



Stormwater Management Report

For

**Mattakeesett Village
7 & 15 Mattakeesett St.
Pembroke, MA 02359**

September 5, 2023

**Prepared for:
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[Handwritten Signature]
9/5/2023

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1.1 EXECUTIVE SUMMARY

In accordance with the provisions of the Town of Pembroke Zoning Bylaws, the Applicant, Weathervane at Mattakeesett, LLC., proposes to construct three (3) multifamily buildings consisting of 66 age restricted units as well a Tavern with 132 seats at 7/15 Mattakeesett Street in Pembroke, Massachusetts. The project includes the construction of site parking, associated utilities, and a closed drainage system with a combination infiltration/detention basin.

The property at 7 & 15 Mattakeesett Street is bound by Center Cemetery to the North, Mattakeesett Street to the South, and commercial businesses to the east and West. The Parcels C914 and C915, combined are approximately 3.27 acres and is owned by 1317 Washington RE Holdings, LLC. Please refer to the Existing Conditions Plan, enclosed with the plan set.

The property (to be referred to as “the site”) is located within the Center Protection Zoning District and the Residential A Zoning District. The site consists of a former funeral home building, a garage, paved parking and driveways.

1.2 APPROVALS BEING SOUGHT

The Stormwater Report is being filed with the Pembroke Zoning Board as part of the Comprehensive Permit submission. The Applicant requests that the permit approvals encompass the entirety of the scope listed below, and as shown in the accompanying plan set:

- The demolition of all existing structures and associated site infrastructure
- The construction of a three (3) apartment buildings with a combined 66 units.
- The travel aisles and associated parking (both garage and exterior).
- Two (2) entrances from Mattakeesett Street.
- Supporting site infrastructure including a stormwater management system, utilities, pavement and landscaping.

1.3 FEMA – FLOODPLAIN SUMMARY

The parcel is shown on two (2) FEMA Flood Insurance Rate Map Panels including 25023C0204K and also 25023C0208K. Both maps are shown on the FEMA website with the “Active” map dated 7/6/2021. The site is located within Zone X, which is defined as areas determined to be outside the 500-year floodplain and determined to be outside the 1% and 0.2% annual chance floodplain.



1.4 ON-SITE SOIL INFORMATION

The Natural Resource Conservation Service (NRCS) maps the majority of the site as Deerfield loamy fine sand, Soil Map Unit 256A, classified as Hydrologic Soil Group (HSG) "A." The developed portion of the site is mapped as Merrimac-Urban land complex, Soil Map Unit 626B.

CDG has performed several rounds of test pits at the site on 11/1/21, 8/17/22 and 1/14/23, all performed by a Mass DEP Licensed Soil Evaluator and a portion of which were witnessed by the Pembroke Board of Health Agent (which is noted on the enclosed test pit logs). The test pits within the proposed infiltration basin are TP-2, TP-3 and TP-4, as shown on the Test Pit Plan within the site plan set. The test pits revealed a subsurface comprised of sand and loamy sand, consistent with an "A" soil. An infiltration rate of 8.27 inches per hour was used in the HydroCAD model as this Rawls rate is consistent with a sand.

Please refer to Section 6 for the test pit logs.

1.5 WETLANDS AND ENVIRONMENTAL RESOURCE AREAS ANALYSIS

The site does not contain any environmental resource areas that are jurisdictional through MassDEP or the Pembroke Conservation Commission. The site does not contain any areas designated as estimated or priority endangered species habitat, certified vernal pools or Areas of Critical Environmental Concern. The site does not contain areas classified as Estimated Habitats of Rare Wildlife by the Natural Heritage and Endangered Species Program of the Division of Fisheries and Wildlife.

1.6 OBJECTIVE OF CALCULATIONS

The purpose of this stormwater analysis is to examine the stormwater runoff from the proposed site based upon the Massachusetts Department of Environmental Protection Stormwater Management Policy and the applicable provisions of the Town of Pembroke Bylaws and regulations.

The goal of the stormwater management system design on this project is to comply with the MA Stormwater Management Requirements and provide improved water quality, reduce post-development peak runoff rates below pre-development peak flow rates, maximize the opportunities for recharge and infiltration, and protect the surrounding area from any potential flooding and/or environmental impacts associated with the unmitigated condition. The following stormwater hydrology calculations were performed using the 2-year, 10-year, 25-year, and 100-year frequency, Type III, 24-hour SCS design storms (NOAA 14) and were compared for both pre-development and post-development conditions.



1.7 METHODOLOGY

We utilized the latest version of Hydro CAD for the overall stormwater hydrology/routing analysis to assess and compare peak rates of runoff at the various discharge points from the subject property. We then utilized the Hydraflow Storm Sewers Extension Pack through AutoCAD Civil 3d to analyze the pipe design and to select appropriate pipe sizing.

Refer to Section 3 – Hydrocad Model, which includes the detailed print-out of the HydroCAD Model Reports for the 2, 10, 25 and 100-year storms as well as Section 7 – Hydraulic Pipe Analysis / Sizing, which includes the Hydraflow reports for the 10 and 100-year storms for pipe capacity analysis and sizing.

1.8 SITE HYDROLOGY

Existing Conditions

Please refer to the attached Existing Conditions Watershed Analysis Plan in Section 3.3. The property has been divided into two (2) subcatchment areas based on the existing site topography and flow paths. These subcatchments then combine where appropriate from an analysis standpoint where they discharge toward adjacent rights-of-ways, abutting commercial properties and to existing drainage infrastructure. Each subcatchment area has been analyzed and assigned an appropriate Curve Number to represent the existing vegetative cover and underlying soils conditions. Times of concentration have been computed and the extent of pervious vs. impervious cover computed. This data was then input into HydroCAD to determine peak rates of runoff at the design point which provide the locations for which to compare existing versus proposed conditions to document compliance that the peak rates have been reduced in the regulatory storm events as required. A Summary table is provided in the Hydrology Model Results and Conclusions Section below.

For the purposes of this analysis, the pre- and post- development drainage conditions were analyzed at one (1) “design points” where stormwater runoff currently drains to under existing conditions. The design points are described below:

- Design Point #1 (PD1) is to the north of the Site.

The existing site consists of approximately 3.27± acres of land, formerly a funeral home business. The site includes a large residential style building (that was used as the funeral home) and a separate garage. The site has four (4) existing entrances from Mattakeesett Street. There are bituminous drives from each access point and striped parking spaces near the entrances. The site



is primarily comprised of dense vegetated/wooded areas to the north of the former funeral home and associated parking lot. The site generally conveys stormwater in a northerly direction.

A more comprehensive description of the existing subcatchment areas is provided below:+

- Subcatchment EW-1 is approximately 30,979 SF of paved parking and access drives along with a portion of the buildings. Most of the runoff in this watershed is collected via catch basins and underground drainage that outlets to an existing drainage basin. The overflow of the basin discharges into EW-2 and eventually to DP-1. The area consists mostly of impervious surfaces (CN: 87). The minimum time of concentration of 6.0 minutes is used.
- Subcatchment EW-2 is approximately 153,575 SF consisting of a portion of the existing parking area and a large majority of the wooded area on site and partially offsite. Stormwater in this subwatershed flows overland to the south towards DP-1. This area is mostly pervious (CN: 32) and a time of concentration of 11.1 minutes was calculated.

Proposed Conditions

The proposed Project consists of three multifamily buildings and a tavern and associate parking. Propose site improvements also include landscaping improvements, utilities, and a modernized stormwater management system. The proposed parking areas and access drives have been designed to drain into deep sump hooded catch basins or trench drains. The catch basins will capture and convey stormwater runoff, via an underground pipe system, to a sediment forebay and eventually to an infiltration/detention basin. Pretreatment of stormwater runoff will be provided by a combination of the deep-sump hooded catch basins and sediment forebay prior to the infiltration basin. Rooftop runoff has been designed to flow directly to the infiltration basin.

Please refer to the attached Proposed Conditions Watershed Analysis Plan. The proposed project has been divided into three (3) subcatchment areas and the stormwater infiltration BMPs have been modeled. Appropriate Times of Concentration and Curve Numbers have been assigned for each catchment area. A more comprehensive description of the proposed subcatchment areas is provided below:

- Subcatchment PW-1 is approximately 26,941 SF of the proposed building roof which is proposed to discharge directly to the infiltration basin. This area is completely impervious (CN: 98) and the minimum time of concentration of 6.0 minutes is used.
- Subcatchment PW-2 is 87,189 SF mostly consisting of the paved parking and access drives, as well as some landscaped area (CN: 87). This area is captured via catch basins and transported via underground pipe network to a sediment forebay and infiltration basin. The minimum time of concentration of 6.0 minutes is used.



- Subcatchment PW-3 is approximately 70,424 SF of the pervious area abutting the proposed development area. This area is proposed to be pervious, consisting of grass and landscaped areas (CN: 34). A calculated time of concentration of 6.0 minutes is used.

Hydrology Model Results and Conclusions

While the project is a mix of new and redevelopment, the goal of the stormwater design for the project is to fully comply with the Massachusetts Stormwater Policy and the Town of Pembroke Regulations. This analysis confirms that the stormwater system is receiving proper treatment and peak rates of runoff have been reduced to below pre-development rates using stormwater Best Management Practices including deep sump hooded catch basins, a sediment forebay and infiltration/detention basin.

The results of the pre- and post-development hydrology calculations provided in Section 3 are summarized in the following tables:

Table 1.8.1 shows the peak rate of runoff for the existing site as well as for the developed site at 2, 10, 25 and 100-year design storms.

Point of Analysis	2-Year Storm (cfs)			10-Year Storm (cfs)			25-Year Storm (cfs)			100-Year Storm (cfs)		
	Existing	Proposed	Δ	Existing	Proposed	Δ	Existing	Proposed	Δ	Existing	Proposed	Δ
PD1	0.00	0.00	0.00	2.85	1.60	-1.25	4.39	2.28	-2.11	8.31	4.75	-3.56

Table 1.8.1

As shown in Table 1.8.1, the peak stormwater runoff generated by the development are the same or less in post development conditions versus the existing conditions, for every storm. Refer to Section 3 for the complete HydroCAD Analysis that documents the above results as well as the Existing and Proposed Conditions Watershed Plans, also enclosed in Section 3.

1.9 Massachusetts Department of Environmental Protection- Stormwater Standards

The following section describes each of the ten (10) Massachusetts Stormwater Management Standards and describes how the project complies with each.

Standard 1: No New Untreated Discharges – No new stormwater conveyances (e.g. outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.



There are no new stormwater conveyances proposed with this project. The stormwater management system has been designed to direct stormwater runoff from impervious areas through various stormwater systems designed to capture, convey, treat, detain, and recharge.

Standard 2: Peak Rate Attenuation – Stormwater management systems have been designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates.

Table 1.8.1, above, shows the reduction in peak flow rates in the 2, 10, 25 and 100 year storms at design points 1, 2, and 3.

Standard 3: Recharge – Loss of annual recharge to groundwater shall be eliminated or minimized through the use of infiltration measures including environmentally sensitive site design, low impact development techniques, stormwater best management practices, and good operation and maintenance. At a minimum, the annual recharge from the post-development site shall approximate the annual recharge from pre-development conditions based on soil type. This standard is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the Massachusetts Stormwater Handbook.

The stormwater system has been designed to comply with the recharge requirements for both the MA Stormwater Management Regulations. Refer to Section 4 for a summary of the stormwater recharge calculations.

Standard 4: Water Quality – Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS).

The project utilizes deep sump hooded catch basins, a properly sized sediment forebay and an infiltration basin.

Standard 5: Land Uses with Higher Potential Pollutant Loads (LUHPPL) – For land uses with higher potential pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable.

This project is not considered a LUHPPL. This standard does not apply.



Standard 6: Critical Areas – Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply, and stormwater discharges near or to any other critical area, require the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas, as provided in the Massachusetts Stormwater Handbook.

There are no critical areas in or near the project site however, water quality calculations use the 1-inch treatment.

Standard 7: Redevelopment and Other Projects Subject to the Standards only to the maximum extent practicable – A redevelopment project is required to meet the following Stormwater Management Standards only to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural best management practice requirements of Standards 4, 5, and 6. Existing stormwater discharges shall comply with Standard 1 only to the maximum extent practicable. A redevelopment project shall also comply with all other requirements of the Stormwater Management Standards and improve existing conditions.

The project qualifies as a partial redevelopment and partial new development. The existing stormwater management systems conveys stormwater without treatment or attenuation. The proposed system provides significantly improved treatment (80% TSS Removal or greater), groundwater recharge and peak rate attenuation, exceeding the minimum requirements.

Standard 8: Construction Period Pollution Prevention Plan and Erosion and Sedimentation Control – A plan to control construction-related impacts including erosion, sedimentation and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) shall be developed and implemented.

An Erosion and Sedimentation Controls Plan has been incorporated into the Site Plans.

Standard 9: Operation and Maintenance Plan – A long-term operation and maintenance plan shall be developed and implemented to ensure that stormwater management systems function as designed.

A long-term Operation and Maintenance Plan has been incorporated herein. See Section 5.



Standard 10: Prohibition of Illicit Discharges – All illicit discharges to the stormwater management system are prohibited.

An Illicit Discharge Compliance Statement is included as required and is enclosed in Section 2.2.

1.10 BEST MANAGEMENT PRACTICES (BMP'S)

A series of deep sump hooded catch basins, a sediment forebay and infiltration basin, will be used to treat stormwater runoff on the site. See Section 4 for stormwater management calculations.

1.11 PIPE SIZING

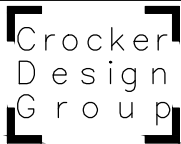
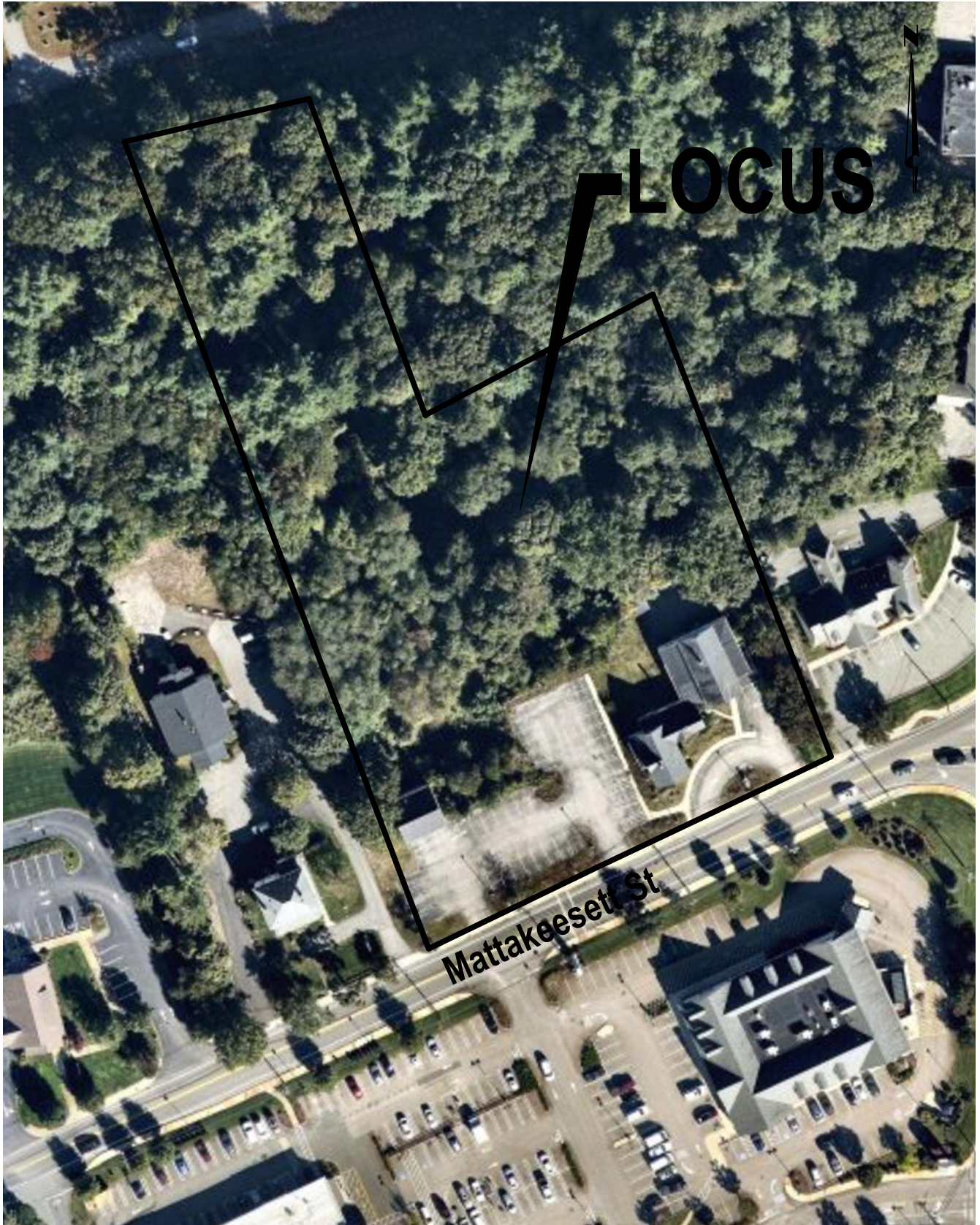
Refer to Section 7 for the output results from the Hydraflow Sewer Storm Sewers Extension for AutoCAD Civil 3D. Hydraflow utilized the Rational Method. The tributary area for each inlet/subcatchment area has been computed along with pipe length, slope and friction coefficient. The Rational Method is then utilized to determine the hydraulic grade line. For design purposes, this approach was used to size the pipes such that the 10-year storm event is contained within the pipe. The 100-year storm was then checked to confirm the hydraulic grade line for the pipe network does not exceed the rim elevations of the drainage structures. In addition, pipe velocities were checked to be within the range of 2fps to 10 fps flowing 1/3 full.

1.12 CONCLUSION

In conclusion, the project has been designed in accordance with the requirements of the MA DEP's Stormwater Management Standards.

1.13 Figures

- FIG 1 AERIAL MAP
- FIG 2 USGS MAP
- FIG 3 FEMA FLOODPLAIN MAP
- FIG 4 NHESP MAP
- FIG 5 MASSDEP WETLANDS MAP



2 SHARP STREET, UNIT A
HINGHAM, MA 02043

Project

**MATTAKEESETT
VILLAGE**

**7 & 15 MATTAKEESETT ST
PEMBROKE MA 02359**

Prepared for

**WEATHERVANE AT
MATTAKEESETT, LLC**

**190 OLD DERBY STREET
HINGHAM, MA 02043**

Drawing Title

AERIAL PLAN

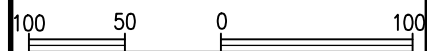
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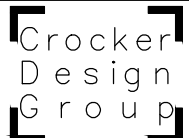
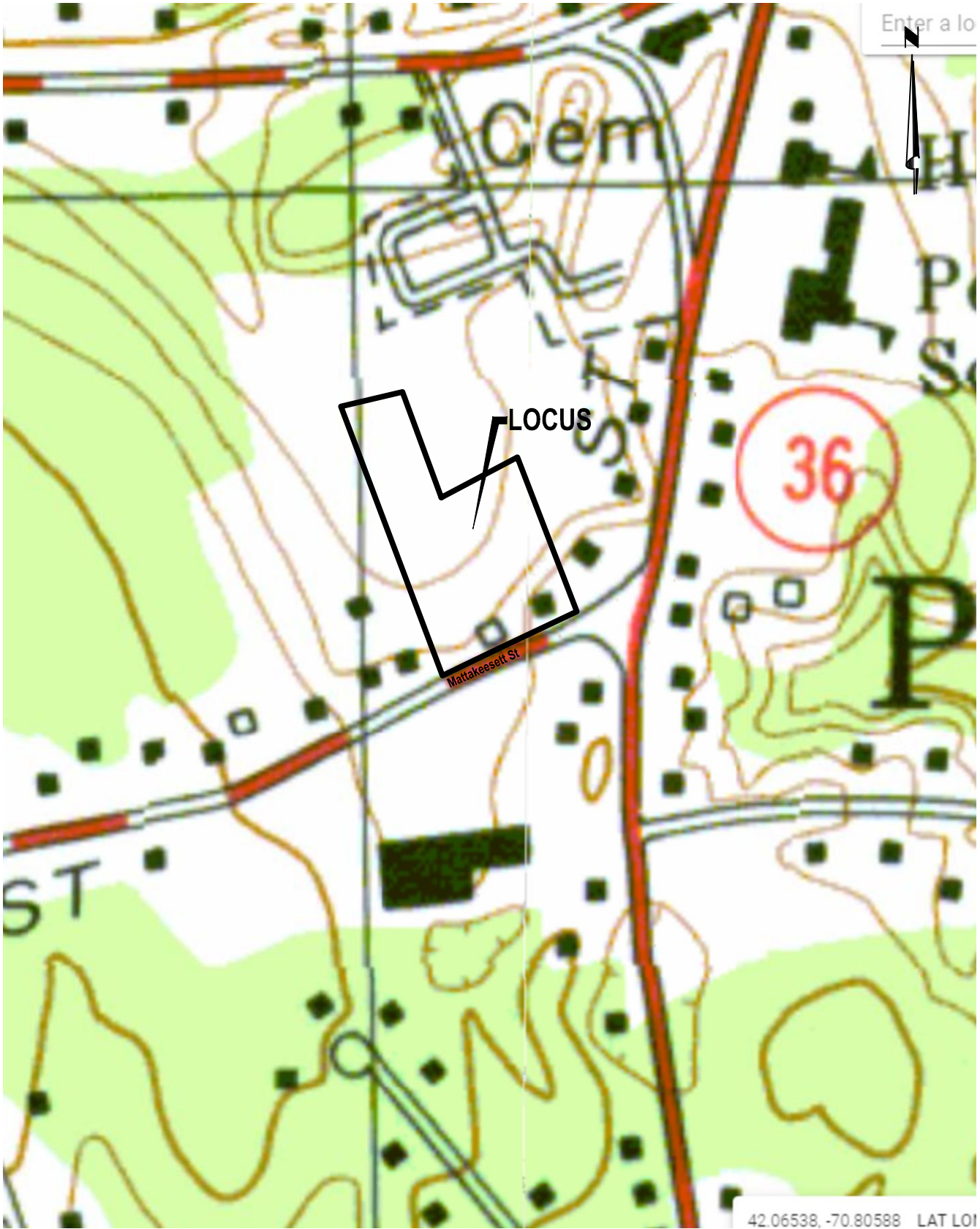
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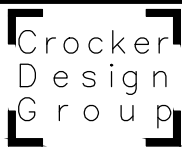
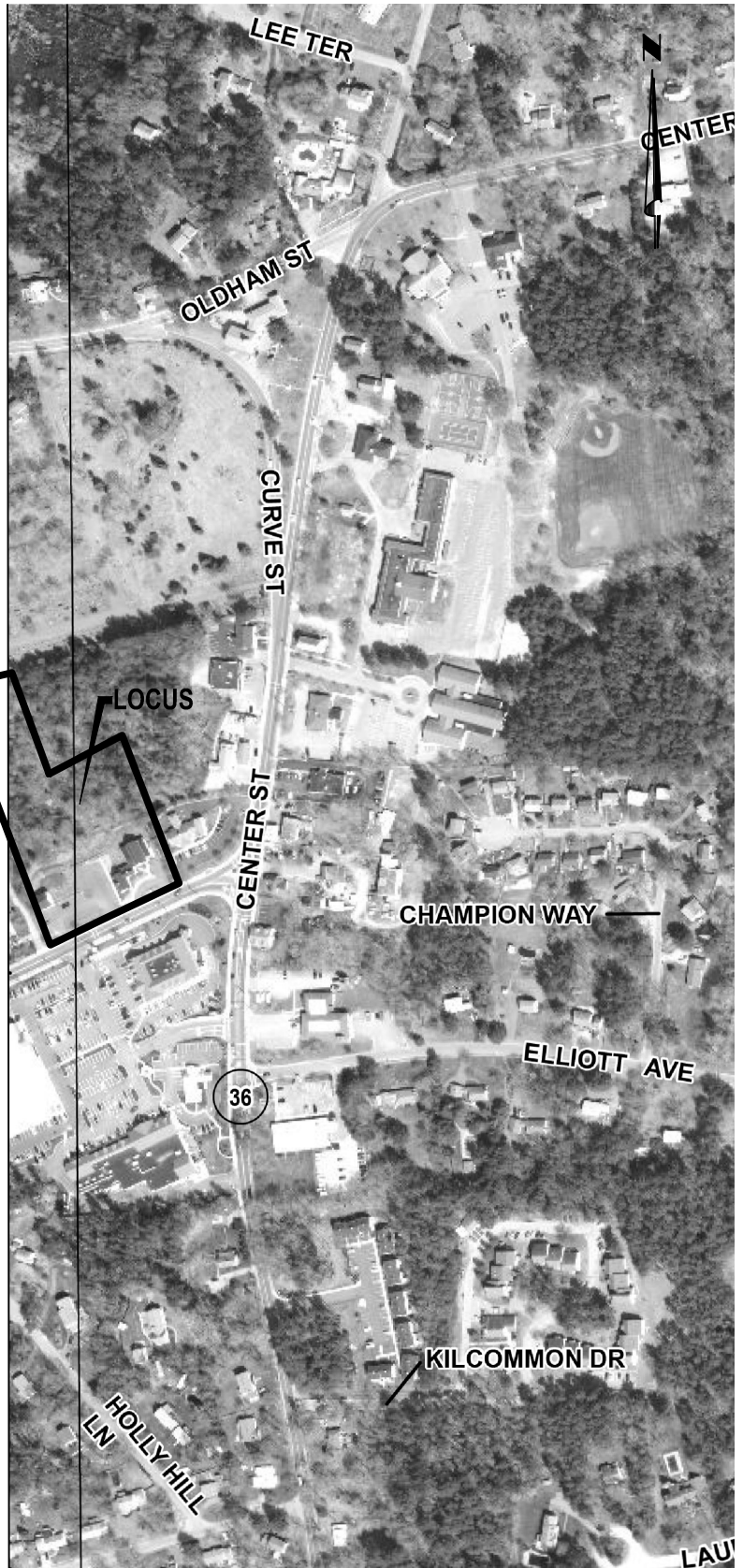
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2 SHARP STREET, UNIT A
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Drawing Title

FEMA FLOOD MAP

EFFECTIVE PANEL 25023C0204K, 25023C0208K (7/6/2021)

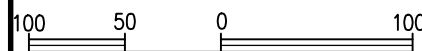
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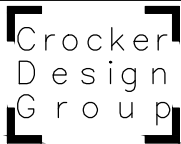
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2 SHARP STREET, UNIT A
HINGHAM, MA 02043

Project

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Drawing Title

NHESP PLAN

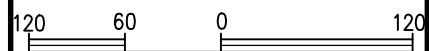
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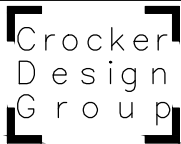
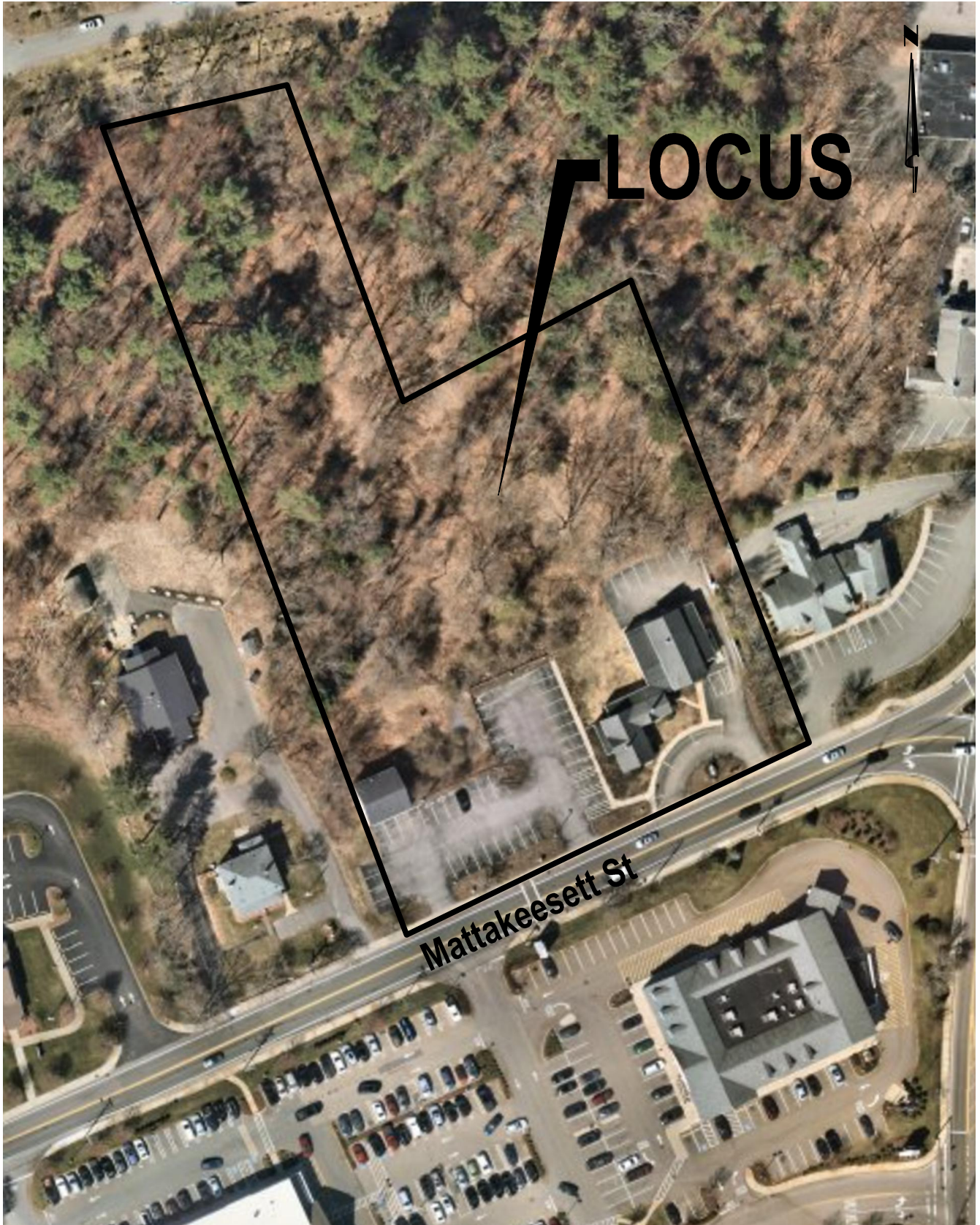
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2 SHARP STREET, UNIT A
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Drawing Title

WETLANDS PLAN

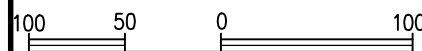
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SECTION 2 – STORMWATER CHECKLIST



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 8²
- Operation and Maintenance Plan required by Standard 9

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

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

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

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

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



Checklist for Stormwater Report

B. Stormwater Checklist and Certification

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

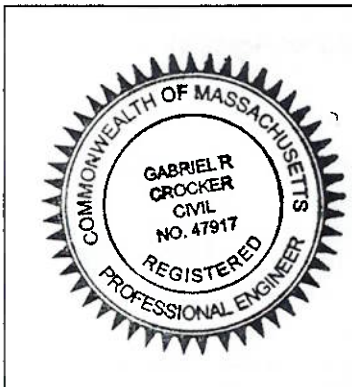
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the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

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

Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature



 9/5/2023
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 for Stormwater Report

Checklist (continued)

LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

- ☒ No disturbance to any Wetland Resource Areas
- ☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)
- ☐ Reduced Impervious Area (Redevelopment Only)
- ☐ Minimizing disturbance to existing trees and shrubs
- ☐ LID Site Design Credit Requested:
 - ☐ Credit 1
 - ☐ Credit 2
 - ☐ Credit 3
- ☐ Use of “country drainage” versus curb and gutter conveyance and pipe
- ☐ Bioretention Cells (includes Rain Gardens)
- ☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)
- ☐ Treebox Filter
- ☐ Water Quality Swale
- ☐ Grass Channel
- ☐ Green Roof
- ☐ Other (describe): _____

Standard 1: No New Untreated Discharges

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



Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

- ☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.
- ☐ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.
- ☒ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

- ☒ Soil Analysis provided.
- ☒ Required Recharge Volume calculation provided.
- ☐ Required Recharge volume reduced through use of the LID site Design Credits.
- ☐ Sizing the infiltration, BMPs is based on the following method: Check the method used.
 - ☐ Static
 - ☒ Simple Dynamic
 - ☐ Dynamic Field¹
- ☒ Runoff from all impervious areas at the site discharging to the infiltration BMP.
- ☐ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.
- ☒ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.
- ☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:
 - ☐ Site is comprised solely of C and D soils and/or bedrock at the land surface
 - ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
 - ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
 - ☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.
- ☒ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.
- ☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

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



Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

- ☒ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.
- ☐ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

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

- Good housekeeping practices;
 - Provisions for storing materials and waste products inside or under cover;
 - Vehicle washing controls;
 - Requirements for routine inspections and maintenance of stormwater BMPs;
 - Spill prevention and response plans;
 - Provisions for maintenance of lawns, gardens, and other landscaped areas;
 - Requirements for storage and use of fertilizers, herbicides, and pesticides;
 - Pet waste management provisions;
 - Provisions for operation and management of septic systems;
 - Provisions for solid waste management;
 - Snow disposal and plowing plans relative to Wetland Resource Areas;
 - Winter Road Salt and/or Sand Use and Storage restrictions;
 - Street sweeping schedules;
 - Provisions for prevention of illicit discharges to the stormwater management system;
 - Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
 - Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
 - List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.
- ☒ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.
 - ☒ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:
 - ☐ is within the Zone II or Interim Wellhead Protection Area
 - ☐ is near or to other critical areas
 - ☒ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
 - ☐ involves runoff from land uses with higher potential pollutant loads.
 - ☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.
 - ☒ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.



Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

- ☒ The BMP is sized (and calculations provided) based on:
 - ☒ The ½" or 1" Water Quality Volume or
 - ☐ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.
- ☐ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.
- ☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

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

- ☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.
- ☐ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted **prior to** the discharge of stormwater to the post-construction stormwater BMPs.
- ☐ The NPDES Multi-Sector General Permit does **not** cover the land use.
- ☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.
- ☐ All exposure has been eliminated.
- ☐ All exposure has **not** been eliminated and all BMPs selected are on MassDEP LUHPPL list.
- ☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

- ☐ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.
- ☐ Critical areas and BMPs are identified in the Stormwater Report.



Checklist for Stormwater Report

Checklist (continued)

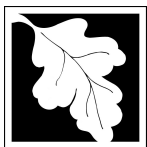
Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

- ☒ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:
 - ☐ Limited Project
 - ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
 - ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
 - ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
 - ☐ Bike Path and/or Foot Path
 - ☐ Redevelopment Project
- ☒ Redevelopment portion of mix of new and redevelopment.
- ☐ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.
- ☒ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

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

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

- Narrative;
 - Construction Period Operation and Maintenance Plan;
 - Names of Persons or Entity Responsible for Plan Compliance;
 - Construction Period Pollution Prevention Measures;
 - Erosion and Sedimentation Control Plan Drawings;
 - Detail drawings and specifications for erosion control BMPs, including sizing calculations;
 - Vegetation Planning;
 - Site Development Plan;
 - Construction Sequencing Plan;
 - Sequencing of Erosion and Sedimentation Controls;
 - Operation and Maintenance of Erosion and Sedimentation Controls;
 - Inspection Schedule;
 - Maintenance Schedule;
 - Inspection and Maintenance Log Form.
- ☐ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.



Checklist for Stormwater Report

Checklist (continued)

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

- ☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has **not** been included in the Stormwater Report but will be submitted **before** land disturbance begins.
- ☐ The project is **not** covered by a NPDES Construction General Permit.
- ☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.
- ☒ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

- ☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:
 - ☒ Name of the stormwater management system owners;
 - ☒ Party responsible for operation and maintenance;
 - ☒ Schedule for implementation of routine and non-routine maintenance tasks;
 - ☒ Plan showing the location of all stormwater BMPs maintenance access areas;
 - ☒ Description and delineation of public safety features;
 - ☒ Estimated operation and maintenance budget; and
 - ☒ Operation and Maintenance Log Form.
- ☐ The responsible party is **not** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:
 - ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
 - ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

- ☒ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;
- ☐ An Illicit Discharge Compliance Statement is attached;
- ☒ NO Illicit Discharge Compliance Statement is attached but will be submitted **prior to** the discharge of any stormwater to post-construction BMPs.

ILLICIT DISCHARGE COMPLIANCE STATEMENT

Standard 10: Massachusetts Stormwater Standards Handbook

Illicit discharges are defined as discharges into waters of the State or municipal separate stormwater system (MS4) that are not entirely comprised of stormwater. Exclusions for non-stormwater discharges into drainage systems include activities or facilities for firefighting, water line flushing, landscape irrigation, uncontaminated groundwater discharge, potable water sources, foundation drains, air conditioning condensation, footing drains, individual resident car washing, water used to clean residential buildings without detergents, water used for street washing, and flows from riparian habitats/wetlands. These exclusions are subject to change and are under the discretion of the local governing authority.

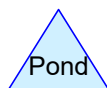
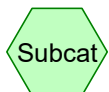
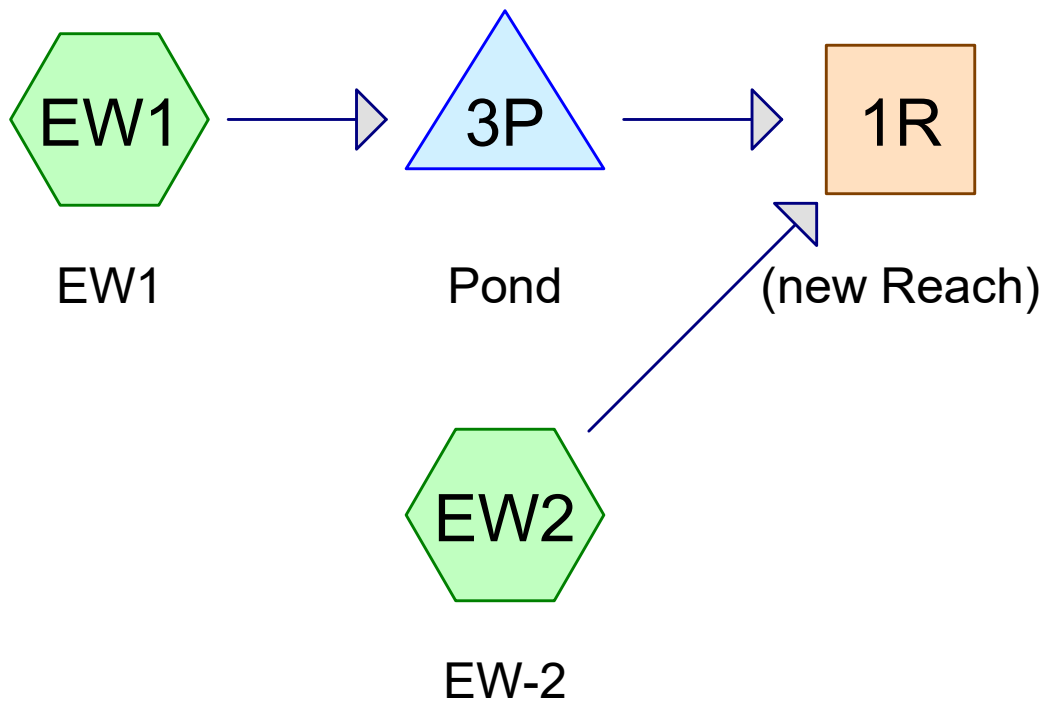
To the best of our knowledge and professional belief no illicit discharges to the stormwater system, surface waters, or wetland resource areas will remain on the site after construction. We will agree to implement a pollution prevention plan to prevent illicit discharges into the stormwater management system. The design of the site based on the plans entitled "SITE DEVELOPMENT PLANS: MATTAKEESETT VILLAGE." prepared by Crocker Design Group, 2 Sharp Street, Unit A, Hingham, Massachusetts, show a separation and no direct connection between the stormwater management systems and the wastewater and/ or groundwater on the site. To the maximum extent practicable, the design prevents entry of illicit discharges into the stormwater management system.

Engineer's Name: _____
(please print)

Engineer's Signature: _____ Date: _____

Company: Crocker Design Group, LLC.

SECTION 3 – STORMATER HYDROLOGY MODEL



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Page 2

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.103	49	50-75% Grass cover, Fair, HSG A (EW2)
0.131	39	>75% Grass cover, Good, HSG A (EW1)
0.463	98	Pavement/House (EW1)
0.117	98	Pond (EW1)
0.170	98	Unconnected pavement, HSG A (EW2)
3.253	30	Woods, Good, HSG A (EW2)
4.237	43	TOTAL AREA

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Page 3

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
3.656	HSG A	EW1, EW2
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
0.580	Other	EW1
4.237		TOTAL AREA

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Page 4

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.103	0.000	0.000	0.000	0.000	0.103	50-75% Grass cover, Fair	EW2
0.131	0.000	0.000	0.000	0.000	0.131	>75% Grass cover, Good	EW1
0.000	0.000	0.000	0.000	0.463	0.463	Pavement/House	EW1
0.000	0.000	0.000	0.000	0.117	0.117	Pond	EW1
0.170	0.000	0.000	0.000	0.000	0.170	Unconnected pavement	EW2
3.253	0.000	0.000	0.000	0.000	3.253	Woods, Good	EW2
3.656	0.000	0.000	0.000	0.580	4.237	TOTAL AREA	

100-152 Existing HydroCAD

Type II 24-hr 2-YR Rainfall=3.40"

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Page 5

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EW1: EW1

Runoff Area=30,979 sf 81.61% Impervious Runoff Depth>2.09"
Tc=6.0 min CN=87 Runoff=2.52 cfs 0.124 af

Subcatchment EW2: EW-2

Runoff Area=153,575 sf 4.81% Impervious Runoff Depth=0.00"
Flow Length=615' Tc=11.1 min UI Adjusted CN=32 Runoff=0.00 cfs 0.000 af

Reach 1R: (new Reach)

Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Pond 3P: Pond

Peak Elev=76.32' Storage=1,899 cf Inflow=2.52 cfs 0.124 af
Discarded=0.35 cfs 0.124 af Primary=0.00 cfs 0.000 af Outflow=0.35 cfs 0.124 af

Total Runoff Area = 4.237 ac Runoff Volume = 0.124 af Average Runoff Depth = 0.35"
82.30% Pervious = 3.487 ac 17.70% Impervious = 0.750 ac

100-152 Existing HydroCAD

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Type II 24-hr 2-YR Rainfall=3.40"

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Page 6

Summary for Subcatchment EW1: EW1

Runoff = 2.52 cfs @ 11.97 hrs, Volume= 0.124 af, Depth> 2.09"

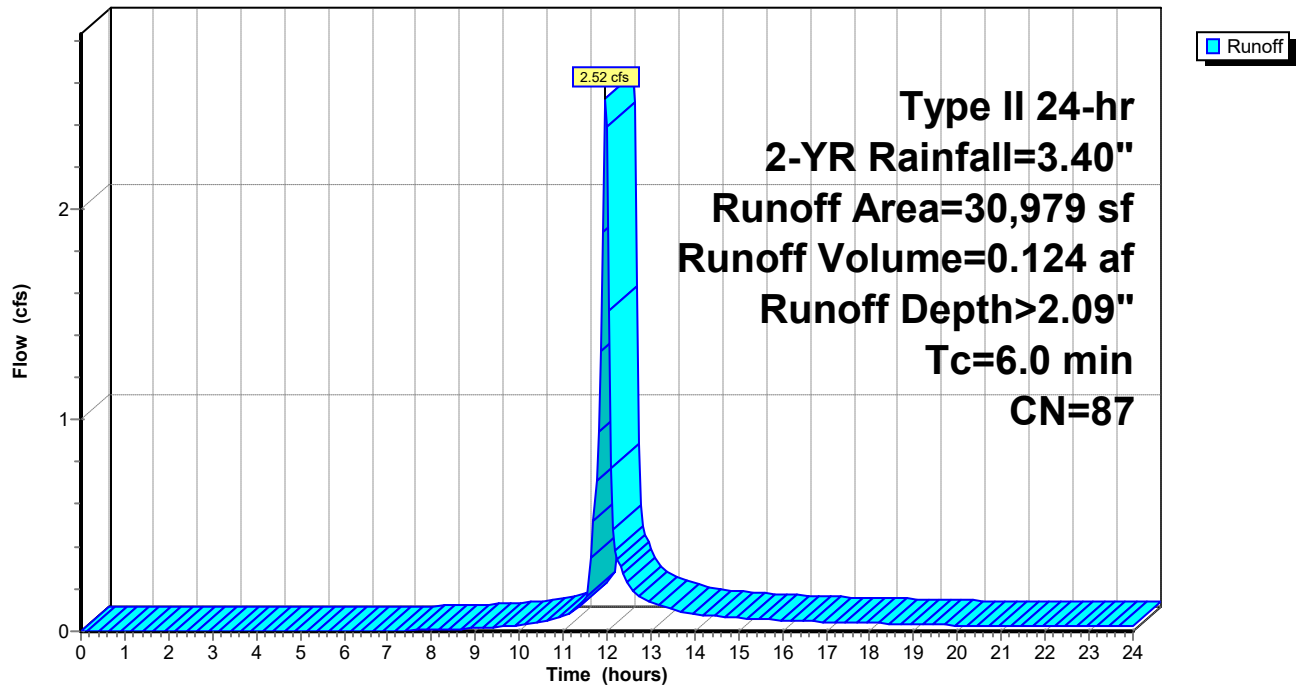
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-YR Rainfall=3.40"

	Area (sf)	CN	Description
*	20,183	98	Pavement/House
*	5,100	98	Pond
	5,696	39	>75% Grass cover, Good, HSG A
	30,979	87	Weighted Average
	5,696		18.39% Pervious Area
	25,283		81.61% Impervious Area

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

Subcatchment EW1: EW1

Hydrograph



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Type II 24-hr 2-YR Rainfall=3.40"

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Summary for Subcatchment EW2: EW-2

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

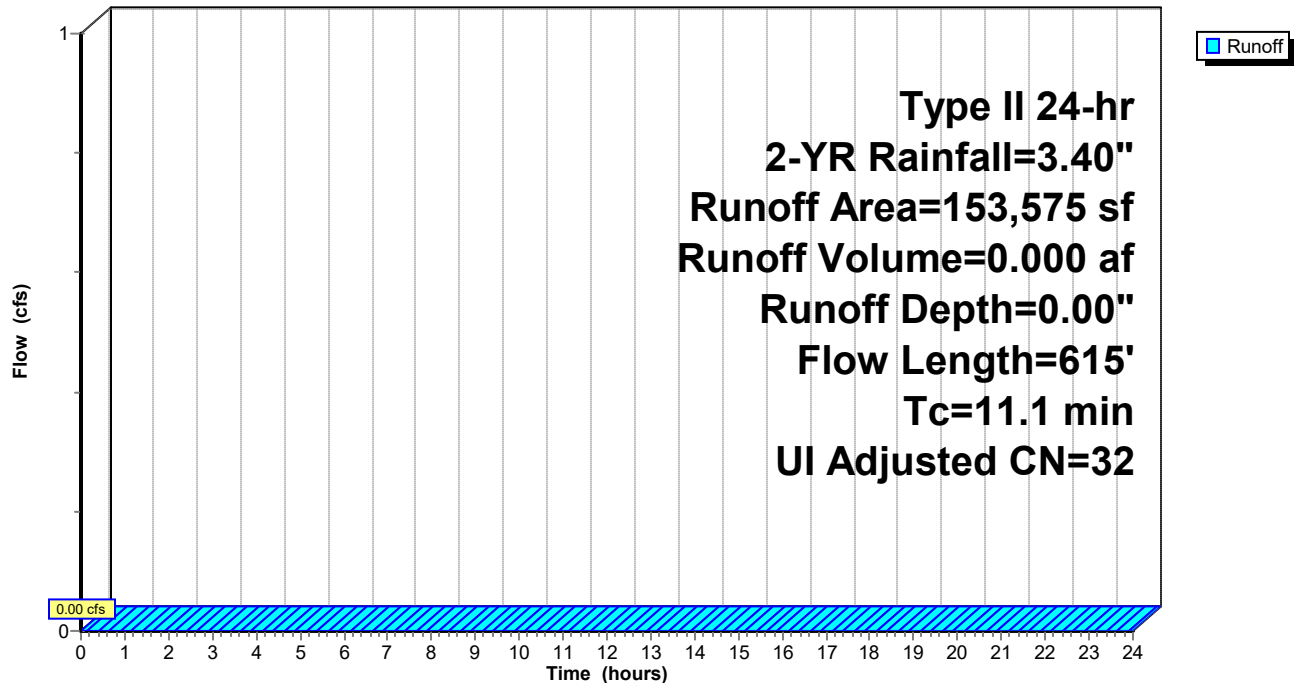
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-YR Rainfall=3.40"

Area (sf)	CN	Adj	Description
7,390	98		Unconnected pavement, HSG A
4,488	49		50-75% Grass cover, Fair, HSG A
141,697	30		Woods, Good, HSG A
153,575	34	32	Weighted Average, UI Adjusted
146,185			95.19% Pervious Area
7,390			4.81% Impervious Area
7,390			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.23		Sheet Flow, A-B
					Smooth surfaces n= 0.011 P2= 3.39"
10.4	565	0.0327	0.90		Shallow Concentrated Flow, B-C
					Woodland Kv= 5.0 fps
11.1	615	Total			

Subcatchment EW2: EW-2

Hydrograph



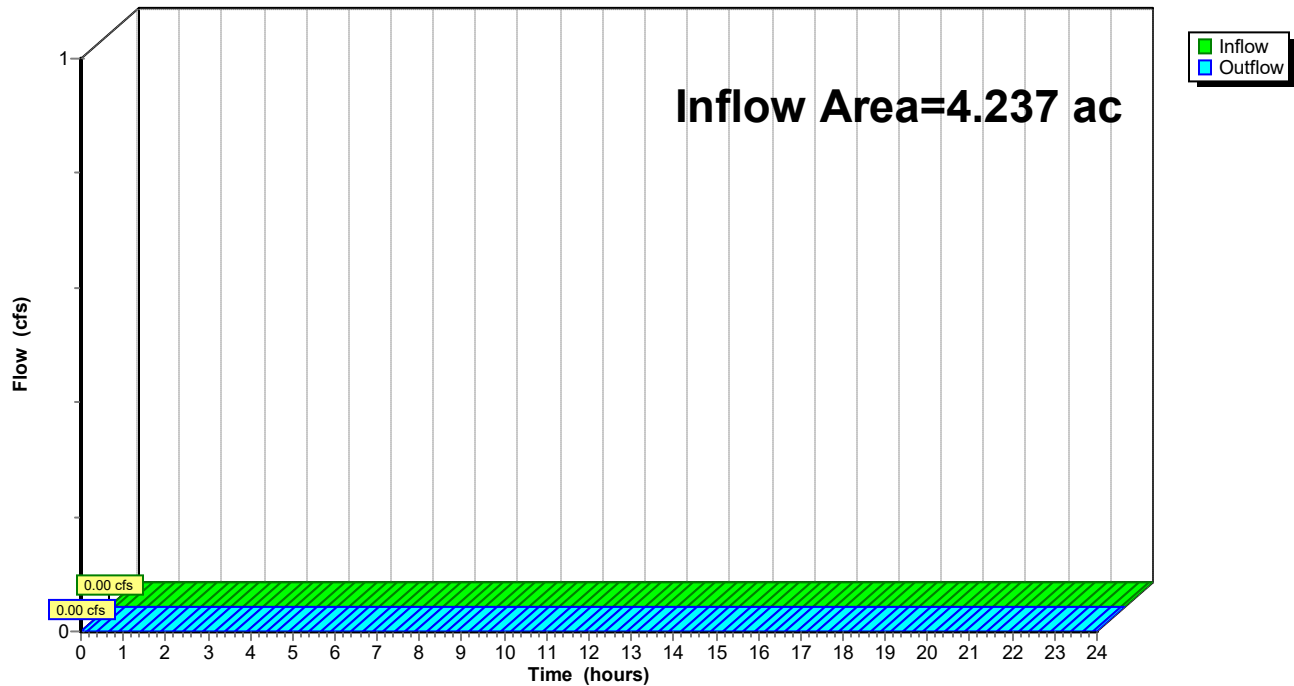
Summary for Reach 1R: (new Reach)

Inflow Area = 4.237 ac, 17.70% Impervious, Inflow Depth = 0.00" for 2-YR event
 Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach 1R: (new Reach)

Hydrograph



100-152 Existing HydroCAD

Type II 24-hr 2-YR Rainfall=3.40"

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Summary for Pond 3P: Pond

Inflow Area = 0.711 ac, 81.61% Impervious, Inflow Depth > 2.09" for 2-YR event
 Inflow = 2.52 cfs @ 11.97 hrs, Volume= 0.124 af
 Outflow = 0.35 cfs @ 12.24 hrs, Volume= 0.124 af, Atten= 86%, Lag= 16.5 min
 Discarded = 0.35 cfs @ 12.24 hrs, Volume= 0.124 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 76.32' @ 12.24 hrs Surf.Area= 1,813 sf Storage= 1,899 cf

Plug-Flow detention time= 40.6 min calculated for 0.124 af (100% of inflow)
 Center-of-Mass det. time= 40.2 min (852.8 - 812.6)

Volume	Invert	Avail.Storage	Storage Description
#1	75.00'	3,222 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
75.00	991	0	0
76.00	1,684	1,338	1,338
77.00	2,084	1,884	3,222

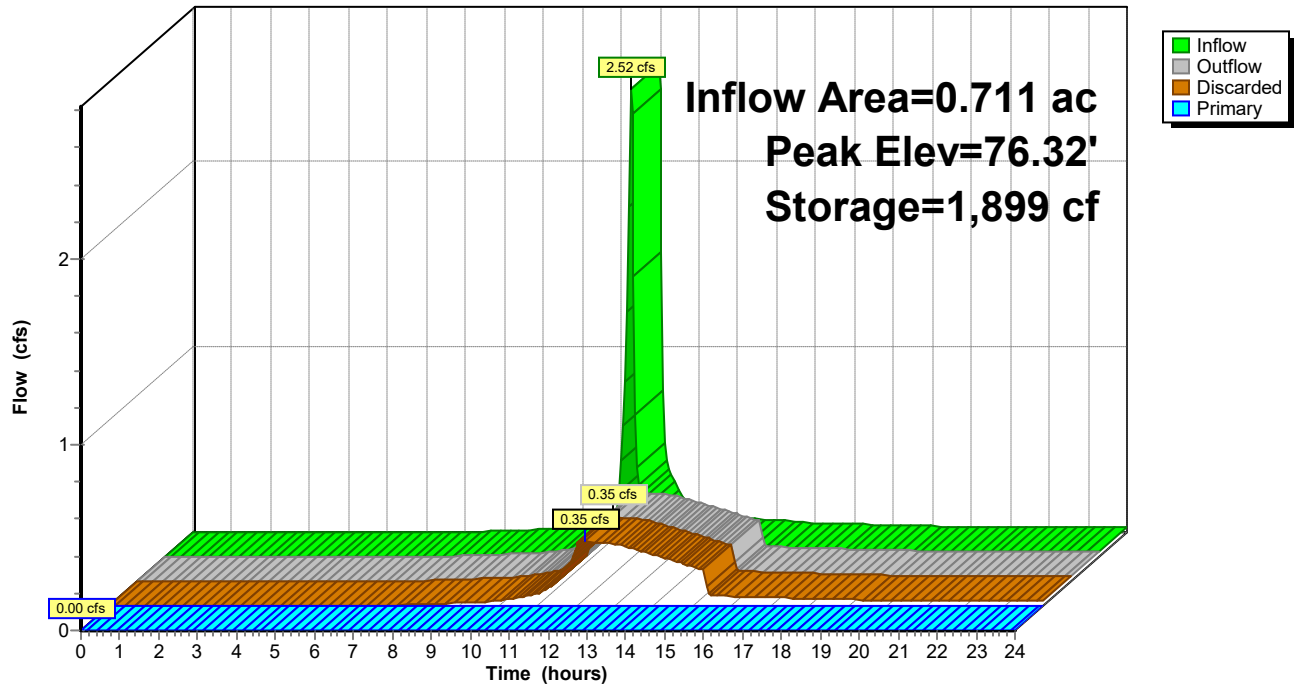
Device	Routing	Invert	Outlet Devices
#1	Discarded	75.00'	8.270 in/hr Exfiltration over Surface area
#2	Primary	77.00'	89.0' long x 4.0' breadth Broad-Crested Rectangular Weir
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00
			2.50 3.00 3.50 4.00 4.50 5.00 5.50
			Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66
			2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Discarded OutFlow Max=0.35 cfs @ 12.24 hrs HW=76.32' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.35 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=75.00' (Free Discharge)
 ↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 3P: Pond

Hydrograph



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Type II 24-hr 10-YR Rainfall=5.05"

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Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EW1: EW1

Runoff Area=30,979 sf 81.61% Impervious Runoff Depth>3.61"
Tc=6.0 min CN=87 Runoff=4.24 cfs 0.214 af

Subcatchment EW2: EW-2

Runoff Area=153,575 sf 4.81% Impervious Runoff Depth>0.03"
Flow Length=615' Tc=11.1 min UI Adjusted CN=32 Runoff=0.01 cfs 0.008 af

Reach 1R: (new Reach)

Inflow=2.85 cfs 0.020 af
Outflow=2.85 cfs 0.020 af

Pond 3P: Pond

Peak Elev=77.06' Storage=3,222 cf Inflow=4.24 cfs 0.214 af
Discarded=0.40 cfs 0.020 af Primary=2.85 cfs 0.012 af Outflow=3.24 cfs 0.214 af

Total Runoff Area = 4.237 ac Runoff Volume = 0.222 af Average Runoff Depth = 0.63"
82.30% Pervious = 3.487 ac 17.70% Impervious = 0.750 ac

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Type II 24-hr 10-YR Rainfall=5.05"

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Summary for Subcatchment EW1: EW1

Runoff = 4.24 cfs @ 11.97 hrs, Volume= 0.214 af, Depth> 3.61"

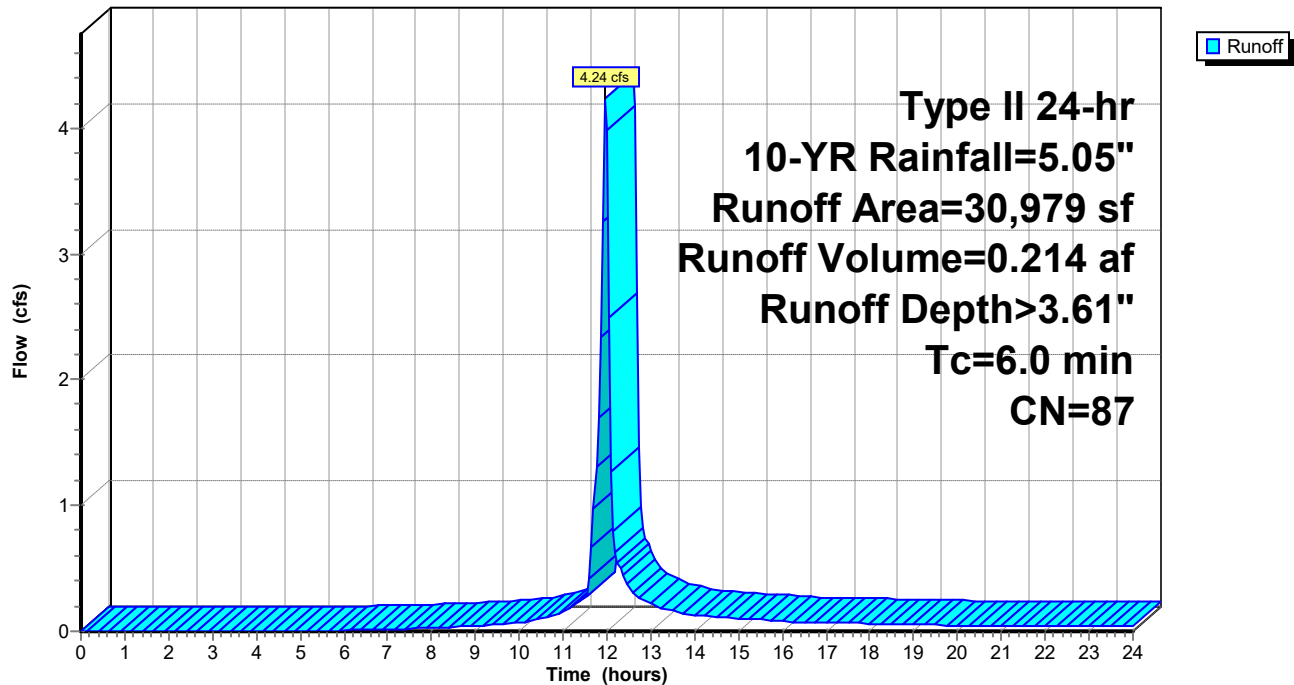
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-YR Rainfall=5.05"

	Area (sf)	CN	Description
*	20,183	98	Pavement/House
*	5,100	98	Pond
	5,696	39	>75% Grass cover, Good, HSG A
	30,979	87	Weighted Average
	5,696		18.39% Pervious Area
	25,283		81.61% Impervious Area

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

Subcatchment EW1: EW1

Hydrograph



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Type II 24-hr 10-YR Rainfall=5.05"

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Summary for Subcatchment EW2: EW-2

Runoff = 0.01 cfs @ 24.00 hrs, Volume= 0.008 af, Depth> 0.03"

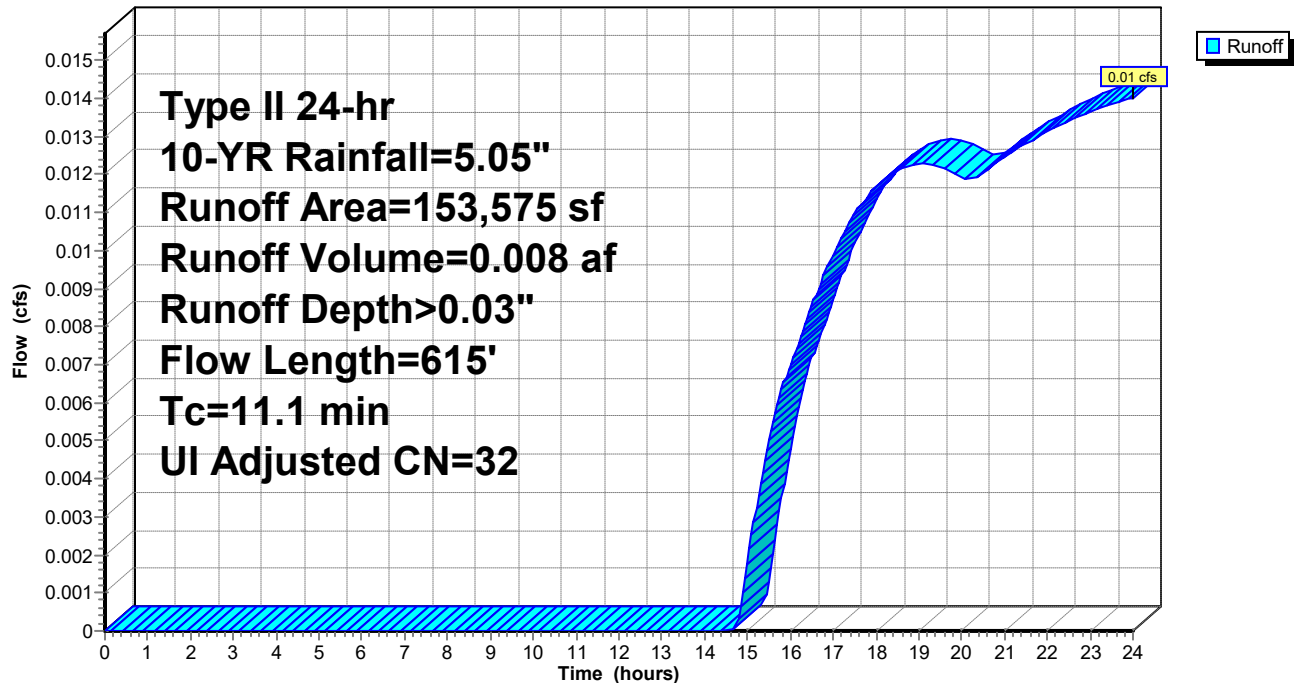
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-YR Rainfall=5.05"

Area (sf)	CN	Adj	Description
7,390	98		Unconnected pavement, HSG A
4,488	49		50-75% Grass cover, Fair, HSG A
141,697	30		Woods, Good, HSG A
153,575	34	32	Weighted Average, UI Adjusted
146,185			95.19% Pervious Area
7,390			4.81% Impervious Area
7,390			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.23		Sheet Flow, A-B
					Smooth surfaces n= 0.011 P2= 3.39"
10.4	565	0.0327	0.90		Shallow Concentrated Flow, B-C
					Woodland Kv= 5.0 fps
11.1	615	Total			

Subcatchment EW2: EW-2

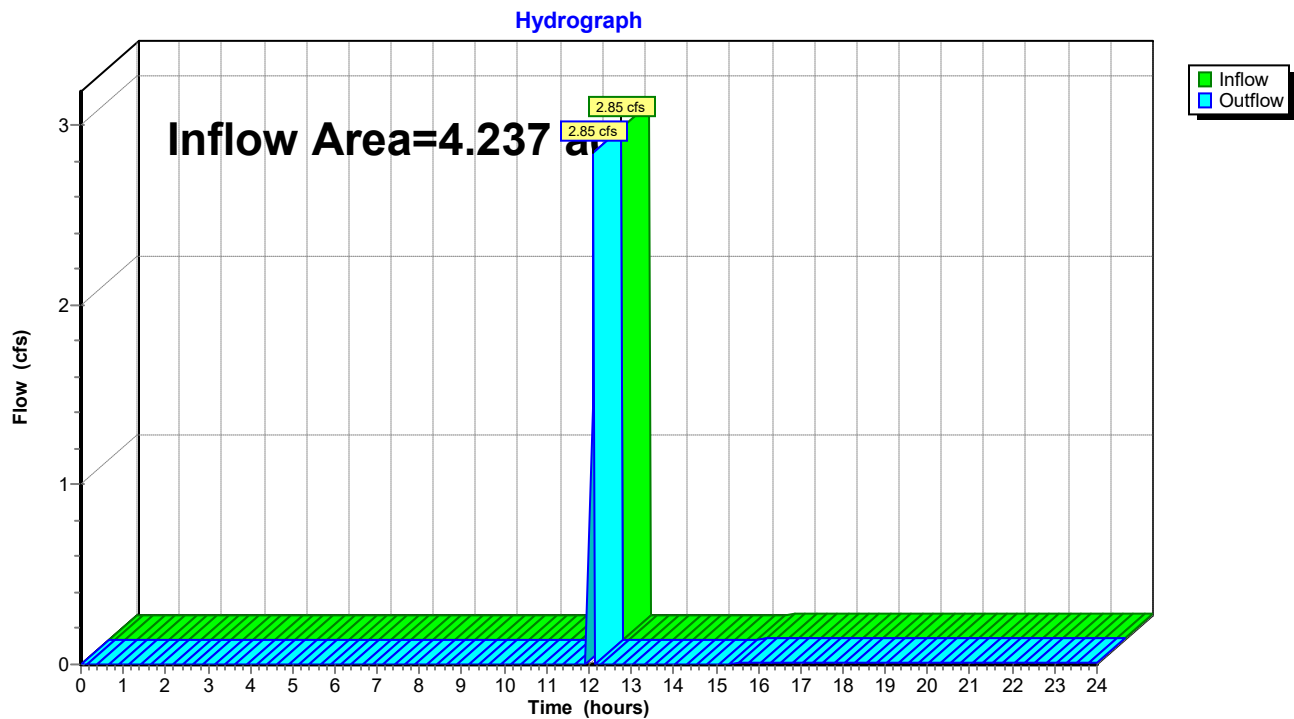
Hydrograph



Summary for Reach 1R: (new Reach)

Inflow Area = 4.237 ac, 17.70% Impervious, Inflow Depth > 0.06" for 10-YR event
Inflow = 2.85 cfs @ 12.10 hrs, Volume= 0.020 af
Outflow = 2.85 cfs @ 12.10 hrs, Volume= 0.020 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach 1R: (new Reach)

Summary for Pond 3P: Pond

Inflow Area = 0.711 ac, 81.61% Impervious, Inflow Depth > 3.61" for 10-YR event
 Inflow = 4.24 cfs @ 11.97 hrs, Volume= 0.214 af
 Outflow = 3.24 cfs @ 12.10 hrs, Volume= 0.214 af, Atten= 24%, Lag= 8.1 min
 Discarded = 0.40 cfs @ 12.08 hrs, Volume= 0.202 af
 Primary = 2.85 cfs @ 12.10 hrs, Volume= 0.012 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 77.06' @ 12.09 hrs Surf.Area= 2,084 sf Storage= 3,222 cf

Plug-Flow detention time= 60.6 min calculated for 0.214 af (100% of inflow)
 Center-of-Mass det. time= 60.4 min (857.5 - 797.1)

Volume	Invert	Avail.Storage	Storage Description
#1	75.00'	3,222 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
75.00	991	0	0
76.00	1,684	1,338	1,338
77.00	2,084	1,884	3,222

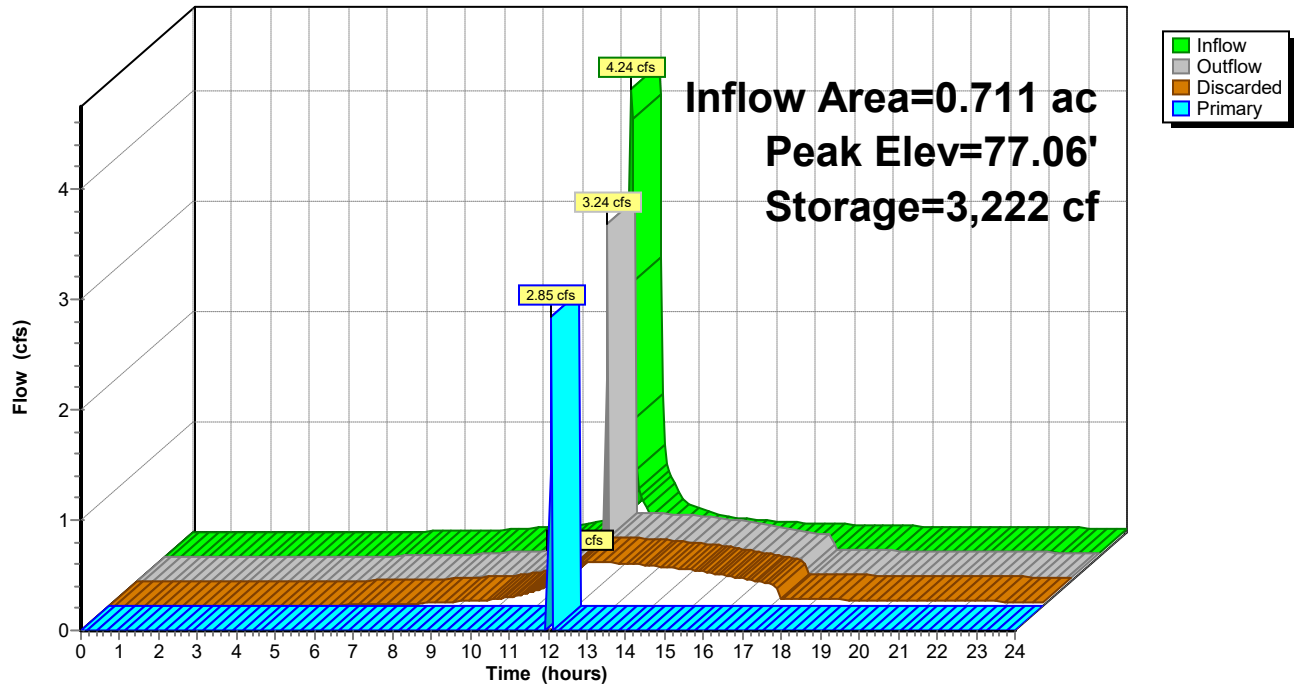
Device	Routing	Invert	Outlet Devices
#1	Discarded	75.00'	8.270 in/hr Exfiltration over Surface area
#2	Primary	77.00'	89.0' long x 4.0' breadth Broad-Crested Rectangular Weir
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00
			2.50 3.00 3.50 4.00 4.50 5.00 5.50
			Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66
			2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Discarded OutFlow Max=0.40 cfs @ 12.08 hrs HW=77.03' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.40 cfs)

Primary OutFlow Max=2.82 cfs @ 12.10 hrs HW=77.06' (Free Discharge)
 ↑2=Broad-Crested Rectangular Weir (Weir Controls 2.82 cfs @ 0.56 fps)

Pond 3P: Pond

Hydrograph



100-152 Existing HydroCAD

Type II 24-hr 25-YR Rainfall=6.08"

Prepared by HP

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Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EW1: EW1

Runoff Area=30,979 sf 81.61% Impervious Runoff Depth>4.59"
Tc=6.0 min CN=87 Runoff=5.32 cfs 0.272 af

Subcatchment EW2: EW-2

Runoff Area=153,575 sf 4.81% Impervious Runoff Depth>0.14"
Flow Length=615' Tc=11.1 min UI Adjusted CN=32 Runoff=0.06 cfs 0.042 af

Reach 1R: (new Reach)

Inflow=4.39 cfs 0.084 af
Outflow=4.39 cfs 0.084 af

Pond 3P: Pond

Peak Elev=77.11' Storage=3,222 cf Inflow=5.32 cfs 0.272 af
Discarded=0.40 cfs 0.230 af Primary=4.39 cfs 0.042 af Outflow=4.79 cfs 0.272 af

Total Runoff Area = 4.237 ac Runoff Volume = 0.314 af Average Runoff Depth = 0.89"
82.30% Pervious = 3.487 ac 17.70% Impervious = 0.750 ac

100-152 Existing HydroCAD

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Type II 24-hr 25-YR Rainfall=6.08"

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Summary for Subcatchment EW1: EW1

Runoff = 5.32 cfs @ 11.96 hrs, Volume= 0.272 af, Depth> 4.59"

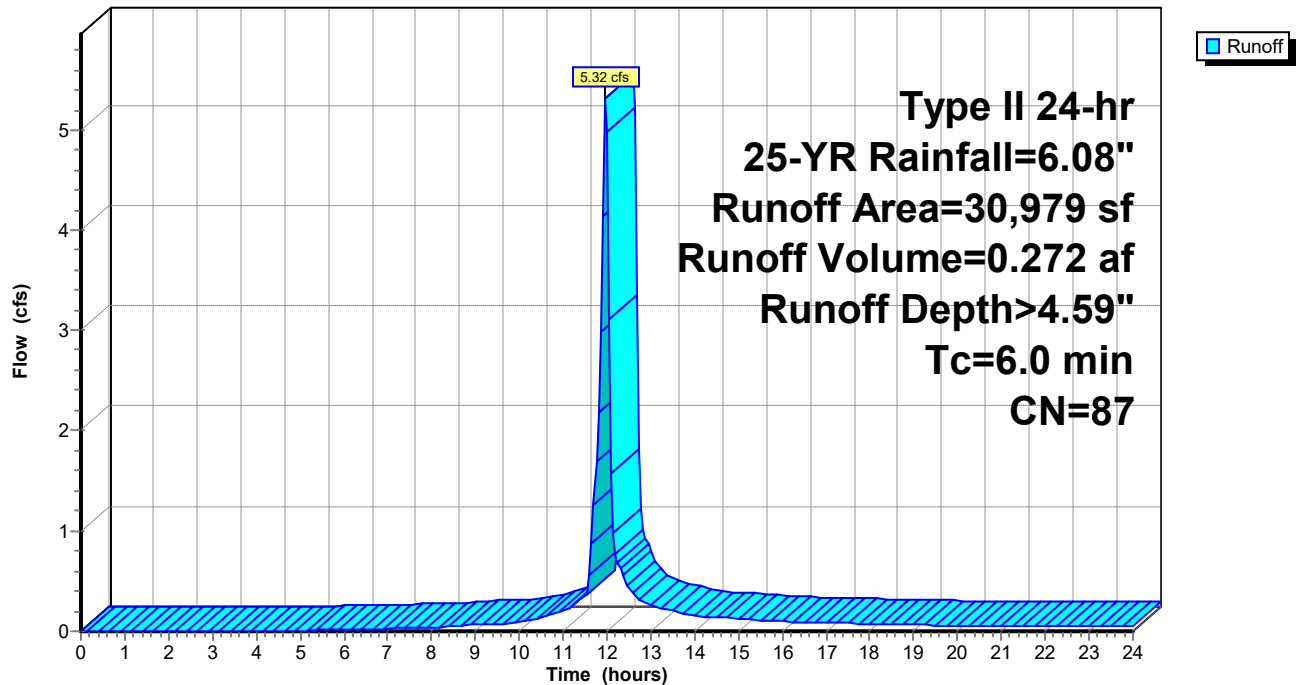
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-YR Rainfall=6.08"

	Area (sf)	CN	Description
*	20,183	98	Pavement/House
*	5,100	98	Pond
	5,696	39	>75% Grass cover, Good, HSG A
	30,979	87	Weighted Average
	5,696		18.39% Pervious Area
	25,283		81.61% Impervious Area

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

Subcatchment EW1: EW1

Hydrograph



100-152 Existing HydroCAD

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Type II 24-hr 25-YR Rainfall=6.08"

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Summary for Subcatchment EW2: EW-2

Runoff = 0.06 cfs @ 13.51 hrs, Volume= 0.042 af, Depth> 0.14"

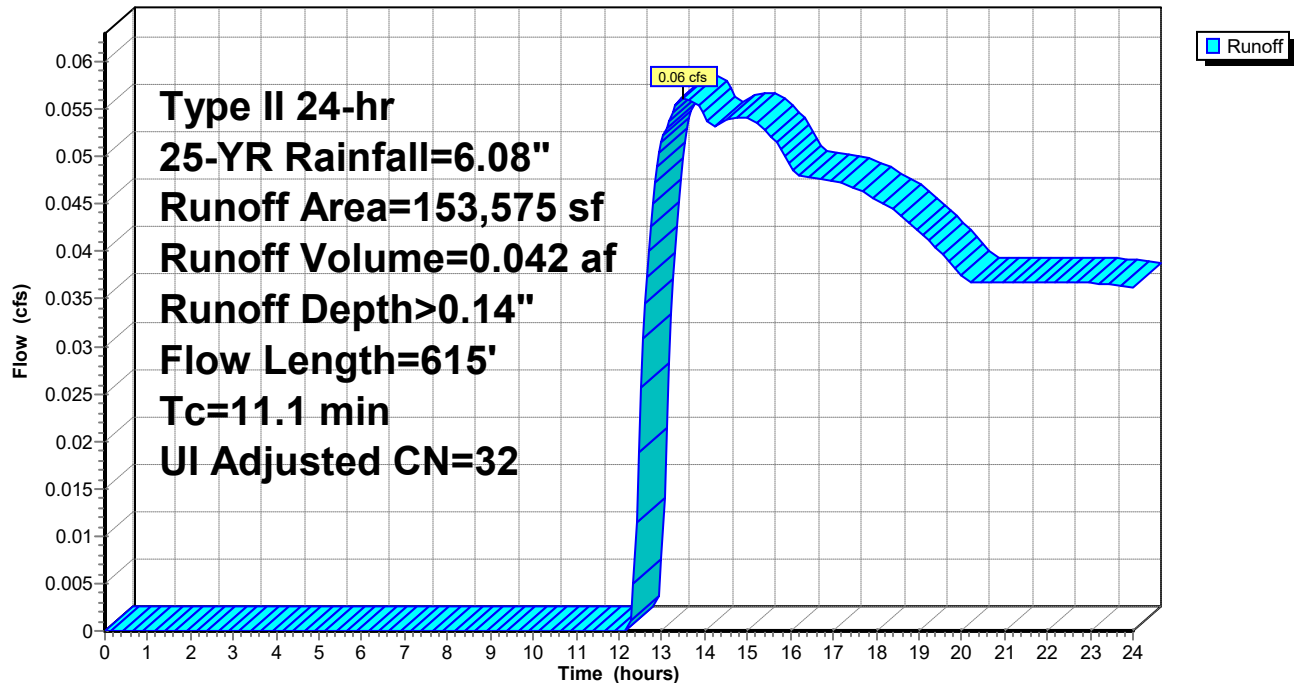
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-YR Rainfall=6.08"

Area (sf)	CN	Adj	Description
7,390	98		Unconnected pavement, HSG A
4,488	49		50-75% Grass cover, Fair, HSG A
141,697	30		Woods, Good, HSG A
153,575	34	32	Weighted Average, UI Adjusted
146,185			95.19% Pervious Area
7,390			4.81% Impervious Area
7,390			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.23		Sheet Flow, A-B
					Smooth surfaces n= 0.011 P2= 3.39"
10.4	565	0.0327	0.90		Shallow Concentrated Flow, B-C
					Woodland Kv= 5.0 fps
11.1	615	Total			

Subcatchment EW2: EW-2

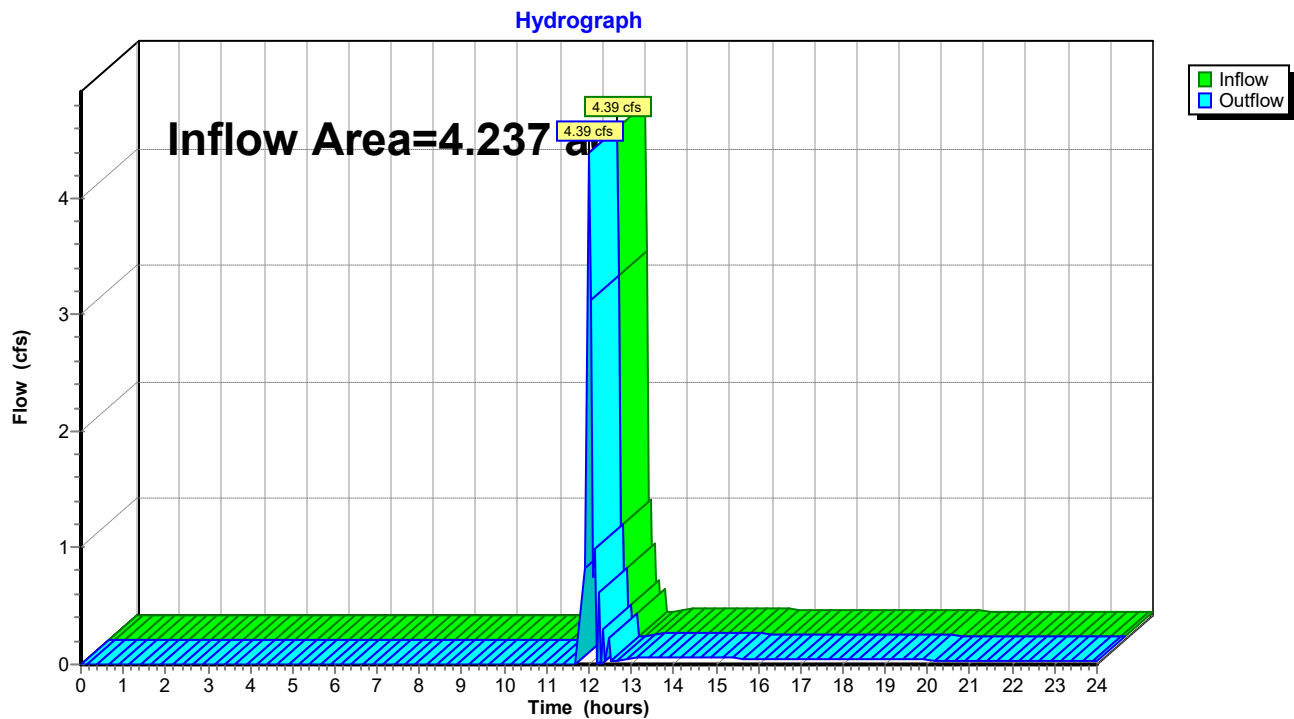
Hydrograph



Summary for Reach 1R: (new Reach)

Inflow Area = 4.237 ac, 17.70% Impervious, Inflow Depth > 0.24" for 25-YR event
Inflow = 4.39 cfs @ 12.02 hrs, Volume= 0.084 af
Outflow = 4.39 cfs @ 12.02 hrs, Volume= 0.084 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach 1R: (new Reach)

Summary for Pond 3P: Pond

Inflow Area = 0.711 ac, 81.61% Impervious, Inflow Depth > 4.59" for 25-YR event
 Inflow = 5.32 cfs @ 11.96 hrs, Volume= 0.272 af
 Outflow = 4.79 cfs @ 12.02 hrs, Volume= 0.272 af, Atten= 10%, Lag= 3.0 min
 Discarded = 0.40 cfs @ 12.00 hrs, Volume= 0.230 af
 Primary = 4.39 cfs @ 12.02 hrs, Volume= 0.042 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 77.11' @ 12.02 hrs Surf.Area= 2,084 sf Storage= 3,222 cf

Plug-Flow detention time= 54.5 min calculated for 0.272 af (100% of inflow)
 Center-of-Mass det. time= 54.2 min (844.6 - 790.4)

Volume	Invert	Avail.Storage	Storage Description
#1	75.00'	3,222 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
75.00	991	0	0
76.00	1,684	1,338	1,338
77.00	2,084	1,884	3,222

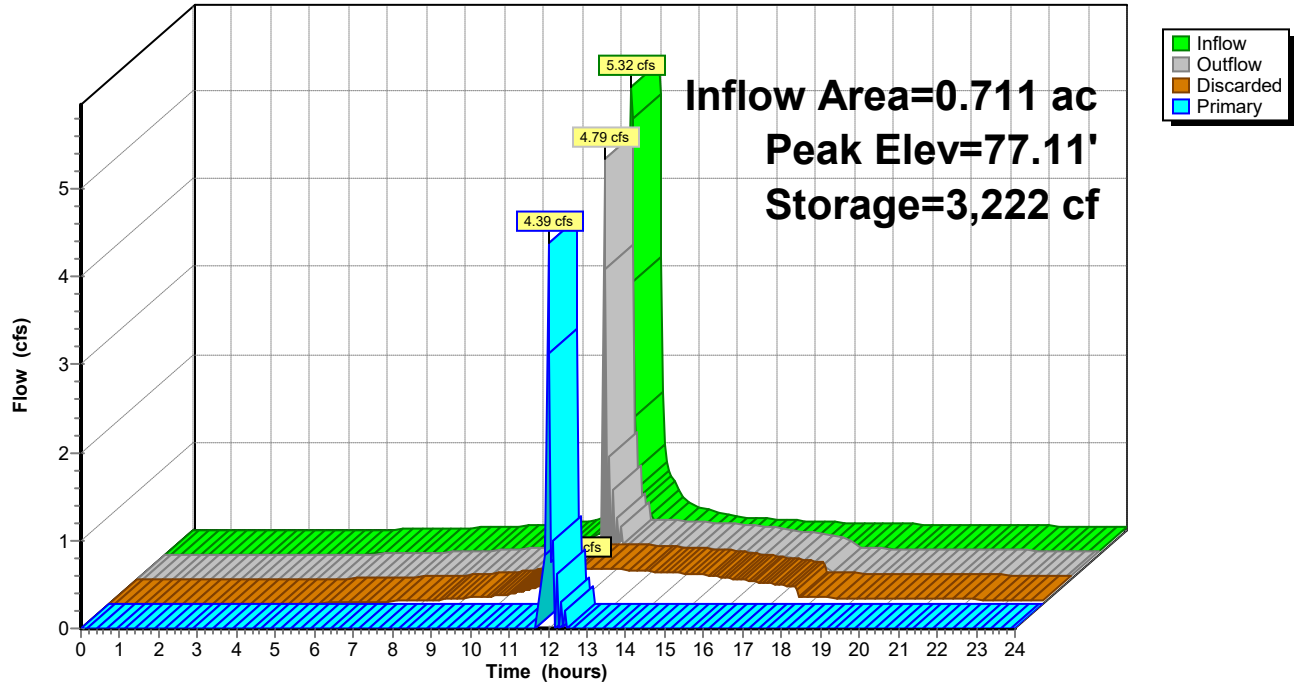
Device	Routing	Invert	Outlet Devices
#1	Discarded	75.00'	8.270 in/hr Exfiltration over Surface area
#2	Primary	77.00'	89.0' long x 4.0' breadth Broad-Crested Rectangular Weir
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00
			2.50 3.00 3.50 4.00 4.50 5.00 5.50
			Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66
			2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Discarded OutFlow Max=0.40 cfs @ 12.00 hrs HW=77.07' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.40 cfs)

Primary OutFlow Max=3.81 cfs @ 12.02 hrs HW=77.07' (Free Discharge)
 ↑2=Broad-Crested Rectangular Weir (Weir Controls 3.81 cfs @ 0.62 fps)

Pond 3P: Pond

Hydrograph



100-152 Existing HydroCAD

Type II 24-hr 100-Yr Rainfall=7.68"

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Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EW1: EW1

Runoff Area=30,979 sf 81.61% Impervious Runoff Depth>6.13"
Tc=6.0 min CN=87 Runoff=6.98 cfs 0.363 af

Subcatchment EW2: EW-2

Runoff Area=153,575 sf 4.81% Impervious Runoff Depth>0.47"
Flow Length=615' Tc=11.1 min UI Adjusted CN=32 Runoff=0.69 cfs 0.139 af

Reach 1R: (new Reach)

Inflow=8.31 cfs 0.231 af
Outflow=8.31 cfs 0.231 af

Pond 3P: Pond

Peak Elev=77.11' Storage=3,222 cf Inflow=6.98 cfs 0.363 af
Discarded=0.40 cfs 0.271 af Primary=8.26 cfs 0.092 af Outflow=8.66 cfs 0.363 af

Total Runoff Area = 4.237 ac Runoff Volume = 0.503 af Average Runoff Depth = 1.42"
82.30% Pervious = 3.487 ac 17.70% Impervious = 0.750 ac

100-152 Existing HydroCAD

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Type II 24-hr 100-Yr Rainfall=7.68"

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Summary for Subcatchment EW1: EW1

Runoff = 6.98 cfs @ 11.96 hrs, Volume= 0.363 af, Depth> 6.13"

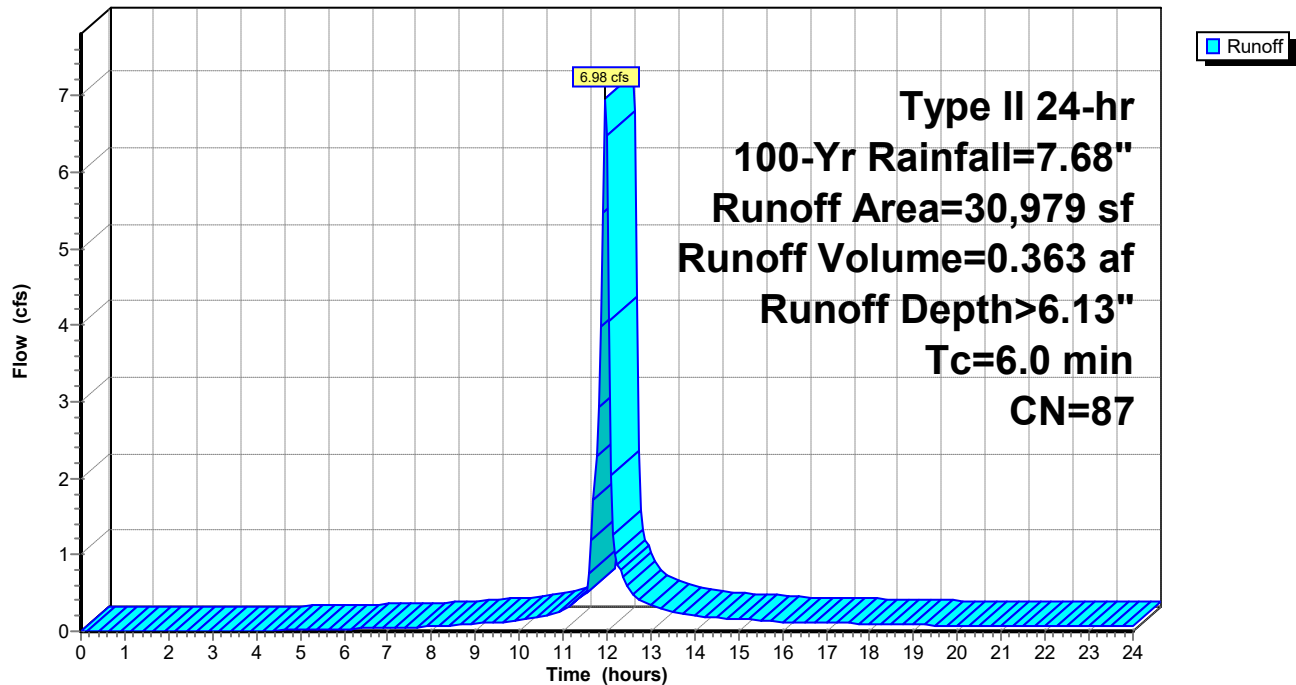
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Yr Rainfall=7.68"

	Area (sf)	CN	Description
*	20,183	98	Pavement/House
*	5,100	98	Pond
	5,696	39	>75% Grass cover, Good, HSG A
	30,979	87	Weighted Average
	5,696		18.39% Pervious Area
	25,283		81.61% Impervious Area

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

Subcatchment EW1: EW1

Hydrograph



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Type II 24-hr 100-Yr Rainfall=7.68"

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Summary for Subcatchment EW2: EW-2

Runoff = 0.69 cfs @ 12.11 hrs, Volume= 0.139 af, Depth> 0.47"

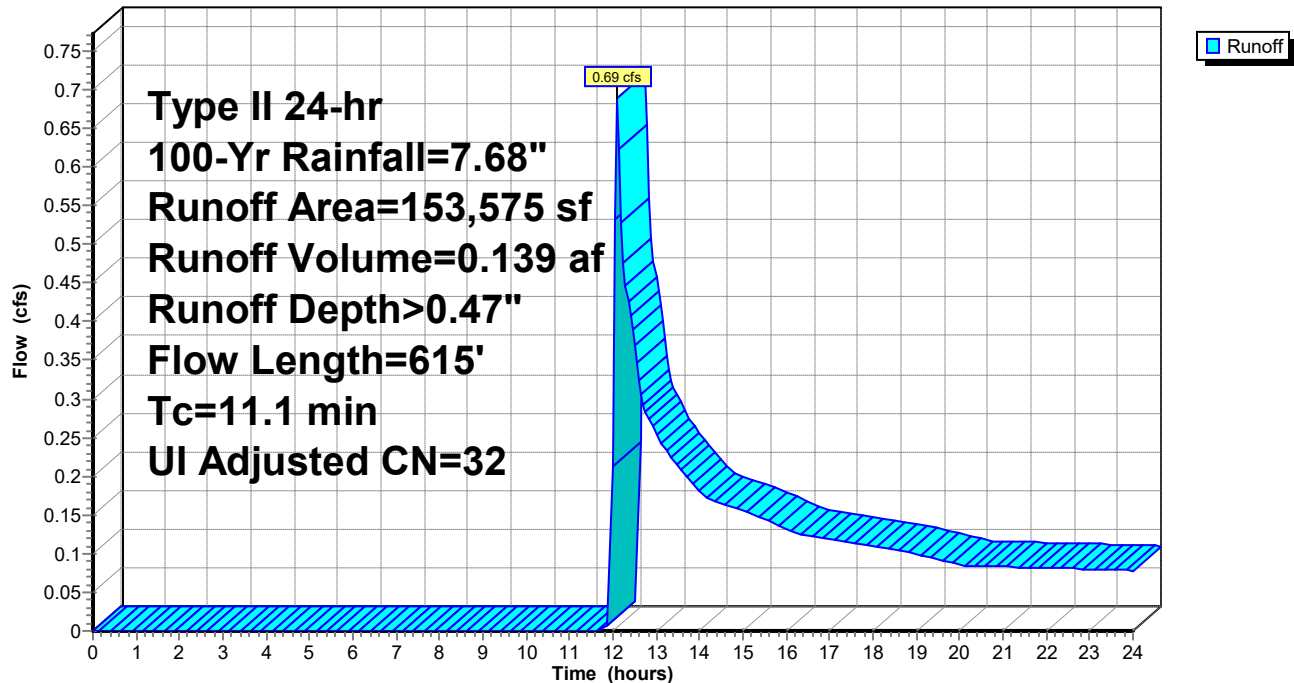
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Yr Rainfall=7.68"

Area (sf)	CN	Adj	Description
7,390	98		Unconnected pavement, HSG A
4,488	49		50-75% Grass cover, Fair, HSG A
141,697	30		Woods, Good, HSG A
153,575	34	32	Weighted Average, UI Adjusted
146,185			95.19% Pervious Area
7,390			4.81% Impervious Area
7,390			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.23		Sheet Flow, A-B
					Smooth surfaces n= 0.011 P2= 3.39"
10.4	565	0.0327	0.90		Shallow Concentrated Flow, B-C
					Woodland Kv= 5.0 fps
11.1	615	Total			

Subcatchment EW2: EW-2

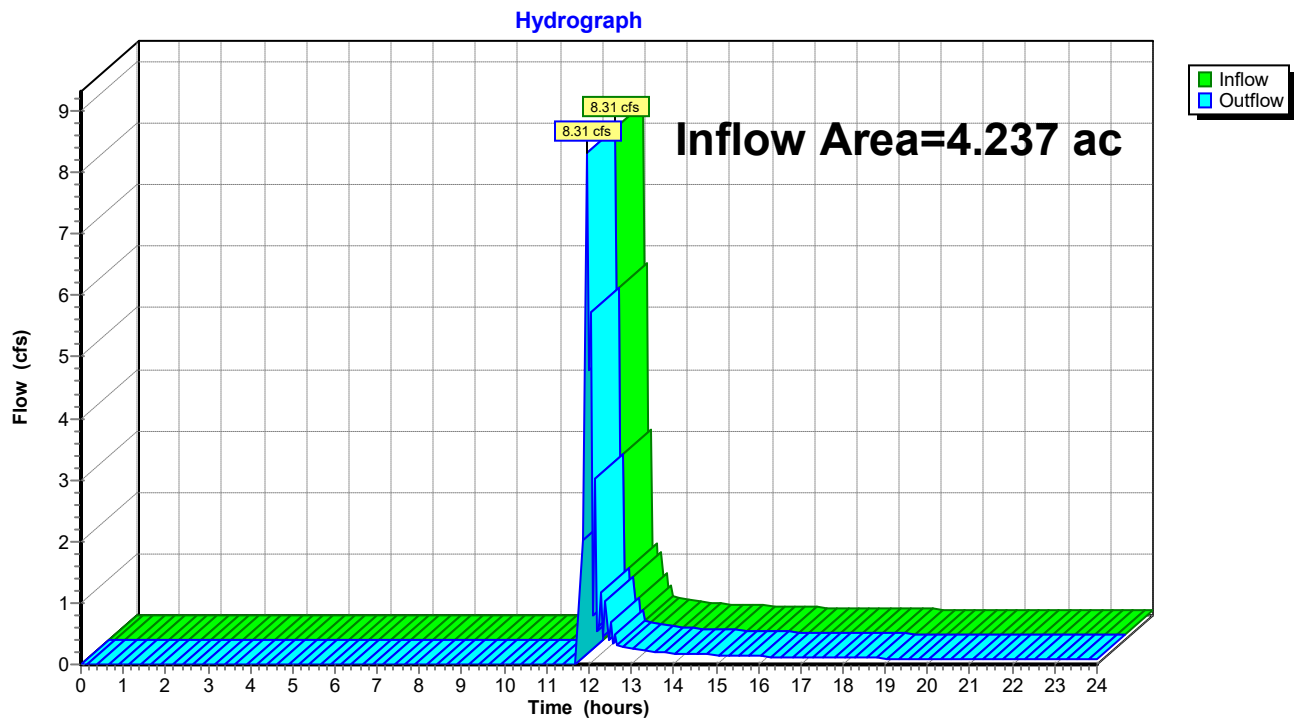
Hydrograph



Summary for Reach 1R: (new Reach)

Inflow Area = 4.237 ac, 17.70% Impervious, Inflow Depth > 0.66" for 100-Yr event
Inflow = 8.31 cfs @ 11.96 hrs, Volume= 0.231 af
Outflow = 8.31 cfs @ 11.96 hrs, Volume= 0.231 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach 1R: (new Reach)

Summary for Pond 3P: Pond

Inflow Area = 0.711 ac, 81.61% Impervious, Inflow Depth > 6.13" for 100-Yr event
 Inflow = 6.98 cfs @ 11.96 hrs, Volume= 0.363 af
 Outflow = 8.66 cfs @ 11.96 hrs, Volume= 0.363 af, Atten= 0%, Lag= 0.0 min
 Discarded = 0.40 cfs @ 11.95 hrs, Volume= 0.271 af
 Primary = 8.26 cfs @ 11.96 hrs, Volume= 0.092 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 77.11' @ 11.95 hrs Surf.Area= 2,084 sf Storage= 3,222 cf

Plug-Flow detention time= 49.0 min calculated for 0.363 af (100% of inflow)
 Center-of-Mass det. time= 48.6 min (831.0 - 782.4)

Volume	Invert	Avail.Storage	Storage Description
#1	75.00'	3,222 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
75.00	991	0	0
76.00	1,684	1,338	1,338
77.00	2,084	1,884	3,222

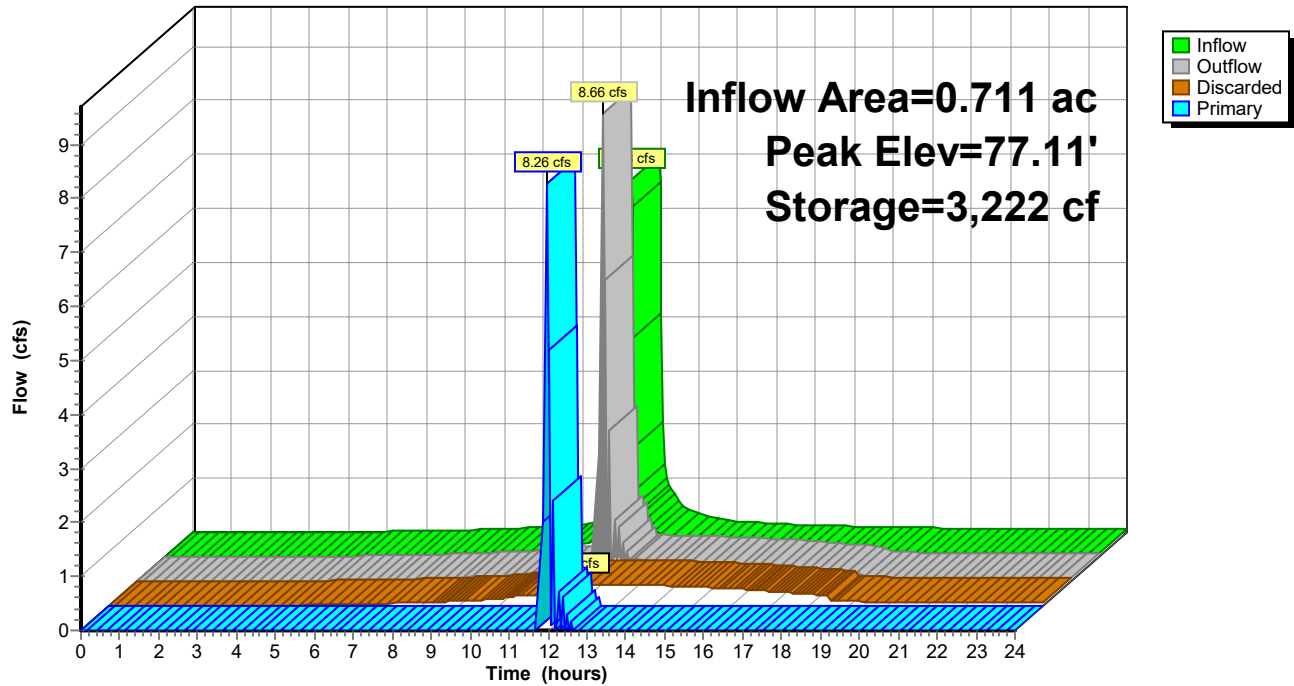
Device	Routing	Invert	Outlet Devices
#1	Discarded	75.00'	8.270 in/hr Exfiltration over Surface area
#2	Primary	77.00'	89.0' long x 4.0' breadth Broad-Crested Rectangular Weir
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00
			2.50 3.00 3.50 4.00 4.50 5.00 5.50
			Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66
			2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

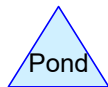
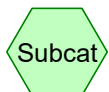
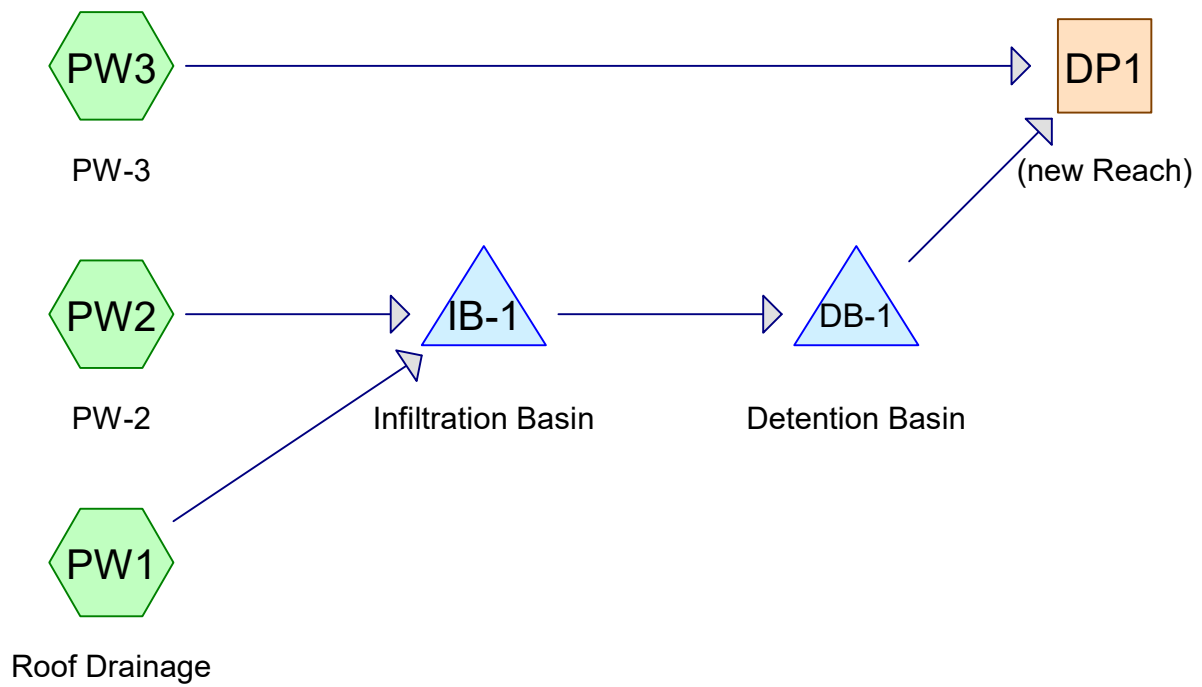
Discarded OutFlow Max=0.40 cfs @ 11.95 hrs HW=77.11' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.40 cfs)

Primary OutFlow Max=7.28 cfs @ 11.96 hrs HW=77.11' (Free Discharge)
 ↑2=Broad-Crested Rectangular Weir (Weir Controls 7.28 cfs @ 0.77 fps)

Pond 3P: Pond

Hydrograph





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Page 2

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.092	39	>75% Grass cover, Good, HSG A (PW2, PW3)
0.326	98	Basin Area, HSG A (PW2)
0.618	98	Buildings (PW1)
1.296	98	Pavement (PW2)
0.903	30	Woods, Good, HSG A (PW3)
4.237	68	TOTAL AREA

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Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
2.322	HSG A	PW2, PW3
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
1.915	Other	PW1, PW2
4.237		TOTAL AREA

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Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
1.092	0.000	0.000	0.000	0.000	1.092	>75% Grass cover, Good	PW2, PW3
0.326	0.000	0.000	0.000	0.000	0.326	Basin Area	PW2
0.000	0.000	0.000	0.000	0.618	0.618	Buildings	PW1
0.000	0.000	0.000	0.000	1.296	1.296	Pavement	PW2
0.903	0.000	0.000	0.000	0.000	0.903	Woods, Good	PW3
2.322	0.000	0.000	0.000	1.915	4.237	TOTAL AREA	

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Pipe Listing (selected nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	DB-1	64.00	63.00	50.0	0.0200	0.012	18.0	0.0	0.0

100-152 Proposed HydroCAD*Type III 24-hr 2-YR Rainfall=3.40"*

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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 PW1: Roof Drainage Runoff Area=26,941 sf 100.00% Impervious Runoff Depth=3.17"
Tc=6.0 min CN=98 Runoff=2.00 cfs 0.163 af

Subcatchment PW2: PW-2 Runoff Area=87,189 sf 81.06% Impervious Runoff Depth=2.09"
Tc=6.0 min CN=87 Runoff=4.80 cfs 0.349 af

Subcatchment PW3: PW-3 Runoff Area=70,424 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=86' Tc=6.0 min CN=34 Runoff=0.00 cfs 0.000 af

Reach DP1: (new Reach) Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Pond DB-1: Detention Basin Peak Elev=64.00' Storage=0 cf Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Pond IB-1: Infiltration Basin Peak Elev=67.18' Storage=7,860 cf Inflow=6.79 cfs 0.512 af
Discarded=0.84 cfs 0.512 af Primary=0.00 cfs 0.000 af Outflow=0.84 cfs 0.512 af

Total Runoff Area = 4.237 ac Runoff Volume = 0.512 af Average Runoff Depth = 1.45"
47.11% Pervious = 1.996 ac 52.89% Impervious = 2.241 ac

100-152 Proposed HydroCAD

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Type III 24-hr 2-YR Rainfall=3.40"

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Summary for Subcatchment PW1: Roof Drainage

Runoff = 2.00 cfs @ 12.09 hrs, Volume= 0.163 af, Depth= 3.17"

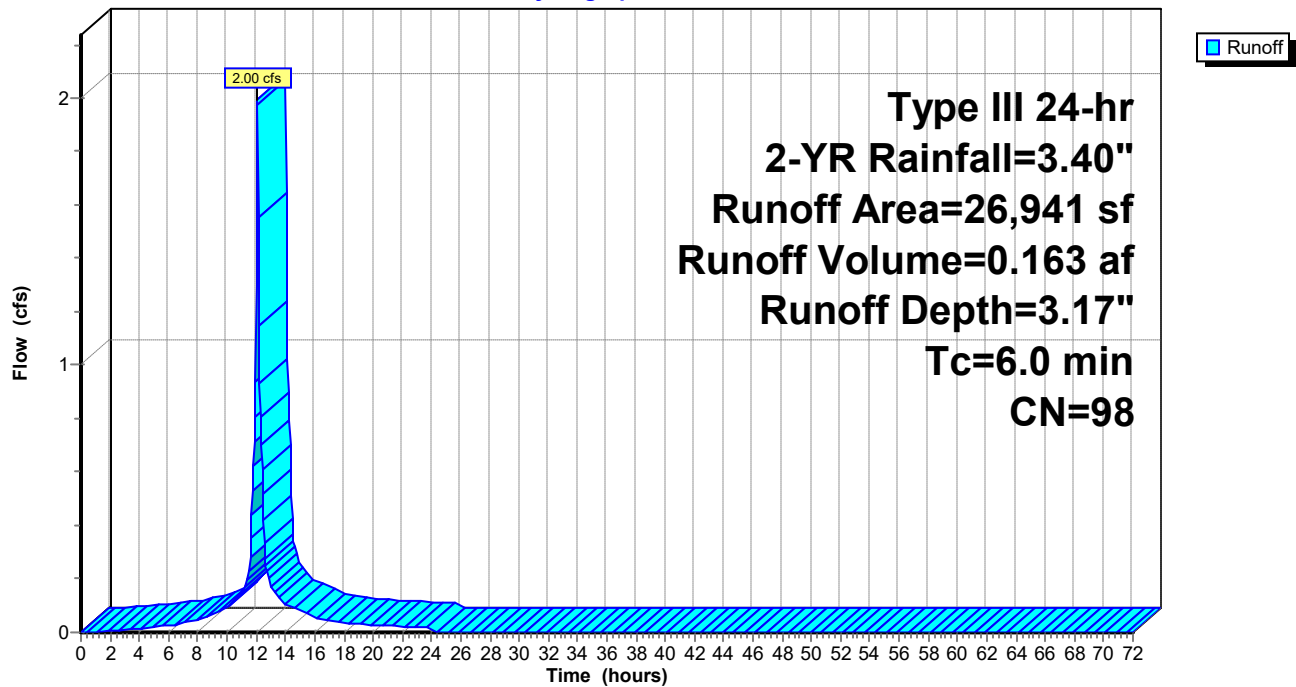
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.40"

	Area (sf)	CN	Description
*	26,941	98	Buildings
	26,941		100.00% Impervious Area

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

Subcatchment PW1: Roof Drainage

Hydrograph



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Type III 24-hr 2-YR Rainfall=3.40"

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Summary for Subcatchment PW2: PW-2

Runoff = 4.80 cfs @ 12.09 hrs, Volume= 0.349 af, Depth= 2.09"

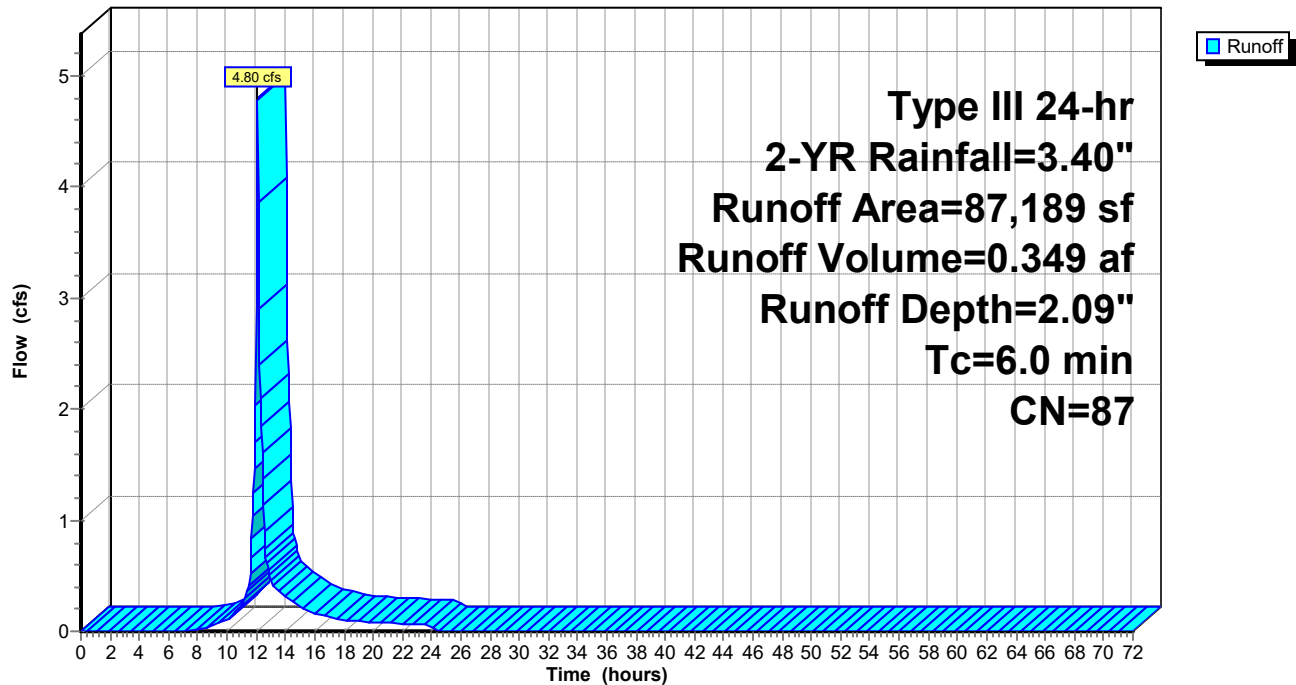
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.40"

	Area (sf)	CN	Description
*	56,459	98	Pavement
	16,514	39	>75% Grass cover, Good, HSG A
*	14,216	98	Basin Area, HSG A
	87,189	87	Weighted Average
	16,514		18.94% Pervious Area
	70,675		81.06% Impervious Area

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

Subcatchment PW2: PW-2

Hydrograph



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Type III 24-hr 2-YR Rainfall=3.40"

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Summary for Subcatchment PW3: PW-3

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

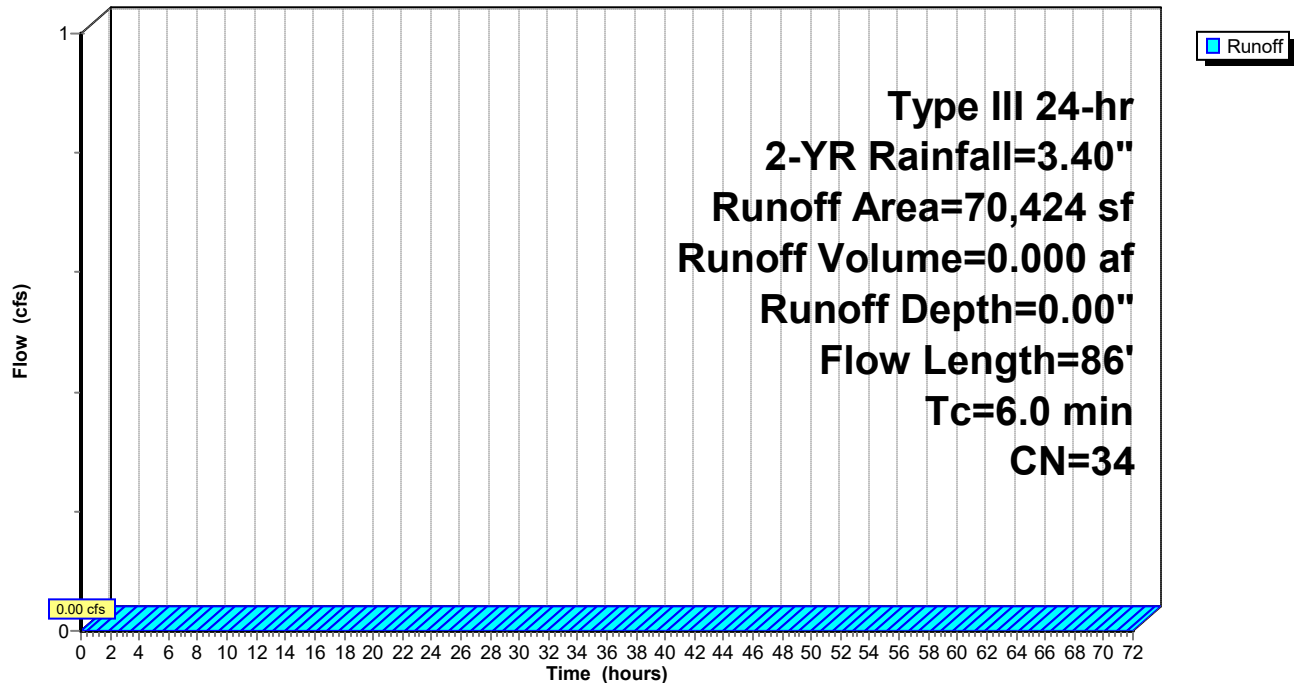
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.40"

Area (sf)	CN	Description
31,070	39	>75% Grass cover, Good, HSG A
39,354	30	Woods, Good, HSG A
70,424	34	Weighted Average
70,424		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	50	0.0400	0.20		Sheet Flow, Grass: Short n= 0.150 P2= 3.39"
0.2	36	0.0474	3.51		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
1.7					Direct Entry, Direct
6.0	86	Total			

Subcatchment PW3: PW-3

Hydrograph

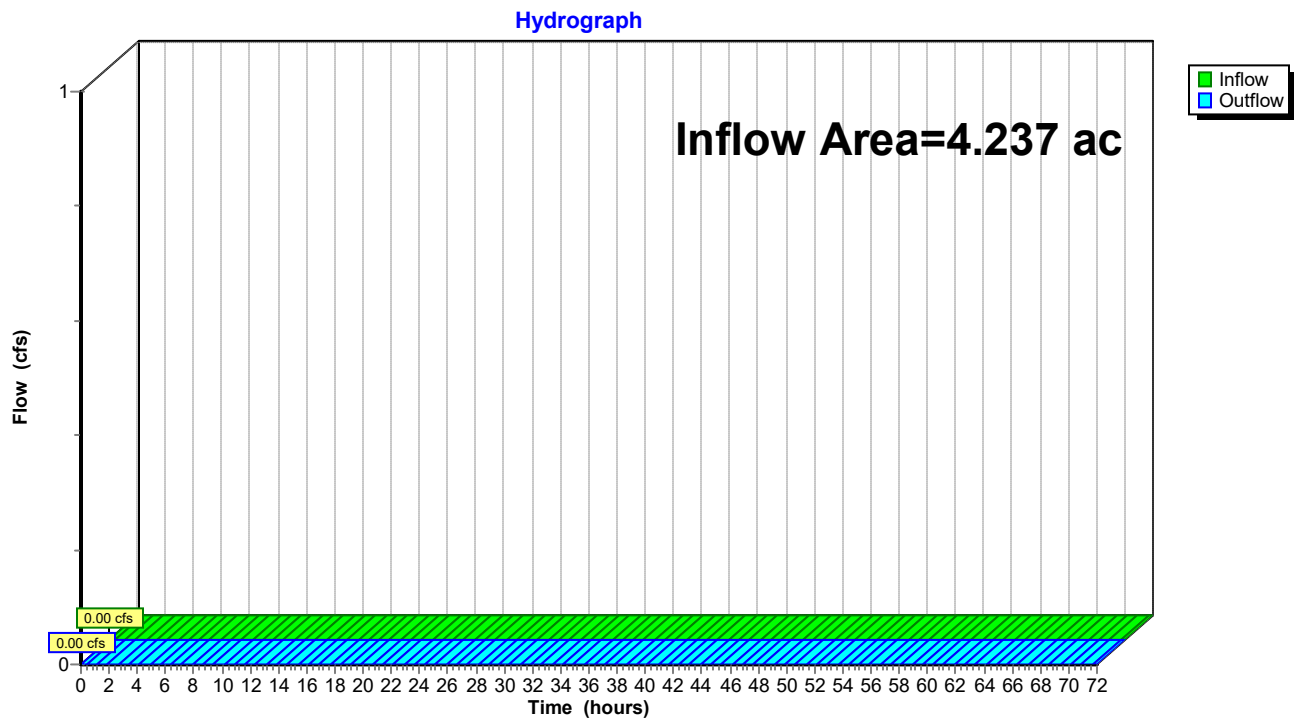


Summary for Reach DP1: (new Reach)

Inflow Area = 4.237 ac, 52.89% Impervious, Inflow Depth = 0.00" for 2-YR event
 Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 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 DP1: (new Reach)



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Type III 24-hr 2-YR Rainfall=3.40"

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Summary for Pond DB-1: Detention Basin

Inflow Area = 2.620 ac, 85.53% Impervious, Inflow Depth = 0.00" for 2-YR event
 Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
 Peak Elev= 64.00' @ 0.00 hrs Surf.Area= 2,787 sf Storage= 0 cf

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

Volume	Invert	Avail.Storage	Storage Description
#1	64.00'	22,935 cf	Infiltration Basin/Sediment Forebay (Prismatic) Listed below (Recalc)

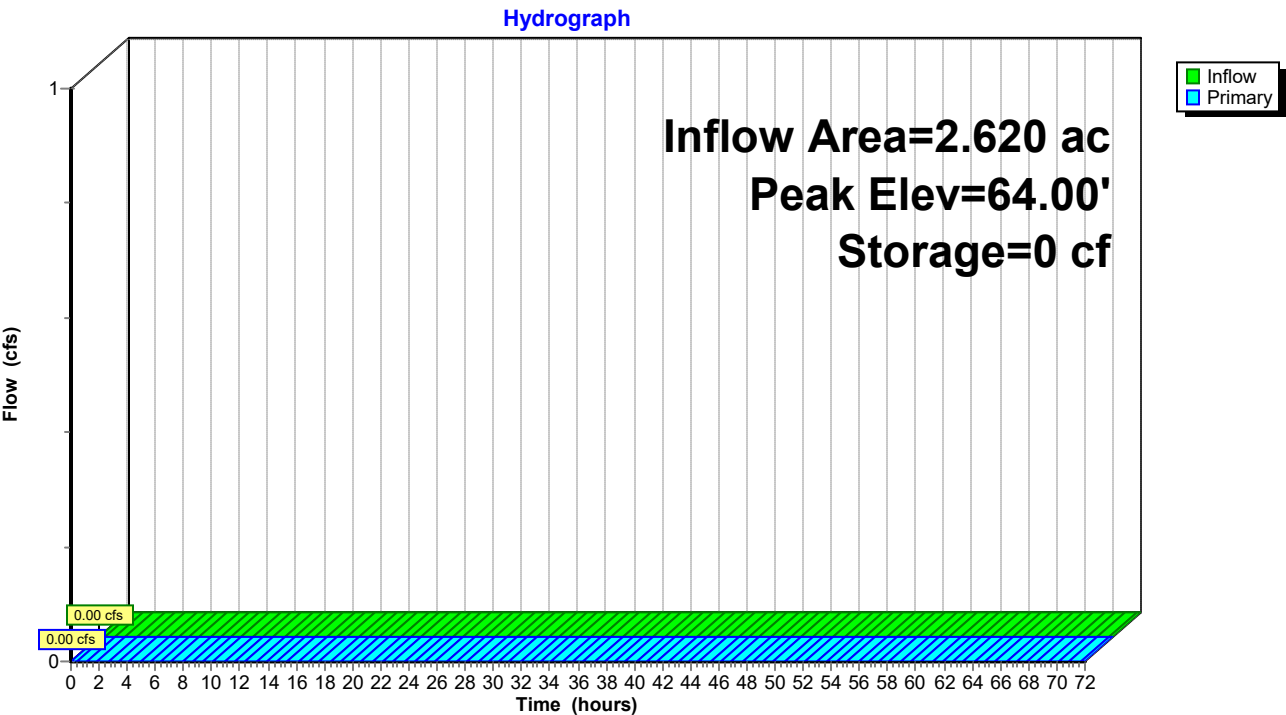
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
64.00	2,787	0	0
65.00	3,440	3,114	3,114
66.00	4,148	3,794	6,908
67.00	4,913	4,531	11,438
68.00	5,734	5,324	16,762
69.00	6,612	6,173	22,935

Device	Routing	Invert	Outlet Devices
#1	Primary	64.00'	18.0" Round Culvert L= 50.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 64.00' / 63.00' S= 0.0200 ' S= 0.0200 ' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 1.77 sf
#2	Device 1	64.00'	8.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	66.80'	24.0" W x 8.0" H Vert. Orifice/Grate C= 0.600

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=64.00' (Free Discharge)

↑ **1=Culvert** (Controls 0.00 cfs)
 ↑ **2=Orifice/Grate** (Controls 0.00 cfs)
 ↑ **3=Orifice/Grate** (Controls 0.00 cfs)

Pond DB-1: Detention Basin



100-152 Proposed HydroCAD

Type III 24-hr 2-YR Rainfall=3.40"

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Summary for Pond IB-1: Infiltration Basin

Inflow Area = 2.620 ac, 85.53% Impervious, Inflow Depth = 2.35" for 2-YR event
 Inflow = 6.79 cfs @ 12.09 hrs, Volume= 0.512 af
 Outflow = 0.84 cfs @ 12.73 hrs, Volume= 0.512 af, Atten= 88%, Lag= 38.2 min
 Discarded = 0.84 cfs @ 12.73 hrs, Volume= 0.512 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
 Peak Elev= 67.18' @ 12.73 hrs Surf.Area= 4,370 sf Storage= 7,860 cf

Plug-Flow detention time= 77.2 min calculated for 0.512 af (100% of inflow)
 Center-of-Mass det. time= 77.1 min (873.9 - 796.8)

Volume	Invert	Avail.Storage	Storage Description
#1	65.00'	17,114 cf	Infiltration Basin/Sediment Forebay (Prismatic) Listed below (Recalc)

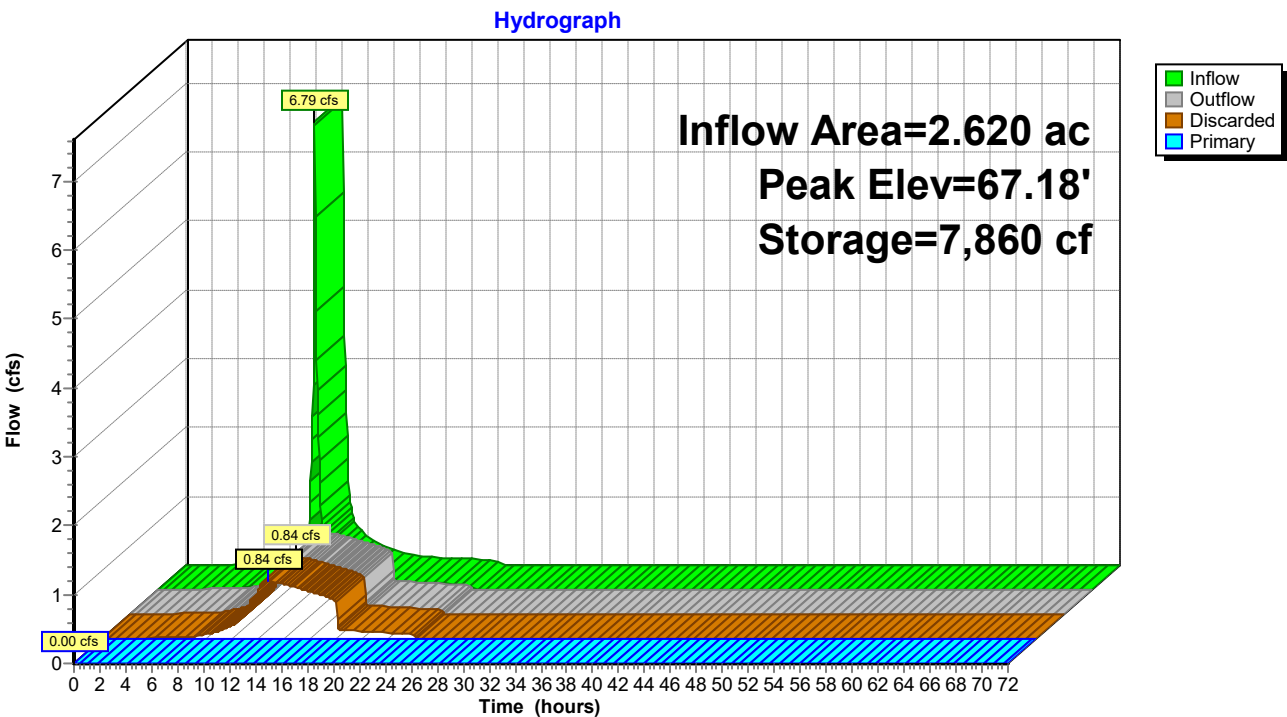
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
65.00	2,890	0	0
66.00	3,535	3,213	3,213
67.00	4,236	3,886	7,098
68.00	4,994	4,615	11,713
69.00	5,808	5,401	17,114

Device	Routing	Invert	Outlet Devices
#1	Discarded	65.00'	8.270 in/hr Exfiltration over Surface area
#2	Primary	67.30'	12.0' long x 8.0' breadth Broad-Crested Rectangular Weir
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00
			2.50 3.00 3.50 4.00 4.50 5.00 5.50
			Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64
			2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

Discarded OutFlow Max=0.84 cfs @ 12.73 hrs HW=67.18' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.84 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=65.00' (Free Discharge)
 ↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond IB-1: Infiltration Basin



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Type III 24-hr 10-YR Rainfall=5.05"

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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 PW1: Roof DrainageRunoff Area=26,941 sf 100.00% Impervious Runoff Depth=4.81"
Tc=6.0 min CN=98 Runoff=2.98 cfs 0.248 af**Subcatchment PW2: PW-2**Runoff Area=87,189 sf 81.06% Impervious Runoff Depth=3.61"
Tc=6.0 min CN=87 Runoff=8.14 cfs 0.603 af**Subcatchment PW3: PW-3**Runoff Area=70,424 sf 0.00% Impervious Runoff Depth=0.07"
Flow Length=86' Tc=6.0 min CN=34 Runoff=0.01 cfs 0.009 af**Reach DP1: (new Reach)**Inflow=1.60 cfs 0.170 af
Outflow=1.60 cfs 0.170 af**Pond DB-1: Detention Basin**Peak Elev=65.24' Storage=3,953 cf Inflow=5.63 cfs 0.161 af
Outflow=1.60 cfs 0.161 af**Pond IB-1: Infiltration Basin**Peak Elev=67.63' Storage=9,909 cf Inflow=11.12 cfs 0.851 af
Discarded=0.90 cfs 0.690 af Primary=5.63 cfs 0.161 af Outflow=6.53 cfs 0.851 af**Total Runoff Area = 4.237 ac Runoff Volume = 0.860 af Average Runoff Depth = 2.44"**
47.11% Pervious = 1.996 ac 52.89% Impervious = 2.241 ac

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Type III 24-hr 10-YR Rainfall=5.05"

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Summary for Subcatchment PW1: Roof Drainage

Runoff = 2.98 cfs @ 12.09 hrs, Volume= 0.248 af, Depth= 4.81"

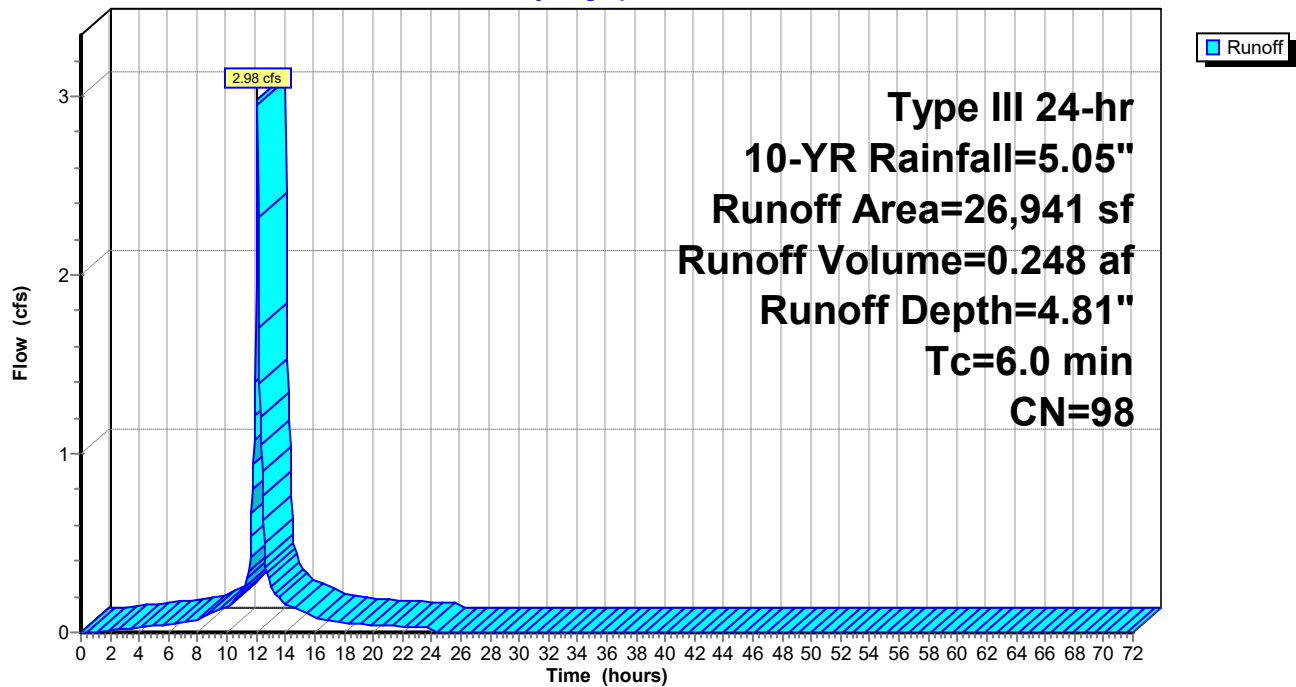
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=5.05"

	Area (sf)	CN	Description
*	26,941	98	Buildings
	26,941		100.00% Impervious Area

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

Subcatchment PW1: Roof Drainage

Hydrograph



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Type III 24-hr 10-YR Rainfall=5.05"

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Summary for Subcatchment PW2: PW-2

Runoff = 8.14 cfs @ 12.09 hrs, Volume= 0.603 af, Depth= 3.61"

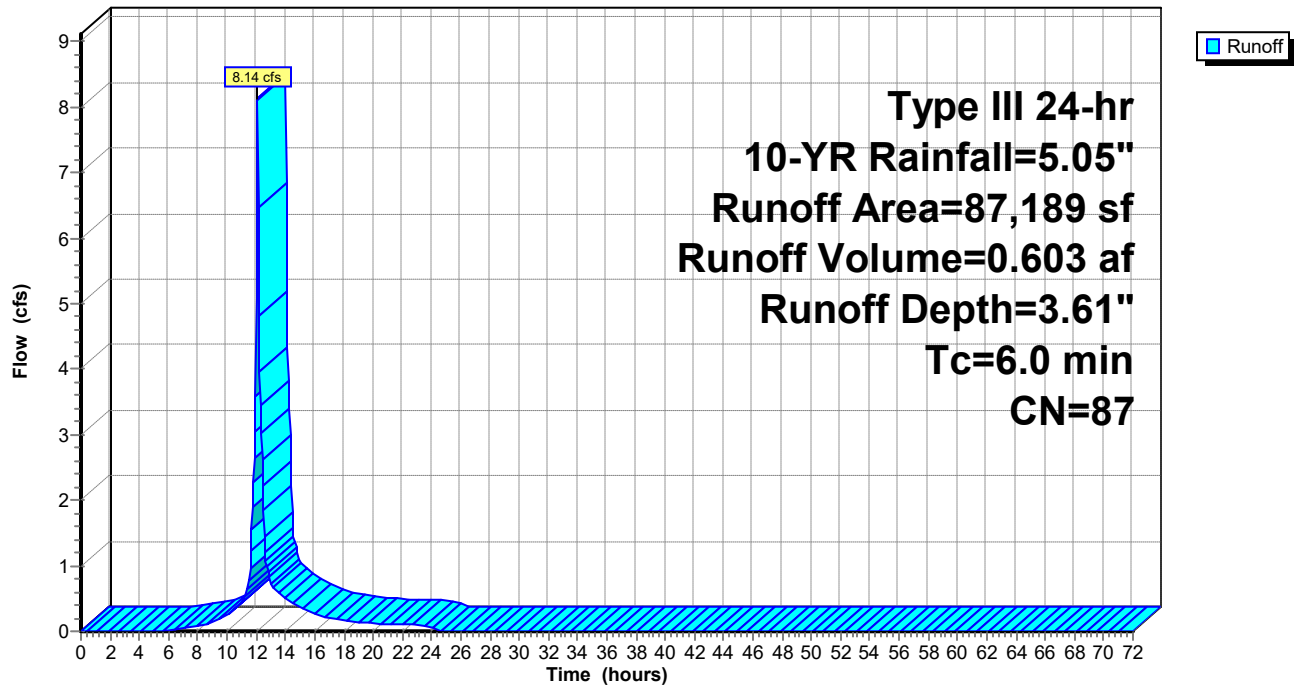
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=5.05"

	Area (sf)	CN	Description
*	56,459	98	Pavement
	16,514	39	>75% Grass cover, Good, HSG A
*	14,216	98	Basin Area, HSG A
	87,189	87	Weighted Average
	16,514		18.94% Pervious Area
	70,675		81.06% Impervious Area

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

Subcatchment PW2: PW-2

Hydrograph



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Type III 24-hr 10-YR Rainfall=5.05"

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Summary for Subcatchment PW3: PW-3

Runoff = 0.01 cfs @ 15.40 hrs, Volume= 0.009 af, Depth= 0.07"

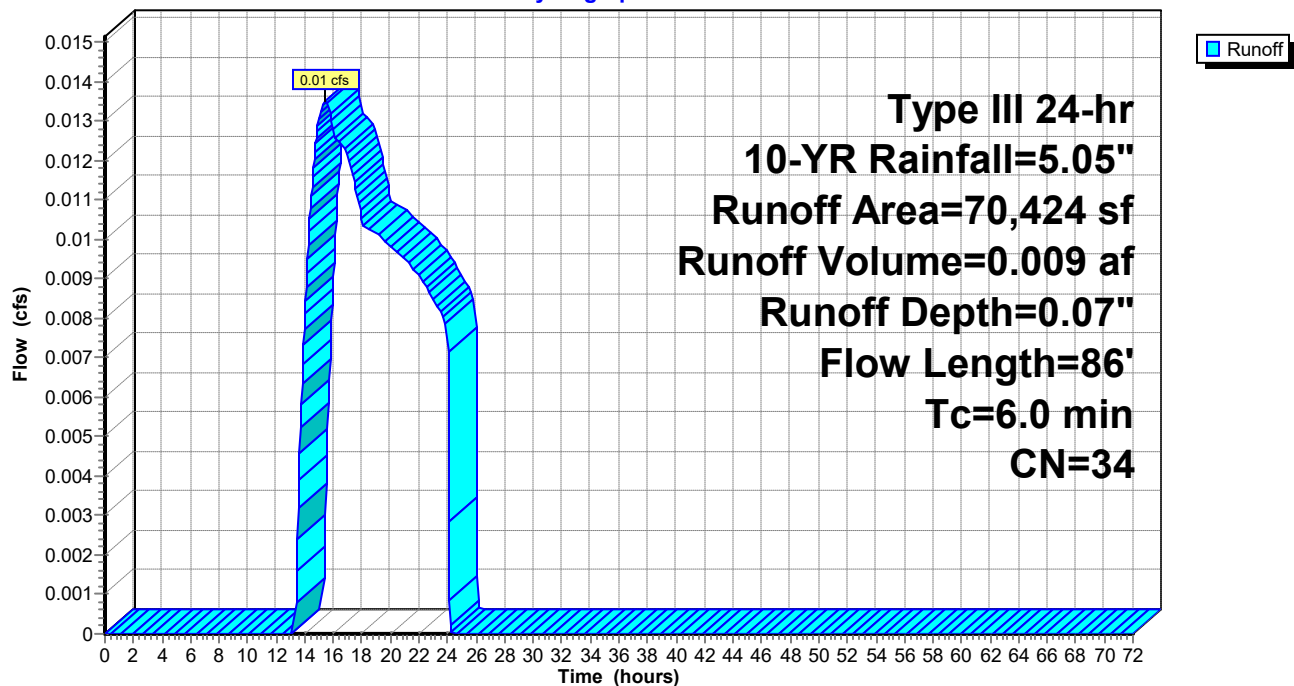
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=5.05"

Area (sf)	CN	Description
31,070	39	>75% Grass cover, Good, HSG A
39,354	30	Woods, Good, HSG A
70,424	34	Weighted Average
70,424		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	50	0.0400	0.20		Sheet Flow, Grass: Short n= 0.150 P2= 3.39"
0.2	36	0.0474	3.51		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
1.7					Direct Entry, Direct
6.0	86	Total			

Subcatchment PW3: PW-3

Hydrograph

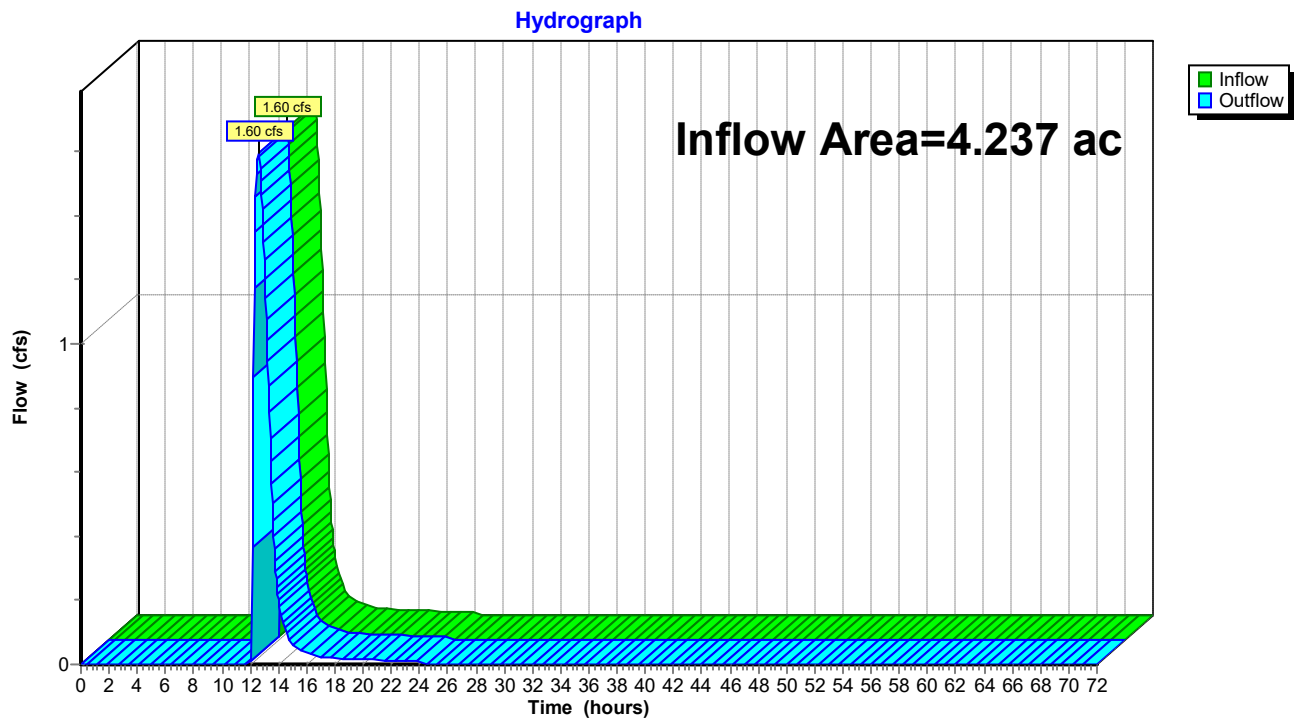


Summary for Reach DP1: (new Reach)

Inflow Area = 4.237 ac, 52.89% Impervious, Inflow Depth = 0.48" for 10-YR event
 Inflow = 1.60 cfs @ 12.57 hrs, Volume= 0.170 af
 Outflow = 1.60 cfs @ 12.57 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= 0.05 hrs

Reach DP1: (new Reach)



100-152 Proposed HydroCAD

Type III 24-hr 10-YR Rainfall=5.05"

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Summary for Pond DB-1: Detention Basin

Inflow Area = 2.620 ac, 85.53% Impervious, Inflow Depth = 0.74" for 10-YR event
 Inflow = 5.63 cfs @ 12.22 hrs, Volume= 0.161 af
 Outflow = 1.60 cfs @ 12.57 hrs, Volume= 0.161 af, Atten= 72%, Lag= 21.1 min
 Primary = 1.60 cfs @ 12.57 hrs, Volume= 0.161 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
 Peak Elev= 65.24' @ 12.57 hrs Surf.Area= 3,609 sf Storage= 3,953 cf

Plug-Flow detention time= 49.3 min calculated for 0.161 af (100% of inflow)
 Center-of-Mass det. time= 48.7 min (793.0 - 744.3)

Volume	Invert	Avail.Storage	Storage Description
#1	64.00'	22,935 cf	Infiltration Basin/Sediment Forebay (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
64.00	2,787	0	0
65.00	3,440	3,114	3,114
66.00	4,148	3,794	6,908
67.00	4,913	4,531	11,438
68.00	5,734	5,324	16,762
69.00	6,612	6,173	22,935

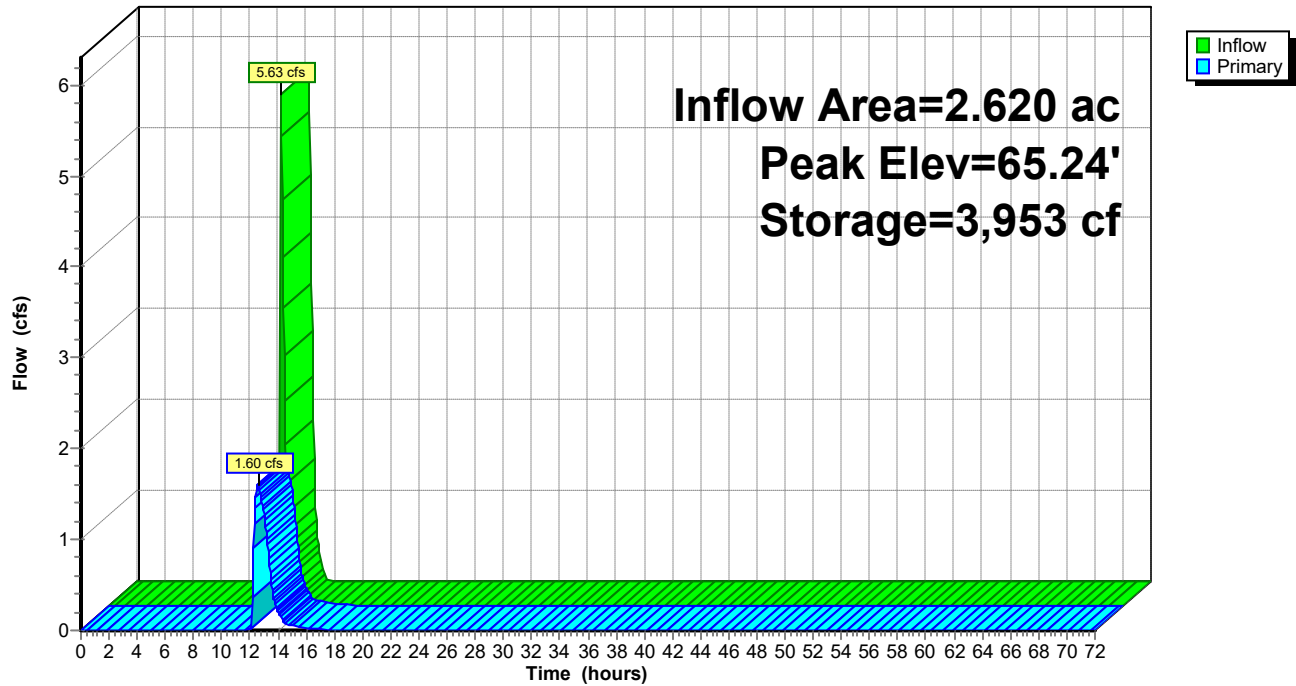
Device	Routing	Invert	Outlet Devices
#1	Primary	64.00'	18.0" Round Culvert L= 50.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 64.00' / 63.00' S= 0.0200 ' S= 0.0200 ' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 1.77 sf
#2	Device 1	64.00'	8.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	66.80'	24.0" W x 8.0" H Vert. Orifice/Grate C= 0.600

Primary OutFlow Max=1.60 cfs @ 12.57 hrs HW=65.24' (Free Discharge)

↑ **1=Culvert** (Passes 1.60 cfs of 7.37 cfs potential flow)
 ↑ **2=Orifice/Grate** (Orifice Controls 1.60 cfs @ 4.57 fps)
 ↑ **3=Orifice/Grate** (Controls 0.00 cfs)

Pond DB-1: Detention Basin

Hydrograph



100-152 Proposed HydroCAD

Type III 24-hr 10-YR Rainfall=5.05"

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Summary for Pond IB-1: Infiltration Basin

Inflow Area = 2.620 ac, 85.53% Impervious, Inflow Depth = 3.90" for 10-YR event
 Inflow = 11.12 cfs @ 12.09 hrs, Volume= 0.851 af
 Outflow = 6.53 cfs @ 12.22 hrs, Volume= 0.851 af, Atten= 41%, Lag= 7.9 min
 Discarded = 0.90 cfs @ 12.22 hrs, Volume= 0.690 af
 Primary = 5.63 cfs @ 12.22 hrs, Volume= 0.161 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
 Peak Elev= 67.63' @ 12.22 hrs Surf.Area= 4,712 sf Storage= 9,909 cf

Plug-Flow detention time= 71.0 min calculated for 0.850 af (100% of inflow)
 Center-of-Mass det. time= 71.0 min (856.4 - 785.4)

Volume	Invert	Avail.Storage	Storage Description
#1	65.00'	17,114 cf	Infiltration Basin/Sediment Forebay (Prismatic) Listed below (Recalc)

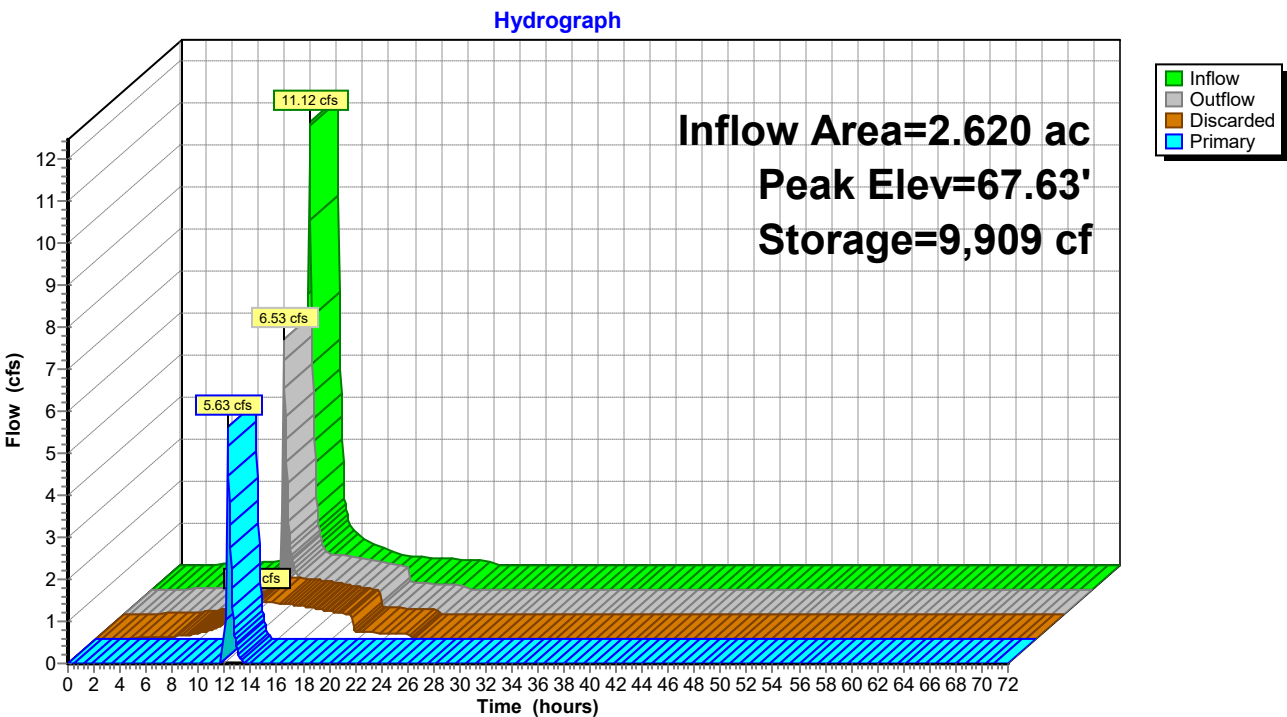
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
65.00	2,890	0	0
66.00	3,535	3,213	3,213
67.00	4,236	3,886	7,098
68.00	4,994	4,615	11,713
69.00	5,808	5,401	17,114

Device	Routing	Invert	Outlet Devices
#1	Discarded	65.00'	8.270 in/hr Exfiltration over Surface area
#2	Primary	67.30'	12.0' long x 8.0' breadth Broad-Crested Rectangular Weir
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00
			2.50 3.00 3.50 4.00 4.50 5.00 5.50
			Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64
			2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

Discarded OutFlow Max=0.90 cfs @ 12.22 hrs HW=67.62' (Free Discharge)
 ↑ **1=Exfiltration** (Exfiltration Controls 0.90 cfs)

Primary OutFlow Max=5.30 cfs @ 12.22 hrs HW=67.62' (Free Discharge)
 ↑ **2=Broad-Crested Rectangular Weir** (Weir Controls 5.30 cfs @ 1.40 fps)

Pond IB-1: Infiltration Basin



100-152 Proposed HydroCAD*Type III 24-hr 25-YR Rainfall=6.08"*

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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 PW1: Roof DrainageRunoff Area=26,941 sf 100.00% Impervious Runoff Depth=5.84"
Tc=6.0 min CN=98 Runoff=3.60 cfs 0.301 af**Subcatchment PW2: PW-2**Runoff Area=87,189 sf 81.06% Impervious Runoff Depth=4.59"
Tc=6.0 min CN=87 Runoff=10.23 cfs 0.766 af**Subcatchment PW3: PW-3**Runoff Area=70,424 sf 0.00% Impervious Runoff Depth=0.22"
Flow Length=86' Tc=6.0 min CN=34 Runoff=0.06 cfs 0.030 af**Reach DP1: (new Reach)**Inflow=2.28 cfs 0.321 af
Outflow=2.28 cfs 0.321 af**Pond DB-1: Detention Basin**Peak Elev=66.10' Storage=7,314 cf Inflow=10.55 cfs 0.291 af
Outflow=2.23 cfs 0.291 af**Pond IB-1: Infiltration Basin**Peak Elev=67.78' Storage=10,654 cf Inflow=13.83 cfs 1.067 af
Discarded=0.92 cfs 0.776 af Primary=10.55 cfs 0.291 af Outflow=11.47 cfs 1.067 af**Total Runoff Area = 4.237 ac Runoff Volume = 1.097 af Average Runoff Depth = 3.11"**
47.11% Pervious = 1.996 ac 52.89% Impervious = 2.241 ac

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Type III 24-hr 25-YR Rainfall=6.08"

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Summary for Subcatchment PW1: Roof Drainage

Runoff = 3.60 cfs @ 12.09 hrs, Volume= 0.301 af, Depth= 5.84"

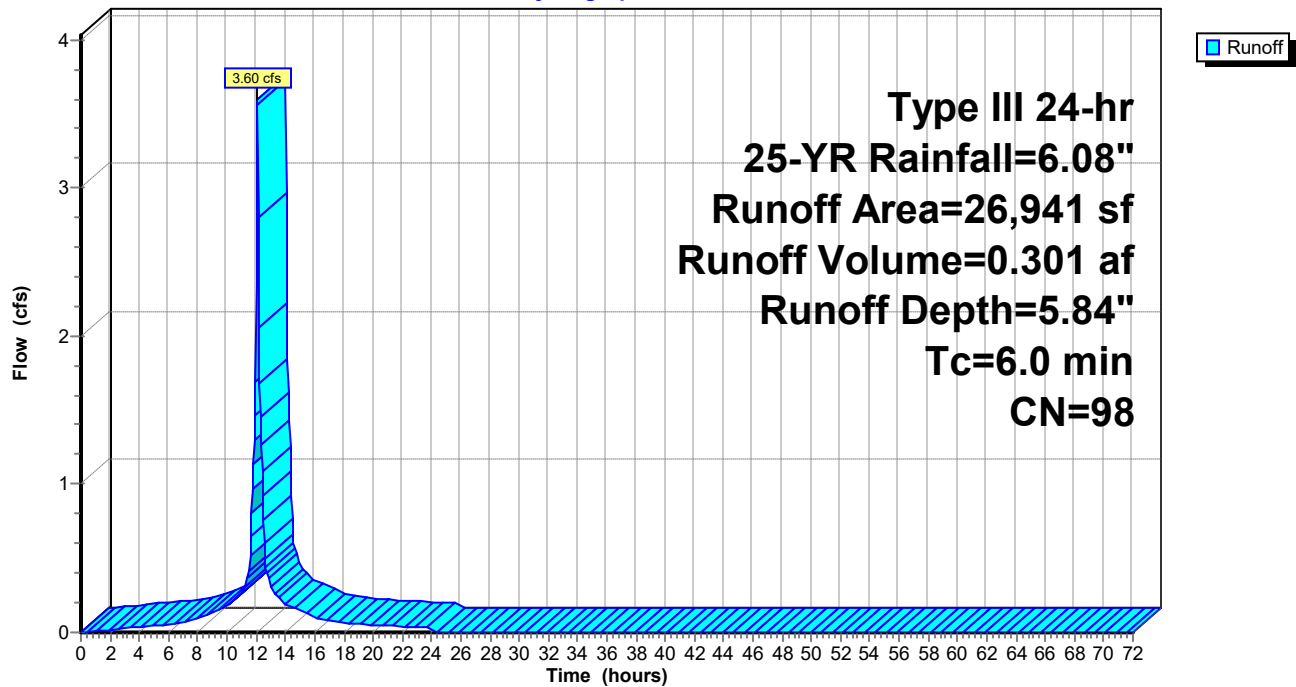
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.08"

	Area (sf)	CN	Description
*	26,941	98	Buildings
	26,941		100.00% Impervious Area

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

Subcatchment PW1: Roof Drainage

Hydrograph



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Type III 24-hr 25-YR Rainfall=6.08"

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Summary for Subcatchment PW2: PW-2

Runoff = 10.23 cfs @ 12.09 hrs, Volume= 0.766 af, Depth= 4.59"

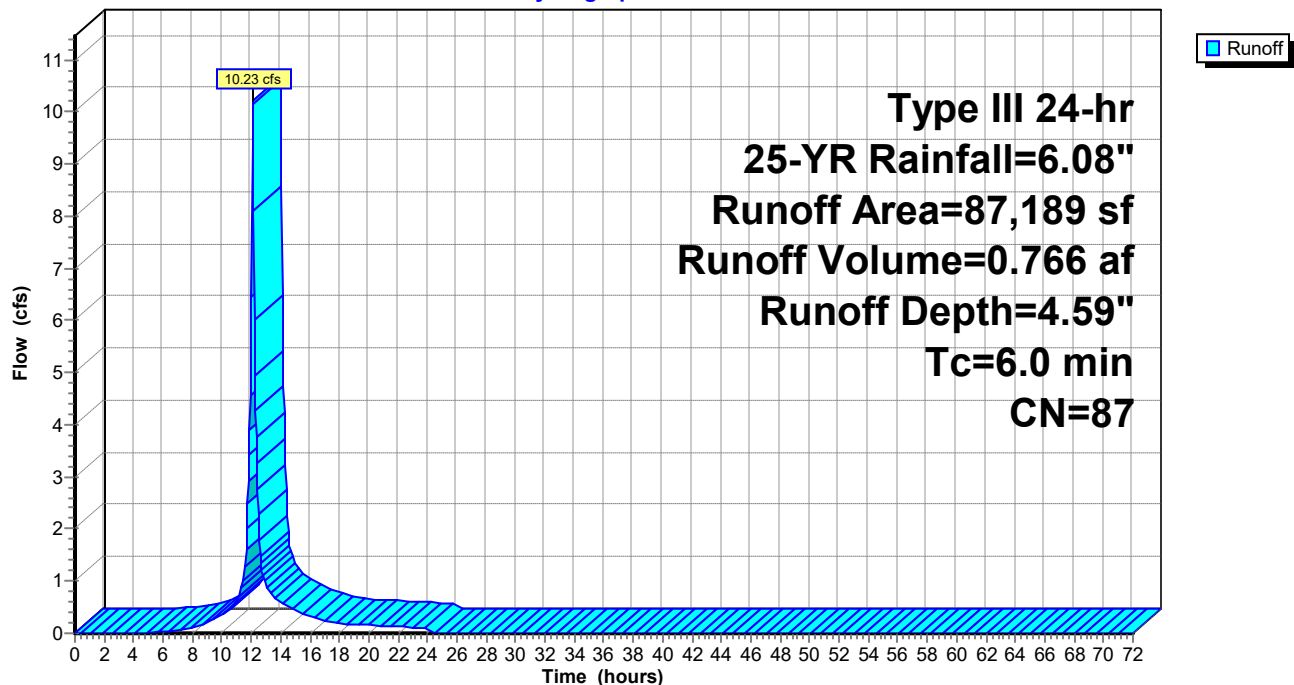
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.08"

	Area (sf)	CN	Description
*	56,459	98	Pavement
	16,514	39	>75% Grass cover, Good, HSG A
*	14,216	98	Basin Area, HSG A
	87,189	87	Weighted Average
	16,514		18.94% Pervious Area
	70,675		81.06% Impervious Area

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

Subcatchment PW2: PW-2

Hydrograph



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Type III 24-hr 25-YR Rainfall=6.08"

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Summary for Subcatchment PW3: PW-3

Runoff = 0.06 cfs @ 12.50 hrs, Volume= 0.030 af, Depth= 0.22"

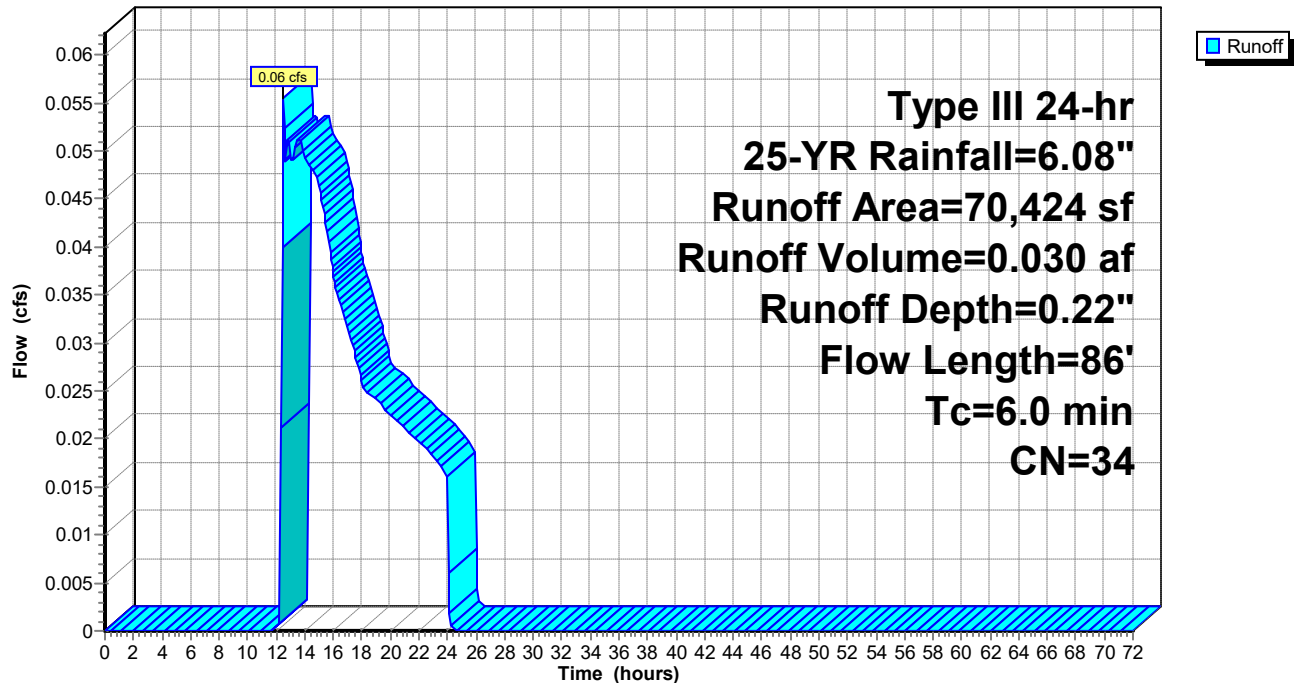
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.08"

Area (sf)	CN	Description
31,070	39	>75% Grass cover, Good, HSG A
39,354	30	Woods, Good, HSG A
70,424	34	Weighted Average
70,424		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	50	0.0400	0.20		Sheet Flow, Grass: Short n= 0.150 P2= 3.39"
0.2	36	0.0474	3.51		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
1.7					Direct Entry, Direct
6.0	86	Total			

Subcatchment PW3: PW-3

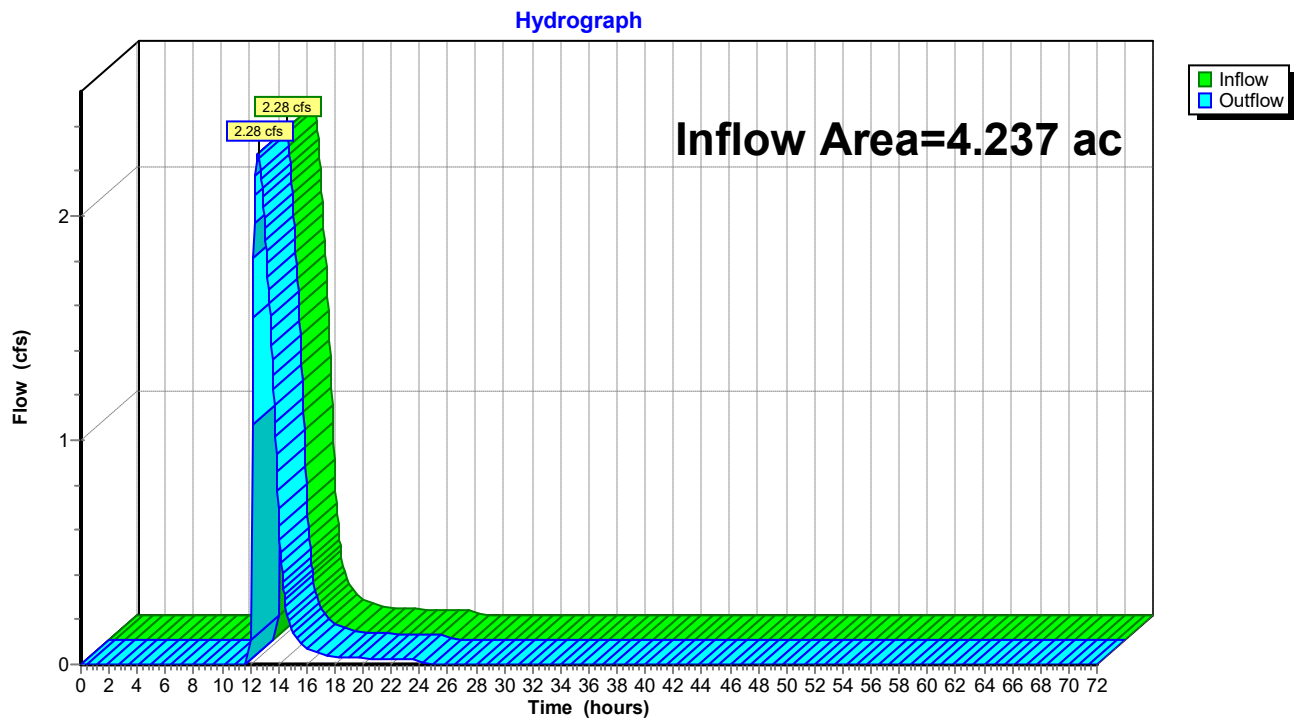
Hydrograph



Summary for Reach DP1: (new Reach)

Inflow Area = 4.237 ac, 52.89% Impervious, Inflow Depth = 0.91" for 25-YR event
Inflow = 2.28 cfs @ 12.55 hrs, Volume= 0.321 af
Outflow = 2.28 cfs @ 12.55 hrs, Volume= 0.321 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 DP1: (new Reach)

100-152 Proposed HydroCAD

Type III 24-hr 25-YR Rainfall=6.08"

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Summary for Pond DB-1: Detention Basin

Inflow Area = 2.620 ac, 85.53% Impervious, Inflow Depth = 1.33" for 25-YR event
 Inflow = 10.55 cfs @ 12.16 hrs, Volume= 0.291 af
 Outflow = 2.23 cfs @ 12.56 hrs, Volume= 0.291 af, Atten= 79%, Lag= 24.0 min
 Primary = 2.23 cfs @ 12.56 hrs, Volume= 0.291 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
 Peak Elev= 66.10' @ 12.56 hrs Surf.Area= 4,222 sf Storage= 7,314 cf

Plug-Flow detention time= 50.3 min calculated for 0.291 af (100% of inflow)
 Center-of-Mass det. time= 51.1 min (793.8 - 742.7)

Volume	Invert	Avail.Storage	Storage Description
#1	64.00'	22,935 cf	Infiltration Basin/Sediment Forebay (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
64.00	2,787	0	0
65.00	3,440	3,114	3,114
66.00	4,148	3,794	6,908
67.00	4,913	4,531	11,438
68.00	5,734	5,324	16,762
69.00	6,612	6,173	22,935

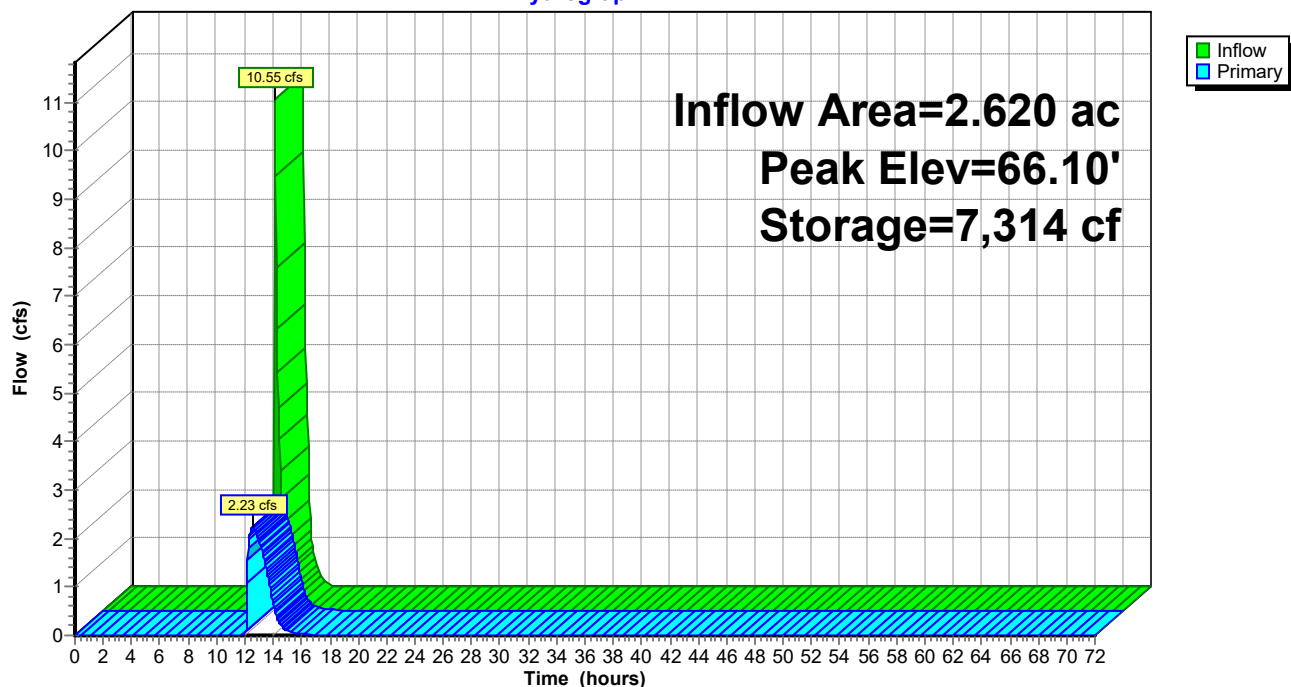
Device	Routing	Invert	Outlet Devices
#1	Primary	64.00'	18.0" Round Culvert L= 50.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 64.00' / 63.00' S= 0.0200 ' S= 0.0200 ' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 1.77 sf
#2	Device 1	64.00'	8.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	66.80'	24.0" W x 8.0" H Vert. Orifice/Grate C= 0.600

Primary OutFlow Max=2.23 cfs @ 12.56 hrs HW=66.10' (Free Discharge)

1=Culvert (Passes 2.23 cfs of 12.34 cfs potential flow)
 2=Orifice/Grate (Orifice Controls 2.23 cfs @ 6.39 fps)
 3=Orifice/Grate (Controls 0.00 cfs)

Pond DB-1: Detention Basin

Hydrograph



100-152 Proposed HydroCAD

Type III 24-hr 25-YR Rainfall=6.08"

Prepared by HP

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Summary for Pond IB-1: Infiltration Basin

Inflow Area = 2.620 ac, 85.53% Impervious, Inflow Depth = 4.89" for 25-YR event
 Inflow = 13.83 cfs @ 12.09 hrs, Volume= 1.067 af
 Outflow = 11.47 cfs @ 12.16 hrs, Volume= 1.067 af, Atten= 17%, Lag= 4.2 min
 Discarded = 0.92 cfs @ 12.16 hrs, Volume= 0.776 af
 Primary = 10.55 cfs @ 12.16 hrs, Volume= 0.291 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
 Peak Elev= 67.78' @ 12.16 hrs Surf.Area= 4,831 sf Storage= 10,654 cf

Plug-Flow detention time= 65.9 min calculated for 1.067 af (100% of inflow)
 Center-of-Mass det. time= 65.9 min (846.2 - 780.3)

Volume	Invert	Avail.Storage	Storage Description
#1	65.00'	17,114 cf	Infiltration Basin/Sediment Forebay (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
65.00	2,890	0	0
66.00	3,535	3,213	3,213
67.00	4,236	3,886	7,098
68.00	4,994	4,615	11,713
69.00	5,808	5,401	17,114

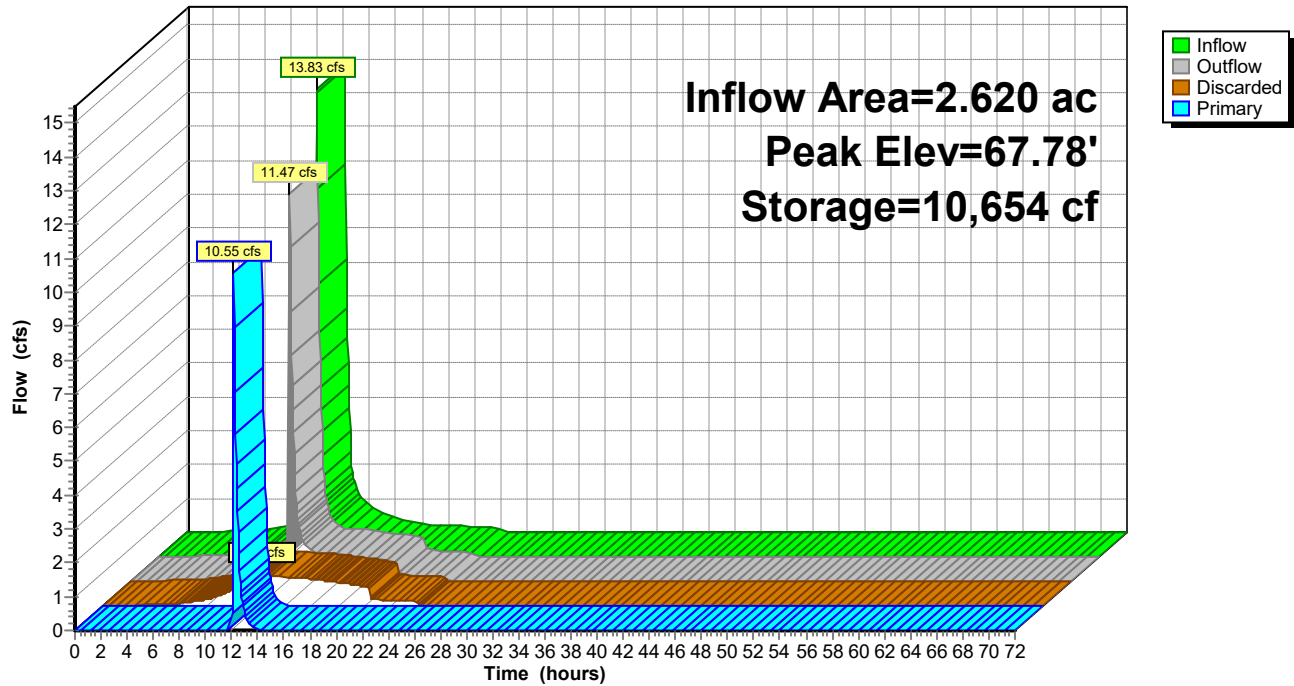
Device	Routing	Invert	Outlet Devices
#1	Discarded	65.00'	8.270 in/hr Exfiltration over Surface area
#2	Primary	67.30'	12.0' long x 8.0' breadth Broad-Crested Rectangular Weir
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00
			2.50 3.00 3.50 4.00 4.50 5.00 5.50
			Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64
			2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

Discarded OutFlow Max=0.92 cfs @ 12.16 hrs HW=67.77' (Free Discharge)
 ↑ **1=Exfiltration** (Exfiltration Controls 0.92 cfs)

Primary OutFlow Max=10.22 cfs @ 12.16 hrs HW=67.78' (Free Discharge)
 ↑ **2=Broad-Crested Rectangular Weir** (Weir Controls 10.22 cfs @ 1.79 fps)

Pond IB-1: Infiltration Basin

Hydrograph



100-152 Proposed HydroCAD*Type III 24-hr 100-YR Rainfall=7.68"*

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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 PW1: Roof DrainageRunoff Area=26,941 sf 100.00% Impervious Runoff Depth=7.44"
Tc=6.0 min CN=98 Runoff=4.55 cfs 0.383 af**Subcatchment PW2: PW-2**Runoff Area=87,189 sf 81.06% Impervious Runoff Depth=6.14"
Tc=6.0 min CN=87 Runoff=13.46 cfs 1.024 af**Subcatchment PW3: PW-3**Runoff Area=70,424 sf 0.00% Impervious Runoff Depth=0.62"
Flow Length=86' Tc=6.0 min CN=34 Runoff=0.42 cfs 0.084 af**Reach DP1: (new Reach)**Inflow=4.75 cfs 0.598 af
Outflow=4.75 cfs 0.598 af**Pond DB-1: Detention Basin**Peak Elev=67.19' Storage=12,380 cf Inflow=15.89 cfs 0.514 af
Outflow=4.40 cfs 0.514 af**Pond IB-1: Infiltration Basin**Peak Elev=67.92' Storage=11,327 cf Inflow=18.02 cfs 1.407 af
Discarded=0.94 cfs 0.893 af Primary=15.89 cfs 0.514 af Outflow=16.84 cfs 1.407 af**Total Runoff Area = 4.237 ac Runoff Volume = 1.491 af Average Runoff Depth = 4.22"**
47.11% Pervious = 1.996 ac 52.89% Impervious = 2.241 ac

100-152 Proposed HydroCAD

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Type III 24-hr 100-YR Rainfall=7.68"

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Summary for Subcatchment PW1: Roof Drainage

Runoff = 4.55 cfs @ 12.09 hrs, Volume= 0.383 af, Depth= 7.44"

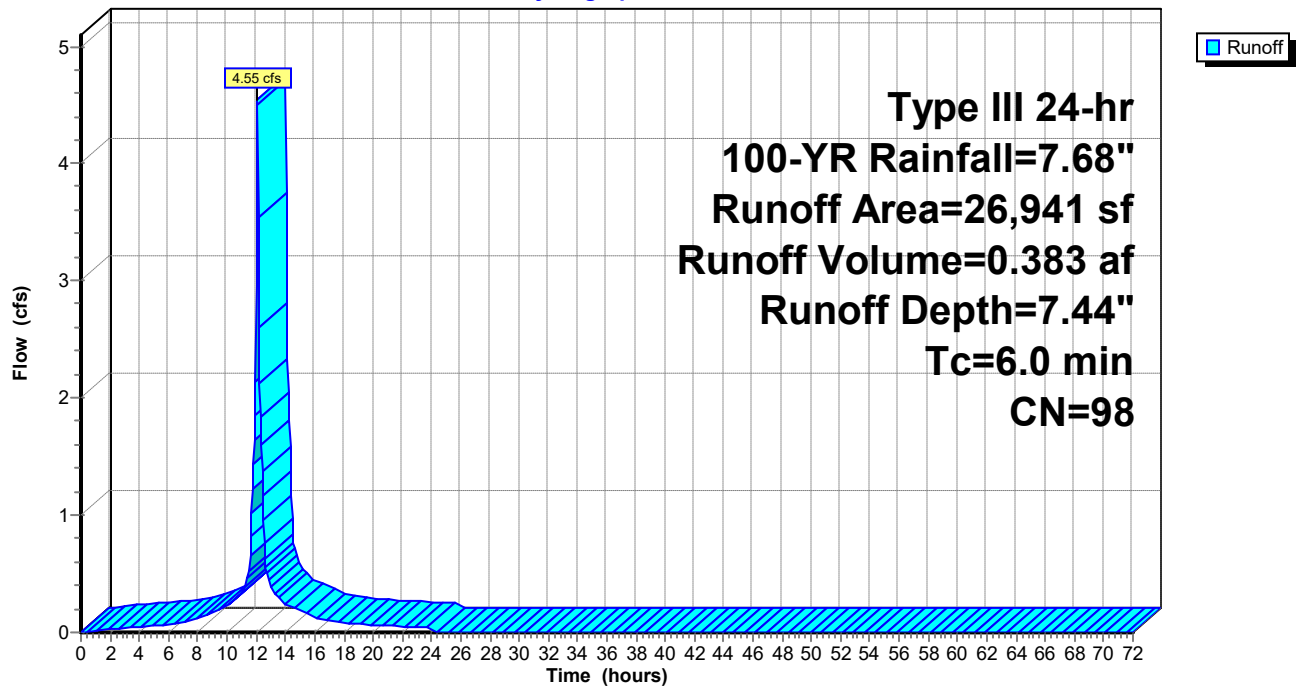
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=7.68"

	Area (sf)	CN	Description
*	26,941	98	Buildings
	26,941		100.00% Impervious Area

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

Subcatchment PW1: Roof Drainage

Hydrograph



100-152 Proposed HydroCAD

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Type III 24-hr 100-YR Rainfall=7.68"

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Summary for Subcatchment PW2: PW-2

Runoff = 13.46 cfs @ 12.09 hrs, Volume= 1.024 af, Depth= 6.14"

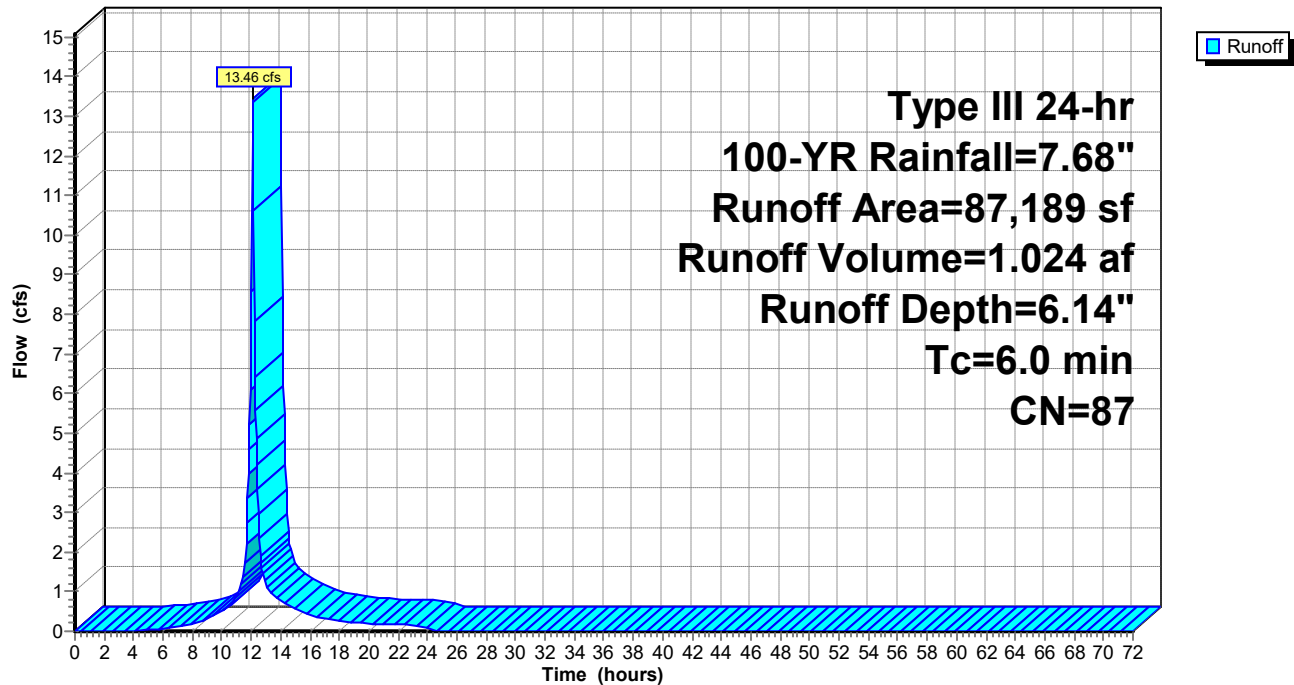
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=7.68"

	Area (sf)	CN	Description
*	56,459	98	Pavement
	16,514	39	>75% Grass cover, Good, HSG A
*	14,216	98	Basin Area, HSG A
	87,189	87	Weighted Average
	16,514		18.94% Pervious Area
	70,675		81.06% Impervious Area

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

Subcatchment PW2: PW-2

Hydrograph



100-152 Proposed HydroCAD

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Type III 24-hr 100-YR Rainfall=7.68"

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Summary for Subcatchment PW3: PW-3

Runoff = 0.42 cfs @ 12.33 hrs, Volume= 0.084 af, Depth= 0.62"

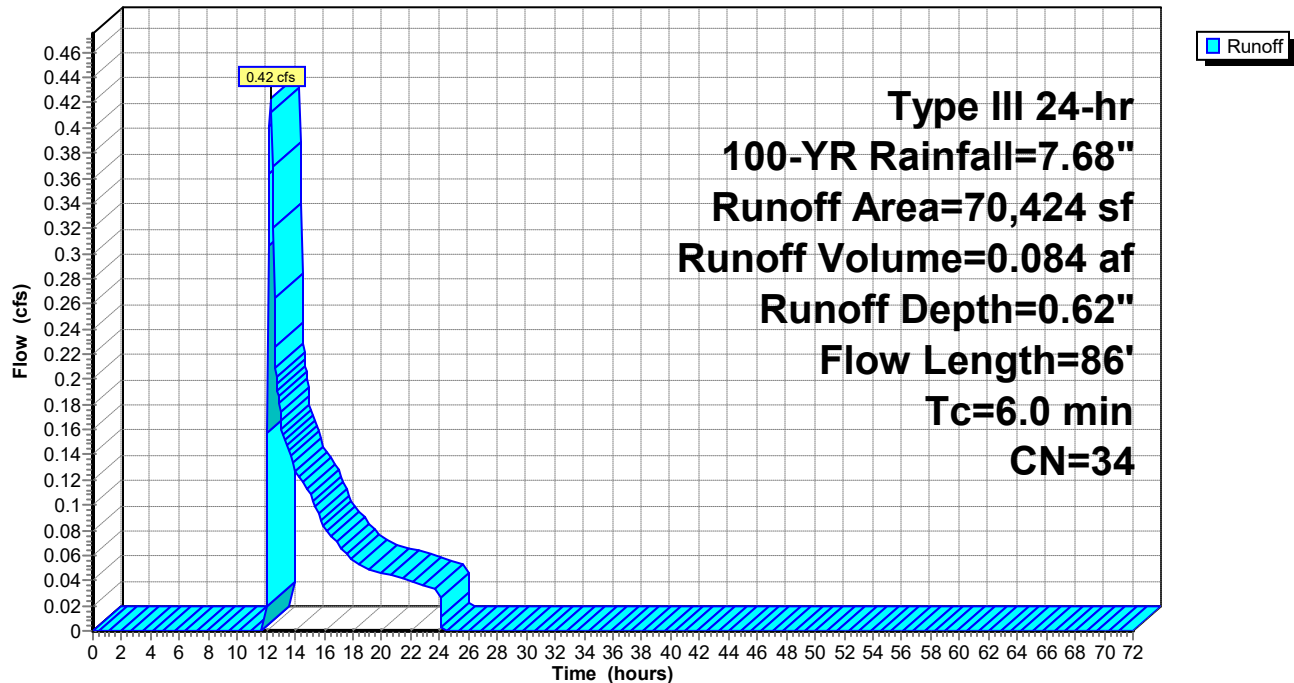
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=7.68"

Area (sf)	CN	Description
31,070	39	>75% Grass cover, Good, HSG A
39,354	30	Woods, Good, HSG A
70,424	34	Weighted Average
70,424		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	50	0.0400	0.20		Sheet Flow, Grass: Short n= 0.150 P2= 3.39"
0.2	36	0.0474	3.51		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
1.7					Direct Entry, Direct
6.0	86	Total			

Subcatchment PW3: PW-3

Hydrograph



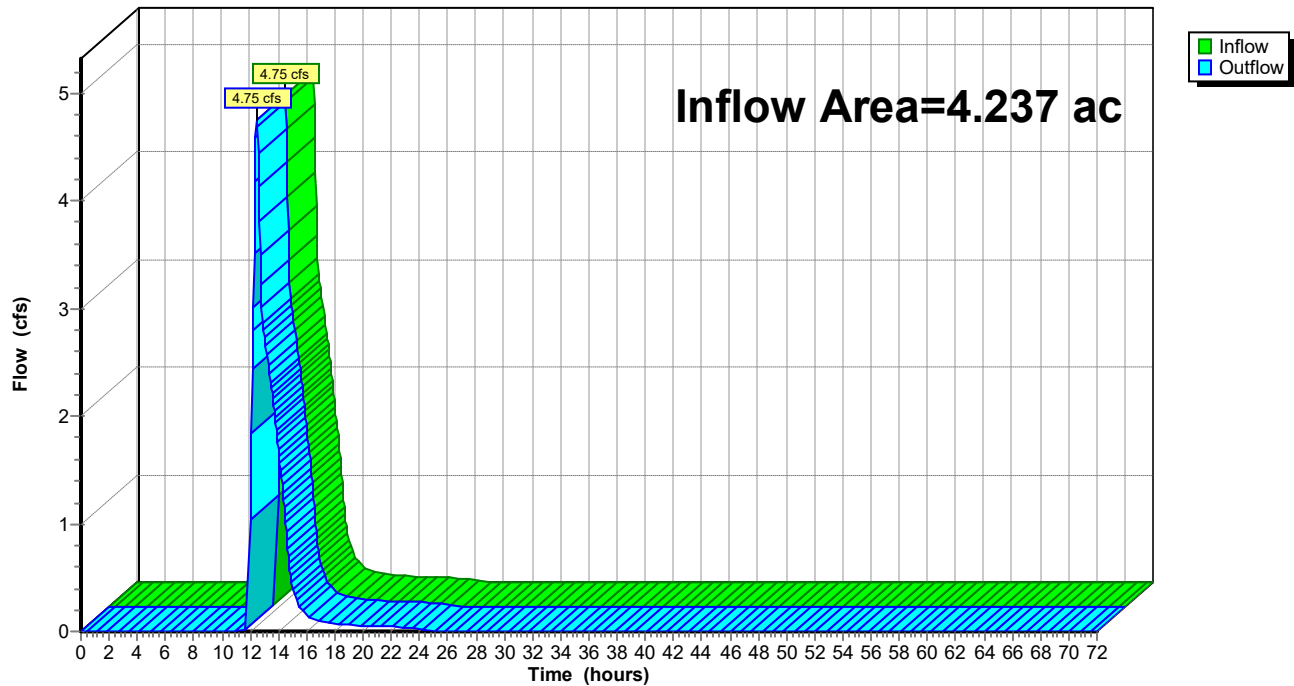
Summary for Reach DP1: (new Reach)

Inflow Area = 4.237 ac, 52.89% Impervious, Inflow Depth = 1.69" for 100-YR event
 Inflow = 4.75 cfs @ 12.46 hrs, Volume= 0.598 af
 Outflow = 4.75 cfs @ 12.46 hrs, Volume= 0.598 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 DP1: (new Reach)

Hydrograph



100-152 Proposed HydroCAD

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Type III 24-hr 100-YR Rainfall=7.68"

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Summary for Pond DB-1: Detention Basin

Inflow Area = 2.620 ac, 85.53% Impervious, Inflow Depth = 2.36" for 100-YR event
 Inflow = 15.89 cfs @ 12.12 hrs, Volume= 0.514 af
 Outflow = 4.40 cfs @ 12.47 hrs, Volume= 0.514 af, Atten= 72%, Lag= 21.0 min
 Primary = 4.40 cfs @ 12.47 hrs, Volume= 0.514 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
 Peak Elev= 67.19' @ 12.47 hrs Surf.Area= 5,068 sf Storage= 12,380 cf

Plug-Flow detention time= 53.7 min calculated for 0.514 af (100% of inflow)
 Center-of-Mass det. time= 54.3 min (797.0 - 742.7)

Volume	Invert	Avail.Storage	Storage Description
#1	64.00'	22,935 cf	Infiltration Basin/Sediment Forebay (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
64.00	2,787	0	0
65.00	3,440	3,114	3,114
66.00	4,148	3,794	6,908
67.00	4,913	4,531	11,438
68.00	5,734	5,324	16,762
69.00	6,612	6,173	22,935

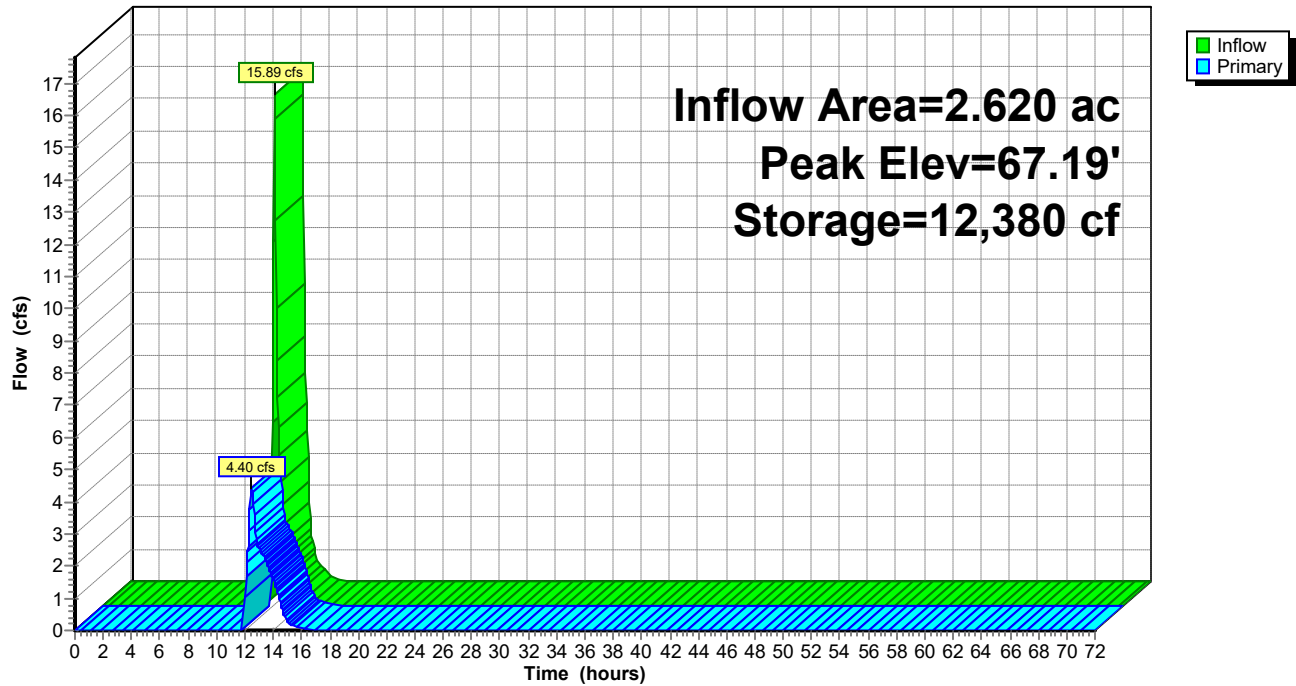
Device	Routing	Invert	Outlet Devices
#1	Primary	64.00'	18.0" Round Culvert L= 50.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 64.00' / 63.00' S= 0.0200 ' S= 0.0200 ' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 1.77 sf
#2	Device 1	64.00'	8.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	66.80'	24.0" W x 8.0" H Vert. Orifice/Grate C= 0.600

Primary OutFlow Max=4.37 cfs @ 12.47 hrs HW=67.18' (Free Discharge)

↑ **1=Culvert** (Passes 4.37 cfs of 16.52 cfs potential flow)
 ↑ **2=Orifice/Grate** (Orifice Controls 2.84 cfs @ 8.13 fps)
 ↑ **3=Orifice/Grate** (Orifice Controls 1.53 cfs @ 1.99 fps)

Pond DB-1: Detention Basin

Hydrograph



100-152 Proposed HydroCAD

Prepared by HP

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Type III 24-hr 100-YR Rainfall=7.68"

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Summary for Pond IB-1: Infiltration Basin

Inflow Area = 2.620 ac, 85.53% Impervious, Inflow Depth = 6.45" for 100-YR event
 Inflow = 18.02 cfs @ 12.09 hrs, Volume= 1.407 af
 Outflow = 16.84 cfs @ 12.12 hrs, Volume= 1.407 af, Atten= 7%, Lag= 2.0 min
 Discarded = 0.94 cfs @ 12.12 hrs, Volume= 0.893 af
 Primary = 15.89 cfs @ 12.12 hrs, Volume= 0.514 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
 Peak Elev= 67.92' @ 12.12 hrs Surf.Area= 4,935 sf Storage= 11,327 cf

Plug-Flow detention time= 60.7 min calculated for 1.406 af (100% of inflow)
 Center-of-Mass det. time= 60.6 min (834.8 - 774.2)

Volume	Invert	Avail.Storage	Storage Description
#1	65.00'	17,114 cf	Infiltration Basin/Sediment Forebay (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
65.00	2,890	0	0
66.00	3,535	3,213	3,213
67.00	4,236	3,886	7,098
68.00	4,994	4,615	11,713
69.00	5,808	5,401	17,114

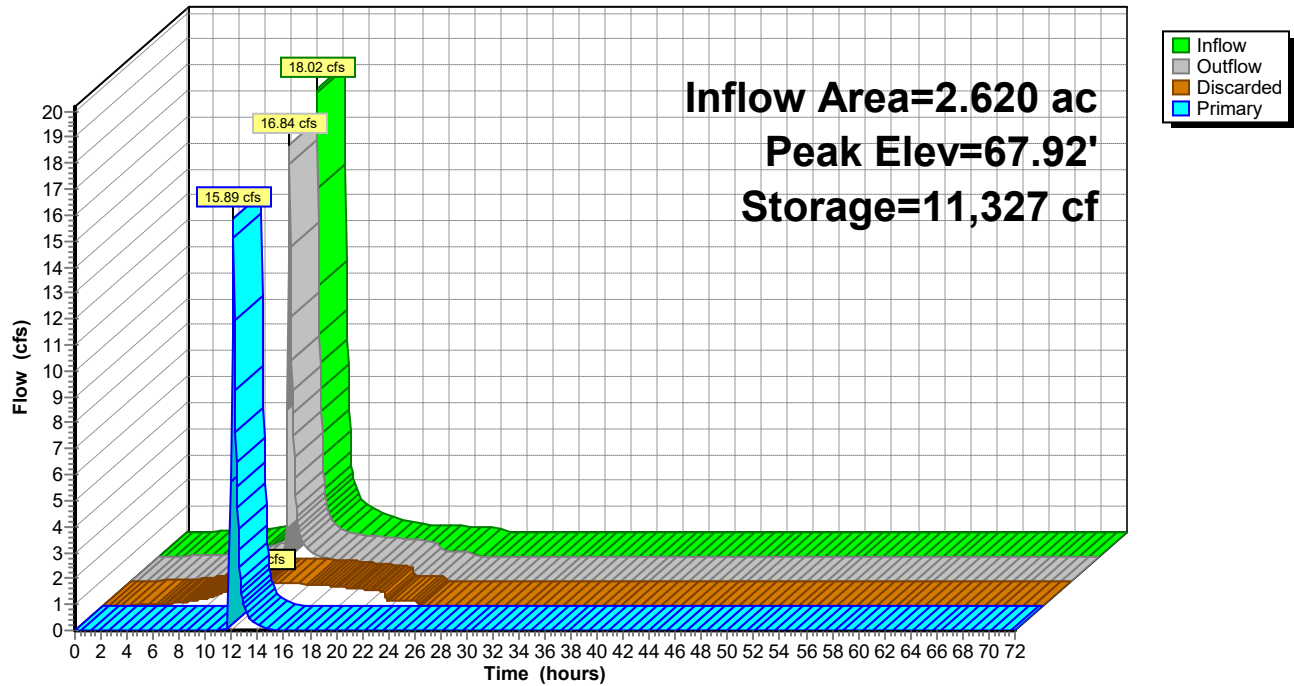
Device	Routing	Invert	Outlet Devices
#1	Discarded	65.00'	8.270 in/hr Exfiltration over Surface area
#2	Primary	67.30'	12.0' long x 8.0' breadth Broad-Crested Rectangular Weir
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00
			2.50 3.00 3.50 4.00 4.50 5.00 5.50
			Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64
			2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

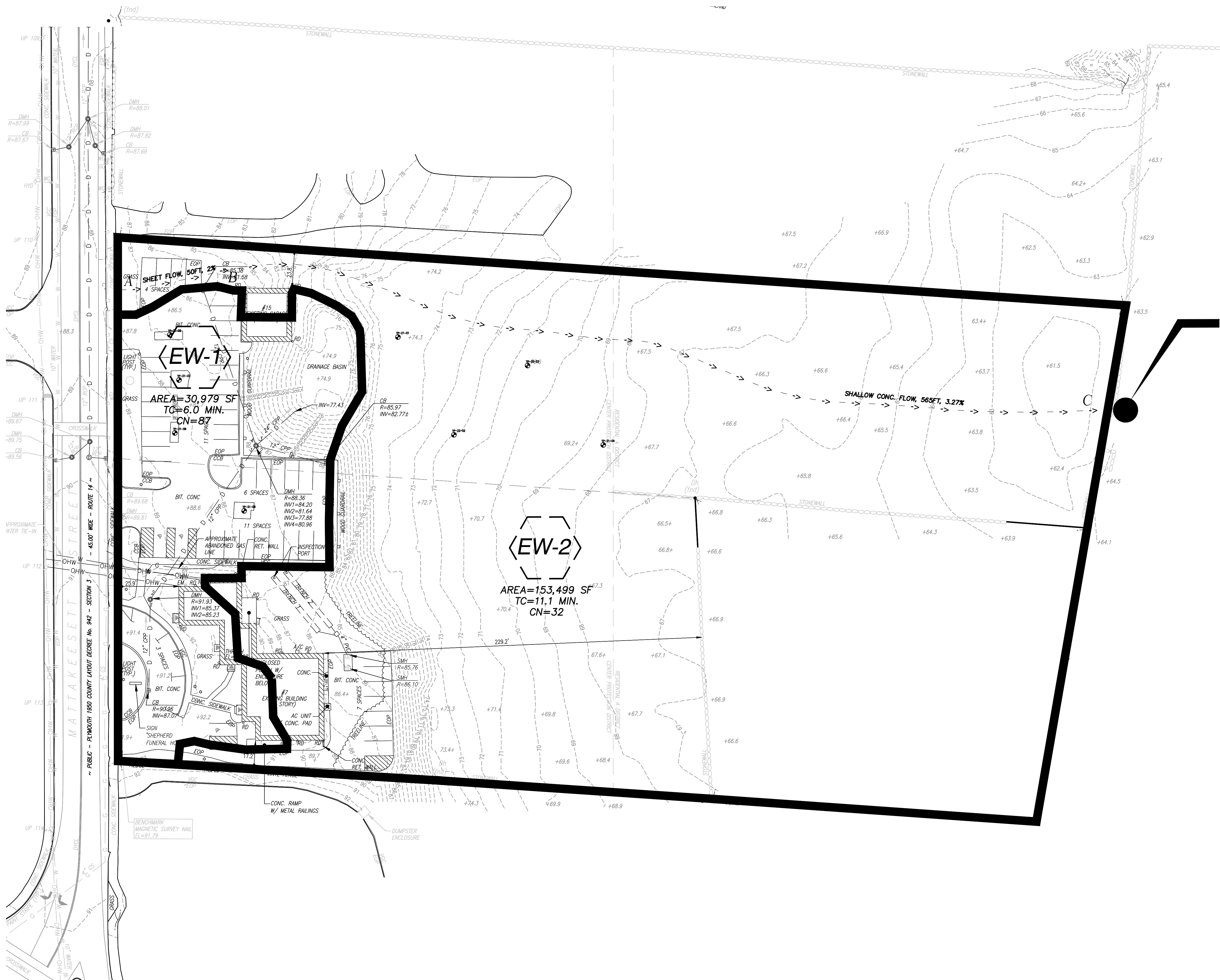
Discarded OutFlow Max=0.94 cfs @ 12.12 hrs HW=67.91' (Free Discharge)
 ↑ **1=Exfiltration** (Exfiltration Controls 0.94 cfs)

Primary OutFlow Max=15.36 cfs @ 12.12 hrs HW=67.91' (Free Discharge)
 ↑ **2=Broad-Crested Rectangular Weir** (Weir Controls 15.36 cfs @ 2.11 fps)

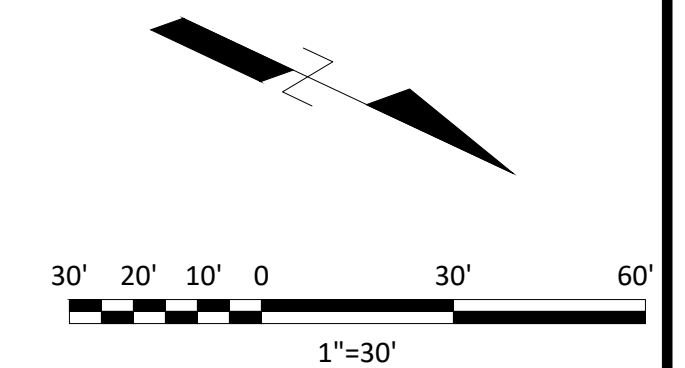
Pond IB-1: Infiltration Basin

Hydrograph





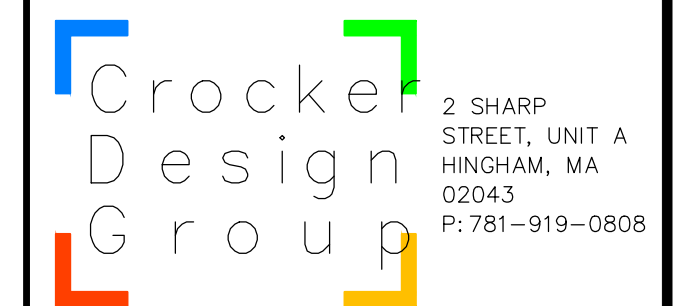
POINT OF DISCHARGE 1
PEAK DISCHARGE SUMMARY
2-YEAR STORM = 0.00 cfs
10-YEAR STORM = 2.85 cfs
25-YEAR STORM = 4.39 cfs
100-YEAR STORM = 8.31 cfs



Date	Description	No.
Revisions		

WATERSHED MAP

GABRIEL R. CROCKER
PROFESSIONAL ENGINEER, MA REGISTRATION #47917

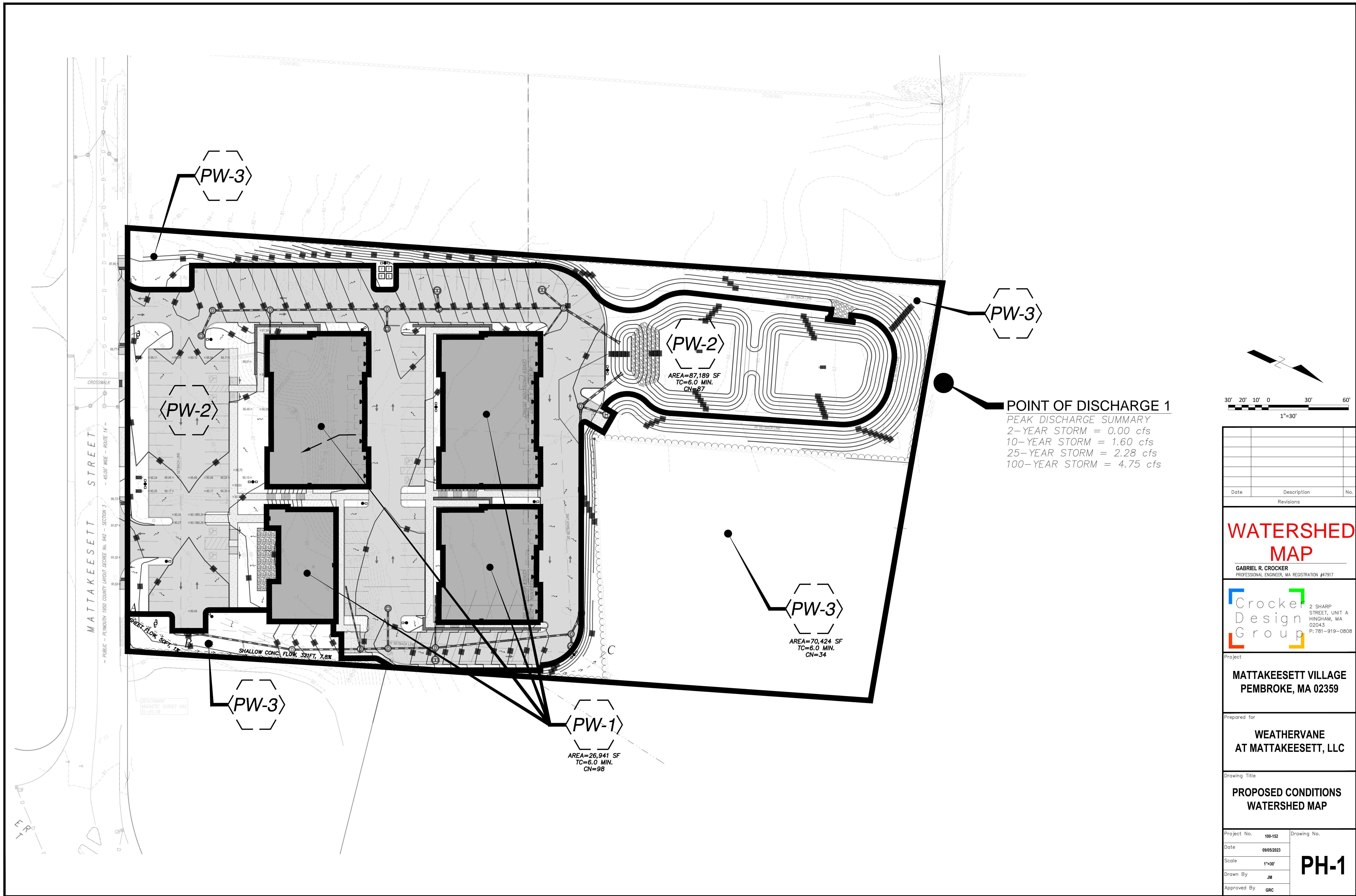


Project
**MATTAKEESETT VILLAGE
PEMBROKE, MA 02359**

Prepared for
**WEATHERVANE
AT MATTAKEESETT, LLC**

Drawing Title
**EXISTING CONDITIONS
WATERSHED MAP**

Project No.	100-152	Drawing No.	EH-1
Date	09/05/2023		
Scale	1"=30'		
Drawn By	JM		
Approved By	GRC		



SECTION 4 – STORMWATER MANAGEMENT CALCS

4.1 STANDARD 3: RECHARGE CALCULATIONS

The Required Recharge Volume is computed using the equation provided in the 2008 Massachusetts Stormwater Handbook. The volume is computed as an equivalent depth of rainfall over the proposed impervious areas in accordance with a Target Depth Factor based on the soil classifications. The Calculations is as follows:

$$Rv = (F) \times (\text{Impervious Area})$$

(Equation 1) Volume 3, Ch 1, page 15

- Rv = Required Recharge Volume, expressed in cubic feet, cubic yards, or acre-feet
- F = Target Depth Factor associated with each Hydrologic Soil Group (HSG)
- Impervious Area = new pavement and new rooftop area
- The Target Depth Factor "F" per Table 2.3.2, Volume 3, Chapter 1 for each soil classification is as follows:
 - A soils = 0.60 inches
 - B soils = 0.35 inches
 - C soils = 0.25 inches
 - D soils = 0.10 inches

The existing impervious area within limit of work is 27,573 SF and the total proposed impervious area within the watershed areas is 83,400 SF. There is an increase in impervious area of 51,271 SF. Based on the above formula, the required recharge volume for the site is as follows:

Per Section 1.3, the onsite soils are considered "A" soils:

- F (A soils) = 0.60 inches
- Impervious Area (New Impervious) = 51,271 SF

$$Rv = (F) \times (\text{Impervious Area})$$

$$Rv = (0.60 \text{ inches}) \times (1\text{in}/12 \text{ ft}) \times 51,271 \text{ SF} = 2,564 \text{ CF}$$

TOTAL RECHARGE VOLUME REQUIRED (Rv)= 2,792 CF

Infiltration BMP	Infiltration Rate (in/hr) k	Storage (Recharge) Volume (CF) Rv	Required Recharge Volume (CF)
Infiltration Basin	8.27	8,403	2,564
Totals		8,403 CF	2,564 CF
<i>k = saturated hydraulic conductivity (in/hr)</i> <i>Rv = storage volume (CF)</i> <i>Bottom Area (SF)</i> <i>Volume 3, Chapter 1 of the MA Stormwater Handbook</i>			

Mounding Analysis

The infiltration system is proposed to be less than 4 feet from seasonal high ground water but greater than 2 feet of separation. As such, a mounding analysis was performed to ensure the groundwater

mounding from the infiltration portion of the system would intercept the bottom of the proposed system. The following assumptions were made as part of the calculation.

Recharge Rate (R): Assumed Rawls rate of 8.27 in/hr converted to ft/day.

Specific Yield (Sy): the average value for a Medium Sand was chosen per USGS guidance on Specific Yields, see "Specific Yield – Compilation of Specific Yields for Various Materials" by A.I. Johnson.

Horizontal Hyd. (K): Per USGS guidance supplied with the Hantush Calculation Spreadsheet a 10:1 Ratio was chosen between the K and R values.

X and Y Dimensions: The infiltration basin base elevation was approximately 56 feet by 55 feet.

Infiltration Period (t): See the drawdown calculation for determination of this value.

Saturated Zone (hi(0)): The closest published well on the DEP database was utilized as on-site soils did not encounter bedrock (43 Mattakeesett Street). The depth of to bedrock was 110 feet and the static water levels were encountered 20 feet below grade. In an effort to be conservative with the drainage calculations the 90 foot saturated zone was cut in half for the purposes of this calculation and 45 feet was chosen.

Conclusion:

The recharge provided by the proposed infiltration system exceeds the required recharge volume for redevelopment as well as new construction which would require 4,170 c.f. of recharge volume. The project satisfies Standard 3 of the Massachusetts DEP Stormwater. The mounding analysis performed alongside the recharge calculations determined the groundwater will mound 1.86 feet which is less than the 2.1 feet of separation proposed between the base of the infiltration basin and Seasonal High Groundwater and will not intercept the bottom of the basin.

4.2 DRAWDOWN TIME

Below are the drawdown time calculations for the infiltration systems proposed on the site. The calculation uses estimated hydraulic conductivity values "K" in accordance with the Rawls Rates table. The formula below utilized the recommended formula per the MA Stormwater Handbook as follows:

$$\text{Drawdown Time} = [Rv / (K * \text{Bottom Area})] * (12\text{IN}/1\text{FT})$$

- Rv = Storage Volume (CF)
- K = Saturated Hydraulic Conductivity per Rawls Rate Table (IN/HR)
- Bottom Area = Area of Bottom of Proposed Recharge Structure (SF)

Below is a summary table of the drawdown calculations:

Infiltration Basin Drawdown Calculations				
Infiltration BMP	Infiltration Rate (IN/HR) k	Storage (Recharge) Volume Provided (CF) Rv	Bottom Area (SF)	Draw Down Time (HR)
Infiltration Basin	8.27	8,403	2,895	4.3
Totals		8,403		4.3
<i>k = saturated hydraulic conductivity (IN/HR)</i> <i>Rv = storage volume (CF)</i> <i>Bottom Area (SF)</i> <i>Volume 3, Chapter 1 of the MA Stormwater Handbook</i>				

Conclusion:

The calculations show that the infiltration BMP draws down in less than 72 hours, as required.

4.3 STANDARD 4: WATER QUALITY

The applicant is proposing to treat stormwater runoff from the pavement through a series of deep sump catch basins piped to a sediment forebay, that spills flows into an infiltration basin. The sediment forebay was sized to treat 0.1in per impervious acre, as required per the Massachusetts Stormwater Standards.

	Tributary Impervious Area (SF)	Tributary Impervious Area (AC)	Amount of Treatment/ 1 AC Impervious (IN)	Required Forebay Volume (CF)	Provided Forebay Volume
Sediment Forebay	78844	1.91	0.1	695	1,260

Required Water Quality Volume:

$V_{wq} = (D_{wq}/12\text{in}/1\text{ft}) * (\text{imp-pavement})$

$V_{wq} = (1\text{in}/12\text{in}/1\text{ft}) * (56,459\text{SF})$

$V_{wq} = 4,705 \text{ CF}$

Water Quality BMP	WQV Treatment Provided (CF)	Required WQV (CF)
Infiltration Basin	8,403	
Total	8,403	4,705

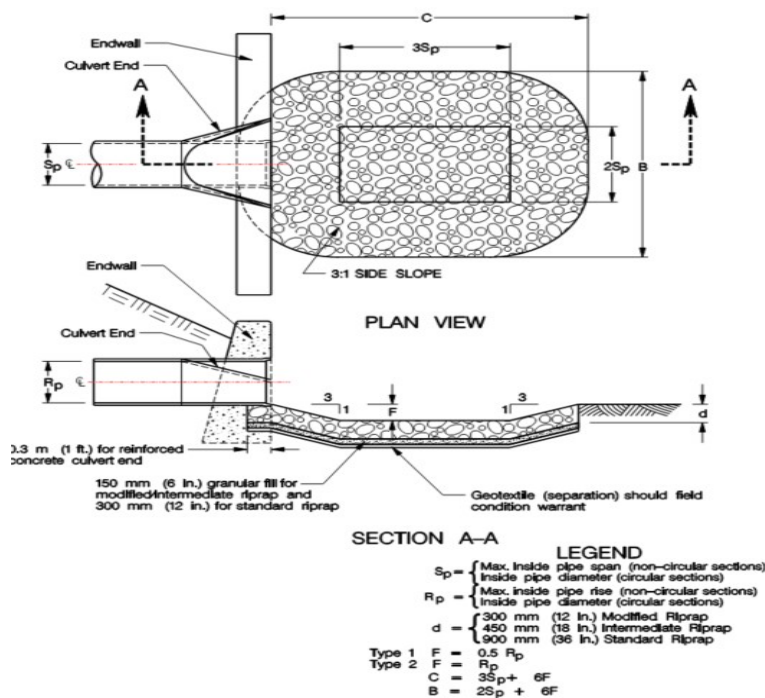
4.4 PLUNGE POOL CALCULATION

Rip rap splash pads are designed to dissipate energy, prevent scour at the stormwater outlet, and minimize the potential for downstream erosion. A LEVEL SPREADER / PLUNGE POOLE was sized for each of the outlets of the drainage system. The calculations below are in accordance with the methodology of the "2002 Connecticut Guidelines for Soil Erosion and Sediment Control" produced by The Connecticut Council on Soil and Water Conservation.

Preformed Scour Hole Calculations										
	Q	Do	TW	Depression	C	3Sp	B	2Sp	d50	
	(cfs)	(ft.)	(ft.)	(ft.)	(ft.)	(ft.)	(ft.)	(ft.)	(ft.)	(in.)
FES 1	4.4	1.5	0.30	0.75	9.00	4.50	7.50	3.00	0.17	2.10

Conclusion:

As identified above, the discharge points have been designed to accommodate and exceed the required minimum Preformed scour hole sizing.



4.5 TSS REMOVAL

The project has been designed to comply with the required 80% TSS (minimum) removal per the Massachusetts Stormwater Regulations. A combination of stormwater BMPs including deep sump hooded catch basins, sediment forebay, and an infiltration basin are utilized. This combination also meets the 44% TSS removal prior to infiltration as the site soils do provide rapid infiltration. Please refer to the attached TSS calculation sheets that follow:

This spreadsheet will calculate the height of a groundwater mound beneath a stormwater infiltration basin. More information can be found in the U.S. Geological Survey Scientific Investigations Report 2010-5102 "Simulation of groundwater mounding beneath hypothetical stormwater infiltration basins".

The user must specify infiltration rate (R), specific yield (Sy), horizontal hydraulic conductivity (Kh), basin dimensions (x, y), duration of infiltration period (t), and the initial thickness of the saturated zone (hi(0), height of the water table if the bottom of the aquifer is the datum). For a square basin the half width equals the half length (x = y). For a rectangular basin, if the user wants the water-table changes perpendicular to the long side, specify x as the short dimension and y as the long dimension. Conversely, if the user wants the values perpendicular to the short side, specify y as the short dimension, x as the long dimension. All distances are from the center of the basin. Users can change the distances from the center of the basin at which water-table aquifer thickness are calculated.

Cells highlighted in yellow are values that can be changed by the user. Cells highlighted in red are output values based on user-specified inputs. **The user MUST click the blue "Re-Calculate Now" button each time ANY of the user-specified inputs are changed** otherwise necessary iterations to converge on the correct solution will not be done and values shown will be incorrect. Use consistent units for all input values (for example, feet and days)

Input Values		use consistent units (e.g. feet & days or inches & hours)		Conversion Table		In the report accompanying this spreadsheet (USGS SIR 2010-5102), vertical soil permeability (ft/d) is assumed to be one-tenth horizontal hydraulic conductivity (ft/d).
				inch/hour	feet/day	
16.5400	R	Recharge (infiltration) rate (feet/day)		0.67	1.33	
0.260	Sy	Specific yield, Sy (dimensionless, between 0 and 1)				
165.40	K	Horizontal hydraulic conductivity, Kh (feet/day)*		2.00	4.00	
28.000	x	1/2 length of basin (x direction, in feet)				
27.500	y	1/2 width of basin (y direction, in feet)		hours	days	
0.180	t	duration of infiltration period (days)		36	1.50	
45.000	hi(0)	initial thickness of saturated zone (feet)				

46.863	h(max)	maximum thickness of saturated zone (beneath center of basin at end of infiltration period)
1.863	Δh(max)	maximum groundwater mounding (beneath center of basin at end of infiltration period)

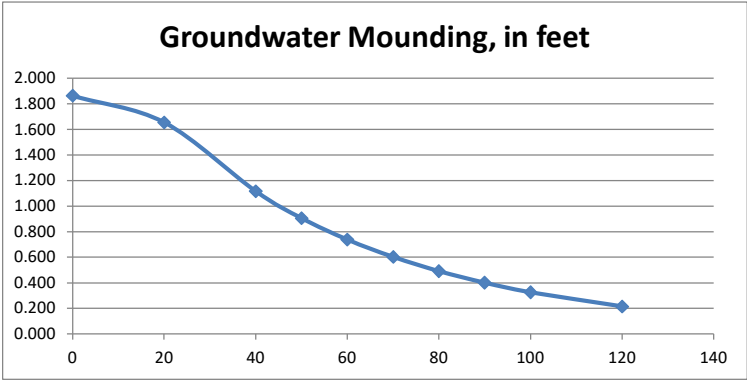
Ground-water Mounding, in feet

Distance from center of basin in x direction, in feet

1.863	0
1.654	20
1.116	40
0.906	50
0.738	60
0.603	70
0.492	80
0.402	90
0.327	100
0.215	120



Re-Calculate Now



Disclaimer

This spreadsheet solving the Hantush (1967) equation for ground-water mounding beneath an infiltration basin is made available to the general public as a convenience for those wishing to replicate values documented in the USGS Scientific Investigations Report 2010-5102 "Groundwater mounding beneath hypothetical stormwater infiltration basins" or to calculate values based on user-specified site conditions. Any changes made to the spreadsheet (other than values identified as user-specified) after transmission from the USGS could have unintended, undesirable consequences. These consequences could include, but may not be limited to: erroneous output, numerical instabilities, and violations of underlying assumptions that are inherent in results presented in the accompanying USGS published report. The USGS assumes no responsibility for the consequences of any changes made to the spreadsheet. If changes are made to the spreadsheet, the user is responsible for documenting the changes and justifying the results and conclusions.

MassDEP

Well Completion Report

WELL LOCATION

GPS North: 42.068186

Address: 43 Mattakesett Street

Sub Division:

City/Town: PEMBROKE

GPS West: -70.814311

Assessors Map:

Assessors Lot:

Permit Number:

Date Issued:

Board Of Health Permit Obtained: Y

Work Performed	Well Type	Drilling Method Overburden	Drilling Method Bedrock
	Domestic		

ADDITIONAL WELL INFORMATION

Developed: No

Disinfected: No

Total Well Depth: 320.00

Fracture Enhancement: No

Well Seal Type:

Depth to Bedrock: 110.00

PERMANENT PUMP (IF AVAILABLE)

Pump Description:

Type:

Nominal Pump Capacity:

Intake Depth:

Horsepower:

Comments:

CASING					SCREEN				
From(ft)	To(ft)	Type	Thickness	Diameter	From(ft)	To(ft)	Type	slotsize	Diameter
	120.00	Steel		6					

WELL SEAL / FILTER PACK / ABANDONMENT MATERIAL				STATIC WATER LEVEL(ALL WELLS)	
From(ft)	To(ft)	Material Description	Purpose	Date Measured	Depth Below Ground Surface
				10/08/2001	20.00

WELL TEST DATA (ALL SECTIONS MANDATORY FOR PRODUCTION WELLS)						
Date	Method	Yield(GPM)	Time Pumped (hrs & min)	Pumping Level (Ft. BGS)	Time To Recoover (Hrs & min)	Recovery
	Constant Rate Pump	17.00	05:00:00	77	01:45:00	77

OVER BURDEN								
From(ft)	To(ft)	Lithology	Color	Comment	Water Zone	Loss / Add of Fluid	Drill Stem Drop	Drill Rate

BEDROCK										
<u>From(ft)</u>	<u>To(ft)</u>	<u>Lithology</u>	<u>Comment</u>	<u>Water Zone</u>	<u>Drill Stem Drop</u>	<u>Extra Large</u>	<u>Drill Rate</u>	<u>Rust Stain</u>	<u>Loss / Add Of Fluid</u>	<u># of Fract Per Ft</u>

100-152 Proposed HydroCAD

Prepared by HP

HydroCAD® 10.00-26 s/n 01012 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 100-YR Rainfall=7.68"

Printed 9/1/2023

Page 3

Stage-Area-Storage for Pond IB-1: Infiltration Basin

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
65.00	2,890	0	67.60	4,691	9,776
65.05	2,922	145	67.65	4,729	10,012
65.10	2,954	292	67.70	4,767	10,249
65.15	2,987	441	67.75	4,805	10,488
65.20	3,019	591	67.80	4,842	10,729
65.25	3,051	743	67.85	4,880	10,972
65.30	3,083	896	67.90	4,918	11,217
65.35	3,116	1,051	67.95	4,956	11,464
65.40	3,148	1,208	68.00	4,994	11,713
65.45	3,180	1,366	68.05	5,035	11,964
65.50	3,213	1,526	68.10	5,075	12,216
65.55	3,245	1,687	68.15	5,116	12,471
65.60	3,277	1,850	68.20	5,157	12,728
65.65	3,309	2,015	68.25	5,198	12,987
65.70	3,342	2,181	68.30	5,238	13,248
65.75	3,374	2,349	68.35	5,279	13,511
65.80	3,406	2,518	68.40	5,320	13,776
65.85	3,438	2,690	68.45	5,360	14,043
65.90	3,471	2,862	68.50	5,401	14,312
65.95	3,503	3,037	68.55	5,442	14,583
66.00	3,535	3,213	68.60	5,482	14,856
66.05	3,570	3,390	68.65	5,523	15,131
66.10	3,605	3,570	68.70	5,564	15,408
66.15	3,640	3,751	68.75	5,605	15,687
66.20	3,675	3,934	68.80	5,645	15,969
66.25	3,710	4,118	68.85	5,686	16,252
66.30	3,745	4,305	68.90	5,727	16,537
66.35	3,780	4,493	68.95	5,767	16,825
66.40	3,815	4,683	69.00	5,808	17,114
66.45	3,850	4,874			
66.50	3,886	5,068			
66.55	3,921	5,263			
66.60	3,956	5,460			
66.65	3,991	5,658			
66.70	4,026	5,859			
66.75	4,061	6,061			
66.80	4,096	6,265			
66.85	4,131	6,470			
66.90	4,166	6,678			
66.95	4,201	6,887			
67.00	4,236	7,098			
67.05	4,274	7,311			
67.10	4,312	7,525			
67.15	4,350	7,742			
67.20	4,388	7,960			
67.25	4,426	8,181			
67.30	4,463	8,403			
67.35	4,501	8,627			
67.40	4,539	8,853			
67.45	4,577	9,081			
67.50	4,615	9,311			
67.55	4,653	9,542			

100-152 Proposed HydroCAD*Type III 24-hr 100-YR Rainfall=7.68"*

Prepared by HP

Printed 9/1/2023

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Page 1

Summary for Pond 1P: Sediment Forebay

Volume	Invert	Avail.Storage	Storage Description
#1	65.00'	1,260 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
65.00	73	0	0
66.00	270	172	172
67.00	529	400	571
68.00	848	689	1,260

INSTRUCTIONS:

Non-automated: Mar. 4, 2008

1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C within Row
5. Total TSS Removal = Sum All Values in Column D

Location: **Infiltration Basin (via CB, Sediment Forebay)**

**TSS Removal
Calculation Worksheet**

A BMP ¹	B TSS Removal Rate ¹	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
Deep Sump and Hooded Catch Basin	0.25	1.00	0.25	0.75
Sediment Forebay/Infiltration Basin	0.80	0.75	0.60	0.15
	0.00	0.00	0.00	0.00
	0.00	0.04	0.00	0.00
	0.00	0.40	0.00	0.00

Total TSS Removal =

85%

**Separate Form Needs to
be Completed for Each
Outlet or BMP Train**

Project: **Mattakeesett Village**
Prepared By: **JG**
Date: **8/31/2023**

*Equals remaining load from previous BMP (E)
which enters the BMP

SECTION 5 – LONG TERM OPERATION & MAINTENANCE

OPERATION AND MAINTENANCE BMP MAP

September 5, 2023

Mattakeesett Village

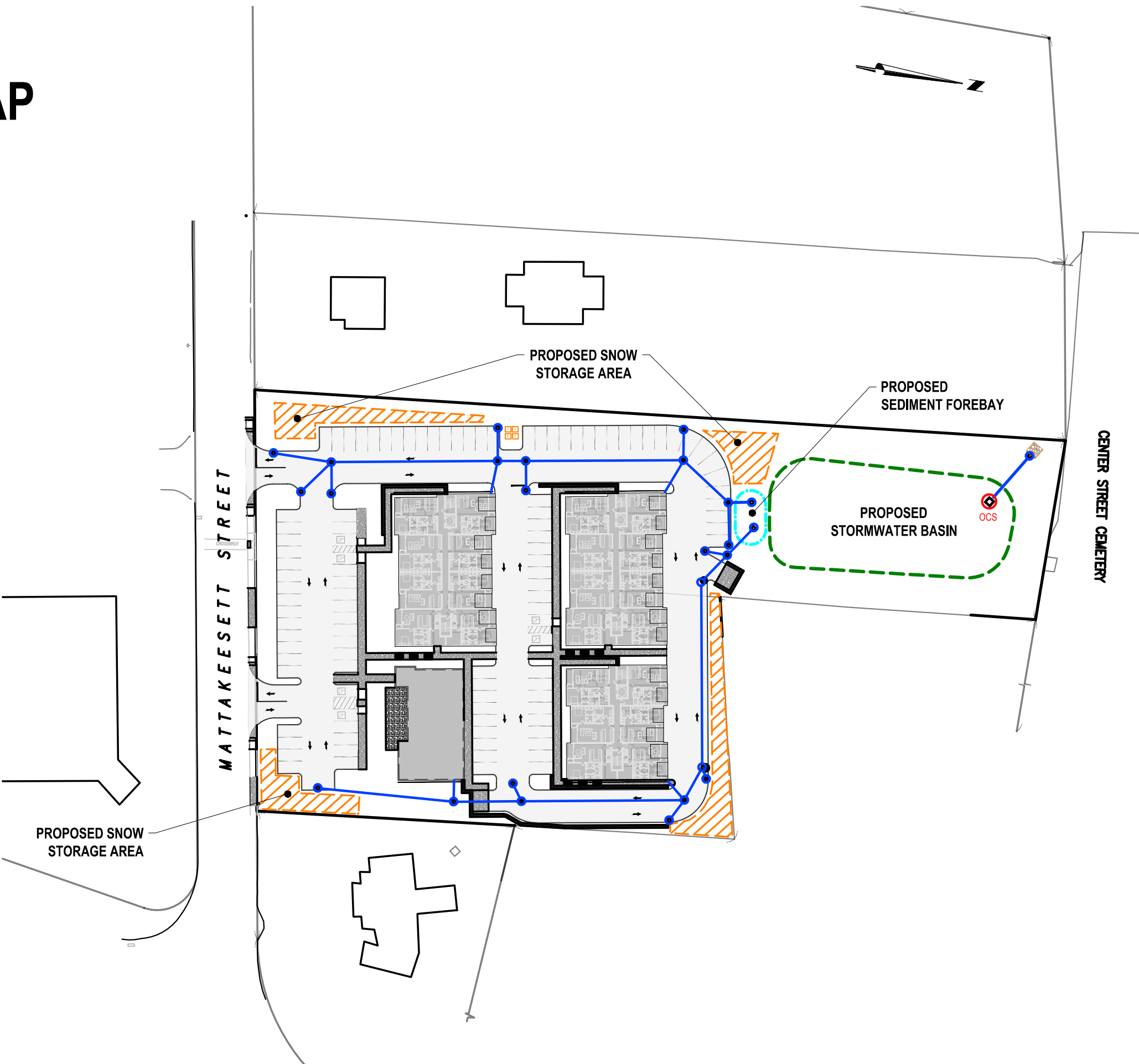
7 & 15 MATTAKEESETT ST.
PEMBROKE, MASSACHUSETTS 02359



- INFILTRATION + BASIN
- SEDIMENT FOREBAY
- DRAINAGE SYSTEM
- SNOW STORAGE
- OUTLET CONTROL STRUCTURE

SNOW STORAGE:

- 1. DRIVE AISLE TO BE PLOWED TO EACH EDGE OF PAVEMENT MAINTAINING MIN 20' WIDE ACCESS AT ALL TIMES.
- 2. SNOW STORAGE SHALL NOT OCCUR OVER CATCH BASINS.



LONG-TERM STORMWATER OPERATION & MAINTENANCE PLAN

Mattakeesett Village
7 & 15 Mattakeesett Street
Pembroke, MA 02359

PROJECT OVERVIEW:

The proposed project is three (3) multi-family buildings consisting of 66-units and a Tavern on Mattakeesett St. in Pembroke, Massachusetts. The project includes the construction of the site and garage parking. Stormwater management consists of a series of deep sump catch basins which collect stormwater from throughout the site and pipe it to a sediment forebay and combination infiltration/detention basin. The project has been designed to comply with the Massachusetts Stormwater Management Regulations.

Appended to this document is a sample maintenance form and a chart describing the anticipated frequency of tasks.

OWNER AND RESPONSIBLE PARTY:

Current Land Owners:

1317 Washington Re Holdings, LLC.
190 Old Derby Street, Suite 311
Hingham, MA 02043

Proposed Site Contractor:

To Be Determined

Proposed Owner (Once project is approved):

1317 Washington Re Holdings, LLC.
190 Old Derby Street, Suite 311
Hingham, MA 02043

CONSTRUCTION MANAGEMENT:

A construction manager with adequate knowledge and experience on projects of similar size and scope shall be employed to oversee all site work related construction. The contractor shall incorporate the appropriate techniques to control sediment and erosion pollution during construction in accordance with the *Massachusetts Erosion and Sediment Control Guidelines for Urban and Suburban Areas* and any conditions of approval from the Planning Board.

Care should be taken when constructing stormwater control structures. Light earth-moving equipment shall be used to excavate in the vicinity of the infiltration areas. Use of heavy-equipment causes excessive compaction of the soils beneath the basin resulting in reduced infiltration capacity. At no time shall temporary infiltration areas or settling basins be constructed in the vicinity of the proposed infiltration basins in order to prevent the soils from becoming clogged with sediment.

ON-GOING MAINTENANCE CONTRACT

The non-structural and structural approaches recommended below, as well as the required BMP maintenance, will be completed by the selected contractor. In Adequate personnel with appropriate training and access to proper equipment will be available to complete the tasks. Future responsible parties must be notified of their responsibility to operate and maintain the system in perpetuity.

MAINTENANCE LOG

The Responsible Party shall develop and maintain a log of inspections, maintenance, repairs, and disposal (including location of disposal) during the life of the project. Records will be maintained for at least 3 years and be made available to the Massachusetts Department of Environmental Protection or the Town of Hingham in accordance with the provisions of the Massachusetts Stormwater Handbook. A sample of such a maintenance log is provided.

STORMWATER BMP MAINTENANCE

The proposed stormwater management system has been designed with appropriate BMPs aimed at reducing the pollutants discharge based upon the intended use of the property. All BMPs require regular maintenance to function as intended. Some management measures have simple maintenance requirements; others are more involved. The Responsible Party must have all BMPs regularly inspected to ensure they are operating properly on an as needed basis, including during runoff events exceeding 0.5 inches of rainfall.

A description of the non-structural and structural approaches to be incorporated is indicated below. The following best management practices are proposed to be incorporated into the stormwater management design to reduce source runoff and improve stormwater runoff discharge quality. The Responsible Party will regularly inspect all BMPs to ensure they are operating properly. If any deficiencies are identified during these inspections, action to resolve it will be initiated and documented on the maintenance log.

STRUCTURAL BMPs

Deep Sump Hooded Catch Basins and Area/Yard Drains

On a regular basis the inlet pipe and outlet pipe shall be checked for debris and removed as necessary to ensure unobstructed flow of water. Inspections shall occur at least four times per year, and at the end of the foliage and snow removal seasons. Inspections shall verify the tees are secure and free flowing. Sediments must also be removed four times per year or whenever the depth of deposits is greater than or equal to one half the depth from the bottom of the invert of the lowest pipe in the basin. Because these catch basins will be discharging near a critical area, more frequent cleaning may be necessary. Basins shall be cleaned using a vacuum pump. All liquid shall be pumped from the sump of each basin at least once per year. All sediments and hydrocarbons should be properly handled and disposed of in accordance with local, state and federal guidelines and regulations.

Sediment Forebay

Frequently remove accumulated sediment. At a minimum, inspect forebay monthly and clean them out at least four times a year. Stabilize the floor and sidewalls of the forebay before making it operational. Grass height shall be no higher than 6-inches, and no lower than 3-inches. Check for signs of riling and gullyng and repair as needed.

Infiltration Basin

Accumulated debris and sediment shall be removed on an annual basis unless or more frequently if deemed necessary. Sediment shall be transported off site and disposed of in accordance with applicable local, state, and federal guidelines and regulations. Vegetated surfaces shall be repaired to ensure stable surfaces exist. Any debris or landscape growth extending within the identified maintenance access paths shall be trimmed/removed accordingly to maintain a clear and open pathway. Inspection should occur twice annually, once in the fall and then in the spring after the snow melts. Cleaning will take place at the completion of construction and as deemed necessary based on the inspections and manufacturer's requirements.

NON-STRUCTURAL BMPs

Pavement Sweeping

As street sweeping is a BMP under DEP guidelines, this non-structural BMP is an effective removal of Total Suspended Solids (TSS) in a comprehensive stormwater management program. Litter and debris is to be regularly picked up and removed from the pavement and porous pavers. Paved areas are to be swept a minimum of quarterly per year.

Pervious Areas and Slopes

Runoff from pervious areas and slopes shall be directed over vegetated areas to promote settlement of suspended solids before entering a wetland or resource area. Steep pervious slopes will be permanently vegetated to dissipate energy and reduce potential erosion. No constructed vegetated slopes should exceed 2H:1V. Slopes exceeding 2:1 shall be stabilized with rip-rap, jute netting or other similar measures to minimize the potential for future erosion.

Drainage Control Structures, Flared End Sections, Trash Racks, Riprap Pads, Swales, and Level Spreader Splash Pads

Basin control structures, flared end sections, trash racks, riprap pads and level spreader splash pads shall be inspected and any debris or growth surrounding or within these structures shall be removed. Any/all debris or vegetation encroaching on the control structures or outfall components shall be removed or appropriately trimmed back to maintain the designed control elevation and flow patterns/cross section without impediment. Inspection should occur twice annually, once in the fall and then in the spring after the snow melts. Cleaning will take place at the completion of construction and as deemed necessary based on the inspections and manufacturer's requirements.

Pest and Insect Control

- As a first-line defense against pests/insects and weeds (the "First-Line Defense"), the party responsible for maintenance shall avoid the use of non-organic pesticides, herbicides, fungicides and insecticides unless spot treatment is required for a specific control application. The owner shall not be required to undertake extraordinary measures or incur unreasonable cost to locate, purchase or apply non-organic products.
- If the First-Line Defense fails, as determined by the owner or party responsible for maintenance, in its sole but reasonable discretion, non-organic approaches to pest/insect control may be used, the same to be applied by a professional licensed in the Commonwealth of Massachusetts, where required.

Waste Management

Solid waste and recycling will be contained in dumpsters for routine and regular trash pickup.

Snow Removal

Snow that is plowed from the paved driveway surfaces shall be plowed to the edges of the pavement. When capacity of these areas is exceeded, accumulated snow shall be removed. Refer to the enclosed O&M Map which identifies location of BMPs and provides additional Snow Removal information.

Hazardous Waste and Spill Control Containment

In the event of a discharge or spill of oil or another hazardous material, outlets to stormwater management facilities immediately downstream of the spill shall be plugged so that hazardous materials do not enter the system. In the event of a discharge of oil or other hazardous material, responsible facility personnel shall notify the appropriate state agencies, the Town of Hingham DPW and the EPA National Response Center 1-800-424-8802 shall be notified. All hazardous waste materials will be disposed of in a manner specified by local, state and/or federal regulations and by the manufacturer of such products.

Stormwater BMP Inspection and Maintenance Log

Facility Name
Address
Begin Date End Date

Date	BMP ID#	BMP Description	Inspected by:	Cause for Inspection	Exceptions Noted	Comments and Actions Taken

Instructions: Record all inspections and maintenance for all treatment BMPs on this form. Use additional log sheets and/or attach extended comments or documentation as necessary. Submit a copy of the completed log with the annual independent inspectors' report to the municipality and start a new log at that time.

BMP ID# — Always use ID# from the Operation and Maintenance Manual.

Inspected by — Note all inspections and maintenance on this form, including the required independent annual inspection.

Cause for inspection — Note if the inspection is routine, pre-rainy-season, post-storm, annual, or in response to a noted problem or complaint.

Exceptions noted — Note any condition that requires correction or indicates a need for maintenance.

Comments and actions taken — Describe any maintenance done and need for follow-up.

Stormwater BMP Inspection Matrix

Conventional & LID Best Management Practices	Inspection & Maint. Frequency	Erosion& Scour	Obstructions	Trash & Debris	Sediment Build-Up Removal	Vegetation Cover	Remove/Reset Filter Fabric & Stone As Required	Vac Truck Sediment & Contaminants	Remove/Reset Riprap as Required
Catch Basins/Area & Yard Drains	Twice-Annually (Spring and Fall)								
Pavement Sweeping	Four times per year								
Stone Trench	Twice-Annually (Spring and Fall)								
Sediment Forebay	Twice-Annually (Spring and Fall)								
Infiltration Basin	Twice-Annually (Spring and Fall)								
Outlets (FES, Rip Rap Pad, Level Spreaders)	Twice-Annually (Spring and Fall)								

SECTION 6 – SOILS TESTING DATA

Project No. 100-152

Date: 11/1/21
Revision: _____

Commonwealth of Massachusetts
Pembroke, Massachusetts
Soil Suitability Assessment for On-site Sewage Disposal

Performed By: David Newhall Test Dates: 11/1/21
Performed By: _____ Test Dates: _____
Witnessed By: Lisa Cullity Testhole #: 21-01 to 21-04
Witnessed By: _____ Testhole #: _____

FACILITY INFORMATION

Site Location: _____ Owner/ Applicant Information: _____
Builder's lot #: _____ Name: 7-15 Mattakeesett Street LLC
Street Address: 7-15 Mattakeesett Street Address: _____
Town, State, Zip: Pembroke, MA Town, State, Zip: _____
Assessor's Map: Map 123 Lot 78 Telephone no.: _____

SITE INFORMATION

Construction Type:

New Construction: ☒ Repair: ☐ Upgrade: ☐ Drainage: ☐

Published Soil Survey Available: No: ☐ Yes: ☒

Year Published: 2021 Publication Scale: Attached a. Soil Map Unit: 256A Drainage Class: MWD
b. Soil Map Unit: 626B Drainage Class: SED

Soil Name: a. Deerfield loamy fine sand Soil Limitations: None
b. Merrimac-Urban land complex

Surficial Geologic Report Available: No: ☐ Yes: ☒

Year Published: 2004 Publication Scale: 1:100,000

Geological Material/map unit: Qsd and Qt

Landform: Glacial Stratified Deposits and Till

Flood Insurance Rate Map:

Above 500 year flood boundary? No: ☐ Yes: ☒ Within a velocity zone? No: ☒ Yes: ☐

Within 500 year flood boundary? No: ☒ Yes: ☐ Within 100 year flood boundary? No: ☒ Yes: ☐

Wetland Area:

National Wetland Inventory Map: (map unit) n/a Name: _____

Wetlands Conservancy Program Map: (map unit) n/a Name: _____

Current Water Resource Conditions (USGS): (Month/year) December-2018

Range: Above Normal: ☒ Normal: ☐ Below Normal: ☐

Other References Reviewed: _____

Comments: _____

Project No.: 100-152

Date: 11/1/21
Revised: _____

*Deep Hole # 21-01 to 21-04

Street Address: 7-15 Mattakeesett Street
Town: Pembroke, MA
Assessor's Map: Map 123 Lot 78

DETERMINATION OF HIGH GROUNDWATER ELEVATION

Method Used:

- ☐ Depth observed standing in observation hole: A: _____ inches B: _____ inches
- ☐ Depth weeping from side of observation hole: A: _____ inches B: _____ inches
- ☐ Depth to soil mottles: _____ inches
- ☒ Ground water adjustment: 132 inches

Index Well Number: MA-D4W 79 Duxbury Reading Date: 10/22/21 Index well level: Above

Adjustment factor: None Adjustment groundwater level:

DEPTH OF PERVIOUS MATERIAL

Depth of Naturally Occurring Pervious Material

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: ☐

If yes, at what depth was it observed? Upper Boundary (inches): see logs
Lower Boundary (inches): see logs

CERTIFICATION

I certify that I have passed the soil evaluator examination approved by the Department of Environmental Protection and that the above analysis was performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017.

Signature of Soil Evaluator: _____ Date: _____
Typed or Printed Name of Soil Evaluator: David Newhall
Date of Soil Evaluator Exam: May 2018

Name of Board of Health Witness: Lisa Cullity
Board of Health: Pembroke

*If applicable, only deep hole with shallowest ESHGW listed.

ON-SITE REVIEW

DEEP HOLE #: 21-01 DATE: 11/1/21 TIME: 8:30 AM WEATHER: Clear 55°
SITE ADDRESS or MAP/LOT #: 7 & 15 Mattakeesett st, Pembroke, MA
OWNER: 7-15 Mattakeesett Street LLC JOB NO.: 100-152
LOCATION (Identify on Plan): See Plan GROUND ELEVATION AT SURFACE OF HOLE: See Plan

LAND USE: Commercial SURFACE STONES: Yes: ☐ No: ☒ SLOPE (%): 0-3%

VEGETATION: Wooded LANDFORM: Glacial Stratified Deposits and Till

DISTANCES FROM:

OPEN WATER BODY: >100 ft PROPERTY LINE: >10 ft POSSIBLE WET AREA: >100 ft DRAINAGEWAY: >50 ft

DRINKING WATER WELL: >200 ft OTHER: _____

DEEP OBSERVATION HOLE LOG

Depth (inches)	Soil Hor./ Layer	Soil Texture (USDA)	Soil Color (Munsell)	Redoximorphic Features	Other (Structure, Consistency,% Gravels, Stones, Boulders)
0-8"	A	Loamy Sand	10 YR 3/3		
8"-24"	B	Loamy Sand	10 YR 5/6	5YR 5/6 at 18"	
24"-96"	C ₁	Sand	2.5 Y 5/3	Weeping at 75"	

PARENT MATERIAL: Sandy outwash / Loamy glaciofluvial deposit Unsuitable Material Present? Yes: ☐ No: ☒ If Yes:

Disturbed Soil: ☐ Fill Mat'l: ☐ Impervious Layer(s): ☐ Weathered/Fractured Rock: ☐ Bedrock: ☐

GROUNDWATER OBSERVED: Yes: ☒ No: ☐ If Yes: What is the depth of Groundwater:

Standing in Hole: 77" Weeping from Face: 75" Saturating the Face: _____ Mottling: 16"

Estimated Depth to Seasonal High Ground Water : _____

PERCOLATION TEST

Percolation Hole #:	<u>21-01</u>	Percolation Hole #:	_____
Test Date:	<u>11/1/21</u>	Test Date:	_____
Depth of Perc:	<u>36"-54"</u>	Depth of Perc:	_____
Start of Presoak:	<u>9:03 AM</u>	Start of Presoak:	_____
End of Presoak:	<u>9:18 AM</u>	End of Presoak:	_____
Time @ 12":	<u>9:18 AM</u>	Time @ 12":	_____
Time @ 9":	<u>9:24 AM</u>	Time @ 9":	_____
Time Elapse:(12"-9")	<u>6 min</u>	Time Elapse:(12"-9")	_____
Time AT 6":	<u>9:33 AM</u>	Time AT 6":	_____
Time Elapse: (9"-6"):	<u>9 min</u>	Time Elapse: (9"-6"):	_____
Rate: (min/in.):	<u>3 min/in</u>	Rate: (min/in.):	_____
Test Passed/ Failed/ Discon/ Add. Test Req'd:	<u>Passed</u>	Test Passed/ Failed/ Discon/ Add. Testing Req'd:	_____

Performed By: David Newhall Witnessed By: Lisa Cullity Mach./Oper.: J.F. Price

Comments: _____

An indication that the "site passed" indicates only that the basic criteria for a soil evaluation and percolation test under Title 5 have been met in the area tested. Further soil evaluations and design work are necessary to determine whether a septic system for a particular use, meeting the requirements of Title 5 and applicable local bylaws, will in fact be feasible on this site.

An indication that the "site failed" indicates only that the area tested did not meet the minimum criteria (at the time of testing) for a successful soil evaluation and/or percolation test in the area tested. Additional testing at another depth or other areas may result in passing results.

ON-SITE REVIEW

DEEP HOLE #: 21-02 DATE: 11/1/21 TIME: 10:00 AM WEATHER: Clear 55°

SITE ADDRESS or MAP/LOT #: 7 & 15 Mattakeesett st, Pembroke, MA

OWNER: 7-15 Mattakeesett Street LLC JOB NO.: 100-152

LOCATION (Identify on Plan): See Plan GROUND ELEVATION AT SURFACE OF HOLE: See Plan

LAND USE: Commercial SURFACE STONES: Yes: ☐ No: ☒ SLOPE (%): 0-3%

VEGETATION: Wooded LANDFORM: Glacial Stratified Deposits and Till

DISTANCES FROM:

OPEN WATER BODY: >100 ft PROPERTY LINE: >10 ft POSSIBLE WET AREA: >100 ft DRAINAGEWAY: >50 ft

DRINKING WATER WELL: >200 ft OTHER: _____

DEEP OBSERVATION HOLE LOG

Depth (inches)	Soil Hor./ Layer	Soil Texture (USDA)	Soil Color (Munsell)	Redoximorphic Features	Other (Structure, Consistency, % Gravels, Stones, Boulders)
0-18"	A	Loamy Sand	10 YR 3/3		Granular, Friable
18"-44"	B	Loamy Sand	10 YR 5/6	at 40"	Massive, Friable
44"-108"	C ₁	Sand	2.5 Y 5/3	5YR 5/6 at 36"	Single Grain, 10% Gravel

PARENT MATERIAL: Sandy outwash / Loamy glaciofluvial deposit Unsuitable Material Present? Yes: ☐ No: ☒ If Yes: _____

Disturbed Soil: ☐ Fill Mat'l: ☐ Impervious Layer(s): ☐ Weathered/Fractured Rock: ☐ Bedrock: ☐

GROUNDWATER OBSERVED: Yes: ☒ No: ☐ If Yes: What is the depth of Groundwater: _____

Standing in Hole: 80" Weeping from Face: 76" Saturating the Face: _____ Mottling: 36"

Estimated Depth to Seasonal High Ground Water : _____

PERCOLATION TEST

Percolation Hole #:	<u>21-02</u>	Percolation Hole #:	_____
Test Date:	<u>11/1/21</u>	Test Date:	_____
Depth of Perc:	<u>48"-66"</u>	Depth of Perc:	_____
Start of Presoak:	<u>10:48 AM</u>	Start of Presoak:	_____
End of Presoak:	<u>11:03 AM</u>	End of Presoak:	_____
Time @ 12":	<u>11:03 AM</u>	Time @ 12":	_____
Time @ 9":	<u>11:16 AM</u>	Time @ 9":	_____
Time Elapse:(12"-9")	<u>13 min</u>	Time Elapse:(12"-9")	_____
Time AT 6":	<u>11:33 AM</u>	Time AT 6":	_____
Time Elapse: (9"-6"):	<u>17 min</u>	Time Elapse: (9"-6"):	_____
Rate: (min/in.):	<u>6 min/in</u>	Rate: (min/in.):	_____
Test Passed/ Failed/ Discon/ Add. Test Req'd:	<u>Passed</u>	Test Passed/ Failed/ Discon/ Add. Testing Req'd:	_____

Performed By: David Newhall Witnessed By: Lisa Cullity Mach./Oper.: J.F. Price

Comments: Some finer material within sand layer, coarser at bottom.

An indication that the "site passed" indicates only that the basic criteria for a soil evaluation and percolation test under Title 5 have been met in the area tested. Further soil evaluations and design work are necessary to determine whether a septic system for a particular use, meeting the requirements of Title 5 and applicable local bylaws, will in fact be feasible on this site.

An indication that the "site failed" indicates only that the area tested did not meet the minimum criteria (at the time of testing) for a successful soil evaluation and/or percolation test in the area tested. Additional testing at another depth or other areas may result in passing results.

ON-SITE REVIEW

DEEP HOLE #: **21-03** DATE: 11/1/21 TIME: 10:30 AM WEATHER: Clear 55°
SITE ADDRESS or MAP/LOT #: 7 & 15 Mattakeesett st, Pembroke, MA
OWNER: 7-15 Mattakeesett Street LLC JOB NO.: 100-152
LOCATION (Identify on Plan): See Plan GROUND ELEVATION AT SURFACE OF HOLE: See Plan

LAND USE: Commercial SURFACE STONES: Yes: ☐ No: ☒ SLOPE (%): 0-3%

VEGETATION: Wooded LANDFORM: Glacial Stratified Deposits and Till

DISTANCES FROM:

OPEN WATER BODY: >100 ft PROPERTY LINE: >10 ft POSSIBLE WET AREA: >100 ft DRAINAGEWAY: >50 ft

DRINKING WATER WELL: >200 ft OTHER: _____

DEEP OBSERVATION HOLE LOG

Depth (inches)	Soil Hor./ Layer	Soil Texture (USDA)	Soil Color (Munsell)	Redoximorphic Features	Other (Structure, Consistency, % Gravels, Stones, Boulders)
0-12"	A	Loamy Sand	10 YR 3/3		Granular, Friable
12"-36"	B	Loamy Sand	10 YR 5/6	at 22"	Massive, Friable
36"-96"	C ₁	Sand	2.5 Y 5/3	5YR 5/6	Single Grain, 10% Gravel

PARENT MATERIAL: Sandy outwash / Loamy glaciofluvial deposit Unsuitable Material Present? Yes: ☐ No: ☒ If Yes:

Disturbed Soil: ☐ Fill Mat'l: ☐ Impervious Layer(s): ☐ Weathered/Fractured Rock: ☐ Bedrock: ☐

GROUNDWATER OBSERVED: Yes: ☒ No: ☐ If Yes: What is the depth of Groundwater:

Standing in Hole: 52" Weeping from Face: _____ Saturating the Face: _____ Mottling: 22"

Estimated Depth to Seasonal High Ground Water : _____

PERCOLATION TEST

Percolation Hole #:	_____	Percolation Hole #:	_____
Test Date:	_____	Test Date:	_____
Depth of Perc:	_____	Depth of Perc:	_____
Start of Presoak:	_____	Start of Presoak:	_____
End of Presoak:	_____	End of Presoak:	_____
Time @ 12":	_____	Time @ 12":	_____
Time @ 9":	_____	Time @ 9":	_____
Time Elapse:(12"-9")	_____	Time Elapse:(12"-9")	_____
Time AT 6":	_____	Time AT 6":	_____
Time Elapse: (9"-6"):	_____	Time Elapse: (9"-6"):	_____
Rate: (min/in.):	_____	Rate: (min/in.):	_____
Test Passed/ Failed/	_____	Test Passed/ Failed/ Discon/	_____
Discon/ Add. Test Req'd:	_____	Add. Testing Req'd:	_____

Performed By: David Newhall Witnessed By: Lisa Cullity Mach./Oper.: J.F. Price

Comments: _____

An indication that the "site passed" indicates only that the basic criteria for a soil evaluation and percolation test under Title 5 have been met in the area tested. Further soil evaluations and design work are necessary to determine whether a septic system for a particular use, meeting the requirements of Title 5 and applicable local bylaws, will in fact be feasible on this site.

An indication that the "site failed" indicates only that the area tested did not meet the minimum criteria (at the time of testing) for a successful soil evaluation and/or percolation test in the area tested. Additional testing at another depth or other areas may result in passing results.

ON-SITE REVIEW

DEEP HOLE #: 21-04 DATE: 11/1/21 TIME: 11:30 AM WEATHER: Clear 55°
SITE ADDRESS or MAP/LOT #: 7 & 15 Mattakeesett st, Pembroke, MA
OWNER: 7-15 Mattakeesett Street LLC JOB NO.: 100-152
LOCATION (Identify on Plan): See Plan GROUND ELEVATION AT SURFACE OF HOLE: See Plan

LAND USE: Commercial SURFACE STONES: Yes: ☐ No: ☒ SLOPE (%): 0-3%

VEGETATION: Wooded LANDFORM: Glacial Stratified Deposits and Till

DISTANCES FROM:

OPEN WATER BODY: >100 ft PROPERTY LINE: >10 ft POSSIBLE WET AREA: >100 ft DRAINAGEWAY: >50 ft
DRINKING WATER WELL: >200 ft OTHER: _____

DEEP OBSERVATION HOLE LOG

Depth (inches)	Soil Hor./ Layer	Soil Texture (USDA)	Soil Color (Munsell)	Redoximorphic Features	Other (Structure, Consistency,% Gravels, Stones, Boulders)
0-12"	A	Loamy Sand	10 YR 3/3		Granular, Friable
12"-28"	B	Loamy Sand	10 YR 5/6		Massive, Friable
28"-96"	C ₁	Sand	2.5 Y 5/3	5YR 5/6 at 26"	Single Grain, Loose, 5% Gravel

PARENT MATERIAL: Sandy outwash / Loamy glaciofluvial deposit Unsuitable Material Present? Yes: ☐ No: ☒ If Yes: _____
Disturbed Soil: ☐ Fill Mat'l: ☐ Impervious Layer(s): ☐ Weathered/Fractured Rock: ☐ Bedrock: ☐

GROUNDWATER OBSERVED: Yes: ☒ No: ☐ If Yes: What is the depth of Groundwater: _____
Standing in Hole: 52" Weeping from Face: _____ Saturating the Face: _____ Mottling: 22"

Estimated Depth to Seasonal High Ground Water : _____

PERCOLATION TEST

Percolation Hole #:	_____	Percolation Hole #:	_____
Test Date:	_____	Test Date:	_____
Depth of Perc:	_____	Depth of Perc:	_____
Start of Presoak:	_____	Start of Presoak:	_____
End of Presoak:	_____	End of Presoak:	_____
Time @ 12":	_____	Time @ 12":	_____
Time @ 9":	_____	Time @ 9":	_____
Time Elapse:(12"-9")	_____	Time Elapse:(12"-9")	_____
Time AT 6":	_____	Time AT 6":	_____
Time Elapse: (9"-6"):	_____	Time Elapse: (9"-6"):	_____
Rate: (min/in.):	_____	Rate: (min/in.):	_____
Test Passed/ Failed/ Discon/ Add. Test Req'd:	<u>Passed</u>	Test Passed/ Failed/ Discon/ Add. Testing Req'd:	_____

Performed By: David Newhall Witnessed By: Lisa Cullity Mach./Oper.: J.F. Price
Comments: _____

An indication that the "site passed" indicates only that the basic criteria for a soil evaluation and percolation test under Title 5 have been met in the area tested. Further soil evaluations and design work are necessary to determine whether a septic system for a particular use, meeting the requirements of Title 5 and applicable local bylaws, will in fact be feasible on this site.

An indication that the "site failed" indicates only that the area tested did not meet the minimum criteria (at the time of testing) for a successful soil evaluation and/or percolation test in the area tested. Additional testing at another depth or other areas may result in passing results.

ON-SITE REVIEW

DEEP HOLE #: 21-05 DATE: 12/14/21 TIME: 9:00 AM WEATHER: Partly Cloudy
SITE ADDRESS or MAP/LOT #: 7 & 15 Mattakeesett st, Pembroke, MA
OWNER: 7-15 Mattakeesett Street LLC JOB NO.: 100-152
LOCATION (Identify on Plan): See Plan GROUND ELEVATION AT SURFACE OF HOLE: See Plan

LAND USE: Commercial SURFACE STONES: Yes: ☐ No: ☒ SLOPE (%): 0-3%

VEGETATION: Pavement LANDFORM: Glacial Stratified Deposits and Till

DISTANCES FROM:

OPEN WATER BODY: >100 ft PROPERTY LINE: >10 ft POSSIBLE WET AREA: >100 ft DRAINAGEWAY: >50 ft
DRINKING WATER WELL: >200 ft OTHER: _____

DEEP OBSERVATION HOLE LOG

Depth (inches)	Soil Hor./ Layer	Soil Texture (USDA)	Soil Color (Munsell)	Redoximorphic Features	Other (Structure, Consistency, % Gravels, Stones, Boulders)
0-112"	Fill	Fill			
112"-126"	A _B	Loamy Sand	2.5 Y 6/2		Sinlge Grain, Loose
126"-186"	C ₁	Sand	2.5 Y 5/3		Sinlge Grain, Loose

PARENT MATERIAL: Sandy outwash / Loamy glaciofluvial deposit Unsuitable Material Present? Yes: ☐ No: ☒ If Yes:
Disturbed Soil: ☐ Fill Mat'l: ☐ Impervious Layer(s): ☐ Weathered/Fractured Rock: ☐ Bedrock: ☐

GROUNDWATER OBSERVED: Yes: ☐ No: ☒ If Yes: What is the depth of Groundwater:
Standing in Hole: _____ Weeping from Face: _____ Saturating the Face: _____ Mottling: _____

Estimated Depth to Seasonal High Ground Water : _____

PERCOLATION TEST

Percolation Hole #:	_____	Percolation Hole #:	_____
Test Date:	_____	Test Date:	_____
Depth of Perc:	_____	Depth of Perc:	_____
Start of Presoak:	_____	Start of Presoak:	_____
End of Presoak:	_____	End of Presoak:	_____
Time @ 12":	_____	Time @ 12":	_____
Time @ 9":	_____	Time @ 9":	_____
Time Elapse:(12"-9")	_____	Time Elapse:(12"-9")	_____
Time AT 6":	_____	Time AT 6":	_____
Time Elapse: (9"-6"):	_____	Time Elapse: (9"-6"):	_____
Rate: (min/in.):	_____	Rate: (min/in.):	_____
Test Passed/ Failed/ Discon/	_____	Test Passed/ Failed/ Discon/	_____
Add. Test Req'd:	_____	Add. Testing Req'd:	_____

Performed By: David Newhall Witnessed By: Lisa Cullity Mach./Oper.: J.F. Price
Comments: _____

An indication that the "site passed" indicates only that the basic criteria for a soil evaluation and percolation test under Title 5 have been met in the area tested. Further soil evaluations and design work are necessary to determine whether a septic system for a particular use, meeting the requirements of Title 5 and applicable local bylaws, will in fact be feasible on this site.

An indication that the "site failed" indicates only that the area tested did not meet the minimum criteria (at the time of testing) for a successful soil evaluation and/or percolation test in the area tested. Additional testing at another depth or other areas may result in passing results.

ON-SITE REVIEW

DEEP HOLE #: 21-06 DATE: 12/14/21 TIME: 9:00 AM WEATHER: Partly Cloudy

SITE ADDRESS or MAP/LOT #: 7 & 15 Mattakeesett st, Pembroke, MA

OWNER: 7-15 Mattakeesett Street LLC JOB NO.: 100-152

LOCATION (Identify on Plan): See Plan GROUND ELEVATION AT SURFACE OF HOLE: See Plan

LAND USE: Commercial SURFACE STONES: Yes: ☐ No: ☒ SLOPE (%): 0-3%

VEGETATION: Pavement LANDFORM: Glacial Stratified Deposits and Till

DISTANCES FROM:

OPEN WATER BODY: >100 ft PROPERTY LINE: >10 ft POSSIBLE WET AREA: >100 ft DRAINAGEWAY: >50 ft

DRINKING WATER WELL: >200 ft OTHER: _____

DEEP OBSERVATION HOLE LOG

Depth (inches)	Soil Hor./ Layer	Soil Texture (USDA)	Soil Color (Munsell)	Redoximorphic Features	Other (Structure, Consistency,% Gravels, Stones, Boulders)
0-82"	Fill	Fill	-	-	-
112"-126"	C ₁	Sand	2.5 Y 5/3		Sinlge Grain, Loose

PARENT MATERIAL: Sandy outwash / Loamy glaciofluvial deposit Unsuitable Material Present? Yes: ☐ No: ☒ If Yes:

Disturbed Soil: ☐ Fill Mat'l: ☐ Impervious Layer(s): ☐ Weathered/Fractured Rock: ☐ Bedrock: ☐

GROUNDWATER OBSERVED: Yes: ☐ No: ☒ If Yes: What is the depth of Groundwater:

Standing in Hole: _____ Weeping from Face: _____ Saturating the Face: _____ Mottling: _____

Estimated Depth to Seasonal High Ground Water : _____

PERCOLATION TEST

Percolation Hole #:	_____	Percolation Hole #:	_____
Test Date:	_____	Test Date:	_____
Depth of Perc:	_____	Depth of Perc:	_____
Start of Presoak:	_____	Start of Presoak:	_____
End of Presoak:	_____	End of Presoak:	_____
Time @ 12":	_____	Time @ 12":	_____
Time @ 9":	_____	Time @ 9":	_____
Time Elapse:(12"-9")	_____	Time Elapse:(12"-9")	_____
Time AT 6":	_____	Time AT 6":	_____
Time Elapse: (9"-6"):	_____	Time Elapse: (9"-6"):	_____
Rate: (min/in.):	_____	Rate: (min/in.):	_____
Test Passed/ Failed/ Discon/	_____	Test Passed/ Failed/ Discon/	_____
Add. Test Req'd:	_____	Add. Testing Req'd:	_____

Performed By: David Newhall Witnessed By: Lisa Cullity Mach./Oper.: J.F. Price

Comments: Pockets

An indication that the "site passed" indicates only that the basic criteria for a soil evaluation and percolation test under Title 5 have been met in the area tested. Further soil evaluations and design work are necessary to determine whether a septic system for a particular use, meeting the requirements of Title 5 and applicable local bylaws, will in fact be feasible on this site.

An indication that the "site failed" indicates only that the area tested did not meet the minimum criteria (at the time of testing) for a successful soil evaluation and/or percolation test in the area tested. Additional testing at another depth or other areas may result in passing results.

ON-SITE REVIEW

DEEP HOLE #: 21-07 DATE: 12/14/21 TIME: 9:00 AM WEATHER: Partly Cloudy

SITE ADDRESS or MAP/LOT #: 7 & 15 Mattakeesett st, Pembroke, MA

OWNER: 7-15 Mattakeesett Street LLC JOB NO.: 100-152

LOCATION (Identify on Plan): See Plan GROUND ELEVATION AT SURFACE OF HOLE: See Plan

LAND USE: Commercial SURFACE STONES: Yes: ☐ No: ☒ SLOPE (%): 0-3%

VEGETATION: Pavement LANDFORM: Glacial Stratified Deposits and Till

DISTANCES FROM:

OPEN WATER BODY: >100 ft PROPERTY LINE: >10 ft POSSIBLE WET AREA: >100 ft DRAINAGEWAY: >50 ft

DRINKING WATER WELL: >200 ft OTHER: _____

DEEP OBSERVATION HOLE LOG

Depth (inches)	Soil Hor./ Layer	Soil Texture (USDA)	Soil Color (Munsell)	Redoximorphic Features	Other (Structure, Consistency,% Gravels, Stones, Boulders)
0-102"	Fill	Fill	-	-	-
112"-174"	C ₁	Sand	2.5 Y 5/3		Single Grain, Loose

PARENT MATERIAL: Sandy outwash / Loamy glaciofluvial deposit Unsuitable Material Present? Yes: ☐ No: ☒ If Yes:

Disturbed Soil: ☐ Fill Mat'l: ☐ Impervious Layer(s): ☐ Weathered/Fractured Rock: ☐ Bedrock: ☐

GROUNDWATER OBSERVED: Yes: ☐ No: ☒ If Yes: What is the depth of Groundwater:

Standing in Hole: _____ Weeping from Face: _____ Saturating the Face: _____ Mottling: _____

Estimated Depth to Seasonal High Ground Water : _____

PERCOLATION TEST

Percolation Hole #:	_____	Percolation Hole #:	_____
Test Date:	_____	Test Date:	_____
Depth of Perc:	_____	Depth of Perc:	_____
Start of Presoak:	_____	Start of Presoak:	_____
End of Presoak:	_____	End of Presoak:	_____
Time @ 12":	_____	Time @ 12":	_____
Time @ 9":	_____	Time @ 9":	_____
Time Elapse:(12"-9")	_____	Time Elapse:(12"-9")	_____
Time AT 6":	_____	Time AT 6":	_____
Time Elapse: (9"-6"):	_____	Time Elapse: (9"-6"):	_____
Rate: (min/in.):	_____	Rate: (min/in.):	_____
Test Passed/ Failed/ Discon/	_____	Test Passed/ Failed/ Discon/	_____
Add. Test Req'd:	_____	Add. Testing Req'd:	_____

Performed By: David Newhall Witnessed By: Lisa Cullity Mach./Oper.: J.F. Price

Comments: _____

An indication that the "site passed" indicates only that the basic criteria for a soil evaluation and percolation test under Title 5 have been met in the area tested. Further soil evaluations and design work are necessary to determine whether a septic system for a particular use, meeting the requirements of Title 5 and applicable local bylaws, will in fact be feasible on this site.

An indication that the "site failed" indicates only that the area tested did not meet the minimum criteria (at the time of testing) for a successful soil evaluation and/or percolation test in the area tested. Additional testing at another depth or other areas may result in passing results.

ON-SITE REVIEW

DEEP HOLE #: 21-06 DATE: 12/14/21 TIME: 9:00 AM WEATHER: Partly Cloudy
SITE ADDRESS or MAP/LOT #: 7 & 15 Mattakeesett st, Pembroke, MA
OWNER: 7-15 Mattakeesett Street LLC JOB NO.: 100-152
LOCATION (Identify on Plan): See Plan GROUND ELEVATION AT SURFACE OF HOLE: See Plan

LAND USE: Commercial SURFACE STONES: Yes: ☐ No: ☒ SLOPE (%): 0-3%

VEGETATION: Pavement LANDFORM: Glacial Stratified Deposits and Till

DISTANCES FROM:

OPEN WATER BODY: >100 ft PROPERTY LINE: >10 ft POSSIBLE WET AREA: >100 ft DRAINAGEWAY: >50 ft
DRINKING WATER WELL: >200 ft OTHER: _____

DEEP OBSERVATION HOLE LOG

Depth (inches)	Soil Hor./ Layer	Soil Texture (USDA)	Soil Color (Munsell)	Redoximorphic Features	Other (Structure, Consistency,% Gravels, Stones, Boulders)
0-110"	Fill	Fill	-	-	-
110"-180"	C ₁	Sand	2.5 Y 5/3		Sinlge Grain, Loose

PARENT MATERIAL: Sandy outwash / Loamy glaciofluvial deposit Unsuitable Material Present? Yes: ☐ No: ☒ If Yes:
Disturbed Soil: ☐ Fill Mat'l: ☐ Impervious Layer(s): ☐ Weathered/Fractured Rock: ☐ Bedrock: ☐

GROUNDWATER OBSERVED: Yes: ☐ No: ☒ If Yes: What is the depth of Groundwater:
Standing in Hole: _____ Weeping from Face: _____ Saturating the Face: _____ Mottling: _____

Estimated Depth to Seasonal High Ground Water : _____

PERCOLATION TEST

Percolation Hole #:	_____	Percolation Hole #:	_____
Test Date:	_____	Test Date:	_____
Depth of Perc:	_____	Depth of Perc:	_____
Start of Presoak:	_____	Start of Presoak:	_____
End of Presoak:	_____	End of Presoak:	_____
Time @ 12":	_____	Time @ 12":	_____
Time @ 9":	_____	Time @ 9":	_____
Time Elapse:(12"-9")	_____	Time Elapse:(12"-9")	_____
Time AT 6":	_____	Time AT 6":	_____
Time Elapse: (9"-6"):	_____	Time Elapse: (9"-6"):	_____
Rate: (min/in.):	_____	Rate: (min/in.):	_____
Test Passed/ Failed/ Discon/	_____	Test Passed/ Failed/ Discon/	_____
Add. Test Req'd:	_____	Add. Testing Req'd:	_____

Performed By: David Newhall Witnessed By: Lisa Cullity Mach./Oper.: J.F. Price
Comments: _____

An indication that the "site passed" indicates only that the basic criteria for a soil evaluation and percolation test under Title 5 have been met in the area tested. Further soil evaluations and design work are necessary to determine whether a septic system for a particular use, meeting the requirements of Title5 and applicable local bylaws, will in fact be feasible on this site.

An indication that the "site failed" indicates only that the area tested did not meet the minimum criteria (at the time of testing) for a successful soil evaluation and/or percolation test in the area tested. Additional testing at another depth or other areas may result in passing results.

ON-SITE REVIEW

DEEP HOLE #: TP-1 DATE: 8/17/22 TIME: 10:50 AM WEATHER: Sunny 72°F

SITE ADDRESS or MAP/LOT #: 7 & 15 Mattakeesett st, Pembroke, MA

OWNER: 7-15 Mattakeesett Street LLC JOB NO.: 100-152

LOCATION (Identify on Plan): See Plan GROUND ELEVATION AT SURFACE OF HOLE: See Plan

LAND USE: Commercial SURFACE STONES: Yes: ☐ No: ☒ SLOPE (%): 0-3%

VEGETATION: Pavement LANDFORM: Glacial Stratified Deposits and Till

DISTANCES FROM:

OPEN WATER BODY: >100 ft PROPERTY LINE: >10 ft POSSIBLE WET AREA: >100 ft DRAINAGEWAY: >50 ft

DRINKING WATER WELL: >200 ft OTHER: _____

DEEP OBSERVATION HOLE LOG

Depth (inches)	Soil Hor./ Layer	Soil Texture (USDA)	Soil Color (Munsell)	Redoximorphic Features	Other (Structure, Consistency,% Gravels, Stones, Boulders)
0-127"	Fill	Fill	-	-	-

PARENT MATERIAL: Sandy outwash / Loamy glaciofluvial deposit Unsuitable Material Present? Yes: ☐ No: ☒ If Yes:

Disturbed Soil: ☐ Fill Mat'l: ☐ Impervious Layer(s): ☐ Weathered/Fractured Rock: ☐ Bedrock: ☐

GROUNDWATER OBSERVED: Yes: ☐ No: ☒ If Yes: What is the depth of Groundwater:

Standing in Hole: _____ Weeping from Face: _____ Saturating the Face: _____ Mottling: _____

Estimated Depth to Seasonal High Ground Water : _____

PERCOLATION TEST

Percolation Hole #:	_____	Percolation Hole #:	_____
Test Date:	_____	Test Date:	_____
Depth of Perc:	_____	Depth of Perc:	_____
Start of Presoak:	_____	Start of Presoak:	_____
End of Presoak:	_____	End of Presoak:	_____
Time @ 12":	_____	Time @ 12":	_____
Time @ 9":	_____	Time @ 9":	_____
Time Elapse:(12"-9")	_____	Time Elapse:(12"-9")	_____
Time AT 6":	_____	Time AT 6":	_____
Time Elapse: (9"-6"):	_____	Time Elapse: (9"-6"):	_____
Rate: (min/in.):	_____	Rate: (min/in.):	_____
Test Passed/ Failed/ Discon/	_____	Test Passed/ Failed/ Discon/	_____
Add. Test Req'd:	_____	Add. Testing Req'd:	_____

Performed By: Maggie Laracy Witnessed By: _____ Mach./Oper.: J.F. Price

Comments: There were some pockets of what appeared to be ash, but the test pit was completely comprised of fill materials.

An indication that the "site passed" indicates only that the basic criteria for a soil evaluation and percolation test under Title 5 have been met in the area tested. Further soil evaluations and design work are necessary to determine whether a septic system for a particular use, meeting the requirements of Title 5 and applicable local bylaws, will in fact be feasible on this site.

An indication that the "site failed" indicates only that the area tested did not meet the minimum criteria (at the time of testing) for a successful soil evaluation and/or percolation test in the area tested. Additional testing at another depth or other areas may result in passing results.

ON-SITE REVIEW

DEEP HOLE #: TP-2 DATE: 8/17/22 TIME: 10:15 AM WEATHER: Sunny 72°F

SITE ADDRESS or MAP/LOT #: 7 & 15 Mattakeesett st, Pembroke, MA

OWNER: 7-15 Mattakeesett Street LLC JOB NO.: 100-152

LOCATION (Identify on Plan): See Plan GROUND ELEVATION AT SURFACE OF HOLE: See Plan

LAND USE: Commercial SURFACE STONES: Yes: ☐ No: ☒ SLOPE (%): 0-3%

VEGETATION: Woods LANDFORM: Glacial Stratified Deposits and Till

DISTANCES FROM:

OPEN WATER BODY: >100 ft PROPERTY LINE: >10 ft POSSIBLE WET AREA: >100 ft DRAINAGEWAY: >50 ft

DRINKING WATER WELL: >200 ft OTHER: _____

DEEP OBSERVATION HOLE LOG

Depth (inches)	Soil Hor./ Layer	Soil Texture (USDA)	Soil Color (Munsell)	Redoximorphic Features	Other (Structure, Consistency,% Gravels, Stones, Boulders)
0-13"	Ap		-	-	-
13-25"	B	Loamy Sand	10YR 5/5		massive, friable
25-95"	C ₁	Loamy Sand	2.5Y 5/4	5YR 5/6 at 40"	massive, friable

PARENT MATERIAL: Sandy outwash / Loamy glaciofluvial deposit Unsuitable Material Present? Yes: ☐ No: ☒ If Yes:

Disturbed Soil: ☐ Fill Mat'l: ☐ Impervious Layer(s): ☐ Weathered/Fractured Rock: ☐ Bedrock: ☐

GROUNDWATER OBSERVED: Yes: ☐ No: ☒ If Yes: What is the depth of Groundwater:

Standing in Hole: _____ Weeping from Face: _____ Saturating the Face: _____ Mottling: 40"

Estimated Depth to Seasonal High Ground Water : _____

PERCOLATION TEST

Percolation Hole #:	_____	Percolation Hole #:	_____
Test Date:	_____	Test Date:	_____
Depth of Perc:	_____	Depth of Perc:	_____
Start of Presoak:	_____	Start of Presoak:	_____
End of Presoak:	_____	End of Presoak:	_____
Time @ 12":	_____	Time @ 12":	_____
Time @ 9":	_____	Time @ 9":	_____
Time Elapse:(12"-9")	_____	Time Elapse:(12"-9")	_____
Time AT 6":	_____	Time AT 6":	_____
Time Elapse: (9"-6"):	_____	Time Elapse: (9"-6"):	_____
Rate: (min/in.):	_____	Rate: (min/in.):	_____
Test Passed/ Failed/ Discon/	_____	Test Passed/ Failed/ Discon/	_____
Add. Test Req'd:	_____	Add. Testing Req'd:	_____

Performed By: Maggie Laracy Witnessed By: _____ Mach./Oper.: J.F. Price

Comments: _____

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ON-SITE REVIEW

DEEP HOLE #: TP-3 DATE: 8/17/22 TIME: 10:00 AM WEATHER: Sunny 72°F

SITE ADDRESS or MAP/LOT #: 7 & 15 Mattakeesett st, Pembroke, MA

OWNER: 7-15 Mattakeesett Street LLC JOB NO.: 100-152

LOCATION (Identify on Plan): See Plan GROUND ELEVATION AT SURFACE OF HOLE: See Plan

LAND USE: Commercial SURFACE STONES: Yes: ☐ No: ☒ SLOPE (%): 0-3%

VEGETATION: Woods ~ 100ft from property line/cemetery LANDFORM: Glacial Stratified Deposits and Till

DISTANCES FROM:

OPEN WATER BODY: >100 ft PROPERTY LINE: >10 ft POSSIBLE WET AREA: >100 ft DRAINAGEWAY: >50 ft

DRINKING WATER WELL: >200 ft OTHER: _____

DEEP OBSERVATION HOLE LOG

Depth (inches)	Soil Hor./ Layer	Soil Texture (USDA)	Soil Color (Munsell)	Redoximorphic Features	Other (Structure, Consistency,% Gravels, Stones, Boulders)
0-11"	Ap		-	-	-
11-25"	B	Loamy Sand	-		massive, friable
25-75"	C ₁	Loamy Sand	10YR 5/6		5%gravel & cobbles, massive, friable
75-105"	C ₂	Sand	10YR 4/4	5YR 5/6 at 81"	Sinlge Grain, Loose

PARENT MATERIAL: Sandy outwash / Loamy glaciofluvial deposit Unsuitable Material Present? Yes: ☐ No: ☒ If Yes:

Disturbed Soil: ☐ Fill Mat'l: ☐ Impervious Layer(s): ☐ Weathered/Fractured Rock: ☐ Bedrock: ☐

GROUNDWATER OBSERVED: Yes: ☒ No: ☐ If Yes: What is the depth of Groundwater: 105"

Standing in Hole: 105" Weeping from Face: _____ Saturating the Face: _____ Mottling: at 81"

Estimated Depth to Seasonal High Ground Water : _____

PERCOLATION TEST

Percolation Hole #:	_____	Percolation Hole #:	_____
Test Date:	_____	Test Date:	_____
Depth of Perc:	_____	Depth of Perc:	_____
Start of Presoak:	_____	Start of Presoak:	_____
End of Presoak:	_____	End of Presoak:	_____
Time @ 12":	_____	Time @ 12":	_____
Time @ 9":	_____	Time @ 9":	_____
Time Elapse:(12"-9")	_____	Time Elapse:(12"-9")	_____
Time AT 6":	_____	Time AT 6":	_____
Time Elapse: (9"-6"):	_____	Time Elapse: (9"-6"):	_____
Rate: (min/in.):	_____	Rate: (min/in.):	_____
Test Passed/ Failed/ Discon/	_____	Test Passed/ Failed/ Discon/	_____
Add. Test Req'd:	_____	Add. Testing Req'd:	_____

Performed By: Maggie Laracy Witnessed By: _____ Mach./Oper.: J.F. Price

Comments: _____

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ON-SITE REVIEW

DEEP HOLE #: TP-4 DATE: 8/17/22 TIME: 9:40 AM WEATHER: Overcast 66°F

SITE ADDRESS or MAP/LOT #: 7 & 15 Mattakeesett st, Pembroke, MA

OWNER: 7-15 Mattakeesett Street LLC JOB NO.: 100-152

LOCATION (Identify on Plan): ~ 30' from PL/cemetery GROUND ELEVATION AT SURFACE OF HOLE: See Plan

LAND USE: Commercial SURFACE STONES: Yes: ☐ No: ☒ SLOPE (%): 0-3%

VEGETATION: Woods LANDFORM: Glacial Stratified Deposits and Till

DISTANCES FROM:

OPEN WATER BODY: >100 ft PROPERTY LINE: ~30 ft POSSIBLE WET AREA: >100 ft DRAINAGEWAY: >50 ft

DRINKING WATER WELL: >200 ft OTHER: _____

DEEP OBSERVATION HOLE LOG

Depth (inches)	Soil Hor./ Layer	Soil Texture (USDA)	Soil Color (Munsell)	Redoximorphic Features	Other (Structure, Consistency,% Gravels, Stones, Boulders)
0-12"	Ap		-	-	-
12-27"	B	Loamy Sand	-		massive, friable
27-97+"	C ₁	Loamy Sand	10YR 5/4	7.5YR 5/8, 15% at 60"	massive, friable

PARENT MATERIAL: Sandy outwash / Loamy glaciofluvial deposit Unsuitable Material Present? Yes: ☐ No: ☒ If Yes:

Disturbed Soil: ☐ Fill Mat'l: ☐ Impervious Layer(s): ☐ Weathered/Fractured Rock: ☐ Bedrock: ☐

GROUNDWATER OBSERVED: Yes: ☐ No: ☒ If Yes: What is the depth of Groundwater:

Standing in Hole: _____ Weeping from Face: _____ Saturating the Face: _____ Mottling: at 60"

Estimated Depth to Seasonal High Ground Water : _____

PERCOLATION TEST

Percolation Hole #:	_____	Percolation Hole #:	_____
Test Date:	_____	Test Date:	_____
Depth of Perc:	_____	Depth of Perc:	_____
Start of Presoak:	_____	Start of Presoak:	_____
End of Presoak:	_____	End of Presoak:	_____
Time @ 12":	_____	Time @ 12":	_____
Time @ 9":	_____	Time @ 9":	_____
Time Elapse:(12"-9")	_____	Time Elapse:(12"-9")	_____
Time AT 6":	_____	Time AT 6":	_____
Time Elapse: (9"-6"):	_____	Time Elapse: (9"-6"):	_____
Rate: (min/in.):	_____	Rate: (min/in.):	_____
Test Passed/ Failed/ Discon/	_____	Test Passed/ Failed/ Discon/	_____
Add. Test Req'd:	_____	Add. Testing Req'd:	_____

Performed By: Maggie Laracy Witnessed By: _____ Mach./Oper.: J.F. Price

Comments: _____

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ON-SITE REVIEW

DEEP HOLE #: 23-01 DATE: 1/14/23 TIME: 8:30 AM WEATHER: Cloudy 35°F

SITE ADDRESS or MAP/LOT #: 7 & 15 Mattakeesett st, Pembroke, MA

OWNER: 7-15 Mattakeesett Street LLC JOB NO.: 100-152

LOCATION (Identify on Plan): See Plan GROUND ELEVATION AT SURFACE OF HOLE: See Plan

LAND USE: Commercial SURFACE STONES: Yes: ☒ No: ☐ stonewall SLOPE (%): 3-5%

VEGETATION: Woods - mixed LANDFORM: Moraine

DISTANCES FROM:

OPEN WATER BODY: >100 ft PROPERTY LINE: ~70 ft POSSIBLE WET AREA: >100 ft DRAINAGEWAY: >100 ft

DRINKING WATER WELL: >100 ft OTHER: _____

DEEP OBSERVATION HOLE LOG

Depth (inches)	Soil Hor./ Layer	Soil Texture (USDA)	Soil Color (Munsell)	Redoximorphic Features	Other (Structure, Consistency,% Gravels, Stones, Boulders)
0-8"	Ap	Loamy Sand	10YR 3/2	-	massive, friable
8-30"	B	Loamy Sand	10YR 5/4		massive, friable
30-120"	C ₁	Med. Sand	10YR 6/3		single grain loose, 2% gravel

PARENT MATERIAL: Outwash Unsuitable Material Present? Yes: ☐ No: ☒ If Yes:

Disturbed Soil: ☐ Fill Mat'l: ☐ Impervious Layer(s): ☐ Weathered/Fractured Rock: ☐ Bedrock: ☐

GROUNDWATER OBSERVED: Yes: ☒ No: ☐ If Yes: What is the depth of Groundwater:

Standing in Hole: 110 Weeping from Face: _____ Saturating the Face: _____ Mottling: _____

Estimated Depth to Seasonal High Ground Water : _____

PERCOLATION TEST

Percolation Hole #:	<u>Not performed</u>	Percolation Hole #:	_____
Test Date:	_____	Test Date:	_____
Depth of Perc:	_____	Depth of Perc:	_____
Start of Presoak:	_____	Start of Presoak:	_____
End of Presoak:	_____	End of Presoak:	_____
Time @ 12":	_____	Time @ 12":	_____
Time @ 9":	_____	Time @ 9":	_____
Time Elapse:(12"-9")	_____	Time Elapse:(12"-9")	_____
Time AT 6":	_____	Time AT 6":	_____
Time Elapse: (9"-6"):	_____	Time Elapse: (9"-6"):	_____
Rate: (min/in.):	_____	Rate: (min/in.):	_____
Test Passed/ Failed/ Discon/	_____	Test Passed/ Failed/ Discon/	_____
Add. Test Req'd:	_____	Add. Testing Req'd:	_____

Performed By: Josh Green Witnessed By: Lisa Cullity Mach./Oper.: J.F. Price

Comments: _____

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ON-SITE REVIEW

DEEP HOLE #: 23-02 DATE: 1/14/23 TIME: 9:00 AM WEATHER: Cloudy 35°F
SITE ADDRESS or MAP/LOT #: 7 & 15 Mattakeesett st, Pembroke, MA
OWNER: 7-15 Mattakeesett Street LLC JOB NO.: 100-152
LOCATION (Identify on Plan): See Plan GROUND ELEVATION AT SURFACE OF HOLE: See Plan

LAND USE: Commercial SURFACE STONES: Yes: ☒ No: ☐ stonewall SLOPE (%): 3-5%

VEGETATION: Woods - mixed LANDFORM: Moraine

DISTANCES FROM:

OPEN WATER BODY: >100 ft PROPERTY LINE: ~25 ft POSSIBLE WET AREA: >100 ft DRAINAGEWAY: >100 ft

DRINKING WATER WELL: >100 ft OTHER: _____

DEEP OBSERVATION HOLE LOG

Depth (inches)	Soil Hor./ Layer	Soil Texture (USDA)	Soil Color (Munsell)	Redoximorphic Features	Other (Structure, Consistency,% Gravels, Stones, Boulders)
0-8"	Ap	Loamy Sand	10YR 3/2	-	massive, friable
8-24"	B	Loamy Sand	10YR 5/6		massive, friable
24-120"	C ₁	Med. Sand	2.5Y 6/3	none	single grain loose, 2% gravel

PARENT MATERIAL: Outwash Unsuitable Material Present? Yes: ☐ No: ☒ If Yes:
Disturbed Soil: ☐ Fill Mat'l: ☐ Impervious Layer(s): ☐ Weathered/Fractured Rock: ☐ Bedrock: ☐

GROUNDWATER OBSERVED: Yes: ☒ No: ☐ If Yes: What is the depth of Groundwater:
Standing in Hole: 108 Weeping from Face: _____ Saturating the Face: _____ Mottling: _____

Estimated Depth to Seasonal High Ground Water : _____

PERCOLATION TEST

Percolation Hole #:	<u>23-02</u>	Percolation Hole #:	_____
Test Date:	<u>1/19/23</u>	Test Date:	_____
Depth of Perc:	<u>34-52</u>	Depth of Perc:	_____
Start of Presoak:	<u>9:26 AM</u>	Start of Presoak:	_____
End of Presoak:	<u>9:41 AM</u>	End of Presoak:	_____
Time @ 12":	<u>9:41 AM</u>	Time @ 12":	_____
Time @ 9":	<u>9:46 AM</u>	Time @ 9":	_____
Time Elapse:(12"-9")	<u>5 min</u>	Time Elapse:(12"-9")	_____
Time AT 6":	<u>9:52 AM</u>	Time AT 6":	_____
Time Elapse: (9"-6"):	<u>6 min</u>	Time Elapse: (9"-6"):	_____
Rate: (min/in.):	<u>2min/in</u>	Rate: (min/in.):	_____
Test Passed/ Failed/ Discon/	_____	Test Passed/ Failed/ Discon/	_____
Add. Test Req'd:	_____	Add. Testing Req'd:	_____

Performed By: Josh Green Witnessed By: Lisa Cullity Mach./Oper.: J.F. Price
Comments: Dense layer at 45-65", loose in hand, same material as below

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ON-SITE REVIEW

DEEP HOLE #: 23-03 DATE: 1/14/23 TIME: 10:00 AM WEATHER: Cloudy 35°F

SITE ADDRESS or MAP/LOT #: 7 & 15 Mattakeesett st, Pembroke, MA

OWNER: 7-15 Mattakeesett Street LLC JOB NO.: 100-152

LOCATION (Identify on Plan): See Plan GROUND ELEVATION AT SURFACE OF HOLE: See Plan

LAND USE: Commercial SURFACE STONES: Yes: ☒ No: ☐ stonewall SLOPE (%): 3-5%

VEGETATION: Woods - mixed LANDFORM: Moraine

DISTANCES FROM:

OPEN WATER BODY: >100 ft PROPERTY LINE: ~10 ft POSSIBLE WET AREA: >100 ft DRAINAGEWAY: 20 ft

DRINKING WATER WELL: >100 ft OTHER: _____

DEEP OBSERVATION HOLE LOG

Depth (inches)	Soil Hor./ Layer	Soil Texture (USDA)	Soil Color (Munsell)	Redoximorphic Features	Other (Structure, Consistency,% Gravels, Stones, Boulders)
0-12"	Ap	Loamy Sand	10YR 3/2	-	massive, friable
12-34"	B	Loamy Sand	10YR 5/4		massive, friable
34-108"	C ₁	Med. Sand	2.5Y 6/3	none	single grain loose, 5% gravel

PARENT MATERIAL: Outwash Unsuitable Material Present? Yes: ☐ No: ☒ If Yes:

Disturbed Soil: ☐ Fill Mat'l: ☐ Impervious Layer(s): ☐ Weathered/Fractured Rock: ☐ Bedrock: ☐

GROUNDWATER OBSERVED: Yes: ☐ No: ☒ If Yes: What is the depth of Groundwater:

Standing in Hole: _____ Weeping from Face: 108 Saturating the Face: _____ Mottling: _____

Estimated Depth to Seasonal High Ground Water : _____

PERCOLATION TEST

Percolation Hole #:	<u>Not performed</u>	Percolation Hole #:	_____
Test Date:	_____	Test Date:	_____
Depth of Perc:	_____	Depth of Perc:	_____
Start of Presoak:	_____	Start of Presoak:	_____
End of Presoak:	_____	End of Presoak:	_____
Time @ 12":	_____	Time @ 12":	_____
Time @ 9":	_____	Time @ 9":	_____
Time Elapse:(12"-9")	_____	Time Elapse:(12"-9")	_____
Time AT 6":	_____	Time AT 6":	_____
Time Elapse: (9"-6"):	_____	Time Elapse: (9"-6"):	_____
Rate: (min/in.):	_____	Rate: (min/in.):	_____
Test Passed/ Failed/ Discon/	_____	Test Passed/ Failed/ Discon/	_____
Add. Test Req'd:	_____	Add. Testing Req'd:	_____

Performed By: Josh Green Witnessed By: Lisa Cullity Mach./Oper.: J.F. Price

Comments: _____

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Soil Map—Plymouth County, Massachusetts



**Natural Resources
Conservation Service**

Web Soil Survey
National Cooperative Soil Survey

2/1/2023
Page 1 of 3


MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features



Blowout



Borrow Pit



Clay Spot



Closed Depression



Gravel Pit



Gravelly Spot



Landfill



Lava Flow



Marsh or swamp



Mine or Quarry



Miscellaneous Water



Perennial Water



Rock Outcrop



Saline Spot



Sandy Spot



Severely Eroded Spot



Sinkhole



Slide or Slip



Sodic Spot



Spoil Area



Stony Spot



Very Stony Spot



Wet Spot



Other



Special Line Features

Water Features



Streams and Canals

Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

Background



Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

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

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

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

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: Plymouth County, Massachusetts

Survey Area Data: Version 15, Sep 9, 2022

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

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

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
256A	Deerfield loamy fine sand, 0 to 3 percent slopes	3.5	80.2%
626B	Merrimac-Urban land complex, 0 to 8 percent slopes	0.9	19.8%
Totals for Area of Interest		4.3	100.0%

Plymouth County, Massachusetts

256A—Deerfield loamy fine sand, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2xfg8

Elevation: 0 to 1,100 feet

Mean annual precipitation: 36 to 71 inches

Mean annual air temperature: 39 to 55 degrees F

Frost-free period: 145 to 240 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Deerfield and similar soils: 85 percent

Minor components: 15 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Deerfield

Setting

Landform: Outwash terraces, outwash deltas, outwash plains, kame terraces

Landform position (three-dimensional): Tread

Down-slope shape: Concave, convex, linear

Across-slope shape: Convex, linear, concave

Parent material: Sandy outwash derived from granite, gneiss, and/or quartzite

Typical profile

Ap - 0 to 9 inches: loamy fine sand

Bw - 9 to 25 inches: loamy fine sand

BC - 25 to 33 inches: fine sand

Cg - 33 to 60 inches: sand

Properties and qualities

Slope: 0 to 3 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Moderately well drained

Runoff class: Negligible

Capacity of the most limiting layer to transmit water

(Ksat): Moderately high to very high (1.42 to 99.90 in/hr)

Depth to water table: About 15 to 37 inches

Frequency of flooding: None

Frequency of ponding: None

Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)

Sodium adsorption ratio, maximum: 11.0

Available water supply, 0 to 60 inches: Moderate (about 6.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: A
Ecological site: F144AY027MA - Moist Sandy Outwash
Hydric soil rating: No

Minor Components

Windsor

Percent of map unit: 7 percent
Landform: Outwash terraces, kame terraces, outwash deltas,
outwash plains
Landform position (three-dimensional): Tread
Down-slope shape: Concave, convex, linear
Across-slope shape: Convex, linear, concave
Hydric soil rating: No

Wareham

Percent of map unit: 5 percent
Landform: Drainageways, depressions
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Sudbury

Percent of map unit: 2 percent
Landform: Outwash plains, kame terraces, outwash deltas,
outwash terraces
Landform position (three-dimensional): Tread
Down-slope shape: Concave, convex, linear
Across-slope shape: Convex, linear, concave
Hydric soil rating: No

Ninigret

Percent of map unit: 1 percent
Landform: Outwash terraces, kame terraces, outwash plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear, convex
Across-slope shape: Concave, convex
Hydric soil rating: No

Data Source Information

Soil Survey Area: Plymouth County, Massachusetts
Survey Area Data: Version 15, Sep 9, 2022

Plymouth County, Massachusetts

626B—Merrimac-Urban land complex, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2tyr9

Elevation: 0 to 820 feet

Mean annual precipitation: 36 to 71 inches

Mean annual air temperature: 39 to 55 degrees F

Frost-free period: 140 to 250 days

Farmland classification: Not prime farmland

Map Unit Composition

Merrimac and similar soils: 45 percent

Urban land: 40 percent

Minor components: 15 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Merrimac

Setting

Landform: Outwash plains, outwash terraces, moraines, eskers, kames

Landform position (two-dimensional): Summit, shoulder, backslope, footslope

Landform position (three-dimensional): Side slope, crest, riser, tread

Down-slope shape: Convex

Across-slope shape: Convex

Parent material: Loamy glaciofluvial deposits derived from granite, schist, and gneiss over sandy and gravelly glaciofluvial deposits derived from granite, schist, and gneiss

Typical profile

Ap - 0 to 10 inches: fine sandy loam

Bw1 - 10 to 22 inches: fine sandy loam

Bw2 - 22 to 26 inches: stratified gravel to gravelly loamy sand

2C - 26 to 65 inches: stratified gravel to very gravelly sand

Properties and qualities

Slope: 0 to 8 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Somewhat excessively drained

Runoff class: Very low

Capacity of the most limiting layer to transmit water

(Ksat): Moderately high to very high (1.42 to 99.90 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum content: 2 percent

Maximum salinity: Nonsaline (0.0 to 1.4 mmhos/cm)

Sodium adsorption ratio, maximum: 1.0
Available water supply, 0 to 60 inches: Low (about 4.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: A
Ecological site: F144AY022MA - Dry Outwash
Hydric soil rating: No

Description of Urban Land

Typical profile

M - 0 to 10 inches: cemented material

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: 0 inches to manufactured layer
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low
(0.00 to 0.00 in/hr)
Available water supply, 0 to 60 inches: Very low (about 0.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydrologic Soil Group: D
Hydric soil rating: Unranked

Minor Components

Windsor

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

Hinckley

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

Sudbury

Percent of map unit: 5 percent
Landform: Deltas, terraces, outwash plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave

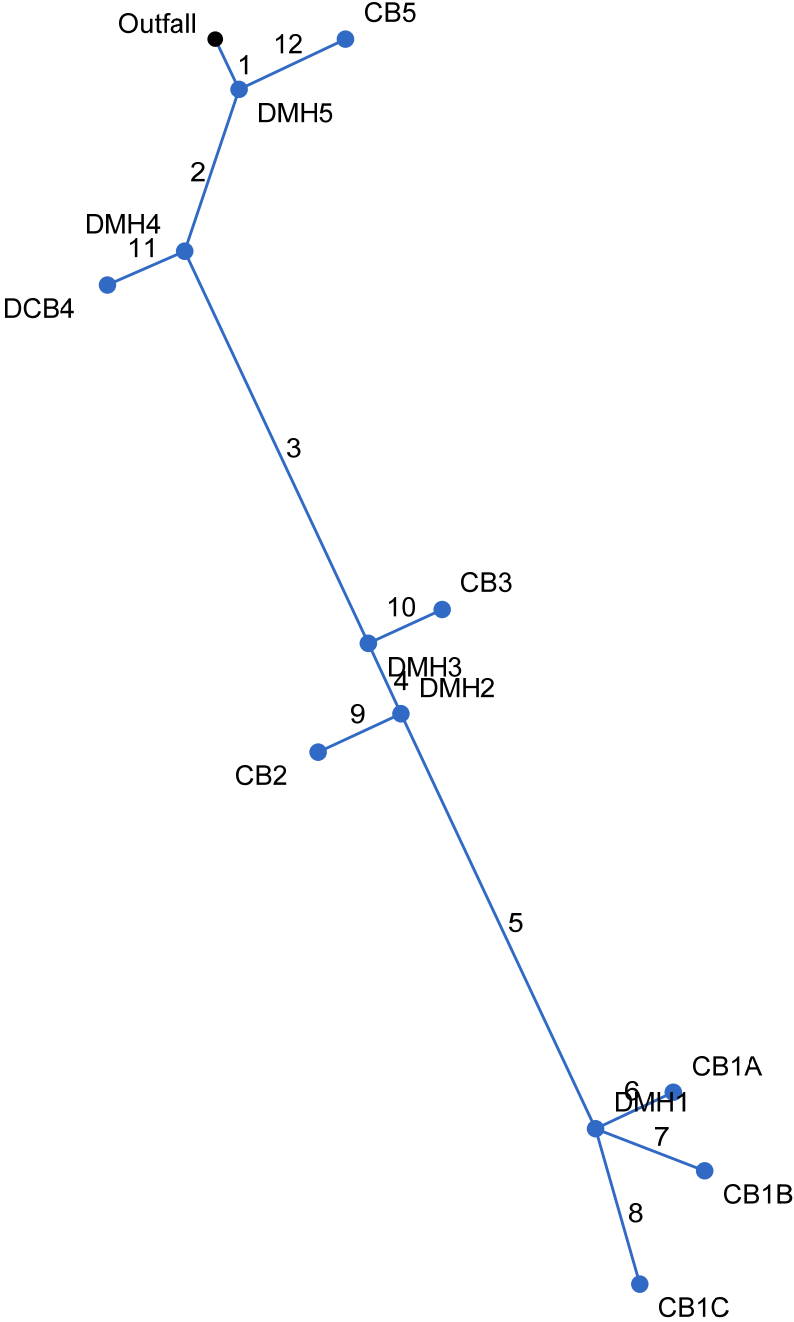
Across-slope shape: Linear
Hydric soil rating: No

Data Source Information

Soil Survey Area: Plymouth County, Massachusetts
Survey Area Data: Version 15, Sep 9, 2022

SECTION 7 – HYDRAULIC PIPE SIZING

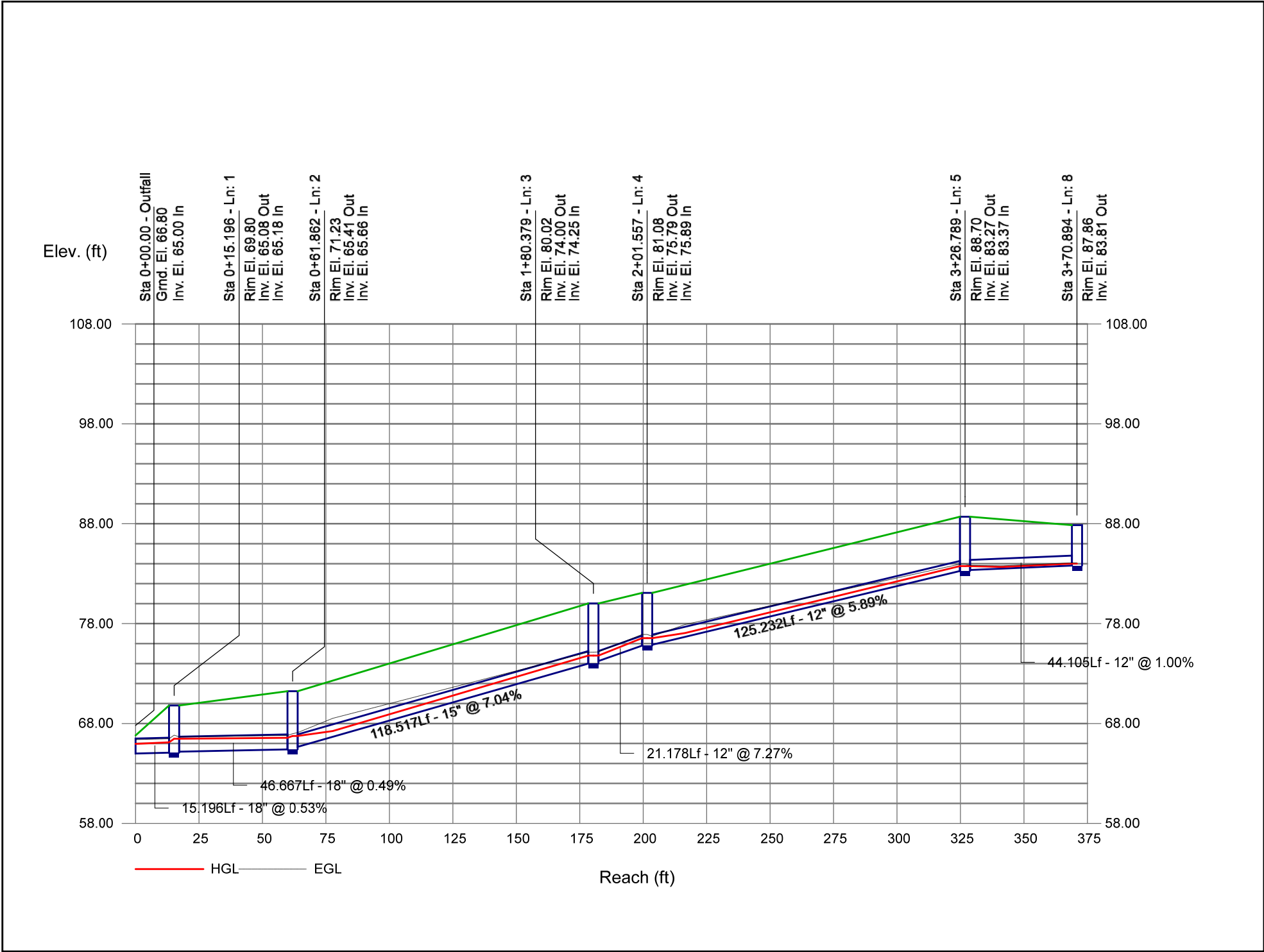
Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



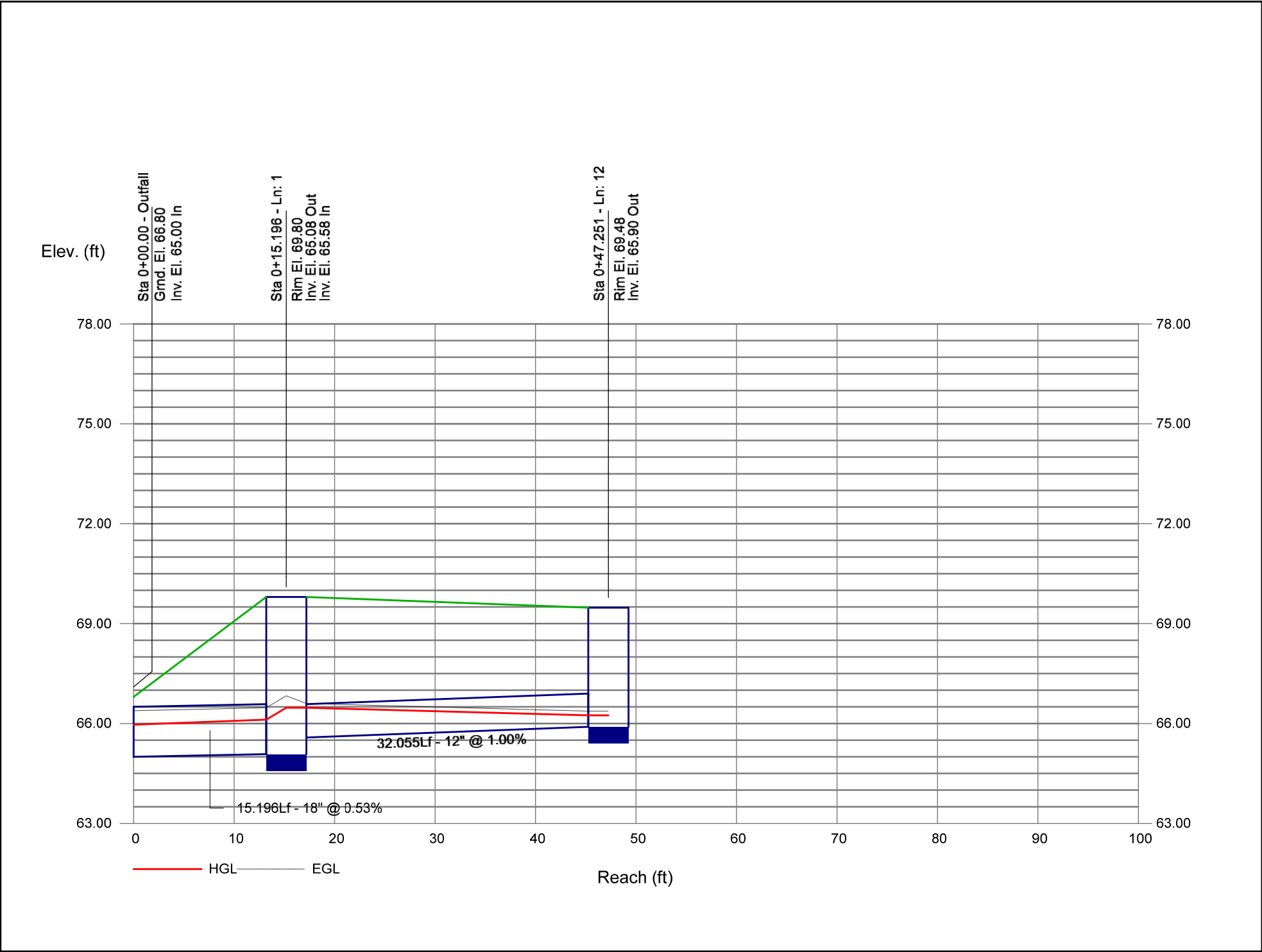
Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Dn	Up	Dn	Up	Dn	Up	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	15.196	0.00	0.91	0.00	0.00	0.68	0.0	8.0	6.5	6.24	7.62	5.00	18	0.53	65.00	65.08	65.96	66.12	66.80	69.80	Pipe - (157)
2	1	46.667	0.00	0.79	0.00	0.00	0.58	0.0	7.7	6.5	5.64	7.37	3.66	18	0.49	65.18	65.41	66.47	66.57	69.80	71.23	Pipe - (155) (1)
3	2	118.517	0.00	0.63	0.00	0.00	0.44	0.0	7.3	6.6	3.87	18.54	4.06	15	7.04	65.66	74.00	66.75	74.79	71.23	80.02	Pipe - (155)
4	3	21.178	0.00	0.49	0.00	0.00	0.33	0.0	7.2	6.7	3.10	10.40	5.99	12	7.27	74.25	75.79	74.79	76.54	80.02	81.08	Pipe - (153) (1) (1)
5	4	125.232	0.00	0.28	0.00	0.00	0.20	0.0	6.5	6.8	1.35	9.37	3.00	12	5.89	75.89	83.27	76.54	83.76	81.08	88.70	Pipe - (153)
6	5	23.361	0.10	0.10	0.83	0.08	0.08	6.0	6.0	7.0	0.58	3.83	2.38	12	0.98	83.37	83.60	83.76	83.92	88.70	88.56	Pipe - (159)
7	5	31.853	0.09	0.09	0.90	0.08	0.08	6.0	6.0	7.0	0.56	3.87	2.34	12	1.00	83.37	83.69	83.76	84.00	88.70	88.54	Pipe - (160)
8	5	44.105	0.09	0.09	0.37	0.03	0.03	6.0	6.0	7.0	0.23	3.85	1.46	12	1.00	83.37	83.81	83.76	84.01	88.70	87.86	Pipe - (161)
9	4	24.893	0.21	0.21	0.62	0.13	0.13	6.0	6.0	7.0	0.91	3.87	2.39	12	1.00	75.89	76.14	76.54	76.54	81.08	80.45	Pipe - (154)
10	3	22.180	0.14	0.14	0.83	0.12	0.12	6.0	6.0	7.0	0.81	5.43	2.19	12	1.98	74.10	74.54	74.79	74.92	80.02	80.51	Pipe - (152)
11	2	23.004	0.16	0.16	0.86	0.14	0.14	6.0	6.0	7.0	0.96	5.46	2.26	12	2.00	65.91	66.37	66.75	66.78	71.23	70.91	Pipe - (156)
12	1	32.055	0.12	0.12	0.82	0.10	0.10	6.0	6.0	7.0	0.69	3.56	1.89	12	1.00	65.58	65.90	66.47	66.24	69.80	69.48	Pipe - (171)
Project File: Storm-1-10.stm																Number of lines: 12				Run Date: 8/31/2023		
NOTES:Intensity = 86.72 / (Inlet time + 15.30) ^ 0.82; Return period =Yrs. 10 ; c = cir e = ellip b = box																						

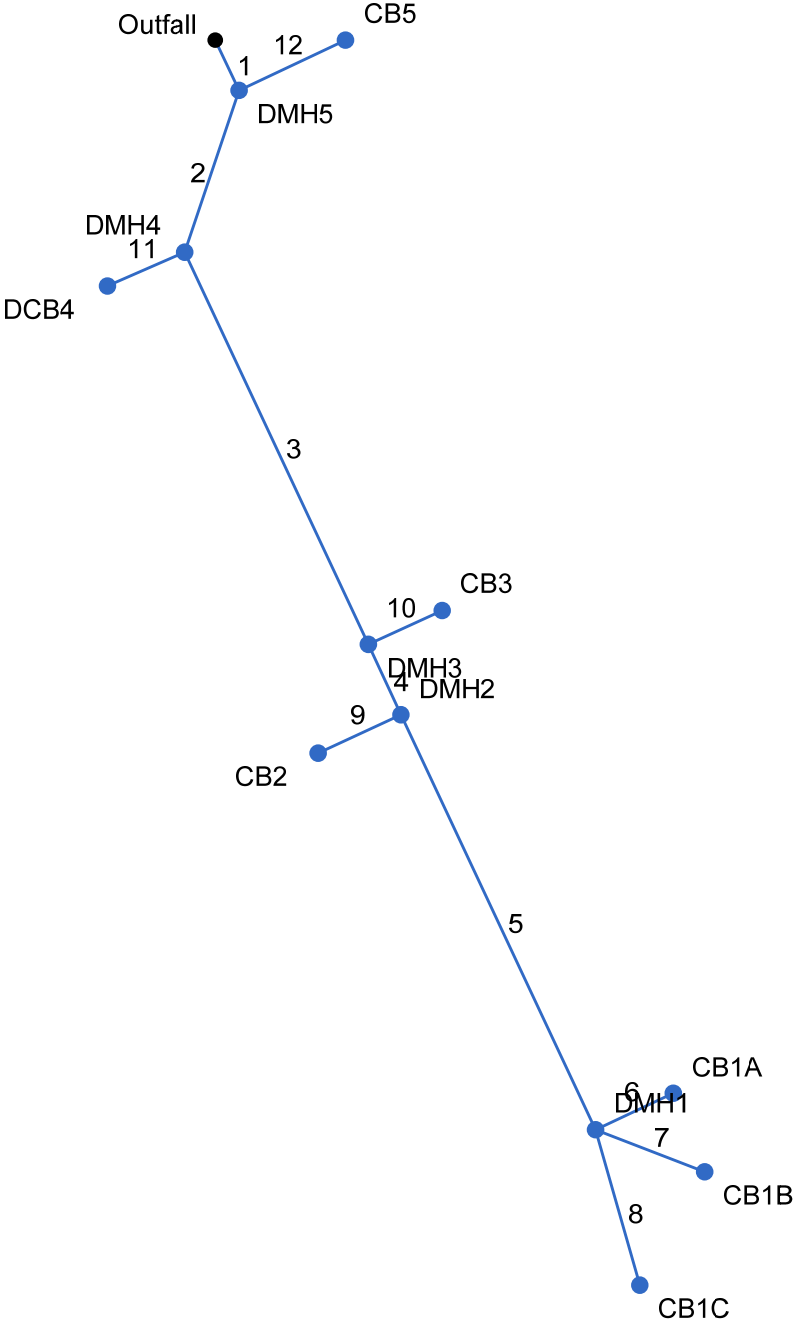
Storm Sewer Profile



Storm Sewer Profile



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

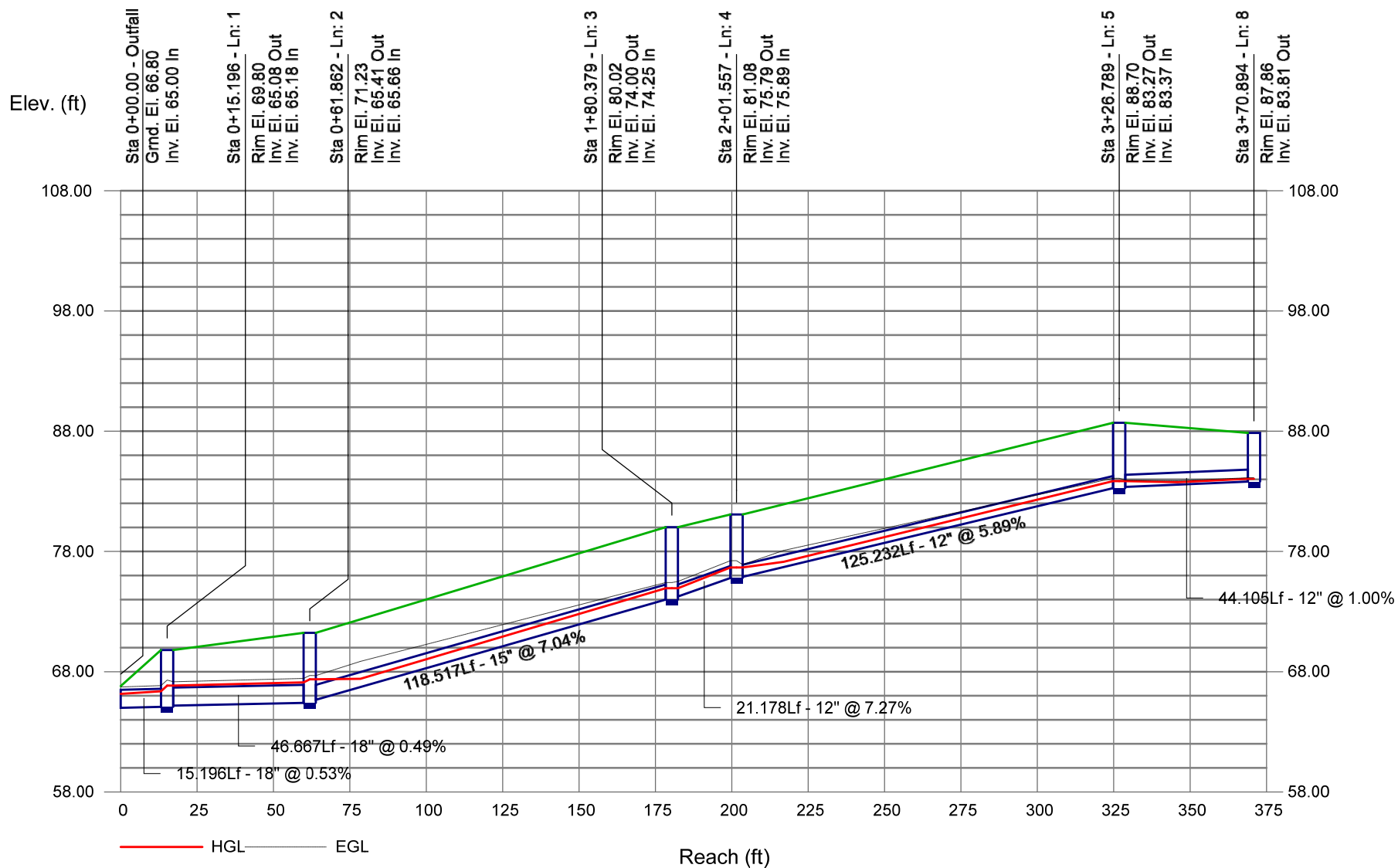


Storm Sewer Tabulation

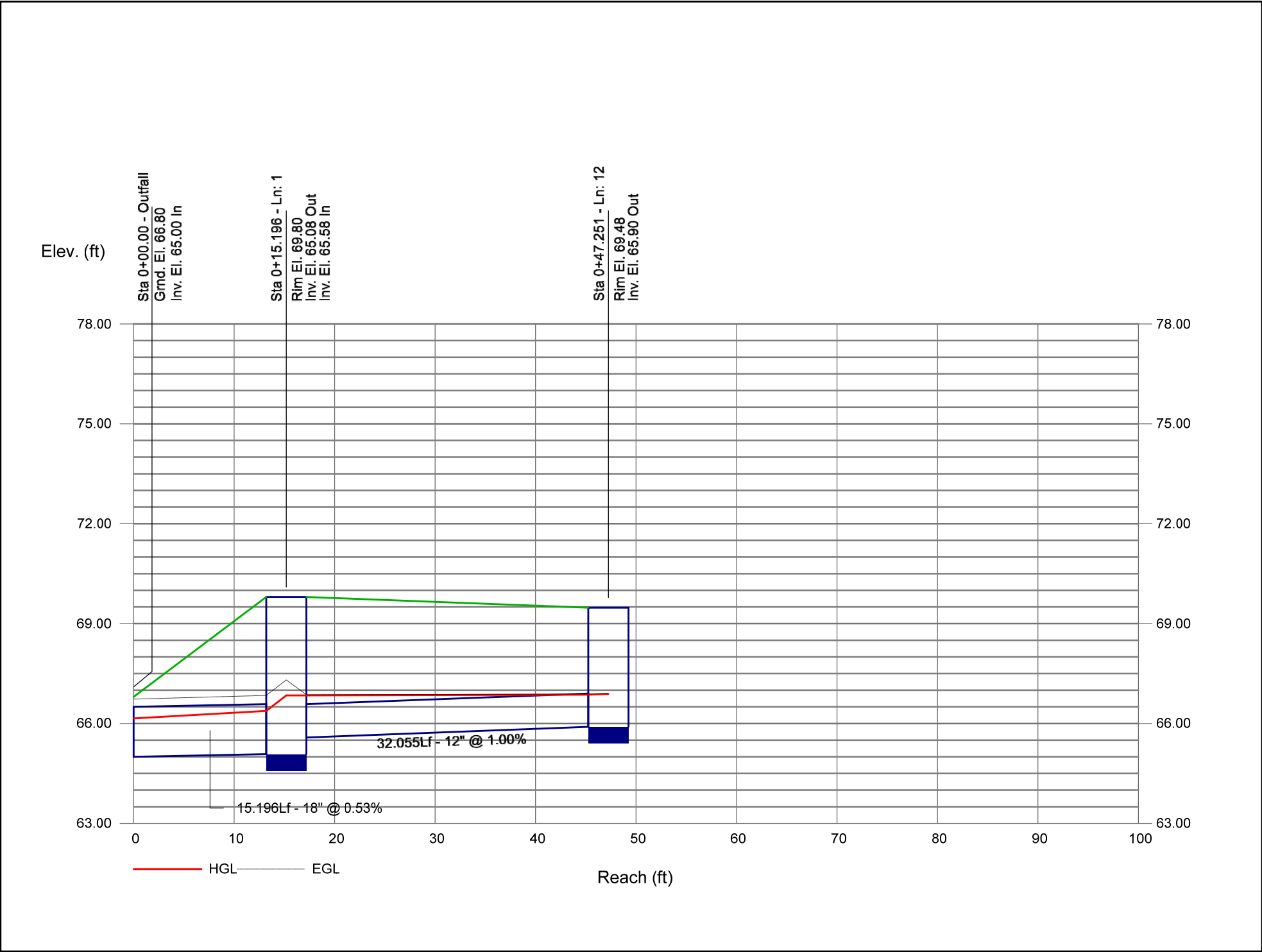
Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Dn	Up	Dn	Up	Dn	Up	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	15.196	0.00	0.91	0.00	0.00	0.68	0.0	7.7	9.0	8.89	7.62	5.79	18	0.53	65.00	65.08	66.15	66.38	66.80	69.80	Pipe - (157)
2	1	46.667	0.00	0.79	0.00	0.00	0.58	0.0	7.5	9.0	8.04	7.37	4.55	18	0.49	65.18	65.41	66.84	67.12	69.80	71.23	Pipe - (155) (1)
3	2	118.517	0.00	0.63	0.00	0.00	0.44	0.0	7.1	9.1	5.45	18.54	4.96	15	7.04	65.66	74.00	67.37	74.95	71.23	80.02	Pipe - (155)
4	3	21.178	0.00	0.49	0.00	0.00	0.33	0.0	7.1	9.1	4.40	10.40	6.78	12	7.27	74.25	75.79	74.95	76.67	80.02	81.08	Pipe - (153) (1) (1)
5	4	125.232	0.00	0.28	0.00	0.00	0.20	0.0	6.5	9.3	1.84	9.37	3.36	12	5.89	75.89	83.27	76.67	83.85	81.08	88.70	Pipe - (153)
6	5	23.361	0.10	0.10	0.83	0.08	0.08	6.0	6.0	9.5	0.79	3.83	2.55	12	0.98	83.37	83.60	83.85	83.97	88.70	88.56	Pipe - (159)
7	5	31.853	0.09	0.09	0.90	0.08	0.08	6.0	6.0	9.5	0.77	3.87	2.51	12	1.00	83.37	83.69	83.85	84.06	88.70	88.54	Pipe - (160)
8	5	44.105	0.09	0.09	0.37	0.03	0.03	6.0	6.0	9.5	0.32	3.85	1.57	12	1.00	83.37	83.81	83.85	84.04	88.70	87.86	Pipe - (161)
9	4	24.893	0.21	0.21	0.62	0.13	0.13	6.0	6.0	9.5	1.24	3.87	2.65	12	1.00	75.89	76.14	76.67	76.61	81.08	80.45	Pipe - (154)
10	3	22.180	0.14	0.14	0.83	0.12	0.12	6.0	6.0	9.5	1.10	5.43	2.43	12	1.98	74.10	74.54	74.95	74.98	80.02	80.51	Pipe - (152)
11	2	23.004	0.16	0.16	0.86	0.14	0.14	6.0	6.0	9.5	1.31	5.46	1.66	12	2.00	65.91	66.37	67.37	67.37	71.23	70.91	Pipe - (156)
12	1	32.055	0.12	0.12	0.82	0.10	0.10	6.0	6.0	9.5	0.93	3.56	1.20	12	1.00	65.58	65.90	66.84	66.86	69.80	69.48	Pipe - (171)
Project File: Storm-1-100.stm																Number of lines: 12				Run Date: 8/31/2023		
NOTES:Intensity = 124.57 / (Inlet time + 17.60) ^ 0.81; Return period =Yrs. 100 ; c = cir e = ellip b = box																						

Storm Sewer Profile

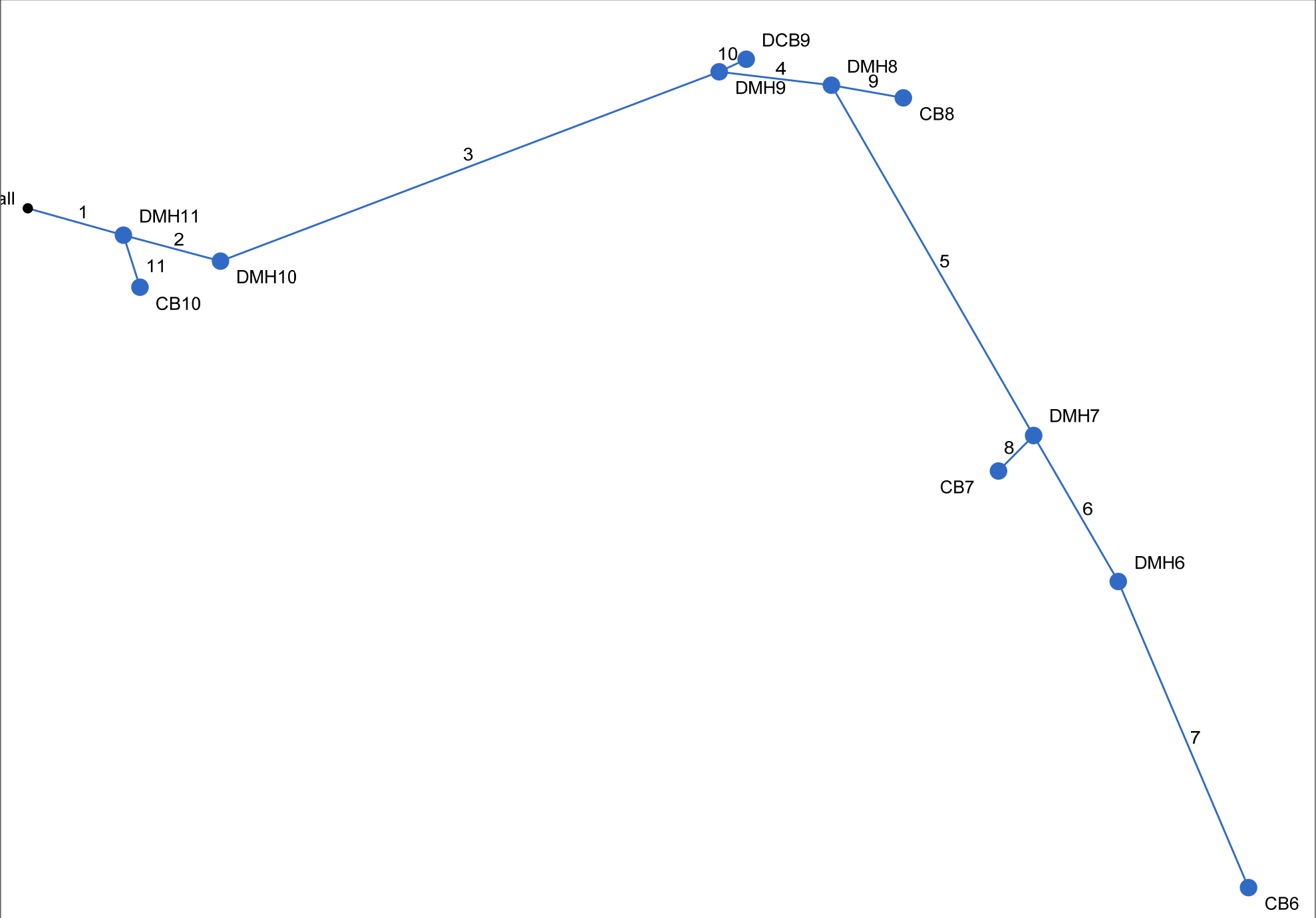
Proj. file: Storm-1-100.stm



Storm Sewer Profile



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

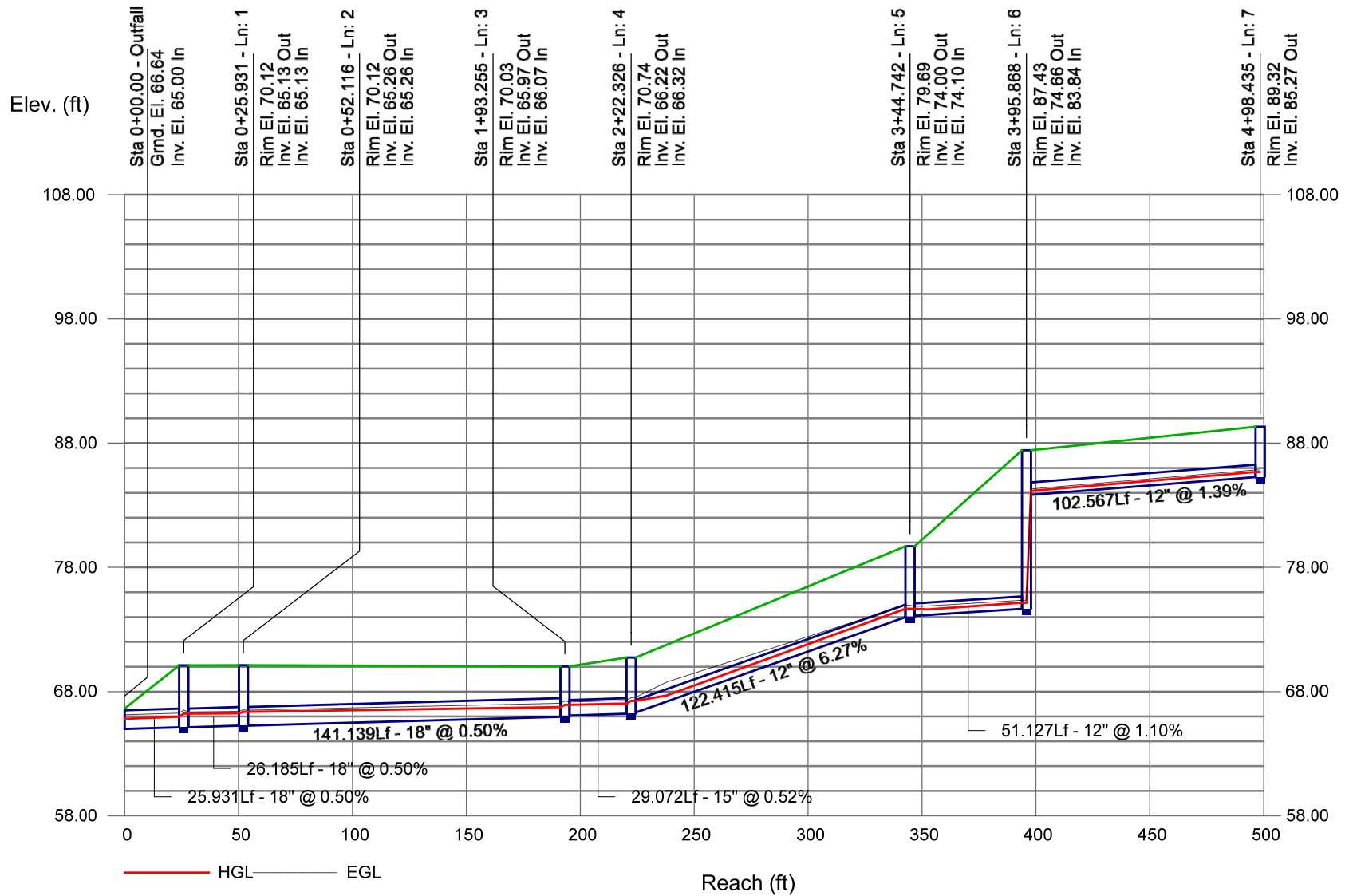


Storm Sewer Tabulation

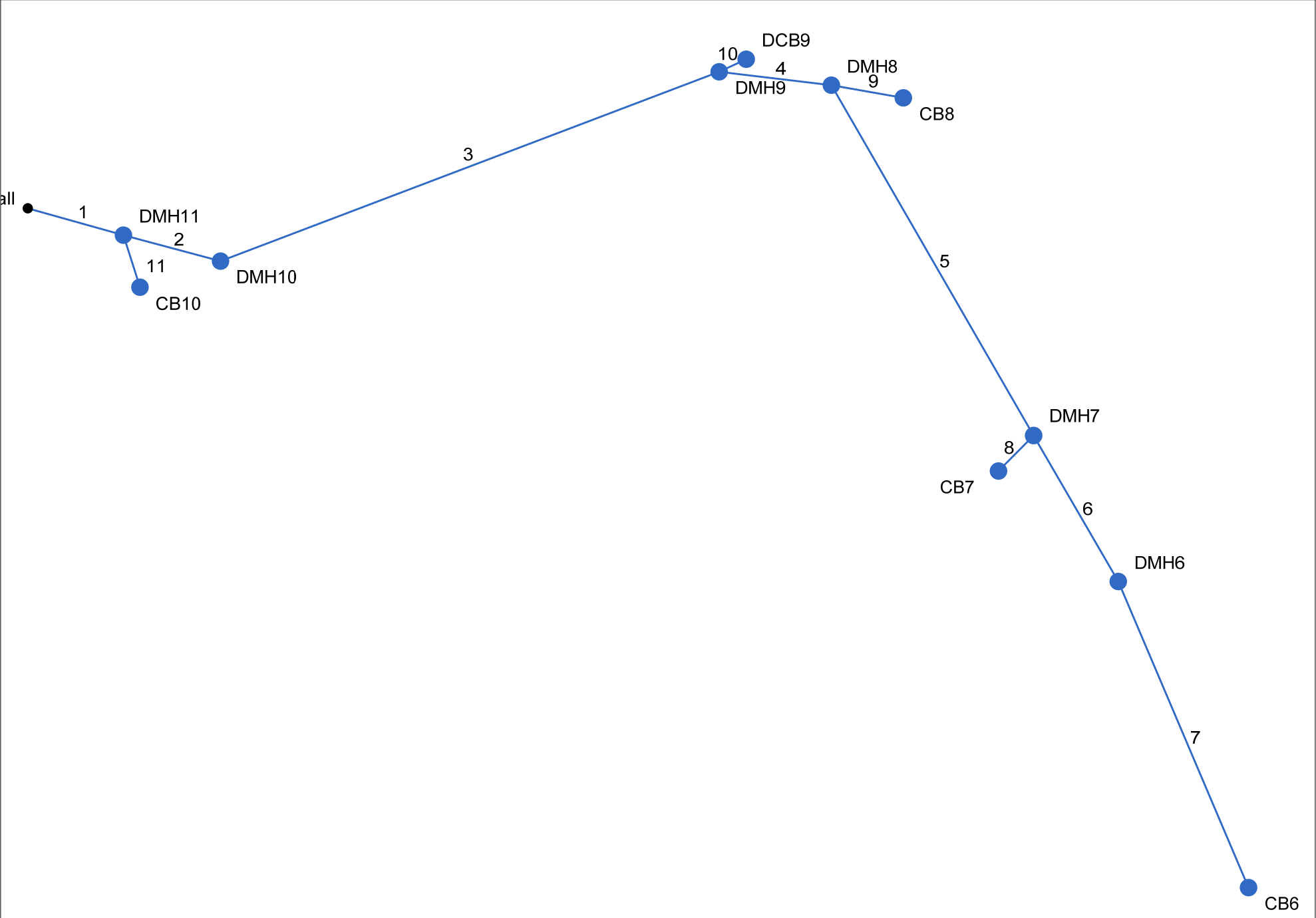
Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Dn	Up	Dn	Up	Dn	Up	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	25.931	0.00	0.79	0.00	0.00	0.54	0.0	9.8	6.1	4.44	7.43	4.43	18	0.50	65.00	65.13	65.81	65.98	66.64	70.12	Pipe - (173) (1)
2	1	26.185	0.00	0.70	0.00	0.00	0.47	0.0	9.7	6.1	4.02	7.40	3.07	18	0.50	65.13	65.26	66.23	66.25	70.12	70.12	Pipe - (173)
3	2	141.139	0.00	0.70	0.00	0.00	0.47	0.0	8.7	6.3	4.12	7.45	3.69	18	0.50	65.26	65.97	66.37	66.75	70.12	70.03	Pipe - (170)
4	3	29.072	0.00	0.57	0.00	0.00	0.36	0.0	8.5	6.4	3.43	4.64	3.91	15	0.52	66.07	66.22	66.94	67.04	70.03	70.74	Pipe - (167)
5	4	122.415	0.00	0.46	0.00	0.00	0.30	0.0	7.9	6.5	2.40	9.66	3.75	12	6.27	66.32	74.00	67.25	74.66	70.74	79.69	Pipe - (166)
6	5	51.127	0.00	0.25	0.00	0.00	0.14	0.0	7.4	6.6	1.37	4.04	3.27	12	1.10	74.10	74.66	74.66	75.15	79.69	87.43	Pipe - (164)
7	6	102.567	0.25	0.25	0.56	0.14	0.14	6.0	6.0	7.0	0.98	4.56	3.89	12	1.39	83.84	85.27	84.15	85.68	87.43	89.32	Pipe - (163)
8	5	14.528	0.21	0.21	0.77	0.16	0.16	6.0	6.0	7.0	1.13	5.45	4.39	12	2.00	74.98	75.27	75.29	75.72	79.69	79.94	Pipe - (165)
9	4	18.838	0.11	0.11	0.53	0.06	0.06	6.0	6.0	7.0	0.41	5.48	1.50	12	2.02	66.32	66.70	67.25	66.96	70.74	70.95	Pipe - (178)
10	3	8.063	0.13	0.13	0.86	0.11	0.11	6.0	6.0	7.0	0.78	5.02	2.02	12	1.98	66.07	66.23	66.94	66.60	70.03	70.23	Pipe - (168)
11	1	17.110	0.09	0.09	0.80	0.07	0.07	6.0	6.0	7.0	0.50	5.44	1.62	12	1.99	65.23	65.57	66.23	65.86	70.12	69.82	Pipe - (177)
Project File: Storm-2-10.stm																Number of lines: 11				Run Date: 8/31/2023		
NOTES:Intensity = 86.72 / (Inlet time + 15.30) ^ 0.82; Return period =Yrs. 10 ; c = cir e = ellip b = box																						

Storm Sewer Profile

Proj. file: Storm-2-10.stm



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



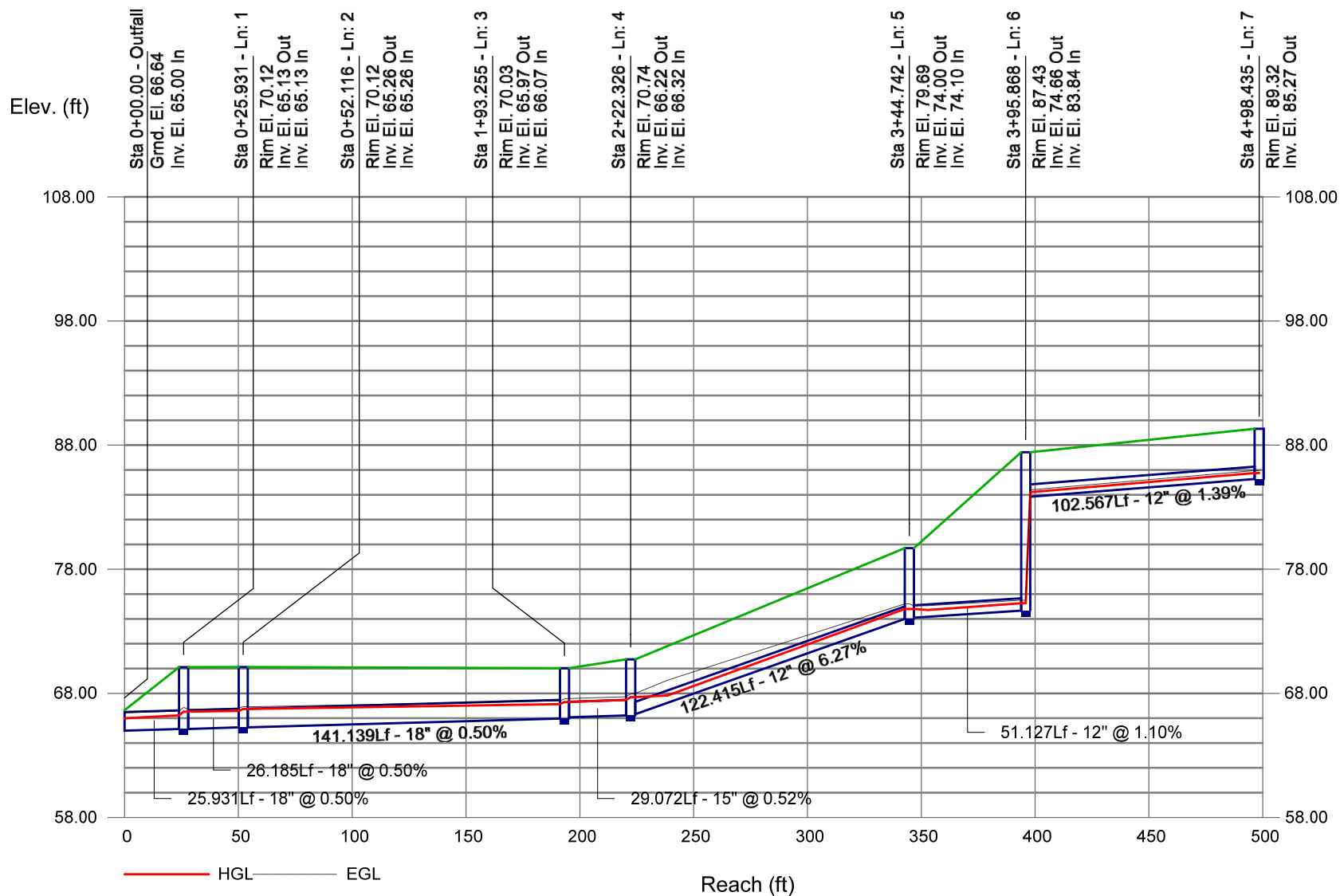
Project File: Storm-2-100.stm	Number of lines: 11	Date: 8/31/2023
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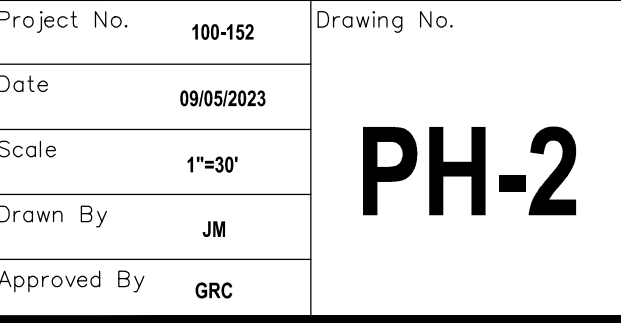
Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Dn	Up	Dn	Up	Dn	Up	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	25.931	0.00	0.79	0.00	0.00	0.54	0.0	7.9	8.9	6.58	7.43	5.02	18	0.50	65.00	65.13	65.99	66.23	66.64	70.12	Pipe - (173) (1)
2	1	26.185	0.00	0.70	0.00	0.00	0.47	0.0	7.8	8.9	5.96	7.40	3.53	18	0.50	65.13	65.26	66.53	66.59	70.12	70.12	Pipe - (173)
3	2	141.139	0.00	0.70	0.00	0.00	0.47	0.0	7.2	9.1	6.04	7.45	3.77	18	0.50	65.26	65.97	66.74	67.13	70.12	70.03	Pipe - (170)
4	3	29.072	0.00	0.57	0.00	0.00	0.36	0.0	7.1	9.2	5.04	4.64	4.11	15	0.52	66.07	66.22	67.32	67.47	70.03	70.74	Pipe - (167)
5	4	122.415	0.00	0.46	0.00	0.00	0.30	0.0	6.6	9.3	3.47	9.66	4.80	12	6.27	66.32	74.00	67.69	74.80	70.74	79.69	Pipe - (166)
6	5	51.127	0.00	0.25	0.00	0.00	0.14	0.0	6.4	9.4	1.98	4.04	3.71	12	1.10	74.10	74.66	74.80	75.26	79.69	87.43	Pipe - (164)
7	6	102.567	0.25	0.25	0.56	0.14	0.14	6.0	6.0	9.5	1.33	4.56	4.26	12	1.39	83.84	85.27	84.21	85.76	87.43	89.32	Pipe - (163)
8	5	14.528	0.21	0.21	0.77	0.16	0.16	6.0	6.0	9.5	1.53	5.45	4.82	12	2.00	74.98	75.27	75.34	75.80	79.69	79.94	Pipe - (165)
9	4	18.838	0.11	0.11	0.53	0.06	0.06	6.0	6.0	9.5	0.55	5.48	0.70	12	2.02	66.32	66.70	67.69	67.70	70.74	70.95	Pipe - (178)
10	3	8.063	0.13	0.13	0.86	0.11	0.11	6.0	6.0	9.5	1.06	5.02	1.35	12	1.98	66.07	66.23	67.29	67.30	70.03	70.23	Pipe - (168)
11	1	17.110	0.09	0.09	0.80	0.07	0.07	6.0	6.0	9.5	0.68	5.44	0.87	12	1.99	65.23	65.57	66.53	66.54	70.12	69.82	Pipe - (177)
Project File: Storm-2-100.stm																Number of lines: 11				Run Date: 8/31/2023		
NOTES:Intensity = 124.57 / (Inlet time + 17.60) ^ 0.81; Return period =Yrs. 100 ; c = cir e = ellip b = box																						

Storm Sewer Profile

Proj. file: Storm-2-100.stm





SECTION 8-
SITE DEVELOPMENT PLANS – MATTAKEESETT VILLAGE