STORMWATER MANAGEMENT REPORT

FOR

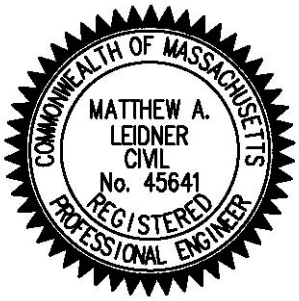
LEWIS RIDGE

28 HAVERHILL ROAD (ROUTE 110)
AMESBURY, MASSACHUSETTS

PREPARED FOR:
PULTE HOMES OF NEW ENGLAND, LLC
1900 WEST PARK DRIVE, SUITE 180
WESTBOROUGH, MA 01581

PREPARED BY:

CIVIL DESIGN GROUP, LLC
4 HIGH STREET, SUITE 155
NORTH ANDOVER, MA 01845



DATE: APRIL 13, 2026

CONTENTS

1.0 INTRODUCTION 1
2.0 SITE DESCRIPTION 1
3.0 UNTREATED DISCHARGE (STANDARD 1) 1
4.0 PEAK RATE ATTENUATION (STANDARD 2) 1
4.1 Points of Analysis 2
4.2 Subcatchments 2
4.3 Times of Concentration 2
4.4 Curve Numbers 2
4.5 Soils 2
4.6 Mitigation Measures 3
4.7 Peak Flow Comparison 4
5.0 STORMWATER RECHARGE (STANDARD 3) 4
6.0 WATER QUALITY (STANDARD 4) 5
7.0 LUHPPL (STANDARD 5) 6
8.0 CRITICAL AREAS (STANDARD 6) 6
9.0 REDEVELOPMENT (STANDARD 7) 6
10.0 EROSION & SEDIMENT CONTROL PLAN (STANDARD 8) 6
11.0 OPERATION & MAINTENANCE PLAN (STANDARD 9) 6
12.0 ILLICIT DISCHARGES (STANDARD 10) 6
13.0 DRAINAGE CONVEYANCE SYSTEM AND CULVERTS 7

CONTENTS

Figure 1 – Locus Plan
Figure 2 – Pre-Development Watersheds
Figure 3 – Post-Development Watersheds
Figure 4 – Catch Basin Watersheds
Figure 5 – Culvert Watersheds

Attachment 1 – DEP Checklist for Stormwater Report
Attachment 2 – NRCS Soils Data & Test Pit Logs
Attachment 3 – NOAA Atlas 14 Table
Attachment 4 – HydroCad Output for Pre-Development Conditions
Attachment 5 – HydroCad Output for Post-Development Conditions
Attachment 6 – HydroCad Output for Culvert Sizing
Attachment 7 – Hydraflow Storm Sewers Output
Attachment 8 – Water Quality Unit Treatment Summary
Attachment 9 – Operation & Maintenance (O&M) Plan
Attachment 10 – Illicit Discharge Statement

1.0 INTRODUCTION

Civil Design Group, LLC (CDG) has been retained by Pulte Homes to prepare this Stormwater Management Report for the construction of Lewis Ridge, a residential multi-family housing community to be located on a 13.27± acre site at 28 Haverhill Road (Route 110) in Amesbury, Massachusetts. A locus plan is included as Figure 1. The project includes 126 "garden style" residential condominium units contained in two buildings as well as supporting amenities and infrastructure.

This study presents a comparative analysis of the pre-development and post-development hydrologic characteristics of the site and outlines the proposed measures to mitigate flow, provide groundwater recharge, and maintain water quality from the site in accordance with the Massachusetts Department of Environmental Protection's (DEP's) stormwater standards and applicable municipal requirements. A detailed description of how this project meets the applicable DEP standards is included herein and the DEP *Checklist for Stormwater Report* is included as Attachment 1.

2.0 SITE DESCRIPTION

The project site (Assessor's Map 76 Parcel 1) consists of 13.27± acres with frontage on Haverhill Road and Route 150 Extension. The 13.27± project site is bisected by wetland resource areas including a perennial stream which drains from northwest to southeast along with associated bordering vegetated wetlands, riverfront, and flood plain. Site topography generally slopes towards these wetland resource areas. The location of these wetland resources areas limits the development footprint to approximately 3.5 acres in the northern portion of the site along Haverhill Road and Route 150 Extension. This area presently includes a single-family home with some open fields, brush, and woods. The area of the site to the south of the development area, which comprises almost 10 acres, presently consists of wetlands and wooded upland areas and is proposed to remain undeveloped. The project proposes to utilize this area as passive public recreational space.

The most recently issued Flood Insurance Rate Map ("FIRM") for the area, produced by the Federal Emergency Management Agency ("FEMA"), shows a Zone A associated with the on-site perennial stream. The site does not contain any Priority Habitat of Rare Species, Estimated Habitat of Rare Wildlife, Certified Vernal Pools, or Potential Vernal Pools. According to the Massachusetts Department of Environmental Protection ("DEP"), the Project is not located within an Area of Critical Environmental Concern (ACEC) or an area designated as an Outstanding Resource Water (ORW).

3.0 UNTREATED DISCHARGE (STANDARD 1)

Runoff from the proposed developed area that will contribute to the study points will be treated prior to discharging as further discussed herein and as shown on the accompanying project design plans. No untreated discharges are proposed.

4.0 PEAK RATE ATTENUATION (STANDARD 2)

Pre- and post-development hydrologic modeling was performed using HydroCad 10.0, an industry standard software package that develops a hydrologic model based on the SCS method. This software was used to study the peak discharges from rainfall runoff over the study area in both the pre- and post-development conditions at the points of analysis described below and utilizing curve numbers, times of concentration, and soil data inputs as described herein.

4.1 Points of Analysis

This study utilizes a point of analysis (POA) that serves as comparison point for the peak discharge rates of the pre- and post-development hydrologic conditions. This design point is illustrated in the attached figures and can be described as follows:

POA-1 – This POA represents the downstream-most point where the on-site perennial stream exits the property. This point receives runoff from the entire study area, as defined in the next section.

4.2 Subcatchments

The existing and proposed subcatchments are delineated based on topography and other physical characteristics. The study area includes the northern portion of the project site delineated by a line just downstream of the limit of work as well as offsite strips within the public rights-of-way along both frontages that flow onto the site and contribute to the POA.

The existing conditions analysis encompasses one (1) subcatchment totaling 5.13± acres. The proposed conditions analysis encompasses a total of three (3) subcatchments totaling 5.13± acres (same overall study area as the existing conditions). Existing and proposed subcatchment areas are depicted on the attached figures.

4.3 Times of Concentration

The times of concentration (Tcs) for each of the existing and proposed watersheds have been calculated in HydroCad. The areas that do not show a Tc travel path on the accompanying figures resulted in travel times of less than 6 minutes, in which case a Tc of 6 minutes was manually entered into the model.

4.4 Curve Numbers

For purposes of generating the weighted Curve Numbers (CNs) for the existing and proposed conditions, the following values were utilized:

- pavement and concrete were classified as “paved parking”
- roof tops were classified as “roofs”
- wooded areas were classified as “woods, good”
- existing dirt driveways were classified as “dirt roads”
- proposed gravel and stone dust areas were classified as “gravel roads”
- grass and landscaped areas were classified as “>75% grass cover, good”

4.5 Soils

According to Natural Resources Conservation Service (NRCS) data, soils within the study area fall into Hydrologic Soil Groups (HSGs) A and D. These HSGs were used in determining the CNs for the various ground covers utilized in this analysis.

In addition to the NRCS data, subsurface testing was conducted by the proponent’s geotechnical engineering consultant, Sanborn Head, in August and September 2025, the results of which are included in the attachments of this report.

This data together was utilized in determining the design depths and infiltration rates associated with the proposed stormwater best management practices (BMPs) as further described in the “Mitigation Measures” section of this report.

4.6 Mitigation Measures

Peak flow from the project has been mitigated through the use of subsurface infiltration systems. Each of these proposed BMPs is described in more detail below and shown on the corresponding design plans

Subsurface Infiltration System (SIS) 1: This BMP is a subsurface infiltration system consisting of a series square open-bottom concrete galleys set on a bed of stone. An outlet control structure containing an overflow weir has been designed to optimize the amount of detention and infiltration that this system will provide. The system has been designed to retain and infiltrate up to and including the 100-year storm without overflowing. The following considerations were factored into the design of this BMP:

- Groundwater: The NRCS map indicates that this BMP lies within Map Unit 254C Merrimac fine sandy loam with a typical C horizon consisting of stratified gravel to very gravelly sand and a depth to water table of more than 80 inches. Test pit SH-TP-1 showed a depth to water of 15.4' corresponding to an elevation of 72.6±. Test pit SH-TP-5 showed a depth to water of 10.1' corresponding to an elevation of 80.9±. Test pit SH-TP-6A showed a depth to water of 13.3' corresponding to an elevation of 78.7±. The bottom of this BMP has been designed to be at elevation 90.00 (no deeper than the existing ground surface elevation) to provide sufficient separation to the observed groundwater readings. The SIS detail further requires that confirmatory test pits be conducted within the footprint of the system at the time of construction. The SIS detail calls for existing soils to be removed down to native glacial sand/gravel before building up to the bottom of the system using clean sand or crushed stone to ensure a good hydraulic connection to the underlying sand/gravel soils.
- Infiltration Rate: Based on the NRCS data and test pits, a "Rawls" infiltration rate of 8.27 inches/hour was utilized to model this BMP.
- Drawdown Time: The highest possible ponded water depth in this system is 60 inches based on the weir invert. Utilizing the "Rawls" infiltration rate of 8.27 inches/hour, the drawdown time is 60/8.27 = 7.3 hours thereby meeting the DEP drawdown requirement of <72 hours.

Subsurface Infiltration System (SIS) 2: This BMP is a subsurface infiltration system consisting of a series square open-bottom concrete galleys set on a bed of stone. An outlet control structure containing an overflow weir has been designed to optimize the amount of detention and infiltration that this system will provide. The system has been designed to retain and infiltrate up to and including the 100-year storm without overflowing. The following considerations were factored into the design of this BMP:

- Groundwater: The NRCS map indicates that this BMP lies within Map Unit 254C Merrimac fine sandy loam with a typical C horizon consisting of stratified gravel to very gravelly sand and a depth to water table of more than 80 inches. Test pit SH-TP-2 showed a depth to water of 14.8' corresponding to an elevation of 71.2±. Test boring SH-TB-11 showed wet soil at a depth of 25' corresponding to an elevation of 59± (though it is acknowledged that the stabilized groundwater depth likely would have been higher given adequate time to recover). The bottom of this BMP has been designed to be at elevation 84.00 (no deeper than the existing ground surface elevation) to provide sufficient separation to the observed groundwater readings. The SIS detail further requires that confirmatory test pits be conducted within the footprint of the system at the time of construction. The SIS detail calls for existing soils to be removed down to native glacial sand/gravel before building up to the bottom of the system using clean sand or crushed stone to ensure a good hydraulic connection to the underlying sand/gravel soils.
- Infiltration Rate: Based on the NRCS data and test pits, a "Rawls" infiltration rate of 8.27 inches/hour was utilized to model this BMP.
- Drawdown Time: The highest possible ponded water depth in this system is 42 inches based on the weir invert. Utilizing the "Rawls" infiltration rate of 8.27 inches/hour, the drawdown time is 42/8.27 = 5.1 hours thereby meeting the DEP drawdown requirement of <72 hours.

4.7 Peak Flow Comparison Table

In accordance with the DEP stormwater standards, the stormwater management system is designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates for the 2-year, 10-year, and 100-year, 24-hour storm events. The peak flow has been mitigated through the use of the BMPs described herein. Rainfall values used for each design storm are based on NOAA Atlas 14. Peak flow rates for the pre-development and post-development conditions are illustrated in the following table:

POINT OF ANALYSIS	**2-YEAR STORM EVENT (3.38"/24-HR)**		**10-YEAR STORM EVENT (5.34"/24-HR)**		**100-YEAR STORM EVENT (8.46"/24-HR)**	
	PRE (CFS)	**POST (CFS)**	*PRE (CFS)*	**POST (CFS)**	*PRE (CFS)*	**POST (CFS)**
POA-1	*0.00*	**0.00**	*0.09*	**0.09**	*2.66*	**1.98**

Pre- and post-development Hydrocad output for these storm events is included in the attachments of this report.

5.0 STORMWATER RECHARGE (STANDARD 3)

The DEP Stormwater Management Policy requires that the project's impervious area be used to calculate the required infiltration in order to approximate the annual recharge from pre-development conditions. On this site, the total proposed impervious area is 2.19± acres whereas the existing onsite impervious area is 0.02± acres (net 2.17± acre increase). The required recharge equals a depth of runoff corresponding to the underlying soil type multiplied by the impervious area for each soil type in the post development condition. The following values were used for this project:

HSG	**RUNOFF DEPTH TO INFILTRATE (in)**	**EXISTING IMPERVIOUS AREA (ac)**	**PROPOSED IMPERVIOUS AREA (ac)**	**NET CHANGE IMPERVIOUS AREA (ac)**
A	0.60	0.02	2.19	2.17
B	0.35	0.00	0.00	0.00
C	0.25	0.00	0.00	0.00
D	0.10	0.00	0.00	0.00

Recharge Volume (Rv) = (required runoff depth) x (newly created impervious area) =

0.60 inch x 2.17 acres x (43,560 ft^2/acre) x (1 ft/ 12 inches)
\+ 0.35 inch x 0.00 acres x (43,560 ft^2/acre) x (1 ft/ 12 inches)
\+ 0.25 inch x 0.00 acres x (43,560 ft^2/acre) x (1 ft/ 12 inches)
\+ 0.10 inch x 0.00 acres x (43,560 ft^2/acre) x (1 ft/ 12 inches)

4,726
(cubic feet)

The static recharge volume provided in the BMPs exceeds DEP's recharge requirement as follows:

BMP	STATIC RECHARGE VOLUME
	(cubic feet)
SIS-1	18,018
SIS-2	10,232
TOTAL STATIC RECHARGE VOLUME	**28,250**
	(cubic feet)

6.0 WATER QUALITY (STANDARD 4)

Water quality treatment for total suspended solids (TSS) and total phosphorus (TP) will be provided by the infiltration systems with pretreatment through deep-sump hooded catch basins and water quality units. The proposed treatment measures have been designed to achieve 90% TSS removal and 60% TP removal by retaining a volume of runoff greater than one inch multiplied the total post-development impervious surface area. The systems therefore also achieve 80% TSS as required by the DEP Stormwater Management Policy.

WATER QUALITY VOLUME (WQV)

BMP	Contributing Impervious Area (ac.)	1" WQV (ft^3)	Static Infiltration Volume Provided (ft^3)
SIS-1	1.35	4,901	18,018
SIS-2	0.77	2,795	10,232

TSS TREATMENT TRAIN: INFILTRATION WITH PRETREATMENT

BMP (A)	TSS Removal Rate (B)	Starting TSS Load (C)	Amount Removed (BxC) (D)	Remaining Load (C-D) (E)
Infiltration with pretreatment where applicable	0.90	1.0	0.90	0.10
Total TSS Removal = Summation of (D) =			**90%**	

TP TREATMENT TRAIN: INFILTRATION WITH PRETREATMENT

BMP (A)	TP Removal Rate (B)	Starting TP Load (C)	Amount Removed (BxC) (D)	Remaining Load (C-D) (E)
Infiltration with pretreatment where applicable	0.60	1.0	0.60	0.40
Total TP Removal = Summation of (D) =			**60%**	

7.0 LUHPPL (STANDARD 5)

Not applicable to the Project.

8.0 CRITICAL AREAS (STANDARD 6)

Not applicable to the Project.

9.0 REDEVELOPMENT (STANDARD 7)

Not applicable to the Project.

10.0 EROSION & SEDIMENT CONTROL PLAN (STANDARD 8)

The project is subject to the National Pollutant Discharge Elimination System (NPDES) program of the United States Environmental Protection Agency. This will require construction operations to comply with the NPDES General Permit for Stormwater Discharges from Construction Activities and the implementation of a site-specific a Stormwater Pollution Prevention Plan (SWPPP) addressing erosion and sedimentation control practices to be used throughout the construction period. The SWPPP will be prepared prior to construction as required by the NPDES permit and will address this standard.

Proposed erosion and sedimentation control measures will typically include compost filter socks, silt fence, crushed stone, riprap, hydroseeding, mulching, erosion control matting, diversion berms, and sedimentation basins. Compost filter sock and siltation fence will typically be used for the perimeter erosion control barrier and elsewhere as conditions warrant. Sedimentation basins will typically be used throughout the site to treat runoff and diversion berms will be utilized as needed to divert untreated stormwater to the sedimentation basins. Sedimentation basins and diversion berms will be added, removed, and adjusted as the site evolves throughout the construction process. Hydroseeding or sod will typically be used as a permanent stabilization measure for all revegetated areas of the site. Slopes 3:1 and steeper will typically be stabilized with an erosion control matting. Mulching may be used to reinforce seeded areas where erosion control matting is not required or warranted, but where some protection is warranted. Mulching may also be used to stabilize areas where construction activities will temporarily cease for more than 14 days. Silt sacks will typically be used to protect catch basins prior to binder and elsewhere as conditions warrant. The SWPPP will require the contractor to keep a reasonable stock of erosion controls on site to be able to supplement or make repairs as necessary.

11.0 OPERATION & MAINTENANCE PLAN (STANDARD 9)

A post-construction Operation and Maintenance (O&M) Plan for the Project is included as an attachment to this report.

12.0 ILLICIT DISCHARGES (STANDARD 10)

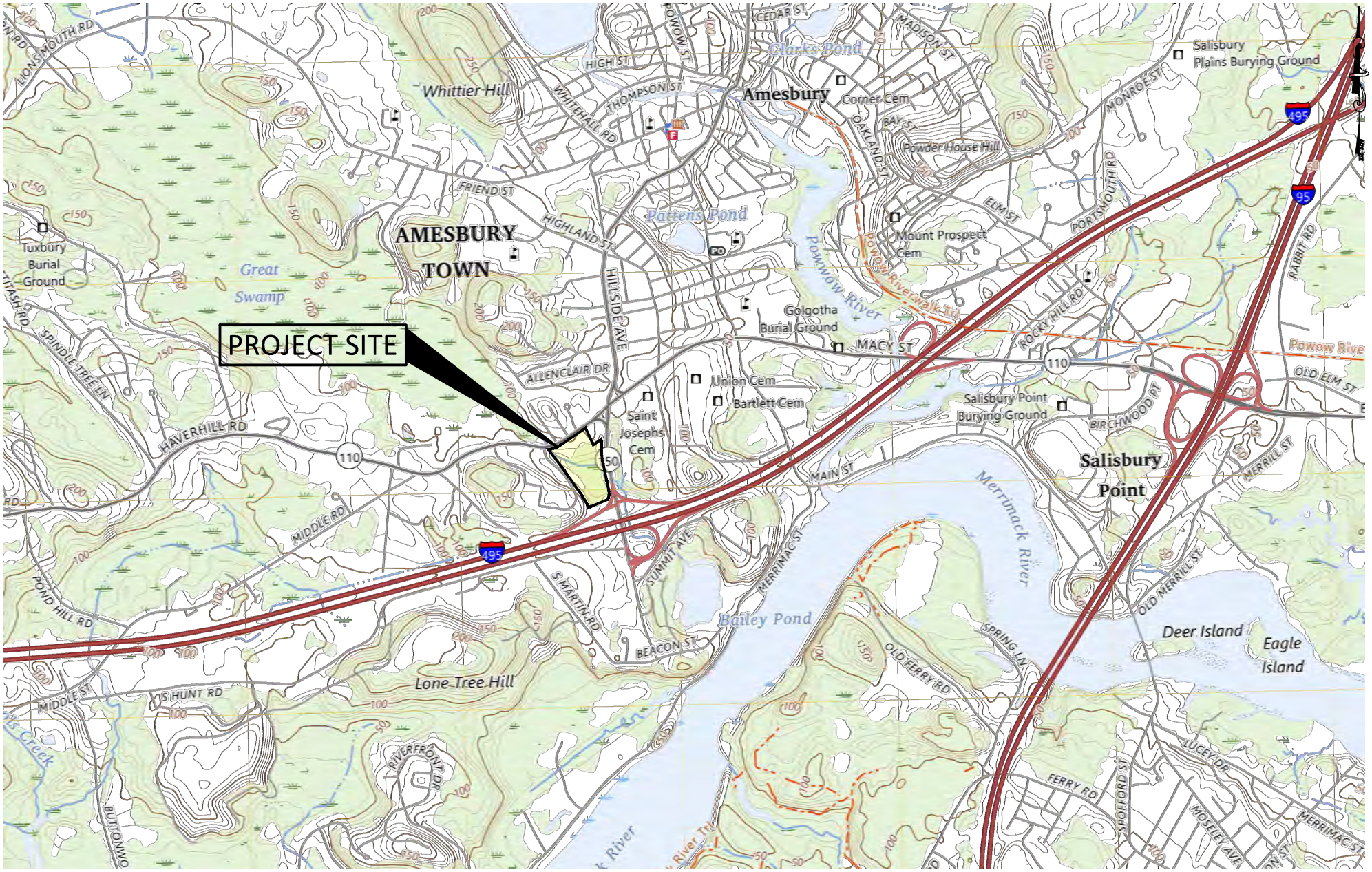
The proposed stormwater management system does not include any illicit discharges. An illicit discharge statement is included as an attachment to this report.

13.0 DRAINAGE CONVEYANCE SYSTEM AND CULVERTS

The proposed stormwater conveyance system is designed to collect and convey runoff from developed areas to the associated stormwater management system BMPs described in this report. Using the rational method to determine peak runoff flows, the proposed conveyance system is designed to accommodate the 25-year storm event. Hydraflow Storm Sewers output is included as an attachment to this report.

Additionally, two culverts are proposed including one located on-site adjacent to the southeast corner of Building 2 (Culvert 1) and one located in the Route 150 right-of-way beneath the proposed site access drive (Culvert 2). Both culverts were sized to pass a 100-year storm event from their respective contributing watershed area as illustrated in Figure 5. The culverts were modeled utilizing HydroCad 10.0 with the area immediately upstream of each culvert modeled as a pond. The pipe sizes were selected such that the headwater in the 100-year storm does not surcharge above the crown of the pipe. The HydroCad output for the culvert sizing is included in the attachments of this report.

Figures



2000 0 1000 2000 4000

GRAPHIC SCALE IN FEET

SOURCE: USGS TOPO 2024, NEWBURYPORT WEST

PROJECT:

Pulte HOMES

LEWIS RIDGE
28 HAVERHILL ROAD (ROUTE 110)
AMESBURY, MA 01913

CIVIL DESIGN GROUP, LLC

4 HIGH STREET SUITE 155
NORTH ANDOVER, MA 01845
www.cdgengineering.com
p: 978-794-5400 f: 978-965-3971

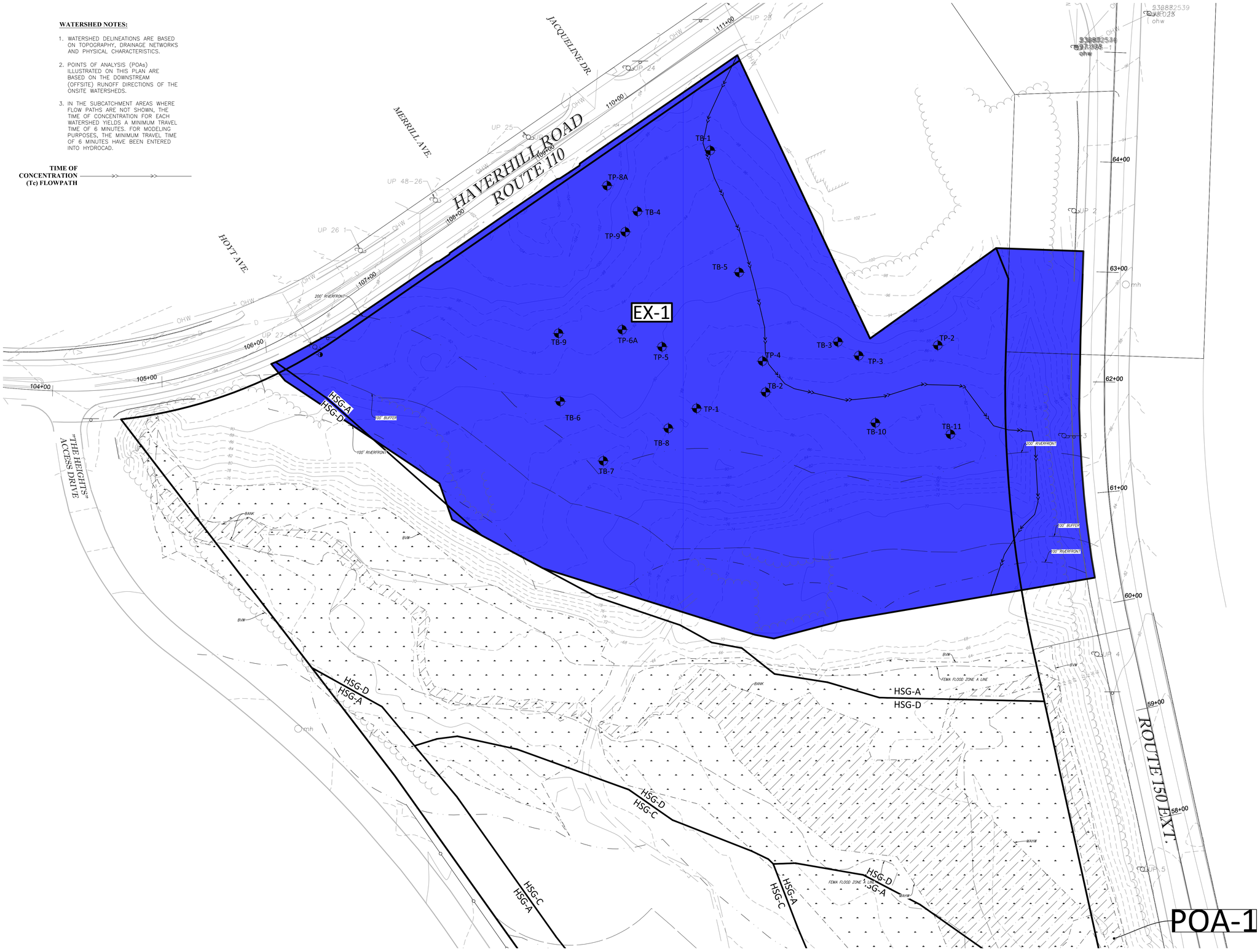
FIGURE 1
LOCUS MAP

04/13/2026

WATERSHED NOTES:

1. WATERSHED DELINEATIONS ARE BASED ON TOPOGRAPHY, DRAINAGE NETWORKS AND PHYSICAL CHARACTERISTICS.
2. POINTS OF ANALYSIS (POAs) ILLUSTRATED ON THIS PLAN ARE BASED ON THE DOWNSTREAM (OFFSITE) RUNOFF DIRECTIONS OF THE ONSITE WATERSHEDS.
3. IN THE SUBCATCHMENT AREAS WHERE FLOW PATHS ARE NOT SHOWN, THE TIME OF CONCENTRATION FOR EACH WATERSHED YIELDS A MINIMUM TRAVEL TIME OF 6 MINUTES. FOR MODELING PURPOSES, THE MINIMUM TRAVEL TIME OF 6 MINUTES HAVE BEEN ENTERED INTO HYDROCAD.

TIME OF CONCENTRATION (Tc) FLOWPATH ——>>——>>——



NOT FOR CONSTRUCTION

CDG PROJECT #: 25015

REVISIONS:

REV	DATE	COMMENT
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

PREPARED BY:

CIVIL DESIGN GROUP, LLC

4 HIGH STREET, SUITE 155
NORTH ANDOVER, MA 01845
www.cdgengineering.com
p: 978-794-5400 f: 978-965-3971

PREPARED FOR:

PULTE HOMES

1900 WEST PARK DRIVE
SUITE 180
WESTBOROUGH, MA 01581
www.pulte.com

PROJECT:

LEWIS RIDGE

28 HAVERHILL ROAD (ROUTE 110)
AMESBURY, MA

SCALE:

40 0 20 40 80
GRAPHIC SCALE IN FEET

SHEET:

PRE-DEVELOPMENT WATERSHEDS

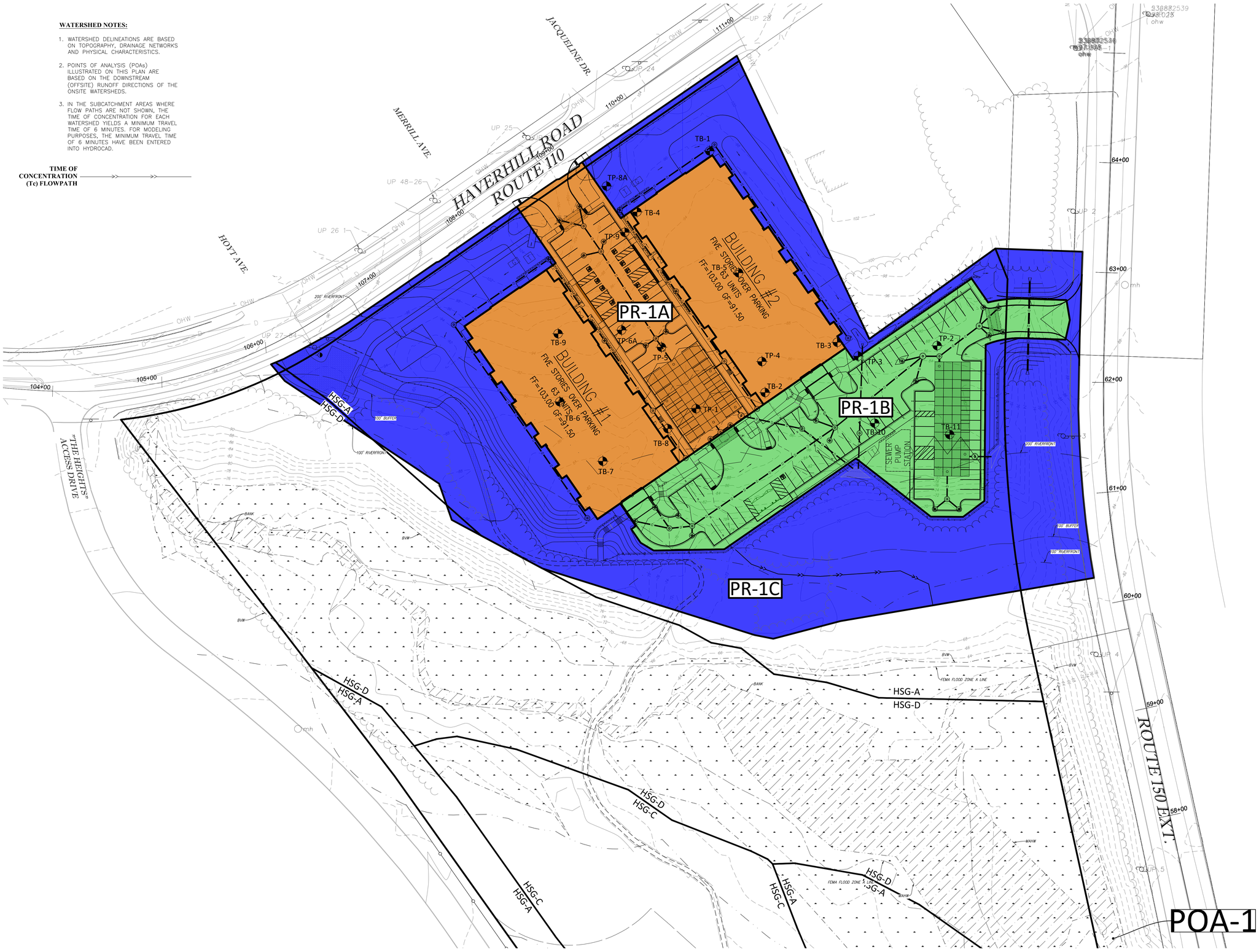
FIGURE 2

DATE: 04/13/2026

WATERSHED NOTES:

1. WATERSHED DELINEATIONS ARE BASED ON TOPOGRAPHY, DRAINAGE NETWORKS AND PHYSICAL CHARACTERISTICS.
2. POINTS OF ANALYSIS (POAs) ILLUSTRATED ON THIS PLAN ARE BASED ON THE DOWNSTREAM (OFFSITE) RUNOFF DIRECTIONS OF THE ONSITE WATERSHEDS.
3. IN THE SUBCATCHMENT AREAS WHERE FLOW PATHS ARE NOT SHOWN, THE TIME OF CONCENTRATION FOR EACH WATERSHED YIELDS A MINIMUM TRAVEL TIME OF 6 MINUTES. FOR MODELING PURPOSES, THE MINIMUM TRAVEL TIME OF 6 MINUTES HAVE BEEN ENTERED INTO HYDROCAD.

TIME OF CONCENTRATION (Tc) FLOWPATH ——>>——>>——



NOT FOR CONSTRUCTION

CDG PROJECT #: 25015

REVISIONS:

REV	DATE	COMMENT
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

PREPARED BY:

CIVIL DESIGN GROUP, LLC
4 HIGH STREET, SUITE 155
NORTH ANDOVER, MA 01845
www.cdgengineering.com
p: 978-794-5400 f: 978-965-3971

PREPARED FOR:

PULTE HOMES
1900 WEST PARK DRIVE
SUITE 180
WESTBOROUGH, MA 01581
www.pulte.com

PROJECT:

LEWIS RIDGE

28 HAVERHILL ROAD (ROUTE 110)
AMESBURY, MA

SCALE:

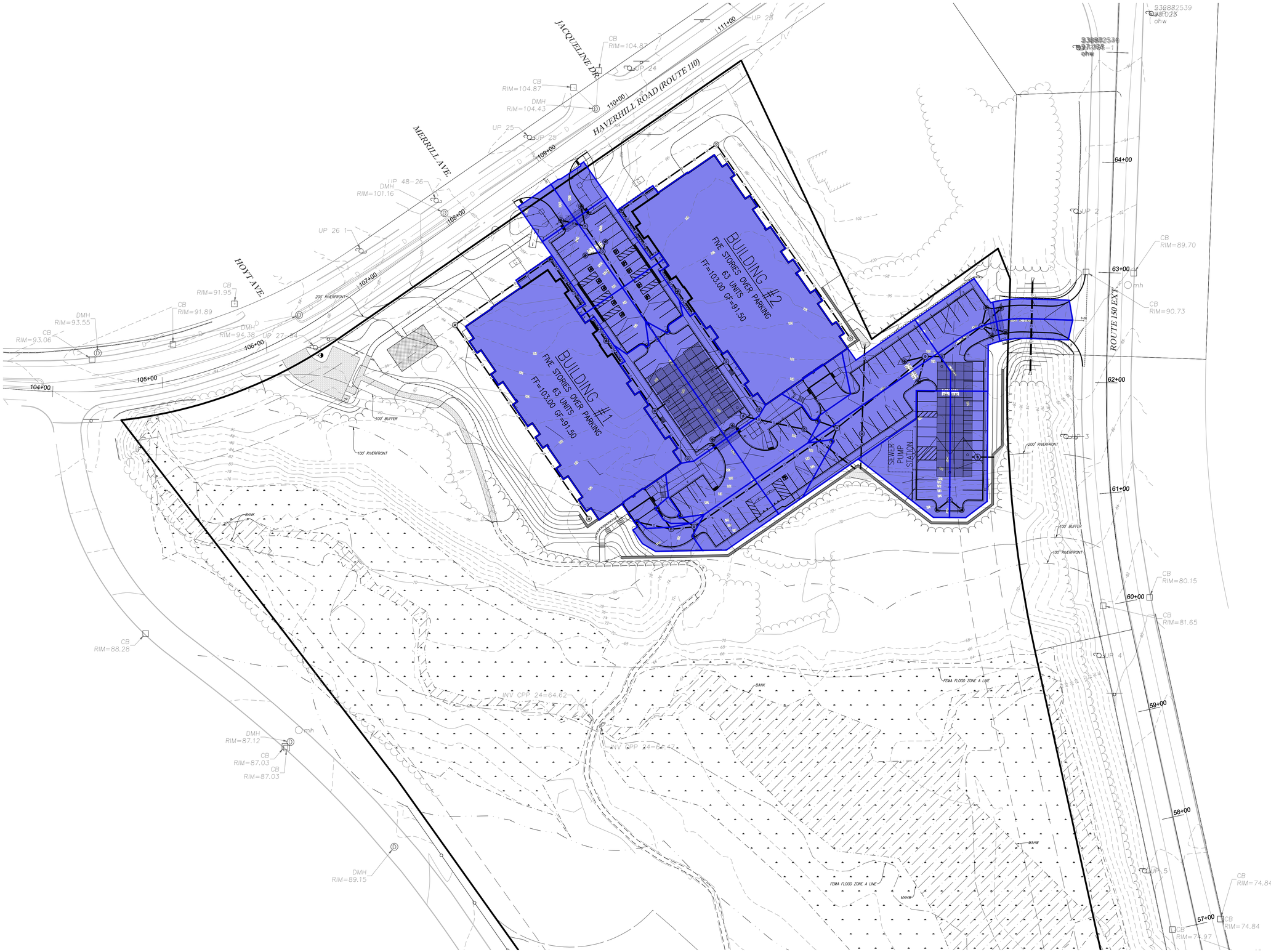
40 0 20 40 80
GRAPHIC SCALE IN FEET

SHEET:

POST-DEVELOPMENT WATERSHEDS

FIGURE 3

DATE: 04/13/2026



NOT FOR CONSTRUCTION

CDG PROJECT #: 25015

REVISIONS:

REV	DATE	COMMENT
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

PREPARED BY:

CIVIL DESIGN GROUP, LLC

4 HIGH STREET, SUITE 155
NORTH ANDOVER, MA 01845
www.cdgengineering.com
p: 978-794-5400 f: 978-965-3971

PREPARED FOR:

PULTE HOMES

1900 WEST PARK DRIVE
SUITE 180
WESTBOROUGH, MA 01581
www.pulte.com

PROJECT:

LEWIS RIDGE

28 HAVERHILL ROAD (ROUTE 110)
AMESBURY, MA

SCALE:

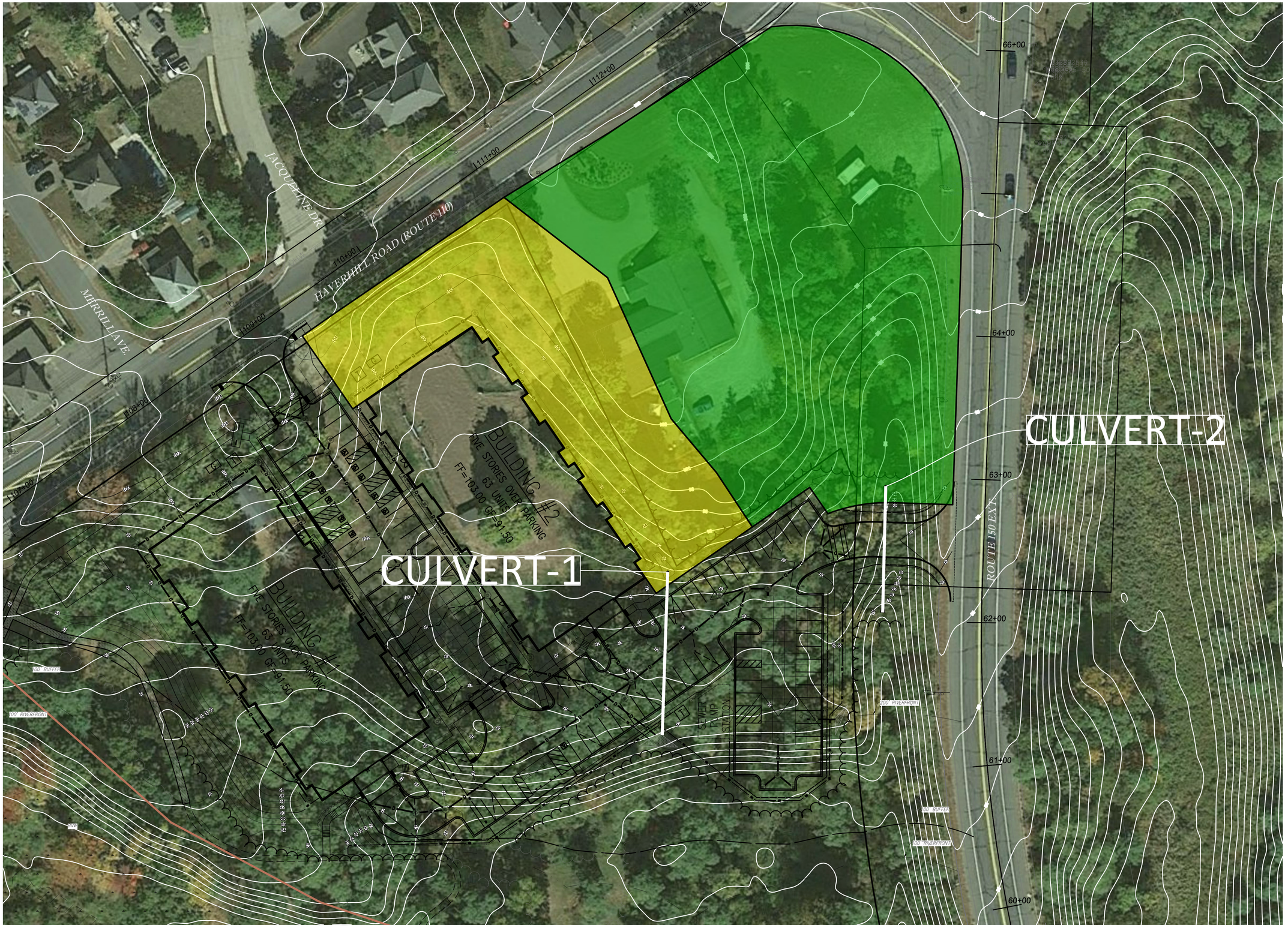
40 0 20 40 80
GRAPHIC SCALE IN FEET

SHEET:

CATCH BASIN WATERSHEDS

FIGURE 4

DATE: 04/13/2026



NOT FOR CONSTRUCTION

CDG PROJECT #: 25015

REVISIONS:

REV	DATE	COMMENT
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

PREPARED BY:

CIVIL DESIGN GROUP, LLC

4 HIGH STREET, SUITE 155
NORTH ANDOVER, MA 01845
www.cdgengineering.com
p: 978-794-5400 f: 978-965-3971

PREPARED FOR:

PULTE HOMES

1900 WEST PARK DRIVE
SUITE 180
WESTBOROUGH, MA 01581
www.pulte.com

PROJECT:

LEWIS RIDGE

28 HAVERHILL ROAD (ROUTE 110)
AMESBURY, MA

SCALE:

30 0 15 30 60
GRAPHIC SCALE IN FEET

SHEET:

CULVERT WATERSHEDS

FIGURE 5

DATE: 04/13/2026

Attachment 1 –

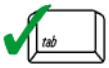
DEP Checklist for Stormwater Report

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

Checklist for Stormwater Report

A. Introduction

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



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

The Stormwater Report must include:

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

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

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

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

---

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

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

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

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

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

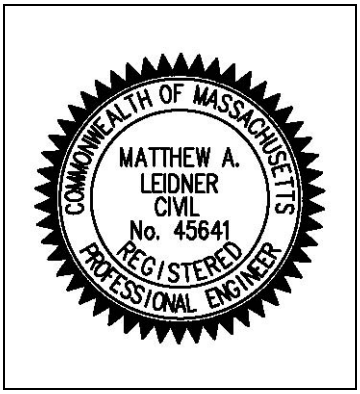
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the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

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

Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature



04-13-2026

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): Parking under buildings to reduce project footprint and impervious area.

Standard 1: No New Untreated Discharges

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

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

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

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

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

Standard 3: Recharge

☒ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

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

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

☒ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

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

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

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

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

- ☐ Site is comprised solely of C and D soils and/or bedrock at the land surface
- ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
- ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
- ☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

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

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

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

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

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

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

Standard 4: Water Quality

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

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

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

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

☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.

☐ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted ***prior to*** the discharge of stormwater to the post-construction stormwater BMPs.

☐ The NPDES Multi-Sector General Permit does ***not*** cover the land use.

☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.

☐ All exposure has been eliminated.

☐ All exposure has ***not*** been eliminated and all BMPs selected are on MassDEP LUHPPL list.

☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

☐ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.

☐ Critical areas and BMPs are identified in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

☐ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:

- ☐ Limited Project
- ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
- ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
- ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
- ☐ Bike Path and/or Foot Path
- ☐ Redevelopment Project
- ☐ Redevelopment portion of mix of new and redevelopment.

☐ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.

☐ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
- Construction Period Operation and Maintenance Plan;
- Names of Persons or Entity Responsible for Plan Compliance;
- Construction Period Pollution Prevention Measures;
- Erosion and Sedimentation Control Plan Drawings;
- Detail drawings and specifications for erosion control BMPs, including sizing calculations;
- Vegetation Planning;
- Site Development Plan;
- Construction Sequencing Plan;
- Sequencing of Erosion and Sedimentation Controls;
- Operation and Maintenance of Erosion and Sedimentation Controls;
- Inspection Schedule;
- Maintenance Schedule;
- Inspection and Maintenance Log Form.

☐ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has ***not*** been included in the Stormwater Report but will be submitted ***before*** land disturbance begins.

☐ The project is ***not*** covered by a NPDES Construction General Permit.

☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.

☒ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:

- ☒ Name of the stormwater management system owners;
- ☒ Party responsible for operation and maintenance;
- ☒ Schedule for implementation of routine and non-routine maintenance tasks;
- ☐ Plan showing the location of all stormwater BMPs maintenance access areas;
- ☐ Description and delineation of public safety features;
- ☐ Estimated operation and maintenance budget; and
- ☒ Operation and Maintenance Log Form.

☐ The responsible party is ***not*** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:

- ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
- ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

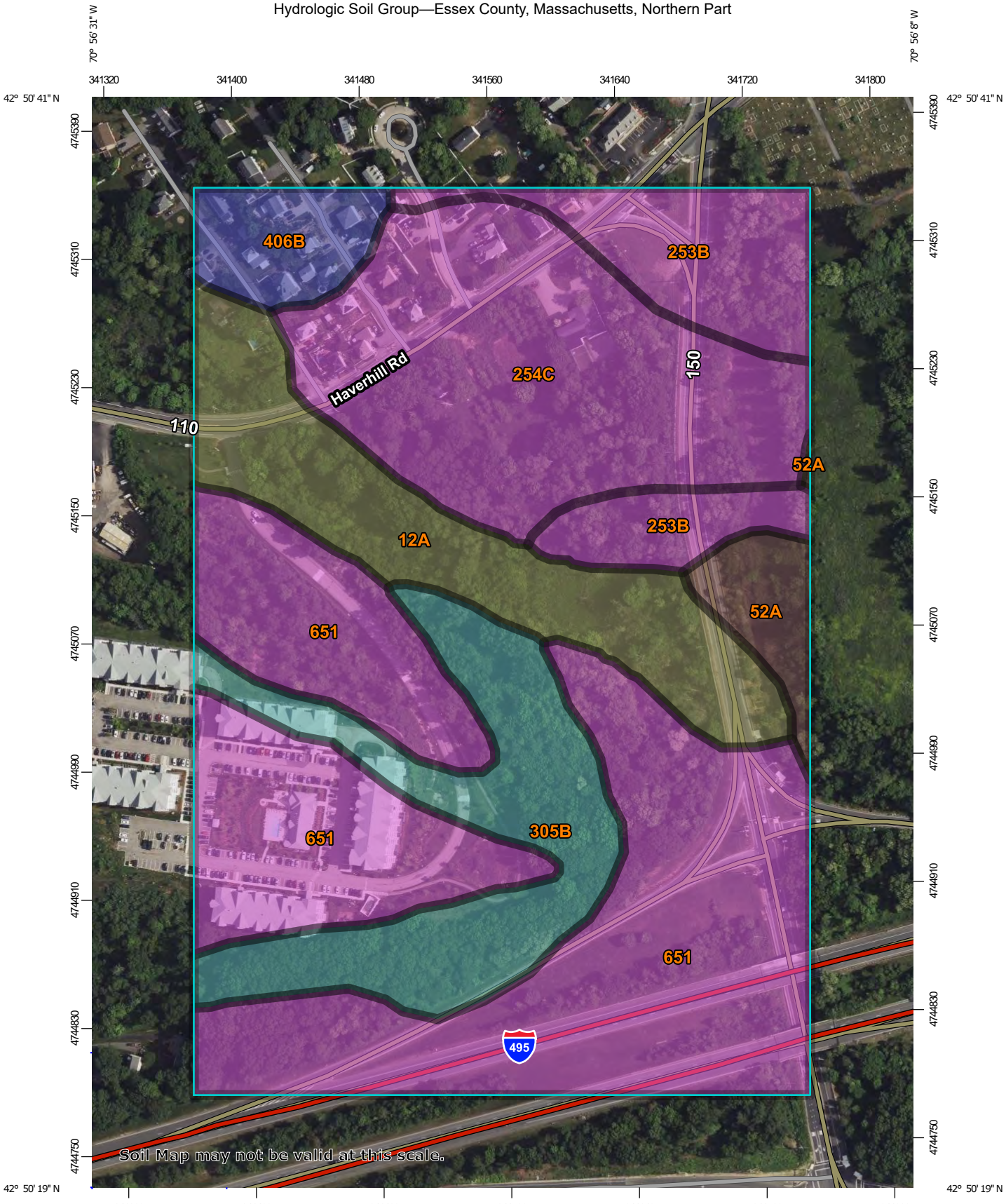
☒ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☒ An Illicit Discharge Compliance Statement is attached;

☐ NO Illicit Discharge Compliance Statement is attached but will be submitted ***prior to*** the discharge of any stormwater to post-construction BMPs.

Attachment 2 –

NRCS Soils Data & Test Pit Logs



Map Scale: 1:3,320 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 45 90 180 270

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 1:15,800.

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

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

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

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

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

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

Soil Survey Area: Essex County, Massachusetts, Northern Part
Survey Area Data: Version 20, Aug 27, 2024

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.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
12A	Maybid silt loam, 0 to 3 percent slopes	C/D	6.8	12.5%
52A	Freetown muck, 0 to 1 percent slopes	B/D	1.4	2.7%
253B	Hinckley loamy sand, 3 to 8 percent slopes	A	4.9	9.1%
254C	Merrimac fine sandy loam, 8 to 15 percent slopes	A	11.0	20.2%
305B	Paxton fine sandy loam, 3 to 8 percent slopes	C	7.1	13.2%
406B	Charlton fine sandy loam, 3 to 8 percent slopes, very stony	B	1.9	3.5%
651	Udorthents, smoothed	A	21.1	38.8%
Totals for Area of Interest			**54.3**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Essex County, Massachusetts, Northern Part

254C—Merrimac fine sandy loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2tyqt
Elevation: 0 to 1,030 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

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

Description of Merrimac

Setting

Landform: Eskers, outwash plains, moraines, kames, outwash terraces
Landform position (two-dimensional): Backslope, footslope, summit, shoulder
Landform position (three-dimensional): Side slope, crest, riser, tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy glaciofluvial deposits derived from granite, schist, and gneiss over sandy and gravelly glaciofluvial deposits derived from granite, schist, and gneiss

Typical profile

Ap - 0 to 10 inches: fine sandy loam
Bw1 - 10 to 22 inches: fine sandy loam
Bw2 - 22 to 26 inches: stratified gravel to gravelly loamy sand
2C - 26 to 65 inches: stratified gravel to very gravelly sand

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 2 percent
Maximum salinity: Nonsaline (0.0 to 1.4 mmhos/cm)
Sodium adsorption ratio, maximum: 1.0

Available water supply, 0 to 60 inches: Low (about 4.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: A
Ecological site: F145XY008MA - Dry Outwash
Hydric soil rating: No

Minor Components

Sudbury

Percent of map unit: 5 percent
Landform: Deltas, terraces, outwash plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Hinckley

Percent of map unit: 5 percent
Landform: Deltas, kames, eskers, outwash plains
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Head slope, nose slope, side slope, crest, rise
Down-slope shape: Convex
Across-slope shape: Convex, linear
Hydric soil rating: No

Windsor

Percent of map unit: 5 percent
Landform: Outwash plains, dunes, deltas, outwash terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Tread, riser
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Hydric soil rating: No

Data Source Information

Soil Survey Area: Essex County, Massachusetts, Northern Part
Survey Area Data: Version 20, Aug 27, 2024

NOTES:

1. THE BASE MAP WAS DRAWN FROM A PLAN TITLED, "CONCEPTUAL SKETCH", PREPARED BY CIVIL DESIGN GROUP, LLC (CDG) OF NORTH ANDOVER, MA, DATED 08/22/2025.
2. EXPLORATIONS DESIGNATED SH-TB-1 THROUGH SH-TB-11 WERE ADVANCED BY SOIL X CORPORATION OF LEOMINSTER, MA AND OBSERVED BY SANBORN HEAD BETWEEN SEPTEMBER 8 AND 10, 2025.
3. TEST PITS DESIGNATED SH-TP-1 THROUGH SH-TP-6, SH-TP-8 AND SH-TP-9 WERE EXCAVATED BY STRATEGIC ENVIRONMENTAL SERVICES INC. OF AUBURN, NH AND OBSERVED BY SANBORN HEAD BETWEEN AUGUST 7 AND 8, 2025.
4. APPROXIMATE LOCATIONS OF EXPLORATIONS WERE MARKED IN THE FIELD USING A GLOBAL NAVIGATION SATELLITE SYSTEM (GNSS) RECEIVER AND SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.

LEGEND:

- APPROXIMATE SITE BOUNDARY
- APPROXIMATE LOCATION OF PROPOSED BUILDING
- SH-TB-1 — APPROXIMATE LOCATION AND DESIGNATION OF TEST BORING OBSERVED BY SANBORN HEAD (SEPTEMBER 2025)
- SH-TB-5 — APPROXIMATE LOCATION AND DESIGNATION OF TEST BORING COMPLETED AS MONITORING WELL OBSERVED BY SANBORN HEAD (SEPTEMBER 2025)
- SH-TP-1 — APPROXIMATE LOCATION AND DESIGNATION OF TEST PIT OBSERVED BY SANBORN HEAD (AUGUST 2025)

SANBORN HEAD

GRAPHICAL SCALE
70' 35' 0' 70' 140'

NO.	DATE	DESCRIPTION	BY

DRAWN BY: D. DOMBROWSKY
DESIGNED BY: Z. WHITE
REVIEWED BY: A. SANTAMARIA
PROJECT MGR: A. SANTAMARIA
PIC: R. BENTLEY
DATE: SEPTEMBER 2025

PRELIMINARY GEOTECHNICAL ENGINEERING REPORT
28 HAVERHILL ROAD
AMESBURY, MASSACHUSETTS

PROJECT NUMBER: 6761.000

EXPLORATION LOCATION PLAN

FIGURE NUMBER: 2

SANBORN HEAD

Sanborn, Head & Associates, Inc.

Project: 28 Haverhill Rd
Location: Amesbury, MA
Project No.: 6761.000

Log of Boring SH-TB-1

Ground Elevation: 96 ± feet
Datum: NAVD 1988

Drilling Method: CME 750X Drill Rig with 4" ID HSA

Sampling Method: 2" O.D. Split Spoon, Automatic Hammer

Drilling Company: Soil X
Foreman: J. Valeulis
Date Started: 09/08/25 **Date Finished: 09/08/25**
Logged By: Z. White **Checked By: A. Santamaria**

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Casing	Depth of Hole	Stab. Time
09/08/25	11:15	20.2'	Ground Surface	25'	27'	10 minutes

Depth (ft)	Sample Information: Sample No.	Depth (ft)	Spoon Blows per 6 in	Pen/ Rec (in)	Field Testing Data	Stratum: Log	Description	Geologic Description	Remarks
0	S-1	0 - 2	1 1 1 1	24/15			-----0'----- TOPSOIL -----1'----- SUBSOIL -----2'-----	S-1A (0 to 1'): Very loose, dark brown, fine to coarse SAND, little Silt, little Gravel, few Organics. Moist. TOPSOIL. S-1B (1 to 2'): Very loose, light brown, fine to coarse SAND, little Silt, very few Organics, trace Gravel. Moist. SUBSOIL.	
2	S-2	2 - 4	1 2 2 3	24/9				S-2 (2 to 4'): Very loose, light brown, fine to coarse SAND and Silt, trace Gravel. Moist.	
4	S-3	4 - 6	7 9 17 23	24/12				S-3 (4 to 6'): Medium dense, light brown, fine to coarse SAND, some Gravel, little Silt. Moist.	
6	S-4	6 - 8	18 26 28 28	24/16				S-4 (6 to 8'): Very dense, light brown, fine to coarse SAND & GRAVEL, trace Silt. Moist.	Increased drilling action and chatter from 6 to 22'.
8	S-5	8 - 10	25 27 22 20	24/11				S-5 (8 to 10'): Dense, light brown, fine to coarse SAND & GRAVEL, trace Silt. Moist.	(S-5): Redoximorphic staining observed around few gravel pieces.
10	S-6	10 - 12	19 27 23 29	24/12				S-6 (10 to 12'): Dense, light brown, fine to coarse SAND & GRAVEL, trace Silt. Moist.	(S-6): Redoximorphic staining observed around few gravel pieces.
12									
14							GLACIAL DEPOSITS		
16	S-7	15 - 17	9 12 8 9	24/7				S-7 (15 to 17'): Medium dense, brown, fine to coarse SAND, some Silt, trace Gravel. Wet.	Rods wet at 15'.
18									
20	S-8	20 - 22	7 21 17 20	24/9				S-8 (20 to 22'): Dense, brown, fine to coarse SAND, some Gravel, trace Silt. Wet.	
22									
24									

BORING LOG P:\6700S\6761.000\WORKLOGS\6761.000.GPJ 2017 SANBORN HEAD V1.GLB 2017 SANBORN HEAD V1.GDT 9/24/25

SANBORN HEAD

Sanborn, Head & Associates, Inc.

Project: 28 Haverhill Rd
Location: Amesbury, MA
Project No.: 6761.000

Log of Boring SH-TB-1

Ground Elevation: 96 ± feet
Datum: NAVD 1988

Drilling Method: CME 750X Drill Rig with 4" ID HSA

Sampling Method: 2" O.D. Split Spoon, Automatic Hammer

Drilling Company: Soil X
Foreman: J. Valeulis
Date Started: 09/08/25 **Date Finished: 09/08/25**
Logged By: Z. White **Checked By: A. Santamaria**

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Casing	Depth of Hole	Stab. Time
09/08/25	11:15	20.2'	Ground Surface	25'	27'	10 minutes

Depth (ft)	Sample Information					Stratum		Geologic Description	Remarks
	Sample No.	Depth (ft)	Spoon Blows per 6 in	Pen/ Rec (in)	Field Testing Data	Log	Description		
26	S-9	25 - 27	15 19 28 43	24/12			GLACIAL DEPOSITS	S-9 (25 to 27'): Hard, gray, Clayey SILT, trace Gravel, trace Sand. Moist.	
28							-----27'-----	Boring terminated at 27 feet below ground surface. No refusal encountered.	
30									
32									
34									
36									
38									
40									
42									
44									
46									
48									
50									

BORING LOG P:\6700S\6761.000\WORK\LOGS\6761.000.GPJ 2017 SANBORN HEAD V1.GLB 2017 SANBORN HEAD V1.GDT 9/24/25

SANBORN HEAD

Sanborn, Head & Associates, Inc.

Project: 28 Haverhill Rd
Location: Amesbury, MA
Project No.: 6761.000

Log of Boring SH-TB-2

Ground Elevation: 84 ± feet
Datum: NAVD 1988

Drilling Method: CME 750X Drill Rig with 4" ID HSA

Sampling Method: 2" O.D. Split Spoon, Automatic Hammer

Drilling Company: Soil X
Foreman: J. Valeulis
Date Started: 09/08/25 **Date Finished: 09/08/25**
Logged By: Z. White **Checked By: A. Santamaria**

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Casing	Depth of Hole	Stab. Time
09/09/25	07:45	5'	Ground Surface	25'	27'	10 minutes

Depth (ft)	Sample Information: Sample No.	Depth (ft)	Spoon Blows per 6 in	Pen/ Rec (in)	Field Testing Data	Stratum: Log	Description	Geologic Description	Remarks
0	S-1	0 - 2	2 7 6 2	24/8			-----0'----- FILL	S-1 (0 to 2'): Medium dense, dark brown, black, fine to coarse SAND, little Silt, little Gravel, few Slag pieces, very few Organics. Moist. FILL.	
2	S-2	2 - 4	1 2 4 8	24/19			-----2'----- SUBSOIL -----2.5'-----	S-2A (2 to 2.5'): Loose, dark brown, fine to coarse SAND, little Silt, few Organics, trace Gravel. Moist. SUBSOIL. S-2B (2.5 to 4'): Medium stiff, brown, Clayey SILT, trace Sand, trace Gravel. Moist.	
4	S-3	4 - 6	6 5 9 10	24/20				S-3 (4 to 6'): Stiff, brown, Clayey SILT, little Sand, trace Gravel. Moist.	(S-3): Some redoximorphic features observed in sand seams.
6	S-4	6 - 8	9 8 9 8	24/18				S-4 (6 to 8'): Very stiff, light brown, Clayey SILT, little Sand, trace Gravel. Moist.	(S-4): Some redoximorphic staining observed. Approximately 1" seam of sand in tip of split spoon.
8	S-5	8 - 10	4 5 6 6	24/22				S-5 (8 to 10'): Stiff, light brown, SILT & CLAY, little Sand, trace Gravel. Wet.	
10	S-6	10 - 12	9 8 8 9	24/20				S-6 (10 to 12'): Very stiff, light brown, SILT & CLAY, little Sand. Wet.	
12									
14							GLACIAL DEPOSITS		
15	S-7	15 - 17	3 5 8 9	24/18				S-7 (15 to 17'): Stiff, light brown, gray, SILT & CLAY, little Sand, trace Gravel. Moist.	(S-7): Sand seam approximately 4" from top of split spoon.
16									
18									
20	S-8	20 - 22	8 9 18 11	24/12				S-8A (20 to 20.5'): Very stiff, light brown, gray, SILT & CLAY, little Sand, trace Gravel. Moist to wet. S-8B (20.5 to 22'): Medium dense, brown, fine to coarse SAND & GRAVEL, little Silt, Wet.	
22									Increased drilling action and chatter observed between 23 to 25'.
24									

BORING LOG P:\6700S\6761.000\WORKLOGS\6761.000.GPJ 2017 SANBORN HEAD V1.GLB 2017 SANBORN HEAD V1.GDT 9/24/25

SANBORN HEAD

Sanborn, Head & Associates, Inc.

Project: 28 Haverhill Rd
Location: Amesbury, MA
Project No.: 6761.000

Log of Boring SH-TB-2

Ground Elevation: 84 ± feet
Datum: NAVD 1988

Drilling Method: CME 750X Drill Rig with 4" ID HSA

Sampling Method: 2" O.D. Split Spoon, Automatic Hammer

Drilling Company: Soil X
Foreman: J. Valeulis
Date Started: 09/08/25 **Date Finished: 09/08/25**
Logged By: Z. White **Checked By: A. Santamaria**

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Casing	Depth of Hole	Stab. Time
09/09/25	07:45	5'	Ground Surface	25'	27'	10 minutes

Depth (ft)	Sample Information					Stratum		Geologic Description	Remarks
	Sample No.	Depth (ft)	Spoon Blows per 6 in	Pen/ Rec (in)	Field Testing Data	Log	Description		
26	S-9	25 - 27	22 28 22 21	24/12			GLACIAL DEPOSITS -----27'-----	S-9 (25 to 27'): Dense, brown, fine to coarse SAND & GRAVEL, little Silt. Wet. Boring terminated at 27 feet below ground surface. No refusal encountered.	(S-9): Redoximorphic staining observed around gravel pieces. Some gravel pieces were very weathered and could be broken by hand.
28									
30									
32									
34									
36									
38									
40									
42									
44									
46									
48									
50									

BORING LOG P:\6700S\6761.000\WORK\LOGS\6761.000.GPJ 2017 SANBORN HEAD V1.GLB 2017 SANBORN HEAD V1.GDT 9/24/25

SANBORN HEAD

Sanborn, Head & Associates, Inc.

Project: 28 Haverhill Rd
Location: Amesbury, MA
Project No.: 6761.000

Log of Boring SH-TB-3

Ground Elevation: 88 ± feet
Datum: NAVD 1988

Drilling Method: CME 750X Drill Rig with 4" ID HSA

Sampling Method: 2" O.D. Split Spoon, Automatic Hammer

Drilling Company: Soil X
Foreman: J. Valeulis
Date Started: 09/09/25 **Date Finished: 09/09/25**
Logged By: Z. White **Checked By: A. Santamaria**

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Casing	Depth of Hole	Stab. Time
09/09/25	09:45	8.6'	Ground Surface	25'	27'	15 minutes

Depth (ft)	Sample Information: Sample No.	Depth (ft)	Spoon Blows per 6 in	Pen/ Rec (in)	Field Testing Data	Stratum: Log	Description	Geologic Description	Remarks
0	S-1	0 - 2	1 3 5 8	24/9			-----0'----- TOPSOIL -----0.5'----- SUBSOIL -----2'-----	S-1A (0 to 0.5'): Loose, dark brown, fine to coarse SAND, little Silt, few Organics, trace Gravel. Moist. TOPSOIL. S-1B (0.5 to 2'): Loose, brown, fine to coarse SAND, little Gravel, little Silt, very few Organics. Moist. SUBSOIL.	
2	S-2	2 - 4	11 10 16 21	24/13				S-2 (2 to 4'): Very stiff, gray, brown, Clayey SILT, trace Sand. Moist.	
4	S-3	4 - 6	6 11 17 20	24/19				S-3 (4 to 6'): Very stiff, gray, brown, Clayey SILT, trace Sand. Moist.	
6	S-4	6 - 8	19 21 23 22	24/17				S-4 (6 to 8'): Hard, gray, Clayey SILT, trace Sand, trace Gravel. Moist.	(S-4): Thin layer of organics observed near top of split spoon.
8	S-5	8 - 10	10 11 8 8	24/14				S-5 (8 to 10'): Medium dense, brown, fine to coarse SAND, some Gravel, little Silt. Moist to wet.	Rods wet at approximately 9'.
10	S-6	10 - 12	8 10 16 14	24/12				S-6 (10 to 12'): Medium dense, brown, fine to coarse SAND & GRAVEL, little Silt. Wet.	(S-6): Redoximorphic staining observed around some gravel pieces.
12									
14							GLACIAL DEPOSITS		
15	S-7	15 - 17	5 54 33 34	24/9				S-7 (15 to 17'): Very dense, brown, fine to coarse SAND, some Silt, little Gravel. Wet.	(S-7): Redoximorphic staining observed in bottom half of split spoon.
16									
18									
20	S-8	20 - 22	18 29 25 36	24/16				S-8 (20 to 22'): Hard, gray, brown, Clayey SILT, trace Gravel, trace Sand. Moist.	
22									
24									

BORING LOG P:\6700S\6761.000\WORKLOGS\6761.000.GPJ 2017 SANBORN HEAD V1.GLB 2017 SANBORN HEAD V1.GDT 9/24/25

SANBORN HEAD

Sanborn, Head & Associates, Inc.

Project: 28 Haverhill Rd
Location: Amesbury, MA
Project No.: 6761.000

Log of Boring SH-TB-3

Ground Elevation: 88 ± feet
Datum: NAVD 1988

Drilling Method: CME 750X Drill Rig with 4" ID HSA

Sampling Method: 2" O.D. Split Spoon, Automatic Hammer

Drilling Company: Soil X
Foreman: J. Valeulis
Date Started: 09/09/25 **Date Finished: 09/09/25**
Logged By: Z. White **Checked By: A. Santamaria**

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Casing	Depth of Hole	Stab. Time
09/09/25	09:45	8.6'	Ground Surface	25'	27'	15 minutes

Depth (ft)	Sample Information					Stratum		Geologic Description	Remarks
	Sample No.	Depth (ft)	Spoon Blows per 6 in	Pen/ Rec (in)	Field Testing Data	Log	Description		
26	S-9	25 - 27	21 22 34 44	24/12			GLACIAL DEPOSITS -----27'-----	S-9 (25 to 27'): Hard, gray, brown, Clayey SILT, trace Sand, trace Gravel. Moist. Boring terminated at 27 feet below ground surface. No refusal encountered.	
28									
30									
32									
34									
36									
38									
40									
42									
44									
46									
48									
50									

BORING LOG P:\6700S\6761.000\WORK\LOGS\6761.000.GPJ 2017 SANBORN HEAD V1.GLB 2017 SANBORN HEAD V1.GDT 9/24/25

SANBORN HEAD

Sanborn, Head & Associates, Inc.

Project: 28 Haverhill Rd
Location: Amesbury, MA
Project No.: 6761.000

Log of Boring SH-TB-4

Ground Elevation: 97 ± feet
Datum: NAVD 1988

Drilling Method: CME 750X Drill Rig with 4" ID HSA

Sampling Method: 2" O.D. Split Spoon, Automatic Hammer

Drilling Company: Soil X
Foreman: J. Valeulis
Date Started: 09/08/25 **Date Finished: 09/08/25**
Logged By: Z. White **Checked By: A. Santamaria**

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Casing	Depth of Hole	Stab. Time
09/08/25	09:30	28.5'	Ground Surface	30'	32'	15 minutes

Depth (ft)	Sample Information: Sample No.	Depth (ft)	Spoon Blows per 6 in	Pen/ Rec (in)	Field Testing Data	Stratum: Log	Description	Geologic Description	Remarks
0	S-1	0 - 2	2 4 3 3	24/4			-----0'-----	S-1 (0 to 2'): Loose, brown, fine to coarse SAND, some Silt, trace Gravel, few Organics. Moist. TOPSOIL.	
							TOPSOIL		
2	S-2	2 - 4	6 7 13 15	24/7			-----2'-----	S-2A (2 to 3'): Medium dense, light brown, fine to coarse SAND, some Gravel, trace Silt. Moist. SUBSOIL.	
							SUBSOIL	S-2B (3 to 4'): Medium dense, dark brown, fine to coarse SAND, some Silt, trace Gravel, very few Organics. Moist. SUBSOIL.	
4	S-3	4 - 6	7 15 15 23	24/17			-----4.5'-----	S-3A (4 to 4.5'): Medium dense, dark brown, fine to coarse SAND, little Silt, little Gravel, very few Organics. Moist. SUBSOIL.	
6	S-4	6 - 8	28 31 32 18	24/11				S-3B (4.5 to 6'): Medium dense, light brown, fine to coarse SAND, some Gravel, trace Silt. Moist. S-4 (6 to 8'): Very dense, light brown, fine to coarse SAND & GRAVEL, trace Silt. Moist.	
8	S-5	8 - 10	22 15 12 12	24/10				S-5 (8 to 10'): Medium dense, light brown, fine to coarse SAND & GRAVEL, little Silt. Moist.	(S-5): Redoximorphic staining around gravel pieces and in band approximately 3" from bottom of split spoon.
10	S-6	10 - 12	17 22 17 17	24/7				S-6 (10 to 12'): Dense, light brown, fine to coarse SAND & GRAVEL, little Silt. Moist.	
12									Heavy auger chatter and increased drilling action from 12 to 18'.
14							GLACIAL DEPOSITS		
	S-7	15 - 17	9 11 14 22	24/18				S-7 (15 to 17'): Medium dense, fine to coarse SAND, some Gravel, little Silt. Wet.	Rod and spoon wet at 15'.
16									
18									Increased auger chatter and drilling action at 19 to 22'.
20	S-8	20 - 21.3	45 50 50/4"	16/0				S-8 (20 to 21.3'): Very dense, No Recovery.	
22	S-9	22 - 24	50/3"	3/0				S-9 (22 to 22.3'): Very dense, No Recovery.	
24									

BORING LOG P:\6700S\6761.000\WORKLOGS\6761.000.GPJ 2017 SANBORN HEAD V1.GLB 2017 SANBORN HEAD V1.GDT 9/24/25

SANBORN HEAD

Sanborn, Head & Associates, Inc.

Project: 28 Haverhill Rd
Location: Amesbury, MA
Project No.: 6761.000

Log of Boring SH-TB-4

Ground Elevation: 97 ± feet
Datum: NAVD 1988

Drilling Method: CME 750X Drill Rig with 4" ID HSA

Sampling Method: 2" O.D. Split Spoon, Automatic Hammer

Drilling Company: Soil X
Foreman: J. Valeulis
Date Started: 09/08/25 **Date Finished: 09/08/25**
Logged By: Z. White **Checked By: A. Santamaria**

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Casing	Depth of Hole	Stab. Time
09/08/25	09:30	28.5'	Ground Surface	30'	32'	15 minutes

Depth (ft)	Sample Information: Sample No.	Depth (ft)	Spoon Blows per 6 in	Pen/ Rec (in)	Field Testing Data	Stratum: Log	Description	Geologic Description	Remarks
26	S-10	25 - 27	19 29 37 46	24/16			GLACIAL DEPOSITS	S-10 (25 to 27'): Hard, gray, Clayey SILT, little Sand, little Gravel. Moist.	(S-10): Redoximorphic features observed around few gravel pieces.
30	S-11	30 - 32	21 22 27 25	24/15				S-11 (30 to 32'): Hard, gray, Clayey SILT, little Sand, little Gravel. Moist.	
32							-----32'-----	Boring terminated at 32 feet below ground surface. No refusal encountered.	

BORING LOG P:\6700S\6761.000\WORK\LOGS\6761.000.GPJ 2017 SANBORN HEAD V1.GLB 2017 SANBORN HEAD V1.GDT 9/24/25

SANBORN HEAD

Sanborn, Head & Associates, Inc.

Project: 28 Haverhill Rd
Location: Amesbury, MA
Project No.: 6761.000

Log of Monitoring Well SH-TB-5

Ground Elevation: 91 ± feet
Datum: NAVD 1988

Drilling Method: CME 750X Drill Rig with 4" ID HSA

Sampling Method: 2" O.D. Split Spoon, Automatic Hammer

Drilling Company: Soil X
Foreman: J. Valeulis
Date Started: 09/08/25 **Date Finished: 09/08/25**
Logged By: Z. White **Checked By: A. Santamaria**

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Casing	Depth of Hole	Stab. Time
09/08/25	13:30	9.6'	Ground Surface	25'	27'	15 minutes
09/19/25	09:05	8.8'	Ground Surface	18'	18'	11 days

Depth (ft)	Sample Information: Sample No.	Depth (ft)	Spoon Blows per 6 in	Pen/ Rec (in)	Field Testing Data	Stratum: Log	Stratum: Description	Geologic Description	Well Diagram	Well Description
-2										4" Dia. Protective Steel Casing with Locking Cap and Expansion Plug Set in Concrete (-2.8 to 1')
0	S-1	0 - 2	1 1 1 1	24/12			-----0'----- TOPSOIL -----1'----- SUBSOIL -----2 -----	S-1A (0 to 1'): Very loose, dark brown, fine to coarse SAND, some Silt, few Organics, trace Gravel, very few Brick fragments. Moist. TOPSOIL. S-1B (1 to 2'): Very loose, light brown, fine to coarse SAND, little Silt, trace Gravel, very few Organics. Moist. SUBSOIL.		
2	S-2	2 - 4	1 2 4 7	24/14				S-2 (2 to 4'): Loose, light brown, fine to coarse SAND, little Silt, trace Gravel. Moist.		Cuttings (0 to 5')
4	S-3	4 - 6	5 7 7 7	24/18				S-3 (4 to 6'): Medium dense, light brown, fine to coarse SAND, little Silt, trace Gravel. Moist.		
6	S-4	6 - 8	8 9 8 8	24/22				S-4 (6 to 8'): Medium dense, light brown, fine to coarse SAND, little Silt, trace Gravel. Moist.		Bentonite (5 to 7')
8	S-5	8 - 10	14 12 14 18	24/14				S-5 (8 to 10'): Medium dense, brown, fine to coarse SAND & GRAVEL, trace Silt. Moist.		
10	S-6	10 - 12	7 15 24 24	24/5				S-6 (10 to 12'): Dense, brown, fine to coarse SAND, some Gravel, little Silt. Wet.		
12							GLACIAL DEPOSITS			Well Sand (7 to 19') 2" Dia. Sch. 40 PVC Well Screen (0.010" Slots) (8 to 18')
14	S-7	15 - 17	13 14 14 21	24/9				S-7 (15 to 17'): Medium dense, brown, fine to coarse GRAVEL and Sand, trace Silt. Wet.		
16										
18										
20	S-8	20 - 22	5 12 19 27	24/15				S-8 (20 to 22'): Dense, brown, fine to coarse GRAVEL and Sand, trace Silt. Wet.		
22										

BORING LOG P:\6700S\6761.000\WORKLOGS\6761.000.GPJ 2017 SANBORN HEAD V1.GLB 2017 SANBORN HEAD V1.GDT 9/24/25

SANBORN HEAD

Sanborn, Head & Associates, Inc.

Project: 28 Haverhill Rd
Location: Amesbury, MA
Project No.: 6761.000

Log of Monitoring Well SH-TB-5

Ground Elevation: 91 ± feet
Datum: NAVD 1988

Drilling Method: CME 750X Drill Rig with 4" ID HSA

Sampling Method: 2" O.D. Split Spoon, Automatic Hammer

Drilling Company: Soil X
Foreman: J. Valeulis
Date Started: 09/08/25 **Date Finished: 09/08/25**
Logged By: Z. White **Checked By: A. Santamaria**

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Casing	Depth of Hole	Stab. Time
09/08/25	13:30	9.6'	Ground Surface	25'	27'	15 minutes
09/19/25	09:05	8.8'	Ground Surface	18'	18'	11 days

Depth (ft)	Sample Information: Sample No.	Depth (ft)	Spoon Blows per 6 in	Pen/ Rec (in)	Field Testing Data	Stratum: Log	Description	Geologic Description	Well Diagram	Well Description
24							GLACIAL DEPOSITS			Cuttings (19 to 27')
	S-9	25 - 27	4 8 30 25	24/10				S-9A (25 to 26.5'): Dense, brown, fine to coarse SAND & GRAVEL, trace Silt. Wet.		
26							-----27'-----	S-9B (26.5 to 27'): Hard, brown, Clayey SILT, little Gravel, trace Sand. Moist.		
								Boring terminated at 27 feet below ground surface. No refusal encountered. Well installed.		
28										
30										
32										
34										
36										
38										
40										
42										
44										
46										

BORING LOG P:\6700S\6761.000\WORK\LOGS\6761.000.GPJ 2017 SANBORN HEAD V1.GLB 2017 SANBORN HEAD V1.GDT 9/24/25

SANBORN HEAD

Sanborn, Head & Associates, Inc.

Project: 28 Haverhill Rd
Location: Amesbury, MA
Project No.: 6761.000

Log of Monitoring Well SH-TB-6

Ground Elevation: 90 ± feet
Datum: NAVD 1988

Drilling Method: CME 750X Drill Rig with 4" ID HSA

Sampling Method: 2" O.D. Split Spoon, Automatic Hammer

Drilling Company: Soil X
Foreman: J. Valeulis
Date Started: 09/10/25 **Date Finished: 09/10/25**
Logged By: Z. White **Checked By: A. Santamaria**

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Casing	Depth of Hole	Stab. Time
09/10/25	12:00	23.5'	Ground Surface	25'	27'	10 minutes
09/19/25	09:20	11.5'	Ground Surface	18'	18'	9 days

Depth (ft)	Sample Information: Sample No.	Depth (ft)	Spoon Blows per 6 in	Pen/ Rec (in)	Field Testing Data	Stratum: Log	Stratum: Description	Geologic Description	Well Diagram	Well Description
-2										4" Dia. Protective Steel Casing with Locking Cap and Expansion Plug Set in Concrete (-2.8 to 1')
0	S-1	0 - 2	3 6 9 15	24/17			-----0'----- TOPSOIL -----0.5'-----	S-1A (0 to 0.5'): Medium dense, dark brown, fine to coarse SAND, some Silt, common Organics, trace Gravel. Moist. TOPSOIL.		
2	S-2	2 - 4	10 21 36 35	24/17			SUBSOIL	S-1B (0.5 to 2'): Medium dense, light brown, fine to coarse SAND, little Silt, trace Gravel, very few Organics. Moist. SUBSOIL. S-2 (2 to 4'): Very dense, light brown, fine to coarse SAND, little Gravel, little Silt, very few Organics. Moist. SUBSOIL.		Cuttings (0 to 5')
4	S-3	4 - 6	14 15 7 6	24/7			4'	S-3 (4 to 6'): Medium dense, light brown, fine to coarse SAND, some Gravel, little Silt. Moist.		
6	S-4	6 - 8	6 4 3 5	24/12				S-4 (6 to 8'): Loose, brown, fine to coarse SAND, little Silt, trace Gravel. Moist.		Bentonite (5 to 7')
8	S-5	8 - 10	3 11 11 14	24/10				S-5A (8 to 8.5'): Very stiff, gray, Clayey SILT, trace Gravel, trace Sand. Moist. Redoximorphic specks observed. S-5B (8.5 to 10'): Medium dense, gray, dark brown, fine to coarse SAND, little Gravel, little Silt. Moist.		
10	S-6	10 - 12	13 24 25 21	24/16				S-6 (10 to 12'): Dense, dark brown, black, fine to coarse SAND, some Gravel, trace Silt. Moist to wet.		
12							GLACIAL DEPOSITS			Well Sand (7 to 19')
14										2" Dia. Sch. 40 PVC Well Screen (0.010" Slots) (8 to 18')
16	S-7	15 - 17	15 13 21 24	24/0				S-7 (15 to 17'): Dense, No Recovery.		
18										
20	S-8	20 - 22	6 17 15 17	24/3				S-8 (20 to 22'): Dense, brown, fine to coarse GRAVEL, little Sand, trace Silt. Wet.		
22										Cuttings (19 to 25')

BORING LOG P:\6700S\6761.000\WORKLOGS\6761.000.GPJ 2017 SANBORN HEAD V1.GLB 2017 SANBORN HEAD V1.GDT 9/24/25

SANBORN HEAD

Sanborn, Head & Associates, Inc.

Project: 28 Haverhill Rd
Location: Amesbury, MA
Project No.: 6761.000

Log of Monitoring Well SH-TB-6

Ground Elevation: 90 ± feet
Datum: NAVD 1988

Drilling Method: CME 750X Drill Rig with 4" ID HSA

Sampling Method: 2" O.D. Split Spoon, Automatic Hammer

Drilling Company: Soil X
Foreman: J. Valeulis
Date Started: 09/10/25 **Date Finished: 09/10/25**
Logged By: Z. White **Checked By: A. Santamaria**

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Casing	Depth of Hole	Stab. Time
09/10/25	12:00	23.5'	Ground Surface	25'	27'	10 minutes
09/19/25	09:20	11.5'	Ground Surface	18'	18'	9 days

Depth (ft)	Sample Information: Sample No.	Depth (ft)	Spoon Blows per 6 in	Pen/ Rec (in)	Field Testing Data	Stratum: Log	Description	Geologic Description	Well Diagram	Well Description
24	S-9	25 - 27	17 20 41 35	24/7			GLACIAL DEPOSITS	S-9 (25 to 27'): Hard, gray, Clayey SILT, some Gravel, little Sand. Wet.		
26							-----27'-----	Boring terminated at 27 feet below ground surface. No refusal encountered. Well installed.		
28										
30										
32										
34										
36										
38										
40										
42										
44										
46										

BORING LOG P:\6700S\6761.000\WORK\LOGS\6761.000.GPJ 2017 SANBORN HEAD V1.GLB 2017 SANBORN HEAD V1.GDT 9/24/25

SANBORN HEAD

Sanborn, Head & Associates, Inc.

Project: 28 Haverhill Rd
Location: Amesbury, MA
Project No.: 6761.000

Log of Boring SH-TB-7

Ground Elevation: 88 ± feet
Datum: NAVD 1988

Drilling Method: CME 750X Drill Rig with 4" ID HSA

Sampling Method: 2" O.D. Split Spoon, Automatic Hammer

Drilling Company: Soil X
Foreman: J. Valeulis
Date Started: 09/10/25 **Date Finished: 09/10/25**
Logged By: Z. White **Checked By: A. Santamaria**

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Casing	Depth of Hole	Stab. Time
09/10/25	14:45	12'	Ground Surface	20'	20.8'	5 minutes

Depth (ft)	Sample Information: Sample No.	Depth (ft)	Spoon Blows per 6 in	Pen/ Rec (in)	Field Testing Data	Stratum: Log	Description	Geologic Description	Remarks
0	S-1	0 - 2	3 16 22 34	24/18			-----0'----- TOPSOIL -----0.5'-----	S-1A (0 to 0.5'): Dense, dark brown, fine to coarse SAND, some Silt, common Organics, trace Gravel. Moist. TOPSOIL.	
2	S-2	2 - 2.8	31 50/3"	9/5				S-1B (0.5 to 2'): Dense, gray, brown, fine to coarse SAND, little Gravel, trace Silt. Moist. S-2 (2 to 2.8'): Very dense, gray, brown, fine to coarse SAND, some Gravel, trace Silt. Moist.	
4	S-3	4 - 6	48 39 38 39	24/11				S-3 (4 to 6'): Very dense, brown, fine to coarse SAND & GRAVEL, trace Silt. Moist.	
6	S-4	6 - 8	29 28 31 37	24/13				S-4 (6 to 8'): Very dense, brown, fine to coarse SAND & GRAVEL, trace Silt. Moist.	
8	S-5	8 - 8.3	50/4"	4/0				S-5 (8 to 8.3'): Very dense, No Recovery.	
10	S-6	10 - 12	12 22 15 19	24/9			GLACIAL DEPOSITS	S-6 (10 to 12'): Dense, brown, fine to coarse SAND, some Gravel, trace Silt. Wet.	
12									
14									
16	S-7	15 - 17	9 18 23 24	24/14				S-7 (15 to 17'): Dense, brown, fine to coarse SAND, some Gravel, little Silt. Wet.	
18									
20	S-8	20 - 20.8	44 50/4"	10/6				S-8 (20 to 20.8'): Very dense, brown, fine to coarse SAND, some Gravel, trace Silt. Moist.	
22							-----20.8'-----	Boring terminated at 20.8 feet below ground surface.	
24									

BORING LOG P:\6700S\6761.000\WORKLOGS\6761.000.GPJ 2017 SANBORN HEAD V1.GLB 2017 SANBORN HEAD V1.GDT 9/24/25

SANBORN HEAD

Sanborn, Head & Associates, Inc.

Project: 28 Haverhill Rd
Location: Amesbury, MA
Project No.: 6761.000

Log of Boring SH-TB-8

Ground Elevation: 88 ± feet
Datum: NAVD 1988

Drilling Method: CME 750X Drill Rig with 4" ID HSA

Sampling Method: 2" O.D. Split Spoon, Automatic Hammer

Drilling Company: Soil X
Foreman: J. Valeulis
Date Started: 09/10/25 **Date Finished: 09/10/25**
Logged By: Z. White **Checked By: A. Santamaria**

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Casing	Depth of Hole	Stab. Time
09/10/25	08:30	17.5'	Ground Surface	25'	27'	10 minutes

Depth (ft)	Sample Information: Sample No.	Depth (ft)	Spoon Blows per 6 in	Pen/ Rec (in)	Field Testing Data	Stratum: Log	Description	Geologic Description	Remarks
0	S-1	0 - 2	2 9 6 4	24/14			0' TOPSOIL 0.3 SUBSOIL	S-1A (0 to 0.3'): Medium dense, dark brown, fine to coarse SAND, little Silt, common Organics, trace Gravel. Moist. TOPSOIL.	
2	S-2	2 - 4	5 6 10 13	24/7			2'	S-1B (0.3 to 2'): Medium dense, brown, fine to coarse SAND, little Silt, little Gravel, very few Organics. Moist. SUBSOIL. S-2 (2 to 4'): Medium dense, brown, fine to coarse SAND, little Silt, trace Gravel. Moist.	
4	S-3	4 - 6	22 24 24 24	24/0				S-3 (4 to 6'): Dense, No Recovery.	
6	S-4	6 - 8	22 25 33 34	24/6				S-4 (6 to 8'): Very dense, brown, fine to coarse GRAVEL, little Sand, trace Silt, very few Organics. Moist.	
8	S-5	8 - 10	10 10 7 8	24/10				S-5 (8 to 10'): Very stiff, gray, SILT & CLAY, trace Sand, trace Gravel. Moist.	(S-5): Redoximorphic staining observed,
10	S-6	10 - 12	7 9 18 20	24/21				S-6A (10 to 11.5'): Very stiff, gray, SILT & CLAY, trace Sand. Moist.	
12								S-6B (11.5 to 12'): Medium dense, gray, brown, fine to coarse SAND, little Silt, little Gravel. Moist.	Drill rods wet at approximately 12'.
14	S-7	15 - 15.3	50/4"	4/0			GLACIAL DEPOSITS	S-7 (15 to 15.3'): Very dense, No Recovery.	
16									
18									Increased auger chatter and drilling effort between 11 to 18'.
20	S-8	20 - 22	6 37 7 9	24/13				S-8 (20 to 22'): Dense, gray, brown, fine to coarse SAND, little Gravel, little Silt. Wet.	Increased auger chatter and drilling effort between 20 to 23'.
22									
24									

BORING LOG P:\6700S\6761.000\WORK\LOGS\6761.000.GPJ 2017 SANBORN HEAD V1.GLB 2017 SANBORN HEAD V1.GDT 9/24/25

SANBORN HEAD

Sanborn, Head & Associates, Inc.

Project: 28 Haverhill Rd
Location: Amesbury, MA
Project No.: 6761.000

Log of Boring SH-TB-8

Ground Elevation: 88 ± feet
Datum: NAVD 1988

Drilling Method: CME 750X Drill Rig with 4" ID HSA

Sampling Method: 2" O.D. Split Spoon, Automatic Hammer

Drilling Company: Soil X
Foreman: J. Valeulis
Date Started: 09/10/25 **Date Finished: 09/10/25**
Logged By: Z. White **Checked By: A. Santamaria**

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Casing	Depth of Hole	Stab. Time
09/10/25	08:30	17.5'	Ground Surface	25'	27'	10 minutes

Depth (ft)	Sample Information					Stratum		Geologic Description	Remarks
	Sample No.	Depth (ft)	Spoon Blows per 6 in	Pen/ Rec (in)	Field Testing Data	Log	Description		
26	S-9	25 - 27	9 18 22 38	24/17			GLACIAL DEPOSITS	S-9 (25 to 27'): Dense, gray, brown, fine to coarse SAND, little Gravel, little Silt. Moist to wet.	
28							-----27'-----	Boring terminated at 27 feet below ground surface. No refusal encountered.	
30									
32									
34									
36									
38									
40									
42									
44									
46									
48									
50									

BORING LOG P:\6700S\6761.000\WORK\LOGS\6761.000.GPJ 2017 SANBORN HEAD V1.GLB 2017 SANBORN HEAD V1.GDT 9/24/25

SANBORN HEAD

Sanborn, Head & Associates, Inc.

Project: 28 Haverhill Rd
Location: Amesbury, MA
Project No.: 6761.000

Log of Boring SH-TB-9

Ground Elevation: 94 ± feet
Datum: NAVD 1988

Drilling Method: CME 750X Drill Rig with 4" ID HSA

Sampling Method: 2" O.D. Split Spoon, Automatic Hammer

Drilling Company: Soil X
Foreman: J. Valeulis
Date Started: 09/10/25 **Date Finished: 09/10/25**
Logged By: Z. White **Checked By: A. Santamaria**

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Casing	Depth of Hole	Stab. Time
09/10/25	10:15	17'	Ground Surface	25'	27'	10 minutes

Depth (ft)	Sample Information: Sample No.	Depth (ft)	Spoon Blows per 6 in	Pen/ Rec (in)	Field Testing Data	Stratum: Log	Description	Geologic Description	Remarks
0	S-1	0 - 2	4 3 4 7	24/8			0' TOPSOIL 0.3 SUBSOIL	S-1A (0 to 0.3'): Loose, dark brown, fine to coarse SAND, some Silt, common Organics, trace Gravel. Moist. TOPSOIL. S-1B (0.3 to 2'): Loose, brown, fine to coarse SAND, some Silt, trace Gravel, very few Organics. Moist.	(S-1B): Dark brown/black material observed in bottom of split spoon.
2	S-2	2 - 4	5 10 9 16	24/12			2'	SUBSOIL. S-2 (2 to 4'): Medium dense, brown, fine to coarse SAND, little Gravel, little Silt, very few Organics. Moist.	
4	S-3	4 - 6	20 24 36 38	24/10				S-3 (4 to 6'): Very dense, light brown, fine to coarse SAND, some Gravel, little Silt. Moist.	Increased auger chatter and drilling action from 5 to 14'.
6	S-4	6 - 8	36 34 30 38	24/12				S-4 (6 to 8'): Very dense, light brown, fine to coarse SAND & GRAVEL, trace Silt. Moist.	(S-4): Some redoximorphic staining observed around gravel pieces.
8	S-5	8 - 10	13 19 12 5	24/15				S-5 (8 to 10'): Dense, brown, fine to coarse SAND, some Gravel, little Silt. Moist.	(S-5): Heavy redoximorphic features in bottom 6" of split spoon.
10	S-6	10 - 12	14 19 16 18	24/15				S-6 (10 to 12'): Dense, brown, fine to coarse SAND, little Gravel, little Silt. Moist.	
12									
14	S-7	15 - 17	18 24 38 32	24/13			GLACIAL DEPOSITS	S-7 (15 to 17'): Hard, brown, gray, Clayey SILT, some Gravel, trace Sand. Moist to wet.	(S-7): Few redoximorphic specks observed throughout sample.
16									
18									(18.5 to 20'): Ground through probable boulder.
20	S-8	20 - 22	12 31 44 54	24/22				S-8A (20 to 21'): Hard, gray, Clayey SILT, trace Gravel, trace Sand. Moist. S-8B (21 to 22'): Hard, light brown, Clayey SILT, little Gravel, trace Sand. Moist.	
22									
24									

BORING LOG P:\6700S\6761.000\WORK\LOGS\6761.000.GPJ 2017 SANBORN HEAD V1.GLB 2017 SANBORN HEAD V1.GDT 9/24/25

SANBORN HEAD

Sanborn, Head & Associates, Inc.

Project: 28 Haverhill Rd
Location: Amesbury, MA
Project No.: 6761.000

Log of Boring SH-TB-9

Ground Elevation: 94 ± feet
Datum: NAVD 1988

Drilling Method: CME 750X Drill Rig with 4" ID HSA

Sampling Method: 2" O.D. Split Spoon, Automatic Hammer

Drilling Company: Soil X
Foreman: J. Valeulis
Date Started: 09/10/25 **Date Finished: 09/10/25**
Logged By: Z. White **Checked By: A. Santamaria**

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Casing	Depth of Hole	Stab. Time
09/10/25	10:15	17'	Ground Surface	25'	27'	10 minutes

Depth (ft)	Sample Information					Stratum		Geologic Description	Remarks
	Sample No.	Depth (ft)	Spoon Blows per 6 in	Pen/ Rec (in)	Field Testing Data	Log	Description		
26	S-9	25 - 27	22 26 34 34	24/17			GLACIAL DEPOSITS -----27'-----	S-9 (25 to 27'): Very stiff, gray, Clayey SILT, little Sand, trace Gravel. Moist. Boring terminated at 27 feet below ground surface. No refusal encountered.	
28									
30									
32									
34									
36									
38									
40									
42									
44									
46									
48									
50									

BORING LOG P:\6700S\6761.000\WORK\LOGS\6761.000.GPJ 2017 SANBORN HEAD V1.GLB 2017 SANBORN HEAD V1.GDT 9/24/25

SANBORN HEAD

Sanborn, Head & Associates, Inc.

Project: 28 Haverhill Rd
Location: Amesbury, MA
Project No.: 6761.000

Log of Monitoring Well SH-TB-10

Ground Elevation: 83 ± feet
Datum: NAVD 1988

Drilling Method: CME 750X Drill Rig with 4" ID HSA

Sampling Method: 2" O.D. Split Spoon, Automatic Hammer

Drilling Company: Soil X
Foreman: J. Valeulis
Date Started: 09/09/25 **Date Finished: 09/09/25**
Logged By: Z. White **Checked By: A. Santamaria**

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Casing	Depth of Hole	Stab. Time
09/09/25	11:50	19'	Ground Surface	25'	27'	15 minutes
09/19/25	09:15	1.6'	Ground Surface	18'	18'	10 days

Depth (ft)	Sample Information: Sample No.	Depth (ft)	Spoon Blows per 6 in	Pen/ Rec (in)	Field Testing Data	Stratum: Log	Description	Geologic Description	Well Diagram	Well Description
-2										4" Dia. Protective Steel Casing with Locking Cap and Expansion Plug Set in Concrete (-3 to 1')
0	S-1	0 - 2	1 1 2 2	24/11			-----0'----- TOPSOIL	S-1 (0 to 2'): Very loose, dark brown, fine to coarse SAND, little Gravel, little Silt, very few Organic particles. Moist. TOPSOIL.		
2	S-2	2 - 4	2 5 5 7	24/15			-----2'----- SUBSOIL	S-2 (2 to 4'): Loose, dark brown, fine to coarse SAND, little Silt, little Gravel, very few Organic particles. Moist. SUBSOIL.		Cuttings (0 to 5')
4	S-3	4 - 6	5 5 6 6	24/15			-----4'-----	S-3 (4 to 6'): Stiff, gray, CLAY & SILT, little Sand. Moist.		
6	S-4	6 - 8	5 6 10 8	24/14				S-4 (6 to 8'): Very stiff, gray, CLAY & SILT, little Sand. Moist.		Bentonite (5 to 7')
8	S-5	8 - 10	4 6 8 8	24/24				S-5 (8 to 10'): Stiff, gray, CLAY & SILT, trace Sand. Moist.		2" Dia. Sch. 40 PVC Well Screen (0.010" Slots) (8 to 18')
10	S-6	10 - 12	8 12 11 12	24/13				S-6 (10 to 12'): Very stiff, gray, CLAY & SILT, some Sand, trace Gravel. Wet.		
12							GLACIAL DEPOSITS			Well Sand (7 to 19')
14										
16	S-7	15 - 17	2 3 3 4	24/16				S-7 (15 to 17'): Medium stiff, gray, SILT & CLAY, little Sand. Wet.		
18										
20	S-8	20 - 22	4 19 32 31	24/20				S-8 (20 to 22'): Very dense, brown, gray, fine to coarse SAND, little Gravel, little Silt. Wet.		
22										

BORING LOG P:\6700S\6761.000\WORKLOGS\6761.000.GPJ 2017 SANBORN HEAD V1.GLB 2017 SANBORN HEAD V1.GDT 9/24/25

SANBORN HEAD

Sanborn, Head & Associates, Inc.

Project: 28 Haverhill Rd
Location: Amesbury, MA
Project No.: 6761.000

Log of Monitoring Well SH-TB-10

Ground Elevation: 83 ± feet
Datum: NAVD 1988

Drilling Method: CME 750X Drill Rig with 4" ID HSA

Sampling Method: 2" O.D. Split Spoon, Automatic Hammer

Drilling Company: Soil X
Foreman: J. Valeulis
Date Started: 09/09/25 **Date Finished: 09/09/25**
Logged By: Z. White **Checked By: A. Santamaria**

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Casing	Depth of Hole	Stab. Time
09/09/25	11:50	19'	Ground Surface	25'	27'	15 minutes
09/19/25	09:15	1.6'	Ground Surface	18'	18'	10 days

Depth (ft)	Sample Information: Sample No.	Depth (ft)	Spoon Blows per 6 in	Pen/ Rec (in)	Field Testing Data	Stratum: Log	Description	Geologic Description	Well Diagram	Well Description
22										Cuttings (19 to 27')
24	S-9	25 - 27	18 32 25 17	24/12			GLACIAL DEPOSITS	S-9 (25 to 27'): Very dense, brown, fine to coarse SAND, some Gravel, trace Silt. Wet.		
26							-----27'-----	Boring terminated at 27 feet below ground surface. No refusal encountered. Well installed.		
28										
30										
32										
34										
36										
38										
40										
42										
44										
46										

BORING LOG P:\6700S\6761.000\WORK\LOGS\6761.000.GPJ 2017 SANBORN HEAD V1.GLB 2017 SANBORN HEAD V1.GDT 9/24/25

SANBORN HEAD

Sanborn, Head & Associates, Inc.

Project: 28 Haverhill Rd
Location: Amesbury, MA
Project No.: 6761.000

Log of Boring SH-TB-11

Ground Elevation: 84 ± feet
Datum: NAVD 1988

Drilling Method: CME 750X Drill Rig with 4" ID HSA

Sampling Method: 2" O.D. Split Spoon, Automatic Hammer

Drilling Company: Soil X
Foreman: J. Valeulis
Date Started: 09/09/25 **Date Finished: 09/09/25**
Logged By: Z. White **Checked By: A. Santamaria**

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Casing	Depth of Hole	Stab. Time
09/09/25	14:30	Dry	Ground Surface	25'	27'	15 minutes

Depth (ft)	Sample Information: Sample No.	Depth (ft)	Spoon Blows per 6 in	Pen/ Rec (in)	Field Testing Data	Stratum: Log	Stratum: Description	Geologic Description	Remarks
0	S-1	0 - 2	1 6 10 14	24/12			0' TOPSOIL 0.3	S-1A (0 to 0.3'): Medium dense, dark brown, fine to coarse SAND, some Silt, few Organics, trace Gravel. Moist. TOPSOIL.	
								S-1B (0.3 to 2'): Very stiff, light brown, gray, Clayey SILT, trace Gravel, trace Sand. Moist.	
2	S-2	2 - 4	19 39 46 40	24/18				S-2 (2 to 4'): Hard, light brown, gray, Clayey SILT, little Sand, trace Gravel, very few Organics. Moist.	
4	S-3	4 - 6	7 27 24 21	24/19				S-3A (4 to 4.3'): Hard, dark brown, Clayey SILT, trace Sand, very few Organics, trace Gravel. Moist.	
								S-3B (4.3 to 6'): Very dense, brown, fine to coarse SAND, some Gravel, trace Silt. Moist.	
6	S-4	6 - 8	13 18 23 21	24/15				S-4 (6 to 8'): Dense, brown, fine to coarse SAND, little Gravel, little Silt. Moist.	(S-4): Approximate 1" seam of silt in bottom of split spoon.
8	S-5	8 - 10	10 17 19 22	24/11				S-5 (8 to 10'): Dense, brown, fine to coarse SAND, some Silt, little Gravel. Moist.	
10	S-6	10 - 12	14 15 28 26	24/16				S-6 (10 to 12'): Dense, light brown, fine to coarse SAND, little Silt, little Gravel. Moist.	(S-6): Broken pieces of gravel 5" from bottom of split spoon.
12							GLACIAL DEPOSITS		
14	S-7	15 - 17	10 13 13 12	24/21				S-7 (15 to 17'): Medium dense, brown, fine to coarse SAND, some Silt, little Gravel. Moist.	
16									
18									
20	S-8	20 - 22	17 15 15 12	24/0				S-8 (20 to 22'): Medium dense, No Recovery.	
22									
24									

BORING LOG P:\6700S\6761.000\WORKLOGS\6761.000.GPJ 2017 SANBORN HEAD V1.GLB 2017 SANBORN HEAD V1.GDT 9/24/25

SANBORN HEAD

Sanborn, Head & Associates, Inc.

Project: 28 Haverhill Rd
Location: Amesbury, MA
Project No.: 6761.000

Log of Boring SH-TB-11

Ground Elevation: 84 ± feet
Datum: NAVD 1988

Drilling Method: CME 750X Drill Rig with 4" ID HSA

Sampling Method: 2" O.D. Split Spoon, Automatic Hammer

Drilling Company: Soil X
Foreman: J. Valeulis
Date Started: 09/09/25 **Date Finished: 09/09/25**
Logged By: Z. White **Checked By: A. Santamaria**

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Casing	Depth of Hole	Stab. Time
09/09/25	14:30	Dry	Ground Surface	25'	27'	15 minutes

Depth (ft)	Sample Information					Stratum		Geologic Description	Remarks
	Sample No.	Depth (ft)	Spoon Blows per 6 in	Pen/ Rec (in)	Field Testing Data	Log	Description		
26	S-9	25 - 27	12 15 22 28	24/19			GLACIAL DEPOSITS	S-9 (25 to 27'): Dense, dark brown, fine to coarse SAND, little Gravel, little Silt. Wet.	(S-9): Redoximorphic staining observed in sample.
							-----27'-----		
28								Boring terminated at 27 feet below ground surface. No refusal encountered.	
30									
32									
34									
36									
38									
40									
42									
44									
46									
48									
50									

BORING LOG P:\6700S\6761.000\WORK\LOGS\6761.000.GPJ 2017 SANBORN HEAD V1.GLB 2017 SANBORN HEAD V1.GDT 9/24/25

SANBORN HEAD

Sanborn, Head & Associates, Inc.

Project: 28 Haverhill Rd
Location: Amesbury, MA
Project No.: 6761.000

Test Pit No. SH-TP-1

Ground Elevation: 88 ± feet
Datum: NAVD 1988

Date: 08/07/25
Time Started: 11:13
Time Finished: 11:55

Logged By: J. DeWitt
Checked By: A. Santamaria

Weather: Sunny, 80°F

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Test Pit	Stab. Time
08/07/25	13:25	15.4'	Ground Surface	15.8'	1.2 hours

Excavation Equipment

Contractor: Strategic Environmental
Operator: K. Sweeney
Reach: 18 ft

Make: Komatsu
Model: PC15805
Bucket Capacity: 0.75 CY

Depth (ft)	Field Testing Data	Strata Depth (ft)	Geologic Description	Strata Depth (ft)	Excv. Effort	Boulder Qty & Class	Remarks
0		0	Light brown, fine to coarse SAND, little Silt, common Root fragments, trace Gravel. Moist. TOPSOIL.	0			
		1.4	Light brown, fine to coarse SAND, some Silt, little Gravel, very few Root fragments. Moist.	1.4	E		
2		3.1	Gray/brown, SILT & CLAY, little Sand, little Gravel. Moist.	3.1			
4							
6							
8					D		
10							
12		12.5	Beige, fine to coarse SAND, little Gravel, trace Silt. Moist.	12.5			
14					E		
16		15.8	Test Pit terminated at 15.8 feet bgs. No refusal encountered.	15.8			(15.8'): Groundwater was observed seeping into the bottom of the test pit.
18							
20							

Excavation Effort

E	Easy
M	Moderate
D	Difficult

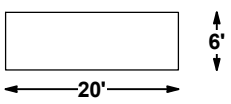
Boulder Size Classification

12" - 24"	A
24" - 36"	B
36" and larger	C

Soil Description
Minor Component Proportions

trace	0 - 10%
little	10 - 20%
some	20 - 35%
and	35 - 50%

Test Pit Plan



North Arrow

TEST PIT P:\6700S\6761.000\WORK\LOGS\6761.000.GPJ 2017 SANBORN HEAD V1.GLB 2010 SANBORN HEAD V2.GDT 9/24/25

SANBORN HEAD

Sanborn, Head & Associates, Inc.

Project: 28 Haverhill Rd
Location: Amesbury, MA
Project No.: 6761.000

Test Pit No. SH-TP-2

Ground Elevation: 86 ± feet
Datum: NAVD 1988

Date: 08/08/25
Time Started: 08:00
Time Finished: 08:55

Logged By: J. DeWitt
Checked By: A. Santamaria

Weather: Sunny, 80°F

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Test Pit	Stab. Time
08/08/25	12:05	14.8'	Ground Surface	15.6'	3.2 Hours

Excavation Equipment

Contractor: Strategic Environmental
Operator: A. Olivera
Reach: 18 ft

Make: Komatsu
Model: PC15805
Bucket Capacity: 0.75 CY

Depth (ft)	Field Testing Data	Strata Depth (ft)	Geologic Description	Strata Depth (ft)	Excv. Effort	Boulder Qty & Class	Remarks
0		0	Dark brown, fine to coarse SAND, frequent Root fragments, litte Silt, trace Gravel. Moist. TOPSOIL.	0			
		1.5	Light brown, fine to coarse SAND, some Silt, frequent Root fragments, trace Gravel. Moist.	1.5			
2							
		3.4	Brown, fine to coarse SAND, some Gravel, frequent Cobbles, trace Silt. Moist.	3.4			
4							
6							
		7.3	Brown, fine to coarse SAND, little Gravel, little Silt. Moist.	7.3	E		
8							
10							(11'): Groundwater was observed entering the test pit.
12							
14							
		15.6	Test Pit terminated at 15.6 feet bgs. No refusal encountered.	15.6			
16							
18							
20							

Excavation Effort

E	Easy
M	Moderate
D	Difficult

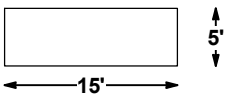
Boulder Size Classification

12" - 24"	A
24" - 36"	B
36" and larger	C

Soil Description
Minor Component Proportions

trace	0 - 10%
little	10 - 20%
some	20 - 35%
and	35 - 50%

Test Pit Plan



North Arrow

Sheet: 1 of 1

TEST PIT P:\6700S\6761.000\WORK\LOGS\6761.000.GPJ 2017 SANBORN HEAD V1.GLB 2010 SANBORN HEAD V2.GDT 9/24/25

SANBORN HEAD

Sanborn, Head & Associates, Inc.

Project: 28 Haverhill Rd
Location: Amesbury, MA
Project No.: 6761.000

Test Pit No. SH-TP-3

Ground Elevation: 86 ± feet
Datum: NAVD 1988

Date: 08/08/25
Time Started: 08:55
Time Finished: 09:25

Logged By: J. DeWitt
Checked By: A. Santamaria

Weather: Sunny, 80°F

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Test Pit	Stab. Time
08/08/25	12:00	5.5'	Ground Surface	11.3'	2.6 Hours

Excavation Equipment

Contractor: Strategic Environmental
Operator: A. Olivera
Reach: 18 ft

Make: Komatsu
Model: PC15805
Bucket Capacity: 0.75 CY

Depth (ft)	Field Testing Data	Strata Depth (ft)	Geologic Description	Strata Depth (ft)	Excv. Effort	Boulder Qty & Class	Remarks
0		0	Dark brown, fine to coarse SAND, little Silt, common Root fragments, trace Gravel. Moist. TOPSOIL.	0	E		
		1.3	Gray/brown, Clayey SILT, little Sand, trace Gravel, very few Organic particles. Moist. SUBSOIL.	1.3			
2		2	Gray/brown, Clayey SILT, little Sand, trace Gravel. Moist.	2			
4					M		
6							
8							
		9.5	Red/brown, fine to coarse SAND, some Gravel, trace Silt. Wet.	9.5	E		
10							
		11.3	Test Pit terminated at 11.3 feet bgs due to groundwater encountered and cave-in.	11.3			
12							
14							
16							
18							
20							

Excavation Effort

E	Easy
M	Moderate
D	Difficult

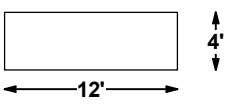
Boulder Size Classification

12" - 24"	A
24" - 36"	B
36" and larger	C

Soil Description
Minor Component Proportions

trace	0 - 10%
little	10 - 20%
some	20 - 35%
and	35 - 50%

Test Pit Plan



North Arrow

TEST PIT P:\6700S\6761.000\WORKLOGS\6761.000.GPJ 2017 SANBORN HEAD V1.GLB 2010 SANBORN HEAD V2.GDT 9/24/25

SANBORN HEAD

Sanborn, Head & Associates, Inc.

Project: 28 Haverhill Rd
Location: Amesbury, MA
Project No.: 6761.000

Test Pit No. SH-TP-4

Ground Elevation: 85 ± feet
Datum: NAVD 1988

Date: 08/07/25
Time Started: 12:20
Time Finished: 12:40

Logged By: J. DeWitt
Checked By: A. Santamaria

Weather: Sunny, 80°F

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Test Pit	Stab. Time
08/07/25	13:40	15.3'	Ground Surface	15.7'	1 Hour

Excavation Equipment

Contractor: Strategic Environmental
Operator: K. Sweeney
Reach: 18 ft

Make: Komatsu
Model: PC15805
Bucket Capacity: 0.75 CY

Depth (ft)	Field Testing Data	Strata Depth (ft)	Geologic Description	Strata Depth (ft)	Excv. Effort	Boulder Qty & Class	Remarks
0		0	Dark brown, fine to coarse SAND, little Silt. Moist. TOPSOIL.	0			
		1.1	Gray/brown, SILT, some Sand. Moist.	1.1	E		
2		2.8	Gray/brown, SILT, trace Sand. Moist.	2.8			
4							
6							
8					M		
10							
12							
14							
		14.8	Gray/brown, Clayey SILT, little Sand, trace Gravel. Wet.	14.8	E		
16		15.7	Test Pit terminated at 15.7 feet bgs. No refusal encountered.	15.7			(15.7'): Groundwater was observed seeping into the bottom of the test pit.
18							
20							

Excavation Effort

E	Easy
M	Moderate
D	Difficult

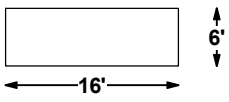
Boulder Size Classification

12" - 24"	A
24" - 36"	B
36" and larger	C

Soil Description
Minor Component Proportions

trace	0 - 10%
little	10 - 20%
some	20 - 35%
and	35 - 50%

Test Pit Plan



North Arrow

TEST PIT P:\6700S\6761.000\WORKLOGS\6761.000.GPJ 2017 SANBORN HEAD V1.GLB 2010 SANBORN HEAD V2.GDT 9/24/25

SANBORN HEAD

Sanborn, Head & Associates, Inc.

Project: 28 Haverhill Rd
Location: Amesbury, MA
Project No.: 6761.000

Test Pit No. SH-TP-5

Ground Elevation: 91 ± feet
Datum: NAVD 1988

Date: 08/07/25
Time Started: 10:10
Time Finished: 10:45

Logged By: J. DeWitt
Checked By: A. Santamaria

Weather: Sunny, 80°F

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Test Pit	Stab. Time
08/07/25	13:00	10.1'	Ground Surface	12.3'	2.3 Hours

Excavation Equipment

Contractor: Strategic Environmental
Operator: K. Sweeney
Reach: 18 ft

Make: Komatsu
Model: PC15805
Bucket Capacity: 0.75 CY

Depth (ft)	Field Testing Data	Strata Depth (ft)	Geologic Description	Strata Depth (ft)	Excv. Effort	Boulder Qty & Class	Remarks
0		0	Dark brown, fine to coarse SAND, some Silt, little Gravel, few Root fragments. Moist. TOPSOIL.	0			
		0.9	Light brown, fine to coarse SAND, some Gravel, little Silt, few Root fragments. Moist. SUBSOIL.	0.9			
2							
4		4.1	Brown, fine to coarse SAND, some Gravel, frequent Cobbles, trace Silt. Moist.	4.1			
6					E		
8							
10							
		10.8	Gray/brown, fine to coarse SAND, some Silt, little Gravel. Wet. TILL.	10.8			
12		12.3	Test Pit terminated at 12.3 feet bgs due to cave-in.	12.3			
14							
16							
18							
20							

Excavation Effort

E	Easy
M	Moderate
D	Difficult

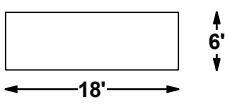
Boulder Size Classification

12" - 24"	A
24" - 36"	B
36" and larger	C

Soil Description
Minor Component Proportions

trace	0 - 10%
little	10 - 20%
some	20 - 35%
and	35 - 50%

Test Pit Plan



North Arrow

TEST PIT P:\6700S\6761.000\WORK\LOGS\6761.000.GPJ 2017 SANBORN HEAD V1.GLB 2010 SANBORN HEAD V2.GDT 9/24/25

SANBORN HEAD

Sanborn, Head & Associates, Inc.

Project: 28 Haverhill Rd
Location: Amesbury, MA
Project No.: 6761.000

Test Pit No. SH-TP-6A

Ground Elevation: 92 ± feet
Datum: NAVD 1988

Date: 08/08/25
Time Started: 09:55
Time Finished: 10:50

Logged By: J. DeWitt
Checked By: A. Santamaria

Weather: Sunny, 80°F

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Test Pit	Stab. Time
08/08/25	11:30	13.3'	Ground Surface	14.3'	1 Hour

Excavation Equipment

Contractor: Strategic Environmental
Operator: A. Olivera
Reach: 18 ft
Make: Komatsu
Model: PC15805
Bucket Capacity: 0.75 CY

Depth (ft)	Field Testing Data	Strata Depth (ft)	Geologic Description	Strata Depth (ft)	Excv. Effort	Boulder Qty & Class	Remarks
0		0	Dark brown, fine to coarse SAND, little Silt, common Root fragments, trace Gravel. Moist. TOPSOIL.	0	E		
		0.8	Brown, fine to coarse SAND, little Gravel, common Cobbles, trace Silt. Moist.	0.8			
8		8.5	Brown, fine to coarse SAND, some Silt, little Gravel. Moist.	8.5			
14		14.3	Test Pit terminated at 14.3 feet bgs due to cave-in.	14.3			

Excavation Effort

E	Easy
M	Moderate
D	Difficult

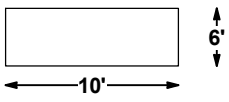
Boulder Size Classification

12" - 24"	A
24" - 36"	B
36" and larger	C

Soil Description
Minor Component Proportions

trace	0 - 10%
little	10 - 20%
some	20 - 35%
and	35 - 50%

Test Pit Plan



North Arrow

TEST PIT P:\6700S\6761.000\WORK\LOGS\6761.000.GPJ 2017 SANBORN HEAD V1.GLB 2010 SANBORN HEAD V2.GDT 9/24/25

SANBORN HEAD

Sanborn, Head & Associates, Inc.

Project: 28 Haverhill Rd
Location: Amesbury, MA
Project No.: 6761.000

Test Pit No. SH-TP-8A

Ground Elevation: 102 ± feet
Datum: NAVD 1988

Date: 08/08/25
Time Started: 10:40
Time Finished: 11:00

Logged By: J. DeWitt
Checked By: A. Santamaria

Weather:

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Test Pit	Stab. Time
08/08/25	---	No Groundwater Encountered		5'	

Excavation Equipment

Contractor: Strategic Environmental
Operator: A. Olivera
Reach: 18 ft

Make: Komatsu
Model: PC13805
Bucket Capacity: 0.75 CY

Depth (ft)	Field Testing Data	Strata Depth (ft)	Geologic Description	Strata Depth (ft)	Excv. Effort	Boulder Qty & Class	Remarks
0		0	Dark brown, coarse SAND, little Silt, common Root fragments, trace Gravel. Moist.	0			
		0.3	TOPSOIL.	0.3			
			Brown, fine to coarse SAND, little Silt, little Gravel, few Root fragments. Moist.		E		
2							
4							
		5	Test Pit terminated at 5 feet bgs. No refusal encountered.	5			
6							
8							
10							
12							
14							
16							
18							
20							

Excavation Effort

E	Easy
M	Moderate
D	Difficult

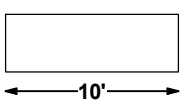
Boulder Size Classification

12" - 24"	A
24" - 36"	B
36" and larger	C

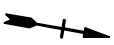
Soil Description
Minor Component Proportions

trace	0 - 10%
little	10 - 20%
some	20 - 35%
and	35 - 50%

Test Pit Plan



North Arrow



TEST PIT P:\6700S\6761.000\WORK\LOGS\6761.000.GPJ 2017 SANBORN HEAD V1.GLB 2010 SANBORN HEAD V2.GDT 9/24/25

SANBORN HEAD

Sanborn, Head & Associates, Inc.

Project: 28 Haverhill Rd
Location: Amesbury, MA
Project No.: 6761.000

Test Pit No. SH-TP-9

Ground Elevation: 99 ± feet
Datum: NAVD 1988

Date: 08/07/25
Time Started: 08:15
Time Finished: 09:30

Logged By: J. DeWitt
Checked By: A. Santamaria

Weather: Sunny, 80°F

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Test Pit	Stab. Time
08/07/25	---	No Groundwater Observed		15'	

Excavation Equipment

Contractor: Strategic Environmental
Operator: K. Sweeney
Reach: 18 ft
Make: Komatsu
Model: PC15805
Bucket Capacity: 0.75 CY

Depth (ft)	Field Testing Data	Strata Depth (ft)	Geologic Description	Strata Depth (ft)	Excv. Effort	Boulder Qty & Class	Remarks
0		0	Dark brown, fine to coarse SAND, little Silt, trace Gravel, few Root fragments. Moist. TOPSOIL.	0	E		
			Brown, fine to coarse SAND, little Gravel, little Silt. Moist.				
2							
		3.5	Brown, fine to coarse SAND, some Gravel, frequent Cobbles, trace Silt. Moist.	3.5			
4							
6							
8					M		
10							
12							
14							
		15	Test Pit terminated at 15 feet bgs due to sidewall cave-in.	15			
16							
18							
20							

Excavation Effort

E	Easy
M	Moderate
D	Difficult

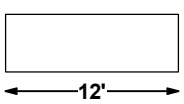
Boulder Size Classification

12" - 24"	A
24" - 36"	B
36" and larger	C

Soil Description
Minor Component Proportions

trace	0 - 10%
little	10 - 20%
some	20 - 35%
and	35 - 50%

Test Pit Plan



North Arrow

Sheet: 1 of 1

TEST PIT P:\6700S\6761.000\WORKLOGS\6761.000.GPJ 2017 SANBORN HEAD V1.GLB 2010 SANBORN HEAD V2.GDT 9/24/25

Attachment 3 – NOAA Atlas 14 Table

NOAA Atlas 14, Volume 10, Version 3
Location name: Amesbury, Massachusetts, USA*
Latitude: 42.8426°, Longitude: -70.9388°
Elevation: 76 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	**0.315** (0.252-0.394)	**0.377** (0.302-0.472)	**0.478** (0.381-0.601)	**0.562** (0.445-0.710)	**0.678** (0.517-0.891)	**0.766** (0.571-1.02)	**0.857** (0.617-1.19)	**0.958** (0.651-1.36)	**1.10** (0.717-1.61)	**1.22** (0.771-1.82)
10-min	**0.446** (0.357-0.558)	**0.534** (0.427-0.668)	**0.678** (0.540-0.851)	**0.797** (0.631-1.01)	**0.961** (0.733-1.26)	**1.08** (0.808-1.45)	**1.21** (0.874-1.68)	**1.36** (0.922-1.92)	**1.56** (1.02-2.28)	**1.73** (1.09-2.57)
15-min	**0.525** (0.420-0.656)	**0.628** (0.503-0.786)	**0.797** (0.635-1.00)	**0.937** (0.742-1.18)	**1.13** (0.862-1.48)	**1.28** (0.951-1.71)	**1.43** (1.03-1.98)	**1.60** (1.08-2.26)	**1.84** (1.19-2.68)	**2.03** (1.29-3.02)
30-min	**0.720** (0.577-0.900)	**0.862** (0.690-1.08)	**1.09** (0.872-1.37)	**1.29** (1.02-1.62)	**1.55** (1.18-2.04)	**1.75** (1.30-2.34)	**1.96** (1.41-2.71)	**2.19** (1.49-3.10)	**2.52** (1.64-3.68)	**2.78** (1.76-4.15)
60-min	**0.915** (0.733-1.14)	**1.10** (0.876-1.37)	**1.39** (1.11-1.75)	**1.63** (1.29-2.06)	**1.97** (1.50-2.59)	**2.22** (1.66-2.98)	**2.49** (1.79-3.45)	**2.78** (1.89-3.94)	**3.20** (2.08-4.68)	**3.54** (2.24-5.27)
2-hr	**1.20** (0.967-1.49)	**1.44** (1.16-1.79)	**1.84** (1.48-2.30)	**2.17** (1.73-2.72)	**2.63** (2.02-3.44)	**2.97** (2.23-3.97)	**3.33** (2.43-4.63)	**3.76** (2.56-5.30)	**4.42** (2.88-6.41)	**4.97** (3.15-7.35)
3-hr	**1.40** (1.13-1.73)	**1.69** (1.37-2.09)	**2.17** (1.74-2.69)	**2.56** (2.05-3.20)	**3.10** (2.40-4.06)	**3.50** (2.65-4.68)	**3.94** (2.89-5.48)	**4.47** (3.05-6.27)	**5.28** (3.45-7.65)	**5.98** (3.80-8.81)
6-hr	**1.81** (1.48-2.23)	**2.20** (1.79-2.71)	**2.83** (2.30-3.50)	**3.36** (2.71-4.17)	**4.08** (3.18-5.31)	**4.62** (3.51-6.14)	**5.20** (3.84-7.20)	**5.92** (4.05-8.24)	**7.02** (4.60-10.1)	**7.98** (5.09-11.7)
12-hr	**2.30** (1.88-2.80)	**2.80** (2.30-3.43)	**3.63** (2.97-4.46)	**4.32** (3.51-5.33)	**5.27** (4.12-6.81)	**5.97** (4.57-7.88)	**6.73** (5.00-9.26)	**7.67** (5.27-10.6)	**9.11** (5.98-13.0)	**10.3** (6.62-15.0)
24-hr	**2.72** (2.25-3.30)	**3.38** (2.79-4.10)	**4.45** (3.66-5.42)	**5.34** (4.36-6.54)	**6.57** (5.18-8.45)	**7.47** (5.76-9.83)	**8.46** (6.33-11.6)	**9.70** (6.70-13.3)	**11.6** (7.67-16.5)	**13.3** (8.55-19.2)
2-day	**3.04** (2.53-3.66)	**3.86** (3.21-4.65)	**5.19** (4.30-6.28)	**6.30** (5.18-7.66)	**7.82** (6.22-10.0)	**8.94** (6.95-11.7)	**10.2** (7.70-14.0)	**11.8** (8.16-16.1)	**14.4** (9.51-20.3)	**16.7** (10.7-24.0)
3-day	**3.31** (2.77-3.98)	**4.19** (3.50-5.03)	**5.62** (4.67-6.78)	**6.81** (5.62-8.25)	**8.45** (6.74-10.8)	**9.64** (7.52-12.6)	**11.0** (8.33-15.0)	**12.7** (8.82-17.3)	**15.6** (10.3-21.9)	**18.1** (11.7-25.8)
4-day	**3.58** (3.00-4.29)	**4.48** (3.75-5.37)	**5.96** (4.97-7.16)	**7.18** (5.94-8.67)	**8.86** (7.09-11.3)	**10.1** (7.90-13.2)	**11.5** (8.72-15.7)	**13.3** (9.22-18.0)	**16.2** (10.7-22.7)	**18.8** (12.1-26.8)
7-day	**4.34** (3.66-5.16)	**5.27** (4.44-6.28)	**6.79** (5.70-8.12)	**8.05** (6.71-9.68)	**9.79** (7.87-12.4)	**11.1** (8.69-14.3)	**12.5** (9.52-16.9)	**14.3** (10.0-19.3)	**17.3** (11.5-24.2)	**20.0** (13.0-28.4)
10-day	**5.04** (4.26-5.97)	**5.99** (5.06-7.11)	**7.55** (6.36-9.00)	**8.85** (7.39-10.6)	**10.6** (8.56-13.4)	**11.9** (9.39-15.4)	**13.4** (10.2-18.0)	**15.2** (10.7-20.5)	**18.2** (12.1-25.3)	**20.8** (13.5-29.4)
20-day	**7.04** (6.00-8.29)	**8.09** (6.89-9.54)	**9.81** (8.32-11.6)	**11.2** (9.45-13.4)	**13.2** (10.6-16.3)	**14.7** (11.5-18.5)	**16.2** (12.3-21.2)	**18.0** (12.7-24.0)	**20.7** (13.9-28.4)	**22.9** (14.9-32.1)
30-day	**8.71** (7.46-10.2)	**9.84** (8.41-11.6)	**11.7** (9.95-13.8)	**13.2** (11.2-15.7)	**15.3** (12.4-18.8)	**16.9** (13.3-21.2)	**18.6** (14.0-24.0)	**20.3** (14.4-27.0)	**22.8** (15.3-31.2)	**24.7** (16.1-34.5)
45-day	**10.8** (9.30-12.6)	**12.0** (10.3-14.1)	**14.0** (12.0-16.5)	**15.7** (13.3-18.5)	**18.0** (14.6-21.9)	**19.7** (15.5-24.4)	**21.5** (16.1-27.4)	**23.2** (16.5-30.6)	**25.4** (17.2-34.6)	**27.0** (17.7-37.6)
60-day	**12.6** (10.9-14.7)	**13.9** (12.0-16.2)	**16.0** (13.7-18.7)	**17.7** (15.1-20.9)	**20.1** (16.4-24.4)	**22.0** (17.3-27.2)	**23.8** (17.9-30.2)	**25.6** (18.2-33.6)	**27.7** (18.8-37.6)	**29.2** (19.1-40.5)

[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.

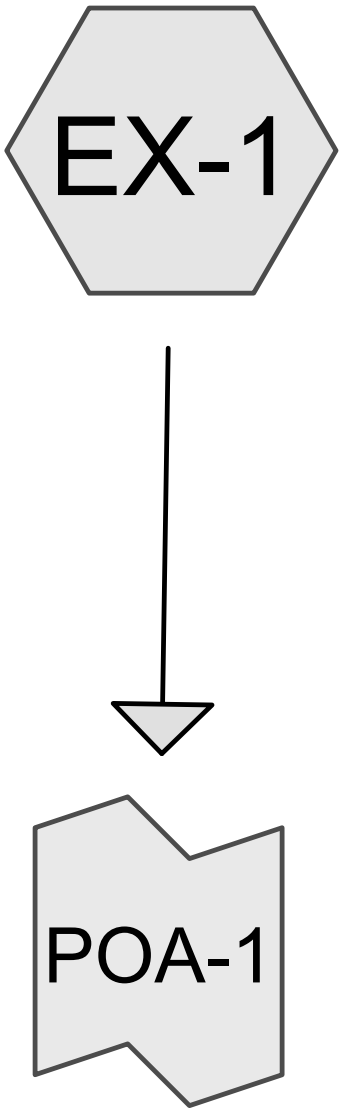
Please refer to NOAA Atlas 14 document for more information.

Back to Top

PF graphical

Attachment 4 – HydroCad Output:

Pre-Development Conditions



Subcat Reach Pond Link

Routing Diagram for Pre-Development
Prepared by CDG, Printed 3/30/2026

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.930	39	>75% Grass cover, Good, HSG A (EX-1)
0.020	80	>75% Grass cover, Good, HSG D (EX-1)
0.130	72	Dirt roads, HSG A (EX-1)
0.020	98	Roofs, HSG A (EX-1)
3.030	30	Woods, Good, HSG A (EX-1)
5.130	**35**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
5.110	HSG A	EX-1
0.000	HSG B	
0.000	HSG C	
0.020	HSG D	EX-1
0.000	Other	
5.130		**TOTAL AREA**

Time span=0.00-48.00 hrs, dt=0.10 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EX-1: Runoff Area=5.130 ac 0.39% Impervious Runoff Depth=0.00"
Flow Length=743' Tc=14.7 min CN=35 Runoff=0.00 cfs 0.000 af

Link POA-1: Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Total Runoff Area = 5.130 ac Runoff Volume = 0.000 af Average Runoff Depth = 0.00"
99.61% Pervious = 5.110 ac 0.39% Impervious = 0.020 ac

Summary for Subcatchment EX-1:

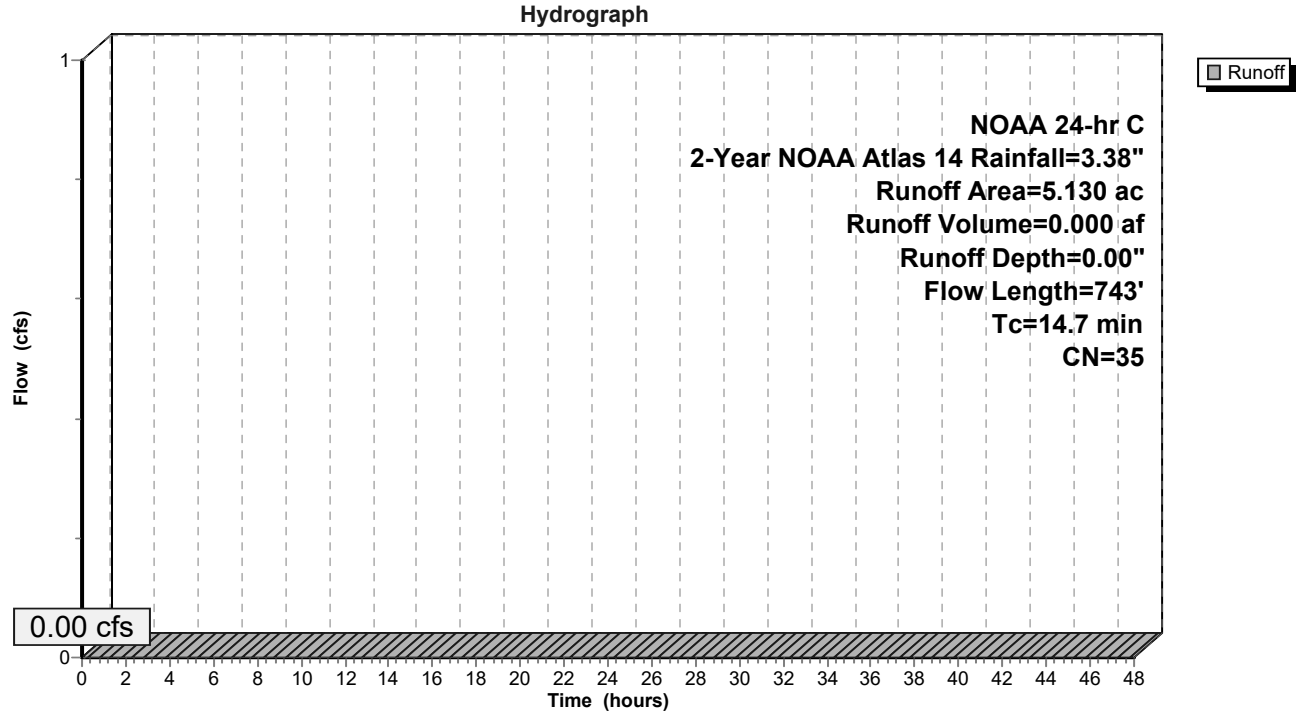
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
NOAA 24-hr C 2-Year NOAA Atlas 14 Rainfall=3.38"

Area (ac)	CN	Description
0.020	98	Roofs, HSG A
0.130	72	Dirt roads, HSG A
3.030	30	Woods, Good, HSG A
1.930	39	>75% Grass cover, Good, HSG A
0.020	80	>75% Grass cover, Good, HSG D
5.130	35	Weighted Average
5.110	35	99.61% Pervious Area
0.020	98	0.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	50	0.0800	0.18		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.42"
3.4	315	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
6.7	378	0.0350	0.94		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
14.7	743	Total			

Subcatchment EX-1:

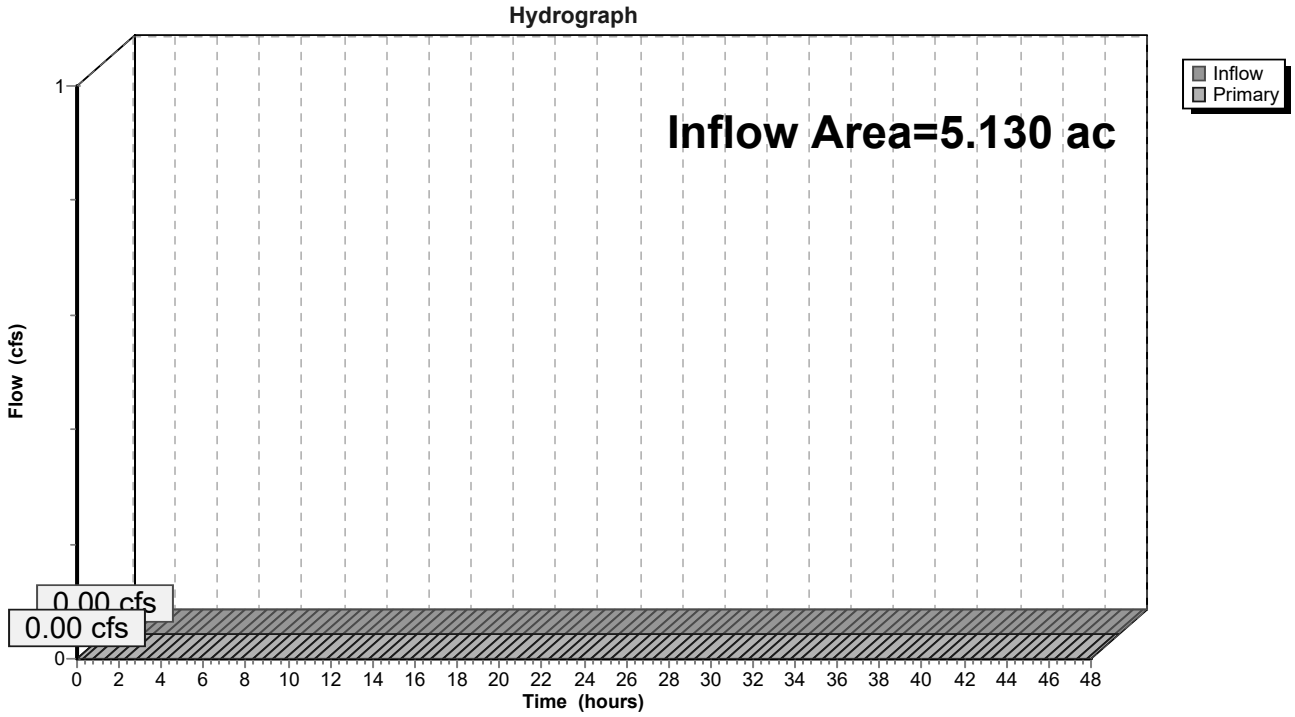


Summary for Link POA-1:

Inflow Area = 5.130 ac, 0.39% Impervious, Inflow Depth = 0.00" for 2-Year NOAA Atlas 14 event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs

Link POA-1:



Time span=0.00-48.00 hrs, dt=0.10 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EX-1: Runoff Area=5.130 ac 0.39% Impervious Runoff Depth=0.13"
Flow Length=743' Tc=14.7 min CN=35 Runoff=0.09 cfs 0.056 af

Link POA-1: Inflow=0.09 cfs 0.056 af
Primary=0.09 cfs 0.056 af

Total Runoff Area = 5.130 ac Runoff Volume = 0.056 af Average Runoff Depth = 0.13"
99.61% Pervious = 5.110 ac 0.39% Impervious = 0.020 ac

Summary for Subcatchment EX-1:

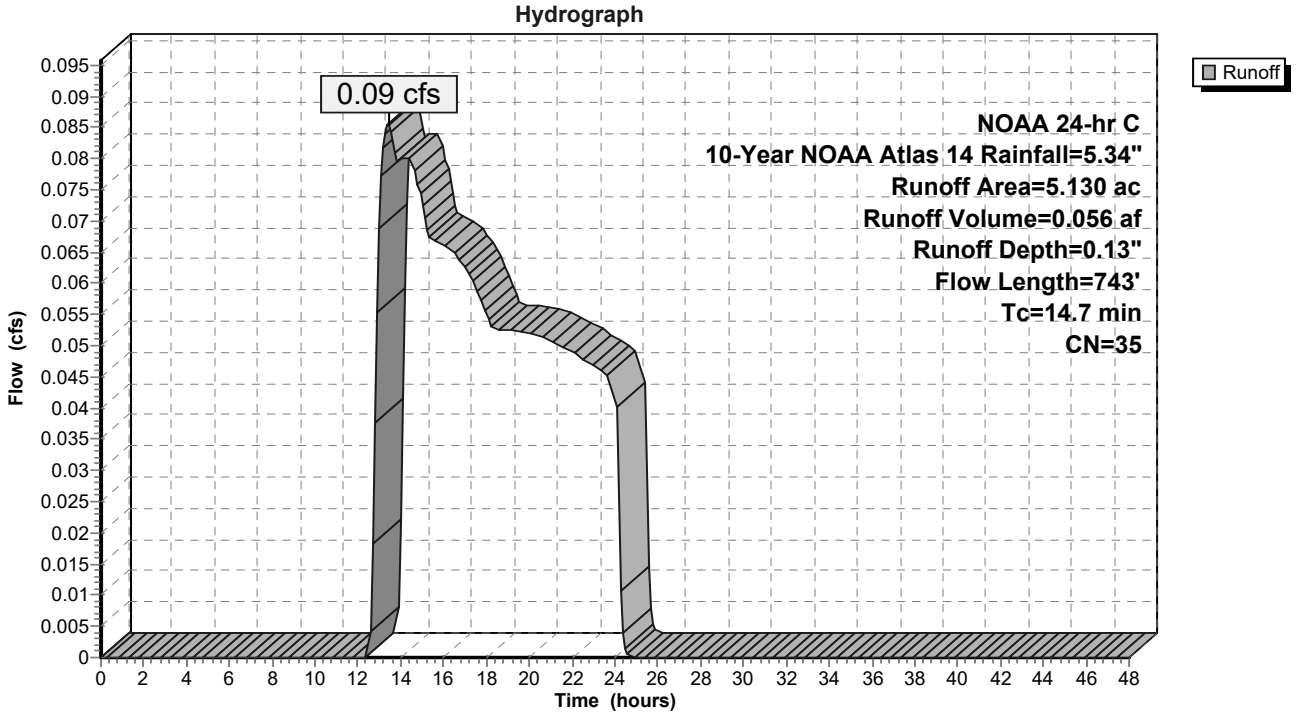
Runoff = 0.09 cfs @ 13.44 hrs, Volume= 0.056 af, Depth= 0.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
NOAA 24-hr C 10-Year NOAA Atlas 14 Rainfall=5.34"

Area (ac)	CN	Description
0.020	98	Roofs, HSG A
0.130	72	Dirt roads, HSG A
3.030	30	Woods, Good, HSG A
1.930	39	>75% Grass cover, Good, HSG A
0.020	80	>75% Grass cover, Good, HSG D
5.130	35	Weighted Average
5.110	35	99.61% Pervious Area
0.020	98	0.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	50	0.0800	0.18		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.42"
3.4	315	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
6.7	378	0.0350	0.94		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
14.7	743	Total			

Subcatchment EX-1:

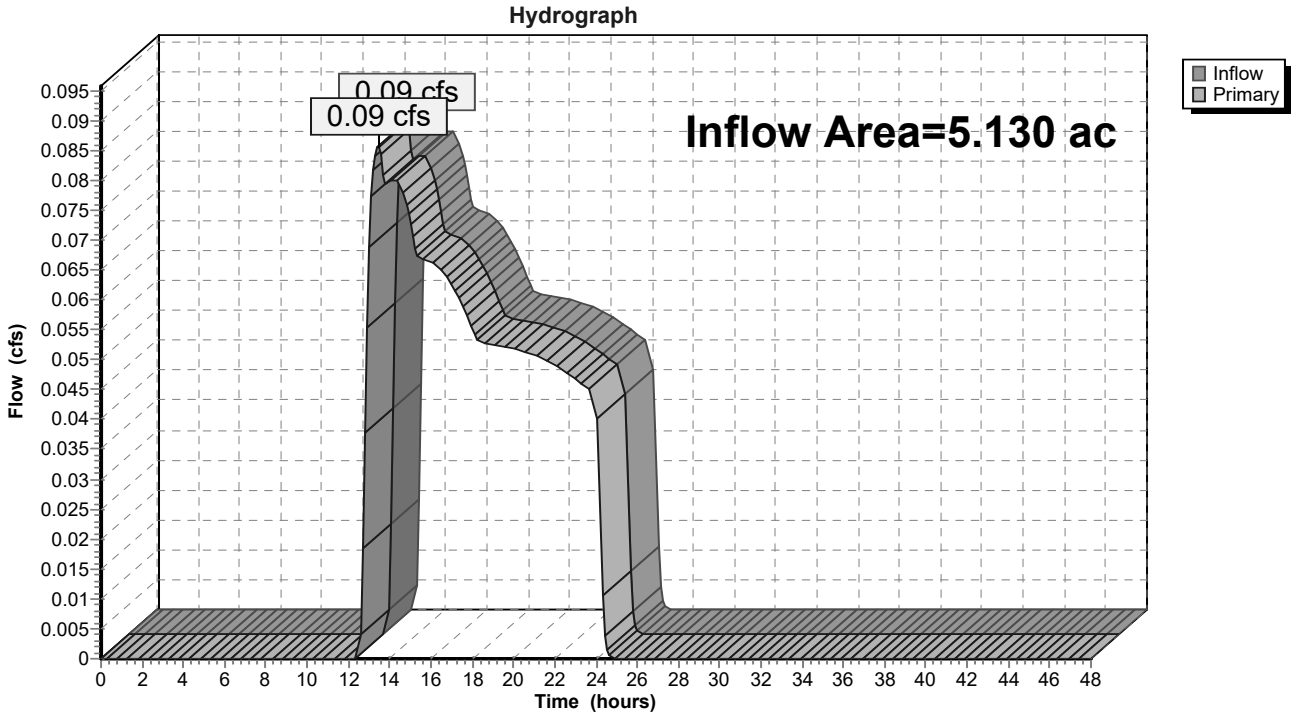


Summary for Link POA-1:

Inflow Area = 5.130 ac, 0.39% Impervious, Inflow Depth = 0.13" for 10-Year NOAA Atlas 14 event
Inflow = 0.09 cfs @ 13.44 hrs, Volume= 0.056 af
Primary = 0.09 cfs @ 13.44 hrs, Volume= 0.056 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs

Link POA-1:



Time span=0.00-48.00 hrs, dt=0.10 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EX-1: Runoff Area=5.130 ac 0.39% Impervious Runoff Depth=0.97"
Flow Length=743' Tc=14.7 min CN=35 Runoff=2.66 cfs 0.413 af

Link POA-1: Inflow=2.66 cfs 0.413 af
Primary=2.66 cfs 0.413 af

Total Runoff Area = 5.130 ac Runoff Volume = 0.413 af Average Runoff Depth = 0.97"
99.61% Pervious = 5.110 ac 0.39% Impervious = 0.020 ac

Summary for Subcatchment EX-1:

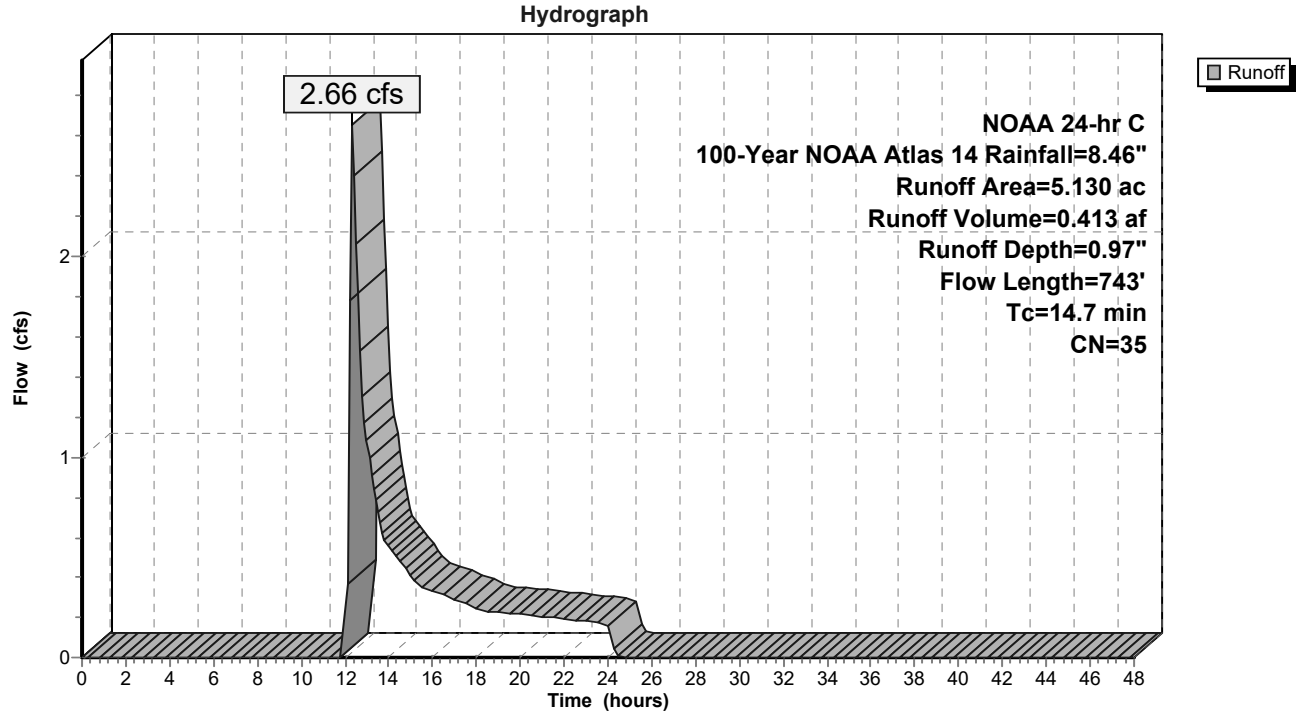
Runoff = 2.66 cfs @ 12.33 hrs, Volume= 0.413 af, Depth= 0.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
NOAA 24-hr C 100-Year NOAA Atlas 14 Rainfall=8.46"

Area (ac)	CN	Description
0.020	98	Roofs, HSG A
0.130	72	Dirt roads, HSG A
3.030	30	Woods, Good, HSG A
1.930	39	>75% Grass cover, Good, HSG A
0.020	80	>75% Grass cover, Good, HSG D
5.130	35	Weighted Average
5.110	35	99.61% Pervious Area
0.020	98	0.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	50	0.0800	0.18		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.42"
3.4	315	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
6.7	378	0.0350	0.94		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
14.7	743	Total			

Subcatchment EX-1:

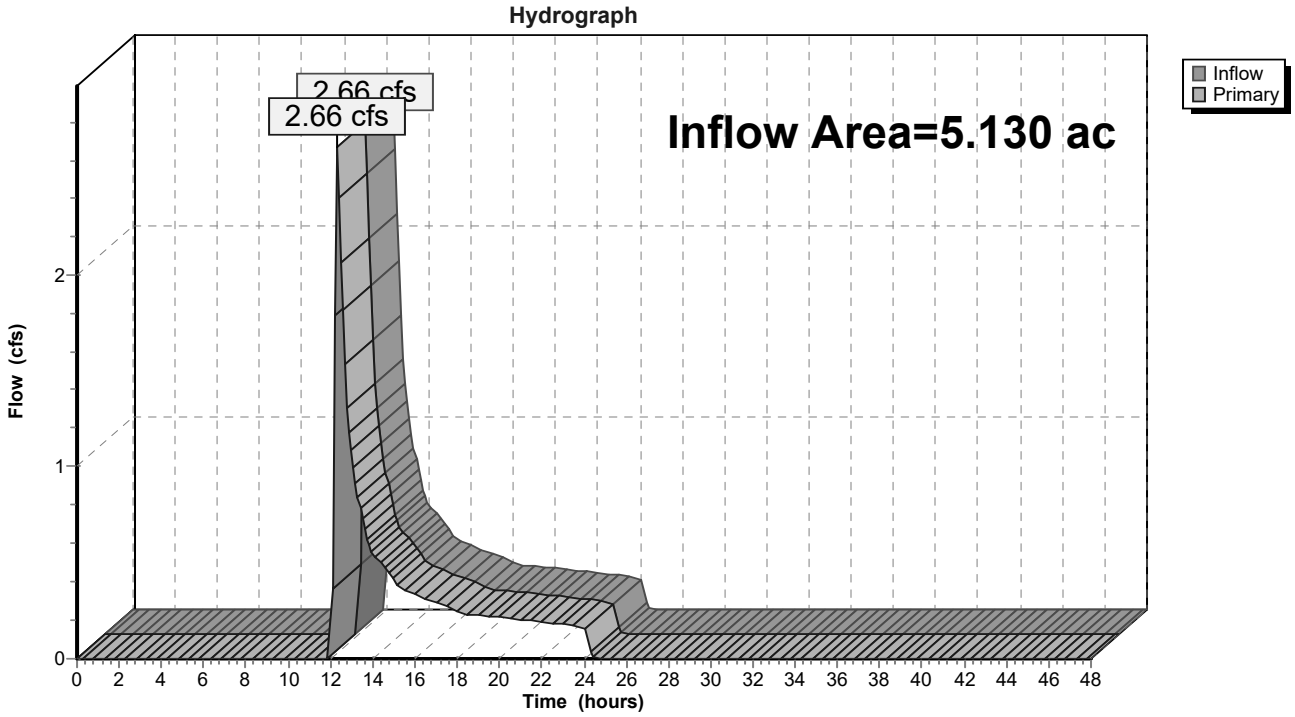


Summary for Link POA-1:

Inflow Area = 5.130 ac, 0.39% Impervious, Inflow Depth = 0.97" for 100-Year NOAA Atlas 14 event
Inflow = 2.66 cfs @ 12.33 hrs, Volume= 0.413 af
Primary = 2.66 cfs @ 12.33 hrs, Volume= 0.413 af, Atten= 0%, Lag= 0.0 min

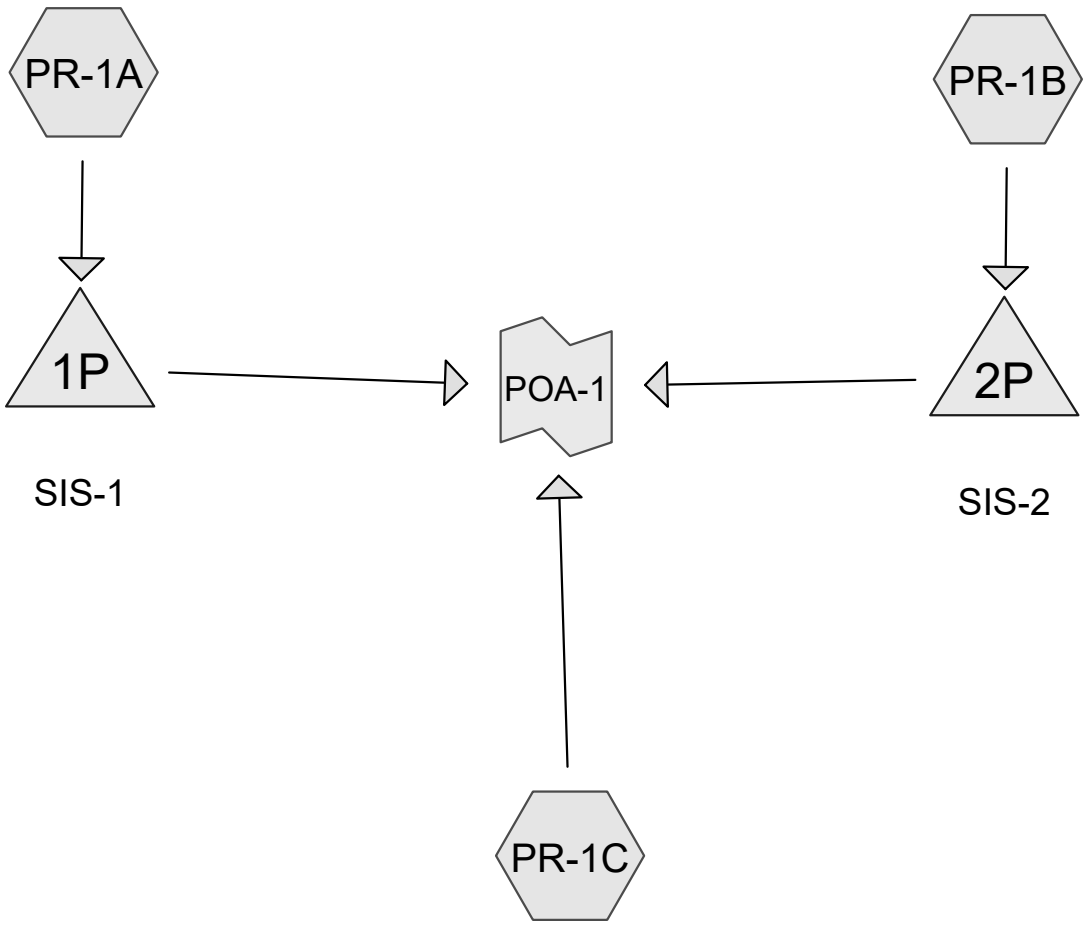
Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs

Link POA-1:



Attachment 5 – HydroCad Output:

Post-Development Conditions



Subcat Reach Pond Link

Routing Diagram for Post-Development
Prepared by CDG, Printed 3/30/2026

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.730	39	>75% Grass cover, Good, HSG A (PR-1A, PR-1B, PR-1C)
0.020	80	>75% Grass cover, Good, HSG D (PR-1C)
0.070	76	Gravel roads, HSG A (PR-1C)
1.190	98	Paved parking, HSG A (PR-1A, PR-1B)
0.930	98	Roofs, HSG A (PR-1A)
0.070	98	Unconnected pavement, HSG A (PR-1C)
1.120	30	Woods, Good, HSG A (PR-1C)
5.130	**63**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
5.110	HSG A	PR-1A, PR-1B, PR-1C
0.000	HSG B	
0.000	HSG C	
0.020	HSG D	PR-1C
0.000	Other	
5.130		**TOTAL AREA**

Time span=0.00-48.00 hrs, dt=0.10 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PR-1A: Runoff Area=1.470 ac 91.84% Impervious Runoff Depth=2.62"
Tc=6.0 min CN=93 Runoff=4.28 cfs 0.321 af

Subcatchment PR-1B: Runoff Area=0.960 ac 80.21% Impervious Runoff Depth=1.99"
Tc=6.0 min CN=86 Runoff=2.21 cfs 0.159 af

Subcatchment PR-1C: Runoff Area=2.700 ac 2.59% Impervious Runoff Depth=0.00"
Flow Length=216' Tc=13.0 min UI Adjusted CN=37 Runoff=0.00 cfs 0.000 af

Pond 1P: SIS-1 Peak Elev=91.07' Storage=3,864 cf Inflow=4.28 cfs 0.321 af
Discarded=0.77 cfs 0.321 af Primary=0.00 cfs 0.000 af Outflow=0.77 cfs 0.321 af

Pond 2P: SIS-2 Peak Elev=84.47' Storage=1,388 cf Inflow=2.21 cfs 0.159 af
Discarded=0.64 cfs 0.159 af Primary=0.00 cfs 0.000 af Outflow=0.64 cfs 0.159 af

Link POA-1: Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Total Runoff Area = 5.130 ac Runoff Volume = 0.480 af Average Runoff Depth = 1.12"
57.31% Pervious = 2.940 ac 42.69% Impervious = 2.190 ac

Summary for Subcatchment PR-1A:

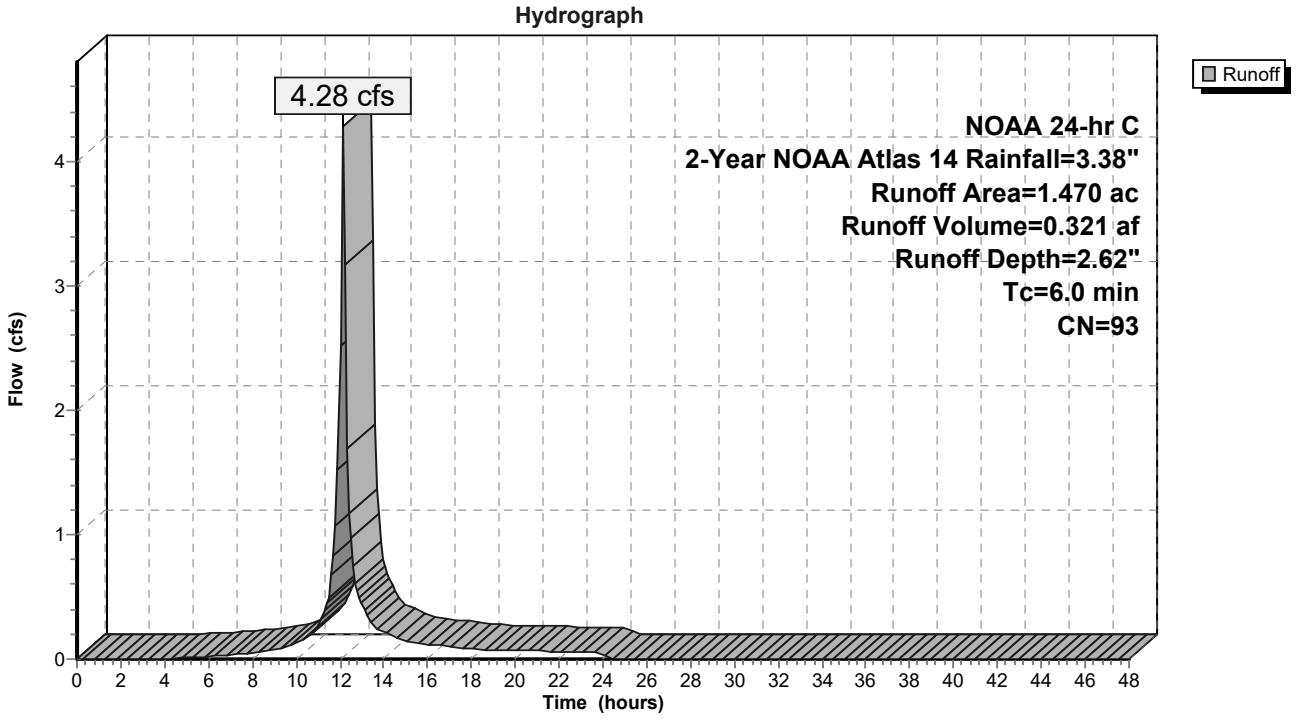
Runoff = 4.28 cfs @ 12.11 hrs, Volume= 0.321 af, Depth= 2.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
NOAA 24-hr C 2-Year NOAA Atlas 14 Rainfall=3.38"

Area (ac)	CN	Description
0.420	98	Paved parking, HSG A
0.930	98	Roofs, HSG A
0.120	39	>75% Grass cover, Good, HSG A
1.470	93	Weighted Average
0.120	39	8.16% Pervious Area
1.350	98	91.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment PR-1A:



Summary for Subcatchment PR-1B:

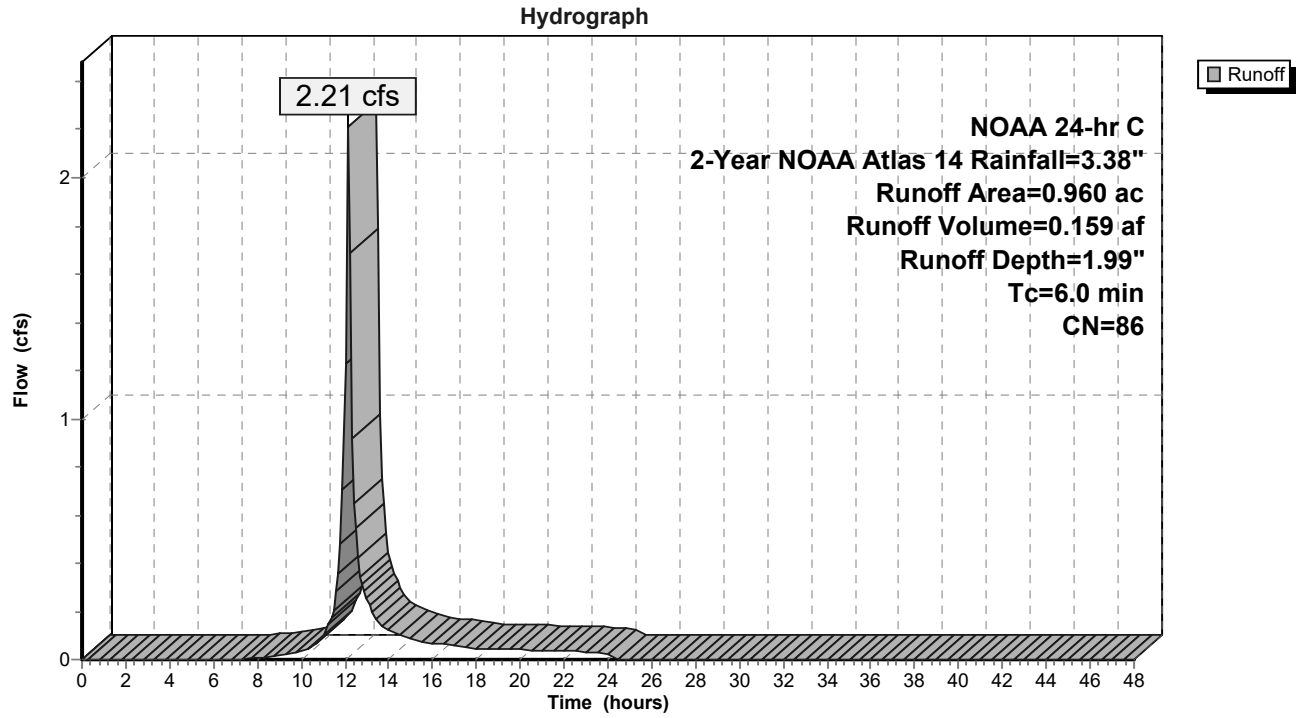
Runoff = 2.21 cfs @ 12.12 hrs, Volume= 0.159 af, Depth= 1.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
NOAA 24-hr C 2-Year NOAA Atlas 14 Rainfall=3.38"

Area (ac)	CN	Description
0.770	98	Paved parking, HSG A
0.190	39	>75% Grass cover, Good, HSG A
0.960	86	Weighted Average
0.190	39	19.79% Pervious Area
0.770	98	80.21% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment PR-1B:



Summary for Subcatchment PR-1C:

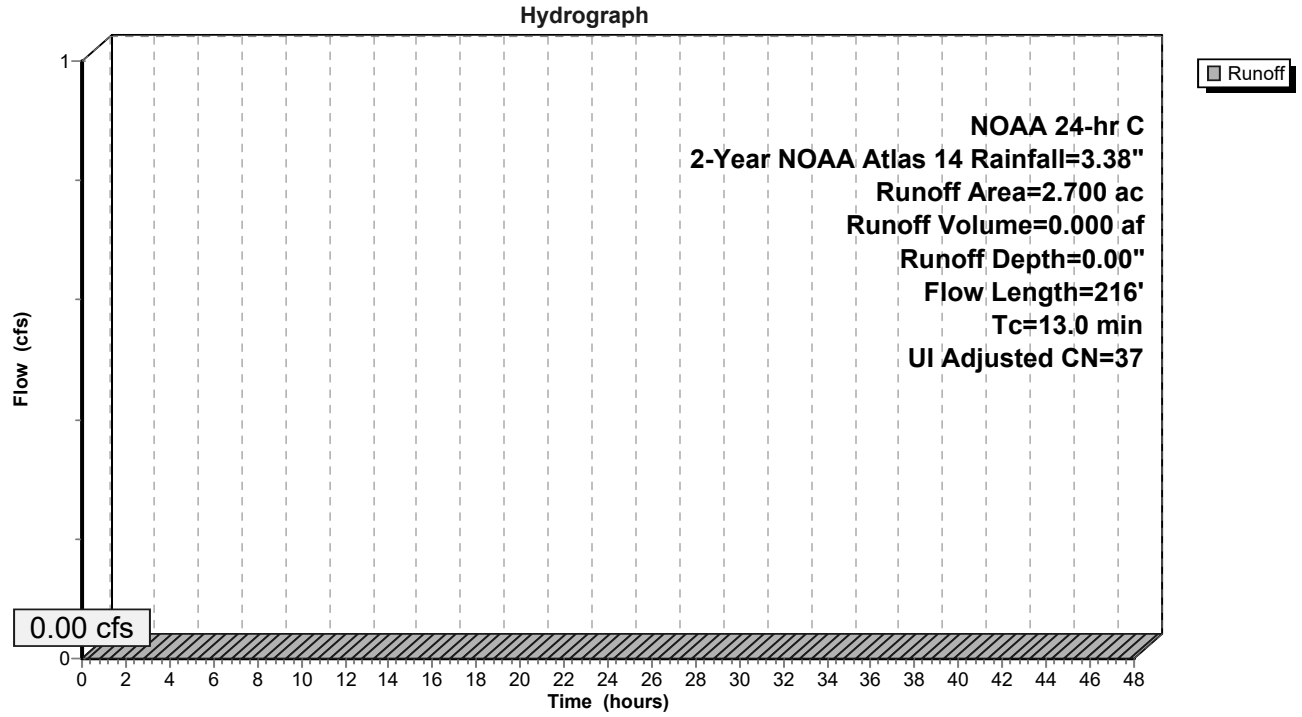
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
NOAA 24-hr C 2-Year NOAA Atlas 14 Rainfall=3.38"

Area (ac)	CN	Adj	Description
0.070	98		Unconnected pavement, HSG A
0.070	76		Gravel roads, HSG A
1.420	39		>75% Grass cover, Good, HSG A
0.020	80		>75% Grass cover, Good, HSG D
1.120	30		Woods, Good, HSG A
2.700	38	37	Weighted Average, UI Adjusted
2.630	36	36	97.41% Pervious Area
0.070	98	98	2.59% Impervious Area
0.070			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0200	0.11		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.42"
1.2	50	0.0100	0.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.9	116	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.0	216	Total			

Subcatchment PR-1C:



Summary for Pond 1P: SIS-1

Inflow Area = 1.470 ac, 91.84% Impervious, Inflow Depth = 2.62" for 2-Year NOAA Atlas 14 event
Inflow = 4.28 cfs @ 12.11 hrs, Volume= 0.321 af
Outflow = 0.77 cfs @ 11.80 hrs, Volume= 0.321 af, Atten= 82%, Lag= 0.0 min
Discarded = 0.77 cfs @ 11.80 hrs, Volume= 0.321 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 91.07' @ 12.60 hrs Surf.Area= 4,032 sf Storage= 3,864 cf

Plug-Flow detention time= 31.8 min calculated for 0.320 af (100% of inflow)
Center-of-Mass det. time= 31.9 min (825.1 - 793.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	90.00'	0 cf	**56.00'W x 72.00'L x 5.67'H Field A** 22,848 cf Overall - 22,848 cf Embedded = 0 cf x 40.0% Voids
#2A	90.00'	18,018 cf	**retain_it retain_it 5.0'** x 63 Inside #1 Inside= 84.0"W x 60.0"H => 36.41 sf x 8.00'L = 291.3 cf Outside= 96.0"W x 68.0"H => 45.33 sf x 8.00'L = 362.7 cf 7 Rows adjusted for 332.5 cf perimeter wall
		18,018 cf	Total Available Storage

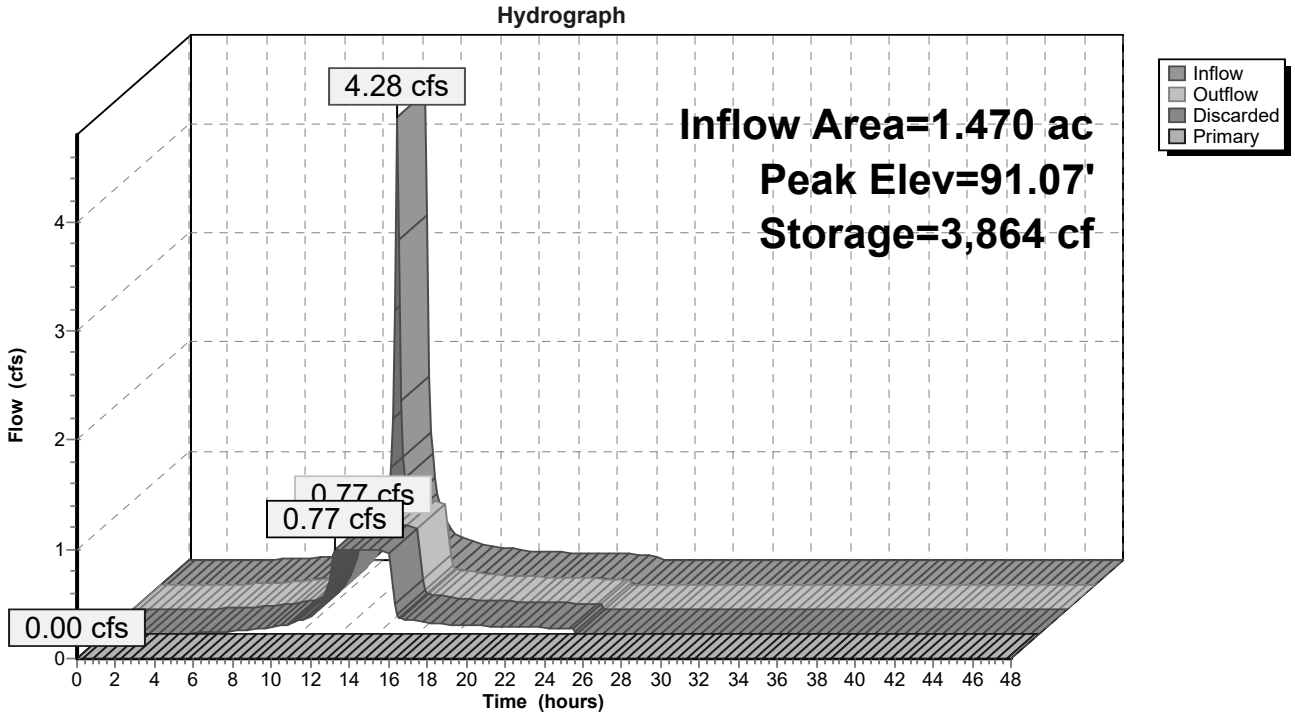
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	95.00'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#2	Discarded	90.00'	**8.270 in/hr Exfiltration over Horizontal area**

Discarded OutFlow Max=0.77 cfs @ 11.80 hrs HW=90.07' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.77 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=90.00' (Free Discharge)
↑—**1=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1P: SIS-1


Hydrograph
Inflow
Outflow
Discarded
Primary
4.28 cfs
0.77 cfs
0.77 cfs
0.00 cfs
Inflow Area=1.470 ac
Peak Elev=91.07'
Storage=3,864 cf
Flow (cfs)
0
1
2
3
4
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48
Time (hours)

Summary for Pond 2P: SIS-2

Inflow Area = 0.960 ac, 80.21% Impervious, Inflow Depth = 1.99" for 2-Year NOAA Atlas 14 event
Inflow = 2.21 cfs @ 12.12 hrs, Volume= 0.159 af
Outflow = 0.64 cfs @ 12.00 hrs, Volume= 0.159 af, Atten= 71%, Lag= 0.0 min
Discarded = 0.64 cfs @ 12.00 hrs, Volume= 0.159 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 84.47' @ 12.43 hrs Surf.Area= 3,328 sf Storage= 1,388 cf

Plug-Flow detention time= 13.7 min calculated for 0.159 af (100% of inflow)
Center-of-Mass det. time= 13.2 min (836.6 - 823.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	84.00'	0 cf	**32.00'W x 104.00'L x 4.17'H Field A** 13,867 cf Overall - 13,867 cf Embedded = 0 cf x 40.0% Voids
#2A	84.00'	10,232 cf	**retain_it retain_it 3.5'** x 52 Inside #1 Inside= 84.0"W x 42.0"H => 25.10 sf x 8.00'L = 200.8 cf Outside= 96.0"W x 50.0"H => 33.33 sf x 8.00'L = 266.7 cf 4 Rows adjusted for 208.8 cf perimeter wall
		10,232 cf	Total Available Storage

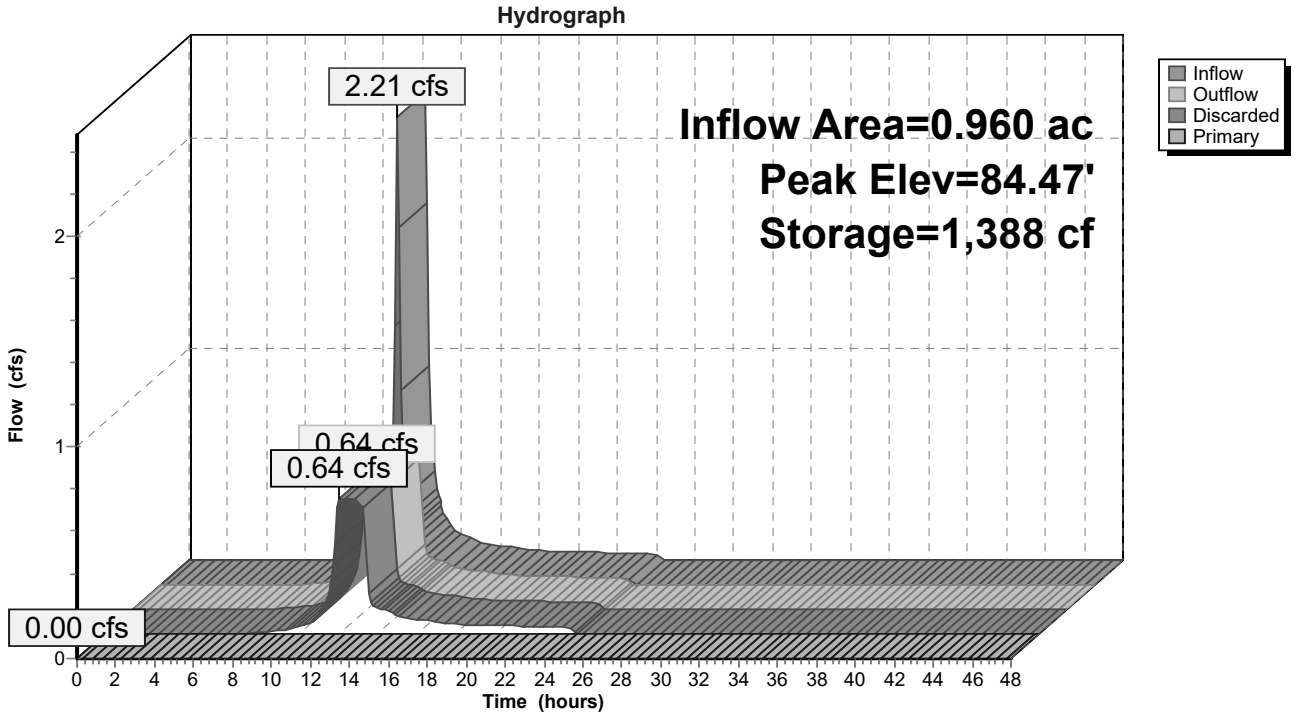
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	87.50'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#2	Discarded	84.00'	**8.270 in/hr Exfiltration over Horizontal area**

Discarded OutFlow Max=0.64 cfs @ 12.00 hrs HW=84.08' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.64 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=84.00' (Free Discharge)
↑—**1=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 2P: SIS-2

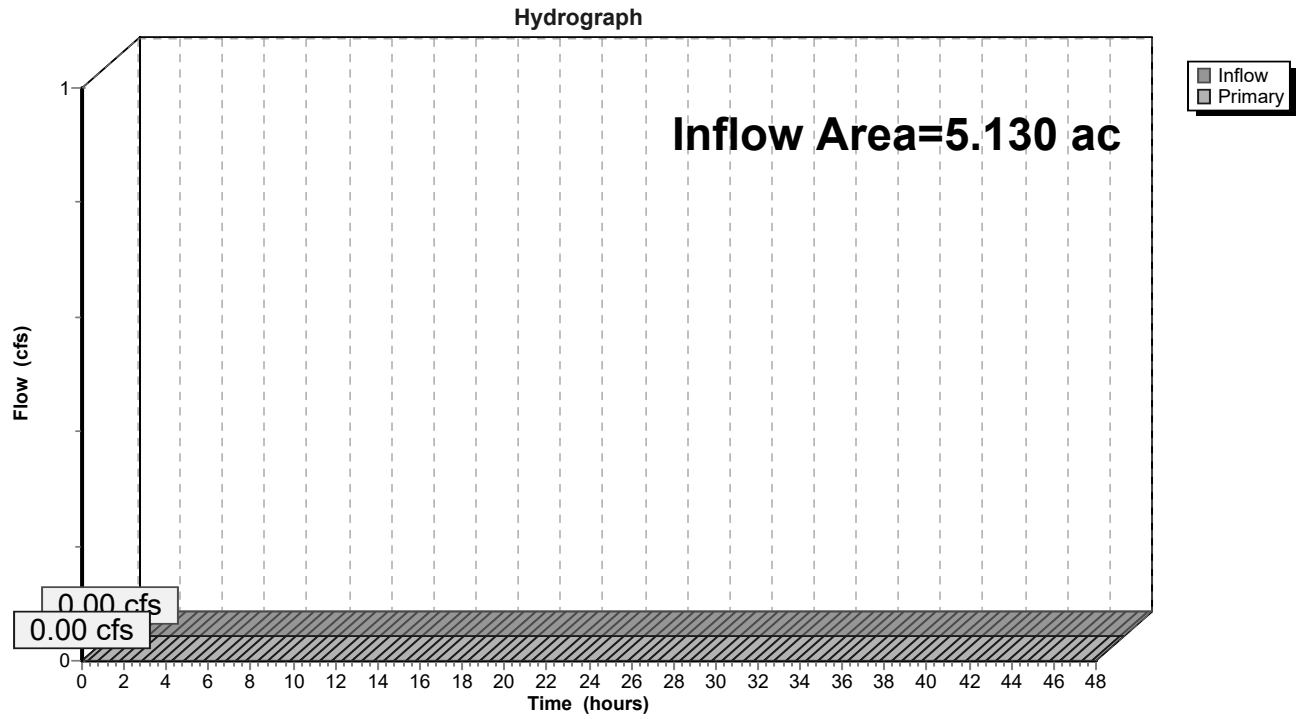

Hydrograph
Inflow
Outflow
Discarded
Primary
2.21 cfs
Inflow Area=0.960 ac
Peak Elev=84.47'
Storage=1,388 cf
0.64 cfs
0.64 cfs
0.00 cfs
Flow (cfs)
0
1
2
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48
Time (hours)

Summary for Link POA-1:

Inflow Area = 5.130 ac, 42.69% Impervious, Inflow Depth = 0.00" for 2-Year NOAA Atlas 14 event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs

Link POA-1:



Time span=0.00-48.00 hrs, dt=0.10 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PR-1A: Runoff Area=1.470 ac 91.84% Impervious Runoff Depth=4.53"
Tc=6.0 min CN=93 Runoff=7.17 cfs 0.555 af

Subcatchment PR-1B: Runoff Area=0.960 ac 80.21% Impervious Runoff Depth=3.79"
Tc=6.0 min CN=86 Runoff=4.12 cfs 0.303 af

Subcatchment PR-1C: Runoff Area=2.700 ac 2.59% Impervious Runoff Depth=0.20"
Flow Length=216' Tc=13.0 min UI Adjusted CN=37 Runoff=0.09 cfs 0.044 af

Pond 1P: SIS-1 Peak Elev=92.39' Storage=8,616 cf Inflow=7.17 cfs 0.555 af
Discarded=0.77 cfs 0.555 af Primary=0.00 cfs 0.000 af Outflow=0.77 cfs 0.555 af

Pond 2P: SIS-2 Peak Elev=85.37' Storage=4,007 cf Inflow=4.12 cfs 0.303 af
Discarded=0.64 cfs 0.303 af Primary=0.00 cfs 0.000 af Outflow=0.64 cfs 0.303 af

Link POA-1: Inflow=0.09 cfs 0.044 af
Primary=0.09 cfs 0.044 af

Total Runoff Area = 5.130 ac Runoff Volume = 0.902 af Average Runoff Depth = 2.11"
57.31% Pervious = 2.940 ac 42.69% Impervious = 2.190 ac

Summary for Subcatchment PR-1A:

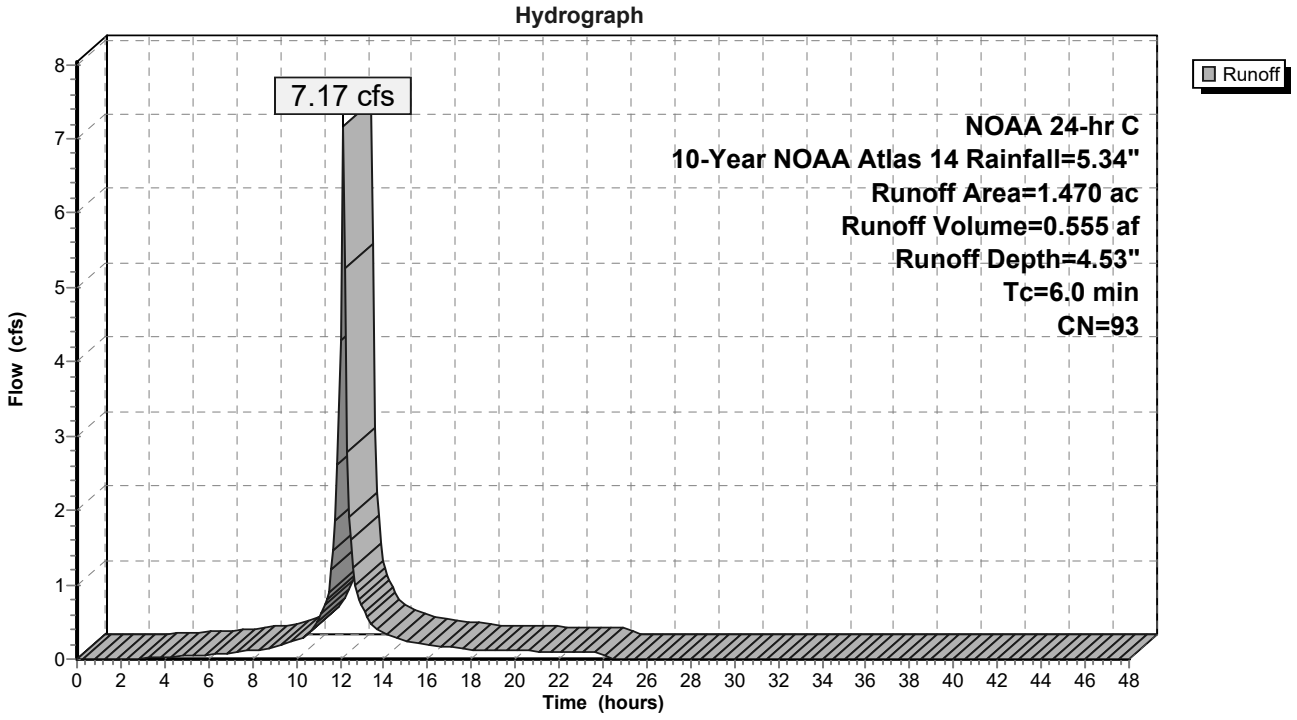
Runoff = 7.17 cfs @ 12.11 hrs, Volume= 0.555 af, Depth= 4.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
NOAA 24-hr C 10-Year NOAA Atlas 14 Rainfall=5.34"

Area (ac)	CN	Description
0.420	98	Paved parking, HSG A
0.930	98	Roofs, HSG A
0.120	39	>75% Grass cover, Good, HSG A
1.470	93	Weighted Average
0.120	39	8.16% Pervious Area
1.350	98	91.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment PR-1A:



Summary for Subcatchment PR-1B:

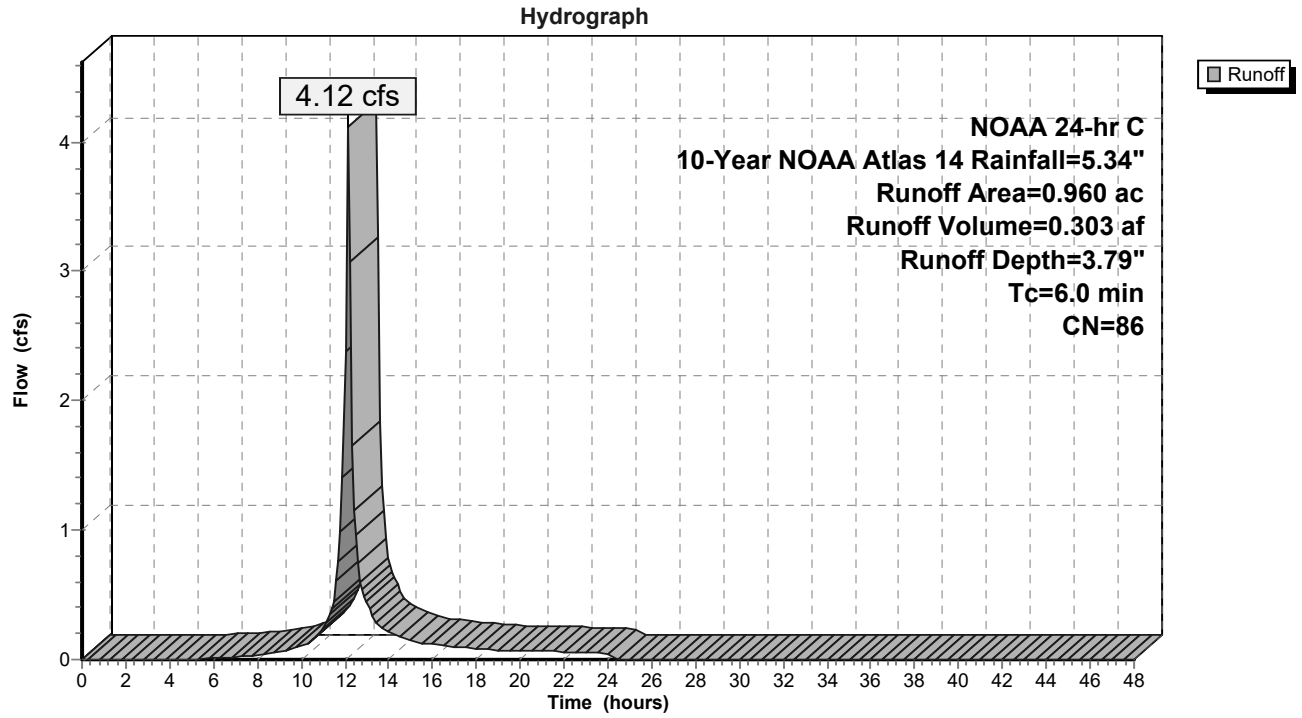
Runoff = 4.12 cfs @ 12.11 hrs, Volume= 0.303 af, Depth= 3.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
NOAA 24-hr C 10-Year NOAA Atlas 14 Rainfall=5.34"

Area (ac)	CN	Description
0.770	98	Paved parking, HSG A
0.190	39	>75% Grass cover, Good, HSG A
0.960	86	Weighted Average
0.190	39	19.79% Pervious Area
0.770	98	80.21% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment PR-1B:



Summary for Subcatchment PR-1C:

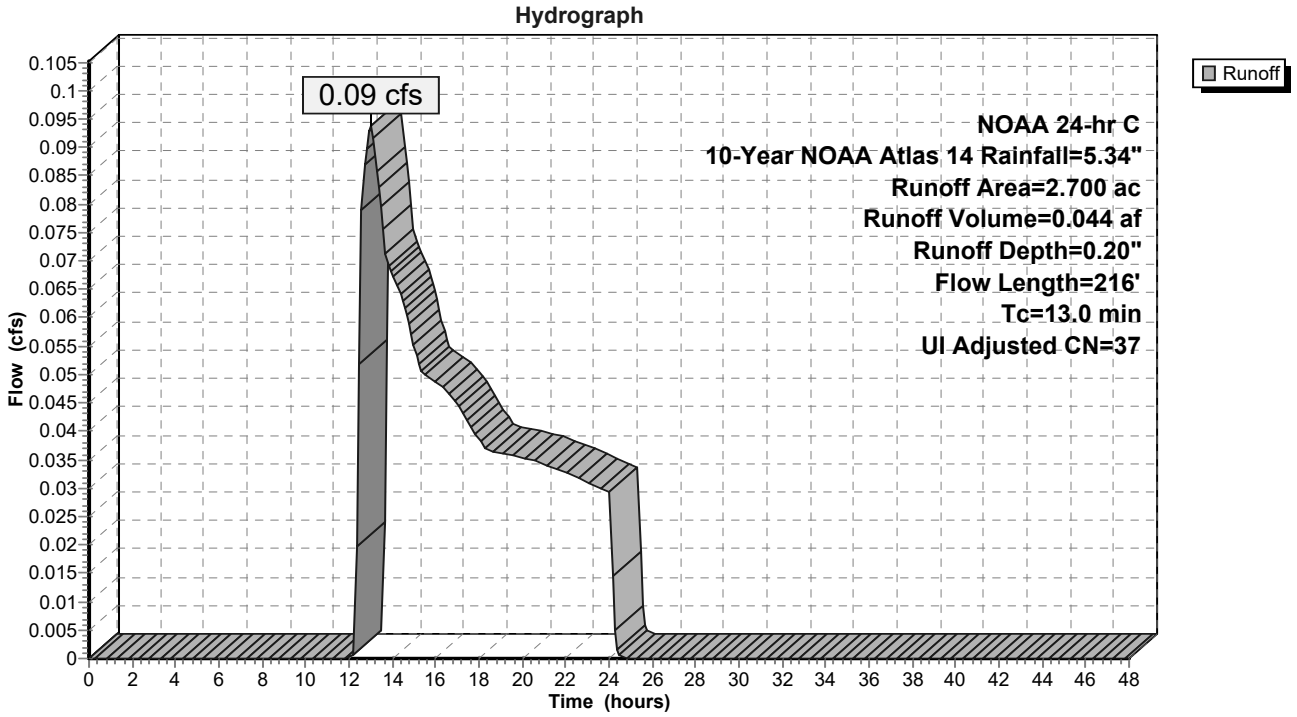
Runoff = 0.09 cfs @ 12.99 hrs, Volume= 0.044 af, Depth= 0.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
NOAA 24-hr C 10-Year NOAA Atlas 14 Rainfall=5.34"

Area (ac)	CN	Adj	Description
0.070	98		Unconnected pavement, HSG A
0.070	76		Gravel roads, HSG A
1.420	39		>75% Grass cover, Good, HSG A
0.020	80		>75% Grass cover, Good, HSG D
1.120	30		Woods, Good, HSG A
2.700	38	37	Weighted Average, UI Adjusted
2.630	36	36	97.41% Pervious Area
0.070	98	98	2.59% Impervious Area
0.070			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0200	0.11		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.42"
1.2	50	0.0100	0.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.9	116	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.0	216	Total			

Subcatchment PR-1C:



Summary for Pond 1P: SIS-1

Inflow Area = 1.470 ac, 91.84% Impervious, Inflow Depth = 4.53" for 10-Year NOAA Atlas 14 event
Inflow = 7.17 cfs @ 12.11 hrs, Volume= 0.555 af
Outflow = 0.77 cfs @ 11.50 hrs, Volume= 0.555 af, Atten= 89%, Lag= 0.0 min
Discarded = 0.77 cfs @ 11.50 hrs, Volume= 0.555 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 92.39' @ 12.95 hrs Surf.Area= 4,032 sf Storage= 8,616 cf

Plug-Flow detention time= 78.2 min calculated for 0.555 af (100% of inflow)
Center-of-Mass det. time= 77.6 min (855.9 - 778.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	90.00'	0 cf	**56.00'W x 72.00'L x 5.67'H Field A** 22,848 cf Overall - 22,848 cf Embedded = 0 cf x 40.0% Voids
#2A	90.00'	18,018 cf	**retain_it retain_it 5.0'** x 63 Inside #1 Inside= 84.0"W x 60.0"H => 36.41 sf x 8.00'L = 291.3 cf Outside= 96.0"W x 68.0"H => 45.33 sf x 8.00'L = 362.7 cf 7 Rows adjusted for 332.5 cf perimeter wall
		18,018 cf	Total Available Storage

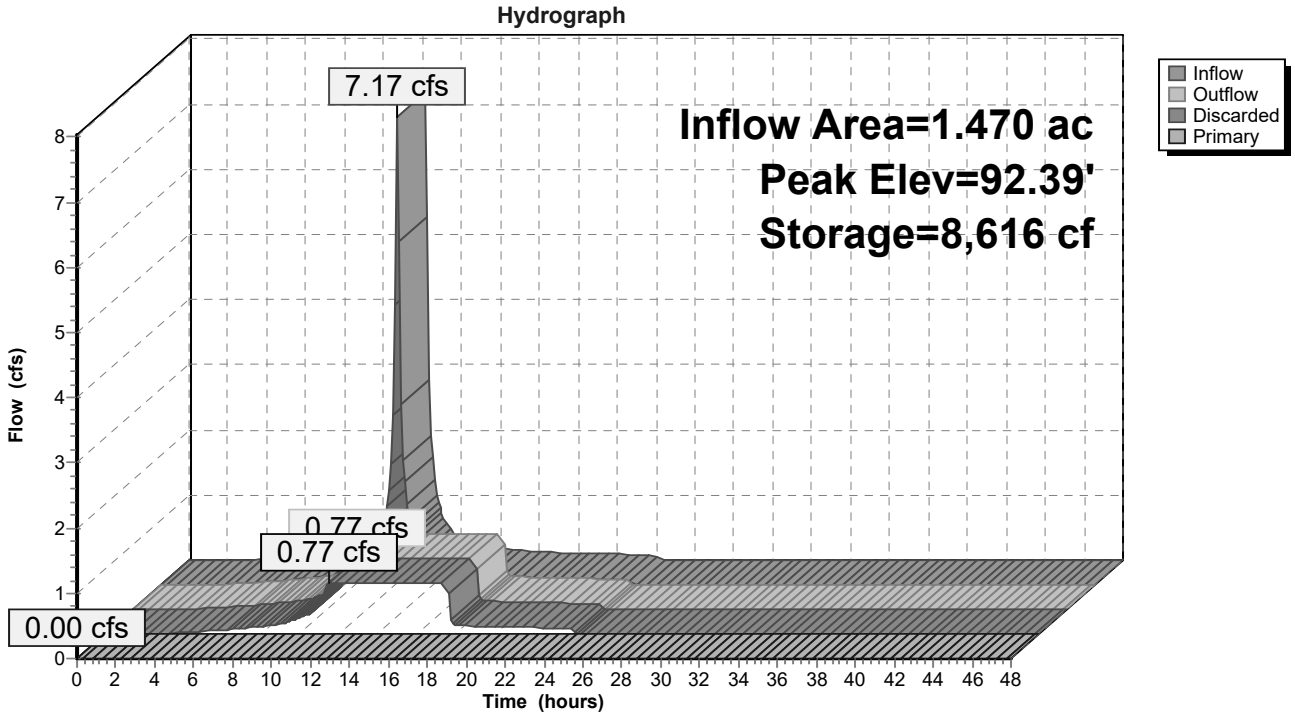
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	95.00'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#2	Discarded	90.00'	**8.270 in/hr Exfiltration over Horizontal area**

Discarded OutFlow Max=0.77 cfs @ 11.50 hrs HW=90.06' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.77 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=90.00' (Free Discharge)
↑—**1=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1P: SIS-1


Hydrograph
7.17 cfs
0.77 cfs
0.77 cfs
0.00 cfs
Inflow Area=1.470 ac
Peak Elev=92.39'
Storage=8,616 cf
Inflow
Outflow
Discarded
Primary
Flow (cfs)
Time (hours)
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48
0 1 2 3 4 5 6 7 8

Summary for Pond 2P: SIS-2

Inflow Area = 0.960 ac, 80.21% Impervious, Inflow Depth = 3.79" for 10-Year NOAA Atlas 14 event
Inflow = 4.12 cfs @ 12.11 hrs, Volume= 0.303 af
Outflow = 0.64 cfs @ 11.70 hrs, Volume= 0.303 af, Atten= 85%, Lag= 0.0 min
Discarded = 0.64 cfs @ 11.70 hrs, Volume= 0.303 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 85.37' @ 12.68 hrs Surf.Area= 3,328 sf Storage= 4,007 cf

Plug-Flow detention time= 41.8 min calculated for 0.302 af (100% of inflow)
Center-of-Mass det. time= 41.9 min (846.6 - 804.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	84.00'	0 cf	**32.00'W x 104.00'L x 4.17'H Field A** 13,867 cf Overall - 13,867 cf Embedded = 0 cf x 40.0% Voids
#2A	84.00'	10,232 cf	**retain_it retain_it 3.5'** x 52 Inside #1 Inside= 84.0"W x 42.0"H => 25.10 sf x 8.00'L = 200.8 cf Outside= 96.0"W x 50.0"H => 33.33 sf x 8.00'L = 266.7 cf 4 Rows adjusted for 208.8 cf perimeter wall
		10,232 cf	Total Available Storage

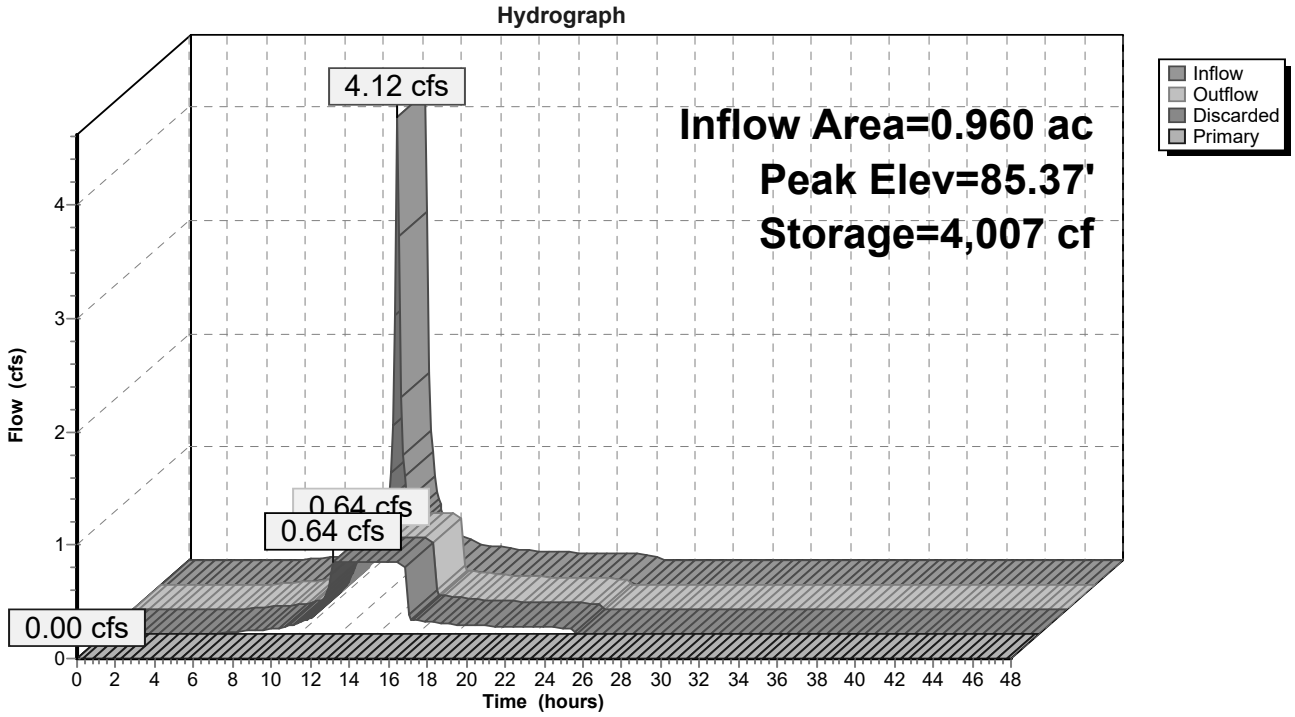
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	87.50'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#2	Discarded	84.00'	**8.270 in/hr Exfiltration over Horizontal area**

Discarded OutFlow Max=0.64 cfs @ 11.70 hrs HW=84.05' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.64 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=84.00' (Free Discharge)
↑—**1=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 2P: SIS-2

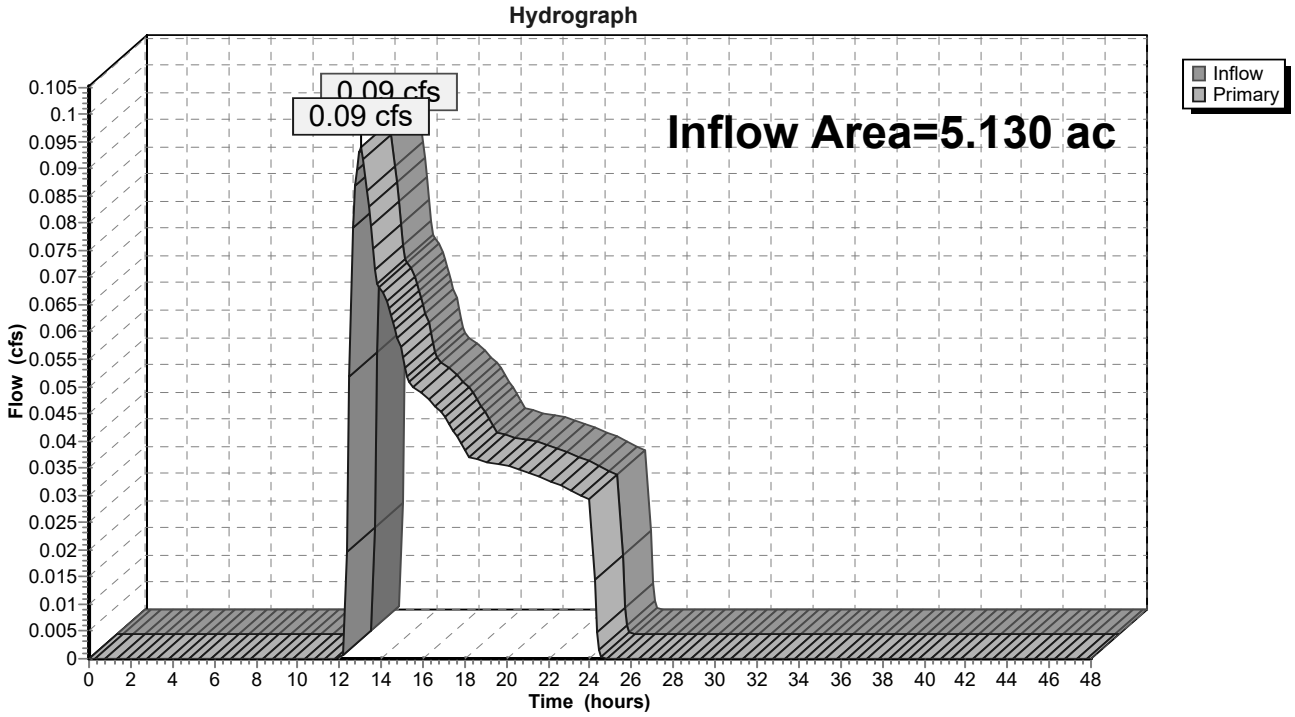

Hydrograph
Inflow
Outflow
Discarded
Primary
4.12 cfs
Inflow Area=0.960 ac
Peak Elev=85.37'
Storage=4,007 cf
0.64 cfs
0.64 cfs
0.00 cfs
Flow (cfs)
0
1
2
3
4
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48
Time (hours)

Summary for Link POA-1:

Inflow Area = 5.130 ac, 42.69% Impervious, Inflow Depth = 0.10" for 10-Year NOAA Atlas 14 event
Inflow = 0.09 cfs @ 12.99 hrs, Volume= 0.044 af
Primary = 0.09 cfs @ 12.99 hrs, Volume= 0.044 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs

Link POA-1:



Time span=0.00-48.00 hrs, dt=0.10 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PR-1A: Runoff Area=1.470 ac 91.84% Impervious Runoff Depth=7.62"
Tc=6.0 min CN=93 Runoff=11.71 cfs 0.933 af

Subcatchment PR-1B: Runoff Area=0.960 ac 80.21% Impervious Runoff Depth=6.78"
Tc=6.0 min CN=86 Runoff=7.16 cfs 0.542 af

Subcatchment PR-1C: Runoff Area=2.700 ac 2.59% Impervious Runoff Depth=1.16"
Flow Length=216' Tc=13.0 min UI Adjusted CN=37 Runoff=1.98 cfs 0.260 af

Pond 1P: SIS-1 Peak Elev=94.89' Storage=17,614 cf Inflow=11.71 cfs 0.933 af
Discarded=0.77 cfs 0.933 af Primary=0.00 cfs 0.000 af Outflow=0.77 cfs 0.933 af

Pond 2P: SIS-2 Peak Elev=87.18' Storage=9,299 cf Inflow=7.16 cfs 0.542 af
Discarded=0.64 cfs 0.542 af Primary=0.00 cfs 0.000 af Outflow=0.64 cfs 0.542 af

Link POA-1: Inflow=1.98 cfs 0.260 af
Primary=1.98 cfs 0.260 af

Total Runoff Area = 5.130 ac Runoff Volume = 1.736 af Average Runoff Depth = 4.06"
57.31% Pervious = 2.940 ac 42.69% Impervious = 2.190 ac

Summary for Subcatchment PR-1A:

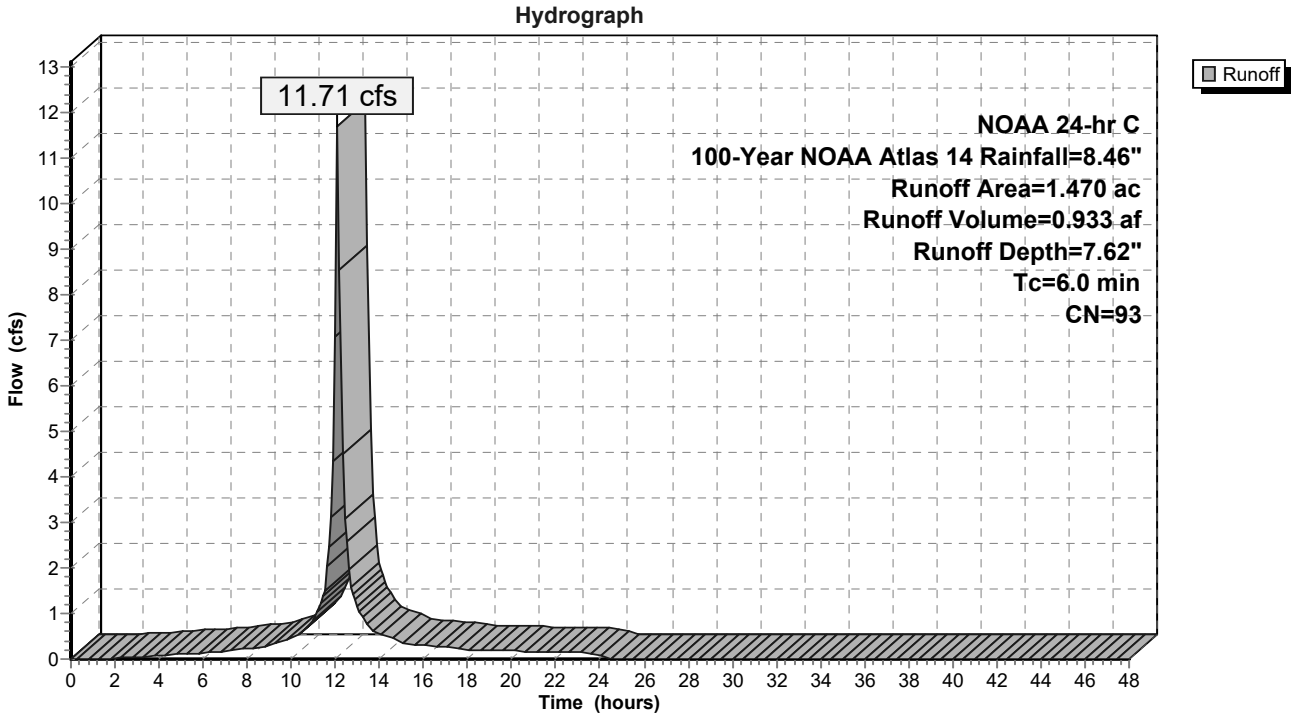
Runoff = 11.71 cfs @ 12.11 hrs, Volume= 0.933 af, Depth= 7.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
NOAA 24-hr C 100-Year NOAA Atlas 14 Rainfall=8.46"

Area (ac)	CN	Description
0.420	98	Paved parking, HSG A
0.930	98	Roofs, HSG A
0.120	39	>75% Grass cover, Good, HSG A
1.470	93	Weighted Average
0.120	39	8.16% Pervious Area
1.350	98	91.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment PR-1A:



Summary for Subcatchment PR-1B:

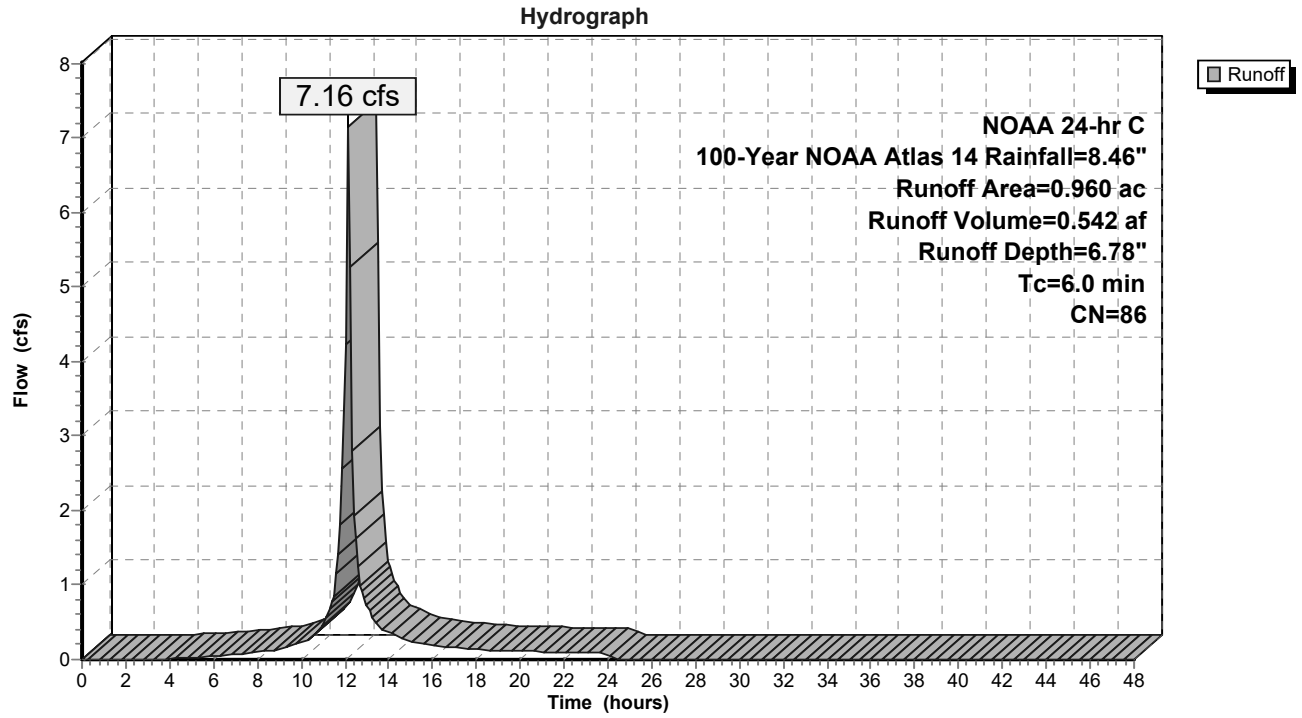
Runoff = 7.16 cfs @ 12.11 hrs, Volume= 0.542 af, Depth= 6.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
NOAA 24-hr C 100-Year NOAA Atlas 14 Rainfall=8.46"

Area (ac)	CN	Description
0.770	98	Paved parking, HSG A
0.190	39	>75% Grass cover, Good, HSG A
0.960	86	Weighted Average
0.190	39	19.79% Pervious Area
0.770	98	80.21% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment PR-1B:



Summary for Subcatchment PR-1C:

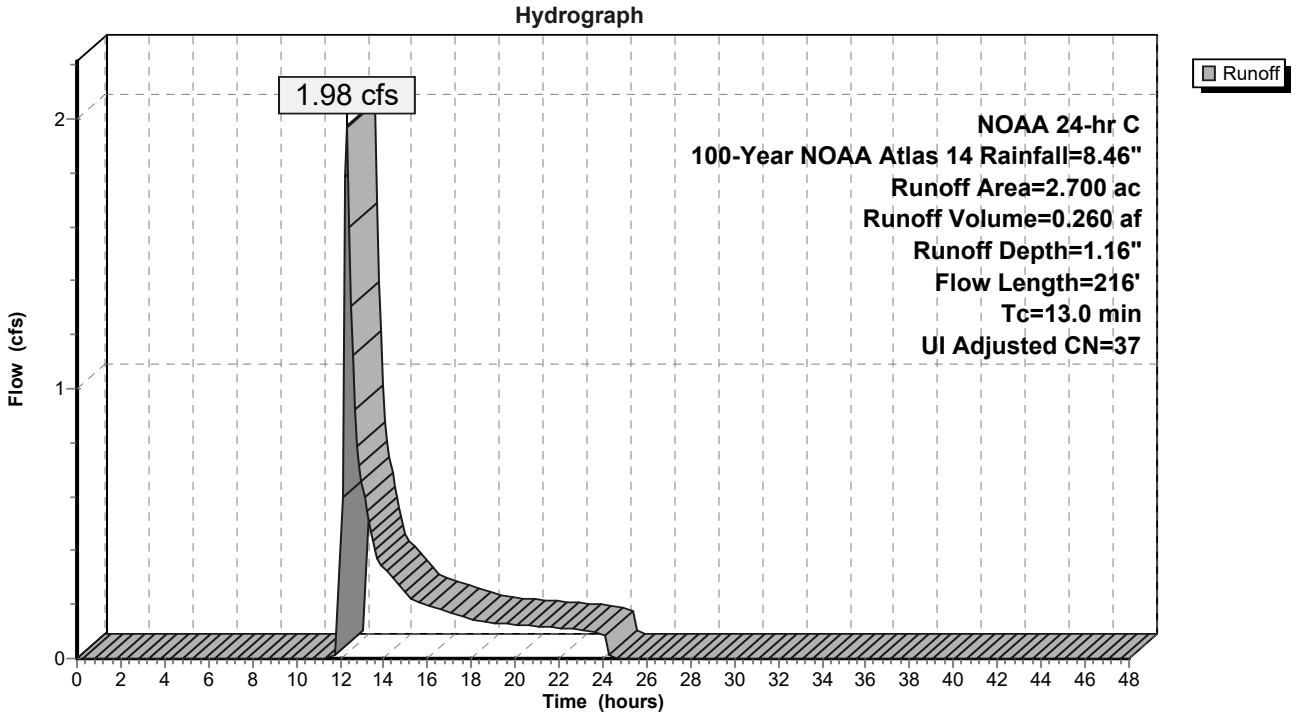
Runoff = 1.98 cfs @ 12.28 hrs, Volume= 0.260 af, Depth= 1.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
NOAA 24-hr C 100-Year NOAA Atlas 14 Rainfall=8.46"

Area (ac)	CN	Adj	Description
0.070	98		Unconnected pavement, HSG A
0.070	76		Gravel roads, HSG A
1.420	39		>75% Grass cover, Good, HSG A
0.020	80		>75% Grass cover, Good, HSG D
1.120	30		Woods, Good, HSG A
2.700	38	37	Weighted Average, UI Adjusted
2.630	36	36	97.41% Pervious Area
0.070	98	98	2.59% Impervious Area
0.070			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0200	0.11		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.42"
1.2	50	0.0100	0.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.9	116	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.0	216	Total			

Subcatchment PR-1C:



Summary for Pond 1P: SIS-1

Inflow Area = 1.470 ac, 91.84% Impervious, Inflow Depth = 7.62" for 100-Year NOAA Atlas 14 event
Inflow = 11.71 cfs @ 12.11 hrs, Volume= 0.933 af
Outflow = 0.77 cfs @ 11.00 hrs, Volume= 0.933 af, Atten= 93%, Lag= 0.0 min
Discarded = 0.77 cfs @ 11.00 hrs, Volume= 0.933 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 94.89' @ 13.44 hrs Surf.Area= 4,032 sf Storage= 17,614 cf

Plug-Flow detention time= 177.5 min calculated for 0.933 af (100% of inflow)
Center-of-Mass det. time= 177.3 min (942.7 - 765.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	90.00'	0 cf	**56.00'W x 72.00'L x 5.67'H Field A** 22,848 cf Overall - 22,848 cf Embedded = 0 cf x 40.0% Voids
#2A	90.00'	18,018 cf	**retain_it retain_it 5.0'** x 63 Inside #1 Inside= 84.0"W x 60.0"H => 36.41 sf x 8.00'L = 291.3 cf Outside= 96.0"W x 68.0"H => 45.33 sf x 8.00'L = 362.7 cf 7 Rows adjusted for 332.5 cf perimeter wall
		18,018 cf	Total Available Storage

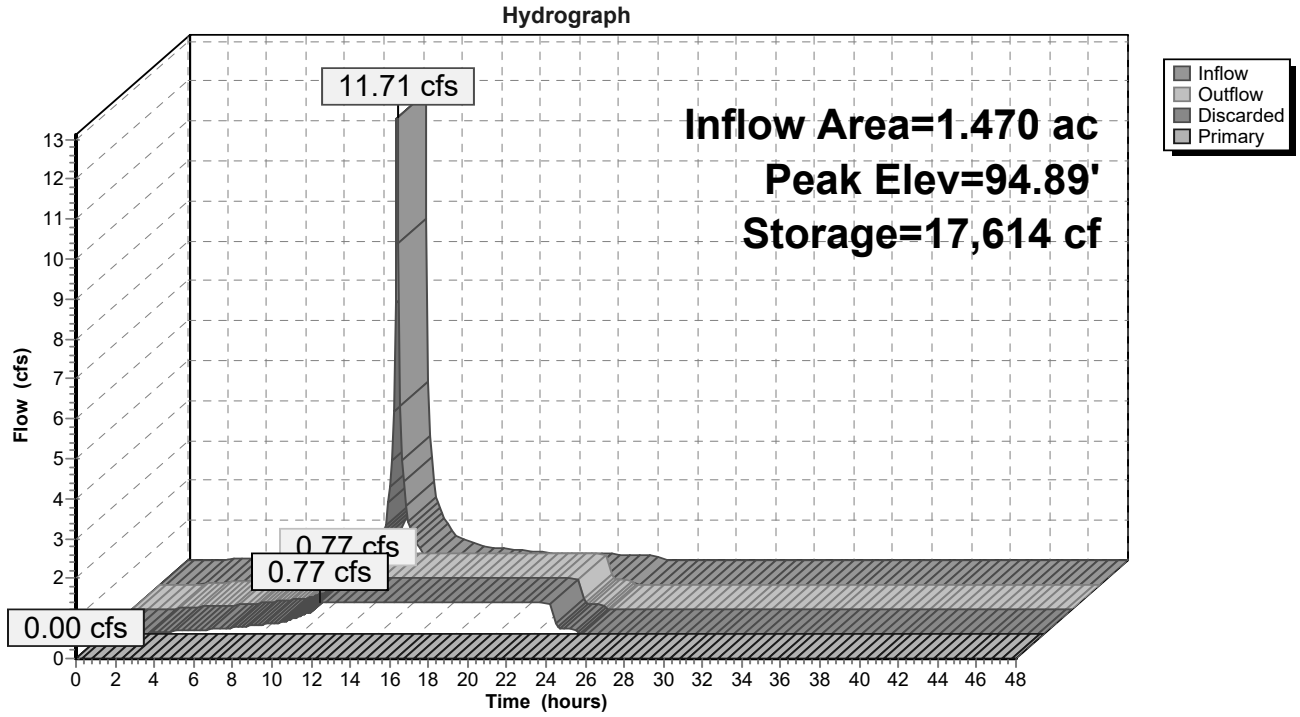
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	95.00'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#2	Discarded	90.00'	**8.270 in/hr Exfiltration over Horizontal area**

Discarded OutFlow Max=0.77 cfs @ 11.00 hrs HW=90.06' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.77 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=90.00' (Free Discharge)
↑—**1=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1P: SIS-1


Hydrograph
11.71 cfs
Inflow Area=1.470 ac
Peak Elev=94.89'
Storage=17,614 cf
0.77 cfs
0.77 cfs
0.00 cfs
Inflow
Outflow
Discarded
Primary
Flow (cfs)
Time (hours)
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48
0 2 3 4 5 6 7 8 9 10 11 12 13

Summary for Pond 2P: SIS-2

Inflow Area = 0.960 ac, 80.21% Impervious, Inflow Depth = 6.78" for 100-Year NOAA Atlas 14 event
Inflow = 7.16 cfs @ 12.11 hrs, Volume= 0.542 af
Outflow = 0.64 cfs @ 11.30 hrs, Volume= 0.542 af, Atten= 91%, Lag= 0.0 min
Discarded = 0.64 cfs @ 11.30 hrs, Volume= 0.542 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 87.18' @ 13.14 hrs Surf.Area= 3,328 sf Storage= 9,299 cf

Plug-Flow detention time= 109.2 min calculated for 0.541 af (100% of inflow)
Center-of-Mass det. time= 109.0 min (897.3 - 788.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	84.00'	0 cf	**32.00'W x 104.00'L x 4.17'H Field A** 13,867 cf Overall - 13,867 cf Embedded = 0 cf x 40.0% Voids
#2A	84.00'	10,232 cf	**retain_it retain_it 3.5'** x 52 Inside #1 Inside= 84.0"W x 42.0"H => 25.10 sf x 8.00'L = 200.8 cf Outside= 96.0"W x 50.0"H => 33.33 sf x 8.00'L = 266.7 cf 4 Rows adjusted for 208.8 cf perimeter wall
		10,232 cf	Total Available Storage

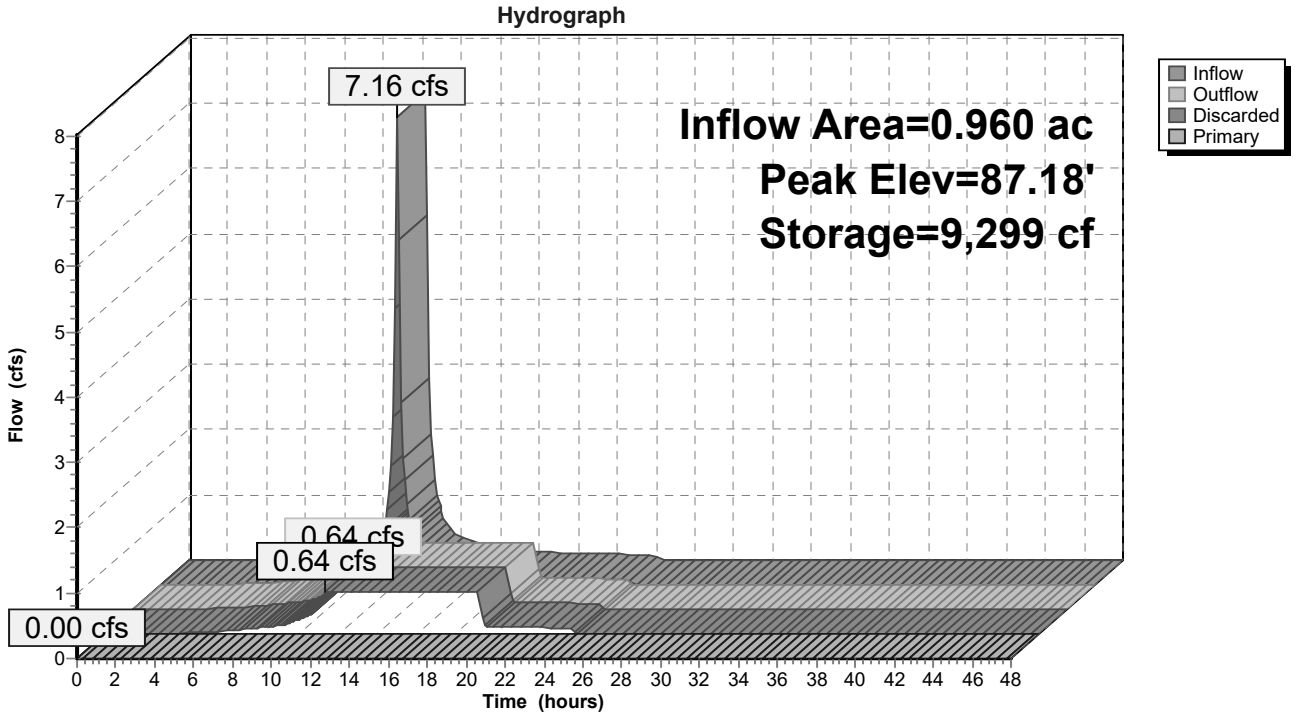
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	87.50'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#2	Discarded	84.00'	**8.270 in/hr Exfiltration over Horizontal area**

Discarded OutFlow Max=0.64 cfs @ 11.30 hrs HW=84.04' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.64 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=84.00' (Free Discharge)
↑—**1=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 2P: SIS-2

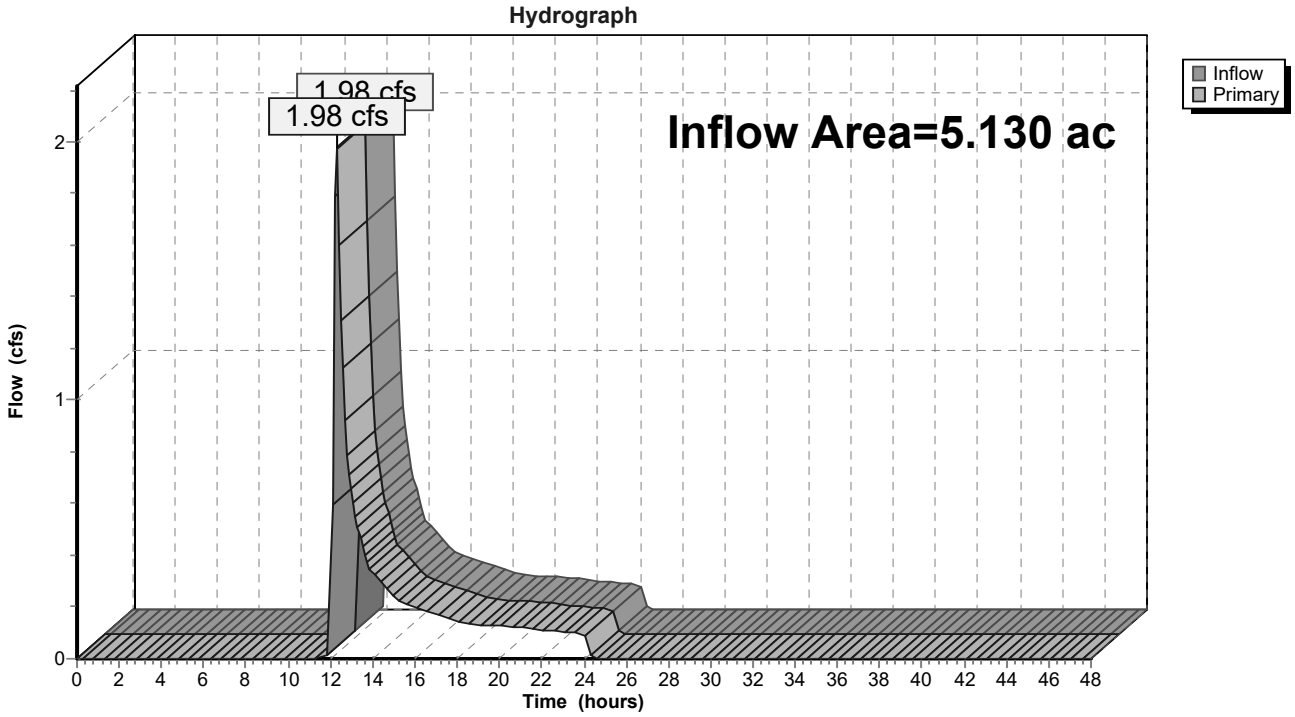

Hydrograph
Inflow
Outflow
Discarded
Primary
7.16 cfs
0.64 cfs
0.64 cfs
0.00 cfs
Inflow Area=0.960 ac
Peak Elev=87.18'
Storage=9,299 cf
Flow (cfs)
Time (hours)
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48
0 1 2 3 4 5 6 7 8

Summary for Link POA-1:

Inflow Area = 5.130 ac, 42.69% Impervious, Inflow Depth = 0.61" for 100-Year NOAA Atlas 14 event
Inflow = 1.98 cfs @ 12.28 hrs, Volume= 0.260 af
Primary = 1.98 cfs @ 12.28 hrs, Volume= 0.260 af, Atten= 0%, Lag= 0.0 min

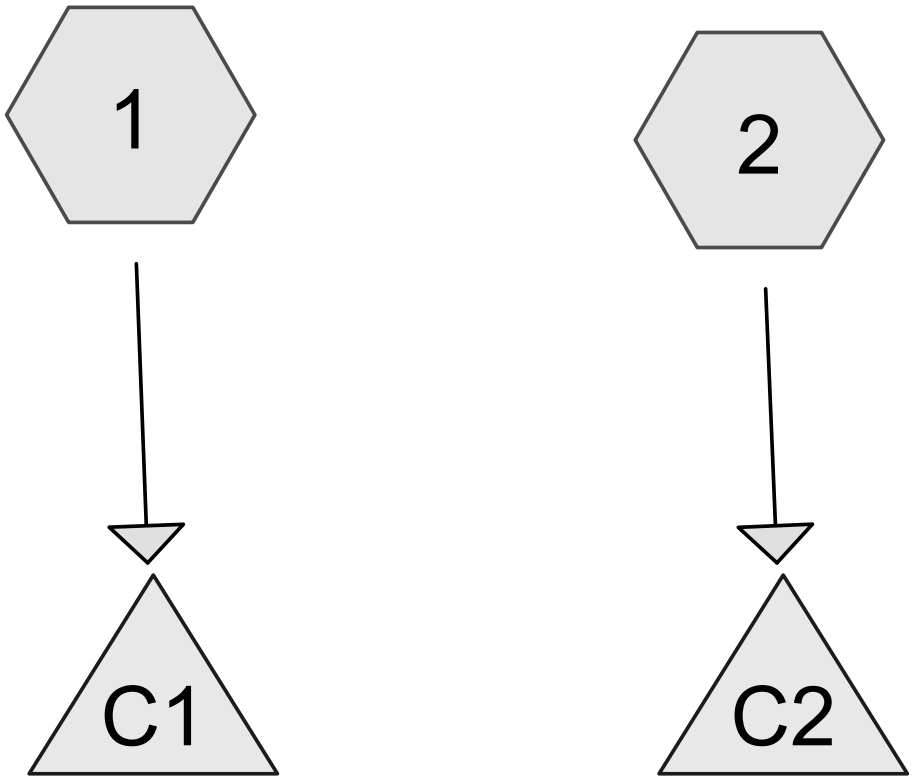
Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs

Link POA-1:



Attachment 6 – HydroCad Output:

Culvert Sizing



Culvert 1

Culvert 2

Subcat Reach Pond Link

Routing Diagram for Culverts
Prepared by CDG, Printed 3/26/2026

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.910	39	>75% Grass cover, Good, HSG A (1, 2)
0.550	98	Paved parking, HSG A (1, 2)
0.890	30	Woods, Good, HSG A (2)
2.350	**49**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
2.350	HSG A	1, 2
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
0.000	Other	
2.350		**TOTAL AREA**

Time span=0.00-48.00 hrs, dt=0.10 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: Runoff Area=0.690 ac 15.94% Impervious Runoff Depth=2.31"
Tc=6.0 min CN=48 Runoff=1.71 cfs 0.133 af

Subcatchment 2: Runoff Area=1.660 ac 26.51% Impervious Runoff Depth=2.54"
Tc=6.0 min CN=50 Runoff=4.61 cfs 0.351 af

Pond C1: Culvert 1 Peak Elev=89.81' Storage=42 cf Inflow=1.71 cfs 0.133 af
12.0" Round Culvert n=0.013 L=79.4' S=0.0151 '/' Outflow=1.65 cfs 0.133 af

Pond C2: Culvert 2 Peak Elev=83.64' Storage=357 cf Inflow=4.61 cfs 0.351 af
18.0" Round Culvert n=0.013 L=81.3' S=0.1046 '/' Outflow=4.14 cfs 0.351 af

Total Runoff Area = 2.350 ac Runoff Volume = 0.484 af Average Runoff Depth = 2.47"
76.60% Pervious = 1.800 ac 23.40% Impervious = 0.550 ac

Summary for Subcatchment 1:

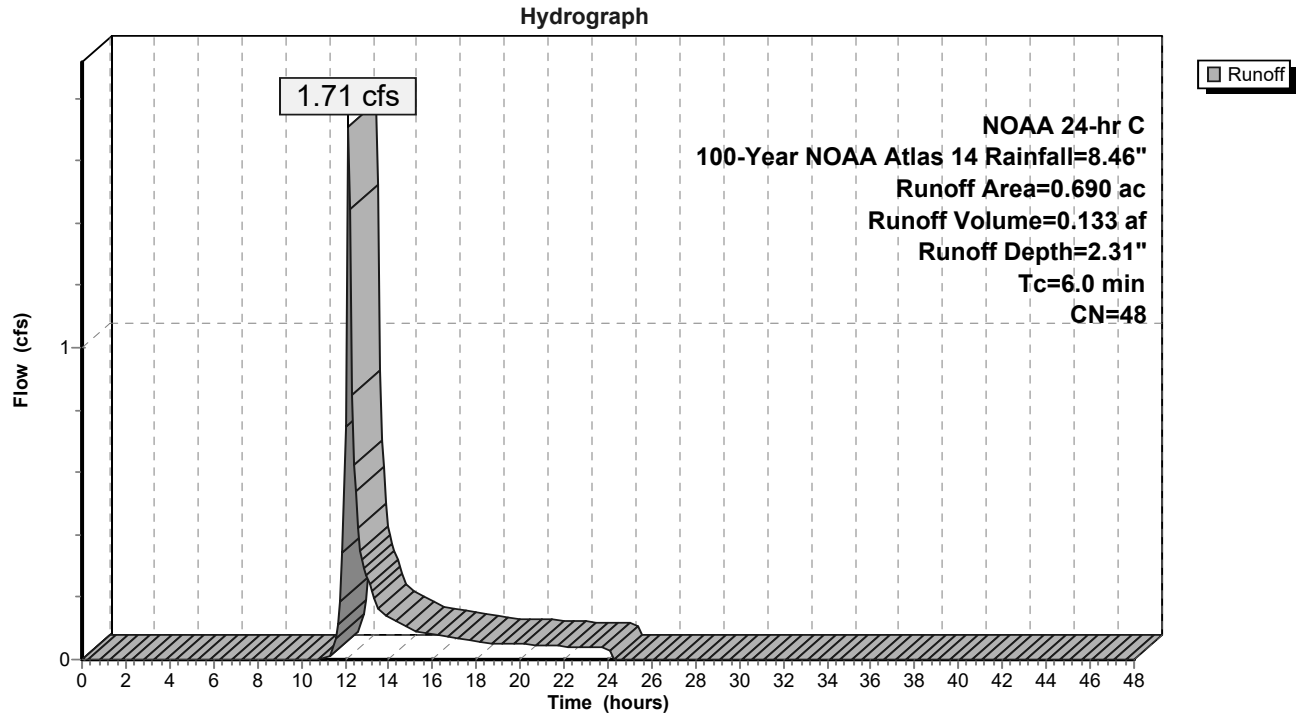
Runoff = 1.71 cfs @ 12.13 hrs, Volume= 0.133 af, Depth= 2.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
NOAA 24-hr C 100-Year NOAA Atlas 14 Rainfall=8.46"

Area (ac)	CN	Description
0.580	39	>75% Grass cover, Good, HSG A
0.110	98	Paved parking, HSG A
0.690	48	Weighted Average
0.580	39	84.06% Pervious Area
0.110	98	15.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment 1:



Summary for Subcatchment 2:

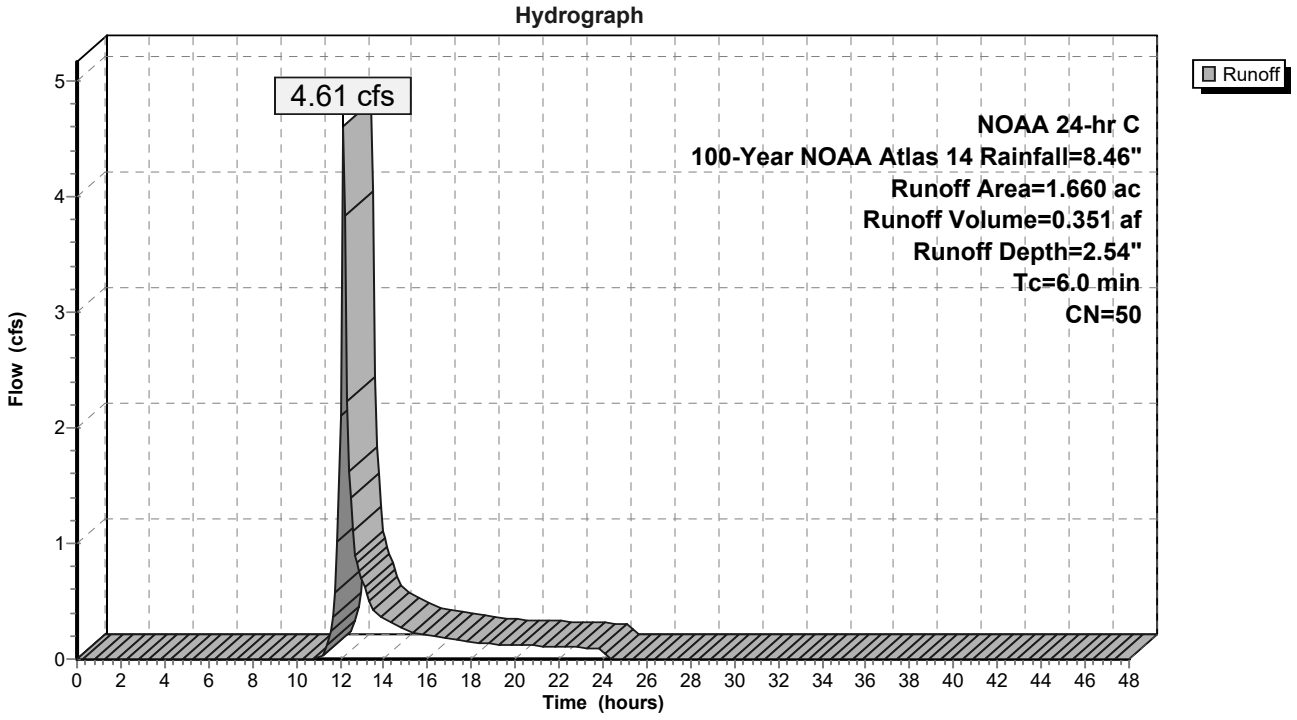
Runoff = 4.61 cfs @ 12.13 hrs, Volume= 0.351 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs
NOAA 24-hr C 100-Year NOAA Atlas 14 Rainfall=8.46"

Area (ac)	CN	Description
0.330	39	>75% Grass cover, Good, HSG A
0.890	30	Woods, Good, HSG A
0.440	98	Paved parking, HSG A
1.660	50	Weighted Average
1.220	32	73.49% Pervious Area
0.440	98	26.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment 2:



Summary for Pond C1: Culvert 1

Inflow Area = 0.690 ac, 15.94% Impervious, Inflow Depth = 2.31" for 100-Year NOAA Atlas 14 event
Inflow = 1.71 cfs @ 12.13 hrs, Volume= 0.133 af
Outflow = 1.65 cfs @ 12.14 hrs, Volume= 0.133 af, Atten= 3%, Lag= 0.3 min
Primary = 1.65 cfs @ 12.14 hrs, Volume= 0.133 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 89.81' @ 12.14 hrs Surf.Area= 98 sf Storage= 42 cf

Plug-Flow detention time= 0.9 min calculated for 0.133 af (100% of inflow)
Center-of-Mass det. time= 0.5 min (876.8 - 876.3)

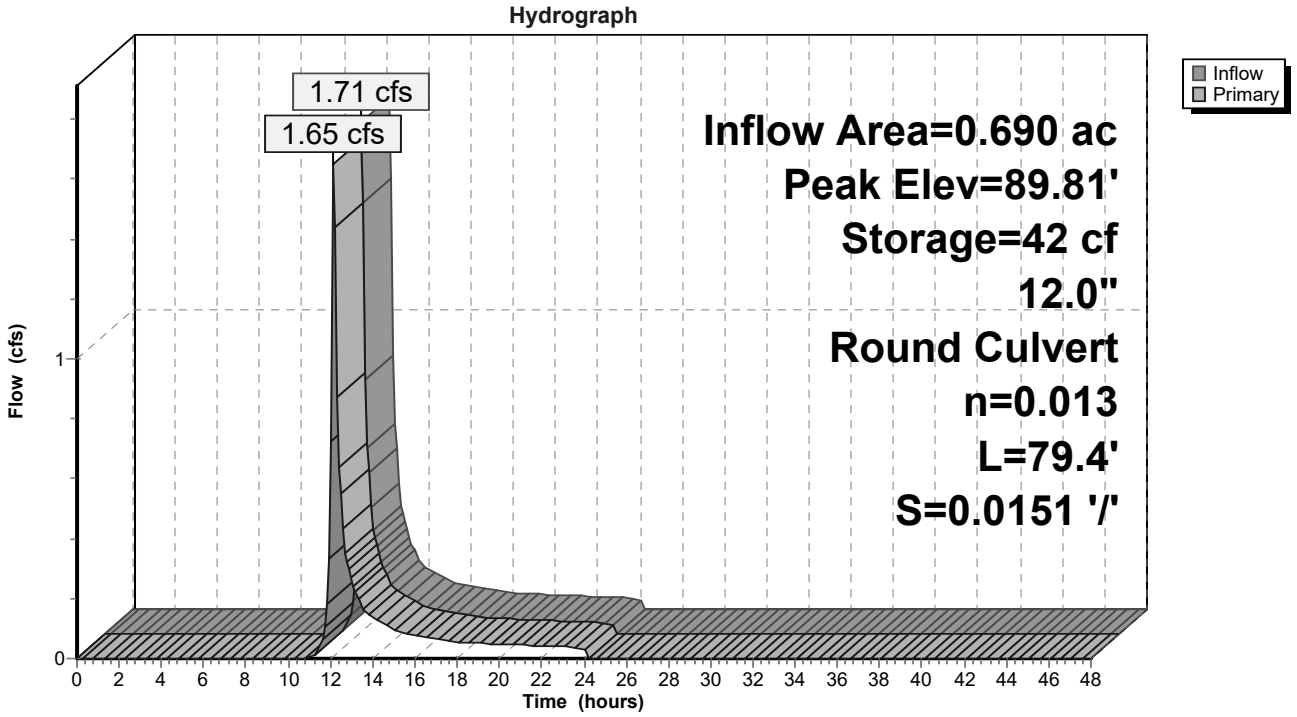
Volume	Invert	Avail.Storage	Storage Description
#1	89.00'	220 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
89.00	5	0	0
90.00	120	63	63
90.75	300	158	220

Device	Routing	Invert	Outlet Devices
#1	Primary	89.00'	**12.0" Round Culvert** L= 79.4' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 89.00' / 87.80' S= 0.0151 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.54 cfs @ 12.14 hrs HW=89.77' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 1.54 cfs @ 2.36 fps)

Pond C1: Culvert 1



Summary for Pond C2: Culvert 2

Inflow Area = 1.660 ac, 26.51% Impervious, Inflow Depth = 2.54" for 100-Year NOAA Atlas 14 event
Inflow = 4.61 cfs @ 12.13 hrs, Volume= 0.351 af
Outflow = 4.14 cfs @ 12.16 hrs, Volume= 0.351 af, Atten= 10%, Lag= 2.0 min
Primary = 4.14 cfs @ 12.16 hrs, Volume= 0.351 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.10 hrs / 2
Peak Elev= 83.64' @ 12.16 hrs Surf.Area= 621 sf Storage= 357 cf

Plug-Flow detention time= 1.2 min calculated for 0.350 af (100% of inflow)
Center-of-Mass det. time= 1.2 min (871.8 - 870.6)

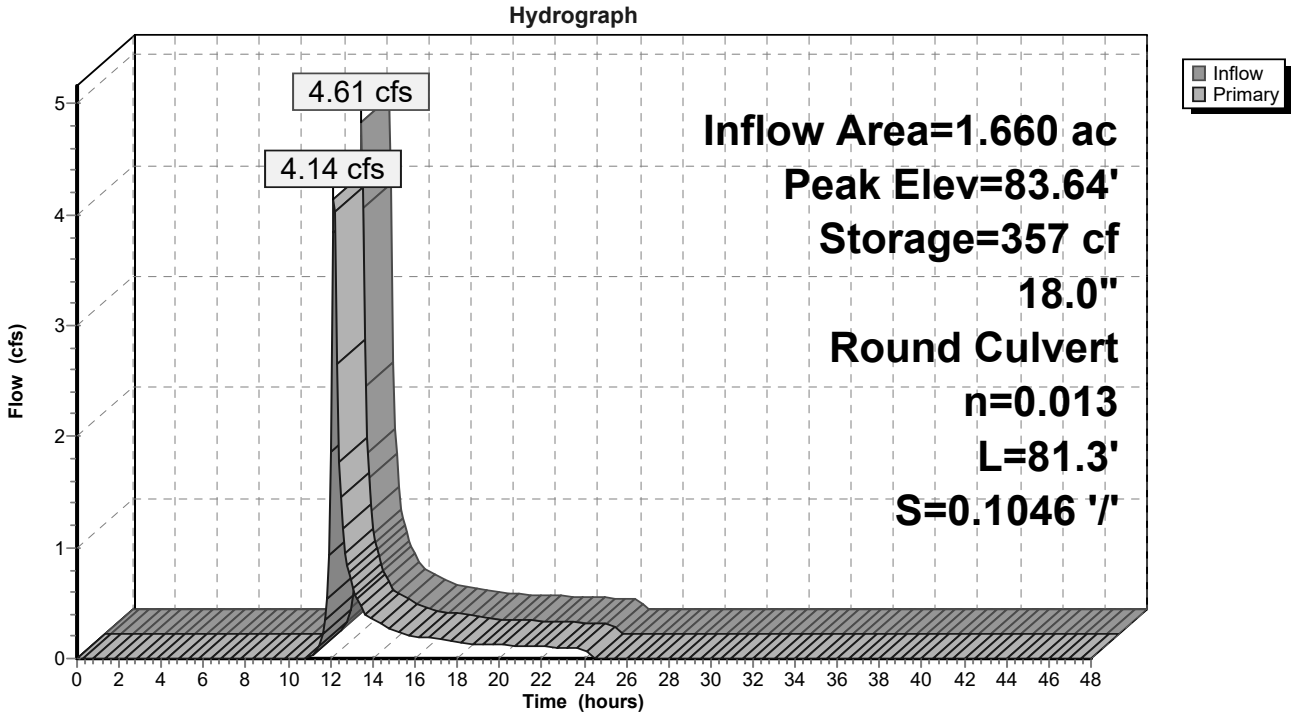
Volume	Invert	Avail.Storage	Storage Description
#1	82.50'	4,933 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
82.50	5	0	0
84.00	815	615	615
86.00	3,503	4,318	4,933

Device	Routing	Invert	Outlet Devices
#1	Primary	82.50'	**18.0" Round Culvert** L= 81.3' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 82.50' / 74.00' S= 0.1046 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=3.95 cfs @ 12.16 hrs HW=83.61' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 3.95 cfs @ 2.83 fps)

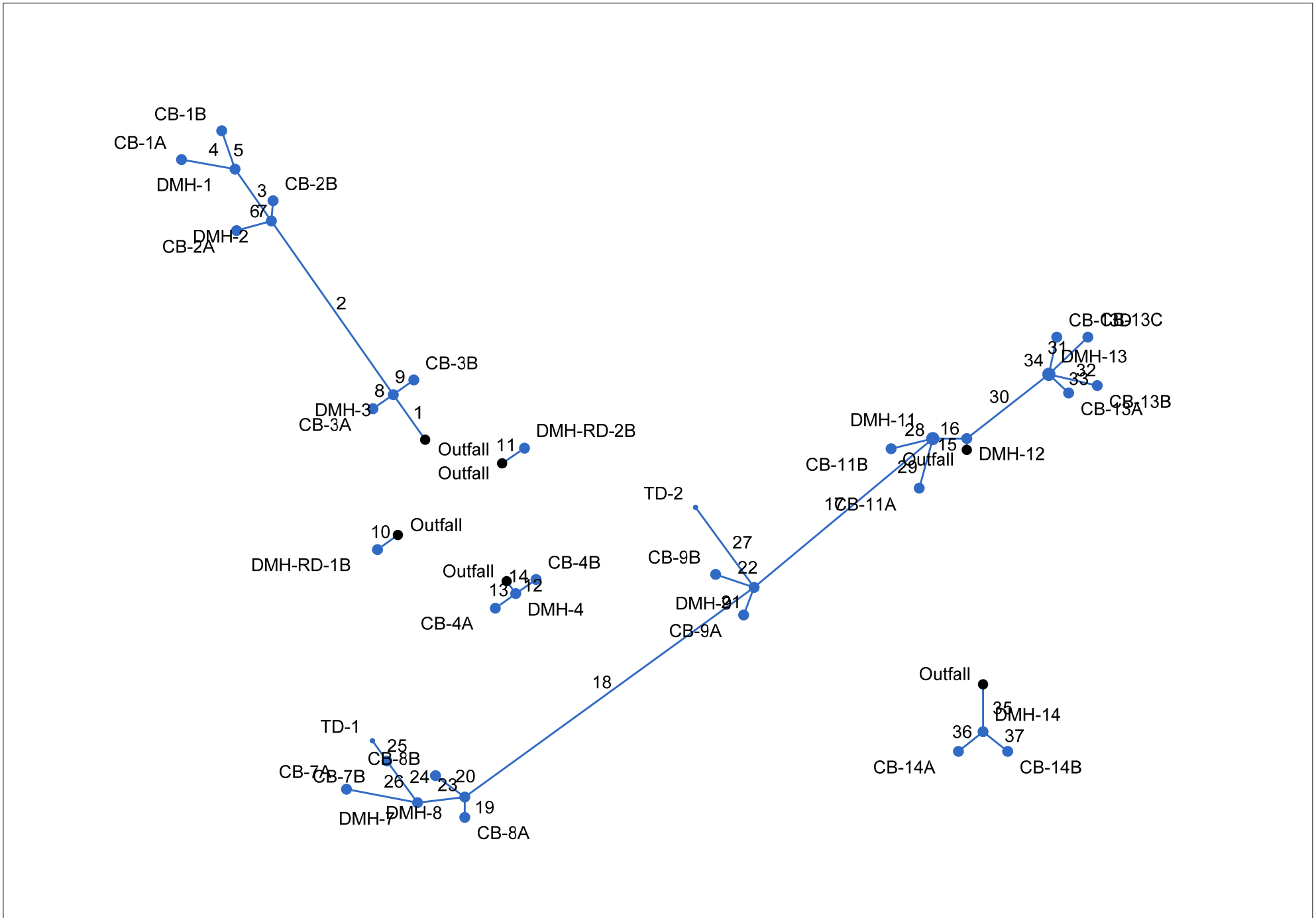
Pond C2: Culvert 2



Attachment 7 –

Hydraflow Storm Sewers Output

Hydraflow Storm Sewers Extension for Autodesk® AutoCAD® Civil 3D® Plan



Project File: Amesbury.stm	Number of lines: 37	Date: 4/2/2026

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert El Dn (ft)	Line Slope (%)	Invert El Up (ft)	Line Size (in)	Line Shape	N Value (n)	J-Loss Coeff (K)	Inlet/ Rim El (ft)	
1	End	25	-125	MH	0.00	0.00	0.00	0.0	93.25	3.88	94.20	12	Cir	0.012	1.00	100.66	Pipe - (546)
2	1	94	0	MH	0.00	0.00	0.00	0.0	95.25	3.94	98.95	12	Cir	0.012	0.96	102.30	Pipe - (545)
3	2	28	0	MH	0.00	0.00	0.00	0.0	99.05	1.61	99.50	12	Cir	0.012	0.75	102.79	Pipe - (544)
4	3	24	-45	Grate	0.00	0.03	0.55	6.0	99.60	1.04	99.85	12	Cir	0.012	1.00	102.87	Pipe - (543)
5	3	18	16	Grate	0.00	0.03	0.55	6.0	99.60	1.39	99.85	12	Cir	0.012	1.00	102.87	Pipe - (547)
6	2	16	-71	Grate	0.00	0.06	0.85	6.0	99.05	0.62	99.15	12	Cir	0.012	1.00	102.15	Pipe - (548)
7	2	9	40	Grate	0.00	0.06	0.85	6.0	99.05	1.11	99.15	12	Cir	0.012	1.00	102.15	Pipe - (552)
8	1	11	-90	Grate	0.00	0.04	0.85	6.0	95.25	2.27	95.50	12	Cir	0.012	1.00	100.80	Pipe - (550)
9	1	11	90	Grate	0.00	0.04	0.85	6.0	95.25	2.27	95.50	12	Cir	0.012	1.00	100.80	Pipe - (551)
10	End	11	145	MH	0.00	0.49	0.85	6.0	90.00	1.82	90.20	12	Cir	0.012	1.00	99.50	Pipe - (503)
11	End	12	-35	MH	0.00	0.49	0.85	6.0	90.00	1.67	90.20	12	Cir	0.012	1.00	99.50	Pipe - (509)
12	End	7	55	MH	0.00	0.00	0.00	0.0	93.00	2.14	93.15	12	Cir	0.012	1.00	96.88	Pipe - (541)
13	12	11	90	Grate	0.00	0.12	0.79	6.0	93.25	1.82	93.45	12	Cir	0.012	1.00	96.66	Pipe - (540)
14	12	11	-90	Grate	0.00	0.12	0.79	6.0	93.25	1.82	93.45	12	Cir	0.012	1.00	96.66	Pipe - (542)
15	End	5	-90	MH	0.00	0.00	0.00	0.0	84.25	2.00	84.35	18	Cir	0.012	1.00	90.37	Pipe - (519)
16	15	15	-90	MH	0.00	0.00	0.00	0.0	84.85	1.33	85.05	12	Cir	0.012	0.97	90.26	Pipe - (518)
17	16	103	-40	MH	0.00	0.00	0.00	0.0	85.15	1.02	86.20	12	Cir	0.012	1.00	93.10	Pipe - (517)
18	17	158	4	MH	0.00	0.00	0.00	0.0	86.30	1.01	87.90	12	Cir	0.012	0.96	93.83	Pipe - (516)
19	18	9	-54	Grate	0.00	0.06	0.79	6.0	90.25	2.22	90.45	12	Cir	0.012	1.00	93.49	Pipe - (531)
20	18	16	72	Grate	0.00	0.08	0.79	6.0	90.10	2.19	90.45	12	Cir	0.012	1.00	93.49	Pipe - (530)
21	17	13	-29	Grate	0.00	0.08	0.79	6.0	90.05	2.31	90.35	12	Cir	0.012	1.00	93.38	Pipe - (529)
22	17	18	59	Grate	0.00	0.05	0.85	6.0	89.95	2.22	90.35	12	Cir	0.012	1.00	93.38	Pipe - (528)
23	18	21	29	MH	0.00	0.00	0.00	0.0	88.00	1.19	88.25	12	Cir	0.012	0.90	93.06	Pipe - (515)

Project File: Amesbury.stm | Number of lines: 37 | Date: 4/2/2026

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert El Dn (ft)	Line Slope (%)	Invert El Up (ft)	Line Size (in)	Line Shape	N Value (n)	J-Loss Coeff (K)	Inlet/ Rim El (ft)	
24	23	23	61	Grate	0.00	0.01	0.55	6.0	88.35	1.30	88.65	12	Cir	0.012	0.50	91.67	Pipe - (533)
25	24	11	0	Grate	0.00	0.03	0.79	6.0	88.75	4.55	89.25	8	Cir	0.012	1.00	91.25	Pipe - (532)
26	23	32	18	Grate	0.00	0.03	0.79	6.0	88.35	0.63	88.55	12	Cir	0.012	1.00	91.55	Pipe - (514)
27	17	44	94	Grate	0.00	0.04	0.73	6.0	88.35	2.05	89.25	8	Cir	0.012	1.00	91.25	Pipe - (527)
28	16	19	-14	Grate	0.00	0.09	0.85	6.0	86.55	2.11	86.95	12	Cir	0.012	1.00	89.97	Pipe - (526)
29	16	23	-75	Grate	0.00	0.11	0.85	6.0	86.45	2.17	86.95	12	Cir	0.012	1.00	89.97	Pipe - (525)
30	15	46	52	MH	0.00	0.00	0.00	0.0	84.85	1.09	85.35	12	Cir	0.012	0.99	89.60	Pipe - (521)
31	30	24	-6	Grate	0.00	0.03	0.73	6.0	85.95	1.04	86.20	12	Cir	0.012	1.00	89.23	Pipe - (524)
32	30	22	51	Grate	0.00	0.03	0.73	6.0	85.95	1.14	86.20	12	Cir	0.012	1.00	89.24	Pipe - (523)
33	30	12	81	Grate	0.00	0.05	0.73	6.0	85.45	2.08	85.70	12	Cir	0.012	1.00	89.27	Pipe - (522)
34	30	17	-40	Grate	0.00	0.06	0.85	6.0	85.45	1.47	85.70	12	Cir	0.012	1.00	89.20	Pipe - (520)
35	End	21	90	MH	0.00	0.00	0.00	0.0	85.00	2.86	85.60	12	Cir	0.012	0.81	89.39	Pipe - (535)
36	35	14	51	Grate	0.00	0.13	0.73	6.0	85.70	2.14	86.00	12	Cir	0.012	1.00	89.03	Pipe - (536)
37	35	14	-51	Grate	0.00	0.09	0.79	6.0	85.70	2.14	86.00	12	Cir	0.012	1.00	89.03	Pipe - (534)

Structure Report

Struct No.	Structure ID	Junction Type	Rim Elev (ft)	Structure			Line Out			Line In		
				Shape	Length (ft)	Width (ft)	Size (in)	Shape	Invert (ft)	Size (in)	Shape	Invert (ft)
1	DMH-3	Manhole	100.66	Cir	4.00	4.00	12	Cir	94.20	12 12 12	Cir Cir Cir	95.25 95.25 95.25
2	DMH-2	Manhole	102.30	Cir	4.00	4.00	12	Cir	98.95	12 12 12	Cir Cir Cir	99.05 99.05 99.05
3	DMH-1	Manhole	102.79	Cir	4.00	4.00	12	Cir	99.50	12 12	Cir Cir	99.60 99.60
4	CB-1A	Grate	102.87	Cir	4.00	4.00	12	Cir	99.85			
5	CB-1B	Grate	102.87	Cir	4.00	4.00	12	Cir	99.85			
6	CB-2A	Grate	102.15	Cir	4.00	4.00	12	Cir	99.15			
7	CB-2B	Grate	102.15	Cir	4.00	4.00	12	Cir	99.15			
8	CB-3A	Grate	100.80	Cir	4.00	4.00	12	Cir	95.50			
9	CB-3B	Grate	100.80	Cir	4.00	4.00	12	Cir	95.50			
10	DMH-RD-1B	Manhole	99.50	Cir	4.00	4.00	12	Cir	90.20			
11	DMH-RD-2B	Manhole	99.50	Cir	4.00	4.00	12	Cir	90.20			
12	DMH-4	Manhole	96.88	Cir	4.00	4.00	12	Cir	93.15	12 12	Cir Cir	93.25 93.25
13	CB-4A	Grate	96.66	Cir	4.00	4.00	12	Cir	93.45			
14	CB-4B	Grate	96.66	Cir	4.00	4.00	12	Cir	93.45			
15	DMH-12	Manhole	90.37	Cir	4.00	4.00	18	Cir	84.35	12 12	Cir Cir	84.85 84.85
16	DMH-11	Manhole	90.26	Cir	5.00	5.00	12	Cir	85.05	12 12 12	Cir Cir Cir	85.15 86.55 86.45
17	DMH-9	Manhole	93.10	Cir	4.00	4.00	12	Cir	86.20	12 12 12 8	Cir Cir Cir Cir	86.30 90.05 89.95 88.35

Project File: Amesbury.stm | Number of Structures: 37 | Run Date: 4/2/2026

Structure Report

Struct No.	Structure ID	Junction Type	Rim Elev (ft)	Structure			Line Out			Line In		
				Shape	Length (ft)	Width (ft)	Size (in)	Shape	Invert (ft)	Size (in)	Shape	Invert (ft)
18	DMH-8	Manhole	93.83	Cir	4.00	4.00	12	Cir	87.90	12 12 12	Cir Cir Cir	90.25 90.10 88.00
19	CB-8A	Grate	93.49	Cir	4.00	4.00	12	Cir	90.45			
20	CB-8B	Grate	93.49	Cir	4.00	4.00	12	Cir	90.45			
21	CB-9A	Grate	93.38	Cir	4.00	4.00	12	Cir	90.35			
22	CB-9B	Grate	93.38	Cir	4.00	4.00	12	Cir	90.35			
23	DMH-7	Manhole	93.06	Cir	4.00	4.00	12	Cir	88.25	12 12	Cir Cir	88.35 88.35
24	CB-7B	Grate	91.67	Cir	4.00	4.00	12	Cir	88.65	8	Cir	88.75
25	TD-1	Grate	91.25	Cir	1.50	1.50	8	Cir	89.25			
26	CB-7A	Grate	91.55	Cir	4.00	4.00	12	Cir	88.55			
27	TD-2	Grate	91.25	Cir	1.50	1.50	8	Cir	89.25			
28	CB-11B	Grate	89.97	Cir	4.00	4.00	12	Cir	86.95			
29	CB-11A	Grate	89.97	Cir	4.00	4.00	12	Cir	86.95			
30	DMH-13	Manhole	89.60	Cir	5.00	5.00	12	Cir	85.35	12 12 12 12	Cir Cir Cir Cir	85.95 85.95 85.45 85.45
31	CB-13C	Grate	89.23	Cir	4.00	4.00	12	Cir	86.20			
32	CB-13B	Grate	89.24	Cir	4.00	4.00	12	Cir	86.20			
33	CB-13A	Grate	89.27	Cir	4.00	4.00	12	Cir	85.70			
34	CB-13D	Grate	89.20	Cir	4.00	4.00	12	Cir	85.70			
35	DMH-14	Manhole	89.39	Cir	4.00	4.00	12	Cir	85.60	12 12	Cir Cir	85.70 85.70
36	CB-14A	Grate	89.03	Cir	4.00	4.00	12	Cir	86.00			

Structure Report

Struct No.	Structure ID	Junction Type	Rim Elev (ft)	Structure			Line Out			Line In		
				Shape	Length (ft)	Width (ft)	Size (in)	Shape	Invert (ft)	Size (in)	Shape	Invert (ft)
37	CB-14B	Grate	89.03	Cir	4.00	4.00	12	Cir	86.00			

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
1	Pipe - (546)	1.13	12	Cir	25	93.25	94.20	3.878	94.89	94.89	0.06	94.95	End	Manhole
2	Pipe - (545)	0.80	12	Cir	94	95.25	98.95	3.936	95.47	99.32	0.13	99.32	1	Manhole
3	Pipe - (544)	0.21	12	Cir	28	99.05	99.50	1.607	99.32	99.69	n/a	99.69 j	2	Manhole
4	Pipe - (543)	0.12	12	Cir	24	99.60	99.85	1.042	99.72	99.99	0.05	99.99	3	Grate
5	Pipe - (547)	0.12	12	Cir	18	99.60	99.85	1.389	99.71	99.99	0.05	99.99	3	Grate
6	Pipe - (548)	0.39	12	Cir	16	99.05	99.15	0.625	99.32	99.41	n/a	99.41	2	Grate
7	Pipe - (552)	0.39	12	Cir	9	99.05	99.15	1.111	99.32	99.41	n/a	99.41 j	2	Grate
8	Pipe - (550)	0.26	12	Cir	11	95.25	95.50	2.273	95.39	95.71	0.07	95.71	1	Grate
9	Pipe - (551)	0.26	12	Cir	11	95.25	95.50	2.273	95.39	95.71	0.07	95.71	1	Grate
10	Pipe - (503)	3.16	12	Cir	11	90.00	90.20	1.818	94.89*	94.96*	0.25	95.21	End	Manhole
11	Pipe - (509)	3.16	12	Cir	12	90.00	90.20	1.667	94.89*	94.97*	0.25	95.22	End	Manhole
12	Pipe - (541)	1.42	12	Cir	7	93.00	93.15	2.143	94.89*	94.90*	0.05	94.95	End	Manhole
13	Pipe - (540)	0.72	12	Cir	11	93.25	93.45	1.818	94.95*	94.95*	0.01	94.97	12	Grate
14	Pipe - (542)	0.72	12	Cir	11	93.25	93.45	1.818	94.95*	94.95*	0.01	94.97	12	Grate
15	Pipe - (519)	3.29	18	Cir	5	84.25	84.35	2.000	87.18*	87.18*	0.05	87.24	End	Manhole
16	Pipe - (518)	2.58	12	Cir	15	84.85	85.05	1.333	87.24*	87.31*	0.16	87.47	15	Manhole
17	Pipe - (517)	1.70	12	Cir	103	85.15	86.20	1.019	87.47*	87.67*	0.07	87.74	16	Manhole
18	Pipe - (516)	1.02	12	Cir	158	86.30	87.90	1.013	87.74	88.32	n/a	88.32 j	17	Manhole
19	Pipe - (531)	0.36	12	Cir	9	90.25	90.45	2.222	90.42	90.70	n/a	90.70	18	Grate
20	Pipe - (530)	0.48	12	Cir	16	90.10	90.45	2.187	90.30	90.74	n/a	90.74	18	Grate
21	Pipe - (529)	0.48	12	Cir	13	90.05	90.35	2.308	90.24	90.64	n/a	90.64	17	Grate
22	Pipe - (528)	0.32	12	Cir	18	89.95	90.35	2.222	90.11	90.58	n/a	90.58	17	Grate
23	Pipe - (515)	0.34	12	Cir	21	88.00	88.25	1.190	88.32	88.49	n/a	88.49 j	18	Manhole
24	Pipe - (533)	0.22	12	Cir	23	88.35	88.65	1.304	88.50	88.84	n/a	88.84	23	Grate

Project File: Amesbury.stm | Number of lines: 37 | Run Date: 4/2/2026

NOTES: Return period = 25 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
25	Pipe - (532)	0.18	8	Cir	11	88.75	89.25	4.545	88.86	89.44	0.07	89.44	24	Grate
26	Pipe - (514)	0.18	12	Cir	32	88.35	88.55	0.625	88.51	88.72	0.06	88.72	23	Grate
27	Pipe - (527)	0.22	8	Cir	44	88.35	89.25	2.045	88.50	89.47	0.08	89.47	17	Grate
28	Pipe - (526)	0.58	12	Cir	19	86.55	86.95	2.105	87.47	87.27	n/a	87.27	16	Grate
29	Pipe - (525)	0.71	12	Cir	23	86.45	86.95	2.174	87.47	87.45	0.05	87.50	16	Grate
30	Pipe - (521)	0.87	12	Cir	46	84.85	85.35	1.087	87.24*	87.26*	0.02	87.28	15	Manhole
31	Pipe - (524)	0.17	12	Cir	24	85.95	86.20	1.042	87.28*	87.28*	0.00	87.28	30	Grate
32	Pipe - (523)	0.17	12	Cir	22	85.95	86.20	1.136	87.28*	87.28*	0.00	87.28	30	Grate
33	Pipe - (522)	0.28	12	Cir	12	85.45	85.70	2.083	87.28*	87.28*	0.00	87.28	30	Grate
34	Pipe - (520)	0.39	12	Cir	17	85.45	85.70	1.471	87.28*	87.28*	0.00	87.29	30	Grate
35	Pipe - (535)	1.23	12	Cir	21	85.00	85.60	2.857	87.18*	87.20*	0.03	87.23	End	Manhole
36	Pipe - (536)	0.72	12	Cir	14	85.70	86.00	2.143	87.23*	87.24*	0.01	87.25	35	Grate
37	Pipe - (534)	0.54	12	Cir	14	85.70	86.00	2.143	87.23*	87.23*	0.01	87.24	35	Grate

Project File: Amesbury.stm | Number of lines: 37 | Run Date: 4/2/2026

NOTES: Return period = 25 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	DMH-3	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
2	DMH-2	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
3	DMH-1	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
4	CB-1A	0.12	0.00	0.12	0.00	Grate	0.0	0.00	4.00	2.00	2.00	Sag	2.00	0.020	0.020	0.000	0.06	2.82	0.06	2.82	0.0	Off
5	CB-1B	0.12	0.00	0.12	0.00	Grate	0.0	0.00	4.00	2.00	2.00	Sag	2.00	0.020	0.020	0.000	0.06	2.82	0.06	2.82	0.0	Off
6	CB-2A	0.39	0.00	0.39	0.00	Grate	0.0	0.00	4.00	2.00	2.00	Sag	2.00	0.020	0.020	0.000	0.10	4.86	0.10	4.86	0.0	Off
7	CB-2B	0.39	0.00	0.39	0.00	Grate	0.0	0.00	4.00	2.00	2.00	Sag	2.00	0.020	0.020	0.000	0.10	4.86	0.10	4.86	0.0	Off
8	CB-3A	0.26	0.00	0.24	0.01	Grate	0.0	0.00	0.00	2.00	2.00	0.040	2.00	0.020	0.020	0.013	0.06	3.10	0.02	1.03	0.0	13
9	CB-3B	0.26	0.00	0.24	0.01	Grate	0.0	0.00	0.00	2.00	2.00	0.040	2.00	0.020	0.020	0.013	0.06	3.10	0.02	1.03	0.0	14
10	DMH-RD-1B	3.16	0.00	0.00	3.16	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
11	DMH-RD-2B	3.16	0.00	0.00	3.16	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
12	DMH-4	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
13	CB-4A	0.72	0.01	0.73	0.00	Grate	0.0	0.00	4.00	2.00	2.00	Sag	2.00	0.020	0.020	0.000	0.14	6.91	0.14	6.91	0.0	Off
14	CB-4B	0.72	0.01	0.73	0.00	Grate	0.0	0.00	4.00	2.00	2.00	Sag	2.00	0.020	0.020	0.000	0.14	6.91	0.14	6.91	0.0	Off
15	DMH-12	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
16	DMH-11	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
17	DMH-9	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
18	DMH-8	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
19	CB-8A	0.36	0.00	0.33	0.03	Grate	0.0	0.00	0.00	2.00	2.00	0.040	2.00	0.020	0.020	0.013	0.07	3.51	0.03	1.44	0.0	26
20	CB-8B	0.48	0.00	0.41	0.06	Grate	0.0	0.00	0.00	2.00	2.00	0.040	2.00	0.020	0.020	0.013	0.08	3.91	0.04	1.84	0.0	24
21	CB-9A	0.48	0.00	0.41	0.06	Grate	0.0	0.00	0.00	2.00	2.00	0.040	2.00	0.020	0.020	0.013	0.08	3.91	0.04	1.84	0.0	29
22	CB-9B	0.32	0.00	0.30	0.03	Grate	0.0	0.00	0.00	2.00	2.00	0.040	2.00	0.020	0.020	0.013	0.07	3.37	0.03	1.30	0.0	28
23	DMH-7	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off

Project File: Amesbury.stm | Number of lines: 37 | Run Date: 4/2/2026

NOTES: Inlet N-Values = 0.016; Intensity = 35.89 / (Inlet time + 3.30) ^ 0.70; Return period = 25 Yrs. ; * Indicates Known Q added. All curb inlets are throat.

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
24	CB-7B	0.04	0.06	0.11	0.00	Grate	0.0	0.00	0.00	2.00	2.00	0.100	2.00	0.020	0.020	0.013	0.04	1.87	0.00	0.01	0.0	25
25	TD-1	0.18	0.00	0.18	0.00	Grate	0.0	0.00	4.00	2.00	2.00	Sag	2.00	0.020	0.020	0.000	0.07	3.32	0.07	3.32	0.0	Off
26	CB-7A	0.18	0.03	0.21	0.00	Grate	0.0	0.00	0.00	2.00	2.00	0.100	2.00	0.020	0.020	0.013	0.05	2.43	0.01	0.33	0.0	25
27	TD-2	0.22	0.00	0.22	0.00	Grate	0.0	0.00	4.00	2.00	2.00	Sag	2.00	0.020	0.020	0.000	0.07	3.66	0.07	3.66	0.0	Off
28	CB-11B	0.58	0.03	0.61	0.00	Grate	0.0	0.00	4.00	2.00	2.00	Sag	2.00	0.020	0.020	0.000	0.12	6.20	0.12	6.20	0.0	Off
29	CB-11A	0.71	0.06	0.77	0.00	Grate	0.0	0.00	4.00	2.00	2.00	Sag	2.00	0.020	0.020	0.000	0.14	7.12	0.14	7.12	0.0	Off
30	DMH-13	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
31	CB-13C	0.17	0.00	0.17	0.00	Grate	0.0	0.00	4.00	2.00	2.00	Sag	2.00	0.020	0.020	0.000	0.06	3.19	0.06	3.19	0.0	Off
32	CB-13B	0.17	0.00	0.17	0.00	Grate	0.0	0.00	4.00	2.00	2.00	Sag	2.00	0.020	0.020	0.000	0.06	3.19	0.06	3.19	0.0	Off
33	CB-13A	0.28	0.00	0.28	0.00	Grate	0.0	0.00	4.00	2.00	2.00	Sag	2.00	0.020	0.020	0.000	0.08	4.09	0.08	4.09	0.0	Off
34	CB-13D	0.39	0.00	0.39	0.00	Grate	0.0	0.00	4.00	2.00	2.00	Sag	2.00	0.020	0.020	0.000	0.10	4.86	0.10	4.86	0.0	Off
35	DMH-14	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
36	CB-14A	0.72	0.00	0.72	0.00	Grate	0.0	0.00	4.00	2.00	2.00	Sag	2.00	0.020	0.020	0.000	0.14	6.84	0.14	6.84	0.0	Off
37	CB-14B	0.54	0.00	0.54	0.00	Grate	0.0	0.00	4.00	2.00	2.00	Sag	2.00	0.020	0.020	0.000	0.12	5.81	0.12	5.81	0.0	Off

Project File: Amesbury.stm | Number of lines: 37 | Run Date: 4/2/2026

NOTES: Inlet N-Values = 0.016; Intensity = 35.89 / (Inlet time + 3.30) ^ 0.70; Return period = 25 Yrs. ; * Indicates Known Q added. All curb inlets are throat.

Line Number	Start Structure	Sag	Total Area (AC)	Impervious Area (AC)	Vegetated Area (AC)	C (Impervious)	C (Vegetated)	C (Weighted)
1	DMH-3							
2	DMH-2							
3	DMH-1							
4	CB-1A	Sag	0.03	0.02	0.02	0.85	0.25	0.55
5	CB-1B	Sag	0.03	0.02	0.02	0.85	0.25	0.55
6	CB-2A	Sag	0.06	0.06	0.00	0.85	0.25	0.85
7	CB-2B	Sag	0.06	0.06	0.00	0.85	0.25	0.85
8	CB-3A		0.04	0.04	0.00	0.85	0.25	0.85
9	CB-3B		0.04	0.04	0.00	0.85	0.25	0.85
10	DMH-RD-1B		0.49	0.49	0.00	0.85	0.25	0.85
11	DMH-RD-1B		0.49	0.49	0.00	0.85	0.25	0.85
12	DMH-4							
13	CB-4A	Sag	0.12	0.10	0.01	0.85	0.25	0.79
14	CB-4B	Sag	0.12	0.10	0.01	0.85	0.25	0.79
15	DMH-12							
16	DMH-11							
17	DMH-9							
18	DMH-8							
19	CB-8A		0.06	0.06	0.01	0.85	0.25	0.79
20	CB-8B		0.08	0.07	0.01	0.85	0.25	0.79
21	CB-9A		0.08	0.07	0.01	0.85	0.25	0.79
22	CB-9B		0.05	0.05	0.00	0.85	0.25	0.85
23	DMH-7							
24	CB-7B		0.01	0.00	0.00	0.85	0.25	0.55
25	TD-1	Sag	0.03	0.03	0.00	0.85	0.25	0.79
26	CB-7A		0.03	0.02	0.00	0.85	0.25	0.79
27	TD-2	Sag	0.04	0.03	0.01	0.85	0.25	0.73
28	CB-11B	Sag	0.09	0.09	0.00	0.85	0.25	0.85
29	CB-11A	Sag	0.11	0.11	0.00	0.85	0.25	0.85
30	DMH-13							
31	CB-13C	Sag	0.03	0.02	0.01	0.85	0.25	0.73
32	CB-13B	Sag	0.03	0.02	0.01	0.85	0.25	0.73
33	CB-13A	Sag	0.05	0.04	0.01	0.85	0.25	0.73
34	CB-13D	Sag	0.06	0.06	0.00	0.85	0.25	0.85
35	DMH-14							
36	CB-14A	Sag	0.13	0.10	0.03	0.85	0.25	0.73
37	CB-14B	Sag	0.09	0.08	0.01	0.85	0.25	0.79

Outfall	Starting HGL	Notes	
Outfall Line 1	94.89	SIS-1	100-year peak from Hydrocad
Outfall Line 10	94.89	SIS-1	100-year peak from Hydrocad
Outfall Line 11	94.89	SIS-1	100-year peak from Hydrocad
Outfall Line 12	94.89	SIS-1	100-year peak from Hydrocad
Outfall Line 15	87.18	SIS-2	100-year peak from Hydrocad
Outfall Line 35	87.18	SIS-2	100-year peak from Hydrocad

Attachment 8 –

Water Quality Unit Treatment Summary

Project: Lewis Ridge
Location: Amesbury, MA
Prepared For: Civil Design Group

Purpose: To calculate the water quality flow rate (WQF) over a given site area. In this situation the WQF is derived from the first 1 of runoff from the contributing impervious surface.

Reference: Massachusetts Dept. of Environmental Protection Wetlands Program / United States Department of Agriculture Natural Resources Conservation Service TR-55 Manual

Procedure: Determine unit peak discharge using Figure 3 or 4. Figure 4 is in tabular form so is preferred. Using the tc, read the unit peak discharge (qu) from Figure 3 or Table in Figure 4. qu is expressed in the following units: cfs/mi^2/watershed inches (csm/in).

Compute Q Rate using the following equation:

$$Q = (qu)\ (A)\ (P)$$

where
:

Q = flow rate associated with first 1 of runoff
qu = the unit peak discharge, in csm/in.
A = impervious surface drainage area (in square miles)
P = water quality volume in watershed inches (1 in this case)
WQV = impervious area (sq ft) * rainfall depth (P)

Structure Name	Impv. (acres)	A (miles^2)	t_c (min)	t_c (hr)	P (in)	WQv (cu ft) (Total)	qu (csm/in.)	Q (cfs)
DMH 3	0.25	0.0003906	6.0	0.100	1.00	907.5	752.00	0.29
DMH 4	0.20	0.0003125	6.0	0.100	1.00	725.7	752.00	0.24
DMH 12	0.68	0.0010625	6.0	0.100	1.00	2467.4	752.00	0.80
DMH 14	0.18	0.0002813	6.0	0.100	1.00	653.1	752.00	0.21

The WQf sizing calculation selects the minimum size CDS/Cascade/StormCeptor model capable of operating at the computed WQf peak flowrate prior to bypassing. It assumes free discharge of the WQf through the unit and ignores the routing effect of any upstream storm drain piping. As with all hydrodynamic separators, there will be some impact to the Hydraulic Gradient of the corresponding drainage system, and evaluation of this impact should be considered in the design.

CONTECH ENGINEERED SOLUTIONS

CASCADE separator™

CASCADE ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION BASED ON THE RATIONAL RAINFALL METHOD

LEWIS RIDGE
AMESBURY, MA

Area	0.25 ac	Unit Site Designation	DMH 3
Weighted C	0.90		
t_c	6 min		
Cascade Model	CS-3	Cascade Treatment Capacity	**1.0 cfs**

Rainfall Intensity[1] (in/hr)	Percent Rainfall Volume[1]	Cumulative Rainfall Volume	Treated Flowrate (cfs)	Hydraulic Loading Rate (gpm/ft2)	Incremental Removal (%)
0.02	10.2%	10.2%	0.00	0.29	10.2
0.04	9.6%	19.8%	0.01	0.57	9.6
0.06	9.4%	29.3%	0.01	0.86	9.4
0.08	7.7%	37.0%	0.02	1.14	7.7
0.10	8.6%	45.6%	0.02	1.43	8.6
0.12	6.3%	51.9%	0.03	1.71	6.3
0.14	4.7%	56.5%	0.03	2.00	4.7
0.16	4.6%	61.2%	0.04	2.29	4.6
0.18	3.5%	64.7%	0.04	2.57	3.5
0.20	4.3%	69.1%	0.05	2.86	4.3
0.25	8.0%	77.1%	0.06	3.57	8.0
0.30	5.6%	82.7%	0.07	4.29	5.6
0.35	4.4%	87.0%	0.08	5.00	4.4
0.40	2.5%	89.5%	0.09	5.71	2.5
0.45	2.5%	92.1%	0.10	6.43	2.5
0.50	1.4%	93.5%	0.11	7.14	1.4
0.75	5.0%	98.5%	0.17	10.72	5.0
1.00	1.0%	99.5%	0.23	14.29	1.0
1.50	0.0%	99.5%	0.34	21.43	0.0
2.00	0.0%	99.5%	0.45	28.57	0.0
3.00	0.5%	100.0%	0.68	42.86	0.3
					99.8
				Removal Efficiency Adjustment[2] =	6.5%
				Predicted % Annual Rainfall Treated =	93.5%
				Predicted Net Annual Load Removal Efficiency =	**93.4%**

1 - Based on 10 years of hourly precipitation data from NCDC Station 770, Boston WSFO AP, Suffolk County, MA

2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

CONTECH ENGINEERED SOLUTIONS

CASCADE separator™

CASCADE ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION BASED ON THE RATIONAL RAINFALL METHOD

LEWIS RIDGE
AMESBURY, MA

Area	0.20 ac	Unit Site Designation	DMH 4
Weighted C	0.90		
t_c	6 min		
Cascade Model	CS-3	Cascade Treatment Capacity	**1.0 cfs**

Rainfall Intensity[1] (in/hr)	Percent Rainfall Volume[1]	Cumulative Rainfall Volume	Treated Flowrate (cfs)	Hydraulic Loading Rate (gpm/ft2)	Incremental Removal (%)
0.02	10.2%	10.2%	0.00	0.23	10.2
0.04	9.6%	19.8%	0.01	0.46	9.6
0.06	9.4%	29.3%	0.01	0.69	9.4
0.08	7.7%	37.0%	0.01	0.91	7.7
0.10	8.6%	45.6%	0.02	1.14	8.6
0.12	6.3%	51.9%	0.02	1.37	6.3
0.14	4.7%	56.5%	0.03	1.60	4.7
0.16	4.6%	61.2%	0.03	1.83	4.6
0.18	3.5%	64.7%	0.03	2.06	3.5
0.20	4.3%	69.1%	0.04	2.29	4.3
0.25	8.0%	77.1%	0.05	2.86	8.0
0.30	5.6%	82.7%	0.05	3.43	5.6
0.35	4.4%	87.0%	0.06	4.00	4.4
0.40	2.5%	89.5%	0.07	4.57	2.5
0.45	2.5%	92.1%	0.08	5.14	2.5
0.50	1.4%	93.5%	0.09	5.71	1.4
0.75	5.0%	98.5%	0.14	8.57	5.0
1.00	1.0%	99.5%	0.18	11.43	1.0
1.50	0.0%	99.5%	0.27	17.14	0.0
2.00	0.0%	99.5%	0.36	22.86	0.0
3.00	0.5%	100.0%	0.54	34.29	0.4
					99.9
				Removal Efficiency Adjustment[2] =	6.5%
				Predicted % Annual Rainfall Treated =	93.5%
				Predicted Net Annual Load Removal Efficiency =	**93.4%**

1 - Based on 10 years of hourly precipitation data from NCDC Station 770, Boston WSFO AP, Suffolk County, MA

2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

CONTECH ENGINEERED SOLUTIONS

CASCADE separator™

CASCADE ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION BASED ON THE RATIONAL RAINFALL METHOD

LEWIS RIDGE
AMESBURY, MA

Area	**0.68 ac**	Unit Site Designation	**DMH 12**
Weighted C	**0.90**		
t_c	**6 min**		
Cascade Model	**CS-3**	Cascade Treatment Capacity	**1.0 cfs**

Rainfall Intensity[1] (in/hr)	Percent Rainfall Volume[1]	Cumulative Rainfall Volume	Treated Flowrate (cfs)	Hydraulic Loading Rate (gpm/ft2)	Incremental Removal (%)
0.02	10.2%	10.2%	0.01	0.78	10.2
0.04	9.6%	19.8%	0.02	1.55	9.6
0.06	9.4%	29.3%	0.04	2.33	9.4
0.08	7.7%	37.0%	0.05	3.11	7.7
0.10	8.6%	45.6%	0.06	3.89	8.6
0.12	6.3%	51.9%	0.07	4.66	6.3
0.14	4.7%	56.5%	0.09	5.44	4.7
0.16	4.6%	61.2%	0.10	6.22	4.6
0.18	3.5%	64.7%	0.11	6.99	3.5
0.20	4.3%	69.1%	0.12	7.77	4.3
0.25	8.0%	77.1%	0.15	9.71	8.0
0.30	5.6%	82.7%	0.18	11.66	5.6
0.35	4.4%	87.0%	0.21	13.60	4.3
0.40	2.5%	89.5%	0.24	15.54	2.5
0.45	2.5%	92.1%	0.28	17.49	2.4
0.50	1.4%	93.5%	0.31	19.43	1.3
0.75	5.0%	98.5%	0.46	29.14	4.3
1.00	1.0%	99.5%	0.61	38.86	0.8
1.50	0.0%	99.5%	0.92	58.29	0.0
2.00	0.0%	99.5%	1.00	63.50	0.0
3.00	0.5%	100.0%	1.00	63.50	0.1
					98.3
				Removal Efficiency Adjustment[2] =	6.5%
				Predicted % Annual Rainfall Treated =	93.3%
				Predicted Net Annual Load Removal Efficiency =	**91.9%**

1 - Based on 10 years of hourly precipitation data from NCDC Station 770, Boston WSFO AP, Suffolk County, MA

2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

CONTECH ENGINEERED SOLUTIONS

CASCADE separator™

CASCADE ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION BASED ON THE RATIONAL RAINFALL METHOD

LEWIS RIDGE
AMESBURY, MA

Area	**0.18 ac**	Unit Site Designation	**DMH 14**
Weighted C	**0.90**		
t_c	**6 min**		
Cascade Model	**CS-3**	Cascade Treatment Capacity	**1.0 cfs**

Rainfall Intensity[1] (in/hr)	Percent Rainfall Volume[1]	Cumulative Rainfall Volume	Treated Flowrate (cfs)	Hydraulic Loading Rate (gpm/ft2)	Incremental Removal (%)
0.02	10.2%	10.2%	0.00	0.21	10.2
0.04	9.6%	19.8%	0.01	0.41	9.6
0.06	9.4%	29.3%	0.01	0.62	9.4
0.08	7.7%	37.0%	0.01	0.82	7.7
0.10	8.6%	45.6%	0.02	1.03	8.6
0.12	6.3%	51.9%	0.02	1.23	6.3
0.14	4.7%	56.5%	0.02	1.44	4.7
0.16	4.6%	61.2%	0.03	1.65	4.6
0.18	3.5%	64.7%	0.03	1.85	3.5
0.20	4.3%	69.1%	0.03	2.06	4.3
0.25	8.0%	77.1%	0.04	2.57	8.0
0.30	5.6%	82.7%	0.05	3.09	5.6
0.35	4.4%	87.0%	0.06	3.60	4.4
0.40	2.5%	89.5%	0.06	4.11	2.5
0.45	2.5%	92.1%	0.07	4.63	2.5
0.50	1.4%	93.5%	0.08	5.14	1.4
0.75	5.0%	98.5%	0.12	7.71	5.0
1.00	1.0%	99.5%	0.16	10.29	1.0
1.50	0.0%	99.5%	0.24	15.43	0.0
2.00	0.0%	99.5%	0.32	20.57	0.0
3.00	0.5%	100.0%	0.49	30.86	0.4
					99.9
				Removal Efficiency Adjustment[2] =	6.5%
				Predicted % Annual Rainfall Treated =	93.5%
				Predicted Net Annual Load Removal Efficiency =	**93.5%**

1 - Based on 10 years of hourly precipitation data from NCDC Station 770, Boston WSFO AP, Suffolk County, MA

2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

Attachment 9 –

Operation & Maintenance (O&M) Plan

OPERATION AND MAINTENANCE PLAN

&

LONG-TERM POLLUTION PREVENTION PLAN

FOR

LEWIS RIDGE

28 HAVERHILL ROAD (ROUTE 110)
AMESBURY, MASSACHUSETTS

PREPARED FOR:
PULTE HOMES OF NEW ENGLAND, LLC
1900 WEST PARK DRIVE, SUITE 180
WESTBOROUGH, MA 01581

PREPARED BY:

CIVIL DESIGN GROUP, LLC
4 HIGH STREET, SUITE 155
NORTH ANDOVER, MA 01845

DATE: APRIL 13, 2026

1.0 OPERATION AND MAINTENANCE PLAN

1.1 INTRODUCTION

In accordance with the standards set forth by the Massachusetts Department of Environmental Protection (MADEP) Stormwater Management Policy, Civil Design Group, LLC has prepared the following Operation and Maintenance (O&M) Plan for *Lewis Ridge*.

PROPERTY INFORMATION

PROPERTY ADDRESS	LANDOWNER & STORMWATER MANAGEMENT SYSTEM OWNER
28 Haverhill Road Amesbury, MA	Owner: Pulte Homes of New England, LLC
	Contact: TBD (interim contact Pulte Homes of New England, LLC)
	Phone: TBD (interim phone 508-870-9999 – Pulte Homes)

The landowner shall be responsible for the long-term operation and maintenance of the site and the stormwater management system and shall be responsible for record keeping of inspections, maintenance and repairs. If the site owner changes, the new site owner shall assume all responsibilities outlined in this O&M plan. The site owner shall hire a qualified professional to conduct scheduled inspections and maintain records in accordance with the inspection schedule outline enclosed within this document.

Site Engineer: Civil Design Group, LLC
Address: 4 High Street, Suite 155, North Andover, MA 01845
Office Phone: 978-794-5400
Contact: Matthew Leidner, P.E.

The components of the stormwater management system shall be inspected, monitored and maintained in accordance with the following to ensure that the on-site stormwater management/ best management practice facilities for the project function as intended. Routine inspection and proper maintenance of these individual components is essential to providing the long-term enhancement of both the quality and quantity of the runoff from the site.

The proposed stormwater management best management practices (BMPs) have been designed to collect and convey runoff from developed areas in accordance with the Massachusetts DEP's Stormwater Management Handbook. The drainage system consists of deep sump hooded catch basins, manholes, water quality units, and subsurface infiltration systems (SISs).

Street Sweeping

Sweeping of the pavement areas is suggested to be performed twice a year, once in the spring and once in the fall, to reduce the amount of sediment and debris entering the catch basins.

Estimated Cost Annual: $4,000

Deep Sump Hooded Catch Basins

Stormwater runoff from proposed pavement areas is directed via curbing and site grading to catch basins with deep sumps and hooded outlets. These structures are designed to trap and remove sediment and larger particles from the stormwater and improve the performance of subsequent BMP's. The sumps are a minimum of 4' in depth and a routine inspection and cleaning schedule shall be followed to ensure optimal effectiveness.

Inspection Frequency:	Quarterly
Inspection Tools:	Manhole hook; survey rod; sludge judge
Items to Inspect:	Measure sediment in sump using survey rod; visually check for floating debris or trash; visually check for oil and if more than a sheen is present, use sludge judge to measure thickness of layer; visually ensure that hood is in place; visually ensure that grate is in good condition; visually ensure that outlet pipe is unobstructed
Maintenance Threshold(s):	Annually or ≥24" sediment in sump (whichever comes first); discernible layer of oil/hydrocarbons on surface; floating trash
Maintenance Equipment:	Vactor or clamshell for sediment removal; vactor and/or oil sorbent pads for oil/hydrocarbon removal; net for floating debris or trash removal
Estimated Annual Cost:	$3,000

Water Quality Units

Proprietary water quality units are designed to remove heavy particles, floating debris and hydrocarbons from stormwater. Stormwater enters the system where floatables and oils are separated prior to the clarified stormwater runoff discharging to an outlet pipe. The project design proposes to use Contech units to provide treatment of runoff from the proposed parking lots prior to reaching the subsurface infiltration systems.

Inspection Frequency:	Quarterly
Inspection Tools:	Manhole hook; survey rod; sludge judge
Items to Inspect:	Measure sediment in sump using survey rod; use sludge judge to measure thickness of oil layer through oil port; visually ensure that insert and weir are in good condition; visually ensure that cover is in good condition
Maintenance Threshold(s):	Refer to Contech maintenance guidelines
Maintenance Equipment:	Vactor
Estimated Annual Cost:	$4,000

p: 978-794-5400 f : 978.965.3971 www.cdgengineering.com

Subsurface Infiltration Systems (SISs)

Subsurface infiltration systems (SISs) 1 and 2 are designed to treat, detain, and infiltrate stormwater. These systems are comprised of open-bottom concrete galleys underlain by stone. The systems are equipped with inspection/cleanout ports to facilitate inspection for standing water and sediment accumulation.

Inspection Frequency:	Quarterly
Inspection Tools:	Ruler or survey rod to measure sediment
Items to Inspect:	Measure any accumulated sediment using a ruler or survey rod; inspect for standing water if more than 72 hours have elapsed since the previous rain event.
Maintenance Threshold(s):	≥1" sediment
Maintenance Equipment:	Water jet and vactor
Estimated Annual Cost:	$2,000

Riprap Aprons

The riprap aprons are intended to dissipate energy and spread out flow prior to discharge.

Inspection Frequency:	Quarterly
Inspection Tools:	None (all visual)
Items to Inspect:	Visually ensure that flared end section is intact; visually ensure that riprap and interspersed boulders are intact; visually inspect that pipe is unobstructed; visually inspect downgradient slope for evidence of re-concentration of sheet flow; visually inspect downgradient wetland area(s) for signs of adverse impacts such as erosion or sedimentation
Maintenance Threshold(s):	Trim vegetation around pipe annually to maintain accessibility and visibility for inspection purposes, remove sediment if present, replace any displaced stones
Maintenance Equipment:	Mower/trimmer for trimming vegetation, hand methods or equipment as required for sediment removal and stone replacement
Estimated Annual Cost:	$1,000

1.2 ILLICIT DISCHARGE STATEMENT

Illicit discharges to the stormwater management system are discharges not entirely comprised of stormwater. Discharges to the stormwater management system from the following activities or facilities are permissible: firefighting, water line flushing, landscape irrigation, uncontaminated groundwater, potable water sources, foundation drains, air conditioning condensation, footing drains, individual resident car washing, flows from riparian habitats and wetlands, dechlorinated water from swimming pools, water used for street washing and water used to clean residential buildings without detergents.

There are no known illicit discharges currently at the site nor are any illicit discharges proposed as part of the project. The stormwater management system is not intended to convey any illicit discharges and or pollutants and as such, control measures that are identified within this report shall be strictly adhered to in order to minimize the risk of contamination. Any unknown existing illicit discharges that are discovered as part of the development of the subject site shall be eliminated in accordance with local, state and federal regulations.

2.0 LONG-TERM POLLUTION PREVENTION PLAN (LTPPP)

The Massachusetts DEP Stormwater Management Handbook requires that a Long-Term Pollution Prevention Plan (LTPPP) be prepared and incorporated as part of the Operation & Maintenance of the Stormwater Management System. The purpose of the LTPPP is to identify potential sources of pollution that may affect the quality of stormwater discharges, and to describe the implementation of practices to reduce the pollutants in stormwater discharges. The following items describe the source control and proper procedures for the LTPPP.

Solid Waste Storage:
There are no proposed exterior (un-covered) solid waste storage areas. Trash and recycling shall be stored either indoors or in closed containers. The homeowner's association shall contract with a waste hauling company to service the development on a routine basis.

Street Sweeping
Sweeping of site drives and parking lots is recommended to be performed twice a year, once in the spring and once in the fall, to reduce the amount of sediment and debris entering the catch basins. Swept materials shall be disposed of in accordance with applicable local and state requirements.

Deicing and Salt Storage
Deicing methods shall be used in conjunction with snow removal to maintain safe pedestrian and vehicular access. The management company will be responsible for maintaining roads, driveways, sidewalks and pedestrian access onsite. To the extent practicable, snow shall be piled in areas where the snowmelt will receive maximum treatment through the proposed BMPs. Deicing products shall be stored off-site or in a covered location. Deicing products such as calcium chloride, rock salt and/or sand may be used unless otherwise restricted by the municipality.

Snow Disposal
To the extent possible, snow shall be stored on pervious surfaces in upland areas away from water resources and wells. At these locations, snow meltwater can filter in to the soil, leaving behind sand and debris, which can be removed in the springtime. Avoid disposing of snow on top of storm drain catch basins or in stormwater drainage swales or ditches. Snow combined with sand and debris may block a storm drainage system, causing localized flooding. In addition, a high volume of sand, sediment, and litter released from melting snow may be quickly transported through the drainage system into surface water. In no case shall snow be disposed of or stored in environmentally sensitive areas such as wetlands, floodplains, streams or other water bodies. If necessary to remove snow from the site, the snow shall be disposed of at an off-site location in accordance with applicable local, state and federal regulations.

Hazardous Materials Containment
Sources of potential spill hazards include vehicle fluids, liquid fuels, pesticides, paints, solvents, and liquid cleaning products. The majority of the spill hazards would likely occur within buildings and would not enter the stormwater drainage system. However, there are potential spill hazards from vehicle fluids or liquid fuels located outside of the buildings. These exterior spill hazards have the potential to enter the stormwater drainage system and shall be addressed as follows:

- Spill Hazards of pesticides, paints, and solvents shall be remediated using the manufacturers' recommended spill cleanup protocol.

- Vehicle fluids and liquid fuel spill shall be remediated according to the local and state regulations governing fuel spills.
- Any hazardous spills shall be cleaned up immediately after discovery
- Should a spill occur, this pollution prevention plan should be adjusted to include measures to prevent another spill of a similar nature. A description of the spill, along with the causes and cleanup measures should be included in the updated pollution prevention plan.

Septic System Management
Not applicable – the project utilizes a public sewer system.

Lawn, Garden, and Landscape Management:
Lawn areas shall be maintained and mowed regularly throughout the growing season. No materials generated from lawn maintenance such as clippings, leaf litter, or any other landscape debris shall be disposed of in wetlands, drainage, or other sensitive areas. Any bare areas of lawn shall be reseeded and plants shall be pruned on an as-needed basis. Trash and debris shall be removed from landscaped and planted areas as-needed.

Fertilizers, herbicides and pesticides shall be used within the amounts recommended by the manufacturer. The use of fertilizers containing phosphorus shall be minimized and if utilized, should favor slow-release phosphorus fertilizers. These products shall be stored in containers indoors.

Pet waste shall be cleaned up routinely and disposed of properly.

APPENDIX-A

EXAMPLE
OPERATION AND MAINTENANCE
REPORT FORMS

CIVIL DESIGN GROUP, LLC
ENGINEERING. LAND USE. PLANNING. PERMITTING.

4 High Street, Suite 155
North Andover, MA 01845
Tel 978.794.5400
www.cdgengineering.com

QUARTERLY STORMWATER INSPECTION REPORT (1/2)

Site:	Lewis Ridge	**Date:**	
Address:	28 Haverhill Road, Amesbury, MA	**Time:**	
Inspector:		**Weather:**	

CATCH BASINS

Unit #	Sediment (inches)	Oil (inches)	Hood/ Pipes	Grate	Last Cleaned	Attention Recommended

CIVIL DESIGN GROUP, LLC

ENGINEERING. LAND USE. PLANNING. PERMITTING.

4 High Street, Suite 155
North Andover, MA 01845
Tel 978.794.5400
www.cdgengineering.com

QUARTERLY STORMWATER INSPECTION REPORT (2/2)

Site:	Lewis Ridge	**Date:**	
Address:	28 Haverhill Road, Amesbury, MA	**Time:**	
Inspector:		**Weather:**	

SUBSURFACE INFILTRATION SYSTEMS

Unit #	Notes	Attention Recommended

WATER QUALITY UNITS

Unit #	Notes	Attention Recommended

RIPRAP APRONS

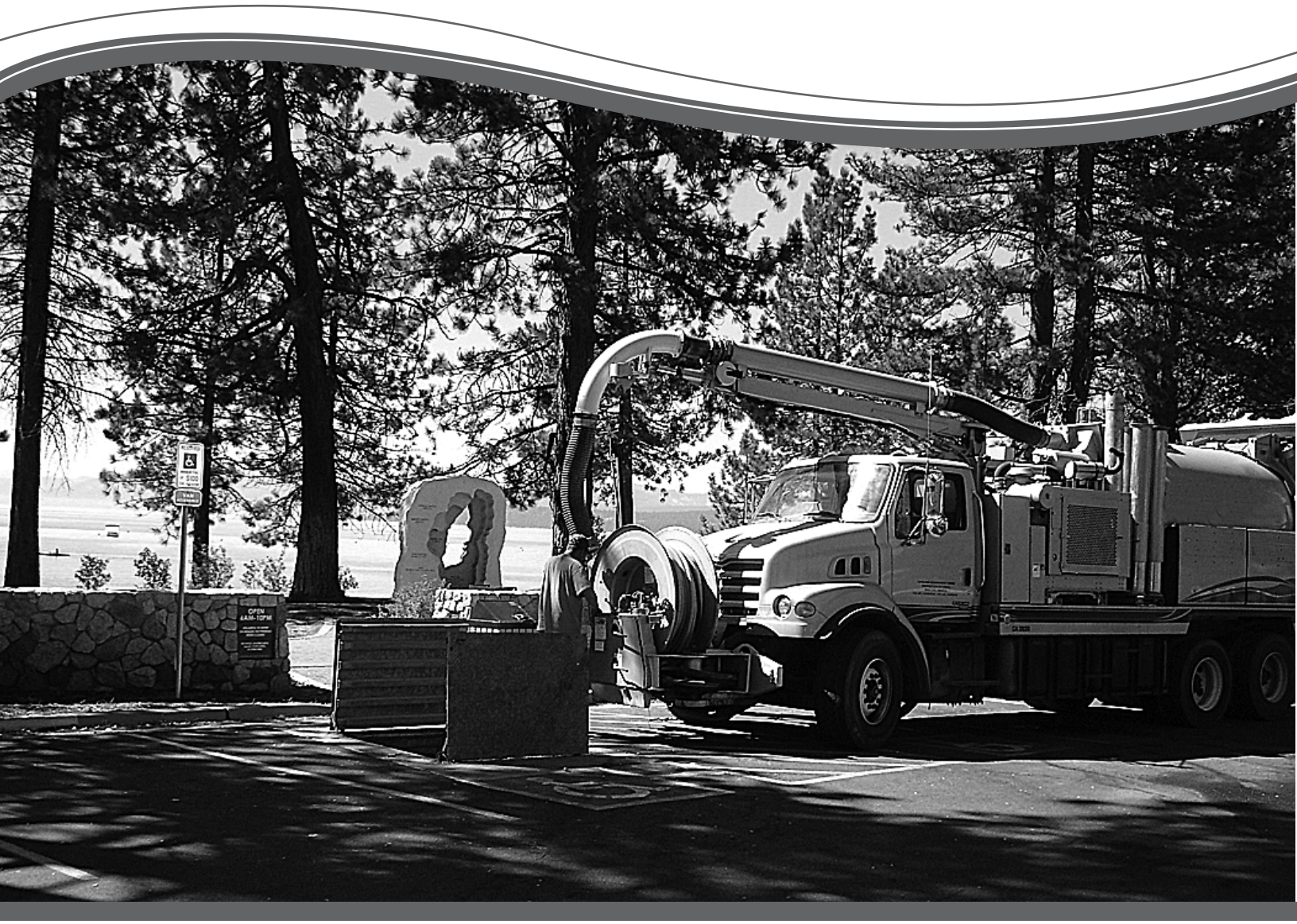
Unit #	Notes	Attention Recommended

APPENDIX-B

WATER QUALITY UNIT
INSPECTION AND MAINTENANCE GUIDE

CONTECH®
ENGINEERED SOLUTIONS

Cascade Separator® Inspection and Maintenance Guide



CASCADE
separator®

Maintenance

The Cascade Separator® system should be inspected at regular intervals and maintained when necessary to ensure optimum performance. The rate at which the system collects sediment and debris will depend upon on-site activities and site pollutant characteristics. For example, unstable soils or heavy winter sanding will cause the sediment storage sump to fill more quickly but regular sweeping of paved surfaces will slow accumulation.

Inspection

Inspection is the key to effective maintenance and is easily performed. Pollutant transport and deposition may vary from year to year and regular inspections will help ensure that the system is cleaned out at the appropriate time. At a minimum, inspections should be performed twice per year (i.e. spring and fall). However, more frequent inspections may be necessary in climates where winter sanding operations may lead to rapid accumulations, or in equipment wash-down areas. Installations should also be inspected more frequently where excessive amounts of trash are expected.

A visual inspection should ascertain that the system components are in working order and that there are no blockages or obstructions in the inlet chamber, flumes or outlet channel. The inspection should also quantify the accumulation of hydrocarbons, trash and sediment in the system. Measuring pollutant accumulation can be done with a calibrated dipstick, tape measure or other measuring instrument. If absorbent material is used for enhanced removal of hydrocarbons, the level of discoloration of the sorbent material should also be identified during inspection. It is useful and often required as part of an operating permit to keep a record of each inspection. A simple form for doing so is provided in this Inspection and Maintenance Guide.

Access to the Cascade Separator unit is typically achieved through one manhole access cover. The opening allows for inspection and cleanout of the center chamber (cylinder) and sediment storage sump, as well as inspection of the inlet chamber and slanted skirt. For large units, multiple manhole covers allow access to the chambers and sump.

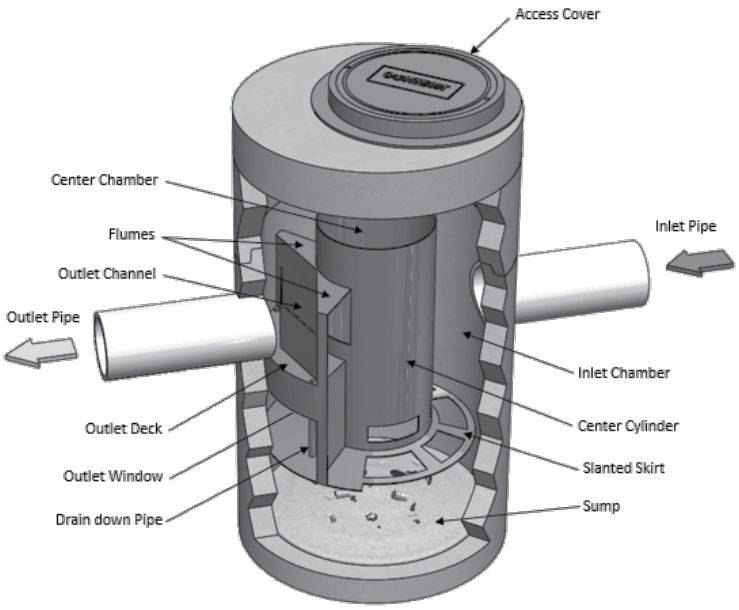
The Cascade Separator system should be cleaned before the level of sediment in the sump reaches the maximum sediment depth and/or when an appreciable level of hydrocarbons and trash has accumulated. If sorbent material is used, it must be replaced when significant discoloration has occurred. Performance may be impacted when maximum sediment storage capacity is exceeded. Contech recommends maintaining the system when sediment level reaches 50% of maximum storage volume. The level of sediment is easily determined by measuring the distance from the system outlet invert (standing water level) to the top of the sediment pile. To avoid underestimating the level of sediment in the chamber, the measuring device must be lowered to the top of the sediment pile carefully. Finer, silty particles at the top of the pile typically offer less resistance to the end of the rod than larger particles toward the bottom of the pile. Once this measurement is recorded, it should be compared to the chart in this document to determine if the height of the sediment pile off the bottom of the sump floor exceeds 50% of the maximum sediment storage.

Cleaning

Cleaning of a Cascade Separator system should be done during dry weather conditions when no flow is entering the system. The use of a vacuum truck is generally the most effective and convenient method of removing pollutants from the system. Simply remove the manhole cover and insert the vacuum tube down through the center chamber and into the sump. The system should be completely drained down and the sump fully evacuated of sediment. The areas outside the center chamber and the slanted skirt should also be washed off if pollutant build-up exists in these areas.

In installations where the risk of petroleum spills is small, liquid contaminants may not accumulate as quickly as sediment. However, the system should be cleaned out immediately in the event of an oil or gasoline spill. Motor oil and other hydrocarbons that accumulate on a more routine basis should be removed when an appreciable layer has been captured. To remove these pollutants, it may be preferable to use absorbent pads since they are usually less expensive to dispose than the oil/water emulsion that may be created by vacuuming the oily layer. Trash and debris can be netted out to separate it from the other pollutants. Then the system should be power washed to ensure it is free of trash and debris.

Manhole covers should be securely seated following cleaning activities to prevent leakage of runoff into the system from above and to ensure proper safety precautions. Confined space entry procedures need to be followed if physical access is required. Disposal of all material removed from the Cascade Separator system must be done in accordance with local regulations. In many locations, disposal of evacuated sediments may be handled in the same manner as disposal of sediments removed from catch basins or deep sump manholes. Check your local regulations for specific requirements on disposal. If any components are damaged, replacement parts can be ordered from the manufacturer.



Cascade Separator® Maintenance Indicators and Sediment Storage Capacities

Model Number	Diameter		Distance from Water Surface to Top of Sediment Pile		Sediment Storage Capacity	
	ft	m	ft	m	y^3	m^3
CS-3	3	0.9	1.5	0.5	0.4	0.3
CS-4	4	1.2	2.5	0.8	0.7	0.5
CS-5	5	1.3	3	0.9	1.1	0.8
CS-6	6	1.8	3.5	1	1.6	1.2
CS-8	8	2.4	4.8	1.4	2.8	2.1
CS-10	10	3.0	6.2	1.9	4.4	3.3
CS-12	12	3.6	7.5	2.3	6.3	4.8

Note: The information in the chart is for standard units. Units may have been designed with non-standard sediment storage depth.

A Cascade Separator unit can be easily cleaned in less than 30 minutes.

A vacuum truck excavates pollutants from the systems.

Cascade Separator® Inspection & Maintenance Log

Cascade Model:			Location:		
Date	Depth Below Invert to Top of Sediment[1]	Floatable Layer Thickness[2]	Describe Maintenance Performed	Maintenance Personnel	Comments

1. The depth to sediment is determined by taking a measurement from the manhole outlet invert (standing water level) to the top of the sediment pile. Once this measurement is recorded, it should be compared to the chart in the maintenance guide to determine if the height of the sediment pile off the bottom of the sump floor exceeds 50% of the maximum sediment storage. Note: to avoid underestimating the volume of sediment in the chamber, the measuring device must be carefully lowered to the top of the sediment pile.
2. For optimum performance, the system should be cleaned out when the floating hydrocarbon layer accumulates to an appreciable thickness. In the event of an oil spill, the system should be cleaned immediately.

SUPPORT

- Drawings and specifications are available at www.ContechES.com.
- Site-specific design support is available from our engineers.

Contech Engineered Solutions LLC provides site solutions for the civil engineering industry. Contech's portfolio includes bridges, drainage, sanitary sewer, stormwater, and earth stabilization products. For information, visit www.ContechES.com or call 800.338.1122

CONTECH ENGINEERED SOLUTIONS
800-925-5240
www.ContechES.com

APPENDIX-C

BMP PLAN

DRAIN MANHOLE SCHEDULE			
NAME	RIM	INV. (IN)	INV. (OUT)
DMH-1	102.83	99.60 (12", CB-1A, 23 LF, 0.011"/") 99.60 (12", CB-1B, 18 LF, 0.014"/")	99.50 (12", DMH-2, 28 LF, 0.016 "/")
DMH-2	102.34	99.05 (12", DMH-1, 28 LF, 0.016"/") 99.05 (12", CB-2A, 16 LF, 0.006"/") 99.05 (12", CB-2B, 9 LF, 0.011"/")	98.95 (12", DMH-3, 94 LF, 0.040 "/")
DMH-3	101.02	95.25 (12", DMH-2, 94 LF, 0.040"/") 95.25 (12", CB-3A, 11 LF, 0.023"/") 95.25 (12", CB-3B, 11 LF, 0.023"/")	94.20 (12", SIS-1 (IN B), 25 LF, 0.039 "/")
DMH-4	96.88	93.25 (12", CB-4A, 11 LF, 0.018"/") 93.25 (12", CB-4B, 11 LF, 0.018"/")	93.15 (12", SIS-1 (IN D), 7 LF, 0.021 "/")
DMH-5	96.94	90.00 (12", SIS-1 (OUT), 5 LF, 0.000"/")	89.50 (12", DMH-6, 57 LF, 0.020 "/")
DMH-6	93.95	88.35 (12", DMH-5, 57 LF, 0.020"/")	80.75 (12", END-1, 59 LF, 0.013 "/")
DMH-7	93.06	88.35 (12", CB-7A, 32 LF, 0.006"/") 88.35 (12", CB-7B, 23 LF, 0.013"/")	88.25 (12", DMH-8, 21 LF, 0.012 "/")
DMH-8	93.83	88.00 (12", DMH-7, 21 LF, 0.012"/") 90.10 (12", CB-8B, 16 LF, 0.022"/") 90.25 (12", CB-8A, 9 LF, 0.023"/")	87.90 (12", DMH-9, 158 LF, 0.010 "/")
DMH-9	93.10	86.30 (12", DMH-8, 158 LF, 0.010"/") 88.35 (8", TD-2, 44 LF, 0.020"/") 89.95 (12", CB-9B, 18 LF, 0.022"/") 90.05 (12", CB-9A, 13 LF, 0.024"/")	86.20 (12", DMH-11, 103 LF, 0.010 "/")
DMH-10	92.50	87.80 (12", FES-1, 79 LF, 0.015"/")	80.75 (12", END-2, 32 LF, 0.023 "/")
DMH-11	90.26	85.15 (12", DMH-9, 103 LF, 0.010"/") 86.45 (12", CB-11A, 23 LF, 0.021"/") 86.55 (12", CB-11B, 19 LF, 0.021"/")	85.05 (12", DMH-12, 15 LF, 0.013 "/")
DMH-12	90.37	84.85 (12", DMH-11, 15 LF, 0.013"/") 84.85 (12", DMH-13, 46 LF, 0.011"/")	84.35 (18", SIS-2 (IN A), 5 LF, 0.020 "/")
DMH-13	89.60	85.45 (12", CB-13D, 17 LF, 0.015"/") 85.45 (12", CB-13A, 12 LF, 0.020"/") 85.95 (12", CB-13B, 22 LF, 0.011"/") 85.95 (12", CB-13C, 24 LF, 0.010"/")	85.35 (12", DMH-12, 46 LF, 0.011 "/")
DMH-14	89.39	85.70 (12", CB-14B, 14 LF, 0.021"/") 85.70 (12", CB-14A, 14 LF, 0.021"/")	85.60 (12", SIS-2 (IN B), 21 LF, 0.029 "/")

CATCH BASIN SCHEDULE			
NAME	RIM	INV. (IN)	INV. (OUT)
CB-1A	102.87		99.85 (12", DMH-1, 23 LF, 0.011 "/")
CB-1B	102.87		99.85 (12", DMH-1, 18 LF, 0.014 "/")
CB-2A	102.15		99.15 (12", DMH-2, 16 LF, 0.006 "/")
CB-2B	102.15		99.15 (12", DMH-2, 9 LF, 0.011 "/")
CB-3A	100.80		95.50 (12", DMH-3, 11 LF, 0.023 "/")
CB-3B	100.80		95.50 (12", DMH-3, 11 LF, 0.023 "/")
CB-4A	96.66		93.45 (12", DMH-4, 11 LF, 0.018 "/")
CB-4B	96.66		93.45 (12", DMH-4, 11 LF, 0.018 "/")
CB-7A	91.55		88.55 (12", DMH-7, 32 LF, 0.006 "/")
CB-7B	91.67	88.75 (8", TD-1, 11 LF, 0.044"/")	88.65 (12", DMH-7, 23 LF, 0.013 "/")
CB-8A	93.49		90.45 (12", DMH-8, 9 LF, 0.023 "/")
CB-8B	93.49		90.45 (12", DMH-8, 16 LF, 0.022 "/")
CB-9A	93.38		90.35 (12", DMH-9, 13 LF, 0.024 "/")
CB-9B	93.38		90.35 (12", DMH-9, 18 LF, 0.022 "/")
CB-11A	89.97		86.95 (12", DMH-11, 23 LF, 0.021 "/")
CB-11B	89.97		86.95 (12", DMH-11, 19 LF, 0.021 "/")
CB-13A	89.27		85.70 (12", DMH-13, 12 LF, 0.020 "/")
CB-13B	89.24		86.20 (12", DMH-13, 22 LF, 0.011 "/")
CB-13C	89.23		86.20 (12", DMH-13, 24 LF, 0.010 "/")
CB-13D	89.20		85.70 (12", DMH-13, 17 LF, 0.015 "/")
CB-14A	89.03		86.00 (12", DMH-14, 14 LF, 0.021 "/")
CB-14B	89.03		86.00 (12", DMH-14, 14 LF, 0.021 "/")

DRAIN MANHOLE SCHEDULE			
NAME	RIM	INV. (IN)	INV. (OUT)
DMH-15	89.99	84.00 (12", SIS-2 (OUT), 5 LF, 0.000"/")	81.30 (12", END-3, 15 LF, 0.020 "/")
DMH-RD-1A	97.50		94.50 (12", DMH-RD-1B, 53 LF, 0.020 "/")
DMH-RD-1B	99.50	90.30 (12", DMH-RD-1C, 77 LF, 0.010"/") 93.45 (12", DMH-RD-1A, 53 LF, 0.020"/")	90.20 (12", SIS-1 (IN A), 11 LF, 0.017 "/")
DMH-RD-1C	101.25	91.20 (12", DMH-RD-1D, 90 LF, 0.010"/")	91.10 (12", DMH-RD-1B, 77 LF, 0.010 "/")
DMH-RD-1D	101.00	92.20 (12", DMH-RD-1E, 105 LF, 0.010"/")	92.10 (12", DMH-RD-1C, 90 LF, 0.010 "/")
DMH-RD-1E	97.75	93.35 (12", DMH-RD-1F, 214 LF, 0.010"/")	93.25 (12", DMH-RD-1D, 105 LF, 0.010 "/")
DMH-RD-1F	98.00		95.50 (12", DMH-RD-1E, 214 LF, 0.010 "/")
DMH-RD-2A	97.50		94.50 (12", DMH-RD-2B, 53 LF, 0.020 "/")
DMH-RD-2B	99.50	90.30 (12", DMH-RD-2C, 77 LF, 0.010"/") 93.45 (12", DMH-RD-2A, 53 LF, 0.020"/")	90.20 (12", SIS-1 (IN C), 11 LF, 0.017 "/")
DMH-RD-2C	101.25	91.20 (12", DMH-RD-2D, 90 LF, 0.010"/")	91.10 (12", DMH-RD-2B, 77 LF, 0.010 "/")
DMH-RD-2D	101.00	92.20 (12", DMH-RD-2E, 105 LF, 0.010"/")	92.10 (12", DMH-RD-2C, 90 LF, 0.010 "/")
DMH-RD-2E	98.50	93.35 (12", DMH-RD-2F, 214 LF, 0.010"/")	93.25 (12", DMH-RD-2D, 105 LF, 0.010 "/")
DMH-RD-2F	98.00		95.50 (12", DMH-RD-2E, 214 LF, 0.010 "/")

NOT FOR CONSTRUCTION

CDG PROJECT #: 25015

REVISIONS:

REV	DATE	COMMENT
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

PREPARED BY:

CIVIL DESIGN GROUP, LLC

4 HIGH STREET, SUITE 155
NORTH ANDOVER, MA 01845
www.cdgengineering.com
p: 978-794-5400 f: 978-965-3971

PREPARED FOR:

PULTE HOMES

1900 WEST PARK DRIVE
SUITE 180
WESTBOROUGH, MA 01581
www.pulte.com

PROJECT:

LEWIS RIDGE

28 HAVERHILL ROAD (ROUTE 110)
AMESBURY, MA

SCALE:

40 0 20 40 80
GRAPHIC SCALE IN FEET

SHEET:

BMP PLAN

APPENDIX C

DATE: 04/13/2026

Attachment 10 –

Illicit Discharge Statement

ILLICIT DISCHARGE STATEMENT

FOR

LEWIS RIDGE

28 HAVERHILL ROAD (ROUTE 110)
AMESBURY, MASSACHUSETTS

DATE: APRIL 13, 2026

Illicit discharges to the stormwater management system are discharges not entirely comprised of stormwater. Discharges to the stormwater management system from the following activities or facilities are permissible: firefighting, water line flushing, landscape irrigation, uncontaminated groundwater, potable water sources, foundation drains, air conditioning condensation, footing drains, individual resident car washing, flows from riparian habitats and wetlands, dechlorinated water from swimming pools, water used for street washing and water used to clean residential buildings without detergents.

There are no known illicit discharges currently at the site nor are any illicit discharges proposed as part of the project. The stormwater management system is *not* intended to convey any illicit discharges and/or pollutants and as such, control measures that are identified within this report shall be strictly adhered to in order to minimize the risk of contamination. Any unknown existing illicit discharges that are discovered as part of the development of the subject site shall be eliminated in accordance with local, state and federal regulations.