaining, repairing or replacing but not substantially changing or enlarging, an existing and lawfully located structure or facility used in the service of the public and used to provide electric, gas, water, telephone, telegraph and other telecommunication services.

While there are no performance standards under the Carlisle Non-Zoning Wetland Bylaw, impacts to the 100 ft-Buffer Zone have been minimized to the maximum extent practicable as described in *Table 4-1* of this NOI.

5.4 Abutter Notification

In accordance with the MAWPA and Carlisle Non-Zoning Wetland Bylaw, 100-foot abutters will be notified via certified mail at least seven (7) days prior to the Public Hearing. Refer to *Appendix D* for the certified list of abutters and a copy of the abutter notification.

Figures



Data Source(s):
1. Esri, USGS, and other contributors, "USA Topo Map," accessed January 7, 2026

Limits of Work

Disclaimer: This map is not the product of a Professional Land Survey. It was created by Fuss & O'Neill, Inc. for general reference, informational, planning and guidance use, and is not a legally authoritative source as to location of natural or manmade features. Proper interpretation of this map may require the assistance of appropriate professional services. Fuss & O'Neill, Inc. makes no warrantee, express or implied, related to the spatial accuracy, reliability, completeness, or currentness of this map.

USGS Topographic Map

66 Westford Street

Carlisle Massachusetts

FUSS & O'NEILL
146 Hartford Road
Manchester, CT 06040
860.646.2469 | www.fando.com

Figure
1

Path: K:\P2025\0003\A10\Carlisle.aprx Layout Name: FandO_8.5x11_Portrait_Bottom Map Name: Main Data Frame Map Frame
Date Exported: 1/29/2026 2:54 PM User: David.Goldstein Date Saved: 1/29/2026 2:53 PM

Appendix A

Permitting Plans

CARLISLE FIRE DEPARTMENT ADDITIONS & ALTERATIONS

66 WESTFORD STREET · CARLISLE · MASSACHUSETTS

PERMITTING PLAN SET

FEBRUARY 02, 2026

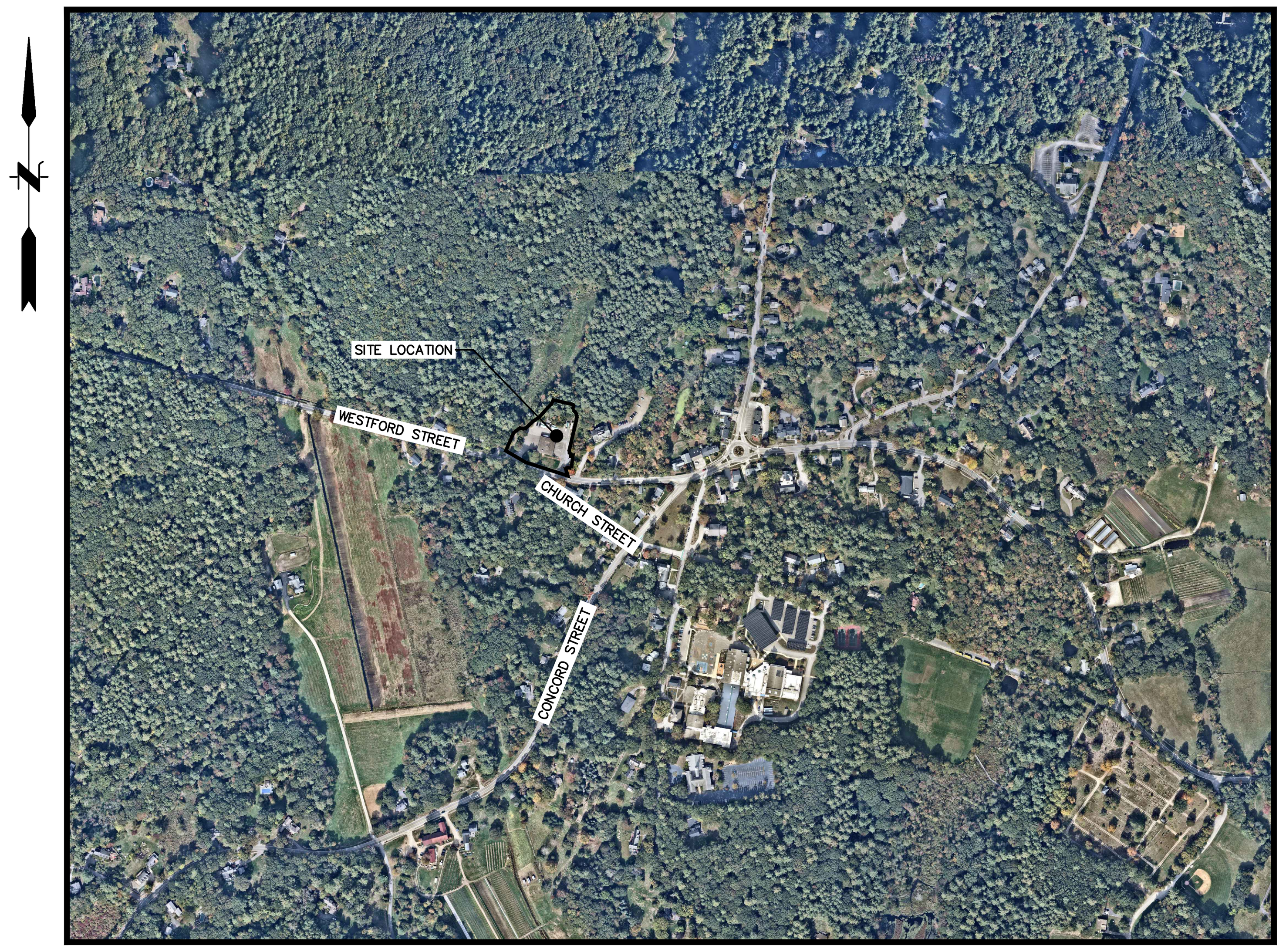
PROJECT TEAM

SURVEYOR:
CONTROL POINT ASSOCIATES, INC.
352 TURNPIKE ROAD
SOUTHBOROUGH, MA 01772
508.948.3000

ARCHITECT:
TECTON ARCHITECTS
34 SEQUASSEN STREET, SUITE 200
HARTFORD, MA 06106
860.548.0802

SHEET INDEX

N



LOCATION MAP
SCALE: 1" = 500'

PREPARED BY

FUSS & O'NEILL
1250 HANCOCK STREET, SUITE 815N
QUINCY, MA 02169
617.282.4675
www.fando.com

COMMONWEALTH OF MASSACHUSETTS
SCOTT D. TURNER
CIVIL
No. 41775
REGISTERED
PROFESSIONAL ENGINEER
2/2/26

PREPARED FOR

TOWN OF CARLISLE
66 WESTFORD STREET
CARLISLE, MA 01741

PROJ. No.: 20250003.A10
DATE: 02/02/2026

GI0.01

File: \\private\DFS\CadProj\DWG\P2025\0003\A10\Civil\Plan\20250003.A10_COV01.dwg Layout: COV Plotted: 2026-01-31 7:48 PM Saved: 2026-01-31 6:50 PM User: kevin.thimotee

12/12/2025 10:44:38 AM Autodesk Docs://CARL01AR - Carlisle Fire Station/CARL01AR_ARCH.rvt

Tecton
ARCHITECTS

FUSS & O'NEILL
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QUINCY, MA 02169
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Client/ Contractor

TOWN OF CARLISLE

66 WESTFORD STREET
CARLISLE, MASSACHUSETTS

Project

CARLISLE FIRE DEPARTMENT ADDITIONS & ALTERATIONS

80 WESTFORD STREET
CARLISLE, MA 01741

SCOTT D. TURNER CIVIL No. 41775

2/2/26

GRAPHIC SCALE
100 50 0 100
1" = 100'

Seals

PERMITTING SET
NOT FOR CONSTRUCTION

Issues / Revisions

No.	Date	Description
1	01/12/2026	ANR/ADI
2	02/02/2026	PERMITTING SET

Drawing Title

INDEX PLAN

Project Manager: JD	Project No: 20250003.A10
Project Architect:	Production Leader:
Project Designer: KT	Peer Reviewer:

Drawing Number

GI1.00

MAP REFERENCE

1. EXISTING CONDITIONS DEPICTED ON THIS PLAN ARE BASED ON A PLAN ENTITLED: "BOUNDARY, TOPOGRAPHIC & UTILITY SURVEY" DATED 01/21/2026 PREPARED BY CONTROL POINT ASSOCIATES, INC.
2. TOPOGRAPHIC ELEVATIONS ARE BASED ON NAV88 DATUM.
3. GEOTECHNICAL DATA INCLUDING TEST PIT AND BORING LOCATIONS AND ELEVATIONS WERE OBTAINED FROM O'REILLY, TALBOT & OKUN ENGINEERING ASSOCIATES'S GEOTECHNICAL REPORT DATED 8/19/2025.
4. WETLANDS WERE DELINEATED BY FUSS & O'NEILL, INC. ON JULY 11, 2025.
5. THE SITE IS OUTSIDE OF THE 0.2% ANNUAL CHANCE FLOOD BASED ON "FIRM, FLOOD RATE MAP, TOWN OF CARLISLE, MASSACHUSETTS, MIDDLESEX COUNTY," MAP NUMBER 25017C0263F, EFFECTIVE DATE 7/7/2014.

GENERAL NOTES

1. SYMBOLS AND LEGENDS OF PROJECT FEATURES ARE GRAPHIC REPRESENTATIONS AND ARE NOT NECESSARILY SHOWN ON THE DRAWINGS TO SCALE OR TO THEIR ACTUAL DIMENSION OR LOCATION. COORDINATE DETAIL SHEET DIMENSIONS, MANUFACTURERS' LITERATURE, SHOP DRAWINGS AND FIELD MEASUREMENTS OF SUPPLIED PRODUCTS FOR LAYOUT OF THE PROJECT FEATURES.
2. DO NOT RELY SOLELY ON ELECTRONIC VERSIONS OF DRAWINGS, SPECIFICATIONS, AND DATA FILES THAT ARE PROVIDED BY THE ENGINEER. FIELD VERIFY LOCATION OF PROJECT FEATURES.
3. PERFORM NECESSARY CONSTRUCTION NOTIFICATIONS, APPLY FOR AND OBTAIN NECESSARY PERMITS, PAY FEES, AND POST BONDS ASSOCIATED WITH THE WORK AS REQUIRED BY THE CONTRACT DOCUMENTS.
4. LOCATION OF UTILITIES SHOWN HEREON ARE THE RESULT OF SURFACE EVIDENCE AS LOCATED BY FIELD SURVEY, PLANS OF RECORD, INFORMATION FURNISHED BY THE RESPECTIVE UTILITY COMPANIES, AND OTHER AVAILABLE SOURCES. THIS PLAN DOES NOT NECESSARILY DEPICT THE EXACT LOCATION OF ALL UTILITIES WHICH MAY EXIST AT THIS TIME WITHIN THE PREMISES SURVEYED. LOCATIONS SHOULD BE VERIFIED BY THE RESPECTIVE UTILITY COMPANY BEFORE BEING RELIED UPON. ALL FIELD CHANGES MUST BE APPROVED BY THE ENGINEER.
   - 4.1. LOCATION AND INVERTS OF EXISTING UTILITIES SHALL BE VERIFIED WITH THE ENGINEER PRIOR TO CONSTRUCTION. ALL FIELD CHANGES MUST BE APPROVED BY THE ENGINEER.
   - 4.2. FUSS & O'NEILL MAKES NO GUARANTEES THAT THE UNDERGROUND UTILITIES SHOWN COMPRISE ALL SUCH UTILITIES IN THE AREA. FUSS & O'NEILL FURTHER DOES NOT WARRANT THAT THE UNDERGROUND UTILITIES SHOWN ARE IN THE EXACT LOCATION INDICATED. FUSS & O'NEILL HAS NOT PHYSICALLY LOCATED THE UNDERGROUND UTILITIES. BEFORE CONSTRUCTION, CALL DIG SAFE SYSTEMS FOR CLEARANCE.

REGULATORY REQUIREMENTS

1. AN APPROVED SET OF PLANS SHALL BE KEPT ON SITE AT ALL TIMES.
2. WITHIN LOCAL RIGHTS-OF-WAY, PERFORM THE WORK IN ACCORDANCE WITH LOCAL MUNICIPAL STANDARDS.
3. WITHIN STATE RIGHTS-OF-WAY, PERFORM THE WORK IN ACCORDANCE WITH THE MASS DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS.
4. BE RESPONSIBLE FOR SITE SECURITY AND JOB SAFETY. PERFORM CONSTRUCTION ACTIVITIES IN ACCORDANCE WITH OSHA STANDARDS AND LOCAL REQUIREMENTS.
5. DISPOSE OF DEMOLITION DEBRIS IN ACCORDANCE WITH APPLICABLE FEDERAL, STATE AND LOCAL REGULATIONS, ORDINANCES AND STATUTES.
6. THIS PROJECT DISTURBS MORE THAN ONE ACRE OF LAND OR IS A PHASE OF A LARGER PROJECT THAT DISTURBS MORE THAN AN ACRE AND REQUIRES THE COMPLETION OF A STORMWATER POLLUTION PREVENTION PLAN (SWPPP) AND THE FILING OF A CONSTRUCTION GENERAL PERMIT (CGP). THE SWPPP SHALL REMAIN ON SITE AT ALL TIMES. PRIOR TO THE START OF CONSTRUCTION, SUBMIT A NOTICE OF INTENT TO OBTAIN COVERAGE UNDER THE CGP.
7. NOTIFY TOWN OF CARLISLE PLANNING BOARD AND CONSERVATION COMMISSION IN WRITING A MINIMUM OF 72 HOURS PRIOR TO CONSTRUCTION.
8. ALLOW AGENTS OR MEMBERS REPRESENTING THE TOWN OF CARLISLE OR OTHER LOCAL, STATE, OR FEDERAL AUTHORITIES TO ENTER AND INSPECT THE SITE.
9. NOTIFY THE ENGINEER A MINIMUM OF ONE WEEK PRIOR TO THE START OF CONSTRUCTION OF STORMWATER BMPs.
   - 9.1. STORMWATER BMPS MUST BE INSPECTED BY THE ENGINEER DURING CONSTRUCTION. SCHEDULE THE WORK IN A MANNER THAT ALLOWS THE ENGINEER TO INSPECT THE CONSTRUCTION OF THE STORMWATER BMPs.
   - 9.2. RE-WORK REQUIRED AS A RESULT OF A FAILURE TO NOTIFY THE ENGINEER OF BMP INSTALLATION SHALL BE DONE AT NO COST TO THE OWNER.

EARTHWORK

1. CALL DIG-SAFE 811 OR 1-888-DIG-SAFE A MINIMUM OF 72 HOURS PRIOR TO CONSTRUCTION.
2. STOP WORK IN THE VICINITY OF SUSPECTED CONTAMINATED SOIL, GROUNDWATER OR OTHER MEDIA. IMMEDIATELY NOTIFY THE OWNER SO THAT APPROPRIATE TESTING AND SUBSEQUENT ACTION CAN BE TAKEN. RESUME WORK IN THE IMMEDIATE VICINITY ONLY UPON DIRECTION BY THE OWNER.
3. WITHIN THE LIMITS OF THE BUILDING FOOTPRINT, PERFORM EARTHWORK OPERATIONS TO SUBGRADE ELEVATIONS. SEE DRAWINGS BY OTHERS FOR WORK ABOVE SUBGRADE.
4. PROTECT ALL SLOPES, VEGETATION, PAVING, WALKS, AND IMPROVEMENTS OUTSIDE THE AREAS TO BE AFFECTED BY THE CONSTRUCTION OF THIS PROJECT.
5. CATCH BASINS WITHIN THE WORK AREA OR DOWN STREAM OF DRAINAGE FLOW SHALL BE PROTECTED WITH CATCH BASIN SILT SACKS.
6. WATER AND CALCIUM CHLORIDE MUST BE AVAILABLE AT ALL TIMES FOR DUST CONTROL.

DEMOLITION

1. REMOVE AND DISPOSE OF EXISTING UTILITIES, FOUNDATIONS AND UNSUITABLE MATERIAL BENEATH AND FOR A DISTANCE OF 10 FEET BEYOND THE PROPOSED BUILDING FOOTPRINT INCLUDING EXTERIOR COLUMNS, UNLESS OTHERWISE NOTED.
2. THE DEMOLITION PLAN IS PROVIDED FOR INFORMATION ONLY AND MAY NOT INDICATE ALL ITEMS REQUIRED TO BE DEMOLISHED. PERFORM A PRE-BID SITE INSPECTION. COORDINATE DEMOLITION OF UNIDENTIFIED UTILITIES OR STRUCTURES WITH OWNER. DEMOLISH STRUCTURES, SITE IMPROVEMENTS, UTILITIES, ETC. AS REQUIRED TO CONSTRUCT PROPOSED FACILITY AND UTILITY SERVICES.
3. TREES, BRUSH AND STUMPS REMOVED BY CLEARING & GRUBBING OPERATIONS SHALL BE TRANSPORTED OFF THE PROJECT SITE TO AN APPROVED DISPOSAL LOCATION.
4. ITEMS TO BE STOCKPILED ON-SITE FOR REUSE OR TO BE RELOCATED SHALL BE PROTECTED FROM CONSTRUCTION OPERATIONS. IF DAMAGED DURING CONSTRUCTION THEY SHALL BE REPLACED IN-KIND AT NO ADDITIONAL COST TO THE OWNER.

WORK RESTRICTIONS

1. DO NOT CLOSE OR OBSTRUCT ROADWAYS, SIDEWALKS, FIRE HYDRANTS, AND UTILITIES WITHOUT APPROPRIATE PERMITS.
2. WORK IS RESTRICTED TO THE HOURS OF 7:00 AM TO 5:00 PM, MONDAY THROUGH FRIDAY EXCLUDING HOLIDAYS UNLESS OTHERWISE APPROVED BY THE OWNER AND THE TOWN OF CARLISLE.

CONSTRUCTION LAYOUT

1. PROVIDE PROPER TRANSITIONS BETWEEN EXISTING AND PROPOSED SITE IMPROVEMENTS. FIELD VERIFY EXISTING PAVEMENT AND GROUND ELEVATIONS AT THE INTERFACE WITH PROPOSED PAVEMENTS AND DRAINAGE STRUCTURES BEFORE START OF CONSTRUCTION.
2. PRIOR TO ORDERING MATERIALS AND BEGINNING CONSTRUCTION, FIELD VERIFY PROPOSED UTILITY ROUTES AND IDENTIFY ANY INTERFERENCES OR OBSTRUCTIONS WITH EXISTING UTILITIES OR PUBLIC RIGHTS-OF-WAY.
3. DIMENSIONS ARE FROM FACE OF CURB, FACE OF BUILDING, FACE OF WALL, AND CENTER LINE OF PAVEMENT MARKINGS, UNLESS NOTED OTHERWISE.
4. BOUNDS OR MONUMENTATION DISTURBED DURING CONSTRUCTION SHALL BE SET OR RESET BY A PROFESSIONAL LICENSED SURVEYOR.
5. BE RESPONSIBLE FOR THE MAINTENANCE AND SAFETY OF TRAFFIC ON THE PUBLIC AND PRIVATE WAYS AFFECTED BY THE CONSTRUCTION OF THIS PROJECT.
6. CONSTRUCT ACCESSIBLE ROUTES, PARKING SPACES, RAMPS, SIDEWALKS AND WALKWAYS IN CONFORMANCE WITH THE FEDERAL AMERICANS WITH DISABILITIES ACT AND WITH MASSACHUSETTS ARCHITECTURAL ACCESS BOARD AND LOCAL LAWS AND REGULATIONS (WHICHEVER ARE MORE STRINGENT).

SITE RESTORATION

1. REPAIR DAMAGES RESULTING FROM CONSTRUCTION LOADS, AT NO ADDITIONAL COST TO OWNER.
2. RESTORE AREAS DISTURBED BY CONSTRUCTION OPERATIONS OUTSIDE OF THE WORK AREA TO THEIR ORIGINAL CONDITION OR BETTER, AT NO ADDITIONAL COST TO OWNER.

UTILITIES

1. TERMINATE EXISTING UTILITIES IN CONFORMANCE WITH LOCAL, STATE AND INDIVIDUAL UTILITY COMPANY STANDARD SPECIFICATIONS AND DETAILS. COORDINATE UTILITY SERVICE DISCONNECTS WITH UTILITY REPRESENTATIVES.
2. THE TYPE, SIZE AND LOCATION OF DEPICTED UNDERGROUND UTILITIES ARE APPROXIMATE REPRESENTATIONS OF INFORMATION OBTAINED FROM FIELD LOCATIONS OF VISIBLE FEATURES, EXISTING MAPS AND PLANS OF RECORD, UTILITY MAPPING, AND OTHER SOURCES OF INFORMATION OBTAINED BY THE ENGINEER. ASSUME NO GUARANTEE AS TO THE COMPLETENESS, SERVICEABILITY, EXISTENCE, OR ACCURACY OF UNDERGROUND FACILITIES. FIELD VERIFY THE EXACT LOCATIONS, SIZES, AND ELEVATIONS OF THE POINTS OF CONNECTIONS TO EXISTING UTILITIES.
3. IMMEDIATELY INFORM THE ENGINEER IN WRITING IF EXISTING UTILITY CONDITIONS CONFLICT OR DIFFER FROM THAT INDICATED AND IF THE WORK CANNOT BE COMPLETED AS INDICATED.
4. PAY ALL FEES AND COSTS ASSOCIATED WITH UTILITY MODIFICATIONS AND CONNECTIONS, REGARDLESS OF THE ENTITY THAT PERFORMS THE WORK.
5. COORDINATE THE WORK AND WORK SCHEDULE WITH UTILITY COMPANIES. PROVIDE ADEQUATE NOTICE TO UTILITIES TO PREVENT DELAYS IN CONSTRUCTION.
6. INSTALL PROPOSED PRIVATE UTILITY SERVICES ACCORDING TO THE REQUIREMENTS PROVIDED BY, AND APPROVED BY THE AUTHORITY HAVING JURISDICTION (WATER, SEWER, GAS, TELEPHONE, ELECTRIC, FIRE ALARM, ETC.). COORDINATE FINAL DESIGN LOADS AND LOCATIONS WITH OWNER AND ARCHITECT.
7. COORDINATE WITH UTILITY COMPANIES FOR THE REMOVAL/RELOCATION OF OVERHEAD WIRE AND POLES.
8. THE PLUMBING CONTRACTOR IS RESPONSIBLE FOR INSTALLATION OF DRAINAGE AND UTILITIES WITHIN 10 FEET OF BUILDING FOOTPRINT.
9. NOTIFY ABUTTING PROPERTY OWNERS AND THE TOWN OF CARLISLE A MINIMUM OF 5 BUSINESS DAYS PRIOR TO DISRUPTION OF UTILITY SERVICE.
10. ALL WATER SERVICE AND SEWER SERVICE WORK SHALL BE COORDINATED WITH THE TOWN OF CARLISLE BOARD OF HEALTH.

EROSION AND SEDIMENT CONTROL

1. DISTURBANCE OF SOIL SURFACES IS REGULATED BY STATE LAW AND LOCAL ORDINANCE. WORK SHALL COMPLY WITH THE FOLLOWING CRITERIA TO PREVENT OR MINIMIZE SOIL EROSION.
2. PRIOR TO THE COMMENCEMENT OF CONSTRUCTION ACTIVITIES, INSTALL EROSION AND SEDIMENT CONTROL DEVICES AS SHOWN ON THE PLAN. MAINTAIN EROSION CONTROL DEVICES IN EFFECTIVE CONDITION DURING CONSTRUCTION.
3. INSTALL, INSPECT, MAINTAIN, AND/OR REPLACE TEMPORARY AND PERMANENT EROSION CONTROL DEVICES TO ENSURE PROPER OPERATION IN A TIMELY MANNER THROUGHOUT THE LIFE OF THE PROJECT. MAINTAIN PERMANENT MEASURES UNTIL CONSTRUCTION OF THE PROJECT IS COMPLETED OR UNTIL IT IS ACCEPTED BY THE OWNER. DISPOSE OF SEDIMENT IN AN UPLAND AREA.
   - 3.1. STABILIZE DISTURBED AREAS WITHIN 30 FEET OF RESOURCE AREAS WITHIN 7 DAYS OF ACHIEVING FINAL GRADES. AREAS THAT HAVE NOT ACHIEVED FINAL GRADES BUT WILL REMAIN INACTIVE FOR 7 DAYS SHALL BE TEMPORARY STABILIZED.
4. INSPECT EROSION AND SEDIMENT CONTROLS DAILY AND REMOVE ACCUMULATED SEDIMENTS AS NEEDED. REPAIR OR CORRECT ANY ISSUES, AND NOTIFY THE CONSERVATION COMMISSION IMMEDIATELY.
5. MAINTAIN A STOCKPILE OF ADDITIONAL EROSION AND SEDIMENT CONTROL DEVICES ON SITE AT ALL TIMES. AT A MINIMUM, MAINTAIN A STOCKPILE OF AT LEAST 100 FEET OR 10% OF THE TOTAL AMOUNT OF DEVICES CURRENTLY DEPLOYED AT THE SITE, WHICHEVER IS GREATER.
6. CLEAN ROADS, CONTROL DUST, AND TAKE NECESSARY MEASURES TO ENSURE THAT THE SITE AND ALL ROADS BE MAINTAINED IN A MUD- AND DUST-FREE CONDITION AT ALL TIMES THROUGHOUT THE LIFE OF THE CONTRACT. DUST CONTROL SHALL INCLUDE, BUT IS NOT LIMITED TO, WATER AND/OR CRUSHED STONE OR COARSE GRAVEL, SUBJECT TO THE APPROVAL OF THE ENGINEER.
7. VEHICLE TRAFFIC ENTERING OR EXITING THE PROJECT SITE SHALL PASS OVER CONSTRUCTION ENTRANCE(S). MAINTAIN THE CONSTRUCTION ENTRANCE(S) IN A CONDITION THAT WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO THE SURROUNDING ROADWAYS. THIS WILL REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE OR ADDITIONAL LENGTH AS CONDITIONS DEMAND AND REPAIR AND/OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT. ALL SEDIMENT SPILLED, DROPPED, WASHED, OR TRACKED ONTO THE SURROUNDING ROADWAYS MUST BE REMOVED IMMEDIATELY.
8. INSTALL PERIMETER SEDIMENT CONTROL BARRIERS AS SHOWN ON THE SITE PLANS OR AS MAY BE REQUIRED TO PREVENT SEDIMENT FLOW TO STORM DRAINS OR SURFACE WATERS. A ROW OF STAKED HAYBALES OR A SILT FENCE SHALL ALSO BE INSTALLED AROUND ANY SOIL STOCKPILE AREAS. CLEANOUT OF ACCUMATED SEDIMENT BEHIND PERIMETER SEDIMENT CONTROL BARRIER IS NECESSARY IF ONE-HALF THE ORIGINAL HEIGHT OF THE BARRIER BECOMES FILLED WITH SEDIMENT. REPLACE BARRIER IMMEDIATELY IF BARRIER DECOMPOSED OR BECOMES INEFFECTIVE.
9. PERFORM CONSTRUCTION SEQUENCING IN SUCH A MANNER TO CONTROL EROSION AND TO MINIMIZE THE TIME THAT EARTH MATERIALS ARE EXPOSED BEFORE THEY ARE COVERED, SEEDED, OR OTHERWISE STABILIZED.
10. IF FINAL GRADING IS TO BE DELAYED FOR MORE THAN THIRTY (30) DAYS AFTER LAND DISTURBANCES CEASE, TEMPORARY VEGETATION OR MULCH SHALL BE USED TO STABILIZE SOILS. OUTSIDE OF THE GROWING SEASON, ONLY WOOD MULCH SHALL BE USED.
11. PERMANENT VEGETATIVE COVER SHALL BE APPLIED TO ALL DISTURBED AREAS THAT HAVE REACHED FINISHED GRADE AS SOON AS POSSIBLE, BUT NOT MORE THAN FOURTEEN (14) DAYS AFTER THE CONSTRUCTION ACTIVITY IN THAT AREA HAS PERMANENTLY CEASED. THE RECOMMENDED PERMANENT SEEDING DATES ARE APRIL 1 TO JUNE 15 AND AUGUST 15 TO SEPTEMBER 30.

    LIMESTONE AND FERTILIZER SHALL BE APPLIED ACCORDING TO SOIL TEST RECOMMENDATIONS OFFERED BY THE UNIVERSITY OF MASSACHUSETTS SOIL TESTING LABORATORY. IF SOIL TESTING IS NOT FEASIBLE ON SMALL OR VARIABLE SITES, OR WHERE TIMING IS CRITICAL, FERTILIZER MAY BE APPLIED AT THE RATE OF 500 POUNDS PER ACRE OR 11.5 POUNDS PER 1,000 SQUARE FEET OF 10-20-20 OR EQUIVALENT. APPLY LIMESTONE (EQUIVALENT TO 50 PERCENT CALCIUM PLUS MAGNESIUM OXIDE) AS FOLLOWS: 4 TONS PER ACRE (OR 180 POUNDS PER 1,000 SQUARE FEET) FOR CLAY, CLAY LOAM AND HIGH ORGANIC SOIL; 3 TONS PER ACRE (OR 135 POUNDS PER 1,000 SQUARE FEET) FOR SANDY LOAM, LOAM, OR SILT LOAM; AND 2 TONS PER ACRE (OR 90 POUNDS PER 1,000 SQUARE FEET) LOAMY SAND OR SAND.

12. EXISTING OR PROPOSED STORMWATER DRAINAGE STRUCTURES THAT MAY BE SUBJECT TO SEDIMENTATION SHALL BE PROTECTED WITH STAKED HAYBALES, SILT FENCE, SILT SACKS, OR OTHER APPROVED MEASURES THROUGHOUT THE ENTIRE CONSTRUCTION PERIOD.
13. WASTE DISPOSAL: MATERIALS WHICH COULD BE A POTENTIAL SOURCE OF STORMWATER POLLUTION SUCH AS GASOLINE, DIESEL FUEL, HYDRAULIC OIL, ETC., SHALL BE STORED AT THE END OF EACH DAY IN A STORAGE TRAILER OR COVERED LOCATION AND TAKEN OFF-SITE AND PROPERLY DISPOSED OF. ALL TYPES OF WASTE GENERATED AT THIS SITE SHALL BE DISPOSED OF IN A MANNER CONSISTENT WITH STATE LAW AND/OR REGULATIONS.
14. CONTROL OF ALLOWABLE NON-STORMWATER DISCHARGES: IF ALLOWABLE NON-STORM WATER DISCHARGES ARE OCCURRING AT THE SITE, SUCH DISCHARGES SHALL BE VISUALLY OBSERVED AND RECORDED. THE LIST OF EXPECTED SOURCES OF ALLOWABLE NON-STORM WATER DISCHARGES FOR THIS PROJECT ARE AS FOLLOWS: (1) DISCHARGE FROM VEHICLE WASHDOWN WHERE NO DETERGENTS ARE USED, (2) EXTERNAL BUILDING WASHDOWN WHERE NO DETERGENTS ARE USED, (3) THE USE OF WATER TO CONTROL DUST, (4) FIRE HYDRANT FLUSHINGS, (5) LAWN WATERING, (6) POTABLE WATER SOURCES INCLUDING WATERLINE FLUSHINGS, (7) IRRIGATION DRAINAGE, (8) PAVEMENT WASHWATERS WHERE SPILLS OR LEAKS OF TOXIC OR HAZARDOUS MATERIALS HAVE NOT OCCURRED (UNLESS ALL SPILLED MATERIALS HAVE BEEN REMOVED) AND WHERE NO DETERGENTS ARE USED, AND (9) FOUNDATION OR FOOTING DRAINS WHERE FLOWS ARE NOT CONTAMINATED WITH PROCESS SUCH AS SOLVENTS OR CONTAMINATED BY CONTACT WITH SOILS WHERE SPILLS OR LEAKS OF TOXIC OR HAZARDOUS MATERIALS HAS OCCURRED.
15. GOOD HOUSEKEEPING: THE PROJECT SITE SHALL PROVIDE FOR THE MINIMIZATION OF EXPOSURE OF CONSTRUCTION DEBRIS (INCLUDING, BUT NOT LIMITED TO, INSULATION, WIRING, PAINTS AND PAINT CANS, SOLVENTS, WALL BOARD, ETC.) TO PRECIPITATION BY MEANS OF DISPOSAL AND/OR PROPER SHELTER OR COVER. CONSTRUCTION WASTE MUST BE PROPERLY DISPOSED OF IN ORDER TO AVOID EXPOSURE TO PRECIPITATION AT THE END OF EACH WORKING DAY.
16. UPON COMPLETION OF CONSTRUCTION AND ESTABLISHMENT OF PERMANENT GROUND COVER, REMOVE AND DISPOSE OF TEMPORARY EROSION CONTROL MEASURES. CLEAN SEDIMENT AND DEBRIS FROM TEMPORARY MEASURES AND FROM PERMANENT STORM DRAIN AND SANITARY SEWER SYSTEMS.

ABBREVIATIONS

BC	BOTTOM OF CURB
BOT	BOTTOM
BW	BOTTOM OF WALL
CB	CATCH BASIN
C.L.D.I.P.	CEMENT LINED DUCTILE IRON PIPE
DMH	DRAINAGE MANHOLE
ELEV	ELEVATION
FF	FINISHED FLOOR
FG	FINISHED GRADE
HDPE	HIGH DENSITY POLYETHYLENE
HYD	HYDRANT
INV	INVERT
MAX.	MAXIMUM
MIN.	MINIMUM
OHW	OVERHEAD WIRE
PVC	POLYVINYL CHLORIDE
SMH	SANITARY SEWER MANHOLE
TC	TOP OF CURB
TF	TOP OF FRAME
TW	TOP OF WALL
TYP.	TYPICAL

GENERAL RESIDENCE DISTRICT A ZONING TABLE

	REQUIRED	EXISTING	PROVIDED
MINIMUM LOT AREA (SQUARE FEET)	43,560	2,347,270	2,347,270
MINIMUM LOT FRONTAGE (FEET)	150	1,770	1,770
MINIMUM FRONT SETBACK (FEET)	43.2	43.2	43.2
MINIMUM SIDE YARD (FEET)	20	224.8	75
MINIMUM REAR YARD (FEET)	20	1,510	1,590
MAXIMUM LOT COVERAGE (%)	25	0.2	0.6
MAXIMUM HEIGHT (STORIES)	2.5	1	2
MAXIMUM BUILDING HEIGHT (FEET)	40	22.4	34.17

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Client/ Contractor

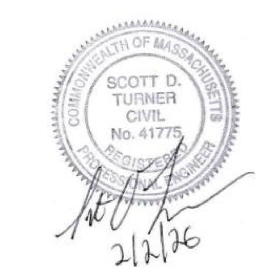
TOWN OF CARLISLE

66 WESTFORD STREET
CARLISLE, MASSACHUSETTS

Project

CARLISLE FIRE DEPARTMENT ADDITIONS & ALTERATIONS

80 WESTFORD STREET
CARLISLE, MA 01741



GRAPHIC SCALE

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Seals

PERMITTING SET

NOT FOR CONSTRUCTION

Issues / Revisions

No.	Date	Description
1.	01/12/2026	ANRAD
2.	02/02/2026	PERMITTING SET

Drawing Title

GENERAL NOTES

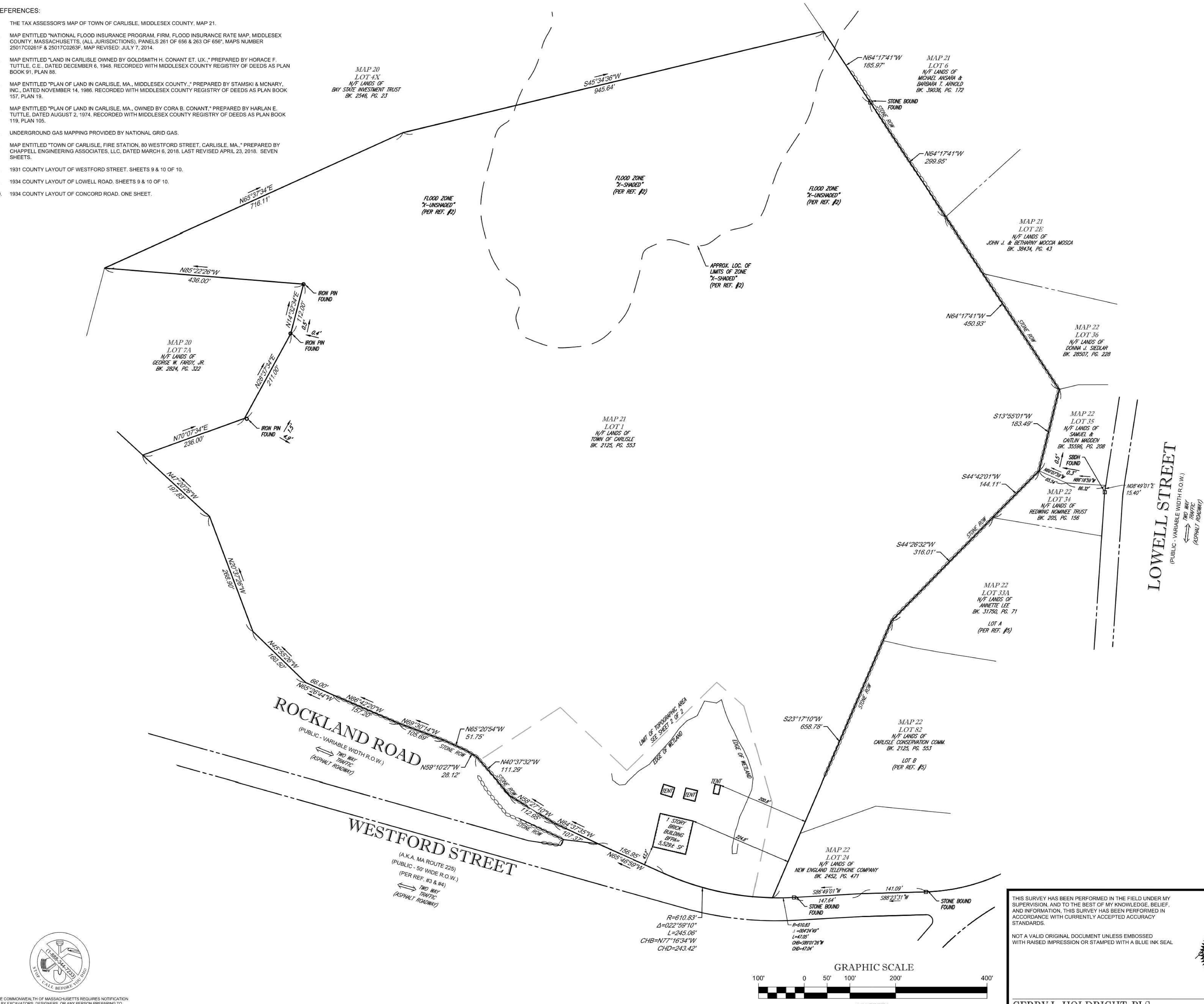
Project Manager: JD	Project No: 20250003.A10
Project Architect:	Production Leader:
Project Designer: KT	Peer Reviewer:

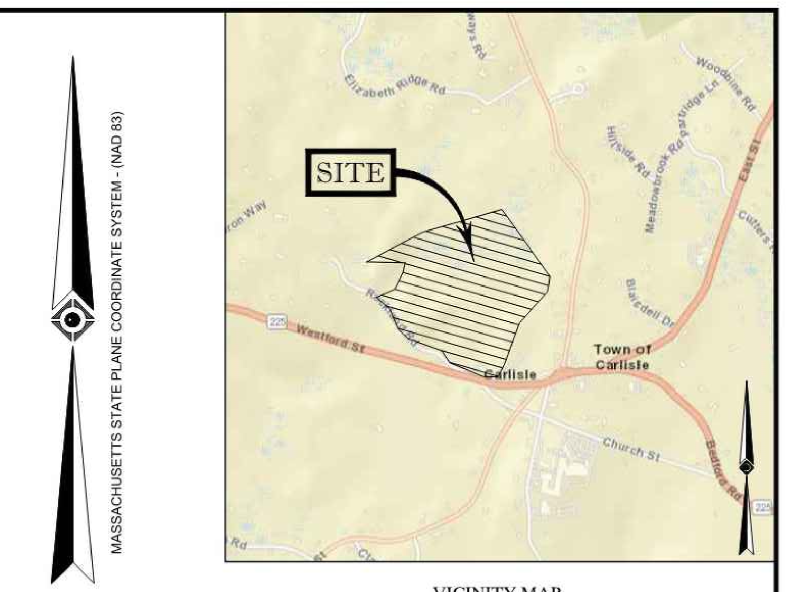
Drawing Number

CN1.01

REFERENCES:

1. THE TAX ASSESSOR'S MAP OF TOWN OF CARLISLE, MIDDLESEX COUNTY, MAP 21.
2. MAP ENTITLED "NATIONAL FLOOD INSURANCE PROGRAM, FIRM, FLOOD INSURANCE RATE MAP, MIDDLESEX COUNTY, MASSACHUSETTS, (ALL JURISDICTIONS), PANELS 261 OF 656 & 263 OF 656", MAPS NUMBER 25017C0261F & 25017C0263F, MAP REVISED: JULY 7, 2014.
3. MAP ENTITLED "LAND IN CARLISLE OWNED BY GOLDSMITH H. CONANT ET. UX.," PREPARED BY HORACE F. TUTTLE, C.E., DATED DECEMBER 6, 1948. RECORDED WITH MIDDLESEX COUNTY REGISTRY OF DEEDS AS PLAN BOOK 91, PLAN 88.
4. MAP ENTITLED "PLAN OF LAND IN CARLISLE, MA., MIDDLESEX COUNTY.," PREPARED BY STAMSKI & MCNARY, INC., DATED NOVEMBER 14, 1986. RECORDED WITH MIDDLESEX COUNTY REGISTRY OF DEEDS AS PLAN BOOK 157, PLAN 19.
5. MAP ENTITLED "PLAN OF LAND IN CARLISLE, MA., OWNED BY CORA B. CONANT," PREPARED BY HARLAN E. TUTTLE, DATED AUGUST 2, 1974. RECORDED WITH MIDDLESEX COUNTY REGISTRY OF DEEDS AS PLAN BOOK 119, PLAN 105.
6. UNDERGROUND GAS MAPPING PROVIDED BY NATIONAL GRID GAS.
7. MAP ENTITLED "TOWN OF CARLISLE, FIRE STATION, 80 WESTFORD STREET, CARLISLE, MA.," PREPARED BY CHAPPELL ENGINEERING ASSOCIATES, LLC, DATED MARCH 6, 2018. LAST REVISED APRIL 23, 2018. SEVEN SHEETS.
8. 1931 COUNTY LAYOUT OF WESTFORD STREET. SHEETS 9 & 10 OF 10.
9. 1934 COUNTY LAYOUT OF LOWELL ROAD. SHEETS 9 & 10 OF 10.
10. 1934 COUNTY LAYOUT OF CONCORD ROAD. ONE SHEET.





VICINITY MAP
(NOT TO SCALE)

NOTES:

1. PROPERTY KNOWN AS LOT 1 AS SHOWN ON THE TOWN OF CARLISLE, MIDDLESEX COUNTY, COMMONWEALTH OF MASSACHUSETTS, MAP NO. 21.
2. AREA = 2,347,270 SQUARE FEET OR 53.886 ACRES.
3. LOCATION OF UNDERGROUND UTILITIES ARE APPROXIMATE. LOCATIONS AND SIZES ARE BASED ON UTILITY MARK-OUTS, ABOVE GROUND STRUCTURES THAT WERE VISIBLE & ACCESSIBLE IN THE FIELD, AND THE MAPS AS LISTED IN THE REFERENCES AVAILABLE AT THE TIME OF THE SURVEY. AVAILABLE AS-BUILT PLANS AND UTILITY MARKOUT DOES NOT ENSURE MAPPING OF ALL UNDERGROUND UTILITIES AND STRUCTURES. BEFORE ANY EXCAVATION IS TO BEGIN, ALL UNDERGROUND UTILITIES SHOULD BE VERIFIED AS TO THEIR LOCATION, SIZE AND TYPE BY THE PROPER UTILITY COMPANIES. CONTROL POINT ASSOCIATES, INC. DOES NOT GUARANTEE THE UTILITIES SHOWN COMPRISE ANY OR ALL SUCH UTILITIES IN THE AREA EITHER IN SERVICE OR ABANDONED. A QUALITY LEVEL SYSTEM IS UTILIZED TO IDENTIFY THE SOURCE OF THE UNDERGROUND UTILITY INFORMATION. THE METHOD OF DETERMINATION IS BASED ON CONTRACTUAL AGREEMENT WITH THE CLIENT AND IS DEPICTED ON THE SURVEY BY THE LINE TYPES SHOWN IN THE DRAWING LEGEND. FOR REFERENCE, THE QUALITY LEVELS ARE AS FOLLOWS:

   QUALITY LEVEL D - UTILITIES SHOWN BASED UPON REFERENCE MAPPING OR ORAL HISTORY. NOT FIELD VERIFIED.

   QUALITY LEVEL C - LOCATION OF UTILITY SURFACE FEATURES SUPPLEMENTS REFERENCE MAPPING. INCLUDES MARKOUT BY OTHERS.

   QUALITY LEVEL B - UTILITY LOCATION DATA IS COLLECTED THROUGH GEOPHYSICAL SENSING TECHNOLOGY TO SUPPLEMENT SURFACE FEATURES AND OR REFERENCE MAPPING. INCLUDES MARKOUT BY CONTROL POINT ASSOCIATES, INC.

   QUALITY LEVEL A - HORIZONTAL AND VERTICAL LOCATION OF UTILITIES ARE OBTAINED USING VACUUM EQUIPMENT EXCAVATION OR OTHER METHODS TO EXPOSE THE UTILITY. LOCATION SHOWN AT SINGLE POINT WHERE EXCAVATION OCCURRED UNLESS UTILITY WAS LOCATED PRIOR TO FILLING.

   ALL FOUR TYPES MAY NOT BE PRESENT ON THIS SURVEY.
4. THIS PLAN IS BASED ON A SURVEY PREPARED IN THE FIELD BY CONTROL POINT ASSOCIATES, INC. (THE SURVEYOR), INFORMATION PROVIDED BY THE CLIENT AND OTHER REFERENCE MATERIAL AS LISTED HEREON. CHANGES TO THE PROPERTY AFTER THE FIELD DATE ARE NOT THE RESPONSIBILITY OF THE SURVEYOR.
5. THIS SURVEY WAS PREPARED WITHOUT THE BENEFIT OF A TITLE REPORT AND IS SUBJECT TO THE RESTRICTIONS, COVENANTS AND/OR EASEMENTS THAT MAY BE CONTAINED THEREIN. IT IS IMPORTANT A COMPLETE TITLE SEARCH BE PROVIDED TO THE SURVEYOR FOR REVIEW PRIOR TO CONVEYANCE AND THE PLACEMENT OF OR ALTERATION TO IMPROVEMENTS ON THE PROPERTY. BOUNDARY AND EASEMENT LINES ARE BASED UPON AVAILABLE DOCUMENTATION AT THE TIME OF SURVEY AND ARE SUBJECT TO SAID TITLE REPORT.

   THIS SURVEY DOES NOT ADDRESS OWNERSHIP AND POSSIBLE RIGHTS OF ADJOINING PROPERTIES.

   THIS SURVEY IS THE OPINION OF THE SURVEYOR AND IS NOT A LEGAL DECISION REGARDING PROPERTY BOUNDARY OR RIGHTS.
6. BY GRAPHIC PLOTTING ONLY PROPERTY IS LOCATED IN FLOOD HAZARD ZONE X- UNSHADED (AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN) AND PARTIALLY LOCATED IN FLOOD HAZARD ZONE X- SHADED (AREAS OF 0.2% ANNUAL CHANCE FLOOD; AREAS OF 1% ANNUAL CHANCE FLOOD WITH AVERAGE DEPTHS OF LESS THAN 1 FOOT OR WITH DRAINAGE AREAS LESS THAN 1 SQUARE MILE; AND AREAS PROTECTED BY LEVEES FROM 1% ANNUAL CHANCE FLOOD), PER REF. #2.
7. THE EXISTENCE OF UNDERGROUND STORAGE TANKS, IF ANY, WAS NOT KNOWN AT THE TIME OF THE FIELD SURVEY. SURVEY DOES NOT ADDRESS ENVIRONMENTAL CONDITIONS OR LAND SUITABILITY.
8. ELEVATIONS REFER TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88), BASED ON GPS/GNSS OBSERVATIONS UTILIZING THE KEYSTONE VRS NETWORK (KEYNETGPS).

   TEMPORARY BENCHMARKS SET:

   TBM-A: DOCK SPIKE SET IN UTILITY POLE #6, ELEVATION= 198.75'
   TBM-B: DOCK SPIKE SET IN UTILITY POLE #3, ELEVATION= 194.68'

   SEVEN (7) DAYS PRIOR TO CONSTRUCTION IT IS THE CONTRACTOR'S RESPONSIBILITY TO VERIFY THAT THE BENCHMARKS ILLUSTRATED ON THIS SURVEY HAVE NOT BEEN DISTURBED AND THEIR ELEVATIONS HAVE BEEN CONFIRMED.
   ANY CONFLICTS MUST BE REPORTED PRIOR TO CONSTRUCTION. SURVEYOR IS NOT RESPONSIBLE FOR CONTRACTOR'S FAILURE TO COMPLY.
9. THE OFFSETS SHOWN ARE NOT TO BE USED FOR THE CONSTRUCTION OF ANY STRUCTURE, FENCE, PERMANENT ADDITION, ETC.
10. ANY DISCREPANCIES FOUND ON THE SURVEY SHOULD BE REPORTED TO THE SURVEYOR IMMEDIATELY.
11. THIS SURVEY WAS PREPARED FOR THE CLIENT, FUSS & O'NEILL, INC. AND INTENDED ONLY FOR THE USE BY THE CLIENT AS CONTRACTED FOR THE PROJECT AND THE PURPOSE ORIGINALLY INTENDED. NO FURTHER PARTIES OTHER THAN THOSE CERTIFIED HEREON SHALL RELY ON IT FOR ANY PURPOSE.
12. PARTIAL TOPOGRAPHY SHOWN HEREON PER CONTRACTUAL AGREEMENT WITH CLIENT.
13. THE WETLANDS LIMITS SHOWN ON THIS SURVEY ARE BASED ON WETLANDS FIELD IDENTIFICATION MARKERS PLACED BY FUSS & O'NEILL, INC. ON JULY 11, 2025, AND FIELD LOCATED BY CONTROL POINT ASSOCIATES INC. ON JULY18, 2025. AT THE TIME OF THIS MAPPING, SAID WETLAND BOUNDARY LIMITS ARE SUBJECT TO CONFIRMATION.

SEE SHEET 2 OF 2 FOR SITE FEATURES & TOPOGRAPHY

NO.	DESCRIPTION OF REVISION	FIELD CREW	DRAWN:	APPROVED:	DATE
1	REVISED PER ADDITIONAL TOPOGRAPHY	C.W.	L.M.M.	G.L.H.	01-21-2026

THIS SURVEY HAS BEEN PERFORMED IN THE FIELD UNDER MY SUPERVISION, AND TO THE BEST OF MY KNOWLEDGE, BELIEF, AND INFORMATION, THIS SURVEY HAS BEEN PERFORMED IN ACCORDANCE WITH CURRENTLY ACCEPTED ACCURACY STANDARDS.

NOT A VALID ORIGINAL DOCUMENT UNLESS EMBOSSED WITH RAISED IMPRESSION OR STAMPED WITH A BLUE INK SEAL

COMMONWEALTH OF MASSACHUSETTS
GERRY L. HOLDRIGHT
NO. 49211
REGISTERED PROFESSIONAL LAND SURVEYOR

01-21-2026
DATE

GERRY L. HOLDRIGHT, PLS
MASSACHUSETTS PROFESSIONAL LAND SURVEYOR #49211

FIELD DATE: 07-18-2025, 12-30-2025
FIELD BOOK NO.: 25-5-MA
FIELD BOOK PG.: 91
FIELD CREW: J.D.O.
DRAWN: R.A.B.

BOUNDARY, TOPOGRAPHIC & UTILITY SURVEY
FUSS & O'NEILL, INC.
66 WESTFORD STREET
MAP 21, LOT 1
TOWN OF CARLISLE, MIDDLESEX COUNTY
COMMONWEALTH OF MASSACHUSETTS

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ALBANY, NY 518.217.5010
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PHILADELPHIA, PA 215.712.9800
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FT. LAUDERDALE, FL 954.763.7611

REVIEWED:	APPROVED:	DATE	SCALE	FILE NO.	DWG. NO.
R.J.K.	G.L.H.	08-08-2025	1"=100'	03-250196-00	1 OF 2

THE COMMONWEALTH OF MASSACHUSETTS REQUIRES NOTIFICATION BY EXCAVATORS, DESIGNERS, OR ANY PERSON PREPARING TO DISTURB THE EARTH'S SURFACE ANYWHERE IN THE COMMONWEALTH.

Tecton ARCHITECTS

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1250 HANCOCK STREET, SUITE 815N
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617.282.4675
www.fando.com

Client/ Contractor

TOWN OF CARLISLE

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CARLISLE, MASSACHUSETTS

Project

CARLISLE FIRE DEPARTMENT ADDITIONS & ALTERATIONS

80 WESTFORD STREET
CARLISLE, MA 01741

GRAPHIC SCALE

Seals

PERMITTING SET
NOT FOR CONSTRUCTION

Issues / Revisions

No.	Date	Description
1.	01/12/2026	ANRAD
2.	02/02/2026	PERMITTING SET

Drawing Title

EXISTING CONDITIONS PLAN

Project Manager: JD	Project No: 20250003.A10
Project Architect:	Production Leader:
Project Designer: KT	Peer Reviewer:

Drawing Number

CI1.00

MASSACHUSETTS STATE PLANE COORDINATE SYSTEM - (NAD 83)

LEGEND

124 / 125	EXISTING CONTOUR
× 123.45	EXISTING SPOT ELEVATION
× TC 123.45	EXISTING TOP OF CURB ELEVATION
× BC 123.45	EXISTING BOTTOM OF CURB ELEVATION
× TW 123.45	EXISTING TOP OF WALL ELEVATION
× BW 122.95	EXISTING BOTTOM OF WALL ELEVATION
× FF 123.45	EXISTING FINISHED FLOOR ELEVATION
× DS 123.45	EXISTING DOOR SILL ELEVATION
	HYDRANT
WV	WATER VALVE
PIV	PRESSURE INDICATOR VALVE
	GROUND FLOOD LIGHT
B	BORING
V#	VENT & NUMBER OF VENTS
	FIRE DEPARTMENT CONNECTION (F.D.C.)
GV	GAS VALVE
GM	GAS METER
EM	ELECTRIC METER
OH	OVERHEAD WIRES
G	APPROX. LOC. UNDERGROUND GAS LINE
E	APPROX. LOC. UNDERGROUND ELECTRIC LINE
E/T	APPROX. LOC. UNDERGROUND ELECTRIC & TELEPHONE LINE
D	APPROX. LOC. UNDERGROUND DRAINAGE LINE
S	APPROX. LOC. UNDERGROUND SANITARY / SEWER LINE
UP #	UTILITY POLE
UPLP #	UTILITY POLE/LIGHT POLE
GW	GUY WIRE
MW	MONITORING WELL
	SIGN
P	POST
	BOLLARD
	METAL GUIDE RAIL
DMH	DRAINAGE/STORM MANHOLE
MH	UNKNOWN MANHOLE
SMH	SANITARY/SEWER MANHOLE
CB	CATCH BASIN OR INLET
T#	TREE & TRUNK SIZE
P#	CONIFEROUS TREE & TRUNK SIZE
	SHRUBS
UG	UNDER GROUND
CLF	CHAIN LINK FENCE
EOC	EDGE OF CONCRETE
EOP	EDGE OF PAVEMENT
LSA	LANDSCAPED AREA
1.0'	OFFSET OF STRUCTURE AT GROUND LEVEL RELATIVE TO PROPERTY LINE
SWL	SOLID WHITE LINE
SYL	SOLID YELLOW LINE
DYL	DOUBLE YELLOW LINE
HT	HEIGHT
BLDG	BUILDING
BFPA	BUILDING FOOTPRINT AREA
NVP	NO VISIBLE PIPE
EL	ELEVATION
PVC	POLYVINYL CHLORIDE PIPE
CI	CAST IRON PIPE
RCP	REINFORCED CONCRETE PIPE
INV	INVERT ELEVATION
GRT	GRATE ELEVATION
-Qc	SUBSURFACE UTILITY QUALITY LEVEL C
-Qd	SUBSURFACE UTILITY QUALITY LEVEL D
	WATER WELL

SEE SHEET 1 OF 2 FOR NOTES AND REFERENCES

GRAPHIC SCALE

30' 0 15' 30' 60' 120'

(IN FEET)
1 inch = 30 ft.

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NO.	DESCRIPTION OF REVISION	FIELD CREW	DRAWN:	APPROVED:	DATE
1	REVISED PER ADDITIONAL TOPOGRAPHY	C.W.	L.M.M.	G.L.H.	01-21-2026

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R.J.K.	G.L.H.	08-08-2025	1"=30'	03-250196-00	2 OF 2

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Drawing Title

EXISTING CONDITIONS PLAN

Project Manager: JD	Project No: 20250003.A10
Project Architect:	Production Leader:
Project Designer: KT	Peer Reviewer:

Drawing Number

CI1.01

Autodesk Docs://CARL01AR - Carlisle Fire Station/CAR01AR_ARCH.rvt
12/12/2025 10:44:38 AM

LEGEND

	LIMIT OF COMPREHENSIVE SITE DEMOLITION
	HARDSCAPE TO BE REMOVED
	LIMIT OF WORK
	SAWCUT
	PIPE TO BE REMOVED
X	STRUCTURE TO BE REMOVED
	TREE PROTECTION
TP-XX	TEST PIT

NOTES

1. PROTECT ITEMS INDICATED TO REMAIN DURING CONSTRUCTION
2. EXISTING BUILDING TO REMAIN OPERATIONAL DURING CONSTRUCTION. COORDINATE UTILITIES AND SITE DEMOLITION ACCORDINGLY.
3. WITHIN LIMITS OF COMPREHENSIVE SITE DEMOLITION. PERFORM EARTHWORK AS FOLLOW:
   - 3.1. INSTALL EROSION CONTROLS CONSISTENT WITH EROSION CONTROL PLANS AND NOTES.
   - 3.2. CLEAR AND GRUB SITE. STRIP AND TEMPORARILY STOCKPILE TOPSOIL FOR RE-USE, PROVIDED IT CONFORMS TO THE SPECIFICATIONS. COORDINATE WITH THE OWNER FOR TOPSOIL DISPOSAL.
   - 3.3. REMOVE EXISTING HARDSCAPED SURFACES (E.G PAVED AREAS, SIDEWALKS, CONCRETE PADS, PAVERS, ETC.)
   - 3.4. EXISTING PAVEMENT BASE MATERIAL MAY BE RE-USED, PROVIDED IT CONFORMS TO THE SPECIFICATIONS.
4. UNLESS OTHERWISE NOTED, EXISTING SITE FEATURES AND LANDSCAPING (E.G LIGHT POLES, FENCES, BOLLARDS, PLANTINGS, TREES, BUT NOT LIMITED TO, ETC.) WITHIN LIMIT OF COMPREHENSIVE SITE DEMOLITION ARE TO BE REMOVED. COORDINATE WITH OWNER, ARCHITECT, AND ENGINEER FOR ITEMS NOT DEPICTED ON THIS PLAN PRIOR TO DEMOLITION.
5. UNLESS OTHERWISE NOTED, EXISTING UTILITY STRUCTURES PIPING, CONDUITS, AND OTHER APPURTENANCES WITHIN LIMIT OF COMPREHENSIVE SITE DEMOLITION ARE TO REMAIN.
   - 5.1. PRIOR TO CONSTRUCTION, VERIFY EXISTING UTILITY ROUTING, EXISTING UTILITIES THAT SERVICE OTHER DEVELOPMENTS ARE TO REMAIN.
   - 5.2. REMOVE UTILITY SERVICE LINES TO EXISTING BUILDING. COORDINATE WITH LOCAL UTILITY COMPANIES PRIOR TO CONSTRUCTION.
6. COORDINATE WITH OWNER FOR ITEMS TO BE SALVAGED.

GRAPHIC SCALE

20 10 0 20

1" = 20'

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Client/ Contractor

TOWN OF CARLISLE

66 WESTFORD STREET
CARLISLE, MASSACHUSETTS

Project

CARLISLE FIRE DEPARTMENT ADDITIONS & ALTERATIONS

80 WESTFORD STREET
CARLISLE, MA 01741

SCOTT D. TURNER CIVIL No. 41775

2/2/26

Seals

PERMITTING SET

NOT FOR CONSTRUCTION

Issues / Revisions

No.	Date	Description
1.	01/12/2026	ANRAD
2.	02/02/2026	PERMITTING SET

Drawing Title

SITE PREPARATION PLAN

Project Manager: JD	Project No: 20250003.A10
Project Architect:	Production Leader:
Project Designer: KT	Peer Reviewer:

Drawing Number

CP1.01

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GENERAL CONSTRUCTION SEQUENCE:

CONSTRUCTION IS A DYNAMIC OPERATION THAT IS AFFECTED BY WEATHER AND OTHER UNANTICIPATED CONDITIONS. THEREFORE, THE LAYOUT OF EROSION AND SEDIMENT CONTROLS SHOWN ON THESE PLANS WILL LIKELY BE MODIFIED TO BEST MANAGE CHANGING FIELD CONDITIONS. THE MASSACHUSETTS EROSION AND SEDIMENT CONTROL GUIDELINES FOR URBAN AND SUBURBAN AREAS RECOGNIZE THIS. THE OWNER SHALL WORK IN CONCERT WITH THE ENGINEER, GENERAL CONTRACTOR, AND REGULATORY AGENCIES SO THAT THE INTENT OF THE GUIDELINES ARE MET UNTIL ALL DISTURBED AREAS ARE PERMANENTLY STABILIZED. THE FOLLOWING IS A GENERAL SEQUENCE OF MAJOR CONSTRUCTION OPERATIONS.

CONSTRUCTION IS ANTICIPATED TO START IN THE SPRING OF 2026.

EXISTING BUILDING TO REMAIN OPERATIONAL DURING CONSTRUCTION. COORDINATE UTILITIES AND SITE DEMOLITION ACCORDINGLY.

PHASE 1 – SITE PREPARATION

1. INSTALL EROSION AND SEDIMENT CONTROLS.
2. REMOVE EXISTING ELECTRIC, SANITARY SEWER, AND WELL WATER SERVICE TO THE EXISTING BUILDING.
3. ROUGH GRADE AND TEMPORARY STABILIZE DISTURBED AREAS AS REQUIRED.
4. MAINTAIN ALL EROSION AND SEDIMENT CONTROL MEASURES UNTIL ALL DISTURBED AREAS ARE STABILIZED. SWEEP ROADS AND EMPLOY DUST CONTROL MEASURES AS NEEDED THROUGHOUT CONSTRUCTION.
5. REMOVE ANY TEMPORARY CONTROL MEASURES AND ACCUMULATED SEDIMENT FROM PERMANENT STRUCTURES.

PHASE 2 – BUILDING CONSTRUCTION AND SITE WORK

1. INSTALL EROSION AND SEDIMENT CONTROLS AND TEMPORARY PERIMETER SECURITY FENCING.
2. BEGIN GENERAL EARTHWORK.
   - 2.1. STRIP AND STOCKPILE EXISTING TOPSOIL. TEMPORARILY SEED STOCKPILE AS REQUIRED.
   - 2.2. ROUGH GRADE AND TEMPORARY STABILIZE DISTURBED AREAS AS REQUIRED.
   - 2.3. EXCAVATE AND CONSTRUCT BUILDING FOUNDATION. CONSTRUCT STONE AGGREGATE COLUMNS/GROUND IMPROVEMENT.
   - 2.4. CONSTRUCT SUBSURFACE INFRASTRUCTURE (E.G., UTILITIES, STORMWATER STRUCTURES, ETC.). ROUGH GRADE AND TEMPORARILY STABILIZE SITE AS REQUIRED FOR BUILDING CONSTRUCTION.
   - 2.5. BEGIN BUILDING CONSTRUCTION.
     - 2.5.1. STORMWATER CONTROLS MUST BE CONSTRUCTED PRIOR TO CONSTRUCTING IMPERVIOUS SURFACES THAT DRAIN TO THEM.
     - 2.5.2. NOTIFY THE ENGINEER AT LEAST THREE WORKING DAYS IN ADVANCE OF THE INSTALLATION OF STORMWATER INFRASTRUCTURE.
   - 2.6. ADJUST SEDIMENT TRAP LOCATIONS, ELEVATIONS, AND DISCHARGE POINTS AS REQUIRED DURING CONSTRUCTION.
   - 2.7. ONCE AREAS HAVE REACHED SUBGRADE, RE–SPREAD STOCKPILED TOPSOIL AND STABILIZE AREAS THAT HAVE REACHED FINISHED GRADE.
3. MAINTAIN ALL EROSION AND SEDIMENT CONTROL MEASURES UNTIL ALL DISTURBED AREAS ARE STABILIZED. SWEEP ROADS AND EMPLOY DUST CONTROL MEASURES AS NEEDED

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GRAPHIC SCALE
20 10 0 20
1"= 20'

Seals

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Issues / Revisions

No.	Date	Description
1.	01/12/2026	ANRAD
2.	02/02/2026	PERMITTING SET

Drawing Title

EROSION AND SEDIMENT CONTROL PLAN

Project Manager: JD	Project No: 20250003.A10
Project Architect:	Production Leader:
Project Designer: KT	Peer Reviewer:

Drawing Number

CE1.01

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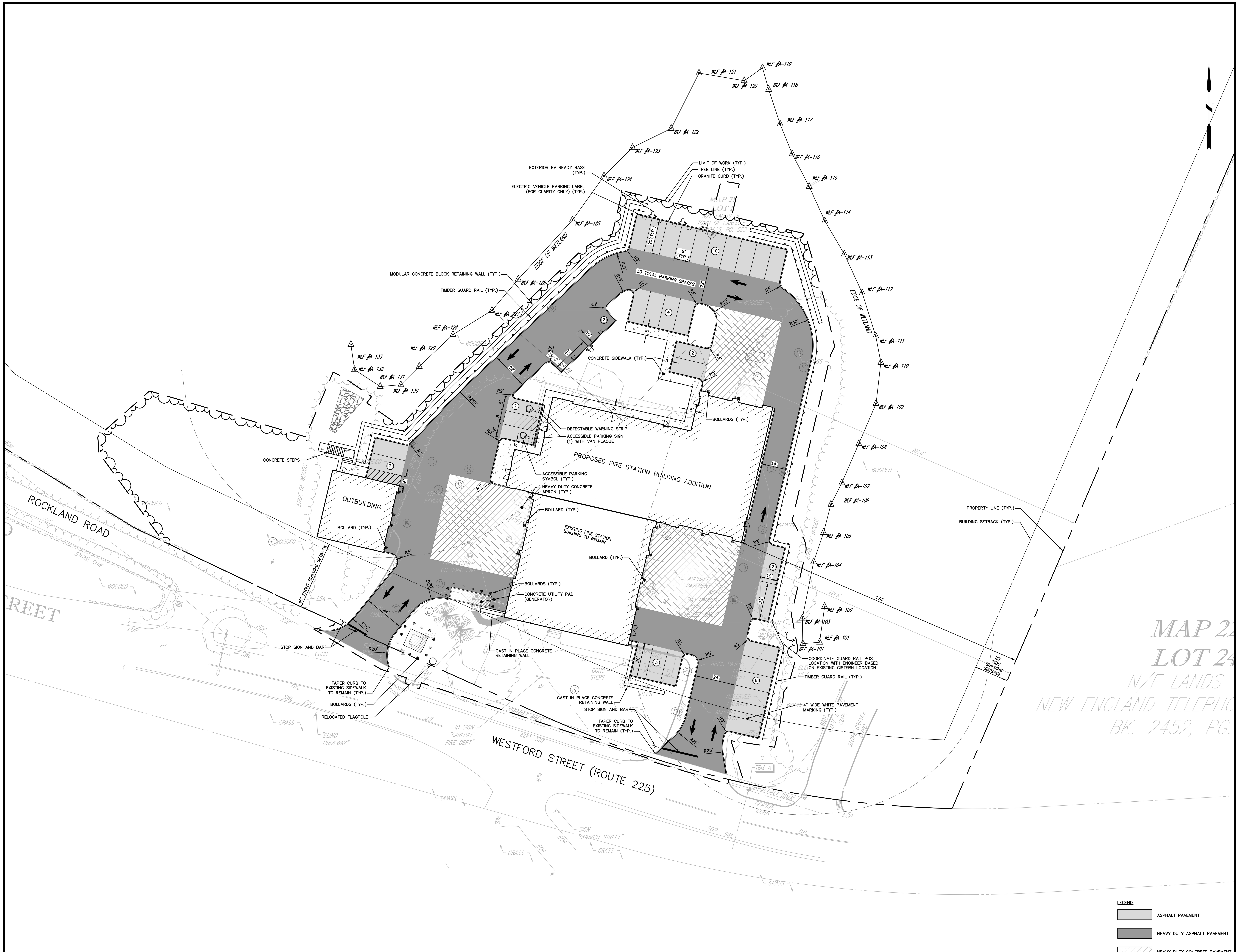

TOTAL PARKING SPACES	
TYPE	TOTAL NUMBER
STANDARD	24
ACCESSIBLE	2
EV	7

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No.	Date	Description
1.	01/12/2026	ANRAD
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Drawing Title

SITE LAYOUT PLAN

Project Manager: JD	Project No: 20250003.A10
Project Architect:	Production Leader:
Project Designer: KT	Peer Reviewer:

Drawing Number

CS1.01

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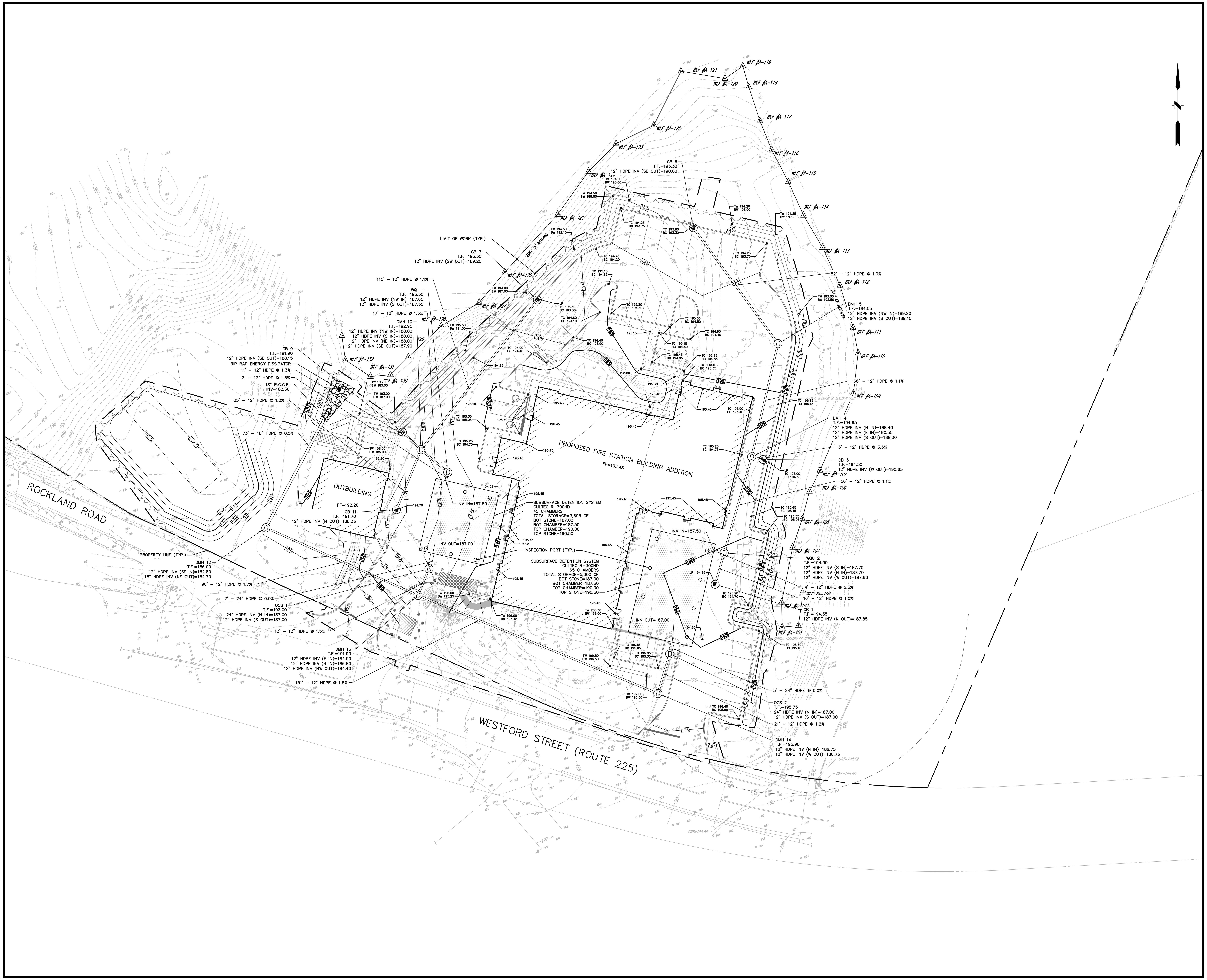

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2	02/02/2026	PERMITTING SET

Drawing Title

GRADING AND DRAINAGE PLAN

Project Manager: JD	Project No: 20250003.A10
Project Architect:	Production Leader:
Project Designer: KT	Peer Reviewer:

Drawing Number

CG1.01

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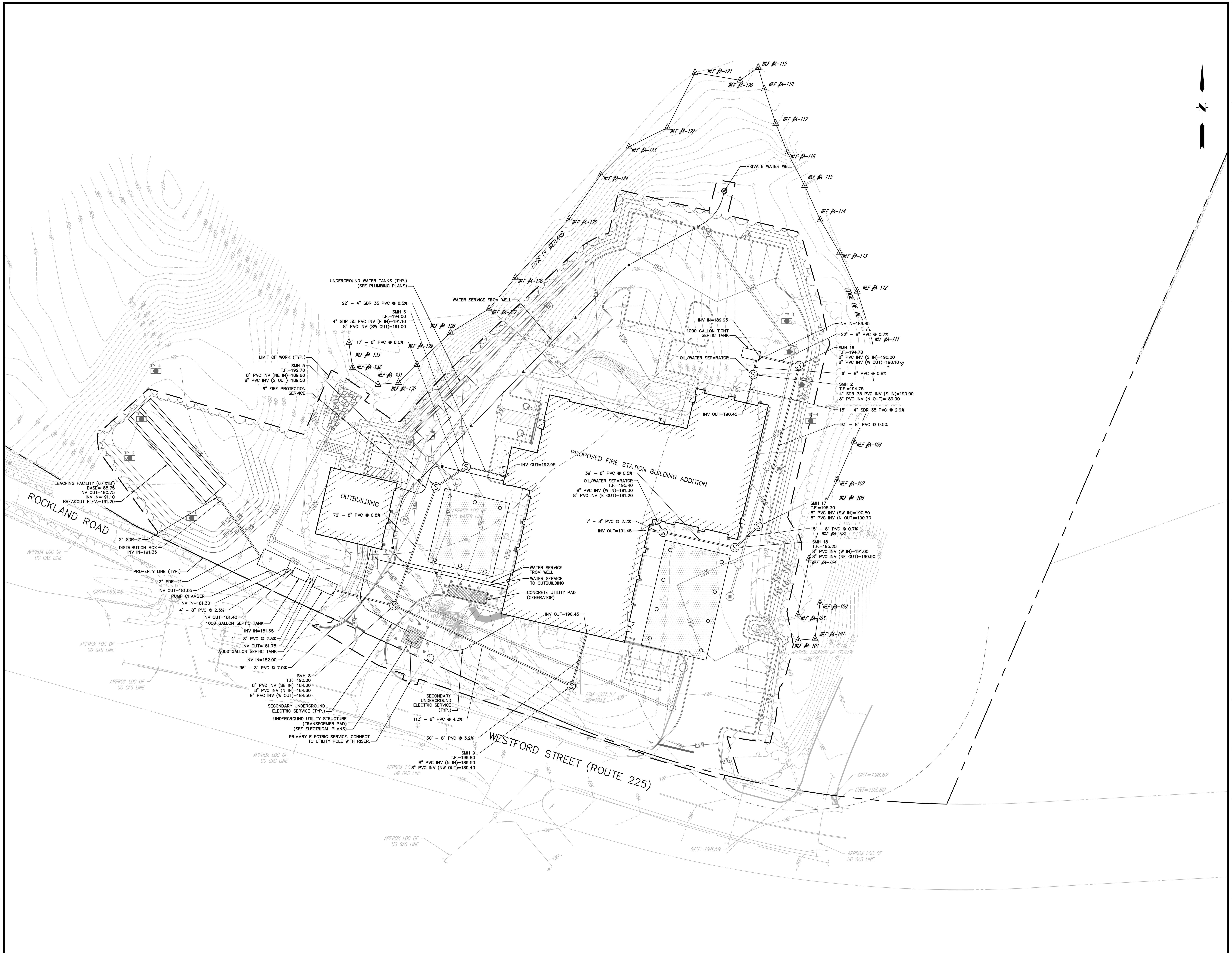

NOTES:

1. PROPOSED WELL IS SHOWN FOR INFORMATION PURPOSES. FINAL LOCATION OF THE WELL WILL BE DETERMINED BY THE WELL DRILLER BASED ON THE WELL YIELD.

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No.	Date	Description
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Drawing Title

UTILITY PLAN

Project Manager: JD	Project No: 20250003.A10
Project Architect:	Production Leader:
Project Designer: KT	Peer Reviewer:

Drawing Number

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PLANTING NOTES:

1. ALL PLANTING MATERIAL TO BE NURSERY GROWN STOCK SUBJECT TO A.A.N. STANDARDS
2. THE CONTRACTOR SHALL SUPPLY ALL PLANTS IN QUANTITIES SUFFICIENT TO COMPLETE THE WORK SHOWN ON THE DRAWINGS AND LISTED IN THE PLANT LIST. IN THE EVENT OF A DISCREPANCY BETWEEN QUANTITIES SHOWN IN THE PLANT LIST AND THOSE REQUIRED BY THE DRAWINGS, THE LARGER NUMBER SHALL APPLY.
3. ALL PLANTS SHALL BE APPROVED PRIOR TO INSTALLATION AND SHALL BE LOCATED ON SITE BY THE CONTRACTOR FOR THE APPROVAL OF THE LANDSCAPE ARCHITECT. ANY INSTALLATIONS WHICH WERE NOT APPROVED BY THE LANDSCAPE ARCHITECT AND WHICH ARE SUBSEQUENTLY REQUESTED TO BE MOVED WILL BE DONE AT THE CONTRACTORS EXPENSE.
4. PRECISE LOCATION OF ITEMS NOT DIMENSIONED ON THE PLAN ARE TO BE FIELD STAKED BY THE CONTRACTOR AND SHALL BE SUBJECT TO THE REQUIREMENTS SPECIFIED IN THE PREVIOUS NOTE.
5. ALL SHRUB MASSINGS AND TREE PITS SHALL BE MULCHED TO A DEPTH OF 3" WITH SHREDDED PINE BARK MULCH.
6. TREES SHALL NOT BE STAKED UNLESS OTHERWISE NOTED.
7. THE CONTRACTOR IS RESPONSIBLE FOR ANY DAMAGED VEGETATION AND SHALL REPLACE OR REPAIR ANY DAMAGED MATERIAL, AT HIS OWN EXPENSE.
8. THE CONTRACTOR SHALL CONTACT "CALL BEFORE YOU DIG" AT 1-800-922-4455 PRIOR TO CONSTRUCTION.
9. ALL SHRUB AND GROUNDCOVER PLANTING AREAS SHALL HAVE CONTINUOUS BEDS OF TOPSOIL 12" DEEP. ALL SOD AND HYDROSEED AREAS SHALL HAVE A MINIMUM TOPSOIL BED OF 6".
10. THE CONTRACTOR IS RESPONSIBLE FOR LOCATING ALL UTILITIES IN THE FIELD. WHERE PLANT MATERIAL MAY INTERFERE WITH UTILITIES, THE CONTRACTOR SHALL NOTIFY THE LANDSCAPE ARCHITECT TO COORDINATE THEIR INSTALLATION.
11. FOR PLANTING SOIL MIX, SEE SPECIFICATIONS OR PLANTING DETAILS.
12. ALL EXISTING RILL, GULLY OR CHANNEL EROSION SHALL BE FILLED WITH APPROPRIATE BACKFILL MATERIAL, FINE RAKED, SCARIFIED AND STABILIZED WITH APPROPRIATE VEGETATIVE MATERIAL AND / OR APPROPRIATE SEDIMENTATION AND EROSION CONTROL MEASURES.
13. ADJUSTMENTS IN THE LOCATION OF THE PROPOSED PLANT MATERIAL AS A RESULT OF EXISTING VEGETATION TO REMAIN SHALL BE APPROVED BY THE LANDSCAPE ARCHITECT PRIOR TO INSTALLATION.
14. THE CONTRACTOR IS RESPONSIBLE FOR ALL MAINTENANCE REPAIR AND REPLACEMENT OF PLANT MATERIAL, AS REQUIRED, FOR THE DURATION OF THE PROJECT AND SUBSEQUENT WARRANTY PERIOD.
15. PLANTINGS INSTALLED IN THE DRY SUMMER MONTHS AND / OR LAWN SEEDED OUT OF SPRING OR FALL PERIODS, IF ALLOWED BY OWNER, WILL REQUIRE AGGRESSIVE IRRIGATION PROGRAMS AT THE CONTRACTOR'S EXPENSE, UNLESS OTHERWISE DIRECTED BY THE OWNER.
16. UPON COMPLETION OF PLANTING, REMOVE FROM SITE ALL EXCESS SOIL, MULCH, AND MATERIALS AND DEBRIS RESULTING FROM WORK OPERATIONS. CLEAN UP SHOULD BE COMPLETED AT THE END OF EACH WORKING DAY. RESTORE TO ORIGINAL CONDITIONS ALL DAMAGED PAVEMENTS, PLANTING AREAS, STRUCTURES AND LAWN AREAS RESULTING FROM LANDSCAPING OPERATIONS.
17. CONTRACTOR SHALL SURVEY, LOCATE, AND PROTECT ALL TREES WITHIN AREAS SHOWN AS "EXISTING VEGETATION TO REMAIN" WITHIN THE DEVELOPMENT ENVELOPE FOR REVIEW BY L.A. PRIOR TO CLEARING OPERATIONS.
18. CONTRACTOR TO RESEED ALL DISTURBED AREAS.

PLANT LIST

KEY	BOTANICAL NAME	COMMON NAME	QTY	SIZE
	TREES			
AC	AMELANCHIER X GRANDIFLORA 'AUTUMN BRILLIANCE'	SERVICEBERRY	5	4-5' MULTISTEM
AR	ACER RUBRUM 'OCTOBER GLORY'	RED MAPLE	1	2.5"-3" CAL.
CF	CORNUS FLORIDA 'CHEROKEE BRAVE'	FLOWERING DOGWOOD	5	2"-2.5" CAL.
GT	GLEDITSIA TRIACANTHOS VAR. INERMIS 'SKYLINE'	HONEY LOCUST	4	2.5"-3" CAL.
	SHRUBS			
CA	CLETHRA ALNIFOLIA 'RUBY SPICE'	SUMMERSWEET	6	2 GAL.
IG	ILEX GLABRA 'SHAMROCK'	INKBERRY HOLLY	2	36"-48" HGT.
PO	PHYSOCARPUS OPULIFOLIUS 'TINY WINE'	EASTERN NINEBARK	9	1 GAL.
RA	RHUS AROMATICA 'GRO-LOW'	FRAGRANT SUMAC	84	1 GAL.
	SEED MIXES			
	NEW ENGLAND CONSERVATION/WILDLIFE MIX	Manufacturer: New England Wetland Plants, www.newp.com 413-548-8000	PER MFG. INSTRUCTIONS	±7,407 SQ FT

LEGEND

- EXISTING TREES TO REMAIN
- PROPOSED DECIDUOUS TREES
- PLANT SPECIES AND QUANTITY (XX / XX)
- PROPOSED DECIDUOUS FLOWERING TREES
- PROPOSED SHRUBS
- PROPOSED GROUNDCOVER
- PROPOSED LIMITS NEW ENGLAND CONSERVATION/WILDLIFE SEED MIX

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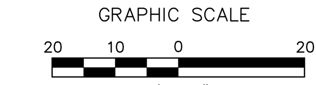
GRAPHIC SCALE



1" = 20'

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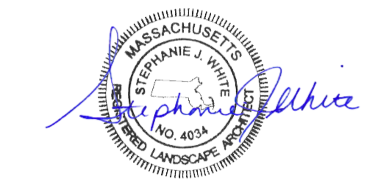

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Issues / Revisions

No.	Date	Description
1.	01/12/2026	ANRAD
2.	02/02/2026	PERMITTING SET

Drawing Title

LANDSCAPE PLAN

Project Manager: JD	Project No: 20250003.A10
Project Architect:	Production Leader:
Project Designer: KT	Peer Reviewer:

Drawing Number

LP1.01

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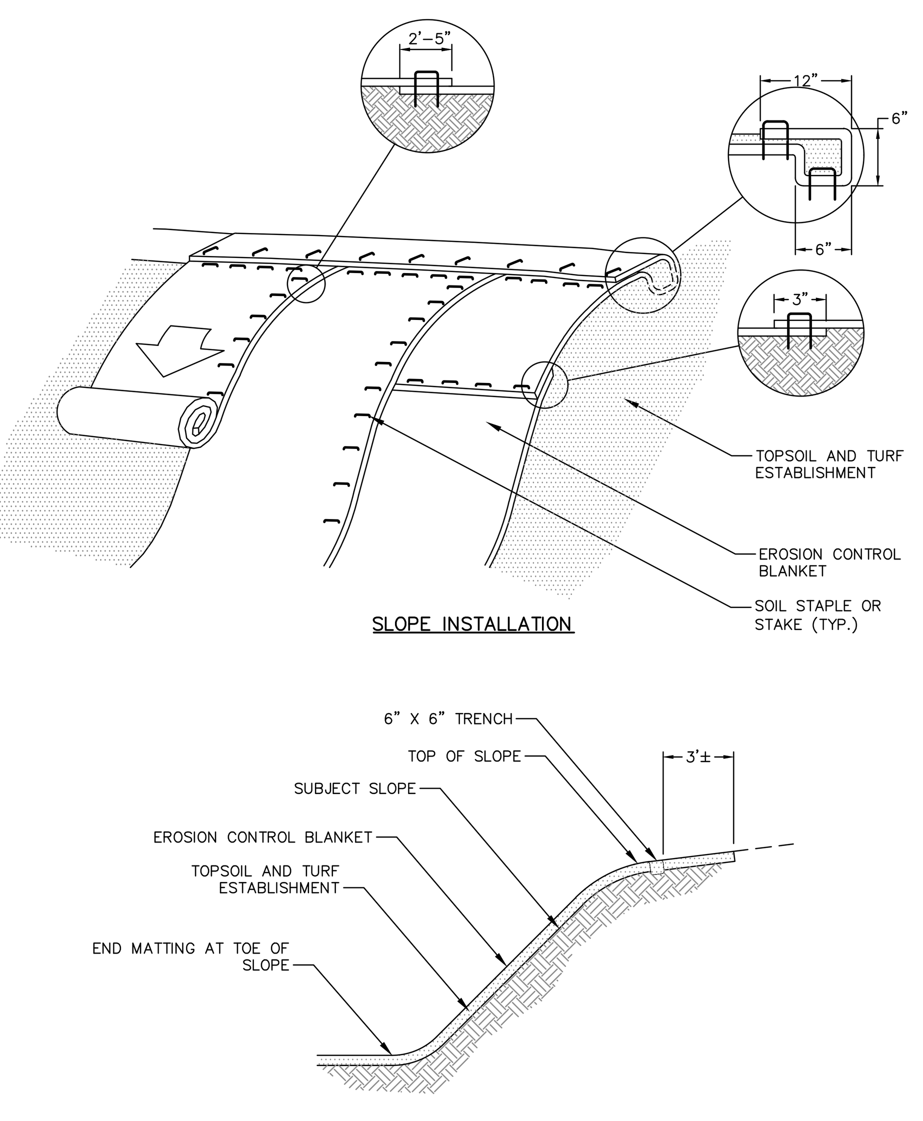
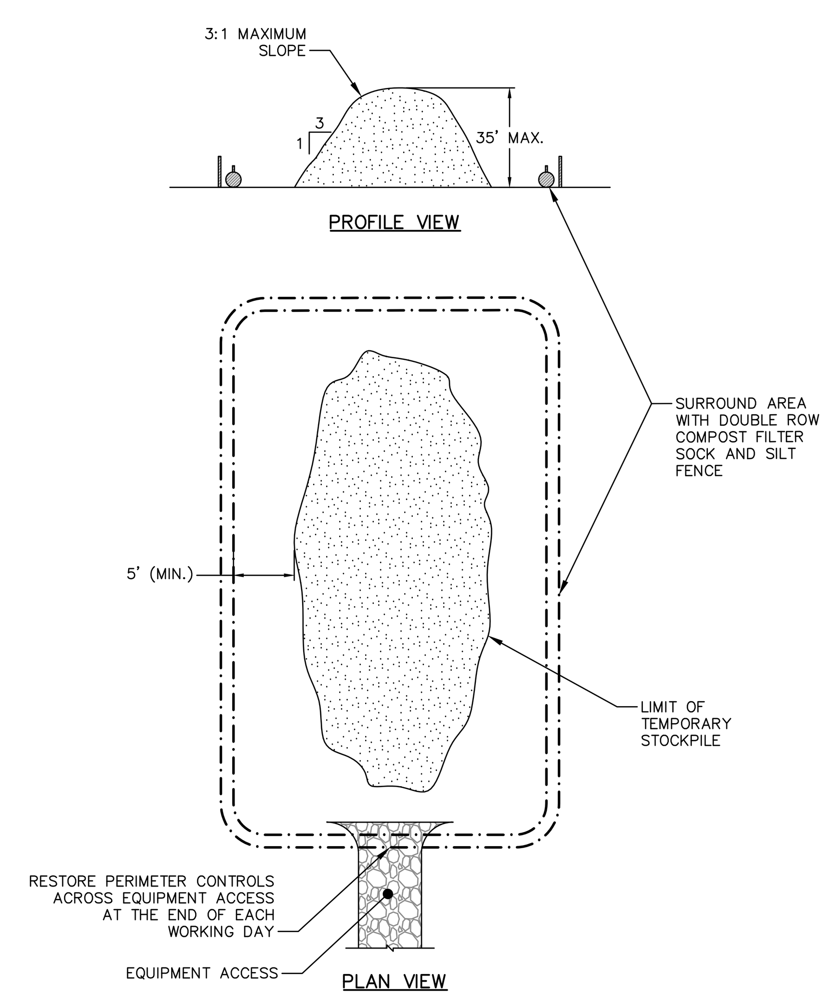


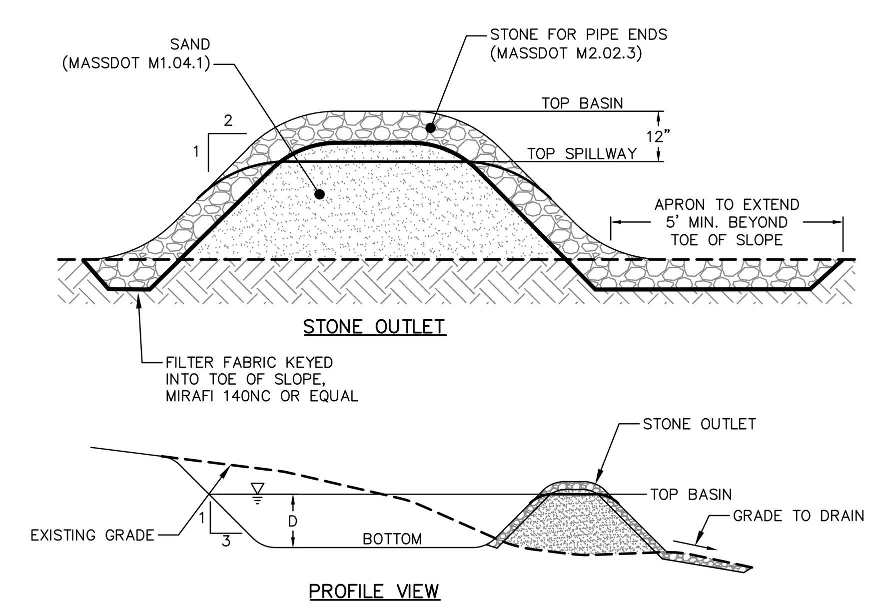
NOTES:
1. PREPARE TOPSOIL BEFORE INSTALLING BLANKET, INCLUDING ANY NECESSARY APPLICATION OF LIME, FERTILIZER, AND SEED.
2. INSTALL IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS.
3. IN LOOSE SOIL CONDITIONS THE USE OF STAPLE OR STAKE LENGTHS GREATER THAN 6" MAY BE NECESSARY TO PROPERLY SECURE THE MATTING.

EROSION CONTROL BLANKET
NOT TO SCALE



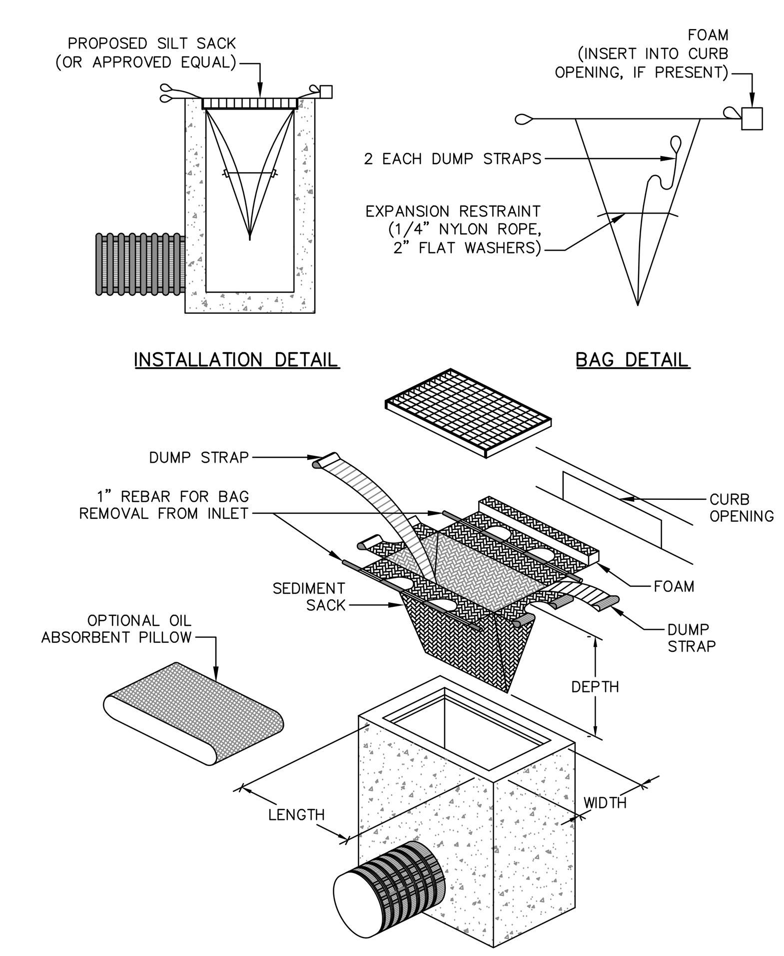
NOTES:
1. STABILIZE STOCKPILES WITH NON-INVASIVE FAST-GERMINATING SEED.

SOIL STOCKPILE AREA
NOT TO SCALE



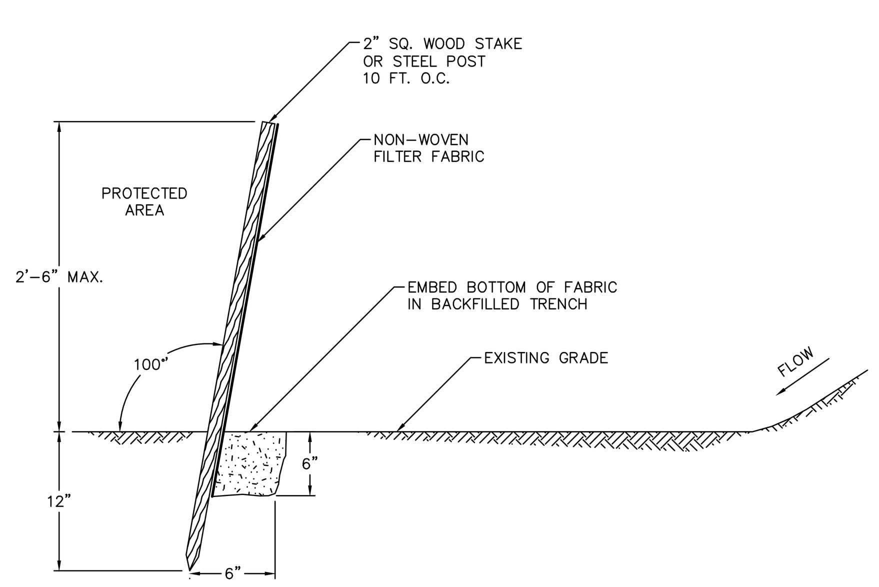
NOTES:
1. CONSTRUCT TEMPORARY SEDIMENT TRAP IN ACCORDANCE WITH THE MASSACHUSETTS EROSION AND SEDIMENT CONTROL GUIDELINES FOR URBAN AND SUBURBAN AREAS AND BASED ON ACTUAL FIELD CONDITIONS.
2. WHERE REQUIRED, TEMPORARILY MODIFY STORMWATER STRUCTURES TO LOWER INLET ELEVATIONS TO ALLOW BASIN TO DRAIN. INSTALL INLET PROTECTION AT ALL INLETS.
3. STONE FOR STONE BERM SHALL BE PLACED MECHANICALLY OR BY HAND. STONE SHALL NOT BE DUMPED DIRECTLY INTO BASIN.
4. CONTRACTOR TO INSTALL TEMPORARY SEDIMENT TRAPS AS NECESSARY. CONTRACTOR TO CONSULT WITH ENGINEER REGARDING SEDIMENT TRAP SIZING AND LOCATION.

TEMPORARY SEDIMENT TRAP
NOT TO SCALE

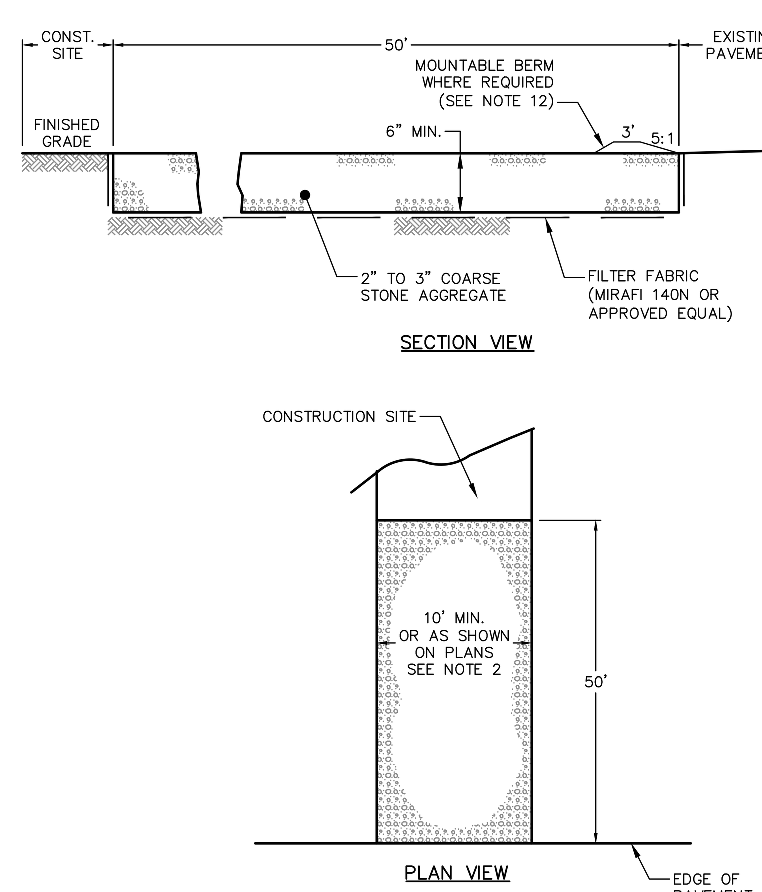


NOTES:
1. SILT SACKS SHALL BE INSPECTED WEEKLY, CONSISTENT WITH REQUIREMENTS OF THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) STORMWATER POLLUTION PREVENTION PLAN (SWPPP). ACCUMULATED SILT SHALL BE REMOVED WHEN THE SILT SACK IS 1/2 FULL TO ALLOW CATCH BASIN TO FUNCTION PROPERLY.
2. SILT SACK INSPECTIONS SHALL ENSURE THAT SILT SACKS OPERATE AS DESIGNED AND DO NOT OVERFLOW.

INLET PROTECTION
NOT TO SCALE



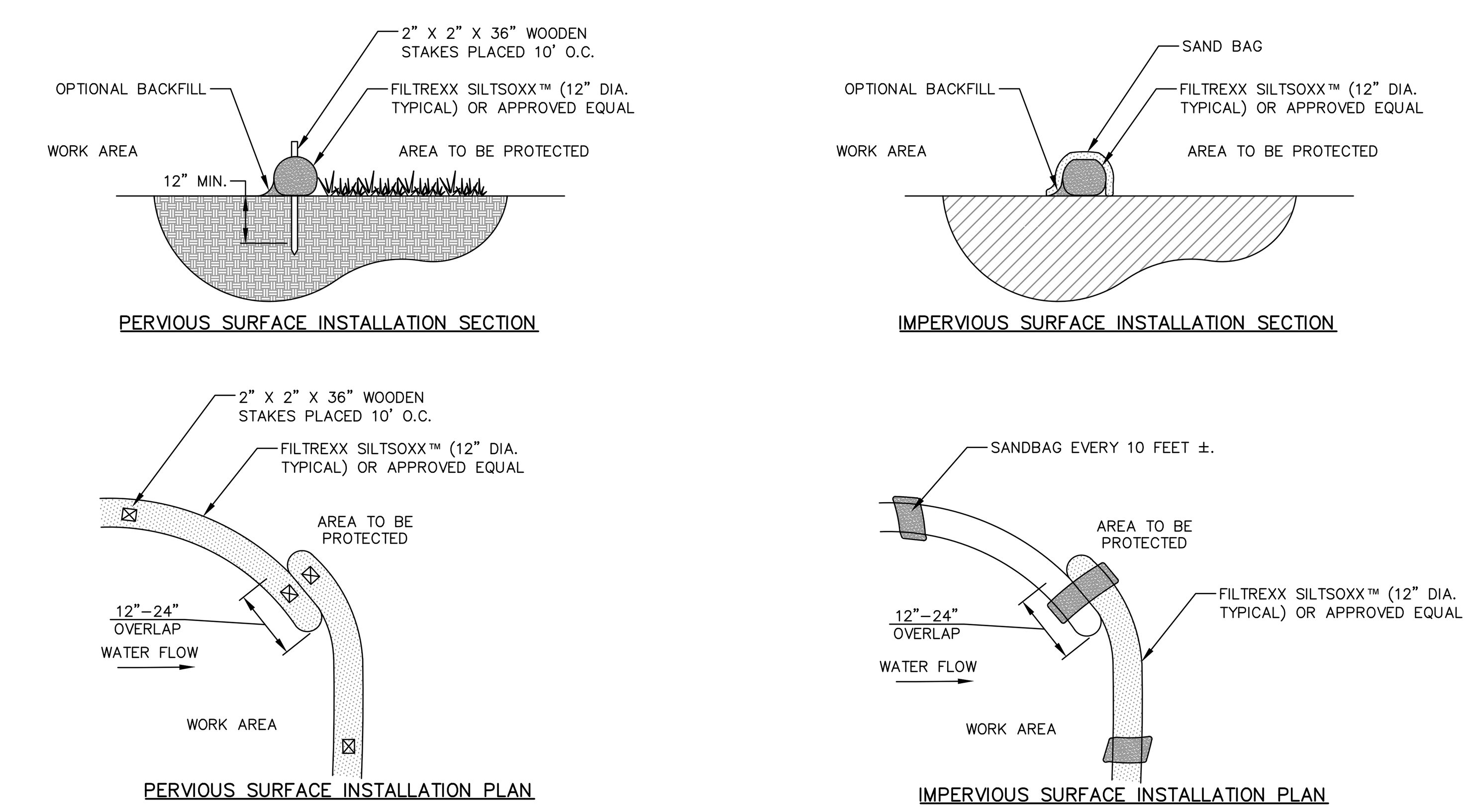
SILT FENCE
NOT TO SCALE



NOTES:
1. COORDINATE WITH THE OWNER AND TOWN OF CARLISLE'S REPRESENTATIVES FOR THE LOCATIONS AND LIMIT OF THE TEMPORARY ACCESS DRIVE PRIOR TO START OF CONSTRUCTION.
2. THE WIDTH OF TEMPORARY ACCESS DRIVE SHALL BE DETERMINED IN THE FIELD AS DIRECTED BY THE ENGINEER AND OWNER.
3. THE TEMPORARY ACCESS DRIVE SHALL NOT EXTEND OFF THE PROPERTY.
4. THE TEMPORARY ACCESS DRIVE SHALL BE MAINTAINED IN A CONDITION WHICH SHALL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS–OF–WAY. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE AS CONDITIONS DEMAND, AND MAY REQUIRE REPAIR OR CLEANOUT OF ANY MEASURES USED TO CAPTURE SEDIMENT. ALL SEDIMENT SPILLED, DROPPED, WASHED, OR TRACKED ONTO PUBLIC RIGHTS–OF–WAY MUST BE REMOVED IMMEDIATELY. BERM SHALL BE PERMITTED.
5. PERIODIC INSPECTION AND MAINTENANCE SHALL BE PROVIDED AS NEEDED OR AS DIRECTED BY THE ENGINEER.
6. MANUFACTURED COMPOSITE TRACKING PAD MADE OF ULTRA–HIGH–MOLECULAR–WEIGHT POLYETHYLENE (UHMWPE) MAY BE USED IN PLACE OF CRUSHED STONE AND FILTER FABRIC. PADS SHALL BE FODS TCH MODEL #1100 OR ENGINEER APPROVED EQUAL.
7. REMOVE ALL VEGETATION AND OTHER OBJECTIONABLE MATERIAL FROM THE FOUNDATION AREA. GRADE AND CROWN FOUNDATION FOR POSITIVE DRAINAGE.
8. STONE FOR A STABILIZED CONSTRUCTION ENTRANCE SHALL BE 2 TO 3–INCH STONE, RECLAIMED STONE, OR RECYCLED CONCRETE EQUIVALENT PLACED ON A STABLE FOUNDATION AS SPECIFIED IN THE PLAN.
9. PAD DIMENSIONS: THE MINIMUM LENGTH OF THE GRAVEL PAD SHOULD BE 50 FEET, THE PAD SHOULD EXTEND THE FULL WIDTH OF THE CONSTRUCTION ACCESS ROAD OR 10 FEET, WHICHEVER IS GREATER. THE AGGREGATE SHOULD BE PLACED AT LEAST SIX INCHES THICK.
10. A GEOTEXTILE FILTER FABRIC SHALL BE PLACED BETWEEN THE STONE FILL AND THE EARTH SURFACE BELOW THE PAD TO REDUCE THE MIGRATION OF SOIL PARTICLES FROM THE UNDERLYING SOIL INTO THE STONE AND VICE VERSA. FILTER FABRIC IS NOT REQUIRED FOR A SINGLE FAMILY RESIDENCE LOT.
11. IF THE SLOPE TOWARD THE ROAD EXCEEDS 2%, CONSTRUCT A RIDGE, 6 TO 8 INCHES HIGH WITH 3:1 SIDE SLOPES, ACROSS THE FOUNDATION APPROXIMATELY 15 FEET FROM THE ENTRANCE TO DIVERT RUNOFF AWAY FROM THE PUBLIC ROAD.
12. ALL SURFACE WATER THAT IS FLOWING TO OR DIVERTED TOWARD THE CONSTRUCTION ENTRANCE SHOULD BE PIPED BENEATH THE ENTRANCE. IF PIPING IS IMPRACTICAL, A BERM WITH 5:1 SLOPES THAT CAN BE CROSSED BY VEHICLES MAY BE SUBSTITUTED FOR THE PIPE.
13. WASHING: IF THE SITE CONDITIONS ARE SUCH THAT THE MAJORITY OF MUD IS NOT REMOVED FROM THE VEHICLE TIRES BY THE STONE PAD, THEN THE TIRES SHOULD BE WASHED BEFORE THE VEHICLE ENTERS THE ROAD OR STREET. THE WASH AREA SHOULD BE A LEVEL AREA WITH 3–INCH WASHED STONE MINIMUM, OR A COMMERCIAL RACK. WASH WATER SHOULD BE DIRECTED INTO A SEDIMENT TRAP, A VEGETATED FILTER STRIP, OR OTHER APPROVED SEDIMENT TRAPPING DEVICE. SEDIMENT SHOULD BE PREVENTED FROM ENTERING ANY WATERCOURSES.

MAINTENANCE NOTES:
1. THE ENTRANCE SHOULD BE MAINTAINED IN A CONDITION THAT WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS–OF–WAY. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE.
2. INSPECT STONE PAD AND SEDIMENT DISPOSAL AREA WEEKLY AND AFTER HEAVY RAINS OR HEAVY USE.
3. REMOVE MUD AND SEDIMENT TRACKED OR WASHED ONTO PUBLIC ROAD IMMEDIATELY.
4. MUD AND SOIL PARTICLES WILL EVENTUALLY CLOG THE VOIDS IN THE GRAVEL AND THE EFFECTIVENESS OF THE GRAVEL PAD WILL NOT BE SATISFACTORY. WHEN THIS OCCURS, THE PAD SHOULD BE TOP DRESSED WITH NEW STONE. COMPLETE REPLACEMENT OF THE PAD MAY BE NECESSARY WHEN THE PAD BECOMES COMPLETELY CLOGGED.
5. IF WASHING FACILITIES ARE USED, THE SEDIMENT TRAPS SHOULD BE CLEANED OUT AS OFTEN AS NECESSARY TO ASSURE THAT ADEQUATE TRAPPING EFFICIENCY AND STORAGE VOLUME IS AVAILABLE. VEGETATIVE FILTER STRIPS SHOULD BE MAINTAINED TO ENSURE A VIGOROUS STAND OF VEGETATION AT ALL TIMES.
6. RESHAPE PAD AS NEEDED FOR DRAINAGE AND RUNOFF CONTROL.
7. REPAIR ANY BROKEN ROAD PAVEMENT IMMEDIATELY.

CONSTRUCTION ENTRANCE
NOT TO SCALE



NOTES:
1. FILTER MEDIA™ FILL TO MEET APPLICATION REQUIREMENTS.
2. UPON SATISFACTORY STABILIZATION OF UPGRADIENT AREAS, COMPOST MATERIAL TO BE DISPERSED ON SITE, AS DETERMINED BY ENGINEER.

COMPOST FILTER SOCK
NOT TO SCALE

Tecton ARCHITECTS

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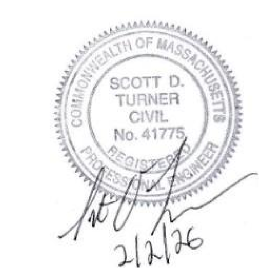
CARLISLE FIRE DEPARTMENT ADDITIONS & ALTERATIONS

80 WESTFORD STREET
CARLISLE, MA 01741



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Seals

PERMITTING SET
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Issues / Revisions

No.	Date	Description
1.	01/12/2026	ANRAD
2.	02/02/2026	PERMITTING SET

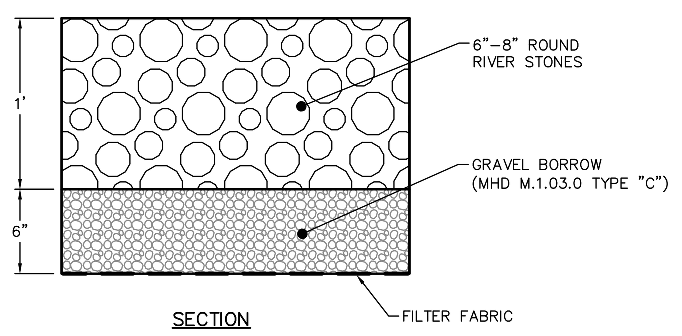
Drawing Title

EROSION AND SEDIMENT CONTROL DETAILS

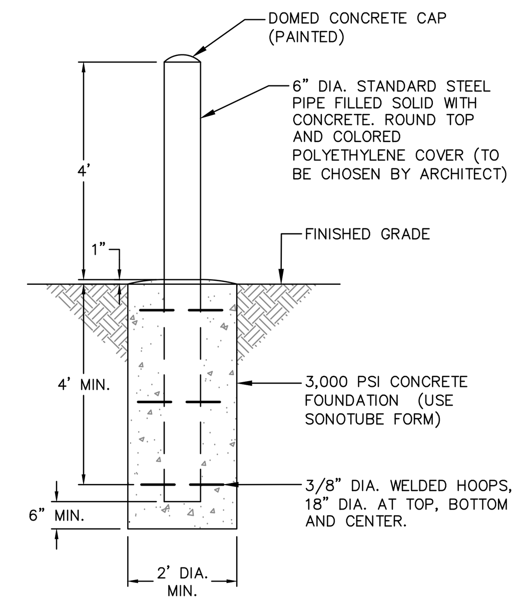
Project Manager: JD	Project No: 20250003.A10
Project Architect:	Production Leader:
Project Designer: KT	Peer Reviewer:

Drawing Number

CD5.01



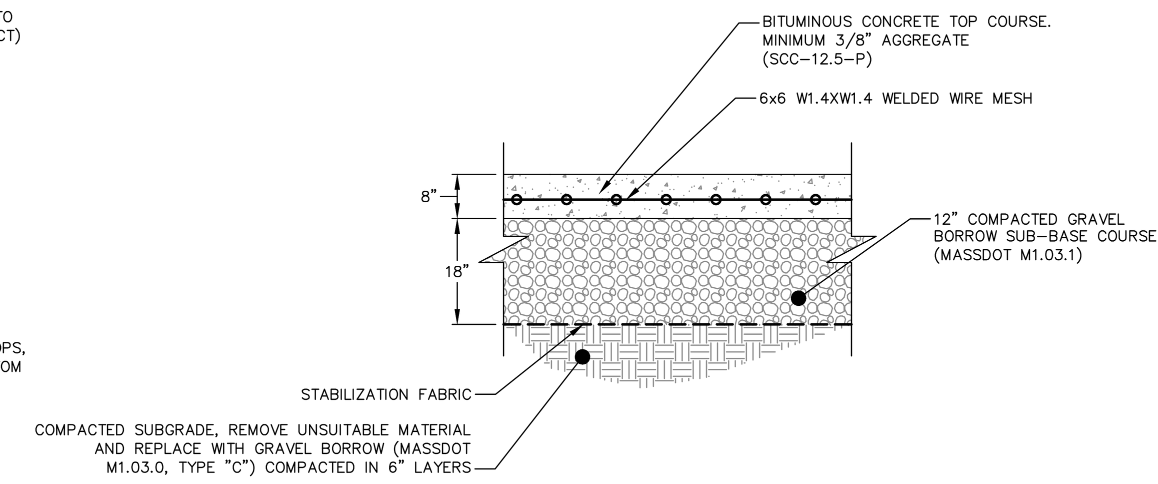
RIVER STONE
NOT TO SCALE



NOTES:

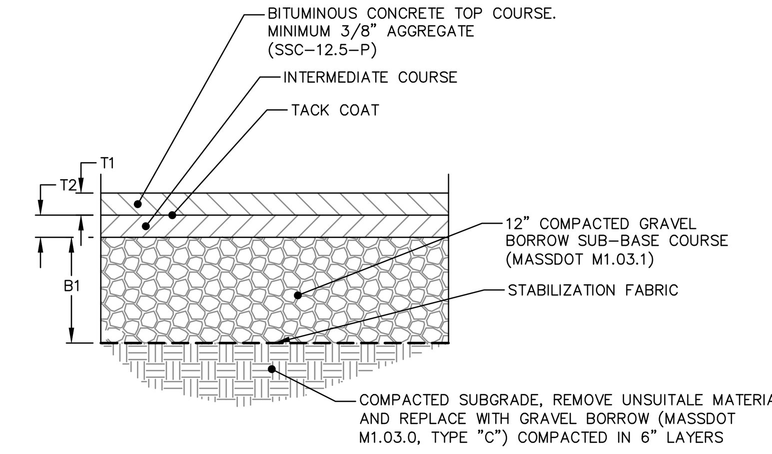
1. BOLLARD LOCATIONS MAY REQUIRE FIELD ADJUSTMENT. THE CONTRACTOR SHALL VERIFY ALL LOCATIONS WITH THE ENGINEER PRIOR TO CONSTRUCTION.

BOLLARD
NOT TO SCALE



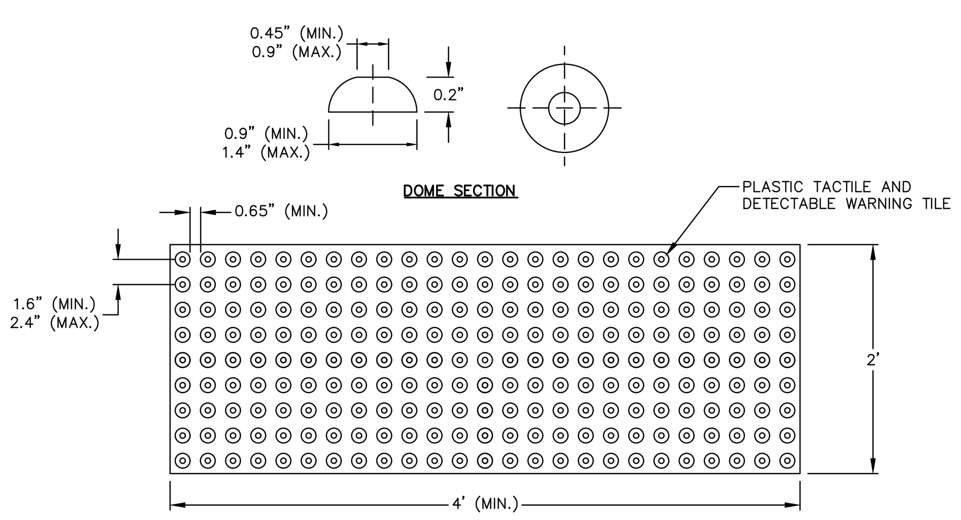
NOTE:
SEE "CONCRETE SIDEWALK" DETAIL FOR JOINT TYPE AND SPACING EXCEPT PROVIDE ASPHALT EXPANSION JOINT EVERY 15' (MAX.) AT EQUIDISTANT INTERVALS.

HEAVY DUTY CONCRETE PAVEMENT
NOT TO SCALE

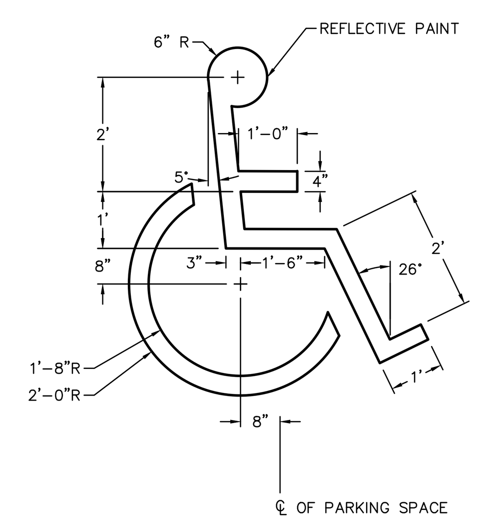


PAVEMENT TYPE	SURFACE COURSE		INTERMEDIATE COURSE		B1
	MASSDOT MIX DESIGNATION	T1	MASSDOT MIX DESIGNATION	T2	
HEAVY DUTY	SSC–12.5–P	2"	SIC–19.0	2"	18"
STANDARD DUTY	SSC–12.5–P	1–1/2"	SIC–19.0	1–1/2"	12"

ASPHALT PAVEMENT
NOT TO SCALE



DETECTABLE WARNING STRIP
NOT TO SCALE



NOTES:

1. WHEELCHAIR SYMBOL PAINT SHALL CONFORM TO THE STRIPING PAINT SPECIFIED AND SYMBOL SHALL BE CENTERED IN THE STALL.
2. ALL PAVEMENT STRIPING SHALL CONFORM TO THE MOST RECENT MASSDOT SPECIFICATIONS.
3. ALL PAVEMENT STRIPING AND MARKINGS SHALL CONSIST OF CHLORINATED RUBBER PAINT APPLIED TO A DRY SURFACE WHEN THE TEMPERATURE IS GREATER THAN 40°F. PAINT SHALL BE APPLIED AT A MINIMUM OF 0.015" (15 MIL) FILM THICKNESS.

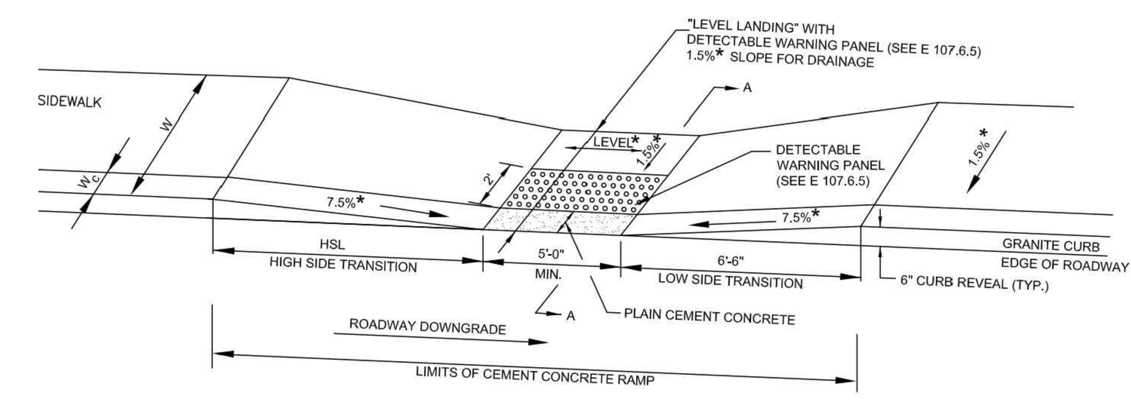
ACCESSIBLE PARKING SYMBOL
NOT TO SCALE

massDOT
CURB TRANSITION LENGTH FOR WHEELCHAIR RAMPS
E 107.9.0

ROADWAY PROFILE GRADE	* HIGH SIDE TRANSITION LENGTH
%	ENGLISH UNITS
=0%	6'-6"
>0% TO 1%	7'-8"
>1% TO 2%	9'-0"
>2% TO 3%	11'-0"
>3% TO 4%	14'-0"
>4% TO 5%	15'-0" Max

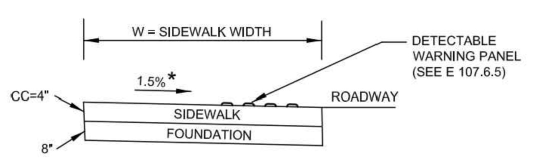
NOTE:
* BASED ON A DESIGN SLOPE OF 7.5% AND A REVEAL OF 6".

CURB TRANSITION LENGTHS FOR WHEELCHAIR RAMPS
NOT TO SCALE



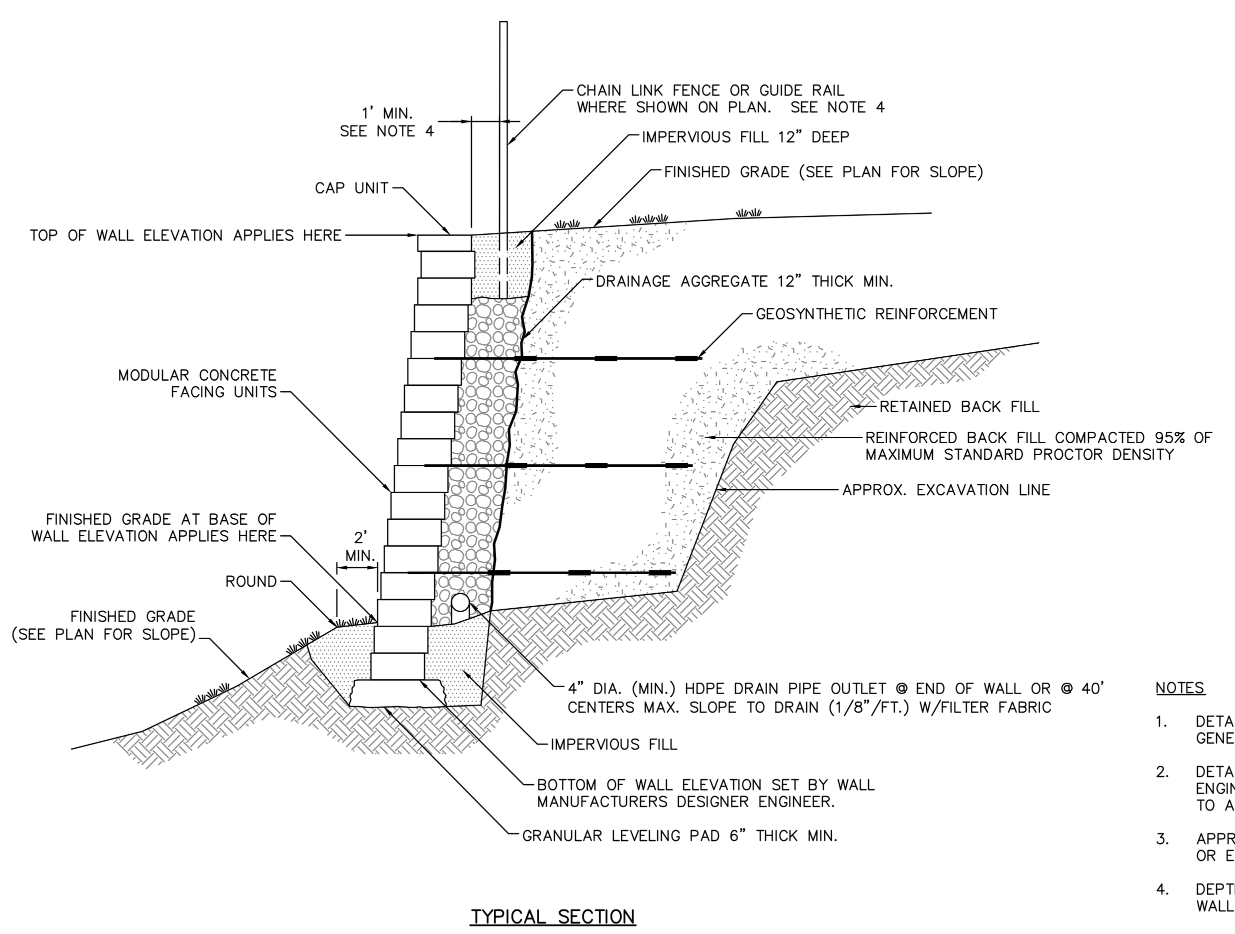
EGEND
SL = HIGH SIDE TRANSITION LENGTH (SEE E 107.9.0)
W = SIDEWALK WIDTH
W_c = CURB WIDTH
CC = CEMENT CONCRETE
* = TOLERANCE FOR CONSTRUCTION ≤0.5%
USABLE SIDEWALK WIDTH PER AAB = W-Wc
USABLE SIDEWALK WIDTH PER AAB IS NOT TO BE LESS THAN 4'0"
SEE E 107.6.5 FOR DETAILS OF DETECTABLE WARNING PANEL

NOTE:
ROADWAY, GUTTER, AND FIRST 6" OF SIDEWALK TO BE ADJUSTED FOR FIELD CONDITIONS



SECTION A-A

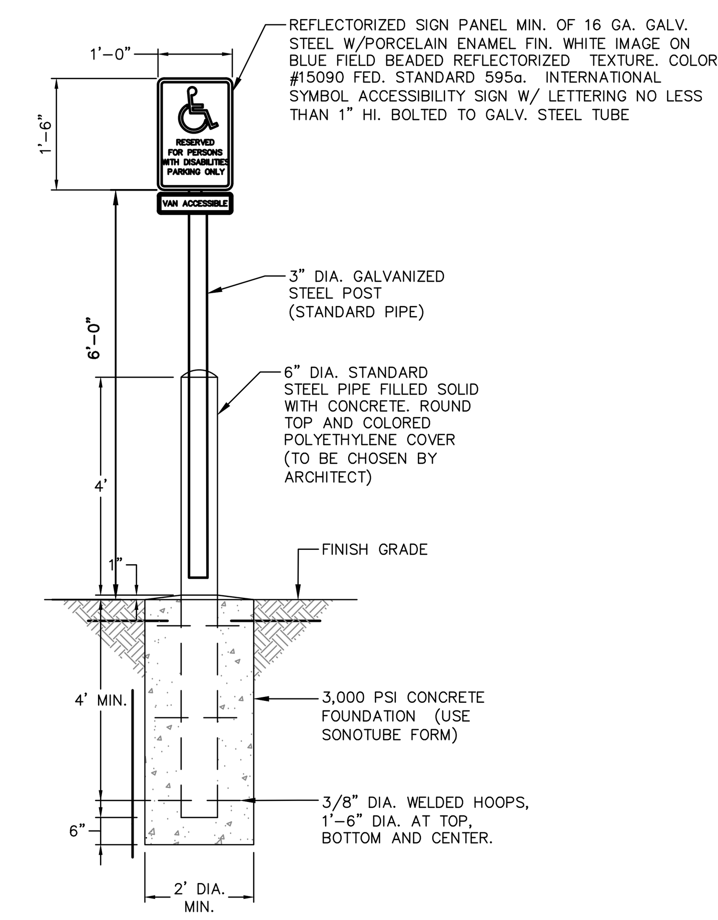
ACCESSIBLE RAMP
NOT TO SCALE



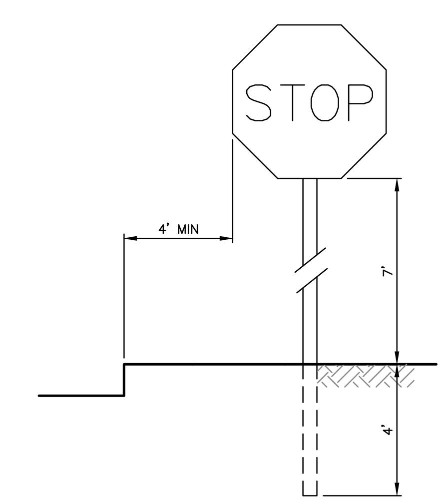
NOTES

1. DETAILS AND NOTES HEREON ARE GENERIC AND ARE INTENDED TO GIVE A GENERAL DESCRIPTION OF THE WALL. THEY ARE NOT FOR CONSTRUCTION.
2. DETAILED WALL CONSTRUCTION PLANS, STAMPED BY A PROFESSIONAL ENGINEER LICENSED IN THE STATE OF CONNECTICUT, SHALL BE SUBMITTED TO AND APPROVED BY THE ENGINEER PRIOR TO CONSTRUCTION.
3. APPROVED WALL MANUFACTURERS INCLUDE VERSA–LOK, KEYSTONE, MESA OR EQUAL.
4. DEPTH OF GUIDE RAIL POST OR FENCE POST SHALL BE DETERMINED BY THE WALL DESIGNER WHEN IN PROXIMITY TO BACK OF WALL.

MODULAR CONCRETE BLOCK RETAINING WALL
NOT TO SCALE



ACCESSIBLE PARKING SIGN
NOT TO SCALE



SIGN GRAPHIC	SIGN NAME	SIZE	MUTCD REFERENCE
STOP	STOP SIGN	24"X24"	R1–1
RESERVED PARKING	ACCESSIBLE PARKING SIGN	12"X18"	R7–8
VAN ACCESSIBLE	VAN ACCESSIBLE PARKING SIGN	12"X6"	R7–8B

NOTE:
HIGH INTENSITY ENCAPSULATED LENS REFLECTIVE SHEETING SHALL BE USED FOR ALL SIGNS. THE 2009 "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES", THE 1990 MDPW "STANDARD DRAWINGS FOR SIGNS AND SUPPORTS", AND ALL AMENDMENTS WILL GOVERN.

SIGNS
NOT TO SCALE

Tecton ARCHITECTS

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2/2/26

PERMITTING SET
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Issues / Revisions

No.	Date	Description
1	01/12/2026	ANRAD
2	02/02/2026	PERMITTING SET

Drawing Title
SITE DETAILS

Project Manager: JD	Project No: 20250003.A10
Project Architect:	Production Leader:
Project Designer: KT	Peer Reviewer:

Drawing Number
CD5.02

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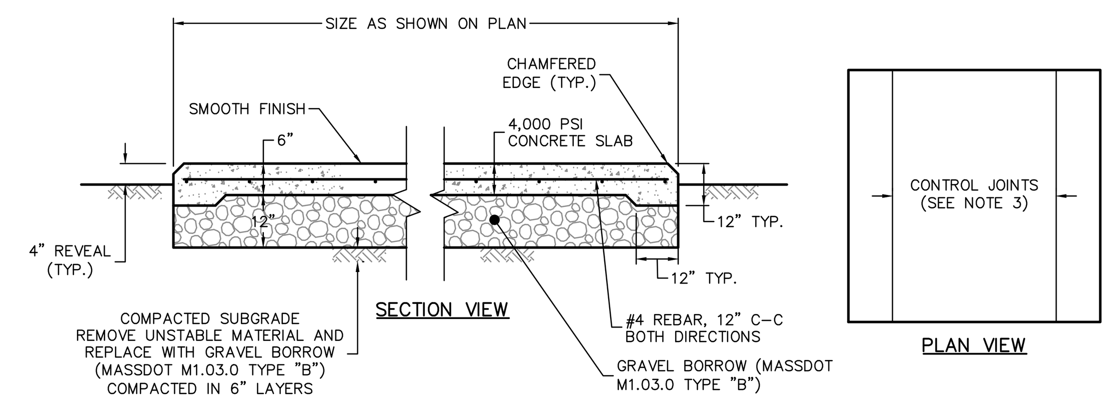
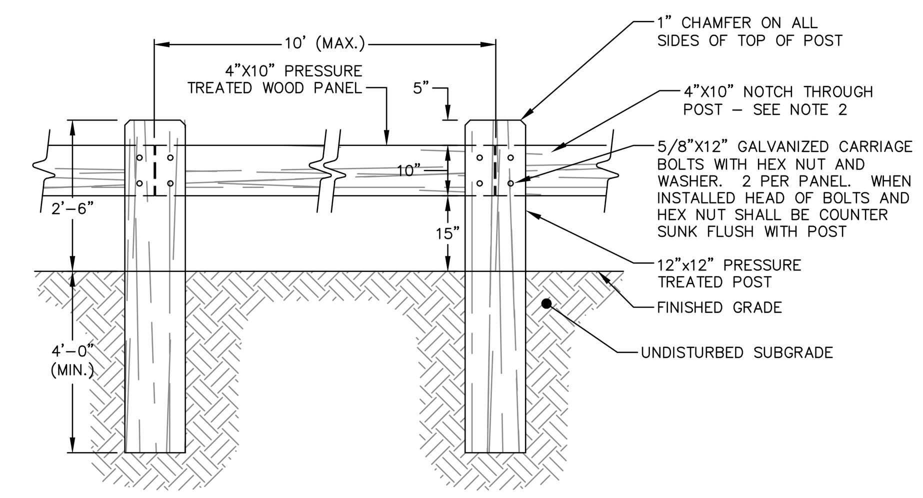


NOTES:

1. SEE MEP PLANS FOR SPECIFIC CONCRETE PAD DETAILS ASSOCIATED WITH ALL ELECTRICAL APPURTENANCES.
2. PAD REQUIREMENTS FROM EQUIPMENT MANUFACTURER SHOULD BE CONFIRMED PRIOR TO INSTALLATION.
3. CONTROL JOINTS: 8' O.C. CUT 24 HRS AFTER FINISH.
4. 4,000 PSI CONCRETE @ 28 DAYS.
5. CONCRETE PAD ON 12" COMPACTED GRAVEL BORROW, MONOLITHIC POUR.
6. SEE EQUIPMENT SUBMITTALS FOR CONDUIT STUB UP DETAILS.
7. PAD SHALL BE INSTALLED WITH 4" REVEAL TO GROUND SURFACE.
8. GRAVEL BORROW TO BE PLACED AND COMPACTED IN 6" LIFTS, COMPACTED TO 95% COMPACTION.

CONCRETE EQUIPMENT PAD

NOT TO SCALE

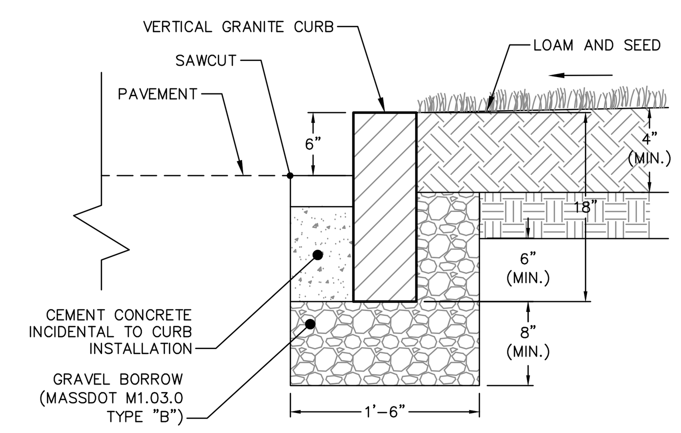


NOTES:

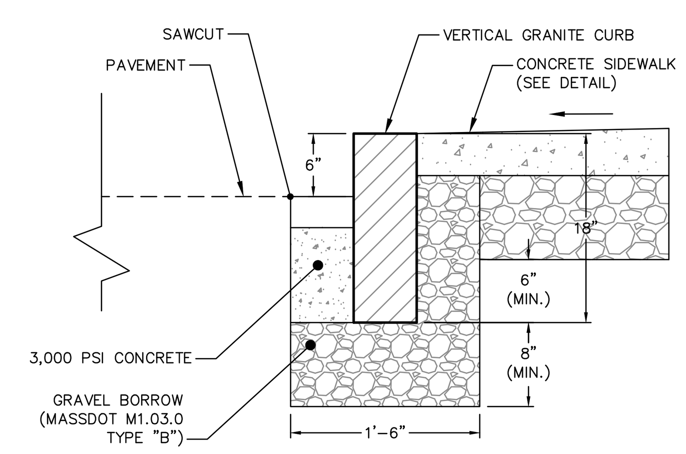
1. LUMBER SHALL BE ROUGH SAWN (NON-PLANED) PRESSURE TREATED SOUTHERN YELLOW PINE OR DOUGLAS FIR.
2. POSTS SHALL HAVE 4"X10" NOTCH THROUGH SIDE OF POST TO RECEIVE GUARD RAIL PANELS. TOP OF OPENING SHALL BE 5" FROM TOP OF POST.

TIMBER GUARDRAIL

NOT TO SCALE



CURB ADJACENT TO GRASS



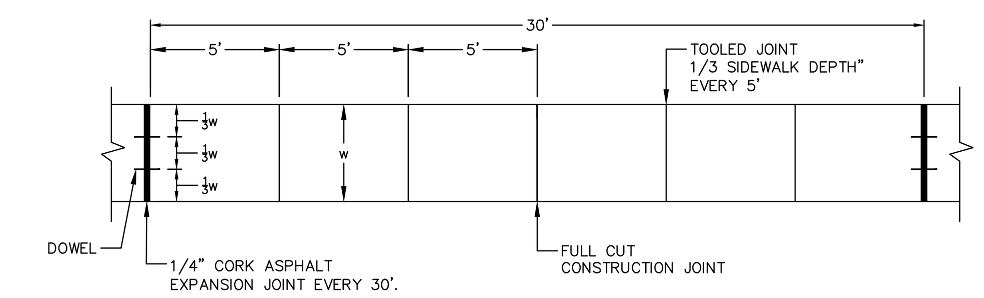
CURB ADJACENT TO SIDEWALK

NOTES:

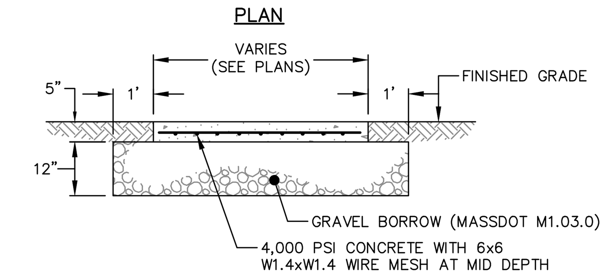
1. GRANITE CURB SHALL BE TYPE VA4 (MASSDOT M9.04.1) AND WILL HAVE A TYPICAL 6-INCH REVEAL (OR AS NOTED ON PLANS). REVEAL HEIGHT TO BE ADJUSTED WITHIN PROVIDED RANGE TO ACHIEVE ADA COMPLIANCE AND MEET AN APPROPRIATE GRADE AT BACK OF SIDEWALK AS DIRECTED BY THE ENGINEER.

GRANITE CURB

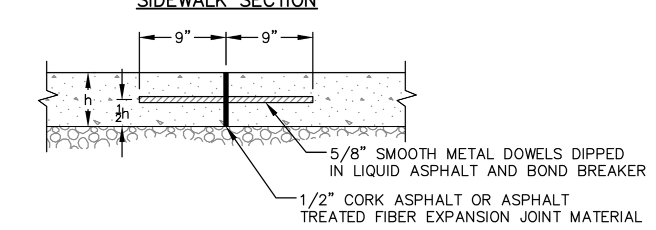
NOT TO SCALE



PLAN



SIDEWALK SECTION



EXPANSION JOINT SECTION

NOTES:

1. PROVIDE TOOLED JOINT EVERY 5' (1/3 DEPTH OF SLAB).
2. REPLACE 1/4" EXPANSION JOINT IF EXISTING JOINT FALLS WITHIN RECONSTRUCTION.
3. PROVIDE JOINT SEALANT FOR EXPANSION JOINTS.

CONCRETE SIDEWALK

NOT TO SCALE

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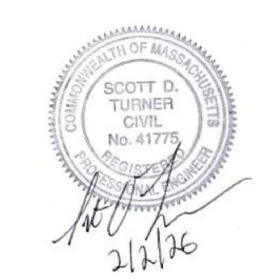

GRAPHIC SCALE

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Seals

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Issues / Revisions

No.	Date	Description
1	01/12/2026	ANRAD
2	02/02/2026	PERMITTING SET

Drawing Title

SITE DETAILS

Project Manager: JD	Project No: 20250003.A10
Project Architect:	Production Leader:
Project Designer: KT	Peer Reviewer:

Drawing Number

CD5.03

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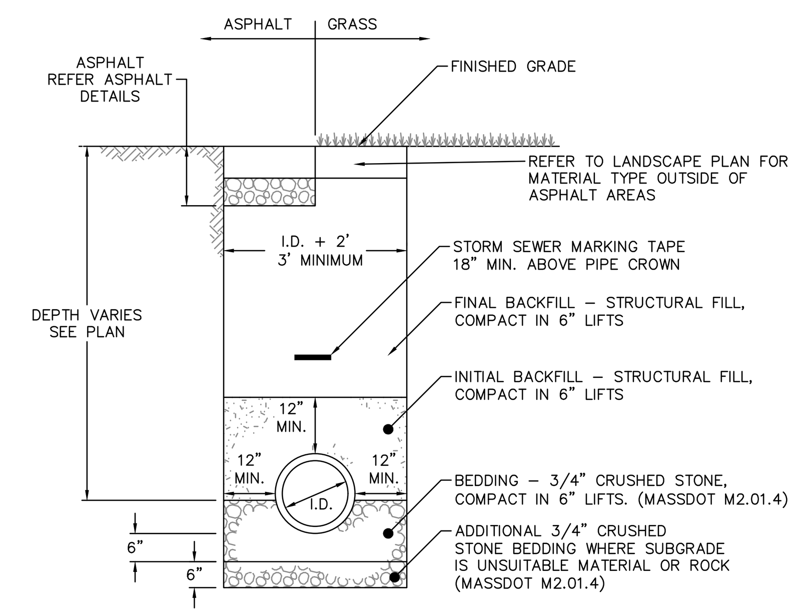
STORM STRUCTURE NOTES

NOTES

1. UNLESS OTHERWISE NOTED, INTERIOR DIAMETER (D) SHALL BE 4 FEET. AT A MINIMUM, INTERIOR DIAMETER SHALL BE 6" LARGER THAN THE LARGEST DIAMETER PIPE.
2. FRAME AND GRATE SHALL CONFORM TO MASSACHUSETTS DEPARTMENT OF TRANSPORTATION CONSTRUCTION STANDARD DETAILS:
   - 2.1. CATCH BASINS
     - 2.1.1. E204.2.0 WHERE ADJACENT TO CURBS.
     - 2.1.2. E201.6.0 AND E201.10.0 IN OTHER AREAS.
   - 2.2. MANHOLES
     - 2.2.1. E202.6.0 AND E202.8.0.
     - 2.2.2. MANHOLE COVERS SHALL HAVE "DRAIN" CAST INTO THE COVER.
3. CATCH BASIN HOODS SHALL CONFORM CONFORM TO MASSACHUSETTS DEPARTMENT OF TRANSPORTATION CONSTRUCTION STANDARD DETAILS E201.12.0.
4. STEPS SHALL CONFORM TO ASTM C478.
5. STRUCTURES SHALL BE DESIGNED FOR HS-20 LOADING.
6. REINFORCING STEEL SHALL CONFORM TO M306 AASHTO.
7. WATERTIGHT GASKET JOINTS SHALL BE BUTYL RESIN CONFORMING TO ASTM C990.
8. FLAT TOP SECTIONS ARE TO BE USED FOR STRUCTURE WITH AN INTERIOR DIAMETER (D) OF 6 FEET OR GREATER AND WHEN REQUIRED DUE TO PIPE COVER.

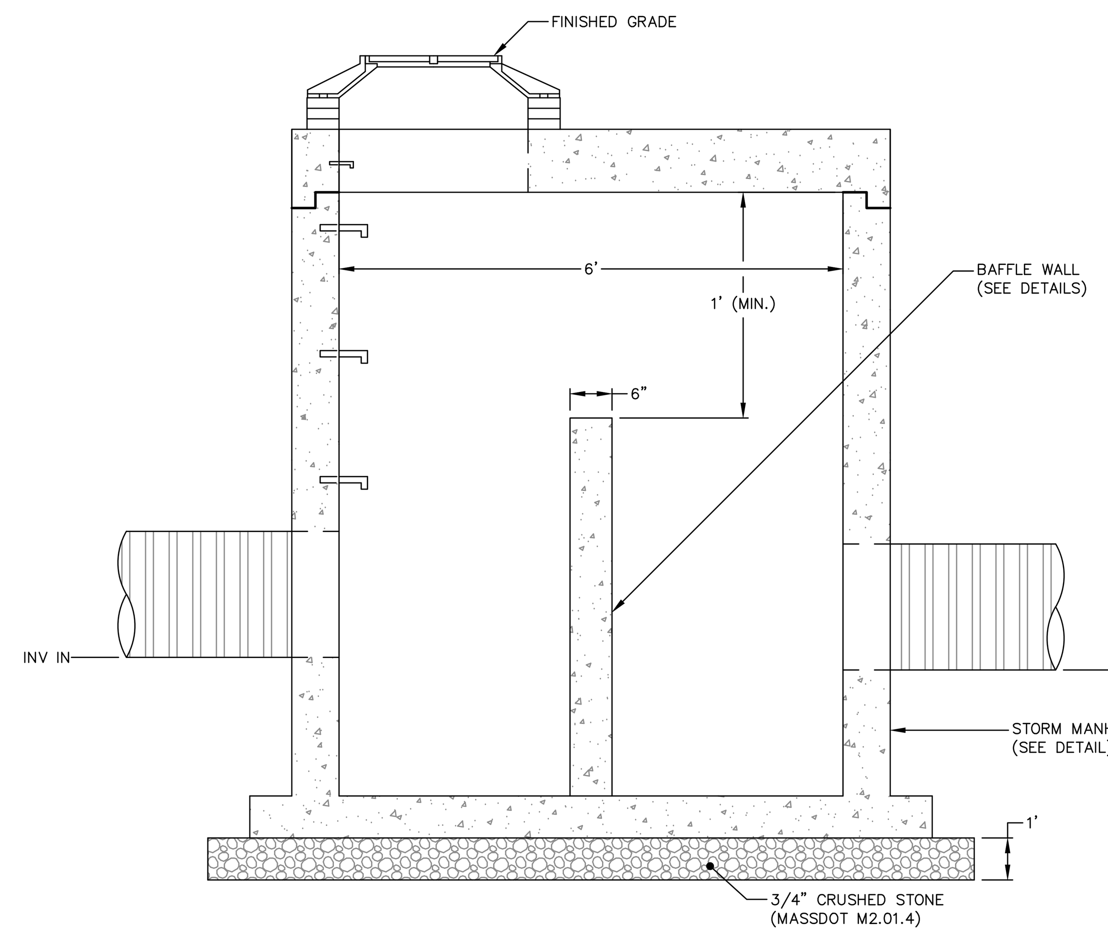
STORM STRUCTURE NOTES

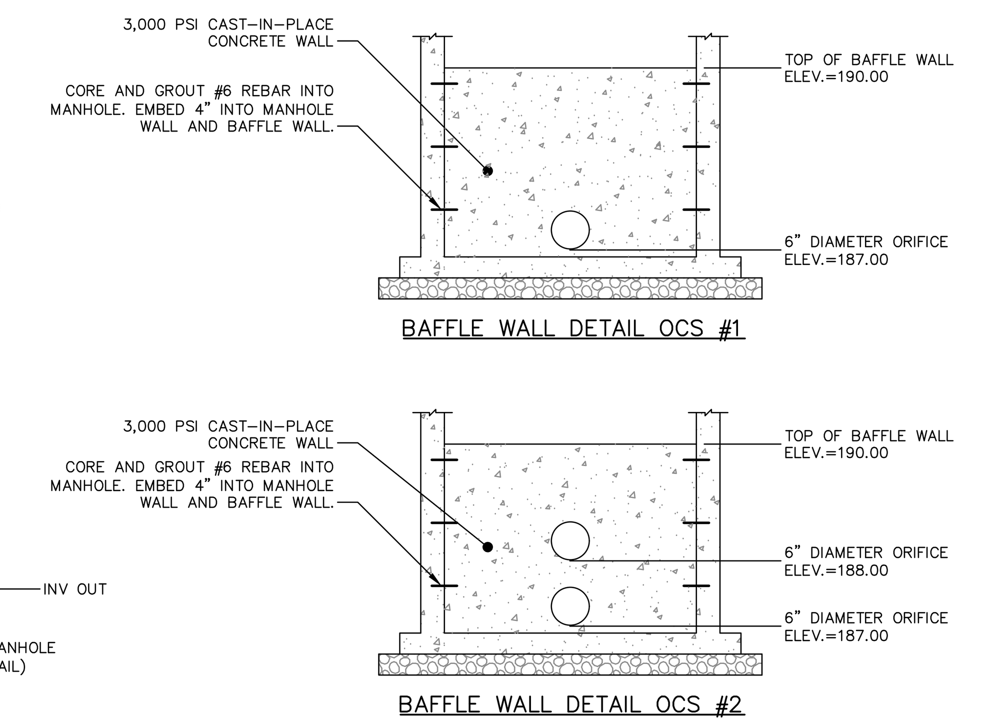
NOT TO SCALE



STORMWATER DRAINAGE TRENCH

NOT TO SCALE

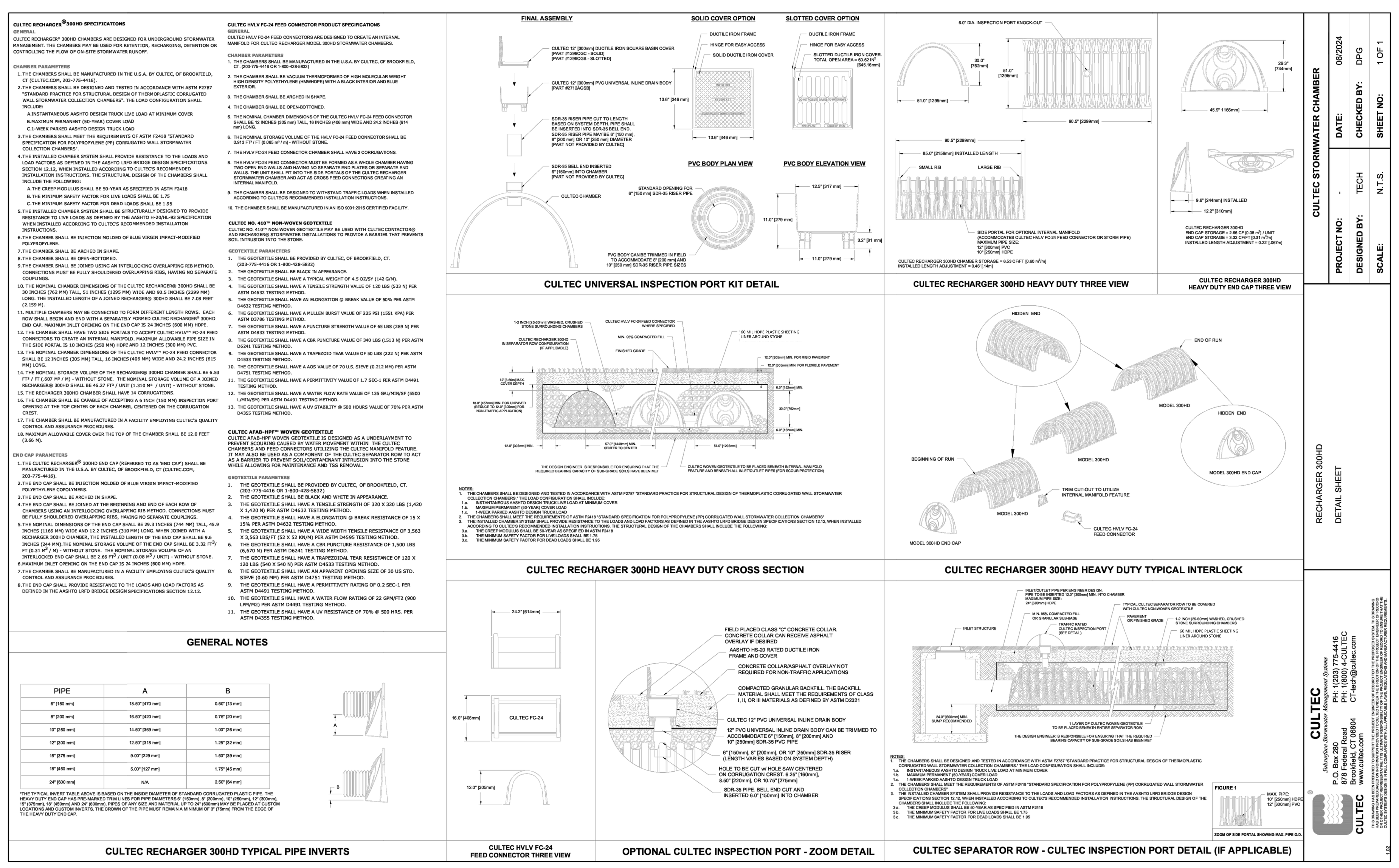




NOTES:
1. REFER TO STORM MANHOLE DETAIL FOR STRUCTURE REQUIREMENTS.
2. REFER TO PLANS FOR ORIFICE SIZES AND ELEVATIONS.

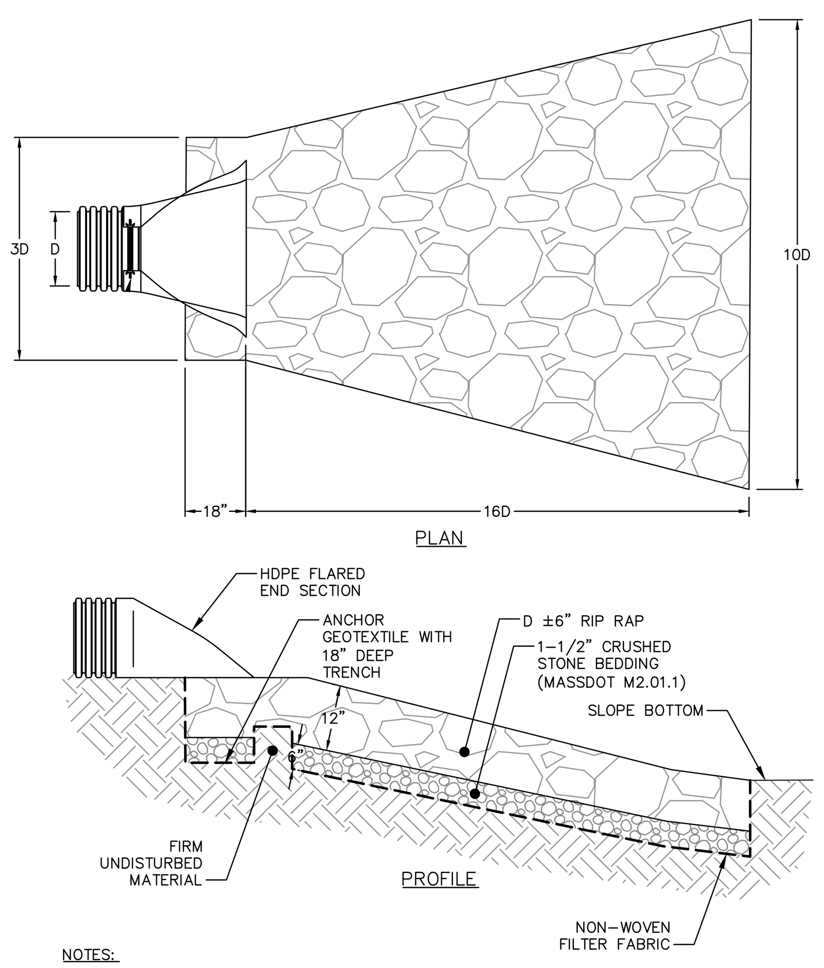
SUBSURFACE SYSTEM OUTLET CONTROL STRUCTURE

NOT TO SCALE



CULTEC RECHARGER 300HD

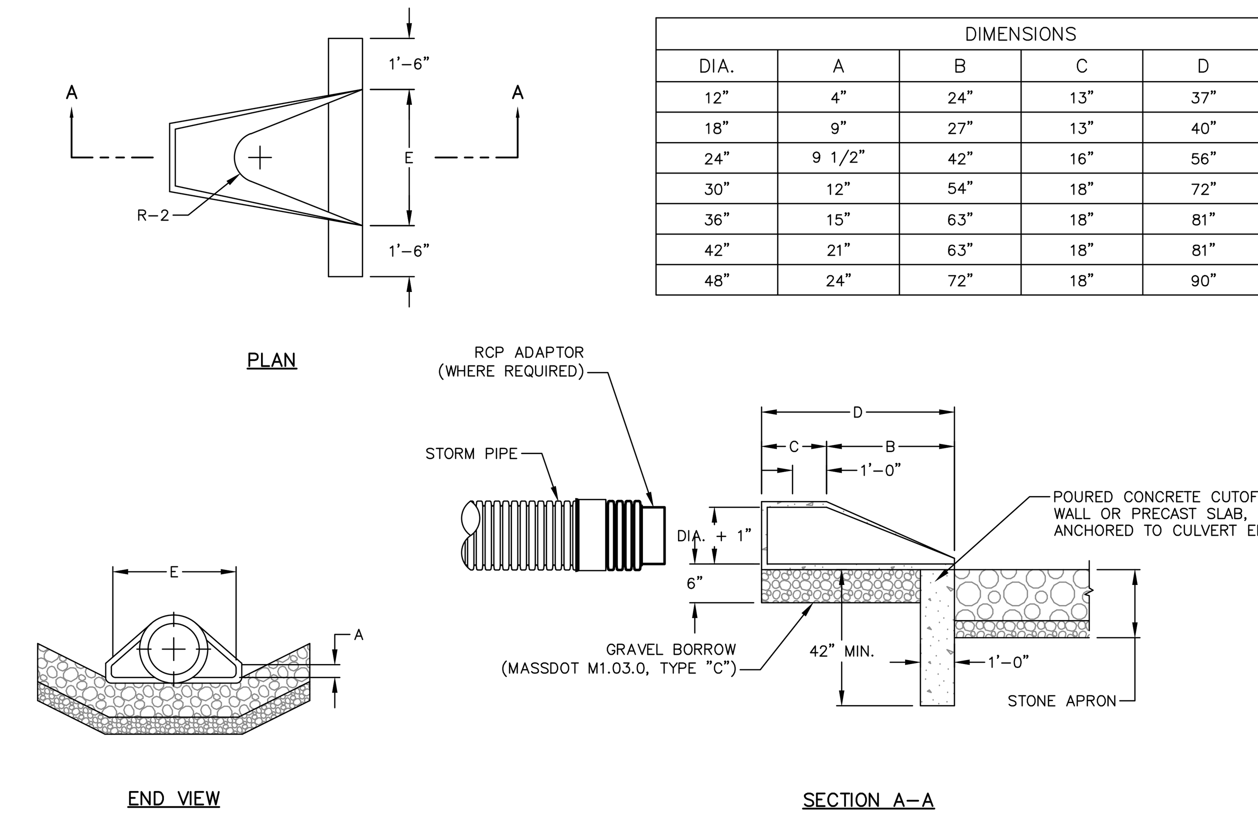
NOT TO SCALE



NOTES:
1. RIP RAP SHALL CONFORM TO MASSDOT REQUIREMENTS SPECIFIED IN SECTION M2.02.03 FOR STONE AT PIPE ENDS.

RIP RAP ENERGY DISSIPATOR

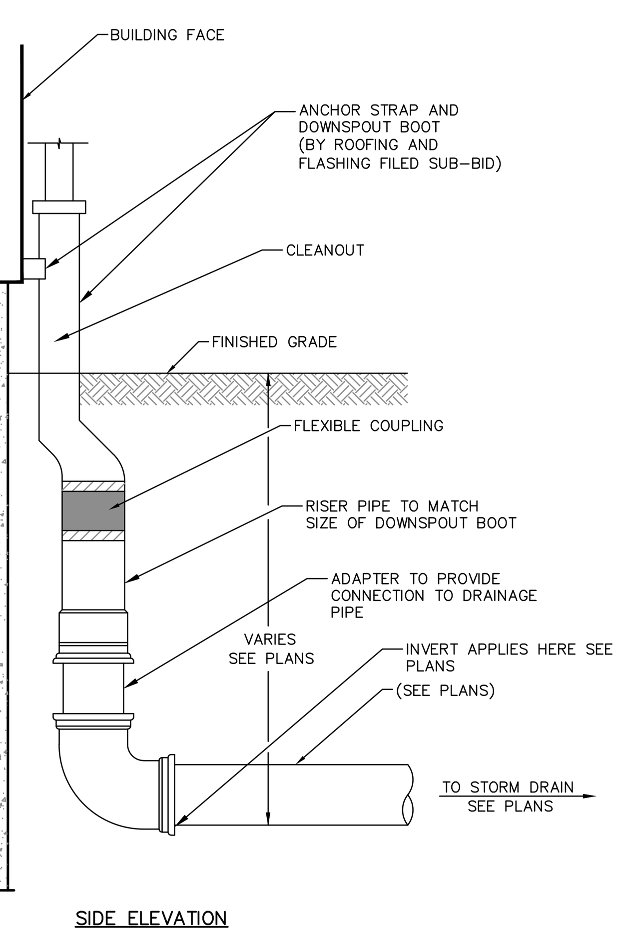
NOT TO SCALE



DIMENSIONS					
DIA.	A	B	C	D	E
12"	4"	24"	13"	37"	24"
18"	9"	27"	13"	40"	36"
24"	9 1/2"	42"	16"	56"	48"
30"	12"	54"	18"	72"	60"
36"	15"	63"	18"	81"	72"
42"	21"	63"	18"	81"	78"
48"	24"	72"	18"	90"	84"

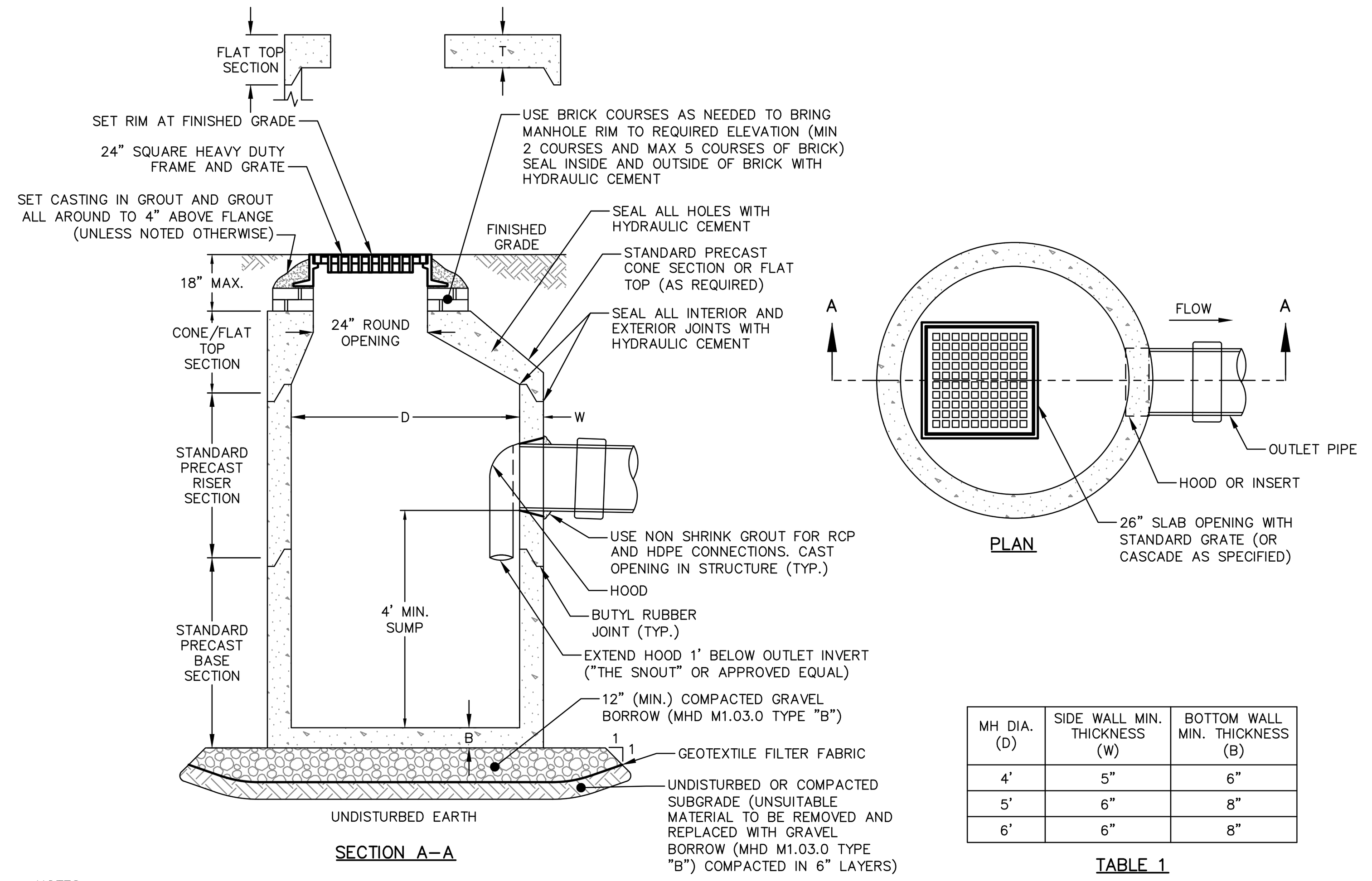
REINFORCED CONCRETE CULVERT END (R.C.C.E)

NOT TO SCALE



DOWNSPOUT BOOT CONNECTION

NOT TO SCALE



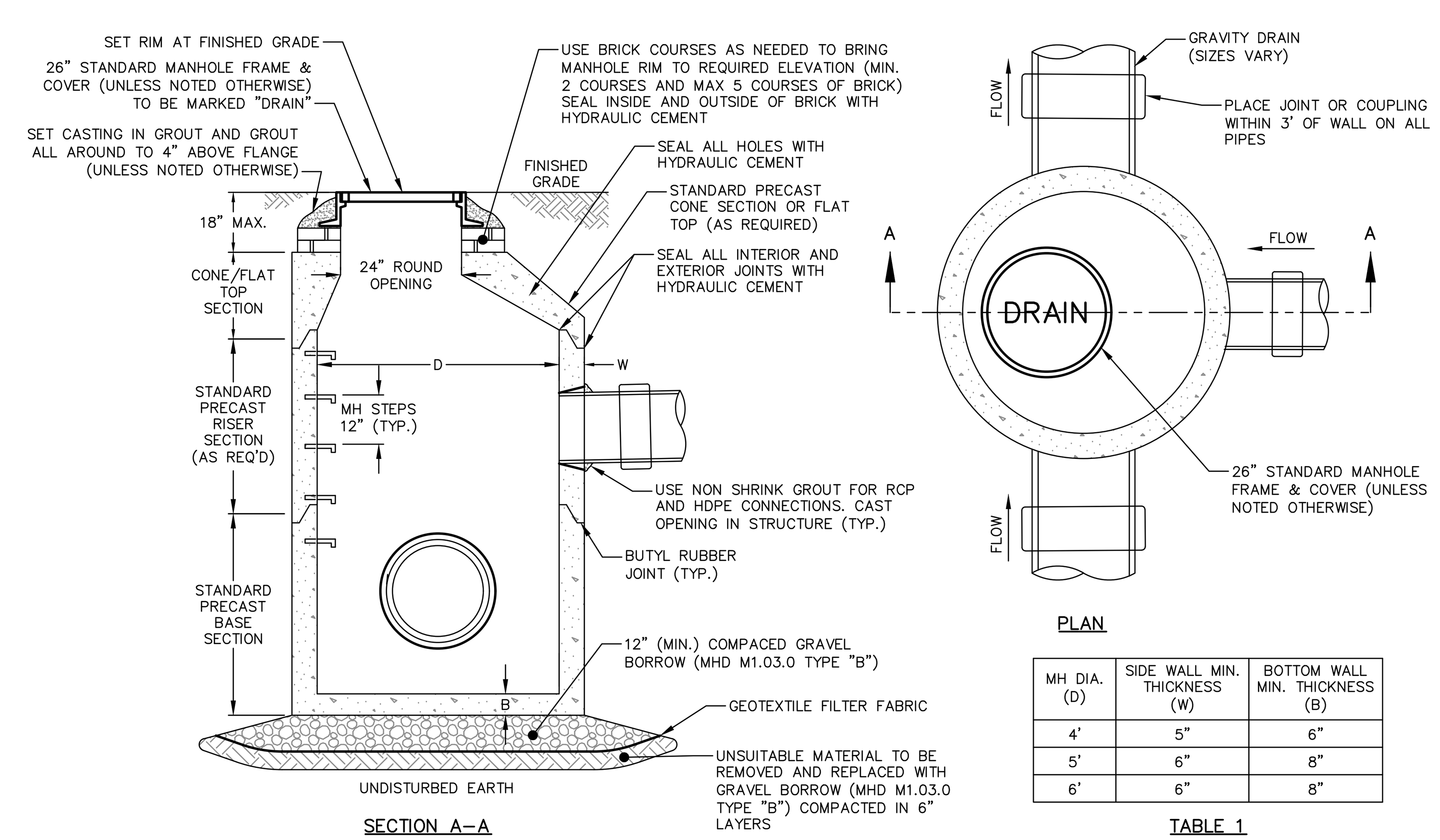
MH DIA. (D)	SIDE WALL MIN. THICKNESS (W)	BOTTOM WALL MIN. THICKNESS (B)
4'	5"	6"
5'	6"	8"
6'	6"	8"

TABLE 1

NOTES:
1. ALL STRUCTURES SHALL BE SUITABLE FOR H-20 LOADING AND SHALL MEET THE REQUIREMENTS OF ASTM C478.

CATCH BASIN (CB)

NOT TO SCALE



MH DIA. (D)	SIDE WALL MIN. THICKNESS (W)	BOTTOM WALL MIN. THICKNESS (B)
4'	5"	6"
5'	6"	8"
6'	6"	8"

TABLE 1

NOTES:

1. ALL PIPE SYSTEMS SHALL BE INSTALLED IN ACCORDANCE WITH ASTM D2321, " STANDARD PRACTICE FOR UNDERGROUND INSTALLATION OF THERMOPLASTIC PIPE FOR SEWERS AND OTHER GRAVITY FLOW APPLICATIONS," LATEST EDITION.
2. GEOTEXTILE FABRIC SHALL BE INSTALLED AROUND TRENCH LIMITS TO PREVENT MIGRATION OF NATIVE FINES INTO BACKFILL MATERIAL, WHEN REQUIRED.
3. FOUNDATION: WHERE THE TRENCH BOTTOM IS UNSTABLE, THE CONTRACTOR SHALL EXCAVATE TO A DEPTH REQUIRED BY THE ENGINEER AND REPLACE WITH SUITABLE MATERIAL AS SPECIFIED BY THE ENGINEER. AS AN ALTERNATIVE AND AT THE DISCRETION OF THE DESIGN ENGINEER, THE TRENCH BOTTOM MAY BE STABILIZED USING A GEOTEXTILE MATERIAL.
4. BEDDING: SUITABLE MATERIAL SHALL BE CLASS I, II, OR III. THE CONTRACTOR SHALL PROVIDE DOCUMENTATION FOR MATERIAL SPECIFICATION TO ENGINEER. UNLESS OTHERWISE NOTED BY THE ENGINEER, MINIMUM BEDDING THICKNESS SHALL BE 4" FOR 12"-24"; 6" FOR 30"-60".
5. INITIAL BACKFILL: SUITABLE MATERIAL SHALL BE CLASS I, II, OR III IN THE PIPE ZONE EXTENDING NOT LESS THAN 6" ABOVE CROWN F PIPE. THE CONTRACTOR SHALL PROVIDE DOCUMENTATION FOR MATERIAL SPECIFICATION TO ENGINEER. MATERIAL SHALL BE INSTALLED AS REQUIRED IN ASTM D2321, LATEST EDITION.
6. MINIMUM COVER: MINIMUM COVER IN NON-TRAFFIC APPLICATIONS (GRASS OR LANDSCAPE AREAS) IS 12" FROM THE TOP OF PIPE TO GROUND SURFACE. CONCRETE CAP MAY BE REQUIRED TO PREVENT FLOTATION FOR PIPE IN GROUNDWATER. FOR TRAFFIC APPLICATIONS, MINIMUM COVER, H, IS36" MEASURED FROM TOP OF PIPE TO BOTTOM OF FLEXIBLE PAVEMENT OF TO TOP OF RIGID PAVEMENT.

STORM MANHOLE (DMH)

NOT TO SCALE

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2/2/26

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Seals

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Issues / Revisions

No.	Date	Description
1.	01/12/2026	ANRAD
2.	02/02/2026	PERMITTING SET

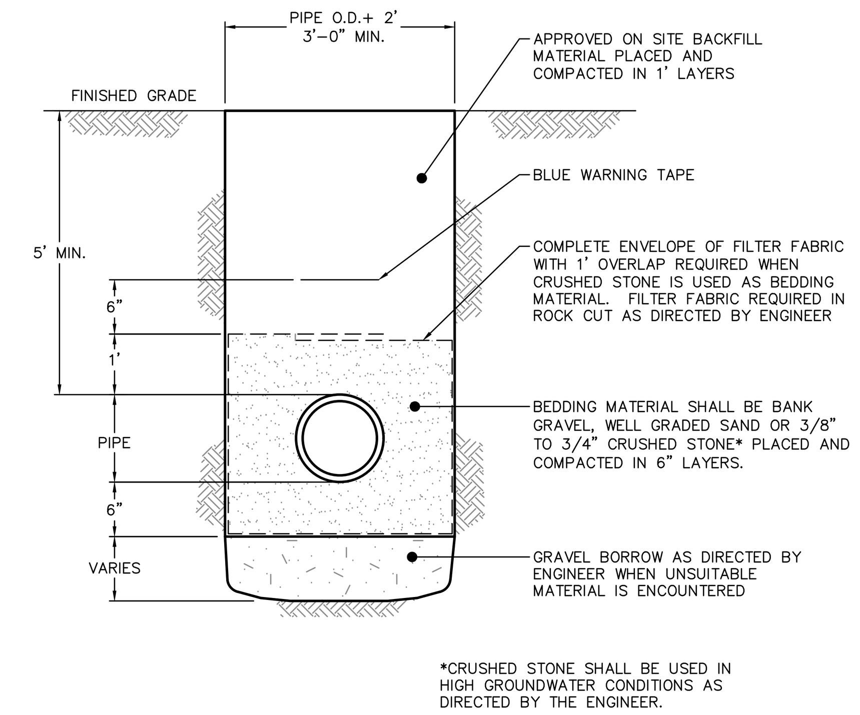
Drawing Title

SITE DETAILS

Project Manager: JD	Project No: 20250003.A10
Project Architect:	Production Leader:
Project Designer: KT	Peer Reviewer:

Drawing Number

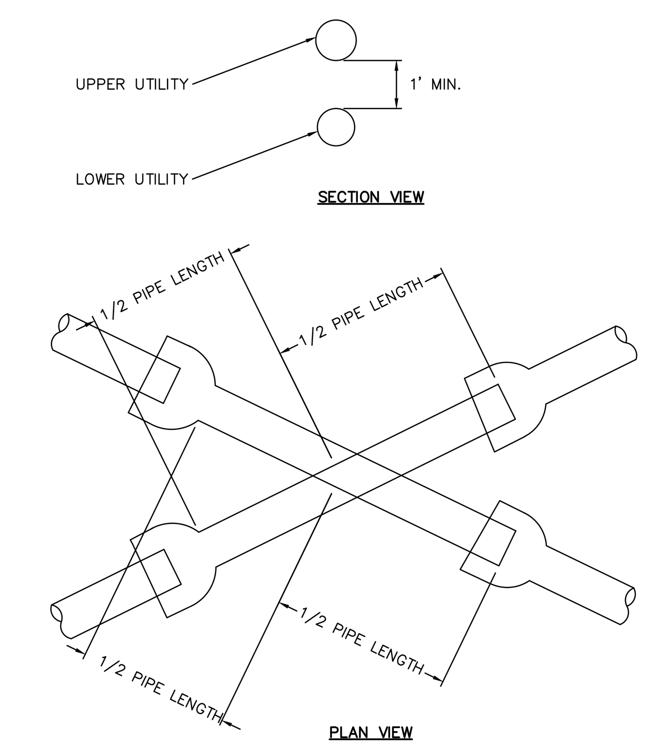
CD5.04



*CRUSHED STONE SHALL BE USED IN HIGH GROUNDWATER CONDITIONS AS DIRECTED BY THE ENGINEER.

WATER MAIN TRENCH

NOT TO SCALE

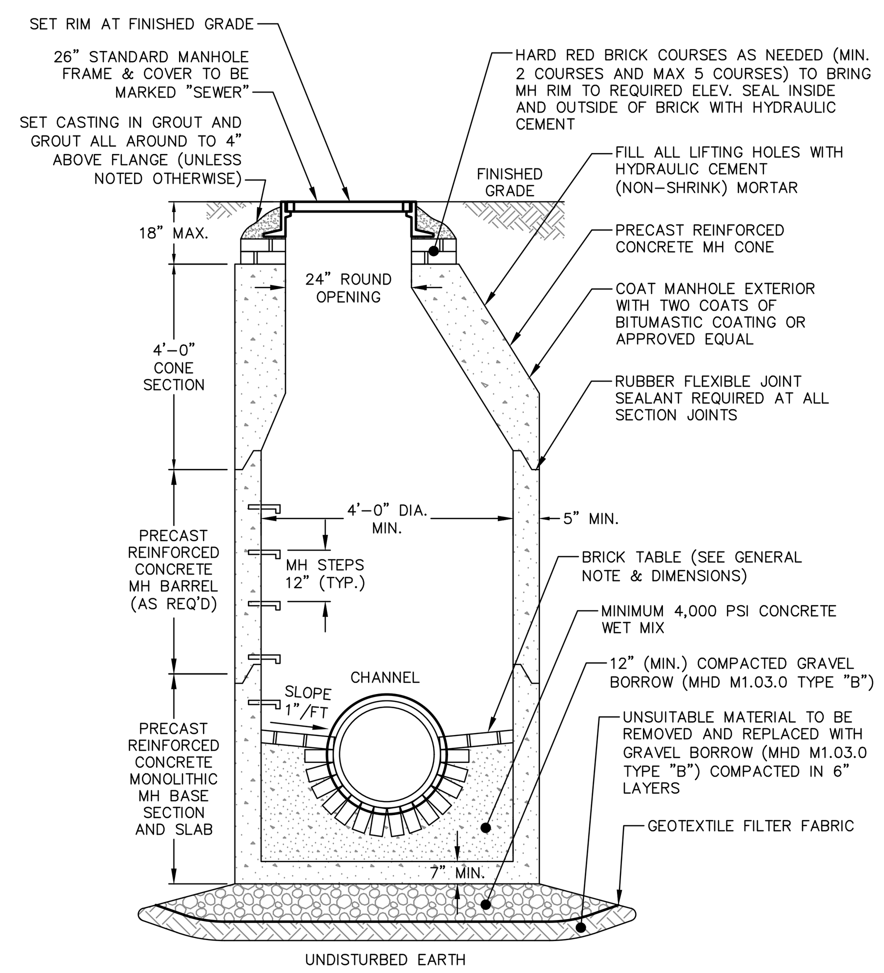


NOTES

1. MAINTAIN 1'-6" MINIMUM CLEARANCE AT ALL UTILITY CROSSING WHERE POSSIBLE. LOCATE JOINTS AS FAR AWAY FROM CROSSING AS POSSIBLE.
   - 1.1. FOR SEWER PIPES, CUT FULL LENGTHS PIPES TO A LENGTH NO SMALLER THAN HALF THE PIPE LENGTH. MAINTAIN FACTORY BELL ENDS. DO NOT USE FLEXIBLE COUPLINGS.
   - 1.2. FOR WATER PIPES, CUT FULL LENGTH TO A LENGTH NO SMALLER THAN HALF THE PIPE LENGTH. PROVIDE MECHANICAL JOINTS AS NEEDED.
   - 1.3. FOR ELECTRIC AND TELECOM PIPES, CUT FULL LENGTH PIPES TO A LENGTH NO SMALLER THAN HALF THE PIPE LENGTH. MAINTAIN FACTORY BELL ENDS. DO NOT USE FLEXIBLE COUPLINGS.
2. IF 1'-6" OF CLEARANCE CAN NOT BE MAINTAINED, SURROUND BOTH PIPES WITH 1' OF 3,000 PSI CONCRETE FOR A LENGTH OF 10 FEET ON EITHER SIDE OF THE CROSSING OR 1' PAST THE NEAREST JOINT, WHICHEVER IS GREATER.

UTILITY CROSSING

NOT TO SCALE

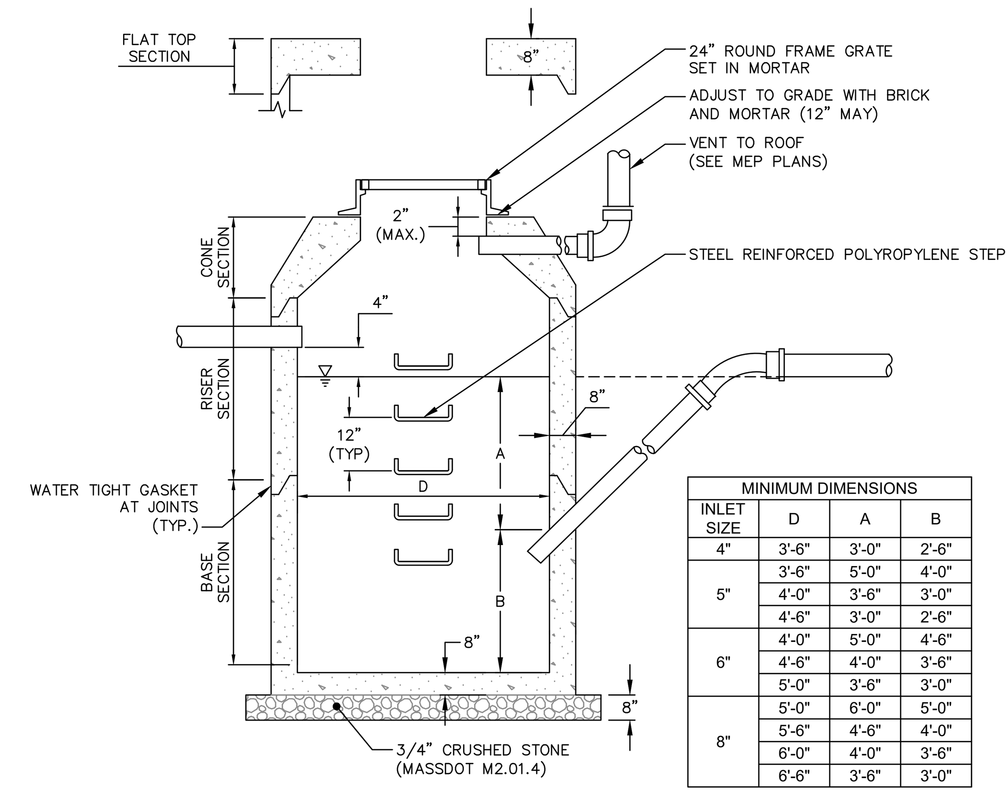


NOTES:

1. TYPICAL SANITARY MANHOLE TO BE 4 FEET IN DIAMETER.
2. 5'-0" DIAMETER FOR ALL MANHOLE DEPTHS GREATER THAN 12 FEET OR WHEN ORDERED BY THE ENGINEER.
3. 6" MIN. WALL THICKNESS AND 7" MIN. BASE THICKNESS WITH 5'-0" DIAMETER MANHOLES.
4. INNER EDGE OF BRICK TABLE TO BE AT ELEVATION OF CROWN OF TOP OF PIPE.
5. DESIGN LOAD – HS20
6. ALL INVERTS SHALL BE 4,000 PSI CEMENT CONCRETE IN VOID AREAS AND RED SEWER BRICK CONSTRUCTION.
7. INVERTS SHALL NOT BE BUILT ABOVE GRADE. ALL INVERTS SHALL BE BUILT IN PLACE AFTER ALL PIPES HAVE BEEN INSTALLED.
8. ALL STRUCTURES SHALL BE SUITABLE FOR H–20 LOADING AND SHALL MEET THE REQUIREMENTS OF ASTM C478.
9. MANHOLE SHALL BE VACUUM TESTED AND PRESSURE TESTED PRIOR TO BEING PLACED INTO SERVICE. ALL TESTING SHALL BE WITNESSED/COORDINATED BY SEWER DEPARTMENT.

SEWER MANHOLE (SMH)

NOT TO SCALE



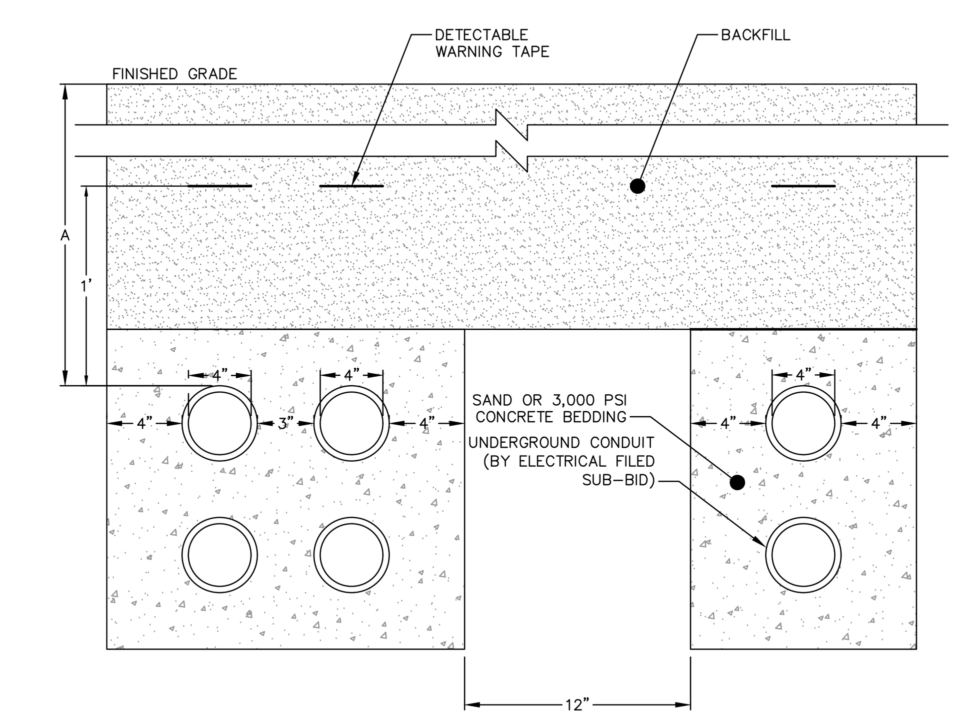
MINIMUM DIMENSIONS			
INLET SIZE	D	A	B
4"	3'-6"	3'-0"	2'-6"
5"	3'-6"	5'-0"	4'-0"
	4'-0"	3'-6"	3'-0"
	4'-6"	3'-0"	2'-6"
6"	4'-0"	5'-0"	4'-6"
	4'-6"	4'-0"	3'-6"
	5'-0"	3'-6"	3'-0"
8"	5'-0"	6'-0"	5'-0"
	5'-6"	4'-6"	4'-0"
	6'-0"	4'-0"	3'-6"
	6'-6"	3'-6"	3'-0"

NOTES

1. STRUCTURE SHALL CONFORM TO 248 CMR 10: UNIFORM STATE PLUMBING CODE.
2. FRAME AND COVER SHALL CONFORM TO MASSACHUSETTS DEPARTMENT OF TRANSPORTATION CONSTRUCTION STANDARD DETAILS E202.6.0 AND E202.8.0
3. STEPS SHALL CONFORM TO ASTM C478.
4. STRUCTURE SHALL BE DESIGNED FOR HS–20 LOADING.
5. REINFORCING STEEL SHALL CONFORM TO ASTM A185.
6. WATERTIGHT GASKET JOINTS SHALL BE BUTYL RESIN CONFORMING TO ASTM C990.
7. FLAT TOP SECTIONS ARE TO BE USED FOR STRUCTURE WITH AN INTERIOR DIAMETER (D) OF 6 FEET OR GREATER AND WHEN REQUIRED DUE TO PIPE COVER.

OIL/WATER SEPARATOR

NOT TO SCALE



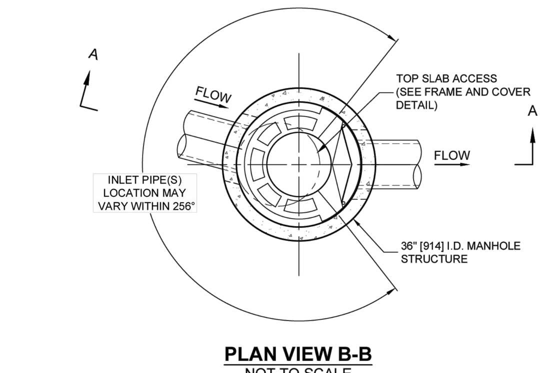
NOTES:

1. INSTALL CONDUITS IN ACCORDANCE WITH LOCAL UTILITY COMPANY REGULATIONS.
2. CONCRETE BEDDING IS REQUIRED UNDER AREAS THAT WILL HAVE VEHICULAR TRAFFIC (E.G., ROADS, DRIVEWAYS, PARKING LOTS, EQUIPMENT ACCESS ROUTES, ETC.). EXTEND CONCRETE BEDDING 2' PAST EDGE OF TRAVELED WAY.
3. COORDINATE WITH ELECTRICAL CONTRACTOR PRIOR TO INSTALLATION.

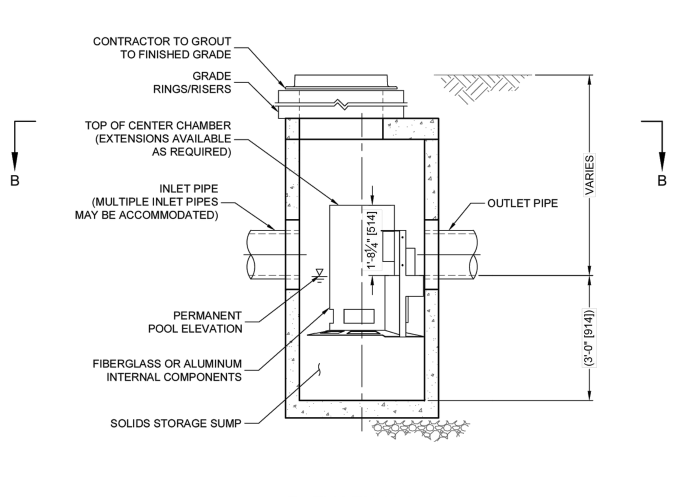
CONDUIT DEPTHS	
SERVICE	DIM "A"
PRIMARY	3'–0"
SECONDARY	2'–0"
TELEPHONE	2'–0"
CABLE TV	2'–0"
SITE LIGHTING	2'–0"

UNDERGROUND CONDUIT TRENCH

NOT TO SCALE



PLAN VIEW B-B
NOT TO SCALE



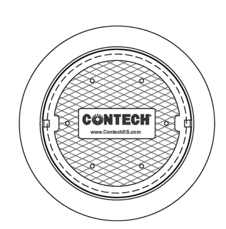
ELEVATION A-A
NOT TO SCALE

CASCADE separator™

CASCADE SEPARATOR DESIGN NOTES

THE STANDARD CS-3 CONFIGURATION IS SHOWN. ALTERNATE CONFIGURATIONS ARE AVAILABLE AND ARE LISTED BELOW. SOME CONFIGURATIONS MAY BE COMBINED TO SUIT SITE REQUIREMENTS.

CONFIGURATION DESCRIPTION
CURB INLET ONLY (NO INLET PIPE)
CURB INLET WITH INLET PIPE OR PIPES



FRAME AND COVER
(DIAMETER VARIES)
NOT TO SCALE

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID			
WATER QUALITY FLOW RATE (cfs [L/s])			
PEAK FLOW RATE (cfs [L/s])			
RETURN PERIOD OF PEAK FLOW (yrs)			
RIM ELEVATION			
PIPE DATA:	INVERT	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2			
OUTLET PIPE			
NOTES / SPECIAL REQUIREMENTS:			

GENERAL NOTES
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. FOR SITE SPECIFIC DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHT, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.ContechES.com
3. CASCADE SEPARATOR WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF PROJECT.
4. CASCADE SEPARATOR STRUCTURE SHALL MEET AASHTO HS20 LOAD RATING, ASSUMING EARTH COVER OF 0' - 2' [610], AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 AND BE CAST WITH THE CONTECH LOGO.
5. CASCADE SEPARATOR STRUCTURE SHALL BE PRECAST CONCRETE CONFORMING TO ASTM C478 AND AASHTO LOAD FACTOR DESIGN METHOD.
6. ALTERNATE UNITS ARE SHOWN IN MILLIMETERS [mm].

INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CASCADE SEPARATOR MANHOLE STRUCTURE.
C. CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT INLET AND OUTLET PIPE(S). MATCH PIPE INVERTS WITH ELEVATIONS SHOWN. ALL PIPE CENTERLINES TO MATCH PIPE OPENING CENTERLINES.
E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

CONTECH ENGINEERED SOLUTIONS LLC
www.contechES.com
9100 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

CS-3
CASCADE SEPARATOR
STANDARD DETAIL

WATER QUALITY UNIT 1 & 2

NOT TO SCALE

Tecton
ARCHITECTS

FUSS & O'NEILL
1250 HANCOCK STREET, SUITE 815N
QUINCY, MA 02169
617.282.4675
www.fando.com

Client/ Contractor

TOWN OF CARLISLE

66 WESTFORD STREET
CARLISLE, MASSACHUSETTS

Project

CARLISLE FIRE DEPARTMENT ADDITIONS & ALTERATIONS

80 WESTFORD STREET
CARLISLE, MA 01741

GRAPHIC SCALE
0

Seals

PERMITTING SET
NOT FOR CONSTRUCTION

Issues / Revisions

No.	Date	Description
1.	01/12/2026	ANRAD
2.	02/02/2026	PERMITTING SET

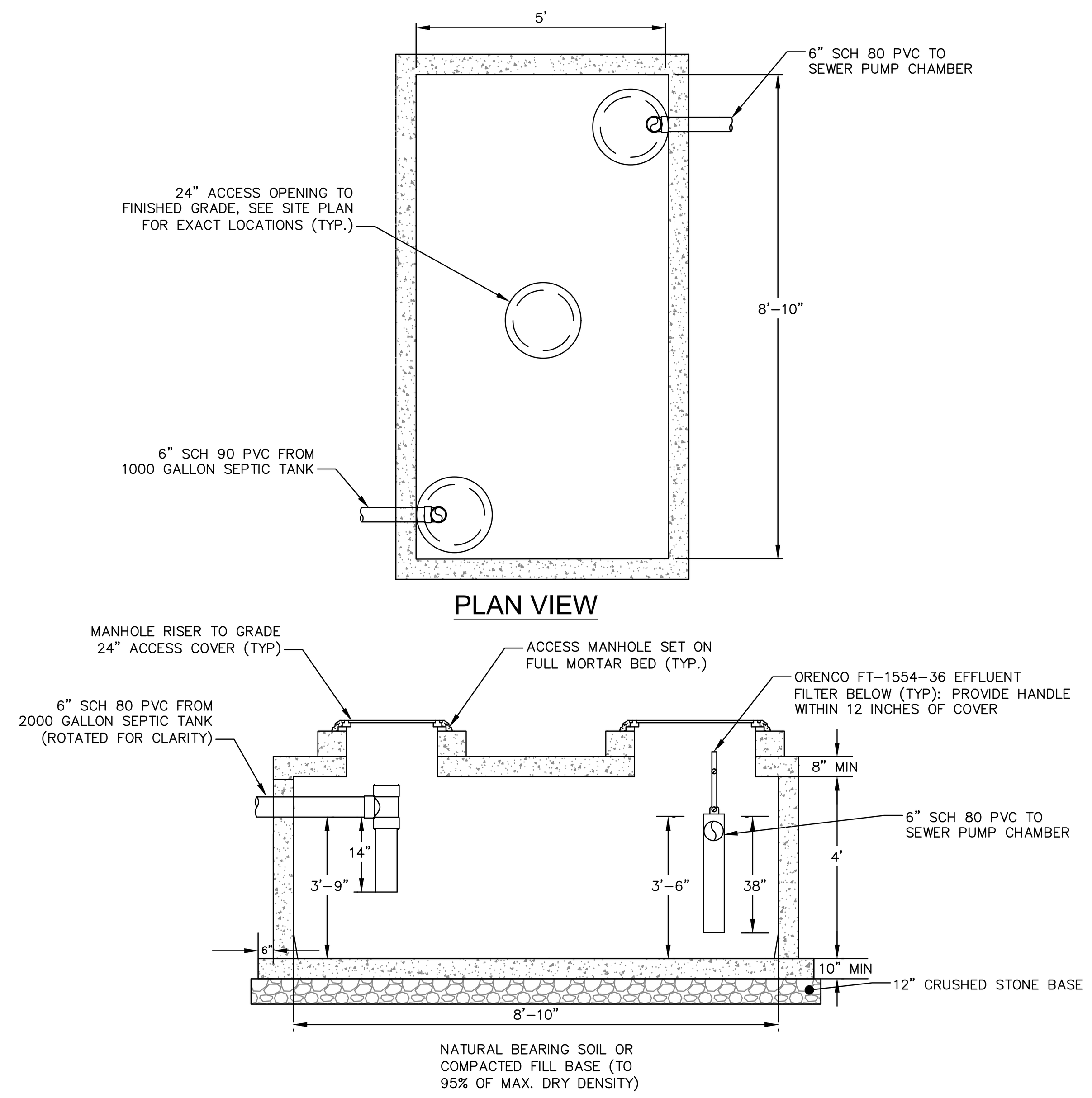
Drawing Title

SITE DETAILS

Project Manager: JD	Project No: 20250003.A10
Project Architect:	Production Leader:
Project Designer: KT	Peer Reviewer:

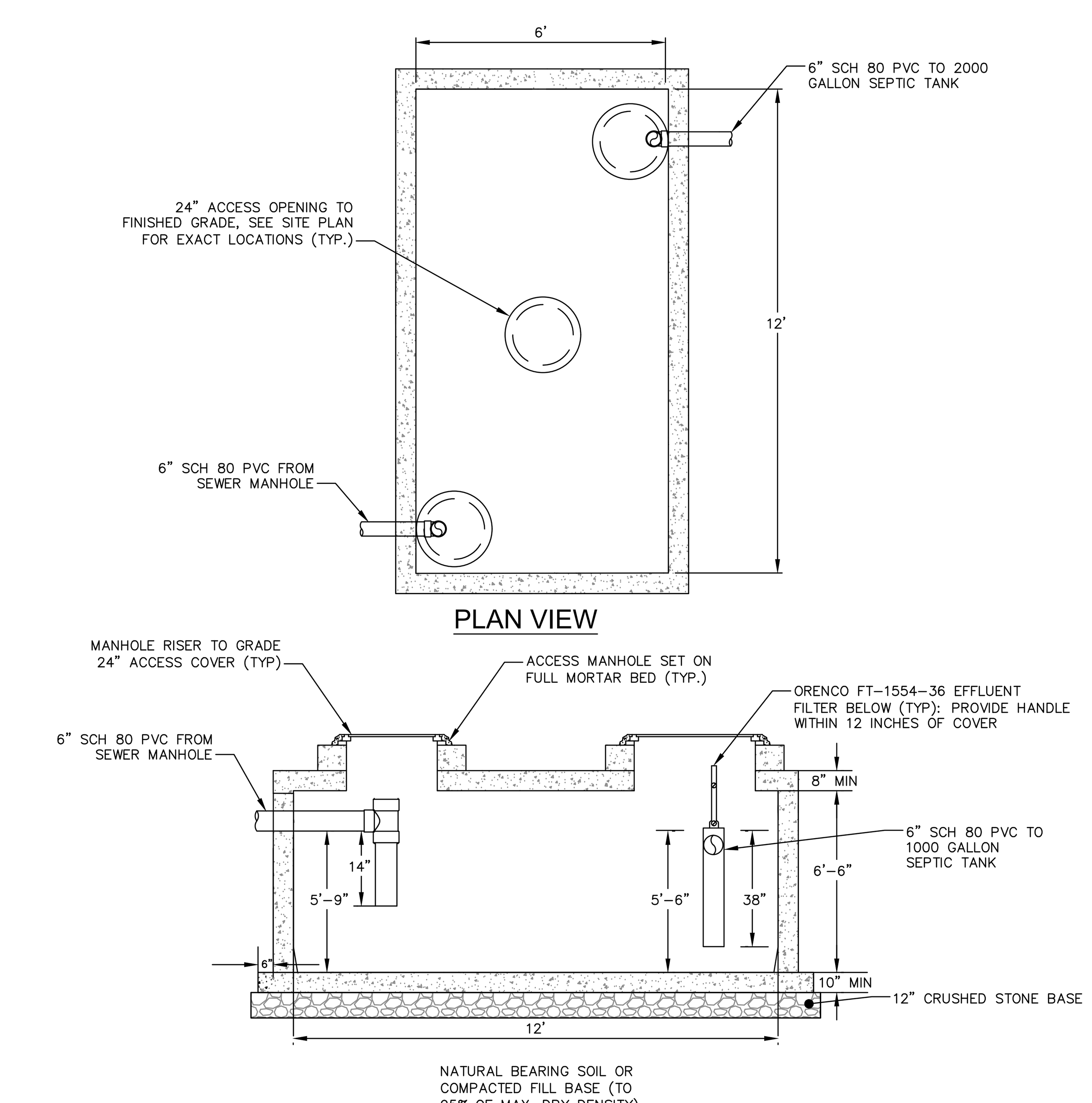
Drawing Number

CD5.05



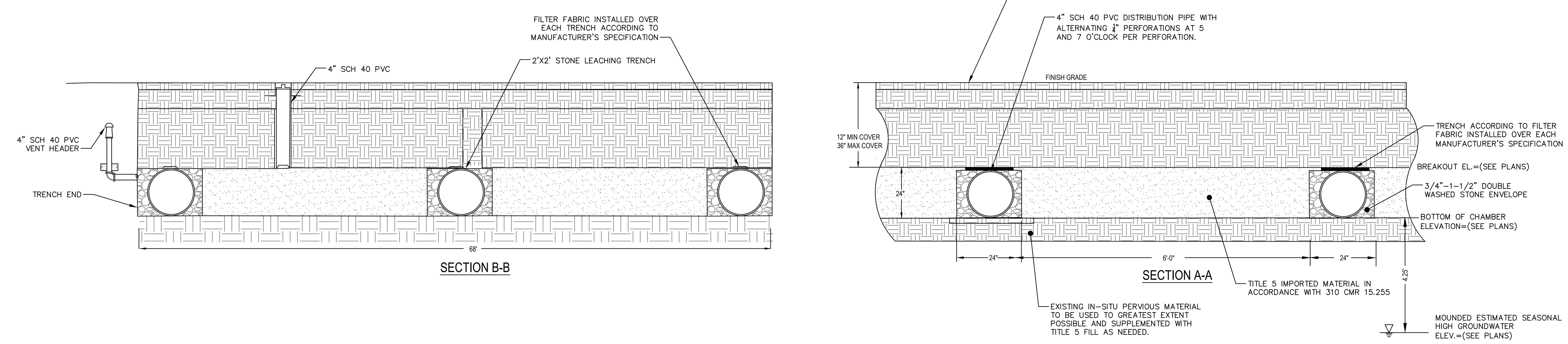
1000 GALLON SEPTIC TANK

NOT TO SCALE



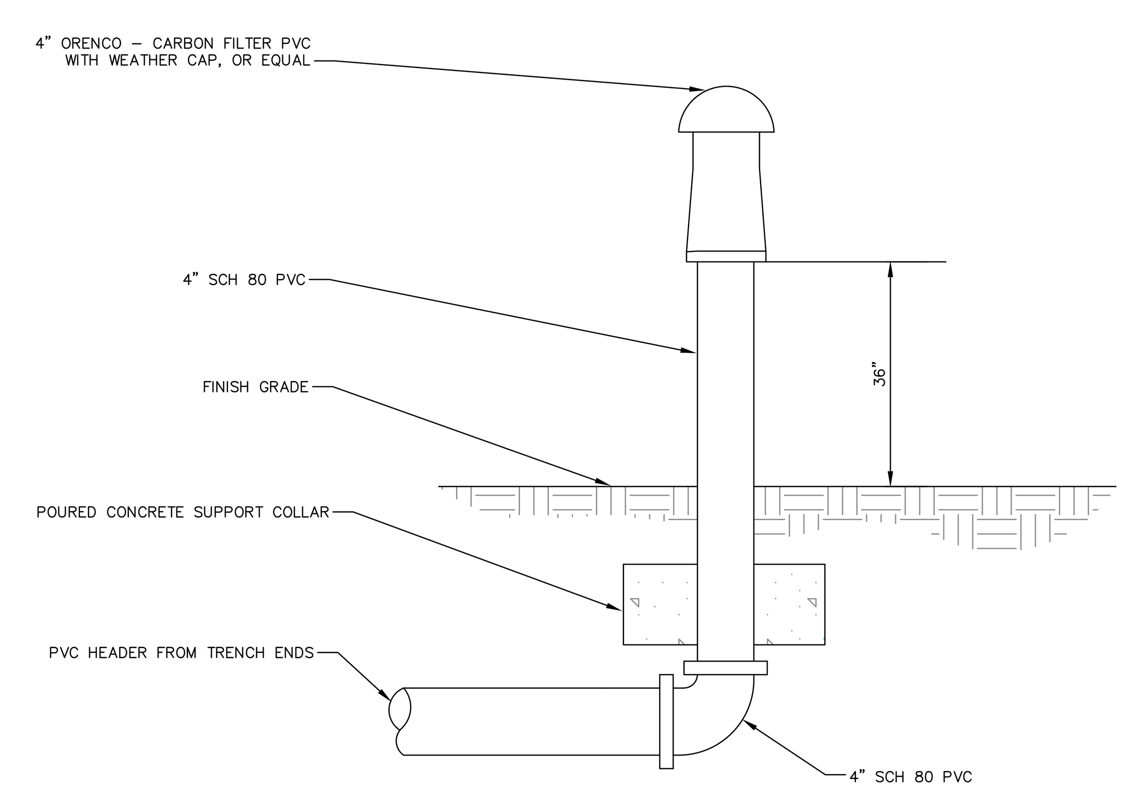
2000 GALLON SEPTIC TANK

NOT TO SCALE



SEPTIC LEACHING CHAMBER TRENCH

NOT TO SCALE



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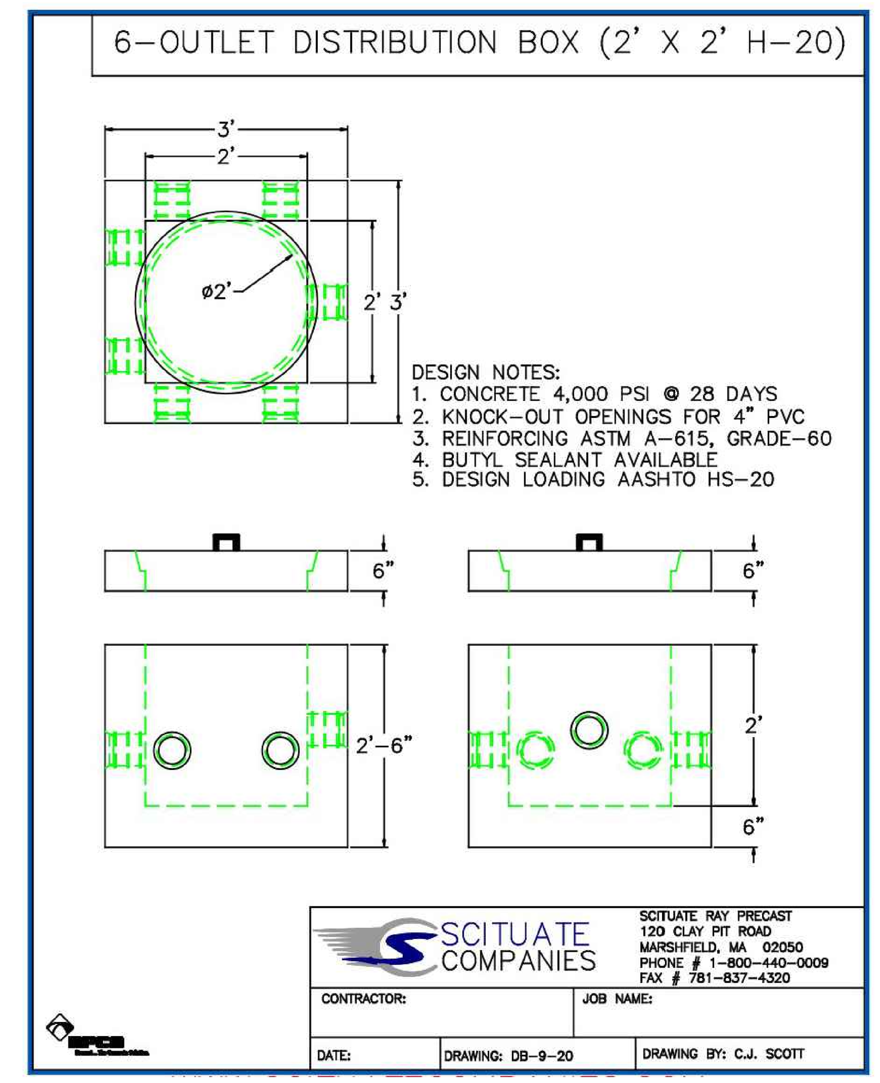
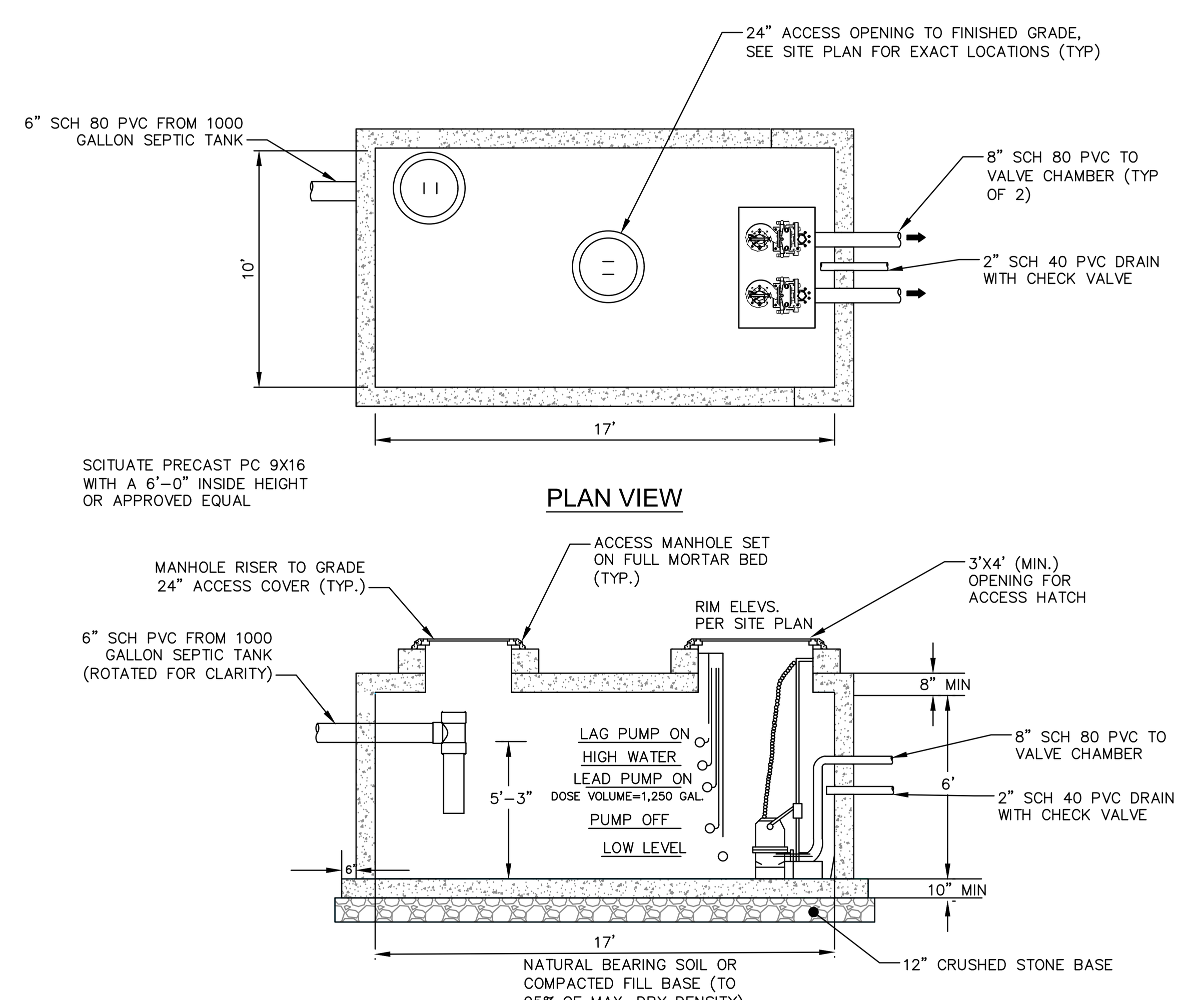


DISTRIBUTION BOX

NOT TO SCALE



SEWER PUMP CHAMBER

NOT TO SCALE

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1250 HANCOCK STREET, SUITE 815N
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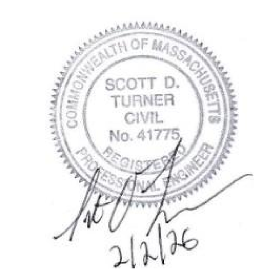

GRAPHIC SCALE

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Seals

PERMITTING SET

NOT FOR CONSTRUCTION

Issues / Revisions

No.	Date	Description
1	01/12/2026	ANRAD
2	02/02/2026	PERMITTING SET

Drawing Title

SITE DETAILS

Project Manager: JD	Project No: 20250003.A10
Project Architect:	Production Leader:
Project Designer: KT	Peer Reviewer:

Drawing Number

CD5.06

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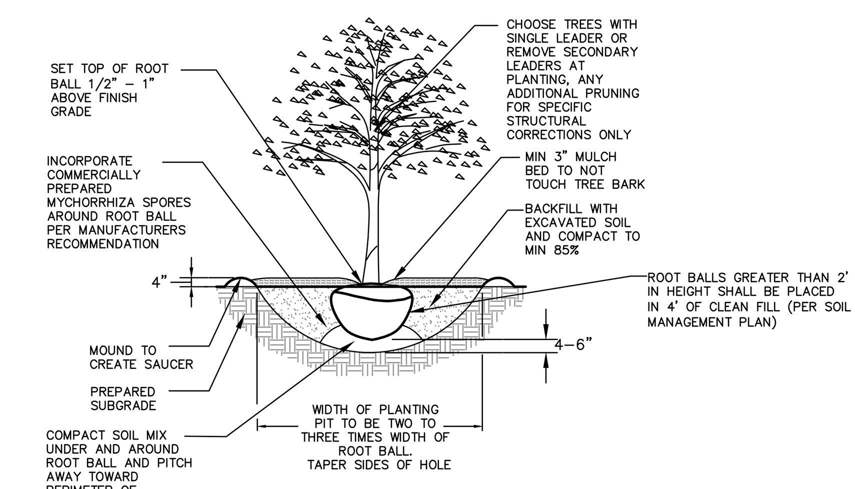
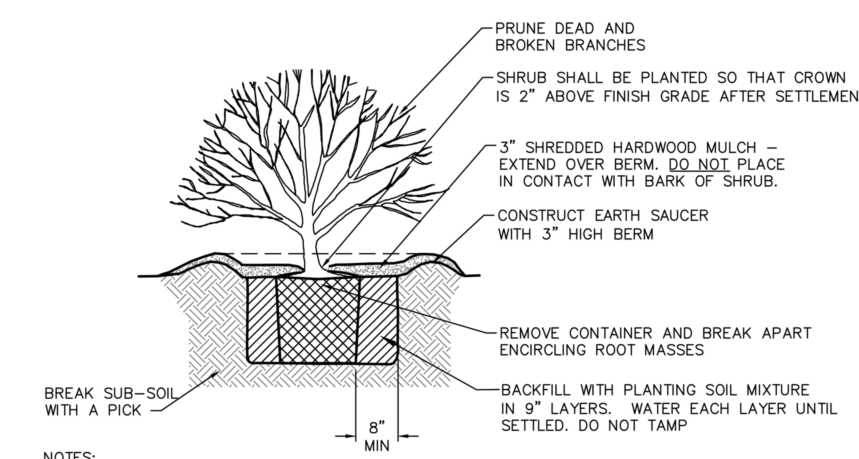


NOTES: REMOVE TREE WRAP, WIRE, STAKES, ANY SYNTHETIC MATERIAL. CUT AWAY MINIMUM OF TOP HALF OF BURLAP &/OR WIRE BASKET. SCARIFY ALL PLANT PITS PRIOR TO PLANTING

TREE PLANTING

NOT TO SCALE



NOTES:

1. SPRAY WITH ANTI DESICCANT IN ACCORDANCE WITH MFG.'S RECOMMENDATIONS IF FOLIAGE IS PRESENT.
2. FOR CONTAINER GROWN SHRUBS, USE FINGERS OR SMALL HAND TOOLS TO PULL THE ROOTS OUT OF THE OUTER LAYER OF POTTING SOIL; THEN CUT OR PULL APART ANY ROOTS CIRCLING THE PERIMETER OF THE CONTAINER.
3. INCORPORATE COMMERCIALLY PREPARED MYCORRHIZA SPORES IN THE SOIL IMMEDIATELY AROUND THE ROOT BALL AT RATES SPECIFIED BY THE MANUFACTURER.

SHRUB PLANTING FOR CONTAINERIZED SHRUBS

NOT TO SCALE

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1250 HANCOCK STREET, SUITE 815N
QUINCY, MA 02169
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Project

CARLISLE FIRE DEPARTMENT ADDITIONS & ALTERATIONS

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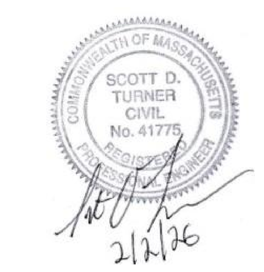
CARLISLE, MA 01741



GRAPHIC SCALE
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Seals

PERMITTING SET

NOT FOR CONSTRUCTION

Issues / Revisions

No.	Date	Description
1.	01/12/2026	ANRAD
2.	02/02/2026	PERMITTING SET

Drawing Title

SITE DETAILS

Project Manager: JD	Project No: 20250003.A10
Project Architect:	Production Leader:
Project Designer: KT	Peer Reviewer:

Drawing Number

CD5.07

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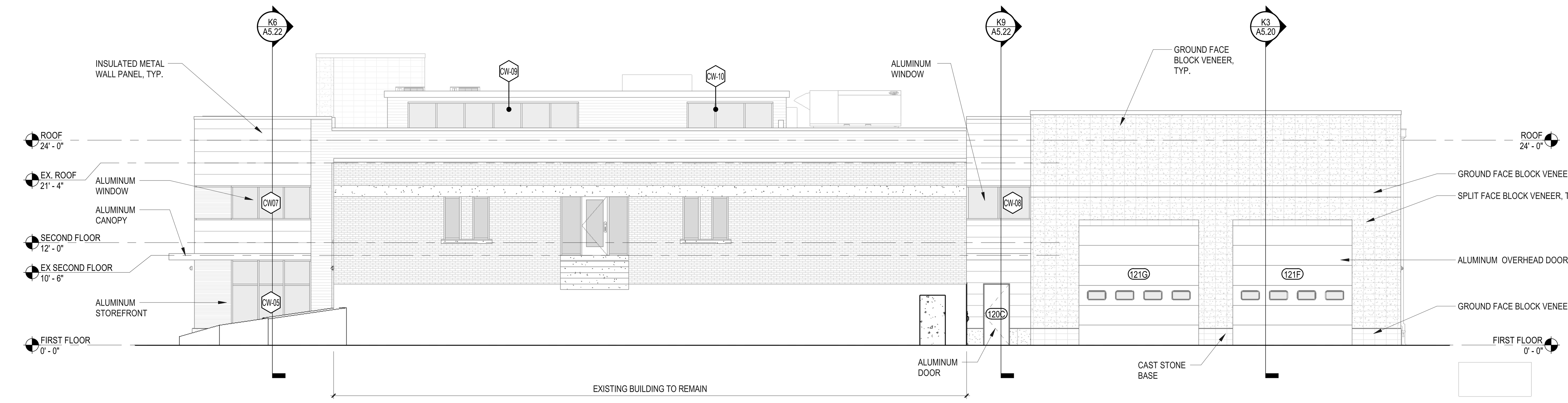
EXTERIOR ELEVATION LEGEND

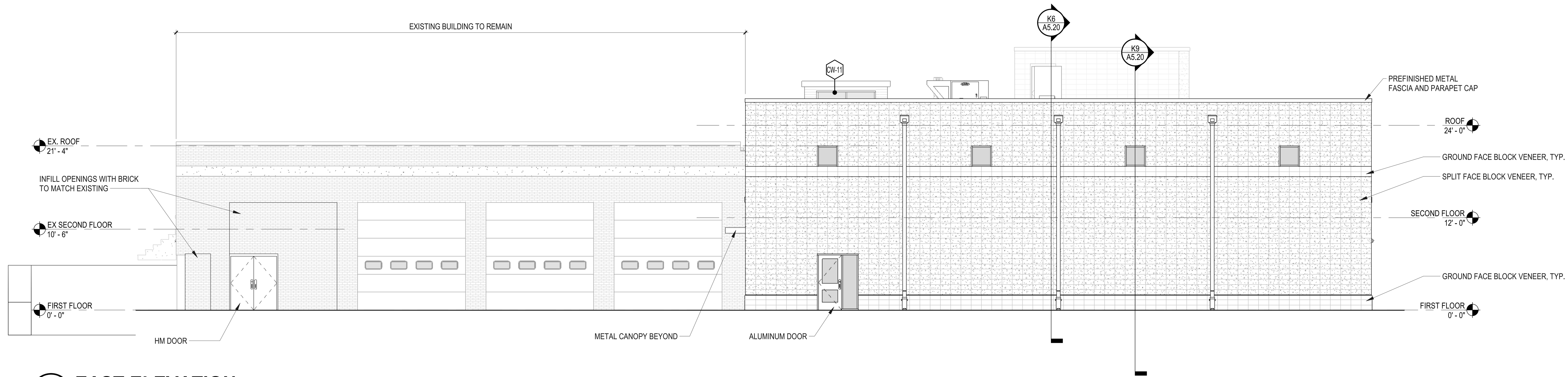
- A3-0 — PARTITION TAG
- 101 — DOOR TAG
- CJ — CONTROL JOINT
- 11 — WINDOW TAG
- 1 — GLAZING TAG

MATERIALS

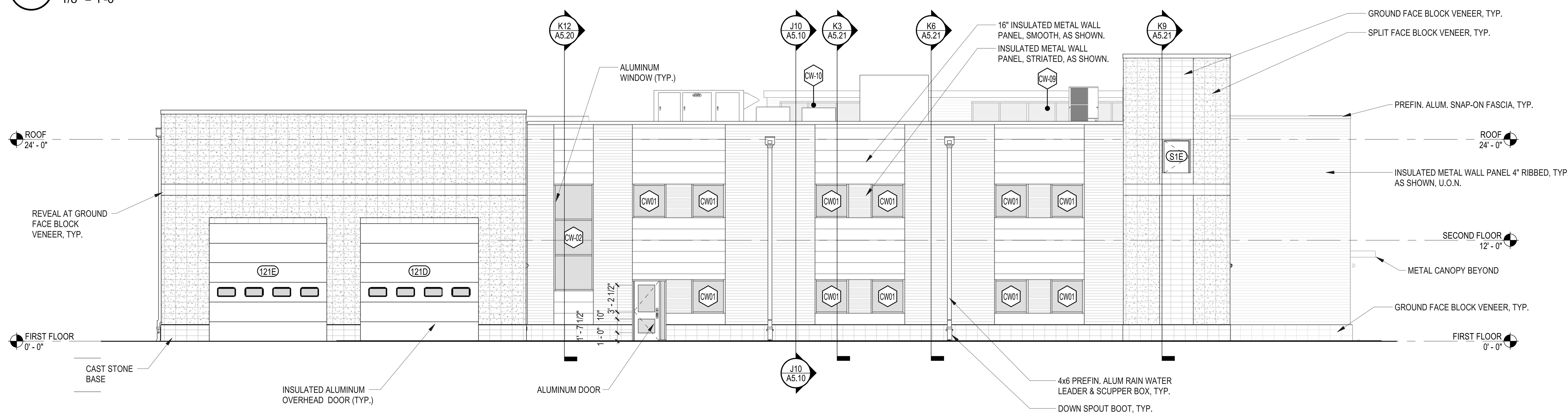
- EXISTING BRICK
- GLASS
- CORRAGATED HORIZONTAL PANEL



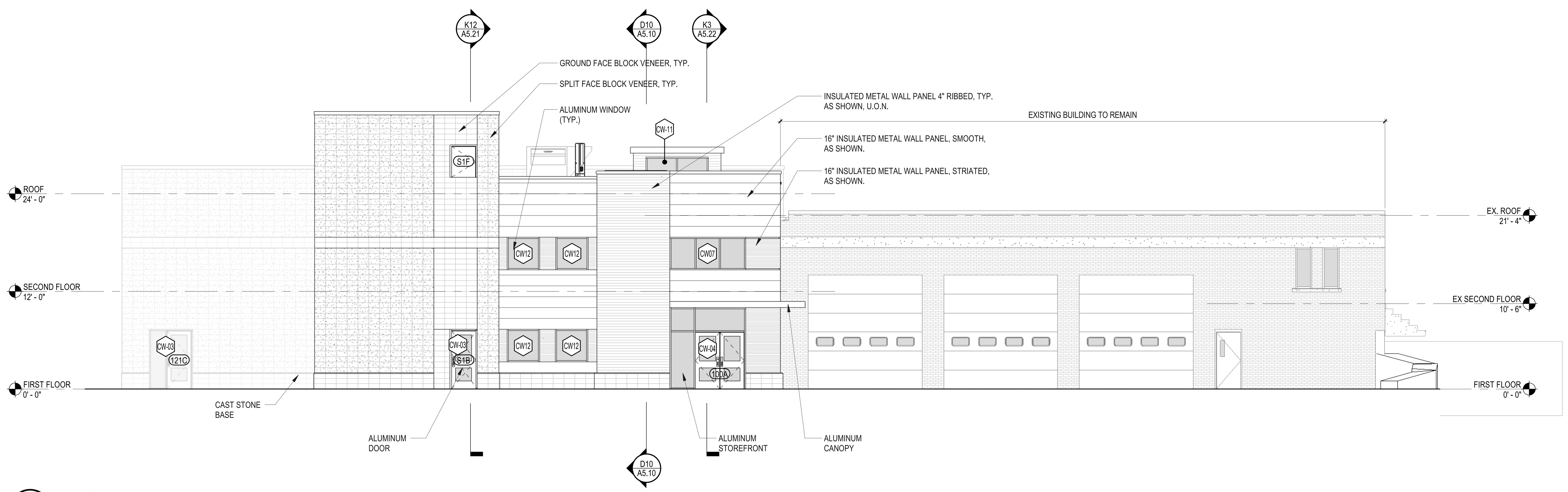
C12 SOUTH ELEVATION
1/8" = 1'-0"



E12 EAST ELEVATION
1/8" = 1'-0"



H12 NORTH ELEVATION
1/8" = 1'-0"



K12 WEST ELEVATION
1/8" = 1'-0"

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Seals

PROGRESS SET
NOT FOR CONSTRUCTION

Issues / Revisions

No.	Date	Description

Drawing Title

EXTERIOR ELEVATIONS

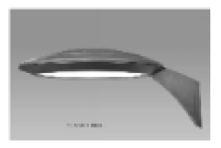
Project Manager:	Project No: CARL01AR
Project Architect:	Production Leader:
Project Designer:	Peer Reviewer:

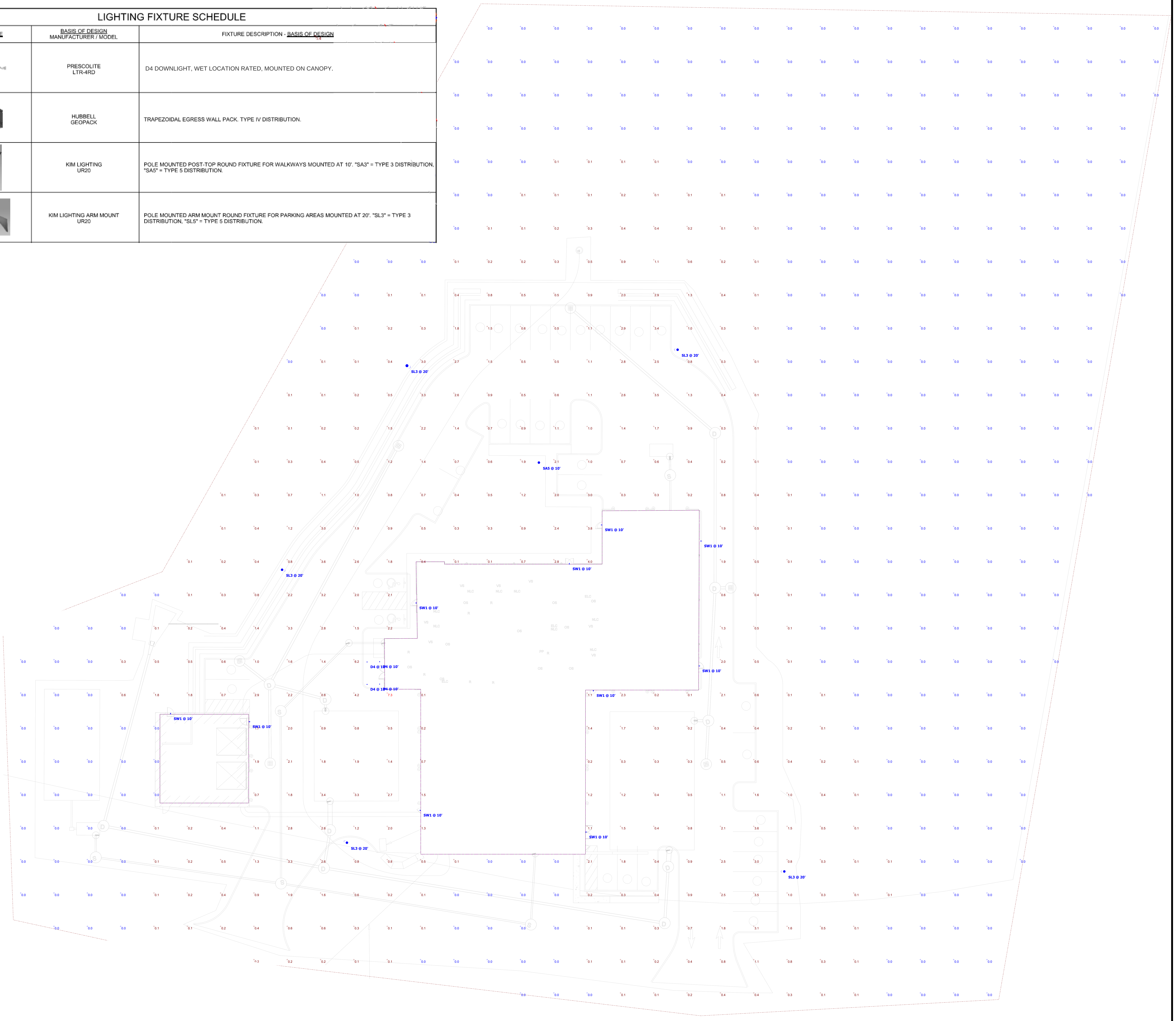
Drawing Number

A4.10

Autodesk Docs://CARL01AR - Carlisle Fire Station/CARL01AR_ARCH.rvt
1/28/2026 11:59:37 AM

LIGHTING FIXTURE SCHEDULE

TYPE	FIXTURE IMAGE	BASIS OF DESIGN MANUFACTURER / MODEL	FIXTURE DESCRIPTION - BASIS OF DESIGN
D4		PRESCOLITE LTR-4RD	D4 DOWNLIGHT, WET LOCATION RATED, MOUNTED ON CANOPY.
SW1		HUBBELL GEOPACK	TRAPEZOIDAL EGRESS WALL PACK. TYPE IV DISTRIBUTION.
SA3 SA5		KIM LIGHTING UR20	POLE MOUNTED POST-TOP ROUND FIXTURE FOR WALKWAYS MOUNTED AT 10'. "SA3" = TYPE 3 DISTRIBUTION, "SA5" = TYPE 5 DISTRIBUTION.
SL3 SL5		KIM LIGHTING ARM MOUNT UR20	POLE MOUNTED ARM MOUNT ROUND FIXTURE FOR PARKING AREAS MOUNTED AT 20'. "SL3" = TYPE 3 DISTRIBUTION, "SL5" = TYPE 5 DISTRIBUTION.



Tecton ARCHITECTS

CES
Consulting Engineering Services, LLC
128 Carnegie Row, Ste. 104
Norwood MA 02062
617.261.7161
ceseng.com
CES #250876

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CARLISLE, MA 01741

SCOTT D. TURNER CIVIL No. 41775

2/2/26

PROJECT NORTH

Seals

P&Z SUBMISSION

Issues / Revisions

No.	Date	Description
	01/29/2026	P&Z SUBMISSION

Drawing Title

SITE PHOTOMETRIC CALCULATION

Project Manager:	Project No: CARL01AR
Project Architect:	Production Leader:
Project Designer:	Peer Reviewer:

Drawing Number

SL-1

Autodesk Docs://CARL01AR - Carlisle Fire Station/R24-2025876-MEP Central-Carlisle Fire Station.rvt

1/27/2026 10:34:20 AM

FUSS & O'NEILL

Appendix B

Wetland Delineation Report

FUSS & O'NEILL
1550 Main Street, Suite 400
Springfield, MA 01103
413.452.0445
www.fando.com

July 25, 2025 (revised January 12, 2026)

Mr. Matt Salad
Tecton Architects
34 Sequassen Street, Suite 200
Hartford, Connecticut 06106

RE: Wetland Delineation Report
66 Westford Street, Carlisle, Massachusetts
Fuss & O'Neill Reference No. 2025003.A10

Dear Mr. Salad:

On July 10, 2025 a Fuss & O'Neill, Inc. wetland and soil scientist performed a wetland resource area delineation within a portion of 80 Westford Street directly adjacent to the parking lot ("Review Area") in Carlisle of Middlesex County, Massachusetts.

This letter provides a summary of regulated and protected resource areas as defined by the Massachusetts Wetlands Protection Act (M.G.L. c. 131 § 40, "MAWPA") and its implementing regulations (310 CMR 10.00), the Massachusetts Endangered Species Act (321 CMR 10.00), the Carlisle Non-Zoning Wetlands Bylaw, and the federal Clean Water Act (33 U.S.C. §1251 et seq., "CWA").

Methodology of Resource Area Delineation

The wetland delineation was conducted in conformance with local, state, and federal regulations and guidelines including:

- MAWPA (M.G.L. c. 131, § 40), its implementing regulations set forth at 310 CMR 10.00
- Massachusetts Department of Environmental Protection (MassDEP) *Massachusetts Handbook for Delineation of Bordering Vegetated Wetlands* (September 2022)
- *Corps of Engineers Wetlands Delineation Manual*, Technical Report Y-87-1 (January 1987)
- *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region* (January 2012)
- *Field Indicators for Identifying Hydric Soils in New England* (Version 4, April 2019)
- Carlisle Non-Zoning Wetlands Bylaw

During the delineation, a Fuss & O'Neill wetland and soil scientist assessed the Review Area and observed vegetation and soils to verify the presence or absence of wetlands. Where Bank and BVW were observed, the resource area boundaries were delineated, and information regarding vegetation, soils, and hydrology was collected. Each flag location was named based on an alpha-numeric nomenclature and collected by a professional land surveyor.

Fuss & O'Neill also conducted a desktop review of available online resources within the vicinity of the Review Area prior to performing the wetland delineation including:

- Massachusetts Mapper (MassMapper)
- Town of Carlisle FEMA Flood Insurance Rate Map (FIRM, Map No. 25017C0263F, effective July 7, 2014)
- Natural Heritage & Endangered Species Program (NHESP) database 15th Edition, effective August 1, 2021

Resource Areas

Resource Areas Not Present

The following resource areas subject to MAWPA, Non-zoning Wetland Bylaw, CWA, and MESA are not located within the Review Area according to MassMapper:

- NHESP Estimated Habitats of Rare Wildlife
- NHESP Priority Habitats of Rare Species
- Land Subject to Flooding
- 200-foot Riverfront Area

Resource Areas and Protected Areas Present within the Review Area

- Inland Bank
- Bordering Vegetated Wetlands
- Land Under Water Bodies and Waterways
- NHESP Certified Vernal Pools

Resource Areas Descriptions

Bordering Vegetated Wetland A and Bank A

Bordering Vegetated Wetland A (BVW A) defined by flags A-100 to A-106 and A-120 through A-130 is best described as a palustrine emergent wetland (PEM) / palustrine scrub shrub wetland (PSS). The upgradient extent of the wetland originates east of the Carlisle Fire Department (FD) parking lot in a low-lying swale that transitions to Bank of an intermittent stream defined by flags A-107 to A-119. This stream generally flows to the north through a cross culvert and into the main portion of BVW A, which is also mapped as a NHESP Certified Vernal Pool generally north of the Carlisle FD parking lot. Land Under Water (LUW) is associated with the unnamed intermittent stream defined by Bank A. Refer to the attached Wetland Sketch for a representation of the delineated boundaries.

BVW A and Bank A are both afforded a 100-foot Buffer Zone per the MAWPA and the Carlisle Non-Zoning Wetlands Bylaw. There are no performance standards for Buffer Zone in the Carlisle Non-Zoning Wetlands Bylaw or MAWPA.

The vernal pool within the main portion of BVW A is also protected under the Title 5 of the Massachusetts Environmental Code, Section 401 of the Federal Clean Water Act, the Massachusetts Surface Water Quality Standards which relate to Section 401, and the Massachusetts Forest Cutting Practices Act.

Sincerely,

April Doroski, PWS, CPSS
Senior Wetland Scientist | Permitting Specialist

Attachments

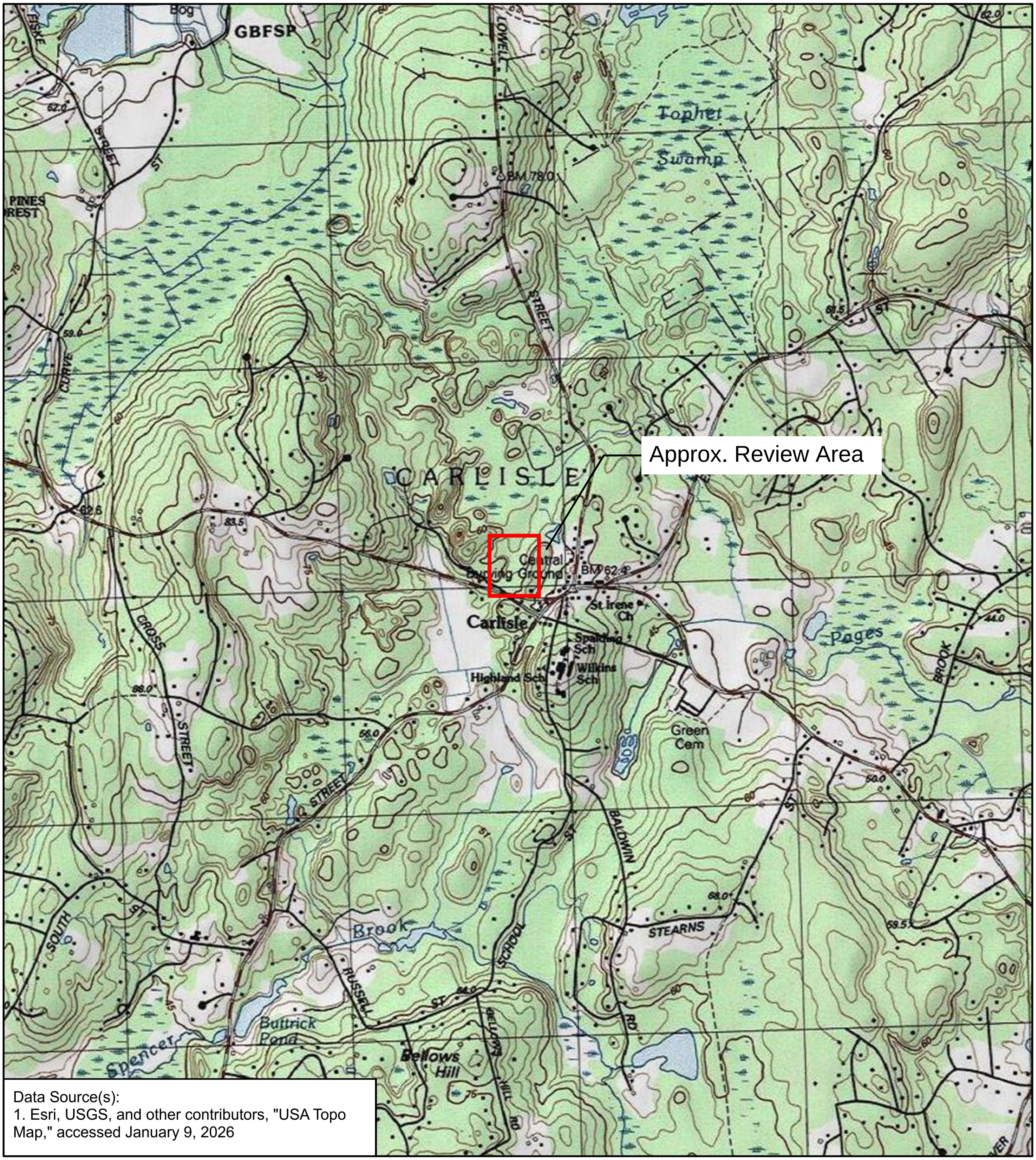
Figures

USGS Topographic Map (Figure 1)
Wetland Delineation Sketch (Figure 2)
FEMA FIRM (Map No. 25017C0263, effective July 7, 2014; Figure 3)

A Site Photographs

B U.S. Army Corps Wetland Delineation Data Forms – Northcentral and Northeast
BVW A

Figures



Data Source(s):
1. Esri, USGS, and other contributors, "USA Topo Map," accessed January 9, 2026

Legend

Approximate Review Area

Scale: 1:24,000

0 750 1,500 3,000 Feet

N

USGS Topographic Map

80 Westford Street

Carlisle Massachusetts

FUSS & O'NEILL

1550 Main Street, Suite 400
Springfield, MA 01103
413.452.0445| www.fando.com

Figure 1

Folder: K:\P2025\0003\A10\ Project: Carlisle Layout: Figure 1 Map: Main Data Frame Map Frame
Date Exported: 1/9/2026 4:57 PM User: Jacob.Gentile Date Saved: 1/9/2026 4:56 PM

Wetland Delineation Sketch

7/11/2025

Parcel Boundry	Culvert	Low Resolution 15m Imagery	Citations
BVW Flag	Wetland Plot	High Resolution 60cm Imagery	30cm Resolution Metadata
Bank Flag	World Imagery	High Resolution 30cm Imagery	

1:1,463

0 0.01 0.01 0.03 mi

0 0.01 0.03 0.05 km

Maxar, Microsoft, Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community

71°22'30.43"W 42°32'4.11"N

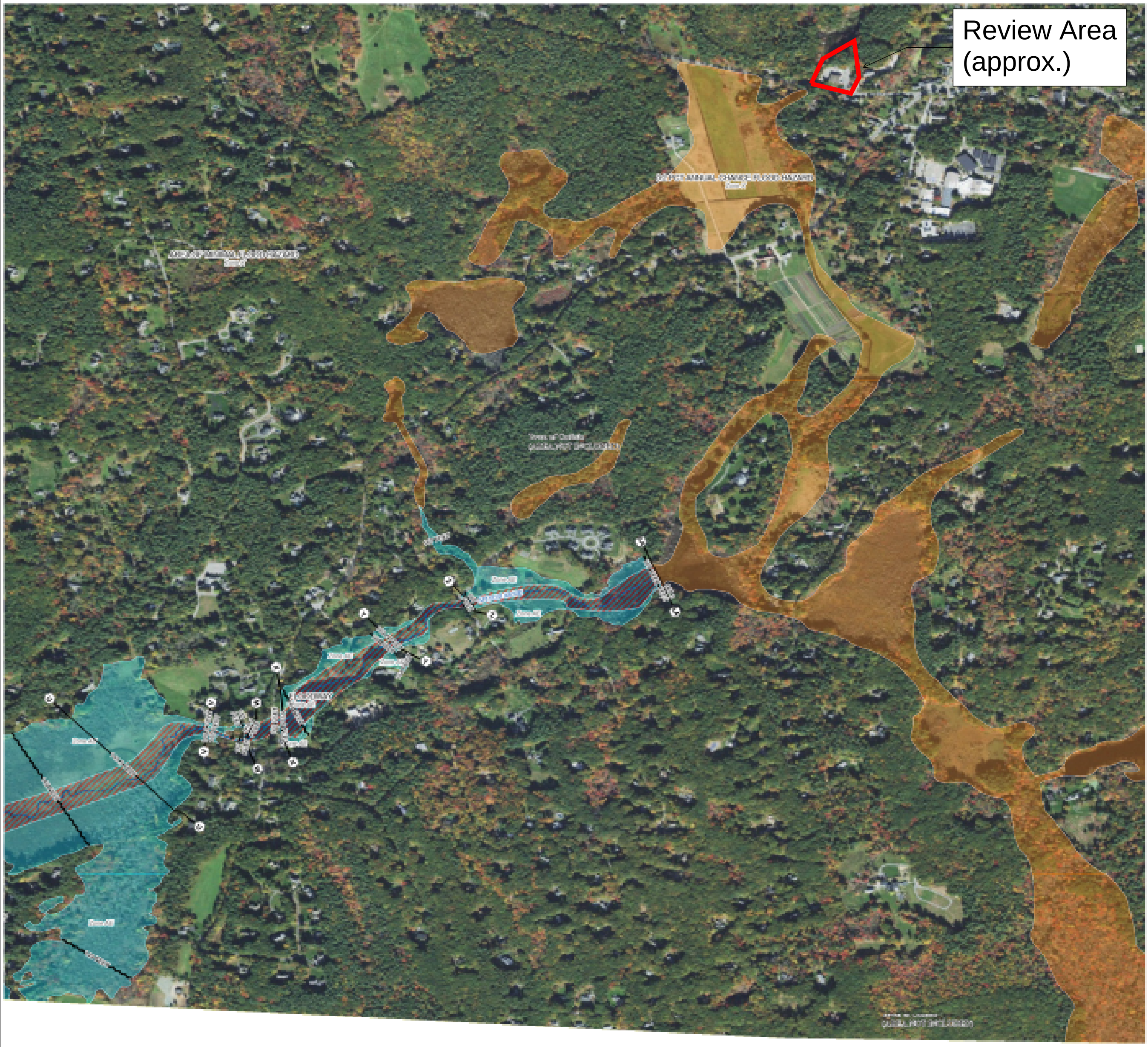


Figure 3

FLOOD HAZARD INFORMATION

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

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

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

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

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

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

NOTES TO USERS

For information and questions about this Flood Insurance Rate Map (FIRM), available products associated with this FIRM, including historic versions, the current map date for each FIRM panel, how to order products, or the National Flood Insurance Program (NFIP) in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Flood Map Service Center website at https://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the website.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM Index. These may be ordered directly from the Flood Map Service Center at the number listed above.

For community and countywide map dates, refer to the Flood Insurance Study Report for this jurisdiction.

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

Basemap information shown on this FIRM was provided in digital format by USDA, Farm Service Agency (FSA). This information was derived from NAIP, dated April 11, 2018.

This map was exported from FEMA's National Flood Hazard Layer (NFHL) on 7/9/2025 8:45 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. For additional information, please see the Flood Hazard Mapping Updates Overview Fact Sheet at https://www.fema.gov/media-library/assets/documents/118418

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. 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.

SCALE

Map Projection:
GCS, Geodetic Reference System 1980;
Vertical Datum: NAVD88
For information about the specific vertical datum for elevation features, datum conversions, or vertical monuments used to create this map, please see the Flood Insurance Study (FIS) Report for your community at https://msc.fema.gov

N

1 inch = 500 feet 1:6,000

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

0 50 100 200 300 400 Meters

FEMA

National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP

PANEL 263 OF 654

Panel Contains:

COMMUNITY	NUMBER	PANEL
TOWN OF CARLISLE	250187	0263

MAP NUMBER
25017C0263F
EFFECTIVE DATE
July 07, 2014

Attachment A

Site Photographs

Photo 1: Overview of BVW A on eastern side of the fire station from flag A-105.

Photo 2: Overview of BVW A data plot near flag A-103.

Photo 3: Overview of BVW A, north of the fire station.

Photo 4: Overview of delineated Bank A on the eastern side of the fire station.

Photo 5: View of the cross culvert conveying the intermittent stream associated with Bank A near flag A-115.

Photo 6: View upstream from the cross culvert that conveys the stream associated with Bank.

Attachment B

U.S. Army Corps Wetland Determination Data Sheet – Northcentral and Northeast

U.S. Army Corps of Engineers **WETLAND DETERMINATION DATA SHEET – Northcentral and Northeast Region** See ERDC/EL TR-12-1; the proponent agency is CECW-CO-R	*OMB Control #: 0710-0024, Exp: 9/30/2027* *Requirement Control Symbol EXEMPT:* *(Authority: AR 335-15, paragraph 5-2a)*

Project/Site: 66 Westford Street City/County: Carlisle Sampling Date: 7/10/2025

Applicant/Owner: Town of Carlisle State: MA Sampling Point: Wet A

Investigator(s): April Doroski, PWS, CPSS. Fuss & O'Neill Section, Township, Range: Carlisle

Landform (hillside, terrace, etc.): Depression Local relief (concave, convex, none): concave Slope %: 0-3

Subregion (LRR or MLRA): LRR R, MLRA 144A Lat: 42.52920292506102, Long: -71.35217273568567 Datum: NAD83 State Plane

Soil Map Unit Name: Hollis-Rock outcrop-Charlton complex, 0 to 15 percent slopes NWI classification: PSS, Freshwater Pond

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

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

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

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

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

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

HYDROLOGY

Wetland Hydrology Indicators:

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

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

Secondary Indicators (minimum of two required)

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

Field Observations:

Surface Water Present?	Yes X	No ___	Depth (inches): 2
Water Table Present?	Yes X	No ___	Depth (inches): ___
Saturation Present? (includes capillary fringe)	Yes X	No ___	Depth (inches): ___

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

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

Remarks:

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VEGETATION – Use scientific names of plants.

Sampling Point: Wet A

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
		=Total Cover	
Sapling/Shrub Stratum (Plot size: 15)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
		=Total Cover	
Herb Stratum (Plot size: 5)			
1. *Onoclea sensibilis*	60	Yes	FACW
2. *Toxicodendron radicans*	15	Yes	FAC
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	75	=Total Cover	
Woody Vine Stratum (Plot size: 30)			
1.			
2.			
3.			
4.			
		=Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

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

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	60	x 2 =	120
FAC species	15	x 3 =	45
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	75 (A)		165 (B)

Prevalence Index = B/A = 2.20

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

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

___ Problematic Hydrophytic Vegetation[1] (Explain)

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

Definitions of Vegetation Strata:

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

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

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

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

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

Remarks: (Include photo numbers here or on a separate sheet.)
Other vegetation observed outside of the data plot includes skunk cabbage and jewelweed.

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SOIL

Sampling Point: Wet A

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

Depth	Matrix		Redox Features				Texture	Remarks
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		
0-8	10YR 2/1	100					Sandy	
8-16	10YR 2/1	100	10YR 4/4	1	C		Sandy	Distinct redox concentrations
16-24	10YR 4/1	100					Loamy/Clayey	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ Depleted Below Dark Surface (A11)
X Thick Dark Surface (A12)
___ Mesic Spodic (A17) **(MLRA 144A, 145, 149B)**
___ Iron Monosulfide (A18)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
X Dark Surface (S7)
___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
___ High Chroma Sands (S11) (**LRR K, L)**
___ Loamy Mucky Mineral (F1) (**LRR K, L**)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Marl (F10) (**LRR K, L**)
___ Red Parent Material (F21) **(MLRA 145)**

Indicators for Problematic Hydric Soils[3]:

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

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

Restrictive Layer (if observed):
Type: NA
Depth (inches): ______

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

Remarks:

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Appendix C

Stormwater Management Report

Stormwater Management Report
Carlisle Fire Department Additions & Alterations

66 Westford Street
Carlisle, Massachusetts 01741

Prepared For:

Town of Carlisle

Carlisle, Massachusetts 01741

February 2, 2026

COMMONWEALTH OF MASSACHUSETTS
SCOTT D.
TURNER
CIVIL
No. 41775
REGISTERED
PROFESSIONAL ENGINEER

2/2/26

FUSS & O'NEILL

1250 Hancock St, Suite 815N
Quincy, MA 02169

Table of Contents

1 Executive Summary

The Town of Carlisle proposes to expand and renovate the existing fire station located at 66 Westford Street in Carlisle, Massachusetts. The site is currently occupied by the Carlisle Volunteer Fire Department Headquarters and the Carlisle Town Hall. The site is bounded by undeveloped land to the north, private properties to the east, Westford Street to the south and Rockland Road and undeveloped land to the west. Bordering vegetated wetlands surround the proposed development to the west, north, and east. The project location is depicted on the Site Location Map attached as *Figure 1* in this report.

The proposed project includes the renovation of the existing Fire Station along with a building addition. Additional improvements include parking lots, sidewalks, stormwater infrastructure, utilities, and landscaping. The proposed stormwater management system consists of deep sump catch basins, two water quality units, and two subsurface detention systems.

The proposed stormwater management system design meets and exceeds the guidelines described in Massachusetts Stormwater Handbook. Stormwater best management practices (BMPs) have been implemented to mitigate increases in peak runoff rates and provide stormwater treatment. The existing and proposed site conditions and the proposed stormwater management system are described in detail in *Section 2* of this report. The proposed stormwater management system is a significant improvement over existing site conditions which do not include any stormwater Best Management Practices.

The design drawings include controls to protect receiving stormwater systems and properties adjacent to the development from erosion and sedimentation impacts caused by construction site runoff. The plan incorporates both non-structural and structural controls, such as inspections, waste management, good housekeeping and maintenance, perimeter sediment barriers, dust suppression, and a construction entrance. The existing and proposed drainage systems will be protected with catch basin inlet protection devices and compost filter socks. A Stormwater Pollution Prevention Plan (SWPPP) will be prepared as required under the Environmental Protection Agency’s (EPA) National Pollutant Discharge Elimination System (NDPES) General Permit for Discharge from Construction Activities prior to the start of construction. To ensure the long-term success of the stormwater management system, post-construction operation and maintenance practices will be required in accordance with the Long-Term Operation and Maintenance Plan that has been developed for the site.

2 Project Description

2.1 Existing Conditions

The project is located at 66 Westford Street in Carlisle, Massachusetts and is identified as parcel 21-1-0 by the Town of Carlisle Assessor, which totals approximately 54 acres. The site is bounded by undeveloped land to the north, private properties to the east, Westford Street to the south and Rockland Road to the west. The site is currently occupied by the Carlisle Volunteer Fire Department Headquarters and the Carlisle Town Hall.

Approximately one acre of the property is currently developed. The site includes a one story 5,294 square foot fire station, access driveways, parking, the storage of equipment, and an on-site sewage disposal system. There is no existing stormwater management system on the property and all stormwater generated by the site flows directly to Westford Street or to the adjacent wetlands system with no detention or treatment.

Bordering vegetated wetlands were delineated by Fuss & O'Neill and are surround the proposed development to the west, north, and east. The site is not within a NHESP Priority Habitat of Rare Species, Estimated Habitat of Rare Wildlife, or Area of Critical Environmental Concern (ACEC) as shown on the Resource Map included as *Figure 2*.

Federal Emergency Management Agency (FEMA) mapping shows that the project area is not located within the Special Flood Hazard Area (SFHA). The site is not within the special flood hazard area based on the FEMA Flood Insurance Rate Maps (FIRM) Panel Numbers 25017C0263F, dated July 7, 2014. The FEMA mapping depicts this area as Zone X.

The site is characterized by Natural Resources Conservation Service (NRCS) Charlton-Hollis-Rock outcrop complex, 3 to 8 percent slopes, (103B) having a hydrologic soil group rating of A, Hollis-Rock outcrop-Charlton complex, 0 to 15 percent slopes, (104C) having a hydrologic soil group rating of D, Freetown muck, 0 to 1 percent slopes, (52A) having a hydrologic soil group rating B/D, and Canton fine sandy loam, 0 to 8 percent slopes, extremely stony, (422B) having a hydrologic soil group rating B. The NRCS soil report is included in *Appendix A*.

A geotechnical evaluation was performed by O'Reilly, Talbot & Okun Engineering Associates. Soil borings performed in the location of Subsurface Detention System 10PA resulted in refusal at approximately 5-feet below the ground surface. The soils above refusal were very dense and not suitable for infiltration. The soil boring performed in the location of Subsurface Detention System 10PB resulted in refusal upon bedrock at approximately 21-feet below the ground surface. The top four feet of material were noted to be fill, followed by dense sand and dense glacial till. The soil and subsurface conditions are not suitable for infiltration. A copy of the geotechnical report with the findings and recommendations, dated August 19, 2025, is included in *Appendix B.*

Four (4) test pits were performed to the north of the existing building on July 9, 2025 by Fuss & O'Neill. Test pits were dug to depths of approximately 8 to 10-feet in depth and contained fill material. Bedrock was observed at a depth of approximately 9-feet in depth in TP-1. The report also identifies the presence of bedrock at the ground surface to the west of the test pits. A Test Pit Memorandum dated July 29, 2025 is included in *Appendix B.*

Four (4) additional test pits were performed to the west of the proposed development on January 7, 2026 in the location of the proposed on-site sewage disposal leaching facility. Test pits were dug to a depth of between 5 and

8.5-feet in depth and consisted of loamy sand and silty sand. Bedrock was observed at a depth of between 2.5-feet and 7.5-feet. Test pit logs are included in *Appendix B*.

Due to the presence of surficial and shallow bedrock as well as poorly draining soils, identified both in the geotechnical report and test pit logs, a hydrologic soil group rating of D was utilized in place of a HSG A rating for soil group 103B to model the existing and proposed hydrology.

2.2 Proposed Conditions

The proposed project consists of the renovation and building addition of the existing Fire Station along with associated parking areas, driveways, sidewalks, stormwater infrastructure, utilities, and landscaping.

The Stormwater Management system is a significant improvement over existing conditions. The proposed system is comprised of deep sump catch basins, two (2) water quality units, and two (2) subsurface detention systems. Through these BMPs, reduction in stormwater peak discharge and stormwater treatment are achieved. The following stormwater BMPs are proposed for the project:

- **Subsurface Detention System 10PA** is located under the driveway to the west of the proposed fire station building. The subsurface detention system provides peak flow attenuation for the westernmost driveways, parking areas, surrounding grassed areas, and the roof of the outbuilding. Stormwater runoff from the paved areas is conveyed through a water quality unit prior to discharging into the subsurface detention system. Stormwater runoff discharges out of the subsurface detention system through an outlet control structure towards the wetlands, design point 10L.

- **Subsurface Detention System 10PB** is located under the driveway to the east of the proposed fire station building. The system provides peak flow attenuation for the easternmost driveways, parking areas, surrounding grassed areas, and the roof of the fire station. Stormwater runoff from the paved areas is conveyed through a water quality unit prior to discharging into the subsurface detention system. Stormwater runoff discharges out of the subsurface detention system through an outlet control structure towards the wetlands, design point 20L.

The proposed BMPs have been sized to accommodate the 100-year design storm without overtopping. Outlet control structures in each detention system will manage the discharges from the site.

3 Hydrologic Analysis

The hydrologic analyses for existing and proposed conditions were completed using a computer software package, HydroCAD version 10.20-7a, to determine peak runoff flow rates and total runoff volumes for the watershed models. The model is based on the NRCS Technical Release 20 and Technical Release 55 (TR-55) and is subject to cumulative rainfall/volume dependent routing calculations. Hydrographs are prepared for each element of the watershed and routed through the dynamic-storage-indication method to produce various time-based results. Precipitation depths and intensities were taken from NOAA Point Precipitation Frequency Estimates (National Oceanic and Atmospheric Administration) for a 24-hour storm event.

Two design points were developed for the project and used as the limits of analysis as described below:

- Design Point 1 (denoted as Link 10L in the hydrologic analyses) is the Bordering Vegetated Wetland to the north of the site.
- Design Point 2 (denoted as Link 20L) is the roadway to the south of the site.

The Pre-Development Hydrologic Analysis is included as *Appendix C* and the Post-Development Hydrologic Analysis is included as *Appendix D*.

Curve numbers for the project were selected based on table 2-2 of TR-55 and section 3 of the Massachusetts Supplement for the TR-55 Hydrology Procedure (TR-55 Supplement). Tabulations of the weighted curve numbers based on cover types and HSG for each sub-watershed are included in *Appendices C* and *D*. The following is a description of how each cover type was modeled:

- Vegetated areas were modeled as " >75% Grass cover, Good, HSG B" – CN 61
- Vegetated areas were modeled as " >75% Grass cover, Good, HSG D" – CN 80
- Impervious areas (e.g., sidewalks, asphalt pavement, concrete pads, etc.) were modeled as "Paved parking, HSG D" – CN 98
- Wooded areas were modeled as "Woods, Good HSG, B" – CN 55
- Wooded areas were modeled as "Woods, Good HSG D" – CN 77
- Building roofs were modeled as "Roofs HSG B" – CN 98
- Building roofs were modeled as "Roofs HSG D" – CN 98

3.1 Existing Watershed Summary

Stormwater runoff from the majority of the site flows overland towards the wetlands surrounding the site, design point 1. Stormwater runoff from the remainder of the site flows overland towards Westford street to the south, design point 2. The property line to the south and the wetland resource areas to the west, north, and east were utilized as the limits of the analysis. Subcatchment areas are depicted on the Pre-Development Watershed Map included as *Figure 4.*

3.2 Proposed Watershed Summary

As a result of the proposed development, overall drainage patterns do not change. The boundary of the post-development analysis is the same as the pre-development conditions. However, the Subcatchments have been further delineated to size the BMPs, as described below:

- Subcatchment 10S consists of grassed area and woodlands. Stormwater runoff from this subcatchment flows overland towards the wetlands, design point 1.
- Subcatchment 10SA consists of grassed area and the parking and driveways to the northwest of the building. Stormwater runoff flows to deep sump catch basins and conveyed through a water quality unit to

subsurface detention system 10PA. Stormwater runoff flows out of the subsurface detention system through an outlet control structure and ultimately discharges towards the wetlands, design point 1.

- Subcatchment 10SB consists of grassed area and the parking and driveways to the west of the building. Stormwater runoff flows to deep sump catch basins and conveyed through a water quality unit to subsurface detention system 10PA. Stormwater runoff flows out of the subsurface detention system through an outlet control structure and ultimately discharges towards the wetlands, design point 1.
- Subcatchment 10SC consists of grassed area and the parking and driveways to the east of the building. Stormwater runoff flows to deep sump catch basins and conveyed through a water quality unit to subsurface detention system 10PB. Stormwater runoff flows out of the subsurface detention system through an outlet control structure and ultimately discharges towards the wetlands, design point 1.
- Subcatchment 10SD consists of grassed area and the parking and driveways to the north of the building. Stormwater runoff flows to deep sump catch basins and conveyed through a water quality unit to subsurface detention system 10PB. Stormwater runoff flows out of the subsurface detention system through an outlet control structure and ultimately discharges towards the wetlands, design point 1.
- Subcatchment 10SE consists of the fire station roof. Stormwater runoff is discharged into subsurface detention system 10PB. Stormwater runoff flows out of the subsurface detention system through an outlet control structure and ultimately discharges towards the wetlands, design point 1.
- Subcatchment 10SF consists of the outbuilding roof. Stormwater runoff is discharged into subsurface detention system 10PA. Stormwater runoff flows out of the subsurface detention system through an outlet control structure and ultimately discharges towards the wetlands, design point 1.
- Subcatchment 20S consists of grassed area and a small portion of the western driveway entrance. Stormwater runoff from this subcatchment flows overland to the street, design point 2.

The post-development subcatchments are depicted on the Post-Development Watershed Map included as *Figure 5.* Descriptions of the various cover types included in each subcatchment can be found in the Post-Development Hydrologic Analysis included as *Appendix D*.

3.3 Hydrologic Analysis Results

The proposed BMPs attenuate peak flows from the site, effectively reducing the site's runoff rates as compared to pre-redevelopment conditions. The pre- and post-development peak flow rates for the two design points are included in the tables below.

2 Year Design Storm				
Design Point	Existing Flow (CFS)	Proposed Flow (CFS)	Net Change (CFS)	Net Change (%)
10L - Wetlands	3.33	2.18	-1.15	-35%
20L - Street	0.40	0.35	-0.05	-13%

10 Year Design Storm				
Design Point	Existing Flow (CFS)	Proposed Flow (CFS)	Net Change (CFS)	Net Change (%)
10L - Wetlands	6.55	4.21	-2.34	-36%
20L - Street	0.96	0.89	-0.07	-7%

25 Year Design Storm				
Design Point	Existing Flow (CFS)	Proposed Flow (CFS)	Net Change (CFS)	Net Change (%)
10L - Wetlands	8.61	5.44	-3.17	-37%
20L - Street	1.35	1.26	-0.09	-7%

100 Year Design Storm				
Design Point	Existing Flow (CFS)	Proposed Flow (CFS)	Net Change (CFS)	Net Change (%)
10L - Wetlands	11.78	7.29	-4.49	-38%
20L - Street	1.96	1.86	-0.10	-5%

The Results indicate that the proposed improvements will not result in increases in peak runoff rates from the site for the 2-, 10-, 25-, and 100-year, Type III, 24-hour storm events as compared to the pre-redevelopment peak runoff rates.

3.4 Storm Sewer Design

The proposed storm sewer system has been designed to convey the 25-year design storm. 24-hour rainfall intensities were obtained from the National Oceanic and Atmospheric Administration (NOAA) Atlas 14, Volume 10, Version 3 Point Precipitation Frequency Estimates. Pipe sizing exceeds the requirements described in the Carlisle Planning Board Rules and Regulations Governing the Subdivision of Land.

Calculations for the proposed storm sewer network along with the rainfall intensities obtained from the NOAA Atlas, are included in *Appendix E.*

4 Soil Erosion and Sedimentation Control

Soil erosion and sedimentation control details and narratives for construction periods are provided on the site plans. Soil erosion and sedimentation control details and procedures are consistent with the "Massachusetts Erosion and Sediment Control Guideline for Urban and Suburban Areas."

Construction period erosion and sedimentation controls will include a construction entrance, compost filter socks, silt fence, catch basin inlet protection, and water for dust control. Additional erosion and sediment controls will be utilized as required. Perimeter sediment controls will be placed down-gradient of disturbed areas. Water will be applied to exposed soils to provide dust control as needed.

Soil disturbance, stabilization measures, stockpile locations, construction waste management procedures, and hazardous materials storage procedures shall be recorded and maintained as part of the Stormwater Pollution Prevention Plan (SWPPP). This is prepared as required under the EPA NPDES General Permit for Discharge from Construction Activities.

Waste materials generated from construction activities will include excavated soil, trees, brush, stumps, pavement, building debris, and utilities. All excavation debris and other waste will be transported to an approved disposal facility. If required, materials may be temporarily stockpiled within designated staging areas. Details and procedures are provided on the site plans and are included in the SWPPP.

Construction materials, including site and building materials, will be present on-site during various stages of construction. All materials will be temporarily stored within designated staging or lay-down areas and will be transported to the site as needed. Construction vehicle fueling will take place on site. Staging areas will be located within the limit of work, and drip lines of existing trees to remain.

5 Construction Sequence

A detailed construction sequence is included in the site plans. This construction sequence is subject to change based on construction methods, weather, or due to other unforeseen circumstances. Any changes to the sequence of construction shall be addressed in the SWPPP, which shall be updated during construction to address site conditions.

6 Massachusetts Stormwater Handbook Standards

The following is a description of how the proposed project conforms with the stormwater management standards (Standards) outlined in the Massachusetts Stormwater Handbook. The Stormwater Management Checklist is included in *Appendix F*.

Standard 1: No Untreated Discharge or Erosion to Wetlands
No concentrated and untreated flows are proposed into wetlands and/or waterways of the Commonwealth.

Standard 2: Peak Rate Attenuation
Post-development discharge rates from the 2-, 10-, 25-, and 100-year storm events will not increase as a result of the development compared to the pre-redevelopment condition. This will be achieved by the storage provided by the subsurface detention systems. Peak flow results are included above.

Standard 3: Stormwater Recharge
Stormwater recharge is not possible at the site due to subsurface soil conditions. As noted previously in this report, and detailed in the soil borings, restrictive layers are present in the subsurface conditions on site which consist of poorly draining, dense soils (glacial till) and bedrock.

Standard 4: Water Quality
Due to the soil conditions on site, water quality cannot be achieved through filtration and infiltration. Water quality is achieved through the proposed water quality units. Water quality flow calculations are included in *Appendix G*. Total Suspended Solid (TSS) removal calculations are included in *Appendix H*.

Standard 5: Land Uses with Higher Potential Pollutant Loads
The project does not contain any area of higher pollutant loads as defined by the Massachusetts Stormwater Handbook.

Standard 6: Critical Areas
The site is not located within an Interim Wellhead Protection Areas, or other Critical Areas, which includes Shellfish Growing Areas, Bathing Beaches, Outstanding Resource Waters, Special Resource Waters, and Cold-Water Fisheries.

However, the site is located within a Zone II. Water Quality Units have been designed to provide the required water quality flow equal to 1.0 inch of runoff times the total impervious area, as shown in the water quality flow calculations included in *Appendix G*.

Standard 7: Redevelopment
The proposed project is considered a mix of new development and redevelopment per the Massachusetts Stormwater Handbook. However, the site has been designed to fully comply with the new development standards of the Massachusetts Stormwater Handbook with the exception of Groundwater Recharge as described above.

Standard 8: Construction Pollution Prevention and Erosion and Sediment Controls
General erosion and sedimentation controls will be implemented and maintained in accordance with local, state, and federal requirements until construction is complete and disturbed areas have been stabilized. The extent and schedule for the commencement or cessation of construction activities, grading, and soil stabilization measures will be recorded and maintained as part of the SWPPP prior to the start of construction. The SWPPP will be developed in accordance with the EPA NPDES General Permit for Discharge from Construction Activities.

Standard 9: Long-Term Operation and Maintenance Plan
A Long-Term Operation and Maintenance Plan has been prepared and is included in *Appendix I.*

Standard 10: Illicit Discharges to Drainage System
This project does not contain illicit discharges to Stormwater Management Systems as defined in the Massachusetts Stormwater Handbook. An Illicit Discharge Compliance Statement is included in *Appendix J*. A signed copy will be provided prior to construction.

7 Local Regulations

The Carlisle Planning Board Rules and Regulations Governing Site Plan Review require stormwater management design for site plans to comply with the requirements described in the Carlisle Planning Board Rules and Regulations Governing the Subdivision of Land. Article III, Section 5, G, (1) requires the first inch of stormwater generated by impervious surfaces to be collected and infiltrated. As described above, site conditions prohibit infiltration on site. The project complies with all other design standards required in the Subdivision Rules and Regulations.

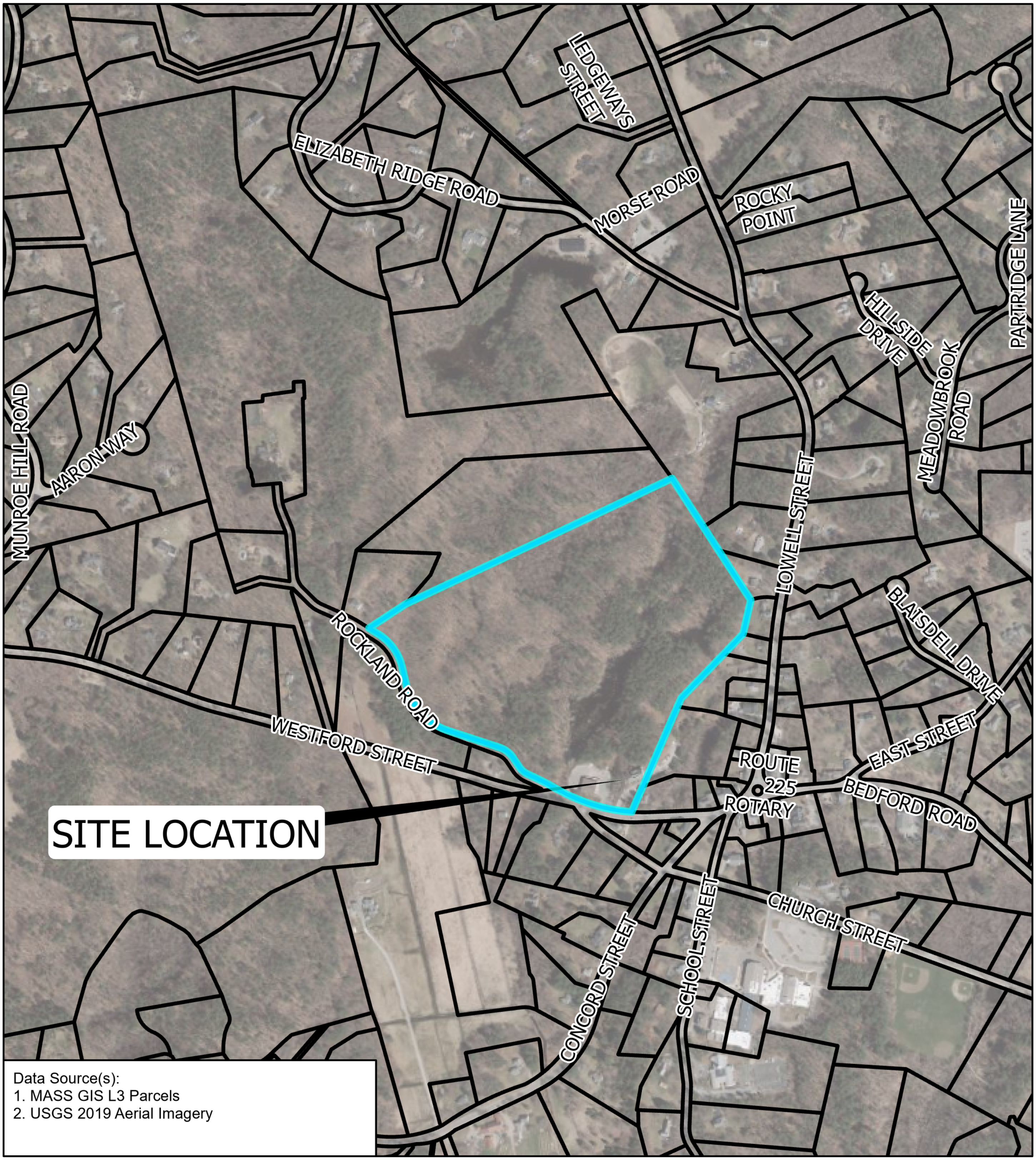
8 Summary

This Stormwater Management Report describes proposed work and stormwater management associated with the renovation of the existing fire station located at 66 Westford Street Carlisle, Massachusetts. The proposed stormwater management system is an improvement over existing site conditions that includes no stormwater Best Management Practices. The proposed stormwater management system, which includes deep sump catch basins, two (2) water quality units, and two (2) subsurface detention systems, will provide water quality treatment and peak flow attenuation. Peak run-off rates from the site will decrease when compared to pre-redevelopment conditions during the 2-, 10-, 25-, and 100-year storm events.

The proposed design addresses the applicable standards set forth in the MassDEP Stormwater Management Guidelines. Erosion control measures have been incorporated into the design, and a site-specific SWPPP will be developed to mitigate the impacts of the proposed land disturbance and construction. Based on the conditions summarized above, the proposed site improvements positively impact abutters and surrounding wetlands systems.

Figure 1

Site Location Map



Data Source(s):
1. MASS GIS L3 Parcels
2. USGS 2019 Aerial Imagery

Parcel Boundary
SITE LOCATION

N

0 180 360 720 Feet

Disclaimer: This map is not the product of a Professional Land Survey. It was created by Fuss & O'Neill, Inc. for general reference, informational, planning and guidance use, and is not a legally authoritative source as to location of natural or manmade features. Proper interpretation of this map may require the assistance of appropriate professional services. Fuss & O'Neill, Inc. makes no warrantee, express or implied, related to the spatial accuracy, reliability, completeness, or currentness of this map.

SITE LOCATION MAP

CARLISLE FIRE STATION

CARLISLE MASSACHUSETTS

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Figure 1

Folder: K:\P2025\0003\A10\MXD\20250003.A10\ Project: 20250003.A10 Layout: Figure 1 Map: Main Data Frame Map Frame
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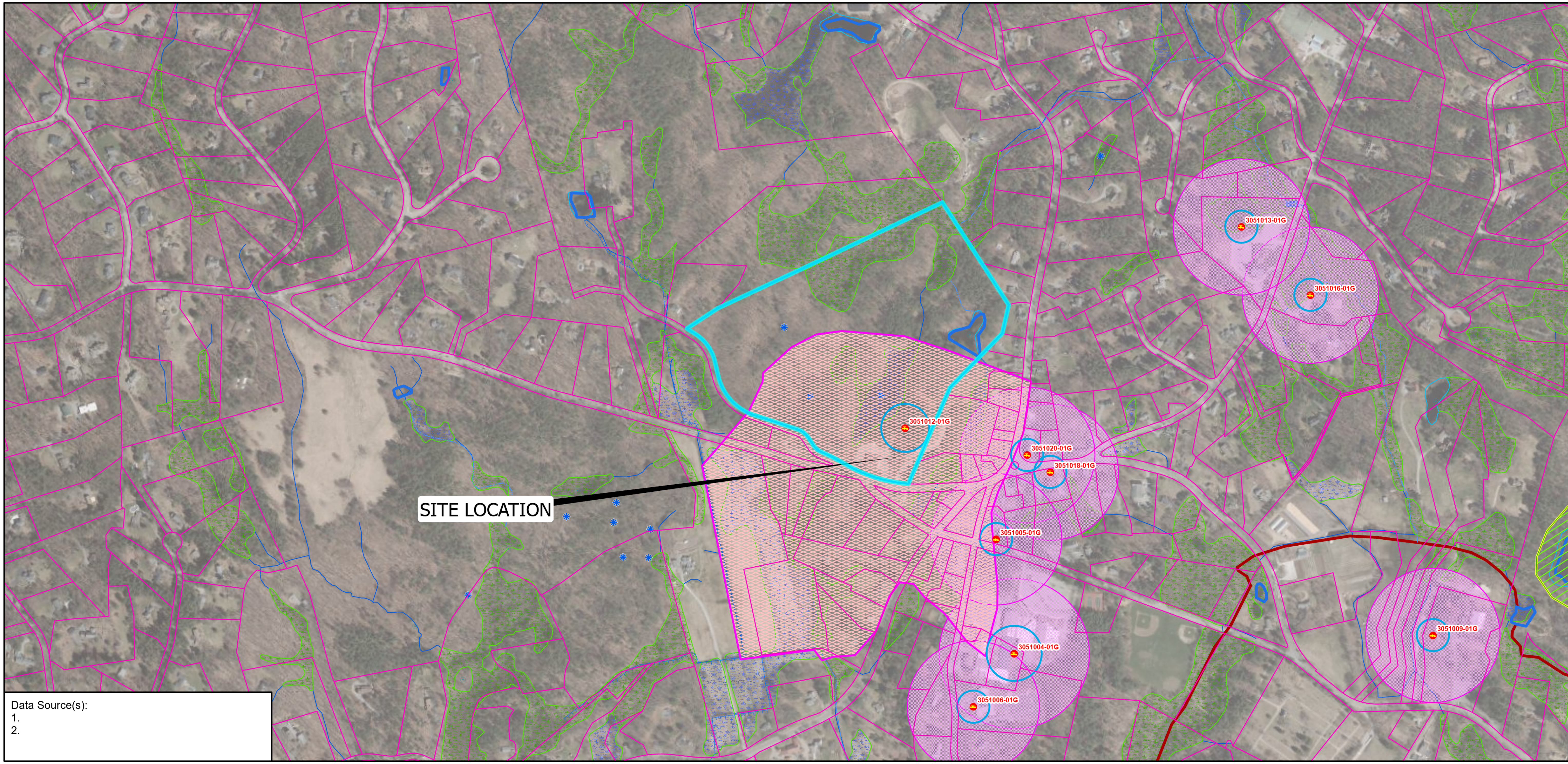
Figure 2

Resource Map



Data Source(s):
1.
2.

0 155 310 620 Feet

N

Disclaimer: This map is not the product of a Professional Land Survey. It was created by Fuss & O'Neill, Inc. for general reference, informational, planning and guidance use, and is not a legally authoratative source as to location of natural or manmade features. Proper interpretation of this map may require the assistance of appropriate professional services. Fuss & O'Neill, Inc. makes no warrantee, express or implied, related to the spatial accuracy, reliability, completeness, or currentness of this map.

RESOURCE MAP

CARLISLE FIRE STATION

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Figure
2

Folder: K:\P2025\0003\A10\MXD\20250003.A10\ Project: 20250003.A10 Layout: Figure 2 Map: Main Data Frame Map Frame
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Chapter 91- Tidelands Jurisdiction Data

- Public Way
- Marsh Boundary - landward
- Landlocked Tidelands
- Jurisdiction
- Historic High Water
- Marsh Boundary - seaward
- Contemporary High Water
- Inferrred Contemporary High Water
- Inferred Historic High Water

Public Water Supplies

- Community Groundwater Source
- Surface Water Intake
- Non-Community Groundwater Source
- Emergency Surface Water

Surface Water Protection Areas

- ZONE A
- ZONE B
- ZONE C

Wellhead Protection Areas

- DEP Approved Zone I
- DEP Approved Zone II
- IWPA

Water Body Segments - Rivers (arcs)

- 2 - Attaining some uses; other uses not assessed 2) Attaining some uses; other uses not assessed
- 3 - No uses assessed
- 4A - TMDL is completed
- 4C - Impairment not caused by a pollutant
- 5 - Waters requiring a TMDL

Water Body Segments - Lakes, Estuaries (polygons)

- 2 - Attaining some uses; other uses not assessed
- 3 - No uses assessed
- 4A - TMDL is completed
- 4C - Impairment not caused by a pollutant
- 5 - Waters requiring a TMDL
- MA DFW Coldwater Fisheries Resources
- Designated Shellfish Growing Areas

Designated Shellfish Growing Areas

- Approved
- Conditionally Approved
- Restricted
- Conditionally Restricted
- Prohibited

Outstanding Resource Waters

- ACEC
- Cape Cod National Seashore
- Protected Shoreline
- Public Water Supply Watershed
- Retired Public Water Supply
- Scenic/Protected River
- Wildlife Refuge

Outstanding Resource Waters

- Public Water Supply Contributor
- ORW for ACEC
- ORW for both Water Supply and Other
- ACECs
- NHESP Estimated Habitats of Rare Wildlife
- NHESP Priority Habitats of Rare Species
- Potential Vernal Pools
- NHESP Certified Vernal Pools

Linear Features

- Perennial Stream
- Intermittent Stream
- Shoreline
- Intermittent Shoreline
- Manmade Shoreline
- Ditch/Canal
- Aqueduct
- Dam
- Channel in Water

DEP Wetlands Outlines and Hydrologic Connections

- Shoreline
- Hydrologic Connection
- Mean Low Water Line
- Apparent Wetland Limit
- Closure Line
- Edge of Interpreted Area

DEP Wetlands and Open Water Features

- Marsh
- Wooded Swamp
- Salt Marsh
- Cranberry Bog
- Beach/Dunes
- Tidal Flats
- Reservoir
- SITE LOCATION

Data Source(s):
1.
2.

0 155 310 620 Feet

N

RESOURCE MAP

CARLISLE FIRE STATION

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Figure 2

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Date Exported: 12/3/2025 9:36 AM User: Nicole.Luongo Date Saved: 12/3/2025 9:31 AM

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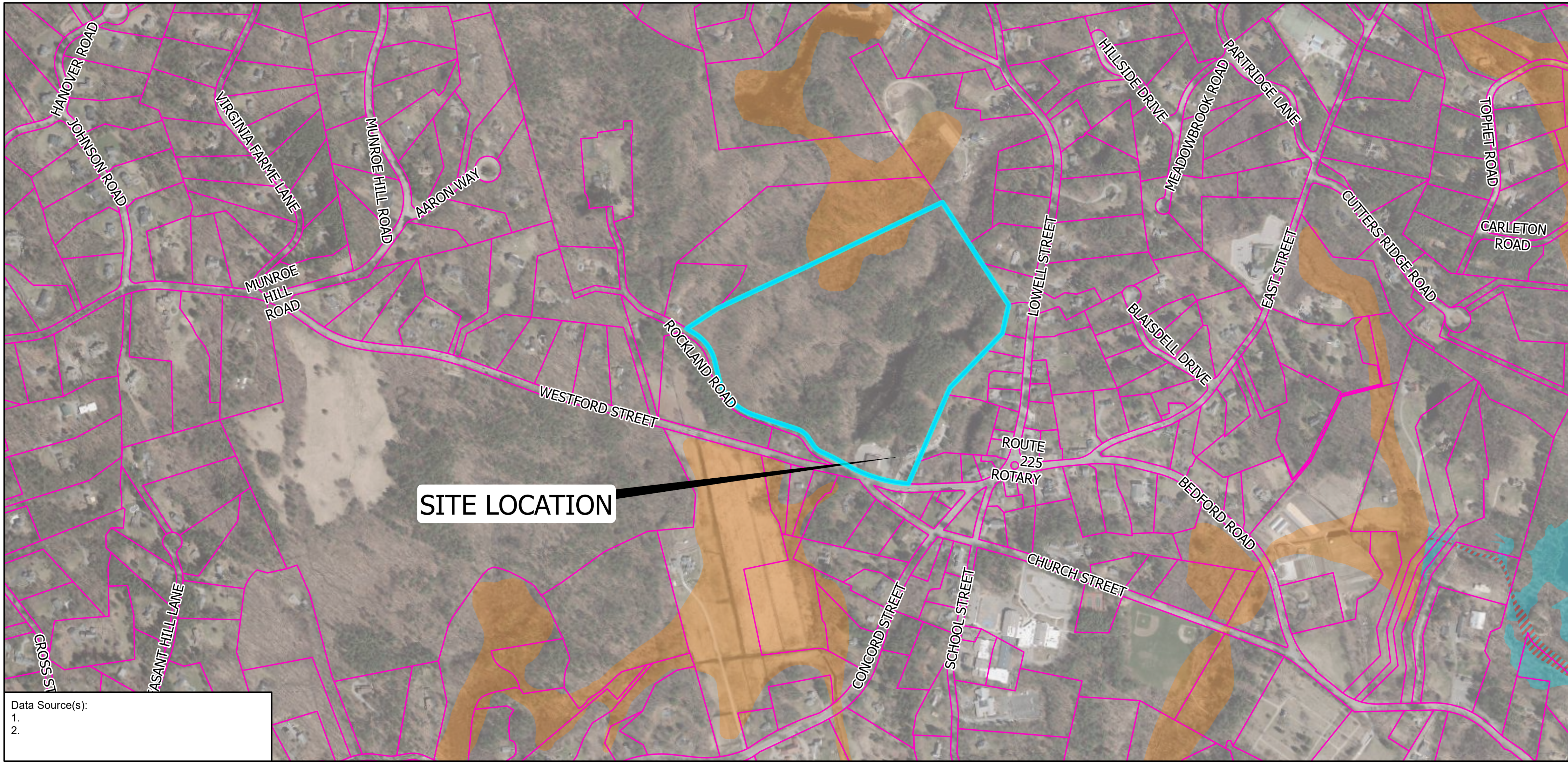
Figure 3

Flood Insurance Rate Map



Data Source(s):
1.
2.

FEMA National Flood Hazard Layer

Flood Zone Designations

- A: 1% Annual Chance of Flooding, no BFE
- AE: 1% Annual Chance of Flooding, with BFE
- AE: Regulatory Floodway
- AH: 1% Annual Chance of 1-3ft Ponding, with BFE
- AO: 1% Annual Chance of 1-3ft Sheet Flow Flooding, with Depth
- VE: High Risk Coastal Area
- D: Possible But Undetermined Hazard
- X: 0.2% Annual Chance of Flooding
- X: 1% Drainage Area < 1 Sq. Mi.
- X: Reduced Flood Risk due to Levee
- Area Not Included
- Area with no DFIRM - Paper FIRMs in Effect
- SITE LOCATION

0 155 310 620 Feet

N

FLOOD PLAIN MAP

CARLISLE FIRE STATION

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Figure
3

Folder: K:\P2025\0003\A10\MXD\20250003.A10\ Project: 20250003.A10 Layout: Figure 3 Map: Main Data Frame Map Frame
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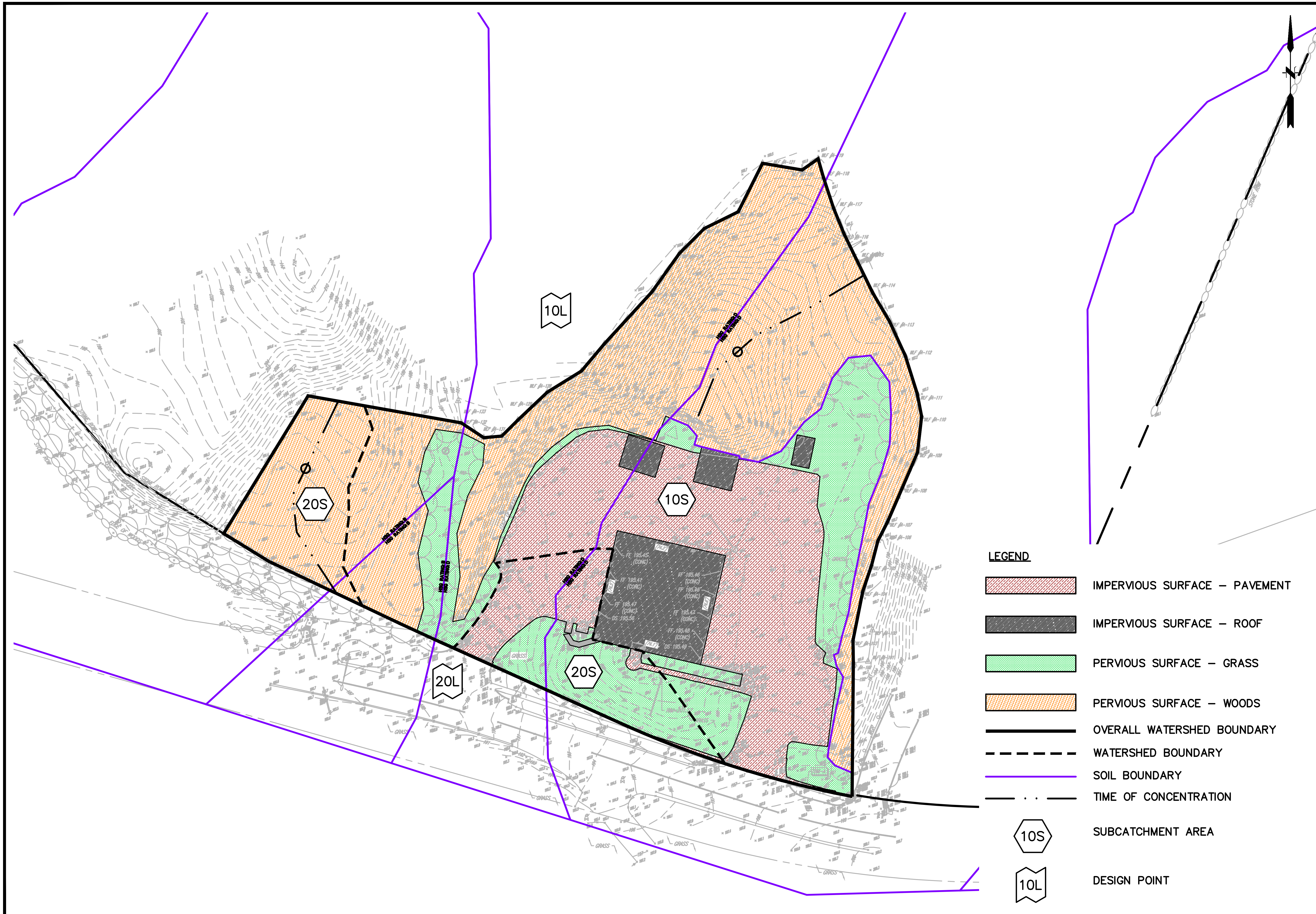
Figure 4

Pre-Development Watershed Map



SCALE: HORZ.: 1" = 60' VERT.: -
DATUM: HORZ.: NAD83 VERT.: NAVD88
0 30' 60' GRAPHIC SCALE

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TOWN OF CARLISLE
PRE-DEVELOPMENT WATERSHED MAP
66 WESTFORD STREET
CARLISLE MASSACHUSETTS

PROJ. No.: 20250003.A10
DATE: 02/02/2026

FIG.4

File: J:\DWG\P2025\0003\A10\Civil\Figures\20250003.A10_DRA01.dwg Layout: EXISTING Plotted: 2026-01-28 12:47 PM Saved: 2026-01-28 12:40 PM User: Jack.Deninger
PC3: AUTOCAD PDF (GENERAL DOCUMENTATION).PC3 STB/CTB: FO.STB
MS VIEW: MASSACHUSETTS
LAYER STATE:

FUSS & O'NEILL

Figure 5

Post Development Watershed Map

SCALE:
HORZ.: 1" = 60'
VERT.: -
DATUM:
HORZ.: NAD83
VERT.: NAVD88
0 30' 60'
GRAPHIC SCALE

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TOWN OF CARLISLE
MASSACHUSETTS

POST DEVELOPMENT WATERSHED MAP

66 WESTFORD STREET

CARLISLE

PROJ. No.: 20250003.A10
DATE: 02/02/2026

FIG.5

File: J:\DWG\P2025\0003\A10\Civil\Figures\20250003.A10_DRA01.dwg Layout: PROPOSED Plotted: 2026-01-29 12:46 PM Saved: 2026-01-29 12:45 PM User: Jack.Deninger
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Appendix A

NRCS Soil Reports

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

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

Custom Soil Resource Report for

Middlesex County, Massachusetts

December 9, 2025

Preface

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

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

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

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

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

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

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

How Soil Surveys Are Made

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

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

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

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

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

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

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

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

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

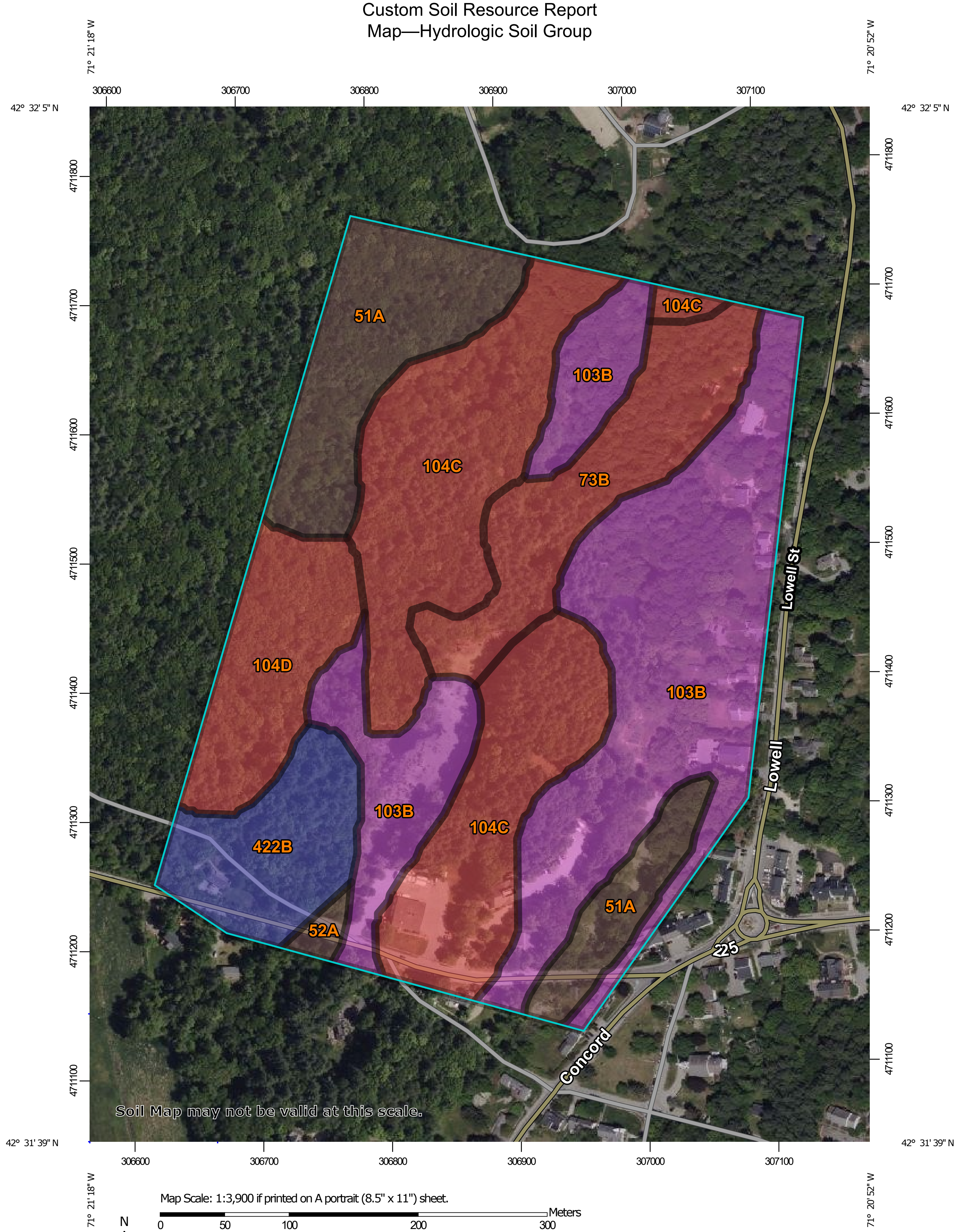
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree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

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

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

Map—Hydrologic Soil Group



Map Scale: 1:3,900 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0, 50, 100, 200, 300

Feet: 0, 150, 300, 600, 900

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

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

Streams and Canals

Transportation

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

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

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

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

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

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

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

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

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 25, Sep 5, 2025

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

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

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

Table—Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
51A	Swansea muck, 0 to 1 percent slopes	B/D	7.5	13.7%
52A	Freetown muck, 0 to 1 percent slopes	B/D	0.4	0.7%
73B	Whitman fine sandy loam, 0 to 3 percent slopes, extremely stony	D	5.7	10.3%
103B	Charlton-Hollis-Rock outcrop complex, 3 to 8 percent slopes	A	18.5	33.7%
104C	Hollis-Rock outcrop-Charlton complex, 0 to 15 percent slopes	D	14.4	26.3%
104D	Hollis-Rock outcrop-Charlton complex, 15 to 25 percent slopes	D	4.4	8.0%
422B	Canton fine sandy loam, 0 to 8 percent slopes, extremely stony	B	4.1	7.4%
Totals for Area of Interest			**55.0**	**100.0%**

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

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FUSS & O'NEILL

Appendix B

Soil Investigations

J2241-17-01
August 19, 2025

Matt Salad, AIA, NCARB, MCPPO
Tecton Architects, Inc.
34 Sequassen Street, Suite 200
Hartford, Connecticut 06106

Re: Preliminary Geotechnical Engineering Recommendations
Carlisle Fire Station
80 Westford Street
Carlisle, Massachusetts 01741

Dear Mr. Salad:

O'Reilly, Talbot & Okun Associates, Inc. (OTO) is pleased to provide this Preliminary Geotechnical Engineering Recommendations report for the fire station facility located at 80 Westford Street in Carlisle, Massachusetts. A Site Locus is provided as Figure 1. A Site Plan is provided as Figure 2.

Our preliminary geotechnical recommendations are based upon subsurface conditions observed in five soil borings performed for this study and a review of published information. Our services included full-time observation of the borings, review of the logs and soil samples, engineering analyses, and preparation of this report. This report is subject to the attached limitations.

This project is in the preliminary design phase. The recommendations in this report should be reviewed and updated (as necessary) once building concepts are finalized and design phase investigations are completed.

1.0 GENERAL INFORMATION

The Site is located at 80 Westford Street in Carlisle, Massachusetts, near the intersection of Westford Street and Church Street.

1.1 Site Description

The Site currently comprises the existing Carlisle Fire Department building, a communications tower, asphalt paved driveway and parking areas, temporary storage structures (e.g., carports), and various landscaped and wooded areas. The Site is bounded to the north by wooded and wetland areas (Conant Land); to the west by the same and by Rockland Road; to the south by Westford Street and residential properties; and to the east by the Carlisle Town Hall property.

We assume that the Site was undeveloped prior to construction of the existing fire station building; however, based on the Site topography, it is likely that fills likely occurred to level the Site prior to construction of the building and/or to construct the building pad.

The ground surface generally slopes downward away from the existing fire station building, especially to the west and south. A relatively steep slope, sloping downward, is present to the west along the side of the clearing that allows access to a well that provides water to the fire station.

1.2 Project Description

This project is in the preliminary phase; therefore, information about the proposed structure(s) is limited at this time. However, we expect that the project will consist of a new fire station building or a combination of renovations and additions to the existing building. For purposes of this report, we have assumed that any new structure will have a slab on grade with a slab elevation near the existing ground surface. This inference should be reviewed during final design, and this report should be updated as needed based upon final slab and exterior Site grading.

For purposes of this report, we have assumed that the building will have a steel frame and a brick façade. Structural loads will be supported on both isolated column and continuous strip footings. Structural loads are unknown at this time; however, it is expected that maximum column loads will be on the order of 100 to 150 kips. We anticipate bearing walls will carry a load of approximately two to five kips per linear foot. Fire apparatus bays and access ways will be designed for equipment loading. The design team should confirm these assumptions.

1.3 Geologic Information

Information regarding surficial soil conditions was obtained from the surficial geology map for the USGS Billerica Quadrangle[1]. A copy of the relevant portion of this USGS Surficial Geology map is presented on Figure 3.

The Site is in an area mapped as being underlain by thin glacial till and/or shallow bedrock. Glacial till is a dense, heterogenous mixture of sand, silt, clay, and gravel that was deposited at the base of the continental glaciers, which covered all of New England during the last period of glaciation. The thin till map unit represents areas where the thickness of glacial till is typically less than 10 to 15 feet. In areas mapped as shallow bedrock or outcrops, bedrock surface is often less than 5 to 10 feet below the ground surface. A small area of coarse granular deposits is also mapped near the Site.

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[1] US Geologic Survey, "Surficial Materials Map of Billerica Quadrangle", by Byron D. Stone, Janet R. Stone and Mary L. DiGiacomo-Cohen, 2018.

Additionally, we reviewed a bedrock depth map[2] which indicates that the depth to bedrock is between 0 to 5 meters (approximately 0 to 16 feet) in the Site vicinity. Individual data points which were used to construct the bedrock depth map indicate that the depth to bedrock at the Site is less than 10 feet. The State Geologic Map Compilation[3] indicates that bedrock in the Site vicinity consists of metamorphic rock (schist and gneiss) of the Nashoba Formation. The rock is described as “sillimanite schist and gneiss, partly sulfidic, amphibolite, biotite gneiss, calc-silicate gneiss, and marble”.

Based upon the assumed construction and the soil borings performed for this study, we do not anticipate that significant amounts of bedrock will be encountered during construction. However, the depth to bedrock likely varies and bedrock may be encountered in some areas, depending on the final location and elevation of proposed structures. We recommend that additional explorations be performed in future design phases once additional project details are known.

Subsurface conditions observed at the Site generally support the information presented on the geologic maps. Additional details are presented in Section 2.0.

2.0 SUBSURFACE EXPLORATIONS AND TESTING

Subsurface investigations for this study consisted of five soil borings (CF-1 through CF-5), which were performed in the vicinity of the existing fire station building. Borings CF-1, CF-2, and CF-3 were performed in asphalt paved areas surrounding the building. Borings CF-4 and CF-5 were performed in a grassy clearing to the west, which provides access to the well that supplies water to the fire station building. Boring CF-3 had numerous off-sets due to shallow refusals.

The borings were performed on July 16 and 24, 2025 by Seaboard Drilling of Chicopee, Massachusetts. They were performed using either a Diedrich D-50 ATV-mounted rig or a Mobile Drill B-53 truck-mounted rig. The borings were advanced using hollow stem auger drilling techniques. Boring locations are shown on Figure 2. Boring logs are attached.

Borings were advanced to a depth of between 4 and 21 feet (approximate elevations between 168.5 and 190.4 feet). Borings CF-2, CF-3/3A/3B/3C, and CF-4 encountered drilling refusal at between 4 to 5.1 feet. These refusals were likely upon cobbles and/or boulders; however, additional investigations are necessary to fully determine if the refusals were upon cobbles/boulders, bedrock, or other debris.

Soil samples were collected using a 2-inch diameter split spoon sampler driven 24 inches with a 140-pound automatic hammer falling 30 inches (American Society for

[2] Mabee, S.B., C.C. Duncan, W.P. Clement, and M.A. Pontrelli, 2023, Massachusetts Depth to Bedrock Project. MassDOT Office of Transportation Planning, Research and Technology Transfer Section, Research Report, 173 p.

[3] Horton, J.D., San Juan, C.A., and Stoeser, D.B., 2017, The State Geologic Map Compilation (SGMC) geodatabase of the conterminous United States (ver. 1.1, August 2017): U.S. Geological Survey Data Series 1052, 46 p., https://doi.org/10.3133/ds1052.

Testing and Materials Test Method D1586-99 “Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils”). The number of blows required to drive the sampler each 6 inches was recorded. The standard penetration resistance, or N-value, is the number of blows required to drive the sampler the middle 12 inches. Soil properties, such as strength and density, are related to the N-value. The field N values are corrected to a standard 60% hammer efficiency, known as N60, to account for differing hammer efficiency, sampler type, borehole diameter and depth. The N values presented on the boring logs are field values, which are not adjusted for hammer efficiency. However, the adjusted N60 values were used in our engineering calculations and analysis.

An O’Reilly, Talbot & Okun Associates, Inc. (OTO) representative observed and logged the borings. Samples were described according to a modified version of the Burmister Soil Classification System. After drilling, bore holes were backfilled with soil cuttings and gravel, and patched with asphalt (where applicable).

Two representative near surface samples were analyzed by Allied Testing Laboratories, Inc. of Springfield, Massachusetts to determine their suitability for re-use as engineered fill. Results are discussed in Sections 3.0 and 5.6

3.0 SUBSURFACE CONDITIONS

Subsurface conditions were interpreted based upon information collected from the soil borings. In general, subsurface conditions consisted of the following: a surface layer of asphalt or topsoil; fill; dense sand and gravel or glacial till; and boulders and/or bedrock. The observed subsurface conditions appear generally consistent with published geologic maps.

With the exception of the near-surface fill layer and organic soils, soil conditions are generally favorable for the proposed construction. Based upon the borings, we do not anticipate that bedrock will be encountered during construction; however, it appears that a significant amount of oversized material (cobbles and boulders) may be present within Site soils.

Final design phase investigations are recommended and outlined in Section 6.0.

3.1 Soil Conditions

Asphalt/Topsoil: Approximately three to five inches of asphalt was encountered at the ground surface in borings CF-1 through CF-3C, which were performed within pavement areas to the north, east, and west of the existing fire station building. No distinct base course was observed. Approximately five to six inches of topsoil was present at the ground surface in borings CF-4/4A and CF-5. The topsoil consisted of a mixture of soil and organics (roots, wood).

Non-Engineered Fill & Granular Fill: Fill was encountered below the surficial (asphalt or topsoil) layer in each boring and extended to between 4 to 8 feet below the ground surface. At some locations, it was difficult to distinguish between fill and native layers. This fill layer was generally sandy and consisted of fine to medium sand with varying amounts of coarse sand, gravel, and silt. Organic containing soils were encountered within the fill layer in boring CF-1 (at approximately 4 feet below ground surface), which are described below. Portions of the fill appear to consist of engineered Granular Fill. In other areas, the fill appeared to vary in composition and was loose, indicating non-engineered fill.

Two samples collected in the upper five feet were analyzed for grain size distribution. Sample from CF-2 and CF-3 consisted of gravel with some sand and 9 percent fines (passing no. 200 sieve) and gravel and sand mixture with 12 percent fines, respectively. These materials appear suitable for re-use as engineered fill, provided any deleterious or oversized materials are removed. Additional recommendations for re-use are provided in Section 5.6.

Organic Containing Soils: A thin (less than 6 inches thick) dark brown, silty sand with organics was encountered in boring CF-1 near a depth of 4 feet. Based upon the observed depth and thickness of this layer, it appears that this layer may be near the original ground surface and it is likely that isolated pockets of organic-containing soils are present in other areas. For preliminary design, we recommend that it is assumed that this layer is present surrounding the existing structure. This layer should be removed from beneath the new footprint and replaced with compacted engineered fill. We recommend that test pits be performed during later design phases to better identify the nature and horizontal and vertical extents of the organic soil layer.

Sand & Gravel/Glacial Till: Dense sand and gravel or glacial till was encountered directly beneath the non-engineered fill layer or organic soil layer in each boring that was able to penetrate the fill (borings CF-1, CF-4, and CF-5).

Glacial till is a relatively dense, heterogeneous mixture of silt, clay, sand, and gravel, and is generally present immediately above bedrock throughout New England. The glacial till encountered at the Site was generally coarse, with significant amounts of sand and gravel and relatively little fines (silt or clay).

Boring CF-4/4A was terminated within very dense soil layer at a depth of 14.5 feet. Borings CF-1 and CF-5 fully penetrated the till layer, encountering weathered bedrock at 15 and 13.5 feet, respectively.

Boulders and Bedrock: Borings CF-2, CF-3/3A/3B/3C, and CF-4/4A encountered drilling refusal within the near-surface fill layer, likely upon cobbles or boulders. However, the cause of the refusal is not certain. Additional investigations, such as rock cores and/or test pits would be needed to confirm if the refusals were upon a boulder, bedrock or other buried debris. In borings CF-1 and CF-5, a layer of weathered bedrock was encountered. The thickness of the overburden soils (above the weathered bedrock layer) in borings CF-1 and CF-5 was approximately 15 and 13.5 feet, respectively, which are consistent with the geologic maps referenced herein.

We note that artificially placed boulders were observed along the face of the slope to the west of the existing building, likely placed during previous development of the Site. In addition, old stone walls were observed near the Site, indicating the likely presence of cobbles and boulders within the near surface soils in the Site vicinity.

3.2 Groundwater Conditions

Groundwater was measured at a depth of approximately 8 feet below ground surface (elevations between 175.5 and 176.8 feet) in borings CF-4A and CF-5. We note that the depth to groundwater could not be determined in the remaining borings, due to the drilling methods employed (cased drive and wash). However, at the time of the drilling, we also measured the depth to groundwater in monitoring wells that were previously installed at the Site by others. The groundwater levels were measured at between 11.9 to 12.7 feet below the ground surface in the wells.

We do not anticipate that significant amounts of groundwater will be encountered during construction of the proposed slab-on-grade building. However, the level of the water will be dependent upon weather conditions and season and may vary significantly due to the density and low permeability of the near-surface soils. We anticipate that sumps and pumps will be adequate to dewater excavations during construction.

4.0 GEOTECHNICAL ISSUES

The significant geotechnical issues for the proposed construction addressed in this preliminary report include the following: the presence of near surface non-engineered fill and soils containing organics; foundation bearing capacity and settlement; seismic considerations; the suitability of on-Site materials for use in engineered fills; and recommendations supplemental investigations.

5.0 PRELIMINARY DESIGN RECOMMENDATIONS

The following preliminary recommendations are provided for the assumed construction. These recommendations should be reviewed during final design. These recommendations may need to be revised if the building location and/or slab elevations differ from what was assumed in this report.

The recommendations in this report refer to the 10th Edition of the Massachusetts State Building Code (MSBC), which includes amendments to the 2021 International Building Code (IBC) and became effective on October 11, 2024.

5.1 Foundations

Any unsuitable soil (non-engineered fill, or soils containing organics such as those observed in CF-1), asphalt or topsoil layers should be removed from beneath the building footprint. The unsuitable soils should be replaced with compacted engineered fill, as recommended below. Any debris (if present), asphalt, topsoil, or organic soils stripped from the excavation should not be reused as fill beneath the structure or beneath pavements. In addition, we recommend that the entire building footprint and pavement subgrades be thoroughly proof compacted, to treat any near surface loose areas. Proof compaction should be accomplished by a minimum of six passes with a 6,000 pound (or heavier) vibratory roller.

Provided any unsuitable layers are addressed, the building can be founded on normal spread footing foundations bearing on compacted engineered fill (as needed) and densified native soils. Provided the recommendations in this section are followed, a maximum allowable bearing pressure of 4,000 pounds per square foot may be used for the preliminary design of footings.

We recommend that exterior footings be embedded a minimum of 48 inches below the lowest adjacent grade for frost protection. Interior footings should be embedded at least 24 inches below the surrounding floor slab. Strip footings, beneath the load bearing walls, should be at least 18 inches wide. Isolated column footings should be at least 24 inches wide. All other applicable requirements of the Massachusetts State Building Code (MSBC) should be followed.

We estimate that the settlement of footings and slabs bearing on the densified native soils and compacted fill should be small and largely elastic in nature. Maximum settlements should be less than 1 inch and should occur relatively quickly after load application (during construction).

Footings should not be placed on frozen soils. Footing excavations should be free of loose or disturbed materials. Any boulders or cobbles larger than four inches in diameter should be removed from within one foot of the bottom of the footings and replaced with Sand and Gravel or Crushed Stone fill. Additional recommendations regarding the presence of over-sized material is provided in Section 5.0. The footing subgrades should be densified with at least three passes with a vibrating plate compactor. If loose materials are present in the excavations, they shall be recompacted to form a firm, dense, bearing surface.

5.2 Concrete Slabs and Rigid Pavements

We recommend that concrete floor slabs and rigid pavements (such as apparatus areas) bear on at least 12 inches of Sand and Gravel or Crushed Stone to provide uniform support and a capillary moisture break. The subgrade should also be free of large cobbles or boulders. The fill beneath the concrete slabs should meet the grain size distribution characteristics outlined in Table 2.

The subgrade within the footprint of the proposed buildings and in rigid pavement areas should be stripped of asphalt, topsoil, and any non-engineered fill and organic soils. We recommend that the building footprint and pavement areas be thoroughly densified to treat any loose areas present. If very dense glacial till is present at subgrade level, proof compaction may not be needed. If non-engineered fill or soft or disturbed areas are present, these materials should be removed and replaced with compacted Sand and Gravel or Crushed Stone fill. Fill supporting slabs should be placed in accordance with the recommendations presented on the attached Sheet 1.

Slabs and rigid pavements should be designed using a standardized (based on a one square foot test plate) vertical subgrade modulus of 200 tons per cubic foot, provided the slab/concrete pavements bear on 12 inches of compacted Sand and Gravel or Crushed Stone fill. This subgrade modulus should be corrected for mat/slab size.

5.3 Groundwater and Surface Water Control

Groundwater was encountered below 8 feet below ground surface in the borings and monitoring wells. However, the dense near surface soil layer may be relatively impermeable and may limit water infiltration. Therefore, groundwater levels may rise during periods of wet weather and water may be encountered during construction. We anticipate that excavations extending into the water table can be dewatered using trenching or sump pits and pumps. We note that initial flow into excavations may be significant if permeable layers are encountered. In addition, the contractor should establish and maintain proper grading to promote drainage during construction.

Since the Site soils are relatively impermeable, we recommend that the project team consider including perimeter drainage to control groundwater and surface water infiltration and allow the soils immediately below the slab to drain quickly after a high water event. This recommendation should be reviewed during final design and in coordination with the stormwater control system design.

5.4 Seismic Considerations

Earthquake loadings must be considered under requirements in Section 1613 and 1806 of the 10th Edition (October 2024) of the Massachusetts State Building Code (MSBC). The 10th Edition of the MSBC is based upon the International Building Code 2021 (IBC) with Massachusetts amendments. Note that the IBC refers to ASCE-7, *Minimum Design Loads for Buildings and Other Structures.*

5.4.1 Site Class and Earthquake Design Factors

Section 1613 of the IBC covers lateral forces imposed on structures from earthquake shaking and requires that every structure be designed and constructed to resist the effects of earthquake motions in accordance with ASCE-7. Lateral forces are dependent on the type and properties of soils present beneath the Site, along with the geographic location.

The maximum considered earthquake spectral response acceleration at short periods (S_s) and at 1-sec (S_1) were determined per Table 1604.11 for Carlisle, Massachusetts, and are presented in Table 1.

Soil properties are represented through Site Classification. Procedures for the Site-specific determination of Site Classification are provided in Chapter 20 of ASCE-7. At this Site, we evaluated Site Classification using one of the parameters allowed, Standard Penetration Resistance (N-value). The Site coefficients F_a and F_v were determined according to Tables 1613.2.3(1) and 1613.2.3(2) of the IBC (2021), using both the S_s and S_1 values and the Site Class. Seismic design values are provided in Table 1.

Table 1
Seismic Design Parameters

Parameter	Value
Ss	0.320
S1	0.072
Site Class	C
Fa	1.3
Fv	1.5

If retaining walls are incorporated into the final design, they should be designed to resist dynamic lateral earth forces in accordance with Section 1610.2 of the MSBC. The seismic earth forces as defined in Section 1610.2 should be applied as an inverted triangle over the height of the wall and added to the static lateral pressures. For purposes of the calculation, a total unit weight of 125 pounds per cubic foot should be used for the backfill against the retaining wall.

Section 1806.4 relates to the liquefaction potential of the underlying soils. The liquefaction potential was evaluated for saturated Site soils, using Figure 1806.4 of the MSBC. Based upon soil density estimated from N-values, liquefaction is not likely to occur under the design earthquake. Furthermore, it is unlikely that loose soils would be encountered below the maximum depth explored.

5.5 Exterior Slabs and Pavements

This section provides recommendations for exterior entryways and slabs, sidewalks, and flexible and rigid pavements.

5.5.1 Entryways and Sidewalks

Exterior concrete slabs, such as those at entryways, and sidewalks adjacent to buildings should be designed to mitigate differential frost movement between adjacent slabs, doorways, and pavements. To address this concern, we recommend that concrete slabs at entryways be underlain by four feet of non-frost susceptible Sand and Gravel fill. Beyond the edges of the slab, the bottom of Sand and Gravel fill should transition gradually upward at a slope of 3H:1V or flatter (zone of influence).

We recommend that concrete sidewalks that are outside the zone of influence of the building and entryways bear on at least 12 inches of compacted Sand and Gravel to provide uniform support and a capillary moisture break. Subgrades should also be free of large boulders. We recommend that the entire subgrade of the sidewalk be proof compacted to treat any loose areas. In addition, we recommend that the design team consider incorporating drainage into sidewalk areas to remove water from the subgrade, in order to limit frost and the resulting vertical movement of sidewalks. The Sand and Gravel fill beneath the concrete slabs and sidewalks should meet the grain size distribution characteristics described in Table 2.

5.5.2 *Subgrade Preparation for Pavements*

We expect that the project will involve the construction of pavements (including both parking lots and roadways) for both light and heavy vehicles. We anticipate that the design of pavement sections will be provided by others.

We recommend that pavement subgrades be proof compacted to treat any loose areas present. If non-engineered fill or deleterious materials (such as organic soils or debris) are encountered in pavement areas, they should be removed and replaced with compacted engineered fill. We recommend at least 12 inches of well graded Sand and Gravel (or Gravel Base Course) be placed below pavements. A geotechnical reinforcing grid (geogrid) can be added to the pavement section in any areas of deeper organics in lieu of over-excavation and replacement.

Table 2 presents recommendations for gradation requirements for Sand and Gravel and Gravel Base Course materials. Please note that the Gravel Base Course specification is Mass Highway M1.03.1, Process Gravel for Sub-base.

5.6 Preliminary Earthwork Recommendations

At this time, we anticipate that earthwork for this project will include the following: small cuts and fills to achieve final grade elevations; removal and replacement of non-engineered fill and any soils containing organics, debris, or other deleterious materials (if encountered); excavations for footings; and placement of compacted engineered fills beneath the building, floor slab and pavements. These recommendations should be reviewed during final design. Additional considerations may be appropriate at that time.

5.6.1 *Engineered Fill Recommendations*

Four engineered fill types are recommended:

- Sand and Gravel for use beneath slabs, pavements and sidewalks;
- Crushed Stone for use beneath footings, and as an alternative to Sand and Gravel;
- Gravel Base Course for use beneath pavements; and
- Granular Fill for depths greater than 12 inches beneath slabs and foundations, and as miscellaneous fill, if needed.

Grain size distribution requirements are presented in Table 2.

Table 2
Grain Size Distribution Requirements

Size	Sand and Gravel	Gravel Base Course	Granular Fill	Crushed Stone
	Percent Finer by Weight			
3 inch	100	100	100	---
1 ½ inch	---	70-100	---	---
1 inch	---	---	---	100
¾ inch	---	---	---	90-100
½ inch	50-85	---	---	10-50
⅜ inch	---	---	---	0-20
¼ inch	---	50-85	---	---
No. 4	40-75	30-60	---	0-5
No. 10	---	---	30-90	---
No. 40	10-35	---	10-70	---
No. 200	0-8	0-10	0-15	---

If Site soils are to be reused as engineered fill, we recommend that representative samples be collected, and grain size distribution (sieve) and moisture-density relationship (Modified Proctor, ASTM D1557) analyses be performed during construction to evaluate the suitability of on-Site soils for reuse. Based upon visual observations of the Site soils and preliminary laboratory testing, it appears that the near-surface soils may be suitable for reuse as engineered fill, provided it is free of debris, oversized materials, and other deleterious materials (such as the organic layer encountered in boring CF-1). Oversized materials can be crushed and mixed with granular material, disposed off-site, used as surficial covering or surficial landscaping. Oversized material should be removed or further crushed so that the maximum particle size is three inches or less.

If approved by the owner and design team, excess boulders or oversized materials to be buried in deep fills should be placed in a single layer and not stacked or placed in clusters in an approved landscaped area. Voids between boulders should be filled with on-Site granular soils, which should be compacted with a vibratory roller to fill all voids between the boulders to minimize future settlement. Multiple layers of boulders can be placed provided the voids in each layer are completely filled and a one-foot thick (minimum) layer of compacted soil is placed between the boulder layers. We recommend that boulders used within fills shall not extend within two feet of final grades within landscaped areas, and four feet within paved areas.

5.6.2 Compaction Recommendations

We recommend that the entire building footprint be stripped of topsoil, non-engineered fill, debris, and organic soils (if encountered) and be thoroughly proof compacted, prior to the placement of engineered fills. Proof compaction should be accomplished by a minimum of six passes with a 6,000-pound vibratory roller. To facilitate compaction, the moisture content of the on-Site material should be maintained at or near the optimum moisture content as determined by ASTM D1557.

Compacted fills should be placed in lifts ranging in thickness between 6 and 12 inches depending on the size and type of equipment. Recommended degrees of compaction and compaction means and methods are presented on Sheet 1.

If new walls are backfilled on both sides, compaction of fill should proceed on both sides of the wall so that the difference in top of fill on either side does not exceed two feet. Engineered fill placed within ten feet of basement and retaining walls should be compacted using hand-operated plate or drum rollers weighing 250 pounds or less.

5.6.3 Weather Considerations

The contractor should note that native Site soils consist of dense, sand and gravel and glacial till. In general, the sand and gravel mixture appeared to have less than 15 percent fines; however, more silty areas may be present. Due to the low permeability of these soils, subgrades may become soft and unstable under normal construction traffic. It may become necessary to remove and replace wet and disturbed soils or excessively soft underlying soils.

This issue is particularly significant during winter construction periods or extended periods of wet weather since fine-grained soils will tend to remain wet and cannot be easily dried or stabilized. It may be necessary to remove the disturbed soils and replace them with imported Sand and Gravel or Crushed Stone if they become wet. To avoid this potential issue, the contractor should limit exposing large areas of silty soils for extended periods of time, cover prepared subgrades with imported Sand and Gravel or Crushed Stone quickly after proof compaction, and establish and maintain proper drainage of exposed surfaces.

6.0 DESIGN AND CONSTRUCTION PHASE SERVICES

The preliminary recommendations in this report should be reviewed during future design phases, once the final building location, footprint, slab elevations, and other detailed information is known. We recommend that additional explorations be performed during future phases to obtain additional subsurface information, as described below. Additionally, we recommend that OTO be retained to prepare and/or review appropriate specification sections and to provide engineering support during construction.

6.1 Supplemental Investigations – Final Design Phases

As described above, we recommend that additional investigations be performed to obtain additional information about subsurface conditions at the Site. The purpose of additional investigations would include:

- Defining the depth and lateral limits of the organic-containing soil identified in boring CF-1;
- Observing the nature of the near-surface soils, including over-sized material (cobbles or boulders) and/or loose fills or debris; and
- Collection of additional near-surface soil samples to determine their suitability for reuse in engineered fills.

At this time, supplemental investigations should include additional test pits within the footprint of the proposed construction and/or cut areas. In addition, supplemental borings may be recommended depending on the final layout, location and size of the proposed building. This report should be reviewed and updated to reflect the results of the supplemental investigations.

6.2 Construction Design and Administration

We recommend that O'Reilly, Talbot & Okun Associates, Inc. (OTO) be retained during construction design phases to prepare and/or review appropriate specification sections and drawings, if necessary.

During construction, we recommend that OTO be retained to provide engineering support; review and approve geotechnical submittals; and to observe and document the limits and removal of any organic soils or non-engineered fill, the contractor's means and methods, and subgrade conditions and preparation.

We appreciated the opportunity to be of service on this project. If you have any questions, please contact the undersigned.

Sincerely yours,
O'Reilly, Talbot & Okun Associates, Inc.

Pierre J. Carriere, EIT
Engineer II

Ashley L. Sullivan, P.E.
Principal

ATTACHMENTS:

Limitations, Figures, Sheet 1, Boring Logs, Laboratory Data Sheets

LIMITATIONS

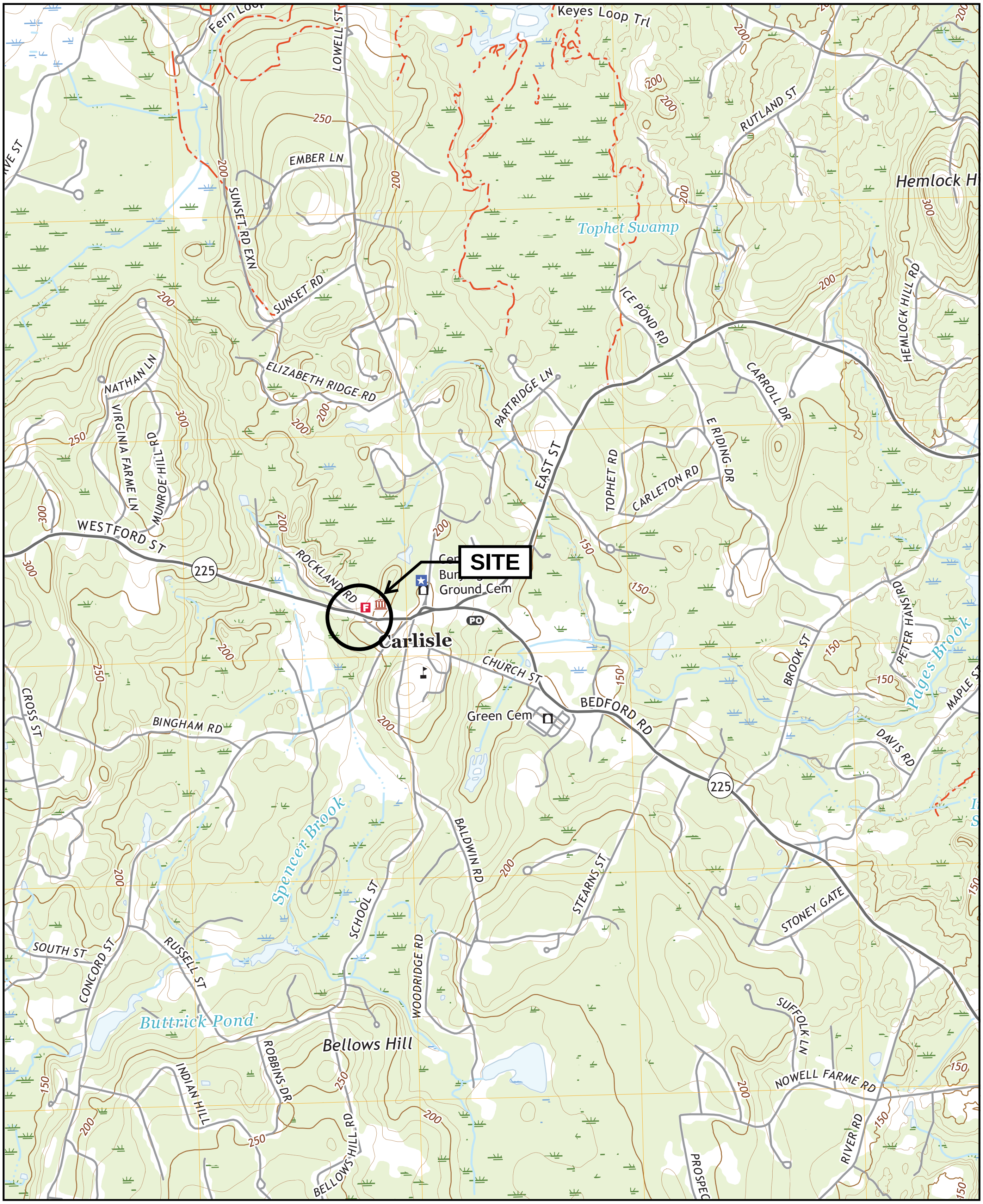
1. The observations presented in this report were made under the conditions described herein. The conclusions presented in this report were based solely upon the services described in the report and not on scientific tasks or procedures beyond the scope of the project or the time and budgetary constraints imposed by the client. The work described in this report was carried out in accordance with the Statement of Terms and Conditions attached to our proposal.

2. The analysis and recommendations submitted in this report are based in part upon the data obtained from widely spaced subsurface explorations. The nature and extent of variations between these explorations may not become evident until construction. If variations then appear evident, it may be necessary to reevaluate the recommendations of this report.

3. The generalized soil profile described in the text is intended to convey trends in subsurface conditions. The boundaries between strata are approximate and idealized and have been developed by interpretations of widely spaced explorations and samples; actual soil transitions are probably more erratic. For specific information, refer to the boring logs.

4. In the event that any changes in the nature, design or location of the proposed structures are planned, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and conclusions of this report modified or verified in writing by O'Reilly, Talbot & Okun Associates Inc. It is recommended that we be retained to provide a general review of final plans and specifications.

5. Our report was prepared for the exclusive benefit of our client. Reliance upon the report and its conclusions is not made to third parties or future property owners.



0	1000
FEET	

0	0.5	1.0
	MILES	

0	0.5	1
	KILOMETERS	

1:24,000 SCALE   NATIONAL GEODETIC VERTICAL DATUM 1929   10 FOOT CONTOUR INTERVAL

O:\Job Files\J2200\J2241 Tecton Architects Inc\17-01 Carlisle Fire Station - Preliminary Geotech\Report and Figures\Figure 1 - Site Locus (24k scale).pdf

O'Reilly, Talbot & Okun
ENGINEERING ASSOCIATES
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www.OTO-ENV.com

CARLISLE FIRE STATION

80 WESTFORD STREET
CARLISLE, MASSACHUSETTS

SITE LOCUS

Topographic Map Quadrants:
Billerica, MA

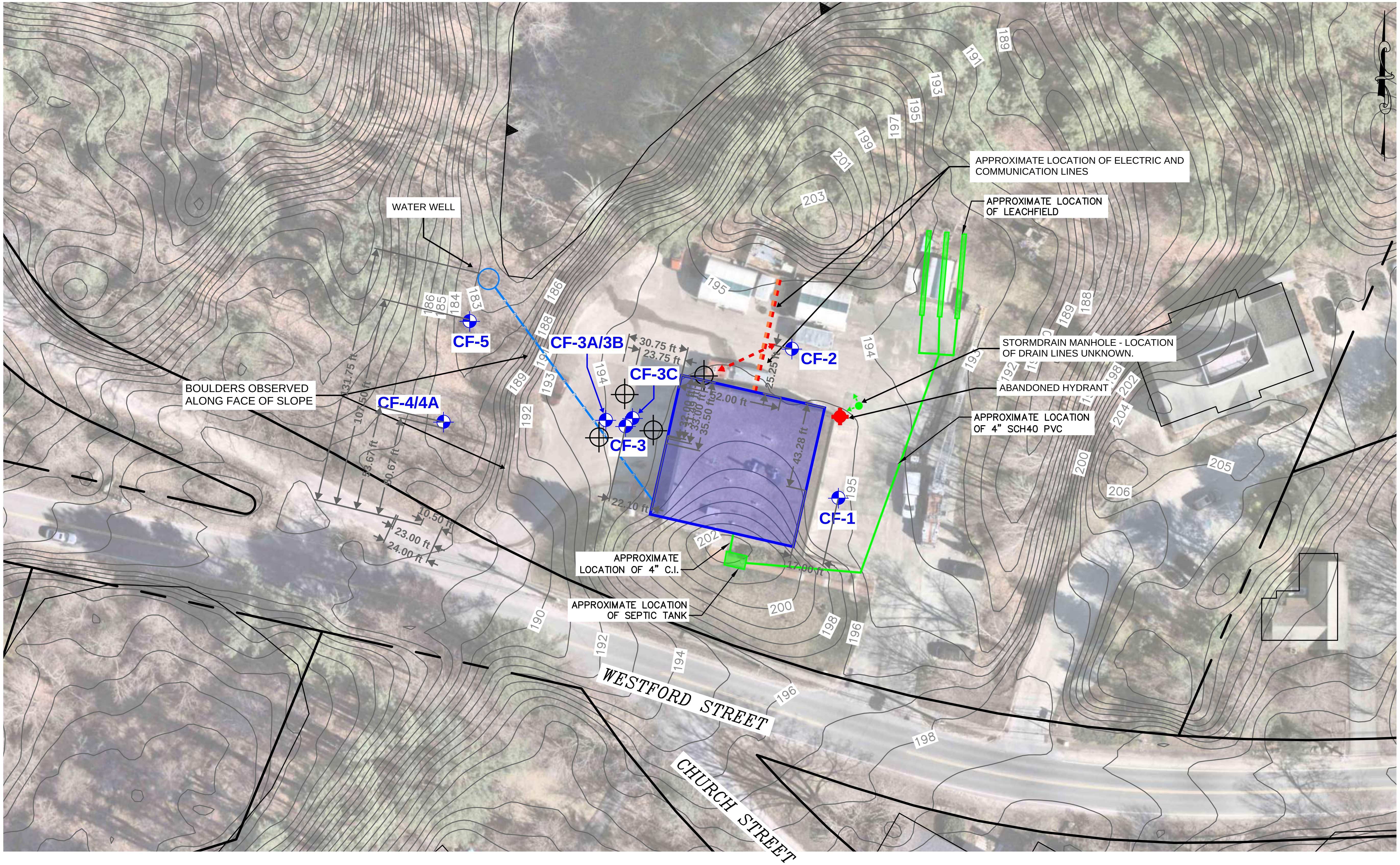
Map Version: 2021

Current As Of: 2021

Date: AUGUST 2025

PROJECT No.
J2241-17-01

FIGURE No.
1



NOTES:

1. BASE MAP PROVIDED TO OTO IN ELECTRONIC FORMAT. ORIGINAL DRAWING TITLED "TEST PITS MAP" (DRAWING TP-101), BY FUSS & O'NEILL, DATED JULY 1, 2025
2. SAMPLE LOCATIONS ARE SHOWN ACCORDING TO TAPED MEASUREMENTS TAKEN FROM EXISTING SITE FEATURES
3. ALL DATA IS TO BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHODS USED IN THE DEVELOPMENT OF THIS PLAN

LEGEND:

- APPROXIMATE LOCATION OF SOIL BORING PERFORMED BY SEABOARD DRILLING ON JULY 16 OR 24, 2025, OBSERVED BY OTO
- EXISTING BUILDING FOOTPRINT
- APPROXIMATE LOCATION OF MONITORING WELLS INSTALLED BY OTHERS

SCALE IN FEET
1" = 50'
0' 25' 50' 100'

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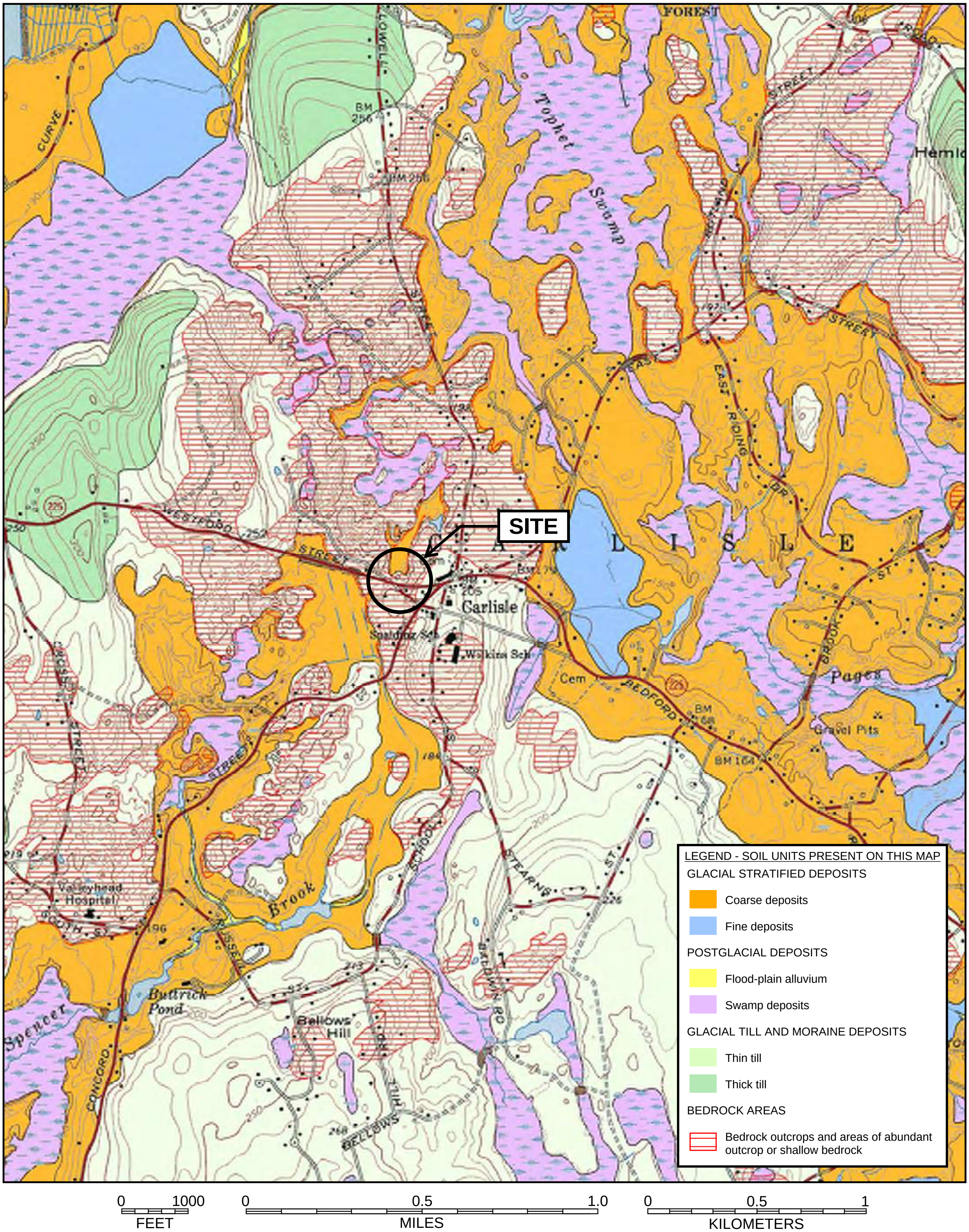
Designed By: CYI
Drawn By: CYI
Checked By: PJC
Date: 08/06/2025
Revised Date:

CARLISLE FIRE STATION
80 WESTFORD STREET
CARLISLE, MASSACHUSETTS

SITE PLAN

PROJECT NO.
J2241-17-01

FIGURE NO.
2



1:24,000 SCALE NATIONAL GEODETIC VERTICAL DATUM 1929 10 FOOT CONTOUR INTERVAL

O:\Job Files\J2200\2241 Tecton Architects Inc\17-01 Carlise Fire Station - Preliminary Geotech\Report and Figures\Figure 3 - Surficial Geology Map.pdf

O'Reilly, Talbot & Okun ENGINEERING ASSOCIATES 276 Bridge Street, Suite 302 Springfield, MA 01103 413.788.6222 www.OTO-ENV.com	CARLISLE FIRE STATION 80 WESTFORD STREET CARLISLE, MASSACHUSETTS	Topographic Map Quadrants: Billerica, MA Map Version: 2018 Base Map Year: 1965	PROJECT No. J2241-17-01
	SURFICIAL GEOLOGIC MAP	Date: AUGUST 2025	FIGURE No. 3

Table 1-1
Degree of Compaction Recommendations

Location	Minimum Compaction
Below Structures (Foundations and Slabs)	95%
Below Pavements/Sidewalks/Exterior Slabs	95%
Against Basement Walls/Retaining Walls	92%
Utility Trenches	95%
General Landscaped Areas	90%

Notes.
1. Percentage of the maximum dry density as determined by Modified Proctor ASTM D1557, Method C.
2. When location falls into two or more categories, the engineer should be notified to determine appropriate compaction efforts and/or methods.
3. Crushed stone should be compacted in lifts of 12 inches to form a dense matrix using either traditional compaction methods (vibratory plate and/or roller) or tamping with an excavator bucket in deep excavations. It is generally not necessary to perform laboratory or field density testing on crushed stone.

Table 1-2
General Guidelines for Compaction Means and Methods

Compaction Method	Maximum Stone Size (Inches Diameter)	Maximum Lift Thickness (Inches)		Minimum Number of Passes	
		Below Structures & Pavement	Non-Critical Areas	Below Structures & Pavement	Non-Critical Areas
Hand-operated Vibratory Plate and confined spaces	3	6	8	6	4
Hand-operated vibratory drum roller (less than 1000 pounds)	3	6	8	6	4
Hand-operated vibratory drum roller (at least 1,000 pounds)	6	8	10	6	4
Light vibratory drum roller (minimum 3000 pounds)	6	10	14	6	4
Heavy vibratory drum roller (minimum 6000 pounds)	6	12	18	6	4

Note: The contractor should reduce or stop drum vibration if pumping of the subgrade is observed.

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LOG OF BORING CF-1

PROJECT	Carlisle Fire Station			CONTRACTOR	Seaboard Drilling, LLC		
JOB NUMBER	2241-17-01	FINAL DEPTH (ft)	21.0	DRILLING EQUIPMENT	Track Mounted Rig		
LOCATION	Carlise, MA	SURFACE ELEV (ft)	195.2	FOREMAN	Nick	CASING	
START DATE	7/16/2025	DISTURBED SAMPLES	6	HELPER	Keeler	CASE DIAMETER	4"
FINISH DATE	7/16/2025	UNDISTURBED SAMPLES	0	BIT TYPE	H.S.A. & Roller Bit with Wash	HAMMER WGT	140 lb
ENGINEER/SCIENTIST	Caren Irgang	WATER LEVEL		ROD TYPE	A (1 5/8" O.D.)	HAMMER DROP	30"
BORING LOCATION	East of existing fire station building	FIRST (ft)	N/A	SAMPLER	2" O.D. Split Spoon	ROCK CORING INFORMATION	
		LAST (ft)	N/A	HAMMER TYPE	Automatic	TYPE	N/A
		TIME (hr)	N/A	HAMMER WGT/DROP	140 lb / 30"	SIZE	N/A

DEPTH (ft)/ SAMPLES	SAMPLES: PENETR. RESIST. (bl / 6 in)	REC. (in)	TYPE/ NO.	FIELD TEST DATA	SAMPLE DESCRIPTION (MODIFIED BURMISTER)	PROFILE DEPTH (ft) ELEV.	REMARKS/ WELL CONSTRUCTION
					3" ASPHALT	ASPHALT	
	14/22/26/25	14/24	S-1 (0.5'-2.5')	--	Dense, light brown, medium SAND and GRAVEL, some fine to coarse sand, trace silt, dry (little silt at tip)	FILL	
	16/12/7/7	14/24	S-2 (2.5'-4.5')	--	Top 2": Medium dense, light brown, fine to coarse SAND and GRAVEL, little silt, dry Next 4": Medium dense, dark brown, fine SAND and SILT, little medium sand, trace coarse sand, trace gravel, little organics (sticks), damp Next 4": Medium dense, gray, fine to medium SAND, some silt, some fractured gravel, damp Bottom 4": Medium dense, very dark brown, ORGANICS (sediment, sticks), some fine to medium sand, damp	4.0 191.2 ORGANICS SAND	1. 2. 3.
5'	7/8/11/14	13/24	S-3 (5'-7')	--	Medium dense, fine SAND, little medium to coarse sand, little silt, little fractured gravel	7.0 188.2	
	16/22/21/25	15/24	S-4 (7'-9')	--	Dense, gray, fine to medium sand, some gravel, little coarse sand, little silt (gravel piece at top and bottom of spoon; TILL)	GLACIAL TILL	
10'	11/9/13/21	9/24	S-5 (10'-12')	--	Medium dense, gray, fine to medium sand, little gravel, little coarse sand, little silt		
15'	48/50 for 3"	9/9	S-6 (15'-15.8')	--	Dense, weathered BEDROCK	15.0 180.2 WEATHERED BEDROCK	
20'						21.0 174.2	4.
	Refusal encountered at 21', likely upon bedrock						
25'							

Remarks:
1. Started cased drive and wash drilling after collection of sample S-2.
2. Color change in wash water from brown to very dark brown at approximately 4.5'. Color change to brownish gray at approximately 5'.
3. Stopped advancing casing after 5' (began open hole drilling).
4. Boring terminated at 21' due to casing/roller bit refusal, likely upon bedrock.

PROJECT NO. 2241-17-01

LOG OF BORING CF-1

O'Reilly, Talbot & Okun
ENGINEERING ASSOCIATES

LOG OF BORING CF-2

PROJECT	Carlisle Fire Station			CONTRACTOR	Seaboard Drilling, LLC
JOB NUMBER	2241-17-01	FINAL DEPTH (ft)	82.0	DRILLING EQUIPMENT	Track Mounted Rig
LOCATION	Carlise, MA	SURFACE ELEV (ft)	195.0	FOREMAN	Nick
START DATE	7/16/2025	DISTURBED SAMPLES	3	HELPER	Keeler
FINISH DATE	7/16/2025	UNDISTURBED SAMPLES	0	BIT TYPE	Hollow Stem Auger
ENGINEER/SCIENTIST	Caren Irgang	WATER LEVEL		ROD TYPE	A (1 5/8" O.D.)
BORING LOCATION	North of existing fire station building	FIRST (ft)	N/A	SAMPLER	2" O.D. Split Spoon
		LAST (ft)	N/E	HAMMER TYPE	Automatic
		TIME (hr)	N/E	HAMMER WGT/DROP	140 lb / 30"

CASING	
CASE DIAMETER	N/A
HAMMER WGT	N/A
HAMMER DROP	N/A
ROCK CORING INFORMATION	
TYPE	N/A
SIZE	N/A

DEPTH (ft)/ SAMPLES	SAMPLES: PENETR. RESIST. (bl / 6 in)	REC. (in)	TYPE/ NO.	FIELD TEST DATA	SAMPLE DESCRIPTION (MODIFIED BURMISTER)	PROFILE DEPTH (ft) ELEV.	REMARKS/ WELL CONSTRUCTION
					5" ASPHALT	ASPHALT	1
	17/23/24/27	18/24	S-1 (0.5'-2.5')	--	Dense, light brown, medium SAND and GRAVEL, some fine to coarse sand, trace silt, dry (fractured gravel at tip)	GRANULAR FILL	
	25/16/8/7	9/24	S-2 (2.5'-4.5')	--	Medium dense, gray, coarse GRAVEL (angular), little fine gravel, little sand, little to trace silt, dry		
5'							2
	50 for 2.5"	1/2.5"	S-3 (8'-8.2')	--	Gray, fractured ROCK, dry	8.0 187.0	
						ROCK	3.
10'					Refusal encountered at 8'		
15'							
20'							
25'							

Remarks:
1. Auger grinding while drilling between 0'-8'. Gravel and cobbles observed in cuttings.
2. Heavy auger grinding while drilling between 5'-8'. Cobbles in cuttings between 5'-8'. Three out of six auger cutter teeth broke off while drilling.
3. Boring terminated at 8' due to auger refusal, likely upon boulder, bedrock, or other obstruction.

PROJECT NO.
2241-17-01

LOG OF BORING
CF-2

O'Reilly, Talbot & Okun
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LOG OF BORING CF-3

PROJECT	Carlisle Fire Station			CONTRACTOR	Seaboard Drilling, LLC		
JOB NUMBER	2241-17-01	FINAL DEPTH (ft)	4.5	DRILLING EQUIPMENT	Track Mounted Rig		
LOCATION	Carlise, MA	SURFACE ELEV (ft)	194.4	FOREMAN	Nick	CASING	
START DATE	7/16/2025	DISTURBED SAMPLES	2	HELPER	Keeler	CASE DIAMETER	N/A
FINISH DATE	7/16/2025	UNDISTURBED SAMPLES	0	BIT TYPE	N/A	HAMMER WGT	N/A
ENGINEER/SCIENTIST	Caren Irgang	WATER LEVEL		ROD TYPE	A (1 5/8" O.D.)	HAMMER DROP	N/A
BORING LOCATION	West of existing fire station building	FIRST (ft)	N/E	SAMPLER	2" O.D. Split Spoon	ROCK CORING INFORMATION	
		LAST (ft)	N/E	HAMMER TYPE	Automatic	TYPE	N/A
		TIME (hr)	N/E	HAMMER WGT/DROP	N/A	SIZE	N/A

DEPTH (ft)/ SAMPLES	SAMPLES: PENETR. RESIST. (bl / 6 in)	REC. (in)	TYPE/ NO.	FIELD TEST DATA	SAMPLE DESCRIPTION (MODIFIED BURMISTER)	PROFILE DEPTH (ft) ELEV.	REMARKS/ WELL CONSTRUCTION
					4" ASPHALT	ASPHALT	
	17/21/18/23	15/24	S-1 (0.5'-2.5')	--	Top 4": Medium dense, GRAVEL and ASPHALT Bottom 11": Medium dense, light brown to brown, GRAVEL and fine to coarse SAND, trace silt, dry	GRANULAR FILL	
	22/18/17	10/18	S-2 (2.5'-4')	--	Medium dense, light brown, GRAVEL and medium SAND, trace silt, dry		1
						4.0 190.4	2, 3
5'					End of exploration at 4'		
10'							
15'							
20'							
25'							

Remarks:
1. Automatic SPT hammer broke 18" into collection of sample S-2.
2. The following depths to groundwater were measured in adjacent monitoring wells: 11.9' (MW north of CF-3), 12.6' (MW east of CF-3), 12.3' (MW southwest of CF-3).
3 Boring terminated at 4' due to equipment failure. Returned to Site on July 24, 2025 (borings CF-3A/3B/3C).

PROJECT NO.
2241-17-01

LOG OF BORING
CF-3

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LOG OF BORING CF-3A/3B/3C

PROJECT	Carlisle Fire Station			CONTRACTOR	Seaboard Drilling, LLC		
JOB NUMBER	2241-17-01	FINAL DEPTH (ft)	5.1	DRILLING EQUIPMENT	B-53 Truck Mounted Rig		
LOCATION	Carlise, MA	SURFACE ELEV (ft)	194.0	FOREMAN	Mike	CASING	
START DATE	7/24/2025	DISTURBED SAMPLES	2	HELPER	Jeremiah	CASE DIAMETER	N/A
FINISH DATE	7/24/2025	UNDISTURBED SAMPLES	0	BIT TYPE	Hollow Stem Auger	HAMMER WGT	N/A
ENGINEER/SCIENTIST	Riley Cole	WATER LEVEL		ROD TYPE	A (1 5/8" O.D.)	HAMMER DROP	N/A
BORING LOCATION	West of existing fire station building	FIRST (ft)	N/A	SAMPLER	2" O.D. Split Spoon	ROCK CORING INFORMATION	
		LAST (ft)	N/A	HAMMER TYPE	Automatic	TYPE	N/A
		TIME (hr)	N/A	HAMMER WGT/DROP	140 lb / 30"	SIZE	N/A

DEPTH (ft)/ SAMPLES	SAMPLES: PENETR. RESIST. (bl / 6 in)	REC. (in)	TYPE/ NO.	FIELD TEST DATA	SAMPLE DESCRIPTION (MODIFIED BURMISTER)	PROFILE DEPTH (ft) ELEV.	REMARKS/ WELL CONSTRUCTION
					3" ASPHALT	ASPHALT	3.
	16/22/15/12	14/24	S-1 (0.5'-2.5')	--	Dense, brown, fine to medium SAND, some gravel, dry (fractured gravel in sample; gravel lodged in tip)	FILL	1. 4.
5'	50 for 1"	1/24	S-2 (5'-5.1')	--	Very dense, brown to gray, fine to medium SAND, some coarse gravel, little coarse sand, dry	5.1 188.9	2.
					Refusal at 5.1' in CF-3B (CF-3A & CF-3C encountered shallower refusals)		
10'							
15'							
20'							
25'							

Remarks:
1. CF-3A: Moderate auger grinding while drilling near 2' and 4'. Cobbles and gravel observed in cuttings.
2. CF-3A: Auger refusal encountered at 5', likely upon boulder.
3. CF-3B: Light brown cuttings between 0'-3'; Dark brown cuttings with cobbles between 4'-5'. Moderate to heavy auger grinding whule drilling.
4. CF-3C: Auger refusal at 4'; cobble lodged in 4 1/4" hollow stem auger after removal from borehole.
5. The following depths to groundwater were measured in adjacent monitoring wells and a nearby manhole: 12.69' (MW north of CF-3), 12.7' (MW east of CF-3), DRY (MW southwest of CF-3), 3.37' (MH).

PROJECT NO. 2241-17-01

LOG OF BORING CF-3A/3B/3C

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LOG OF BORING CF-4/4A

PROJECT	Carlisle Fire Station			CONTRACTOR	Seaboard Drilling, LLC		
JOB NUMBER	2241-17-01	FINAL DEPTH (ft)	14.5	DRILLING EQUIPMENT	B-53 Truck Mounted Rig		
LOCATION	Carlise, MA	SURFACE ELEV (ft)	184.8	FOREMAN	Mike	CASING	
START DATE	7/24/2025	DISTURBED SAMPLES	4	HELPER	Jeremiah	CASE DIAMETER	N/A
FINISH DATE	7/24/2025	UNDISTURBED SAMPLES	0	BIT TYPE	Hollow Stem Auger	HAMMER WGT	N/A
ENGINEER/SCIENTIST	Riley Cole	WATER LEVEL		ROD TYPE	A (1 5/8" O.D.)	HAMMER DROP	N/A
BORING LOCATION	South portion of grassy area downslope of existing fire station building	FIRST (ft)	8.0	SAMPLER	2" O.D. Split Spoon	ROCK CORING INFORMATION	
		LAST (ft)	N/A	HAMMER TYPE	Automatic	TYPE	N/A
		TIME (hr)	N/A	HAMMER WGT/DROP	140 lb / 30"	SIZE	N/A

DEPTH (ft)/ SAMPLES	PENETR. RESIST. (bl / 6 in)	REC. (in)	TYPE/ NO.	FIELD TEST DATA	SAMPLE DESCRIPTION (MODIFIED BURMISTER)	PROFILE DEPTH (ft) ELEV.	REMARKS/ WELL CONSTRUCTION
	3/3/3/4	13/24	S-1 (0'-2')	--	Top 5": TOPSOIL & ORGANICS, dry Next 7": Loose, light brown to dark brown, fine SAND, little silt, damp Bottom 1": Brown, fine to medium SAND, some coarse gravel, dry	TOPSOIL FILL	1. 2.
5'	3/13/15/10	17/24	S-2 (5'-7')	--	Top 13": Medium dense, gray, fine SAND, little medium sand, trace gravel, trace silt, moist Bottom 4": Medium dense, light gray, fine SAND, some gravel, little medium sand, little silt, damp (gravel lodged in tip)	6.0 178.8 GLACIAL TILL ▽ 176.8	3.
10'	7/25/38/47	12/24	S-3 (10'-12')	--	Top 6": Very dense, very light gray fractured GRAVEL and fine to coarse SAND, some fractured gravel, trace silt, damp (possible weathered bedrock) Bottom 6": Very dense, orange to light brown, fine to medium SAND, some fractured gravel, trace silt, damp (possible weathered bedrock)		
	18/33/50 for 4"	10/24	S-4 (13'-14.5')	--	10": Very dense, orange to light brown, fine to medium SAND, some fractured gravel, trace silt, damp (possible weathered bedrock)	14.5 170.3	4.
15'					Refusal encountered at 14.5' (CF-4A)		
20'							
25'							

Remarks:
1. CF-4: Moderate auger grinding while drilling near 2'.
2. CF-4: Refusal encountered at 4', likely upon cobble(s). Boring offset approximately 2' to south to CF-4A.
3. CF-4A: Groundwater level estimated at 8.0', between samples S-2 (5'-7') and S-3 (10'-12').
4. Boring terminated at 14.5' due to auger refusal, likely upon boulder, bedrock, or other obstruction.

PROJECT NO. 2241-17-01

LOG OF BORING CF-4/4A

O'Reilly, Talbot & Okun
ENGINEERING ASSOCIATES

LOG OF BORING CF-5

PROJECT	Carlisle Fire Station			CONTRACTOR	Seaboard Drilling, LLC		
JOB NUMBER	2241-17-01	FINAL DEPTH (ft)	15.0	DRILLING EQUIPMENT	B-53 Truck Mounted Rig		
LOCATION	Carlise, MA	SURFACE ELEV (ft)	183.5	FOREMAN	Mike	CASING	
START DATE	7/24/2025	DISTURBED SAMPLES	4	HELPER	Jeremiah	CASE DIAMETER	N/A
FINISH DATE	7/24/2025	UNDISTURBED SAMPLES	0	BIT TYPE	Hollow Stem Auger	HAMMER WGT	N/A
ENGINEER/SCIENTIST	Riley Cole	WATER LEVEL		ROD TYPE	A (1 5/8" O.D.)	HAMMER DROP	N/A
BORING LOCATION	North portion of grassy area downslope of existing fire station building, near wellhead	FIRST (ft)	8.0	SAMPLER	2" O.D. Split Spoon	ROCK CORING INFORMATION	
		LAST (ft)	N/A	HAMMER TYPE	Automatic	TYPE	N/A
		TIME (hr)	N/A	HAMMER WGT/DROP	140 lb / 30"	SIZE	N/A

DEPTH (ft)/ SAMPLES	SAMPLES: PENETR. RESIST. (bl / 6 in)	REC. (in)	TYPE/ NO.	FIELD TEST DATA	SAMPLE DESCRIPTION (MODIFIED BURMISTER)	PROFILE DEPTH (ft) ELEV.	REMARKS/ WELL CONSTRUCTION
	4/4/2/5	8/24	S-1 (0'-2')	--	Top 6": TOPSOIL & ORGANICS (wood and leaves), dry Bottom 2": Loose, dark brown, fine to medium SAND, some coarse sand, trace gravel, trace silt, damp (gravel and wood lodged in tip)	TOPSOIL FILL	
5'						5.0 178.5	1.
	13/13/16/17	12/24	S-2 (5'-7')	--	Top 11": Medium dense, dark gray, fine to medium SAND, some coarse gravel, trace silt, moist Bottom 1": Medium dense, very light gray, fine to medium SAND, some gravel, trace silt, moist	GLACIAL TILL	
						175.5	2.
10'	10/11/10/9	0/24	S-3 (10'-12')	--	NO RECOVERY		
							3.
	28/36/35/49	10/24	S-4 (13'-15')	--	Top 8": Very dense, orange to light brown, fine SAND, trace silt, dry Bottom 4": Very dense, weathered BEDROCK, dry	13.5 170.0 WEATHERED BEDROCK	
15'						15.0 168.5	4.
					Refusal encountered at 15'		
20'							
25'							

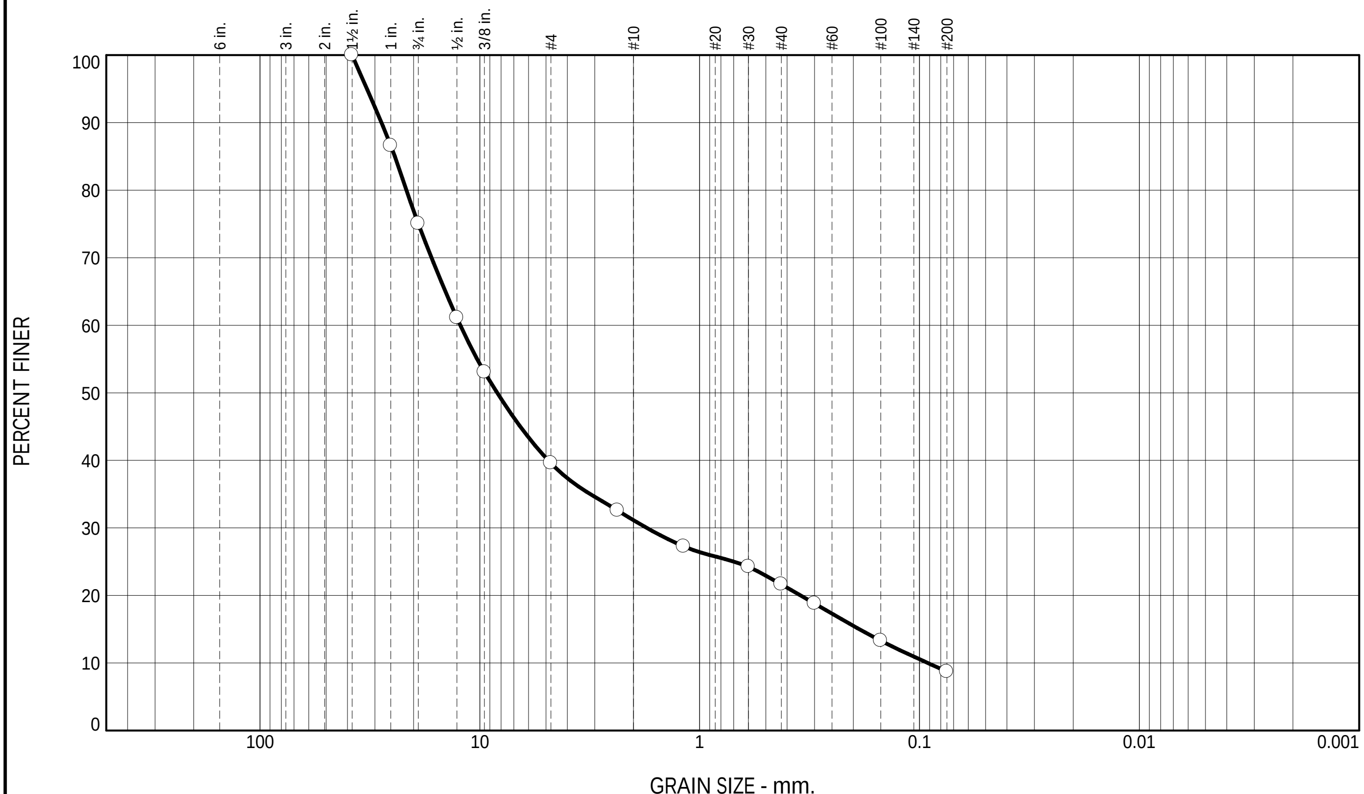
Remarks:
1. Moderate auger grinding while drilling between 4'-5'.
2. Water level estimated at 8', between samples S-2 (5-7') and S-3 (10-12').
3. Moderate auger grinding while drilling near 13', likely upon gravel or cobbles.
4. Boring terminated at 15' due to auger refusal, likely upon boulder, bedrock, or other obstruction.

PROJECT NO. 2241-17-01

LOG OF BORING CF-5

Particle Size Distribution Report

ASTM C117 & C136



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	25.0	35.4	8.5	9.5	12.9	8.7	

Test Results (ASTM C117 & C136)

Sieve Size or Diam. (mm.)	Finer (%)	Spec.* (%)	Out of Spec. (%)	Pct. of Fines
1.5	100.0			
1	86.6			
3/4	75.0			
1/2	61.1			
3/8	53.1			
#4	39.6			
#8	32.6			
#16	27.3			
#30	24.2			
#40	21.6			
#50	18.8			
#100	13.3			
#200	8.7			

* (no specification provided)

Material Description

CF-2 (0.5'-5')

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 27.9934 D_{85}= 24.3590 D_{60}= 12.2607
D_{50}= 8.3362 D_{30}= 1.7406 D_{15}= 0.1877
D_{10}= 0.0916 C_u= 133.82 C_c= 2.70

Classification

USCS= AASHTO=

Test Remarks

This sample was delivered to ATL. This sample was washed.

Sample Number: 3768

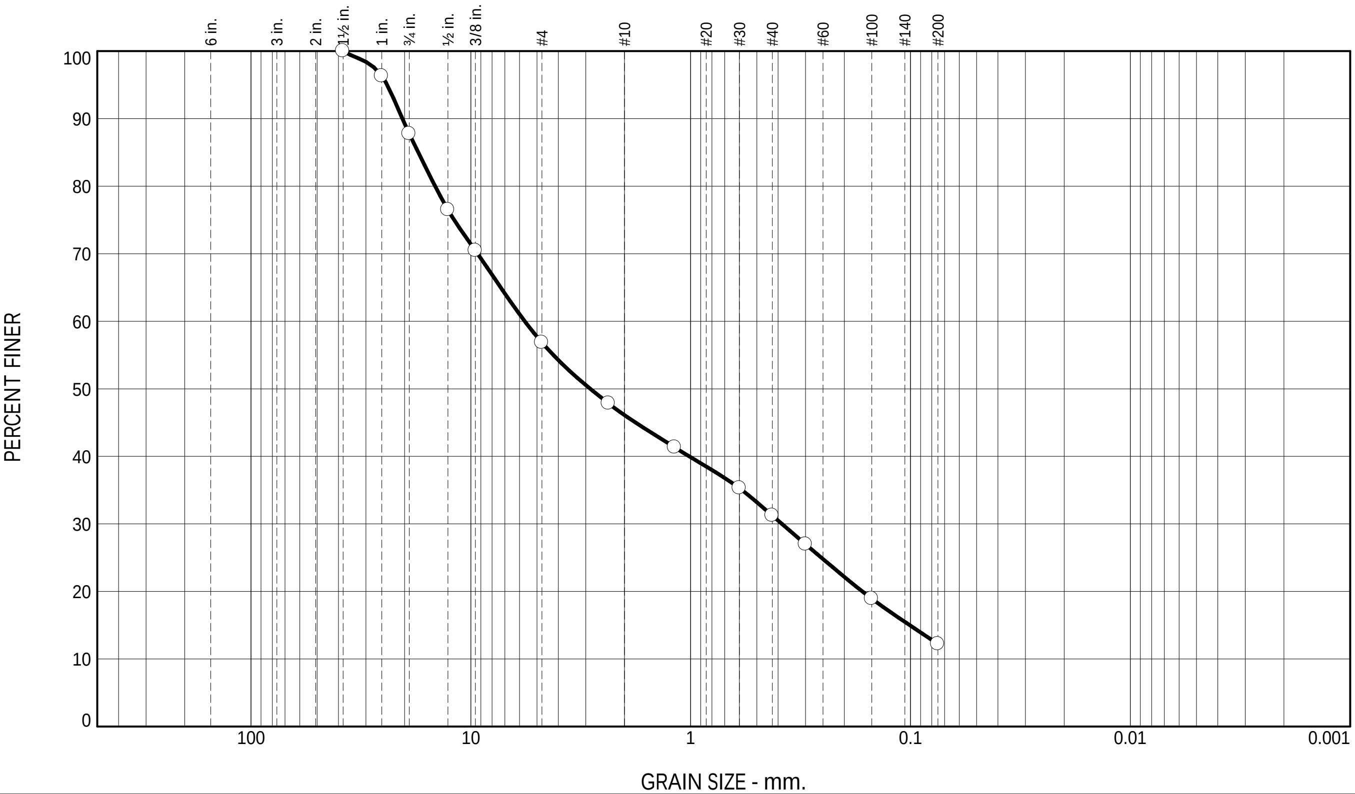
Sample Date: 7/30/25

ALLIED TESTING LABORATORIES, INC. Springfield, Massachusetts	Client: OTO Project: Carlisle MA, Fire Department Project No: 2241-17-01 Figure

Checked By: John McGreevy

Particle Size Distribution Report

ASTM C117 & C136



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	12.2	31.0	10.7	14.9	19.0	12.2	

Test Results (ASTM C117 & C136)

Sieve Size or Diam. (mm.)	Finer (%)	Spec.* (%)	Out of Spec. (%)	Pct. of Fines
1.5	100.0			
1	96.3			
3/4	87.8			
1/2	76.5			
3/8	70.5			
#4	56.8			
#8	47.8			
#16	41.3			
#30	35.3			
#40	31.2			
#50	27.0			
#100	18.9			
#200	12.2			

* (no specification provided)

Material Description

CF-3 (0.5'-5')

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 20.4769 D_{85}= 17.3242 D_{60}= 5.6822
D_{50}= 2.8602 D_{30}= 0.3842 D_{15}= 0.1007
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Test Remarks

This sample was delivered to ATL. This sample was washed.

Sample Number: 3769

Sample Date: 7/30/25

ALLIED TESTING LABORATORIES, INC.
Springfield, Massachusetts

Client: OTO
Project: Carlisle MA, Fire Department
Project No: 2241-17-01 Figure

Checked By: John McGreevy

FUSS & O'NEILL

MEMORANDUM

TO: Matthew Salad, AIA, NCARB, MCPPO
Associate | Project Manager
Tecton Architects, P.C.
34 Sequassen Street, Suite 200, Hartford, CT 06106

FROM: Evan Koncewicz
Environmental Geologist
Fuss & O'Neill, Inc.
108 Myrtle Street, Suite 502, Quincy, MA 02171

DATE: July 29, 2025

RE: Test Pit Memorandum
80 Westford Street, Carlisle, MA 01741
Fuss & O'Neill Reference No. 20250003.A10

Dear Mr. Salad:

Fuss & O'Neill, Inc. (Fuss & O'Neill) prepared this memorandum to summarize field activities conducting during the excavation of test pits at the Town of Carlisle fire station, located at 80 Westford Street in Carlisle, Massachusetts (the "Site"). The test pits were advanced to investigate the soils surrounding an existing septic system/leachfield.

Background

On July 9, 2025, Mr. Evan Koncewicz of Fuss & O'Neill met with Mr. Robert J. Frado of Technical Consulting Group, representing the Town of Carlisle Board of Health. Four (4) test pits were excavated and one (1) percolation test was performed, northeast of the Carlisle fire station within the vicinity of an existing leachfield. Test pit locations are provided at the end of this memorandum as *Figure 1*.

Test pits were advanced to confirm existing soil conditions and assess the potential for improving the current septic system/leachfield. Test pit and percolation test logs are available as Title 5 Form 11s and Form 12s at the end of this memorandum as *Attachment A*.

Field Activities

Soil conditions consisted of topsoil from surface to roughly 7-inches below grade. Beneath topsoil, was fine to medium sandy fill, which generally coarsened to depth, to roughly 7 to 9.5-feet below grade (fbg). Beneath the sandy fill, a naturally occurring sandy loam layer was identified to terminating depths. Groundwater was identified weeping between roughly 6 to 8-fbg within all test pits except TP-3. Standing water was observed between roughly 7 to 7.5-fbg in all test pits, except in TP-1. Bedrock ledge was encountered in TP-1 at terminating depths, roughly 8-fbg. Bedrock ledge was also identified at the surface to the west of the leachfield area. A percolation test performed in the sandy fill layer adjacent to TP-2, which was less than 2-minutes per inch.

Existing Conditions / Conclusions

According to a Sewage Disposal Plan completed by Stamski and McNary, Inc. in May 1984, test pit data indicated a shallow groundwater table, roughly 0.5-feet to 2.5-feet below grade. A Section profile identified that gravel fill was brought in to the Site to facilitate installation of the leaching area. According to Note 4, all loam and subsoil shall be removed for 25-feet around and under the proposed leaching area. The Sewage Disposal Plan is attached at the end of this memorandum as *Attachment B*. The test pits performed in 2025 were likely excavated within the gravel fill, which is unsuitable material.

The following conclusions and conditions were identified during field activities:

- It is of the opinion of Mr. Frado that the sand identified above the sandy loam layer is the gravel fill, brought in to install the leachfield in 1984. The gravel fill is unsuitable material.
- Two (2) soil samples were taken from of the most restrictive sandy loam layer in TP-2 and TP-4, at 116-inches and 83-inches below grade, respectively.
- Mr. Frado recommended that the sandy loam samples be analyzed for grainsize (sieve analysis), in lieu of conducting a percolation test in the layer. A grainsize analysis will support the design of a potential new septic system/leachfield.
- Additional coordination will be required with the Carlisle Board of Health prior to the performance of any additional soil testing. This coordination should include discussions regarding strategies for expanding the existing system, if necessary, given the soil conditions identified in this report.

If you have any questions, please contact the undersigned via email (Evan.Koncewicz@fando.com) or by phone (518-915-9626).

Sincerely,

Evan Koncewicz, SE #14906
Environmental Geologist

Attachments: *Figure 1 – Site Plan*
Attachment A – Title 5 Form 11s and 12s
Attachment B – Sewage Disposal Plan

c:

SCALE:
HORZ.: 1" = 50'
VERT.: -
DATUM:
HORZ.: -
VERT.: -
0 25' 50'
GRAPHIC SCALE

FUSS & O'NEILL
108 MYRTLE STREET, SUITE 502
QUINCY, MA 02171
617.282.4675
www.fando.com

TOWN OF CARLISLE
TEST PITS MAP
CARLISLE FIRE STATION
CARLISLE MASSACHUSETTS

PROJ. No.: 20250003.A10
DATE: 07/29/2025

TP-101

File: J:\DWG\P2025\0003\A10\Civil\Figures\20250003.A10_TP101.dwg Layout: TP-101 Plotted: 2025-07-29 4:37 PM Saved: 2025-07-29 4:33 PM User: lucas.mclain
PC3: AUTOCAD PDF (GENERAL DOCUMENTATION).PC3 STB/CTB: FO.STB
MS VIEW: | LAYER STATE:

Commonwealth of Massachusetts
City/Town of Carlisle

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

A. Facility Information

Town of Carlisle
Owner Name

66 Westford Street
Street Address

21-1-0
Map/Lot #

Carlisle
City

Massachusetts
State

01741
Zip Code

B. Site Information

1. (Check one) ☐ New Construction ☐ Upgrade

2. Soil Survey USDA Web Soil Survey
Source

104C
Soil Map Unit

Hollis-Rock outcrop-Charlton complex, 0 to 15% slopes

Hill on uplands, ridges on uplands
Landform

Depth to restrictive feature 17-26" of bedrock; no frequency of flooding; depth to water table >80"
Soil Limitations

Coarse-loamy milt-out till derrived from granite, gneiss, and/or schist.
Soil Parent material

3. Surficial Geological Report 2018 / Stone, J.R., Stone, B.D., DiGiacomo-Cohen, M.L., and Mabee, S.B. comps.

t- (thin till)
Map Unit

Nonsorted, nonstratified matric of sand, some silt, and little clay containing scattered pebble, cobble, and boulder clasts; large surface boulders are common; unit was mapped where till is generally less than 10 to 15 feet stick including areas of shallow bedrock.

4. Flood Rate Insurance Map Within a regulatory floodway? ☐ Yes ☒ No

5. Within a velocity zone? ☐ Yes ☒ No

6. Within a Mapped Wetland Area? ☐ Yes ☒ No If yes, MassGIS Wetland Data Layer: Not mapped, but <100-feet wetland plants identified in field.

7. Current Water Resource Conditions (USGS): 7/9/2025
Month/Day/ Year
Range: ☐ Above Normal ☒ Normal ☐ Below Normal

8. Other references reviewed: Site located in a Zone II and approximately 150-feet from a Non-Community Groundwater Well
(Zone II, IWPA, Zone A, EEA Data Portal, etc.)

Commonwealth of Massachusetts
City/Town of Carlisle

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP-1 (Hole #) 7/9/2025 (Date) 0905 (Time) 70s, overcast (Weather) 42.529517 (Latitude) -71.351816 (Longitude)

1. Land Use Field, Fire Pit Area (e.g., woodland, agricultural field, vacant lot, etc.) Grassed (Vegetation) Bedrock/ledge (Surface Stones (e.g., cobbles, stones, boulders, etc.)) 0-5% (Slope (%))

Description of Location: Back left corner of field, behind fire pit area

2. Soil Parent Material: Coarse-loamy milt-out till derrived from granite, gneiss, and/or schist. Hill on uplands, ridges on uplands (Landform) SH (Position on Landscape (SU, SH, BS, FS, TS, Plain))

3. Distances from: Open Water Body >100 feet Drainage Way <100 feet Wetlands <100 feet
Property Line >25 feet Drinking Water Well >100 feet Other NA feet

4. Unsuitable Materials Present: ☒ Yes ☐ No If Yes: ☒ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☒ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No If yes: 85" Depth to Weeping in Hole ______ Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-7	Fill / HTM	Loamy Sand	10YR 3/2		Cnc : Dpl:		0-5%	0-5%	Granular	Friable	Organics to 8"
7-97	Fill / HTM	Fine/Medium Sand	10YR 5/4		Cnc : Dpl:		15-35%	0-5%	Single Grain	Loose	Roots to 50"
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Commonwealth of Massachusetts
City/Town of Carlisle

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

Additional Notes:
Logged on east side of TP. Refusal at 97" on presumed bedrock. Ledge visible to west of TP. All material observed is considered fill (human transported material (HTM) and is unsuitable.

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP-2 (Hole #) 7/9/2025 (Date) 1050 (Time) 70s, overcast (Weather) 42.529466 (Latitude) -71.351768 (Longitude)

1. Land Use: Field (e.g., woodland, agricultural field, vacant lot, etc.) Grassed (Vegetation) Bedrock/ledge (Surface Stones (e.g., cobbles, stones, boulders, etc.)) 0-5% (Slope (%))

   Description of Location: South of Fire Pits

2. Soil Parent Material: Coarse-loamy milt-out till derrived from granite, gneiss, and/or schist. Hill on uplands, ridges on uplands (Landform) SH (Position on Landscape (SU, SH, BS, FS, TS, Plain))

3. Distances from: Open Water Body >100 feet Drainage Way <100 feet Wetlands <100 feet

   Property Line >25 feet Drinking Water Well >100 feet Other NA feet

4. Unsuitable Materials Present: ☒ Yes ☐ No If Yes: ☒ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No If yes: 96" Depth to Weeping in Hole 89" Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-7	Fill / HTM	Loamy Sand	10YR 4/2		Cnc : Dpl:		0-5%		Granular	Friable	
7-96	Fill / HTM	Fine/Medium Sand	10YR 5/4		Cnc : Dpl:		5-10%	5-10%	Single Grain	Loose	Fine sand lens on east sidewall (10YR 6/4).
96-116	Fill / HTM	Coarse Sand	10YR 4/4		Cnc : Dpl:				Single Grain	Loose	Moist
116-120	C3	Sandy Loam	2.5Y 6/3	116"	Cnc :7.5YR 4/6 Dpl: 10YR 7/1		0-5%	0-5%	Massive	Friable	
					Cnc : Dpl:						
					Cnc : Dpl:						

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

Additional Notes:
Groundwater weeping. Over time, groundwater pooled and was standing at 89". Soil sample taken from 116-120"

D. Determination of High Groundwater Elevation

1. Method Used (Choose one): Obs. Hole # TP-1 Obs. Hole # TP-2

	Obs. Hole # TP-1	Obs. Hole # TP-2
☒ Depth to soil redoximorphic features	NA inches	116" inches
☒ Depth to observed standing water in observation hole	NA inches	89" inches
☐ Depth to adjusted seasonal high groundwater (S_h) (USGS methodology)	_____ inches	_____ inches

_______________ Index Well Number _______________ Reading Date

$S_h = S_c – [S_r \times (OW_c – OW_{max})/OW_r]$

Obs. Hole/Well# _____ S_c _____ S_r _____ OW_c _____ OW_{max} _____ OW_r _____ S_h _____

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

   a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?

   ☐ Yes ☒ No

   b. If yes, at what depth was it observed (exclude O, A, and E Horizons)? Upper boundary: _____ inches Lower boundary: _____ inches

   c. If no, at what depth was impervious material observed? Upper boundary: 0 inches Lower boundary: 116 inches

Commonwealth of Massachusetts
City/Town of Carlisle

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP-3 (Hole #) | 7/9/2025 (Date) | 1200 (Time) | 70s, overcast (Weather) | 42.529403 (Latitude) | -71.351751 (Longitude)

1. Land Use: Field (e.g., woodland, agricultural field, vacant lot, etc.) | Grassed (Vegetation) | Bedrock/ledge (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 0-5% (Slope (%))

Description of Location: Middle of field, south of TP-1 and TP-2

2. Soil Parent Material: Coarse-loamy milt-out till derrived from granite, gneiss, and/or schist. | Hill on uplands, ridges on uplands (Landform) | SH (Position on Landscape (SU, SH, BS, FS, TS, Plain))

3. Distances from: Open Water Body >100 feet | Drainage Way <100 feet | Wetlands <100 feet
Property Line >25 feet | Drinking Water Well >100 feet | Other NA feet

4. Unsuitable Materials Present: ☒ Yes ☐ No If Yes: ☒ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No If yes: ______ Depth to Weeping in Hole 89" Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-9	Fill / HTM	Loamy Sand	10YR 4/3		Cnc : Dpl:		0-5%		Granular	Friable	
9-66	Fill / HTM	Fine/Medium Sand	10YR 5/6		Cnc : Dpl:		10-20%	5-10%	Single Grain	Loose	
66-109	Fill / HTM	Coarse Sand	10YR 5/3		Cnc : Dpl:		0-5%		Single Grain	Loose	Moist
109-120	C3	Sandy Loam	5Y 5/1		Cnc : Dpl:				Massive	Friable	Moist
					Cnc : Dpl:						
					Cnc : Dpl:						

Commonwealth of Massachusetts
City/Town of Carlisle

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

Additional Notes:
Hit rock/boulder at bottom of TP. All fill / human transported material (HTM) is unsuitable material.

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP-4 (Hole #) 7/9/2025 (Date) 1200 (Time) 70s, overcast (Weather) 42.529344 (Latitude) -71.351757 (Longitude)

1. Land Use: Field (e.g., woodland, agricultural field, vacant lot, etc.) Grassed (Vegetation) Bedrock/ledge (Surface Stones (e.g., cobbles, stones, boulders, etc.)) 0-5% (Slope (%))

   Description of Location: Middle of field, south of TP-1, TP-2, and TP-3

2. Soil Parent Material: Coarse-loamy milt-out till derrived from granite, gneiss, and/or schist. Hill on uplands, ridges on uplands (Landform) SH (Position on Landscape (SU, SH, BS, FS, TS, Plain))

3. Distances from: Open Water Body >100 feet Drainage Way <100 feet Wetlands <100 feet

   Property Line >25 feet Drinking Water Well >100 feet Other NA feet

4. Unsuitable Materials Present: ☒ Yes ☐ No If Yes: ☒ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No If yes: 76" Depth to Weeping in Hole 83" Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-7	Fill / HTM	Loamy Sand	10YR 5/2		Cnc : Dpl:		0-5%		Massive	Friable	
7-55	Fill / HTM	Fine/Medium Sand	10YR 5/4		Cnc : Dpl:		10-20%	0-5%	Single Grain	Loose	
55-83	Fill / HTM	Coarse/Medium Sand	10YR 5/3		Cnc : Dpl:				Single Grain	Loose	
83-97	C3	Sandy Loam	2.5Y 6/1	92"	Cnc :7.5YR 5/6 Dpl: 2.5Y 6/1				Massive	Friable	
					Cnc : Dpl:						
					Cnc : Dpl:						

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

Additional Notes:
All fill / human transported material (HTM) is unsuitable material.

D. Determination of High Groundwater Elevation

1. Method Used (Choose one):

	Obs. Hole # TP-3	Obs. Hole # TP-4
☒ Depth to soil redoximorphic features	NA inches	92 inches
☒ Depth to observed standing water in observation hole	89 inches	83 inches
☐ Depth to adjusted seasonal high groundwater (S_h) (USGS methodology)	_____ inches	_____ inches

_______________ Index Well Number   _______________ Reading Date

$S_h = S_c – [S_r \times (OW_c – OW_{max})/OW_r]$

Obs. Hole/Well# _____ S_c _____ S_r _____ OW_c _____ OW_{max} _____ OW_r _____ S_h _____

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

   a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?

   ☐ Yes ☒ No

   b. If yes, at what depth was it observed (exclude O, A, and E Horizons)? Upper boundary: _____ inches Lower boundary: _____ inches

   c. If no, at what depth was impervious material observed? Upper boundary: 0 inches Lower boundary: 109 inches

Commonwealth of Massachusetts
City/Town of Carlisle

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

F. Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct soil evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.100 through 15.107.

	7/9/2025
Signature of Soil Evaluator	Date
Evan Koncewicz / SE #14906	5/1/2027
Typed or Printed Name of Soil Evaluator / License #	Expiration Date of License
Robert J. Frado / SE #796	Town of Carlisle / Technical Consulting Group
Name of Approving Authority Witness	Approving Authority

Note: In accordance with 310 CMR 15.018(2) this form must be submitted to the approving authority within 60 days of the date of field testing, and to the designer and the property owner with Percolation Test Form 12.

Field Diagrams: Use this area for field diagrams:

Commonwealth of Massachusetts
City/Town of Carlisle
Percolation Test
Form 12

Percolation test results must be submitted with the Soil Suitability Assessment for On-site Sewage Disposal. DEP has provided this form for use by local Boards of Health. Other forms may be used, but the information must be substantially the same as that provided here. Before using this form, check with the local Board of Health to determine the form they use.

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

tab

return

A. Site Information

Town of Carlisle
Owner Name

66 Westford Street
Street Address or Lot #

City/Town	State	Zip Code
Carlisle	Massachusetts	01741

Contact Person (if different from Owner):
Telephone Number:

B. Test Results

	Date	Time	Date	Time
	7/9/2025	1330		
Observation Hole #	TP-2			
Depth of Perc	48"			
Start Pre-Soak	1332			
End Pre-Soak	1347			
Time at 12”	1347			
Time at 9”	1350			
Time at 6”	1355			
Time (9”-6”)	5 minutes			
Rate (Min./Inch)	1.6 min/inch			

Test Passed: ☒ Test Failed: ☐

Test Passed: ☐ Test Failed: ☐

Evan Koncewicz / SE # 14906
Test Performed By:

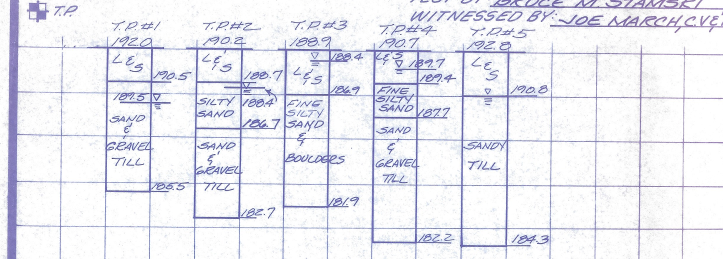
Robert J. Frado / SE #796
Board of Health Witness

Comments:

48" is bottom of the perc hole

TEST PIT DATA:

DATE OF TESTING: 18 APR. 84
TEST BY: BRUCE M. STAMSKI
WITNESSED BY: JOE MARCH, C.V.E.P.



PERC. TEST DATA:

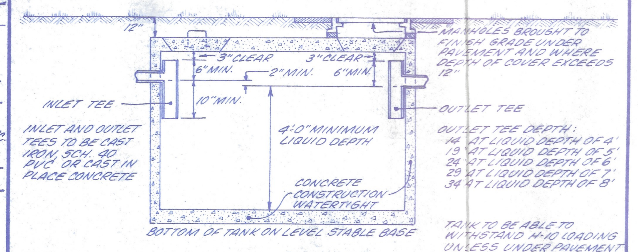
DATE OF TESTING: 7/9/81
TEST BY: H.W. MOORE ASSOC. INC
WITNESSED BY: D.E. REED

P-1
DEPTH OF TEST: 42" ±
RATE: 16 MIN/IN

P-SM-2 11/14/84 BY STAMSKI AND McNARY, INC.
DEPTH OF TEST: 24" (IN STRIPPED AREA)
RATE: 19 MIN/INCH

TANK DETAIL: SIZE: 1,500 GAL.

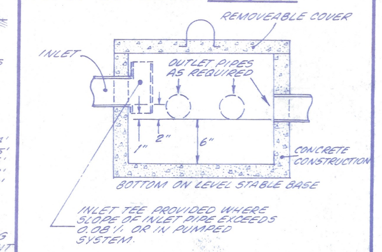
TANK TO CONFORM TO TITLE 5 REQUIREMENTS.



RECOMMENDED MANUFACTURER: CHELMSFORD PRECAST
(OR EQUAL UPON APPROVAL OF DESIGN ENGINEER)

D. BOX DETAIL:

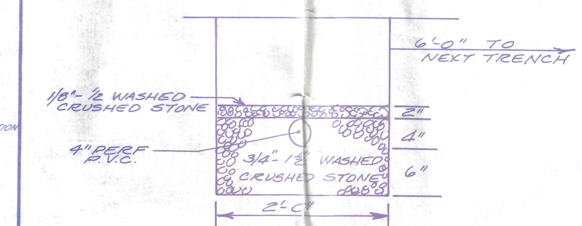
TO CONFORM TO TITLE 5 REQUIREMENTS
NO. OF OUTLETS: 5



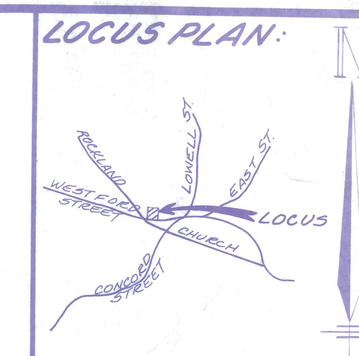
RECOMMENDED MANUFACTURER: CHELMSFORD PRECAST
OR EQUAL UPON APPROVAL OF DESIGN ENGINEER.

LEACHING FACILITY DETAIL:

TRENCH



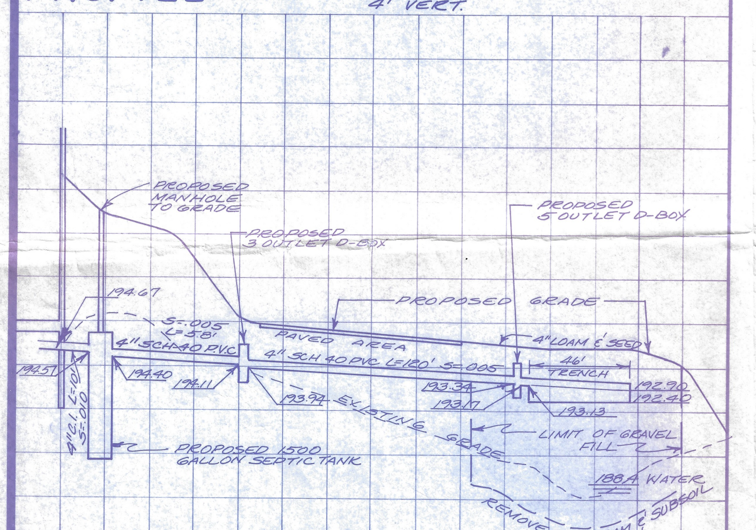
LOCUS PLAN:



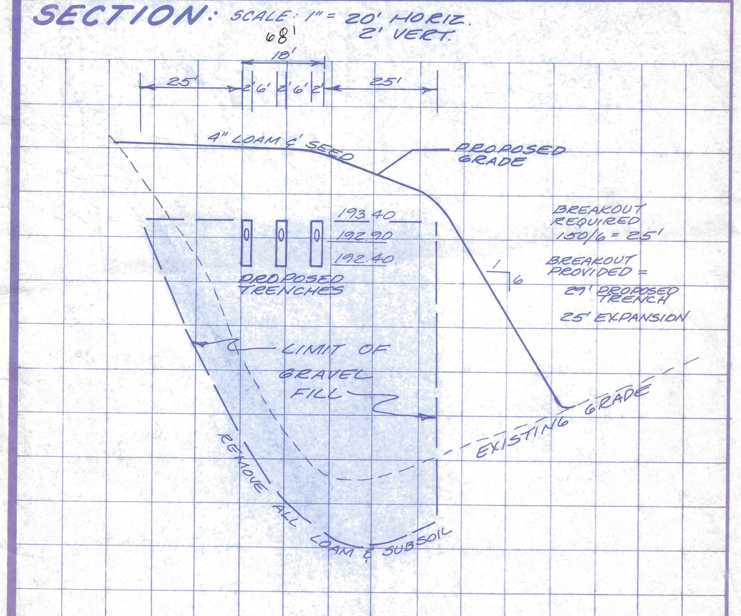
NOTES:

1. THIS PLAN IS FOR THE DESIGN AND CONSTRUCTION OF THE SEWAGE DISPOSAL FACILITY ONLY.
2. ALL CONSTRUCTION METHODS AND MATERIALS SHALL CONFORM TO TITLE 5 AND THE CARLISLE BOARD OF HEALTH REGULATIONS, EXCEPT AS NOTED.
3. NO WELLS ARE LOCATED WITHIN 100 FEET OF PROPOSED SEPTIC SYSTEM NOR ARE ANY SEPTIC SYSTEMS LOCATED WITHIN 100' OF THE PROPOSED WELL.
4. ALL LOAM AND SUBSOIL SHALL BE REMOVED FOR 25' AROUND AND UNDER THE PROPOSED LEACHING AREA. BACKFILL SHALL BE GOOD CLEAN BACKRUN GRAVEL, MECHANICALLY COMPACTED AND HAVE AN INPLACE PERCOLATION RATE OF 2 MIN/INCH OR LESS AFTER COMPACTION.

PROFILE: SCALE: 1" = 40' HORIZ. 4' VERT.

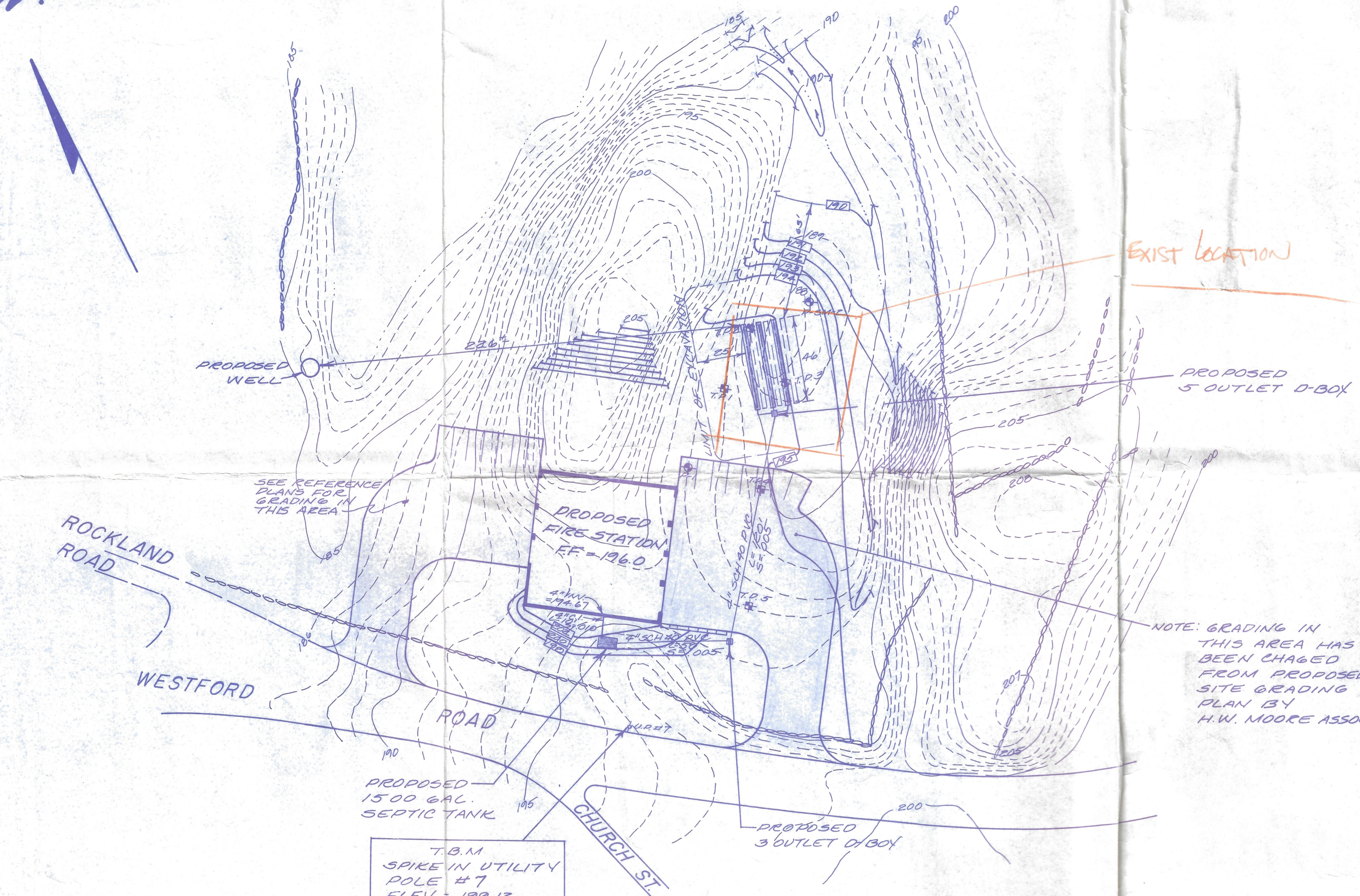


SECTION: SCALE: 1" = 20' HORIZ. 2' VERT.



PLAN VIEW:

SCALE: 1" = 40'



PLAN REFERENCE
TOWN OF CARLISLE
PROPOSED FIRE STATION
SCALE 1" = 40' DATE: DEC. 28, 1982
BY: H.W. MOORE ASSOCIATES

DATUM
ALL ELEVATIONS SHOWN REFER TO N.G.V.D. OF 1929, T.B.M. SET - SEE PLAN

REQUIRED WAIVERS FROM TOWN REGULATIONS

1) USE 6" STONE DEPTH IN TRENCHES
2) 50' SETBACK FROM DITCH
3) PERCOLATION TEST NOT IN LEACHING AREA

INVERT ELEVATIONS

4" INV. @ BUILDING	194.67
4" INV. @ SEPTIC TANK (IN)	194.57
4" INV. @ SEPTIC TANK (OUT)	194.40
4" INV. D-BOX NO. 1 (IN)	194.11
4" INV. D-BOX NO. 1 (OUT)	193.94
4" INV. @ D. BOX (IN) NO. 2	193.34
4" INV. @ D. BOX (OUT) NO. 2	193.17
AT LEACHING FACILITY	
4" INV. BEG. OF LINE	193.13
4" INV. END OF LINE	192.90
BOTTOM OF TRENCH	192.40
GROUNDWATER ELEV = 188.40	

DESIGN DATA:

DESIGN FLOW:
1,000 S.F. OFFICE SPACE
75 GPD/1000 S.F. = 75 G.P.D.
× 150% = 112.5 G.P.D.

REQUIRED SEPTIC TANK:
= GAL.
SEPTIC TANK PROVIDED = 1,500 GAL.

REQUIRED SIZE LEACHING FACILITY:
(SEE BELOW)

SIZE OF LEACHING FACILITY PROVIDED
TYPE OF SYSTEM: LEACHING TRENCHES
3 TRENCHES - 46' LONG × 2' WIDE × 6" STONE BENEATH PIPE

LEACHING PROVIDED
SIDEWALL - 0.53 G/SF × 1 SF/LF = 0.53 G/LF
BOTTOM - 0.35 G/SF × 2 SF/LF = 0.70 G/LF
TOTAL/LF 1.23 G/LF
3 TR × 46 LF/TR × 1.23 G/LF = 169 G.P.D.

SEWAGE DISPOSAL PLAN

PREPARED FOR: TOWN OF CARLISLE, MA.
ADDRESS: TOWN HALL, CARLISLE, MA.
LOCATION: PROPOSED FIRE STATION, WESTFORD ROAD, CARLISLE, MA.
SCALE: AS SHOWN
DATE: MAY 8, 1984
REV. NOV. 15, 1984
PREPARED BY:

STAMSKI AND MCNARY, INC.
ENGINEERING • PLANNING • SURVEYING
229 CENTRAL ST., ACTON, MA.

SM-5

Commonwealth of Massachusetts
City/Town of Carlisle

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

A. Facility Information

Town of Carlisle
Owner Name

66 Westford Street
Street Address

21-1-0
Map/Lot #

Carlisle
City

MA
State

01741
Zip Code

B. Site Information

1. (Check one) ☒ New Construction ☐ Upgrade

2. Soil Survey
   USDA Web Soil Survey — Source
   422B — Soil Map Unit
   Canton fine sandy loam, 0 to 8% slopes — Soil Series
   Hills on uplands, moraines on uplands, ridges on uplands — Landform
   Depth to restrictive feature 23 to 67", well drained, water table > 80" — Soil Limitations
   Coarse-loamy over sandy melt-out till derived from gneiss, granite, and/or schist — Soil Parent material

3. Surficial Geological Report
   2018, Stone J.R., Stone B.D., DiGiacomo-Cohen, M.L., and Mabee, S.B., comps
   t- (thin till) — Map Unit
   Non-sorted, nonstratified matrix of sand, some silt, and little clay containing scattered pebble, cobble, and boulder clasts; large surface boulders are common; unit was mapped where till is generally less than 10 to 15ft thick inlcuding areas of shallow bedrock.

4. Flood Rate Insurance Map — Within a regulatory floodway? ☐ Yes ☒ No

5. Within a velocity zone? ☐ Yes ☒ No

6. Within a Mapped Wetland Area? ☐ Yes ☒ No — If yes, MassGIS Wetland Data Layer: ____ Wetland Type

7. Current Water Resource Conditions (USGS): January 7, 2026 (Month/Day/ Year) — Range: ☐ Above Normal ☐ Normal ☒ Below Normal

8. Other references reviewed:
   (Zone II, IWPA, Zone A, EEA Data Portal, etc.)
   MA-WWW 160 Westford, MA
   Wetland northeast of the Site approx 150-200-feet from the project site. Drinking water well approx 100-feet from the project site, which will be moved during redevelopment activities

Commonwealth of Massachusetts
City/Town of Carlisle

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP-1 (Hole #) 1/7/2026 (Date) 0910 (Time) 30s, rain/sleet/snow (Weather) ____ (Latitude) ____ (Longitude)

1. Land Use Woodland (e.g., woodland, agricultural field, vacant lot, etc.) Trees (Vegetation) Bedrock/Boulders (Surface Stones (e.g., cobbles, stones, boulders, etc.)) 5-8% (Slope (%))

Description of Location: Test pit closest to the road. Southeast corner of staked out grid

2. Soil Parent Material: Coarse-loamy over sandy melt-out till from gneiss, granite, and/or schist — Hills on uplands, ridges on uplands (Landform) — SH (Position on Landscape (SU, SH, BS, FS, TS, Plain))

3. Distances from: Open Water Body >100 feet Drainage Way >100 feet Wetlands >100 feet
Property Line >25 feet Drinking Water Well >100 feet Other NA feet

4. Unsuitable Materials Present: ☒ Yes ☐ No If Yes: ☐ Disturbed Soil/Fill Material ☒ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No If yes: NA Depth to Weeping in Hole NA Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-7	A	Loamy Sand	10YR 3/3		Cnc : Dpl:		0-5%		Granular	Friable	
7-22	Bw	Loamy Sand	10YR 5/6		Cnc : Dpl:		0-5%		Massive	Friable	Organics to 22"
22-84	C	Fine to Medium Sand	10YR 5/3	49"	Cnc :Present Dpl:	5-10%	5%	5%	Single Grain	Loose	2.5YR 6/2 for north sidewall
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc :						

Commonwealth of Massachusetts
City/Town of Carlisle

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

					Dpl:						

Additional Notes:
Refusal on ledge/fractured bedrock at 84". High and low chroma observed in redox area at 49"

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area*)

Deep Observation Hole Number: TP-2 (Hole #) 1/7/2026 (Date) 1100 (Time) 30s rain/sleet/snow (Weather) Latitude: ____ Longitude: ____

1. Land Use: Woodland (e.g., woodland, agricultural field, vacant lot, etc.) Trees (Vegetation) Bedrock/Boulders (Surface Stones (e.g., cobbles, stones, boulders, etc.)) 5-8% (Slope (%))

   Description of Location: Northwest corner of grid.

2. Soil Parent Material: Coarse-loamy over sandy melt-out till from gneiss, granite, and/or schist; Hills on uplands, ridges on uplands (Landform); SH (Position on Landscape (SU, SH, BS, FS, TS, Plain))

3. Distances from: Open Water Body >100 feet; Drainage Way >100 feet; Wetlands >100 feet; Property Line >25 feet; Drinking Water Well >100 feet; Other NA feet

4. Unsuitable Materials Present: ☒ Yes ☐ No If Yes: ☐ Disturbed Soil/Fill Material ☒ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No If yes: NA Depth to Weeping in Hole NA Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features: Depth	Redoximorphic Features: Color	Redoximorphic Features: Percent	Coarse Fragments % by Volume: Gravel	Coarse Fragments % by Volume: Cobbles & Stones	Soil Structure	Soil Consistence (Moist)	Other
0-7	A	Loamy Sand	10YR 3/3		Cnc : Dpl:		NA	NA	Granular	Friable	
7-16	Bw	Loamy Sand	10YR 5/6		Cnc : Dpl:		NA	NA	Massive	Friable	
16-103	C	Silty Sand	10YR 6/3	69"	Cnc :Present Dpl:		10%	5%	Single Grain	Loose	
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

Additional Notes:
High and low chroma observed in redox area at 69"

D. Determination of High Groundwater Elevation

1. Method Used (Choose one):

	Obs. Hole # TP-1	Obs. Hole # TP-2
☒ Depth to soil redoximorphic features	49" inches	69" inches
☐ Depth to observed standing water in observation hole	NA inches	NA inches
☐ Depth to adjusted seasonal high groundwater (S_h) (USGS methodology)	_____ inches	_____ inches

_______________ Index Well Number   _______________ Reading Date

$S_h = S_c – [S_r \times (OW_c – OW_{max})/OW_r]$

Obs. Hole/Well# _____ S_c _____ S_r _____ OW_c _____ OW_{max} _____ OW_r _____ S_h _____

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?

☒ Yes ☐ No

b. If yes, at what depth was it observed (exclude O, A, and E Horizons)? Upper boundary: 7" inches Lower boundary: 84" inches

c. If no, at what depth was impervious material observed? Upper boundary: NA inches Lower boundary: NA inches

Commonwealth of Massachusetts
City/Town of Carlisle

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP-3 (Hole #) 1/7/2026 (Date) 1230 (Time) 30s, rain/sleet/snow (Weather) ____ (Latitude) ____ (Longitude)

1. Land Use: Woodland (e.g., woodland, agricultural field, vacant lot, etc.) Trees (Vegetation) Bedrock/Boulders (Surface Stones (e.g., cobbles, stones, boulders, etc.)) 5-8% (Slope (%))

Description of Location: Test pit closest to the road. Southeast corner of staked out grid

2. Soil Parent Material: Coarse-loamy over sandy melt-out till from gneiss, granite, and/or schist; Hills on uplands, ridges on uplands (Landform); SH (Position on Landscape (SU, SH, BS, FS, TS, Plain))

3. Distances from: Open Water Body >100 feet; Drainage Way >100 feet; Wetlands >100 feet; Property Line >25 feet; Drinking Water Well >100 feet; Other NA feet

4. Unsuitable Materials Present: ☒ Yes ☐ No If Yes: ☐ Disturbed Soil/Fill Material ☒ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No If yes: NA Depth to Weeping in Hole NA Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features: Depth	Redoximorphic Features: Color	Redoximorphic Features: Percent	Coarse Fragments % by Volume: Gravel	Coarse Fragments % by Volume: Cobbles & Stones	Soil Structure	Soil Consistence (Moist)	Other
0-10	A	Loamy Sand	10YR 3/3		Cnc : Dpl:		NA	NA	Granular	Friable	
10-28	Bw	Loamy Sand	10YR 6/6		Cnc : Dpl:		NA	NA	Massive	Friable	
28-90	C	Silty Sand	10YR 6/4	71"	Cnc :Present Dpl:	5-10%	5%	5%	Single Grain	Loose	
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Commonwealth of Massachusetts
City/Town of Carlisle

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

Additional Notes:
High and low chroma observed in redox area at 71". Refusal on fractured bedrock at 90"

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area*)

Deep Observation Hole Number: TP-4 (Hole #) 1/7/2026 (Date) 1330 (Time) 30s rain/sleet/snow (Weather) ____ (Latitude) ____ (Longitude)

1. Land Use: Woodland (e.g., woodland, agricultural field, vacant lot, etc.) Trees (Vegetation) Bedrock/Boulders (Surface Stones (e.g., cobbles, stones, boulders, etc.)) 5-8% (Slope (%))

   Description of Location: Northwest corner of grid.

2. Soil Parent Material: Coarse-loamy over sandy melt-out till from gneiss, granite, and/or schist — Hills on uplands, ridges on uplands (Landform) — SH (Position on Landscape (SU, SH, BS, FS, TS, Plain))

3. Distances from: Open Water Body >100 feet; Drainage Way >100 feet; Wetlands >100 feet; Property Line >25 feet; Drinking Water Well >100 feet; Other NA feet

4. Unsuitable Materials Present: ☒ Yes ☐ No If Yes: ☐ Disturbed Soil/Fill Material ☒ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No If yes: NA Depth to Weeping in Hole NA Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-5	A	Loamy Sand	10YR 3/2		Cnc : Dpl:		NA	NA	Granular	Friable	
5-30	Bw	Loamy Sand	10YR 5/8		Cnc : Dpl:		NA	NA	Massive	Friable	
30-63	C	Silty Sand	10YR 7/2		Cnc : Dpl:		5%	2%	Single Grain	Loose	
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

Additional Notes:
Boulders observed through test pit. Refusal on fractured bedrock. Bedrock encountered in northern portion of test pit around 30". No redox observed.

D. Determination of High Groundwater Elevation

1. Method Used (Choose one): Obs. Hole # TP-3 Obs. Hole # TP-4

	Obs. Hole # TP-3	Obs. Hole # TP-4
☒ Depth to soil redoximorphic features	71" inches	NA inches
☐ Depth to observed standing water in observation hole	NA inches	NA inches
☐ Depth to adjusted seasonal high groundwater (S_h) (USGS methodology)	_____ inches	_____ inches

Index Well Number ____________ Reading Date ____________

$S_h = S_c – [S_r \times (OW_c – OW_{max})/OW_r]$

Obs. Hole/Well# _____ S_c _____ S_r _____ OW_c _____ OW_{max} _____ OW_r _____ S_h _____

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

   a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?

   ☒ Yes ☐ No

   b. If yes, at what depth was it observed (exclude O, A, and E Horizons)? Upper boundary: 10" inches Lower boundary: 63" inches

   c. If no, at what depth was impervious material observed? Upper boundary: NA inches Lower boundary: NA inches

Commonwealth of Massachusetts
City/Town of Carlisle

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

F. Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct soil evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.100 through 15.107.

	1/21/2026
Signature of Soil Evaluator	Date
Evan Koncewicz / SE #14906	5/1/2027
Typed or Printed Name of Soil Evaluator / License #	Expiration Date of License
Robert J. Frado / SE #796	Town of Carlisle
Name of Approving Authority Witness	Approving Authority

Note: In accordance with 310 CMR 15.018(2) this form must be submitted to the approving authority within 60 days of the date of field testing, and to the designer and the property owner with Percolation Test Form 12.

Field Diagrams: Use this area for field diagrams:

Commonwealth of Massachusetts
City/Town of Carlisle
Percolation Test
Form 12

Percolation test results must be submitted with the Soil Suitability Assessment for On-site Sewage Disposal. DEP has provided this form for use by local Boards of Health. Other forms may be used, but the information must be substantially the same as that provided here. Before using this form, check with the local Board of Health to determine the form they use.

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

tab

return

A. Site Information

Town of Carlisle
Owner Name

66 Westford Street / 21-1-0
Street Address or Lot #

Carlisle	MA	01741
City/Town	State	Zip Code

Contact Person (if different from Owner)

Telephone Number

B. Test Results

	1/7/2025	1050	1/7/2025	1345
	Date	Time	Date	Time
Observation Hole #	P-1 / TP-1		P-2 / TP-3	
Depth of Perc	44"		63"	
Start Pre-Soak	1052		1347	
End Pre-Soak	1107		1402	
Time at 12”	1107		1402	
Time at 9”	1119		1416	
Time at 6”	1134		1433	
Time (9”-6”)	15 minutes		17 minutes	
Rate (Min./Inch)	5 min/inch		5.66 min/inch	
	Test Passed: ☒		Test Passed: ☒	
	Test Failed: ☐		Test Failed: ☐	

Evan Koncewicz / SE #14906
Test Performed By:

Robert J. Frado / SE #796
Board of Health Witness

Comments:

FUSS & O'NEILL

Appendix C

Pre-Development Hydrologic Analysis

NOAA Atlas 14, Volume 10, Version 3
Location name: Carlisle, Massachusetts, USA*
Latitude: 42.5294°, Longitude: -71.3513°
Elevation: 202 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.316 (0.250-0.395)	0.379 (0.300-0.475)	0.483 (0.381-0.607)	0.569 (0.446-0.719)	0.688 (0.521-0.905)	0.777 (0.575-1.04)	0.871 (0.626-1.21)	0.980 (0.662-1.38)	1.14 (0.740-1.66)	1.27 (0.804-1.88)
10-min	0.448 (0.354-0.560)	0.538 (0.425-0.673)	0.685 (0.539-0.860)	0.807 (0.631-1.02)	0.975 (0.737-1.28)	1.10 (0.816-1.48)	1.23 (0.886-1.71)	1.39 (0.938-1.96)	1.61 (1.05-2.35)	1.80 (1.14-2.67)
15-min	0.527 (0.417-0.658)	0.632 (0.500-0.792)	0.805 (0.634-1.01)	0.949 (0.743-1.20)	1.15 (0.868-1.51)	1.30 (0.959-1.74)	1.45 (1.04-2.02)	1.63 (1.10-2.30)	1.90 (1.23-2.76)	2.12 (1.34-3.14)
30-min	0.719 (0.569-0.899)	0.865 (0.683-1.08)	1.10 (0.869-1.39)	1.30 (1.02-1.64)	1.57 (1.19-2.07)	1.78 (1.32-2.38)	1.99 (1.43-2.77)	2.24 (1.52-3.16)	2.61 (1.69-3.80)	2.92 (1.84-4.32)
60-min	0.912 (0.721-1.14)	1.10 (0.867-1.37)	1.40 (1.10-1.76)	1.65 (1.29-2.08)	2.00 (1.51-2.63)	2.26 (1.67-3.03)	2.53 (1.82-3.52)	2.85 (1.93-4.02)	3.32 (2.16-4.84)	3.71 (2.35-5.50)
2-hr	1.16 (0.924-1.44)	1.41 (1.12-1.76)	1.83 (1.45-2.28)	2.17 (1.71-2.72)	2.64 (2.02-3.47)	2.99 (2.24-4.01)	3.38 (2.46-4.70)	3.84 (2.61-5.38)	4.56 (2.97-6.59)	5.18 (3.29-7.62)
3-hr	1.34 (1.07-1.65)	1.64 (1.31-2.02)	2.12 (1.70-2.64)	2.53 (2.01-3.16)	3.09 (2.37-4.04)	3.50 (2.64-4.68)	3.96 (2.90-5.50)	4.52 (3.07-6.31)	5.40 (3.52-7.77)	6.16 (3.92-9.02)
6-hr	1.71 (1.38-2.10)	2.10 (1.69-2.57)	2.73 (2.19-3.36)	3.25 (2.60-4.02)	3.97 (3.07-5.15)	4.50 (3.41-5.97)	5.08 (3.75-7.03)	5.82 (3.97-8.05)	6.96 (4.55-9.94)	7.96 (5.08-11.6)
12-hr	2.17 (1.77-2.64)	2.65 (2.16-3.23)	3.44 (2.79-4.20)	4.09 (3.30-5.02)	4.99 (3.89-6.42)	5.66 (4.31-7.44)	6.38 (4.72-8.73)	7.28 (4.99-10.0)	8.66 (5.69-12.3)	9.86 (6.31-14.2)
24-hr	2.60 (2.14-3.14)	3.20 (2.62-3.86)	4.18 (3.41-5.06)	4.99 (4.05-6.08)	6.11 (4.79-7.79)	6.93 (5.31-9.04)	7.83 (5.83-10.6)	8.95 (6.16-12.2)	10.7 (7.04-15.0)	12.2 (7.82-17.4)
2-day	2.94 (2.44-3.52)	3.67 (3.04-4.40)	4.87 (4.01-5.85)	5.86 (4.79-7.07)	7.22 (5.70-9.16)	8.21 (6.35-10.7)	9.32 (7.00-12.6)	10.7 (7.41-14.5)	12.9 (8.55-18.1)	14.9 (9.59-21.1)
3-day	3.22 (2.68-3.84)	4.00 (3.33-4.78)	5.28 (4.37-6.32)	6.34 (5.22-7.63)	7.80 (6.19-9.86)	8.87 (6.89-11.5)	10.1 (7.59-13.6)	11.6 (8.02-15.6)	14.0 (9.25-19.4)	16.1 (10.4-22.7)
4-day	3.49 (2.91-4.14)	4.29 (3.58-5.10)	5.61 (4.66-6.69)	6.71 (5.53-8.04)	8.21 (6.54-10.3)	9.32 (7.26-12.0)	10.5 (7.97-14.2)	12.1 (8.41-16.2)	14.6 (9.67-20.2)	16.8 (10.8-23.6)
7-day	4.22 (3.55-4.98)	5.06 (4.25-5.98)	6.44 (5.38-7.62)	7.58 (6.29-9.02)	9.15 (7.32-11.4)	10.3 (8.05-13.1)	11.6 (8.76-15.4)	13.2 (9.19-17.6)	15.7 (10.4-21.6)	17.9 (11.6-25.0)
10-day	4.90 (4.14-5.75)	5.76 (4.86-6.78)	7.18 (6.03-8.46)	8.35 (6.96-9.90)	9.96 (8.00-12.3)	11.2 (8.74-14.1)	12.5 (9.42-16.4)	14.0 (9.84-18.6)	16.5 (11.0-22.6)	18.6 (12.1-25.9)
20-day	6.85 (5.84-7.98)	7.79 (6.63-9.09)	9.33 (7.91-10.9)	10.6 (8.93-12.5)	12.4 (9.97-15.1)	13.7 (10.7-17.0)	15.1 (11.4-19.4)	16.6 (11.7-21.8)	18.8 (12.6-25.5)	20.6 (13.4-28.5)
30-day	8.48 (7.26-9.83)	9.48 (8.11-11.0)	11.1 (9.48-13.0)	12.5 (10.6-14.6)	14.4 (11.6-17.4)	15.8 (12.4-19.5)	17.3 (13.0-21.9)	18.8 (13.3-24.5)	20.8 (14.0-28.0)	22.3 (14.6-30.7)
45-day	10.5 (9.06-12.1)	11.6 (9.98-13.4)	13.4 (11.5-15.5)	14.9 (12.6-17.3)	16.9 (13.7-20.3)	18.5 (14.5-22.5)	20.0 (15.0-25.1)	21.5 (15.3-27.9)	23.4 (15.8-31.3)	24.7 (16.1-33.8)
60-day	12.3 (10.6-14.1)	13.4 (11.6-15.4)	15.3 (13.1-17.6)	16.8 (14.4-19.5)	19.0 (15.4-22.7)	20.7 (16.3-25.1)	22.3 (16.7-27.7)	23.8 (17.0-30.8)	25.6 (17.3-34.2)	26.9 (17.6-36.7)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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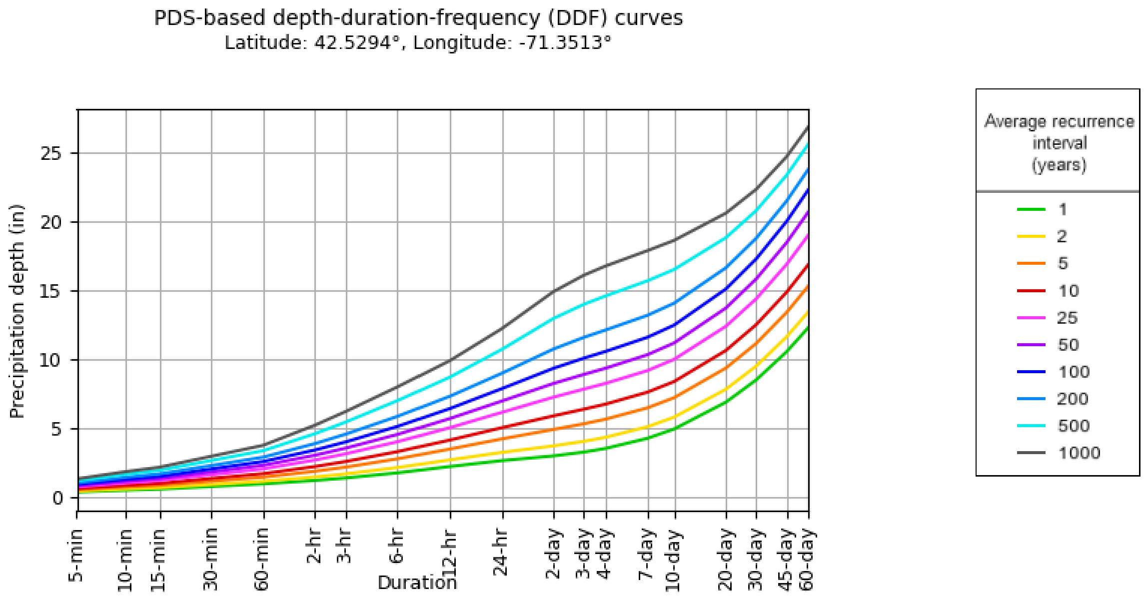
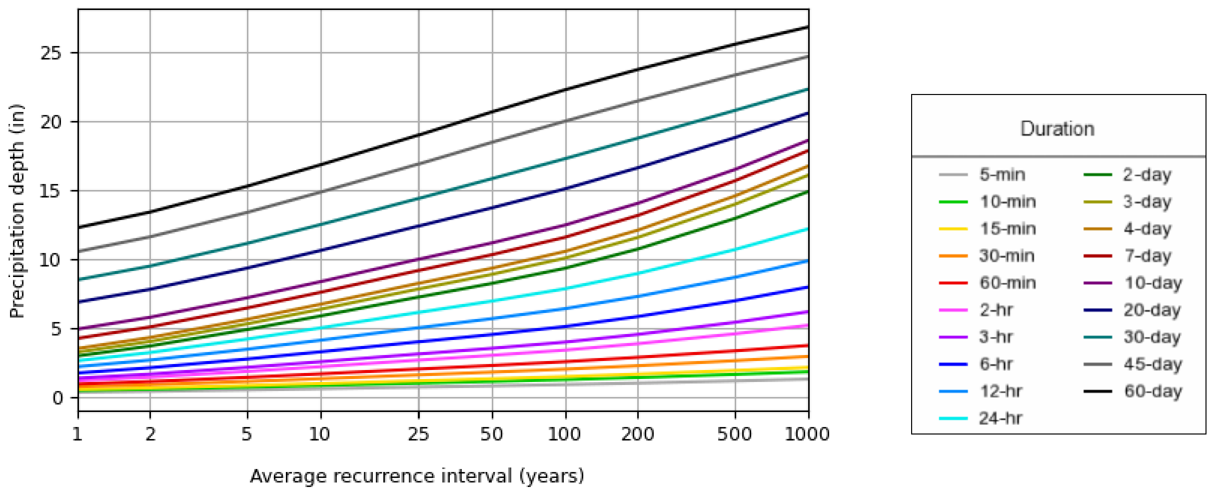
PF graphical





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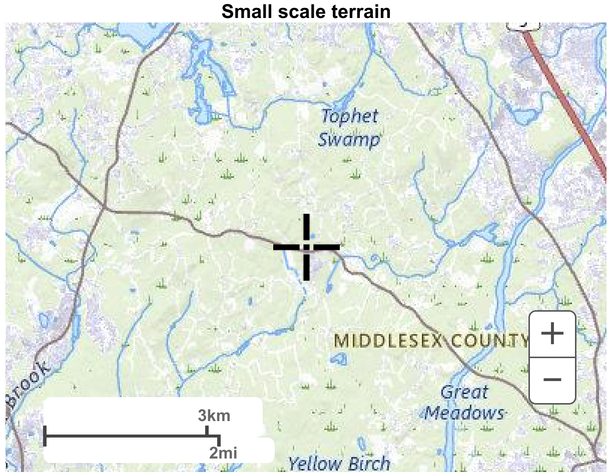
Maps & aerials

Small scale terrain



Large scale terrain

Large scale map

Large scale aerial

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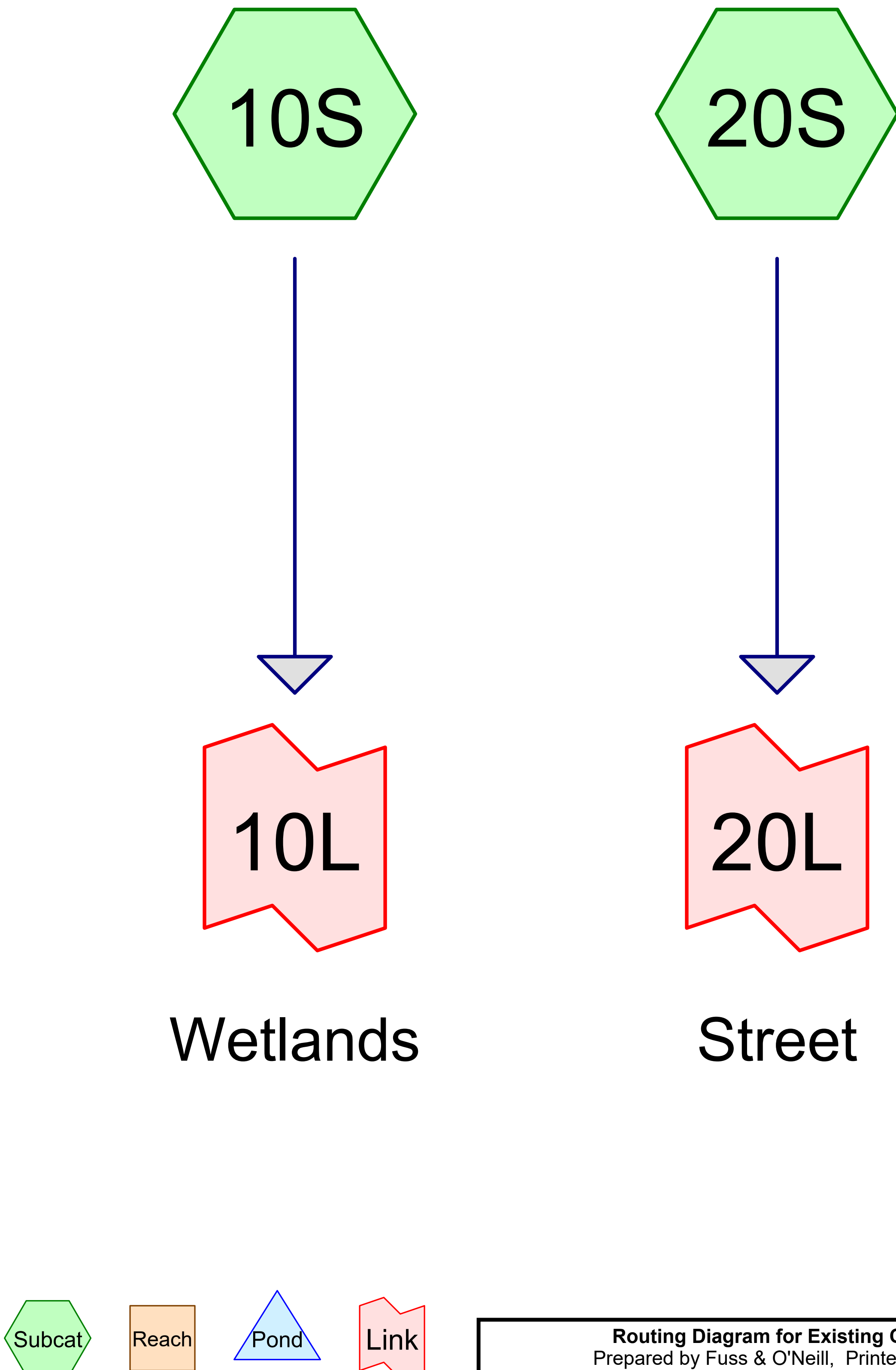


Routing Diagram for Existing Conditions
Prepared by Fuss & O'Neill, Printed 1/28/2026

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2 Year	Type III 24-hr		Default	24.00	1	3.20	2
2	10 Year	Type III 24-hr		Default	24.00	1	4.99	2
3	25 Year	Type III 24-hr		Default	24.00	1	6.11	2
4	100 Year	Type III 24-hr		Default	24.00	1	7.83	2

Area Listing (selected nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
2,401	61	>75% Grass cover, Good, HSG B (10S)
18,501	80	>75% Grass cover, Good, HSG D (10S, 20S)
26,240	98	Paved parking, HSG D (10S, 20S)
6,957	98	Roofs, HSG D (10S)
13,997	55	Woods, Good, HSG B (10S, 20S)
32,605	77	Woods, Good, HSG D (10S)
100,701	**81**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
16,398	HSG B	10S, 20S
0	HSG C	
84,303	HSG D	10S, 20S
0	Other	
100,701		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Su Nu
0	2,401	0	18,501	0	20,902	>75% Grass cover, Good	
0	0	0	26,240	0	26,240	Paved parking	
0	0	0	6,957	0	6,957	Roofs	
0	13,997	0	32,605	0	46,602	Woods, Good	
0	**16,398**	**0**	**84,303**	**0**	**100,701**	**TOTAL AREA**	

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment10S: Runoff Area=83,154 sf 34.49% Impervious Runoff Depth=1.61"
Flow Length=149' Tc=7.8 min CN=83 Runoff=3.33 cfs 11,151 cf

Subcatchment20S: Runoff Area=17,547 sf 25.75% Impervious Runoff Depth=1.04"
Flow Length=144' Tc=9.7 min CN=74 Runoff=0.40 cfs 1,517 cf

Link 10L: Wetlands Inflow=3.33 cfs 11,151 cf
Primary=3.33 cfs 11,151 cf

Link 20L: Street Inflow=0.40 cfs 1,517 cf
Primary=0.40 cfs 1,517 cf

Total Runoff Area = 100,701 sf Runoff Volume = 12,668 cf Average Runoff Depth = 1.51"
67.03% Pervious = 67,504 sf 32.97% Impervious = 33,197 sf

Summary for Subcatchment 10S:

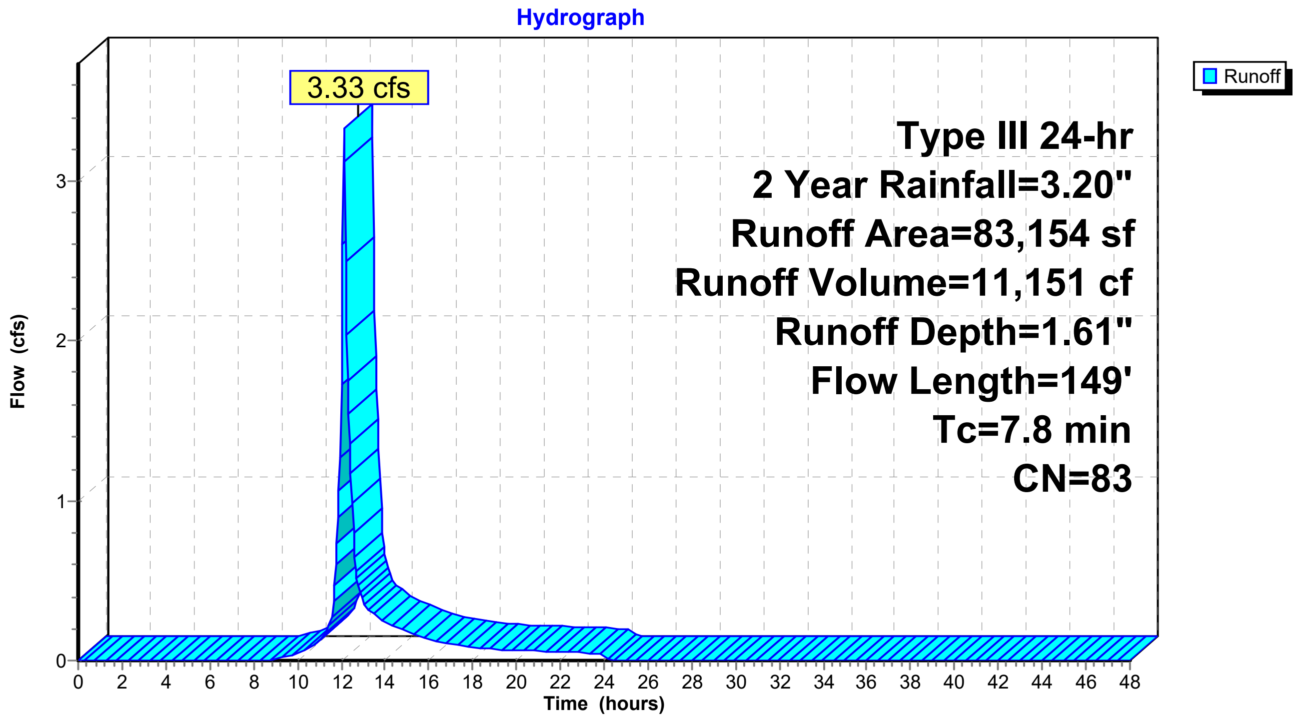
Runoff = 3.33 cfs @ 12.11 hrs, Volume= 11,151 cf, Depth= 1.61"
Routed to Link 10L : Wetlands

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 Year Rainfall=3.20"

Area (sf)	CN	Description
21,722	98	Paved parking, HSG D
6,957	98	Roofs, HSG D
12,936	80	>75% Grass cover, Good, HSG D
2,401	61	>75% Grass cover, Good, HSG B
32,605	77	Woods, Good, HSG D
6,533	55	Woods, Good, HSG B
83,154	83	Weighted Average
54,475		65.51% Pervious Area
28,679		34.49% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	50	0.0900	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
1.0	99	0.1200	1.73		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
7.8	149	Total			

Subcatchment 10S:



Summary for Subcatchment 20S:

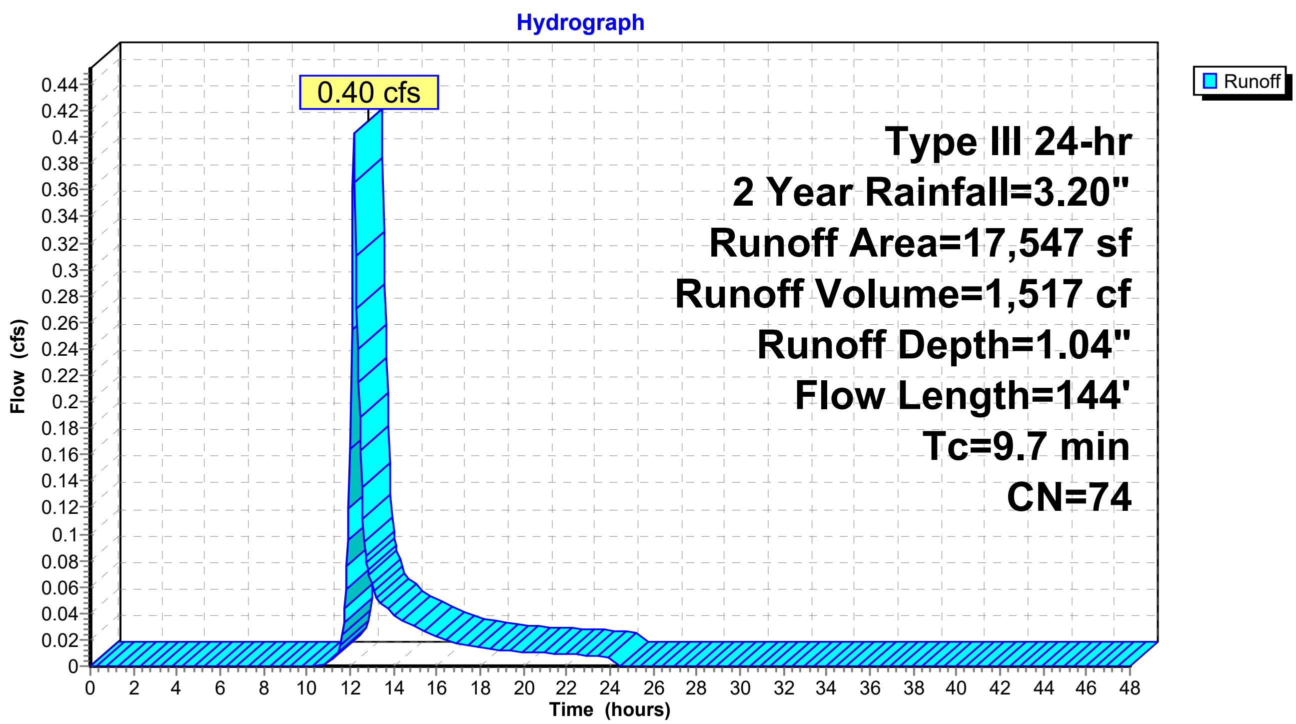
Runoff = 0.40 cfs @ 12.15 hrs, Volume= 1,517 cf, Depth= 1.04"
Routed to Link 20L : Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 Year Rainfall=3.20"

Area (sf)	CN	Description
5,565	80	>75% Grass cover, Good, HSG D
7,464	55	Woods, Good, HSG B
4,518	98	Paved parking, HSG D
17,547	74	Weighted Average
13,029		74.25% Pervious Area
4,518		25.75% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0600	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
1.8	94	0.0320	0.89		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
9.7	144	Total			

Subcatchment 20S:

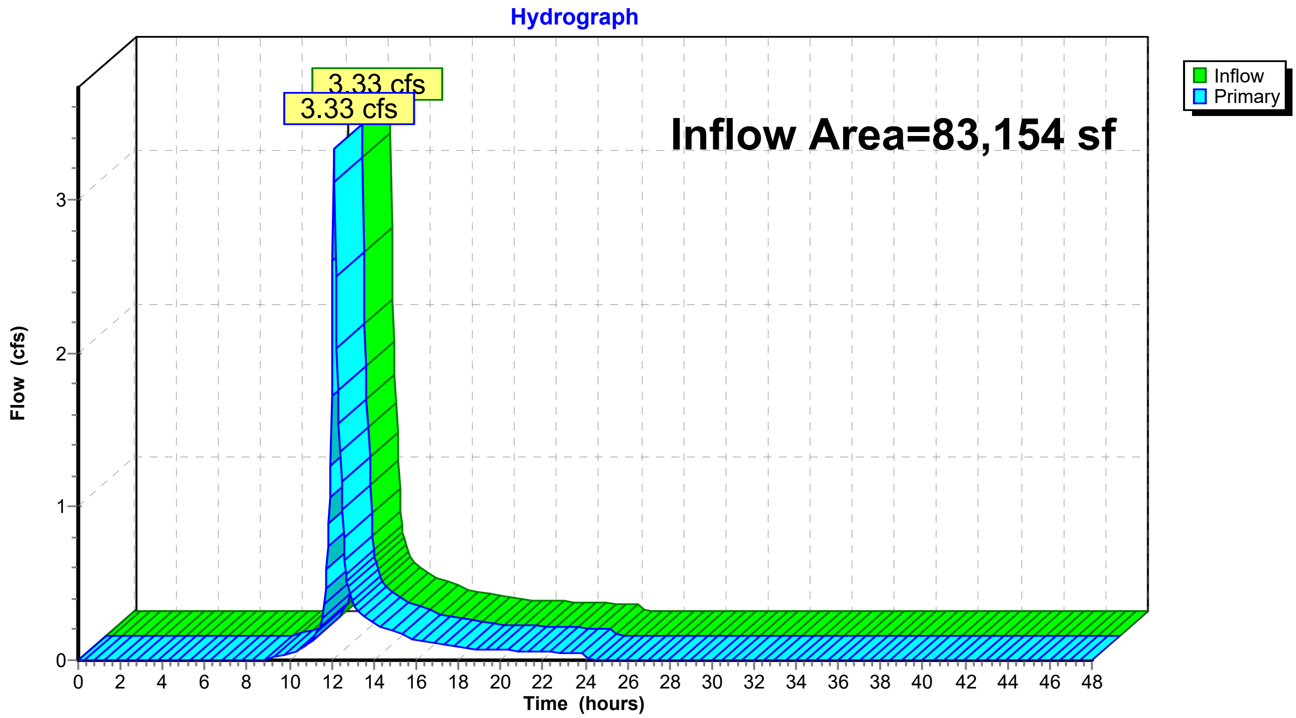


Summary for Link 10L: Wetlands

Inflow Area =	83,154 sf,	34.49% Impervious,	Inflow Depth = 1.61"	for 2 Year event	
Inflow =	3.33 cfs @	12.11 hrs, Volume=	11,151 cf		
Primary =	3.33 cfs @	12.11 hrs, Volume=	11,151 cf,	Atten= 0%,	Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link 10L: Wetlands

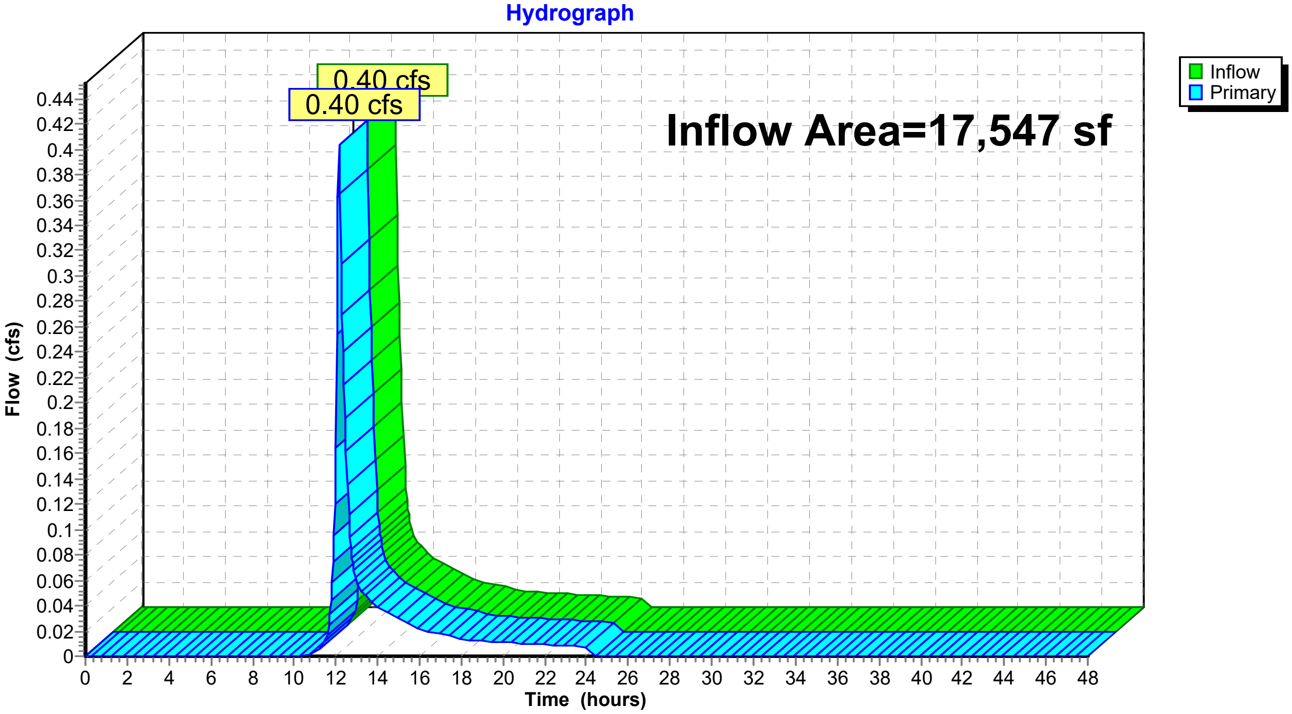


Summary for Link 20L: Street

Inflow Area = 17,547 sf, 25.75% Impervious, Inflow Depth = 1.04" for 2 Year event
Inflow = 0.40 cfs @ 12.15 hrs, Volume= 1,517 cf
Primary = 0.40 cfs @ 12.15 hrs, Volume= 1,517 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link 20L: Street



Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment10S: Runoff Area=83,154 sf 34.49% Impervious Runoff Depth=3.17"
Flow Length=149' Tc=7.8 min CN=83 Runoff=6.55 cfs 21,932 cf

Subcatchment20S: Runoff Area=17,547 sf 25.75% Impervious Runoff Depth=2.36"
Flow Length=144' Tc=9.7 min CN=74 Runoff=0.96 cfs 3,445 cf

Link 10L: Wetlands Inflow=6.55 cfs 21,932 cf
Primary=6.55 cfs 21,932 cf

Link 20L: Street Inflow=0.96 cfs 3,445 cf
Primary=0.96 cfs 3,445 cf

Total Runoff Area = 100,701 sf Runoff Volume = 25,378 cf Average Runoff Depth = 3.02"
67.03% Pervious = 67,504 sf 32.97% Impervious = 33,197 sf

Summary for Subcatchment 10S:

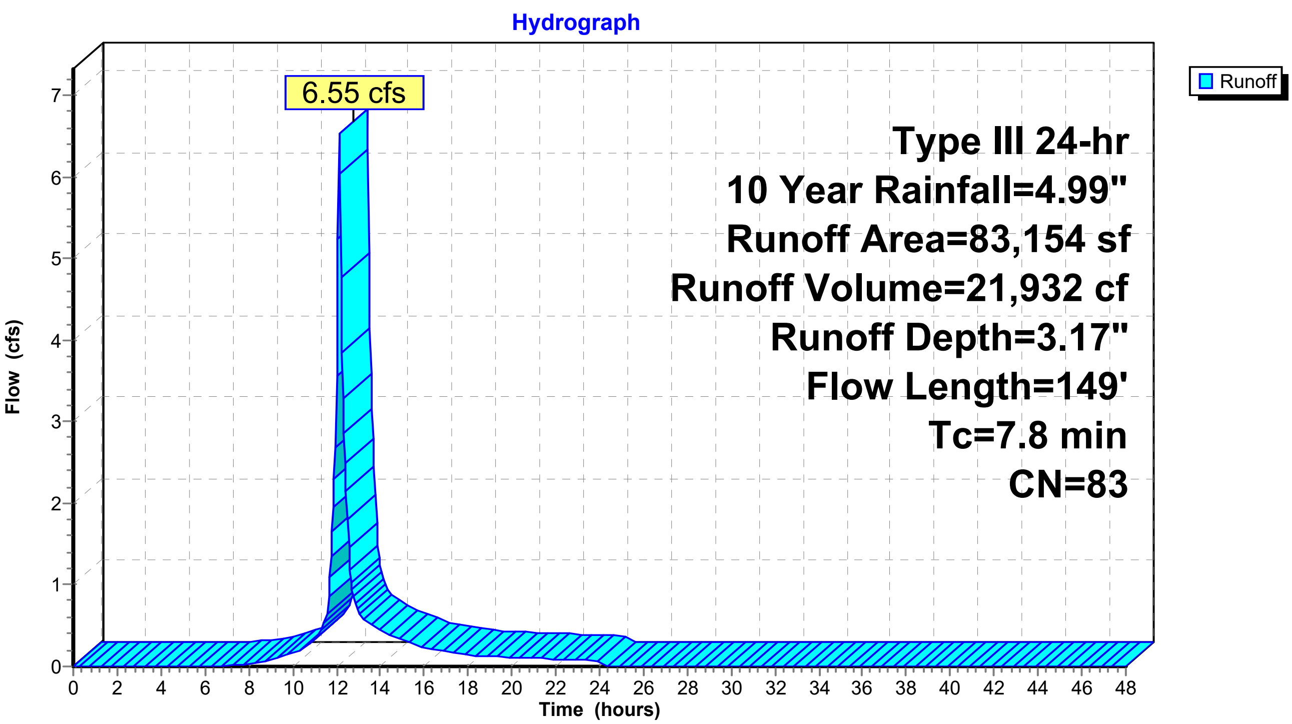
Runoff = 6.55 cfs @ 12.11 hrs, Volume= 21,932 cf, Depth= 3.17"
Routed to Link 10L : Wetlands

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 Year Rainfall=4.99"

Area (sf)	CN	Description
21,722	98	Paved parking, HSG D
6,957	98	Roofs, HSG D
12,936	80	>75% Grass cover, Good, HSG D
2,401	61	>75% Grass cover, Good, HSG B
32,605	77	Woods, Good, HSG D
6,533	55	Woods, Good, HSG B
83,154	83	Weighted Average
54,475		65.51% Pervious Area
28,679		34.49% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	50	0.0900	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
1.0	99	0.1200	1.73		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
7.8	149	Total			

Subcatchment 10S:



Summary for Subcatchment 20S:

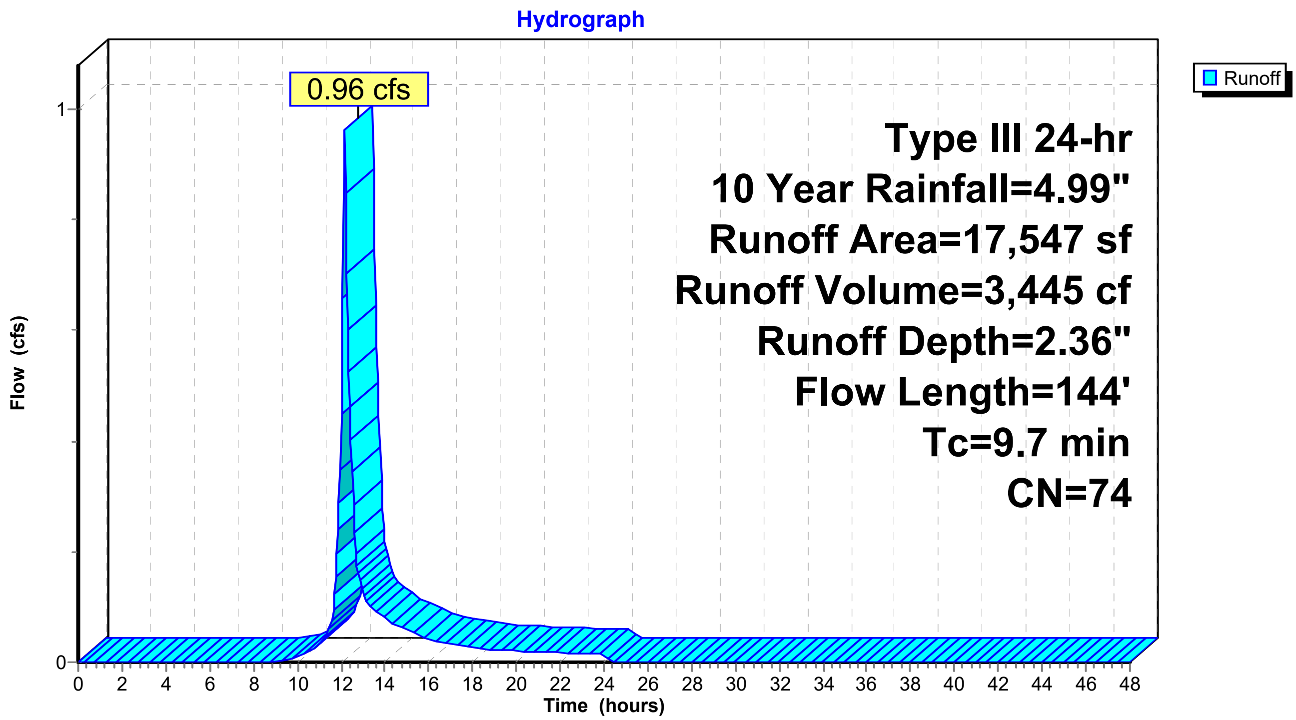
Runoff = 0.96 cfs @ 12.14 hrs, Volume= 3,445 cf, Depth= 2.36"
Routed to Link 20L : Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 Year Rainfall=4.99"

Area (sf)	CN	Description
5,565	80	>75% Grass cover, Good, HSG D
7,464	55	Woods, Good, HSG B
4,518	98	Paved parking, HSG D
17,547	74	Weighted Average
13,029		74.25% Pervious Area
4,518		25.75% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0600	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
1.8	94	0.0320	0.89		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
9.7	144	Total			

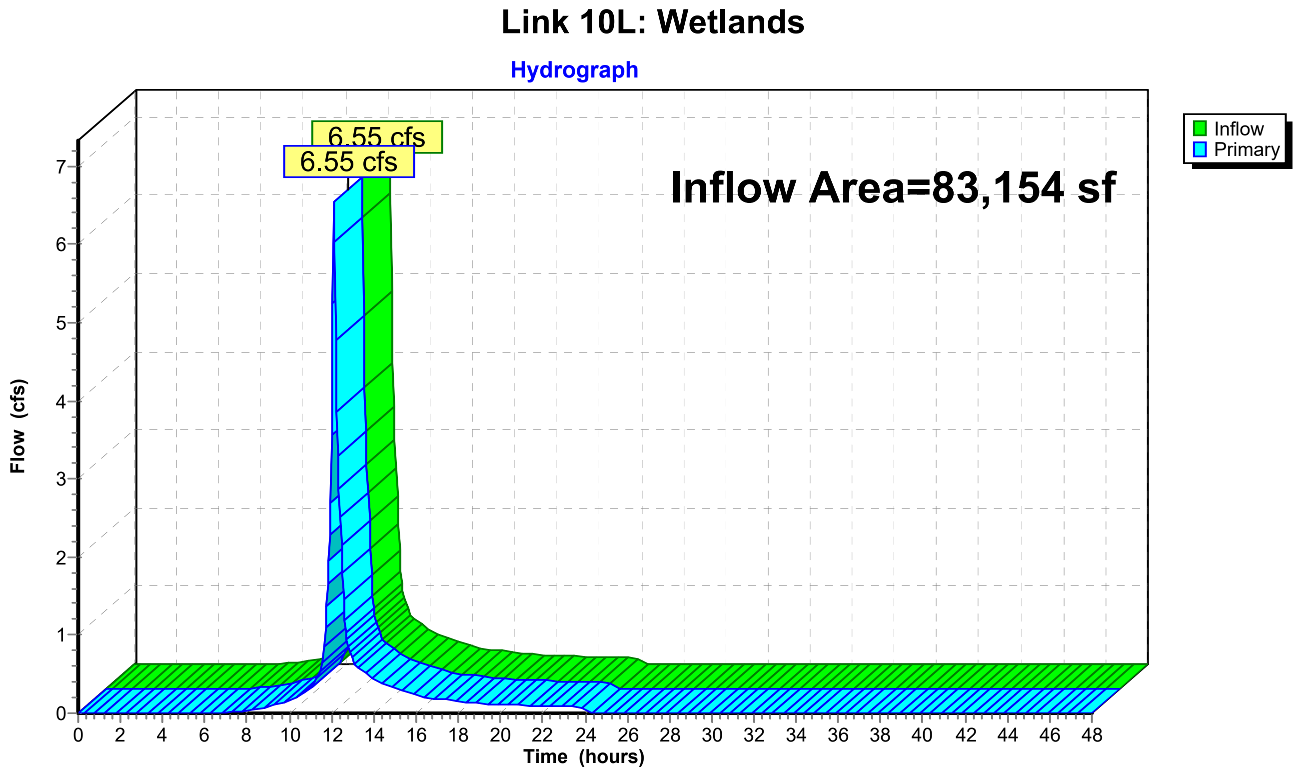
Subcatchment 20S:



Summary for Link 10L: Wetlands

Inflow Area = 83,154 sf, 34.49% Impervious, Inflow Depth = 3.17" for 10 Year event
Inflow = 6.55 cfs @ 12.11 hrs, Volume= 21,932 cf
Primary = 6.55 cfs @ 12.11 hrs, Volume= 21,932 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

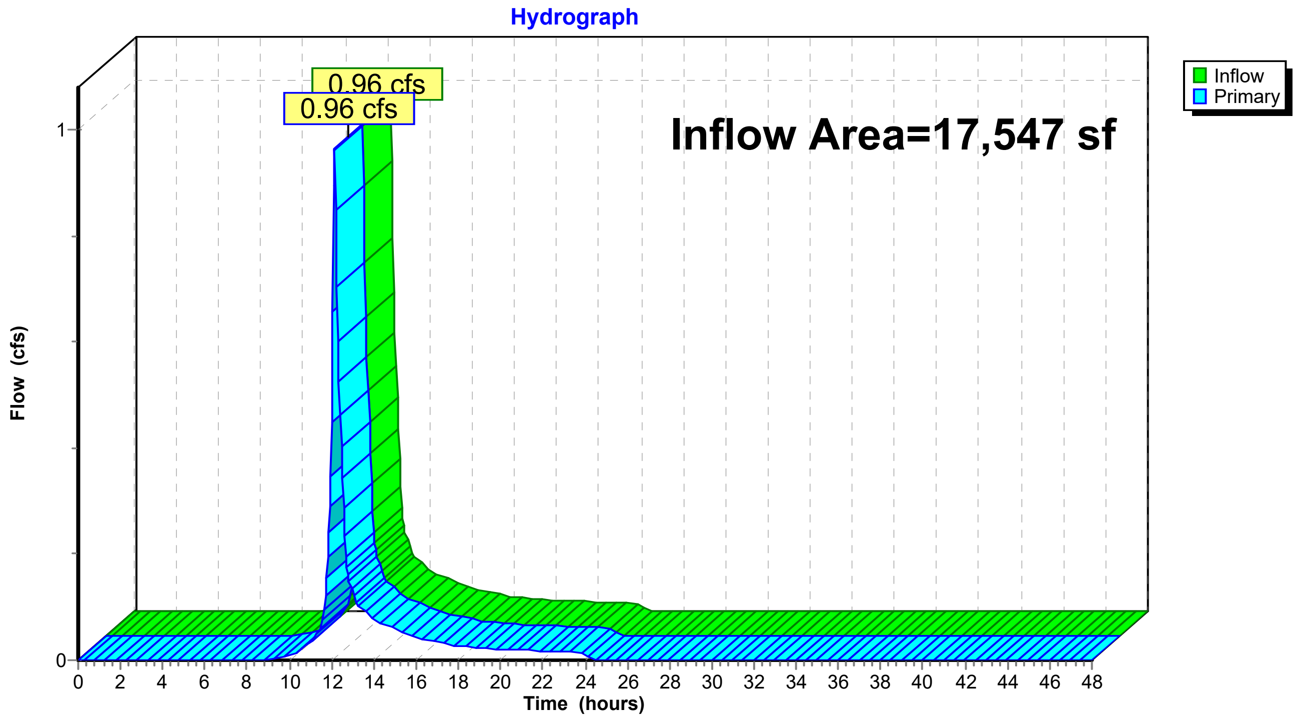


Summary for Link 20L: Street

Inflow Area = 17,547 sf, 25.75% Impervious, Inflow Depth = 2.36" for 10 Year event
Inflow = 0.96 cfs @ 12.14 hrs, Volume= 3,445 cf
Primary = 0.96 cfs @ 12.14 hrs, Volume= 3,445 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link 20L: Street



Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment10S: Runoff Area=83,154 sf 34.49% Impervious Runoff Depth=4.19"
Flow Length=149' Tc=7.8 min CN=83 Runoff=8.61 cfs 29,059 cf

Subcatchment20S: Runoff Area=17,547 sf 25.75% Impervious Runoff Depth=3.28"
Flow Length=144' Tc=9.7 min CN=74 Runoff=1.35 cfs 4,793 cf

Link 10L: Wetlands Inflow=8.61 cfs 29,059 cf
Primary=8.61 cfs 29,059 cf

Link 20L: Street Inflow=1.35 cfs 4,793 cf
Primary=1.35 cfs 4,793 cf

Total Runoff Area = 100,701 sf Runoff Volume = 33,852 cf Average Runoff Depth = 4.03"
67.03% Pervious = 67,504 sf 32.97% Impervious = 33,197 sf

Summary for Subcatchment 10S:

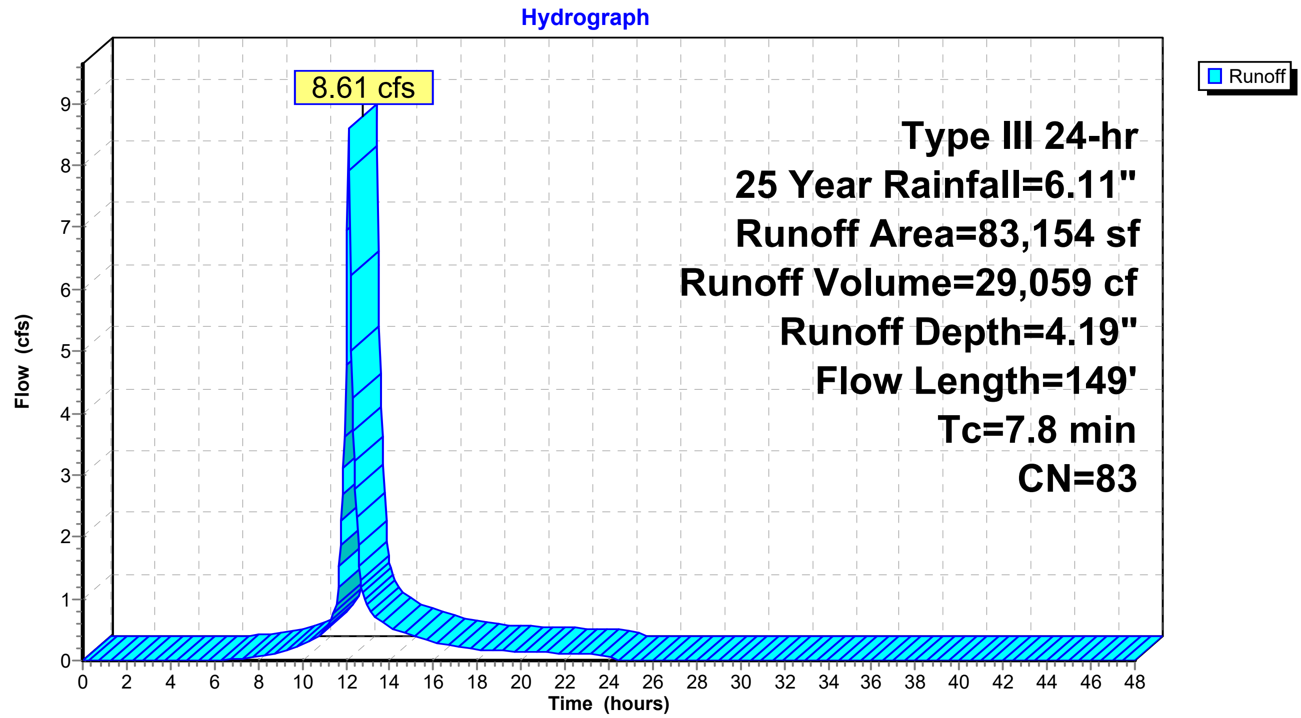
Runoff = 8.61 cfs @ 12.11 hrs, Volume= 29,059 cf, Depth= 4.19"
Routed to Link 10L : Wetlands

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 Year Rainfall=6.11"

Area (sf)	CN	Description
21,722	98	Paved parking, HSG D
6,957	98	Roofs, HSG D
12,936	80	>75% Grass cover, Good, HSG D
2,401	61	>75% Grass cover, Good, HSG B
32,605	77	Woods, Good, HSG D
6,533	55	Woods, Good, HSG B
83,154	83	Weighted Average
54,475		65.51% Pervious Area
28,679		34.49% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	50	0.0900	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
1.0	99	0.1200	1.73		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
7.8	149	Total			

Subcatchment 10S:



Summary for Subcatchment 20S:

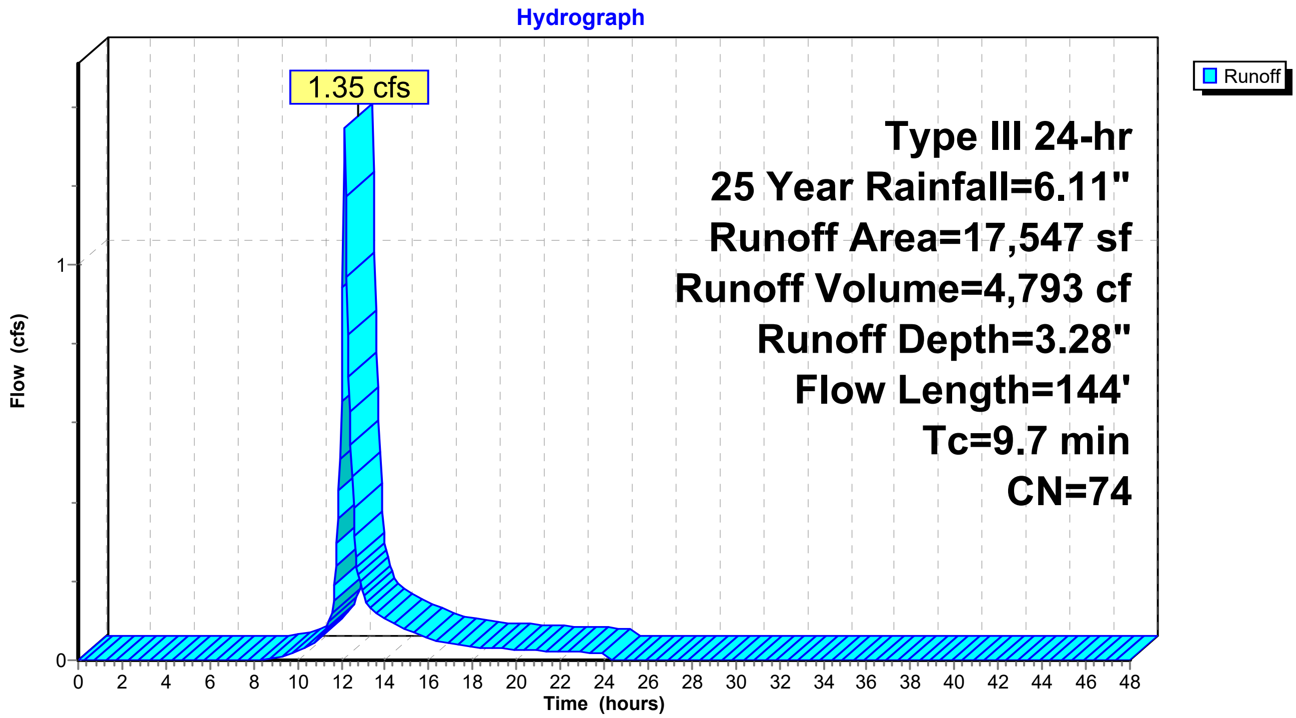
Runoff = 1.35 cfs @ 12.14 hrs, Volume= 4,793 cf, Depth= 3.28"
Routed to Link 20L : Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 Year Rainfall=6.11"

Area (sf)	CN	Description
5,565	80	>75% Grass cover, Good, HSG D
7,464	55	Woods, Good, HSG B
4,518	98	Paved parking, HSG D
17,547	74	Weighted Average
13,029		74.25% Pervious Area
4,518		25.75% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0600	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
1.8	94	0.0320	0.89		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
9.7	144	Total			

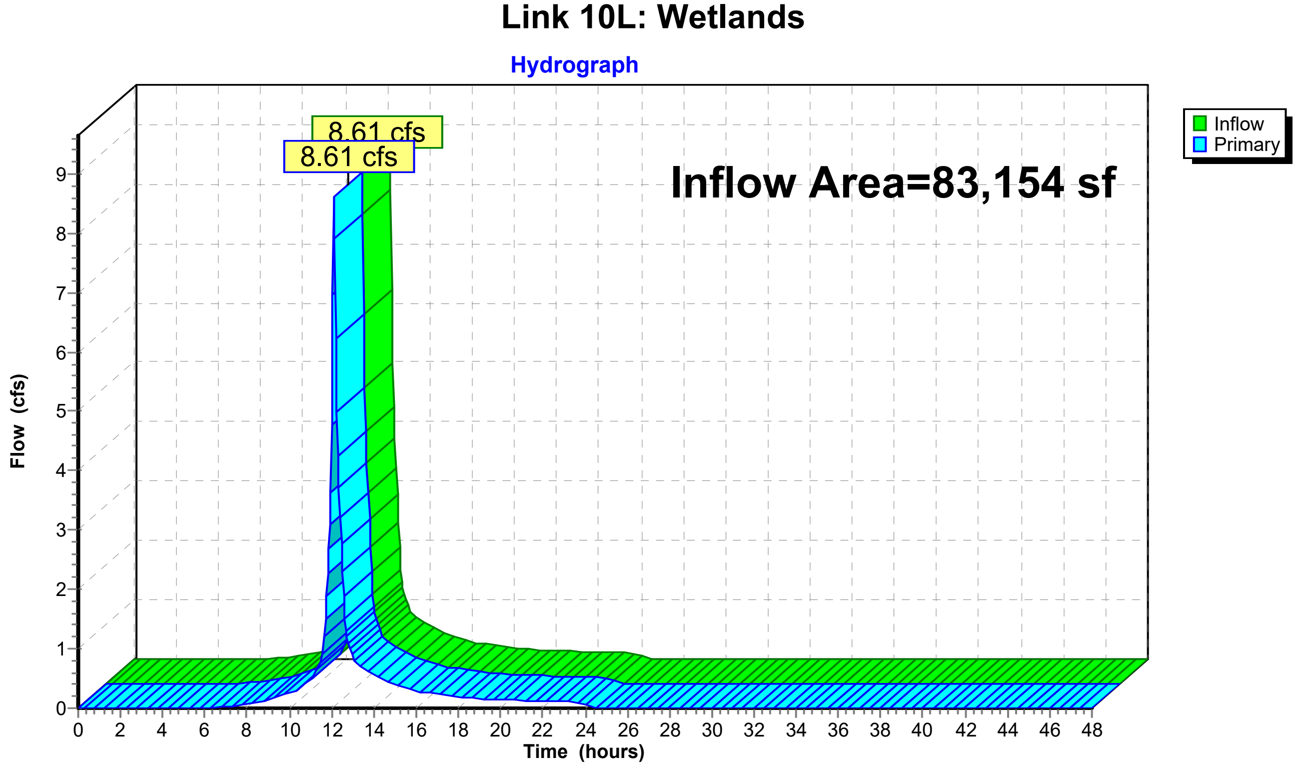
Subcatchment 20S:



Summary for Link 10L: Wetlands

Inflow Area =	83,154 sf,	34.49% Impervious,	Inflow Depth = 4.19"	for 25 Year event
Inflow =	8.61 cfs @	12.11 hrs, Volume=	29,059 cf	
Primary =	8.61 cfs @	12.11 hrs, Volume=	29,059 cf,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

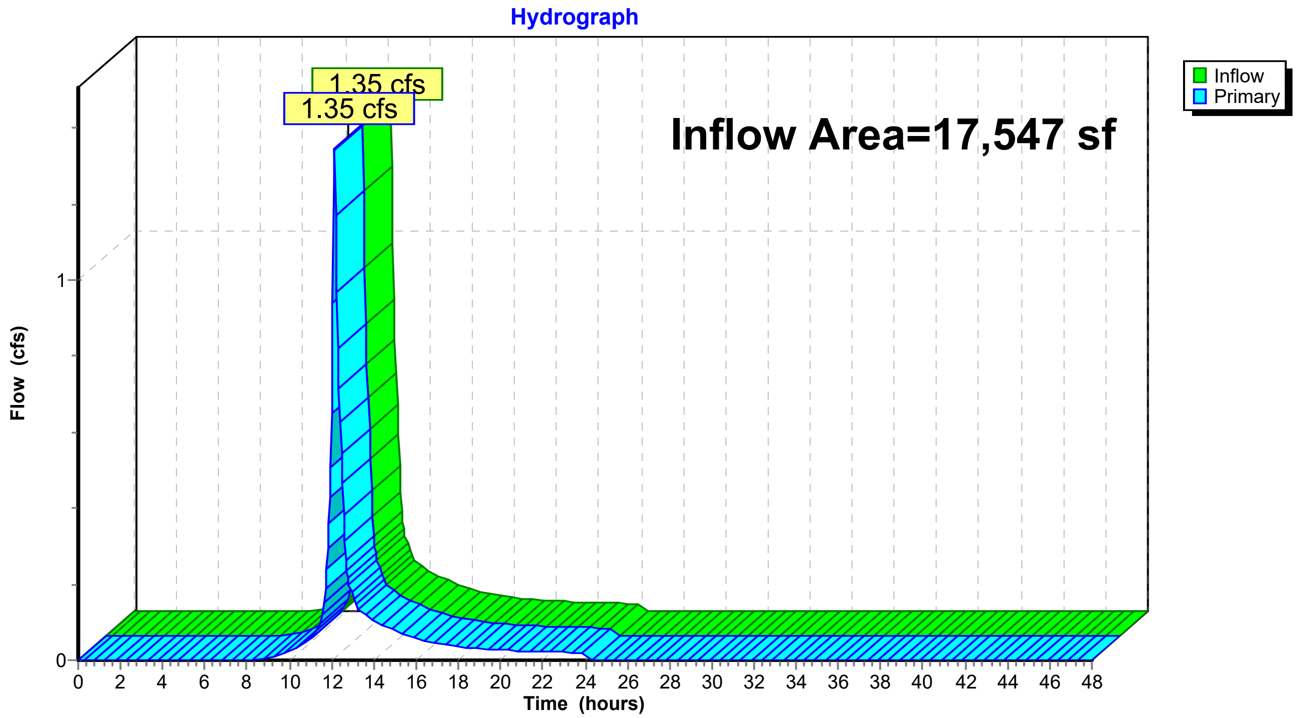


Summary for Link 20L: Street

Inflow Area = 17,547 sf, 25.75% Impervious, Inflow Depth = 3.28" for 25 Year event
Inflow = 1.35 cfs @ 12.14 hrs, Volume= 4,793 cf
Primary = 1.35 cfs @ 12.14 hrs, Volume= 4,793 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link 20L: Street



Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment10S:	Runoff Area=83,154 sf 34.49% Impervious Runoff Depth=5.82" Flow Length=149' Tc=7.8 min CN=83 Runoff=11.78 cfs 40,297 cf
Subcatchment20S:	Runoff Area=17,547 sf 25.75% Impervious Runoff Depth=4.77" Flow Length=144' Tc=9.7 min CN=74 Runoff=1.96 cfs 6,981 cf
Link 10L: Wetlands	Inflow=11.78 cfs 40,297 cf Primary=11.78 cfs 40,297 cf
Link 20L: Street	Inflow=1.96 cfs 6,981 cf Primary=1.96 cfs 6,981 cf

Total Runoff Area = 100,701 sf Runoff Volume = 47,277 cf Average Runoff Depth = 5.63"
67.03% Pervious = 67,504 sf 32.97% Impervious = 33,197 sf

Summary for Subcatchment 10S:

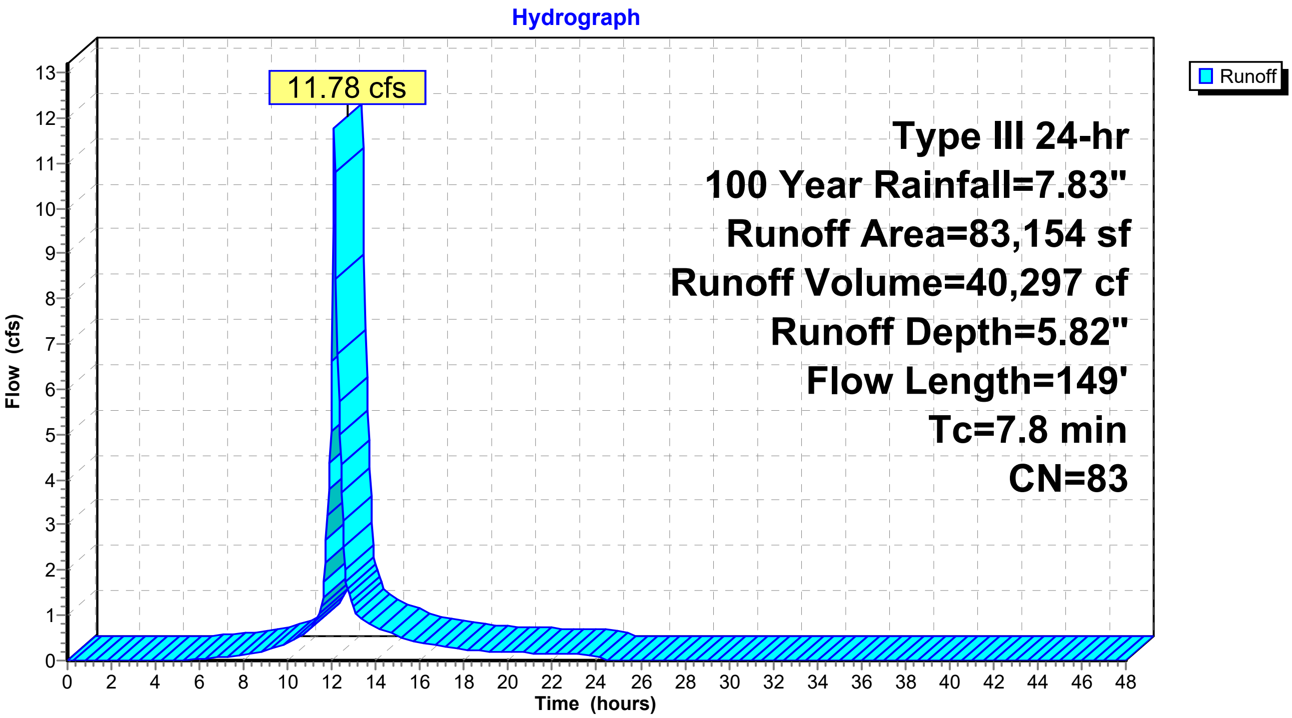
Runoff = 11.78 cfs @ 12.11 hrs, Volume= 40,297 cf, Depth= 5.82"
Routed to Link 10L : Wetlands

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=7.83"

Area (sf)	CN	Description
21,722	98	Paved parking, HSG D
6,957	98	Roofs, HSG D
12,936	80	>75% Grass cover, Good, HSG D
2,401	61	>75% Grass cover, Good, HSG B
32,605	77	Woods, Good, HSG D
6,533	55	Woods, Good, HSG B
83,154	83	Weighted Average
54,475		65.51% Pervious Area
28,679		34.49% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	50	0.0900	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
1.0	99	0.1200	1.73		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
7.8	149	Total			

Subcatchment 10S:



Summary for Subcatchment 20S:

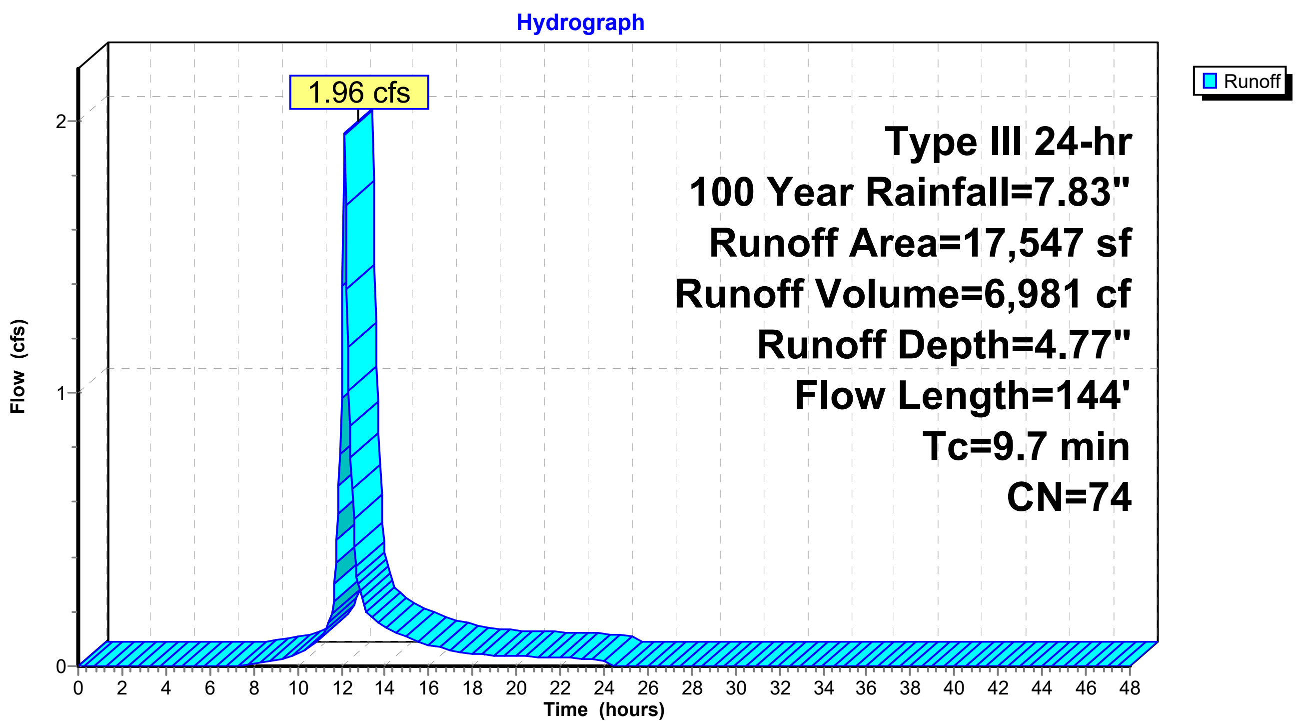
Runoff = 1.96 cfs @ 12.14 hrs, Volume= 6,981 cf, Depth= 4.77"
Routed to Link 20L : Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=7.83"

Area (sf)	CN	Description
5,565	80	>75% Grass cover, Good, HSG D
7,464	55	Woods, Good, HSG B
4,518	98	Paved parking, HSG D
17,547	74	Weighted Average
13,029		74.25% Pervious Area
4,518		25.75% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0600	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
1.8	94	0.0320	0.89		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
9.7	144	Total			

Subcatchment 20S:

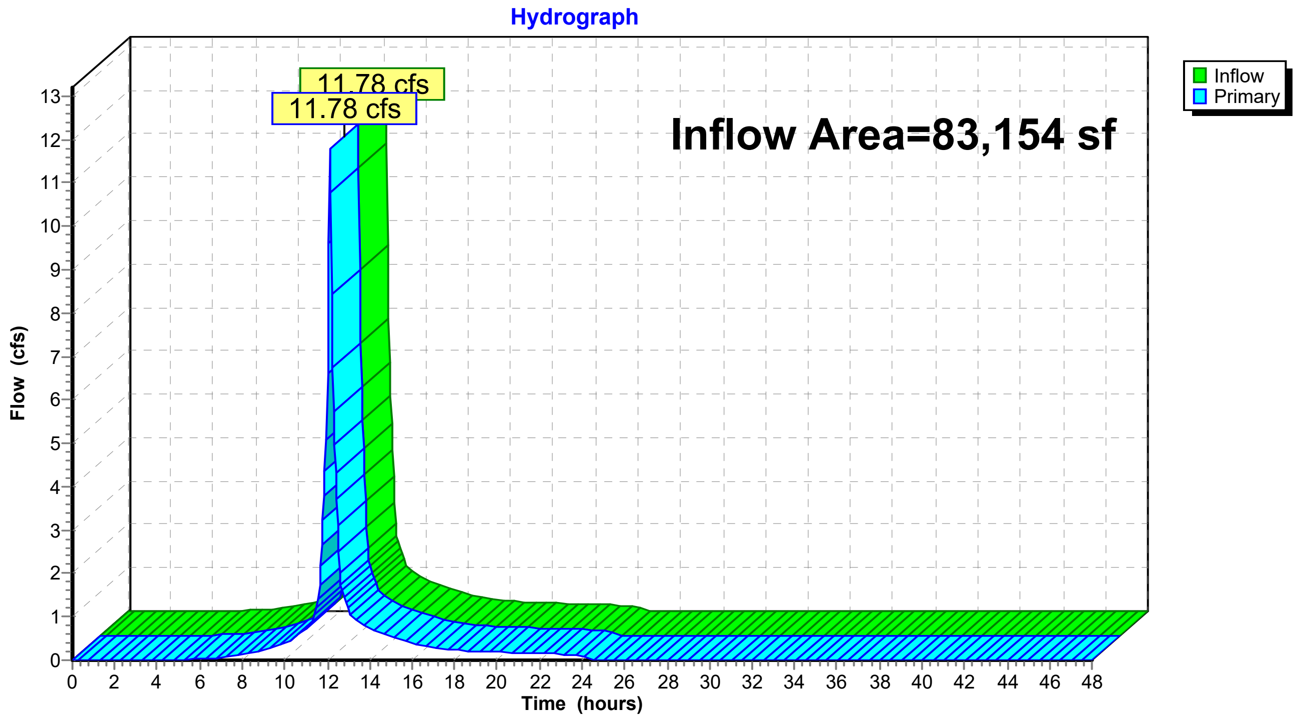


Summary for Link 10L: Wetlands

Inflow Area = 83,154 sf, 34.49% Impervious, Inflow Depth = 5.82" for 100 Year event
Inflow = 11.78 cfs @ 12.11 hrs, Volume= 40,297 cf
Primary = 11.78 cfs @ 12.11 hrs, Volume= 40,297 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

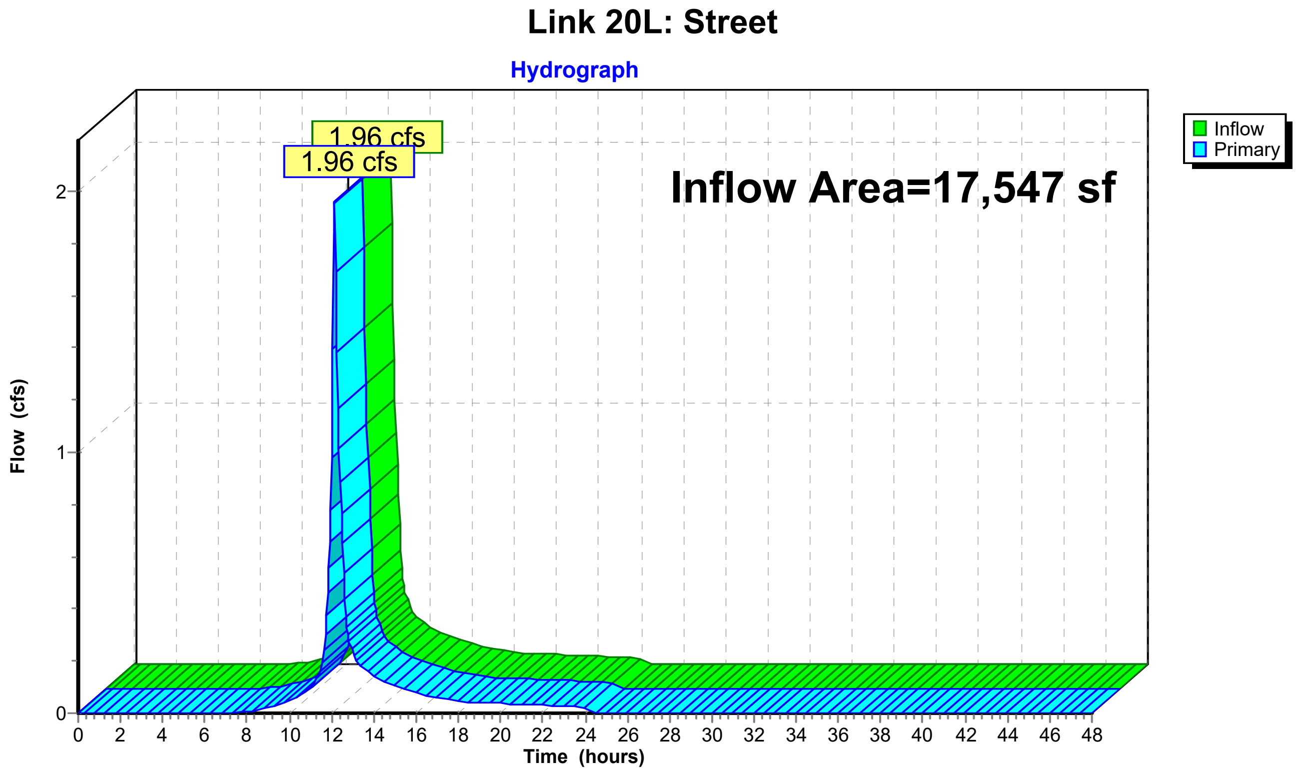
Link 10L: Wetlands



Summary for Link 20L: Street

Inflow Area = 17,547 sf, 25.75% Impervious, Inflow Depth = 4.77" for 100 Year event
Inflow = 1.96 cfs @ 12.14 hrs, Volume= 6,981 cf
Primary = 1.96 cfs @ 12.14 hrs, Volume= 6,981 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs



FUSS & O'NEILL

Appendix D

Post-Development Hydrologic Analysis

NOAA Atlas 14, Volume 10, Version 3
Location name: Carlisle, Massachusetts, USA*
Latitude: 42.5294°, Longitude: -71.3513°
Elevation: 202 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	**2**	**5**	**10**	**25**	**50**	**100**	**200**	**500**	**1000**
5-min	**0.316** (0.250-0.395)	**0.379** (0.300-0.475)	**0.483** (0.381-0.607)	**0.569** (0.446-0.719)	**0.688** (0.521-0.905)	**0.777** (0.575-1.04)	**0.871** (0.626-1.21)	**0.980** (0.662-1.38)	**1.14** (0.740-1.66)	**1.27** (0.804-1.88)
10-min	**0.448** (0.354-0.560)	**0.538** (0.425-0.673)	**0.685** (0.539-0.860)	**0.807** (0.631-1.02)	**0.975** (0.737-1.28)	**1.10** (0.816-1.48)	**1.23** (0.886-1.71)	**1.39** (0.938-1.96)	**1.61** (1.05-2.35)	**1.80** (1.14-2.67)
15-min	**0.527** (0.417-0.658)	**0.632** (0.500-0.792)	**0.805** (0.634-1.01)	**0.949** (0.743-1.20)	**1.15** (0.868-1.51)	**1.30** (0.959-1.74)	**1.45** (1.04-2.02)	**1.63** (1.10-2.30)	**1.90** (1.23-2.76)	**2.12** (1.34-3.14)
30-min	**0.719** (0.569-0.899)	**0.865** (0.683-1.08)	**1.10** (0.869-1.39)	**1.30** (1.02-1.64)	**1.57** (1.19-2.07)	**1.78** (1.32-2.38)	**1.99** (1.43-2.77)	**2.24** (1.52-3.16)	**2.61** (1.69-3.80)	**2.92** (1.84-4.32)
60-min	**0.912** (0.721-1.14)	**1.10** (0.867-1.37)	**1.40** (1.10-1.76)	**1.65** (1.29-2.08)	**2.00** (1.51-2.63)	**2.26** (1.67-3.03)	**2.53** (1.82-3.52)	**2.85** (1.93-4.02)	**3.32** (2.16-4.84)	**3.71** (2.35-5.50)
2-hr	**1.16** (0.924-1.44)	**1.41** (1.12-1.76)	**1.83** (1.45-2.28)	**2.17** (1.71-2.72)	**2.64** (2.02-3.47)	**2.99** (2.24-4.01)	**3.38** (2.46-4.70)	**3.84** (2.61-5.38)	**4.56** (2.97-6.59)	**5.18** (3.29-7.62)
3-hr	**1.34** (1.07-1.65)	**1.64** (1.31-2.02)	**2.12** (1.70-2.64)	**2.53** (2.01-3.16)	**3.09** (2.37-4.04)	**3.50** (2.64-4.68)	**3.96** (2.90-5.50)	**4.52** (3.07-6.31)	**5.40** (3.52-7.77)	**6.16** (3.92-9.02)
6-hr	**1.71** (1.38-2.10)	**2.10** (1.69-2.57)	**2.73** (2.19-3.36)	**3.25** (2.60-4.02)	**3.97** (3.07-5.15)	**4.50** (3.41-5.97)	**5.08** (3.75-7.03)	**5.82** (3.97-8.05)	**6.96** (4.55-9.94)	**7.96** (5.08-11.6)
12-hr	**2.17** (1.77-2.64)	**2.65** (2.16-3.23)	**3.44** (2.79-4.20)	**4.09** (3.30-5.02)	**4.99** (3.89-6.42)	**5.66** (4.31-7.44)	**6.38** (4.72-8.73)	**7.28** (4.99-10.0)	**8.66** (5.69-12.3)	**9.86** (6.31-14.2)
24-hr	**2.60** (2.14-3.14)	**3.20** (2.62-3.86)	**4.18** (3.41-5.06)	**4.99** (4.05-6.08)	**6.11** (4.79-7.79)	**6.93** (5.31-9.04)	**7.83** (5.83-10.6)	**8.95** (6.16-12.2)	**10.7** (7.04-15.0)	**12.2** (7.82-17.4)
2-day	**2.94** (2.44-3.52)	**3.67** (3.04-4.40)	**4.87** (4.01-5.85)	**5.86** (4.79-7.07)	**7.22** (5.70-9.16)	**8.21** (6.35-10.7)	**9.32** (7.00-12.6)	**10.7** (7.41-14.5)	**12.9** (8.55-18.1)	**14.9** (9.59-21.1)
3-day	**3.22** (2.68-3.84)	**4.00** (3.33-4.78)	**5.28** (4.37-6.32)	**6.34** (5.22-7.63)	**7.80** (6.19-9.86)	**8.87** (6.89-11.5)	**10.1** (7.59-13.6)	**11.6** (8.02-15.6)	**14.0** (9.25-19.4)	**16.1** (10.4-22.7)
4-day	**3.49** (2.91-4.14)	**4.29** (3.58-5.10)	**5.61** (4.66-6.69)	**6.71** (5.53-8.04)	**8.21** (6.54-10.3)	**9.32** (7.26-12.0)	**10.5** (7.97-14.2)	**12.1** (8.41-16.2)	**14.6** (9.67-20.2)	**16.8** (10.8-23.6)
7-day	**4.22** (3.55-4.98)	**5.06** (4.25-5.98)	**6.44** (5.38-7.62)	**7.58** (6.29-9.02)	**9.15** (7.32-11.4)	**10.3** (8.05-13.1)	**11.6** (8.76-15.4)	**13.2** (9.19-17.6)	**15.7** (10.4-21.6)	**17.9** (11.6-25.0)
10-day	**4.90** (4.14-5.75)	**5.76** (4.86-6.78)	**7.18** (6.03-8.46)	**8.35** (6.96-9.90)	**9.96** (8.00-12.3)	**11.2** (8.74-14.1)	**12.5** (9.42-16.4)	**14.0** (9.84-18.6)	**16.5** (11.0-22.6)	**18.6** (12.1-25.9)
20-day	**6.85** (5.84-7.98)	**7.79** (6.63-9.09)	**9.33** (7.91-10.9)	**10.6** (8.93-12.5)	**12.4** (9.97-15.1)	**13.7** (10.7-17.0)	**15.1** (11.4-19.4)	**16.6** (11.7-21.8)	**18.8** (12.6-25.5)	**20.6** (13.4-28.5)
30-day	**8.48** (7.26-9.83)	**9.48** (8.11-11.0)	**11.1** (9.48-13.0)	**12.5** (10.6-14.6)	**14.4** (11.6-17.4)	**15.8** (12.4-19.5)	**17.3** (13.0-21.9)	**18.8** (13.3-24.5)	**20.8** (14.0-28.0)	**22.3** (14.6-30.7)
45-day	**10.5** (9.06-12.1)	**11.6** (9.98-13.4)	**13.4** (11.5-15.5)	**14.9** (12.6-17.3)	**16.9** (13.7-20.3)	**18.5** (14.5-22.5)	**20.0** (15.0-25.1)	**21.5** (15.3-27.9)	**23.4** (15.8-31.3)	**24.7** (16.1-33.8)
60-day	**12.3** (10.6-14.1)	**13.4** (11.6-15.4)	**15.3** (13.1-17.6)	**16.8** (14.4-19.5)	**19.0** (15.4-22.7)	**20.7** (16.3-25.1)	**22.3** (16.7-27.7)	**23.8** (17.0-30.8)	**25.6** (17.3-34.2)	**26.9** (17.6-36.7)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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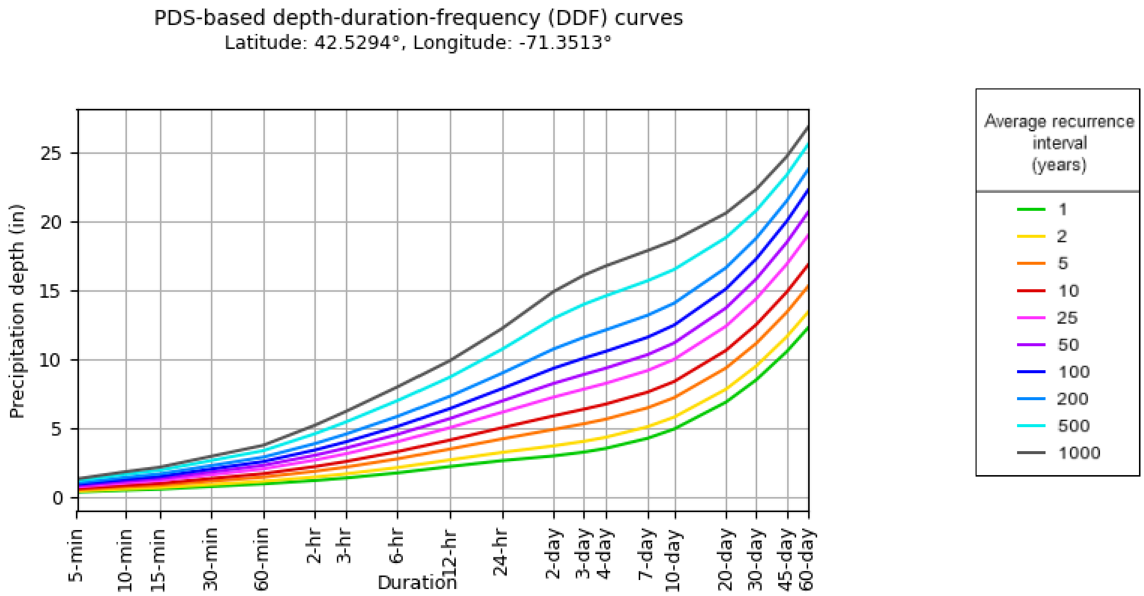
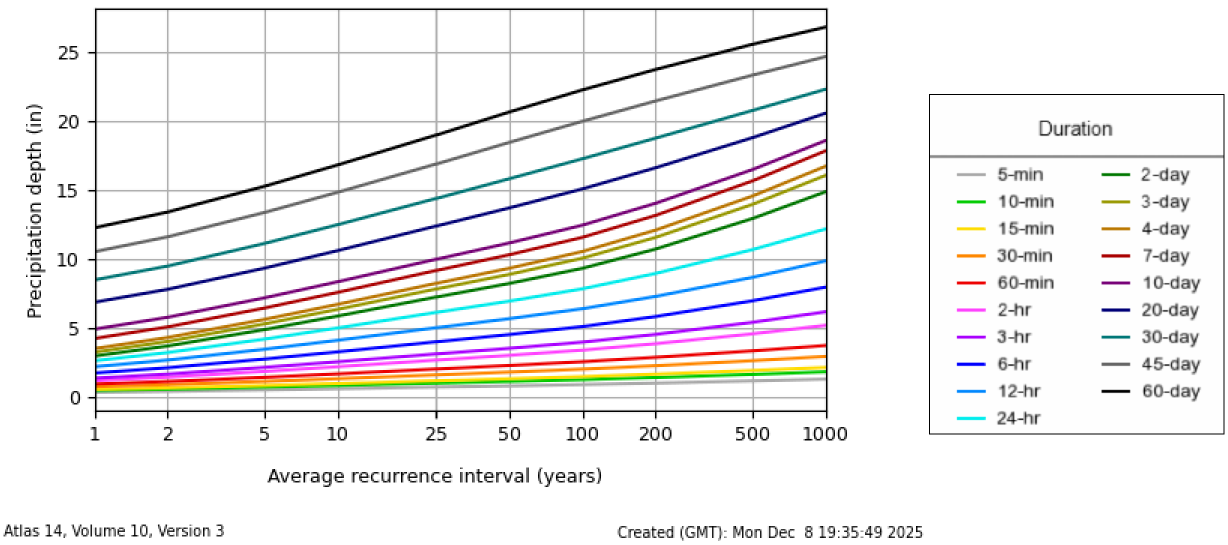
PF graphical





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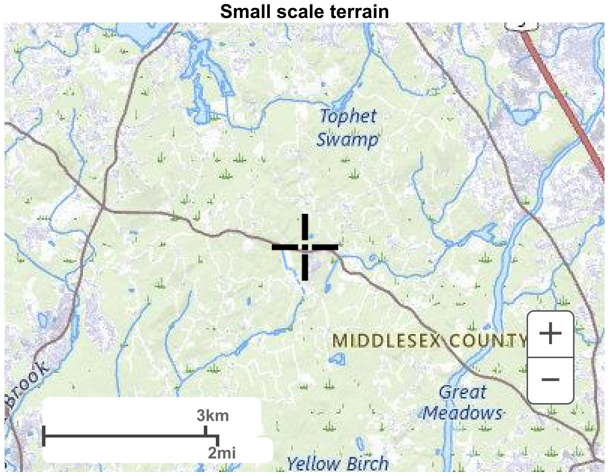
Maps & aerials

Small scale terrain



Large scale terrain

Large scale map

Large scale aerial

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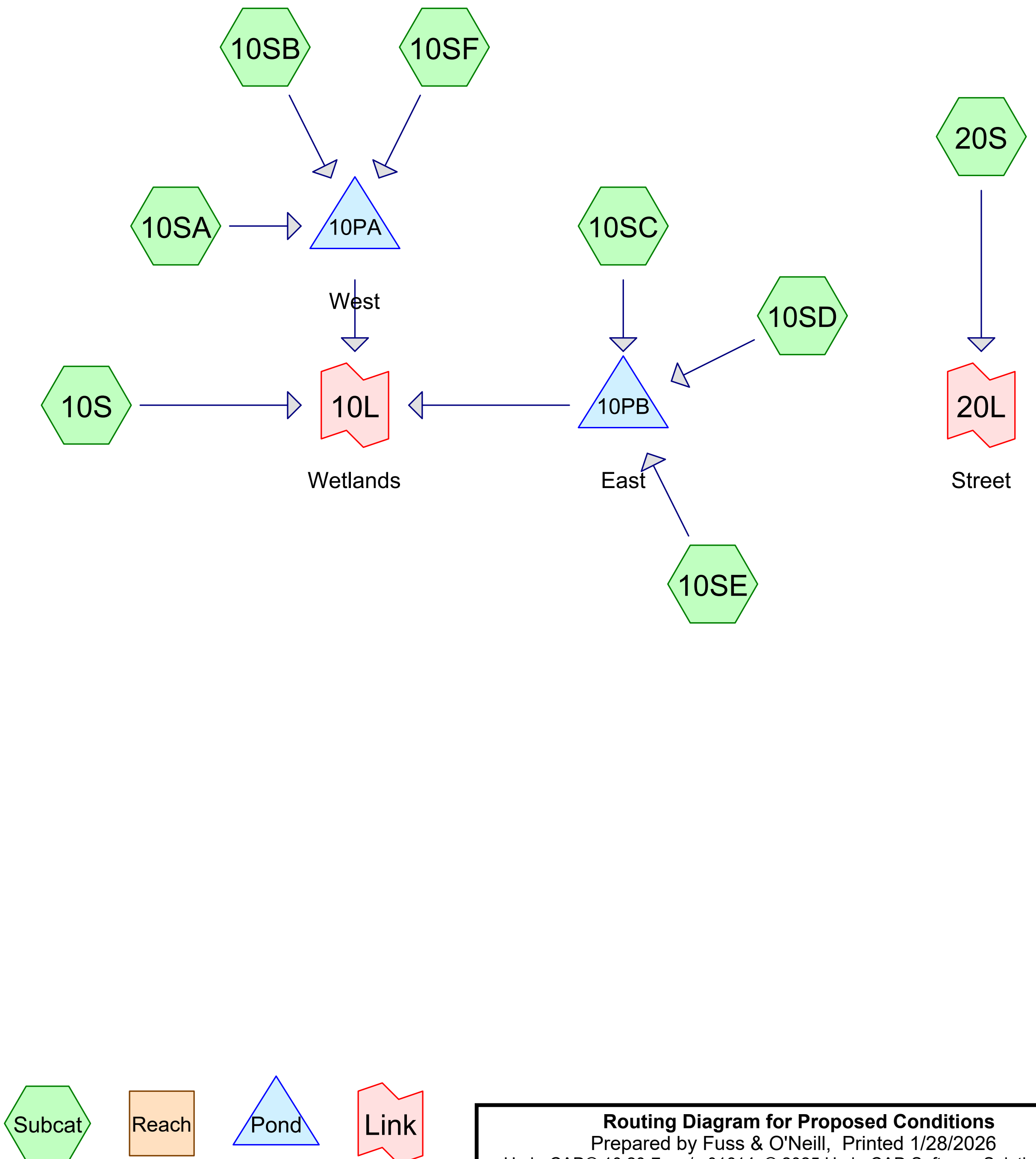
US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov



Routing Diagram for Proposed Conditions
Prepared by Fuss & O'Neill, Printed 1/28/2026

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2 Year	Type III 24-hr		Default	24.00	1	3.20	2
2	10 Year	Type III 24-hr		Default	24.00	1	4.99	2
3	25 Year	Type III 24-hr		Default	24.00	1	6.11	2
4	100 Year	Type III 24-hr		Default	24.00	1	7.83	2

Area Listing (selected nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
16,059	61	>75% Grass cover, Good, HSG B (10S, 20S)
21,415	80	>75% Grass cover, Good, HSG D (10S, 10SA, 10SB, 10SC, 10SD, 20S)
33,351	98	Paved parking, HSG D (10SA, 10SB, 10SC, 10SD, 20S)
339	98	Roofs, HSG B (10SF)
15,014	98	Roofs, HSG D (10SE, 10SF)
14,523	77	Woods, Good, HSG D (10S)
100,701	**85**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
16,398	HSG B	10S, 10SF, 20S
0	HSG C	
84,303	HSG D	10S, 10SA, 10SB, 10SC, 10SD, 10SE, 10SF, 20S
0	Other	
100,701		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Su Nu
0	16,059	0	21,415	0	37,474	>75% Grass cover, Good	
0	0	0	33,351	0	33,351	Paved parking	
0	339	0	15,014	0	15,353	Roofs	
0	0	0	14,523	0	14,523	Woods, Good	
0	**16,398**	**0**	**84,303**	**0**	**100,701**	**TOTAL AREA**	

Pipe Listing (selected nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)	Node Name
1	10PA	187.00	186.80	13.0	0.0154	0.013	0.0	12.0	0.0	
2	10PB	187.00	186.75	21.0	0.0119	0.013	0.0	12.0	0.0	

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment10S: Runoff Area=31,214 sf 0.00% Impervious Runoff Depth=0.98"
Flow Length=85' Slope=0.1400 '/' Tc=6.0 min CN=73 Runoff=0.77 cfs 2,556 cf

Subcatchment10SA: Runoff Area=6,972 sf 48.77% Impervious Runoff Depth=2.08"
Tc=5.0 min CN=89 Runoff=0.40 cfs 1,209 cf

Subcatchment10SB: Runoff Area=9,585 sf 94.11% Impervious Runoff Depth=2.86"
Tc=5.0 min CN=97 Runoff=0.70 cfs 2,282 cf

Subcatchment10SC: Runoff Area=12,245 sf 83.50% Impervious Runoff Depth=2.64"
Tc=5.0 min CN=95 Runoff=0.85 cfs 2,699 cf

Subcatchment10SD: Runoff Area=10,640 sf 85.20% Impervious Runoff Depth=2.64"
Tc=5.0 min CN=95 Runoff=0.74 cfs 2,345 cf

Subcatchment10SE: Runoff Area=13,769 sf 100.00% Impervious Runoff Depth=2.97"
Tc=5.0 min CN=98 Runoff=1.02 cfs 3,405 cf

Subcatchment10SF: Runoff Area=1,584 sf 100.00% Impervious Runoff Depth=2.97"
Tc=5.0 min CN=98 Runoff=0.12 cfs 392 cf

Subcatchment20S: Runoff Area=14,692 sf 11.18% Impervious Runoff Depth=0.93"
Tc=5.0 min CN=72 Runoff=0.35 cfs 1,138 cf

Pond 10PA: West Peak Elev=187.69' Storage=615 cf Inflow=1.22 cfs 3,883 cf
Outflow=0.63 cfs 3,881 cf

Pond 10PB: East Peak Elev=188.16' Storage=1,833 cf Inflow=2.61 cfs 8,449 cf
Outflow=0.98 cfs 8,445 cf

Link 10L: Wetlands Inflow=2.18 cfs 14,883 cf
Primary=2.18 cfs 14,883 cf

Link 20L: Street Inflow=0.35 cfs 1,138 cf
Primary=0.35 cfs 1,138 cf

Total Runoff Area = 100,701 sf Runoff Volume = 16,026 cf Average Runoff Depth = 1.91"
51.64% Pervious = 51,997 sf 48.36% Impervious = 48,704 sf

Summary for Subcatchment 10S:

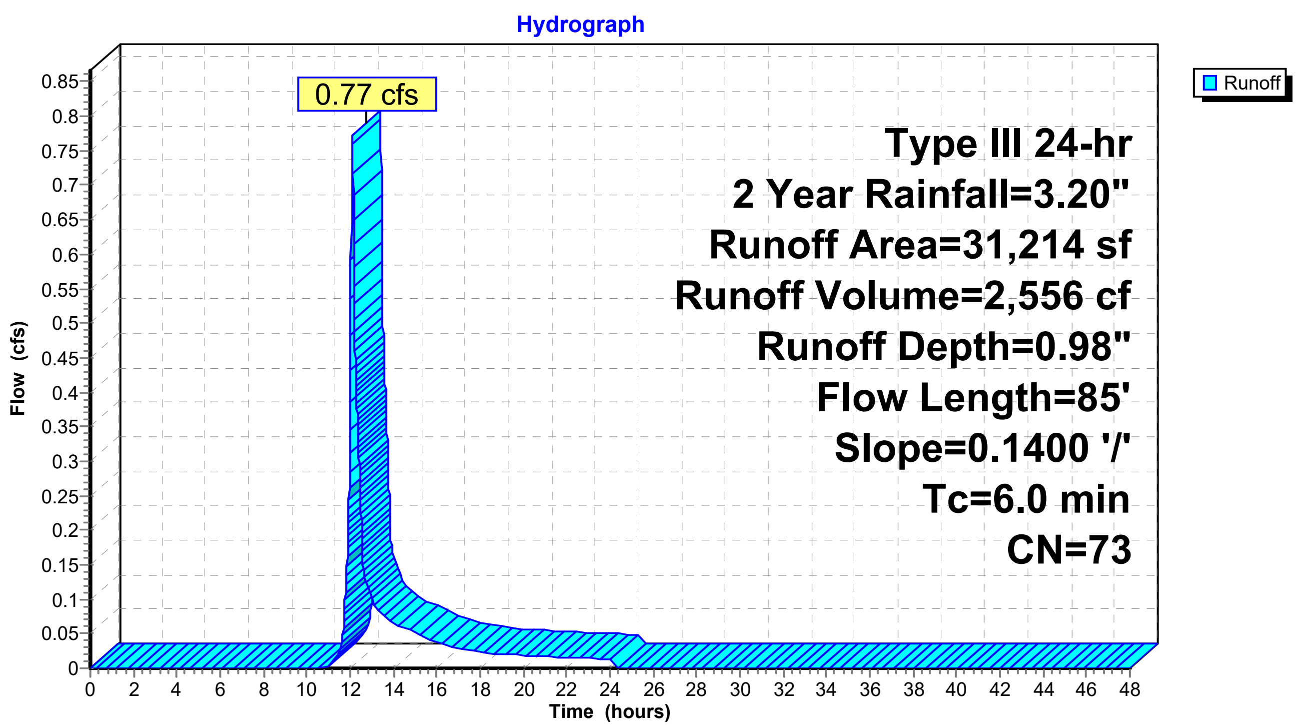
Runoff = 0.77 cfs @ 12.10 hrs, Volume= 2,556 cf, Depth= 0.98"
Routed to Link 10L : Wetlands

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 Year Rainfall=3.20"

Area (sf)	CN	Description
8,595	61	>75% Grass cover, Good, HSG B
8,096	80	>75% Grass cover, Good, HSG D
14,523	77	Woods, Good, HSG D
31,214	73	Weighted Average
31,214		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	50	0.1400	0.15		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.3	35	0.1400	1.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
6.0	85	Total			

Subcatchment 10S:



Summary for Subcatchment 10SA:

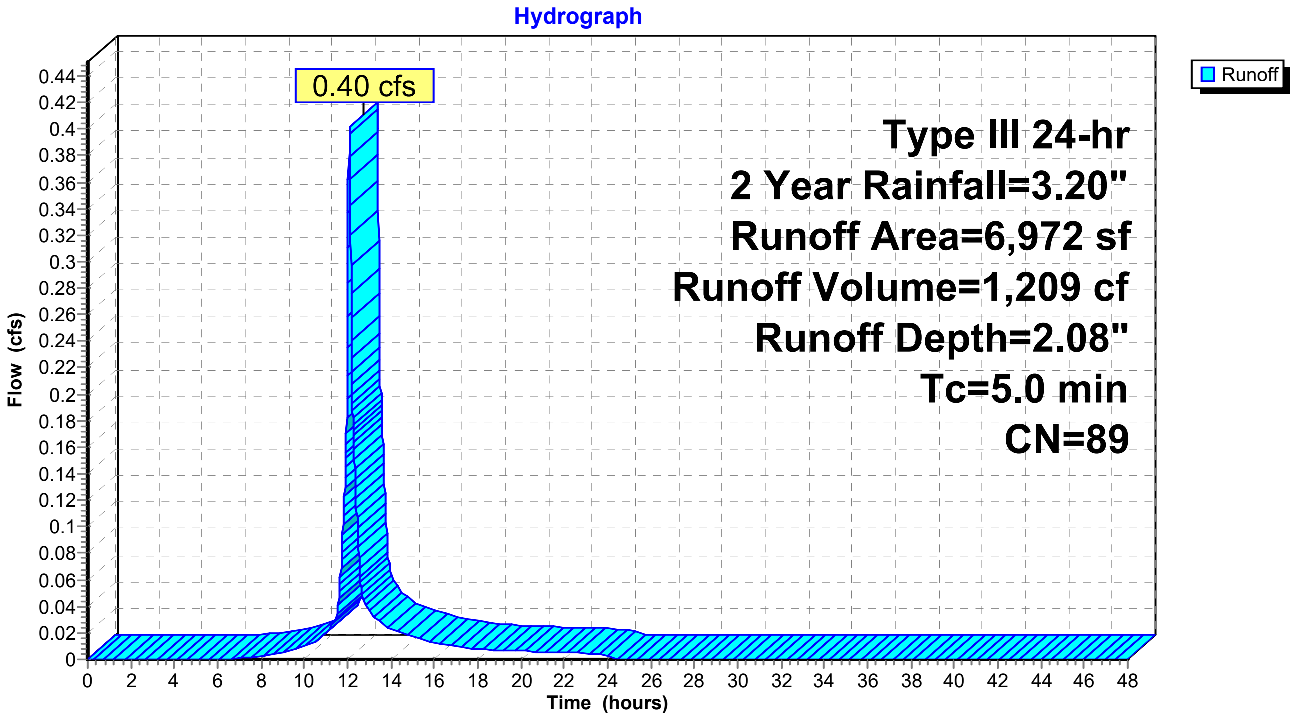
Runoff = 0.40 cfs @ 12.07 hrs, Volume= 1,209 cf, Depth= 2.08"
Routed to Pond 10PA : West

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 Year Rainfall=3.20"

Area (sf)	CN	Description
3,400	98	Paved parking, HSG D
3,572	80	>75% Grass cover, Good, HSG D
6,972	89	Weighted Average
3,572		51.23% Pervious Area
3,400		48.77% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 10SA:



Summary for Subcatchment 10SB:

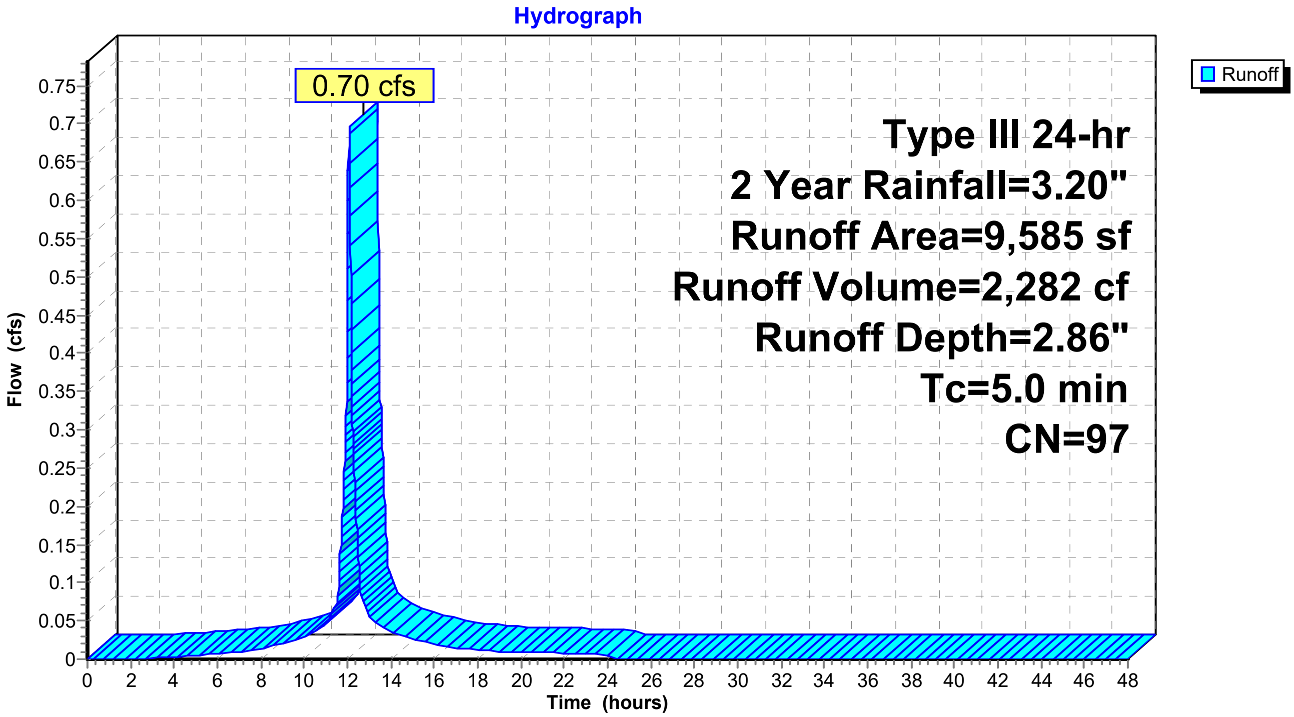
Runoff = 0.70 cfs @ 12.07 hrs, Volume= 2,282 cf, Depth= 2.86"
Routed to Pond 10PA : West

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 Year Rainfall=3.20"

Area (sf)	CN	Description
9,020	98	Paved parking, HSG D
565	80	>75% Grass cover, Good, HSG D
9,585	97	Weighted Average
565		5.89% Pervious Area
9,020		94.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 10SB:



Summary for Subcatchment 10SC:

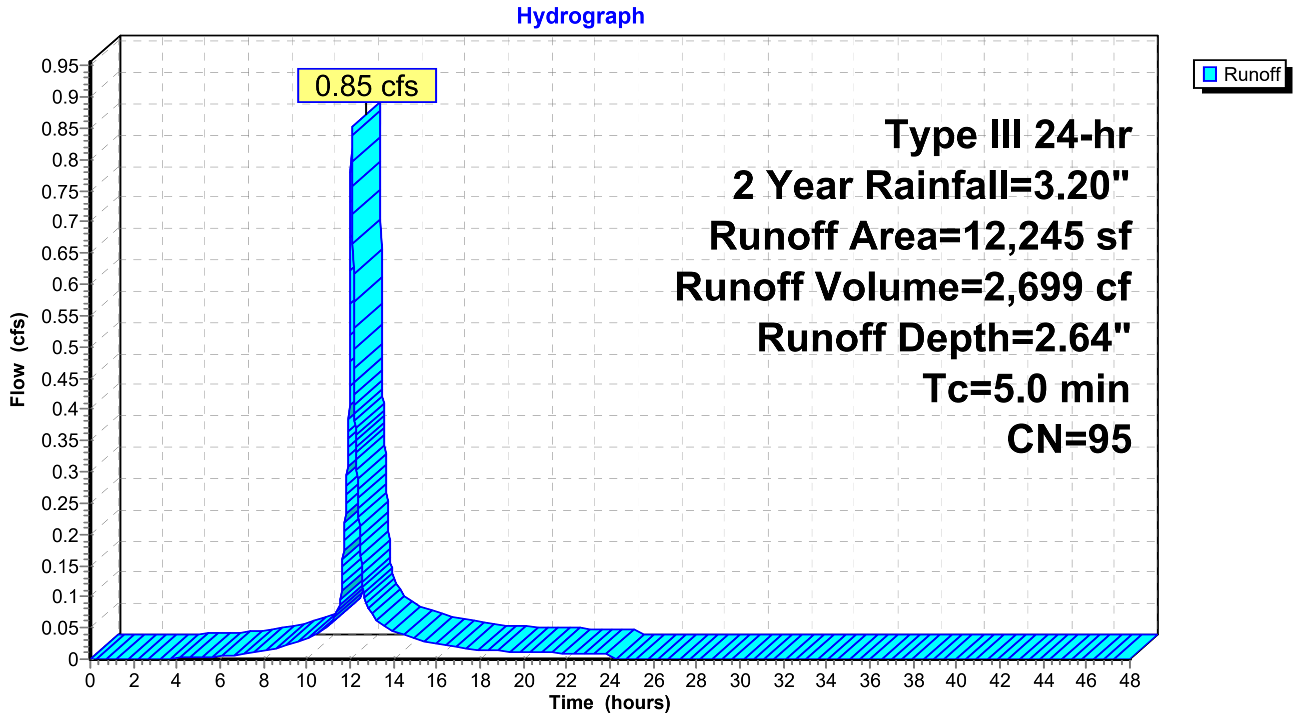
Runoff = 0.85 cfs @ 12.07 hrs, Volume= 2,699 cf, Depth= 2.64"
Routed to Pond 10PB : East

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 Year Rainfall=3.20"

Area (sf)	CN	Description
2,021	80	>75% Grass cover, Good, HSG D
10,224	98	Paved parking, HSG D
12,245	95	Weighted Average
2,021		16.50% Pervious Area
10,224		83.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 10SC:



Summary for Subcatchment 10SD:

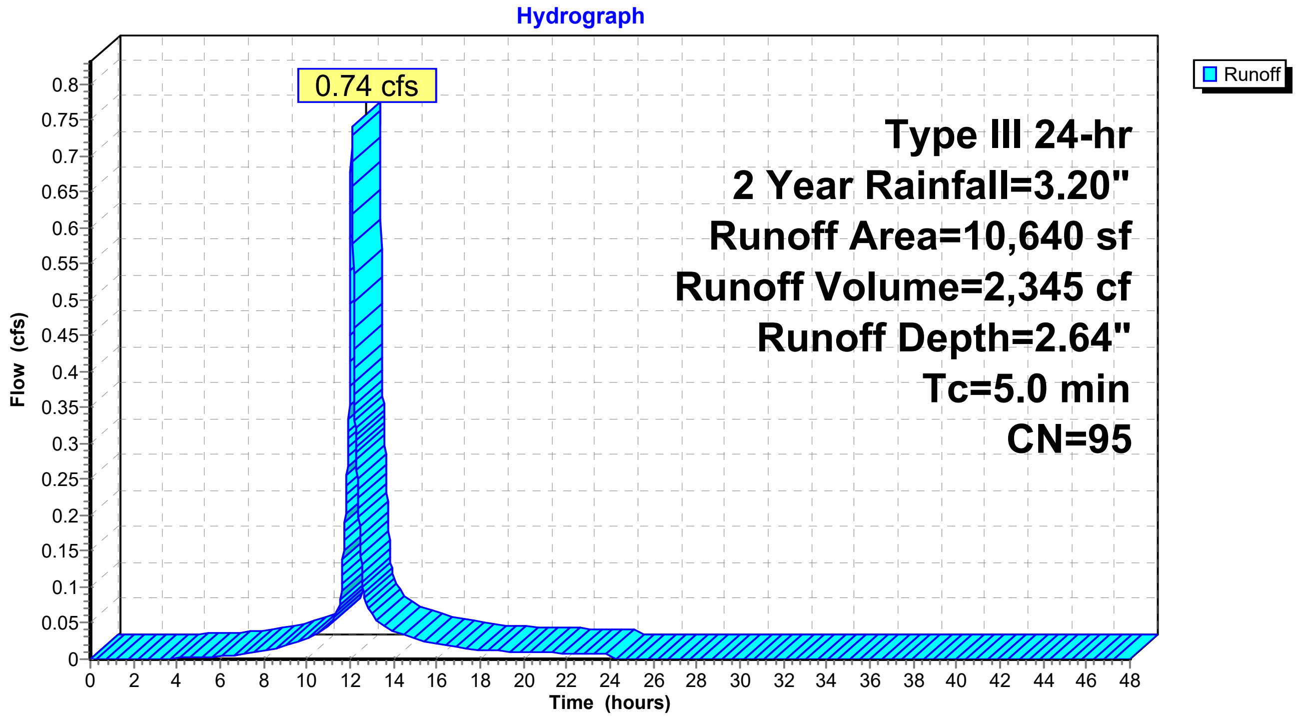
Runoff = 0.74 cfs @ 12.07 hrs, Volume= 2,345 cf, Depth= 2.64"
Routed to Pond 10PB : East

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 Year Rainfall=3.20"

Area (sf)	CN	Description
9,065	98	Paved parking, HSG D
1,575	80	>75% Grass cover, Good, HSG D
10,640	95	Weighted Average
1,575		14.80% Pervious Area
9,065		85.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 10SD:



Summary for Subcatchment 10SE:

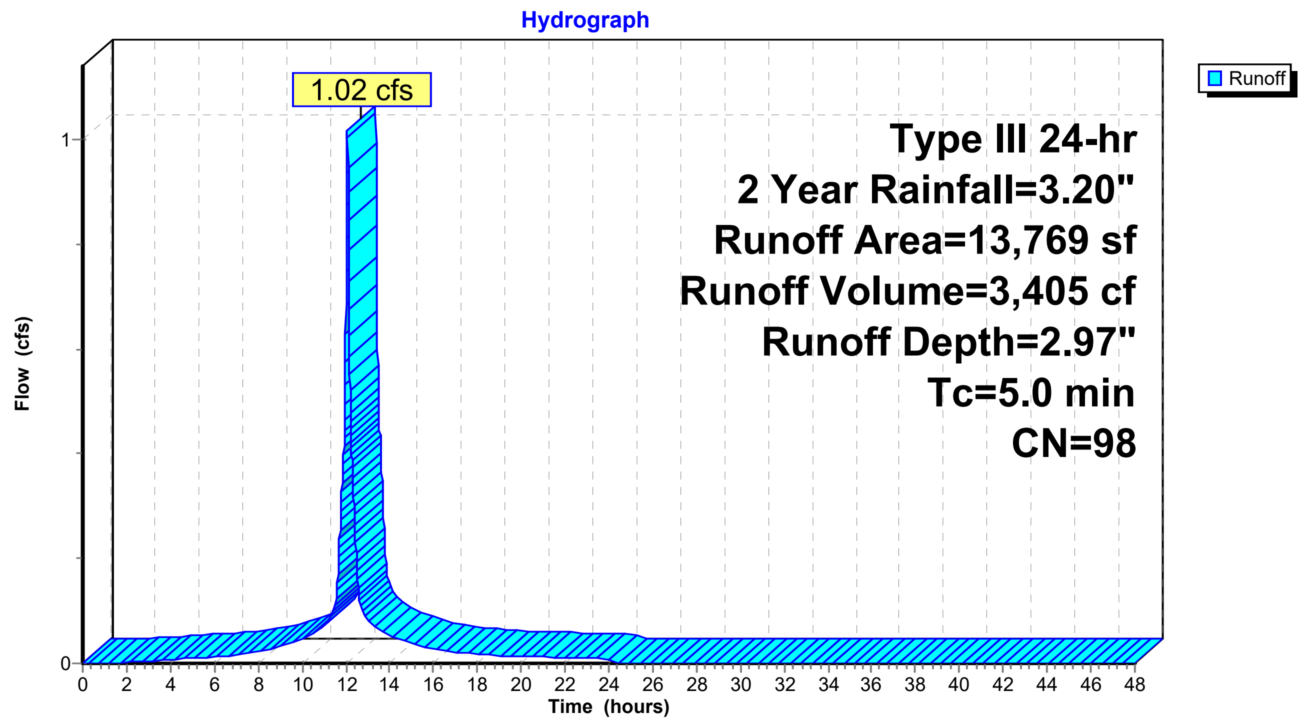
Runoff = 1.02 cfs @ 12.07 hrs, Volume= 3,405 cf, Depth= 2.97"
Routed to Pond 10PB : East

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 Year Rainfall=3.20"

Area (sf)	CN	Description
13,769	98	Roofs, HSG D
13,769		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 10SE:



Summary for Subcatchment 10SF:

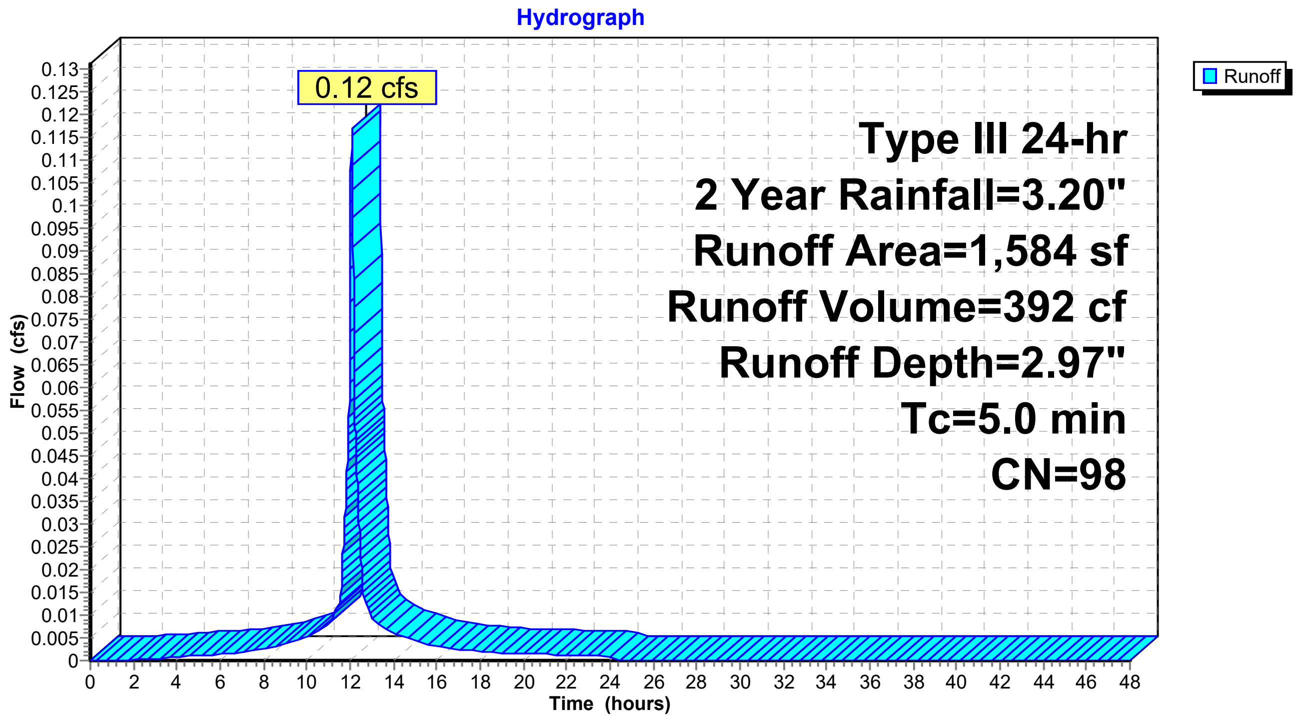
Runoff = 0.12 cfs @ 12.07 hrs, Volume= 392 cf, Depth= 2.97"
Routed to Pond 10PA : West

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 Year Rainfall=3.20"

Area (sf)	CN	Description
1,245	98	Roofs, HSG D
339	98	Roofs, HSG B
1,584	98	Weighted Average
1,584		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 10SF:



Summary for Subcatchment 20S:

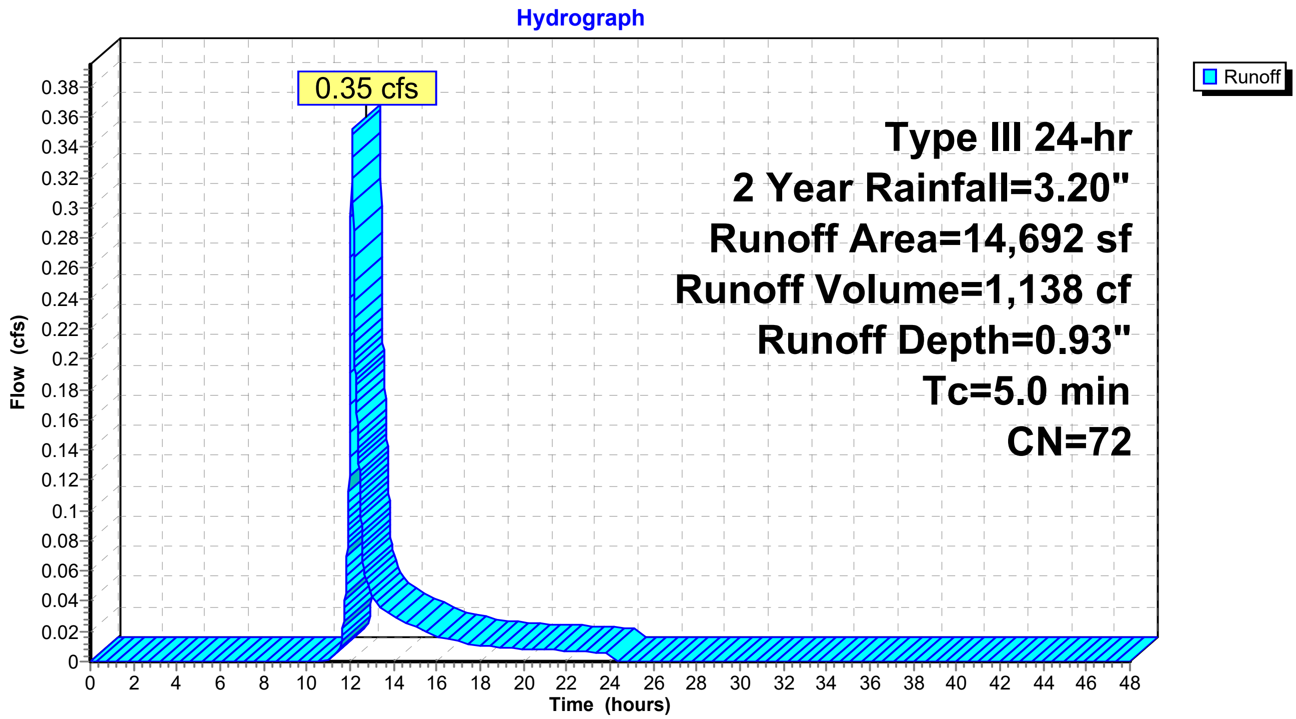
Runoff = 0.35 cfs @ 12.08 hrs, Volume= 1,138 cf, Depth= 0.93"
Routed to Link 20L : Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 Year Rainfall=3.20"

Area (sf)	CN	Description
5,586	80	>75% Grass cover, Good, HSG D
7,464	61	>75% Grass cover, Good, HSG B
1,642	98	Paved parking, HSG D
14,692	72	Weighted Average
13,050		88.82% Pervious Area
1,642		11.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 20S:



Summary for Pond 10PA: West

Inflow Area = 18,141 sf, 77.20% Impervious, Inflow Depth = 2.57" for 2 Year event
Inflow = 1.22 cfs @ 12.07 hrs, Volume= 3,883 cf
Outflow = 0.63 cfs @ 12.19 hrs, Volume= 3,881 cf, Atten= 49%, Lag= 7.3 min
Primary = 0.63 cfs @ 12.19 hrs, Volume= 3,881 cf
Routed to Link 10L : Wetlands

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 187.69' @ 12.19 hrs Surf.Area= 1,726 sf Storage= 615 cf

Plug-Flow detention time= 26.6 min calculated for 3,880 cf (100% of inflow)
Center-of-Mass det. time= 26.5 min (804.7 - 778.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	187.00'	1,566 cf	**44.25'W x 39.02'L x 3.50'H Field A** 6,043 cf Overall - 2,129 cf Embedded = 3,914 cf x 40.0% Voids
#2A	187.50'	2,129 cf	**Cultec R-300HD** x 45 Inside #1 Effective Size= 45.6"W x 30.0"H => 6.53 sf x 7.08'L = 46.2 cf Overall Size= 51.0"W x 30.0"H x 7.54'L with 0.46' Overlap 45 Chambers in 9 Rows Cap Storage= 2.7 cf x 2 x 9 rows = 47.8 cf
		3,694 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	187.00'	**12.0" Round Culvert** L= 13.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 187.00' / 186.80' S= 0.0154 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	190.00'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Device 1	187.00'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.63 cfs @ 12.19 hrs HW=187.69' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.63 cfs of 1.45 cfs potential flow)
  ├─**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
  └─**3=Orifice/Grate** (Orifice Controls 0.63 cfs @ 3.19 fps)

Pond 10PA: West - Chamber Wizard Field A

Chamber Model = Cultec R-300HD (Cultec Recharger®300HD)
Effective Size= 45.6"W x 30.0"H => 6.53 sf x 7.08'L = 46.2 cf
Overall Size= 51.0"W x 30.0"H x 7.54'L with 0.46' Overlap
Cap Storage= 2.7 cf x 2 x 9 rows = 47.8 cf

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

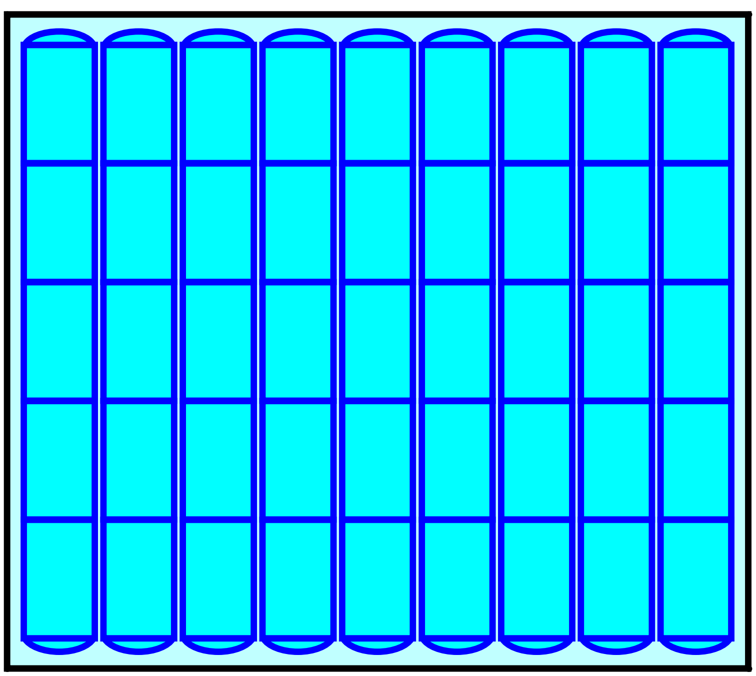
5 Chambers/Row x 7.08' Long +0.80' Cap Length x 2 = 37.02' Row Length +12.0" End Stone x 2 = 39.02' Base Length
9 Rows x 51.0" Wide + 6.0" Spacing x 8 + 12.0" Side Stone x 2 = 44.25' Base Width
6.0" Stone Base + 30.0" Chamber Height + 6.0" Stone Cover = 3.50' Field Height

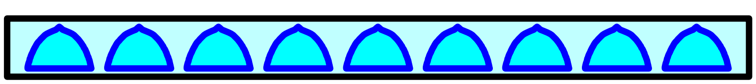
45 Chambers x 46.2 cf + 2.7 cf Cap Volume x 2 x 9 Rows = 2,128.7 cf Chamber Storage

6,042.7 cf Field - 2,128.7 cf Chambers = 3,914.0 cf Stone x 40.0% Voids = 1,565.6 cf Stone Storage

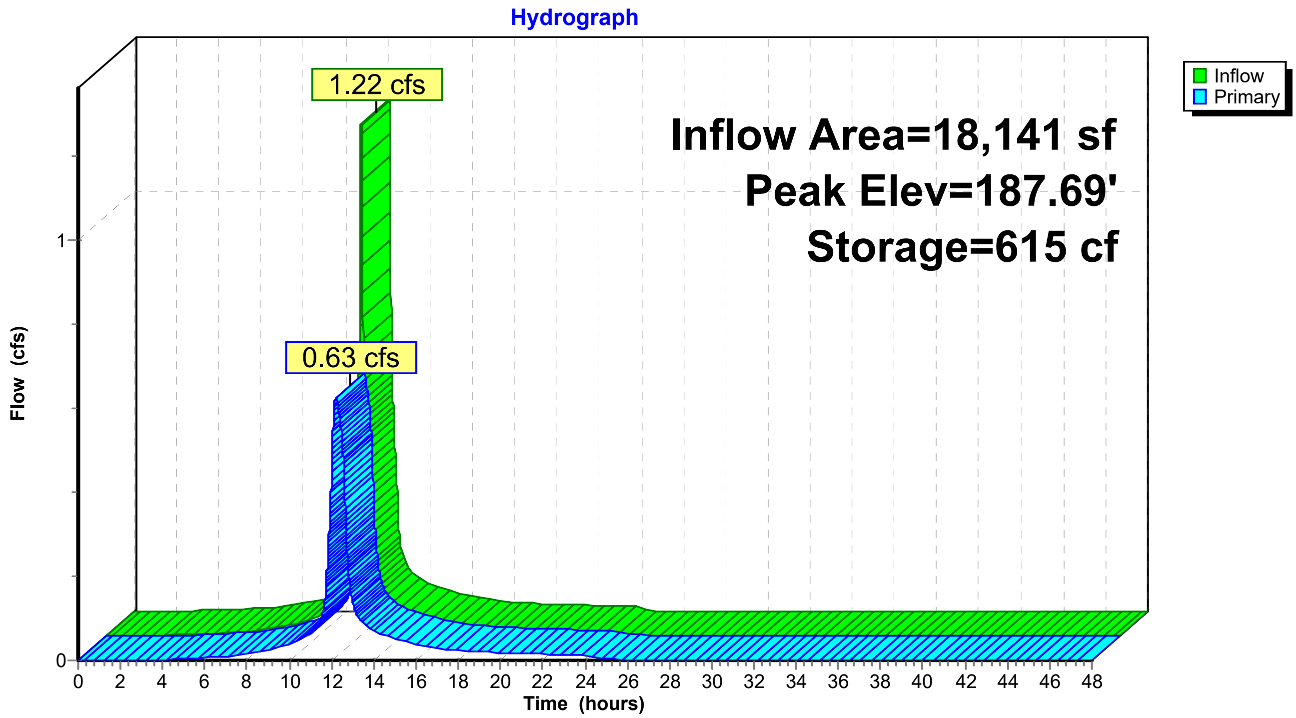
Chamber Storage + Stone Storage = 3,694.3 cf = 0.085 af
Overall Storage Efficiency = 61.1%
Overall System Size = 39.02' x 44.25' x 3.50'

45 Chambers
223.8 cy Field
145.0 cy Stone





Pond 10PA: West



Summary for Pond 10PB: East

Inflow Area = 36,654 sf, 90.19% Impervious, Inflow Depth = 2.77" for 2 Year event
Inflow = 2.61 cfs @ 12.07 hrs, Volume= 8,449 cf
Outflow = 0.98 cfs @ 12.29 hrs, Volume= 8,445 cf, Atten= 62%, Lag= 13.2 min
Primary = 0.98 cfs @ 12.29 hrs, Volume= 8,445 cf
Routed to Link 10L : Wetlands

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 188.16' @ 12.29 hrs Surf.Area= 2,468 sf Storage= 1,833 cf

Plug-Flow detention time= 32.1 min calculated for 8,444 cf (100% of inflow)
Center-of-Mass det. time= 32.0 min (802.2 - 770.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	187.00'	2,225 cf	**63.25'W x 39.02'L x 3.50'H Field A** 8,637 cf Overall - 3,075 cf Embedded = 5,563 cf x 40.0% Voids
#2A	187.50'	3,075 cf	**Cultec R-300HD** x 65 Inside #1 Effective Size= 45.6"W x 30.0"H => 6.53 sf x 7.08'L = 46.2 cf Overall Size= 51.0"W x 30.0"H x 7.54'L with 0.46' Overlap 65 Chambers in 13 Rows Cap Storage= 2.7 cf x 2 x 13 rows = 69.0 cf
		5,300 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	187.00'	**12.0" Round Culvert** L= 21.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 187.00' / 186.75' S= 0.0119 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	190.00'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Device 1	187.00'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	188.00'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.98 cfs @ 12.29 hrs HW=188.16' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.98 cfs of 3.02 cfs potential flow)
  ├─**2=Sharp-Crested Rectangular Weir**(Controls 0.00 cfs)
  ├─**3=Orifice/Grate** (Orifice Controls 0.90 cfs @ 4.60 fps)
  └─**4=Orifice/Grate** (Orifice Controls 0.08 cfs @ 1.38 fps)

Pond 10PB: East - Chamber Wizard Field A

Chamber Model = Cultec R-300HD (Cultec Recharger® 300HD)
Effective Size= 45.6"W x 30.0"H => 6.53 sf x 7.08'L = 46.2 cf
Overall Size= 51.0"W x 30.0"H x 7.54'L with 0.46' Overlap
Cap Storage= 2.7 cf x 2 x 13 rows = 69.0 cf

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

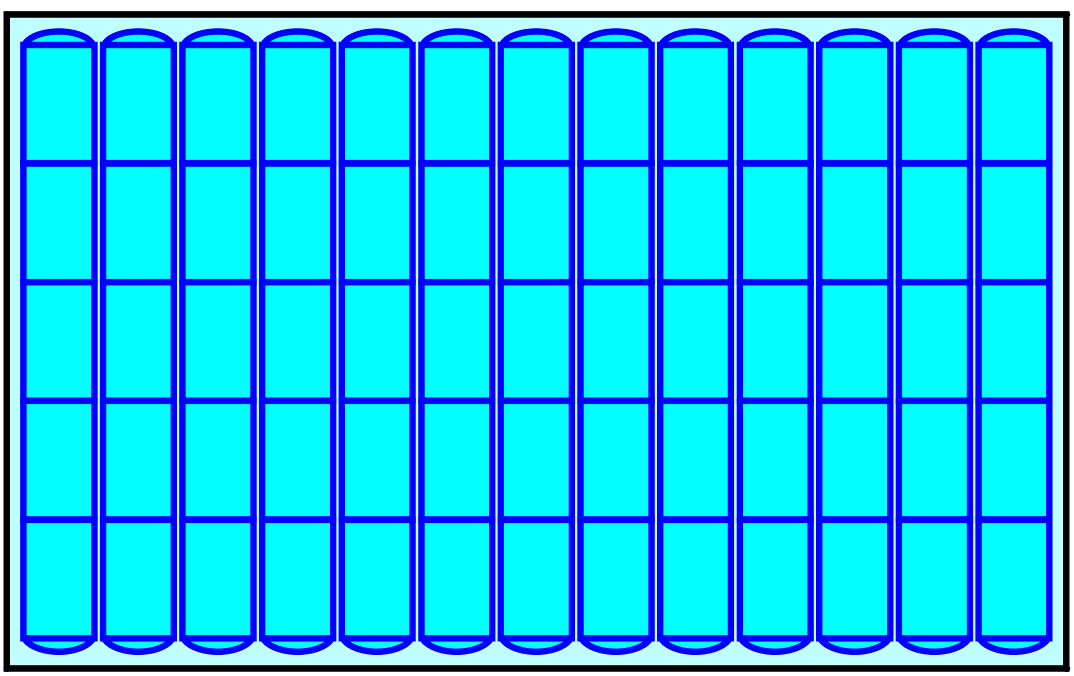
5 Chambers/Row x 7.08' Long +0.80' Cap Length x 2 = 37.02' Row Length +12.0" End Stone x 2 = 39.02' Base Length
13 Rows x 51.0" Wide + 6.0" Spacing x 12 + 12.0" Side Stone x 2 = 63.25' Base Width
6.0" Stone Base + 30.0" Chamber Height + 6.0" Stone Cover = 3.50' Field Height

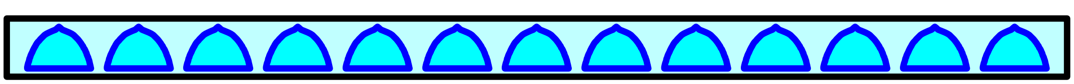
65 Chambers x 46.2 cf + 2.7 cf Cap Volume x 2 x 13 Rows = 3,074.8 cf Chamber Storage

8,637.3 cf Field - 3,074.8 cf Chambers = 5,562.6 cf Stone x 40.0% Voids = 2,225.0 cf Stone Storage

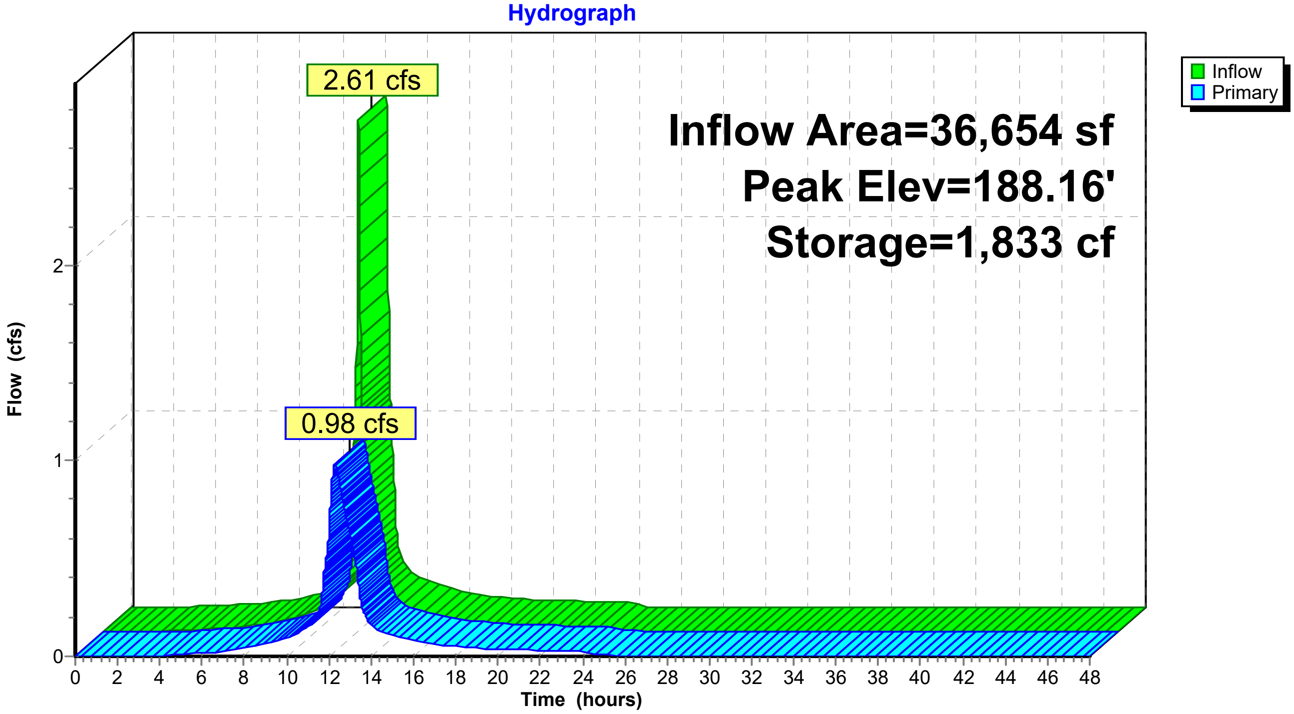
Chamber Storage + Stone Storage = 5,299.8 cf = 0.122 af
Overall Storage Efficiency = 61.4%
Overall System Size = 39.02' x 63.25' x 3.50'

65 Chambers
319.9 cy Field
206.0 cy Stone





Pond 10PB: East

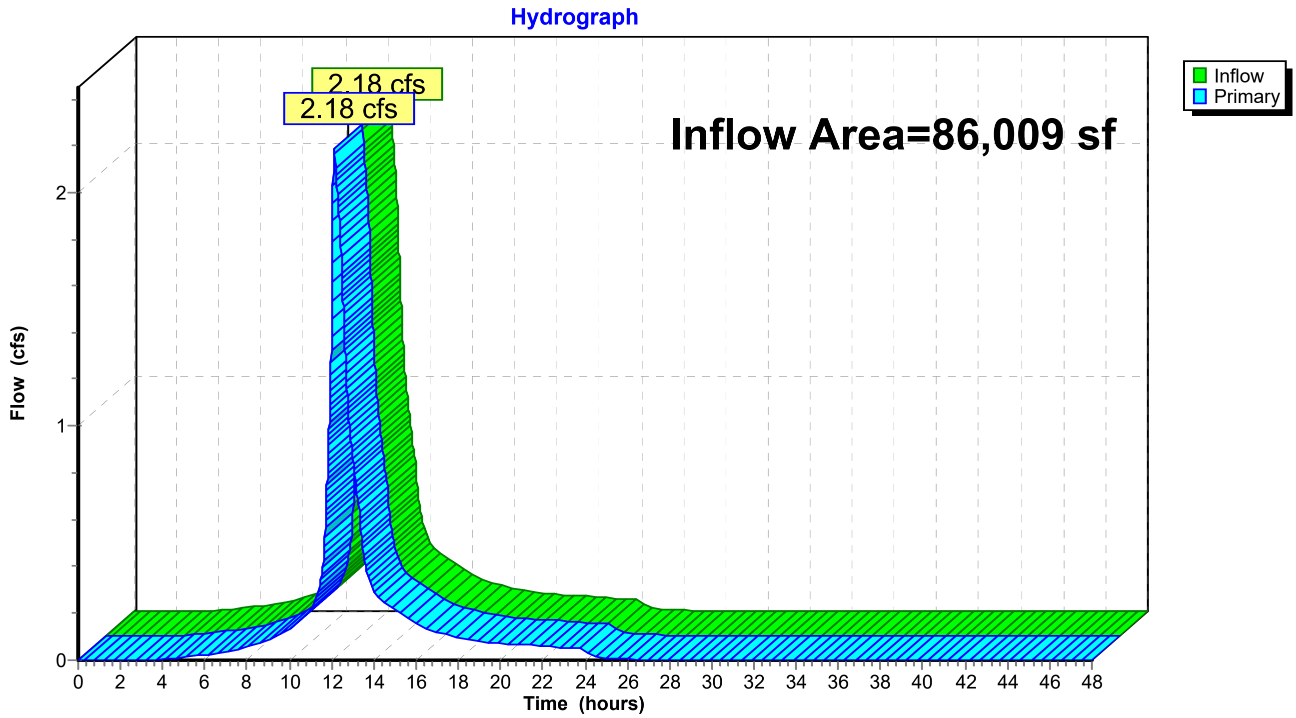


Summary for Link 10L: Wetlands

Inflow Area = 86,009 sf, 54.72% Impervious, Inflow Depth = 2.08" for 2 Year event
Inflow = 2.18 cfs @ 12.12 hrs, Volume= 14,883 cf
Primary = 2.18 cfs @ 12.12 hrs, Volume= 14,883 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link 10L: Wetlands

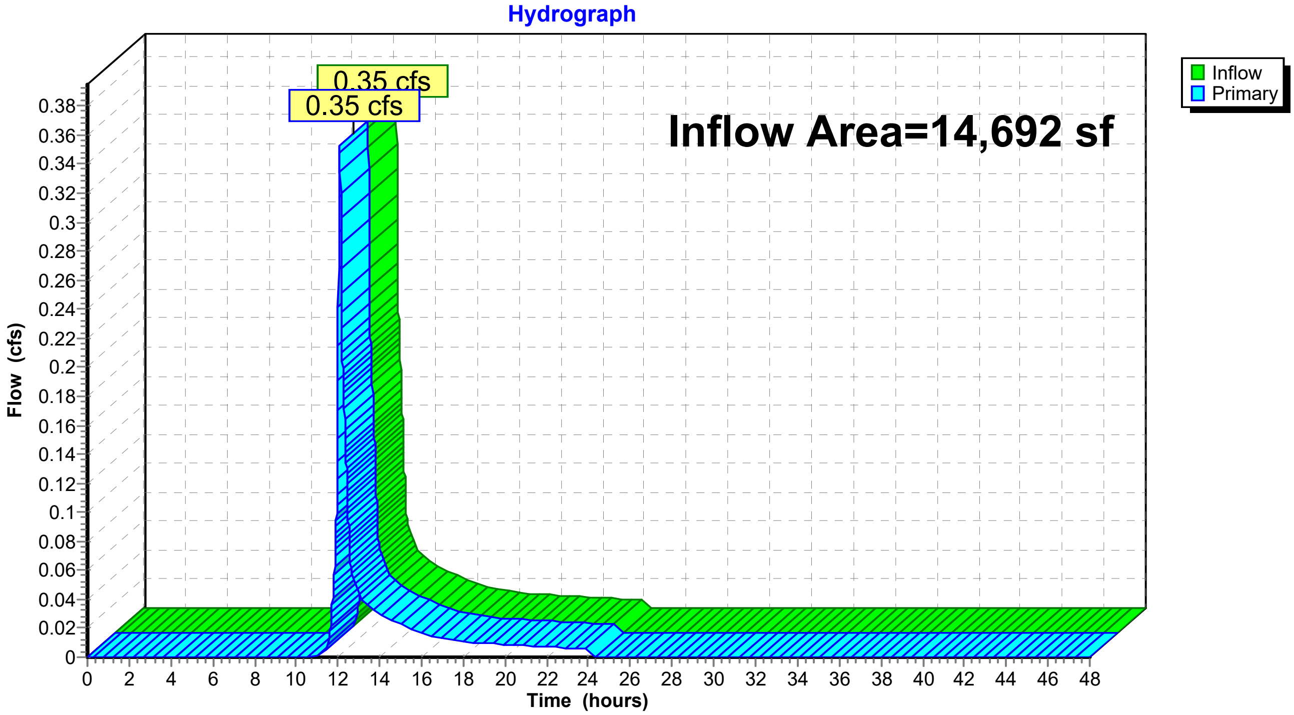


Summary for Link 20L: Street

Inflow Area = 14,692 sf, 11.18% Impervious, Inflow Depth = 0.93" for 2 Year event
Inflow = 0.35 cfs @ 12.08 hrs, Volume= 1,138 cf
Primary = 0.35 cfs @ 12.08 hrs, Volume= 1,138 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link 20L: Street



Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment10S: Runoff Area=31,214 sf 0.00% Impervious Runoff Depth=2.27"
Flow Length=85' Slope=0.1400 '/' Tc=6.0 min CN=73 Runoff=1.90 cfs 5,911 cf

Subcatchment10SA: Runoff Area=6,972 sf 48.77% Impervious Runoff Depth=3.76"
Tc=5.0 min CN=89 Runoff=0.71 cfs 2,186 cf

Subcatchment10SB: Runoff Area=9,585 sf 94.11% Impervious Runoff Depth=4.64"
Tc=5.0 min CN=97 Runoff=1.10 cfs 3,704 cf

Subcatchment10SC: Runoff Area=12,245 sf 83.50% Impervious Runoff Depth=4.41"
Tc=5.0 min CN=95 Runoff=1.38 cfs 4,500 cf

Subcatchment10SD: Runoff Area=10,640 sf 85.20% Impervious Runoff Depth=4.41"
Tc=5.0 min CN=95 Runoff=1.20 cfs 3,910 cf

Subcatchment10SE: Runoff Area=13,769 sf 100.00% Impervious Runoff Depth=4.75"
Tc=5.0 min CN=98 Runoff=1.60 cfs 5,454 cf

Subcatchment10SF: Runoff Area=1,584 sf 100.00% Impervious Runoff Depth=4.75"
Tc=5.0 min CN=98 Runoff=0.18 cfs 627 cf

Subcatchment20S: Runoff Area=14,692 sf 11.18% Impervious Runoff Depth=2.19"
Tc=5.0 min CN=72 Runoff=0.89 cfs 2,681 cf

Pond 10PA: West Peak Elev=188.07' Storage=1,145 cf Inflow=2.00 cfs 6,517 cf
Outflow=0.85 cfs 6,516 cf

Pond 10PB: East Peak Elev=188.72' Storage=2,897 cf Inflow=4.18 cfs 13,863 cf
Outflow=1.80 cfs 13,860 cf

Link 10L: Wetlands Inflow=4.21 cfs 26,287 cf
Primary=4.21 cfs 26,287 cf

Link 20L: Street Inflow=0.89 cfs 2,681 cf
Primary=0.89 cfs 2,681 cf

Total Runoff Area = 100,701 sf Runoff Volume = 28,974 cf Average Runoff Depth = 3.45"
51.64% Pervious = 51,997 sf 48.36% Impervious = 48,704 sf

Summary for Subcatchment 10S:

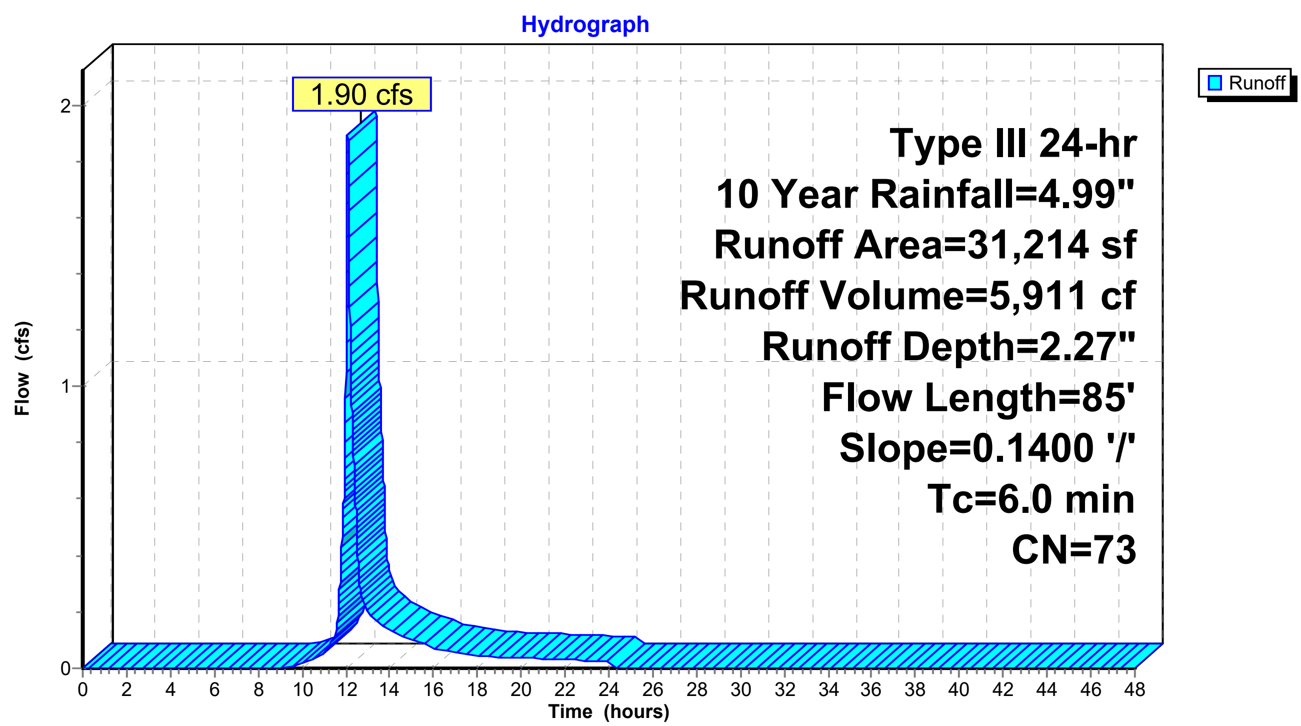
Runoff = 1.90 cfs @ 12.09 hrs, Volume= 5,911 cf, Depth= 2.27"
Routed to Link 10L : Wetlands

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 Year Rainfall=4.99"

Area (sf)	CN	Description
8,595	61	>75% Grass cover, Good, HSG B
8,096	80	>75% Grass cover, Good, HSG D
14,523	77	Woods, Good, HSG D
31,214	73	Weighted Average
31,214		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	50	0.1400	0.15		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.3	35	0.1400	1.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
6.0	85	Total			

Subcatchment 10S:



Summary for Subcatchment 10SA:

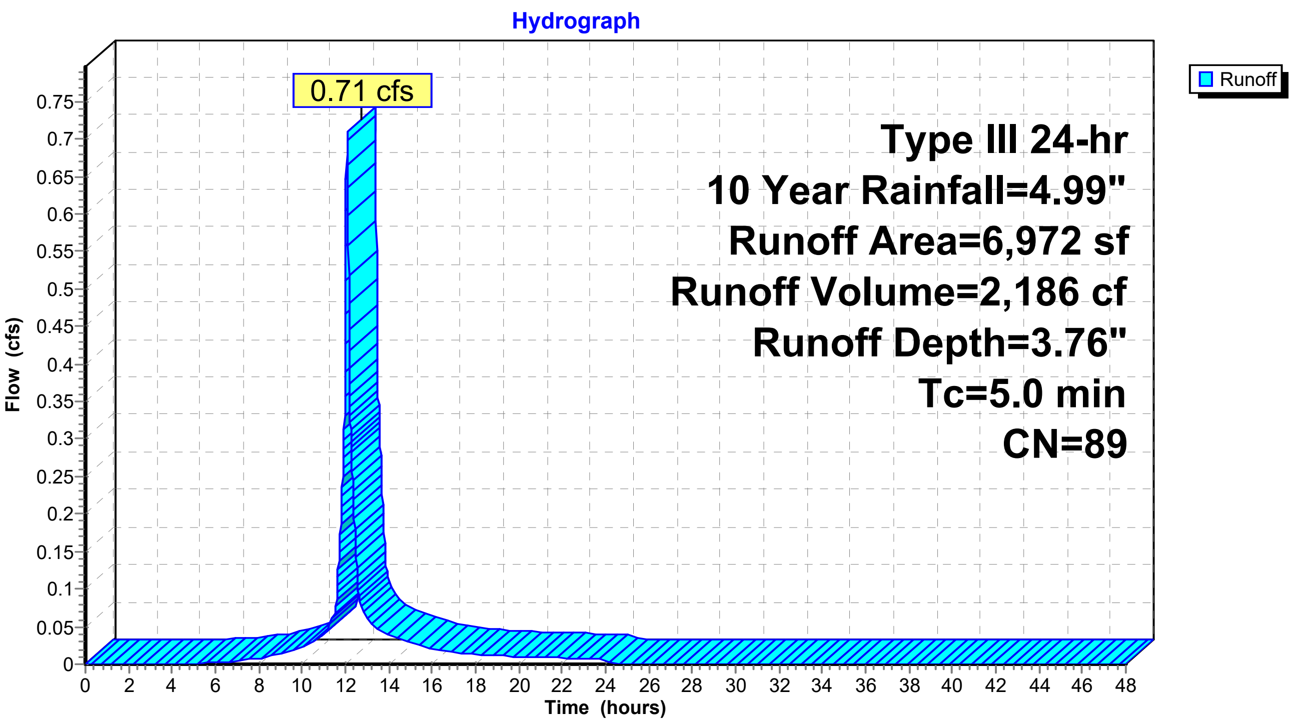
Runoff = 0.71 cfs @ 12.07 hrs, Volume= 2,186 cf, Depth= 3.76"
Routed to Pond 10PA : West

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 Year Rainfall=4.99"

Area (sf)	CN	Description
3,400	98	Paved parking, HSG D
3,572	80	>75% Grass cover, Good, HSG D
6,972	89	Weighted Average
3,572		51.23% Pervious Area
3,400		48.77% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 10SA:



Summary for Subcatchment 10SB:

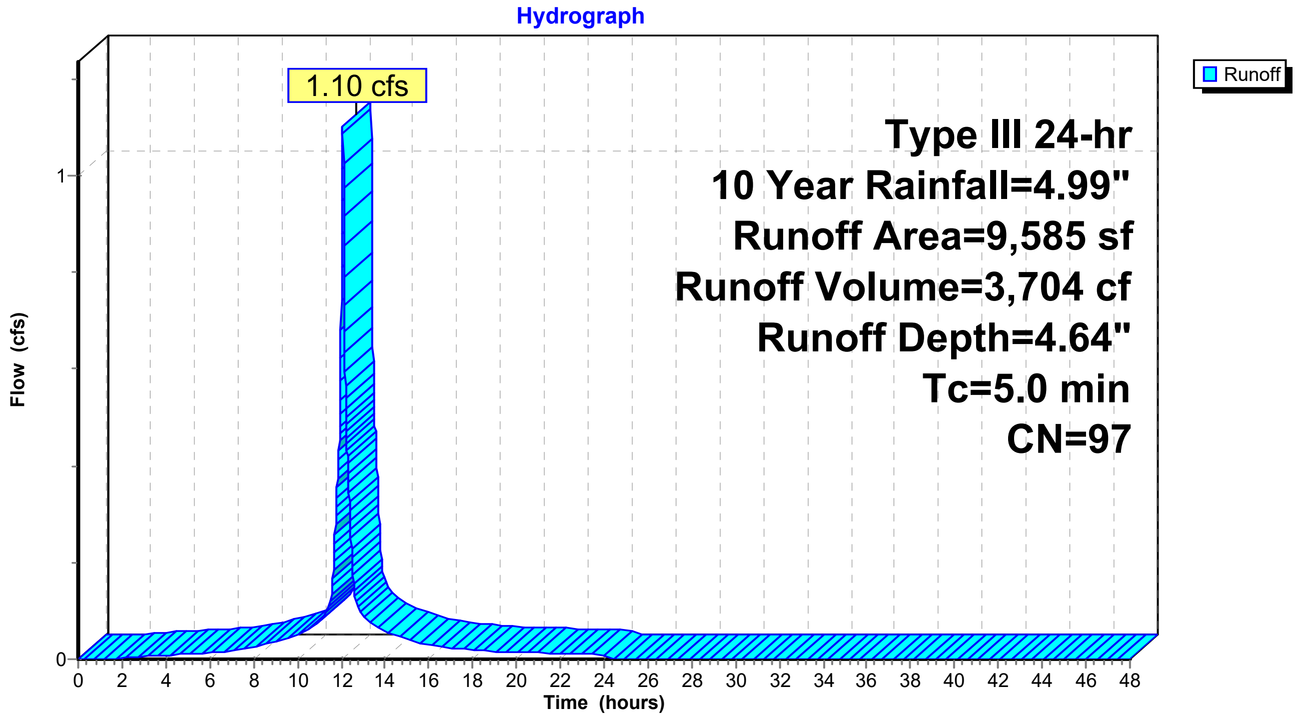
Runoff = 1.10 cfs @ 12.07 hrs, Volume= 3,704 cf, Depth= 4.64"
Routed to Pond 10PA : West

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 Year Rainfall=4.99"

Area (sf)	CN	Description
9,020	98	Paved parking, HSG D
565	80	>75% Grass cover, Good, HSG D
9,585	97	Weighted Average
565		5.89% Pervious Area
9,020		94.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 10SB:



Summary for Subcatchment 10SC:

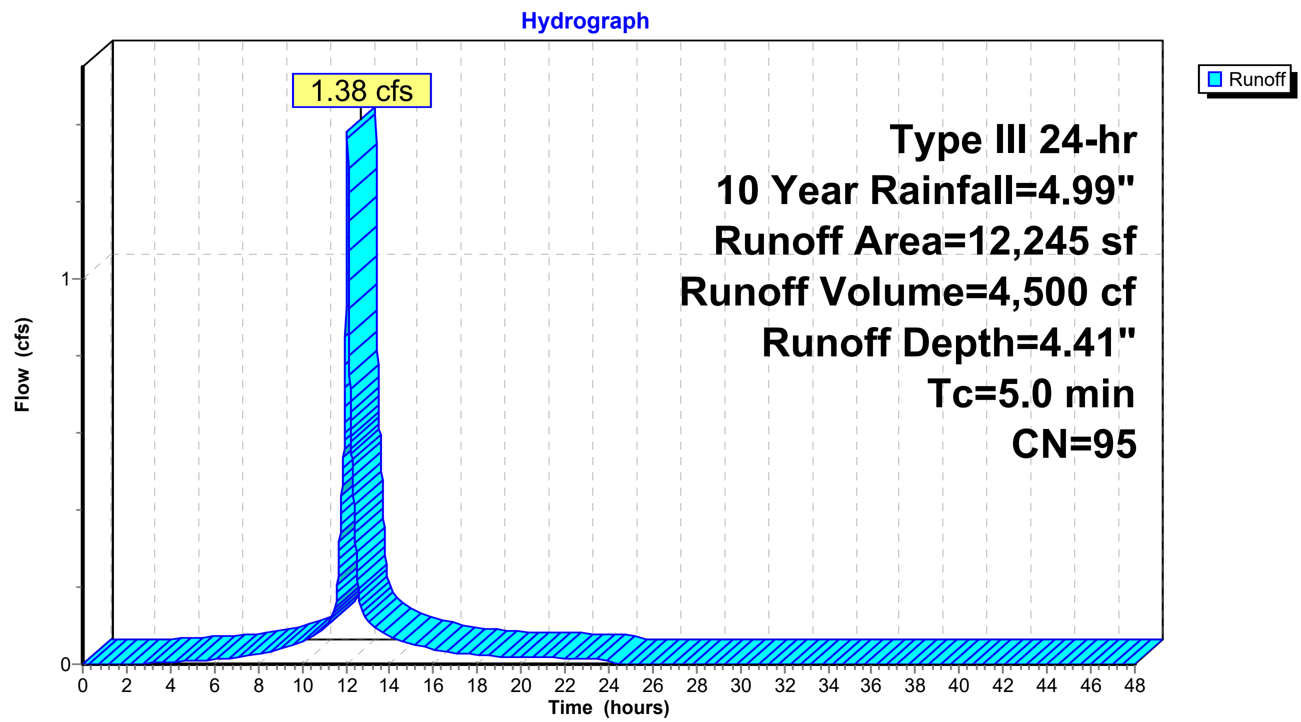
Runoff = 1.38 cfs @ 12.07 hrs, Volume= 4,500 cf, Depth= 4.41"
Routed to Pond 10PB : East

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 Year Rainfall=4.99"

Area (sf)	CN	Description
2,021	80	>75% Grass cover, Good, HSG D
10,224	98	Paved parking, HSG D
12,245	95	Weighted Average
2,021		16.50% Pervious Area
10,224		83.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 10SC:



Summary for Subcatchment 10SD:

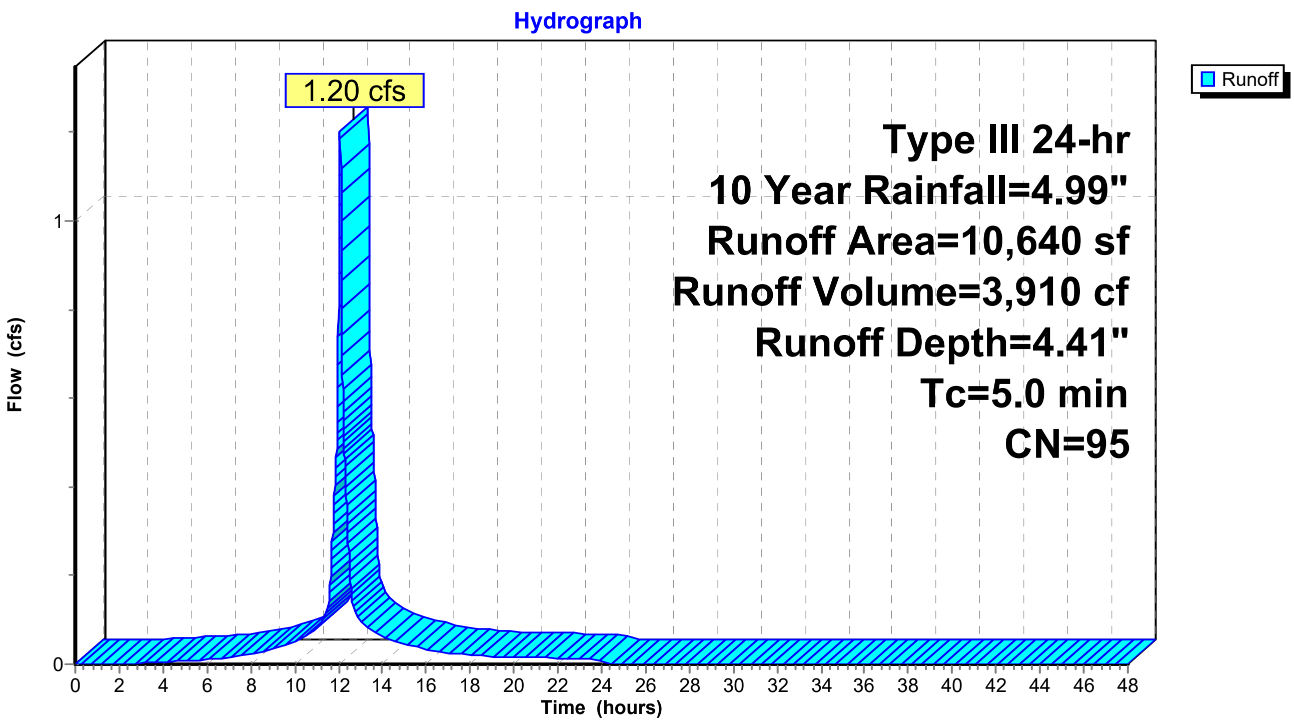
Runoff = 1.20 cfs @ 12.07 hrs, Volume= 3,910 cf, Depth= 4.41"
Routed to Pond 10PB : East

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 Year Rainfall=4.99"

Area (sf)	CN	Description
9,065	98	Paved parking, HSG D
1,575	80	>75% Grass cover, Good, HSG D
10,640	95	Weighted Average
1,575		14.80% Pervious Area
9,065		85.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 10SD:



Summary for Subcatchment 10SE:

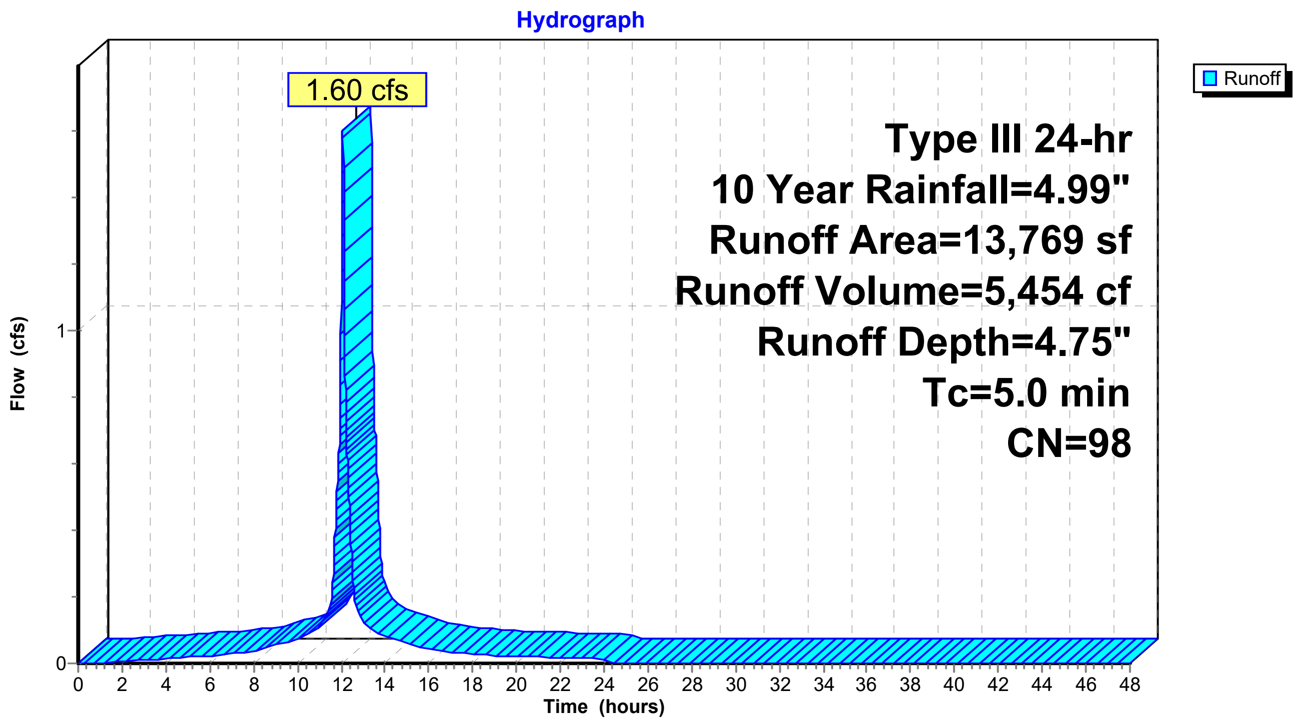
Runoff = 1.60 cfs @ 12.07 hrs, Volume= 5,454 cf, Depth= 4.75"
Routed to Pond 10PB : East

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 Year Rainfall=4.99"

Area (sf)	CN	Description
13,769	98	Roofs, HSG D
13,769		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 10SE:



Summary for Subcatchment 10SF:

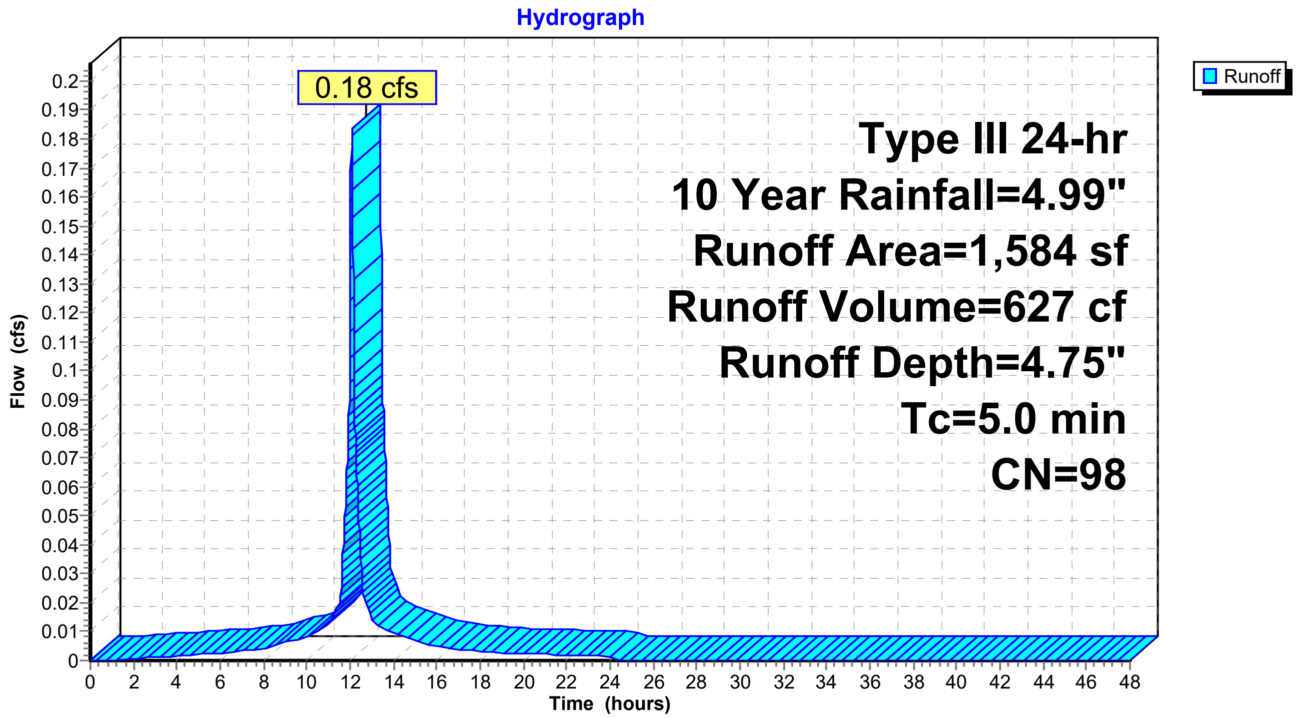
Runoff = 0.18 cfs @ 12.07 hrs, Volume= 627 cf, Depth= 4.75"
Routed to Pond 10PA : West

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 Year Rainfall=4.99"

Area (sf)	CN	Description
1,245	98	Roofs, HSG D
339	98	Roofs, HSG B
1,584	98	Weighted Average
1,584		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 10SF:



Summary for Subcatchment 20S:

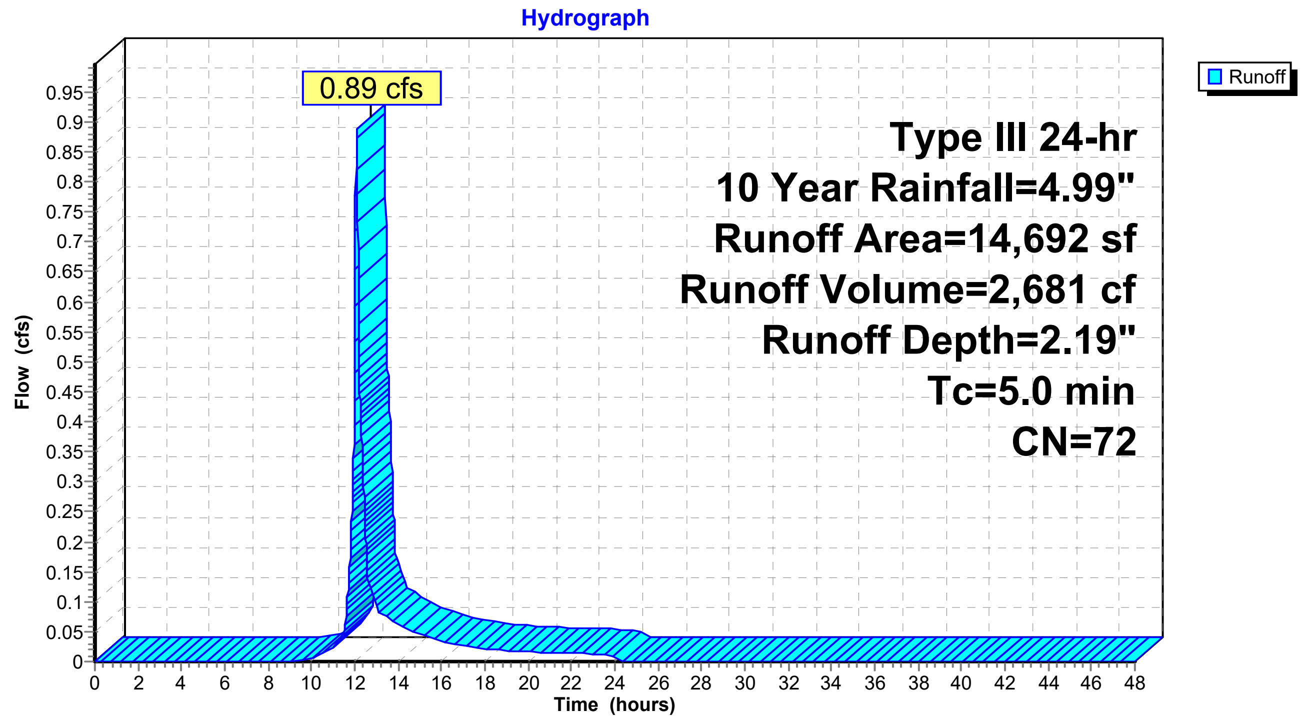
Runoff = 0.89 cfs @ 12.08 hrs, Volume= 2,681 cf, Depth= 2.19"
Routed to Link 20L : Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 Year Rainfall=4.99"

Area (sf)	CN	Description
5,586	80	>75% Grass cover, Good, HSG D
7,464	61	>75% Grass cover, Good, HSG B
1,642	98	Paved parking, HSG D
14,692	72	Weighted Average
13,050		88.82% Pervious Area
1,642		11.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 20S:



Summary for Pond 10PA: West

Inflow Area = 18,141 sf, 77.20% Impervious, Inflow Depth = 4.31" for 10 Year event
Inflow = 2.00 cfs @ 12.07 hrs, Volume= 6,517 cf
Outflow = 0.85 cfs @ 12.24 hrs, Volume= 6,516 cf, Atten= 57%, Lag= 10.3 min
Primary = 0.85 cfs @ 12.24 hrs, Volume= 6,516 cf
Routed to Link 10L : Wetlands

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 188.07' @ 12.24 hrs Surf.Area= 1,726 sf Storage= 1,145 cf

Plug-Flow detention time= 24.2 min calculated for 6,516 cf (100% of inflow)
Center-of-Mass det. time= 24.0 min (791.1 - 767.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	187.00'	1,566 cf	**44.25'W x 39.02'L x 3.50'H Field A** 6,043 cf Overall - 2,129 cf Embedded = 3,914 cf x 40.0% Voids
#2A	187.50'	2,129 cf	**Cultec R-300HD** x 45 Inside #1 Effective Size= 45.6"W x 30.0"H => 6.53 sf x 7.08'L = 46.2 cf Overall Size= 51.0"W x 30.0"H x 7.54'L with 0.46' Overlap 45 Chambers in 9 Rows Cap Storage= 2.7 cf x 2 x 9 rows = 47.8 cf
		3,694 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	187.00'	**12.0" Round Culvert** L= 13.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 187.00' / 186.80' S= 0.0154 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	190.00'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Device 1	187.00'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.85 cfs @ 12.24 hrs HW=188.07' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.85 cfs of 2.74 cfs potential flow)
  ├─**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
  └─**3=Orifice/Grate** (Orifice Controls 0.85 cfs @ 4.35 fps)

Pond 10PA: West - Chamber Wizard Field A

Chamber Model = Cultec R-300HD (Cultec Recharger® 300HD)
Effective Size= 45.6"W x 30.0"H => 6.53 sf x 7.08'L = 46.2 cf
Overall Size= 51.0"W x 30.0"H x 7.54'L with 0.46' Overlap
Cap Storage= 2.7 cf x 2 x 9 rows = 47.8 cf

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

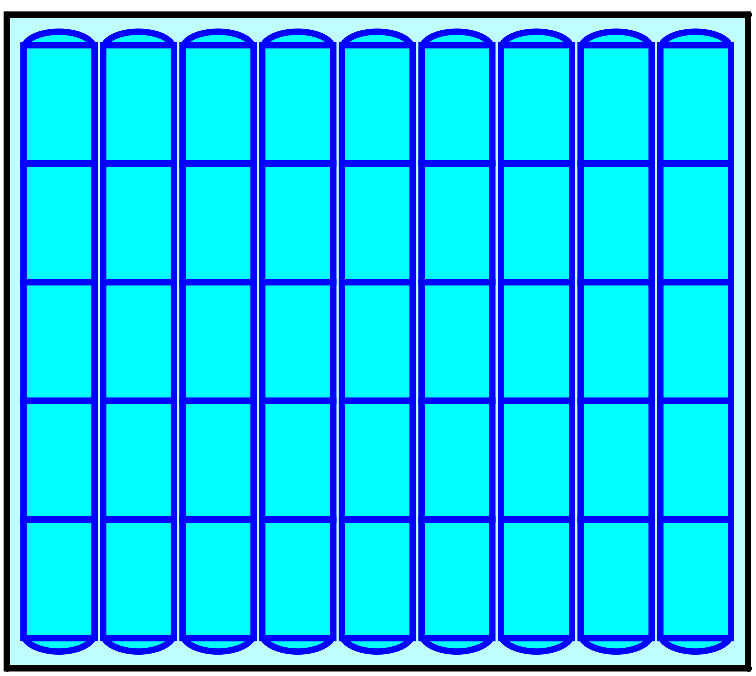
5 Chambers/Row x 7.08' Long +0.80' Cap Length x 2 = 37.02' Row Length +12.0" End Stone x 2 = 39.02' Base Length
9 Rows x 51.0" Wide + 6.0" Spacing x 8 + 12.0" Side Stone x 2 = 44.25' Base Width
6.0" Stone Base + 30.0" Chamber Height + 6.0" Stone Cover = 3.50' Field Height

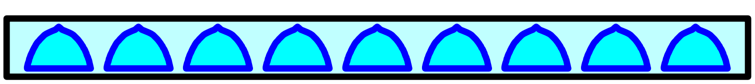
45 Chambers x 46.2 cf + 2.7 cf Cap Volume x 2 x 9 Rows = 2,128.7 cf Chamber Storage

6,042.7 cf Field - 2,128.7 cf Chambers = 3,914.0 cf Stone x 40.0% Voids = 1,565.6 cf Stone Storage

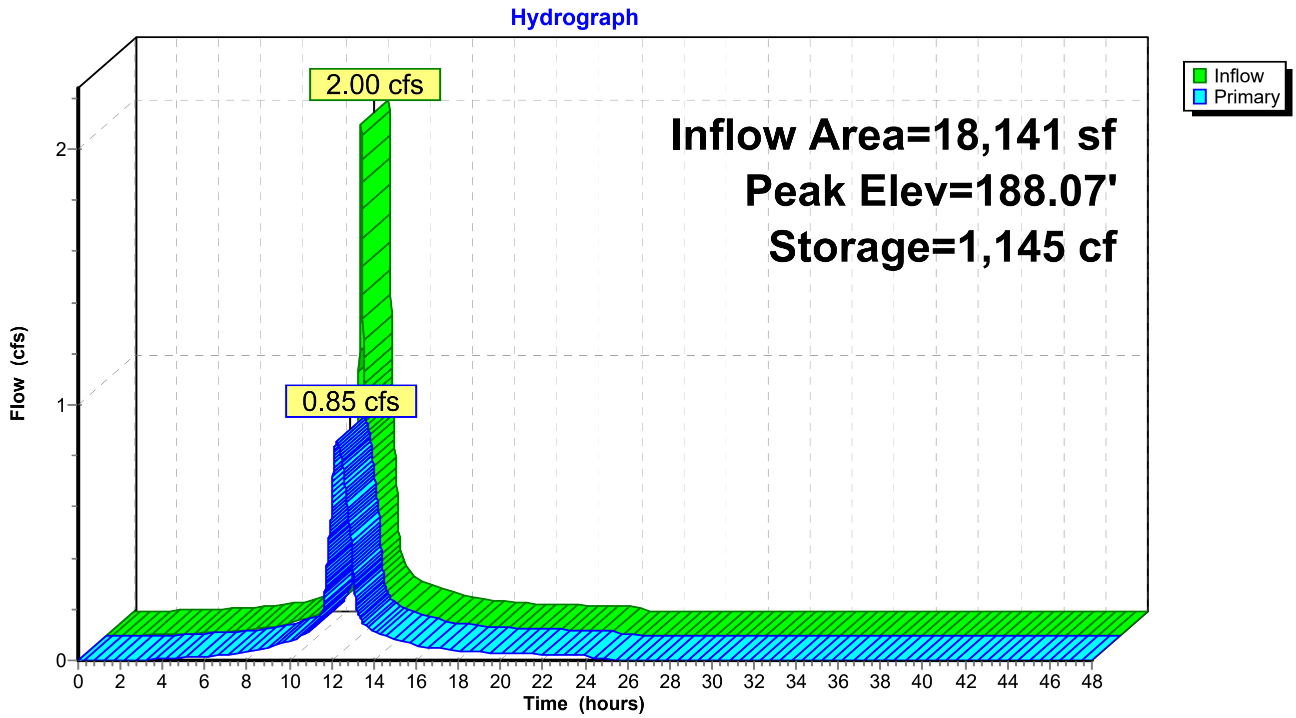
Chamber Storage + Stone Storage = 3,694.3 cf = 0.085 af
Overall Storage Efficiency = 61.1%
Overall System Size = 39.02' x 44.25' x 3.50'

45 Chambers
223.8 cy Field
145.0 cy Stone





Pond 10PA: West



Summary for Pond 10PB: East

Inflow Area = 36,654 sf, 90.19% Impervious, Inflow Depth = 4.54" for 10 Year event
Inflow = 4.18 cfs @ 12.07 hrs, Volume= 13,863 cf
Outflow = 1.80 cfs @ 12.24 hrs, Volume= 13,860 cf, Atten= 57%, Lag= 10.1 min
Primary = 1.80 cfs @ 12.24 hrs, Volume= 13,860 cf
Routed to Link 10L : Wetlands

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 188.72' @ 12.24 hrs Surf.Area= 2,468 sf Storage= 2,897 cf

Plug-Flow detention time= 29.0 min calculated for 13,860 cf (100% of inflow)
Center-of-Mass det. time= 28.8 min (788.2 - 759.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	187.00'	2,225 cf	**63.25'W x 39.02'L x 3.50'H Field A** 8,637 cf Overall - 3,075 cf Embedded = 5,563 cf x 40.0% Voids
#2A	187.50'	3,075 cf	**Cultec R-300HD** x 65 Inside #1 Effective Size= 45.6"W x 30.0"H => 6.53 sf x 7.08'L = 46.2 cf Overall Size= 51.0"W x 30.0"H x 7.54'L with 0.46' Overlap 65 Chambers in 13 Rows Cap Storage= 2.7 cf x 2 x 13 rows = 69.0 cf
		5,300 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	187.00'	**12.0" Round Culvert** L= 21.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 187.00' / 186.75' S= 0.0119 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	190.00'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Device 1	187.00'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	188.00'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.80 cfs @ 12.24 hrs HW=188.72' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 1.80 cfs of 4.18 cfs potential flow)
  ├─**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
  ├─**3=Orifice/Grate** (Orifice Controls 1.15 cfs @ 5.85 fps)
  └─**4=Orifice/Grate** (Orifice Controls 0.65 cfs @ 3.31 fps)

Pond 10PB: East - Chamber Wizard Field A

Chamber Model = Cultec R-300HD (Cultec Recharger®300HD)
Effective Size= 45.6"W x 30.0"H => 6.53 sf x 7.08'L = 46.2 cf
Overall Size= 51.0"W x 30.0"H x 7.54'L with 0.46' Overlap
Cap Storage= 2.7 cf x 2 x 13 rows = 69.0 cf

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

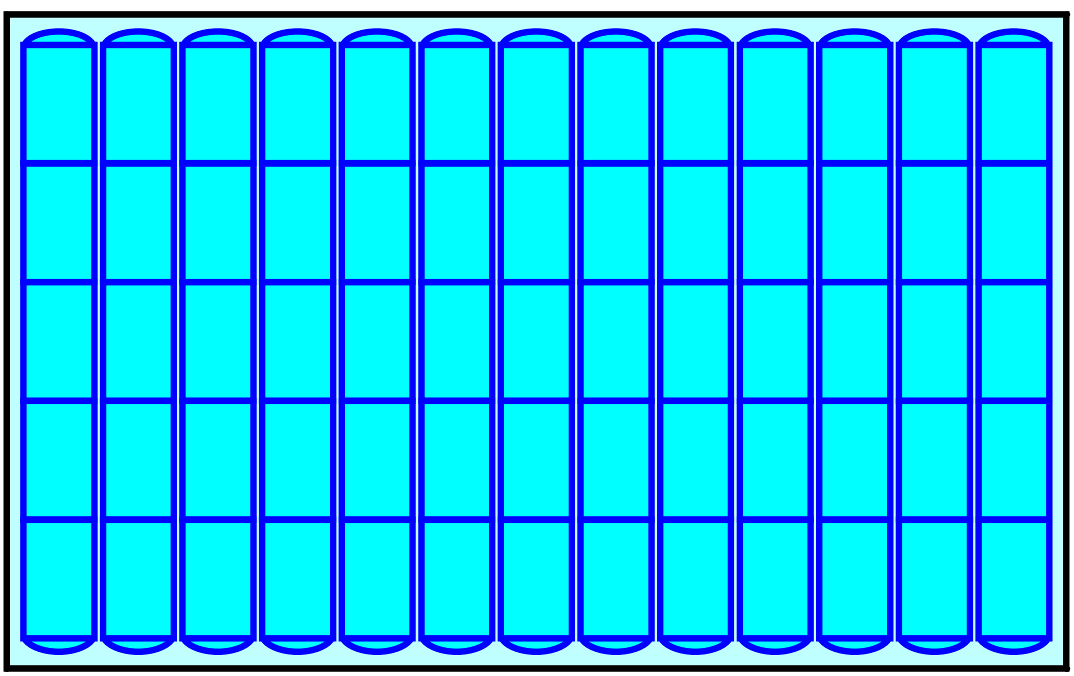
5 Chambers/Row x 7.08' Long +0.80' Cap Length x 2 = 37.02' Row Length +12.0" End Stone x 2 = 39.02' Base Length
13 Rows x 51.0" Wide + 6.0" Spacing x 12 + 12.0" Side Stone x 2 = 63.25' Base Width
6.0" Stone Base + 30.0" Chamber Height + 6.0" Stone Cover = 3.50' Field Height

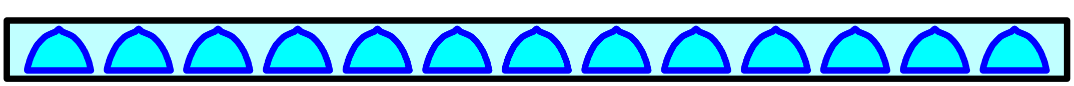
65 Chambers x 46.2 cf + 2.7 cf Cap Volume x 2 x 13 Rows = 3,074.8 cf Chamber Storage

8,637.3 cf Field - 3,074.8 cf Chambers = 5,562.6 cf Stone x 40.0% Voids = 2,225.0 cf Stone Storage

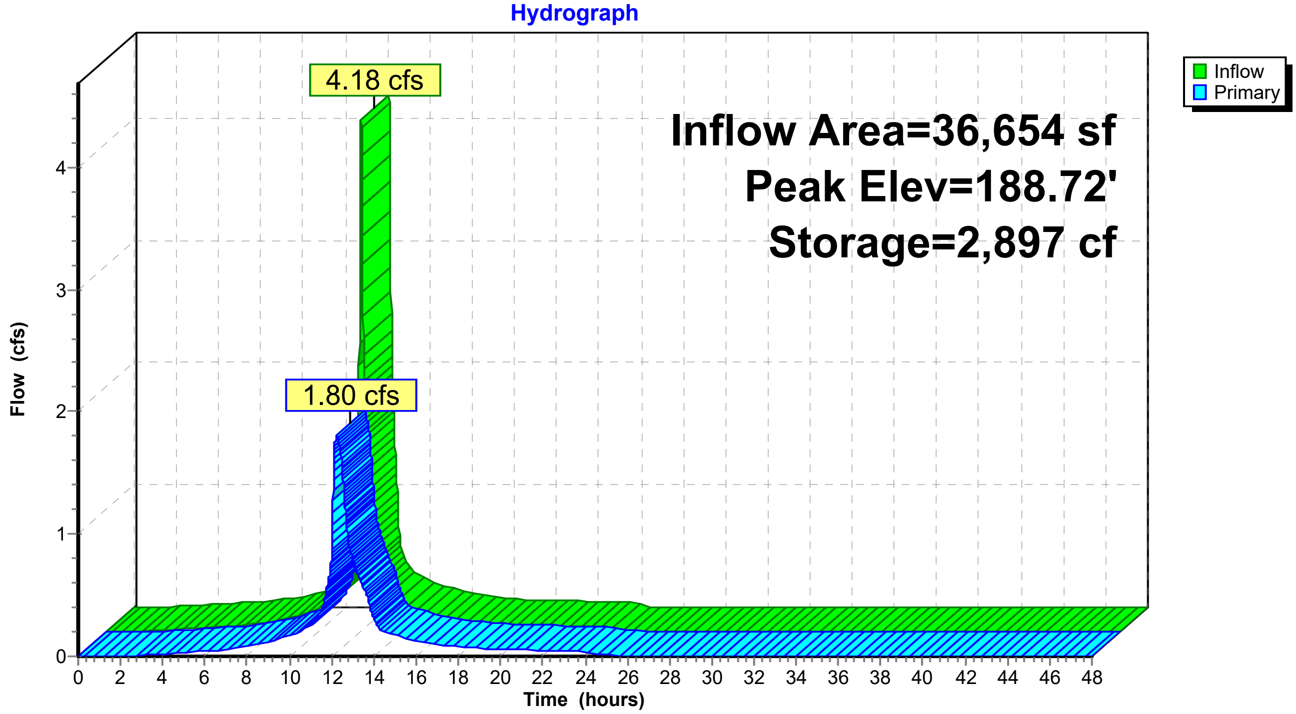
Chamber Storage + Stone Storage = 5,299.8 cf = 0.122 af
Overall Storage Efficiency = 61.4%
Overall System Size = 39.02' x 63.25' x 3.50'

65 Chambers
319.9 cy Field
206.0 cy Stone





Pond 10PB: East

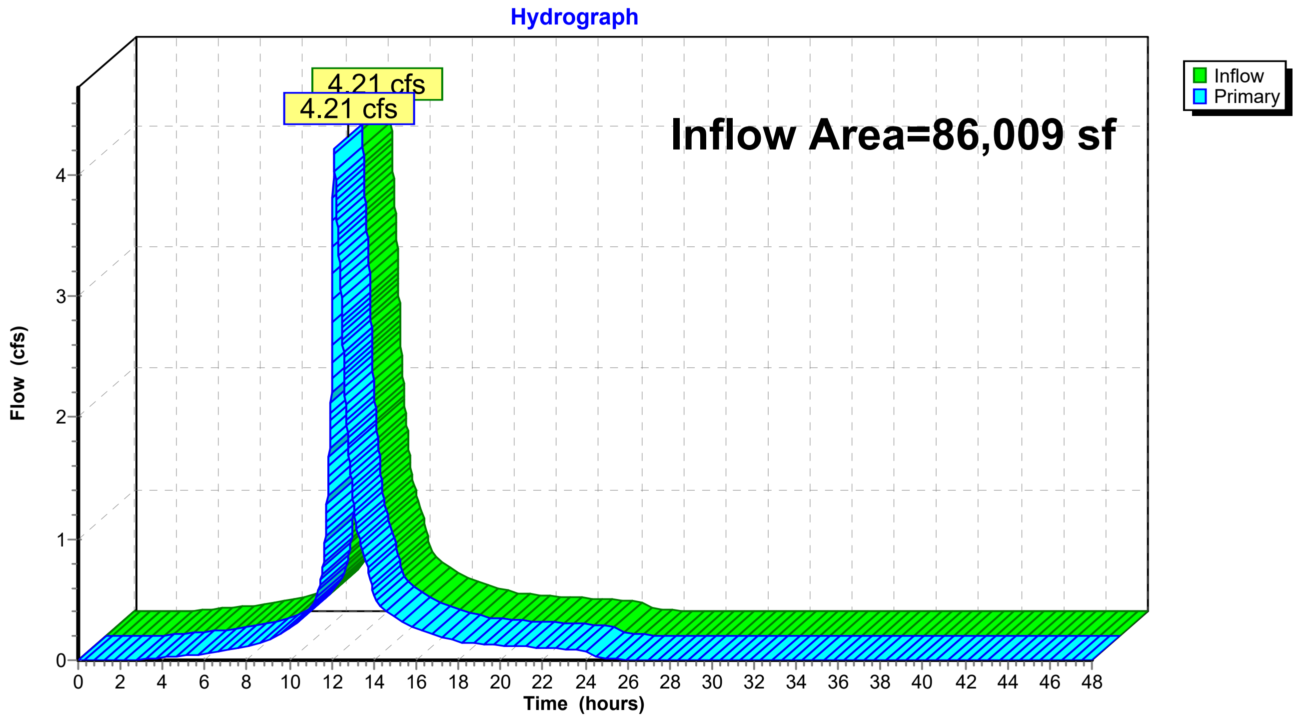


Summary for Link 10L: Wetlands

Inflow Area = 86,009 sf, 54.72% Impervious, Inflow Depth = 3.67" for 10 Year event
Inflow = 4.21 cfs @ 12.12 hrs, Volume= 26,287 cf
Primary = 4.21 cfs @ 12.12 hrs, Volume= 26,287 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

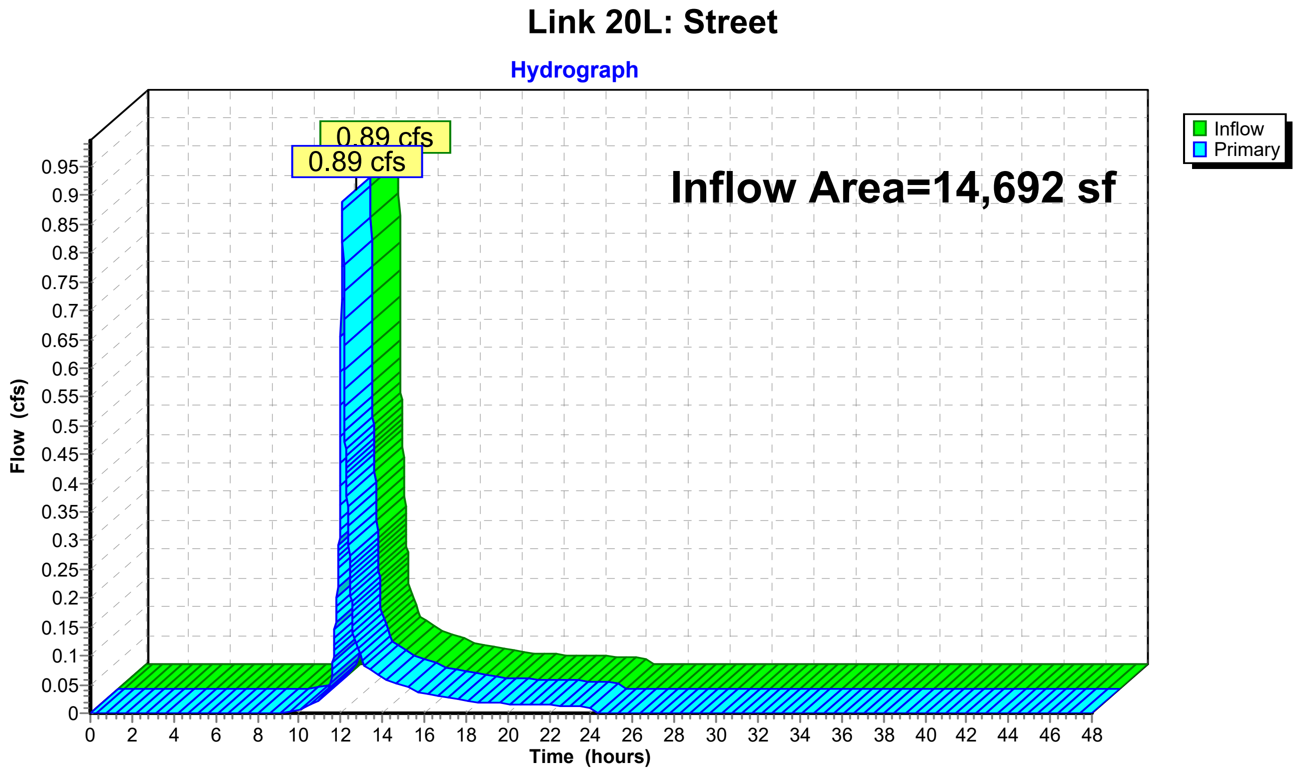
Link 10L: Wetlands



Summary for Link 20L: Street

Inflow Area = 14,692 sf, 11.18% Impervious, Inflow Depth = 2.19" for 10 Year event
Inflow = 0.89 cfs @ 12.08 hrs, Volume= 2,681 cf
Primary = 0.89 cfs @ 12.08 hrs, Volume= 2,681 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs



Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment10S: Runoff Area=31,214 sf 0.00% Impervious Runoff Depth=3.18"
Flow Length=85' Slope=0.1400 '/' Tc=6.0 min CN=73 Runoff=2.67 cfs 8,272 cf

Subcatchment10SA: Runoff Area=6,972 sf 48.77% Impervious Runoff Depth=4.84"
Tc=5.0 min CN=89 Runoff=0.90 cfs 2,813 cf

Subcatchment10SB: Runoff Area=9,585 sf 94.11% Impervious Runoff Depth=5.75"
Tc=5.0 min CN=97 Runoff=1.36 cfs 4,596 cf

Subcatchment10SC: Runoff Area=12,245 sf 83.50% Impervious Runoff Depth=5.52"
Tc=5.0 min CN=95 Runoff=1.71 cfs 5,634 cf

Subcatchment10SD: Runoff Area=10,640 sf 85.20% Impervious Runoff Depth=5.52"
Tc=5.0 min CN=95 Runoff=1.49 cfs 4,895 cf

Subcatchment10SE: Runoff Area=13,769 sf 100.00% Impervious Runoff Depth=5.87"
Tc=5.0 min CN=98 Runoff=1.96 cfs 6,737 cf

Subcatchment10SF: Runoff Area=1,584 sf 100.00% Impervious Runoff Depth=5.87"
Tc=5.0 min CN=98 Runoff=0.23 cfs 775 cf

Subcatchment20S: Runoff Area=14,692 sf 11.18% Impervious Runoff Depth=3.08"
Tc=5.0 min CN=72 Runoff=1.26 cfs 3,775 cf

Pond 10PA: West Peak Elev=188.34' Storage=1,521 cf Inflow=2.49 cfs 8,184 cf
Outflow=0.99 cfs 8,182 cf

Pond 10PB: East Peak Elev=189.13' Storage=3,613 cf Inflow=5.16 cfs 17,266 cf
Outflow=2.18 cfs 17,262 cf

Link 10L: Wetlands Inflow=5.44 cfs 33,717 cf
Primary=5.44 cfs 33,717 cf

Link 20L: Street Inflow=1.26 cfs 3,775 cf
Primary=1.26 cfs 3,775 cf

Total Runoff Area = 100,701 sf Runoff Volume = 37,497 cf Average Runoff Depth = 4.47"
51.64% Pervious = 51,997 sf 48.36% Impervious = 48,704 sf

Summary for Subcatchment 10S:

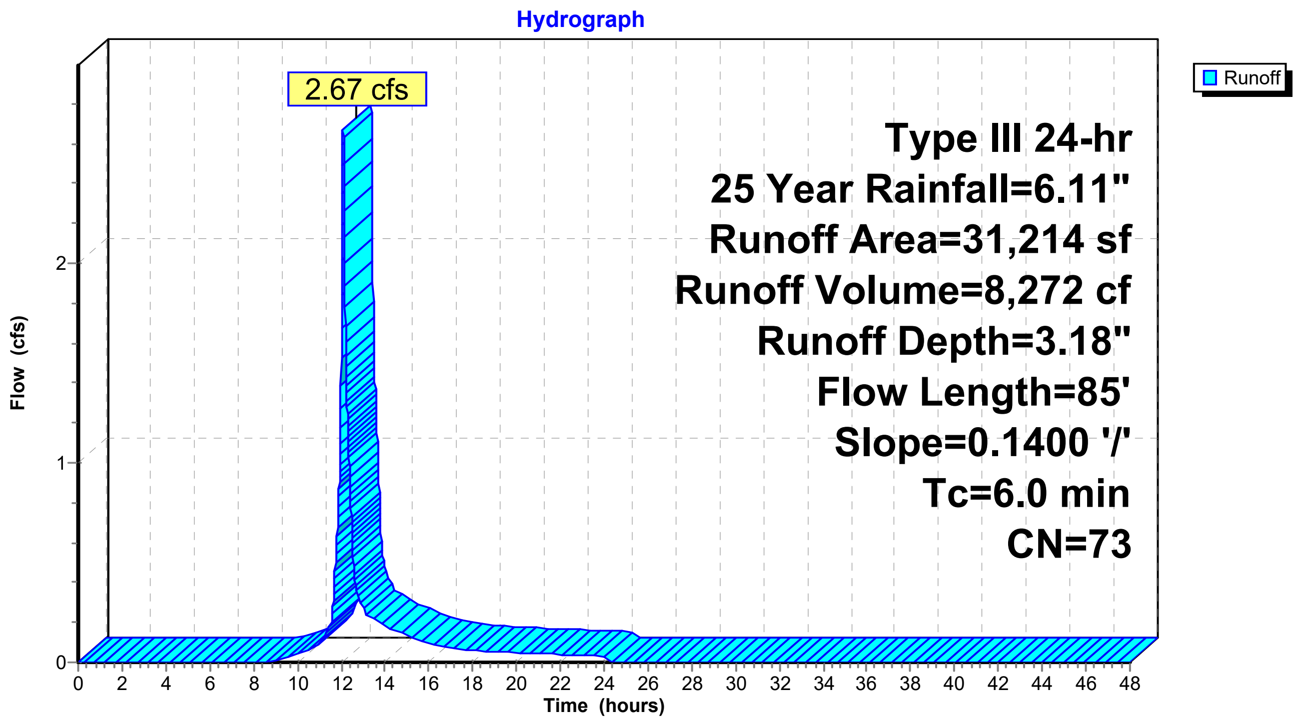
Runoff = 2.67 cfs @ 12.09 hrs, Volume= 8,272 cf, Depth= 3.18"
Routed to Link 10L : Wetlands

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 Year Rainfall=6.11"

Area (sf)	CN	Description
8,595	61	>75% Grass cover, Good, HSG B
8,096	80	>75% Grass cover, Good, HSG D
14,523	77	Woods, Good, HSG D
31,214	73	Weighted Average
31,214		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	50	0.1400	0.15		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.3	35	0.1400	1.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
6.0	85	Total			

Subcatchment 10S:



Summary for Subcatchment 10SA:

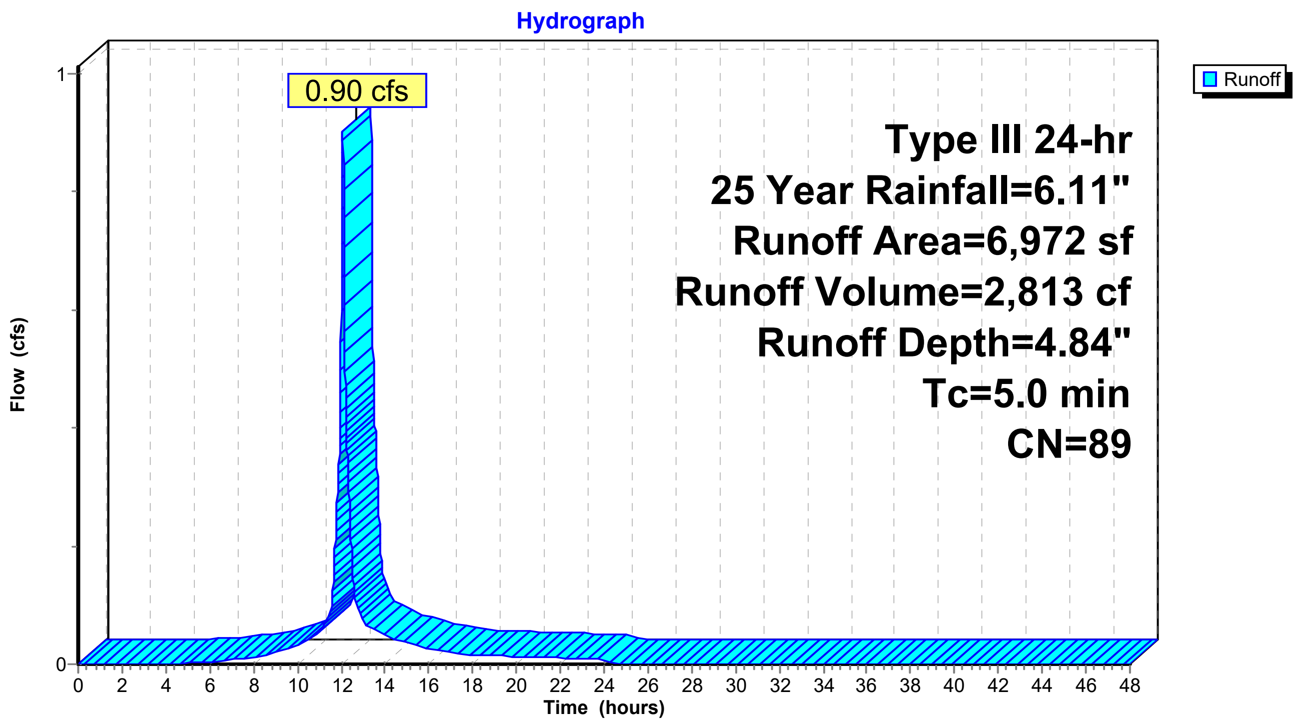
Runoff = 0.90 cfs @ 12.07 hrs, Volume= 2,813 cf, Depth= 4.84"
Routed to Pond 10PA : West

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 Year Rainfall=6.11"

Area (sf)	CN	Description
3,400	98	Paved parking, HSG D
3,572	80	>75% Grass cover, Good, HSG D
6,972	89	Weighted Average
3,572		51.23% Pervious Area
3,400		48.77% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 10SA:



Summary for Subcatchment 10SB:

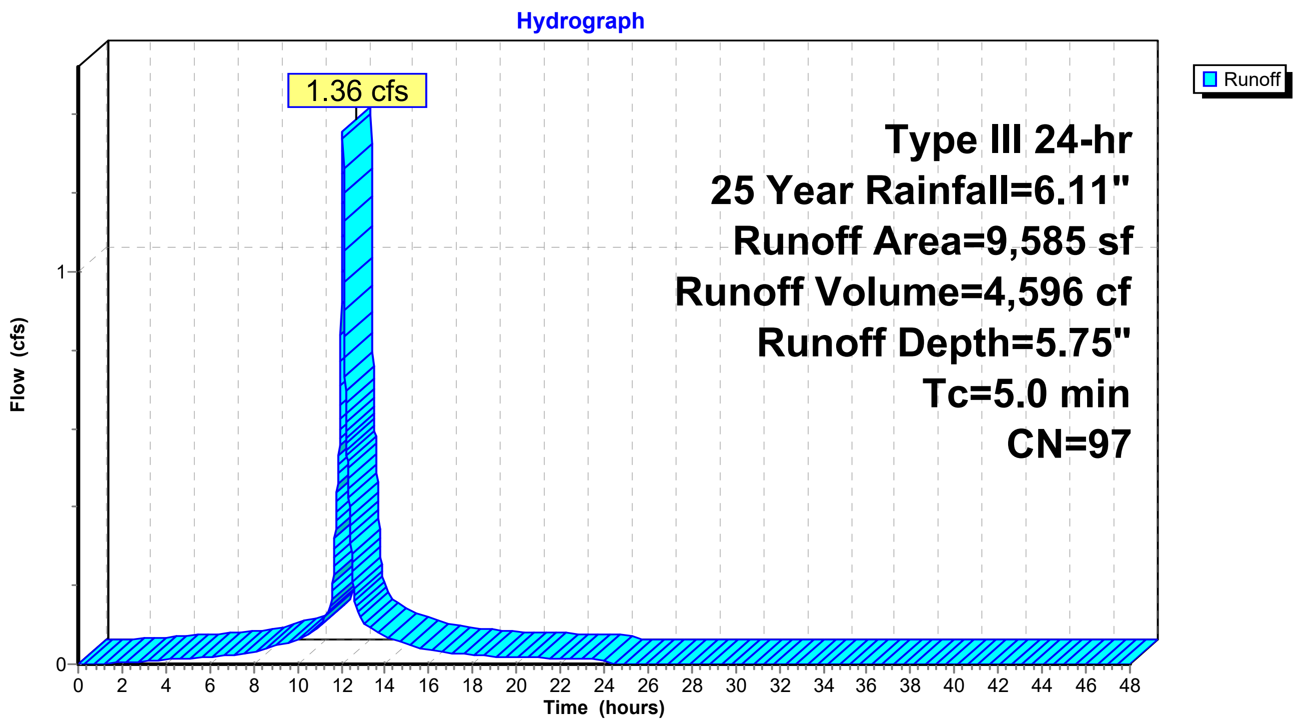
Runoff = 1.36 cfs @ 12.07 hrs, Volume= 4,596 cf, Depth= 5.75"
Routed to Pond 10PA : West

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 Year Rainfall=6.11"

Area (sf)	CN	Description
9,020	98	Paved parking, HSG D
565	80	>75% Grass cover, Good, HSG D
9,585	97	Weighted Average
565		5.89% Pervious Area
9,020		94.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 10SB:



Summary for Subcatchment 10SC:

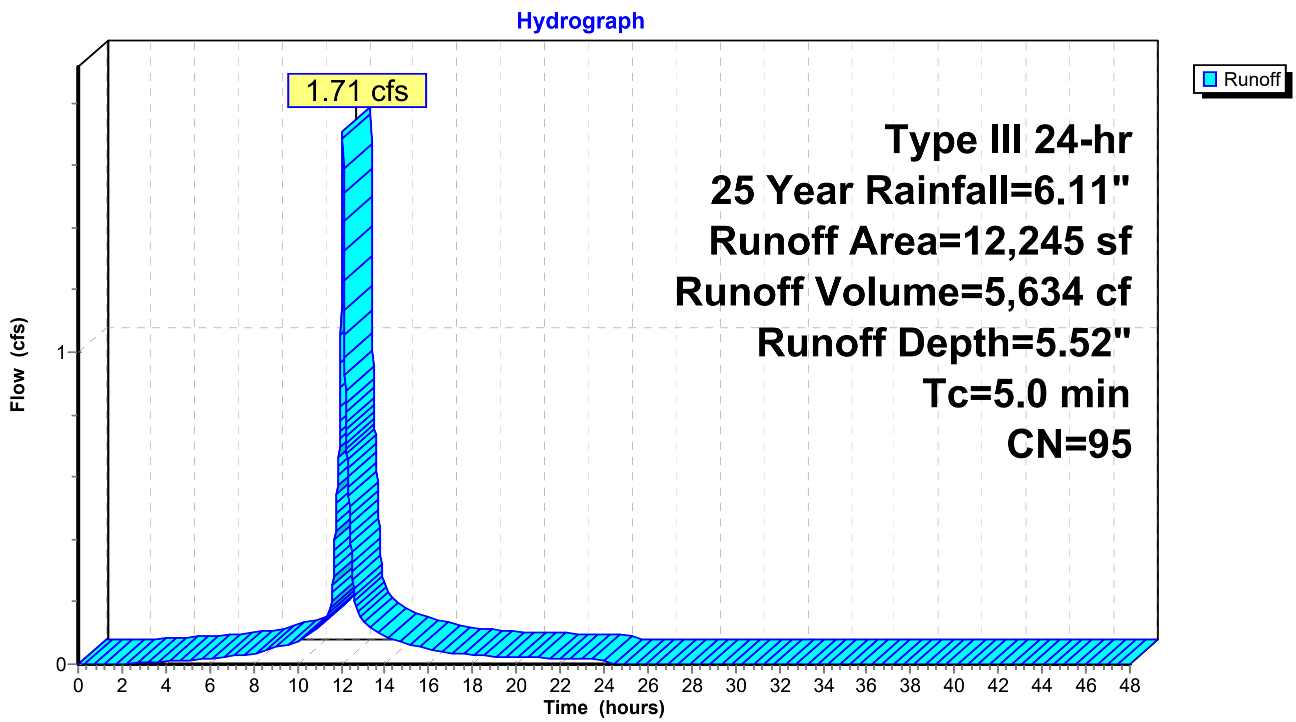
Runoff = 1.71 cfs @ 12.07 hrs, Volume= 5,634 cf, Depth= 5.52"
Routed to Pond 10PB : East

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 Year Rainfall=6.11"

Area (sf)	CN	Description
2,021	80	>75% Grass cover, Good, HSG D
10,224	98	Paved parking, HSG D
12,245	95	Weighted Average
2,021		16.50% Pervious Area
10,224		83.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 10SC:



Summary for Subcatchment 10SD:

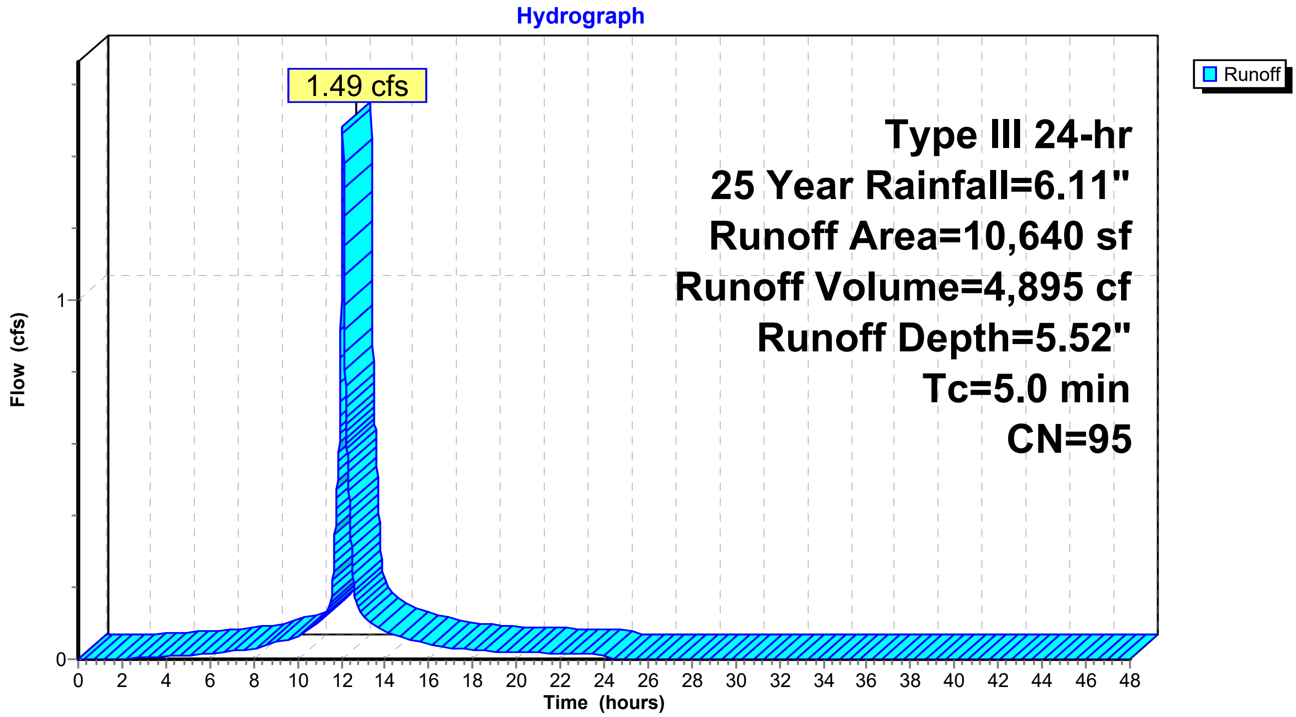
Runoff = 1.49 cfs @ 12.07 hrs, Volume= 4,895 cf, Depth= 5.52"
Routed to Pond 10PB : East

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 Year Rainfall=6.11"

Area (sf)	CN	Description
9,065	98	Paved parking, HSG D
1,575	80	>75% Grass cover, Good, HSG D
10,640	95	Weighted Average
1,575		14.80% Pervious Area
9,065		85.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 10SD:



Summary for Subcatchment 10SE:

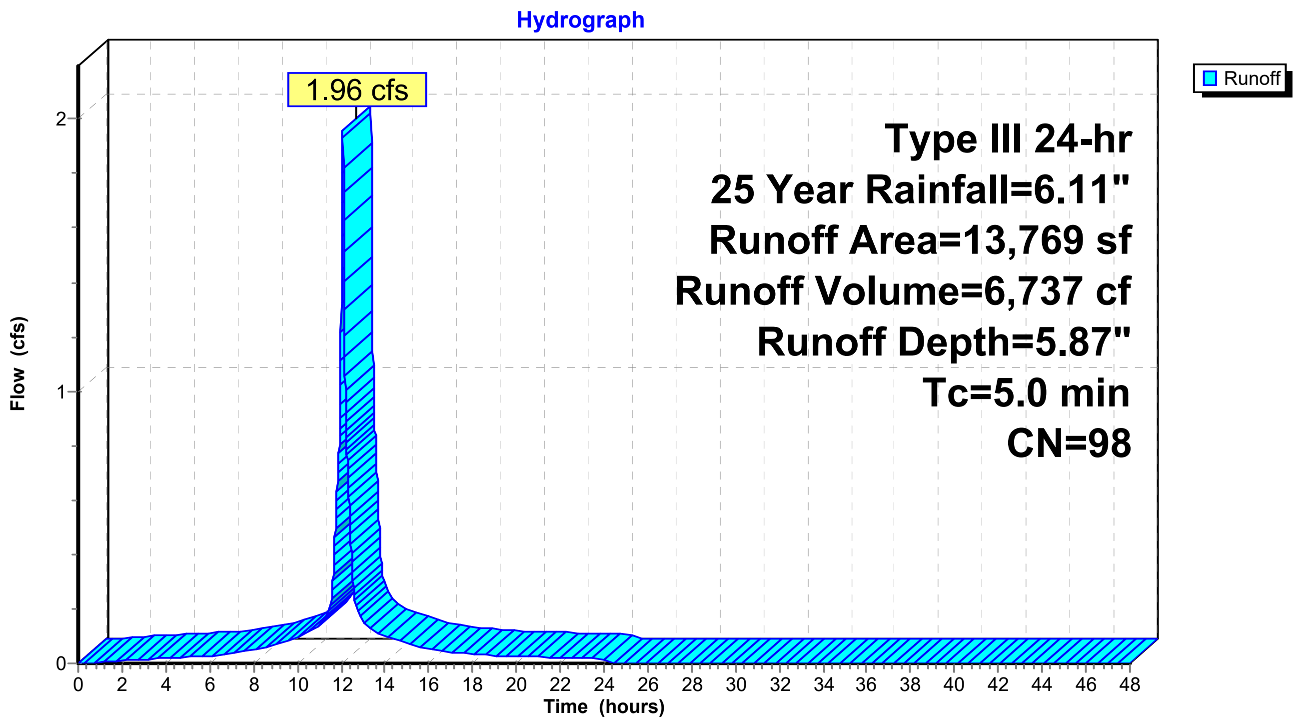
Runoff = 1.96 cfs @ 12.07 hrs, Volume= 6,737 cf, Depth= 5.87"
Routed to Pond 10PB : East

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 Year Rainfall=6.11"

Area (sf)	CN	Description
13,769	98	Roofs, HSG D
13,769		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 10SE:



Summary for Subcatchment 10SF:

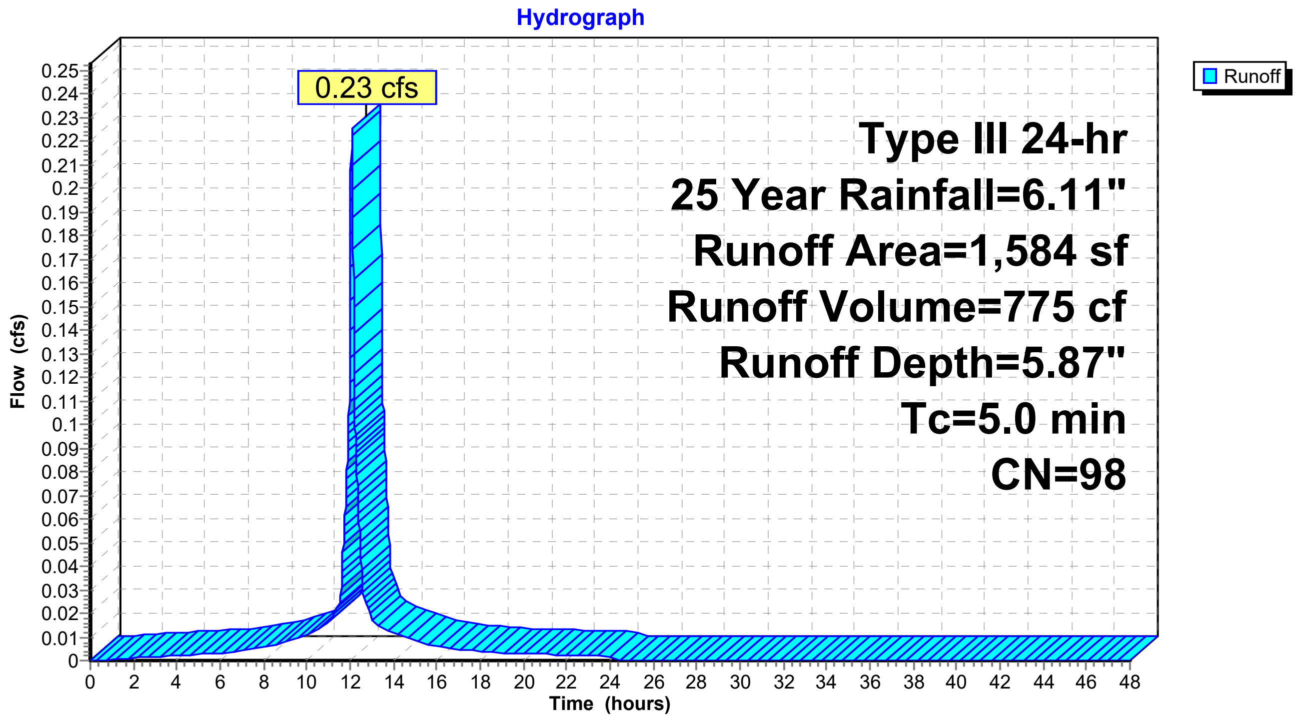
Runoff = 0.23 cfs @ 12.07 hrs, Volume= 775 cf, Depth= 5.87"
Routed to Pond 10PA : West

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 Year Rainfall=6.11"

Area (sf)	CN	Description
1,245	98	Roofs, HSG D
339	98	Roofs, HSG B
1,584	98	Weighted Average
1,584		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 10SF:



Summary for Subcatchment 20S:

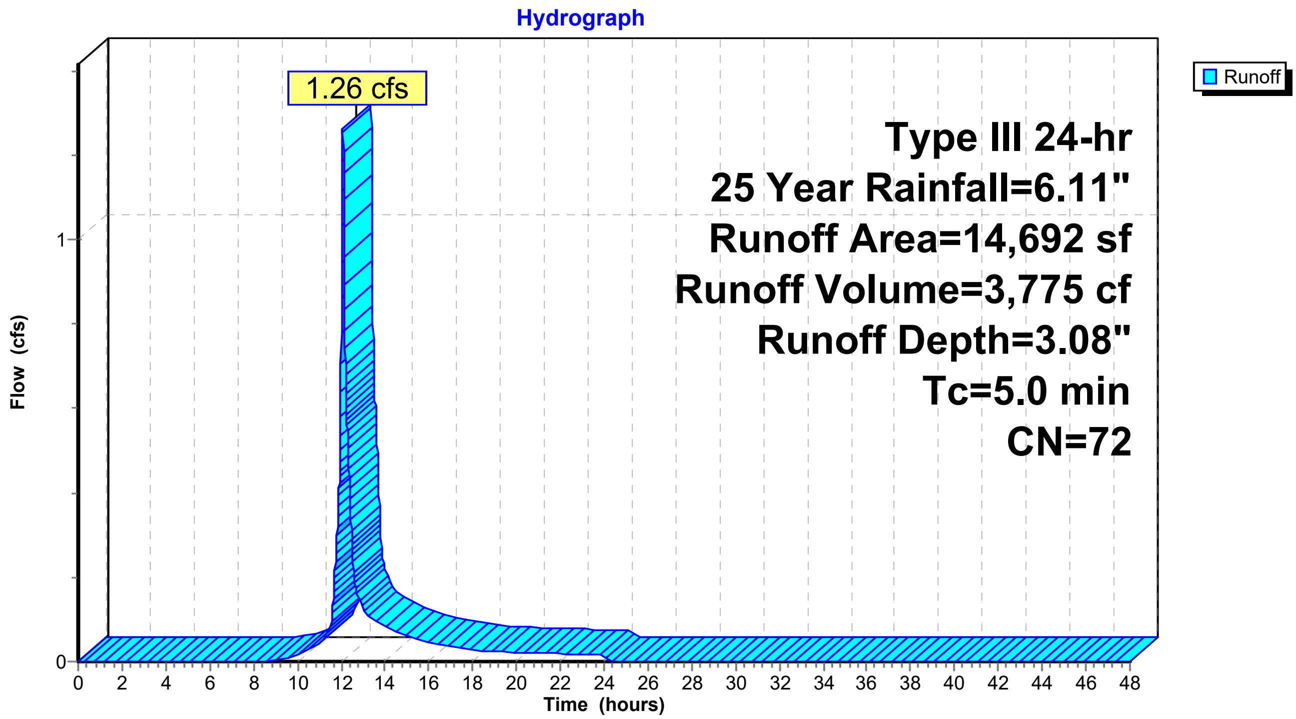
Runoff = 1.26 cfs @ 12.08 hrs, Volume= 3,775 cf, Depth= 3.08"
Routed to Link 20L : Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 Year Rainfall=6.11"

Area (sf)	CN	Description
5,586	80	>75% Grass cover, Good, HSG D
7,464	61	>75% Grass cover, Good, HSG B
1,642	98	Paved parking, HSG D
14,692	72	Weighted Average
13,050		88.82% Pervious Area
1,642		11.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 20S:



Summary for Pond 10PA: West

Inflow Area = 18,141 sf, 77.20% Impervious, Inflow Depth = 5.41" for 25 Year event
Inflow = 2.49 cfs @ 12.07 hrs, Volume= 8,184 cf
Outflow = 0.99 cfs @ 12.27 hrs, Volume= 8,182 cf, Atten= 60%, Lag= 11.8 min
Primary = 0.99 cfs @ 12.27 hrs, Volume= 8,182 cf
Routed to Link 10L : Wetlands

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 188.34' @ 12.27 hrs Surf.Area= 1,726 sf Storage= 1,521 cf

Plug-Flow detention time= 23.6 min calculated for 8,181 cf (100% of inflow)
Center-of-Mass det. time= 23.6 min (786.1 - 762.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	187.00'	1,566 cf	**44.25'W x 39.02'L x 3.50'H Field A** 6,043 cf Overall - 2,129 cf Embedded = 3,914 cf x 40.0% Voids
#2A	187.50'	2,129 cf	**Cultec R-300HD** x 45 Inside #1 Effective Size= 45.6"W x 30.0"H => 6.53 sf x 7.08'L = 46.2 cf Overall Size= 51.0"W x 30.0"H x 7.54'L with 0.46' Overlap 45 Chambers in 9 Rows Cap Storage= 2.7 cf x 2 x 9 rows = 47.8 cf
		3,694 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	187.00'	**12.0" Round Culvert** L= 13.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 187.00' / 186.80' S= 0.0154 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	190.00'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Device 1	187.00'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.99 cfs @ 12.27 hrs HW=188.34' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.99 cfs of 3.36 cfs potential flow)
  ├─**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
  └─**3=Orifice/Grate** (Orifice Controls 0.99 cfs @ 5.03 fps)

Pond 10PA: West - Chamber Wizard Field A

Chamber Model = Cultec R-300HD (Cultec Recharger®300HD)
Effective Size= 45.6"W x 30.0"H => 6.53 sf x 7.08'L = 46.2 cf
Overall Size= 51.0"W x 30.0"H x 7.54'L with 0.46' Overlap
Cap Storage= 2.7 cf x 2 x 9 rows = 47.8 cf

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

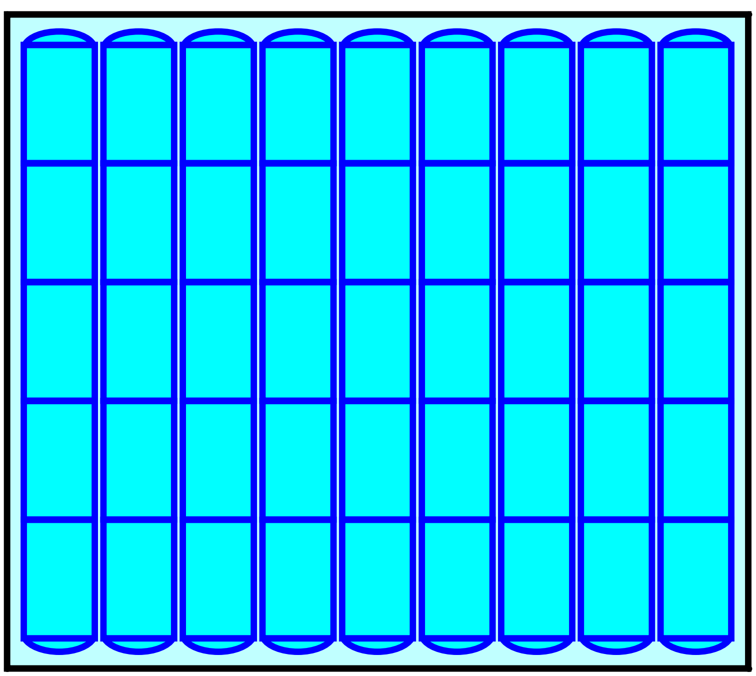
5 Chambers/Row x 7.08' Long +0.80' Cap Length x 2 = 37.02' Row Length +12.0" End Stone x 2 = 39.02' Base Length
9 Rows x 51.0" Wide + 6.0" Spacing x 8 + 12.0" Side Stone x 2 = 44.25' Base Width
6.0" Stone Base + 30.0" Chamber Height + 6.0" Stone Cover = 3.50' Field Height

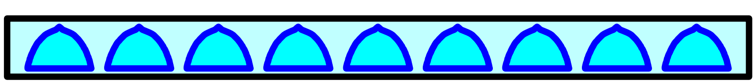
45 Chambers x 46.2 cf + 2.7 cf Cap Volume x 2 x 9 Rows = 2,128.7 cf Chamber Storage

6,042.7 cf Field - 2,128.7 cf Chambers = 3,914.0 cf Stone x 40.0% Voids = 1,565.6 cf Stone Storage

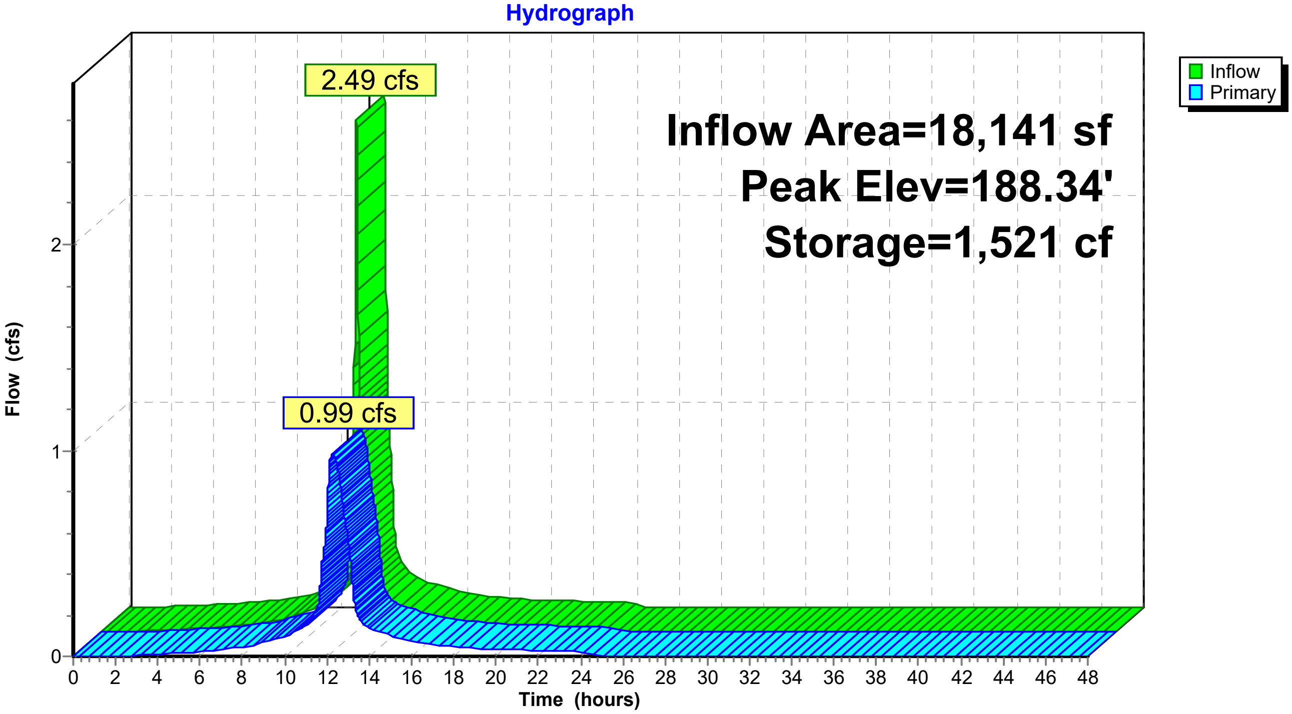
Chamber Storage + Stone Storage = 3,694.3 cf = 0.085 af
Overall Storage Efficiency = 61.1%
Overall System Size = 39.02' x 44.25' x 3.50'

45 Chambers
223.8 cy Field
145.0 cy Stone





Pond 10PA: West



Summary for Pond 10PB: East

Inflow Area = 36,654 sf, 90.19% Impervious, Inflow Depth = 5.65" for 25 Year event
Inflow = 5.16 cfs @ 12.07 hrs, Volume= 17,266 cf
Outflow = 2.18 cfs @ 12.24 hrs, Volume= 17,262 cf, Atten= 58%, Lag= 10.3 min
Primary = 2.18 cfs @ 12.24 hrs, Volume= 17,262 cf
Routed to Link 10L : Wetlands

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 189.13' @ 12.24 hrs Surf.Area= 2,468 sf Storage= 3,613 cf

Plug-Flow detention time= 28.0 min calculated for 17,262 cf (100% of inflow)
Center-of-Mass det. time= 27.8 min (782.9 - 755.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	187.00'	2,225 cf	**63.25'W x 39.02'L x 3.50'H Field A** 8,637 cf Overall - 3,075 cf Embedded = 5,563 cf x 40.0% Voids
#2A	187.50'	3,075 cf	**Cultec R-300HD** x 65 Inside #1 Effective Size= 45.6"W x 30.0"H => 6.53 sf x 7.08'L = 46.2 cf Overall Size= 51.0"W x 30.0"H x 7.54'L with 0.46' Overlap 65 Chambers in 13 Rows Cap Storage= 2.7 cf x 2 x 13 rows = 69.0 cf
		5,300 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	187.00'	**12.0" Round Culvert** L= 21.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 187.00' / 186.75' S= 0.0119 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	190.00'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Device 1	187.00'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	188.00'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=2.18 cfs @ 12.24 hrs HW=189.13' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 2.18 cfs of 4.83 cfs potential flow)
  ├─**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
  ├─**3=Orifice/Grate** (Orifice Controls 1.30 cfs @ 6.60 fps)
  └─**4=Orifice/Grate** (Orifice Controls 0.89 cfs @ 4.52 fps)

Pond 10PB: East - Chamber Wizard Field A

Chamber Model = Cultec R-300HD (Cultec Recharger® 300HD)
Effective Size= 45.6"W x 30.0"H => 6.53 sf x 7.08'L = 46.2 cf
Overall Size= 51.0"W x 30.0"H x 7.54'L with 0.46' Overlap
Cap Storage= 2.7 cf x 2 x 13 rows = 69.0 cf

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

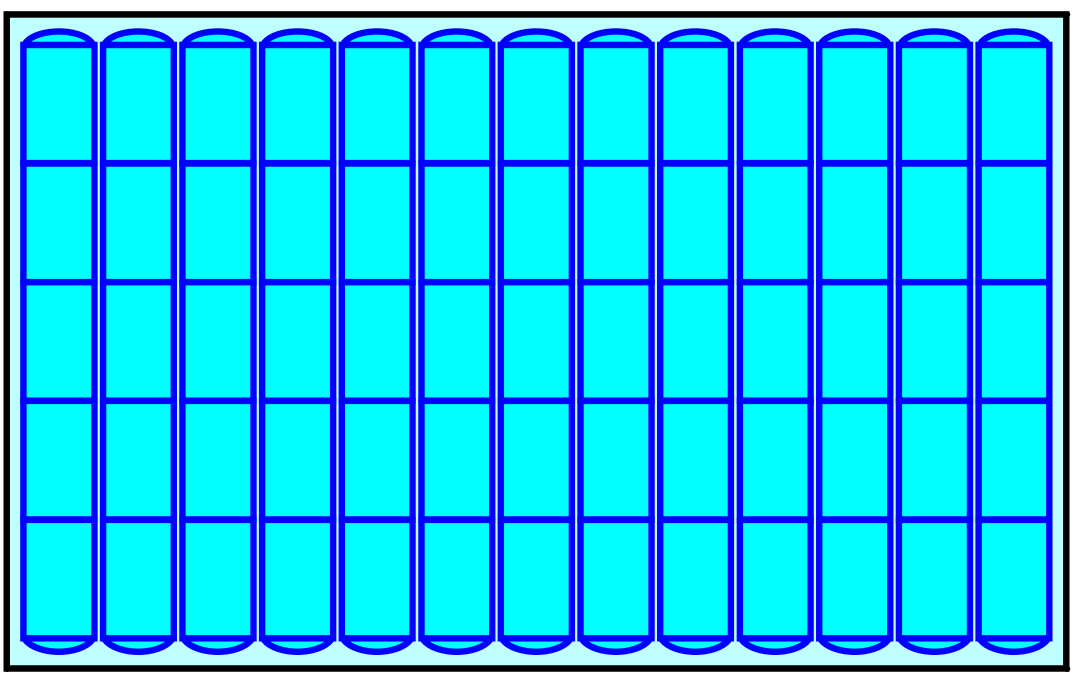
5 Chambers/Row x 7.08' Long +0.80' Cap Length x 2 = 37.02' Row Length +12.0" End Stone x 2 = 39.02' Base Length
13 Rows x 51.0" Wide + 6.0" Spacing x 12 + 12.0" Side Stone x 2 = 63.25' Base Width
6.0" Stone Base + 30.0" Chamber Height + 6.0" Stone Cover = 3.50' Field Height

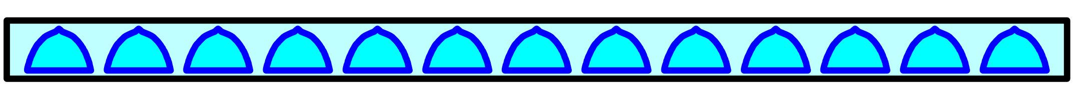
65 Chambers x 46.2 cf + 2.7 cf Cap Volume x 2 x 13 Rows = 3,074.8 cf Chamber Storage

8,637.3 cf Field - 3,074.8 cf Chambers = 5,562.6 cf Stone x 40.0% Voids = 2,225.0 cf Stone Storage

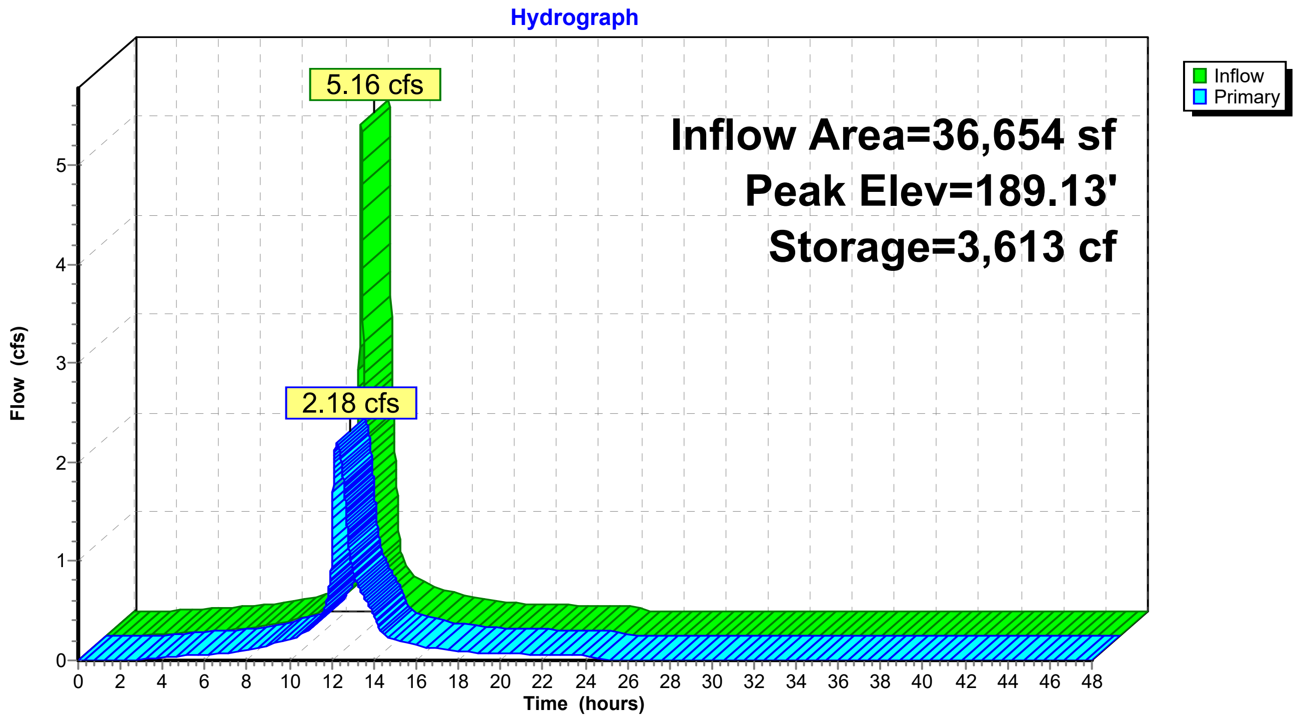
Chamber Storage + Stone Storage = 5,299.8 cf = 0.122 af
Overall Storage Efficiency = 61.4%
Overall System Size = 39.02' x 63.25' x 3.50'

65 Chambers
319.9 cy Field
206.0 cy Stone





Pond 10PB: East

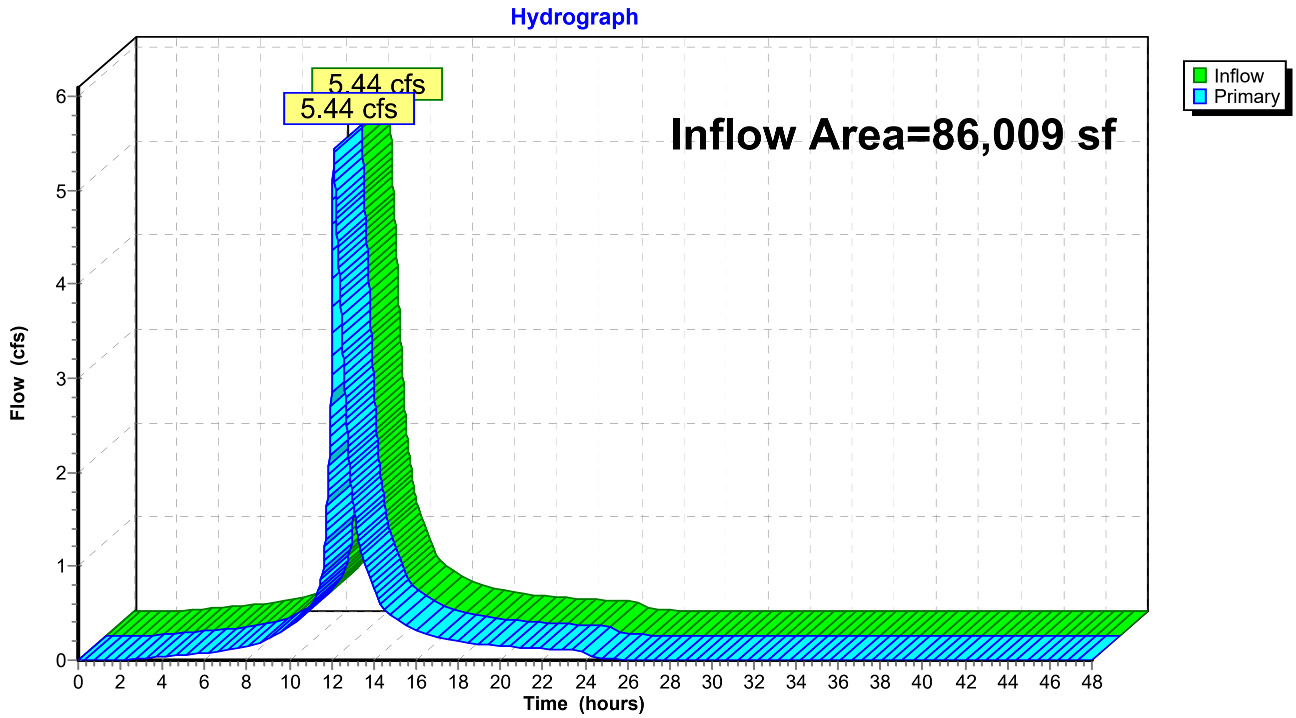


Summary for Link 10L: Wetlands

Inflow Area = 86,009 sf, 54.72% Impervious, Inflow Depth = 4.70" for 25 Year event
Inflow = 5.44 cfs @ 12.11 hrs, Volume= 33,717 cf
Primary = 5.44 cfs @ 12.11 hrs, Volume= 33,717 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link 10L: Wetlands

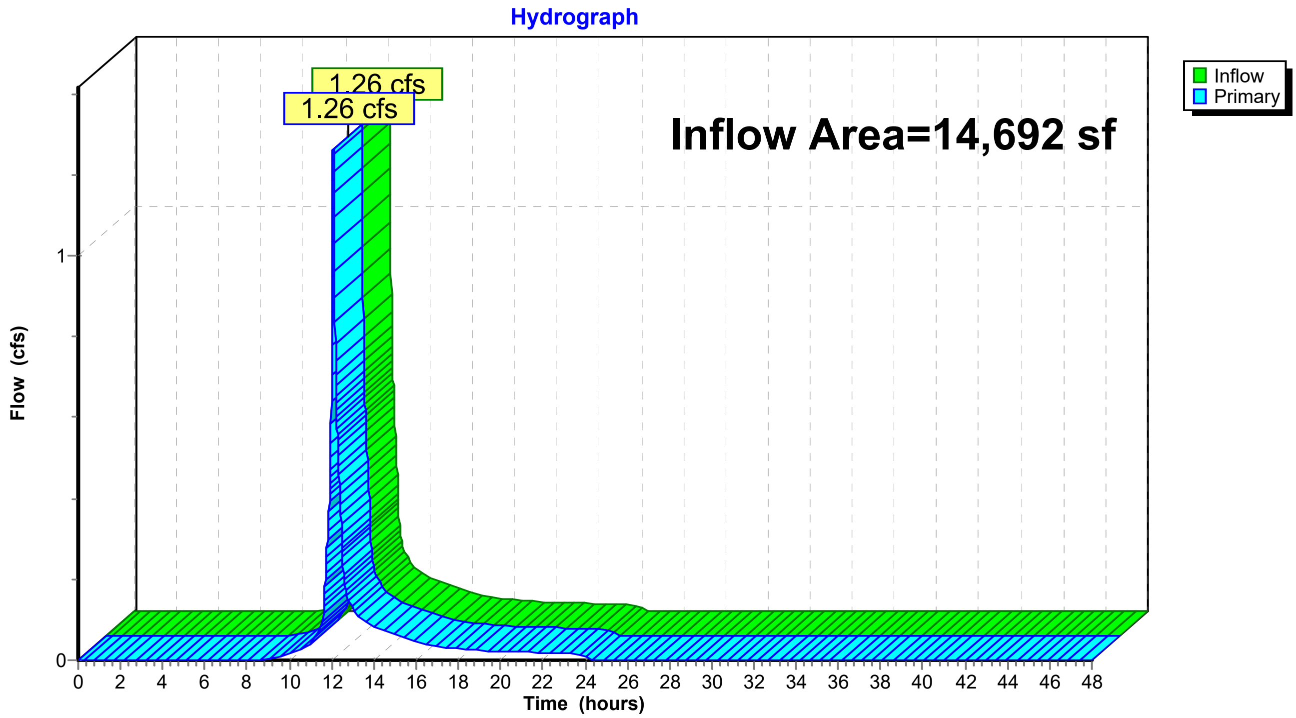


Summary for Link 20L: Street

Inflow Area = 14,692 sf, 11.18% Impervious, Inflow Depth = 3.08" for 25 Year event
Inflow = 1.26 cfs @ 12.08 hrs, Volume= 3,775 cf
Primary = 1.26 cfs @ 12.08 hrs, Volume= 3,775 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link 20L: Street



Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment10S: Runoff Area=31,214 sf 0.00% Impervious Runoff Depth=4.66"
Flow Length=85' Slope=0.1400 '/' Tc=6.0 min CN=73 Runoff=3.91 cfs 12,120 cf

Subcatchment10SA: Runoff Area=6,972 sf 48.77% Impervious Runoff Depth=6.52"
Tc=5.0 min CN=89 Runoff=1.20 cfs 3,788 cf

Subcatchment10SB: Runoff Area=9,585 sf 94.11% Impervious Runoff Depth=7.47"
Tc=5.0 min CN=97 Runoff=1.75 cfs 5,967 cf

Subcatchment10SC: Runoff Area=12,245 sf 83.50% Impervious Runoff Depth=7.23"
Tc=5.0 min CN=95 Runoff=2.21 cfs 7,380 cf

Subcatchment10SD: Runoff Area=10,640 sf 85.20% Impervious Runoff Depth=7.23"
Tc=5.0 min CN=95 Runoff=1.92 cfs 6,412 cf

Subcatchment10SE: Runoff Area=13,769 sf 100.00% Impervious Runoff Depth=7.59"
Tc=5.0 min CN=98 Runoff=2.52 cfs 8,709 cf

Subcatchment10SF: Runoff Area=1,584 sf 100.00% Impervious Runoff Depth=7.59"
Tc=5.0 min CN=98 Runoff=0.29 cfs 1,002 cf

Subcatchment20S: Runoff Area=14,692 sf 11.18% Impervious Runoff Depth=4.55"
Tc=5.0 min CN=72 Runoff=1.86 cfs 5,565 cf

Pond 10PA: West Peak Elev=188.82' Storage=2,137 cf Inflow=3.23 cfs 10,757 cf
Outflow=1.18 cfs 10,756 cf

Pond 10PB: East Peak Elev=189.93' Storage=4,736 cf Inflow=6.65 cfs 22,501 cf
Outflow=2.77 cfs 22,498 cf

Link 10L: Wetlands Inflow=7.29 cfs 45,374 cf
Primary=7.29 cfs 45,374 cf

Link 20L: Street Inflow=1.86 cfs 5,565 cf
Primary=1.86 cfs 5,565 cf

Total Runoff Area = 100,701 sf Runoff Volume = 50,944 cf Average Runoff Depth = 6.07"
51.64% Pervious = 51,997 sf 48.36% Impervious = 48,704 sf

Summary for Subcatchment 10S:

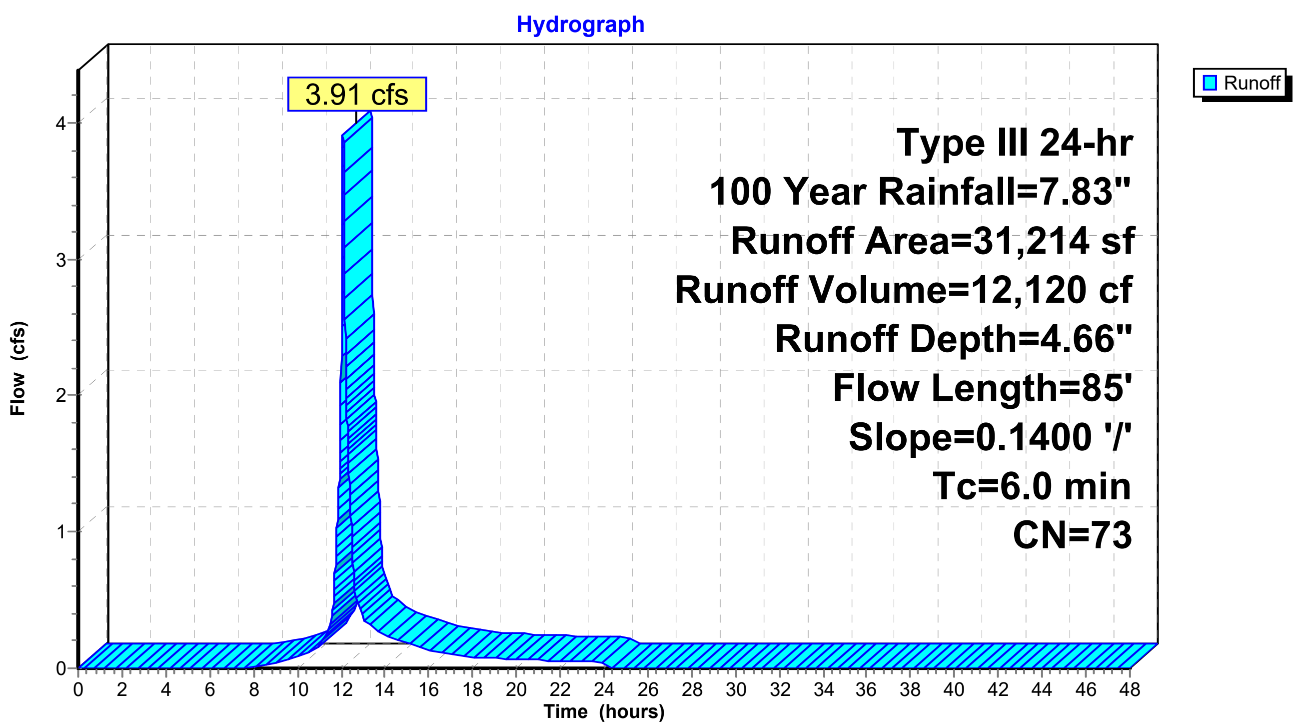
Runoff = 3.91 cfs @ 12.09 hrs, Volume= 12,120 cf, Depth= 4.66"
Routed to Link 10L : Wetlands

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Rainfall=7.83"

Area (sf)	CN	Description
8,595	61	>75% Grass cover, Good, HSG B
8,096	80	>75% Grass cover, Good, HSG D
14,523	77	Woods, Good, HSG D
31,214	73	Weighted Average
31,214		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	50	0.1400	0.15		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.3	35	0.1400	1.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
6.0	85	Total			

Subcatchment 10S:



Summary for Subcatchment 10SA:

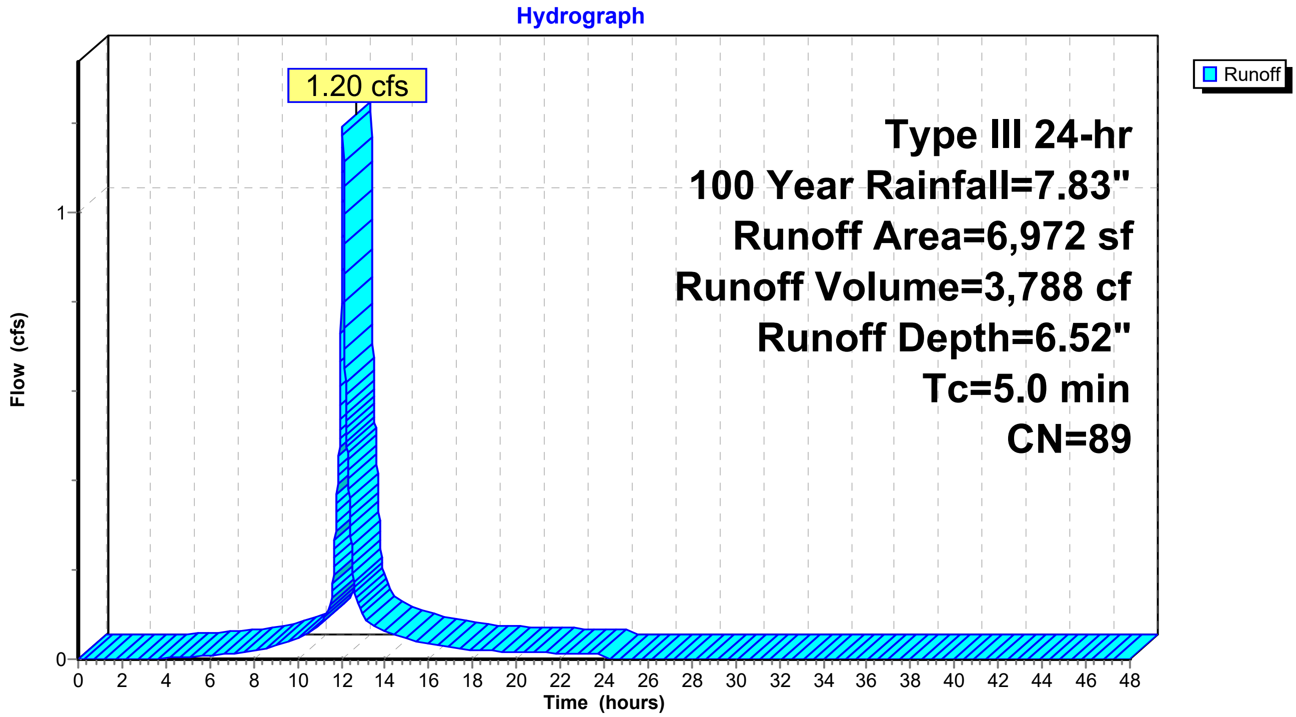
Runoff = 1.20 cfs @ 12.07 hrs, Volume= 3,788 cf, Depth= 6.52"
Routed to Pond 10PA : West

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Rainfall=7.83"

Area (sf)	CN	Description
3,400	98	Paved parking, HSG D
3,572	80	>75% Grass cover, Good, HSG D
6,972	89	Weighted Average
3,572		51.23% Pervious Area
3,400		48.77% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 10SA:



Summary for Subcatchment 10SB:

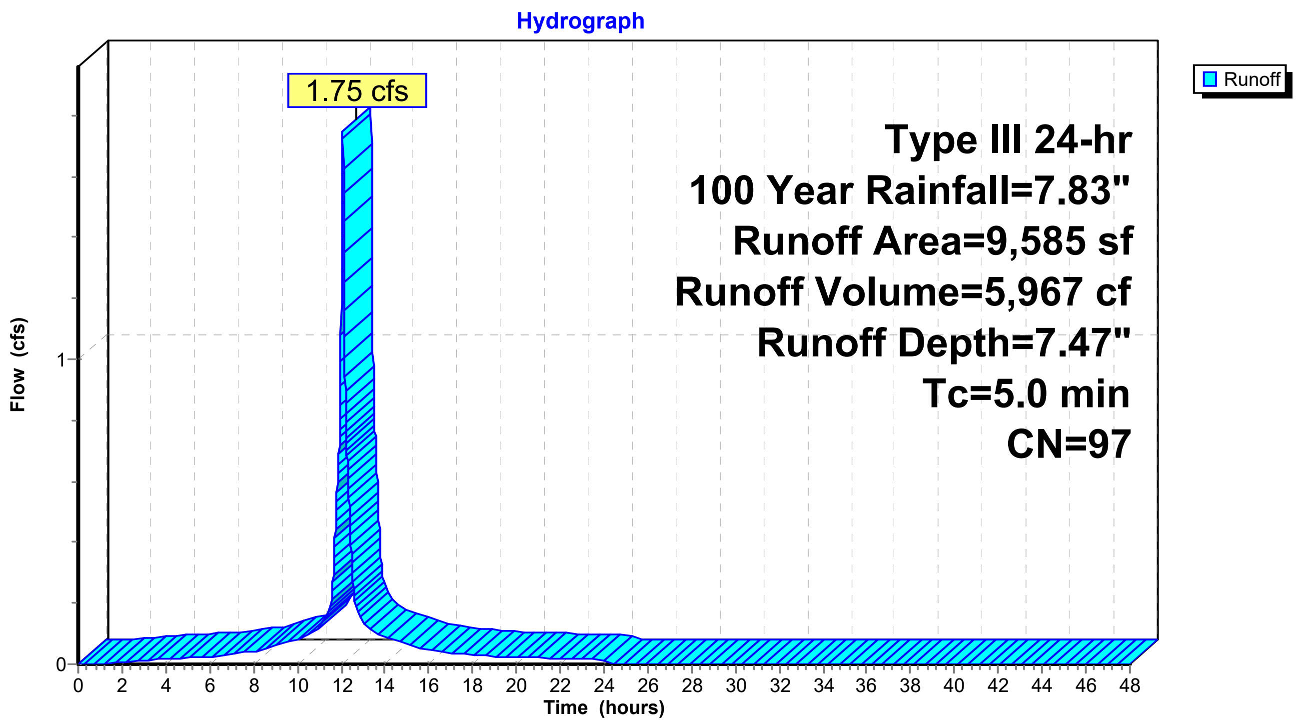
Runoff = 1.75 cfs @ 12.07 hrs, Volume= 5,967 cf, Depth= 7.47"
Routed to Pond 10PA : West

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Rainfall=7.83"

Area (sf)	CN	Description
9,020	98	Paved parking, HSG D
565	80	>75% Grass cover, Good, HSG D
9,585	97	Weighted Average
565		5.89% Pervious Area
9,020		94.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 10SB:



Summary for Subcatchment 10SC:

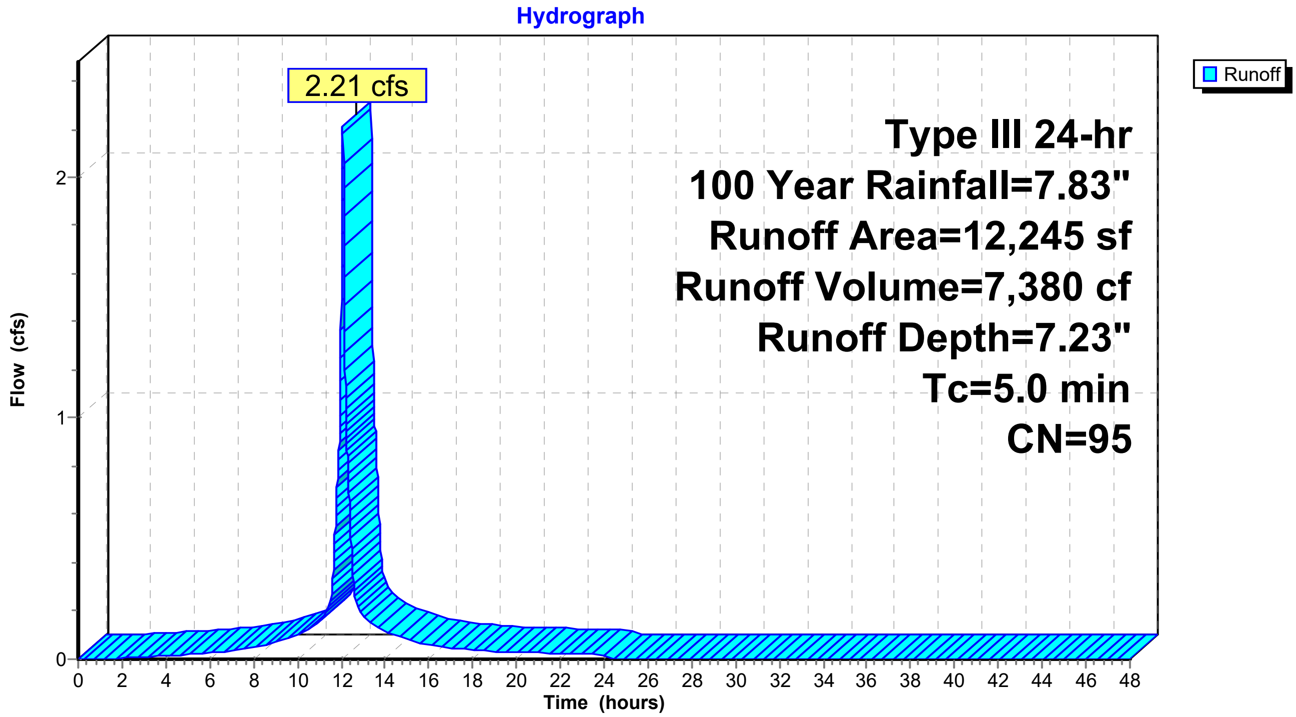
Runoff = 2.21 cfs @ 12.07 hrs, Volume= 7,380 cf, Depth= 7.23"
Routed to Pond 10PB : East

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Rainfall=7.83"

Area (sf)	CN	Description
2,021	80	>75% Grass cover, Good, HSG D
10,224	98	Paved parking, HSG D
12,245	95	Weighted Average
2,021		16.50% Pervious Area
10,224		83.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 10SC:



Summary for Subcatchment 10SD:

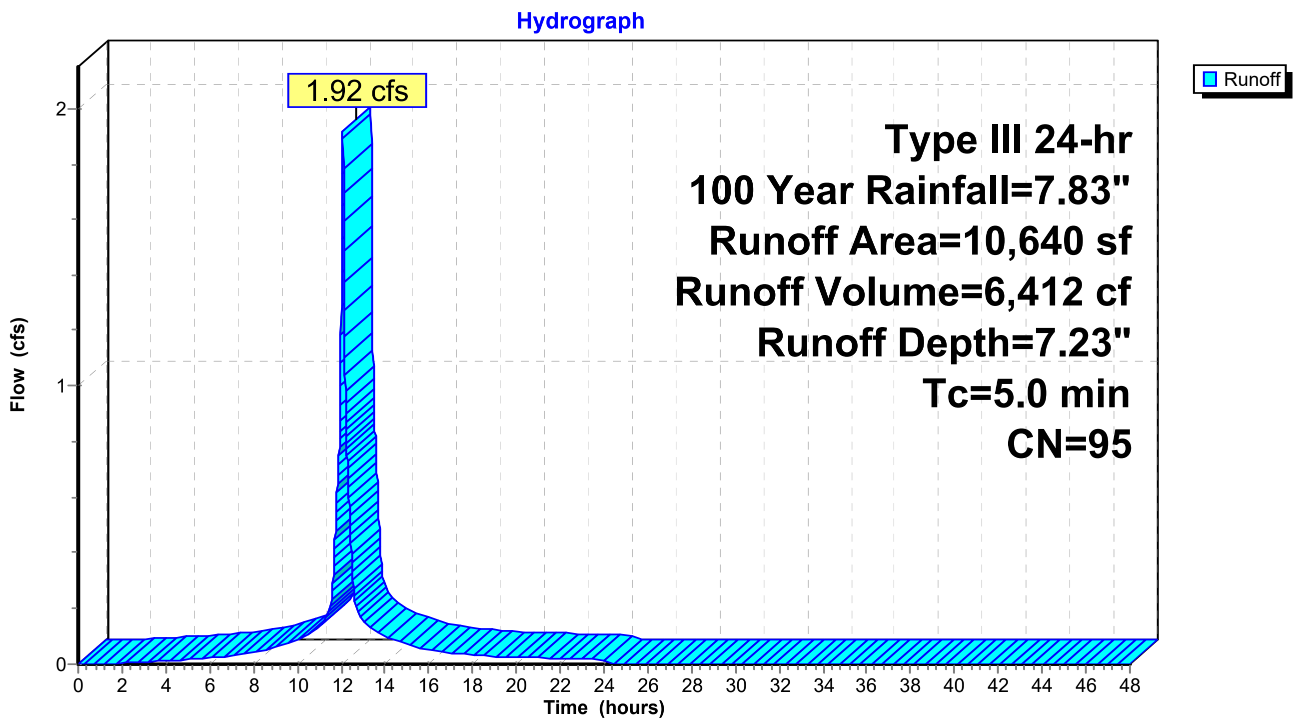
Runoff = 1.92 cfs @ 12.07 hrs, Volume= 6,412 cf, Depth= 7.23"
Routed to Pond 10PB : East

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Rainfall=7.83"

Area (sf)	CN	Description
9,065	98	Paved parking, HSG D
1,575	80	>75% Grass cover, Good, HSG D
10,640	95	Weighted Average
1,575		14.80% Pervious Area
9,065		85.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 10SD:



Summary for Subcatchment 10SE:

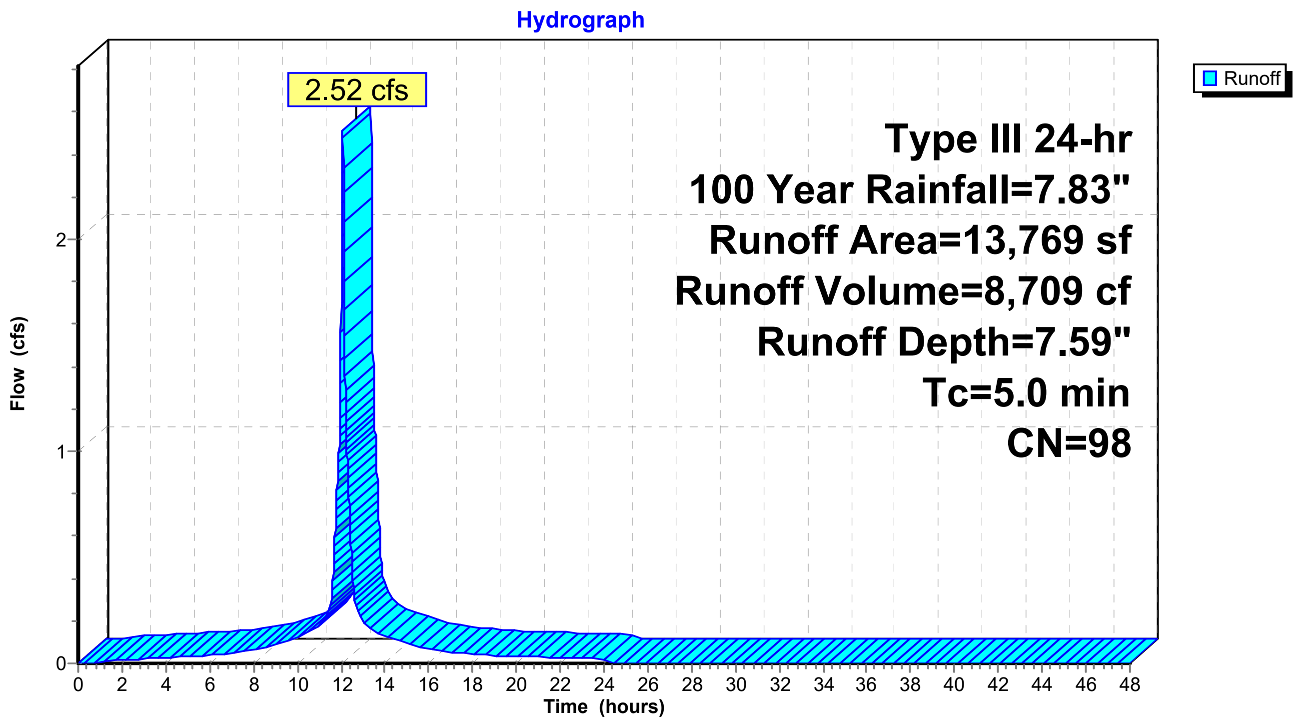
Runoff = 2.52 cfs @ 12.07 hrs, Volume= 8,709 cf, Depth= 7.59"
Routed to Pond 10PB : East

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Rainfall=7.83"

Area (sf)	CN	Description
13,769	98	Roofs, HSG D
13,769		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 10SE:



Summary for Subcatchment 10SF:

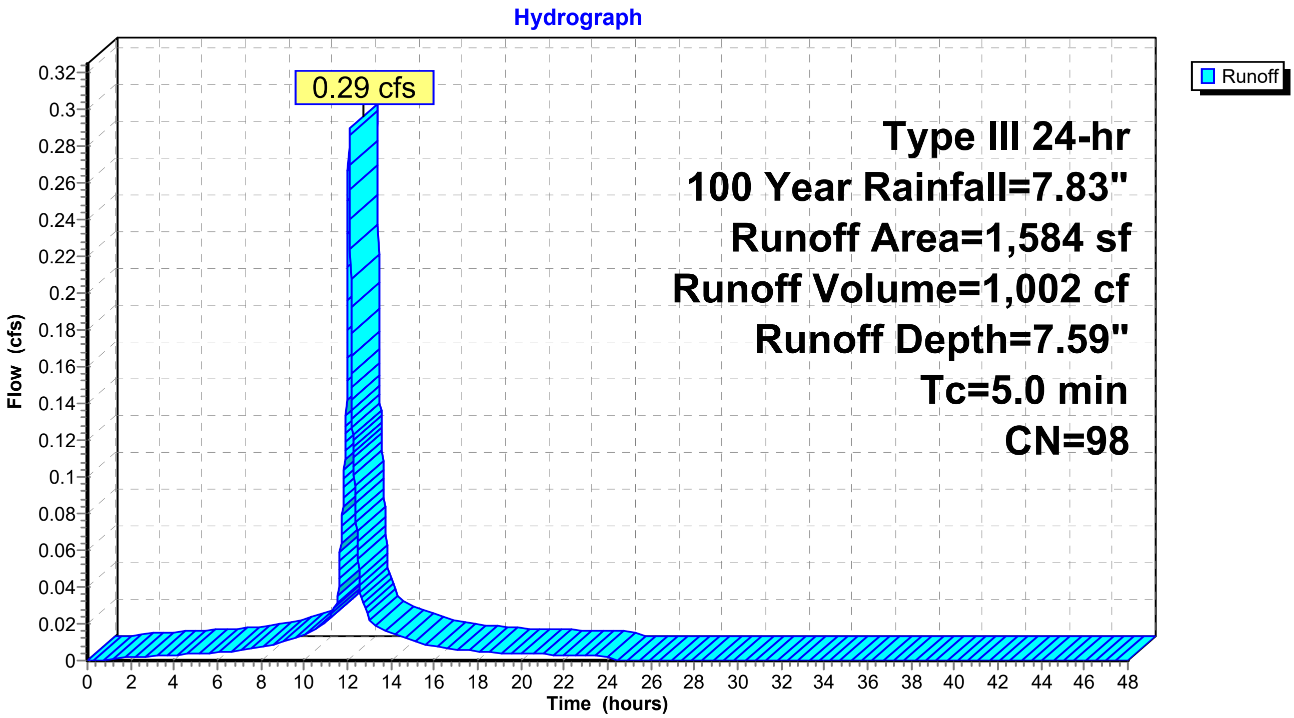
Runoff = 0.29 cfs @ 12.07 hrs, Volume= 1,002 cf, Depth= 7.59"
Routed to Pond 10PA : West

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Rainfall=7.83"

Area (sf)	CN	Description
1,245	98	Roofs, HSG D
339	98	Roofs, HSG B
1,584	98	Weighted Average
1,584		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 10SF:



Summary for Subcatchment 20S:

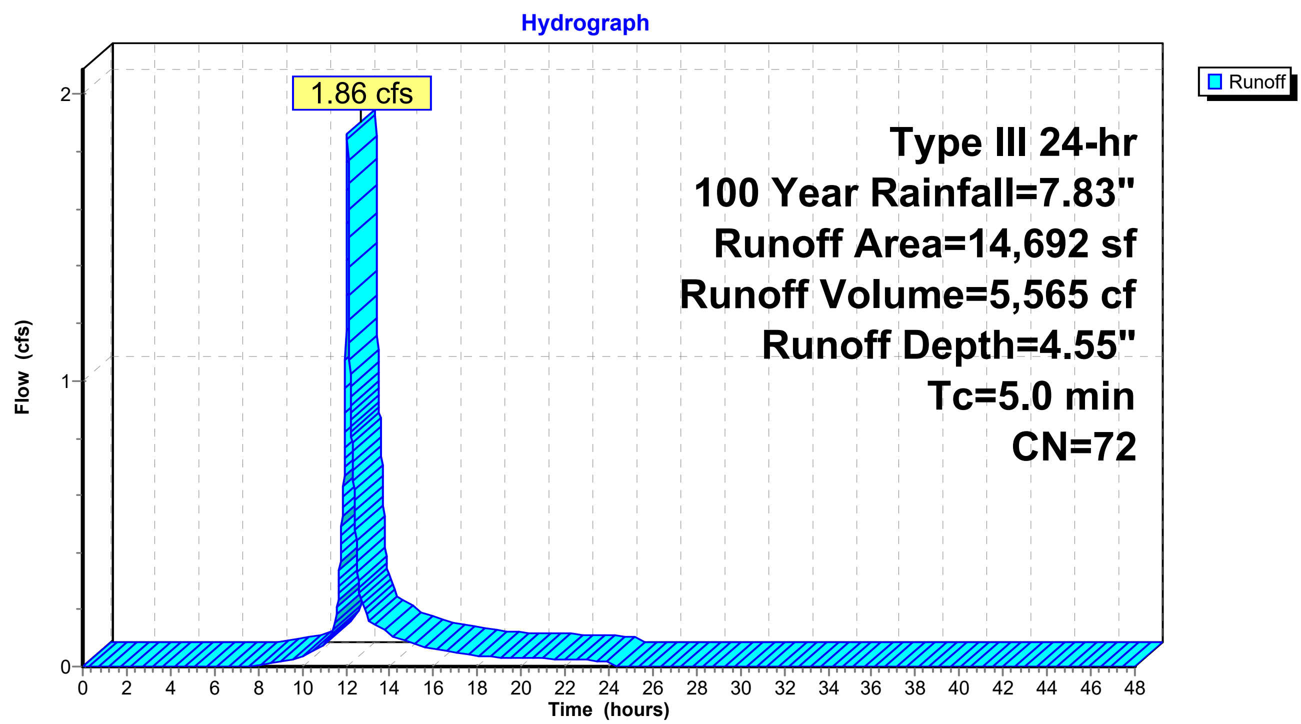
Runoff = 1.86 cfs @ 12.07 hrs, Volume= 5,565 cf, Depth= 4.55"
Routed to Link 20L : Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Rainfall=7.83"

Area (sf)	CN	Description
5,586	80	>75% Grass cover, Good, HSG D
7,464	61	>75% Grass cover, Good, HSG B
1,642	98	Paved parking, HSG D
14,692	72	Weighted Average
13,050		88.82% Pervious Area
1,642		11.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 20S:



Summary for Pond 10PA: West

Inflow Area = 18,141 sf, 77.20% Impervious, Inflow Depth = 7.12" for 100 Year event
Inflow = 3.23 cfs @ 12.07 hrs, Volume= 10,757 cf
Outflow = 1.18 cfs @ 12.30 hrs, Volume= 10,756 cf, Atten= 63%, Lag= 13.6 min
Primary = 1.18 cfs @ 12.30 hrs, Volume= 10,756 cf
Routed to Link 10L : Wetlands

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 188.82' @ 12.30 hrs Surf.Area= 1,726 sf Storage= 2,137 cf

Plug-Flow detention time= 23.9 min calculated for 10,756 cf (100% of inflow)
Center-of-Mass det. time= 23.7 min (781.1 - 757.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	187.00'	1,566 cf	**44.25'W x 39.02'L x 3.50'H Field A** 6,043 cf Overall - 2,129 cf Embedded = 3,914 cf x 40.0% Voids
#2A	187.50'	2,129 cf	**Cultec R-300HD** x 45 Inside #1 Effective Size= 45.6"W x 30.0"H => 6.53 sf x 7.08'L = 46.2 cf Overall Size= 51.0"W x 30.0"H x 7.54'L with 0.46' Overlap 45 Chambers in 9 Rows Cap Storage= 2.7 cf x 2 x 9 rows = 47.8 cf
		3,694 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	187.00'	**12.0" Round Culvert** L= 13.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 187.00' / 186.80' S= 0.0154 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	190.00'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Device 1	187.00'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.18 cfs @ 12.30 hrs HW=188.82' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 1.18 cfs of 4.34 cfs potential flow)
  ├─**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
  └─**3=Orifice/Grate** (Orifice Controls 1.18 cfs @ 6.03 fps)

Pond 10PA: West - Chamber Wizard Field A

Chamber Model = Cultec R-300HD (Cultec Recharger®300HD)
Effective Size= 45.6"W x 30.0"H => 6.53 sf x 7.08'L = 46.2 cf
Overall Size= 51.0"W x 30.0"H x 7.54'L with 0.46' Overlap
Cap Storage= 2.7 cf x 2 x 9 rows = 47.8 cf

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

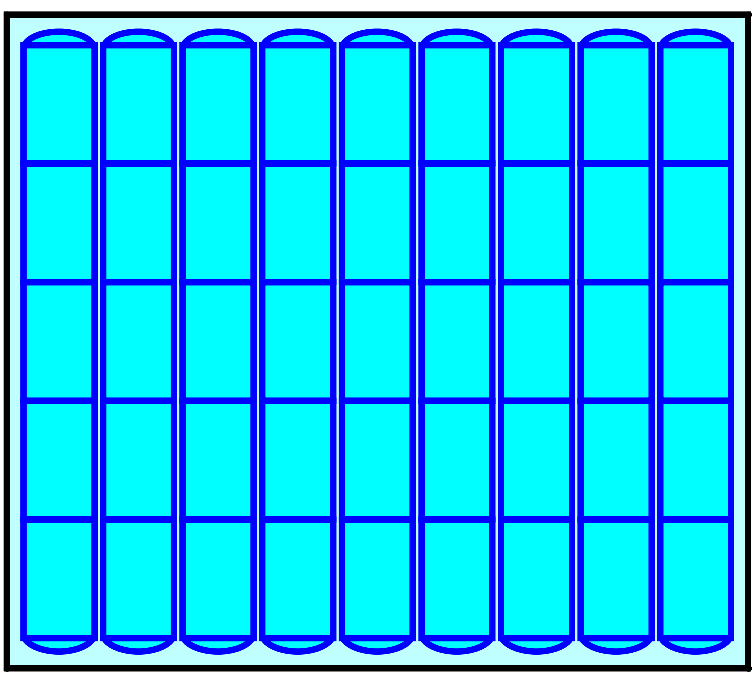
5 Chambers/Row x 7.08' Long +0.80' Cap Length x 2 = 37.02' Row Length +12.0" End Stone x 2 = 39.02' Base Length
9 Rows x 51.0" Wide + 6.0" Spacing x 8 + 12.0" Side Stone x 2 = 44.25' Base Width
6.0" Stone Base + 30.0" Chamber Height + 6.0" Stone Cover = 3.50' Field Height

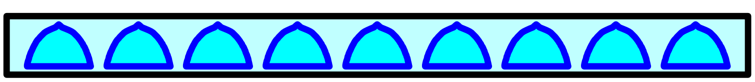
45 Chambers x 46.2 cf + 2.7 cf Cap Volume x 2 x 9 Rows = 2,128.7 cf Chamber Storage

6,042.7 cf Field - 2,128.7 cf Chambers = 3,914.0 cf Stone x 40.0% Voids = 1,565.6 cf Stone Storage

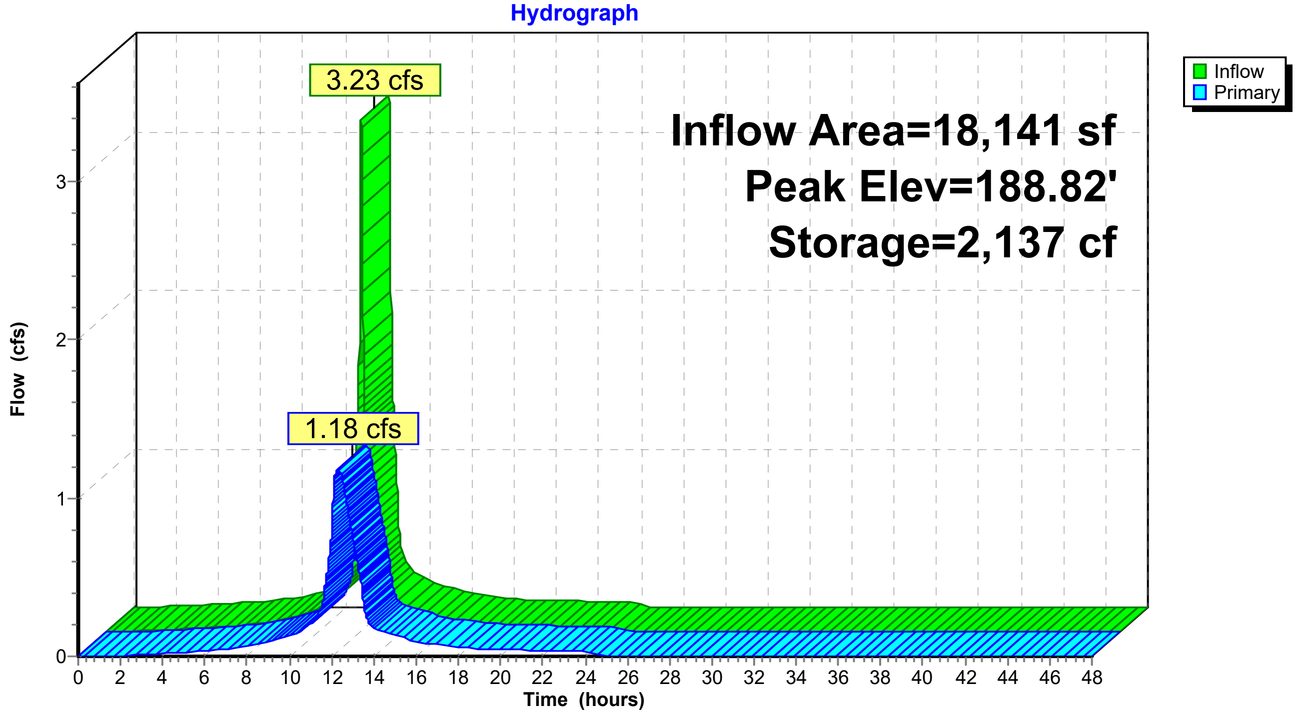
Chamber Storage + Stone Storage = 3,694.3 cf = 0.085 af
Overall Storage Efficiency = 61.1%
Overall System Size = 39.02' x 44.25' x 3.50'

45 Chambers
223.8 cy Field
145.0 cy Stone





Pond 10PA: West



Summary for Pond 10PB: East

Inflow Area = 36,654 sf, 90.19% Impervious, Inflow Depth = 7.37" for 100 Year event
Inflow = 6.65 cfs @ 12.07 hrs, Volume= 22,501 cf
Outflow = 2.77 cfs @ 12.25 hrs, Volume= 22,498 cf, Atten= 58%, Lag= 10.6 min
Primary = 2.77 cfs @ 12.25 hrs, Volume= 22,498 cf
Routed to Link 10L : Wetlands

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 189.93' @ 12.25 hrs Surf.Area= 2,468 sf Storage= 4,736 cf

Plug-Flow detention time= 27.0 min calculated for 22,493 cf (100% of inflow)
Center-of-Mass det. time= 27.0 min (777.4 - 750.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	187.00'	2,225 cf	**63.25'W x 39.02'L x 3.50'H Field A** 8,637 cf Overall - 3,075 cf Embedded = 5,563 cf x 40.0% Voids
#2A	187.50'	3,075 cf	**Cultec R-300HD** x 65 Inside #1 Effective Size= 45.6"W x 30.0"H => 6.53 sf x 7.08'L = 46.2 cf Overall Size= 51.0"W x 30.0"H x 7.54'L with 0.46' Overlap 65 Chambers in 13 Rows Cap Storage= 2.7 cf x 2 x 13 rows = 69.0 cf
		5,300 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	187.00'	**12.0" Round Culvert** L= 21.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 187.00' / 186.75' S= 0.0119 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	190.00'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Device 1	187.00'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	188.00'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=2.77 cfs @ 12.25 hrs HW=189.93' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 2.77 cfs of 5.90 cfs potential flow)
  ├─**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
  ├─**3=Orifice/Grate** (Orifice Controls 1.55 cfs @ 7.88 fps)
  └─**4=Orifice/Grate** (Orifice Controls 1.23 cfs @ 6.24 fps)

Pond 10PB: East - Chamber Wizard Field A

Chamber Model = Cultec R-300HD (Cultec Recharger® 300HD)
Effective Size= 45.6"W x 30.0"H => 6.53 sf x 7.08'L = 46.2 cf
Overall Size= 51.0"W x 30.0"H x 7.54'L with 0.46' Overlap
Cap Storage= 2.7 cf x 2 x 13 rows = 69.0 cf

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

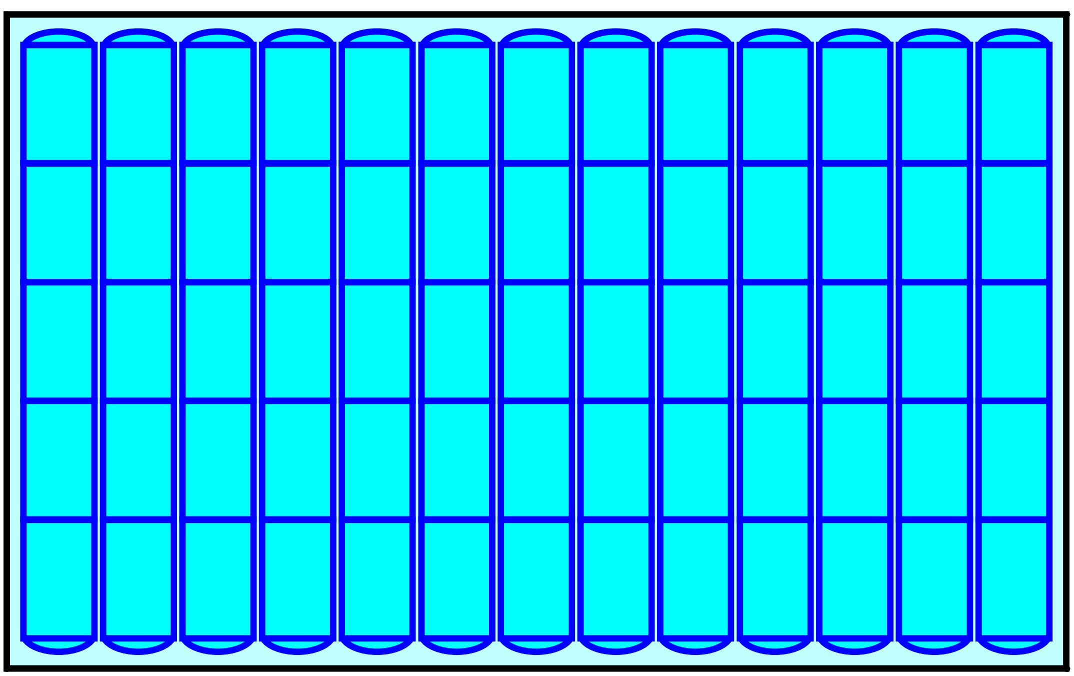
5 Chambers/Row x 7.08' Long +0.80' Cap Length x 2 = 37.02' Row Length +12.0" End Stone x 2 = 39.02' Base Length
13 Rows x 51.0" Wide + 6.0" Spacing x 12 + 12.0" Side Stone x 2 = 63.25' Base Width
6.0" Stone Base + 30.0" Chamber Height + 6.0" Stone Cover = 3.50' Field Height

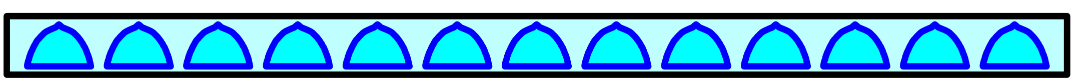
65 Chambers x 46.2 cf + 2.7 cf Cap Volume x 2 x 13 Rows = 3,074.8 cf Chamber Storage

8,637.3 cf Field - 3,074.8 cf Chambers = 5,562.6 cf Stone x 40.0% Voids = 2,225.0 cf Stone Storage

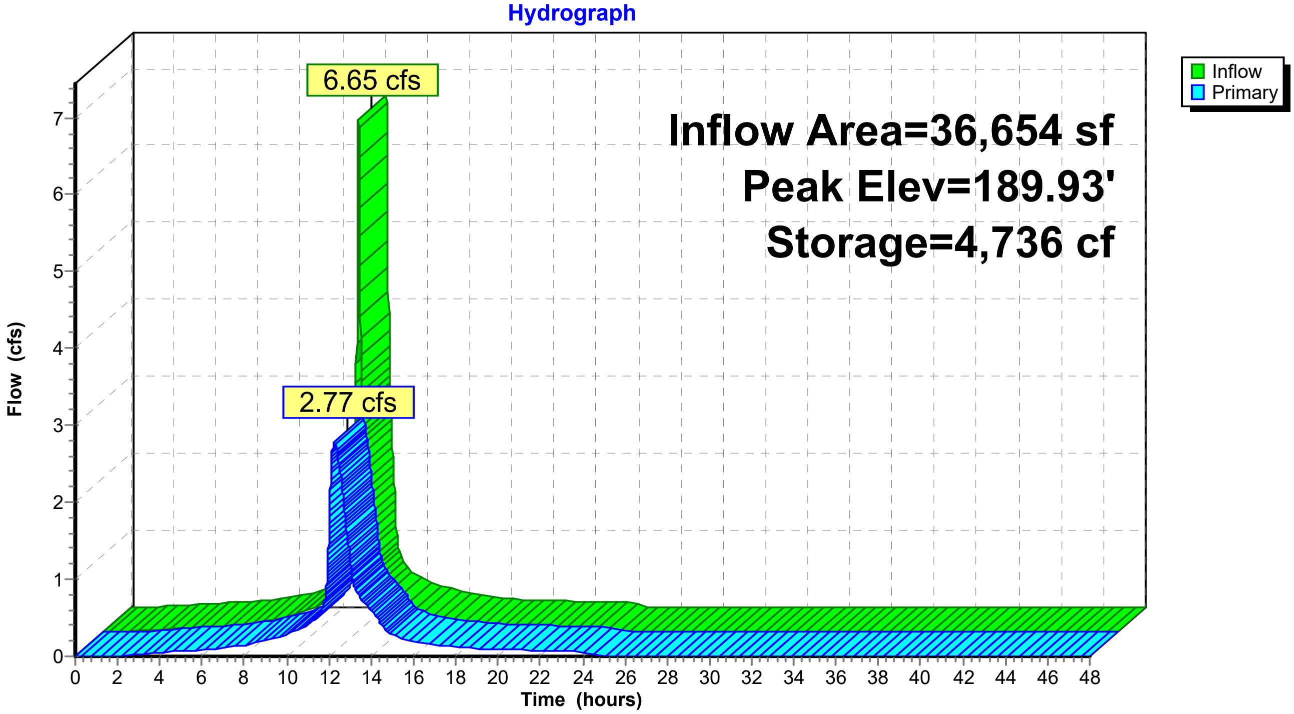
Chamber Storage + Stone Storage = 5,299.8 cf = 0.122 af
Overall Storage Efficiency = 61.4%
Overall System Size = 39.02' x 63.25' x 3.50'

65 Chambers
319.9 cy Field
206.0 cy Stone





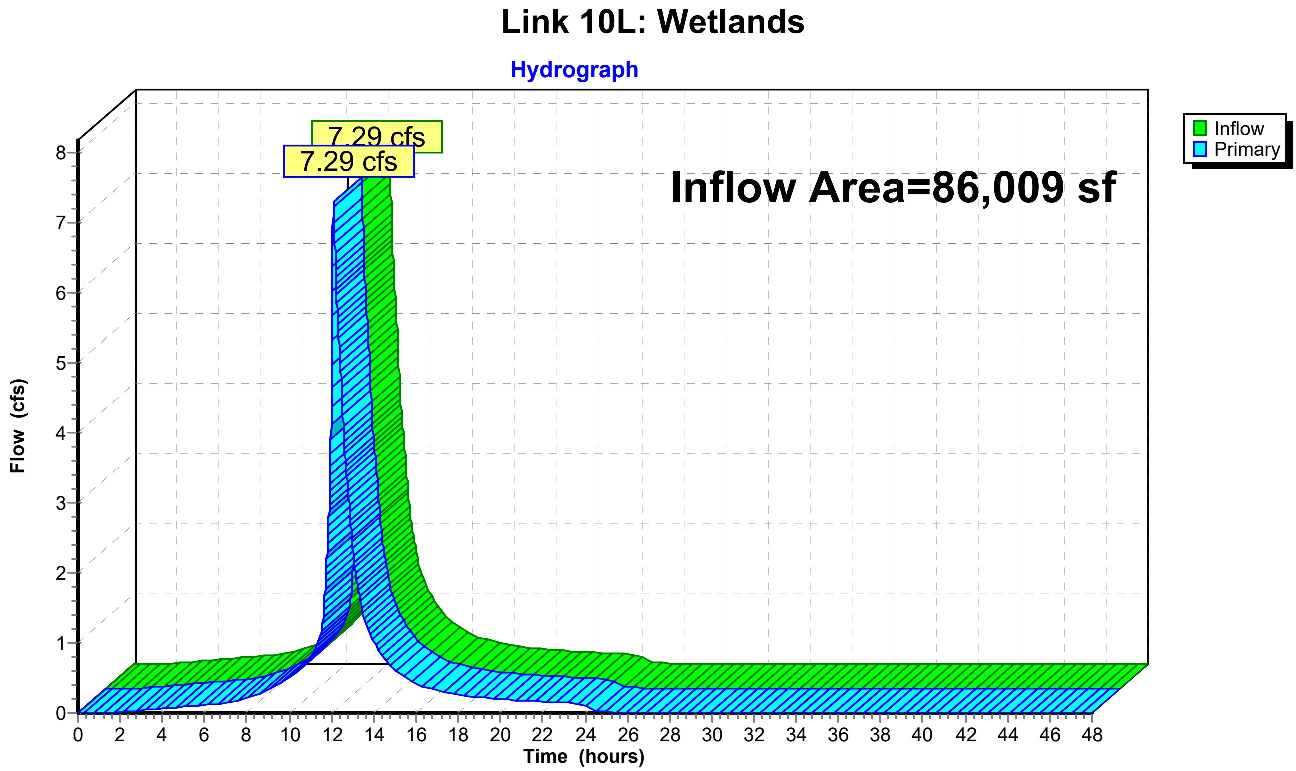
Pond 10PB: East



Summary for Link 10L: Wetlands

Inflow Area =	86,009 sf, 54.72% Impervious,	Inflow Depth = 6.33"	for 100 Year event
Inflow =	7.29 cfs @ 12.10 hrs, Volume=	45,374 cf	
Primary =	7.29 cfs @ 12.10 hrs, Volume=	45,374 cf, Atten= 0%, Lag= 0.0 min	

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

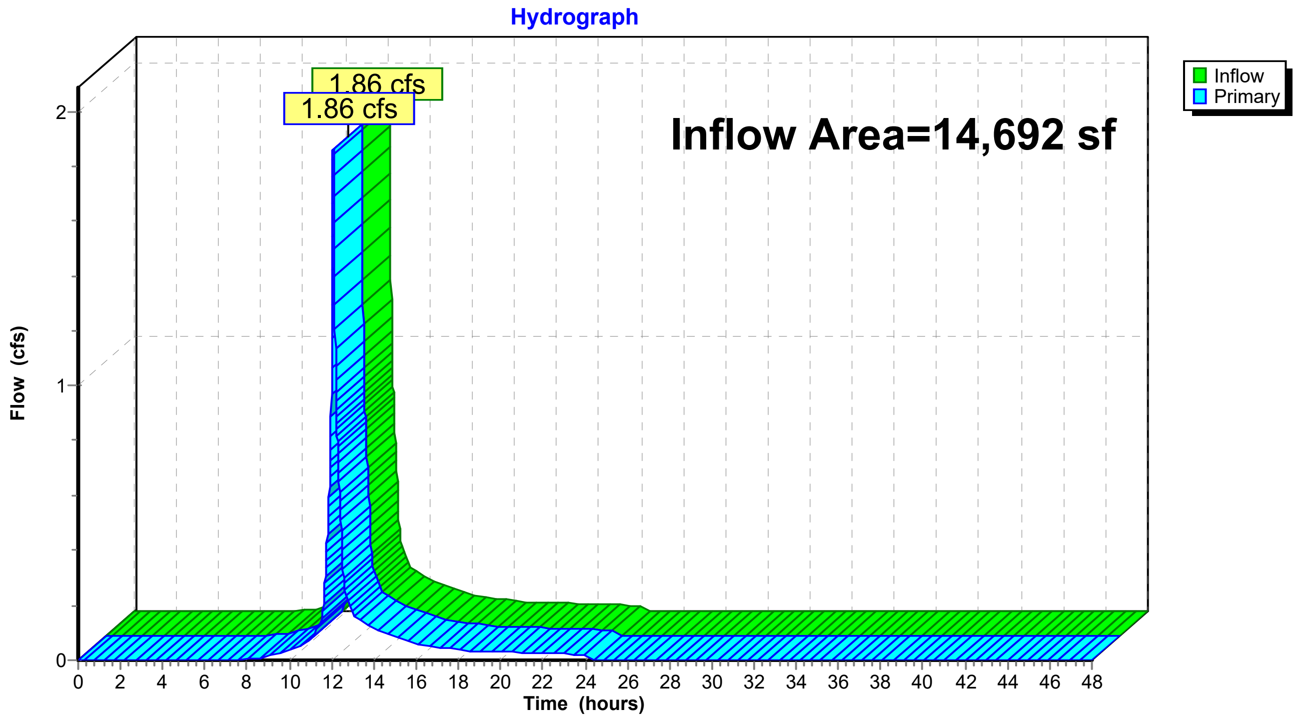


Summary for Link 20L: Street

Inflow Area = 14,692 sf, 11.18% Impervious, Inflow Depth = 4.55" for 100 Year event
Inflow = 1.86 cfs @ 12.07 hrs, Volume= 5,565 cf
Primary = 1.86 cfs @ 12.07 hrs, Volume= 5,565 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link 20L: Street



FUSS & O'NEILL

Appendix E

Storm Sewer Pipe Sizing Calculations

NOAA Atlas 14, Volume 10, Version 3
Location name: Carlisle, Massachusetts, USA*
Latitude: 42.5294°, Longitude: -71.3513°
Elevation: 202 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)[1]

Duration	Average recurrence interval (years)									
	1	**2**	**5**	**10**	**25**	**50**	**100**	**200**	**500**	**1000**
5-min	**3.79** (3.00-4.74)	**4.55** (3.60-5.70)	**5.80** (4.57-7.28)	**6.83** (5.35-8.63)	**8.26** (6.25-10.9)	**9.32** (6.90-12.5)	**10.5** (7.51-14.5)	**11.8** (7.94-16.6)	**13.7** (8.88-19.9)	**15.3** (9.65-22.6)
10-min	**2.69** (2.12-3.36)	**3.23** (2.55-4.04)	**4.11** (3.23-5.16)	**4.84** (3.79-6.11)	**5.85** (4.42-7.69)	**6.61** (4.90-8.86)	**7.40** (5.32-10.3)	**8.33** (5.63-11.7)	**9.68** (6.28-14.1)	**10.8** (6.83-16.0)
15-min	**2.11** (1.67-2.63)	**2.53** (2.00-3.17)	**3.22** (2.54-4.04)	**3.80** (2.97-4.79)	**4.59** (3.47-6.03)	**5.18** (3.84-6.94)	**5.80** (4.17-8.06)	**6.53** (4.41-9.21)	**7.59** (4.92-11.0)	**8.47** (5.36-12.6)
30-min	**1.44** (1.14-1.80)	**1.73** (1.37-2.17)	**2.21** (1.74-2.77)	**2.60** (2.04-3.28)	**3.15** (2.38-4.14)	**3.55** (2.63-4.77)	**3.98** (2.86-5.54)	**4.48** (3.03-6.33)	**5.22** (3.39-7.60)	**5.83** (3.69-8.64)
60-min	**0.912** (0.721-1.14)	**1.10** (0.867-1.37)	**1.40** (1.10-1.76)	**1.65** (1.29-2.08)	**2.00** (1.51-2.63)	**2.26** (1.67-3.03)	**2.53** (1.82-3.52)	**2.85** (1.93-4.02)	**3.32** (2.16-4.84)	**3.71** (2.35-5.50)
2-hr	**0.579** (0.462-0.719)	**0.706** (0.562-0.877)	**0.914** (0.725-1.14)	**1.09** (0.856-1.36)	**1.32** (1.01-1.73)	**1.50** (1.12-2.00)	**1.69** (1.23-2.35)	**1.92** (1.30-2.69)	**2.28** (1.48-3.30)	**2.59** (1.64-3.81)
3-hr	**0.444** (0.356-0.549)	**0.544** (0.435-0.673)	**0.707** (0.564-0.877)	**0.843** (0.667-1.05)	**1.03** (0.790-1.34)	**1.17** (0.877-1.56)	**1.32** (0.965-1.83)	**1.50** (1.02-2.10)	**1.80** (1.17-2.59)	**2.05** (1.30-3.00)
6-hr	**0.285** (0.230-0.350)	**0.350** (0.282-0.429)	**0.455** (0.366-0.560)	**0.543** (0.433-0.671)	**0.663** (0.513-0.860)	**0.752** (0.569-0.997)	**0.849** (0.626-1.17)	**0.971** (0.663-1.34)	**1.16** (0.760-1.66)	**1.33** (0.847-1.93)
12-hr	**0.180** (0.146-0.219)	**0.220** (0.179-0.268)	**0.285** (0.231-0.348)	**0.339** (0.273-0.417)	**0.414** (0.322-0.532)	**0.469** (0.357-0.617)	**0.529** (0.391-0.724)	**0.603** (0.414-0.829)	**0.719** (0.472-1.02)	**0.818** (0.523-1.18)
24-hr	**0.108** (0.088-0.130)	**0.133** (0.109-0.160)	**0.174** (0.142-0.210)	**0.207** (0.168-0.253)	**0.254** (0.199-0.324)	**0.288** (0.221-0.376)	**0.326** (0.242-0.443)	**0.372** (0.256-0.508)	**0.445** (0.293-0.626)	**0.507** (0.325-0.726)
2-day	**0.061** (0.050-0.073)	**0.076** (0.063-0.091)	**0.101** (0.083-0.121)	**0.121** (0.099-0.147)	**0.150** (0.118-0.190)	**0.171** (0.132-0.222)	**0.194** (0.145-0.263)	**0.223** (0.154-0.302)	**0.269** (0.178-0.376)	**0.310** (0.199-0.440)
3-day	**0.044** (0.037-0.053)	**0.055** (0.046-0.066)	**0.073** (0.060-0.087)	**0.088** (0.072-0.105)	**0.108** (0.086-0.136)	**0.123** (0.095-0.159)	**0.139** (0.105-0.188)	**0.160** (0.111-0.216)	**0.194** (0.128-0.269)	**0.223** (0.144-0.315)
4-day	**0.036** (0.030-0.043)	**0.044** (0.037-0.053)	**0.058** (0.048-0.069)	**0.069** (0.057-0.083)	**0.085** (0.068-0.107)	**0.097** (0.075-0.125)	**0.109** (0.083-0.147)	**0.126** (0.087-0.169)	**0.151** (0.100-0.210)	**0.174** (0.112-0.245)
7-day	**0.025** (0.021-0.029)	**0.030** (0.025-0.035)	**0.038** (0.032-0.045)	**0.045** (0.037-0.053)	**0.054** (0.043-0.067)	**0.061** (0.047-0.078)	**0.068** (0.052-0.091)	**0.078** (0.054-0.104)	**0.093** (0.062-0.128)	**0.106** (0.068-0.148)
10-day	**0.020** (0.017-0.023)	**0.024** (0.020-0.028)	**0.029** (0.025-0.035)	**0.034** (0.029-0.041)	**0.041** (0.033-0.051)	**0.046** (0.036-0.058)	**0.051** (0.039-0.068)	**0.058** (0.040-0.077)	**0.068** (0.045-0.094)	**0.077** (0.050-0.108)
20-day	**0.014** (0.012-0.016)	**0.016** (0.013-0.018)	**0.019** (0.016-0.022)	**0.022** (0.018-0.025)	**0.025** (0.020-0.031)	**0.028** (0.022-0.035)	**0.031** (0.023-0.040)	**0.034** (0.024-0.045)	**0.039** (0.026-0.053)	**0.042** (0.027-0.059)
30-day	**0.011** (0.010-0.013)	**0.013** (0.011-0.015)	**0.015** (0.013-0.017)	**0.017** (0.014-0.020)	**0.019** (0.016-0.024)	**0.021** (0.017-0.027)	**0.023** (0.017-0.030)	**0.026** (0.018-0.034)	**0.028** (0.019-0.038)	**0.031** (0.020-0.042)
45-day	**0.009** (0.008-0.011)	**0.010** (0.009-0.012)	**0.012** (0.010-0.014)	**0.013** (0.011-0.016)	**0.015** (0.012-0.018)	**0.017** (0.013-0.020)	**0.018** (0.013-0.023)	**0.019** (0.014-0.025)	**0.021** (0.014-0.029)	**0.022** (0.014-0.031)
60-day	**0.008** (0.007-0.009)	**0.009** (0.008-0.010)	**0.010** (0.009-0.012)	**0.011** (0.009-0.013)	**0.013** (0.010-0.015)	**0.014** (0.011-0.017)	**0.015** (0.011-0.019)	**0.016** (0.011-0.021)	**0.017** (0.012-0.023)	**0.018** (0.012-0.025)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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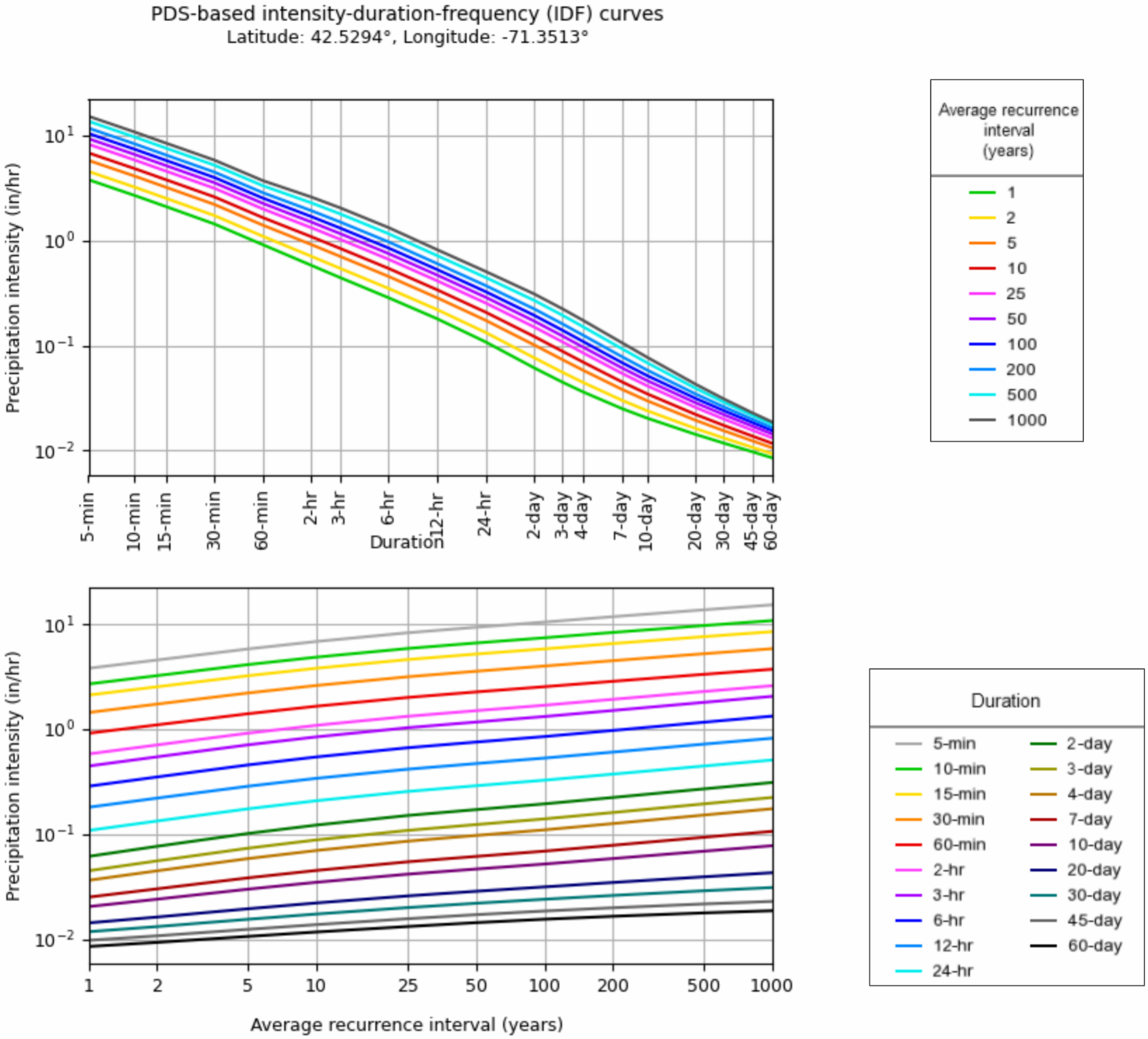
PF graphical



NOAA Atlas 14, Volume 10, Version 3

Created (GMT): Tue Dec 30 16:38:51 2025

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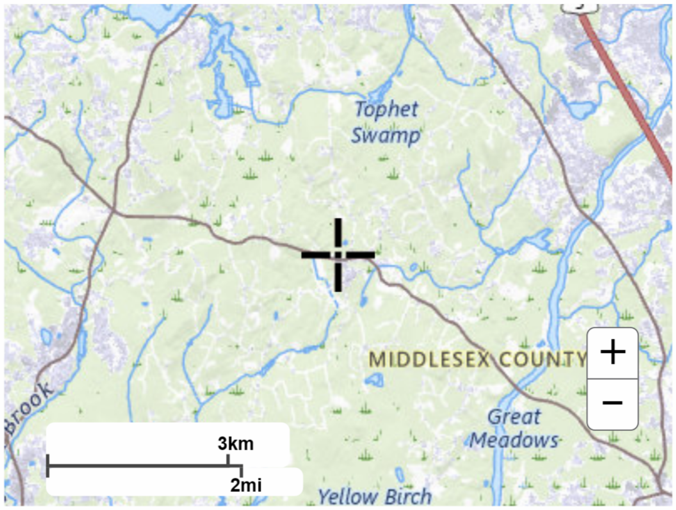
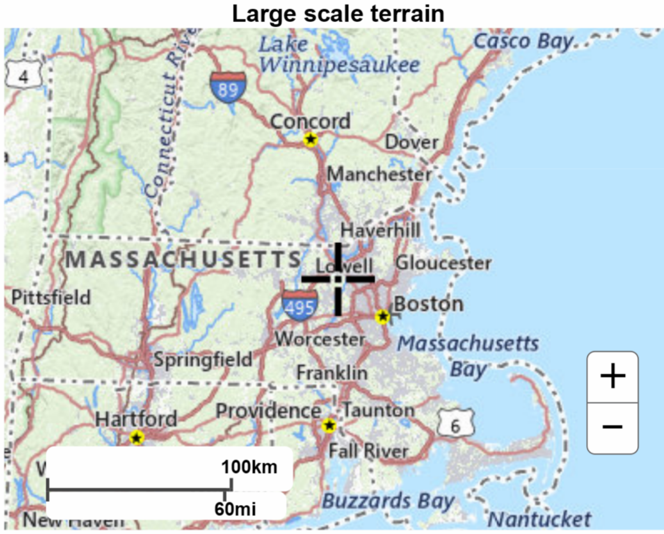
Maps & aerials

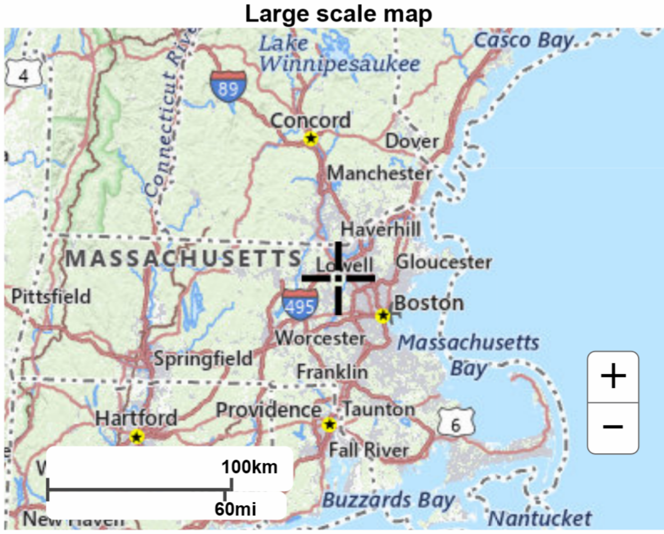
Small scale terrain



Large scale terrain



Large scale map



Large scale aerial

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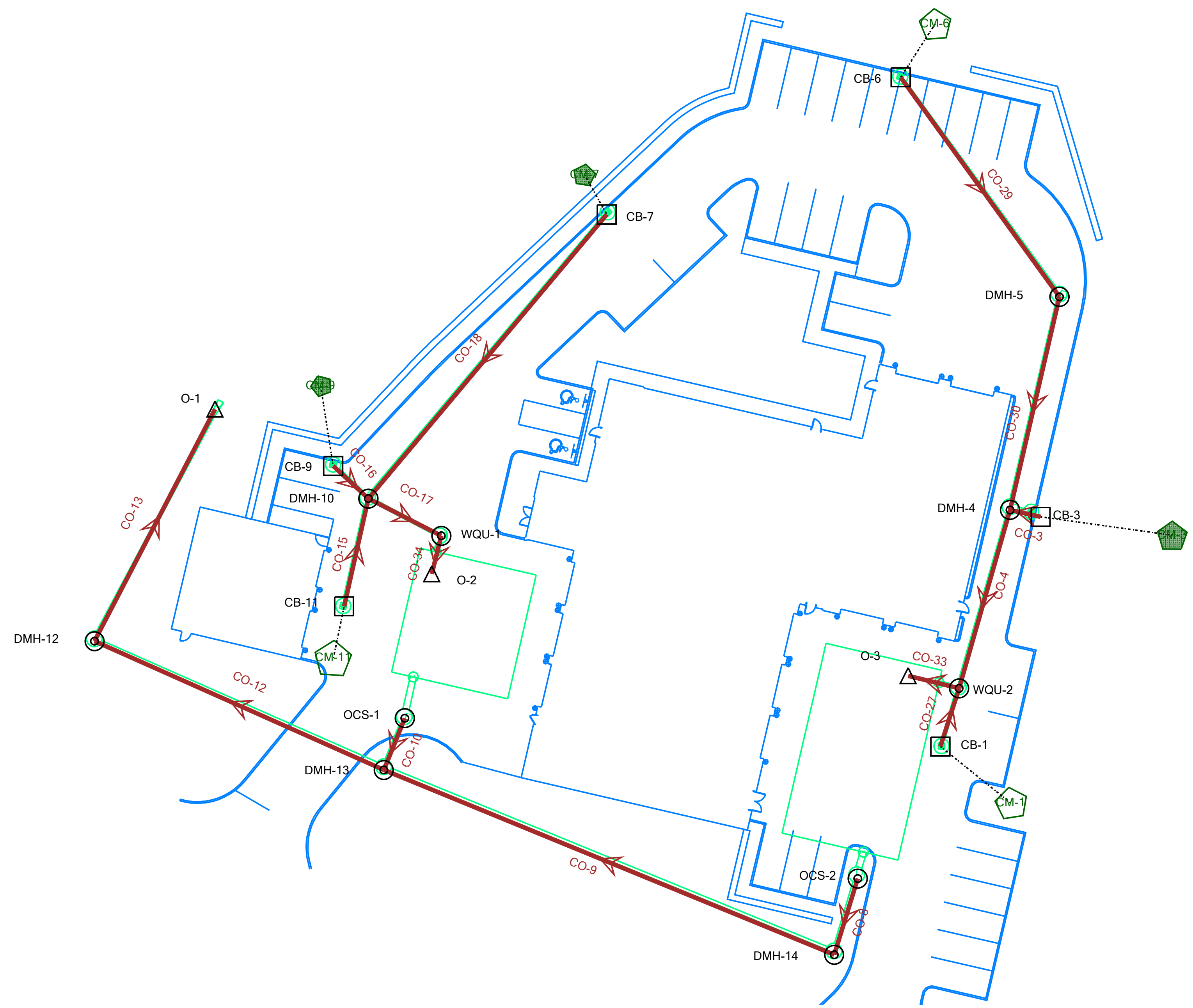
US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Scenario: 25-Year Storm



FlexTable: Catchment Table

Label	Area (User Defined) (ft²)	Runoff Coefficient (Rational)	Time of Concentration (min)	Outflow Element	Catchment Intensity (in/h)	Catchment Rational Flow (cfs)
CM-1	12,131.800	0.758	5.000	CB-1	8.260	1.76
CM-3	1,072.700	0.900	5.000	CB-3	8.260	0.18
CM-6	10,303.150	0.814	5.000	CB-6	8.260	1.60
CM-7	6,768.840	0.583	5.000	CB-7	8.260	0.75
CM-9	4,101.870	0.781	5.000	CB-9	8.260	0.61
CM-11	5,493.970	0.900	5.000	CB-11	8.260	0.95

FlexTable: Catch Basin Table

Label	Elevation (Rim) (ft)	Inlet Drainage Area (ft²)	Inlet C	Local Flow Time (min)	Flow (Captured) (cfs)	Elevation (Invert Out) (ft)
CB-1	194.35	12,131.800	0.758	5.000	1.76	187.85
CB-3	194.50	1,072.700	0.900	5.000	0.18	190.65
CB-6	193.30	10,303.150	0.814	5.000	1.60	190.00
CB-7	193.30	6,768.840	0.583	5.000	0.75	189.20
CB-9	191.90	4,101.870	0.781	5.000	0.61	188.15
CB-11	191.70	5,493.970	0.900	5.000	0.95	188.35

FlexTable: Conduit Table

Label	Start Node	Stop Node	Invert (Start) (ft)	Invert (Stop) (ft)	Length (User Defined) (ft)	Slope (Calculated) (ft/ft)	Diameter (in)	Manning's n	Material	System CA (ft^2)	System Intensity (in/h)	Flow (cfs)	Capacity (Full Flow) (cfs)	Velocity (ft/s)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Flow / Capacity (Design) (%)
CO-3	CB-3	DMH-4	190.65	190.55	3.0	0.033	12.0	0.012	Corrugated HDPE (Smooth Interior)	965.430	8.260	0.18	7.05	3.85	190.83	190.67	2.6
CO-4	DMH-4	WQU-2	188.30	187.70	56.0	0.011	12.0	0.012	Corrugated HDPE (Smooth Interior)	9,348.073	8.007	1.73	3.99	4.91	189.27	189.16	43.4
CO-8	OCS-2	DMH-14	187.00	186.75	21.0	0.012	12.0	0.012	Corrugated HDPE (Smooth Interior)	0.000	8.260	2.18	4.21	5.41	187.63	187.27	51.8
CO-9	DMH-14	DMH-13	186.75	184.50	151.0	0.015	12.0	0.012	Corrugated HDPE (Smooth Interior)	0.000	10.639	2.18	4.71	5.88	187.38	185.16	46.3
CO-10	OCS-1	DMH-13	187.00	186.80	13.0	0.015	12.0	0.012	Corrugated HDPE (Smooth Interior)	0.000	8.260	0.99	4.79	4.80	187.42	187.12	20.7
CO-12	DMH-13	DMH-12	184.40	182.80	96.0	0.017	12.0	0.012	Corrugated HDPE (Smooth Interior)	0.000	10.433	3.17	4.98	6.72	185.16	183.38	63.6
CO-13	DMH-12	O-1	182.70	182.30	73.0	0.005	18.0	0.012	Corrugated HDPE (Smooth Interior)	0.000	10.318	3.17	8.42	4.43	183.38	182.94	37.6
CO-15	CB-11	DMH-10	188.35	188.00	32.0	0.011	12.0	0.012	Corrugated HDPE (Smooth Interior)	4,944.573	8.260	0.95	4.04	4.20	188.76	188.54	23.4
CO-16	CB-9	DMH-10	188.15	188.00	11.0	0.014	12.0	0.012	Corrugated HDPE (Smooth Interior)	3,201.920	8.260	0.61	4.51	4.01	188.48	188.54	13.6
CO-17	DMH-10	WQU-1	187.90	187.65	22.0	0.011	12.0	0.012	Corrugated HDPE (Smooth Interior)	12,090.019	8.021	2.24	4.11	5.35	188.54	188.32	54.5
CO-18	CB-7	DMH-10	189.20	188.00	115.0	0.010	12.0	0.012	Corrugated HDPE (Smooth Interior)	3,943.526	8.260	0.75	3.94	3.87	189.56	188.54	19.1
CO-27	CB-1	WQU-2	187.85	187.70	16.0	0.009	12.0	0.012	Corrugated HDPE (Smooth Interior)	9,193.478	8.260	1.76	3.74	2.24	189.19	189.16	47.0
CO-29	CB-6	DMH-5	190.00	189.20	82.0	0.010	12.0	0.012	Corrugated HDPE (Smooth Interior)	8,382.643	8.260	1.60	3.81	4.65	190.54	189.65	42.0
CO-30	DMH-5	DMH-4	189.10	188.40	66.0	0.011	12.0	0.012	Corrugated HDPE (Smooth Interior)	8,382.643	8.118	1.57	3.97	4.77	189.63	189.27	39.6
CO-33	WQU-2	O-3	187.60	187.50	4.0	0.025	12.0	0.012	Corrugated HDPE (Smooth Interior)	18,541.550	7.915	3.40	6.10	4.32	189.16	189.13	55.7
CO-34	WQU-1	O-2	187.55	187.50	3.0	0.017	12.0	0.012	Corrugated HDPE (Smooth Interior)	12,090.019	7.988	2.23	4.98	6.17	188.32	188.34	44.9

FlexTable: Manhole Table

Label	Elevation (Rim) (ft)	Flow (Total Out) (cfs)	Local Flow Time (min)	Elevation (Invert) (ft)	Elevation (Invert Out) (ft)	Flow (Known) (cfs)
DMH-4	194.65	1.73	5.000	188.30	188.30	0.00
DMH-5	194.55	1.57	5.000	189.10	189.10	0.00
DMH-10	192.75	2.24	5.000	187.90	187.90	0.00
DMH-12	186.00	3.17	5.000	182.70	182.70	0.00
DMH-13	191.90	3.17	5.000	184.40	184.40	0.00
DMH-14	195.90	2.18	5.000	186.75	186.75	0.00
OCS-1	193.00	0.99	5.000	187.00	187.00	0.99
OCS-2	195.75	2.18	5.000	187.00	187.00	2.18
WQU-1	193.30	2.23	5.000	187.55	187.55	0.00
WQU-2	194.90	3.40	5.000	187.60	187.60	0.00

FlexTable: Outfall Table

Label	Elevation (Ground) (ft)	Elevation (Invert) (ft)	Boundary Condition Type	Elevation (User Defined Tailwater) (ft)	Hydraulic Grade (ft)	Flow (Total Out) (cfs)
O-1	182.30	182.30	Free Outfall		182.94	3.17
O-2	193.20	187.50	User Defined Tailwater	188.34	188.34	2.23
O-3	195.00	187.50	User Defined Tailwater	189.13	189.13	3.39

Appendix F

Stormwater Management Checklist

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

Checklist for Stormwater Report

A. Introduction

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

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

The Stormwater Report must include:

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

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

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

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

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

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

B. Stormwater Checklist and Certification

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

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

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

Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature

COMMONWEALTH OF MASSACHUSETTS
SCOTT D.
TURNER
CIVIL
No. 41775
REGISTERED
PROFESSIONAL ENGINEER

2/2/26

Signature and Date

Checklist

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

☐ New development

☐ Redevelopment

☒ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

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

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

Standard 1: No New Untreated Discharges

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

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

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

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

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

Standard 3: Recharge

☒ Soil Analysis provided.

☐ Required Recharge Volume calculation provided.

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

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

☐ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

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

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

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

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

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

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

☐ Solid Waste Landfill pursuant to 310 CMR 19.000

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

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

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

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

Checklist (continued)

Standard 3: Recharge (continued)

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

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

Standard 4: Water Quality

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

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

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

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

☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.

☐ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted ***prior to*** the discharge of stormwater to the post-construction stormwater BMPs.

☐ The NPDES Multi-Sector General Permit does ***not*** cover the land use.

☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.

☐ All exposure has been eliminated.

☐ All exposure has ***not*** been eliminated and all BMPs selected are on MassDEP LUHPPL list.

☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

☐ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.

☒ Critical areas and BMPs are identified in the Stormwater Report.

Checklist (continued)

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

- [x] The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:
  - [ ] Limited Project
  - [ ] Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
  - [ ] Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
  - [ ] Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
  - [ ] Bike Path and/or Foot Path
  - [ ] Redevelopment Project
  - [x] Redevelopment portion of mix of new and redevelopment.
- [ ] Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.
- [ ] The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
- Construction Period Operation and Maintenance Plan;
- Names of Persons or Entity Responsible for Plan Compliance;
- Construction Period Pollution Prevention Measures;
- Erosion and Sedimentation Control Plan Drawings;
- Detail drawings and specifications for erosion control BMPs, including sizing calculations;
- Vegetation Planning;
- Site Development Plan;
- Construction Sequencing Plan;
- Sequencing of Erosion and Sedimentation Controls;
- Operation and Maintenance of Erosion and Sedimentation Controls;
- Inspection Schedule;
- Maintenance Schedule;
- Inspection and Maintenance Log Form.

- [x] A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.

Checklist (continued)

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has ***not*** been included in the Stormwater Report but will be submitted ***before*** land disturbance begins.

☐ The project is ***not*** covered by a NPDES Construction General Permit.

☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.

☒ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:

- ☒ Name of the stormwater management system owners;
- ☒ Party responsible for operation and maintenance;
- ☒ Schedule for implementation of routine and non-routine maintenance tasks;
- ☒ Plan showing the location of all stormwater BMPs maintenance access areas;
- ☐ Description and delineation of public safety features;
- ☒ Estimated operation and maintenance budget; and
- ☒ Operation and Maintenance Log Form.

☐ The responsible party is ***not*** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:

- ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
- ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

☐ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☒ An Illicit Discharge Compliance Statement is attached;

☐ NO Illicit Discharge Compliance Statement is attached but will be submitted ***prior to*** the discharge of any stormwater to post-construction BMPs.

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Appendix G

Water Quality Flow Calculations

Water Quality Unit #1

Objective: Size Best Management Practice (BMP) in accordance with Standard 4 of the MA Stormwater Handbook. BMP shall be sized to treat the required water quality volume (Standard 4).

1) Calculate Water Quality Flow (WQF)

V_{WQF} =(qu)*(A)*(WQV)= 0.34 cfs

D_{WQ} (water quality depth)	1	in	
Runoff Curve Number	98		
A_{IMP} (impervious area)	12,420	sf	Contributing impervious drainage area to water quality unit from subcatchments 10SA & 10SB
Time of Concentration	5	min	
Ia/P	0.058		
Unit Peak Discharge (qu)	773	$cfs/mi^2/in$	

Cascade Separator Project Details

Description

The Cascade Separator® is the latest innovation in hydrodynamic separation from Contech. The Cascade uses advanced sediment capture technology to provide the highest sediment removal efficiency of any Contech HDS product.

Project Information

Project Name	98225 - WQU 1
Location	Carlisle, MA
Date	January 30 2026

Design Parameters	
System Type	Cascade Separator
Particle Size D50	110
System Model	CS-3
Sizing Method	Water Qlty Flow Rate
Treatment Rate	$0.34 ft^3/sec$
Peak Conveyance	$2.23 ft^3/sec$
100% Trash Capture?	No
Primary Access Casting	Solid Cover
Target Removal %	80%

Outlet Pipe Information	
# of Pipes	1
Outlet Diameter	12 inches
Outlet Invert Elev	187.55 ft
Outlet Angle	180°
Outlet Material	HDPE
Inlet Pipe Information	
# of Pipes	1
Inlet Diameter	12 inches
Inlet Invert Elev	187.65 ft
Inlet Angle	63°
Inlet Material	HDPE

Water Quality Unit #2

Objective: Size Best Management Practice (BMP) in accordance with Standard 4 of the MA Stormwater Handbook. BMP shall be sized to treat the required water quality volume (Standard 4).

1) Calculate Water Quality Flow (WQF)

V_{WQF} =(qu)*(A)*(WQV)= 0.53 cfs

D_{WQ} (water quality depth)	1	in	
Runoff Curve Number	98		
A_{IMP} (impervious area)	19,289	sf	Contributing impervious drainage area to water quality unit from subcatchments 10SC & 10SD
Time of Concentration	5	min	
Ia/P	0.058		
Unit Peak Discharge (qu)	773	cfs/mi^2/in	

Cascade Separator Project Details

Description

The Cascade Separator® is the latest innovation in hydrodynamic separation from Contech. The Cascade uses advanced sediment capture technology to provide the highest sediment removal efficiency of any Contech HDS product.

Project Information

Project Name	98226 - WQU 2
Location	Carlisle, MA
Date	January 30 2026

Design Parameters	
System Type	Cascade Separator
Particle Size D50	110
System Model	CS-3
Sizing Method	Water Qlty Flow Rate
Treatment Rate	0.53ft³/sec
Peak Conveyance	3.39ft³/sec
100% Trash Capture?	No
Primary Access Casting	Solid Cover
Target Removal %	80%

Outlet Pipe Information	
# of Pipes	1
Outlet Diameter	12 inches
Outlet Invert Elev	187.6 ft
Outlet Angle	180°
Outlet Material	HDPE

Inlet Pipe Information	
# of Pipes	2
Inlet 1 Diameter	12 inches
Inlet 1 Invert Elev	187.7 ft
Inlet 1 Angle	-83.22°
Inlet 1 Material	HDPE
Inlet 2 Diameter	12 inches
Inlet 2 Invert Elev	187.7 ft
Inlet 2 Angle	83.22°
Inlet 2 Material	HDPE

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Appendix H

TSS Removal Calculations

Project:	Carlisle Fire Department Additions & Alterations	**Prepared By:**	KT
Site Location:	66 Westford Street,Carlisle, Ma	**Date:**	2/2/2026
Project Number:	20250003.A10		
Outfall Location:	Wetlands		
Treatment Train:	Deep Sump Catch Basin to WQU to Subsurface Detention System 10PA		

BMP	TSS Removal Efficiency	Starting TSS Load	TSS Removed	TSS Remaining
Deep Sump Catch Basin	25%	1.00	0.25	0.75
Water Quality Unit	80%	0.75	0.60	0.15
		0.15	0.00	0.15
		0.15	0.00	0.15

Total TSS Removal Efficiency =	**85%**

Project:	Carlisle Fire Department Additions & Alterations	**Prepared By:**	KT
Site Location:	66 Westford Street,Carlisle, Ma	**Date:**	2/2/2026
Project Number:	20250003.A10		
Outfall Location:	Wetlands		
Treatment Train:	Deep Sump Catch Basin to WQU to Subsurface Detention System 10PB		

BMP	TSS Removal Efficiency	Starting TSS Load	TSS Removed	TSS Remaining
Deep Sump Catch Basin	25%	1.00	0.25	0.75
Water Quality Unit	80%	0.75	0.60	0.15
		0.15	0.00	0.15
		0.15	0.00	0.15

Total TSS Removal Efficiency =	**85%**

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Appendix I

Long-Term Operation and Maintenance Plan

FUSS & O'NEILL

Long-Term Operation and Maintenance Plan
Carlisle Fire Department Additions & Alterations

66 Westford Street
Carlisle, Massachusetts 01741

Prepared For:

Town of Carlisle

Carlisle, Massachusetts 01741

February 2, 2026

FUSS & O'NEILL

1250 Hancock St, Suite 815N
Quincy, MA 02169

Project No. 20250003.A10

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Carlisle Fire Department Additions & Alterations
Town of Carlisle

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1 Introduction

The purpose of this Long-Term Operation and Maintenance Plan (O&M Plan) is to outline the requirements for source control and pollution prevention for the proposed Carlisle Fire Station located at 66 Westford Street in Carlisle, Massachusetts. The site is currently occupied with the existing Fire Station. The site is bounded by undeveloped land to the north, private properties to the east, Westford Street to the south and Rockland Road to the west. The project location is depicted on the Site Location Map attached as *Figure 1* in this report.

The proposed work includes the renovation of the existing Fire Station for the Carlisle Fire Department along with associated parking lots, sidewalks, stormwater infrastructure, utilities, and landscaping.

The Stormwater Management system is comprised of deep sump catch basins, two (2) water quality units, and two (2) subsurface detention systems. A map depicting the location of the BMPs is provided in *Figure 2*.

The long-term requirements include following proper site operation procedures and implementing an inspection and maintenance program to ensure the success and minimize the deterioration of the stormwater system over time. The Contractor is responsible for implementing this O&M Plan during construction. The Owner (the Town of Carlisle) is responsible thereafter. Maintenance operations shall be funded by the Owner. In the event the facility becomes owned by different entities, this Long-Term Operation and Maintenance Plan shall be transferred to the future owners/operators. Checklists to assist with the inspection and maintenance activities are provided in *Appendix A*.

This plan has been prepared in accordance with the requirements set forth in Standard 4 and Standard 9 of the Massachusetts Stormwater Handbook.

2 Pollution Prevention

The following pollution prevention activities shall be conducted to minimize potential impacts on stormwater runoff quality. The Contractor is responsible for all activities during construction. The Owner is responsible thereafter.

2.1 Good Housekeeping

Good housekeeping shall be implemented to minimize the impacts to protected areas by pollutants, soil, and fugitive sediment. The site shall be kept in good working order. Trash shall be kept in covered containers (i.e., dumpsters) to prevent waste from escaping. Fugitive litter that is deposited on the site shall be removed and placed in a proper enclosed container.

2.2 Vehicle Washing

The washing of vehicles is to occur on concrete aprons. Vehicle washing is not to occur during rain events.

During vehicle washing, the following procedure shall be followed:

1. Inspect vehicles for leaks.

2. Wash vehicles using domestic water and soaps recommended by the manufacturer for outdoor vehicle washing. Do not use harsh detergents or de-greasers. Do not wash materials from vehicles that could cause pollution in the environment. Do not wash the interior truck beds, engine compartments, undercarriages, or similar components.

3. Upon completion of vehicle washing, remove vehicle from area. Rinse concrete pad to divert residual wash water towards a water quality unit.

2.3 Chemical and Petroleum Products

All chemical and petroleum product containers stored on the site (excluding those contained within vehicles and equipment) shall be provided with impermeable containment which will hold at least 110% of the volume of the largest container, or 10% of the total volume of all containers in the area, whichever is larger, without overflow from the containment area. All chemicals and their containers shall be stored under a roofed area. Containers of 100 gallons capacity or more may be stored without a roof only if stored in a double-walled tank. On-site vehicles shall be monitored for leaks and receive maintenance as needed.

2.3.1 Spill Control Practices

Any discharge of waste oil or other pollutant to the stormwater system will be reported immediately to the Massachusetts Department of Environmental Protection (MA DEP). The Owner will be responsible for any incident of groundwater contamination resulting from the improper discharge of pollutants to the stormwater system and may be required by MA DEP to remediate incidents that may impact groundwater quality. Should property ownership be transferred, the subsequent owner/operator will be informed of the legal responsibilities associated with operation of the stormwater system, as indicated above.

The following practices shall be implemented to mitigate spills of material and prevent their release to the waters of the Commonwealth:

- The manufacturer's recommended methods for spill cleanup shall be clearly posted and site personnel will be made aware of the procedures and the location of the information and cleanup supplies.

- Materials and equipment necessary for spill cleanup will be kept in material storage areas. Equipment and materials will include but not be limited to brooms, dust pans, mops, rags, gloves, goggles, kitty litter, sand, sawdust, and plastic and metal trash containers specifically for this purpose.

- Spills will be cleaned up immediately after discovery.

- Spills of toxic or hazardous material will be reported to the appropriate State and local government agency, regardless of size.

2.4 Landscaped Areas

Lawn areas will be mowed during the growing seasons as required to maintain a healthy stand of vegetation. This is typically once a week but can vary depending on weather conditions. If bagged, grass clippings are to be removed from the site and legally disposed of at an off-site location.

Fertilizers, if required for the maintenance of lawn areas, will be applied only in the amounts recommended by the manufacturer. If kept on site, fertilizers will be stored in a covered area. The contents of any partially used bags of fertilizer will be transferred to a sealable plastic bin to avoid spills.

2.5 Pet Waste Management

There are no provisions for accommodating pets as part of the public safety facility operation. If pets or service animals are required by facility staff, the O&M Plan shall be amended to include pet waste management practices.

2.6 Snow Management

Stormwater runoff caused by snow melt must be properly managed to prevent erosion and pollution. The removal of snow and ice during precipitation events is especially important for fire stations to ensure a safe means of egress from the site, allowing for faster emergency response times. Therefore, a snow management plan has been developed to identify storage areas throughout the site.

Determine the best areas on the site to stockpile snow, keeping pedestrians a car routes cleared. Also take into consideration the locations of BMPs to ensure proper functioning of the stormwater management system.

- Majority of the snow will be stored on the grassed areas adjacent to the parking lot.
- Snow will be stockpiled onsite until the available capacity is exceeded at which point it will be loaded into trucks and properly disposed of at an off-site location.

A Snow Storage Plan is provided as *Figure 3.*

3 Inspection and Maintenance Requirements for Permanent Stormwater Controls

The following inspection and maintenance activities shall be conducted to ensure the success and minimize the deterioration of the stormwater system over time. A map depicting the location of the components of the stormwater management system is provided in *Figure 2*. Checklists to assist with the inspection and maintenance activities are provided in *Appendix A*.

3.1 Subsurface Detention Systems

The recommended manufacturer Operation and Maintenance has been included in *Appendix B.*

3.2 Drainage Structures & Water Quality Units

3.2.1 Post-Construction Inspections

Immediately prior to the end of construction and acceptance by the Owner, the Contractor shall clean all drainage structures.

3.2.2 Quarterly Inspections

Drainage structures shall be inspected at minimum of four times per year. Sediment shall be removed at least twice per year, or when the depth reaches half the height between the bottom of the structure and the lowest pipe invert elevation. Inspections shall include checking for debris, sediment, and hydrocarbons, and structural integrity or damage. Deficiencies must be corrected immediately. Disposal of the accumulated sediment and hydrocarbons must be in accordance with applicable local, state, and federal guidelines and regulations. Grates shall not be welded to the frame so the structures can be easily inspected and maintained.

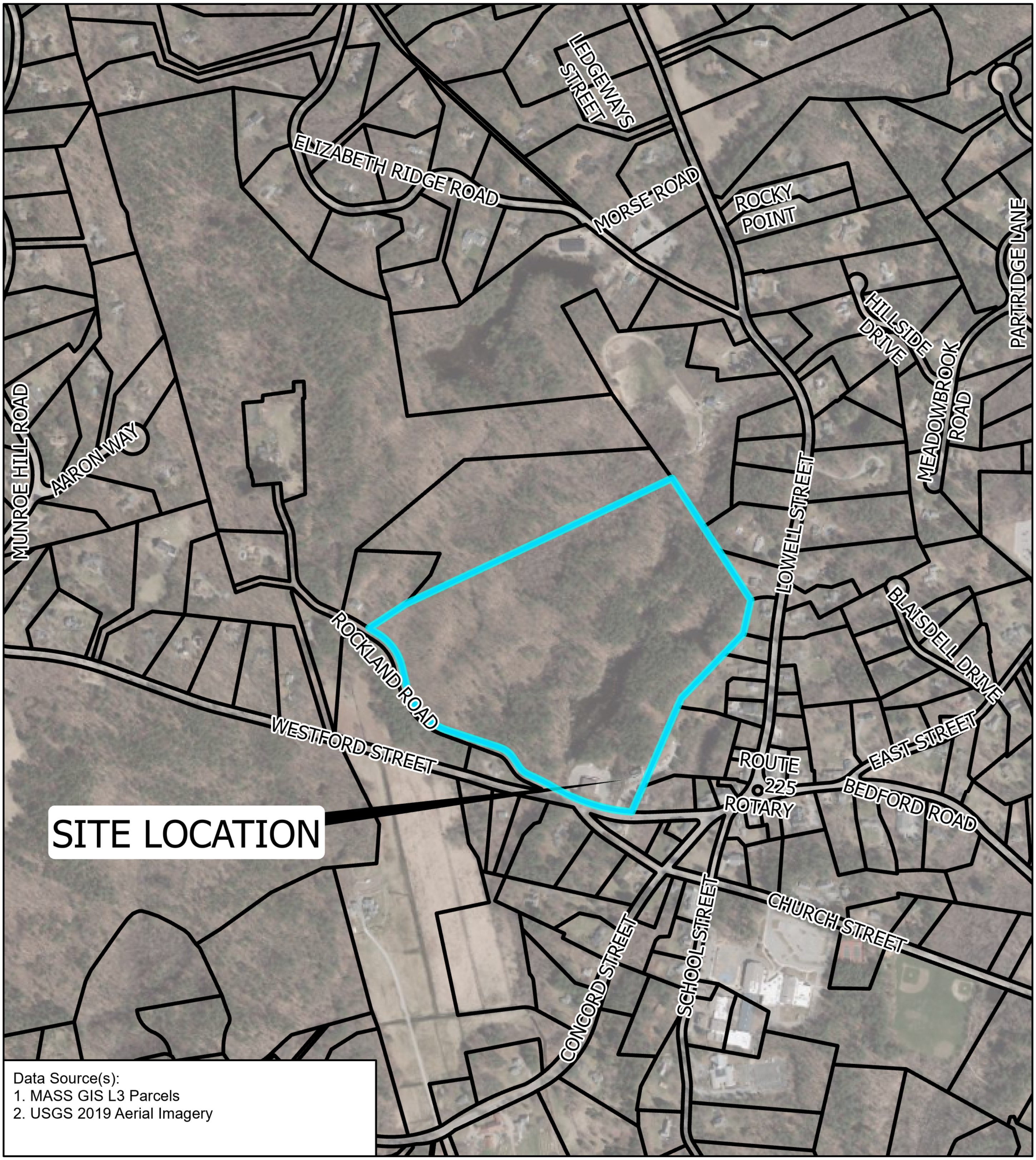
3.3 Anticipated Costs

The annual cost for the inspections and maintenance of the property is estimated to be from $12,500 to $19,000 per year, if performed by an independent third party. A budgetary opinion of cost for the maintenance is included in *Appendix C*.

However, the Town of Carlisle currently has other facilities located throughout the Town with similar BMPs. Therefore, it is possible that the inspection and maintenance of the property can be incorporated into the Town of Carlisle's existing inspection and maintenance program. If so, Town of Carlisle staff would be responsible for the periodic inspections and maintenance listed above using the Town of Carlisle's equipment, which could result in a lower annual cost.

Figure 1

Site Location Map



Data Source(s):
1. MASS GIS L3 Parcels
2. USGS 2019 Aerial Imagery

Parcel Boundary

SITE LOCATION

0 180 360 720 Feet

N

Disclaimer: This map is not the product of a Professional Land Survey. It was created by Fuss & O'Neill, Inc. for general reference, informational, planning and guidance use, and is not a legally authoritative source as to location of natural or manmade features. Proper interpretation of this map may require the assistance of appropriate professional services. Fuss & O'Neill, Inc. makes no warrantee, express or implied, related to the spatial accuracy, reliability, completeness, or currentness of this map.

SITE LOCATION MAP

CARLISLE FIRE STATION

CARLISLE MASSACHUSETTS

F&O
1250 Hancock Street, Suite 815N
Quincy, MA 02169
617.282.4675 | www.fando.com

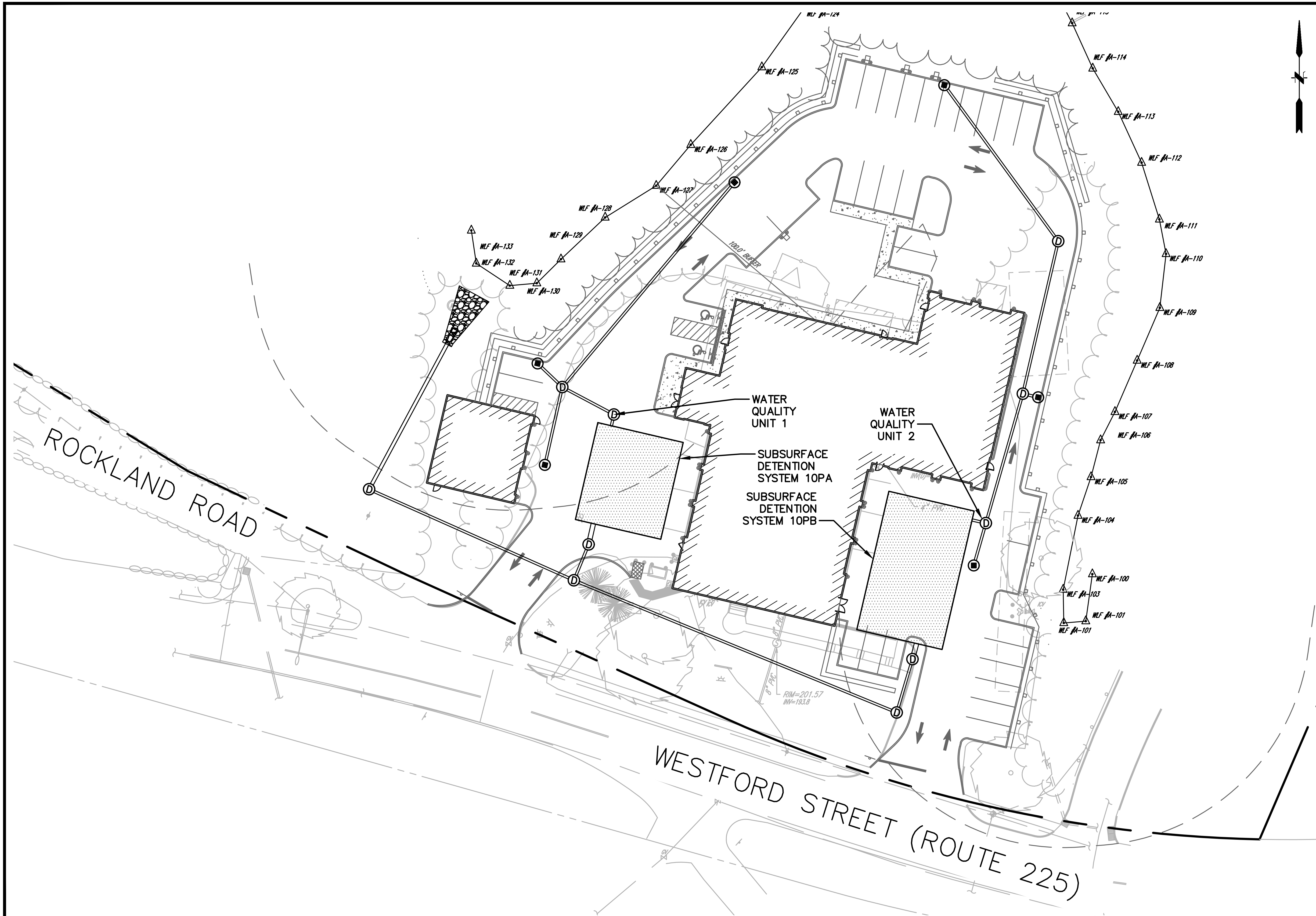
Figure 1

Folder: K:\P2025\0003\A10\MXD\20250003.A10\ Project: 20250003.A10 Layout: Figure 1 Map: Main Data Frame Map Frame
Date Exported: 12/3/2025 9:23 AM User: Nicole.Luongo Date Saved: 12/3/2025 9:20 AM

FUSS & O'NEILL

Figure 2

BMP Location Plan



SCALE: HORZ.: 1" = 40'
VERT.: -
DATUM: HORZ.: NAD83
VERT.: NAVD88
0 20' 40'
GRAPHIC SCALE

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TOWN OF CARLISLE
BMP LOCATION PLAN
66 WESTFORD STREET
CARLISLE
MASSACHUSETTS

PROJ. No.: 20250003.A10
DATE: 02/02/2026

FIG.2

File: J:\DWG\P2025\0003\A10\Civil\Figures\20250003.A10_BMP01.dwg Layout: BMP Plotted: 2026-01-29 11:29 AM Saved: 2026-01-27 1:44 PM User: Jack.Deninger
PC3: AUTOCAD PDF (GENERAL DOCUMENTATION).PC3 STB/CTB: FO.STB
MS VIEW:
LAYER STATE:

FUSS & O'NEILL

Figure 3

Snow Storage Plan

SCALE: HORZ.: 1" = 40'
VERT.: -
DATUM: HORZ.: -
VERT.: NAVD88

0 20' 40'
GRAPHIC SCALE

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QUINCY, MA 02169
617.282.4675
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TOWN OF CARLISLE
SNOW STORAGE PLAN
66 WESTFORD STREET

CARLISLE MASSACHUSETTS

PROJ. No.: 20250003.A10
DATE: 02/02/2026

FIG.3

Appendix A

Operation, Maintenance, and Management Inspection Checklist

Operation, Maintenance, and Management Inspection Checklists
Master Checklist
Carlisle Fire Department Additions Alterations

Inspection Year: ____________

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Subsurface Detention Systems												
Semi-Annual Inspection												
Drainage Structures/Water Quality Units												
Quarterly Inspection												

Inspector Name: ______________________________

Inspection Date: ______________________________

Reviewed By: ______________________________

Review Date: ______________________________

Type of Inspection (Circle One):

Semi-Annual

BMP Name:

____

No.	Monthly	Quarterly	Item	Criteria	Satisfactory	Unsatisfactory	Notes
1			Trash/Debris	System is free of debris, litter, and waste.			
2			Concrete Surfaces	Concrete surfaces are structurally sound and have negligible spalling and cracking.			
3			Sediment	Depth of Sediment is less than three inches.			

4			Clogging	System appears to be draining freely and not clogged.			
5			Oil/Grease	Oil and grease is not evident in the system.			
6			Inlet & Outlet Structures	Structures are free of blockage and are structurally sound.			

Operation, Maintenance, and Management Inspection Checklists
Drainage Structures/Water Quality Units
Carlisle Fire Department Additions Alterations

Inspector Name: ______________________________ **Type of Inspection (Circle One):**

Inspection Date: ______________________________ Quarterly

Reviewed By: ______________________________ **Structure Name:**

Review Date: ______________________________ ______________________________

No.	Quarterly	Item	Criteria	Satisfactory	Unsatisfactory	Notes
1		Trash/Debris	Structure is free of debris, litter, and waste.			
2		Sediment	Depth of sediment is less than half the height between the bottom of the structure and the lowest pipe invert elevation and has been removed within the last six months.			
3		Concrete Surfaces	Concrete surfaces are structurally sound and have negligible spalling and cracking.			

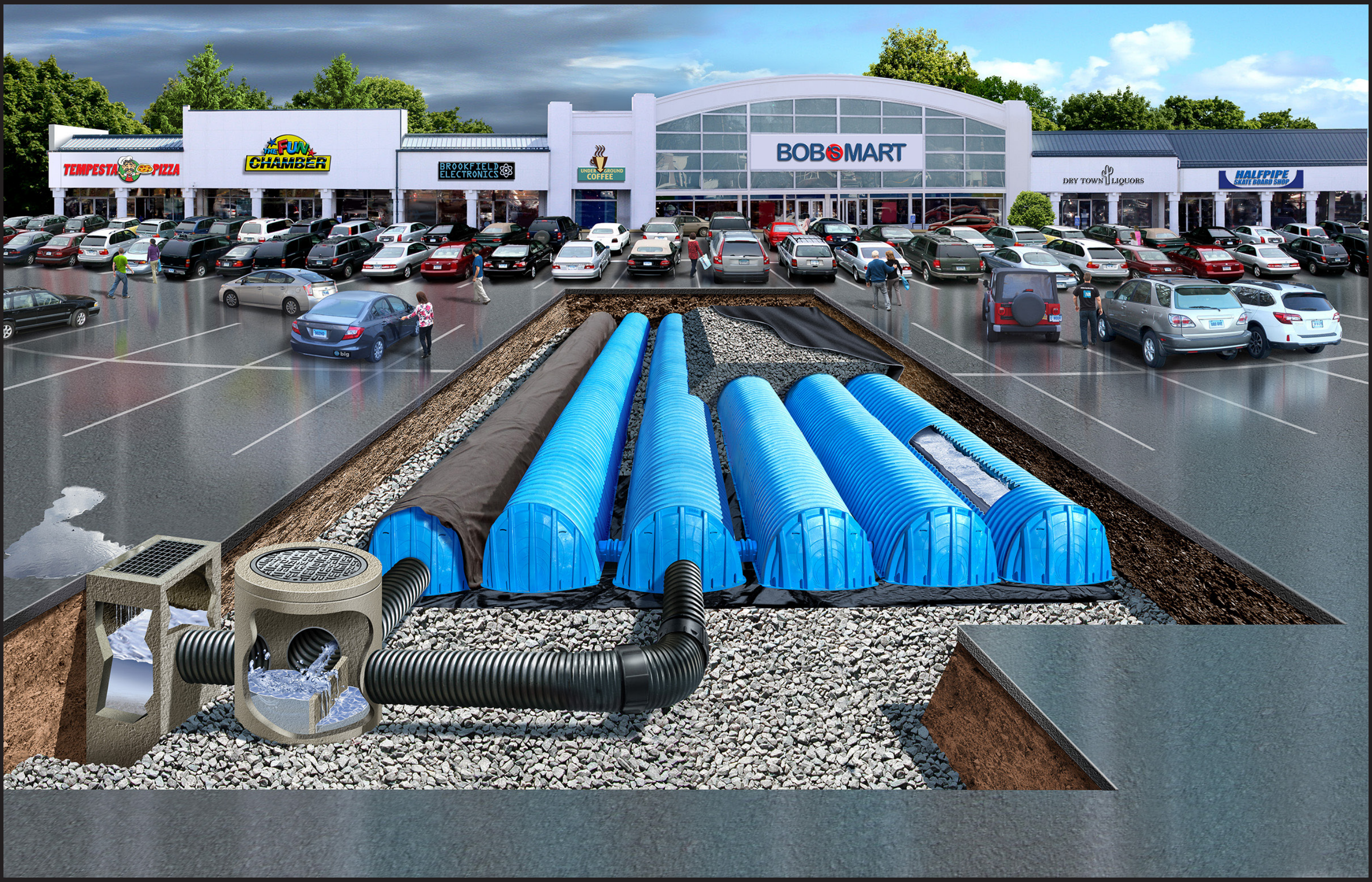
FUSS & O'NEILL

Appendix B

Subsurface Infiltration Systems Operations & Maintenance Manual

CONTACTOR® & RECHARGER®

STORMWATER MANAGEMENT SOLUTIONS



OPERATION & MAINTENANCE GUIDELINES

FOR CULTEC STORMWATER MANAGEMENT SYSTEMS

CULTEC®

Published by
CULTEC
P.O. Box 280
878 Federal Road
Brookfield, Connecticut 06804 USA
www.cultec.com

Contact Information:
For general information on our other products and services, please contact our offices within the United States at (800)428-5832, (203)775-4416 ext. 202, or e-mail us at CT-CustomerService@cultec.com.

For technical support, please call (203)775-4416 ext. 203 or e-mail CT-Tech@cultec.com.

Visit www.cultec.com/downloads.html for Product Downloads and CAD details.

Doc ID: CLT057 11-23
November 2023

These instructions are for single-layer traffic applications only. For multi-layer applications, contact CULTEC.
All illustrations and photos shown herein are examples of typical situations. Be sure to follow the engineer's drawings.
Actual designs may vary.

This manual contains guidelines recommended by CULTEC and may be used in conjunction with, but not to supersede, local regulations or regulatory authorities. OSHA Guidelines must be followed when inspecting or cleaning any structure.

Introduction

The CULTEC Subsurface Stormwater Management System is a high-density polyethylene (HDPE) chamber system arranged in parallel rows surrounded by washed stone. The CULTEC chambers create arch-shaped voids within the washed stone to provide stormwater detention, retention, infiltration, and reclamation. Filter fabric is placed between the native soil and stone interface to prevent the intrusion of fines into the system. In order to minimize the amount of sediment which may enter the CULTEC system, a sediment collection device (stormwater pretreatment device) is recommended upstream from the CULTEC chamber system. Examples of pretreatment devices include, but are not limited to, an appropriately sized catch basin with sump, pretreatment catchment device, oil grit separator, or baffled distribution box. Manufactured pretreatment devices may also be used in accordance with CULTEC chambers. Installation, operation, and maintenance of these devices shall be in accordance with manufacturer's recommendations. Almost all of the sediment entering the stormwater management system will be collected within the pretreatment device.

Best Management Practices allow for the maintenance of the preliminary collection systems prior to feeding the CULTEC chambers. The pretreatment structures shall be inspected for any debris that will restrict inlet flow rates. Outfall structures, if any, such as outlet control must also be inspected for any obstructions that would restrict outlet flow rates. OSHA Guidelines must be followed when inspecting or cleaning any structure.

Operation and Maintenance Requirements

I. Operation

CULTEC stormwater management systems shall be operated to receive only stormwater run-off in accordance with applicable local regulations. CULTEC subsurface stormwater management chambers operate at peak performance when installed in series with pretreatment. Pretreatment of suspended solids is superior to treatment of solids once they have been introduced into the system. The use of pretreatment is adequate as long as the structure is maintained and the site remains stable with finished impervious surfaces such as parking lots, walkways, and pervious areas are properly maintained. If there is to be an unstable condition, such as improvements to buildings or parking areas, all proper silt control measures shall be implemented according to local regulations.

II. Inspection and Maintenance Options

A. The CULTEC system may be equipped with an inspection port located on the inlet row. The inspection port is a circular cast box placed in a rectangular concrete collar. When the lid is removed, a 6-inch (150 mm) pipe with a screw-in plug will be exposed. Remove the plug. This will provide access to the CULTEC Chamber row below. From the surface, through this access, the sediment may be measured at this location. A stadia rod may be used to measure the depth of sediment if any in this row. If the depth of sediment is in excess of 3 inches (76 mm), then this row should be cleaned with high pressure water through a culvert cleaning nozzle. This would be carried out through an upstream manhole or through the CULTEC StormFilter Unit (or other pre-treatment device). CCTV inspection of this row can be deployed through this access port to deter mine if any sediment has accumulated in the inlet row.

B. If the CULTEC bed is not equipped with an inspection port, then access to the inlet row will be through an upstream manhole or the CULTEC StormFilter.

1. Manhole Access
This inspection should only be carried out by persons trained in confined space entry and sewer inspection services. After the manhole cover has been removed a gas detector must be lowered into the manhole to ensure that there are not high concentrations of toxic gases present. The inspector should be lowered into the manhole with the proper safety equipment as per OSHA requirements. The inspector may be able to observe sediment from this location. If this is not possible, the inspector will need to deploy a CCTV robot to permit viewing of the sediment.

2. **StormFilter Access**
Remove the manhole cover to allow access to the unit. Typically a 30-inch (750 mm) pipe is used as a riser from the StormFilter to the surface. As in the case with manhole access, this access point requires a technician trained in confined space entry with proper gas detection equipment. This individual must be equipped with the proper safety equipment for entry into the StormFilter. The technician will be lowered onto the StormFilter unit. The hatch on the unit must be removed. Inside the unit are two filters which may be removed according to StormFilter maintenance guidelines. Once these filters are removed the inspector can enter the StormFilter unit to launch the CCTV camera robot.

C. The inlet row of the CULTEC system is placed on a polyethylene liner to prevent scouring of the washed stone beneath this row. This also facilitates the flushing of this row with high pressure water through a culvert cleaning nozzle. The nozzle is deployed through a manhole or the StormFilter and extended to the end of the row. The water is turned on and the inlet row is back-flushed into the manhole or StormFilter. This water is to be removed from the manhole or StormFilter using a vacuum truck.

III. Maintenance Guidelines

The following guidelines shall be adhered to for the operation and maintenance of the CULTEC stormwater management system:

A. The owner shall keep a maintenance log which shall include details of any events which would have an effect on the system's operational capacity.

B. The operation and maintenance procedure shall be reviewed periodically and changed to meet site conditions.

C. Maintenance of the stormwater management system shall be performed by qualified workers and shall follow applicable occupational health and safety requirements.

D. Debris removed from the stormwater management system shall be disposed of in accordance with applicable laws and regulations.

IV. Suggested Maintenance Schedules

A. **Minor Maintenance**
The following suggested schedule shall be followed for routine maintenance during the regular operation of the stormwater system:

Frequency	Action
Monthly in first year	Check inlets and outlets for clogging and remove any debris, as required.
Spring and Fall	Check inlets and outlets for clogging and remove any debris, as required.
One year after commissioning and every third year following	Check inlets and outlets for clogging and remove any debris, as required.

B. **Major Maintenance**
The following suggested maintenance schedule shall be followed to maintain the performance of the CULTEC stormwater management chambers. Additional work may be necessary due to insufficient performance and other issues that might be found during the inspection of the stormwater management chambers. (See table on next page)

	Frequency	Action
Inlets and Outlets	Every 3 years	• Obtain documentation that the inlets, outlets and vents have been cleaned and will function as intended.
	Spring and Fall	• Check inlet and outlets for clogging and remove any debris as required.
CULTEC Stormwater Chambers	2 years after commissioning	• Inspect the interior of the stormwater management chambers through inspection port for deficiencies using CCTV or comparable technique. • Obtain documentation that the stormwater management chambers and feed connectors will function as anticipated.
	9 years after commissioning every 9 years following	• Clean stormwater management chambers and feed connectors of any debris. • Inspect the interior of the stormwater management structures for deficiencies using CCTV or comparable technique. • Obtain documentation that the stormwater management chambers and feed connectors have been cleaned and will function as intended.
	45 years after commissioning	• Clean stormwater management chambers and feed connectors of any debris. • Determine the remaining life expectancy of the stormwater management chambers and recommended schedule and actions to rehabilitate the stormwater management chambers as required. • Inspect the interior of the stormwater management chambers for deficiencies using CCTV or comparable technique. • Replace or restore the stormwater management chambers in accordance with the schedule determined at the 45-year inspection. • Attain the appropriate approvals as required. • Establish a new operation and maintenance schedule.
Surrounding Site	Monthly in 1st year	• Check for depressions in areas over and surrounding the stormwater management system.
	Spring and Fall	• Check for depressions in areas over and surrounding the stormwater management system.
	Yearly	• Confirm that no unauthorized modifications have been performed to the site.

For additional information concerning the maintenance of CULTEC Subsurface Stormwater Management Chambers, please contact CULTEC at 1-800-428-5832.

WQMP
Operation & Maintenance (O&M) Plan

Project Name:____

Prepared for:

Project Name: ____

Address:____

City, State Zip:____

Prepared on:

Date:____

This O&M Plan describes the designated responsible party for implementation of this WQMP, including: operation and maintenance of all the structural BMP(s), conducting the training/educational program and duties, and any other necessary activities. The O&M Plan includes detailed inspection and maintenance requirements for all structural BMPs, including copies of any maintenance contract agreements, manufacturer's maintenance requirements, permits, etc.

8.1.1 Project Information

Project name	
Address	
City, State Zip	
Site size	
List of structural BMPs, number of each	
Other notes	

8.1.2 Responsible Party

The responsible party for implementation of this WQMP is:

Name of Person or HOA Property Manager	
Address	
City, State Zip	
Phone number	
24-Hour Emergency Contact number	
Email	

8.1.3 Record Keeping

Parties responsible for the O&M plan shall retain records for at least 5 years.

All training and educational activities and BMP operation and maintenance shall be documented to verify compliance with this O&M Plan. A sample Training Log and Inspection and Maintenance Log are included in this document.

8.1.4 Electronic Data Submittal

This document along with the Site Plan and Attachments shall be provided in PDF format. AutoCAD files and/or GIS coordinates of BMPs shall also be submitted to the City.

Appendix ___

BMP SITE PLAN

Site plan is preferred on minimum 11” by 17” colored sheets, as long as legible.

BMP OPERATION & MAINTENANCE LOG

Project Name: ______________________________

Today's Date: ______________________________

Name of Person Performing Activity (Printed): ______________________________

Signature: ______________________________

BMP Name (As Shown in O&M Plan)	Brief Description of Implementation, Maintenance, and Inspection Activity Performed

Minor Maintenance

Frequency		Action
Monthly in first year		Check inlets and outlets for clogging and remove any debris, as required.
		Notes
□ Month 1	Date:	
□ Month 2	Date:	
□ Month 3	Date:	
□ Month 4	Date	
□ Month 5	Date:	
□ Month 6	Date:	
□ Month 7	Date:	
□ Month 8	Date:	
□ Month 9	Date:	
□ Month 10	Date:	
□ Month 11	Date:	
□ Month 12	Date:	
Spring and Fall		Check inlets and outlets for clogging and remove any debris, as required.
		Notes
□ Spring	Date:	
□ Fall	Date:	
□ Spring	Date:	
□ Fall	Date:	
□ Spring	Date:	
□ Fall	Date:	
□ Spring	Date:	
□ Fall	Date:	
□ Spring	Date:	
□ Fall	Date:	
□ Spring	Date:	
□ Fall	Date:	
One year after commissioning and every third year following		Check inlets and outlets for clogging and remove any debris, as required.
		Notes
□ Year 1	Date:	
□ Year 4	Date:	
□ Year 7	Date:	
□ Year 10	Date:	
□ Year 13	Date:	
□ Year 16	Date:	
□ Year 19	Date:	
□ Year 22	Date:	

Major Maintenance

	Frequency		Action
Inlets and Outlets	**Every 3 years**		Obtain documentation that the inlets, outlets and vents have been cleaned and will function as intended.
			Notes
	□ Year 1	Date:	
	□ Year 4	Date:	
	□ Year 7	Date:	
	□ Year 10	Date:	
	□ Year 13	Date:	
	□ Year 16	Date:	
	□ Year 19	Date:	
	□ Year 22	Date:	
	Spring and Fall		Check inlet and outlets for clogging and remove any debris, as required.
			Notes
	□ Spring	Date:	
	□ Fall	Date:	
	□ Spring	Date:	
	□ Fall	Date:	
	□ Spring	Date:	
	□ Fall	Date:	
	□ Spring	Date:	
	□ Fall	Date:	
	□ Spring	Date:	
	□ Fall	Date:	
	□ Spring	Date:	
	□ Fall	Date:	
CULTEC Stormwater Chambers	**2 years after commissioning**		□ Inspect the interior of the stormwater management chambers through inspection port for deficiencies using CCTV or comparable technique. □ Obtain documentation that the stormwater management chambers and feed connectors will function as anticipated.
			Notes
	□ Year 2	Date:	

Major Maintenance

	Frequency		Action
CULTEC Stormwater Chambers	**9 years after commissioning every 9 years following**		□ Clean stormwater management chambers and feed connectors of any debris. □ Inspect the interior of the stormwater management structures for deficiencies using CCTV or comparable technique. □ Obtain documentation that the stormwater management chambers and feed connectors have been cleaned and will function as intended.
			Notes
	□ Year 9	Date:	
	□ Year 18	Date:	
	□ Year 27	Date:	
	□ Year 36	Date:	
	45 years after commissioning		□ Clean stormwater management chambers and feed connectors of any debris. □ Determine the remaining life expectancy of the stormwater management chambers and recommended schedule and actions to rehabilitate the stormwater management chambers as required. □ Inspect the interior of the stormwater management chambers for deficiencies using CCTV or comparable technique. □ Replace or restore the stormwater management chambers in accordance with the schedule determined at the 45-year inspection. □ Attain the appropriate approvals as required. □ Establish a new operation and maintenance schedule.
			Notes
	□ Year 45	Date:	

Major Maintenance

	Frequency		Action
Surrounding Site	**Monthly in 1st year**		□ Check for depressions in areas over and surrounding the stormwater management system.
			Notes
	□ Month 1	Date:	
	□ Month 2	Date:	
	□ Month 3	Date:	
	□ Month 4	Date:	
	□ Month 5	Date:	
	□ Month 6	Date:	
	□ Month 7	Date:	
	□ Month 8	Date:	
	□ Month 9	Date:	
	□ Month 10	Date:	
	□ Month 11	Date:	
	□ Month 12	Date:	
	Spring and Fall		□ Check for depressions in areas over and surrounding the stormwater management system.
			Notes
	□ Spring	Date:	
	□ Fall	Date:	
	□ Spring	Date:	
	□ Fall	Date:	
	□ Spring	Date:	
	□ Fall	Date:	
	□ Spring	Date:	
	□ Fall	Date:	
	□ Spring	Date:	
	□ Fall	Date:	
	□ Spring	Date:	
	□ Fall	Date:	
	Yearly		□ Confirm that no unauthorized modifications have been performed to the site.
			Notes
	□ Year 1	Date:	
	□ Year 2	Date:	
	□ Year 3	Date:	
	□ Year 4	Date:	
	□ Year 5	Date:	
	□ Year 6	Date:	
	□ Year 7	Date:	

CULTEC
878 Federal Road • P.O. Box 280 • Brookfield, CT 06804 USA
P: (203) 775-4416 • Toll Free: 1(800) 4-CULTEC • www.cultec.com

RETENTION • DETENTION • INFILTRATION • WATER QUALITY

FUSS & O'NEILL

Appendix C

Annual O&M Budgetary Opinion of Cost

FUSS & O'NEILL, INC.

1250 Hancock Street, Suite 815N
Quincy, MA 02171

BUDGETARY OPINION OF COST		DATE PREPAR 02/02/26	SHEET 1 OF 1
PROJECT :	Carlisle Fire Department Additions & Alterations	BASIS :	
LOCATION :	66 Westford Street, Carlisle, Ma 01741		
DESCRIPTION:	Long Term Stormwater O&M Costs	ESTIMATOR : KT	CHECKED BY : JD

Since Fuss & O'Neill has no control over the cost of labor, materials, equipment or services furnished by others, or over the Contractor(s)' methods of determining prices, or over competitive bidding or market conditions, Fuss & O'Neill's opinion of probable Total Project Costs and Construction Cost are made on the basis of Fuss & O'Neill's experience and qualifications and represent Fuss & O'Neill's best judgment as an experienced and qualified professional engineer, familiar with the construction industry; but Fuss & O'Neill cannot and does not guarantee that proposals, bids or actual Total Project or Construction Costs will not vary from opinions of probable cost prepared by Fuss & O'Neill. If prior to the bidding or negotiating Phase the Owner wishes greater assurance as to Total Project or Construction Costs, the Owner shall employ an independent cost estimator.

ITEM NO.	ITEM DESCRIPTION	UNIT MEAS.	NO. UNITS	PER UNIT	TOTAL COST
1	Site Inspections(2)	EA	12	$ 500.00	$ 6,000.00
2	Monthly Removal of Trash(3)	EA	12	$ 250.00	$ 3,000.00
3	Vacuum Truck - Drainage Structures & Detention Systems (4)	EA	2	$ 2,800.00	$ 5,600.00
					$ 14,600.00
	TOTAL COST (-15% TO +30% ROUNDED)				**$12,500 TO $19,000**

Notes

1. The following equipment and labor rates were used for this estimate: Site Inspector - $1,000/day; Laborer - $500/day; Skidsteer & Operator - $1,000/day; Dump Truck - $500/day; Vacum Truck - $1800/day
2. Assume a Site Inspector is required for 1/2 day per inspection.
3. Assumes 1 Laborer for a 1/2 day.
4. Assumes 2 Laborers and 1 Vaccum Truck for 1 Day.

FUSS & O'NEILL

Appendix J

Illicit Discharge Compliance Statement

Illicit Discharge Compliance Statement
Carlisle Fire Department Additions & Alterations
Carlisa, MA

No illicit discharges are proposed to enter the developed stormwater system located within the Carlisle Fire Department Additions & Alterations project area. Inspection procedures outlined in the Long-Term Operation and Maintenance Plan will be strictly followed so contaminants do not enter the stormwater system. Illicit discharge detection and elimination procedures will be implemented routinely by visual inspections to prevent illicit discharges into the stormwater system. Further, I certify that the stormwater management system as shown on the referenced plans will be maintained in accordance with the conditions of the Long-Term Operation and Maintenance Plan.

Responsible Party: ___________________________________ Date: _________________

Appendix D

Abutter Information

Notification to Abutters
Under the Massachusetts Wetlands Protection Act
And the Carlisle Wetlands Protection Bylaw

In accordance with the second paragraph of Massachusetts General Laws Chapter 131, Section 40, and with the Carlisle Wetlands Protection Bylaw you are hereby notified of the following:

A. The name of the **Applicant** is Bryan Sorrows, Carlisle Fire Department

B. The Applicant has filed a **Notice of Intent** with the Carlisle Conservation Commission seeking permission to remove, fill, dredge or alter an Area Subject to Protection (Wetland Resource Area and/or Buffer Zone) Under the Massachusetts Wetlands Protection Act (General Laws Chapter 131, Section 40) and the Carlisle Wetlands Protection Bylaw.

C. The **address** of the lot where the activity is proposed: 66 Westford Street

D. The **proposed activity** is: The proposed project includes the renovation of the existing Fire Station along with a building addition. Additional improvements include parking lots, sidewalks, stormwater infrastructure, utilities, and landscaping.

E. A **Public Hearing** regarding this Notice of Intent will be held on:
[ ] Thursday, 02/26/2026 at 7:00 P.M. in the Carlisle Town Hall, 66 Westford Street, Carlisle.
[ ] Information regarding the date, time, and place of the public hearing may be obtained from the applicant or the Carlisle Conservation Commission. Note that the commission office will not be able to discuss projects in depth over the telephone. You must personally view the file or have a representative view the file to decide for yourself if you have any interests/concerns.

F. Copies of the Notice of Intent may be examined on the Town of Carlisle website: https://www.carlislema.gov/181/Conservation-Commission. For more information or to make an appointment, call: 978-369-0336.

G. Copies of the Notice of Intent may be obtained from either:
[ ] The Applicant, or [X] the Applicant's representative Josue Valdez, Fuss & O'Neill, by calling this telephone number: (617) 379-5881 between the hours of 9AM-5PM on the following days of the week: Monday-Friday.

Note: Public Hearing Notice, including its date, time, and place, will be published at least 5 days in advance of the first hearing only in the [ ] **Carlisle Mosquito** **or** [ ] **Concord Journal** (at the applicant's expense).

Note: You also may call the Massachusetts Department of Environmental Protection (DEP) for more information about this application or the Wetlands Protection Act by calling: (978) 694-3200

Since you are receiving this notice, you may have wetland resource areas or wetland buffers on your property.
Therefore, construction, cutting, clearing, or grading may require a permit. For clarification or for more information, call the Conservation office 978-369-0336 or visit our page on the town website
https://www.carlislema.gov/181/Conservation-Commission

100 feet Official Abutters List Report

Carlisle, MA
January 14, 2026
Generated by official Carlisle staff

Subject Property:

Parcel Number:	21-1-0	Mailing Address:	TOWN OF CARLISLE FIRE STATION 80 WESTFORD STREET CARLISLE, MA 01741
CAMA Number:	21-1-0		
Property Address:	66 WESTFORD ST		

Abutters:

Parcel Number	CAMA Number	Property Address	Mailing Address
15-40-0	15-40-0	91 WESTFORD ST	CONNELL MARK ALBERT CONNELL AMY MARIE 91 WESTFORD STREET CARLISLE, MA 01741
15-41-1	15-41-1	WESTFORD ST	WAITKUNAS JOHN A WAITKUNAS GAIL P PO BOX 146 CARLISLE, MA 01741
15-59-0	15-59-0	43 ROCKLAND RD	FREEMAN GEOFFREY 245 ROCKLAND ROAD CARLISLE, MA 01741
15-60-1	15-60-1	173 ROCKLAND RD	YOUNG JOHN LOWE MELANIE 173 ROCKLAND ROAD CARLISLE, MA 01741
15-61-2	15-61-2	ROCKLAND RD	FINDLAY MARJORIE 245 ROCKLAND ROAD CARLISLE, MA 01741
20-4-X	20-4-X	ROCKLAND RD	BAY STATE INVESTMENT TRUST CASNER & EDWARDS LLP 303 CONGRESS STREET BOSTON, MA 02210
20-7-A	20-7-A	160 ROCKLAND RD	FARDY JR GEORGE W FARDY MARY E 160 ROCKLAND ROAD CARLISLE, MA 01741
21-2-E	21-2-E	125 LOWELL ST	MOSCA (TR) JOHN J MOSCA (TR) BETHANY MOCCIA 125 LOWELL STREET CARLISLE, MA 01741
21-6-0	21-6-0	225 LOWELL ST	ANSARA MICHAEL ARNOLD BARBARA T 225 LOWELL STREET CARLISLE, MA 01741
22-23-0	22-23-0	75 WESTFORD ST	MILLIGAN LEONARD E III ELURI AREEG 75 WESTFORD STREET CARLISLE, MA 01741

100 feet Official Abutters List Report

Carlisle, MA
January 14, 2026
Generated by official Carlisle staff

Parcel Number:	22-24-0	Mailing Address:	NEW ENGLAND TELEPHONE COMPANY PROPERTY TAX DEPARTMENT PO BOX 2749 ADDISON, TX 75001
CAMA Number:	22-24-0		
Property Address:	48 WESTFORD ST		

Parcel Number:	22-33-A	Mailing Address:	LEE ANNETTE 65 LOWELL STREET CARLISLE, MA 01741
CAMA Number:	22-33-A		
Property Address:	65 LOWELL ST		

Parcel Number:	22-34-0	Mailing Address:	REDWING NOMINEE TRUST CONSTABLE (TR) GALE K 75 LOWELL STREET CARLISLE, MA 01741
CAMA Number:	22-34-0		
Property Address:	75 LOWELL ST		

Parcel Number:	22-35-0	Mailing Address:	MADDEN SAMUEL MADDEN CAITLIN 93 LOWELL STREET CARLISLE, MA 01741
CAMA Number:	22-35-0		
Property Address:	93 LOWELL ST		

Parcel Number:	22-36-0	Mailing Address:	SIEDLAR (TR) DONNA J 109 LOWELL STREET REALTY TRUST PO BOX 211 CARLISLE, MA 01741
CAMA Number:	22-36-0		
Property Address:	109 LOWELL ST		

Parcel Number:	22-82-0	Mailing Address:	CARLISLE CONSERVATION COMM. 66 WESTFORD STREET CARLISLE, MA 01741
CAMA Number:	22-82-0		
Property Address:	LOWELL ST		

FUSS & O'NEILL

Appendix E

Abbreviated Notice of Resource Area Delineation (ANRAD)

Abbreviated Notice of Resource Area Delineation

Prepared For:

Town of Carlisle

Carlisle, Massachusetts

January 12, 2026

Prepared By:

FUSS & O'NEILL

FUSS & O'NEILL
1550 Main Street, Suite 400
Springfield, MA 01103
413.452.0445
www.fando.com

January 12, 2026

Carlisle Conservation Commission
66 Westford Street
Carlisle, MA 01741

Re: Abbreviated Notice of Resource Area Delineation
Carlisle Fire Station
Carlisle, Massachusetts

Dear Members of the Conservation Commission:

On behalf of the Town of Carlisle (Proponent), Fuss & O'Neill is submitting this Abbreviated Notice of Resource Area Delineation (ANRAD) for the Carlisle Fire Station located at 66 Westford Street in the Town of Carlisle. Table 1 below summarizes the delineated lengths of the boundary of resource areas to be reviewed and identified within the Review Area subject to the Massachusetts Wetlands Protection Act (MAWPA: M.G.L. c 131 § 40) and the Carlisle Non-Zoning Wetlands Bylaw. We respectfully request a waiver of the Winter Delineation Policy due to the low probability of error at this particular site, due to the extent of existing development and location of the delineated resource areas at the toe of slope across the Review Area.

Table 1
Summary of Delineated Length of Resource Areas

MAWPA and Holyoke Wetlands Ordinance Resource Areas	Delineated Length
Bordering Vegetated Wetland	455 feet
Inland Bank	275 feet

As part of the ANRAD process, abutters will be notified. A public notice for the ANRAD will be published in The Carlisle Mosquito. Should you have any questions regarding this application, please contact me at April.Doroski@fando.com / (413) 333-5881.

Sincerely,

April Doroski

April Doroski, PWS, CPSS
Water Resources and Climate Resilience Specialist

Copy: MassDEP (NERO) Division of Wetlands and Waterways
Chief Bryan Sorrows, Carlisle Fire Department

Appendix A

WPA Form 4A – Abbreviated Notice of Resource Area Delineation

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 4A – Abbreviated Notice of Resource Area Delineation

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

Provided by MassDEP:

MassDEP File Number

Document Transaction Number

Carlisle
City/Town

A. General Information

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

1. Project Location (**Note:** electronic filers will click on button for GIS locator):

66 Westford Street	Carlisle	01741
a. Street Address	b. City/Town	c. Zip Code

Latitude and Longitude:

42.52924	-71.35225
d. Latitude	e. Longitude

21	1-0
f. Assessors Map/Plat Number	g. Parcel /Lot Number

2. Applicant:

Bryan	Somers
a. First Name	b. Last Name

Carlisle Fire Department
c. Organization

80 Westford Street P.O. Box 575
d. Mailing Address

Carlisle	MA	01741
e. City/Town	f. State	g. Zip Code

978-369-2888		chief@carlislefdma.org
h. Phone Number	i. Fax Number	j. Email Address

3. Property owner (if different from applicant):

☐ Check if more than one owner (attach additional sheet with names and contact information)

a. First Name | b. Last Name

c. Organization

d. Mailing Address

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

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

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

4. Representative (if any):

April	Doroski
a. Contact Person First Name	b. Contact Person Last Name

Fuss & O'Neill
c. Organization

1550 Main Street, Suite 400
d. Mailing Address

Springfield	MA	01103
e. City/Town	f. State	g. Zip Code

413-333-5881		april.doroski@fando.com
h. Phone Number	i. Fax Number	j. Email Address

Fees will be calculated for online users.

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

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

B. Area(s) Delineated

1. Bordering Vegetated Wetland (BVW) 455 — Linear Feet of Boundary Delineated

2. Check all methods used to delineate the Bordering Vegetated Wetland (BVW) boundary:

   a. ☐ MassDEP BVW Field Data Form (attached)

   b. ☒ Other Methods for Determining the BVW boundary (attach documentation):

      1. ☒ 50% or more wetland indicator plants
      2. ☒ Saturated/inundated conditions exist
      3. ☐ Groundwater indicators
      4. ☒ Direct observation
      5. ☒ Hydric soil indicators
      6. ☐ Credible evidence of conditions prior to disturbance

3. Indicate any other resource area boundaries that are delineated:

a. Resource Area	b. Linear Feet Delineated
Inland Bank	275

c. Resource Area	d. Linear Feet Delineated

C. Additional Information

Applicants must include the following plans with this Abbreviated Notice of Resource Area Delineation. See instructions for details. **Online Users:** Attach the Document Transaction Number (provided on your receipt page) for any of the following information you submit to the Department.

1. ☒ ANRAD (Delineation Plans only)
2. ☒ 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.)
3. ☒ Plans identifying the boundaries of the Bordering Vegetated Wetlands (BVW) (and/or other resource areas, if applicable).
4. ☒ List the titles and final revision dates for all plans and other materials submitted with this Abbreviated Notice of Resource Area Delineation.

D. Fees

Provided by MassDEP:

MassDEP File Number

Document Transaction Number

Carlisle
City/Town

The fees for work proposed under each Abbreviated Notice of Resource Area Delineation must be calculated and submitted to the Conservation Commission and the Department (see Instructions and Wetland Fee Transmittal Form).

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

Applicants must submit the following information (in addition to the attached Wetland Fee Transmittal Form) to confirm fee payment:

2. Municipal Check Number

3. Check date

4. State Check Number

5. Check date

6. Payor name on check: First Name

7. Payor name on check: Last Name

E. Signatures

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

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

I hereby grant permission, to the Agent or member of the Conservation Commission and the Department of Environmental Protection, to enter and inspect the area subject to this Notice at reasonable hours to evaluate the wetland resource boundaries subject to this Notice, and to require the submittal of any data deemed necessary by the Conservation Commission or Department for that evaluation.

I acknowledge that failure to comply with these certification requirements is grounds for the Conservation Commission or the Department to take enforcement action.

Bryan Somers | 1/12/2026
1. Signature of Applicant | 2. Date

3. Signature of Property Owner (if different) | 4. Date

April Doroski | 1/12/26
5. Signature of Representative (if any) | 6. Date

For Conservation Commission:
Two copies of the completed Abbreviated Notice of Resource Area Delineation (Form 4A), including supporting plans and documents; two copies of the ANRAD Wetland Fee Transmittal Form; and the city/town fee payment must be sent to the Conservation Commission by certified mail or hand delivery.

For MassDEP:
One copy of the completed Abbreviated Notice of Resource Area Delineation (Form 4A), including supporting plans and documents; one copy of the ANRAD Wetland Fee Transmittal Form; and a copy of the state fee payment must be sent to the MassDEP Regional Office (see Instructions) by certified mail or hand delivery. (E-filers may submit these electronically.)

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.

ANRAD Wetland Fee Transmittal Form

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

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

tab

return

A. Applicant Information

1. Location of Project:

66 Westford Street	Carlisle
a. Street Address	b. City/Town
Exempt	Exempt
c. Fee amount	d. Check number

2. Applicant:

Bryan	Sorrows	Carlisle Fire Department
a. First Name	b. Last Name	c. Company

80 Westford Street P.O.Box 575
d. Mailing Address

Carlisle	MA	01741
e. City/Town	f. State	g. Zip Code

978-369-2888
h. Phone Number

3. Property Owner (if different):

a. First Name	b. Last Name	c. Company

d. Mailing Address

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

h. Phone Number

B. Fees

The fee is calculated as follows for each Resource Area Delineation included in the ANRAD (check applicable project type). The maximum fee for each ANRAD, regardless of the number of Resource Area Delineations, is $200 activities associated with a single-family house and $2,000 for any other activity.

☒ **Online users:** check box if fee exempt.

Bordering Vegetated Wetland Delineation Fee:

1. ☐	single family house project	a. feet of BVW	x $2.00 =	b. Fee for BVW
2. ☐	all other projects	a. feet of BVW	x $2.00 =	b. Fee for BVW

Other Resource Area (e.g., bank, riverfront area, etc.):

3. ☐	single family house project	a. linear feet	x $2.00 =	b. Fee
4. ☐	all other projects	a. linear feet	x $2.00 =	b. Fee

Total Fee for all Resource Areas: Exempt
Fee

State share of filing fee: Exempt
5. 1/2 of total fee **less** $12.50

City/Town share of filing fee: Exempt
6. 1/2 of total fee **plus** $12.50

ANRAD Wetland Fee Transmittal Form

C. Submittal Requirements

a.) Send a copy of this form, with a check or money order for the state share of the fee, payable to the Commonwealth of Massachusetts, to:

Department of Environmental Protection
Box 4062
Boston, MA 02211

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

c.) **To DEP Regional Office**: Send one copy of the Abbreviated Notice of Resource Area Delineation (and any additional documentation required as part of a Simplified Review Buffer Zone Project); a **copy** of this form; and a **copy** of the state fee payment. (E-filers of Notices of Intent may submit these electronically.)

Appendix B

Wetland Delineation Report

July 25, 2025 (revised January 12, 2026)

Mr. Matt Salad
Tecton Architects
34 Sequassen Street, Suite 200
Hartford, Connecticut 06106

RE: Wetland Delineation Report
66 Westford Street, Carlisle, Massachusetts
Fuss & O'Neill Reference No. 2025003.A10

Dear Mr. Salad:

On July 10, 2025 a Fuss & O'Neill, Inc. wetland and soil scientist performed a wetland resource area delineation within a portion of 66 Westford Street directly adjacent to the parking lot ("Review Area") in Carlisle of Middlesex County, Massachusetts.

This letter provides a summary of regulated and protected resource areas as defined by the Massachusetts Wetlands Protection Act (M.G.L. c. 131 § 40, "MAWPA") and its implementing regulations (310 CMR 10.00), the Massachusetts Endangered Species Act (321 CMR 10.00), the Carlisle Non-Zoning Wetlands Bylaw, and the federal Clean Water Act (33 U.S.C. §1251 et seq., "CWA").

Methodology of Resource Area Delineation

The wetland delineation was conducted in conformance with local, state, and federal regulations and guidelines including:

- MAWPA (M.G.L. c. 131, § 40), its implementing regulations set forth at 310 CMR 10.00
- Massachusetts Department of Environmental Protection (MassDEP) *Massachusetts Handbook for Delineation of Bordering Vegetated Wetlands* (September 2022)
- *Corps of Engineers Wetlands Delineation Manual*, Technical Report Y-87-1 (January 1987)
- *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region* (January 2012)
- *Field Indicators for Identifying Hydric Soils in New England* (Version 4, April 2019)
- Carlisle Non-Zoning Wetlands Bylaw

During the delineation, a Fuss & O'Neill wetland and soil scientist assessed the Review Area and observed vegetation and soils to verify the presence or absence of wetlands. Where Bank and BVW were observed, the resource area boundaries were delineated, and information regarding vegetation, soils, and hydrology was collected. Each flag location was named based on an alpha-numeric nomenclature and collected by a professional land surveyor.

Fuss & O'Neill also conducted a desktop review of available online resources within the vicinity of the Review Area prior to performing the wetland delineation including:

- Massachusetts Mapper (MassMapper)
- Town of Carlisle FEMA Flood Insurance Rate Map (FIRM, Map No. 25017C0263F, effective July 7, 2014)
- Natural Heritage & Endangered Species Program (NHESP) database 15th Edition, effective August 1, 2021

Resource Areas

Resource Areas Not Present

The following resource areas subject to MAWPA, Non-zoning Wetland Bylaw, CWA, and MESA are not located within the Review Area according to MassMapper:

- NHESP Estimated Habitats of Rare Wildlife
- NHESP Priority Habitats of Rare Species
- Land Subject to Flooding
- 200-foot Riverfront Area

Resource Areas and Protected Areas Present within the Review Area

- Inland Bank
- Bordering Vegetated Wetlands
- Land Under Water Bodies and Waterways
- NHESP Certified Vernal Pools

Resource Areas Descriptions

Bordering Vegetated Wetland A and Bank A

Bordering Vegetated Wetland A (BVW A) defined by flags A-100 to A-106 and A-120 through A-130 is best described as a palustrine emergent wetland (PEM) / palustrine scrub shrub wetland (PSS). The upgradient extent of the wetland originates east of the Carlisle Fire Department (FD) parking lot in a low-lying swale that transitions to Bank of an intermittent stream defined by flags A-107 to A-119. This stream generally flows to the north through a cross culvert and into the main portion of BVW A, which is also mapped as a NHESP Certified Vernal Pool generally north of the Carlisle FD parking lot. Land Under Water (LUW) is associated with the unnamed intermittent stream defined by Bank A. Refer to the attached Wetland Sketch for a representation of the delineated boundaries.

BVW A and Bank A are both afforded a 100-foot Buffer Zone per the MAWPA and the Carlisle Non-Zoning Wetlands Bylaw. There are no performance standards for Buffer Zone in the Carlisle Non-Zoning Wetlands Bylaw or MAWPA.

The vernal pool within the main portion of BVW A is also protected under the Title 5 of the Massachusetts Environmental Code, Section 401 of the Federal Clean Water Act, the Massachusetts Surface Water Quality Standards which relate to Section 401, and the Massachusetts Forest Cutting Practices Act.

Sincerely,

April Doroski, PWS, CPSS
Senior Wetland Scientist | Permitting Specialist

Attachments

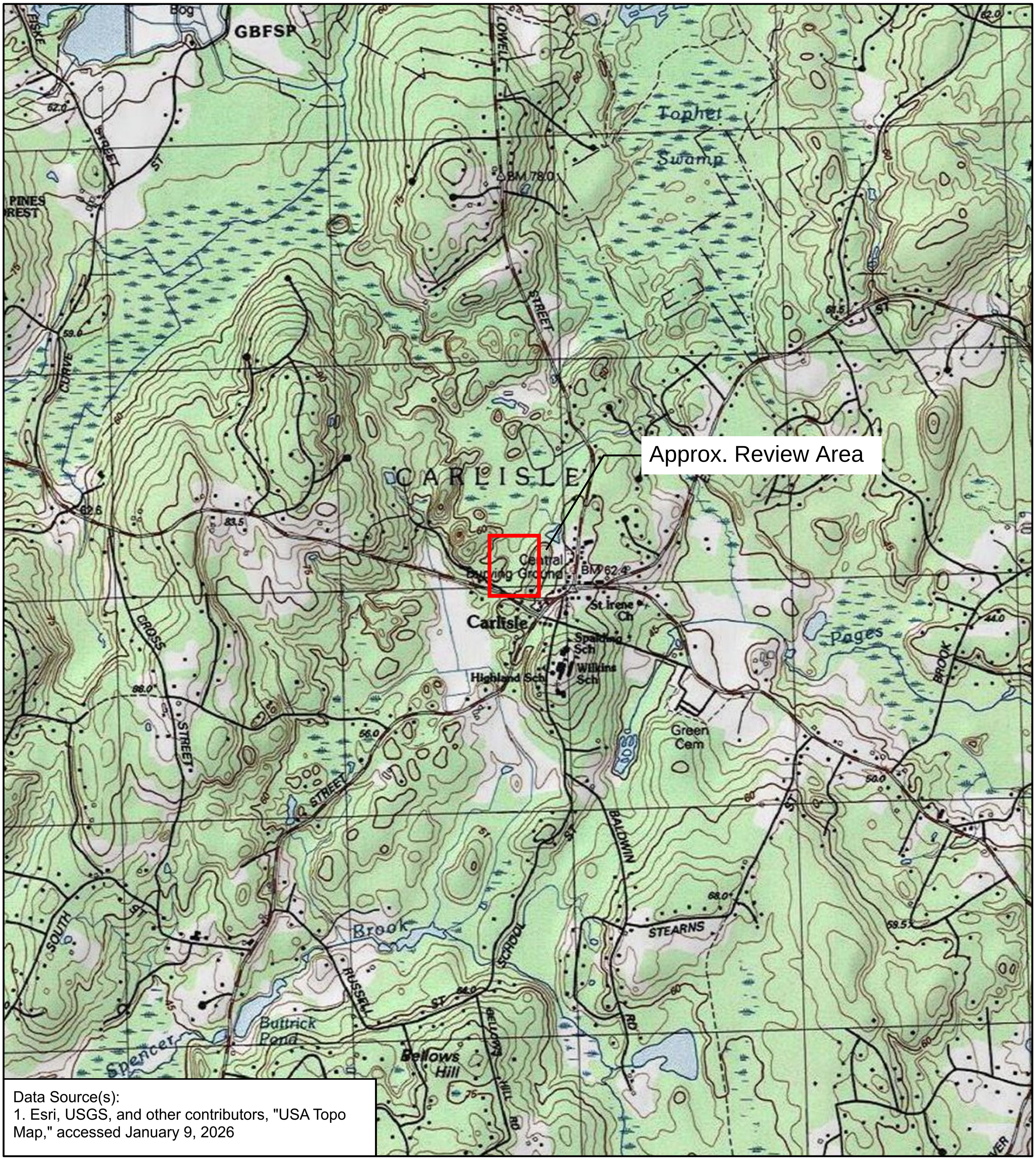
Figures

USGS Topographic Map (Figure 1)
Wetland Delineation Sketch (Figure 2)
FEMA FIRM (Map No. 25017C0263, effective July 7, 2014; Figure 3)

A **Site Photographs**

B **U.S. Army Corps Wetland Delineation Data Forms – Northcentral and Northeast**
BVW A

Figures



Data Source(s):
1. Esri, USGS, and other contributors, "USA Topo Map," accessed January 9, 2026

Legend

Approximate Review Area

Scale: 1:24,000

0 750 1,500 3,000 Feet

N

USGS Topographic Map

66 Westford Street

Carlisle Massachusetts

FUSS&O'NEILL

1550 Main Street, Suite 400
Springfield, MA 01103
413.452.0445| www.fando.com

Figure 1

Folder: K:\P2025\0003\A10\ Project: Carlisle Layout: Figure 1 Map: Main Data Frame Map Frame
Date Exported: 1/9/2026 4:57 PM User: Jacob.Gentile Date Saved: 1/9/2026 4:56 PM

Wetland Delineation Sketch

7/11/2025

Parcel Boundry
BVW Flag
Bank Flag
Culvert
Wetland Plot
World Imagery
Low Resolution 15m Imagery
High Resolution 60cm Imagery
High Resolution 30cm Imagery
Citations
30cm Resolution Metadata

1:1,463

0 0.01 0.01 0.03 mi

0 0.01 0.03 0.05 km

Maxar, Microsoft, Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community

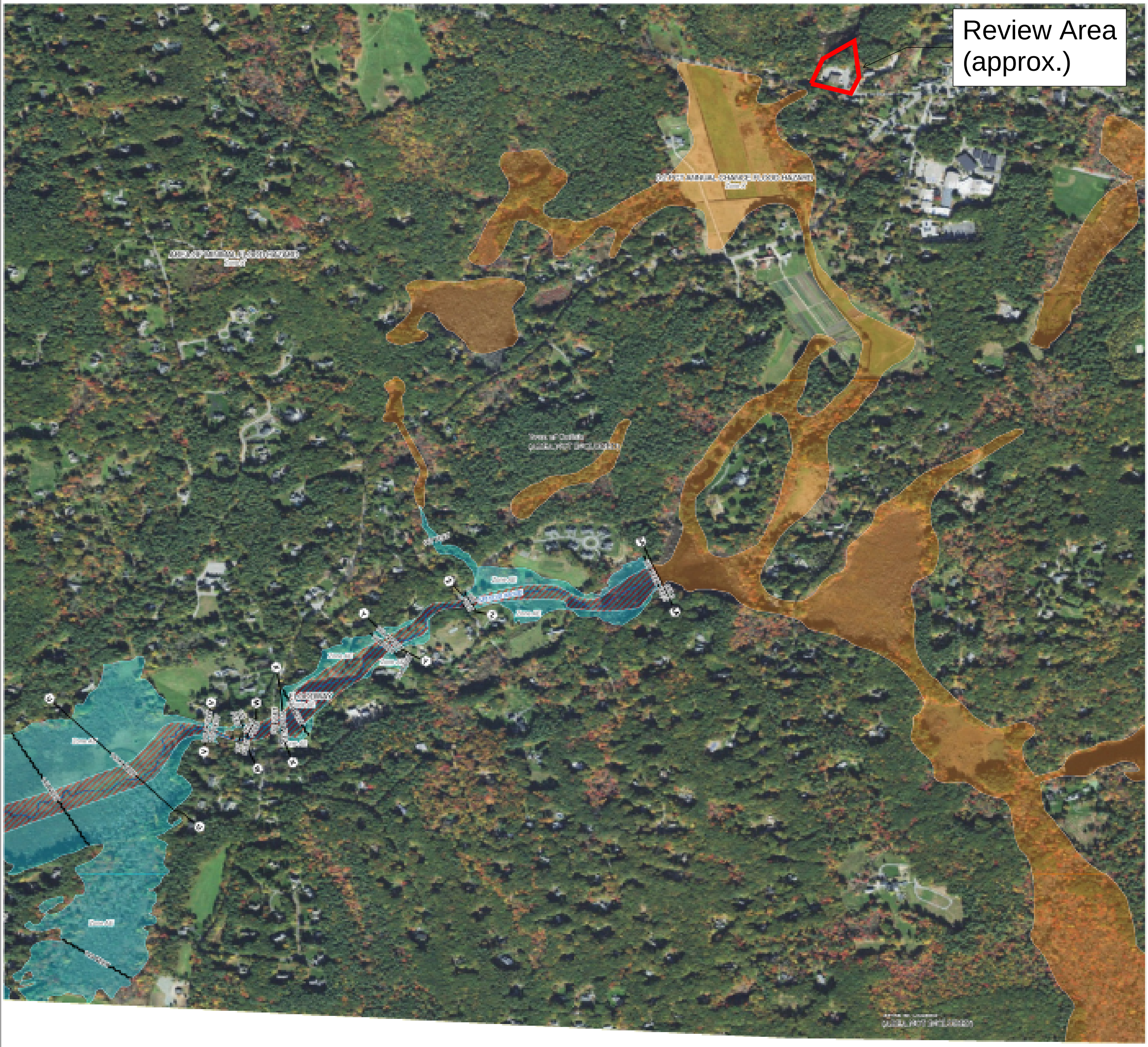


Figure 3

FLOOD HAZARD INFORMATION

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

SPECIAL FLOOD HAZARD AREAS	Without Base Flood Elevation (BFE) *Zone A, V, A99* With BFE or Depth *Zone AE, AO, AH, VE, AR* Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD	0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X* Future Conditions 1% Annual Chance Flood Hazard *Zone X* Area with Reduced Flood Risk due to Levee See Notes *Zone X* Area with Flood Risk due to Levee *Zone D*
OTHER AREAS	NO SCREEN Area of Minimal Flood Hazard *Zone X* Effective LOMRs Area of Undetermined Flood Hazard *Zone D*
GENERAL STRUCTURES	Channel, Culvert, or Storm Sewer Levee, Dike, or Floodwall
OTHER FEATURES	B 20.2 Cross Sections with 1% Annual Chance 17.5 Water Surface Elevation 8 Coastal Transect Coastal Transect Baseline Profile Baseline Hydrographic Feature 513 Base Flood Elevation Line (BFE) Limit of Study Jurisdiction Boundary

NOTES TO USERS

For information and questions about this Flood Insurance Rate Map (FIRM), available products associated with this FIRM, including historic versions, the current map date for each FIRM panel, how to order products, or the National Flood Insurance Program (NFIP) in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Flood Map Service Center website at https://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the website.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM Index. These may be ordered directly from the Flood Map Service Center at the number listed above.

For community and countywide map dates, refer to the Flood Insurance Study Report for this jurisdiction.

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

Basemap information shown on this FIRM was provided in digital format by USDA, Farm Service Agency (FSA). This information was derived from NAIP, dated April 11, 2018.

This map was exported from FEMA's National Flood Hazard Layer (NFHL) on 7/9/2025 8:45 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. For additional information, please see the Flood Hazard Mapping Updates Overview Fact Sheet at https://www.fema.gov/media-library/assets/documents/118418

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. 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.

SCALE

Map Projection:
GCS, Geodetic Reference System 1980;
Vertical Datum: NAVD88
For information about the specific vertical datum for elevation features, datum conversions, or vertical monuments used to create this map, please see the Flood Insurance Study (FIS) Report for your community at https://msc.fema.gov

N

1 inch = 500 feet 1:6,000

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

0 50 100 200 300 400 Meters

FEMA

National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP

PANEL 263 OF 654

Panel Contains:

COMMUNITY	NUMBER	PANEL
TOWN OF CARLISLE	250187	0263

MAP NUMBER
25017C0263F
EFFECTIVE DATE
July 07, 2014

Attachment A

Site Photographs

Photo 1: Overview of BVW A on eastern side of the fire station from flag A-105.

Photo 2: Overview of BVW A data plot near flag A-103.

Photo 3: Overview of BVW A, north of the fire station.

Photo 4: Overview of delineated Bank A on the eastern side of the fire station.

Photo 5: View of the cross culvert conveying the intermittent stream associated with Bank A near flag A-115.

Photo 6: View upstream from the cross culvert that conveys the stream associated with Bank.

Attachment B

U.S. Army Corps Wetland Determination Data Sheet – Northcentral and Northeast

U.S. Army Corps of Engineers **WETLAND DETERMINATION DATA SHEET – Northcentral and Northeast Region** See ERDC/EL TR-12-1; the proponent agency is CECW-CO-R	*OMB Control #: 0710-0024, Exp: 9/30/2027* *Requirement Control Symbol EXEMPT:* *(Authority: AR 335-15, paragraph 5-2a)*

Project/Site: 66 Westford Street City/County: Carlisle Sampling Date: 7/10/2025

Applicant/Owner: Town of Carlisle State: MA Sampling Point: Wet A

Investigator(s): April Doroski, PWS, CPSS. Fuss & O'Neill Section, Township, Range: Carlisle

Landform (hillside, terrace, etc.): Depression Local relief (concave, convex, none): concave Slope %: 0-3

Subregion (LRR or MLRA): LRR R, MLRA 144A Lat: 42.52920292506102, Long: -71.35217273568567 Datum: NAD83 State Plane

Soil Map Unit Name: Hollis-Rock outcrop-Charlton complex, 0 to 15 percent slopes NWI classification: PSS, Freshwater Pond

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

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are “Normal Circumstances” present? Yes X No ___

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

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

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

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

HYDROLOGY

Wetland Hydrology Indicators:

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

		Secondary Indicators (minimum of two required)
X Surface Water (A1)	X Water-Stained Leaves (B9)	___ Surface Soil Cracks (B6)
___ High Water Table (A2)	___ Aquatic Fauna (B13)	___ Drainage Patterns (B10)
___ Saturation (A3)	___ Marl Deposits (B15)	___ Moss Trim Lines (B16)
___ Water Marks (B1)	___ Hydrogen Sulfide Odor (C1)	___ Dry-Season Water Table (C2)
___ Sediment Deposits (B2)	___ Oxidized Rhizospheres on Living Roots (C3)	___ Crayfish Burrows (C8)
___ Drift Deposits (B3)	___ Presence of Reduced Iron (C4)	___ Saturation Visible on Aerial Imagery (C9)
___ Algal Mat or Crust (B4)	___ Recent Iron Reduction in Tilled Soils (C6)	___ Stunted or Stressed Plants (D1)
___ Iron Deposits (B5)	___ Thin Muck Surface (C7)	___ Geomorphic Position (D2)
___ Inundation Visible on Aerial Imagery (B7)	___ Other (Explain in Remarks)	___ Shallow Aquitard (D3)
___ Sparsely Vegetated Concave Surface (B8)		___ Microtopographic Relief (D4)
		X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes X	No ___	Depth (inches): 2
Water Table Present?	Yes X	No ___	Depth (inches): ___
Saturation Present? (includes capillary fringe)	Yes X	No ___	Depth (inches): ___

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

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

Remarks:

ENG FORM 6116-8, SEP 2024 Northcentral and Northeast – Version 2.0

VEGETATION – Use scientific names of plants. Sampling Point: Wet A

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
		=Total Cover	
Sapling/Shrub Stratum (Plot size: 15)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
		=Total Cover	
Herb Stratum (Plot size: 5)			
1. *Onoclea sensibilis*	60	Yes	FACW
2. *Toxicodendron radicans*	15	Yes	FAC
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	75	=Total Cover	
Woody Vine Stratum (Plot size: 30)			
1.			
2.			
3.			
4.			
		=Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

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

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	60	x 2 =	120
FAC species	15	x 3 =	45
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	75 (A)		165 (B)

Prevalence Index = B/A = 2.20

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

X 3 - Prevalence Index is ≤3.0[1]

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

___ Problematic Hydrophytic Vegetation[1] (Explain)

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

Definitions of Vegetation Strata:

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

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

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

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

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

Remarks: (Include photo numbers here or on a separate sheet.)
Other vegetation observed outside of the data plot includes skunk cabbage and jewelweed.

ENG FORM 6116-8, SEP 2024 Northcentral and Northeast – Version 2.0

SOIL

Sampling Point: Wet A

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-8	10YR 2/1	100					Sandy	
8-16	10YR 2/1	100	10YR 4/4	1	C		Sandy	Distinct redox concentrations
16-24	10YR 4/1	100					Loamy/Clayey	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- X Thick Dark Surface (A12)
- ___ Mesic Spodic (A17) **(MLRA 144A, 145, 149B)**
- ___ Iron Monosulfide (A18)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- X Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ High Chroma Sands (S11) (**LRR K, L)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) (**LRR K, L**)
- ___ Red Parent Material (F21) **(MLRA 145)**

Indicators for Problematic Hydric Soils[3]:

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

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

Restrictive Layer (if observed):
Type: NA
Depth (inches): ______

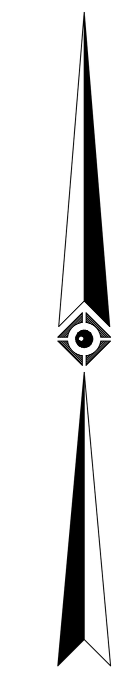
Hydric Soil Present? **Yes** X **No** ___

Remarks:

ENG FORM 6116-8, SEP 2024 Northcentral and Northeast – Version 2.0

Appendix B

Existing Conditions Plan



LEGEND

124 / 125	EXISTING CONTOUR
× 123.45	EXISTING SPOT ELEVATION
× TC 123.45	EXISTING TOP OF CURB ELEVATION
× BC 123.45	EXISTING BOTTOM OF CURB ELEVATION
× TW 123.45	EXISTING TOP OF WALL ELEVATION
× BW 122.95	EXISTING BOTTOM OF WALL ELEVATION
× FF 123.45	EXISTING FINISHED FLOOR ELEVATION
× DS 123.45	EXISTING DOOR SILL ELEVATION
	HYDRANT
WV	WATER VALVE
PIV	PRESSURE INDICATOR VALVE
	GROUND FLOOD LIGHT
	BORING
	VENT & NUMBER OF VENTS
	FIRE DEPARTMENT CONNECTION (F.D.C.)
GV	GAS VALVE
GM	GAS METER
EM	ELECTRIC METER
OH	OVERHEAD WIRES
G	APPROX. LOC. UNDERGROUND GAS LINE
E	APPROX. LOC. UNDERGROUND ELECTRIC LINE
E/T	APPROX. LOC. UNDERGROUND ELECTRIC & TELEPHONE LINE
D	APPROX. LOC. UNDERGROUND DRAINAGE LINE
S	APPROX. LOC. UNDERGROUND SANITARY / SEWER LINE
UP #	UTILITY POLE
UPLP #	UTILITY POLE/LIGHT POLE
GW	GUY WIRE
MW	MONITORING WELL
	SIGN
P	POST
	BOLLARD
	METAL GUIDE RAIL
DMH	DRAINAGE/STORM MANHOLE
MH	UNKNOWN MANHOLE
SMH	SANITARY/SEWER MANHOLE
CB	CATCH BASIN OR INLET
T#	TREE & TRUNK SIZE
P#	CONIFEROUS TREE & TRUNK SIZE
	SHRUBS
UG	UNDER GROUND
CLF	CHAIN LINK FENCE
EOC	EDGE OF CONCRETE
EOP	EDGE OF PAVEMENT
LSA	LANDSCAPED AREA
1.0'	OFFSET OF STRUCTURE AT GROUND LEVEL RELATIVE TO PROPERTY LINE
SWL	SOLID WHITE LINE
SYL	SOLID YELLOW LINE
DYL	DOUBLE YELLOW LINE
HT	HEIGHT
BLDG	BUILDING
BFPA	BUILDING FOOTPRINT AREA
NVP	NO VISIBLE PIPE
EL	ELEVATION
PVC	POLYVINYL CHLORIDE PIPE
CI	CAST IRON PIPE
RCP	REINFORCED CONCRETE PIPE
INV	INVERT ELEVATION
GRT	GRATE ELEVATION
Qc	SUBSURFACE UTILITY QUALITY LEVEL C
Qd	SUBSURFACE UTILITY QUALITY LEVEL D
	WATER WELL

SEE SHEET 1 OF 2 FOR NOTES AND REFERENCES

GRAPHIC SCALE

30' 0 15' 30' 60' 120'

(IN FEET)
1 inch = 30 ft.

THIS SURVEY HAS BEEN PERFORMED IN THE FIELD UNDER MY SUPERVISION, AND TO THE BEST OF MY KNOWLEDGE, BELIEF, AND INFORMATION, THIS SURVEY HAS BEEN PERFORMED IN ACCORDANCE WITH CURRENTLY ACCEPTED ACCURACY STANDARDS.

NOT A VALID ORIGINAL DOCUMENT UNLESS EMBOSSED WITH RAISED IMPRESSION OR STAMPED WITH A BLUE INK SEAL

COMMONWEALTH OF MASSACHUSETTS
GERRY L. HOLDRIGHT
NO. 49211
REGISTERED
PROFESSIONAL LAND SURVEYOR

08-08-2025
DATE

GERRY L. HOLDRIGHT, PLS
MASSACHUSETTS PROFESSIONAL LAND SURVEYOR #49211

FIELD DATE	07-18-2025
FIELD BOOK NO.	25-5-MA
FIELD BOOK PG.	91
FIELD CREW	J.D.O.
DRAWN:	R.A.B.

BOUNDARY, TOPOGRAPHIC & UTILITY SURVEY

FUSS & O'NEILL, INC.

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MAP 21, LOT 1
TOWN OF CARLISLE, MIDDLESEX COUNTY
COMMONWEALTH OF MASSACHUSETTS

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FT. LAUDERDALE, FL 954.763.7611

REVIEWED:	APPROVED:	DATE	SCALE	FILE NO.	DWG. NO.
R.J.K.	G.L.H.	08-08-2025	1"=30'	03-250196-00	2 OF 2

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STOP - CALL BEFORE YOU DIG

THE COMMONWEALTH OF MASSACHUSETTS REQUIRES NOTIFICATION BY EXCAVATORS, DESIGNERS, OR ANY PERSON PREPARING TO DISTURB THE EARTH'S SURFACE ANYWHERE IN THE COMMONWEALTH.