DRAINAGE CALCULATIONS AND STORMWATER MANAGEMENT PLAN

For:

JACKSON SQUARE
ASSESSORS PARCEL IDs 23-253-14, 16, 17
23-305-1,4,9,10,11
23-306-11

WEYMOUTH, MASSACHUSETTS

Located:

JACKSON SQUARE
WEYMOUTH, MASSACHUSETTS

Submitted to:

TOWN OF WEYMOUTH

Prepared For:

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Drainage Calculations and Stormwater Management Plan
Jackson Square
Weymouth, Massachusetts

Project Summary

The project proponent, Irakis N. Papachristos, Manager of 864, 909, 910 Broad Street LLCs and 1409 Commercial Street proposes to re-develop Jackson Square in Weymouth, Massachusetts comprising four sites A-D, as shown on the Weymouth Assessor's Map with the following Parcel Numbers, comprising approximately 1.90 acres.

Site	Assessor's Parcel Number APN
A	23-253-14
	23-253-16
B	23-253-17
C	23-305-1
	23-305-4
	23-305-9
	23-305-10
	23-305-11
D	23-306-11

The entire project site is located within the Jackson Square Overlay District, with sites A, C & D within the Lower Jackson Square (LJSD) subdistrict and Site B within the Upper Jackson Square (UJSD) sub-district.

The proposed redevelopment will consist of razing existing structures, constructing multi-story mixed-use buildings, asphalt parking/access roadways, installing subsurface stormwater management systems, utilities, site grading, and landscaping.

This report contains stormwater runoff calculations for the pre-development and post-development conditions and includes the sizing of the proposed stormwater best management practices (BMPs).

Refer to Figure 1- USGS Locus Map for the parcel's location.

Pre-Development Condition

Site A

The parcels are currently developed with a funeral parlor, law office, barber shop, and tanning salon with bituminous concrete parking areas. The site has frontage on Broad Street to the south. It is bordered by developed commercial property, The Congregational Church of East Weymouth to the west, Lovell Field to the north and east, and undeveloped woodlands at the rear of the parcel.

The existing topography ranges in elevation from approximately 42 feet. (Weymouth Vertical Datum) in the southwest portion of the site to an elevation of approximately 18 feet. (Weymouth Vertical Datum) in the northwest portion of the site. The parcel slopes northerly from its southwest boundary to an existing low point on-site and the abutting parcel to the west.

Site B

The parcel is currently developed with multi-use residential properties with gravel parking areas to the north. The site has frontage on Broad Street to the south, bordered by Lovell Field to the north and Herring Run Brook to the east.

The existing topography ranges in elevation from approximately 29 feet. (Weymouth Vertical Datum) in the southwest portion of the site to an elevation of approximately 22 feet. (Weymouth Vertical Datum) in the northeast portion of the site, which abuts Lovell Field and Herring Run Brook. The parcel slopes northeasterly from its southwest boundary to Lovell Field.

Site C

The parcels are currently developed with multi-use residential properties and a restaurant with bituminous concrete parking to the southwest. The site has frontage on Broad Street to the north and Commercial Street to the southwest and is bordered by commercial properties and Herring Run Brook and Herring Run Pool Park to the east.

The existing topography ranges in elevation from approximately 37 feet. (Weymouth Vertical Datum) in the site's western portion (Broad Street/Commercial Street intersection) to an elevation of approximately 27 feet. (Weymouth Vertical Datum) in the eastern part of the site, which abuts Herring Run Brook. The parcel slopes easterly from its western boundary to Herring Brook and north to Broad Street.

Site D

The site is currently developed with a dry cleaner and tailor retail store with bituminous concrete parking to the north. The site has frontage on Commercial Street to the north, bordered by the United States Post Office – East Weymouth location to the west and a single-family residence and Herring Run Brook to the east.

The existing topography ranges in elevation from approximately 47 feet. (Weymouth Vertical Datum) in the site's southern portion to an elevation of approximately 30 feet. (Weymouth Vertical Datum) in the northern part of the site, which abuts Commercial Street. The parcel slopes northernly from its southern boundary to Commercial Street.

Refer to Figure 1- USGS Locus Map for the Project's location (Sites A-D).

Wetland resource areas jurisdictional under the Massachusetts Wetlands Protection Act Regulations (WPA) (310 CMR 10.00) and Weymouth Wetlands Protection Ordinance (WWPO) include the inland bank resource area associated with Herring Run Brook to the east of Sites B, C, and D. The 200-ft. Riverfront Area extends onto all four (4) sites.

Herring Run Brook is a major tributary to the Weymouth Back River and is an active herring run. Herring begin their journey up the Back River through Herring Run Brook up to Whitman Pond. Herring rest at the Herring Run Pool Park before they start the next segment to Whitman Pond.

A review of available environmental databases such as MassGIS reveals that the site is not located within a mapped Natural Heritage Area, a Zone II Groundwater Recharge Area, the City of Weymouth Aquifer Protection District Zone, an Interim Wellhead Protection Area (IWPA). Herring Brook is classified as an ORW; therefore, the site is or a Contributing Watershed to Outstanding Resource Water (ORW).

A portion of the project site is located within LOMR Zone AE Special Flood Hazard Area (Elevation 26.63 Weymouth Datum) with the remaining portions located within Zone A 1% AEP and Zone X 0.2% AEP. Refer to Figure 2 – FEMA Flood Map.

The Natural Resources Conservation Service (NRCS) has identified the soil on the site as 103B, Charlton-Hollis-Rock outcrop complex, 3 to 8% slopes with hydrologic soil group (HSG) A, 602, Urban land, 0 to 15% slopes, 655, Udorthents, wet substratum and does not further categorize the soil in terms of permeability or presence of groundwater. Soil testing conducted by McKenzie Engineering Group, Inc. (MEG) on February 8, 2023, at Sites A & B identified the soils as sand and loamy sand. Refer to Figure 3 - Soil Map for the NRCS delineation of soil types and Appendix E – Soil Testing Results for supporting data.

The existing watershed for Sites A and B analyzed in this report is comprised of approximately 4.579 acres, including the subject parcel and offsite tributary areas to the east, west, north, and south. The watershed consists of one sub-catchment area, the existing swale located within Lovell Field.

The existing watershed for Site C analyzed in this report is comprised of approximately 0.611 acres, including the subject parcel and offsite tributary areas to the east. The watershed consists of two sub-catchment areas, the north property line with Broad Street and Herring Brook to the east.

The existing watershed for Site D analyzed in this report is comprised of approximately 0.393 acres, including the subject parcel and offsite tributary areas to the southwest. The watershed has one sub-catchment area, the north property line with Commercial Street.

Refer to the Pre-Development Watershed Plan WS-1 in Appendix A for delineating drainage sub-catchments for the pre-development design condition.

The SCS Technical Release 20 (TR-20) and Technical Release 55 (TR-55) method-based program "HydroCAD" was employed to develop pre- and post-development peak flows. Drainage calculations were prepared for the pre-development condition for the 2, 10, 25, and 100-year Type III storm events. Refer to Appendix A for computer results, soil characteristics, cover descriptions, and times of concentrations for all subareas.

Post-Development Condition

Site A

The proposed redevelopment will consist of demolishing existing structures and constructing a five-story mixed-use building with 98,705 square feet (218 spaces) of basement-level parking, 2,465 square feet of commercial space, and 72 residential units totaling 52,790 square feet on five stories. Access to the parking garage will be off the existing entrance drive to Lovell Field. Construction includes installing a subsurface stormwater management system, utilities, retaining walls, site grading, and landscaping.

Site B

The proposed redevelopment will consist of demolishing existing structures and constructing a four-story mixed-use building with 8,610 square feet (19 spaces) of basement-level parking, 3,975 square feet of restaurant space, 1,230 square feet of commercial space, and 42 residential units totaling 25,430 square feet on four stories. Access to the parking garage will be off the existing entrance drive to Lovell Field. Construction includes installing a subsurface stormwater management system, utilities, site grading, and landscaping.

Site C

The proposed redevelopment will consist of demolishing existing structures and constructing a four-story mixed-use building with 11,202 square feet (28 spaces) of ground-level parking, 2,025 square feet of restaurant space, 1,315 square feet of commercial space, and 55 residential units totaling 39,445 square feet on five stories. Access to the parking garage will be off Commercial Street. Construction includes installing a subsurface stormwater management system, utilities, retaining walls, site grading, and landscaping.

Site D

The proposed redevelopment will consist of demolishing existing structures and constructing a five-story mixed-use building with 5,170 square feet (13 spaces) of ground-level parking, 490 square feet of commercial space, and 31 residential units totaling 21,015 square feet on five stories. Access to the parking garage will be off Commercial Street. Construction includes installing a subsurface stormwater management system, utilities, retaining walls, site grading, and landscaping.

Watershed areas were analyzed in the post-development condition to design low-impact stormwater management facilities to mitigate impacts resulting from re-developing the property. The objective in designing the proposed drainage facilities for the Project is to maintain existing drainage patterns to the extent practicable and to ensure that the post-development rates of runoff are less than pre-development rates at the design points.

Refer to the Post-Development Watershed Plan WS-2 in Appendix B for a delineation of post-development drainage subareas. The design points for the post-development design conditions correspond to those analyzed for the pre-development design condition.

As required, parking within buildings will drain to oil/sediment traps before discharge into the municipal sewer system.

Refer to the site plans for the drainage system design. A comprehensive Construction Phase Pollution Prevention and Erosion Control Plan and Post-Development BMP Operation and Maintenance Plan shall support all BMPs.

Drainage calculations were prepared by employing the SCS TR-20 Methods for the 2, 10, 25, and 100-year, type III storm events. Refer to Appendix B for computer results.

Stormwater Best Management Practices (BMP's)

The treatment stream for the redevelopment shall consist of proprietary pretreatment units, subsurface infiltration tank systems, and a bio-retention/rain garden to remove at least 80% of the total suspended solids (TSS) and mitigate the anticipated pollutant loading.

Refer to the TSS Removal Worksheets in Appendix D for TSS removal rates.

Erosion and Sedimentation Controls

Compost filter tube (Silt sock) erosion control barriers will be placed at the limit of work prior to the commencement of any construction activity. The integrity of the silt sock will be maintained by periodic inspection and replacement as necessary. The silt sock will remain in place until the first course of pavement has been placed, all side slopes have been loamed and seeded, and vegetation has been established. Refer to the Erosion Control details on the Site Development Plans and BMP Operation and Maintenance Plan for proposed erosion control measures to be employed for the Project.

Compliance with Stormwater Management Standards

Standard 1 – No New Untreated Discharges

The proposed redevelopment will not introduce any new untreated discharges to a wetland area or the Commonwealth of Massachusetts waters. All discharges from the project site will be treated through proposed stormwater quality controls such as pretreatment structures, subsurface infiltration tank systems, and a bio-retention/rain garden, including establishing proper maintenance procedures.

Standard 2 – Peak Rate Attenuation

Drainage calculations were performed using SCS TR-20 methods for the 2, 10, 25, and 100-year Type III storm events. Refer to Appendix A and B for computer results. All drainage structures will be designed employing the Rational Method and the Mass. DPW Design Manual to accommodate peak flows generated by a minimum of a 25-year storm event or a 100-year storm event where applicable. The stormwater management systems were designed to accommodate peak flows generated by a 100-year storm event.

The peak rates of runoff are as follows:

Sites A and B

Pre-Development vs. Post-Development Peak Rates of Runoff

Design Point	2 Year Storm **(3.22 Inches)**		10 Year Storm **(4.86 Inches)**		25 Year Storm **(6.15 Inches)**		100 Year Storm **(8.80 Inches)**	
	Exist. (CFS)	**Prop. (CFS)**	**Exist. (CFS)**	**Prop. (CFS)**	**Exist. (CFS)**	**Prop. (CFS)**	**Exist. (CFS)**	**Prop. (CFS)**
Design Point 1	*4.37*	3.88	*7.69*	7.14	*9.62*	9.22	*13.10*	13.09

Site C

Pre-Development vs. Post-Development Peak Rates of Runoff

Design Point	2 Year Storm **(3.22 Inches)**		10 Year Storm **(4.86 Inches)**		25 Year Storm **(6.15 Inches)**		100 Year Storm **(8.80 Inches)**	
	Exist. (CFS)	**Prop. (CFS)**	**Exist. (CFS)**	**Prop. (CFS)**	**Exist. (CFS)**	**Prop. (CFS)**	**Exist. (CFS)**	**Prop. (CFS)**
Design Point 1	*1.68*	1.54	*2.57*	2.43	*3.27*	3.14	*4.71*	4.39
Design Point 2	*0.18*	0.14	*0.28*	0.24	*0.37*	0.32	*0.53*	0.47

Site D

Pre-Development vs. Post-Development Peak Rates of Runoff

Design Point	2 Year Storm **(3.22 Inches)**		10 Year Storm **(4.86 Inches)**		25 Year Storm **(6.15 Inches)**		100 Year Storm **(8.80 Inches)**	
	Exist. (CFS)	**Prop. (CFS)**	**Exist. (CFS)**	**Prop. (CFS)**	**Exist. (CFS)**	**Prop. (CFS)**	**Exist. (CFS)**	**Prop. (CFS)**
Design Point 1	*0.66*	0.66	*1.10*	1.09	*1.45*	1.44	*2.15*	2.66

A comparison of the pre-development and post-development peak rates of runoff indicates that the peak rates of runoff for the post-development condition will be equal to or less than the pre-development condition for all storm events.

Sites A & B

Pre-Development vs. Post-Development Volumes of Runoff

Design Point	2 Year Storm **(3.22 Inches)**		10 Year Storm **(4.86 Inches)**		25 Year Storm **(6.15 Inches)**		100 Year Storm **(8.80 Inches)**	
	Exist. (AC-FT)	**Prop. (AC-FT)**	**Exist. (AC-FT)**	**Prop. (AC-FT)**	**Exist. (AC-FT)**	**Prop. (AC-FT)**	**Exist. (AC-FT)**	**Prop. (AC-FT)**
Design Point 1	*0.349*	0.407	*0.643*	0.773	*0.894*	1.095	*1.441*	1.873

Pre-Development vs. Post-Development Peak Surface Elevations

Design Point	2 Year Storm **(3.22 Inches)**		10 Year Storm **(4.86 Inches)**		25 Year Storm **(6.15 Inches)**		100 Year Storm **(8.80 Inches)**	
	Exist. (FT)	**Prop. (FT)**	**Exist. (FT)**	**Prop. (FT)**	**Exist. (FT)**	**Prop. (FT)**	**Exist. (FT)**	**Prop. (FT)**
Design Point 1 Exist. Swale/Basin	*14.94*	14.87	*15.47*	15.38	*15.97*	15.86	*16.99*	16.99

Site C

Pre-Development vs. Post-Development Volumes of Runoff

Design Point	2 Year Storm **(3.22 Inches)**		10 Year Storm **(4.86 Inches)**		25 Year Storm **(6.15 Inches)**		100 Year Storm **(8.80 Inches)**	
	Exist. (AC-FT)	**Prop. (AC-FT)**	**Exist. (AC-FT)**	**Prop. (AC-FT)**	**Exist. (AC-FT)**	**Prop. (AC-FT)**	**Exist. (AC-FT)**	**Prop. (AC-FT)**
Design Point 1	*0.101*	0.123	*0.170*	0.196	*0.226*	0.254	*0.343*	0.346
Design Point 2	*0.013*	0.010	*0.021*	0.017	*0.028*	0.023	*0.042*	0.036

Site D

Pre-Development vs. Post-Development Volumes of Runoff

Design Point	2 Year Storm **(3.22 Inches)**		10 Year Storm **(4.86 Inches)**		25 Year Storm **(6.15 Inches)**		100 Year Storm **(8.80 Inches)**	
	Exist. (AC-FT)	**Prop. (AC-FT)**	**Exist. (AC-FT)**	**Prop. (AC-FT)**	**Exist. (AC-FT)**	**Prop. (AC-FT)**	**Exist. (AC-FT)**	**Prop. (AC-FT)**
Design Point 1	*0.050*	0.061	*0.087*	0.105	*0.123*	0.141	*0.199*	0.217

Standard 3 – Groundwater Recharge

Sites A and Site B

The runoff will be infiltrated by subsurface infiltration tanks and chambers, which will meet the Stormwater Guidelines for infiltration:

- Infiltration structures will be a minimum of two (2) feet above seasonal high groundwater.
- Utilize the "Static" method for sizing the storage volume, which assumes that there is no exfiltration until the entire recharge volume is filled to the elevation associated with the Required Recharge Volume.
- Hydraulic conductivity is based on soil data from the Geotechnical Report and values developed from Rawls, Brakensiek, and Saxton, 1982, Estimation of Soil Water Properties, *Transactions of the American Society of Agricultural Engineers*, vol.25, no. 5.
- Refer to Appendix D for infiltration and drawdown calculations and Appendix E for soil data.

Groundwater Recharge Volume

Sites	Soil Type	Target Depth Factor (F) (in)	Total Impervious Area (sf)	Required Recharge Volume (cf)[1]	Provided Recharge Volume (cf)[2]
A & B	A	0.60	11,288		
	C	0.25	34,508		
				1,283 (1,977 ADJ.)	**3,824**

1. Required Recharge volume = Target Depth Factor x Impervious Area [Static Method]
(Refer to supplemental calculations in Appendix D)

2. Provided recharge volume = volume Provided from Bottom of System to lowest invert elevation.

Per Standard 3, if stormwater runoff from less than 100% of the site's impervious cover is directed to the BMP intended to infiltrate the Required Recharge Volume, then the storage capacity of the infiltration BMP needs to be increased so that the BMP can capture more of the runoff from the impervious surfaces located with the contributing drainage area. The impervious cover directed towards the infiltration system is 64.91%; therefore, a capture area adjustment of 1.54 Is required. Refer to Appendix D for Capture Area Adjustment calculations.

The infiltration tank and chamber systems will provide both water quality treatment and recharge. Per Standard 4, Water Quality, the BMP must be sized to treat or hold the Target Volume, the larger of the Required Water Quality Volume, and the Required Recharge Volume. The Required Water Quality Volume is based on the one inch of runoff, and the Required Recharge Volume is based on 0.60 inches (Soil Type A) and 0.25 inches (Soil Type C); one inch is greater than 0.60 inches and 0.25 inches; therefore, the Target Volume is the Required Water Quality Volume of 3,816 cubic feet. Refer to Appendix D for supplemental calculations.

The proposed subsurface infiltration systems have been designed to drain completely within 72 hours. The drawdown analysis is based on the required recharge volume exfiltrating at the Rawls Rates based on the soil textural analysis conducted at the proposed exfiltration location. Refer to Appendix D for calculations.

Mounding Analysis

A groundwater mounding calculation for subsurface infiltration system AB-3 has been conducted using MOUNDSOLV Groundwater Mounding Analysis for groundwater mounding beneath an infiltration basin with less than 4 feet of separation from groundwater.

The mounding analysis demonstrates that the Required Recharge Volume is fully dewatered, and the groundwater mounding does not break out above the land within the 72-hour evaluation period. Refer to Appendix D for calculations.

Sites C & D

Stormwater recharge is provided through the reduction of impervious areas. Therefore, the Project complies with Standard 3.

The impervious area for post-development conditions vs. existing conditions is as follows:

Site C - Existing vs Proposed Impervious Surfaces

	Exiting Conditions	Proposed Conditions
Impervious Area	*22,298 SF*	*20,503 SF*
Delta		*-1,795 SF*

Impervious areas- roofs, pavement, handicap ramp, walls

Site D - Existing vs Proposed Impervious Surfaces

	Exiting Conditions	Proposed Conditions
Impervious Area	7,639 SF	*7,482 SF*
Delta		*-157 SF*

Impervious areas- roofs, pavement, handicap ramp, walls

Standard 4 – Water Quality

A Long-Term Pollution Prevention Plan has been incorporated into the Post-Development Operation and Maintenance Plan. Refer to Appendix E for BMP Operation and Maintenance Plans.

All stormwater management systems for the site are designed to comply with the DEP Stormwater Management Policy.

Sites A & B

A treatment stream consisting of a proprietary pretreatment separator unit and a subsurface infiltration tank system will be employed to remove 80% of total suspended solids. Refer to the TSS Removal Worksheets in Appendix D for TSS removal rates.

Site C

A treatment stream consisting of bio-retention/rain garden with a sediment forebay will be employed to remove 80% of total suspended solids. Refer to the TSS Removal Worksheets in Appendix D for TSS removal rates.

Site D

A treatment stream consisting of a proprietary pretreatment separator unit will be employed to remove 80% of total suspended solids. Refer to the TSS Removal Worksheets in Appendix D for TSS removal rates.

Water Quality Treatment Volume

Site	Required WQ Volume (cf)	Proposed WQ Volume (cf)	
A & B	3,816	3,824	Subsurface infiltration system with pretreatment
C	1,690	1,973	Bio-retention with sediment forebay
D	588		Stormceptor STC 900

Standard 5 – Land Use with Higher Potential Pollutant Loads (LUHPPL)

The proposed Project does not include land uses with higher potential pollutant loads. Not Applicable.

Standard 6 – Critical Areas

The site discharges to Outstanding Resource Waters, considered a Critical Area under the Stormwater Management Standards. Stormwater discharges near or to any critical areas require specific source control and pollution prevention measures. The selected stormwater BMPs are consistent with Table CA 2: Standard 6 in the Stormwater Management Handbook. Stormwater infiltration BMPs are preceded by pretreatment BMPs, which achieve a minimum of 44% TSS removal. In addition, the stormwater discharges are set back from the Herring Run Brook, consistent with Table CA 2.

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

For sites C and D, the proposed Project can be considered a redevelopment project and meets the Stormwater Management Standards to the maximum extent practicable.

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

The Project will require an NPDES Construction General Permit, but the Stormwater Pollution Prevention Plan (SWPPP) has not been submitted. The SWPPP will be submitted before any proposed construction. A Construction Phase BMP Operation and Maintenance Plan will be provided as a basis for the SWPPP during the final design.

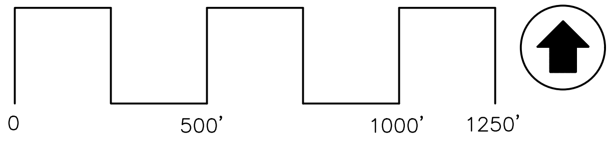
Standard 9 – Operation and Maintenance Plan

The Long-Term Operation and Maintenance Plan is provided in Appendix F.

Standard 10 – Prohibition of Illicit Discharges

No illicit discharges are anticipated on site. An Illicit Discharge Compliance Statement will be submitted prior to the discharge of any stormwater to the post-construction best management practices. The Long-Term Pollution Prevention Plan will include measures to prevent illicit discharges.

FIGURE - 1



U.S. GEOLOGICAL SURVEY
7.5 X 15 MINUTE SERIES

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USGS LOCUS MAP

JACKSON SQUARE
ASSESSOR'S PARCEL ID XXX
WEYMOUTH, MASSACHUSETTS

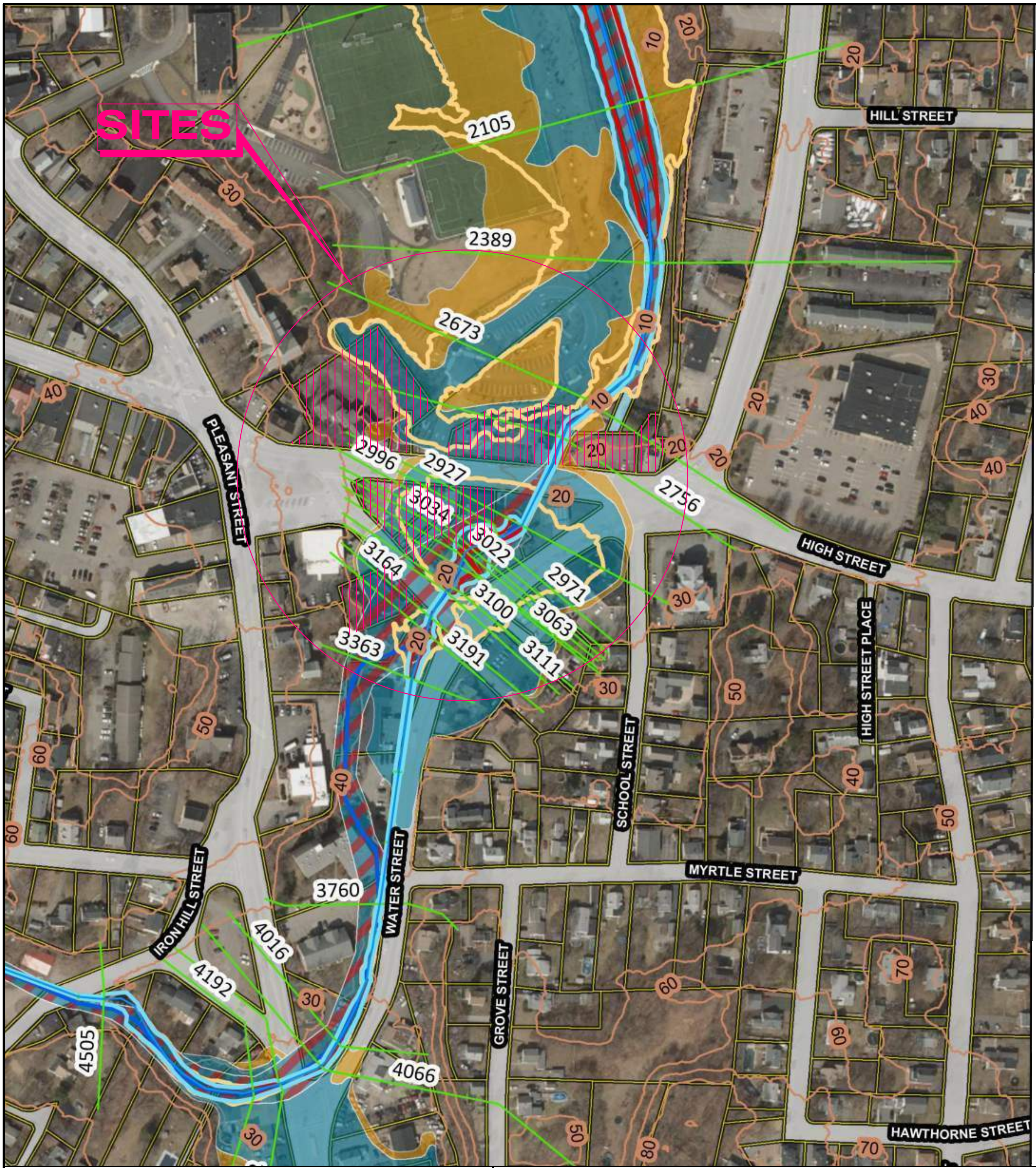
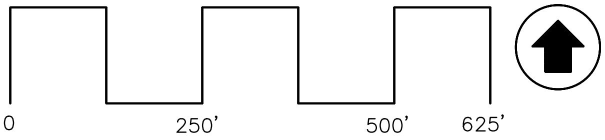


FIGURE - 2



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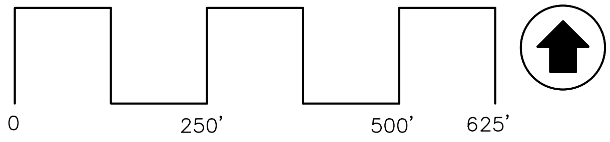
FEMA LOMR MAP

JACKSON SQUARE
ASSESSOR'S PARCEL ID XXX
WEYMOUTH, MASSACHUSETTS

SOIL KEY

SOIL CLASSIFICATION	DESCRIPTION	HYDROLOGIC SOIL GROUP
103B	CHARLTON–HOLLIS–ROCK OUTCROP COMPLEX, 3 TO 8 PERCENT SLOPES	A
602	URBAN LAND, 0 TO 15 PERCENT SLOPES	ASSUMED C
626B	MERIMMAC–URBAN LAND COMPLEX, 0 TO 8 PERCENT SLOPES	A
628C	CANTON–URBAN LAND COMPLEX, 3 TO 15 PERCENT SLOPES	A
655	UDORTHENTS, WET SUBSTRATUM	ASSUMED C

FIGURE - 3



NRCS SOIL SURVEY
PLYMOUTH COUNTY

MEG
MCKENZIE
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NRCS SOILS MAP

JACKSON SQUARE
ASSESSOR'S PARCEL ID XX
WEYMOUTH, MASSACHUSETTS

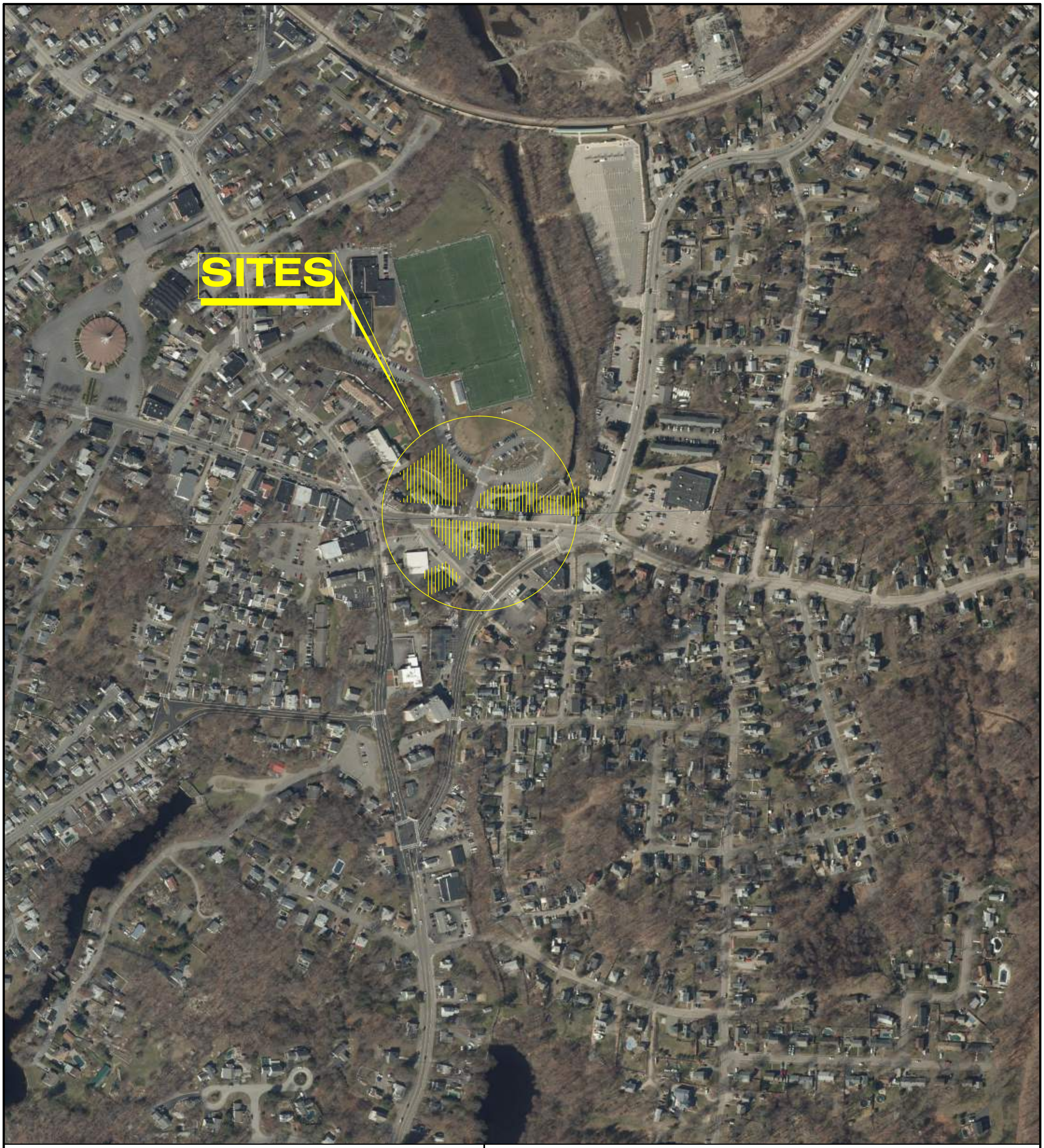
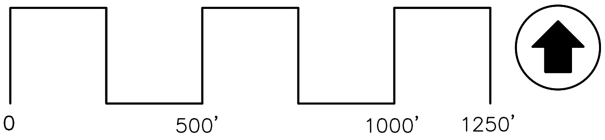


FIGURE - 4



14TH EDITION MASSACHUSETTS
NATURAL HERITAGE ATLAS

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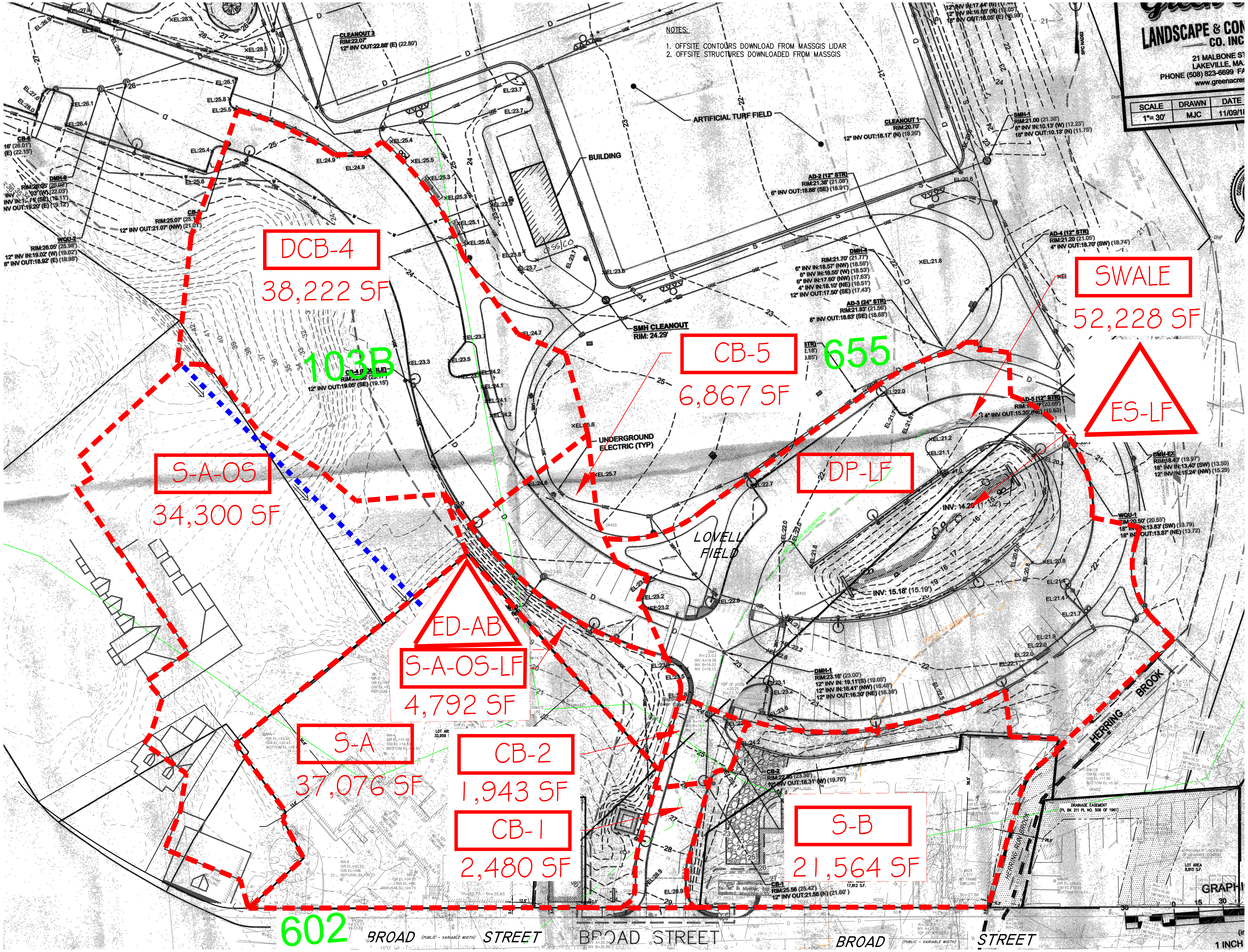
NATURAL HERITAGE & ENDANGERED SPECIES MAP

JACKSON SQUARE
ASSESSOR'S PARCEL ID XX
WEYMOUTH, MASSACHUSETTS

APPENDIX A

Pre-Development Condition

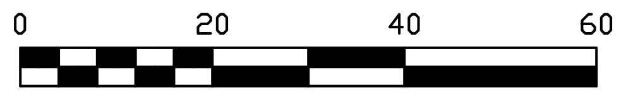


SOIL KEY

SOIL CLASSIFICATION	DESCRIPTION	HYDROLOGIC SOIL GROUP
103B	CHARLTON–HOLLIS–ROCK OUTCROP–COMPLEX, 3 TO 8 PERCENT SLOPES	A
602	URBAN LAND, 0 TO 15 PERCENT SLOPES	C ASSUMED
655	URDORTHENTS, WET SUBSTRATUM	C ASSUMED

LEGEND

⇒ - · - · -	TIME OF CONCENTRATION FLOW PATH
🟥 - - - -	LIMIT OF WATERSHED
━━━━	SOIL TYPE BOUNDARY



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150 LONGWATER DRIVE, SUITE 101
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LANDSCAPE
MDLA
840 SUMMER STREET
SUITE #201A
BOSTON, MA 02127

JACKSON SQUARE
WEYMOUTH, MA

NOI PLAN REVIEW

REVISIONS

MARK	ISSUE	DATE
1	PEER REVIEW COMMENTS	11/17/23

DRAWING INFORMATION
ISSUE: NOI PLAN REVIEW
DATE: SEPTEMBER 6, 2023
PROJECT #: 22034
SCALE:

DRAWING TITLE
PRE-DEVELOPMENT
WATERSHED PLANS
BUILDINGS A&B

DRAWING NUMBER
WS-1

NOTES:

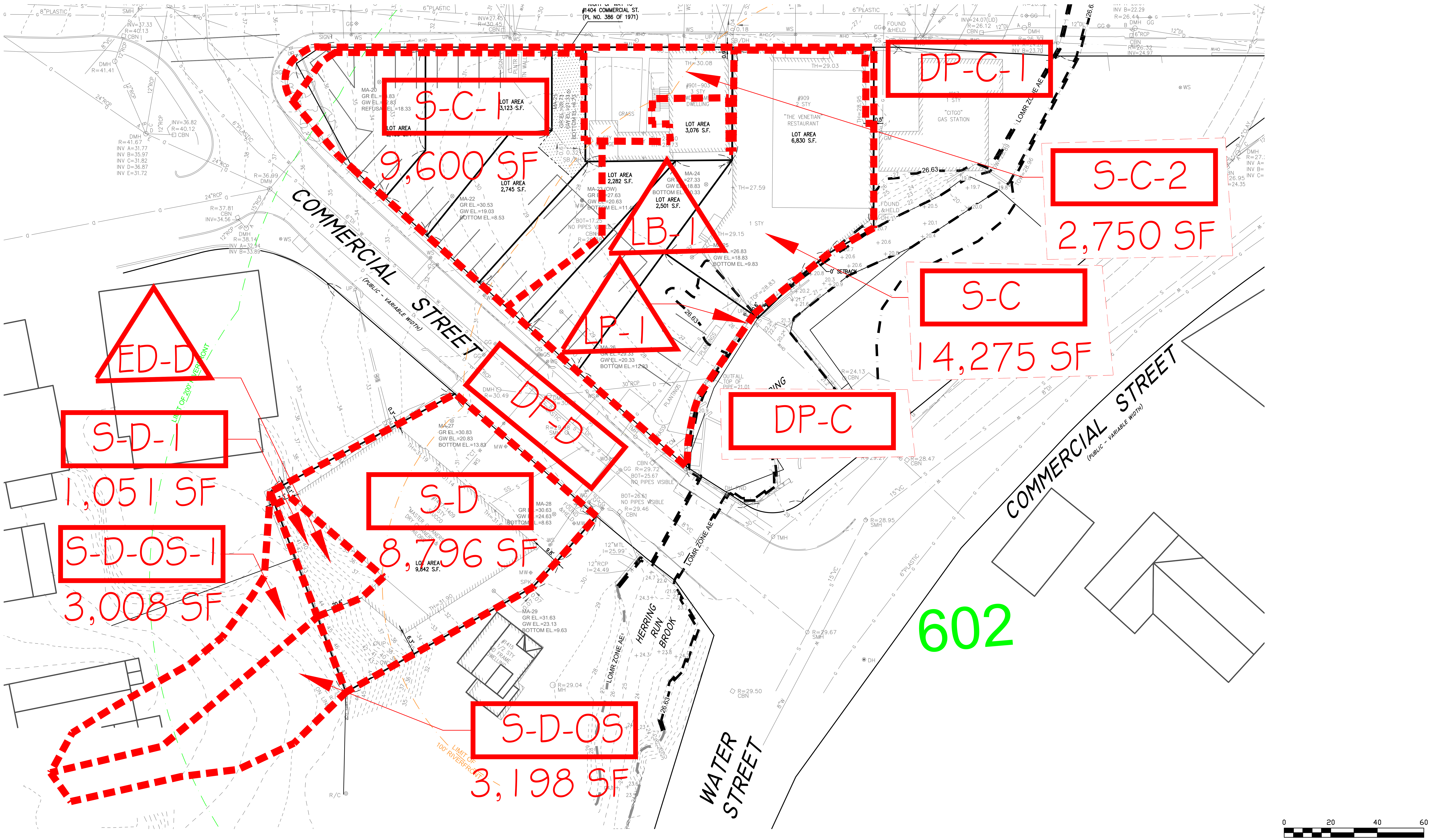
1. OFFSITE CONTOURS DOWNLOAD FROM MASSGIS LIDAR
2. OFFSITE STRUCTURES DOWNLOADED FROM MASSGIS

SOIL KEY

SOIL CLASSIFICATION	DESCRIPTION	HYDROLOGIC SOIL GROUP
103B	CHARLTON–HOLLIS–ROCK OUTCROP–COMPLEX, 3 TO 8 PERCENT SLOPES	A
602	URBAN LAND, 0 TO 15 PERCENT SLOPES	C ASSUMED
655	URDORTHENTS, WET SUBSTRATUM	C ASSUMED

LEGEND

⇒ (blue dashed line)	TIME OF CONCENTRATION FLOW PATH
(red dashed line)	LIMIT OF WATERSHED
(green line)	SOIL TYPE BOUNDARY



ARCHITECT

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ISSUE: NOI PLAN REVIEW
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PROJECT #: 22034
SCALE:

DRAWING TITLE

PRE-DEVELOPMENT
WATERSHED PLANS
BUILDINGS C&D

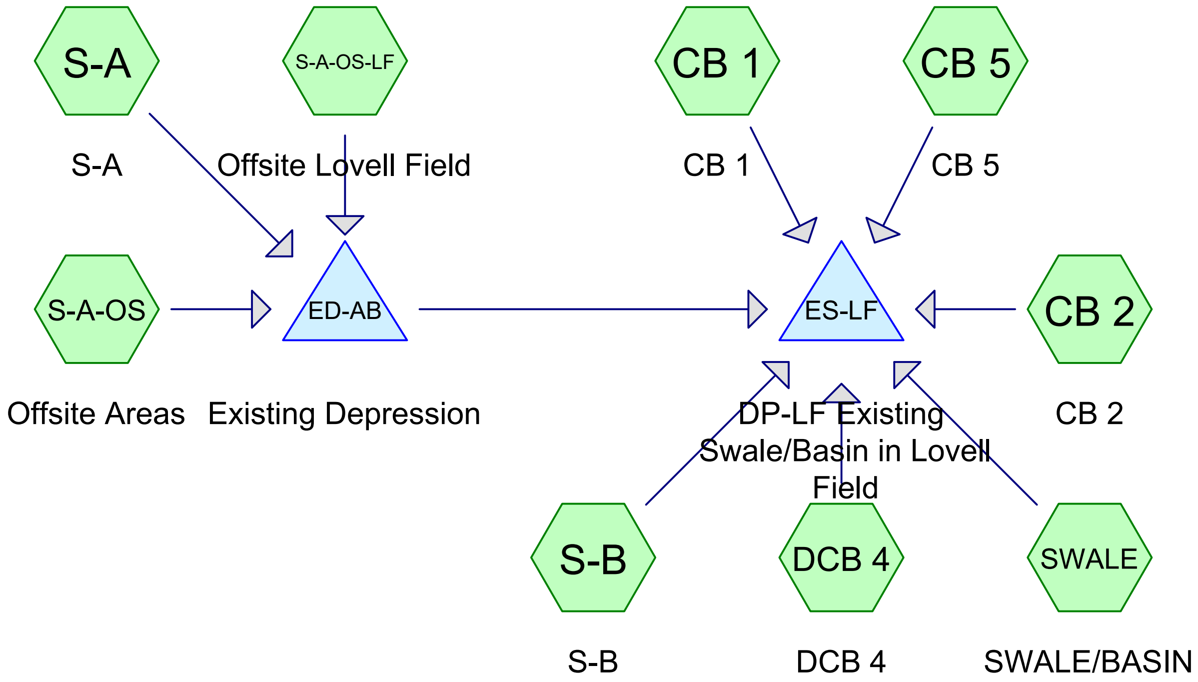
DRAWING NUMBER

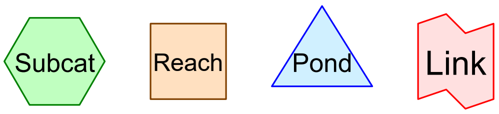
WS-2

C:\Users\tloranger\Documents\22034_Jackson Square Weymouth_tlorangerLPKPZ.rvt

9/6/2023 5:27:10 PM

SITES A & B





Routing Diagram for 222-203 Lot A B Pre Development Conditions (R2)
Prepared by McKenzie Engineering Group Inc, Printed 11/13/2023
HydroCAD® 10.20-3g s/n 00452 © 2023 HydroCAD Software Solutions LLC

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	Type III 24-hr		Default	24.00	1	3.22	2
2	10-Year	Type III 24-hr		Default	24.00	1	4.86	2
3	25-Year	Type III 24-hr		Default	24.00	1	6.15	2
4	100-Year	Type III 24-hr		Default	24.00	1	8.80	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.008	39	>75% Grass cover, Good, HSG A (S-A)
0.272	39	>75% Grass cover, Good, HSG A (OFFSITE) (S-A-OS, S-A-OS-LF)
0.845	74	>75% Grass cover, Good, HSG C (CB 5, S-A, S-A-OS-LF, S-B, SWALE)
0.134	74	>75% Grass cover, Good, HSG C (OFFSITE) (S-A, S-B)
0.095	98	Bottom Basin, HSG A (S-A)
0.079	96	Gravel surface, HSG C (S-B)
0.004	96	Gravel surface, HSG C (OFFSITE) (S-A)
0.032	96	Gravel, HSG C (OFFSITE) (S-B)
0.442	98	Impervious surfaces, HSG A (DCB 4, S-A)
1.159	98	Impervious surfaces, HSG C (CB 1, CB 2, CB 5, S-A, S-B, SWALE)
0.041	98	Impervious surfaces, HSG C (OFFSITE) (S-A, S-A-OS, S-A-OS-LF, S-B)
0.001	98	Roofs, HSG A (S-A)
0.130	98	Roofs, HSG A (OFFSITE) (S-A-OS)
0.199	98	Roofs, HSG C (S-A, S-B)
0.608	30	Woods, Good, HSG A (DCB 4, S-A)
0.366	30	Woods, Good, HSG A (OFFSITE) (S-A-OS)
0.136	70	Woods, Good, HSG C (S-A)
0.027	70	Woods, Good, HSG C (OFFSITE) (S-A-OS-LF)
4.579	**74**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
1.923	HSG A	DCB 4, S-A, S-A-OS, S-A-OS-LF
0.000	HSG B	
2.656	HSG C	CB 1, CB 2, CB 5, S-A, S-A-OS, S-A-OS-LF, S-B, SWALE
0.000	HSG D	
0.000	Other	
4.579		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.280	0.000	0.979	0.000	0.000	1.259	>75% Grass cover, Good	CB 5, S-A, S-A-OS, S-A-OS-LF, S-B, SWALE
0.095	0.000	0.000	0.000	0.000	0.095	Bottom Basin	S-A
0.000	0.000	0.032	0.000	0.000	0.032	Gravel	S-B
0.000	0.000	0.083	0.000	0.000	0.083	Gravel surface	S-A, S-B
0.442	0.000	1.200	0.000	0.000	1.643	Impervious surfaces	CB 1, CB 2, CB 5, DCB 4, S-A, S-A-OS, S-A-OS-LF, S-B, SWALE
0.132	0.000	0.199	0.000	0.000	0.330	Roofs	S-A, S-A-OS, S-B
0.974	0.000	0.163	0.000	0.000	1.137	Woods, Good	DCB 4, S-A, S-A-OS, S-A-OS-LF
1.923	**0.000**	**2.656**	**0.000**	**0.000**	**4.579**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)	Node Name
1	ES-LF	13.87	13.45	39.0	0.0108	0.013	0.0	18.0	0.0	

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentCB 1: CB 1 Runoff Area=2,480 sf 100.00% Impervious Runoff Depth=2.99"
Tc=6.0 min CN=98 Runoff=0.17 cfs 0.014 af

SubcatchmentCB 2: CB 2 Runoff Area=1,943 sf 100.00% Impervious Runoff Depth=2.99"
Tc=6.0 min CN=98 Runoff=0.14 cfs 0.011 af

SubcatchmentCB 5: CB 5 Runoff Area=6,867 sf 82.76% Impervious Runoff Depth=2.56"
Flow Length=195' Slope=0.1230 '/' Tc=7.4 min CN=94 Runoff=0.43 cfs 0.034 af

SubcatchmentDCB 4: DCB 4 Runoff Area=38,222 sf 36.71% Impervious Runoff Depth=0.26"
Tc=6.0 min CN=55 Runoff=0.09 cfs 0.019 af

SubcatchmentS-A: S-A Runoff Area=37,076 sf 61.01% Impervious Runoff Depth=1.77"
Flow Length=195' Slope=0.1230 '/' Tc=7.4 min CN=85 Runoff=1.67 cfs 0.126 af

SubcatchmentS-A-OS: Offsite Areas Runoff Area=34,300 sf 21.18% Impervious Runoff Depth=0.08"
Flow Length=213' Tc=9.4 min CN=47 Runoff=0.01 cfs 0.005 af

SubcatchmentS-A-OS-LF: Offsite Lovell Runoff Area=4,792 sf 2.98% Impervious Runoff Depth=0.74"
Tc=6.0 min CN=68 Runoff=0.08 cfs 0.007 af

SubcatchmentS-B: S-B Runoff Area=21,564 sf 22.87% Impervious Runoff Depth=1.70"
Tc=6.0 min CN=84 Runoff=0.97 cfs 0.070 af

SubcatchmentSWALE: SWALE/BASIN Runoff Area=52,228 sf 59.35% Impervious Runoff Depth=2.01"
Tc=6.0 min CN=88 Runoff=2.76 cfs 0.201 af

Pond ED-AB: Existing Depression Peak Elev=20.00' Storage=5,997 cf Inflow=1.75 cfs 0.138 af
Outflow=0.00 cfs 0.000 af

Pond ES-LF: DP-LF Existing Swale/Basin in Peak Elev=14.94' Storage=219 cf Inflow=4.49 cfs 0.349 af
18.0" Round Culvert n=0.013 L=39.0' S=0.0108 '/' Outflow=4.37 cfs 0.349 af

Total Runoff Area = 4.579 ac Runoff Volume = 0.487 af Average Runoff Depth = 1.28"
54.84% Pervious = 2.511 ac 45.16% Impervious = 2.068 ac

Summary for Subcatchment CB 1: CB 1

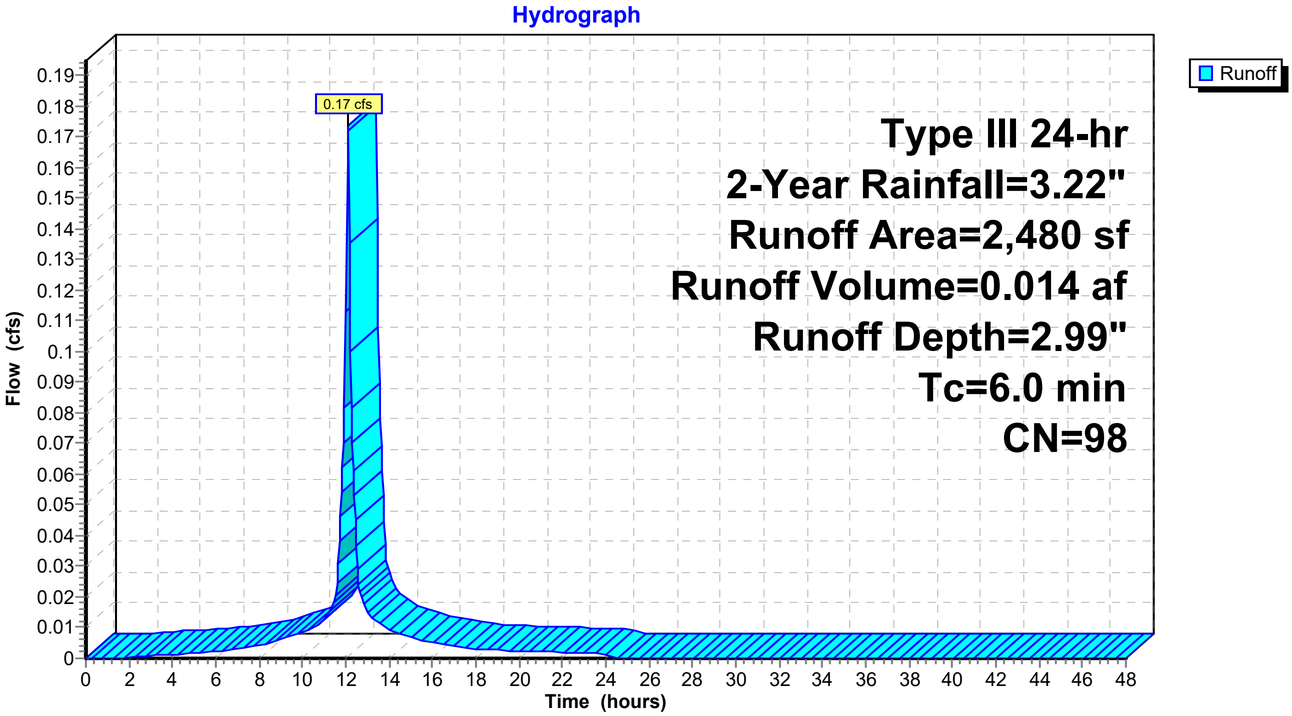
Runoff = 0.17 cfs @ 12.09 hrs, Volume= 0.014 af, Depth= 2.99"
Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.22"

	Area (sf)	CN	Description
*	2,480	98	Impervious surfaces, HSG C
	2,480		100.00% Impervious Area

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

Subcatchment CB 1: CB 1



Summary for Subcatchment CB 2: CB 2

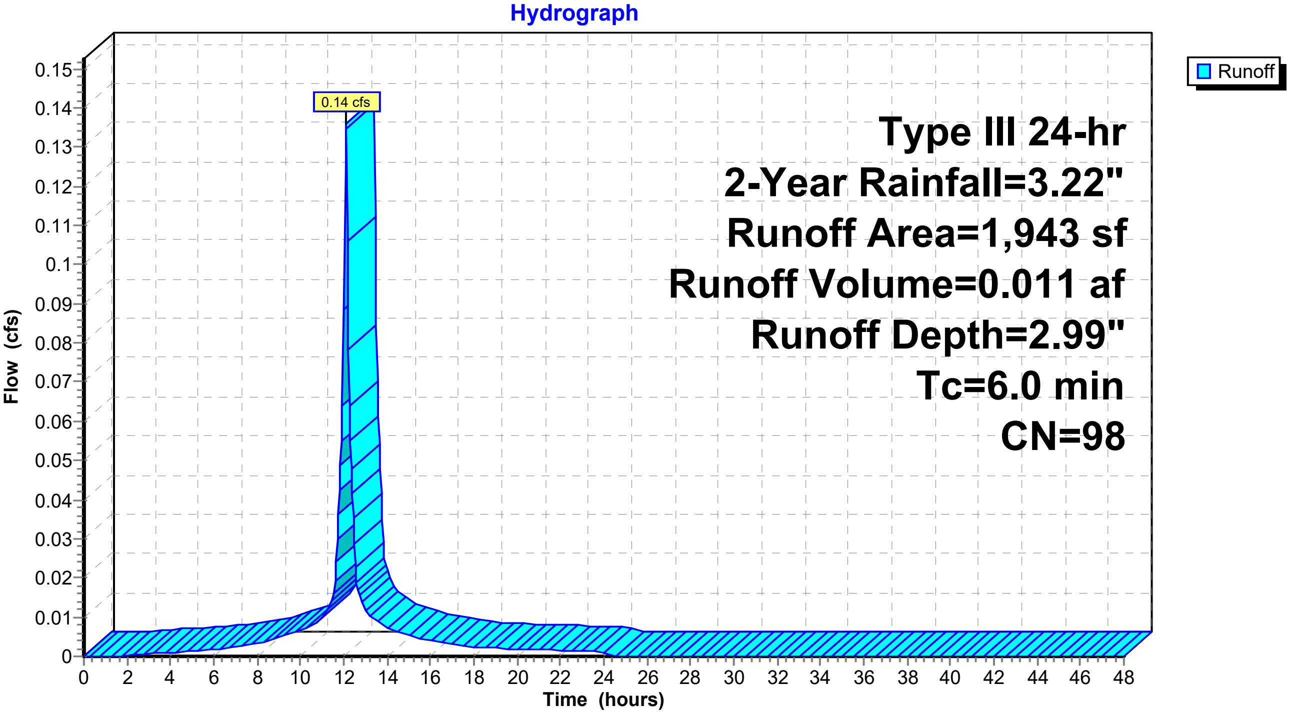
Runoff = 0.14 cfs @ 12.09 hrs, Volume= 0.011 af, Depth= 2.99"
Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.22"

	Area (sf)	CN	Description
*	1,943	98	Impervious surfaces, HSG C
	1,943		100.00% Impervious Area

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

Subcatchment CB 2: CB 2



Summary for Subcatchment CB 5: CB 5

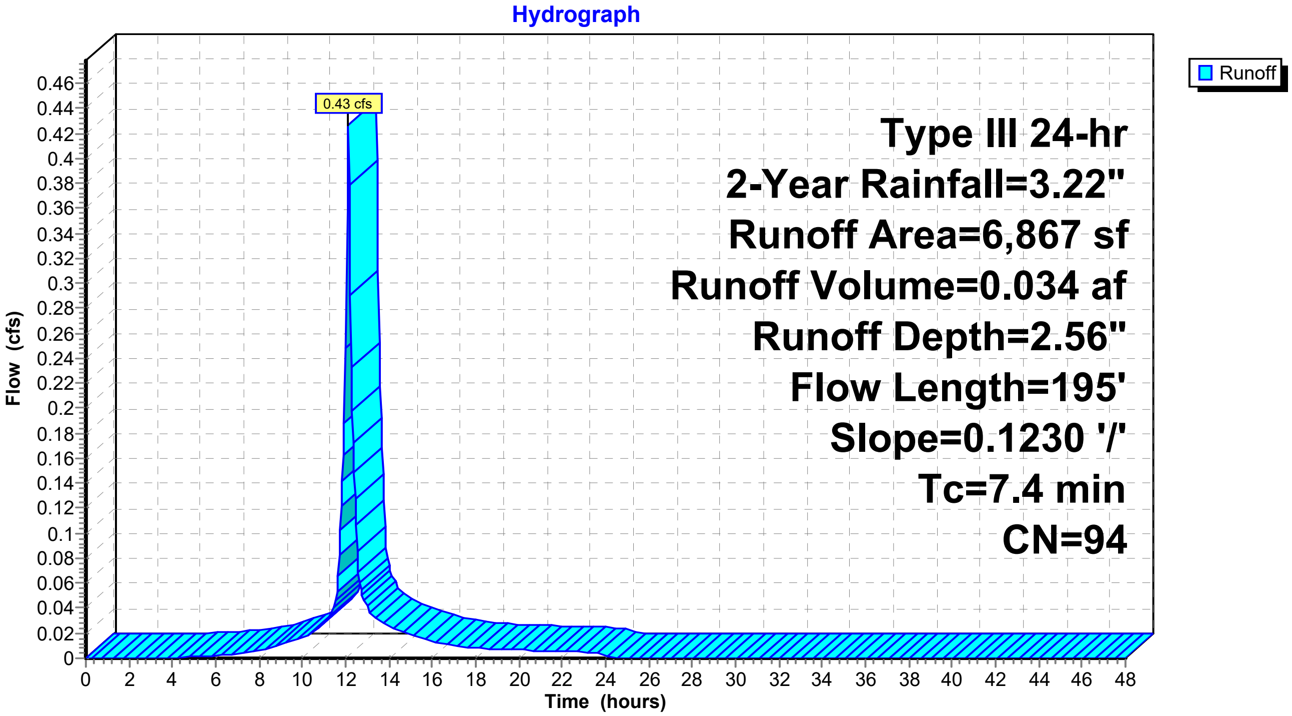
Runoff = 0.43 cfs @ 12.10 hrs, Volume= 0.034 af, Depth= 2.56"
Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.22"

	Area (sf)	CN	Description
*	5,683	98	Impervious surfaces, HSG C
	1,184	74	>75% Grass cover, Good, HSG C
	6,867	94	Weighted Average
	1,184		17.24% Pervious Area
	5,683		82.76% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	50	0.1230	0.14		**Sheet Flow, 1** Woods: Light underbrush n= 0.400 P2= 3.20"
1.4	145	0.1230	1.75		**Shallow Concentrated Flow, 2** Woodland Kv= 5.0 fps
7.4	195	Total			

Subcatchment CB 5: CB 5



Summary for Subcatchment DCB 4: DCB 4

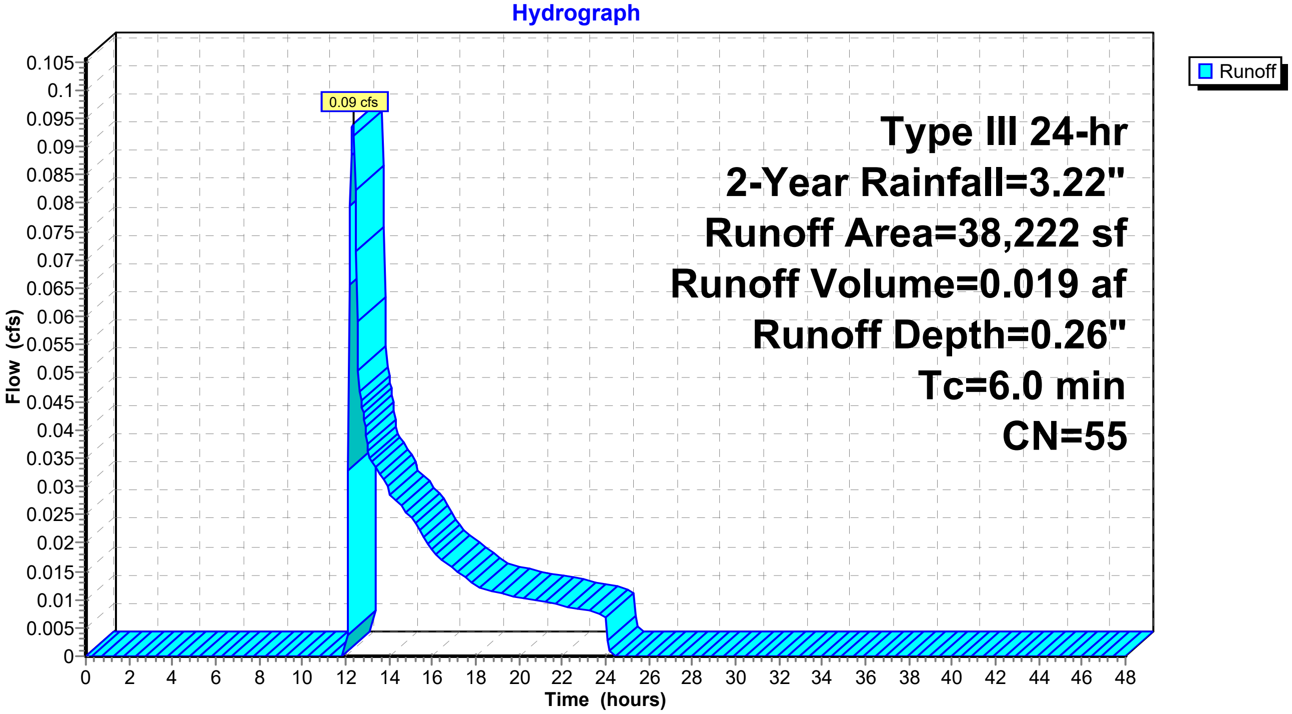
Runoff = 0.09 cfs @ 12.33 hrs, Volume= 0.019 af, Depth= 0.26"
Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.22"

	Area (sf)	CN	Description
*	14,030	98	Impervious surfaces, HSG A
	24,192	30	Woods, Good, HSG A
	38,222	55	Weighted Average
	24,192		63.29% Pervious Area
	14,030		36.71% Impervious Area

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

Subcatchment DCB 4: DCB 4



Summary for Subcatchment S-A: S-A

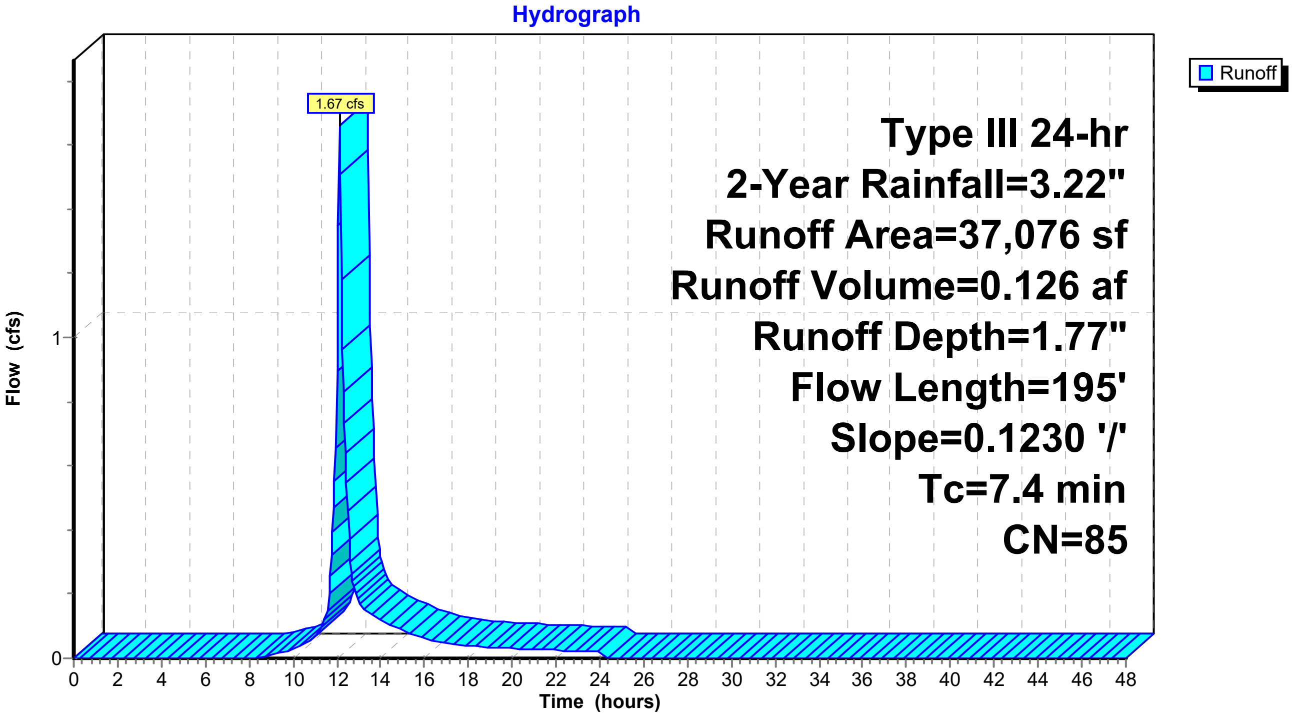
Runoff = 1.67 cfs @ 12.11 hrs, Volume= 0.126 af, Depth= 1.77"
Routed to Pond ED-AB : Existing Depression

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.22"

	Area (sf)	CN	Description
*	4,142	98	Bottom Basin, HSG A
*	5,243	98	Impervious surfaces, HSG A
*	329	39	>75% Grass cover, Good, HSG A
*	2,305	30	Woods, Good, HSG A
*	65	98	Roofs, HSG A
*	4,816	98	Roofs, HSG C
*	8,343	98	Impervious surfaces, HSG C
*	3,814	74	>75% Grass cover, Good, HSG C
*	5,909	70	Woods, Good, HSG C
*	157	96	Gravel surface, HSG C (OFFSITE)
*	10	98	Impervious surfaces, HSG C (OFFSITE)
*	1,943	74	>75% Grass cover, Good, HSG C (OFFSITE)
	37,076	85	Weighted Average
	14,457		38.99% Pervious Area
	22,619		61.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	50	0.1230	0.14		**Sheet Flow, 1** Woods: Light underbrush n= 0.400 P2= 3.20"
1.4	145	0.1230	1.75		**Shallow Concentrated Flow, 2** Woodland Kv= 5.0 fps
7.4	195	Total			

Subcatchment S-A: S-A



Summary for Subcatchment S-A-OS: Offsite Areas

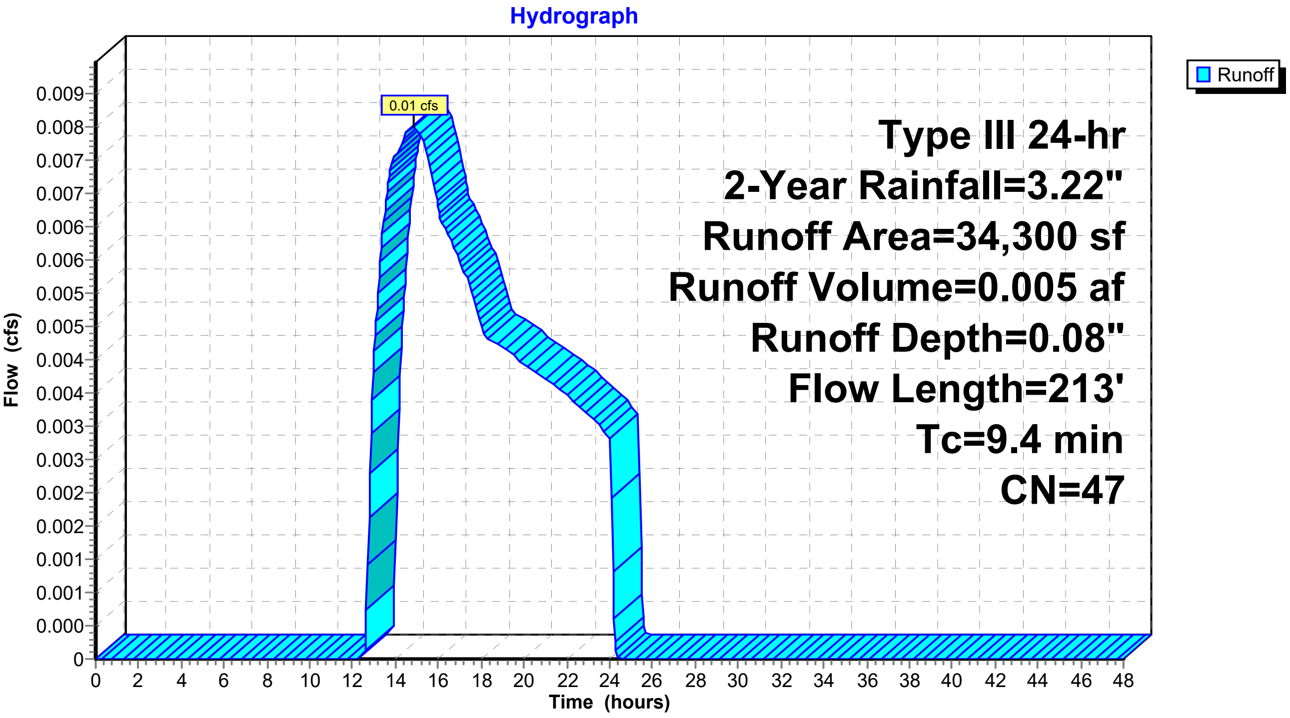
Runoff = 0.01 cfs @ 14.80 hrs, Volume= 0.005 af, Depth= 0.08"
Routed to Pond ED-AB : Existing Depression

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.22"

	Area (sf)	CN	Description
*	15,938	30	Woods, Good, HSG A (OFFSITE)
*	11,097	39	>75% Grass cover, Good, HSG A (OFFSITE)
*	5,665	98	Roofs, HSG A (OFFSITE)
*	1,600	98	Impervious surfaces, HSG C (OFFSITE)
	34,300	47	Weighted Average
	27,035		78.82% Pervious Area
	7,265		21.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0600	0.10		**Sheet Flow, 1** Woods: Light underbrush n= 0.400 P2= 3.20"
1.5	163	0.1290	1.80		**Shallow Concentrated Flow, 2** Woodland Kv= 5.0 fps
9.4	213	Total			

Subcatchment S-A-OS: Offsite Areas



Summary for Subcatchment S-A-OS-LF: Offsite Lovell Field

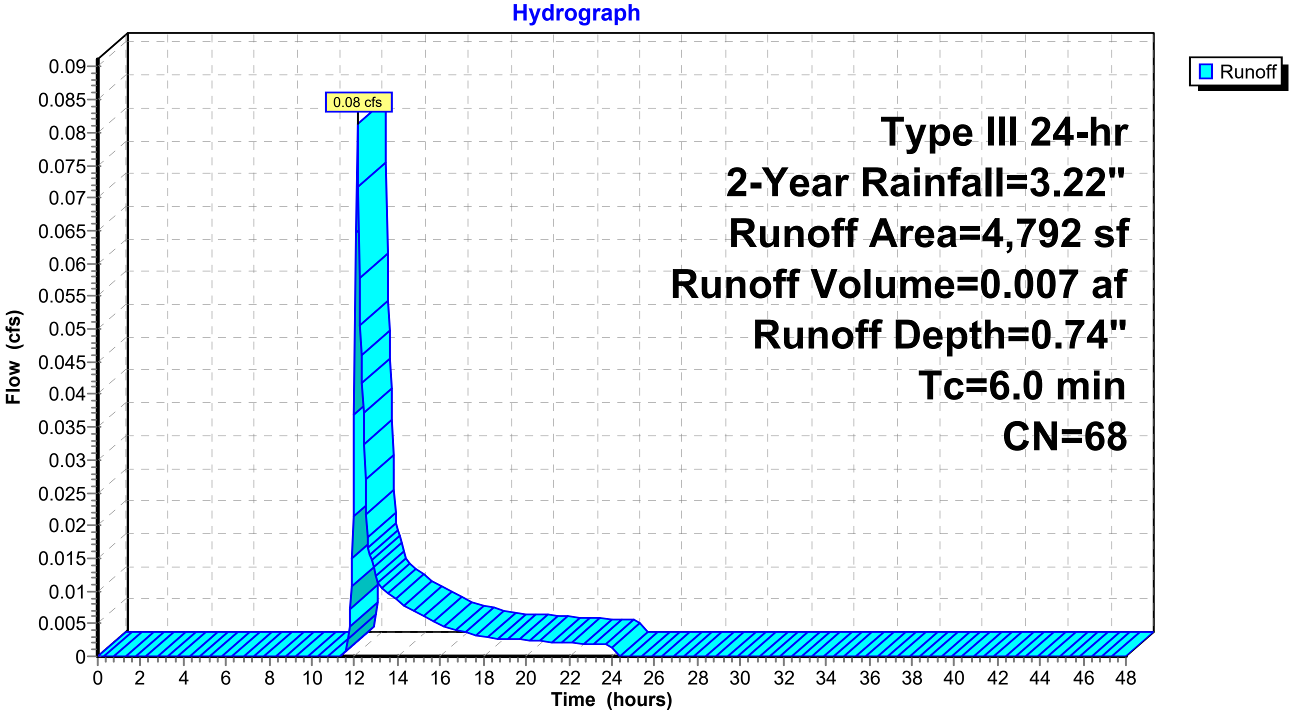
Runoff = 0.08 cfs @ 12.11 hrs, Volume= 0.007 af, Depth= 0.74"
Routed to Pond ED-AB : Existing Depression

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.22"

	Area (sf)	CN	Description
*	772	39	>75% Grass cover, Good, HSG A (OFFSITE)
	2,699	74	>75% Grass cover, Good, HSG C
*	1,178	70	Woods, Good, HSG C (OFFSITE)
*	143	98	Impervious surfaces, HSG C (OFFSITE)
	4,792	68	Weighted Average
	4,649		97.02% Pervious Area
	143		2.98% Impervious Area

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

Subcatchment S-A-OS-LF: Offsite Lovell Field



Summary for Subcatchment S-B: S-B

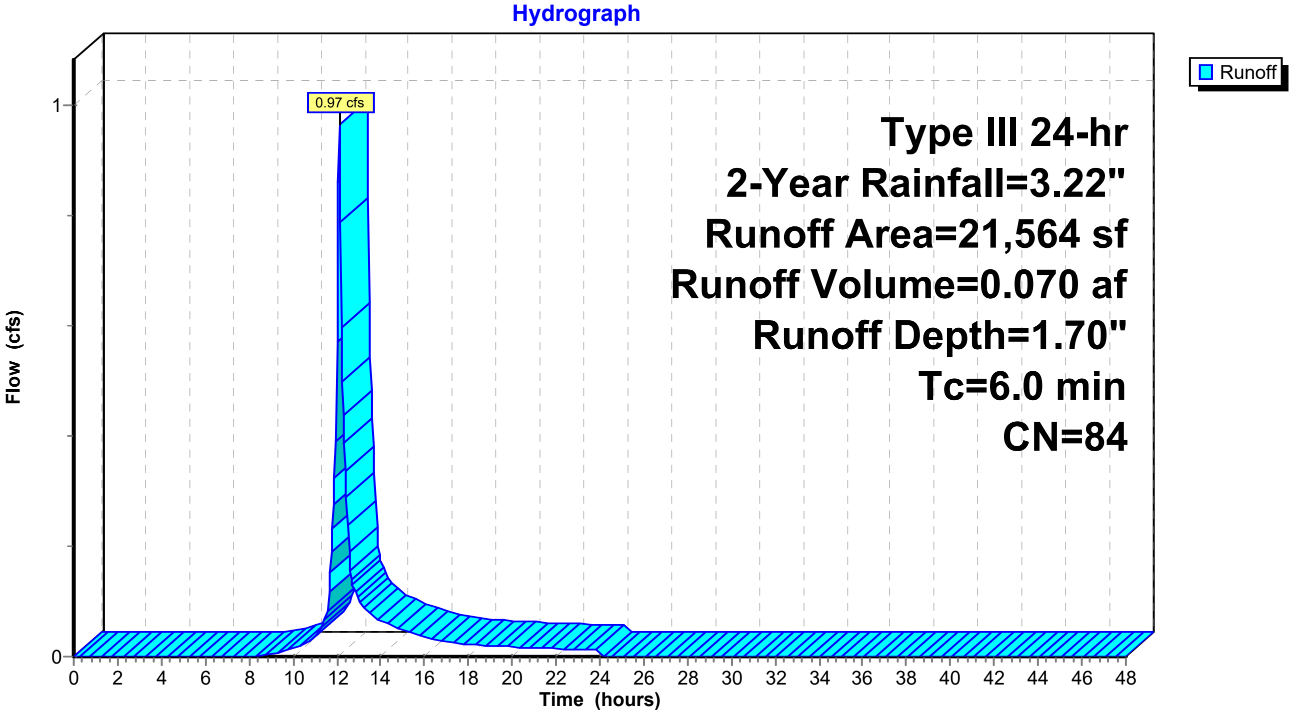
Runoff = 0.97 cfs @ 12.09 hrs, Volume= 0.070 af, Depth= 1.70"
Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.22"

	Area (sf)	CN	Description
	3,849	98	Roofs, HSG C
*	1,038	98	Impervious surfaces, HSG C
	7,880	74	>75% Grass cover, Good, HSG C
	3,460	96	Gravel surface, HSG C
*	44	98	Impervious surfaces, HSG C (OFFSITE)
*	3,893	74	>75% Grass cover, Good, HSG C (OFFSITE)
*	1,400	96	Gravel, HSG C (OFFSITE)
	21,564	84	Weighted Average
	16,633		77.13% Pervious Area
	4,931		22.87% Impervious Area

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

Subcatchment S-B: S-B



Summary for Subcatchment SWALE: SWALE/BASIN

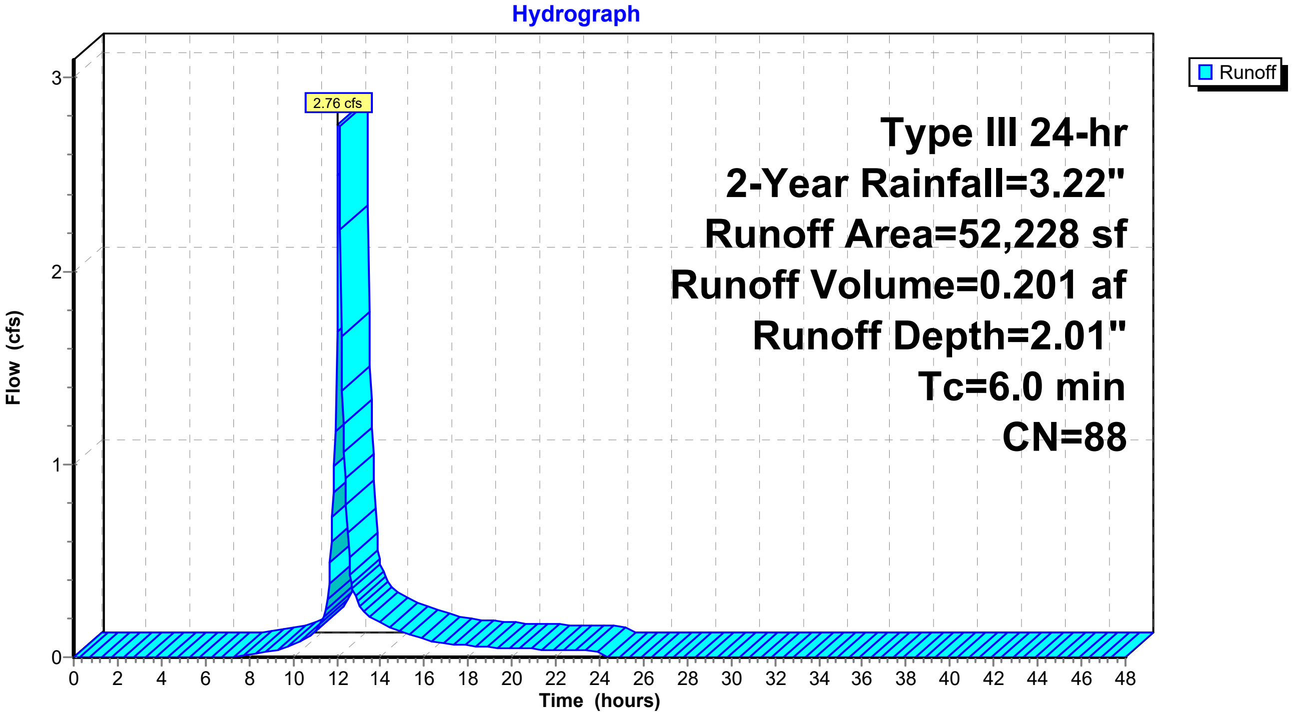
Runoff = 2.76 cfs @ 12.09 hrs, Volume= 0.201 af, Depth= 2.01"
Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.22"

	Area (sf)	CN	Description
*	30,996	98	Impervious surfaces, HSG C
	21,232	74	>75% Grass cover, Good, HSG C
	52,228	88	Weighted Average
	21,232		40.65% Pervious Area
	30,996		59.35% Impervious Area

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

Subcatchment SWALE: SWALE/BASIN



Summary for Pond ED-AB: Existing Depression

```
Inflow Area =         1.749 ac,  39.42% Impervious,  Inflow Depth =   0.94"    for  2-Year event
Inflow      =         1.75 cfs @   12.11 hrs,  Volume=          0.138 af
Outflow     =         0.00 cfs @    0.00 hrs,  Volume=          0.000 af,  Atten= 100%,  Lag= 0.0 min
Primary     =         0.00 cfs @    0.00 hrs,  Volume=          0.000 af
    Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 20.00' @ 24.55 hrs   Surf.Area= 6,325 sf   Storage= 5,997 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

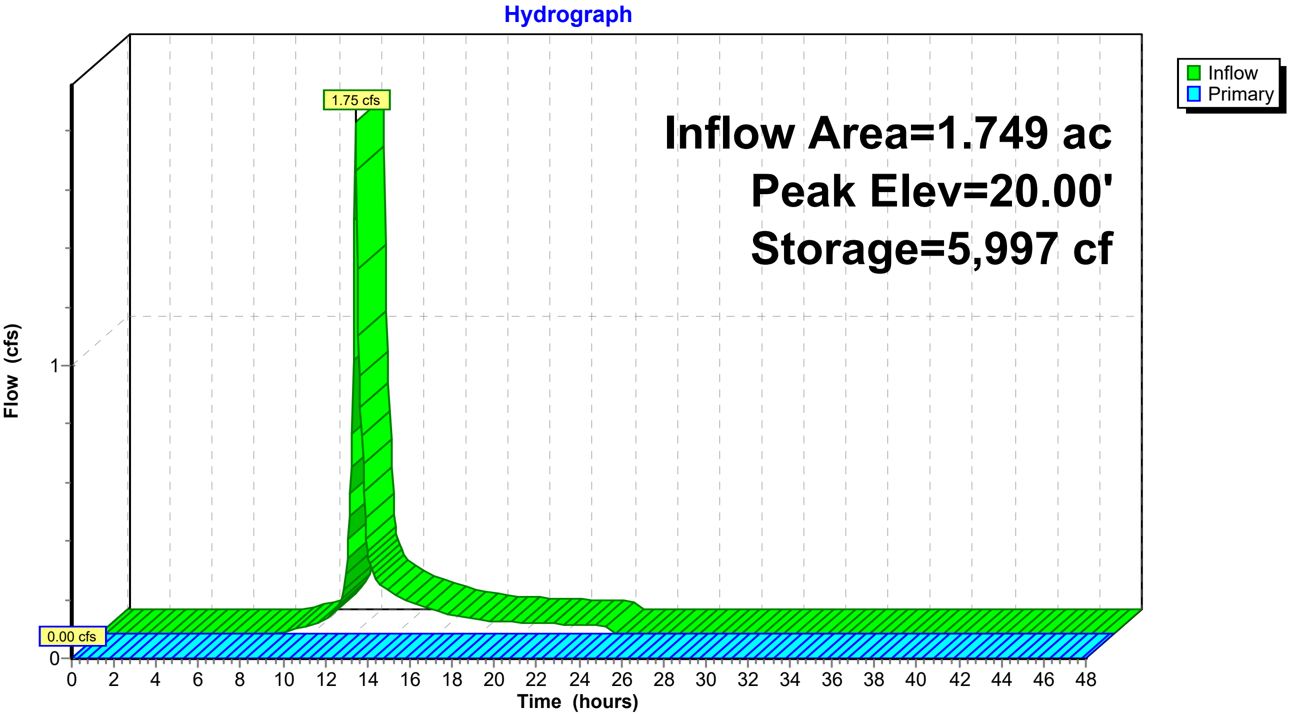
Volume        Invert     Avail.Storage   Storage Description
   #1         18.00'        48,989 cf    Custom Stage Data (Prismatic)Listed below (Recalc)

 Elevation       Surf.Area         Inc.Store        Cum.Store
    (feet)          (sq-ft)      (cubic-feet)     (cubic-feet)
    18.00              313                 0                0
    19.00            2,684             1,499            1,499
    20.00            6,330             4,507            6,006
    21.00           10,192             8,261           14,267
    22.00           12,649            11,421           25,687
    23.00           15,970            14,310           39,997
    23.50           20,000             8,993           48,989

Device   Routing            Invert   Outlet Devices
   #1    Primary            23.43'   2.0' long  x 2.0' breadth Broad-Crested Rectangular Weir
                                     Head (feet)  0.20  0.40  0.60  0.80  1.00  1.20  1.40  1.60  1.80  2.00
                                     2.50  3.00  3.50
                                     Coef. (English)  2.54  2.61  2.61  2.60  2.66  2.70  2.77  2.89  2.88
                                     2.85  3.07  3.20  3.32

Primary OutFlow  Max=0.00 cfs @ 0.00 hrs  HW=18.00'  TW=13.87'   (Dynamic Tailwater)
└─1=Broad-Crested Rectangular Weir ( Controls 0.00 cfs)
```

Pond ED-AB: Existing Depression



Summary for Pond ES-LF: DP-LF Existing Swale/Basin in Lovell Field

```
Inflow Area =         4.579 ac,  45.16% Impervious,  Inflow Depth =   0.91"    for  2-Year event
Inflow      =        4.49 cfs @   12.09 hrs,  Volume=          0.349 af
Outflow     =        4.37 cfs @   12.11 hrs,  Volume=          0.349 af,  Atten= 3%,  Lag= 1.1 min
Primary     =        4.37 cfs @   12.11 hrs,  Volume=          0.349 af
    Routed to nonexistent node 1R

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 14.94' @ 12.11 hrs   Surf.Area= 461 sf   Storage= 219 cf

Plug-Flow detention time= 0.4 min calculated for 0.349 af (100% of inflow)
Center-of-Mass det. time= 0.4 min ( 818.8 - 818.4 )
```

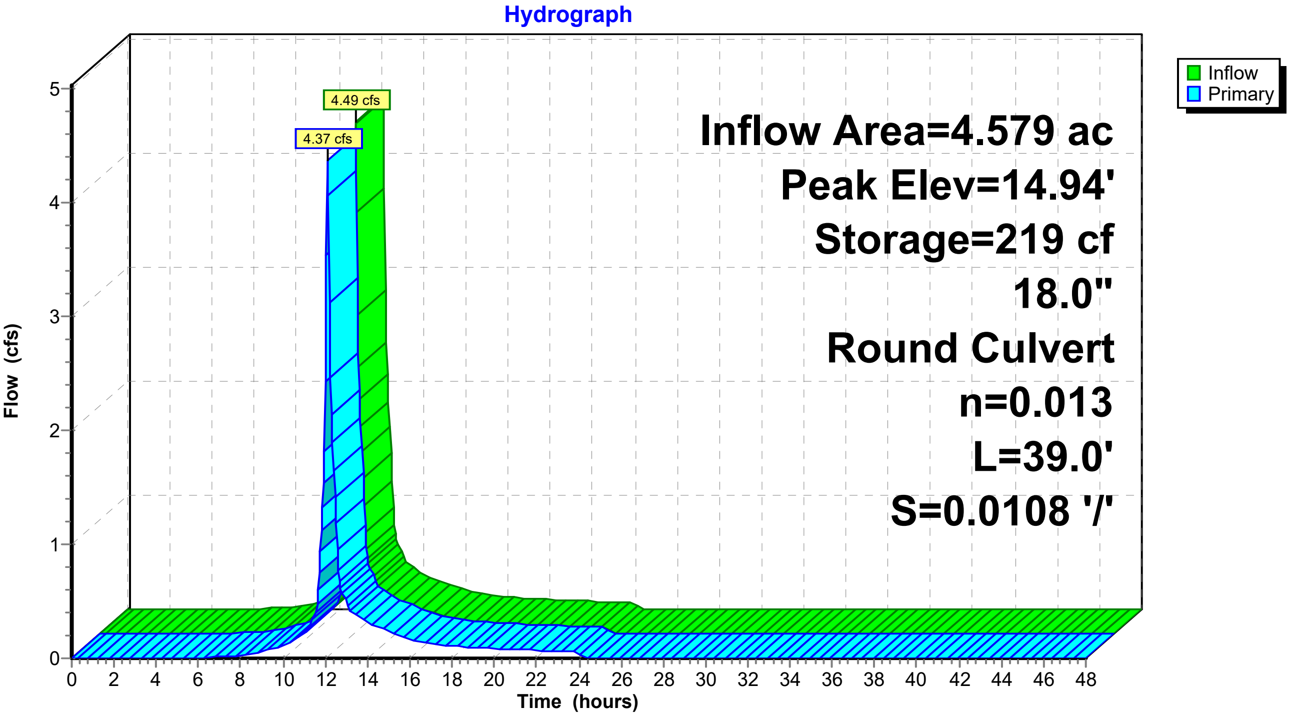
Volume	Invert	Avail.Storage	Storage Description
#1	13.87'	17,546 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
13.87	0	0	0
14.00	3	0	0
15.00	488	246	246
16.00	1,764	1,126	1,372
17.00	2,848	2,306	3,678
18.00	3,993	3,421	7,098
19.00	5,217	4,605	11,703
20.00	6,468	5,843	17,546

Device	Routing	Invert	Outlet Devices
#1	Primary	13.87'	**18.0" Round Culvert** L= 39.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 13.87' / 13.45' S= 0.0108 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=4.27 cfs @ 12.11 hrs HW=14.93' (Free Discharge)
↑—**1=Culvert** (Barrel Controls 4.27 cfs @ 4.50 fps)

Pond ES-LF: DP-LF Existing Swale/Basin in Lovell Field



Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentCB 1: CB 1 Runoff Area=2,480 sf 100.00% Impervious Runoff Depth=4.62"
Tc=6.0 min CN=98 Runoff=0.26 cfs 0.022 af

SubcatchmentCB 2: CB 2 Runoff Area=1,943 sf 100.00% Impervious Runoff Depth=4.62"
Tc=6.0 min CN=98 Runoff=0.21 cfs 0.017 af

SubcatchmentCB 5: CB 5 Runoff Area=6,867 sf 82.76% Impervious Runoff Depth=4.17"
Flow Length=195' Slope=0.1230 '/' Tc=7.4 min CN=94 Runoff=0.68 cfs 0.055 af

SubcatchmentDCB 4: DCB 4 Runoff Area=38,222 sf 36.71% Impervious Runoff Depth=0.91"
Tc=6.0 min CN=55 Runoff=0.72 cfs 0.067 af

SubcatchmentS-A: S-A Runoff Area=37,076 sf 61.01% Impervious Runoff Depth=3.24"
Flow Length=195' Slope=0.1230 '/' Tc=7.4 min CN=85 Runoff=3.02 cfs 0.230 af

SubcatchmentS-A-OS: Offsite Areas Runoff Area=34,300 sf 21.18% Impervious Runoff Depth=0.49"
Flow Length=213' Tc=9.4 min CN=47 Runoff=0.18 cfs 0.032 af

SubcatchmentS-A-OS-LF: Offsite Lovell Runoff Area=4,792 sf 2.98% Impervious Runoff Depth=1.78"
Tc=6.0 min CN=68 Runoff=0.22 cfs 0.016 af

SubcatchmentS-B: S-B Runoff Area=21,564 sf 22.87% Impervious Runoff Depth=3.14"
Tc=6.0 min CN=84 Runoff=1.77 cfs 0.130 af

SubcatchmentSWALE: SWALE/BASIN Runoff Area=52,228 sf 59.35% Impervious Runoff Depth=3.54"
Tc=6.0 min CN=88 Runoff=4.76 cfs 0.353 af

Pond ED-AB: Existing Depression Peak Elev=20.78' Storage=12,115 cf Inflow=3.31 cfs 0.278 af
Outflow=0.00 cfs 0.000 af

Pond ES-LF: DP-LF Existing Swale/Basin in Peak Elev=15.47' Storage=614 cf Inflow=8.37 cfs 0.643 af
18.0" Round Culvert n=0.013 L=39.0' S=0.0108 '/' Outflow=7.69 cfs 0.643 af

Total Runoff Area = 4.579 ac Runoff Volume = 0.922 af Average Runoff Depth = 2.42"
54.84% Pervious = 2.511 ac 45.16% Impervious = 2.068 ac

Summary for Subcatchment CB 1: CB 1

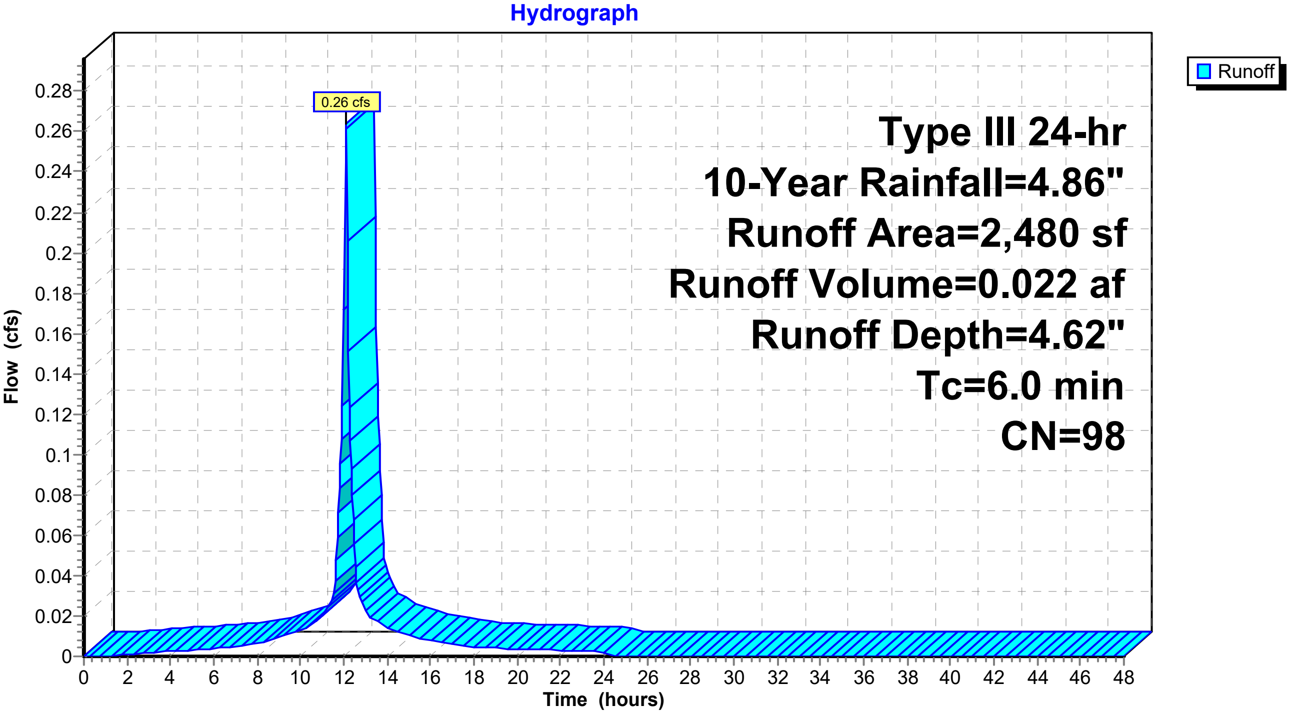
Runoff = 0.26 cfs @ 12.09 hrs, Volume= 0.022 af, Depth= 4.62"
Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.86"

	Area (sf)	CN	Description
*	2,480	98	Impervious surfaces, HSG C
	2,480		100.00% Impervious Area

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

Subcatchment CB 1: CB 1



Summary for Subcatchment CB 2: CB 2

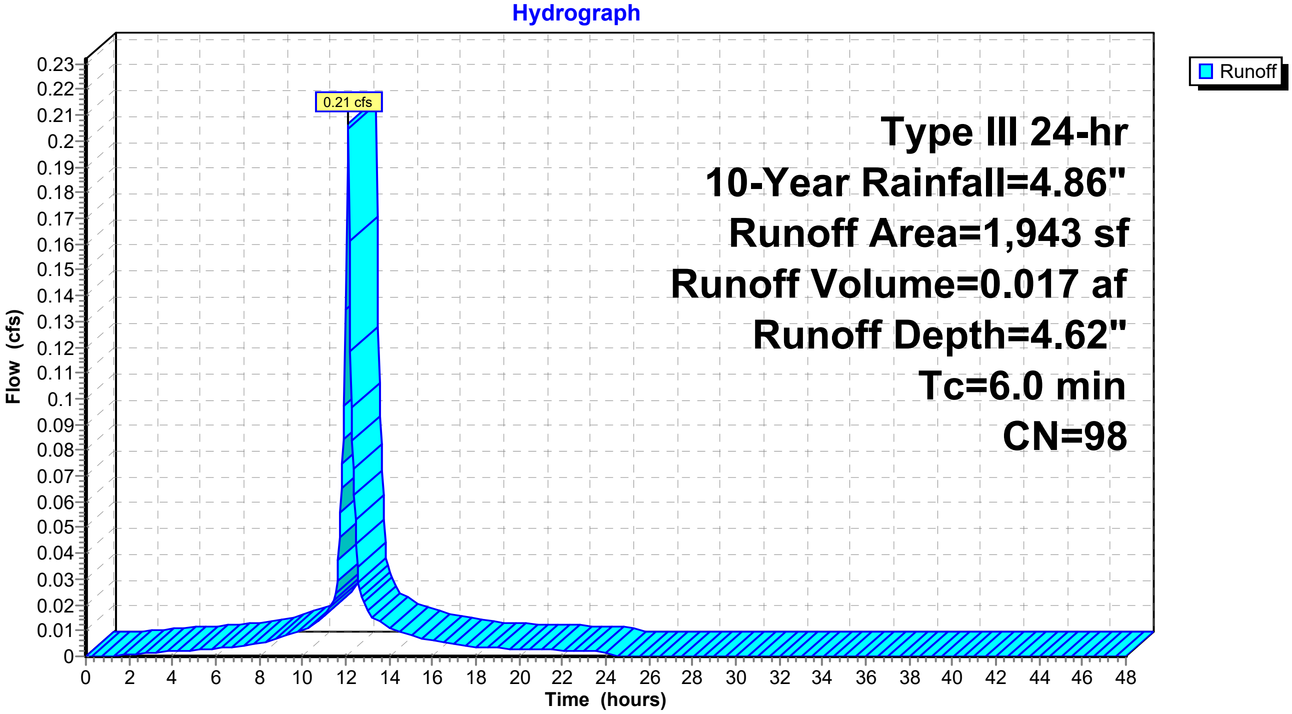
Runoff = 0.21 cfs @ 12.09 hrs, Volume= 0.017 af, Depth= 4.62"
Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.86"

	Area (sf)	CN	Description
*	1,943	98	Impervious surfaces, HSG C
	1,943		100.00% Impervious Area

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

Subcatchment CB 2: CB 2



Summary for Subcatchment CB 5: CB 5

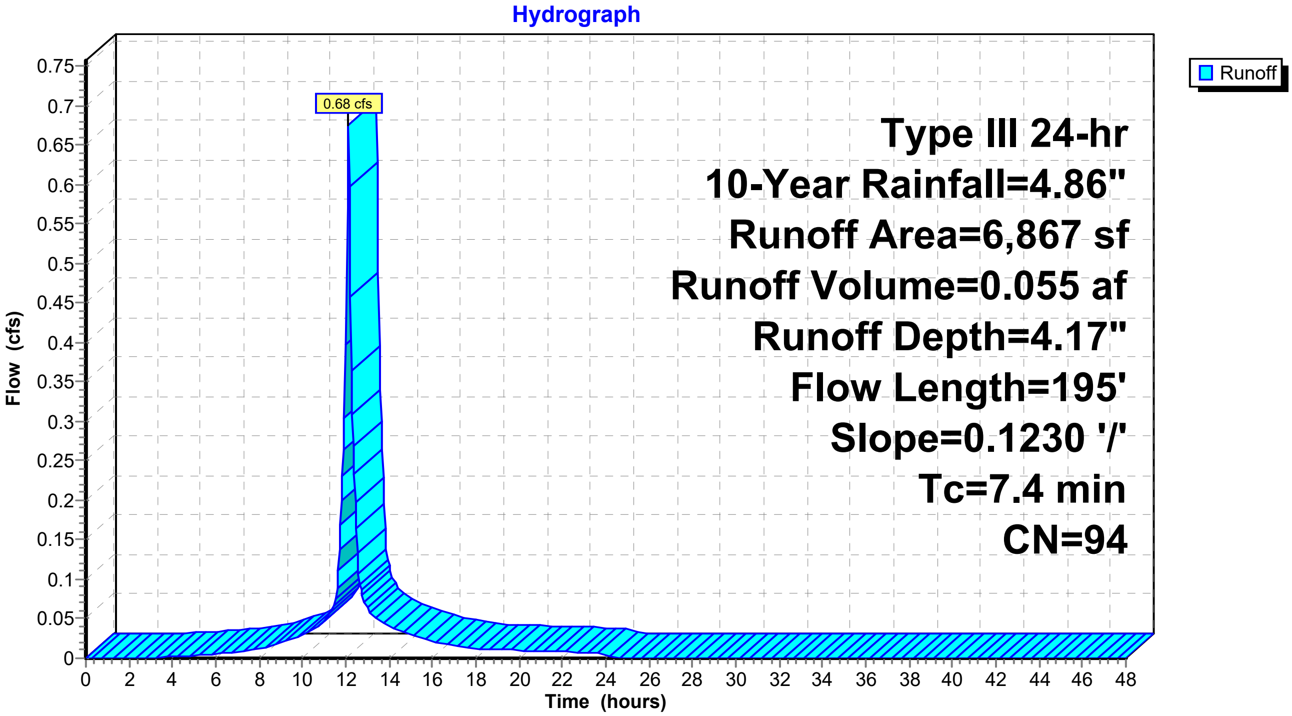
Runoff = 0.68 cfs @ 12.10 hrs, Volume= 0.055 af, Depth= 4.17"
Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.86"

	Area (sf)	CN	Description
*	5,683	98	Impervious surfaces, HSG C
	1,184	74	>75% Grass cover, Good, HSG C
	6,867	94	Weighted Average
	1,184		17.24% Pervious Area
	5,683		82.76% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	50	0.1230	0.14		**Sheet Flow, 1** Woods: Light underbrush n= 0.400 P2= 3.20"
1.4	145	0.1230	1.75		**Shallow Concentrated Flow, 2** Woodland Kv= 5.0 fps
7.4	195	Total			

Subcatchment CB 5: CB 5



Summary for Subcatchment DCB 4: DCB 4

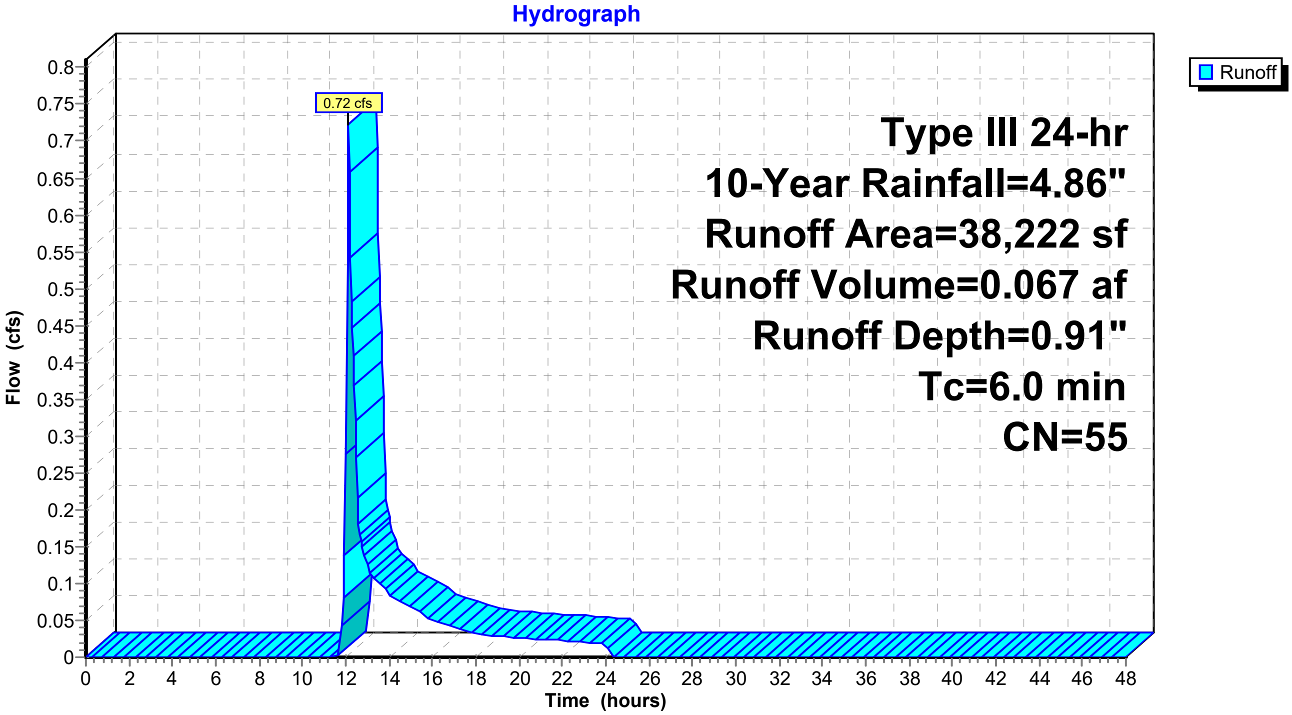
Runoff = 0.72 cfs @ 12.11 hrs, Volume= 0.067 af, Depth= 0.91"
Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.86"

	Area (sf)	CN	Description
*	14,030	98	Impervious surfaces, HSG A
	24,192	30	Woods, Good, HSG A
	38,222	55	Weighted Average
	24,192		63.29% Pervious Area
	14,030		36.71% Impervious Area

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

Subcatchment DCB 4: DCB 4



Summary for Subcatchment S-A: S-A

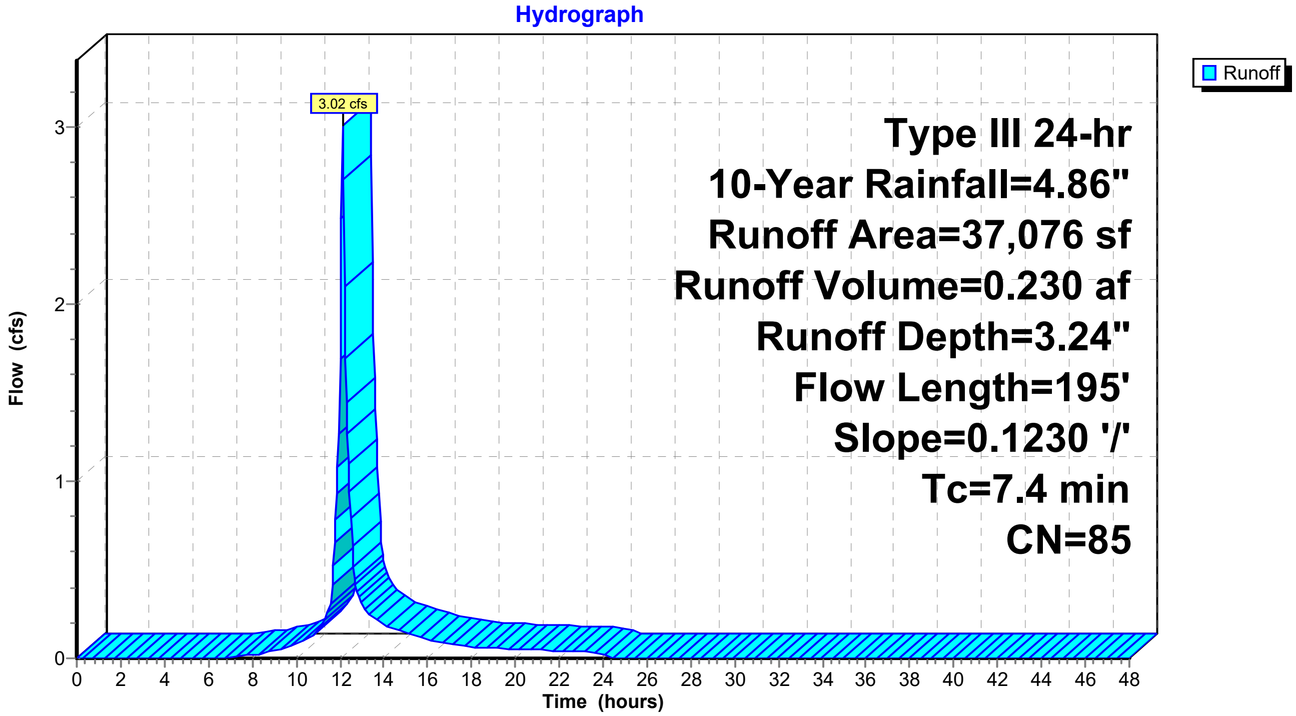
Runoff = 3.02 cfs @ 12.11 hrs, Volume= 0.230 af, Depth= 3.24"
Routed to Pond ED-AB : Existing Depression

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.86"

	Area (sf)	CN	Description
*	4,142	98	Bottom Basin, HSG A
*	5,243	98	Impervious surfaces, HSG A
*	329	39	>75% Grass cover, Good, HSG A
*	2,305	30	Woods, Good, HSG A
*	65	98	Roofs, HSG A
*	4,816	98	Roofs, HSG C
*	8,343	98	Impervious surfaces, HSG C
*	3,814	74	>75% Grass cover, Good, HSG C
*	5,909	70	Woods, Good, HSG C
*	157	96	Gravel surface, HSG C (OFFSITE)
*	10	98	Impervious surfaces, HSG C (OFFSITE)
*	1,943	74	>75% Grass cover, Good, HSG C (OFFSITE)
	37,076	85	Weighted Average
	14,457		38.99% Pervious Area
	22,619		61.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	50	0.1230	0.14		**Sheet Flow, 1** Woods: Light underbrush n= 0.400 P2= 3.20"
1.4	145	0.1230	1.75		**Shallow Concentrated Flow, 2** Woodland Kv= 5.0 fps
7.4	195	Total			

Subcatchment S-A: S-A



Summary for Subcatchment S-A-OS: Offsite Areas

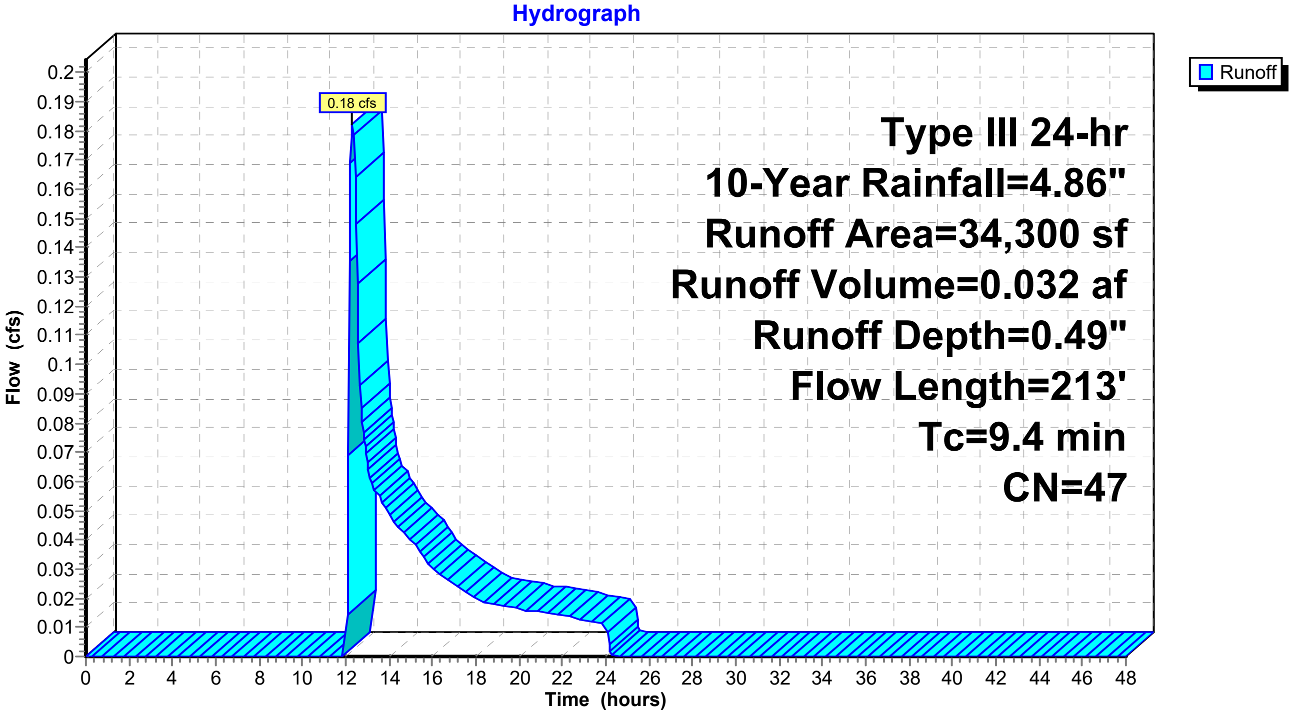
Runoff = 0.18 cfs @ 12.32 hrs, Volume= 0.032 af, Depth= 0.49"
Routed to Pond ED-AB : Existing Depression

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.86"

	Area (sf)	CN	Description
*	15,938	30	Woods, Good, HSG A (OFFSITE)
*	11,097	39	>75% Grass cover, Good, HSG A (OFFSITE)
*	5,665	98	Roofs, HSG A (OFFSITE)
*	1,600	98	Impervious surfaces, HSG C (OFFSITE)
	34,300	47	Weighted Average
	27,035		78.82% Pervious Area
	7,265		21.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0600	0.10		**Sheet Flow, 1** Woods: Light underbrush n= 0.400 P2= 3.20"
1.5	163	0.1290	1.80		**Shallow Concentrated Flow, 2** Woodland Kv= 5.0 fps
9.4	213	Total			

Subcatchment S-A-OS: Offsite Areas



Summary for Subcatchment S-A-OS-LF: Offsite Lovell Field

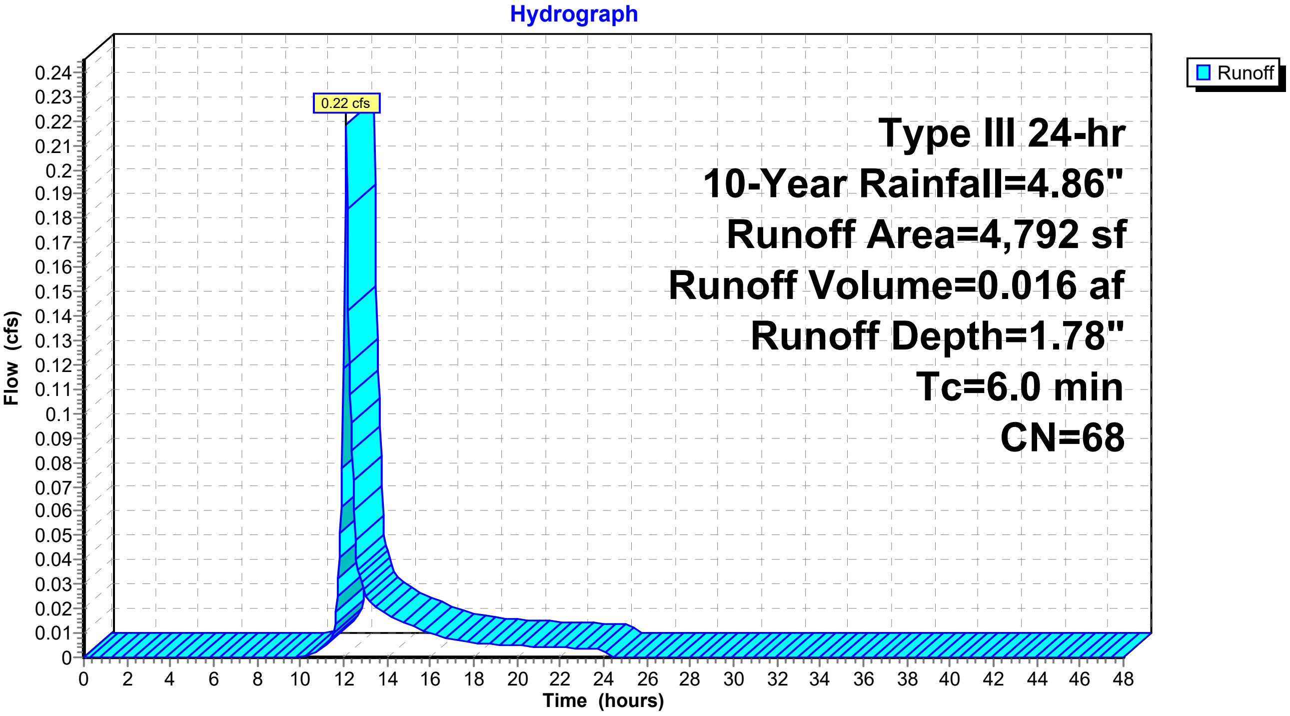
Runoff = 0.22 cfs @ 12.10 hrs, Volume= 0.016 af, Depth= 1.78"
Routed to Pond ED-AB : Existing Depression

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.86"

	Area (sf)	CN	Description
*	772	39	>75% Grass cover, Good, HSG A (OFFSITE)
	2,699	74	>75% Grass cover, Good, HSG C
*	1,178	70	Woods, Good, HSG C (OFFSITE)
*	143	98	Impervious surfaces, HSG C (OFFSITE)
	4,792	68	Weighted Average
	4,649		97.02% Pervious Area
	143		2.98% Impervious Area

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

Subcatchment S-A-OS-LF: Offsite Lovell Field



Summary for Subcatchment S-B: S-B

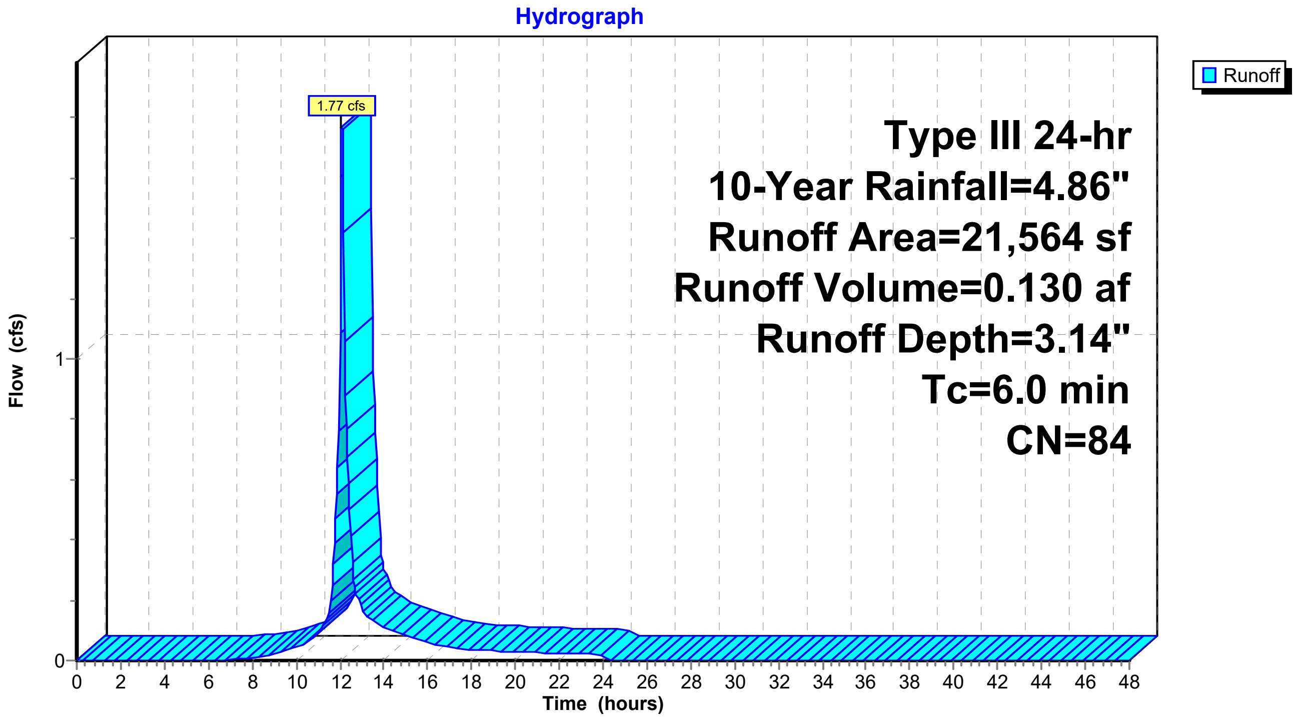
Runoff = 1.77 cfs @ 12.09 hrs, Volume= 0.130 af, Depth= 3.14"
Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.86"

	Area (sf)	CN	Description
	3,849	98	Roofs, HSG C
*	1,038	98	Impervious surfaces, HSG C
	7,880	74	>75% Grass cover, Good, HSG C
	3,460	96	Gravel surface, HSG C
*	44	98	Impervious surfaces, HSG C (OFFSITE)
*	3,893	74	>75% Grass cover, Good, HSG C (OFFSITE)
*	1,400	96	Gravel, HSG C (OFFSITE)
	21,564	84	Weighted Average
	16,633		77.13% Pervious Area
	4,931		22.87% Impervious Area

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

Subcatchment S-B: S-B



Summary for Subcatchment SWALE: SWALE/BASIN

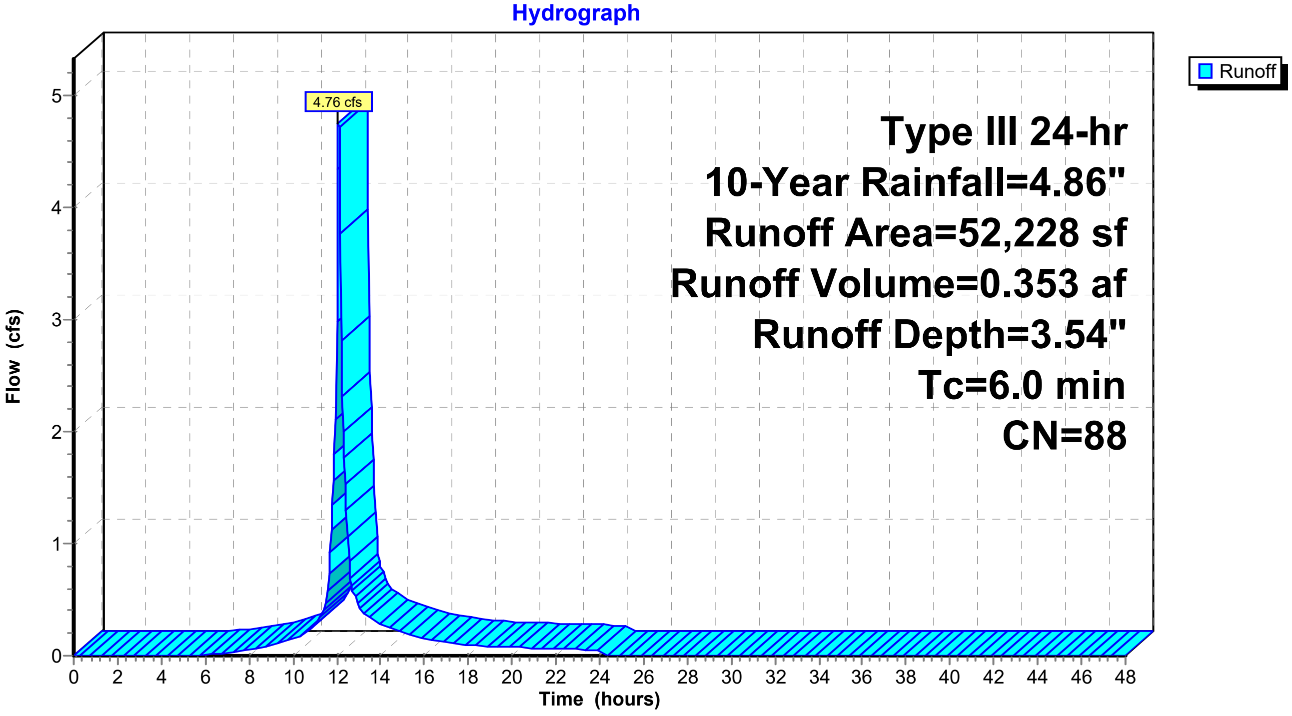
Runoff = 4.76 cfs @ 12.09 hrs, Volume= 0.353 af, Depth= 3.54"
Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.86"

	Area (sf)	CN	Description
*	30,996	98	Impervious surfaces, HSG C
	21,232	74	>75% Grass cover, Good, HSG C
	52,228	88	Weighted Average
	21,232		40.65% Pervious Area
	30,996		59.35% Impervious Area

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

Subcatchment SWALE: SWALE/BASIN



Summary for Pond ED-AB: Existing Depression

```
Inflow Area =        1.749 ac,  39.42% Impervious,  Inflow Depth =   1.91"    for  10-Year event
Inflow      =       3.31 cfs @   12.11 hrs,  Volume=          0.278 af
Outflow     =       0.00 cfs @    0.00 hrs,  Volume=          0.000 af,  Atten= 100%,  Lag= 0.0 min
Primary     =       0.00 cfs @    0.00 hrs,  Volume=          0.000 af
    Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 20.78' @ 24.55 hrs   Surf.Area= 9,341 sf   Storage= 12,115 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

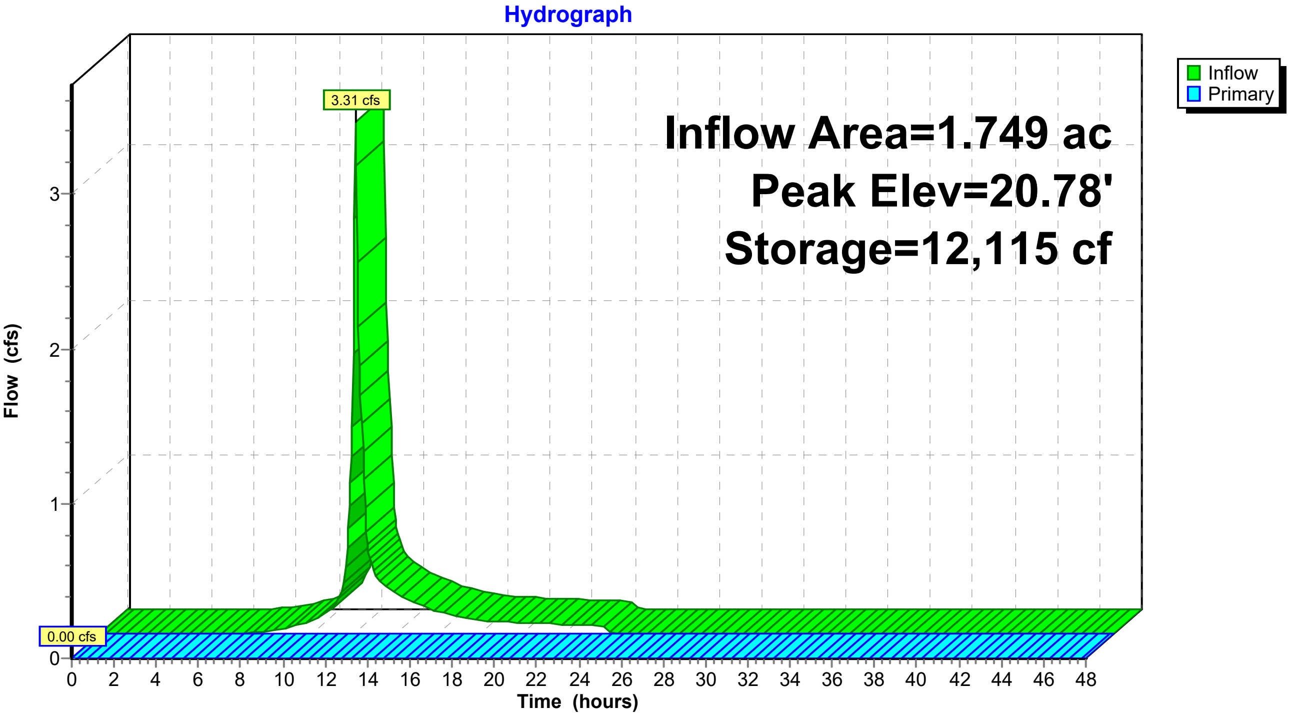
Volume        Invert    Avail.Storage   Storage Description
   #1         18.00'        48,989 cf   Custom Stage Data (Prismatic)Listed below (Recalc)

 Elevation        Surf.Area          Inc.Store         Cum.Store
    (feet)          (sq-ft)       (cubic-feet)      (cubic-feet)
     18.00              313                  0                 0
     19.00            2,684              1,499             1,499
     20.00            6,330              4,507             6,006
     21.00           10,192              8,261            14,267
     22.00           12,649             11,421            25,687
     23.00           15,970             14,310            39,997
     23.50           20,000              8,993            48,989

Device   Routing          Invert   Outlet Devices
   #1    Primary          23.43'   2.0' long  x 2.0' breadth Broad-Crested Rectangular Weir
                                   Head (feet)  0.20  0.40  0.60  0.80  1.00  1.20  1.40  1.60  1.80  2.00
                                   2.50  3.00  3.50
                                   Coef. (English)  2.54  2.61  2.61  2.60  2.66  2.70  2.77  2.89  2.88
                                   2.85  3.07  3.20  3.32

Primary OutFlow Max=0.00 cfs @ 0.00 hrs  HW=18.00'  TW=13.87'   (Dynamic Tailwater)
└─1=Broad-Crested Rectangular Weir( Controls 0.00 cfs)
```

Pond ED-AB: Existing Depression



Summary for Pond ES-LF: DP-LF Existing Swale/Basin in Lovell Field

```
Inflow Area =       4.579 ac,  45.16% Impervious,  Inflow Depth =   1.69"    for  10-Year event
Inflow      =       8.37 cfs @   12.09 hrs,  Volume=          0.643 af
Outflow     =       7.69 cfs @   12.13 hrs,  Volume=          0.643 af,  Atten= 8%,  Lag= 2.0 min
Primary     =       7.69 cfs @   12.13 hrs,  Volume=          0.643 af
    Routed to nonexistent node 1R

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 15.47' @ 12.13 hrs   Surf.Area= 1,085 sf   Storage= 614 cf

Plug-Flow detention time= 0.5 min calculated for 0.643 af (100% of inflow)
Center-of-Mass det. time= 0.5 min ( 807.0 - 806.4 )

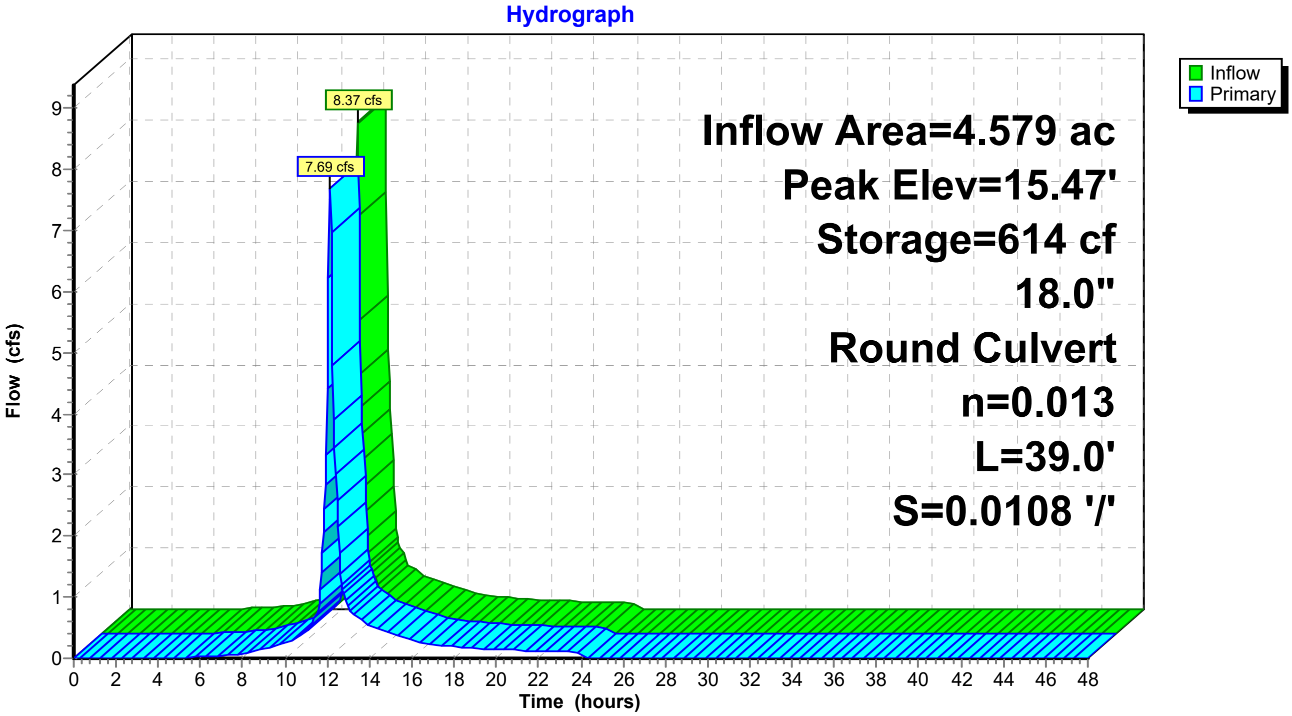
Volume        Invert     Avail.Storage   Storage Description
   #1         13.87'         17,546 cf   Custom Stage Data (Prismatic)Listed below (Recalc)

 Elevation          Surf.Area         Inc.Store        Cum.Store
    (feet)            (sq-ft)       (cubic-feet)     (cubic-feet)
     13.87                  0                 0                0
     14.00                  3                 0                0
     15.00                488               246              246
     16.00              1,764             1,126            1,372
     17.00              2,848             2,306            3,678
     18.00              3,993             3,421            7,098
     19.00              5,217             4,605           11,703
     20.00              6,468             5,843           17,546

Device   Routing           Invert   Outlet Devices
   #1    Primary           13.87'   18.0"  Round Culvert
                                    L= 39.0'   CPP, square edge headwall,  Ke= 0.500
                                    Inlet / Outlet Invert= 13.87' / 13.45'   S= 0.0108 '/'   Cc= 0.900
                                    n= 0.013  Corrugated PE, smooth interior,  Flow Area= 1.77 sf

Primary OutFlow Max=7.54 cfs @ 12.13 hrs  HW=15.44'   (Free Discharge)
└─1=Culvert  (Barrel Controls 7.54 cfs @ 5.05 fps)
```

Pond ES-LF: DP-LF Existing Swale/Basin in Lovell Field



Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentCB 1: CB 1 Runoff Area=2,480 sf 100.00% Impervious Runoff Depth=5.91"
Tc=6.0 min CN=98 Runoff=0.34 cfs 0.028 af

SubcatchmentCB 2: CB 2 Runoff Area=1,943 sf 100.00% Impervious Runoff Depth=5.91"
Tc=6.0 min CN=98 Runoff=0.26 cfs 0.022 af

SubcatchmentCB 5: CB 5 Runoff Area=6,867 sf 82.76% Impervious Runoff Depth=5.45"
Flow Length=195' Slope=0.1230 '/' Tc=7.4 min CN=94 Runoff=0.87 cfs 0.072 af

SubcatchmentDCB 4: DCB 4 Runoff Area=38,222 sf 36.71% Impervious Runoff Depth=1.60"
Tc=6.0 min CN=55 Runoff=1.46 cfs 0.117 af

SubcatchmentS-A: S-A Runoff Area=37,076 sf 61.01% Impervious Runoff Depth=4.44"
Flow Length=195' Slope=0.1230 '/' Tc=7.4 min CN=85 Runoff=4.09 cfs 0.315 af

SubcatchmentS-A-OS: Offsite Areas Runoff Area=34,300 sf 21.18% Impervious Runoff Depth=1.00"
Flow Length=213' Tc=9.4 min CN=47 Runoff=0.58 cfs 0.066 af

SubcatchmentS-A-OS-LF: Offsite Lovell Runoff Area=4,792 sf 2.98% Impervious Runoff Depth=2.74"
Tc=6.0 min CN=68 Runoff=0.34 cfs 0.025 af

SubcatchmentS-B: S-B Runoff Area=21,564 sf 22.87% Impervious Runoff Depth=4.34"
Tc=6.0 min CN=84 Runoff=2.42 cfs 0.179 af

SubcatchmentSWALE: SWALE/BASIN Runoff Area=52,228 sf 59.35% Impervious Runoff Depth=4.77"
Tc=6.0 min CN=88 Runoff=6.32 cfs 0.477 af

Pond ED-AB: Existing Depression Peak Elev=21.32' Storage=17,682 cf Inflow=4.90 cfs 0.406 af
Outflow=0.00 cfs 0.000 af

Pond ES-LF: DP-LF Existing Swale/Basin in Peak Elev=15.97' Storage=1,317 cf Inflow=11.65 cfs 0.894 af
18.0" Round Culvert n=0.013 L=39.0' S=0.0108 '/' Outflow=9.62 cfs 0.894 af

Total Runoff Area = 4.579 ac Runoff Volume = 1.300 af Average Runoff Depth = 3.41"
54.84% Pervious = 2.511 ac 45.16% Impervious = 2.068 ac

Summary for Subcatchment CB 1: CB 1

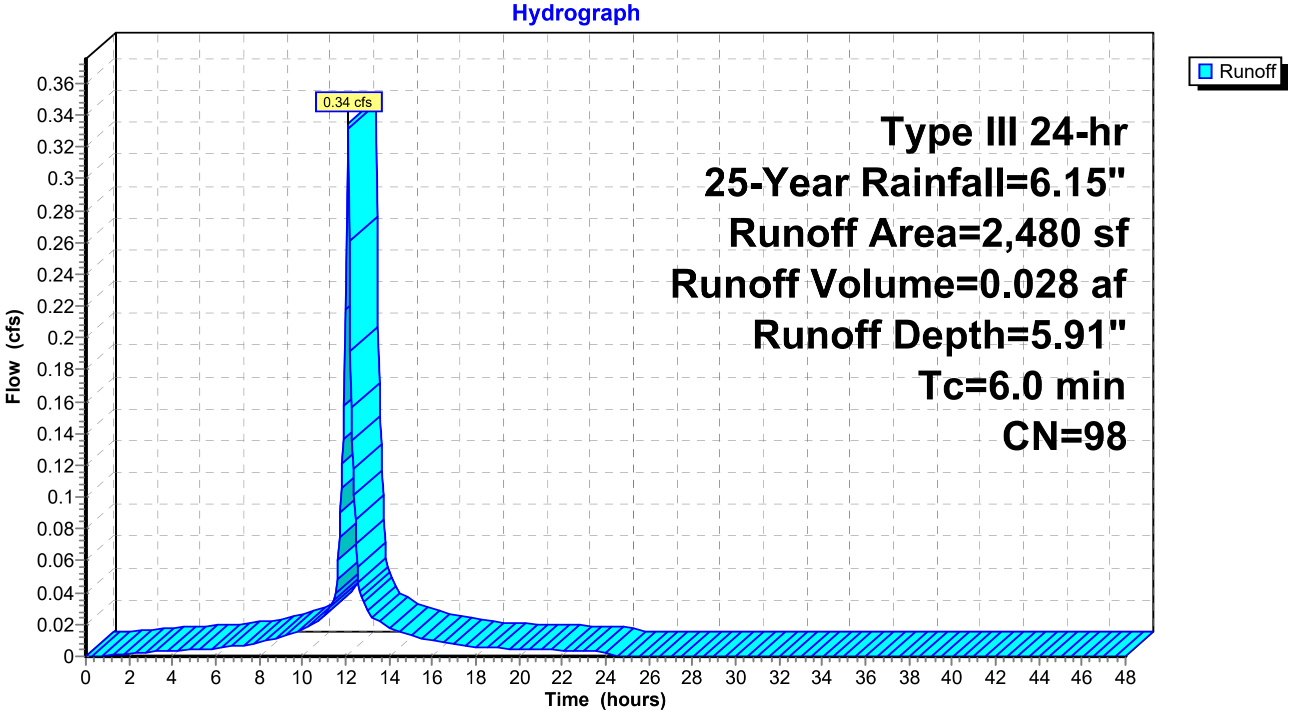
Runoff = 0.34 cfs @ 12.09 hrs, Volume= 0.028 af, Depth= 5.91"
Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.15"

	Area (sf)	CN	Description
*	2,480	98	Impervious surfaces, HSG C
	2,480		100.00% Impervious Area

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

Subcatchment CB 1: CB 1



Summary for Subcatchment CB 2: CB 2

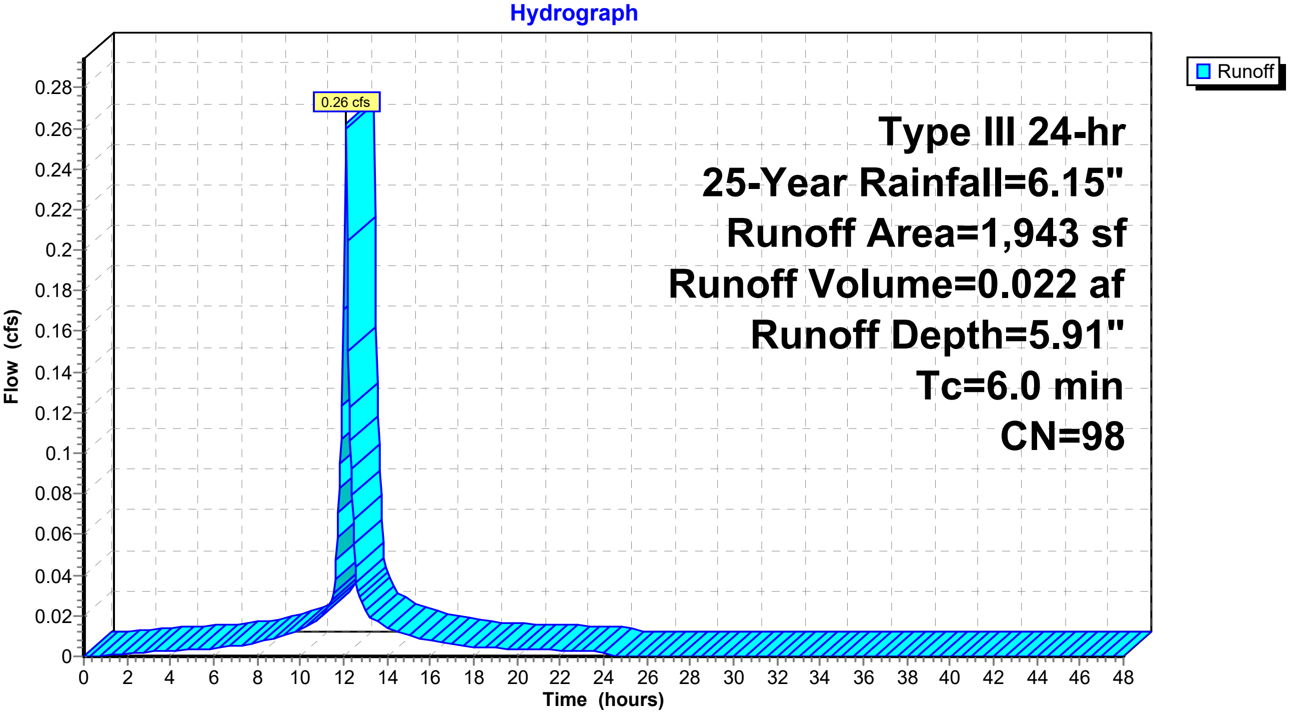
Runoff = 0.26 cfs @ 12.09 hrs, Volume= 0.022 af, Depth= 5.91"
Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.15"

	Area (sf)	CN	Description
*	1,943	98	Impervious surfaces, HSG C
	1,943		100.00% Impervious Area

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

Subcatchment CB 2: CB 2



Summary for Subcatchment CB 5: CB 5

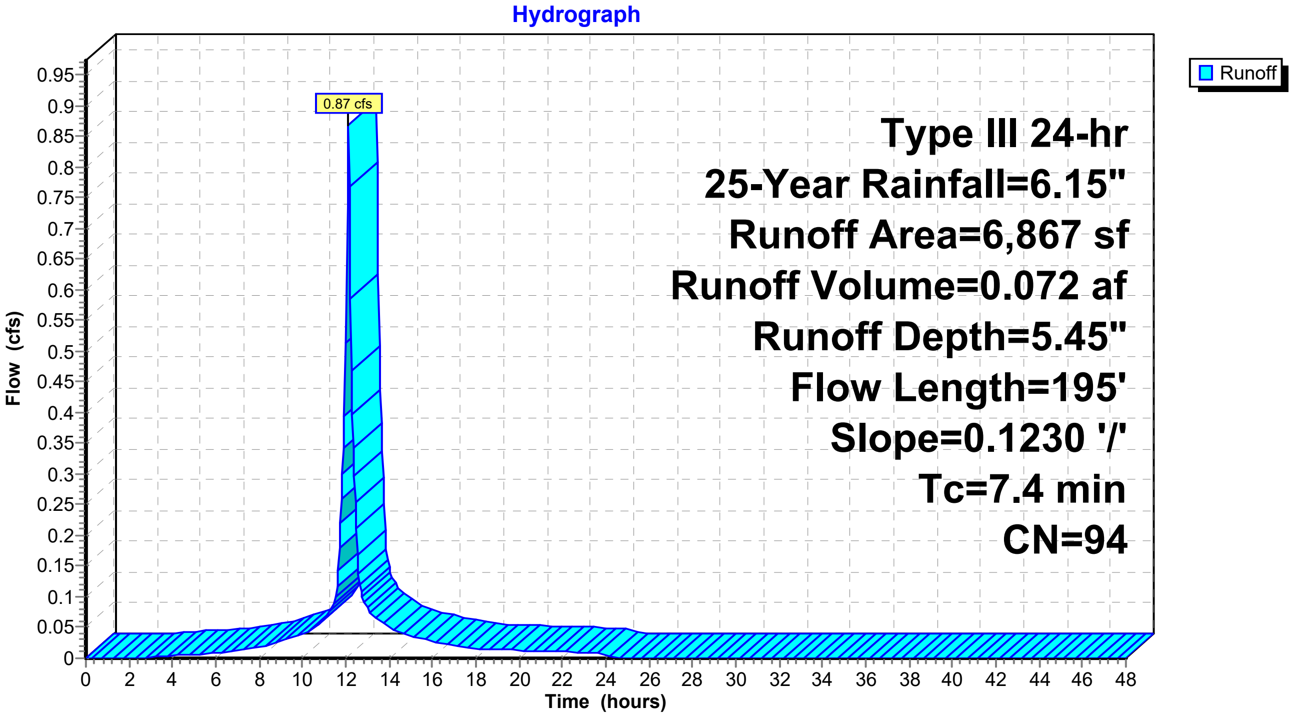
Runoff = 0.87 cfs @ 12.10 hrs, Volume= 0.072 af, Depth= 5.45"
Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.15"

	Area (sf)	CN	Description
*	5,683	98	Impervious surfaces, HSG C
	1,184	74	>75% Grass cover, Good, HSG C
	6,867	94	Weighted Average
	1,184		17.24% Pervious Area
	5,683		82.76% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	50	0.1230	0.14		**Sheet Flow, 1** Woods: Light underbrush n= 0.400 P2= 3.20"
1.4	145	0.1230	1.75		**Shallow Concentrated Flow, 2** Woodland Kv= 5.0 fps
7.4	195	Total			

Subcatchment CB 5: CB 5



Summary for Subcatchment DCB 4: DCB 4

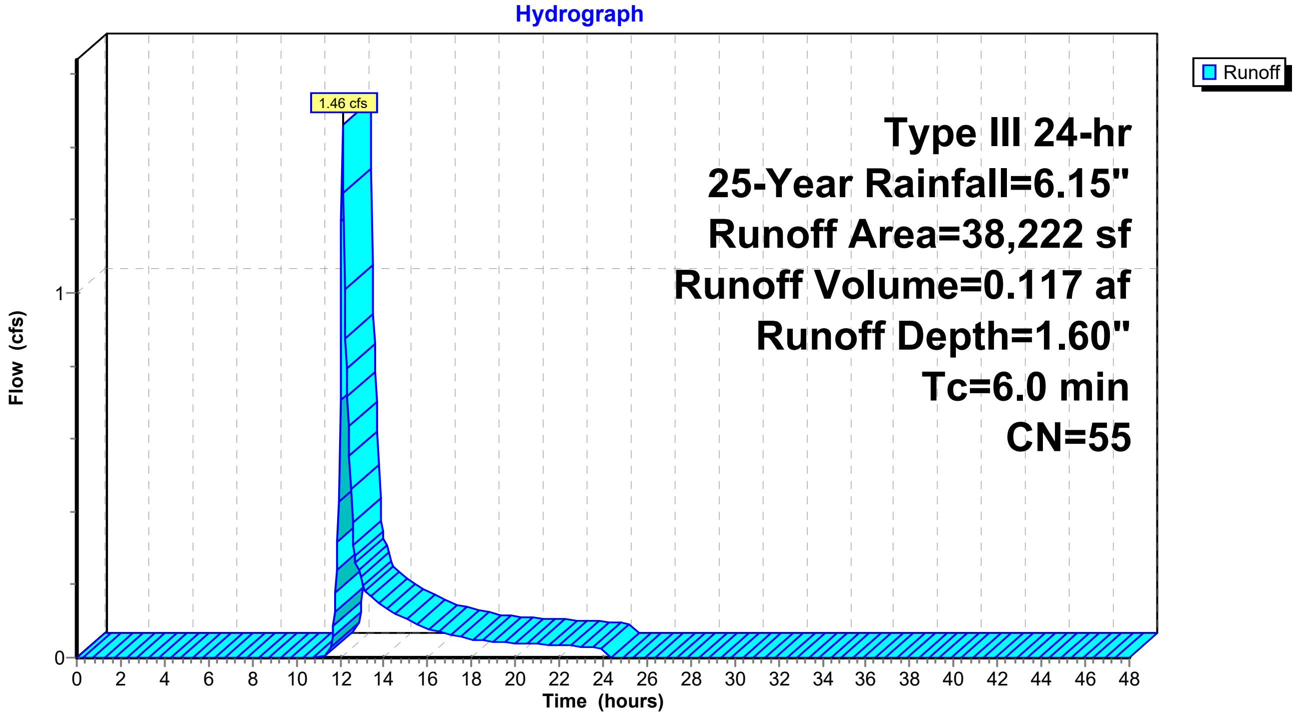
Runoff = 1.46 cfs @ 12.10 hrs, Volume= 0.117 af, Depth= 1.60"
Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.15"

	Area (sf)	CN	Description
*	14,030	98	Impervious surfaces, HSG A
	24,192	30	Woods, Good, HSG A
	38,222	55	Weighted Average
	24,192		63.29% Pervious Area
	14,030		36.71% Impervious Area

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

Subcatchment DCB 4: DCB 4



Summary for Subcatchment S-A: S-A

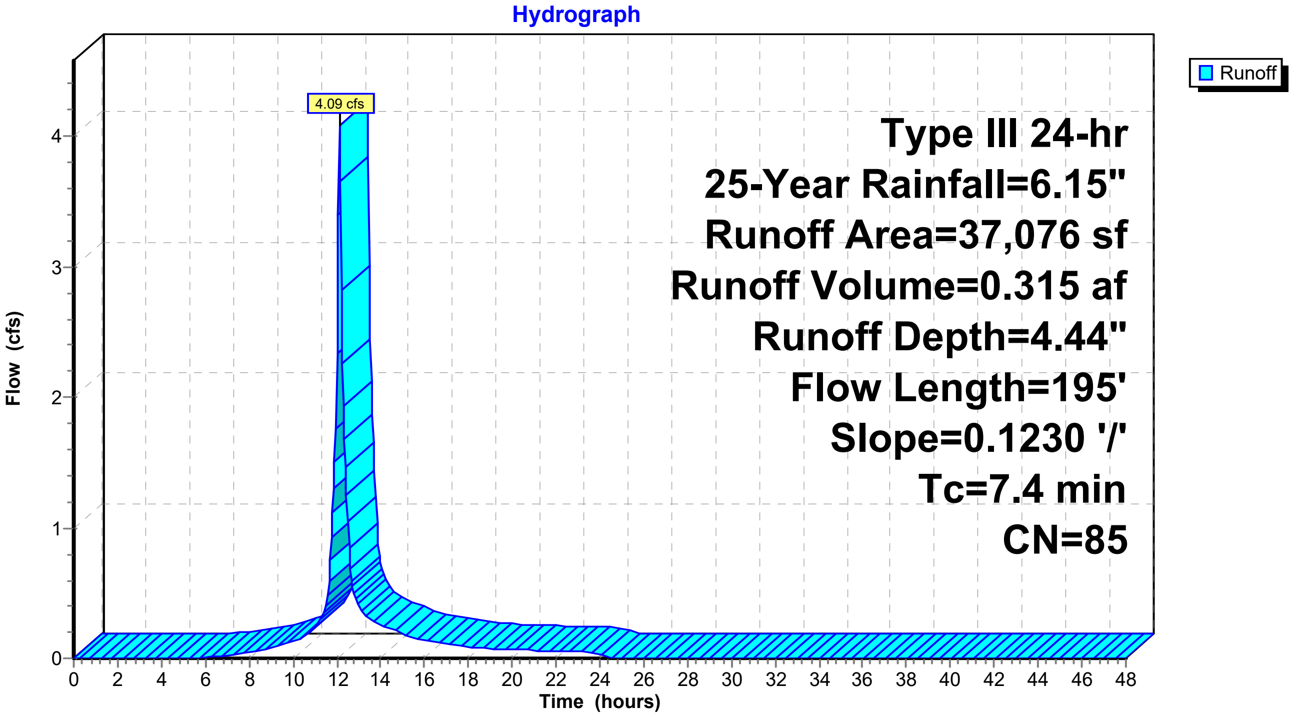
Runoff = 4.09 cfs @ 12.11 hrs, Volume= 0.315 af, Depth= 4.44"
Routed to Pond ED-AB : Existing Depression

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.15"

	Area (sf)	CN	Description
*	4,142	98	Bottom Basin, HSG A
*	5,243	98	Impervious surfaces, HSG A
*	329	39	>75% Grass cover, Good, HSG A
*	2,305	30	Woods, Good, HSG A
*	65	98	Roofs, HSG A
*	4,816	98	Roofs, HSG C
*	8,343	98	Impervious surfaces, HSG C
*	3,814	74	>75% Grass cover, Good, HSG C
*	5,909	70	Woods, Good, HSG C
*	157	96	Gravel surface, HSG C (OFFSITE)
*	10	98	Impervious surfaces, HSG C (OFFSITE)
*	1,943	74	>75% Grass cover, Good, HSG C (OFFSITE)
	37,076	85	Weighted Average
	14,457		38.99% Pervious Area
	22,619		61.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	50	0.1230	0.14		**Sheet Flow, 1** Woods: Light underbrush n= 0.400 P2= 3.20"
1.4	145	0.1230	1.75		**Shallow Concentrated Flow, 2** Woodland Kv= 5.0 fps
7.4	195	Total			

Subcatchment S-A: S-A



Summary for Subcatchment S-A-OS: Offsite Areas

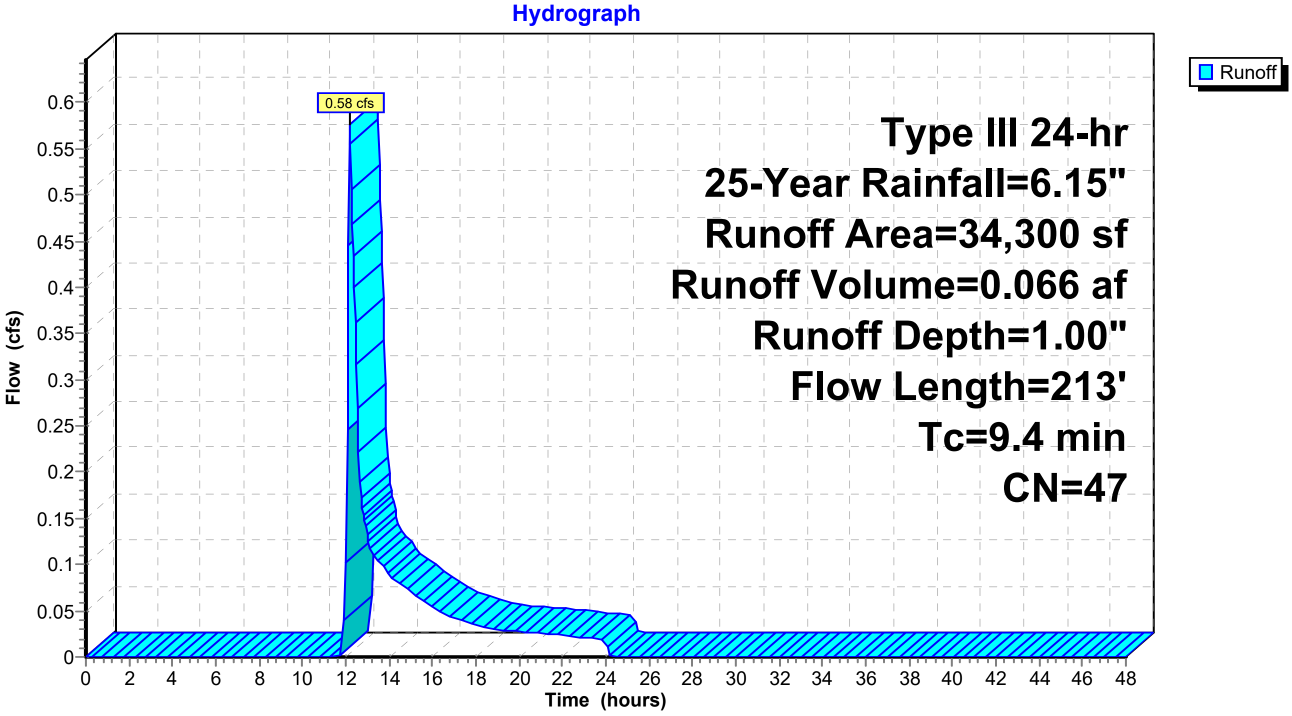
Runoff = 0.58 cfs @ 12.17 hrs, Volume= 0.066 af, Depth= 1.00"
Routed to Pond ED-AB : Existing Depression

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.15"

	Area (sf)	CN	Description
*	15,938	30	Woods, Good, HSG A (OFFSITE)
*	11,097	39	>75% Grass cover, Good, HSG A (OFFSITE)
*	5,665	98	Roofs, HSG A (OFFSITE)
*	1,600	98	Impervious surfaces, HSG C (OFFSITE)
	34,300	47	Weighted Average
	27,035		78.82% Pervious Area
	7,265		21.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0600	0.10		**Sheet Flow, 1** Woods: Light underbrush n= 0.400 P2= 3.20"
1.5	163	0.1290	1.80		**Shallow Concentrated Flow, 2** Woodland Kv= 5.0 fps
9.4	213	Total			

Subcatchment S-A-OS: Offsite Areas



Summary for Subcatchment S-A-OS-LF: Offsite Lovell Field

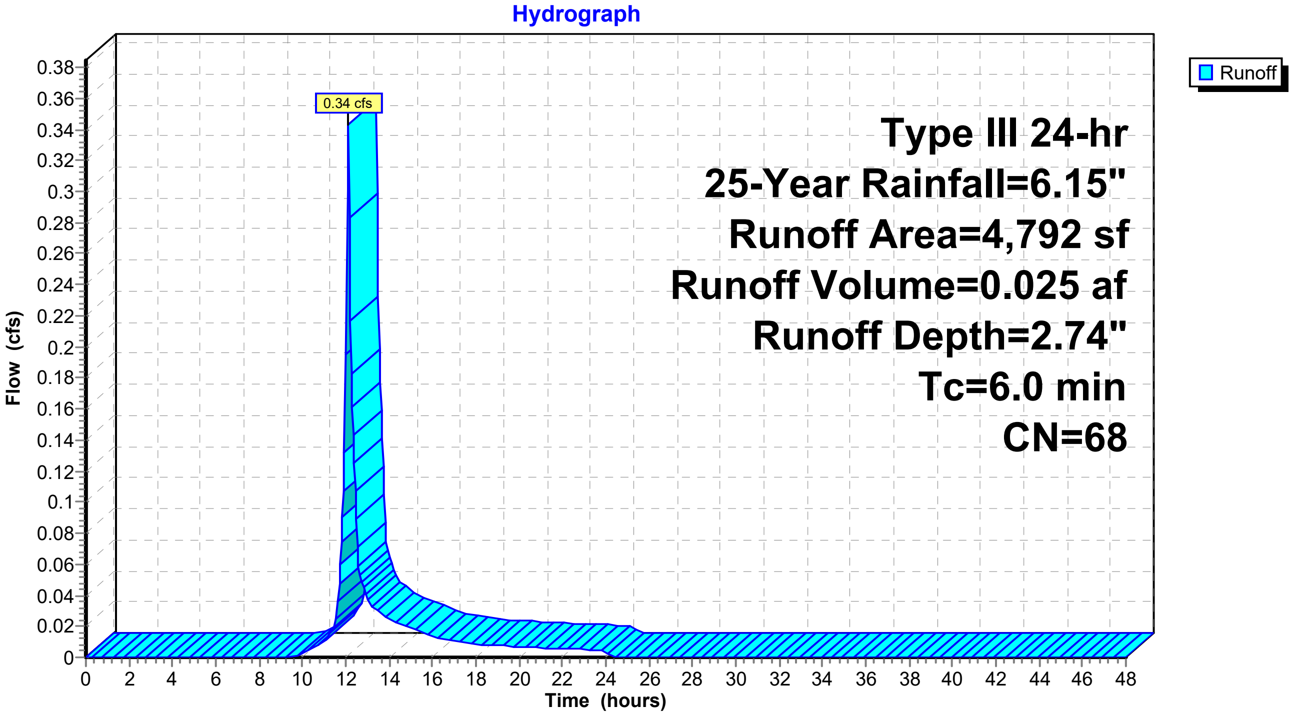
Runoff = 0.34 cfs @ 12.10 hrs, Volume= 0.025 af, Depth= 2.74"
Routed to Pond ED-AB : Existing Depression

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.15"

	Area (sf)	CN	Description
*	772	39	>75% Grass cover, Good, HSG A (OFFSITE)
	2,699	74	>75% Grass cover, Good, HSG C
*	1,178	70	Woods, Good, HSG C (OFFSITE)
*	143	98	Impervious surfaces, HSG C (OFFSITE)
	4,792	68	Weighted Average
	4,649		97.02% Pervious Area
	143		2.98% Impervious Area

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

Subcatchment S-A-OS-LF: Offsite Lovell Field



Summary for Subcatchment S-B: S-B

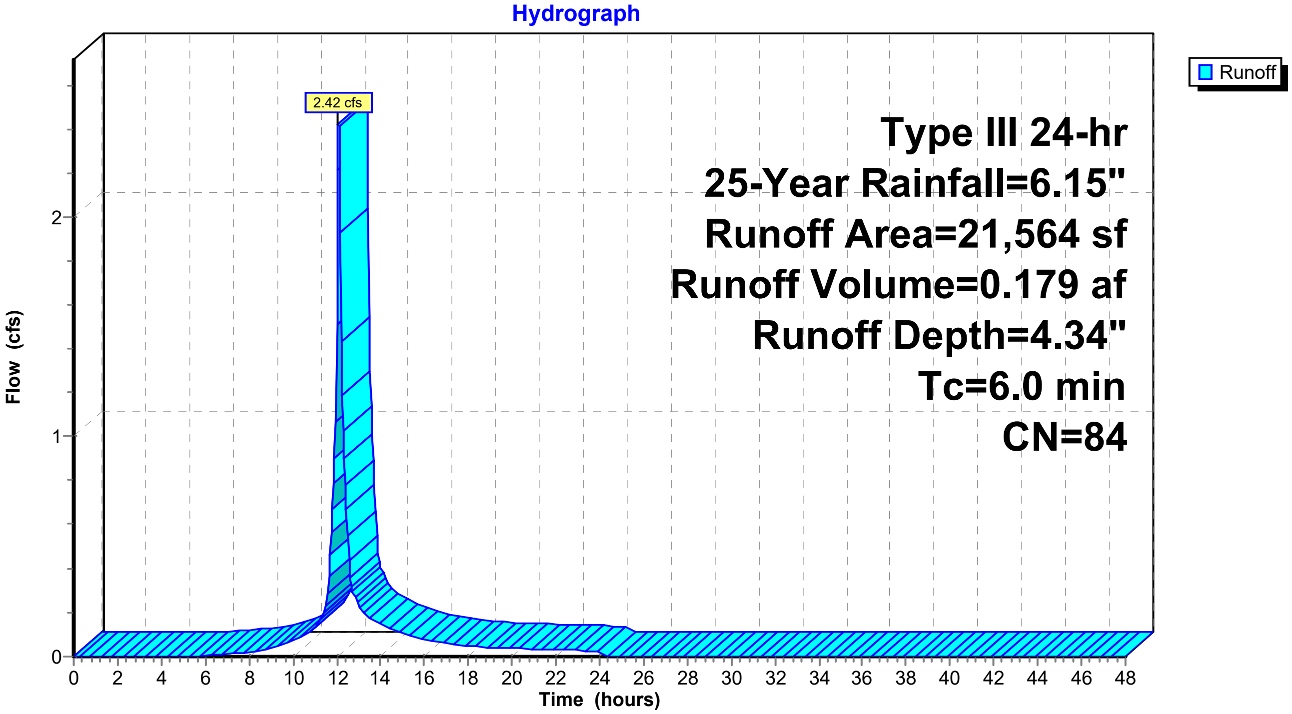
Runoff = 2.42 cfs @ 12.09 hrs, Volume= 0.179 af, Depth= 4.34"
Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.15"

	Area (sf)	CN	Description
	3,849	98	Roofs, HSG C
*	1,038	98	Impervious surfaces, HSG C
	7,880	74	>75% Grass cover, Good, HSG C
	3,460	96	Gravel surface, HSG C
*	44	98	Impervious surfaces, HSG C (OFFSITE)
*	3,893	74	>75% Grass cover, Good, HSG C (OFFSITE)
*	1,400	96	Gravel, HSG C (OFFSITE)
	21,564	84	Weighted Average
	16,633		77.13% Pervious Area
	4,931		22.87% Impervious Area

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

Subcatchment S-B: S-B



Summary for Subcatchment SWALE: SWALE/BASIN

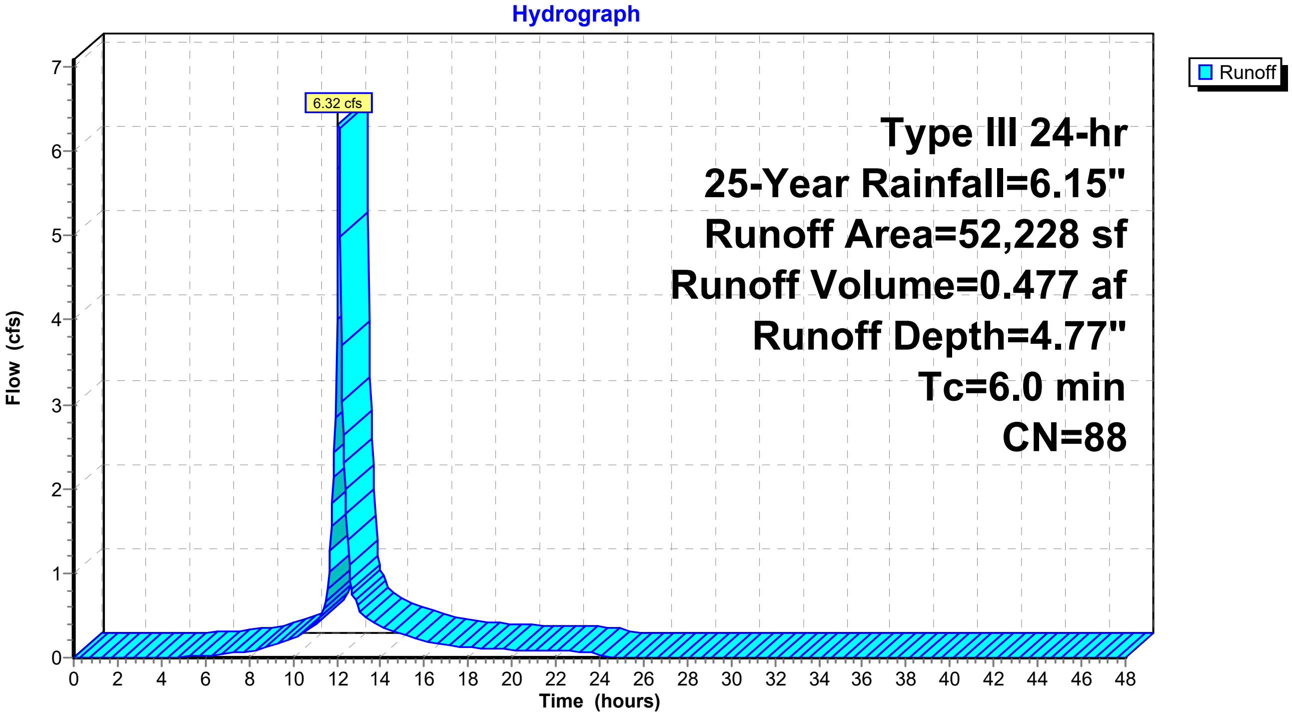
Runoff = 6.32 cfs @ 12.09 hrs, Volume= 0.477 af, Depth= 4.77"
Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.15"

	Area (sf)	CN	Description
*	30,996	98	Impervious surfaces, HSG C
	21,232	74	>75% Grass cover, Good, HSG C
	52,228	88	Weighted Average
	21,232		40.65% Pervious Area
	30,996		59.35% Impervious Area

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

Subcatchment SWALE: SWALE/BASIN



Summary for Pond ED-AB: Existing Depression

Inflow Area = 1.749 ac, 39.42% Impervious, Inflow Depth = 2.79" for 25-Year event
Inflow = 4.90 cfs @ 12.11 hrs, Volume= 0.406 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 21.32' @ 24.55 hrs Surf.Area= 10,984 sf Storage= 17,682 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

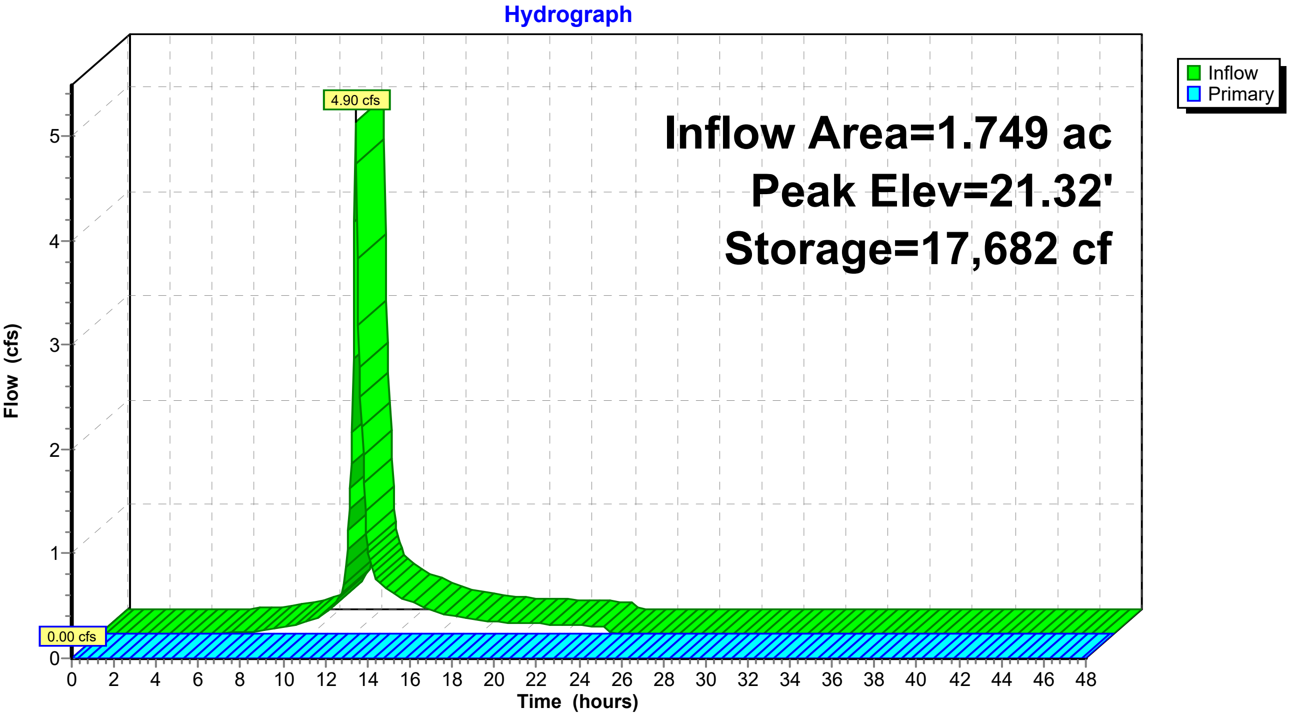
Volume	Invert	Avail.Storage	Storage Description
#1	18.00'	48,989 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
18.00	313	0	0
19.00	2,684	1,499	1,499
20.00	6,330	4,507	6,006
21.00	10,192	8,261	14,267
22.00	12,649	11,421	25,687
23.00	15,970	14,310	39,997
23.50	20,000	8,993	48,989

Device	Routing	Invert	Outlet Devices
#1	Primary	23.43'	**2.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=18.00' TW=13.87' (Dynamic Tailwater)
└─**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond ED-AB: Existing Depression



Summary for Pond ES-LF: DP-LF Existing Swale/Basin in Lovell Field

```
Inflow Area =        4.579 ac,  45.16% Impervious,  Inflow Depth =   2.34"    for  25-Year event
Inflow      =       11.65 cfs @   12.09 hrs,  Volume=          0.894 af
Outflow     =        9.62 cfs @   12.15 hrs,  Volume=          0.894 af,  Atten= 17%,  Lag= 3.5 min
Primary     =        9.62 cfs @   12.15 hrs,  Volume=          0.894 af
   Routed to nonexistent node 1R

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 15.97' @ 12.15 hrs   Surf.Area= 1,724 sf   Storage= 1,317 cf

Plug-Flow detention time= 0.7 min calculated for 0.894 af (100% of inflow)
Center-of-Mass det. time= 0.7 min ( 800.6 - 799.8 )
```

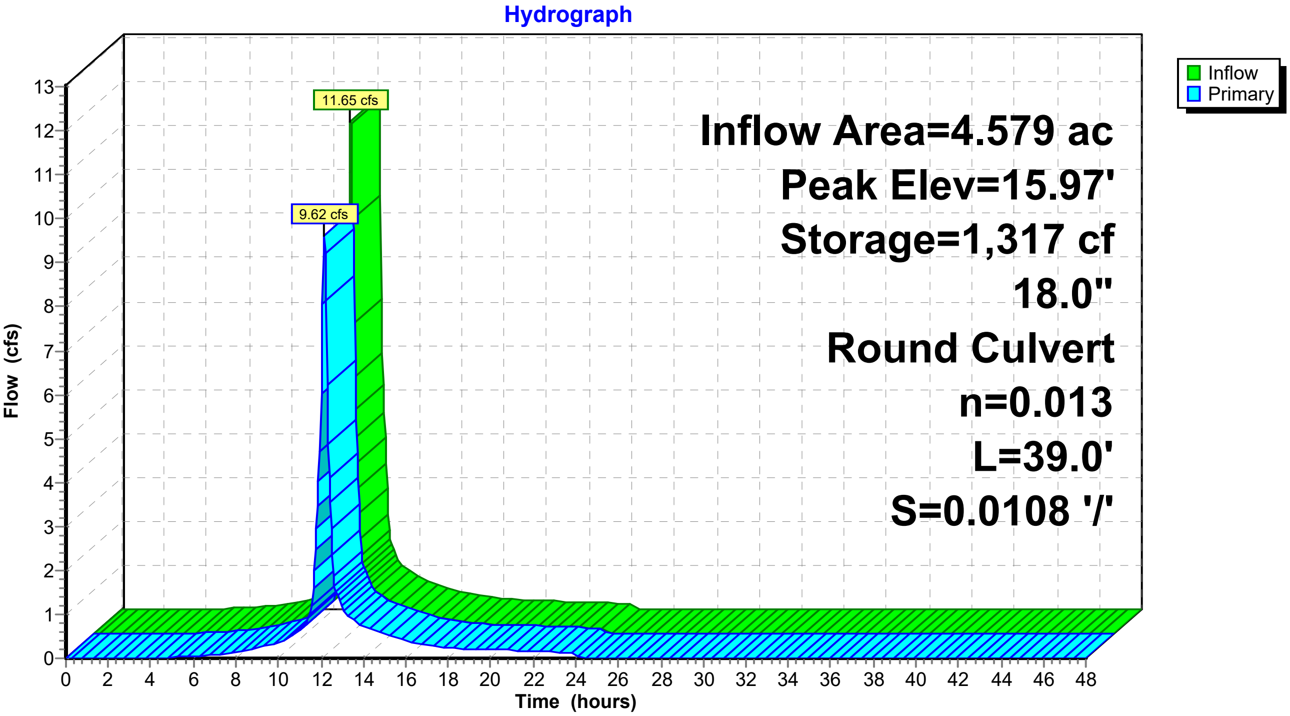
Volume	Invert	Avail.Storage	Storage Description
#1	13.87'	17,546 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
13.87	0	0	0
14.00	3	0	0
15.00	488	246	246
16.00	1,764	1,126	1,372
17.00	2,848	2,306	3,678
18.00	3,993	3,421	7,098
19.00	5,217	4,605	11,703
20.00	6,468	5,843	17,546

Device	Routing	Invert	Outlet Devices
#1	Primary	13.87'	**18.0" Round Culvert** L= 39.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 13.87' / 13.45' S= 0.0108 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=9.62 cfs @ 12.15 hrs HW=15.97' (Free Discharge)
↑—**1=Culvert** (Barrel Controls 9.62 cfs @ 5.44 fps)

Pond ES-LF: DP-LF Existing Swale/Basin in Lovell Field



Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentCB 1: CB 1 Runoff Area=2,480 sf 100.00% Impervious Runoff Depth=8.56"
Tc=6.0 min CN=98 Runoff=0.48 cfs 0.041 af

SubcatchmentCB 2: CB 2 Runoff Area=1,943 sf 100.00% Impervious Runoff Depth=8.56"
Tc=6.0 min CN=98 Runoff=0.38 cfs 0.032 af

SubcatchmentCB 5: CB 5 Runoff Area=6,867 sf 82.76% Impervious Runoff Depth=8.08"
Flow Length=195' Slope=0.1230 '/' Tc=7.4 min CN=94 Runoff=1.26 cfs 0.106 af

SubcatchmentDCB 4: DCB 4 Runoff Area=38,222 sf 36.71% Impervious Runoff Depth=3.34"
Tc=6.0 min CN=55 Runoff=3.29 cfs 0.245 af

SubcatchmentS-A: S-A Runoff Area=37,076 sf 61.01% Impervious Runoff Depth=6.99"
Flow Length=195' Slope=0.1230 '/' Tc=7.4 min CN=85 Runoff=6.29 cfs 0.496 af

SubcatchmentS-A-OS: Offsite Areas Runoff Area=34,300 sf 21.18% Impervious Runoff Depth=2.40"
Flow Length=213' Tc=9.4 min CN=47 Runoff=1.77 cfs 0.158 af

SubcatchmentS-A-OS-LF: Offsite Lovell Runoff Area=4,792 sf 2.98% Impervious Runoff Depth=4.92"
Tc=6.0 min CN=68 Runoff=0.62 cfs 0.045 af

SubcatchmentS-B: S-B Runoff Area=21,564 sf 22.87% Impervious Runoff Depth=6.87"
Tc=6.0 min CN=84 Runoff=3.75 cfs 0.283 af

SubcatchmentSWALE: SWALE/BASIN Runoff Area=52,228 sf 59.35% Impervious Runoff Depth=7.35"
Tc=6.0 min CN=88 Runoff=9.51 cfs 0.735 af

Pond ED-AB: Existing Depression Peak Elev=22.36' Storage=30,421 cf Inflow=8.53 cfs 0.698 af
Outflow=0.00 cfs 0.000 af

Pond ES-LF: DP-LF Existing Swale/Basin in Peak Elev=16.99' Storage=3,650 cf Inflow=18.65 cfs 1.441 af
18.0" Round Culvert n=0.013 L=39.0' S=0.0108 '/' Outflow=13.10 cfs 1.441 af

Total Runoff Area = 4.579 ac Runoff Volume = 2.139 af Average Runoff Depth = 5.61"
54.84% Pervious = 2.511 ac 45.16% Impervious = 2.068 ac

Summary for Subcatchment CB 1: CB 1

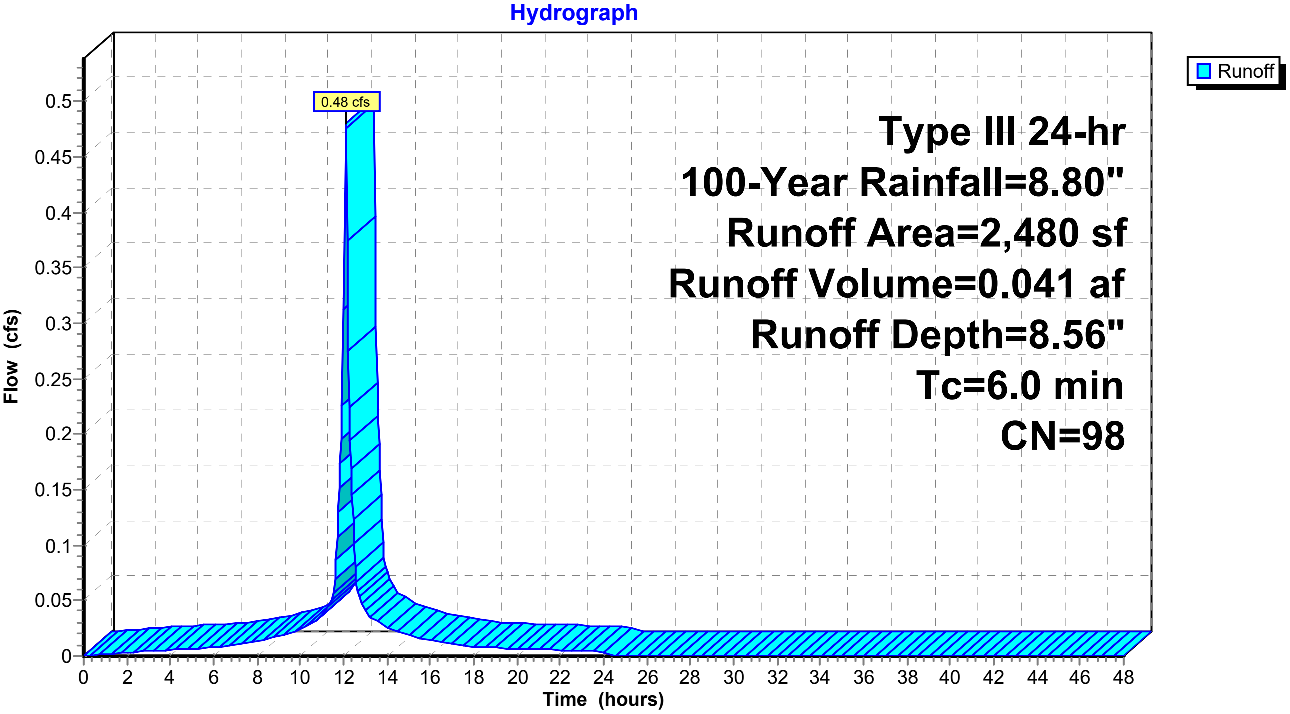
Runoff = 0.48 cfs @ 12.09 hrs, Volume= 0.041 af, Depth= 8.56"
Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.80"

	Area (sf)	CN	Description
*	2,480	98	Impervious surfaces, HSG C
	2,480		100.00% Impervious Area

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

Subcatchment CB 1: CB 1



Summary for Subcatchment CB 2: CB 2

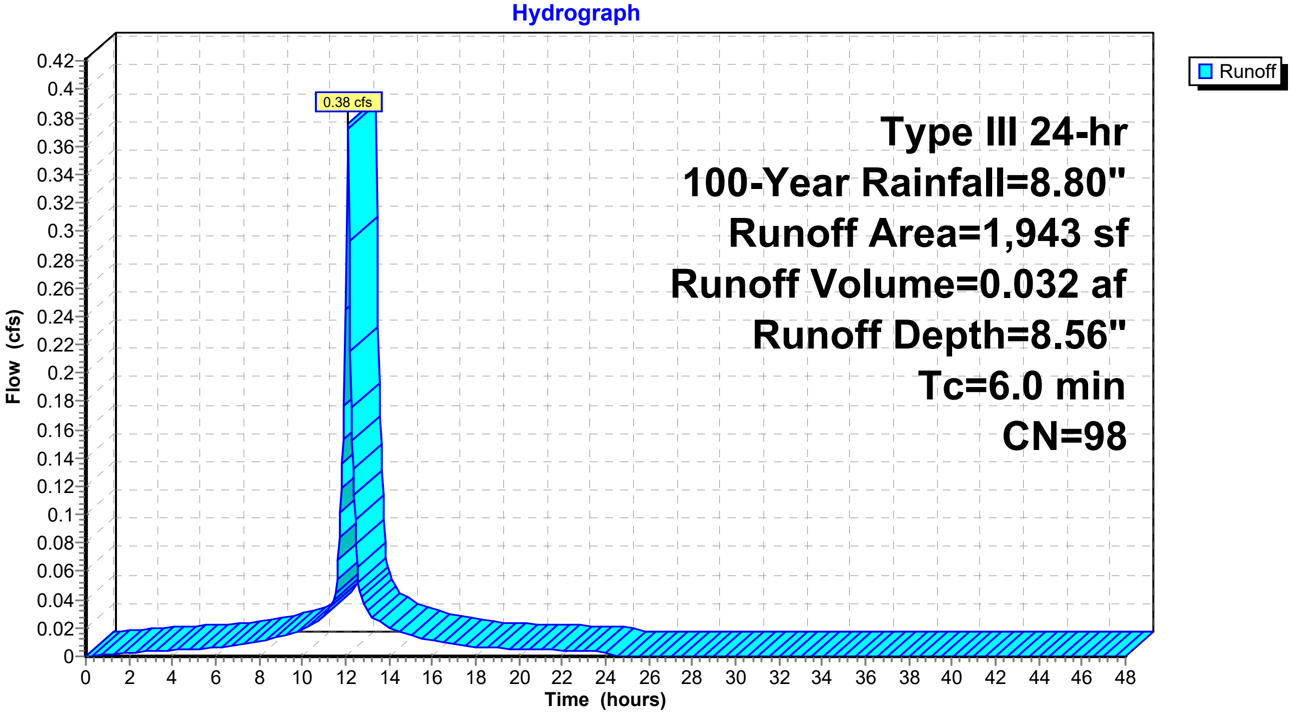
Runoff = 0.38 cfs @ 12.09 hrs, Volume= 0.032 af, Depth= 8.56"
Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.80"

	Area (sf)	CN	Description
*	1,943	98	Impervious surfaces, HSG C
	1,943		100.00% Impervious Area

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

Subcatchment CB 2: CB 2



Summary for Subcatchment CB 5: CB 5

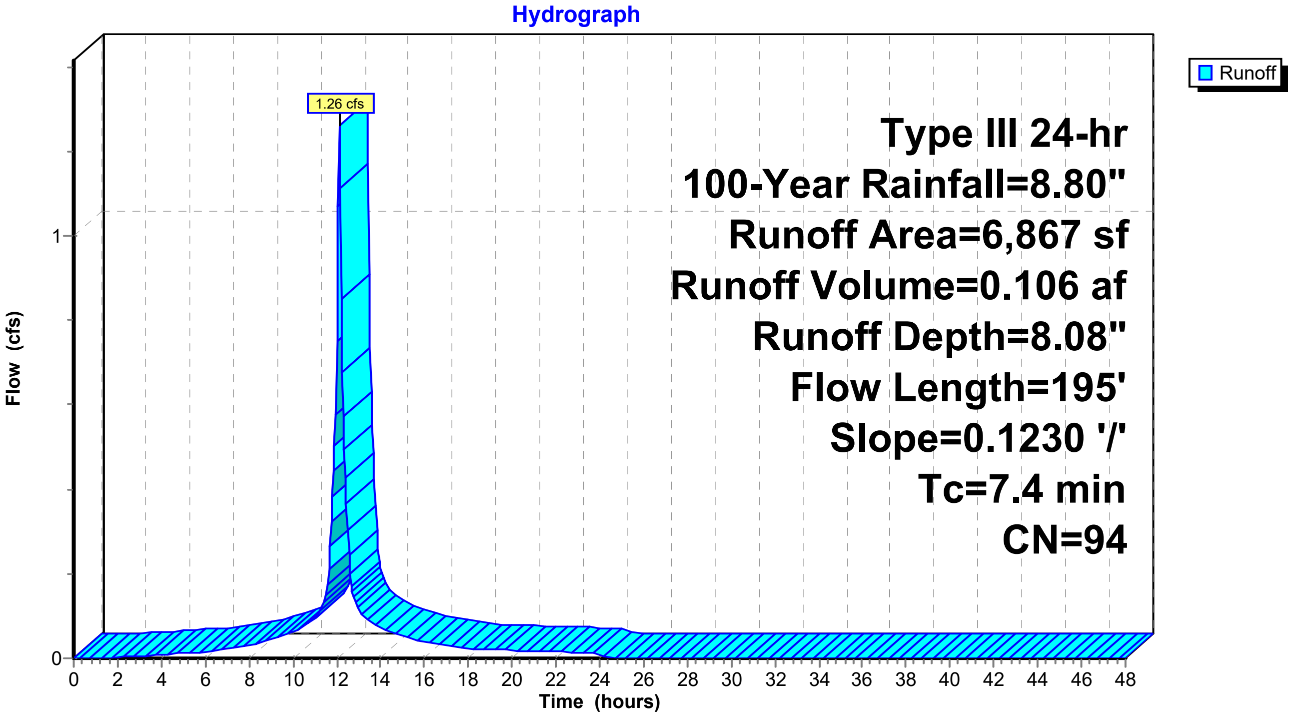
Runoff = 1.26 cfs @ 12.10 hrs, Volume= 0.106 af, Depth= 8.08"
Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.80"

	Area (sf)	CN	Description
*	5,683	98	Impervious surfaces, HSG C
	1,184	74	>75% Grass cover, Good, HSG C
	6,867	94	Weighted Average
	1,184		17.24% Pervious Area
	5,683		82.76% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	50	0.1230	0.14		**Sheet Flow, 1** Woods: Light underbrush n= 0.400 P2= 3.20"
1.4	145	0.1230	1.75		**Shallow Concentrated Flow, 2** Woodland Kv= 5.0 fps
7.4	195	Total			

Subcatchment CB 5: CB 5



Summary for Subcatchment DCB 4: DCB 4

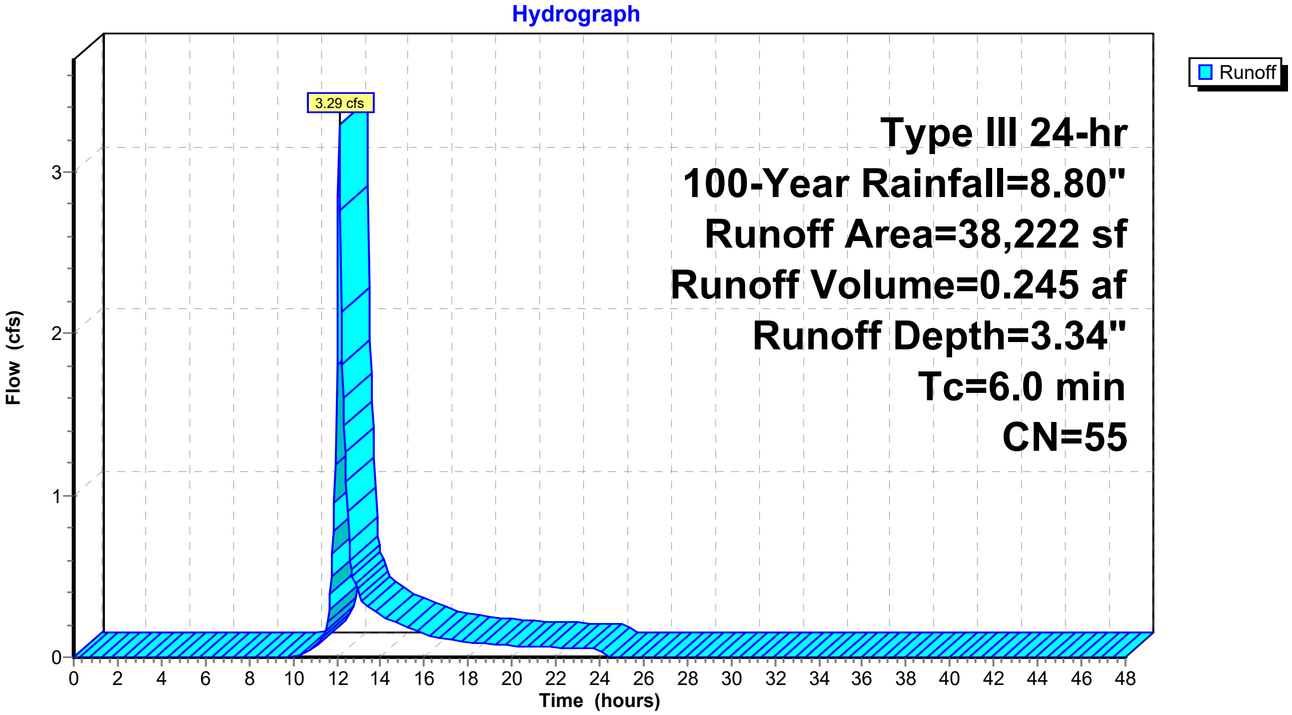
Runoff = 3.29 cfs @ 12.10 hrs, Volume= 0.245 af, Depth= 3.34"
Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.80"

	Area (sf)	CN	Description
*	14,030	98	Impervious surfaces, HSG A
	24,192	30	Woods, Good, HSG A
	38,222	55	Weighted Average
	24,192		63.29% Pervious Area
	14,030		36.71% Impervious Area

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

Subcatchment DCB 4: DCB 4



Summary for Subcatchment S-A: S-A

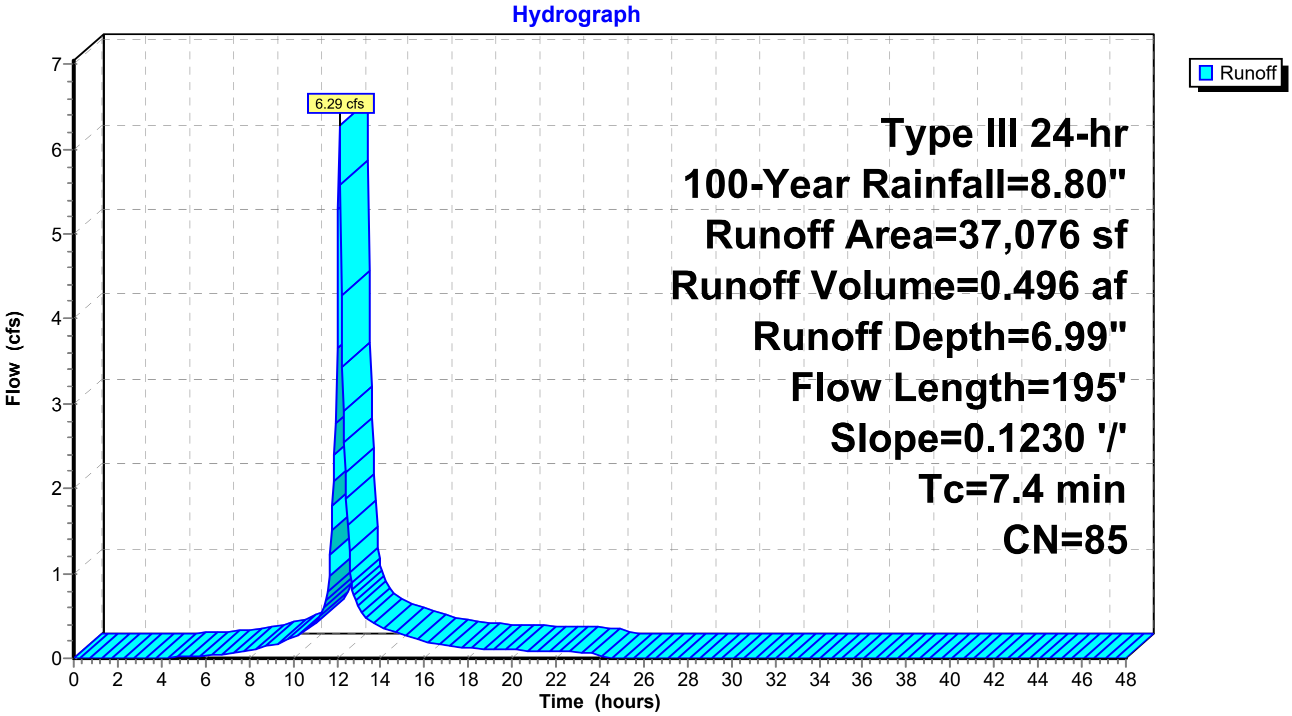
Runoff = 6.29 cfs @ 12.10 hrs, Volume= 0.496 af, Depth= 6.99"
Routed to Pond ED-AB : Existing Depression

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.80"

	Area (sf)	CN	Description
*	4,142	98	Bottom Basin, HSG A
*	5,243	98	Impervious surfaces, HSG A
*	329	39	>75% Grass cover, Good, HSG A
*	2,305	30	Woods, Good, HSG A
*	65	98	Roofs, HSG A
*	4,816	98	Roofs, HSG C
*	8,343	98	Impervious surfaces, HSG C
*	3,814	74	>75% Grass cover, Good, HSG C
*	5,909	70	Woods, Good, HSG C
*	157	96	Gravel surface, HSG C (OFFSITE)
*	10	98	Impervious surfaces, HSG C (OFFSITE)
*	1,943	74	>75% Grass cover, Good, HSG C (OFFSITE)
	37,076	85	Weighted Average
	14,457		38.99% Pervious Area
	22,619		61.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	50	0.1230	0.14		**Sheet Flow, 1** Woods: Light underbrush n= 0.400 P2= 3.20"
1.4	145	0.1230	1.75		**Shallow Concentrated Flow, 2** Woodland Kv= 5.0 fps
7.4	195	Total			

Subcatchment S-A: S-A



Summary for Subcatchment S-A-OS: Offsite Areas

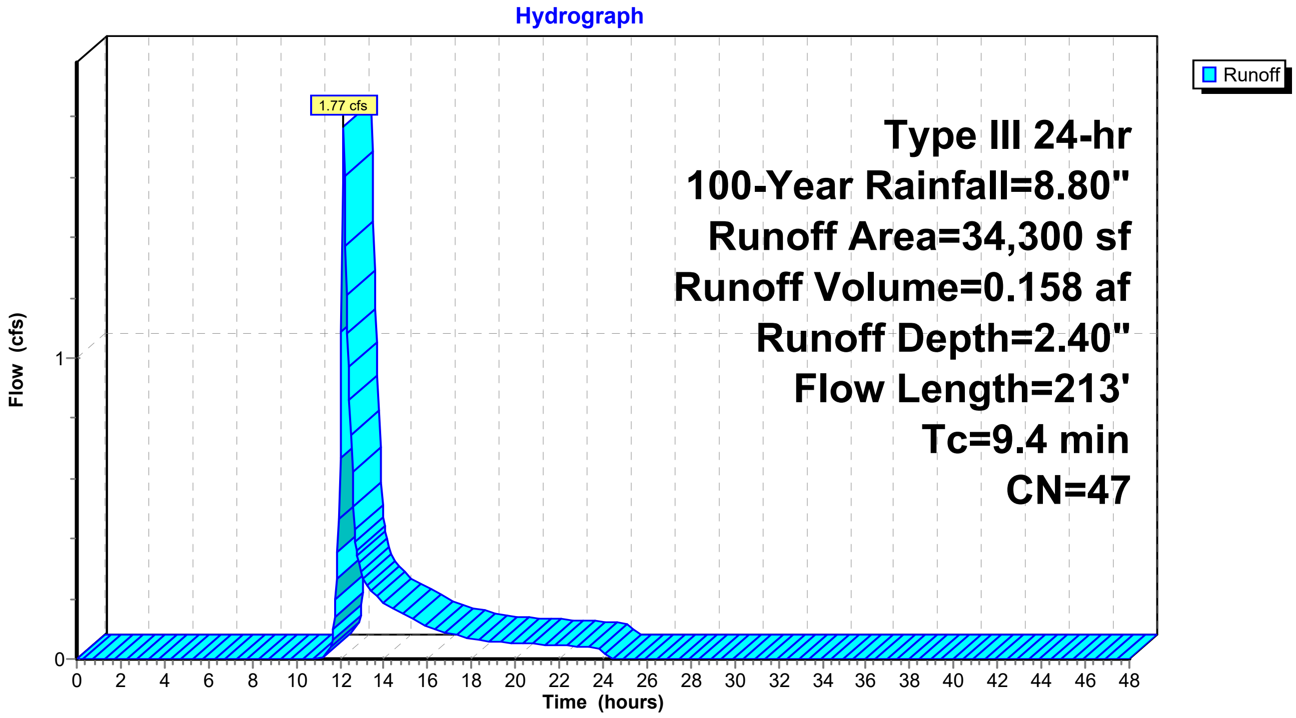
Runoff = 1.77 cfs @ 12.15 hrs, Volume= 0.158 af, Depth= 2.40"
Routed to Pond ED-AB : Existing Depression

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.80"

	Area (sf)	CN	Description
*	15,938	30	Woods, Good, HSG A (OFFSITE)
*	11,097	39	>75% Grass cover, Good, HSG A (OFFSITE)
*	5,665	98	Roofs, HSG A (OFFSITE)
*	1,600	98	Impervious surfaces, HSG C (OFFSITE)
	34,300	47	Weighted Average
	27,035		78.82% Pervious Area
	7,265		21.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0600	0.10		**Sheet Flow, 1** Woods: Light underbrush n= 0.400 P2= 3.20"
1.5	163	0.1290	1.80		**Shallow Concentrated Flow, 2** Woodland Kv= 5.0 fps
9.4	213	Total			

Subcatchment S-A-OS: Offsite Areas



Summary for Subcatchment S-A-OS-LF: Offsite Lovell Field

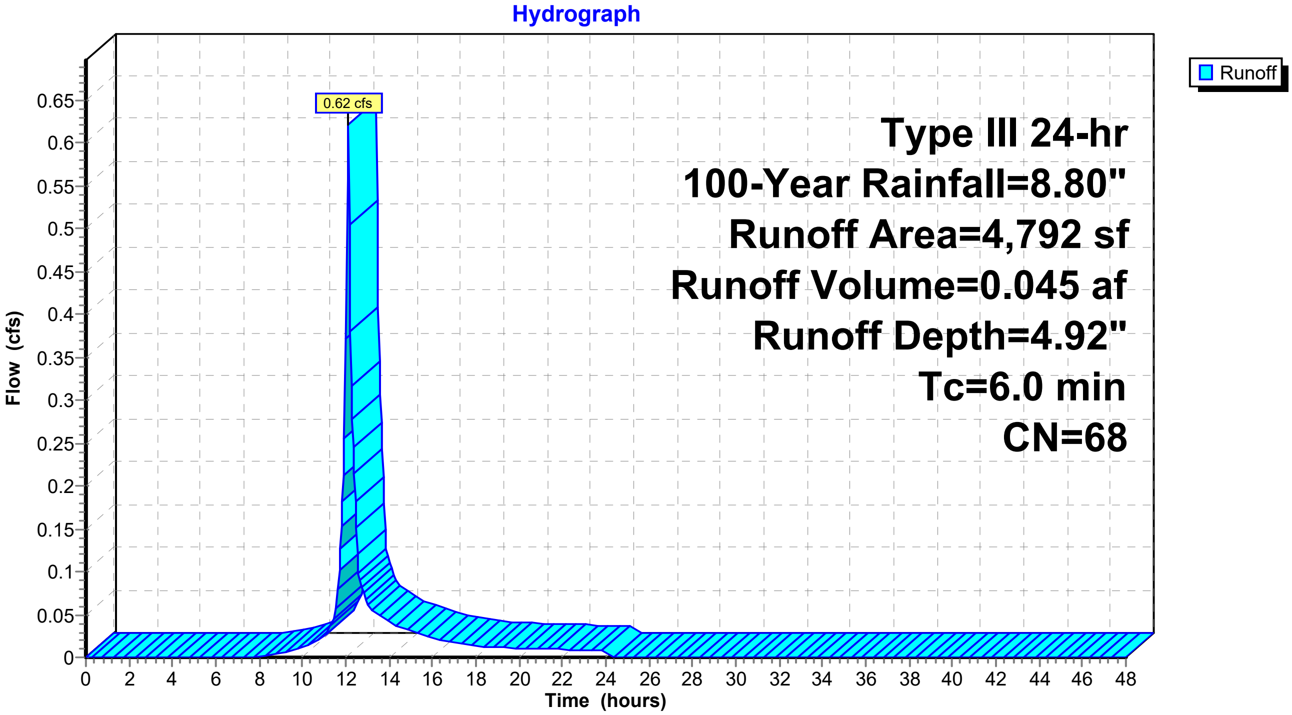
Runoff = 0.62 cfs @ 12.09 hrs, Volume= 0.045 af, Depth= 4.92"
Routed to Pond ED-AB : Existing Depression

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.80"

	Area (sf)	CN	Description
*	772	39	>75% Grass cover, Good, HSG A (OFFSITE)
	2,699	74	>75% Grass cover, Good, HSG C
*	1,178	70	Woods, Good, HSG C (OFFSITE)
*	143	98	Impervious surfaces, HSG C (OFFSITE)
	4,792	68	Weighted Average
	4,649		97.02% Pervious Area
	143		2.98% Impervious Area

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

Subcatchment S-A-OS-LF: Offsite Lovell Field



Summary for Subcatchment S-B: S-B

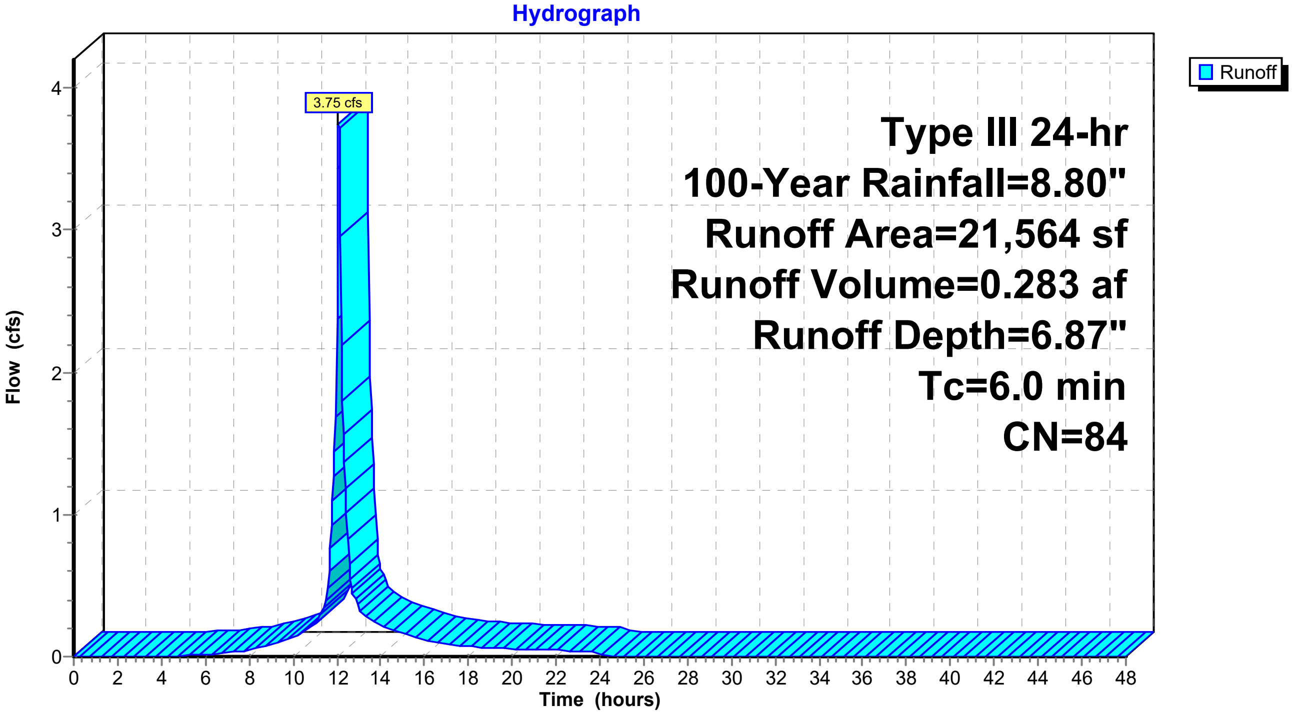
Runoff = 3.75 cfs @ 12.09 hrs, Volume= 0.283 af, Depth= 6.87"
Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.80"

	Area (sf)	CN	Description
	3,849	98	Roofs, HSG C
*	1,038	98	Impervious surfaces, HSG C
	7,880	74	>75% Grass cover, Good, HSG C
	3,460	96	Gravel surface, HSG C
*	44	98	Impervious surfaces, HSG C (OFFSITE)
*	3,893	74	>75% Grass cover, Good, HSG C (OFFSITE)
*	1,400	96	Gravel, HSG C (OFFSITE)
	21,564	84	Weighted Average
	16,633		77.13% Pervious Area
	4,931		22.87% Impervious Area

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

Subcatchment S-B: S-B



Summary for Subcatchment SWALE: SWALE/BASIN

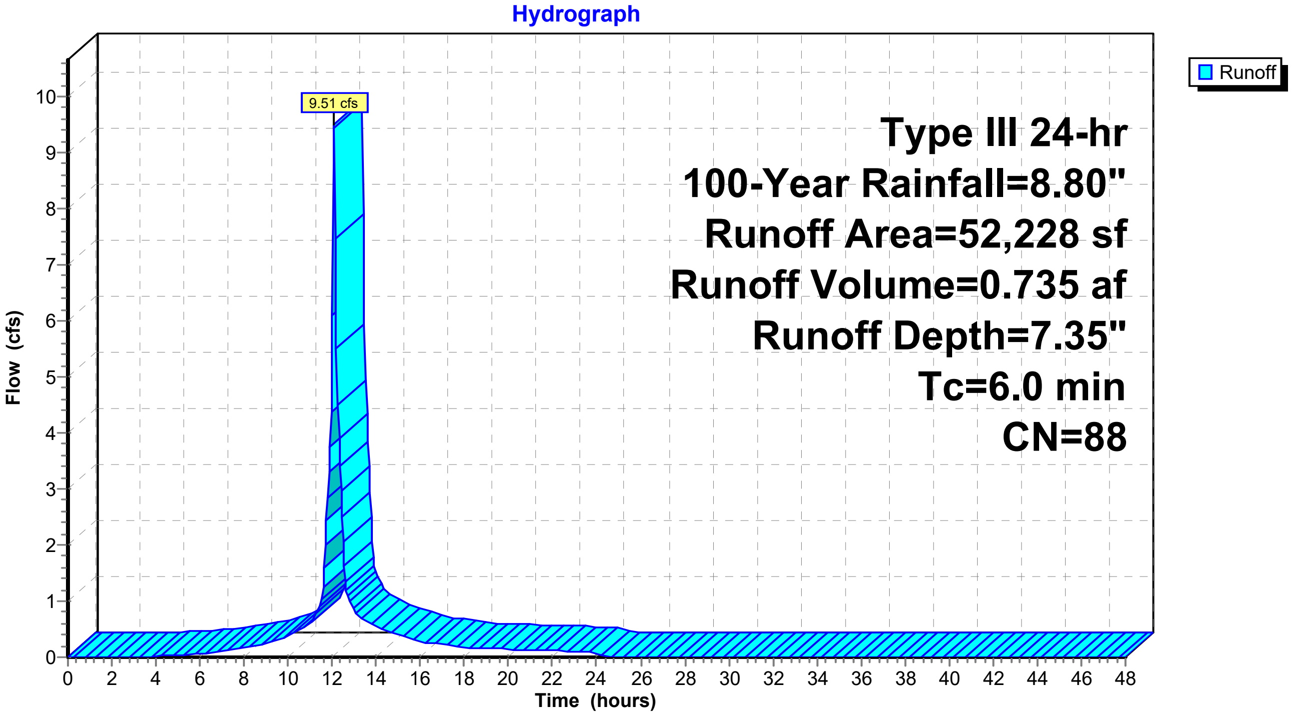
Runoff = 9.51 cfs @ 12.09 hrs, Volume= 0.735 af, Depth= 7.35"
Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.80"

	Area (sf)	CN	Description
*	30,996	98	Impervious surfaces, HSG C
	21,232	74	>75% Grass cover, Good, HSG C
	52,228	88	Weighted Average
	21,232		40.65% Pervious Area
	30,996		59.35% Impervious Area

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

Subcatchment SWALE: SWALE/BASIN



Summary for Pond ED-AB: Existing Depression

```
Inflow Area =        1.749 ac,  39.42% Impervious,  Inflow Depth =   4.79"    for  100-Year event
Inflow      =        8.53 cfs @   12.11 hrs,  Volume=          0.698 af
Outflow     =        0.00 cfs @    0.00 hrs,  Volume=          0.000 af,  Atten= 100%,  Lag= 0.0 min
Primary     =        0.00 cfs @    0.00 hrs,  Volume=          0.000 af
    Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 22.36' @ 24.55 hrs Surf.Area= 13,836 sf Storage= 30,421 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

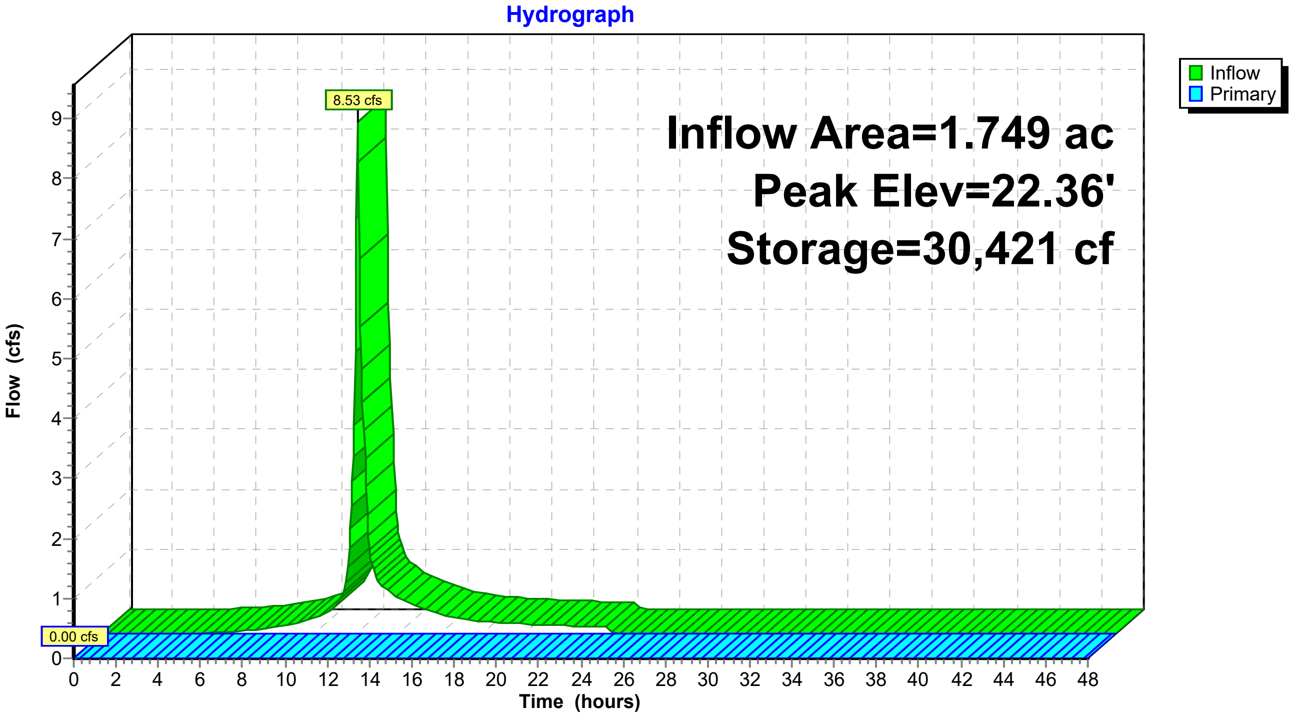
Volume	Invert	Avail.Storage	Storage Description
#1	18.00'	48,989 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
18.00	313	0	0
19.00	2,684	1,499	1,499
20.00	6,330	4,507	6,006
21.00	10,192	8,261	14,267
22.00	12,649	11,421	25,687
23.00	15,970	14,310	39,997
23.50	20,000	8,993	48,989

Device	Routing	Invert	Outlet Devices
#1	Primary	23.43'	**2.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=18.00' TW=13.87' (Dynamic Tailwater)
└─**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond ED-AB: Existing Depression



Summary for Pond ES-LF: DP-LF Existing Swale/Basin in Lovell Field

Inflow Area = 4.579 ac, 45.16% Impervious, Inflow Depth = 3.78" for 100-Year event
Inflow = 18.65 cfs @ 12.09 hrs, Volume= 1.441 af
Outflow = 13.10 cfs @ 12.18 hrs, Volume= 1.441 af, Atten= 30%, Lag= 5.1 min
Primary = 13.10 cfs @ 12.18 hrs, Volume= 1.441 af
Routed to nonexistent node 1R

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 16.99' @ 12.18 hrs Surf.Area= 2,838 sf Storage= 3,650 cf

Plug-Flow detention time= 1.4 min calculated for 1.439 af (100% of inflow)
Center-of-Mass det. time= 1.4 min (791.7 - 790.3)

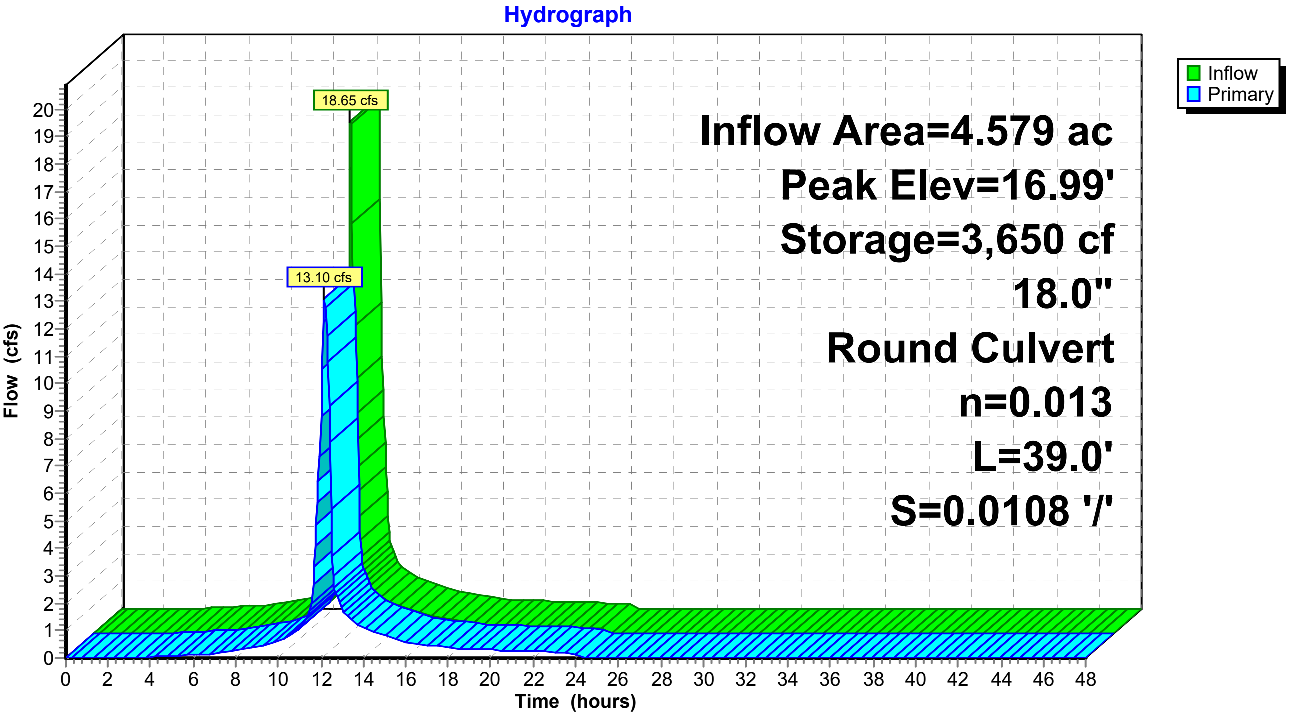
Volume	Invert	Avail.Storage	Storage Description
#1	13.87'	17,546 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
13.87	0	0	0
14.00	3	0	0
15.00	488	246	246
16.00	1,764	1,126	1,372
17.00	2,848	2,306	3,678
18.00	3,993	3,421	7,098
19.00	5,217	4,605	11,703
20.00	6,468	5,843	17,546

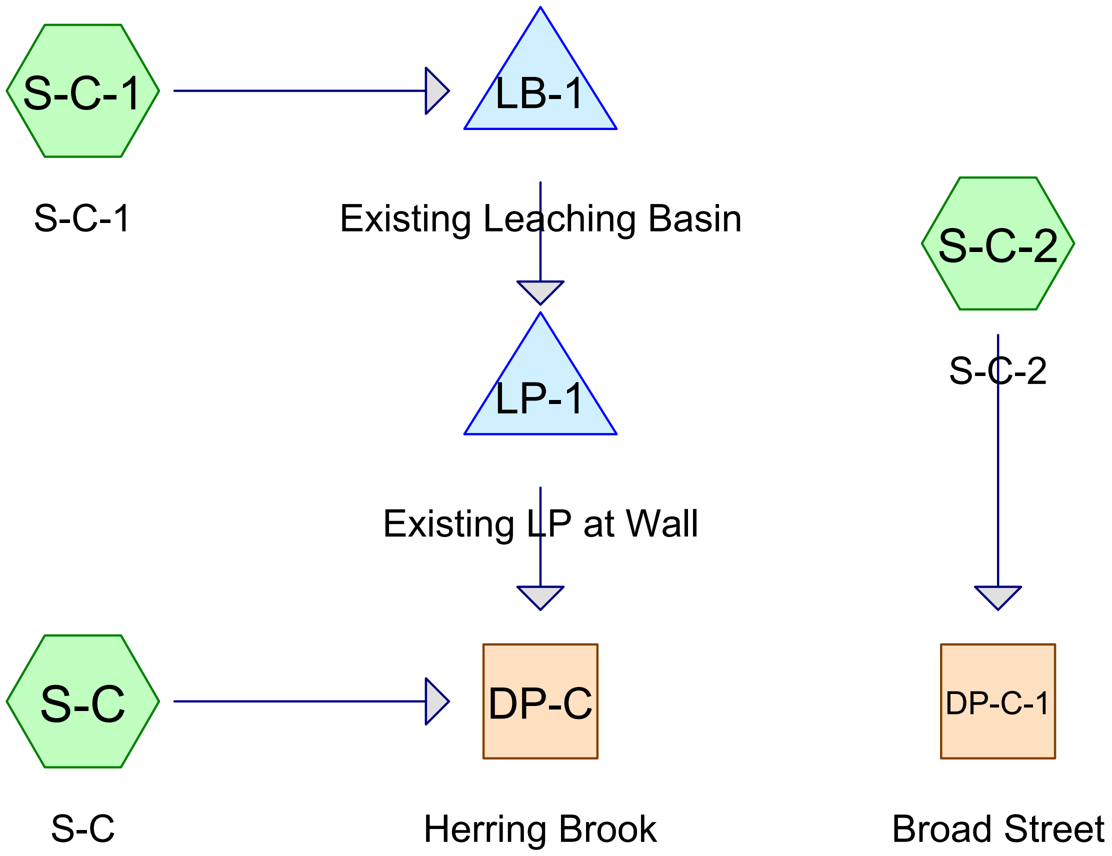
Device	Routing	Invert	Outlet Devices
#1	Primary	13.87'	**18.0" Round Culvert** L= 39.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 13.87' / 13.45' S= 0.0108 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

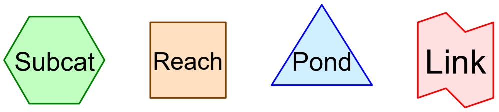
Primary OutFlow Max=13.04 cfs @ 12.18 hrs HW=16.97' (Free Discharge)
↑**1=Culvert** (Inlet Controls 13.04 cfs @ 7.38 fps)

Pond ES-LF: DP-LF Existing Swale/Basin in Lovell Field



SITE C





Routing Diagram for 222-203 Lot C Pre Development Conditions (R2)
Prepared by McKenzie Engineering Group Inc, Printed 11/13/2023
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Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	Type III 24-hr		Default	24.00	1	3.22	2
2	10-Year	Type III 24-hr		Default	24.00	1	4.86	2
3	25-Year	Type III 24-hr		Default	24.00	1	6.15	2
4	100-Year	Type III 24-hr		Default	24.00	1	8.80	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.016	74	>75% Grass cover, Good, HSG C (S-C-1, S-C-2)
0.011	74	>75% Grass cover, Good, HSG C (OFFSITE) (S-C)
0.335	98	Impervious surfaces, HSG C (S-C, S-C-1, S-C-2)
0.064	98	Impervious surfaces, HSG C (OFFSITE) (S-C)
0.001	98	Impervious, HSG C (OFFSITE) (S-C-2)
0.007	74	Plantings, HSG C (OFFSITE) (S-C)
0.177	98	Roofs, HSG C (S-C, S-C-1, S-C-2)
0.611	**97**	**TOTAL AREA**

Soil Listing (all nodes)

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

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.027	0.000	0.000	0.027	>75% Grass cover, Good	S-C, S-C-1, S-C-2
0.000	0.000	0.001	0.000	0.000	0.001	Impervious	S-C-2
0.000	0.000	0.399	0.000	0.000	0.399	Impervious surfaces	S-C, S-C-1, S-C-2
0.000	0.000	0.007	0.000	0.000	0.007	Plantings	S-C
0.000	0.000	0.177	0.000	0.000	0.177	Roofs	S-C, S-C-1, S-C-2
0.000	**0.000**	**0.611**	**0.000**	**0.000**	**0.611**	**TOTAL AREA**	

```
                    Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
                   Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
           Reach routing by Stor-Ind+Trans method  -  Pond routing by Stor-Ind method

SubcatchmentS-C: S-C                   Runoff Area=14,275 sf   94.41% Impervious   Runoff Depth=2.88"
                                                   Tc=6.0 min   CN=97   Runoff=1.01 cfs  0.079 af

SubcatchmentS-C-1: S-C-1                Runoff Area=9,600 sf   99.04% Impervious   Runoff Depth=2.99"
                                                   Tc=6.0 min   CN=98   Runoff=0.69 cfs  0.055 af

SubcatchmentS-C-2: S-C-2                Runoff Area=2,750 sf   78.11% Impervious   Runoff Depth=2.46"
                                                   Tc=6.0 min   CN=93   Runoff=0.18 cfs  0.013 af

Reach DP-C: Herring Brook                                                  Inflow=1.68 cfs  0.101 af
                                                                          Outflow=1.68 cfs  0.101 af

Reach DP-C-1: Broad Street                                                 Inflow=0.18 cfs  0.013 af
                                                                          Outflow=0.18 cfs  0.013 af

Pond LB-1: Existing Leaching Basin      Peak Elev=26.89'  Storage=405 cf   Inflow=0.69 cfs  0.055 af
                        Discarded=0.02 cfs  0.032 af   Primary=0.68 cfs  0.023 af   Outflow=0.69 cfs  0.055 af

Pond LP-1: Existing LP at Wall             Peak Elev=25.77'  Storage=8 cf   Inflow=0.68 cfs  0.023 af
                                                                          Outflow=0.67 cfs  0.023 af

         Total Runoff Area = 0.611 ac   Runoff Volume = 0.146 af   Average Runoff Depth = 2.87"
                                          5.60% Pervious = 0.034 ac     94.40% Impervious = 0.577 ac
```

Summary for Subcatchment S-C: S-C

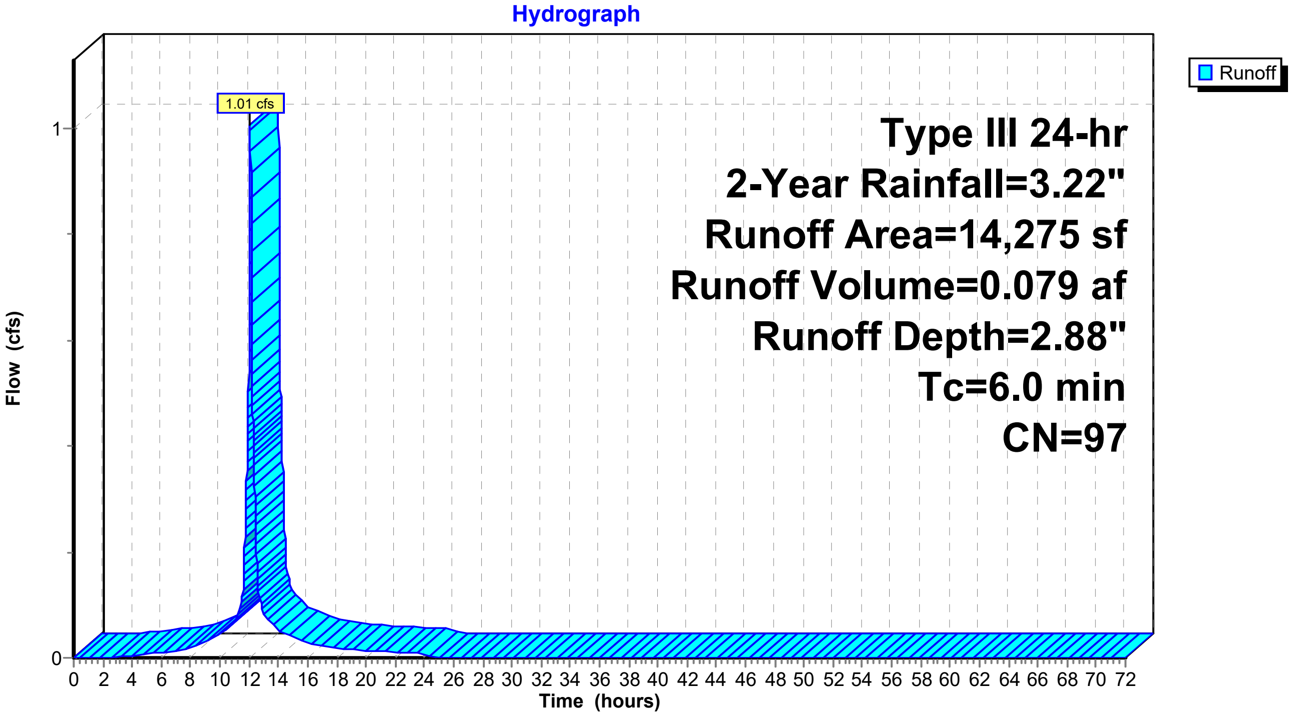
Runoff = 1.01 cfs @ 12.08 hrs, Volume= 0.079 af, Depth= 2.88"
Routed to Reach DP-C : Herring Brook

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.22"

	Area (sf)	CN	Description
	6,749	98	Roofs, HSG C
*	3,919	98	Impervious surfaces, HSG C
*	2,792	98	Impervious surfaces, HSG C (OFFSITE)
*	490	74	>75% Grass cover, Good, HSG C (OFFSITE)
*	308	74	Plantings, HSG C (OFFSITE)
*	17	98	Impervious surfaces, HSG C (OFFSITE)
	14,275	97	Weighted Average
	798		5.59% Pervious Area
	13,477		94.41% Impervious Area

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

Subcatchment S-C: S-C



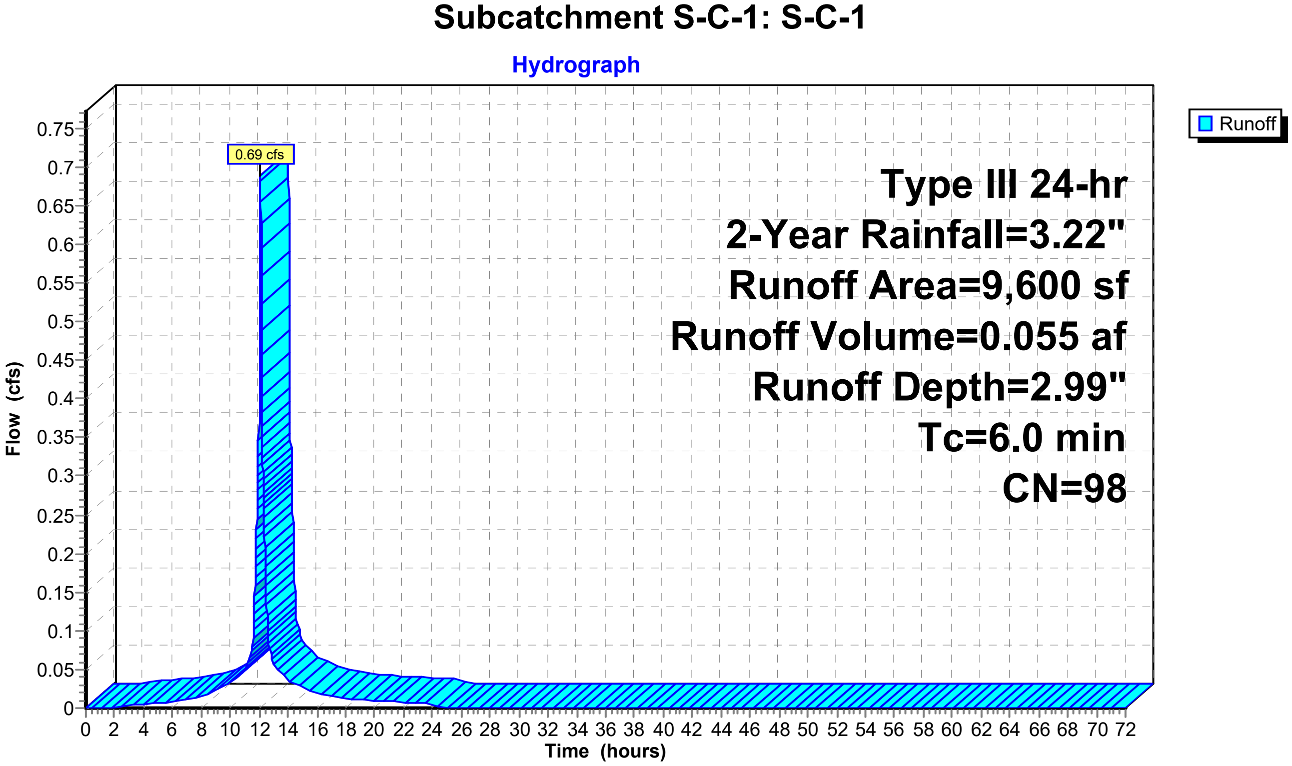
Summary for Subcatchment S-C-1: S-C-1

Runoff = 0.69 cfs @ 12.08 hrs, Volume= 0.055 af, Depth= 2.99"
Routed to Pond LB-1 : Existing Leaching Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.22"

	Area (sf)	CN	Description
	66	98	Roofs, HSG C
*	9,442	98	Impervious surfaces, HSG C
	92	74	>75% Grass cover, Good, HSG C
	9,600	98	Weighted Average
	92		0.96% Pervious Area
	9,508		99.04% Impervious Area

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



Summary for Subcatchment S-C-2: S-C-2

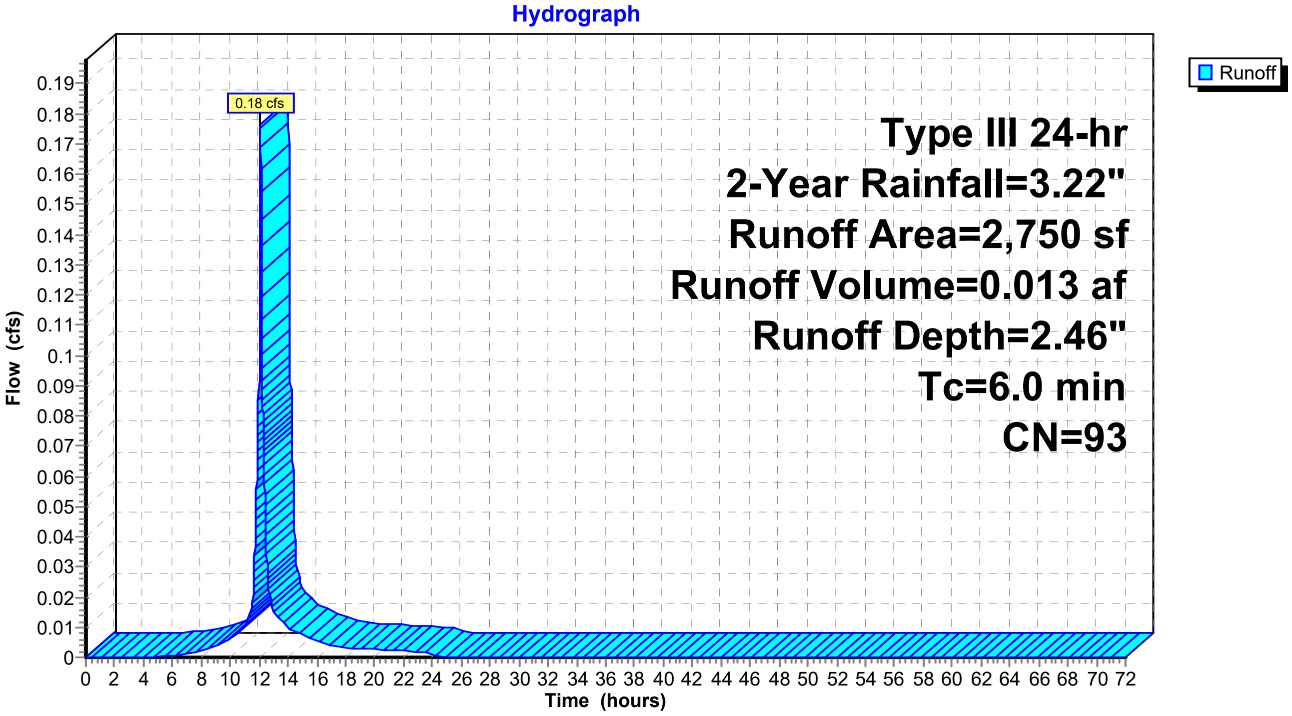
Runoff = 0.18 cfs @ 12.09 hrs, Volume= 0.013 af, Depth= 2.46"
Routed to Reach DP-C-1 : Broad Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.22"

	Area (sf)	CN	Description
	894	98	Roofs, HSG C
*	1,228	98	Impervious surfaces, HSG C
	602	74	>75% Grass cover, Good, HSG C
*	26	98	Impervious, HSG C (OFFSITE)
	2,750	93	Weighted Average
	602		21.89% Pervious Area
	2,148		78.11% Impervious Area

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

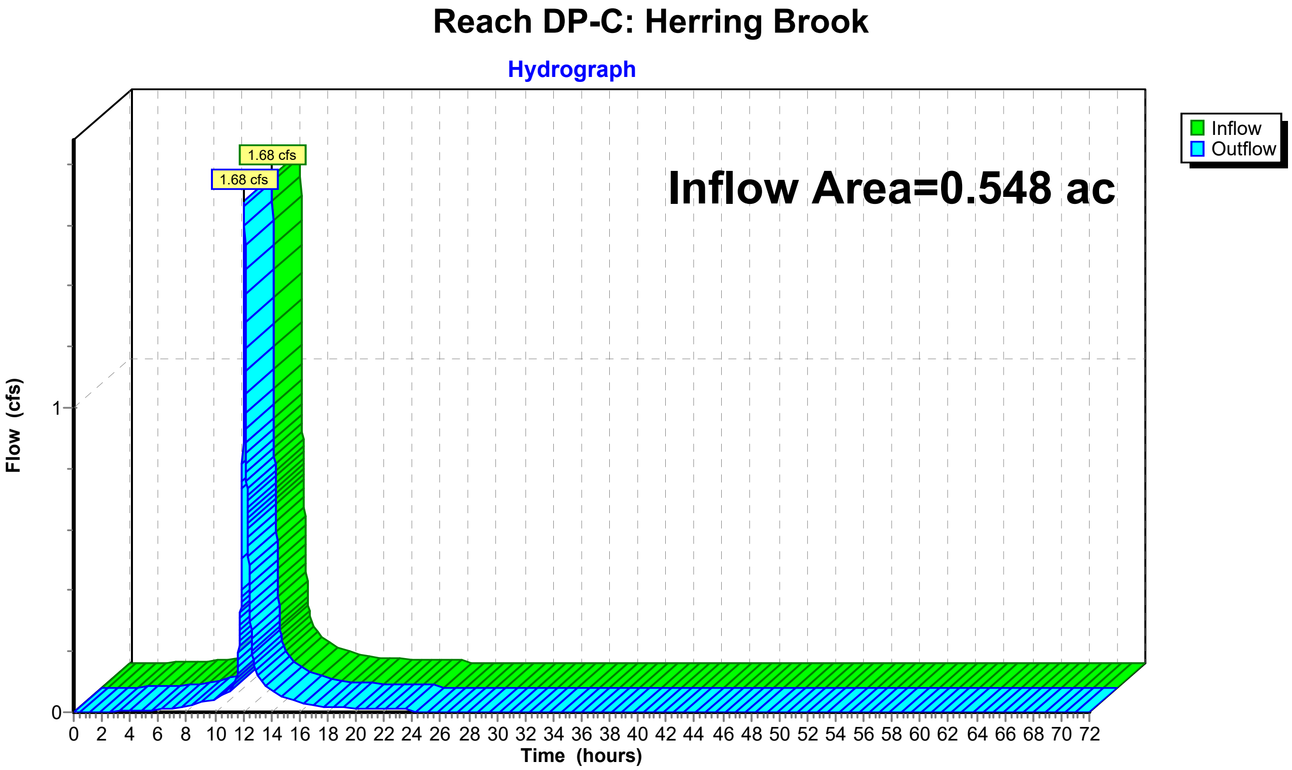
Subcatchment S-C-2: S-C-2



Summary for Reach DP-C: Herring Brook

Inflow Area = 0.548 ac, 96.27% Impervious, Inflow Depth = 2.22" for 2-Year event
Inflow = 1.68 cfs @ 12.08 hrs, Volume= 0.101 af
Outflow = 1.68 cfs @ 12.08 hrs, Volume= 0.101 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

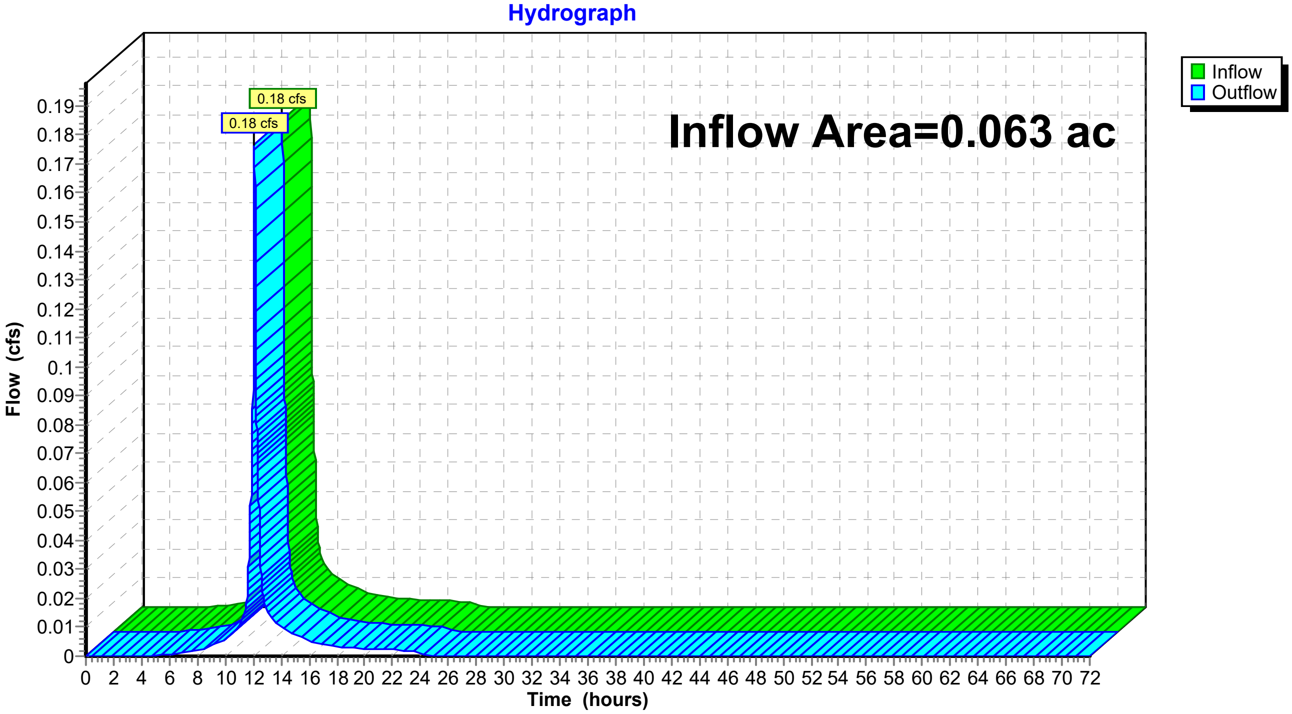


Summary for Reach DP-C-1: Broad Street

Inflow Area =	0.063 ac,	78.11% Impervious,	Inflow Depth = 2.46"	for 2-Year event
Inflow =	0.18 cfs @	12.09 hrs,	Volume=	0.013 af
Outflow =	0.18 cfs @	12.09 hrs,	Volume=	0.013 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach DP-C-1: Broad Street



Summary for Pond LB-1: Existing Leaching Basin

Inflow Area = 0.220 ac, 99.04% Impervious, Inflow Depth = 2.99" for 2-Year event
Inflow = 0.69 cfs @ 12.08 hrs, Volume= 0.055 af
Outflow = 0.69 cfs @ 12.09 hrs, Volume= 0.055 af, Atten= 0%, Lag= 0.3 min
Discarded = 0.02 cfs @ 8.57 hrs, Volume= 0.032 af
Primary = 0.68 cfs @ 12.09 hrs, Volume= 0.023 af
Routed to Pond LP-1 : Existing LP at Wall

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 26.89' @ 12.09 hrs Surf.Area= 100 sf Storage= 405 cf

Plug-Flow detention time= 114.0 min calculated for 0.055 af (100% of inflow)
Center-of-Mass det. time= 114.0 min (870.3 - 756.3)

Volume	Invert	Avail.Storage	Storage Description
#1	16.75'	405 cf	**10.00'W x 10.00'L x 10.13'H Prismatoid** 1,013 cf Overall x 40.0% Voids
#2	26.88'	113 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc) -Impervious
		519 cf	Total Available Storage

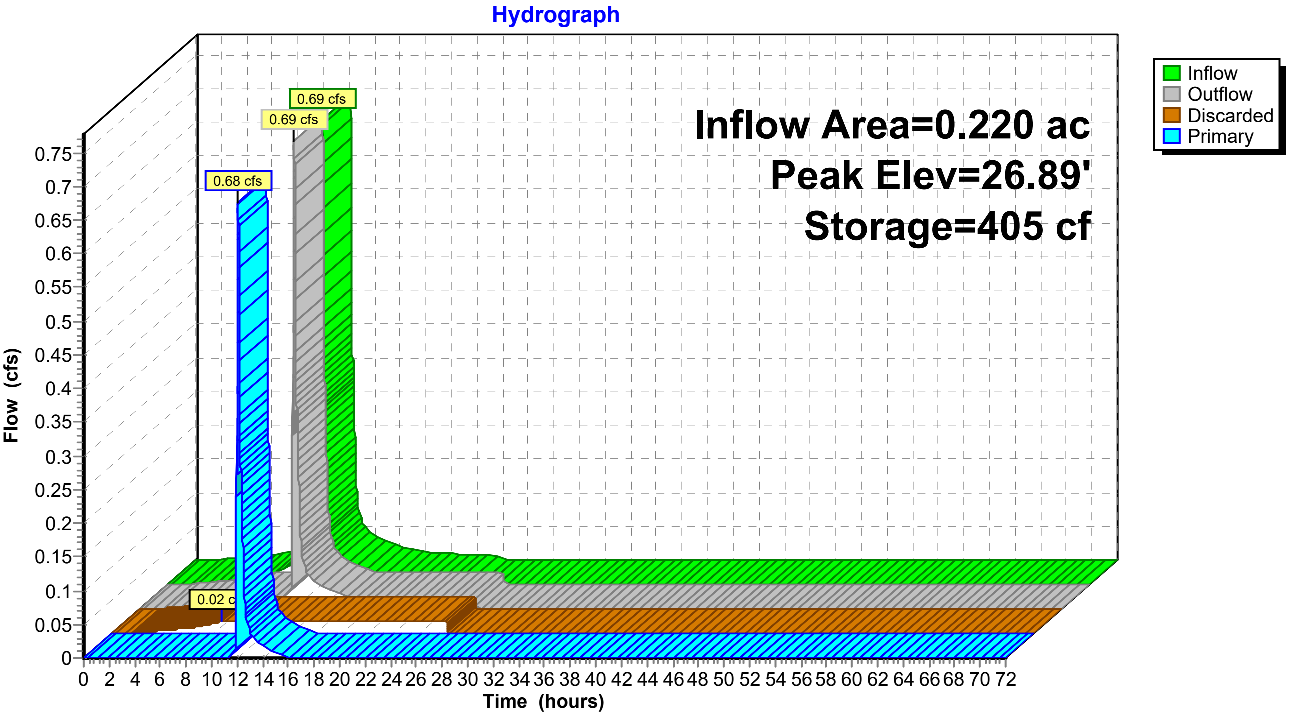
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
26.88	0	0	0
27.00	1,889	113	113

Device	Routing	Invert	Outlet Devices
#1	Discarded	16.75'	**8.270 in/hr Exfiltration over Surface area** Phase-In= 0.02'
#2	Primary	26.88'	**24.0" x 24.0" Horiz. Orifice/Grate X 6.00 columns** X 6 rows C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.02 cfs @ 8.57 hrs HW=16.85' (Free Discharge)
⮤**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.37 cfs @ 12.09 hrs HW=26.89' (Free Discharge)
⮤**2=Orifice/Grate** (Weir Controls 0.37 cfs @ 0.24 fps)

Pond LB-1: Existing Leaching Basin



Summary for Pond LP-1: Existing LP at Wall

Inflow Area = 0.220 ac, 99.04% Impervious, Inflow Depth = 1.23" for 2-Year event
Inflow = 0.68 cfs @ 12.09 hrs, Volume= 0.023 af
Outflow = 0.67 cfs @ 12.08 hrs, Volume= 0.023 af, Atten= 1%, Lag= 0.0 min
Primary = 0.67 cfs @ 12.08 hrs, Volume= 0.023 af
Routed to Reach DP-C : Herring Brook

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 25.77' @ 12.08 hrs Surf.Area= 70 sf Storage= 8 cf

Plug-Flow detention time= 0.3 min calculated for 0.023 af (100% of inflow)
Center-of-Mass det. time= 0.3 min (749.9 - 749.6)

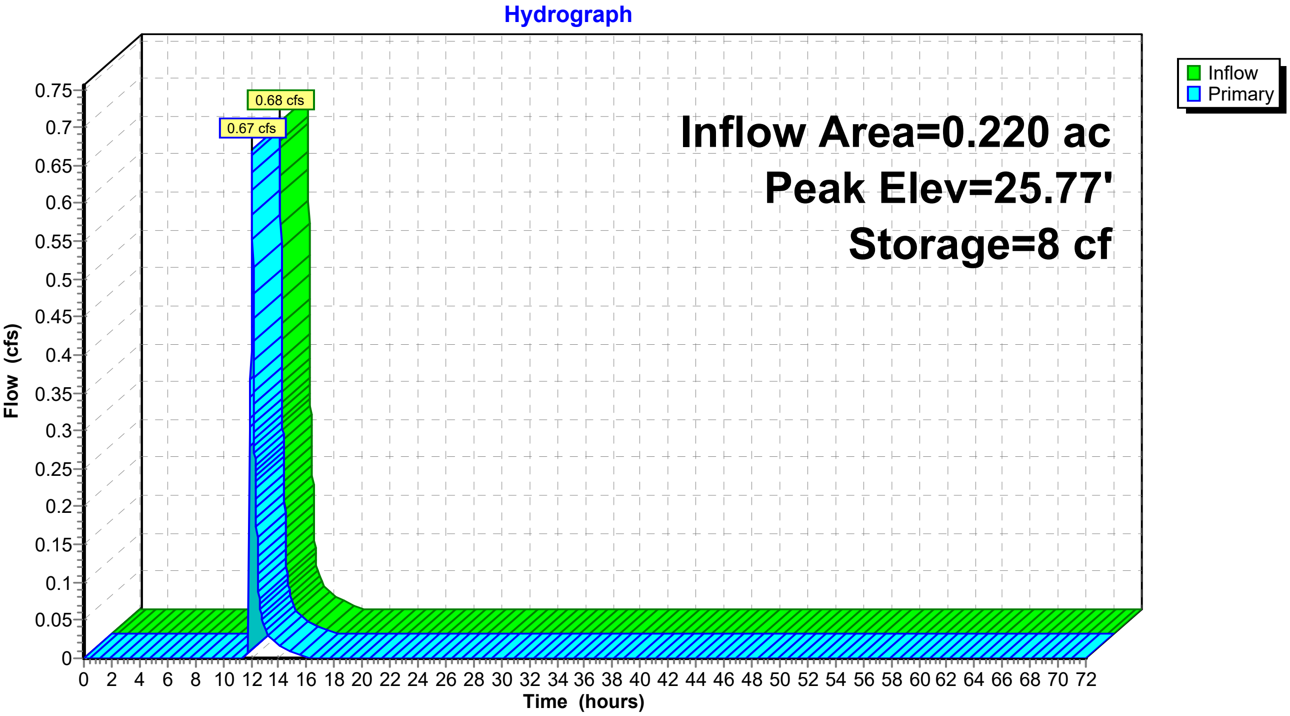
Volume	Invert	Avail.Storage	Storage Description
#1	25.53'	33 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
25.53	0	0	0
26.00	139	33	33

Device	Routing	Invert	Outlet Devices
#1	Primary	25.53'	**Asymmetrical Weir, C= 3.27** Offset (feet) 0.00 8.89 8.89 Elev. (feet) 26.00 25.53 26.00

Primary OutFlow Max=0.67 cfs @ 12.08 hrs HW=25.77' (Free Discharge)
↑—**1=Asymmetrical Weir** (Weir Controls 0.67 cfs @ 0.64 fps)

Pond LP-1: Existing LP at Wall



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentS-C: S-C Runoff Area=14,275 sf 94.41% Impervious Runoff Depth=4.51"
Tc=6.0 min CN=97 Runoff=1.55 cfs 0.123 af

SubcatchmentS-C-1: S-C-1 Runoff Area=9,600 sf 99.04% Impervious Runoff Depth=4.62"
Tc=6.0 min CN=98 Runoff=1.05 cfs 0.085 af

SubcatchmentS-C-2: S-C-2 Runoff Area=2,750 sf 78.11% Impervious Runoff Depth=4.06"
Tc=6.0 min CN=93 Runoff=0.28 cfs 0.021 af

Reach DP-C: Herring Brook Inflow=2.57 cfs 0.170 af
Outflow=2.57 cfs 0.170 af

Reach DP-C-1: Broad Street Inflow=0.28 cfs 0.021 af
Outflow=0.28 cfs 0.021 af

Pond LB-1: Existing Leaching Basin Peak Elev=26.89' Storage=406 cf Inflow=1.05 cfs 0.085 af
Discarded=0.02 cfs 0.038 af Primary=1.03 cfs 0.047 af Outflow=1.05 cfs 0.085 af

Pond LP-1: Existing LP at Wall Peak Elev=25.81' Storage=12 cf Inflow=1.03 cfs 0.047 af
Outflow=1.03 cfs 0.047 af

Total Runoff Area = 0.611 ac Runoff Volume = 0.229 af Average Runoff Depth = 4.50"
5.60% Pervious = 0.034 ac 94.40% Impervious = 0.577 ac

Summary for Subcatchment S-C: S-C

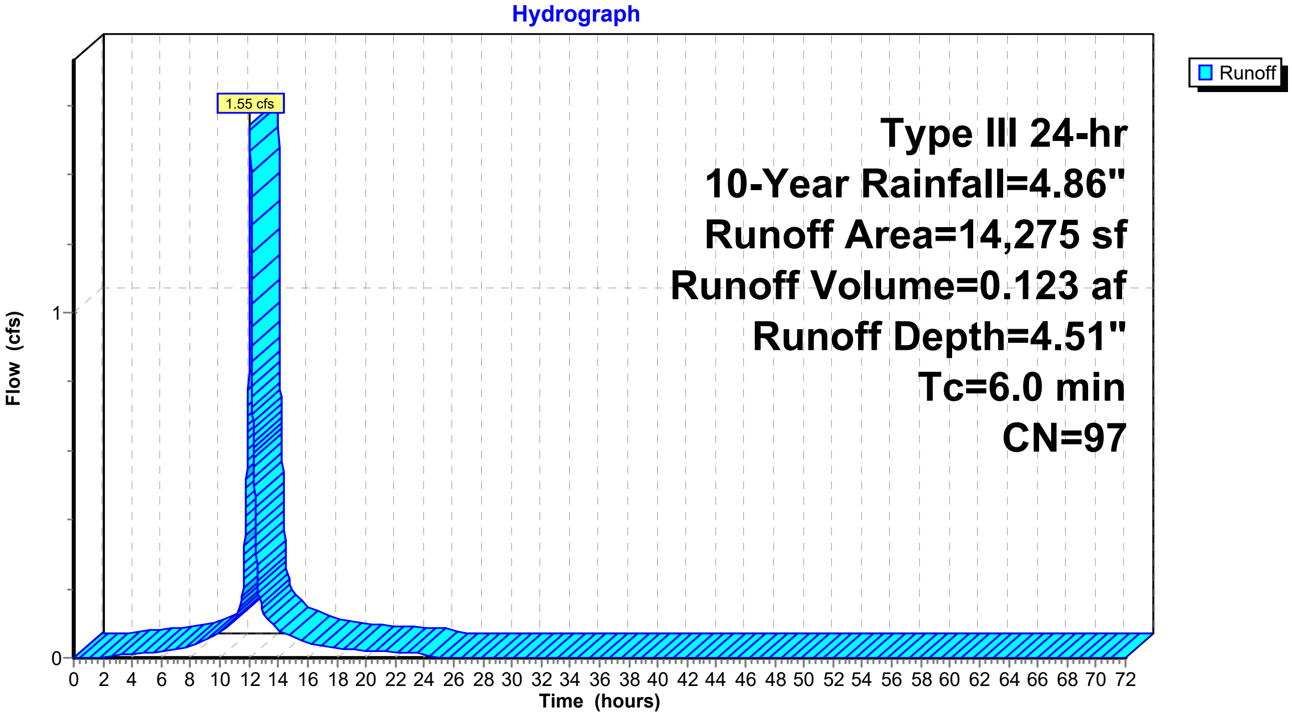
Runoff = 1.55 cfs @ 12.08 hrs, Volume= 0.123 af, Depth= 4.51"
Routed to Reach DP-C : Herring Brook

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.86"

	Area (sf)	CN	Description
	6,749	98	Roofs, HSG C
*	3,919	98	Impervious surfaces, HSG C
*	2,792	98	Impervious surfaces, HSG C (OFFSITE)
*	490	74	>75% Grass cover, Good, HSG C (OFFSITE)
*	308	74	Plantings, HSG C (OFFSITE)
*	17	98	Impervious surfaces, HSG C (OFFSITE)
	14,275	97	Weighted Average
	798		5.59% Pervious Area
	13,477		94.41% Impervious Area

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

Subcatchment S-C: S-C



Summary for Subcatchment S-C-1: S-C-1

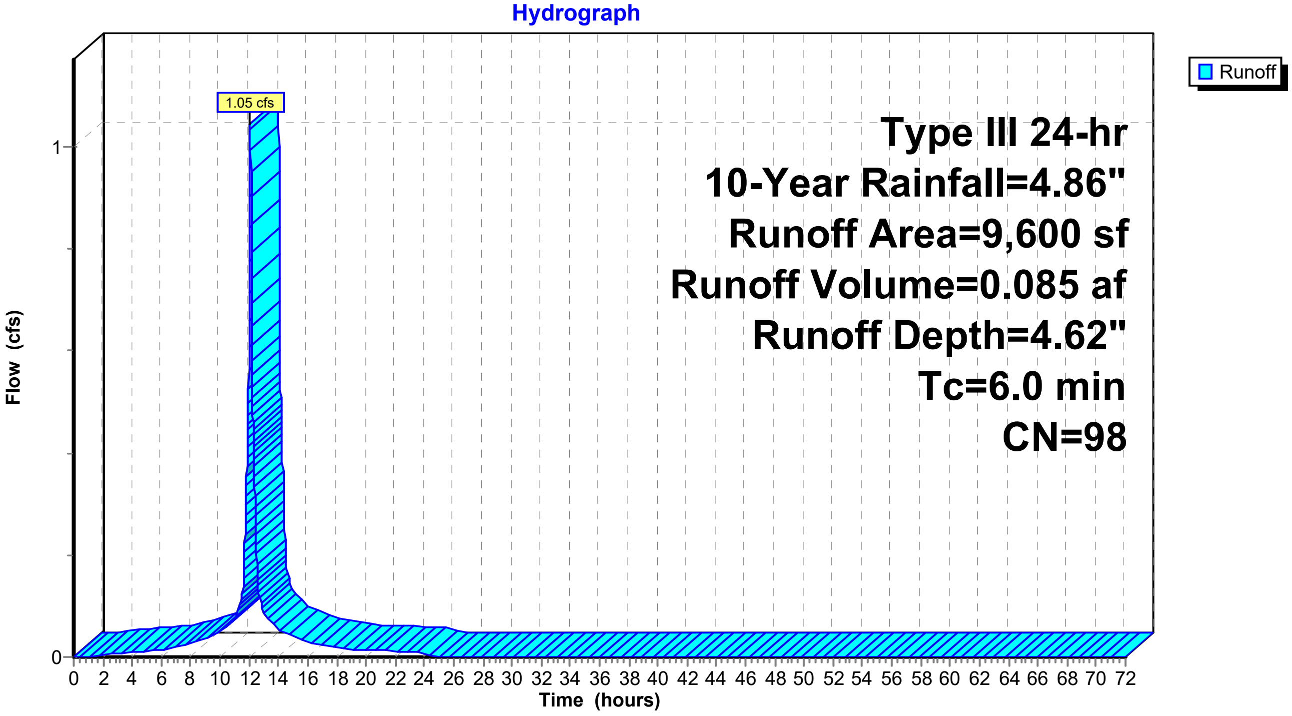
Runoff = 1.05 cfs @ 12.08 hrs, Volume= 0.085 af, Depth= 4.62"
Routed to Pond LB-1 : Existing Leaching Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.86"

	Area (sf)	CN	Description
	66	98	Roofs, HSG C
*	9,442	98	Impervious surfaces, HSG C
	92	74	>75% Grass cover, Good, HSG C
	9,600	98	Weighted Average
	92		0.96% Pervious Area
	9,508		99.04% Impervious Area

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

Subcatchment S-C-1: S-C-1



Summary for Subcatchment S-C-2: S-C-2

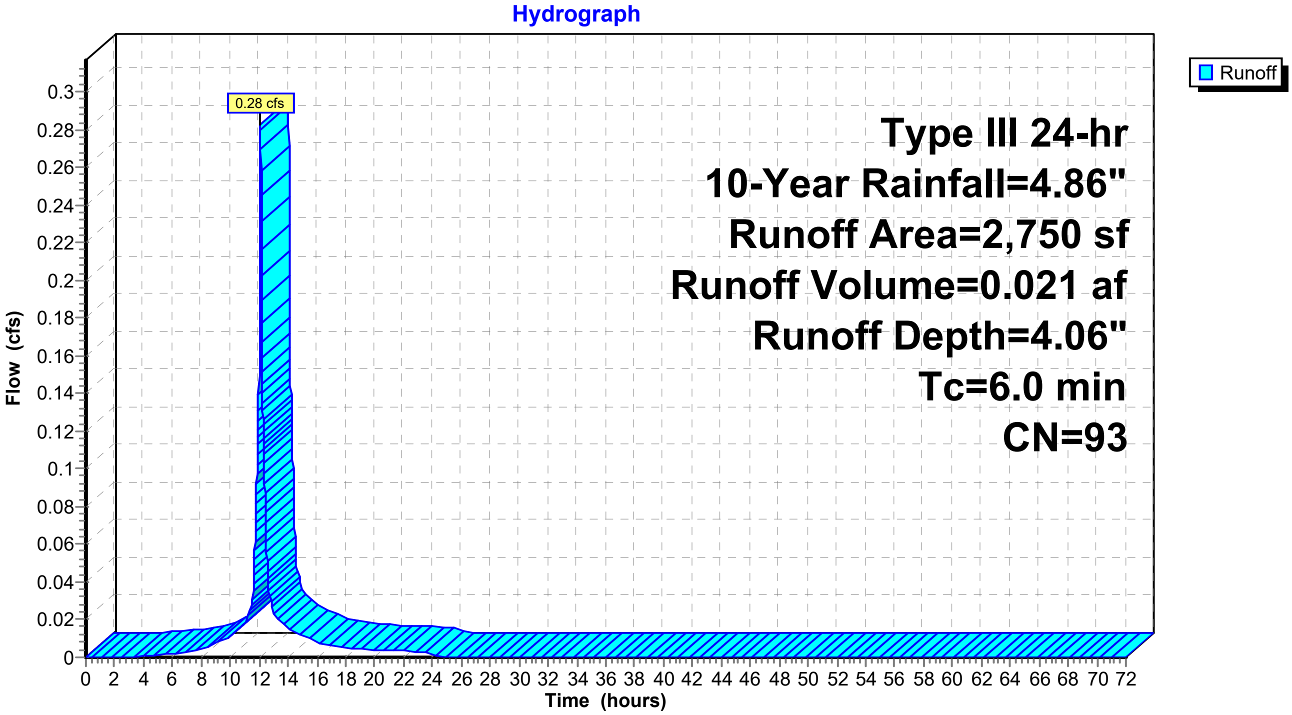
Runoff = 0.28 cfs @ 12.08 hrs, Volume= 0.021 af, Depth= 4.06"
Routed to Reach DP-C-1 : Broad Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.86"

	Area (sf)	CN	Description
	894	98	Roofs, HSG C
*	1,228	98	Impervious surfaces, HSG C
	602	74	>75% Grass cover, Good, HSG C
*	26	98	Impervious, HSG C (OFFSITE)
	2,750	93	Weighted Average
	602		21.89% Pervious Area
	2,148		78.11% Impervious Area

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

Subcatchment S-C-2: S-C-2

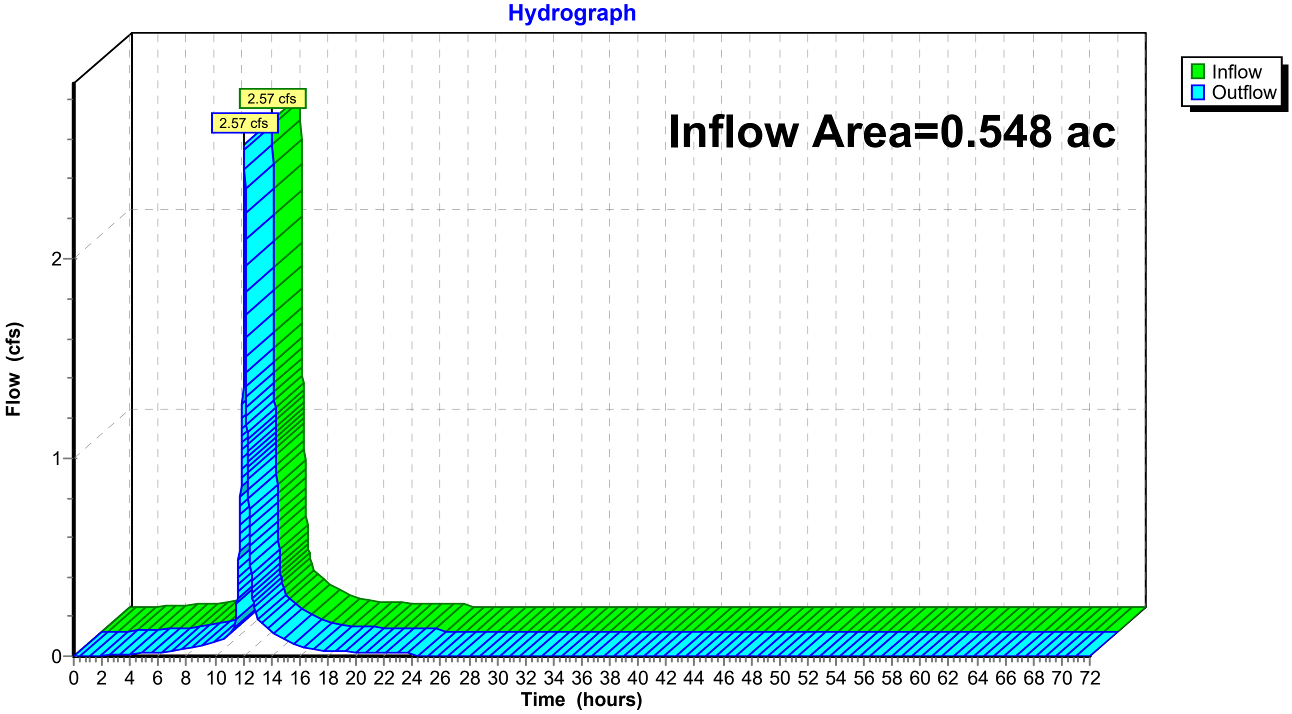


Summary for Reach DP-C: Herring Brook

```
Inflow Area =        0.548 ac,  96.27% Impervious,  Inflow Depth =   3.73"    for  10-Year event
Inflow      =       2.57 cfs @   12.08 hrs,  Volume=             0.170 af
Outflow     =       2.57 cfs @   12.08 hrs,  Volume=             0.170 af,  Atten= 0%,  Lag= 0.0 min
```

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach DP-C: Herring Brook

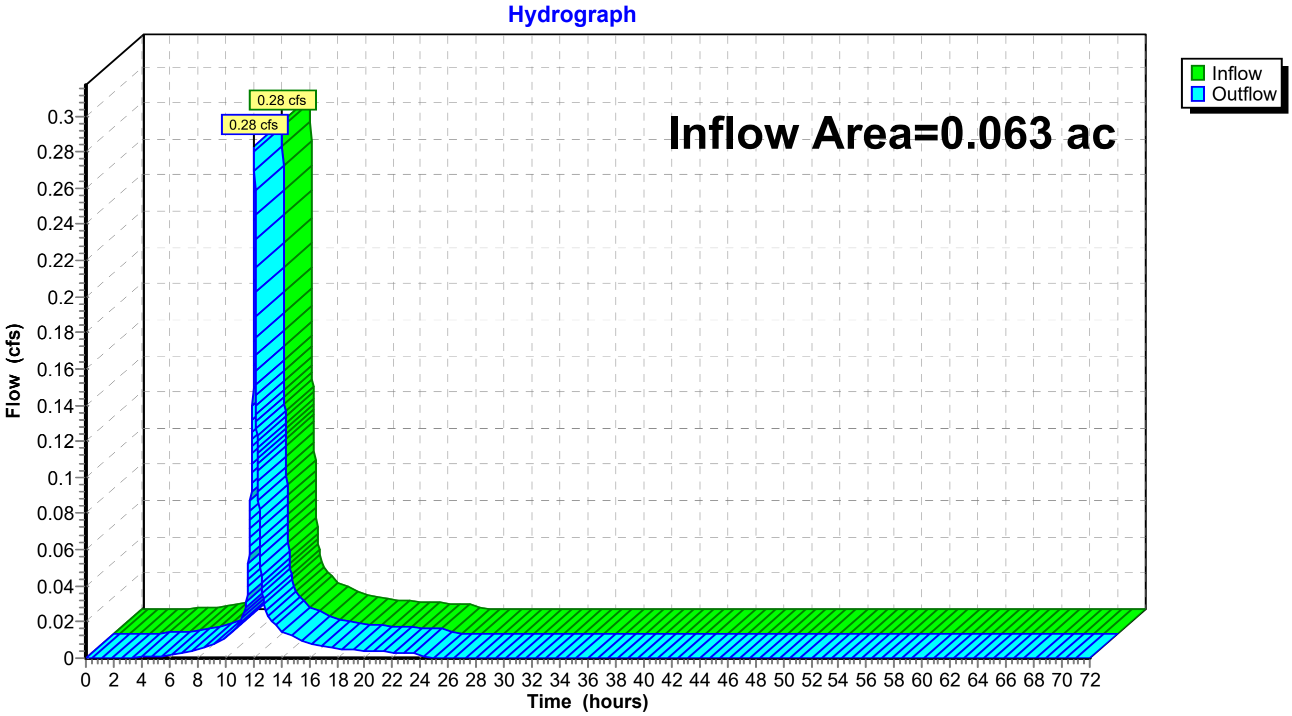


Summary for Reach DP-C-1: Broad Street

Inflow Area = 0.063 ac, 78.11% Impervious, Inflow Depth = 4.06" for 10-Year event
Inflow = 0.28 cfs @ 12.08 hrs, Volume= 0.021 af
Outflow = 0.28 cfs @ 12.08 hrs, Volume= 0.021 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach DP-C-1: Broad Street



Summary for Pond LB-1: Existing Leaching Basin

Inflow Area = 0.220 ac, 99.04% Impervious, Inflow Depth = 4.62" for 10-Year event
Inflow = 1.05 cfs @ 12.08 hrs, Volume= 0.085 af
Outflow = 1.05 cfs @ 12.08 hrs, Volume= 0.085 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.02 cfs @ 6.99 hrs, Volume= 0.038 af
Primary = 1.03 cfs @ 12.08 hrs, Volume= 0.047 af
Routed to Pond LP-1 : Existing LP at Wall

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 26.89' @ 12.08 hrs Surf.Area= 100 sf Storage= 406 cf

Plug-Flow detention time= 94.9 min calculated for 0.085 af (100% of inflow)
Center-of-Mass det. time= 94.9 min (843.4 - 748.5)

Volume	Invert	Avail.Storage	Storage Description
#1	16.75'	405 cf	**10.00'W x 10.00'L x 10.13'H Prismatoid** 1,013 cf Overall x 40.0% Voids
#2	26.88'	113 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) -Impervious
		519 cf	Total Available Storage

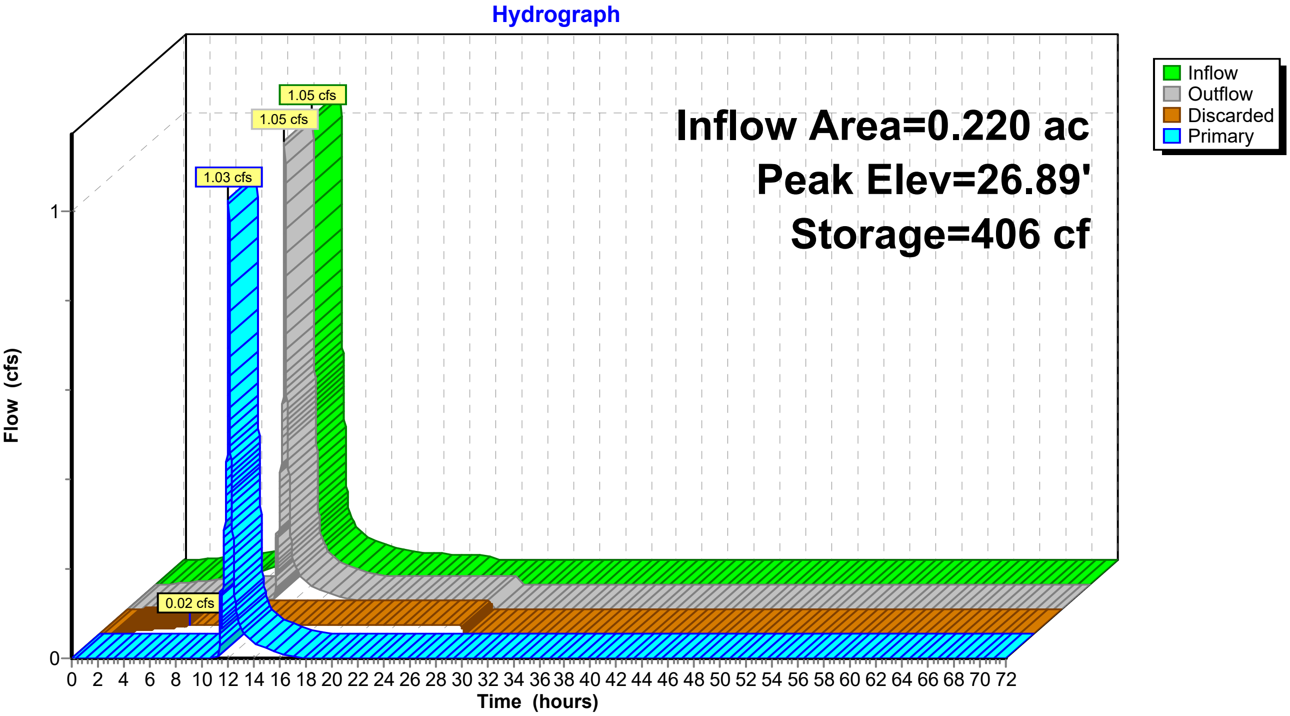
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
26.88	0	0	0
27.00	1,889	113	113

Device	Routing	Invert	Outlet Devices
#1	Discarded	16.75'	**8.270 in/hr Exfiltration over Surface area** Phase-In= 0.02'
#2	Primary	26.88'	**24.0" x 24.0" Horiz. Orifice/Grate X 6.00 columns** X 6 rows C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.02 cfs @ 6.99 hrs HW=16.85' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.70 cfs @ 12.08 hrs HW=26.89' (Free Discharge)
└─**2=Orifice/Grate** (Weir Controls 0.70 cfs @ 0.30 fps)

Pond LB-1: Existing Leaching Basin



Summary for Pond LP-1: Existing LP at Wall

```
Inflow Area =         0.220 ac,  99.04% Impervious,  Inflow Depth =   2.56"    for  10-Year event
Inflow      =        1.03 cfs @   12.08 hrs,  Volume=          0.047 af
Outflow     =        1.03 cfs @   12.09 hrs,  Volume=          0.047 af,  Atten= 0%,  Lag= 0.1 min
Primary     =        1.03 cfs @   12.09 hrs,  Volume=          0.047 af
    Routed to Reach DP-C : Herring Brook
```

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 25.81' @ 12.09 hrs Surf.Area= 83 sf Storage= 12 cf

Plug-Flow detention time= 0.3 min calculated for 0.047 af (100% of inflow)
Center-of-Mass det. time= 0.3 min (751.3 - 751.0)

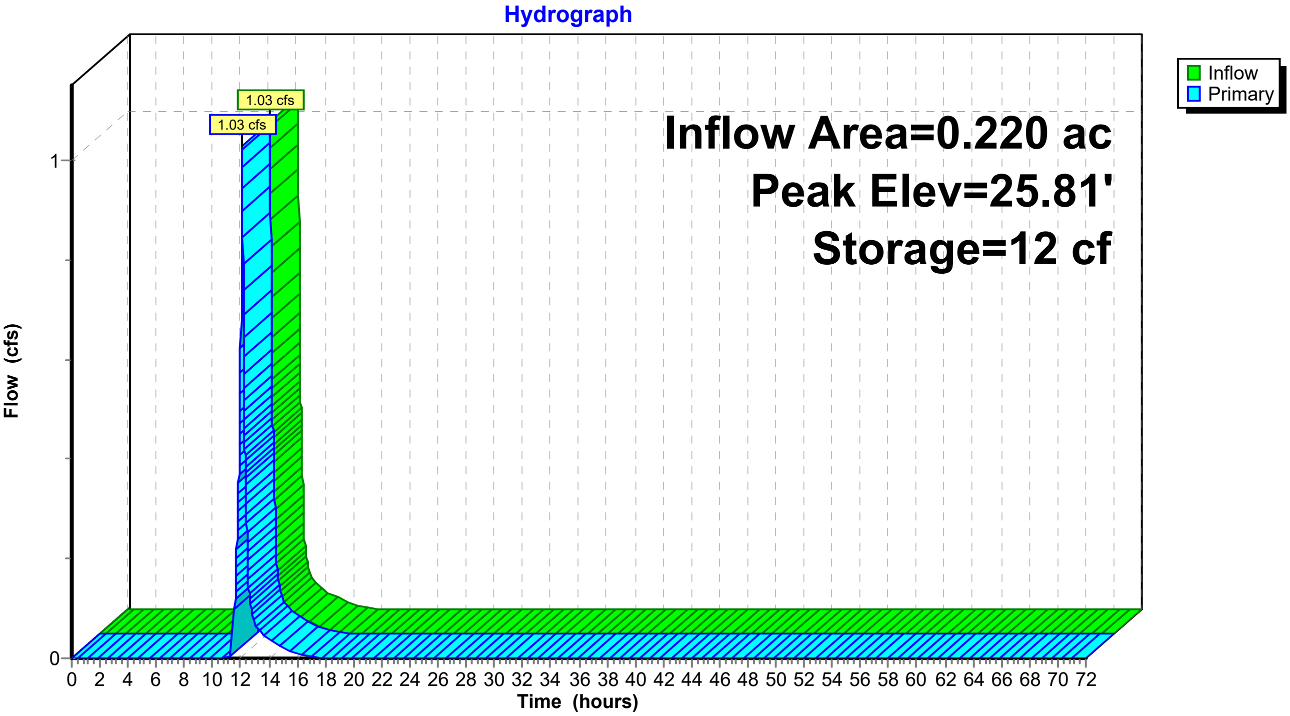
Volume	Invert	Avail.Storage	Storage Description
#1	25.53'	33 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
25.53	0	0	0
26.00	139	33	33

Device	Routing	Invert	Outlet Devices
#1	Primary	25.53'	**Asymmetrical Weir, C= 3.27** Offset (feet) 0.00 8.89 8.89 Elev. (feet) 26.00 25.53 26.00

Primary OutFlow Max=1.03 cfs @ 12.09 hrs HW=25.81' (Free Discharge)
└─**1=Asymmetrical Weir** (Weir Controls 1.03 cfs @ 0.69 fps)

Pond LP-1: Existing LP at Wall



```
                Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
               Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
        Reach routing by Stor-Ind+Trans method  -  Pond routing by Stor-Ind method

SubcatchmentS-C: S-C                  Runoff Area=14,275 sf   94.41% Impervious   Runoff Depth=5.79"
                                                  Tc=6.0 min   CN=97   Runoff=1.97 cfs  0.158 af

SubcatchmentS-C-1: S-C-1               Runoff Area=9,600 sf   99.04% Impervious   Runoff Depth=5.91"
                                                  Tc=6.0 min   CN=98   Runoff=1.33 cfs  0.109 af

SubcatchmentS-C-2: S-C-2               Runoff Area=2,750 sf   78.11% Impervious   Runoff Depth=5.33"
                                                  Tc=6.0 min   CN=93   Runoff=0.37 cfs  0.028 af

Reach DP-C: Herring Brook                                            Inflow=3.27 cfs  0.226 af
                                                                    Outflow=3.27 cfs  0.226 af

Reach DP-C-1: Broad Street                                           Inflow=0.37 cfs  0.028 af
                                                                    Outflow=0.37 cfs  0.028 af

Pond LB-1: Existing Leaching Basin        Peak Elev=26.89'  Storage=406 cf   Inflow=1.33 cfs  0.109 af
                     Discarded=0.02 cfs  0.041 af   Primary=1.31 cfs  0.068 af   Outflow=1.33 cfs  0.109 af

Pond LP-1: Existing LP at Wall              Peak Elev=25.84'  Storage=14 cf   Inflow=1.31 cfs  0.068 af
                                                                    Outflow=1.31 cfs  0.068 af

         Total Runoff Area = 0.611 ac   Runoff Volume = 0.295 af   Average Runoff Depth = 5.79"
                                    5.60% Pervious = 0.034 ac     94.40% Impervious = 0.577 ac
```

Summary for Subcatchment S-C: S-C

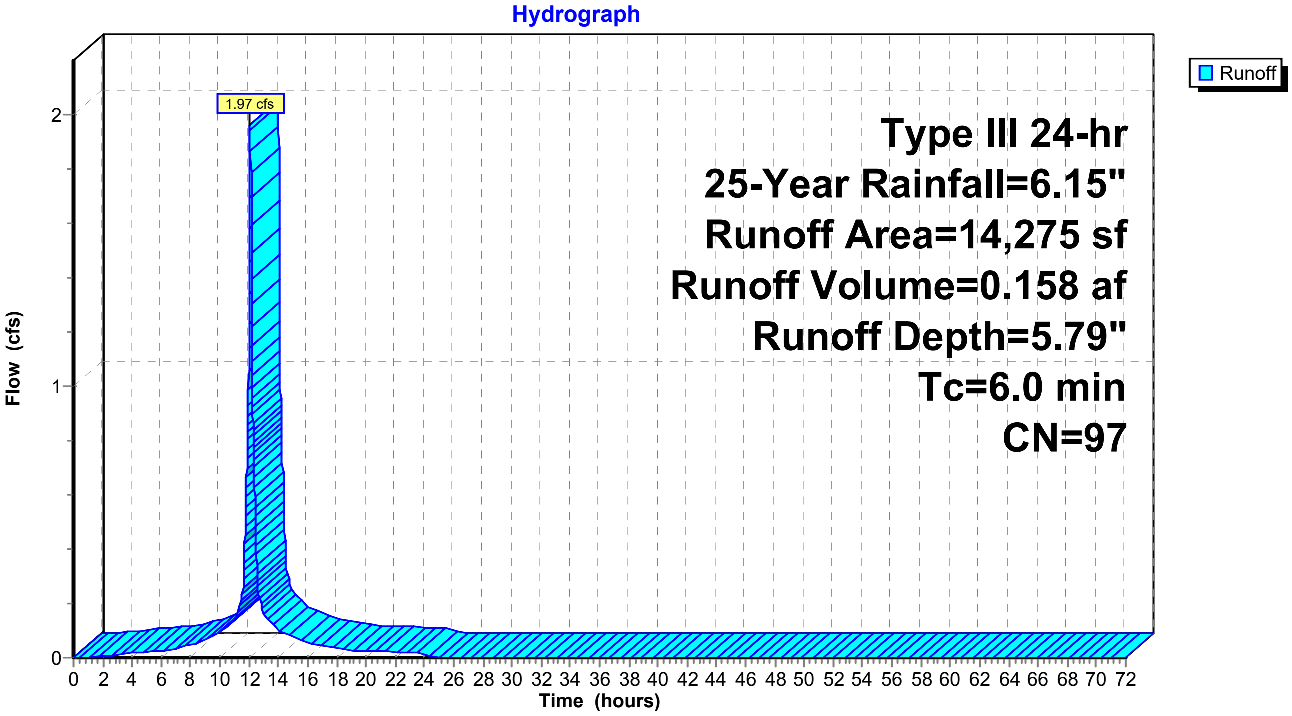
Runoff = 1.97 cfs @ 12.08 hrs, Volume= 0.158 af, Depth= 5.79"
Routed to Reach DP-C : Herring Brook

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.15"

	Area (sf)	CN	Description
	6,749	98	Roofs, HSG C
*	3,919	98	Impervious surfaces, HSG C
*	2,792	98	Impervious surfaces, HSG C (OFFSITE)
*	490	74	>75% Grass cover, Good, HSG C (OFFSITE)
*	308	74	Plantings, HSG C (OFFSITE)
*	17	98	Impervious surfaces, HSG C (OFFSITE)
	14,275	97	Weighted Average
	798		5.59% Pervious Area
	13,477		94.41% Impervious Area

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

Subcatchment S-C: S-C



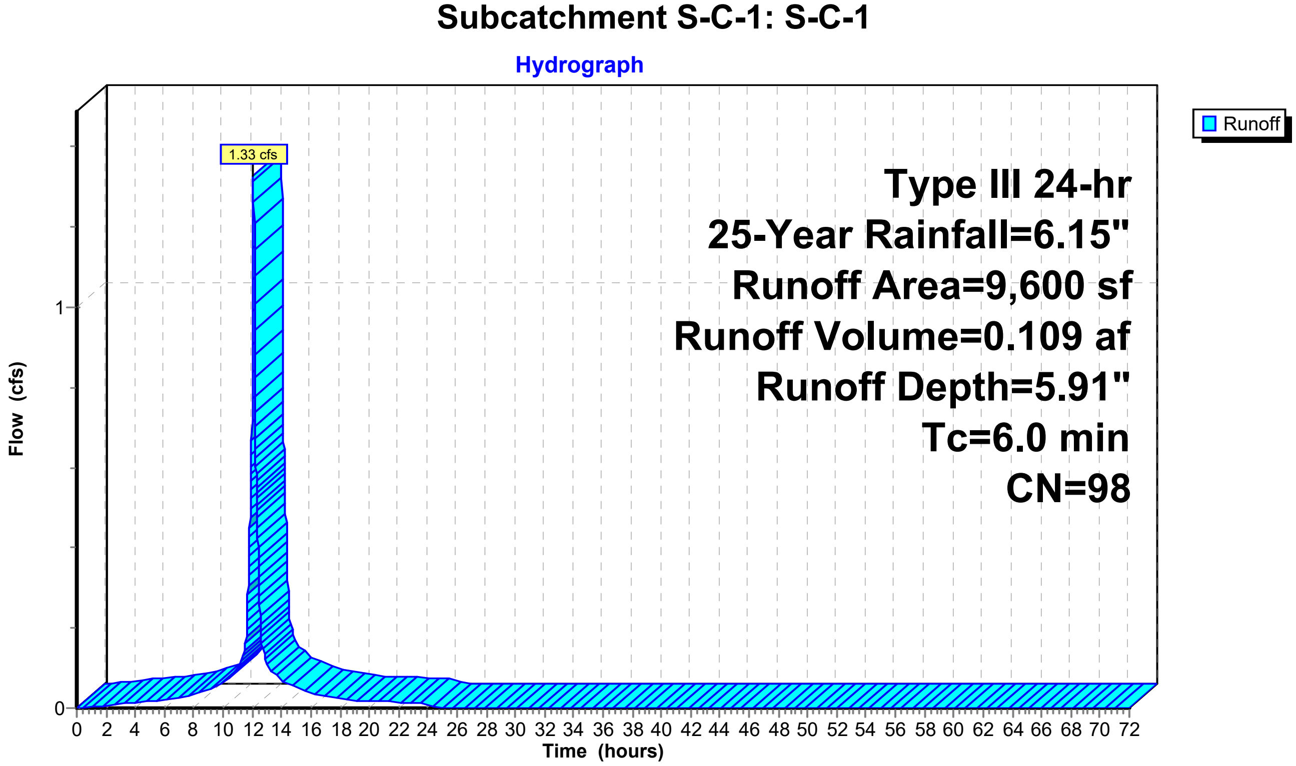
Summary for Subcatchment S-C-1: S-C-1

Runoff = 1.33 cfs @ 12.08 hrs, Volume= 0.109 af, Depth= 5.91"
Routed to Pond LB-1 : Existing Leaching Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.15"

	Area (sf)	CN	Description
	66	98	Roofs, HSG C
*	9,442	98	Impervious surfaces, HSG C
	92	74	>75% Grass cover, Good, HSG C
	9,600	98	Weighted Average
	92		0.96% Pervious Area
	9,508		99.04% Impervious Area

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



Summary for Subcatchment S-C-2: S-C-2

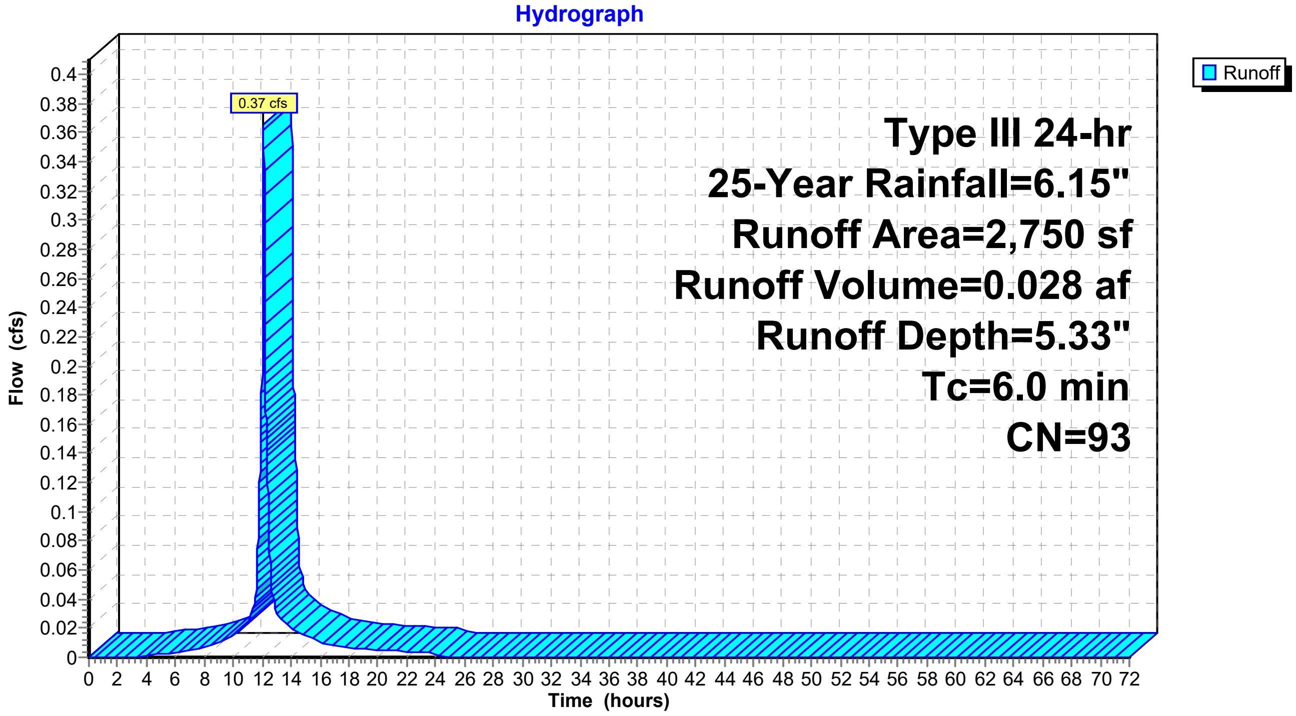
Runoff = 0.37 cfs @ 12.08 hrs, Volume= 0.028 af, Depth= 5.33"
Routed to Reach DP-C-1 : Broad Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.15"

	Area (sf)	CN	Description
	894	98	Roofs, HSG C
*	1,228	98	Impervious surfaces, HSG C
	602	74	>75% Grass cover, Good, HSG C
*	26	98	Impervious, HSG C (OFFSITE)
	2,750	93	Weighted Average
	602		21.89% Pervious Area
	2,148		78.11% Impervious Area

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

Subcatchment S-C-2: S-C-2

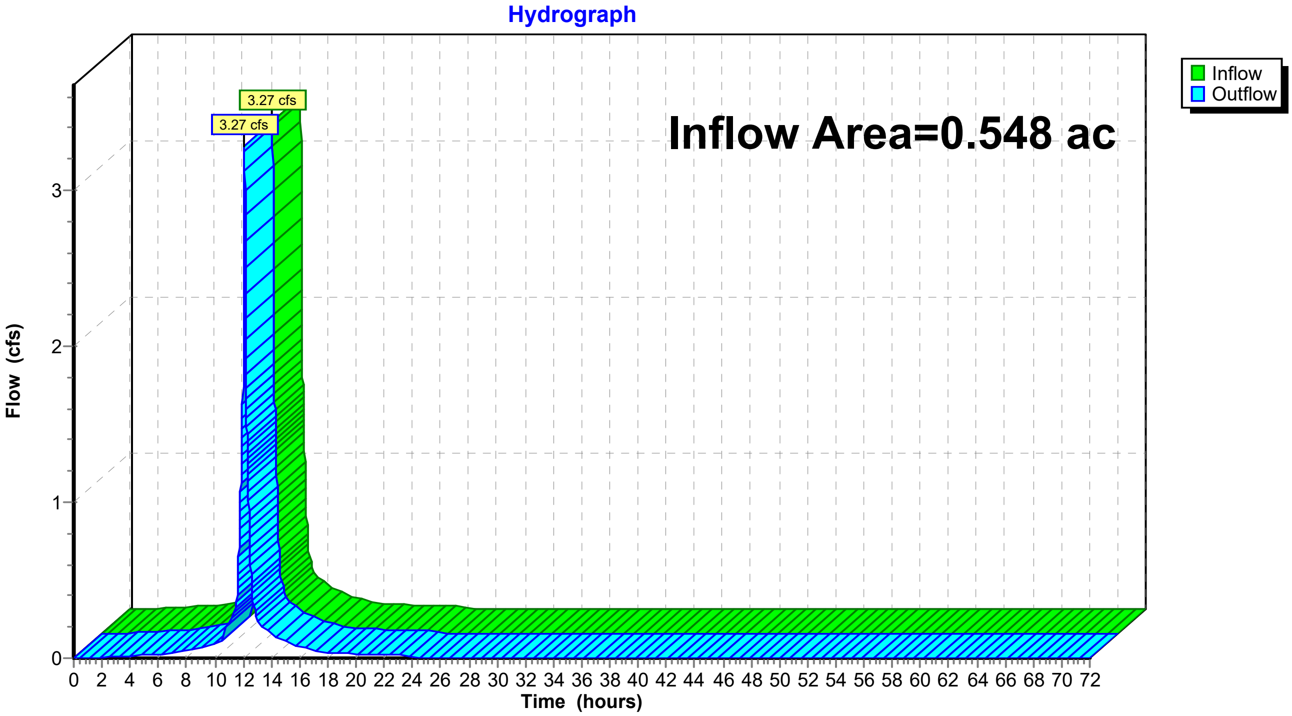


Summary for Reach DP-C: Herring Brook

Inflow Area = 0.548 ac, 96.27% Impervious, Inflow Depth = 4.94" for 25-Year event
Inflow = 3.27 cfs @ 12.08 hrs, Volume= 0.226 af
Outflow = 3.27 cfs @ 12.08 hrs, Volume= 0.226 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach DP-C: Herring Brook

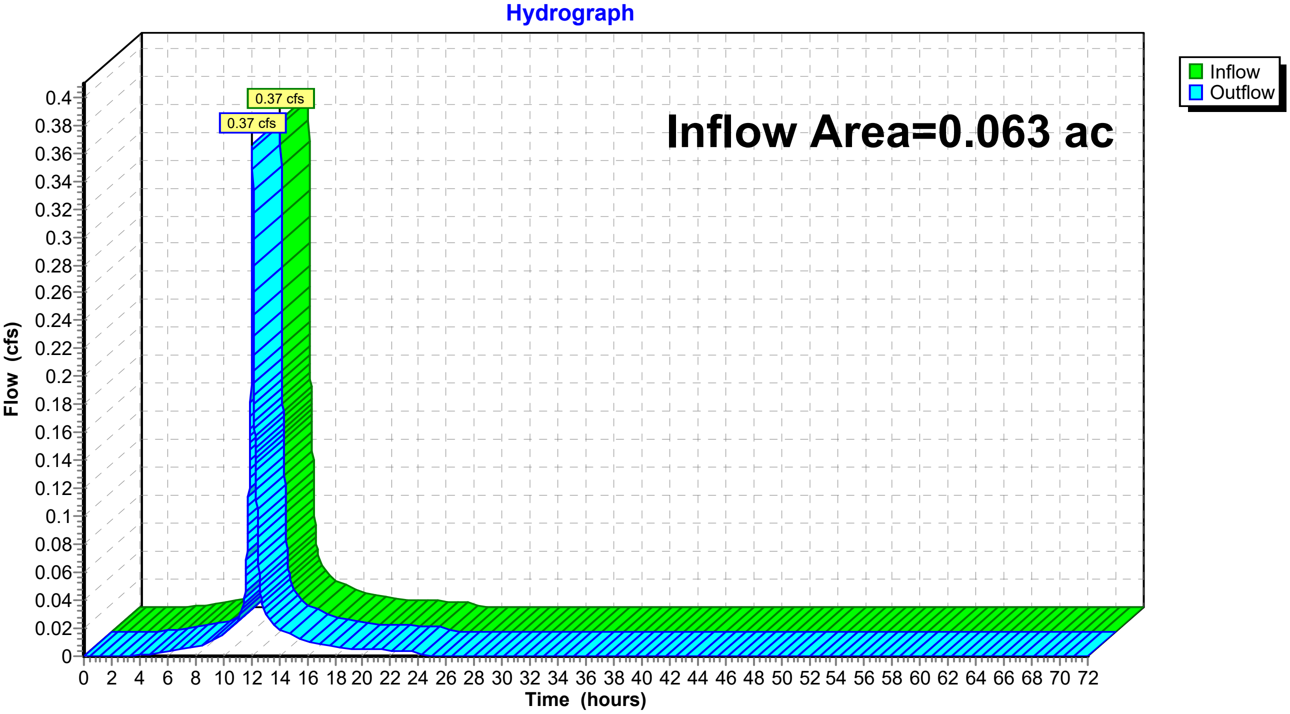


Summary for Reach DP-C-1: Broad Street

Inflow Area =	0.063 ac, 78.11% Impervious, Inflow Depth = 5.33" for 25-Year event			
Inflow =	0.37 cfs @	12.08 hrs, Volume=	0.028 af	
Outflow =	0.37 cfs @	12.08 hrs, Volume=	0.028 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach DP-C-1: Broad Street



Summary for Pond LB-1: Existing Leaching Basin

Inflow Area = 0.220 ac, 99.04% Impervious, Inflow Depth = 5.91" for 25-Year event
Inflow = 1.33 cfs @ 12.08 hrs, Volume= 0.109 af
Outflow = 1.33 cfs @ 12.08 hrs, Volume= 0.109 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.02 cfs @ 6.06 hrs, Volume= 0.041 af
Primary = 1.31 cfs @ 12.08 hrs, Volume= 0.068 af
Routed to Pond LP-1 : Existing LP at Wall

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 26.89' @ 12.08 hrs Surf.Area= 100 sf Storage= 406 cf

Plug-Flow detention time= 85.0 min calculated for 0.109 af (100% of inflow)
Center-of-Mass det. time= 85.1 min (829.9 - 744.8)

Volume	Invert	Avail.Storage	Storage Description
#1	16.75'	405 cf	**10.00'W x 10.00'L x 10.13'H Prismatoid** 1,013 cf Overall x 40.0% Voids
#2	26.88'	113 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) -Impervious
		519 cf	Total Available Storage

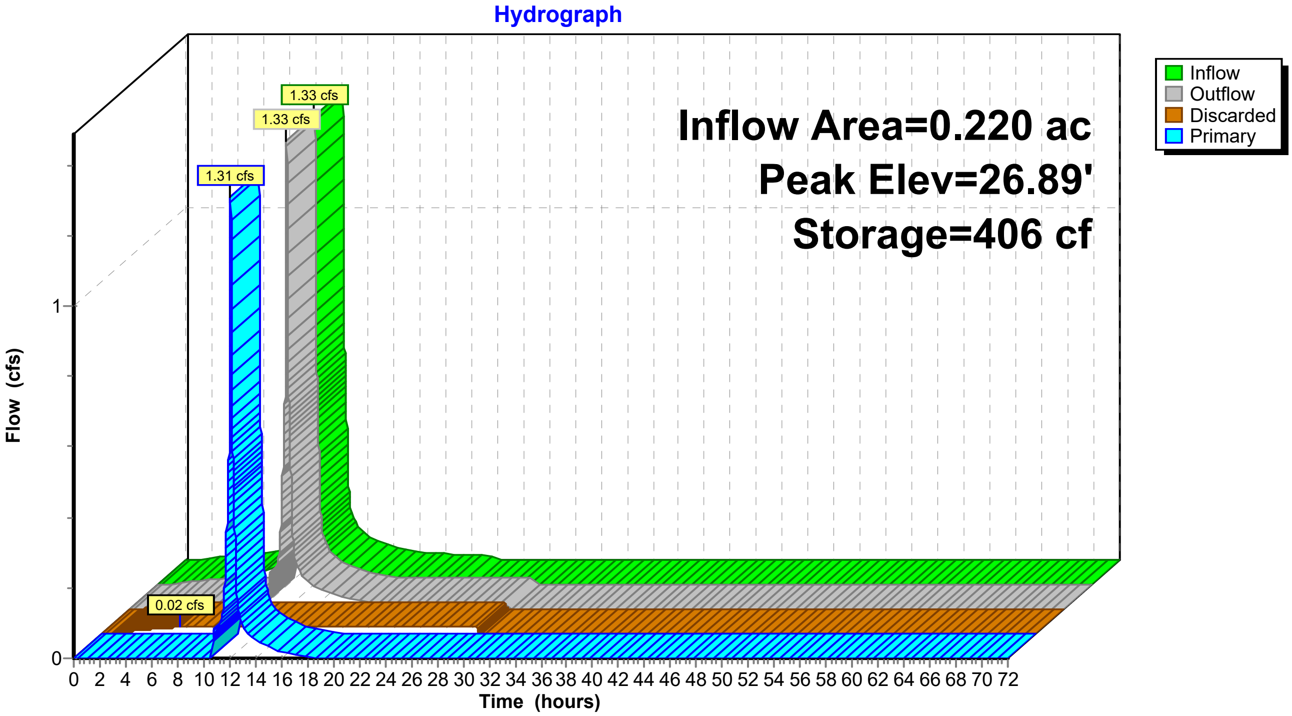
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
26.88	0	0	0
27.00	1,889	113	113

Device	Routing	Invert	Outlet Devices
#1	Discarded	16.75'	**8.270 in/hr Exfiltration over Surface area** Phase-In= 0.02'
#2	Primary	26.88'	**24.0" x 24.0" Horiz. Orifice/Grate X 6.00 columns** X 6 rows C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.02 cfs @ 6.06 hrs HW=16.85' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=1.01 cfs @ 12.08 hrs HW=26.89' (Free Discharge)
↑—**2=Orifice/Grate** (Weir Controls 1.01 cfs @ 0.33 fps)

Pond LB-1: Existing Leaching Basin



Summary for Pond LP-1: Existing LP at Wall

```
Inflow Area =         0.220 ac, 99.04% Impervious, Inflow Depth =   3.68"    for 25-Year event
Inflow      =        1.31 cfs @   12.08 hrs, Volume=          0.068 af
Outflow     =        1.31 cfs @   12.09 hrs, Volume=          0.068 af, Atten= 0%, Lag= 0.1 min
Primary     =        1.31 cfs @   12.09 hrs, Volume=          0.068 af
    Routed to Reach DP-C : Herring Brook

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 25.84' @ 12.09 hrs   Surf.Area= 91 sf   Storage= 14 cf

Plug-Flow detention time= 0.3 min calculated for 0.067 af (100% of inflow)
Center-of-Mass det. time= 0.3 min ( 751.3 - 751.1 )

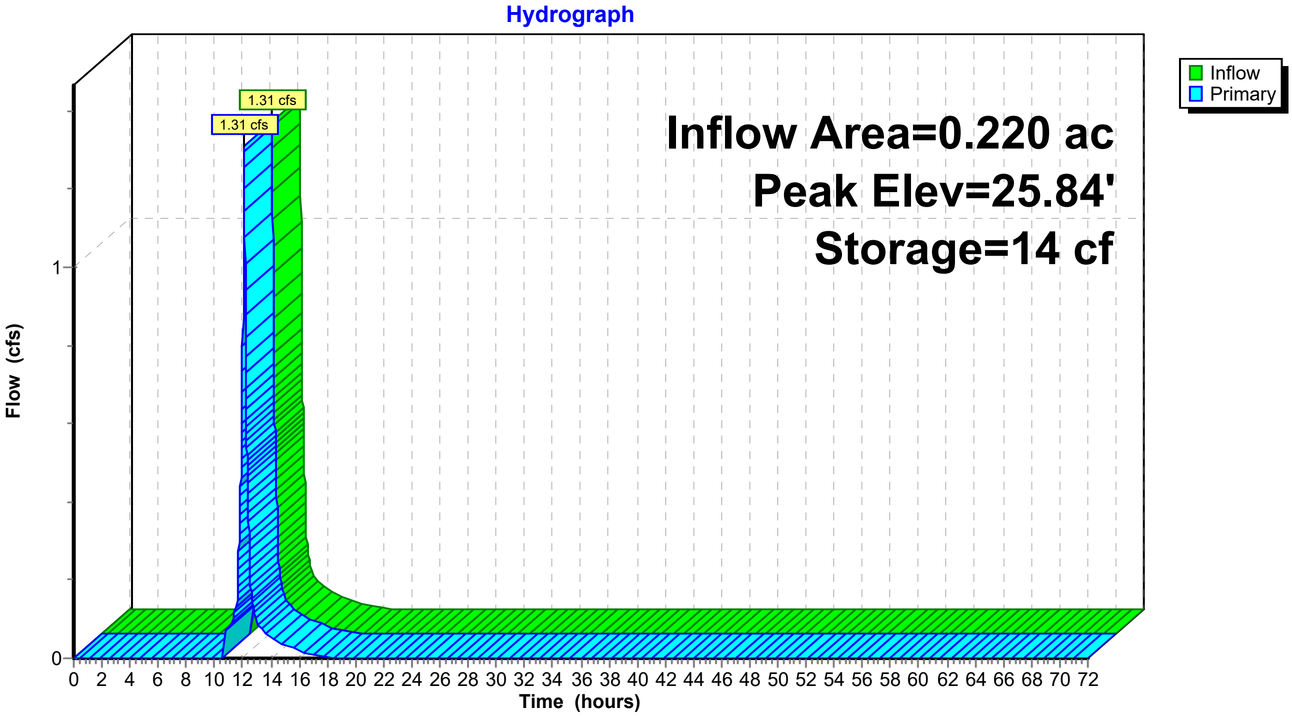
Volume        Invert     Avail.Storage   Storage Description
   #1         25.53'             33 cf   Custom Stage Data (Prismatic)Listed below (Recalc)

 Elevation          Surf.Area         Inc.Store        Cum.Store
     (feet)             (sq-ft)     (cubic-feet)     (cubic-feet)
     25.53                   0                0                0
     26.00                 139               33               33

Device   Routing            Invert   Outlet Devices
   #1    Primary            25.53'   Asymmetrical Weir, C= 3.27
                                     Offset (feet)  0.00  8.89  8.89
                                     Elev.  (feet)  26.00  25.53  26.00

Primary OutFlow Max=1.31 cfs @ 12.09 hrs  HW=25.84'   (Free Discharge)
└─1=Asymmetrical Weir (Weir Controls 1.31 cfs @ 0.73 fps)
```

Pond LP-1: Existing LP at Wall



```
                         Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
                          Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
              Reach routing by Stor-Ind+Trans method  -  Pond routing by Stor-Ind method

SubcatchmentS-C: S-C                      Runoff Area=14,275 sf  94.41% Impervious   Runoff Depth=8.44"
                                                       Tc=6.0 min   CN=97   Runoff=2.83 cfs  0.230 af

SubcatchmentS-C-1: S-C-1                   Runoff Area=9,600 sf  99.04% Impervious   Runoff Depth=8.56"
                                                       Tc=6.0 min   CN=98   Runoff=1.90 cfs  0.157 af

SubcatchmentS-C-2: S-C-2                   Runoff Area=2,750 sf  78.11% Impervious   Runoff Depth=7.96"
                                                       Tc=6.0 min   CN=93   Runoff=0.53 cfs  0.042 af

Reach DP-C: Herring Brook                                                      Inflow=4.71 cfs  0.343 af
                                                                              Outflow=4.71 cfs  0.343 af

Reach DP-C-1: Broad Street                                                     Inflow=0.53 cfs  0.042 af
                                                                              Outflow=0.53 cfs  0.042 af

Pond LB-1: Existing Leaching Basin         Peak Elev=26.90'  Storage=407 cf   Inflow=1.90 cfs  0.157 af
                          Discarded=0.02 cfs  0.045 af   Primary=1.89 cfs  0.113 af   Outflow=1.90 cfs  0.157 af

Pond LP-1: Existing LP at Wall               Peak Elev=25.89'  Storage=19 cf   Inflow=1.89 cfs  0.113 af
                                                                              Outflow=1.89 cfs  0.113 af

          Total Runoff Area = 0.611 ac   Runoff Volume = 0.430 af   Average Runoff Depth = 8.43"
                                        5.60% Pervious = 0.034 ac     94.40% Impervious = 0.577 ac
```

Summary for Subcatchment S-C: S-C

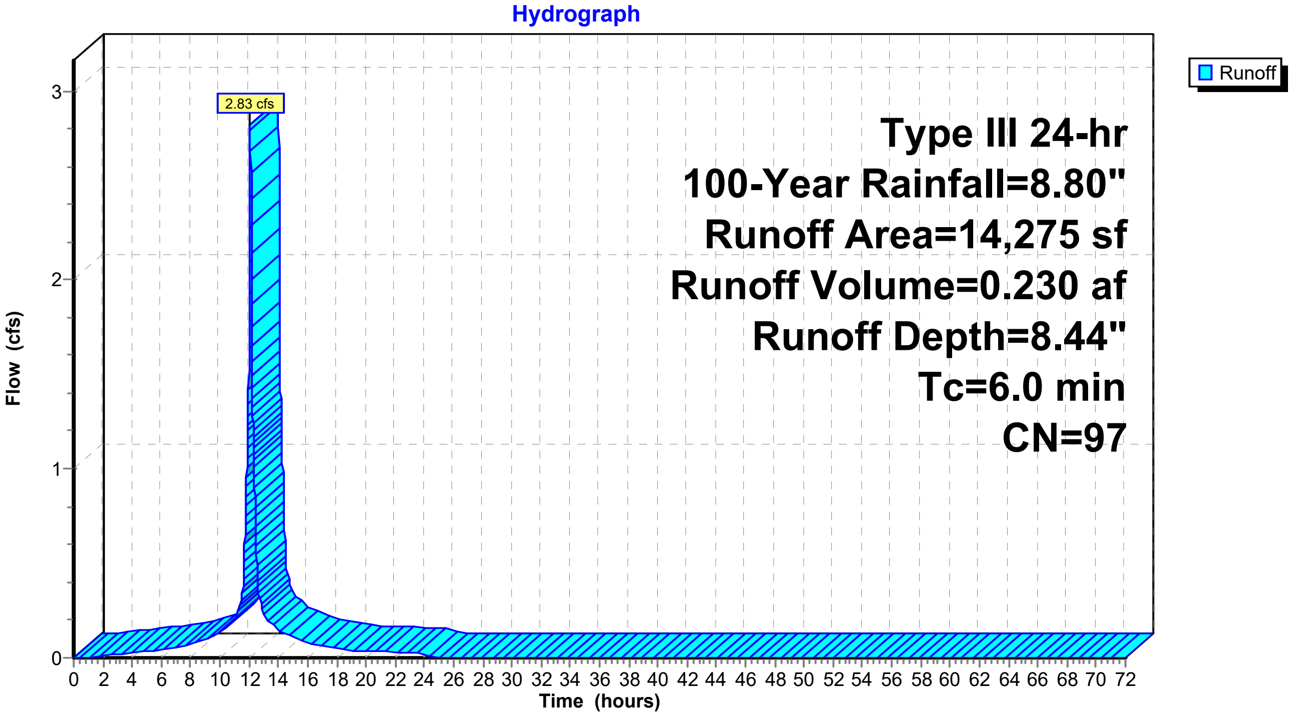
Runoff = 2.83 cfs @ 12.08 hrs, Volume= 0.230 af, Depth= 8.44"
Routed to Reach DP-C : Herring Brook

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.80"

	Area (sf)	CN	Description
	6,749	98	Roofs, HSG C
*	3,919	98	Impervious surfaces, HSG C
*	2,792	98	Impervious surfaces, HSG C (OFFSITE)
*	490	74	>75% Grass cover, Good, HSG C (OFFSITE)
*	308	74	Plantings, HSG C (OFFSITE)
*	17	98	Impervious surfaces, HSG C (OFFSITE)
	14,275	97	Weighted Average
	798		5.59% Pervious Area
	13,477		94.41% Impervious Area

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

Subcatchment S-C: S-C



Summary for Subcatchment S-C-1: S-C-1

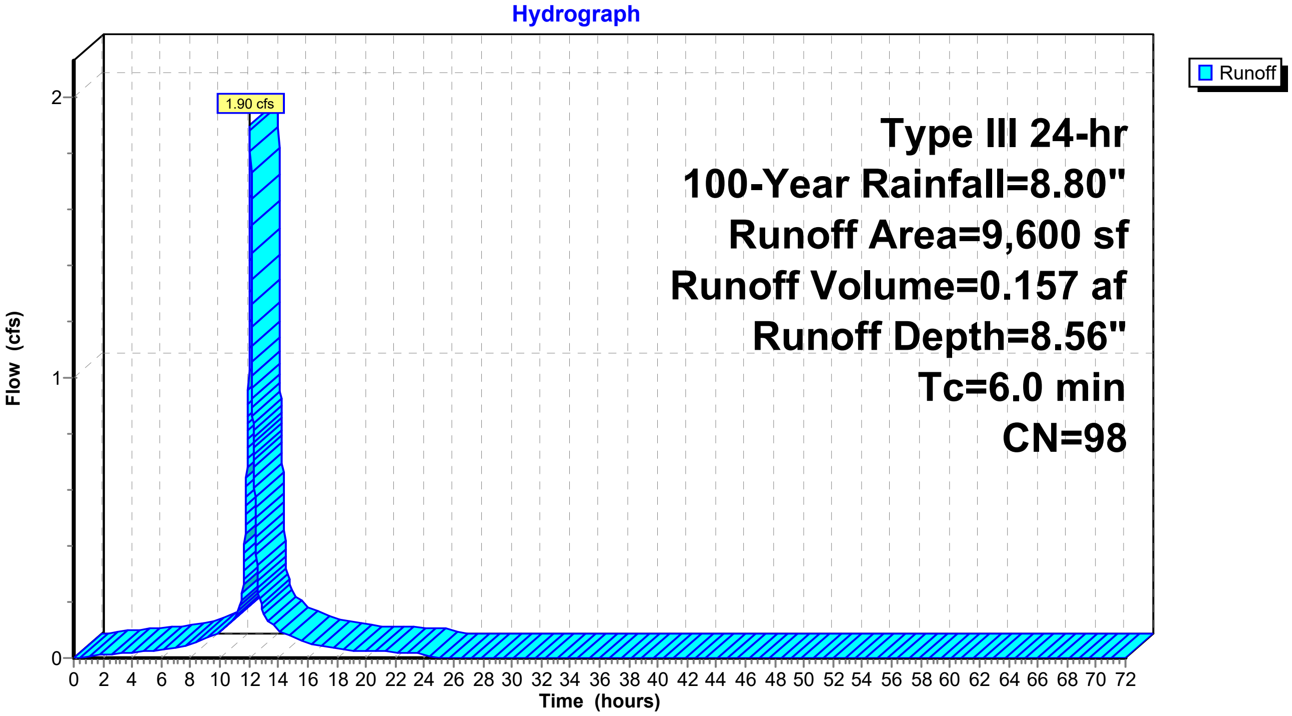
Runoff = 1.90 cfs @ 12.08 hrs, Volume= 0.157 af, Depth= 8.56"
Routed to Pond LB-1 : Existing Leaching Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.80"

	Area (sf)	CN	Description
	66	98	Roofs, HSG C
*	9,442	98	Impervious surfaces, HSG C
	92	74	>75% Grass cover, Good, HSG C
	9,600	98	Weighted Average
	92		0.96% Pervious Area
	9,508		99.04% Impervious Area

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

Subcatchment S-C-1: S-C-1



Summary for Subcatchment S-C-2: S-C-2

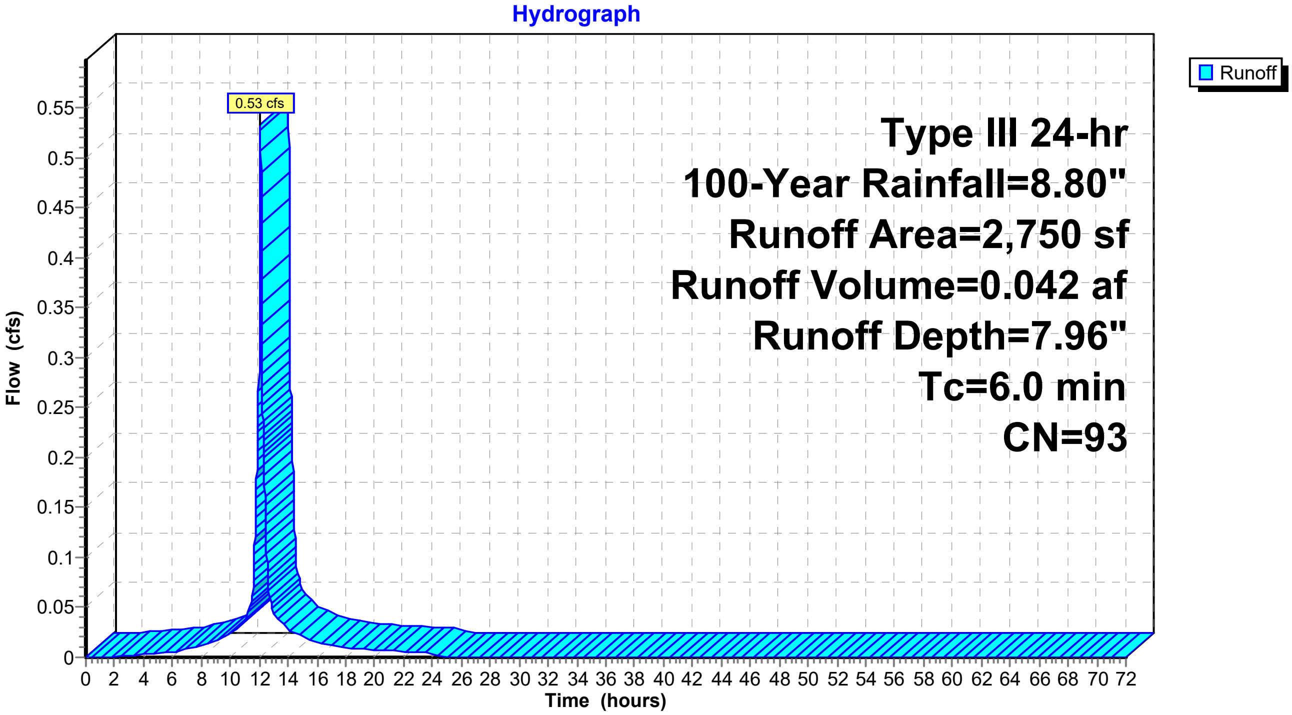
Runoff = 0.53 cfs @ 12.08 hrs, Volume= 0.042 af, Depth= 7.96"
Routed to Reach DP-C-1 : Broad Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.80"

	Area (sf)	CN	Description
	894	98	Roofs, HSG C
*	1,228	98	Impervious surfaces, HSG C
	602	74	>75% Grass cover, Good, HSG C
*	26	98	Impervious, HSG C (OFFSITE)
	2,750	93	Weighted Average
	602		21.89% Pervious Area
	2,148		78.11% Impervious Area

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

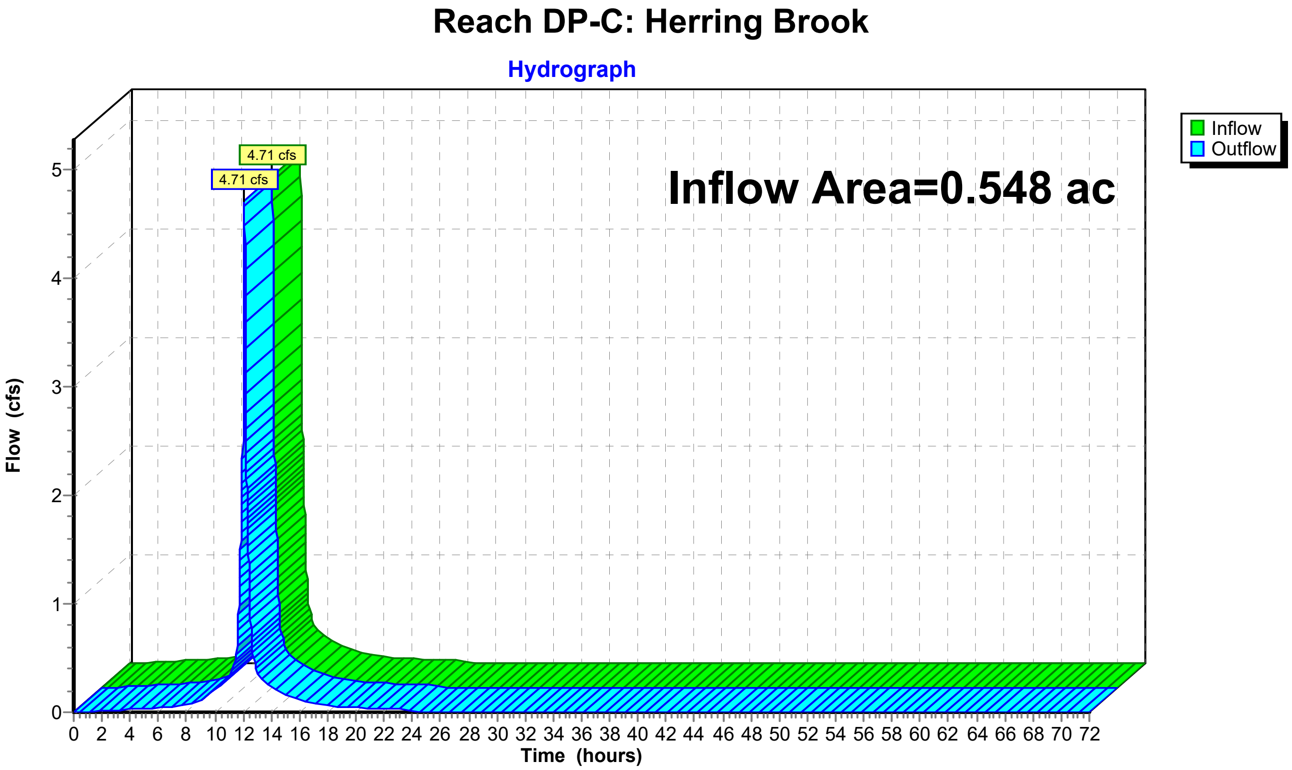
Subcatchment S-C-2: S-C-2



Summary for Reach DP-C: Herring Brook

Inflow Area = 0.548 ac, 96.27% Impervious, Inflow Depth = 7.51" for 100-Year event
Inflow = 4.71 cfs @ 12.08 hrs, Volume= 0.343 af
Outflow = 4.71 cfs @ 12.08 hrs, Volume= 0.343 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

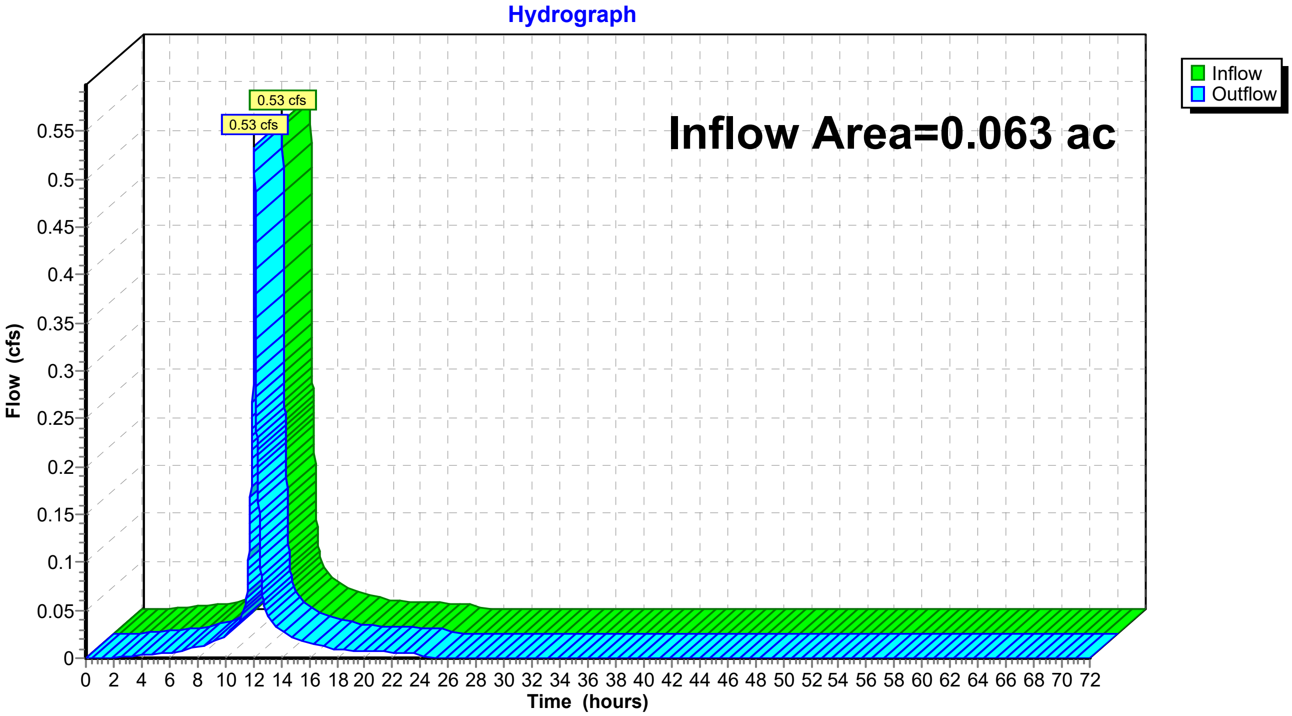


Summary for Reach DP-C-1: Broad Street

Inflow Area = 0.063 ac, 78.11% Impervious, Inflow Depth = 7.96" for 100-Year event
Inflow = 0.53 cfs @ 12.08 hrs, Volume= 0.042 af
Outflow = 0.53 cfs @ 12.08 hrs, Volume= 0.042 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach DP-C-1: Broad Street



Summary for Pond LB-1: Existing Leaching Basin

```
Inflow Area =         0.220 ac, 99.04% Impervious, Inflow Depth =  8.56"   for 100-Year event
Inflow      =         1.90 cfs @  12.08 hrs, Volume=          0.157 af
Outflow     =         1.90 cfs @  12.08 hrs, Volume=          0.157 af, Atten= 0%, Lag= 0.0 min
Discarded   =         0.02 cfs @   3.52 hrs, Volume=          0.045 af
Primary     =         1.89 cfs @  12.08 hrs, Volume=          0.113 af
    Routed to Pond LP-1 : Existing LP at Wall
```

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 26.90' @ 12.08 hrs Surf.Area= 100 sf Storage= 407 cf

Plug-Flow detention time= 68.2 min calculated for 0.157 af (100% of inflow)
Center-of-Mass det. time= 68.2 min (808.3 - 740.1)

Volume	Invert	Avail.Storage	Storage Description
#1	16.75'	405 cf	**10.00'W x 10.00'L x 10.13'H Prismatoid** 1,013 cf Overall x 40.0% Voids
#2	26.88'	113 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) -Impervious
		519 cf	Total Available Storage

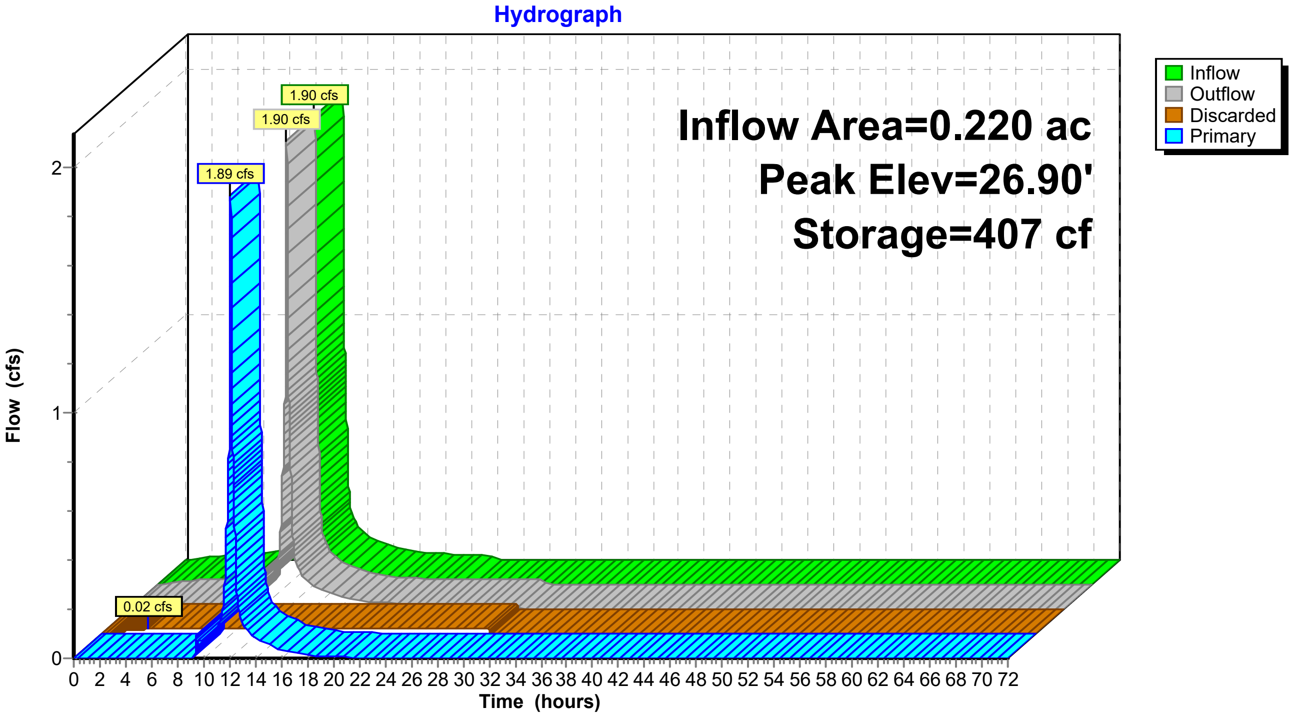
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
26.88	0	0	0
27.00	1,889	113	113

Device	Routing	Invert	Outlet Devices
#1	Discarded	16.75'	**8.270 in/hr Exfiltration over Surface area** Phase-In= 0.02'
#2	Primary	26.88'	**24.0" x 24.0" Horiz. Orifice/Grate X 6.00 columns** X 6 rows C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.02 cfs @ 3.52 hrs HW=16.85' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=1.75 cfs @ 12.08 hrs HW=26.90' (Free Discharge)
↑—**2=Orifice/Grate** (Weir Controls 1.75 cfs @ 0.40 fps)

Pond LB-1: Existing Leaching Basin



Summary for Pond LP-1: Existing LP at Wall

Inflow Area = 0.220 ac, 99.04% Impervious, Inflow Depth = 6.14" for 100-Year event
Inflow = 1.89 cfs @ 12.08 hrs, Volume= 0.113 af
Outflow = 1.89 cfs @ 12.09 hrs, Volume= 0.113 af, Atten= 0%, Lag= 0.1 min
Primary = 1.89 cfs @ 12.09 hrs, Volume= 0.113 af
Routed to Reach DP-C : Herring Brook

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 25.89' @ 12.09 hrs Surf.Area= 106 sf Storage= 19 cf

Plug-Flow detention time= 0.2 min calculated for 0.113 af (100% of inflow)
Center-of-Mass det. time= 0.2 min (753.1 - 752.8)

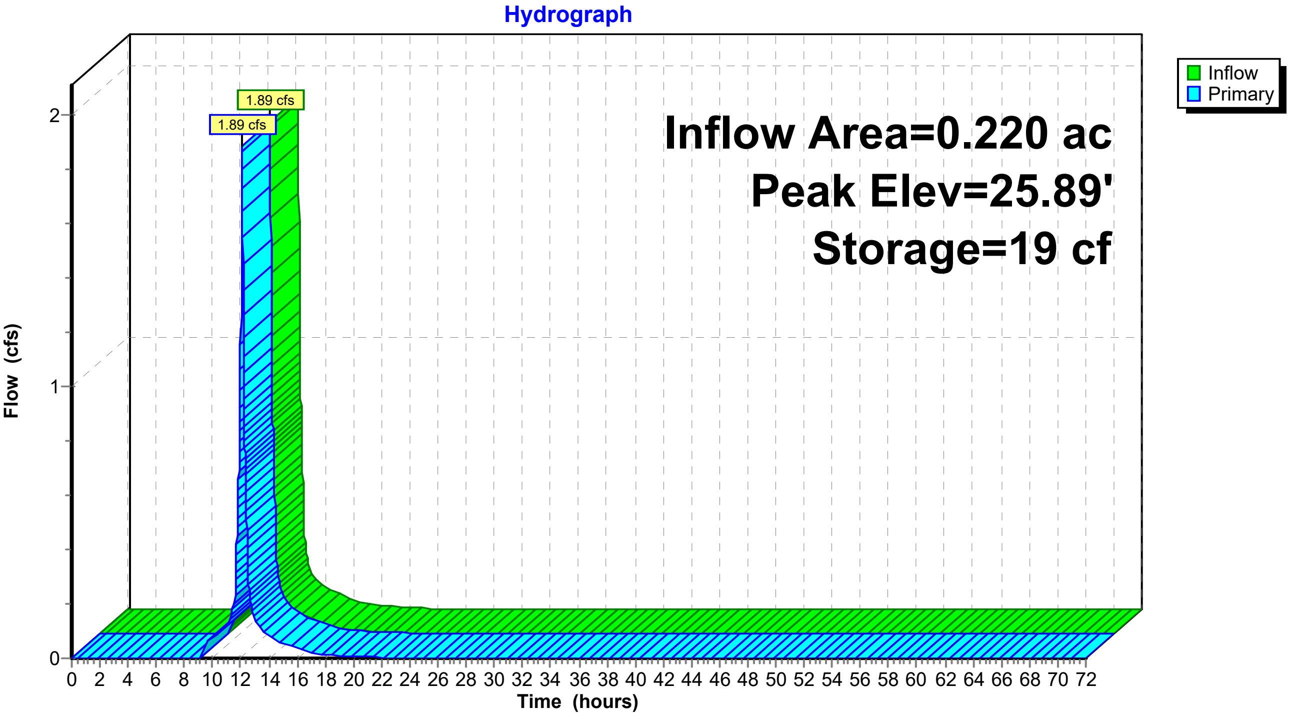
Volume	Invert	Avail.Storage	Storage Description
#1	25.53'	33 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
25.53	0	0	0
26.00	139	33	33

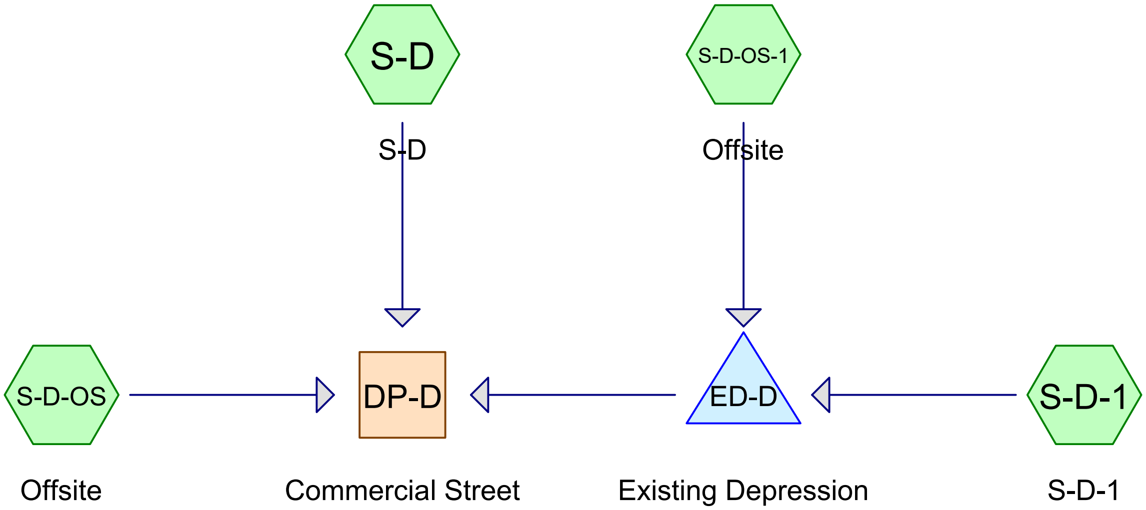
Device	Routing	Invert	Outlet Devices
#1	Primary	25.53'	**Asymmetrical Weir, C= 3.27** Offset (feet) 0.00 8.89 8.89 Elev. (feet) 26.00 25.53 26.00

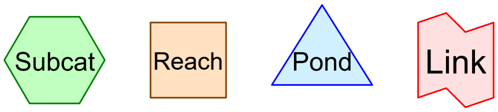
Primary OutFlow Max=1.88 cfs @ 12.09 hrs HW=25.89' (Free Discharge)
↳**1=Asymmetrical Weir** (Weir Controls 1.88 cfs @ 0.78 fps)

Pond LP-1: Existing LP at Wall



SITE D





Routing Diagram for 222-203 Lot D Pre Development Conditions (R2)
Prepared by McKenzie Engineering Group Inc, Printed 11/13/2023
HydroCAD® 10.20-3g s/n 00452 © 2023 HydroCAD Software Solutions LLC

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	Type III 24-hr		Default	24.00	1	3.22	2
2	10-Year	Type III 24-hr		Default	24.00	1	4.86	2
3	25-Year	Type III 24-hr		Default	24.00	1	6.15	2
4	100-Year	Type III 24-hr		Default	24.00	1	8.80	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.071	98	Impervious surfaces, HSG C (S-D)
0.104	98	Roofs, HSG C (S-D)
0.016	98	Roofs, HSG C (OFFSITE) (S-D-OS)
0.051	70	Woods, Good, HSG C (S-D, S-D-1)
0.126	70	Woods, Good, HSG C (OFFSITE) (S-D-OS, S-D-OS-1)
0.369	**85**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.369	HSG C	S-D, S-D-1, S-D-OS, S-D-OS-1
0.000	HSG D	
0.000	Other	
0.369		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.071	0.000	0.000	0.071	Impervious surfaces	S-D
0.000	0.000	0.121	0.000	0.000	0.121	Roofs	S-D, S-D-OS
0.000	0.000	0.177	0.000	0.000	0.177	Woods, Good	S-D, S-D-1, S-D-OS, S-D-OS-1
0.000	**0.000**	**0.369**	**0.000**	**0.000**	**0.369**	**TOTAL AREA**	

```
                       Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
                       Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
            Reach routing by Dyn-Stor-Ind method  -  Pond routing by Dyn-Stor-Ind method

SubcatchmentS-D: S-D                 Runoff Area=8,796 sf   86.85% Impervious   Runoff Depth=2.56"
                                                Tc=6.0 min   CN=94   Runoff=0.57 cfs  0.043 af

SubcatchmentS-D-1: S-D-1              Runoff Area=1,051 sf   0.00% Impervious   Runoff Depth=0.84"
                                                Tc=6.0 min   CN=70   Runoff=0.02 cfs  0.002 af

SubcatchmentS-D-OS: Offsite          Runoff Area=3,198 sf   21.89% Impervious   Runoff Depth=1.17"
                                                Tc=6.0 min   CN=76   Runoff=0.10 cfs  0.007 af

SubcatchmentS-D-OS-1: Offsite         Runoff Area=3,008 sf   0.00% Impervious   Runoff Depth=0.84"
                                                Tc=6.0 min   CN=70   Runoff=0.06 cfs  0.005 af

Reach DP-D: Commercial Street                                          Inflow=0.66 cfs  0.050 af
                                                                      Outflow=0.66 cfs  0.050 af

Pond ED-D: Existing Depression    Peak Elev=36.83'  Storage=284 cf   Inflow=0.08 cfs  0.007 af
                                                                      Outflow=0.00 cfs  0.000 af

             Total Runoff Area = 0.369 ac   Runoff Volume = 0.057 af   Average Runoff Depth = 1.85"
                                    48.05% Pervious = 0.177 ac     51.95% Impervious = 0.191 ac
```

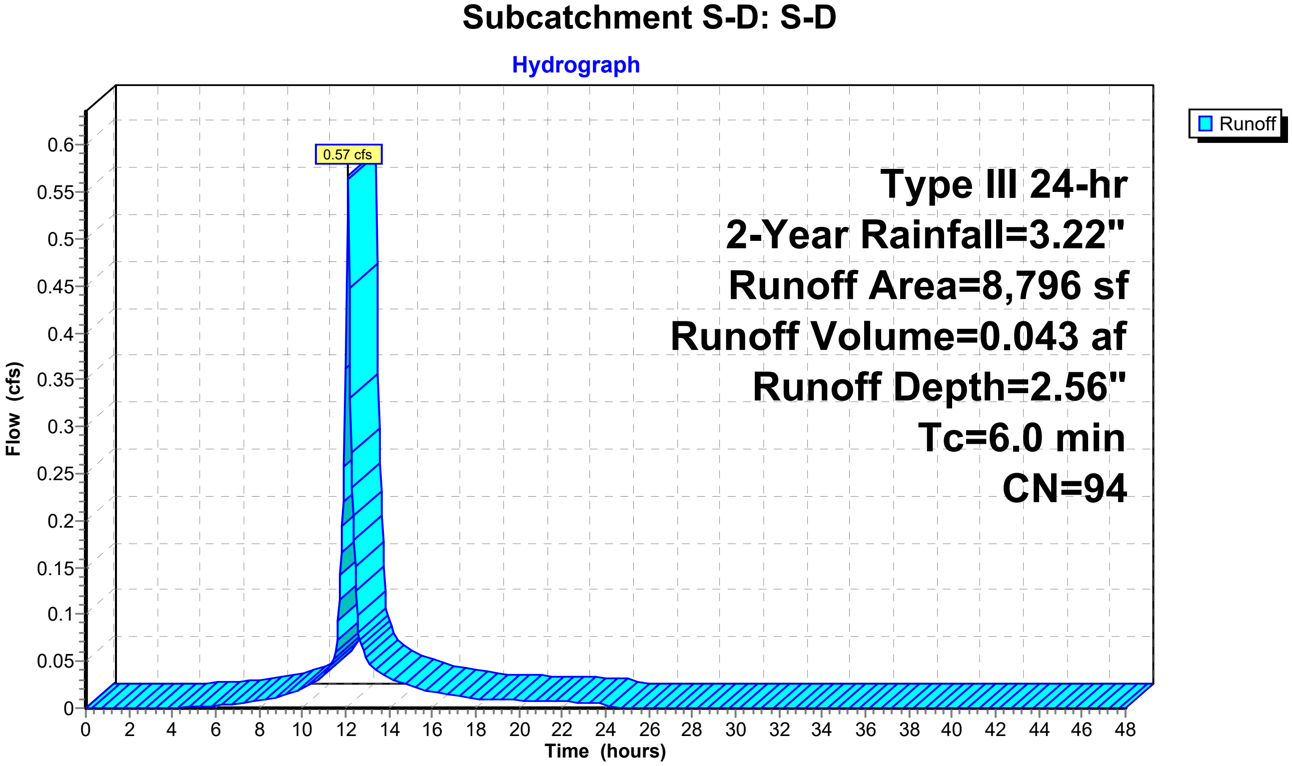
Summary for Subcatchment S-D: S-D

Runoff = 0.57 cfs @ 12.09 hrs, Volume= 0.043 af, Depth= 2.56"
Routed to Reach DP-D : Commercial Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.22"

	Area (sf)	CN	Description
	4,549	98	Roofs, HSG C
*	3,090	98	Impervious surfaces, HSG C
	1,157	70	Woods, Good, HSG C
	8,796	94	Weighted Average
	1,157		13.15% Pervious Area
	7,639		86.85% Impervious Area

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



Summary for Subcatchment S-D-1: S-D-1

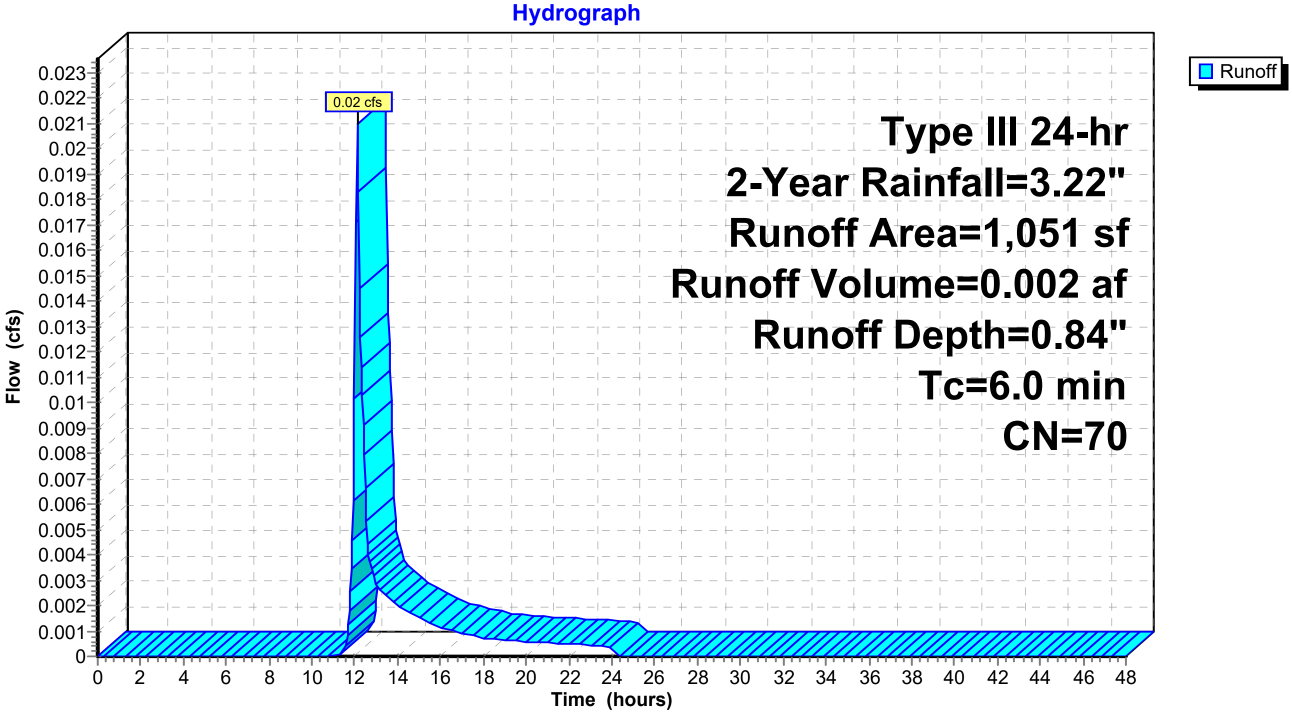
Runoff = 0.02 cfs @ 12.10 hrs, Volume= 0.002 af, Depth= 0.84"
Routed to Pond ED-D : Existing Depression

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.22"

Area (sf)	CN	Description
1,051	70	Woods, Good, HSG C
1,051		100.00% Pervious Area

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

Subcatchment S-D-1: S-D-1



Summary for Subcatchment S-D-OS: Offsite

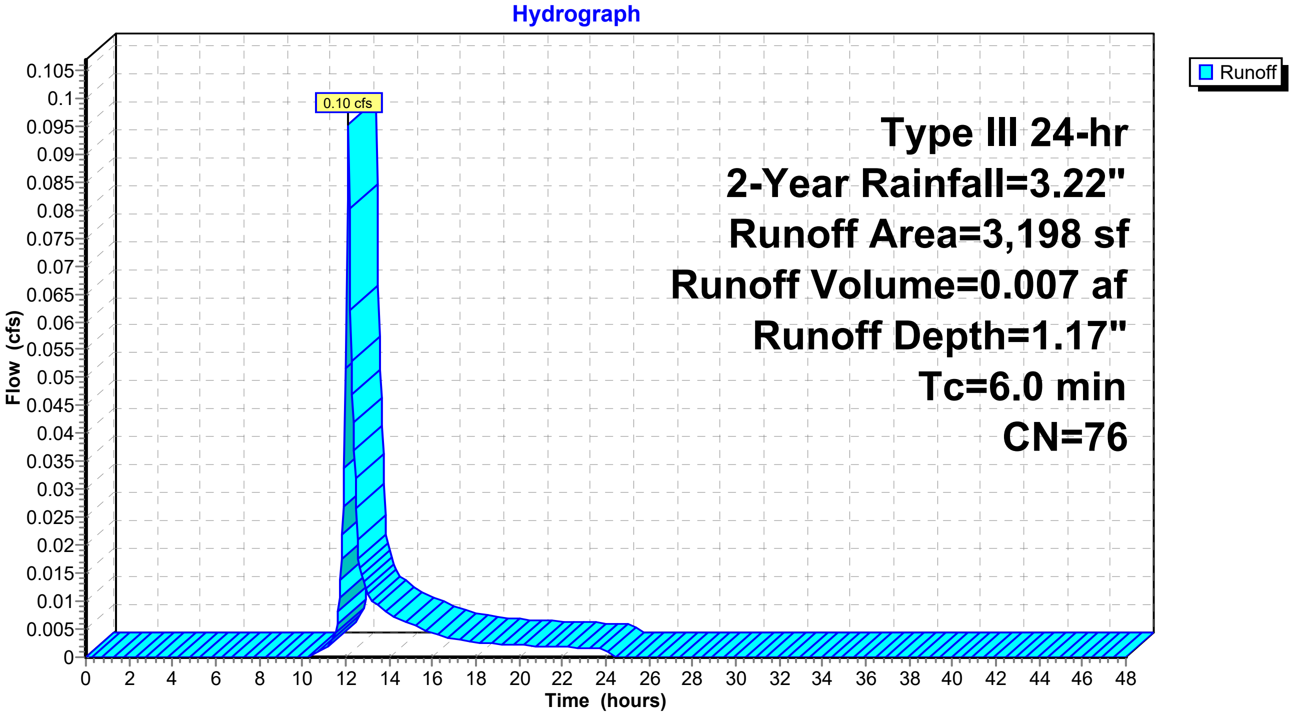
Runoff = 0.10 cfs @ 12.10 hrs, Volume= 0.007 af, Depth= 1.17"
Routed to Reach DP-D : Commercial Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.22"

	Area (sf)	CN	Description
*	700	98	Roofs, HSG C (OFFSITE)
*	2,498	70	Woods, Good, HSG C (OFFSITE)
	3,198	76	Weighted Average
	2,498		78.11% Pervious Area
	700		21.89% Impervious Area

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

Subcatchment S-D-OS: Offsite



Summary for Subcatchment S-D-OS-1: Offsite

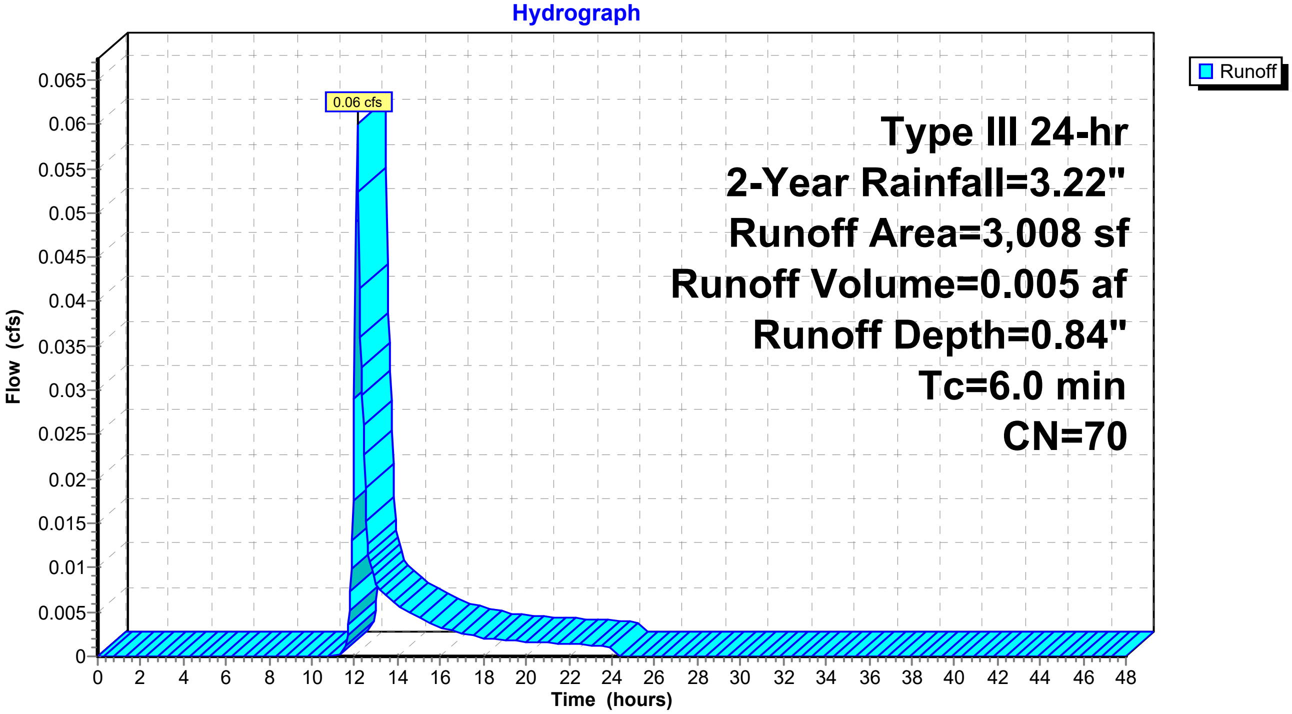
Runoff = 0.06 cfs @ 12.10 hrs, Volume= 0.005 af, Depth= 0.84"
Routed to Pond ED-D : Existing Depression

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.22"

	Area (sf)	CN	Description
*	3,008	70	Woods, Good, HSG C (OFFSITE)
	3,008		100.00% Pervious Area

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

Subcatchment S-D-OS-1: Offsite

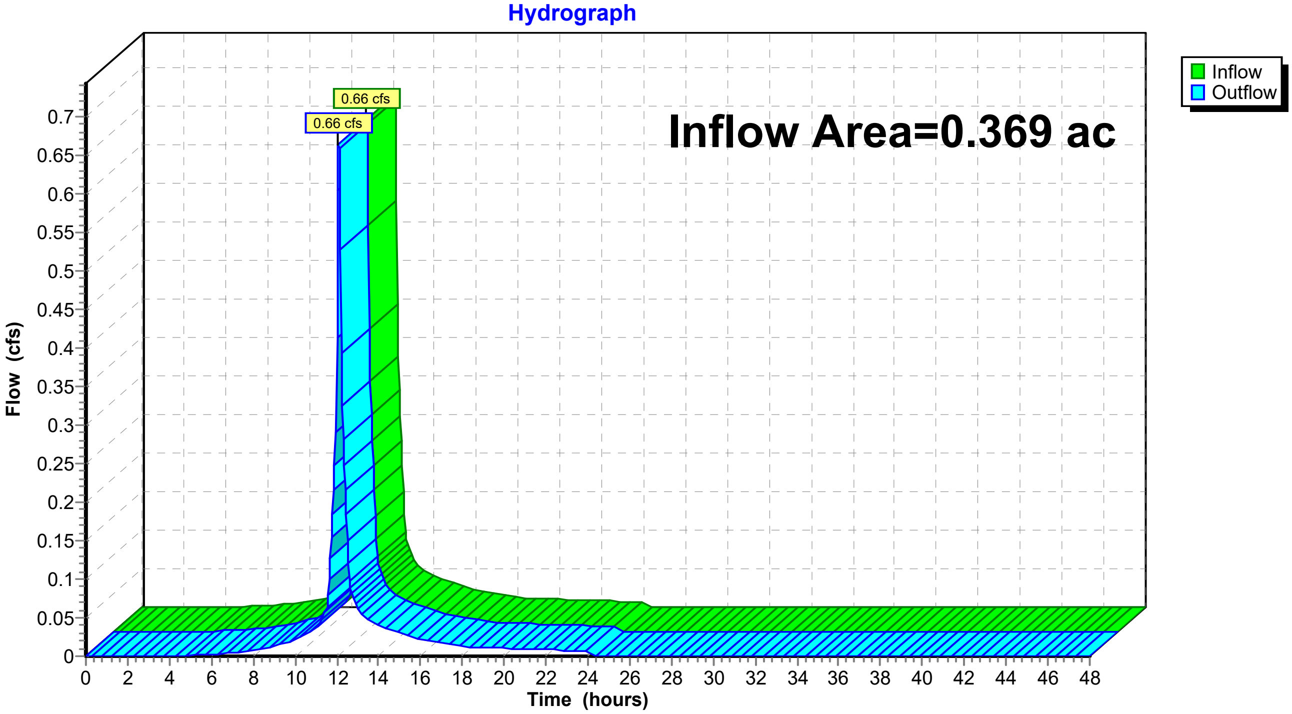


Summary for Reach DP-D: Commercial Street

Inflow Area = 0.369 ac, 51.95% Impervious, Inflow Depth = 1.64" for 2-Year event
Inflow = 0.66 cfs @ 12.09 hrs, Volume= 0.050 af
Outflow = 0.66 cfs @ 12.09 hrs, Volume= 0.050 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Reach DP-D: Commercial Street



Summary for Pond ED-D: Existing Depression

```
Inflow Area =         0.093 ac,    0.00% Impervious,  Inflow Depth =   0.84"    for  2-Year event
Inflow      =        0.08 cfs @   12.10 hrs,  Volume=           0.007 af
Outflow     =        0.00 cfs @    0.00 hrs,  Volume=           0.000 af,  Atten= 100%,  Lag= 0.0 min
Primary     =        0.00 cfs @    0.00 hrs,  Volume=           0.000 af
    Routed to Reach DP-D : Commercial Street

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 36.83' @ 24.40 hrs   Surf.Area= 235 sf   Storage= 284 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)
```

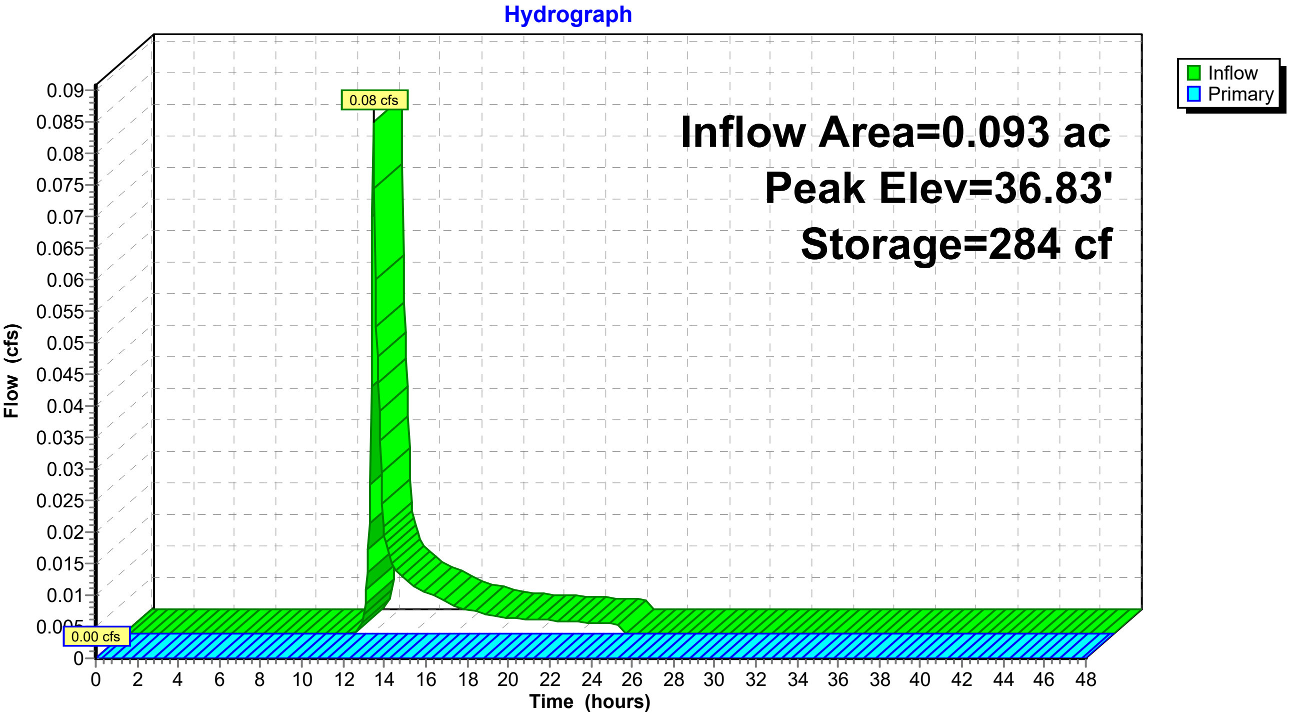
Volume	Invert	Avail.Storage	Storage Description
#1	34.00'	1,108 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
34.00	13	0	0
35.00	55	34	34
36.00	137	96	130
37.00	255	196	326
38.00	404	330	656
39.00	500	452	1,108

Device	Routing	Invert	Outlet Devices
#1	Primary	37.75'	**2.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=34.00' TW=0.00' (Dynamic Tailwater)
↰**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond ED-D: Existing Depression



```
                 Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
                 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
      Reach routing by Dyn-Stor-Ind method  -  Pond routing by Dyn-Stor-Ind method

SubcatchmentS-D: S-D              Runoff Area=8,796 sf   86.85% Impervious   Runoff Depth=4.17"
                                              Tc=6.0 min   CN=94   Runoff=0.90 cfs  0.070 af

SubcatchmentS-D-1: S-D-1            Runoff Area=1,051 sf   0.00% Impervious   Runoff Depth=1.93"
                                              Tc=6.0 min   CN=70   Runoff=0.05 cfs  0.004 af

SubcatchmentS-D-OS: Offsite       Runoff Area=3,198 sf   21.89% Impervious   Runoff Depth=2.42"
                                              Tc=6.0 min   CN=76   Runoff=0.20 cfs  0.015 af

SubcatchmentS-D-OS-1: Offsite       Runoff Area=3,008 sf   0.00% Impervious   Runoff Depth=1.93"
                                              Tc=6.0 min   CN=70   Runoff=0.15 cfs  0.011 af

Reach DP-D: Commercial Street                                          Inflow=1.10 cfs  0.087 af
                                                                      Outflow=1.10 cfs  0.087 af

Pond ED-D: Existing Depression      Peak Elev=37.76'  Storage=563 cf   Inflow=0.20 cfs  0.015 af
                                                                      Outflow=0.01 cfs  0.002 af

         Total Runoff Area = 0.369 ac   Runoff Volume = 0.100 af   Average Runoff Depth = 3.26"
                                  48.05% Pervious = 0.177 ac     51.95% Impervious = 0.191 ac
```

Summary for Subcatchment S-D: S-D

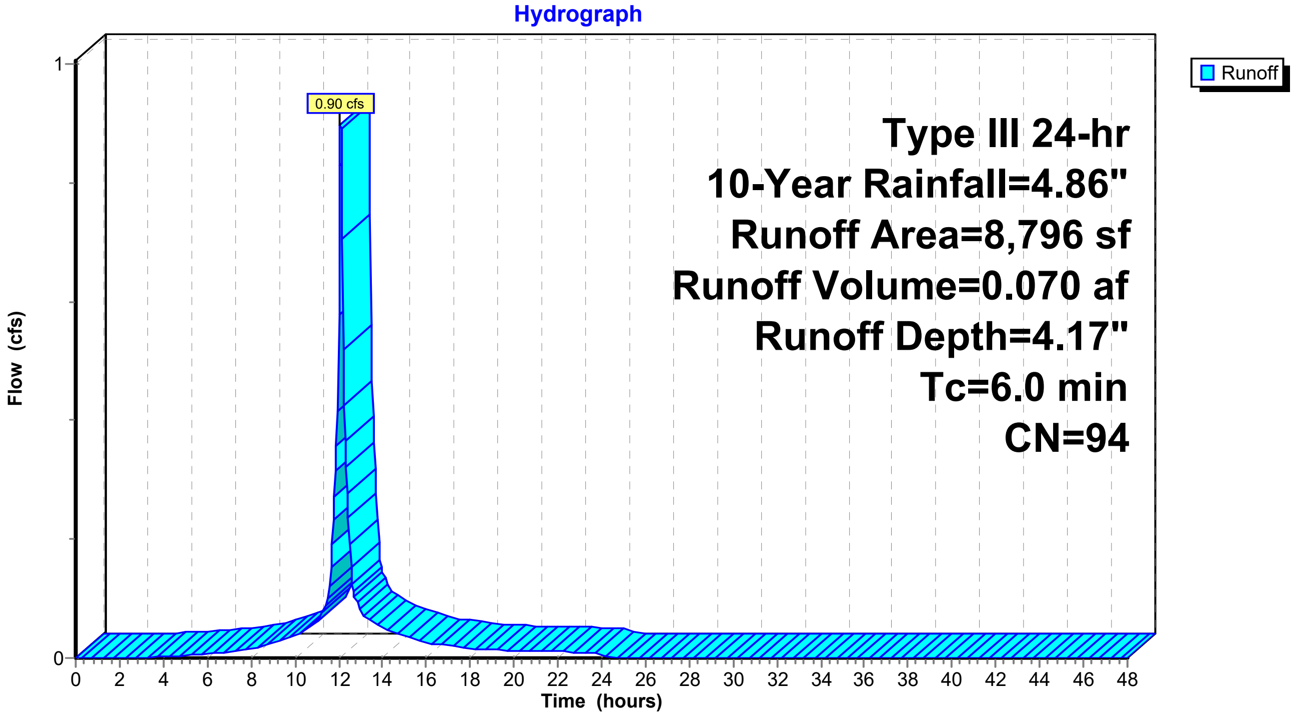
Runoff = 0.90 cfs @ 12.09 hrs, Volume= 0.070 af, Depth= 4.17"
Routed to Reach DP-D : Commercial Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.86"

	Area (sf)	CN	Description
	4,549	98	Roofs, HSG C
*	3,090	98	Impervious surfaces, HSG C
	1,157	70	Woods, Good, HSG C
	8,796	94	Weighted Average
	1,157		13.15% Pervious Area
	7,639		86.85% Impervious Area

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

Subcatchment S-D: S-D



Summary for Subcatchment S-D-1: S-D-1

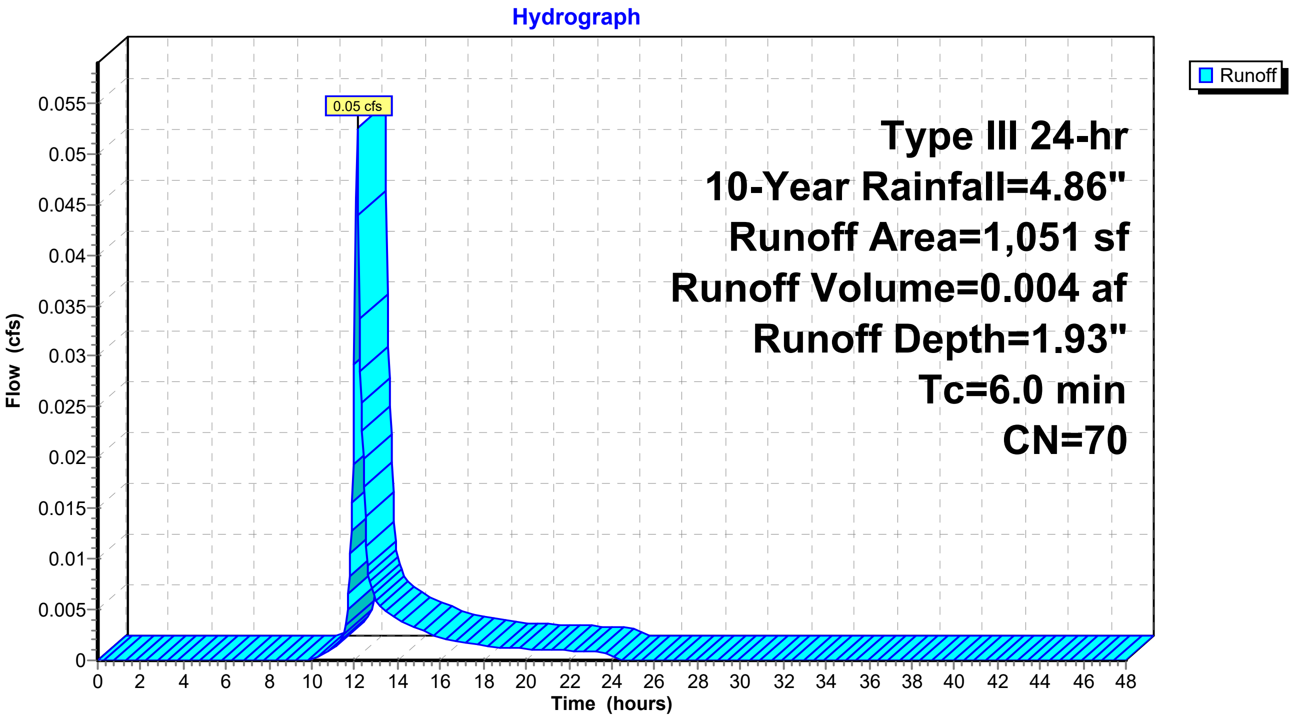
Runoff = 0.05 cfs @ 12.10 hrs, Volume= 0.004 af, Depth= 1.93"
Routed to Pond ED-D : Existing Depression

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.86"

Area (sf)	CN	Description
1,051	70	Woods, Good, HSG C
1,051		100.00% Pervious Area

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

Subcatchment S-D-1: S-D-1



Summary for Subcatchment S-D-OS: Offsite

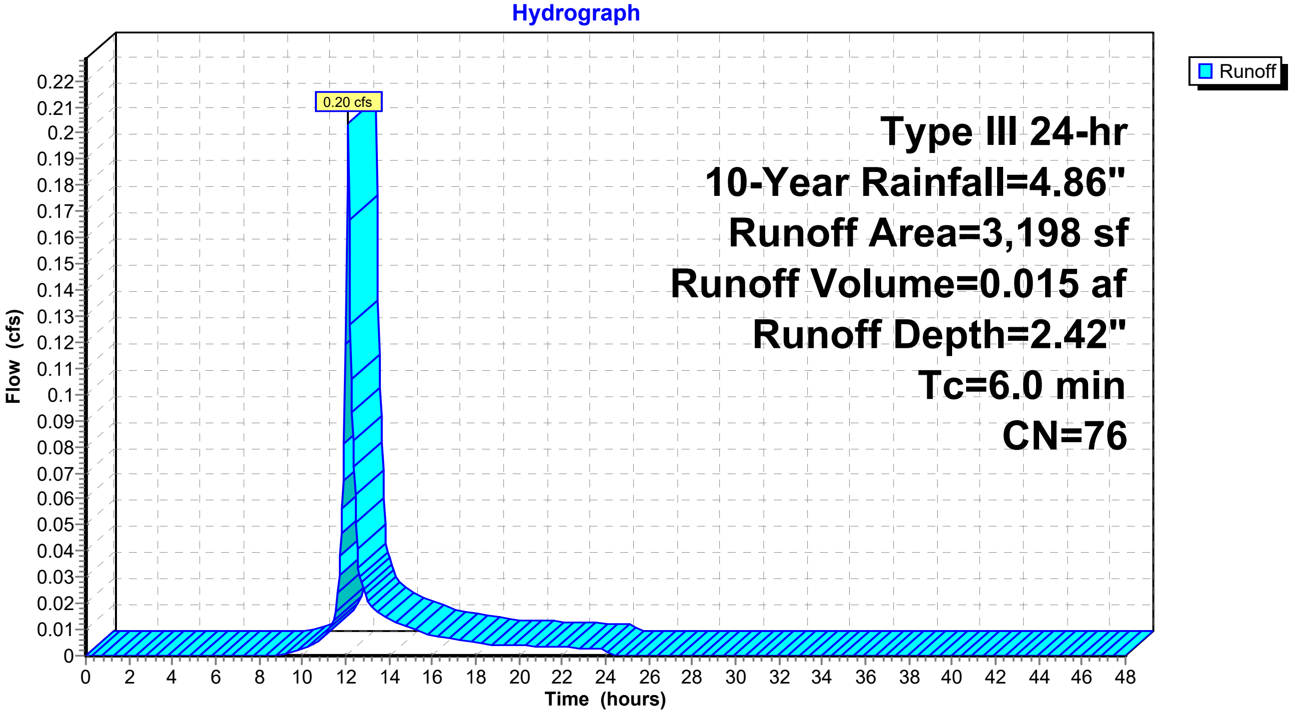
Runoff = 0.20 cfs @ 12.09 hrs, Volume= 0.015 af, Depth= 2.42"
Routed to Reach DP-D : Commercial Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.86"

	Area (sf)	CN	Description
*	700	98	Roofs, HSG C (OFFSITE)
*	2,498	70	Woods, Good, HSG C (OFFSITE)
	3,198	76	Weighted Average
	2,498		78.11% Pervious Area
	700		21.89% Impervious Area

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

Subcatchment S-D-OS: Offsite



Summary for Subcatchment S-D-OS-1: Offsite

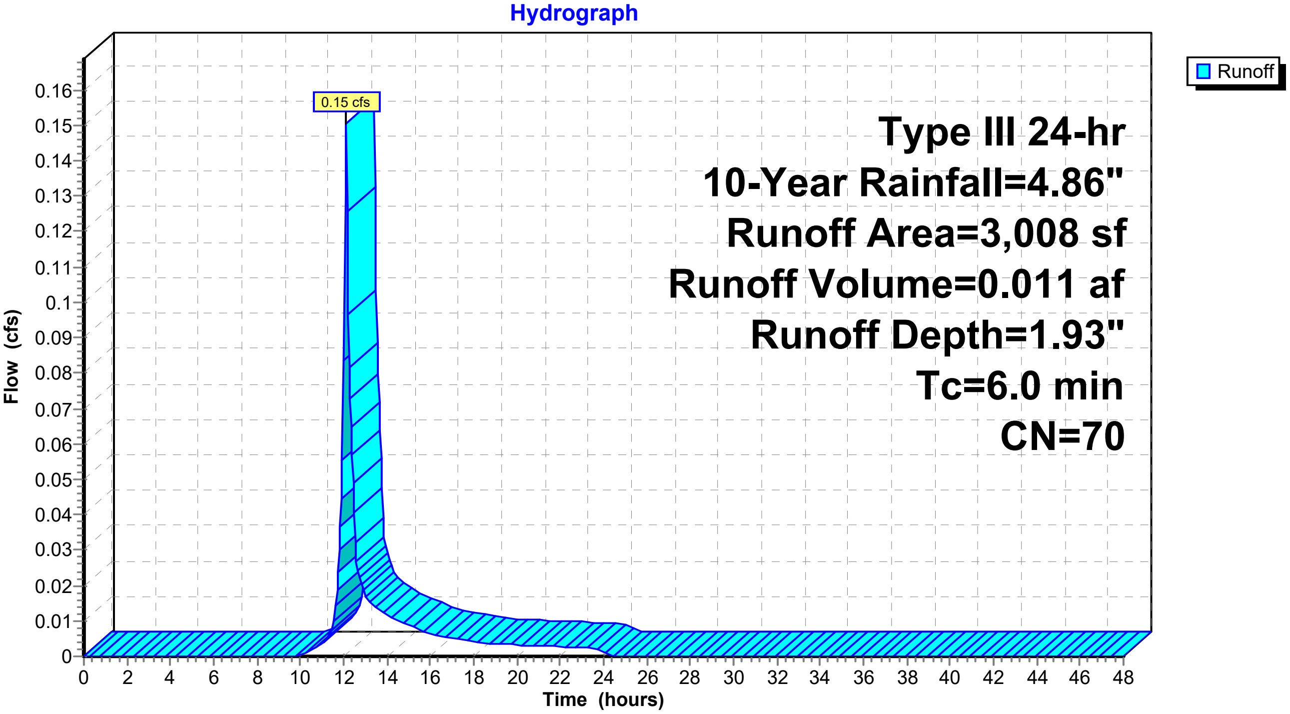
Runoff = 0.15 cfs @ 12.10 hrs, Volume= 0.011 af, Depth= 1.93"
Routed to Pond ED-D : Existing Depression

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.86"

	Area (sf)	CN	Description
*	3,008	70	Woods, Good, HSG C (OFFSITE)
	3,008		100.00% Pervious Area

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

Subcatchment S-D-OS-1: Offsite

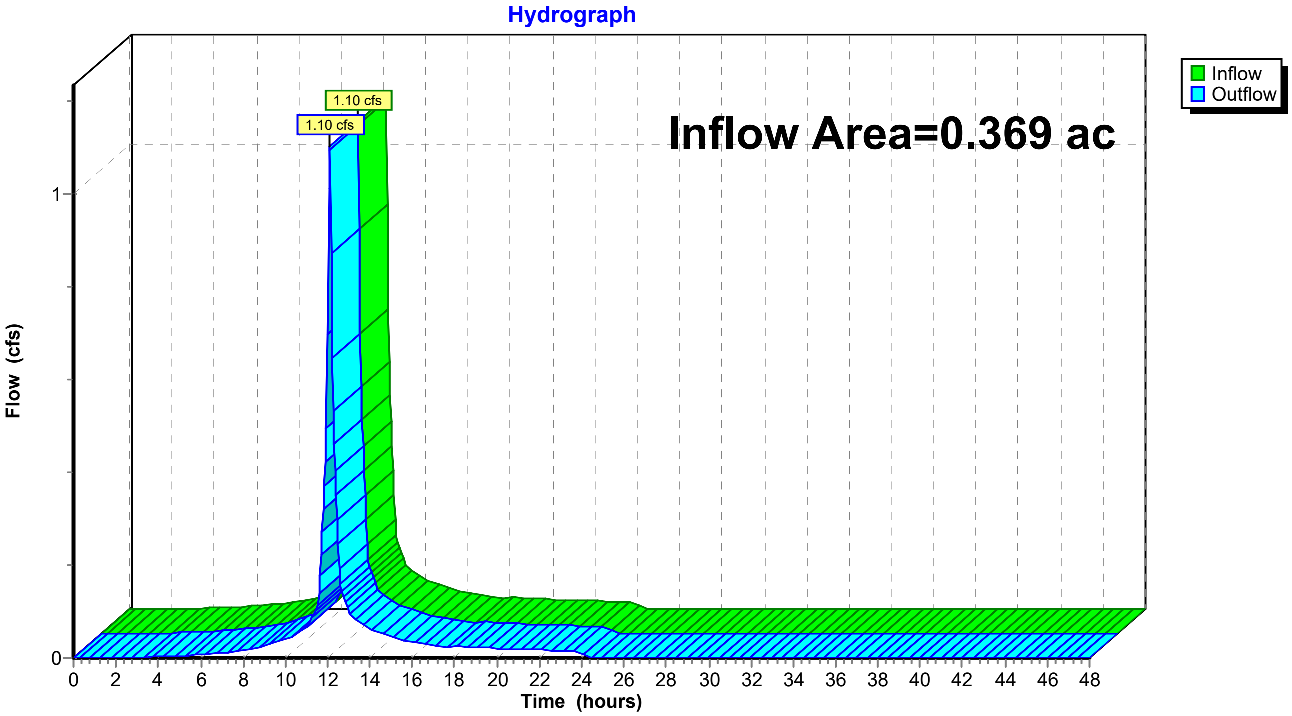


Summary for Reach DP-D: Commercial Street

Inflow Area = 0.369 ac, 51.95% Impervious, Inflow Depth = 2.84" for 10-Year event
Inflow = 1.10 cfs @ 12.09 hrs, Volume= 0.087 af
Outflow = 1.10 cfs @ 12.09 hrs, Volume= 0.087 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Reach DP-D: Commercial Street



Summary for Pond ED-D: Existing Depression

```
Inflow Area =       0.093 ac,   0.00% Impervious,  Inflow Depth =   1.93"    for  10-Year event
Inflow      =       0.20 cfs @  12.10 hrs,  Volume=          0.015 af
Outflow     =       0.01 cfs @  18.23 hrs,  Volume=          0.002 af,  Atten= 97%,  Lag= 368.1 min
Primary     =       0.01 cfs @  18.23 hrs,  Volume=          0.002 af
    Routed to Reach DP-D : Commercial Street

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 37.76' @ 18.23 hrs   Surf.Area= 368 sf   Storage= 563 cf

Plug-Flow detention time= 544.0 min calculated for 0.002 af (14% of inflow)
Center-of-Mass det. time= 395.0 min ( 1,244.2 - 849.2 )

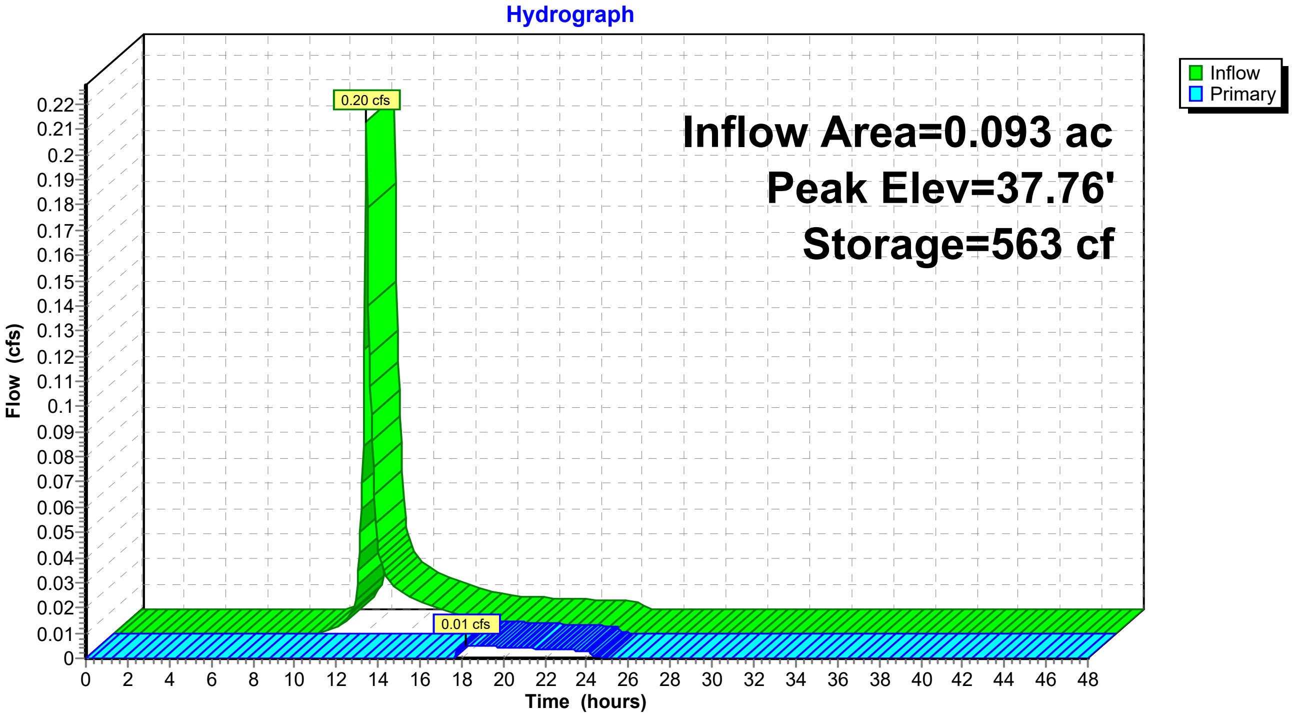
Volume      Invert    Avail.Storage   Storage Description
   #1       34.00'         1,108 cf   Custom Stage Data (Prismatic)Listed below (Recalc)

 Elevation      Surf.Area       Inc.Store       Cum.Store
    (feet)        (sq-ft)    (cubic-feet)    (cubic-feet)
     34.00             13               0               0
     35.00             55              34              34
     36.00            137              96             130
     37.00            255             196             326
     38.00            404             330             656
     39.00            500             452           1,108

Device  Routing          Invert   Outlet Devices
   #1   Primary          37.75'   2.0' long  x 10.0' breadth Broad-Crested Rectangular Weir
                                  Head (feet)  0.20  0.40  0.60  0.80  1.00  1.20  1.40  1.60
                                  Coef. (English)  2.49  2.56  2.70  2.69  2.68  2.69  2.67  2.64

Primary OutFlow  Max=0.01 cfs @ 18.23 hrs  HW=37.76'  TW=0.00'   (Dynamic Tailwater)
└─1=Broad-Crested Rectangular Weir (Weir Controls 0.01 cfs @ 0.25 fps)
```

Pond ED-D: Existing Depression



```
                      Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
                      Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
              Reach routing by Dyn-Stor-Ind method  -  Pond routing by Dyn-Stor-Ind method

SubcatchmentS-D: S-D                    Runoff Area=8,796 sf   86.85% Impervious   Runoff Depth=5.45"
                                                      Tc=6.0 min   CN=94   Runoff=1.16 cfs  0.092 af

SubcatchmentS-D-1: S-D-1                 Runoff Area=1,051 sf   0.00% Impervious   Runoff Depth=2.92"
                                                      Tc=6.0 min   CN=70   Runoff=0.08 cfs  0.006 af

SubcatchmentS-D-OS: Offsite             Runoff Area=3,198 sf   21.89% Impervious   Runoff Depth=3.51"
                                                      Tc=6.0 min   CN=76   Runoff=0.30 cfs  0.021 af

SubcatchmentS-D-OS-1: Offsite            Runoff Area=3,008 sf   0.00% Impervious   Runoff Depth=2.92"
                                                      Tc=6.0 min   CN=70   Runoff=0.23 cfs  0.017 af

Reach DP-D: Commercial Street                                              Inflow=1.45 cfs  0.123 af
                                                                          Outflow=1.45 cfs  0.123 af

Pond ED-D: Existing Depression        Peak Elev=37.78'  Storage=572 cf   Inflow=0.31 cfs  0.023 af
                                                                          Outflow=0.03 cfs  0.010 af

              Total Runoff Area = 0.369 ac   Runoff Volume = 0.136 af   Average Runoff Depth = 4.42"
                                            48.05% Pervious = 0.177 ac     51.95% Impervious = 0.191 ac
```

Summary for Subcatchment S-D: S-D

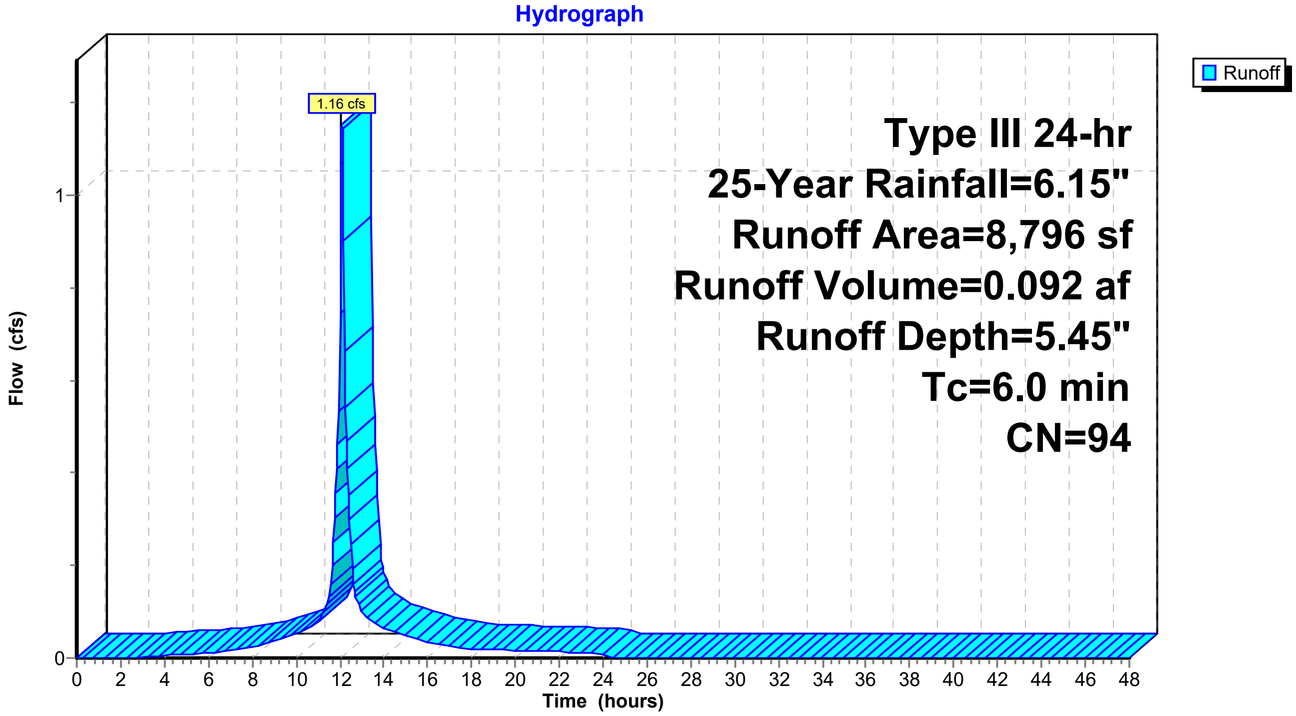
Runoff = 1.16 cfs @ 12.09 hrs, Volume= 0.092 af, Depth= 5.45"
Routed to Reach DP-D : Commercial Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.15"

	Area (sf)	CN	Description
	4,549	98	Roofs, HSG C
*	3,090	98	Impervious surfaces, HSG C
	1,157	70	Woods, Good, HSG C
	8,796	94	Weighted Average
	1,157		13.15% Pervious Area
	7,639		86.85% Impervious Area

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

Subcatchment S-D: S-D



Summary for Subcatchment S-D-1: S-D-1

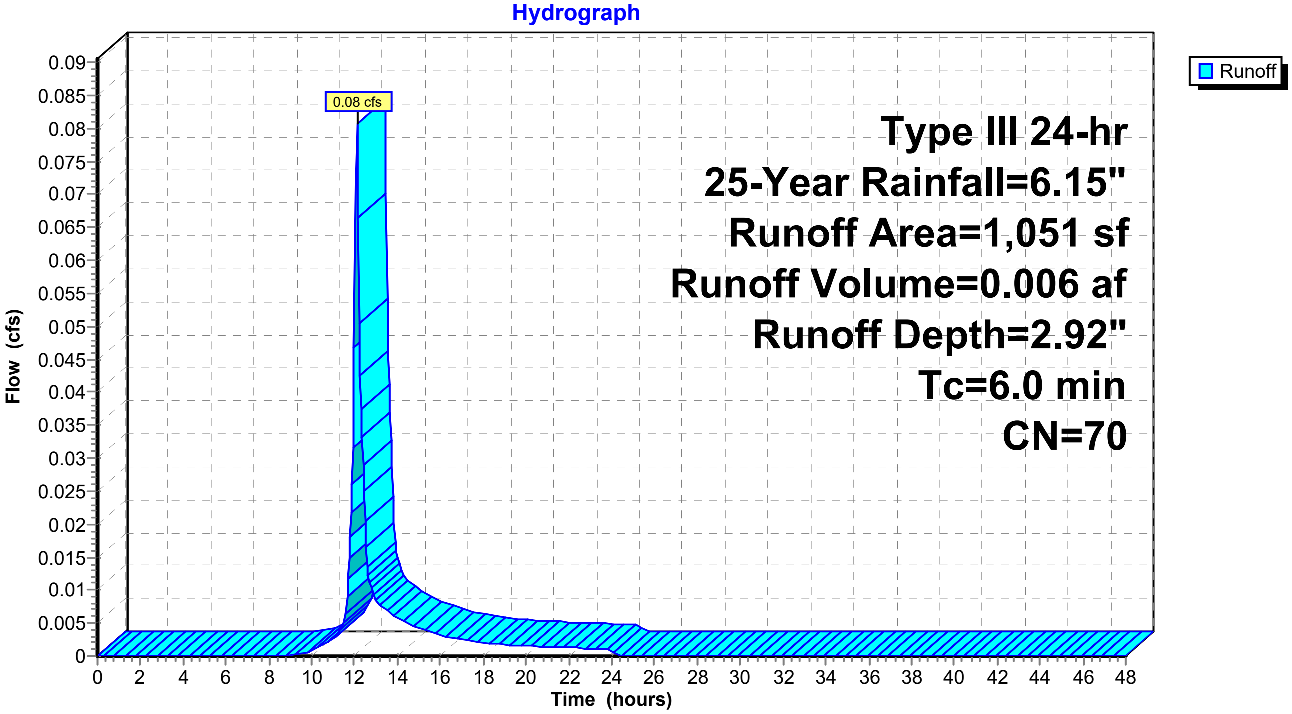
Runoff = 0.08 cfs @ 12.09 hrs, Volume= 0.006 af, Depth= 2.92"
Routed to Pond ED-D : Existing Depression

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.15"

Area (sf)	CN	Description
1,051	70	Woods, Good, HSG C
1,051		100.00% Pervious Area

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

Subcatchment S-D-1: S-D-1



Summary for Subcatchment S-D-OS: Offsite

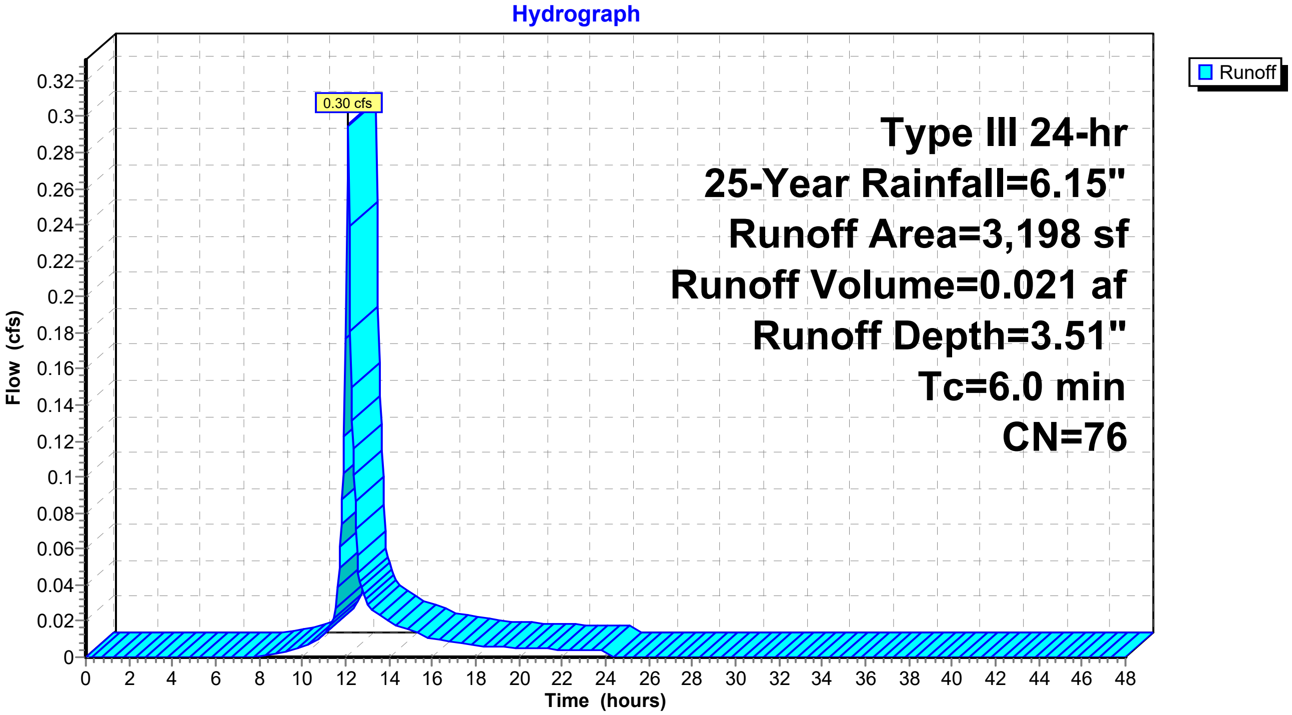
Runoff = 0.30 cfs @ 12.09 hrs, Volume= 0.021 af, Depth= 3.51"
Routed to Reach DP-D : Commercial Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.15"

	Area (sf)	CN	Description
*	700	98	Roofs, HSG C (OFFSITE)
*	2,498	70	Woods, Good, HSG C (OFFSITE)
	3,198	76	Weighted Average
	2,498		78.11% Pervious Area
	700		21.89% Impervious Area

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

Subcatchment S-D-OS: Offsite



Summary for Subcatchment S-D-OS-1: Offsite

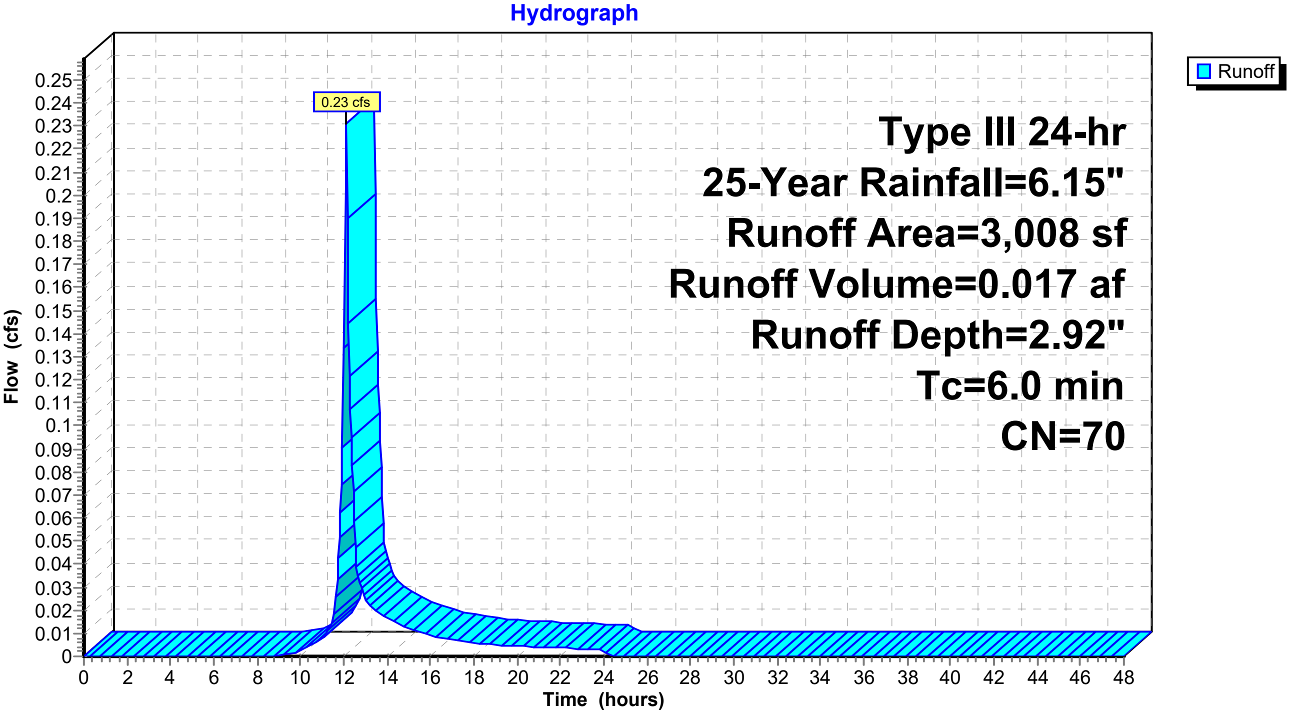
Runoff = 0.23 cfs @ 12.09 hrs, Volume= 0.017 af, Depth= 2.92"
Routed to Pond ED-D : Existing Depression

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.15"

	Area (sf)	CN	Description
*	3,008	70	Woods, Good, HSG C (OFFSITE)
	3,008		100.00% Pervious Area

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

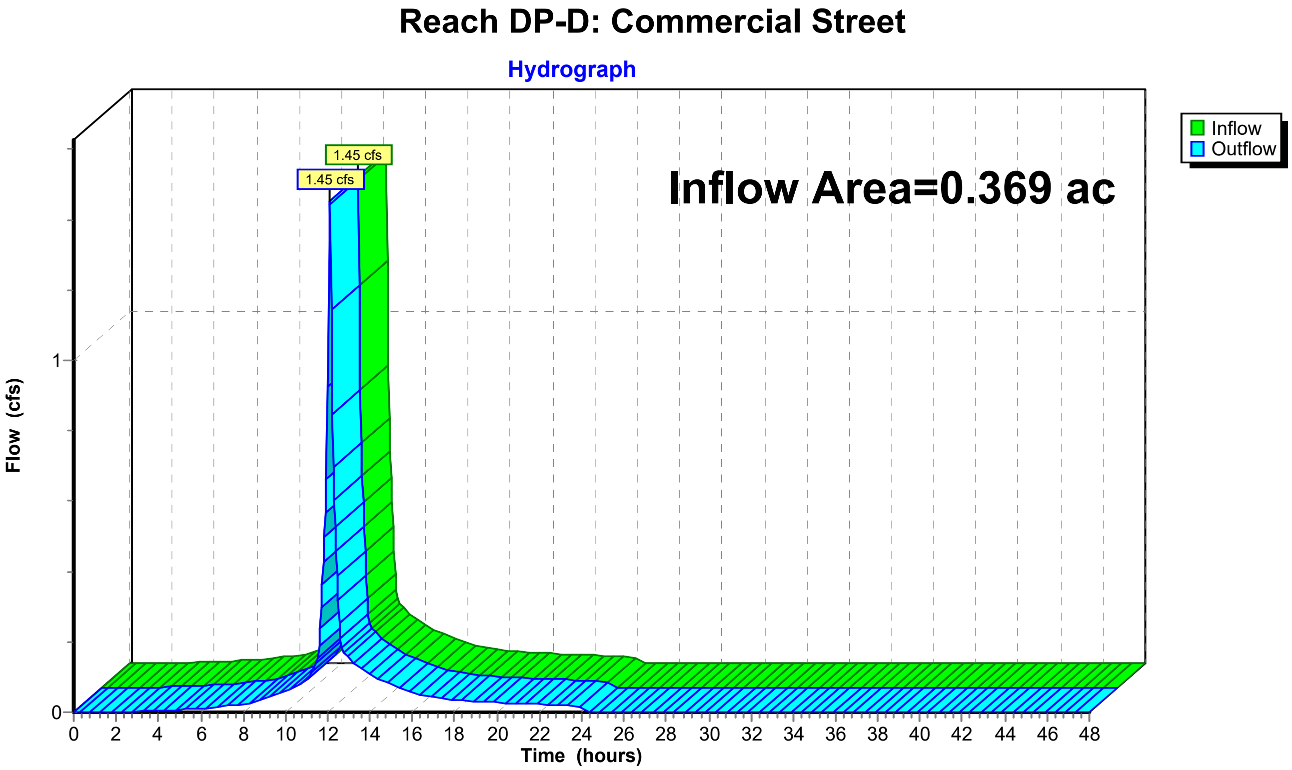
Subcatchment S-D-OS-1: Offsite



Summary for Reach DP-D: Commercial Street

Inflow Area = 0.369 ac, 51.95% Impervious, Inflow Depth = 4.00" for 25-Year event
Inflow = 1.45 cfs @ 12.09 hrs, Volume= 0.123 af
Outflow = 1.45 cfs @ 12.09 hrs, Volume= 0.123 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs



Summary for Pond ED-D: Existing Depression

Inflow Area = 0.093 ac, 0.00% Impervious, Inflow Depth = 2.92" for 25-Year event
Inflow = 0.31 cfs @ 12.09 hrs, Volume= 0.023 af
Outflow = 0.03 cfs @ 13.07 hrs, Volume= 0.010 af, Atten= 90%, Lag= 58.7 min
Primary = 0.03 cfs @ 13.07 hrs, Volume= 0.010 af
Routed to Reach DP-D : Commercial Street

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 37.78' @ 13.07 hrs Surf.Area= 372 sf Storage= 572 cf

Plug-Flow detention time= 282.7 min calculated for 0.010 af (43% of inflow)
Center-of-Mass det. time= 158.7 min (995.7 - 837.0)

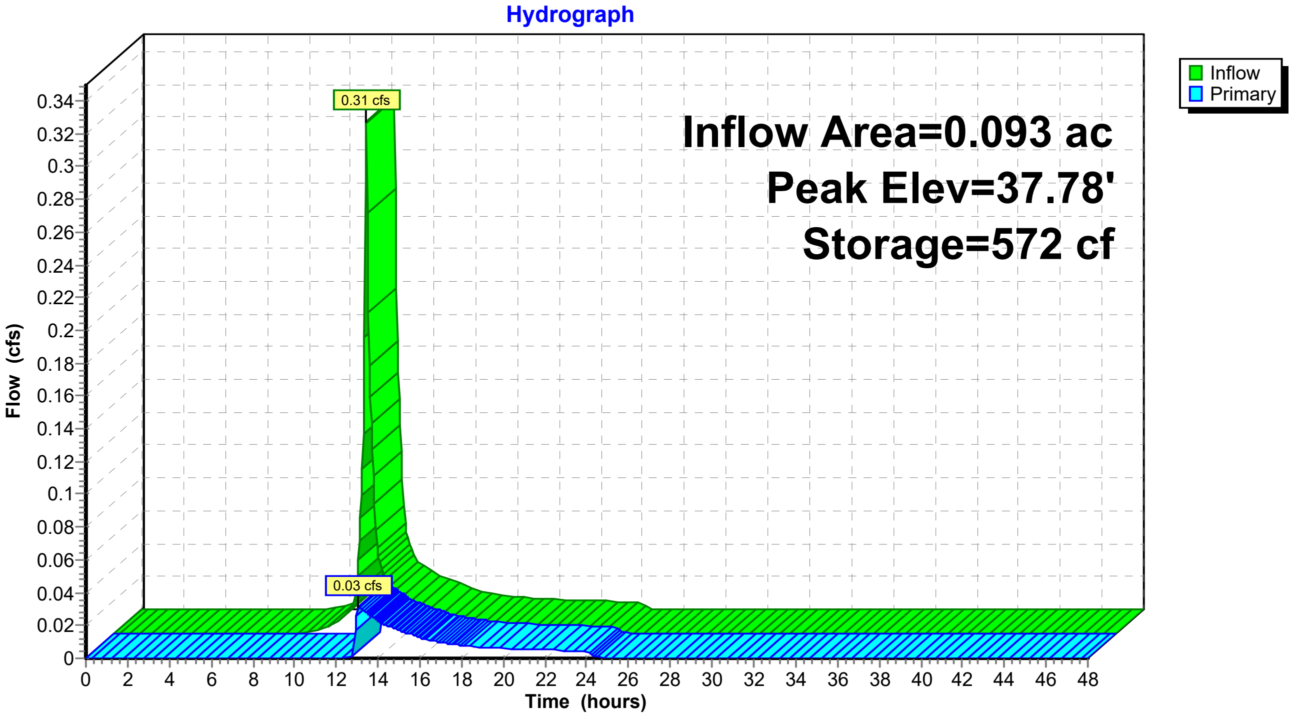
Volume	Invert	Avail.Storage	Storage Description
#1	34.00'	1,108 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
34.00	13	0	0
35.00	55	34	34
36.00	137	96	130
37.00	255	196	326
38.00	404	330	656
39.00	500	452	1,108

Device	Routing	Invert	Outlet Devices
#1	Primary	37.75'	**2.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=0.03 cfs @ 13.07 hrs HW=37.78' TW=0.00' (Dynamic Tailwater)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 0.03 cfs @ 0.46 fps)

Pond ED-D: Existing Depression



Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment S-D: S-D Runoff Area=8,796 sf 86.85% Impervious Runoff Depth=8.08"
Tc=6.0 min CN=94 Runoff=1.68 cfs 0.136 af

Subcatchment S-D-1: S-D-1 Runoff Area=1,051 sf 0.00% Impervious Runoff Depth=5.16"
Tc=6.0 min CN=70 Runoff=0.14 cfs 0.010 af

Subcatchment S-D-OS: Offsite Runoff Area=3,198 sf 21.89% Impervious Runoff Depth=5.89"
Tc=6.0 min CN=76 Runoff=0.49 cfs 0.036 af

Subcatchment S-D-OS-1: Offsite Runoff Area=3,008 sf 0.00% Impervious Runoff Depth=5.16"
Tc=6.0 min CN=70 Runoff=0.41 cfs 0.030 af

Reach DP-D: Commercial Street Inflow=2.15 cfs 0.199 af
Outflow=2.15 cfs 0.199 af

Pond ED-D: Existing Depression Peak Elev=37.93' Storage=628 cf Inflow=0.55 cfs 0.040 af
Outflow=0.38 cfs 0.027 af

Total Runoff Area = 0.369 ac Runoff Volume = 0.212 af Average Runoff Depth = 6.90"
48.05% Pervious = 0.177 ac 51.95% Impervious = 0.191 ac

Summary for Subcatchment S-D: S-D

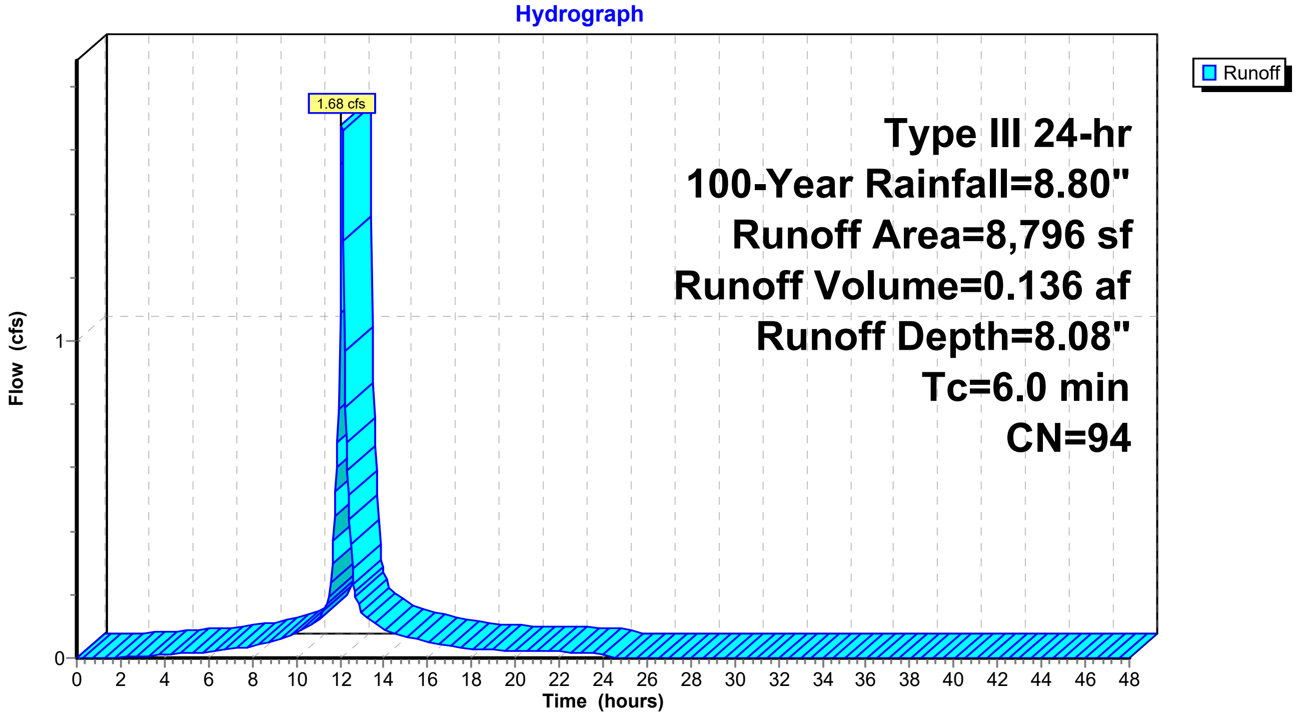
Runoff = 1.68 cfs @ 12.09 hrs, Volume= 0.136 af, Depth= 8.08"
Routed to Reach DP-D : Commercial Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.80"

	Area (sf)	CN	Description
	4,549	98	Roofs, HSG C
*	3,090	98	Impervious surfaces, HSG C
	1,157	70	Woods, Good, HSG C
	8,796	94	Weighted Average
	1,157		13.15% Pervious Area
	7,639		86.85% Impervious Area

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

Subcatchment S-D: S-D



Summary for Subcatchment S-D-1: S-D-1

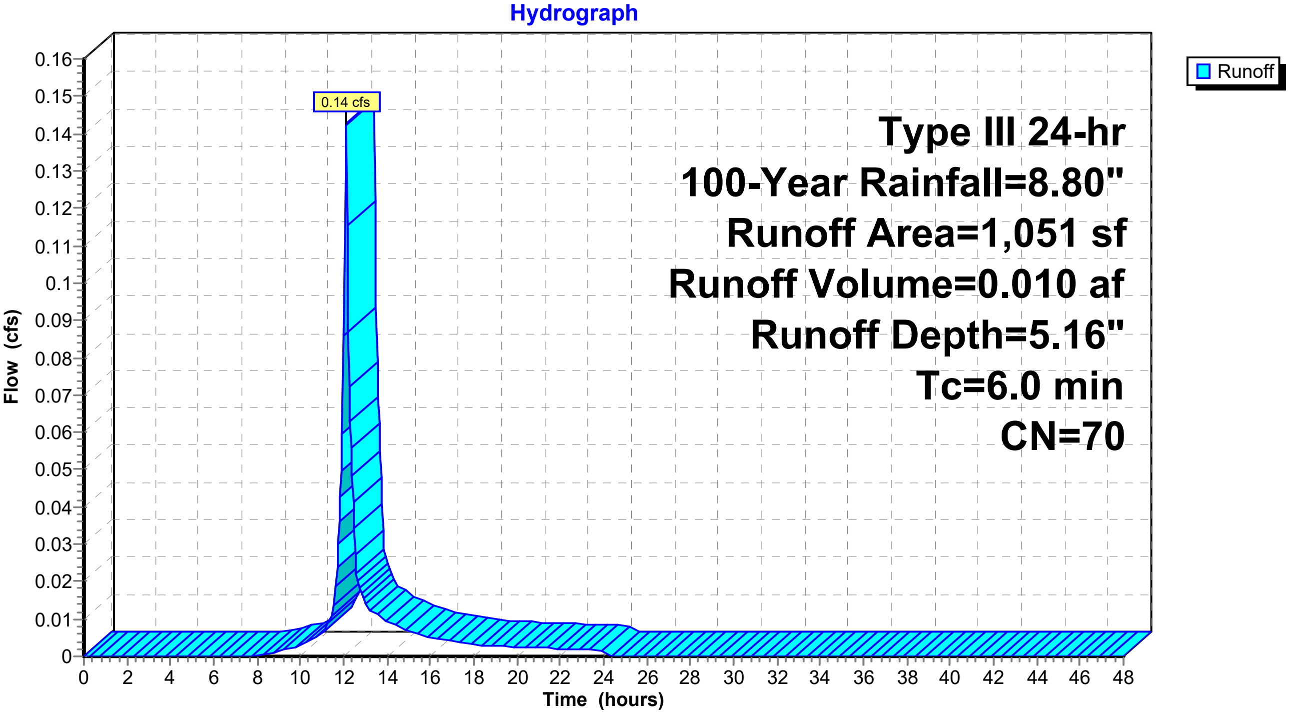
```
Runoff      =        0.14 cfs @   12.09 hrs,  Volume=           0.010 af,  Depth=  5.16"
    Routed to Pond ED-D : Existing Depression
```

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.80"

Area (sf)	CN	Description
1,051	70	Woods, Good, HSG C
1,051		100.00% Pervious Area

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

Subcatchment S-D-1: S-D-1



Summary for Subcatchment S-D-OS: Offsite

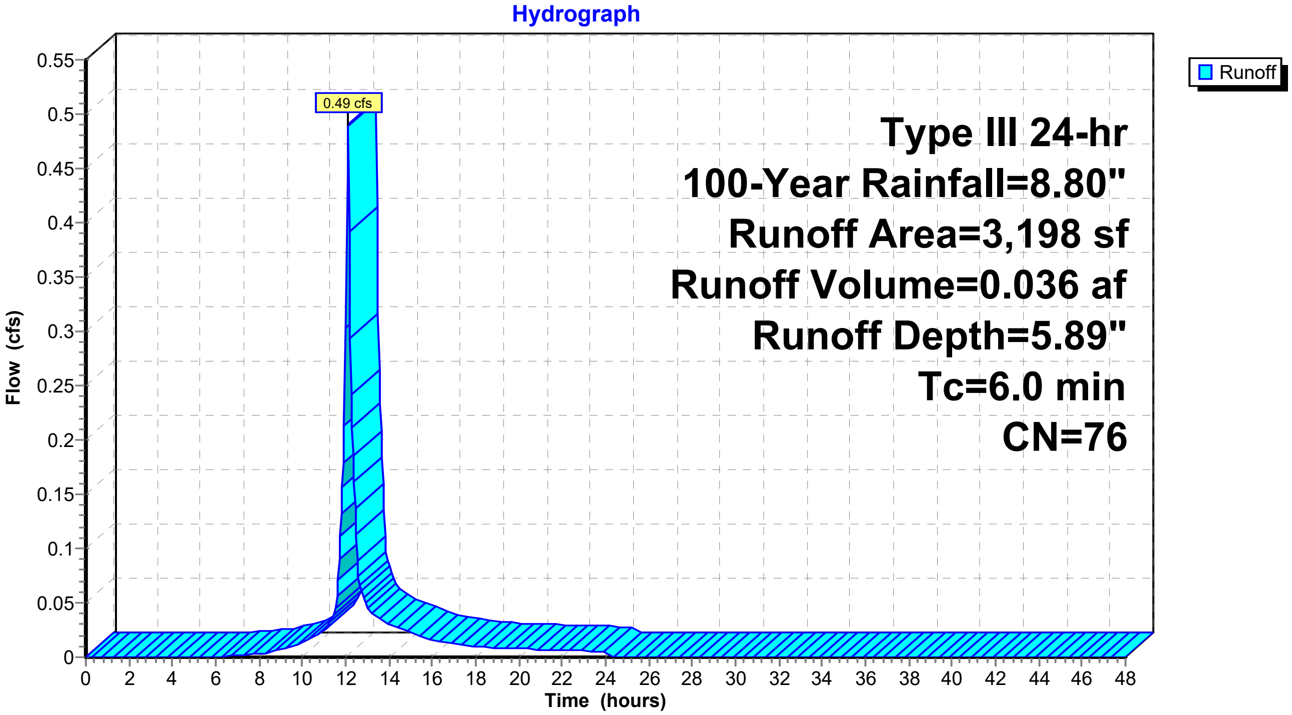
Runoff = 0.49 cfs @ 12.09 hrs, Volume= 0.036 af, Depth= 5.89"
Routed to Reach DP-D : Commercial Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.80"

	Area (sf)	CN	Description
*	700	98	Roofs, HSG C (OFFSITE)
*	2,498	70	Woods, Good, HSG C (OFFSITE)
	3,198	76	Weighted Average
	2,498		78.11% Pervious Area
	700		21.89% Impervious Area

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

Subcatchment S-D-OS: Offsite



Summary for Subcatchment S-D-OS-1: Offsite

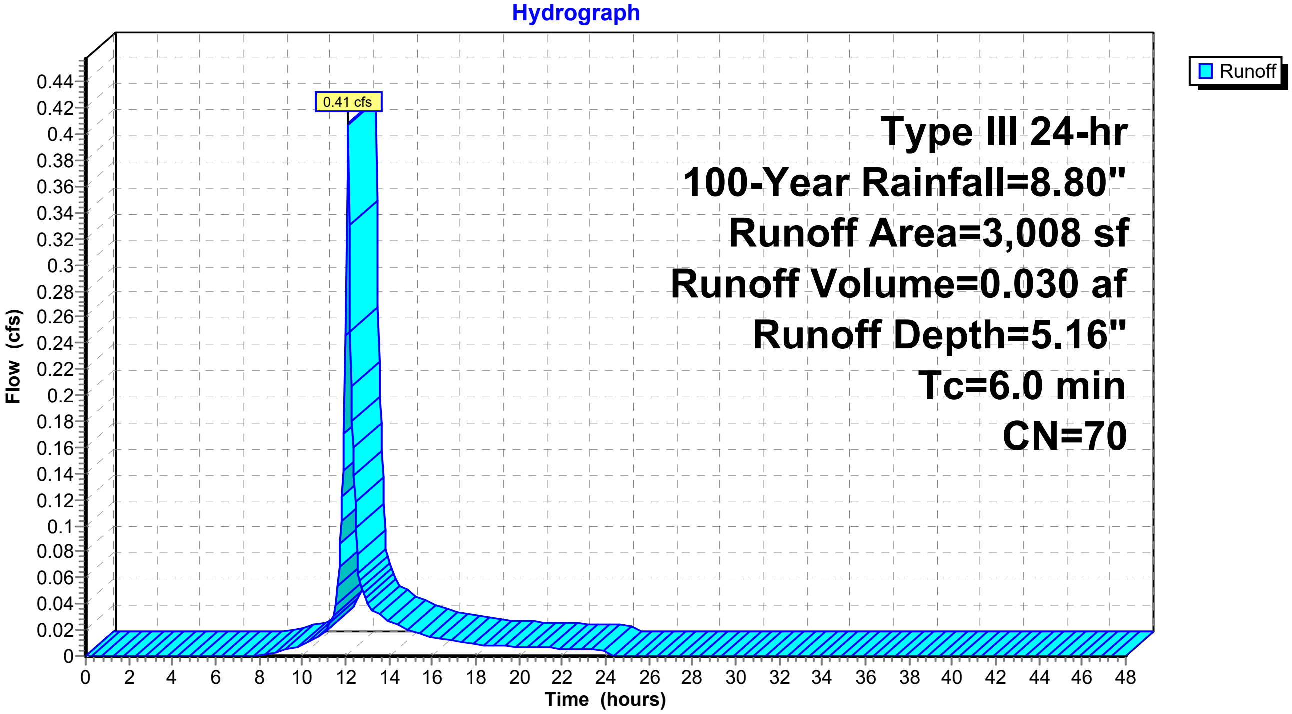
Runoff = 0.41 cfs @ 12.09 hrs, Volume= 0.030 af, Depth= 5.16"
Routed to Pond ED-D : Existing Depression

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.80"

	Area (sf)	CN	Description
*	3,008	70	Woods, Good, HSG C (OFFSITE)
	3,008		100.00% Pervious Area

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

Subcatchment S-D-OS-1: Offsite

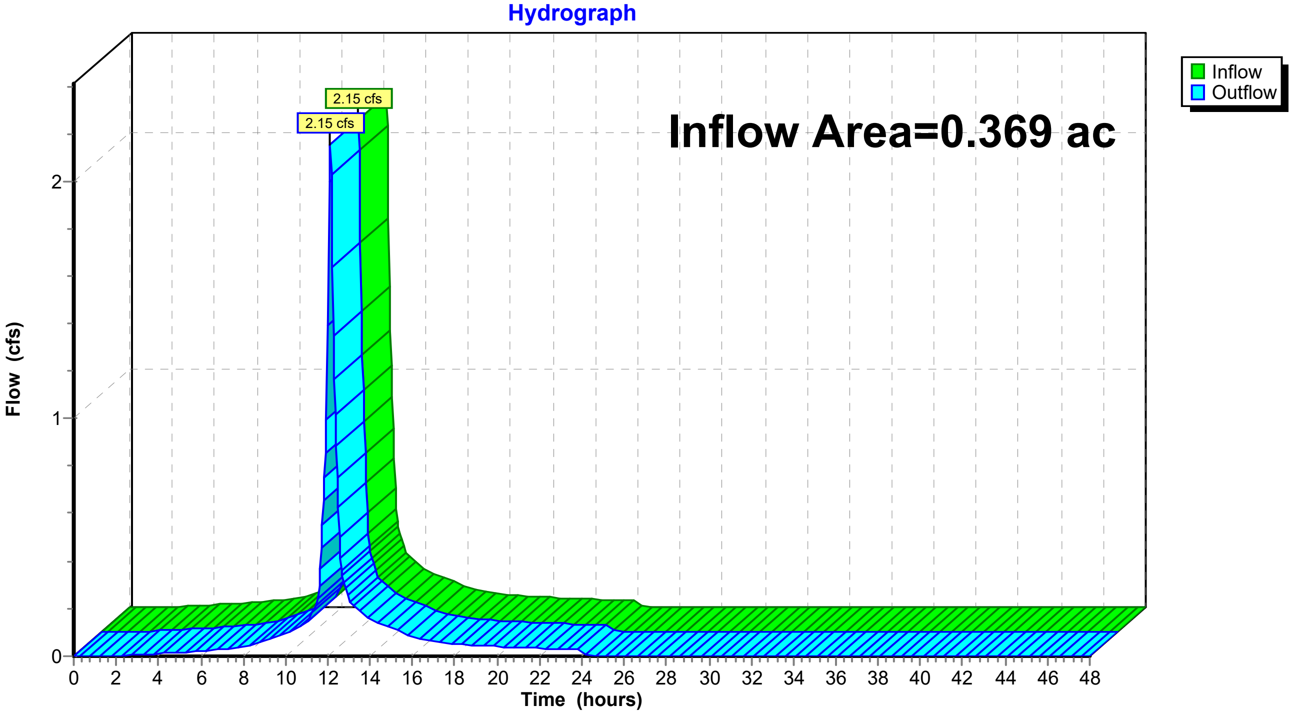


Summary for Reach DP-D: Commercial Street

Inflow Area =	0.369 ac,	51.95% Impervious,	Inflow Depth = 6.49"	for 100-Year event	
Inflow =	2.15 cfs @	12.10 hrs,	Volume=	0.199 af	
Outflow =	2.15 cfs @	12.10 hrs,	Volume=	0.199 af,	Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Reach DP-D: Commercial Street



Summary for Pond ED-D: Existing Depression

Inflow Area = 0.093 ac, 0.00% Impervious, Inflow Depth = 5.16" for 100-Year event
Inflow = 0.55 cfs @ 12.09 hrs, Volume= 0.040 af
Outflow = 0.38 cfs @ 12.20 hrs, Volume= 0.027 af, Atten= 31%, Lag= 6.3 min
Primary = 0.38 cfs @ 12.20 hrs, Volume= 0.027 af
Routed to Reach DP-D : Commercial Street

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 37.93' @ 12.20 hrs Surf.Area= 394 sf Storage= 628 cf

Plug-Flow detention time= 166.0 min calculated for 0.027 af (68% of inflow)
Center-of-Mass det. time= 67.2 min (887.9 - 820.7)

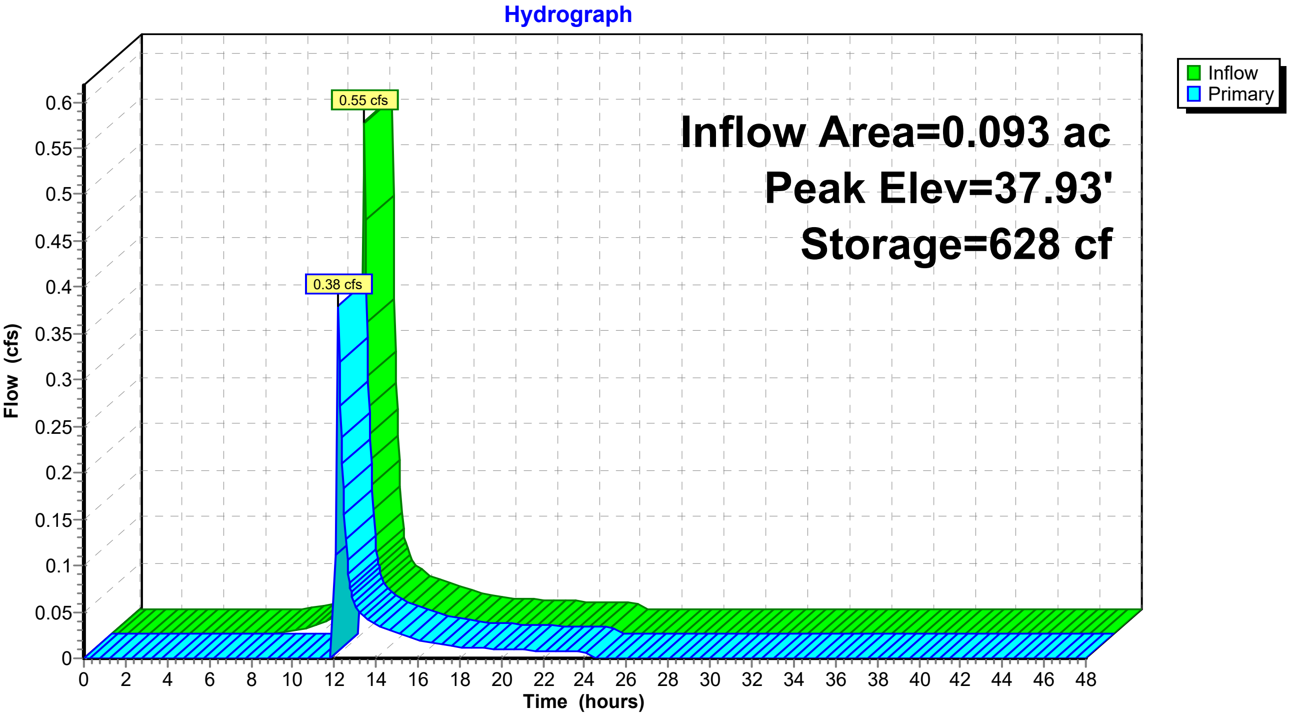
Volume	Invert	Avail.Storage	Storage Description
#1	34.00'	1,108 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
34.00	13	0	0
35.00	55	34	34
36.00	137	96	130
37.00	255	196	326
38.00	404	330	656
39.00	500	452	1,108

Device	Routing	Invert	Outlet Devices
#1	Primary	37.75'	**2.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

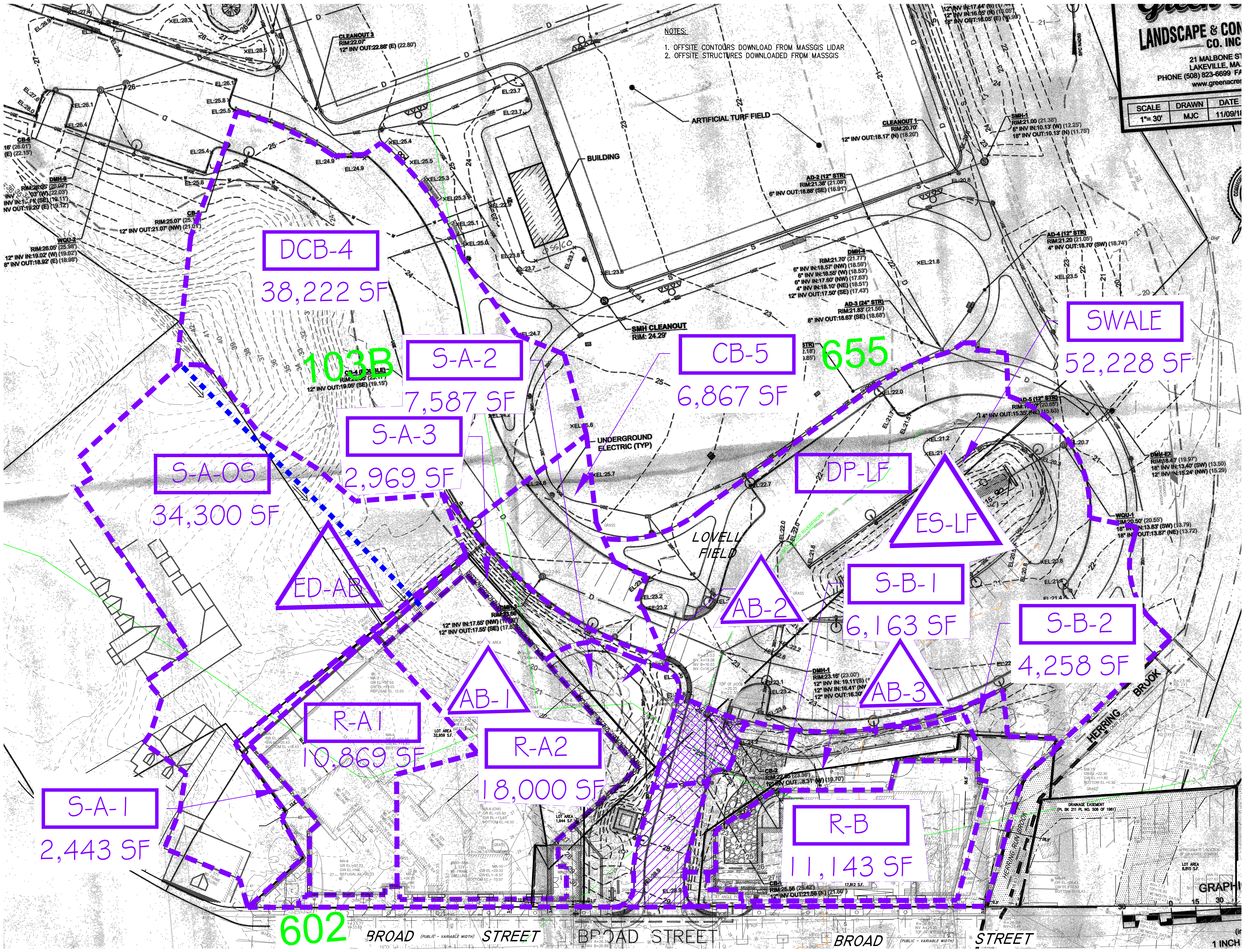
Primary OutFlow Max=0.38 cfs @ 12.20 hrs HW=37.93' TW=0.00' (Dynamic Tailwater)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 0.38 cfs @ 1.05 fps)

Pond ED-D: Existing Depression



APPENDIX B

Post-Development Condition



▨ CB-1 2,480 SF

▦ CB-2 1,943 SF

SOIL KEY

SOIL CLASSIFICATION	DESCRIPTION	HYDROLOGIC SOIL GROUP
103B	CHARLTON-HOLLIS-ROCK OUTCROP-COMPLEX, 3 TO 8 PERCENT SLOPES	A
602	URBAN LAND, 0 TO 15 PERCENT SLOPES	C ASSUMED
655	URDORTHENTS, WET SUBSTRATUM	C ASSUMED

LEGEND

⇒ - - - - -	TIME OF CONCENTRATION FLOW PATH
- - - - -	LIMIT OF WATERSHED
———	SOIL TYPE BOUNDARY

0 20 40 60

ARCHITECT
EMBARC
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AND 1409 COMMERCIAL ST LLC
1 FRANKLIN STREET, UNIT 2308
BOSTON, MA 02110
202.230.1693

CONSULTANTS

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MCKENZIE ENGINEERING GROUP
150 LONGWATER DRIVE, SUITE 101
NORWELL, MA 02061
781.792.3900

LANDSCAPE
MDLA
840 SUMMER STREET
SUITE #201A
BOSTON, MA 02127

JACKSON SQUARE
WEYMOUTH, MA

NOI PLAN REVIEW

REVISIONS

MARK	ISSUE	DATE
1	PEER REVIEW COMMENTS	11/17/23

DRAWING INFORMATION
ISSUE: NOI PLAN REVIEW
DATE: SEPTEMBER 6, 2023
PROJECT #: 22034
SCALE:

DRAWING TITLE
POST-DEVELOPMENT
WATERSHED PLANS
BUILDINGS A&B

DRAWING NUMBER
WS-3

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SOIL KEY

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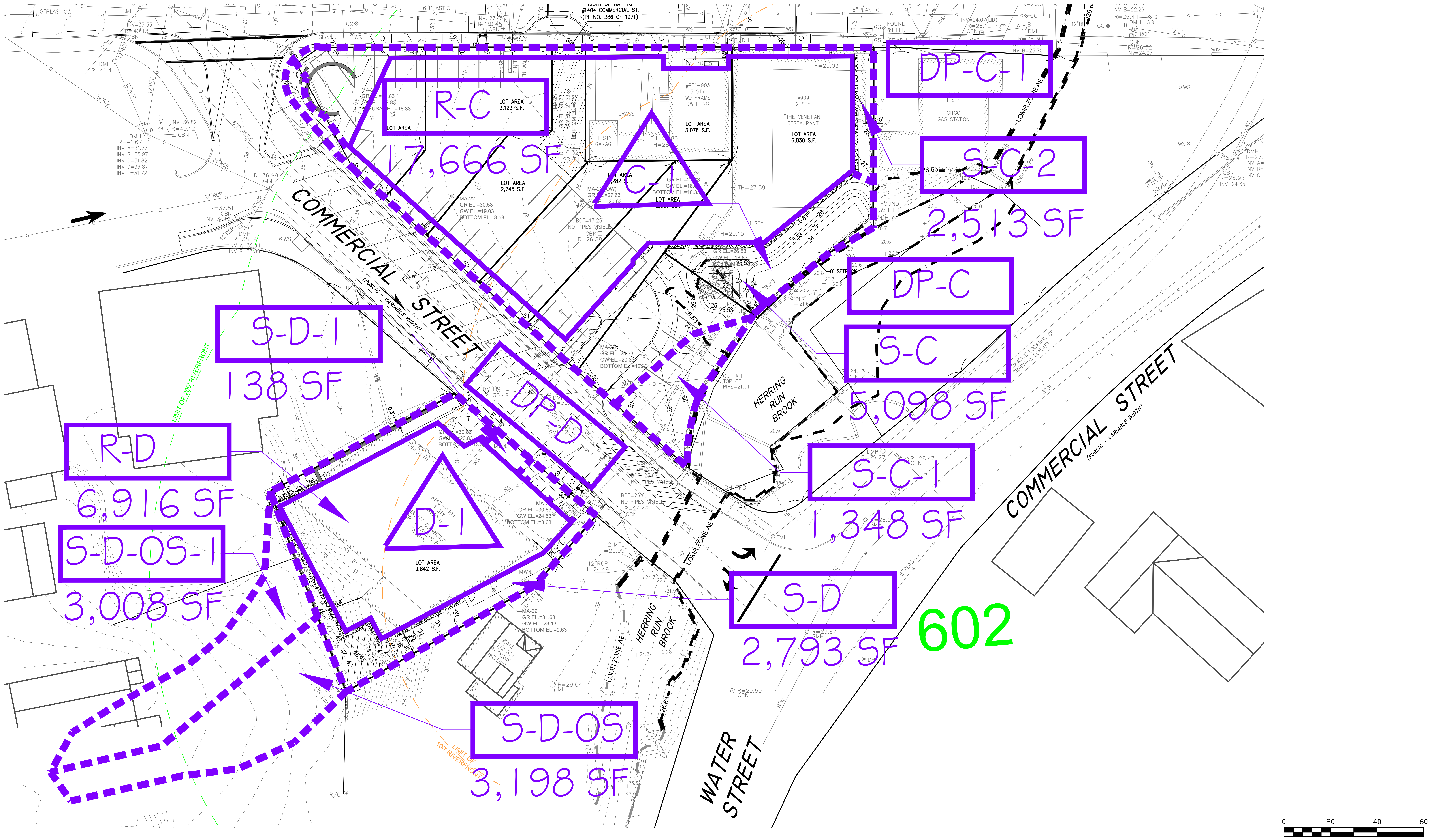
LEGEND

⇒	TIME OF CONCENTRATION FLOW PATH
▬ ▬	LIMIT OF WATERSHED
―	SOIL TYPE BOUNDARY

NOTES:

1. OFFSITE CONTOURS DOWNLOAD FROM MASSGIS LIDAR
2. OFFSITE STRUCTURES DOWNLOADED FROM MASSGIS



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REVISIONS

MARK	ISSUE	DATE
1	PEER REVIEW COMMENTS	11/17/23

DRAWING INFORMATION
ISSUE: NOI PLAN REVIEW
DATE: SEPTEMBER 6, 2023
PROJECT #: 22034
SCALE:

DRAWING TITLE
POST-DEVELOPMENT
WATERSHED PLANS
BUILDINGS C&D

DRAWING NUMBER
WS-4

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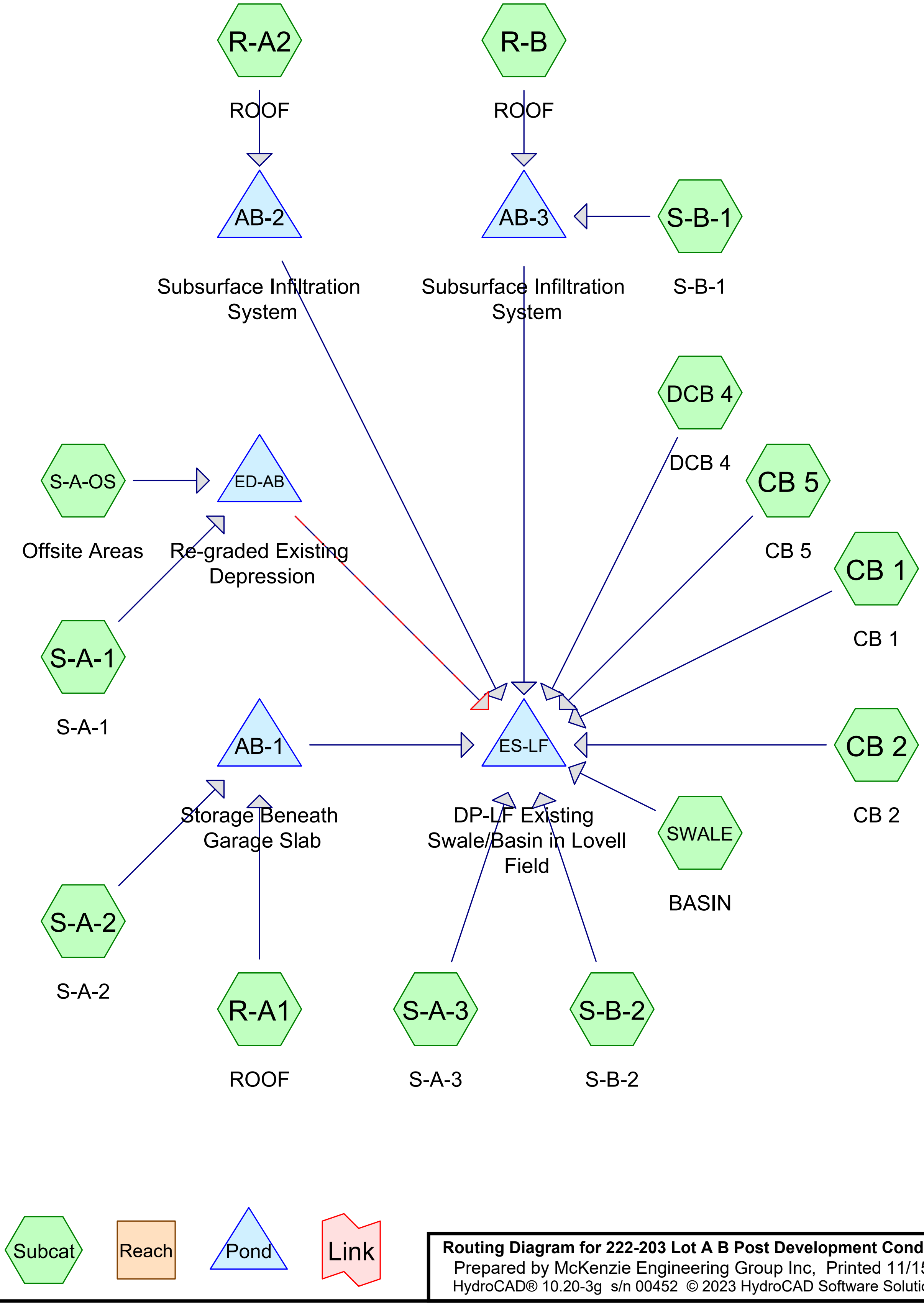
SITES A & B



Routing Diagram for 222-203 Lot A B Post Development Conditions (R2)
Prepared by McKenzie Engineering Group Inc, Printed 11/15/2023
HydroCAD® 10.20-3g s/n 00452 © 2023 HydroCAD Software Solutions LLC

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	Type III 24-hr		Default	24.00	1	3.22	2
2	10-Year	Type III 24-hr		Default	24.00	1	4.86	2
3	25-Year	Type III 24-hr		Default	24.00	1	6.15	2
4	100-Year	Type III 24-hr		Default	24.00	1	8.80	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.255	39	>75% Grass cover, Good, HSG A (OFFSITE) (S-A-OS)
0.515	74	>75% Grass cover, Good, HSG C (CB 5, SWALE)
0.009	96	Gravel surface, HSG C (S-A-1, S-B-1, S-B-2)
0.004	96	Gravel surface, HSG C (OFFSITE) (S-A-2)
0.003	96	Gravel, HSG A (S-A-3)
0.006	96	Gravel, HSG C (S-A-2, S-A-3)
0.322	98	Impervious surfaces, HSG A (DCB 4)
0.944	98	Impervious surfaces, HSG C (CB 1, CB 2, CB 5, SWALE)
0.037	98	Impervious surfaces, HSG C (OFFSITE) (S-A-2, S-A-OS)
0.014	98	Patio, HSG A (R-A1)
0.004	98	Patio, HSG C (R-A1)
0.048	98	Pavement, HSG C (S-A-2, S-B-1)
0.023	98	Pavement, HSG C (OFFSITE) (S-B-1)
0.017	39	Plantings, HSG A (S-A-1, S-A-3)
0.010	39	Plantings, HSG A (OFFSITE) (S-A-3)
0.142	74	Plantings, HSG C (S-A-1, S-A-2, S-A-3, S-B-1, S-B-2)
0.164	74	Plantings, HSG C (OFFSITE) (S-A-2, S-A-3, S-B-1, S-B-2)
0.413	98	Roof, HSG C (R-A2)
0.229	98	Roofs, HSG A (R-A1)
0.130	98	Roofs, HSG A (OFFSITE) (S-A-OS)
0.258	98	Roofs, HSG C (R-A1, R-B)
0.010	98	Sidewalk, HSG A (S-A-3)
0.005	98	Sidewalk, HSG A (OFFSITE) (S-A-3)
0.027	98	Sidewalk, HSG C (S-B-1, S-B-2)
0.020	98	Sidewalk, HSG C (OFFSITE) (S-A-3, S-B-1)
0.032	98	Sidewalk,HSG C (S-A-2)
0.000	98	Sign, HSG C (OFFSITE) (S-A-2)
0.002	98	Transformer pad, HSG C (S-A-1)
0.002	98	Transformer, HSG C (S-B-1)
0.006	98	Wall, HSG A (S-A-1)
0.006	98	Wall, HSG C (S-A-1, S-A-2, S-B-1, S-B-2)
0.001	98	Wall, HSG C (OFFSITE) (S-A-2)
0.555	30	Woods, Good, HSG A (DCB 4)
0.366	30	Woods, Good, HSG A (OFFSITE) (S-A-OS)
4.579	**76**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
1.923	HSG A	DCB 4, R-A1, S-A-1, S-A-3, S-A-OS
0.000	HSG B	
2.656	HSG C	CB 1, CB 2, CB 5, R-A1, R-A2, R-B, S-A-1, S-A-2, S-A-3, S-A-OS, S-B-1, S-B-2, SWALE
0.000	HSG D	
0.000	Other	
4.579		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.255	0.000	0.515	0.000	0.000	0.769	>75% Grass cover, Good	CB 5, S-A-OS, SWALE
0.003	0.000	0.006	0.000	0.000	0.010	Gravel	S-A-2, S-A-3
0.000	0.000	0.013	0.000	0.000	0.013	Gravel surface	S-A-1, S-A-2, S-B-1, S-B-2
0.322	0.000	0.981	0.000	0.000	1.303	Impervious surfaces	CB 1, CB 2, CB 5, DCB 4, S-A-2, S-A-OS, SWALE
0.014	0.000	0.004	0.000	0.000	0.019	Patio	R-A1
0.000	0.000	0.071	0.000	0.000	0.071	Pavement	S-A-2, S-B-1
0.028	0.000	0.306	0.000	0.000	0.333	Plantings	S-A-1, S-A-2, S-A-3, S-B-1, S-B-2
0.000	0.000	0.413	0.000	0.000	0.413	Roof	R-A2
0.359	0.000	0.258	0.000	0.000	0.617	Roofs	R-A1, R-B, S-A-OS
0.015	0.000	0.079	0.000	0.000	0.094	Sidewalk	S-A-2, S-A-3, S-B-1, S-B-2
0.000	0.000	0.000	0.000	0.000	0.000	Sign	S-A-2
0.000	0.000	0.002	0.000	0.000	0.002	Transformer	S-B-1
0.000	0.000	0.002	0.000	0.000	0.002	Transformer pad	S-A-1
0.006	0.000	0.008	0.000	0.000	0.013	Wall	S-A-1, S-A-2, S-B-1, S-B-2
0.921	0.000	0.000	0.000	0.000	0.921	Woods, Good	DCB 4, S-A-OS

Ground Covers (all nodes) (continued)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
1.923	**0.000**	**2.656**	**0.000**	**0.000**	**4.579**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)	Node Name
1	AB-1	16.75	16.44	48.0	0.0065	0.013	0.0	12.0	0.0	
2	AB-2	19.08	19.08	3.0	0.0000	0.013	0.0	12.0	0.0	
3	AB-3	19.83	19.61	22.0	0.0100	0.013	0.0	12.0	0.0	
4	ED-AB	19.50	18.58	27.0	0.0341	0.013	0.0	12.0	0.0	
5	ES-LF	13.87	13.45	39.0	0.0108	0.013	0.0	18.0	0.0	

```
                     Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
                     Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
          Reach routing by Dyn-Stor-Ind method  -  Pond routing by Dyn-Stor-Ind method

SubcatchmentCB 1: CB 1                 Runoff Area=2,480 sf   100.00% Impervious   Runoff Depth=2.99"
                                                  Tc=6.0 min   CN=98   Runoff=0.17 cfs  0.014 af

SubcatchmentCB 2: CB 2                 Runoff Area=1,943 sf   100.00% Impervious   Runoff Depth=2.99"
                                                  Tc=6.0 min   CN=98   Runoff=0.14 cfs  0.011 af

SubcatchmentCB 5: CB 5                  Runoff Area=6,867 sf   82.76% Impervious   Runoff Depth=2.56"
                                                  Tc=6.0 min   CN=94   Runoff=0.44 cfs  0.034 af

SubcatchmentDCB 4: DCB 4               Runoff Area=38,222 sf   36.71% Impervious   Runoff Depth=0.26"
                                                  Tc=6.0 min   CN=55   Runoff=0.09 cfs  0.019 af

SubcatchmentR-A1: ROOF                Runoff Area=10,869 sf   100.00% Impervious   Runoff Depth=2.99"
                                                  Tc=6.0 min   CN=98   Runoff=0.76 cfs  0.062 af

SubcatchmentR-A2: ROOF                Runoff Area=18,000 sf   100.00% Impervious   Runoff Depth=2.99"
                                                  Tc=6.0 min   CN=98   Runoff=1.26 cfs  0.103 af

SubcatchmentR-B: ROOF                 Runoff Area=11,143 sf   100.00% Impervious   Runoff Depth=2.99"
                                                  Tc=6.0 min   CN=98   Runoff=0.78 cfs  0.064 af

SubcatchmentS-A-1: S-A-1                Runoff Area=2,443 sf   21.29% Impervious   Runoff Depth=1.00"
                                                  Tc=6.0 min   CN=73   Runoff=0.06 cfs  0.005 af

SubcatchmentS-A-2: S-A-2                Runoff Area=7,587 sf   44.19% Impervious   Runoff Depth=1.85"
                                                  Tc=6.0 min   CN=86   Runoff=0.37 cfs  0.027 af

SubcatchmentS-A-3: S-A-3                Runoff Area=2,969 sf   43.45% Impervious   Runoff Depth=1.29"
                                                  Tc=6.0 min   CN=78   Runoff=0.10 cfs  0.007 af

SubcatchmentS-A-OS: Offsite Areas      Runoff Area=34,300 sf   21.18% Impervious   Runoff Depth=0.08"
                                      Flow Length=213'   Tc=9.4 min   CN=47   Runoff=0.01 cfs  0.005 af

SubcatchmentS-B-1: S-B-1                Runoff Area=6,163 sf   29.13% Impervious   Runoff Depth=1.48"
                                                  Tc=6.0 min   CN=81   Runoff=0.24 cfs  0.018 af

SubcatchmentS-B-2: S-B-2                Runoff Area=4,258 sf   22.85% Impervious   Runoff Depth=1.42"
                                                  Tc=6.0 min   CN=80   Runoff=0.16 cfs  0.012 af

SubcatchmentSWALE: BASIN               Runoff Area=52,228 sf   59.35% Impervious   Runoff Depth=2.01"
                                                  Tc=6.0 min   CN=88   Runoff=2.76 cfs  0.201 af

Pond AB-1: Storage Beneath Garage Slab    Peak Elev=17.34'  Storage=1,397 cf   Inflow=1.13 cfs  0.089 af
                                                                              Outflow=0.16 cfs  0.089 af

Pond AB-2: Subsurface Infiltration System    Peak Elev=19.45'  Storage=1,307 cf   Inflow=1.26 cfs  0.103 af
                          Discarded=0.17 cfs  0.103 af   Primary=0.00 cfs  0.000 af   Outflow=0.17 cfs  0.103 af
```

Pond AB-3: Subsurface Infiltration System Peak Elev=20.06' Storage=808 cf Inflow=1.02 cfs 0.081 af
Discarded=0.14 cfs 0.071 af Primary=0.20 cfs 0.010 af Outflow=0.34 cfs 0.081 af

Pond ED-AB: Re-graded Existing Depression Peak Elev=19.74' Storage=39 cf Inflow=0.06 cfs 0.010 af
Primary=0.02 cfs 0.010 af Secondary=0.00 cfs 0.000 af Outflow=0.02 cfs 0.010 af

Pond ES-LF: DP-LF Existing Swale/Basin in Peak Elev=14.87' Storage=185 cf Inflow=3.97 cfs 0.407 af
18.0" Round Culvert n=0.013 L=39.0' S=0.0108 '/' Outflow=3.88 cfs 0.407 af

Total Runoff Area = 4.579 ac Runoff Volume = 0.581 af Average Runoff Depth = 1.52"
44.68% Pervious = 2.046 ac 55.32% Impervious = 2.533 ac

Summary for Subcatchment CB 1: CB 1

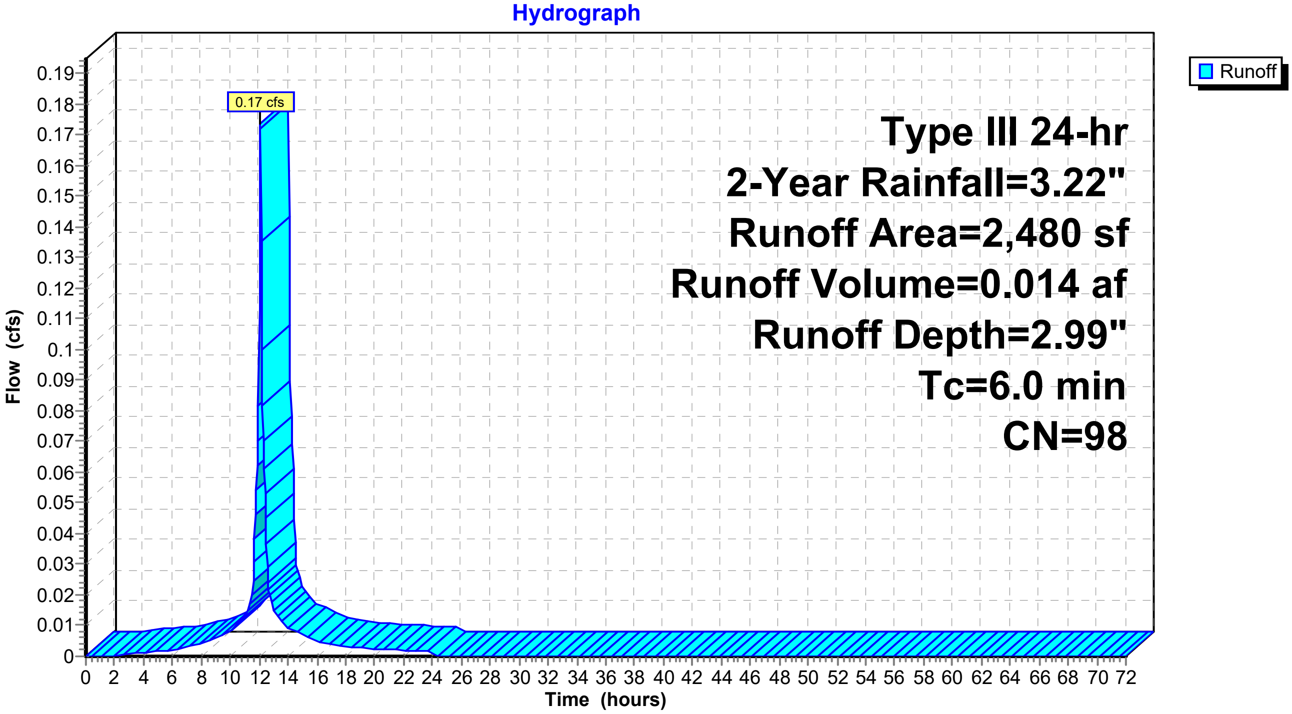
Runoff = 0.17 cfs @ 12.09 hrs, Volume= 0.014 af, Depth= 2.99"
Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.22"

	Area (sf)	CN	Description
*	2,480	98	Impervious surfaces, HSG C
	2,480		100.00% Impervious Area

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

Subcatchment CB 1: CB 1



Summary for Subcatchment CB 2: CB 2

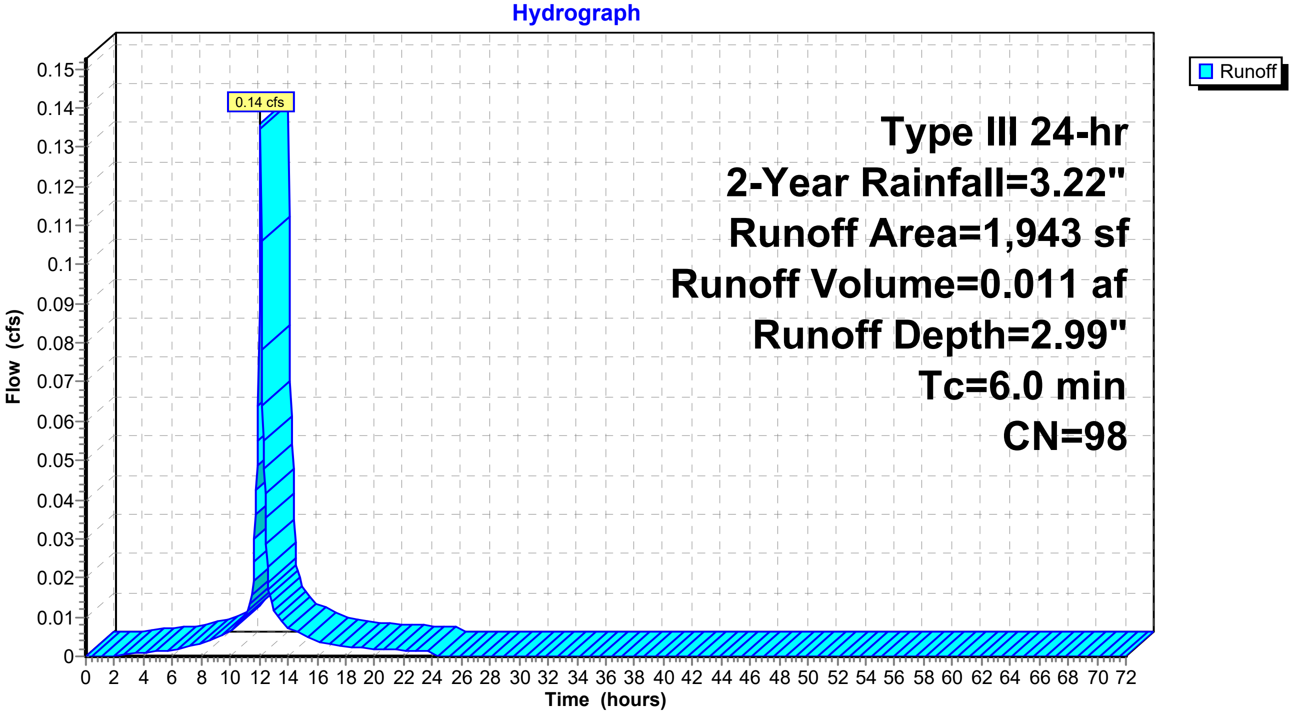
Runoff = 0.14 cfs @ 12.09 hrs, Volume= 0.011 af, Depth= 2.99"
Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.22"

	Area (sf)	CN	Description
*	1,943	98	Impervious surfaces, HSG C
	1,943		100.00% Impervious Area

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

Subcatchment CB 2: CB 2



Summary for Subcatchment CB 5: CB 5

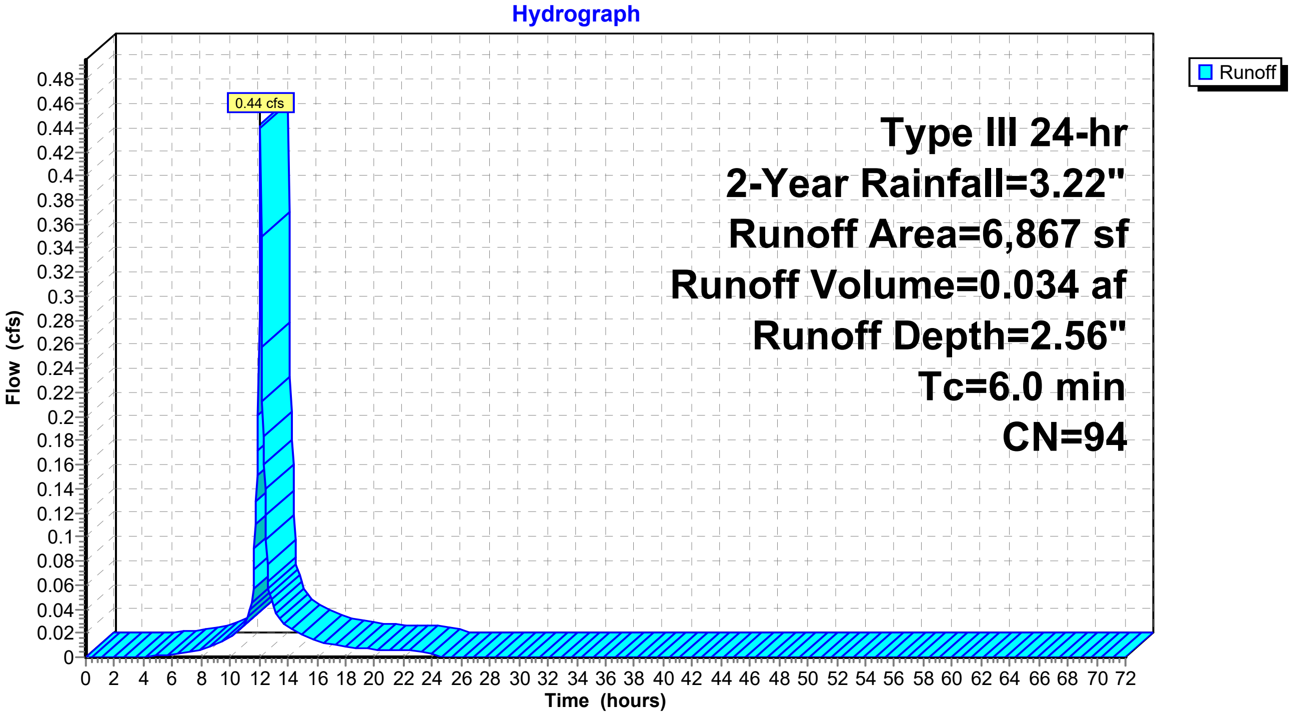
Runoff = 0.44 cfs @ 12.09 hrs, Volume= 0.034 af, Depth= 2.56"
Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.22"

	Area (sf)	CN	Description
*	5,683	98	Impervious surfaces, HSG C
	1,184	74	>75% Grass cover, Good, HSG C
	6,867	94	Weighted Average
	1,184		17.24% Pervious Area
	5,683		82.76% Impervious Area

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

Subcatchment CB 5: CB 5



Summary for Subcatchment DCB 4: DCB 4

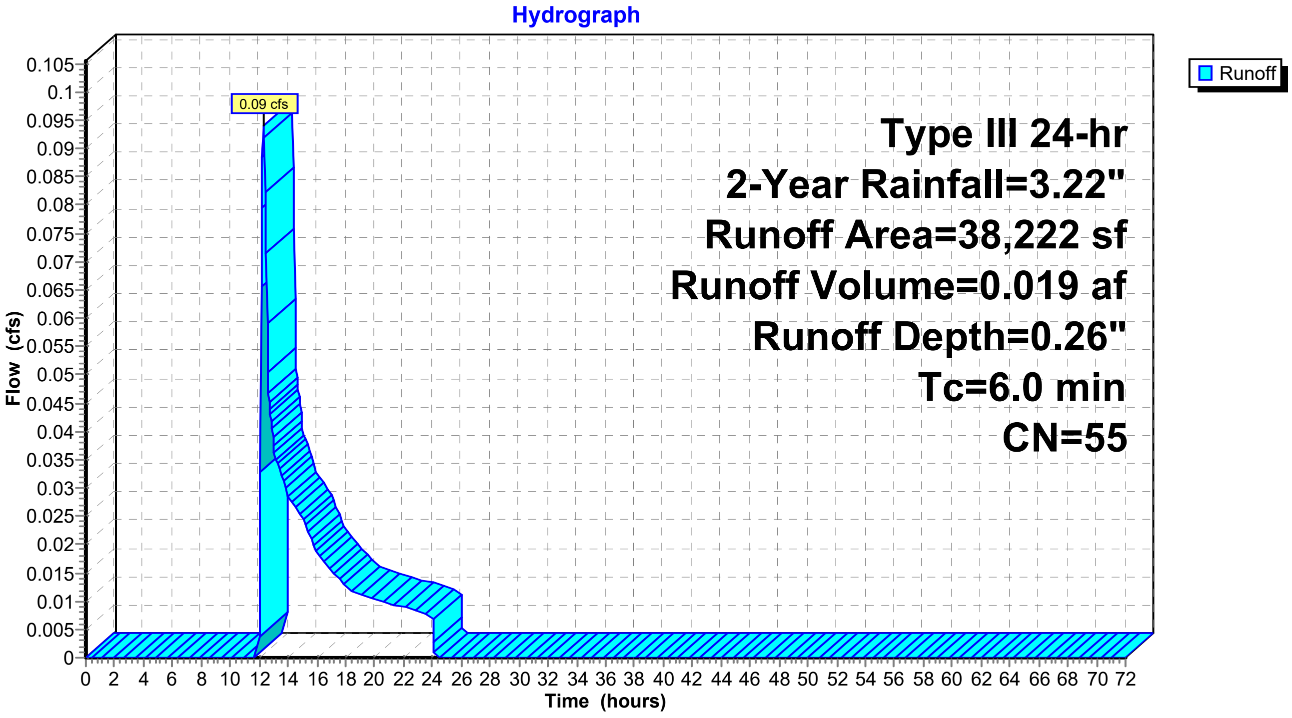
Runoff = 0.09 cfs @ 12.33 hrs, Volume= 0.019 af, Depth= 0.26"
Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.22"

	Area (sf)	CN	Description
*	14,030	98	Impervious surfaces, HSG A
	24,192	30	Woods, Good, HSG A
	38,222	55	Weighted Average
	24,192		63.29% Pervious Area
	14,030		36.71% Impervious Area

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

Subcatchment DCB 4: DCB 4



Summary for Subcatchment R-A1: ROOF

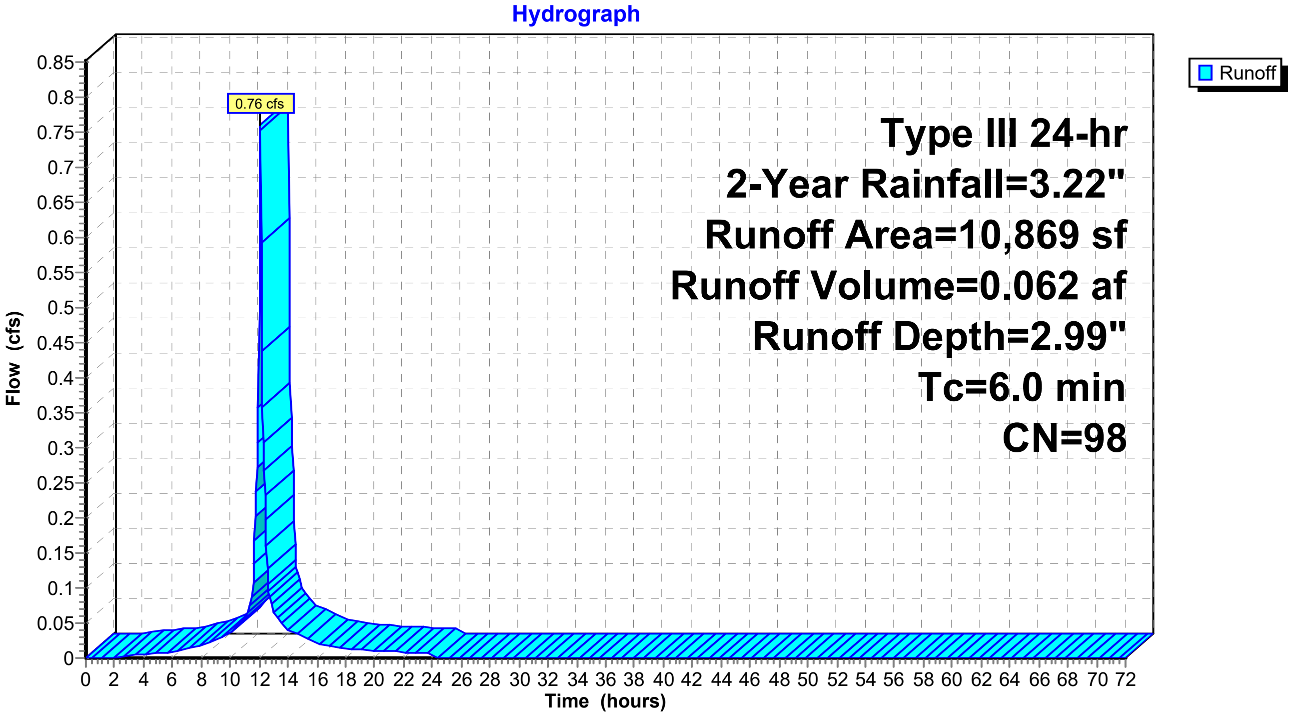
Runoff = 0.76 cfs @ 12.09 hrs, Volume= 0.062 af, Depth= 2.99"
Routed to Pond AB-1 : Storage Beneath Garage Slab

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.22"

	Area (sf)	CN	Description
	9,976	98	Roofs, HSG A
*	630	98	Patio, HSG A
*	74	98	Roofs, HSG C
*	189	98	Patio, HSG C
	10,869	98	Weighted Average
	10,869		100.00% Impervious Area

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

Subcatchment R-A1: ROOF



Summary for Subcatchment R-A2: ROOF

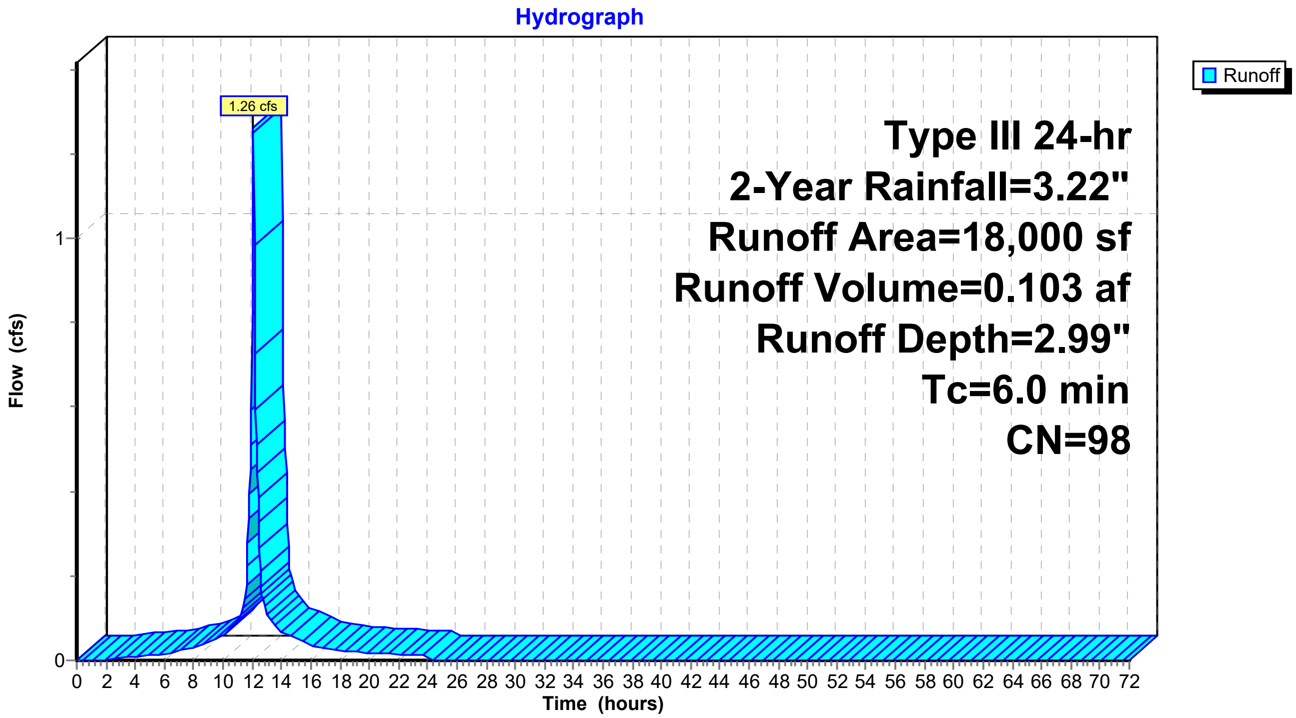
Runoff = 1.26 cfs @ 12.09 hrs, Volume= 0.103 af, Depth= 2.99"
Routed to Pond AB-2 : Subsurface Infiltration System

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.22"

	Area (sf)	CN	Description
*	18,000	98	Roof, HSG C
	18,000		100.00% Impervious Area

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

Subcatchment R-A2: ROOF



Summary for Subcatchment R-B: ROOF

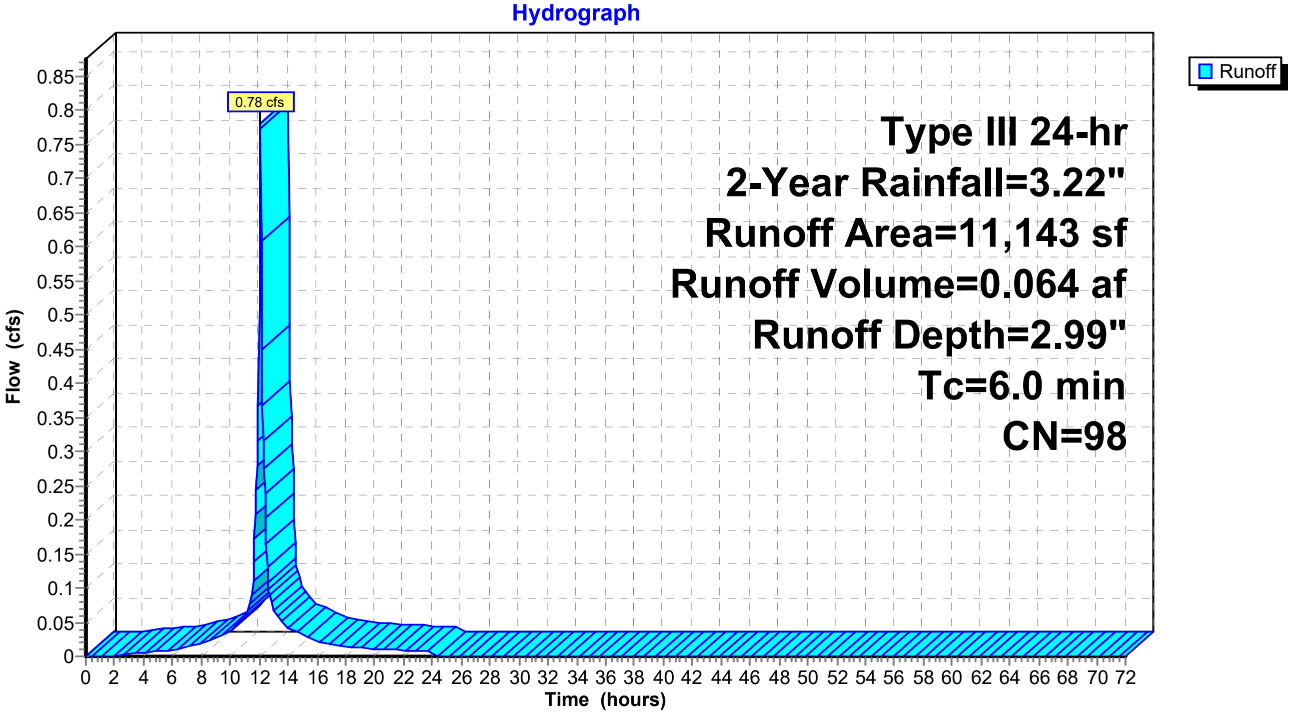
Runoff = 0.78 cfs @ 12.09 hrs, Volume= 0.064 af, Depth= 2.99"
Routed to Pond AB-3 : Subsurface Infiltration System

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.22"

Area (sf)	CN	Description
11,143	98	Roofs, HSG C
11,143		100.00% Impervious Area

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

Subcatchment R-B: ROOF



Summary for Subcatchment S-A-1: S-A-1

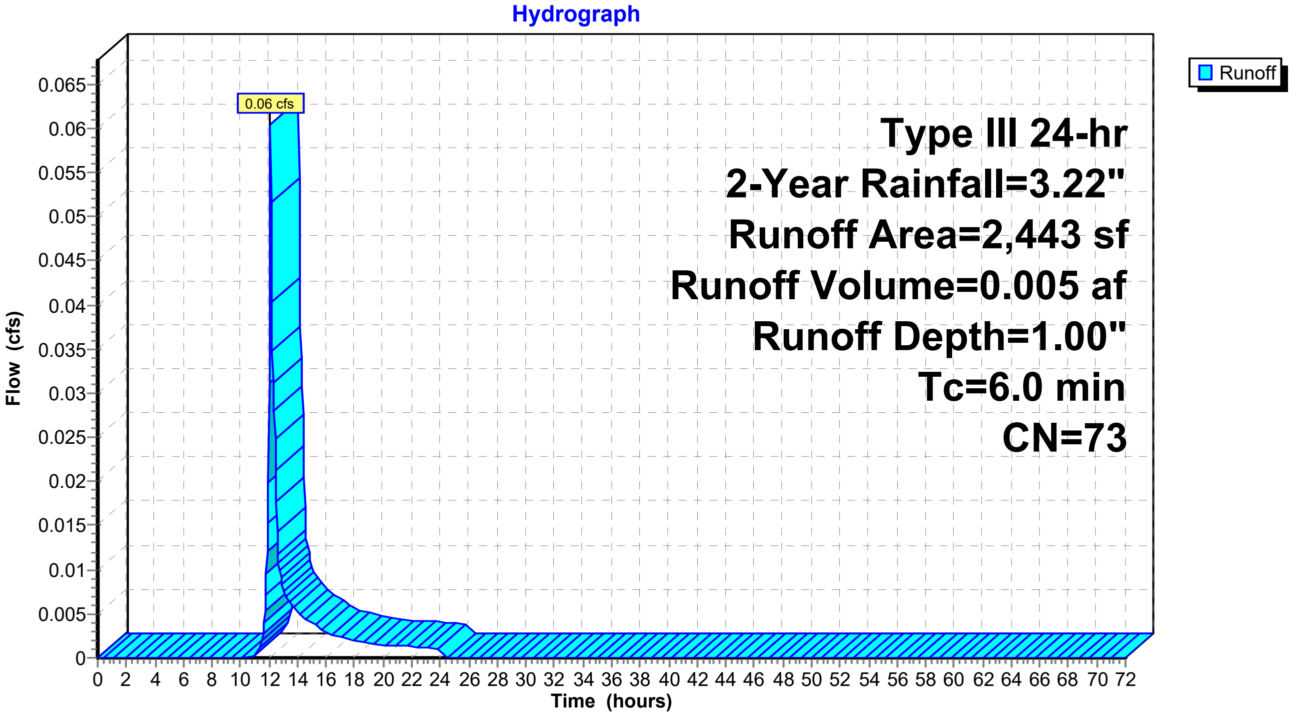
Runoff = 0.06 cfs @ 12.10 hrs, Volume= 0.005 af, Depth= 1.00"
Routed to Pond ED-AB : Re-graded Existing Depression

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.22"

	Area (sf)	CN	Description
*	244	98	Wall, HSG A
*	527	39	Plantings, HSG A
*	72	98	Transformer pad, HSG C
	160	96	Gravel surface, HSG C
*	204	98	Wall, HSG C
*	1,236	74	Plantings, HSG C
	2,443	73	Weighted Average
	1,923		78.71% Pervious Area
	520		21.29% Impervious Area

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

Subcatchment S-A-1: S-A-1



Summary for Subcatchment S-A-2: S-A-2

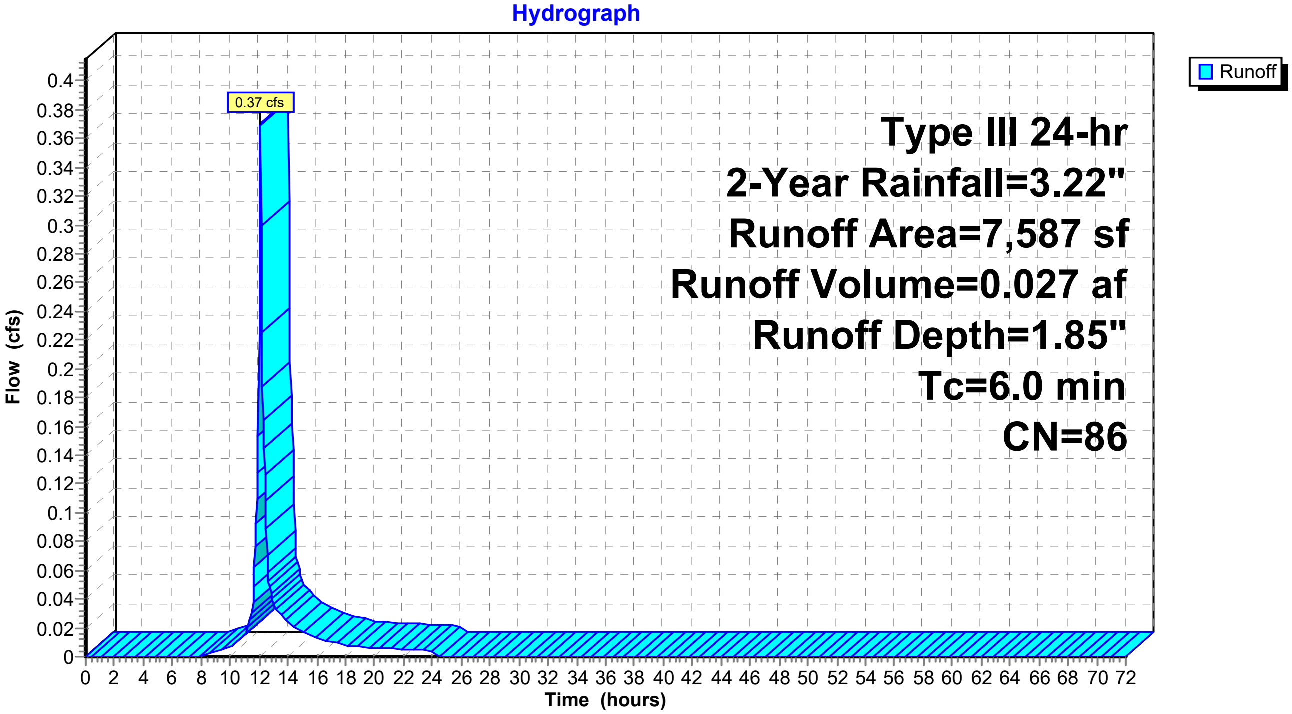
Runoff = 0.37 cfs @ 12.09 hrs, Volume= 0.027 af, Depth= 1.85"
Routed to Pond AB-1 : Storage Beneath Garage Slab

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.22"

	Area (sf)	CN	Description
*	1,431	74	Plantings, HSG C
*	1,401	98	Sidewalk,HSG C
*	236	96	Gravel, HSG C
*	14	98	Wall, HSG C
*	2,410	74	Plantings, HSG C (OFFSITE)
*	1,855	98	Pavement, HSG C
*	63	98	Wall, HSG C (OFFSITE)
*	10	98	Sign, HSG C (OFFSITE)
*	157	96	Gravel surface, HSG C (OFFSITE)
*	10	98	Impervious surfaces, HSG C (OFFSITE)
	7,587	86	Weighted Average
	4,234		55.81% Pervious Area
	3,353		44.19% Impervious Area

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

Subcatchment S-A-2: S-A-2



Summary for Subcatchment S-A-3: S-A-3

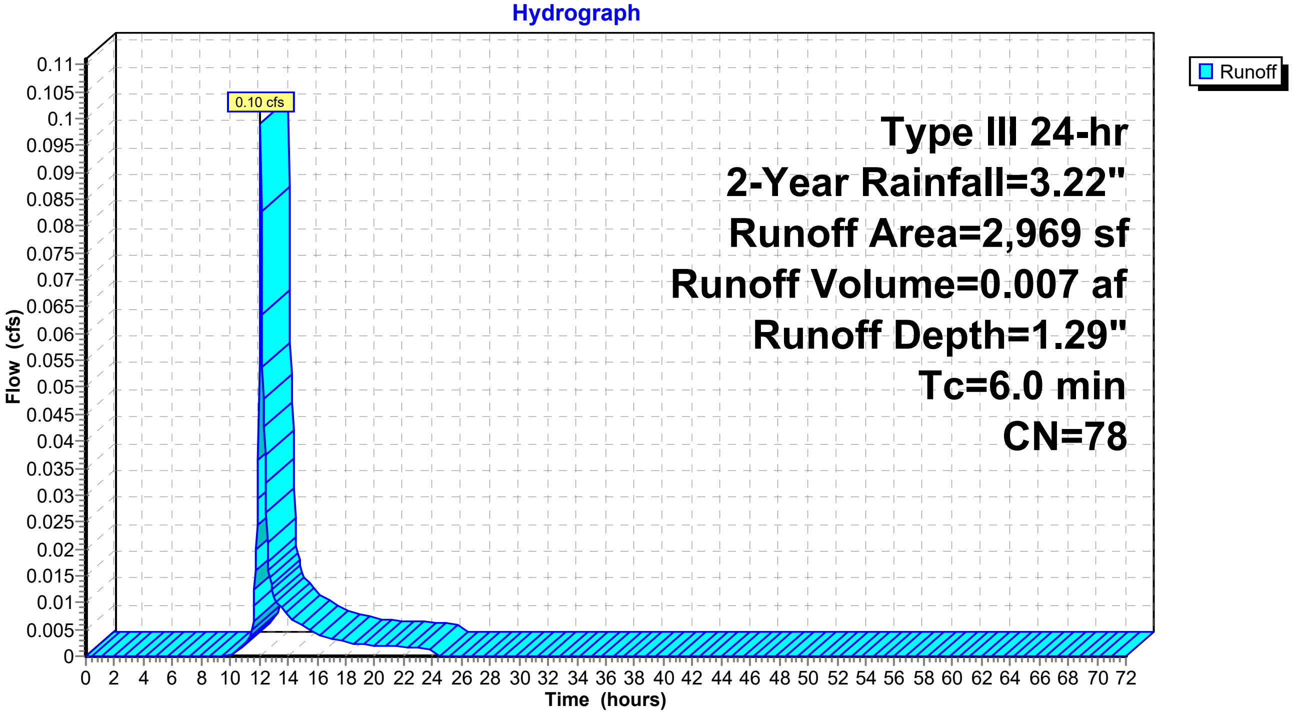
Runoff = 0.10 cfs @ 12.10 hrs, Volume= 0.007 af, Depth= 1.29"
Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.22"

	Area (sf)	CN	Description
*	438	98	Sidewalk, HSG A
*	143	96	Gravel, HSG A
*	227	39	Plantings, HSG A
*	227	98	Sidewalk, HSG A (OFFSITE)
*	444	39	Plantings, HSG A (OFFSITE)
*	40	96	Gravel, HSG C
*	126	74	Plantings, HSG C
*	625	98	Sidewalk, HSG C (OFFSITE)
*	699	74	Plantings, HSG C (OFFSITE)
	2,969	78	Weighted Average
	1,679		56.55% Pervious Area
	1,290		43.45% Impervious Area

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

Subcatchment S-A-3: S-A-3



Summary for Subcatchment S-A-OS: Offsite Areas

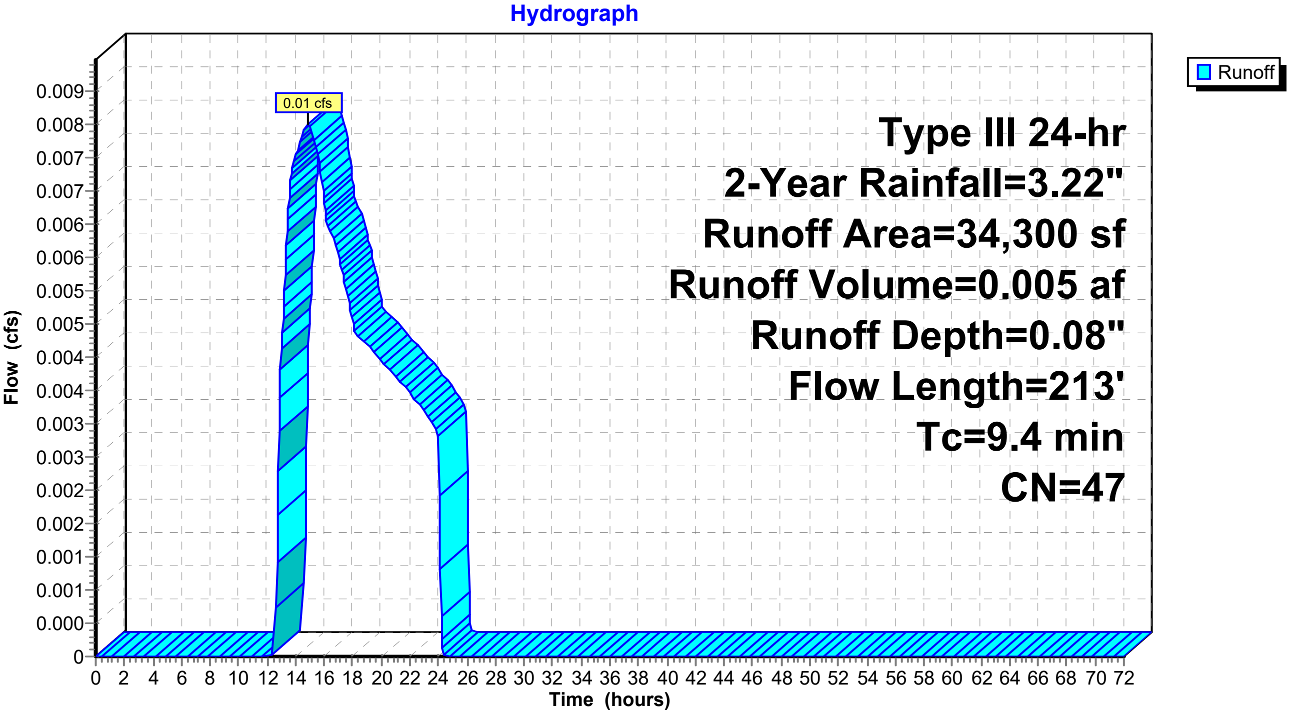
Runoff = 0.01 cfs @ 14.80 hrs, Volume= 0.005 af, Depth= 0.08"
Routed to Pond ED-AB : Re-graded Existing Depression

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.22"

	Area (sf)	CN	Description
*	15,938	30	Woods, Good, HSG A (OFFSITE)
*	11,097	39	>75% Grass cover, Good, HSG A (OFFSITE)
*	5,665	98	Roofs, HSG A (OFFSITE)
*	1,600	98	Impervious surfaces, HSG C (OFFSITE)
	34,300	47	Weighted Average
	27,035		78.82% Pervious Area
	7,265		21.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0600	0.10		**Sheet Flow, 1** Woods: Light underbrush n= 0.400 P2= 3.20"
1.5	163	0.1290	1.80		**Shallow Concentrated Flow, 2** Woodland Kv= 5.0 fps
9.4	213	Total			

Subcatchment S-A-OS: Offsite Areas



Summary for Subcatchment S-B-1: S-B-1

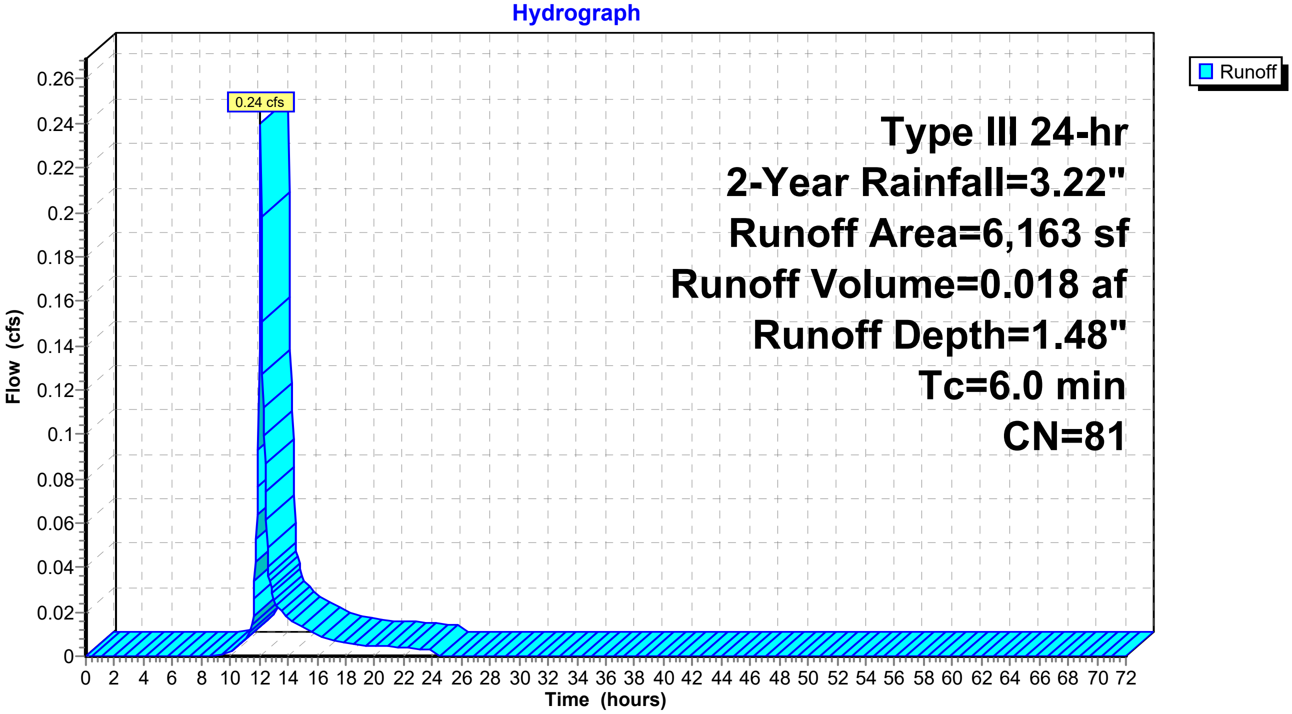
Runoff = 0.24 cfs @ 12.10 hrs, Volume= 0.018 af, Depth= 1.48"
Routed to Pond AB-3 : Subsurface Infiltration System

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.22"

	Area (sf)	CN	Description
*	252	98	Pavement, HSG C
*	245	98	Sidewalk, HSG C
*	14	98	Wall, HSG C
*	124	96	Gravel surface, HSG C
*	975	74	Plantings, HSG C
*	72	98	Transformer, HSG C
*	226	98	Sidewalk, HSG C (OFFSITE)
*	986	98	Pavement, HSG C (OFFSITE)
*	3,269	74	Plantings, HSG C (OFFSITE)
	6,163	81	Weighted Average
	4,368		70.87% Pervious Area
	1,795		29.13% Impervious Area

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

Subcatchment S-B-1: S-B-1



Summary for Subcatchment S-B-2: S-B-2

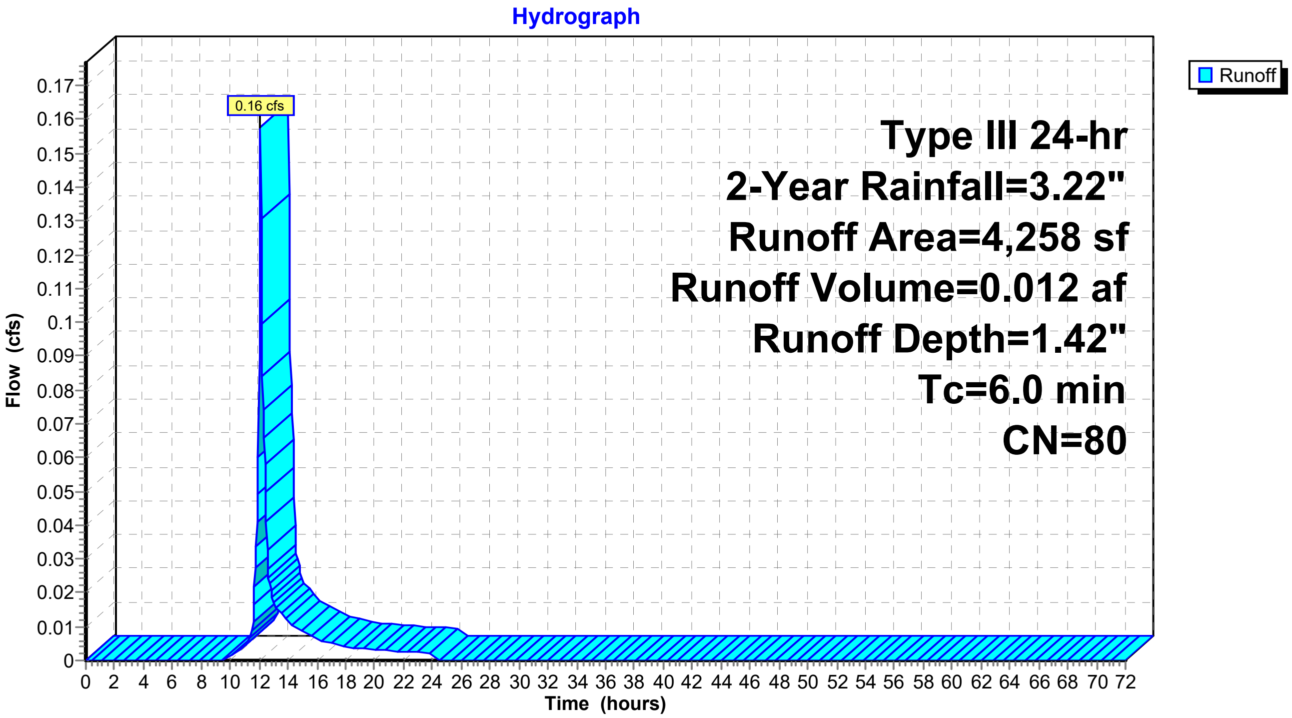
Runoff = 0.16 cfs @ 12.10 hrs, Volume= 0.012 af, Depth= 1.42"
Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.22"

	Area (sf)	CN	Description
*	931	98	Sidewalk, HSG C
*	42	98	Wall, HSG C
*	2,417	74	Plantings, HSG C
	108	96	Gravel surface, HSG C
*	760	74	Plantings, HSG C (OFFSITE)
	4,258	80	Weighted Average
	3,285		77.15% Pervious Area
	973		22.85% Impervious Area

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

Subcatchment S-B-2: S-B-2



Summary for Subcatchment SWALE: BASIN

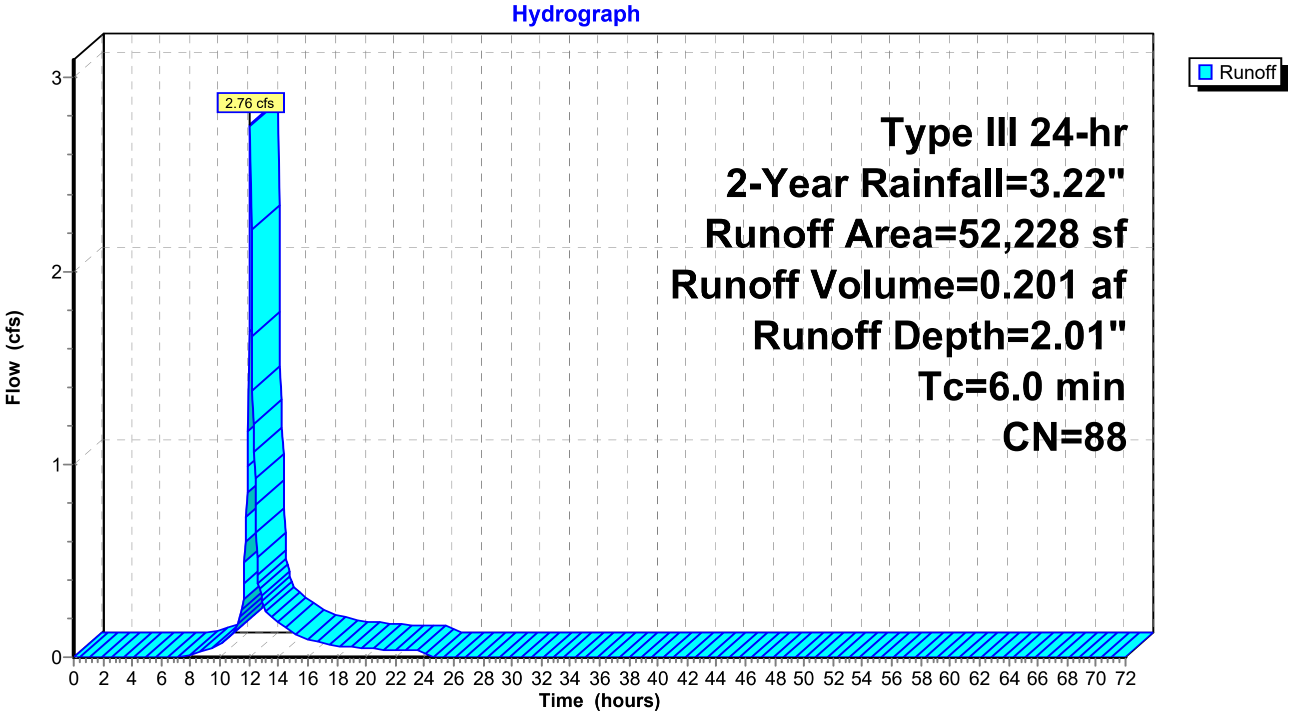
Runoff = 2.76 cfs @ 12.09 hrs, Volume= 0.201 af, Depth= 2.01"
Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.22"

	Area (sf)	CN	Description
*	30,996	98	Impervious surfaces, HSG C
	21,232	74	>75% Grass cover, Good, HSG C
	52,228	88	Weighted Average
	21,232		40.65% Pervious Area
	30,996		59.35% Impervious Area

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

Subcatchment SWALE: BASIN



Summary for Pond AB-1: Storage Beneath Garage Slab

Inflow Area = 0.424 ac, 77.06% Impervious, Inflow Depth = 2.52" for 2-Year event
Inflow = 1.13 cfs @ 12.09 hrs, Volume= 0.089 af
Outflow = 0.16 cfs @ 12.61 hrs, Volume= 0.089 af, Atten= 86%, Lag= 31.5 min
Primary = 0.16 cfs @ 12.61 hrs, Volume= 0.089 af
Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 17.34' @ 12.61 hrs Surf.Area= 8,842 sf Storage= 1,397 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 74.5 min (850.7 - 776.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	16.42'	0 cf	**85.63'W x 103.25'L x 2.42'H Field A** 21,372 cf Overall - 6,644 cf Embedded = 14,729 cf x 0.0% Voids
#2A	16.75'	5,371 cf	**ADS N-12 18"** x 145 Inside #1 Inside= 18.2"W x 18.2"H => 1.80 sf x 20.00'L = 36.0 cf Outside= 21.0"W x 21.0"H => 2.23 sf x 20.00'L = 44.5 cf 145 Chambers in 29 Rows 84.13' Header x 1.80 sf x 1 = 151.4 cf Inside
		5,371 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	16.75'	**12.0" Round Culvert** L= 48.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 16.75' / 16.44' S= 0.0065 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	16.75'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	18.05'	**4.0' long x 5.40' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.16 cfs @ 12.61 hrs HW=17.34' TW=14.31' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.16 cfs of 1.01 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.16 cfs @ 3.27 fps)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond AB-1: Storage Beneath Garage Slab - Chamber Wizard Field A

Chamber Model = ADS N-12 18" (ADS N-12® Pipe)
Inside= 18.2"W x 18.2"H => 1.80 sf x 20.00'L = 36.0 cf
Outside= 21.0"W x 21.0"H => 2.23 sf x 20.00'L = 44.5 cf

21.0" Wide + 14.3" Spacing = 35.3" C-C Row Spacing

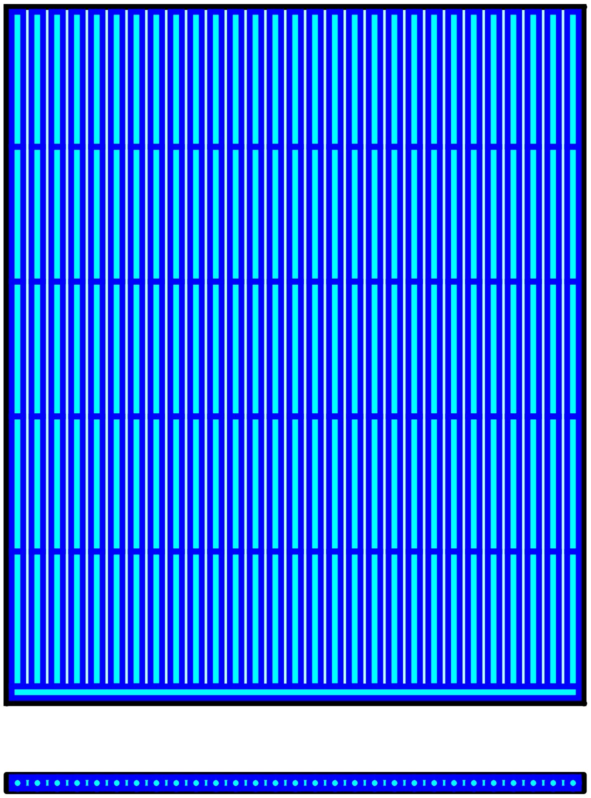
5 Chambers/Row x 20.00' Long +1.75' Header x 1 = 101.75' Row Length +9.0" End Stone x 2 = 103.25' Base Length
29 Rows x 21.0" Wide + 14.3" Spacing x 28 + 9.0" Side Stone x 2 = 85.63' Base Width
4.0" Stone Base + 21.0" Chamber Height + 4.0" Stone Cover = 2.42' Field Height

145 Chambers x 36.0 cf + 84.13' Header x 1.80 sf = 5,371.5 cf Chamber Storage
145 Chambers x 44.5 cf + 84.13' Header x 2.23 sf = 6,643.5 cf Displacement

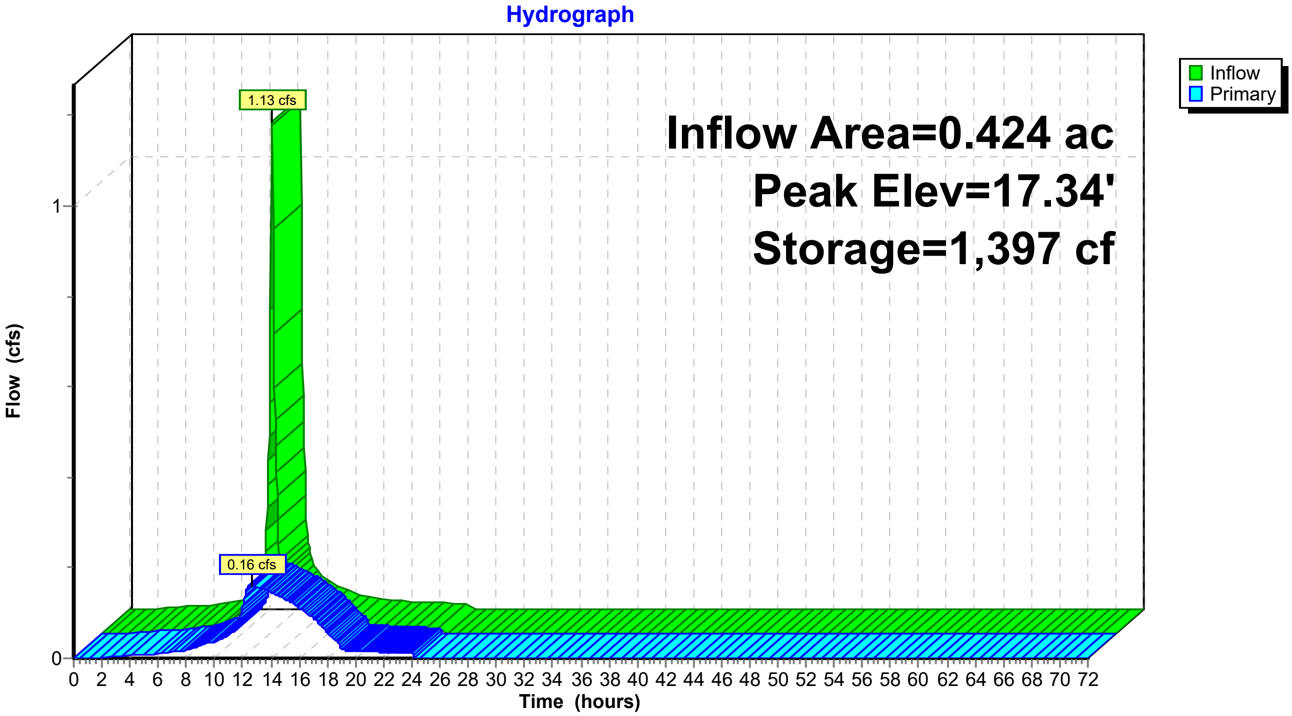
21,372.1 cf Field - 6,643.5 cf Chambers = 14,728.6 cf Stone x 0.0% Voids = 0.0 cf Stone Storage

Chamber Storage = 5,371.5 cf = 0.123 af
Overall Storage Efficiency = 25.1%
Overall System Size = 103.25' x 85.63' x 2.42'

145 Chambers
791.6 cy Field
545.5 cy Stone



Pond AB-1: Storage Beneath Garage Slab



Summary for Pond AB-2: Subsurface Infiltration System

```
Inflow Area =       0.413 ac,100.00% Impervious,  Inflow Depth =  2.99"   for  2-Year event
Inflow      =       1.26 cfs @  12.09 hrs,  Volume=          0.103 af
Outflow     =       0.17 cfs @  11.80 hrs,  Volume=          0.103 af,  Atten= 86%,  Lag= 0.0 min
Discarded   =       0.17 cfs @  11.80 hrs,  Volume=          0.103 af
Primary     =       0.00 cfs @   0.00 hrs,  Volume=          0.000 af
   Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 19.45' @ 12.61 hrs   Surf.Area= 3,092 sf   Storage= 1,307 cf

Plug-Flow detention time= 45.1 min calculated for 0.103 af (100% of inflow)
Center-of-Mass det. time= 45.1 min ( 801.3 - 756.3 )

Volume        Invert    Avail.Storage   Storage Description
   #1         18.75'         1,410 cf   Custom Stage Data (Prismatic)Listed below (Recalc)
                                        7,143 cf Overall - 3,619 cf Embedded = 3,524 cf  x 40.0% Voids
   #2         19.08'         3,257 cf   Ferguson R-Tank XD  9 x 759  Inside #1
                                        Inside= 19.7"W x 17.7"H => 2.18 sf x 1.97'L = 4.3 cf
                                        Outside= 19.7"W x 17.7"H => 2.42 sf x 1.97'L = 4.8 cf
                                        759 Chambers in 36 Rows
                             4,666 cf   Total Available Storage

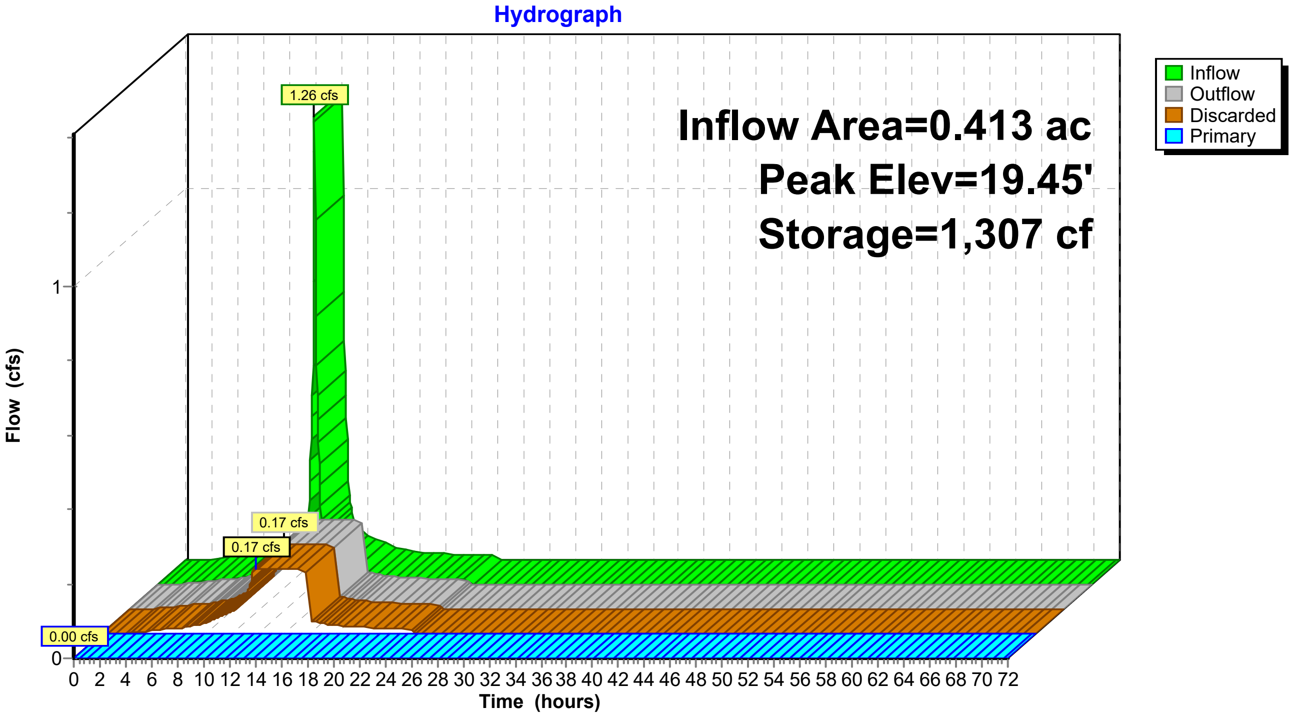
 Elevation        Surf.Area        Inc.Store       Cum.Store
    (feet)          (sq-ft)     (cubic-feet)    (cubic-feet)
     18.75            3,092                0               0
     21.06            3,092            7,143           7,143

Device   Routing         Invert   Outlet Devices
   #1    Primary         19.08'   12.0"  Round Culvert
                                  L= 3.0'   CPP, square edge headwall,  Ke= 0.500
                                  Inlet / Outlet Invert= 19.08' / 19.08'   S= 0.0000 '/'   Cc= 0.900
                                  n= 0.013  Corrugated PE, smooth interior,  Flow Area= 0.79 sf
   #2    Device 1        20.30'   4.0' long x 3.15' rise Sharp-Crested Rectangular Weir
                                  2 End Contraction(s)
   #3    Discarded       18.75'   2.410 in/hr Exfiltration over Surface area   Phase-In= 0.01'

Discarded OutFlow Max=0.17 cfs @ 11.80 hrs  HW=18.82'   (Free Discharge)
└─3=Exfiltration  (Exfiltration Controls 0.17 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs  HW=18.75'  TW=13.87'   (Dynamic Tailwater)
└─1=Culvert  ( Controls 0.00 cfs)
   └─2=Sharp-Crested Rectangular Weir( Controls 0.00 cfs)
```

Pond AB-2: Subsurface Infiltration System



Summary for Pond AB-3: Subsurface Infiltration System

```
Inflow Area =       0.397 ac, 74.76% Impervious,  Inflow Depth =  2.45"   for  2-Year event
Inflow      =      1.02 cfs @  12.09 hrs,  Volume=          0.081 af
Outflow     =      0.34 cfs @  12.38 hrs,  Volume=          0.081 af,  Atten= 66%,  Lag= 17.7 min
Discarded   =      0.14 cfs @  11.75 hrs,  Volume=          0.071 af
Primary     =      0.20 cfs @  12.38 hrs,  Volume=          0.010 af
   Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 20.06' @ 12.38 hrs   Surf.Area= 2,589 sf   Storage= 808 cf

Plug-Flow detention time= 21.9 min calculated for 0.081 af (100% of inflow)
Center-of-Mass det. time= 21.8 min ( 796.0 - 774.2 )

Volume      Invert   Avail.Storage  Storage Description
   #1       19.50'       1,022 cf   Custom Stage Data (Prismatic)Listed below (Recalc)
                                    3,858 cf Overall - 1,303 cf Embedded = 2,554 cf  x 40.0% Voids
   #2       19.83'       1,173 cf   Ferguson R-Tank XD  4 x 615  Inside #1
                                    Inside= 19.7"W x 7.9"H => 0.97 sf x 1.97'L = 1.9 cf
                                    Outside= 19.7"W x 7.9"H => 1.08 sf x 1.97'L = 2.1 cf
                                    615 Chambers in 10 Rows
                         2,195 cf   Total Available Storage

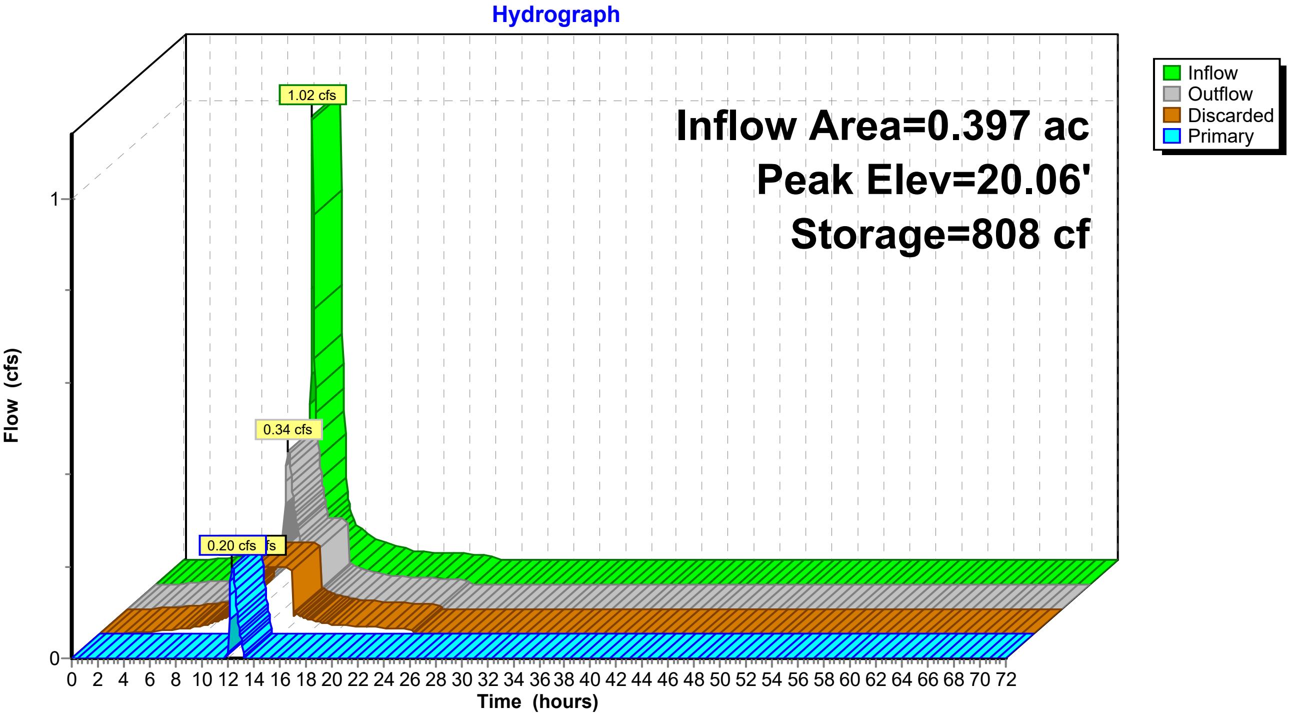
 Elevation      Surf.Area      Inc.Store      Cum.Store
    (feet)        (sq-ft)   (cubic-feet)   (cubic-feet)
     19.50          2,589              0              0
     20.99          2,589          3,858          3,858

Device  Routing        Invert  Outlet Devices
  #1    Primary        19.83'  12.0"  Round Culvert
                               L= 22.0'   CPP, square edge headwall,  Ke= 0.500
                               Inlet / Outlet Invert= 19.83' / 19.61'   S= 0.0100 '/'   Cc= 0.900
                               n= 0.013  Corrugated PE, smooth interior,  Flow Area= 0.79 sf
  #2    Device 1       19.90'  4.0' long x 2.20' rise Sharp-Crested Rectangular Weir
                               2 End Contraction(s)
  #3    Discarded      19.50'  2.410 in/hr Exfiltration over Surface area   Phase-In= 0.01'

Discarded OutFlow Max=0.14 cfs @ 11.75 hrs  HW=19.53'   (Free Discharge)
└─3=Exfiltration  (Exfiltration Controls 0.14 cfs)

Primary OutFlow Max=0.20 cfs @ 12.38 hrs  HW=20.06'  TW=14.51'   (Dynamic Tailwater)
└─1=Culvert  (Barrel Controls 0.20 cfs @ 2.20 fps)
   └─2=Sharp-Crested Rectangular Weir(Passes 0.20 cfs of 0.82 cfs potential flow)
```

Pond AB-3: Subsurface Infiltration System



Summary for Pond ED-AB: Re-graded Existing Depression

```
Inflow Area =         0.844 ac,  21.19% Impervious,  Inflow Depth =   0.14"    for  2-Year event
Inflow      =         0.06 cfs @   12.10 hrs,  Volume=            0.010 af
Outflow     =         0.02 cfs @   12.40 hrs,  Volume=            0.010 af,  Atten= 59%,  Lag= 18.0 min
Primary     =         0.02 cfs @   12.40 hrs,  Volume=            0.010 af
    Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field
Secondary =           0.00 cfs @    0.00 hrs,  Volume=            0.000 af
    Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 19.74' @ 12.40 hrs   Surf.Area= 265 sf   Storage= 39 cf

Plug-Flow detention time= 19.8 min calculated for 0.010 af (100% of inflow)
Center-of-Mass det. time= 19.1 min ( 985.3 - 966.2 )
```

Volume	Invert	Avail.Storage	Storage Description
#1	19.50'	8,308 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

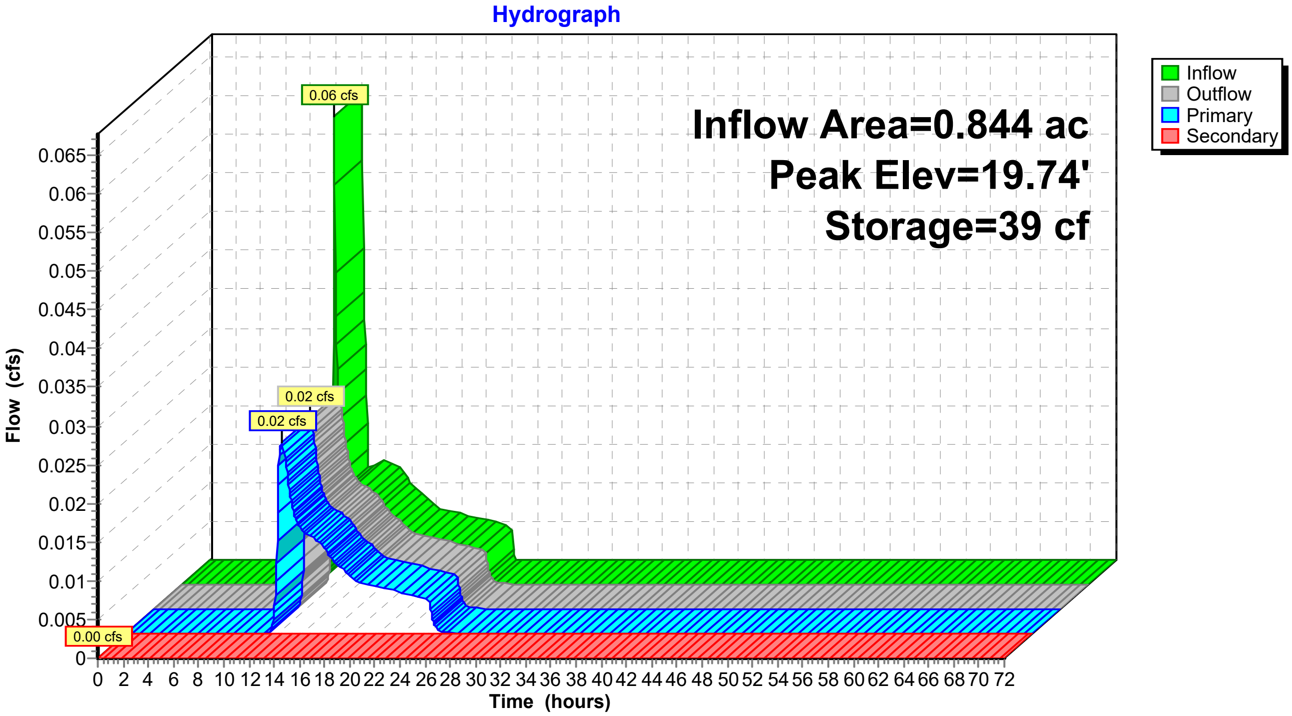
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
19.50	69	0	0
20.00	484	138	138
21.00	1,371	928	1,066
22.00	2,351	1,861	2,927
23.00	3,941	3,146	6,073
23.50	5,000	2,235	8,308

Device	Routing	Invert	Outlet Devices
#1	Primary	19.50'	**12.0" Round Culvert** L= 27.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 19.50' / 18.58' S= 0.0341 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	19.50'	**1.5" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	22.45'	**4.0' long x 1.00' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Secondary	23.43'	**2.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

```
Primary OutFlow Max=0.02 cfs @ 12.40 hrs  HW=19.74'  TW=14.49'   (Dynamic Tailwater)
└─1=Culvert  (Passes 0.02 cfs of 0.21 cfs potential flow)
   ├─2=Orifice/Grate  (Orifice Controls 0.02 cfs @ 2.01 fps)
   └─3=Sharp-Crested Rectangular Weir( Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs  HW=19.50'  TW=13.87'   (Dynamic Tailwater)
└─4=Broad-Crested Rectangular Weir( Controls 0.00 cfs)
```

Pond ED-AB: Re-graded Existing Depression



Summary for Pond ES-LF: DP-LF Existing Swale/Basin in Lovell Field

Inflow Area = 4.579 ac, 55.32% Impervious, Inflow Depth = 1.07" for 2-Year event
Inflow = 3.97 cfs @ 12.09 hrs, Volume= 0.407 af
Outflow = 3.88 cfs @ 12.11 hrs, Volume= 0.407 af, Atten= 2%, Lag= 1.0 min
Primary = 3.88 cfs @ 12.11 hrs, Volume= 0.407 af
Routed to nonexistent node 1R

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 14.87' @ 12.11 hrs Surf.Area= 424 sf Storage= 185 cf

Plug-Flow detention time= 0.3 min calculated for 0.407 af (100% of inflow)
Center-of-Mass det. time= 0.3 min (827.3 - 827.0)

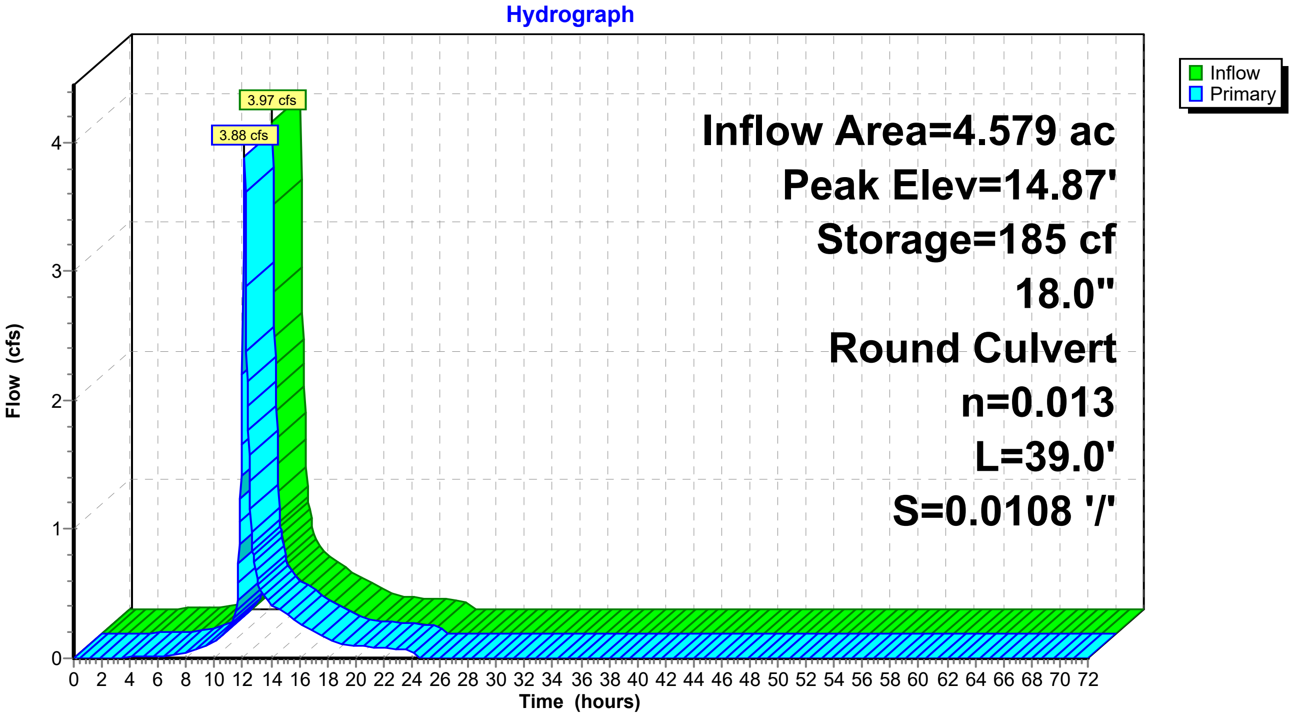
Volume	Invert	Avail.Storage	Storage Description
#1	13.87'	17,546 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
13.87	0	0	0
14.00	3	0	0
15.00	488	246	246
16.00	1,764	1,126	1,372
17.00	2,848	2,306	3,678
18.00	3,993	3,421	7,098
19.00	5,217	4,605	11,703
20.00	6,468	5,843	17,546

Device	Routing	Invert	Outlet Devices
#1	Primary	13.87'	**18.0" Round Culvert** L= 39.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 13.87' / 13.45' S= 0.0108 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=3.80 cfs @ 12.11 hrs HW=14.85' (Free Discharge)
└─**1=Culvert** (Barrel Controls 3.80 cfs @ 4.39 fps)

Pond ES-LF: DP-LF Existing Swale/Basin in Lovell Field



Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentCB 1: CB 1 Runoff Area=2,480 sf 100.00% Impervious Runoff Depth=4.62"
Tc=6.0 min CN=98 Runoff=0.26 cfs 0.022 af

SubcatchmentCB 2: CB 2 Runoff Area=1,943 sf 100.00% Impervious Runoff Depth=4.62"
Tc=6.0 min CN=98 Runoff=0.21 cfs 0.017 af

SubcatchmentCB 5: CB 5 Runoff Area=6,867 sf 82.76% Impervious Runoff Depth=4.17"
Tc=6.0 min CN=94 Runoff=0.70 cfs 0.055 af

SubcatchmentDCB 4: DCB 4 Runoff Area=38,222 sf 36.71% Impervious Runoff Depth=0.91"
Tc=6.0 min CN=55 Runoff=0.72 cfs 0.067 af

SubcatchmentR-A1: ROOF Runoff Area=10,869 sf 100.00% Impervious Runoff Depth=4.62"
Tc=6.0 min CN=98 Runoff=1.16 cfs 0.096 af

SubcatchmentR-A2: ROOF Runoff Area=18,000 sf 100.00% Impervious Runoff Depth=4.62"
Tc=6.0 min CN=98 Runoff=1.92 cfs 0.159 af

SubcatchmentR-B: ROOF Runoff Area=11,143 sf 100.00% Impervious Runoff Depth=4.62"
Tc=6.0 min CN=98 Runoff=1.19 cfs 0.099 af

SubcatchmentS-A-1: S-A-1 Runoff Area=2,443 sf 21.29% Impervious Runoff Depth=2.17"
Tc=6.0 min CN=73 Runoff=0.14 cfs 0.010 af

SubcatchmentS-A-2: S-A-2 Runoff Area=7,587 sf 44.19% Impervious Runoff Depth=3.34"
Tc=6.0 min CN=86 Runoff=0.66 cfs 0.048 af

SubcatchmentS-A-3: S-A-3 Runoff Area=2,969 sf 43.45% Impervious Runoff Depth=2.59"
Tc=6.0 min CN=78 Runoff=0.20 cfs 0.015 af

SubcatchmentS-A-OS: Offsite Areas Runoff Area=34,300 sf 21.18% Impervious Runoff Depth=0.49"
Flow Length=213' Tc=9.4 min CN=47 Runoff=0.18 cfs 0.032 af

SubcatchmentS-B-1: S-B-1 Runoff Area=6,163 sf 29.13% Impervious Runoff Depth=2.86"
Tc=6.0 min CN=81 Runoff=0.46 cfs 0.034 af

SubcatchmentS-B-2: S-B-2 Runoff Area=4,258 sf 22.85% Impervious Runoff Depth=2.77"
Tc=6.0 min CN=80 Runoff=0.31 cfs 0.023 af

SubcatchmentSWALE: BASIN Runoff Area=52,228 sf 59.35% Impervious Runoff Depth=3.54"
Tc=6.0 min CN=88 Runoff=4.76 cfs 0.353 af

Pond AB-1: Storage Beneath Garage Slab Peak Elev=17.60' Storage=2,536 cf Inflow=1.82 cfs 0.145 af
Outflow=0.20 cfs 0.145 af

Pond AB-2: Subsurface Infiltration System Peak Elev=19.89' Storage=2,399 cf Inflow=1.92 cfs 0.159 af
Discarded=0.17 cfs 0.159 af Primary=0.00 cfs 0.000 af Outflow=0.17 cfs 0.159 af

Pond AB-3: Subsurface Infiltration System Peak Elev=20.26' Storage=1,222 cf Inflow=1.65 cfs 0.132 af
Discarded=0.14 cfs 0.098 af Primary=0.64 cfs 0.035 af Outflow=0.78 cfs 0.132 af

Pond ED-AB: Re-graded Existing Depression Peak Elev=20.50' Storage=489 cf Inflow=0.26 cfs 0.042 af
Primary=0.06 cfs 0.042 af Secondary=0.00 cfs 0.000 af Outflow=0.06 cfs 0.042 af

Pond ES-LF: DP-LF Existing Swale/Basin in Peak Elev=15.38' Storage=520 cf Inflow=7.66 cfs 0.773 af
18.0" Round Culvert n=0.013 L=39.0' S=0.0108 '/' Outflow=7.14 cfs 0.773 af

Total Runoff Area = 4.579 ac Runoff Volume = 1.029 af Average Runoff Depth = 2.70"
44.68% Pervious = 2.046 ac 55.32% Impervious = 2.533 ac

Summary for Subcatchment CB 1: CB 1

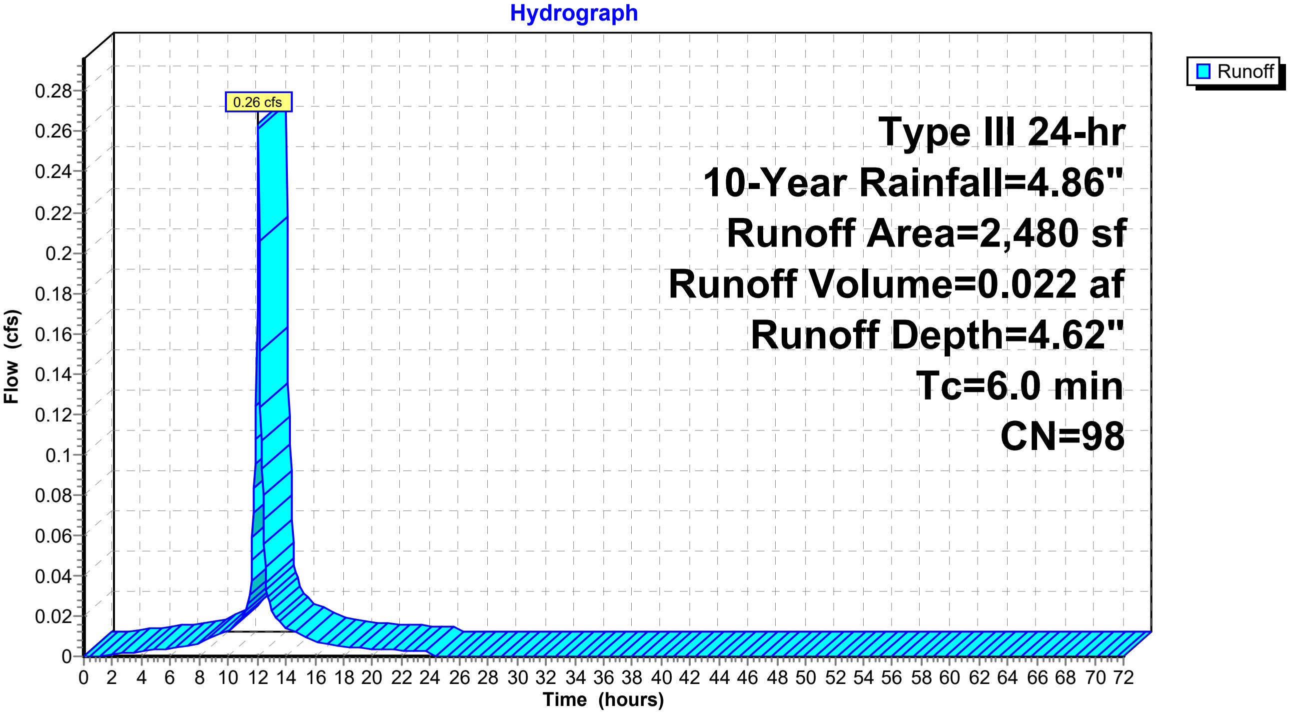
Runoff = 0.26 cfs @ 12.09 hrs, Volume= 0.022 af, Depth= 4.62"
Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.86"

	Area (sf)	CN	Description
*	2,480	98	Impervious surfaces, HSG C
	2,480		100.00% Impervious Area

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

Subcatchment CB 1: CB 1



Summary for Subcatchment CB 2: CB 2

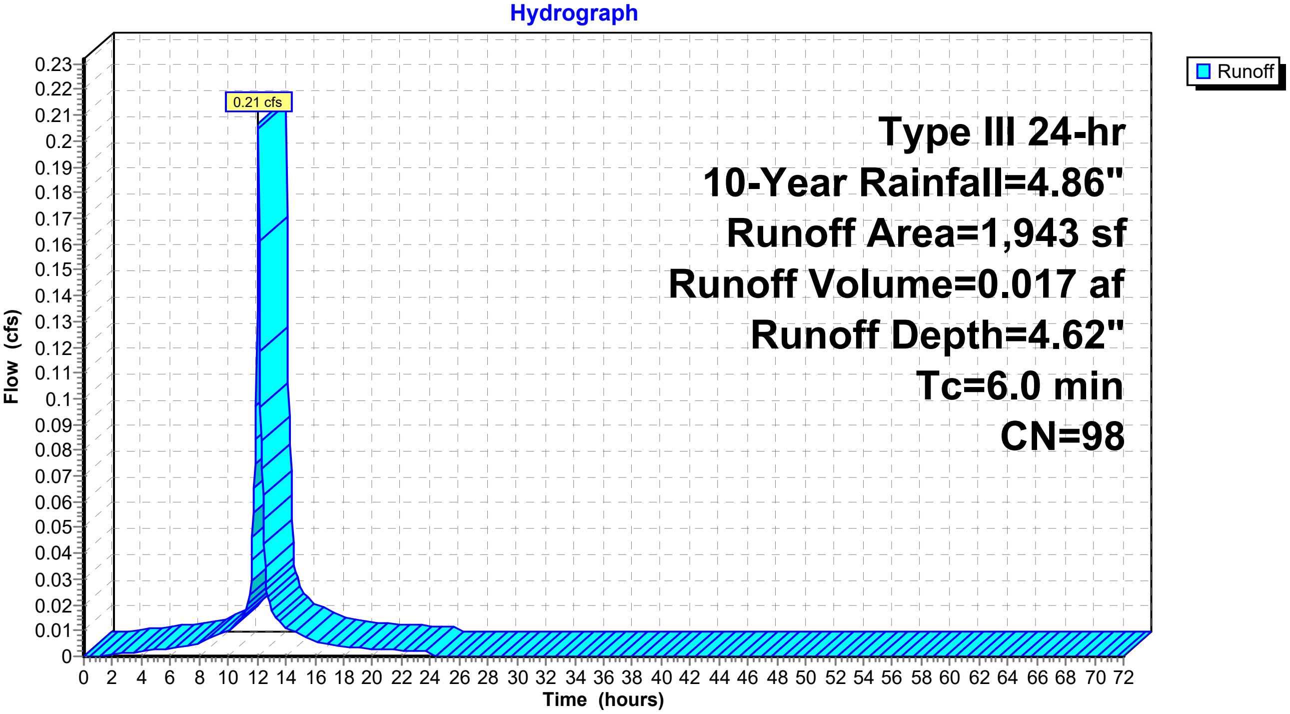
Runoff = 0.21 cfs @ 12.09 hrs, Volume= 0.017 af, Depth= 4.62"
Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.86"

	Area (sf)	CN	Description
*	1,943	98	Impervious surfaces, HSG C
	1,943		100.00% Impervious Area

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

Subcatchment CB 2: CB 2



Summary for Subcatchment CB 5: CB 5

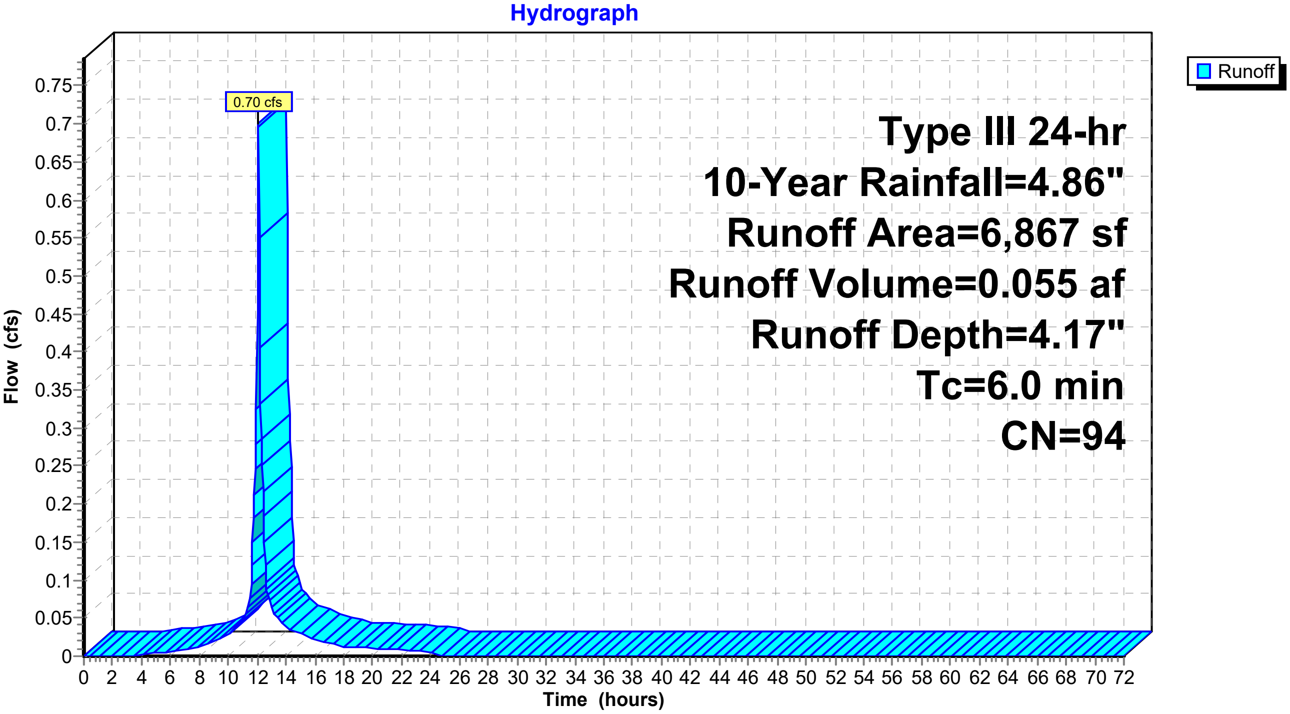
Runoff = 0.70 cfs @ 12.09 hrs, Volume= 0.055 af, Depth= 4.17"
Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.86"

	Area (sf)	CN	Description
*	5,683	98	Impervious surfaces, HSG C
	1,184	74	>75% Grass cover, Good, HSG C
	6,867	94	Weighted Average
	1,184		17.24% Pervious Area
	5,683		82.76% Impervious Area

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

Subcatchment CB 5: CB 5



Summary for Subcatchment DCB 4: DCB 4

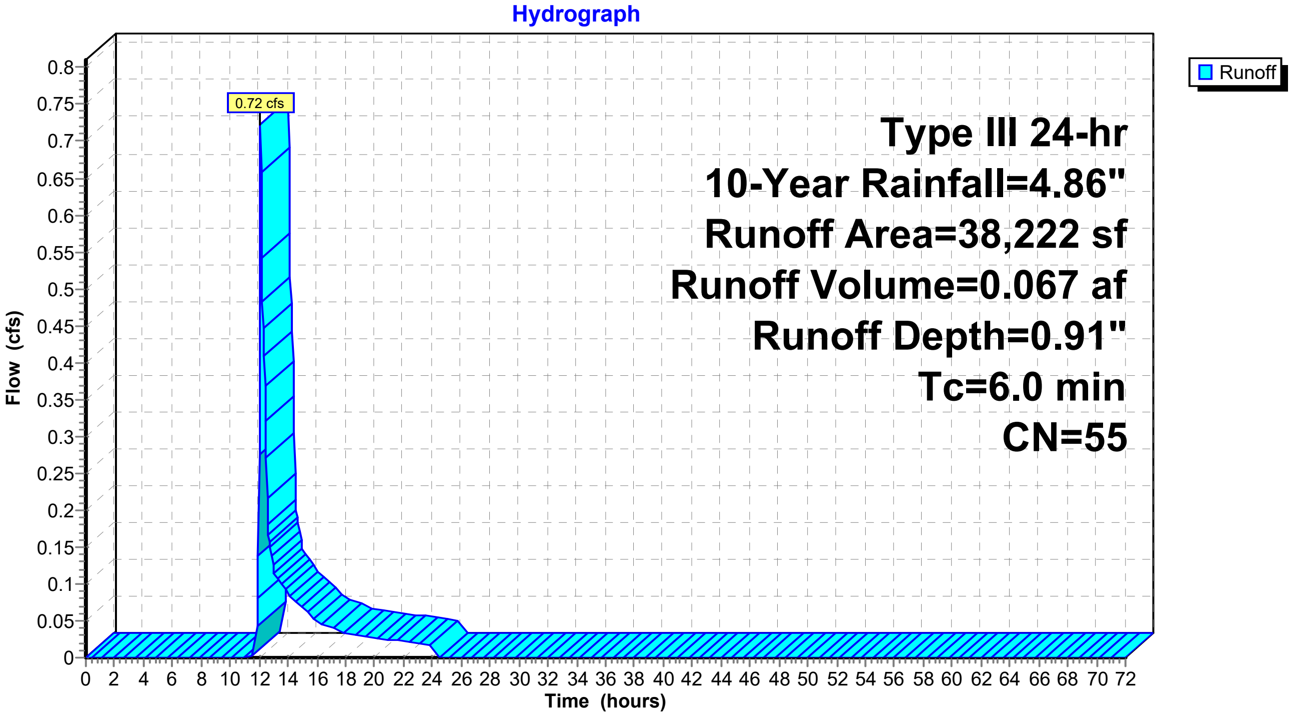
Runoff = 0.72 cfs @ 12.11 hrs, Volume= 0.067 af, Depth= 0.91"
Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.86"

	Area (sf)	CN	Description
*	14,030	98	Impervious surfaces, HSG A
	24,192	30	Woods, Good, HSG A
	38,222	55	Weighted Average
	24,192		63.29% Pervious Area
	14,030		36.71% Impervious Area

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

Subcatchment DCB 4: DCB 4



Summary for Subcatchment R-A1: ROOF

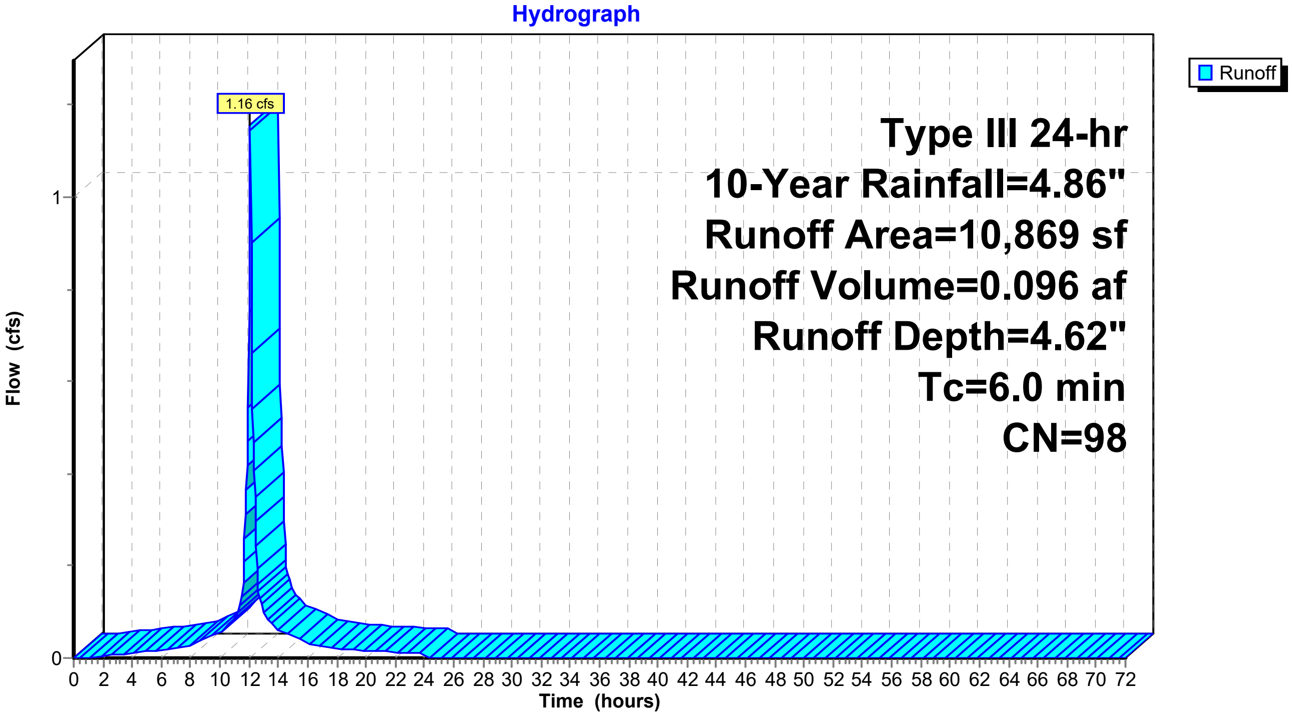
Runoff = 1.16 cfs @ 12.09 hrs, Volume= 0.096 af, Depth= 4.62"
Routed to Pond AB-1 : Storage Beneath Garage Slab

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.86"

	Area (sf)	CN	Description
	9,976	98	Roofs, HSG A
*	630	98	Patio, HSG A
*	74	98	Roofs, HSG C
*	189	98	Patio, HSG C
	10,869	98	Weighted Average
	10,869		100.00% Impervious Area

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

Subcatchment R-A1: ROOF



Summary for Subcatchment R-A2: ROOF

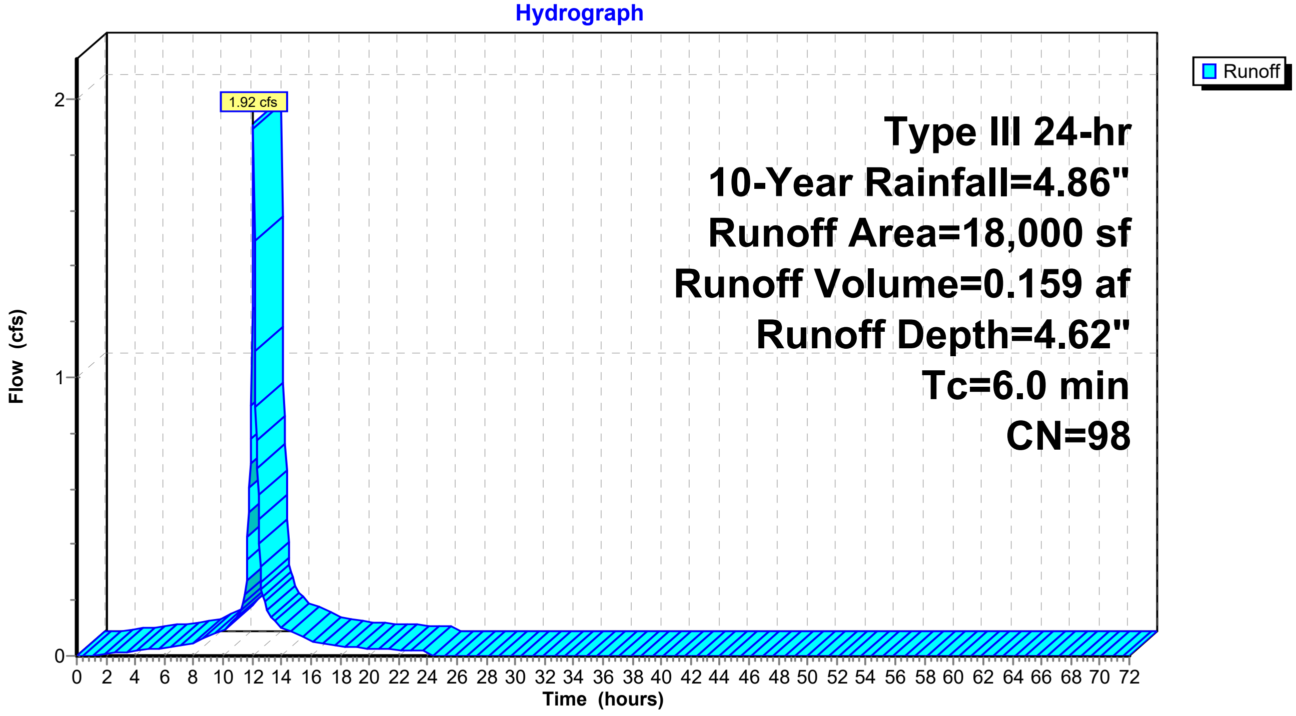
Runoff = 1.92 cfs @ 12.09 hrs, Volume= 0.159 af, Depth= 4.62"
Routed to Pond AB-2 : Subsurface Infiltration System

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.86"

	Area (sf)	CN	Description
*	18,000	98	Roof, HSG C
	18,000		100.00% Impervious Area

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

Subcatchment R-A2: ROOF



Summary for Subcatchment R-B: ROOF

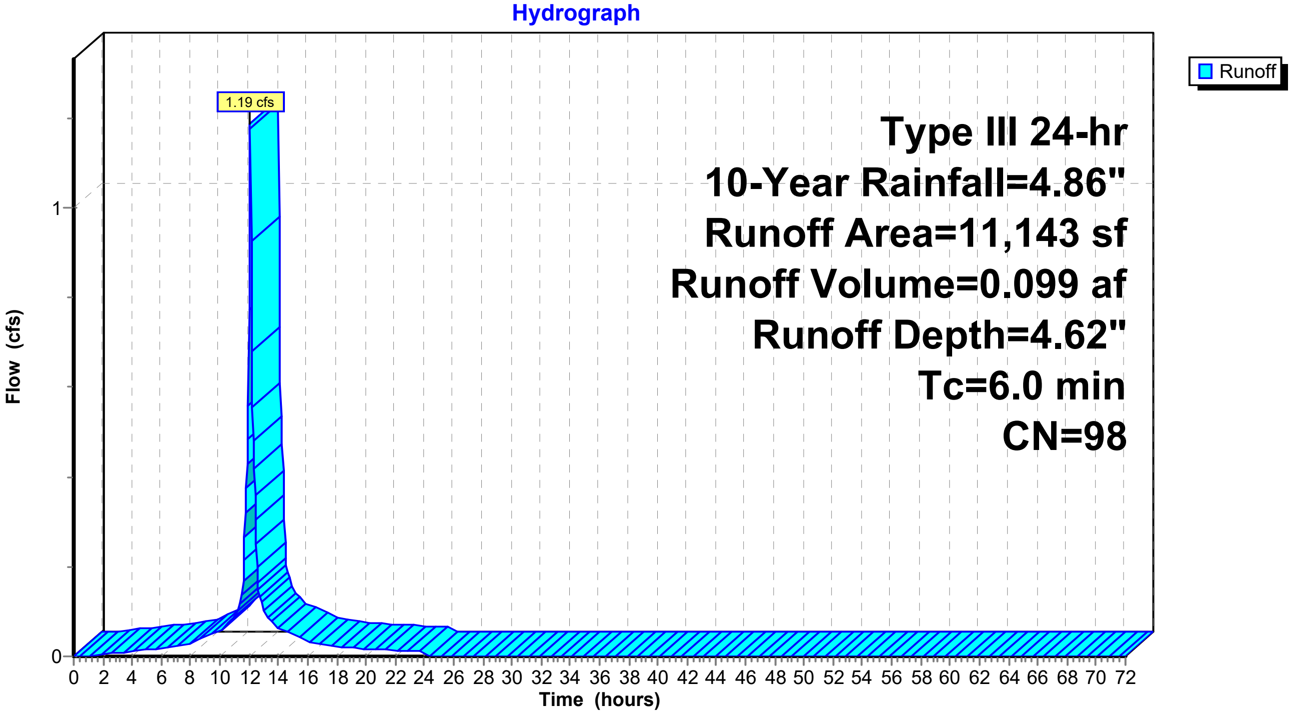
Runoff = 1.19 cfs @ 12.09 hrs, Volume= 0.099 af, Depth= 4.62"
Routed to Pond AB-3 : Subsurface Infiltration System

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.86"

Area (sf)	CN	Description
11,143	98	Roofs, HSG C
11,143		100.00% Impervious Area

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

Subcatchment R-B: ROOF



Summary for Subcatchment S-A-1: S-A-1

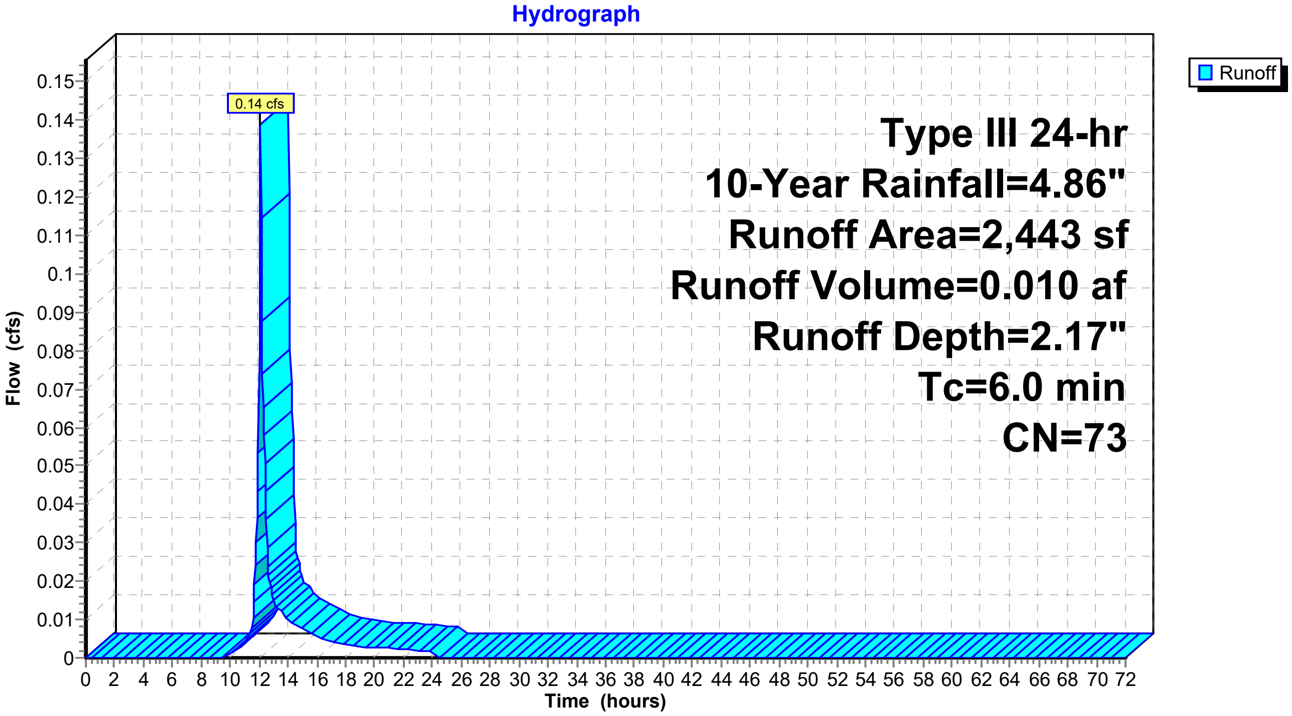
Runoff = 0.14 cfs @ 12.10 hrs, Volume= 0.010 af, Depth= 2.17"
Routed to Pond ED-AB : Re-graded Existing Depression

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.86"

	Area (sf)	CN	Description
*	244	98	Wall, HSG A
*	527	39	Plantings, HSG A
*	72	98	Transformer pad, HSG C
	160	96	Gravel surface, HSG C
*	204	98	Wall, HSG C
*	1,236	74	Plantings, HSG C
	2,443	73	Weighted Average
	1,923		78.71% Pervious Area
	520		21.29% Impervious Area

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

Subcatchment S-A-1: S-A-1



Summary for Subcatchment S-A-2: S-A-2

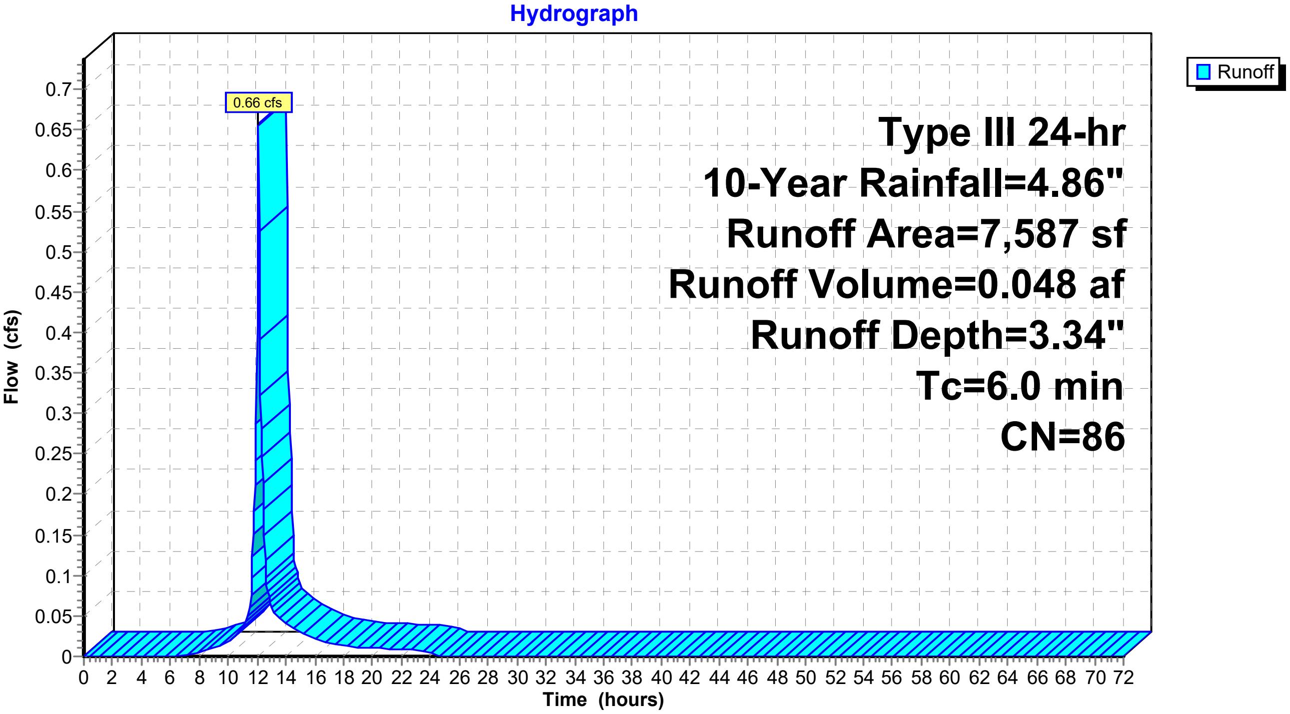
Runoff = 0.66 cfs @ 12.09 hrs, Volume= 0.048 af, Depth= 3.34"
Routed to Pond AB-1 : Storage Beneath Garage Slab

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.86"

	Area (sf)	CN	Description
*	1,431	74	Plantings, HSG C
*	1,401	98	Sidewalk,HSG C
*	236	96	Gravel, HSG C
*	14	98	Wall, HSG C
*	2,410	74	Plantings, HSG C (OFFSITE)
*	1,855	98	Pavement, HSG C
*	63	98	Wall, HSG C (OFFSITE)
*	10	98	Sign, HSG C (OFFSITE)
*	157	96	Gravel surface, HSG C (OFFSITE)
*	10	98	Impervious surfaces, HSG C (OFFSITE)
	7,587	86	Weighted Average
	4,234		55.81% Pervious Area
	3,353		44.19% Impervious Area

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

Subcatchment S-A-2: S-A-2



Summary for Subcatchment S-A-3: S-A-3

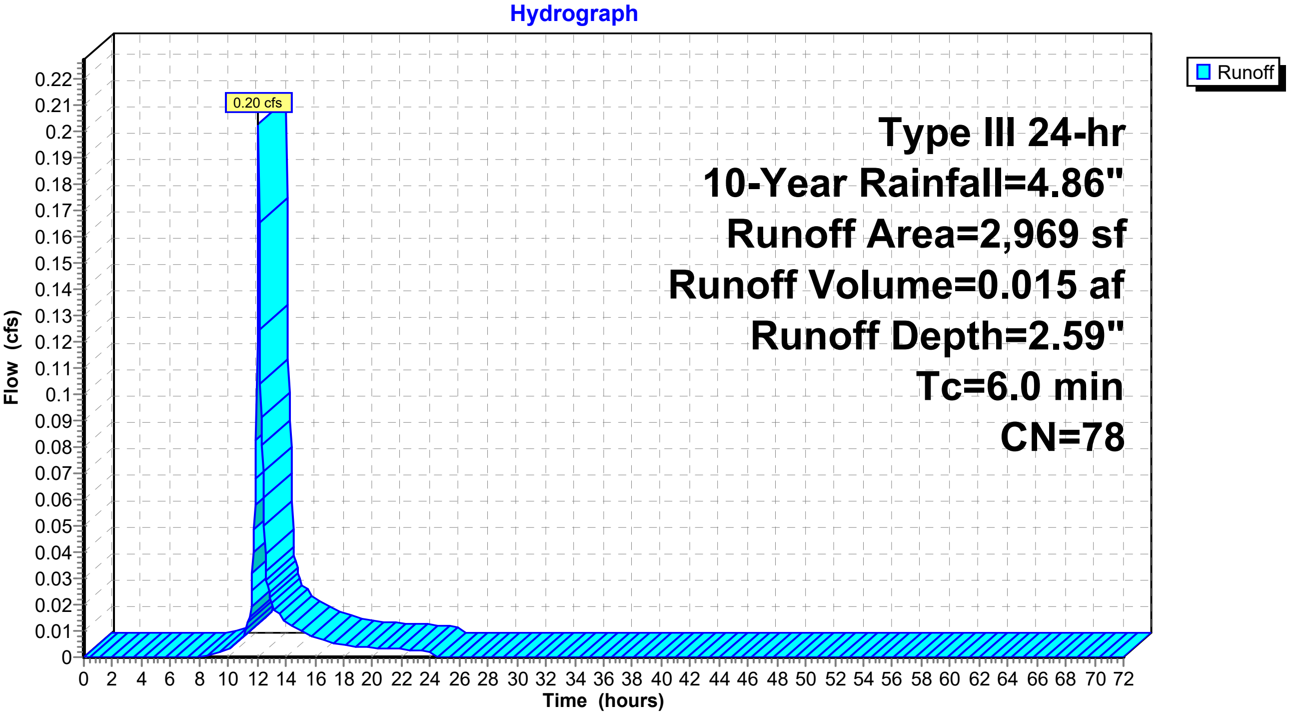
Runoff = 0.20 cfs @ 12.09 hrs, Volume= 0.015 af, Depth= 2.59"
Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.86"

	Area (sf)	CN	Description
*	438	98	Sidewalk, HSG A
*	143	96	Gravel, HSG A
*	227	39	Plantings, HSG A
*	227	98	Sidewalk, HSG A (OFFSITE)
*	444	39	Plantings, HSG A (OFFSITE)
*	40	96	Gravel, HSG C
*	126	74	Plantings, HSG C
*	625	98	Sidewalk, HSG C (OFFSITE)
*	699	74	Plantings, HSG C (OFFSITE)
	2,969	78	Weighted Average
	1,679		56.55% Pervious Area
	1,290		43.45% Impervious Area

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

Subcatchment S-A-3: S-A-3



Summary for Subcatchment S-A-OS: Offsite Areas

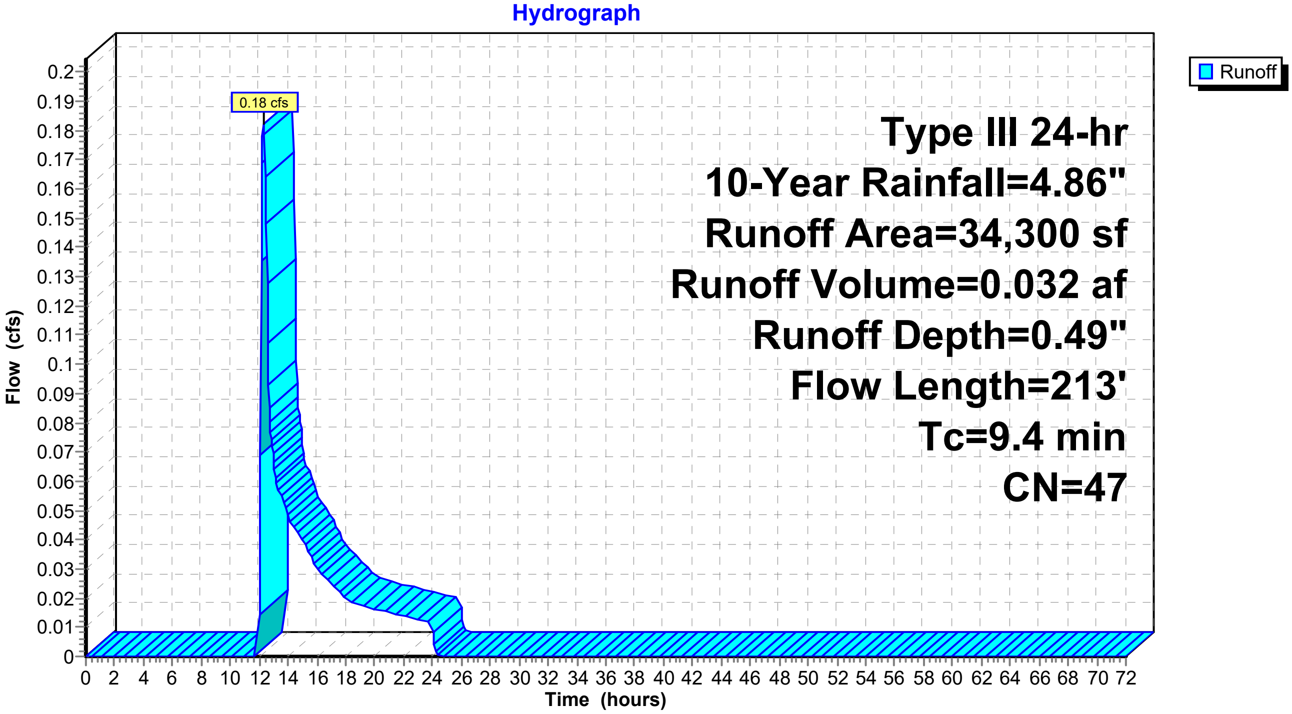
Runoff = 0.18 cfs @ 12.32 hrs, Volume= 0.032 af, Depth= 0.49"
Routed to Pond ED-AB : Re-graded Existing Depression

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.86"

	Area (sf)	CN	Description
*	15,938	30	Woods, Good, HSG A (OFFSITE)
*	11,097	39	>75% Grass cover, Good, HSG A (OFFSITE)
*	5,665	98	Roofs, HSG A (OFFSITE)
*	1,600	98	Impervious surfaces, HSG C (OFFSITE)
	34,300	47	Weighted Average
	27,035		78.82% Pervious Area
	7,265		21.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0600	0.10		**Sheet Flow, 1** Woods: Light underbrush n= 0.400 P2= 3.20"
1.5	163	0.1290	1.80		**Shallow Concentrated Flow, 2** Woodland Kv= 5.0 fps
9.4	213	Total			

Subcatchment S-A-OS: Offsite Areas



Summary for Subcatchment S-B-1: S-B-1

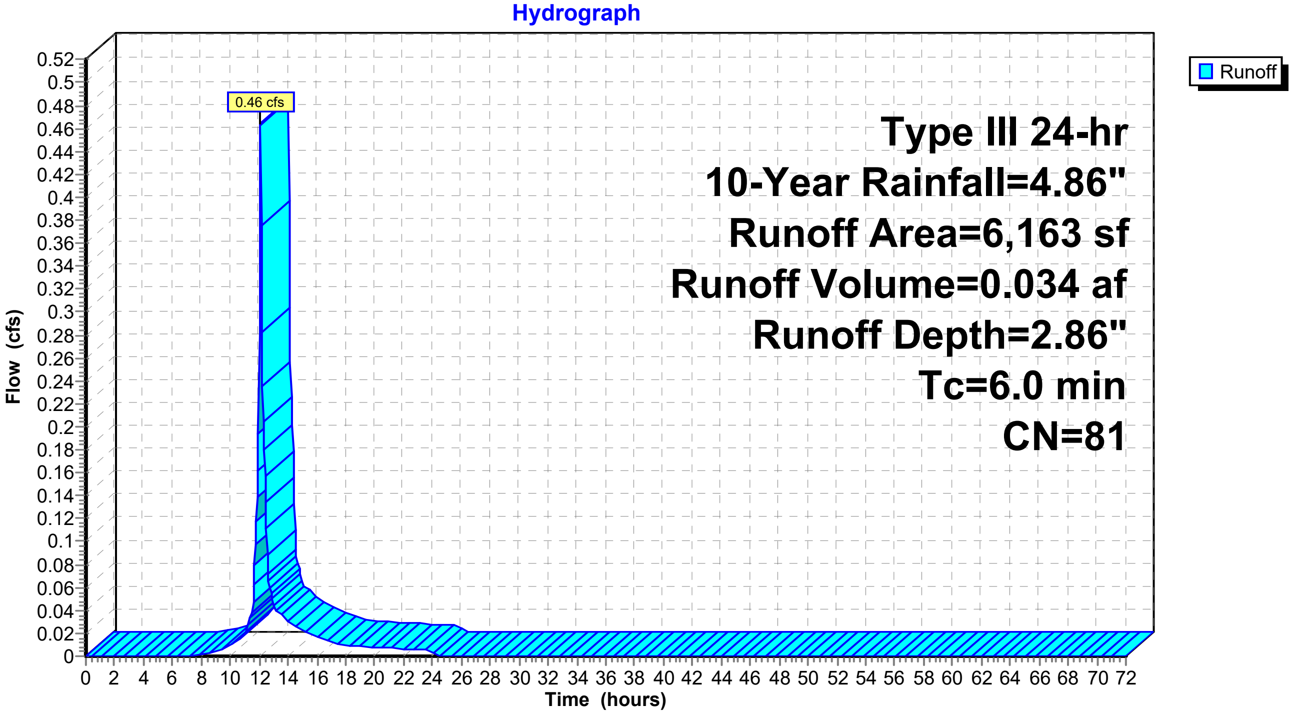
Runoff = 0.46 cfs @ 12.09 hrs, Volume= 0.034 af, Depth= 2.86"
Routed to Pond AB-3 : Subsurface Infiltration System

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.86"

	Area (sf)	CN	Description
*	252	98	Pavement, HSG C
*	245	98	Sidewalk, HSG C
*	14	98	Wall, HSG C
*	124	96	Gravel surface, HSG C
*	975	74	Plantings, HSG C
*	72	98	Transformer, HSG C
*	226	98	Sidewalk, HSG C (OFFSITE)
*	986	98	Pavement, HSG C (OFFSITE)
*	3,269	74	Plantings, HSG C (OFFSITE)
	6,163	81	Weighted Average
	4,368		70.87% Pervious Area
	1,795		29.13% Impervious Area

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

Subcatchment S-B-1: S-B-1



Summary for Subcatchment S-B-2: S-B-2

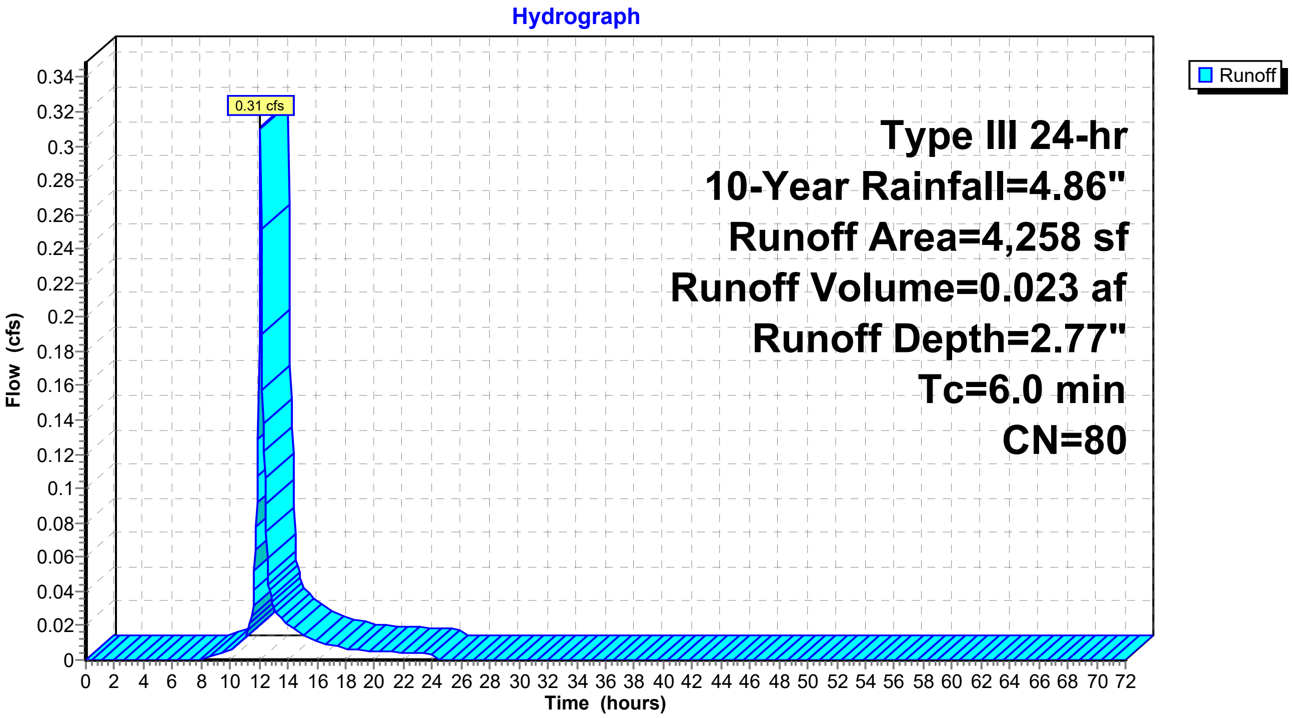
Runoff = 0.31 cfs @ 12.09 hrs, Volume= 0.023 af, Depth= 2.77"
Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.86"

	Area (sf)	CN	Description
*	931	98	Sidewalk, HSG C
*	42	98	Wall, HSG C
*	2,417	74	Plantings, HSG C
	108	96	Gravel surface, HSG C
*	760	74	Plantings, HSG C (OFFSITE)
	4,258	80	Weighted Average
	3,285		77.15% Pervious Area
	973		22.85% Impervious Area

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

Subcatchment S-B-2: S-B-2



Summary for Subcatchment SWALE: BASIN

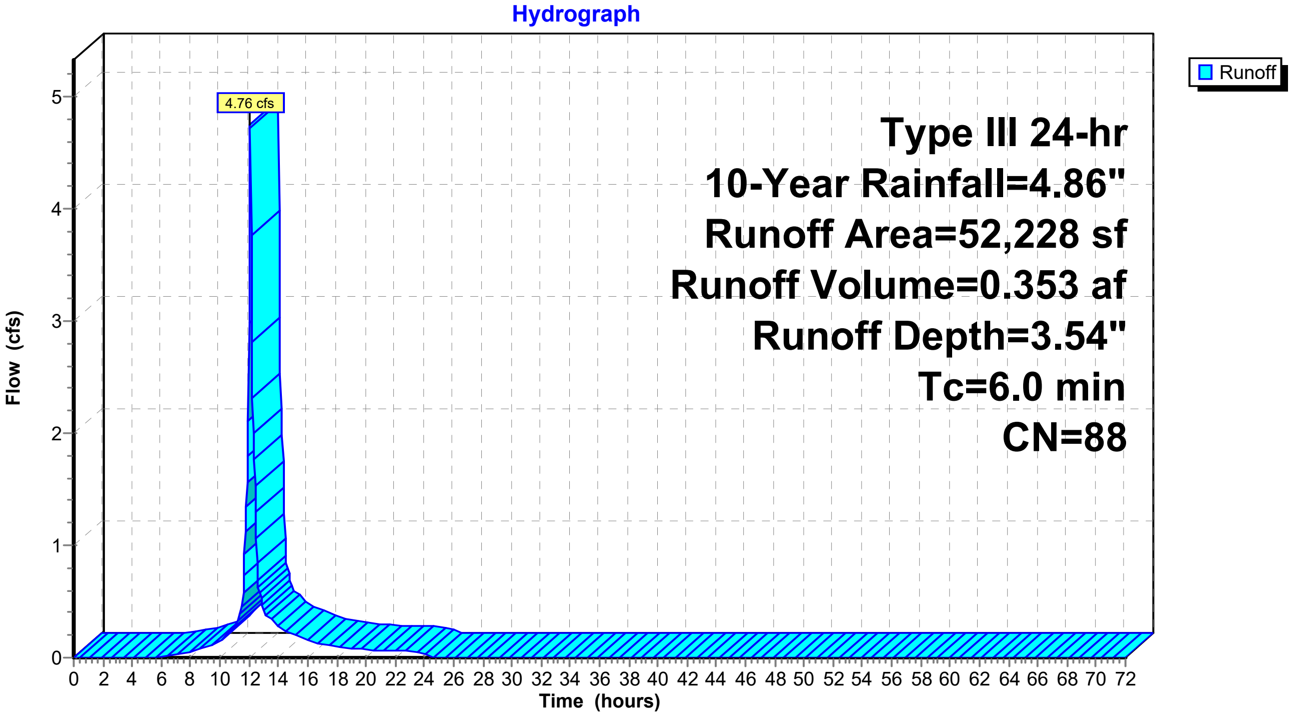
Runoff = 4.76 cfs @ 12.09 hrs, Volume= 0.353 af, Depth= 3.54"
Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.86"

	Area (sf)	CN	Description
*	30,996	98	Impervious surfaces, HSG C
	21,232	74	>75% Grass cover, Good, HSG C
	52,228	88	Weighted Average
	21,232		40.65% Pervious Area
	30,996		59.35% Impervious Area

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

Subcatchment SWALE: BASIN



Summary for Pond AB-1: Storage Beneath Garage Slab

Inflow Area = 0.424 ac, 77.06% Impervious, Inflow Depth = 4.09" for 10-Year event
Inflow = 1.82 cfs @ 12.09 hrs, Volume= 0.145 af
Outflow = 0.20 cfs @ 12.78 hrs, Volume= 0.145 af, Atten= 89%, Lag= 41.7 min
Primary = 0.20 cfs @ 12.78 hrs, Volume= 0.145 af
Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 17.60' @ 12.78 hrs Surf.Area= 8,842 sf Storage= 2,536 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 118.0 min (885.6 - 767.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	16.42'	0 cf	**85.63'W x 103.25'L x 2.42'H Field A** 21,372 cf Overall - 6,644 cf Embedded = 14,729 cf x 0.0% Voids
#2A	16.75'	5,371 cf	**ADS N-12 18"** x 145 Inside #1 Inside= 18.2"W x 18.2"H => 1.80 sf x 20.00'L = 36.0 cf Outside= 21.0"W x 21.0"H => 2.23 sf x 20.00'L = 44.5 cf 145 Chambers in 29 Rows 84.13' Header x 1.80 sf x 1 = 151.4 cf Inside
		5,371 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	16.75'	**12.0" Round Culvert** L= 48.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 16.75' / 16.44' S= 0.0065 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	16.75'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	18.05'	**4.0' long x 5.40' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.20 cfs @ 12.78 hrs HW=17.60' TW=14.41' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.20 cfs of 1.83 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.20 cfs @ 4.09 fps)
  └─**3=Sharp-Crested Rectangular Weir**(Controls 0.00 cfs)

Pond AB-1: Storage Beneath Garage Slab - Chamber Wizard Field A

Chamber Model = ADS N-12 18" (ADS N-12® Pipe)
Inside= 18.2"W x 18.2"H => 1.80 sf x 20.00'L = 36.0 cf
Outside= 21.0"W x 21.0"H => 2.23 sf x 20.00'L = 44.5 cf

21.0" Wide + 14.3" Spacing = 35.3" C-C Row Spacing

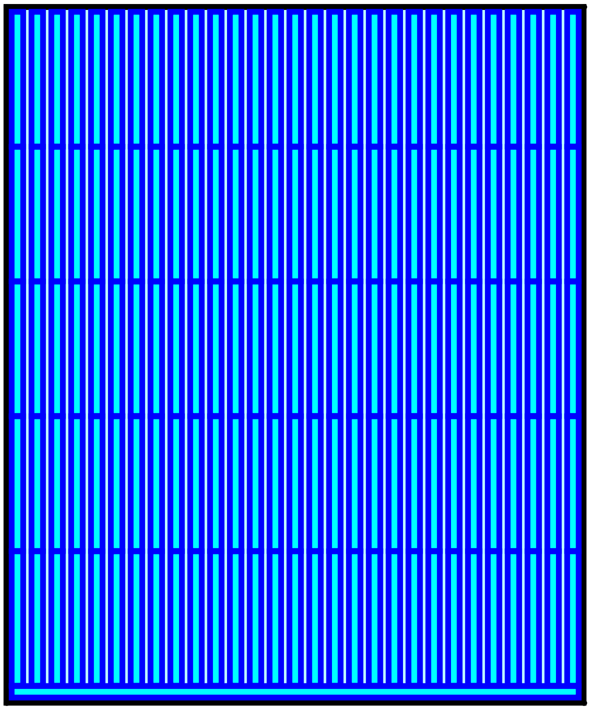
5 Chambers/Row x 20.00' Long +1.75' Header x 1 = 101.75' Row Length +9.0" End Stone x 2 = 103.25' Base Length
29 Rows x 21.0" Wide + 14.3" Spacing x 28 + 9.0" Side Stone x 2 = 85.63' Base Width
4.0" Stone Base + 21.0" Chamber Height + 4.0" Stone Cover = 2.42' Field Height

145 Chambers x 36.0 cf + 84.13' Header x 1.80 sf = 5,371.5 cf Chamber Storage
145 Chambers x 44.5 cf + 84.13' Header x 2.23 sf = 6,643.5 cf Displacement

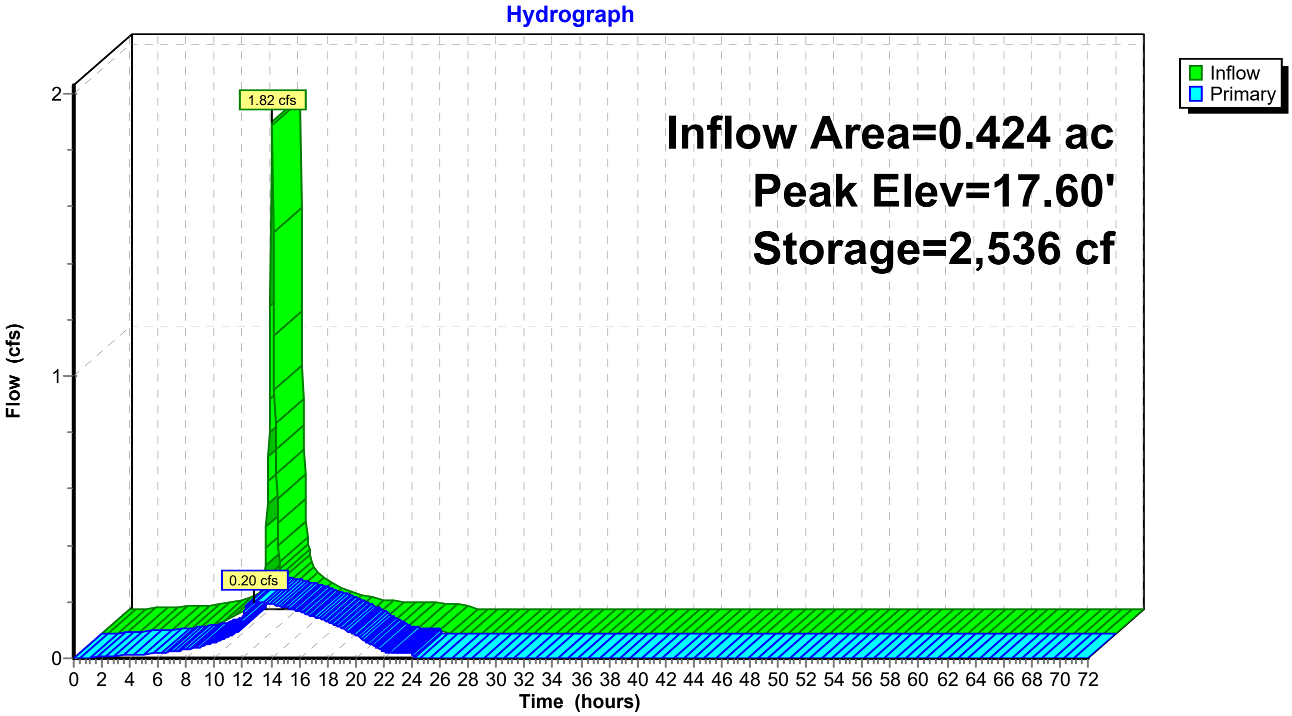
21,372.1 cf Field - 6,643.5 cf Chambers = 14,728.6 cf Stone x 0.0% Voids = 0.0 cf Stone Storage

Chamber Storage = 5,371.5 cf = 0.123 af
Overall Storage Efficiency = 25.1%
Overall System Size = 103.25' x 85.63' x 2.42'

145 Chambers
791.6 cy Field
545.5 cy Stone



Pond AB-1: Storage Beneath Garage Slab



Summary for Pond AB-2: Subsurface Infiltration System

Inflow Area = 0.413 ac,100.00% Impervious, Inflow Depth = 4.62" for 10-Year event
Inflow = 1.92 cfs @ 12.09 hrs, Volume= 0.159 af
Outflow = 0.17 cfs @ 11.60 hrs, Volume= 0.159 af, Atten= 91%, Lag= 0.0 min
Discarded = 0.17 cfs @ 11.60 hrs, Volume= 0.159 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 19.89' @ 12.96 hrs Surf.Area= 3,092 sf Storage= 2,399 cf

Plug-Flow detention time= 95.3 min calculated for 0.159 af (100% of inflow)
Center-of-Mass det. time= 95.3 min (843.8 - 748.5)

Volume	Invert	Avail.Storage	Storage Description
#1	18.75'	1,410 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 7,143 cf Overall - 3,619 cf Embedded = 3,524 cf x 40.0% Voids
#2	19.08'	3,257 cf	**Ferguson R-Tank XD 9** x 759 Inside #1 Inside= 19.7"W x 17.7"H => 2.18 sf x 1.97'L = 4.3 cf Outside= 19.7"W x 17.7"H => 2.42 sf x 1.97'L = 4.8 cf 759 Chambers in 36 Rows
		4,666 cf	Total Available Storage

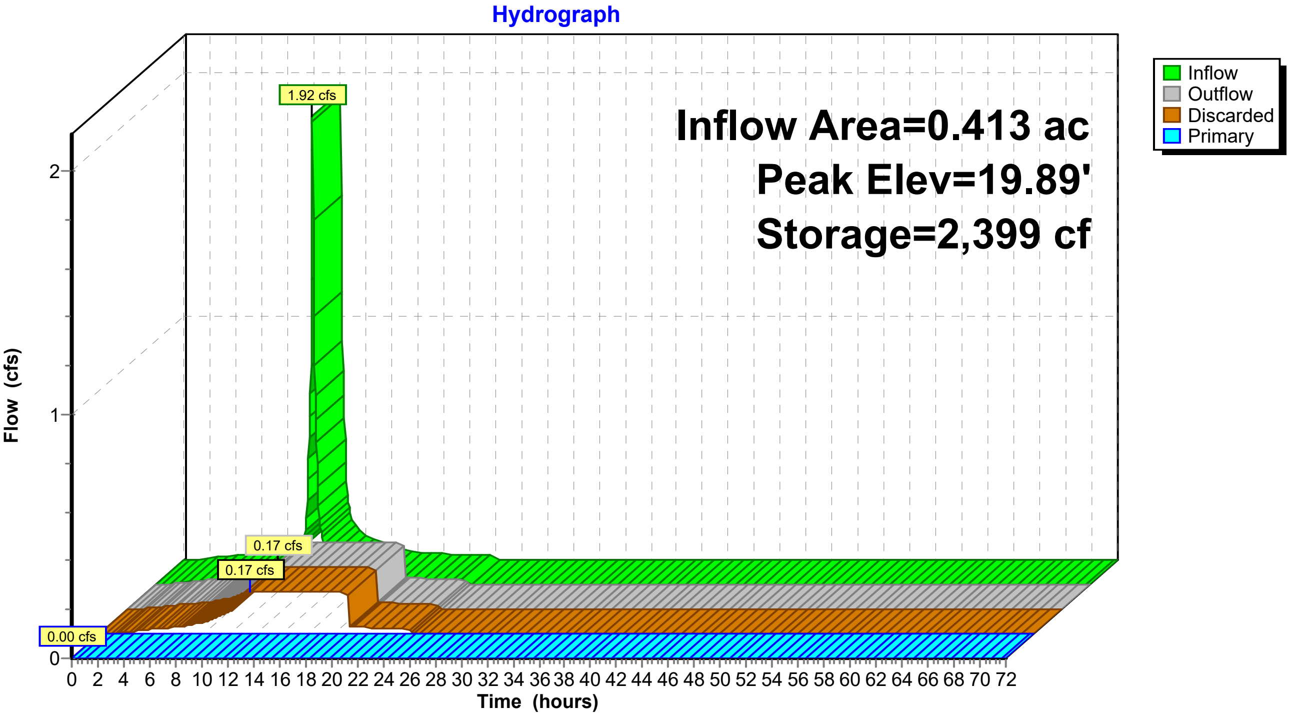
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
18.75	3,092	0	0
21.06	3,092	7,143	7,143

Device	Routing	Invert	Outlet Devices
#1	Primary	19.08'	**12.0" Round Culvert** L= 3.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 19.08' / 19.08' S= 0.0000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	20.30'	**4.0' long x 3.15' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Discarded	18.75'	**2.410 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=0.17 cfs @ 11.60 hrs HW=18.80' (Free Discharge)
└─**3=Exfiltration** (Exfiltration Controls 0.17 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=18.75' TW=13.87' (Dynamic Tailwater)
└─**1=Culvert** (Controls 0.00 cfs)
  └─**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond AB-2: Subsurface Infiltration System



Summary for Pond AB-3: Subsurface Infiltration System

Inflow Area = 0.397 ac, 74.76% Impervious, Inflow Depth = 4.00" for 10-Year event
Inflow = 1.65 cfs @ 12.09 hrs, Volume= 0.132 af
Outflow = 0.78 cfs @ 12.26 hrs, Volume= 0.132 af, Atten= 53%, Lag= 10.4 min
Discarded = 0.14 cfs @ 11.60 hrs, Volume= 0.098 af
Primary = 0.64 cfs @ 12.26 hrs, Volume= 0.035 af
Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 20.26' @ 12.26 hrs Surf.Area= 2,589 sf Storage= 1,222 cf

Plug-Flow detention time= 22.0 min calculated for 0.132 af (100% of inflow)
Center-of-Mass det. time= 21.9 min (788.7 - 766.8)

Volume	Invert	Avail.Storage	Storage Description
#1	19.50'	1,022 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 3,858 cf Overall - 1,303 cf Embedded = 2,554 cf x 40.0% Voids
#2	19.83'	1,173 cf	**Ferguson R-Tank XD 4** x 615 Inside #1 Inside= 19.7"W x 7.9"H => 0.97 sf x 1.97'L = 1.9 cf Outside= 19.7"W x 7.9"H => 1.08 sf x 1.97'L = 2.1 cf 615 Chambers in 10 Rows
		2,195 cf	Total Available Storage

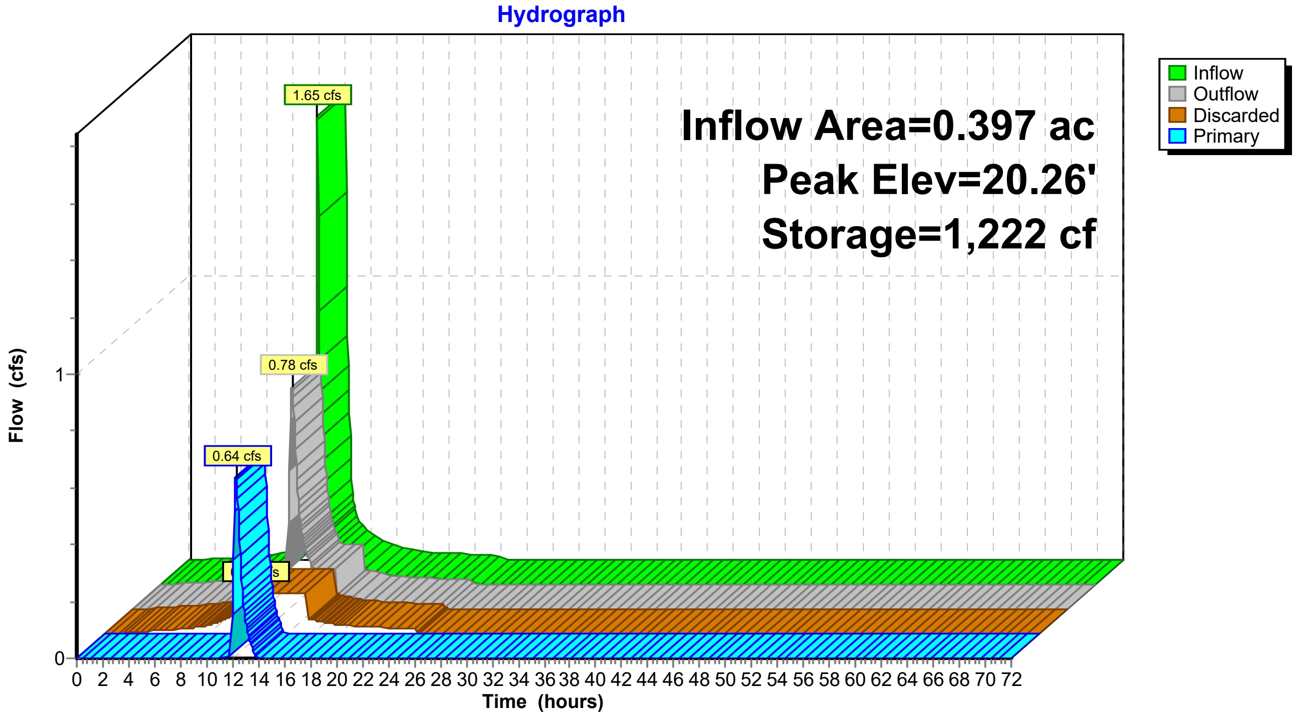
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
19.50	2,589	0	0
20.99	2,589	3,858	3,858

Device	Routing	Invert	Outlet Devices
#1	Primary	19.83'	**12.0" Round Culvert** L= 22.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 19.83' / 19.61' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	19.90'	**4.0' long x 2.20' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Discarded	19.50'	**2.410 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=0.14 cfs @ 11.60 hrs HW=19.54' (Free Discharge)
└─**3=Exfiltration** (Exfiltration Controls 0.14 cfs)

Primary OutFlow Max=0.64 cfs @ 12.26 hrs HW=20.26' TW=15.00' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 0.64 cfs @ 2.88 fps)
  └─**2=Sharp-Crested Rectangular Weir** (Passes 0.64 cfs of 2.81 cfs potential flow)

Pond AB-3: Subsurface Infiltration System



Summary for Pond ED-AB: Re-graded Existing Depression

Inflow Area = 0.844 ac, 21.19% Impervious, Inflow Depth = 0.60" for 10-Year event
Inflow = 0.26 cfs @ 12.20 hrs, Volume= 0.042 af
Outflow = 0.06 cfs @ 14.06 hrs, Volume= 0.042 af, Atten= 78%, Lag= 111.6 min
Primary = 0.06 cfs @ 14.06 hrs, Volume= 0.042 af
Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 20.50' @ 14.06 hrs Surf.Area= 925 sf Storage= 489 cf

Plug-Flow detention time= 96.6 min calculated for 0.042 af (100% of inflow)
Center-of-Mass det. time= 95.8 min (1,012.2 - 916.4)

Volume	Invert	Avail.Storage	Storage Description
#1	19.50'	8,308 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

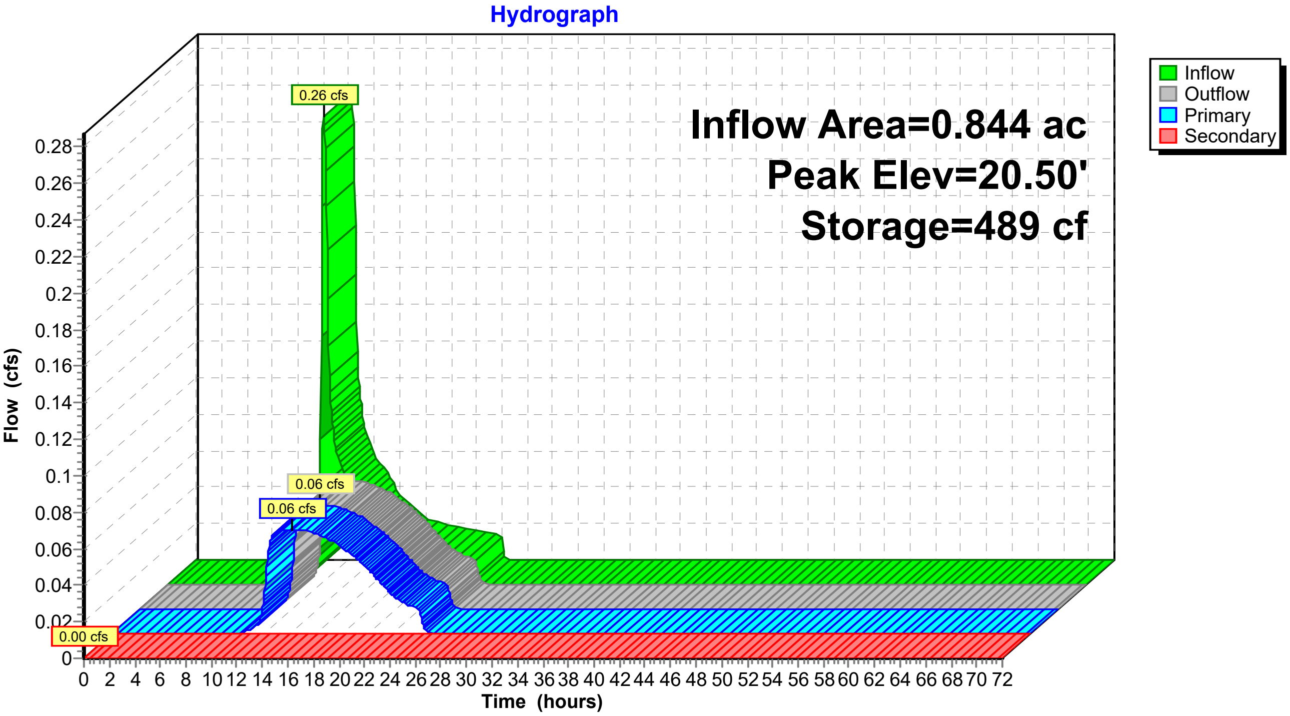
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
19.50	69	0	0
20.00	484	138	138
21.00	1,371	928	1,066
22.00	2,351	1,861	2,927
23.00	3,941	3,146	6,073
23.50	5,000	2,235	8,308

Device	Routing	Invert	Outlet Devices
#1	Primary	19.50'	**12.0" Round Culvert** L= 27.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 19.50' / 18.58' S= 0.0341 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	19.50'	**1.5" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	22.45'	**4.0' long x 1.00' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Secondary	23.43'	**2.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Primary OutFlow Max=0.06 cfs @ 14.06 hrs HW=20.50' TW=14.24' (Dynamic Tailwater)
↑—**1=Culvert** (Passes 0.06 cfs of 2.36 cfs potential flow)
  ↑—**2=Orifice/Grate** (Orifice Controls 0.06 cfs @ 4.66 fps)
  └—**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=19.50' TW=13.87' (Dynamic Tailwater)
↑—**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond ED-AB: Re-graded Existing Depression



Summary for Pond ES-LF: DP-LF Existing Swale/Basin in Lovell Field

```
Inflow Area =        4.579 ac, 55.32% Impervious,  Inflow Depth =  2.02"   for  10-Year event
Inflow      =       7.66 cfs @  12.10 hrs,  Volume=          0.773 af
Outflow     =       7.14 cfs @  12.13 hrs,  Volume=          0.773 af,  Atten= 7%,  Lag= 1.9 min
Primary     =       7.14 cfs @  12.13 hrs,  Volume=          0.773 af
   Routed to nonexistent node 1R
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 15.38' @ 12.13 hrs   Surf.Area= 968 sf   Storage= 520 cf

Plug-Flow detention time= 0.5 min calculated for 0.772 af (100% of inflow)
Center-of-Mass det. time= 0.5 min (830.4 - 829.9)

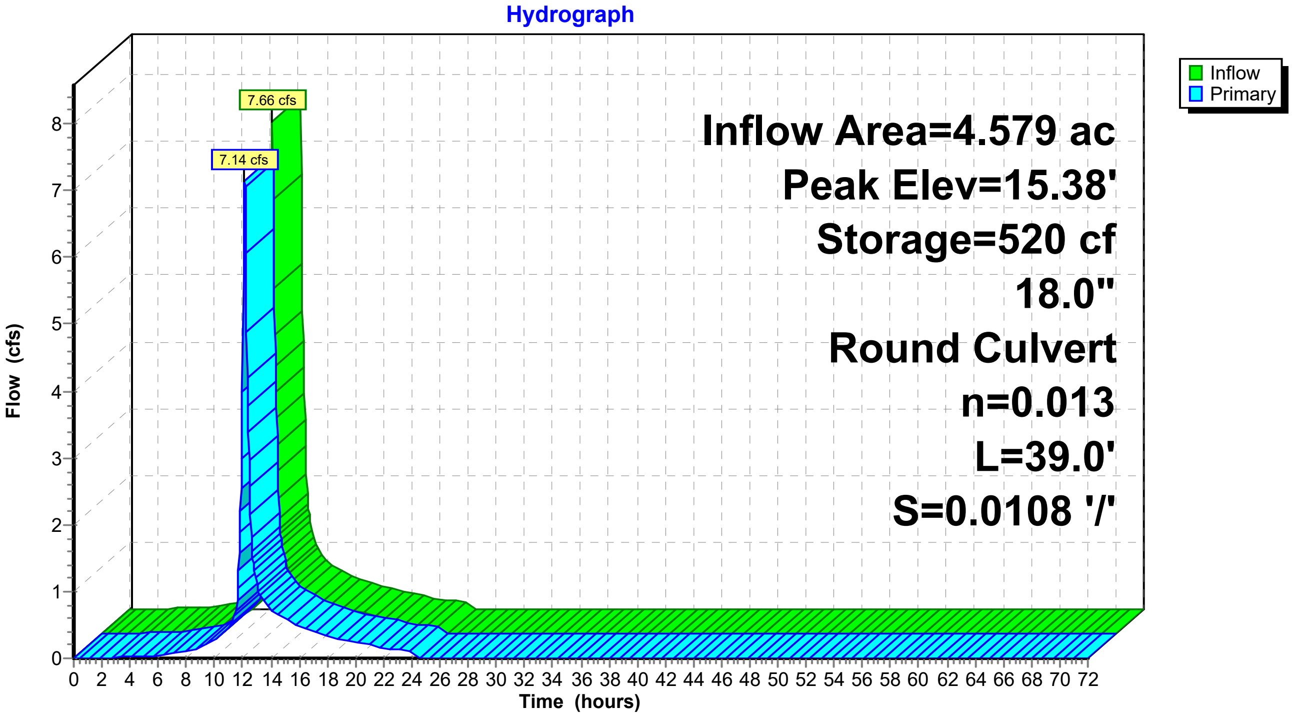
Volume	Invert	Avail.Storage	Storage Description
#1	13.87'	17,546 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
13.87	0	0	0
14.00	3	0	0
15.00	488	246	246
16.00	1,764	1,126	1,372
17.00	2,848	2,306	3,678
18.00	3,993	3,421	7,098
19.00	5,217	4,605	11,703
20.00	6,468	5,843	17,546

Device	Routing	Invert	Outlet Devices
#1	Primary	13.87'	**18.0" Round Culvert** L= 39.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 13.87' / 13.45' S= 0.0108 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=7.01 cfs @ 12.13 hrs HW=15.36' (Free Discharge)
└─**1=Culvert** (Barrel Controls 7.01 cfs @ 4.98 fps)

Pond ES-LF: DP-LF Existing Swale/Basin in Lovell Field



Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentCB 1: CB 1 Runoff Area=2,480 sf 100.00% Impervious Runoff Depth=5.91"
Tc=6.0 min CN=98 Runoff=0.34 cfs 0.028 af

SubcatchmentCB 2: CB 2 Runoff Area=1,943 sf 100.00% Impervious Runoff Depth=5.91"
Tc=6.0 min CN=98 Runoff=0.26 cfs 0.022 af

SubcatchmentCB 5: CB 5 Runoff Area=6,867 sf 82.76% Impervious Runoff Depth=5.45"
Tc=6.0 min CN=94 Runoff=0.90 cfs 0.072 af

SubcatchmentDCB 4: DCB 4 Runoff Area=38,222 sf 36.71% Impervious Runoff Depth=1.60"
Tc=6.0 min CN=55 Runoff=1.46 cfs 0.117 af

SubcatchmentR-A1: ROOF Runoff Area=10,869 sf 100.00% Impervious Runoff Depth=5.91"
Tc=6.0 min CN=98 Runoff=1.47 cfs 0.123 af

SubcatchmentR-A2: ROOF Runoff Area=18,000 sf 100.00% Impervious Runoff Depth=5.91"
Tc=6.0 min CN=98 Runoff=2.43 cfs 0.204 af

SubcatchmentR-B: ROOF Runoff Area=11,143 sf 100.00% Impervious Runoff Depth=5.91"
Tc=6.0 min CN=98 Runoff=1.51 cfs 0.126 af

SubcatchmentS-A-1: S-A-1 Runoff Area=2,443 sf 21.29% Impervious Runoff Depth=3.21"
Tc=6.0 min CN=73 Runoff=0.21 cfs 0.015 af

SubcatchmentS-A-2: S-A-2 Runoff Area=7,587 sf 44.19% Impervious Runoff Depth=4.55"
Tc=6.0 min CN=86 Runoff=0.89 cfs 0.066 af

SubcatchmentS-A-3: S-A-3 Runoff Area=2,969 sf 43.45% Impervious Runoff Depth=3.71"
Tc=6.0 min CN=78 Runoff=0.29 cfs 0.021 af

SubcatchmentS-A-OS: Offsite Areas Runoff Area=34,300 sf 21.18% Impervious Runoff Depth=1.00"
Flow Length=213' Tc=9.4 min CN=47 Runoff=0.58 cfs 0.066 af

SubcatchmentS-B-1: S-B-1 Runoff Area=6,163 sf 29.13% Impervious Runoff Depth=4.02"
Tc=6.0 min CN=81 Runoff=0.65 cfs 0.047 af

SubcatchmentS-B-2: S-B-2 Runoff Area=4,258 sf 22.85% Impervious Runoff Depth=3.92"
Tc=6.0 min CN=80 Runoff=0.44 cfs 0.032 af

SubcatchmentSWALE: BASIN Runoff Area=52,228 sf 59.35% Impervious Runoff Depth=4.77"
Tc=6.0 min CN=88 Runoff=6.32 cfs 0.477 af

Pond AB-1: Storage Beneath Garage Slab Peak Elev=17.81' Storage=3,511 cf Inflow=2.35 cfs 0.189 af
Outflow=0.23 cfs 0.189 af

Pond AB-2: Subsurface Infiltration System Peak Elev=20.28' Storage=3,369 cf Inflow=2.43 cfs 0.204 af
Discarded=0.17 cfs 0.204 af Primary=0.00 cfs 0.000 af Outflow=0.17 cfs 0.204 af

Pond AB-3: Subsurface Infiltration System Peak Elev=20.41' Storage=1,521 cf Inflow=2.15 cfs 0.173 af
Discarded=0.14 cfs 0.116 af Primary=1.06 cfs 0.057 af Outflow=1.20 cfs 0.173 af

Pond ED-AB: Re-graded Existing Depression Peak Elev=21.24' Storage=1,426 cf Inflow=0.74 cfs 0.081 af
Primary=0.08 cfs 0.081 af Secondary=0.00 cfs 0.000 af Outflow=0.08 cfs 0.081 af

Pond ES-LF: DP-LF Existing Swale/Basin in Peak Elev=15.86' Storage=1,129 cf Inflow=10.92 cfs 1.095 af
18.0" Round Culvert n=0.013 L=39.0' S=0.0108 '/' Outflow=9.22 cfs 1.095 af

Total Runoff Area = 4.579 ac Runoff Volume = 1.415 af Average Runoff Depth = 3.71"
44.68% Pervious = 2.046 ac 55.32% Impervious = 2.533 ac

Summary for Subcatchment CB 1: CB 1

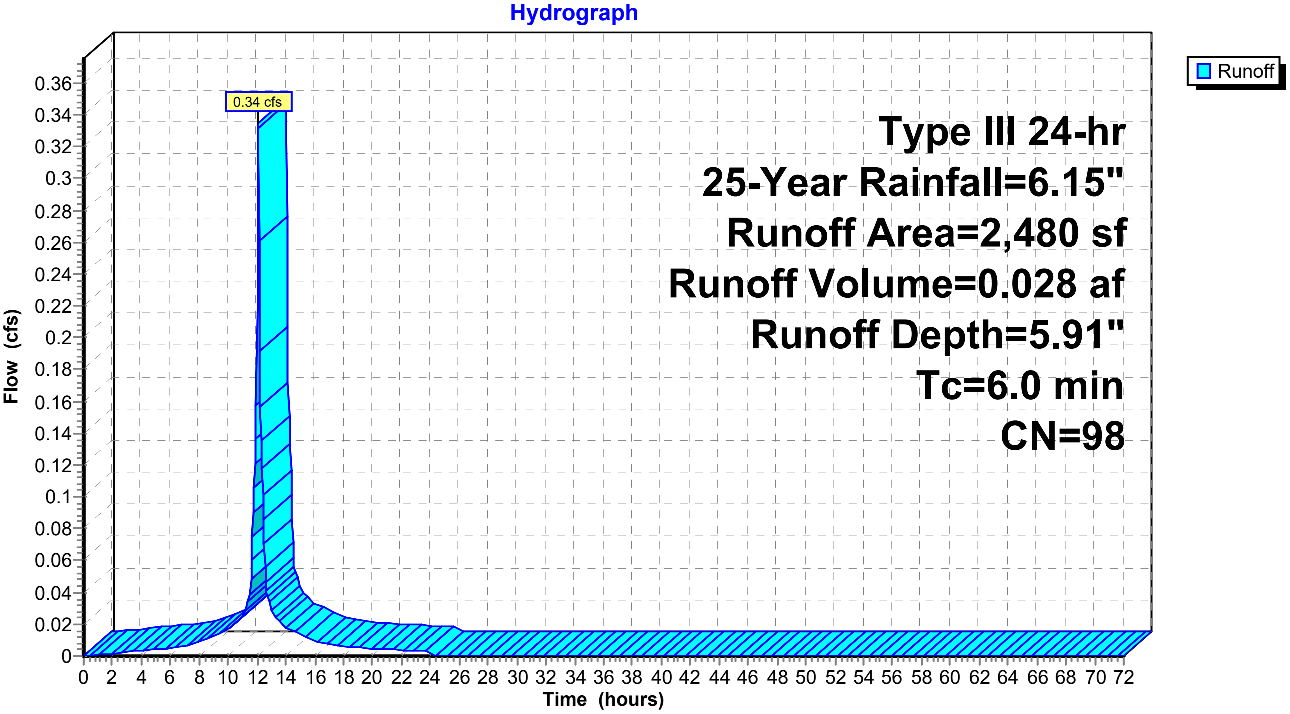
Runoff = 0.34 cfs @ 12.09 hrs, Volume= 0.028 af, Depth= 5.91"
Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.15"

	Area (sf)	CN	Description
*	2,480	98	Impervious surfaces, HSG C
	2,480		100.00% Impervious Area

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

Subcatchment CB 1: CB 1



Summary for Subcatchment CB 2: CB 2

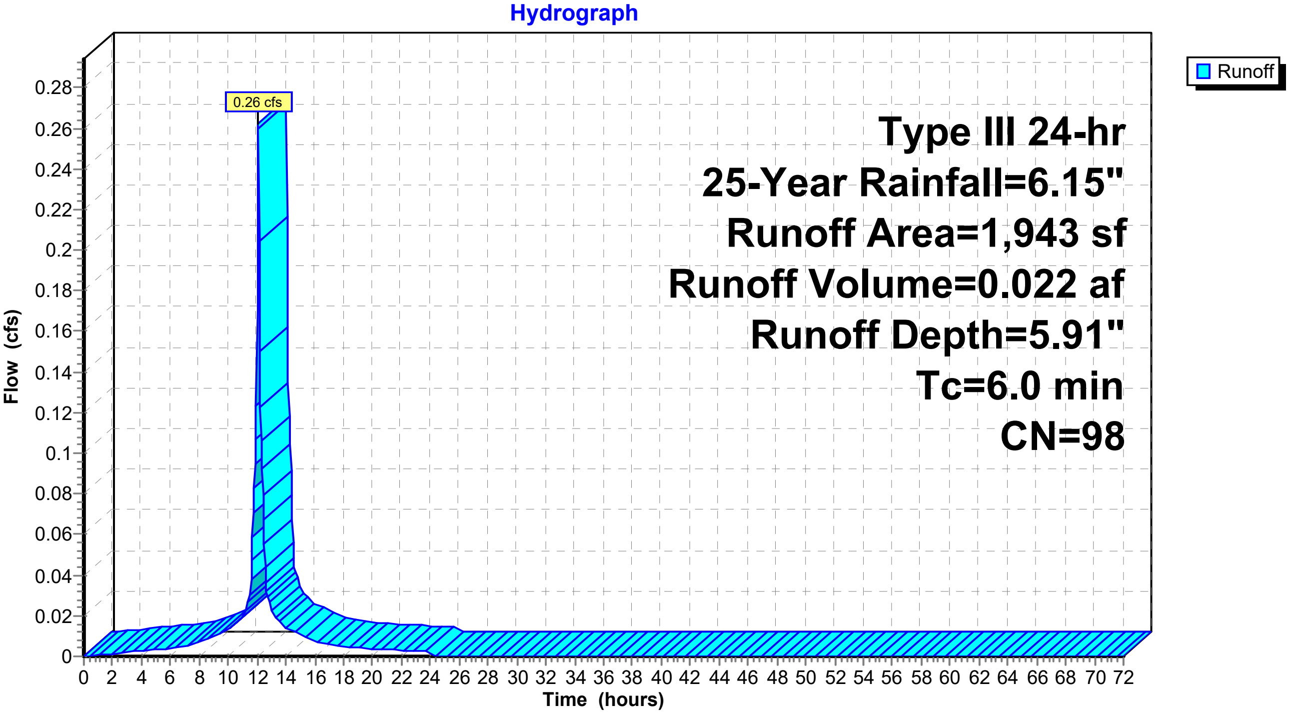
Runoff = 0.26 cfs @ 12.09 hrs, Volume= 0.022 af, Depth= 5.91"
Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.15"

	Area (sf)	CN	Description
*	1,943	98	Impervious surfaces, HSG C
	1,943		100.00% Impervious Area

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

Subcatchment CB 2: CB 2



Summary for Subcatchment CB 5: CB 5

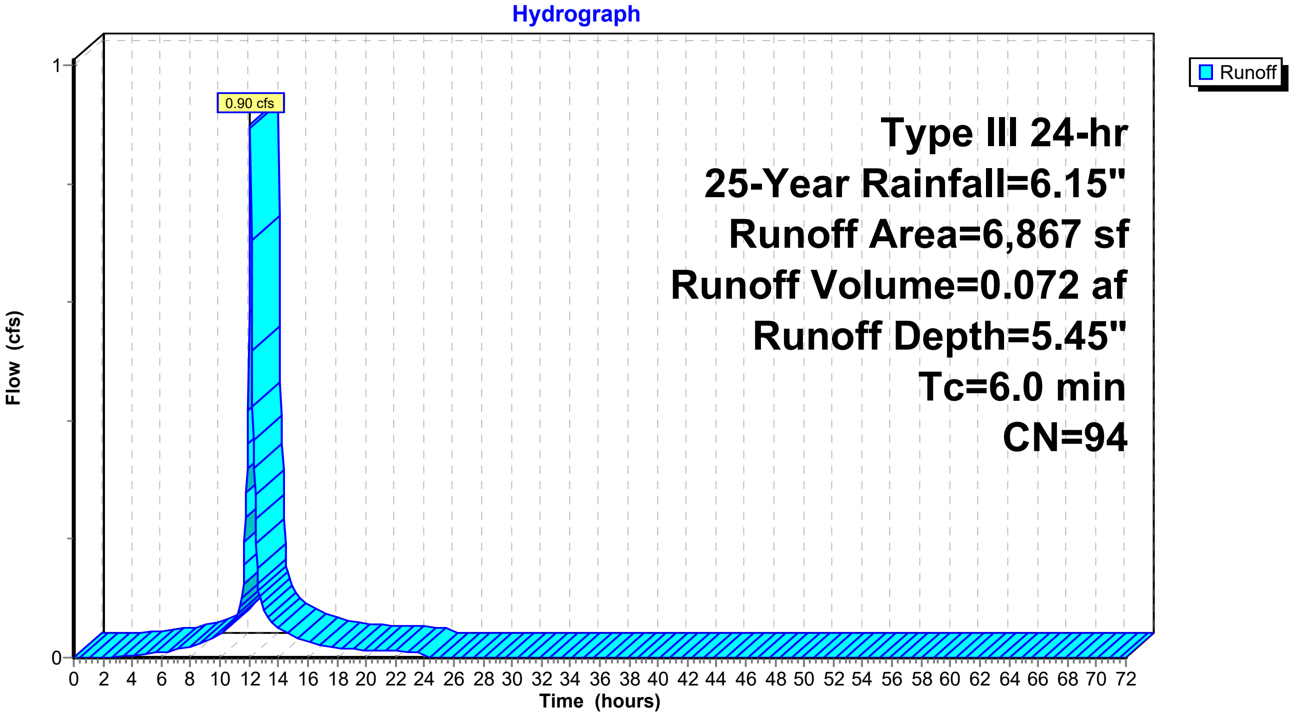
Runoff = 0.90 cfs @ 12.09 hrs, Volume= 0.072 af, Depth= 5.45"
Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.15"

	Area (sf)	CN	Description
*	5,683	98	Impervious surfaces, HSG C
	1,184	74	>75% Grass cover, Good, HSG C
	6,867	94	Weighted Average
	1,184		17.24% Pervious Area
	5,683		82.76% Impervious Area

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

Subcatchment CB 5: CB 5



Summary for Subcatchment DCB 4: DCB 4

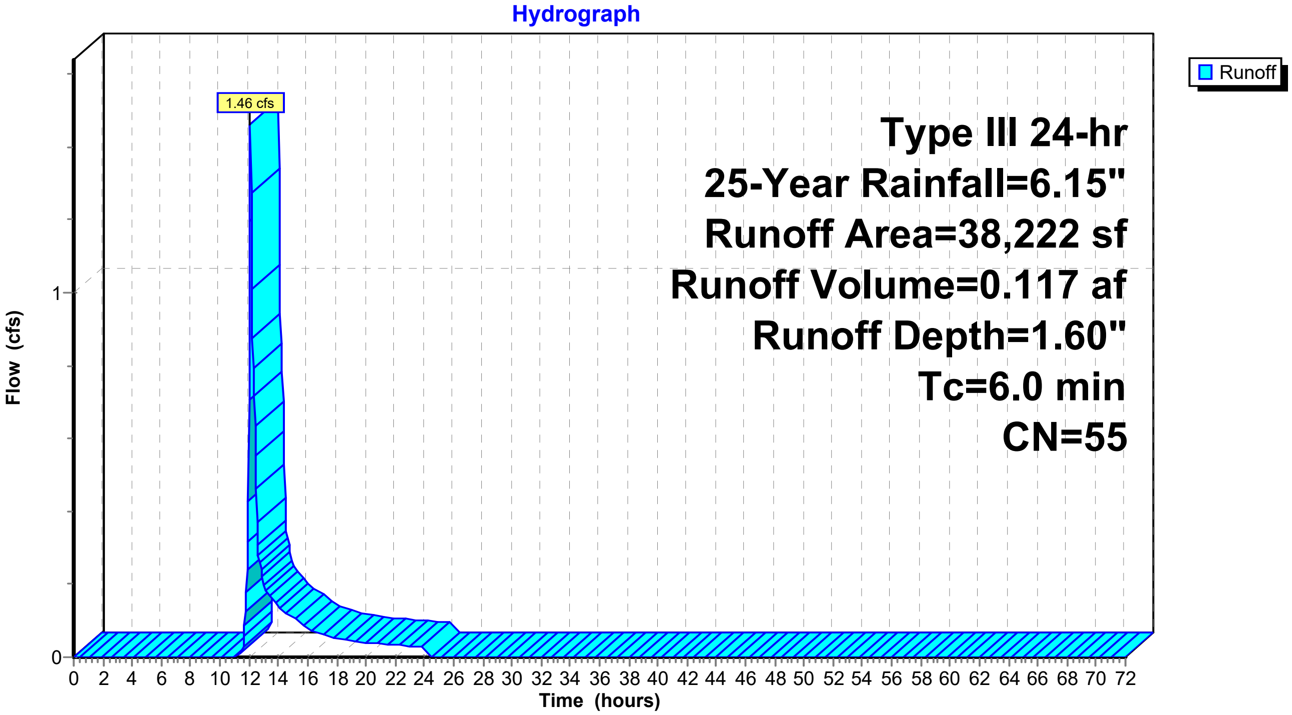
Runoff = 1.46 cfs @ 12.10 hrs, Volume= 0.117 af, Depth= 1.60"
Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.15"

	Area (sf)	CN	Description
*	14,030	98	Impervious surfaces, HSG A
	24,192	30	Woods, Good, HSG A
	38,222	55	Weighted Average
	24,192		63.29% Pervious Area
	14,030		36.71% Impervious Area

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

Subcatchment DCB 4: DCB 4



Summary for Subcatchment R-A1: ROOF

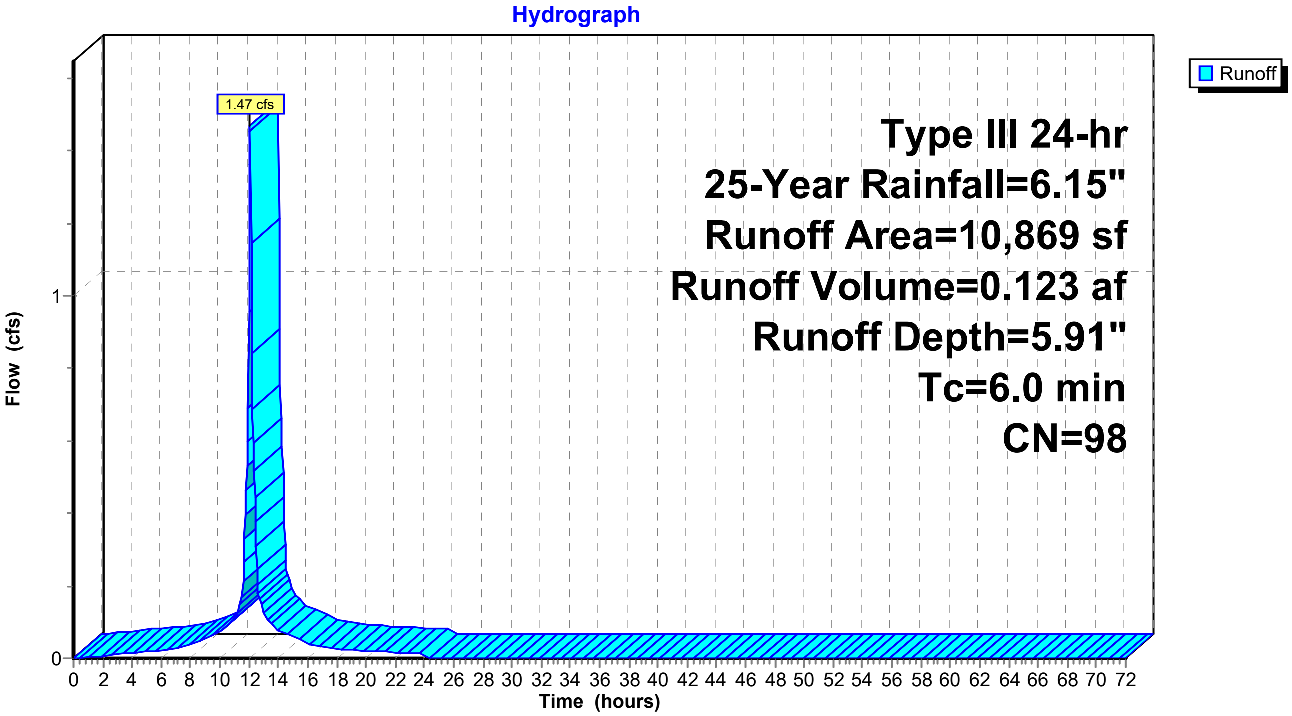
Runoff = 1.47 cfs @ 12.09 hrs, Volume= 0.123 af, Depth= 5.91"
Routed to Pond AB-1 : Storage Beneath Garage Slab

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.15"

	Area (sf)	CN	Description
	9,976	98	Roofs, HSG A
*	630	98	Patio, HSG A
*	74	98	Roofs, HSG C
*	189	98	Patio, HSG C
	10,869	98	Weighted Average
	10,869		100.00% Impervious Area

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

Subcatchment R-A1: ROOF



Summary for Subcatchment R-A2: ROOF

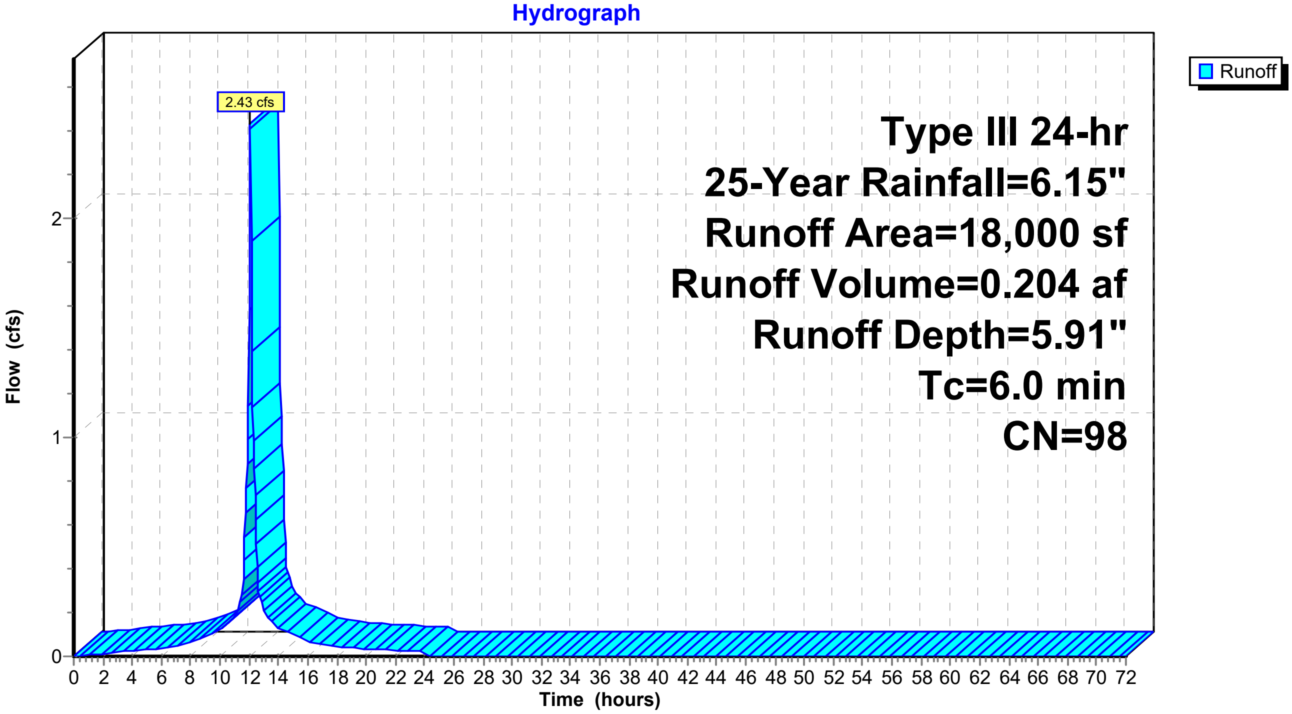
Runoff = 2.43 cfs @ 12.09 hrs, Volume= 0.204 af, Depth= 5.91"
Routed to Pond AB-2 : Subsurface Infiltration System

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.15"

	Area (sf)	CN	Description
*	18,000	98	Roof, HSG C
	18,000		100.00% Impervious Area

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

Subcatchment R-A2: ROOF



Summary for Subcatchment R-B: ROOF

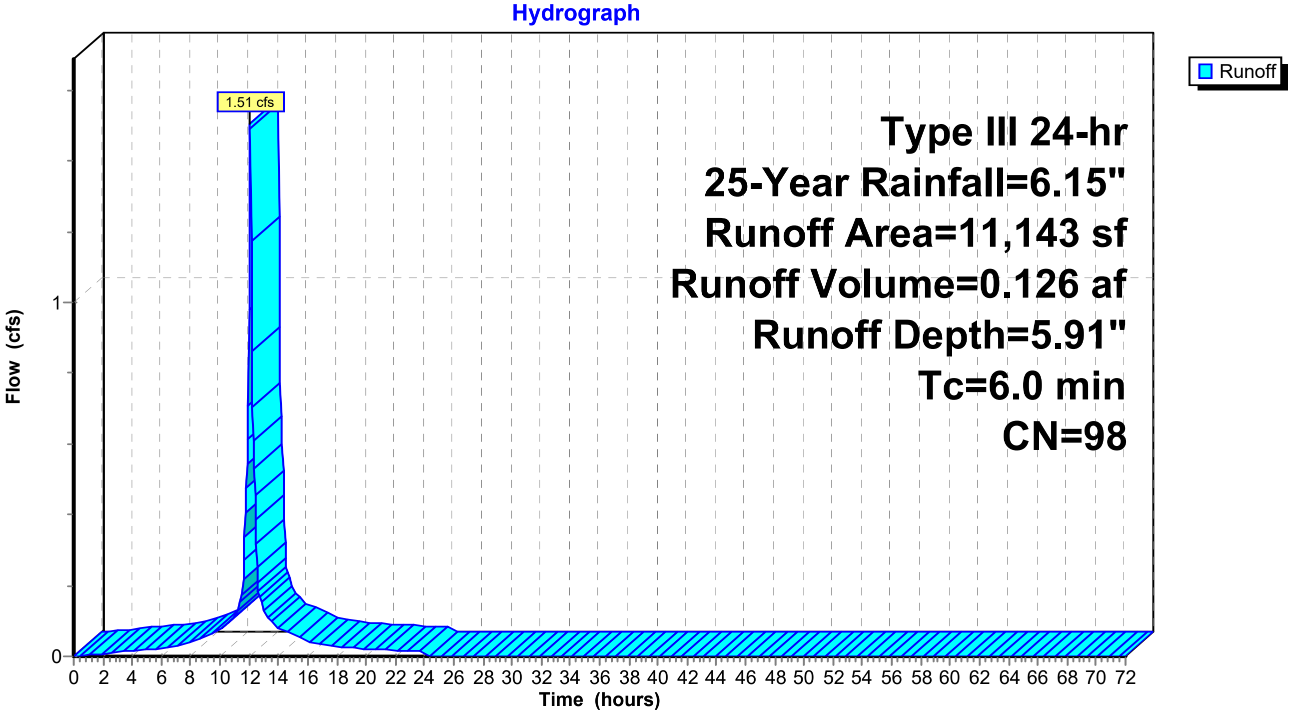
Runoff = 1.51 cfs @ 12.09 hrs, Volume= 0.126 af, Depth= 5.91"
Routed to Pond AB-3 : Subsurface Infiltration System

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.15"

Area (sf)	CN	Description
11,143	98	Roofs, HSG C
11,143		100.00% Impervious Area

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

Subcatchment R-B: ROOF



Summary for Subcatchment S-A-1: S-A-1

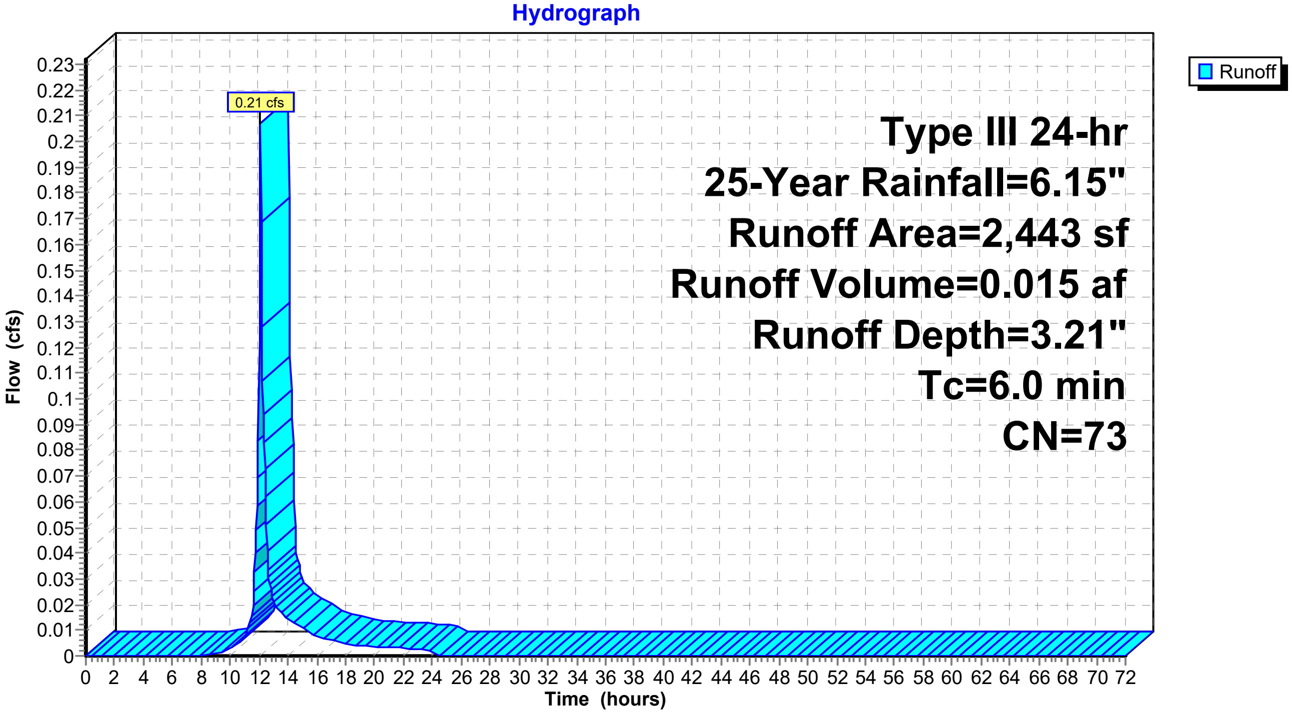
Runoff = 0.21 cfs @ 12.09 hrs, Volume= 0.015 af, Depth= 3.21"
Routed to Pond ED-AB : Re-graded Existing Depression

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.15"

	Area (sf)	CN	Description
*	244	98	Wall, HSG A
*	527	39	Plantings, HSG A
*	72	98	Transformer pad, HSG C
	160	96	Gravel surface, HSG C
*	204	98	Wall, HSG C
*	1,236	74	Plantings, HSG C
	2,443	73	Weighted Average
	1,923		78.71% Pervious Area
	520		21.29% Impervious Area

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

Subcatchment S-A-1: S-A-1



Summary for Subcatchment S-A-2: S-A-2

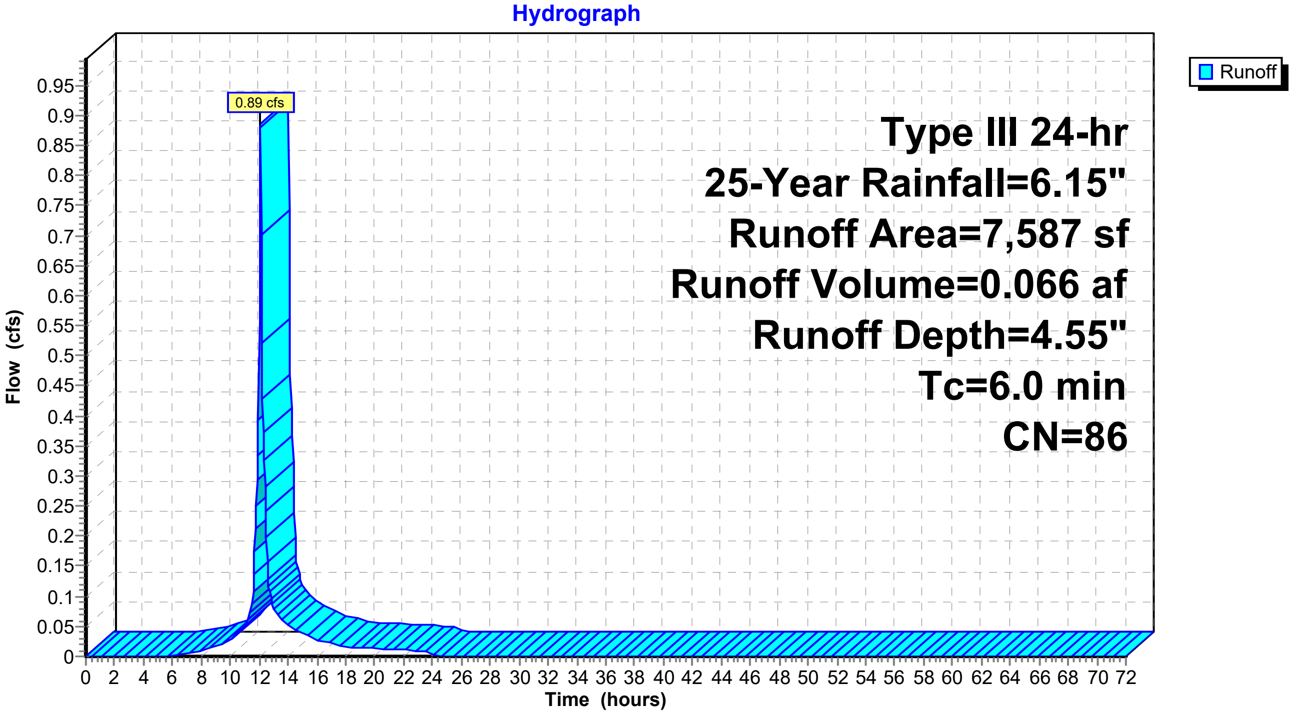
Runoff = 0.89 cfs @ 12.09 hrs, Volume= 0.066 af, Depth= 4.55"
Routed to Pond AB-1 : Storage Beneath Garage Slab

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.15"

	Area (sf)	CN	Description
*	1,431	74	Plantings, HSG C
*	1,401	98	Sidewalk,HSG C
*	236	96	Gravel, HSG C
*	14	98	Wall, HSG C
*	2,410	74	Plantings, HSG C (OFFSITE)
*	1,855	98	Pavement, HSG C
*	63	98	Wall, HSG C (OFFSITE)
*	10	98	Sign, HSG C (OFFSITE)
*	157	96	Gravel surface, HSG C (OFFSITE)
*	10	98	Impervious surfaces, HSG C (OFFSITE)
	7,587	86	Weighted Average
	4,234		55.81% Pervious Area
	3,353		44.19% Impervious Area

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

Subcatchment S-A-2: S-A-2



Summary for Subcatchment S-A-3: S-A-3

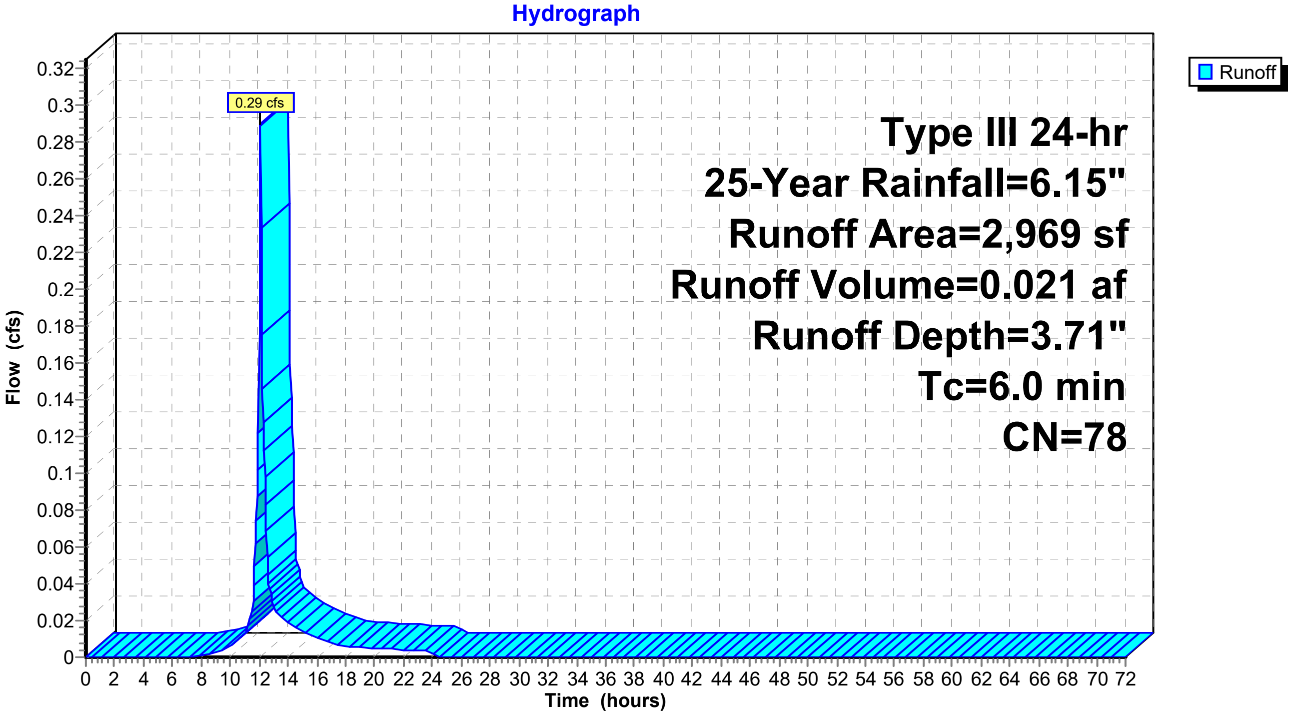
Runoff = 0.29 cfs @ 12.09 hrs, Volume= 0.021 af, Depth= 3.71"
Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.15"

	Area (sf)	CN	Description
*	438	98	Sidewalk, HSG A
*	143	96	Gravel, HSG A
*	227	39	Plantings, HSG A
*	227	98	Sidewalk, HSG A (OFFSITE)
*	444	39	Plantings, HSG A (OFFSITE)
*	40	96	Gravel, HSG C
*	126	74	Plantings, HSG C
*	625	98	Sidewalk, HSG C (OFFSITE)
*	699	74	Plantings, HSG C (OFFSITE)
	2,969	78	Weighted Average
	1,679		56.55% Pervious Area
	1,290		43.45% Impervious Area

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

Subcatchment S-A-3: S-A-3



Summary for Subcatchment S-A-OS: Offsite Areas

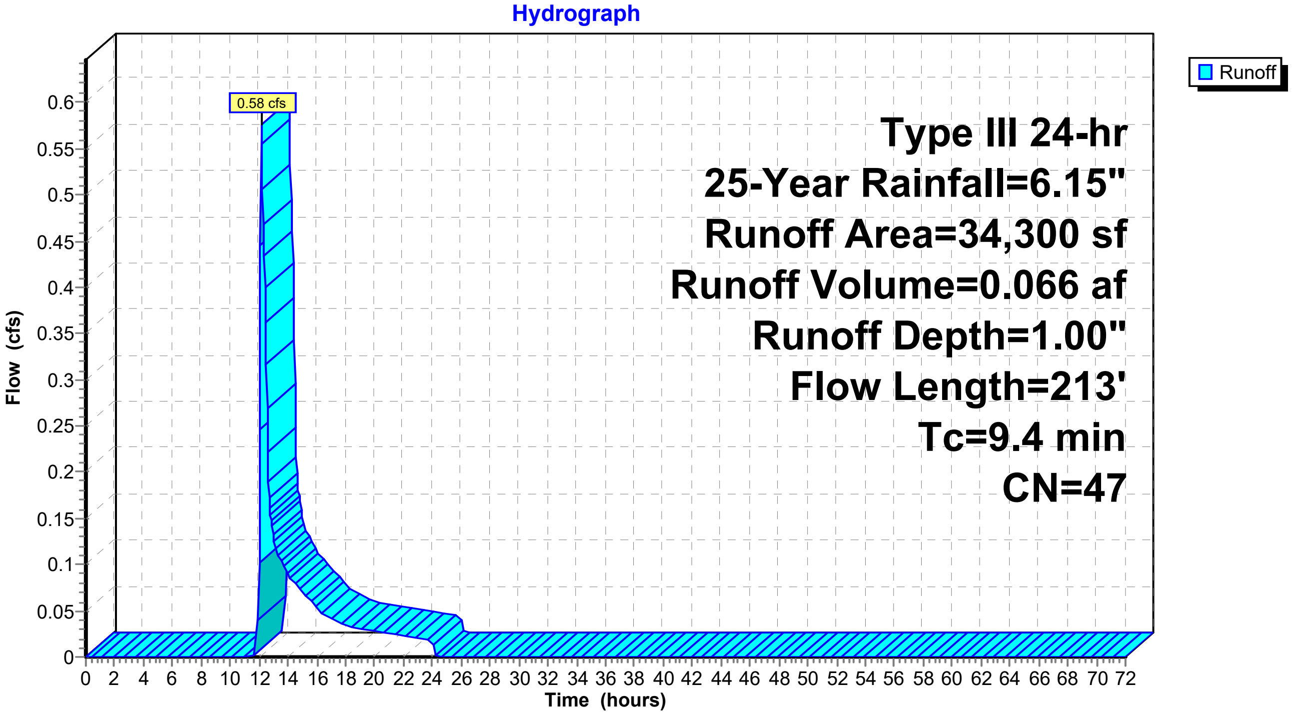
Runoff = 0.58 cfs @ 12.17 hrs, Volume= 0.066 af, Depth= 1.00"
Routed to Pond ED-AB : Re-graded Existing Depression

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.15"

	Area (sf)	CN	Description
*	15,938	30	Woods, Good, HSG A (OFFSITE)
*	11,097	39	>75% Grass cover, Good, HSG A (OFFSITE)
*	5,665	98	Roofs, HSG A (OFFSITE)
*	1,600	98	Impervious surfaces, HSG C (OFFSITE)
	34,300	47	Weighted Average
	27,035		78.82% Pervious Area
	7,265		21.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0600	0.10		**Sheet Flow, 1** Woods: Light underbrush n= 0.400 P2= 3.20"
1.5	163	0.1290	1.80		**Shallow Concentrated Flow, 2** Woodland Kv= 5.0 fps
9.4	213	Total			

Subcatchment S-A-OS: Offsite Areas



Summary for Subcatchment S-B-1: S-B-1

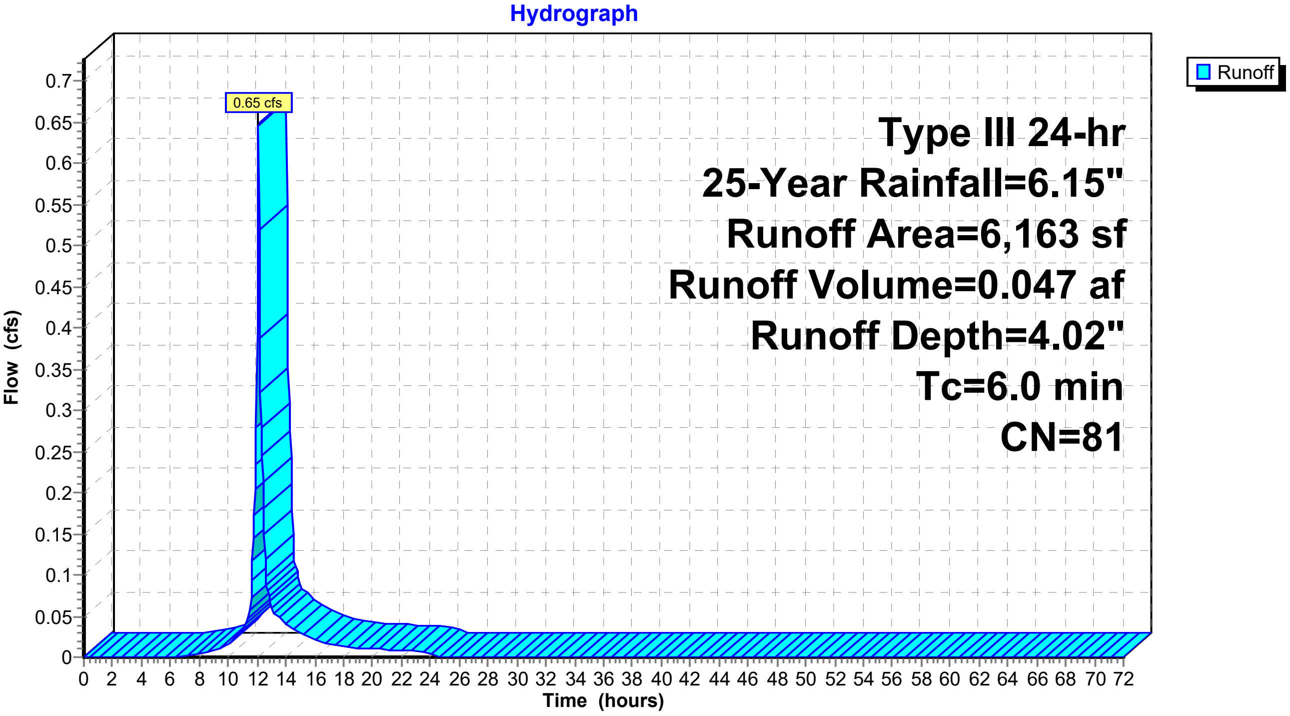
Runoff = 0.65 cfs @ 12.09 hrs, Volume= 0.047 af, Depth= 4.02"
Routed to Pond AB-3 : Subsurface Infiltration System

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.15"

	Area (sf)	CN	Description
*	252	98	Pavement, HSG C
*	245	98	Sidewalk, HSG C
*	14	98	Wall, HSG C
*	124	96	Gravel surface, HSG C
*	975	74	Plantings, HSG C
*	72	98	Transformer, HSG C
*	226	98	Sidewalk, HSG C (OFFSITE)
*	986	98	Pavement, HSG C (OFFSITE)
*	3,269	74	Plantings, HSG C (OFFSITE)
	6,163	81	Weighted Average
	4,368		70.87% Pervious Area
	1,795		29.13% Impervious Area

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

Subcatchment S-B-1: S-B-1



Summary for Subcatchment S-B-2: S-B-2

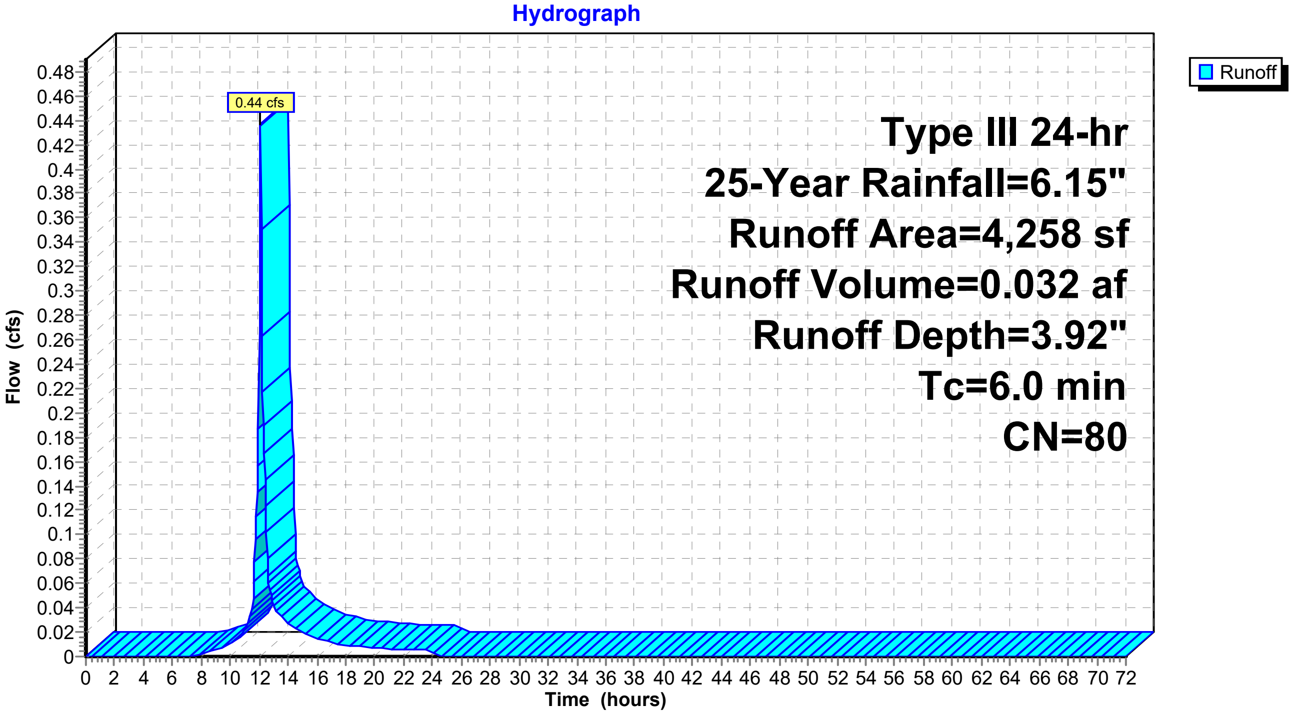
Runoff = 0.44 cfs @ 12.09 hrs, Volume= 0.032 af, Depth= 3.92"
Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.15"

	Area (sf)	CN	Description
*	931	98	Sidewalk, HSG C
*	42	98	Wall, HSG C
*	2,417	74	Plantings, HSG C
	108	96	Gravel surface, HSG C
*	760	74	Plantings, HSG C (OFFSITE)
	4,258	80	Weighted Average
	3,285		77.15% Pervious Area
	973		22.85% Impervious Area

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

Subcatchment S-B-2: S-B-2



Summary for Subcatchment SWALE: BASIN

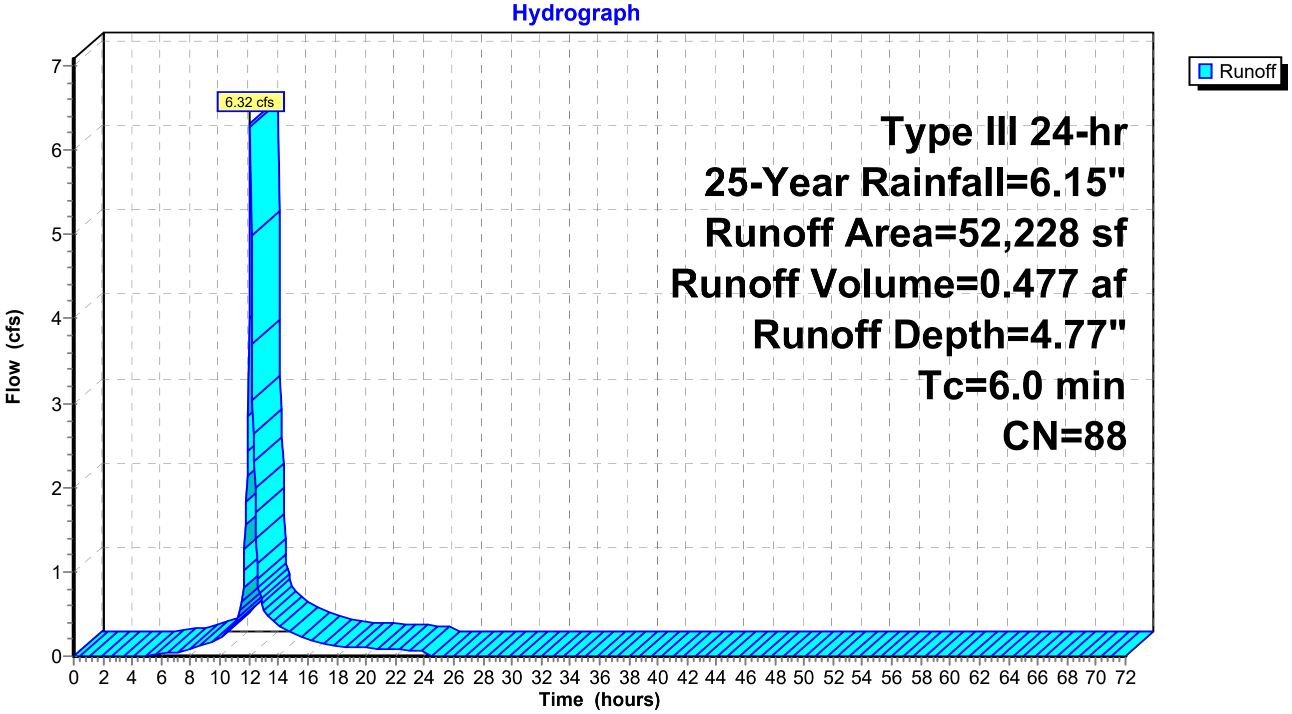
Runoff = 6.32 cfs @ 12.09 hrs, Volume= 0.477 af, Depth= 4.77"
Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.15"

	Area (sf)	CN	Description
*	30,996	98	Impervious surfaces, HSG C
	21,232	74	>75% Grass cover, Good, HSG C
	52,228	88	Weighted Average
	21,232		40.65% Pervious Area
	30,996		59.35% Impervious Area

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

Subcatchment SWALE: BASIN



Summary for Pond AB-1: Storage Beneath Garage Slab

Inflow Area = 0.424 ac, 77.06% Impervious, Inflow Depth = 5.35" for 25-Year event
Inflow = 2.35 cfs @ 12.09 hrs, Volume= 0.189 af
Outflow = 0.23 cfs @ 12.91 hrs, Volume= 0.189 af, Atten= 90%, Lag= 49.1 min
Primary = 0.23 cfs @ 12.91 hrs, Volume= 0.189 af
Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 17.81' @ 12.91 hrs Surf.Area= 8,842 sf Storage= 3,511 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 150.1 min (913.0 - 763.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	16.42'	0 cf	**85.63'W x 103.25'L x 2.42'H Field A** 21,372 cf Overall - 6,644 cf Embedded = 14,729 cf x 0.0% Voids
#2A	16.75'	5,371 cf	**ADS N-12 18"** x 145 Inside #1 Inside= 18.2"W x 18.2"H => 1.80 sf x 20.00'L = 36.0 cf Outside= 21.0"W x 21.0"H => 2.23 sf x 20.00'L = 44.5 cf 145 Chambers in 29 Rows 84.13' Header x 1.80 sf x 1 = 151.4 cf Inside
		5,371 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	16.75'	**12.0" Round Culvert** L= 48.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 16.75' / 16.44' S= 0.0065 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	16.75'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	18.05'	**4.0' long x 5.40' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.23 cfs @ 12.91 hrs HW=17.81' TW=14.47' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.23 cfs of 2.51 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.23 cfs @ 4.66 fps)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond AB-1: Storage Beneath Garage Slab - Chamber Wizard Field A

Chamber Model = ADS N-12 18" (ADS N-12® Pipe)
Inside= 18.2"W x 18.2"H => 1.80 sf x 20.00'L = 36.0 cf
Outside= 21.0"W x 21.0"H => 2.23 sf x 20.00'L = 44.5 cf

21.0" Wide + 14.3" Spacing = 35.3" C-C Row Spacing

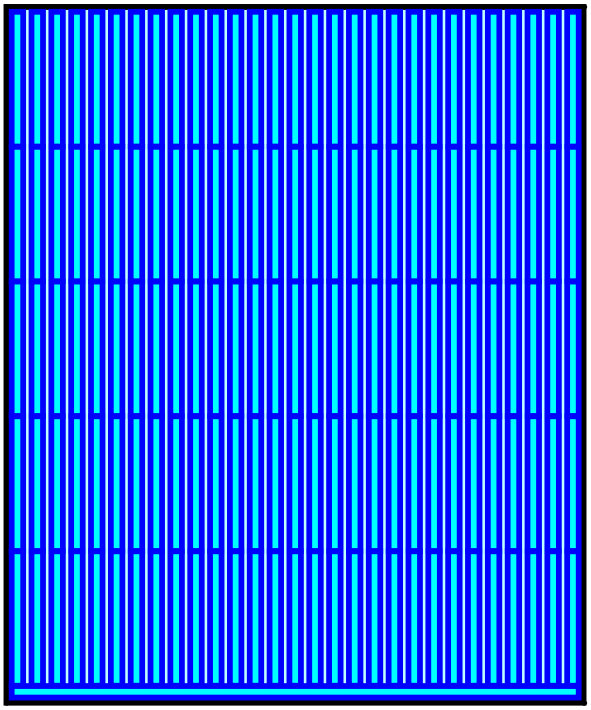
5 Chambers/Row x 20.00' Long +1.75' Header x 1 = 101.75' Row Length +9.0" End Stone x 2 = 103.25' Base Length
29 Rows x 21.0" Wide + 14.3" Spacing x 28 + 9.0" Side Stone x 2 = 85.63' Base Width
4.0" Stone Base + 21.0" Chamber Height + 4.0" Stone Cover = 2.42' Field Height

145 Chambers x 36.0 cf + 84.13' Header x 1.80 sf = 5,371.5 cf Chamber Storage
145 Chambers x 44.5 cf + 84.13' Header x 2.23 sf = 6,643.5 cf Displacement

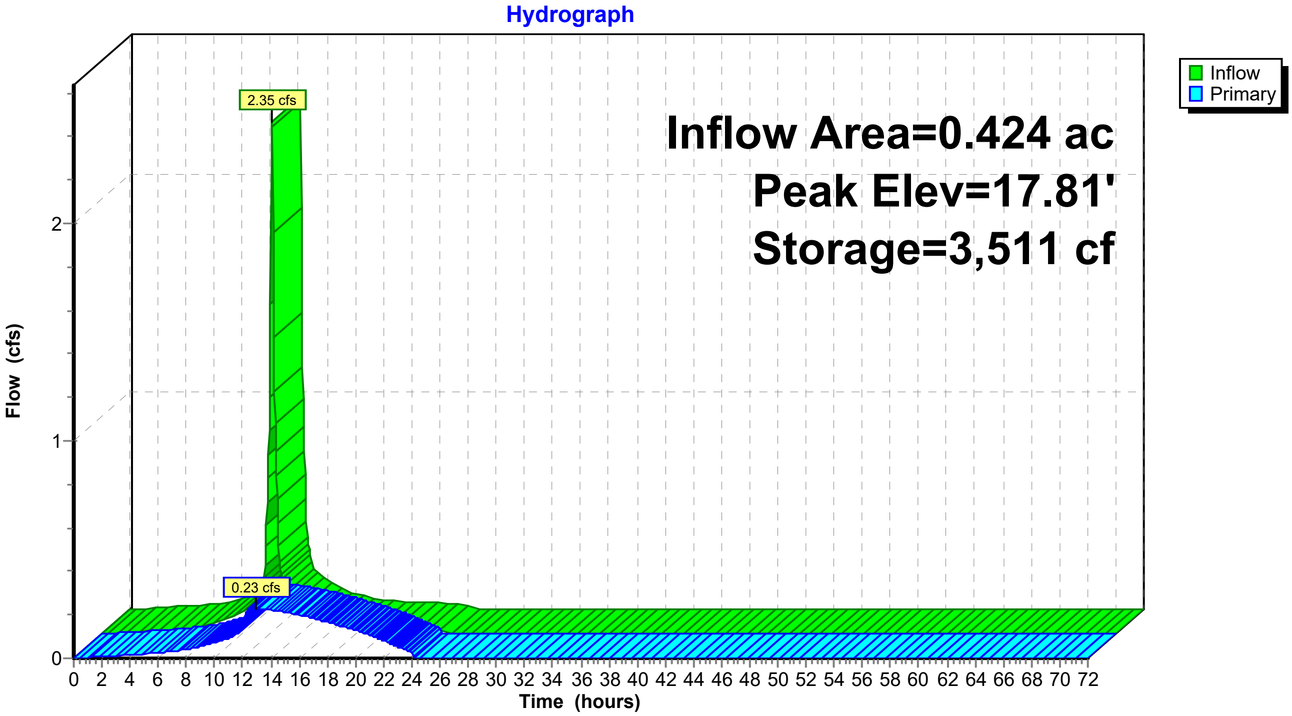
21,372.1 cf Field - 6,643.5 cf Chambers = 14,728.6 cf Stone x 0.0% Voids = 0.0 cf Stone Storage

Chamber Storage = 5,371.5 cf = 0.123 af
Overall Storage Efficiency = 25.1%
Overall System Size = 103.25' x 85.63' x 2.42'

145 Chambers
791.6 cy Field
545.5 cy Stone



Pond AB-1: Storage Beneath Garage Slab



Summary for Pond AB-2: Subsurface Infiltration System

Inflow Area = 0.413 ac,100.00% Impervious, Inflow Depth = 5.91" for 25-Year event
Inflow = 2.43 cfs @ 12.09 hrs, Volume= 0.204 af
Outflow = 0.17 cfs @ 11.40 hrs, Volume= 0.204 af, Atten= 93%, Lag= 0.0 min
Discarded = 0.17 cfs @ 11.40 hrs, Volume= 0.204 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 20.28' @ 13.32 hrs Surf.Area= 3,092 sf Storage= 3,369 cf

Plug-Flow detention time= 143.9 min calculated for 0.203 af (100% of inflow)
Center-of-Mass det. time= 143.8 min (888.5 - 744.8)

Volume	Invert	Avail.Storage	Storage Description
#1	18.75'	1,410 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc) 7,143 cf Overall - 3,619 cf Embedded = 3,524 cf x 40.0% Voids
#2	19.08'	3,257 cf	**Ferguson R-Tank XD 9** x 759 Inside #1 Inside= 19.7"W x 17.7"H => 2.18 sf x 1.97'L = 4.3 cf Outside= 19.7"W x 17.7"H => 2.42 sf x 1.97'L = 4.8 cf 759 Chambers in 36 Rows
		4,666 cf	Total Available Storage

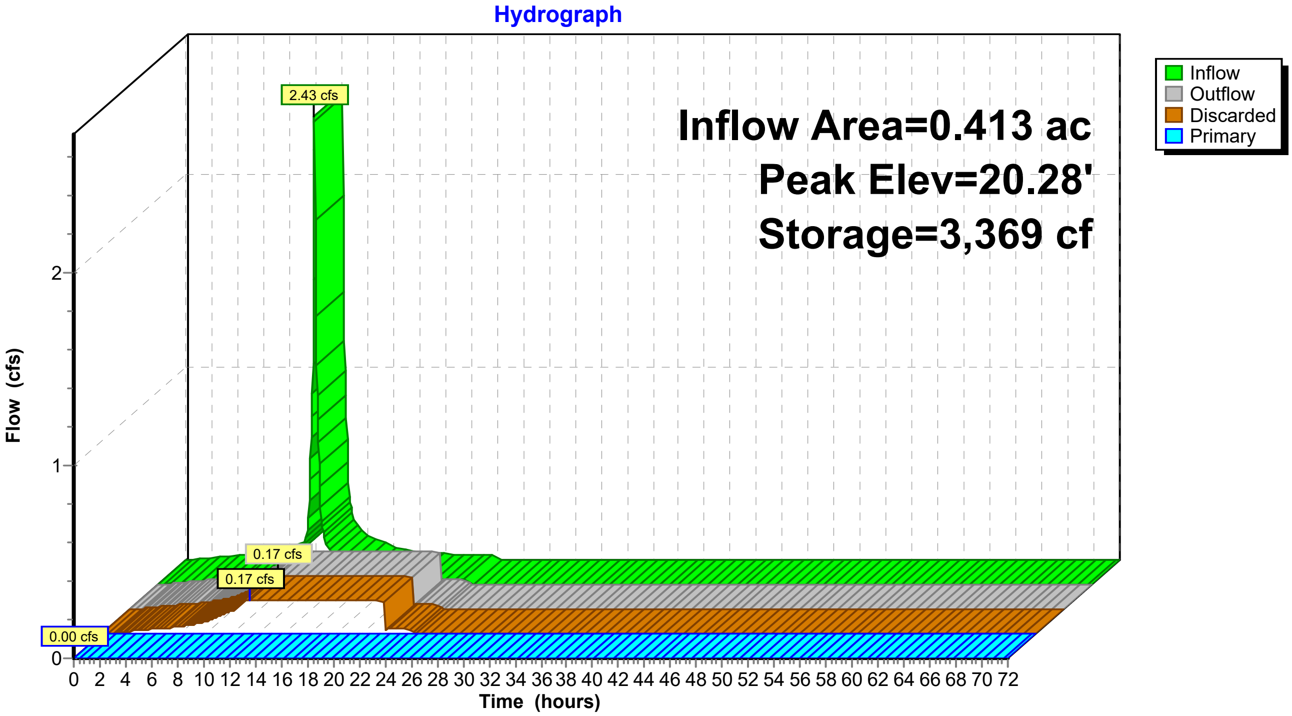
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
18.75	3,092	0	0
21.06	3,092	7,143	7,143

Device	Routing	Invert	Outlet Devices
#1	Primary	19.08'	**12.0" Round Culvert** L= 3.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 19.08' / 19.08' S= 0.0000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	20.30'	**4.0' long x 3.15' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Discarded	18.75'	**2.410 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=0.17 cfs @ 11.40 hrs HW=18.81' (Free Discharge)
└─**3=Exfiltration** (Exfiltration Controls 0.17 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=18.75' TW=13.87' (Dynamic Tailwater)
└─**1=Culvert** (Controls 0.00 cfs)
  └─**2=Sharp-Crested Rectangular Weir**(Controls 0.00 cfs)

Pond AB-2: Subsurface Infiltration System



Summary for Pond AB-3: Subsurface Infiltration System

Inflow Area = 0.397 ac, 74.76% Impervious, Inflow Depth = 5.24" for 25-Year event
Inflow = 2.15 cfs @ 12.09 hrs, Volume= 0.173 af
Outflow = 1.20 cfs @ 12.22 hrs, Volume= 0.173 af, Atten= 44%, Lag= 7.8 min
Discarded = 0.14 cfs @ 11.30 hrs, Volume= 0.116 af
Primary = 1.06 cfs @ 12.22 hrs, Volume= 0.057 af
Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 20.41' @ 12.22 hrs Surf.Area= 2,589 sf Storage= 1,521 cf

Plug-Flow detention time= 21.8 min calculated for 0.173 af (100% of inflow)
Center-of-Mass det. time= 21.8 min (784.6 - 762.8)

Volume	Invert	Avail.Storage	Storage Description
#1	19.50'	1,022 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 3,858 cf Overall - 1,303 cf Embedded = 2,554 cf x 40.0% Voids
#2	19.83'	1,173 cf	**Ferguson R-Tank XD 4** x 615 Inside #1 Inside= 19.7"W x 7.9"H => 0.97 sf x 1.97'L = 1.9 cf Outside= 19.7"W x 7.9"H => 1.08 sf x 1.97'L = 2.1 cf 615 Chambers in 10 Rows
		2,195 cf	Total Available Storage

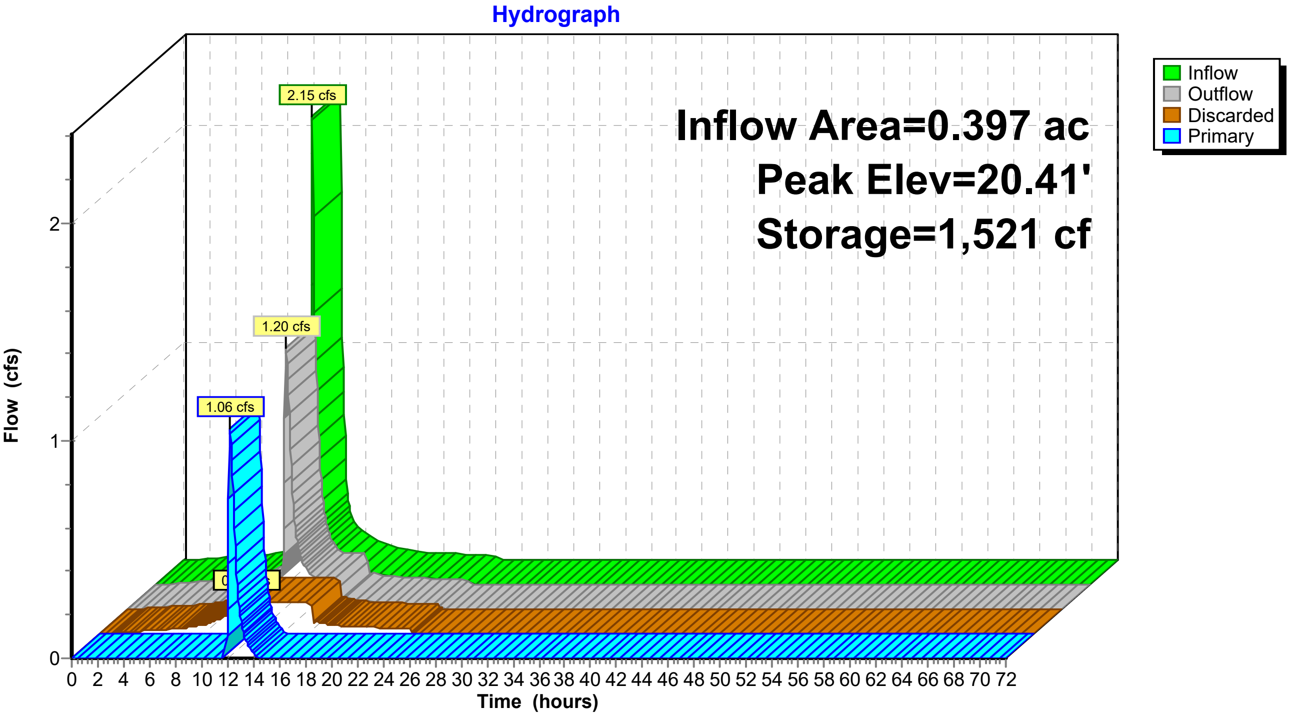
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
19.50	2,589	0	0
20.99	2,589	3,858	3,858

Device	Routing	Invert	Outlet Devices
#1	Primary	19.83'	**12.0" Round Culvert** L= 22.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 19.83' / 19.61' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	19.90'	**4.0' long x 2.20' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Discarded	19.50'	**2.410 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=0.14 cfs @ 11.30 hrs HW=19.53' (Free Discharge)
└─**3=Exfiltration** (Exfiltration Controls 0.14 cfs)

Primary OutFlow Max=1.05 cfs @ 12.22 hrs HW=20.41' TW=15.67' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 1.05 cfs @ 3.20 fps)
  └─**2=Sharp-Crested Rectangular Weir** (Passes 1.05 cfs of 4.61 cfs potential flow)

Pond AB-3: Subsurface Infiltration System



Summary for Pond ED-AB: Re-graded Existing Depression

```
Inflow Area =        0.844 ac, 21.19% Impervious, Inflow Depth =  1.15"   for 25-Year event
Inflow      =        0.74 cfs @  12.16 hrs, Volume=          0.081 af
Outflow     =        0.08 cfs @  15.27 hrs, Volume=          0.081 af,  Atten= 90%,  Lag= 186.6 min
Primary     =        0.08 cfs @  15.27 hrs, Volume=          0.081 af
   Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field
Secondary =          0.00 cfs @   0.00 hrs, Volume=          0.000 af
   Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 21.24' @ 15.27 hrs   Surf.Area= 1,608 sf   Storage= 1,426 cf

Plug-Flow detention time= 224.8 min calculated for 0.081 af (100% of inflow)
Center-of-Mass det. time= 223.9 min ( 1,117.1 - 893.1 )
```

Volume	Invert	Avail.Storage	Storage Description
#1	19.50'	8,308 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

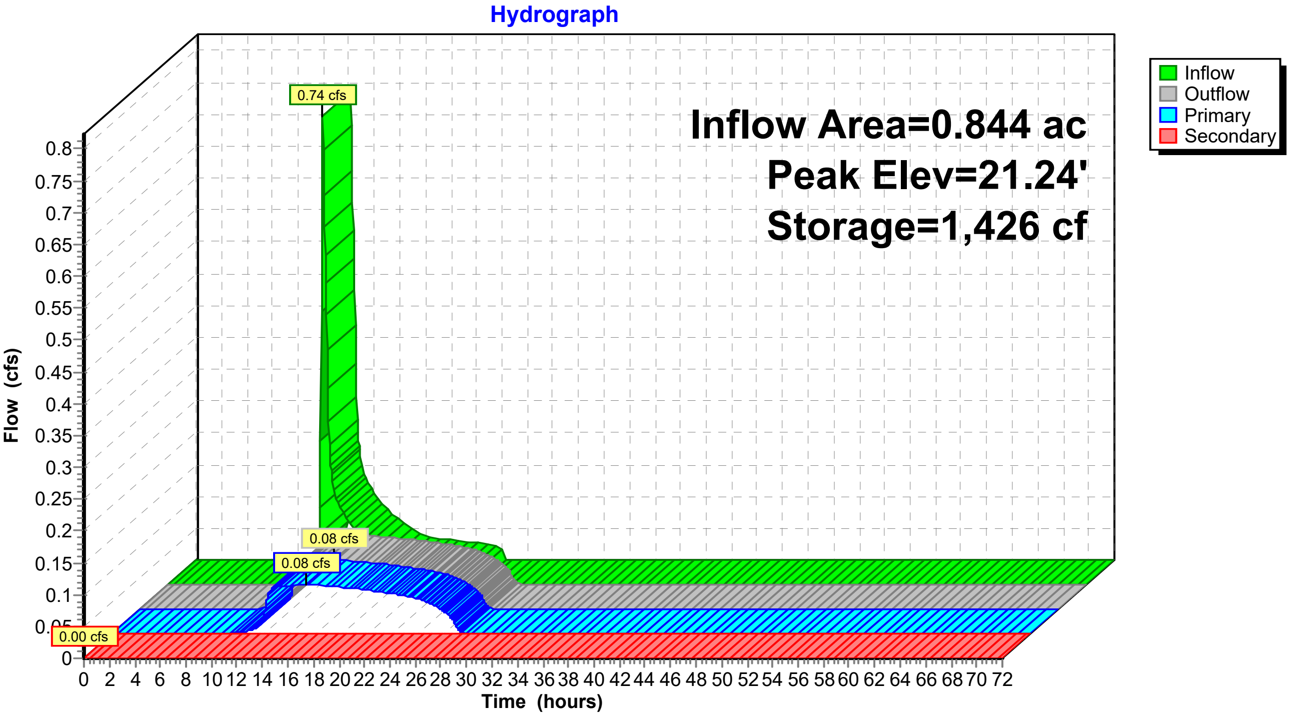
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
19.50	69	0	0
20.00	484	138	138
21.00	1,371	928	1,066
22.00	2,351	1,861	2,927
23.00	3,941	3,146	6,073
23.50	5,000	2,235	8,308

Device	Routing	Invert	Outlet Devices
#1	Primary	19.50'	**12.0" Round Culvert** L= 27.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 19.50' / 18.58' S= 0.0341 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	19.50'	**1.5" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	22.45'	**4.0' long x 1.00' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Secondary	23.43'	**2.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Primary OutFlow Max=0.08 cfs @ 15.27 hrs HW=21.24' TW=14.25' (Dynamic Tailwater)
```
↑—1=Culvert (Passes 0.08 cfs of 3.72 cfs potential flow)
   ↑—2=Orifice/Grate (Orifice Controls 0.08 cfs @ 6.24 fps)
   └—3=Sharp-Crested Rectangular Weir( Controls 0.00 cfs)
```

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=19.50' TW=13.87' (Dynamic Tailwater)
```
↑—4=Broad-Crested Rectangular Weir( Controls 0.00 cfs)
```

Pond ED-AB: Re-graded Existing Depression



Summary for Pond ES-LF: DP-LF Existing Swale/Basin in Lovell Field

Inflow Area = 4.579 ac, 55.32% Impervious, Inflow Depth = 2.87" for 25-Year event
Inflow = 10.92 cfs @ 12.10 hrs, Volume= 1.095 af
Outflow = 9.22 cfs @ 12.15 hrs, Volume= 1.095 af, Atten= 16%, Lag= 3.4 min
Primary = 9.22 cfs @ 12.15 hrs, Volume= 1.095 af
Routed to nonexistent node 1R

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 15.86' @ 12.15 hrs Surf.Area= 1,579 sf Storage= 1,129 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.7 min (841.0 - 840.4)

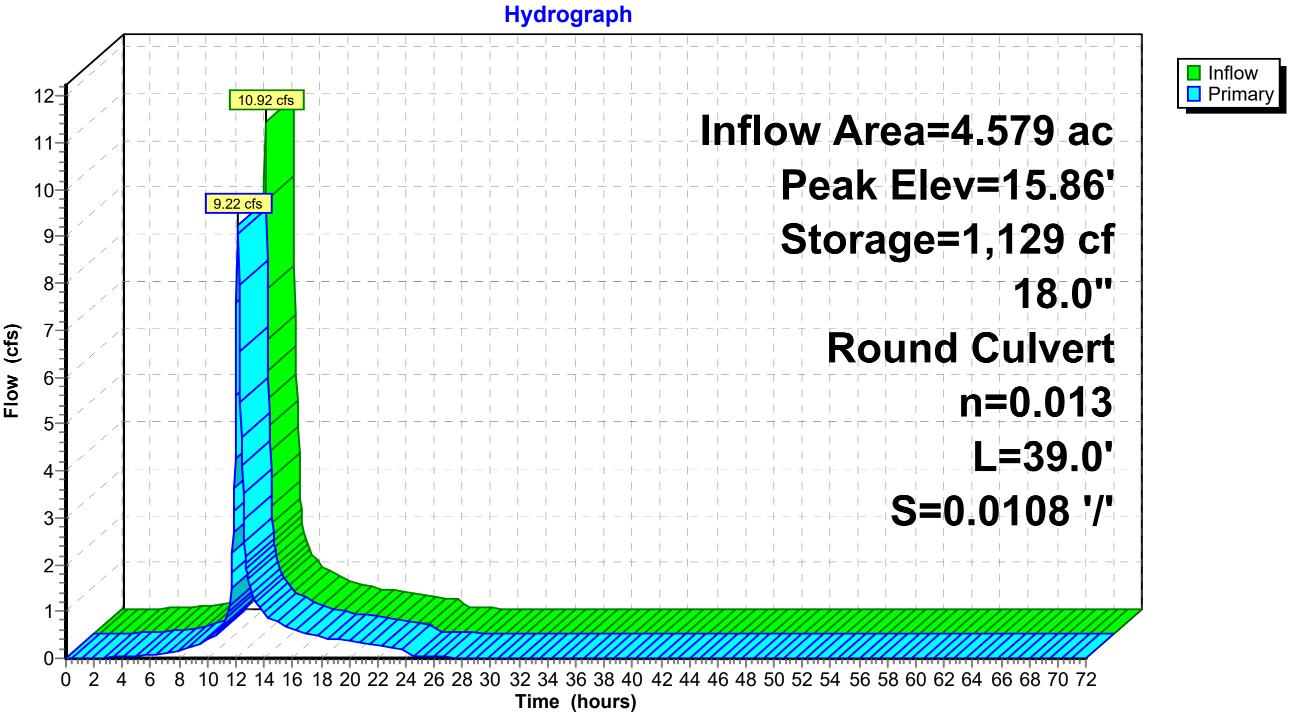
Volume	Invert	Avail.Storage	Storage Description
#1	13.87'	17,546 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
13.87	0	0	0
14.00	3	0	0
15.00	488	246	246
16.00	1,764	1,126	1,372
17.00	2,848	2,306	3,678
18.00	3,993	3,421	7,098
19.00	5,217	4,605	11,703
20.00	6,468	5,843	17,546

Device	Routing	Invert	Outlet Devices
#1	Primary	13.87'	**18.0" Round Culvert** L= 39.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 13.87' / 13.45' S= 0.0108 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=9.23 cfs @ 12.15 hrs HW=15.85' (Free Discharge)
└─**1=Culvert** (Barrel Controls 9.23 cfs @ 5.23 fps)

Pond ES-LF: DP-LF Existing Swale/Basin in Lovell Field



Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

```
SubcatchmentCB 1: CB 1                       Runoff Area=2,480 sf   100.00% Impervious   Runoff Depth=8.56"
                                                       Tc=6.0 min   CN=98   Runoff=0.48 cfs  0.041 af

SubcatchmentCB 2: CB 2                       Runoff Area=1,943 sf   100.00% Impervious   Runoff Depth=8.56"
                                                       Tc=6.0 min   CN=98   Runoff=0.38 cfs  0.032 af

SubcatchmentCB 5: CB 5                        Runoff Area=6,867 sf   82.76% Impervious   Runoff Depth=8.08"
                                                       Tc=6.0 min   CN=94   Runoff=1.31 cfs  0.106 af

SubcatchmentDCB 4: DCB 4                     Runoff Area=38,222 sf   36.71% Impervious   Runoff Depth=3.34"
                                                       Tc=6.0 min   CN=55   Runoff=3.29 cfs  0.245 af

SubcatchmentR-A1: ROOF                      Runoff Area=10,869 sf   100.00% Impervious   Runoff Depth=8.56"
                                                       Tc=6.0 min   CN=98   Runoff=2.11 cfs  0.178 af

SubcatchmentR-A2: ROOF                      Runoff Area=18,000 sf   100.00% Impervious   Runoff Depth=8.56"
                                                       Tc=6.0 min   CN=98   Runoff=3.49 cfs  0.295 af

SubcatchmentR-B: ROOF                       Runoff Area=11,143 sf   100.00% Impervious   Runoff Depth=8.56"
                                                       Tc=6.0 min   CN=98   Runoff=2.16 cfs  0.182 af

SubcatchmentS-A-1: S-A-1                      Runoff Area=2,443 sf   21.29% Impervious   Runoff Depth=5.53"
                                                       Tc=6.0 min   CN=73   Runoff=0.35 cfs  0.026 af

SubcatchmentS-A-2: S-A-2                      Runoff Area=7,587 sf   44.19% Impervious   Runoff Depth=7.11"
                                                       Tc=6.0 min   CN=86   Runoff=1.35 cfs  0.103 af

SubcatchmentS-A-3: S-A-3                      Runoff Area=2,969 sf   43.45% Impervious   Runoff Depth=6.13"
                                                       Tc=6.0 min   CN=78   Runoff=0.47 cfs  0.035 af

SubcatchmentS-A-OS: Offsite Areas            Runoff Area=34,300 sf   21.18% Impervious   Runoff Depth=2.40"
                                     Flow Length=213'   Tc=9.4 min   CN=47   Runoff=1.77 cfs  0.158 af

SubcatchmentS-B-1: S-B-1                      Runoff Area=6,163 sf   29.13% Impervious   Runoff Depth=6.50"
                                                       Tc=6.0 min   CN=81   Runoff=1.03 cfs  0.077 af

SubcatchmentS-B-2: S-B-2                      Runoff Area=4,258 sf   22.85% Impervious   Runoff Depth=6.38"
                                                       Tc=6.0 min   CN=80   Runoff=0.70 cfs  0.052 af

SubcatchmentSWALE: BASIN                     Runoff Area=52,228 sf   59.35% Impervious   Runoff Depth=7.35"
                                                       Tc=6.0 min   CN=88   Runoff=9.51 cfs  0.735 af

Pond AB-1: Storage Beneath Garage Slab     Peak Elev=18.19'  Storage=4,961 cf   Inflow=3.46 cfs  0.281 af
                                                                              Outflow=0.94 cfs  0.281 af

Pond AB-2: Subsurface Infiltration System    Peak Elev=20.51'  Storage=3,934 cf   Inflow=3.49 cfs  0.295 af
                   Discarded=0.17 cfs  0.242 af   Primary=1.26 cfs  0.052 af   Outflow=1.43 cfs  0.295 af
```

Pond AB-3: Subsurface Infiltration System Peak Elev=20.77' Storage=1,967 cf Inflow=3.19 cfs 0.259 af
Discarded=0.14 cfs 0.148 af Primary=2.24 cfs 0.111 af Outflow=2.38 cfs 0.259 af

Pond ED-AB: Re-graded Existing Depression Peak Elev=22.48' Storage=4,240 cf Inflow=2.06 cfs 0.184 af
Primary=0.17 cfs 0.184 af Secondary=0.00 cfs 0.000 af Outflow=0.17 cfs 0.184 af

Pond ES-LF: DP-LF Existing Swale/Basin in Peak Elev=16.99' Storage=3,637 cf Inflow=18.17 cfs 1.873 af
18.0" Round Culvert n=0.013 L=39.0' S=0.0108 '/' Outflow=13.09 cfs 1.873 af

Total Runoff Area = 4.579 ac Runoff Volume = 2.263 af Average Runoff Depth = 5.93"
44.68% Pervious = 2.046 ac 55.32% Impervious = 2.533 ac

Summary for Subcatchment CB 1: CB 1

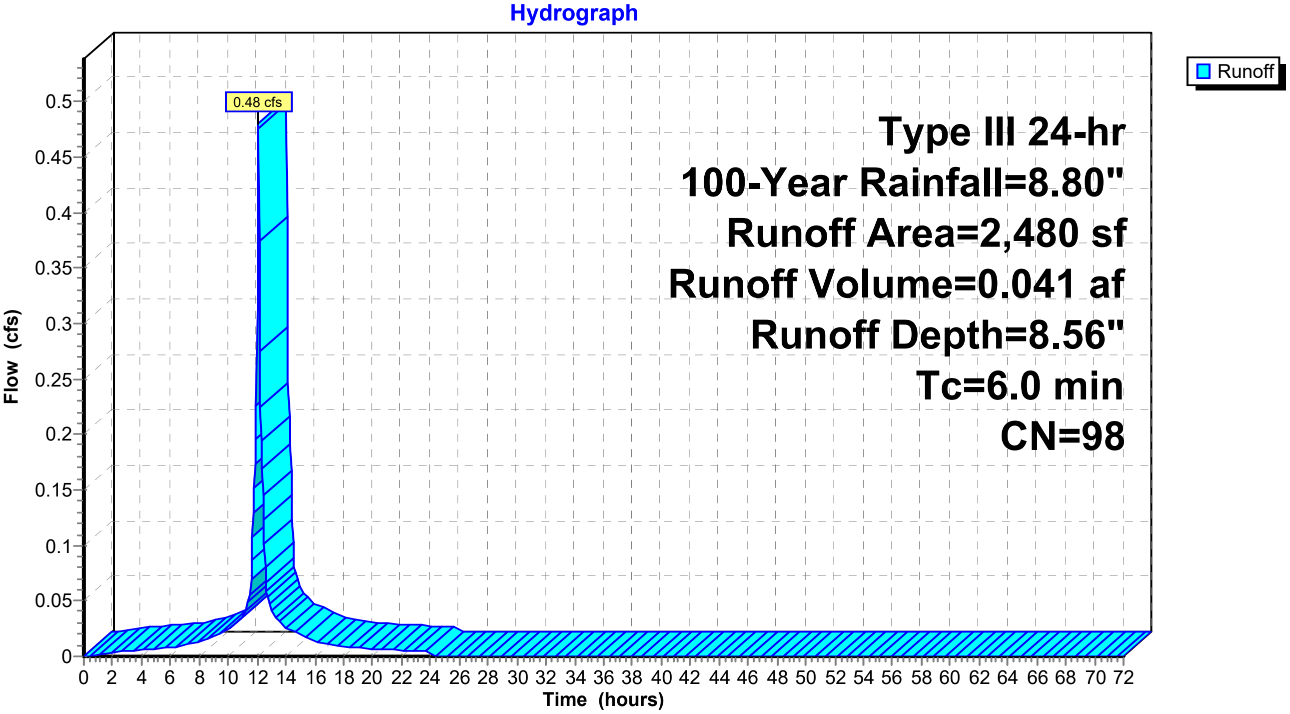
Runoff = 0.48 cfs @ 12.09 hrs, Volume= 0.041 af, Depth= 8.56"
Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.80"

	Area (sf)	CN	Description
*	2,480	98	Impervious surfaces, HSG C
	2,480		100.00% Impervious Area

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

Subcatchment CB 1: CB 1



Summary for Subcatchment CB 2: CB 2

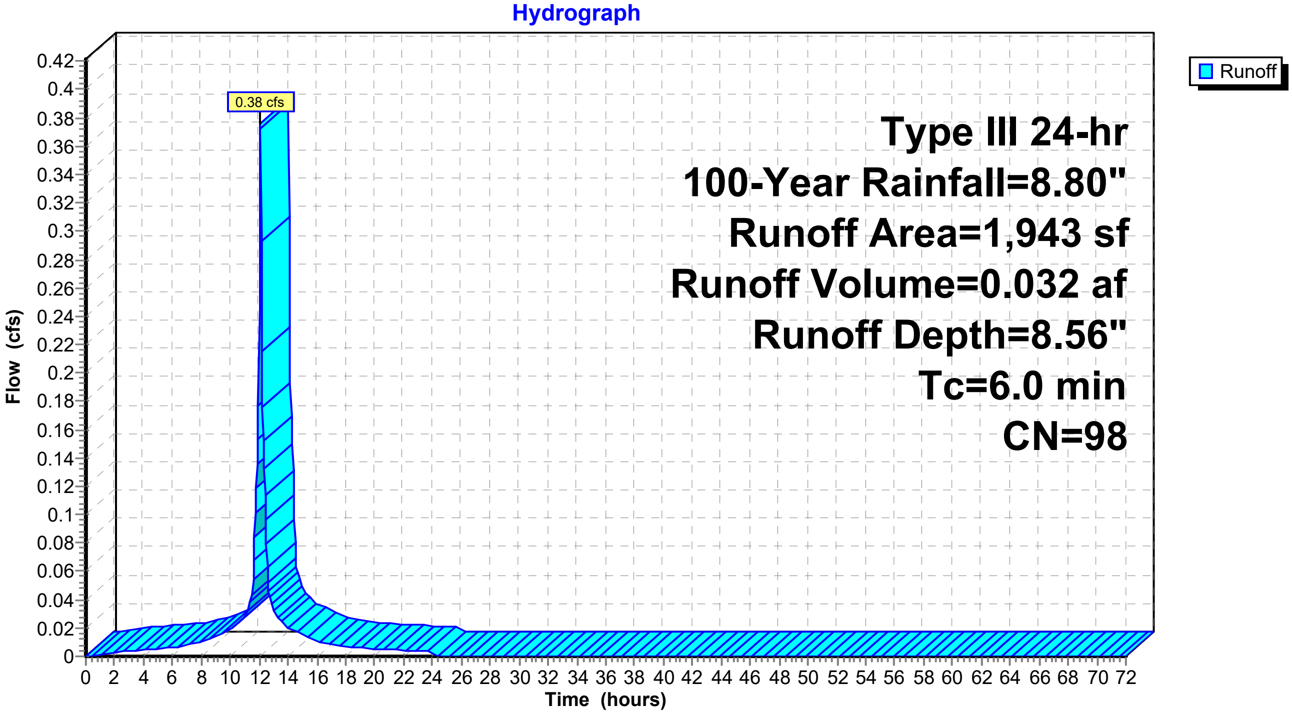
Runoff = 0.38 cfs @ 12.09 hrs, Volume= 0.032 af, Depth= 8.56"
Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.80"

	Area (sf)	CN	Description
*	1,943	98	Impervious surfaces, HSG C
	1,943		100.00% Impervious Area

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

Subcatchment CB 2: CB 2



Summary for Subcatchment CB 5: CB 5

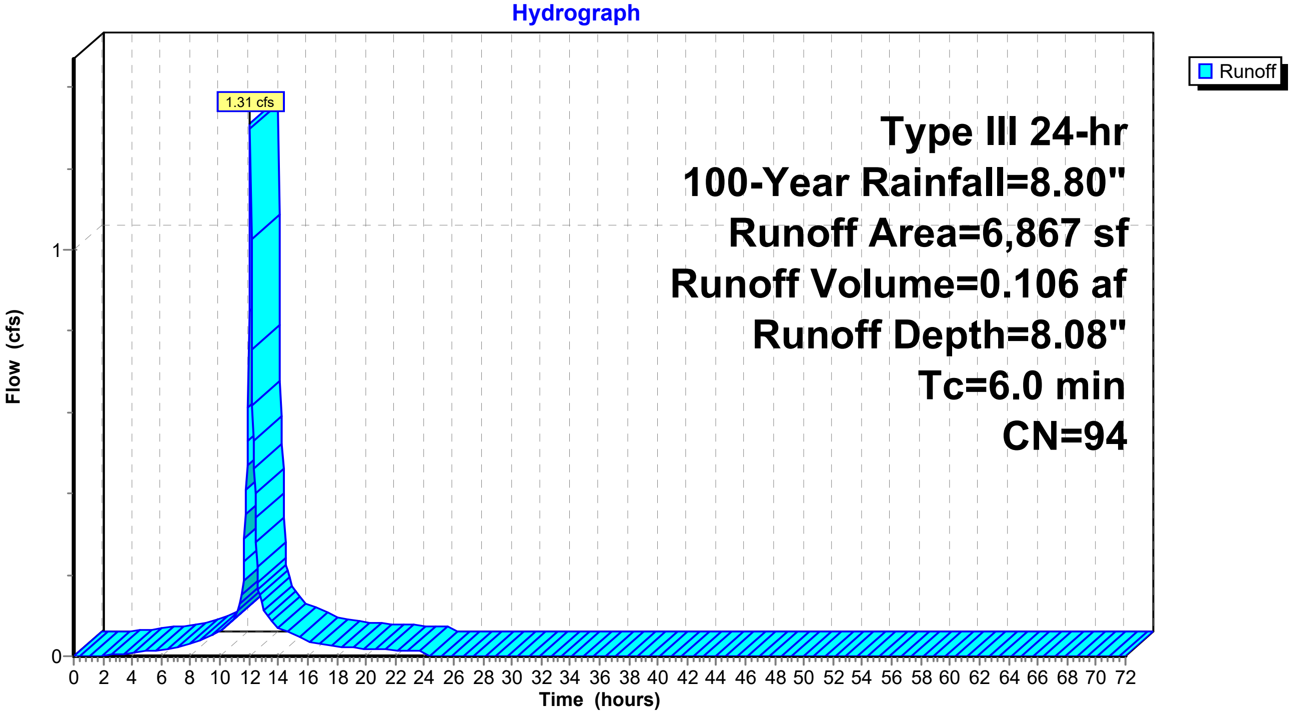
Runoff = 1.31 cfs @ 12.09 hrs, Volume= 0.106 af, Depth= 8.08"
Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.80"

	Area (sf)	CN	Description
*	5,683	98	Impervious surfaces, HSG C
	1,184	74	>75% Grass cover, Good, HSG C
	6,867	94	Weighted Average
	1,184		17.24% Pervious Area
	5,683		82.76% Impervious Area

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

Subcatchment CB 5: CB 5



Summary for Subcatchment DCB 4: DCB 4

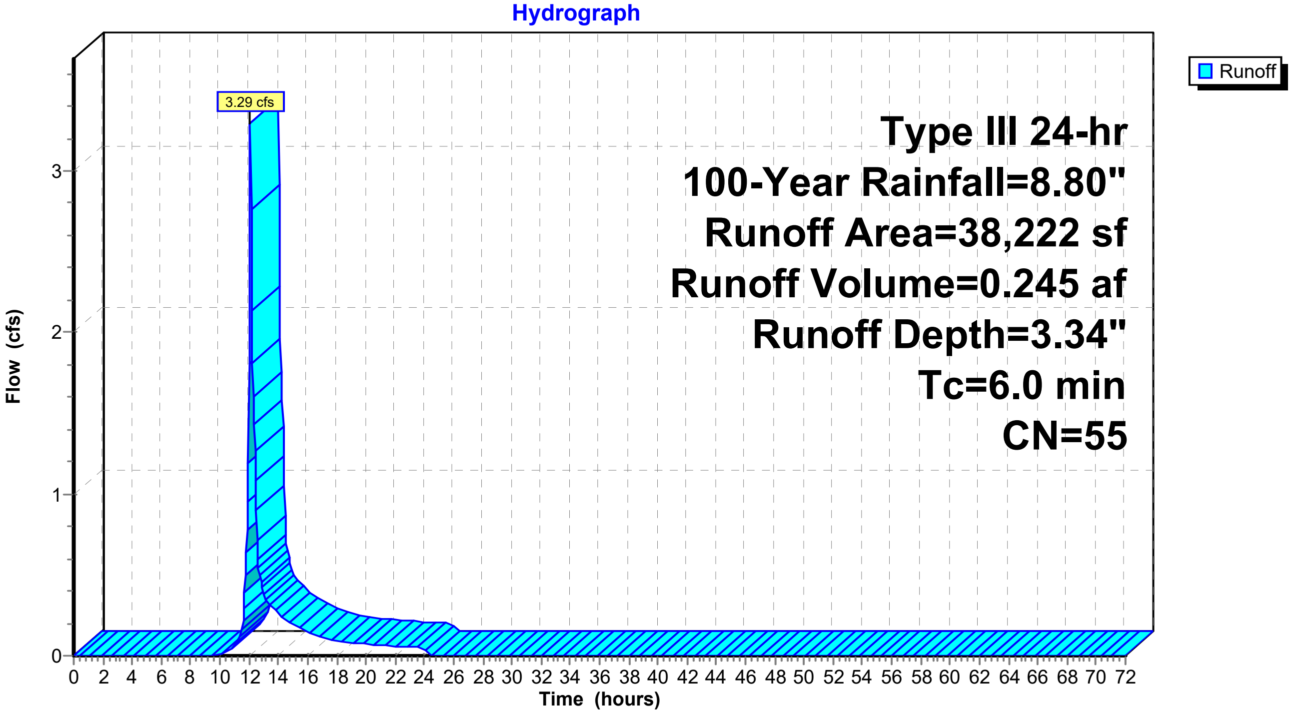
Runoff = 3.29 cfs @ 12.10 hrs, Volume= 0.245 af, Depth= 3.34"
Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.80"

	Area (sf)	CN	Description
*	14,030	98	Impervious surfaces, HSG A
	24,192	30	Woods, Good, HSG A
	38,222	55	Weighted Average
	24,192		63.29% Pervious Area
	14,030		36.71% Impervious Area

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

Subcatchment DCB 4: DCB 4



Summary for Subcatchment R-A1: ROOF

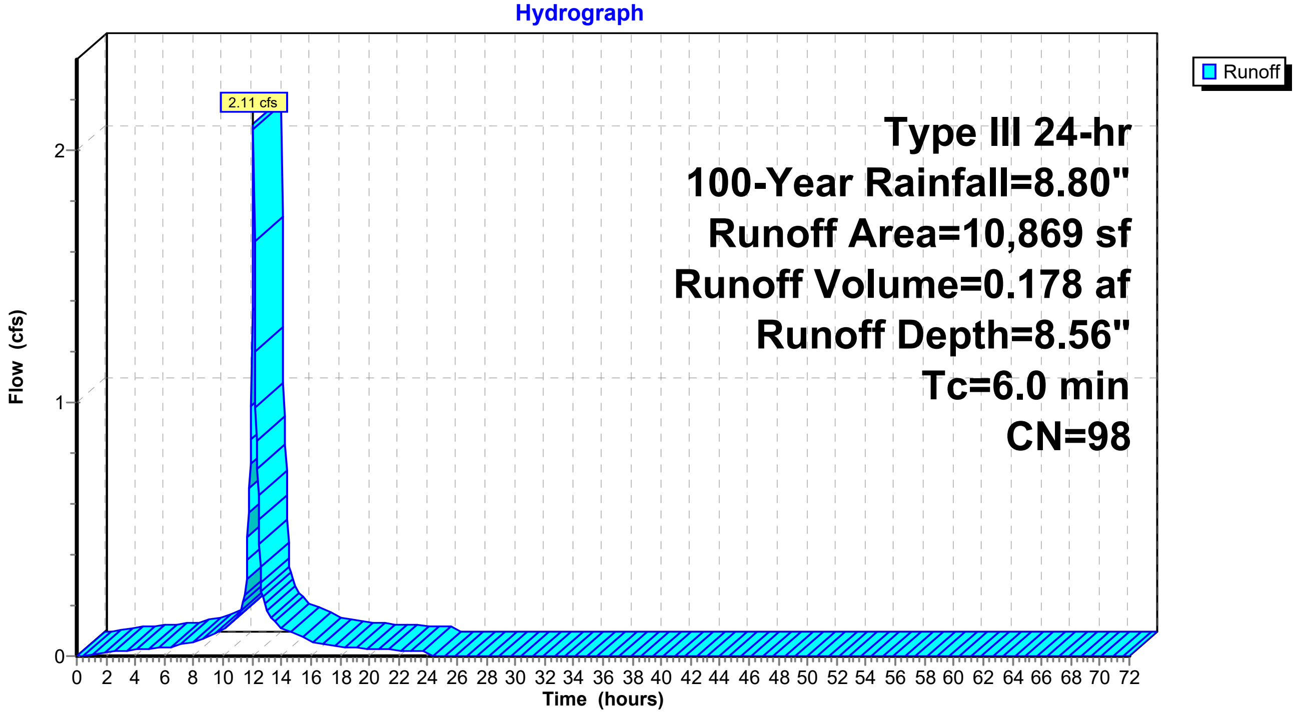
Runoff = 2.11 cfs @ 12.09 hrs, Volume= 0.178 af, Depth= 8.56"
Routed to Pond AB-1 : Storage Beneath Garage Slab

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.80"

	Area (sf)	CN	Description
	9,976	98	Roofs, HSG A
*	630	98	Patio, HSG A
*	74	98	Roofs, HSG C
*	189	98	Patio, HSG C
	10,869	98	Weighted Average
	10,869		100.00% Impervious Area

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

Subcatchment R-A1: ROOF



Summary for Subcatchment R-A2: ROOF

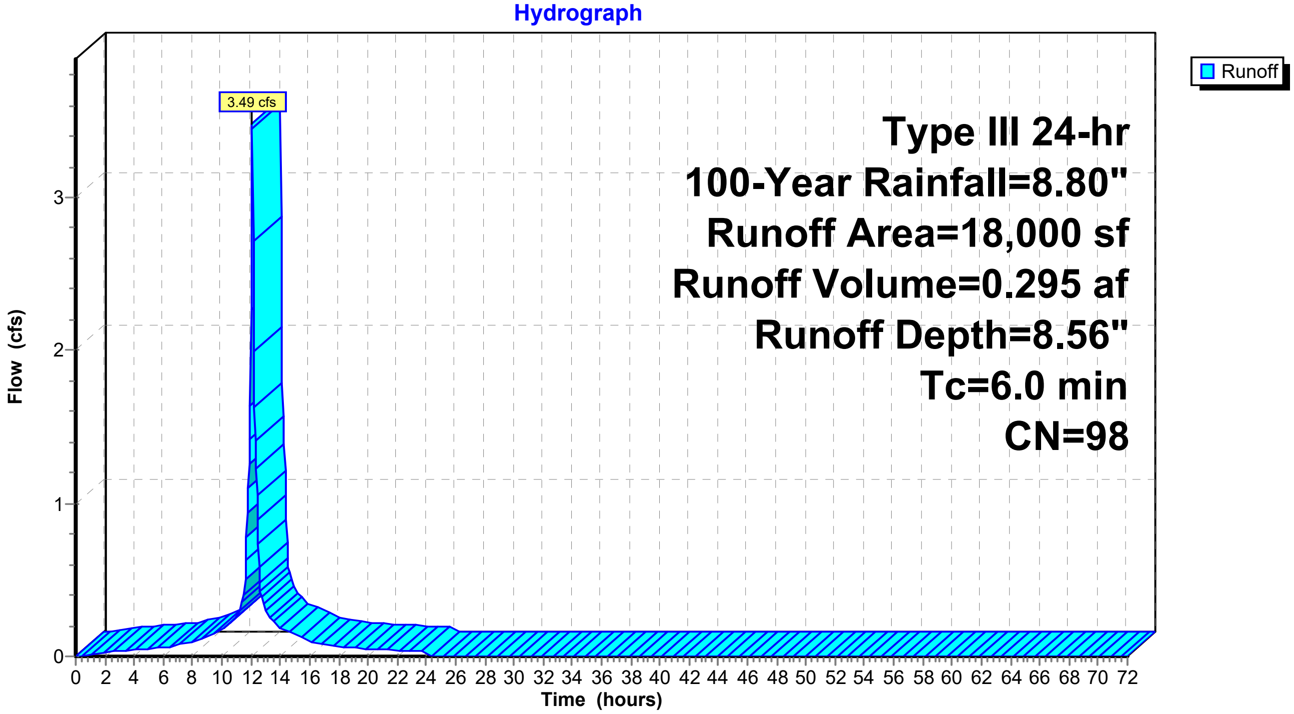
Runoff = 3.49 cfs @ 12.09 hrs, Volume= 0.295 af, Depth= 8.56"
Routed to Pond AB-2 : Subsurface Infiltration System

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.80"

	Area (sf)	CN	Description
*	18,000	98	Roof, HSG C
	18,000		100.00% Impervious Area

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

Subcatchment R-A2: ROOF



Summary for Subcatchment R-B: ROOF

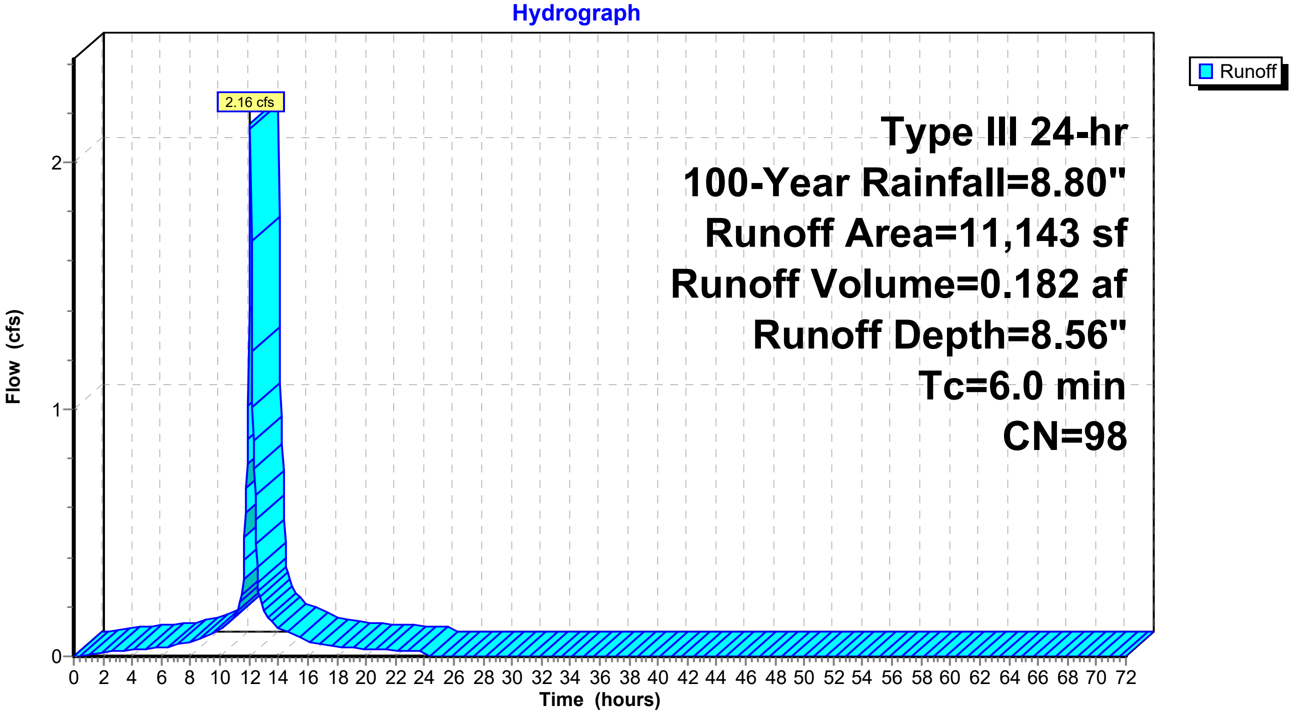
Runoff = 2.16 cfs @ 12.09 hrs, Volume= 0.182 af, Depth= 8.56"
Routed to Pond AB-3 : Subsurface Infiltration System

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.80"

Area (sf)	CN	Description
11,143	98	Roofs, HSG C
11,143		100.00% Impervious Area

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

Subcatchment R-B: ROOF



Summary for Subcatchment S-A-1: S-A-1

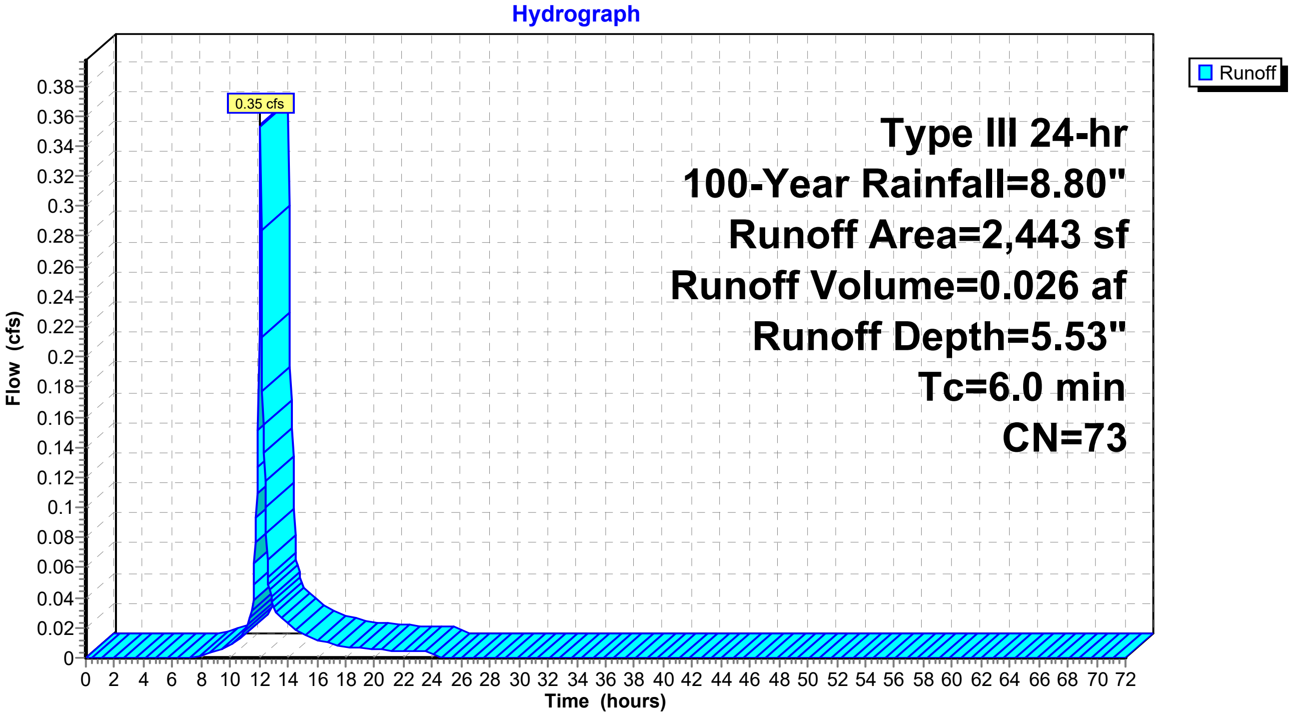
Runoff = 0.35 cfs @ 12.09 hrs, Volume= 0.026 af, Depth= 5.53"
Routed to Pond ED-AB : Re-graded Existing Depression

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.80"

	Area (sf)	CN	Description
*	244	98	Wall, HSG A
*	527	39	Plantings, HSG A
*	72	98	Transformer pad, HSG C
	160	96	Gravel surface, HSG C
*	204	98	Wall, HSG C
*	1,236	74	Plantings, HSG C
	2,443	73	Weighted Average
	1,923		78.71% Pervious Area
	520		21.29% Impervious Area

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

Subcatchment S-A-1: S-A-1



Summary for Subcatchment S-A-2: S-A-2

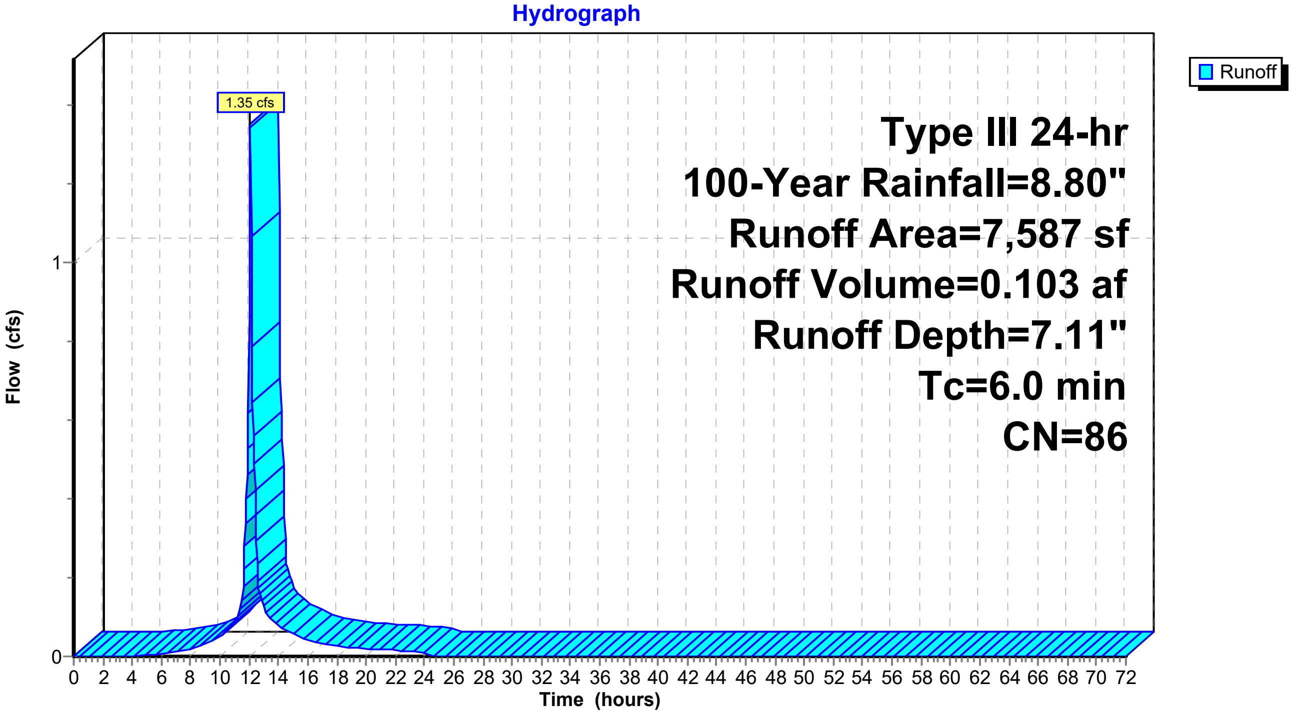
Runoff = 1.35 cfs @ 12.09 hrs, Volume= 0.103 af, Depth= 7.11"
Routed to Pond AB-1 : Storage Beneath Garage Slab

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.80"

	Area (sf)	CN	Description
*	1,431	74	Plantings, HSG C
*	1,401	98	Sidewalk,HSG C
*	236	96	Gravel, HSG C
*	14	98	Wall, HSG C
*	2,410	74	Plantings, HSG C (OFFSITE)
*	1,855	98	Pavement, HSG C
*	63	98	Wall, HSG C (OFFSITE)
*	10	98	Sign, HSG C (OFFSITE)
*	157	96	Gravel surface, HSG C (OFFSITE)
*	10	98	Impervious surfaces, HSG C (OFFSITE)
	7,587	86	Weighted Average
	4,234		55.81% Pervious Area
	3,353		44.19% Impervious Area

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

Subcatchment S-A-2: S-A-2



Summary for Subcatchment S-A-3: S-A-3

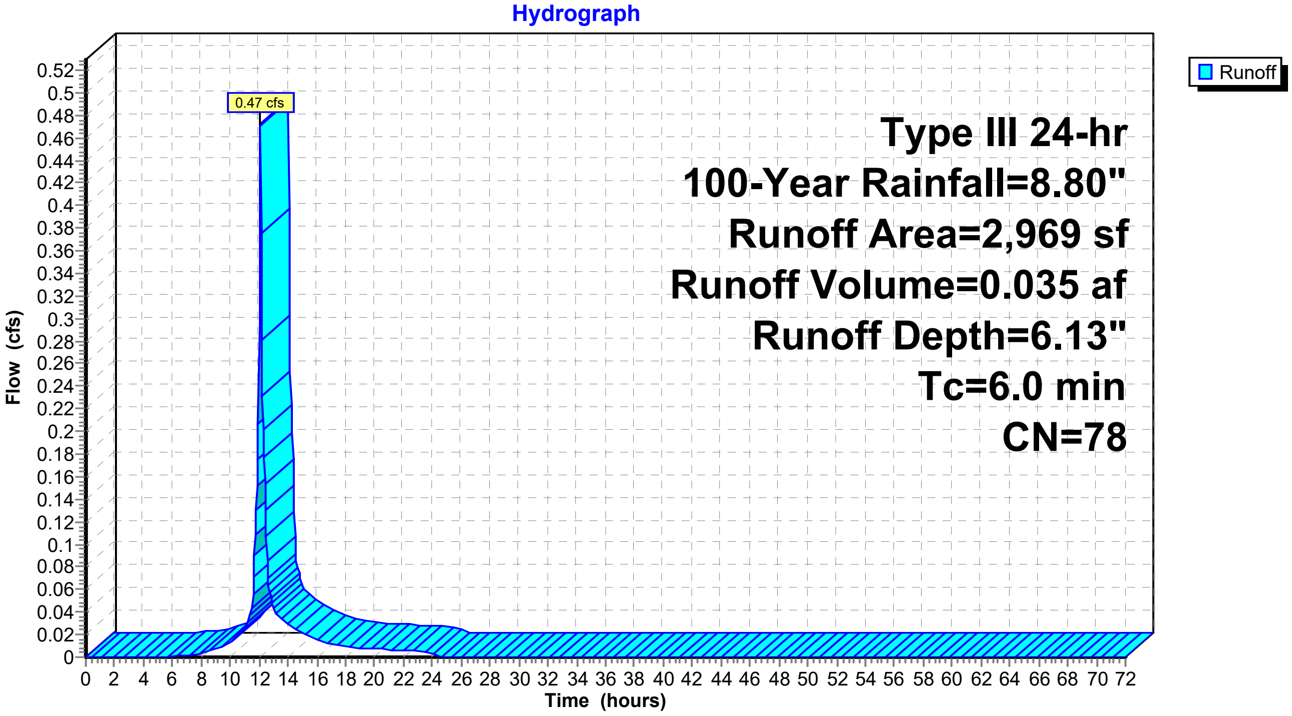
Runoff = 0.47 cfs @ 12.09 hrs, Volume= 0.035 af, Depth= 6.13"
Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.80"

	Area (sf)	CN	Description
*	438	98	Sidewalk, HSG A
*	143	96	Gravel, HSG A
*	227	39	Plantings, HSG A
*	227	98	Sidewalk, HSG A (OFFSITE)
*	444	39	Plantings, HSG A (OFFSITE)
*	40	96	Gravel, HSG C
*	126	74	Plantings, HSG C
*	625	98	Sidewalk, HSG C (OFFSITE)
*	699	74	Plantings, HSG C (OFFSITE)
	2,969	78	Weighted Average
	1,679		56.55% Pervious Area
	1,290		43.45% Impervious Area

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

Subcatchment S-A-3: S-A-3



Summary for Subcatchment S-A-OS: Offsite Areas

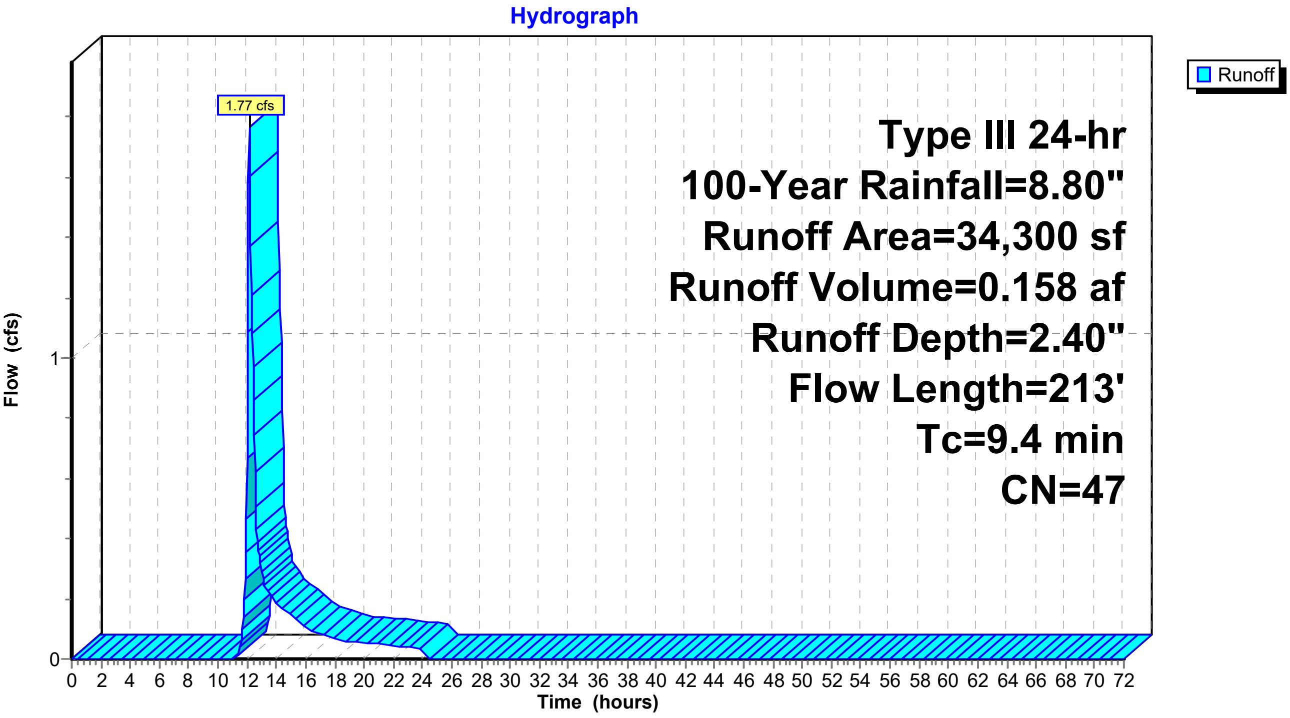
Runoff = 1.77 cfs @ 12.15 hrs, Volume= 0.158 af, Depth= 2.40"
Routed to Pond ED-AB : Re-graded Existing Depression

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.80"

	Area (sf)	CN	Description
*	15,938	30	Woods, Good, HSG A (OFFSITE)
*	11,097	39	>75% Grass cover, Good, HSG A (OFFSITE)
*	5,665	98	Roofs, HSG A (OFFSITE)
*	1,600	98	Impervious surfaces, HSG C (OFFSITE)
	34,300	47	Weighted Average
	27,035		78.82% Pervious Area
	7,265		21.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0600	0.10		**Sheet Flow, 1** Woods: Light underbrush n= 0.400 P2= 3.20"
1.5	163	0.1290	1.80		**Shallow Concentrated Flow, 2** Woodland Kv= 5.0 fps
9.4	213	Total			

Subcatchment S-A-OS: Offsite Areas



Summary for Subcatchment S-B-1: S-B-1

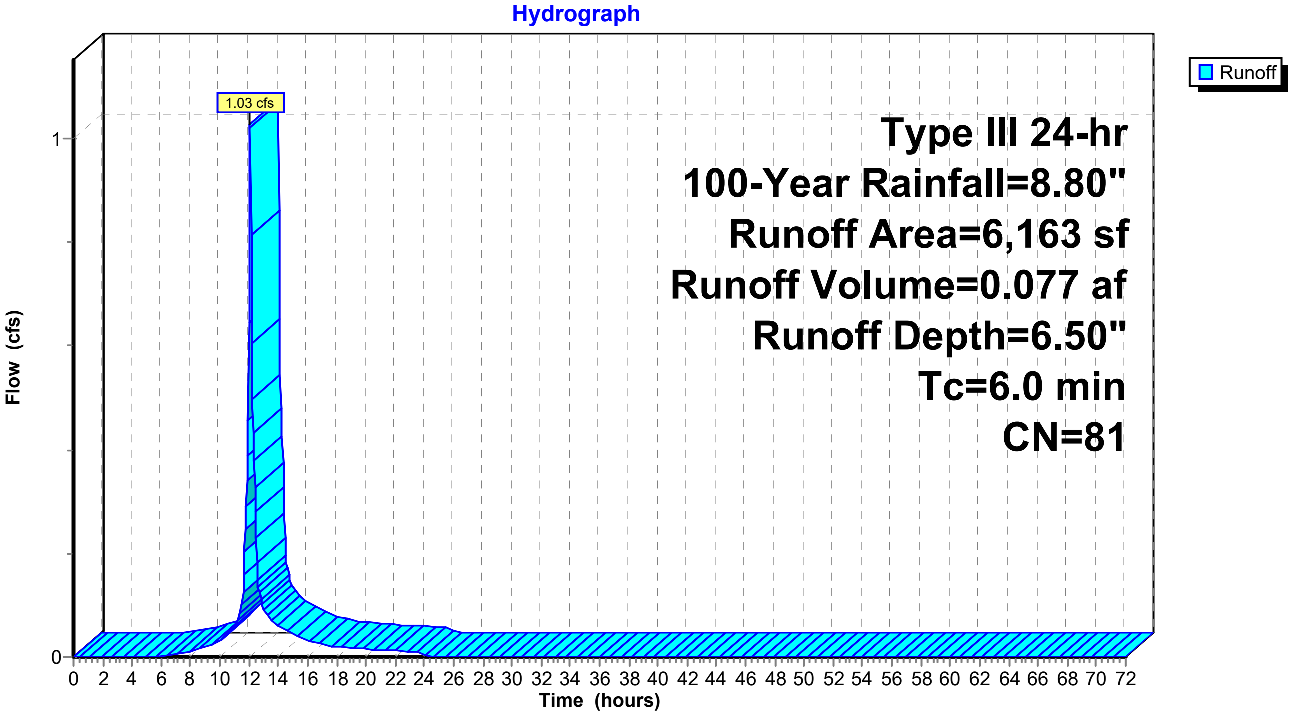
Runoff = 1.03 cfs @ 12.09 hrs, Volume= 0.077 af, Depth= 6.50"
Routed to Pond AB-3 : Subsurface Infiltration System

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.80"

	Area (sf)	CN	Description
*	252	98	Pavement, HSG C
*	245	98	Sidewalk, HSG C
*	14	98	Wall, HSG C
*	124	96	Gravel surface, HSG C
*	975	74	Plantings, HSG C
*	72	98	Transformer, HSG C
*	226	98	Sidewalk, HSG C (OFFSITE)
*	986	98	Pavement, HSG C (OFFSITE)
*	3,269	74	Plantings, HSG C (OFFSITE)
	6,163	81	Weighted Average
	4,368		70.87% Pervious Area
	1,795		29.13% Impervious Area

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

Subcatchment S-B-1: S-B-1



Summary for Subcatchment S-B-2: S-B-2

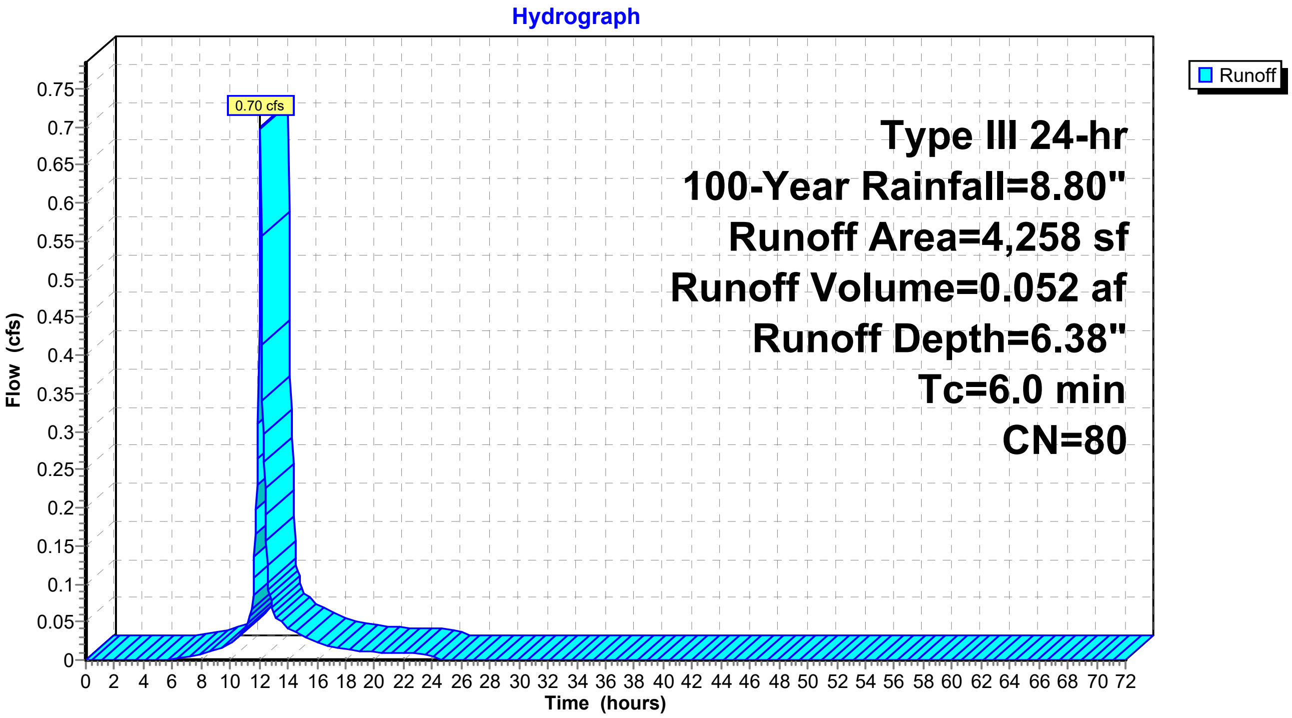
Runoff = 0.70 cfs @ 12.09 hrs, Volume= 0.052 af, Depth= 6.38"
Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.80"

	Area (sf)	CN	Description
*	931	98	Sidewalk, HSG C
*	42	98	Wall, HSG C
*	2,417	74	Plantings, HSG C
	108	96	Gravel surface, HSG C
*	760	74	Plantings, HSG C (OFFSITE)
	4,258	80	Weighted Average
	3,285		77.15% Pervious Area
	973		22.85% Impervious Area

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

Subcatchment S-B-2: S-B-2



Summary for Subcatchment SWALE: BASIN

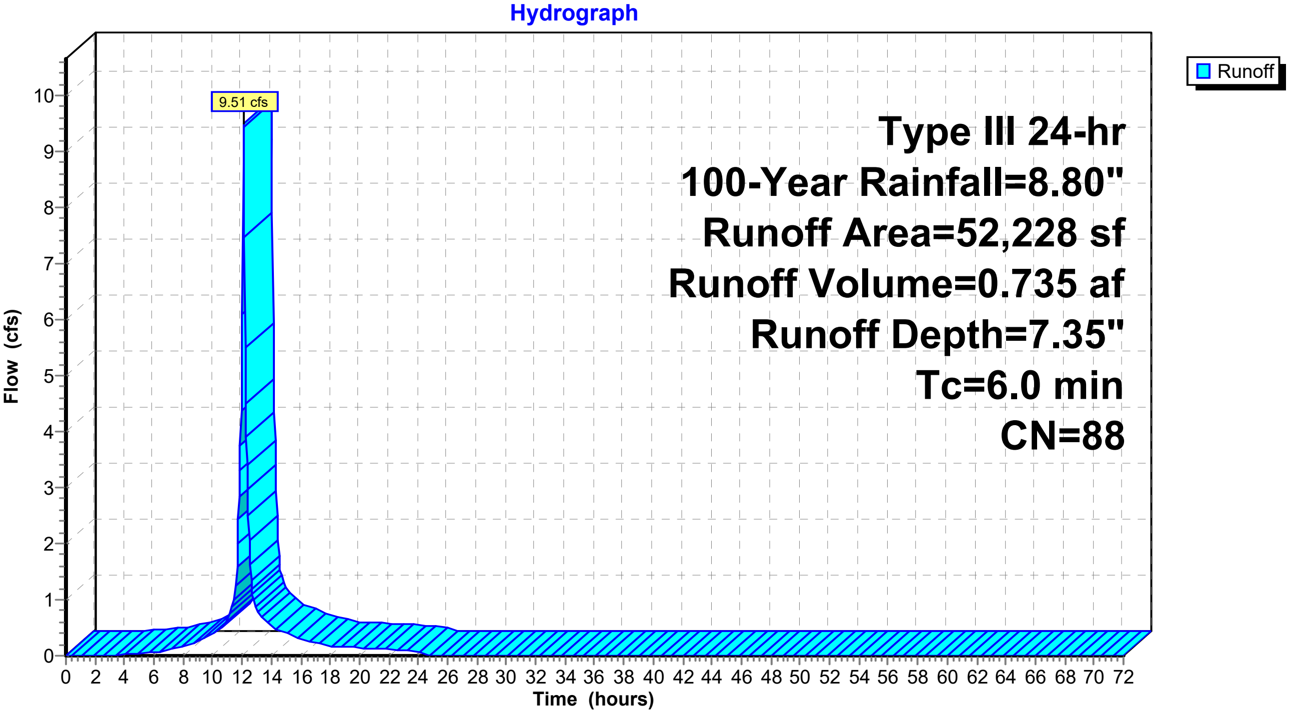
Runoff = 9.51 cfs @ 12.09 hrs, Volume= 0.735 af, Depth= 7.35"
Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.80"

	Area (sf)	CN	Description
*	30,996	98	Impervious surfaces, HSG C
	21,232	74	>75% Grass cover, Good, HSG C
	52,228	88	Weighted Average
	21,232		40.65% Pervious Area
	30,996		59.35% Impervious Area

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

Subcatchment SWALE: BASIN



Summary for Pond AB-1: Storage Beneath Garage Slab

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Inflow Area =        0.424 ac, 77.06% Impervious,  Inflow Depth =  7.96"   for  100-Year event
Inflow      =       3.46 cfs @  12.09 hrs,  Volume=          0.281 af
Outflow     =       0.94 cfs @  12.44 hrs,  Volume=          0.281 af,  Atten= 73%,  Lag= 21.3 min
Primary     =       0.94 cfs @  12.44 hrs,  Volume=          0.281 af
   Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 18.19' @ 12.44 hrs   Surf.Area= 8,842 sf   Storage= 4,961 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 167.5 min ( 923.9 - 756.4 )

Volume        Invert    Avail.Storage  Storage Description
   #1A        16.42'             0 cf  85.63'W x 103.25'L x 2.42'H Field A
                                       21,372 cf Overall - 6,644 cf Embedded = 14,729 cf  x 0.0% Voids
   #2A        16.75'         5,371 cf  ADS N-12  18" x 145  Inside #1
                                       Inside= 18.2"W x 18.2"H => 1.80 sf x 20.00'L = 36.0 cf
                                       Outside= 21.0"W x 21.0"H => 2.23 sf x 20.00'L = 44.5 cf
                                       145 Chambers in 29 Rows
                                       84.13' Header x 1.80 sf  x 1 = 151.4 cf Inside
                             5,371 cf  Total Available Storage

   Storage Group A created with Chamber Wizard

Device   Routing          Invert   Outlet Devices
   #1    Primary          16.75'   12.0"  Round Culvert
                                   L= 48.0'   CPP, square edge headwall,  Ke= 0.500
                                   Inlet / Outlet Invert= 16.75' / 16.44'   S= 0.0065 '/'   Cc= 0.900
                                   n= 0.013  Corrugated PE, smooth interior,  Flow Area= 0.79 sf
   #2    Device 1         16.75'   3.0" Vert. Orifice/Grate   C= 0.600   Limited to weir flow at low heads
   #3    Device 1         18.05'   4.0' long x 5.40' rise Sharp-Crested Rectangular Weir
                                   2 End Contraction(s)

Primary OutFlow Max=0.94 cfs @ 12.44 hrs  HW=18.19'  TW=16.21'   (Dynamic Tailwater)
└─1=Culvert  (Passes 0.94 cfs of 3.14 cfs potential flow)
   ├─2=Orifice/Grate  (Orifice Controls 0.27 cfs @ 5.52 fps)
   └─3=Sharp-Crested Rectangular Weir (Weir Controls 0.67 cfs @ 1.22 fps)
```

Pond AB-1: Storage Beneath Garage Slab - Chamber Wizard Field A

Chamber Model = ADS N-12 18" (ADS N-12® Pipe)
Inside= 18.2"W x 18.2"H => 1.80 sf x 20.00'L = 36.0 cf
Outside= 21.0"W x 21.0"H => 2.23 sf x 20.00'L = 44.5 cf

21.0" Wide + 14.3" Spacing = 35.3" C-C Row Spacing

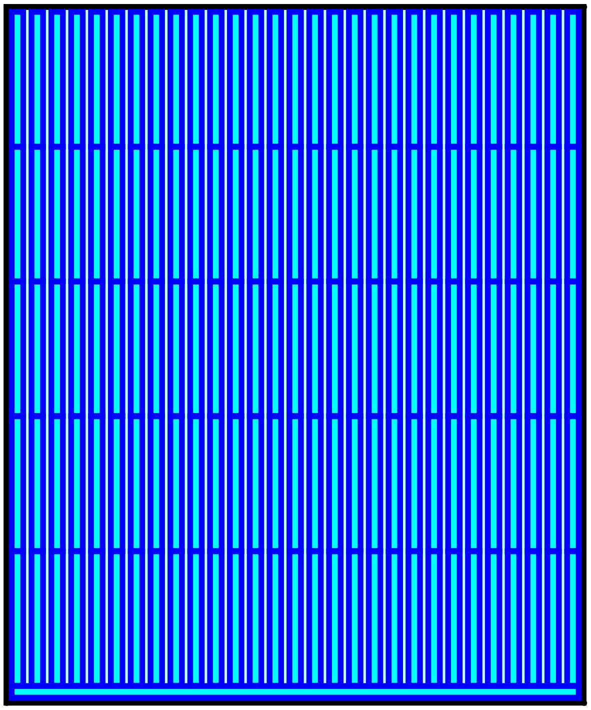
5 Chambers/Row x 20.00' Long +1.75' Header x 1 = 101.75' Row Length +9.0" End Stone x 2 = 103.25' Base Length
29 Rows x 21.0" Wide + 14.3" Spacing x 28 + 9.0" Side Stone x 2 = 85.63' Base Width
4.0" Stone Base + 21.0" Chamber Height + 4.0" Stone Cover = 2.42' Field Height

145 Chambers x 36.0 cf + 84.13' Header x 1.80 sf = 5,371.5 cf Chamber Storage
145 Chambers x 44.5 cf + 84.13' Header x 2.23 sf = 6,643.5 cf Displacement

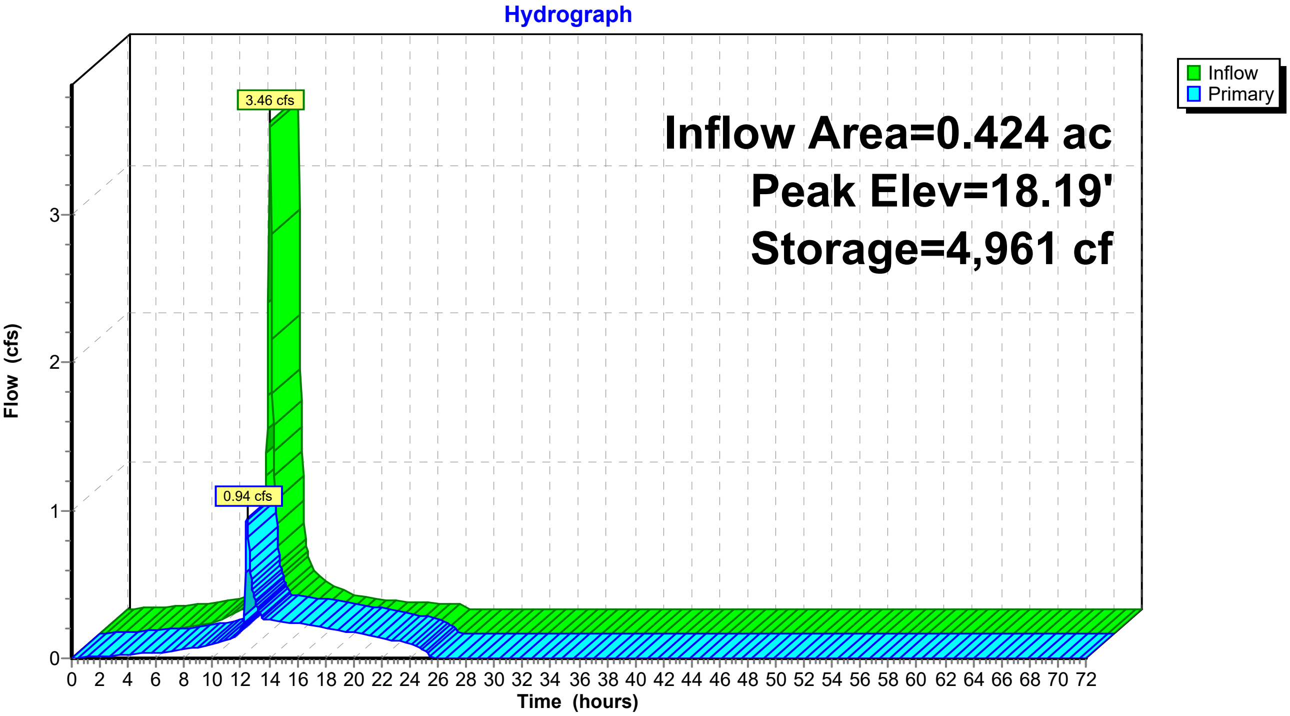
21,372.1 cf Field - 6,643.5 cf Chambers = 14,728.6 cf Stone x 0.0% Voids = 0.0 cf Stone Storage

Chamber Storage = 5,371.5 cf = 0.123 af
Overall Storage Efficiency = 25.1%
Overall System Size = 103.25' x 85.63' x 2.42'

145 Chambers
791.6 cy Field
545.5 cy Stone



Pond AB-1: Storage Beneath Garage Slab



Summary for Pond AB-2: Subsurface Infiltration System

Inflow Area = 0.413 ac,100.00% Impervious, Inflow Depth = 8.56" for 100-Year event
Inflow = 3.49 cfs @ 12.09 hrs, Volume= 0.295 af
Outflow = 1.43 cfs @ 12.30 hrs, Volume= 0.295 af, Atten= 59%, Lag= 13.0 min
Discarded = 0.17 cfs @ 10.60 hrs, Volume= 0.242 af
Primary = 1.26 cfs @ 12.30 hrs, Volume= 0.052 af
Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 20.51' @ 12.30 hrs Surf.Area= 3,092 sf Storage= 3,934 cf

Plug-Flow detention time= 128.5 min calculated for 0.295 af (100% of inflow)
Center-of-Mass det. time= 128.4 min (868.5 - 740.1)

Volume	Invert	Avail.Storage	Storage Description
#1	18.75'	1,410 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc) 7,143 cf Overall - 3,619 cf Embedded = 3,524 cf x 40.0% Voids
#2	19.08'	3,257 cf	**Ferguson R-Tank XD 9** x 759 Inside #1 Inside= 19.7"W x 17.7"H => 2.18 sf x 1.97'L = 4.3 cf Outside= 19.7"W x 17.7"H => 2.42 sf x 1.97'L = 4.8 cf 759 Chambers in 36 Rows
		4,666 cf	Total Available Storage

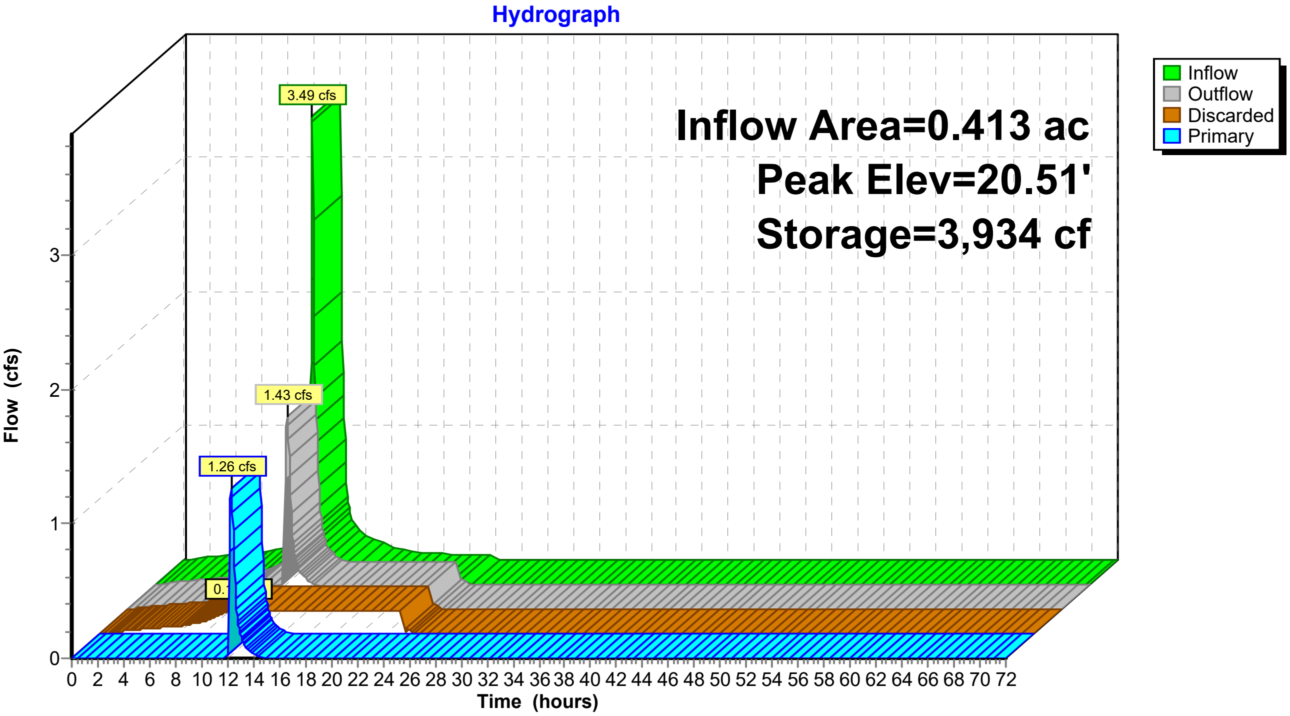
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
18.75	3,092	0	0
21.06	3,092	7,143	7,143

Device	Routing	Invert	Outlet Devices
#1	Primary	19.08'	**12.0" Round Culvert** L= 3.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 19.08' / 19.08' S= 0.0000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	20.30'	**4.0' long x 3.15' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Discarded	18.75'	**2.410 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=0.17 cfs @ 10.60 hrs HW=18.80' (Free Discharge)
└─**3=Exfiltration** (Exfiltration Controls 0.17 cfs)

Primary OutFlow Max=1.26 cfs @ 12.30 hrs HW=20.51' TW=16.79' (Dynamic Tailwater)
└─**1=Culvert** (Passes 1.26 cfs of 3.28 cfs potential flow)
  └─**2=Sharp-Crested Rectangular Weir** (Weir Controls 1.26 cfs @ 1.50 fps)

Pond AB-2: Subsurface Infiltration System



Summary for Pond AB-3: Subsurface Infiltration System

Inflow Area = 0.397 ac, 74.76% Impervious, Inflow Depth = 7.83" for 100-Year event
Inflow = 3.19 cfs @ 12.09 hrs, Volume= 0.259 af
Outflow = 2.38 cfs @ 12.17 hrs, Volume= 0.259 af, Atten= 25%, Lag= 4.7 min
Discarded = 0.14 cfs @ 10.45 hrs, Volume= 0.148 af
Primary = 2.24 cfs @ 12.17 hrs, Volume= 0.111 af
Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 20.77' @ 12.17 hrs Surf.Area= 2,589 sf Storage= 1,967 cf

Plug-Flow detention time= 21.8 min calculated for 0.259 af (100% of inflow)
Center-of-Mass det. time= 21.8 min (778.7 - 756.9)

Volume	Invert	Avail.Storage	Storage Description
#1	19.50'	1,022 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 3,858 cf Overall - 1,303 cf Embedded = 2,554 cf x 40.0% Voids
#2	19.83'	1,173 cf	**Ferguson R-Tank XD 4** x 615 Inside #1 Inside= 19.7"W x 7.9"H => 0.97 sf x 1.97'L = 1.9 cf Outside= 19.7"W x 7.9"H => 1.08 sf x 1.97'L = 2.1 cf 615 Chambers in 10 Rows
		2,195 cf	Total Available Storage

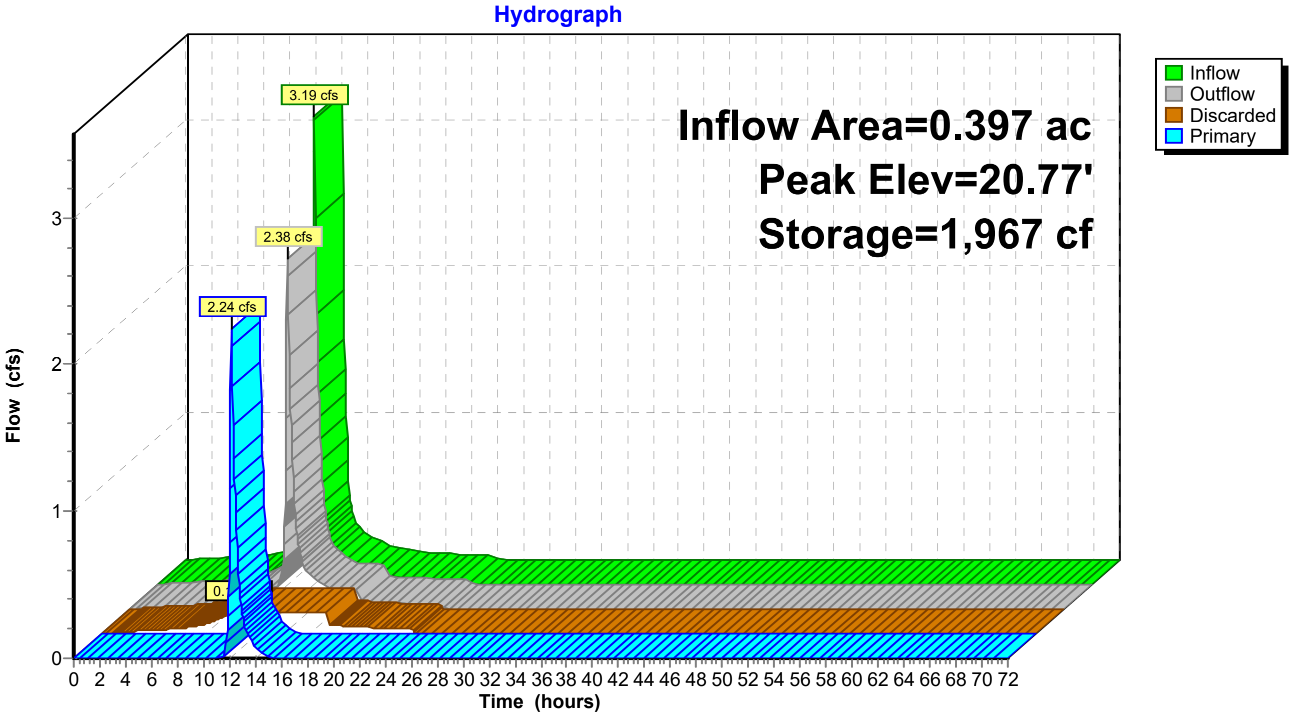
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
19.50	2,589	0	0
20.99	2,589	3,858	3,858

Device	Routing	Invert	Outlet Devices
#1	Primary	19.83'	**12.0" Round Culvert** L= 22.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 19.83' / 19.61' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	19.90'	**4.0' long x 2.20' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Discarded	19.50'	**2.410 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=0.14 cfs @ 10.45 hrs HW=19.53' (Free Discharge)
⮤**3=Exfiltration** (Exfiltration Controls 0.14 cfs)

Primary OutFlow Max=2.19 cfs @ 12.17 hrs HW=20.76' TW=16.94' (Dynamic Tailwater)
⮤**1=Culvert** (Barrel Controls 2.19 cfs @ 3.76 fps)
  ⮤**2=Sharp-Crested Rectangular Weir** (Passes 2.19 cfs of 9.90 cfs potential flow)

Pond AB-3: Subsurface Infiltration System



Summary for Pond ED-AB: Re-graded Existing Depression

Inflow Area = 0.844 ac, 21.19% Impervious, Inflow Depth = 2.61" for 100-Year event
Inflow = 2.06 cfs @ 12.14 hrs, Volume= 0.184 af
Outflow = 0.17 cfs @ 14.81 hrs, Volume= 0.184 af, Atten= 92%, Lag= 160.1 min
Primary = 0.17 cfs @ 14.81 hrs, Volume= 0.184 af
Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond ES-LF : DP-LF Existing Swale/Basin in Lovell Field

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 22.48' @ 14.81 hrs Surf.Area= 3,115 sf Storage= 4,240 cf

Plug-Flow detention time= 470.8 min calculated for 0.183 af (100% of inflow)
Center-of-Mass det. time= 471.0 min (1,338.0 - 867.0)

Volume	Invert	Avail.Storage	Storage Description
#1	19.50'	8,308 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

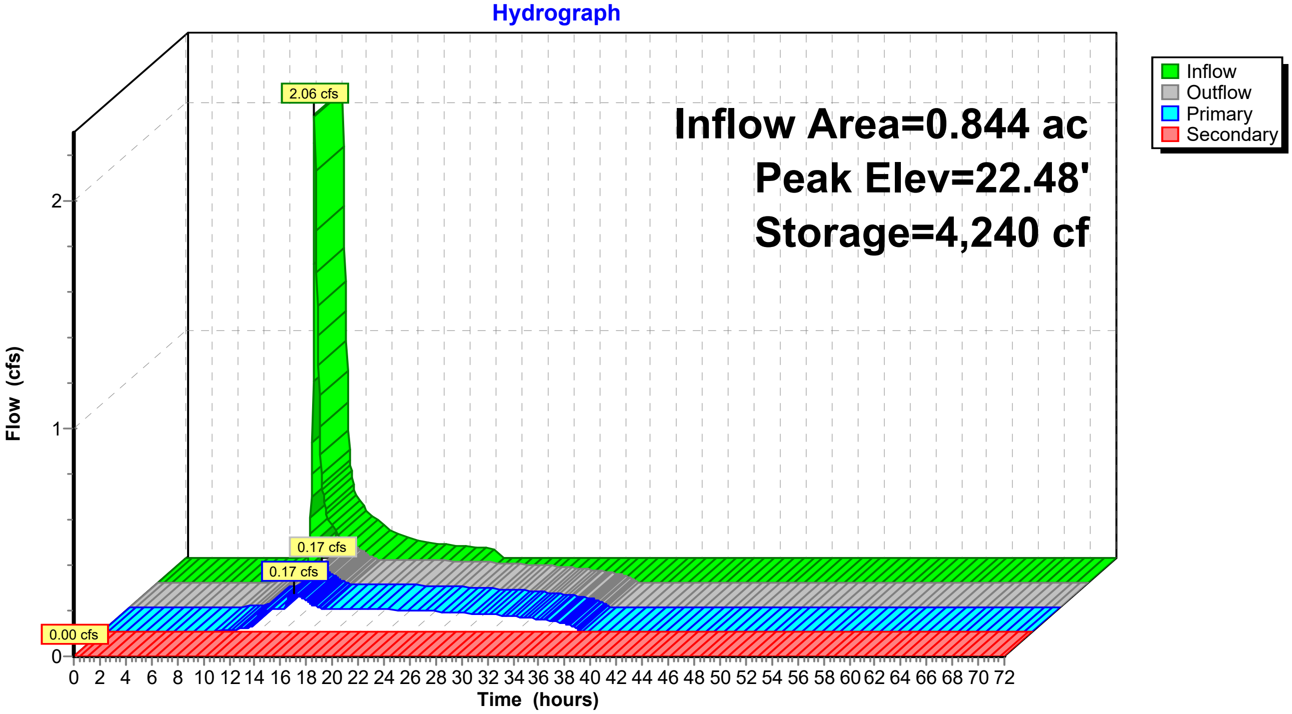
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
19.50	69	0	0
20.00	484	138	138
21.00	1,371	928	1,066
22.00	2,351	1,861	2,927
23.00	3,941	3,146	6,073
23.50	5,000	2,235	8,308

Device	Routing	Invert	Outlet Devices
#1	Primary	19.50'	**12.0" Round Culvert** L= 27.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 19.50' / 18.58' S= 0.0341 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	19.50'	**1.5" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	22.45'	**4.0' long x 1.00' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Secondary	23.43'	**2.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Primary OutFlow Max=0.17 cfs @ 14.81 hrs HW=22.48' TW=14.38' (Dynamic Tailwater)
↑—**1=Culvert** (Passes 0.17 cfs of 5.26 cfs potential flow)
  ↑—**2=Orifice/Grate** (Orifice Controls 0.10 cfs @ 8.23 fps)
  └—**3=Sharp-Crested Rectangular Weir** (Weir Controls 0.07 cfs @ 0.57 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=19.50' TW=13.87' (Dynamic Tailwater)
↑—**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond ED-AB: Re-graded Existing Depression



Summary for Pond ES-LF: DP-LF Existing Swale/Basin in Lovell Field

```
Inflow Area =        4.579 ac,  55.32% Impervious,  Inflow Depth =  4.91"    for  100-Year event
Inflow      =       18.17 cfs @   12.10 hrs,  Volume=          1.873 af
Outflow     =       13.09 cfs @   12.20 hrs,  Volume=          1.873 af,  Atten= 28%,  Lag= 6.4 min
Primary     =       13.09 cfs @   12.20 hrs,  Volume=          1.873 af
    Routed to nonexistent node 1R

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 16.99' @ 12.20 hrs   Surf.Area= 2,833 sf   Storage= 3,637 cf

Plug-Flow detention time= 1.3 min calculated for 1.872 af (100% of inflow)
Center-of-Mass det. time= 1.3 min ( 862.6 - 861.2 )

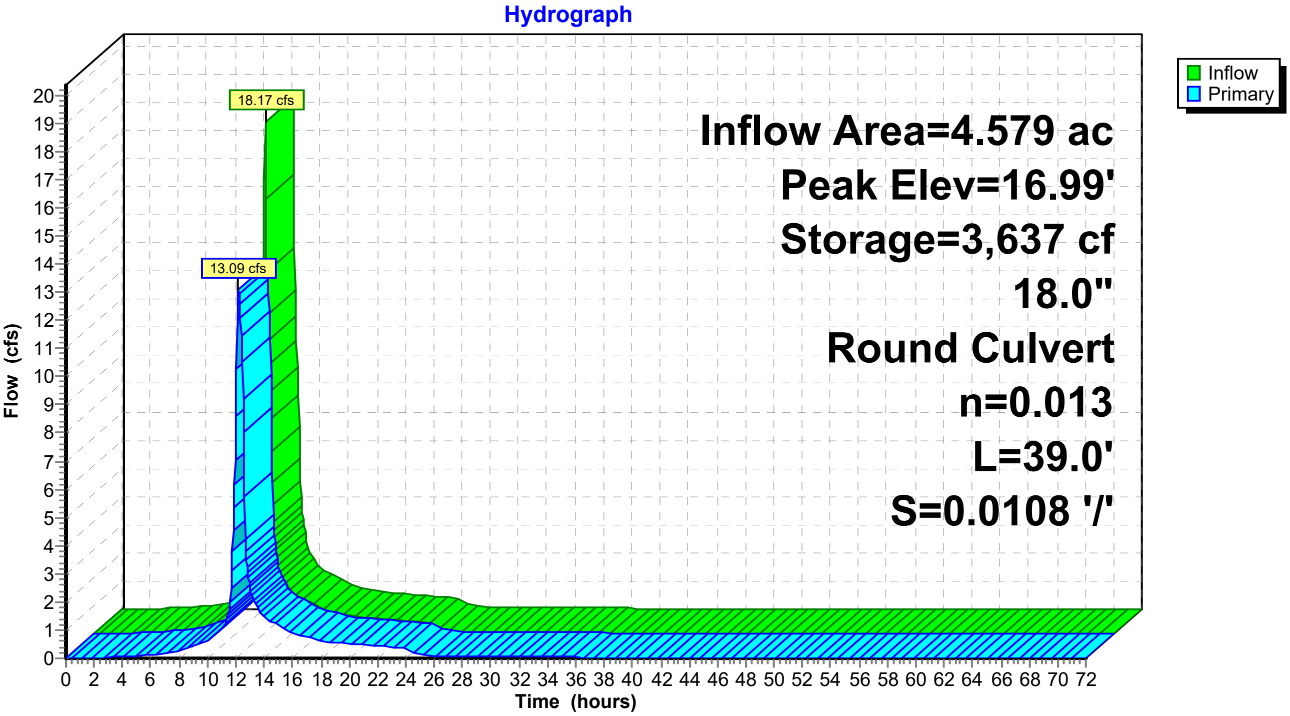
Volume       Invert    Avail.Storage   Storage Description
   #1        13.87'        17,546 cf   Custom Stage Data (Prismatic)Listed below (Recalc)

 Elevation       Surf.Area        Inc.Store       Cum.Store
    (feet)         (sq-ft)     (cubic-feet)    (cubic-feet)
     13.87               0                0               0
     14.00               3                0               0
     15.00             488              246             246
     16.00           1,764            1,126           1,372
     17.00           2,848            2,306           3,678
     18.00           3,993            3,421           7,098
     19.00           5,217            4,605          11,703
     20.00           6,468            5,843          17,546

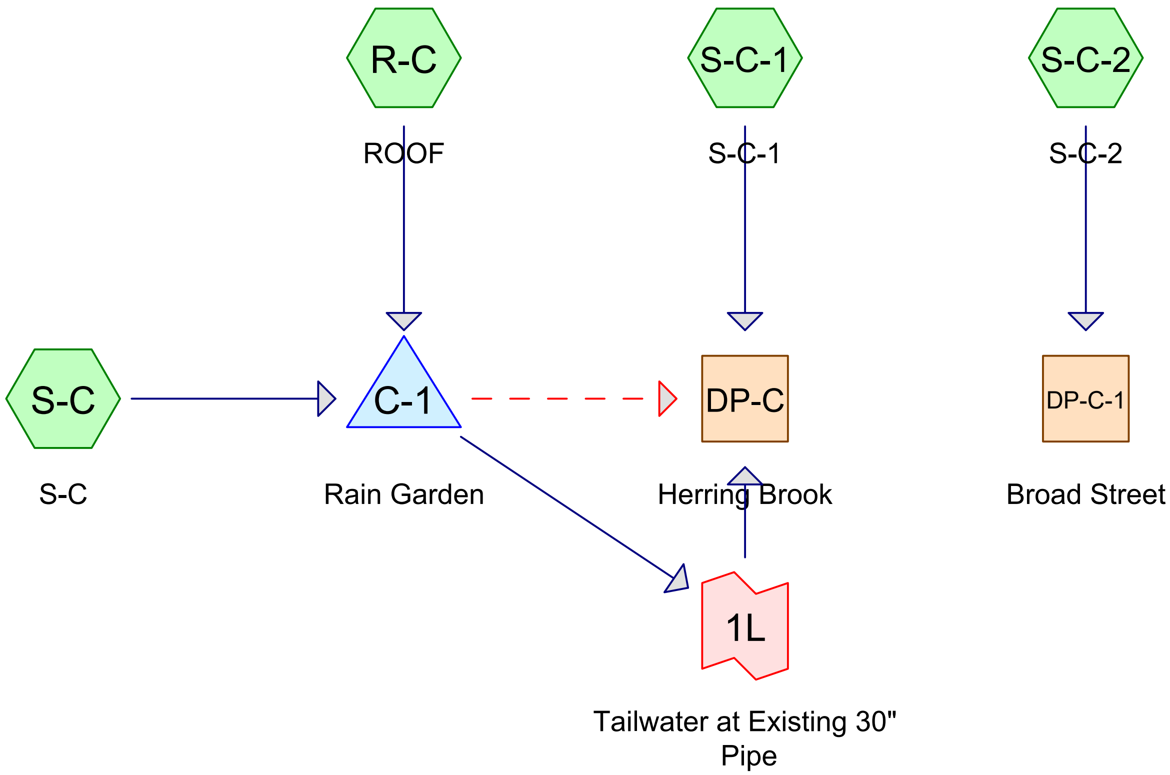
Device   Routing           Invert   Outlet Devices
   #1    Primary           13.87'   18.0"  Round Culvert
                                    L= 39.0'   CPP, square edge headwall,  Ke= 0.500
                                    Inlet / Outlet Invert= 13.87' / 13.45'   S= 0.0108 '/'   Cc= 0.900
                                    n= 0.013  Corrugated PE, smooth interior,  Flow Area= 1.77 sf

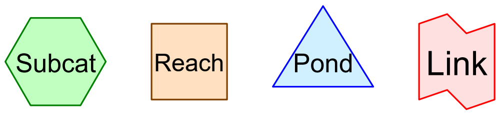
Primary OutFlow  Max=13.08 cfs @ 12.20 hrs  HW=16.98'   (Free Discharge)
└─1=Culvert  (Inlet Controls 13.08 cfs @ 7.40 fps)
```

Pond ES-LF: DP-LF Existing Swale/Basin in Lovell Field



SITE C





Routing Diagram for 222-203 Lot C Post Development Conditions (R2)
Prepared by McKenzie Engineering Group Inc, Printed 11/13/2023
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Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	Type III 24-hr		Default	24.00	1	3.22	2
2	10-Year	Type III 24-hr		Default	24.00	1	4.86	2
3	25-Year	Type III 24-hr		Default	24.00	1	6.15	2
4	100-Year	Type III 24-hr		Default	24.00	1	8.80	2
5	WQV	Type III 24-hr		Default	24.00	1	1.42	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.005	96	Gravel, HSG C (S-C)
0.007	98	Pavement, HSG C (S-C)
0.018	98	Pavement, HSG C (OFFSITE) (S-C)
0.052	74	Plantings, HSG C (S-C, S-C-2)
0.052	74	Plantings, HSG C (OFFSITE) (S-C, S-C-1)
0.406	98	Roofs, HSG C (R-C)
0.051	98	Sidewalk, HSG C (S-C, S-C-2)
0.013	98	Sidewalk, HSG C (OFFSITE) (S-C, S-C-2)
0.002	98	Transformer, HSG C (S-C)
0.005	98	Wall, HSG C (S-C, S-C-2)
0.000	98	Wall, HSG C (OFFSITE) (S-C)
0.611	**94**	**TOTAL AREA**

Soil Listing (all nodes)

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

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.005	0.000	0.000	0.005	Gravel	S-C
0.000	0.000	0.025	0.000	0.000	0.025	Pavement	S-C
0.000	0.000	0.104	0.000	0.000	0.104	Plantings	S-C, S-C-1, S-C-2
0.000	0.000	0.406	0.000	0.000	0.406	Roofs	R-C
0.000	0.000	0.064	0.000	0.000	0.064	Sidewalk	S-C, S-C-2
0.000	0.000	0.002	0.000	0.000	0.002	Transformer	S-C
0.000	0.000	0.005	0.000	0.000	0.005	Wall	S-C, S-C-2
0.000	**0.000**	**0.611**	**0.000**	**0.000**	**0.611**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)	Node Name
1	C-1	21.50	21.20	52.0	0.0058	0.013	0.0	18.0	0.0	
2	C-1	22.00	21.50	50.0	0.0100	0.013	0.0	4.0	0.0	

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment R-C: ROOF Runoff Area=17,666 sf 100.00% Impervious Runoff Depth=2.99"
Tc=6.0 min CN=98 Runoff=1.27 cfs 0.101 af

Subcatchment S-C: S-C Runoff Area=5,098 sf 51.20% Impervious Runoff Depth=1.93"
Tc=6.0 min CN=87 Runoff=0.26 cfs 0.019 af

Subcatchment S-C-1: S-C-1 Runoff Area=1,348 sf 0.00% Impervious Runoff Depth=1.05"
Tc=6.0 min CN=74 Runoff=0.04 cfs 0.003 af

Subcatchment S-C-2: S-C-2 Runoff Area=2,513 sf 62.83% Impervious Runoff Depth=2.10"
Tc=6.0 min CN=89 Runoff=0.14 cfs 0.010 af

Reach DP-C: Herring Brook Inflow=1.54 cfs 0.123 af
Outflow=1.54 cfs 0.123 af

Reach DP-C-1: Broad Street Inflow=0.14 cfs 0.010 af
Outflow=0.14 cfs 0.010 af

Pond C-1: Rain Garden Peak Elev=24.92' Storage=603 cf Inflow=1.53 cfs 0.120 af
Primary=1.50 cfs 0.120 af Secondary=0.00 cfs 0.000 af Outflow=1.50 cfs 0.120 af

Link 1L: Tailwater at Existing 30" Pipe Inflow=1.50 cfs 0.120 af
Primary=1.50 cfs 0.120 af

Total Runoff Area = 0.611 ac Runoff Volume = 0.133 af Average Runoff Depth = 2.60"
17.92% Pervious = 0.110 ac 82.08% Impervious = 0.502 ac

Summary for Subcatchment R-C: ROOF

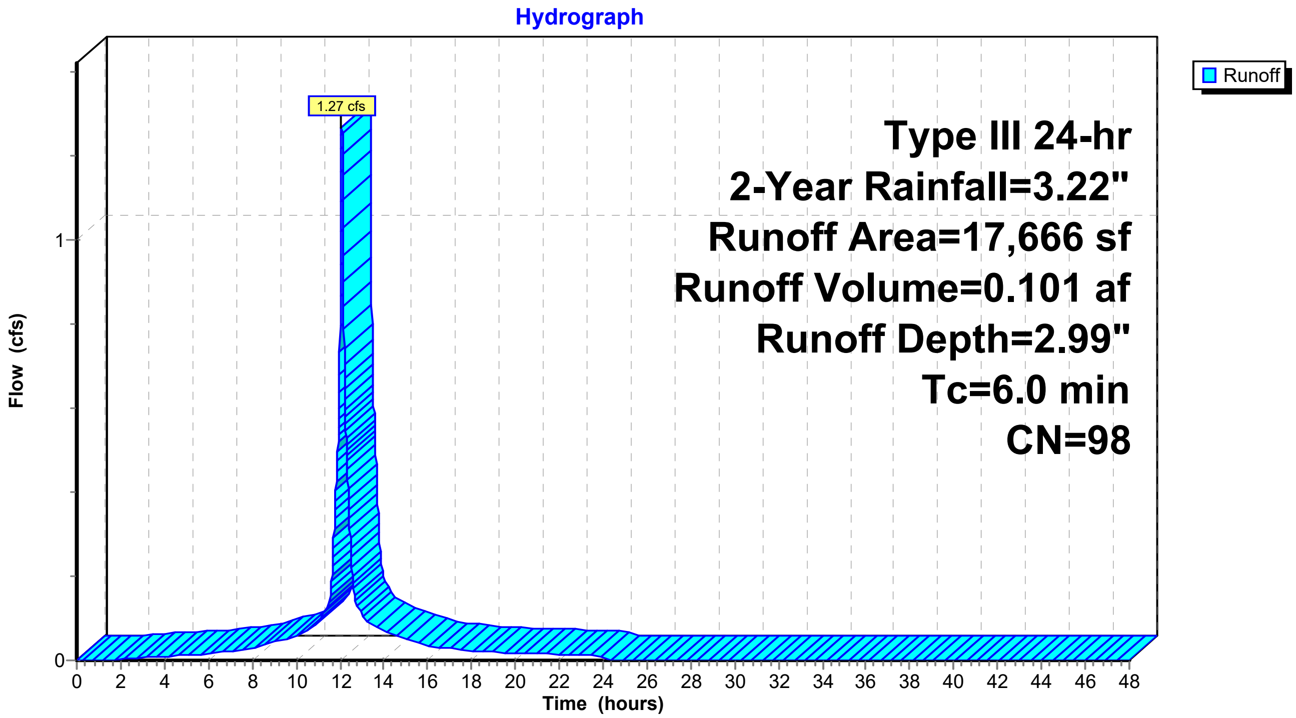
Runoff = 1.27 cfs @ 12.08 hrs, Volume= 0.101 af, Depth= 2.99"
Routed to Pond C-1 : Rain Garden

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.22"

Area (sf)	CN	Description
17,666	98	Roofs, HSG C
17,666		100.00% Impervious Area

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

Subcatchment R-C: ROOF



Summary for Subcatchment S-C: S-C

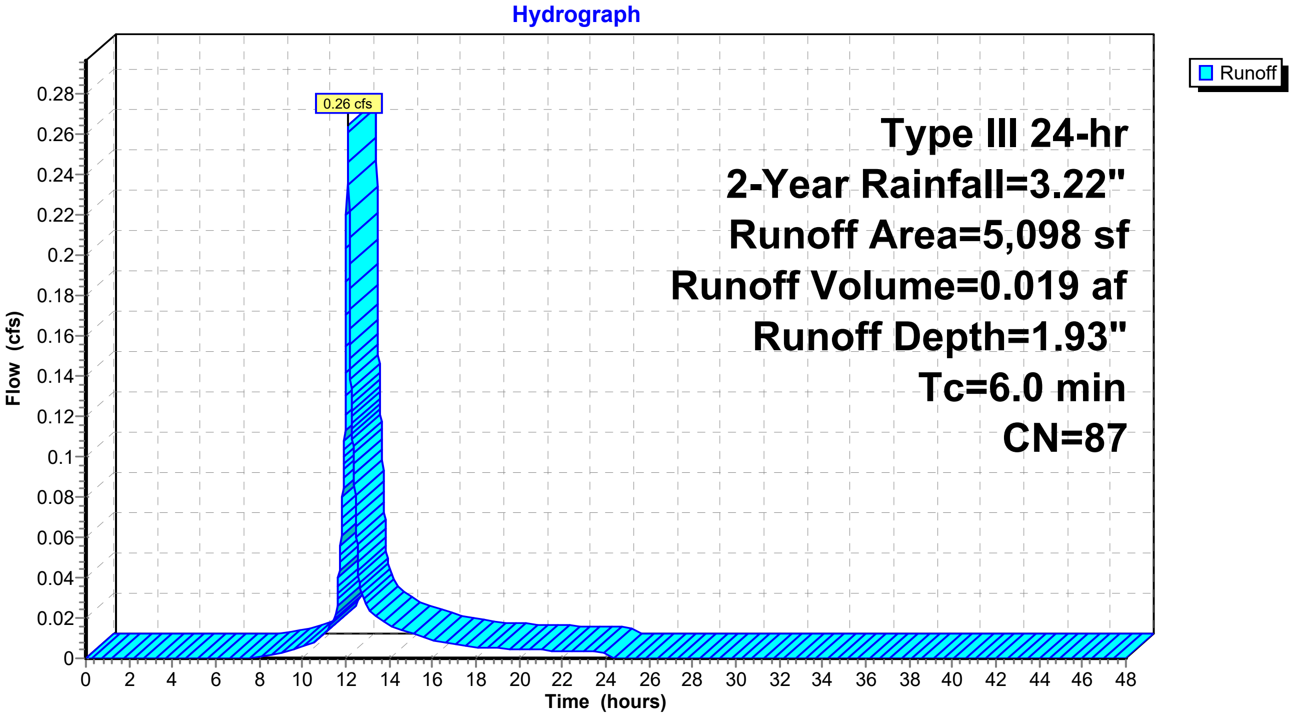
Runoff = 0.26 cfs @ 12.09 hrs, Volume= 0.019 af, Depth= 1.93"
Routed to Pond C-1 : Rain Garden

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.22"

	Area (sf)	CN	Description
*	314	98	Pavement, HSG C
*	752	98	Sidewalk, HSG C
*	113	74	Plantings, HSG C
*	933	74	Plantings, HSG C (OFFSITE)
*	534	98	Sidewalk, HSG C (OFFSITE)
*	788	98	Pavement, HSG C (OFFSITE)
*	4	98	Wall, HSG C (OFFSITE)
*	72	98	Transformer, HSG C
*	1,206	74	Plantings, HSG C
*	236	96	Gravel, HSG C
*	146	98	Wall, HSG C
	5,098	87	Weighted Average
	2,488		48.80% Pervious Area
	2,610		51.20% Impervious Area

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

Subcatchment S-C: S-C



Summary for Subcatchment S-C-1: S-C-1

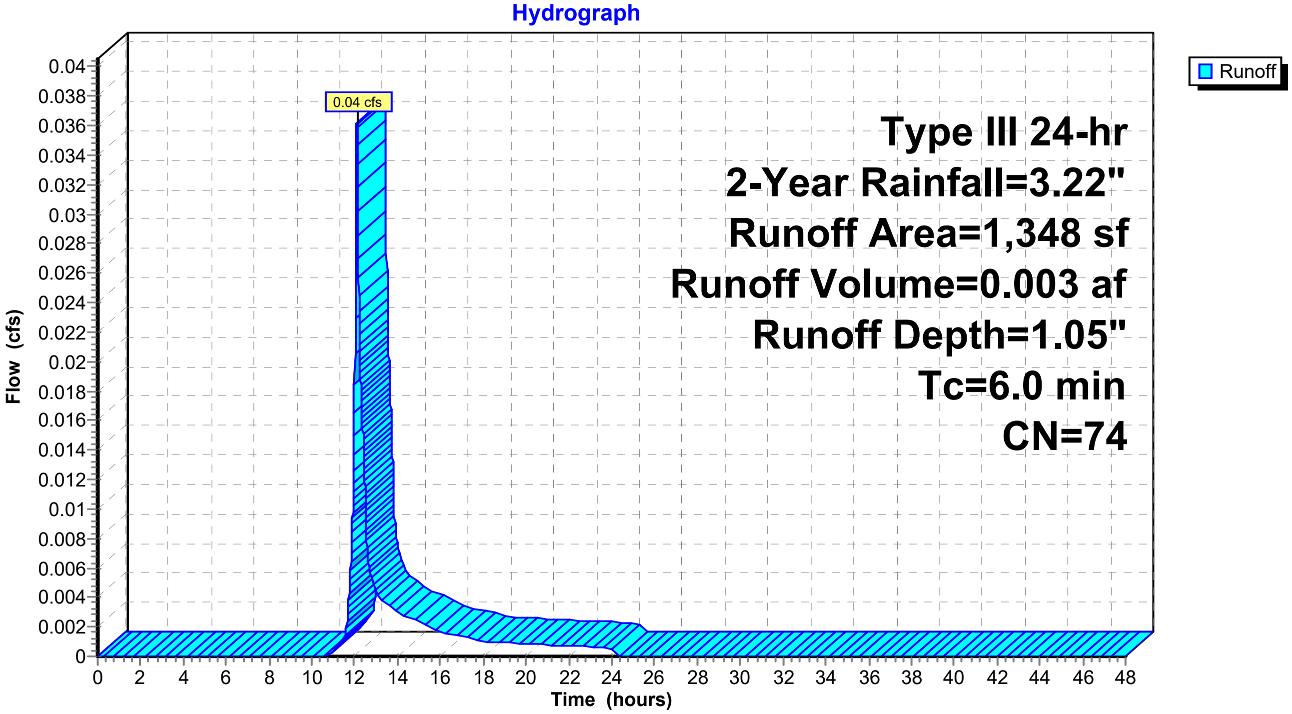
Runoff = 0.04 cfs @ 12.10 hrs, Volume= 0.003 af, Depth= 1.05"
Routed to Reach DP-C : Herring Brook

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.22"

	Area (sf)	CN	Description
*	1,348	74	Plantings, HSG C (OFFSITE)
	1,348		100.00% Pervious Area

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

Subcatchment S-C-1: S-C-1



Summary for Subcatchment S-C-2: S-C-2

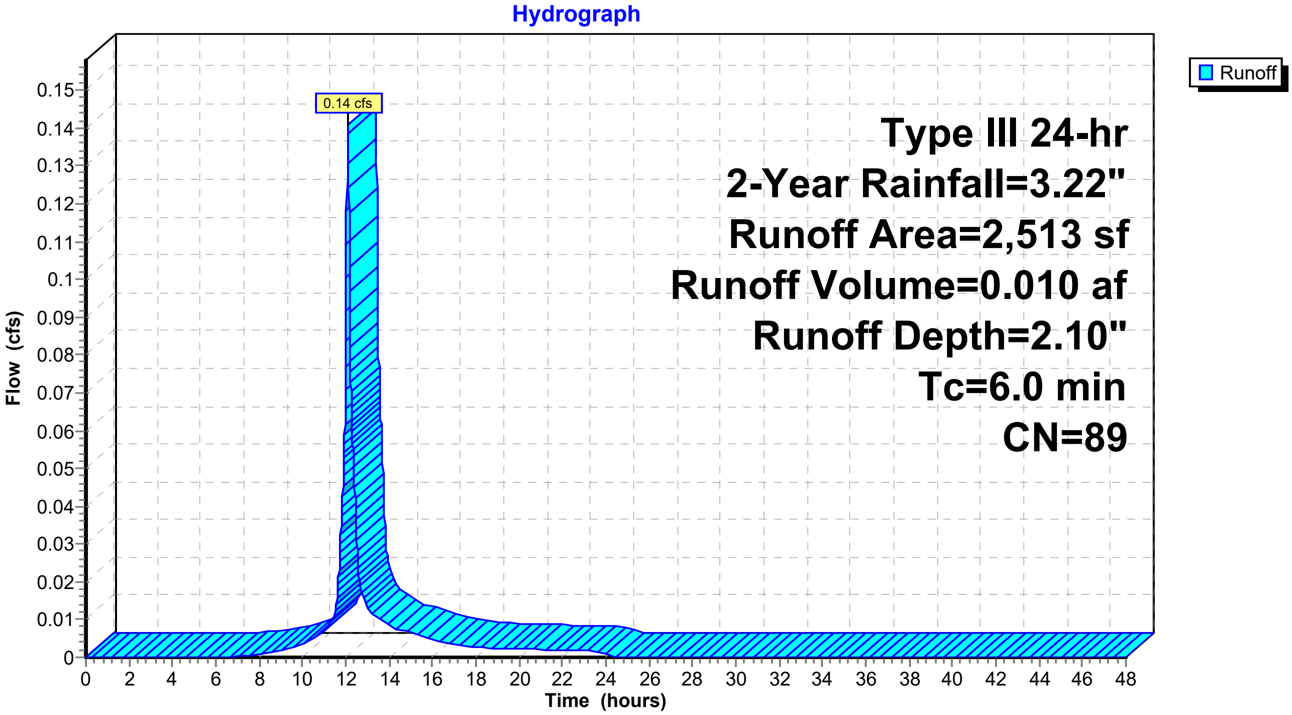
Runoff = 0.14 cfs @ 12.09 hrs, Volume= 0.010 af, Depth= 2.10"
Routed to Reach DP-C-1 : Broad Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.22"

	Area (sf)	CN	Description
*	1,472	98	Sidewalk, HSG C
*	934	74	Plantings, HSG C
*	81	98	Wall, HSG C
*	26	98	Sidewalk, HSG C (OFFSITE)
	2,513	89	Weighted Average
	934		37.17% Pervious Area
	1,579		62.83% Impervious Area

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

Subcatchment S-C-2: S-C-2

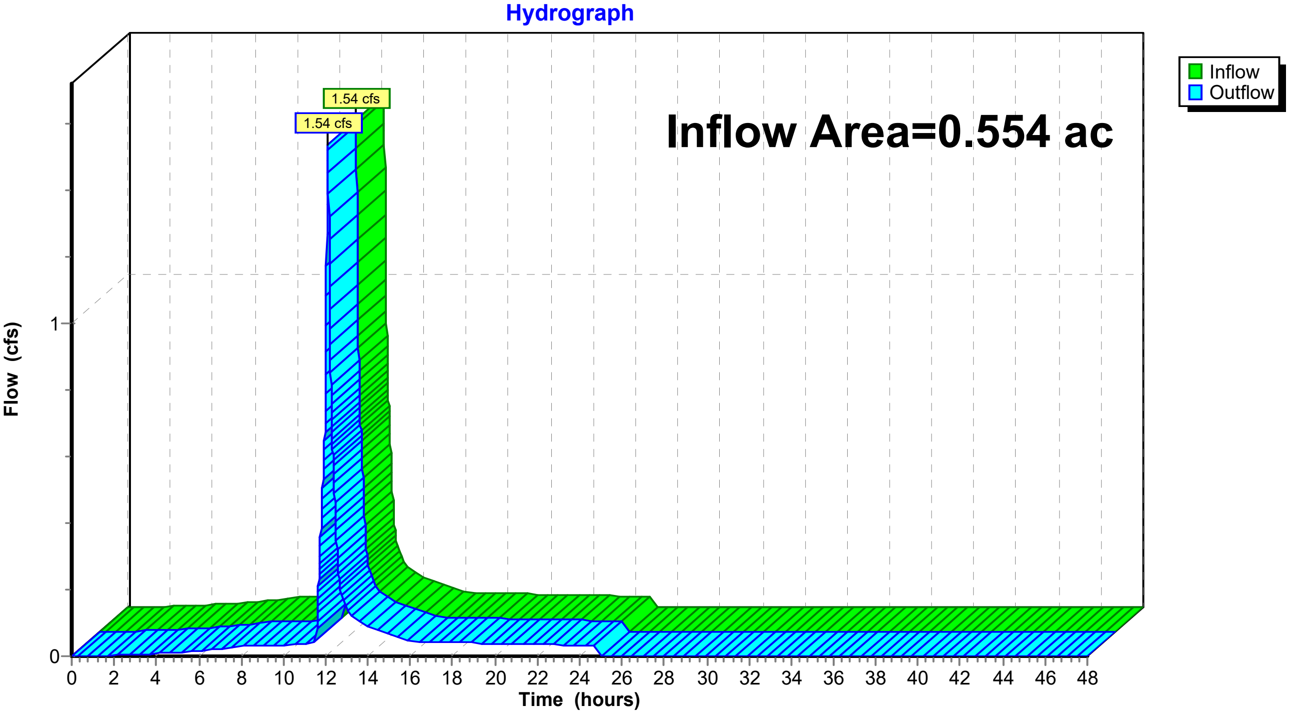


Summary for Reach DP-C: Herring Brook

Inflow Area = 0.554 ac, 84.09% Impervious, Inflow Depth = 2.66" for 2-Year event
Inflow = 1.54 cfs @ 12.10 hrs, Volume= 0.123 af
Outflow = 1.54 cfs @ 12.10 hrs, Volume= 0.123 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Reach DP-C: Herring Brook

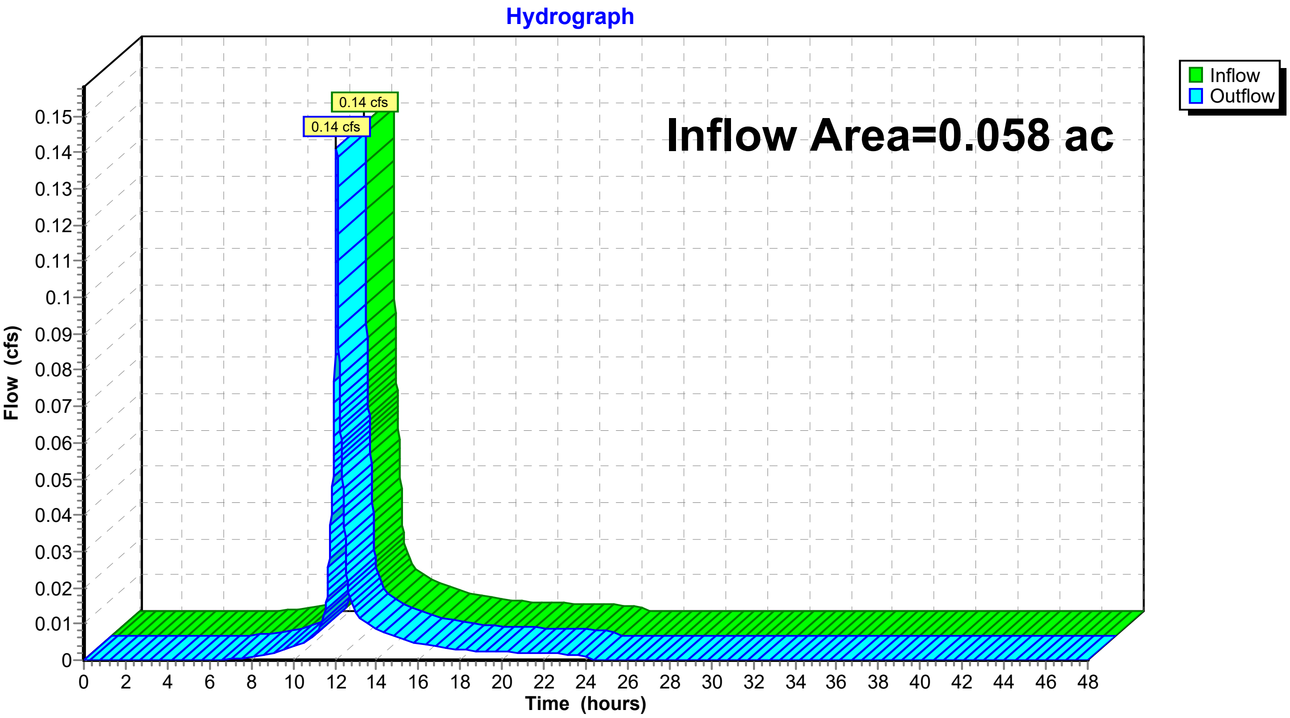


Summary for Reach DP-C-1: Broad Street

Inflow Area = 0.058 ac, 62.83% Impervious, Inflow Depth = 2.10" for 2-Year event
Inflow = 0.14 cfs @ 12.09 hrs, Volume= 0.010 af
Outflow = 0.14 cfs @ 12.09 hrs, Volume= 0.010 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Reach DP-C-1: Broad Street



Summary for Pond C-1: Rain Garden

```
Inflow Area =         0.523 ac,  89.07% Impervious,  Inflow Depth =   2.75"    for  2-Year event
Inflow       =        1.53 cfs @   12.08 hrs,  Volume=           0.120 af
Outflow      =        1.50 cfs @   12.10 hrs,  Volume=           0.120 af,  Atten= 2%,  Lag= 1.0 min
Primary      =        1.50 cfs @   12.10 hrs,  Volume=           0.120 af
    Routed to Link 1L : Tailwater at Existing 30" Pipe
Secondary =           0.00 cfs @    0.00 hrs,  Volume=           0.000 af
    Routed to Reach DP-C : Herring Brook

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 24.92' @ 12.10 hrs   Surf.Area= 767 sf   Storage= 603 cf

Plug-Flow detention time= 60.6 min calculated for 0.120 af (100% of inflow)
Center-of-Mass det. time= 60.6 min ( 826.7 - 766.1 )

Volume       Invert     Avail.Storage   Storage Description
   #1        24.00'          3,033 cf   Custom Stage Data (Prismatic)Listed below (Recalc)

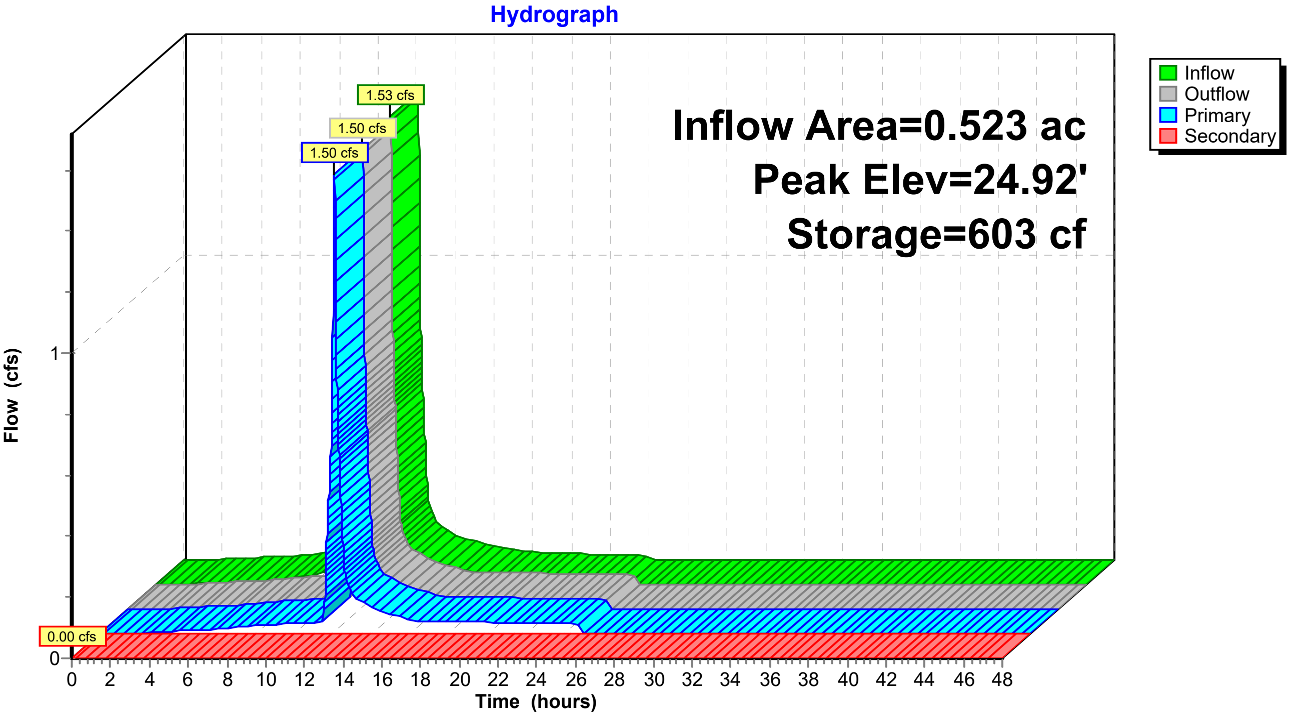
 Elevation          Surf.Area          Inc.Store         Cum.Store
    (feet)            (sq-ft)        (cubic-feet)      (cubic-feet)
     24.00                541                  0                 0
     25.00                786                664               664
     25.53              1,297                552             1,215
     26.00              1,526                663             1,879
     26.63              2,138              1,154             3,033

Device   Routing           Invert   Outlet Devices
   #1    Primary           21.50'   18.0"  Round Culvert
                                    L= 52.0'   CPP, square edge headwall,  Ke= 0.500
                                    Inlet / Outlet Invert= 21.50' / 21.20'   S= 0.0058 '/'   Cc= 0.900
                                    n= 0.013  Corrugated PE, smooth interior,  Flow Area= 1.77 sf
   #2    Device 1          24.75'   24.0" Horiz. Orifice/Grate   C= 0.600
                                    Limited to weir flow at low heads
   #3    Device 1          22.00'   4.0"  Round Culvert
                                    L= 50.0'   CPP, square edge headwall,  Ke= 0.500
                                    Inlet / Outlet Invert= 22.00' / 21.50'   S= 0.0100 '/'   Cc= 0.900
                                    n= 0.013  Corrugated PE, smooth interior,  Flow Area= 0.09 sf
   #4    Device 3          24.00'   2.410 in/hr Exfiltration over Surface area   Phase-In= 0.01'
   #5    Secondary         25.53'   Asymmetrical Weir, C= 3.27
                                    Offset (feet)  0.00  8.89  8.89
                                    Elev.  (feet)  26.50  25.53  26.50

Primary OutFlow Max=1.50 cfs @ 12.10 hrs  HW=24.92'  TW=20.95'   (Dynamic Tailwater)
↑
└─1=Culvert  (Passes 1.50 cfs of 13.50 cfs potential flow)
    ↑
    ├─2=Orifice/Grate  (Weir Controls 1.46 cfs @ 1.35 fps)
    └─3=Culvert  (Passes 0.04 cfs of 0.43 cfs potential flow)
        ↑
        └─4=Exfiltration  (Exfiltration Controls 0.04 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs  HW=24.00'  TW=0.00'   (Dynamic Tailwater)
↑
└─5=Asymmetrical Weir ( Controls 0.00 cfs)
```

Pond C-1: Rain Garden



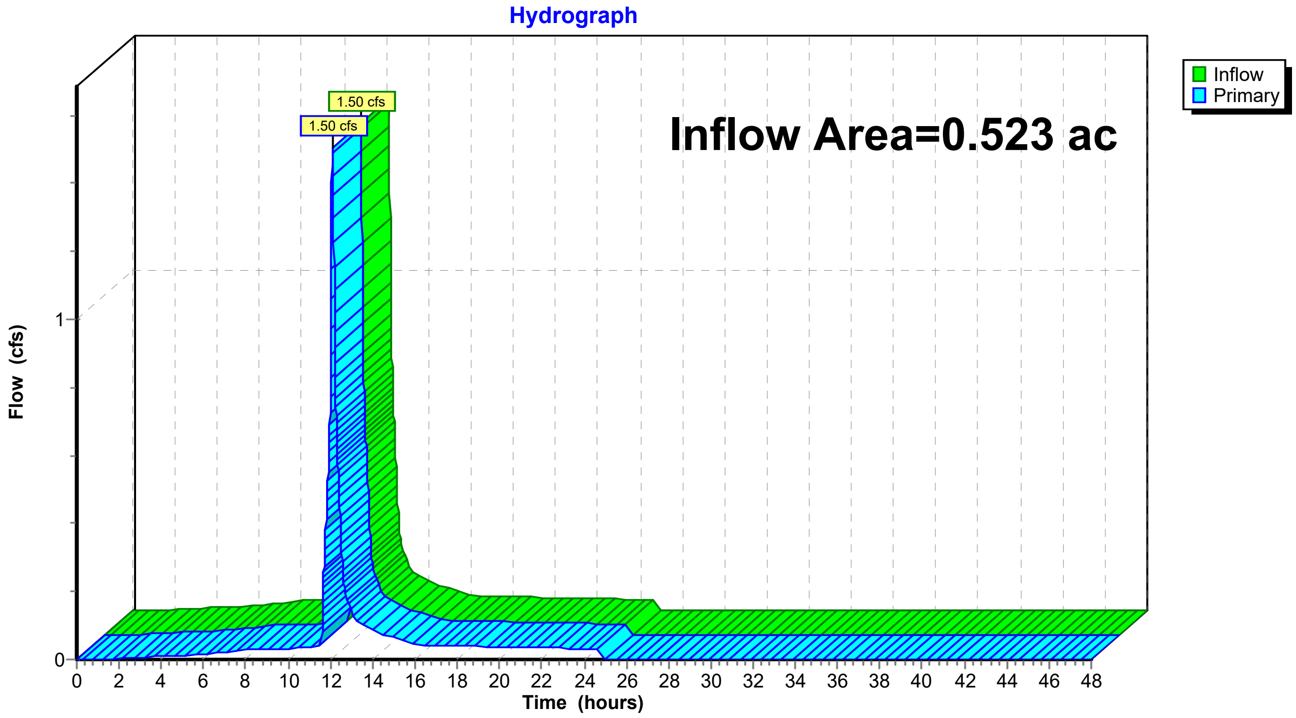
Summary for Link 1L: Tailwater at Existing 30" Pipe

Inflow Area = 0.523 ac, 89.07% Impervious, Inflow Depth = 2.75" for 2-Year event
Inflow = 1.50 cfs @ 12.10 hrs, Volume= 0.120 af
Primary = 1.50 cfs @ 12.10 hrs, Volume= 0.120 af, Atten= 0%, Lag= 0.0 min
Routed to Reach DP-C : Herring Brook

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

2-Year Fixed water surface Elevation= 20.95'

Link 1L: Tailwater at Existing 30" Pipe



Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentR-C: ROOF Runoff Area=17,666 sf 100.00% Impervious Runoff Depth=4.62"
Tc=6.0 min CN=98 Runoff=1.93 cfs 0.156 af

SubcatchmentS-C: S-C Runoff Area=5,098 sf 51.20% Impervious Runoff Depth=3.44"
Tc=6.0 min CN=87 Runoff=0.46 cfs 0.034 af

SubcatchmentS-C-1: S-C-1 Runoff Area=1,348 sf 0.00% Impervious Runoff Depth=2.25"
Tc=6.0 min CN=74 Runoff=0.08 cfs 0.006 af

SubcatchmentS-C-2: S-C-2 Runoff Area=2,513 sf 62.83% Impervious Runoff Depth=3.64"
Tc=6.0 min CN=89 Runoff=0.24 cfs 0.017 af

Reach DP-C: Herring Brook Inflow=2.43 cfs 0.196 af
Outflow=2.43 cfs 0.196 af

Reach DP-C-1: Broad Street Inflow=0.24 cfs 0.017 af
Outflow=0.24 cfs 0.017 af

Pond C-1: Rain Garden Peak Elev=24.98' Storage=650 cf Inflow=2.39 cfs 0.190 af
Primary=2.35 cfs 0.190 af Secondary=0.00 cfs 0.000 af Outflow=2.35 cfs 0.190 af

Link 1L: Tailwater at Existing 30" Pipe Inflow=2.35 cfs 0.190 af
Primary=2.35 cfs 0.190 af

Total Runoff Area = 0.611 ac Runoff Volume = 0.213 af Average Runoff Depth = 4.18"
17.92% Pervious = 0.110 ac 82.08% Impervious = 0.502 ac

Summary for Subcatchment R-C: ROOF

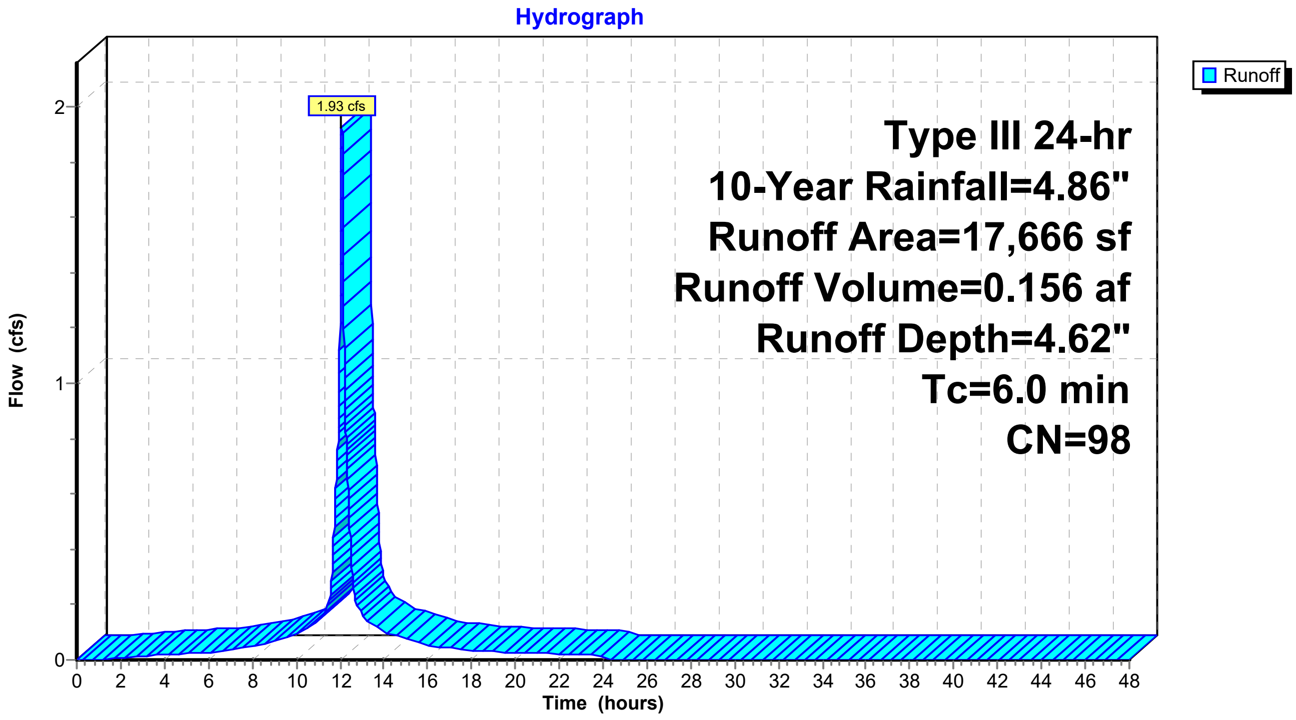
Runoff = 1.93 cfs @ 12.08 hrs, Volume= 0.156 af, Depth= 4.62"
Routed to Pond C-1 : Rain Garden

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.86"

Area (sf)	CN	Description
17,666	98	Roofs, HSG C
17,666		100.00% Impervious Area

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

Subcatchment R-C: ROOF



Summary for Subcatchment S-C: S-C

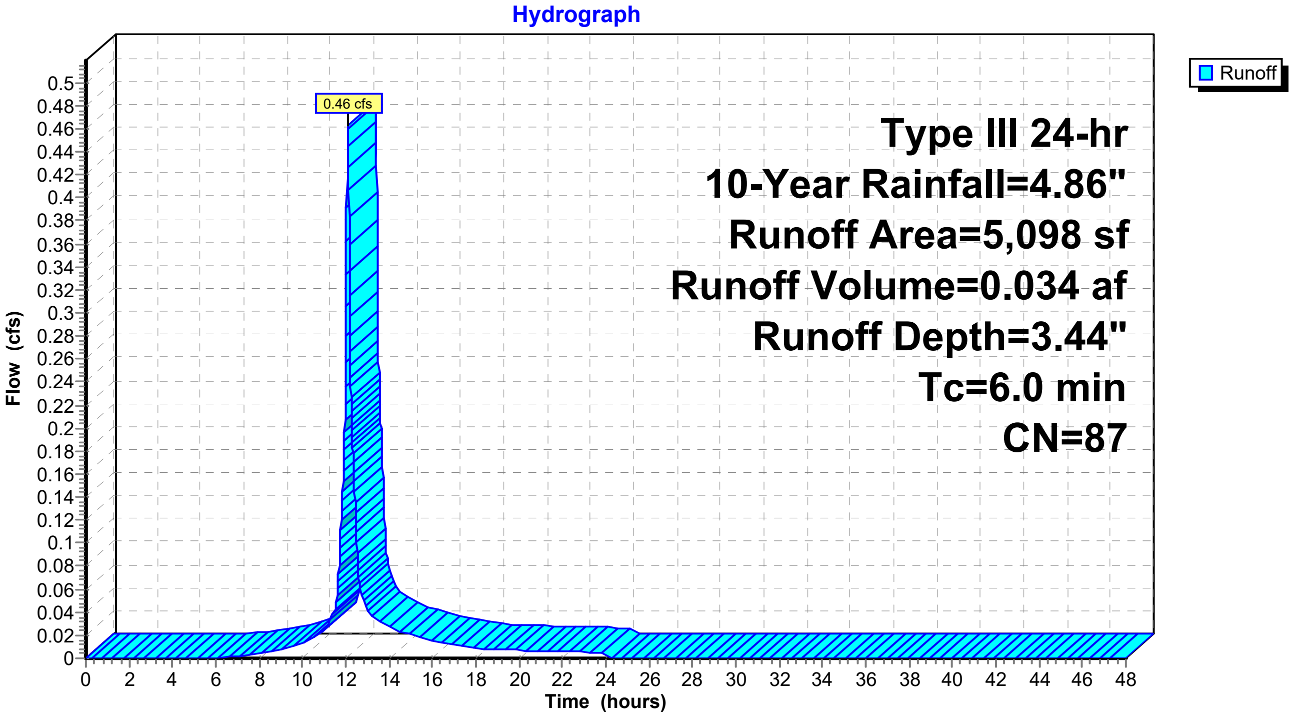
```
Runoff      =        0.46 cfs @   12.09 hrs,  Volume=          0.034 af,  Depth=  3.44"
    Routed to Pond C-1 : Rain Garden
```

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.86"

	Area (sf)	CN	Description
*	314	98	Pavement, HSG C
*	752	98	Sidewalk, HSG C
*	113	74	Plantings, HSG C
*	933	74	Plantings, HSG C (OFFSITE)
*	534	98	Sidewalk, HSG C (OFFSITE)
*	788	98	Pavement, HSG C (OFFSITE)
*	4	98	Wall, HSG C (OFFSITE)
*	72	98	Transformer, HSG C
*	1,206	74	Plantings, HSG C
*	236	96	Gravel, HSG C
*	146	98	Wall, HSG C
	5,098	87	Weighted Average
	2,488		48.80% Pervious Area
	2,610		51.20% Impervious Area

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

Subcatchment S-C: S-C



Summary for Subcatchment S-C-1: S-C-1

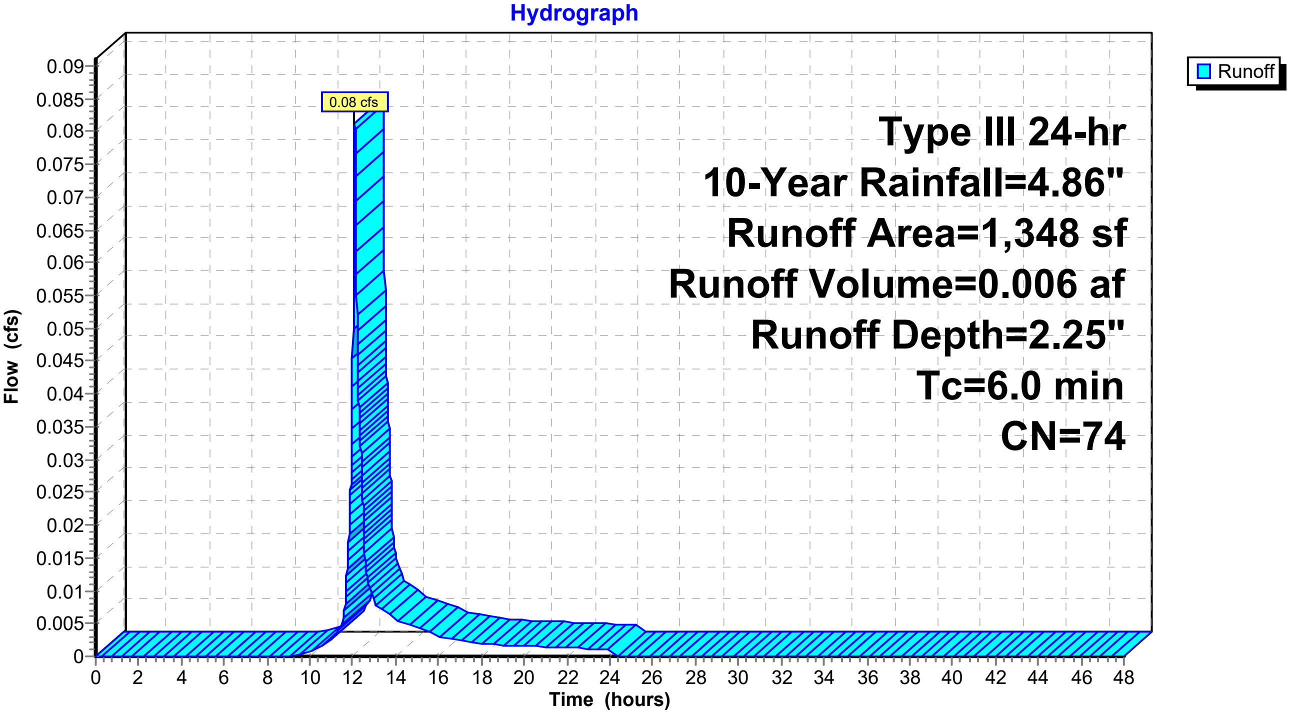
Runoff = 0.08 cfs @ 12.09 hrs, Volume= 0.006 af, Depth= 2.25"
Routed to Reach DP-C : Herring Brook

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.86"

	Area (sf)	CN	Description
*	1,348	74	Plantings, HSG C (OFFSITE)
	1,348		100.00% Pervious Area

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

Subcatchment S-C-1: S-C-1



Summary for Subcatchment S-C-2: S-C-2

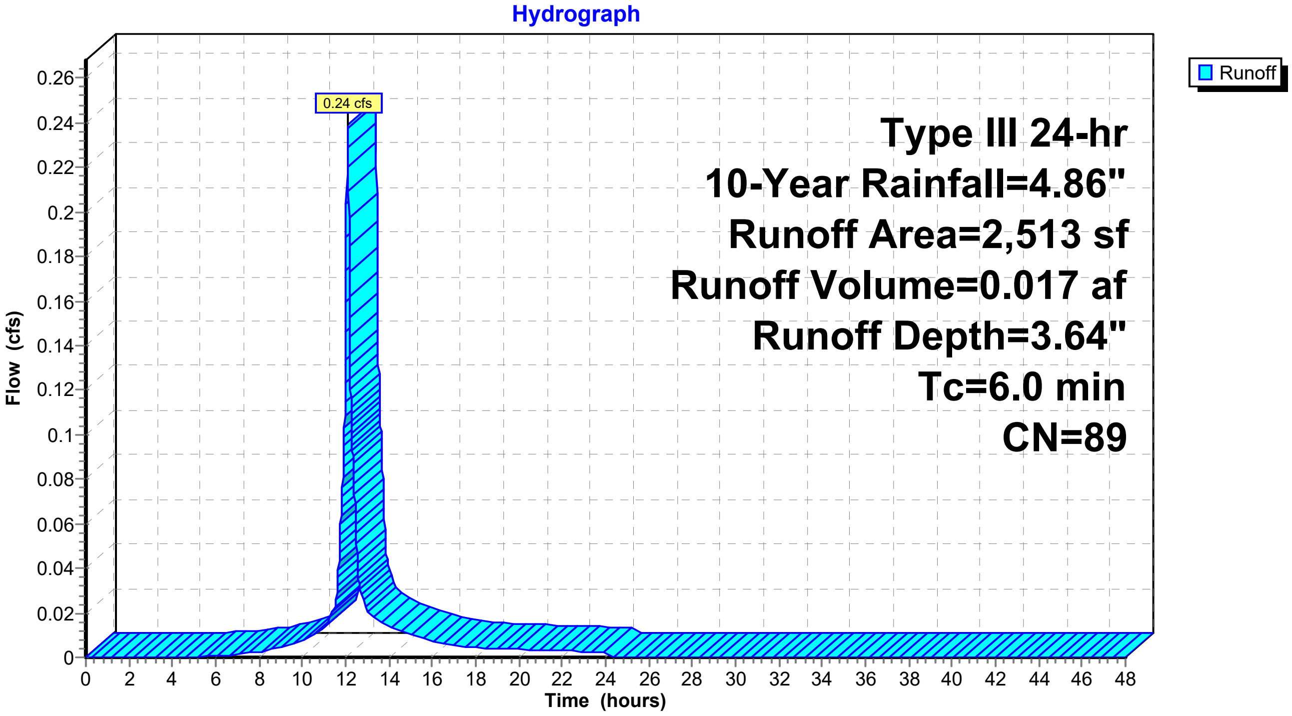
Runoff = 0.24 cfs @ 12.09 hrs, Volume= 0.017 af, Depth= 3.64"
Routed to Reach DP-C-1 : Broad Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.86"

	Area (sf)	CN	Description
*	1,472	98	Sidewalk, HSG C
*	934	74	Plantings, HSG C
*	81	98	Wall, HSG C
*	26	98	Sidewalk, HSG C (OFFSITE)
	2,513	89	Weighted Average
	934		37.17% Pervious Area
	1,579		62.83% Impervious Area

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

Subcatchment S-C-2: S-C-2

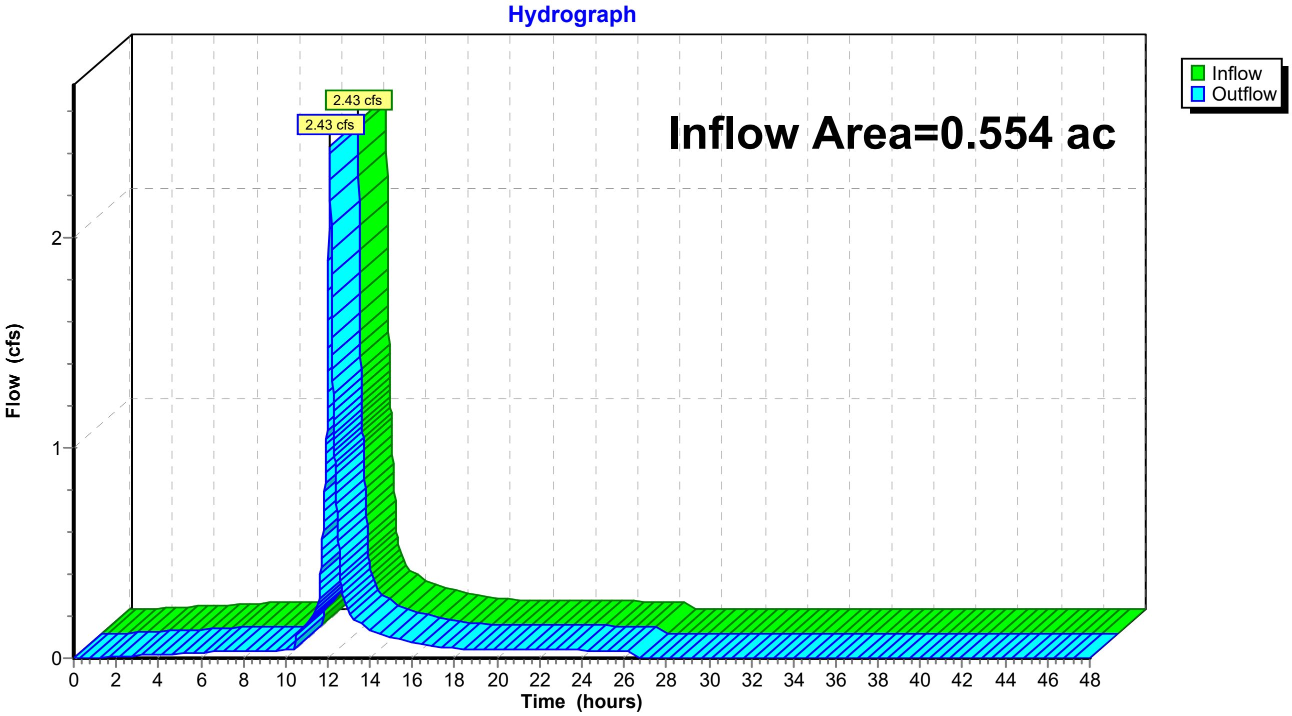


Summary for Reach DP-C: Herring Brook

Inflow Area =	0.554 ac,	84.09% Impervious,	Inflow Depth = 4.24"	for 10-Year event
Inflow =	2.43 cfs @	12.10 hrs, Volume=	0.196 af	
Outflow =	2.43 cfs @	12.10 hrs, Volume=	0.196 af, Atten= 0%, Lag= 0.0 min	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Reach DP-C: Herring Brook

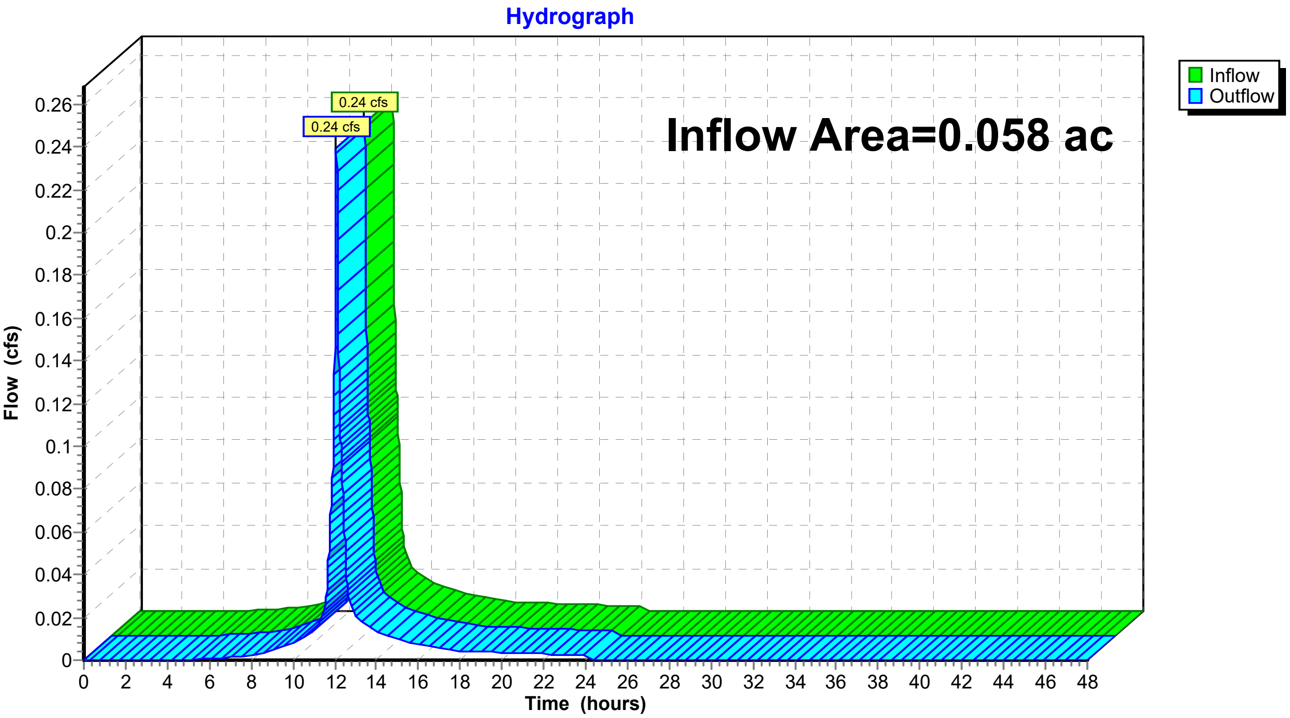


Summary for Reach DP-C-1: Broad Street

```
Inflow Area =       0.058 ac,  62.83% Impervious,  Inflow Depth =   3.64"    for  10-Year event
Inflow      =      0.24 cfs @   12.09 hrs,  Volume=           0.017 af
Outflow     =      0.24 cfs @   12.09 hrs,  Volume=           0.017 af,  Atten= 0%,  Lag= 0.0 min
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Reach DP-C-1: Broad Street



Summary for Pond C-1: Rain Garden

Inflow Area = 0.523 ac, 89.07% Impervious, Inflow Depth = 4.36" for 10-Year event
Inflow = 2.39 cfs @ 12.08 hrs, Volume= 0.190 af
Outflow = 2.35 cfs @ 12.10 hrs, Volume= 0.190 af, Atten= 2%, Lag= 0.9 min
Primary = 2.35 cfs @ 12.10 hrs, Volume= 0.190 af
Routed to Link 1L : Tailwater at Existing 30" Pipe
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach DP-C : Herring Brook

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 24.98' @ 12.10 hrs Surf.Area= 782 sf Storage= 650 cf

Plug-Flow detention time= 52.2 min calculated for 0.190 af (100% of inflow)
Center-of-Mass det. time= 52.2 min (810.2 - 758.0)

Volume	Invert	Avail.Storage	Storage Description
#1	24.00'	3,033 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

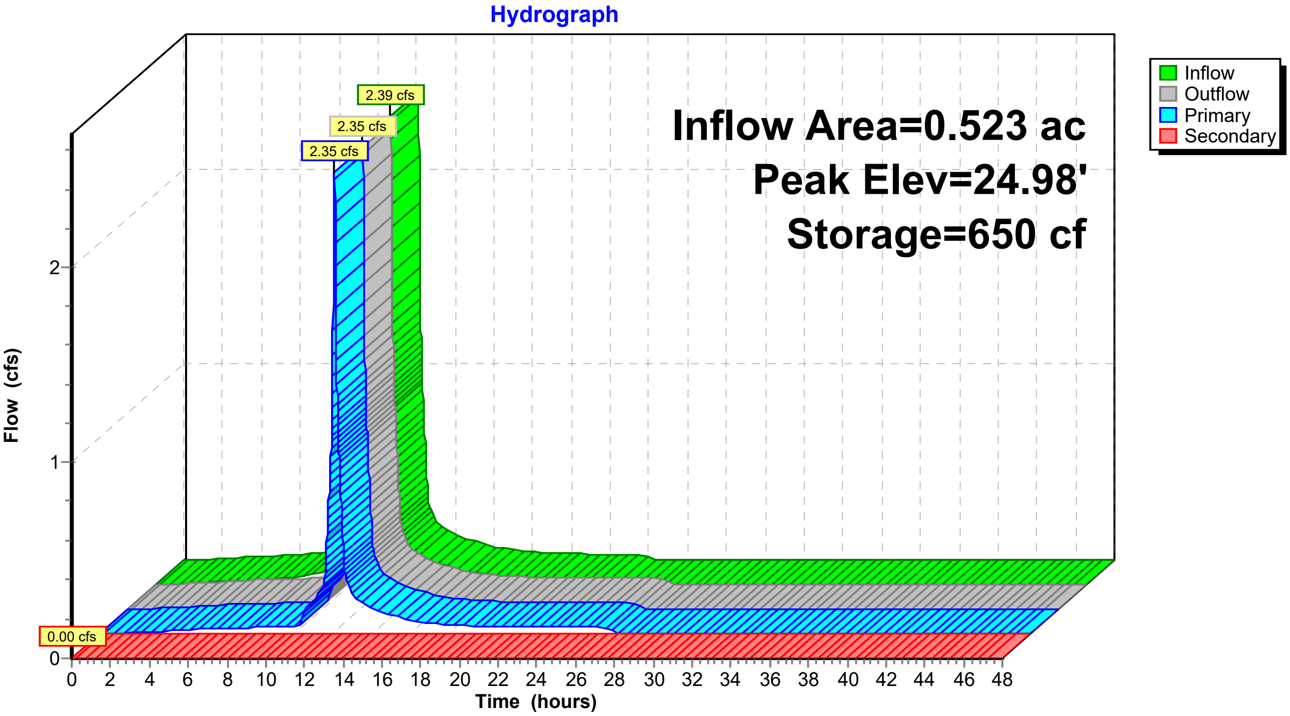
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
24.00	541	0	0
25.00	786	664	664
25.53	1,297	552	1,215
26.00	1,526	663	1,879
26.63	2,138	1,154	3,033

Device	Routing	Invert	Outlet Devices
#1	Primary	21.50'	**18.0" Round Culvert** L= 52.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 21.50' / 21.20' S= 0.0058 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	24.75'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	22.00'	**4.0" Round Culvert** L= 50.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 22.00' / 21.50' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.09 sf
#4	Device 3	24.00'	**2.410 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#5	Secondary	25.53'	**Asymmetrical Weir, C= 3.27** Offset (feet) 0.00 8.89 8.89 Elev. (feet) 26.50 25.53 26.50

Primary OutFlow Max=2.35 cfs @ 12.10 hrs HW=24.98' TW=22.63' (Dynamic Tailwater)
1=Culvert (Passes 2.35 cfs of 13.05 cfs potential flow)
2=Orifice/Grate (Weir Controls 2.31 cfs @ 1.58 fps)
3=Culvert (Passes 0.04 cfs of 0.37 cfs potential flow)
4=Exfiltration (Exfiltration Controls 0.04 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=24.00' TW=0.00' (Dynamic Tailwater)
5=Asymmetrical Weir (Controls 0.00 cfs)

Pond C-1: Rain Garden



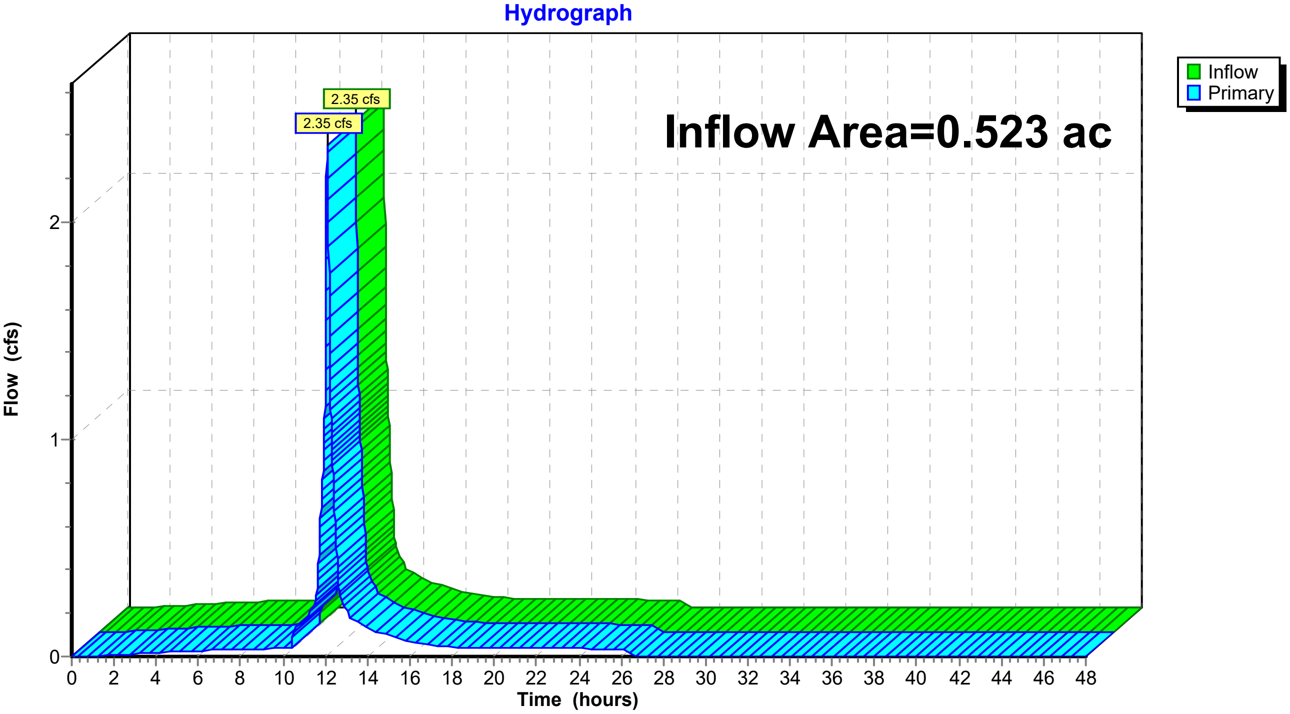
Summary for Link 1L: Tailwater at Existing 30" Pipe

Inflow Area = 0.523 ac, 89.07% Impervious, Inflow Depth = 4.36" for 10-Year event
Inflow = 2.35 cfs @ 12.10 hrs, Volume= 0.190 af
Primary = 2.35 cfs @ 12.10 hrs, Volume= 0.190 af, Atten= 0%, Lag= 0.0 min
Routed to Reach DP-C : Herring Brook

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

10-Year Fixed water surface Elevation= 22.63'

Link 1L: Tailwater at Existing 30" Pipe



```
                         Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
                         Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
            Reach routing by Dyn-Stor-Ind method  -  Pond routing by Dyn-Stor-Ind method

SubcatchmentR-C: ROOF                   Runoff Area=17,666 sf   100.00% Impervious   Runoff Depth=5.91"
                                                   Tc=6.0 min   CN=98   Runoff=2.44 cfs  0.200 af

SubcatchmentS-C: S-C                      Runoff Area=5,098 sf   51.20% Impervious   Runoff Depth=4.66"
                                                   Tc=6.0 min   CN=87   Runoff=0.62 cfs  0.045 af

SubcatchmentS-C-1: S-C-1                   Runoff Area=1,348 sf   0.00% Impervious   Runoff Depth=3.31"
                                                   Tc=6.0 min   CN=74   Runoff=0.12 cfs  0.009 af

SubcatchmentS-C-2: S-C-2                  Runoff Area=2,513 sf   62.83% Impervious   Runoff Depth=4.88"
                                                   Tc=6.0 min   CN=89   Runoff=0.32 cfs  0.023 af

Reach DP-C: Herring Brook                                                  Inflow=3.14 cfs  0.254 af
                                                                          Outflow=3.14 cfs  0.254 af

Reach DP-C-1: Broad Street                                                 Inflow=0.32 cfs  0.023 af
                                                                          Outflow=0.32 cfs  0.023 af

Pond C-1: Rain Garden                       Peak Elev=25.03'  Storage=684 cf   Inflow=3.07 cfs  0.245 af
                      Primary=3.02 cfs  0.245 af   Secondary=0.00 cfs  0.000 af   Outflow=3.02 cfs  0.245 af

Link 1L: Tailwater at Existing 30" Pipe                                    Inflow=3.02 cfs  0.245 af
                                                                          Primary=3.02 cfs  0.245 af

             Total Runoff Area = 0.611 ac   Runoff Volume = 0.277 af   Average Runoff Depth = 5.44"
                                         17.92% Pervious = 0.110 ac     82.08% Impervious = 0.502 ac
```

Summary for Subcatchment R-C: ROOF

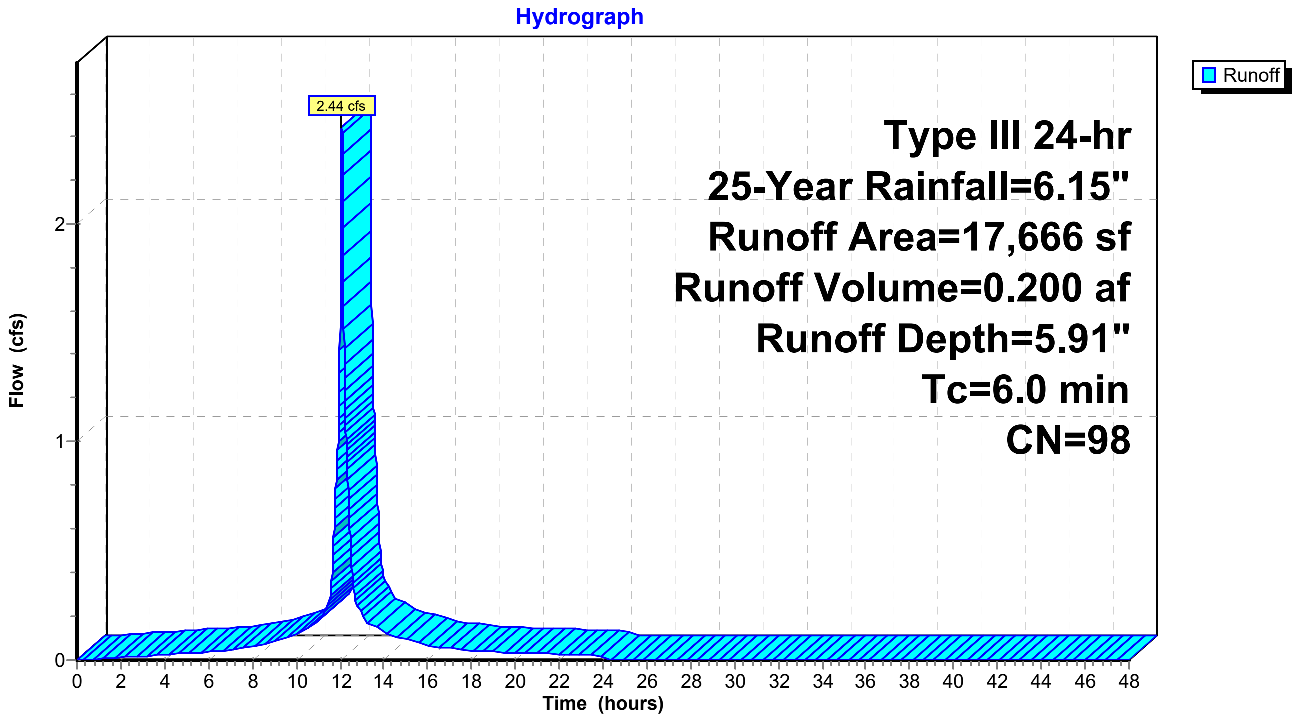
Runoff = 2.44 cfs @ 12.08 hrs, Volume= 0.200 af, Depth= 5.91"
Routed to Pond C-1 : Rain Garden

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.15"

Area (sf)	CN	Description
17,666	98	Roofs, HSG C
17,666		100.00% Impervious Area

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

Subcatchment R-C: ROOF



Summary for Subcatchment S-C: S-C

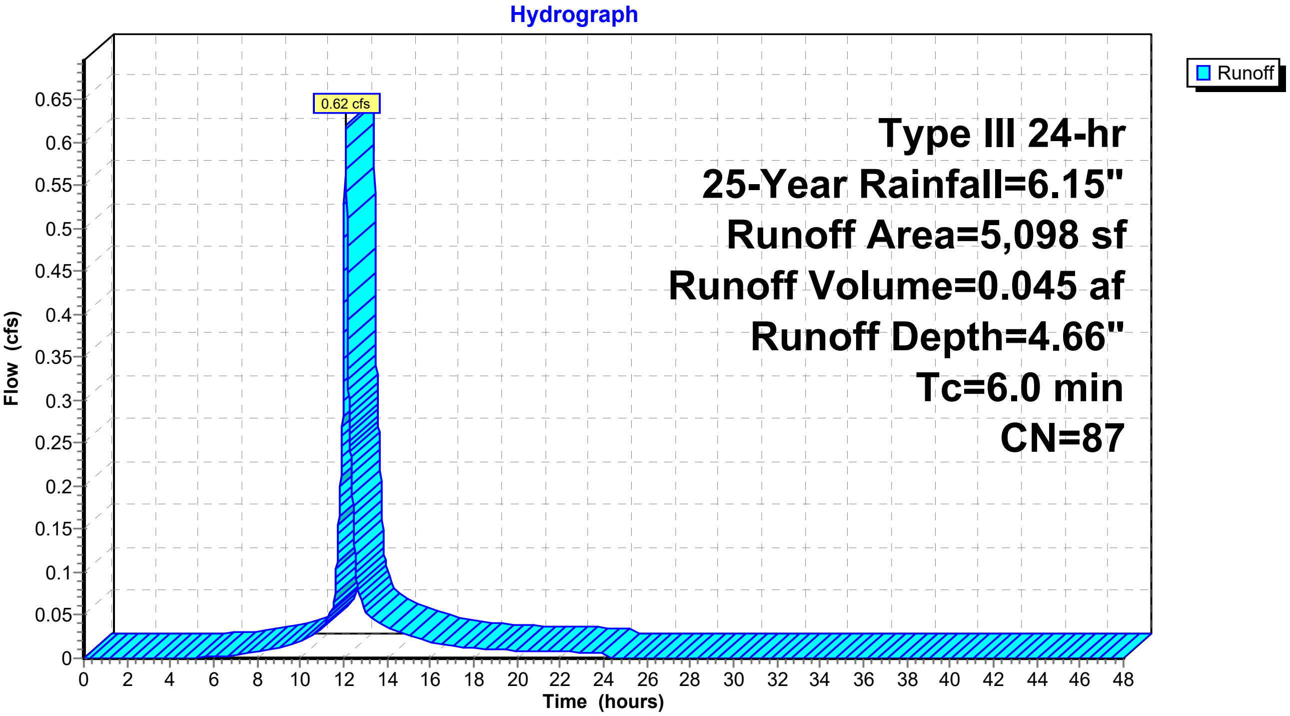
Runoff = 0.62 cfs @ 12.09 hrs, Volume= 0.045 af, Depth= 4.66"
Routed to Pond C-1 : Rain Garden

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.15"

	Area (sf)	CN	Description
*	314	98	Pavement, HSG C
*	752	98	Sidewalk, HSG C
*	113	74	Plantings, HSG C
*	933	74	Plantings, HSG C (OFFSITE)
*	534	98	Sidewalk, HSG C (OFFSITE)
*	788	98	Pavement, HSG C (OFFSITE)
*	4	98	Wall, HSG C (OFFSITE)
*	72	98	Transformer, HSG C
*	1,206	74	Plantings, HSG C
*	236	96	Gravel, HSG C
*	146	98	Wall, HSG C
	5,098	87	Weighted Average
	2,488		48.80% Pervious Area
	2,610		51.20% Impervious Area

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

Subcatchment S-C: S-C



Summary for Subcatchment S-C-1: S-C-1

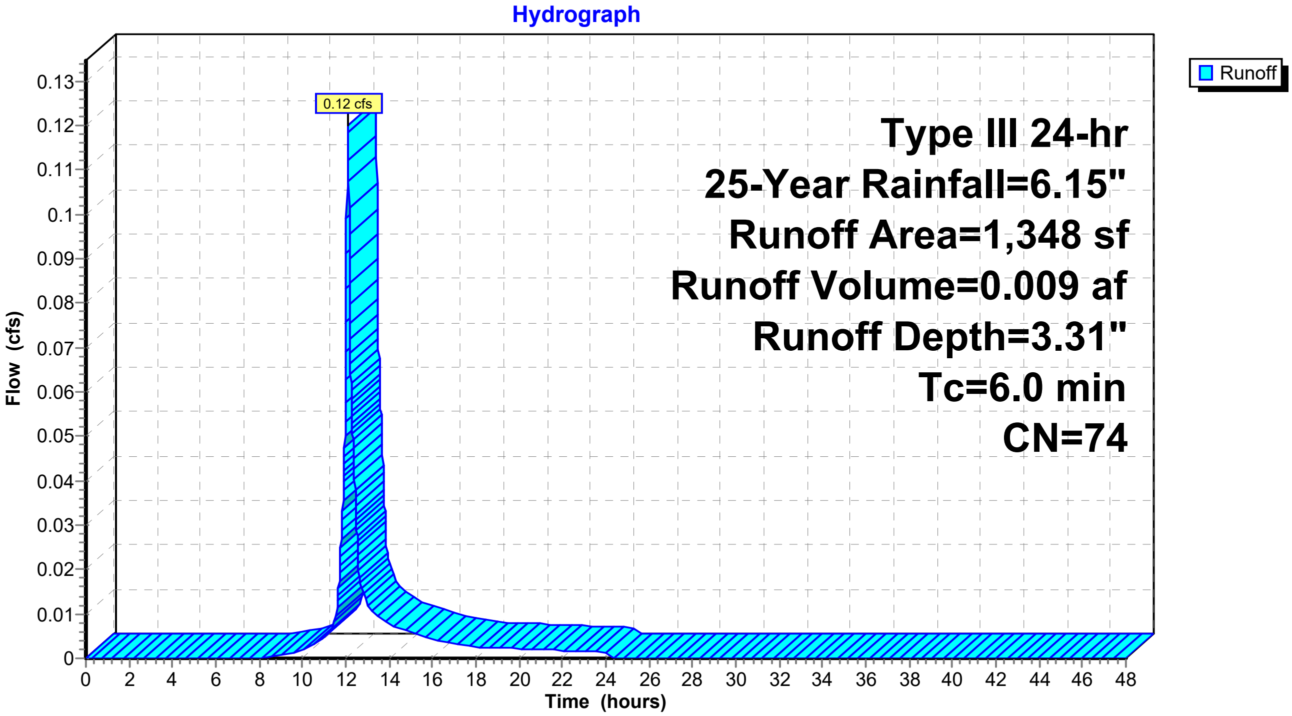
Runoff = 0.12 cfs @ 12.09 hrs, Volume= 0.009 af, Depth= 3.31"
Routed to Reach DP-C : Herring Brook

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.15"

	Area (sf)	CN	Description
*	1,348	74	Plantings, HSG C (OFFSITE)
	1,348		100.00% Pervious Area

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

Subcatchment S-C-1: S-C-1



Summary for Subcatchment S-C-2: S-C-2

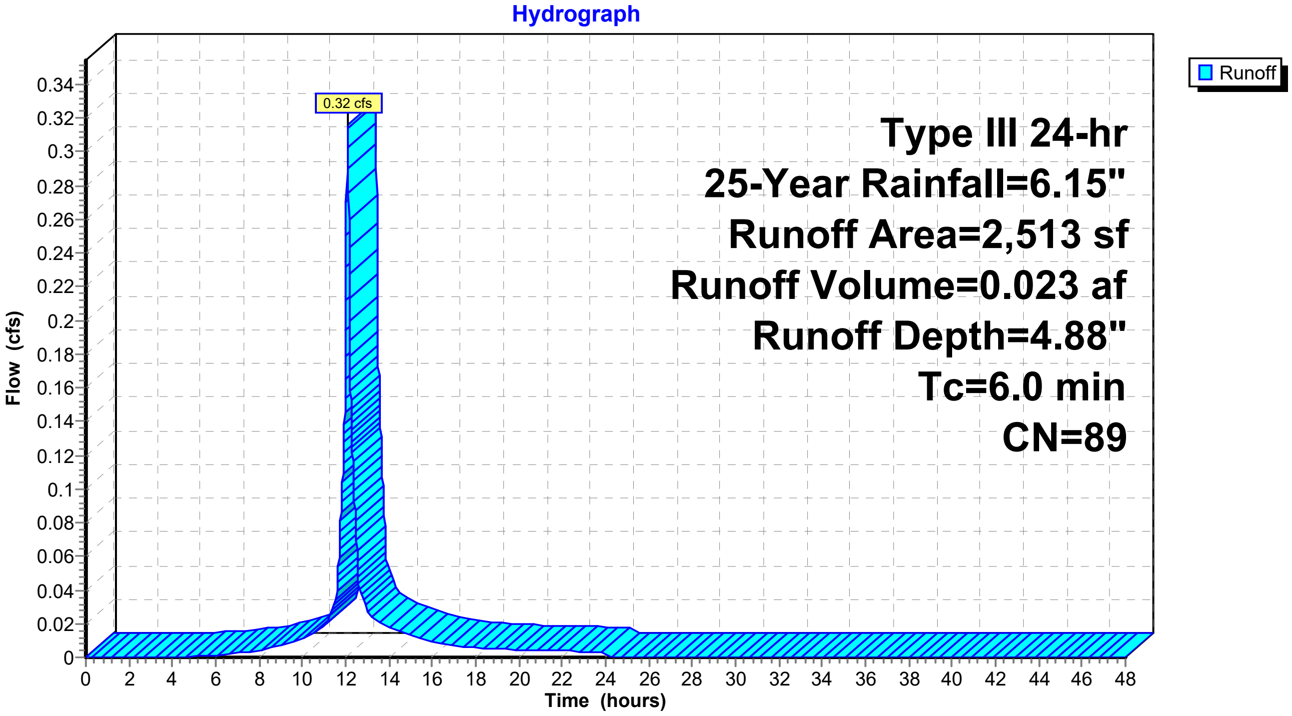
Runoff = 0.32 cfs @ 12.08 hrs, Volume= 0.023 af, Depth= 4.88"
Routed to Reach DP-C-1 : Broad Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.15"

	Area (sf)	CN	Description
*	1,472	98	Sidewalk, HSG C
*	934	74	Plantings, HSG C
*	81	98	Wall, HSG C
*	26	98	Sidewalk, HSG C (OFFSITE)
	2,513	89	Weighted Average
	934		37.17% Pervious Area
	1,579		62.83% Impervious Area

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

Subcatchment S-C-2: S-C-2

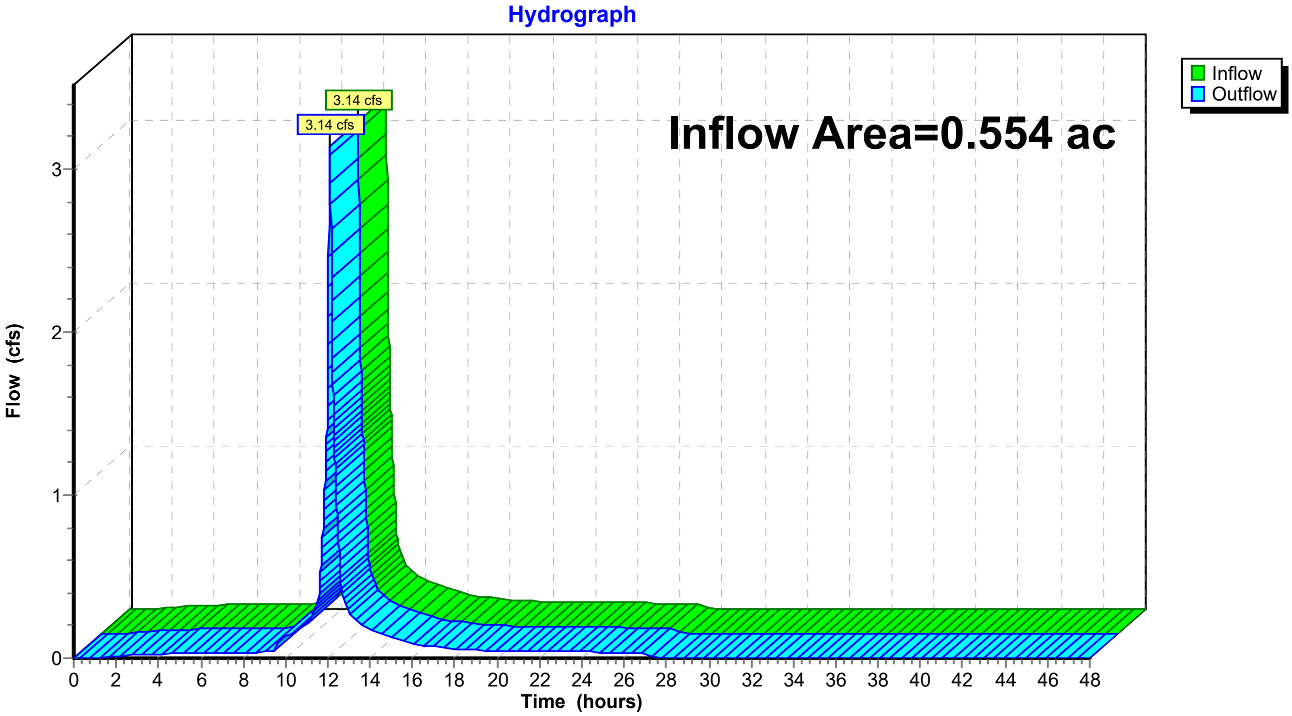


Summary for Reach DP-C: Herring Brook

Inflow Area =	0.554 ac, 84.09% Impervious, Inflow Depth = 5.50" for 25-Year event			
Inflow =	3.14 cfs @	12.10 hrs, Volume=	0.254 af	
Outflow =	3.14 cfs @	12.10 hrs, Volume=	0.254 af,	Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Reach DP-C: Herring Brook

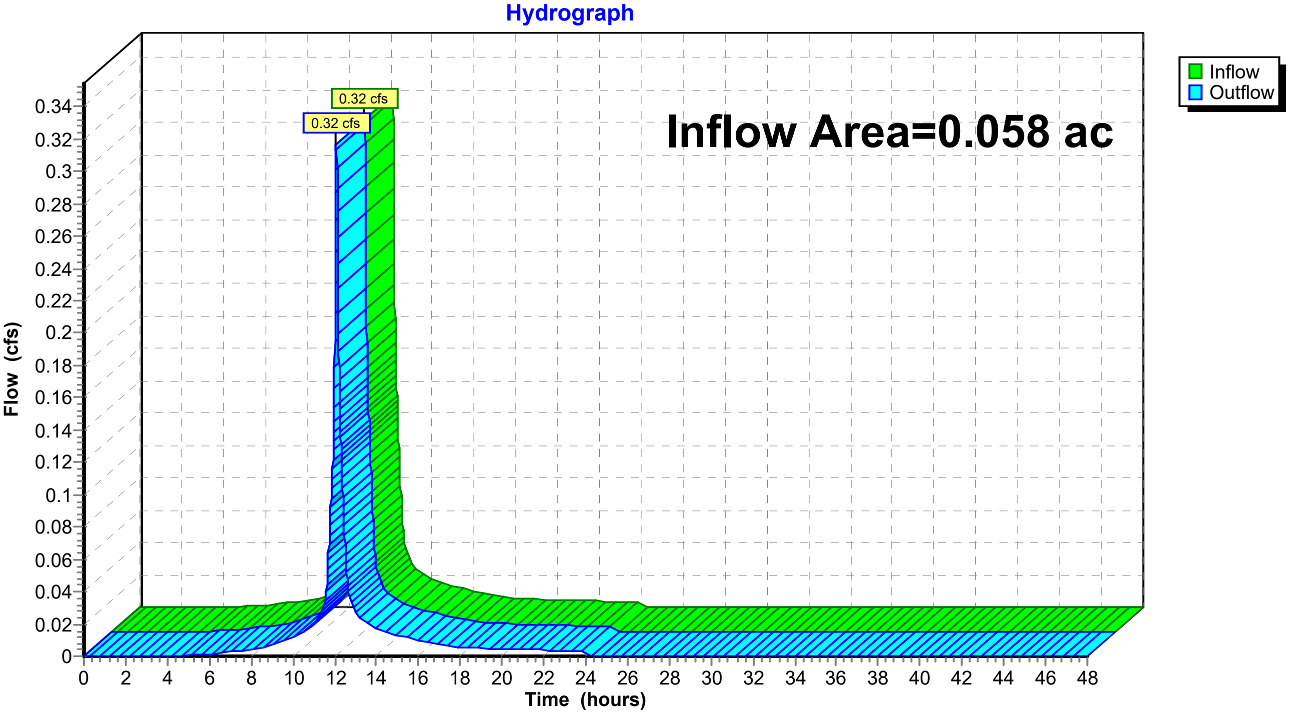


Summary for Reach DP-C-1: Broad Street

Inflow Area =	0.058 ac, 62.83% Impervious,	Inflow Depth = 4.88"	for 25-Year event	
Inflow =	0.32 cfs @	12.08 hrs, Volume=	0.023 af	
Outflow =	0.32 cfs @	12.08 hrs, Volume=	0.023 af,	Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Reach DP-C-1: Broad Street



Summary for Pond C-1: Rain Garden

```
Inflow Area =       0.523 ac, 89.07% Impervious, Inflow Depth =  5.63"   for 25-Year event
Inflow      =      3.07 cfs @  12.08 hrs, Volume=          0.245 af
Outflow     =      3.02 cfs @  12.10 hrs, Volume=          0.245 af, Atten= 1%, Lag= 0.8 min
Primary     =      3.02 cfs @  12.10 hrs, Volume=          0.245 af
    Routed to Link 1L : Tailwater at Existing 30" Pipe
Secondary =        0.00 cfs @   0.00 hrs, Volume=          0.000 af
    Routed to Reach DP-C : Herring Brook

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 25.03' @ 12.10 hrs   Surf.Area= 811 sf   Storage= 684 cf

Plug-Flow detention time= 46.6 min calculated for 0.245 af (100% of inflow)
Center-of-Mass det. time= 46.6 min ( 800.5 - 753.9 )

Volume      Invert    Avail.Storage   Storage Description
   #1       24.00'         3,033 cf   Custom Stage Data (Prismatic)Listed below (Recalc)

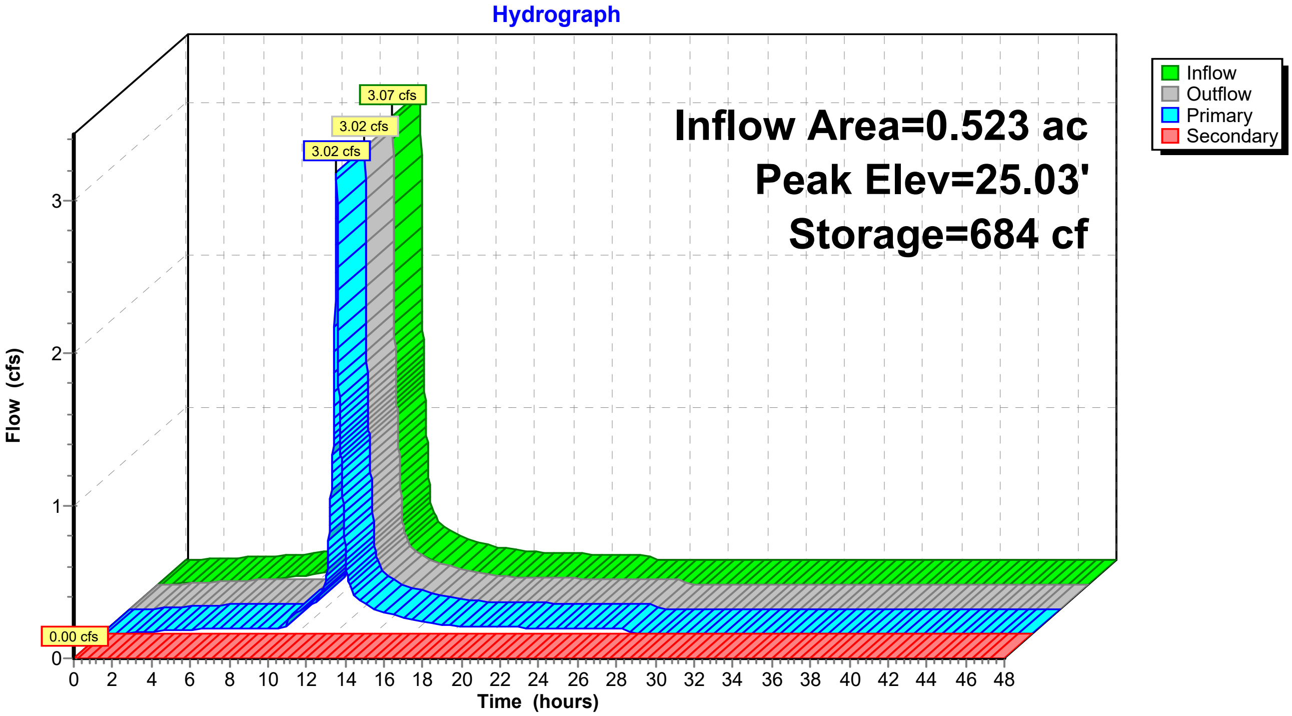
 Elevation        Surf.Area       Inc.Store       Cum.Store
    (feet)          (sq-ft)    (cubic-feet)    (cubic-feet)
     24.00              541               0               0
     25.00              786             664             664
     25.53            1,297             552           1,215
     26.00            1,526             663           1,879
     26.63            2,138           1,154           3,033

Device  Routing          Invert   Outlet Devices
   #1   Primary          21.50'   18.0"  Round Culvert
                                  L= 52.0'   CPP, square edge headwall,  Ke= 0.500
                                  Inlet / Outlet Invert= 21.50' / 21.20'   S= 0.0058 '/'   Cc= 0.900
                                  n= 0.013  Corrugated PE, smooth interior,  Flow Area= 1.77 sf
   #2   Device 1         24.75'   24.0" Horiz. Orifice/Grate   C= 0.600
                                  Limited to weir flow at low heads
   #3   Device 1         22.00'   4.0"  Round Culvert
                                  L= 50.0'   CPP, square edge headwall,  Ke= 0.500
                                  Inlet / Outlet Invert= 22.00' / 21.50'   S= 0.0100 '/'   Cc= 0.900
                                  n= 0.013  Corrugated PE, smooth interior,  Flow Area= 0.09 sf
   #4   Device 3         24.00'   2.410 in/hr Exfiltration over Surface area   Phase-In= 0.01'
   #5   Secondary        25.53'   Asymmetrical Weir, C= 3.27
                                  Offset (feet)  0.00  8.89  8.89
                                  Elev.  (feet)  26.50  25.53  26.50

Primary OutFlow Max=3.02 cfs @ 12.10 hrs  HW=25.03'  TW=22.63'   (Dynamic Tailwater)
└─1=Culvert  (Passes 3.02 cfs of 13.17 cfs potential flow)
    ├─2=Orifice/Grate  (Weir Controls 2.97 cfs @ 1.72 fps)
    └─3=Culvert  (Passes 0.05 cfs of 0.38 cfs potential flow)
        └─4=Exfiltration  (Exfiltration Controls 0.05 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs  HW=24.00'  TW=0.00'   (Dynamic Tailwater)
└─5=Asymmetrical Weir ( Controls 0.00 cfs)
```

Pond C-1: Rain Garden



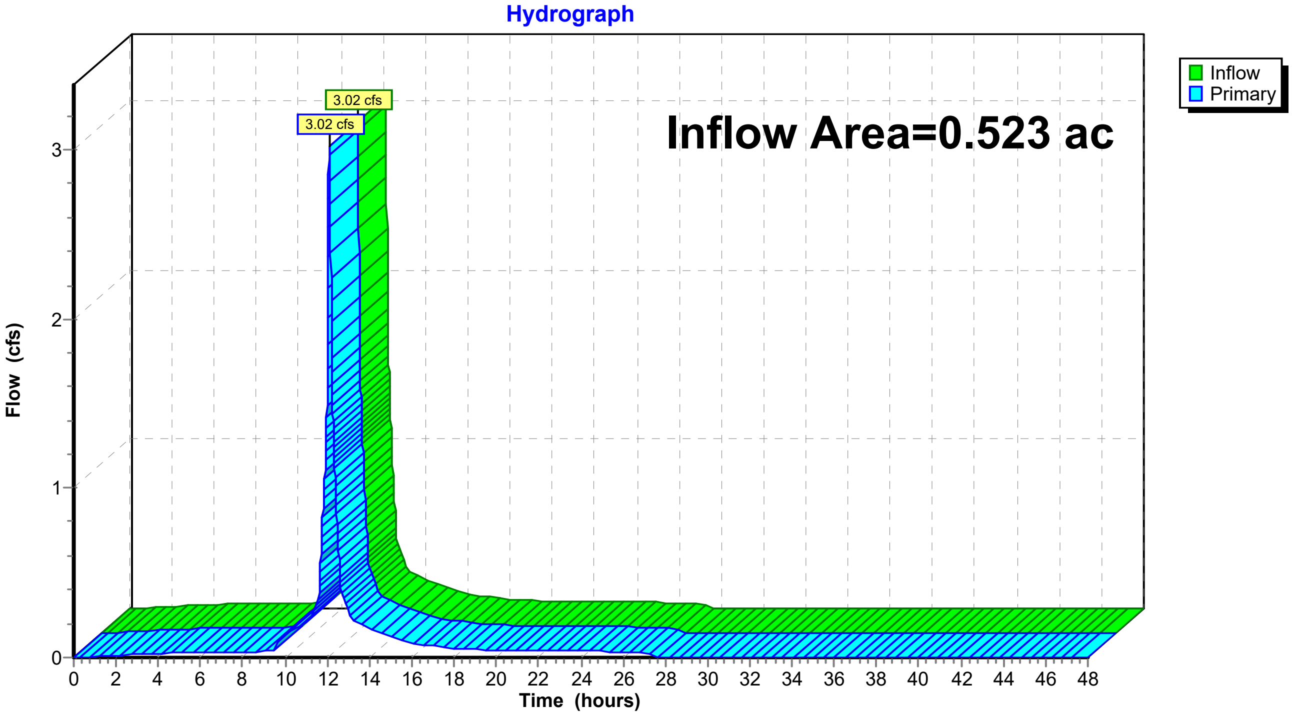
Summary for Link 1L: Tailwater at Existing 30" Pipe

Inflow Area = 0.523 ac, 89.07% Impervious, Inflow Depth = 5.63" for 25-Year event
Inflow = 3.02 cfs @ 12.10 hrs, Volume= 0.245 af
Primary = 3.02 cfs @ 12.10 hrs, Volume= 0.245 af, Atten= 0%, Lag= 0.0 min
Routed to Reach DP-C : Herring Brook

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

25-Year Fixed water surface Elevation= 22.63'

Link 1L: Tailwater at Existing 30" Pipe



Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentR-C: ROOF Runoff Area=17,666 sf 100.00% Impervious Runoff Depth=8.56"
Tc=6.0 min CN=98 Runoff=3.51 cfs 0.289 af

SubcatchmentS-C: S-C Runoff Area=5,098 sf 51.20% Impervious Runoff Depth=7.23"
Tc=6.0 min CN=87 Runoff=0.94 cfs 0.071 af

SubcatchmentS-C-1: S-C-1 Runoff Area=1,348 sf 0.00% Impervious Runoff Depth=5.65"
Tc=6.0 min CN=74 Runoff=0.20 cfs 0.015 af

SubcatchmentS-C-2: S-C-2 Runoff Area=2,513 sf 62.83% Impervious Runoff Depth=7.47"
Tc=6.0 min CN=89 Runoff=0.47 cfs 0.036 af

Reach DP-C: Herring Brook Inflow=4.39 cfs 0.346 af
Outflow=4.39 cfs 0.346 af

Reach DP-C-1: Broad Street Inflow=0.47 cfs 0.036 af
Outflow=0.47 cfs 0.036 af

Pond C-1: Rain Garden Peak Elev=26.19' Storage=2,181 cf Inflow=4.45 cfs 0.360 af
Primary=0.00 cfs 0.000 af Secondary=4.19 cfs 0.332 af Outflow=4.19 cfs 0.332 af

Link 1L: Tailwater at Existing 30" Pipe Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Total Runoff Area = 0.611 ac Runoff Volume = 0.410 af Average Runoff Depth = 8.06"
17.92% Pervious = 0.110 ac 82.08% Impervious = 0.502 ac

Summary for Subcatchment R-C: ROOF

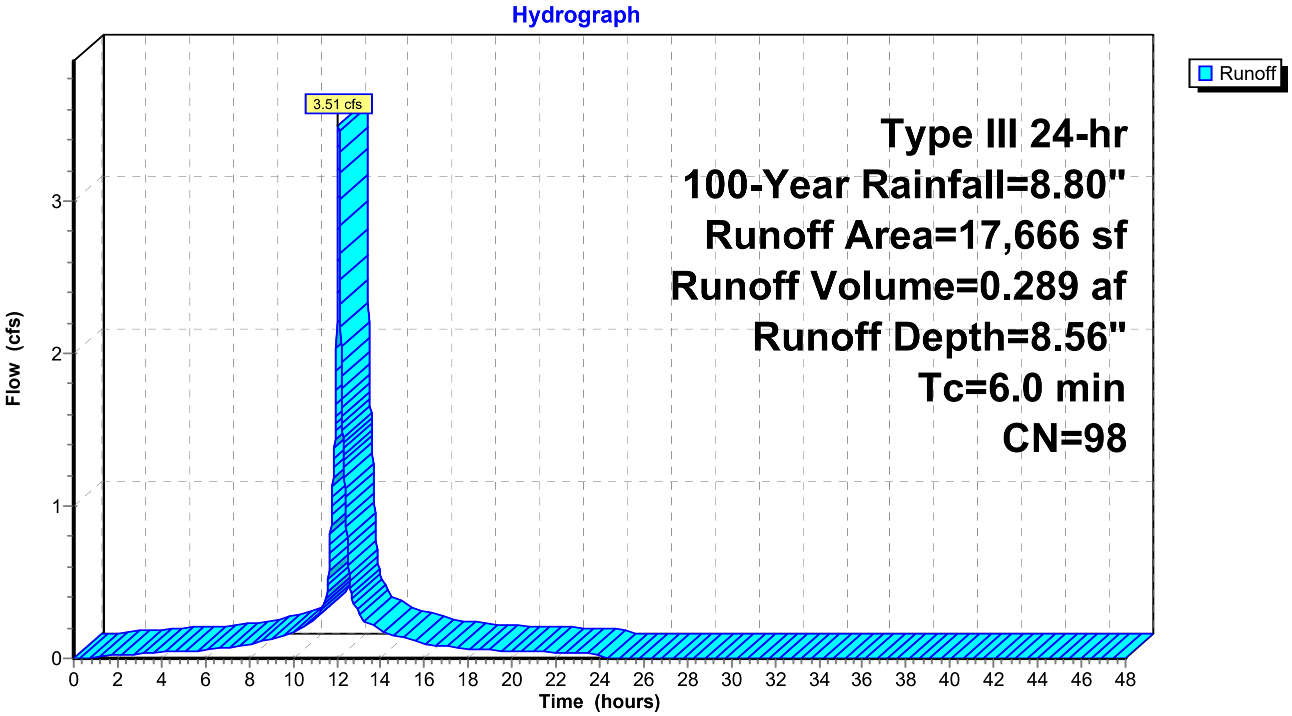
Runoff = 3.51 cfs @ 12.08 hrs, Volume= 0.289 af, Depth= 8.56"
Routed to Pond C-1 : Rain Garden

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.80"

Area (sf)	CN	Description
17,666	98	Roofs, HSG C
17,666		100.00% Impervious Area

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

Subcatchment R-C: ROOF



Summary for Subcatchment S-C: S-C

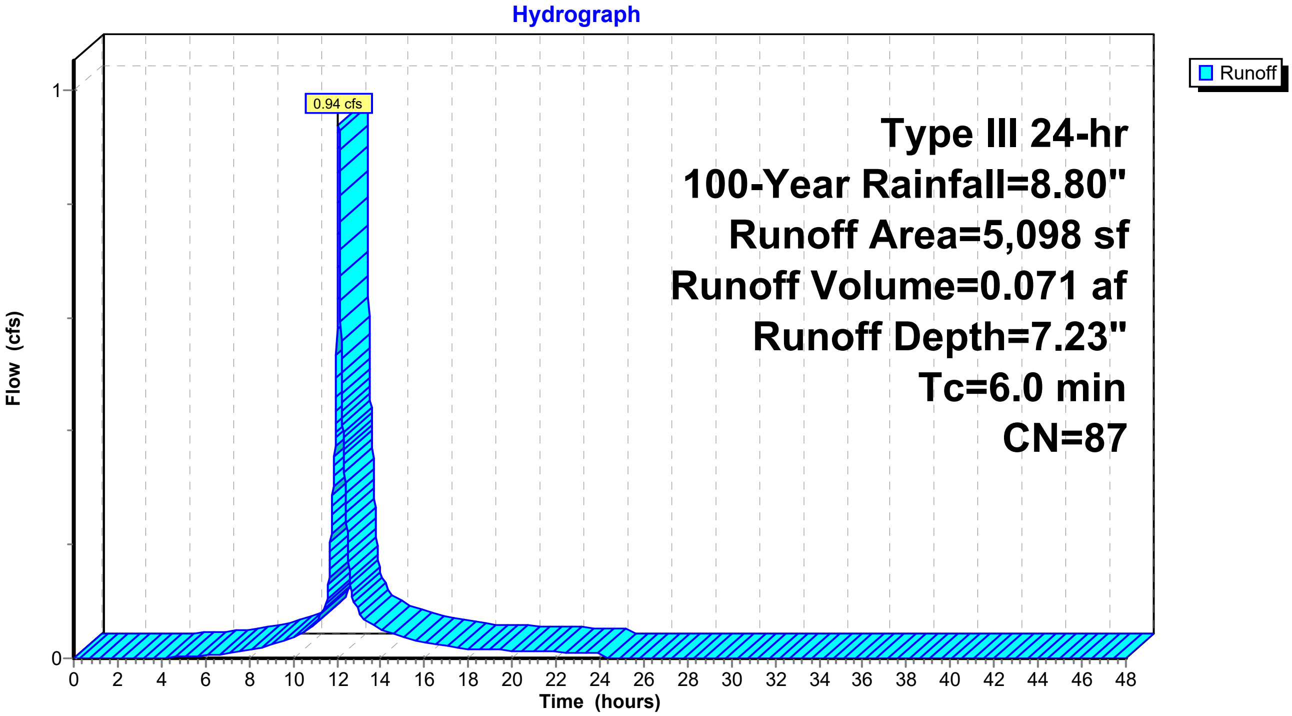
Runoff = 0.94 cfs @ 12.08 hrs, Volume= 0.071 af, Depth= 7.23"
Routed to Pond C-1 : Rain Garden

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.80"

	Area (sf)	CN	Description
*	314	98	Pavement, HSG C
*	752	98	Sidewalk, HSG C
*	113	74	Plantings, HSG C
*	933	74	Plantings, HSG C (OFFSITE)
*	534	98	Sidewalk, HSG C (OFFSITE)
*	788	98	Pavement, HSG C (OFFSITE)
*	4	98	Wall, HSG C (OFFSITE)
*	72	98	Transformer, HSG C
*	1,206	74	Plantings, HSG C
*	236	96	Gravel, HSG C
*	146	98	Wall, HSG C
	5,098	87	Weighted Average
	2,488		48.80% Pervious Area
	2,610		51.20% Impervious Area

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

Subcatchment S-C: S-C



Summary for Subcatchment S-C-1: S-C-1

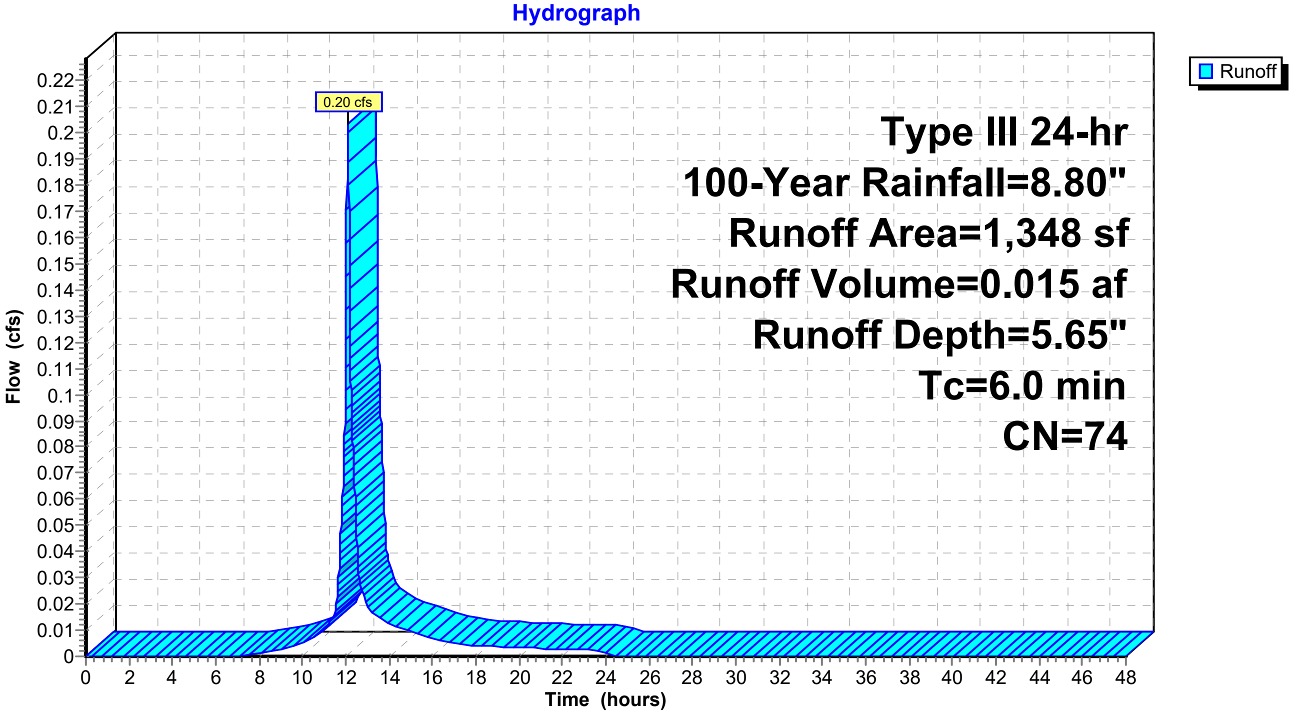
Runoff = 0.20 cfs @ 12.09 hrs, Volume= 0.015 af, Depth= 5.65"
Routed to Reach DP-C : Herring Brook

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.80"

	Area (sf)	CN	Description
*	1,348	74	Plantings, HSG C (OFFSITE)
	1,348		100.00% Pervious Area

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

Subcatchment S-C-1: S-C-1



Summary for Subcatchment S-C-2: S-C-2

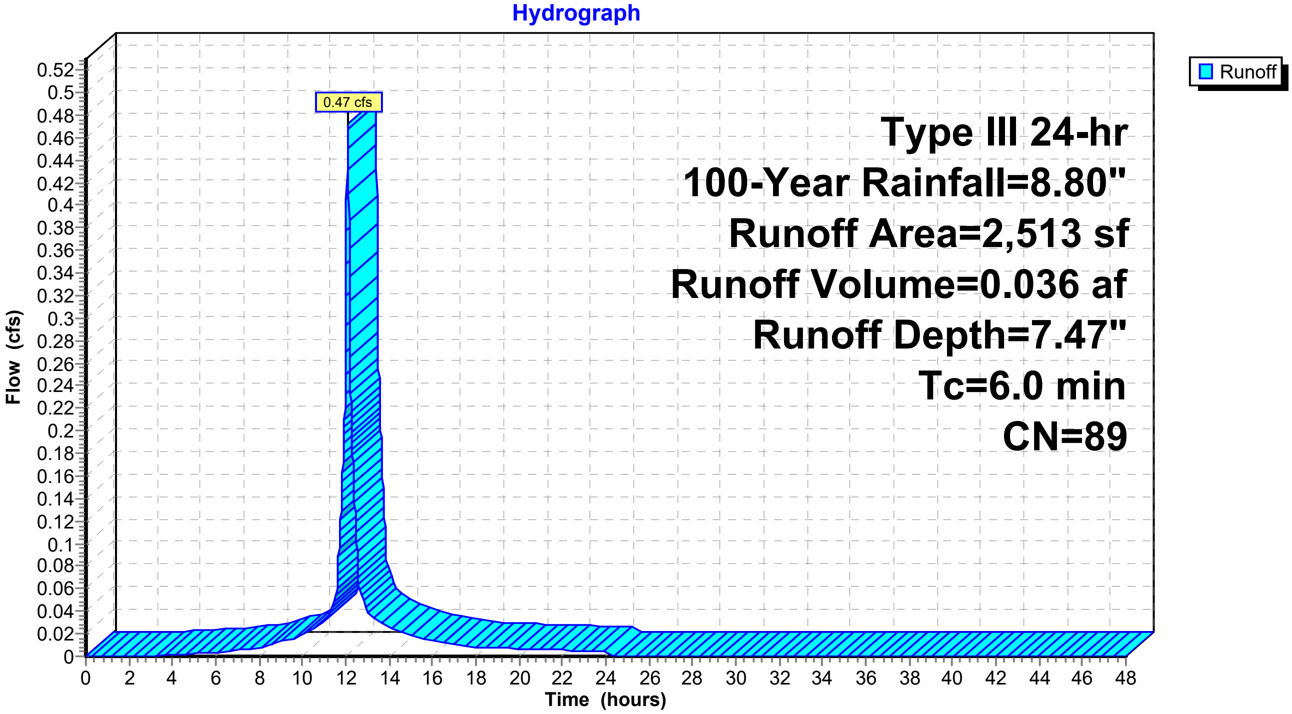
Runoff = 0.47 cfs @ 12.08 hrs, Volume= 0.036 af, Depth= 7.47"
Routed to Reach DP-C-1 : Broad Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.80"

	Area (sf)	CN	Description
*	1,472	98	Sidewalk, HSG C
*	934	74	Plantings, HSG C
*	81	98	Wall, HSG C
*	26	98	Sidewalk, HSG C (OFFSITE)
	2,513	89	Weighted Average
	934		37.17% Pervious Area
	1,579		62.83% Impervious Area

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

Subcatchment S-C-2: S-C-2

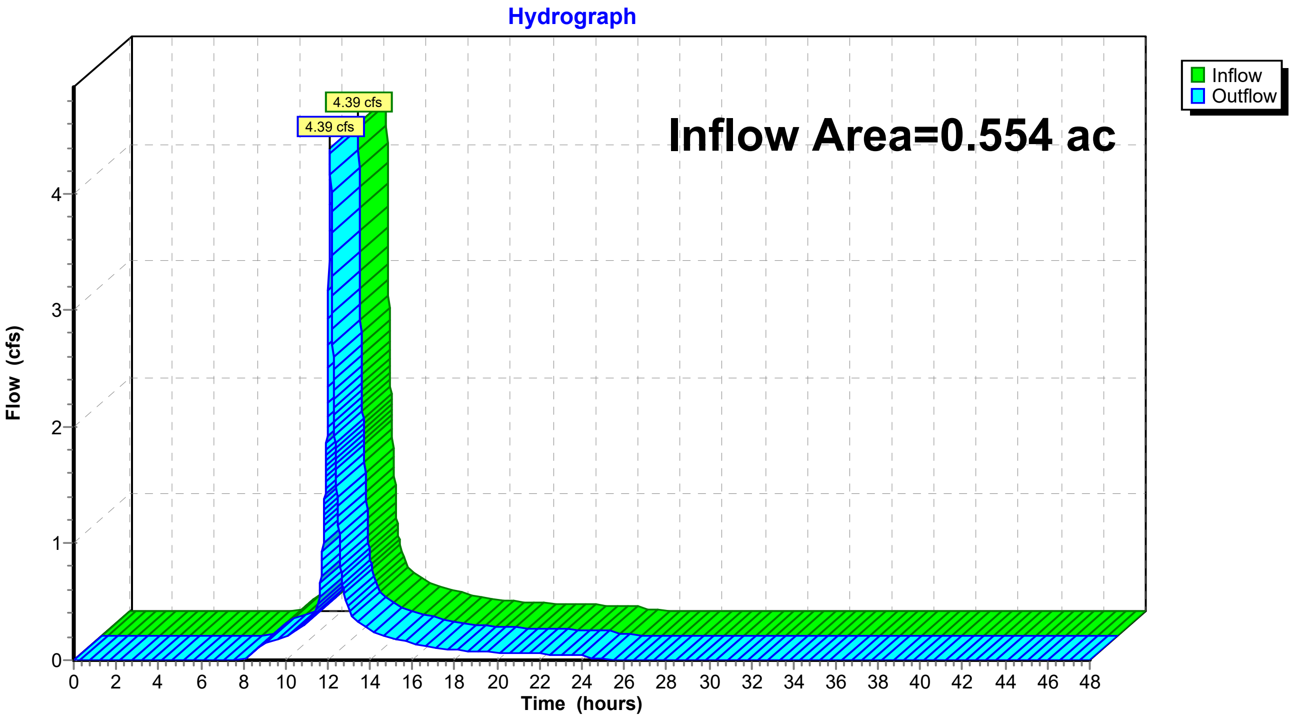


Summary for Reach DP-C: Herring Brook

```
Inflow Area =         0.554 ac, 84.09% Impervious, Inflow Depth =  7.51"   for 100-Year event
Inflow      =        4.39 cfs @  12.11 hrs, Volume=           0.346 af
Outflow     =        4.39 cfs @  12.11 hrs, Volume=           0.346 af, Atten= 0%, Lag= 0.0 min
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Reach DP-C: Herring Brook

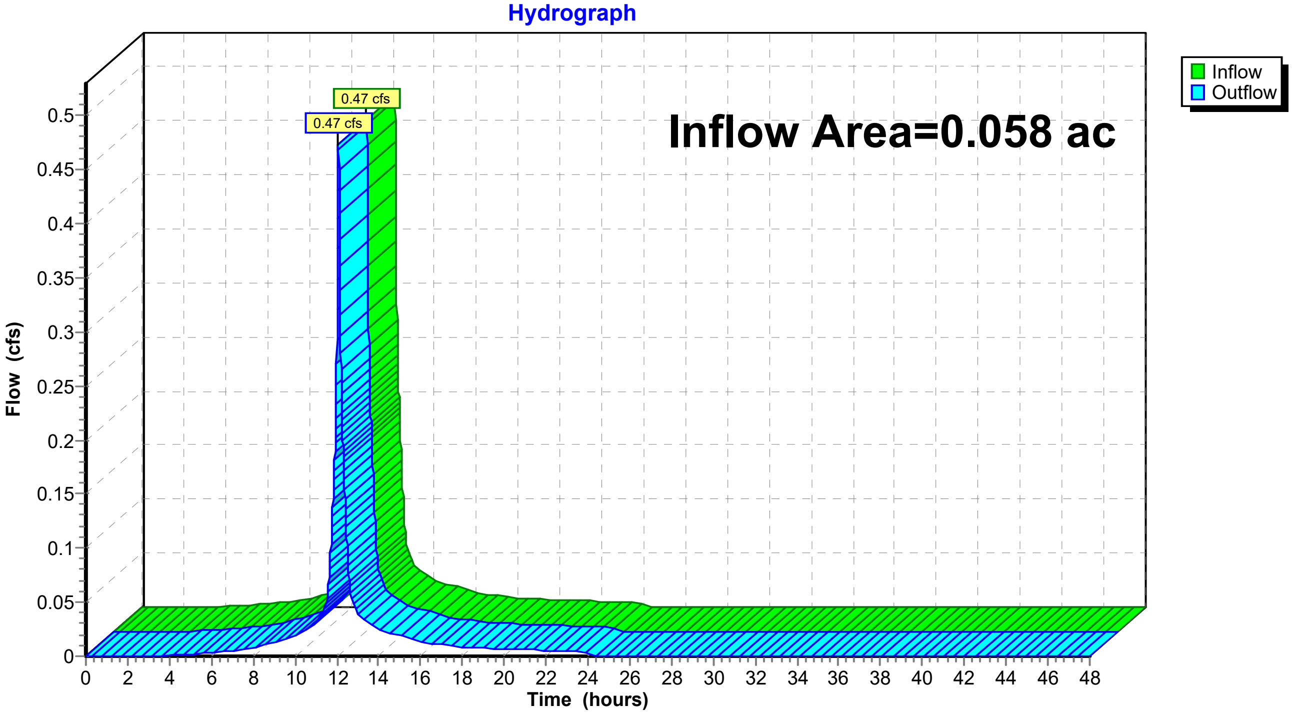


Summary for Reach DP-C-1: Broad Street

Inflow Area = 0.058 ac, 62.83% Impervious, Inflow Depth = 7.47" for 100-Year event
Inflow = 0.47 cfs @ 12.08 hrs, Volume= 0.036 af
Outflow = 0.47 cfs @ 12.08 hrs, Volume= 0.036 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Reach DP-C-1: Broad Street



Summary for Pond C-1: Rain Garden

Inflow Area = 0.523 ac, 89.07% Impervious, Inflow Depth = 8.26" for 100-Year event
Inflow = 4.45 cfs @ 12.08 hrs, Volume= 0.360 af
Outflow = 4.19 cfs @ 12.11 hrs, Volume= 0.332 af, Atten= 6%, Lag= 1.7 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 1L : Tailwater at Existing 30" Pipe
Secondary = 4.19 cfs @ 12.11 hrs, Volume= 0.332 af
Routed to Reach DP-C : Herring Brook

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 26.19' @ 12.11 hrs Surf.Area= 1,708 sf Storage= 2,181 cf

Plug-Flow detention time= 94.4 min calculated for 0.332 af (92% of inflow)
Center-of-Mass det. time= 52.5 min (800.7 - 748.3)

Volume	Invert	Avail.Storage	Storage Description
#1	24.00'	3,033 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

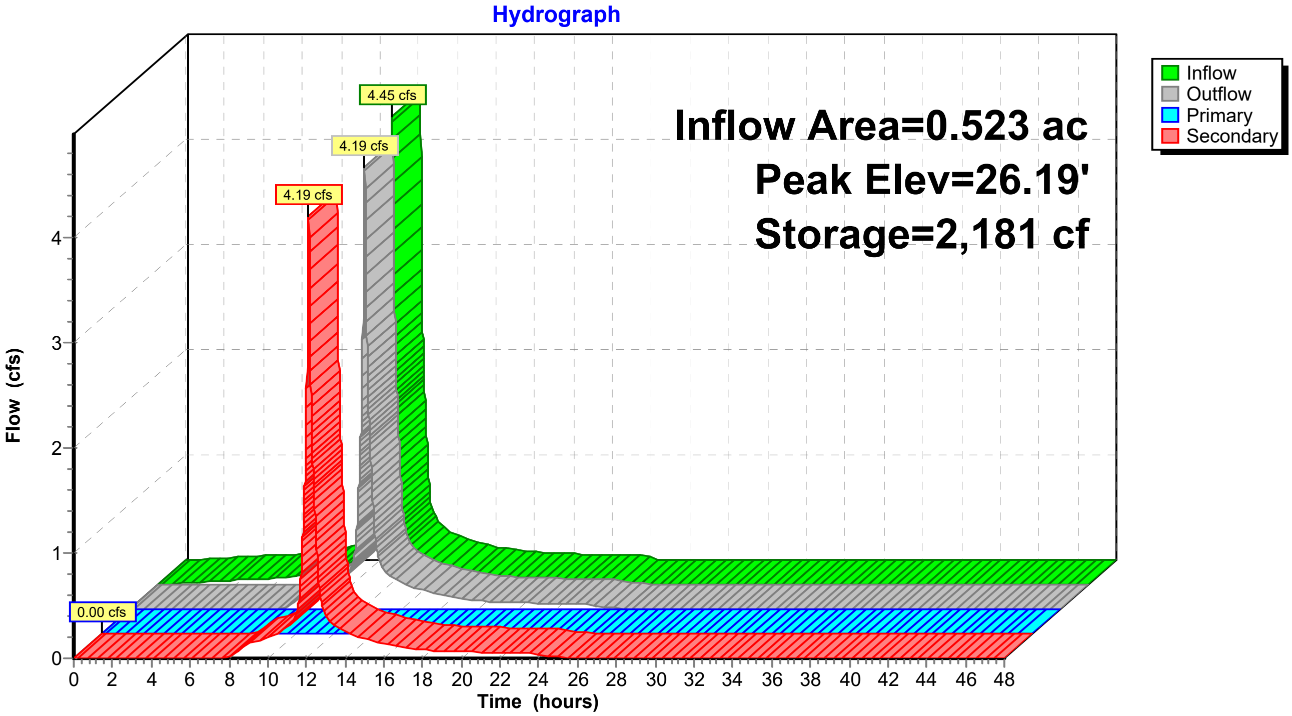
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
24.00	541	0	0
25.00	786	664	664
25.53	1,297	552	1,215
26.00	1,526	663	1,879
26.63	2,138	1,154	3,033

Device	Routing	Invert	Outlet Devices
#1	Primary	21.50'	**18.0" Round Culvert** L= 52.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 21.50' / 21.20' S= 0.0058 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	24.75'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	22.00'	**4.0" Round Culvert** L= 50.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 22.00' / 21.50' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.09 sf
#4	Device 3	24.00'	**2.410 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#5	Secondary	25.53'	**Asymmetrical Weir, C= 3.27** Offset (feet) 0.00 8.89 8.89 Elev. (feet) 26.50 25.53 26.50

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=24.00' TW=26.63' (Dynamic Tailwater)
└─**1=Culvert** (Controls 0.00 cfs)
  ├─**2=Orifice/Grate** (Controls 0.00 cfs)
  └─**3=Culvert** (Controls 0.00 cfs)
    └─**4=Exfiltration** (Controls 0.00 cfs)

Secondary OutFlow Max=4.19 cfs @ 12.11 hrs HW=26.19' TW=0.00' (Dynamic Tailwater)
└─**5=Asymmetrical Weir** (Weir Controls 4.19 cfs @ 1.06 fps)

Pond C-1: Rain Garden



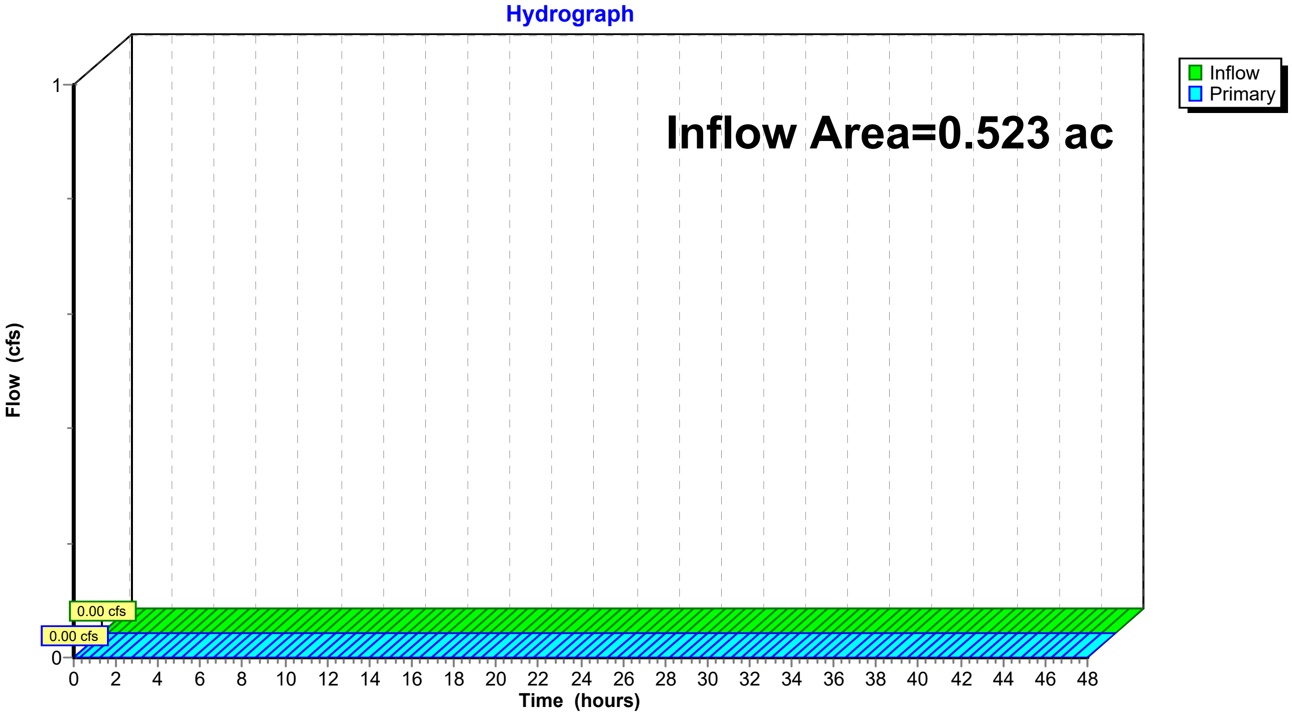
Summary for Link 1L: Tailwater at Existing 30" Pipe

Inflow Area = 0.523 ac, 89.07% Impervious, Inflow Depth = 0.00" for 100-Year 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
Routed to Reach DP-C : Herring Brook

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

100-Year Fixed water surface Elevation= 26.63'

Link 1L: Tailwater at Existing 30" Pipe



Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentR-C: ROOF Runoff Area=17,666 sf 100.00% Impervious Runoff Depth=1.20"
Tc=6.0 min CN=98 Runoff=0.54 cfs 0.041 af

SubcatchmentS-C: S-C Runoff Area=5,098 sf 51.20% Impervious Runoff Depth=0.48"
Tc=6.0 min CN=87 Runoff=0.06 cfs 0.005 af

SubcatchmentS-C-1: S-C-1 Runoff Area=1,348 sf 0.00% Impervious Runoff Depth=0.12"
Tc=6.0 min CN=74 Runoff=0.00 cfs 0.000 af

SubcatchmentS-C-2: S-C-2 Runoff Area=2,513 sf 62.83% Impervious Runoff Depth=0.57"
Tc=6.0 min CN=89 Runoff=0.04 cfs 0.003 af

Reach DP-C: Herring Brook Inflow=0.36 cfs 0.046 af
Outflow=0.36 cfs 0.046 af

Reach DP-C-1: Broad Street Inflow=0.04 cfs 0.003 af
Outflow=0.04 cfs 0.003 af

Pond C-1: Rain Garden Peak Elev=24.81' Storage=520 cf Inflow=0.60 cfs 0.045 af
Primary=0.35 cfs 0.045 af Secondary=0.00 cfs 0.000 af Outflow=0.35 cfs 0.045 af

Link 1L: Tailwater at Existing 30" Pipe Inflow=0.35 cfs 0.045 af
Primary=0.35 cfs 0.045 af

Total Runoff Area = 0.611 ac Runoff Volume = 0.048 af Average Runoff Depth = 0.95"
17.92% Pervious = 0.110 ac 82.08% Impervious = 0.502 ac

Summary for Subcatchment R-C: ROOF

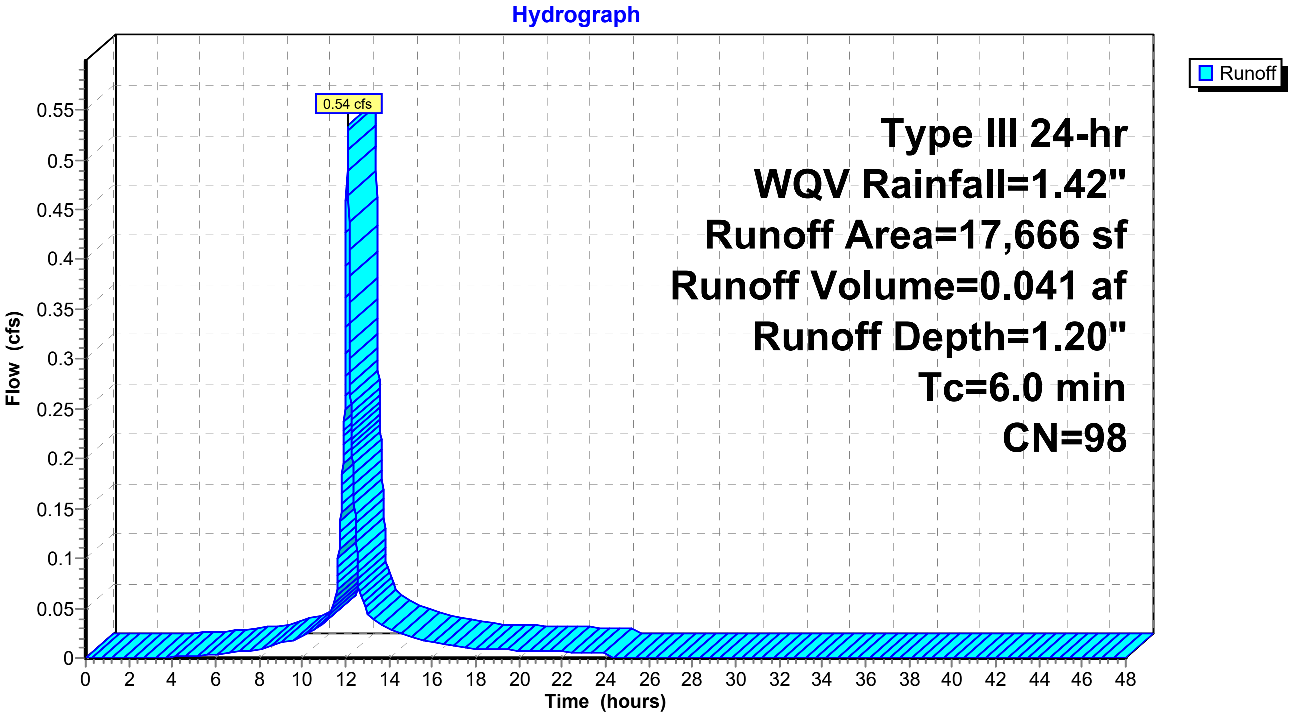
Runoff = 0.54 cfs @ 12.08 hrs, Volume= 0.041 af, Depth= 1.20"
Routed to Pond C-1 : Rain Garden

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr WQV Rainfall=1.42"

Area (sf)	CN	Description
17,666	98	Roofs, HSG C
17,666		100.00% Impervious Area

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

Subcatchment R-C: ROOF



Summary for Subcatchment S-C: S-C

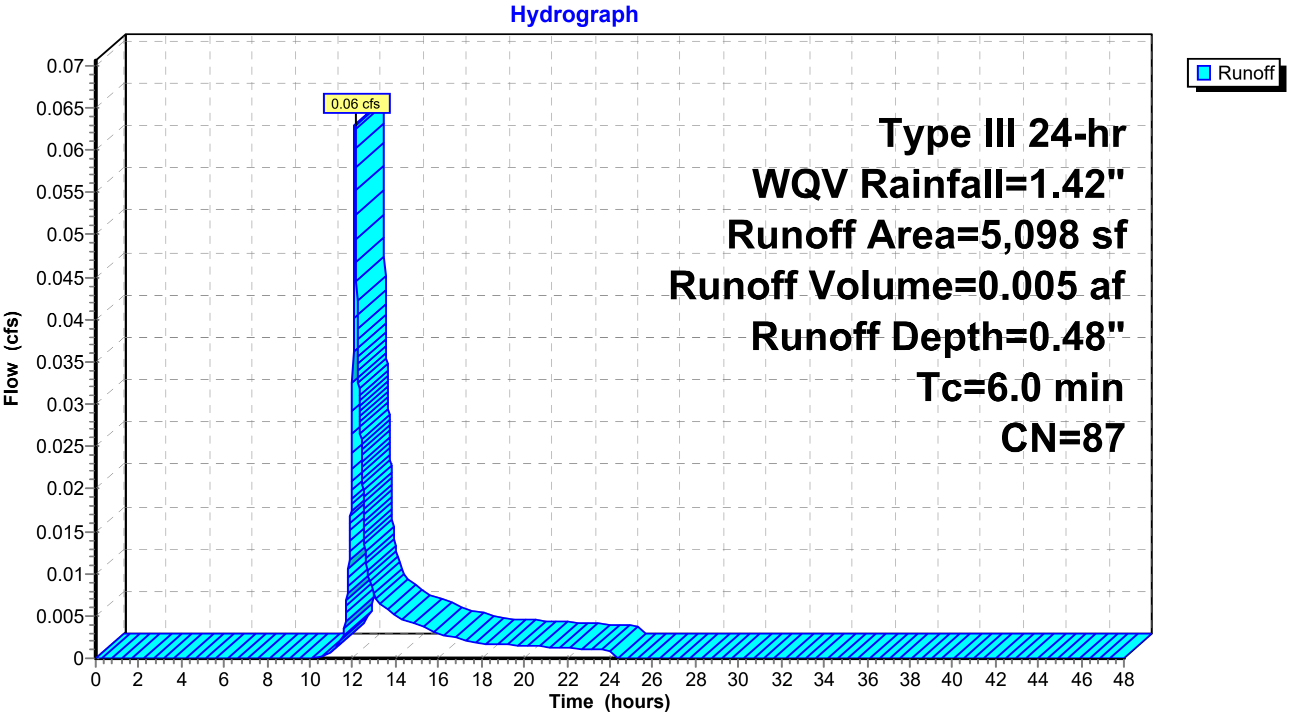
Runoff = 0.06 cfs @ 12.10 hrs, Volume= 0.005 af, Depth= 0.48"
Routed to Pond C-1 : Rain Garden

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr WQV Rainfall=1.42"

	Area (sf)	CN	Description
*	314	98	Pavement, HSG C
*	752	98	Sidewalk, HSG C
*	113	74	Plantings, HSG C
*	933	74	Plantings, HSG C (OFFSITE)
*	534	98	Sidewalk, HSG C (OFFSITE)
*	788	98	Pavement, HSG C (OFFSITE)
*	4	98	Wall, HSG C (OFFSITE)
*	72	98	Transformer, HSG C
*	1,206	74	Plantings, HSG C
*	236	96	Gravel, HSG C
*	146	98	Wall, HSG C
	5,098	87	Weighted Average
	2,488		48.80% Pervious Area
	2,610		51.20% Impervious Area

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

Subcatchment S-C: S-C



Summary for Subcatchment S-C-1: S-C-1

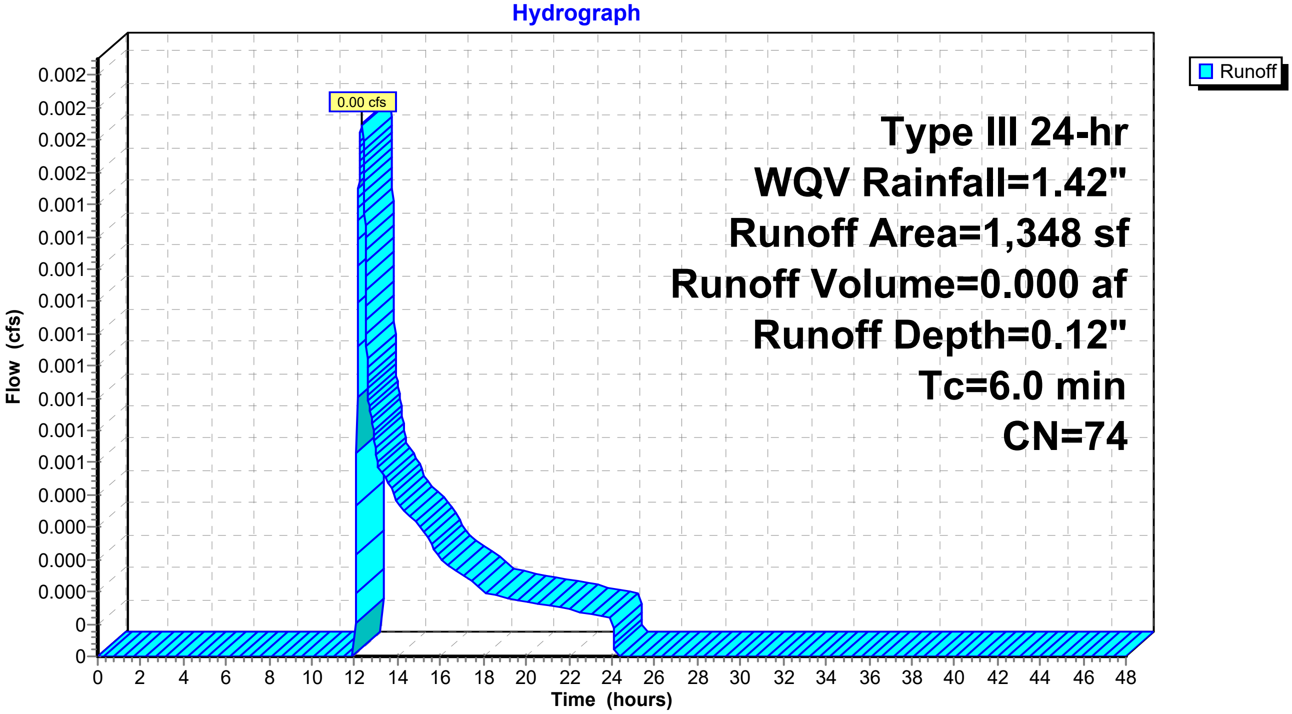
Runoff = 0.00 cfs @ 12.31 hrs, Volume= 0.000 af, Depth= 0.12"
Routed to Reach DP-C : Herring Brook

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr WQV Rainfall=1.42"

	Area (sf)	CN	Description
*	1,348	74	Plantings, HSG C (OFFSITE)
	1,348		100.00% Pervious Area

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

Subcatchment S-C-1: S-C-1



Summary for Subcatchment S-C-2: S-C-2

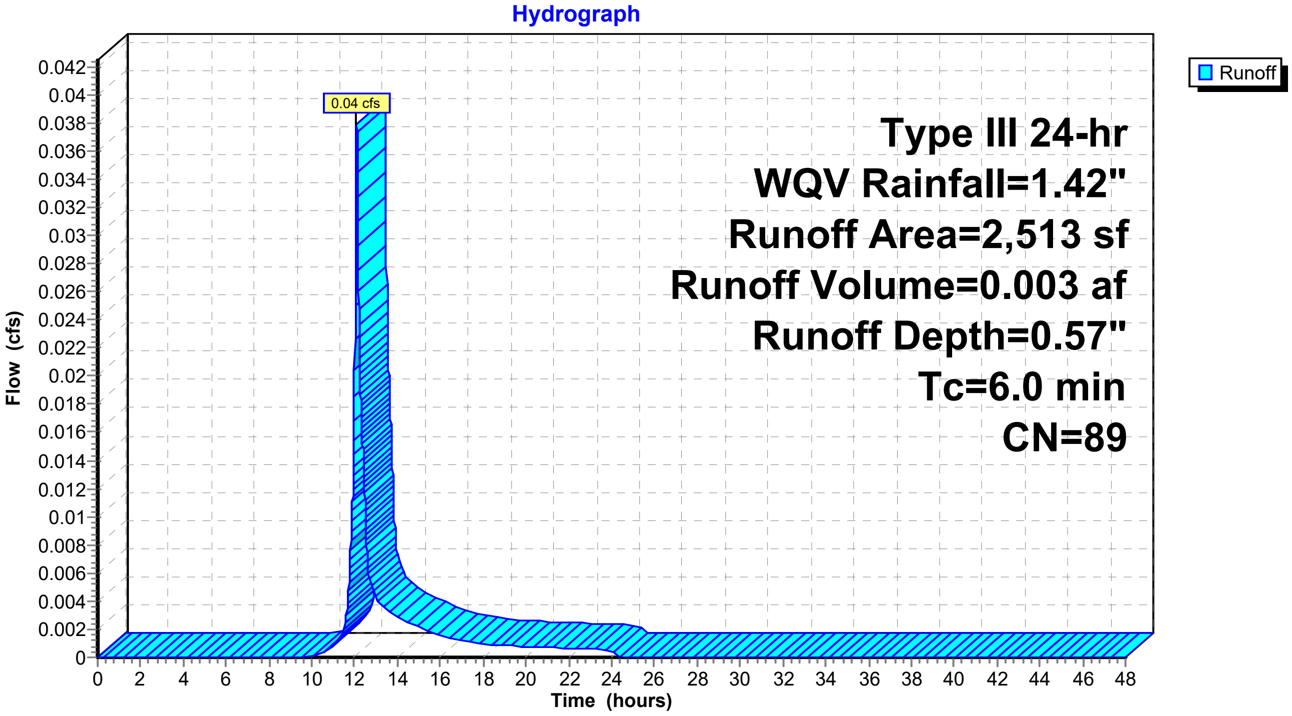
Runoff = 0.04 cfs @ 12.09 hrs, Volume= 0.003 af, Depth= 0.57"
Routed to Reach DP-C-1 : Broad Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr WQV Rainfall=1.42"

	Area (sf)	CN	Description
*	1,472	98	Sidewalk, HSG C
*	934	74	Plantings, HSG C
*	81	98	Wall, HSG C
*	26	98	Sidewalk, HSG C (OFFSITE)
	2,513	89	Weighted Average
	934		37.17% Pervious Area
	1,579		62.83% Impervious Area

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

Subcatchment S-C-2: S-C-2

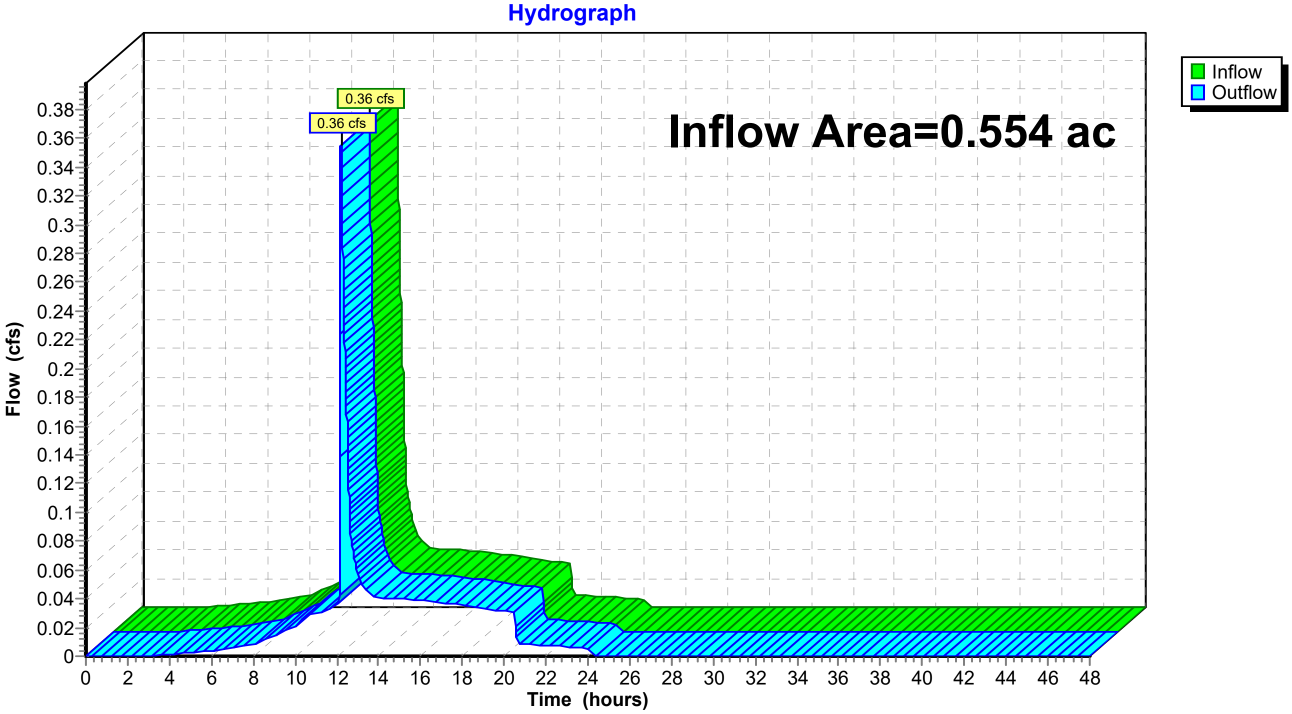


Summary for Reach DP-C: Herring Brook

Inflow Area = 0.554 ac, 84.09% Impervious, Inflow Depth = 0.99" for WQV event
Inflow = 0.36 cfs @ 12.19 hrs, Volume= 0.046 af
Outflow = 0.36 cfs @ 12.19 hrs, Volume= 0.046 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Reach DP-C: Herring Brook

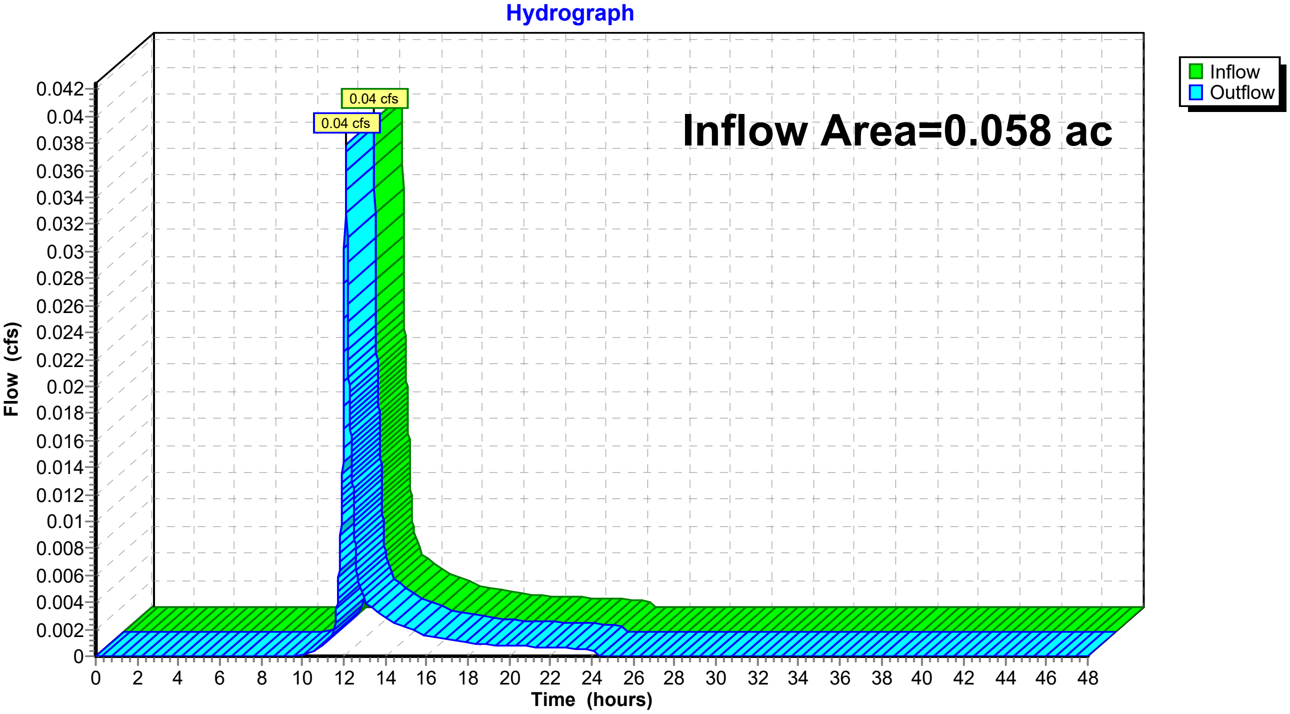


Summary for Reach DP-C-1: Broad Street

Inflow Area =	0.058 ac,	62.83% Impervious,	Inflow Depth = 0.57"	for WQV event
Inflow =	0.04 cfs @	12.09 hrs,	Volume=	0.003 af
Outflow =	0.04 cfs @	12.09 hrs,	Volume=	0.003 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Reach DP-C-1: Broad Street



Summary for Pond C-1: Rain Garden

Inflow Area = 0.523 ac, 89.07% Impervious, Inflow Depth = 1.04" for WQV event
Inflow = 0.60 cfs @ 12.09 hrs, Volume= 0.045 af
Outflow = 0.35 cfs @ 12.19 hrs, Volume= 0.045 af, Atten= 41%, Lag= 6.5 min
Primary = 0.35 cfs @ 12.19 hrs, Volume= 0.045 af
Routed to Link 1L : Tailwater at Existing 30" Pipe
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach DP-C : Herring Brook

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 24.81' @ 12.19 hrs Surf.Area= 740 sf Storage= 520 cf

Plug-Flow detention time= 83.5 min calculated for 0.045 af (100% of inflow)
Center-of-Mass det. time= 83.5 min (869.0 - 785.4)

Volume	Invert	Avail.Storage	Storage Description
#1	24.00'	3,033 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

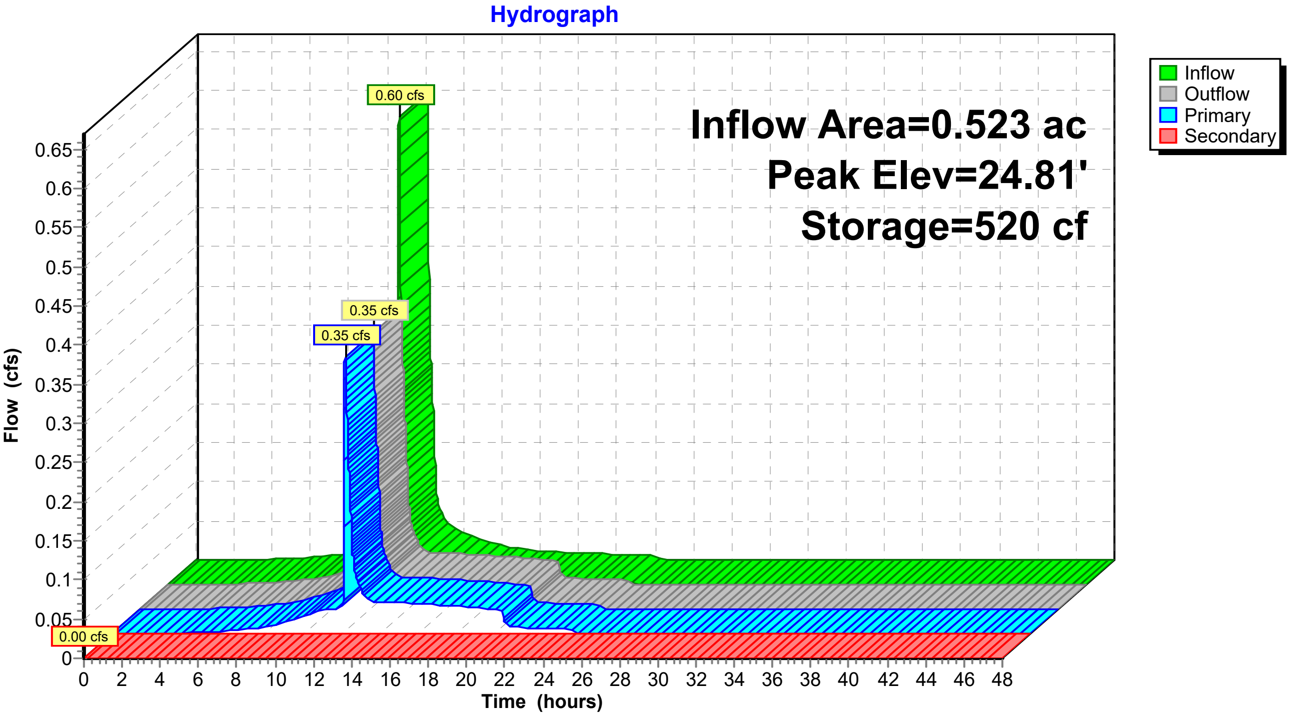
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
24.00	541	0	0
25.00	786	664	664
25.53	1,297	552	1,215
26.00	1,526	663	1,879
26.63	2,138	1,154	3,033

Device	Routing	Invert	Outlet Devices
#1	Primary	21.50'	**18.0" Round Culvert** L= 52.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 21.50' / 21.20' S= 0.0058 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	24.75'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	22.00'	**4.0" Round Culvert** L= 50.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 22.00' / 21.50' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.09 sf
#4	Device 3	24.00'	**2.410 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#5	Secondary	25.53'	**Asymmetrical Weir, C= 3.27** Offset (feet) 0.00 8.89 8.89 Elev. (feet) 26.50 25.53 26.50

Primary OutFlow Max=0.35 cfs @ 12.19 hrs HW=24.81' TW=20.95' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.35 cfs of 13.16 cfs potential flow)
  ├─**2=Orifice/Grate** (Weir Controls 0.31 cfs @ 0.81 fps)
  └─**3=Culvert** (Passes 0.04 cfs of 0.42 cfs potential flow)
    └─**4=Exfiltration** (Exfiltration Controls 0.04 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=24.00' TW=0.00' (Dynamic Tailwater)
└─**5=Asymmetrical Weir** (Controls 0.00 cfs)

Pond C-1: Rain Garden



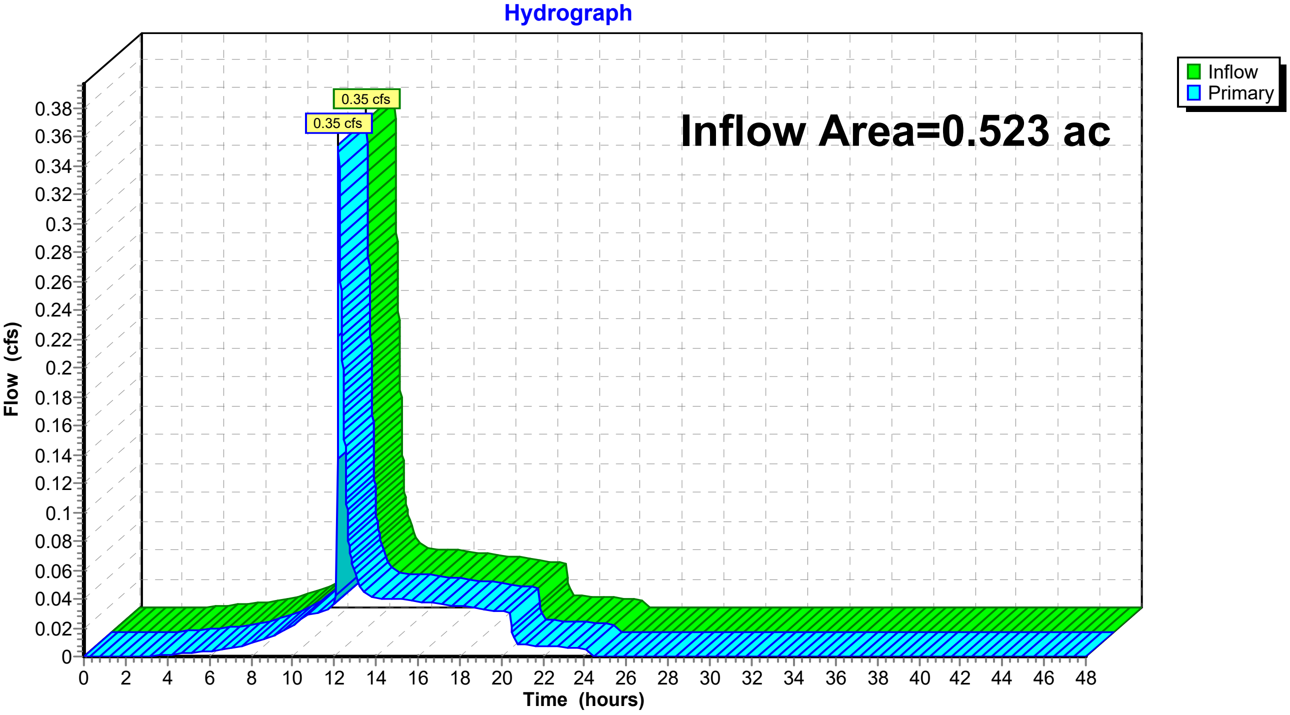
Summary for Link 1L: Tailwater at Existing 30" Pipe

Inflow Area = 0.523 ac, 89.07% Impervious, Inflow Depth = 1.04" for WQV event
Inflow = 0.35 cfs @ 12.19 hrs, Volume= 0.045 af
Primary = 0.35 cfs @ 12.19 hrs, Volume= 0.045 af, Atten= 0%, Lag= 0.0 min
Routed to Reach DP-C : Herring Brook

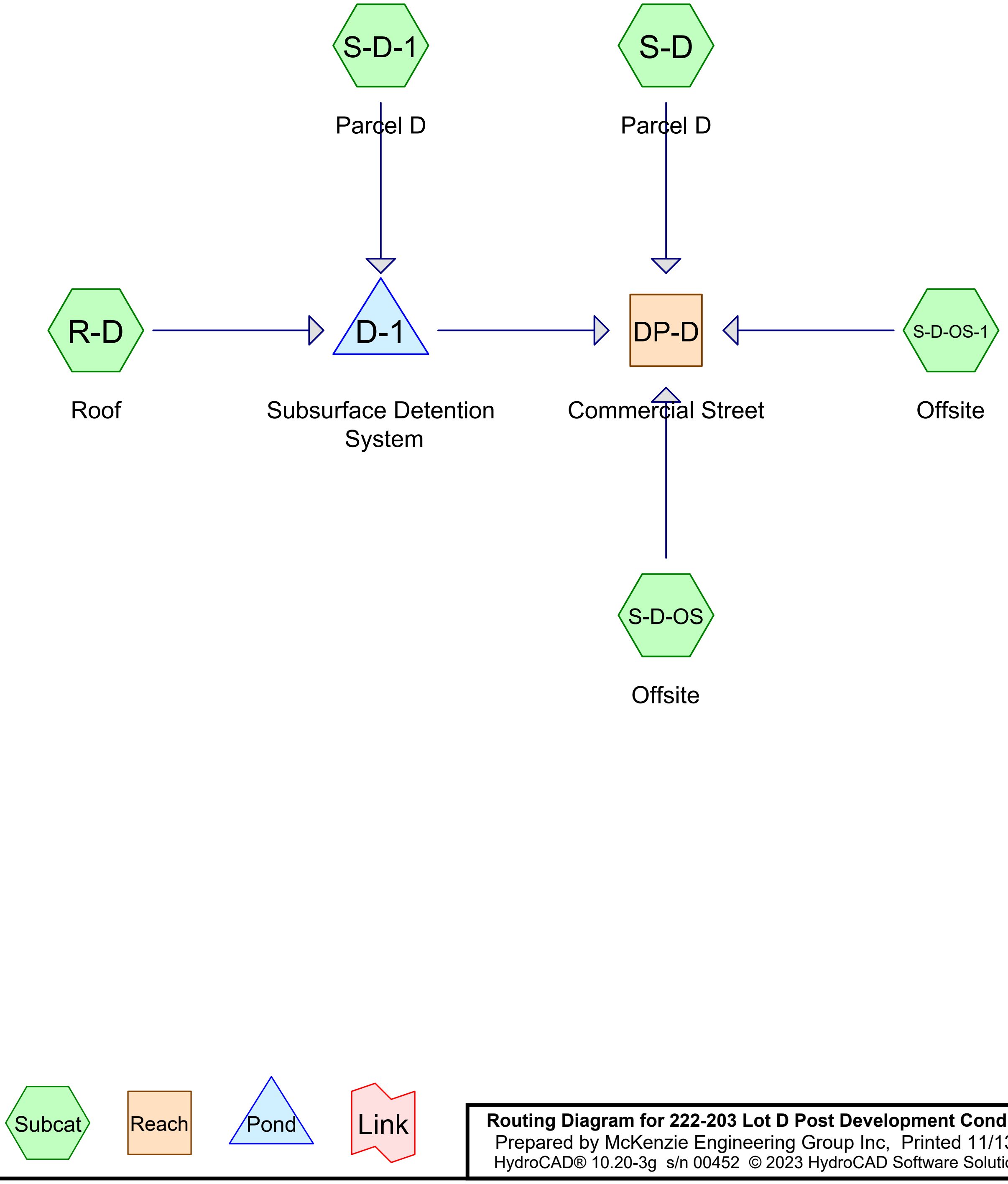
Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

WQV Fixed water surface Elevation= 20.95'

Link 1L: Tailwater at Existing 30" Pipe



SITE D



Routing Diagram for 222-203 Lot D Post Development Conditions (R2)
Prepared by McKenzie Engineering Group Inc, Printed 11/13/2023
HydroCAD® 10.20-3g s/n 00452 © 2023 HydroCAD Software Solutions LLC

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	Type III 24-hr		Default	24.00	1	3.22	2
2	10-Year	Type III 24-hr		Default	24.00	1	4.86	2
3	25-Year	Type III 24-hr		Default	24.00	1	6.15	2
4	100-Year	Type III 24-hr		Default	24.00	1	8.80	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.005	96	Gravel surface, HSG C (S-D)
0.003	98	Pavement, HSG C (S-D-1)
0.014	92	Permeable paver sidewalk, HSG C (S-D)
0.035	74	Plantings, HSG C (S-D)
0.159	98	Roofs, HSG C (R-D)
0.016	98	Roofs, HSG C (OFFSITE) (S-D-OS)
0.006	98	Sidewalk, HSG C (S-D)
0.002	98	Transformer, HSG C (S-D)
0.002	98	Wall, HSG C (S-D)
0.126	70	Woods, Good, HSG C (OFFSITE) (S-D-OS, S-D-OS-1)
0.369	**86**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.369	HSG C	R-D, S-D, S-D-1, S-D-OS, S-D-OS-1
0.000	HSG D	
0.000	Other	
0.369		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.005	0.000	0.000	0.005	Gravel surface	S-D
0.000	0.000	0.003	0.000	0.000	0.003	Pavement	S-D-1
0.000	0.000	0.014	0.000	0.000	0.014	Permeable paver sidewalk	S-D
0.000	0.000	0.035	0.000	0.000	0.035	Plantings	S-D
0.000	0.000	0.175	0.000	0.000	0.175	Roofs	R-D, S-D-OS
0.000	0.000	0.006	0.000	0.000	0.006	Sidewalk	S-D
0.000	0.000	0.002	0.000	0.000	0.002	Transformer	S-D
0.000	0.000	0.002	0.000	0.000	0.002	Wall	S-D
0.000	0.000	0.126	0.000	0.000	0.126	Woods, Good	S-D-OS, S-D-OS-1
0.000	**0.000**	**0.369**	**0.000**	**0.000**	**0.369**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)	Node Name
1	D-1	26.66	25.00	20.0	0.0830	0.013	0.0	12.0	0.0	

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 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 R-D: Roof	Runoff Area=6,916 sf 100.00% Impervious Runoff Depth=2.99" Tc=6.0 min CN=98 Runoff=0.48 cfs 0.040 af
Subcatchment S-D: Parcel D	Runoff Area=2,793 sf 15.32% Impervious Runoff Depth=1.63" Tc=6.0 min CN=83 Runoff=0.12 cfs 0.009 af
Subcatchment S-D-1: Parcel D	Runoff Area=138 sf 100.00% Impervious Runoff Depth=2.99" Tc=6.0 min CN=98 Runoff=0.01 cfs 0.001 af
Subcatchment S-D-OS: Offsite	Runoff Area=3,198 sf 21.89% Impervious Runoff Depth=1.17" Tc=6.0 min CN=76 Runoff=0.10 cfs 0.007 af
Subcatchment S-D-OS-1: Offsite	Runoff Area=3,008 sf 0.00% Impervious Runoff Depth=0.84" Tc=6.0 min CN=70 Runoff=0.06 cfs 0.005 af
Reach DP-D: Commercial Street	Inflow=0.66 cfs 0.061 af Outflow=0.66 cfs 0.061 af
Pond D-1: Subsurface Detention System	Peak Elev=27.09' Storage=101 cf Inflow=0.49 cfs 0.040 af Outflow=0.40 cfs 0.040 af

Total Runoff Area = 0.369 ac Runoff Volume = 0.061 af Average Runoff Depth = 1.99"
49.03% Pervious = 0.181 ac 50.97% Impervious = 0.188 ac

Summary for Subcatchment R-D: Roof

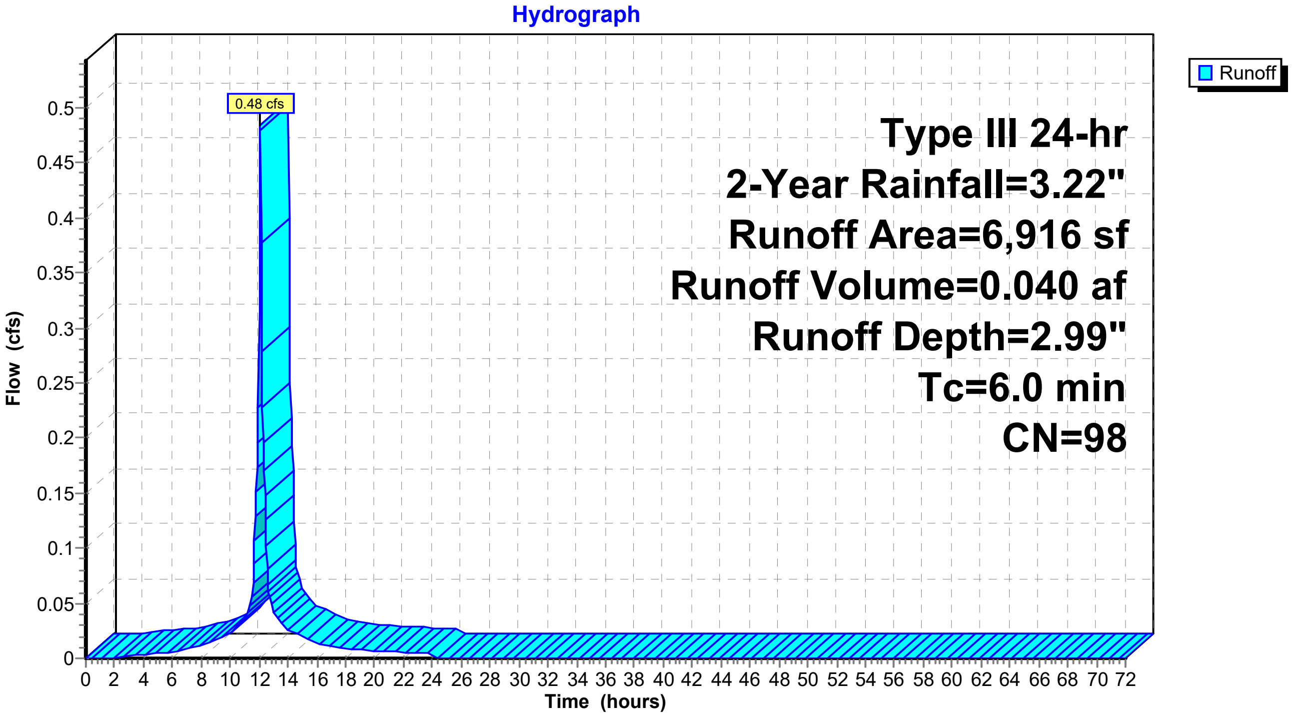
Runoff = 0.48 cfs @ 12.09 hrs, Volume= 0.040 af, Depth= 2.99"
Routed to Pond D-1 : Subsurface Detention System

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.22"

Area (sf)	CN	Description
6,916	98	Roofs, HSG C
6,916		100.00% Impervious Area

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

Subcatchment R-D: Roof



Summary for Subcatchment S-D: Parcel D

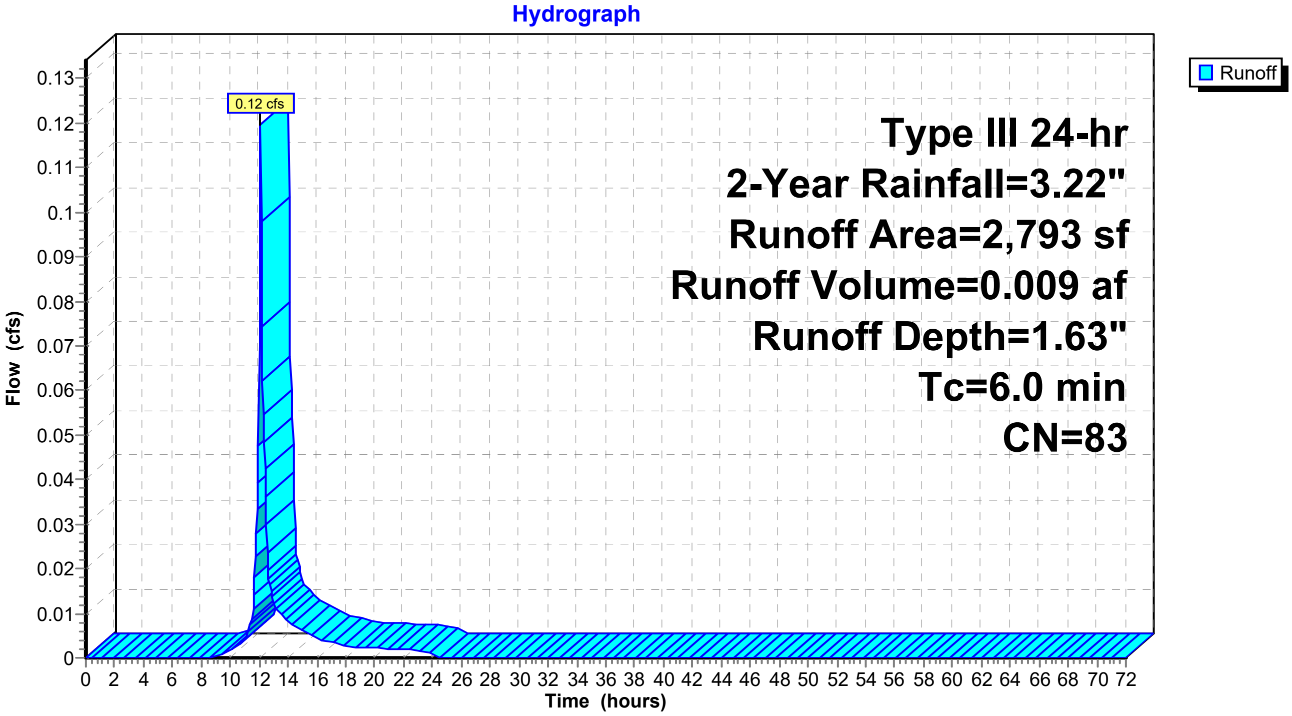
Runoff = 0.12 cfs @ 12.09 hrs, Volume= 0.009 af, Depth= 1.63"
Routed to Reach DP-D : Commercial Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.22"

	Area (sf)	CN	Description
*	72	98	Transformer, HSG C
	218	96	Gravel surface, HSG C
*	630	92	Permeable paver sidewalk, HSG C
*	94	98	Wall, HSG C
*	1,517	74	Plantings, HSG C
*	262	98	Sidewalk, HSG C
	2,793	83	Weighted Average
	2,365		84.68% Pervious Area
	428		15.32% Impervious Area

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

Subcatchment S-D: Parcel D



Summary for Subcatchment S-D-1: Parcel D

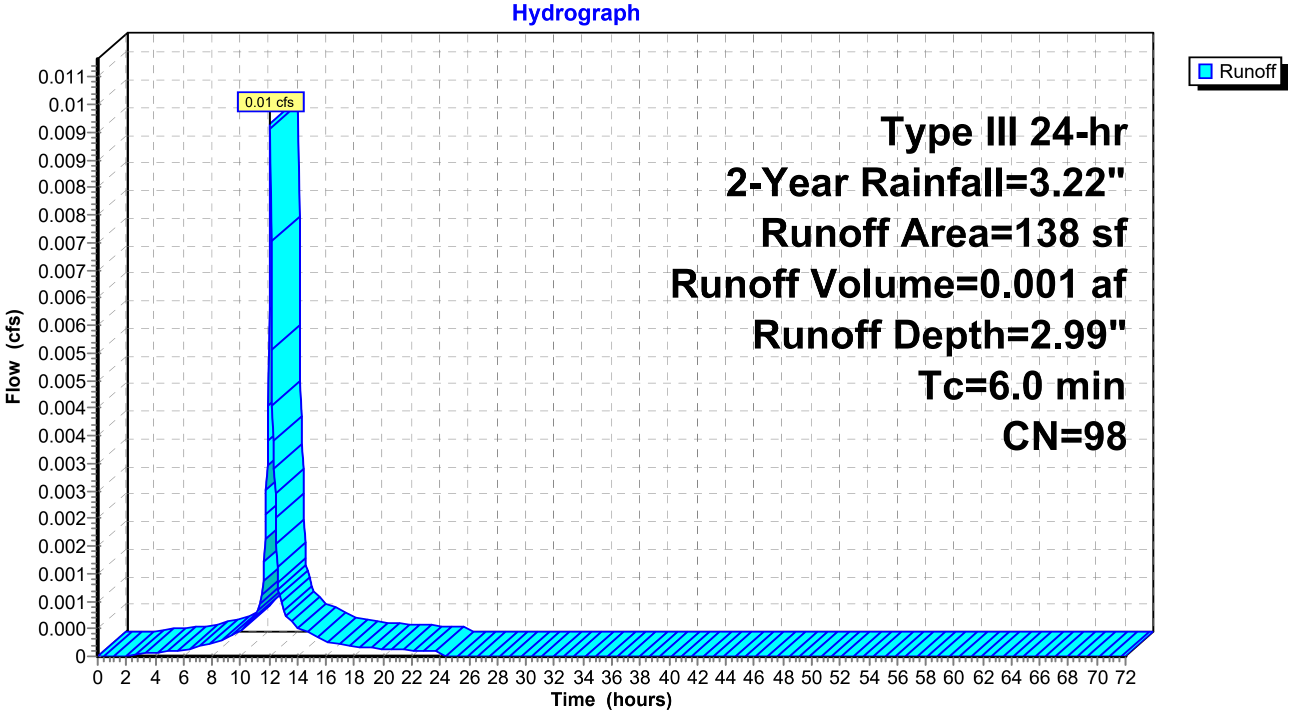
Runoff = 0.01 cfs @ 12.09 hrs, Volume= 0.001 af, Depth= 2.99"
Routed to Pond D-1 : Subsurface Detention System

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.22"

	Area (sf)	CN	Description
*	138	98	Pavement, HSG C
	138		100.00% Impervious Area

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

Subcatchment S-D-1: Parcel D



Summary for Subcatchment S-D-OS: Offsite

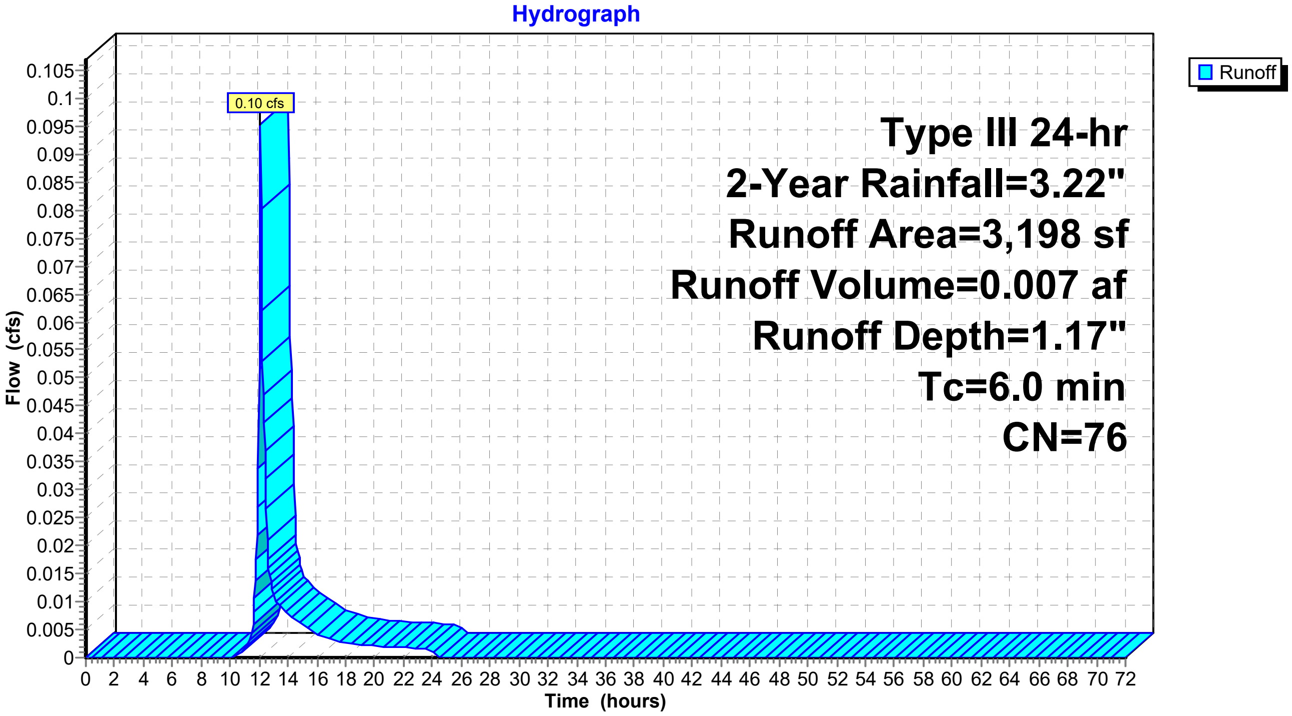
Runoff = 0.10 cfs @ 12.10 hrs, Volume= 0.007 af, Depth= 1.17"
Routed to Reach DP-D : Commercial Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.22"

	Area (sf)	CN	Description
*	700	98	Roofs, HSG C (OFFSITE)
*	2,498	70	Woods, Good, HSG C (OFFSITE)
	3,198	76	Weighted Average
	2,498		78.11% Pervious Area
	700		21.89% Impervious Area

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

Subcatchment S-D-OS: Offsite



Summary for Subcatchment S-D-OS-1: Offsite

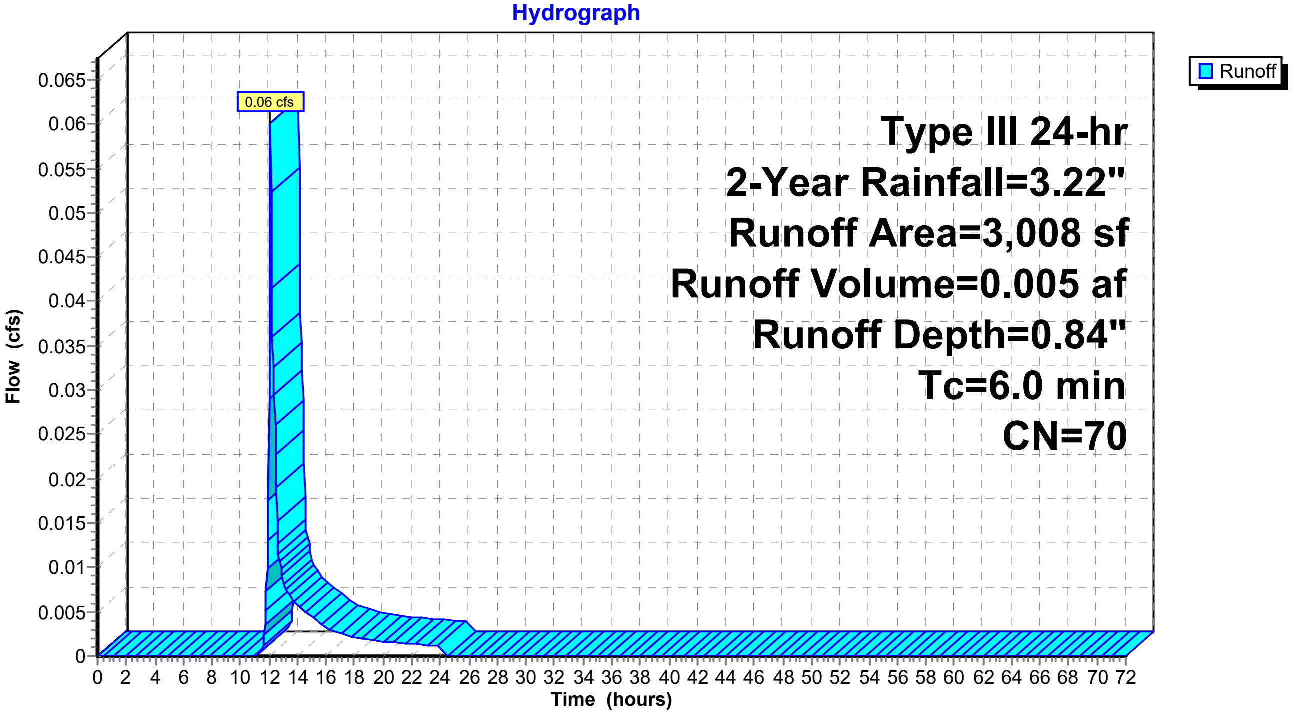
Runoff = 0.06 cfs @ 12.10 hrs, Volume= 0.005 af, Depth= 0.84"
Routed to Reach DP-D : Commercial Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.22"

	Area (sf)	CN	Description
*	3,008	70	Woods, Good, HSG C (OFFSITE)
	3,008		100.00% Pervious Area

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

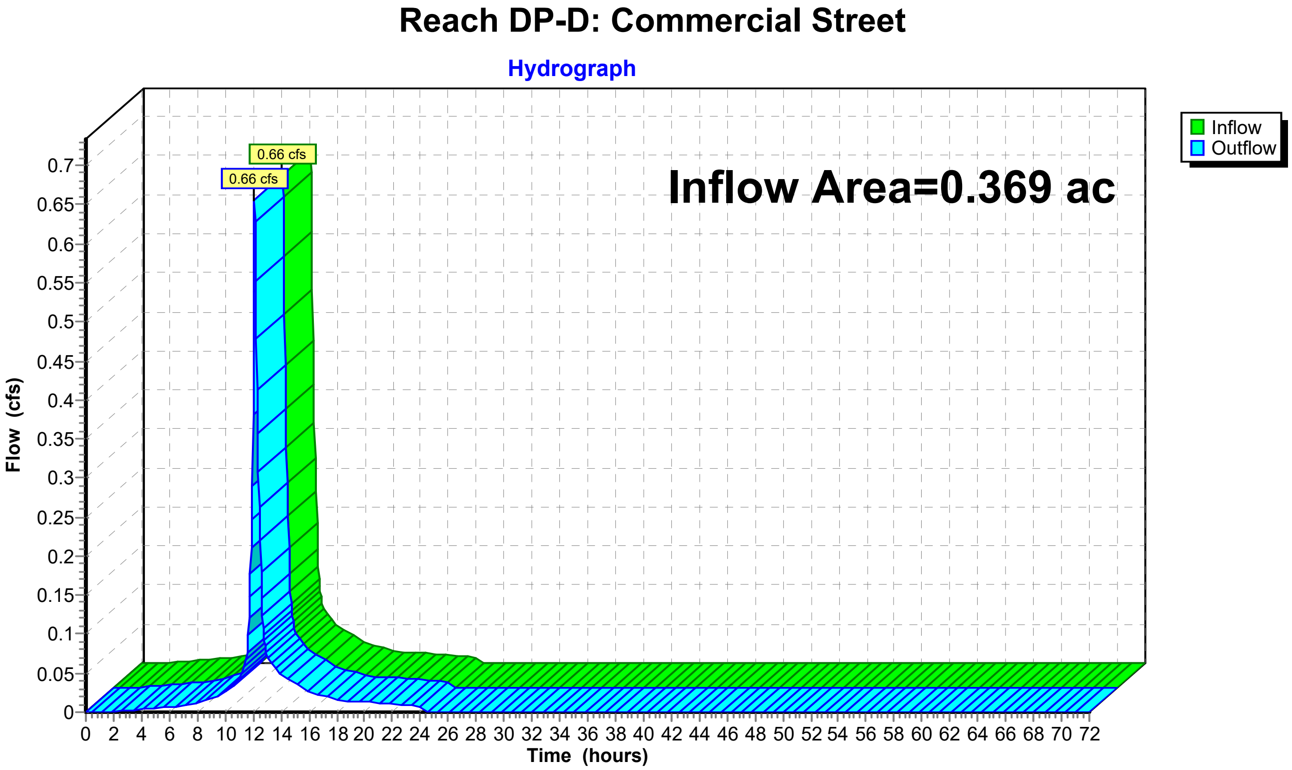
Subcatchment S-D-OS-1: Offsite



Summary for Reach DP-D: Commercial Street

Inflow Area = 0.369 ac, 50.97% Impervious, Inflow Depth = 1.99" for 2-Year event
Inflow = 0.66 cfs @ 12.12 hrs, Volume= 0.061 af
Outflow = 0.66 cfs @ 12.12 hrs, Volume= 0.061 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs



Summary for Pond D-1: Subsurface Detention System

Inflow Area = 0.162 ac,100.00% Impervious, Inflow Depth = 2.99" for 2-Year event
Inflow = 0.49 cfs @ 12.09 hrs, Volume= 0.040 af
Outflow = 0.40 cfs @ 12.15 hrs, Volume= 0.040 af, Atten= 20%, Lag= 3.8 min
Primary = 0.40 cfs @ 12.15 hrs, Volume= 0.040 af
Routed to Reach DP-D : Commercial Street

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 27.09' @ 12.15 hrs Surf.Area= 1,153 sf Storage= 101 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 1.4 min (757.6 - 756.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	26.33'	0 cf	**26.91'W x 42.83'L x 2.17'H Field A** 2,497 cf Overall - 743 cf Embedded = 1,754 cf x 0.0% Voids
#2A	26.66'	559 cf	**ADS N-12 15"** x 22 Inside #1 Inside= 14.8"W x 14.8"H => 1.20 sf x 20.00'L = 24.0 cf Outside= 18.0"W x 18.0"H => 1.60 sf x 20.00'L = 31.9 cf 22 Chambers in 11 Rows 25.58' Header x 1.20 sf x 1 = 30.7 cf Inside
		559 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	26.66'	**12.0" Round Culvert** L= 20.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 26.66' / 25.00' S= 0.0830 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	26.66'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	27.85'	**4.0' long x 2.00' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.40 cfs @ 12.15 hrs HW=27.09' (Free Discharge)
└─**1=Culvert** (Passes 0.40 cfs of 0.71 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.40 cfs @ 2.23 fps)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond D-1: Subsurface Detention System - Chamber Wizard Field A

Chamber Model = ADS N-12 15" (ADS N-12® Pipe)
Inside= 14.8"W x 14.8"H => 1.20 sf x 20.00'L = 24.0 cf
Outside= 18.0"W x 18.0"H => 1.60 sf x 20.00'L = 31.9 cf

18.0" Wide + 10.9" Spacing = 28.9" C-C Row Spacing

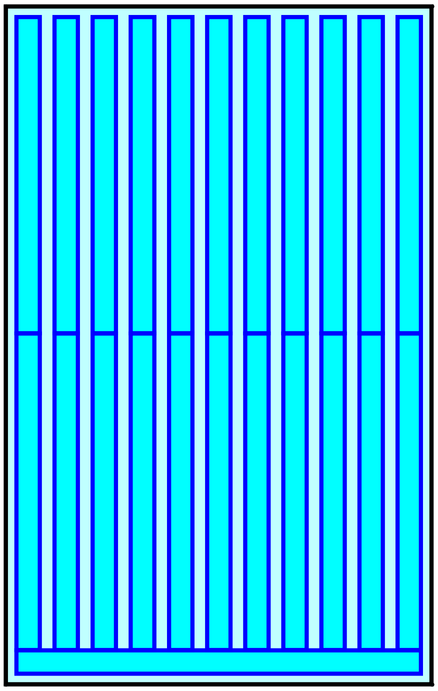
2 Chambers/Row x 20.00' Long +1.50' Header x 1 = 41.50' Row Length +8.0" End Stone x 2 = 42.83' Base Length
11 Rows x 18.0" Wide + 10.9" Spacing x 10 + 8.0" Side Stone x 2 = 26.91' Base Width
4.0" Stone Base + 18.0" Chamber Height + 4.0" Stone Cover = 2.17' Field Height

22 Chambers x 24.0 cf + 25.58' Header x 1.20 sf = 558.7 cf Chamber Storage
22 Chambers x 31.9 cf + 25.58' Header x 1.60 sf = 743.2 cf Displacement

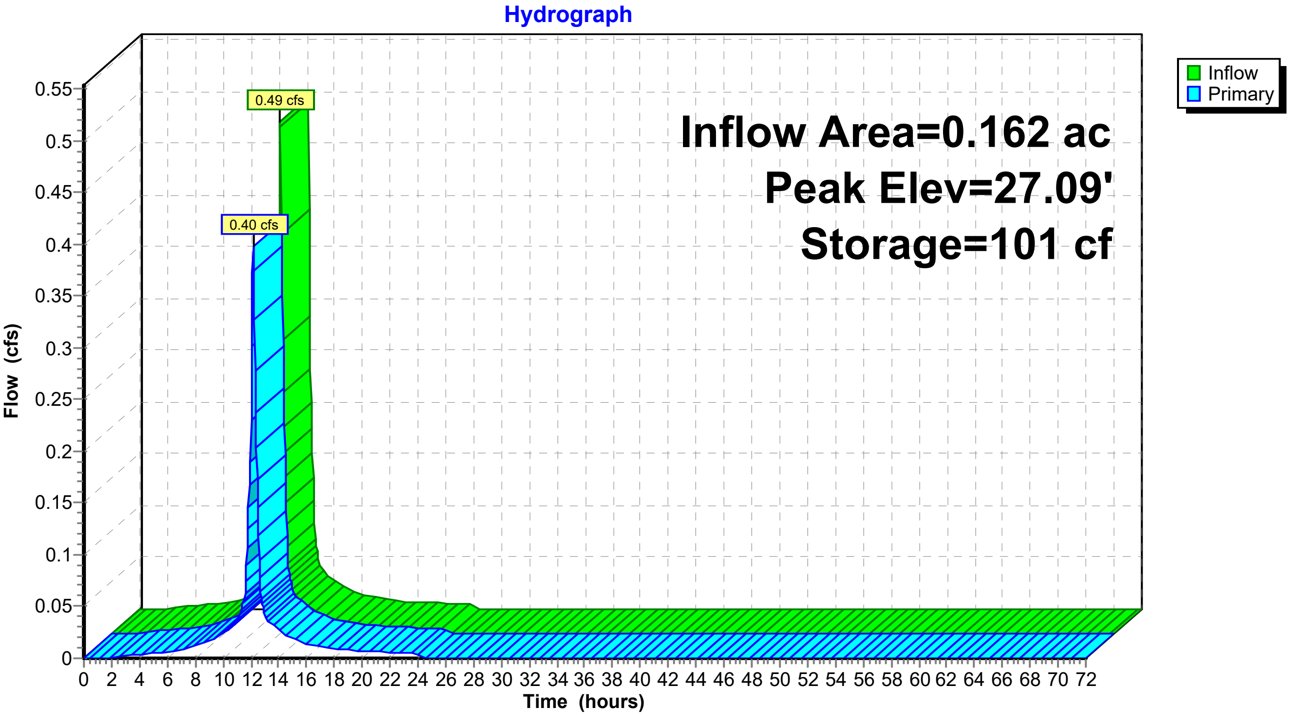
2,496.7 cf Field - 743.2 cf Chambers = 1,753.5 cf Stone x 0.0% Voids = 0.0 cf Stone Storage

Chamber Storage = 558.7 cf = 0.013 af
Overall Storage Efficiency = 22.4%
Overall System Size = 42.83' x 26.91' x 2.17'

22 Chambers
92.5 cy Field
64.9 cy Stone



Pond D-1: Subsurface Detention System



Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 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 R-D: Roof	Runoff Area=6,916 sf 100.00% Impervious Runoff Depth=4.62" Tc=6.0 min CN=98 Runoff=0.74 cfs 0.061 af
Subcatchment S-D: Parcel D	Runoff Area=2,793 sf 15.32% Impervious Runoff Depth=3.05" Tc=6.0 min CN=83 Runoff=0.22 cfs 0.016 af
Subcatchment S-D-1: Parcel D	Runoff Area=138 sf 100.00% Impervious Runoff Depth=4.62" Tc=6.0 min CN=98 Runoff=0.01 cfs 0.001 af
Subcatchment S-D-OS: Offsite	Runoff Area=3,198 sf 21.89% Impervious Runoff Depth=2.42" Tc=6.0 min CN=76 Runoff=0.20 cfs 0.015 af
Subcatchment S-D-OS-1: Offsite	Runoff Area=3,008 sf 0.00% Impervious Runoff Depth=1.93" Tc=6.0 min CN=70 Runoff=0.15 cfs 0.011 af
Reach DP-D: Commercial Street	Inflow=1.09 cfs 0.105 af Outflow=1.09 cfs 0.105 af
Pond D-1: Subsurface Detention System	Peak Elev=27.25' Storage=187 cf Inflow=0.75 cfs 0.062 af Outflow=0.55 cfs 0.062 af

Total Runoff Area = 0.369 ac Runoff Volume = 0.105 af Average Runoff Depth = 3.41"
49.03% Pervious = 0.181 ac 50.97% Impervious = 0.188 ac

Summary for Subcatchment R-D: Roof

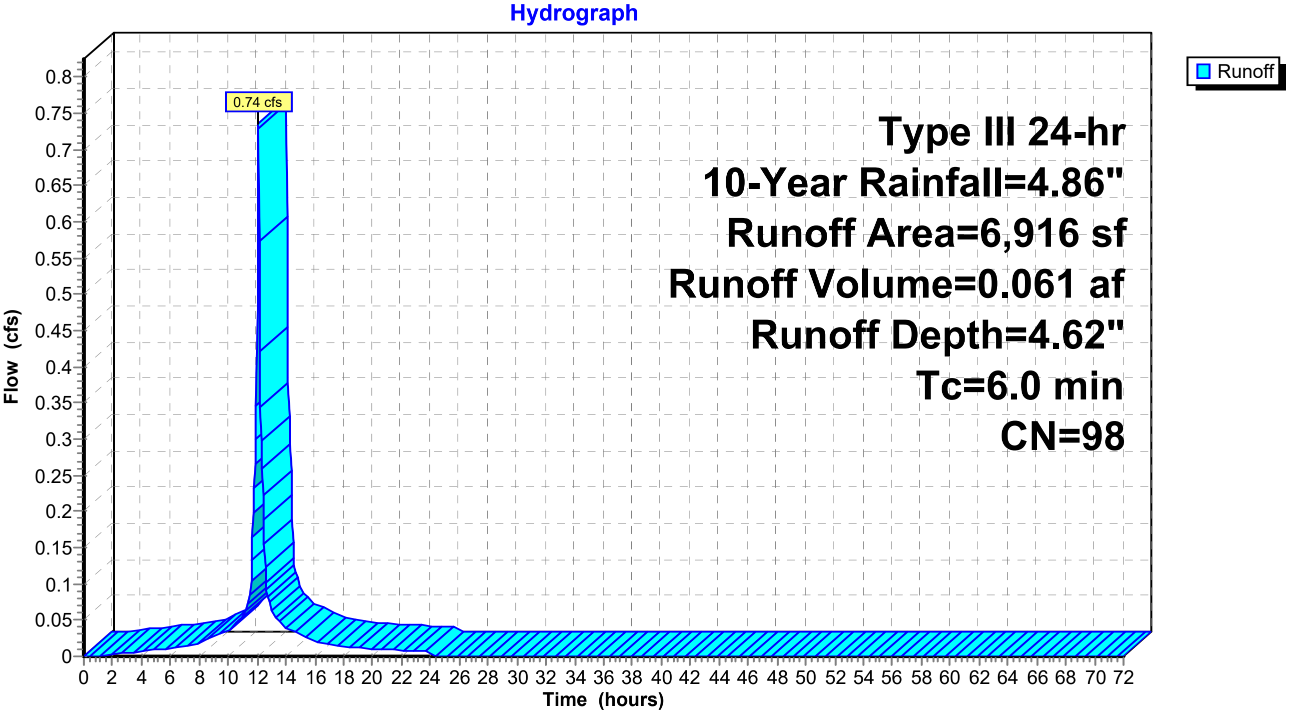
Runoff = 0.74 cfs @ 12.09 hrs, Volume= 0.061 af, Depth= 4.62"
Routed to Pond D-1 : Subsurface Detention System

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.86"

Area (sf)	CN	Description
6,916	98	Roofs, HSG C
6,916		100.00% Impervious Area

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

Subcatchment R-D: Roof



Summary for Subcatchment S-D: Parcel D

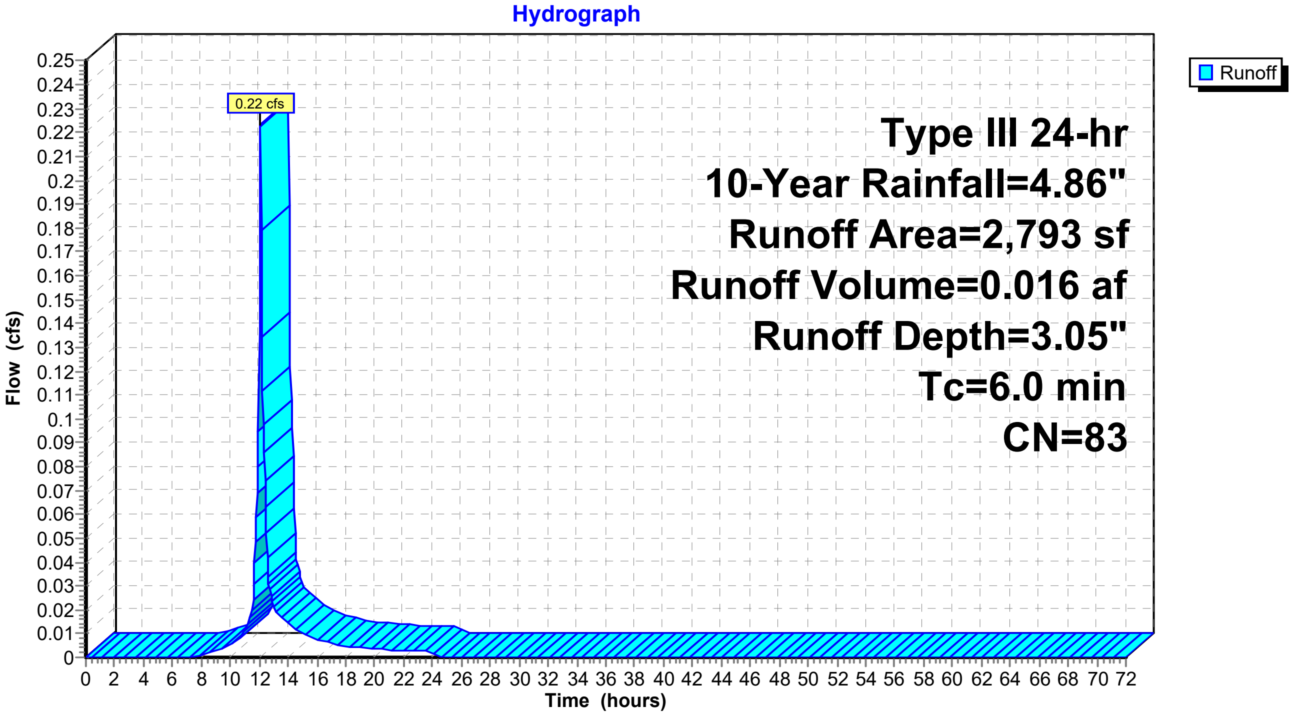
Runoff = 0.22 cfs @ 12.09 hrs, Volume= 0.016 af, Depth= 3.05"
Routed to Reach DP-D : Commercial Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.86"

	Area (sf)	CN	Description
*	72	98	Transformer, HSG C
	218	96	Gravel surface, HSG C
*	630	92	Permeable paver sidewalk, HSG C
*	94	98	Wall, HSG C
*	1,517	74	Plantings, HSG C
*	262	98	Sidewalk, HSG C
	2,793	83	Weighted Average
	2,365		84.68% Pervious Area
	428		15.32% Impervious Area

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

Subcatchment S-D: Parcel D



Summary for Subcatchment S-D-1: Parcel D

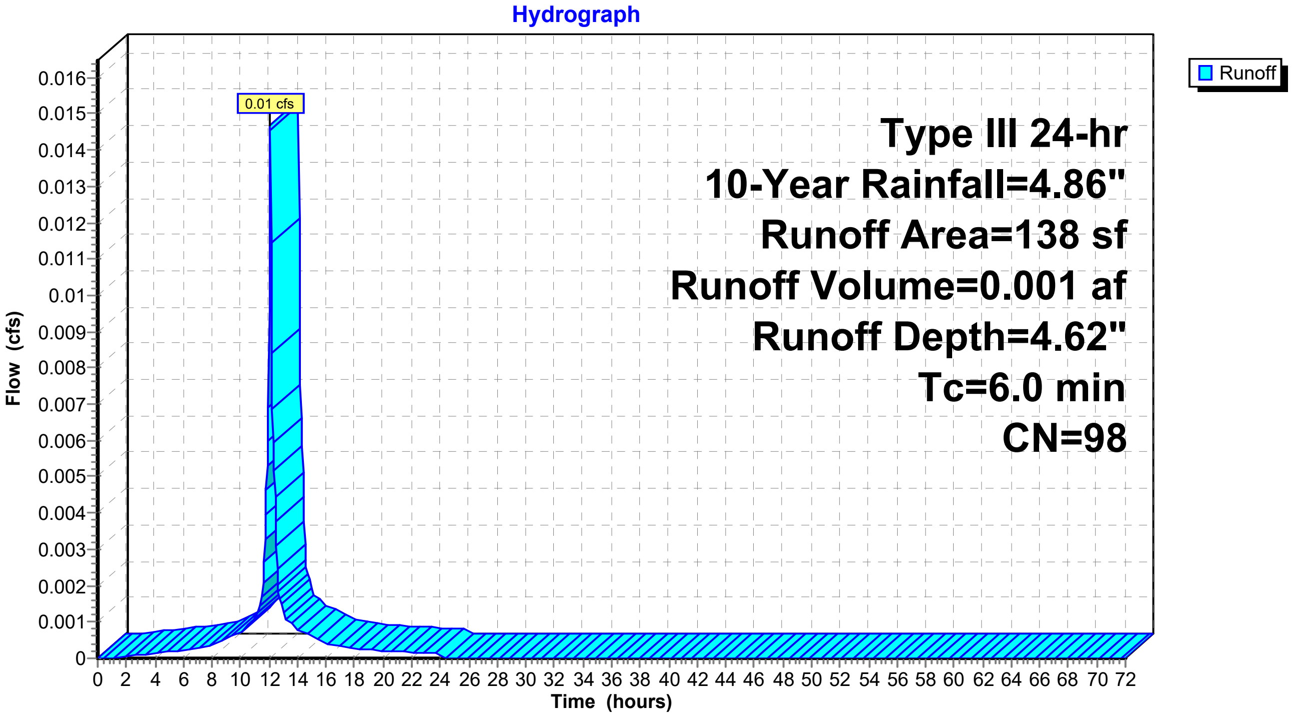
Runoff = 0.01 cfs @ 12.09 hrs, Volume= 0.001 af, Depth= 4.62"
Routed to Pond D-1 : Subsurface Detention System

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.86"

	Area (sf)	CN	Description
*	138	98	Pavement, HSG C
	138		100.00% Impervious Area

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

Subcatchment S-D-1: Parcel D



Summary for Subcatchment S-D-OS: Offsite

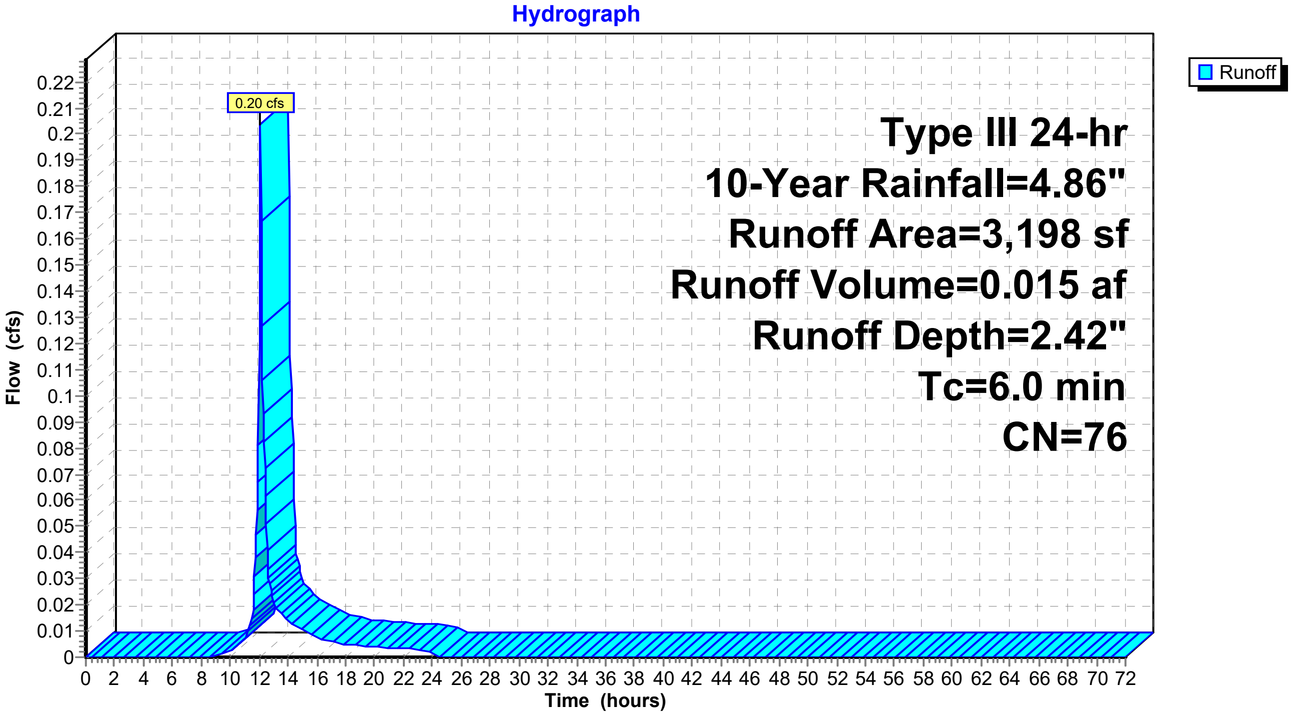
Runoff = 0.20 cfs @ 12.09 hrs, Volume= 0.015 af, Depth= 2.42"
Routed to Reach DP-D : Commercial Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.86"

	Area (sf)	CN	Description
*	700	98	Roofs, HSG C (OFFSITE)
*	2,498	70	Woods, Good, HSG C (OFFSITE)
	3,198	76	Weighted Average
	2,498		78.11% Pervious Area
	700		21.89% Impervious Area

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

Subcatchment S-D-OS: Offsite



Summary for Subcatchment S-D-OS-1: Offsite

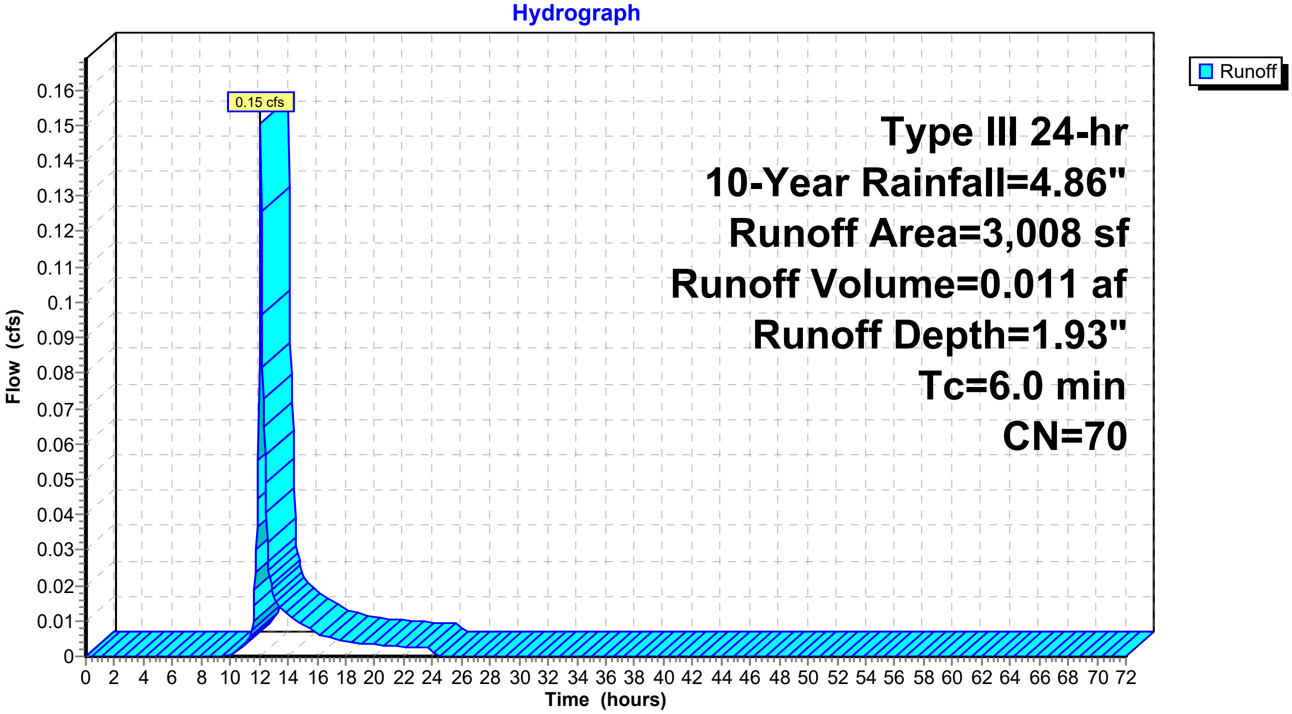
Runoff = 0.15 cfs @ 12.10 hrs, Volume= 0.011 af, Depth= 1.93"
Routed to Reach DP-D : Commercial Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.86"

	Area (sf)	CN	Description
*	3,008	70	Woods, Good, HSG C (OFFSITE)
	3,008		100.00% Pervious Area

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

Subcatchment S-D-OS-1: Offsite

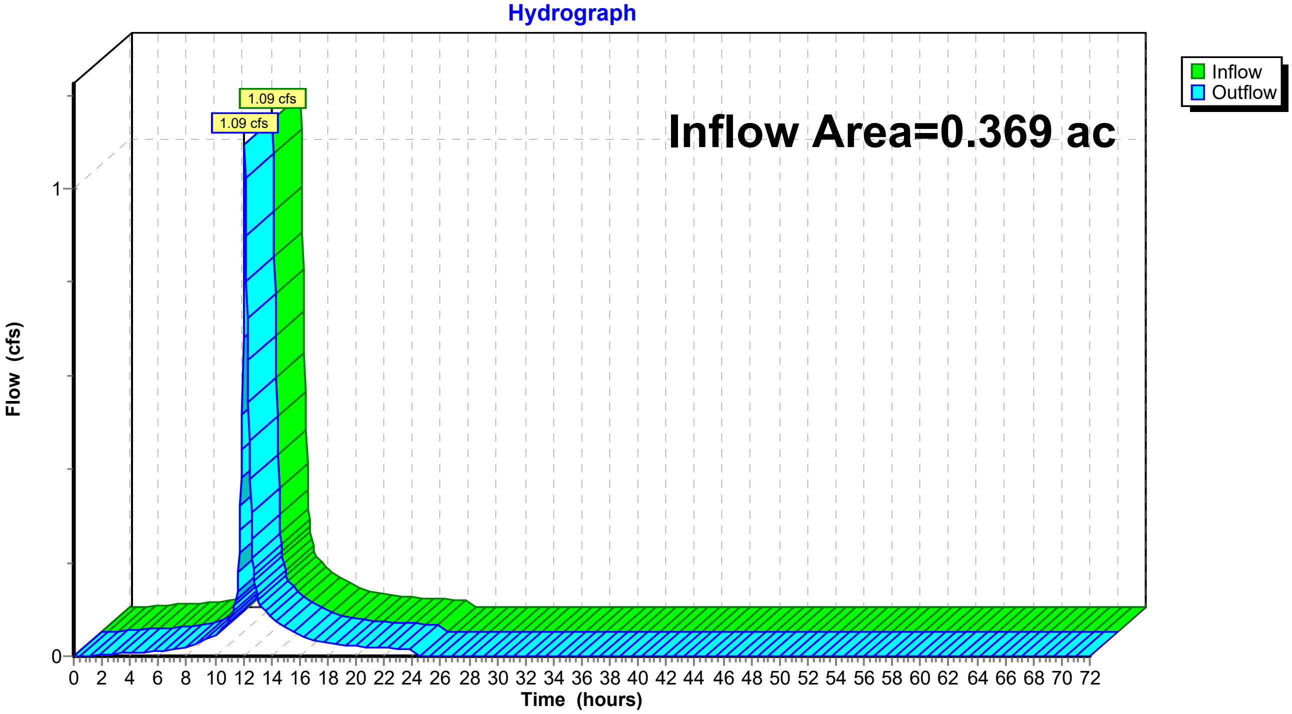


Summary for Reach DP-D: Commercial Street

Inflow Area = 0.369 ac, 50.97% Impervious, Inflow Depth = 3.41" for 10-Year event
Inflow = 1.09 cfs @ 12.11 hrs, Volume= 0.105 af
Outflow = 1.09 cfs @ 12.11 hrs, Volume= 0.105 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach DP-D: Commercial Street



Summary for Pond D-1: Subsurface Detention System

```
Inflow Area =        0.162 ac,100.00% Impervious,  Inflow Depth =   4.62"    for  10-Year event
Inflow      =        0.75 cfs @  12.09 hrs,  Volume=          0.062 af
Outflow     =        0.55 cfs @  12.16 hrs,  Volume=          0.062 af,  Atten= 27%,  Lag= 4.7 min
Primary     =        0.55 cfs @  12.16 hrs,  Volume=          0.062 af
    Routed to Reach DP-D : Commercial Street

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 27.25' @ 12.16 hrs   Surf.Area= 1,153 sf   Storage= 187 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 1.8 min ( 750.3 - 748.5 )

Volume      Invert   Avail.Storage  Storage Description
   #1A      26.33'            0 cf  26.91'W x 42.83'L x 2.17'H Field A
                                    2,497 cf Overall - 743 cf Embedded = 1,754 cf  x 0.0% Voids
   #2A      26.66'          559 cf  ADS N-12  15" x 22  Inside #1
                                    Inside= 14.8"W x 14.8"H => 1.20 sf x 20.00'L = 24.0 cf
                                    Outside= 18.0"W x 18.0"H => 1.60 sf x 20.00'L = 31.9 cf
                                    22 Chambers in 11 Rows
                                    25.58' Header x 1.20 sf  x 1 = 30.7 cf Inside
                            559 cf  Total Available Storage

    Storage Group A created with Chamber Wizard

Device   Routing          Invert  Outlet Devices
   #1    Primary          26.66'  12.0"  Round Culvert
                                  L= 20.0'   RCP, square edge headwall,  Ke= 0.500
                                  Inlet / Outlet Invert= 26.66' / 25.00'   S= 0.0830 '/'   Cc= 0.900
                                  n= 0.013  Corrugated PE, smooth interior,  Flow Area= 0.79 sf
   #2    Device 1         26.66'  6.0" Vert. Orifice/Grate   C= 0.600   Limited to weir flow at low heads
   #3    Device 1         27.85'  4.0' long x 2.00' rise Sharp-Crested Rectangular Weir
                                  2 End Contraction(s)

Primary OutFlow Max=0.55 cfs @ 12.16 hrs  HW=27.24'   (Free Discharge)
↑
└─1=Culvert  (Passes 0.55 cfs of 1.24 cfs potential flow)
   ↑
   ├─2=Orifice/Grate  (Orifice Controls 0.55 cfs @ 2.79 fps)
   └─3=Sharp-Crested Rectangular Weir( Controls 0.00 cfs)
```

Pond D-1: Subsurface Detention System - Chamber Wizard Field A

Chamber Model = ADS N-12 15" (ADS N-12® Pipe)
Inside= 14.8"W x 14.8"H => 1.20 sf x 20.00'L = 24.0 cf
Outside= 18.0"W x 18.0"H => 1.60 sf x 20.00'L = 31.9 cf

18.0" Wide + 10.9" Spacing = 28.9" C-C Row Spacing

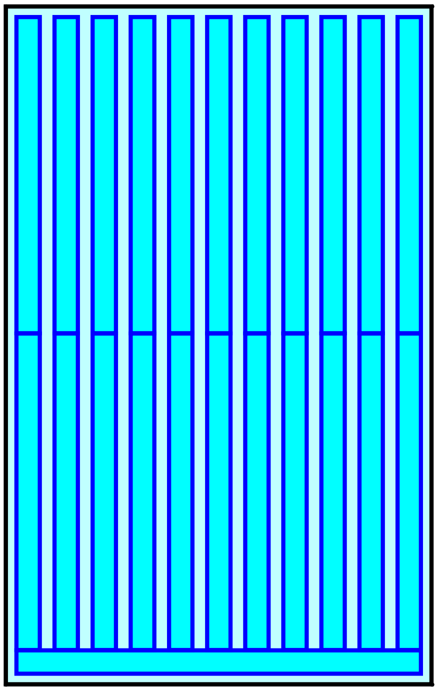
2 Chambers/Row x 20.00' Long +1.50' Header x 1 = 41.50' Row Length +8.0" End Stone x 2 = 42.83' Base Length
11 Rows x 18.0" Wide + 10.9" Spacing x 10 + 8.0" Side Stone x 2 = 26.91' Base Width
4.0" Stone Base + 18.0" Chamber Height + 4.0" Stone Cover = 2.17' Field Height

22 Chambers x 24.0 cf + 25.58' Header x 1.20 sf = 558.7 cf Chamber Storage
22 Chambers x 31.9 cf + 25.58' Header x 1.60 sf = 743.2 cf Displacement

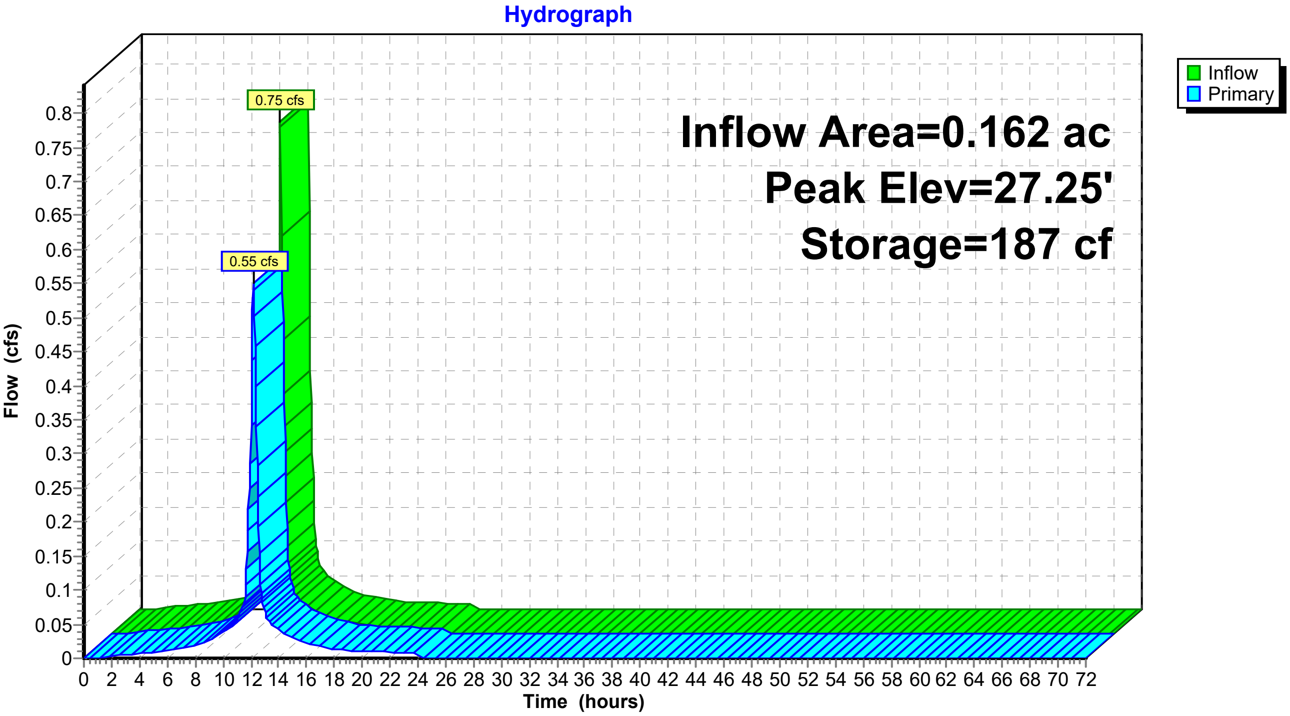
2,496.7 cf Field - 743.2 cf Chambers = 1,753.5 cf Stone x 0.0% Voids = 0.0 cf Stone Storage

Chamber Storage = 558.7 cf = 0.013 af
Overall Storage Efficiency = 22.4%
Overall System Size = 42.83' x 26.91' x 2.17'

22 Chambers
92.5 cy Field
64.9 cy Stone



Pond D-1: Subsurface Detention System



Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentR-D: Roof Runoff Area=6,916 sf 100.00% Impervious Runoff Depth=5.91"
Tc=6.0 min CN=98 Runoff=0.93 cfs 0.078 af

SubcatchmentS-D: Parcel D Runoff Area=2,793 sf 15.32% Impervious Runoff Depth=4.23"
Tc=6.0 min CN=83 Runoff=0.31 cfs 0.023 af

SubcatchmentS-D-1: Parcel D Runoff Area=138 sf 100.00% Impervious Runoff Depth=5.91"
Tc=6.0 min CN=98 Runoff=0.02 cfs 0.002 af

SubcatchmentS-D-OS: Offsite Runoff Area=3,198 sf 21.89% Impervious Runoff Depth=3.51"
Tc=6.0 min CN=76 Runoff=0.30 cfs 0.021 af

SubcatchmentS-D-OS-1: Offsite Runoff Area=3,008 sf 0.00% Impervious Runoff Depth=2.92"
Tc=6.0 min CN=70 Runoff=0.23 cfs 0.017 af

Reach DP-D: Commercial Street Inflow=1.44 cfs 0.141 af
Outflow=1.44 cfs 0.141 af

Pond D-1: Subsurface Detention System Peak Elev=27.40' Storage=269 cf Inflow=0.95 cfs 0.080 af
Outflow=0.66 cfs 0.080 af

Total Runoff Area = 0.369 ac Runoff Volume = 0.141 af Average Runoff Depth = 4.58"
49.03% Pervious = 0.181 ac 50.97% Impervious = 0.188 ac

Summary for Subcatchment R-D: Roof

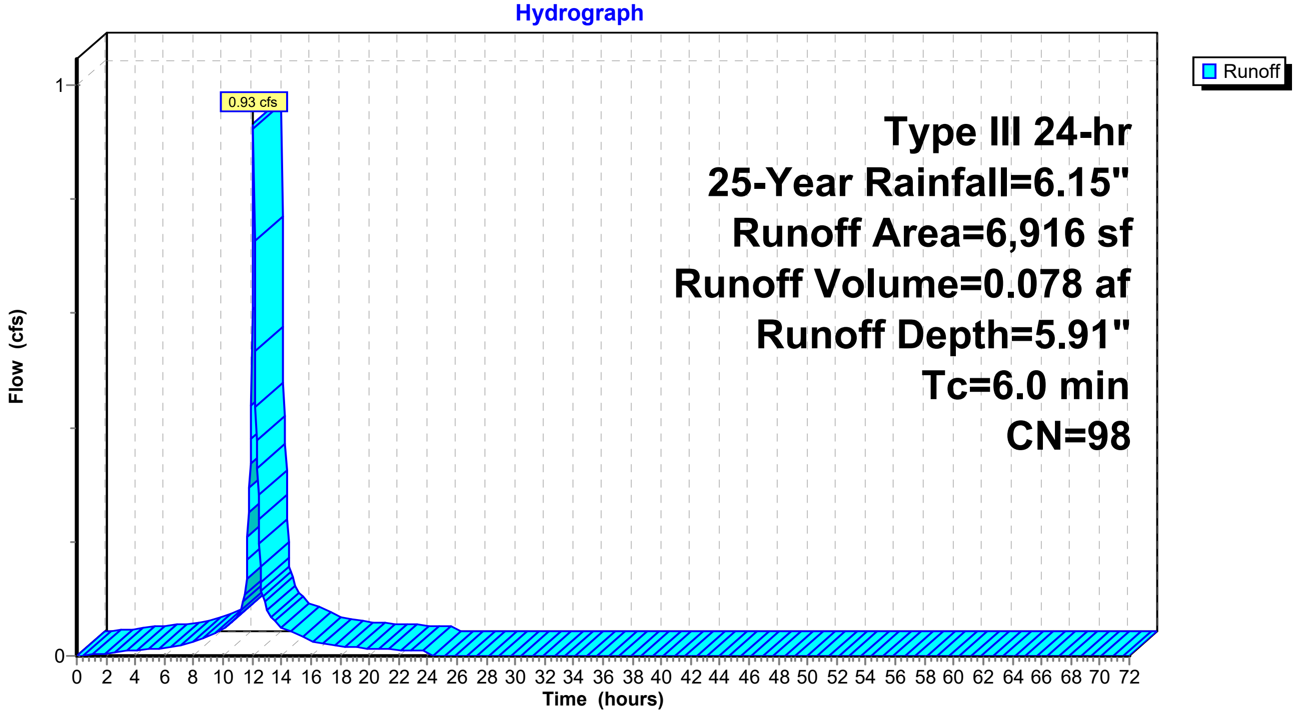
Runoff = 0.93 cfs @ 12.09 hrs, Volume= 0.078 af, Depth= 5.91"
Routed to Pond D-1 : Subsurface Detention System

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.15"

Area (sf)	CN	Description
6,916	98	Roofs, HSG C
6,916		100.00% Impervious Area

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

Subcatchment R-D: Roof



Summary for Subcatchment S-D: Parcel D

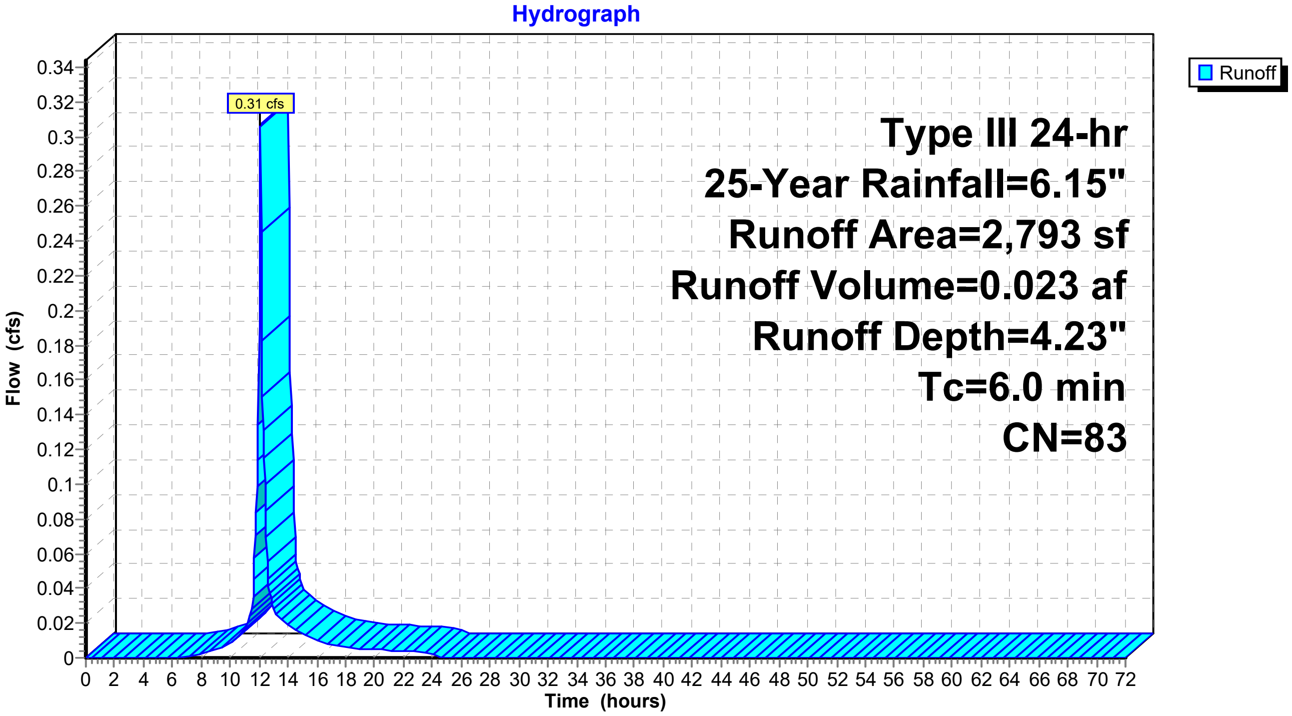
Runoff = 0.31 cfs @ 12.09 hrs, Volume= 0.023 af, Depth= 4.23"
Routed to Reach DP-D : Commercial Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.15"

	Area (sf)	CN	Description
*	72	98	Transformer, HSG C
	218	96	Gravel surface, HSG C
*	630	92	Permeable paver sidewalk, HSG C
*	94	98	Wall, HSG C
*	1,517	74	Plantings, HSG C
*	262	98	Sidewalk, HSG C
	2,793	83	Weighted Average
	2,365		84.68% Pervious Area
	428		15.32% Impervious Area

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

Subcatchment S-D: Parcel D



Summary for Subcatchment S-D-1: Parcel D

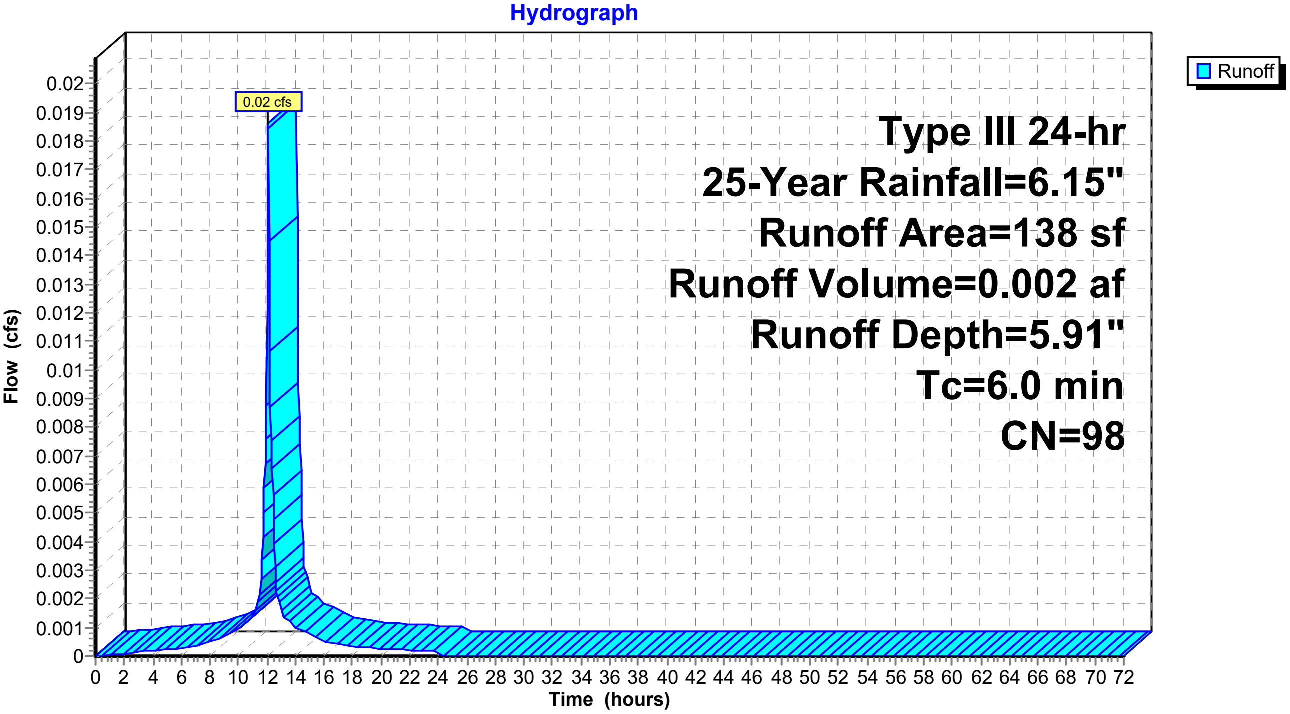
Runoff = 0.02 cfs @ 12.09 hrs, Volume= 0.002 af, Depth= 5.91"
Routed to Pond D-1 : Subsurface Detention System

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.15"

	Area (sf)	CN	Description
*	138	98	Pavement, HSG C
	138		100.00% Impervious Area

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

Subcatchment S-D-1: Parcel D



Summary for Subcatchment S-D-OS: Offsite

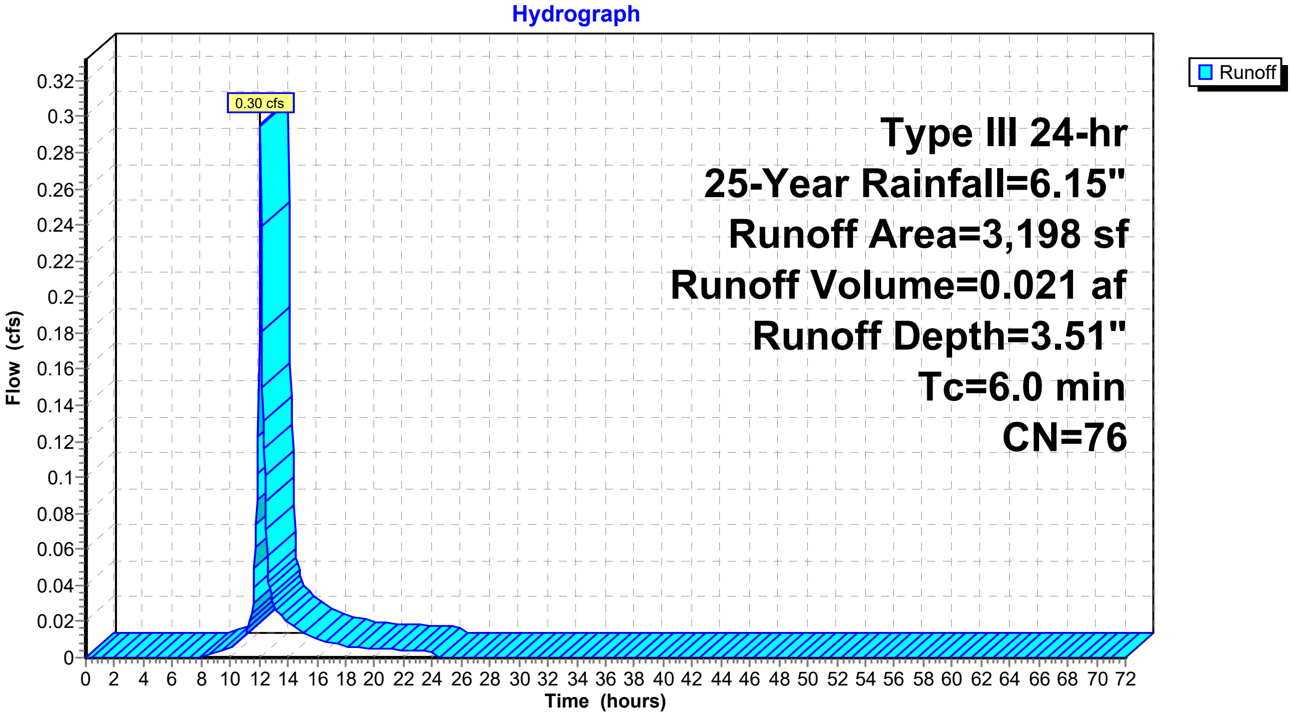
Runoff = 0.30 cfs @ 12.09 hrs, Volume= 0.021 af, Depth= 3.51"
Routed to Reach DP-D : Commercial Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.15"

	Area (sf)	CN	Description
*	700	98	Roofs, HSG C (OFFSITE)
*	2,498	70	Woods, Good, HSG C (OFFSITE)
	3,198	76	Weighted Average
	2,498		78.11% Pervious Area
	700		21.89% Impervious Area

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

Subcatchment S-D-OS: Offsite



Summary for Subcatchment S-D-OS-1: Offsite

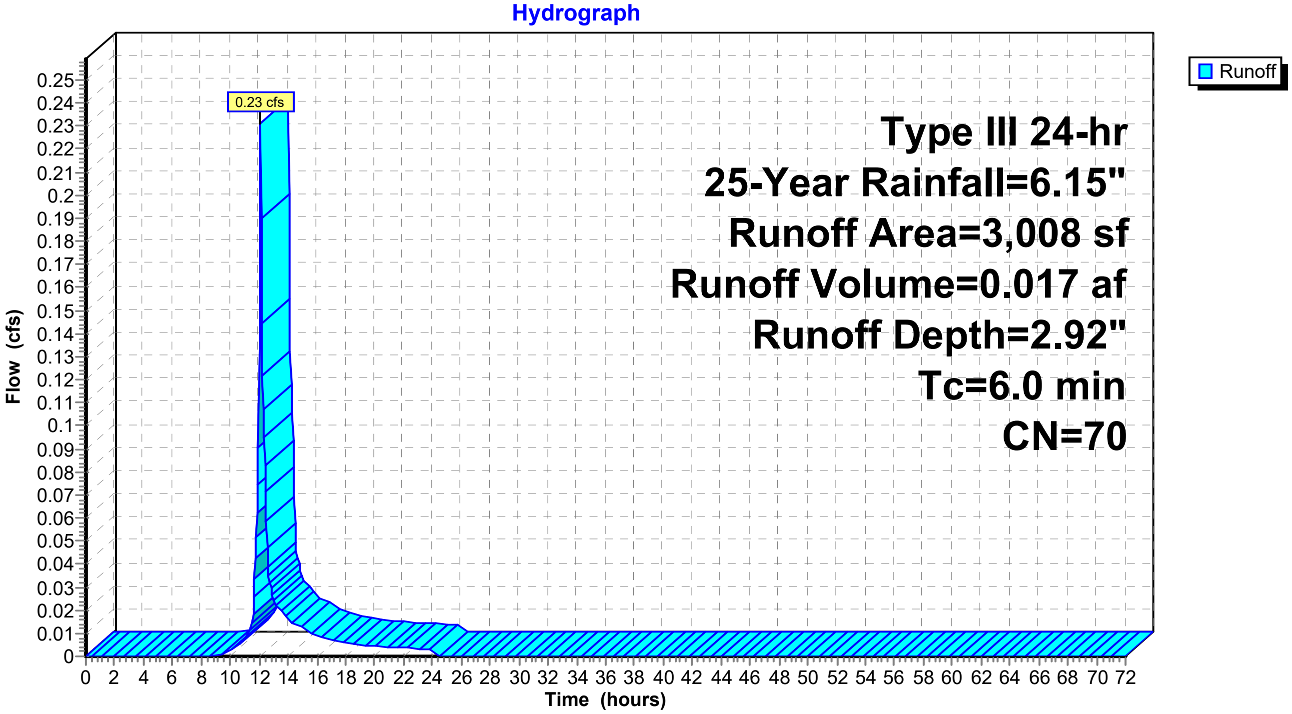
Runoff = 0.23 cfs @ 12.09 hrs, Volume= 0.017 af, Depth= 2.92"
Routed to Reach DP-D : Commercial Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.15"

	Area (sf)	CN	Description
*	3,008	70	Woods, Good, HSG C (OFFSITE)
	3,008		100.00% Pervious Area

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

Subcatchment S-D-OS-1: Offsite

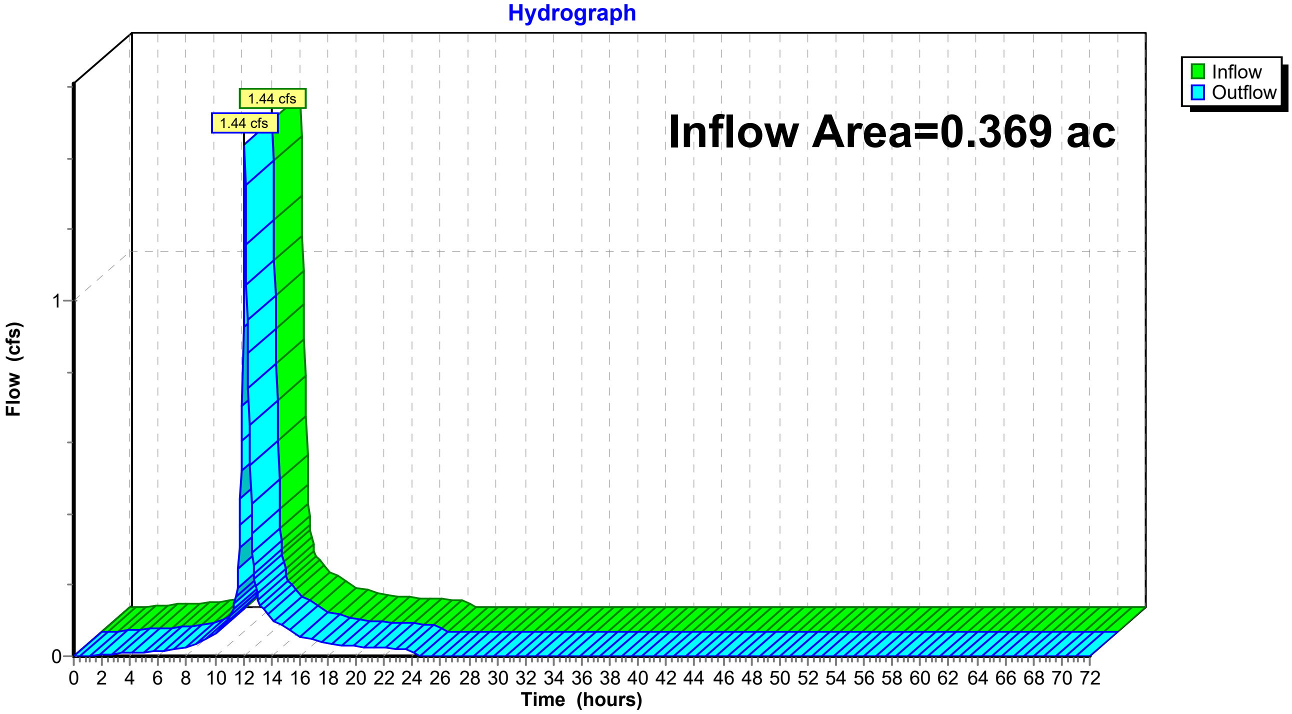


Summary for Reach DP-D: Commercial Street

Inflow Area =	0.369 ac,	50.97% Impervious,	Inflow Depth = 4.58"	for 25-Year event
Inflow =	1.44 cfs @	12.11 hrs, Volume=	0.141 af	
Outflow =	1.44 cfs @	12.11 hrs, Volume=	0.141 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach DP-D: Commercial Street



Summary for Pond D-1: Subsurface Detention System

Inflow Area = 0.162 ac,100.00% Impervious, Inflow Depth = 5.91" for 25-Year event
Inflow = 0.95 cfs @ 12.09 hrs, Volume= 0.080 af
Outflow = 0.66 cfs @ 12.17 hrs, Volume= 0.080 af, Atten= 31%, Lag= 5.2 min
Primary = 0.66 cfs @ 12.17 hrs, Volume= 0.080 af
Routed to Reach DP-D : Commercial Street

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 27.40' @ 12.17 hrs Surf.Area= 1,153 sf Storage= 269 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 2.3 min (747.0 - 744.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	26.33'	0 cf	**26.91'W x 42.83'L x 2.17'H Field A** 2,497 cf Overall - 743 cf Embedded = 1,754 cf x 0.0% Voids
#2A	26.66'	559 cf	**ADS N-12 15"** x 22 Inside #1 Inside= 14.8"W x 14.8"H => 1.20 sf x 20.00'L = 24.0 cf Outside= 18.0"W x 18.0"H => 1.60 sf x 20.00'L = 31.9 cf 22 Chambers in 11 Rows 25.58' Header x 1.20 sf x 1 = 30.7 cf Inside
		559 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	26.66'	**12.0" Round Culvert** L= 20.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 26.66' / 25.00' S= 0.0830 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	26.66'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	27.85'	**4.0' long x 2.00' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.65 cfs @ 12.17 hrs HW=27.39' (Free Discharge)
└─**1=Culvert** (Passes 0.65 cfs of 1.77 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.65 cfs @ 3.32 fps)
  └─**3=Sharp-Crested Rectangular Weir**(Controls 0.00 cfs)

Pond D-1: Subsurface Detention System - Chamber Wizard Field A

Chamber Model = ADS N-12 15" (ADS N-12® Pipe)
Inside= 14.8"W x 14.8"H => 1.20 sf x 20.00'L = 24.0 cf
Outside= 18.0"W x 18.0"H => 1.60 sf x 20.00'L = 31.9 cf

18.0" Wide + 10.9" Spacing = 28.9" C-C Row Spacing

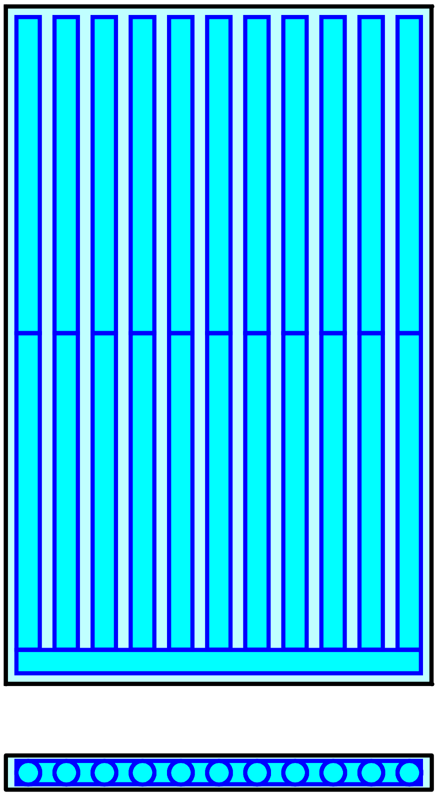
2 Chambers/Row x 20.00' Long +1.50' Header x 1 = 41.50' Row Length +8.0" End Stone x 2 = 42.83' Base Length
11 Rows x 18.0" Wide + 10.9" Spacing x 10 + 8.0" Side Stone x 2 = 26.91' Base Width
4.0" Stone Base + 18.0" Chamber Height + 4.0" Stone Cover = 2.17' Field Height

22 Chambers x 24.0 cf + 25.58' Header x 1.20 sf = 558.7 cf Chamber Storage
22 Chambers x 31.9 cf + 25.58' Header x 1.60 sf = 743.2 cf Displacement

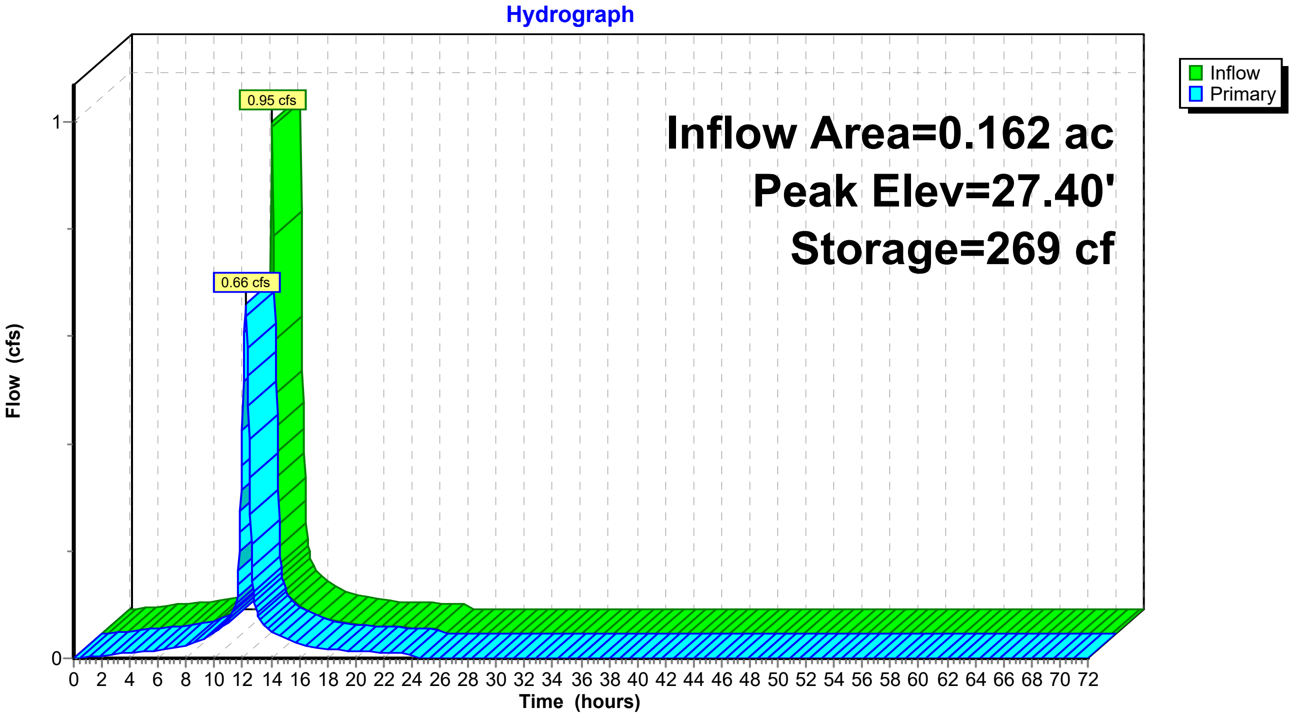
2,496.7 cf Field - 743.2 cf Chambers = 1,753.5 cf Stone x 0.0% Voids = 0.0 cf Stone Storage

Chamber Storage = 558.7 cf = 0.013 af
Overall Storage Efficiency = 22.4%
Overall System Size = 42.83' x 26.91' x 2.17'

22 Chambers
92.5 cy Field
64.9 cy Stone



Pond D-1: Subsurface Detention System



Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 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 R-D: Roof	Runoff Area=6,916 sf 100.00% Impervious Runoff Depth=8.56" Tc=6.0 min CN=98 Runoff=1.34 cfs 0.113 af
Subcatchment S-D: Parcel D	Runoff Area=2,793 sf 15.32% Impervious Runoff Depth=6.74" Tc=6.0 min CN=83 Runoff=0.48 cfs 0.036 af
Subcatchment S-D-1: Parcel D	Runoff Area=138 sf 100.00% Impervious Runoff Depth=8.56" Tc=6.0 min CN=98 Runoff=0.03 cfs 0.002 af
Subcatchment S-D-OS: Offsite	Runoff Area=3,198 sf 21.89% Impervious Runoff Depth=5.89" Tc=6.0 min CN=76 Runoff=0.49 cfs 0.036 af
Subcatchment S-D-OS-1: Offsite	Runoff Area=3,008 sf 0.00% Impervious Runoff Depth=5.16" Tc=6.0 min CN=70 Runoff=0.41 cfs 0.030 af
Reach DP-D: Commercial Street	Inflow=2.15 cfs 0.217 af Outflow=2.15 cfs 0.217 af
Pond D-1: Subsurface Detention System	Peak Elev=27.75' Storage=462 cf Inflow=1.37 cfs 0.116 af Outflow=0.86 cfs 0.116 af

Total Runoff Area = 0.369 ac Runoff Volume = 0.217 af Average Runoff Depth = 7.07"
49.03% Pervious = 0.181 ac 50.97% Impervious = 0.188 ac

Summary for Subcatchment R-D: Roof

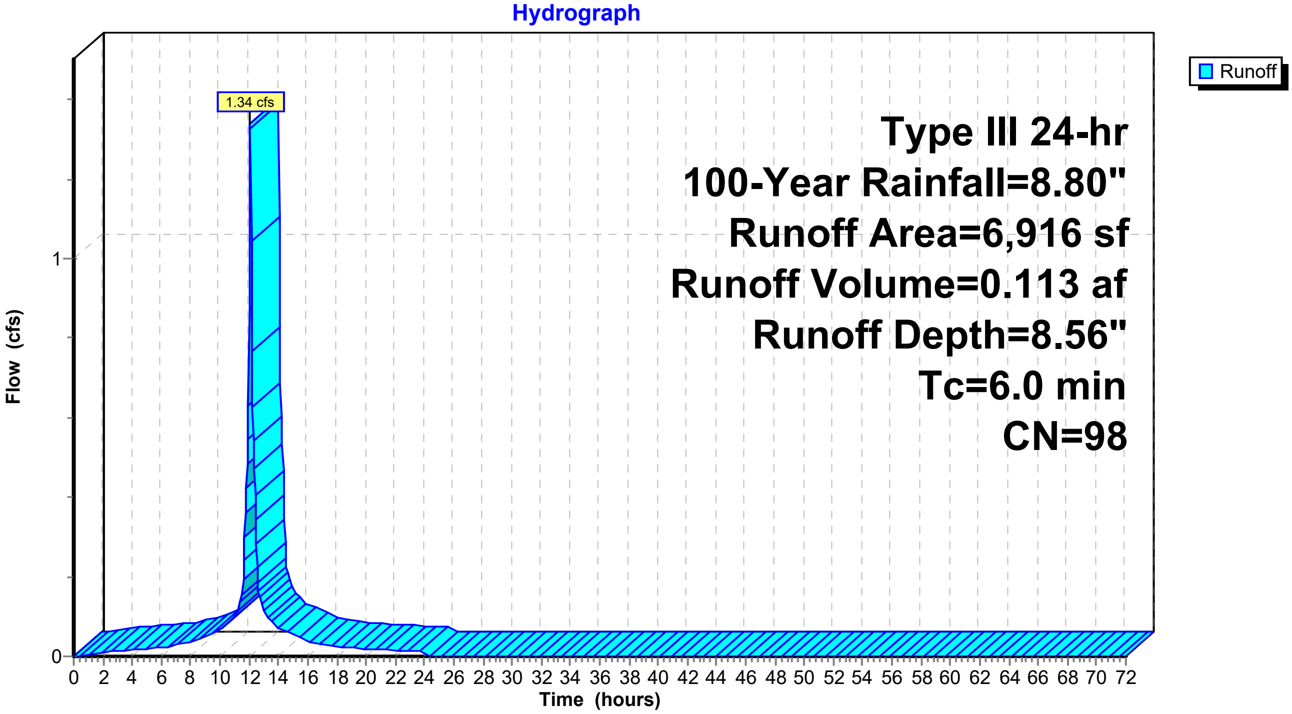
Runoff = 1.34 cfs @ 12.09 hrs, Volume= 0.113 af, Depth= 8.56"
Routed to Pond D-1 : Subsurface Detention System

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.80"

Area (sf)	CN	Description
6,916	98	Roofs, HSG C
6,916		100.00% Impervious Area

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

Subcatchment R-D: Roof



Summary for Subcatchment S-D: Parcel D

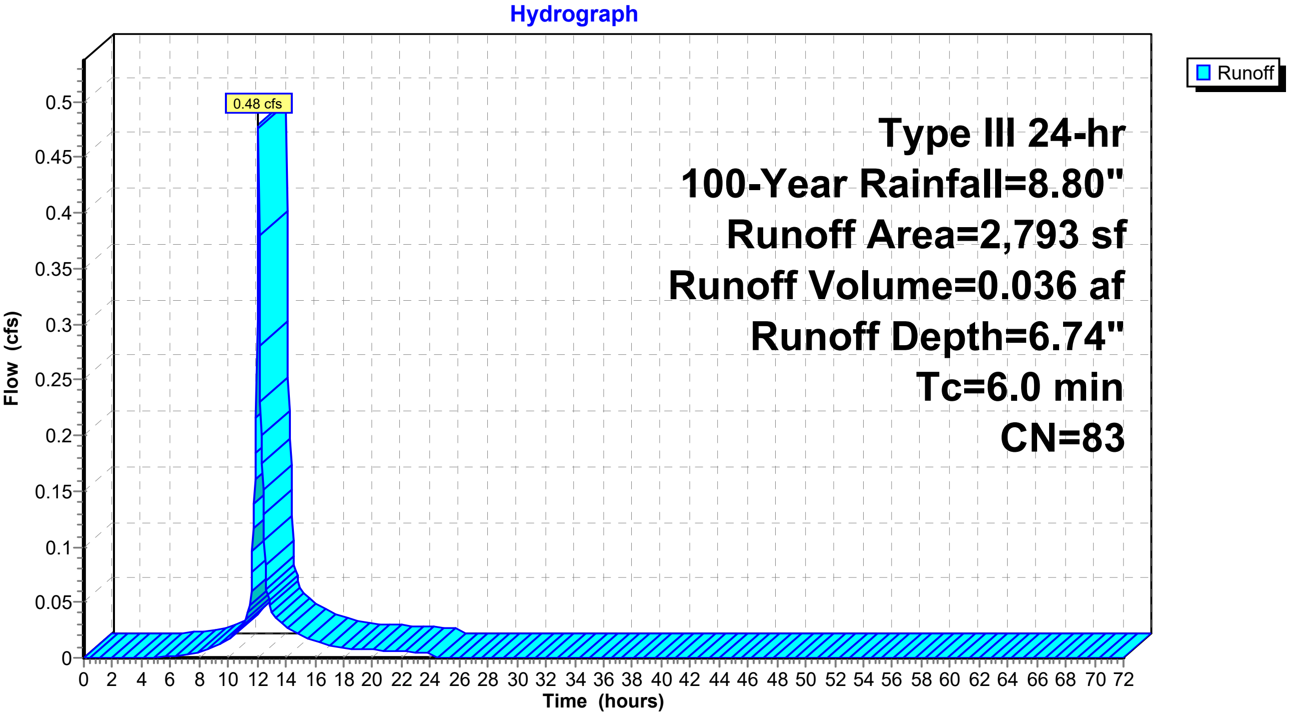
Runoff = 0.48 cfs @ 12.09 hrs, Volume= 0.036 af, Depth= 6.74"
Routed to Reach DP-D : Commercial Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.80"

	Area (sf)	CN	Description
*	72	98	Transformer, HSG C
	218	96	Gravel surface, HSG C
*	630	92	Permeable paver sidewalk, HSG C
*	94	98	Wall, HSG C
*	1,517	74	Plantings, HSG C
*	262	98	Sidewalk, HSG C
	2,793	83	Weighted Average
	2,365		84.68% Pervious Area
	428		15.32% Impervious Area

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

Subcatchment S-D: Parcel D



Summary for Subcatchment S-D-1: Parcel D

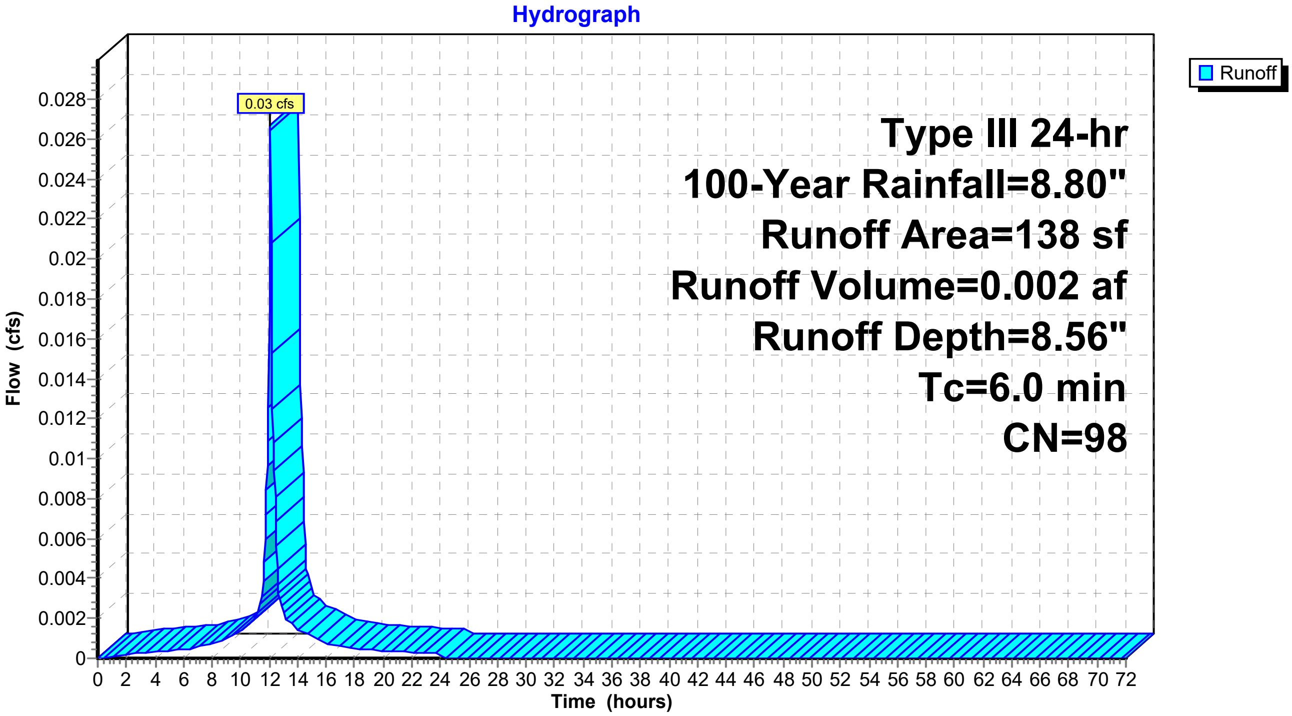
Runoff = 0.03 cfs @ 12.09 hrs, Volume= 0.002 af, Depth= 8.56"
Routed to Pond D-1 : Subsurface Detention System

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.80"

	Area (sf)	CN	Description
*	138	98	Pavement, HSG C
	138		100.00% Impervious Area

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

Subcatchment S-D-1: Parcel D



Summary for Subcatchment S-D-OS: Offsite

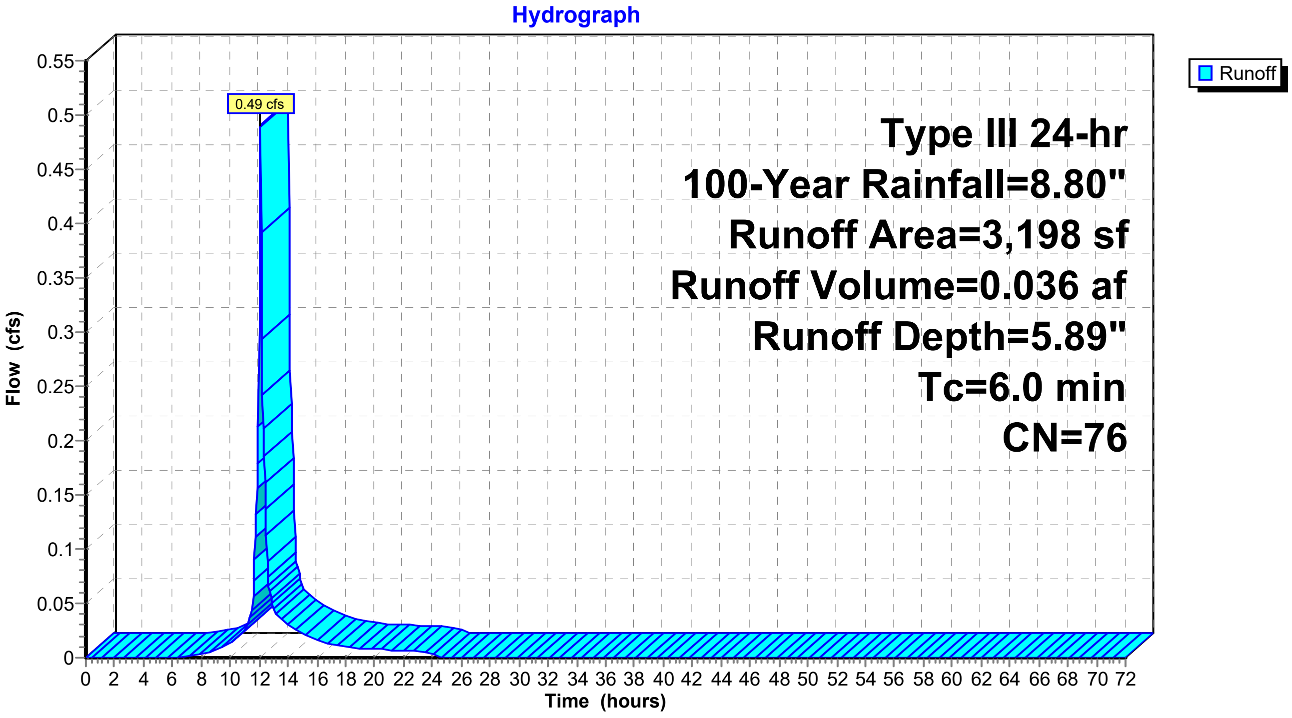
Runoff = 0.49 cfs @ 12.09 hrs, Volume= 0.036 af, Depth= 5.89"
Routed to Reach DP-D : Commercial Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.80"

	Area (sf)	CN	Description
*	700	98	Roofs, HSG C (OFFSITE)
*	2,498	70	Woods, Good, HSG C (OFFSITE)
	3,198	76	Weighted Average
	2,498		78.11% Pervious Area
	700		21.89% Impervious Area

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

Subcatchment S-D-OS: Offsite



Summary for Subcatchment S-D-OS-1: Offsite

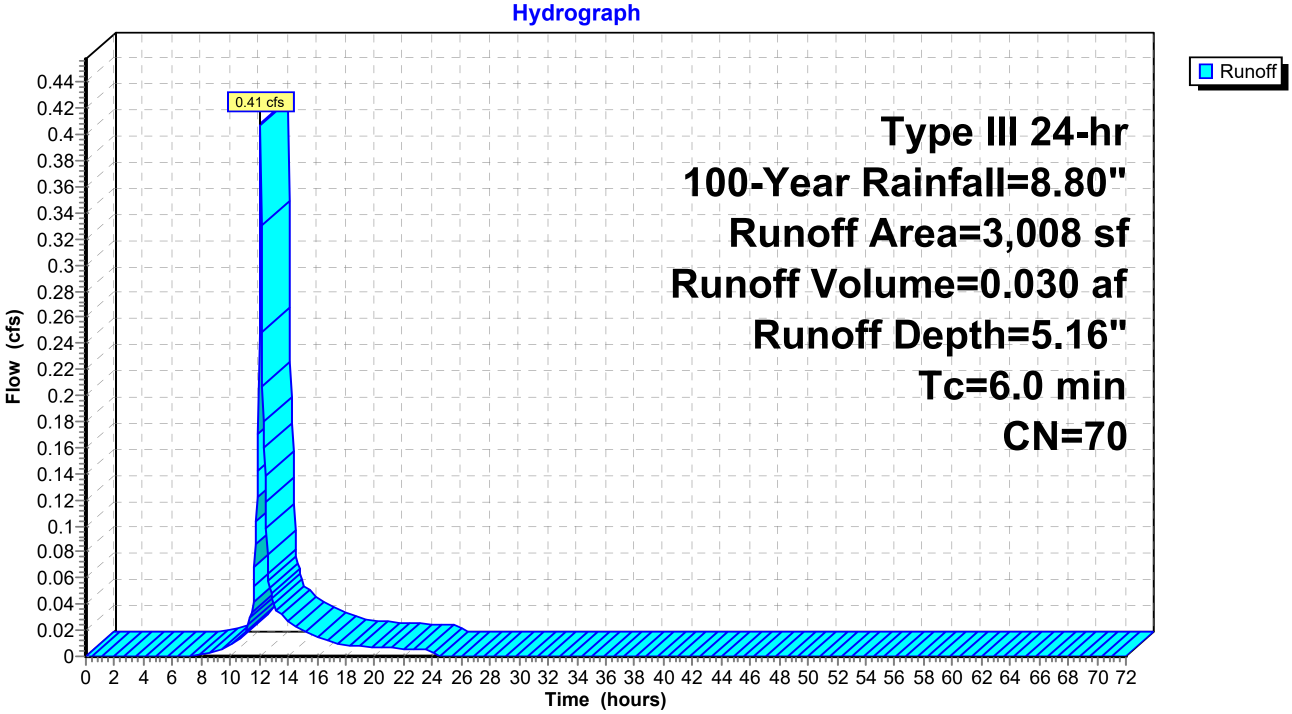
Runoff = 0.41 cfs @ 12.09 hrs, Volume= 0.030 af, Depth= 5.16"
Routed to Reach DP-D : Commercial Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.80"

	Area (sf)	CN	Description
*	3,008	70	Woods, Good, HSG C (OFFSITE)
	3,008		100.00% Pervious Area

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

Subcatchment S-D-OS-1: Offsite

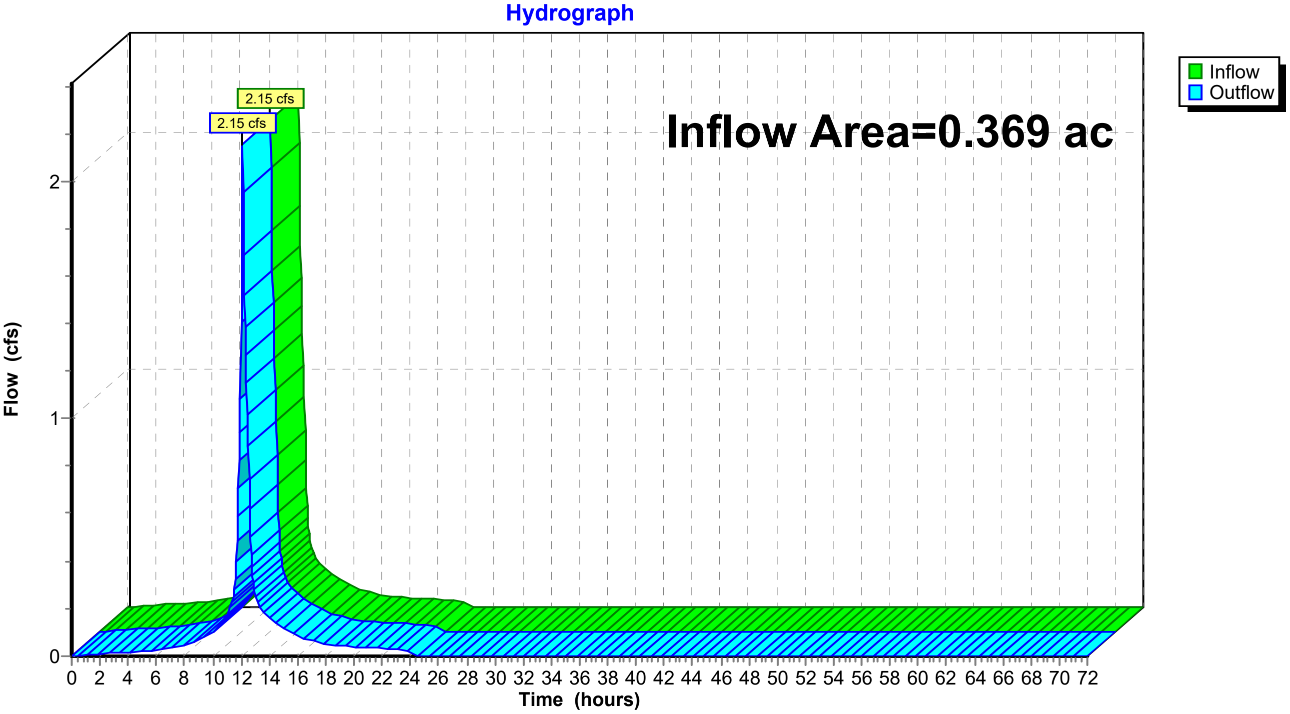


Summary for Reach DP-D: Commercial Street

Inflow Area =	0.369 ac,	50.97% Impervious,	Inflow Depth = 7.07"	for 100-Year event
Inflow =	2.15 cfs @	12.10 hrs, Volume=	0.217 af	
Outflow =	2.15 cfs @	12.10 hrs, Volume=	0.217 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach DP-D: Commercial Street



Summary for Pond D-1: Subsurface Detention System

Inflow Area = 0.162 ac,100.00% Impervious, Inflow Depth = 8.56" for 100-Year event
Inflow = 1.37 cfs @ 12.09 hrs, Volume= 0.116 af
Outflow = 0.86 cfs @ 12.19 hrs, Volume= 0.116 af, Atten= 37%, Lag= 6.3 min
Primary = 0.86 cfs @ 12.19 hrs, Volume= 0.116 af
Routed to Reach DP-D : Commercial Street

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 27.75' @ 12.19 hrs Surf.Area= 1,153 sf Storage= 462 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 3.1 min (743.2 - 740.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	26.33'	0 cf	**26.91'W x 42.83'L x 2.17'H Field A** 2,497 cf Overall - 743 cf Embedded = 1,754 cf x 0.0% Voids
#2A	26.66'	559 cf	**ADS N-12 15"** x 22 Inside #1 Inside= 14.8"W x 14.8"H => 1.20 sf x 20.00'L = 24.0 cf Outside= 18.0"W x 18.0"H => 1.60 sf x 20.00'L = 31.9 cf 22 Chambers in 11 Rows 25.58' Header x 1.20 sf x 1 = 30.7 cf Inside
		559 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	26.66'	**12.0" Round Culvert** L= 20.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 26.66' / 25.00' S= 0.0830 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	26.66'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	27.85'	**4.0' long x 2.00' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.86 cfs @ 12.19 hrs HW=27.74' (Free Discharge)
└─**1=Culvert** (Passes 0.86 cfs of 2.88 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.86 cfs @ 4.39 fps)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond D-1: Subsurface Detention System - Chamber Wizard Field A

Chamber Model = ADS N-12 15" (ADS N-12® Pipe)
Inside= 14.8"W x 14.8"H => 1.20 sf x 20.00'L = 24.0 cf
Outside= 18.0"W x 18.0"H => 1.60 sf x 20.00'L = 31.9 cf

18.0" Wide + 10.9" Spacing = 28.9" C-C Row Spacing

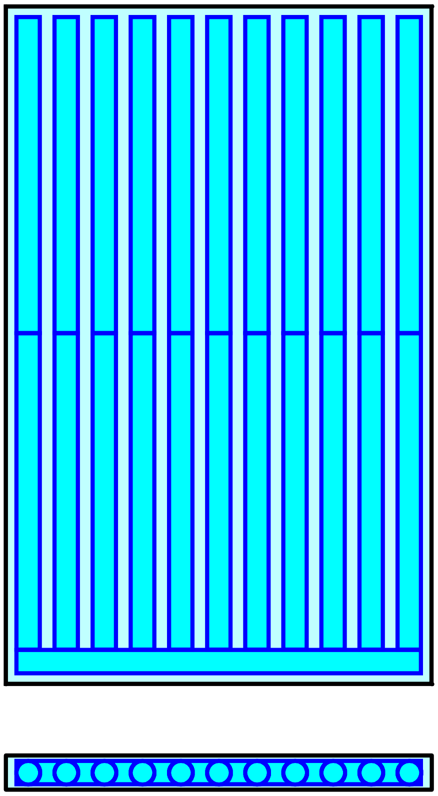
2 Chambers/Row x 20.00' Long +1.50' Header x 1 = 41.50' Row Length +8.0" End Stone x 2 = 42.83' Base Length
11 Rows x 18.0" Wide + 10.9" Spacing x 10 + 8.0" Side Stone x 2 = 26.91' Base Width
4.0" Stone Base + 18.0" Chamber Height + 4.0" Stone Cover = 2.17' Field Height

22 Chambers x 24.0 cf + 25.58' Header x 1.20 sf = 558.7 cf Chamber Storage
22 Chambers x 31.9 cf + 25.58' Header x 1.60 sf = 743.2 cf Displacement

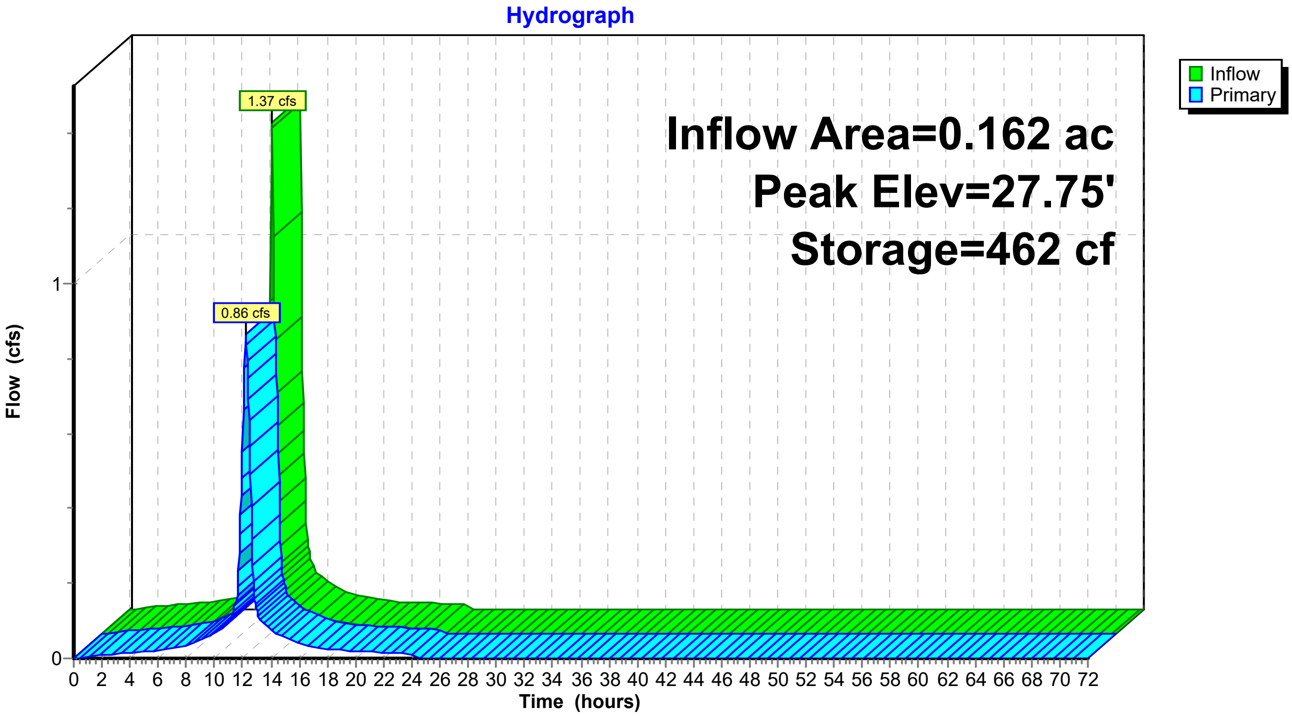
2,496.7 cf Field - 743.2 cf Chambers = 1,753.5 cf Stone x 0.0% Voids = 0.0 cf Stone Storage

Chamber Storage = 558.7 cf = 0.013 af
Overall Storage Efficiency = 22.4%
Overall System Size = 42.83' x 26.91' x 2.17'

22 Chambers
92.5 cy Field
64.9 cy Stone



Pond D-1: Subsurface Detention System



APPENDIX C

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.

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

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

B. Stormwater Checklist and Certification

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

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

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

Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature

BRADLEY C McKENZIE
CIVIL
No. 36917

11-17-2023
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 (continued)

LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

☒ No disturbance to any Wetland Resource Areas

☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)

☐ Reduced Impervious Area (Redevelopment Only)

☐ Minimizing disturbance to existing trees and shrubs

☐ LID Site Design Credit Requested:

  ☐ Credit 1

  ☐ Credit 2

  ☐ Credit 3

☐ Use of "country drainage" versus curb and gutter conveyance and pipe

☒ Bioretention Cells (includes Rain Gardens)

☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)

☐ Treebox Filter

☐ Water Quality Swale

☐ Grass Channel

☐ Green Roof

☐ Other (describe): ____________________

Standard 1: No New Untreated Discharges

☒ No new untreated discharges

☐ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth

☐ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.

Checklist (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.

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

Checklist (continued)

Standard 3: Recharge (continued)

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

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

Standard 4: Water Quality

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

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

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

  ☐ is within the Zone II or Interim Wellhead Protection Area

  ☒ is near or to other critical areas

  ☐ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)

  ☐ involves runoff from land uses with higher potential pollutant loads.

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

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

Checklist (continued)

Standard 4: Water Quality (continued)

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

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

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

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

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

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

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

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

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

☐ All exposure has been eliminated.

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

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

Standard 6: Critical Areas

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

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

Checklist for Stormwater Report

Checklist (continued)

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

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

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

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

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

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

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

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

Standard 9: Operation and Maintenance Plan

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

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

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

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

Standard 10: Prohibition of Illicit Discharges

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

☒ An Illicit Discharge Compliance Statement is attached;

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

APPENDIX D

Illicit Discharge Compliance Statement
Supplemental BMP Calculations
Mounding Analysis

Illicit Discharge Compliance Statement

I, Bradley C. McKenzie, P.E., hereby notify the Weymouthl Conservation Commission that I have not witnessed, nor am aware of any existing illicit discharges at the site known as Parcel IDs 23-253-14, 16 & 17, 23-305-1,4,9,10 & 11, 23-306-11 in Weymouth, Massachusetts. I also hereby certify that the development of said property as illustrated on the final plans entitled "NOI Site Plan Review, Jackson Square, Weymouth, Massachusetts," prepared by McKenzie Engineering Group. Inc. dated September 6, 2023 and as revised and approved by the Weymouth Conservation Commission and maintenance thereof in accordance with the "Construction Phase Operations and Maintenance Plan" and "Long-Term Operations and Maintenance Plan" prepared by McKenzie Engineering Group, Inc. dated August 4, 2023 and as revised and approved by the Weymouth Conservation Commission will not create any new illicit discharges. There is no warranty implied regarding future illicit discharges that may occur as a result of improper construction or maintenance of the stormwater management system or unforeseen accidents.

Name: Bradley C. McKenzie, P.E.

Company: McKenzie Engineering Group, Inc.

Title: President

Signature:

Date: 11-17-2023

MCKENZIE
ENGINEERING GROUP

Assinippi Office Park
150 Longwater Drive, Suite 101
Norwell, MA 02061

JACKSON SQUARE **11/17/2023**
WEYMOUTH, MA

Sediment Trap Sizing for Proposed Outlets - FES-1 (12" HDPE from Trench Drain TD-3)

Key: ☐ input data in cell

Equation: d_{10}=(0.0125(Q_{10})^(4/3))/(Tw * D_0)

Outlet Pipe Diameter (D_o):	12	in.	=	1	ft.		
10-yr Flow (Q_{10}):	0.46	cfs					
Depth of Trap (Y) (1/2 pipe diameter, 1ft. min):	6	in.	=	0.5	ft.	use -->	1 ft.
Depth of Tailwater (Tw) (assume 0.2')	0.2	ft.					
Min. Stone Size (d_{100}) (8" min.)	0.022	ft.	=	0.266	in.	use -->	8 in.

Trap Size

Length (l) (3'+3'+3(D_0))	9	ft.
Width (w) (3'+3'+2(D_0))	8	ft.

MCKENZIE
ENGINEERING GROUP

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Norwell, MA 02061

JACKSON SQUARE **11/17/2023**
WEYMOUTH, MA

Sediment Trap Sizing for Proposed Outlets - FES-2 (6" Roof Drain)

Key: ☐ input data in cell

Equation: d_{10}=(0.0125(Q_{10})^(4/3))/(Tw * D_0)

Outlet Pipe Diameter (D_o):	6 in.	=	0.5 ft.		
10-yr Flow (Q_{10}):	1.93 cfs				
Depth of Trap (Y) (1/2 pipe diameter, 1ft. min):	3 in.	=	0.25 ft.	use -->	1 ft.
Depth of Tailwater (Tw) (assume 0.2')	0.2 ft.				
Min. Stone Size (d_{100}) (8" min.)	0.300 ft.	=	3.604 in.	use -->	8 in.

Trap Size

Length (l) (3'+3'+3(D_0))	7.5 ft.
Width (w) (3'+3'+2(D_0))	7 ft.

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SITES A & B

REQUIRED RECHARGE VOLUME (CF) *"STATIC METHOD"*

WATERSHED #	IMPERVIOUS AREA (SF)	TARGET DEPTH FACTOR (F) A SOIL	IMPERVIOUS AREA (SF)	TARGET DEPTH FACTOR (F) B SOIL	IMPERVIOUS AREA (SF)	TARGET DEPTH FACTOR (F) C SOIL	IMPERVIOUS AREA (SF)	TARGET DEPTH FACTOR (F) D SOIL		REQUIRED RECHARGE VOLUME (CF)
S-A-1	244	0.60		0.35	276	0.25		0.10		18
R-A1	10,606	0.60		0.35	263	0.25		0.10		536
R-A2		0.60		0.35	18,000	0.25		0.10		375
S-A-2		0.60		0.35	3,270	0.25		0.10		68
S-A-3	438	0.60		0.35		0.25		0.10		22
S-B-1		0.60		0.35	583	0.25		0.10		12
S-B-2		0.60		0.35	973	0.25		0.10		20
R-B		0.60		0.35	11,143	0.25		0.10		232
		0.60		0.35		0.25		0.10		0
		0.60		0.35		0.25		0.10		0
		0.60		0.35		0.25		0.10		0
TOTAL	**11,288**				**34,508**					**1,283**

CAPTURE ADJUSTMENT

WATERSHED #	TOTAL IMPERVIOUS AREA (SF)	TOTAL IMPERVIOUS COLLECTED	% DIRECTED TOWARDS INFILTRATION SYSTEM	STANDARD NO. 3 <100% - > 65% CAPTURED	CAPTURE ADJUSTMENT	ADJUSTED REQUIRED RECHARGE VOLUME (CF)
TOTAL SITE	45,796	29,726	64.91%	**CAPTURE ADJUSTMENT REQUIRED**	1.54	1,977

PROVIDED RECHARGE VOLUME (CF)
BELOW LOWEST INVERT

	REQUIRED RECHARGE VOLUME (CF)	POND	STORAGE VOLUME PROVIDED (CF)	NET STORAGE VOLUME PROVIDED (CF)
	1,977	AB-2	3,412	
		AB-3	484	
TOTAL	**1,977**		**3,896**	**1,919**

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DRAWDOWN WITHIN 72 HOURS ANALYSIS

POND	RAWLS RATE (IN/HR)	STORAGE VOLUME PROVIDED (CF)	BOTTOM AREA (FT2)	DRAWDOWN (HR)
AB-2	2.41	3,412	3,092	5
AB-3	2.41	484	2,589	1

Stage-Area-Storage for Pond AB-2: Subsurface Infiltration System

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
18.75	**3,092**	0
18.80	3,092	62
18.85	3,092	124
18.90	3,092	186
18.95	3,092	247
19.00	3,092	309
19.05	3,092	371
19.10	3,092	457
19.15	3,092	581
19.20	3,092	704
19.25	3,092	827
19.30	3,092	950
19.35	3,092	1,073
19.40	3,092	1,196
19.45	3,092	1,319
19.50	3,092	1,442
19.55	3,092	1,565
19.60	3,092	1,689
19.65	3,092	1,812
19.70	3,092	1,935
19.75	3,092	2,058
19.80	3,092	2,181
19.85	3,092	2,304
19.90	3,092	2,427
19.95	3,092	2,550
20.00	3,092	2,673
20.05	3,092	2,797
20.10	3,092	2,920
20.15	3,092	3,043
20.20	3,092	3,166
20.25	3,092	3,289
20.30	3,092	3,412
20.35	3,092	3,535
20.40	3,092	3,658
20.45	3,092	3,781
20.50	3,092	3,905
20.55	3,092	4,028
20.60	3,092	4,097
20.65	3,092	4,159
20.70	3,092	4,221
20.75	3,092	4,283
20.80	3,092	4,345
20.85	3,092	4,407
20.90	3,092	4,468
20.95	3,092	4,530
21.00	3,092	4,592
21.05	3,092	**4,654**
21.10	3,092	**4,666**
21.15	3,092	4,666
21.20	3,092	4,666
21.25	3,092	4,666
21.30	3,092	4,666
21.35	3,092	4,666
21.40	3,092	4,666
21.45	3,092	4,666
21.50	3,092	4,666
21.55	3,092	4,666
21.60	3,092	4,666
21.65	3,092	4,666
21.70	3,092	4,666
21.75	3,092	4,666
21.80	3,092	4,666
21.85	3,092	4,666
21.90	3,092	4,666
21.95	3,092	4,666
22.00	3,092	4,666
22.05	3,092	4,666
22.10	3,092	4,666
22.15	3,092	4,666
22.20	3,092	4,666
22.25	3,092	4,666
22.30	3,092	4,666
22.35	3,092	4,666
22.40	3,092	4,666
22.45	3,092	4,666
22.50	3,092	4,666
22.55	3,092	4,666
22.60	3,092	4,666
22.65	3,092	4,666
22.70	3,092	4,666
22.75	3,092	4,666
22.80	3,092	4,666
22.85	3,092	4,666
22.90	3,092	4,666
22.95	3,092	4,666
23.00	3,092	4,666
23.05	3,092	4,666
23.10	3,092	4,666
23.15	3,092	4,666
23.20	3,092	4,666
23.25	3,092	4,666
23.30	3,092	4,666
23.35	3,092	4,666
23.40	3,092	4,666
23.45	3,092	4,666

Stage-Area-Storage for Pond AB-3: Subsurface Infiltration System

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
19.50	**2,589**	0
19.55	2,589	52
19.60	2,589	104
19.65	2,589	155
19.70	2,589	207
19.75	2,589	259
19.80	2,589	311
19.85	2,589	382
19.90	2,589	484
19.95	2,589	585
20.00	2,589	687
20.05	2,589	788
20.10	2,589	889
20.15	2,589	991
20.20	2,589	1,092
20.25	2,589	1,194
20.30	2,589	1,295
20.35	2,589	1,397
20.40	2,589	1,498
20.45	2,589	1,599
20.50	2,589	1,687
20.55	2,589	1,739
20.60	2,589	1,791
20.65	2,589	1,842
20.70	2,589	1,894
20.75	2,589	1,946
20.80	2,589	1,998
20.85	2,589	2,050
20.90	2,589	2,101
20.95	2,589	**2,153**
21.00	2,589	**2,195**
21.05	2,589	2,195
21.10	2,589	2,195
21.15	2,589	2,195
21.20	2,589	2,195
21.25	2,589	2,195
21.30	2,589	2,195
21.35	2,589	2,195
21.40	2,589	2,195
21.45	2,589	2,195
21.50	2,589	2,195
21.55	2,589	2,195
21.60	2,589	2,195
21.65	2,589	2,195
21.70	2,589	2,195
21.75	2,589	2,195
21.80	2,589	2,195
21.85	2,589	2,195
21.90	2,589	2,195
21.95	2,589	2,195
22.00	2,589	2,195
22.05	2,589	2,195
22.10	2,589	2,195

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WATER QUALITY VOLUME ANALYSIS - SITES A & B

WATERSHED	IMPERVIOUS AREA (SF) CN=98	PRECIPITATION (IN)	WATER QUALITY VOLUME REQUIRED (CF)	TREATMENT VOLUME PROVIDED (CF) UP TO INVERT ELEVATION	NET TREATMENT VOLUME PROVIDED (CF)
S-A-1	520	1.00	43		
R-A1	10,869	1.00	906		
R-A2	18,000	1.00	1,500		
S-A-2	3,270	1.00	273		
S-A-3	438	1.00	37		
S-B-1	583	1.00	49		
S-B-2	973	1.00	81		
R-B	11,143	1.00	929		
TOTAL	**45,796**		**3,816**	**3,896**	**80**

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WEYMOUTH, MA

8/4/2023
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WATER QUALITY VOLUME ANALYSIS - SITE C

	IMPERVIOUS AREA (SF) CN=98	PRECIPITATION (IN)	WATER QUALITY VOLUME REQUIRED (CF)	TREATMENT VOLUME PROVIDED (CF) IN RAIN GARDEN	NET TREATMENT VOLUME PROVIDED (CF)
S-C	2,610	1.00	218		
R-C	17,666	1.00	1,472		
TOTAL	**20,276**		**1,690**	**1,973**	283
*OFFSITE TO BROOK	256,299	1.00	21,358		
TOTAL	**296,851**		**24,738**		

* TO BE PROVIDED BY STORMCEPTOR STC 16000

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JACKSON SQUARE
WEYMOUTH, MA **8/4/2023**

WATER QUALITY VOLUME ANALYSIS - SITE D

	IMPERVIOUS AREA (SF) CN=98	PRECIPITATION (IN)	WATER QUALITY VOLUME REQUIRED (CF)		
R-D	6,916	1.00	576		
S-D-1	138	1.00	12		
TOTAL	**7,054**		**588**		

* TO BE PROVIDED BY STORMCEPTOR STC 900

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JACKSON SQUARE
WEYMOUTH, MA

8/4/2023
REVISED 9/6/23
REVISED 11/17/2023

SEDIMENT FOREBAY SIZING (0.1-INCH / IMPERVIOUS ACRE) FOR BIO-RETENTION

	WATERSHED	IMPERVIOUS AREA (SF) CN=98	0.1 INCH / IMPERVIOUS ACRE	WATER QUALITY VOLUME REQUIRED (CF)
	S-C	2,610	0.10	22
	R-C	17,666	0.10	147
TOTAL		**20,276**		**169**

SEDIMENT FOREBAY VOLUME PROVIDED

FOREBAY	ELEVATION	AREA (SF)	CUMULATIVE VOLUME (CF)	TREATMENT VOLUME PROVIDED (CF) ELEVATIONS 26 TO 27.00	NET TREATMENT VOLUME PROVIDED (CF)
C-1	24.00	101.90	0		
	25.00	248.80	175		
TOTAL				**175**	**6**

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Standard 4: Pretreatment: **Subsurface**
Tanks AB-2

NAME: Jackson Square - Sites A & B
Weymouth, MA
CLIENT: CMK Development Partners
COUNTY: Norfolk

Proj. No.: 222-203
Date: 8/4/2023
Revised:
Computed by: SBS
Checked by: BCM

TSS Removal Calculation Worksheet

B BMP	C TSS Removal Rate	D Starting TSS Load (*F)	E Amount Removed (C*D)	F Remaining Load (D-E)
Proprietary Treatment Practice STC 900	**0.96**	**1.00**	**0.96**	**0.04**

Total TSS Removal = **96%**

*Equals remaining load from previous BMP (E)
which enters the BMP

Non-automated TSS Calculation Sheet
must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

Mass. Dept. of Environmental Protection

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Standard 4: Total Suspended Solids Calculation: Subsurface Tanks AB-2

NAME: Jackson Square - Sites A & B
Weymouth, MA
CLIENT: CMK Development Partners
COUNTY: Norfolk

Proj. No.: 222-203
Date: 8/4/2023
Revised:
Computed by: SBS
Checked by: BCM

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TSS Removal Calculation Worksheet

B BMP	C TSS Removal Rate	D Starting TSS Load (*F)	E Amount Removed (C*D)	F Remaining Load (D-E)
Proprietary Treatment Practice STC 900	**0.96**	**1.00**	**0.96**	**0.04**
Subsurface Infiltration Structure	**0.80**	**0.04**	**0.03**	**0.01**
	0.00	**0.01**	**0.00**	**0.01**
	0.00	**0.01**	**0.00**	**0.01**
	0.00	**0.01**	**0.00**	**0.01**

Total TSS Removal = **99%**

*Equals remaining load from previous BMP (E)
which enters the BMP

Non-automated TSS Calculation Sheet
must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

Mass. Dept. of Environmental Protection

Standard 4: Pretreatment: Subsurface
Tanks AB-3

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NAME: Jackson Square - Sites A & B
Weymouth, MA
CLIENT: CMK Development Partners
COUNTY: Norfolk

Proj. No.: 222-203
Date: 8/4/2023
Revised:
Computed by: SBS
Checked by: BCM

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TSS Removal Calculation Worksheet

B BMP	C TSS Removal Rate	D Starting TSS Load (*F)	E Amount Removed (C*D)	F Remaining Load (D-E)
Proprietary Treatment Practice STC 900	**0.88**	**1.00**	**0.88**	**0.12**

Total TSS Removal = **88%**

*Equals remaining load from previous BMP (E)
which enters the BMP

Non-automated TSS Calculation Sheet
must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

Mass. Dept. of Environmental Protection

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Standard 4: Total Suspended Solids Calculation:
Subsurface Tanks AB-3

NAME: Jackson Square - Sites A & B
Weymouth, MA
CLIENT: CMK Development Partners
COUNTY: Norfolk

Proj. No.: 222-203
Date: 8/4/2023
Revised:
Computed by: SBS
Checked by: BCM

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TSS Removal Calculation Worksheet

B BMP	C TSS Removal Rate	D Starting TSS Load (*F)	E Amount Removed (C*D)	F Remaining Load (D-E)
Proprietary Treatment Practice STC 900	**0.88**	**1.00**	**0.88**	**0.12**
Subsurface Infiltration Structure	**0.80**	**0.12**	**0.10**	**0.02**
	0.00	**0.02**	**0.00**	**0.02**
	0.00	**0.02**	**0.00**	**0.02**
	0.00	**0.02**	**0.00**	**0.02**

Total TSS Removal = **98%**

*Equals remaining load from previous BMP (E)
which enters the BMP

Non-automated TSS Calculation Sheet
must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

Mass. Dept. of Environmental Protection

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Standard 4: Total Suspended Solids Calculation: Bio-Retention / Rain Garden

NAME: Jackson Square - Sites A & B
Weymouth, MA
CLIENT: CMK Development Partners
COUNTY: Norfolk

Proj. No.: 222-203
Date:
Revised:
Computed by: SBS
Checked by: BCM

TSS Removal Calculation Worksheet

B	C	D	E	F
BMP	TSS Removal Rate	Starting TSS Load (*F)	Amount Removed (C*D)	Remaining Load (D-E)
Bio-retention with Sediment Forebay	**0.90**	**1.00**	**0.90**	**0.10**
	0.00	**0.10**	**0.00**	**0.10**
	0.00	**0.10**	**0.00**	**0.10**
	0.00	**0.10**	**0.00**	**0.10**
	0.00	**0.10**	**0.00**	**0.10**

Total TSS Removal = **90%**

*Equals remaining load from previous BMP (E)
which enters the BMP

Non-automated TSS Calculation Sheet
must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

To treat off-site runoff that discharges from the existing 30" RCP
at Herring Run Pool Park

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Standard 4: Total Suspended Solids Calculation: Stormceptor SC-C-1

NAME: Jackson Square - Sites A & B
Weymouth, MA
CLIENT: CMK Development Partners
COUNTY: Norfolk

Proj. No.: 222-203
Date: 8/4/2023
Revised:
Computed by: SBS
Checked by: BCM

TSS Removal Calculation Worksheet

B BMP	C TSS Removal Rate	D Starting TSS Load (*F)	E Amount Removed (C*D)	F Remaining Load (D-E)
Proprietary Treatment Practice STC 16000	**0.82**	**1.00**	**0.82**	**0.18**
	0.00	**0.18**	**0.00**	**0.18**
	0.00	**0.18**	**0.00**	**0.18**
	0.00	**0.18**	**0.00**	**0.18**
	0.00	**0.18**	**0.00**	**0.18**

Total TSS Removal = **82%**

*Equals remaining load from previous BMP (E)
which enters the BMP

Non-automated TSS Calculation Sheet
must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

Detailed Stormceptor Sizing Report – Jackson Square SC-AB-1

Project Information & Location			
Project Name	Jackson Square	**Project Number**	222-203
City	Weymouth	**State/ Province**	Massachusetts
Country	United States of America	**Date**	7/13/2023
Designer Information		**EOR Information (optional)**	
Name	Susan Spratt	**Name**	
Company	McKenzie Engineering	**Company**	
Phone #	781-792-3900	**Phone #**	
Email	sspratt@mckeng.com	**Email**	

Stormwater Treatment Recommendation

The recommended Stormceptor Model(s) which achieve or exceed the user defined water quality objective for each site within the project are listed in the below Sizing Summary table.

Site Name	Jackson Square SC-AB-1
Recommended Stormceptor Model	STC 450i
Target TSS Removal (%)	80.0
TSS Removal (%) Provided	97
PSD	Fine Distribution
Rainfall Station	BLUE HILL

The recommended Stormceptor model achieves the water quality objectives based on the selected inputs, historical rainfall records and selected particle size distribution.

Stormceptor Sizing Summary	
Stormceptor Model	**% TSS Removal Provided**
STC 450i	97
STC 900	98
STC 1200	98
STC 1800	99
STC 2400	99
STC 3600	99
STC 4800	99
STC 6000	99
STC 7200	100
STC 11000	100
STC 13000	100
STC 16000	100

Stormceptor

The Stormceptor oil and sediment separator is sized to treat stormwater runoff by removing pollutants through gravity separation and flotation. Stormceptor's patented design generates positive TSS removal for each rainfall event, including large storms. Significant levels of pollutants such as heavy metals, free oils and nutrients are prevented from entering natural water resources and the re-suspension of previously captured sediment (scour) does not occur.

Stormceptor provides a high level of TSS removal for small frequent storm events that represent the majority of annual rainfall volume and pollutant load. Positive treatment continues for large infrequent events, however, such events have little impact on the average annual TSS removal as they represent a small percentage of the total runoff volume and pollutant load.

Design Methodology

Stormceptor is sized using PCSWMM for Stormceptor, a continuous simulation model based on US EPA SWMM. The program calculates hydrology using local historical rainfall data and specified site parameters. With US EPA SWMM's precision, every Stormceptor unit is designed to achieve a defined water quality objective. The TSS removal data presented follows US EPA guidelines to reduce the average annual TSS load. The Stormceptor's unit process for TSS removal is settling. The settling model calculates TSS removal by analyzing:

- Site parameters
- Continuous historical rainfall data, including duration, distribution, peaks & inter-event dry periods
- Particle size distribution, and associated settling velocities (Stokes Law, corrected for drag)
- TSS load
- Detention time of the system

Hydrology Analysis

PCSWMM for Stormceptor calculates annual hydrology with the US EPA SWMM and local continuous historical rainfall data. Performance calculations of Stormceptor are based on the average annual removal of TSS for the selected site parameters. The Stormceptor is engineered to capture sediment particles by treating the required average annual runoff volume, ensuring positive removal efficiency is maintained during each rainfall event, and preventing negative removal efficiency (scour).

Smaller recurring storms account for the majority of rainfall events and average annual runoff volume, as observed in the historical rainfall data analyses presented in this section.

Rainfall Station

State/Province	Massachusetts	**Total Number of Rainfall Events**	8652
Rainfall Station Name	BLUE HILL	**Total Rainfall (in)**	2849.7
Station ID #	0736	**Average Annual Rainfall (in)**	49.1
Coordinates	42°12'44"N, 71°6'53"W	**Total Evaporation (in)**	157.0
Elevation (ft)	630	**Total Infiltration (in)**	888.5
Years of Rainfall Data	58	**Total Rainfall that is Runoff (in)**	1804.2

Notes

- Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor, which uses the EPA Rainfall and Runoff modules.
- Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal defined by the selected PSD, and based on stable site conditions only, after construction is completed.
- For submerged applications or sites specific to spill control, please contact your local Stormceptor representative for further design assistance.

Drainage Area	
Total Area (acres)	0.06
Imperviousness %	68.2

Up Stream Storage	
Storage (ac-ft)	**Discharge (cfs)**
0.000	0.000

Water Quality Objective	
TSS Removal (%)	80.0
Runoff Volume Capture (%)	
Oil Spill Capture Volume (Gal)	
Peak Conveyed Flow Rate (CFS)	
Water Quality Flow Rate (CFS)	

Up Stream Flow Diversion	
Max. Flow to Stormceptor (cfs)	

Design Details	
Stormceptor Inlet Invert Elev (ft)	18.77
Stormceptor Outlet Invert Elev (ft)	18.77
Stormceptor Rim Elev (ft)	21.80
Normal Water Level Elevation (ft)	
Pipe Diameter (in)	
Pipe Material	
Multiple Inlets (Y/N)	No
Grate Inlet (Y/N)	No

Particle Size Distribution (PSD)

Removing the smallest fraction of particulates from runoff ensures the majority of pollutants, such as metals, hydrocarbons and nutrients are captured. The table below identifies the Particle Size Distribution (PSD) that was selected to define TSS removal for the Stormceptor design.

Fine Distribution

Particle Diameter (microns)	Distribution %	Specific Gravity
20.0	20.0	1.30
60.0	20.0	1.80
150.0	20.0	2.20
400.0	20.0	2.65
2000.0	20.0	2.65

Site Name	Jackson Square SC-AB-1

Site Details

Drainage Area

Total Area (acres)	0.06
Imperviousness %	68.2

Surface Characteristics

Width (ft)	102.00
Slope %	2
Impervious Depression Storage (in)	0.02
Pervious Depression Storage (in)	0.2
Impervious Manning's n	0.015
Pervious Manning's n	0.25

Maintenance Frequency

Maintenance Frequency (months) >	12

Infiltration Parameters

Horton's equation is used to estimate infiltration

Max. Infiltration Rate (in/hr)	2.44
Min. Infiltration Rate (in/hr)	0.4
Decay Rate (1/sec)	0.00055
Regeneration Rate (1/sec)	0.01

Evaporation

Daily Evaporation Rate (in/day)	0.1

Dry Weather Flow

Dry Weather Flow (cfs)	0

Winter Months

Winter Infiltration	0

TSS Loading Parameters

TSS Loading Function	

Buildup/Wash-off Parameters

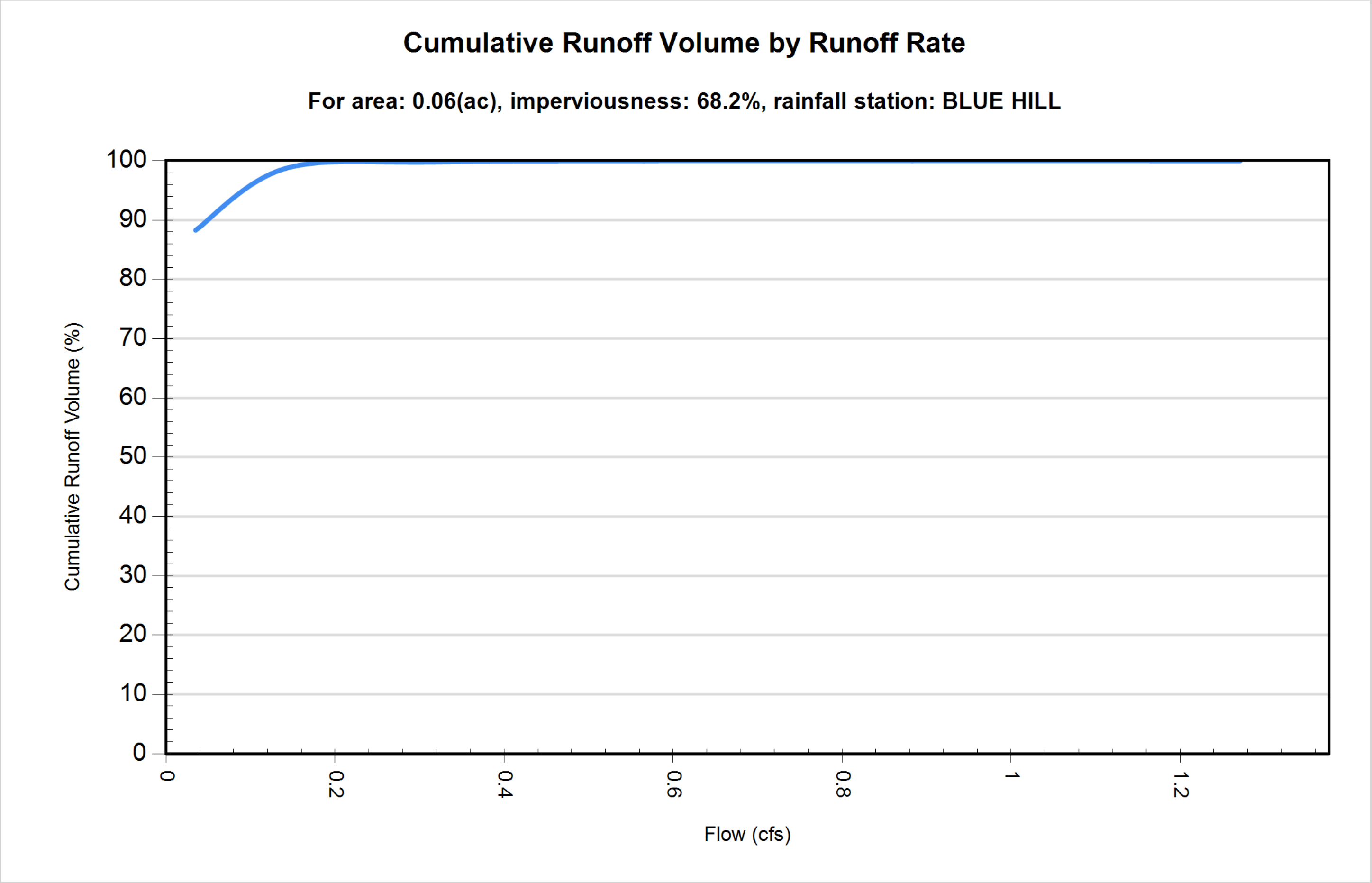
Target Event Mean Conc. (EMC) mg/L	
Exponential Buildup Power	
Exponential Washoff Exponent	

TSS Availability Parameters

Availability Constant A	
Availability Factor B	
Availability Exponent C	
Min. Particle Size Affected by Availability (micron)	

Cumulative Runoff Volume by Runoff Rate

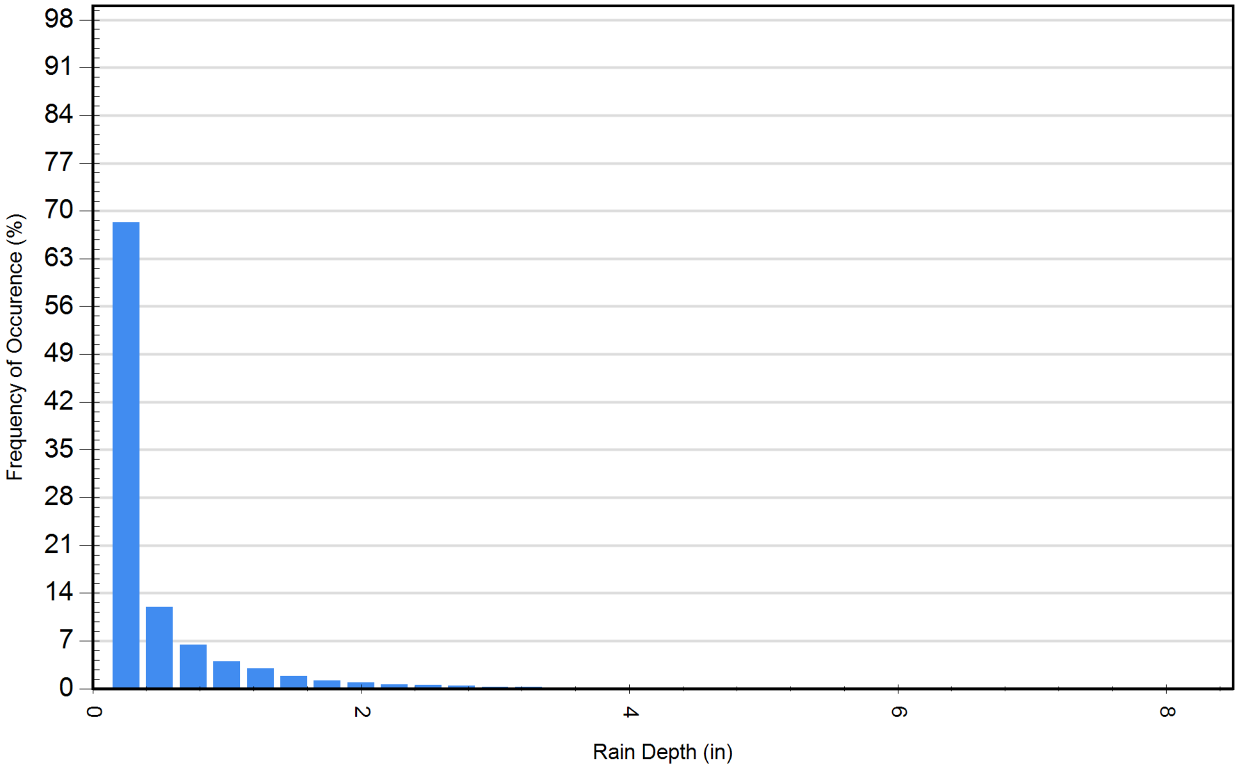
Runoff Rate (cfs)	Runoff Volume (ft³)	Volume Over (ft³)	Cumulative Runoff Volume (%)
0.035	358503	47419	88.3
0.141	400689	5224	98.7
0.318	405115	797	99.8
0.565	405803	109	100.0
0.883	405911	0	100.0
1.271	405911	0	100.0



Rainfall Event Analysis

Rainfall Depth (in)	No. of Events	Percentage of Total Events (%)	Total Volume (in)	Percentage of Annual Volume (%)
0.25	5908	68.3	386	13.6
0.50	1039	12.0	381	13.4
0.75	555	6.4	344	12.1
1.00	349	4.0	301	10.6
1.25	262	3.0	292	10.3
1.50	154	1.8	211	7.4
1.75	104	1.2	168	5.9
2.00	75	0.9	140	4.9
2.25	48	0.6	102	3.6
2.50	43	0.5	102	3.6
2.75	33	0.4	87	3.0
3.00	17	0.2	49	1.7
3.25	18	0.2	56	2.0
3.50	8	0.1	27	0.9
3.75	7	0.1	25	0.9
4.00	4	0.0	15	0.5
4.25	1	0.0	4	0.1
4.50	4	0.0	18	0.6
4.75	3	0.0	14	0.5
5.00	1	0.0	5	0.2
5.25	1	0.0	5	0.2
5.50	4	0.0	21	0.7
5.75	2	0.0	11	0.4
6.00	4	0.0	23	0.8
6.25	0	0.0	0	0.0
6.50	0	0.0	0	0.0
6.75	1	0.0	7	0.2
7.00	1	0.0	7	0.2
7.25	2	0.0	14	0.5
7.50	0	0.0	0	0.0
7.75	1	0.0	8	0.3
8.00	1	0.0	8	0.3
8.25	0	0.0	0	0.0
8.25	2	0.0	17	0.6

Frequency of Occurence by Rainfall Depths



For Stormceptor Specifications and Drawings Please Visit:
https://www.conteches.com/technical-guides/search?filter=1WBC0O5EYX

Detailed Stormceptor Sizing Report – Jackson Square SC-AB-2

Project Information & Location			
Project Name	Jackson Square	**Project Number**	222-203
City	Weymouth	**State/ Province**	Massachusetts
Country	United States of America	**Date**	7/13/2023
Designer Information		**EOR Information (optional)**	
Name	Susan Spratt	**Name**	
Company	McKenzie Engineering	**Company**	
Phone #	781-792-3900	**Phone #**	
Email	sspratt@mckeng.com	**Email**	

Stormwater Treatment Recommendation

The recommended Stormceptor Model(s) which achieve or exceed the user defined water quality objective for each site within the project are listed in the below Sizing Summary table.

Site Name	Jackson Square SC-AB-2
Recommended Stormceptor Model	STC 450i
Target TSS Removal (%)	80.0
TSS Removal (%) Provided	94
PSD	Fine Distribution
Rainfall Station	BLUE HILL

The recommended Stormceptor model achieves the water quality objectives based on the selected inputs, historical rainfall records and selected particle size distribution.

Stormceptor Sizing Summary	
Stormceptor Model	**% TSS Removal Provided**
STC 450i	94
STC 900	96
STC 1200	97
STC 1800	97
STC 2400	98
STC 3600	98
STC 4800	99
STC 6000	99
STC 7200	99
STC 11000	99
STC 13000	99
STC 16000	100

Stormceptor

The Stormceptor oil and sediment separator is sized to treat stormwater runoff by removing pollutants through gravity separation and flotation. Stormceptor's patented design generates positive TSS removal for each rainfall event, including large storms. Significant levels of pollutants such as heavy metals, free oils and nutrients are prevented from entering natural water resources and the re-suspension of previously captured sediment (scour) does not occur.

Stormceptor provides a high level of TSS removal for small frequent storm events that represent the majority of annual rainfall volume and pollutant load. Positive treatment continues for large infrequent events, however, such events have little impact on the average annual TSS removal as they represent a small percentage of the total runoff volume and pollutant load.

Design Methodology

Stormceptor is sized using PCSWMM for Stormceptor, a continuous simulation model based on US EPA SWMM. The program calculates hydrology using local historical rainfall data and specified site parameters. With US EPA SWMM's precision, every Stormceptor unit is designed to achieve a defined water quality objective. The TSS removal data presented follows US EPA guidelines to reduce the average annual TSS load. The Stormceptor's unit process for TSS removal is settling. The settling model calculates TSS removal by analyzing:

- Site parameters
- Continuous historical rainfall data, including duration, distribution, peaks & inter-event dry periods
- Particle size distribution, and associated settling velocities (Stokes Law, corrected for drag)
- TSS load
- Detention time of the system

Hydrology Analysis

PCSWMM for Stormceptor calculates annual hydrology with the US EPA SWMM and local continuous historical rainfall data. Performance calculations of Stormceptor are based on the average annual removal of TSS for the selected site parameters. The Stormceptor is engineered to capture sediment particles by treating the required average annual runoff volume, ensuring positive removal efficiency is maintained during each rainfall event, and preventing negative removal efficiency (scour).

Smaller recurring storms account for the majority of rainfall events and average annual runoff volume, as observed in the historical rainfall data analyses presented in this section.

Rainfall Station

State/Province	Massachusetts	**Total Number of Rainfall Events**	8652
Rainfall Station Name	BLUE HILL	**Total Rainfall (in)**	2849.7
Station ID #	0736	**Average Annual Rainfall (in)**	49.1
Coordinates	42°12'44"N, 71°6'53"W	**Total Evaporation (in)**	93.9
Elevation (ft)	630	**Total Infiltration (in)**	1630.1
Years of Rainfall Data	58	**Total Rainfall that is Runoff (in)**	1125.7

Notes

- Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor, which uses the EPA Rainfall and Runoff modules.
- Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal defined by the selected PSD, and based on stable site conditions only, after construction is completed.
- For submerged applications or sites specific to spill control, please contact your local Stormceptor representative for further design assistance.

Drainage Area

Total Area (acres)	0.08
Imperviousness %	41.7

Water Quality Objective

TSS Removal (%)	80.0
Runoff Volume Capture (%)	
Oil Spill Capture Volume (Gal)	
Peak Conveyed Flow Rate (CFS)	
Water Quality Flow Rate (CFS)	

Up Stream Storage

Storage (ac-ft)	Discharge (cfs)
0.000	0.000

Up Stream Flow Diversion

Max. Flow to Stormceptor (cfs)	

Design Details

Stormceptor Inlet Invert Elev (ft)	
Stormceptor Outlet Invert Elev (ft)	
Stormceptor Rim Elev (ft)	
Normal Water Level Elevation (ft)	
Pipe Diameter (in)	
Pipe Material	
Multiple Inlets (Y/N)	No
Grate Inlet (Y/N)	Yes

Particle Size Distribution (PSD)

Removing the smallest fraction of particulates from runoff ensures the majority of pollutants, such as metals, hydrocarbons and nutrients are captured. The table below identifies the Particle Size Distribution (PSD) that was selected to define TSS removal for the Stormceptor design.

Fine Distribution

Particle Diameter (microns)	Distribution %	Specific Gravity
20.0	20.0	1.30
60.0	20.0	1.80
150.0	20.0	2.20
400.0	20.0	2.65
2000.0	20.0	2.65

Site Name	Jackson Square SC-AB-2

Site Details

Drainage Area

Total Area (acres)	0.08
Imperviousness %	41.7

Surface Characteristics

Width (ft)	118.00
Slope %	2
Impervious Depression Storage (in)	0.02
Pervious Depression Storage (in)	0.2
Impervious Manning's n	0.015
Pervious Manning's n	0.25

Maintenance Frequency

Maintenance Frequency (months) >	12

Infiltration Parameters

Horton's equation is used to estimate infiltration

Max. Infiltration Rate (in/hr)	2.44
Min. Infiltration Rate (in/hr)	0.4
Decay Rate (1/sec)	0.00055
Regeneration Rate (1/sec)	0.01

Evaporation

Daily Evaporation Rate (in/day)	0.1

Dry Weather Flow

Dry Weather Flow (cfs)	0

Winter Months

Winter Infiltration	0

TSS Loading Parameters

TSS Loading Function	

Buildup/Wash-off Parameters

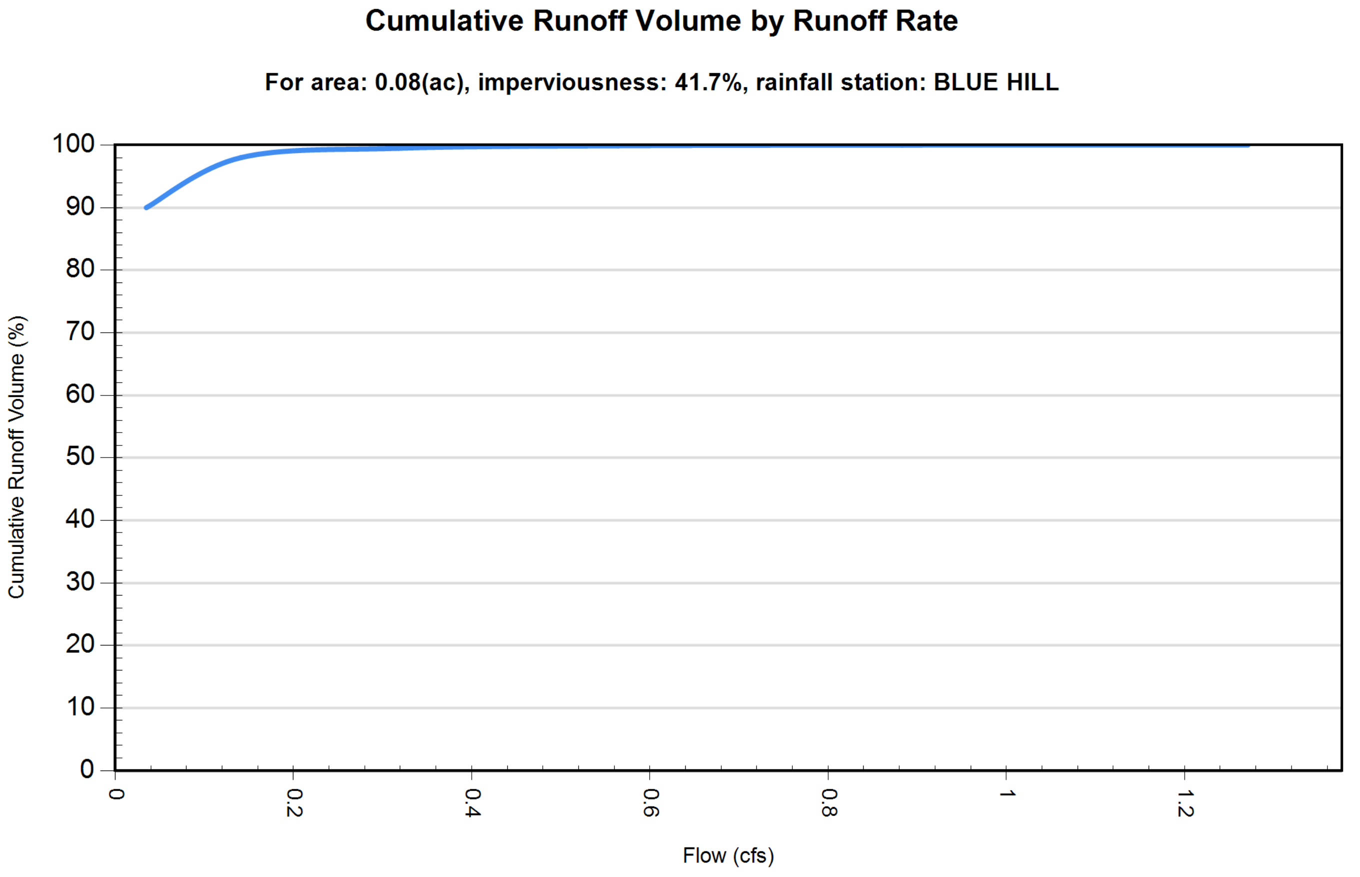
Target Event Mean Conc. (EMC) mg/L	
Exponential Buildup Power	
Exponential Washoff Exponent	

TSS Availability Parameters

Availability Constant A	
Availability Factor B	
Availability Exponent C	
Min. Particle Size Affected by Availability (micron)	

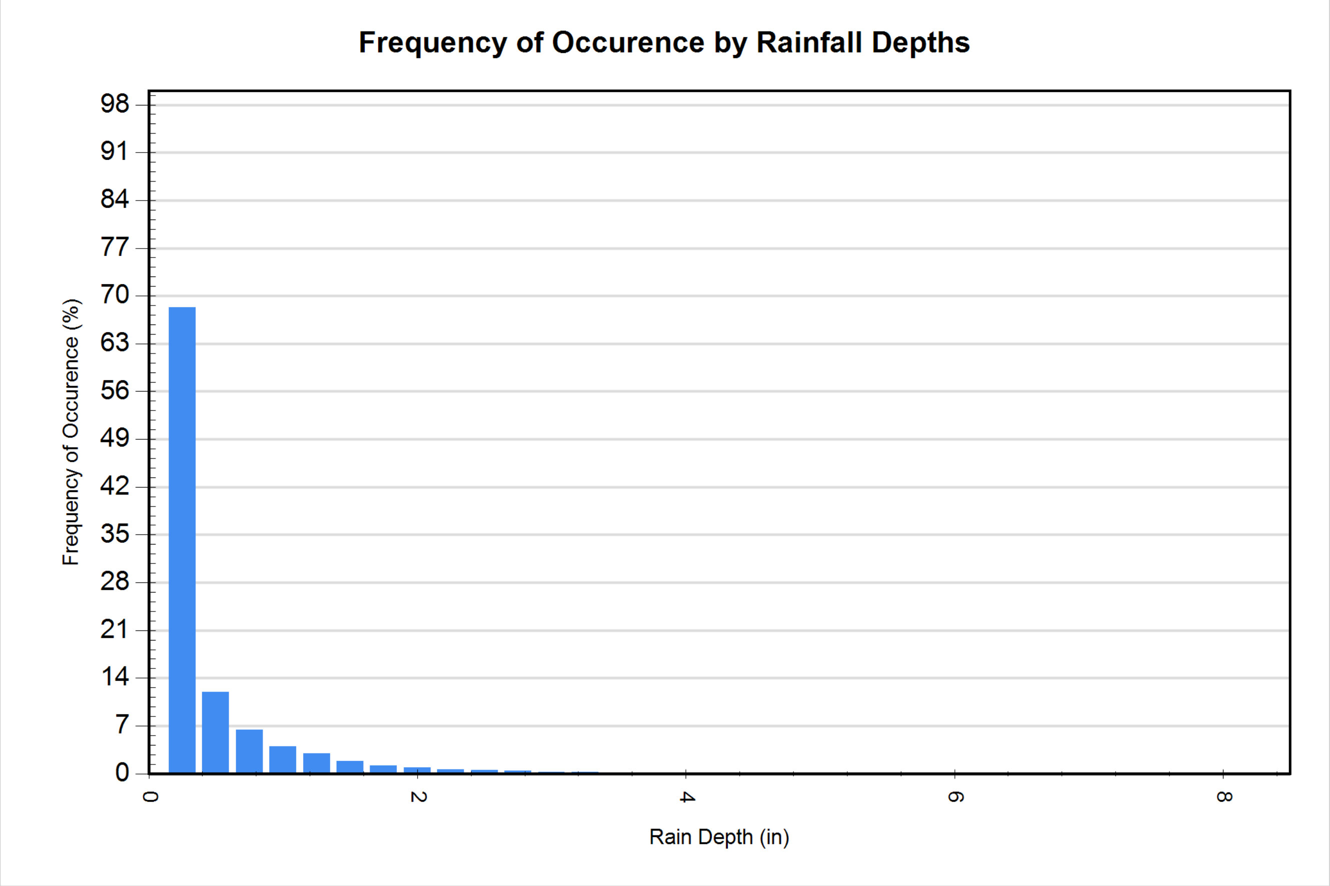
Cumulative Runoff Volume by Runoff Rate

Runoff Rate (cfs)	Runoff Volume (ft³)	Volume Over (ft³)	Cumulative Runoff Volume (%)
0.035	302146	33389	90.0
0.141	328826	6709	98.0
0.318	333963	1573	99.5
0.565	335248	287	99.9
0.883	335516	19	100.0
1.271	335535	0	100.0



Rainfall Event Analysis

Rainfall Depth (in)	No. of Events	Percentage of Total Events (%)	Total Volume (in)	Percentage of Annual Volume (%)
0.25	5908	68.3	386	13.6
0.50	1039	12.0	381	13.4
0.75	555	6.4	344	12.1
1.00	349	4.0	301	10.6
1.25	262	3.0	292	10.3
1.50	154	1.8	211	7.4
1.75	104	1.2	168	5.9
2.00	75	0.9	140	4.9
2.25	48	0.6	102	3.6
2.50	43	0.5	102	3.6
2.75	33	0.4	87	3.0
3.00	17	0.2	49	1.7
3.25	18	0.2	56	2.0
3.50	8	0.1	27	0.9
3.75	7	0.1	25	0.9
4.00	4	0.0	15	0.5
4.25	1	0.0	4	0.1
4.50	4	0.0	18	0.6
4.75	3	0.0	14	0.5
5.00	1	0.0	5	0.2
5.25	1	0.0	5	0.2
5.50	4	0.0	21	0.7
5.75	2	0.0	11	0.4
6.00	4	0.0	23	0.8
6.25	0	0.0	0	0.0
6.50	0	0.0	0	0.0
6.75	1	0.0	7	0.2
7.00	1	0.0	7	0.2
7.25	2	0.0	14	0.5
7.50	0	0.0	0	0.0
7.75	1	0.0	8	0.3
8.00	1	0.0	8	0.3
8.25	0	0.0	0	0.0
8.25	2	0.0	17	0.6



For Stormceptor Specifications and Drawings Please Visit:
https://www.conteches.com/technical-guides/search?filter=1WBC0O5EYX

Detailed Stormceptor Sizing Report – Jackson Square SC-AB-3

Project Information & Location			
Project Name	Jackson Square	**Project Number**	222-203
City	Weymouth	**State/ Province**	Massachusetts
Country	United States of America	**Date**	7/13/2023
Designer Information		**EOR Information (optional)**	
Name	Susan Spratt	**Name**	
Company	McKenzie Engineering	**Company**	
Phone #	781-792-3900	**Phone #**	
Email	sspratt@mckeng.com	**Email**	

Stormwater Treatment Recommendation

The recommended Stormceptor Model(s) which achieve or exceed the user defined water quality objective for each site within the project are listed in the below Sizing Summary table.

Site Name	Jackson Square SC-AB-3
Recommended Stormceptor Model	STC 450i
Target TSS Removal (%)	80.0
TSS Removal (%) Provided	83
PSD	Fine Distribution
Rainfall Station	BLUE HILL

The recommended Stormceptor model achieves the water quality objectives based on the selected inputs, historical rainfall records and selected particle size distribution.

Stormceptor Sizing Summary	
Stormceptor Model	**% TSS Removal Provided**
STC 450i	83
STC 900	88
STC 1200	88
STC 1800	89
STC 2400	91
STC 3600	92
STC 4800	93
STC 6000	94
STC 7200	95
STC 11000	96
STC 13000	96
STC 16000	97

Stormceptor

The Stormceptor oil and sediment separator is sized to treat stormwater runoff by removing pollutants through gravity separation and flotation. Stormceptor's patented design generates positive TSS removal for each rainfall event, including large storms. Significant levels of pollutants such as heavy metals, free oils and nutrients are prevented from entering natural water resources and the re-suspension of previously captured sediment (scour) does not occur.

Stormceptor provides a high level of TSS removal for small frequent storm events that represent the majority of annual rainfall volume and pollutant load. Positive treatment continues for large infrequent events, however, such events have little impact on the average annual TSS removal as they represent a small percentage of the total runoff volume and pollutant load.

Design Methodology

Stormceptor is sized using PCSWMM for Stormceptor, a continuous simulation model based on US EPA SWMM. The program calculates hydrology using local historical rainfall data and specified site parameters. With US EPA SWMM's precision, every Stormceptor unit is designed to achieve a defined water quality objective. The TSS removal data presented follows US EPA guidelines to reduce the average annual TSS load. The Stormceptor's unit process for TSS removal is settling. The settling model calculates TSS removal by analyzing:

- Site parameters
- Continuous historical rainfall data, including duration, distribution, peaks & inter-event dry periods
- Particle size distribution, and associated settling velocities (Stokes Law, corrected for drag)
- TSS load
- Detention time of the system

Hydrology Analysis

PCSWMM for Stormceptor calculates annual hydrology with the US EPA SWMM and local continuous historical rainfall data. Performance calculations of Stormceptor are based on the average annual removal of TSS for the selected site parameters. The Stormceptor is engineered to capture sediment particles by treating the required average annual runoff volume, ensuring positive removal efficiency is maintained during each rainfall event, and preventing negative removal efficiency (scour).

Smaller recurring storms account for the majority of rainfall events and average annual runoff volume, as observed in the historical rainfall data analyses presented in this section.

Rainfall Station

State/Province	Massachusetts	**Total Number of Rainfall Events**	8652
Rainfall Station Name	BLUE HILL	**Total Rainfall (in)**	2849.7
Station ID #	0736	**Average Annual Rainfall (in)**	49.1
Coordinates	42°12'44"N, 71°6'53"W	**Total Evaporation (in)**	217.6
Elevation (ft)	630	**Total Infiltration (in)**	313.1
Years of Rainfall Data	58	**Total Rainfall that is Runoff (in)**	2319.0

Notes

- Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor, which uses the EPA Rainfall and Runoff modules.
- Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal defined by the selected PSD, and based on stable site conditions only, after construction is completed.
- For submerged applications or sites specific to spill control, please contact your local Stormceptor representative for further design assistance.

Drainage Area	
Total Area (acres)	0.32
Imperviousness %	88.7

Up Stream Storage	
Storage (ac-ft)	**Discharge (cfs)**
0.000	0.000

Water Quality Objective	
TSS Removal (%)	80.0
Runoff Volume Capture (%)	
Oil Spill Capture Volume (Gal)	
Peak Conveyed Flow Rate (CFS)	
Water Quality Flow Rate (CFS)	

Up Stream Flow Diversion	
Max. Flow to Stormceptor (cfs)	

Design Details	
Stormceptor Inlet Invert Elev (ft)	21.95
Stormceptor Outlet Invert Elev (ft)	21.95
Stormceptor Rim Elev (ft)	24.55
Normal Water Level Elevation (ft)	
Pipe Diameter (in)	
Pipe Material	
Multiple Inlets (Y/N)	No
Grate Inlet (Y/N)	No

Particle Size Distribution (PSD)

Removing the smallest fraction of particulates from runoff ensures the majority of pollutants, such as metals, hydrocarbons and nutrients are captured. The table below identifies the Particle Size Distribution (PSD) that was selected to define TSS removal for the Stormceptor design.

Fine Distribution		
Particle Diameter (microns)	**Distribution %**	**Specific Gravity**
20.0	20.0	1.30
60.0	20.0	1.80
150.0	20.0	2.20
400.0	20.0	2.65
2000.0	20.0	2.65

Site Name	Jackson Square SC-AB-3

Site Details

Drainage Area

Total Area (acres)	0.32
Imperviousness %	88.7

Surface Characteristics

Width (ft)	236.00
Slope %	2
Impervious Depression Storage (in)	0.02
Pervious Depression Storage (in)	0.2
Impervious Manning's n	0.015
Pervious Manning's n	0.25

Maintenance Frequency

Maintenance Frequency (months) >	12

Infiltration Parameters

Horton's equation is used to estimate infiltration

Max. Infiltration Rate (in/hr)	2.44
Min. Infiltration Rate (in/hr)	0.4
Decay Rate (1/sec)	0.00055
Regeneration Rate (1/sec)	0.01

Evaporation

Daily Evaporation Rate (in/day)	0.1

Dry Weather Flow

Dry Weather Flow (cfs)	0

Winter Months

Winter Infiltration	0

TSS Loading Parameters

TSS Loading Function	

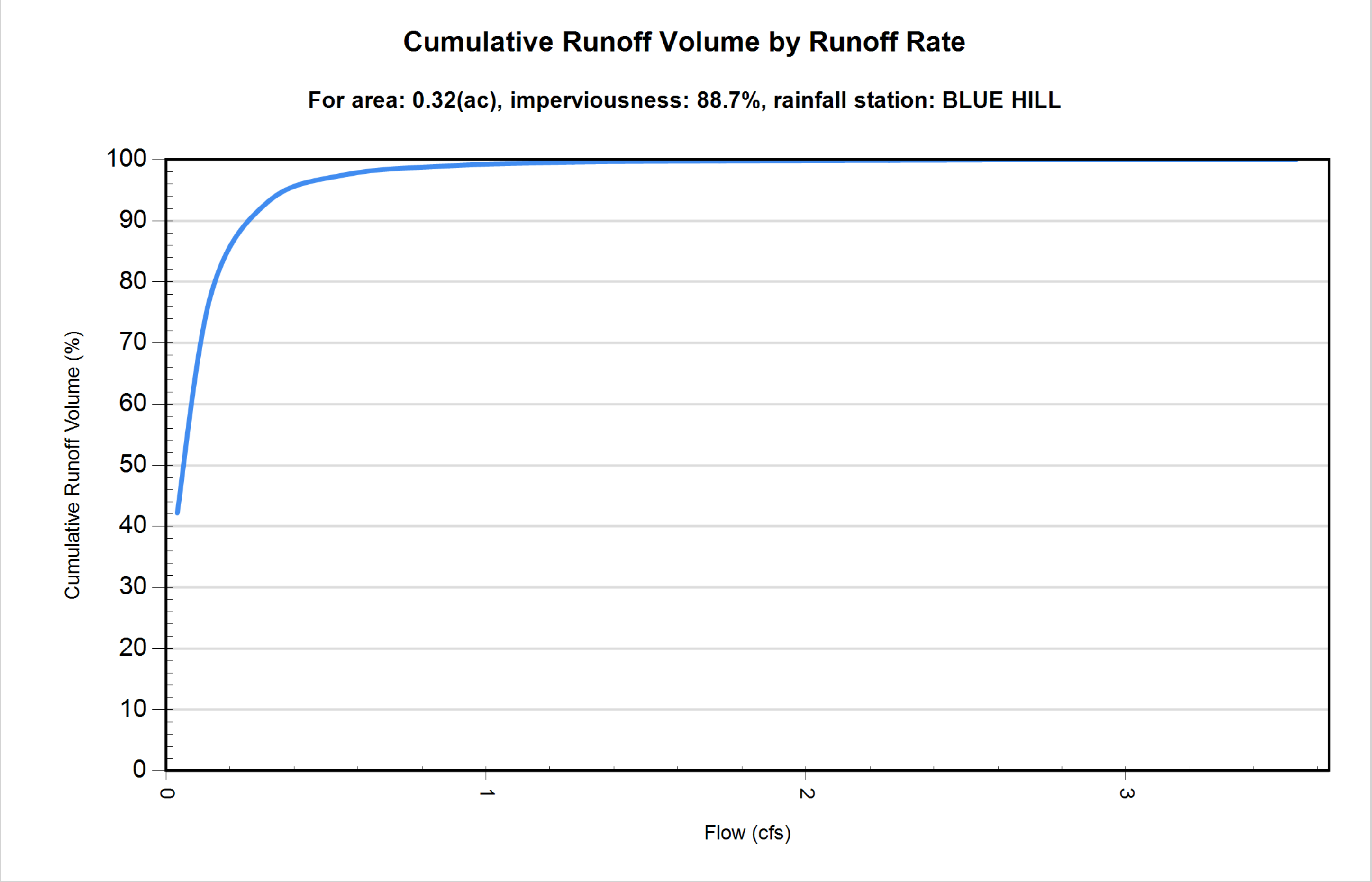
Buildup/Wash-off Parameters

Target Event Mean Conc. (EMC) mg/L	
Exponential Buildup Power	
Exponential Washoff Exponent	

TSS Availability Parameters

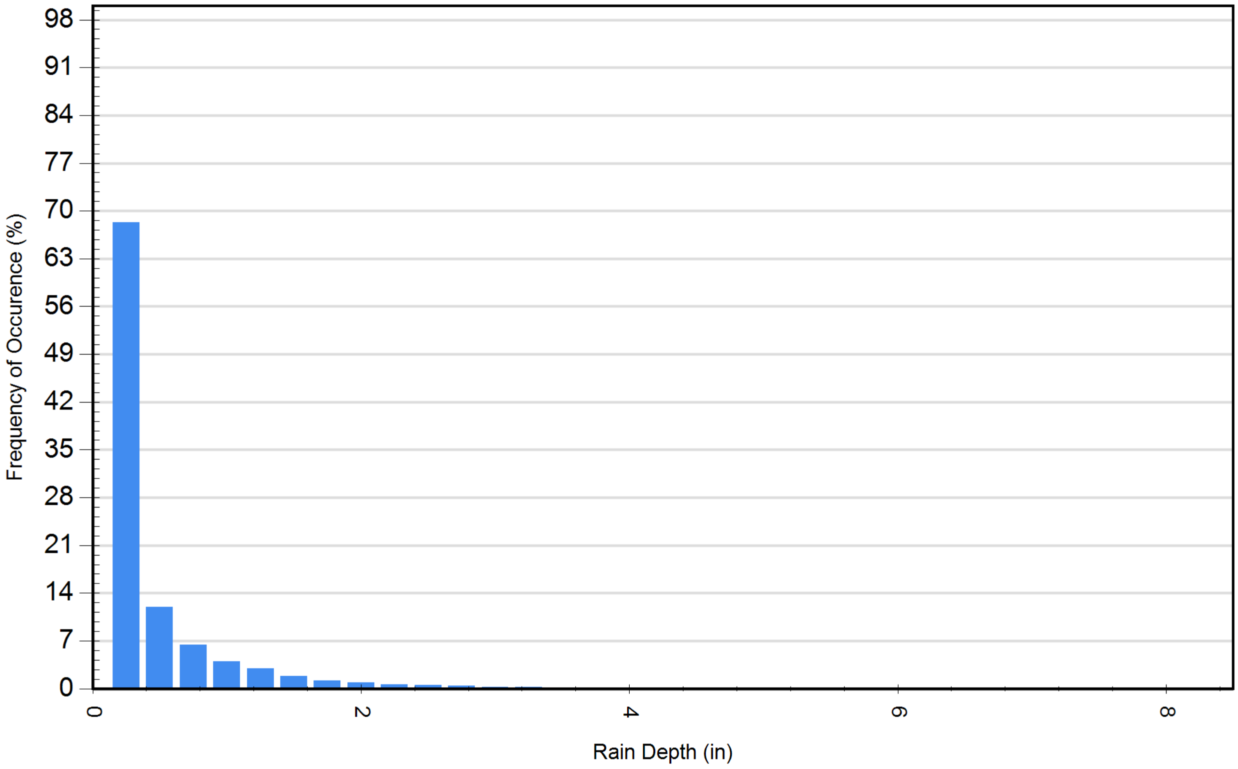
Availability Constant A	
Availability Factor B	
Availability Exponent C	
Min. Particle Size Affected by Availability (micron)	

Cumulative Runoff Volume by Runoff Rate			
Runoff Rate (cfs)	**Runoff Volume (ft³)**	**Volume Over (ft³)**	**Cumulative Runoff Volume (%)**
0.035	1180324	1618911	42.2
0.141	2184556	614467	78.1
0.318	2606676	192197	93.1
0.565	2730727	68022	97.6
0.883	2770951	27785	99.0
1.271	2786671	12055	99.6
1.730	2793764	4960	99.8
2.260	2796824	1897	99.9
2.860	2797878	844	100.0
3.531	2798482	240	100.0



Rainfall Event Analysis

Rainfall Depth (in)	No. of Events	Percentage of Total Events (%)	Total Volume (in)	Percentage of Annual Volume (%)
0.25	5908	68.3	386	13.6
0.50	1039	12.0	381	13.4
0.75	555	6.4	344	12.1
1.00	349	4.0	301	10.6
1.25	262	3.0	292	10.3
1.50	154	1.8	211	7.4
1.75	104	1.2	168	5.9
2.00	75	0.9	140	4.9
2.25	48	0.6	102	3.6
2.50	43	0.5	102	3.6
2.75	33	0.4	87	3.0
3.00	17	0.2	49	1.7
3.25	18	0.2	56	2.0
3.50	8	0.1	27	0.9
3.75	7	0.1	25	0.9
4.00	4	0.0	15	0.5
4.25	1	0.0	4	0.1
4.50	4	0.0	18	0.6
4.75	3	0.0	14	0.5
5.00	1	0.0	5	0.2
5.25	1	0.0	5	0.2
5.50	4	0.0	21	0.7
5.75	2	0.0	11	0.4
6.00	4	0.0	23	0.8
6.25	0	0.0	0	0.0
6.50	0	0.0	0	0.0
6.75	1	0.0	7	0.2
7.00	1	0.0	7	0.2
7.25	2	0.0	14	0.5
7.50	0	0.0	0	0.0
7.75	1	0.0	8	0.3
8.00	1	0.0	8	0.3
8.25	0	0.0	0	0.0
8.25	2	0.0	17	0.6



Frequency of Occurence by Rainfall Depths

For Stormceptor Specifications and Drawings Please Visit:
https://www.conteches.com/technical-guides/search?filter=1WBC0O5EYX

Detailed Stormceptor Sizing Report – Jackson Square SC-C-1

Project Information & Location			
Project Name	Jackson Square	**Project Number**	222-203
City	Weymouth	**State/ Province**	Massachusetts
Country	United States of America	**Date**	7/13/2023
Designer Information		**EOR Information (optional)**	
Name	Susan Spratt	**Name**	
Company	McKenzie Engineering	**Company**	
Phone #	781-792-3900	**Phone #**	
Email	sspratt@mckeng.com	**Email**	

Stormwater Treatment Recommendation

The recommended Stormceptor Model(s) which achieve or exceed the user defined water quality objective for each site within the project are listed in the below Sizing Summary table.

Site Name	Jackson Square SC-C-1
Recommended Stormceptor Model	STC 16000
Target TSS Removal (%)	80.0
TSS Removal (%) Provided	82
PSD	Fine Distribution
Rainfall Station	BLUE HILL

The recommended Stormceptor model achieves the water quality objectives based on the selected inputs, historical rainfall records and selected particle size distribution.

Stormceptor Sizing Summary	
Stormceptor Model	**% TSS Removal Provided**
STC 450i	50
STC 900	61
STC 1200	62
STC 1800	62
STC 2400	67
STC 3600	67
STC 4800	72
STC 6000	72
STC 7200	75
STC 11000	79
STC 13000	79
STC 16000	82

Stormceptor

The Stormceptor oil and sediment separator is sized to treat stormwater runoff by removing pollutants through gravity separation and flotation. Stormceptor's patented design generates positive TSS removal for each rainfall event, including large storms. Significant levels of pollutants such as heavy metals, free oils and nutrients are prevented from entering natural water resources and the re-suspension of previously captured sediment (scour) does not occur.

Stormceptor provides a high level of TSS removal for small frequent storm events that represent the majority of annual rainfall volume and pollutant load. Positive treatment continues for large infrequent events, however, such events have little impact on the average annual TSS removal as they represent a small percentage of the total runoff volume and pollutant load.

Design Methodology

Stormceptor is sized using PCSWMM for Stormceptor, a continuous simulation model based on US EPA SWMM. The program calculates hydrology using local historical rainfall data and specified site parameters. With US EPA SWMM's precision, every Stormceptor unit is designed to achieve a defined water quality objective. The TSS removal data presented follows US EPA guidelines to reduce the average annual TSS load. The Stormceptor's unit process for TSS removal is settling. The settling model calculates TSS removal by analyzing:

- Site parameters
- Continuous historical rainfall data, including duration, distribution, peaks & inter-event dry periods
- Particle size distribution, and associated settling velocities (Stokes Law, corrected for drag)
- TSS load
- Detention time of the system

Hydrology Analysis

PCSWMM for Stormceptor calculates annual hydrology with the US EPA SWMM and local continuous historical rainfall data. Performance calculations of Stormceptor are based on the average annual removal of TSS for the selected site parameters. The Stormceptor is engineered to capture sediment particles by treating the required average annual runoff volume, ensuring positive removal efficiency is maintained during each rainfall event, and preventing negative removal efficiency (scour).

Smaller recurring storms account for the majority of rainfall events and average annual runoff volume, as observed in the historical rainfall data analyses presented in this section.

Rainfall Station

State/Province	Massachusetts	**Total Number of Rainfall Events**	8652
Rainfall Station Name	BLUE HILL	**Total Rainfall (in)**	2849.7
Station ID #	0736	**Average Annual Rainfall (in)**	49.1
Coordinates	42°12'44"N, 71°6'53"W	**Total Evaporation (in)**	185.2
Elevation (ft)	630	**Total Infiltration (in)**	866.9
Years of Rainfall Data	58	**Total Rainfall that is Runoff (in)**	1797.6

Notes

- Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor, which uses the EPA Rainfall and Runoff modules.
- Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal defined by the selected PSD, and based on stable site conditions only, after construction is completed.
- For submerged applications or sites specific to spill control, please contact your local Stormceptor representative for further design assistance.

Drainage Area

Total Area (acres)	8.55
Imperviousness %	69.2

Water Quality Objective

TSS Removal (%)	80.0
Runoff Volume Capture (%)	
Oil Spill Capture Volume (Gal)	
Peak Conveyed Flow Rate (CFS)	
Water Quality Flow Rate (CFS)	

Up Stream Storage

Storage (ac-ft)	Discharge (cfs)
0.000	0.000

Up Stream Flow Diversion

Max. Flow to Stormceptor (cfs)	

Design Details

Stormceptor Inlet Invert Elev (ft)	25.20
Stormceptor Outlet Invert Elev (ft)	25.20
Stormceptor Rim Elev (ft)	28.00
Normal Water Level Elevation (ft)	
Pipe Diameter (in)	
Pipe Material	
Multiple Inlets (Y/N)	No
Grate Inlet (Y/N)	No

Particle Size Distribution (PSD)

Removing the smallest fraction of particulates from runoff ensures the majority of pollutants, such as metals, hydrocarbons and nutrients are captured. The table below identifies the Particle Size Distribution (PSD) that was selected to define TSS removal for the Stormceptor design.

Fine Distribution

Particle Diameter (microns)	Distribution %	Specific Gravity
20.0	20.0	1.30
60.0	20.0	1.80
150.0	20.0	2.20
400.0	20.0	2.65
2000.0	20.0	2.65

Site Name	Jackson Square SC-C-1

Site Details

Drainage Area	
Total Area (acres)	8.55
Imperviousness %	69.2

Surface Characteristics	
Width (ft)	1221.00
Slope %	2
Impervious Depression Storage (in)	0.02
Pervious Depression Storage (in)	0.2
Impervious Manning's n	0.015
Pervious Manning's n	0.25

Maintenance Frequency	
Maintenance Frequency (months) >	12

Infiltration Parameters	
Horton's equation is used to estimate infiltration	
Max. Infiltration Rate (in/hr)	2.44
Min. Infiltration Rate (in/hr)	0.4
Decay Rate (1/sec)	0.00055
Regeneration Rate (1/sec)	0.01

Evaporation	
Daily Evaporation Rate (in/day)	0.1

Dry Weather Flow	
Dry Weather Flow (cfs)	0

Winter Months	
Winter Infiltration	0

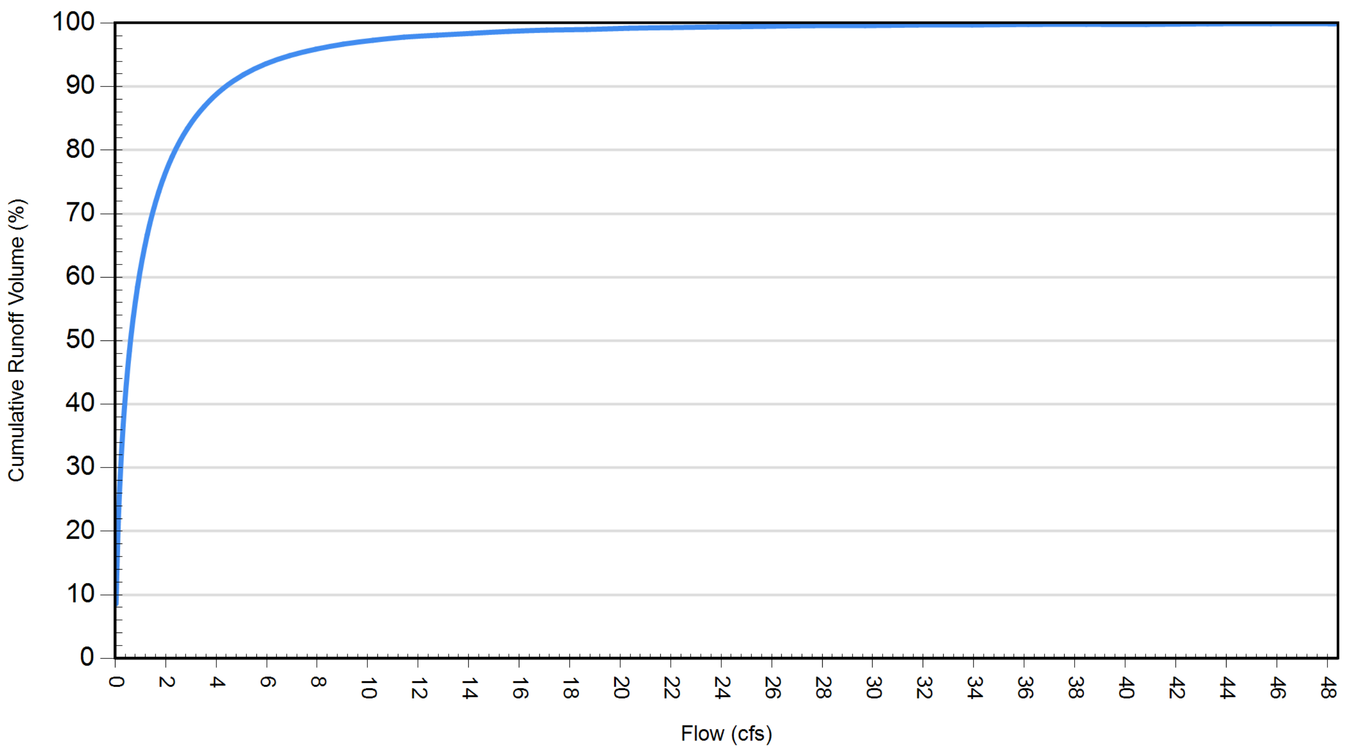
TSS Loading Parameters	
TSS Loading Function	

Buildup/Wash-off Parameters	
Target Event Mean Conc. (EMC) mg/L	
Exponential Buildup Power	
Exponential Washoff Exponent	

TSS Availability Parameters	
Availability Constant A	
Availability Factor B	
Availability Exponent C	
Min. Particle Size Affected by Availability (micron)	

Cumulative Runoff Volume by Runoff Rate

Runoff Rate (cfs)	Runoff Volume (ft³)	Volume Over (ft³)	Cumulative Runoff Volume (%)
0.035	4896203	52169730	8.6
0.141	13203310	43865260	23.2
0.318	20904440	36116210	36.7
0.565	27624740	29416710	48.4
0.883	33310980	23717740	58.4
1.271	38055300	18999460	66.7
1.730	41911970	15130630	73.5
2.260	45044750	11987070	79.0
2.860	47573540	9459703	83.4
3.531	49578950	7446418	86.9
4.273	51172100	5855130	89.7
5.085	52424810	4600902	91.9
5.968	53391500	3630782	93.6
6.922	54129560	2892545	94.9
7.946	54694420	2327223	95.9
9.041	55129710	1892246	96.7
10.206	55470440	1550771	97.3
11.442	55742340	1278809	97.8
12.749	55956970	1064206	98.1
14.126	56126180	895165	98.4
15.574	56264190	757126	98.7
17.092	56379410	641530	98.9
18.681	56474380	546759	99.0
20.341	56553780	467226	99.2
22.072	56624110	396958	99.3
23.873	56683900	337037	99.4
25.744	56732280	288729	99.5
27.687	56773090	247860	99.6
29.700	56809840	210994	99.6
31.783	56843440	177391	99.7
33.937	56870160	150634	99.7
36.162	56891820	128936	99.8
38.458	56910340	110407	99.8
40.824	56927950	92785	99.8
43.261	56942310	78437	99.9
45.768	56954620	66134	99.9
48.346	56965090	55670	99.9



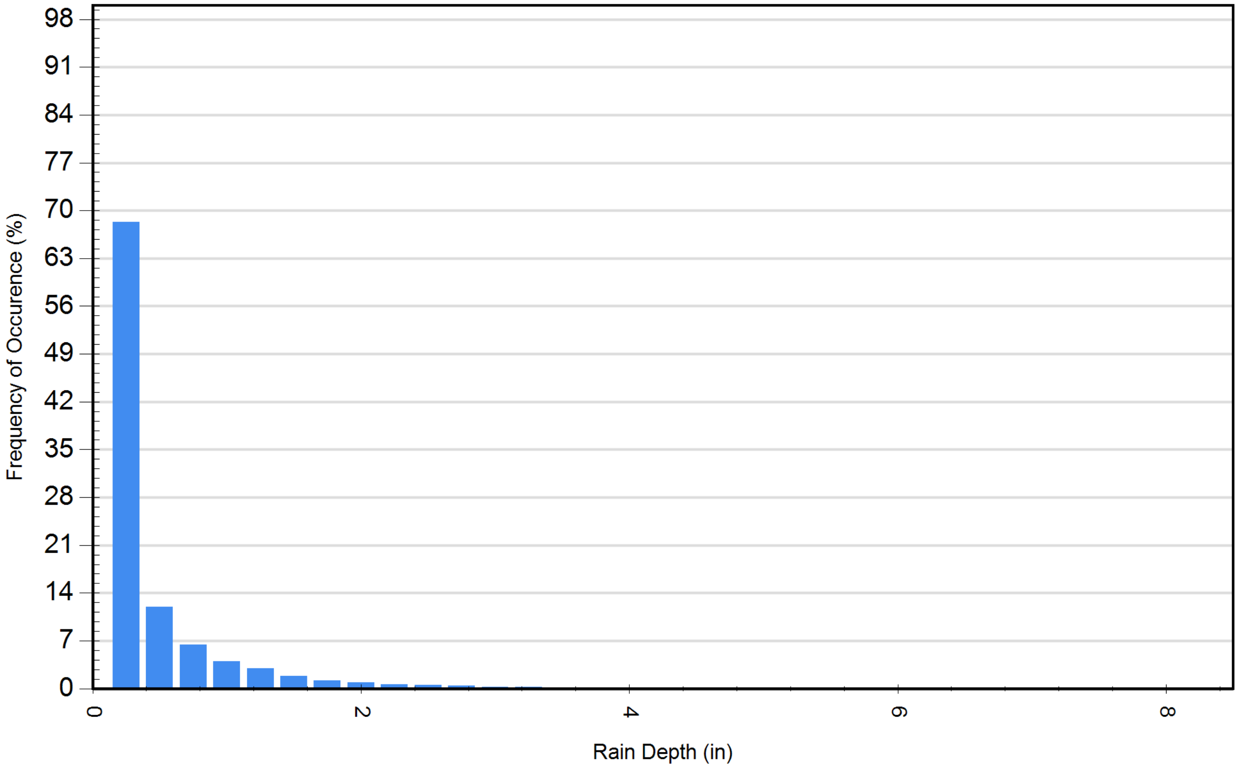
Cumulative Runoff Volume by Runoff Rate

For area: 8.55(ac), imperviousness: 69.2%, rainfall station: BLUE HILL

Rainfall Event Analysis

Rainfall Depth (in)	No. of Events	Percentage of Total Events (%)	Total Volume (in)	Percentage of Annual Volume (%)
0.25	5908	68.3	386	13.6
0.50	1039	12.0	381	13.4
0.75	555	6.4	344	12.1
1.00	349	4.0	301	10.6
1.25	262	3.0	292	10.3
1.50	154	1.8	211	7.4
1.75	104	1.2	168	5.9
2.00	75	0.9	140	4.9
2.25	48	0.6	102	3.6
2.50	43	0.5	102	3.6
2.75	33	0.4	87	3.0
3.00	17	0.2	49	1.7
3.25	18	0.2	56	2.0
3.50	8	0.1	27	0.9
3.75	7	0.1	25	0.9
4.00	4	0.0	15	0.5
4.25	1	0.0	4	0.1
4.50	4	0.0	18	0.6
4.75	3	0.0	14	0.5
5.00	1	0.0	5	0.2
5.25	1	0.0	5	0.2
5.50	4	0.0	21	0.7
5.75	2	0.0	11	0.4
6.00	4	0.0	23	0.8
6.25	0	0.0	0	0.0
6.50	0	0.0	0	0.0
6.75	1	0.0	7	0.2
7.00	1	0.0	7	0.2
7.25	2	0.0	14	0.5
7.50	0	0.0	0	0.0
7.75	1	0.0	8	0.3
8.00	1	0.0	8	0.3
8.25	0	0.0	0	0.0
8.25	2	0.0	17	0.6

Frequency of Occurence by Rainfall Depths



For Stormceptor Specifications and Drawings Please Visit:
https://www.conteches.com/technical-guides/search?filter=1WBC0O5EYX

Detailed Stormceptor Sizing Report – Jackson Square SC-D-1

Project Information & Location			
Project Name	Jackson Square	**Project Number**	222-203
City	Weymouth	**State/ Province**	Massachusetts
Country	United States of America	**Date**	7/13/2023
Designer Information		**EOR Information (optional)**	
Name	Susan Spratt	**Name**	
Company	McKenzie Engineering	**Company**	
Phone #	781-792-3900	**Phone #**	
Email	sspratt@mckeng.com	**Email**	

Stormwater Treatment Recommendation

The recommended Stormceptor Model(s) which achieve or exceed the user defined water quality objective for each site within the project are listed in the below Sizing Summary table.

Site Name	Jackson Square SC-D-1
Recommended Stormceptor Model	STC 450i
Target TSS Removal (%)	80.0
TSS Removal (%) Provided	86
PSD	Fine Distribution
Rainfall Station	BLUE HILL

The recommended Stormceptor model achieves the water quality objectives based on the selected inputs, historical rainfall records and selected particle size distribution.

Stormceptor Sizing Summary	
Stormceptor Model	**% TSS Removal Provided**
STC 450i	86
STC 900	90
STC 1200	90
STC 1800	91
STC 2400	93
STC 3600	93
STC 4800	95
STC 6000	95
STC 7200	96
STC 11000	97
STC 13000	97
STC 16000	98

Stormceptor

The Stormceptor oil and sediment separator is sized to treat stormwater runoff by removing pollutants through gravity separation and flotation. Stormceptor's patented design generates positive TSS removal for each rainfall event, including large storms. Significant levels of pollutants such as heavy metals, free oils and nutrients are prevented from entering natural water resources and the re-suspension of previously captured sediment (scour) does not occur.

Stormceptor provides a high level of TSS removal for small frequent storm events that represent the majority of annual rainfall volume and pollutant load. Positive treatment continues for large infrequent events, however, such events have little impact on the average annual TSS removal as they represent a small percentage of the total runoff volume and pollutant load.

Design Methodology

Stormceptor is sized using PCSWMM for Stormceptor, a continuous simulation model based on US EPA SWMM. The program calculates hydrology using local historical rainfall data and specified site parameters. With US EPA SWMM's precision, every Stormceptor unit is designed to achieve a defined water quality objective. The TSS removal data presented follows US EPA guidelines to reduce the average annual TSS load. The Stormceptor's unit process for TSS removal is settling. The settling model calculates TSS removal by analyzing:

- Site parameters
- Continuous historical rainfall data, including duration, distribution, peaks & inter-event dry periods
- Particle size distribution, and associated settling velocities (Stokes Law, corrected for drag)
- TSS load
- Detention time of the system

Hydrology Analysis

PCSWMM for Stormceptor calculates annual hydrology with the US EPA SWMM and local continuous historical rainfall data. Performance calculations of Stormceptor are based on the average annual removal of TSS for the selected site parameters. The Stormceptor is engineered to capture sediment particles by treating the required average annual runoff volume, ensuring positive removal efficiency is maintained during each rainfall event, and preventing negative removal efficiency (scour).

Smaller recurring storms account for the majority of rainfall events and average annual runoff volume, as observed in the historical rainfall data analyses presented in this section.

Rainfall Station

State/Province	Massachusetts	**Total Number of Rainfall Events**	8652
Rainfall Station Name	BLUE HILL	**Total Rainfall (in)**	2849.7
Station ID #	0736	**Average Annual Rainfall (in)**	49.1
Coordinates	42°12'44"N, 71°6'53"W	**Total Evaporation (in)**	120.6
Elevation (ft)	630	**Total Infiltration (in)**	1375.6
Years of Rainfall Data	58	**Total Rainfall that is Runoff (in)**	1353.5

Notes

- Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor, which uses the EPA Rainfall and Runoff modules.
- Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal defined by the selected PSD, and based on stable site conditions only, after construction is completed.
- For submerged applications or sites specific to spill control, please contact your local Stormceptor representative for further design assistance.

Drainage Area

Total Area (acres)	0.36
Imperviousness %	50.9

Water Quality Objective

TSS Removal (%)	80.0
Runoff Volume Capture (%)	
Oil Spill Capture Volume (Gal)	
Peak Conveyed Flow Rate (CFS)	
Water Quality Flow Rate (CFS)	

Up Stream Storage

Storage (ac-ft)	Discharge (cfs)
0.000	0.000

Up Stream Flow Diversion

Max. Flow to Stormceptor (cfs)	

Design Details

Stormceptor Inlet Invert Elev (ft)	27.73
Stormceptor Outlet Invert Elev (ft)	27.65
Stormceptor Rim Elev (ft)	30.00
Normal Water Level Elevation (ft)	
Pipe Diameter (in)	12
Pipe Material	HDPE - plastic
Multiple Inlets (Y/N)	No
Grate Inlet (Y/N)	No

Particle Size Distribution (PSD)

Removing the smallest fraction of particulates from runoff ensures the majority of pollutants, such as metals, hydrocarbons and nutrients are captured. The table below identifies the Particle Size Distribution (PSD) that was selected to define TSS removal for the Stormceptor design.

Fine Distribution

Particle Diameter (microns)	Distribution %	Specific Gravity
20.0	20.0	1.30
60.0	20.0	1.80
150.0	20.0	2.20
400.0	20.0	2.65
2000.0	20.0	2.65

Site Name	Jackson Square SC-D-1

Site Details

Drainage Area

Total Area (acres)	0.36
Imperviousness %	50.9

Surface Characteristics

Width (ft)	250.00
Slope %	2
Impervious Depression Storage (in)	0.02
Pervious Depression Storage (in)	0.2
Impervious Manning's n	0.015
Pervious Manning's n	0.25

Maintenance Frequency

Maintenance Frequency (months) >	12

Infiltration Parameters

Horton's equation is used to estimate infiltration

Max. Infiltration Rate (in/hr)	2.44
Min. Infiltration Rate (in/hr)	0.4
Decay Rate (1/sec)	0.00055
Regeneration Rate (1/sec)	0.01

Evaporation

Daily Evaporation Rate (in/day)	0.1

Dry Weather Flow

Dry Weather Flow (cfs)	0

Winter Months

Winter Infiltration	0

TSS Loading Parameters

TSS Loading Function	

Buildup/Wash-off Parameters

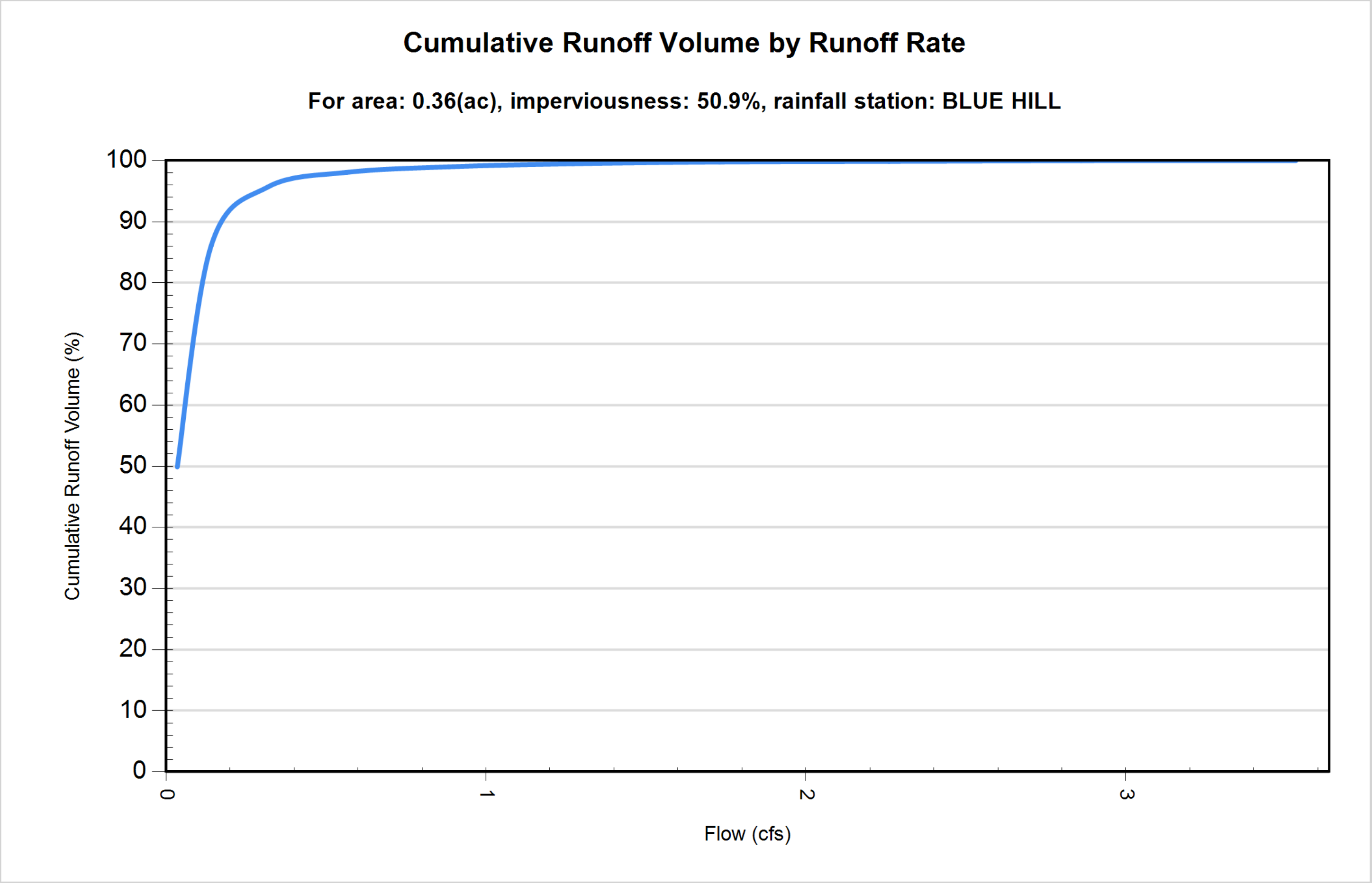
Target Event Mean Conc. (EMC) mg/L	
Exponential Buildup Power	
Exponential Washoff Exponent	

TSS Availability Parameters

Availability Constant A	
Availability Factor B	
Availability Exponent C	
Min. Particle Size Affected by Availability (micron)	

Cumulative Runoff Volume by Runoff Rate

Runoff Rate (cfs)	Runoff Volume (ft³)	Volume Over (ft³)	Cumulative Runoff Volume (%)
0.035	916192	918992	49.9
0.141	1579850	255074	86.1
0.318	1756205	78662	95.7
0.565	1799114	35742	98.1
0.883	1816782	18067	99.0
1.271	1825954	8894	99.5
1.730	1830577	4270	99.8
2.260	1832986	1861	99.9
2.860	1834018	829	100.0
3.531	1834508	339	100.0



Rainfall Event Analysis

Rainfall Depth (in)	No. of Events	Percentage of Total Events (%)	Total Volume (in)	Percentage of Annual Volume (%)
0.25	5908	68.3	386	13.6
0.50	1039	12.0	381	13.4
0.75	555	6.4	344	12.1
1.00	349	4.0	301	10.6
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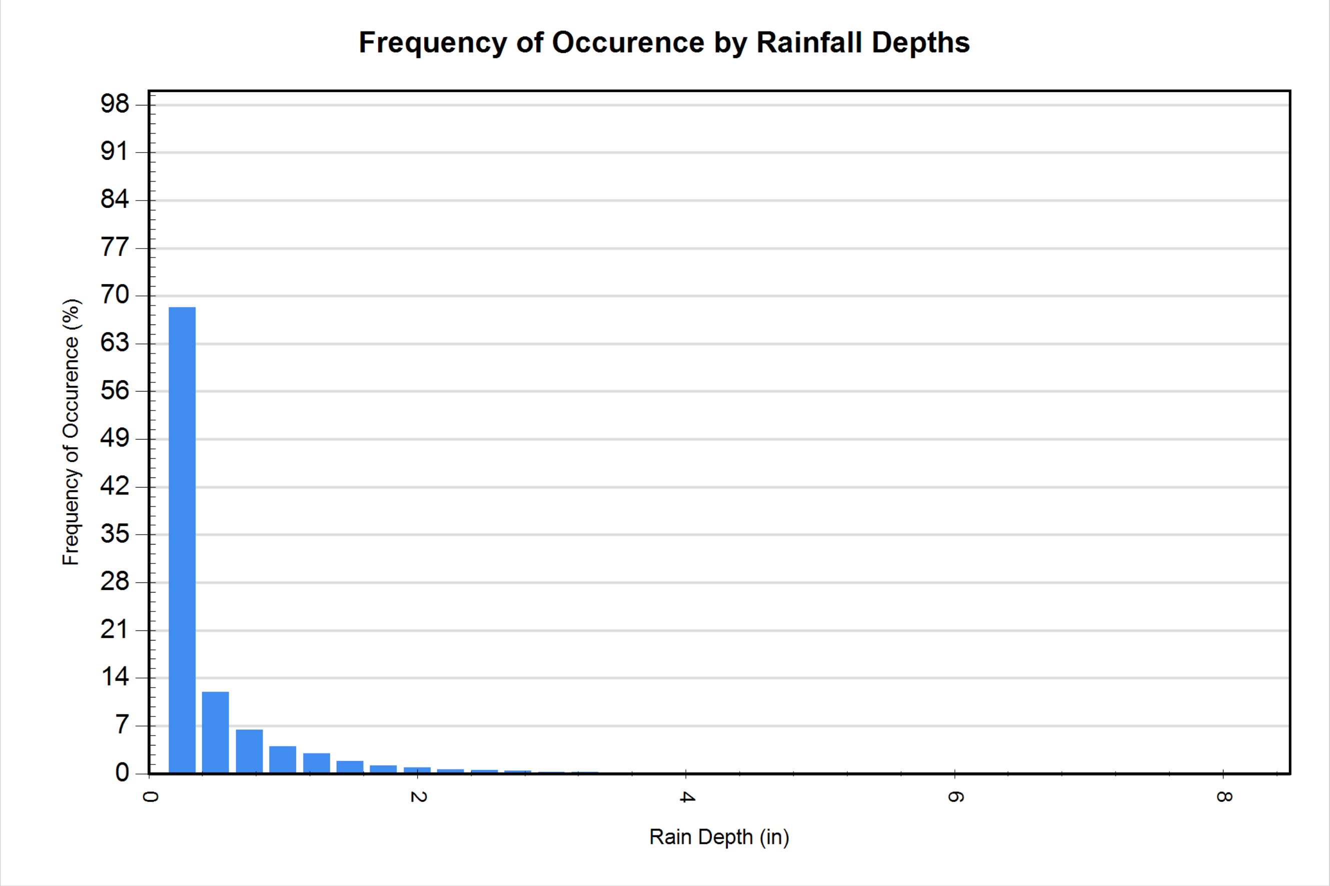
1.50	154	1.8	211	7.4
1.75	104	1.2	168	5.9
2.00	75	0.9	140	4.9
2.25	48	0.6	102	3.6
2.50	43	0.5	102	3.6
2.75	33	0.4	87	3.0
3.00	17	0.2	49	1.7
3.25	18	0.2	56	2.0
3.50	8	0.1	27	0.9
3.75	7	0.1	25	0.9
4.00	4	0.0	15	0.5
4.25	1	0.0	4	0.1
4.50	4	0.0	18	0.6
4.75	3	0.0	14	0.5
5.00	1	0.0	5	0.2
5.25	1	0.0	5	0.2
5.50	4	0.0	21	0.7
5.75	2	0.0	11	0.4
6.00	4	0.0	23	0.8
6.25	0	0.0	0	0.0
6.50	0	0.0	0	0.0
6.75	1	0.0	7	0.2
7.00	1	0.0	7	0.2
7.25	2	0.0	14	0.5
7.50	0	0.0	0	0.0
7.75	1	0.0	8	0.3
8.00	1	0.0	8	0.3
8.25	0	0.0	0	0.0
8.25	2	0.0	17	0.6



For Stormceptor Specifications and Drawings Please Visit:
https://www.conteches.com/technical-guides/search?filter=1WBC0O5EYX

MEG
MCKENZIE
ENGINEERING GROUP

Assinippi Office Park
150 Longwater Drive, Suite 101
Norwell, MA 02061

Existing Storm Drainage Computations with Proposed Overflow Connections: Closed Drainage System

Name: **Jackson Square, Weymouth, MA**

Client:

Proj. No.: **222-203**
Date: **8/4/23** **Revised 11/17/23**
Computed by: **SBS**
Checked by: **BCM**

Design Parameters:
25 **Year Storm** Boston, MA

k_e= **0.5**

	LOCATION						FLOW TIME (MIN)				DESIGN						CAPACITY						
	FROM	TO	AREA (AC.)	C	C x A	SUM C x A	PIPE	CONC TIME	i*	Q cfs	Q Total cfs	V fps	n	PIPE SIZE	SLOPE	MATERIAL	Q full ft^3/s	V full ft/s	LENGTH ft	FALL ft	RIM UPPER	INV UPPER	INV LOWER
	CB-1	DMH-2	0.06	0.90	0.05	0.05	0.39	6.0	5.7	0.3	0.3	2.3	0.013	12	0.014	HDPE	4.2	5.3	55	0.75	25.42	21.60	20.85
	CB-2	DMH-2	0.04	0.90	0.04	0.04	0.12	6.0	5.7	0.2	0.2	1.6	0.013	12	0.006	HDPE	2.7	3.5	12	0.07	23.38	19.70	19.63
LOVELL FIELD	DMH-2	DMH-1	---	---	---	0.21	0.19	6.4	5.7	1.2	1.2	3.5	0.013	12	0.010	HDPE	3.6	4.6	39	0.40	23.94	19.45	19.05
	DCB-4	DMH-3	0.88	0.52	0.00	0.09	0.89	6.0	5.7	0.5	0.5	2.7	0.013	12	0.010	HDPE	3.6	4.6	142	1.45	23.17	19.15	17.70
	CB-5	DMH-3	0.16	0.80	0.13	0.13	0.08	6.0	5.7	0.7	0.7	4.3	0.013	12	0.032	HDPE	6.3	8.1	20	0.63	23.66	17.63	17.00
	EX DEPRESSION	DMH-3	---	---	---	0.03	1.13	6.6	5.6	0.2	0.2	1.8	0.013	12	0.010	HDPE	3.5	4.4	120	1.15	23.66	17.63	16.48
	DMH-3	DMH-1	---	---	---	0.25	0.57	6.9	5.5	1.4	1.4	3.5	0.013	12	0.010	HDPE	3.5	4.4	120	1.15	23.66	17.63	16.48
LOVELL FIELD	DMH-1	HWALL	---	---	---	0.51	0.29	7.5	5.4	2.8	2.8	4.9	0.013	12	0.014	HDPE	4.2	5.4	85	1.19	23.00	16.38	15.19
	SWALE	DMH	---	---	---	1.46	0.11	6.0	5.7	8.4	8.4	6.0	0.013	18	0.011	HDPE	10.9	6.2	39	0.42	20.00	13.87	13.45
	AB-1	DMH-1	---	---	---	0.04	0.76	6.0	5.7	0.2	0.2	1.8	0.013	12	0.008	HDPE	3.1	4.0	80	0.62	23.90	16.75	16.13
	AB-2	DMH-1	---	---	---	0.01	0.01	6.0	5.7	0.05	0.1	1.4	0.013	12	0.020	HDPE	5.0	6.4	1	0.02	23.90	19.00	18.98
	AB3	DMH-2	---	---	---	0.12	0.11	6.0	5.7	0.7	0.7	4.1	0.013	12	0.030	HDPE	6.1	7.8	28	0.83	23.90	21.83	21.00

Mounding Analysis – Building B
Jackson Square
Weymouth, Massachusetts

Mounding Analysis

A groundwater mounding calculation for subsurface infiltration system AB-3 has been conducted using MOUNDSOLV Groundwater Mounding Analysis for groundwater mounding beneath an infiltration basin with less than 4 feet of separation from groundwater.

The mounding analysis demonstrates that the Required Recharge Volume is fully dewatered, and the groundwater mounding does not break out above the land within the 72-hour evaluation period.

System Inputs

Horizontal Hydraulic Conductivity Kh:

Three (3) test borings were conducted on September 7, 2022, and October 5, 2022, by McPhail Associates, Inc. at the site for Building B. Soil samples were collected and tested for grain size analysis. The infiltration system is located within the glacial outwash. Therefore, boring MA-13 was used to determine the hydraulic conductivity.

The Excel spreadsheet HydrogeoSieveXL v2.3.2 was used to classify sample MA-13 and evaluate hydraulic conductivity.

Sample MA-13 was classified as poorly sorted sandy gravel low in fines. The HydrogeoSieveXL analysis using grain size meeting the criteria indicates the hydraulic conductivity as follows.

Test Boring #	Soil Strata	Geometric Mean M/D	Geometric Mean FT/D
MA-13	Outwash	6.59	21.62

Specific Yield

Use 0.26, average between 0.24 (Gravel, medium) and 28 (Gravel, fine).

Recharge (Infiltration) Area

The infiltration area is irregular, with a surface area of 2,589 square feet. Therefore, the shape needs to be converted to a rectangular shape with the same depth of stormwater runoff to be infiltrated and best fits the original shape.

The system's Required Recharge Volume (basin storage) is 484 cubic feet.

The converted rectangular shape is 100.53 feet long by 25.75 feet wide.

Duration of Infiltration Period

72 hours or 3 days after the rain event. T(d) = 4, T0 (d) = 1.

Need to determine the recharge rate for the Required Recharge Volume.

Required Recharge Volume = 535 cubic feet

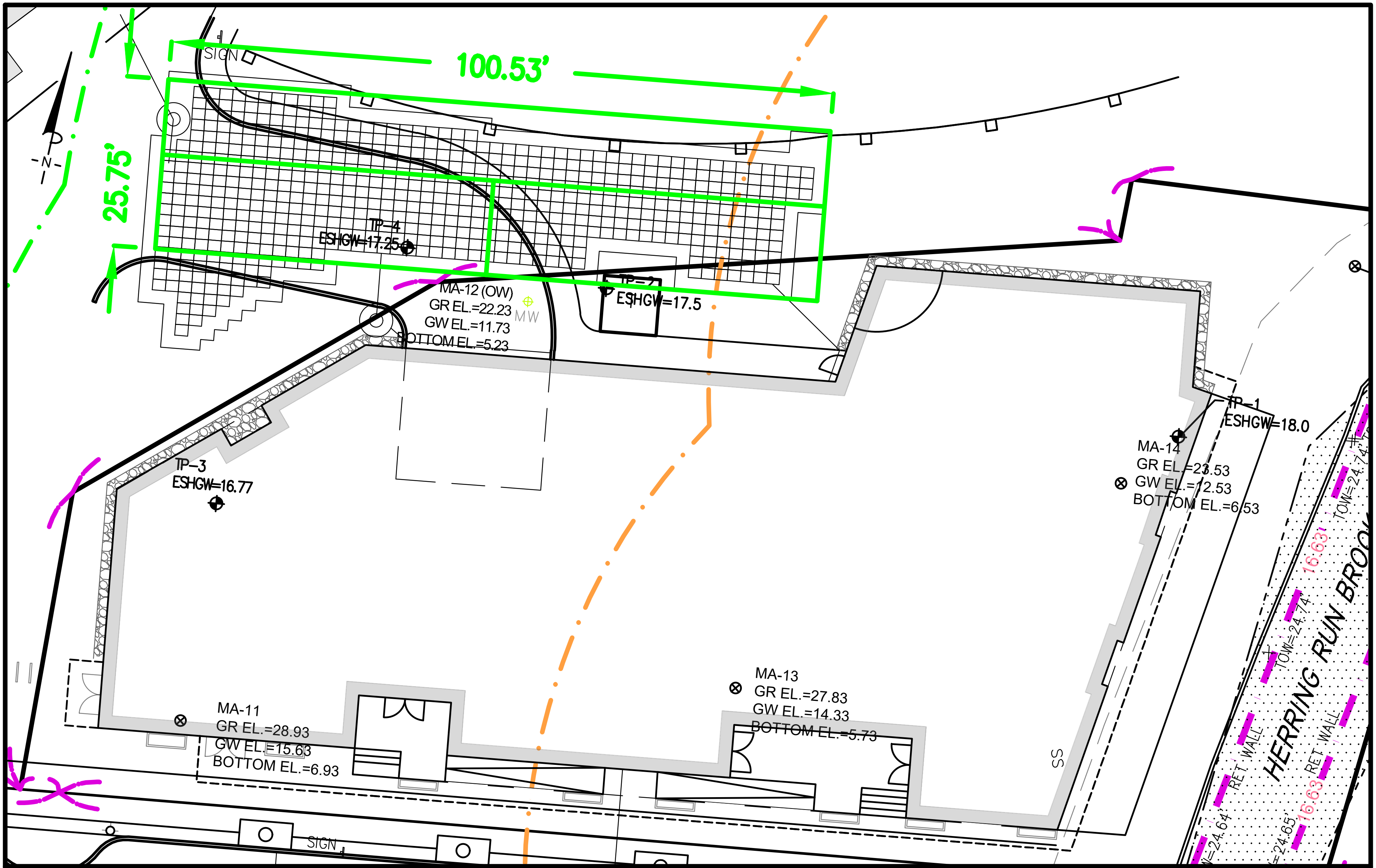
$$\text{Recharge Rate} = \frac{\text{Volume}}{\text{(Surface Area)}} \quad \frac{\text{484 cubic feet}}{\text{(2,589 sq ft)}} = 0.186944766 \text{ ft/day}$$

Initial Saturated Thickness (hi):

Test Boring #	Depth to Bottom of Test Hole (elevation)	Depth to Groundwater (elevation)	Saturated Thickness (FT.)
MA-11	6.93	15.63	8.7
MA-12	5.23	11.73	6.5
MA-13	5.73	14.33	8.6
Average Saturated Thickness			**7.93**

Results

See Moundsolv Report



MEG
MCKENZIE
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Norwell, MA 02061
Ph: 781-792-3900 www.mckeng.com

OWNER/APPLICANT:
Iraklis N. Papachristos Manager of
864,909,910 Broad Street, LLC and
1409 Commercial Street, LLC
1 Franklin Street, Unit 2308
Boston, Massachusetts 02110

JACKSON SQUARE
WEYMOUTH, MASSACHUSETTS

GRAPHIC SCALE:

DWG. TITLE:
EXHIBIT MA
MOUNDING ANALYSIS

DRAWN BY:	SBS
DESIGNED BY:	SBS
CHECKED BY:	BCM
APPROVED BY:	BCM
DATE:	11/17/2023
SCALE:	1"=20'
PROJECT NO.:	222-203

DWG. No:
MA-1

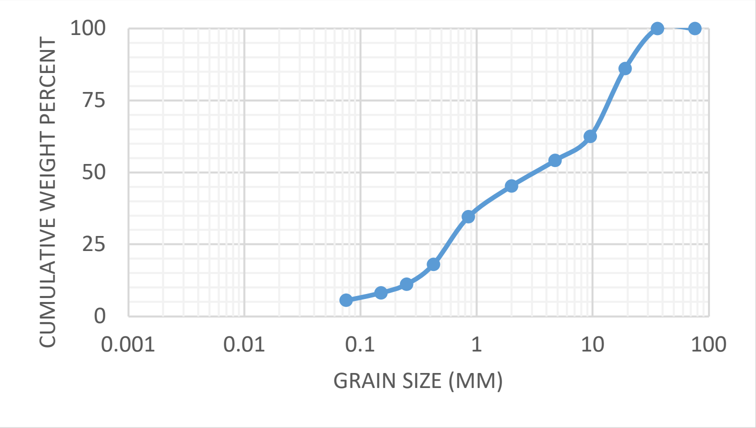
M:\MEG\2022 PROJECTS\222-203 PAPACHRISTOS, ERIC - JACKSON SQUARE, WEYMOUTH\DWGS\SUBMISSIONS\(R2)\222-203 MOUNDING ANALYSIS.DWG

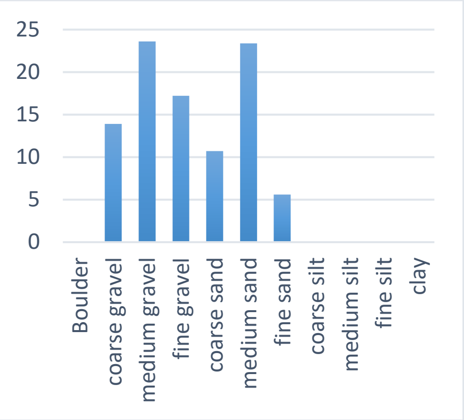
Grain Size Analysis Report Date: 11/13/2023

Sample Name: MA-13 OUTWASH 11'-12'

Mass Sample (g): 251.7 T (oC) 20

Poorly sorted sandy gravel low in fines





Sieve opening (ps) di (mm)	Mass of retained (mr) (g)	mass fraction (mf)	Percent Passing (pp)
76.2	0	0	100
36.1	0	0	100
19.05	34.9863	0.139	86.1
9.525	59.4012	0.236	62.5
4.75	20.8911	0.083	54.2
2	22.4013	0.089	45.3
0.85	26.9319	0.107	34.6
0.425	41.5305	0.165	18.1
0.25	17.3673	0.069	11.2
0.15	7.551	0.03	8.2
0.075	6.5442	0.026	5.6

Effective Grain Diameters (mm)		Other Useful Parameters	
d10	0.210	Uniformity Coef.	38.51
d17	0.397	n computed	0.26
d20	0.474	g (cm/s^2)	980.00
d50	3.452	ρ (g/cm^3)	0.9981
d60	8.087	μ (g/cm s)	0.0098
de (Kruger)	1.021	ρg/μ (1/cm s)	9.9327E+04
de (Kozeny)	0.918	tau (Sauerbrei)	1.053
de (Zunker)	0.951	$d_{geometric\ mean}$	2.961
de (Zamarin)	0.986	σ_ϕ	2.738
Io (Alyameni)	-0.601		

mm	0	% in sample
>64	Boulder	0
16 - 64	coarse gravel	13.9
8 - 16	medium gravel	23.6
2 - 8	fine gravel	17.2
0.5 - 2	coarse sand	10.7
0.25 - 0.5	medium sand	23.4
0.063 - 0.25	fine sand	5.6
0.016 - 0.063	coarse silt	
0.008 - 0.016	medium silt	
0.002 - 0.008	fine silt	
<0.002	clay	

K from Grain Size Analysis Report

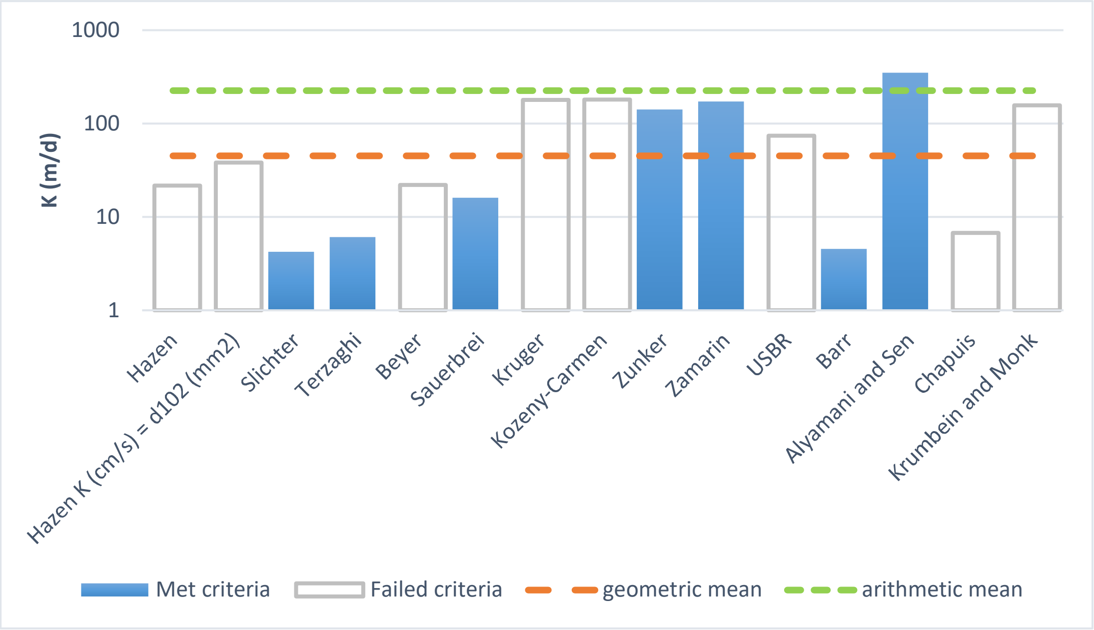
Date: 11/13/2023

Sample Name: MA-13 OUTWASH 11'-12'

Mass Sample (g): 251.7

T (oC) 20

Poorly sorted sandy gravel low in fines



Estimation of Hydraulic Conductivity	cm/s	m/s	m/d	de
Hazen	.250E-01	.250E-03	21.62	
Hazen K (cm/s) = d_{10} (mm)	.441E-01	.441E-03	38.10	
Slichter	.492E-02	.492E-04	4.25	
Terzaghi	.702E-02	.702E-04	6.06	
Beyer	.254E-01	.254E-03	21.91	
Sauerbrei	.185E-01	.185E-03	16.01	
Kruger	.207E+00	.207E-02	179.17	
Kozeny-Carmen	.208E+00	.208E-02	179.97	
Zunker	.164E+00	.164E-02	141.34	
Zamarin	.199E+00	.199E-02	172.20	
USBR	.856E-01	.856E-03	73.96	
Barr	.528E-02	.528E-04	4.56	
Alyamani and Sen	.406E+00	.406E-02	350.85	
Chapuis	.776E-02	.776E-04	6.70	
Krumbein and Monk	.181E+00	.181E-02	156.36	
Shepherd	.128E+01	.128E-01	1103.05	
geometric mean	.524E-01	.524E-03	6.59	
arithmetic mean	.260E+00	.260E-02	7.72	

Soil Classification Spreadsheet - FOR REPORT

Project: Jackson Square

Project Location: Boston, MA

Project Number: 7517.2.00

Soil Strata: Outwash

Figure Number:

Exploration ID: MA-13

Sample Number: S-7A

Sample Depth: 11-12'

Sample EL.:

Initial Weight: 251.7 grams

Grain Size (mm)	Sieve	Weight Retained (g)	Percent Retained	Percent Passing	Material	Fraction	Percent
76.2	3"	0.0	0.0%	100.0%	Gravel	Coarse	13.9%
38.1	1.5"	0.0	0.0%	100.0%			
76.2	0.750"	35.1	13.9%	86.1%			
9.525	0.375"	94.3	37.5%	62.5%	Gravel	Medium	23.5%
4.75	#4	115.4	45.8%	54.2%	Gravel	Fine	17.3%
2	#10	137.8	54.7%	45.3%			
0.85	#20	164.7	65.4%	34.6%	Sand	Coarse	10.7%
0.425	#40	206.2	81.9%	18.1%	Sand	Medium	23.4%
0.25	#60	223.6	88.8%	11.2%			
0.15	#100	231.1	91.8%	8.2%	Sand	Fine	5.6%
0.075	#200	237.7	94.4%	5.6%			
	Fines	239.0	95.0%	--	Fines	--	5.6%

Gravel	--	**55%**
Sand	--	**40%**
Fines	--	**6%**

MOUNDSOLV
GROUNDWATER MOUNDING ANALYSIS FOR A SLOPING WATER-TABLE AQUIFER
ZLOTNIK ET AL. (2017) SOLUTION

Solution Method

Zlotnik et al. (2017) transient solution for a rectangular source (linearization method 2)

Site Description

Aquifer Data

Property	Value
Horizontal hydraulic conductivity, *K* (ft/d)	21.62
Specific yield, *Sy*	0.26
Initial saturated thickness, h_0 (ft)	7.93
Maximum allowable water-table rise, *σ* (ft)	0
Dip, *i* (ft/ft)	0
Slope rotation from x axis, *γ* (°)	0

Recharge Sources

Property	Source 1
X coordinate at center, *X* (ft)	0
Y coordinate at center, *Y* (ft)	0
Dimension along x* axis, *L* (ft)	100.53
Dimension along y* axis, *W* (ft)	25.75
Rotation from slope direction, *ϕ* (°)	0
Recharge rate, *Q* (ft^3/d)	484
Infiltration rate, *q* (ft/d)	0.1869702229
Recharge duration, t_0 (d)	1

Monitoring Points

Elapsed Time, t = 4 d

Name	x (ft)	y (ft)	s (ft)	h (ft)	z (ft)
Source 1	0	0	0.05857	7.989	0

Time Series Data

Time	Source 1	
(d)	s (ft)	h (ft)
0	0	7.93
0.002327	0.001674	7.932
0.005236	0.003766	7.934
0.008873	0.006381	7.936
0.01342	0.009646	7.94
0.0191	0.01371	7.944
0.0262	0.01872	7.949
0.03508	0.02483	7.955
0.04618	0.03218	7.962
0.06005	0.04091	7.971
0.07739	0.05118	7.981
0.09906	0.06313	7.993
0.1262	0.07692	8.007
0.16	0.09275	8.023
0.2024	0.1108	8.041
0.2553	0.1312	8.061
0.3214	0.1542	8.084
0.4041	0.1798	8.11
0.5075	0.2081	8.138
0.6366	0.239	8.169
0.7981	0.2723	8.202
1	0.3079	8.238
1.007	0.304	8.234
1.016	0.2992	8.229
1.027	0.2933	8.223

1.04	0.2863	8.216
1.057	0.2782	8.208
1.079	0.269	8.199
1.105	0.2587	8.189
1.139	0.2474	8.177
1.18	0.235	8.165
1.232	0.2215	8.152
1.297	0.2071	8.137
1.378	0.1917	8.122
1.48	0.1757	8.106
1.607	0.1592	8.089
1.766	0.1426	8.073
1.964	0.1263	8.056
2.212	0.1106	8.041
2.522	0.09574	8.026
2.91	0.08204	8.012
3.394	0.06962	8
4	0.05857	7.989

Profile Data

Profile Along X Axis for Source 1 at Elapsed Time, t = 4 d*

x* (ft)	s (ft)	h (ft)	z (ft)
-101	0.02316	7.953	0
-96.96	0.02492	7.955	0
-92.92	0.02673	7.957	0
-88.88	0.02858	7.959	0
-84.84	0.03047	7.96	0
-80.8	0.03239	7.962	0
-76.76	0.03432	7.964	0
-72.72	0.03626	7.966	0

-68.68	0.0382	7.968	0
-64.64	0.04011	7.97	0
-60.6	0.042	7.972	0
-56.56	0.04384	7.974	0
-52.52	0.04563	7.976	0
-48.48	0.04735	7.977	0
-44.44	0.04899	7.979	0
-40.4	0.05053	7.981	0
-36.36	0.05197	7.982	0
-32.32	0.05329	7.983	0
-28.28	0.05449	7.984	0
-24.24	0.05554	7.986	0
-20.2	0.05645	7.986	0
-16.16	0.0572	7.987	0
-12.12	0.0578	7.988	0
-8.08	0.05822	7.988	0
-4.04	0.05848	7.988	0
0	0.05857	7.989	0
4.04	0.05848	7.988	0
8.08	0.05822	7.988	0
12.12	0.0578	7.988	0
16.16	0.0572	7.987	0
20.2	0.05645	7.986	0
24.24	0.05554	7.986	0
28.28	0.05449	7.984	0
32.32	0.05329	7.983	0
36.36	0.05197	7.982	0
40.4	0.05053	7.981	0
44.44	0.04899	7.979	0
48.48	0.04735	7.977	0
52.52	0.04563	7.976	0
56.56	0.04384	7.974	0

60.6	0.042	7.972	0
64.64	0.04011	7.97	0
68.68	0.0382	7.968	0
72.72	0.03626	7.966	0
76.76	0.03432	7.964	0
80.8	0.03239	7.962	0
84.84	0.03047	7.96	0
88.88	0.02858	7.959	0
92.92	0.02673	7.957	0
96.96	0.02492	7.955	0
101	0.02316	7.953	0

The axes of Source 1 (x, y*) are rotated 0°*
from the axes of mapping coordinate system (x, y)

Profile Along Y Axis for Source 1 at Elapsed Time, t = 4 d*

y* (ft)	s (ft)	h (ft)	z (ft)
-101	0.01953	7.95	0
-96.96	0.02128	7.951	0
-92.92	0.02311	7.953	0
-88.88	0.02501	7.955	0
-84.84	0.02698	7.957	0
-80.8	0.02899	7.959	0
-76.76	0.03105	7.961	0
-72.72	0.03313	7.963	0
-68.68	0.03524	7.965	0
-64.64	0.03734	7.967	0
-60.6	0.03943	7.969	0
-56.56	0.0415	7.971	0
-52.52	0.04351	7.974	0
-48.48	0.04547	7.975	0
-44.44	0.04735	7.977	0

-40.4	0.04913	7.979	0
-36.36	0.05079	7.981	0
-32.32	0.05234	7.982	0
-28.28	0.05373	7.984	0
-24.24	0.05498	7.985	0
-20.2	0.05605	7.986	0
-16.16	0.05694	7.987	0
-12.12	0.05765	7.988	0
-8.08	0.05816	7.988	0
-4.04	0.05846	7.988	0
0	0.05857	7.989	0
4.04	0.05846	7.988	0
8.08	0.05816	7.988	0
12.12	0.05765	7.988	0
16.16	0.05694	7.987	0
20.2	0.05605	7.986	0
24.24	0.05498	7.985	0
28.28	0.05373	7.984	0
32.32	0.05234	7.982	0
36.36	0.05079	7.981	0
40.4	0.04913	7.979	0
44.44	0.04735	7.977	0
48.48	0.04547	7.975	0
52.52	0.04351	7.974	0
56.56	0.0415	7.971	0
60.6	0.03943	7.969	0
64.64	0.03734	7.967	0
68.68	0.03524	7.965	0
72.72	0.03313	7.963	0
76.76	0.03105	7.961	0
80.8	0.02899	7.959	0
84.84	0.02698	7.957	0

88.88	0.02501	7.955	0
92.92	0.02311	7.953	0
96.96	0.02128	7.951	0
101	0.01953	7.95	0

The axes of Source 1 (x, y*) are rotated 0°*
from the axes of mapping coordinate system (x, y)

Sensitivity Data

Source 1, x=0 ft, y=0 ft

Parameter	**Water-Table Rise (ft)**		
Multiplier	**K**	**Sy**	**h_0**
0.5	0.107	0.06135	0.1064
0.575	0.09518	0.06092	0.09483
0.65	0.08573	0.06049	0.08551
0.725	0.07798	0.06007	0.07785
0.8	0.07152	0.05965	0.07145
0.875	0.06604	0.05924	0.06601
0.95	0.06134	0.05883	0.06133
1.025	0.05727	0.05843	0.05727
1.1	0.0537	0.05804	0.05372
1.175	0.05055	0.05765	0.05058
1.25	0.04775	0.05726	0.04778
1.325	0.04525	0.05688	0.04528
1.4	0.04299	0.0565	0.04302
1.475	0.04095	0.05612	0.04098
1.55	0.03909	0.05576	0.03912
1.625	0.0374	0.05539	0.03743
1.7	0.03584	0.05503	0.03587
1.775	0.03441	0.05468	0.03444
1.85	0.03309	0.05432	0.03312
1.925	0.03187	-1E+31	0.0319
2	0.03073	-1E+31	0.03076

Notation

h is water-table elevation above datum[1]
h_0 is aquifer saturated thickness prior to mounding
i is dip of aquifer
K is horizontal hydraulic conductivity
L is dimension of recharge source parallel to x^* axis
q is infiltration rate ($= Q / L \cdot W$)
Q is recharge rate
s is water-table rise above static water table
Sy is specific yield
t is time since start of recharge
t_0 is time when recharge stops
W is dimension of recharge source parallel to y^* axis
x, y are mapping Cartesian coordinate axes
x^*, y^* are recharge source Cartesian coordinate axes
z is elevation above datum[1]
γ is angle between x axis and dip direction
ϕ is angle between dip direction and x^* axis of recharge source
σ is maximum acceptable water-table rise

[1] *Elevation datum is the base of aquifer beneath the center of primary recharge source*

Report generated by MOUNDSOLV v4.0 on 13 Nov 2023 at 21:48:42
MOUNDSOLV (www.aqtesolv.com)

APPENDIX E

Soil Testing Data

Commonwealth of Massachusetts
City/Town of Weymouth

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

A. Facility Information

Eric Papachristos
Owner Name

Broad Street
Street Address

Parcel Nos.253-14, 253-16, 253-17, 253-18, 253-21, 305-1, 305-9, 305-10, 305-11, 305-4, 306-11

Weymouth
City

MA
State

02189
Zip Code

B. Site Information

1. (Check one) ☒ New Construction ☐ Upgrade

2. Soil Survey
Web Soil Survey
Source
602 & 655
Soil Map Unit
Urban Land & Udorthents, wet substratum
Soil Series

Landform
None
Soil Limitations

Outwash
Soil Parent material

3. Surficial Geological Report
2018/ Surficial Materials of Massachusetts
Year Published/Source
Coarse deposits
Map Unit

gravel deposits, sand & gravel deposits and sand deposits
Description of Geologic Map Unit:

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

5. Within a velocity zone? ☐ Yes ☒ No

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

7. Current Water Resource Conditions (USGS): 01/08/23
Month/Day/ Year
Range: ☐ Above Normal ☒ Normal ☐ Below Normal

8. Other references reviewed:
(Zone II, IWPA, Zone A, EEA Data Portal, etc.)

Commonwealth of Massachusetts
City/Town of Weymouth

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

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

Deep Observation Hole Number: TP-1 (Hole #) 02/08/23 (Date) 8:15 AM (Time) Mostly Cloudy - 43 (Weather) 42d 12'56.6" (Latitude) 70d 55'23.1" (Longitude)

1. Land Use Residential/Commercial (e.g., woodland, agricultural field, vacant lot, etc.) Grass/weeds (Vegetation) None (Surface Stones (e.g., cobbles, stones, boulders, etc.)) 1-3% (Slope (%))

Description of Location: Vacant gravel parking area

2. Soil Parent Material: Outwash ______ Landform ______ Position on Landscape (SU, SH, BS, FS, TS, Plain)

3. Distances from: Open Water Body 25 feet Drainage Way 25 feet Wetlands N/A feet

Property Line 30 feet Drinking Water Well N/A feet Other ______ feet

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

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

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0"-42"	F	Fill			Cnc : Dpl:						
42"-66"	F	Fill			Cnc : Dpl:						
66"-108"	C1	Loamy sand /Sand	10YR3/4	66"	Cnc :10YR4/6 Dpl:		30	30	Single grain	Loose	Coarse/ many cobbles/ Trace of fines
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes:
C1 horizon looks to be oxidized - perhaps high iron content.

Commonwealth of Massachusetts
City/Town of Weymouth

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

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

Deep Observation Hole Number: TP-2 (Hole #) 02/08/23 (Date) 8:50 AM (Time) Mostly Cloudy-45 (Weather) 42d 12'56.7" (Latitude) 70d 55'24.2" (Longitude)

1. Land Use: Residential/Commercial (e.g., woodland, agricultural field, vacant lot, etc.) Grass/weeds (Vegetation) None (Surface Stones (e.g., cobbles, stones, boulders, etc.)) 1-3% (Slope (%))

   Description of Location: Vacant gravel parking area

2. Soil Parent Material: Outwash ______ Landform ______ Position on Landscape (SU, SH, BS, FS, TS, Plain)

3. Distances from: Open Water Body 105 feet Drainage Way 105 feet Wetlands N/A feet

   Property Line 5 feet Drinking Water Well N/A feet Other ______ feet

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

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

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0"-32"	F	Fill			Cnc : Dpl:						
32"-42"	A	Sandy loam	10YR2/2		Cnc : Dpl:				Massive	Friable	
42"-52"	Bw	Sandy loam	7.5YR4/6		Cnc : Dpl:				Massive	Friable	
52"-108"	C1	Sand/loamy sand	10YR3/4	60"	Cnc :10YR4/6 Dpl:		30	25	Single grain	Loose	Coarse/some fines
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes:
Entire C1 horizon appears to be oxidized - perhaps high iron content.

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

D. Determination of High Groundwater Elevation

1. Method Used (Choose one):	Obs. Hole # TP-1	Obs. Hole # TP-2
☒ Depth to soil redoximorphic features	66 inches	60 inches
☐ Depth to observed standing water in observation hole	_____ inches	_____ inches
☐ Depth to adjusted seasonal high groundwater (S_h) (USGS methodology)	_____ inches	_____ inches

Index Well Number ______________ Reading Date ______________

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

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

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

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

☒ Yes ☐ No

b. If yes, at what depth was it observed (exclude O, A, and E Horizons)? Upper boundary: 52 inches Lower boundary: 108 inches

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

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

F. Certification

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

Alan W. Loomis
Signature of Soil Evaluator

Feb. 8, 2023
Date

Alan Loomis / SE #1405
Typed or Printed Name of Soil Evaluator / License #

June 30, 2025
Expiration Date of License

Name of Approving Authority Witness

Approving Authority

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

Field Diagrams: Use this area for field diagrams:

Commonwealth of Massachusetts
City/Town of Weymouth

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

A. Facility Information

Eric Papachristos
Owner Name

Broad Street
Street Address

Parcel Nos.253-14, 253-16, 253-17, 253-18, 253-21, 305-1, 305-9, 305-10, 305-11, 305-4, 306-11

Weymouth
City

MA
State

02189
Zip Code

B. Site Information

1. (Check one) ☒ New Construction ☐ Upgrade

2. Soil Survey
Web Soil Survey
Source
602 & 655
Soil Map Unit
Urban Land & Udorthents, wet substratum
Soil Series

Landform
None
Soil Limitations

Outwash
Soil Parent material

3. Surficial Geological Report
2018/ Surficial Materials of Massachusetts
Year Published/Source
Coarse deposits
Map Unit

gravel deposits, sand & gravel deposits and sand deposits
Description of Geologic Map Unit:

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

5. Within a velocity zone? ☐ Yes ☒ No

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

7. Current Water Resource Conditions (USGS): 01/08/23
Month/Day/ Year
Range: ☐ Above Normal ☒ Normal ☐ Below Normal

8. Other references reviewed:
(Zone II, IWPA, Zone A, EEA Data Portal, etc.)

Commonwealth of Massachusetts
City/Town of Weymouth

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

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

Deep Observation Hole Number: TP-3 (Hole #) 02/08/23 (Date) 9:20 AM (Time) Mostly Cloudy - 45 (Weather) 42d 12'56.5" (Latitude) 70d 55'25.0" (Longitude)

1. Land Use Residential/Commercial (e.g., woodland, agricultural field, vacant lot, etc.) Grass/weeds (Vegetation) None (Surface Stones (e.g., cobbles, stones, boulders, etc.)) 1-3% (Slope (%))

Description of Location: Vacant gravel parking area

2. Soil Parent Material: Outwash ______ Landform ______ Position on Landscape (SU, SH, BS, FS, TS, Plain)

3. Distances from: Open Water Body 160 feet Drainage Way 160 feet Wetlands N/A feet

Property Line 20 feet Drinking Water Well N/A feet Other ______ feet

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

5. Groundwater Observed: ☒ Yes ☐ No If yes: ______ Depth to Weeping in Hole 102" Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0"-38"	F	Fill			Cnc : Dpl:						
38"-47"	C1	Fill	10YR3/4		Cnc : Dpl:		30	25	Single grain	Loose	
47"-67"	C2	Loamy sand /Sand	10YR2/1		Cnc : Dpl:		30	25	Single grain	Cemented in place	Bog iron
67"-108	C3		10YR3/3	70"	Cnc :10YR4/6 Dpl:		30	25	Single grain	Loose	Coarse/ many cobbles/
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes:
Bright band of redox at 70"

Commonwealth of Massachusetts
City/Town of Weymouth

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

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

Deep Observation Hole Number: TP-4 (Hole #) 02/08/23 (Date) 10:00 AM (Time) Mostly Cloudy-45 (Weather) 42d 12'56.8" (Latitude) 70d 55'24.7" (Longitude)

1. Land Use: Residential/Commercial (e.g., woodland, agricultural field, vacant lot, etc.) Grass/weeds (Vegetation) None (Surface Stones (e.g., cobbles, stones, boulders, etc.)) 1-3% (Slope (%))

Description of Location: Vacant gravel parking area

2. Soil Parent Material: Outwash ______ Landform ______ Position on Landscape (SU, SH, BS, FS, TS, Plain)

3. Distances from: Open Water Body 135 feet Drainage Way 135 feet Wetlands N/A feet

Property Line 5 feet Drinking Water Well N/A feet Other ______ feet

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

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

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0"-57"	F	Fill			Cnc : Dpl:						
57"-63"	B	Sandy loam	7.5YR4/6		Cnc : Dpl:		30	25	Massive	Friable	
63"-102"	C1	Sand/loamy sand	10YR3/4	63"	Cnc :10YR4/6 Dpl:		30	25	Single grain	Loose	Coarse/some fines
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes:
Bog iron lenses & redox throughout C1 horizon

Commonwealth of Massachusetts
City/Town of Weymouth

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

D. Determination of High Groundwater Elevation

1. Method Used (Choose one):

	Obs. Hole #TP-3	Obs. Hole #TP-4
☒ Depth to soil redoximorphic features	70 inches	63 inches
☐ Depth to observed standing water in observation hole	____ inches	____ inches
☐ Depth to adjusted seasonal high groundwater (S_h) (USGS methodology)	____ inches	____ inches

Index Well Number ____ Reading Date ____

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

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

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

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

☒ Yes ☐ No

b. If yes, at what depth was it observed (exclude O, A, and E Horizons)? Upper boundary: 67 inches Lower boundary: 108 inches

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

F. Certification

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

Alan W. Loomis
Signature of Soil Evaluator

Feb. 8, 2023
Date

Alan Loomis / SE #1405
Typed or Printed Name of Soil Evaluator / License #

June 30, 2025
Expiration Date of License

Name of Approving Authority Witness

Approving Authority

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

Field Diagrams: Use this area for field diagrams:

Commonwealth of Massachusetts
City/Town of Weymouth

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

A. Facility Information

Owner Name: Eric Papachristos

Street Address: Broad Street

Parcel Nos.253-14, 253-16, 253-17, 253-18, 253-21, 305-1, 305-9, 305-10, 305-11, 305-4, 306-11

City: Weymouth

State: MA

Zip Code: 02189

B. Site Information

1. (Check one) ☒ New Construction ☐ Upgrade

2. Soil Survey

Source: Web Soil Survey

Soil Map Unit: 602 & 655

Soil Series: Urban Land & Udorthents, wet substratum

Landform:

Soil Limitations: None

Soil Parent material: Outwash

3. Surficial Geological Report

Year Published/Source: 2018/ Surficial Materials of Massachusetts

Map Unit: Coarse deposits

Description of Geologic Map Unit: gravel deposits, sand & gravel deposits and sand deposits

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

5. Within a velocity zone? ☐ Yes ☒ No

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

Wetland Type:

7. Current Water Resource Conditions (USGS): 01/08/23 Month/Day/ Year Range: ☐ Above Normal ☒ Normal ☐ Below Normal

8. Other references reviewed:
(Zone II, IWPA, Zone A, EEA Data Portal, etc.)

Commonwealth of Massachusetts
City/Town of Weymouth

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

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

Deep Observation Hole Number: TP-5 (Hole #) 02/08/23 (Date) 10:50 AM (Time) Mostly Cloudy - 45 (Weather) 42d 12'57.0" (Latitude) 70d 55'26.0" (Longitude)

1. Land Use Residential/Commercial (e.g., woodland, agricultural field, vacant lot, etc.) Grass/weeds (Vegetation) None (Surface Stones (e.g., cobbles, stones, boulders, etc.)) 1-3% (Slope (%))

Description of Location: Wooded area

2. Soil Parent Material: Outwash ______ Landform ______ Position on Landscape (SU, SH, BS, FS, TS, Plain)

3. Distances from: Open Water Body >100 feet Drainage Way >100 feet Wetlands N/A feet

Property Line 10 feet Drinking Water Well N/A feet Other ______ feet

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

5. Groundwater Observed: ☒ Yes ☐ No If yes: ______ Depth to Weeping in Hole 81" Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0"-12"	Ap	Sandy loam	10YR2/2		Cnc : Dpl:		15	5	Massive	Friable	
12"-27"	Bw	Loamy sand	10YR3/6		Cnc : Dpl:		20	10	Massive	Very friable	
27"-96"	C1	Sand	10YR3/4	64"	Cnc :10YR4/6 Dpl:	50	30	25	Single grain	Cemented in place	Coarse
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes:
Band of redox at 64"

Commonwealth of Massachusetts
City/Town of Weymouth

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

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

Deep Observation Hole Number: TP-6 (Hole #) 02/08/23 (Date) 11:05 AM (Time) Mostly Cloudy-45 (Weather) 42d 12'57.3" (Latitude) 70d 55'26.4" (Longitude)

1. Land Use: Residential/Commercial (e.g., woodland, agricultural field, vacant lot, etc.) Grass/weeds (Vegetation) None (Surface Stones (e.g., cobbles, stones, boulders, etc.)) 1-3% (Slope (%))

Description of Location: Wooded area

2. Soil Parent Material: Outwash ______ (Landform) ______ (Position on Landscape (SU, SH, BS, FS, TS, Plain))

3. Distances from: Open Water Body >100 feet Drainage Way >100 feet Wetlands N/A feet

Property Line 15 feet Drinking Water Well N/A feet Other ______ feet

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

5. Groundwater Observed: ☒ Yes ☐ No If yes: ______ Depth to Weeping in Hole 95" Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0"-13"	A	Sandy loam	10YR2/2		Cnc : Dpl:		10	5	Massive	Friable	
13"-28"	Bw	Loamy sand	10YR3/6		Cnc : Dpl:		25	10	Massive	Very friable	
28"-64"	C1	Loamy sand	Variegated*	64"**	Cnc :10YR4/6 Dpl:		30	25	Single grain	Cemented lenses	See comments below
62"-105"	C2	Sand	10YR3/4		Cnc : Dpl:		30	25	Single grain	Loose	Coarse
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes:
*Bog iron lenses & various colors & textures throughout C1 horizon **Bright band of redox @ 64"

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

D. Determination of High Groundwater Elevation

1. Method Used (Choose one):	Obs. Hole #TP-5	Obs. Hole #TP-6
☒ Depth to soil redoximorphic features	64 inches	64 inches
☐ Depth to observed standing water in observation hole	_____ inches	_____ inches
☐ Depth to adjusted seasonal high groundwater (S_h) (USGS methodology)	_____ inches	_____ inches

Index Well Number _____ Reading Date _____

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

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

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

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

☒ Yes ☐ No

b. If yes, at what depth was it observed (exclude O, A, and E Horizons)? Upper boundary: 27 inches Lower boundary: 96 inches

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

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

F. Certification

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

Alan W. Loomis
Signature of Soil Evaluator

Feb. 8, 2023
Date

Alan Loomis / SE #1405
Typed or Printed Name of Soil Evaluator / License #

June 30, 2025
Expiration Date of License

Name of Approving Authority Witness

Approving Authority

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

Field Diagrams: Use this area for field diagrams:

Commonwealth of Massachusetts
City/Town of Weymouth

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

A. Facility Information

Eric Papachristos
Owner Name

Broad Street
Street Address

Parcel Nos.253-14, 253-16, 253-17, 253-18, 253-21, 305-1, 305-9, 305-10, 305-11, 305-4, 306-11

Weymouth
City

MA
State

02189
Zip Code

B. Site Information

1. (Check one) ☒ New Construction ☐ Upgrade

2. Soil Survey

Web Soil Survey
Source

602 & 655
Soil Map Unit

Urban Land & Udorthents, wet substratum
Soil Series

Landform

None
Soil Limitations

Outwash
Soil Parent material

3. Surficial Geological Report

2018/ Surficial Materials of Massachusetts
Year Published/Source

Coarse deposits
Map Unit

gravel deposits, sand & gravel deposits and sand deposits
Description of Geologic Map Unit:

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

5. Within a velocity zone? ☐ Yes ☒ No

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

Wetland Type

7. Current Water Resource Conditions (USGS): 01/08/23 Range: ☐ Above Normal ☒ Normal ☐ Below Normal

Month/Day/ Year

8. Other references reviewed:
(Zone II, IWPA, Zone A, EEA Data Portal, etc.)

Commonwealth of Massachusetts
City/Town of Weymouth

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

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

Deep Observation Hole Number: TP-7 (Hole #) 02/08/23 (Date) 11:25 AM (Time) Mostly Cloudy - 45 (Weather) 42d 12'57.6" (Latitude) 70d 55'26.7" (Longitude)

1. Land Use Residential/Commercial (e.g., woodland, agricultural field, vacant lot, etc.) Oak, briar (Vegetation) None (Surface Stones (e.g., cobbles, stones, boulders, etc.)) 1-3% (Slope (%))

Description of Location: Wooded area

2. Soil Parent Material: Outwash ____ Landform ____ Position on Landscape (SU, SH, BS, FS, TS, Plain)

3. Distances from: Open Water Body >100 feet Drainage Way >100 feet Wetlands N/A feet

Property Line 10 feet Drinking Water Well N/A feet Other _____ feet

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

5. Groundwater Observed: ☒ Yes ☐ No If yes: _____ Depth to Weeping in Hole 51" Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0"-22"	F	Fill			Cnc : Dpl:						
22"-51"	C1	Sand	10YR3/4		Cnc : Dpl:		30	20	Single grain	Loose	
51"-60"	C2	Sand*	10YR2/1	51"	Cnc :10YR2/1 Dpl:	100	30	20	Single grain	Cemented	Bog iron
60"-96"	C3	Sand	10YR3/4		Cnc : Dpl:		30	20	Single grain	Loose	Coarse
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes:
*C2 horizon is cemented coarse sand & gravel-bog iron-groundwater is weeping over bog iron.

LEGEND

⌖ – APPROXIMATE LOCATION OF BORING PERFORMED BY TECHNICAL DRILLING SERVICES BETWEEN SEPTEMBER 26 TO OCTOBER 9, 2022 FOR McPHAIL ASSOCIATES, LLC

(OW) – INDICATES OBSERVATION WELL INSTALLED WITHIN COMPLETED BOREHOLE

REFERENCE: THIS PLAN WAS PREPARED FROM A 20-SCALE DRAWING ENTITLED "EXISTING CONDITIONS PLAN" DATED NOVEMBER 29, 2022 BY MCKENZIE ENGINEERING GROUP, INC.

GRAPHIC SCALE

30 0 30 60 120

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www.mcphailgeo.com

JACKSON SQUARE MULTI-USE DEVELOPMENT

WEYMOUTH MASSACHUSETTS

SUBSURFACE EXPLORATION PLAN

FOR

CMK DEVELOPMENTS PARTNERS

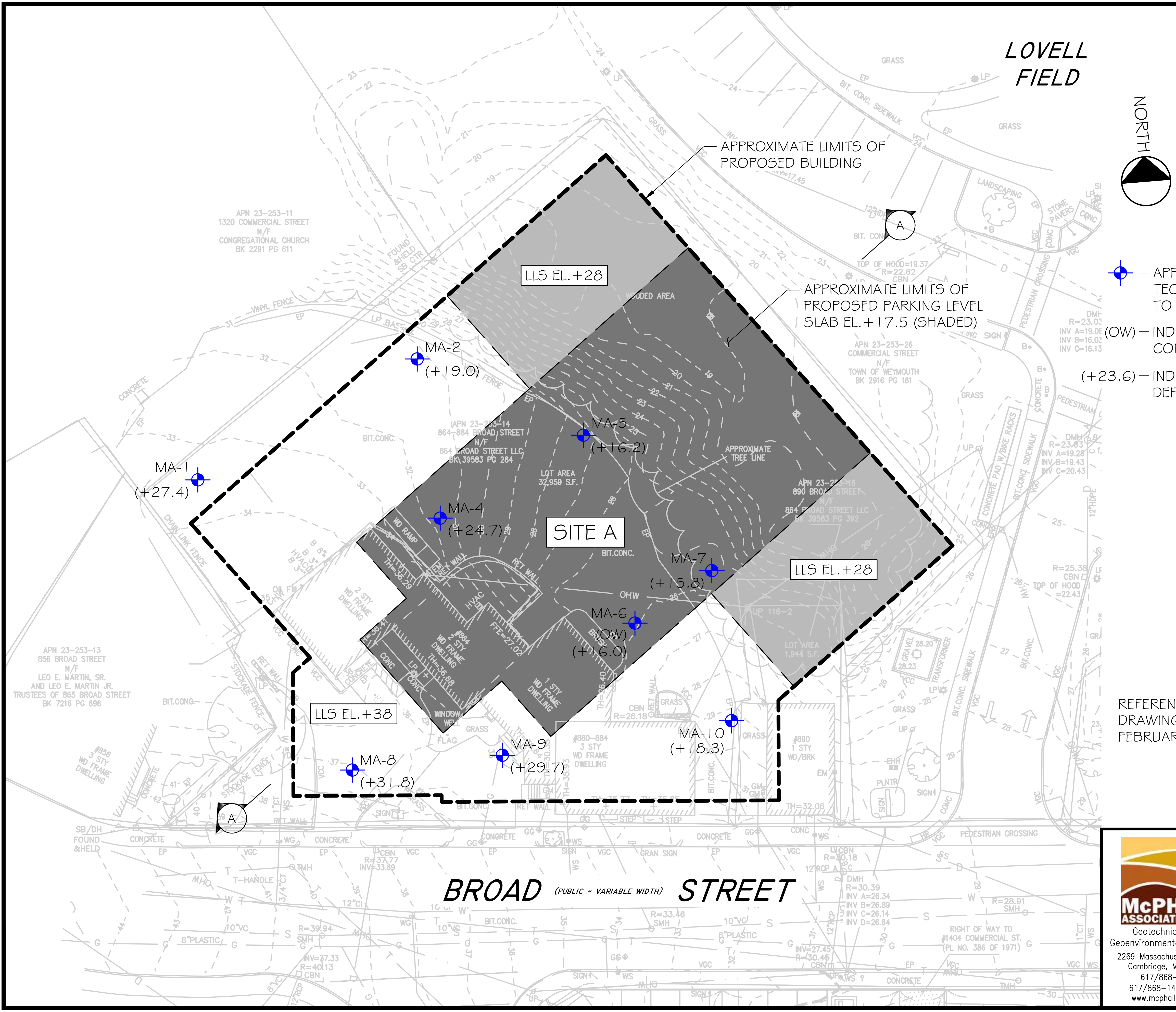
BY

McPHAIL ASSOCIATES, LLC

Date: MARCH 2023	Dwn: I.J.M.	Chkd: N.D.H.	Scale: 1" = 30'
Project No: 7517			FIGURE 2

FILE NAME: N:\Acad\JOBS\7517\7517-F02rev1.dwg

FIGURE 2A



LEGEND

⌖ — APPROXIMATE LOCATION OF BORING PERFORMED BY TECHNICAL DRILLING SERVICES BETWEEN SEPTEMBER 26 TO OCTOBER 9, 2022 FOR McPHAIL ASSOCIATES, LLC

(OW) — INDICATES OBSERVATION WELL INSTALLED WITHIN COMPLETED BOREHOLE

(+23.6) — INDICATES ELEVATION OF THE TOP OF NATURAL INORGANIC DEPOSIT CONSISTING OF ALLUVIUM OR GLACIAL OUTWASH

REFERENCE: THIS PLAN WAS PREPARED FROM A 20-SCALE DRAWING ENTITLED "EXISTING CONDITIONS PLAN" DATED FEBRUARY 3, 2023 BY MCKENZIE ENGINEERING GROUP, INC.

GRAPHIC SCALE

30 0 30 60

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www.mcphailgeo.com

JACKSON SQUARE MULTI-USE DEVELOPMENT
WEYMOUTH MASSACHUSETTS

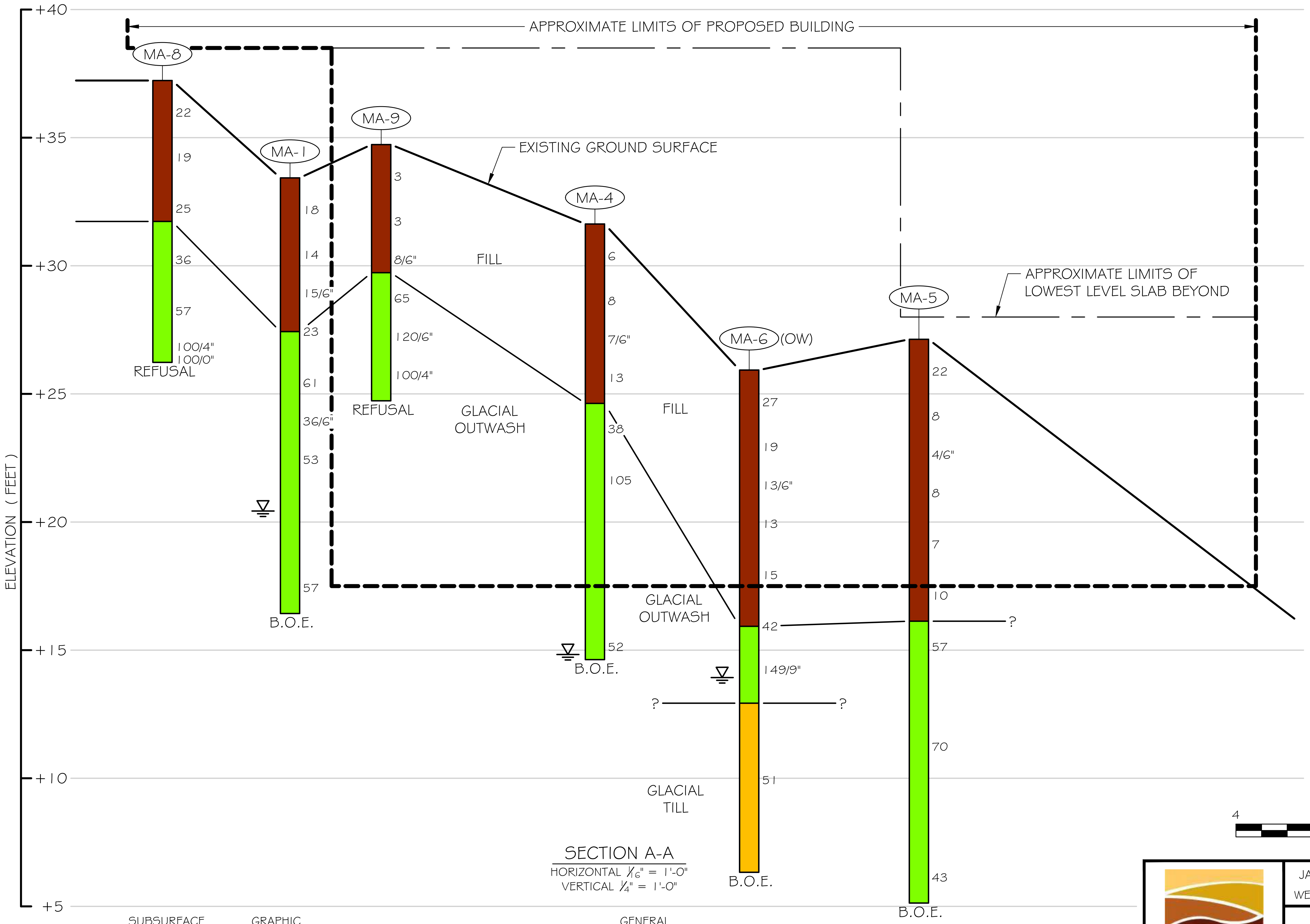
SUBSURFACE EXPLORATION PLAN - SITE A

FOR
CMK DEVELOPMENTS PARTNERS
BY
McPHAIL ASSOCIATES, LLC

Date: APRIL 2023 | Dwn: I.J.M. | Chkd: N.D.H. | Scale: 1" = 30'
Project No: 7517

FILE NAME: N:\Acad\JOBS\7517\Site A\7517-F02Arev1.dwg

FIGURE 2B



SECTION A-A

HORIZONTAL 1/16" = 1'-0"
VERTICAL 1/4" = 1'-0"

LEGEND

MA-1 — BOREHOLE NUMBER
▽ — GROUNDWATER LEVEL OBSERVED IN BOREHOLE
18 — STANDARD PENETRATION RESISTANCE OR N-VALUE, BLOWS PER FOOT
B.O.E. — BOTTOM OF EXPLORATION

NOTES:

1. REFER TO FIGURE 1 FOR LOCATION AND ORIENTATION OF SUBSURFACE SECTION.
2. STRATIFICATION LINES BETWEEN EXPLORATIONS ARE BASED ON LINEAR INTERPOLATION OF DATA FROM THE EXPLORATIONS AND MAY NOT NECESSARILY REPRESENT ACTUAL SUBSURFACE CONDITIONS.

GRAPHIC SCALE

4 0 4 8

SUBSURFACE UNIT	GRAPHIC SYMBOL	GENERAL DESCRIPTION
FILL	🟫	VERY LOOSE TO COMPACT, BROWN TO BLACK, SILT AND SAND WITH SOME GRAVEL VARYING TO A SAND AND GRAVEL WITH TRACE SILT. ALSO CONTAINING BRICK, SLAG, ASPHALT, ASH AND CINDERS
GLACIAL OUTWASH	🟩	COMPACT TO VERY DENSE, ORANGE-BROWN TO GRAY-BROWN, SILT AND SAND WITH SOME GRAVEL, VARYING TO A SAND AND GRAVEL WITH TRACE SILT
GLACIAL TILL	🟧	VERY DENSE, BROWN TO GRAY-BROWN, WELL GRADED MIXTURE OF SILT, SAND AND GRAVEL

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JACKSON SQUARE MULTI-USE DEVELOPMENT - SITE A
WEYMOUTH MASSACHUSETTS

GENERALIZED SUBSURFACE PROFILE - SECTION A-A

FOR
CMK DEVELOPMENTS PARTNERS
BY
McPHAIL ASSOCIATES, LLC

Date: APRIL 2023
Dwn: I.J.M.
Chkd: N.D.H.
Scale: AS NOTED
Project No: 7517

FILE NAME: N:\Acad\JOBS\7517\Site A\7517-F02Brev1_Section.dwg

FIGURE 3A

APPROXIMATE LIMITS OF PROPOSED BUILDING

APPROXIMATE LIMITS OF PROPOSED PARKING LEVEL SLAB EL.+17.5 (HATCHED)

LEGEND

⌖ — APPROXIMATE LOCATION OF BORING PERFORMED BY TECHNICAL DRILLING SERVICES BETWEEN SEPTEMBER 26 TO OCTOBER 9, 2022 FOR McPHAIL ASSOCIATES, LLC

(OW) — INDICATES OBSERVATION WELL INSTALLED WITHIN COMPLETED BOREHOLE

(+23.6) — INDICATES ELEVATION OF THE TOP OF NATURAL INORGANIC DEPOSIT CONSISTING OF ALLUVIUM OR GLACIAL OUTWASH

🟩 — LESS THAN RCS-1
🟪 — LESS THAN RCS-2
🟨 — UNLINED LANDFILL
🟦 — LINED LANDFILL
🟧 — BATCH PLANT

REFERENCE: THIS PLAN WAS PREPARED FROM A 20-SCALE DRAWING ENTITLED "EXISTING CONDITIONS PLAN" DATED FEBRUARY 3, 2023 BY MCKENZIE ENGINEERING GROUP, INC.

GRAPHIC SCALE
30 0 30 60

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www.mcphailgeo.com

JACKSON SQUARE MULTI-USE DEVELOPMENT
WEYMOUTH MASSACHUSETTS

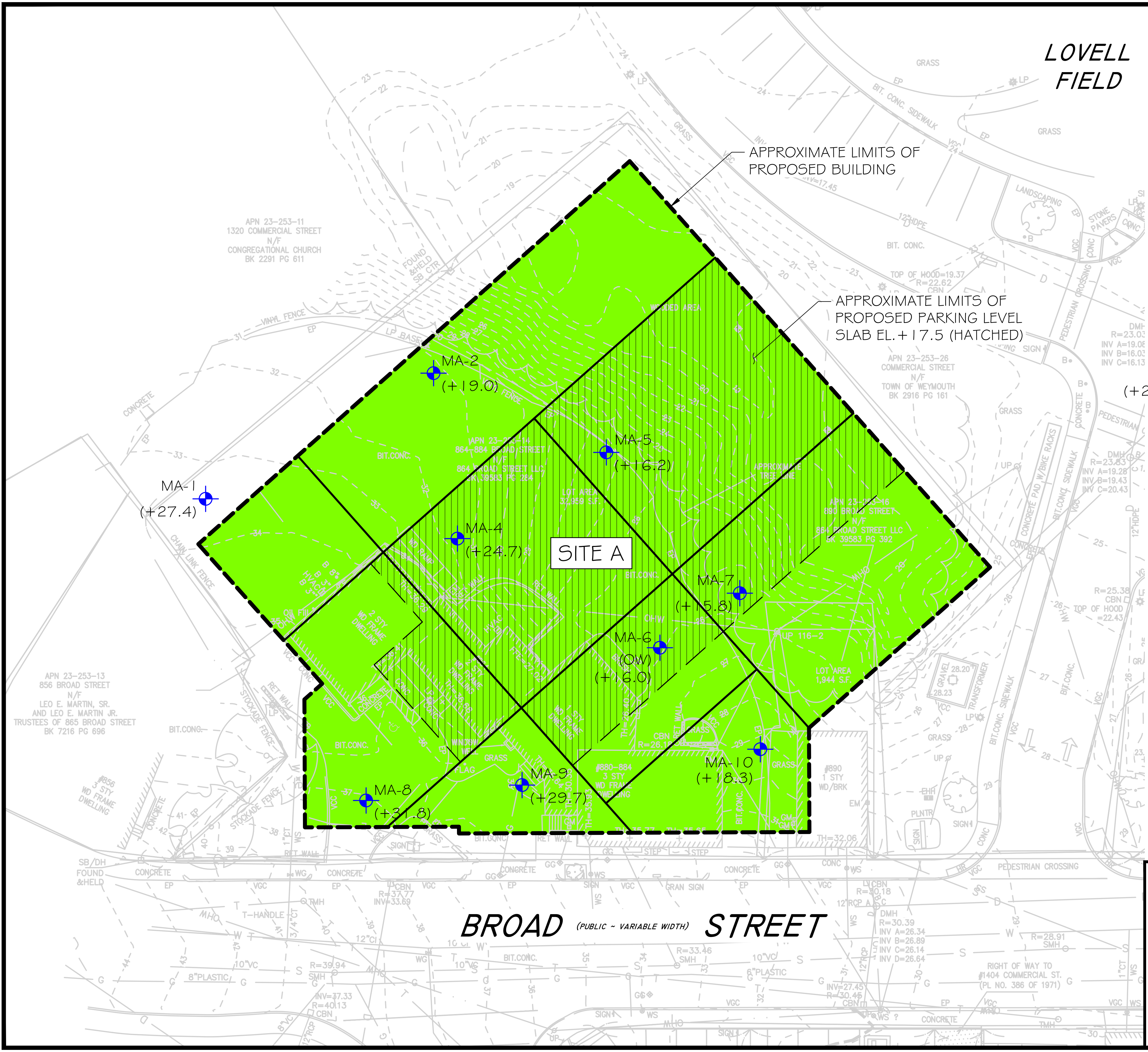
SOIL MANAGEMENT PLAN - FILL MATERIAL

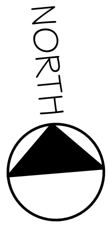
FOR
CMK DEVELOPMENTS PARTNERS
BY
McPHAIL ASSOCIATES, LLC

Date: APRIL 2023 | Dwn: I.J.M. | Chkd: N.D.H. | Scale: 1" = 30'
Project No: 7517

FILE NAME: N:\Acad\JOBS\7517\Site A\7517-F03Arev1.dwg

FIGURE 3B





LEGEND

⌖ — APPROXIMATE LOCATION OF BORING PERFORMED BY TECHNICAL DRILLING SERVICES BETWEEN SEPTEMBER 26 TO OCTOBER 9, 2022 FOR McPHAIL ASSOCIATES, LLC

(OW) — INDICATES OBSERVATION WELL INSTALLED WITHIN COMPLETED BOREHOLE

(+23.6) — INDICATES ELEVATION OF THE TOP OF NATURAL INORGANIC DEPOSIT CONSISTING OF ALLUVIUM OR GLACIAL OUTWASH

🟩 — LESS THAN RCS-1

🟪 — LESS THAN RCS-2

🟨 — UNLINED LANDFILL

🟦 — LINED LANDFILL

🟧 — BATCH PLANT

REFERENCE: THIS PLAN WAS PREPARED FROM A 20-SCALE DRAWING ENTITLED "EXISTING CONDITIONS PLAN" DATED FEBRUARY 3, 2023 BY MCKENZIE ENGINEERING GROUP, INC.

GRAPHIC SCALE

30 0 30 60

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JACKSON SQUARE MULTI-USE DEVELOPMENT
WEYMOUTH MASSACHUSETTS

SOIL MANAGEMENT PLAN - NATURAL

FOR
CMK DEVELOPMENTS PARTNERS
BY
McPHAIL ASSOCIATES, LLC

Date: APRIL 2023	Dwn: I.J.M.	Chkd: N.D.H.	Scale: 1" = 30'
Project No: 7517			

FILE NAME: N:\Acad\JOBS\7517\Site A\7517-F03Brev1.dwg

Project:	Jackson Square Development	**Job #:**	7517.9
Location:	Paved Parking Lot	**Date Started:**	9-30-22
City/State:	Weymouth, Massachusetts	**Date Finished:**	9-30-22

Boring No.
MA-1

Contractor: TDS
Driller/Helper: D. Newton/B. Lee
Logged By/Reviewed By: T. M. Cormican
Surface Elevation (ft): 33.4

Casing Type/Depth (ft): 4.25 " I.D. Hollow Stem augers
Casing Hammer (lbs)/Drop (in): NE
Sampler Size/Type: 1-3/8 " I.D. Split-Spoon
Sampler Hammer (lbs)/Drop (in): 140 lbs./30 inches

Groundwater Observations

Date	Depth	Elev.	Notes
9-30-22	13	20.4	

Depth (ft)	Elev. (ft)
	33
1	32
2	31
3	30
4	29
5	28
6	27
7	26
8	25
9	24
10	23
11	22
12	21
13	20
14	19
15	18
16	17
17	16
18	15
19	14
20	13
21	12
22	11
23	10

Depth/EL to Strata Change (ft)	Stratum	Sample TVOC (ppm)	N-Value RQD	No.	Pen. /Rec. (in)	Depth (ft)	Blows/6" Min/ft	Sample Description and Boring Notes
0.3 / 33.1	ASPHALT							
	FILL	0.0	18	S-1	18/9	0.5-2.0	12 11 7	Compact brown gravelly SAND, some silt. (FILL)
		0.0	14	S-2	24/11	2.0-4.0	5 5 9 8	Compact brown gravelly SAND, some silt, with brick. (FILL)
		0.1	22	S-3	12/8	4.0-5.0	7 15	Compact dark brown SILT and SAND, some gravel, with brick. (FILL)
6.0 / 27.4		0.0	21	S-4	12/7	5.0-6.0	11 10	Compact dark brown SILT and SAND, some gravel, with brick. (FILL)
	GLACIAL OUTWASH	0.0	26	S-4A	12/7	6.0-7.0	13 13	Compact orange-brown silty SAND and GRAVEL. (GLACIAL OUTWASH)
		0.1	61	S-5	24/14	7.0-9.0	12 24 37 33	Very dense gray-brown SAND and GRAVEL, trace silt. (GLACIAL OUTWASH)
		0.1	60	S-6	12/10	9.0-10.0	24 36	Dense to very dense gray-brown SAND and GRAVEL, trace silt. (GLACIAL OUTWASH)
		0.1	53	S-7	24/16	10.0-12.0	17 22 31 27	Very dense gray-brown SAND and GRAVEL, trace silt. (GLACIAL OUTWASH)
17.0 / 16.4		0.2	57	S-8	24/15	15.0-17.0	12 27 30 60	Very dense gray-brown SAND and GRAVEL, trace to some silt. (GLACIAL OUTWASH)
	Bottom of borehole 17.0 feet below ground surface.							

GRANULAR SOILS	
BLOWS/FT.	DENSITY
0-4	V.LOOSE
4-10	LOOSE
10-30	COMPACT
30-50	DENSE
>50	V.DENSE

COHESIVE SOILS	
BLOWS/FT.	CONSISTENCY
<2	V.SOFT
2-4	SOFT
4-8	FIRM
8-15	STIFF
15-30	V.STIFF
>30	HARD

SOIL COMPONENT

DESCRIPTIVE TERM	PROPORTION OF TOTAL
"TRACE"	0-10%
"SOME"	10-20%
"ADJECTIVE" (eg SANDY, SILTY)	20-35%
"AND"	35-50%

SOIL CONTAINING THREE COMPONENTS EACH OF WHICH COMPRISE AT LEAST 25% OF THE TOTAL ARE CLASSIFIED AS "A WELL-GRADED MIXTURE OF"

Notes:
Used automatic hammer to drive Split Spoon

Total Volatile Organic Compounds (TVOC) measured w/ PID Model:
TVOC Background: ppm
Weather: Variable
Temperature:

McPHAIL ASSOCIATES, LLC
2269 MASSACHUSETTS AVENUE
CAMBRIDGE, MA 02140
TEL: 617-868-1420
FAX: 617-868-1423

Project: Jackson Square Development
Location: Paved Parking Lot
City/State: Weymouth, Massachusetts

Job #: 7517.9
Date Started: 9-29-22
Date Finished: 9-29-22

Boring No.
MA-2

Contractor: TDS
Driller/Helper: D. Newton/B. Lee
Logged By/Reviewed By: T. M. Cormican
Surface Elevation (ft): 31.0

Casing Type/Depth (ft): 4.25 " I.D. Hollow Stem augers
Casing Hammer (lbs)/Drop (in): NE
Sampler Size/Type: 1-3/8 " I.D. Split-Spoon
Sampler Hammer (lbs)/Drop (in): 140 lbs./30 inches

Groundwater Observations			
Date	Depth	Elev.	Notes
9-29-22	18	13.0	

Depth (ft)	Elev. (ft)	Symbol	Depth/EL to Strata Change (ft)	Stratum	Sample TVOC (ppm)	N-Value RQD	No.	Pen. /Rec. (in)	Depth (ft)	Blows/6" Min/ft	Sample Description and Boring Notes
			0.3 / 30.7	PAVEMENT							
1	30				0.1	10	S-1	18/7	0.5-2.0	5 4 6	Loose to compact brown gravelly SAND, trace silt. (FILL)
2	29										
3	28				0.1	12	S-2	24/12	2.0-4.0	5 4 8 7	Compact light brown fine to medium SAND, some gravel, trace silt. (FILL)
4	27										
5	26			FILL	0.0	14	S-3	24/13	4.0-6.0	4 6 8 6	Compact brown gravelly SAND, trace silt. (FILL)
6	25										
7	24				0.1	15	S-4	24/6	6.0-8.0	9 9 6 8	Compact brown gravelly SAND, trace silt. (FILL)
8	23										
9	22				0.0	36	S-5	24/15	8.0-10.0	11 14 22 24	Dense dark brown SILT and SAND, some gravel, with organics and glass. (FILL)
10	21		10.0 / 21.0								
11	20			SUBSOIL	0.0	24	S-6	24/18	10.0-12.0	11 10 14 15	Compact yellow-brown SILT and SAND, some gravel. (SUBSOIL) Sand and gravel in split-spoon nose.
12	19		12.0 / 19.0								
13	18										
14	17										
15	16			GLACIAL OUTWASH							
16	15				0.0	121	S-7	24/16	15.0-17.0	22 50 71 36	Very dense gray-brown sandy GRAVEL, trace silt. (GLACIAL OUTWASH)
17	14										
18	13										
19	12		19.0 / 12.0	Bottom of borehole 19.0 feet below ground surface.		100/0"	S-8	0/0	19.0-19.0	100/0"	NO RECOVERY
20	11										Split-spoon and auger refusal 19 feet below ground surface.
21	10										
22	9										
23	8										

GRANULAR SOILS	
BLOWS/FT.	DENSITY
0-4	V.LOOSE
4-10	LOOSE
10-30	COMPACT
30-50	DENSE
>50	V.DENSE

COHESIVE SOILS	
BLOWS/FT.	CONSISTENCY
<2	V.SOFT
2-4	SOFT
4-8	FIRM
8-15	STIFF
15-30	V.STIFF
>30	HARD

SOIL COMPONENT

DESCRIPTIVE TERM	PROPORTION OF TOTAL
"TRACE"	0-10%
"SOME"	10-20%
"ADJECTIVE" (eg SANDY, SILTY)	20-35%
"AND"	35-50%

SOIL CONTAINING THREE COMPONENTS EACH OF WHICH COMPRISE AT LEAST 25% OF THE TOTAL ARE CLASSIFIED AS "A WELL-GRADED MIXTURE OF"

Notes:
Used automatic hammer to drive Split Spoon

Total Volatile Organic Compounds (TVOC) measured w/ PID Model:
TVOC Background: ppm
Weather: Variable
Temperature:

McPHAIL ASSOCIATES, LLC
2269 MASSACHUSETTS AVENUE
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TEL: 617-868-1420
FAX: 617-868-1423

Project: Jackson Square Development
Location: Paved Parking Lot
City/State: Weymouth, Massachusetts

Job #: 7517.9
Date Started: 9-29-22
Date Finished: 9-29-22

Boring No.
MA-4

Contractor: TDS
Driller/Helper: D. Newton/B. Lee
Logged By/Reviewed By: T. M. Cormican
Surface Elevation (ft): 31.7

Casing Type/Depth (ft): 4.25 " I.D. Hollow Stem augers
Casing Hammer (lbs)/Drop (in): NE
Sampler Size/Type: 1-3/8 " I.D. Split-Spoon
Sampler Hammer (lbs)/Drop (in): 140 lbs./30 inches

Groundwater Observations

Date	Depth	Elev.	Notes
9-29-22	16.8	14.9	

Depth (ft): 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23

Elev. (ft): 31 30 29 28 27 26 25 24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8

Depth/EL to Strata Change (ft)	Stratum	Sample TVOC (ppm)	N-Value RQD	No.	Pen. /Rec. (in)	Depth (ft)	Blows/6" Min/ft	Sample Description and Boring Notes
0.2 / 31.5	ASPHALT							
	FILL	0.0	6	S-1	18/10	0.5-2.0	2 4 2	Loose gray-black ASH and CINDERS, with brick and mortar. (FILL)
		0.1	8	S-2	24/10	2.0-4.0	4 4 4 6	Loose gray-black to dark gray-brown silty SAND and GRAVEL, with ash, cinders, and brick. (FILL)
		0.0	14	S-3	12/10	4.0-5.0	7 7	Compact dark gray-brown silty SAND and GRAVEL, with brick, ash and cinders. (FILL)
		0.0	13	S-4	24/9	5.0-7.0	4 5 8 7	Compact yellow-brown silty SAND, some gravel, with ash and cinders. (FILL)
7.0 / 24.7								
	GLACIAL OUTWASH	0.1	38	S-5	24/6	7.0-9.0	11 15 23 17	Dense gray-brown SAND and GRAVEL, trace silt. (FILL)
		0.1	94	S-6	24/16	9.0-11.0	88 72 22 50	Very dense gray-brown SAND and GRAVEL, trace silt. (FILL)
		0.0	52	S-7	25/13	15.0-17.1	47 22 30 30	Very dense gray SAND and GRAVEL, trace to some silt. (GLACIAL OUTWASH)
17.0 / 14.7	Bottom of borehole 17.0 feet below ground surface.							

GRANULAR SOILS

BLOWS/FT.	DENSITY
0-4	V.LOOSE
4-10	LOOSE
10-30	COMPACT
30-50	DENSE
>50	V.DENSE

COHESIVE SOILS

BLOWS/FT.	CONSISTENCY
<2	V.SOFT
2-4	SOFT
4-8	FIRM
8-15	STIFF
15-30	V.STIFF
>30	HARD

SOIL COMPONENT

DESCRIPTIVE TERM	PROPORTION OF TOTAL
"TRACE"	0-10%
"SOME"	10-20%
"ADJECTIVE" (eg SANDY, SILTY)	20-35%
"AND"	35-50%

SOIL CONTAINING THREE COMPONENTS EACH OF WHICH COMPRISE AT LEAST 25% OF THE TOTAL ARE CLASSIFIED AS "A WELL-GRADED MIXTURE OF"

Notes:
Used automatic hammer to drive Split Spoon

Total Volatile Organic Compounds (TVOC) measured w/ PID Model:
TVOC Background: ppm
Weather: Variable
Temperature:

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Project:	Jackson Square Development	**Job #:**	7517.9	Boring No.
Location:	Paved Parking Lot	**Date Started:**	9-29-22	**MA-5**
City/State:	Weymouth, Massachusetts	**Date Finished:**	9-30-22	

Contractor: TDS

Driller/Helper: D. Newton/B. Lee

Logged By/Reviewed By: T. M. Cormican

Surface Elevation (ft): 27.2

Casing Type/Depth (ft): 4.25 " I.D. Hollow Stem augers

Casing Hammer (lbs)/Drop (in): NE

Sampler Size/Type: 1-3/8 " I.D. Split-Spoon

Sampler Hammer (lbs)/Drop (in): 140 lbs./30 inches

Groundwater Observations

Date	Depth	Elev.	Notes

Depth (ft)	Elev. (ft)	Symbol	Depth/EL to Strata Change (ft)	Stratum	Sample TVOC (ppm)	N-Value RQD	No.	Pen. /Rec. (in)	Depth (ft)	Blows/6" Min/ft	Sample Description and Boring Notes
	27	■	0.3 / 26.9	PAVEMENT							
1	26	▨			0.1	22	S-1	18/11	0.5-2.0	10 10 12	Compact brown gravelly SAND, trace silt. (FILL)
2 3	25 24	▨			0.0	8	S-2	24/16	2.0-4.0	9 4 4 4	Loose gray-brown SAND and GRAVEL, trace silt , with ash and cinders. (FILL)
4	23	▨			0.2	9	S-3	12/10	4.0-5.0	5 4	Loose brown SAND and GRAVEL, some silt, with ash and cinders. (FILL)
5 6	22 21	▨		FILL	0.1	8	S-4	24/11	5.0-7.0	5 4 4 4	Loose brown gravelly SAND, some silt. (FILL)
7 8	20 19	▨			0.1	7	S-5	24/8	7.0-9.0	5 4 3 3	Loose dark gray-brown silty SAND and GRAVEL. (FILL)
9 10	18 17	▨	11.0 / 16.2		0.1	10	S-6	24/14	9.0-11.0	2 1 9 12	Loose to compact dark brown SILT and SAND, some gravel, with brick. (FILL)
11 12	16 15	∴			0.2	57	S-7	24/15	11.0-13.0	30 41 16 14	Very dense gray-brown SAND and GRAVEL, trace silt. (GLACIAL OUTWASH)
13 14	14 13	∴									
15 16	12 11	∴		GLACIAL OUTWASH	0.1	70	S-8	22/14	15.0-16.8	43 27 43 120/4"	Very dense gray-brown SAND and GRAVEL, trace silt. (GLACIAL OUTWASH) Boulder encountered 16.8 to 17.4 feet below ground surface.
17 18 19	10 9 8	∴									
20 21	7 6	∴	22.0 / 5.2		0.0	43	S-9	24/13	20.0-22.0	28 22 21 44	Dense gray-brown SAND and GRAVEL, some silt. (GLACIAL OUTWASH)
22 23	5 4			Bottom of borehole 22.0 feet below ground surface.							

GRANULAR SOILS	
BLOWS/FT.	DENSITY
0-4	V.LOOSE
4-10	LOOSE
10-30	COMPACT
30-50	DENSE
>50	V.DENSE

COHESIVE SOILS	
BLOWS/FT.	CONSISTENCY
<2	V.SOFT
2-4	SOFT
4-8	FIRM
8-15	STIFF
15-30	V.STIFF
>30	HARD

SOIL COMPONENT

DESCRIPTIVE TERM	PROPORTION OF TOTAL
"TRACE"	0-10%
"SOME"	10-20%
"ADJECTIVE" (eg SANDY, SILTY)	20-35%
"AND"	35-50%

SOIL CONTAINING THREE COMPONENTS EACH OF WHICH COMPRISE AT LEAST 25% OF THE TOTAL ARE CLASSIFIED AS "A WELL-GRADED MIXTURE OF"

Notes:
Used automatic hammer to drive Split Spoon

Total Volatile Organic Compounds (TVOC) measured w/ PID Model:
TVOC Background: ppm
Weather: Variable
Temperature:

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Project: Jackson Square Development
Location: Paved Parking Lot
City/State: Weymouth, Massachusetts

Job #: 7517.9
Date Started: 9-27-22
Date Finished: 9-27-22

Boring No.
MA-6 (OW)

Contractor: TDS
Driller/Helper: D. Newton/B. Lee
Logged By/Reviewed By: T. M. Cormican
Surface Elevation (ft): 26.0

Casing Type/Depth (ft): 4.25 " I.D. Hollow Stem augers
Casing Hammer (lbs)/Drop (in): NE
Sampler Size/Type: 1-3/8 " I.D. Split-Spoon
Sampler Hammer (lbs)/Drop (in): 140 lbs./30 inches

Groundwater Observations

Date	Depth	Elev.	Notes
9-27-22	12	14.0	

Depth (ft)	Elev. (ft)
1	25
2	24
3	23
4	22
5	21
6	20
7	19
8	18
9	17
10	16
11	15
12	14
13	13
14	12
15	11
16	10
17	9
18	8
19	7
20	6
21	5
22	4
23	3

Depth/EL to Strata Change (ft)	Stratum	Sample TVOC (ppm)	N-Value / RQD	No.	Pen. /Rec. (in)	Depth (ft)	Blows/6" / Min/ft	Sample Description and Boring Notes
0.3 / 25.7	PAVEMENT							
	FILL	0.6	27	S-1	18/8	0.5-2.0	12 13 14	Compact brown SAND and GRAVEL, trace silt. (FILL)
		0.4	19	S-2	24/9	2.0-4.0	11 10 9 7	Compact brown SAND and GRAVEL, trace silt with ash and cinders. (FILL)
		0.3	21	S-3	12/8	4.0-5.0	8 13	Compact brown SAND and GRAVEL, trace silt, with ash and cinders. (FILL)
		0.7	13	S-4	24/13	5.0-7.0	6 7 6 9	Compact dark gray-brown silty SAND and GRAVEL. (FILL)
		0.4	15	S-5	24/14	7.0-9.0	12 8 7 8	Compact dark gray-brown silty SAND, some gravel, with brick (FILL)
10.0 / 16.0		0.4	26	S-6	12/10	9.0-10.0	12 14	Compact dark gray-brown silty SAND and GRAVEL. (FILL)
	GLACIAL OUTWASH	0.6	63	S-6A	12/10	10.0-11.0	28 35	Very dense mottled orange-brown to gray-brown, sandy GRAVEL, trace silt. (GLACIAL OUTWASH)
		0.6	149/9"	S-7	15/3	11.0-12.3	27 49 120/3"	Very dense gray-brown SAND and GRAVEL, trace silt. (GLACIAL OUTWASH) Boulder encountered 12 to 13 feet below ground surface.
15.0 / 11.0								
	GLACIAL TILL	0.2	51	S-8	24/14	15.0-17.0	72 26 25 31	Very dense gray-brown silty SAND and GRAVEL. (GLACIAL TILL) Auger refusal 19.6 feet below ground surface.
17.0 / 9.0	Bottom of borehole 19.6 feet below ground surface.							

GRANULAR SOILS	
BLOWS/FT.	DENSITY
0-4	V.LOOSE
4-10	LOOSE
10-30	COMPACT
30-50	DENSE
>50	V.DENSE

COHESIVE SOILS	
BLOWS/FT.	CONSISTENCY
<2	V.SOFT
2-4	SOFT
4-8	FIRM
8-15	STIFF
15-30	V.STIFF
>30	HARD

SOIL COMPONENT

DESCRIPTIVE TERM	PROPORTION OF TOTAL
"TRACE"	0-10%
"SOME"	10-20%
"ADJECTIVE" (eg SANDY, SILTY)	20-35%
"AND"	35-50%

SOIL CONTAINING THREE COMPONENTS EACH OF WHICH COMPRISE AT LEAST 25% OF THE TOTAL ARE CLASSIFIED AS "A WELL-GRADED MIXTURE OF"

Notes:
Used automatic hammer to drive Split Spoon

Total Volatile Organic Compounds (TVOC) measured w/ PID Model:
TVOC Background: ppm
Weather: Variable
Temperature:

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FAX: 617-868-1423

Project: Jackson Square Development
Location:
City/State: Weymouth, Massachusetts

Job #: 7517.9
Date Started: 10-3-22
Date Finished: 10-3-22

Boring No.
MA-7

Contractor: TDS
Driller/Helper: D. Newton/B. Lee
Logged By/Reviewed By: T. M. Cormican
Surface Elevation (ft): 25.8

Casing Type/Depth (ft): 4.25 " I.D. Hollow Stem augers
Casing Hammer (lbs)/Drop (in): NE
Sampler Size/Type: 1-3/8 " I.D. Split-Spoon
Sampler Hammer (lbs)/Drop (in): 140 lbs./30 inches

Groundwater Observations

Date	Depth	Elev.	Notes
10-3-22	14.5	11.3	

Depth (ft)	Elev. (ft)
1	25
2	24
3	23
4	22
5	21
6	20
7	19
8	18
9	17
10	16
11	15
12	14
13	13
14	12
15	11
16	10
17	9
18	8
19	7
20	6
21	5
22	4
23	3
	2

Symbol	Depth/EL to Strata Change (ft)	Stratum	Sample TVOC (ppm)	N-Value / RQD	No.	Pen. /Rec. (in)	Depth (ft)	Blows/6" / Min/ft	Sample Description and Boring Notes
	2.0 / 23.8	TOPSOIL	0.0	6	S-1	24/18	0.0-2.0	1 3 3 3	Loose dark brown SILT and SAND, with organics. (TOPSOIL)
	10.0 / 15.8	FILL	0.0	2	S-2	24/14	2.0-4.0	1 1 1 1	Very loose light gray ASH and CINDERS. (FILL)
			0.0	2	S-3	12/6	4.0-5.0	1 1	Very loose light gray SAND and GRAVEL, some silt, with ash and cinders. (FILL)
			0.0	5	S-4	24/8	5.0-7.0	2 2 3 4	Loose light gray ASH and CINDERS. (FILL)
			0.0	20	S-5	24/16	7.0-9.0	4 9 11 12	Compact brown silty SAND, trace gravel, with ash and cinders. (FILL)
	17.0 / 8.8	GLACIAL OUTWASH	0.0	55	S-6	24/16	10.0-12.0	22 24 31 25	Very dense mottled orange-brown and gray-brown SAND and GRAVEL, trace silt. (GLACIAL OUTWASH)
			0.0	33	S-7	24/10	15.0-17.0	11 14 19 22	Dense gray-brown SAND and GRAVEL, trace to some silt. (GLACIAL OUTWASH)
		Bottom of borehole 17.0 feet below ground surface.							

GRANULAR SOILS

BLOWS/FT.	DENSITY
0-4	V.LOOSE
4-10	LOOSE
10-30	COMPACT
30-50	DENSE
>50	V.DENSE

COHESIVE SOILS

BLOWS/FT.	CONSISTENCY
<2	V.SOFT
2-4	SOFT
4-8	FIRM
8-15	STIFF
15-30	V.STIFF
>30	HARD

SOIL COMPONENT

DESCRIPTIVE TERM	PROPORTION OF TOTAL
"TRACE"	0-10%
"SOME"	10-20%
"ADJECTIVE" (eg SANDY, SILTY)	20-35%
"AND"	35-50%

SOIL CONTAINING THREE COMPONENTS EACH OF WHICH COMPRISE AT LEAST 25% OF THE TOTAL ARE CLASSIFIED AS "A WELL-GRADED MIXTURE OF"

Notes:
Used automatic hammer to drive Split Spoon

Total Volatile Organic Compounds (TVOC) measured w/ PID Model:
TVOC Background: ppm
Weather: Variable
Temperature:

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2269 MASSACHUSETTS AVENUE
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TEL: 617-868-1420
FAX: 617-868-1423

Project: Jackson Square Development
Location: Paved Driveway
City/State: Weymouth, Massachusetts

Job #: 7517.9
Date Started: 9-30-22
Date Finished: 9-30-22

Boring No.

MA-8

Contractor: TDS
Driller/Helper: D. Newton/B. Lee
Logged By/Reviewed By: T. M. Cormican
Surface Elevation (ft): 37.3

Casing Type/Depth (ft): 4.25 " I.D. Hollow Stem augers
Casing Hammer (lbs)/Drop (in): NE
Sampler Size/Type: 1-3/8 " I.D. Split-Spoon
Sampler Hammer (lbs)/Drop (in): 140 lbs./30 inches

Groundwater Observations

Date	Depth	Elev.	Notes
9-30-22	NE		

Depth (ft)	Elev. (ft)
	37
1	36
2	35
3	34
4	33
5	32
6	31
7	30
8	29
9	28
10	27
11	26
12	25
13	24
14	23
15	22
16	21
17	20
18	19
19	18
20	17
21	16
22	15
23	14

Depth/EL to Strata Change (ft)	Stratum
0.3 / 37.0	PAVEMENT
5.5 / 31.8	FILL
11.0 / 26.3	GLACIAL OUTWASH
	Bottom of borehole 11.0 feet below ground surface.

Sample						Sample Description and Boring Notes
TVOC (ppm)	N-Value RQD	No.	Pen. /Rec. (in)	Depth (ft)	Blows/6" Min/ft	
0.0	21	S-1	18/13	0.5-2.0	10 11 10	Compact brown SAND and GRAVEL, trace silt. (FILL)
0.1	19	S-2	24/8	2.0-4.0	8 8 11 10	Compact brown SAND and GRAVEL, trace silt. (FILL)
0.2	25	S-3	18/13	4.0-5.5	14 15 10	Compact gray-black SAND and GRAVEL, some silt. (FILL)
0.0	13/6"	S-3a	6/4	5.5-6.0	13	Compact orange-brown silty SAND and GRAVEL. (GLACIAL OUTWASH)
0.1	36	S-4	24/16	6.0-8.0	23 17 19 22	Dense gray-brown to yellow-brown SAND and GRAVEL, trace silt. (GLACIAL OUTWASH)
0.0	57	S-5	24/11	8.0-10.0	13 21 36 62	Very dense gray-brown SAND and GRAVEL, trace silt. (GLACIAL OUTWASH)
0.1	140/10"	S-6	10/7	10.0-10.8	40 100/4"	Very dense gray-brown SAND and GRAVEL, trace silt. (GLACIAL OUTWASH)
	100/0"	S-7	0/0	11.0-11.0	100/0"	NO RECOVERY. Auger refusal 11 feet below ground surface.

GRANULAR SOILS	
BLOWS/FT.	DENSITY
0-4	V.LOOSE
4-10	LOOSE
10-30	COMPACT
30-50	DENSE
>50	V.DENSE

COHESIVE SOILS	
BLOWS/FT.	CONSISTENCY
<2	V.SOFT
2-4	SOFT
4-8	FIRM
8-15	STIFF
15-30	V.STIFF
>30	HARD

SOIL COMPONENT

DESCRIPTIVE TERM	PROPORTION OF TOTAL
"TRACE"	0-10%
"SOME"	10-20%
"ADJECTIVE" (eg SANDY, SILTY)	20-35%
"AND"	35-50%

SOIL CONTAINING THREE COMPONENTS EACH OF WHICH COMPRISE AT LEAST 25% OF THE TOTAL ARE CLASSIFIED AS "A WELL-GRADED MIXTURE OF"

Notes:
Used automatic hammer to drive Split Spoon

Total Volatile Organic Compounds (TVOC) measured w/ PID Model:
TVOC Background: ppm
Weather: Variable
Temperature:

McPHAIL ASSOCIATES, LLC
2269 MASSACHUSETTS AVENUE
CAMBRIDGE, MA 02140
TEL: 617-868-1420
FAX: 617-868-1423

Project: Jackson Square Development
Location: Paved Driveway
City/State: Weymouth, Massachusetts

Job #: 7517.9
Date Started: 10-3-22
Date Finished: 10-3-22

Boring No.
MA-9

Contractor: TDS
Driller/Helper: D. Newton/B. Lee
Logged By/Reviewed By: T. M. Cormican
Surface Elevation (ft): 34.7

Casing Type/Depth (ft): 4.25 " I.D. Hollow Stem augers
Casing Hammer (lbs)/Drop (in): NE
Sampler Size/Type: 1-3/8 " I.D. Split-Spoon
Sampler Hammer (lbs)/Drop (in): 140 lbs./30 inches

Groundwater Observations

Date	Depth	Elev.	Notes
10-3-22	NE		

Symbol	Depth/EL to Strata Change (ft)	Stratum	TVOC (ppm)	N-Value RQD	No.	Pen. /Rec. (in)	Depth (ft)	Blows/6" Min/ft	Sample Description and Boring Notes
■	0.1 / 34.6	ASPHALT							
▨		FILL	0.0	3	S-1	18/6	0.5-2.0	3 2 1	Very loose dark gray-brown SILT and SAND, some gravel, with ash and cinders. (FILL)
▨			0.1	3	S-2	24/8	2.0-4.0	1 1 2 2	Very loose brown SILT and SAND, some gravel, with brick, mortar. (fFILL)
▨	5.0 / 29.7		0.0	12	S-3	12/4	4.0-5.0	4 8	Compact dark gray-brown SILT, SAND and GRAVEL. (FILL)
⁘		GLACIAL OUTWASH	0.1	65	S-4	24/9	5.0-7.0	26 28 37 50	Very dense gray-brown SAND and GRAVEL, trace silt. (GLACIAL OUTWASH)
⁘			0.1	120/6"	S-5	12/64	7.0-8.0	120	Very dense gray-brown SAND and GRAVEL, trace silt. (GLACIAL OUTWASH)
⁘									Cobble encountered 7.9 to 8.4 feet below ground surface.
⁘	10.0 / 24.7		0.1	135/10"	S-6	10/4	8.5-9.3	35 100/4"	Very dense gray-brown SAND and GRAVEL, trace silt. (GLACIAL OUTWASH)
		Bottom of borehole 10.0 feet below ground surface.							

Depth (ft)	Elev. (ft)
1	34
2	33
3	32
4	31
5	30
6	29
7	28
8	27
9	26
10	25
11	24
12	23
13	22
14	21
15	20
16	19
17	18
18	17
19	16
20	15
21	14
22	13
23	12
	11

GRANULAR SOILS

BLOWS/FT.	DENSITY
0-4	V.LOOSE
4-10	LOOSE
10-30	COMPACT
30-50	DENSE
>50	V.DENSE

COHESIVE SOILS

BLOWS/FT.	CONSISTENCY
<2	V.SOFT
2-4	SOFT
4-8	FIRM
8-15	STIFF
15-30	V.STIFF
>30	HARD

SOIL COMPONENT

DESCRIPTIVE TERM	PROPORTION OF TOTAL
"TRACE"	0-10%
"SOME"	10-20%
"ADJECTIVE" (eg SANDY, SILTY)	20-35%
"AND"	35-50%

SOIL CONTAINING THREE COMPONENTS EACH OF WHICH COMPRISE AT LEAST 25% OF THE TOTAL ARE CLASSIFIED AS "A WELL-GRADED MIXTURE OF"

Notes:
Used automatic hammer to drive Split Spoon

Total Volatile Organic Compounds (TVOC) measured w/ PID Model:
TVOC Background: ppm
Weather: Variable
Temperature:

McPHAIL ASSOCIATES, LLC
2269 MASSACHUSETTS AVENUE
CAMBRIDGE, MA 02140
TEL: 617-868-1420
FAX: 617-868-1423

Project:	Jackson Square Development	**Job #:**	7517.9
Location:	Grassed area	**Date Started:**	10-5-22
City/State:	Weymouth, Massachusetts	**Date Finished:**	10-5-22

Boring No.

MA-10

Contractor: TDS

Driller/Helper: D. Watson/J. Junoville

Logged By/Reviewed By: T. M. Cormican

Surface Elevation (ft): 29.3

Casing Type/Depth (ft): 4.25 " I.D. Hollow Stem augers

Casing Hammer (lbs)/Drop (in): NE

Sampler Size/Type: 1-3/8 " I.D. Split-Spoon

Sampler Hammer (lbs)/Drop (in): 140 lbs./30 inches

Groundwater Observations

Date	Depth	Elev.	Notes
10-5-22	13.5	15.8	

Depth (ft)	Elev. (ft)	Symbol	Depth/EL to Strata Change (ft)	Stratum	Sample						Sample Description and Boring Notes
					TVOC (ppm)	N-Value RQD	No.	Pen. /Rec. (in)	Depth (ft)	Blows/6" Min/ft	
1	29 28		1.5 / 27.8	TOPSOIL	0.0	8	S-1	24/16	0.0-2.0	3 4 4 2	Loose dark brown SILT and SAND, some organics, with ash and cinders. (FILL)
2 3	27 26			FILL	0.0	3	S-2	24/13	2.0-4.0	2 2 1 1	Very loose gray-black ASH and CINDERS. (FILL)
4	25				0.0	9	S-3	12/10	4.0-5.0	4 5	Loose to compact dark brown SILT and SAND, some gravel, with organics, ash, and cinders. (FILL)
5 6	24 23				0.0	2	S-4	24/15	5.0-7.0	1 1 1 3	Very loose dark brown SILT and SAND, with ash and cinders. (FILL)
7 8	22 21				0.1	9	S-5	24/10	7.0-9.0	4 4 5 6	Loose black SILT and SAND, with ash, cinders, and slag. (FILL)
9 10	20 19		10.5 / 18.8		0.0	15	S-6	18/16	9.0-10.5	5 9 6	Compact gray-brown silty SAND, some gravel. (FILL)
11	18		11.0 / 18.3	ORGANIC DEPOSIT	0.0	6/6"	S-6A	6/6	10.5-11.0	6	Firm brown ORGANIC SILT to peaty SAND. (ORGANIC DEPOSIT)
12	17			GLACIAL OUTWASH	0.0	31	S-7	24/11	11.0-13.0	69 15 16 22	Dense orange-brown SILT and SAND, some gravel, to light gray SILT to orange-brown SAND and GRAVEL, trace silt. (GLACIAL OUTWASH)
13 14	16 15										
15 16	14 13				0.2	78	S-8	24/18	15.0-17.0	26 32 46 60	Very dense gray-brown SAND and GRAVEL, trace silt. (GLACIAL OUTWASH)
17 18 19	12 11 10										
20 21	9 8		22.0 / 7.3		0.0	66	S-9	24/13	20.0-22.0	42 33 33 88	Very dense gray-brown SAND and GRAVEL, trace silt. (GLACIAL OUTWASH)
22 23	7 6			Bottom of borehole 22.5 feet below ground surface.							

GRANULAR SOILS	
BLOWS/FT.	DENSITY
0-4	V.LOOSE
4-10	LOOSE
10-30	COMPACT
30-50	DENSE
>50	V.DENSE

COHESIVE SOILS	
BLOWS/FT.	CONSISTENCY
<2	V.SOFT
2-4	SOFT
4-8	FIRM
8-15	STIFF
15-30	V.STIFF
>30	HARD

SOIL COMPONENT

DESCRIPTIVE TERM	PROPORTION OF TOTAL
"TRACE"	0-10%
"SOME"	10-20%
"ADJECTIVE" (eg SANDY, SILTY)	20-35%
"AND"	35-50%

SOIL CONTAINING THREE COMPONENTS EACH OF WHICH COMPRISE AT LEAST 25% OF THE TOTAL ARE CLASSIFIED AS "A WELL-GRADED MIXTURE OF"

Notes:
Used automatic hammer to drive Split Spoon

Total Volatile Organic Compounds (TVOC) measured w/ PID Model:
TVOC Background: ppm
Weather: Variable
Temperature:

McPHAIL ASSOCIATES, LLC
2269 MASSACHUSETTS AVENUE
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TEL: 617-868-1420
FAX: 617-868-1423

LEGEND

⊕ — APPROXIMATE LOCATION OF BORING PERFORMED BY TECHNICAL DRILLING SERVICES BETWEEN SEPTEMBER 26 TO OCTOBER 9, 2022 FOR McPHAIL ASSOCIATES, LLC

(OW) — INDICATES OBSERVATION WELL INSTALLED WITHIN COMPLETED BOREHOLE

REFERENCE: THIS PLAN WAS PREPARED FROM A 20-SCALE DRAWING ENTITLED "EXISTING CONDITIONS PLAN" DATED NOVEMBER 29, 2022 BY MCKENZIE ENGINEERING GROUP, INC.

GRAPHIC SCALE

30 0 30 60 120

McPHAIL ASSOCIATES, LLC
Geotechnical and
Geoenvironmental Engineers
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Cambridge, MA 02140
617/868-1420
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www.mcphailgeo.com

JACKSON SQUARE MULTI-USE DEVELOPMENT

WEYMOUTH MASSACHUSETTS

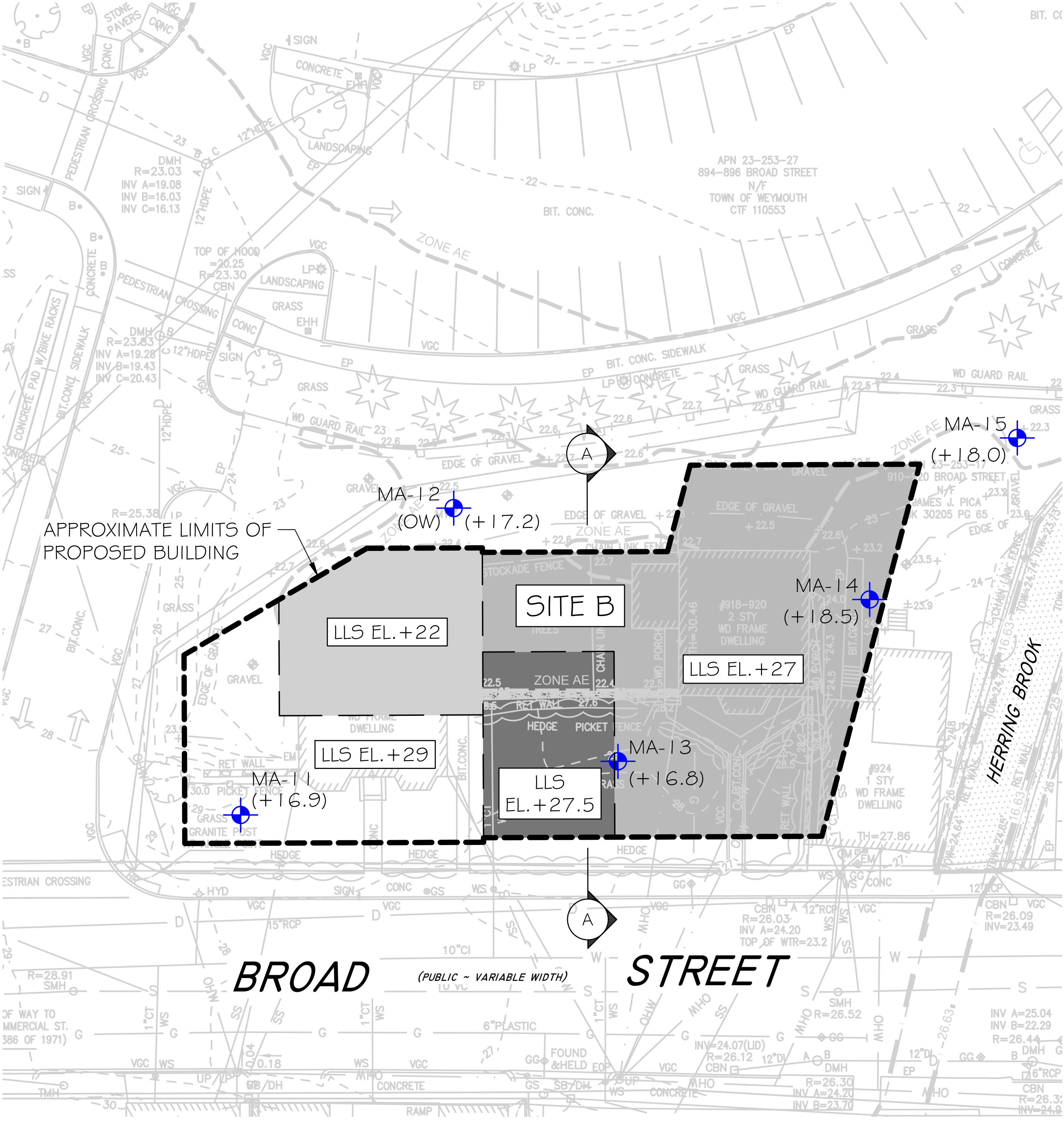
SUBSURFACE EXPLORATION PLAN

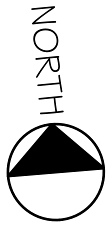
FOR
CMK DEVELOPMENTS PARTNERS
BY
McPHAIL ASSOCIATES, LLC

Date: MARCH 2023	Dwn: I.J.M.	Chkd: N.D.H.	Scale: 1" = 30'
Project No: 7517			FIGURE 2

FILE NAME: N:\Acad\JOBS\7517\7517-F02rev1.dwg

FIGURE 2A





LEGEND

⌖ — APPROXIMATE LOCATION OF BORING PERFORMED BY TECHNICAL DRILLING SERVICES BETWEEN SEPTEMBER 26 TO OCTOBER 9, 2022 FOR McPHAIL ASSOCIATES, LLC

(OW) — INDICATES OBSERVATION WELL INSTALLED WITHIN COMPLETED BOREHOLE

(+23.6) — INDICATES ELEVATION OF THE TOP OF NATURAL INORGANIC DEPOSIT CONSISTING OF ALLUVIUM OR GLACIAL OUTWASH

REFERENCE: THIS PLAN WAS PREPARED FROM A 20-SCALE DRAWING ENTITLED "EXISTING CONDITIONS PLAN" DATED FERBUARY 3, 2023 BY MCKENZIE ENGINEERING GROUP, INC.

GRAPHIC SCALE
30 0 30 60

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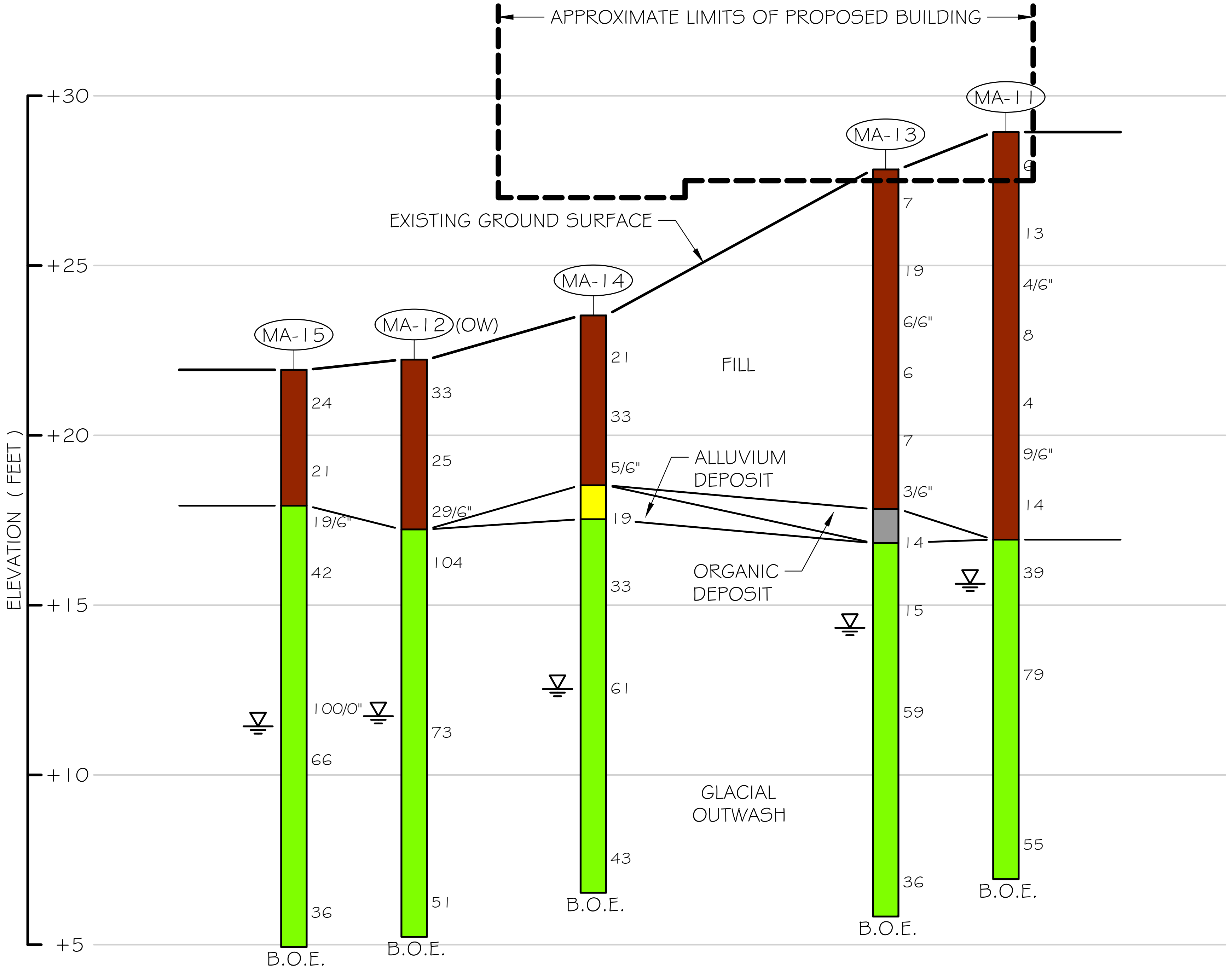
JACKSON SQUARE MULTI-USE DEVELOPMENT
WEYMOUTH MASSACHUSETTS
SUBSURFACE EXPLORATION PLAN - SITE B
FOR
CMK DEVELOPMENTS PARTNERS
BY
McPHAIL ASSOCIATES, LLC

Date: APRIL 2023 | Dwn: I.J.M. | Chkd: N.D.H. | Scale: 1" = 30'
Project No: 7517

FILE NAME: N:\Acad\JOBS\7517\Site B\7517-F02Arev1.dwg

FIGURE 2B



SECTION A-A

HORIZONTAL 1/16" = 1'-0"
VERTICAL 1/4" = 1'-0"

LEGEND

MA-1 — BOREHOLE NUMBER

▽ — GROUNDWATER LEVEL OBSERVED IN BOREHOLE

18 — STANDARD PENETRATION RESISTANCE OR N-VALUE, BLOWS PER FOOT

B.O.E. — BOTTOM OF EXPLORATION

NOTES:
1. REFER TO FIGURE 1 FOR LOCATION AND ORIENTATION OF SUBSURFACE SECTION.
2. STRATIFICATION LINES BETWEEN EXPLORATIONS ARE BASED ON LINEAR INTERPOLATION OF DATA FROM THE EXPLORATIONS AND MAY NOT NECESSARILY REPRESENT ACTUAL SUBSURFACE CONDITIONS.

GRAPHIC SCALE

SUBSURFACE UNIT	GRAPHIC SYMBOL	GENERAL DESCRIPTION
FILL	🟫	VERY LOOSE TO COMPACT, BROWN TO BLACK, SILT AND SAND WITH SOME GRAVEL VARYING TO A SAND AND GRAVEL WITH TRACE SILT. ALSO CONTAINING BRICK, SLAG, ASPHALT, ASH AND CINDERS
ORGANIC DEPOSIT	▨	VERY SOFT TO FIRM, BROWN, ORGANIC SILT VARYING TO A PEATY SAND
ALLUVIUM DEPOSIT	🟨	LOOSE, ORANGE-BROWN, SAND WITH TRACE SILT
GLACIAL OUTWASH	🟩	COMPACT TO VERY DENSE, ORANGE-BROWN TO GRAY-BROWN, SILT AND SAND WITH SOME GRAVEL, VARYING TO A SAND AND GRAVEL WITH TRACE SILT

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JACKSON SQUARE MULTI-USE DEVELOPMENT - SITE B
WEYMOUTH MASSACHUSETTS

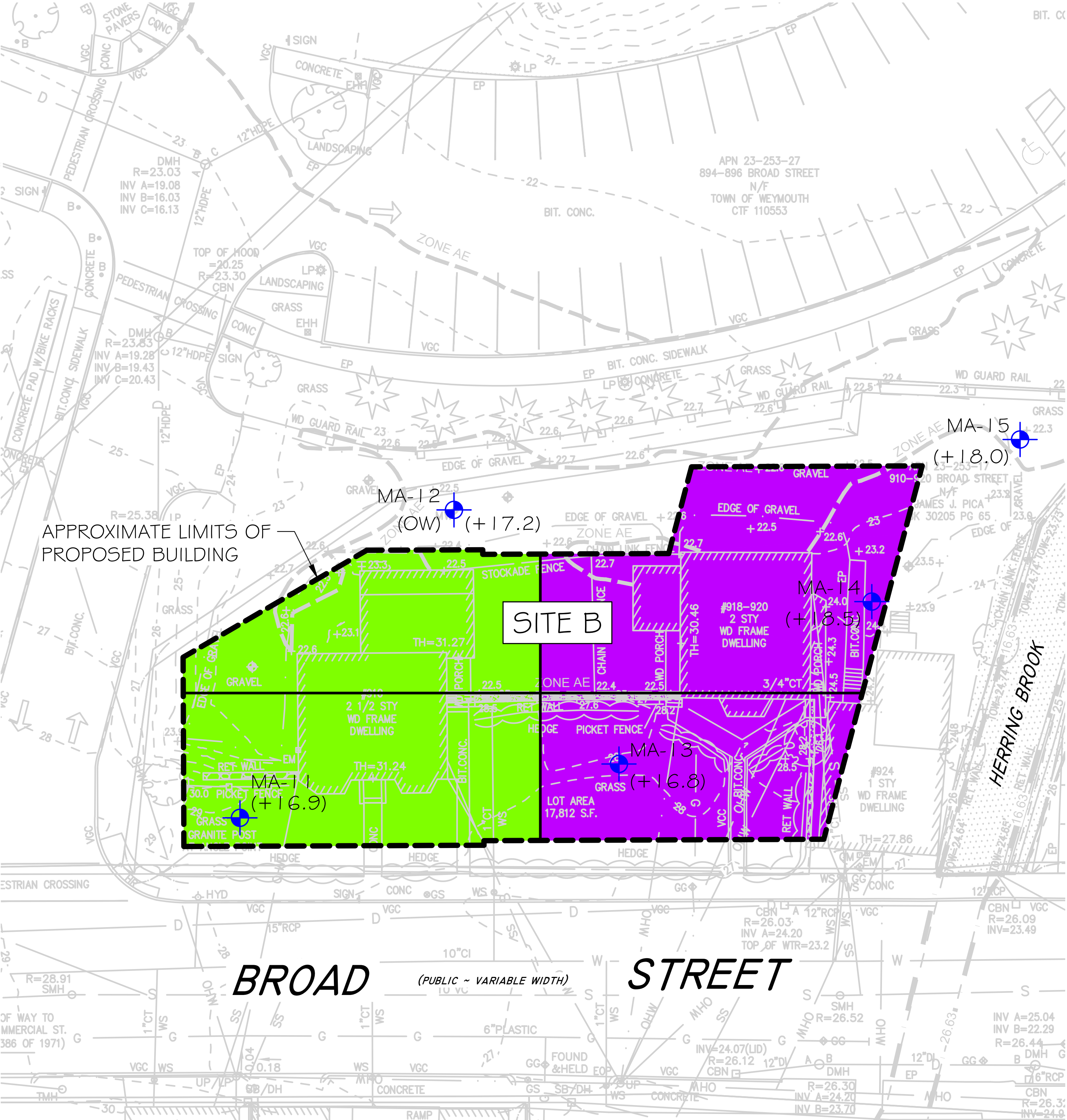
GENERALIZED SUBSURFACE PROFILE - SECTION A-A

FOR
CMK DEVELOPMENTS PARTNERS
BY
McPHAIL ASSOCIATES, LLC

Date: MARCH 2023
Dwn: I.J.M.
Chkd: N.D.H.
Scale: AS NOTED
Project No: 7517

FILE NAME: N:\AcadJOBS\7517\Site B\7517-F02B_Section.dwg

FIGURE 3A



NORTH

LEGEND

⌖ — APPROXIMATE LOCATION OF BORING PERFORMED BY TECHNICAL DRILLING SERVICES BETWEEN SEPTEMBER 26 TO OCTOBER 9, 2022 FOR McPHAIL ASSOCIATES, LLC

(OW) — INDICATES OBSERVATION WELL INSTALLED WITHIN COMPLETED BOREHOLE

(+23.6) — INDICATES ELEVATION OF THE TOP OF NATURAL INORGANIC DEPOSIT CONSISTING OF ALLUVIUM OR GLACIAL OUTWASH

🟩 — LESS THAN RCS-1
🟪 — LESS THAN RCS-2
🟨 — UNLINED LANDFILL
🟦 — LINED LANDFILL
🟧 — BATCH PLANT

REFERENCE: THIS PLAN WAS PREPARED FROM A 20-SCALE DRAWING ENTITLED "EXISTING CONDITIONS PLAN" DATED FEBRUARY 3, 2023 BY MCKENZIE ENGINEERING GROUP, INC.

GRAPHIC SCALE
30 0 30 60

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Geotechnical and Geoenvironmental Engineers
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Cambridge, MA 02140
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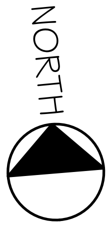
617/868-1423 (Fax)
www.mcphailgeo.com

JACKSON SQUARE MULTI-USE DEVELOPMENT
WEYMOUTH MASSACHUSETTS
SOIL MANAGEMENT PLAN - FILL MATERIAL (0'-5')
FOR
CMK DEVELOPMENTS PARTNERS
BY
McPHAIL ASSOCIATES, LLC

Date: APRIL 2023	Dwn: I.J.M.	Chkd: N.D.H.	Scale: 1" = 30'
Project No: 7517			

FILE NAME: N:\Acad\JOBS\7517\Site B\7517-F03Arev1.dwg

FIGURE 3B



LEGEND

⌖ — APPROXIMATE LOCATION OF BORING PERFORMED BY TECHNICAL DRILLING SERVICES BETWEEN SEPTEMBER 26 TO OCTOBER 9, 2022 FOR McPHAIL ASSOCIATES, LLC

(OW) — INDICATES OBSERVATION WELL INSTALLED WITHIN COMPLETED BOREHOLE

(+23.6) — INDICATES ELEVATION OF THE TOP OF NATURAL INORGANIC DEPOSIT CONSISTING OF ALLUVIUM OR GLACIAL OUTWASH

🟩 — LESS THAN RCS-1

🟪 — LESS THAN RCS-2

🟨 — UNLINED LANDFILL

🟦 — LINED LANDFILL

🟧 — BATCH PLANT

REFERENCE: THIS PLAN WAS PREPARED FROM A 20-SCALE DRAWING ENTITLED "EXISTING CONDITIONS PLAN" DATED FEBRUARY 3, 2023 BY MCKENZIE ENGINEERING GROUP, INC.

GRAPHIC SCALE

McPHAIL ASSOCIATES, LLC
Geotechnical and
Geoenvironmental Engineers
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617/868-1423 (Fax)
www.mcphailgeo.com

JACKSON SQUARE MULTI-USE DEVELOPMENT
WEYMOUTH MASSACHUSETTS

SOIL MANAGEMENT PLAN - FILL MATERIAL (5'-10')

FOR
CMK DEVELOPMENTS PARTNERS
BY
McPHAIL ASSOCIATES, LLC

Date: APRIL 2023	Dwn: I.J.M.	Chkd: N.D.H.	Scale: 1" = 30'
Project No: 7517			

FILE NAME: N:\Acad\JOBS\7517\Site B\7517-F03Brev1.dwg

Project:	Jackson Square Development	**Job #:**	7517.9	Boring No.
Location:	Grassed area	**Date Started:**	10-5-22	**MA-11**
City/State:	Weymouth, Massachusetts	**Date Finished:**	10-5-22	

Contractor: TDS
Casing Type/Depth (ft): 4.25 " I.D. Hollow Stem augers
Driller/Helper: D. Watson/J. Junoville
Casing Hammer (lbs)/Drop (in): NE
Logged By/Reviewed By: T. M. Cormican
Sampler Size/Type: 1-3/8 " I.D. Split-Spoon
Surface Elevation (ft): 28.9
Sampler Hammer (lbs)/Drop (in): 140 lbs./30 inches

Groundwater Observations

Date	Depth	Elev.	Notes
10-5-22	13.3	15.6	

Depth (ft)	Elev. (ft)	Symbol	Depth/EL to Strata Change (ft)	Stratum	Sample TVOC (ppm)	N-Value RQD	No.	Pen. /Rec. (in)	Depth (ft)	Blows/6" Min/ft	Sample Description and Boring Notes
1	28		1.0 / 27.9	TOPSOIL	0.1	6	S-1	24/16	0.0-2.0	2 2 4 6	Loose brown gravelly SAND, trace silt. (FILL)
2 3	27 26				0.3	13	S-2	24/10	2.0-4.0	8 7 6 6	Compact brown SAND and GRAVEL, trace silt, with black ASH and CINDERS and SLAG. (FILL)
4	25				0.4	11	S-3	12/10	4.0-5.0	7 4	Compact black ASH, CINDERS and SLAG. (FILL)
5 6	24 23				0.6	8	S-4	24/18	5.0-7.0	3 3 5 5	Loose black ASH, CINDERS and SLAG. (FILL)
7 8	22 21			FILL	03	4	S-5	24/13	7.0-9.0	4 2 2 4	Very loose to loose black ASH, CINDERS and SLAG. (FILL)
9	20				0.4	18	S-6	12/9	9.0-10.0	9 9	Loose to compact mottled dark brown to brown SILT and SAND, with ash, cinders, and brick. (FILL)
10 11	19 18		12.0 / 16.9		3.8	14	S-7	24/16	10.0-12.0	8 7 7 12	Compact mottled dark brown to brown SILT and SAND, some gravel, with brick. (FILL)
12 13	17 16				0.1	59	S-8	24/16	12.0-14.0	18 24 35 44	Very dense brown to gray-brown SAND and GRAVEL, trace silt. (GLACIAL OUTWASH)
14	15										
15 16	14 13				0.5	69	S-9	24/14	15.0-17.0	11 27 42 37	Very dense gray-brown SAND and GRAVEL, trace silt. (GLACIAL OUTWASH)
17 18 19	12 11 10			GLACIAL OUTWASH							
20 21	9 8		22.0 / 6.9		0.3	55	S-10	24/14	20.0-22.0	12 23 32 46	Very dense gray-brown SAND and GRAVEL, trace silt. (GLACIAL OUTWASH)
22 23	7 6			Bottom of borehole 22.0 feet below ground surface.							

GRANULAR SOILS

BLOWS/FT.	DENSITY
0-4	V.LOOSE
4-10	LOOSE
10-30	COMPACT
30-50	DENSE
>50	V.DENSE

COHESIVE SOILS

BLOWS/FT.	CONSISTENCY
<2	V.SOFT
2-4	SOFT
4-8	FIRM
8-15	STIFF
15-30	V.STIFF
>30	HARD

SOIL COMPONENT

DESCRIPTIVE TERM	PROPORTION OF TOTAL
"TRACE"	0-10%
"SOME"	10-20%
"ADJECTIVE" (eg SANDY, SILTY)	20-35%
"AND"	35-50%

SOIL CONTAINING THREE COMPONENTS EACH OF WHICH COMPRISE AT LEAST 25% OF THE TOTAL ARE CLASSIFIED AS "A WELL-GRADED MIXTURE OF"

Notes:
Used automatic hammer to drive Split Spoon

Total Volatile Organic Compounds (TVOC) measured w/ PID Model:
TVOC Background: ppm
Weather: Variable
Temperature:

McPHAIL ASSOCIATES, LLC
2269 MASSACHUSETTS AVENUE
CAMBRIDGE, MA 02140
TEL: 617-868-1420
FAX: 617-868-1423

Project: Jackson Square Development
Location: Gravel driveway
City/State: Weymouth, Massachusetts

Job #: 7517.9
Date Started: 9-27-22
Date Finished: 9-27-22

Boring No.
MA-12 (OW)

Contractor: TDS
Driller/Helper: D. Newton/B. Lee
Logged By/Reviewed By: T. M. Cormican
Surface Elevation (ft): 22.2

Casing Type/Depth (ft): 4.25 " I.D. Hollow Stem augers
Casing Hammer (lbs)/Drop (in): NE
Sampler Size/Type: 1-3/8 " I.D. Split-Spoon
Sampler Hammer (lbs)/Drop (in): 140 lbs./30 inches

Groundwater Observations			
Date	Depth	Elev.	Notes
9-27-22	10.5	11.7	

Depth (ft)	Elev. (ft)	Symbol	Depth/EL to Strata Change (ft)	Stratum	Sample TVOC (ppm)	N-Value RQD	No.	Pen. /Rec. (in)	Depth (ft)	Blows/6" Min/ft	Sample Description and Boring Notes
	22										
1	21				0.1	33	S-1	24/7	0.0-2.0	14 15 18 11	Dense gray-black GRAVEL and CRUSHED PAVEMENT, with ash and cinders. (FILL)
2	20										
3	19			FILL	0.1	25	S-2	24/6	2.0-4.0	9 10 15 20	Compact brown SAND and GRAVEL, trace silt. (FILL)
4	18				0.1	74	S-3	12/6	4.0-5.0	45 29	Very dense brown SAND and GRAVEL, trace silt. (FILL)
5	17		5.0 / 17.2								
6	16				0.0	104	S-4	24/11	5.0-7.0	30 64 40 43	Very dense gray-brown SAND and GRAVEL, trace silt. (GLACIAL OUTWASH)
7	15										
8	14										
9	13										
10	12										
11	11			GLACIAL OUTWASH	0.1	73	S-5	24/16	10.0-12.0	24 40 33 26	Very dense gray-brown SAND and GRAVEL, trace silt. (GLACIAL OUTWASH)
12	10										
13	9										
14	8										
15	7										
16	6				0.1	51	S-6	24/12	15.0-17.0	21 22 29 20	Very dense brown SAND and GRAVEL, trace silt. (GLACIAL OUTWASH)
17	5		17.0 / 5.2	Bottom of Borehole 17.0 feet below ground surface.							
18	4										
19	3										
20	2										
21	1										
22	0										
23	-1										

GRANULAR SOILS	
BLOWS/FT.	DENSITY
0-4	V.LOOSE
4-10	LOOSE
10-30	COMPACT
30-50	DENSE
>50	V.DENSE

COHESIVE SOILS	
BLOWS/FT.	CONSISTENCY
<2	V.SOFT
2-4	SOFT
4-8	FIRM
8-15	STIFF
15-30	V.STIFF
>30	HARD

SOIL COMPONENT

DESCRIPTIVE TERM	PROPORTION OF TOTAL
"TRACE"	0-10%
"SOME"	10-20%
"ADJECTIVE" (eg SANDY, SILTY)	20-35%
"AND"	35-50%

SOIL CONTAINING THREE COMPONENTS EACH OF WHICH COMPRISE AT LEAST 25% OF THE TOTAL ARE CLASSIFIED AS "A WELL-GRADED MIXTURE OF"

Notes:
Used automatic hammer to drive Split Spoon

Total Volatile Organic Compounds (TVOC) measured w/ PID Model:
TVOC Background: ppm
Weather: Variable
Temperature:

McPHAIL ASSOCIATES, LLC
2269 MASSACHUSETTS AVENUE
CAMBRIDGE, MA 02140
TEL: 617-868-1420
FAX: 617-868-1423

Project:	Jackson Square Development	**Job #:**	7517.9	Boring No.
Location:	Grassed area	**Date Started:**	10-5-22	**MA-13**
City/State:	Weymouth, Massachusetts	**Date Finished:**	10-5-22	

Contractor: TDS

Driller/Helper: D. Watson/J. Junoville

Logged By/Reviewed By: T. M. Cormican

Surface Elevation (ft): 27.8

Casing Type/Depth (ft): 4.25 " I.D. Hollow Stem augers

Casing Hammer (lbs)/Drop (in): NE

Sampler Size/Type: 1-3/8 " I.D. Split-Spoon

Sampler Hammer (lbs)/Drop (in): 140 lbs./30 inches

Groundwater Observations

Date	Depth	Elev.	Notes
10-5-22	13.5	14.3	

Depth (ft)	Elev. (ft)
1	27
2	26
3	25
4	24
5	23
6	22
7	21
8	20
9	19
10	18
11	17
12	16
13	15
14	14
15	13
16	12
17	11
18	10
19	9
20	8
21	7
22	6
23	5
	4

Symbol	Depth/EL to Strata Change (ft)	Stratum	Sample						Sample Description and Boring Notes
			TVOC (ppm)	N-Value RQD	No.	Pen. /Rec. (in)	Depth (ft)	Blows/6" Min/ft	
	1.0 / 26.8	TOPSOIL	0.0	7	S-1	24/20	0.0-2.0	1 1 6 9	Loose brown to black SAND, some gravel, trace silt, with ash and cinders. (FILL)
		FILL	0.1	19	S-2	24/15	2.0-4.0	9 6 13 9	Compact black ASH, CINDERS and SLAG. (FILL)
			0.2	14	S-3	12/9	4.0-5.0	8 6	Compact black ASH, CINDERS and SLAG. (FILL)
			0.3	6	S-4	24/7	5.0-7.0	5 3 3 2	Loose black ASH, CINDERS and SLAG. (FILL)
			0.4	7	S-5	24/10	7.0-9.0	5 4 3 2	Loose black ASH, CINDERS and SLAG. (FILL)
	10.0 / 17.8		1.2	8	S-6	12/8	9.0-10.0	5 3	Loose black ASH, CINDERS and SLAG. (FILL)
	11.0 / 16.8	ORGANIC DEPOSIT	0.4	4	S-7	12/10	10.0-11.0	1 3	Soft to firm dark brown ORGANIC SILT. (ORGANIC DEPOSIT)
		GLACIAL OUTWASH	0.2	22	S-7A	12/6	11.0-12.0	11 11	Compact brown SAND and GRAVEL, trace silt. (GLACIAL OUTWASH)
			0.0	15	S-8	24/12	12.0-14.0	10 8 7 19	Compact gray-brown SAND and GRAVEL, trace silt. (GLACIAL OUTWASH)
			0.1	59	S-9	24/13	15.0-17.0	11 26 33 34	Very dense gray SAND and GRAVEL, trace silt. (GLACIAL OUTWASH)
	22.0 / 5.8		0.1	36	S-10	23/14	20.0-21.9	14 18 18 15	Dense gray SAND and GRAVEL, trace silt. (GLACIAL OUTWASH)
		Bottom of borehole 22.0 feet below ground surface.							

GRANULAR SOILS

BLOWS/FT.	DENSITY
0-4	V.LOOSE
4-10	LOOSE
10-30	COMPACT
30-50	DENSE
>50	V.DENSE

COHESIVE SOILS

BLOWS/FT.	CONSISTENCY
<2	V.SOFT
2-4	SOFT
4-8	FIRM
8-15	STIFF
15-30	V.STIFF
>30	HARD

SOIL COMPONENT

DESCRIPTIVE TERM	PROPORTION OF TOTAL
"TRACE"	0-10%
"SOME"	10-20%
"ADJECTIVE" (eg SANDY, SILTY)	20-35%
"AND"	35-50%

SOIL CONTAINING THREE COMPONENTS EACH OF WHICH COMPRISE AT LEAST 25% OF THE TOTAL ARE CLASSIFIED AS "A WELL-GRADED MIXTURE OF"

Notes:
Used automatic hammer to drive Split Spoon

Total Volatile Organic Compounds (TVOC) measured w/ PID Model:
TVOC Background: ppm
Weather: Variable
Temperature:

McPHAIL ASSOCIATES, LLC
2269 MASSACHUSETTS AVENUE
CAMBRIDGE, MA 02140
TEL: 617-868-1420
FAX: 617-868-1423

Project:	Jackson Square Development	**Job #:**	7517.9	Boring No.
Location:	Gravel driveway	**Date Started:**	10-3-22	**MA-14**
City/State:	Weymouth, Massachusetts	**Date Finished:**	10-3-22	

Contractor: TDS

Driller/Helper: D. Newton/B. Lee

Logged By/Reviewed By: T. M. Cormican

Surface Elevation (ft): 23.5

Casing Type/Depth (ft): 4.25 " I.D. Hollow Stem augers

Casing Hammer (lbs)/Drop (in): NE

Sampler Size/Type: 1-3/8 " I.D. Split-Spoon

Sampler Hammer (lbs)/Drop (in): 140 lbs./30 inches

Groundwater Observations

Date	Depth	Elev.	Notes
10-3-22	11	12.5	

Depth (ft): 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23

Elev. (ft): 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0

Depth/EL to Strata Change (ft)	Stratum	Sample TVOC (ppm)	N-Value RQD	No.	Pen. /Rec. (in)	Depth (ft)	Blows/6" Min/ft	Sample Description and Boring Notes
5.0 / 18.5	FILL	0.0	23	S-1	18/13	0.5-2.0	7 11 12	Compact brown SAND and GRAVEL, some silt, with pavement. (FILL)
		0.1	33	S-2	24/15	2.0-4.0	18 18 15 9	Dense brown SAND and GRAVEL, some silt, with shells, slag, and brick. (FILL)
		0.1	10	S-3	12/8	4.0-5.0	5 5	Loose to compact black ASH, CINDERS and SLAG. (FILL)
6.0 / 17.5	ALLUVIUM DEPOSIT	0.1	8	S-4	12/5	5.0-6.0	4 4	Loose orange-brown fine to medium SAND, trace silt. (ALLUVIUM DEPOSIT)
17.0 / 6.5	GLACIAL OUTWASH	0.0	25	S-4a	12/7	6.0-7.0	15 10	Compact brown SAND and GRAVEL, trace silt. (GLACIAL OUTWASH)
		0.1	33	S-5	24/10	7.0-9.0	18 16 17 22	Dense gray-brown SAND and GRAVEL, trace silt. (GLACIAL OUTWASH)
		0.1	61	S-6	24/13	10.0-12.0	15 30 31 30	Very dense gray-brown SAND and GRAVEL, trace silt. (GLACIAL OUTWASH)
		0.0	43	S-7	24/14	15.0-17.0	10 20 23 26	Dense gray-brown SAND and GRAVEL, trace silt. (GLACIAL OUTWASH)
	Bottom of borehole 17.0 feet below ground surface.							

GRANULAR SOILS

BLOWS/FT.	DENSITY
0-4	V.LOOSE
4-10	LOOSE
10-30	COMPACT
30-50	DENSE
>50	V.DENSE

COHESIVE SOILS

BLOWS/FT.	CONSISTENCY
<2	V.SOFT
2-4	SOFT
4-8	FIRM
8-15	STIFF
15-30	V.STIFF
>30	HARD

SOIL COMPONENT

DESCRIPTIVE TERM	PROPORTION OF TOTAL
"TRACE"	0-10%
"SOME"	10-20%
"ADJECTIVE" (eg SANDY, SILTY)	20-35%
"AND"	35-50%

SOIL CONTAINING THREE COMPONENTS EACH OF WHICH COMPRISE AT LEAST 25% OF THE TOTAL ARE CLASSIFIED AS "A WELL-GRADED MIXTURE OF"

Notes:
Used automatic hammer to drive Split Spoon

Total Volatile Organic Compounds (TVOC) measured w/ PID Model:
TVOC Background: ppm
Weather: Variable
Temperature:

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CAMBRIDGE, MA 02140
TEL: 617-868-1420
FAX: 617-868-1423

Project:	Jackson Square Development	**Job #:**	7517.9
Location:	Gravel driveway	**Date Started:**	9-30-22
City/State:	Weymouth, Massachusetts	**Date Finished:**	10-3-22

Boring No.

MA-15

Contractor: TDS

Driller/Helper: D. Newton/B. Lee

Logged By/Reviewed By: T. M. Cormican

Surface Elevation (ft): 22.0

Casing Type/Depth (ft): 4.25 " I.D. Hollow Stem augers

Casing Hammer (lbs)/Drop (in): NE

Sampler Size/Type: 1-3/8 " I.D. Split-Spoon

Sampler Hammer (lbs)/Drop (in): 140 lbs./30 inches

Groundwater Observations

Date	Depth	Elev.	Notes
10-3-22	10.5	11.5	

Depth (ft)	Elev. (ft)	Symbol	Depth/EL to Strata Change (ft)	Stratum	Sample						Sample Description and Boring Notes
					TVOC (ppm)	N-Value RQD	No.	Pen. /Rec. (in)	Depth (ft)	Blows/6" Min/ft	
			0.4 / 21.6	TOPSOIL							
1	21				0.1	24	S-1	24/15	0.0-2.0	5 10 14 12	Compact dark gray-brown to black well-graded mixture of SILT, SAND, and GRAVEL. (FILL)
2	20			FILL							
3	19				0.0	21	S-2	24/18	2.0-4.0	12 12 9 14	Compact brown SAND and GRAVEL, trace silt, with ash, cinders, and mortar. (FILL)
4	18		4.0 / 18.0		0.0	35	S-3	12/10	4.0-5.0	16 19	Compact to dense mottled brown to gray-brown SAND and GRAVEL, trace silt. (GLACIAL OUTWASH)
5	17										
6	16				0.0	52	S-4	24/13	5.0-7.0	21 29 23 19	Very dense mottled orange-brown silty SAND and GRAVEL. (GLACIAL OUTWASH)
7	15										
8	14										
9	13										
10	12					100/0"	S-5	0/0	10.0-10.0	100/0"	NO RECOVERY. Cobble encountered 9.9 to 10.4 feet below ground surface.
11	11			GLACIAL OUTWASH	0.1	66	S-6	24/11	10.5-12.5	36 35 31 33	Very dense gray-brown SAND and GRAVEL, trace to some silt. (GLACIAL OUTWASH)
12	10										
13	9										
14	8										
15	7										
16	6				0.0	36	S-7	24/14	15.0-17.0	24 17 19 21	Dense gray-brown SAND and GRAVEL, trace silt. (GLACIAL OUTWASH)
17	5		17.0 / 5.0	Bottom of borehole 17.0 feet below ground surface.							
18	4										
19	3										
20	2										
21	1										
22	0										
23	-1										

GRANULAR SOILS

BLOWS/FT.	DENSITY
0-4	V.LOOSE
4-10	LOOSE
10-30	COMPACT
30-50	DENSE
>50	V.DENSE

COHESIVE SOILS

BLOWS/FT.	CONSISTENCY
<2	V.SOFT
2-4	SOFT
4-8	FIRM
8-15	STIFF
15-30	V.STIFF
>30	HARD

SOIL COMPONENT

DESCRIPTIVE TERM	PROPORTION OF TOTAL
"TRACE"	0-10%
"SOME"	10-20%
"ADJECTIVE" (eg SANDY, SILTY)	20-35%
"AND"	35-50%

SOIL CONTAINING THREE COMPONENTS EACH OF WHICH COMPRISE AT LEAST 25% OF THE TOTAL ARE CLASSIFIED AS "A WELL-GRADED MIXTURE OF"

Notes:
Used automatic hammer to drive Split Spoon

Total Volatile Organic Compounds (TVOC) measured w/ PID Model:
TVOC Background: ppm
Weather: Variable
Temperature:

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TEL: 617-868-1420
FAX: 617-868-1423

Page 1 of 1

LEGEND

⌖ — APPROXIMATE LOCATION OF BORING PERFORMED BY TECHNICAL DRILLING SERVICES BETWEEN SEPTEMBER 26 TO OCTOBER 9, 2022 FOR McPHAIL ASSOCIATES, LLC

(OW) — INDICATES OBSERVATION WELL INSTALLED WITHIN COMPLETED BOREHOLE

REFERENCE: THIS PLAN WAS PREPARED FROM A 20-SCALE DRAWING ENTITLED "EXISTING CONDITIONS PLAN" DATED NOVEMBER 29, 2022 BY MCKENZIE ENGINEERING GROUP, INC.

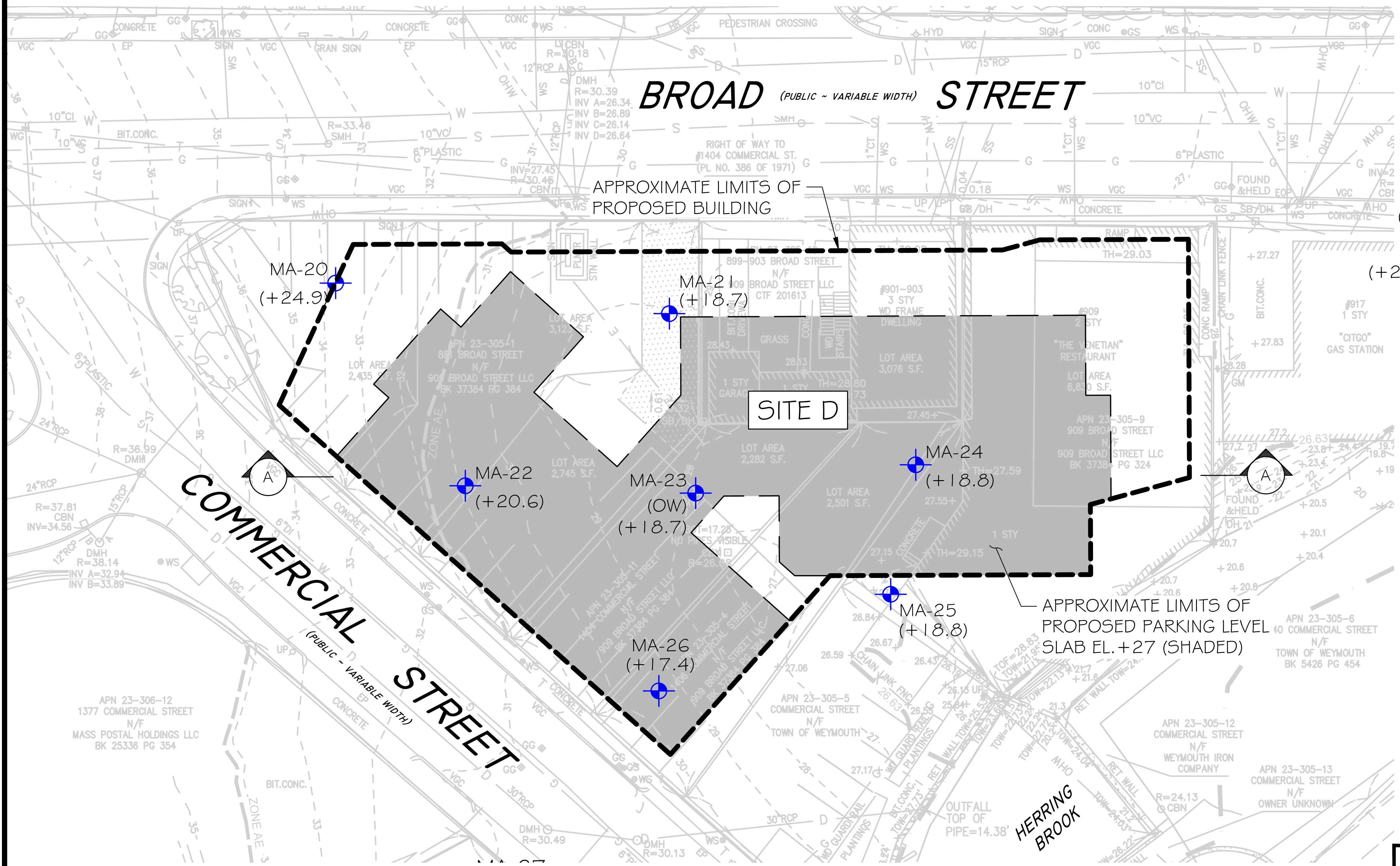
McPHAIL ASSOCIATES, LLC
Geotechnical and
Geoenvironmental Engineers
2269 Massachusetts Avenue
Cambridge, MA 02140
617/868-1420
617/868-1423 (Fax)
www.mcphailgeo.com

JACKSON SQUARE MULTI-USE DEVELOPMENT
WEYMOUTH MASSACHUSETTS
SUBSURFACE EXPLORATION PLAN
FOR
CMK DEVELOPMENTS PARTNERS
BY
McPHAIL ASSOCIATES, LLC

Date: MARCH 2023	Dwn: I.J.M.	Chkd: N.D.H.	Scale: 1" = 30'
Project No: 7517			FIGURE 2

FILE NAME: N:\Acad\JOBS\7517\7517-F02rev1.dwg

FIGURE 2A



NORTH

LEGEND

⊕ — APPROXIMATE LOCATION OF BORING PERFORMED BY TECHNICAL DRILLING SERVICES BETWEEN SEPTEMBER 26 TO OCTOBER 9, 2022 FOR McPHAIL ASSOCIATES, LLC

(OW) — INDICATES OBSERVATION WELL INSTALLED WITHIN COMPLETED BOREHOLE

(+23.6) — INDICATES ELEVATION OF THE TOP OF NATURAL INORGANIC DEPOSIT CONSISTING OF ALLUVIUM OR GLACIAL OUTWASH

REFERENCE: THIS PLAN WAS PREPARED FROM A 20-SCALE DRAWING ENTITLED "EXISTING CONDITIONS PLAN" DATED FERBUARY 3, 2023 BY MCKENZIE ENGINEERING GROUP, INC.

GRAPHIC SCALE
30 0 30 60

McPHAIL ASSOCIATES, LLC
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JACKSON SQUARE MULTI-USE DEVELOPMENT
WEYMOUTH MASSACHUSETTS

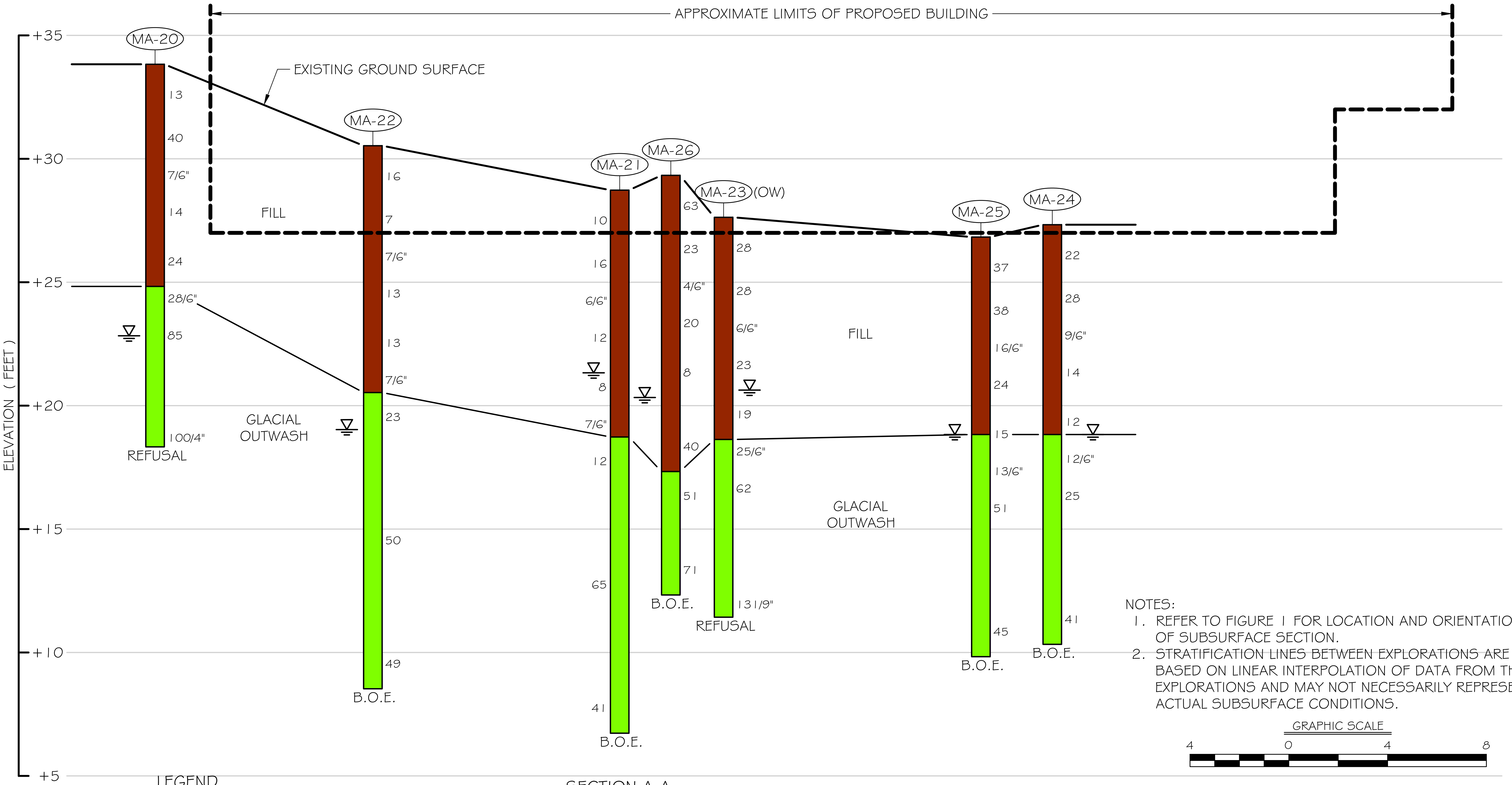
SUBSURFACE EXPLORATION PLAN - SITE D

FOR
CMK DEVELOPMENTS PARTNERS
BY
McPHAIL ASSOCIATES, LLC

Date: APRIL 2023
Dwn: I.J.M.
Chkd: N.D.H.
Scale: 1" = 30'
Project No: 7517

FILE NAME: N:\Acad\JOBS\7517\Site D\7517-F02Arev1.dwg

FIGURE 2B



NOTES:
1. REFER TO FIGURE 1 FOR LOCATION AND ORIENTATION OF SUBSURFACE SECTION.
2. STRATIFICATION LINES BETWEEN EXPLORATIONS ARE BASED ON LINEAR INTERPOLATION OF DATA FROM THE EXPLORATIONS AND MAY NOT NECESSARILY REPRESENT ACTUAL SUBSURFACE CONDITIONS.

SECTION A-A
HORIZONTAL 1/16" = 1'-0"
VERTICAL 1/4" = 1'-0"

LEGEND

MA-1 — BOREHOLE NUMBER
▽ — GROUNDWATER LEVEL OBSERVED IN BOREHOLE
18 — STANDARD PENETRATION RESISTANCE OR N-VALUE, BLOWS PER FOOT
B.O.E. — BOTTOM OF EXPLORATION

SUBSURFACE UNIT	GRAPHIC SYMBOL	GENERAL DESCRIPTION
FILL	🟥	VERY LOOSE TO COMPACT, BROWN TO BLACK, SILT AND SAND WITH SOME GRAVEL VARYING TO A SAND AND GRAVEL WITH TRACE SILT. ALSO CONTAINING BRICK, SLAG, ASPHALT, ASH AND CINDERS
GLACIAL OUTWASH	🟩	COMPACT TO VERY DENSE, ORANGE-BROWN TO GRAY-BROWN, SILT AND SAND WITH SOME GRAVEL, VARYING TO A SAND AND GRAVEL WITH TRACE SILT

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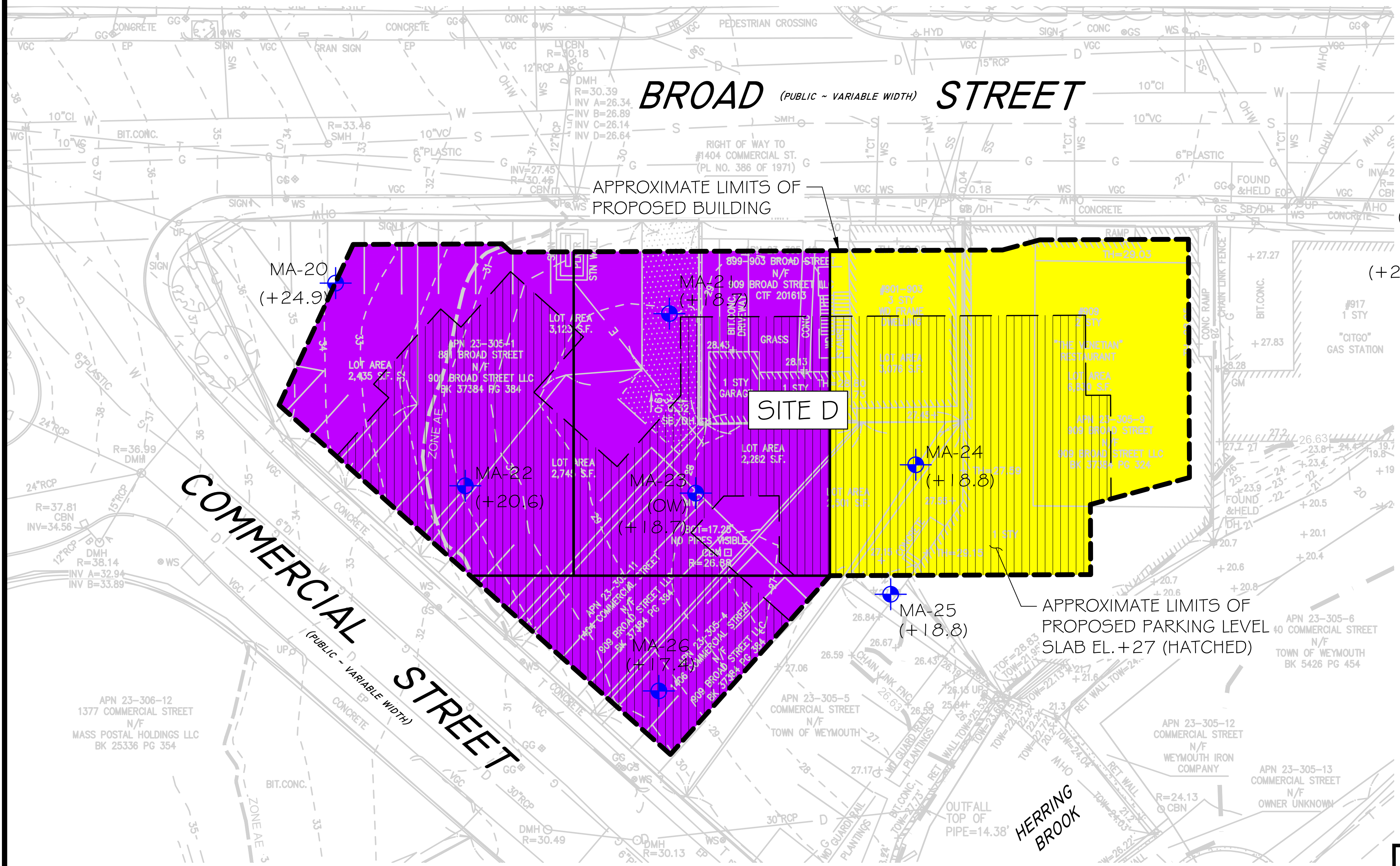
JACKSON SQUARE MULTI-USE DEVELOPMENT - SITE D
WEYMOUTH MASSACHUSETTS
GENERALIZED SUBSURFACE PROFILE - SECTION A-A
FOR
CMK DEVELOPMENTS PARTNERS
BY
McPHAIL ASSOCIATES, LLC

Date: MARCH 2023	Dwn: I.J.M.	Chkd: N.D.H.	Scale: AS NOTED
Project No: 7517			

FILE NAME: N:\Acad\JOBS\7517\Site D\7517-F02B_Section.dwg

FIGURE 3A



LEGEND

⌖ – APPROXIMATE LOCATION OF BORING PERFORMED BY TECHNICAL DRILLING SERVICES BETWEEN SEPTEMBER 26 TO OCTOBER 9, 2022 FOR McPHAIL ASSOCIATES, LLC

(OW) – INDICATES OBSERVATION WELL INSTALLED WITHIN COMPLETED BOREHOLE

(+23.6) – INDICATES ELEVATION OF THE TOP OF NATURAL INORGANIC DEPOSIT CONSISTING OF ALLUVIUM OR GLACIAL OUTWASH

🟩 – LESS THAN RCS-1
🟪 – LESS THAN RCS-2
🟨 – UNLINED LANDFILL
🟦 – LINED LANDFILL
🟧 – BATCH PLANT

REFERENCE: THIS PLAN WAS PREPARED FROM A 20-SCALE DRAWING ENTITLED "EXISTING CONDITIONS PLAN" DATED FERBUARY 3, 2023 BY MCKENZIE ENGINEERING GROUP, INC.

GRAPHIC SCALE
30 0 30 60

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JACKSON SQUARE MULTI-USE DEVELOPMENT
WEYMOUTH MASSACHUSETTS

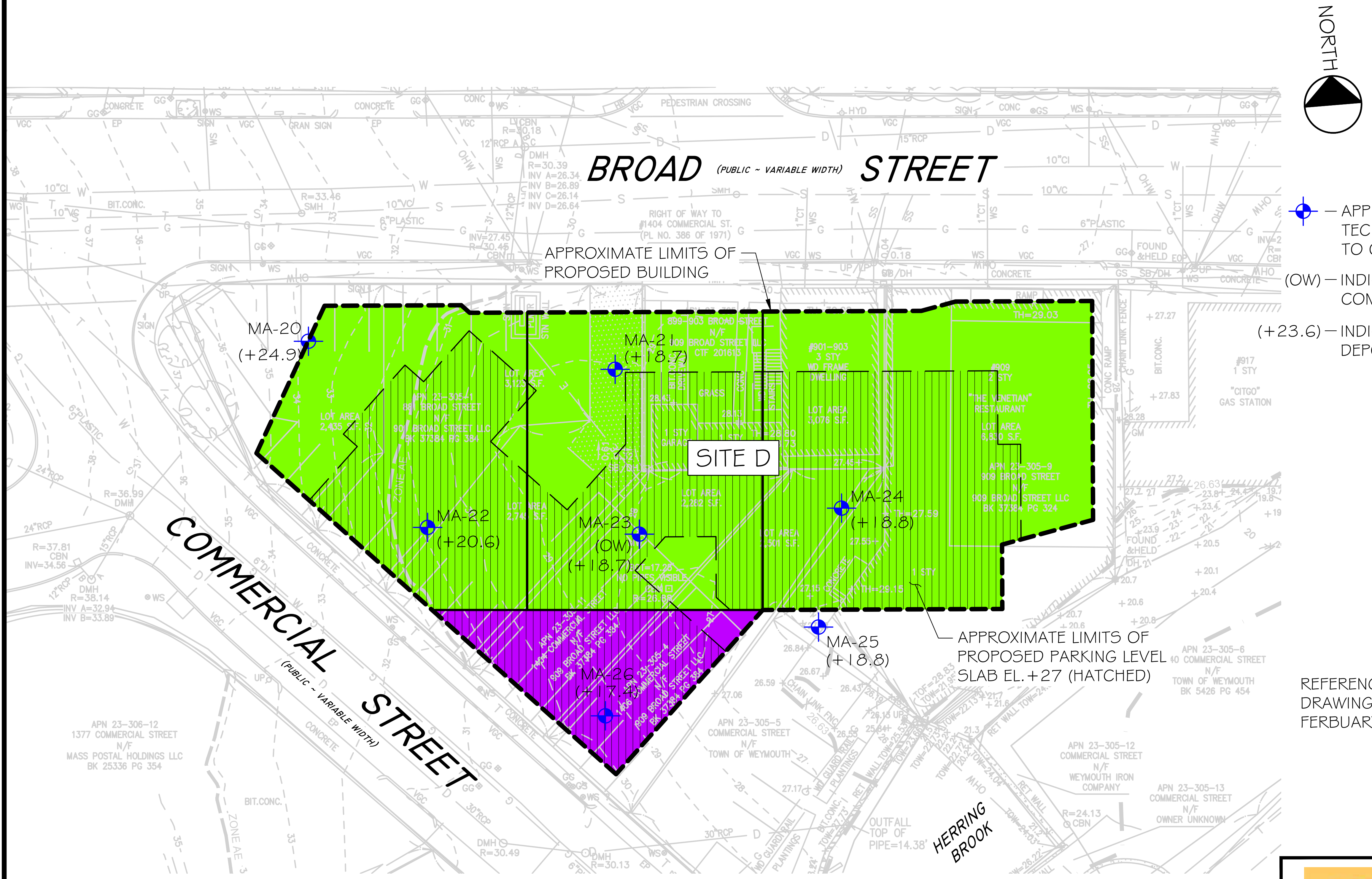
SOIL MANAGEMENT PLAN - FILL MATERIAL (0'-5')

FOR
CMK DEVELOPMENTS PARTNERS
BY
McPHAIL ASSOCIATES, LLC

Date: APRIL 2023
Dwn: I.J.M.
Chkd: N.D.H.
Scale: 1" = 30'
Project No: 7517

FILE NAME: N:\Acad\JOBS\7517\Site D\7517-F03Arev1.dwg

FIGURE 3B



LEGEND

⌖ — APPROXIMATE LOCATION OF BORING PERFORMED BY TECHNICAL DRILLING SERVICES BETWEEN SEPTEMBER 26 TO OCTOBER 9, 2022 FOR McPHAIL ASSOCIATES, LLC

(OW) — INDICATES OBSERVATION WELL INSTALLED WITHIN COMPLETED BOREHOLE

(+23.6) — INDICATES ELEVATION OF THE TOP OF NATURAL INORGANIC DEPOSIT CONSISTING OF ALLUVIUM OR GLACIAL OUTWASH

🟩 — LESS THAN RCS-1

🟪 — LESS THAN RCS-2

🟨 — UNLINED LANDFILL

🟦 — LINED LANDFILL

🟧 — BATCH PLANT

REFERENCE: THIS PLAN WAS PREPARED FROM A 20-SCALE DRAWING ENTITLED "EXISTING CONDITIONS PLAN" DATED FERBUARY 3, 2023 BY MCKENZIE ENGINEERING GROUP, INC.

GRAPHIC SCALE

30 0 30 60

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Geotechnical and
Geoenvironmental Engineers
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617/868-1423 (Fax)
www.mcphailgeo.com

JACKSON SQUARE MULTI-USE DEVELOPMENT
WEYMOUTH MASSACHUSETTS

SOIL MANAGEMENT PLAN - FILL MATERIAL (5'-10')

FOR
CMK DEVELOPMENTS PARTNERS
BY
McPHAIL ASSOCIATES, LLC

Date: APRIL 2023	Dwn: I.J.M.	Chkd: N.D.H.	Scale: 1" = 30'
Project No: 7517			

FILE NAME: N:\Acad\JOBS\7517\Site D\7517-F03Brev1.dwg

Project:	Jackson Square Development	**Job #:**	7517.9
Location:	Paved Parking Lot	**Date Started:**	9-28-22
City/State:	Weymouth, Massachusetts	**Date Finished:**	9-29-22

Boring No.
MA-20

Contractor: TDS

Driller/Helper: D. Newton/B. Lee

Logged By/Reviewed By: T. M. Cormican

Surface Elevation (ft): 33.9

Casing Type/Depth (ft): 4.25 " I.D. Hollow Stem augers

Casing Hammer (lbs)/Drop (in): NE

Sampler Size/Type: 1-3/8 " I.D. Split-Spoon

Sampler Hammer (lbs)/Drop (in): 140 lbs./30 inches

Groundwater Observations

Date	Depth	Elev.	Notes
9-28-22	11	22.9	

Depth (ft)	Elev. (ft)
1	33
2	32
3	31
4	30
5	29
6	28
7	27
8	26
9	25
10	24
11	23
12	22
13	21
14	20
15	19
16	18
17	17
18	16
19	15
20	14
21	13
22	12
23	11

Depth/EL to Strata Change (ft)	Stratum
0.3 / 33.6	PAVEMENT
9.0 / 24.9	FILL
15.5 / 18.4	GLACIAL OUTWASH
	Bottom of Borehole 15.5 feet below ground surface.

Sample: TVOC (ppm)	N-Value / RQD	No.	Pen. /Rec. (in)	Depth (ft)	Blows/6" / Min/ft	Sample Description and Boring Notes
0.0	13	S-1	18/9	0.5-2.0	8 5 8	Compact brown gravelly SAND, trace silt. (FILL)
0.1	40	S-2	24/18	2.0-4.0	8 25 15 7	Dense gray-brown well-graded mixture of SILT, SAND and GRAVEL, with brick, concrete, ash and cinders. (FILL)
0.4	14	S-3	12/9	4.0-5.0	7 7	Loose to compact gray-brown SAND and GRAVEL, trace silt, with concrete. (FILL)
0.0	14	S-4	24/13	5.0-7.0	2 3 11 15	Compact gray-brown SAND and GRAVEL, trace silt, with concrete and wood. (FILL)
0.0	24	S-5	24/14	7.0-9.0	13 10 14 20	Compact gray-brown SAND and GRAVEL, trace silt. (FILL)
0.0	49	S-6	12/10	9.0-10.0	21 28	Dense gray-brown SAND and GRAVEL, trace silt. (GLACIAL OUTWASH)
0.0	85	S-7	24/15	10.0-12.0	22 45 40 31	Very dense gray-brown SAND and GRAVEL, some silt. (GLACIAL OUTWASH)
0.0	100/4"	S-8	4/4	15.0-15.3	100/4"	Very dense mottled gray-brown to orange-brown SAND and GRAVEL, some silt. (GLACIAL OUTWASH) Split-spoon and auger refusal 15.5 feet below ground surface.

GRANULAR SOILS	
BLOWS/FT.	DENSITY
0-4	V.LOOSE
4-10	LOOSE
10-30	COMPACT
30-50	DENSE
>50	V.DENSE

COHESIVE SOILS	
BLOWS/FT.	CONSISTENCY
<2	V.SOFT
2-4	SOFT
4-8	FIRM
8-15	STIFF
15-30	V.STIFF
>30	HARD

SOIL COMPONENT

DESCRIPTIVE TERM	PROPORTION OF TOTAL
"TRACE"	0-10%
"SOME"	10-20%
"ADJECTIVE" (eg SANDY, SILTY)	20-35%
"AND"	35-50%

SOIL CONTAINING THREE COMPONENTS EACH OF WHICH COMPRISE AT LEAST 25% OF THE TOTAL ARE CLASSIFIED AS "A WELL-GRADED MIXTURE OF"

Notes:
Used automatic hammer to drive Split Spoon

Total Volatile Organic Compounds (TVOC) measured w/ PID Model:
TVOC Background: ppm
Weather: Variable
Temperature:

McPHAIL ASSOCIATES, LLC
2269 MASSACHUSETTS AVENUE
CAMBRIDGE, MA 02140
TEL: 617-868-1420
FAX: 617-868-1423

Project: Jackson Square Development
Location: Paved Parking Lot
City/State: Weymouth, Massachusetts

Job #: 7517.9
Date Started: 9-28-22
Date Finished: 9-28-22

Boring No.

MA-21

Contractor: TDS
Driller/Helper: D. Newton/B. Lee
Logged By/Reviewed By: T. M. Cormican
Surface Elevation (ft): 28.7

Casing Type/Depth (ft): 4.25 " I.D. Hollow Stem augers
Casing Hammer (lbs)/Drop (in): NE
Sampler Size/Type: 1-3/8 " I.D. Split-Spoon
Sampler Hammer (lbs)/Drop (in): 140 lbs./30 inches

Groundwater Observations

Date	Depth	Elev.	Notes
9-28-22	7.4	21.3	

Depth (ft)	Elev. (ft)	Symbol	Depth/EL to Strata Change (ft)	Stratum	Sample TVOC (ppm)	N-Value RQD	No.	Pen. /Rec. (in)	Depth (ft)	Blows/6" Min/ft	Sample Description and Boring Notes
			0.3 / 28.4	ASPHALT							
1	28 27				0.1	10	S-1	18/13	0.5-2.0	5 5 5	Loose to compact brown SAND, some silt, gravel. (FILL)
2 3	26 25				0.1	16	S-2	24/16	2.0-4.0	6 10 6 5	Compact black SILT and SAND, some gravel to ASH and CINDERS and SLAG. (FILL)
4	24				1.9	9	S-3	12/10	4.0-5.0	3 6	Loose to compact black ASH, CINDERS and SLAG. (FILL)
5 6	23 22			FILL	0.2	12	S-4	24/8	5.0-7.0	4 6 6 3	Compact black SILT and SAND, with ash, cinders, and slag. (FILL)
7 8	21 20				0.3	8	S-5	24/10	7.0-9.0	5 4 4 4	Loose black SILT and SAND, with ash, cinders, and slag. (FILL)
9	19		10.0 / 18.7		0.1	11	S-6	12/10	9.0-10.0	4 7	Loose to compact dark brown to black well-graded mixture of ORGANIC SILT, SAND and GRAVEL. (FILL)
10 11	18 17				0.1	12	S-7	24/11	10.0-12.0	5 6 6 4	Compact orange-brown silty SAND and GRAVEL to brown gravelly SAND. (GLACIAL OUTWASH)
12 13 14	16 15 14										
15 16	13			GLACIAL OUTWASH	0.1	65	S-8	24/17	15.0-17.0	26 38 27 26	Very dense gray-brown SAND and GRAVEL, trace silt. (GLACIAL OUTWASH)
17 18 19	12 11 10										
20 21	9 8		22.0 / 6.7		0.0	41	S-9	24/8	20.0-22.0	10 16 25 22	Dense brown SAND and GRAVEL, trace silt. (GLACIAL OUTWASH)
22 23	7 6 5			Bottom of borehole 22.0 feet below ground surface.							

GRANULAR SOILS	
BLOWS/FT.	DENSITY
0-4	V.LOOSE
4-10	LOOSE
10-30	COMPACT
30-50	DENSE
>50	V.DENSE

COHESIVE SOILS	
BLOWS/FT.	CONSISTENCY
<2	V.SOFT
2-4	SOFT
4-8	FIRM
8-15	STIFF
15-30	V.STIFF
>30	HARD

SOIL COMPONENT

DESCRIPTIVE TERM	PROPORTION OF TOTAL
"TRACE"	0-10%
"SOME"	10-20%
"ADJECTIVE" (eg SANDY, SILTY)	20-35%
"AND"	35-50%

SOIL CONTAINING THREE COMPONENTS EACH OF WHICH COMPRISE AT LEAST 25% OF THE TOTAL ARE CLASSIFIED AS "A WELL-GRADED MIXTURE OF"

Notes:
Used automatic hammer to drive Split Spoon

Total Volatile Organic Compounds (TVOC) measured w/ PID Model:
TVOC Background: ppm
Weather: Variable
Temperature:

McPHAIL ASSOCIATES, LLC
2269 MASSACHUSETTS AVENUE
CAMBRIDGE, MA 02140
TEL: 617-868-1420
FAX: 617-868-1423

Project: Jackson Square Development
Location: Paved Parking Lot
City/State: Weymouth, Massachusetts

Job #: 7517.9
Date Started: 9-28-22
Date Finished: 9-28-22

Boring No.
MA-22

Contractor: TDS
Driller/Helper: D. Newton/B. Lee
Logged By/Reviewed By: T. M. Cormican
Surface Elevation (ft): 30.6

Casing Type/Depth (ft): 4.25 " I.D. Hollow Stem augers
Casing Hammer (lbs)/Drop (in): NE
Sampler Size/Type: 1-3/8 " I.D. Split-Spoon
Sampler Hammer (lbs)/Drop (in): 140 lbs./30 inches

Groundwater Observations			
Date	Depth	Elev.	Notes
9-28-22	11.5	19.1	

Depth (ft)	Elev. (ft)	Symbol	Depth/EL to Strata Change (ft)	Stratum	Sample TVOC (ppm)	N-Value RQD	No.	Pen. /Rec. (in)	Depth (ft)	Blows/6" Min/ft	Sample Description and Boring Notes
			0.3 / 30.3	PAVEMENT							
1	30 29			FILL	0.0	16	S-1	18/8	0.5-2.0	8 10 6	Compact brown gravelly SAND, some silt, to CRUSHED BRICK, MORTAR, and CONCRETE. (FILL)
2 3	28 27				0.0	7	S-2	24/13	2.0-4.0	4 3 4 14	Loose gray-black SILT and SAND, with ash and cinders. (FILL)
4	26				0.0	13	S-3	12/6	4.0-5.0	6 7	Compact SILT and SAND, with ash and cinders. (FILL)
5 6	25 24				0.1	13	S-4	24/16	5.0-7.0	8 5 8 15	Compact gray-brown well-graded mixture of SILT, SAND and GRAVEL, with ash, cinders and slag. (FILL)
7 8	23 22				0.0	13	S-5	24/13	7.0-9.0	11 8 5 4	Compact gray-brown well-graded mixture of SILT, SAND and GRAVEL, with brick, ash, cinders, and slag. (FILL)
9 10	21		10.0 / 20.6		0.0	12	S-6	12/9	9.0-10.0	5 7	Compact dark brown well-graded mixture of ORGANIC SILT, SAND, and GRAVEL. (FILL)
11	20 19			GLACIAL OUTWASH	0.0	23	S-7	24/11	10.0-12.0	14 12 11 10	Compact brown SAND and GRAVEL, trace silt. (GLACIAL OUTWASH)
12 13 14	18 17 16										
15 16	15 14				0.0	50	S-8	24/15	15.0-17.0	16 23 27 24	Dense to very dense gray-brown SAND and GRAVEL, trace silt. (GLACIAL OUTWASH)
17 18 19	13 12 11										
20 21	10 9		22.0 / 8.6		0.0	49	S-9	24/16	20.0-22.0	15 25 24 26	Dense gray-brown silty SAND and GRAVEL. (GLACIAL OUTWASH)
22 23	8 7			Bottom of borehole 22.0 feet below ground surface.							

GRANULAR SOILS	
BLOWS/FT.	DENSITY
0-4	V.LOOSE
4-10	LOOSE
10-30	COMPACT
30-50	DENSE
>50	V.DENSE

COHESIVE SOILS	
BLOWS/FT.	CONSISTENCY
<2	V.SOFT
2-4	SOFT
4-8	FIRM
8-15	STIFF
15-30	V.STIFF
>30	HARD

SOIL COMPONENT

DESCRIPTIVE TERM	PROPORTION OF TOTAL
"TRACE"	0-10%
"SOME"	10-20%
"ADJECTIVE" (eg SANDY, SILTY)	20-35%
"AND"	35-50%

SOIL CONTAINING THREE COMPONENTS EACH OF WHICH COMPRISE AT LEAST 25% OF THE TOTAL ARE CLASSIFIED AS "A WELL-GRADED MIXTURE OF"

Notes:
Used automatic hammer to drive Split Spoon

Total Volatile Organic Compounds (TVOC) measured w/ PID Model:
TVOC Background: ppm
Weather: Variable
Temperature:

McPHAIL ASSOCIATES, LLC
2269 MASSACHUSETTS AVENUE
CAMBRIDGE, MA 02140
TEL: 617-868-1420
FAX: 617-868-1423

Project:	Jackson Square Development	**Job #:**	7517.9	Boring No.
Location:	Paved Parking Lot	**Date Started:**	9-27-22	**MA-23 (OW)**
City/State:	Weymouth, Massachusetts	**Date Finished:**	9-27-22	

Contractor: TDS

Driller/Helper: D. Newton/B. Lee

Logged By/Reviewed By: T. M. Cormican

Surface Elevation (ft): 27.7

Casing Type/Depth (ft): 4.25 " I.D. Hollow Stem augers

Casing Hammer (lbs)/Drop (in): NE

Sampler Size/Type: 1-3/8 " I.D. Split-Spoon

Sampler Hammer (lbs)/Drop (in): 140 lbs./30 inches

Groundwater Observations

Date	Depth	Elev.	Notes
9-27-22	7	20.7	

Depth (ft)	Elev. (ft)	Symbol	Depth/EL to Strata Change (ft)	Stratum	Sample TVOC (ppm)	N-Value RQD	No.	Pen. /Rec. (in)	Depth (ft)	Blows/6" Min/ft	Sample Description and Boring Notes
			0.3 / 27.4	PAVEMENT							
1 2	27 26				0.1	28	S-1	18/14	0.5-2.0	15 12 16	Compact brown sandy GRAVEL, some silt, with ash and cinders. (FILL)
3 4	25 24				0.3	28	S-2	24/10	2.0-4.0	20 13 15 15	Compact black ASH, CINDERS, and SLAG. (FILL)
5	23			FILL	0.2	16	S-3	12/8	4.0-5.0	10 6	Compact black ASH, CINDERS, and SLAG. (FILL)
6 7	22 21				0.1	23	S-4	24/10	5.0-7.0	14 11 12 9	Compact black ASH, CINDERS, and SLAG. (FILL)
8 9	20 19		9.0 / 18.7		0.6	19	S-5	24/12	7.0-9.0	12 8 11 11	Compact black ASH, CINDERS, and SLAG. (FILL)
10	18				0.0	39	S-6	12/9	9.0-10.0	14 25	Dense brown to gray-brown SAND and GRAVEL, trace silt. (GLACIAL OUTWASH)
11 12	17 16				0.1	62	S-7	24/15	10.0-12.0	20 29 33 36	Very dense brown GRAVEL, some sand, trace silt. (GLACIAL OUTWASH)
13 14 15	15 14 13			GLACIAL OUTWASH							
16	12		16.2 / 11.5		0.1	131/9"	S-8	15/12	15.0-16.3	14 31 100/3"	Very dense gray-brown silty SAND and GRAVEL. (GLACIAL OUTWASH) Split-spoon and auger refusal 16.2 feet below ground surface.
17 18 19 20 21 22 23	11 10 9 8 7 6 5 4			Bottom of borehole 16.2 feet below ground surface.							

GRANULAR SOILS	
BLOWS/FT.	DENSITY
0-4	V.LOOSE
4-10	LOOSE
10-30	COMPACT
30-50	DENSE
>50	V.DENSE

COHESIVE SOILS	
BLOWS/FT.	CONSISTENCY
<2	V.SOFT
2-4	SOFT
4-8	FIRM
8-15	STIFF
15-30	V.STIFF
>30	HARD

SOIL COMPONENT

DESCRIPTIVE TERM	PROPORTION OF TOTAL
"TRACE"	0-10%
"SOME"	10-20%
"ADJECTIVE" (eg SANDY, SILTY)	20-35%
"AND"	35-50%

SOIL CONTAINING THREE COMPONENTS EACH OF WHICH COMPRISE AT LEAST 25% OF THE TOTAL ARE CLASSIFIED AS "A WELL-GRADED MIXTURE OF"

Notes:
Used automatic hammer to drive Split Spoon

Total Volatile Organic Compounds (TVOC) measured w/ PID Model:
TVOC Background: ppm
Weather: Variable
Temperature:

McPHAIL ASSOCIATES, LLC
2269 MASSACHUSETTS AVENUE
CAMBRIDGE, MA 02140
TEL: 617-868-1420
FAX: 617-868-1423

Project: Jackson Square Development
Location: Paved Parking Lot
City/State: Weymouth, Massachusetts

Job #: 7517.9
Date Started: 10-4-22
Date Finished: 10-4-22

Boring No.
MA-24

Contractor: TDS
Driller/Helper: D. Newton/B. Lee
Logged By/Reviewed By: T. M. Cormican
Surface Elevation (ft): 27.3

Casing Type/Depth (ft): 4.25 " I.D. Hollow Stem augers
Casing Hammer (lbs)/Drop (in): NE
Sampler Size/Type: 1-3/8 " I.D. Split-Spoon
Sampler Hammer (lbs)/Drop (in): 140 lbs./30 inches

Groundwater Observations			
Date	Depth	Elev.	Notes
10-4-22	8.5	18.8	

Depth (ft)	Elev. (ft)
	27
1	26
2	25
3	24
4	23
5	22
6	21
7	20
8	19
9	18
10	17
11	16
12	15
13	14
14	13
15	12
16	11
17	10
18	9
19	8
20	7
21	6
22	5
23	4

Depth/EL to Strata Change (ft)	Stratum	TVOC (ppm)	N-Value / RQD	No.	Pen. /Rec. (in)	Depth (ft)	Blows/6" / Min/ft	Sample Description and Boring Notes
0.3 / 27.0	PAVEMENT							
	FILL	0.0	22	S-1	18/12	0.5-2.0	4 10 12	Compact brown gravelly SAND, some silt, to black SILT and SAND, with ash and cinders. (FILL)
		0.7	28	S-2	24/16	2.0-4.0	22 11 17 4	Compact black ASH, CINDERS, and SLAG. (FILL)
		0.4	17	S-3	12/6	4.0-5.0	8 9	Loose to compact black ASH, CINDERS, and SLAG. (FILL)
		0.2	14	S-4	24/12	5.0-7.0	8 7 7 5	Compact black ASH, CINDERS, and SLAG. (FILL)
8.5 / 18.8		0.2	12	S-5	18/8	7.0-8.5	6 6 6	Compact black ASH, and CINDERS, and SLAG. (FILL)
	GLACIAL OUTWASH	0.0	15/6"	S-5A	6/6	8.5-9.0	15	Compact to dense yellow-brown to gray-brown SAND and GRAVEL, trace silt. (GLACIAL OUTWASH)
		0.0	20	S-6	12/6	9.0-10.0	8 12	Compact gray-brown SAND and GRAVEL, trace silt. (GLACIAL OUTWASH)
		0.0	25	S-7	24/13	10.0-12.0	6 8 17 22	Compact gray-brown SAND and GRAVEL, trace silt. (GLACIAL OUTWASH)
17.0 / 10.3		0.0	41	S-8	24/10	15.0-17.0	21 20 21 24	Dense gray-brown SAND and GRAVEL, trace silt. (GLACIAL OUTWASH)
	Bottom of borehole 17.0 feet below ground surface.							

GRANULAR SOILS	
BLOWS/FT.	DENSITY
0-4	V.LOOSE
4-10	LOOSE
10-30	COMPACT
30-50	DENSE
>50	V.DENSE

COHESIVE SOILS	
BLOWS/FT.	CONSISTENCY
<2	V.SOFT
2-4	SOFT
4-8	FIRM
8-15	STIFF
15-30	V.STIFF
>30	HARD

SOIL COMPONENT

DESCRIPTIVE TERM	PROPORTION OF TOTAL
"TRACE"	0-10%
"SOME"	10-20%
"ADJECTIVE" (eg SANDY, SILTY)	20-35%
"AND"	35-50%

SOIL CONTAINING THREE COMPONENTS EACH OF WHICH COMPRISE AT LEAST 25% OF THE TOTAL ARE CLASSIFIED AS "A WELL-GRADED MIXTURE OF"

Notes:
Used automatic hammer to drive Split Spoon

Total Volatile Organic Compounds (TVOC) measured w/ PID Model:
TVOC Background: ppm
Weather: Variable
Temperature:

McPHAIL ASSOCIATES, LLC
2269 MASSACHUSETTS AVENUE
CAMBRIDGE, MA 02140
TEL: 617-868-1420
FAX: 617-868-1423

Project:	Jackson Square Development	**Job #:**	7517.9
Location:	Paved Parking Lot	**Date Started:**	10-4-22
City/State:	Weymouth, Massachusetts	**Date Finished:**	10-4-22

Boring No.
MA-25

Contractor: TDS

Driller/Helper: D. Newton/B. Lee

Logged By/Reviewed By: T. M. Cormican

Surface Elevation (ft): 26.8

Casing Type/Depth (ft): 4.25 " I.D. Hollow Stem augers

Casing Hammer (lbs)/Drop (in): NE

Sampler Size/Type: 1-3/8 " I.D. Split-Spoon

Sampler Hammer (lbs)/Drop (in): 140 lbs./30 inches

Groundwater Observations

Date	Depth	Elev.	Notes
10-4-22	8	18.8	

Depth/EL to Strata Change (ft)	Stratum	Sample TVOC (ppm)	N-Value / RQD	No.	Pen. /Rec. (in)	Depth (ft)	Blows/6" / Min/ft	Sample Description and Boring Notes
0.3 / 26.5	ASPHALT							
	FILL	0.0	37	S-1	18/16	0.5-2.0	7 15 22	Dense brown SAND and GRAVEL, some silt, to black ASH, CINDERS, and SLAG. (FILL)
		0.5	38	S-2	24/14	2.0-4.0	31 22 16 16	Dense black ASH, CINDERS and SLAG. (FILL)
		0.1	28	S-3	12/8	4.0-5.0	12 16	Compact black ASH, CINDERS, and SLAG. (FILL)
		0.1	24	S-4	24/11	5.0-7.0	16 17 7 4	Compact black ASH, CINDERS, and SLAG. (FILL)
8.0 / 18.8		0.0	12	S-5	12/8	7.0-8.0	5 7	Loose to compact brown to dark brown silty SAND, some gravel. (FILL)
	GLACIAL OUTWASH	0.0	17	S-5a	12/9	8.0-9.0	8 9	Compact light gray silty fine to medium SAND. (GLACIAL OUTWASH)
		0.0	38	S-6	12/9	9.0-10.0	25 13	Compact yellow-gray SAND and GRAVEL, trace silt. (GLACIAL OUTWASH)
		0.1	51	S-7	24/14	10.0-12.0	17 30 21 24	Very dense yellow-gray SAND and GRAVEL, trace silt. (GLACIAL OUTWASH)
17.0 / 9.8		0.1	45	S-8	24/13	15.0-17.0	30 28 17 19	Dense yellow-gray SAND and GRAVEL, trace silt. (GLACIAL OUTWASH)
	Bottom of borehole 17.0 feet below ground surface.							

Depth (ft)	Elev. (ft)
1	26
2	25
3	24
4	23
5	22
6	21
7	20
8	19
9	18
10	17
11	16
12	15
13	14
14	13
15	12
16	11
17	10
18	9
19	8
20	7
21	6
22	5
23	4
	3

GRANULAR SOILS

BLOWS/FT.	DENSITY
0-4	V.LOOSE
4-10	LOOSE
10-30	COMPACT
30-50	DENSE
>50	V.DENSE

COHESIVE SOILS

BLOWS/FT.	CONSISTENCY
<2	V.SOFT
2-4	SOFT
4-8	FIRM
8-15	STIFF
15-30	V.STIFF
>30	HARD

SOIL COMPONENT

DESCRIPTIVE TERM	PROPORTION OF TOTAL
"TRACE"	0-10%
"SOME"	10-20%
"ADJECTIVE" (eg SANDY, SILTY)	20-35%
"AND"	35-50%

SOIL CONTAINING THREE COMPONENTS EACH OF WHICH COMPRISE AT LEAST 25% OF THE TOTAL ARE CLASSIFIED AS "A WELL-GRADED MIXTURE OF"

Notes:
Used automatic hammer to drive Split Spoon

Total Volatile Organic Compounds (TVOC) measured w/ PID Model:
TVOC Background: ppm
Weather: Variable
Temperature:

McPHAIL ASSOCIATES, LLC
2269 MASSACHUSETTS AVENUE
CAMBRIDGE, MA 02140
TEL: 617-868-1420
FAX: 617-868-1423

Project:	Jackson Square Development	**Job #:**	7517.9	Boring No.
Location:	Paved Parking Lot	**Date Started:**	10-3-22	**MA-26**
City/State:	Weymouth, Massachusetts	**Date Finished:**	10-4-22	

Contractor: TDS

Driller/Helper: D. Newton/B. Lee

Logged By/Reviewed By: T. M. Cormican

Surface Elevation (ft): 29.4

Casing Type/Depth (ft): 4.25 " I.D. Hollow Stem augers

Casing Hammer (lbs)/Drop (in): NE

Sampler Size/Type: 1-3/8 " I.D. Split-Spoon

Sampler Hammer (lbs)/Drop (in): 140 lbs./30 inches

Groundwater Observations

Date	Depth	Elev.	Notes
10-3-22	9	20.4	

Depth (ft)	Elev. (ft)	Symbol	Depth/EL to Strata Change (ft)	Stratum	Sample: TVOC (ppm)	Sample: N-Value / RQD	Sample: No.	Sample: Pen. /Rec. (in)	Sample: Depth (ft)	Sample: Blows/6" / Min/ft	Sample Description and Boring Notes
	29		0.2 / 29.2	ASPHALT							
1	28				0.4	63	S-1	18/8	0.5-2.0	15 28 35	Very dense brown gravelly SAND, some silt, with brick. (FILL)
2 3	27 26				0.0	23	S-2	24/14	2.0-4.0	10 12 11 6	Compact sandy GRAVEL, trace silt, with crushed brick and mortar. (FILL)
4	25				0.0	15	S-3	12/6	4.0-5.0	9 6	Compact brown SAND, some silt, with brick. (FILL)
5 6	24 23			FILL	0.1	20	S-4	24/13	5.0-7.0	7 10 10 10	Compact brown SAND, some silt, with brick and mortar to black ASH, CINDERS, and SLAG. (FILL)
7 8	22 21				0.0	8	S-5	24/9	7.0-9.0	5 6 2 2	Loose gray-black ASH, CINDERS, and SLAG. (FILL)
9	20										
10 11	19 18		12.0 / 17.4		0.0	40	S-7	24/6	10.0-12.0	14 20 20 20	Dense dark brown silty SAND and GRAVEL. (FILL)
12 13	17 16				0.0	51	S-8	24/8	12.0-14.0	17 22 29 41	Very dense gray-brown SAND and GRAVEL, trace to some silt. (GLACIAL OUTWASH)
14	15			GLACIAL OUTWASH							
15 16	14 13		17.0 / 12.4		0.0	71	S-9	24/14	15.0-17.0	88 42 29 26	Very dense gray SAND and GRAVEL, trace to some silt. (GLACIAL OUTWASH)
17 18 19 20 21 22 23	12 11 10 9 8 7 6			Bottom of borehole 17.0 feet below ground surface.							

GRANULAR SOILS

BLOWS/FT.	DENSITY
0-4	V.LOOSE
4-10	LOOSE
10-30	COMPACT
30-50	DENSE
>50	V.DENSE

COHESIVE SOILS

BLOWS/FT.	CONSISTENCY
<2	V.SOFT
2-4	SOFT
4-8	FIRM
8-15	STIFF
15-30	V.STIFF
>30	HARD

SOIL COMPONENT

DESCRIPTIVE TERM	PROPORTION OF TOTAL
"TRACE"	0-10%
"SOME"	10-20%
"ADJECTIVE" (eg SANDY, SILTY)	20-35%
"AND"	35-50%

SOIL CONTAINING THREE COMPONENTS EACH OF WHICH COMPRISE AT LEAST 25% OF THE TOTAL ARE CLASSIFIED AS "A WELL-GRADED MIXTURE OF"

Notes:
Used automatic hammer to drive Split Spoon

Total Volatile Organic Compounds (TVOC) measured w/ PID Model:
TVOC Background: ppm
Weather: Variable
Temperature:

McPHAIL ASSOCIATES, LLC
2269 MASSACHUSETTS AVENUE
CAMBRIDGE, MA 02140
TEL: 617-868-1420
FAX: 617-868-1423

LEGEND

⌖ – APPROXIMATE LOCATION OF BORING PERFORMED BY TECHNICAL DRILLING SERVICES BETWEEN SEPTEMBER 26 TO OCTOBER 9, 2022 FOR McPHAIL ASSOCIATES, LLC

(OW) – INDICATES OBSERVATION WELL INSTALLED WITHIN COMPLETED BOREHOLE

REFERENCE: THIS PLAN WAS PREPARED FROM A 20-SCALE DRAWING ENTITLED "EXISTING CONDITIONS PLAN" DATED NOVEMBER 29, 2022 BY MCKENZIE ENGINEERING GROUP, INC.

McPHAIL ASSOCIATES, LLC
Geotechnical and Geoenvironmental Engineers
2269 Massachusetts Avenue
Cambridge, MA 02140
617/868-1420
617/868-1423 (Fax)
www.mcphailgeo.com

JACKSON SQUARE MULTI-USE DEVELOPMENT

WEYMOUTH MASSACHUSETTS

SUBSURFACE EXPLORATION PLAN

FOR

CMK DEVELOPMENTS PARTNERS

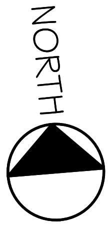
BY

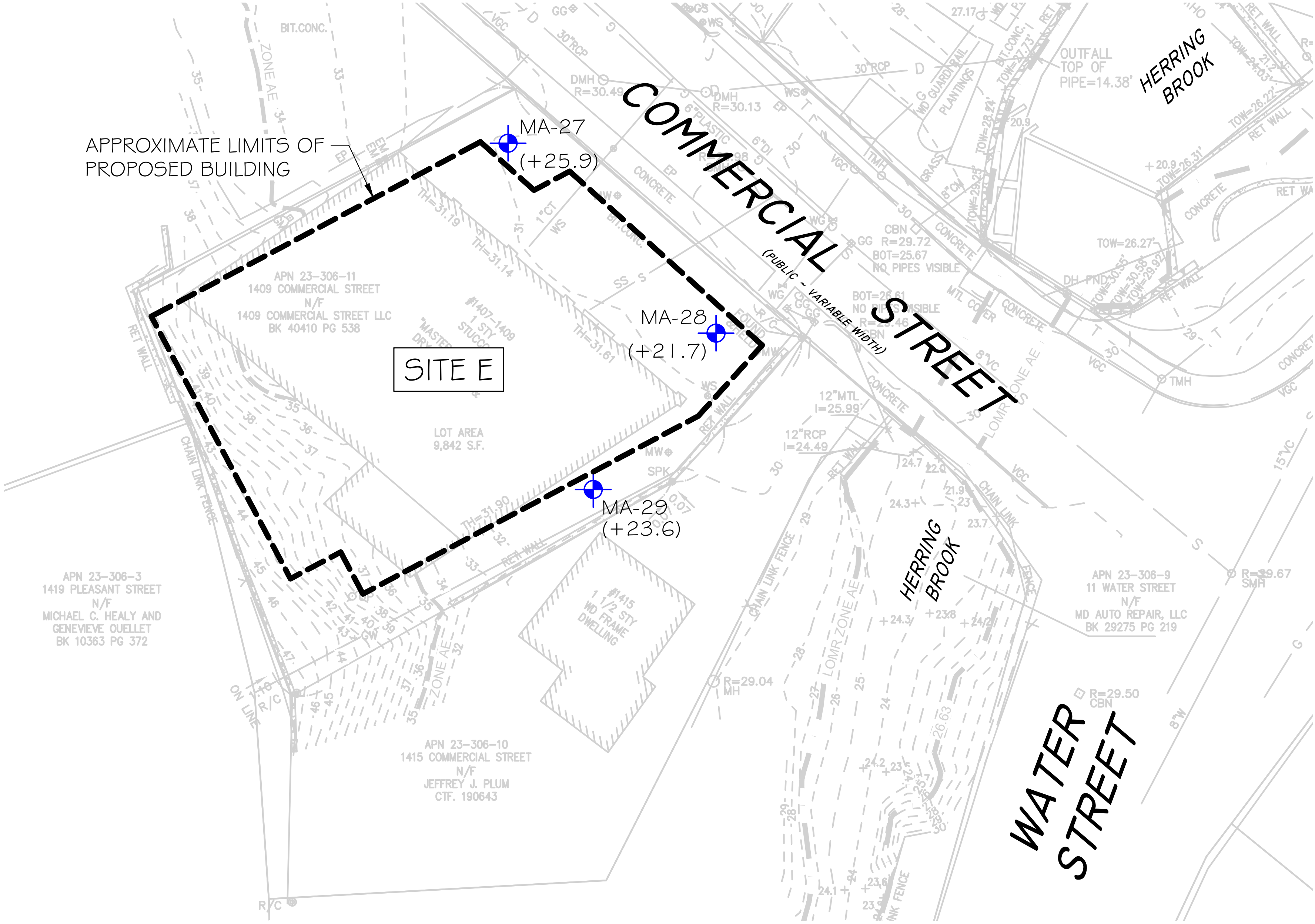
McPHAIL ASSOCIATES, LLC

Date: MARCH 2023
Dwn: I.J.M.
Chkd: N.D.H.
Scale: 1" = 30'
Project No: 7517
FIGURE 2

FILE NAME: N:\Acad\JOBS\7517\7517-F02rev1.dwg

FIGURE 2A





LEGEND

⌖ — APPROXIMATE LOCATION OF BORING PERFORMED BY TECHNICAL DRILLING SERVICES BETWEEN SEPTEMBER 26 TO OCTOBER 9, 2022 FOR McPHAIL ASSOCIATES, LLC

(OW) — INDICATES OBSERVATION WELL INSTALLED WITHIN COMPLETED BOREHOLE

(+23.6) — INDICATES ELEVATION OF THE TOP OF NATURAL INORGANIC DEPOSIT CONSISTING OF ALLUVIUM OR GLACIAL OUTWASH

REFERENCE: THIS PLAN WAS PREPARED FROM A 20-SCALE DRAWING ENTITLED "EXISTING CONDITIONS PLAN" DATED FERBUARY 3, 2023 BY MCKENZIE ENGINEERING GROUP, INC.

GRAPHIC SCALE

30 0 30 60

McPHAIL ASSOCIATES, LLC
Geotechnical and
Geoenvironmental Engineers
2269 Massachusetts Avenue
Cambridge, MA 02140
617/868-1420
617/868-1423 (Fax)
www.mcphailgeo.com

JACKSON SQUARE MULTI-USE DEVELOPMENT
WEYMOUTH MASSACHUSETTS

SUBSURFACE EXPLORATION PLAN - SITE E

FOR
CMK DEVELOPMENTS PARTNERS
BY
McPHAIL ASSOCIATES, LLC

Date: APRIL 2023
Dwn: I.J.M.
Chkd: N.D.H.
Scale: 1" = 30'
Project No: 7517

FILE NAME: N:\Acad\JOBS\7517\Site E\7517-F02Arev1.dwg

FIGURE 3A

NORTH

LEGEND

- APPROXIMATE LOCATION OF BORING PERFORMED BY TECHNICAL DRILLING SERVICES BETWEEN SEPTEMBER 26 TO OCTOBER 9, 2022 FOR McPHAIL ASSOCIATES, LLC

(OW) – INDICATES OBSERVATION WELL INSTALLED WITHIN COMPLETED BOREHOLE

(+23.6) – INDICATES ELEVATION OF THE TOP OF NATURAL INORGANIC DEPOSIT CONSISTING OF ALLUVIUM OR GLACIAL OUTWASH

🟩 – LESS THAN RCS-1

🟪 – LESS THAN RCS-2

🟨 – UNLINED LANDFILL

🟦 – LINED LANDFILL

🟧 – BATCH PLANT

REFERENCE: THIS PLAN WAS PREPARED FROM A 20-SCALE DRAWING ENTITLED "EXISTING CONDITIONS PLAN" DATED FERBUARY 3, 2023 BY MCKENZIE ENGINEERING GROUP, INC.

GRAPHIC SCALE

30 0 30 60

McPHAIL ASSOCIATES, LLC
Geotechnical and
Geoenvironmental Engineers
2269 Massachusetts Avenue
Cambridge, MA 02140
617/868-1420
617/868-1423 (Fax)
www.mcphailgeo.com

JACKSON SQUARE MULTI-USE DEVELOPMENT
WEYMOUTH MASSACHUSETTS

SOIL MANAGEMENT PLAN - FILL MATERIAL (0'-5')

FOR
CMK DEVELOPMENTS PARTNERS
BY
McPHAIL ASSOCIATES, LLC

Date: APRIL 2023
Dwn: I.J.M.
Chkd: N.D.H.
Scale: 1" = 30'
Project No: 7517

FILE NAME: N:\Acad\JOBS\7517\Site E\7517-F03Arev1.dwg

Project:	Jackson Square Development	**Job #:**	7517.9
Location:	Paved Parking Lot	**Date Started:**	10-4-22
City/State:	Weymouth, Massachusetts	**Date Finished:**	10-4-22

Boring No.
MA-27

Contractor: TDS
Driller/Helper: D. Newton/B. Lee
Logged By/Reviewed By: T. M. Cormican
Surface Elevation (ft): 30.9

Casing Type/Depth (ft): 4.25 " I.D. Hollow Stem augers
Casing Hammer (lbs)/Drop (in): NE
Sampler Size/Type: 1-3/8 " I.D. Split-Spoon
Sampler Hammer (lbs)/Drop (in): 140 lbs./30 inches

Groundwater Observations			
Date	Depth	Elev.	Notes
10-4-22	10	20.9	

Depth (ft)	Elev. (ft)
1	30
2	29
3	28
4	27
5	26
6	25
7	24
8	23
9	22
10	21
11	20
12	19
13	18
14	17
15	16
16	15
17	14
18	13
19	12
20	11
21	10
22	9
23	8

Depth/EL to Strata Change (ft)	Stratum	Sample						Sample Description and Boring Notes
		TVOC (ppm)	N-Value RQD	No.	Pen. /Rec. (in)	Depth (ft)	Blows/6" Min/ft	
0.2 / 30.7	PAVEMENT							
	FILL	0.2	14	S-1	18/8	0.5-2.0	7 9 5	Compact SAND, some silt, some gravel, to black ASH, CINDERS, and SLAG. (FILL)
		0.3	8	S-2	24/11	2.0-4.0	6 5 3 3	Loose black ASH, CINDERS, and SLAG. (FILL)
5.0 / 25.9		0.3	12	S-3	12/7	4.0-5.0	5 7	Compact black ASH, CINDERS and SLAG to dark brown gravelly SAND, some silt. (FILL)
	ALLUVIUM DEPOSIT	0.1	10	S-4	24/13	5.0-7.0	3 4 6 6	Loose to compact yellow-brown SAND, some gravel, trace silt. (ALLUVIUM DEPOSIT)
		0.1	16	S-5	24/18	7.0-9.0	9 9 7 6	Compact stratified yellow-brown to gray-brown fine to medium SAND, trace silt to SAND, trace silt, trace gravel. (ALLUVIUM DEPOSIT)
10.0 / 20.9								
	GLACIAL OUTWASH	0.2	20	S-6	24/14	10.0-12.0	15 12 8 5	Compact yellow-brown SAND and GRAVEL, trace silt. (GLACIAL OUTWASH)
17.0 / 13.9		0.2	35	S-7	24/12	15.0-17.0	13 18 15 12	Dense gray-brown SAND and GRAVEL, trace silt. (GLACIAL OUTWASH)
	Bottom of borehole 17.0 feet below ground surface.							

GRANULAR SOILS	
BLOWS/FT.	DENSITY
0-4	V.LOOSE
4-10	LOOSE
10-30	COMPACT
30-50	DENSE
>50	V.DENSE

COHESIVE SOILS	
BLOWS/FT.	CONSISTENCY
<2	V.SOFT
2-4	SOFT
4-8	FIRM
8-15	STIFF
15-30	V.STIFF
>30	HARD

SOIL COMPONENT

DESCRIPTIVE TERM	PROPORTION OF TOTAL
"TRACE"	0-10%
"SOME"	10-20%
"ADJECTIVE" (eg SANDY, SILTY)	20-35%
"AND"	35-50%

SOIL CONTAINING THREE COMPONENTS EACH OF WHICH COMPRISE AT LEAST 25% OF THE TOTAL ARE CLASSIFIED AS "A WELL-GRADED MIXTURE OF"

Notes:
Used automatic hammer to drive Split Spoon

Total Volatile Organic Compounds (TVOC) measured w/ PID Model:
TVOC Background: ppm
Weather: Variable
Temperature:

McPHAIL ASSOCIATES, LLC
2269 MASSACHUSETTS AVENUE
CAMBRIDGE, MA 02140
TEL: 617-868-1420
FAX: 617-868-1423

Project: Jackson Square Development
Location: Paved Parking Lot
City/State: Weymouth, Massachusetts

Job #: 7517.9
Date Started: 10-6-22
Date Finished: 10-6-22

Boring No.
MA-28

Contractor: TDS
Driller/Helper: D. Watson/J. Junoville
Logged By/Reviewed By: T. M. Cormican
Surface Elevation (ft): 30.7

Casing Type/Depth (ft): 4.25 " I.D. Hollow Stem augers
Casing Hammer (lbs)/Drop (in): NE
Sampler Size/Type: 1-3/8 " I.D. Split-Spoon
Sampler Hammer (lbs)/Drop (in): 140 lbs./30 inches

Groundwater Observations			
Date	Depth	Elev.	Notes
10-6-22	6	24.7	

Depth (ft)	Elev. (ft)	Symbol	Depth/EL to Strata Change (ft)	Stratum	Sample TVOC (ppm)	N-Value / RQD	No.	Pen. /Rec. (in)	Depth (ft)	Blows/6" / Min/ft	Sample Description and Boring Notes
			0.2 / 30.5	FILL							
1	30 29				0.1	16	S-1	18/12	0.5-2.0	6 8 8	Compact dark gray SAND and GRAVEL, some silt. (FILL)
2 3	28				0.0	26	S-2	14/17	2.0-3.2	21 14 12	Compact gray-brown SAND and GRAVEL, trace silt. (FILL)
4	27										
	26			FILL	0.0	26	S-3	12/10	4.0-5.0	10 16	Compact gray-brown SAND and GRAVEL, some silt. (FILL)
5 6 7	25 24				0.0	36	S-4	24/9	5.0-7.0	25 19 17 20	Dense gray-brown SAND and GRAVEL, trace to some silt. (FILL)
8	23 22		9.0 / 21.7		0.0	13	S-5	24/15	7.0-9.0	14 5 8 14	Compact gray-brown SAND and GRAVEL, trace to some silt. (FILL)
9 10	21 20				0.0	55	S-6	24/13	9.0-11.0	24 22 33 31	Very dense gray SAND and GRAVEL, trace silt. (GLACIAL OUTWASH)
11 12 13 14	19 18 17 16										
15 16	15 14			GLACIAL OUTWASH	0.0	40	S-7	24/12	15.0-17.0	8 16 24 28	Dense gray-brown SAND and GRAVEL, trace silt. (GLACIAL OUTWASH)
17 18 19	13 12 11										
20 21	10 9		22.0 / 8.7		0.0	40	S-8	24/12	20.0-22.0	16 21 19 19	Dense gray-brown SAND and GRAVEL, trace silt. (GLACIAL OUTWASH)
22 23	8 7			Bottom of borehole 22.0 feet below ground surface.							

GRANULAR SOILS	
BLOWS/FT.	DENSITY
0-4	V.LOOSE
4-10	LOOSE
10-30	COMPACT
30-50	DENSE
>50	V.DENSE

COHESIVE SOILS	
BLOWS/FT.	CONSISTENCY
<2	V.SOFT
2-4	SOFT
4-8	FIRM
8-15	STIFF
15-30	V.STIFF
>30	HARD

SOIL COMPONENT

DESCRIPTIVE TERM	PROPORTION OF TOTAL
"TRACE"	0-10%
"SOME"	10-20%
"ADJECTIVE" (eg SANDY, SILTY)	20-35%
"AND"	35-50%

SOIL CONTAINING THREE COMPONENTS EACH OF WHICH COMPRISE AT LEAST 25% OF THE TOTAL ARE CLASSIFIED AS "A WELL-GRADED MIXTURE OF"

Notes:
Used automatic hammer to drive Split Spoon

Total Volatile Organic Compounds (TVOC) measured w/ PID Model:
TVOC Background: ppm
Weather: Variable
Temperature:

McPHAIL ASSOCIATES, LLC
2269 MASSACHUSETTS AVENUE
CAMBRIDGE, MA 02140
TEL: 617-868-1420
FAX: 617-868-1423

Project:	Jackson Square Development	**Job #:**	7517.9
Location:	Paved Driveway	**Date Started:**	10-6-22
City/State:	Weymouth, Massachusetts	**Date Finished:**	10-6-22

Boring No.
MA-29

Contractor:	TDS	**Casing Type/Depth (ft):**	4.25 " I.D. Hollow Stem augers
Driller/Helper:	D. Watson/J. Junoville	**Casing Hammer (lbs)/Drop (in):**	NE
Logged By/Reviewed By:	T. M. Cormican	**Sampler Size/Type:**	1-3/8 " I.D. Split-Spoon
Surface Elevation (ft):	31.6	**Sampler Hammer (lbs)/Drop (in):**	140 lbs./30 inches

Groundwater Observations

Date	Depth	Elev.	Notes
10-6-22	8.5	23.1	

Depth (ft)	Elev. (ft)	Symbol	Depth/EL to Strata Change (ft)	Stratum	Sample TVOC (ppm)	N-Value / RQD	No.	Pen. /Rec. (in)	Depth (ft)	Blows/6" / Min/ft	Sample Description and Boring Notes
			0.2 / 31.4	PAVEMENT							
1 2	31 30			FILL	0.2	12	S-1	18/11	0.5-2.0	3 4 8	Compact brown SAND and GRAVEL, trace silt. (FILL)
3 4	29 28				0.2	15	S-2	24/12	2.0-4.0	9 8 7 8	Compact black ASH, CINDERS, and SLAG. (FILL)
5	27				0.2	15	S-3	12/9	4.0-5.0	7 8	Compact ASH, CINDERS, and SLAG. (FILL)
6	26		6.5 / 25.1		0.1	7	S-4	18/10	5.0-6.5	4 4 3	Loose gray to black ASH, CINDERS, and SLAG. (FILL)
7	25			SUBSOIL	0.1	2/6"	S-4A	6/6	6.5-7.0	2	Very loose to loose, brown, SILT and SAND, trace gravel. (SUBSOIL)
8	24		8.0 / 23.6		0.1	5	S-5	12/6	7.0-8.0	2 3	Loose, brown, SILT and SAND, trace gravel. (SUBSOIL)
9	23			GLACIAL OUTWASH	0.1	20	S-5A	12/9	8.0-9.0	8 12	Compact orange-brown sandy GRAVEL, some silt. (GLACIAL OUTWASH)
10	22										
11 12	21 20				0.3	28	S-6	24/10	10.0-12.0	10 12 16 19	Compact brown SAND and GRAVEL, trace silt. (GLACIAL OUTWASH)
13 14 15	19 18 17										
16 17	16 15				0.2	41	S-7	24/8	15.0-17.0	14 16 25 36	Dense brown SAND and GRAVEL, trace silt. (GLACIAL OUTWASH)
18 19 20	14 13 12										
21 22	11 10		22.0 / 9.6		0.2	35	S-8	24/13	20.0-22.0	19 20 15 18	Dense brown SAND and GRAVEL, trace silt. (GLACIAL OUTWASH)
23	9 8			Bottom of Borehole 22.0 feet below ground surface.							

GRANULAR SOILS	
BLOWS/FT.	DENSITY
0-4	V.LOOSE
4-10	LOOSE
10-30	COMPACT
30-50	DENSE
>50	V.DENSE

COHESIVE SOILS	
BLOWS/FT.	CONSISTENCY
<2	V.SOFT
2-4	SOFT
4-8	FIRM
8-15	STIFF
15-30	V.STIFF
>30	HARD

SOIL COMPONENT

DESCRIPTIVE TERM	PROPORTION OF TOTAL
"TRACE"	0-10%
"SOME"	10-20%
"ADJECTIVE" (eg SANDY, SILTY)	20-35%
"AND"	35-50%

SOIL CONTAINING THREE COMPONENTS EACH OF WHICH COMPRISE AT LEAST 25% OF THE TOTAL ARE CLASSIFIED AS "A WELL-GRADED MIXTURE OF"

Notes:
Used automatic hammer to drive Split Spoon

Total Volatile Organic Compounds (TVOC) measured w/ PID Model:
TVOC Background: ppm
Weather: Variable
Temperature:

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2269 MASSACHUSETTS AVENUE
CAMBRIDGE, MA 02140
TEL: 617-868-1420
FAX: 617-868-1423

APPENDIX F

Best Management Practices Operation and Maintenance Plans

SITES A & B

CONSTRUCTION PHASE POLLUTION PREVENTION AND EROSION AND SEDIMENTATION CONTROL PLAN (BEST MANAGEMENT PRACTICES OPERATION AND MAINTENANCE PLAN)

for

JACKSON SQUARE

In

Weymouth, Massachusetts
Building A
(Assessor's Parcel IDs 23-253-14 & 23-253-16)

Submitted to:

TOWN OF WEYMOUTH

Prepared for:

Irakis N. Papachristos, Manager
864, 909, 910 Broad Street LLCs and
1409 Commercial Street
1 Franklin Street
Boston, Massachusetts 02110

Prepared by:

MCKENZIE
ENGINEERING GROUP

Professional Civil Engineering • Project Management • Land Planning
150 Longwater Drive, Suite 101, Norwell, Massachusetts 02061
Tel.: (781) 792-3900 Facsimile: (781) 792-0333
www.mckeng.com

August 4, 2023
Revised September 6, 2023
Revised November 17, 2023

TABLE OF CONTENTS

Construction Phase Best Management Practices (BMP's)

Erosion and Sedimentation will be controlled at the site by utilizing Structural Practices, Stabilization Practices, and Dust Control.

Responsible Party Contact Information:

Stormwater Management System Owner:
Irakis N. Papachristos, Manager
864, 909, 910 Broad Street LLCs and
1409 Commercial Street
1 Franklin Street
Boston, MA 02110
Phone: (202) 230.1693

Town of Weymouth Contact Information:

Weymouth Department of Public Works
120 Winter Street
Weymouth, MA 02188
Phone: 781-337-5100

Weymouth Conservation Commission
Town Hall
75 Middle Street
Weymouth, MA 02189
Phone: (781) 340-5007

Weymouth Department of Municipal
Licenses and Inspections
Jeffrey E. Richards, C.B.O., Director
Town Hall
75 Middle Street
Weymouth, MA 02189
Phone: (781) 340-5004

Structural Practices:

1) **Compost Filter Tube Barrier Controls** – A compost filter tube barrier will be constructed along downward slopes at the limit of work in locations shown on the plans. This control will be installed prior to major soil disturbance on the site. The sediment silt sack barrier should be installed as shown on the Construction Detail Plan.

Compost Filter Tube Design/Installation Requirements *

a) Locate the compost filter tube where identified on the plans.

b) The compost filter tube line should be nearly level through most of its length to impound a broad, temporary pool. The last 10 to 20 feet at each end of the silt sack should be swung slightly uphill (approximately 0.5 feet in elevation) to provide storage capacity.

c) The compost filter tube shall be staked every 8 linear feet with 1-inch by 1-inch stakes.

d) Compost filter tubes should be removed when they have served their useful purpose, but not before the upslope area has been permanently stabilized through one growing season. Retained sediment must be removed and properly disposed of or mulched and seeded.

Compost Filter Tube Inspection/Maintenance *

a) Compost filter tubes should be inspected immediately after each rainfall event of 1-inch or greater, and at least daily during prolonged rainfall. Inspect the depth of sediment, fabric tears, and to see that the fence posts are firmly in the ground. Repair or replace as necessary.

b) Remove sediment deposits promptly after storm events to provide adequate storage volume for the next rain and to reduce pressure on the fence. Sediment will be removed from behind the sediment fence when it becomes about ½ foot deep at the compost filter tube. Take care to avoid undermining fence during cleanout.

c) If the fabric tears, decomposes, or in any way becomes ineffective, replace it immediately.

d) Remove all compost filter tube materials after the contributing drainage area has been properly stabilized. Sediment deposits remaining after the fabric has been removed should be graded to conform with the existing topography and vegetated.

2) Sediment Fence Controls – A sediment fence will be constructed along the limit of work as needed to prevent the spreading of fine sediments from the site. This control will be installed prior to major soil disturbance on the site. The sediment fence should be installed as shown on the Erosion Control Detail Plan and be Amoco woven polypropylene 1198 or equivalent.

Sediment Fence Design/Installation Requirements *

a) Locate the fence upland of the hay bale barriers and where identified on the plans.

b) The fence line should be nearly level through most of its length to impound a broad, temporary pool. The last 10 to 20 feet at each end of the fence should be swung slightly uphill (approximately 0.5 feet in elevation) to provide storage capacity.

c) Excavate a trench approximately 8 inches deep and 4 inches wide, or a V-trench; along the line of the fence, upslope side.

d) Fasten support wire fence (14 gauge with 6-inch mesh) securely to the upslope side of the fence posts with wire ties or staples. Wire should extend 6 inches into the trench.

e) Attach continuous length of fabric to upslope side of fence posts. Avoid joints, particularly at low points in the fence line. Where joints are necessary, fasten fabric securely to support posts and overlap to the next post.

f) Place the bottom one foot of fabric in the trench. Backfill with compacted earth or gravel.

g) Filter cloth shall be fastened securely to the woven wire fence with ties spaced every 24 inches at the top, mid-section, and bottom.

h) Sediment fences should be removed when they have served their useful purpose, but not before the upslope area has been permanently stabilized through one growing season and only following approval by the Engineering Department or their representative. Retained sediment must be removed and properly disposed of, or mulched and seeded.

<u>Sediment Fence Inspection/Maintenance *</u>

a) Silt fences should be inspected immediately after each rainfall event of 1-inch or greater, and at least daily during prolonged rainfall. Inspect the depth of sediment, fabric tears, if the fabric is securely attached to the fence posts, and to see that the fence posts are firmly in the ground. Repair or replace as necessary.

b) Remove sediment deposits promptly after storm events to provide adequate storage volume for the next rain and to reduce pressure on the fence. Sediment will be removed from behind the sediment fence when it becomes about ½ foot deep at the fence. Take care to avoid undermining fence during cleanout.

c) If the fabric tears, decomposes, or in any way becomes ineffective, replace it immediately.

d) Remove all fencing materials after the contributing drainage area has been properly stabilized. Sediment deposits remaining after the fabric has been removed should be graded to conform to the existing topography and vegetation.

3) **Stabilized Construction Entrance** – A stabilized construction entrance will be placed at the proposed entrance at Lovell Field. The construction entrance will keep mud and sediment from being tracked off the construction site by vehicles leaving the site. The stabilized construction entrance will be installed immediately after the clearing and grubbing of the roadway entrance and associated roadway fill to maintain access to the site are completed. The stabilized construction entrance shall be constructed as shown on the Construction Detail Plans.

Construction Entrance Design/Construction Requirements *

a) Stone for a stabilized construction entrance shall consist of 1 to 3-inch stone placed on a stable foundation.

b) Pad dimensions: The minimum length of the gravel pad should be 50 feet. The pad should extend the full width of the proposed roadway, or wide enough so that the largest construction vehicle will fit in the entrance with room to spare; whichever is greater.

c) A geotextile filter fabric shall be placed between the stone fill and the earth surface below the pad to reduce the migration of soil particles from the underlying soil into the stone and vice versa. The filter fabric should be Amoco woven polypropylene 1198 or equivalent.

d) Washing: If the site conditions are such that the majority of mud is not removed from the vehicle tires by the gravel pad, then the tires should be washed before the vehicle enters the street. The wash area shall be located at the stabilized construction entrance.

e) Water employed in the washing process shall be directed to the temporary dewatering area as shown on the plans prior to discharge. Sediment should be prevented from entering any watercourses.

Construction Entrance Inspection/Maintenance *

a) The entrance should be maintained in a condition that will prevent tracking or flowing of sediment onto Lovell Field and Commercial Street. This may require periodic topdressing with additional stone.

b) The construction entrance and sediment disposal area shall be inspected weekly and after heavy rains or heavy use.

c) Mud and sediment tracked or washed onto public road shall be immediately removed by sweeping.

d) Once mud and soil particles clog the voids in the gravel and the effectiveness of the gravel pad is no longer satisfactory, the pad must be topdressed with new stone. Replacement of the entire pad may be necessary when the pad becomes completely clogged.

e) If washing facilities are used, the dewatering area should be cleaned out as often as necessary to assure that adequate trapping efficiency and storage volume is available.

f) The pad shall be reshaped as needed for drainage and runoff control.

g) Broken road pavement on Lovell Field and Commercial Street shall be repaired immediately.

h) All temporary erosion and sediment control measures shall be removed within 30 days after final site stabilization is achieved or after the temporary practices are no longer needed and only following approval by the Public Works Department or their representative. Trapped sediment shall be removed or stabilized on site. Disturbed soil areas resulting from removal shall be permanently stabilized.

Stabilization Practices:

Stabilization measures shall be implemented as soon as practicable in portions of the site where construction activities have temporarily or permanently ceased, but in no case more than 14 days after the construction activity in that portion of the site has temporarily or permanently ceased, with the following exceptions.

- Where the initiation of stabilization measures by the 14th day after construction activity temporarily or permanently cease is precluded by snow cover, stabilization measures shall be initiated as soon as practicable.

- Where construction activity will resume on a portion of the site within 21 days from when activities ceased, (e.g. the total time period that construction activity is temporarily ceased is less than 21 days) then stabilization measures do not have to be initiated on that portion of the site by the 14th day after construction activity temporarily ceased.

- The contractor shall provide erosion control measures around all soil stockpiles.

1) Temporary Seeding – Temporary seeding will allow short–term vegetative cover on disturbed site areas that may be in danger of erosion. Temporary seeding will be done at stockpiles and disturbed portions of the site where construction activity will temporarily cease for at least 21 days. The temporary seedings will stabilize cleared and unvegetated areas that will not be brought into final grade for several weeks or months.

Temporary Seeding Planting Procedures *

a) Planting should preferably be done between April 1st and June 30th, and September 1st through September 31st. If planting is done in the months of July and August, irrigation may be required. If planting is done between October 1st and March 31st, mulching should be applied immediately after planting. If seeding is done during the summer months, irrigation of some sort will probably be necessary.

b) Before seeding, install structural practice controls. Utilize Amoco supergro or equivalent.

c) Select the appropriate seed species for temporary cover from the following table.

Species	Seeding Rate (lbs/1,000 sq.ft.)	Seeding Rate (lbs/acre)	Recommended Seeding Dates	Seed Cover required
Annual Ryegrass	1	40	April 1st to June 1st August 15th to Sept. 15th	¼ inch
Foxtail Millet	0.7	30	May 1st to June 30th	½ to ¾ inch
Oats	2	80	April 1st to July 1st August 15th to Sept. 15th	1 to 1-½ inch
Winter Rye	3	120	August 15th to Oct. 15th	1 to 1-½ inch

Apply the seed uniformly by hydroseeding, broadcasting, or by hand.

d) Use effective mulch, tacked and/or tied with netting to protect seedbed and encourage plant growth.

Temporary Seeding Inspection/Maintenance *

a) Inspect within 6 weeks of planting to see if stands are adequate. Check for damage within 24 hours of the end to heavy rainfall, defined as a 2-year storm event (i.e., 3.2 inches of rainfall within a twenty-four-hour period). Stands should be uniform and dense. Reseed and mulch damaged and sparse areas immediately. Tack or tie down mulch as necessary.

b) Seeds should be supplied with adequate moisture. Furnish water as needed, especially in abnormally hot or dry weather. Water application rates should be controlled to prevent runoff.

2) **Geotextiles** - Geotextiles such as jute netting will be used in combination with other practices such as mulching to stabilize slopes. The following geotextile materials or equivalent are to be utilized for structural and nonstructural controls as shown in the following table.

Practice	Manufacturer	Product	Remarks
Sediment Fence	Amoco	Woven polypropylene 1198 or equivalent	0.425 mm opening
Construction Entrance	Amoco	Woven polypropylene 2002 or equivalent	0.300 mm opening
Outlet Protection	Amoco	Nonwoven polypropylene 4551 or equivalent	0.150 mm opening
Erosion Control (slope stability)	Amoco	Supergro or equivalent	Erosion control revegetation mix, open polypropylene fiber on degradable polypropylene net scrim

Amoco may be reached at (800) 445-7732

Geotextile Installation

a) Netting and matting require firm, continuous contact between the materials and the soil. If there is no contact, the material will not hold the soil and erosion will occur underneath the material.

Geotextile Inspection/Maintenance *

a) In the field, regular inspections should be made to check for cracks, tears, or breaches in the fabric. The appropriate repairs should be made.

3) **Mulching and Netting** – Mulching will provide immediate protection to exposed soils during the period of short construction delays, or over winter months through the application of plant residues, or other suitable materials, to exposed soil areas. In areas, which have been seeded either for temporary or permanent cover, mulching should immediately follow seeding. On steep slopes, mulch must be supplemented with netting.

Mulch Maintenance *

a) Inspect after rainstorms to check for movement of mulch or erosion. If washout, breakage, or erosion occurs, repair surface, reseed, remulch, and install new netting.

b) Grass mulches that blow or wash away should be repaired promptly.

c) If plastic netting is used to anchor mulch, care should be taken during initial mowings to keep the mower height high. Otherwise, the netting can wrap up on the mower blade shafts. After a period of time, the netting degrades and becomes less of a problem.

d) Continue inspections until vegetation is well established.

4) Land Grading – Grading on fill slopes, cut slopes, and stockpile areas will be done with full siltation controls in place.

Land Grading Design/Installation Requirements

a) Areas to be graded should be cleared and grubbed of all timber, logs, brush, rubbish, and vegetated matter that will interfere with the grading operation. Topsoil should be stripped and stockpiled for use on critical disturbed areas for establishment of vegetation. Cut slopes to be topsoiled should be thoroughly scarified to a minimum depth of 3-inches prior to placement of topsoil.

b) Fill materials should be generally free of brush, rubbish, rocks, and stumps. Frozen materials or soft and easily compressible materials should not be used in fills intended to support buildings, parking lots, roads, conduits, or other structures.

c) Earth fill intended to support structural measures should be compacted to a minimum of 90 percent of Standard Proctor Test density with proper moisture control, or as otherwise specified by the engineer responsible for the design. Compaction of other fills should be to the density required to control sloughing, erosion or excessive moisture content. Maximum thickness of fill layers prior to compaction should not exceed 9 inches.

d) The uppermost one foot of fill slopes should be compacted to at least 85 percent of the maximum unit weight (based on the modified AASHTO compaction test). This is usually accomplished by running heavy equipment over the fill.

e) Fill should consist of material from borrow areas and excess cut will be stockpiled in areas shown on the Site Plans. All disturbed areas should be free draining, left with a neat and finished appearance, and should be protected from erosion.

f) Infiltration basins shall be excavated, graded and shaped to subgrade elevation and shall then be suitably protected with installation of erosion control measures to prevent sediment-laden runoff from washing into the basins. The basins shall also be protected from heavy equipment activity from this point forward. Prior to application of loam and seed to infiltration basin surfaces, the contractor shall

remove any unsuitable soil such as silt or clay that may have been deposited during construction. The surface shall be scarified with a York rake or other small tractor mounted equipment. The loam and seed shall then be applied as required by this document.

Land Grading Stabilization Inspection/Maintenance *

a) All slopes should be checked periodically to see that vegetation is in good condition. Any rills or damage from erosion and animal burrowing should be repaired immediately to avoid further damage.

b) If seeps develop on the slopes, the area should be evaluated to determine if the seep will cause an unstable condition. Subsurface drains or a gravel mulch may be required to solve seep problems. However, no seeps are anticipated.

c) Areas requiring revegetation should be repaired immediately. Control undesirable vegetation such as weeds and woody growth to avoid bank stability problems in the future.

5) Topsoiling * – Topsoiling will help establish vegetation on all disturbed areas throughout the site during the seeding process. The soil texture of the topsoil to be used will be a sandy loam to a silt loam texture with 15% to 20% organic content.

Topsoiling Placement

a) Topsoil should not be placed while in a frozen or muddy condition, when the subgrade is excessively wet, or when conditions exist that may otherwise be detrimental to proper grading or proposed seeding.

b) Do not place topsoil on slopes steeper than 2.5:1, as it will tend to erode.

c) If topsoil and subsoil are not properly bonded, water will not infiltrate the soil profile evenly and it will be difficult to establish vegetation. The best method is to actually work the topsoil into the layer below for a depth of at least 6 inches.

6) Permanent Seeding – Permanent Seeding should be done immediately after the final design grades are achieved. Native species of plants should be used to establish perennial vegetative cover on disturbed areas. The revegetation should be done early enough in the fall so that a good cover is established before cold weather comes and growth stops until the spring. A good cover is defined as vegetation covering 75 percent or more of the ground surface.

Permanent Seeding Seedbed Preparation

a) In infertile or coarse-textured subsoil, it is best to stockpile topsoil and re-spread it over the finished slope at a minimum 2 to 6-inch depth and roll it to provide a firm seedbed. The topsoil must have a sandy loam to silt loam texture with 15% to 20% organic content. If construction fill operations have left soil exposed with a loose, rough, or irregular surface, smooth with blade and roll.

b) Loosen the soil to a depth of 3-5 inches with suitable agricultural or construction equipment.

c) Areas not to receive topsoil shall be treated to firm the seedbed after incorporation of the lime and fertilizer so that it is depressed no more than ½ - 1 inch when stepped on with a shoe. Areas to receive topsoil shall not be firmed until after topsoiling and lime and fertilizer is applied and incorporated, at which time it shall be treated to firm the seedbed as described above.

Permanent Seeding Grass Selection/Application

a) Select an appropriate cool or warm season grass based on site conditions and seeding date. Apply the seed uniformly by hydro-seeding, broadcasting, or by hand. Uniform seed distribution is essential. On steep slopes, hydroseeding may be the most effective seeding method. Surface roughening is particularly important when preparing slopes for hydroseeding.

b) Lime and fertilize. Organic fertilizer shall be utilized in areas within the 100 foot buffer zone to a wetland resource area.

c) Mulch the seedings with straw applied at the rate of ½ tons per acre. Anchor the mulch with erosion control netting or fabric on sloping areas. Amoco supergro or equivalent should be utilized.

Permanent Seeding Inspection/Maintenance *

a) Frequently inspect seeded areas for failure and make necessary repairs and reseed immediately. Conduct or follow-up survey after one year and replace failed plants where necessary.

b) If vegetative cover is inadequate to prevent rill erosion, overseed and fertilize in accordance with soil test results.

c) If a stand has less than 40% cover, reevaluate choice of plant materials and quantities of lime and fertilizer. Re-establish the stand following seedbed preparation and seeding recommendations, omitting lime and fertilizer in the absence of soil test results. If the season prevents resowing, mulch or jute netting is an effective temporary cover.

d) Seeded areas should be fertilized during the second growing season. Lime and fertilize thereafter at periodic intervals, as needed.

Fueling and Maintenance of Equipment and Vehicles:

1. Refueling/maintenance Rules – The site supervisor shall produce a written document received by all subcontractors and employees that delineates their responsibilities on site. This document shall include language that shall permit the maintenance of vehicles only in designated locations on the job site. In the event of mechanical failure of a vehicle, the vehicle shall be moved to the designated maintenance area on the site to perform maintenance. The site supervisor shall document receipt of these instructions by obtaining the

signatures of subcontractors and individuals that may enter the site and the date in which they were notified of their responsibilities. Refueling for vehicles or equipment shall occur either within the designated washout area or shall utilize temporary drip protection measures at the location of fueling. The site supervisor or their representative shall be present at the time of any fueling procedure. The site supervisor shall have a fuel spill plan and measures on site to initiate containment and clean-up in the event a fuel spill occurs.

2. Installation Schedule: Prior to start of Work

3. Maintenance and Inspection: The site supervisor shall maintain a log of individuals receiving these instructions.

4. Specific Pollution Prevention Practices

   Pollution Prevention Practice # 1

   a. Description: Fueling operations shall take place in designated area(s) as shown on site maps. Provide temporary drip protection during fueling operations which take place outside of designated area(s). Materials necessary to address a spill shall be made readily available in a location known to the site supervisor or his/her designee.

   b. Installation: Fueling operation procedures shall be in effect throughout the project duration.

   c. Maintenance Requirements: All emergency response equipment listed in the Emergency Response Equipment Inventory shall be made readily available and kept in a designated location known to the site supervisor or his/her designee. All such materials shall be replenished as necessary to the listed amounts.

<u>Dust Control</u>:

Dust control will be utilized throughout the entire construction process of the site. For example, keeping disturbed surfaces moist during windy periods will be an effective control measure, especially for construction access roads. The use of dust control will prevent the movement of soil to offsite areas. However, care must be taken to not create runoff from excessive use of water to control dust. The following are methods of Dust Control that may be used on-site:

- Vegetative Cover – The most practical method for disturbed areas not subject to traffic.
- Calcium Chloride – Calcium chloride may be applied by mechanical spreader as loose, dry granules or flakes at a rate that keeps the surface moist but not so high as to cause water pollution or plant damage.
- Sprinkling – The site may be sprinkled until the surface is wet. Sprinkling will be effective for dust control on haul roads and other traffic routes.
- Stone – Stone will be used to stabilize construction roads; will also be effective for dust control.

The general contractor shall employ an on-site water vehicle for the control of dust as necessary.

Non-Stormwater Discharges:

The construction de-watering and all non-stormwater discharges will be directed into a sediment dirt bag (or equivalent inlet protection) or a sediment basin. Sediment material removed shall be disposed of in accordance with all applicable local, state, and federal regulations.

The developer and site general contractor will comply with the E.P.A.'s Final General Permit for Construction De-watering Discharges, (N.P.D.E.S., Section 402 and 40 C.F.R. 122.26(b)(14)(x).

Inspection/Maintenance:

Operator personnel must inspect the construction site at least once every 14 calendar days and within 24 hours of a storm event of ½-inch or greater. The applicant shall be responsible to secure the services of a design professional or similar professional (inspector) on an on-going basis throughout all phases of the project. Refer to the Inspection/Maintenance Requirements presented earlier in the "Structural and Stabilization Practices." The inspector should review the erosion and sediment controls with respect to the following:

- Whether or not the measure was installed/performed correctly.
- Whether or not there has been damage to the measure since it was installed or performed.
- What should be done to correct any problems with the measure.

The inspector should complete the Stormwater Management Construction Phase BMP Inspection Schedule and Evaluation Checklist, as attached, for documenting the findings and should request the required maintenance or repair for the pollution prevention measures when the inspector finds that it is necessary for the measure to be effective. The inspector should notify the appropriate person to make the changes and submit copies of the form to the Weymouth Highway Department.

Project Location: Jackson Square, Parcel IDs 23-253-14 & 23-253-16, Weymouth, MA Date:
Stormwater Management – Construction Phase
Best Management Practices – Inspection Schedule and Evaluation Checklist

Construction Practices

Best Management Practice	Inspection Frequency	Date Inspected	Inspector	Minimum Maintenance and Key Items to Check	Cleaning/Repair Needed: (List Items)	Date of Cleaning/ Repair	Performed by
Silt Sock and Sediment Fence Controls	After heavy rainfall events (minimum weekly)			1. Sediment Fence Design/Installation Requirements 2. Sediment Fence Inspection/Maintenance	☐yes ☐no		
Stabilized Construction Entrance	After heavy rainfall events (minimum weekly)			1. Construction Entrance Design/ Construction Requirements 2. Construction Entrance Inspection/ Maintenance	☐yes ☐no		
Temporary Seeding	After heavy rainfall events (minimum weekly)			1. Temporary Seeding Planting Procedures 2. Temporary Seeding Inspection/ Maintenance	☐yes ☐no		
Geotextiles	After heavy rainfall events (minimum weekly)			1. Geotextile Inspection/Maintenance	☐yes ☐no		
Mulching & Netting	After heavy rainfall events (minimum weekly)			1. Mulch Maintenance	☐yes ☐no		
Land Grading	After heavy rainfall events (minimum weekly)			1. Land Grading Stabilization Inspection/ Maintenance	☐yes ☐no		

Project Location: Jackson Square, Parcel IDs 23-253-14 & 23-253-16, Weymouth, MA **Date:**
Stormwater Management – Construction Phase
Best Management Practices – Inspection Schedule and Evaluation Checklist

Construction Practices

Permanent Seeding	After heavy rainfall events (minimum weekly)			1. Permanent Seeding Inspection/ Maintenance	☐**yes** ☐**no**		
Dust Control	After heavy rainfall events (minimum weekly)				☐**yes** ☐**no**		
Soil Stockpiling	After heavy rainfall events (minimum weekly)				☐**yes** ☐**no**		

(1) Refer to the Massachusetts Stormwater Handbook issued January 2, 2008.

Notes (Include deviations from : Definitive Subdivision Decision and Special Conditions and Approved Plan):

Stormwater Control Manager ________________________________

Spill Containment and Management Plan

Initial Notification

In the event of a spill, the facility manager will be notified immediately.

Facility Managers (name)	Irakis N. Papachristos, Manager 1 Franklin Street, Boston, MA 02110
Facility Manager (phone)	203-230.1693

Assessment - Initial Containment

The supervisor will assess the incident and initiate containment control measures with the appropriate spill containment equipment included in the spill kit kept on-site. The supervisor will first contact the Fire Department and then notify the Police Department, Department of Public Works, Board of Health and Conservation Commission. The fire department is ultimately responsible for matters of public health and safety and should be notified immediately.

Contact:	Phone Number:
Fire Department:	911
Police Department:	911
Department of Public Works:	(781) 337-5100
Board of Health Phone:	(781) 335-2000
Conservation Commission Phone:	(781) 340-5007

Further Notification

Based on the assessment from the Fire Chief, additional notification to a cleanup contractor may be made. The Massachusetts Department of Environmental Protection (DEP) and the EPA may be notified depending upon the nature and severity of the spill. The Fire Chief will be responsible for determining the level of cleanup and notification required. The attached list of emergency phone numbers shall be posted in the facility office and readily accessible to all employees.

HAZARDOUS WASTE / OIL SPILL REPORT

Date____/_____/_____ Time____________ AM / PM

Exact location (Transformer #)____

Type of equipment__________________________Make_____________Size______________

S / N________________________________Weather Conditions________________________

On or near water ☐ Yes If yes, name of body of water____________________

☐ No

Type of chemical / oil spilled_________________________

Amount of chemical / oil spilled_______________________

Cause of spill____

____

____

Measures taken to contain or clean up spill____

____

____

Amount of chemical / oil recovered_______________Method____________________________

Material collected as a result of clean up

____________drums containing____

____________drums containing____

____________drums containing____

Location and method of debris disposal____

____

Name and address of any person, firm, or corporation suffering damages___________________

____

Procedures, method, and precautions instituted to prevent a similar occurrence from recurring___

____

Spill reported to General Office by_________________________Time____________AM / PM

Spill reported to DEP / National Response Center by_____________________________________

DEP Date____/_____/_____ Time_________ AM / PM Inspector_______________

NRC Date____/_____/_____ Time_________ AM / PM Inspector_______________

Additional comments____

____

____

EMERGENCY RESPONSE EQUIPMENT INVENTORY

The following equipment and materials shall be maintained at all times and stored in a secure area for long-term emergency response need.

--	SORBENT PADS	1 BALE
--	SAND BAGS (empty)	5
--	SPEEDI-DRI ABSORBENT	2 – 40LB BAGS
--	12” INFLATABLE PIPE PLUG	1
--	SQUARE END SHOVELS	1
--	PRY BAR	1
--	CATCH BASIN COVER	1

EMERGENCY NOTIFICATION PHONE NUMBERS

1. FACILITY MANAGER
   NAME: ________________ BEEPER: ______________________
   PHONE: ________________ CELL PHONE: _________________

   ALTERNATE:
   NAME: ________________ BEEPER: N/A ___________________
   PHONE: ________________ CEL PHONE: N/A ________________

2. FIRE DEPARTMENT
   EMERGENCY: 911
   BUSINESS: (781) 337-5151

   POLICE DEPARTMENT
   EMERGENCY: 911
   BUSINESS: (781) 335-1212

   DEPARTMENT OF PUBLIC WORKS
   CONTACT: Director – Kenan Connell
   BUSINESS: (781) 337-5100

   CONSERVATION COMMISSION
   CONTACT: Andrew Hultin
   BUSINESS: (781) 340-5007

   BOARD OF HEALTH
   CONTACT: Board of Health Agent Clerk – Clare LaMorte, RN
   BUSINESS: (781) 335-2000

3. MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
   EMERGENCY: (617) 556-1133
   SOUTHEAST REGION - LAKEVILLE OFFICE: (508) 946-2700

4. NATIONAL RESPONSE CENTER
   PHONE: (800) 424-8802

   ALTERNATE: U.S. ENVIRONMENTAL PROTECTION AGENCY
   EMERGENCY: (617) 223-7265
   BUSINESS: (617) 860-4300

POST-DEVELOPMENT BEST MANAGEMENT PRACTICE
OPERATION AND MAINTENANCE PLAN & LONG-TERM POLLUTION PREVENTION PLAN

for

JACKSON SQUARE

In

Weymouth, Massachusetts
Building A
(Assessor's Parcel IDs 23-253-14 & 23-253-16)

Submitted to:

TOWN OF WEYMOUTH

Prepared for:

Irakis N. Papachristos, Manager
864, 909, 910 Broad Street LLCs and
1409 Commercial Street
1 Franklin Street
Boston, Massachusetts 02110

Prepared by:

MCKENZIE ENGINEERING GROUP

Professional Civil Engineering • Project Management • Land Planning
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Revised November 17, 2023

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Post-Development Best Management Practice
Operation and Maintenance Plan &
Long-Term Pollution Prevention Plan

Post-Development Best Management Practices (BMPs) Operation and Maintenance Plan

Responsible Party/Property Owner/Developer contact information:

Property Owner: Irakis N. Papachristos, Manager
864, 909, 910 Broad Street LLCs and
1409 Commercial Street
1 Franklin Street
Boston, MA 02110
Phone: (202) 230.1693
Developer Contact Information:

Irakis N. Papachristos, Manager
864, 909, 910 Broad Street and
1409 Commercial Street
1 Franklin Street
Boston, MA 02110
Phone: (202) 230.1693

City of Weymouth Contact Information:

Weymouth Department of Public Works
120 Winter Street
Weymouth, MA 02188
Phone: 781-337-5100

Best Management Practices (BMPs) of the Commonwealth of Massachusetts Department of Environmental Protection's (DEP's) Stormwater Management Policy (SMP) have been implemented and utilized for the project. The following information provided is to be used as a guideline for monitoring and maintaining the performance of the drainage facilities and to ensure that the quality of water runoff meets the standards set forth by the SMP. The structural Best Management Practices (BMPs) shall be inspected during rainfall conditions during the first year of operation to verify functionality.

All BMPs located within the drainage easements will be owned and maintained by the developer until such a time that a homeowners association is created, then the homeowners association will maintain the BMPs.

BMPs included in the design consist of the use of:

- Stormceptor Treatment Units
- Subsurface Infiltration System
- Subsurface Pipe Storage System
- Access Drive Pavement Maintenance

Operation:

Once the stormwater management systems have been constructed and site has been permanently stabilized and put into action, the operation of the stormwater management system will function as intended. Stormwater runoff is directed into the trench drain to the First Defense unit, and lastly to the subsurface infiltration system. The stormwater management systems have been designed to attenuate peak flows for the 2-year through 100-year storm events.

Maintenance:

1. **Paved Areas** –Sweepers shall sweep paved areas periodically during dry weather to remove excess sediments and to reduce the amount of sediments that the drainage system shall have to remove from the runoff. The sweeping shall be conducted primarily between March 15th and November 15th. Special attention should be made to sweeping paved surfaces in March and April before spring rains wash residual sand into the drainage system.

   The frequency of sweeping shall average:

   - Monthly if by a high-efficiency vacuum sweeper
   - Bi-weekly if by a regenerative air sweeper
   - Weekly if by a mechanical sweeper

   Salt used for de-icing on the parking lot during winter months shall be limited as much as possible as this will reduce the need for removal and treatment. Sand containing the minimum amount of calcium chloride (or approved equivalent) needed for handling may be applied as part of the routine winter maintenance activities.

   Cost: The property owner should consult local sweeping contractors for detailed cost estimates.

2. **Proprietary Pretreatment Units –** The proprietary pretreatment units shall be inspected and maintained from the surface, without entry into the unit a minimum of annually and following heavy rain events. Perform maintenance once the stored volume reaches 15% of the unit capacity, or immediately in the event of a spill. Perform Maintenance at quarterly intervals during the first year of installation, so an accurate maintenance schedule can be established. Sediment and debris should be removed through the 12-inch diameter outlet pipe. Alternatively, oil and floatables should be removed through the 12-inch oil inspection port. The requirements for the disposal from the units should be in compliance with all local, state and federal regulations. Consult the Natick Board of Health for transfer station locations prior to disposing the separator contents. Please refer to the Manufacturer's Manual for additional detail on proper inspection and maintenance of the First Defense units.

   Cost: Cleaning should be included along with the routine maintenance of the catch basins. The property owner should consult local vacuum cleaning contractors for detailed cost estimates.

3. **Subsurface Infiltration Tank System** –Proper maintenance of the subsurface infiltration system is essential to the long-term effectiveness of the infiltration function. The subsurface infiltration system shall have inspection ports and additional inspections should be scheduled during the first few months to ensure

proper stabilization and function. Thereafter, they shall be checked semiannually and following heavy rainfalls, defined as a 1-year storm event exceeding 2.5 inches of rainfall within a twenty-four-hour period. Water levels in the chambers shall be checked to verify proper drainage. Ponding water in a chamber indicates failure from the bottom. If water remains within the chambers after 48-hours following a storm event, steps to restore the infiltration function shall be taken, as directed by a qualified stormwater management professional. In order to rectify the problem, accumulated sediment must be removed from the bottom of the chamber. The stone aggregate and filter fabric must be removed and replaced, and the underlying soil layer must be scarified to encourage proper infiltration. Material removed from the system shall be disposed of in accordance with all applicable local, state, and federal regulations. Please refer to the Manufacturer's Manual for additional details on proper inspection and maintenance of the R-Tank chambers.

Cost: The property owner should consult local landscape contractors for a detailed cost estimate.

4. **Subsurface Detention Pipe System** – Proper maintenance of the subsurface detention systems is essential to the long-term effectiveness of the system. The subsurface detention system shall have inspection ports. Additional inspections should be scheduled during the first few months to ensure proper stabilization and function. After that, they shall be checked semiannually, following heavy rainfalls, defined as a 1-year storm exceeding 2.5 inches of rainfall within twenty-four hours, and periodically during the spring seasonally high groundwater periods to confirm no groundwater intrusion. Water levels in the chambers shall be checked to verify proper drainage. Material removed from the system shall be disposed of in accordance with all applicable local, state, and federal regulations.

   Cost: The property owner should consult local landscape contractors for a detailed cost estimate.

5. **Trench Drains -** Trench drain grates shall be checked quarterly and following heavy rainfalls to verify that the inlet openings are not clogged by debris. Debris shall be removed from the grates and disposed of in accordance with all applicable regulations.

   Cost: The property owner should consult local landscape contractors for a detailed cost estimate.

6. **Pesticides, Herbicides, and Fertilizers -** Pesticides and herbicides shall be used sparingly. Fertilizers should be restricted to the use of organic fertilizers only.

   All structural BMP's as identified on the site plans will be owned and maintained by the homeowner's association of the development and shall run with the title of the property.

   Cost: Included in the routine landscaping maintenance schedule. The Owner should consult local landscaping contractors for details.

7. **Snow Removal -** Snow accumulations removed from access road should be placed in upland areas only, where sand and other debris will remain after snowmelt for later removal. Excess snow should be removed from the site and properly disposed of in an approved snow disposal facility. Care must be exercised not to deposit snow in the in areas where sand and debris can get into the watercourse.

Cost: The owner should consult local snow removal contractors for a detailed cost estimate.

Maintenance Responsibilities:

All post construction maintenance activities will be documented and kept on file. Annual inspection reports in the form of an Evaluation Checklist, see attached form, will be submitted to the City of Weymouth. Inspections shall be performed by a licensed engineer or similar professional (inspector).

All BMPs located within the drainage easements will be owned and maintained by the developer until such a time that a homeowners association is created, then the homeowners association will maintain the BMPs.

Long-Term Pollution Prevention Plan

Good Housekeeping:

To develop and implement an operation and maintenance program with the goal of preventing or reducing pollutant runoff by keeping potential pollutants from coming into contact with stormwater or being transported off site without treatment, the following efforts will be made:

- Property Management awareness and training on how to incorporate pollution prevention techniques into maintenance operations.
- Follow appropriate best management practices (BMPs) by proper maintenance and inspection procedures.
- Homeowner education outreach, including promoting recycling through the City of Weymouth Transfer Station.

Storage and Disposal of Household Waste and Toxics:

This management measure involves educating the general public on the management considerations for hazardous materials. Failure to properly store hazardous materials dramatically increases the probability that they will end up in local waterways. Many people have hazardous chemicals stored throughout their homes, especially in garages and storage sheds. Practices such as covering hazardous materials or even storing them properly, can have dramatic impacts. Property owners are encouraged to support the household hazardous product collection events sponsored by the City of Weymouth.

MADEP has prepared several materials for homeowners on how to properly use and dispose of household hazardous materials:
http://www.mass.gov/dep/recycle/reduce/househol.htm

For consumer questions on household hazardous waste call the following number:
DEP Household Hazardous Waste Hotline 800-343-3420

The following is a list of management considerations for hazardous materials as outlined by the EPA:

- Ensuring sufficient aisle space to provide access for inspections and to improve the ease of material transport;

- Storing materials well away from high-traffic areas to reduce the likelihood of accidents that might cause spills or damage to drums, bags, or containers.
- Stacking containers in accordance with the manufacturers' directions to avoid damaging the container or the product itself;
- Storing containers on pallets or equivalent structures. This facilitates inspection for leaks and prevents the containers from coming into contact with wet floors, which can cause corrosion. This consideration also reduces the incidence of damage by pests.

The following is a list of commonly used hazardous materials used in the household:

Batteries – automotive and rechargeable
nickel cadmium batteries
(no alkaline batteries)
Gasoline
Oil-based paints
Fluorescent light bulbs and lamps
Pool chemicals
Propane tanks
Lawn chemicals,
fertilizers and weed killers
Turpentine
Bug sprays
Antifreeze
Paint thinners, strippers, varnishes and
stains
Arts and crafts chemicals
Charcoal lighter fluid

Disinfectant
Drain clog dissolvers
Driveway sealer
Flea dips, sprays and collars
Houseplant insecticides
Metal polishes
Mothballs
Motor oil and filters
Muriatic acid (concrete cleaner)
Nail polishes and nail polish
removers
Oven cleaner
Household pest and rat poisons
Rug and upholstery cleaners
Shoe polish
Windshield wiper fluid

Landscape Maintenance:

This management measure seeks to control the storm water impacts of landscaping and lawn care practices through education and outreach on methods that reduce nutrient loadings and the amount of storm water runoff generated from lawns. Nutrient loads generated by fertilizer use on suburban lawns can be significant, and recent research has shown that lawns produce more surface runoff than previously thought.

Using proper landscaping techniques can effectively increase the value of a property while benefiting the environment. These practices can benefit the environment by reducing water use; decreasing energy use (because less water pumping and treatment is required); minimizing runoff of storm and irrigation water that transports soils, fertilizers, and pesticides; and creating additional habitat for plants and wildlife. The following lawn and landscaping management practices will be encouraged:

- Mow lawns at the highest recommended height.
- Minimize lawn size and maintain existing native vegetation.
- Collect rainwater for landscaping/gardening needs (rain barrels and cisterns to capture roof runoff).

- Raise public awareness for promoting the water efficient maintenance practices by informing users of water efficient irrigation techniques and other innovative approaches to water conservation.
- Abide by water restrictions and other conservation measures implemented by the City of Weymouth.
- Water only when necessary.
- Use automatic irrigation systems to reduce water use.

Integrated Pest Management (IPM):

This management measure seeks to limit the adverse impacts of insecticides and herbicides by providing information on alternative pest control techniques other than chemicals or explaining how to determine the correct dosages needed to manage pests.

The presence of pesticides in stormwater runoff has a direct impact on the health of aquatic organisms and can present a threat to humans through contamination of drinking water supplies. The pesticides of greatest concern are insecticides, such as diazinon and chloropyrifos, which even at very low levels can be harmful to aquatic life. The major source of pesticides to urban steams is home application of products designed to kill insects and weeds in the lawn and garden. The following IPM practices will be encouraged:

- Lawn care and landscaping management programs including appropriate pesticide use management as part of program.
- Raise public awareness by referring homeowners to "A Homeowner's Guide to Environmentally Sound Lawncare, Maintaining a Healthy Lawn the IPM Way", Massachusetts Department of Food and Agriculture, Pesticide Bureau or link **http://www.mass.gov/dep/water/resources/nonpoint.htm#megaman>**

Illicit Discharges:

Illicit discharges are non-stormwater discharges to the storm drain system which typically contain bacteria and other pollutants. All illicit discharges are prohibited. Any illicit discharges should be reported to MassDOT and/or the DPW as applicable to be addressed in accordance with their respective policies.

The following is a list of EPA allowed non-stormwater discharges. If the non-stormwater discharge is not listed, it is prohibited.

1. Water line flushing,
2. Landscape irrigation,
3. Diverted stream flows,
4. Rising ground waters,
5. Uncontaminated ground water infiltration (as defined at 40 CFR 35.2005(20)),
6. Uncontaminated pumped ground water,
7. Discharge from potable water sources,
8. Foundation drains,
9. Air conditioning condensation,
10. Irrigation water, springs,
11. Water from crawl space pumps,
12. Footing drains,
13. Lawn watering,

14. Flows from riparian habitats and wetlands,
15. Street wash water,
16. Discharges or flows from firefighting activities occur during emergency conditions.

Project Location: Jackson Square, Assessor's Parcel IDs 23-253-14 & 23-253-16, Weymouth, MA

Stormwater Management – Post Construction Phase
Best Management Practices – Inspection Schedule and Evaluation Checklist

Long Term Practices

Best Management Practice	Inspection Frequency (1)	Date Inspected	Inspector	Minimum Maintenance and Key Items to Check (1)	Cleaning/Repair Needed: ☐yes ☐no (List Items)	Date of Cleaning/ Repair	Performed by
Street Sweeping Maintenance	4-times annually - specifically in Spring and Fall			1. Sediment build-up 2. Trash and debris 3. Minor Spills (vehicular)			
Proprietary Pretreatment Units	After heavy rainfall events (minimum annually)			1. Sediment level exceeds Manufacturer's specification 2. Trash and debris 3. Floatable oils or hydrocarbons 4. Outlet blockages			
Subsurface Infiltration Chambers	After heavy rainfall events (minimum semi-annually)			1. Sediment build-up 2. Standing Water greater than 48 hours			
Subsurface Detention System	After heavy rainfall events (minimum semi-annually)			1. Sediment build-up			
Trench Drains	After heavy rainfall events (minimum quarterly)			1. Sediment level exceeds 8" 2. Trash and debris 3. Floatable oils or hydrocarbons 4. Grate or outlet blockages			

(1) Refer to the Massachusetts Stormwater Management, Volume Two: Stormwater Technical Handbook (February 2008) for recommendations regarding frequency for inspection and maintenance of specific BMP's.

Notes (Include deviations from: Con Com Order of Conditions, PB Approval, Construction Sequence and Approved Plan):

1.

Stormwater Control Manager ________________________________ Stamp:

Spill Containment and Management Plan

Initial Notification

In the event of a spill, the facility manager will be notified immediately.

Facility Managers (name) Irakis N. Papachristos, Manager
1 Franklin Street, Boston, MA 02110
Facility Manager (phone) 203-230.1693

Assessment - Initial Containment

The supervisor will assess the incident and initiate containment control measures with the appropriate spill containment equipment included in the spill kit kept on-site. The supervisor will first contact the Fire Department and then notify the Police Department, Department of Public Works, Board of Health and Conservation Commission. The fire department is ultimately responsible for matters of public health and safety and should be notified immediately.

Contact:	Phone Number:
Fire Department:	911
Police Department:	911
Department of Public Works:	(781) 337-5100
Board of Health Phone:	(781) 335-2000
Conservation Commission Phone:	(781) 340-5007

Further Notification

Based on the assessment from the Fire Chief, additional notification to a cleanup contractor may be made. The Massachusetts Department of Environmental Protection (DEP) and the EPA may be notified depending upon the nature and severity of the spill. The Fire Chief will be responsible for determining the level of cleanup and notification required. The attached list of emergency phone numbers shall be posted in the facility office and readily accessible to all employees.

HAZARDOUS WASTE / OIL SPILL REPORT

Date____/_____/_____ Time____________ AM / PM

Exact location (Transformer #)____

Type of equipment___________________________Make_____________Size______________

S / N_________________________________Weather Conditions________________________

On or near water ☐ Yes If yes, name of body of water____________________

☐ No

Type of chemical / oil spilled__________________________

Amount of chemical / oil spilled________________________

Cause of spill____

____

____

Measures taken to contain or clean up spill____________________________________

____

____

Amount of chemical / oil recovered________________Method___________________________

Material collected as a result of clean up

_____________drums containing____

_____________drums containing____

_____________drums containing____

Location and method of debris disposal____

____

Name and address of any person, firm, or corporation suffering damages____________________

____

Procedures, method, and precautions instituted to prevent a similar occurrence from recurring___

____

Spill reported to General Office by___________________________Time_____________AM / PM

Spill reported to DEP / National Response Center by_________________________________

DEP Date____/_____/_____ Time_________ AM / PM Inspector_______________

NRC Date____/_____/_____ Time_________ AM / PM Inspector_______________

Additional comments____

____

____

EMERGENCY RESPONSE EQUIPMENT
INVENTORY

The following equipment and materials shall be maintained at all times and stored in a secure area for long-term emergency response need.

--	SORBENT PADS	1 BALE
--	SAND BAGS (empty)	5
--	SPEEDI-DRI ABSORBENT	2 – 40LB BAGS
--	12” INFLATABLE PIPE PLUG	1
--	SQUARE END SHOVELS	1
--	PRY BAR	1
--	CATCH BASIN COVER	1

EMERGENCY NOTIFICATION PHONE NUMBERS

1. FACILITY MANAGER
   - NAME: ________________ BEEPER: ______________________
   - PHONE: ________________ CELL PHONE: ________________

   ALTERNATE:
   - NAME: ________________ BEEPER: N/A ___________________
   - PHONE: ________________ CEL PHONE: N/A ________________

2. FIRE DEPARTMENT
   - EMERGENCY: 911
   - BUSINESS: (781) 337-5151

   POLICE DEPARTMENT
   - EMERGENCY: 911
   - BUSINESS: (781) 335-1212

   DEPARTMENT OF PUBLIC WORKS
   - CONTACT: Director – Kenan Connell
   - BUSINESS: (781) 337-5100

   CONSERVATION COMMISSION
   - CONTACT: Andrew Hultin
   - BUSINESS: (781) 340-5007

   BOARD OF HEALTH
   - CONTACT: Board of Health Agent Clerk – Clare LaMorte, RN
   - BUSINESS: (781) 335-2000

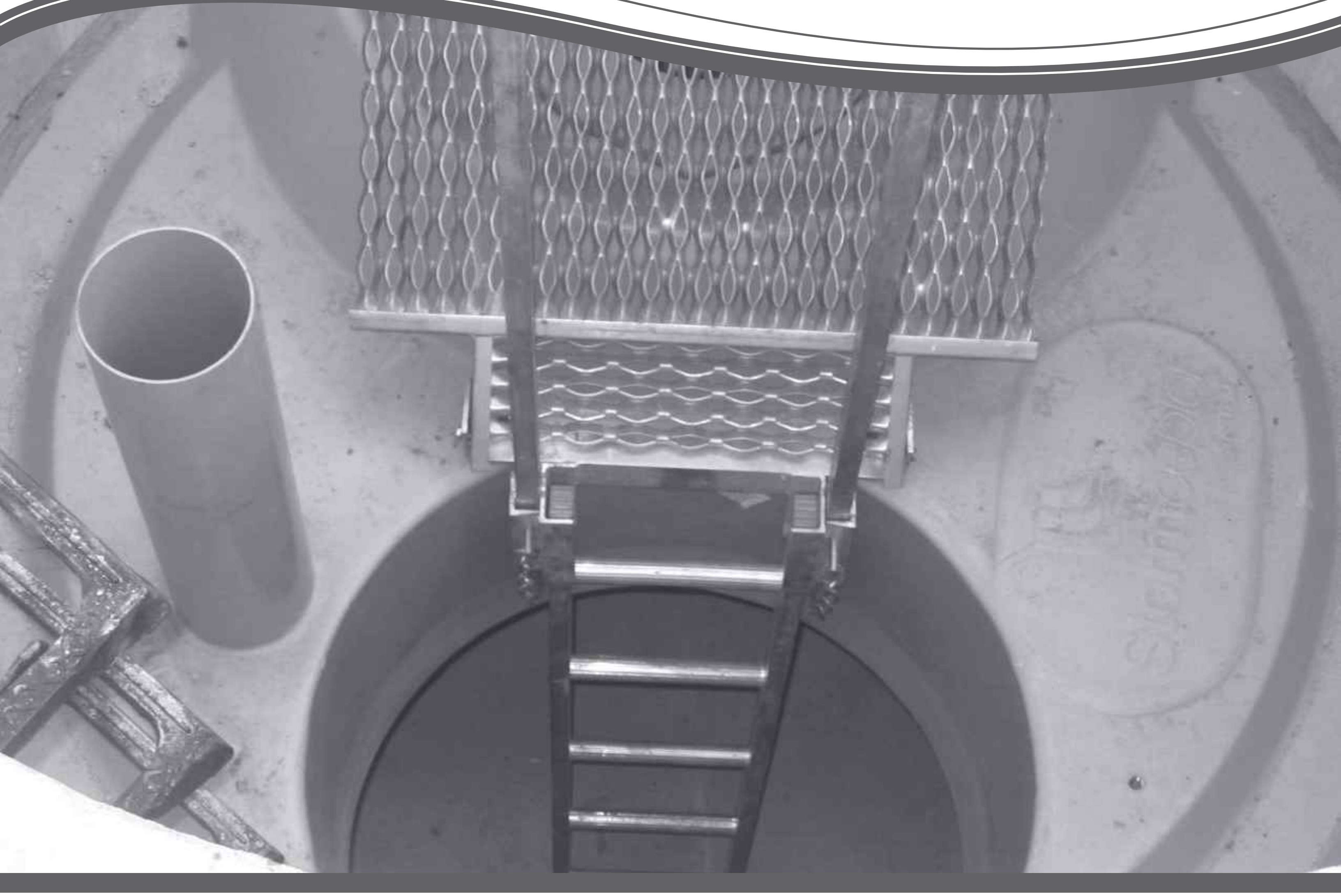
3. MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
   - EMERGENCY: (617) 556-1133
   - SOUTHEAST REGION - LAKEVILLE OFFICE: (508) 946-2700

4. NATIONAL RESPONSE CENTER
   - PHONE: (800) 424-8802

   ALTERNATE: U.S. ENVIRONMENTAL PROTECTION AGENCY
   - EMERGENCY: (617) 223-7265
   - BUSINESS: (617) 860-4300

CONTECH®
ENGINEERED SOLUTIONS

Stormceptor® STC
Operation and Maintenance Guide



Stormceptor® STC

Stormceptor Design Notes

- Only the STC 450i is adaptable to function with a catch basin inlet and/or inline pipes.
- Only the Stormceptor models STC 450i to STC 7200 may accommodate multiple inlet pipes.

Inlet and outlet invert elevation differences are as follows:

Inlet and Outlet Pipe Invert Elevations Differences			
Inlet Pipe Configuration	STC 450i	STC 900 to STC 7200	STC 11000 to STC 16000
Single inlet pipe	3 in. (75 mm)	1 in. (25 mm)	3 in. (75 mm)
Multiple inlet pipes	3 in. (75 mm)	3 in. (75 mm)	Only one inlet pipe.

Maximum inlet and outlet pipe diameters:

Inlet/Outlet Configuration	Inlet Unit STC 450i	In-Line Unit STC 900 to STC 7200	Series* STC 11000 to STC 16000
Straight Through	24 inch (600 mm)	42 inch (1050 mm)	60 inch (1500 mm)
Bend (90 degrees)	18 inch (450 mm)	33 inch (825 mm)	33 inch (825 mm)

- The inlet and in-line Stormceptor units can accommodate turns to a maximum of 90 degrees.
- Minimum distance from top of grade to crown is 2 feet (0.6 m)
- Submerged conditions. A unit is submerged when the standing water elevation at the proposed location of the Stormceptor unit is greater than the outlet invert elevation during zero flow conditions. In these cases, please contact your local Stormceptor representative and provide the following information:
- Top of grade elevation
- Stormceptor inlet and outlet pipe diameters and invert elevations
- Standing water elevation
- Stormceptor head loss, K = 1.3 (for submerged condition, K = 4)

OPERATION AND MAINTENANCE GUIDE
Table of Content

1. About Stormceptor

The Stormceptor® STC (Standard Treatment Cell) was developed by Imbrium™ Systems to address the growing need to remove and isolate pollution from the storm drain system before it enters the environment. The Stormceptor STC targets hydrocarbons and total suspended solids (TSS) in stormwater runoff. It improves water quality by removing contaminants through the gravitational settling of fine sediments and floatation of hydrocarbons while preventing the re-suspension or scour of previously captured pollutants.

The development of the Stormceptor STC revolutionized stormwater treatment, and created an entirely new category of environmental technology. Protecting thousands of waterways around the world, the Stormceptor System has set the standard for effective stormwater treatment.

1.1. Patent Information

The Stormceptor technology is protected by the following patents:

- Australia Patent No. 693,164 • 693,164 • 707,133 • 729,096 • 779401
- Austrian Patent No. 289647
- Canadian Patent No 2,009,208 •2,137,942 • 2,175,277 • 2,180,305 • 2,180,383 • 2,206,338 • 2,327,768 (Pending)
- China Patent No 1168439
- Denmark DK 711879
- German DE 69534021
- Indonesian Patent No 16688
- Japan Patent No 9-11476 (Pending)
- Korea 10-2000-0026101 (Pending)
- Malaysia Patent No PI9701737 (Pending)
- New Zealand Patent No 314646
- United States Patent No 4,985,148 • 5,498,331 • 5,725,760 • 5,753,115 • 5,849,181 • 6,068,765 • 6,371,690
- Stormceptor OSR Patent Pending • Stormceptor LCS Patent Pending

2. Stormceptor Design Overview

2.1. Design Philosophy

The patented Stormceptor System has been designed to focus on the environmental objective of providing long-term pollution control. The unique and innovative Stormceptor design allows for continuous positive treatment of runoff during all rainfall events, while ensuring that all captured pollutants are retained within the system, even during intense storm events.

An integral part of the Stormceptor design is PCSWMM for Stormceptor - sizing software developed in conjunction with Computational Hydraulics Inc. (CHI) and internationally acclaimed expert, Dr. Bill James. Using local historical rainfall data and continuous simulation modeling, this software allows a Stormceptor unit to be designed for each individual site and the corresponding water quality objectives.

By using PCSWMM for Stormceptor, the Stormceptor System can be designed to remove a wide range of particles (typically from 20 to 2,000 microns), and can also be customized to remove a specific particle size distribution (PSD). The specified PSD should accurately reflect what is in the stormwater runoff to ensure the device is achieving the desired water quality objective. Since stormwater runoff contains small particles (less than 75 microns), it is important to design a treatment system to remove smaller particles in addition to coarse particles.

2.2. Benefits

The Stormceptor System removes free oil and suspended solids from stormwater, preventing spills and non-point source pollution from entering downstream lakes and rivers. The key benefits, capabilities and applications of the Stormceptor System are as follows:

- Provides continuous positive treatment during all rainfall events
- Can be designed to remove over 80% of the annual sediment load
- Removes a wide range of particles
- Can be designed to remove a specific particle size distribution (PSD)
- Captures free oil from stormwater
- Prevents scouring or re-suspension of trapped pollutants
- Pre-treatment to reduce maintenance costs for downstream treatment measures (ponds, swales, detention basins, filters)
- Groundwater recharge protection
- Spills capture and mitigation
- Simple to design and specify
- Designed to your local watershed conditions
- Small footprint to allow for easy retrofit installations
- Easy to maintain (vacuum truck)
- Multiple inlets can connect to a single unit
- Suitable as a bend structure
- Pre-engineered for traffic loading (minimum AASHTO HS-20)
- Minimal elevation drop between inlet and outlet pipes
- Small head loss
- Additional protection provided by an 18” (457 mm) fiberglass skirt below the top of the insert, for the containment of hydrocarbons in the event of a spill.

2.3. Environmental Benefit

Freshwater resources are vital to the health and welfare of their surrounding communities. There is increasing public awareness, government regulations and corporate commitment to reducing the pollution entering our waterways. A major source of this pollution originates from stormwater runoff from urban areas. Rainfall runoff carries oils, sediment and other contaminants from roads and parking lots discharging directly into our streams, lakes and coastal waterways.

The Stormceptor System is designed to isolate contaminants from getting into the natural environment. The Stormceptor technology provides protection for the environment from spills that occur at service stations and vehicle accident sites, while also removing contaminated sediment in runoff that washes from roads and parking lots.

3. Key Operation Features

3.1. Scour Prevention

A key feature of the Stormceptor System is its patented scour prevention technology. This innovation ensures pollutants are captured and retained during all rainfall events, even extreme storms. The Stormceptor System provides continuous positive treatment for all rainfall events, including intense storms. Stormceptor slows incoming runoff, controlling and reducing velocities in the lower chamber to create a non-turbulent environment that promotes free oils and floatable debris to rise and sediment to settle.

The patented scour prevention technology, the fiberglass insert, regulates flows into the lower chamber through a combination of a weir and orifice while diverting high energy flows away through the upper chamber to prevent scouring. Laboratory testing demonstrated no scouring when tested up to 125% of the unit's operating rate, with the unit loaded to 100% sediment capacity (NJDEP, 2005). Second, the depth of the lower chamber ensures the sediment storage zone is adequately separated from the path of flow in the lower chamber to prevent scouring.

3.2. Operational Hydraulic Loading Rate

Designers and regulators need to evaluate the treatment capacity and performance of manufactured stormwater treatment systems. A commonly used parameter is the "operational hydraulic loading rate" which originated as a design methodology for wastewater treatment devices.

Operational hydraulic loading rate may be calculated by dividing the flow rate into a device by its settling area. This represents the critical settling velocity that is the prime determinant to quantify the influent particle size and density captured by the device. PCSWMM for Stormceptor uses a similar parameter that is calculated by dividing the hydraulic detention time in the device by the fall distance of the sediment.

$$v_{SC} = \frac{H}{6_H} = \frac{Q}{A_S}$$

Where:

v_{SC} = critical settling velocity, ft/s (m/s)

H = tank depth, ft (m)

$\O_H$ = hydraulic detention time, ft/s (m/s)

Q = volumetric flow rate, ft3/s (m3/s)

A_S = surface area, ft^2 (m^2)

(Tchobanoglous, G. and Schroeder, E.D. 1987. Water Quality. Addison Wesley.)

Unlike designing typical wastewater devices, stormwater systems are designed for highly variable flow rates including intense peak flows. PCSWMM for Stormceptor incorporates all of the flows into its calculations, ensuring that the operational hydraulic loading rate is considered not only for one flow rate, but for all flows including extreme events.

3.3. Double Wall Containment

The Stormceptor System was conceived as a pollution identifier to assist with identifying illicit discharges. The fiberglass insert has a continuous skirt that lines the concrete barrel wall for a depth of 18 inches (457 mm) that provides double wall containment for hydrocarbons storage. This protective barrier ensures that toxic floatables do not migrate through the concrete wall into the surrounding soils.

4. Stormceptor Product Line

4.1. Stormceptor Models

A summary of Stormceptor models and capacities are listed in Table 1.

Table 1. Stormceptor Models

Stormceptor Model	Total Storage Volume U.S. Gal (L)	Hydrocarbon Storage Capacity U.S. Gal (L)	Maximum Sediment Capacity ft^3 (L)
STC 450i	470 (1,780)	86 (330)	46 (1,302)
STC 900	952 (3,600)	251 (950)	89 (2,520)
STC 1200	1,234 (4,670)	251 (950)	127 (3,596)
STC 1800	1,833 (6,940)	251 (950)	207 (5,861)
STC 2400	2,462 (9,320)	840 (3,180)	205 (5,805)
STC 3600	3,715 (1,406)	840 (3,180)	373 (10,562)
STC 4800	5,059 (1,950)	909 (3,440)	543 (15,376)
STC 6000	6,136 (23,230)	909 (3,440)	687 (19,453)
STC 7200	7,420 (28,090)	1,059 (4,010)	839 (23,757)
STC 11000	11,194 (42,370)	2,797 (10, 590)	1,086 (30,752)
STC 13000	13,348 (50,530)	2,797 (10, 590)	1,374 (38,907)
STC 16000	15,918 (60,260)	3,055 (11, 560)	1,677 (47,487)

NOTE: Storage volumes may vary slightly from region to region. For detailed information, contact your local Stormceptor representative.

4.2. Inline Stormceptor

The Inline Stormceptor, Figure 1, is the standard design for most stormwater treatment applications. The patented Stormceptor design allows the Inline unit to maintain continuous positive treatment of total suspended solids (TSS) year-round, regardless of flow rate. The Inline Stormceptor is composed of a precast concrete tank with a fiberglass insert situated at the invert of the storm sewer pipe, creating an upper chamber above the insert and a lower chamber below the insert.

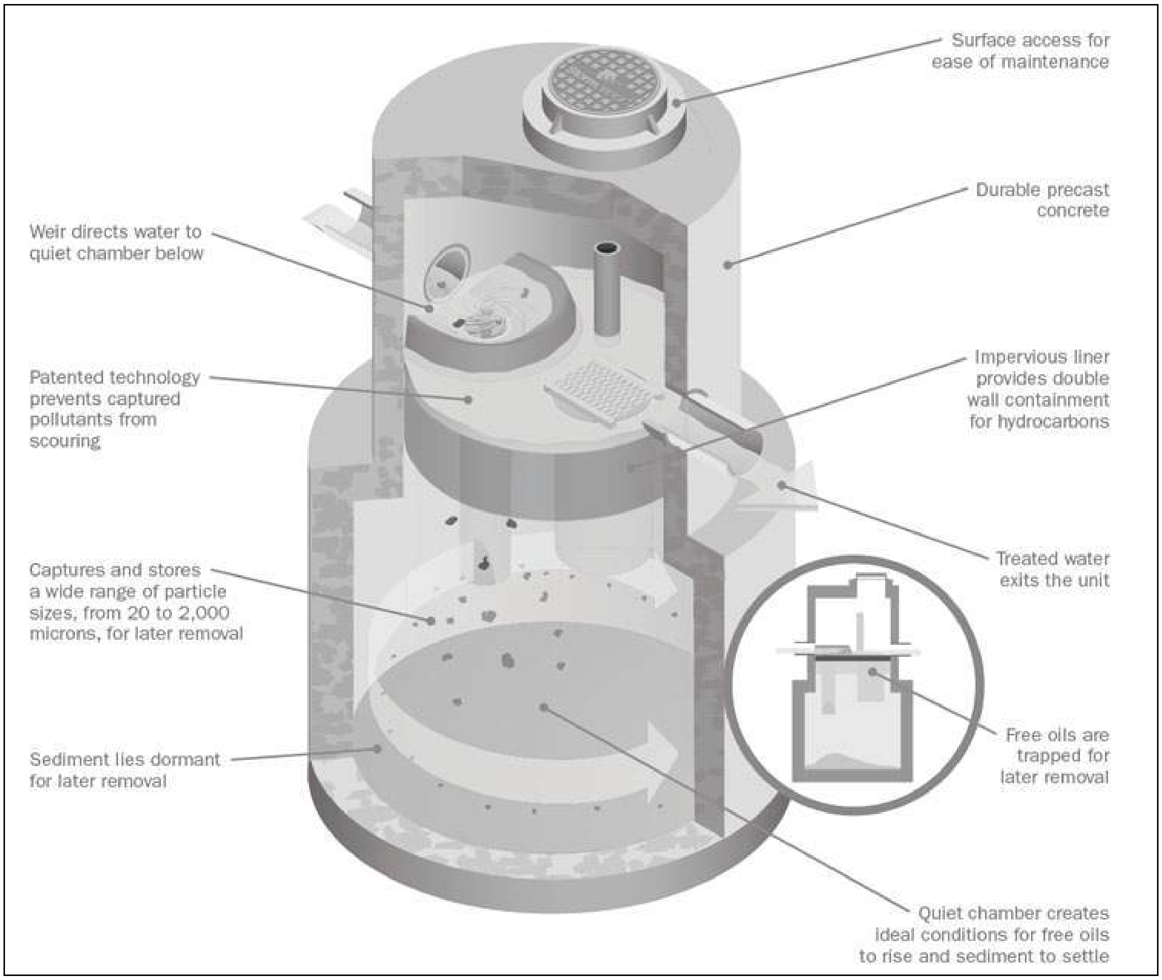


Figure 1. Inline Stormceptor

Operation

As water flows into the Stormceptor unit, it is slowed and directed to the lower chamber by a weir and drop tee. The stormwater enters the lower chamber, a non-turbulent environment, allowing free oils to rise and sediment to settle. The oil is captured underneath the fiberglass insert and shielded from exposure to the concrete walls by a fiberglass skirt. After the pollutants separate, treated water continues up a riser pipe, and exits the lower chamber on the downstream side of the weir before leaving the unit. During high flow events, the Stormceptor System's patented scour prevention technology ensures continuous pollutant removal and prevents re-suspension of previously captured pollutants.

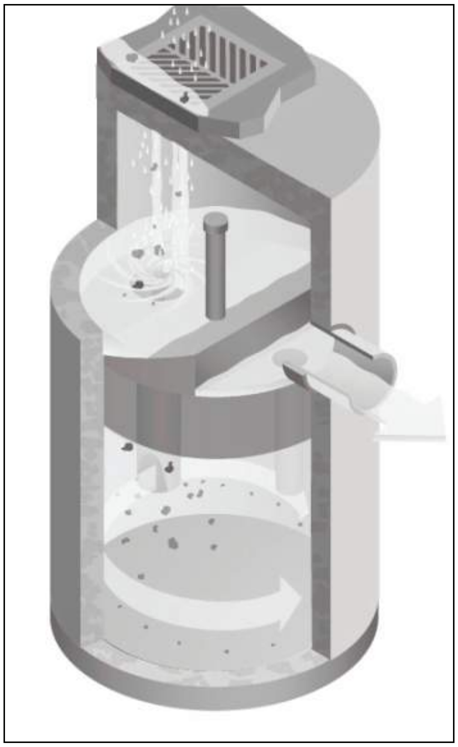


Figure 2. Inlet Stormceptor

4.3. Inlet Stormceptor

The Inlet Stormceptor System, Figure 2, was designed to provide protection for parking lots, loading bays, gas stations and other spill-prone areas. The Inlet Stormceptor is designed to remove sediment from stormwater introduced through a grated inlet, a storm sewer pipe, or both.

The Inlet Stormceptor design operates in the same manner as the Inline unit, providing continuous positive treatment, and ensuring that captured material is not re-suspended.

4.4. Series Stormceptor

Designed to treat larger drainage areas, the Series Stormceptor System, Figure 3, consists of two adjacent Stormceptor models that function in parallel. This design eliminates the need for additional structures and piping to reduce installation costs.

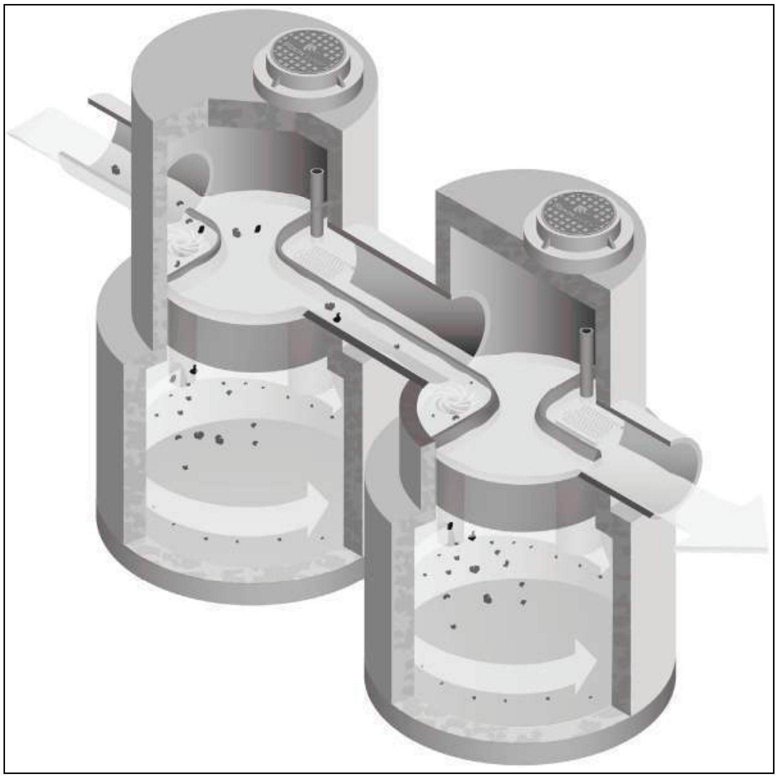


Figure 3. Series System

The Series Stormceptor design operates in the same manner as the Inline unit, providing continuous positive treatment, and ensuring that captured material is not re-suspended.

5. Sizing the Stormceptor System

The Stormceptor System is a versatile product that can be used for many different aspects of water quality improvement. While addressing these needs, there are conditions that the designer needs to be aware of in order to size the Stormceptor model to meet the demands of each individual site in an efficient and cost-effective manner.

PCSWMM for Stormceptor is the support tool used for identifying the appropriate Stormceptor model. In order to size a unit, it is recommended the user follow the seven design steps in the program. The steps are as follows:

STEP 1 – Project Details

The first step prior to sizing the Stormceptor System is to clearly identify the water quality objective for the development. It is recommended that a level of annual sediment (TSS) removal be identified and defined by a particle size distribution.

STEP 2 – Site Details

Identify the site development by the drainage area and the level of imperviousness. It is recommended that imperviousness be calculated based on the actual area of imperviousness based on paved surfaces, sidewalks and rooftops.

STEP 3 – Upstream Attenuation

The Stormceptor System is designed as a water quality device and is sometimes used in conjunction with onsite water quantity control devices such as ponds or underground detention systems. When possible, a greater benefit is typically achieved when installing a Stormceptor unit upstream of a detention facility. By placing the Stormceptor unit upstream of a detention structure, a benefit of less maintenance of the detention facility is realized.

STEP 4 – Particle Size Distribution

It is critical that the PSD be defined as part of the water quality objective. PSD is critical for the design of treatment system for a unit process of gravity settling and governs the size of a treatment system. A range of particle sizes has been provided and it is recommended that clays and silt-sized particles be considered in addition to sand and gravel-sized particles. Options and sample PSDs are provided in PCSWMM for Stormceptor. The default particle size distribution is the Fine Distribution, Table 2, option.

Table 2. Fine Distribution

Particle Size	Distribution	Specific Gravity
20	20%	1.3
60	20%	1.8
150	20%	2.2
400	20%	2.65
2000	20%	2.65

If the objective is the long-term removal of 80% of the total suspended solids on a given site, the PSD should be representative of the expected sediment on the site. For example, a system designed to remove 80% of coarse particles (greater than 75 microns) would provide relatively poor removal efficiency of finer particles that may be naturally prevalent in runoff from the site.

Since the small particle fraction contributes a disproportionately large amount of the total available particle surface area for pollutant adsorption, a system designed primarily for coarse particle capture will compromise water quality objectives.

STEP 5 – Rainfall Records

Local historical rainfall has been acquired from the U.S. National Oceanic and Atmospheric Administration, Environment Canada and regulatory agencies across North America. The rainfall data provided with PCSMM for Stormceptor provides an accurate estimation of small storm hydrology by modeling actual historical storm events including duration, intensities and peaks.

STEP 6 – Summary

At this point, the program may be executed to predict the level of TSS removal from the site. Once the simulation has completed, a table shall be generated identifying the TSS removal of each Stormceptor unit.

STEP 7 – Sizing Summary

Performance estimates of all Stormceptor units for the given site parameters will be displayed in a tabular format. The unit that meets the water quality objective, identified in Step 1, will be highlighted.

5.1. PCSWMM for Stormceptor

The Stormceptor System has been developed in conjunction with PCSWMM for Stormceptor as a technological solution to achieve water quality goals. Together, these two innovations model, simulate, predict and calculate the water quality objectives desired by a design engineer for TSS removal.

PCSWMM for Stormceptor is a proprietary sizing program which uses site specific inputs to a computer model to simulate sediment accumulation, hydrology and long-term total suspended solids removal. The model has been calibrated to field monitoring results from Stormceptor units that have been monitored in North America. The sizing methodology can be described by three processes:

1. Determination of real time hydrology
2. Buildup and wash off of TSS from impervious land areas
3. TSS transport through the Stormceptor (settling and discharge). The use of a calibrated model is the preferred method for sizing stormwater quality structures for the following reasons:
    - The hydrology of the local area is properly and accurately incorporated in the sizing (distribution of flows, flow rate ranges and peaks, back-to-back storms, inter-event times)
    - The distribution of TSS with the hydrology is properly and accurately considered in the sizing
    - Particle size distribution is properly considered in the sizing
    - The sizing can be optimized for TSS removal
    - The cost benefit of alternate TSS removal criteria can be easily assessed
    - The program assesses the performance of all Stormceptor models. Sizing may be selected based on a specific water quality outcome or based on the Maximum Extent Practicable

For more information regarding PCSWMM for Stormceptor, contact your local Stormceptor representative, or visit www.imbriumsystems.com to download a free copy of the program.

5.2. Sediment Loading Characteristics

The way in which sediment is transferred to stormwater can have a considerable effect on which type of system is implemented. On typical impervious surfaces (e.g. parking lots) sediment will build over time and wash off with the next rainfall. When rainfall patterns are examined, a short intense storm will have a higher concentration of sediment than a long slow drizzle. Together with rainfall data representing the site's typical rainfall patterns, sediment loading characteristics play a part in the correct sizing of a stormwater quality device.

Typical Sites

For standard site design of the Stormceptor System, PCSWMM for Stormceptor is utilized to accurately assess the unit's performance. As an integral part of the product's design, the program can be used to meet local requirements for total suspended solid removal. Typical installations of manufactured stormwater treatment devices would occur on areas such as paved parking lots or paved roads. These are considered "stable" surfaces which have non – erodible surfaces.

Unstable Sites

While standard sites consist of stable concrete or asphalt surfaces, sites such as gravel parking lots, or maintenance yards with stockpiles of sediment would be classified as "unstable". These types of sites do not exhibit first flush characteristics, are highly erodible and exhibit atypical sediment loading characteristics and must therefore be sized more carefully. Contact your local Stormceptor representative for assistance in selecting a proper unit sized for such unstable sites.

6. Spill Controls

When considering the removal of total petroleum hydrocarbons (TPH) from a storm sewer system there are two functions of the system: oil removal, and spill capture.

'Oil Removal' describes the capture of the minute volumes of free oil mobilized from impervious surfaces. In this instance relatively low concentrations, volumes and flow rates are considered. While the Stormceptor unit will still provide an appreciable oil removal function during higher flow events and/or with higher TPH concentrations, desired effluent limits may be exceeded under these conditions.

‘Spill Capture’ describes a manner of TPH removal more appropriate to recovery of a relatively high volume of a single phase deleterious liquid that is introduced to the storm sewer system over a relatively short duration. The two design criteria involved when considering this manner of introduction are overall volume and the specific gravity of the material. A standard Stormceptor unit will be able to capture and retain a maximum spill volume and a minimum specific gravity.

For spill characteristics that fall outside these limits, unit modifications are required. Contact your local Stormceptor Representative for more information.

One of the key features of the Stormceptor technology is its ability to capture and retain spills. While the standard Stormceptor System provides excellent protection for spill control, there are additional options to enhance spill protection if desired.

6.1. Oil Level Alarm

The oil level alarm is an electronic monitoring system designed to trigger a visual and audible alarm when a pre-set level of oil is reached within the lower chamber. As a standard, the oil

level alarm is designed to trigger at approximately 85% of the unit’s available depth level for oil capture. The feature acts as a safeguard against spills caused by exceeding the oil storage capacity of the separator and eliminates the need for manual oil level inspection.

The oil level alarm installed on the Stormceptor insert is illustrated in Figure 4.

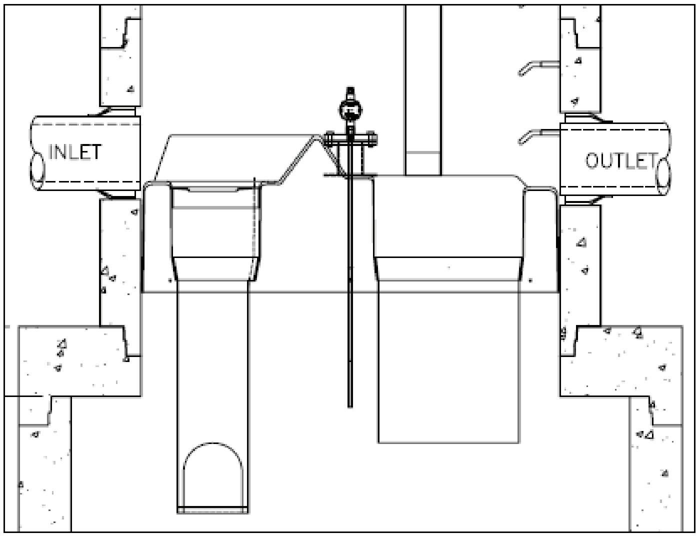


Figure 4. Oil level alarm

6.2. Increased Volume Storage Capacity

The Stormceptor unit may be modified to store a greater spill volume than is typically available. Under such a scenario, instead of installing a larger than required unit, modifications can be made to the recommended Stormceptor model to accommodate larger volumes. Contact your local Stormceptor representative for additional information and assistance for modifications.

7. Stormceptor Options

The Stormceptor System allows flexibility to incorporate to existing and new storm drainage infrastructure. The following section identifies considerations that should be reviewed when installing the system into a drainage network. For conditions that fall outside of the recommendations in this section, please contact your local Stormceptor representative for further guidance.

7.1. Installation Depth Minimum Cover

The minimum distance from the top of grade to the crown of the inlet pipe is 24 inches (600 mm). For situations that have a lower minimum distance, contact your local Stormceptor representative.

7.2. Maximum Inlet and Outlet Pipe Diameters

Maximum inlet and outlet pipe diameters are illustrated in Figure 5. Contact your local Stormceptor representative for larger pipe diameters

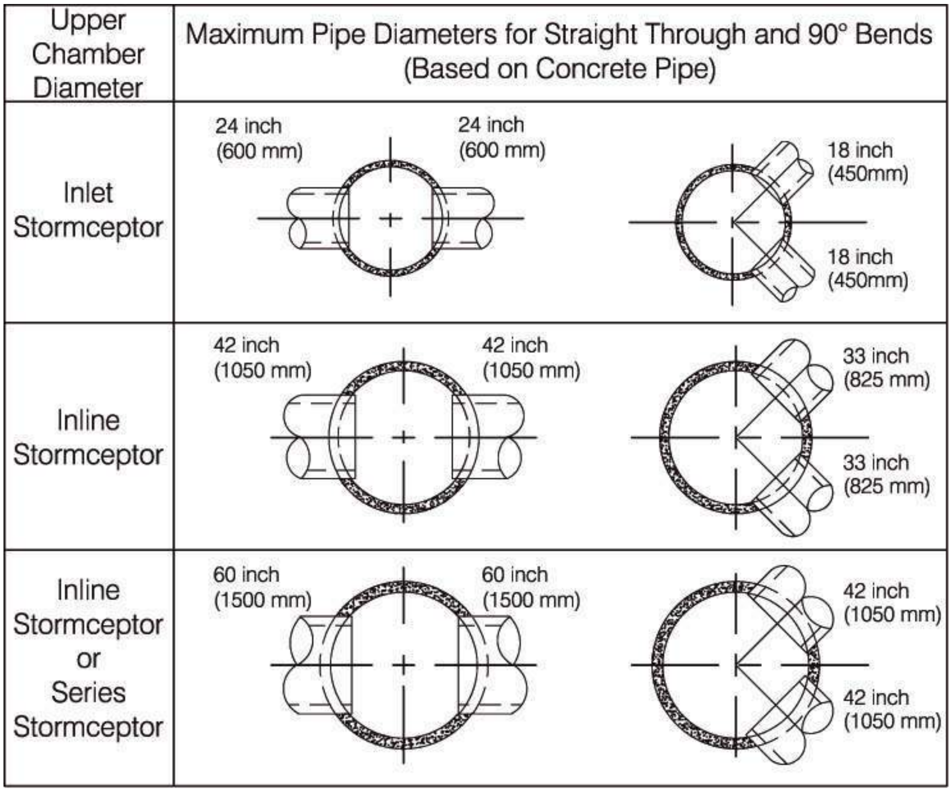


Figure 5. Maximum pipe diameters for straight through and bend applications

*The bend should only be incorporated into the second structure (downstream structure) of the Series Stormceptor System

7.3. Bends

The Stormceptor System can be used to change horizontal alignment in the storm drain network up to a maximum of 90 degrees. Figure 6 illustrates the typical bend situations of the Stormceptor System. Bends should only be applied to the second structure (downstream structure) of the Series Stormceptor System.

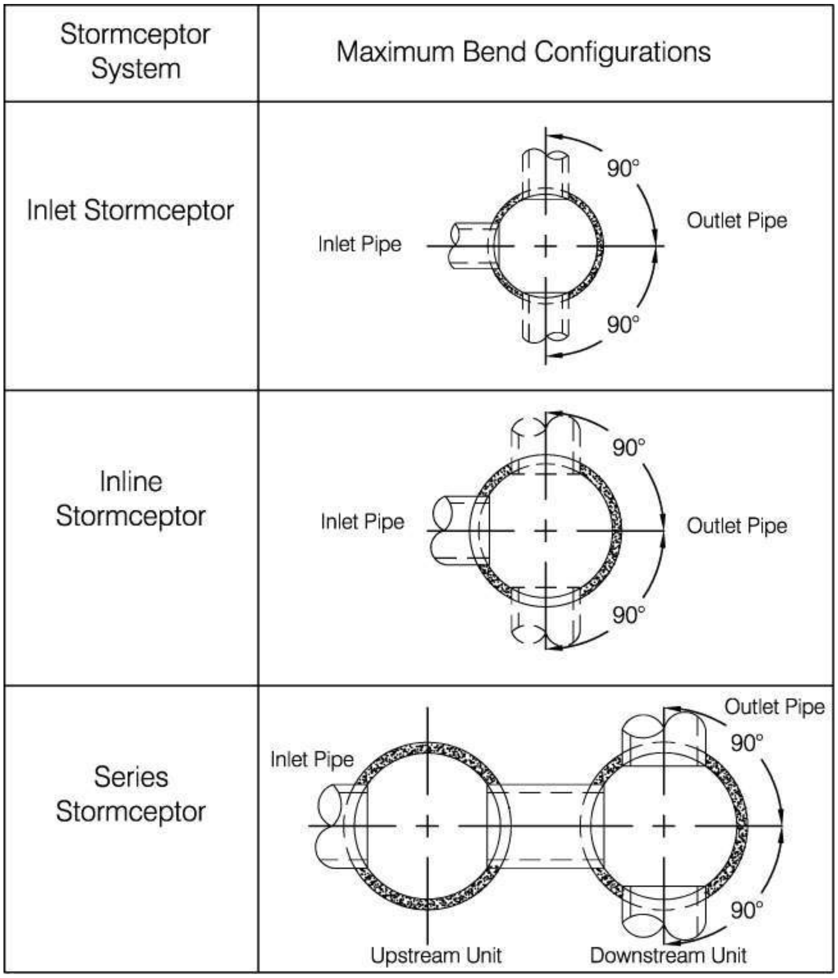


Figure 6. Maximum bend angles

7.4. Multiple Inlet Pipes

The Inlet and Inline Stormceptor System can accommodate two or more inlet pipes. The maximum number of inlet pipes that can be accommodated into a Stormceptor unit is a function of the number, alignment and diameter of the pipes and its effects on the structural integrity of the precast concrete. When multiple inlet pipes are used for new developments, each inlet pipe shall have an invert elevation 3 inches (75 mm) higher than the outlet pipe invert elevation.

7.5. Inlet/Outlet Pipe Invert Elevations

Recommended inlet and outlet pipe invert differences are listed in Table 3.

Table 3. Recommended Drops Between Inlet and Outlet Pipe Inverts

Number of Inlet Pipes	Inlet System	In-Line System	Series System
1	3 inches (75 mm)	1 inch (25 mm)	3 inches (75 mm)
>1	3 inches (75 mm)	3 inches (75 mm)	Not Applicable

7.6. Shallow Stormceptor

In cases where there may be restrictions to the depth of burial of storm sewer systems. In this situation, for selected Stormceptor models, the lower chamber components may be increased in diameter to reduce the overall depth of excavation required.

7.7. Customized Live Load

The Stormceptor system is typically designed for local highway truck loading (AASHTO HS- 20). When the project requires live loads greater than HS-20, the Stormceptor System may be customized structurally for a pre-specified live load. Contact your local Stormceptor representative for customized loading conditions.

7.8. Pre-treatment

The Stormceptor System may be sized to remove sediment and for spills control in conjunction with other stormwater BMPs to meet the water quality objective. For pretreatment applications, the Stormceptor System should be the first unit in a treatment train. The benefits of pre-treatment include the extension of the operational life (extension of maintenance frequency) of large stormwater management facilities, prevention of spills and lower total life- cycle maintenance cost.

7.9. Head loss

The head loss through the Stormceptor System is similar to a 60 degree bend at a manhole. The K value for calculating minor losses is approximately 1.3 (minor loss = k*1.3v2/2g).

However, when a Submerged modification is applied to a Stormceptor unit, the corresponding K value is 4.

7.10. Submerged

The Submerged modification, Figure 7, allows the Stormceptor System to operate in submerged or partially submerged storm sewers. This configuration can be installed on all models of the Stormceptor System by modifying the fiberglass insert. A customized weir height and a secondary drop tee are added.

Submerged instances are defined as standing water in the storm drain system during zero flow conditions. In these instances, the following information is necessary for the proper design and application of submerged modifications:

- Stormceptor top of grade elevation
- Stormceptor outlet pipe invert elevation
- Standing water elevation

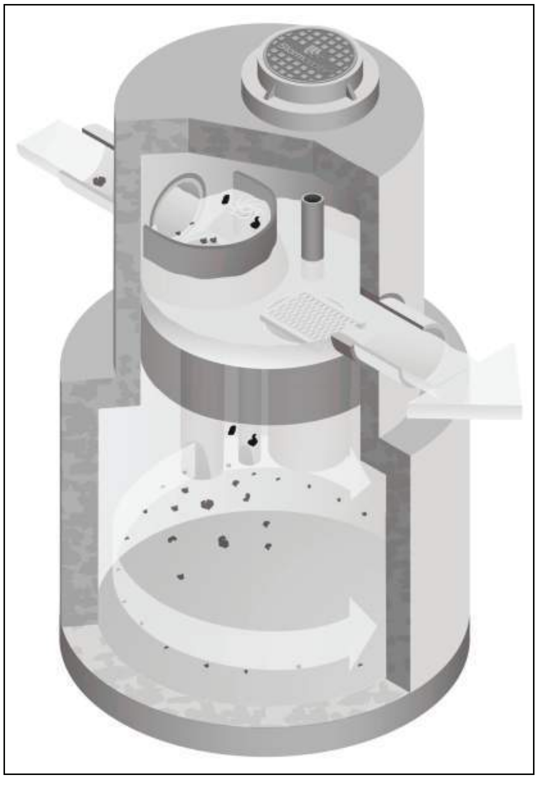


Figure 7. Submerged Stormceptor

8. Comparing Technologies

Designers have many choices available to achieve water quality goals in the treatment of stormwater runoff. Since many alternatives are available for use in stormwater quality treatment it is important to consider how to make an appropriate comparison between "approved alternatives". The following is a guide to assist with the accurate comparison of differing technologies and performance claims.

8.1. Particle Size Distribution (PSD)

The most sensitive parameter to the design of a stormwater quality device is the selection of the design particle size. While it is recommended that the actual particle size distribution (PSD) for sites be measured prior to sizing, alternative values for particle size should be selected to represent what is likely to occur naturally on the site. A reasonable estimate of a particle size distribution likely to be found on parking lots or other impervious surfaces should consist of a wide range of particles such as 20 microns to 2,000 microns (Ontario MOE, 1994).

There is no absolute right particle size distribution or specific gravity and the user is cautioned to review the site location, characteristics, material handling practices and regulatory requirements when selecting a particle size distribution. When comparing technologies, designs using different PSDs will result in incomparable TSS removal efficiencies. The PSD of the TSS removed needs to be standard between two products to allow for an accurate comparison.

8.2. Scour Prevention

In order to accurately predict the performance of a manufactured treatment device, there must be confidence that it will perform under all conditions. Since rainfall patterns cannot be predicted, stormwater quality devices placed in storm sewer systems must be able to withstand extreme events, and ensure that all pollutants previously captured are retained in the system.

In order to have confidence in a system's performance under extreme conditions, independent validation of scour prevention is essential when examining different technologies. Lack of independent verification of scour prevention should make a designer wary of accepting any product's performance claims.

8.3. Hydraulics

Full scale laboratory testing has been used to confirm the hydraulics of the Stormceptor System. Results of lab testing have been used to physically design the Stormceptor System and the sewer pipes entering and leaving the unit. Key benefits of Stormceptor are:

- Low head loss (typical k value of 1.3)
- Minimal inlet/outlet invert elevation drop across the structure
- Use as a bend structure
- Accommodates multiple inlets

The adaptability of the treatment device to the storm sewer design infrastructure can affect the overall performance and cost of the site.

8.4. Hydrology

Stormwater quality treatment technologies need to perform under varying climatic conditions. These can vary from long low intensity rainfall to short duration, high intensity storms. Since a treatment device is expected to perform under all these conditions, it makes sense that any system's design should accommodate those conditions as well.

Long-term continuous simulation evaluates the performance of a technology under the varying conditions expected in the climate of the subject site. Single, peak event design does not provide this information and is not equivalent to long-term simulation. Designers should request long-term simulation performance to ensure the technology can meet the long-term water quality objective.

9. Testing

The Stormceptor System has been the most widely monitored stormwater treatment technology in the world. Performance verification and monitoring programs are completed to the strictest standards and integrity. Since its introduction in 1990, numerous independent field tests and studies detailing the effectiveness of the Stormceptor System have been completed.

- Coventry University, UK – 97% removal of oil, 83% removal of sand and 73% removal of peat
- National Water Research Institute, Canada, - scaled testing for the development of the Stormceptor System identifying both TSS removal and scour prevention.
- New Jersey TARP Program – full scale testing of an STC 900 demonstrating 75% TSS removal of particles from 1 to 1000 microns. Scour testing completed demonstrated that the system does not scour. The New Jersey Department of Environmental Protection was followed.
- City of Indianapolis – full scale testing of an STC 900 demonstrating over 80% TSS removal of particles from 50 microns to 300 microns at 130% of the unit's operating rate. Scour testing completed demonstrated that the system does not scour.
- Westwood Massachusetts (1997), demonstrated >80% TSS removal
- Como Park (1997), demonstrated 76% TSS removal
- Ontario MOE SWAMP Program – 57% removal of 1 to 25 micron particles
- Laval Quebec – 50% removal of 1 to 25 micron particles

10. Installation

The installation of the concrete Stormceptor should conform in general to state highway, or local specifications for the installation of manholes. Selected sections of a general specification that are applicable are summarized in the following sections.

10.1. Excavation

Excavation for the installation of the Stormceptor should conform to state highway, or local specifications. Topsoil removed during the excavation for the Stormceptor should be stockpiled in designated areas and should not be mixed with subsoil or other materials.

Topsoil stockpiles and the general site preparation for the installation of the Stormceptor should conform to state highway or local specifications.

The Stormceptor should not be installed on frozen ground. Excavation should extend a minimum of 12 inches (300 mm) from the precast concrete surfaces plus an allowance for shoring and bracing where required. If the bottom of the excavation provides an unsuitable foundation additional excavation may be required.

In areas with a high water table, continuous dewatering may be required to ensure that the excavation is stable and free of water.

10.2. Backfilling

Backfill material should conform to state highway or local specifications. Backfill material should be placed in uniform layers not exceeding 12 inches (300mm) in depth and compacted to state highway or local specifications.

11. Stormceptor Construction Sequence

The concrete Stormceptor is installed in sections in the following sequence:

1. Aggregate base
2. Base slab
3. Lower chamber sections
4. Upper chamber section with fiberglass insert
5. Connect inlet and outlet pipes
6. Assembly of fiberglass insert components (drop tee, riser pipe, oil cleanout port and orifice plate
7. Remainder of upper chamber
8. Frame and access cover

The precast base should be placed level at the specified grade. The entire base should be in contact with the underlying compacted granular material. Subsequent sections, complete with joint seals, should be installed in accordance with the precast concrete manufacturer's recommendations.

Adjustment of the Stormceptor can be performed by lifting the upper sections free of the excavated area, re-leveling the base and re-installing the sections. Damaged sections and gaskets should be repaired or replaced as necessary. Once the Stormceptor has been constructed, any lift holes must be plugged with mortar.

12. Maintenance

12.1. Health and Safety

The Stormceptor System has been designed considering safety first. It is recommended that confined space entry protocols be followed if entry to the unit is required. In addition, the fiberglass insert has the following health and safety features:

- Designed to withstand the weight of personnel
- A safety grate is located over the 24 inch (600 mm) riser pipe opening
- Ladder rungs can be provided for entry into the unit, if required

12.2. Maintenance Procedures

Maintenance of the Stormceptor system is performed using vacuum trucks. No entry into the unit is required for maintenance (in most cases). The vacuum service industry is a well- established sector of the service industry that cleans underground tanks, sewers and catch basins. Costs to clean a Stormceptor will vary based on the size of unit and transportation distances.

The need for maintenance can be determined easily by inspecting the unit from the surface. The depth of oil in the unit can be determined by inserting a dipstick in the oil inspection/cleanout port.

Similarly, the depth of sediment can be measured from the surface without entry into the Stormceptor via a dipstick tube equipped with a ball valve. This tube would be inserted through the riser pipe. Maintenance should be performed once the sediment depth exceeds the guideline values provided in the Table 4.

Table 4. Sediment Depths Indicating Required Servicing*

Particle Size	Specific Gravity
Model	Sediment Depth inches (mm)
450i	8 (200)
900	8 (200)
1200	10 (250)
1800	15 (381)
2400	12 (300)
3600	17 (430)
4800	15 (380)
6000	18 (460)
7200	15 (381)
11000	17 (380)
13000	20 (500)
16000	17 (380)
* based on 15% of the Stormceptor unit's total storage	

Although annual servicing is recommended, the frequency of maintenance may need to be increased or reduced based on local conditions (i.e. if the unit is filling up with sediment more quickly than projected, maintenance may be required semi-annually; conversely once the site has stabilized maintenance may only be required every two or three years).

Oil is removed through the oil inspection/cleanout port and sediment is removed through the riser pipe. Alternatively oil could be removed from the 24 inches (600 mm) opening if water is removed from the lower chamber to lower the oil level below the drop pipes.

The following procedures should be taken when cleaning out Stormceptor:

1. Check for oil through the oil cleanout port
2. Remove any oil separately using a small portable pump
3. Decant the water from the unit to the sanitary sewer, if permitted by the local regulating authority, or into a separate containment tank
4. Remove the sludge from the bottom of the unit using the vacuum truck
5. Re-fill Stormceptor with water where required by the local jurisdiction

12.3. Submerged Stormceptor

Careful attention should be paid to maintenance of the Submerged Stormceptor System. In cases where the storm drain system is submerged, there is a requirement to plug both the inlet and outlet pipes to economically clean out the unit.

12.4. Hydrocarbon Spills

The Stormceptor is often installed in areas where the potential for spills is great. The Stormceptor System should be cleaned immediately after a spill occurs by a licensed liquid waste hauler.

12.5. Disposal

Requirements for the disposal of material from the Stormceptor System are similar to that of any other stormwater Best Management Practice (BMP) where permitted. Disposal options for the sediment may range from disposal in a sanitary trunk sewer upstream of a sewage treatment plant, to disposal in a sanitary landfill site. Petroleum waste products collected in the Stormceptor (free oil/chemical/fuel spills) should be removed by a licensed waste management company.

12.6. Oil Sheens

With a steady influx of water with high concentrations of oil, a sheen may be noticeable at the Stormceptor outlet. This may occur because a rainbow or sheen can be seen at very small oil concentrations (<10 mg/L). Stormceptor will remove over 98% of all free oil spills from storm sewer systems for dry weather or frequently occurring runoff events.

The appearance of a sheen at the outlet with high influent oil concentrations does not mean the unit is not working to this level of removal. In addition, if the influent oil is emulsified the Stormceptor will not be able to remove it. The Stormceptor is designed for free oil removal and not emulsified conditions.

SUPPORT

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

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ADS LANDMAX® RETENTION/DETENTION PIPE SYSTEM SPECIFICATION

Scope

This specification describes ADS LandMax Retention/Detention Pipe Systems for use in non-pressure gravity-flow storm water collection systems utilizing a continuous outfall structure.

Pipe Requirements

ADS Retention/Detention systems may utilize any of the various pipe products below:

- N-12® ST IB pipe (per AASHTO) shall meet AASHTO M294, Type S or ASTM F2306
- N-12 ST IB pipe (per ASTM F2648) shall meet ASTM F2648
- N-12 MEGA GREEN™ ST IB shall meet ASTM F2648
- N-12 WT IB pipe (per AASHTO) shall meet AASHTO M294, Type S or ASTM F2306
- N-12 WT IB pipe (per ASTM F2648) shall meet ASTM F2648
- N-12 MEGA GREEN™ WT IB shall meet ASTM F2648

All products shall have a smooth interior and annular exterior corrugations. All ST IB pipe products are available as perforated or non-perforated. WT IB pipe products are only available as non-perforated.

Product-specific pipe specifications are available in the Drainage Handbook Section 1 *Specifications*.

Joint Performance

Plain End/Soil-tight (ST IB)

ST IB pipe shall be joined using a bell & spigot joint. The bell & spigot joint shall meet the soil-tight requirements of ASTM F2306 and gaskets shall meet the requirements of ASTM F477.

Plain End pipe & fittings connections shall be joined with coupling bands covering at least two full corrugations on each end of the pipe. Gasketed soil-tight coupling band connections shall incorporate a closed-cell synthetic expanded rubber gasket meeting the requirements of ASTM D1056 Grade 2A2. Gaskets, when applicable, shall be installed by the pipe manufacturer.

Watertight (WT IB):

WT IB pipe shall be joined using a bell & spigot joint. The joint shall be watertight according to the requirements of ASTM D3212. Gaskets shall meet the requirements of ASTM F477. 12- through 60-inch (300 to 1500 mm) diameters shall have an exterior bell wrap installed by the manufacturer.

Pipe & fitting connections shall be with a bell and spigot connection utilizing a welded bell and valley or saddle gasket. The joint shall meet the watertight requirements of ASTM D3212 and gaskets shall meet the requirements of ASTM F477. Detention systems are subject to greater leakage than typical single run storm sewer application and therefore are not appropriate for applications requiring long-term fluid containment or hydrostatic pressure. For additional details refer to Technical Note 7.01 *Rainwater Harvesting with HDPE Cisterns*.

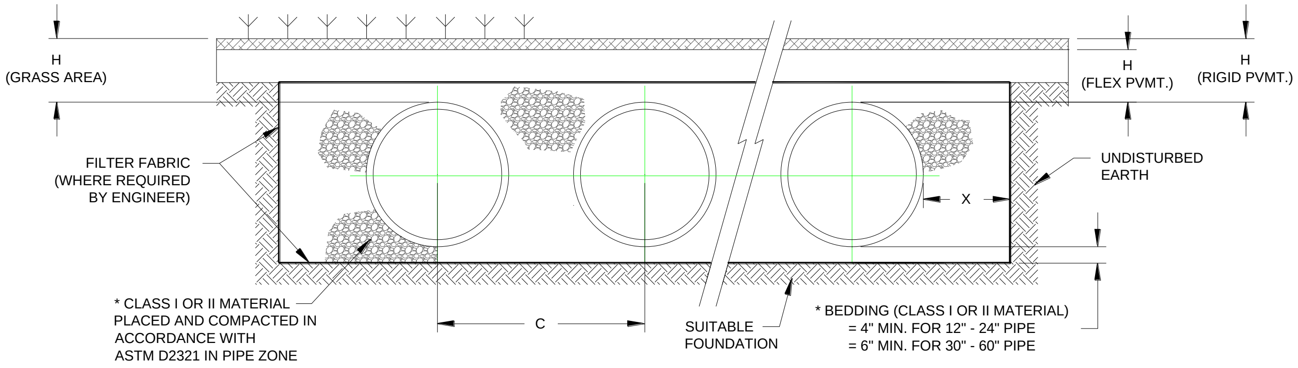
Fittings

Fittings shall conform to ASTM F2306 and meet joint performance requirements indicated above for fitting connections. Custom fittings are available and may require special installation criterion.

Installation

Installation shall be in accordance with ASTM D2321 and ADS recommended installation guidelines, with the exception that minimum cover in non-traffic areas for 12- through 60-inch (300 to 1500mm) diameters shall be one foot (0.3m). Minimum cover in trafficked areas for 12- through 36-inch (300 to 900mm) diameters shall be one foot (0.3m) and for 42- through 60-inch (1050 to 1500mm) diameters, the minimum cover shall be two feet (0.6m). Backfill shall consist of Class 1 (compacted) or Class 2 (minimum 90% SPD) material, with the exception that 60-inch fittings shall use Class 1 (compacted) material only. Minimum cover heights do not account for pipe buoyancy. Refer to ADS Technical Note 5.05 HDPE Pipe Flotation for buoyancy design considerations. Maximum cover over system using standard backfill is 8 feet (2.4m); contact a representative when maximum fill height may be exceeded. Additional installation requirements are provided in the Drainage Handbook Section 6 Retention/Detention.

TYPICAL RETENTION/DETENTION CROSS SECTION



MINIMUM H (GRASS) = 12" FOR 12" THROUGH 60" HDPE PIPE
MINIMUM H (FLEX PVMT), H (RIGID PVMT) = 12" FOR UP TO AND INCLUDING 36" HDPE PIPE
= 24" FOR 42" THROUGH 60" HDPE PIPE

* CLASS I BACKFILL REQUIRED AROUND 60" DIAMETER FITTINGS.

MAXIMUM FILL HEIGHT LIMITED TO 8-FT OVER FITTINGS FOR STANDARD INSTALLATIONS. CONTACT REPRESENTATIVE WHEN MAXIMUM FILL HEIGHTS EXCEED 8-FT FOR INSTALLATION CONSIDERATIONS.

ADDITIONAL REFERENCES

Drainage Handbook Section 6 *Retention/Detention*

Technical Note 6.01 *Retention/Detention System Maintenance*

Technical Note 7.01 *Rainwater Harvesting with HDPE Pipe*

Standard Detail 701 Retention-Detention System (Plan View)

Standard Detail 702 Retention-Detention System (Cross-Section)

Standard Detail 703 Retention-Detention System (Riser & Cleanout)

Standard Detail 704 Flowable Fill Installation (Nyloplast Riser)

All references are available for download at www.adspipe.com

Technical Note

TN 6.01 Retention/Detention System Maintenance

This document is provided for informational purposes only and is meant only to be a guide. Individuals using this information should make their own decisions as to suitability of this guideline for their individual projects and adjust accordingly.

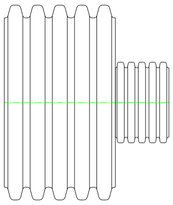
Introduction

A retention/detention system is comprised of a series of pipes and fittings that form an underground storage area, which retains or detains storm water runoff from a given area. As sediment and debris settle out of the detained stormwater, build up occurs that requires the system to be regularly inspected and cleaned in order for the system to perform as originally designed. The following provides the available fittings and guidelines for inspection and maintenance of an HDPE underground storage system.

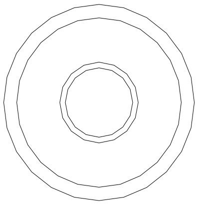
System Accessories and Fittings

Concentric Reducers

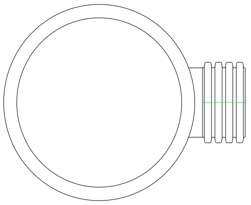
Concentric Reducers are fittings that transition between two pipes, either in line with one another or at perpendicular angles. The centerlines of the two pipes are at the same elevation. When a concentric reducer is used to connect the manifold pipe to the lateral pipes, most debris will be trapped in the manifold pipe.



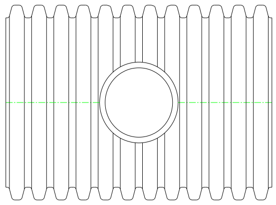
SIDE VIEW



SECTION VIEW



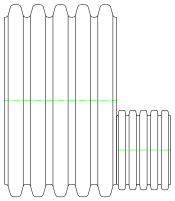
SIDE VIEW



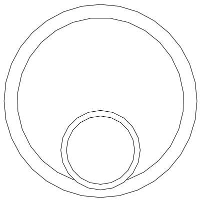
SECTION VIEW

Eccentric Reducers

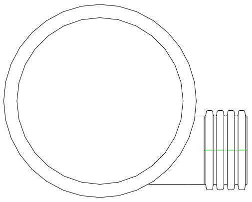
Eccentric Reducers are fittings that transition between two pipes, either in line with one another or at perpendicular angles. The inverts of the two pipes are at the same elevations. When an eccentric reducer is used to connect the manifold pipe to the lateral pipes, most debris will follow the flow of the storm water into the lateral pipes.



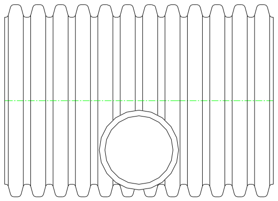
SIDE VIEW



SECTION VIEW



SIDE VIEW



SECTION VIEW

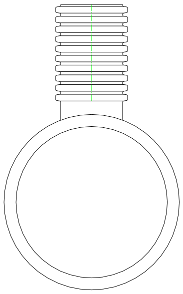
Riser

Each retention/detention system typically has risers strategically placed for maintenance and inspection of the system. These risers are typically 24” in diameter or larger and are placed on the manifold fittings.

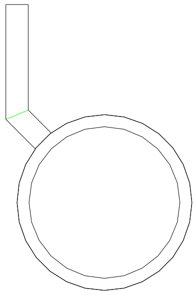
Cleanouts

Cleanout ports are usually 4-, 6-, or 8-in diameter pipe and are placed on the manifold fittings. They are used for entrance of a pipe from a vacuum truck or a water-jetting device.

For a complete listing of available fittings and components please refer to the *ADS Fittings Manual*.



RISER
CROSS-SECTION VIEW



CLEANOUT
CROSS-SECTION VIEW

Maintenance Overview of a Retention/Detention System

Maintaining a clean and obstruction-free retention/detention system helps to ensure the system performs the intended function of the primary design. Build up of debris may obstruct flow through the laterals in a retention system or block the entranceway of the outlet pipe in a detention system. This may result in ineffective operation or complete failure of the system . Additionally, surrounding areas may potentially run the risk of damage due to flooding or other similar issues.

Inspection/Maintenance Frequency

All retention/detention systems must be cleaned and maintained. Underground systems may be maintained more cost effectively if these simple guidelines are followed. Inspection should be performed at a minimum of once per year. Cleaning should be done at the discretion of individuals responsible to maintain proper storage and flow. While maintenance can generally be performed year round, it should be scheduled during a relatively dry season.

Pre-Inspection

A post-installation inspection should be performed to allow the owner to measure the invert prior to accumulation of sediment. This survey will allow the monitoring of sediment build-up without requiring access to the retention/detention system.

The following is the recommended procedure for pre-inspections:

1) Locate the riser section or cleanouts of the retention/detention system. The riser will typically be 24” in diameter or larger and the cleanouts are usually 4”, 6” or 8” in diameter.
2) Remove the lid of the riser or clean outs.
3) Insert a measuring device into the opening and make note to a point of reference on the stick or string. (This is done so that sediment build up can be determined in the future without having to enter the system.)

Inspection/Maintenance

A retention/detention system should be inspected at a minimum of one time a year or after major rain events if necessary.

The following is the recommended procedure to inspect system in service:

1) Locate the riser section of the retention/detention system. The riser will typically be 24” in diameter or larger.
2) Remove the lid from the riser.
3) Measure the sediment buildup at each riser and cleanout location. Only certified confined space entry personnel having appropriate equipment should be permitted to enter the retention/detention System.
4) Inspect each manifold, all laterals, and outlet pipes for sediment build up, obstructions, or other problems. Obstructions should be removed at this time.
5) If measured sediment build up is between 5% - 20% of the pipe diameter, cleaning should be considered; if sediment build up exceeds 20%, cleaning should be performed at the earliest opportunity. A thorough cleaning of the system (manifolds and laterals) shall be performed by either manual methods or by a vacuum truck.

R-TANK MAINTENANCE

Designing an underground stormwater detention system with future maintenance in mind is a simple process that includes three primary objectives: **PREVENT** debris from entering the system by using good pre-treatment systems, **ISOLATE** debris and sediments that manage to enter the system, and **PROTECT** the body of the system by providing backflush mechanisms to ensure longevity.

1. PREVENT

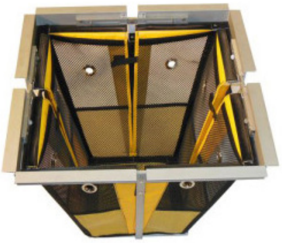
Keeping debris and sediment out of the system by pre-treating runoff is one of the smartest things an engineer can do when designing underground detention systems. It makes no sense to allow trash and sediments to flow unrestricted into an underground system where removal will be expensive. Instead, capture pollutants simply and inexpensively in the inlets, where removal is easy. There are several ways this can be accomplished with minimal cost impacts to your project.

Trash Guard Plus®

Trash Guard Plus®

Trash Guard Plus is a patented stormwater pretreatment device that traps debris, sediment and floatables in the inlet. It helps extend maintenance cycles by using the full volume of the inlet structure for sediment capacity. And it is easy to maintain by accessing pollutants through the manhole lid.

Trash Guard Plus works by both screening debris out of the runoff and by slowing the flow of runoff, causing sediments to fall to the bottom of the inlet. Testing at NC State has shown the Trash Guard to be effective at removing trash, sediment, nutrients, and metals.



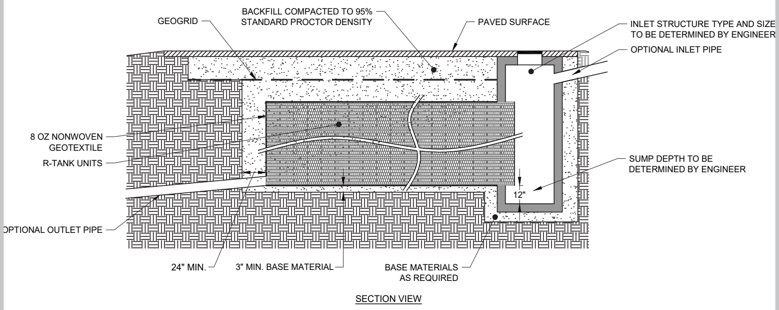
Gratemaster

Gratemaster

To treat a single inlet that serves as a junction for a larger drainage area, consider an insert like the Gratemaster. Ideal for capturing sediment and trash, it makes clean-up a snap by holding all the pollutants right near the surface for easy extraction.

R-Tank Screening

For a more centralized approach, some engineers prefer to create an opening in the inlet structures to allow the R-Tank modules to penetrate the structure to act as a trash screen. This works best with a structure that includes a sump (see drawing below).



SECTION VIEW

R-TANK MAINTENANCE

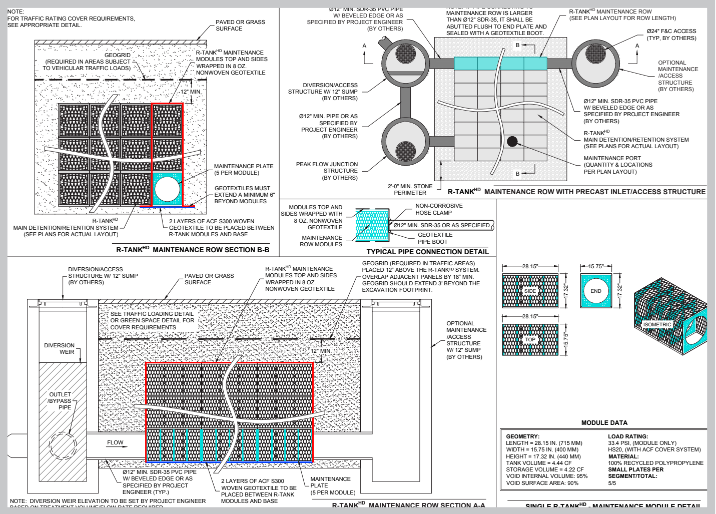
2. ISOLATE

Some pollutants may elude the pre-treatment systems. Trap these materials inside the maintenance row (see drawing to right). Consolidating sediments in a single location makes them easy to remove. Maintenance rows are formed by using maintenance modules, which have open internal components that are fully accessible by conventional jet-vac systems. These modules are set in a row (or multiple rows) to your desired length. Longer maintenance rows should include an access structure on both ends. Extremely long rows may require access from the middle of the row, as well.

The maintenance row is always wrapped in geotextile independently from the rest of the system. The geotextile retains trash, sediments, and other solids, preventing contamination of the rest of the system.

The maintenance row should be sized to treat the first flush (usually 1”) of runoff. Use a bypass structure to divert that flow into the maintenance row, and allow larger flows to continue to a downstream inlet where they can enter the R-Tank outside of the maintenance row.

The maintenance row is only available in LD, HD, and UD modules. For SD and XD modules, consider creating a forebay around the inlet locations to collect sediment. This is done by using a taller module installed at a lower invert. Geotextile baffles between the forebay and the rest of the system can help retain sediments. Concentrate Maintenance Ports (see PROTECT below) in the forebay to ensure access to sediment for removal.

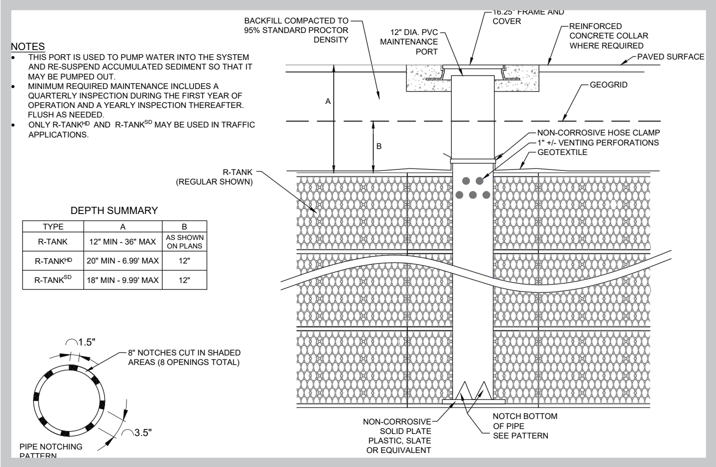


GEOMETRY:
LENGTH = 28.15 IN. (715 MM)
WIDTH = 15.75 IN. (400 MM)
HEIGHT = 17.32 IN. (440 MM)
TANK VOLUME = 4.44 CF
STORAGE VOLUME = 4.22 CF
VOID INTERNAL VOLUME: 95%
VOID SURFACE AREA: 90%

LOAD RATING:
33.4 PSI, (MODULE ONLY)
HS20, (WITH ACF COVER SYSTEM)
MATERIAL:
100% RECYCLED POLYPROPYLENE
SMALL PLATES PER SEGMENT/TOTAL:
5/5

3. PROTECT

Every good system has a fall-back plan. You can ensure a long system life by including maintenance ports throughout the system footprint to remove any pollutants that evade the pretreatment system and maintenance row. Maintenance ports should be specified within 10’ of inlet and outlet connections, and roughly 50’ on center (see maintenance port detail to right).



NOTES
- THIS PORT IS USED TO PUMP WATER INTO THE SYSTEM AND RE-SUSPEND ACCUMULATED SEDIMENT SO THAT IT MAY BE PUMPED OUT.
- MINIMUM REQUIRED MAINTENANCE INCLUDES A QUARTERLY INSPECTION DURING THE FIRST YEAR OF OPERATION AND A YEARLY INSPECTION THEREAFTER. FLUSH AS NEEDED.
- ONLY R-TANKHD AND R-TANKSD MAY BE USED IN TRAFFIC APPLICATIONS.

DEPTH SUMMARY

TYPE	A	B
R-TANK	12" MIN - 36" MAX	AS SHOWN ON PLANS
R-TANKHD	20" MIN - 6.99' MAX	12"
R-TANKSD	18" MIN - 9.99' MAX	12"

R TANK

R-TANK OPERATION, INSPECTION & MAINTENANCE

Operation

Your ACF R-Tank System has been designed to function in conjunction with the engineered drainage system on your site, the existing municipal infrastructure, and/or the existing soils and geography of the receiving watershed. Unless your site included certain unique and rare features, the operation of your R-Tank System will be driven by naturally occurring systems and will function autonomously. However, upholding a proper schedule of Inspection & Maintenance is critical to ensuring continued functionality and optimum performance of the system.

Inspection

Both the R-Tank and all stormwater pre-treatment features incorporated into your site must be inspected regularly. Inspection frequency for your system must be determined based on the contributing drainage area, but should never exceed one year between inspections (six months during the first year of operation).

Inspections may be required more frequently for pre-treatment systems. You should refer to the manufacturer requirements for the proper inspection schedule.

With the right equipment your inspection and measurements can be accomplished from the surface without physically entering any confined spaces. If your inspection does require confined space entry, you MUST follow all local/regional requirements as well as OSHA standards.

R-Tank Systems may incorporate Inspection Ports, Maintenance Ports, and/or adjoining manholes. Each of these features are easily accessed by removing the lid at the surface. With the cover removed, a visual inspection can be performed to identify sediment deposits within the structure. Using a flashlight, ALL access points should be examined to complete a thorough inspection.

Inspection Ports

Usually located centrally in the R-Tank System, these perforated columns are designed to give the user a base-line sediment depth across the system floor.

Maintenance Ports

Usually located near the inlet and outlet connections, you'll likely find deeper deposits of heavier sediments when compared to the Inspection Ports.

Manholes

Most systems will include at least two manholes - one at the inlet and another at the outlet. There may be more than one location where stormwater enters the system, which would result in additional manholes to inspect.

Bear in mind that these manholes often include a sump below the invert of the pipe connecting to the R-Tank. These sumps are designed to capture sediment before it reaches the R-Tank, and they should be kept clean to ensure they function properly. However, existence of sediment in the sump does NOT necessarily mean sediment has accumulated in the R-Tank.

After inspecting the bottom of the structure, use a mirror on a pole (or some other device) to check for sediment or debris in the pipe connecting to the R-Tank.

R-TANK OPERATION INSPECTION & MAINTENANCE

If sediment or debris is observed in any of these structures, you should determine the depth of the material. This is typically accomplished with a stadia rod, but you should determine the best way to obtain the measurement.

All observations and measurements should be recorded on an Inspection Log kept on file. We've included a form you can use at the end of this guideline.

Maintenance

The R-Tank System should be back-flushed once sediment accumulation has reached 6" or 15% of the total system height. Use the chart below as a guideline to determine the point at which maintenance is required on your system.

R-Tank Unit	Height	Max Sediment Dept
Mini	9.5"	1.5"
Single	17"	3"
Double	34"	5"
Triple	50"	6"
Quad	67"	6"
Pent	84"	6"

Before any maintenance is performed on your system, be sure to plug the outlet pipe to prevent contamination of the adjacent systems.

To back-flush the R-Tank, water is pumped into the system through the Maintenance Ports as rapidly as possible. Water should be pumped into ALL Maintenance Ports. The turbulent action of the water moving through the R-Tank will suspend sediments which may then be pumped out.

If your system includes an Outlet Structure, this will be the ideal location to pump contaminated water out of the system. However, removal of back-flush water may be accomplished through the Maintenance Ports, as well.

For systems with large footprints that would require extensive volumes of water to properly flush the system, you should consider performing your maintenance within 24 hours of a rain event. Stormwater entering the system will aid in the suspension of sediments and reduce the volume of water required to properly flush the system.

Once removed, sediment-laden water may be captured for disposal or pumped through a Dirtbag^{TM} (if permitted by the locality).

Step-By-Step Inspection & Maintenance Routine

1) **Inspection**
    a. Inspection Port
        i. Remove Cap
        ii. Use flashlight to detect sediment deposits
        iii. If present, measure sediment depth with stadia rod
        iv. Record results on Maintenance Log
        v. Replace Cap
    b. Maintenance Port/s
        i. Remove Cap
        ii. Use flashlight to detect sediment deposits
        iii. If present, measure sediment depth with stadia rod
        iv. Record results on Maintenance Log
        v. Replace Cap
        vi. Repeat for ALL Maintenance Ports
    c. Adjacent Manholes
        i. Remove Cover
        ii. Use flashlight to detect sediment deposits
        iii. If present, measure sediment depth with stadia rod, accounting for depth of sump (if present)
        iv. Inspect pipes connecting to R-Tank
        v. Record results on Maintenance Log
        vi. Replace Cover
        vii. Repeat for ALL Manholes that connect to the R-Tank

2) **Maintenance**
    a. Plug system outlet to prevent discharge of back-flush water
    b. Determine best location to pump out back-flush water
    c. Remove Cap from Maintenance Port
    d. Pump water as rapidly as possible (without over-topping port) into system until at least 1”
    of water covers system bottom
    e. Replace Cap
    f. Repeat at ALL Maintenance Ports
    g. Pump out back-flush water to complete back-flushing
    h. Vacuum all adjacent structures and any other structures or stormwater pre-treatment systems that require attention
    i. Sediment-laden water may be captured for disposal or pumped through a Dirtbag™.
    j. Replace any remaining Caps or Covers
    k. Record the back-flushing event in your Maintenance Log with any relevant specifics

ACF ENVIRONMENTAL
LET'S GET IT DONE

R-Tank Maintenance Log

Site Name:______________________________

Location:______________________________

System Owner:______________________________

Company Responsible for Maintenance:______________________________

Contact:______________________________

Phone Number:______________________________

Date	Location	Depth to Bottom	Depth to Sediment	Sediment Depth	Observations/Notes	Initials

For more information about our products, contact Inside Sales at 800.448.3636 or email at info@acfenv.com

CONSTRUCTION PHASE POLLUTION PREVENTION AND EROSION AND SEDIMENTATION CONTROL PLAN (BEST MANAGEMENT PRACTICES OPERATION AND MAINTENANCE PLAN)

for

JACKSON SQUARE

In

Weymouth, Massachusetts
Building B
(Assessor's Parcel IDs 23-253-17)

Submitted to:

TOWN OF WEYMOUTH

Prepared for:

Irakis N. Papachristos, Manager
864, 909, 910 Broad Street LLCs and
1409 Commercial Street
1 Franklin Street
Boston, Massachusetts 02110

Prepared by:

MCKENZIE
ENGINEERING GROUP

Professional Civil Engineering • Project Management • Land Planning
150 Longwater Drive, Suite 101, Norwell, Massachusetts 02061
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August 4, 2023
Revised September 6, 2023
Revised November 17, 2023

TABLE OF CONTENTS

Construction Phase Best Management Practices (BMP's)

Erosion and Sedimentation will be controlled at the site by utilizing Structural Practices, Stabilization Practices, and Dust Control.

Responsible Party Contact Information:

Stormwater Management System Owner:

Irakis N. Papachristos, Manager
864, 909, 910 Broad Street LLCs and
1409 Commercial Street
1 Franklin Street
Boston, MA 02110
Phone: (202) 230.1693

Town of Weymouth Contact Information:

Weymouth Department of Public Works
120 Winter Street
Weymouth, MA 02188
Phone: 781-337-5100

Weymouth Conservation Commission
Town Hall
75 Middle Street
Weymouth, MA 02189
Phone: (781) 340-5007

Weymouth Department of Municipal
Licenses and Inspections
Jeffrey E. Richards, C.B.O., Director
Town Hall
75 Middle Street
Weymouth, MA 02189
Phone: (781) 340-5004

Structural Practices:

1) Compost Filter Tube Barrier Controls – A compost filter tube barrier will be constructed along downward slopes at the limit of work in locations shown on the plans. This control will be installed prior to major soil disturbance on the site. The sediment silt sack barrier should be installed as shown on the Construction Detail Plan.

Compost Filter Tube Design/Installation Requirements *

a) Locate the compost filter tube where identified on the plans.

b) The compost filter tube line should be nearly level through most of its length to impound a broad, temporary pool. The last 10 to 20 feet at each end of the silt sack should be swung slightly uphill (approximately 0.5 feet in elevation) to provide storage capacity.

c) The compost filter tube shall be staked every 8 linear feet with 1-inch by 1-inch stakes.

d) Compost filter tubes should be removed when they have served their useful purpose, but not before the upslope area has been permanently stabilized through one growing season. Retained sediment must be removed and properly disposed of or mulched and seeded.

Compost Filter Tube Inspection/Maintenance *

a) Compost filter tubes should be inspected immediately after each rainfall event of 1-inch or greater, and at least daily during prolonged rainfall. Inspect the depth of sediment, fabric tears, and to see that the fence posts are firmly in the ground. Repair or replace as necessary.

b) Remove sediment deposits promptly after storm events to provide adequate storage volume for the next rain and to reduce pressure on the fence. Sediment will be removed from behind the sediment fence when it becomes about ½ foot deep at the compost filter tube. Take care to avoid undermining fence during cleanout.

c) If the fabric tears, decomposes, or in any way becomes ineffective, replace it immediately.

d) Remove all compost filter tube materials after the contributing drainage area has been properly stabilized. Sediment deposits remaining after the fabric has been removed should be graded to conform with the existing topography and vegetated.

2) Sediment Fence Controls – A sediment fence will be constructed along the limit of work as needed to prevent the spreading of fine sediments from the site. This control will be installed prior to major soil disturbance on the site. The sediment fence should be installed as shown on the Erosion Control Detail Plan and be Amoco woven polypropylene 1198 or equivalent.

Sediment Fence Design/Installation Requirements *

a) Locate the fence upland of the hay bale barriers and where identified on the plans.

b) The fence line should be nearly level through most of its length to impound a broad, temporary pool. The last 10 to 20 feet at each end of the fence should be swung slightly uphill (approximately 0.5 feet in elevation) to provide storage capacity.

c) Excavate a trench approximately 8 inches deep and 4 inches wide, or a V-trench; along the line of the fence, upslope side.

d) Fasten support wire fence (14 gauge with 6-inch mesh) securely to the upslope side of the fence posts with wire ties or staples. Wire should extend 6 inches into the trench.

e) Attach continuous length of fabric to upslope side of fence posts. Avoid joints, particularly at low points in the fence line. Where joints are necessary, fasten fabric securely to support posts and overlap to the next post.

f) Place the bottom one foot of fabric in the trench. Backfill with compacted earth or gravel.

g) Filter cloth shall be fastened securely to the woven wire fence with ties spaced every 24 inches at the top, mid-section, and bottom.

h) Sediment fences should be removed when they have served their useful purpose, but not before the upslope area has been permanently stabilized through one growing season and only following approval by the Engineering Department or their representative. Retained sediment must be removed and properly disposed of, or mulched and seeded.

<u>Sediment Fence Inspection/Maintenance *</u>

a) Silt fences should be inspected immediately after each rainfall event of 1-inch or greater, and at least daily during prolonged rainfall. Inspect the depth of sediment, fabric tears, if the fabric is securely attached to the fence posts, and to see that the fence posts are firmly in the ground. Repair or replace as necessary.

b) Remove sediment deposits promptly after storm events to provide adequate storage volume for the next rain and to reduce pressure on the fence. Sediment will be removed from behind the sediment fence when it becomes about ½ foot deep at the fence. Take care to avoid undermining fence during cleanout.

c) If the fabric tears, decomposes, or in any way becomes ineffective, replace it immediately.

d) Remove all fencing materials after the contributing drainage area has been properly stabilized. Sediment deposits remaining after the fabric has been removed should be graded to conform to the existing topography and vegetation.

3) **Stabilized Construction Entrance** – A stabilized construction entrance will be placed at the proposed entrance at Lovell Field. The construction entrance will keep mud and sediment from being tracked off the construction site by vehicles leaving the site. The stabilized construction entrance will be installed immediately after the clearing and grubbing of the roadway entrance and associated roadway fill to maintain access to the site are completed. The stabilized construction entrance shall be constructed as shown on the Construction Detail Plans.

Construction Entrance Design/Construction Requirements *

a) Stone for a stabilized construction entrance shall consist of 1 to 3-inch stone placed on a stable foundation.

b) Pad dimensions: The minimum length of the gravel pad should be 50 feet. The pad should extend the full width of the proposed roadway, or wide enough so that the largest construction vehicle will fit in the entrance with room to spare; whichever is greater.

c) A geotextile filter fabric shall be placed between the stone fill and the earth surface below the pad to reduce the migration of soil particles from the underlying soil into the stone and vice versa. The filter fabric should be Amoco woven polypropylene 1198 or equivalent.

d) Washing: If the site conditions are such that the majority of mud is not removed from the vehicle tires by the gravel pad, then the tires should be washed before the vehicle enters the street. The wash area shall be located at the stabilized construction entrance.

e) Water employed in the washing process shall be directed to the temporary dewatering area as shown on the plans prior to discharge. Sediment should be prevented from entering any watercourses.

Construction Entrance Inspection/Maintenance *

a) The entrance should be maintained in a condition that will prevent tracking or flowing of sediment onto Lovell Field and Commercial Street. This may require periodic topdressing with additional stone.

b) The construction entrance and sediment disposal area shall be inspected weekly and after heavy rains or heavy use.

c) Mud and sediment tracked or washed onto public road shall be immediately removed by sweeping.

d) Once mud and soil particles clog the voids in the gravel and the effectiveness of the gravel pad is no longer satisfactory, the pad must be topdressed with new stone. Replacement of the entire pad may be necessary when the pad becomes completely clogged.

e) If washing facilities are used, the dewatering area should be cleaned out as often as necessary to assure that adequate trapping efficiency and storage volume is available.

f) The pad shall be reshaped as needed for drainage and runoff control.

g) Broken road pavement on Lovell Field and Commercial Street shall be repaired immediately.

h) All temporary erosion and sediment control measures shall be removed within 30 days after final site stabilization is achieved or after the temporary practices are no longer needed and only following approval by the Public Works Department or their representative. Trapped sediment shall be removed or stabilized on site. Disturbed soil areas resulting from removal shall be permanently stabilized.

Stabilization Practices:

Stabilization measures shall be implemented as soon as practicable in portions of the site where construction activities have temporarily or permanently ceased, but in no case more than 14 days after the construction activity in that portion of the site has temporarily or permanently ceased, with the following exceptions.

- Where the initiation of stabilization measures by the 14th day after construction activity temporarily or permanently cease is precluded by snow cover, stabilization measures shall be initiated as soon as practicable.

- Where construction activity will resume on a portion of the site within 21 days from when activities ceased, (e.g. the total time period that construction activity is temporarily ceased is less than 21 days) then stabilization measures do not have to be initiated on that portion of the site by the 14th day after construction activity temporarily ceased.

- The contractor shall provide erosion control measures around all soil stockpiles.

1) **Temporary Seeding** – Temporary seeding will allow short–term vegetative cover on disturbed site areas that may be in danger of erosion. Temporary seeding will be done at stockpiles and disturbed portions of the site where construction activity will temporarily cease for at least 21 days. The temporary seedings will stabilize cleared and unvegetated areas that will not be brought into final grade for several weeks or months.

Temporary Seeding Planting Procedures *

a) Planting should preferably be done between April 1st and June 30th, and September 1st through September 31st. If planting is done in the months of July and August, irrigation may be required. If planting is done between October 1st and March 31st, mulching should be applied immediately after planting. If seeding is done during the summer months, irrigation of some sort will probably be necessary.

b) Before seeding, install structural practice controls. Utilize Amoco supergro or equivalent.

c) Select the appropriate seed species for temporary cover from the following table.

Species	Seeding Rate (lbs/1,000 sq.ft.)	Seeding Rate (lbs/acre)	Recommended Seeding Dates	Seed Cover required
Annual Ryegrass	1	40	April 1st to June 1st August 15th to Sept. 15th	¼ inch
Foxtail Millet	0.7	30	May 1st to June 30th	½ to ¾ inch
Oats	2	80	April 1st to July 1st August 15th to Sept. 15th	1 to 1-½ inch
Winter Rye	3	120	August 15th to Oct. 15th	1 to 1-½ inch

Apply the seed uniformly by hydroseeding, broadcasting, or by hand.

d) Use effective mulch, tacked and/or tied with netting to protect seedbed and encourage plant growth.

Temporary Seeding Inspection/Maintenance *

a) Inspect within 6 weeks of planting to see if stands are adequate. Check for damage within 24 hours of the end to heavy rainfall, defined as a 2-year storm event (i.e., 3.2 inches of rainfall within a twenty-four-hour period). Stands should be uniform and dense. Reseed and mulch damaged and sparse areas immediately. Tack or tie down mulch as necessary.

b) Seeds should be supplied with adequate moisture. Furnish water as needed, especially in abnormally hot or dry weather. Water application rates should be controlled to prevent runoff.

2) **Geotextiles** - Geotextiles such as jute netting will be used in combination with other practices such as mulching to stabilize slopes. The following geotextile materials or equivalent are to be utilized for structural and nonstructural controls as shown in the following table.

Practice	Manufacturer	Product	Remarks
Sediment Fence	Amoco	Woven polypropylene 1198 or equivalent	0.425 mm opening
Construction Entrance	Amoco	Woven polypropylene 2002 or equivalent	0.300 mm opening
Outlet Protection	Amoco	Nonwoven polypropylene 4551 or equivalent	0.150 mm opening
Erosion Control (slope stability)	Amoco	Supergro or equivalent	Erosion control revegetation mix, open polypropylene fiber on degradable polypropylene net scrim

Amoco may be reached at (800) 445-7732

Geotextile Installation

a) Netting and matting require firm, continuous contact between the materials and the soil. If there is no contact, the material will not hold the soil and erosion will occur underneath the material.

Geotextile Inspection/Maintenance *

a) In the field, regular inspections should be made to check for cracks, tears, or breaches in the fabric. The appropriate repairs should be made.

3) **Mulching and Netting** – Mulching will provide immediate protection to exposed soils during the period of short construction delays, or over winter months through the application of plant residues, or other suitable materials, to exposed soil areas. In areas, which have been seeded either for temporary or permanent cover, mulching should immediately follow seeding. On steep slopes, mulch must be supplemented with netting.

Mulch Maintenance *

a) Inspect after rainstorms to check for movement of mulch or erosion. If washout, breakage, or erosion occurs, repair surface, reseed, remulch, and install new netting.

b) Grass mulches that blow or wash away should be repaired promptly.

c) If plastic netting is used to anchor mulch, care should be taken during initial mowings to keep the mower height high. Otherwise, the netting can wrap up on the mower blade shafts. After a period of time, the netting degrades and becomes less of a problem.

d) Continue inspections until vegetation is well established.

4) Land Grading – Grading on fill slopes, cut slopes, and stockpile areas will be done with full siltation controls in place.

Land Grading Design/Installation Requirements

a) Areas to be graded should be cleared and grubbed of all timber, logs, brush, rubbish, and vegetated matter that will interfere with the grading operation. Topsoil should be stripped and stockpiled for use on critical disturbed areas for establishment of vegetation. Cut slopes to be topsoiled should be thoroughly scarified to a minimum depth of 3-inches prior to placement of topsoil.

b) Fill materials should be generally free of brush, rubbish, rocks, and stumps. Frozen materials or soft and easily compressible materials should not be used in fills intended to support buildings, parking lots, roads, conduits, or other structures.

c) Earth fill intended to support structural measures should be compacted to a minimum of 90 percent of Standard Proctor Test density with proper moisture control, or as otherwise specified by the engineer responsible for the design. Compaction of other fills should be to the density required to control sloughing, erosion or excessive moisture content. Maximum thickness of fill layers prior to compaction should not exceed 9 inches.

d) The uppermost one foot of fill slopes should be compacted to at least 85 percent of the maximum unit weight (based on the modified AASHTO compaction test). This is usually accomplished by running heavy equipment over the fill.

e) Fill should consist of material from borrow areas and excess cut will be stockpiled in areas shown on the Site Plans. All disturbed areas should be free draining, left with a neat and finished appearance, and should be protected from erosion.

f) Infiltration basins shall be excavated, graded and shaped to subgrade elevation and shall then be suitably protected with installation of erosion control measures to prevent sediment-laden runoff from washing into the basins. The basins shall also be protected from heavy equipment activity from this point forward. Prior to application of loam and seed to infiltration basin surfaces, the contractor shall

remove any unsuitable soil such as silt or clay that may have been deposited during construction. The surface shall be scarified with a York rake or other small tractor mounted equipment. The loam and seed shall then be applied as required by this document.

Land Grading Stabilization Inspection/Maintenance *

a) All slopes should be checked periodically to see that vegetation is in good condition. Any rills or damage from erosion and animal burrowing should be repaired immediately to avoid further damage.

b) If seeps develop on the slopes, the area should be evaluated to determine if the seep will cause an unstable condition. Subsurface drains or a gravel mulch may be required to solve seep problems. However, no seeps are anticipated.

c) Areas requiring revegetation should be repaired immediately. Control undesirable vegetation such as weeds and woody growth to avoid bank stability problems in the future.

5) **Topsoiling *** – Topsoiling will help establish vegetation on all disturbed areas throughout the site during the seeding process. The soil texture of the topsoil to be used will be a sandy loam to a silt loam texture with 15% to 20% organic content.

Topsoiling Placement

a) Topsoil should not be placed while in a frozen or muddy condition, when the subgrade is excessively wet, or when conditions exist that may otherwise be detrimental to proper grading or proposed seeding.

b) Do not place topsoil on slopes steeper than 2.5:1, as it will tend to erode.

c) If topsoil and subsoil are not properly bonded, water will not infiltrate the soil profile evenly and it will be difficult to establish vegetation. The best method is to actually work the topsoil into the layer below for a depth of at least 6 inches.

6) **Permanent Seeding** – Permanent Seeding should be done immediately after the final design grades are achieved. Native species of plants should be used to establish perennial vegetative cover on disturbed areas. The revegetation should be done early enough in the fall so that a good cover is established before cold weather comes and growth stops until the spring. A good cover is defined as vegetation covering 75 percent or more of the ground surface.

Permanent Seeding Seedbed Preparation

a) In infertile or coarse-textured subsoil, it is best to stockpile topsoil and re-spread it over the finished slope at a minimum 2 to 6-inch depth and roll it to provide a firm seedbed. The topsoil must have a sandy loam to silt loam texture with 15% to 20% organic content. If construction fill operations have left soil exposed with a loose, rough, or irregular surface, smooth with blade and roll.

b) Loosen the soil to a depth of 3-5 inches with suitable agricultural or construction equipment.

c) Areas not to receive topsoil shall be treated to firm the seedbed after incorporation of the lime and fertilizer so that it is depressed no more than ½ - 1 inch when stepped on with a shoe. Areas to receive topsoil shall not be firmed until after topsoiling and lime and fertilizer is applied and incorporated, at which time it shall be treated to firm the seedbed as described above.

Permanent Seeding Grass Selection/Application

a) Select an appropriate cool or warm season grass based on site conditions and seeding date. Apply the seed uniformly by hydro-seeding, broadcasting, or by hand. Uniform seed distribution is essential. On steep slopes, hydroseeding may be the most effective seeding method. Surface roughening is particularly important when preparing slopes for hydroseeding.

b) Lime and fertilize. Organic fertilizer shall be utilized in areas within the 100 foot buffer zone to a wetland resource area.

c) Mulch the seedings with straw applied at the rate of ½ tons per acre. Anchor the mulch with erosion control netting or fabric on sloping areas. Amoco supergro or equivalent should be utilized.

Permanent Seeding Inspection/Maintenance *

a) Frequently inspect seeded areas for failure and make necessary repairs and reseed immediately. Conduct or follow-up survey after one year and replace failed plants where necessary.

b) If vegetative cover is inadequate to prevent rill erosion, overseed and fertilize in accordance with soil test results.

c) If a stand has less than 40% cover, reevaluate choice of plant materials and quantities of lime and fertilizer. Re-establish the stand following seedbed preparation and seeding recommendations, omitting lime and fertilizer in the absence of soil test results. If the season prevents resowing, mulch or jute netting is an effective temporary cover.

d) Seeded areas should be fertilized during the second growing season. Lime and fertilize thereafter at periodic intervals, as needed.

Fueling and Maintenance of Equipment and Vehicles:

1. Refueling/maintenance Rules – The site supervisor shall produce a written document received by all subcontractors and employees that delineates their responsibilities on site. This document shall include language that shall permit the maintenance of vehicles only in designated locations on the job site. In the event of mechanical failure of a vehicle, the vehicle shall be moved to the designated maintenance area on the site to perform maintenance. The site supervisor shall document receipt of these instructions by obtaining the

signatures of subcontractors and individuals that may enter the site and the date in which they were notified of their responsibilities. Refueling for vehicles or equipment shall occur either within the designated washout area or shall utilize temporary drip protection measures at the location of fueling. The site supervisor or their representative shall be present at the time of any fueling procedure. The site supervisor shall have a fuel spill plan and measures on site to initiate containment and clean-up in the event a fuel spill occurs.

2. Installation Schedule: Prior to start of Work

3. Maintenance and Inspection: The site supervisor shall maintain a log of individuals receiving these instructions.

4. Specific Pollution Prevention Practices

   Pollution Prevention Practice # 1

   a. Description: Fueling operations shall take place in designated area(s) as shown on site maps. Provide temporary drip protection during fueling operations which take place outside of designated area(s). Materials necessary to address a spill shall be made readily available in a location known to the site supervisor or his/her designee.

   b. Installation: Fueling operation procedures shall be in effect throughout the project duration.

   c. Maintenance Requirements: All emergency response equipment listed in the Emergency Response Equipment Inventory shall be made readily available and kept in a designated location known to the site supervisor or his/her designee. All such materials shall be replenished as necessary to the listed amounts.

Dust Control:

Dust control will be utilized throughout the entire construction process of the site. For example, keeping disturbed surfaces moist during windy periods will be an effective control measure, especially for construction access roads. The use of dust control will prevent the movement of soil to offsite areas. However, care must be taken to not create runoff from excessive use of water to control dust. The following are methods of Dust Control that may be used on-site:

- Vegetative Cover – The most practical method for disturbed areas not subject to traffic.
- Calcium Chloride – Calcium chloride may be applied by mechanical spreader as loose, dry granules or flakes at a rate that keeps the surface moist but not so high as to cause water pollution or plant damage.
- Sprinkling – The site may be sprinkled until the surface is wet. Sprinkling will be effective for dust control on haul roads and other traffic routes.
- Stone – Stone will be used to stabilize construction roads; will also be effective for dust control.

The general contractor shall employ an on-site water vehicle for the control of dust as necessary.

Non-Stormwater Discharges:

The construction de-watering and all non-stormwater discharges will be directed into a sediment dirt bag (or equivalent inlet protection) or a sediment basin. Sediment material removed shall be disposed of in accordance with all applicable local, state, and federal regulations.

The developer and site general contractor will comply with the E.P.A.'s Final General Permit for Construction De-watering Discharges, (N.P.D.E.S., Section 402 and 40 C.F.R. 122.26(b)(14)(x).

Inspection/Maintenance:

Operator personnel must inspect the construction site at least once every 14 calendar days and within 24 hours of a storm event of ½-inch or greater. The applicant shall be responsible to secure the services of a design professional or similar professional (inspector) on an on-going basis throughout all phases of the project. Refer to the Inspection/Maintenance Requirements presented earlier in the "Structural and Stabilization Practices." The inspector should review the erosion and sediment controls with respect to the following:

- Whether or not the measure was installed/performed correctly.
- Whether or not there has been damage to the measure since it was installed or performed.
- What should be done to correct any problems with the measure.

The inspector should complete the Stormwater Management Construction Phase BMP Inspection Schedule and Evaluation Checklist, as attached, for documenting the findings and should request the required maintenance or repair for the pollution prevention measures when the inspector finds that it is necessary for the measure to be effective. The inspector should notify the appropriate person to make the changes and submit copies of the form to the Weymouth Highway Department.

Project Location: Jackson Square, Parcel IDs 23-253-17, Weymouth, MA **Date:**
Stormwater Management – Construction Phase
Best Management Practices – Inspection Schedule and Evaluation Checklist

Construction Practices

Best Management Practice	Inspection Frequency	Date Inspected	Inspector	Minimum Maintenance and Key Items to Check	Cleaning/Repair Needed: (List Items)	Date of Cleaning/ Repair	Performed by
Silt Sock and Sediment Fence Controls	After heavy rainfall events (minimum weekly)			1. Sediment Fence Design/Installation Requirements 2. Sediment Fence Inspection/Maintenance	☐yes ☐no		
Stabilized Construction Entrance	After heavy rainfall events (minimum weekly)			1. Construction Entrance Design/ Construction Requirements 2. Construction Entrance Inspection/ Maintenance	☐yes ☐no		
Temporary Seeding	After heavy rainfall events (minimum weekly)			1. Temporary Seeding Planting Procedures 2. Temporary Seeding Inspection/ Maintenance	☐yes ☐no		
Geotextiles	After heavy rainfall events (minimum weekly)			1. Geotextile Inspection/Maintenance	☐yes ☐no		
Mulching & Netting	After heavy rainfall events (minimum weekly)			1. Mulch Maintenance	☐yes ☐no		
Land Grading	After heavy rainfall events (minimum weekly)			1. Land Grading Stabilization Inspection/ Maintenance	☐yes ☐no		

Project Location: Jackson Square, Parcel IDs 23-253-17, Weymouth, MA **Date:**
Stormwater Management – Construction Phase
Best Management Practices – Inspection Schedule and Evaluation Checklist

Construction Practices

Permanent Seeding	After heavy rainfall events (minimum weekly)			1. Permanent Seeding Inspection/ Maintenance	☐**yes** ☐**no**		
Dust Control	After heavy rainfall events (minimum weekly)				☐**yes** ☐**no**		
Soil Stockpiling	After heavy rainfall events (minimum weekly)				☐**yes** ☐**no**		

(1) Refer to the Massachusetts Stormwater Handbook issued January 2, 2008.

Notes (Include deviations from : Definitive Subdivision Decision and Special Conditions and Approved Plan):

Stormwater Control Manager ________________________________

Spill Containment and Management Plan

Initial Notification

In the event of a spill, the facility manager will be notified immediately.

Facility Managers (name)	Irakis N. Papachristos, Manager 1 Franklin Street, Boston, MA 02110
Facility Manager (phone)	203-230.1693

Assessment - Initial Containment

The supervisor will assess the incident and initiate containment control measures with the appropriate spill containment equipment included in the spill kit kept on-site. The supervisor will first contact the Fire Department and then notify the Police Department, Department of Public Works, Board of Health and Conservation Commission. The fire department is ultimately responsible for matters of public health and safety and should be notified immediately.

Contact:	Phone Number:
Fire Department:	911
Police Department:	911
Department of Public Works:	(781) 337-5100
Board of Health Phone:	(781) 335-2000
Conservation Commission Phone:	(781) 340-5007

Further Notification

Based on the assessment from the Fire Chief, additional notification to a cleanup contractor may be made. The Massachusetts Department of Environmental Protection (DEP) and the EPA may be notified depending upon the nature and severity of the spill. The Fire Chief will be responsible for determining the level of cleanup and notification required. The attached list of emergency phone numbers shall be posted in the facility office and readily accessible to all employees.

HAZARDOUS WASTE / OIL SPILL REPORT

Date____/_____/_____ Time____________ AM / PM

Exact location (Transformer #)____

Type of equipment___________________________Make_____________Size______________

S / N_________________________________Weather Conditions________________________

On or near water ☐ Yes If yes, name of body of water____________________

☐ No

Type of chemical / oil spilled__________________________

Amount of chemical / oil spilled________________________

Cause of spill____

____

____

Measures taken to contain or clean up spill___________________________________

____

____

Amount of chemical / oil recovered________________Method____________________________

Material collected as a result of clean up

_____________drums containing____

_____________drums containing____

_____________drums containing____

Location and method of debris disposal______________________________________

____

Name and address of any person, firm, or corporation suffering damages____________________

____

Procedures, method, and precautions instituted to prevent a similar occurrence from recurring___

____

Spill reported to General Office by__________________________Time_____________AM / PM

Spill reported to DEP / National Response Center by__________________________________

DEP Date____/_____/_____ Time_________ AM / PM Inspector_______________

NRC Date____/_____/_____ Time_________ AM / PM Inspector_______________

Additional comments____

____

____

EMERGENCY RESPONSE EQUIPMENT
INVENTORY

The following equipment and materials shall be maintained at all times and stored in a secure area for long-term emergency response need.

--	SORBENT PADS	1 BALE
--	SAND BAGS (empty)	5
--	SPEEDI-DRI ABSORBENT	2 – 40LB BAGS
--	12” INFLATABLE PIPE PLUG	1
--	SQUARE END SHOVELS	1
--	PRY BAR	1
--	CATCH BASIN COVER	1

EMERGENCY NOTIFICATION PHONE NUMBERS

1. FACILITY MANAGER

NAME: ________________ BEEPER: ______________________
PHONE: ________________ CELL PHONE: ________________

ALTERNATE:

NAME: ________________ BEEPER: N/A ___________________
PHONE: ________________ CEL PHONE: N/A ________________

2. FIRE DEPARTMENT

EMERGENCY: 911
BUSINESS: (781) 337-5151

POLICE DEPARTMENT

EMERGENCY: 911
BUSINESS: (781) 335-1212

DEPARTMENT OF PUBLIC WORKS

CONTACT: Director – Kenan Connell
BUSINESS: (781) 337-5100

CONSERVATION COMMISSION

CONTACT: Andrew Hultin
BUSINESS: (781) 340-5007

BOARD OF HEALTH

CONTACT: Board of Health Agent Clerk – Clare LaMorte, RN
BUSINESS: (781) 335-2000

3. MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION

EMERGENCY: (617) 556-1133
SOUTHEAST REGION - LAKEVILLE OFFICE: (508) 946-2700

4. NATIONAL RESPONSE CENTER

PHONE: (800) 424-8802

ALTERNATE: U.S. ENVIRONMENTAL PROTECTION AGENCY

EMERGENCY: (617) 223-7265
BUSINESS: (617) 860-4300

POST-DEVELOPMENT BEST MANAGEMENT PRACTICE OPERATION AND MAINTENANCE PLAN & LONG-TERM POLLUTION PREVENTION PLAN

for

JACKSON SQUARE

In

Weymouth, Massachusetts
Building B
(Assessor's Parcel IDs 23-253-17)

Submitted to:

TOWN OF WEYMOUTH

Prepared for:

Irakis N. Papachristos, Manager
864, 909, 910 Broad Street LLCs and
1409 Commercial Street
1 Franklin Street
Boston, Massachusetts 02110

Prepared by:

MEG
MCKENZIE
ENGINEERING GROUP

Professional Civil Engineering • Project Management • Land Planning
150 Longwater Drive, Suite 101, Norwell, Massachusetts 02061
Tel.: (781) 792-3900 Facsimile: (781) 792-0333
www.mckeng.com

August 4, 2023
Revised September 6, 2023
Revised November 17, 2023

TABLE OF CONTENTS

Post-Development Best Management Practice
Operation and Maintenance Plan &
Long-Term Pollution Prevention Plan

Post-Development Best Management Practices (BMPs) Operation and Maintenance Plan

Responsible Party/Property Owner/Developer contact information:

Property Owner:

Irakis N. Papachristos, Manager
864, 909, 910 Broad Street LLCs and
1409 Commercial Street
1 Franklin Street
Boston, MA 02110
Phone: (202) 230.1693

Developer Contact Information:

Irakis N. Papachristos, Manager
864, 909, 910 Broad Street and
1409 Commercial Street
1 Franklin Street
Boston, MA 02110
Phone: (202) 230.1693

City of Weymouth Contact Information:

Weymouth Department of Public Works
120 Winter Street
Weymouth, MA 02188
Phone: 781-337-5100

Best Management Practices (BMPs) of the Commonwealth of Massachusetts Department of Environmental Protection's (DEP's) Stormwater Management Policy (SMP) have been implemented and utilized for the project. The following information provided is to be used as a guideline for monitoring and maintaining the performance of the drainage facilities and to ensure that the quality of water runoff meets the standards set forth by the SMP. The structural Best Management Practices (BMPs) shall be inspected during rainfall conditions during the first year of operation to verify functionality.

All BMPs located within the drainage easements will be owned and maintained by the developer until such a time that a homeowners association is created, then the homeowners association will maintain the BMPs.

BMPs included in the design consist of the use of:

- Stormceptor units
- Subsurface Infiltration systems
- Roadway pavement maintenance

Operation:

Once the stormwater management systems have been constructed and site has been permanently stabilized and put into action, the operation of the stormwater management system will function as intended. Stormwater runoff is directed into the trench drain to the First Defense unit, and lastly to the subsurface infiltration system. The stormwater management systems have been designed to attenuate peak flows for the 2-year through 100-year storm events.

Maintenance:

1. **Paved Areas** –Sweepers shall sweep paved areas periodically during dry weather to remove excess sediments and to reduce the amount of sediments that the drainage system shall have to remove from the runoff. The sweeping shall be conducted primarily between March 15th and November 15th. Special attention should be made to sweeping paved surfaces in March and April before spring rains wash residual sand into the drainage system.

   The frequency of sweeping shall average:

   - Monthly if by a high-efficiency vacuum sweeper
   - Bi-weekly if by a regenerative air sweeper
   - Weekly if by a mechanical sweeper

   Salt used for de-icing on the parking lot during winter months shall be limited as much as possible as this will reduce the need for removal and treatment. Sand containing the minimum amount of calcium chloride (or approved equivalent) needed for handling may be applied as part of the routine winter maintenance activities.

   Cost: The property owner should consult local sweeping contractors for detailed cost estimates.

2. **Proprietary Pretreatment Units –** The proprietary pretreatment units shall be inspected and maintained from the surface, without entry into the unit a minimum of annually and following heavy rain events. Perform maintenance once the stored volume reaches 15% of the unit capacity, or immediately in the event of a spill. Perform Maintenance at quarterly intervals during the first year of installation, so an accurate maintenance schedule can be established. Sediment and debris should be removed through the 12-inch diameter outlet pipe. Alternatively, oil and floatables should be removed through the 12-inch oil inspection port. The requirements for the disposal from the units should be in compliance with all local, state and federal regulations. Consult the Natick Board of Health for transfer station locations prior to disposing the separator contents. Please refer to the Manufacturer's Manual for additional detail on proper inspection and maintenance of the First Defense units.

   Cost: Cleaning should be included along with the routine maintenance of the catch basins. The property owner should consult local vacuum cleaning contractors for detailed cost estimates.

3. **Subsurface Infiltration Tank System** –Proper maintenance of the subsurface infiltration system is essential to the long-term effectiveness of the infiltration function. The subsurface infiltration system shall have inspection ports and additional inspections should be scheduled during the first few months to ensure

proper stabilization and function. Thereafter, they shall be checked semiannually and following heavy rainfalls, defined as a 1-year storm event exceeding 2.5 inches of rainfall within a twenty-four-hour period. Water levels in the chambers shall be checked to verify proper drainage. Ponding water in a chamber indicates failure from the bottom. If water remains within the chambers after 48-hours following a storm event, steps to restore the infiltration function shall be taken, as directed by a qualified stormwater management professional. In order to rectify the problem, accumulated sediment must be removed from the bottom of the chamber. The stone aggregate and filter fabric must be removed and replaced, and the underlying soil layer must be scarified to encourage proper infiltration. Material removed from the system shall be disposed of in accordance with all applicable local, state, and federal regulations. Please refer to the Manufacturer's Manual for additional details on proper inspection and maintenance of the R-Tank chambers.

Cost: The property owner should consult local landscape contractors for a detailed cost estimate.

4. **Trench Drains -** Trench drain grates shall be checked quarterly and following heavy rainfalls to verify that the inlet openings are not clogged by debris. Debris shall be removed from the grates and disposed of in accordance with all applicable regulations.

   Cost: The property owner should consult local landscape contractors for a detailed cost estimate.

5. **Pesticides, Herbicides, and Fertilizers -** Pesticides and herbicides shall be used sparingly. Fertilizers should be restricted to the use of organic fertilizers only.

   All structural BMP's as identified on the site plans will be owned and maintained by the homeowner's association of the development and shall run with the title of the property.

   Cost: Included in the routine landscaping maintenance schedule. The Owner should consult local landscaping contractors for details.

6. **Snow Removal -** Snow accumulations removed from access road should be placed in upland areas only, where sand and other debris will remain after snowmelt for later removal. Excess snow should be removed from the site and properly disposed of in an approved snow disposal facility. Care must be exercised not to deposit snow in the in areas where sand and debris can get into the watercourse.

   Cost: The owner should consult local snow removal contractors for a detailed cost estimate.

Maintenance Responsibilities:

All post construction maintenance activities will be documented and kept on file. Annual inspection reports in the form of an Evaluation Checklist, see attached form, will be submitted to the City of Weymouth. Inspections shall be performed by a licensed engineer or similar professional (inspector).

All BMPs located within the drainage easements will be owned and maintained by the developer until such a time that a homeowners association is created, then the homeowners association will maintain the BMPs.

Long-Term Pollution Prevention Plan

Good Housekeeping:

To develop and implement an operation and maintenance program with the goal of preventing or reducing pollutant runoff by keeping potential pollutants from coming into contact with stormwater or being transported off site without treatment, the following efforts will be made:

- Property Management awareness and training on how to incorporate pollution prevention techniques into maintenance operations.
- Follow appropriate best management practices (BMPs) by proper maintenance and inspection procedures.
- Homeowner education outreach, including promoting recycling through the City of Weymouth Transfer Station.

Storage and Disposal of Household Waste and Toxics:

This management measure involves educating the general public on the management considerations for hazardous materials. Failure to properly store hazardous materials dramatically increases the probability that they will end up in local waterways. Many people have hazardous chemicals stored throughout their homes, especially in garages and storage sheds. Practices such as covering hazardous materials or even storing them properly, can have dramatic impacts. Property owners are encouraged to support the household hazardous product collection events sponsored by the City of Weymouth.

MADEP has prepared several materials for homeowners on how to properly use and dispose of household hazardous materials:

http://www.mass.gov/dep/recycle/reduce/househol.htm

For consumer questions on household hazardous waste call the following number:

DEP Household Hazardous Waste Hotline 800-343-3420

The following is a list of management considerations for hazardous materials as outlined by the EPA:

- Ensuring sufficient aisle space to provide access for inspections and to improve the ease of material transport;
- Storing materials well away from high-traffic areas to reduce the likelihood of accidents that might cause spills or damage to drums, bags, or containers.
- Stacking containers in accordance with the manufacturers' directions to avoid damaging the container or the product itself;
- Storing containers on pallets or equivalent structures. This facilitates inspection for leaks and prevents the containers from coming into contact with wet floors, which can cause corrosion. This consideration also reduces the incidence of damage by pests.

The following is a list of commonly used hazardous materials used in the household:

Batteries – automotive and rechargeable
  nickel cadmium batteries
  (no alkaline batteries)
Gasoline
Oil-based paints
Fluorescent light bulbs and lamps
Pool chemicals
Propane tanks
Lawn chemicals,
fertilizers and weed killers
Turpentine
Bug sprays
Antifreeze
Paint thinners, strippers, varnishes and
  stains
Arts and crafts chemicals
Charcoal lighter fluid
Disinfectant
Drain clog dissolvers
Driveway sealer
Flea dips, sprays and collars
Houseplant insecticides
Metal polishes
Mothballs
Motor oil and filters
Muriatic acid (concrete cleaner)
Nail polishes and nail polish removers
Oven cleaner
Household pest and rat poisons
Rug and upholstery cleaners
Shoe polish
Windshield wiper fluid

<u>Landscape Maintenance:</u>

This management measure seeks to control the storm water impacts of landscaping and lawn care practices through education and outreach on methods that reduce nutrient loadings and the amount of storm water runoff generated from lawns. Nutrient loads generated by fertilizer use on suburban lawns can be significant, and recent research has shown that lawns produce more surface runoff than previously thought.

Using proper landscaping techniques can effectively increase the value of a property while benefiting the environment. These practices can benefit the environment by reducing water use; decreasing energy use (because less water pumping and treatment is required); minimizing runoff of storm and irrigation water that transports soils, fertilizers, and pesticides; and creating additional habitat for plants and wildlife. The following lawn and landscaping management practices will be encouraged:

- Mow lawns at the highest recommended height.
- Minimize lawn size and maintain existing native vegetation.
- Collect rainwater for landscaping/gardening needs (rain barrels and cisterns to capture roof runoff).
- Raise public awareness for promoting the water efficient maintenance practices by informing users of water efficient irrigation techniques and other innovative approaches to water conservation.
- Abide by water restrictions and other conservation measures implemented by the City of Weymouth.
- Water only when necessary.
- Use automatic irrigation systems to reduce water use.

Integrated Pest Management (IPM):

This management measure seeks to limit the adverse impacts of insecticides and herbicides by providing information on alternative pest control techniques other than chemicals or explaining how to determine the correct dosages needed to manage pests.

The presence of pesticides in stormwater runoff has a direct impact on the health of aquatic organisms and can present a threat to humans through contamination of drinking water supplies. The pesticides of greatest concern are insecticides, such as diazinon and chloropyrifos, which even at very low levels can be harmful to aquatic life. The major source of pesticides to urban steams is home application of products designed to kill insects and weeds in the lawn and garden. The following IPM practices will be encouraged:

- Lawn care and landscaping management programs including appropriate pesticide use management as part of program.
- Raise public awareness by referring homeowners to "A Homeowner's Guide to Environmentally Sound Lawncare, Maintaining a Healthy Lawn the IPM Way", Massachusetts Department of Food and Agriculture, Pesticide Bureau or link **http://www.mass.gov/dep/water/resources/nonpoint.htm#megaman>**

Illicit Discharges:

Illicit discharges are non-stormwater discharges to the storm drain system which typically contain bacteria and other pollutants. All illicit discharges are prohibited. Any illicit discharges should be reported to MassDOT and/or the DPW as applicable to be addressed in accordance with their respective policies.

The following is a list of EPA allowed non-stormwater discharges. If the non-stormwater discharge is not listed, it is prohibited.

1. Water line flushing,
2. Landscape irrigation,
3. Diverted stream flows,
4. Rising ground waters,
5. Uncontaminated ground water infiltration (as defined at 40 CFR 35.2005(20)),
6. Uncontaminated pumped ground water,
7. Discharge from potable water sources,
8. Foundation drains,
9. Air conditioning condensation,
10. Irrigation water, springs,
11. Water from crawl space pumps,
12. Footing drains,
13. Lawn watering,
14. Flows from riparian habitats and wetlands,
15. Street wash water,
16. Discharges or flows from firefighting activities occur during emergency conditions.

Project Location: Jackson Square, Assessor's Parcel IDs 23-305-1, 23-305-4, 23-205-9, 23-305-10, 23-305-11, Weymouth, MA

Stormwater Management – Post Construction Phase
Best Management Practices – Inspection Schedule and Evaluation Checklist

Long Term Practices

Best Management Practice	Inspection Frequency (1)	Date Inspected	Inspector	Minimum Maintenance and Key Items to Check (1)	Cleaning/Repair Needed: ☐yes ☐no (List Items)	Date of Cleaning/ Repair	Performed by
Street Sweeping Maintenance	4-times annually - specifically in Spring and Fall			1. Sediment build-up 2. Trash and debris 3. Minor Spills (vehicular)			
Proprietary Pretreatment Units	After heavy rainfall events (minimum annually)			1. Sediment level exceeds Manufacturer's specification 2. Trash and debris 3. Floatable oils or hydrocarbons 4. Outlet blockages			
Subsurface Infiltration Tanks	After heavy rainfall events (minimum semi-annually)			1. Sediment build-up 2. Standing Water greater than 48 hours			
Trench Drains	After heavy rainfall events (minimum quarterly)			1. Sediment level exceeds 8" 2. Trash and debris 3. Floatable oils or hydrocarbons 4. Grate or outlet blockages			

(1) Refer to the Massachusetts Stormwater Management, Volume Two: Stormwater Technical Handbook (February 2008) for recommendations regarding frequency for inspection and maintenance of specific BMP's.

Notes (Include deviations from: Con Com Order of Conditions, PB Approval, Construction Sequence and Approved Plan):
1.

Stormwater Control Manager ________________________________

Stamp:

Spill Containment and Management Plan

Initial Notification

In the event of a spill, the facility manager will be notified immediately.

Facility Managers (name)	Irakis N. Papachristos, Manager 1 Franklin Street, Boston, MA 02110
Facility Manager (phone)	203-230.1693

Assessment - Initial Containment

The supervisor will assess the incident and initiate containment control measures with the appropriate spill containment equipment included in the spill kit kept on-site. The supervisor will first contact the Fire Department and then notify the Police Department, Department of Public Works, Board of Health and Conservation Commission. The fire department is ultimately responsible for matters of public health and safety and should be notified immediately.

Contact:	Phone Number:
Fire Department:	911
Police Department:	911
Department of Public Works:	(781) 337-5100
Board of Health Phone:	(781) 335-2000
Conservation Commission Phone:	(781) 340-5007

Further Notification

Based on the assessment from the Fire Chief, additional notification to a cleanup contractor may be made. The Massachusetts Department of Environmental Protection (DEP) and the EPA may be notified depending upon the nature and severity of the spill. The Fire Chief will be responsible for determining the level of cleanup and notification required. The attached list of emergency phone numbers shall be posted in the facility office and readily accessible to all employees.

HAZARDOUS WASTE / OIL SPILL REPORT

Date____/_____/_____ Time____________ AM / PM

Exact location (Transformer #)____

Type of equipment___________________________Make_____________Size______________

S / N_________________________________Weather Conditions________________________

On or near water ☐ Yes If yes, name of body of water____________________

☐ No

Type of chemical / oil spilled__________________________

Amount of chemical / oil spilled________________________

Cause of spill____

____

____

Measures taken to contain or clean up spill____________________________________

____

____

Amount of chemical / oil recovered________________Method____________________________

Material collected as a result of clean up

_____________drums containing____

_____________drums containing____

_____________drums containing____

Location and method of debris disposal____

____

Name and address of any person, firm, or corporation suffering damages____________________

____

Procedures, method, and precautions instituted to prevent a similar occurrence from recurring___

____

Spill reported to General Office by___________________________Time_____________AM / PM

Spill reported to DEP / National Response Center by___________________________________

DEP Date____/_____/_____ Time_________ AM / PM Inspector_______________

NRC Date____/_____/_____ Time_________ AM / PM Inspector_______________

Additional comments____

____

____

EMERGENCY RESPONSE EQUIPMENT
INVENTORY

The following equipment and materials shall be maintained at all times and stored in a secure area for long-term emergency response need.

--	SORBENT PADS	1 BALE
--	SAND BAGS (empty)	5
--	SPEEDI-DRI ABSORBENT	2 – 40LB BAGS
--	12” INFLATABLE PIPE PLUG	1
--	SQUARE END SHOVELS	1
--	PRY BAR	1
--	CATCH BASIN COVER	1

EMERGENCY NOTIFICATION PHONE NUMBERS

1. FACILITY MANAGER

NAME: __________________ BEEPER: ________________________
PHONE: __________________ CELL PHONE: __________________

ALTERNATE:

NAME: __________________ BEEPER: N/A ____________________
PHONE: __________________ CEL PHONE: N/A _________________

2. FIRE DEPARTMENT

EMERGENCY: 911
BUSINESS: (781) 337-5151

POLICE DEPARTMENT

EMERGENCY: 911
BUSINESS: (781) 335-1212

DEPARTMENT OF PUBLIC WORKS

CONTACT: Director – Kenan Connell
BUSINESS: (781) 337-5100

CONSERVATION COMMISSION

CONTACT: Andrew Hultin
BUSINESS: (781) 340-5007

BOARD OF HEALTH

CONTACT: Board of Health Agent Clerk – Clare LaMorte, RN
BUSINESS: (781) 335-2000

3. MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION

EMERGENCY: (617) 556-1133
SOUTHEAST REGION - LAKEVILLE OFFICE: (508) 946-2700

4. NATIONAL RESPONSE CENTER

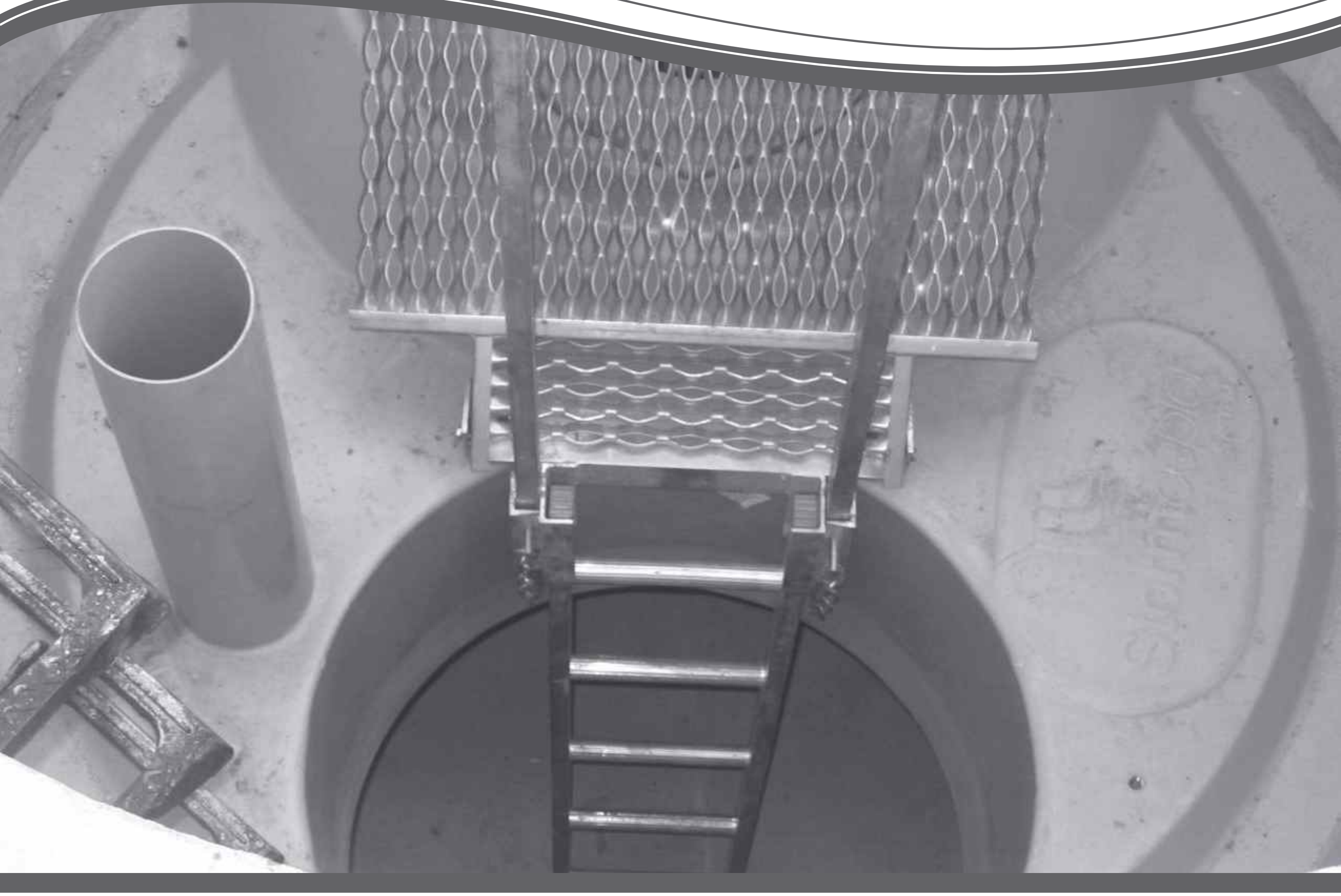
PHONE: (800) 424-8802

ALTERNATE: U.S. ENVIRONMENTAL PROTECTION AGENCY

EMERGENCY: (617) 223-7265
BUSINESS: (617) 860-4300

CONTECH®
ENGINEERED SOLUTIONS

Stormceptor® STC
Operation and Maintenance Guide



Stormceptor® STC

Stormceptor Design Notes

- Only the STC 450i is adaptable to function with a catch basin inlet and/or inline pipes.
- Only the Stormceptor models STC 450i to STC 7200 may accommodate multiple inlet pipes.

Inlet and outlet invert elevation differences are as follows:

Inlet and Outlet Pipe Invert Elevations Differences			
Inlet Pipe Configuration	STC 450i	STC 900 to STC 7200	STC 11000 to STC 16000
Single inlet pipe	3 in. (75 mm)	1 in. (25 mm)	3 in. (75 mm)
Multiple inlet pipes	3 in. (75 mm)	3 in. (75 mm)	Only one inlet pipe.

Maximum inlet and outlet pipe diameters:

Inlet/Outlet Configuration	Inlet Unit STC 450i	In-Line Unit STC 900 to STC 7200	Series* STC 11000 to STC 16000
Straight Through	24 inch (600 mm)	42 inch (1050 mm)	60 inch (1500 mm)
Bend (90 degrees)	18 inch (450 mm)	33 inch (825 mm)	33 inch (825 mm)

- The inlet and in-line Stormceptor units can accommodate turns to a maximum of 90 degrees.
- Minimum distance from top of grade to crown is 2 feet (0.6 m)
- Submerged conditions. A unit is submerged when the standing water elevation at the proposed location of the Stormceptor unit is greater than the outlet invert elevation during zero flow conditions. In these cases, please contact your local Stormceptor representative and provide the following information:
- Top of grade elevation
- Stormceptor inlet and outlet pipe diameters and invert elevations
- Standing water elevation
- Stormceptor head loss, K = 1.3 (for submerged condition, K = 4)

Stormceptor® STC

OPERATION AND MAINTENANCE GUIDE

Table of Content

1. About Stormceptor

The Stormceptor® STC (Standard Treatment Cell) was developed by Imbrium™ Systems to address the growing need to remove and isolate pollution from the storm drain system before it enters the environment. The Stormceptor STC targets hydrocarbons and total suspended solids (TSS) in stormwater runoff. It improves water quality by removing contaminants through the gravitational settling of fine sediments and floatation of hydrocarbons while preventing the re-suspension or scour of previously captured pollutants.

The development of the Stormceptor STC revolutionized stormwater treatment, and created an entirely new category of environmental technology. Protecting thousands of waterways around the world, the Stormceptor System has set the standard for effective stormwater treatment.

1.1. Patent Information

The Stormceptor technology is protected by the following patents:

- Australia Patent No. 693,164 • 693,164 • 707,133 • 729,096 • 779401
- Austrian Patent No. 289647
- Canadian Patent No 2,009,208 •2,137,942 • 2,175,277 • 2,180,305 • 2,180,383 • 2,206,338 • 2,327,768 (Pending)
- China Patent No 1168439
- Denmark DK 711879
- German DE 69534021
- Indonesian Patent No 16688
- Japan Patent No 9-11476 (Pending)
- Korea 10-2000-0026101 (Pending)
- Malaysia Patent No PI9701737 (Pending)
- New Zealand Patent No 314646
- United States Patent No 4,985,148 • 5,498,331 • 5,725,760 • 5,753,115 • 5,849,181 • 6,068,765 • 6,371,690
- Stormceptor OSR Patent Pending • Stormceptor LCS Patent Pending

2. Stormceptor Design Overview

2.1. Design Philosophy

The patented Stormceptor System has been designed to focus on the environmental objective of providing long-term pollution control. The unique and innovative Stormceptor design allows for continuous positive treatment of runoff during all rainfall events, while ensuring that all captured pollutants are retained within the system, even during intense storm events.

An integral part of the Stormceptor design is PCSWMM for Stormceptor - sizing software developed in conjunction with Computational Hydraulics Inc. (CHI) and internationally acclaimed expert, Dr. Bill James. Using local historical rainfall data and continuous simulation modeling, this software allows a Stormceptor unit to be designed for each individual site and the corresponding water quality objectives.

By using PCSWMM for Stormceptor, the Stormceptor System can be designed to remove a wide range of particles (typically from 20 to 2,000 microns), and can also be customized to remove a specific particle size distribution (PSD). The specified PSD should accurately reflect what is in the stormwater runoff to ensure the device is achieving the desired water quality objective. Since stormwater runoff contains small particles (less than 75 microns), it is important to design a treatment system to remove smaller particles in addition to coarse particles.

2.2. Benefits

The Stormceptor System removes free oil and suspended solids from stormwater, preventing spills and non-point source pollution from entering downstream lakes and rivers. The key benefits, capabilities and applications of the Stormceptor System are as follows:

- Provides continuous positive treatment during all rainfall events
- Can be designed to remove over 80% of the annual sediment load
- Removes a wide range of particles
- Can be designed to remove a specific particle size distribution (PSD)
- Captures free oil from stormwater
- Prevents scouring or re-suspension of trapped pollutants
- Pre-treatment to reduce maintenance costs for downstream treatment measures (ponds, swales, detention basins, filters)
- Groundwater recharge protection
- Spills capture and mitigation
- Simple to design and specify
- Designed to your local watershed conditions
- Small footprint to allow for easy retrofit installations
- Easy to maintain (vacuum truck)
- Multiple inlets can connect to a single unit
- Suitable as a bend structure
- Pre-engineered for traffic loading (minimum AASHTO HS-20)
- Minimal elevation drop between inlet and outlet pipes
- Small head loss
- Additional protection provided by an 18” (457 mm) fiberglass skirt below the top of the insert, for the containment of hydrocarbons in the event of a spill.

2.3. Environmental Benefit

Freshwater resources are vital to the health and welfare of their surrounding communities. There is increasing public awareness, government regulations and corporate commitment to reducing the pollution entering our waterways. A major source of this pollution originates from stormwater runoff from urban areas. Rainfall runoff carries oils, sediment and other contaminants from roads and parking lots discharging directly into our streams, lakes and coastal waterways.

The Stormceptor System is designed to isolate contaminants from getting into the natural environment. The Stormceptor technology provides protection for the environment from spills that occur at service stations and vehicle accident sites, while also removing contaminated sediment in runoff that washes from roads and parking lots.

3. Key Operation Features

3.1. Scour Prevention

A key feature of the Stormceptor System is its patented scour prevention technology. This innovation ensures pollutants are captured and retained during all rainfall events, even extreme storms. The Stormceptor System provides continuous positive treatment for all rainfall events, including intense storms. Stormceptor slows incoming runoff, controlling and reducing velocities in the lower chamber to create a non-turbulent environment that promotes free oils and floatable debris to rise and sediment to settle.

The patented scour prevention technology, the fiberglass insert, regulates flows into the lower chamber through a combination of a weir and orifice while diverting high energy flows away through the upper chamber to prevent scouring. Laboratory testing demonstrated no scouring when tested up to 125% of the unit's operating rate, with the unit loaded to 100% sediment capacity (NJDEP, 2005). Second, the depth of the lower chamber ensures the sediment storage zone is adequately separated from the path of flow in the lower chamber to prevent scouring.

3.2. Operational Hydraulic Loading Rate

Designers and regulators need to evaluate the treatment capacity and performance of manufactured stormwater treatment systems. A commonly used parameter is the "operational hydraulic loading rate" which originated as a design methodology for wastewater treatment devices.

Operational hydraulic loading rate may be calculated by dividing the flow rate into a device by its settling area. This represents the critical settling velocity that is the prime determinant to quantify the influent particle size and density captured by the device. PCSWMM for Stormceptor uses a similar parameter that is calculated by dividing the hydraulic detention time in the device by the fall distance of the sediment.

$$v_{SC} = \frac{H}{6_H} = \frac{Q}{A_S}$$

Where:

v_{SC} = critical settling velocity, ft/s (m/s)

H = tank depth, ft (m)

$\O_H$ = hydraulic detention time, ft/s (m/s)

Q = volumetric flow rate, ft3/s (m3/s)

A_S = surface area, ft^2 (m^2)

(Tchobanoglous, G. and Schroeder, E.D. 1987. Water Quality. Addison Wesley.)

Unlike designing typical wastewater devices, stormwater systems are designed for highly variable flow rates including intense peak flows. PCSWMM for Stormceptor incorporates all of the flows into its calculations, ensuring that the operational hydraulic loading rate is considered not only for one flow rate, but for all flows including extreme events.

3.3. Double Wall Containment

The Stormceptor System was conceived as a pollution identifier to assist with identifying illicit discharges. The fiberglass insert has a continuous skirt that lines the concrete barrel wall for a depth of 18 inches (457 mm) that provides double wall containment for hydrocarbons storage. This protective barrier ensures that toxic floatables do not migrate through the concrete wall into the surrounding soils.

4. Stormceptor Product Line

4.1. Stormceptor Models

A summary of Stormceptor models and capacities are listed in Table 1.

Table 1. Stormceptor Models

Stormceptor Model	Total Storage Volume U.S. Gal (L)	Hydrocarbon Storage Capacity U.S. Gal (L)	Maximum Sediment Capacity ft^3 (L)
STC 450i	470 (1,780)	86 (330)	46 (1,302)
STC 900	952 (3,600)	251 (950)	89 (2,520)
STC 1200	1,234 (4,670)	251 (950)	127 (3,596)
STC 1800	1,833 (6,940)	251 (950)	207 (5,861)
STC 2400	2,462 (9,320)	840 (3,180)	205 (5,805)
STC 3600	3,715 (1,406)	840 (3,180)	373 (10,562)
STC 4800	5,059 (1,950)	909 (3,440)	543 (15,376)
STC 6000	6,136 (23,230)	909 (3,440)	687 (19,453)
STC 7200	7,420 (28,090)	1,059 (4,010)	839 (23,757)
STC 11000	11,194 (42,370)	2,797 (10, 590)	1,086 (30,752)
STC 13000	13,348 (50,530)	2,797 (10, 590)	1,374 (38,907)
STC 16000	15,918 (60,260)	3,055 (11, 560)	1,677 (47,487)

NOTE: Storage volumes may vary slightly from region to region. For detailed information, contact your local Stormceptor representative.

4.2. Inline Stormceptor

The Inline Stormceptor, Figure 1, is the standard design for most stormwater treatment applications. The patented Stormceptor design allows the Inline unit to maintain continuous positive treatment of total suspended solids (TSS) year-round, regardless of flow rate. The Inline Stormceptor is composed of a precast concrete tank with a fiberglass insert situated at the invert of the storm sewer pipe, creating an upper chamber above the insert and a lower chamber below the insert.

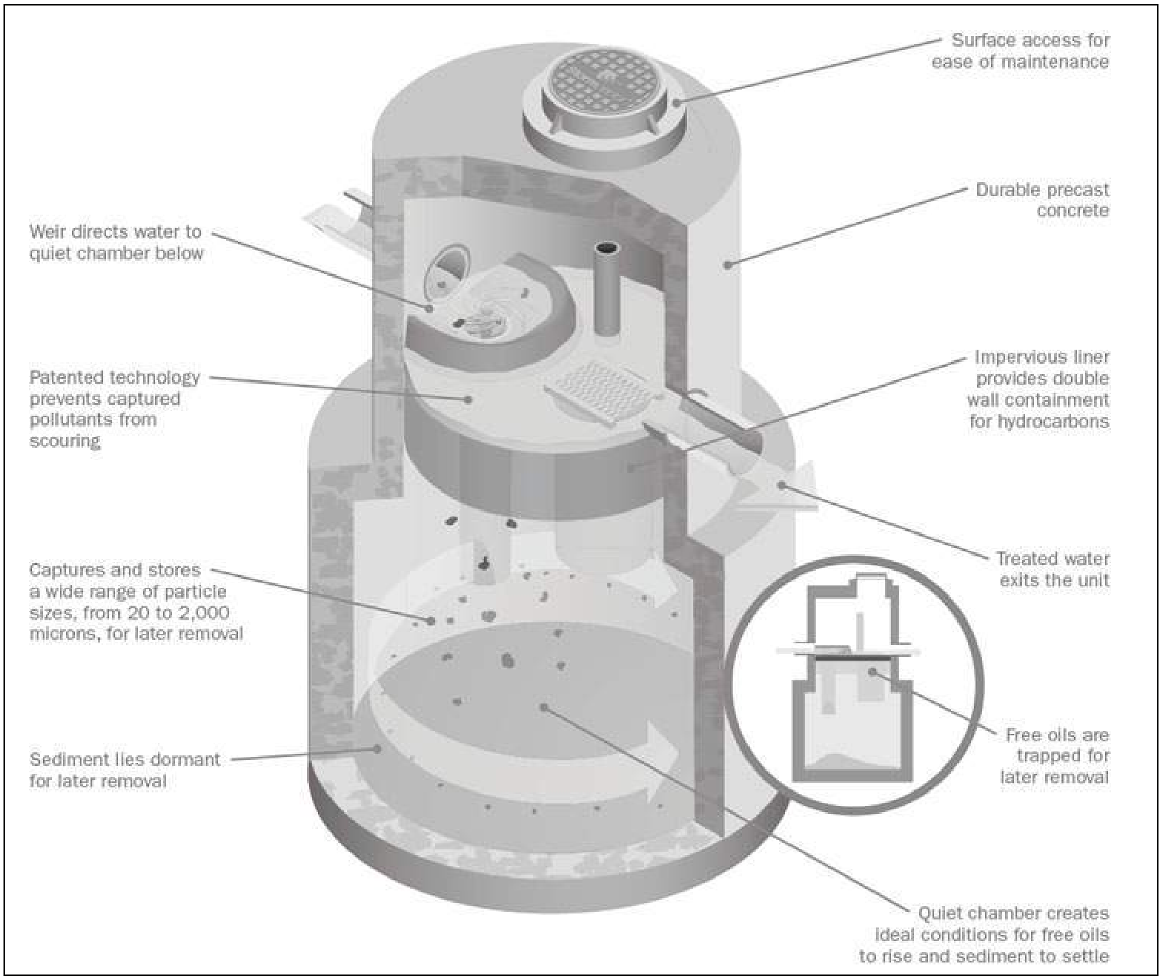


Figure 1. Inline Stormceptor

Operation

As water flows into the Stormceptor unit, it is slowed and directed to the lower chamber by a weir and drop tee. The stormwater enters the lower chamber, a non-turbulent environment, allowing free oils to rise and sediment to settle. The oil is captured underneath the fiberglass insert and shielded from exposure to the concrete walls by a fiberglass skirt. After the pollutants separate, treated water continues up a riser pipe, and exits the lower chamber on the downstream side of the weir before leaving the unit. During high flow events, the Stormceptor System's patented scour prevention technology ensures continuous pollutant removal and prevents re-suspension of previously captured pollutants.

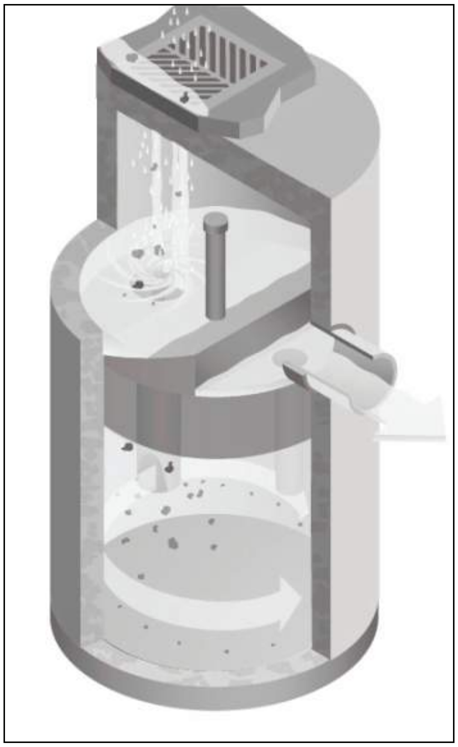


Figure 2. Inlet Stormceptor

4.3. Inlet Stormceptor

The Inlet Stormceptor System, Figure 2, was designed to provide protection for parking lots, loading bays, gas stations and other spill-prone areas. The Inlet Stormceptor is designed to remove sediment from stormwater introduced through a grated inlet, a storm sewer pipe, or both.

The Inlet Stormceptor design operates in the same manner as the Inline unit, providing continuous positive treatment, and ensuring that captured material is not re-suspended.

4.4. Series Stormceptor

Designed to treat larger drainage areas, the Series Stormceptor System, Figure 3, consists of two adjacent Stormceptor models that function in parallel. This design eliminates the need for additional structures and piping to reduce installation costs.

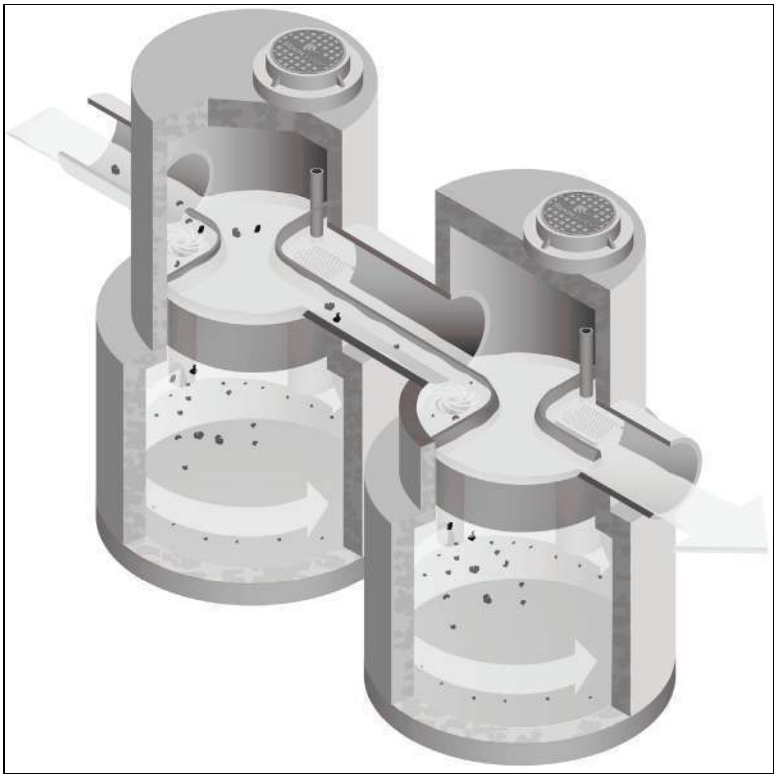


Figure 3. Series System

The Series Stormceptor design operates in the same manner as the Inline unit, providing continuous positive treatment, and ensuring that captured material is not re-suspended.

5. Sizing the Stormceptor System

The Stormceptor System is a versatile product that can be used for many different aspects of water quality improvement. While addressing these needs, there are conditions that the designer needs to be aware of in order to size the Stormceptor model to meet the demands of each individual site in an efficient and cost-effective manner.

PCSWMM for Stormceptor is the support tool used for identifying the appropriate Stormceptor model. In order to size a unit, it is recommended the user follow the seven design steps in the program. The steps are as follows:

STEP 1 – Project Details

The first step prior to sizing the Stormceptor System is to clearly identify the water quality objective for the development. It is recommended that a level of annual sediment (TSS) removal be identified and defined by a particle size distribution.

STEP 2 – Site Details

Identify the site development by the drainage area and the level of imperviousness. It is recommended that imperviousness be calculated based on the actual area of imperviousness based on paved surfaces, sidewalks and rooftops.

STEP 3 – Upstream Attenuation

The Stormceptor System is designed as a water quality device and is sometimes used in conjunction with onsite water quantity control devices such as ponds or underground detention systems. When possible, a greater benefit is typically achieved when installing a Stormceptor unit upstream of a detention facility. By placing the Stormceptor unit upstream of a detention structure, a benefit of less maintenance of the detention facility is realized.

STEP 4 – Particle Size Distribution

It is critical that the PSD be defined as part of the water quality objective. PSD is critical for the design of treatment system for a unit process of gravity settling and governs the size of a treatment system. A range of particle sizes has been provided and it is recommended that clays and silt-sized particles be considered in addition to sand and gravel-sized particles. Options and sample PSDs are provided in PCSWMM for Stormceptor. The default particle size distribution is the Fine Distribution, Table 2, option.

Table 2. Fine Distribution

Particle Size	Distribution	Specific Gravity
20	20%	1.3
60	20%	1.8
150	20%	2.2
400	20%	2.65
2000	20%	2.65

If the objective is the long-term removal of 80% of the total suspended solids on a given site, the PSD should be representative of the expected sediment on the site. For example, a system designed to remove 80% of coarse particles (greater than 75 microns) would provide relatively poor removal efficiency of finer particles that may be naturally prevalent in runoff from the site.

Since the small particle fraction contributes a disproportionately large amount of the total available particle surface area for pollutant adsorption, a system designed primarily for coarse particle capture will compromise water quality objectives.

STEP 5 – Rainfall Records

Local historical rainfall has been acquired from the U.S. National Oceanic and Atmospheric Administration, Environment Canada and regulatory agencies across North America. The rainfall data provided with PCSMM for Stormceptor provides an accurate estimation of small storm hydrology by modeling actual historical storm events including duration, intensities and peaks.

STEP 6 – Summary

At this point, the program may be executed to predict the level of TSS removal from the site. Once the simulation has completed, a table shall be generated identifying the TSS removal of each Stormceptor unit.

STEP 7 – Sizing Summary

Performance estimates of all Stormceptor units for the given site parameters will be displayed in a tabular format. The unit that meets the water quality objective, identified in Step 1, will be highlighted.

5.1. PCSWMM for Stormceptor

The Stormceptor System has been developed in conjunction with PCSWMM for Stormceptor as a technological solution to achieve water quality goals. Together, these two innovations model, simulate, predict and calculate the water quality objectives desired by a design engineer for TSS removal.

PCSWMM for Stormceptor is a proprietary sizing program which uses site specific inputs to a computer model to simulate sediment accumulation, hydrology and long-term total suspended solids removal. The model has been calibrated to field monitoring results from Stormceptor units that have been monitored in North America. The sizing methodology can be described by three processes:

1. Determination of real time hydrology
2. Buildup and wash off of TSS from impervious land areas
3. TSS transport through the Stormceptor (settling and discharge). The use of a calibrated model is the preferred method for sizing stormwater quality structures for the following reasons:
   - The hydrology of the local area is properly and accurately incorporated in the sizing (distribution of flows, flow rate ranges and peaks, back-to-back storms, inter-event times)
   - The distribution of TSS with the hydrology is properly and accurately considered in the sizing
   - Particle size distribution is properly considered in the sizing
   - The sizing can be optimized for TSS removal
   - The cost benefit of alternate TSS removal criteria can be easily assessed
   - The program assesses the performance of all Stormceptor models. Sizing may be selected based on a specific water quality outcome or based on the Maximum Extent Practicable

For more information regarding PCSWMM for Stormceptor, contact your local Stormceptor representative, or visit www.imbriumsystems.com to download a free copy of the program.

5.2. Sediment Loading Characteristics

The way in which sediment is transferred to stormwater can have a considerable effect on which type of system is implemented. On typical impervious surfaces (e.g. parking lots) sediment will build over time and wash off with the next rainfall. When rainfall patterns are examined, a short intense storm will have a higher concentration of sediment than a long slow drizzle. Together with rainfall data representing the site's typical rainfall patterns, sediment loading characteristics play a part in the correct sizing of a stormwater quality device.

Typical Sites

For standard site design of the Stormceptor System, PCSWMM for Stormceptor is utilized to accurately assess the unit's performance. As an integral part of the product's design, the program can be used to meet local requirements for total suspended solid removal. Typical installations of manufactured stormwater treatment devices would occur on areas such as paved parking lots or paved roads. These are considered "stable" surfaces which have non – erodible surfaces.

Unstable Sites

While standard sites consist of stable concrete or asphalt surfaces, sites such as gravel parking lots, or maintenance yards with stockpiles of sediment would be classified as "unstable". These types of sites do not exhibit first flush characteristics, are highly erodible and exhibit atypical sediment loading characteristics and must therefore be sized more carefully. Contact your local Stormceptor representative for assistance in selecting a proper unit sized for such unstable sites.

6. Spill Controls

When considering the removal of total petroleum hydrocarbons (TPH) from a storm sewer system there are two functions of the system: oil removal, and spill capture.

'Oil Removal' describes the capture of the minute volumes of free oil mobilized from impervious surfaces. In this instance relatively low concentrations, volumes and flow rates are considered. While the Stormceptor unit will still provide an appreciable oil removal function during higher flow events and/or with higher TPH concentrations, desired effluent limits may be exceeded under these conditions.

‘Spill Capture’ describes a manner of TPH removal more appropriate to recovery of a relatively high volume of a single phase deleterious liquid that is introduced to the storm sewer system over a relatively short duration. The two design criteria involved when considering this manner of introduction are overall volume and the specific gravity of the material. A standard Stormceptor unit will be able to capture and retain a maximum spill volume and a minimum specific gravity.

For spill characteristics that fall outside these limits, unit modifications are required. Contact your local Stormceptor Representative for more information.

One of the key features of the Stormceptor technology is its ability to capture and retain spills. While the standard Stormceptor System provides excellent protection for spill control, there are additional options to enhance spill protection if desired.

6.1. Oil Level Alarm

The oil level alarm is an electronic monitoring system designed to trigger a visual and audible alarm when a pre-set level of oil is reached within the lower chamber. As a standard, the oil

level alarm is designed to trigger at approximately 85% of the unit’s available depth level for oil capture. The feature acts as a safeguard against spills caused by exceeding the oil storage capacity of the separator and eliminates the need for manual oil level inspection.

The oil level alarm installed on the Stormceptor insert is illustrated in Figure 4.

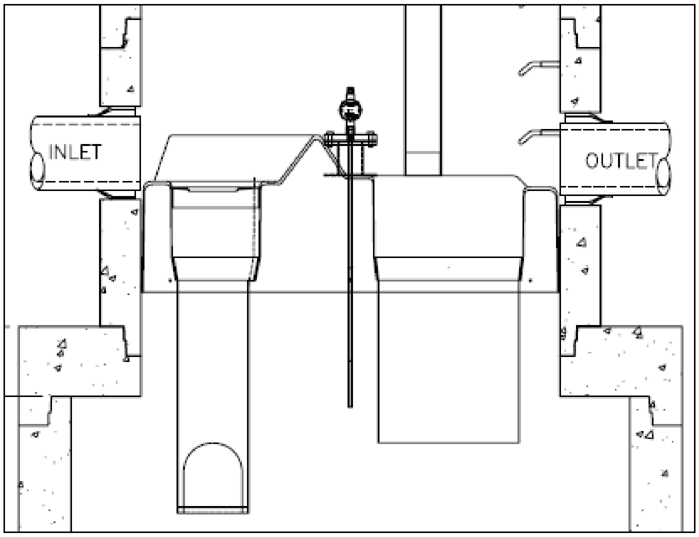


Figure 4. Oil level alarm

6.2. Increased Volume Storage Capacity

The Stormceptor unit may be modified to store a greater spill volume than is typically available. Under such a scenario, instead of installing a larger than required unit, modifications can be made to the recommended Stormceptor model to accommodate larger volumes. Contact your local Stormceptor representative for additional information and assistance for modifications.

7. Stormceptor Options

The Stormceptor System allows flexibility to incorporate to existing and new storm drainage infrastructure. The following section identifies considerations that should be reviewed when installing the system into a drainage network. For conditions that fall outside of the recommendations in this section, please contact your local Stormceptor representative for further guidance.

7.1. Installation Depth Minimum Cover

The minimum distance from the top of grade to the crown of the inlet pipe is 24 inches (600 mm). For situations that have a lower minimum distance, contact your local Stormceptor representative.

7.2. Maximum Inlet and Outlet Pipe Diameters

Maximum inlet and outlet pipe diameters are illustrated in Figure 5. Contact your local Stormceptor representative for larger pipe diameters

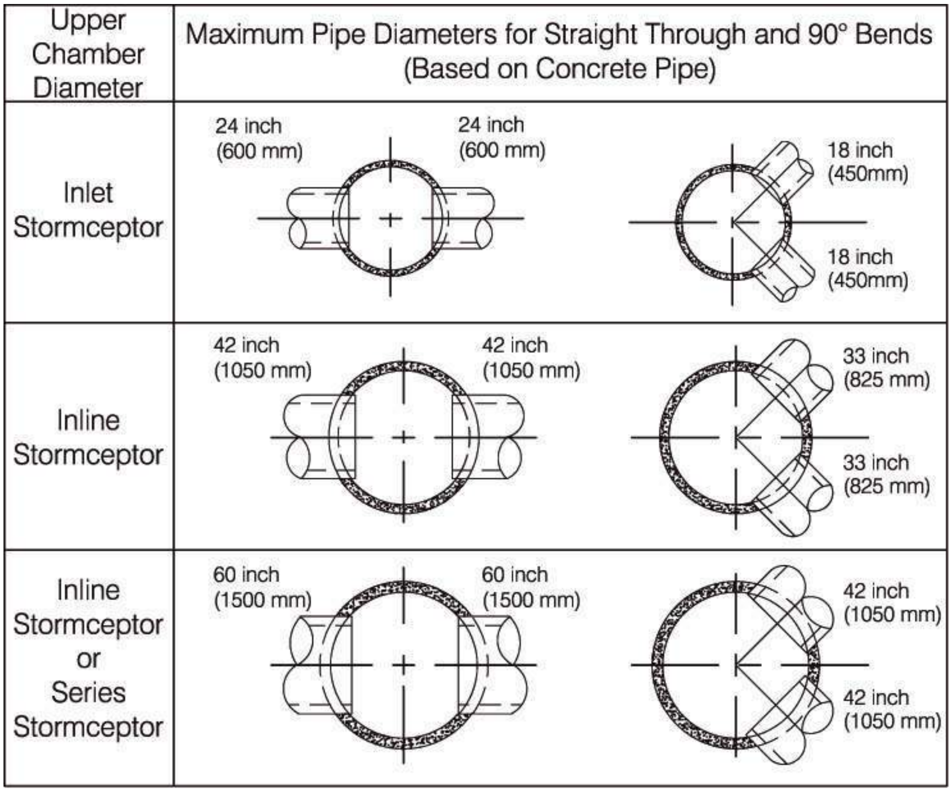


Figure 5. Maximum pipe diameters for straight through and bend applications

*The bend should only be incorporated into the second structure (downstream structure) of the Series Stormceptor System

7.3. Bends

The Stormceptor System can be used to change horizontal alignment in the storm drain network up to a maximum of 90 degrees. Figure 6 illustrates the typical bend situations of the Stormceptor System. Bends should only be applied to the second structure (downstream structure) of the Series Stormceptor System.

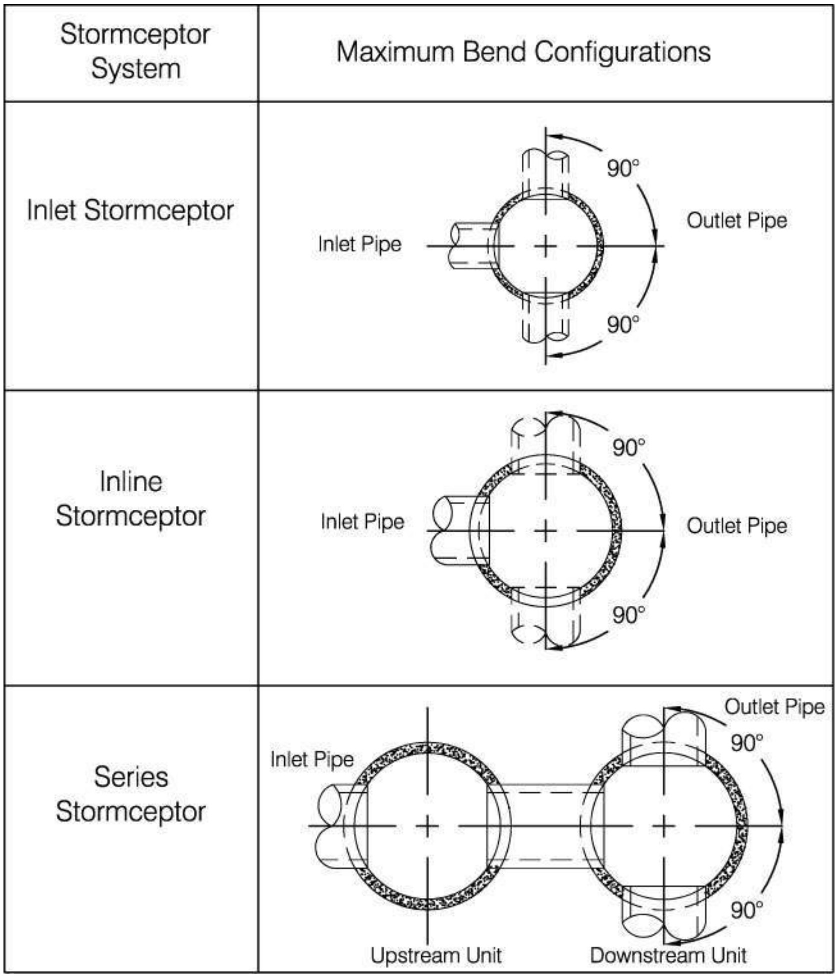


Figure 6. Maximum bend angles

7.4. Multiple Inlet Pipes

The Inlet and Inline Stormceptor System can accommodate two or more inlet pipes. The maximum number of inlet pipes that can be accommodated into a Stormceptor unit is a function of the number, alignment and diameter of the pipes and its effects on the structural integrity of the precast concrete. When multiple inlet pipes are used for new developments, each inlet pipe shall have an invert elevation 3 inches (75 mm) higher than the outlet pipe invert elevation.

7.5. Inlet/Outlet Pipe Invert Elevations

Recommended inlet and outlet pipe invert differences are listed in Table 3.

Table 3. Recommended Drops Between Inlet and Outlet Pipe Inverts

Number of Inlet Pipes	Inlet System	In-Line System	Series System
1	3 inches (75 mm)	1 inch (25 mm)	3 inches (75 mm)
>1	3 inches (75 mm)	3 inches (75 mm)	Not Applicable

7.6. Shallow Stormceptor

In cases where there may be restrictions to the depth of burial of storm sewer systems. In this situation, for selected Stormceptor models, the lower chamber components may be increased in diameter to reduce the overall depth of excavation required.

7.7. Customized Live Load

The Stormceptor system is typically designed for local highway truck loading (AASHTO HS- 20). When the project requires live loads greater than HS-20, the Stormceptor System may be customized structurally for a pre-specified live load. Contact your local Stormceptor representative for customized loading conditions.

7.8. Pre-treatment

The Stormceptor System may be sized to remove sediment and for spills control in conjunction with other stormwater BMPs to meet the water quality objective. For pretreatment applications, the Stormceptor System should be the first unit in a treatment train. The benefits of pre-treatment include the extension of the operational life (extension of maintenance frequency) of large stormwater management facilities, prevention of spills and lower total life- cycle maintenance cost.

7.9. Head loss

The head loss through the Stormceptor System is similar to a 60 degree bend at a manhole. The K value for calculating minor losses is approximately 1.3 (minor loss = k*1.3v2/2g).

However, when a Submerged modification is applied to a Stormceptor unit, the corresponding K value is 4.

7.10. Submerged

The Submerged modification, Figure 7, allows the Stormceptor System to operate in submerged or partially submerged storm sewers. This configuration can be installed on all models of the Stormceptor System by modifying the fiberglass insert. A customized weir height and a secondary drop tee are added.

Submerged instances are defined as standing water in the storm drain system during zero flow conditions. In these instances, the following information is necessary for the proper design and application of submerged modifications:

- Stormceptor top of grade elevation
- Stormceptor outlet pipe invert elevation
- Standing water elevation

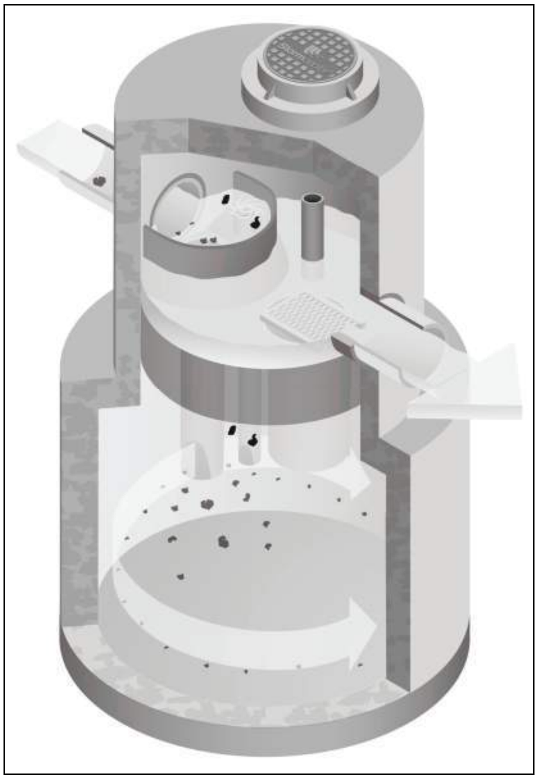


Figure 7. Submerged Stormceptor

8. Comparing Technologies

Designers have many choices available to achieve water quality goals in the treatment of stormwater runoff. Since many alternatives are available for use in stormwater quality treatment it is important to consider how to make an appropriate comparison between "approved alternatives". The following is a guide to assist with the accurate comparison of differing technologies and performance claims.

8.1. Particle Size Distribution (PSD)

The most sensitive parameter to the design of a stormwater quality device is the selection of the design particle size. While it is recommended that the actual particle size distribution (PSD) for sites be measured prior to sizing, alternative values for particle size should be selected to represent what is likely to occur naturally on the site. A reasonable estimate of a particle size distribution likely to be found on parking lots or other impervious surfaces should consist of a wide range of particles such as 20 microns to 2,000 microns (Ontario MOE, 1994).

There is no absolute right particle size distribution or specific gravity and the user is cautioned to review the site location, characteristics, material handling practices and regulatory requirements when selecting a particle size distribution. When comparing technologies, designs using different PSDs will result in incomparable TSS removal efficiencies. The PSD of the TSS removed needs to be standard between two products to allow for an accurate comparison.

8.2. Scour Prevention

In order to accurately predict the performance of a manufactured treatment device, there must be confidence that it will perform under all conditions. Since rainfall patterns cannot be predicted, stormwater quality devices placed in storm sewer systems must be able to withstand extreme events, and ensure that all pollutants previously captured are retained in the system.

In order to have confidence in a system's performance under extreme conditions, independent validation of scour prevention is essential when examining different technologies. Lack of independent verification of scour prevention should make a designer wary of accepting any product's performance claims.

8.3. Hydraulics

Full scale laboratory testing has been used to confirm the hydraulics of the Stormceptor System. Results of lab testing have been used to physically design the Stormceptor System and the sewer pipes entering and leaving the unit. Key benefits of Stormceptor are:

- Low head loss (typical k value of 1.3)
- Minimal inlet/outlet invert elevation drop across the structure
- Use as a bend structure
- Accommodates multiple inlets

The adaptability of the treatment device to the storm sewer design infrastructure can affect the overall performance and cost of the site.

8.4. Hydrology

Stormwater quality treatment technologies need to perform under varying climatic conditions. These can vary from long low intensity rainfall to short duration, high intensity storms. Since a treatment device is expected to perform under all these conditions, it makes sense that any system's design should accommodate those conditions as well.

Long-term continuous simulation evaluates the performance of a technology under the varying conditions expected in the climate of the subject site. Single, peak event design does not provide this information and is not equivalent to long-term simulation. Designers should request long-term simulation performance to ensure the technology can meet the long-term water quality objective.

9. Testing

The Stormceptor System has been the most widely monitored stormwater treatment technology in the world. Performance verification and monitoring programs are completed to the strictest standards and integrity. Since its introduction in 1990, numerous independent field tests and studies detailing the effectiveness of the Stormceptor System have been completed.

- Coventry University, UK – 97% removal of oil, 83% removal of sand and 73% removal of peat
- National Water Research Institute, Canada, - scaled testing for the development of the Stormceptor System identifying both TSS removal and scour prevention.
- New Jersey TARP Program – full scale testing of an STC 900 demonstrating 75% TSS removal of particles from 1 to 1000 microns. Scour testing completed demonstrated that the system does not scour. The New Jersey Department of Environmental Protection was followed.
- City of Indianapolis – full scale testing of an STC 900 demonstrating over 80% TSS removal of particles from 50 microns to 300 microns at 130% of the unit's operating rate. Scour testing completed demonstrated that the system does not scour.
- Westwood Massachusetts (1997), demonstrated >80% TSS removal
- Como Park (1997), demonstrated 76% TSS removal
- Ontario MOE SWAMP Program – 57% removal of 1 to 25 micron particles
- Laval Quebec – 50% removal of 1 to 25 micron particles

10. Installation

The installation of the concrete Stormceptor should conform in general to state highway, or local specifications for the installation of manholes. Selected sections of a general specification that are applicable are summarized in the following sections.

10.1. Excavation

Excavation for the installation of the Stormceptor should conform to state highway, or local specifications. Topsoil removed during the excavation for the Stormceptor should be stockpiled in designated areas and should not be mixed with subsoil or other materials.

Topsoil stockpiles and the general site preparation for the installation of the Stormceptor should conform to state highway or local specifications.

The Stormceptor should not be installed on frozen ground. Excavation should extend a minimum of 12 inches (300 mm) from the precast concrete surfaces plus an allowance for shoring and bracing where required. If the bottom of the excavation provides an unsuitable foundation additional excavation may be required.

In areas with a high water table, continuous dewatering may be required to ensure that the excavation is stable and free of water.

10.2. Backfilling

Backfill material should conform to state highway or local specifications. Backfill material should be placed in uniform layers not exceeding 12 inches (300mm) in depth and compacted to state highway or local specifications.

11. Stormceptor Construction Sequence

The concrete Stormceptor is installed in sections in the following sequence:

1. Aggregate base
2. Base slab
3. Lower chamber sections
4. Upper chamber section with fiberglass insert
5. Connect inlet and outlet pipes
6. Assembly of fiberglass insert components (drop tee, riser pipe, oil cleanout port and orifice plate
7. Remainder of upper chamber
8. Frame and access cover

The precast base should be placed level at the specified grade. The entire base should be in contact with the underlying compacted granular material. Subsequent sections, complete with joint seals, should be installed in accordance with the precast concrete manufacturer's recommendations.

Adjustment of the Stormceptor can be performed by lifting the upper sections free of the excavated area, re-leveling the base and re-installing the sections. Damaged sections and gaskets should be repaired or replaced as necessary. Once the Stormceptor has been constructed, any lift holes must be plugged with mortar.

12. Maintenance

12.1. Health and Safety

The Stormceptor System has been designed considering safety first. It is recommended that confined space entry protocols be followed if entry to the unit is required. In addition, the fiberglass insert has the following health and safety features:

- Designed to withstand the weight of personnel
- A safety grate is located over the 24 inch (600 mm) riser pipe opening
- Ladder rungs can be provided for entry into the unit, if required

12.2. Maintenance Procedures

Maintenance of the Stormceptor system is performed using vacuum trucks. No entry into the unit is required for maintenance (in most cases). The vacuum service industry is a well- established sector of the service industry that cleans underground tanks, sewers and catch basins. Costs to clean a Stormceptor will vary based on the size of unit and transportation distances.

The need for maintenance can be determined easily by inspecting the unit from the surface. The depth of oil in the unit can be determined by inserting a dipstick in the oil inspection/cleanout port.

Similarly, the depth of sediment can be measured from the surface without entry into the Stormceptor via a dipstick tube equipped with a ball valve. This tube would be inserted through the riser pipe. Maintenance should be performed once the sediment depth exceeds the guideline values provided in the Table 4.

Table 4. Sediment Depths Indicating Required Servicing*

Particle Size	Specific Gravity
Model	Sediment Depth inches (mm)
450i	8 (200)
900	8 (200)
1200	10 (250)
1800	15 (381)
2400	12 (300)
3600	17 (430)
4800	15 (380)
6000	18 (460)
7200	15 (381)
11000	17 (380)
13000	20 (500)
16000	17 (380)
* based on 15% of the Stormceptor unit's total storage	

Although annual servicing is recommended, the frequency of maintenance may need to be increased or reduced based on local conditions (i.e. if the unit is filling up with sediment more quickly than projected, maintenance may be required semi-annually; conversely once the site has stabilized maintenance may only be required every two or three years).

Oil is removed through the oil inspection/cleanout port and sediment is removed through the riser pipe. Alternatively oil could be removed from the 24 inches (600 mm) opening if water is removed from the lower chamber to lower the oil level below the drop pipes.

The following procedures should be taken when cleaning out Stormceptor:

1. Check for oil through the oil cleanout port
2. Remove any oil separately using a small portable pump
3. Decant the water from the unit to the sanitary sewer, if permitted by the local regulating authority, or into a separate containment tank
4. Remove the sludge from the bottom of the unit using the vacuum truck
5. Re-fill Stormceptor with water where required by the local jurisdiction

12.3. Submerged Stormceptor

Careful attention should be paid to maintenance of the Submerged Stormceptor System. In cases where the storm drain system is submerged, there is a requirement to plug both the inlet and outlet pipes to economically clean out the unit.

12.4. Hydrocarbon Spills

The Stormceptor is often installed in areas where the potential for spills is great. The Stormceptor System should be cleaned immediately after a spill occurs by a licensed liquid waste hauler.

12.5. Disposal

Requirements for the disposal of material from the Stormceptor System are similar to that of any other stormwater Best Management Practice (BMP) where permitted. Disposal options for the sediment may range from disposal in a sanitary trunk sewer upstream of a sewage treatment plant, to disposal in a sanitary landfill site. Petroleum waste products collected in the Stormceptor (free oil/chemical/fuel spills) should be removed by a licensed waste management company.

12.6. Oil Sheens

With a steady influx of water with high concentrations of oil, a sheen may be noticeable at the Stormceptor outlet. This may occur because a rainbow or sheen can be seen at very small oil concentrations (<10 mg/L). Stormceptor will remove over 98% of all free oil spills from storm sewer systems for dry weather or frequently occurring runoff events.

The appearance of a sheen at the outlet with high influent oil concentrations does not mean the unit is not working to this level of removal. In addition, if the influent oil is emulsified the Stormceptor will not be able to remove it. The Stormceptor is designed for free oil removal and not emulsified conditions.

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

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R-TANK MAINTENANCE

Designing an underground stormwater detention system with future maintenance in mind is a simple process that includes three primary objectives: **PREVENT** debris from entering the system by using good pre-treatment systems, **ISOLATE** debris and sediments that manage to enter the system, and **PROTECT** the body of the system by providing backflush mechanisms to ensure longevity.

1. PREVENT

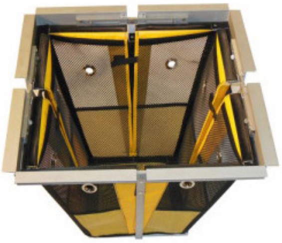
Keeping debris and sediment out of the system by pre-treating runoff is one of the smartest things an engineer can do when designing underground detention systems. It makes no sense to allow trash and sediments to flow unrestricted into an underground system where removal will be expensive. Instead, capture pollutants simply and inexpensively in the inlets, where removal is easy. There are several ways this can be accomplished with minimal cost impacts to your project.

Trash Guard Plus®

Trash Guard Plus®

Trash Guard Plus is a patented stormwater pretreatment device that traps debris, sediment and floatables in the inlet. It helps extend maintenance cycles by using the full volume of the inlet structure for sediment capacity. And it is easy to maintain by accessing pollutants through the manhole lid.

Trash Guard Plus works by both screening debris out of the runoff and by slowing the flow of runoff, causing sediments to fall to the bottom of the inlet. Testing at NC State has shown the Trash Guard to be effective at removing trash, sediment, nutrients, and metals.



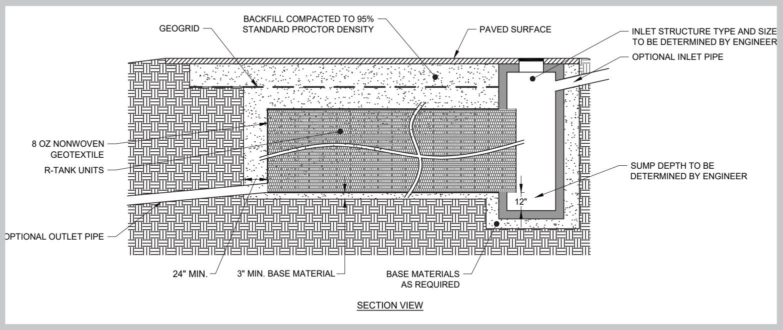
Gratemaster

Gratemaster

To treat a single inlet that serves as a junction for a larger drainage area, consider an insert like the Gratemaster. Ideal for capturing sediment and trash, it makes clean-up a snap by holding all the pollutants right near the surface for easy extraction.

R-Tank Screening

For a more centralized approach, some engineers prefer to create an opening in the inlet structures to allow the R-Tank modules to penetrate the structure to act as a trash screen. This works best with a structure that includes a sump (see drawing below).



R-TANK MAINTENANCE

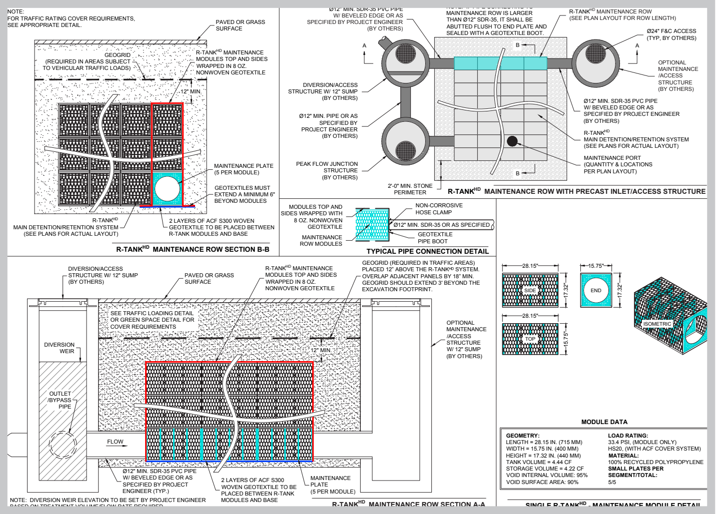
2. ISOLATE

Some pollutants may elude the pre-treatment systems. Trap these materials inside the maintenance row (see drawing to right). Consolidating sediments in a single location makes them easy to remove. Maintenance rows are formed by using maintenance modules, which have open internal components that are fully accessible by conventional jet-vac systems. These modules are set in a row (or multiple rows) to your desired length. Longer maintenance rows should include an access structure on both ends. Extremely long rows may require access from the middle of the row, as well.

The maintenance row is always wrapped in geotextile independently from the rest of the system. The geotextile retains trash, sediments, and other solids, preventing contamination of the rest of the system.

The maintenance row should be sized to treat the first flush (usually 1”) of runoff. Use a bypass structure to divert that flow into the maintenance row, and allow larger flows to continue to a downstream inlet where they can enter the R-Tank outside of the maintenance row.

The maintenance row is only available in LD, HD, and UD modules. For SD and XD modules, consider creating a forebay around the inlet locations to collect sediment. This is done by using a taller module installed at a lower invert. Geotextile baffles between the forebay and the rest of the system can help retain sediments. Concentrate Maintenance Ports (see PROTECT below) in the forebay to ensure access to sediment for removal.



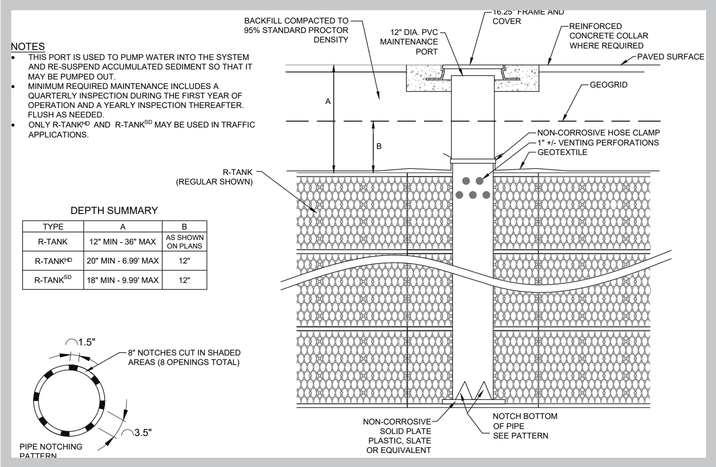
MODULE DATA

GEOMETRY:
LENGTH = 28.15 IN. (715 MM)
WIDTH = 15.75 IN. (400 MM)
HEIGHT = 17.32 IN. (440 MM)
TANK VOLUME = 4.44 CF
STORAGE VOLUME = 4.22 CF
VOID INTERNAL VOLUME: 95%
VOID SURFACE AREA: 90%

LOAD RATING:
33.4 PSI, (MODULE ONLY)
HS20, (WITH ACF COVER SYSTEM)
MATERIAL:
100% RECYCLED POLYPROPYLENE
SMALL PLATES PER SEGMENT/TOTAL:
5/5

3. PROTECT

Every good system has a fall-back plan. You can ensure a long system life by including maintenance ports throughout the system footprint to remove any pollutants that evade the pretreatment system and maintenance row. Maintenance ports should be specified within 10’ of inlet and outlet connections, and roughly 50’ on center (see maintenance port detail to right).



NOTES
- THIS PORT IS USED TO PUMP WATER INTO THE SYSTEM AND RE-SUSPEND ACCUMULATED SEDIMENT SO THAT IT MAY BE PUMPED OUT.
- MINIMUM REQUIRED MAINTENANCE INCLUDES A QUARTERLY INSPECTION DURING THE FIRST YEAR OF OPERATION AND A YEARLY INSPECTION THEREAFTER. FLUSH AS NEEDED.
- ONLY R-TANK^{HD} AND R-TANK^{SD} MAY BE USED IN TRAFFIC APPLICATIONS.

DEPTH SUMMARY

TYPE	A	B
R-TANK	12" MIN - 36" MAX	AS SHOWN ON PLANS
R-TANK^{HD}	20" MIN - 6.99' MAX	12"
R-TANK^{SD}	18" MIN - 9.99' MAX	12"

R-TANK OPERATION, INSPECTION & MAINTENANCE

Operation

Your ACF R-Tank System has been designed to function in conjunction with the engineered drainage system on your site, the existing municipal infrastructure, and/or the existing soils and geography of the receiving watershed. Unless your site included certain unique and rare features, the operation of your R-Tank System will be driven by naturally occurring systems and will function autonomously. However, upholding a proper schedule of Inspection & Maintenance is critical to ensuring continued functionality and optimum performance of the system.

Inspection

Both the R-Tank and all stormwater pre-treatment features incorporated into your site must be inspected regularly. Inspection frequency for your system must be determined based on the contributing drainage area, but should never exceed one year between inspections (six months during the first year of operation).

Inspections may be required more frequently for pre-treatment systems. You should refer to the manufacturer requirements for the proper inspection schedule.

With the right equipment your inspection and measurements can be accomplished from the surface without physically entering any confined spaces. If your inspection does require confined space entry, you MUST follow all local/regional requirements as well as OSHA standards.

R-Tank Systems may incorporate Inspection Ports, Maintenance Ports, and/or adjoining manholes. Each of these features are easily accessed by removing the lid at the surface. With the cover removed, a visual inspection can be performed to identify sediment deposits within the structure. Using a flashlight, ALL access points should be examined to complete a thorough inspection.

Inspection Ports

Usually located centrally in the R-Tank System, these perforated columns are designed to give the user a base-line sediment depth across the system floor.

Maintenance Ports

Usually located near the inlet and outlet connections, you'll likely find deeper deposits of heavier sediments when compared to the Inspection Ports.

Manholes

Most systems will include at least two manholes - one at the inlet and another at the outlet. There may be more than one location where stormwater enters the system, which would result in additional manholes to inspect.

Bear in mind that these manholes often include a sump below the invert of the pipe connecting to the R-Tank. These sumps are designed to capture sediment before it reaches the R-Tank, and they should be kept clean to ensure they function properly. However, existence of sediment in the sump does NOT necessarily mean sediment has accumulated in the R-Tank.

After inspecting the bottom of the structure, use a mirror on a pole (or some other device) to check for sediment or debris in the pipe connecting to the R-Tank.

If sediment or debris is observed in any of these structures, you should determine the depth of the material. This is typically accomplished with a stadia rod, but you should determine the best way to obtain the measurement.

All observations and measurements should be recorded on an Inspection Log kept on file. We've included a form you can use at the end of this guideline.

Maintenance

The R-Tank System should be back-flushed once sediment accumulation has reached 6" or 15% of the total system height. Use the chart below as a guideline to determine the point at which maintenance is required on your system.

R-Tank Unit	Height	Max Sediment Dept
Mini	9.5"	1.5"
Single	17"	3"
Double	34"	5"
Triple	50"	6"
Quad	67"	6"
Pent	84"	6"

Before any maintenance is performed on your system, be sure to plug the outlet pipe to prevent contamination of the adjacent systems.

To back-flush the R-Tank, water is pumped into the system through the Maintenance Ports as rapidly as possible. Water should be pumped into ALL Maintenance Ports. The turbulent action of the water moving through the R-Tank will suspend sediments which may then be pumped out.

If your system includes an Outlet Structure, this will be the ideal location to pump contaminated water out of the system. However, removal of back-flush water may be accomplished through the Maintenance Ports, as well.

For systems with large footprints that would require extensive volumes of water to properly flush the system, you should consider performing your maintenance within 24 hours of a rain event. Stormwater entering the system will aid in the suspension of sediments and reduce the volume of water required to properly flush the system.

Once removed, sediment-laden water may be captured for disposal or pumped through a Dirtbag™ (if permitted by the locality).

Step-By-Step Inspection & Maintenance Routine

1) **Inspection**
    - a. Inspection Port
        - i. Remove Cap
        - ii. Use flashlight to detect sediment deposits
        - iii. If present, measure sediment depth with stadia rod
        - iv. Record results on Maintenance Log
        - v. Replace Cap
    - b. Maintenance Port/s
        - i. Remove Cap
        - ii. Use flashlight to detect sediment deposits
        - iii. If present, measure sediment depth with stadia rod
        - iv. Record results on Maintenance Log
        - v. Replace Cap
        - vi. Repeat for ALL Maintenance Ports
    - c. Adjacent Manholes
        - i. Remove Cover
        - ii. Use flashlight to detect sediment deposits
        - iii. If present, measure sediment depth with stadia rod, accounting for depth of sump (if present)
        - iv. Inspect pipes connecting to R-Tank
        - v. Record results on Maintenance Log
        - vi. Replace Cover
        - vii. Repeat for ALL Manholes that connect to the R-Tank

2) **Maintenance**
    - a. Plug system outlet to prevent discharge of back-flush water
    - b. Determine best location to pump out back-flush water
    - c. Remove Cap from Maintenance Port
    - d. Pump water as rapidly as possible (without over-topping port) into system until at least 1” of water covers system bottom
    - e. Replace Cap
    - f. Repeat at ALL Maintenance Ports
    - g. Pump out back-flush water to complete back-flushing
    - h. Vacuum all adjacent structures and any other structures or stormwater pre-treatment systems that require attention
    - i. Sediment-laden water may be captured for disposal or pumped through a Dirtbag™.
    - j. Replace any remaining Caps or Covers
    - k. Record the back-flushing event in your Maintenance Log with any relevant specifics

LET'S GET IT DONE

R-Tank Maintenance Log

Site Name:______________________________

Location:______________________________

System Owner:______________________________

Company Responsible for Maintenance:______________________________

Contact:______________________________

Phone Number:______________________________

Date	Location	Depth to Bottom	Depth to Sediment	Sediment Depth	Observations/Notes	Initials

For more information about our products, contact Inside Sales at 800.448.3636 or email at info@acfenv.com

SITE C

CONSTRUCTION PHASE POLLUTION PREVENTION AND EROSION AND SEDIMENTATION CONTROL PLAN (BEST MANAGEMENT PRACTICES OPERATION AND MAINTENANCE PLAN)

for

JACKSON SQUARE

In

Weymouth, Massachusetts
Building C
(Assessor's Parcel IDs 23-305-1, 23-305-4, 23-305-9, 23-305-10, & 23-253-11)

Submitted to:

TOWN OF WEYMOUTH

Prepared for:

Irakis N. Papachristos, Manager
864, 909, 910 Broad Street LLCs and
1409 Commercial Street
1 Franklin Street
Boston, Massachusetts 02110

Prepared by:

MCKENZIE ENGINEERING GROUP

Professional Civil Engineering • Project Management • Land Planning
150 Longwater Drive, Suite 101, Norwell, Massachusetts 02061
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August 4, 2023
Revised September 6, 2023
Revised November 17, 2023

TABLE OF CONTENTS

Construction Phase Best Management Practices (BMP's)

Erosion and Sedimentation will be controlled at the site by utilizing Structural Practices, Stabilization Practices, and Dust Control

Responsible Party Contact Information:

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Boston, MA 02110
Phone: (202) 230.1693

Town of Weymouth Contact Information:

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120 Winter Street
Weymouth, MA 02188
Phone: 781-337-5100

Weymouth Conservation Commission
Town Hall
75 Middle Street
Weymouth, MA 02189
Phone: (781) 340-5007

Weymouth Department of Municipal
Licenses and Inspections
Jeffrey E. Richards, C.B.O., Director
Town Hall
75 Middle Street
Weymouth, MA 02189
Phone: (781) 340-5004

Structural Practices:

1) **Compost Filter Tube Barrier Controls** – A compost filter tube barrier will be constructed along downward slopes at the limit of work in locations shown on the plans. This control will be installed prior to major soil disturbance on the site. The sediment silt sack barrier should be installed as shown on the Construction Detail Plan.

   Compost Filter Tube Design/Installation Requirements *

   a) Locate the compost filter tube where identified on the plans.

   b) The compost filter tube line should be nearly level through most of its length to impound a broad, temporary pool. The last 10 to 20 feet at each end of the silt sack should be swung slightly uphill (approximately 0.5 feet in elevation) to provide storage capacity.

c) The compost filter tube shall be staked every 8 linear feet with 1-inch by 1-inch stakes.

d) Compost filter tubes should be removed when they have served their useful purpose, but not before the upslope area has been permanently stabilized through one growing season. Retained sediment must be removed and properly disposed of or mulched and seeded.

Compost Filter Tube Inspection/Maintenance *

a) Compost filter tubes should be inspected immediately after each rainfall event of 1-inch or greater, and at least daily during prolonged rainfall. Inspect the depth of sediment, fabric tears, and to see that the fence posts are firmly in the ground. Repair or replace as necessary.

b) Remove sediment deposits promptly after storm events to provide adequate storage volume for the next rain and to reduce pressure on the fence. Sediment will be removed from behind the sediment fence when it becomes about ½ foot deep at the compost filter tube. Take care to avoid undermining fence during cleanout.

c) If the fabric tears, decomposes, or in any way becomes ineffective, replace it immediately.

d) Remove all compost filter tube materials after the contributing drainage area has been properly stabilized. Sediment deposits remaining after the fabric has been removed should be graded to conform with the existing topography and vegetated.

2) Sediment Fence Controls – A sediment fence will be constructed along the limit of work as needed to prevent the spreading of fine sediments from the site. This control will be installed prior to major soil disturbance on the site. The sediment fence should be installed as shown on the Erosion Control Detail Plan and be Amoco woven polypropylene 1198 or equivalent.

Sediment Fence Design/Installation Requirements *

a) Locate the fence upland of the hay bale barriers and where identified on the plans.

b) The fence line should be nearly level through most of its length to impound a broad, temporary pool. The last 10 to 20 feet at each end of the fence should be swung slightly uphill (approximately 0.5 feet in elevation) to provide storage capacity.

c) Excavate a trench approximately 8 inches deep and 4 inches wide, or a V-trench; along the line of the fence, upslope side.

d) Fasten support wire fence (14 gauge with 6-inch mesh) securely to the upslope side of the fence posts with wire ties or staples. Wire should extend 6 inches into the trench.

e) Attach continuous length of fabric to upslope side of fence posts. Avoid joints, particularly at low points in the fence line. Where joints are necessary, fasten fabric securely to support posts and overlap to the next post.

f) Place the bottom one foot of fabric in the trench. Backfill with compacted earth or gravel.

g) Filter cloth shall be fastened securely to the woven wire fence with ties spaced every 24 inches at the top, mid-section, and bottom.

h) Sediment fences should be removed when they have served their useful purpose, but not before the upslope area has been permanently stabilized through one growing season and only following approval by the Engineering Department or their representative. Retained sediment must be removed and properly disposed of, or mulched and seeded.

<u>Sediment Fence Inspection/Maintenance *</u>

a) Silt fences should be inspected immediately after each rainfall event of 1-inch or greater, and at least daily during prolonged rainfall. Inspect the depth of sediment, fabric tears, if the fabric is securely attached to the fence posts, and to see that the fence posts are firmly in the ground. Repair or replace as necessary.

b) Remove sediment deposits promptly after storm events to provide adequate storage volume for the next rain and to reduce pressure on the fence. Sediment will be removed from behind the sediment fence when it becomes about ½ foot deep at the fence. Take care to avoid undermining fence during cleanout.

c) If the fabric tears, decomposes, or in any way becomes ineffective, replace it immediately.

d) Remove all fencing materials after the contributing drainage area has been properly stabilized. Sediment deposits remaining after the fabric has been removed should be graded to conform to the existing topography and vegetation.

3) **Stabilized Construction Entrance** – A stabilized construction entrance will be placed at the proposed entrance at Commercial Street. The construction entrance will keep mud and sediment from being tracked off the construction site by vehicles leaving the site. The stabilized construction entrance will be installed immediately after the clearing and grubbing of the roadway entrance and associated roadway fill to maintain access to the site are completed. The stabilized construction entrance shall be constructed as shown on the Construction Detail Plans.

Construction Entrance Design/Construction Requirements *

a) Stone for a stabilized construction entrance shall consist of 1 to 3-inch stone placed on a stable foundation.

b) Pad dimensions: The minimum length of the gravel pad should be 50 feet. The pad should extend the full width of the proposed roadway, or wide enough so that the largest construction vehicle will fit in the entrance with room to spare; whichever is greater.

c) A geotextile filter fabric shall be placed between the stone fill and the earth surface below the pad to reduce the migration of soil particles from the underlying soil into the stone and vice versa. The filter fabric should be Amoco woven polypropylene 1198 or equivalent.

d) Washing: If the site conditions are such that the majority of mud is not removed from the vehicle tires by the gravel pad, then the tires should be washed before the vehicle enters the street. The wash area shall be located at the stabilized construction entrance.

e) Water employed in the washing process shall be directed to the temporary dewatering area as shown on the plans prior to discharge. Sediment should be prevented from entering any watercourses.

<u>Construction Entrance Inspection/Maintenance *</u>

a) The entrance should be maintained in a condition that will prevent tracking or flowing of sediment onto Lovell Field and Commercial Street. This may require periodic topdressing with additional stone.

b) The construction entrance and sediment disposal area shall be inspected weekly and after heavy rains or heavy use.

c) Mud and sediment tracked or washed onto public road shall be immediately removed by sweeping.

d) Once mud and soil particles clog the voids in the gravel and the effectiveness of the gravel pad is no longer satisfactory, the pad must be topdressed with new stone. Replacement of the entire pad may be necessary when the pad becomes completely clogged.

e) If washing facilities are used, the dewatering area should be cleaned out as often as necessary to assure that adequate trapping efficiency and storage volume is available.

f) The pad shall be reshaped as needed for drainage and runoff control.

g) Broken road pavement on Lovell Field and Commercial Street shall be repaired immediately.

h) All temporary erosion and sediment control measures shall be removed within 30 days after final site stabilization is achieved or after the temporary practices are no longer needed and only following approval by the Public Works Department or their representative. Trapped sediment shall be removed or stabilized on site. Disturbed soil areas resulting from removal shall be permanently stabilized.

Stabilization Practices:

Stabilization measures shall be implemented as soon as practicable in portions of the site where construction activities have temporarily or permanently ceased, but in no case more than 14 days after the construction activity in that portion of the site has temporarily or permanently ceased, with the following exceptions.

- Where the initiation of stabilization measures by the 14th day after construction activity temporarily or permanently cease is precluded by snow cover, stabilization measures shall be initiated as soon as practicable.

- Where construction activity will resume on a portion of the site within 21 days from when activities ceased, (e.g. the total time period that construction activity is temporarily ceased is less than 21 days) then stabilization measures do not have to be initiated on that portion of the site by the 14th day after construction activity temporarily ceased.

- The contractor shall provide erosion control measures around all soil stockpiles.

1) **Temporary Seeding** – Temporary seeding will allow short–term vegetative cover on disturbed site areas that may be in danger of erosion. Temporary seeding will be done at stockpiles and disturbed portions of the site where construction activity will temporarily cease for at least 21 days. The temporary seedings will stabilize cleared and unvegetated areas that will not be brought into final grade for several weeks or months.

   Temporary Seeding Planting Procedures *

   a) Planting should preferably be done between April 1st and June 30th, and September 1st through September 31st. If planting is done in the months of July and August, irrigation may be required. If planting is done between October 1st and March 31st, mulching should be applied immediately after planting. If seeding is done during the summer months, irrigation of some sort will probably be necessary.

   b) Before seeding, install structural practice controls. Utilize Amoco supergro or equivalent.

   c) Select the appropriate seed species for temporary cover from the following table.

Species	Seeding Rate (lbs/1,000 sq.ft.)	Seeding Rate (lbs/acre)	Recommended Seeding Dates	Seed Cover required
Annual Ryegrass	1	40	April 1st to June 1st August 15th to Sept. 15th	¼ inch
Foxtail Millet	0.7	30	May 1st to June 30th	½ to ¾ inch
Oats	2	80	April 1st to July 1st August 15th to Sept. 15th	1 to 1-½ inch
Winter Rye	3	120	August 15th to Oct. 15th	1 to 1-½ inch

Apply the seed uniformly by hydroseeding, broadcasting, or by hand.

d) Use effective mulch, tacked and/or tied with netting to protect seedbed and encourage plant growth.

Temporary Seeding Inspection/Maintenance *

a) Inspect within 6 weeks of planting to see if stands are adequate. Check for damage within 24 hours of the end to heavy rainfall, defined as a 2-year storm event (i.e., 3.2 inches of rainfall within a twenty-four-hour period). Stands should be uniform and dense. Reseed and mulch damaged and sparse areas immediately. Tack or tie down mulch as necessary.

b) Seeds should be supplied with adequate moisture. Furnish water as needed, especially in abnormally hot or dry weather. Water application rates should be controlled to prevent runoff.

2) Geotextiles - Geotextiles such as jute netting will be used in combination with other practices such as mulching to stabilize slopes. The following geotextile materials or equivalent are to be utilized for structural and nonstructural controls as shown in the following table.

Practice	**Manufacturer**	**Product**	**Remarks**
Sediment Fence	Amoco	Woven polypropylene 1198 or equivalent	0.425 mm opening
Construction Entrance	Amoco	Woven polypropylene 2002 or equivalent	0.300 mm opening
Outlet Protection	Amoco	Nonwoven polypropylene 4551 or equivalent	0.150 mm opening
Erosion Control (slope stability)	Amoco	Supergro or equivalent	Erosion control revegetation mix, open polypropylene fiber on degradable polypropylene net scrim

Amoco may be reached at (800) 445-7732

Geotextile Installation

a) Netting and matting require firm, continuous contact between the materials and the soil. If there is no contact, the material will not hold the soil and erosion will occur underneath the material.

Geotextile Inspection/Maintenance *

a) In the field, regular inspections should be made to check for cracks, tears, or breaches in the fabric. The appropriate repairs should be made.

3) Mulching and Netting – Mulching will provide immediate protection to exposed soils during the period of short construction delays, or over winter months through the application of plant residues, or other suitable materials, to exposed soil areas. In areas, which have been seeded either for temporary or permanent cover, mulching should immediately follow seeding. On steep slopes, mulch must be supplemented with netting.

Mulch Maintenance *

a) Inspect after rainstorms to check for movement of mulch or erosion. If washout, breakage, or erosion occurs, repair surface, reseed, remulch, and install new netting.

b) Grass mulches that blow or wash away should be repaired promptly.

c) If plastic netting is used to anchor mulch, care should be taken during initial mowings to keep the mower height high. Otherwise, the netting can wrap up on the mower blade shafts. After a period of time, the netting degrades and becomes less of a problem.

d) Continue inspections until vegetation is well established.

4) Land Grading – Grading on fill slopes, cut slopes, and stockpile areas will be done with full siltation controls in place.

Land Grading Design/Installation Requirements

a) Areas to be graded should be cleared and grubbed of all timber, logs, brush, rubbish, and vegetated matter that will interfere with the grading operation. Topsoil should be stripped and stockpiled for use on critical disturbed areas for establishment of vegetation. Cut slopes to be topsoiled should be thoroughly scarified to a minimum depth of 3-inches prior to placement of topsoil.

b) Fill materials should be generally free of brush, rubbish, rocks, and stumps. Frozen materials or soft and easily compressible materials should not be used in fills intended to support buildings, parking lots, roads, conduits, or other structures.

c) Earth fill intended to support structural measures should be compacted to a minimum of 90 percent of Standard Proctor Test density with proper moisture control, or as otherwise specified by the engineer responsible for the design. Compaction of other fills should be to the density required to control sloughing, erosion or excessive moisture content. Maximum thickness of fill layers prior to compaction should not exceed 9 inches.

d) The uppermost one foot of fill slopes should be compacted to at least 85 percent of the maximum unit weight (based on the modified AASHTO compaction test). This is usually accomplished by running heavy equipment over the fill.

e) Fill should consist of material from borrow areas and excess cut will be stockpiled in areas shown on the Site Plans. All disturbed areas should be free draining, left with a neat and finished appearance, and should be protected from erosion.

f) Infiltration basins shall be excavated, graded and shaped to subgrade elevation and shall then be suitably protected with installation of erosion control measures to prevent sediment-laden runoff from washing into the basins. The basins shall also be protected from heavy equipment activity from this point forward. Prior to application of loam and seed to infiltration basin surfaces, the contractor shall

remove any unsuitable soil such as silt or clay that may have been deposited during construction. The surface shall be scarified with a York rake or other small tractor mounted equipment. The loam and seed shall then be applied as required by this document.

Land Grading Stabilization Inspection/Maintenance *

a) All slopes should be checked periodically to see that vegetation is in good condition. Any rills or damage from erosion and animal burrowing should be repaired immediately to avoid further damage.

b) If seeps develop on the slopes, the area should be evaluated to determine if the seep will cause an unstable condition. Subsurface drains or a gravel mulch may be required to solve seep problems. However, no seeps are anticipated.

c) Areas requiring revegetation should be repaired immediately. Control undesirable vegetation such as weeds and woody growth to avoid bank stability problems in the future.

5) **Topsoiling *** – Topsoiling will help establish vegetation on all disturbed areas throughout the site during the seeding process. The soil texture of the topsoil to be used will be a sandy loam to a silt loam texture with 15% to 20% organic content.

Topsoiling Placement

a) Topsoil should not be placed while in a frozen or muddy condition, when the subgrade is excessively wet, or when conditions exist that may otherwise be detrimental to proper grading or proposed seeding.

b) Do not place topsoil on slopes steeper than 2.5:1, as it will tend to erode.

c) If topsoil and subsoil are not properly bonded, water will not infiltrate the soil profile evenly and it will be difficult to establish vegetation. The best method is to actually work the topsoil into the layer below for a depth of at least 6 inches.

6) **Permanent Seeding** – Permanent Seeding should be done immediately after the final design grades are achieved. Native species of plants should be used to establish perennial vegetative cover on disturbed areas. The revegetation should be done early enough in the fall so that a good cover is established before cold weather comes and growth stops until the spring. A good cover is defined as vegetation covering 75 percent or more of the ground surface.

Permanent Seeding Seedbed Preparation

a) In infertile or coarse-textured subsoil, it is best to stockpile topsoil and re-spread it over the finished slope at a minimum 2 to 6-inch depth and roll it to provide a firm seedbed. The topsoil must have a sandy loam to silt loam texture with 15% to 20% organic content. If construction fill operations have left soil exposed with a loose, rough, or irregular surface, smooth with blade and roll.

b) Loosen the soil to a depth of 3-5 inches with suitable agricultural or construction equipment.

c) Areas not to receive topsoil shall be treated to firm the seedbed after incorporation of the lime and fertilizer so that it is depressed no more than ½ - 1 inch when stepped on with a shoe. Areas to receive topsoil shall not be firmed until after topsoiling and lime and fertilizer is applied and incorporated, at which time it shall be treated to firm the seedbed as described above.

Permanent Seeding Grass Selection/Application

a) Select an appropriate cool or warm season grass based on site conditions and seeding date. Apply the seed uniformly by hydro-seeding, broadcasting, or by hand. Uniform seed distribution is essential. On steep slopes, hydroseeding may be the most effective seeding method. Surface roughening is particularly important when preparing slopes for hydroseeding.

b) Lime and fertilize. Organic fertilizer shall be utilized in areas within the 100 foot buffer zone to a wetland resource area.

c) Mulch the seedings with straw applied at the rate of ½ tons per acre. Anchor the mulch with erosion control netting or fabric on sloping areas. Amoco supergro or equivalent should be utilized.

Permanent Seeding Inspection/Maintenance *

a) Frequently inspect seeded areas for failure and make necessary repairs and reseed immediately. Conduct or follow-up survey after one year and replace failed plants where necessary.

b) If vegetative cover is inadequate to prevent rill erosion, overseed and fertilize in accordance with soil test results.

c) If a stand has less than 40% cover, reevaluate choice of plant materials and quantities of lime and fertilizer. Re-establish the stand following seedbed preparation and seeding recommendations, omitting lime and fertilizer in the absence of soil test results. If the season prevents resowing, mulch or jute netting is an effective temporary cover.

d) Seeded areas should be fertilized during the second growing season. Lime and fertilize thereafter at periodic intervals, as needed.

Fueling and Maintenance of Equipment and Vehicles:

1. Refueling/maintenance Rules – The site supervisor shall produce a written document received by all subcontractors and employees that delineates their responsibilities on site. This document shall include language that shall permit the maintenance of vehicles only in designated locations on the job site. In the event of mechanical failure of a vehicle, the vehicle shall be moved to the designated maintenance area on the site to perform maintenance. The site supervisor shall document receipt of these instructions by obtaining the

signatures of subcontractors and individuals that may enter the site and the date in which they were notified of their responsibilities. Refueling for vehicles or equipment shall occur either within the designated washout area or shall utilize temporary drip protection measures at the location of fueling. The site supervisor or their representative shall be present at the time of any fueling procedure. The site supervisor shall have a fuel spill plan and measures on site to initiate containment and clean-up in the event a fuel spill occurs.

2. Installation Schedule: Prior to start of Work

3. Maintenance and Inspection: The site supervisor shall maintain a log of individuals receiving these instructions.

4. Specific Pollution Prevention Practices

   Pollution Prevention Practice # 1

   a. Description: Fueling operations shall take place in designated area(s) as shown on site maps. Provide temporary drip protection during fueling operations which take place outside of designated area(s). Materials necessary to address a spill shall be made readily available in a location known to the site supervisor or his/her designee.

   b. Installation: Fueling operation procedures shall be in effect throughout the project duration.

   c. Maintenance Requirements: All emergency response equipment listed in the Emergency Response Equipment Inventory shall be made readily available and kept in a designated location known to the site supervisor or his/her designee. All such materials shall be replenished as necessary to the listed amounts.

Dust Control:

Dust control will be utilized throughout the entire construction process of the site. For example, keeping disturbed surfaces moist during windy periods will be an effective control measure, especially for construction access roads. The use of dust control will prevent the movement of soil to offsite areas. However, care must be taken to not create runoff from excessive use of water to control dust. The following are methods of Dust Control that may be used on-site:

- Vegetative Cover – The most practical method for disturbed areas not subject to traffic.
- Calcium Chloride – Calcium chloride may be applied by mechanical spreader as loose, dry granules or flakes at a rate that keeps the surface moist but not so high as to cause water pollution or plant damage.
- Sprinkling – The site may be sprinkled until the surface is wet. Sprinkling will be effective for dust control on haul roads and other traffic routes.
- Stone – Stone will be used to stabilize construction roads; will also be effective for dust control.

The general contractor shall employ an on-site water vehicle for the control of dust as necessary.

Non-Stormwater Discharges:

The construction de-watering and all non-stormwater discharges will be directed into a sediment dirt bag (or equivalent inlet protection) or a sediment basin. Sediment material removed shall be disposed of in accordance with all applicable local, state, and federal regulations.

The developer and site general contractor will comply with the E.P.A.'s Final General Permit for Construction De-watering Discharges, (N.P.D.E.S., Section 402 and 40 C.F.R. 122.26(b)(14)(x).

Inspection/Maintenance:

Operator personnel must inspect the construction site at least once every 14 calendar days and within 24 hours of a storm event of ½-inch or greater. The applicant shall be responsible to secure the services of a design professional or similar professional (inspector) on an on-going basis throughout all phases of the project. Refer to the Inspection/Maintenance Requirements presented earlier in the "Structural and Stabilization Practices." The inspector should review the erosion and sediment controls with respect to the following:

- Whether or not the measure was installed/performed correctly.
- Whether or not there has been damage to the measure since it was installed or performed.
- What should be done to correct any problems with the measure.

The inspector should complete the Stormwater Management Construction Phase BMP Inspection Schedule and Evaluation Checklist, as attached, for documenting the findings and should request the required maintenance or repair for the pollution prevention measures when the inspector finds that it is necessary for the measure to be effective. The inspector should notify the appropriate person to make the changes and submit copies of the form to the Weymouth Highway Department.

Project Location: Jackson Square, Parcel IDs 23-305-1, 23-305-4, 23-305-9, 23-305-10 & 23-350-11, Weymouth, MA **Date:**
Stormwater Management – Construction Phase
Best Management Practices – Inspection Schedule and Evaluation Checklist

Construction Practices

Best Management Practice	Inspection Frequency	Date Inspected	Inspector	Minimum Maintenance and Key Items to Check	Cleaning/Repair Needed: (List Items)	Date of Cleaning/ Repair	Performed by
Silt Sock and Sediment Fence Controls	After heavy rainfall events (minimum weekly)			1. Sediment Fence Design/Installation Requirements 2. Sediment Fence Inspection/Maintenance	☐yes ☐no		
Stabilized Construction Entrance	After heavy rainfall events (minimum weekly)			1. Construction Entrance Design/ Construction Requirements 2. Construction Entrance Inspection/ Maintenance	☐yes ☐no		
Temporary Seeding	After heavy rainfall events (minimum weekly)			1. Temporary Seeding Planting Procedures 2. Temporary Seeding Inspection/ Maintenance	☐yes ☐no		
Geotextiles	After heavy rainfall events (minimum weekly)			1. Geotextile Inspection/Maintenance	☐yes ☐no		
Mulching & Netting	After heavy rainfall events (minimum weekly)			1. Mulch Maintenance	☐yes ☐no		
Land Grading	After heavy rainfall events (minimum weekly)			1. Land Grading Stabilization Inspection/ Maintenance	☐yes ☐no		

Project Location: Jackson Square, Parcel IDs 23-305-1, 23-305-4, 23-305-9, 23-305-10 & 23-350-11, Weymouth, MA **Date:**
Stormwater Management – Construction Phase
Best Management Practices – Inspection Schedule and Evaluation Checklist

Construction Practices

Permanent Seeding	After heavy rainfall events (minimum weekly)			1. Permanent Seeding Inspection/ Maintenance	☐**yes** ☐**no**		
Dust Control	After heavy rainfall events (minimum weekly)				☐**yes** ☐**no**		
Soil Stockpiling	After heavy rainfall events (minimum weekly)				☐**yes** ☐**no**		

(1) Refer to the Massachusetts Stormwater Handbook issued January 2, 2008.

Notes (Include deviations from : Definitive Subdivision Decision and Special Conditions and Approved Plan):

Stormwater Control Manager ________________________________

Spill Containment and Management Plan

Initial Notification

In the event of a spill, the facility manager will be notified immediately.

Facility Managers (name)	Irakis N. Papachristos, Manager 1 Franklin Street, Boston, MA 02110
Facility Manager (phone)	203-230.1693

Assessment - Initial Containment

The supervisor will assess the incident and initiate containment control measures with the appropriate spill containment equipment included in the spill kit kept on-site. The supervisor will first contact the Fire Department and then notify the Police Department, Department of Public Works, Board of Health and Conservation Commission. The fire department is ultimately responsible for matters of public health and safety and should be notified immediately.

Contact:	Phone Number:
Fire Department:	911
Police Department:	911
Department of Public Works:	(781) 337-5100
Board of Health Phone:	(781) 335-2000
Conservation Commission Phone:	(781) 340-5007

Further Notification

Based on the assessment from the Fire Chief, additional notification to a cleanup contractor may be made. The Massachusetts Department of Environmental Protection (DEP) and the EPA may be notified depending upon the nature and severity of the spill. The Fire Chief will be responsible for determining the level of cleanup and notification required. The attached list of emergency phone numbers shall be posted in the facility office and readily accessible to all employees.

HAZARDOUS WASTE / OIL SPILL REPORT

Date____/_____/_____ Time____________ AM / PM

Exact location (Transformer #)____

Type of equipment___________________________Make_____________Size______________

S / N_________________________________Weather Conditions________________________

On or near water ☐ Yes If yes, name of body of water____________________

☐ No

Type of chemical / oil spilled__________________________

Amount of chemical / oil spilled________________________

Cause of spill____

____

____

Measures taken to contain or clean up spill____

____

____

Amount of chemical / oil recovered________________Method____________________________

Material collected as a result of clean up

_____________drums containing____

_____________drums containing____

_____________drums containing____

Location and method of debris disposal____

____

Name and address of any person, firm, or corporation suffering damages____________________

____

Procedures, method, and precautions instituted to prevent a similar occurrence from recurring___

____

Spill reported to General Office by__________________________Time_____________AM / PM

Spill reported to DEP / National Response Center by____________________________________

DEP Date____/_____/_____ Time_________ AM / PM Inspector_______________

NRC Date____/_____/_____ Time_________ AM / PM Inspector_______________

Additional comments____

____

____

EMERGENCY RESPONSE EQUIPMENT
INVENTORY

The following equipment and materials shall be maintained at all times and stored in a secure area for long-term emergency response need.

--	SORBENT PADS	1 BALE
--	SAND BAGS (empty)	5
--	SPEEDI-DRI ABSORBENT	2 – 40LB BAGS
--	12” INFLATABLE PIPE PLUG	1
--	SQUARE END SHOVELS	1
--	PRY BAR	1
--	CATCH BASIN COVER	1

EMERGENCY NOTIFICATION PHONE NUMBERS

1. FACILITY MANAGER
   NAME: ____________________ BEEPER: ____________________
   PHONE: ____________________ CELL PHONE: ____________________

   ALTERNATE:
   NAME: ____________________ BEEPER: N/A ____________________
   PHONE: ____________________ CEL PHONE: N/A ____________________

2. FIRE DEPARTMENT
   EMERGENCY: 911
   BUSINESS: (781) 337-5151

   POLICE DEPARTMENT
   EMERGENCY: 911
   BUSINESS: (781) 335-1212

   DEPARTMENT OF PUBLIC WORKS
   CONTACT: Director – Kenan Connell
   BUSINESS: (781) 337-5100

   CONSERVATION COMMISSION
   CONTACT: Andrew Hultin
   BUSINESS: (781) 340-5007

   BOARD OF HEALTH
   CONTACT: Board of Health Agent Clerk – Clare LaMorte, RN
   BUSINESS: (781) 335-2000

3. MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
   EMERGENCY: (617) 556-1133
   SOUTHEAST REGION - LAKEVILLE OFFICE: (508) 946-2700

4. NATIONAL RESPONSE CENTER
   PHONE: (800) 424-8802

   ALTERNATE: U.S. ENVIRONMENTAL PROTECTION AGENCY
   EMERGENCY: (617) 223-7265
   BUSINESS: (617) 860-4300

POST-DEVELOPMENT BEST MANAGEMENT PRACTICE OPERATION AND MAINTENANCE PLAN & LONG-TERM POLLUTION PREVENTION PLAN

for

JACKSON SQUARE

In

Weymouth, Massachusetts
Building C
(Assessor's Parcel IDs 23-305-1, 23-305-4, 23-305-9, 23-305-10, & 23-253-11)

Submitted to:

TOWN OF WEYMOUTH

Prepared for:

Irakis N. Papachristos, Manager
864, 909, 910 Broad Street LLCs and
1409 Commercial Street
1 Franklin Street
Boston, Massachusetts 02110

Prepared by:

MCKENZIE
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Professional Civil Engineering • Project Management • Land Planning
150 Longwater Drive, Suite 101, Norwell, Massachusetts 02061
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August 4, 2023
Revised September 6, 2023
Revised November 17, 2023

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Post-Development Best Management Practice
Operation and Maintenance Plan &
Long-Term Pollution Prevention Plan

Post-Development Best Management Practices (BMPs) Operation and Maintenance Plan

Responsible Party/Property Owner/Developer contact information:

Property Owner: Irakis N. Papachristos, Manager
864, 909, 910 Broad Street LLCs and
1409 Commercial Street
1 Franklin Street
Boston, MA 02110
Phone: (202) 230.1693

Developer Contact Information:

Irakis N. Papachristos, Manager
864, 909, 910 Broad Street LLCs and
1409 Commercial Street
1 Franklin Street
Boston, MA 02110
Phone: (202) 230.1693

City of Weymouth Contact Information:

Weymouth Department of Public Works
120 Winter Street
Weymouth, MA 02188
Phone: 781-337-5100

Best Management Practices (BMPs) of the Commonwealth of Massachusetts Department of Environmental Protection's (DEP's) Stormwater Management Policy (SMP) have been implemented and utilized for the project. The following information provided is to be used as a guideline for monitoring and maintaining the performance of the drainage facilities and to ensure that the quality of water runoff meets the standards set forth by the SMP. The structural Best Management Practices (BMPs) shall be inspected during rainfall conditions during the first year of operation to verify functionality.

All BMPs located within the drainage easements will be owned and maintained by the developer until such a time that a homeowners association is created, then the homeowners association will maintain the BMPs.

BMPs included in the design consist of the use of:

- Stormceptor Treatment Units
- Bio-retention/Rain Garden
- Access Drive Pavement Maintenance

Operation:

Once the stormwater management systems have been constructed and site has been permanently stabilized and put into action, the operation of the stormwater management system will function as intended. Stormwater runoff is directed into the trench drain to the First Defense unit, and lastly to the subsurface infiltration system. The stormwater management systems have been designed to attenuate peak flows for the 2-year through 100-year storm events.

Maintenance:

1. **Paved Areas** –Sweepers shall sweep paved areas periodically during dry weather to remove excess sediments and to reduce the amount of sediments that the drainage system shall have to remove from the runoff. The sweeping shall be conducted primarily between March 15th and November 15th. Special attention should be made to sweeping paved surfaces in March and April before spring rains wash residual sand into the drainage system.

   The frequency of sweeping shall average:

   - Monthly if by a high-efficiency vacuum sweeper
   - Bi-weekly if by a regenerative air sweeper
   - Weekly if by a mechanical sweeper

   Salt used for de-icing on the parking lot during winter months shall be limited as much as possible as this will reduce the need for removal and treatment. Sand containing the minimum amount of calcium chloride (or approved equivalent) needed for handling may be applied as part of the routine winter maintenance activities.

   Cost: The property owner should consult local sweeping contractors for detailed cost estimates.

2. **Proprietary Pretreatment Units –** The proprietary pretreatment units shall be inspected and maintained from the surface, without entry into the unit a minimum of annually and following heavy rain events. Perform maintenance once the stored volume reaches 15% of the unit capacity, or immediately in the event of a spill. Perform Maintenance at quarterly intervals during the first year of installation, so an accurate maintenance schedule can be established. Sediment and debris should be removed through the 12-inch diameter outlet pipe. Alternatively, oil and floatables should be removed through the 12-inch oil inspection port. The requirements for the disposal from the units should be in compliance with all local, state and federal regulations. Consult the Natick Board of Health for transfer station locations prior to disposing the separator contents. Please refer to the Manufacturer's Manual for additional detail on proper inspection and maintenance of the First Defense units.

   Cost: Cleaning should be included along with the routine maintenance of the catch basins. The property owner should consult local vacuum cleaning contractors for detailed cost estimates.

3. **Trench Drains -** Trench drain grates shall be checked quarterly and following heavy rainfalls to verify that the inlet openings are not clogged by debris. Debris shall be removed from the grates and disposed of in accordance with all applicable regulations.

Cost: The property owner should consult local landscape contractors for a detailed cost estimate.

4. **Bio-Retention (Rain Garden)** - The bio-retention area shall be inspected at least twice per year to ensure that the area is operating as intended and immediately after heavy rainfall events to verify that the area drain is not blocked by litter or other debris. Accumulated debris shall be removed as soon as possible. Deeply accumulated sediments shall be removed from the area periodically to ensure proper functioning of the system. If standing water is observed in the bio-retention area for a period greater than 72 hours, replacement of the substratum may be required to rejuvenate the area. Do not store snow in the bio-retention area.

   The following maintenance schedule should be adhered:

Inspect and Remove Trash and Debris:	*6 times per year*	*Year Round*
Mulch/re-seed:	*1 time per year*	*Spring*
Fertilize:	*1 time*	*Initially*
Remove Dead Vegetation:	*2 times per year*	*Fall and Spring*
Replace Dead Vegetation:	*2 times per year*	*Fall and Spring*
Prune:	*1 time per year*	*Fall or Spring*
Repair Eroded Areas:	*As needed*	*Year Round*
Replace Entire Media & All Vegetation:	*As needed*	*Late Spring/ Early Summer*

   Maintenance and inspections can be performed along with other routine landscaping tasks by a landscaping contractor. The contractor should be qualified to inspect the planter for sediment build-up, structural damage and standing water. The plant selection for the planter was specifically intended to minimize the need for fertilizers and pesticides. The planter shall be routinely weeded and kept free of invasive or intrusive plant species.

5. **Pesticides, Herbicides, and Fertilizers -** Pesticides and herbicides shall be used sparingly. Fertilizers should be restricted to the use of organic fertilizers only.

   All structural BMP's as identified on the site plans will be owned and maintained by the homeowner's association of the development and shall run with the title of the property.

   Cost: Included in the routine landscaping maintenance schedule. The Owner should consult local landscaping contractors for details.

6. **Snow Removal -** Snow accumulations removed from access road should be placed in upland areas only, where sand and other debris will remain after snowmelt for later removal. Excess snow should be removed from the site and properly disposed of in an approved snow disposal facility. Care must be exercised not to deposit snow in the in areas where sand and debris can get into the watercourse.

   Cost: The owner should consult local snow removal contractors for a detailed cost estimate.

Maintenance Responsibilities:

All post construction maintenance activities will be documented and kept on file. Annual inspection reports in the form of an Evaluation Checklist, see attached form, will be submitted to the City of Weymouth. Inspections shall be performed by a licensed engineer or similar professional (inspector).

All BMPs located within the drainage easements will be owned and maintained by the developer until such time that a homeowners association is created, then the homeowners association will maintain the BMPs.

Long-Term Pollution Prevention Plan

Good Housekeeping:

To develop and implement an operation and maintenance program with the goal of preventing or reducing pollutant runoff by keeping potential pollutants from coming into contact with stormwater or being transported off site without treatment, the following efforts will be made:

- Property Management awareness and training on how to incorporate pollution prevention techniques into maintenance operations.
- Follow appropriate best management practices (BMPs) by proper maintenance and inspection procedures.
- Homeowner education outreach, including promoting recycling through the City of Weymouth Transfer Station.

Storage and Disposal of Household Waste and Toxics:

This management measure involves educating the general public on the management considerations for hazardous materials. Failure to properly store hazardous materials dramatically increases the probability that they will end up in local waterways. Many people have hazardous chemicals stored throughout their homes, especially in garages and storage sheds. Practices such as covering hazardous materials or even storing them properly, can have dramatic impacts. Property owners are encouraged to support the household hazardous product collection events sponsored by the City of Weymouth.

MADEP has prepared several materials for homeowners on how to properly use and dispose of household hazardous materials:
http://www.mass.gov/dep/recycle/reduce/househol.htm

For consumer questions on household hazardous waste call the following number:
DEP Household Hazardous Waste Hotline 800-343-3420

The following is a list of management considerations for hazardous materials as outlined by the EPA:

- Ensuring sufficient aisle space to provide access for inspections and to improve the ease of material transport;
- Storing materials well away from high-traffic areas to reduce the likelihood of accidents that might cause spills or damage to drums, bags, or containers.
- Stacking containers in accordance with the manufacturers' directions to avoid damaging the container or the product itself;
- Storing containers on pallets or equivalent structures. This facilitates inspection for leaks and prevents the containers from coming into contact

with wet floors, which can cause corrosion. This consideration also reduces the incidence of damage by pests.

The following is a list of commonly used hazardous materials used in the household:

Batteries – automotive and rechargeable
  nickel cadmium batteries
  (no alkaline batteries)
Gasoline
Oil-based paints
Fluorescent light bulbs and lamps
Pool chemicals
Propane tanks
Lawn chemicals,
fertilizers and weed killers
Turpentine
Bug sprays
Antifreeze
Paint thinners, strippers, varnishes and stains
Arts and crafts chemicals
Charcoal lighter fluid
Disinfectant
Drain clog dissolvers
Driveway sealer
Flea dips, sprays and collars
Houseplant insecticides
Metal polishes
Mothballs
Motor oil and filters
Muriatic acid (concrete cleaner)
Nail polishes and nail polish removers
Oven cleaner
Household pest and rat poisons
Rug and upholstery cleaners
Shoe polish
Windshield wiper fluid

Landscape Maintenance:

This management measure seeks to control the storm water impacts of landscaping and lawn care practices through education and outreach on methods that reduce nutrient loadings and the amount of storm water runoff generated from lawns. Nutrient loads generated by fertilizer use on suburban lawns can be significant, and recent research has shown that lawns produce more surface runoff than previously thought.

Using proper landscaping techniques can effectively increase the value of a property while benefiting the environment. These practices can benefit the environment by reducing water use; decreasing energy use (because less water pumping and treatment is required); minimizing runoff of storm and irrigation water that transports soils, fertilizers, and pesticides; and creating additional habitat for plants and wildlife. The following lawn and landscaping management practices will be encouraged:

- Mow lawns at the highest recommended height.
- Minimize lawn size and maintain existing native vegetation.
- Collect rainwater for landscaping/gardening needs (rain barrels and cisterns to capture roof runoff).
- Raise public awareness for promoting the water efficient maintenance practices by informing users of water efficient irrigation techniques and other innovative approaches to water conservation.
- Abide by water restrictions and other conservation measures implemented by the City of Weymouth.
- Water only when necessary.
- Use automatic irrigation systems to reduce water use.

Integrated Pest Management (IPM):

This management measure seeks to limit the adverse impacts of insecticides and herbicides by providing information on alternative pest control techniques other than chemicals or explaining how to determine the correct dosages needed to manage pests.

The presence of pesticides in stormwater runoff has a direct impact on the health of aquatic organisms and can present a threat to humans through contamination of drinking water supplies. The pesticides of greatest concern are insecticides, such as diazinon and chloropyrifos, which even at very low levels can be harmful to aquatic life. The major source of pesticides to urban steams is home application of products designed to kill insects and weeds in the lawn and garden. The following IPM practices will be encouraged:

- Lawn care and landscaping management programs including appropriate pesticide use management as part of program.
- Raise public awareness by referring homeowners to “A Homeowner’s Guide to Environmentally Sound Lawncare, Maintaining a Healthy Lawn the IPM Way”, Massachusetts Department of Food and Agriculture, Pesticide Bureau or link **http://www.mass.gov/dep/water/resources/nonpoint.htm#megaman>**

Illicit Discharges:

Illicit discharges are non-stormwater discharges to the storm drain system which typically contain bacteria and other pollutants. All illicit discharges are prohibited. Any illicit discharges should be reported to MassDOT and/or the DPW as applicable to be addressed in accordance with their respective policies.

The following is a list of EPA allowed non-stormwater discharges. If the non-stormwater discharge is not listed, it is prohibited.

1. Water line flushing,
2. Landscape irrigation,
3. Diverted stream flows,
4. Rising ground waters,
5. Uncontaminated ground water infiltration (as defined at 40 CFR 35.2005(20)),
6. Uncontaminated pumped ground water,
7. Discharge from potable water sources,
8. Foundation drains,
9. Air conditioning condensation,
10. Irrigation water, springs,
11. Water from crawl space pumps,
12. Footing drains,
13. Lawn watering,
14. Flows from riparian habitats and wetlands,
15. Street wash water,
16. Discharges or flows from firefighting activities occur during emergency conditions.

Project Location: Jackson Square, Assessor's Parcel IDs 23-253-14 & 23-253-16, Weymouth, MA

Stormwater Management – Post Construction Phase
Best Management Practices – Inspection Schedule and Evaluation Checklist

Long Term Practices

Best Management Practice	Inspection Frequency (1)	Date Inspected	Inspector	Minimum Maintenance and Key Items to Check (1)	Cleaning/Repair Needed: ☐yes ☐no (List Items)	Date of Cleaning/ Repair	Performed by
Street Sweeping Maintenance	4-times annually - specifically in Spring and Fall			1. Sediment build-up 2. Trash and debris 3. Minor Spills (vehicular)			
Proprietary Pretreatment Units	After heavy rainfall events (minimum annually)			1. Sediment level exceeds Manufacturer's specification 2. Trash and debris 3. Floatable oils or hydrocarbons 4. Outlet blockages			
Bio-Retention/Rain Garden	After heavy rainfall events (minimum semi-annually)			1. Sediment build-up 2. Trash and debris 3. Dead vegetation 4. Standing Water greater than 72 hours			
Trench Drains	After heavy rainfall events (minimum quarterly)			1. Sediment level exceeds 8" 2. Trash and debris 3. Floatable oils or hydrocarbons 4. Grate or outlet blockages			

(1) Refer to the Massachusetts Stormwater Management, Volume Two: Stormwater Technical Handbook (February 2008) for recommendations regarding frequency for inspection and maintenance of specific BMP's.

Notes (Include deviations from: Con Com Order of Conditions, PB Approval, Construction Sequence and Approved Plan):

1.

Stormwater Control Manager ________________________________ Stamp:

Spill Containment and Management Plan

Initial Notification

In the event of a spill, the facility manager will be notified immediately.

Facility Managers (name)	Irakis N. Papachristos, Manager 1 Franklin Street, Boston, MA 02110
Facility Manager (phone)	203-230.1693

Assessment - Initial Containment

The supervisor will assess the incident and initiate containment control measures with the appropriate spill containment equipment included in the spill kit kept on-site. The supervisor will first contact the Fire Department and then notify the Police Department, Department of Public Works, Board of Health and Conservation Commission. The fire department is ultimately responsible for matters of public health and safety and should be notified immediately.

Contact:	Phone Number:
Fire Department:	911
Police Department:	911
Department of Public Works:	(781) 337-5100
Board of Health Phone:	(781) 335-2000
Conservation Commission Phone:	(781) 340-5007

Further Notification

Based on the assessment from the Fire Chief, additional notification to a cleanup contractor may be made. The Massachusetts Department of Environmental Protection (DEP) and the EPA may be notified depending upon the nature and severity of the spill. The Fire Chief will be responsible for determining the level of cleanup and notification required. The attached list of emergency phone numbers shall be posted in the facility office and readily accessible to all employees.

HAZARDOUS WASTE / OIL SPILL REPORT

Date____/_____/_____ Time____________ AM / PM

Exact location (Transformer #)____

Type of equipment___________________________Make_____________Size______________

S / N_________________________________Weather Conditions________________________

On or near water ☐ Yes If yes, name of body of water____________________

☐ No

Type of chemical / oil spilled__________________________

Amount of chemical / oil spilled________________________

Cause of spill____

____

____

Measures taken to contain or clean up spill____

____

____

Amount of chemical / oil recovered________________Method_____________________________

Material collected as a result of clean up

_____________drums containing____

_____________drums containing____

_____________drums containing____

Location and method of debris disposal____

____

Name and address of any person, firm, or corporation suffering damages____________________

____

Procedures, method, and precautions instituted to prevent a similar occurrence from recurring____

____

Spill reported to General Office by___________________________Time_____________AM / PM

Spill reported to DEP / National Response Center by____________________________________

DEP Date____/_____/_____ Time_________ AM / PM Inspector________________

NRC Date____/_____/_____ Time_________ AM / PM Inspector________________

Additional comments____

____

____

EMERGENCY RESPONSE EQUIPMENT
INVENTORY

The following equipment and materials shall be maintained at all times and stored in a secure area for long-term emergency response need.

--	SORBENT PADS	1 BALE
--	SAND BAGS (empty)	5
--	SPEEDI-DRI ABSORBENT	2 – 40LB BAGS
--	12” INFLATABLE PIPE PLUG	1
--	SQUARE END SHOVELS	1
--	PRY BAR	1
--	CATCH BASIN COVER	1

EMERGENCY NOTIFICATION PHONE NUMBERS

1. FACILITY MANAGER
    NAME: __________________ BEEPER: _________________________
    PHONE: __________________ CELL PHONE: __________________

    ALTERNATE:
    NAME: __________________ BEEPER: N/A ____________________
    PHONE: __________________ CEL PHONE: N/A _________________

2. FIRE DEPARTMENT
    EMERGENCY: 911
    BUSINESS: (781) 337-5151

    POLICE DEPARTMENT
    EMERGENCY: 911
    BUSINESS: (781) 335-1212

    DEPARTMENT OF PUBLIC WORKS
    CONTACT: Director – Kenan Connell
    BUSINESS: (781) 337-5100

    CONSERVATION COMMISSION
    CONTACT: Andrew Hultin
    BUSINESS: (781) 340-5007

    BOARD OF HEALTH
    CONTACT: Board of Health Agent Clerk – Clare LaMorte, RN
    BUSINESS: (781) 335-2000

3. MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
    EMERGENCY: (617) 556-1133
    SOUTHEAST REGION - LAKEVILLE OFFICE: (508) 946-2700

4. NATIONAL RESPONSE CENTER
    PHONE: (800) 424-8802

    ALTERNATE: U.S. ENVIRONMENTAL PROTECTION AGENCY
    EMERGENCY: (617) 223-7265
    BUSINESS: (617) 860-4300

Stormceptor® STC
Operation and Maintenance Guide

Stormceptor Design Notes

- Only the STC 450i is adaptable to function with a catch basin inlet and/or inline pipes.
- Only the Stormceptor models STC 450i to STC 7200 may accommodate multiple inlet pipes.

Inlet and outlet invert elevation differences are as follows:

Inlet and Outlet Pipe Invert Elevations Differences			
Inlet Pipe Configuration	STC 450i	STC 900 to STC 7200	STC 11000 to STC 16000
Single inlet pipe	3 in. (75 mm)	1 in. (25 mm)	3 in. (75 mm)
Multiple inlet pipes	3 in. (75 mm)	3 in. (75 mm)	Only one inlet pipe.

Maximum inlet and outlet pipe diameters:

Inlet/Outlet Configuration	Inlet Unit STC 450i	In-Line Unit STC 900 to STC 7200	Series* STC 11000 to STC 16000
Straight Through	24 inch (600 mm)	42 inch (1050 mm)	60 inch (1500 mm)
Bend (90 degrees)	18 inch (450 mm)	33 inch (825 mm)	33 inch (825 mm)

- The inlet and in-line Stormceptor units can accommodate turns to a maximum of 90 degrees.
- Minimum distance from top of grade to crown is 2 feet (0.6 m)
- Submerged conditions. A unit is submerged when the standing water elevation at the proposed location of the Stormceptor unit is greater than the outlet invert elevation during zero flow conditions. In these cases, please contact your local Stormceptor representative and provide the following information:
- Top of grade elevation
- Stormceptor inlet and outlet pipe diameters and invert elevations
- Standing water elevation
- Stormceptor head loss, K = 1.3 (for submerged condition, K = 4)

Stormceptor® STC

OPERATION AND MAINTENANCE GUIDE

Table of Content

1. About Stormceptor

The Stormceptor® STC (Standard Treatment Cell) was developed by Imbrium™ Systems to address the growing need to remove and isolate pollution from the storm drain system before it enters the environment. The Stormceptor STC targets hydrocarbons and total suspended solids (TSS) in stormwater runoff. It improves water quality by removing contaminants through the gravitational settling of fine sediments and floatation of hydrocarbons while preventing the re-suspension or scour of previously captured pollutants.

The development of the Stormceptor STC revolutionized stormwater treatment, and created an entirely new category of environmental technology. Protecting thousands of waterways around the world, the Stormceptor System has set the standard for effective stormwater treatment.

1.1. Patent Information

The Stormceptor technology is protected by the following patents:

- Australia Patent No. 693,164 • 693,164 • 707,133 • 729,096 • 779401
- Austrian Patent No. 289647
- Canadian Patent No 2,009,208 •2,137,942 • 2,175,277 • 2,180,305 • 2,180,383 • 2,206,338 • 2,327,768 (Pending)
- China Patent No 1168439
- Denmark DK 711879
- German DE 69534021
- Indonesian Patent No 16688
- Japan Patent No 9-11476 (Pending)
- Korea 10-2000-0026101 (Pending)
- Malaysia Patent No PI9701737 (Pending)
- New Zealand Patent No 314646
- United States Patent No 4,985,148 • 5,498,331 • 5,725,760 • 5,753,115 • 5,849,181 • 6,068,765 • 6,371,690
- Stormceptor OSR Patent Pending • Stormceptor LCS Patent Pending

2. Stormceptor Design Overview

2.1. Design Philosophy

The patented Stormceptor System has been designed to focus on the environmental objective of providing long-term pollution control. The unique and innovative Stormceptor design allows for continuous positive treatment of runoff during all rainfall events, while ensuring that all captured pollutants are retained within the system, even during intense storm events.

An integral part of the Stormceptor design is PCSWMM for Stormceptor - sizing software developed in conjunction with Computational Hydraulics Inc. (CHI) and internationally acclaimed expert, Dr. Bill James. Using local historical rainfall data and continuous simulation modeling, this software allows a Stormceptor unit to be designed for each individual site and the corresponding water quality objectives.

By using PCSWMM for Stormceptor, the Stormceptor System can be designed to remove a wide range of particles (typically from 20 to 2,000 microns), and can also be customized to remove a specific particle size distribution (PSD). The specified PSD should accurately reflect what is in the stormwater runoff to ensure the device is achieving the desired water quality objective. Since stormwater runoff contains small particles (less than 75 microns), it is important to design a treatment system to remove smaller particles in addition to coarse particles.

2.2. Benefits

The Stormceptor System removes free oil and suspended solids from stormwater, preventing spills and non-point source pollution from entering downstream lakes and rivers. The key benefits, capabilities and applications of the Stormceptor System are as follows:

- Provides continuous positive treatment during all rainfall events
- Can be designed to remove over 80% of the annual sediment load
- Removes a wide range of particles
- Can be designed to remove a specific particle size distribution (PSD)
- Captures free oil from stormwater
- Prevents scouring or re-suspension of trapped pollutants
- Pre-treatment to reduce maintenance costs for downstream treatment measures (ponds, swales, detention basins, filters)
- Groundwater recharge protection
- Spills capture and mitigation
- Simple to design and specify
- Designed to your local watershed conditions
- Small footprint to allow for easy retrofit installations
- Easy to maintain (vacuum truck)
- Multiple inlets can connect to a single unit
- Suitable as a bend structure
- Pre-engineered for traffic loading (minimum AASHTO HS-20)
- Minimal elevation drop between inlet and outlet pipes
- Small head loss
- Additional protection provided by an 18” (457 mm) fiberglass skirt below the top of the insert, for the containment of hydrocarbons in the event of a spill.

2.3. Environmental Benefit

Freshwater resources are vital to the health and welfare of their surrounding communities. There is increasing public awareness, government regulations and corporate commitment to reducing the pollution entering our waterways. A major source of this pollution originates from stormwater runoff from urban areas. Rainfall runoff carries oils, sediment and other contaminants from roads and parking lots discharging directly into our streams, lakes and coastal waterways.

The Stormceptor System is designed to isolate contaminants from getting into the natural environment. The Stormceptor technology provides protection for the environment from spills that occur at service stations and vehicle accident sites, while also removing contaminated sediment in runoff that washes from roads and parking lots.

3. Key Operation Features

3.1. Scour Prevention

A key feature of the Stormceptor System is its patented scour prevention technology. This innovation ensures pollutants are captured and retained during all rainfall events, even extreme storms. The Stormceptor System provides continuous positive treatment for all rainfall events, including intense storms. Stormceptor slows incoming runoff, controlling and reducing velocities in the lower chamber to create a non-turbulent environment that promotes free oils and floatable debris to rise and sediment to settle.

The patented scour prevention technology, the fiberglass insert, regulates flows into the lower chamber through a combination of a weir and orifice while diverting high energy flows away through the upper chamber to prevent scouring. Laboratory testing demonstrated no scouring when tested up to 125% of the unit's operating rate, with the unit loaded to 100% sediment capacity (NJDEP, 2005). Second, the depth of the lower chamber ensures the sediment storage zone is adequately separated from the path of flow in the lower chamber to prevent scouring.

3.2. Operational Hydraulic Loading Rate

Designers and regulators need to evaluate the treatment capacity and performance of manufactured stormwater treatment systems. A commonly used parameter is the "operational hydraulic loading rate" which originated as a design methodology for wastewater treatment devices.

Operational hydraulic loading rate may be calculated by dividing the flow rate into a device by its settling area. This represents the critical settling velocity that is the prime determinant to quantify the influent particle size and density captured by the device. PCSWMM for Stormceptor uses a similar parameter that is calculated by dividing the hydraulic detention time in the device by the fall distance of the sediment.

$$v_{SC} = \frac{H}{6_H} = \frac{Q}{A_S}$$

Where:

v_{SC} = critical settling velocity, ft/s (m/s)

H = tank depth, ft (m)

Ø_H = hydraulic detention time, ft/s (m/s)

Q = volumetric flow rate, ft3/s (m3/s)

A_S = surface area, ft^2 (m^2)

(Tchobanoglous, G. and Schroeder, E.D. 1987. Water Quality. Addison Wesley.)

Unlike designing typical wastewater devices, stormwater systems are designed for highly variable flow rates including intense peak flows. PCSWMM for Stormceptor incorporates all of the flows into its calculations, ensuring that the operational hydraulic loading rate is considered not only for one flow rate, but for all flows including extreme events.

3.3. Double Wall Containment

The Stormceptor System was conceived as a pollution identifier to assist with identifying illicit discharges. The fiberglass insert has a continuous skirt that lines the concrete barrel wall for a depth of 18 inches (457 mm) that provides double wall containment for hydrocarbons storage. This protective barrier ensures that toxic floatables do not migrate through the concrete wall into the surrounding soils.

4. Stormceptor Product Line

4.1. Stormceptor Models

A summary of Stormceptor models and capacities are listed in Table 1.

Table 1. Stormceptor Models

Stormceptor Model	Total Storage Volume U.S. Gal (L)	Hydrocarbon Storage Capacity U.S. Gal (L)	Maximum Sediment Capacity ft^3 (L)
STC 450i	470 (1,780)	86 (330)	46 (1,302)
STC 900	952 (3,600)	251 (950)	89 (2,520)
STC 1200	1,234 (4,670)	251 (950)	127 (3,596)
STC 1800	1,833 (6,940)	251 (950)	207 (5,861)
STC 2400	2,462 (9,320)	840 (3,180)	205 (5,805)
STC 3600	3,715 (1,406)	840 (3,180)	373 (10,562)
STC 4800	5,059 (1,950)	909 (3,440)	543 (15,376)
STC 6000	6,136 (23,230)	909 (3,440)	687 (19,453)
STC 7200	7,420 (28,090)	1,059 (4,010)	839 (23,757)
STC 11000	11,194 (42,370)	2,797 (10, 590)	1,086 (30,752)
STC 13000	13,348 (50,530)	2,797 (10, 590)	1,374 (38,907)
STC 16000	15,918 (60,260)	3,055 (11, 560)	1,677 (47,487)

NOTE: Storage volumes may vary slightly from region to region. For detailed information, contact your local Stormceptor representative.

4.2. Inline Stormceptor

The Inline Stormceptor, Figure 1, is the standard design for most stormwater treatment applications. The patented Stormceptor design allows the Inline unit to maintain continuous positive treatment of total suspended solids (TSS) year-round, regardless of flow rate. The Inline Stormceptor is composed of a precast concrete tank with a fiberglass insert situated at the invert of the storm sewer pipe, creating an upper chamber above the insert and a lower chamber below the insert.

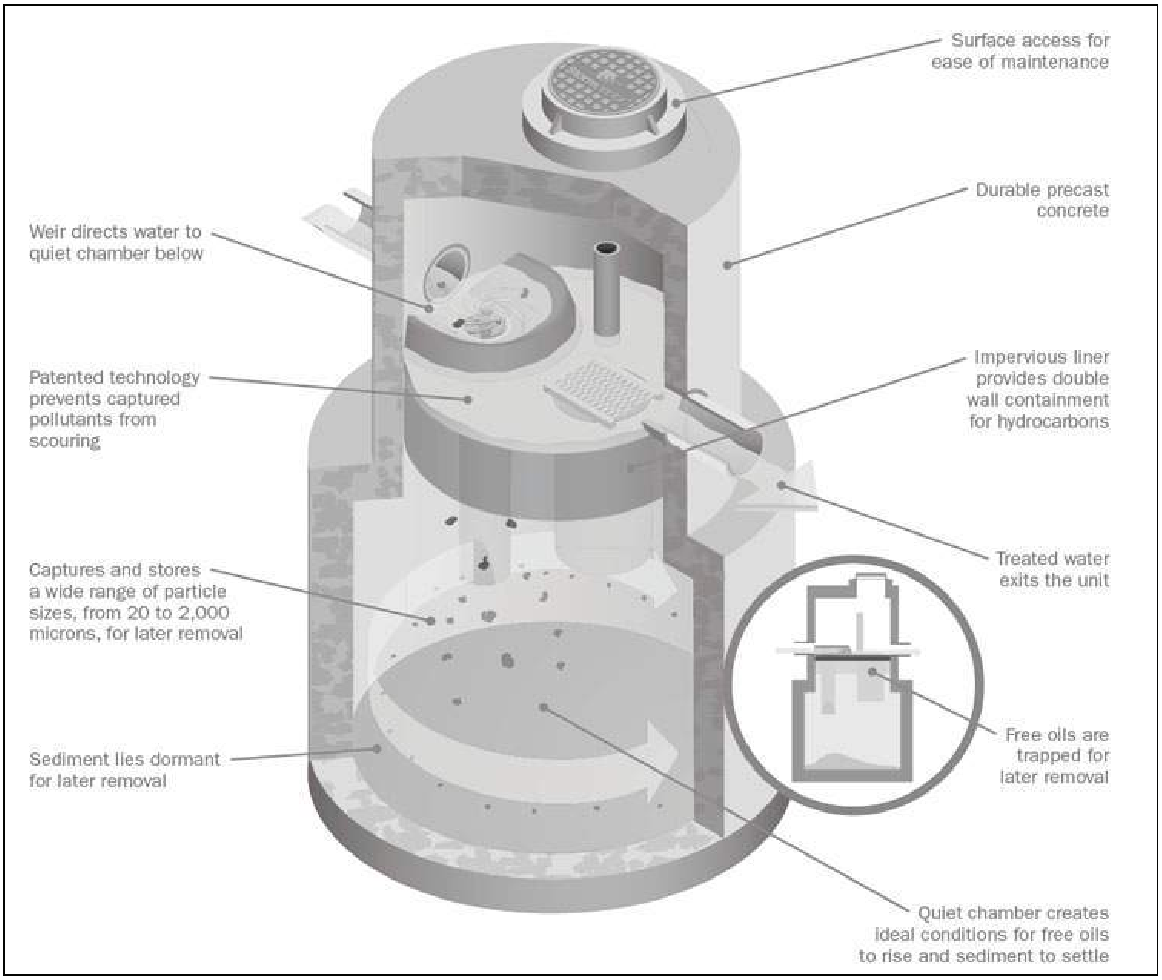

Figure 1. Inline Stormceptor

Operation

As water flows into the Stormceptor unit, it is slowed and directed to the lower chamber by a weir and drop tee. The stormwater enters the lower chamber, a non-turbulent environment, allowing free oils to rise and sediment to settle. The oil is captured underneath the fiberglass insert and shielded from exposure to the concrete walls by a fiberglass skirt. After the pollutants separate, treated water continues up a riser pipe, and exits the lower chamber on the downstream side of the weir before leaving the unit. During high flow events, the Stormceptor System's patented scour prevention technology ensures continuous pollutant removal and prevents re-suspension of previously captured pollutants.

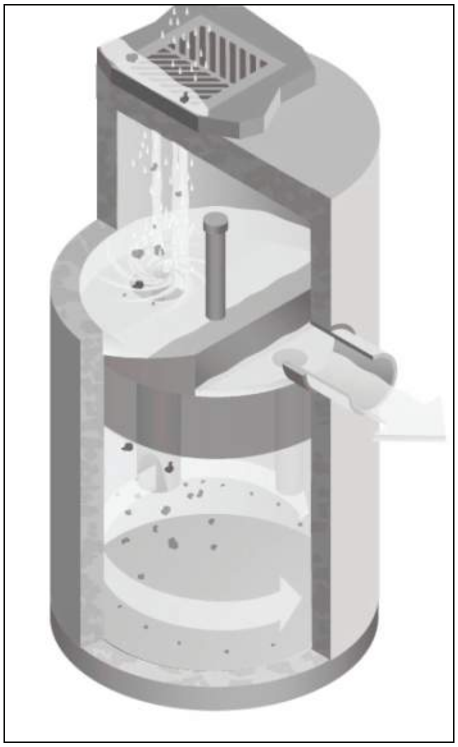

Figure 2. Inlet Stormceptor

4.3. Inlet Stormceptor

The Inlet Stormceptor System, Figure 2, was designed to provide protection for parking lots, loading bays, gas stations and other spill-prone areas. The Inlet Stormceptor is designed to remove sediment from stormwater introduced through a grated inlet, a storm sewer pipe, or both.

The Inlet Stormceptor design operates in the same manner as the Inline unit, providing continuous positive treatment, and ensuring that captured material is not re-suspended.

4.4. Series Stormceptor

Designed to treat larger drainage areas, the Series Stormceptor System, Figure 3, consists of two adjacent Stormceptor models that function in parallel. This design eliminates the need for additional structures and piping to reduce installation costs.

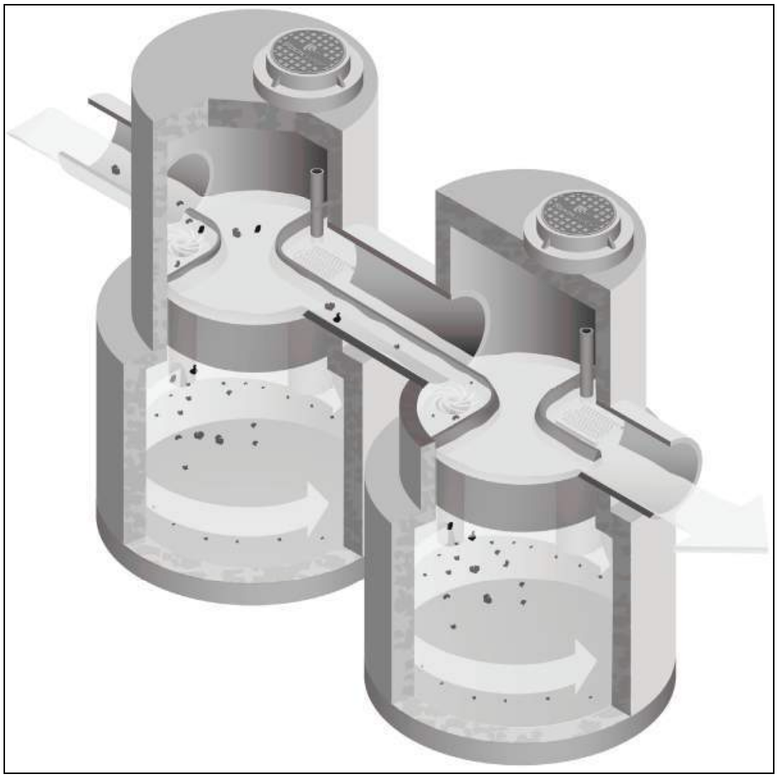

Figure 3. Series System

The Series Stormceptor design operates in the same manner as the Inline unit, providing continuous positive treatment, and ensuring that captured material is not re-suspended.

5. Sizing the Stormceptor System

The Stormceptor System is a versatile product that can be used for many different aspects of water quality improvement. While addressing these needs, there are conditions that the designer needs to be aware of in order to size the Stormceptor model to meet the demands of each individual site in an efficient and cost-effective manner.

PCSWMM for Stormceptor is the support tool used for identifying the appropriate Stormceptor model. In order to size a unit, it is recommended the user follow the seven design steps in the program. The steps are as follows:

STEP 1 – Project Details

The first step prior to sizing the Stormceptor System is to clearly identify the water quality objective for the development. It is recommended that a level of annual sediment (TSS) removal be identified and defined by a particle size distribution.

STEP 2 – Site Details

Identify the site development by the drainage area and the level of imperviousness. It is recommended that imperviousness be calculated based on the actual area of imperviousness based on paved surfaces, sidewalks and rooftops.

STEP 3 – Upstream Attenuation

The Stormceptor System is designed as a water quality device and is sometimes used in conjunction with onsite water quantity control devices such as ponds or underground detention systems. When possible, a greater benefit is typically achieved when installing a Stormceptor unit upstream of a detention facility. By placing the Stormceptor unit upstream of a detention structure, a benefit of less maintenance of the detention facility is realized.

STEP 4 – Particle Size Distribution

It is critical that the PSD be defined as part of the water quality objective. PSD is critical for the design of treatment system for a unit process of gravity settling and governs the size of a treatment system. A range of particle sizes has been provided and it is recommended that clays and silt-sized particles be considered in addition to sand and gravel-sized particles. Options and sample PSDs are provided in PCSWMM for Stormceptor. The default particle size distribution is the Fine Distribution, Table 2, option.

Table 2. Fine Distribution

Particle Size	Distribution	Specific Gravity
20	20%	1.3
60	20%	1.8
150	20%	2.2
400	20%	2.65
2000	20%	2.65

If the objective is the long-term removal of 80% of the total suspended solids on a given site, the PSD should be representative of the expected sediment on the site. For example, a system designed to remove 80% of coarse particles (greater than 75 microns) would provide relatively poor removal efficiency of finer particles that may be naturally prevalent in runoff from the site.

Since the small particle fraction contributes a disproportionately large amount of the total available particle surface area for pollutant adsorption, a system designed primarily for coarse particle capture will compromise water quality objectives.

STEP 5 – Rainfall Records

Local historical rainfall has been acquired from the U.S. National Oceanic and Atmospheric Administration, Environment Canada and regulatory agencies across North America. The rainfall data provided with PCSMM for Stormceptor provides an accurate estimation of small storm hydrology by modeling actual historical storm events including duration, intensities and peaks.

STEP 6 – Summary

At this point, the program may be executed to predict the level of TSS removal from the site. Once the simulation has completed, a table shall be generated identifying the TSS removal of each Stormceptor unit.

STEP 7 – Sizing Summary

Performance estimates of all Stormceptor units for the given site parameters will be displayed in a tabular format. The unit that meets the water quality objective, identified in Step 1, will be highlighted.

5.1. PCSWMM for Stormceptor

The Stormceptor System has been developed in conjunction with PCSWMM for Stormceptor as a technological solution to achieve water quality goals. Together, these two innovations model, simulate, predict and calculate the water quality objectives desired by a design engineer for TSS removal.

PCSWMM for Stormceptor is a proprietary sizing program which uses site specific inputs to a computer model to simulate sediment accumulation, hydrology and long-term total suspended solids removal. The model has been calibrated to field monitoring results from Stormceptor units that have been monitored in North America. The sizing methodology can be described by three processes:

1. Determination of real time hydrology
2. Buildup and wash off of TSS from impervious land areas
3. TSS transport through the Stormceptor (settling and discharge). The use of a calibrated model is the preferred method for sizing stormwater quality structures for the following reasons:
   - The hydrology of the local area is properly and accurately incorporated in the sizing (distribution of flows, flow rate ranges and peaks, back-to-back storms, inter-event times)
   - The distribution of TSS with the hydrology is properly and accurately considered in the sizing
   - Particle size distribution is properly considered in the sizing
   - The sizing can be optimized for TSS removal
   - The cost benefit of alternate TSS removal criteria can be easily assessed
   - The program assesses the performance of all Stormceptor models. Sizing may be selected based on a specific water quality outcome or based on the Maximum Extent Practicable

For more information regarding PCSWMM for Stormceptor, contact your local Stormceptor representative, or visit www.imbriumsystems.com to download a free copy of the program.

5.2. Sediment Loading Characteristics

The way in which sediment is transferred to stormwater can have a considerable effect on which type of system is implemented. On typical impervious surfaces (e.g. parking lots) sediment will build over time and wash off with the next rainfall. When rainfall patterns are examined, a short intense storm will have a higher concentration of sediment than a long slow drizzle. Together with rainfall data representing the site's typical rainfall patterns, sediment loading characteristics play a part in the correct sizing of a stormwater quality device.

Typical Sites

For standard site design of the Stormceptor System, PCSWMM for Stormceptor is utilized to accurately assess the unit's performance. As an integral part of the product's design, the program can be used to meet local requirements for total suspended solid removal. Typical installations of manufactured stormwater treatment devices would occur on areas such as paved parking lots or paved roads. These are considered "stable" surfaces which have non – erodible surfaces.

Unstable Sites

While standard sites consist of stable concrete or asphalt surfaces, sites such as gravel parking lots, or maintenance yards with stockpiles of sediment would be classified as "unstable". These types of sites do not exhibit first flush characteristics, are highly erodible and exhibit atypical sediment loading characteristics and must therefore be sized more carefully. Contact your local Stormceptor representative for assistance in selecting a proper unit sized for such unstable sites.

6. Spill Controls

When considering the removal of total petroleum hydrocarbons (TPH) from a storm sewer system there are two functions of the system: oil removal, and spill capture.

'Oil Removal' describes the capture of the minute volumes of free oil mobilized from impervious surfaces. In this instance relatively low concentrations, volumes and flow rates are considered. While the Stormceptor unit will still provide an appreciable oil removal function during higher flow events and/or with higher TPH concentrations, desired effluent limits may be exceeded under these conditions.

‘Spill Capture’ describes a manner of TPH removal more appropriate to recovery of a relatively high volume of a single phase deleterious liquid that is introduced to the storm sewer system over a relatively short duration. The two design criteria involved when considering this manner of introduction are overall volume and the specific gravity of the material. A standard Stormceptor unit will be able to capture and retain a maximum spill volume and a minimum specific gravity.

For spill characteristics that fall outside these limits, unit modifications are required. Contact your local Stormceptor Representative for more information.

One of the key features of the Stormceptor technology is its ability to capture and retain spills. While the standard Stormceptor System provides excellent protection for spill control, there are additional options to enhance spill protection if desired.

6.1. Oil Level Alarm

The oil level alarm is an electronic monitoring system designed to trigger a visual and audible alarm when a pre-set level of oil is reached within the lower chamber. As a standard, the oil

level alarm is designed to trigger at approximately 85% of the unit’s available depth level for oil capture. The feature acts as a safeguard against spills caused by exceeding the oil storage capacity of the separator and eliminates the need for manual oil level inspection.

The oil level alarm installed on the Stormceptor insert is illustrated in Figure 4.

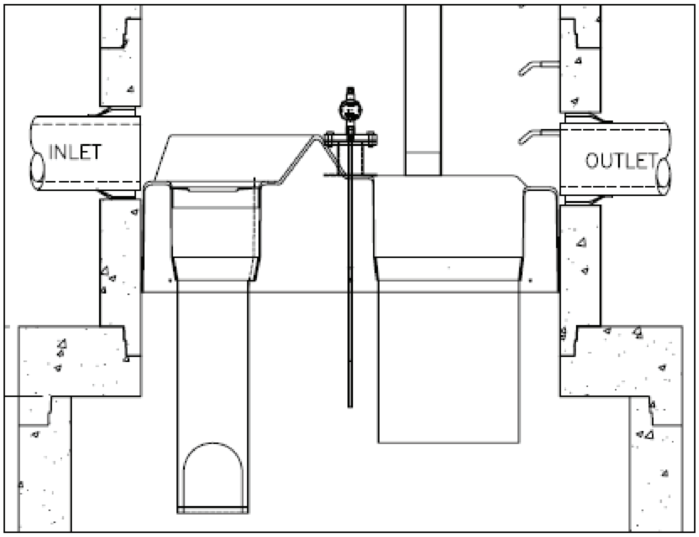

Figure 4. Oil level alarm

6.2. Increased Volume Storage Capacity

The Stormceptor unit may be modified to store a greater spill volume than is typically available. Under such a scenario, instead of installing a larger than required unit, modifications can be made to the recommended Stormceptor model to accommodate larger volumes. Contact your local Stormceptor representative for additional information and assistance for modifications.

7. Stormceptor Options

The Stormceptor System allows flexibility to incorporate to existing and new storm drainage infrastructure. The following section identifies considerations that should be reviewed when installing the system into a drainage network. For conditions that fall outside of the recommendations in this section, please contact your local Stormceptor representative for further guidance.

7.1. Installation Depth Minimum Cover

The minimum distance from the top of grade to the crown of the inlet pipe is 24 inches (600 mm). For situations that have a lower minimum distance, contact your local Stormceptor representative.

7.2. Maximum Inlet and Outlet Pipe Diameters

Maximum inlet and outlet pipe diameters are illustrated in Figure 5. Contact your local Stormceptor representative for larger pipe diameters

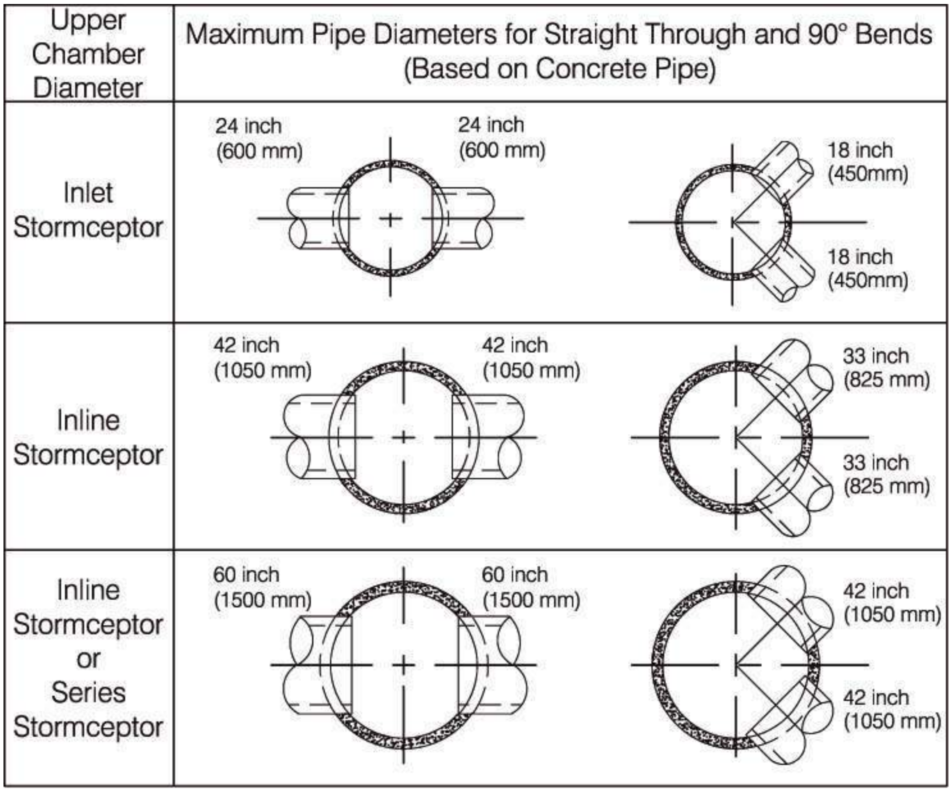

Figure 5. Maximum pipe diameters for straight through and bend applications

*The bend should only be incorporated into the second structure (downstream structure) of the Series Stormceptor System

7.3. Bends

The Stormceptor System can be used to change horizontal alignment in the storm drain network up to a maximum of 90 degrees. Figure 6 illustrates the typical bend situations of the Stormceptor System. Bends should only be applied to the second structure (downstream structure) of the Series Stormceptor System.

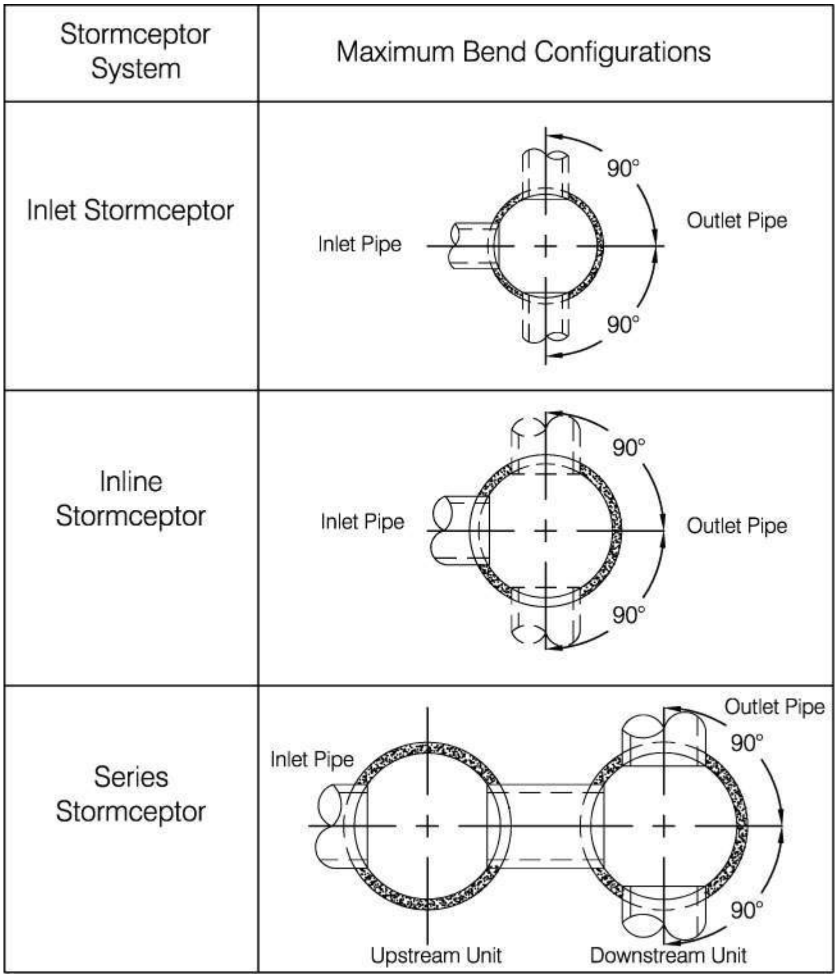

Figure 6. Maximum bend angles

7.4. Multiple Inlet Pipes

The Inlet and Inline Stormceptor System can accommodate two or more inlet pipes. The maximum number of inlet pipes that can be accommodated into a Stormceptor unit is a function of the number, alignment and diameter of the pipes and its effects on the structural integrity of the precast concrete. When multiple inlet pipes are used for new developments, each inlet pipe shall have an invert elevation 3 inches (75 mm) higher than the outlet pipe invert elevation.

7.5. Inlet/Outlet Pipe Invert Elevations

Recommended inlet and outlet pipe invert differences are listed in Table 3.

Table 3. Recommended Drops Between Inlet and Outlet Pipe Inverts

Number of Inlet Pipes	Inlet System	In-Line System	Series System
1	3 inches (75 mm)	1 inch (25 mm)	3 inches (75 mm)
>1	3 inches (75 mm)	3 inches (75 mm)	Not Applicable

7.6. Shallow Stormceptor

In cases where there may be restrictions to the depth of burial of storm sewer systems. In this situation, for selected Stormceptor models, the lower chamber components may be increased in diameter to reduce the overall depth of excavation required.

7.7. Customized Live Load

The Stormceptor system is typically designed for local highway truck loading (AASHTO HS- 20). When the project requires live loads greater than HS-20, the Stormceptor System may be customized structurally for a pre-specified live load. Contact your local Stormceptor representative for customized loading conditions.

7.8. Pre-treatment

The Stormceptor System may be sized to remove sediment and for spills control in conjunction with other stormwater BMPs to meet the water quality objective. For pretreatment applications, the Stormceptor System should be the first unit in a treatment train. The benefits of pre-treatment include the extension of the operational life (extension of maintenance frequency) of large stormwater management facilities, prevention of spills and lower total life- cycle maintenance cost.

7.9. Head loss

The head loss through the Stormceptor System is similar to a 60 degree bend at a manhole. The K value for calculating minor losses is approximately 1.3 (minor loss = k*1.3v2/2g).

However, when a Submerged modification is applied to a Stormceptor unit, the corresponding K value is 4.

7.10. Submerged

The Submerged modification, Figure 7, allows the Stormceptor System to operate in submerged or partially submerged storm sewers. This configuration can be installed on all models of the Stormceptor System by modifying the fiberglass insert. A customized weir height and a secondary drop tee are added.

Submerged instances are defined as standing water in the storm drain system during zero flow conditions. In these instances, the following information is necessary for the proper design and application of submerged modifications:

- Stormceptor top of grade elevation
- Stormceptor outlet pipe invert elevation
- Standing water elevation

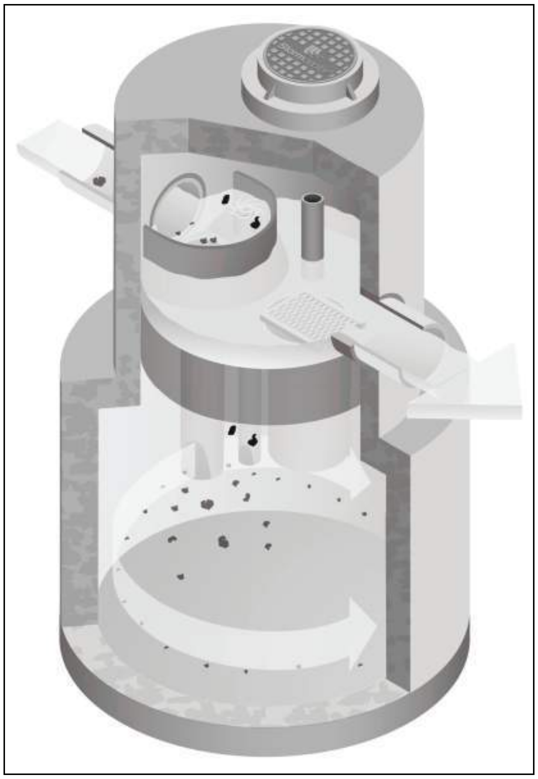

Figure 7. Submerged Stormceptor

8. Comparing Technologies

Designers have many choices available to achieve water quality goals in the treatment of stormwater runoff. Since many alternatives are available for use in stormwater quality treatment it is important to consider how to make an appropriate comparison between "approved alternatives". The following is a guide to assist with the accurate comparison of differing technologies and performance claims.

8.1. Particle Size Distribution (PSD)

The most sensitive parameter to the design of a stormwater quality device is the selection of the design particle size. While it is recommended that the actual particle size distribution (PSD) for sites be measured prior to sizing, alternative values for particle size should be selected to represent what is likely to occur naturally on the site. A reasonable estimate of a particle size distribution likely to be found on parking lots or other impervious surfaces should consist of a wide range of particles such as 20 microns to 2,000 microns (Ontario MOE, 1994).

There is no absolute right particle size distribution or specific gravity and the user is cautioned to review the site location, characteristics, material handling practices and regulatory requirements when selecting a particle size distribution. When comparing technologies, designs using different PSDs will result in incomparable TSS removal efficiencies. The PSD of the TSS removed needs to be standard between two products to allow for an accurate comparison.

8.2. Scour Prevention

In order to accurately predict the performance of a manufactured treatment device, there must be confidence that it will perform under all conditions. Since rainfall patterns cannot be predicted, stormwater quality devices placed in storm sewer systems must be able to withstand extreme events, and ensure that all pollutants previously captured are retained in the system.

In order to have confidence in a system's performance under extreme conditions, independent validation of scour prevention is essential when examining different technologies. Lack of independent verification of scour prevention should make a designer wary of accepting any product's performance claims.

8.3. Hydraulics

Full scale laboratory testing has been used to confirm the hydraulics of the Stormceptor System. Results of lab testing have been used to physically design the Stormceptor System and the sewer pipes entering and leaving the unit. Key benefits of Stormceptor are:

- Low head loss (typical k value of 1.3)
- Minimal inlet/outlet invert elevation drop across the structure
- Use as a bend structure
- Accommodates multiple inlets

The adaptability of the treatment device to the storm sewer design infrastructure can affect the overall performance and cost of the site.

8.4. Hydrology

Stormwater quality treatment technologies need to perform under varying climatic conditions. These can vary from long low intensity rainfall to short duration, high intensity storms. Since a treatment device is expected to perform under all these conditions, it makes sense that any system's design should accommodate those conditions as well.

Long-term continuous simulation evaluates the performance of a technology under the varying conditions expected in the climate of the subject site. Single, peak event design does not provide this information and is not equivalent to long-term simulation. Designers should request long-term simulation performance to ensure the technology can meet the long-term water quality objective.

9. Testing

The Stormceptor System has been the most widely monitored stormwater treatment technology in the world. Performance verification and monitoring programs are completed to the strictest standards and integrity. Since its introduction in 1990, numerous independent field tests and studies detailing the effectiveness of the Stormceptor System have been completed.

- Coventry University, UK – 97% removal of oil, 83% removal of sand and 73% removal of peat
- National Water Research Institute, Canada, - scaled testing for the development of the Stormceptor System identifying both TSS removal and scour prevention.
- New Jersey TARP Program – full scale testing of an STC 900 demonstrating 75% TSS removal of particles from 1 to 1000 microns. Scour testing completed demonstrated that the system does not scour. The New Jersey Department of Environmental Protection was followed.
- City of Indianapolis – full scale testing of an STC 900 demonstrating over 80% TSS removal of particles from 50 microns to 300 microns at 130% of the unit's operating rate. Scour testing completed demonstrated that the system does not scour.
- Westwood Massachusetts (1997), demonstrated >80% TSS removal
- Como Park (1997), demonstrated 76% TSS removal
- Ontario MOE SWAMP Program – 57% removal of 1 to 25 micron particles
- Laval Quebec – 50% removal of 1 to 25 micron particles

10. Installation

The installation of the concrete Stormceptor should conform in general to state highway, or local specifications for the installation of manholes. Selected sections of a general specification that are applicable are summarized in the following sections.

10.1. Excavation

Excavation for the installation of the Stormceptor should conform to state highway, or local specifications. Topsoil removed during the excavation for the Stormceptor should be stockpiled in designated areas and should not be mixed with subsoil or other materials.

Topsoil stockpiles and the general site preparation for the installation of the Stormceptor should conform to state highway or local specifications.

The Stormceptor should not be installed on frozen ground. Excavation should extend a minimum of 12 inches (300 mm) from the precast concrete surfaces plus an allowance for shoring and bracing where required. If the bottom of the excavation provides an unsuitable foundation additional excavation may be required.

In areas with a high water table, continuous dewatering may be required to ensure that the excavation is stable and free of water.

10.2. Backfilling

Backfill material should conform to state highway or local specifications. Backfill material should be placed in uniform layers not exceeding 12 inches (300mm) in depth and compacted to state highway or local specifications.

11. Stormceptor Construction Sequence

The concrete Stormceptor is installed in sections in the following sequence:

1. Aggregate base
2. Base slab
3. Lower chamber sections
4. Upper chamber section with fiberglass insert
5. Connect inlet and outlet pipes
6. Assembly of fiberglass insert components (drop tee, riser pipe, oil cleanout port and orifice plate
7. Remainder of upper chamber
8. Frame and access cover

The precast base should be placed level at the specified grade. The entire base should be in contact with the underlying compacted granular material. Subsequent sections, complete with joint seals, should be installed in accordance with the precast concrete manufacturer's recommendations.

Adjustment of the Stormceptor can be performed by lifting the upper sections free of the excavated area, re-leveling the base and re-installing the sections. Damaged sections and gaskets should be repaired or replaced as necessary. Once the Stormceptor has been constructed, any lift holes must be plugged with mortar.

12. Maintenance

12.1. Health and Safety

The Stormceptor System has been designed considering safety first. It is recommended that confined space entry protocols be followed if entry to the unit is required. In addition, the fiberglass insert has the following health and safety features:

- Designed to withstand the weight of personnel
- A safety grate is located over the 24 inch (600 mm) riser pipe opening
- Ladder rungs can be provided for entry into the unit, if required

12.2. Maintenance Procedures

Maintenance of the Stormceptor system is performed using vacuum trucks. No entry into the unit is required for maintenance (in most cases). The vacuum service industry is a well- established sector of the service industry that cleans underground tanks, sewers and catch basins. Costs to clean a Stormceptor will vary based on the size of unit and transportation distances.

The need for maintenance can be determined easily by inspecting the unit from the surface. The depth of oil in the unit can be determined by inserting a dipstick in the oil inspection/cleanout port.

Similarly, the depth of sediment can be measured from the surface without entry into the Stormceptor via a dipstick tube equipped with a ball valve. This tube would be inserted through the riser pipe. Maintenance should be performed once the sediment depth exceeds the guideline values provided in the Table 4.

Table 4. Sediment Depths Indicating Required Servicing*

Particle Size	Specific Gravity
Model	Sediment Depth inches (mm)
450i	8 (200)
900	8 (200)
1200	10 (250)
1800	15 (381)
2400	12 (300)
3600	17 (430)
4800	15 (380)
6000	18 (460)
7200	15 (381)
11000	17 (380)
13000	20 (500)
16000	17 (380)
* based on 15% of the Stormceptor unit's total storage	

Although annual servicing is recommended, the frequency of maintenance may need to be increased or reduced based on local conditions (i.e. if the unit is filling up with sediment more quickly than projected, maintenance may be required semi-annually; conversely once the site has stabilized maintenance may only be required every two or three years).

Oil is removed through the oil inspection/cleanout port and sediment is removed through the riser pipe. Alternatively oil could be removed from the 24 inches (600 mm) opening if water is removed from the lower chamber to lower the oil level below the drop pipes.

The following procedures should be taken when cleaning out Stormceptor:

1. Check for oil through the oil cleanout port
2. Remove any oil separately using a small portable pump
3. Decant the water from the unit to the sanitary sewer, if permitted by the local regulating authority, or into a separate containment tank
4. Remove the sludge from the bottom of the unit using the vacuum truck
5. Re-fill Stormceptor with water where required by the local jurisdiction

12.3. Submerged Stormceptor

Careful attention should be paid to maintenance of the Submerged Stormceptor System. In cases where the storm drain system is submerged, there is a requirement to plug both the inlet and outlet pipes to economically clean out the unit.

12.4. Hydrocarbon Spills

The Stormceptor is often installed in areas where the potential for spills is great. The Stormceptor System should be cleaned immediately after a spill occurs by a licensed liquid waste hauler.

12.5. Disposal

Requirements for the disposal of material from the Stormceptor System are similar to that of any other stormwater Best Management Practice (BMP) where permitted. Disposal options for the sediment may range from disposal in a sanitary trunk sewer upstream of a sewage treatment plant, to disposal in a sanitary landfill site. Petroleum waste products collected in the Stormceptor (free oil/chemical/fuel spills) should be removed by a licensed waste management company.

12.6. Oil Sheens

With a steady influx of water with high concentrations of oil, a sheen may be noticeable at the Stormceptor outlet. This may occur because a rainbow or sheen can be seen at very small oil concentrations (<10 mg/L). Stormceptor will remove over 98% of all free oil spills from storm sewer systems for dry weather or frequently occurring runoff events.

The appearance of a sheen at the outlet with high influent oil concentrations does not mean the unit is not working to this level of removal. In addition, if the influent oil is emulsified the Stormceptor will not be able to remove it. The Stormceptor is designed for free oil removal and not emulsified conditions.

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

800-925-5240
www.ContechES.com

SITE D

CONSTRUCTION PHASE POLLUTION PREVENTION AND EROSION AND SEDIMENTATION CONTROL PLAN (BEST MANAGEMENT PRACTICES OPERATION AND MAINTENANCE PLAN)

for

JACKSON SQUARE

In

Weymouth, Massachusetts
Building D
(Assessor's Parcel IDs 23-306-11)

Submitted to:

TOWN OF WEYMOUTH

Prepared for:

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1409 Commercial Street
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Construction Phase Best Management Practices (BMP's)

Erosion and Sedimentation will be controlled at the site by utilizing Structural Practices, Stabilization Practices, and Dust Control.

Responsible Party Contact Information:

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Phone: 781-337-5100

Weymouth Conservation Commission
Town Hall
75 Middle Street
Weymouth, MA 02189
Phone: (781) 340-5007

Weymouth Department of Municipal
Licenses and Inspections
Jeffrey E. Richards, C.B.O., Director
Town Hall
75 Middle Street
Weymouth, MA 02189
Phone: (781) 340-5004

Structural Practices:

1) **Compost Filter Tube Barrier Controls** – A compost filter tube barrier will be constructed along downward slopes at the limit of work in locations shown on the plans. This control will be installed prior to major soil disturbance on the site. The sediment silt sack barrier should be installed as shown on the Construction Detail Plan.

   Compost Filter Tube Design/Installation Requirements *

   a) Locate the compost filter tube where identified on the plans.

   b) The compost filter tube line should be nearly level through most of its length to impound a broad, temporary pool. The last 10 to 20 feet at each end of the silt sack should be swung slightly uphill (approximately 0.5 feet in elevation) to provide storage capacity.

c) The compost filter tube shall be staked every 8 linear feet with 1-inch by 1-inch stakes.

d) Compost filter tubes should be removed when they have served their useful purpose, but not before the upslope area has been permanently stabilized through one growing season. Retained sediment must be removed and properly disposed of or mulched and seeded.

Compost Filter Tube Inspection/Maintenance *

a) Compost filter tubes should be inspected immediately after each rainfall event of 1-inch or greater, and at least daily during prolonged rainfall. Inspect the depth of sediment, fabric tears, and to see that the fence posts are firmly in the ground. Repair or replace as necessary.

b) Remove sediment deposits promptly after storm events to provide adequate storage volume for the next rain and to reduce pressure on the fence. Sediment will be removed from behind the sediment fence when it becomes about ½ foot deep at the compost filter tube. Take care to avoid undermining fence during cleanout.

c) If the fabric tears, decomposes, or in any way becomes ineffective, replace it immediately.

d) Remove all compost filter tube materials after the contributing drainage area has been properly stabilized. Sediment deposits remaining after the fabric has been removed should be graded to conform with the existing topography and vegetated.

2) Sediment Fence Controls – A sediment fence will be constructed along the limit of work as needed to prevent the spreading of fine sediments from the site. This control will be installed prior to major soil disturbance on the site. The sediment fence should be installed as shown on the Erosion Control Detail Plan and be Amoco woven polypropylene 1198 or equivalent.

Sediment Fence Design/Installation Requirements *

a) Locate the fence upland of the hay bale barriers and where identified on the plans.

b) The fence line should be nearly level through most of its length to impound a broad, temporary pool. The last 10 to 20 feet at each end of the fence should be swung slightly uphill (approximately 0.5 feet in elevation) to provide storage capacity.

c) Excavate a trench approximately 8 inches deep and 4 inches wide, or a V-trench; along the line of the fence, upslope side.

d) Fasten support wire fence (14 gauge with 6-inch mesh) securely to the upslope side of the fence posts with wire ties or staples. Wire should extend 6 inches into the trench.

e) Attach continuous length of fabric to upslope side of fence posts. Avoid joints, particularly at low points in the fence line. Where joints are necessary, fasten fabric securely to support posts and overlap to the next post.

f) Place the bottom one foot of fabric in the trench. Backfill with compacted earth or gravel.

g) Filter cloth shall be fastened securely to the woven wire fence with ties spaced every 24 inches at the top, mid-section, and bottom.

h) Sediment fences should be removed when they have served their useful purpose, but not before the upslope area has been permanently stabilized through one growing season and only following approval by the Engineering Department or their representative. Retained sediment must be removed and properly disposed of, or mulched and seeded.

Sediment Fence Inspection/Maintenance *

a) Silt fences should be inspected immediately after each rainfall event of 1-inch or greater, and at least daily during prolonged rainfall. Inspect the depth of sediment, fabric tears, if the fabric is securely attached to the fence posts, and to see that the fence posts are firmly in the ground. Repair or replace as necessary.

b) Remove sediment deposits promptly after storm events to provide adequate storage volume for the next rain and to reduce pressure on the fence. Sediment will be removed from behind the sediment fence when it becomes about ½ foot deep at the fence. Take care to avoid undermining fence during cleanout.

c) If the fabric tears, decomposes, or in any way becomes ineffective, replace it immediately.

d) Remove all fencing materials after the contributing drainage area has been properly stabilized. Sediment deposits remaining after the fabric has been removed should be graded to conform to the existing topography and vegetation.

3) Stabilized Construction Entrance – A stabilized construction entrance will be placed at the proposed entrances at Commercial Street. The construction entrance will keep mud and sediment from being tracked off the construction site by vehicles leaving the site. The stabilized construction entrance will be installed immediately after the clearing and grubbing of the roadway entrance and associated roadway fill to maintain access to the site are completed. The stabilized construction entrance shall be constructed as shown on the Construction Detail Plans.

Construction Entrance Design/Construction Requirements *

a) Stone for a stabilized construction entrance shall consist of 1 to 3-inch stone placed on a stable foundation.

b) Pad dimensions: The minimum length of the gravel pad should be 50 feet. The pad should extend the full width of the proposed roadway, or wide enough so that the largest construction vehicle will fit in the entrance with room to spare; whichever is greater.

c) A geotextile filter fabric shall be placed between the stone fill and the earth surface below the pad to reduce the migration of soil particles from the underlying soil into the stone and vice versa. The filter fabric should be Amoco woven polypropylene 1198 or equivalent.

d) Washing: If the site conditions are such that the majority of mud is not removed from the vehicle tires by the gravel pad, then the tires should be washed before the vehicle enters the street. The wash area shall be located at the stabilized construction entrance.

e) Water employed in the washing process shall be directed to the temporary dewatering area as shown on the plans prior to discharge. Sediment should be prevented from entering any watercourses.

<u>Construction Entrance Inspection/Maintenance *</u>

a) The entrance should be maintained in a condition that will prevent tracking or flowing of sediment onto Lovell Field and Commercial Street. This may require periodic topdressing with additional stone.

b) The construction entrance and sediment disposal area shall be inspected weekly and after heavy rains or heavy use.

c) Mud and sediment tracked or washed onto public road shall be immediately removed by sweeping.

d) Once mud and soil particles clog the voids in the gravel and the effectiveness of the gravel pad is no longer satisfactory, the pad must be topdressed with new stone. Replacement of the entire pad may be necessary when the pad becomes completely clogged.

e) If washing facilities are used, the dewatering area should be cleaned out as often as necessary to assure that adequate trapping efficiency and storage volume is available.

f) The pad shall be reshaped as needed for drainage and runoff control.

g) Broken road pavement on Lovell Field and Commercial Street shall be repaired immediately.

h) All temporary erosion and sediment control measures shall be removed within 30 days after final site stabilization is achieved or after the temporary practices are no longer needed and only following approval by the Public Works Department or their representative. Trapped sediment shall be removed or stabilized on site. Disturbed soil areas resulting from removal shall be permanently stabilized.

Stabilization Practices:

Stabilization measures shall be implemented as soon as practicable in portions of the site where construction activities have temporarily or permanently ceased, but in no case more than 14 days after the construction activity in that portion of the site has temporarily or permanently ceased, with the following exceptions.

- Where the initiation of stabilization measures by the 14th day after construction activity temporarily or permanently cease is precluded by snow cover, stabilization measures shall be initiated as soon as practicable.

- Where construction activity will resume on a portion of the site within 21 days from when activities ceased, (e.g. the total time period that construction activity is temporarily ceased is less than 21 days) then stabilization measures do not have to be initiated on that portion of the site by the 14th day after construction activity temporarily ceased.

- The contractor shall provide erosion control measures around all soil stockpiles.

1) **Temporary Seeding** – Temporary seeding will allow short–term vegetative cover on disturbed site areas that may be in danger of erosion. Temporary seeding will be done at stockpiles and disturbed portions of the site where construction activity will temporarily cease for at least 21 days. The temporary seedings will stabilize cleared and unvegetated areas that will not be brought into final grade for several weeks or months.

   Temporary Seeding Planting Procedures *

   a) Planting should preferably be done between April 1st and June 30th, and September 1st through September 31st. If planting is done in the months of July and August, irrigation may be required. If planting is done between October 1st and March 31st, mulching should be applied immediately after planting. If seeding is done during the summer months, irrigation of some sort will probably be necessary.

   b) Before seeding, install structural practice controls. Utilize Amoco supergro or equivalent.

   c) Select the appropriate seed species for temporary cover from the following table.

Species	Seeding Rate (lbs/1,000 sq.ft.)	Seeding Rate (lbs/acre)	Recommended Seeding Dates	Seed Cover required
Annual Ryegrass	1	40	April 1st to June 1st August 15th to Sept. 15th	¼ inch
Foxtail Millet	0.7	30	May 1st to June 30th	½ to ¾ inch
Oats	2	80	April 1st to July 1st August 15th to Sept. 15th	1 to 1-½ inch
Winter Rye	3	120	August 15th to Oct. 15th	1 to 1-½ inch

Apply the seed uniformly by hydroseeding, broadcasting, or by hand.

d) Use effective mulch, tacked and/or tied with netting to protect seedbed and encourage plant growth.

Temporary Seeding Inspection/Maintenance *

a) Inspect within 6 weeks of planting to see if stands are adequate. Check for damage within 24 hours of the end to heavy rainfall, defined as a 2-year storm event (i.e., 3.2 inches of rainfall within a twenty-four-hour period). Stands should be uniform and dense. Reseed and mulch damaged and sparse areas immediately. Tack or tie down mulch as necessary.

b) Seeds should be supplied with adequate moisture. Furnish water as needed, especially in abnormally hot or dry weather. Water application rates should be controlled to prevent runoff.

2) **Geotextiles** - Geotextiles such as jute netting will be used in combination with other practices such as mulching to stabilize slopes. The following geotextile materials or equivalent are to be utilized for structural and nonstructural controls as shown in the following table.

Practice	Manufacturer	Product	Remarks
Sediment Fence	Amoco	Woven polypropylene 1198 or equivalent	0.425 mm opening
Construction Entrance	Amoco	Woven polypropylene 2002 or equivalent	0.300 mm opening
Outlet Protection	Amoco	Nonwoven polypropylene 4551 or equivalent	0.150 mm opening
Erosion Control (slope stability)	Amoco	Supergro or equivalent	Erosion control revegetation mix, open polypropylene fiber on degradable polypropylene net scrim

Amoco may be reached at (800) 445-7732

Geotextile Installation

a) Netting and matting require firm, continuous contact between the materials and the soil. If there is no contact, the material will not hold the soil and erosion will occur underneath the material.

Geotextile Inspection/Maintenance *

a) In the field, regular inspections should be made to check for cracks, tears, or breaches in the fabric. The appropriate repairs should be made.

3) **Mulching and Netting** – Mulching will provide immediate protection to exposed soils during the period of short construction delays, or over winter months through the application of plant residues, or other suitable materials, to exposed soil areas. In areas, which have been seeded either for temporary or permanent cover, mulching should immediately follow seeding. On steep slopes, mulch must be supplemented with netting.

Mulch Maintenance *

a) Inspect after rainstorms to check for movement of mulch or erosion. If washout, breakage, or erosion occurs, repair surface, reseed, remulch, and install new netting.

b) Grass mulches that blow or wash away should be repaired promptly.

c) If plastic netting is used to anchor mulch, care should be taken during initial mowings to keep the mower height high. Otherwise, the netting can wrap up on the mower blade shafts. After a period of time, the netting degrades and becomes less of a problem.

d) Continue inspections until vegetation is well established.

4) Land Grading – Grading on fill slopes, cut slopes, and stockpile areas will be done with full siltation controls in place.

Land Grading Design/Installation Requirements

a) Areas to be graded should be cleared and grubbed of all timber, logs, brush, rubbish, and vegetated matter that will interfere with the grading operation. Topsoil should be stripped and stockpiled for use on critical disturbed areas for establishment of vegetation. Cut slopes to be topsoiled should be thoroughly scarified to a minimum depth of 3-inches prior to placement of topsoil.

b) Fill materials should be generally free of brush, rubbish, rocks, and stumps. Frozen materials or soft and easily compressible materials should not be used in fills intended to support buildings, parking lots, roads, conduits, or other structures.

c) Earth fill intended to support structural measures should be compacted to a minimum of 90 percent of Standard Proctor Test density with proper moisture control, or as otherwise specified by the engineer responsible for the design. Compaction of other fills should be to the density required to control sloughing, erosion or excessive moisture content. Maximum thickness of fill layers prior to compaction should not exceed 9 inches.

d) The uppermost one foot of fill slopes should be compacted to at least 85 percent of the maximum unit weight (based on the modified AASHTO compaction test). This is usually accomplished by running heavy equipment over the fill.

e) Fill should consist of material from borrow areas and excess cut will be stockpiled in areas shown on the Site Plans. All disturbed areas should be free draining, left with a neat and finished appearance, and should be protected from erosion.

f) Infiltration basins shall be excavated, graded and shaped to subgrade elevation and shall then be suitably protected with installation of erosion control measures to prevent sediment-laden runoff from washing into the basins. The basins shall also be protected from heavy equipment activity from this point forward. Prior to application of loam and seed to infiltration basin surfaces, the contractor shall

remove any unsuitable soil such as silt or clay that may have been deposited during construction. The surface shall be scarified with a York rake or other small tractor mounted equipment. The loam and seed shall then be applied as required by this document.

Land Grading Stabilization Inspection/Maintenance *

a) All slopes should be checked periodically to see that vegetation is in good condition. Any rills or damage from erosion and animal burrowing should be repaired immediately to avoid further damage.

b) If seeps develop on the slopes, the area should be evaluated to determine if the seep will cause an unstable condition. Subsurface drains or a gravel mulch may be required to solve seep problems. However, no seeps are anticipated.

c) Areas requiring revegetation should be repaired immediately. Control undesirable vegetation such as weeds and woody growth to avoid bank stability problems in the future.

5) **Topsoiling *** – Topsoiling will help establish vegetation on all disturbed areas throughout the site during the seeding process. The soil texture of the topsoil to be used will be a sandy loam to a silt loam texture with 15% to 20% organic content.

Topsoiling Placement

a) Topsoil should not be placed while in a frozen or muddy condition, when the subgrade is excessively wet, or when conditions exist that may otherwise be detrimental to proper grading or proposed seeding.

b) Do not place topsoil on slopes steeper than 2.5:1, as it will tend to erode.

c) If topsoil and subsoil are not properly bonded, water will not infiltrate the soil profile evenly and it will be difficult to establish vegetation. The best method is to actually work the topsoil into the layer below for a depth of at least 6 inches.

6) **Permanent Seeding** – Permanent Seeding should be done immediately after the final design grades are achieved. Native species of plants should be used to establish perennial vegetative cover on disturbed areas. The revegetation should be done early enough in the fall so that a good cover is established before cold weather comes and growth stops until the spring. A good cover is defined as vegetation covering 75 percent or more of the ground surface.

Permanent Seeding Seedbed Preparation

a) In infertile or coarse-textured subsoil, it is best to stockpile topsoil and re-spread it over the finished slope at a minimum 2 to 6-inch depth and roll it to provide a firm seedbed. The topsoil must have a sandy loam to silt loam texture with 15% to 20% organic content. If construction fill operations have left soil exposed with a loose, rough, or irregular surface, smooth with blade and roll.

b) Loosen the soil to a depth of 3-5 inches with suitable agricultural or construction equipment.

c) Areas not to receive topsoil shall be treated to firm the seedbed after incorporation of the lime and fertilizer so that it is depressed no more than ½ - 1 inch when stepped on with a shoe. Areas to receive topsoil shall not be firmed until after topsoiling and lime and fertilizer is applied and incorporated, at which time it shall be treated to firm the seedbed as described above.

Permanent Seeding Grass Selection/Application

a) Select an appropriate cool or warm season grass based on site conditions and seeding date. Apply the seed uniformly by hydro-seeding, broadcasting, or by hand. Uniform seed distribution is essential. On steep slopes, hydroseeding may be the most effective seeding method. Surface roughening is particularly important when preparing slopes for hydroseeding.

b) Lime and fertilize. Organic fertilizer shall be utilized in areas within the 100 foot buffer zone to a wetland resource area.

c) Mulch the seedings with straw applied at the rate of ½ tons per acre. Anchor the mulch with erosion control netting or fabric on sloping areas. Amoco supergro or equivalent should be utilized.

Permanent Seeding Inspection/Maintenance *

a) Frequently inspect seeded areas for failure and make necessary repairs and reseed immediately. Conduct or follow-up survey after one year and replace failed plants where necessary.

b) If vegetative cover is inadequate to prevent rill erosion, overseed and fertilize in accordance with soil test results.

c) If a stand has less than 40% cover, reevaluate choice of plant materials and quantities of lime and fertilizer. Re-establish the stand following seedbed preparation and seeding recommendations, omitting lime and fertilizer in the absence of soil test results. If the season prevents resowing, mulch or jute netting is an effective temporary cover.

d) Seeded areas should be fertilized during the second growing season. Lime and fertilize thereafter at periodic intervals, as needed.

Fueling and Maintenance of Equipment and Vehicles:

1. Refueling/maintenance Rules – The site supervisor shall produce a written document received by all subcontractors and employees that delineates their responsibilities on site. This document shall include language that shall permit the maintenance of vehicles only in designated locations on the job site. In the event of mechanical failure of a vehicle, the vehicle shall be moved to the designated maintenance area on the site to perform maintenance. The site supervisor shall document receipt of these instructions by obtaining the

signatures of subcontractors and individuals that may enter the site and the date in which they were notified of their responsibilities. Refueling for vehicles or equipment shall occur either within the designated washout area or shall utilize temporary drip protection measures at the location of fueling. The site supervisor or their representative shall be present at the time of any fueling procedure. The site supervisor shall have a fuel spill plan and measures on site to initiate containment and clean-up in the event a fuel spill occurs.

2. Installation Schedule: Prior to start of Work

3. Maintenance and Inspection: The site supervisor shall maintain a log of individuals receiving these instructions.

4. Specific Pollution Prevention Practices

   Pollution Prevention Practice # 1

   a. Description: Fueling operations shall take place in designated area(s) as shown on site maps. Provide temporary drip protection during fueling operations which take place outside of designated area(s). Materials necessary to address a spill shall be made readily available in a location known to the site supervisor or his/her designee.

   b. Installation: Fueling operation procedures shall be in effect throughout the project duration.

   c. Maintenance Requirements: All emergency response equipment listed in the Emergency Response Equipment Inventory shall be made readily available and kept in a designated location known to the site supervisor or his/her designee. All such materials shall be replenished as necessary to the listed amounts.

Dust Control:

Dust control will be utilized throughout the entire construction process of the site. For example, keeping disturbed surfaces moist during windy periods will be an effective control measure, especially for construction access roads. The use of dust control will prevent the movement of soil to offsite areas. However, care must be taken to not create runoff from excessive use of water to control dust. The following are methods of Dust Control that may be used on-site:

- Vegetative Cover – The most practical method for disturbed areas not subject to traffic.
- Calcium Chloride – Calcium chloride may be applied by mechanical spreader as loose, dry granules or flakes at a rate that keeps the surface moist but not so high as to cause water pollution or plant damage.
- Sprinkling – The site may be sprinkled until the surface is wet. Sprinkling will be effective for dust control on haul roads and other traffic routes.
- Stone – Stone will be used to stabilize construction roads; will also be effective for dust control.

The general contractor shall employ an on-site water vehicle for the control of dust as necessary.

Non-Stormwater Discharges:

The construction de-watering and all non-stormwater discharges will be directed into a sediment dirt bag (or equivalent inlet protection) or a sediment basin. Sediment material removed shall be disposed of in accordance with all applicable local, state, and federal regulations.

The developer and site general contractor will comply with the E.P.A.'s Final General Permit for Construction De-watering Discharges, (N.P.D.E.S., Section 402 and 40 C.F.R. 122.26(b)(14)(x).

Inspection/Maintenance:

Operator personnel must inspect the construction site at least once every 14 calendar days and within 24 hours of a storm event of ½-inch or greater. The applicant shall be responsible to secure the services of a design professional or similar professional (inspector) on an on-going basis throughout all phases of the project. Refer to the Inspection/Maintenance Requirements presented earlier in the "Structural and Stabilization Practices." The inspector should review the erosion and sediment controls with respect to the following:

- Whether or not the measure was installed/performed correctly.
- Whether or not there has been damage to the measure since it was installed or performed.
- What should be done to correct any problems with the measure.

The inspector should complete the Stormwater Management Construction Phase BMP Inspection Schedule and Evaluation Checklist, as attached, for documenting the findings and should request the required maintenance or repair for the pollution prevention measures when the inspector finds that it is necessary for the measure to be effective. The inspector should notify the appropriate person to make the changes and submit copies of the form to the Weymouth Highway Department.

Project Location: Jackson Square, Parcel IDs 23-306-11, Weymouth, MA **Date:**
Stormwater Management – Construction Phase
Best Management Practices – Inspection Schedule and Evaluation Checklist

Construction Practices

Best Management Practice	Inspection Frequency	Date Inspected	Inspector	Minimum Maintenance and Key Items to Check	Cleaning/Repair Needed: (List Items)	Date of Cleaning/ Repair	Performed by
Silt Sock and Sediment Fence Controls	After heavy rainfall events (minimum weekly)			1. Sediment Fence Design/Installation Requirements 2. Sediment Fence Inspection/Maintenance	☐yes ☐no		
Stabilized Construction Entrance	After heavy rainfall events (minimum weekly)			1. Construction Entrance Design/ Construction Requirements 2. Construction Entrance Inspection/ Maintenance	☐yes ☐no		
Temporary Seeding	After heavy rainfall events (minimum weekly)			1. Temporary Seeding Planting Procedures 2. Temporary Seeding Inspection/ Maintenance	☐yes ☐no		
Geotextiles	After heavy rainfall events (minimum weekly)			1. Geotextile Inspection/Maintenance	☐yes ☐no		
Mulching & Netting	After heavy rainfall events (minimum weekly)			1. Mulch Maintenance	☐yes ☐no		
Land Grading	After heavy rainfall events (minimum weekly)			1. Land Grading Stabilization Inspection/ Maintenance	☐yes ☐no		

Project Location: Jackson Square, Parcel IDs 23-306-11, Weymouth, MA **Date:**
Stormwater Management – Construction Phase
Best Management Practices – Inspection Schedule and Evaluation Checklist

Construction Practices

Permanent Seeding	After heavy rainfall events (minimum weekly)			1. Permanent Seeding Inspection/ Maintenance	☐**yes** ☐**no**		
Dust Control	After heavy rainfall events (minimum weekly)				☐**yes** ☐**no**		
Soil Stockpiling	After heavy rainfall events (minimum weekly)				☐**yes** ☐**no**		

(1) Refer to the Massachusetts Stormwater Handbook issued January 2, 2008.

Notes (Include deviations from : Definitive Subdivision Decision and Special Conditions and Approved Plan):

Stormwater Control Manager ________________________________

Spill Containment and Management Plan

Initial Notification

In the event of a spill, the facility manager will be notified immediately.

Facility Managers (name)	Irakis N. Papachristos, Manager 1 Franklin Street, Boston, MA 02110
Facility Manager (phone)	203-230.1693

Assessment - Initial Containment

The supervisor will assess the incident and initiate containment control measures with the appropriate spill containment equipment included in the spill kit kept on-site. The supervisor will first contact the Fire Department and then notify the Police Department, Department of Public Works, Board of Health and Conservation Commission. The fire department is ultimately responsible for matters of public health and safety and should be notified immediately.

Contact:	Phone Number:
Fire Department:	911
Police Department:	911
Department of Public Works:	(781) 337-5100
Board of Health Phone:	(781) 335-2000
Conservation Commission Phone:	(781) 340-5007

Further Notification

Based on the assessment from the Fire Chief, additional notification to a cleanup contractor may be made. The Massachusetts Department of Environmental Protection (DEP) and the EPA may be notified depending upon the nature and severity of the spill. The Fire Chief will be responsible for determining the level of cleanup and notification required. The attached list of emergency phone numbers shall be posted in the facility office and readily accessible to all employees.

HAZARDOUS WASTE / OIL SPILL REPORT

Date____/_____/_____ Time____________ AM / PM

Exact location (Transformer #)____

Type of equipment___________________________Make_____________Size______________

S / N_________________________________Weather Conditions________________________

On or near water ☐ Yes If yes, name of body of water____________________

☐ No

Type of chemical / oil spilled__________________________

Amount of chemical / oil spilled________________________

Cause of spill____

____

____

Measures taken to contain or clean up spill____

____

____

Amount of chemical / oil recovered________________Method____________________________

Material collected as a result of clean up

_____________drums containing____

_____________drums containing____

_____________drums containing____

Location and method of debris disposal____

____

Name and address of any person, firm, or corporation suffering damages____________________

____

Procedures, method, and precautions instituted to prevent a similar occurrence from recurring___

____

Spill reported to General Office by__________________________Time_____________AM / PM

Spill reported to DEP / National Response Center by___________________________________

DEP Date____/_____/_____ Time_________ AM / PM Inspector_______________

NRC Date____/_____/_____ Time_________ AM / PM Inspector_______________

Additional comments____

____

____

EMERGENCY RESPONSE EQUIPMENT
INVENTORY

The following equipment and materials shall be maintained at all times and stored in a secure area for long-term emergency response need.

--	SORBENT PADS	1 BALE
--	SAND BAGS (empty)	5
--	SPEEDI-DRI ABSORBENT	2 – 40LB BAGS
--	12” INFLATABLE PIPE PLUG	1
--	SQUARE END SHOVELS	1
--	PRY BAR	1
--	CATCH BASIN COVER	1

EMERGENCY NOTIFICATION PHONE NUMBERS

1. FACILITY MANAGER
    NAME: ____________ BEEPER: ____________
    PHONE: ____________ CELL PHONE: ____________

    ALTERNATE:
    NAME: ____________ BEEPER: N/A ____________
    PHONE: ____________ CEL PHONE: N/A ____________

2. FIRE DEPARTMENT
    EMERGENCY: 911
    BUSINESS: (781) 337-5151

    POLICE DEPARTMENT
    EMERGENCY: 911
    BUSINESS: (781) 335-1212

    DEPARTMENT OF PUBLIC WORKS
    CONTACT: Director – Kenan Connell
    BUSINESS: (781) 337-5100

    CONSERVATION COMMISSION
    CONTACT: Andrew Hultin
    BUSINESS: (781) 340-5007

    BOARD OF HEALTH
    CONTACT: Board of Health Agent Clerk – Clare LaMorte, RN
    BUSINESS: (781) 335-2000

3. MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
    EMERGENCY: (617) 556-1133
    SOUTHEAST REGION - LAKEVILLE OFFICE: (508) 946-2700

4. NATIONAL RESPONSE CENTER
    PHONE: (800) 424-8802

    ALTERNATE: U.S. ENVIRONMENTAL PROTECTION AGENCY
    EMERGENCY: (617) 223-7265
    BUSINESS: (617) 860-4300

POST-DEVELOPMENT BEST MANAGEMENT PRACTICE OPERATION AND MAINTENANCE PLAN & LONG-TERM POLLUTION PREVENTION PLAN

for

JACKSON SQUARE

In

Weymouth, Massachusetts
Building D
(Assessor's Parcel ID 23-306-11)

Submitted to:

TOWN OF WEYMOUTH

Prepared for:

Irakis N. Papachristos, Manager
864, 909, 910 Broad Street LLCs and
1409 Commercial Street
1 Franklin Street
Boston, Massachusetts 02110

Prepared by:

MCKENZIE
ENGINEERING GROUP

Professional Civil Engineering • Project Management • Land Planning
150 Longwater Drive, Suite 101, Norwell, Massachusetts 02061
Tel.: (781) 792-3900 Facsimile: (781) 792-0333
www.mckeng.com

August 4, 2023
Revised September 6, 2023
Revised November 17, 2023

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Post-Development Best Management Practice Operation and Maintenance Plan & Long-Term Pollution Prevention Plan

Post-Development Best Management Practices (BMPs) Operation and Maintenance Plan

Responsible Party/Property Owner/Developer contact information:

Property Owner: Irakis N. Papachristos, Manager
864, 909, 910 Broad Street LLCs and
1409 Commercial Street
1 Franklin Street
Boston, MA 02110
Phone: (202) 230.1693

Developer Contact Information:

Irakis N. Papachristos, Manager
864, 909, 910 Broad Street LLCs and
1409 Commercial Street
1 Franklin Street
Boston, MA 02110
Phone: (202) 230.1693

City of Weymouth Contact Information:

Weymouth Department of Public Works
120 Winter Street
Weymouth, MA 02188
Phone: 781-337-5100

Best Management Practices (BMPs) of the Commonwealth of Massachusetts Department of Environmental Protection's (DEP's) Stormwater Management Policy (SMP) have been implemented and utilized for the project. The following information provided is to be used as a guideline for monitoring and maintaining the performance of the drainage facilities and to ensure that the quality of water runoff meets the standards set forth by the SMP. The structural Best Management Practices (BMPs) shall be inspected during rainfall conditions during the first year of operation to verify functionality.

All BMPs located within the drainage easements will be owned and maintained by the developer until such a time that a homeowners association is created, then the homeowners association will maintain the BMPs.

BMPs included in the design consist of the use of:

- Stormceptor Treatment Units
- Subsurface Pipe Storage System
- Access Drive Pavement Maintenance

Operation:

Once the stormwater management systems have been constructed and site has been permanently stabilized and put into action, the operation of the stormwater management system will function as intended. Stormwater runoff is directed into the trench drain to the First Defense unit, and lastly to the subsurface infiltration system. The stormwater management systems have been designed to attenuate peak flows for the 2-year through 100-year storm events.

Maintenance:

1. **Paved Areas** –Sweepers shall sweep paved areas periodically during dry weather to remove excess sediments and to reduce the amount of sediments that the drainage system shall have to remove from the runoff. The sweeping shall be conducted primarily between March 15th and November 15th. Special attention should be made to sweeping paved surfaces in March and April before spring rains wash residual sand into the drainage system.

   The frequency of sweeping shall average:

   - Monthly if by a high-efficiency vacuum sweeper
   - Bi-weekly if by a regenerative air sweeper
   - Weekly if by a mechanical sweeper

   Salt used for de-icing on the parking lot during winter months shall be limited as much as possible as this will reduce the need for removal and treatment. Sand containing the minimum amount of calcium chloride (or approved equivalent) needed for handling may be applied as part of the routine winter maintenance activities.

   Cost: The property owner should consult local sweeping contractors for detailed cost estimates.

2. **Proprietary Pretreatment Units –** The proprietary pretreatment units shall be inspected and maintained from the surface, without entry into the unit a minimum of annually and following heavy rain events. Perform maintenance once the stored volume reaches 15% of the unit capacity, or immediately in the event of a spill. Perform Maintenance at quarterly intervals during the first year of installation, so an accurate maintenance schedule can be established. Sediment and debris should be removed through the 12-inch diameter outlet pipe. Alternatively, oil and floatables should be removed through the 12-inch oil inspection port. The requirements for the disposal from the units should be in compliance with all local, state and federal regulations. Consult the Natick Board of Health for transfer station locations prior to disposing the separator contents. Please refer to the Manufacturer's Manual for additional detail on proper inspection and maintenance of the First Defense units.

   Cost: Cleaning should be included along with the routine maintenance of the catch basins. The property owner should consult local vacuum cleaning contractors for detailed cost estimates.

3. **Subsurface Detention Pipe System** – Proper maintenance of the subsurface detention systems is essential to the long-term effectiveness of the system. The subsurface detention system shall have inspection ports. Additional inspections should be scheduled during the first few months to ensure proper stabilization and

function. After that, they shall be checked semiannually, following heavy rainfalls, defined as a 1-year storm exceeding 2.5 inches of rainfall within twenty-four hours, and periodically during the spring seasonally high groundwater periods to confirm no groundwater intrusion. Water levels in the chambers shall be checked to verify proper drainage. Material removed from the system shall be disposed of in accordance with all applicable local, state, and federal regulations.

Cost: The property owner should consult local landscape contractors for a detailed cost estimate.

4. **Trench Drains -** Trench drain grates shall be checked quarterly and following heavy rainfalls to verify that the inlet openings are not clogged by debris. Debris shall be removed from the grates and disposed of in accordance with all applicable regulations.

   Cost: The property owner should consult local landscape contractors for a detailed cost estimate.

5. **Pesticides, Herbicides, and Fertilizers -** Pesticides and herbicides shall be used sparingly. Fertilizers should be restricted to the use of organic fertilizers only.

   All structural BMP's as identified on the site plans will be owned and maintained by the homeowner's association of the development and shall run with the title of the property.

   Cost: Included in the routine landscaping maintenance schedule. The Owner should consult local landscaping contractors for details.

6. **Snow Removal -** Snow accumulations removed from access road should be placed in upland areas only, where sand and other debris will remain after snowmelt for later removal. Excess snow should be removed from the site and properly disposed of in an approved snow disposal facility. Care must be exercised not to deposit snow in the in areas where sand and debris can get into the watercourse.

   Cost: The owner should consult local snow removal contractors for a detailed cost estimate.

Maintenance Responsibilities:

All post construction maintenance activities will be documented and kept on file. Annual inspection reports in the form of an Evaluation Checklist, see attached form, will be submitted to the City of Weymouth. Inspections shall be performed by a licensed engineer or similar professional (inspector).

All BMPs located within the drainage easements will be owned and maintained by the developer until such a time that a homeowners association is created, then the homeowners association will maintain the BMPs.

Long-Term Pollution Prevention Plan

Good Housekeeping:

To develop and implement an operation and maintenance program with the goal of preventing or reducing pollutant runoff by keeping potential pollutants from coming into contact with stormwater or being transported off site without treatment, the following efforts will be made:

- Property Management awareness and training on how to incorporate pollution prevention techniques into maintenance operations.
- Follow appropriate best management practices (BMPs) by proper maintenance and inspection procedures.
- Homeowner education outreach, including promoting recycling through the City of Weymouth Transfer Station.

Storage and Disposal of Household Waste and Toxics:

This management measure involves educating the general public on the management considerations for hazardous materials. Failure to properly store hazardous materials dramatically increases the probability that they will end up in local waterways. Many people have hazardous chemicals stored throughout their homes, especially in garages and storage sheds. Practices such as covering hazardous materials or even storing them properly, can have dramatic impacts. Property owners are encouraged to support the household hazardous product collection events sponsored by the City of Weymouth.

MADEP has prepared several materials for homeowners on how to properly use and dispose of household hazardous materials:

http://www.mass.gov/dep/recycle/reduce/househol.htm

For consumer questions on household hazardous waste call the following number:

DEP Household Hazardous Waste Hotline 800-343-3420

The following is a list of management considerations for hazardous materials as outlined by the EPA:

- Ensuring sufficient aisle space to provide access for inspections and to improve the ease of material transport;
- Storing materials well away from high-traffic areas to reduce the likelihood of accidents that might cause spills or damage to drums, bags, or containers.
- Stacking containers in accordance with the manufacturers' directions to avoid damaging the container or the product itself;
- Storing containers on pallets or equivalent structures. This facilitates inspection for leaks and prevents the containers from coming into contact with wet floors, which can cause corrosion. This consideration also reduces the incidence of damage by pests.

The following is a list of commonly used hazardous materials used in the household:

Batteries – automotive and rechargeable
  nickel cadmium batteries
  (no alkaline batteries)
Gasoline
Oil-based paints
Fluorescent light bulbs and lamps
Pool chemicals
Propane tanks
Lawn chemicals,

Disinfectant
Drain clog dissolvers
Driveway sealer
Flea dips, sprays and collars
Houseplant insecticides
Metal polishes
Mothballs
Motor oil and filters
Muriatic acid (concrete cleaner)

fertilizers and weed killers
Turpentine
Bug sprays
Antifreeze
Paint thinners, strippers, varnishes and stains
Arts and crafts chemicals
Charcoal lighter fluid
Nail polishes and nail polish removers
Oven cleaner
Household pest and rat poisons
Rug and upholstery cleaners
Shoe polish
Windshield wiper fluid

Landscape Maintenance:

This management measure seeks to control the storm water impacts of landscaping and lawn care practices through education and outreach on methods that reduce nutrient loadings and the amount of storm water runoff generated from lawns. Nutrient loads generated by fertilizer use on suburban lawns can be significant, and recent research has shown that lawns produce more surface runoff than previously thought.

Using proper landscaping techniques can effectively increase the value of a property while benefiting the environment. These practices can benefit the environment by reducing water use; decreasing energy use (because less water pumping and treatment is required); minimizing runoff of storm and irrigation water that transports soils, fertilizers, and pesticides; and creating additional habitat for plants and wildlife. The following lawn and landscaping management practices will be encouraged:

- Mow lawns at the highest recommended height.
- Minimize lawn size and maintain existing native vegetation.
- Collect rainwater for landscaping/gardening needs (rain barrels and cisterns to capture roof runoff).
- Raise public awareness for promoting the water efficient maintenance practices by informing users of water efficient irrigation techniques and other innovative approaches to water conservation.
- Abide by water restrictions and other conservation measures implemented by the City of Weymouth.
- Water only when necessary.
- Use automatic irrigation systems to reduce water use.

Integrated Pest Management (IPM):

This management measure seeks to limit the adverse impacts of insecticides and herbicides by providing information on alternative pest control techniques other than chemicals or explaining how to determine the correct dosages needed to manage pests.

The presence of pesticides in stormwater runoff has a direct impact on the health of aquatic organisms and can present a threat to humans through contamination of drinking water supplies. The pesticides of greatest concern are insecticides, such as diazinon and chloropyrifos, which even at very low levels can be harmful to aquatic life. The major source of pesticides to urban steams is home application of products designed to kill insects and weeds in the lawn and garden. The following IPM practices will be encouraged:

- Lawn care and landscaping management programs including appropriate pesticide use management as part of program.
- Raise public awareness by referring homeowners to "A Homeowner's Guide to Environmentally Sound Lawncare, Maintaining a Healthy Lawn the IPM Way", Massachusetts Department of Food and Agriculture, Pesticide Bureau or link **http://www.mass.gov/dep/water/resources/nonpoint.htm#megaman>**

Illicit Discharges:

Illicit discharges are non-stormwater discharges to the storm drain system which typically contain bacteria and other pollutants. All illicit discharges are prohibited. Any illicit discharges should be reported to MassDOT and/or the DPW as applicable to be addressed in accordance with their respective policies.

The following is a list of EPA allowed non-stormwater discharges. If the non-stormwater discharge is not listed, it is prohibited.

1. Water line flushing,
2. Landscape irrigation,
3. Diverted stream flows,
4. Rising ground waters,
5. Uncontaminated ground water infiltration (as defined at 40 CFR 35.2005(20)),
6. Uncontaminated pumped ground water,
7. Discharge from potable water sources,
8. Foundation drains,
9. Air conditioning condensation,
10. Irrigation water, springs,
11. Water from crawl space pumps,
12. Footing drains,
13. Lawn watering,
14. Flows from riparian habitats and wetlands,
15. Street wash water,
16. Discharges or flows from firefighting activities occur during emergency conditions.

Project Location: Jackson Square, Assessor's Parcel IDs 23-306-11, Weymouth, MA

Stormwater Management – Post Construction Phase
Best Management Practices – Inspection Schedule and Evaluation Checklist

Long Term Practices

Best Management Practice	**Inspection Frequency (1)**	**Date Inspected**	**Inspector**	**Minimum Maintenance and Key Items to Check (1)**	**Cleaning/Repair Needed:** ☐**yes** ☐**no** **(List Items)**	**Date of Cleaning/ Repair**	**Performed by**
Street Sweeping Maintenance	4-times annually - specifically in Spring and Fall			1. Sediment build-up 2. Trash and debris 3. Minor Spills (vehicular)			
Proprietary Pretreatment Units	After heavy rainfall events (minimum annually)			1. Sediment level exceeds Manufacturer's specification 2. Trash and debris 3. Floatable oils or hydrocarbons 4. Outlet blockages			
Subsurface Detention System	After heavy rainfall events (minimum semi-annually)			1. Sediment build-up			
Trench Drains	After heavy rainfall events (minimum quarterly)			1. Sediment level exceeds 8" 2. Trash and debris 3. Floatable oils or hydrocarbons 4. Grate or outlet blockages			

(1) Refer to the Massachusetts Stormwater Management, Volume Two: Stormwater Technical Handbook (February 2008) for recommendations regarding frequency for inspection and maintenance of specific BMP's.

Notes (Include deviations from: Con Com Order of Conditions, PB Approval, Construction Sequence and Approved Plan):

1.

Stormwater Control Manager ________________________________ Stamp:

Spill Containment and Management Plan

Initial Notification

In the event of a spill, the facility manager will be notified immediately.

Facility Managers (name)	Irakis N. Papachristos, Manager 1 Franklin Street, Boston, MA 02110
Facility Manager (phone)	203-230.1693

Assessment - Initial Containment

The supervisor will assess the incident and initiate containment control measures with the appropriate spill containment equipment included in the spill kit kept on-site. The supervisor will first contact the Fire Department and then notify the Police Department, Department of Public Works, Board of Health and Conservation Commission. The fire department is ultimately responsible for matters of public health and safety and should be notified immediately.

Contact:	Phone Number:
Fire Department:	911
Police Department:	911
Department of Public Works:	(781) 337-5100
Board of Health Phone:	(781) 335-2000
Conservation Commission Phone:	(781) 340-5007

Further Notification

Based on the assessment from the Fire Chief, additional notification to a cleanup contractor may be made. The Massachusetts Department of Environmental Protection (DEP) and the EPA may be notified depending upon the nature and severity of the spill. The Fire Chief will be responsible for determining the level of cleanup and notification required. The attached list of emergency phone numbers shall be posted in the facility office and readily accessible to all employees.

HAZARDOUS WASTE / OIL SPILL REPORT

Date____/_____/_____ Time____________ AM / PM

Exact location (Transformer #)____

Type of equipment___________________________Make_____________Size______________

S / N_________________________________Weather Conditions________________________

On or near water ☐ Yes If yes, name of body of water____________________

☐ No

Type of chemical / oil spilled__________________________

Amount of chemical / oil spilled________________________

Cause of spill____

____

____

Measures taken to contain or clean up spill____

____

____

Amount of chemical / oil recovered________________Method____________________________

Material collected as a result of clean up

_____________drums containing____

_____________drums containing____

_____________drums containing____

Location and method of debris disposal____

____

Name and address of any person, firm, or corporation suffering damages____________________

____

Procedures, method, and precautions instituted to prevent a similar occurrence from recurring___

____

Spill reported to General Office by__________________________Time_____________AM / PM

Spill reported to DEP / National Response Center by___________________________________

DEP Date____/_____/_____ Time_________ AM / PM Inspector_______________

NRC Date____/_____/_____ Time_________ AM / PM Inspector_______________

Additional comments____

____

____

EMERGENCY RESPONSE EQUIPMENT
INVENTORY

The following equipment and materials shall be maintained at all times and stored in a secure area for long-term emergency response need.

--	SORBENT PADS	1 BALE
--	SAND BAGS (empty)	5
--	SPEEDI-DRI ABSORBENT	2 – 40LB BAGS
--	12” INFLATABLE PIPE PLUG	1
--	SQUARE END SHOVELS	1
--	PRY BAR	1
--	CATCH BASIN COVER	1

EMERGENCY NOTIFICATION PHONE NUMBERS

1. FACILITY MANAGER
    - NAME: __________________ BEEPER: ________________________
    - PHONE: __________________ CELL PHONE: __________________

    ALTERNATE:
    - NAME: __________________ BEEPER: N/A ____________________
    - PHONE: __________________ CEL PHONE: N/A _________________

2. FIRE DEPARTMENT
    - EMERGENCY: 911
    - BUSINESS: (781) 337-5151

    POLICE DEPARTMENT
    - EMERGENCY: 911
    - BUSINESS: (781) 335-1212

    DEPARTMENT OF PUBLIC WORKS
    - CONTACT: Director – Kenan Connell
    - BUSINESS: (781) 337-5100

    CONSERVATION COMMISSION
    - CONTACT: Andrew Hultin
    - BUSINESS: (781) 340-5007

    BOARD OF HEALTH
    - CONTACT: Board of Health Agent Clerk – Clare LaMorte, RN
    - BUSINESS: (781) 335-2000

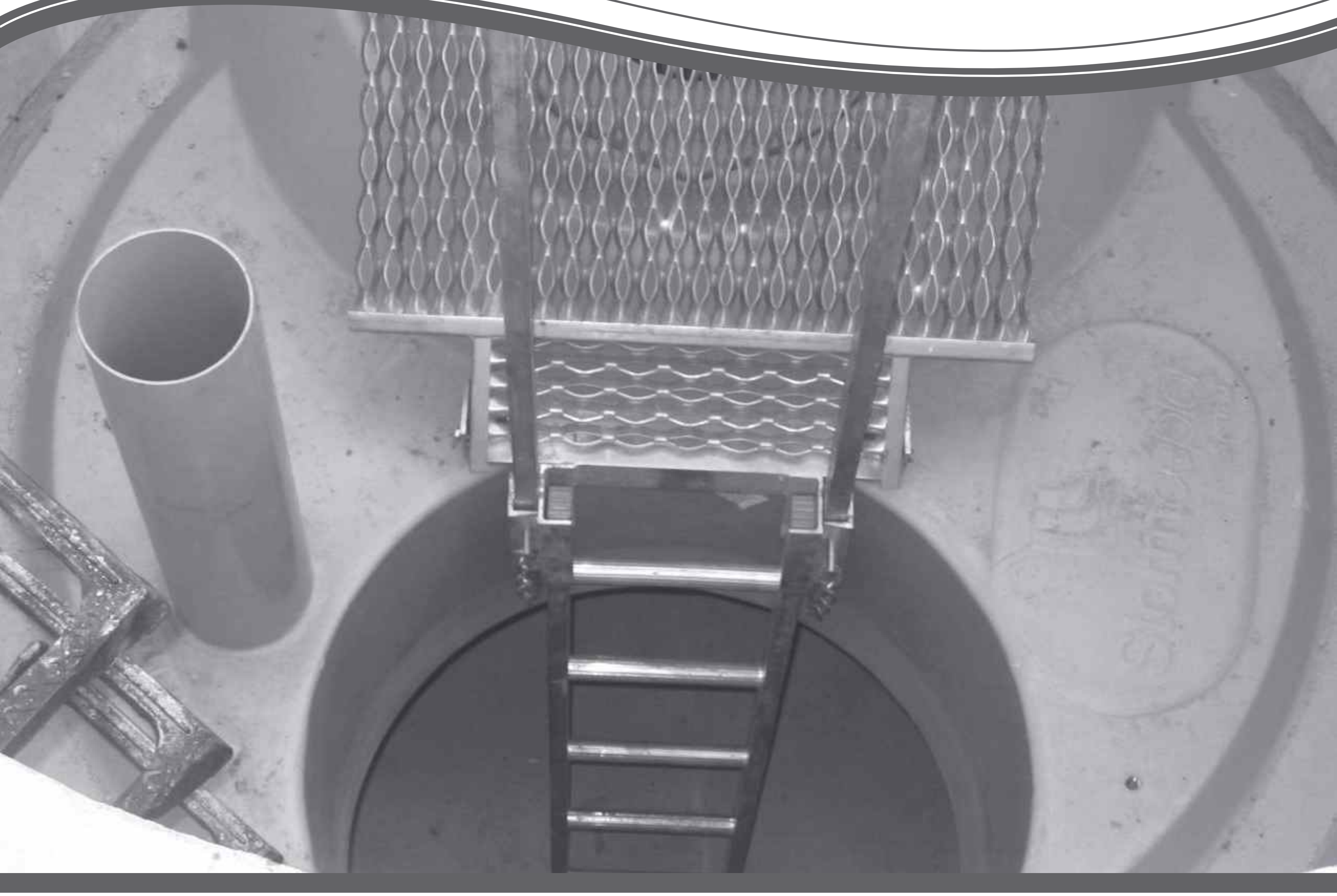
3. MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
    - EMERGENCY: (617) 556-1133
    - SOUTHEAST REGION - LAKEVILLE OFFICE: (508) 946-2700

4. NATIONAL RESPONSE CENTER
    - PHONE: (800) 424-8802

    ALTERNATE: U.S. ENVIRONMENTAL PROTECTION AGENCY
    - EMERGENCY: (617) 223-7265
    - BUSINESS: (617) 860-4300

CONTECH®
ENGINEERED SOLUTIONS

Stormceptor® STC
Operation and Maintenance Guide



Stormceptor® STC

Stormceptor Design Notes

- Only the STC 450i is adaptable to function with a catch basin inlet and/or inline pipes.
- Only the Stormceptor models STC 450i to STC 7200 may accommodate multiple inlet pipes.

Inlet and outlet invert elevation differences are as follows:

Inlet and Outlet Pipe Invert Elevations Differences			
Inlet Pipe Configuration	STC 450i	STC 900 to STC 7200	STC 11000 to STC 16000
Single inlet pipe	3 in. (75 mm)	1 in. (25 mm)	3 in. (75 mm)
Multiple inlet pipes	3 in. (75 mm)	3 in. (75 mm)	Only one inlet pipe.

Maximum inlet and outlet pipe diameters:

Inlet/Outlet Configuration	Inlet Unit STC 450i	In-Line Unit STC 900 to STC 7200	Series* STC 11000 to STC 16000
Straight Through	24 inch (600 mm)	42 inch (1050 mm)	60 inch (1500 mm)
Bend (90 degrees)	18 inch (450 mm)	33 inch (825 mm)	33 inch (825 mm)

- The inlet and in-line Stormceptor units can accommodate turns to a maximum of 90 degrees.
- Minimum distance from top of grade to crown is 2 feet (0.6 m)
- Submerged conditions. A unit is submerged when the standing water elevation at the proposed location of the Stormceptor unit is greater than the outlet invert elevation during zero flow conditions. In these cases, please contact your local Stormceptor representative and provide the following information:
- Top of grade elevation
- Stormceptor inlet and outlet pipe diameters and invert elevations
- Standing water elevation
- Stormceptor head loss, K = 1.3 (for submerged condition, K = 4)

OPERATION AND MAINTENANCE GUIDE
Table of Content

1. About Stormceptor

The Stormceptor® STC (Standard Treatment Cell) was developed by Imbrium™ Systems to address the growing need to remove and isolate pollution from the storm drain system before it enters the environment. The Stormceptor STC targets hydrocarbons and total suspended solids (TSS) in stormwater runoff. It improves water quality by removing contaminants through the gravitational settling of fine sediments and floatation of hydrocarbons while preventing the re-suspension or scour of previously captured pollutants.

The development of the Stormceptor STC revolutionized stormwater treatment, and created an entirely new category of environmental technology. Protecting thousands of waterways around the world, the Stormceptor System has set the standard for effective stormwater treatment.

1.1. Patent Information

The Stormceptor technology is protected by the following patents:

- Australia Patent No. 693,164 • 693,164 • 707,133 • 729,096 • 779401
- Austrian Patent No. 289647
- Canadian Patent No 2,009,208 •2,137,942 • 2,175,277 • 2,180,305 • 2,180,383 • 2,206,338 • 2,327,768 (Pending)
- China Patent No 1168439
- Denmark DK 711879
- German DE 69534021
- Indonesian Patent No 16688
- Japan Patent No 9-11476 (Pending)
- Korea 10-2000-0026101 (Pending)
- Malaysia Patent No PI9701737 (Pending)
- New Zealand Patent No 314646
- United States Patent No 4,985,148 • 5,498,331 • 5,725,760 • 5,753,115 • 5,849,181 • 6,068,765 • 6,371,690
- Stormceptor OSR Patent Pending • Stormceptor LCS Patent Pending

2. Stormceptor Design Overview

2.1. Design Philosophy

The patented Stormceptor System has been designed to focus on the environmental objective of providing long-term pollution control. The unique and innovative Stormceptor design allows for continuous positive treatment of runoff during all rainfall events, while ensuring that all captured pollutants are retained within the system, even during intense storm events.

An integral part of the Stormceptor design is PCSWMM for Stormceptor - sizing software developed in conjunction with Computational Hydraulics Inc. (CHI) and internationally acclaimed expert, Dr. Bill James. Using local historical rainfall data and continuous simulation modeling, this software allows a Stormceptor unit to be designed for each individual site and the corresponding water quality objectives.

By using PCSWMM for Stormceptor, the Stormceptor System can be designed to remove a wide range of particles (typically from 20 to 2,000 microns), and can also be customized to remove a specific particle size distribution (PSD). The specified PSD should accurately reflect what is in the stormwater runoff to ensure the device is achieving the desired water quality objective. Since stormwater runoff contains small particles (less than 75 microns), it is important to design a treatment system to remove smaller particles in addition to coarse particles.

2.2. Benefits

The Stormceptor System removes free oil and suspended solids from stormwater, preventing spills and non-point source pollution from entering downstream lakes and rivers. The key benefits, capabilities and applications of the Stormceptor System are as follows:

- Provides continuous positive treatment during all rainfall events
- Can be designed to remove over 80% of the annual sediment load
- Removes a wide range of particles
- Can be designed to remove a specific particle size distribution (PSD)
- Captures free oil from stormwater
- Prevents scouring or re-suspension of trapped pollutants
- Pre-treatment to reduce maintenance costs for downstream treatment measures (ponds, swales, detention basins, filters)
- Groundwater recharge protection
- Spills capture and mitigation
- Simple to design and specify
- Designed to your local watershed conditions
- Small footprint to allow for easy retrofit installations
- Easy to maintain (vacuum truck)
- Multiple inlets can connect to a single unit
- Suitable as a bend structure
- Pre-engineered for traffic loading (minimum AASHTO HS-20)
- Minimal elevation drop between inlet and outlet pipes
- Small head loss
- Additional protection provided by an 18” (457 mm) fiberglass skirt below the top of the insert, for the containment of hydrocarbons in the event of a spill.

2.3. Environmental Benefit

Freshwater resources are vital to the health and welfare of their surrounding communities. There is increasing public awareness, government regulations and corporate commitment to reducing the pollution entering our waterways. A major source of this pollution originates from stormwater runoff from urban areas. Rainfall runoff carries oils, sediment and other contaminants from roads and parking lots discharging directly into our streams, lakes and coastal waterways.

The Stormceptor System is designed to isolate contaminants from getting into the natural environment. The Stormceptor technology provides protection for the environment from spills that occur at service stations and vehicle accident sites, while also removing contaminated sediment in runoff that washes from roads and parking lots.

3. Key Operation Features

3.1. Scour Prevention

A key feature of the Stormceptor System is its patented scour prevention technology. This innovation ensures pollutants are captured and retained during all rainfall events, even extreme storms. The Stormceptor System provides continuous positive treatment for all rainfall events, including intense storms. Stormceptor slows incoming runoff, controlling and reducing velocities in the lower chamber to create a non-turbulent environment that promotes free oils and floatable debris to rise and sediment to settle.

The patented scour prevention technology, the fiberglass insert, regulates flows into the lower chamber through a combination of a weir and orifice while diverting high energy flows away through the upper chamber to prevent scouring. Laboratory testing demonstrated no scouring when tested up to 125% of the unit's operating rate, with the unit loaded to 100% sediment capacity (NJDEP, 2005). Second, the depth of the lower chamber ensures the sediment storage zone is adequately separated from the path of flow in the lower chamber to prevent scouring.

3.2. Operational Hydraulic Loading Rate

Designers and regulators need to evaluate the treatment capacity and performance of manufactured stormwater treatment systems. A commonly used parameter is the "operational hydraulic loading rate" which originated as a design methodology for wastewater treatment devices.

Operational hydraulic loading rate may be calculated by dividing the flow rate into a device by its settling area. This represents the critical settling velocity that is the prime determinant to quantify the influent particle size and density captured by the device. PCSWMM for Stormceptor uses a similar parameter that is calculated by dividing the hydraulic detention time in the device by the fall distance of the sediment.

$$v_{SC} = \frac{H}{6_H} = \frac{Q}{A_S}$$

Where:

v_{SC} = critical settling velocity, ft/s (m/s)

H = tank depth, ft (m)

Ø_H = hydraulic detention time, ft/s (m/s)

Q = volumetric flow rate, ft3/s (m3/s)

A_S = surface area, ft^2 (m^2)

(Tchobanoglous, G. and Schroeder, E.D. 1987. Water Quality. Addison Wesley.)

Unlike designing typical wastewater devices, stormwater systems are designed for highly variable flow rates including intense peak flows. PCSWMM for Stormceptor incorporates all of the flows into its calculations, ensuring that the operational hydraulic loading rate is considered not only for one flow rate, but for all flows including extreme events.

3.3. Double Wall Containment

The Stormceptor System was conceived as a pollution identifier to assist with identifying illicit discharges. The fiberglass insert has a continuous skirt that lines the concrete barrel wall for a depth of 18 inches (457 mm) that provides double wall containment for hydrocarbons storage. This protective barrier ensures that toxic floatables do not migrate through the concrete wall into the surrounding soils.

4. Stormceptor Product Line

4.1. Stormceptor Models

A summary of Stormceptor models and capacities are listed in Table 1.

Table 1. Stormceptor Models

Stormceptor Model	Total Storage Volume U.S. Gal (L)	Hydrocarbon Storage Capacity U.S. Gal (L)	Maximum Sediment Capacity ft^3 (L)
STC 450i	470 (1,780)	86 (330)	46 (1,302)
STC 900	952 (3,600)	251 (950)	89 (2,520)
STC 1200	1,234 (4,670)	251 (950)	127 (3,596)
STC 1800	1,833 (6,940)	251 (950)	207 (5,861)
STC 2400	2,462 (9,320)	840 (3,180)	205 (5,805)
STC 3600	3,715 (1,406)	840 (3,180)	373 (10,562)
STC 4800	5,059 (1,950)	909 (3,440)	543 (15,376)
STC 6000	6,136 (23,230)	909 (3,440)	687 (19,453)
STC 7200	7,420 (28,090)	1,059 (4,010)	839 (23,757)
STC 11000	11,194 (42,370)	2,797 (10, 590)	1,086 (30,752)
STC 13000	13,348 (50,530)	2,797 (10, 590)	1,374 (38,907)
STC 16000	15,918 (60,260)	3,055 (11, 560)	1,677 (47,487)

NOTE: Storage volumes may vary slightly from region to region. For detailed information, contact your local Stormceptor representative.

4.2. Inline Stormceptor

The Inline Stormceptor, Figure 1, is the standard design for most stormwater treatment applications. The patented Stormceptor design allows the Inline unit to maintain continuous positive treatment of total suspended solids (TSS) year-round, regardless of flow rate. The Inline Stormceptor is composed of a precast concrete tank with a fiberglass insert situated at the invert of the storm sewer pipe, creating an upper chamber above the insert and a lower chamber below the insert.

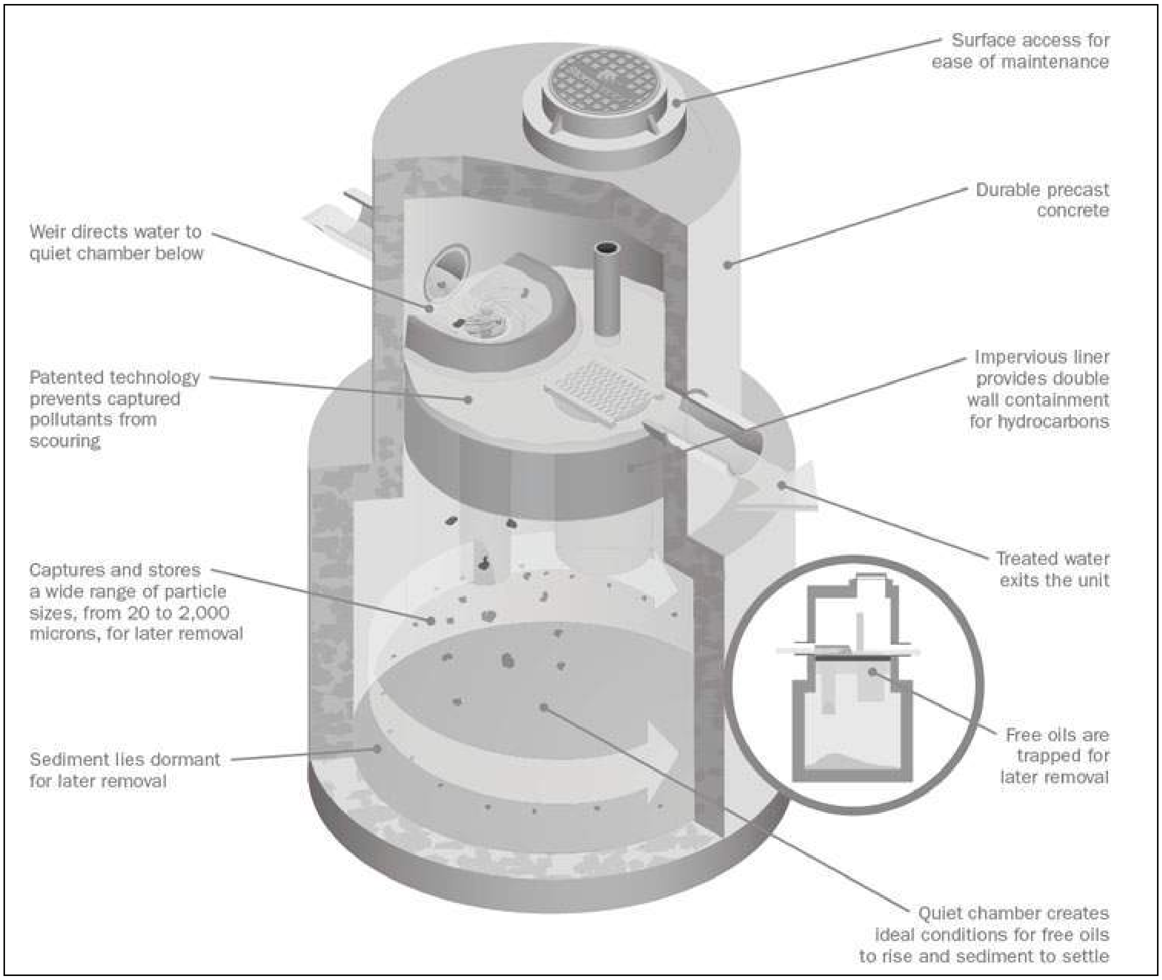


Figure 1. Inline Stormceptor

Operation

As water flows into the Stormceptor unit, it is slowed and directed to the lower chamber by a weir and drop tee. The stormwater enters the lower chamber, a non-turbulent environment, allowing free oils to rise and sediment to settle. The oil is captured underneath the fiberglass insert and shielded from exposure to the concrete walls by a fiberglass skirt. After the pollutants separate, treated water continues up a riser pipe, and exits the lower chamber on the downstream side of the weir before leaving the unit. During high flow events, the Stormceptor System's patented scour prevention technology ensures continuous pollutant removal and prevents re-suspension of previously captured pollutants.

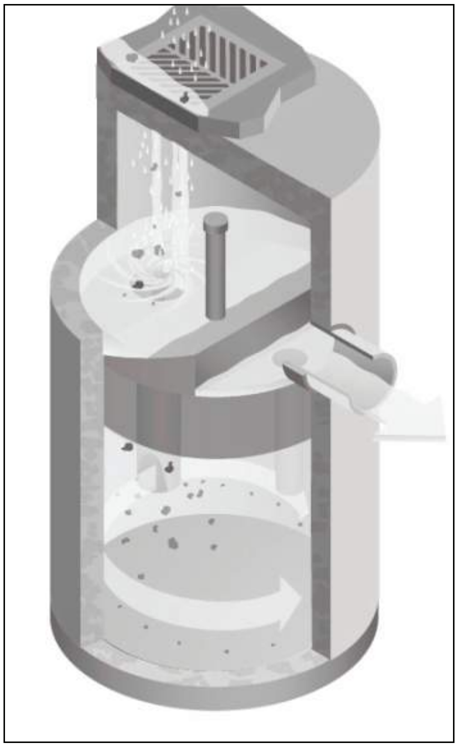


Figure 2. Inlet Stormceptor

4.3. Inlet Stormceptor

The Inlet Stormceptor System, Figure 2, was designed to provide protection for parking lots, loading bays, gas stations and other spill-prone areas. The Inlet Stormceptor is designed to remove sediment from stormwater introduced through a grated inlet, a storm sewer pipe, or both.

The Inlet Stormceptor design operates in the same manner as the Inline unit, providing continuous positive treatment, and ensuring that captured material is not re-suspended.

4.4. Series Stormceptor

Designed to treat larger drainage areas, the Series Stormceptor System, Figure 3, consists of two adjacent Stormceptor models that function in parallel. This design eliminates the need for additional structures and piping to reduce installation costs.

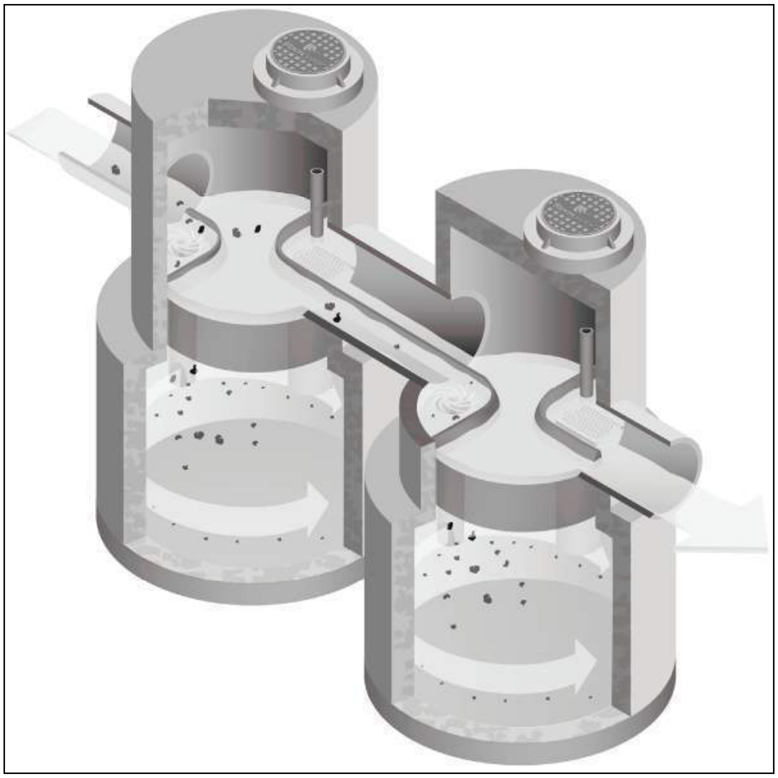


Figure 3. Series System

The Series Stormceptor design operates in the same manner as the Inline unit, providing continuous positive treatment, and ensuring that captured material is not re-suspended.

5. Sizing the Stormceptor System

The Stormceptor System is a versatile product that can be used for many different aspects of water quality improvement. While addressing these needs, there are conditions that the designer needs to be aware of in order to size the Stormceptor model to meet the demands of each individual site in an efficient and cost-effective manner.

PCSWMM for Stormceptor is the support tool used for identifying the appropriate Stormceptor model. In order to size a unit, it is recommended the user follow the seven design steps in the program. The steps are as follows:

STEP 1 – Project Details

The first step prior to sizing the Stormceptor System is to clearly identify the water quality objective for the development. It is recommended that a level of annual sediment (TSS) removal be identified and defined by a particle size distribution.

STEP 2 – Site Details

Identify the site development by the drainage area and the level of imperviousness. It is recommended that imperviousness be calculated based on the actual area of imperviousness based on paved surfaces, sidewalks and rooftops.

STEP 3 – Upstream Attenuation

The Stormceptor System is designed as a water quality device and is sometimes used in conjunction with onsite water quantity control devices such as ponds or underground detention systems. When possible, a greater benefit is typically achieved when installing a Stormceptor unit upstream of a detention facility. By placing the Stormceptor unit upstream of a detention structure, a benefit of less maintenance of the detention facility is realized.

STEP 4 – Particle Size Distribution

It is critical that the PSD be defined as part of the water quality objective. PSD is critical for the design of treatment system for a unit process of gravity settling and governs the size of a treatment system. A range of particle sizes has been provided and it is recommended that clays and silt-sized particles be considered in addition to sand and gravel-sized particles. Options and sample PSDs are provided in PCSWMM for Stormceptor. The default particle size distribution is the Fine Distribution, Table 2, option.

Table 2. Fine Distribution

Particle Size	Distribution	Specific Gravity
20	20%	1.3
60	20%	1.8
150	20%	2.2
400	20%	2.65
2000	20%	2.65

If the objective is the long-term removal of 80% of the total suspended solids on a given site, the PSD should be representative of the expected sediment on the site. For example, a system designed to remove 80% of coarse particles (greater than 75 microns) would provide relatively poor removal efficiency of finer particles that may be naturally prevalent in runoff from the site.

Since the small particle fraction contributes a disproportionately large amount of the total available particle surface area for pollutant adsorption, a system designed primarily for coarse particle capture will compromise water quality objectives.

STEP 5 – Rainfall Records

Local historical rainfall has been acquired from the U.S. National Oceanic and Atmospheric Administration, Environment Canada and regulatory agencies across North America. The rainfall data provided with PCSMM for Stormceptor provides an accurate estimation of small storm hydrology by modeling actual historical storm events including duration, intensities and peaks.

STEP 6 – Summary

At this point, the program may be executed to predict the level of TSS removal from the site. Once the simulation has completed, a table shall be generated identifying the TSS removal of each Stormceptor unit.

STEP 7 – Sizing Summary

Performance estimates of all Stormceptor units for the given site parameters will be displayed in a tabular format. The unit that meets the water quality objective, identified in Step 1, will be highlighted.

5.1. PCSWMM for Stormceptor

The Stormceptor System has been developed in conjunction with PCSWMM for Stormceptor as a technological solution to achieve water quality goals. Together, these two innovations model, simulate, predict and calculate the water quality objectives desired by a design engineer for TSS removal.

PCSWMM for Stormceptor is a proprietary sizing program which uses site specific inputs to a computer model to simulate sediment accumulation, hydrology and long-term total suspended solids removal. The model has been calibrated to field monitoring results from Stormceptor units that have been monitored in North America. The sizing methodology can be described by three processes:

1. Determination of real time hydrology
2. Buildup and wash off of TSS from impervious land areas
3. TSS transport through the Stormceptor (settling and discharge). The use of a calibrated model is the preferred method for sizing stormwater quality structures for the following reasons:
   - » The hydrology of the local area is properly and accurately incorporated in the sizing (distribution of flows, flow rate ranges and peaks, back-to-back storms, inter-event times)
   - » The distribution of TSS with the hydrology is properly and accurately considered in the sizing
   - » Particle size distribution is properly considered in the sizing
   - » The sizing can be optimized for TSS removal
   - » The cost benefit of alternate TSS removal criteria can be easily assessed
   - » The program assesses the performance of all Stormceptor models. Sizing may be selected based on a specific water quality outcome or based on the Maximum Extent Practicable

For more information regarding PCSWMM for Stormceptor, contact your local Stormceptor representative, or visit www.imbriumsystems.com to download a free copy of the program.

5.2. Sediment Loading Characteristics

The way in which sediment is transferred to stormwater can have a considerable effect on which type of system is implemented. On typical impervious surfaces (e.g. parking lots) sediment will build over time and wash off with the next rainfall. When rainfall patterns are examined, a short intense storm will have a higher concentration of sediment than a long slow drizzle. Together with rainfall data representing the site's typical rainfall patterns, sediment loading characteristics play a part in the correct sizing of a stormwater quality device.

Typical Sites

For standard site design of the Stormceptor System, PCSWMM for Stormceptor is utilized to accurately assess the unit's performance. As an integral part of the product's design, the program can be used to meet local requirements for total suspended solid removal. Typical installations of manufactured stormwater treatment devices would occur on areas such as paved parking lots or paved roads. These are considered "stable" surfaces which have non – erodible surfaces.

Unstable Sites

While standard sites consist of stable concrete or asphalt surfaces, sites such as gravel parking lots, or maintenance yards with stockpiles of sediment would be classified as "unstable". These types of sites do not exhibit first flush characteristics, are highly erodible and exhibit atypical sediment loading characteristics and must therefore be sized more carefully. Contact your local Stormceptor representative for assistance in selecting a proper unit sized for such unstable sites.

6. Spill Controls

When considering the removal of total petroleum hydrocarbons (TPH) from a storm sewer system there are two functions of the system: oil removal, and spill capture.

'Oil Removal' describes the capture of the minute volumes of free oil mobilized from impervious surfaces. In this instance relatively low concentrations, volumes and flow rates are considered. While the Stormceptor unit will still provide an appreciable oil removal function during higher flow events and/or with higher TPH concentrations, desired effluent limits may be exceeded under these conditions.

‘Spill Capture’ describes a manner of TPH removal more appropriate to recovery of a relatively high volume of a single phase deleterious liquid that is introduced to the storm sewer system over a relatively short duration. The two design criteria involved when considering this manner of introduction are overall volume and the specific gravity of the material. A standard Stormceptor unit will be able to capture and retain a maximum spill volume and a minimum specific gravity.

For spill characteristics that fall outside these limits, unit modifications are required. Contact your local Stormceptor Representative for more information.

One of the key features of the Stormceptor technology is its ability to capture and retain spills. While the standard Stormceptor System provides excellent protection for spill control, there are additional options to enhance spill protection if desired.

6.1. Oil Level Alarm

The oil level alarm is an electronic monitoring system designed to trigger a visual and audible alarm when a pre-set level of oil is reached within the lower chamber. As a standard, the oil

level alarm is designed to trigger at approximately 85% of the unit’s available depth level for oil capture. The feature acts as a safeguard against spills caused by exceeding the oil storage capacity of the separator and eliminates the need for manual oil level inspection.

The oil level alarm installed on the Stormceptor insert is illustrated in Figure 4.

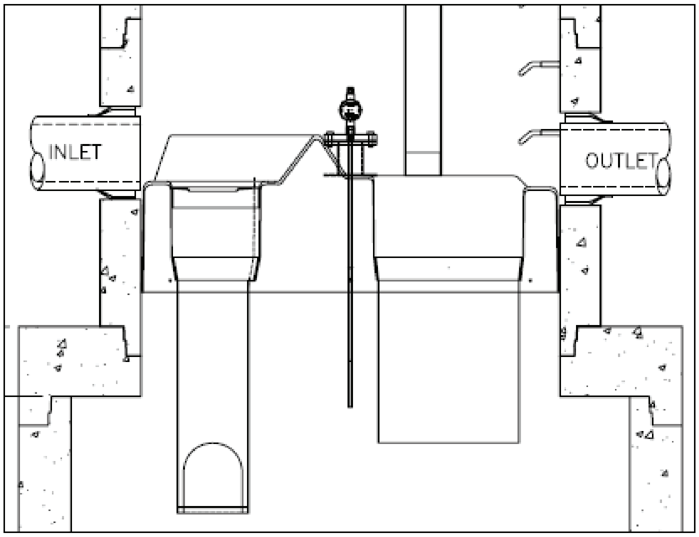


Figure 4. Oil level alarm

6.2. Increased Volume Storage Capacity

The Stormceptor unit may be modified to store a greater spill volume than is typically available. Under such a scenario, instead of installing a larger than required unit, modifications can be made to the recommended Stormceptor model to accommodate larger volumes. Contact your local Stormceptor representative for additional information and assistance for modifications.

7. Stormceptor Options

The Stormceptor System allows flexibility to incorporate to existing and new storm drainage infrastructure. The following section identifies considerations that should be reviewed when installing the system into a drainage network. For conditions that fall outside of the recommendations in this section, please contact your local Stormceptor representative for further guidance.

7.1. Installation Depth Minimum Cover

The minimum distance from the top of grade to the crown of the inlet pipe is 24 inches (600 mm). For situations that have a lower minimum distance, contact your local Stormceptor representative.

7.2. Maximum Inlet and Outlet Pipe Diameters

Maximum inlet and outlet pipe diameters are illustrated in Figure 5. Contact your local Stormceptor representative for larger pipe diameters

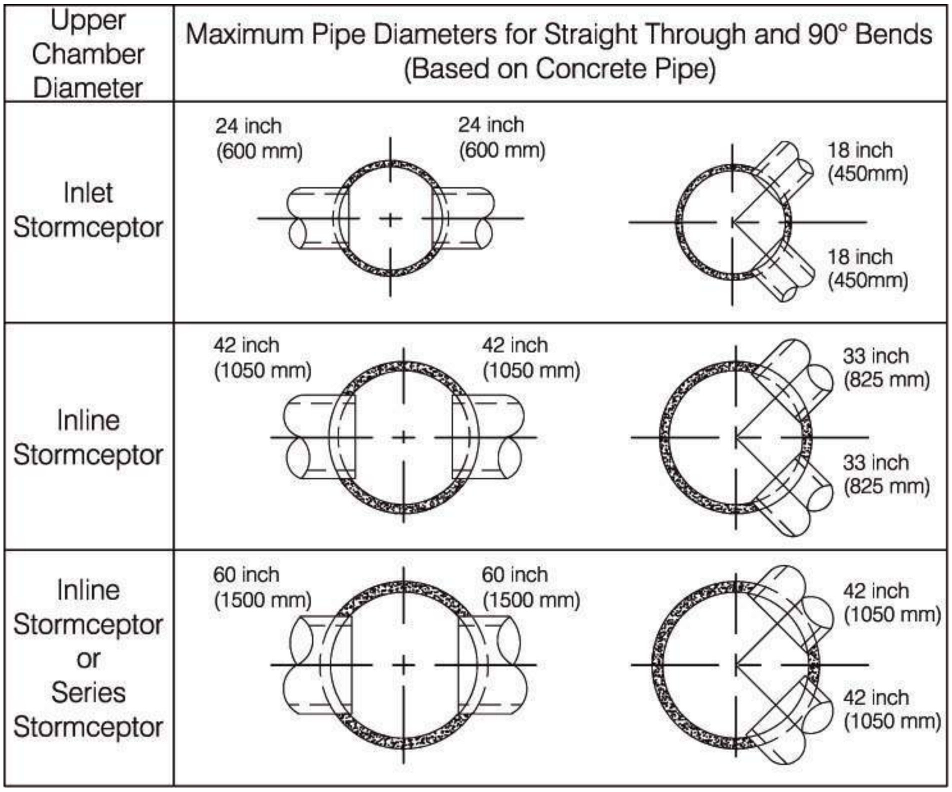


Figure 5. Maximum pipe diameters for straight through and bend applications

*The bend should only be incorporated into the second structure (downstream structure) of the Series Stormceptor System

7.3. Bends

The Stormceptor System can be used to change horizontal alignment in the storm drain network up to a maximum of 90 degrees. Figure 6 illustrates the typical bend situations of the Stormceptor System. Bends should only be applied to the second structure (downstream structure) of the Series Stormceptor System.

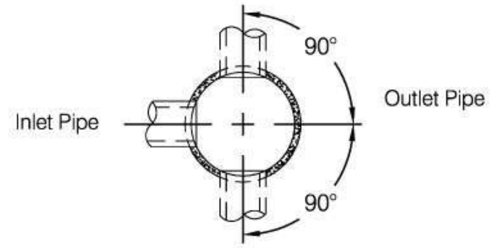
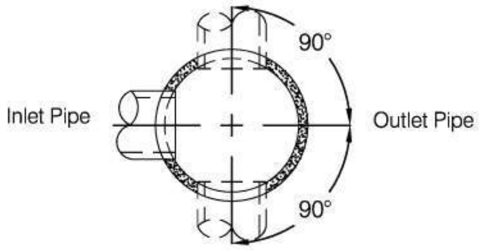
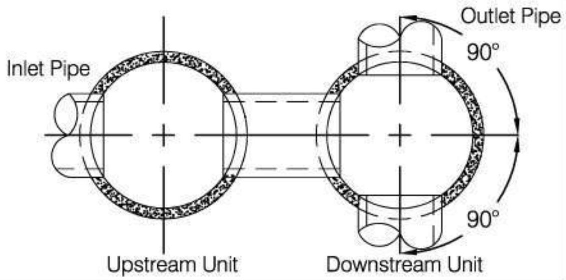
Stormceptor System	Maximum Bend Configurations
Inlet Stormceptor	
Inline Stormceptor	
Series Stormceptor	

Figure 6. Maximum bend angles

7.4. Multiple Inlet Pipes

The Inlet and Inline Stormceptor System can accommodate two or more inlet pipes. The maximum number of inlet pipes that can be accommodated into a Stormceptor unit is a function of the number, alignment and diameter of the pipes and its effects on the structural integrity of the precast concrete. When multiple inlet pipes are used for new developments, each inlet pipe shall have an invert elevation 3 inches (75 mm) higher than the outlet pipe invert elevation.

7.5. Inlet/Outlet Pipe Invert Elevations

Recommended inlet and outlet pipe invert differences are listed in Table 3.

Table 3. Recommended Drops Between Inlet and Outlet Pipe Inverts

Number of Inlet Pipes	Inlet System	In-Line System	Series System
1	3 inches (75 mm)	1 inch (25 mm)	3 inches (75 mm)
>1	3 inches (75 mm)	3 inches (75 mm)	Not Applicable

7.6. Shallow Stormceptor

In cases where there may be restrictions to the depth of burial of storm sewer systems. In this situation, for selected Stormceptor models, the lower chamber components may be increased in diameter to reduce the overall depth of excavation required.

7.7. Customized Live Load

The Stormceptor system is typically designed for local highway truck loading (AASHTO HS- 20). When the project requires live loads greater than HS-20, the Stormceptor System may be customized structurally for a pre-specified live load. Contact your local Stormceptor representative for customized loading conditions.

7.8. Pre-treatment

The Stormceptor System may be sized to remove sediment and for spills control in conjunction with other stormwater BMPs to meet the water quality objective. For pretreatment applications, the Stormceptor System should be the first unit in a treatment train. The benefits of pre-treatment include the extension of the operational life (extension of maintenance frequency) of large stormwater management facilities, prevention of spills and lower total life- cycle maintenance cost.

7.9. Head loss

The head loss through the Stormceptor System is similar to a 60 degree bend at a manhole. The K value for calculating minor losses is approximately 1.3 (minor loss = k*1.3v2/2g).

However, when a Submerged modification is applied to a Stormceptor unit, the corresponding K value is 4.

7.10. Submerged

The Submerged modification, Figure 7, allows the Stormceptor System to operate in submerged or partially submerged storm sewers. This configuration can be installed on all models of the Stormceptor System by modifying the fiberglass insert. A customized weir height and a secondary drop tee are added.

Submerged instances are defined as standing water in the storm drain system during zero flow conditions. In these instances, the following information is necessary for the proper design and application of submerged modifications:

- Stormceptor top of grade elevation
- Stormceptor outlet pipe invert elevation
- Standing water elevation

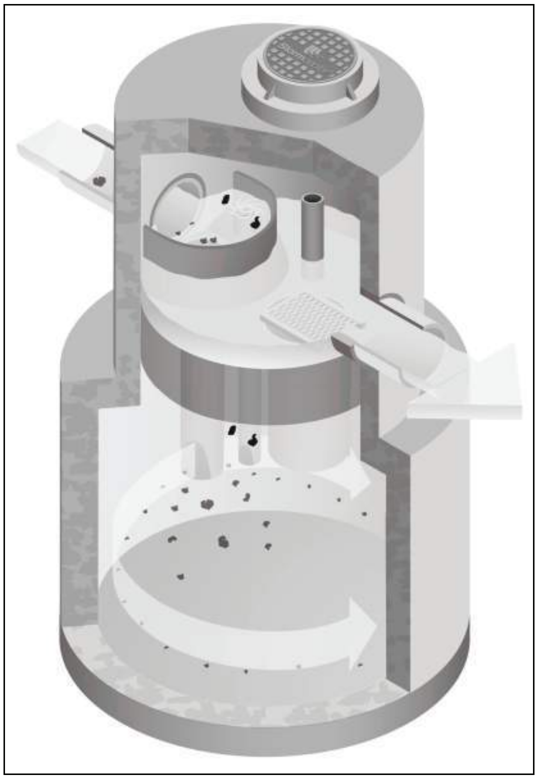


Figure 7. Submerged Stormceptor

8. Comparing Technologies

Designers have many choices available to achieve water quality goals in the treatment of stormwater runoff. Since many alternatives are available for use in stormwater quality treatment it is important to consider how to make an appropriate comparison between "approved alternatives". The following is a guide to assist with the accurate comparison of differing technologies and performance claims.

8.1. Particle Size Distribution (PSD)

The most sensitive parameter to the design of a stormwater quality device is the selection of the design particle size. While it is recommended that the actual particle size distribution (PSD) for sites be measured prior to sizing, alternative values for particle size should be selected to represent what is likely to occur naturally on the site. A reasonable estimate of a particle size distribution likely to be found on parking lots or other impervious surfaces should consist of a wide range of particles such as 20 microns to 2,000 microns (Ontario MOE, 1994).

There is no absolute right particle size distribution or specific gravity and the user is cautioned to review the site location, characteristics, material handling practices and regulatory requirements when selecting a particle size distribution. When comparing technologies, designs using different PSDs will result in incomparable TSS removal efficiencies. The PSD of the TSS removed needs to be standard between two products to allow for an accurate comparison.

8.2. Scour Prevention

In order to accurately predict the performance of a manufactured treatment device, there must be confidence that it will perform under all conditions. Since rainfall patterns cannot be predicted, stormwater quality devices placed in storm sewer systems must be able to withstand extreme events, and ensure that all pollutants previously captured are retained in the system.

In order to have confidence in a system's performance under extreme conditions, independent validation of scour prevention is essential when examining different technologies. Lack of independent verification of scour prevention should make a designer wary of accepting any product's performance claims.

8.3. Hydraulics

Full scale laboratory testing has been used to confirm the hydraulics of the Stormceptor System. Results of lab testing have been used to physically design the Stormceptor System and the sewer pipes entering and leaving the unit. Key benefits of Stormceptor are:

- Low head loss (typical k value of 1.3)
- Minimal inlet/outlet invert elevation drop across the structure
- Use as a bend structure
- Accommodates multiple inlets

The adaptability of the treatment device to the storm sewer design infrastructure can affect the overall performance and cost of the site.

8.4. Hydrology

Stormwater quality treatment technologies need to perform under varying climatic conditions. These can vary from long low intensity rainfall to short duration, high intensity storms. Since a treatment device is expected to perform under all these conditions, it makes sense that any system's design should accommodate those conditions as well.

Long-term continuous simulation evaluates the performance of a technology under the varying conditions expected in the climate of the subject site. Single, peak event design does not provide this information and is not equivalent to long-term simulation. Designers should request long-term simulation performance to ensure the technology can meet the long-term water quality objective.

9. Testing

The Stormceptor System has been the most widely monitored stormwater treatment technology in the world. Performance verification and monitoring programs are completed to the strictest standards and integrity. Since its introduction in 1990, numerous independent field tests and studies detailing the effectiveness of the Stormceptor System have been completed.

- Coventry University, UK – 97% removal of oil, 83% removal of sand and 73% removal of peat
- National Water Research Institute, Canada, - scaled testing for the development of the Stormceptor System identifying both TSS removal and scour prevention.
- New Jersey TARP Program – full scale testing of an STC 900 demonstrating 75% TSS removal of particles from 1 to 1000 microns. Scour testing completed demonstrated that the system does not scour. The New Jersey Department of Environmental Protection was followed.
- City of Indianapolis – full scale testing of an STC 900 demonstrating over 80% TSS removal of particles from 50 microns to 300 microns at 130% of the unit's operating rate. Scour testing completed demonstrated that the system does not scour.
- Westwood Massachusetts (1997), demonstrated >80% TSS removal
- Como Park (1997), demonstrated 76% TSS removal
- Ontario MOE SWAMP Program – 57% removal of 1 to 25 micron particles
- Laval Quebec – 50% removal of 1 to 25 micron particles

10. Installation

The installation of the concrete Stormceptor should conform in general to state highway, or local specifications for the installation of manholes. Selected sections of a general specification that are applicable are summarized in the following sections.

10.1. Excavation

Excavation for the installation of the Stormceptor should conform to state highway, or local specifications. Topsoil removed during the excavation for the Stormceptor should be stockpiled in designated areas and should not be mixed with subsoil or other materials.

Topsoil stockpiles and the general site preparation for the installation of the Stormceptor should conform to state highway or local specifications.

The Stormceptor should not be installed on frozen ground. Excavation should extend a minimum of 12 inches (300 mm) from the precast concrete surfaces plus an allowance for shoring and bracing where required. If the bottom of the excavation provides an unsuitable foundation additional excavation may be required.

In areas with a high water table, continuous dewatering may be required to ensure that the excavation is stable and free of water.

10.2. Backfilling

Backfill material should conform to state highway or local specifications. Backfill material should be placed in uniform layers not exceeding 12 inches (300mm) in depth and compacted to state highway or local specifications.

11. Stormceptor Construction Sequence

The concrete Stormceptor is installed in sections in the following sequence:

1. Aggregate base
2. Base slab
3. Lower chamber sections
4. Upper chamber section with fiberglass insert
5. Connect inlet and outlet pipes
6. Assembly of fiberglass insert components (drop tee, riser pipe, oil cleanout port and orifice plate
7. Remainder of upper chamber
8. Frame and access cover

The precast base should be placed level at the specified grade. The entire base should be in contact with the underlying compacted granular material. Subsequent sections, complete with joint seals, should be installed in accordance with the precast concrete manufacturer's recommendations.

Adjustment of the Stormceptor can be performed by lifting the upper sections free of the excavated area, re-leveling the base and re-installing the sections. Damaged sections and gaskets should be repaired or replaced as necessary. Once the Stormceptor has been constructed, any lift holes must be plugged with mortar.

12. Maintenance

12.1. Health and Safety

The Stormceptor System has been designed considering safety first. It is recommended that confined space entry protocols be followed if entry to the unit is required. In addition, the fiberglass insert has the following health and safety features:

- Designed to withstand the weight of personnel
- A safety grate is located over the 24 inch (600 mm) riser pipe opening
- Ladder rungs can be provided for entry into the unit, if required

12.2. Maintenance Procedures

Maintenance of the Stormceptor system is performed using vacuum trucks. No entry into the unit is required for maintenance (in most cases). The vacuum service industry is a well- established sector of the service industry that cleans underground tanks, sewers and catch basins. Costs to clean a Stormceptor will vary based on the size of unit and transportation distances.

The need for maintenance can be determined easily by inspecting the unit from the surface. The depth of oil in the unit can be determined by inserting a dipstick in the oil inspection/cleanout port.

Similarly, the depth of sediment can be measured from the surface without entry into the Stormceptor via a dipstick tube equipped with a ball valve. This tube would be inserted through the riser pipe. Maintenance should be performed once the sediment depth exceeds the guideline values provided in the Table 4.

Table 4. Sediment Depths Indicating Required Servicing*

Particle Size	Specific Gravity
Model	Sediment Depth inches (mm)
450i	8 (200)
900	8 (200)
1200	10 (250)
1800	15 (381)
2400	12 (300)
3600	17 (430)
4800	15 (380)
6000	18 (460)
7200	15 (381)
11000	17 (380)
13000	20 (500)
16000	17 (380)
* based on 15% of the Stormceptor unit's total storage	

Although annual servicing is recommended, the frequency of maintenance may need to be increased or reduced based on local conditions (i.e. if the unit is filling up with sediment more quickly than projected, maintenance may be required semi-annually; conversely once the site has stabilized maintenance may only be required every two or three years).

Oil is removed through the oil inspection/cleanout port and sediment is removed through the riser pipe. Alternatively oil could be removed from the 24 inches (600 mm) opening if water is removed from the lower chamber to lower the oil level below the drop pipes.

The following procedures should be taken when cleaning out Stormceptor:

1. Check for oil through the oil cleanout port
2. Remove any oil separately using a small portable pump
3. Decant the water from the unit to the sanitary sewer, if permitted by the local regulating authority, or into a separate containment tank
4. Remove the sludge from the bottom of the unit using the vacuum truck
5. Re-fill Stormceptor with water where required by the local jurisdiction

12.3. Submerged Stormceptor

Careful attention should be paid to maintenance of the Submerged Stormceptor System. In cases where the storm drain system is submerged, there is a requirement to plug both the inlet and outlet pipes to economically clean out the unit.

12.4. Hydrocarbon Spills

The Stormceptor is often installed in areas where the potential for spills is great. The Stormceptor System should be cleaned immediately after a spill occurs by a licensed liquid waste hauler.

12.5. Disposal

Requirements for the disposal of material from the Stormceptor System are similar to that of any other stormwater Best Management Practice (BMP) where permitted. Disposal options for the sediment may range from disposal in a sanitary trunk sewer upstream of a sewage treatment plant, to disposal in a sanitary landfill site. Petroleum waste products collected in the Stormceptor (free oil/chemical/fuel spills) should be removed by a licensed waste management company.

12.6. Oil Sheens

With a steady influx of water with high concentrations of oil, a sheen may be noticeable at the Stormceptor outlet. This may occur because a rainbow or sheen can be seen at very small oil concentrations (<10 mg/L). Stormceptor will remove over 98% of all free oil spills from storm sewer systems for dry weather or frequently occurring runoff events.

The appearance of a sheen at the outlet with high influent oil concentrations does not mean the unit is not working to this level of removal. In addition, if the influent oil is emulsified the Stormceptor will not be able to remove it. The Stormceptor is designed for free oil removal and not emulsified conditions.

SUPPORT

Drawings and specifications are available at www.ContechES.com.

Site-specific design support is available from our engineers.

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ADS LANDMAX® RETENTION/DETENTION PIPE SYSTEM SPECIFICATION

Scope

This specification describes ADS LandMax Retention/Detention Pipe Systems for use in non-pressure gravity-flow storm water collection systems utilizing a continuous outfall structure.

Pipe Requirements

ADS Retention/Detention systems may utilize any of the various pipe products below:

- N-12® ST IB pipe (per AASHTO) shall meet AASHTO M294, Type S or ASTM F2306
- N-12 ST IB pipe (per ASTM F2648) shall meet ASTM F2648
- N-12 MEGA GREEN™ ST IB shall meet ASTM F2648
- N-12 WT IB pipe (per AASHTO) shall meet AASHTO M294, Type S or ASTM F2306
- N-12 WT IB pipe (per ASTM F2648) shall meet ASTM F2648
- N-12 MEGA GREEN™ WT IB shall meet ASTM F2648

All products shall have a smooth interior and annular exterior corrugations. All ST IB pipe products are available as perforated or non-perforated. WT IB pipe products are only available as non-perforated.

Product-specific pipe specifications are available in the Drainage Handbook Section 1 *Specifications*.

Joint Performance

Plain End/Soil-tight (ST IB)

ST IB pipe shall be joined using a bell & spigot joint. The bell & spigot joint shall meet the soil-tight requirements of ASTM F2306 and gaskets shall meet the requirements of ASTM F477.

Plain End pipe & fittings connections shall be joined with coupling bands covering at least two full corrugations on each end of the pipe. Gasketed soil-tight coupling band connections shall incorporate a closed-cell synthetic expanded rubber gasket meeting the requirements of ASTM D1056 Grade 2A2. Gaskets, when applicable, shall be installed by the pipe manufacturer.

Watertight (WT IB):

WT IB pipe shall be joined using a bell & spigot joint. The joint shall be watertight according to the requirements of ASTM D3212. Gaskets shall meet the requirements of ASTM F477. 12- through 60-inch (300 to 1500 mm) diameters shall have an exterior bell wrap installed by the manufacturer.

Pipe & fitting connections shall be with a bell and spigot connection utilizing a welded bell and valley or saddle gasket. The joint shall meet the watertight requirements of ASTM D3212 and gaskets shall meet the requirements of ASTM F477. Detention systems are subject to greater leakage than typical single run storm sewer application and therefore are not appropriate for applications requiring long-term fluid containment or hydrostatic pressure. For additional details refer to Technical Note 7.01 *Rainwater Harvesting with HDPE Cisterns*.

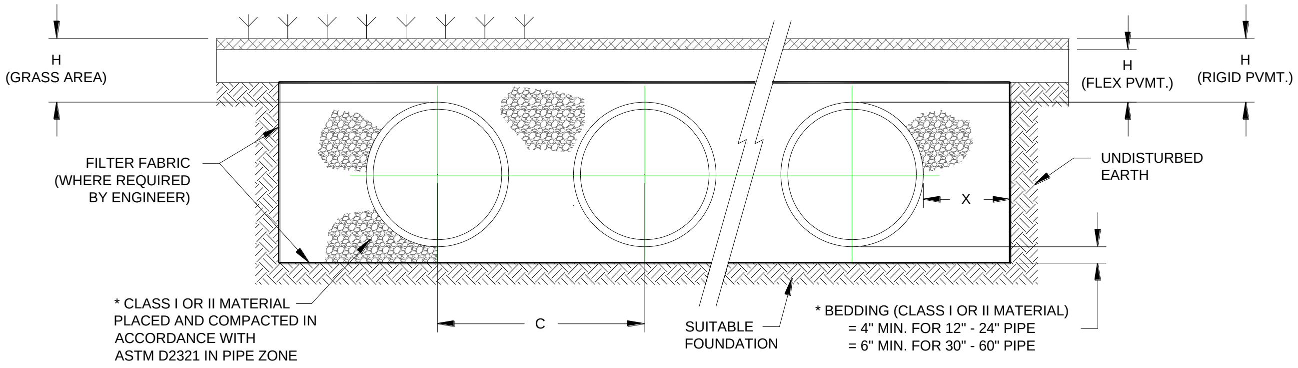
Fittings

Fittings shall conform to ASTM F2306 and meet joint performance requirements indicated above for fitting connections. Custom fittings are available and may require special installation criterion.

Installation

Installation shall be in accordance with ASTM D2321 and ADS recommended installation guidelines, with the exception that minimum cover in non-traffic areas for 12- through 60-inch (300 to 1500mm) diameters shall be one foot (0.3m). Minimum cover in trafficked areas for 12- through 36-inch (300 to 900mm) diameters shall be one foot (0.3m) and for 42- through 60-inch (1050 to 1500mm) diameters, the minimum cover shall be two feet (0.6m). Backfill shall consist of Class 1 (compacted) or Class 2 (minimum 90% SPD) material, with the exception that 60-inch fittings shall use Class 1 (compacted) material only. Minimum cover heights do not account for pipe buoyancy. Refer to ADS Technical Note 5.05 HDPE Pipe Flotation for buoyancy design considerations. Maximum cover over system using standard backfill is 8 feet (2.4m); contact a representative when maximum fill height may be exceeded. Additional installation requirements are provided in the Drainage Handbook Section 6 Retention/Detention.

TYPICAL RETENTION/DETENTION CROSS SECTION



MINIMUM H (GRASS) = 12" FOR 12" THROUGH 60" HDPE PIPE
MINIMUM H (FLEX PVMT), H (RIGID PVMT) = 12" FOR UP TO AND INCLUDING 36" HDPE PIPE
= 24" FOR 42" THROUGH 60" HDPE PIPE

* CLASS I BACKFILL REQUIRED AROUND 60" DIAMETER FITTINGS.

MAXIMUM FILL HEIGHT LIMITED TO 8-FT OVER FITTINGS FOR STANDARD INSTALLATIONS. CONTACT REPRESENTATIVE WHEN MAXIMUM FILL HEIGHTS EXCEED 8-FT FOR INSTALLATION CONSIDERATIONS.

ADDITIONAL REFERENCES

Drainage Handbook Section 6 *Retention/Detention*

Technical Note 6.01 *Retention/Detention System Maintenance*

Technical Note 7.01 *Rainwater Harvesting with HDPE Pipe*

Standard Detail 701 Retention-Detention System (Plan View)

Standard Detail 702 Retention-Detention System (Cross-Section)

Standard Detail 703 Retention-Detention System (Riser & Cleanout)

Standard Detail 704 Flowable Fill Installation (Nyloplast Riser)

All references are available for download at www.adspipe.com

Technical Note

TN 6.01 Retention/Detention System Maintenance

This document is provided for informational purposes only and is meant only to be a guide. Individuals using this information should make their own decisions as to suitability of this guideline for their individual projects and adjust accordingly.

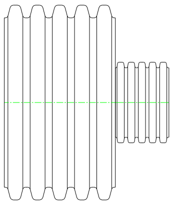
Introduction

A retention/detention system is comprised of a series of pipes and fittings that form an underground storage area, which retains or detains storm water runoff from a given area. As sediment and debris settle out of the detained stormwater, build up occurs that requires the system to be regularly inspected and cleaned in order for the system to perform as originally designed. The following provides the available fittings and guidelines for inspection and maintenance of an HDPE underground storage system.

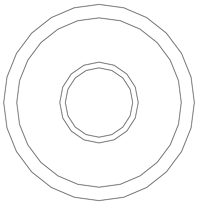
System Accessories and Fittings

Concentric Reducers

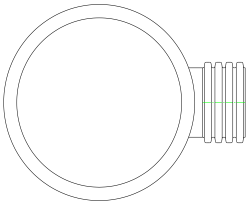
Concentric Reducers are fittings that transition between two pipes, either in line with one another or at perpendicular angles. The centerlines of the two pipes are at the same elevation. When a concentric reducer is used to connect the manifold pipe to the lateral pipes, most debris will be trapped in the manifold pipe.



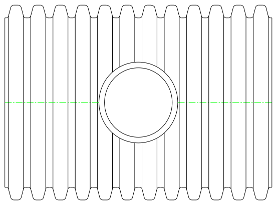
SIDE VIEW



SECTION VIEW



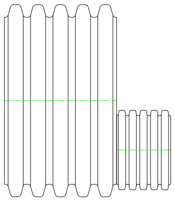
SIDE VIEW



SECTION VIEW

Eccentric Reducers

Eccentric Reducers are fittings that transition between two pipes, either in line with one another or at perpendicular angles. The inverts of the two pipes are at the same elevations. When an eccentric reducer is used to connect the manifold pipe to the lateral pipes, most debris will follow the flow of the storm water into the lateral pipes.



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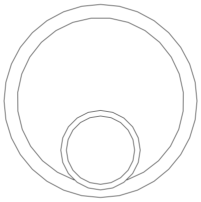

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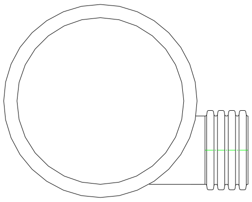

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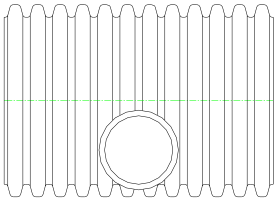

SECTION VIEW

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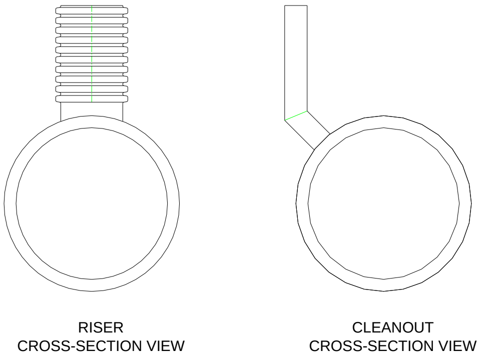
Riser

Each retention/detention system typically has risers strategically placed for maintenance and inspection of the system. These risers are typically 24” in diameter or larger and are placed on the manifold fittings.

Cleanouts

Cleanout ports are usually 4-, 6-, or 8-in diameter pipe and are placed on the manifold fittings. They are used for entrance of a pipe from a vacuum truck or a water-jetting device.

For a complete listing of available fittings and components please refer to the *ADS Fittings Manual*.



Maintenance Overview of a Retention/Detention System

Maintaining a clean and obstruction-free retention/detention system helps to ensure the system performs the intended function of the primary design. Build up of debris may obstruct flow through the laterals in a retention system or block the entranceway of the outlet pipe in a detention system. This may result in ineffective operation or complete failure of the system . Additionally, surrounding areas may potentially run the risk of damage due to flooding or other similar issues.

Inspection/Maintenance Frequency

All retention/detention systems must be cleaned and maintained. Underground systems may be maintained more cost effectively if these simple guidelines are followed. Inspection should be performed at a minimum of once per year. Cleaning should be done at the discretion of individuals responsible to maintain proper storage and flow. While maintenance can generally be performed year round, it should be scheduled during a relatively dry season.

Pre-Inspection

A post-installation inspection should be performed to allow the owner to measure the invert prior to accumulation of sediment. This survey will allow the monitoring of sediment build-up without requiring access to the retention/detention system.

The following is the recommended procedure for pre-inspections:

1) Locate the riser section or cleanouts of the retention/detention system. The riser will typically be 24” in diameter or larger and the cleanouts are usually 4”, 6” or 8” in diameter.
2) Remove the lid of the riser or clean outs.
3) Insert a measuring device into the opening and make note to a point of reference on the stick or string. (This is done so that sediment build up can be determined in the future without having to enter the system.)

Inspection/Maintenance

A retention/detention system should be inspected at a minimum of one time a year or after major rain events if necessary.

The following is the recommended procedure to inspect system in service:

1) Locate the riser section of the retention/detention system. The riser will typically be 24” in diameter or larger.
2) Remove the lid from the riser.
3) Measure the sediment buildup at each riser and cleanout location. Only certified confined space entry personnel having appropriate equipment should be permitted to enter the retention/detention System.
4) Inspect each manifold, all laterals, and outlet pipes for sediment build up, obstructions, or other problems. Obstructions should be removed at this time.
5) If measured sediment build up is between 5% - 20% of the pipe diameter, cleaning should be considered; if sediment build up exceeds 20%, cleaning should be performed at the earliest opportunity. A thorough cleaning of the system (manifolds and laterals) shall be performed by either manual methods or by a vacuum truck.