Stormwater Management Report
Cassidy Field Parking Improvements

Cassidy Field
11R Winthrop Street
Medway, Massachusetts

Submitted to:

Town of Medway Planning & Economic Development Board
April 7, 2022

Prepared For:

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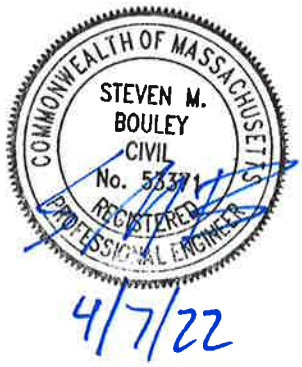

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1.0 INTRODUCTION

This Stormwater Management Report, prepared in accordance with Massachusetts Department of Environmental Protection (MA DEP) Stormwater Standards, is submitted on behalf of the applicant, Medway Department of Public Works (DPW). The report summarizes the drainage analysis and Stormwater Management Plan for the proposed Cassidy Field Parking Improvements located at 13 Winthrop Street in Medway, Massachusetts. **See Figure 1, USGS Locus Map**.

The purpose of the Stormwater Management Plan is to provide a comprehensive framework for the long-term protection of natural resources in and around the Site from degradation as a result of stormwater discharges. This is achieved through the use of a variety of water quality and quantity control measures designed to decrease the amount of pollutants discharged from the Site and control discharge rates and volumes.

The following sections describe the regulations pertinent to stormwater management and the specific components of the Stormwater Management Plan to be implemented at the Site.

1.1 EXISTING CONDITIONS

The project site is located on Winthrop Street in Medway, MA in the AR-1 (Agricultural Residential 1) Zoning District. The Site is approximately 21.8 acres and contains recreational space (baseball fields, playgrounds, and walking trails) and appurtenant amenities for guests such as concession stand, public bathrooms, and parking. A paved driveway from Winthrop Street provides access to the parking lot at the baseball fields, with gravel paths to access the remainder of the property. The existing parking lot contains both paved (in poor condition) and gravel surfaces with little to no parking designations. The site is primarily developed for youth-league sporting events, with mixed hardwood/pine wooded areas to the west and southwest. Bordering vegetated wetlands (BVW) and riverfront areas are located in the western portions of the site with contiguous areas of upland scattered throughout. The site contains Park Pond, located in the center of the Site, and is in FEMA Flood Zone AE (1% annual chance flood event) and FEMA Zone AE Floodway (Chicken Brook) along the west and center of the site. No development is proposed within those areas.

1.2 PROPOSED CONDITIONS

The proposed Project includes the demolition and redevelopment of the existing parking lot at the north side of the site adjacent to the baseball fields. The proposed parking lot will contain a fully paved parking area with designated parking stalls, as well as designated parking spaces for the future installation of electric vehicle charging stations. Paved walkways from the parking lot to the concession stand will also be provided. The design intent of the proposed site grading and stormwater management system is to collect, treat and infiltrate runoff from proposed impervious areas. The proposed stormwater management system will consist of deep-sump catch basins and subsurface infiltration systems with isolator rows to emphasize the Project's goal of implementing Low Impact Development guidelines when feasible throughout the site.

The proposed stormwater system has been designed in accordance with DEP Stormwater Management Standards as well as the Stormwater Design Requirements set forth in the Town's Stormwater Management and Land Disturbance Bylaw. The Project's stormwater management design reduces the rate of stormwater runoff, provides improved stormwater quality, and maintains groundwater recharge volumes.

1.3 GROUND COVER

The overall hydrologic study area for the proposed development is 2.5 acres and includes land area from both on and off the project site. Table 1, below, summarizes the ground cover distribution for the hydrologic study area for existing and proposed conditions. There is an increase of approximately 0.38 acres in impervious area within the Project. Gravel parking areas present on site are proposed to be removed and paved with the rest of the parking lot.

Table 1 Ground Cover Distribution

Ground Cover Type	Existing Conditions (acres)	Proposed Conditions (acres)
Impervious	0.54	0.92
Gravel	0.24	0.00
Pervious	1.69	1.63
Total	**2.47**	**2.55**

2.0 STORMWATER MANAGEMENT

2.1 METHOD OF CALCULATIONS

The hydrologic model created to analyze the hydrology of the site was developed using the Soil Conservation Service (SCS) Technical Release No. 20 (SCS unit hydrograph procedures) and SCS Technical Release No. 55 (for Times of Concentration and Runoff Curve Numbers). The stormwater facilities were modeled using the Storage-Indication Routing Method.

The hydrologic model was created and calculated with HydroCAD, Version 10.0 software, developed by Applied Microcomputer Systems. Runoff from the sub-drainage areas (HydroCAD subcatchments) is calculated based on rainfall and the watershed characteristics, and a runoff hydrograph (a runoff rate versus time curve) is developed. The stage-storage-discharge curve for a specific detention area (i.e., a detention basin) is used to compute an outflow hydrograph by hydraulically routing an inflow hydrograph through the detention facilities. This procedure calculates the relationship of the inflow hydrograph with the characteristics of the detention basin systems to determine the outflow, stage, and storage capacity of the detention systems for a given time during the specified storm event. The HydroCAD models for pre- and post-development are included in **Appendix B**.

Existing watershed boundaries for the analysis were determined based on the topography of the site which was obtained through an aerial survey performed by CivilView, Inc. in December of 2016.

2.2 RAINFALL DEPTHS

In accordance with Medway Stormwater Management and Land Disturbance Bylaw, the 2-, 10-, and 100-year, 24-hour storm events were analyzed. The rainfall depths summarized in Table 2 are based on the National Oceanic and Atmospheric Administration (NOAA) Atlas 14 precipitation rates as required by the Town's Stormwater Management and Land Disturbance Bylaw.

Table 2 Rainfall Depths

Storm Event	24-Hour Rainfall Depth (inches)
2-year	3.37
10-year	5.27
100-year	8.28

2.3 SOIL CONDITIONS

Natural Resources Conservation Service (NRCS) Norfolk and Suffolk County Soil Survey indicates that soils onsite consist of the following Hydrologic Soil Groups (HSG):

- 70A – Ridgebury fine sandy loam, 0-3% slopes, HSG D
- 71B – Ridgebury fine sandy loam, 3-8% slopes, extremely stony, HSG D
- 254B – Merrimac fine sandy loam, 3-8% slopes, HSG A
- 317B – Scituate fine sandy loam, 3-8% slopes, extremely stony, HSG C
- 420B – Canton fine sandy loam, 3-8% slopes, HSG B
- 422B – Canton fine sandy loam, 0-8% slopes, extremely stony, HSG B
- 653 – Udorthents, sandy, HSG A

Subsurface exploration has been performed around the property and at proposed stormwater mitigation locations and generally confirmed the information gathered from the NRCS Soil Survey. Based on subsurface explorations, soil conditions at these locations consist of sandy loam and loamy sand categorized as HSG B and HSG A soils, respectively. The NRCS Web Soil Survey and subsurface exploration data is provided in **Appendix F**.

2.4 EXISTING STORMWATER MANAGEMENT

2.4.1 Existing Watershed

Under existing conditions, the site is divided into two (2) Subcatchment areas, Subcatchments E1 and E2 which are tributary to the Design Point described below and shown on attached **Figure 2, Pre-Development Watershed Map**.

There is one (1) Design Point for the site:

- **Design Point 1 (DP-1) - Winthrop Street**
  - Subcatchment E1: Consists of a mix of wooded area, gravel parking area, and paved parking on the north portion of the study area.
  - Subcatchment E2: Consists of primarily grassed and dirt areas from the existing baseball field to the west, as well as the paved driveway and parking lot on the south portion of the study area.

2.5 PROPOSED STORMWATER MANAGEMENT

The proposed project incorporates a stormwater management system that meets the guidelines in the 2008 MA DEP Stormwater Management Standards and the Town's Stormwater Management and Land Disturbance Bylaw. Stormwater quality and quantity on the Site will be managed by implementing a series of best management practices (BMPs) that will include street sweeping, deep sump hooded catch basins, manholes and subsurface Infiltration systems with isolator rows. The proposed BMPs will remove a minimum 80 percent of total suspended solids from stormwater runoff, maintain or decrease peak rates of stormwater runoff, and maintain recharge rates to groundwater, as described in the MA DEP Stormwater Standards section of this report.

Runoff from the proposed site will be intercepted by the proposed catch basins located at the low points of the paved parking areas and discharge to subsurface infiltration systems. The subsurface infiltration systems will be sized to meet the requirements of the MA DEP Stormwater Standards and meet the requirements of the Town's Stormwater Management and Land Disturbance Bylaw. All discharge from the site flows to Winthrop Street.

2.5.1 Proposed Watershed

Under proposed conditions, the site is divided into four (4) Subcatchment areas discharging to the Design Point. Under proposed conditions, the following Subcatchments flow to the designated Design Point and a description of each is provided below and shown on attached **Figure 3, Post-Development Watershed Map**.

- **Design Point 1 (DP-1) – Winthrop Street**
  - Subcatchment P1a: Consists of primarily a mix of wooded area, lawn, and landscape areas. Stormwater from this Subcatchment is routed to the existing swale along the Cassidy Field driveway and ultimately travels into the drainage system within Winthrop Street.
  - Subcatchment P1b: Consists primarily of the north component of the proposed impervious parking area, and existing lawn and gravel from the upgradient baseball field. Stormwater travels into the proposed catch basin within the parking lot and enters the subsurface infiltration system (Pond 1P). Overflow discharge from Pond 1P will enter the existing swale along the Cassidy Field driveway and enter the drainage system within Winthrop Street.
  - Subcatchment P1c: Consists of primarily a mix of wooded area, the existing paved driveway, and lawn. Stormwater from this Subcatchment is routed directly to Design Point 1 (DP-1).
  - Subcatchment P1d: Consists of primarily lawn, landscape areas and the south component of the proposed impervious parking area. Stormwater travels into the proposed catch basin within the parking lot and enters the subsurface infiltration system (Pond 2P). Overflow discharge from Pond 2P during large storms (greater than the 10-year storm) will travel down the existing driveway and enter the drainage system within Winthrop Street.

3.0 DEP STORMWATER STANDARDS

The ten (10) MA DEP Stormwater Management Standards provided in the Stormwater Management Policy and Massachusetts Wetlands Protection Act relate to the protection of wetlands and water bodies, control of water quantity, recharge to groundwater, water quality and protection of critical areas, erosion/sedimentation control and stormwater maintenance. The MA DEP Checklist for Stormwater Report is provided in **Appendix A**, and the following sections summarize the Project's compliance with the Stormwater Management Standards.

3.1 STANDARD 1 – NO NEW UNTREATED DISCHARGES

The Project complies with Standard 1. No new point source discharges of untreated stormwater to or causing erosion in resource areas are proposed as part of the Project. Stormwater discharge velocities are minimal and are mitigated by a level spreader located at the downstream end of pipe outfalls.

3.2 STANDARD 2 – PEAK RATE ATTENUATION

The Project complies with Standard 2. The Project's stormwater management systems are designed to meet the redevelopment standards for a mix of new and redevelopment at the site so that post-development peak discharge rates do not exceed pre-development discharge rates for the 2-year and 10-year, 24-hour storm event, and so that there will be no increased flooding impacts off-site for the 100-year, 24-hour storm event.

To determine the peak rate of discharge for existing and proposed conditions, runoff hydrographs were generated for the storm events using the SCS TR-20 method. HydroCAD input/output data for pre-development and post-development conditions are provided in **Appendix B**. Table 3 summarizes the pre- and post-development peak runoff discharge rates determined in the hydrologic/hydraulic analyses performed for the Project Site.

Table 3 Comparison of Peak Runoff Rates

Point of Analysis	2-Year Storm Event (cfs)		10-Year Storm Event (cfs)		100-Year Storm Event (cfs)	
	Pre	Post	Pre	Post	Pre	Post
DP-1	1.88	0.48	4.68	1.42	9.75	8.10
Δ	**-1.40**		**-3.26**		**-1.65**	

3.3 STANDARD 3 - RECHARGE TO GROUNDWATER

The Project complies with Standard 3. The proposed stormwater management system incorporates the use of two (2) Subsurface Infiltration Systems (SIS) to provide groundwater recharge for impervious surfaces associated with the proposed site improvements.

The proposed recharge BMPs are located in soils capable of absorbing the recharge volume within 72 hours and there is a minimum 2-foot separation between the bottom of the infiltration structures and the estimated seasonal high groundwater (ESHGW) table. SIS 1 is located within four (4) feet of the ESHGW table and a mounding analysis has been provided to show the groundwater mound beneath the BMP does not extend into the basin. Calculations have been provided for the SIS to demonstrate that they drain within the required 72 hours. Refer to **Appendix C** for Groundwater Recharge Calculations.

3.4 STANDARD 4 – WATER QUALITY

The Project complies with Standard 4. The incorporation of the following stormwater best management practices (BMPs) will achieve a cumulative Total Suspended Solids (TSS) removal rate greater than 80%. Additionally, the Project must meet the 44% pre-treatment requirements since the infiltration BMP's are located in rapidly infiltrating soils. Refer to **Appendix D** for Water Quality Calculations and **Appendix F** for a copy of the Long-Term Pollution Prevention and Stormwater Operation & Maintenance Plan.

3.4.1 Street Sweeping

The proposed design incorporates street sweeping as a BMP to control the amount of sediment that enters the stormwater management system. Street sweeping will be conducted on a quarterly average and be primarily scheduled in the spring and fall. In accordance with MA DEP Standards a 5% TSS removal rate is credited for this BMP.

3.4.2 Deep Sump/Hooded Catch Basins

All proposed catch basins will be deep sump/hooded catch basins, which will serve to trap sediment and floatables before entering the stormwater management system. Sumps will be four-feet deep. Catch basins will be inspected quarterly and, if necessary, cleaned when sediment reaches half full sump depth to ensure that the catch basins are working in their intended fashion and that they are free of debris. Sediments and hydrocarbons shall be properly handled and disposed of, in accordance with local, state, and federal requirements. In accordance with MA DEP Standards a 25% TSS removal rate is credited for this BMP.

3.4.3 Subsurface Infiltration Systems (Isolator Row)

The proposed design incorporates two Stormtech SIS with isolator rows which act as sediment forebays at the inlets of each system. The pavement runoff is directed through the catch basins and isolator rows prior to entering the remaining infiltration systems. Subsurface infiltration systems will be inspected twice in the first year, and annually thereafter. Additionally, inspections will be conducted following one major rainfall event (>0.5”) each year to verify that the systems drain within 72 hours. Isolator rows shall be cleaned and vacuumed when sediment reaches a depth of 3”. In accordance with MA DEP Standards an 80% TSS removal rate is credited for this BMP.

3.5 STANDARD 5 – LAND USES WITH HIGHER POTENTIAL POLLUTANT LOADS (LUHPPL)

Standard 5 is not applicable to this Project. The Project does not meet any of the criteria for being considered a LUHPPL.

3.6 STANDARD 6 - CRITICAL AREAS

Standard 6 is not applicable to this Project. The Project does not discharge stormwater within the Zone II or Interim Wellhead Protection Area of a public water supply, or near or to a Critical Area as defined in the Massachusetts Stormwater Handbook.

3.7 STANDARD 7 - REDEVELOPMENT PROJECTS

Standard 7 is applicable to the Project. The Project proposes to redevelop the existing parking area which is currently a mix of degraded paved surface and gravel area with no existing stormwater mitigation. The Project will install new pavement throughout the current limit of the parking area and includes two (2) SIS to mitigate stormwater runoff from the development area using the latest NOAA Atlas-14 rainfall data. The SIS in the north will mitigate up to the 100-year event and will fully meet the Stormwater Standards. The southern SIS is located within the current paved area and will mitigate up to the 10-year storm event which is an improvement on existing conditions. The Project complies with Standard 7.

3.8 STANDARD 8 – CONSTRUCTION PERIOD POLLUTION PREVENTION AND EROSION AND SEDIMENTATION CONTROL

This Project complies with Standard 8. The Project will result in the disturbance of greater than one (1) acre of land and requires coverage under the U.S. EPA National Pollutant Discharge Elimination System (NPDES) General Permit for Stormwater Discharges from Construction Activities (CGP). In support of coverage, a project-specific Storm Water Pollution Prevention Plan (SWPPP) will be prepared and a Notice of Intent will be submitted to the EPA prior to commencement of construction activities.

The SWPPP will be prepared describing the specific practices, installation methods and inspection requirements for temporary and permanent erosion prevention and sediment control practices. At a minimum, the SWPPP will include the following measures:

- Minimize the extent and time of disturbed area and exposed soils;
- Provide perimeter sedimentation control;
- Minimize sediment track out with stabilized construction exits;
- Control discharges from soil stockpiles;
- Minimize dust and soil compaction;
- Temporary and permanent stabilization requirements including seeding, mulching and matting;
- Good housekeeping pollution prevention measures;
- Maintenance requirements; and
- Inspection, recordkeeping, and reporting requirements.

Refer to the project's Erosion and Sediment Control Plan and associated Erosion Control Details for information pertaining to the project's construction-term maintenance requirements, construction sequence, and inspection frequencies.

3.9 STANDARD 9 – OPERATION AND MAINTENANCE PLAN

The Project complies with Standard 9. Refer to **Appendix E** for the Project's Long-Term Pollution Prevention and Stormwater Operation and Maintenance Plan.

3.10 STANDARD 10 – PROHIBITION OF ILLICIT DISCHARGE

The Project complies with Standard 10. There are no known or designed illicit discharges on the Project Site. An Illicit Discharge Compliance Statement is provided in **Appendix F**.

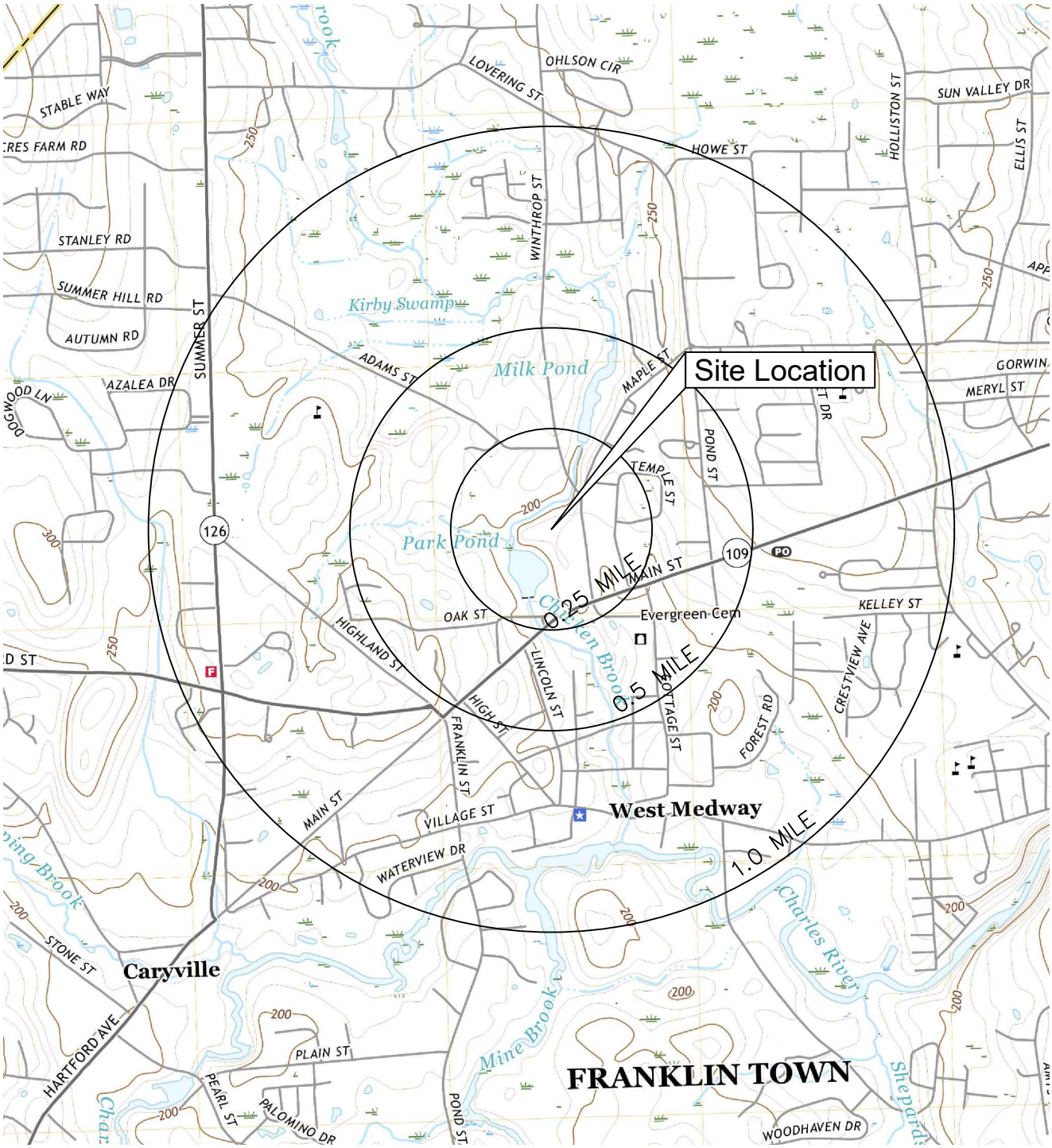
4.0 CONCLUSION

The Stormwater Management Plan addresses both the quantity and quality of stormwater runoff from the Project Site and conforms to the ten (10) MA DEP Stormwater Management Standards and Town of Medway Stormwater Management and Land Disturbance Bylaw. The Project will not have a negative impact on the surrounding areas, will be constructed in compliance with the U.S. EPA NPDES CGP, and will implement stormwater BMPs to mitigate peak runoff rates while providing adequate recharge and treatment of stormwater runoff.

Figures

INFORMATION BASED ON:

1. USGS MAP OF HOLLISTON, MASSACHUSETTS. DATED 2021.



NOTE: DISTANCE RADII MEASURED FROM THE APPROXIMATE CENTER OF SITE PROPERTY.

TETRA TECH

www.tetratech.com

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Marlborough, MA 01752
Phone: 508-786-2000 Fax: 508-786-2001

Site Locus Plan

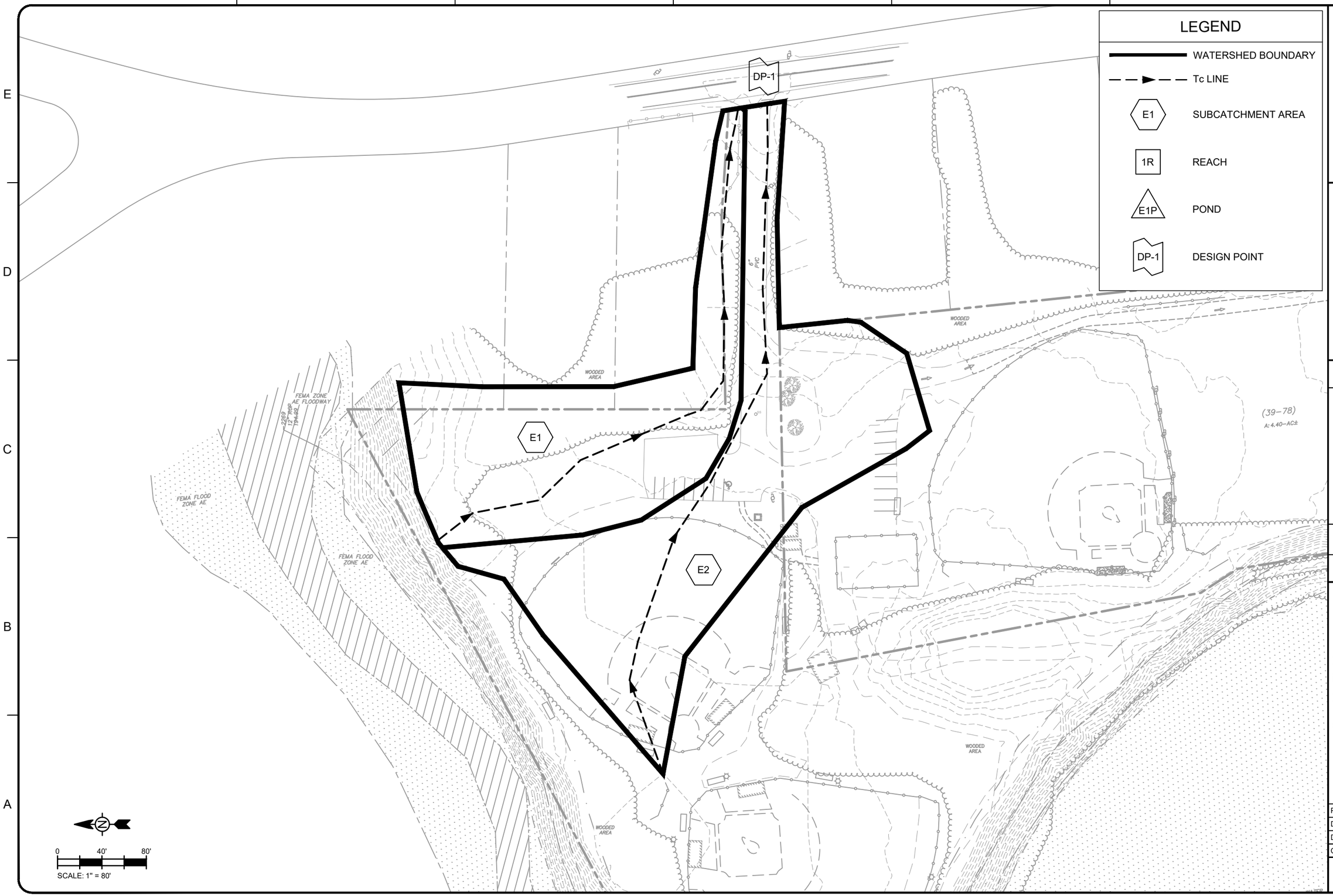
Cassidy Field Parking Improvements
13 Winthrop Street
Medway, MA

0 1000 2000

SCALE: 1" = 2000'

Project No.:	143-21583-21012
Date:	March 11, 2022
Designed By:	BMP
Figure	1

Bar Measures 1 inch



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MARK	DATE	DESCRIPTION	BY

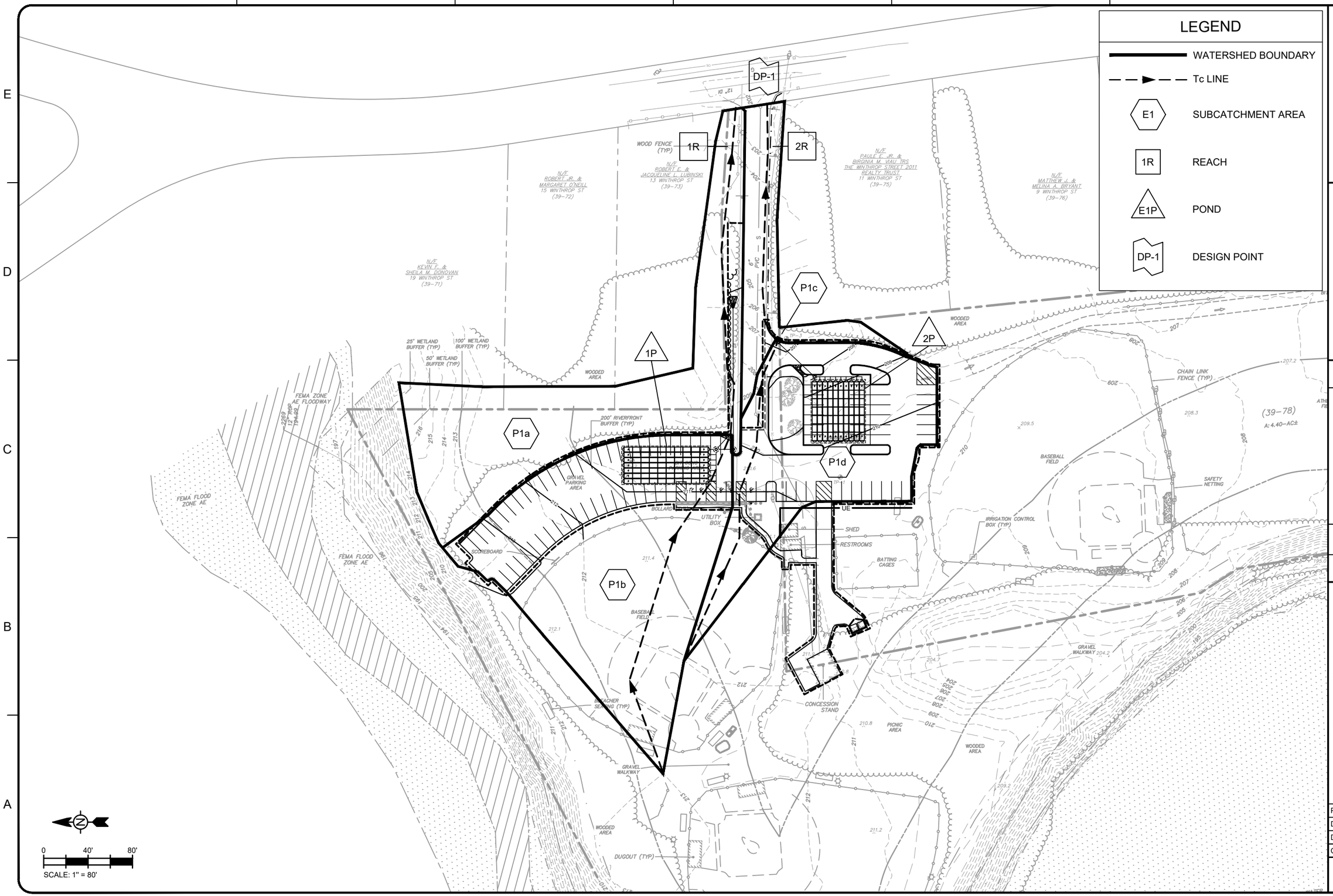
Cassidy Field
Winthrop Street
Medway, MA

Pre-Development Watershed Map

PROJ:	143-21583-21012
DESN:	BMP
DRWN:	BMP
CHKD:	SMB

Figure 2

Bar Measures 1 inch, otherwise drawing not to scale



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MARK	DATE	DESCRIPTION	BY

Cassidy Field
Winthrop Street
Medway, MA

Post-Development Watershed Map

PROJ:	143-21583-21012
DESN:	BMP
DRWN:	BMP
CHKD:	SMB

Figure 3

Bar Measures 1 inch, otherwise drawing not to scale

Appendix A

MA DEP Checklist for Stormwater Report

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

Checklist for Stormwater Report

A. Introduction

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

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

The Stormwater Report must include:

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

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

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

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

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

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

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

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

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

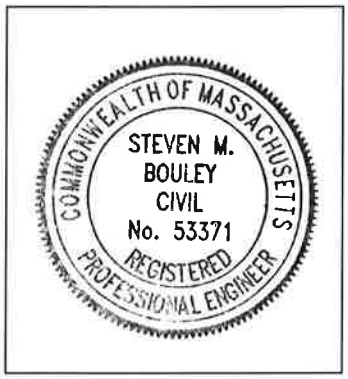
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the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

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

Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature



Signature and Date 4/7/22

Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

☐ New development

☐ Redevelopment

☒ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

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

☒ No disturbance to any Wetland Resource Areas

☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)

☐ Reduced Impervious Area (Redevelopment Only)

☒ Minimizing disturbance to existing trees and shrubs

☐ LID Site Design Credit Requested:

- ☐ Credit 1
- ☐ Credit 2
- ☐ Credit 3

☐ Use of "country drainage" versus curb and gutter conveyance and pipe

☐ Bioretention Cells (includes Rain Gardens)

☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)

☐ Treebox Filter

☐ Water Quality Swale

☐ Grass Channel

☐ Green Roof

☐ Other (describe): _____

Standard 1: No New Untreated Discharges

☒ No new untreated discharges

☒ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth

☐ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

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

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

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

Standard 3: Recharge

☒ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

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

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

☒ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

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

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

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

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

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

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

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

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

Checklist 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

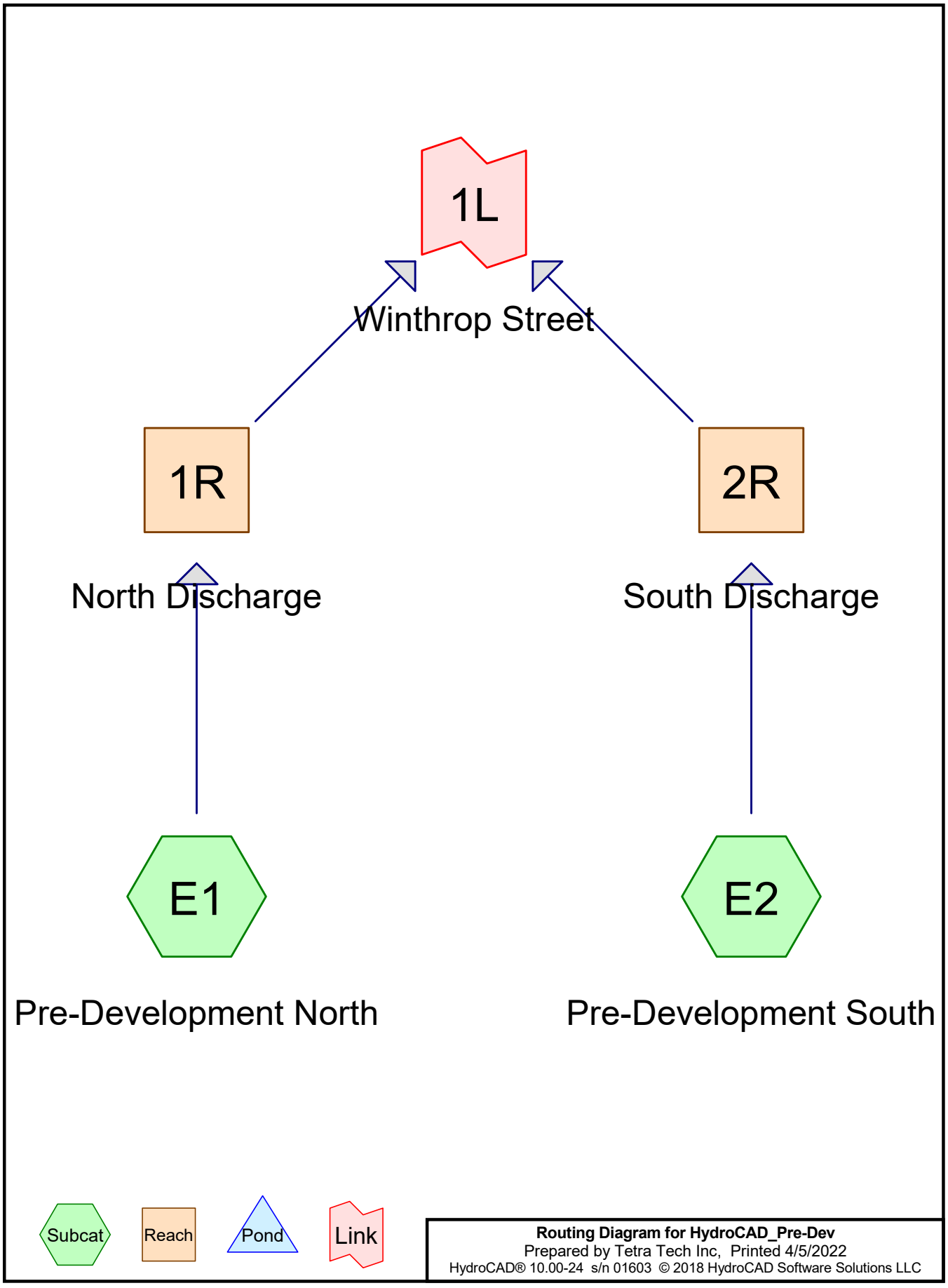
☐ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☒ 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.

Appendix B

HydroCAD Reports



Routing Diagram for HydroCAD_Pre-Dev
Prepared by Tetra Tech Inc, Printed 4/5/2022

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 E1: Pre-Development North Runoff Area=1.037 ac 6.94% Impervious Runoff Depth=0.83"
Flow Length=550' Tc=20.9 min CN=68 Runoff=0.58 cfs 0.071 af

Subcatchment E2: Pre-Development South Runoff Area=1.434 ac 32.64% Impervious Runoff Depth=1.15"
Flow Length=687' Tc=16.3 min CN=74 Runoff=1.34 cfs 0.138 af

Reach 1R: North Discharge Inflow=0.58 cfs 0.071 af
Outflow=0.58 cfs 0.071 af

Reach 2R: South Discharge Inflow=1.34 cfs 0.138 af
Outflow=1.34 cfs 0.138 af

Link 1L: Winthrop Street Inflow=1.88 cfs 0.209 af
Primary=1.88 cfs 0.209 af

Total Runoff Area = 2.471 ac Runoff Volume = 0.209 af Average Runoff Depth = 1.01"
78.15% Pervious = 1.931 ac 21.85% Impervious = 0.540 ac

Summary for Subcatchment E1: Pre-Development North

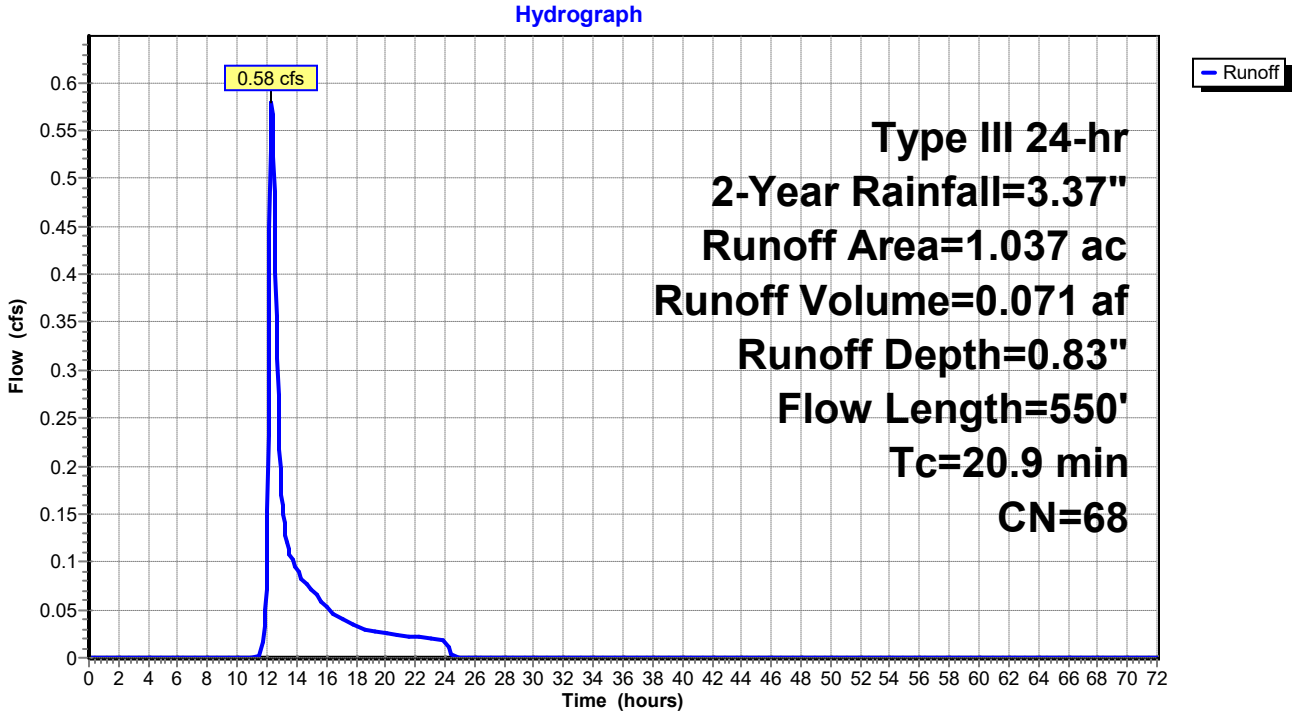
Runoff = 0.58 cfs @ 12.33 hrs, Volume= 0.071 af, Depth= 0.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.37"

Area (ac)	CN	Description
0.160	61	>75% Grass cover, Good, HSG B
0.072	98	Paved parking, HSG B
0.229	96	Gravel surface, HSG B
0.576	55	Woods, Good, HSG B
1.037	68	Weighted Average
0.965		93.06% Pervious Area
0.072		6.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.5	50	0.0200	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
1.4	190	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
7.0	310	0.0220	0.74		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
20.9	550	Total			

Subcatchment E1: Pre-Development North



Summary for Subcatchment E2: Pre-Development South

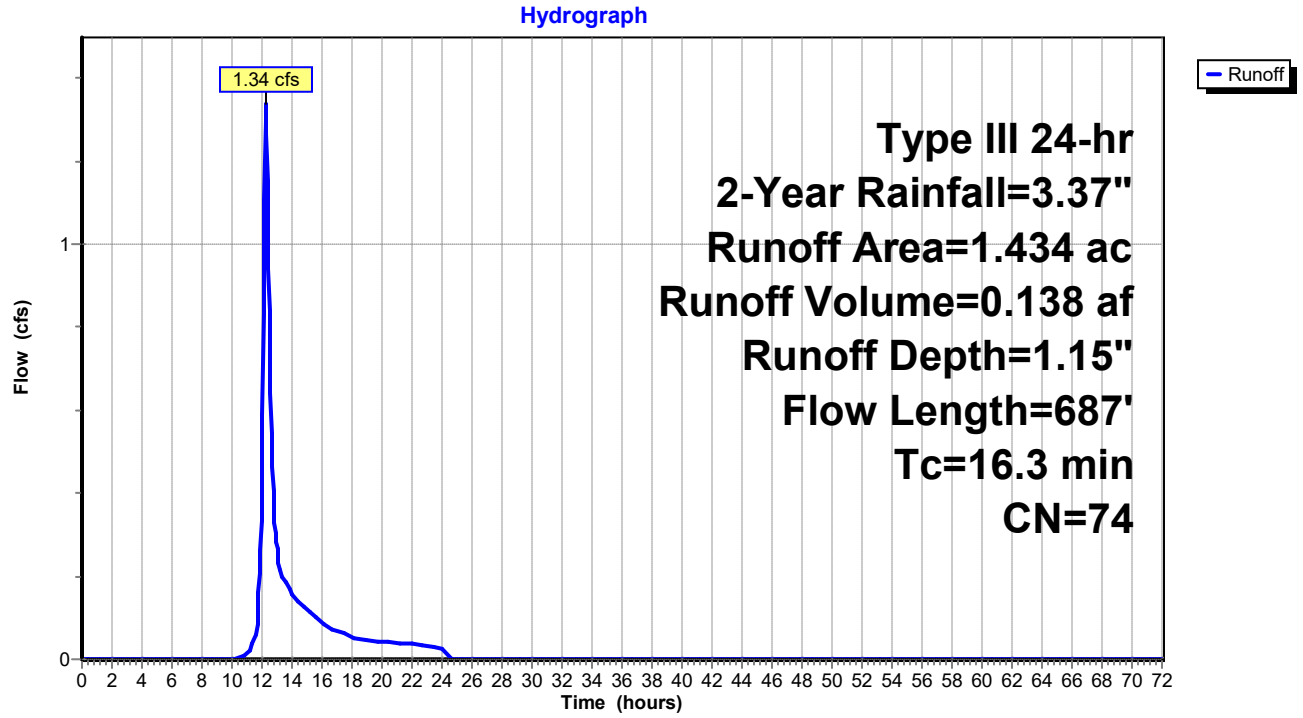
Runoff = 1.34 cfs @ 12.24 hrs, Volume= 0.138 af, Depth= 1.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.37"

Area (ac)	CN	Description
0.767	61	>75% Grass cover, Good, HSG B
0.468	98	Paved parking, HSG B
0.013	96	Gravel surface, HSG B
0.090	55	Woods, Good, HSG B
0.096	82	Dirt roads, HSG B
1.434	74	Weighted Average
0.966		67.36% Pervious Area
0.468		32.64% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0060	0.09		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.10"
4.8	210	0.0110	0.73		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.2	427	0.0250	3.21		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
16.3	687	Total			

Subcatchment E2: Pre-Development South



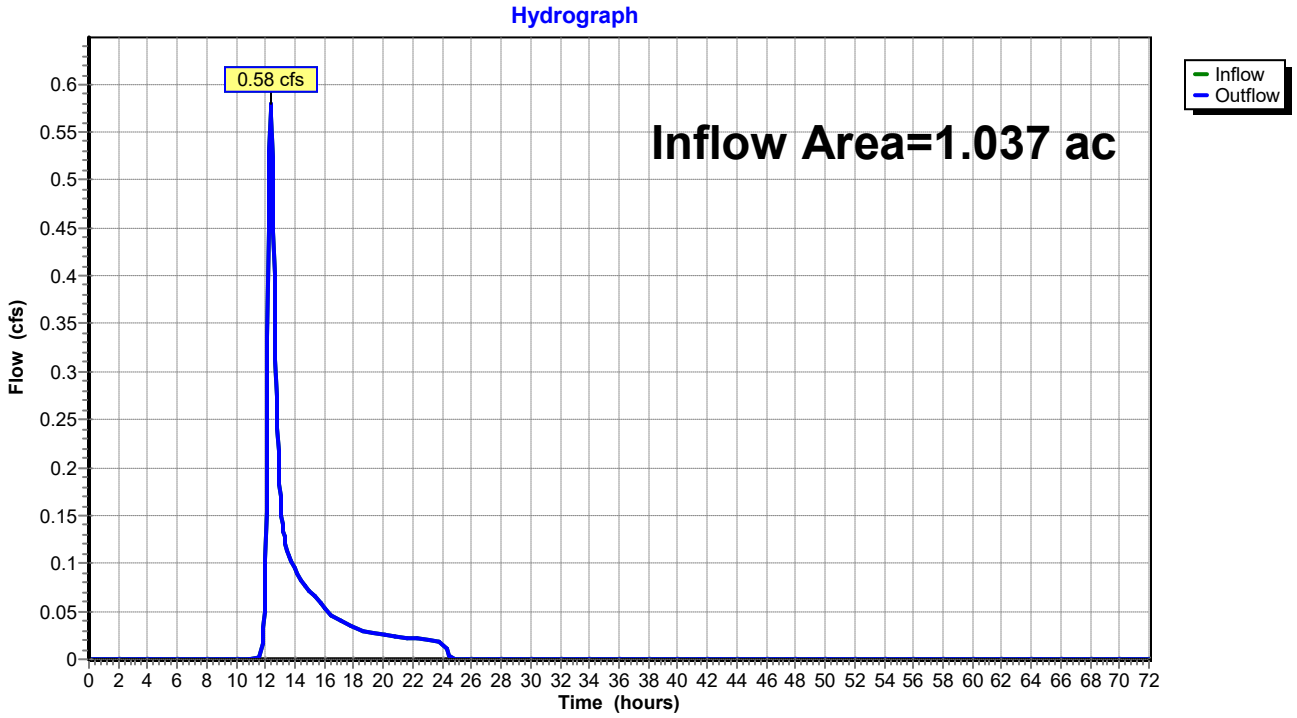
Summary for Reach 1R: North Discharge

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.037 ac, 6.94% Impervious, Inflow Depth = 0.83" for 2-Year event
Inflow = 0.58 cfs @ 12.33 hrs, Volume= 0.071 af
Outflow = 0.58 cfs @ 12.33 hrs, Volume= 0.071 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 1R: North Discharge



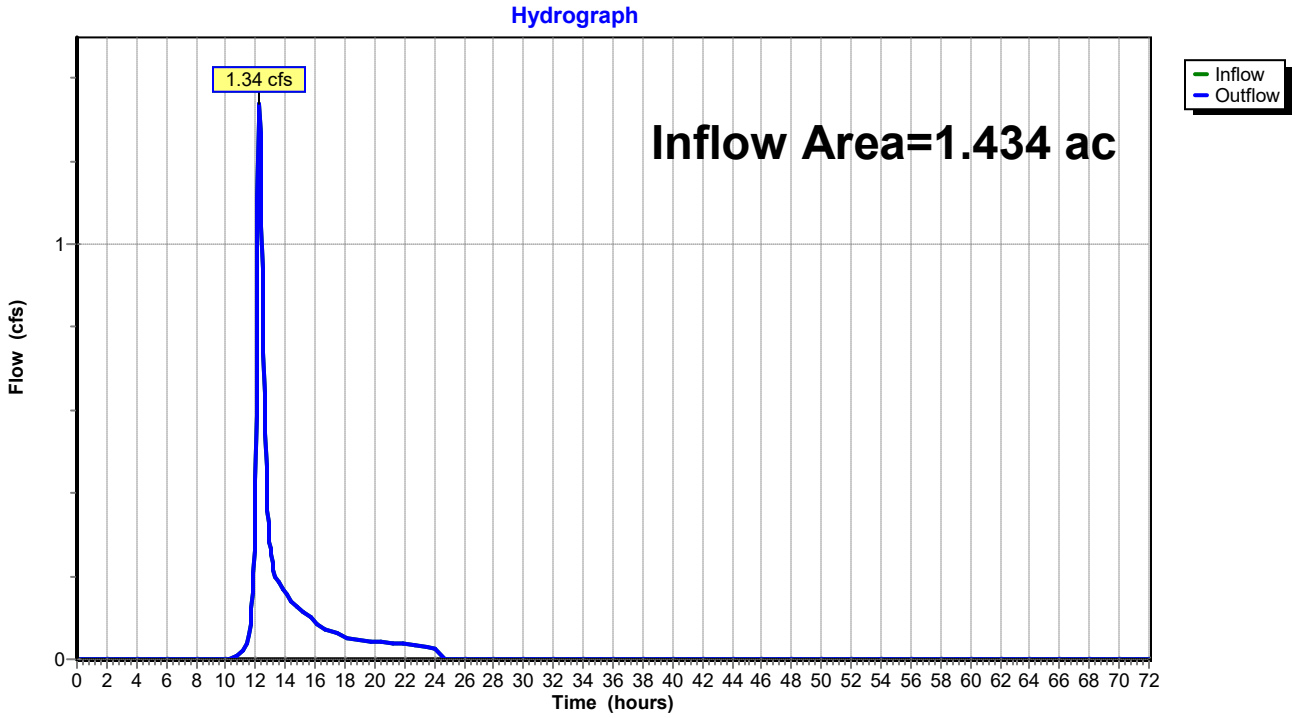
Summary for Reach 2R: South Discharge

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.434 ac, 32.64% Impervious, Inflow Depth = 1.15" for 2-Year event
Inflow = 1.34 cfs @ 12.24 hrs, Volume= 0.138 af
Outflow = 1.34 cfs @ 12.24 hrs, Volume= 0.138 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 2R: South Discharge

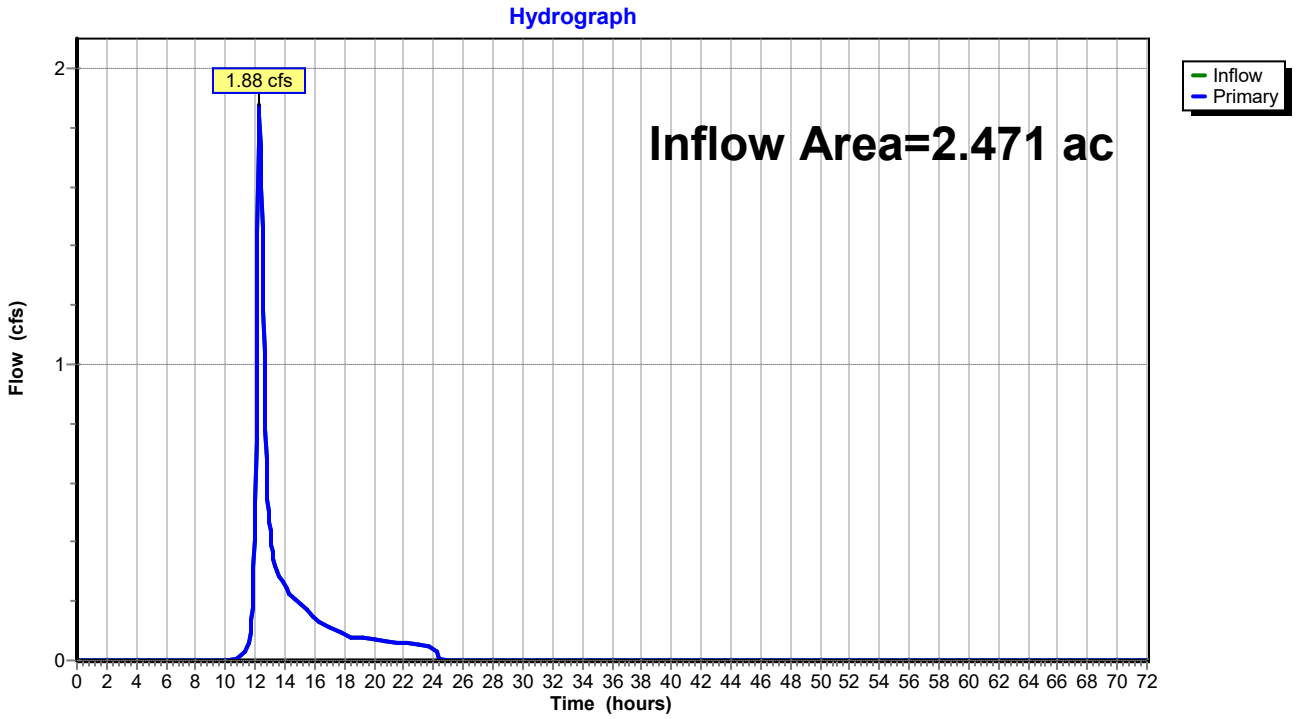


Summary for Link 1L: Winthrop Street

Inflow Area = 2.471 ac, 21.85% Impervious, Inflow Depth = 1.01" for 2-Year event
Inflow = 1.88 cfs @ 12.27 hrs, Volume= 0.209 af
Primary = 1.88 cfs @ 12.27 hrs, Volume= 0.209 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link 1L: Winthrop Street



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 E1: Pre-Development North Runoff Area=1.037 ac 6.94% Impervious Runoff Depth=2.07"
Flow Length=550' Tc=20.9 min CN=68 Runoff=1.62 cfs 0.179 af

Subcatchment E2: Pre-Development South Runoff Area=1.434 ac 32.64% Impervious Runoff Depth=2.58"
Flow Length=687' Tc=16.3 min CN=74 Runoff=3.14 cfs 0.308 af

Reach 1R: North Discharge Inflow=1.62 cfs 0.179 af
Outflow=1.62 cfs 0.179 af

Reach 2R: South Discharge Inflow=3.14 cfs 0.308 af
Outflow=3.14 cfs 0.308 af

Link 1L: Winthrop Street Inflow=4.68 cfs 0.488 af
Primary=4.68 cfs 0.488 af

Total Runoff Area = 2.471 ac Runoff Volume = 0.488 af Average Runoff Depth = 2.37"
78.15% Pervious = 1.931 ac 21.85% Impervious = 0.540 ac

Summary for Subcatchment E1: Pre-Development North

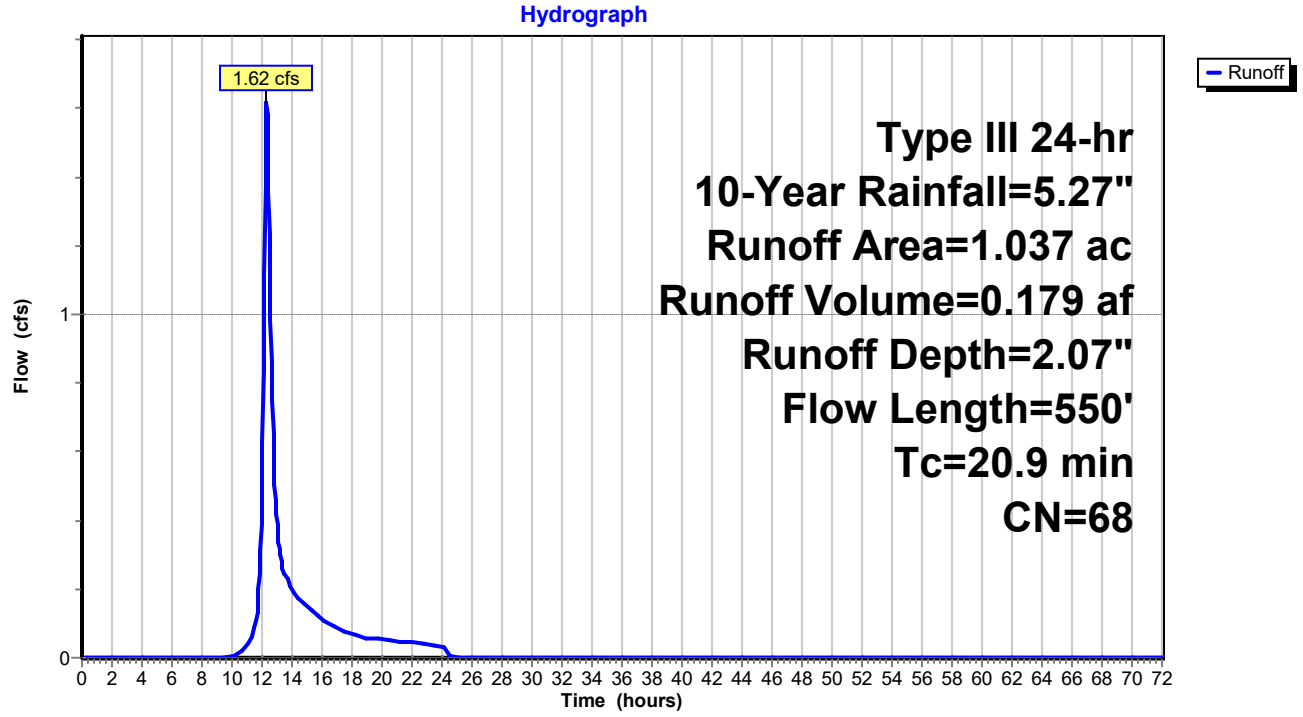
Runoff = 1.62 cfs @ 12.31 hrs, Volume= 0.179 af, Depth= 2.07"

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-Year Rainfall=5.27"

Area (ac)	CN	Description
0.160	61	>75% Grass cover, Good, HSG B
0.072	98	Paved parking, HSG B
0.229	96	Gravel surface, HSG B
0.576	55	Woods, Good, HSG B
1.037	68	Weighted Average
0.965		93.06% Pervious Area
0.072		6.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.5	50	0.0200	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
1.4	190	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
7.0	310	0.0220	0.74		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
20.9	550	Total			

Subcatchment E1: Pre-Development North



Summary for Subcatchment E2: Pre-Development South

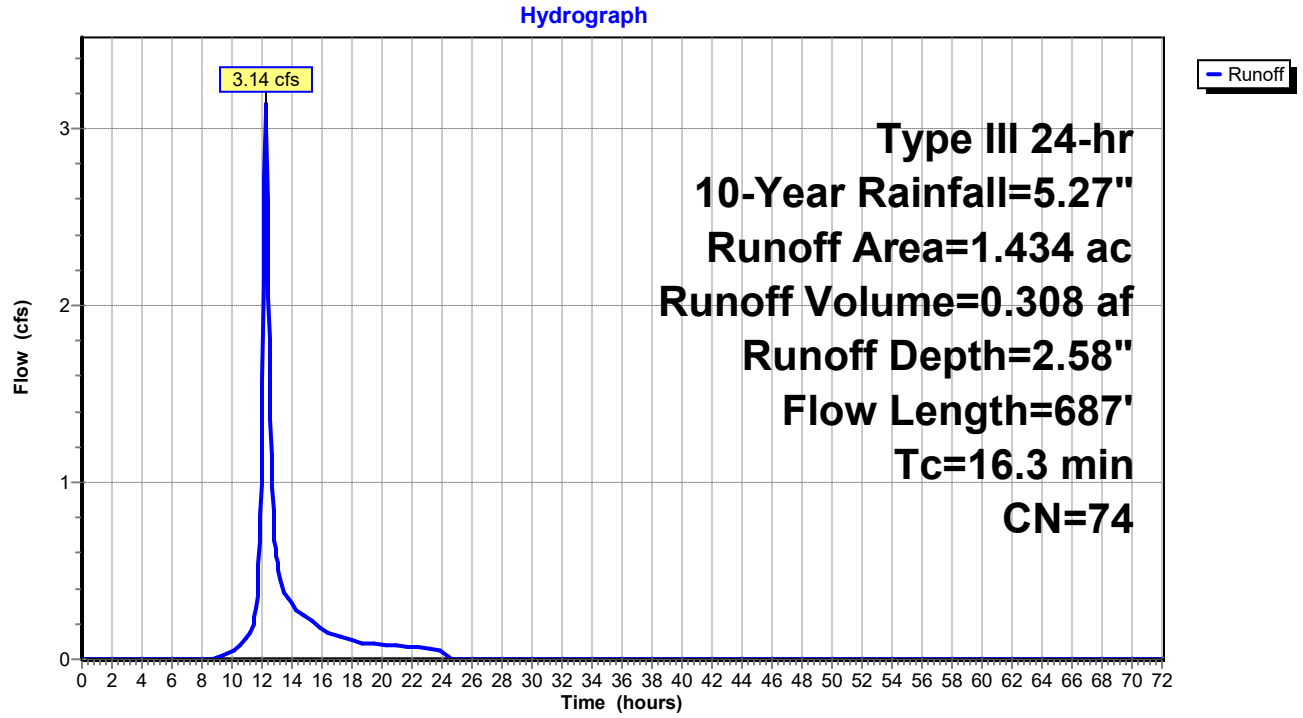
Runoff = 3.14 cfs @ 12.23 hrs, Volume= 0.308 af, Depth= 2.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.27"

Area (ac)	CN	Description
0.767	61	>75% Grass cover, Good, HSG B
0.468	98	Paved parking, HSG B
0.013	96	Gravel surface, HSG B
0.090	55	Woods, Good, HSG B
0.096	82	Dirt roads, HSG B
1.434	74	Weighted Average
0.966		67.36% Pervious Area
0.468		32.64% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0060	0.09		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.10"
4.8	210	0.0110	0.73		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.2	427	0.0250	3.21		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
16.3	687	Total			

Subcatchment E2: Pre-Development South



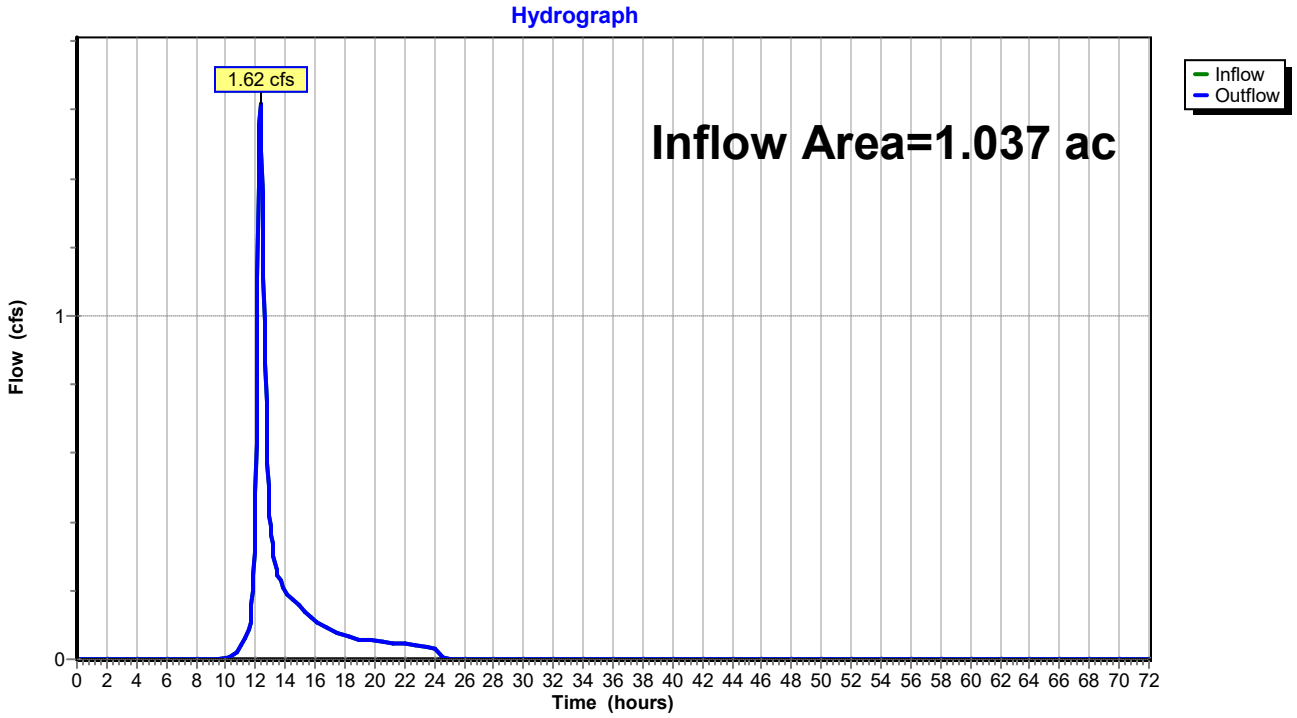
Summary for Reach 1R: North Discharge

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.037 ac, 6.94% Impervious, Inflow Depth = 2.07" for 10-Year event
Inflow = 1.62 cfs @ 12.31 hrs, Volume= 0.179 af
Outflow = 1.62 cfs @ 12.31 hrs, Volume= 0.179 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 1R: North Discharge



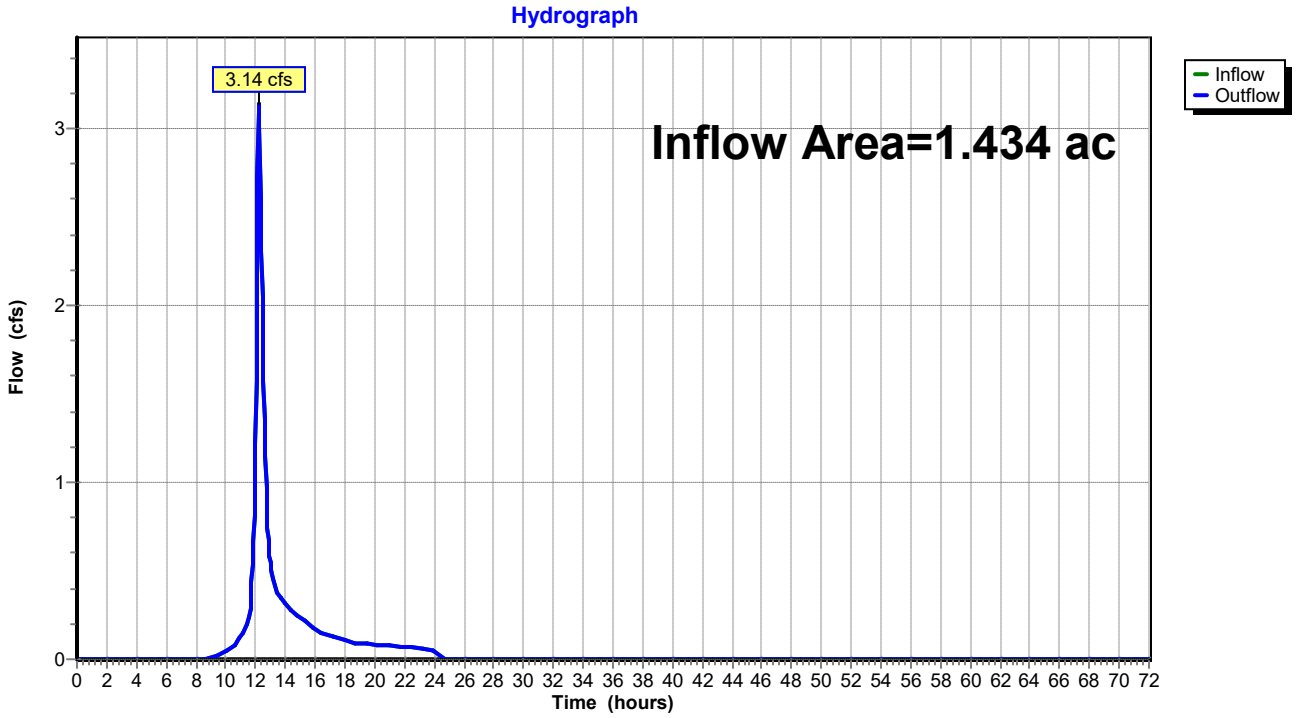
Summary for Reach 2R: South Discharge

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.434 ac, 32.64% Impervious, Inflow Depth = 2.58" for 10-Year event
Inflow = 3.14 cfs @ 12.23 hrs, Volume= 0.308 af
Outflow = 3.14 cfs @ 12.23 hrs, Volume= 0.308 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 2R: South Discharge

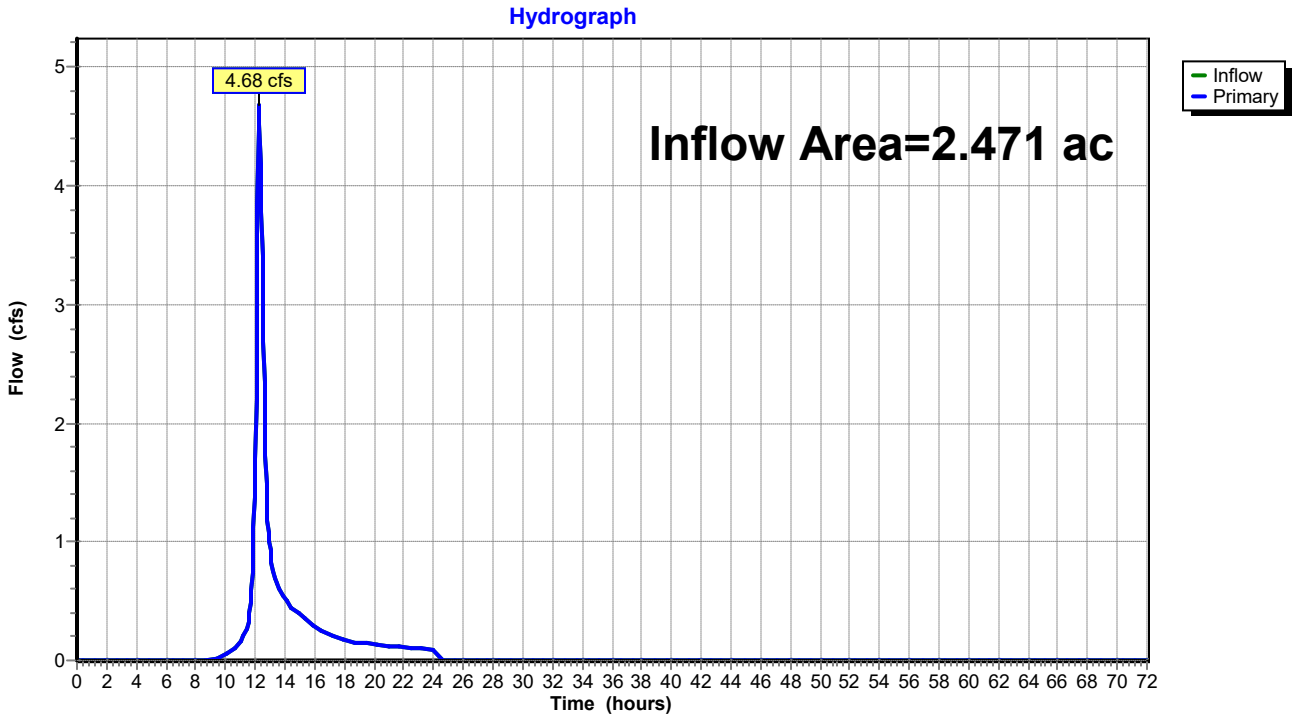


Summary for Link 1L: Winthrop Street

Inflow Area = 2.471 ac, 21.85% Impervious, Inflow Depth = 2.37" for 10-Year event
Inflow = 4.68 cfs @ 12.25 hrs, Volume= 0.488 af
Primary = 4.68 cfs @ 12.25 hrs, Volume= 0.488 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link 1L: Winthrop Street



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 E1: Pre-Development North Runoff Area=1.037 ac 6.94% Impervious Runoff Depth=4.47"
Flow Length=550' Tc=20.9 min CN=68 Runoff=3.59 cfs 0.386 af

Subcatchment E2: Pre-Development South Runoff Area=1.434 ac 32.64% Impervious Runoff Depth=5.18"
Flow Length=687' Tc=16.3 min CN=74 Runoff=6.35 cfs 0.619 af

Reach 1R: North Discharge Inflow=3.59 cfs 0.386 af
Outflow=3.59 cfs 0.386 af

Reach 2R: South Discharge Inflow=6.35 cfs 0.619 af
Outflow=6.35 cfs 0.619 af

Link 1L: Winthrop Street Inflow=9.75 cfs 1.005 af
Primary=9.75 cfs 1.005 af

Total Runoff Area = 2.471 ac Runoff Volume = 1.005 af Average Runoff Depth = 4.88"
78.15% Pervious = 1.931 ac 21.85% Impervious = 0.540 ac

Summary for Subcatchment E1: Pre-Development North

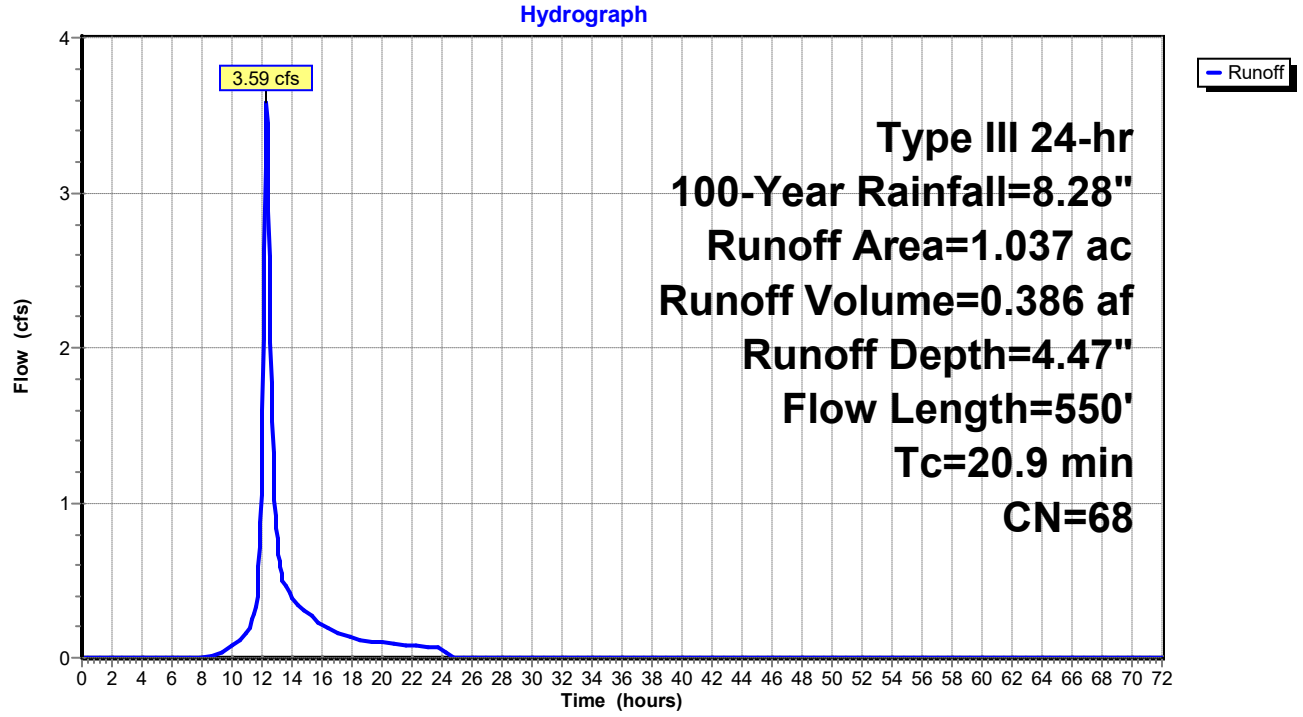
Runoff = 3.59 cfs @ 12.29 hrs, Volume= 0.386 af, Depth= 4.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.28"

Area (ac)	CN	Description
0.160	61	>75% Grass cover, Good, HSG B
0.072	98	Paved parking, HSG B
0.229	96	Gravel surface, HSG B
0.576	55	Woods, Good, HSG B
1.037	68	Weighted Average
0.965		93.06% Pervious Area
0.072		6.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.5	50	0.0200	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
1.4	190	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
7.0	310	0.0220	0.74		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
20.9	550	Total			

Subcatchment E1: Pre-Development North



Summary for Subcatchment E2: Pre-Development South

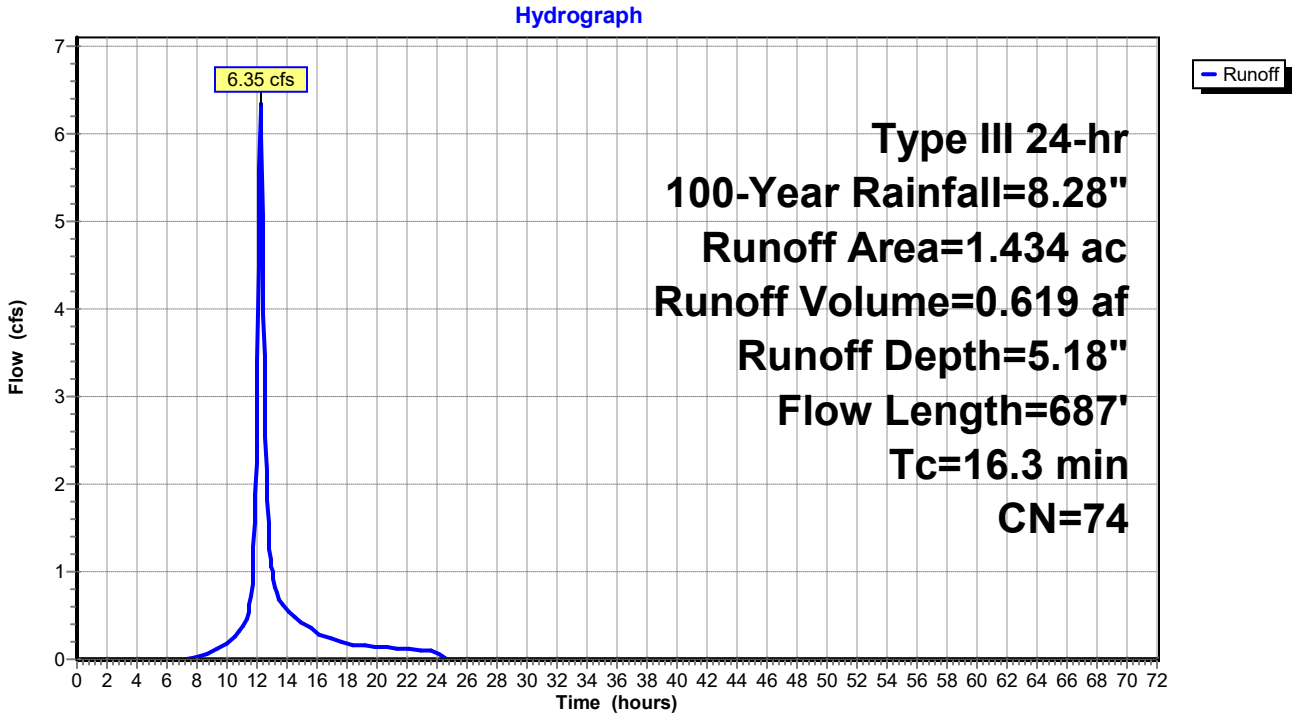
Runoff = 6.35 cfs @ 12.22 hrs, Volume= 0.619 af, Depth= 5.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.28"

Area (ac)	CN	Description
0.767	61	>75% Grass cover, Good, HSG B
0.468	98	Paved parking, HSG B
0.013	96	Gravel surface, HSG B
0.090	55	Woods, Good, HSG B
0.096	82	Dirt roads, HSG B
1.434	74	Weighted Average
0.966		67.36% Pervious Area
0.468		32.64% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0060	0.09		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.10"
4.8	210	0.0110	0.73		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.2	427	0.0250	3.21		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
16.3	687	Total			

Subcatchment E2: Pre-Development South



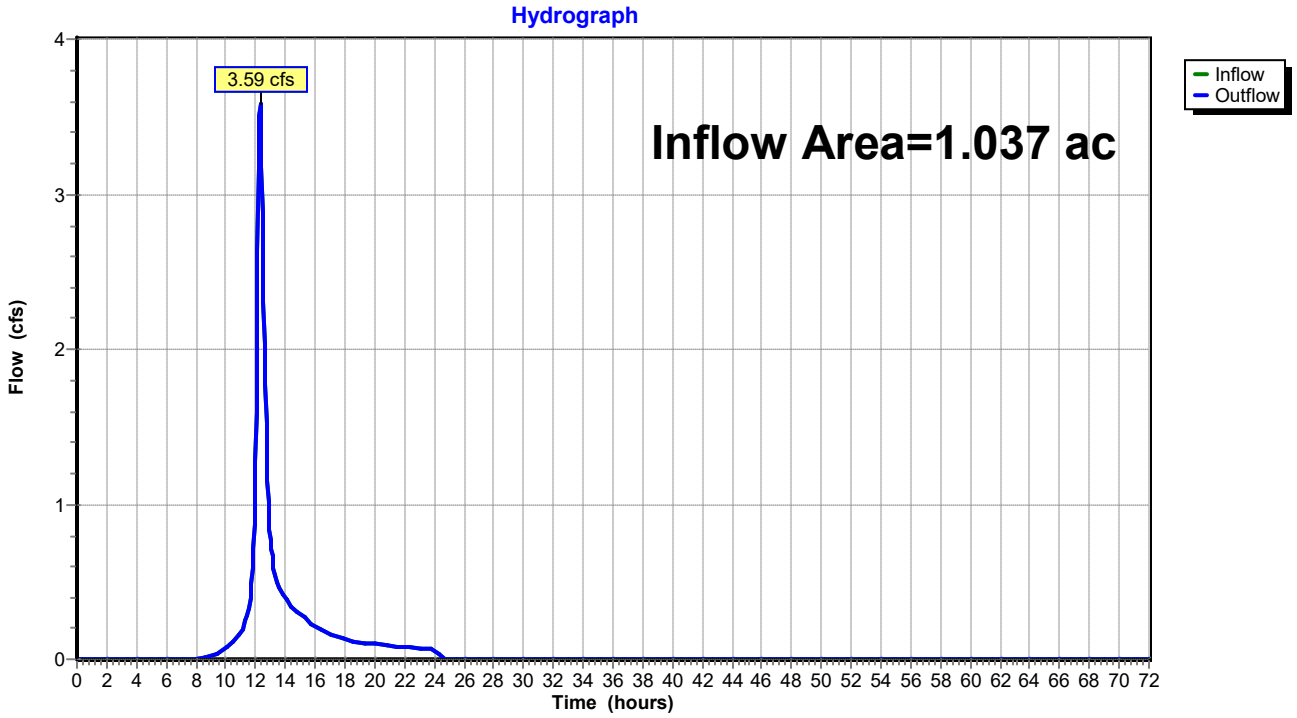
Summary for Reach 1R: North Discharge

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.037 ac, 6.94% Impervious, Inflow Depth = 4.47" for 100-Year event
Inflow = 3.59 cfs @ 12.29 hrs, Volume= 0.386 af
Outflow = 3.59 cfs @ 12.29 hrs, Volume= 0.386 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 1R: North Discharge



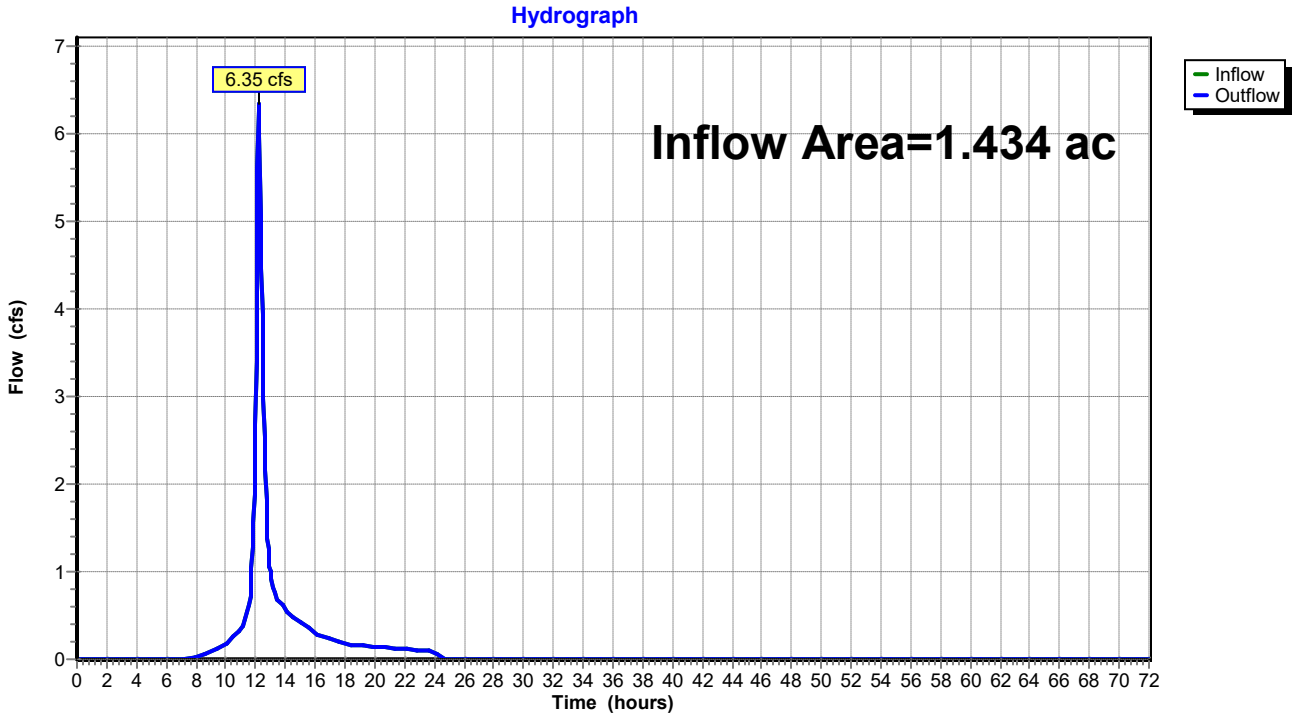
Summary for Reach 2R: South Discharge

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.434 ac, 32.64% Impervious, Inflow Depth = 5.18" for 100-Year event
Inflow = 6.35 cfs @ 12.22 hrs, Volume= 0.619 af
Outflow = 6.35 cfs @ 12.22 hrs, Volume= 0.619 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 2R: South Discharge

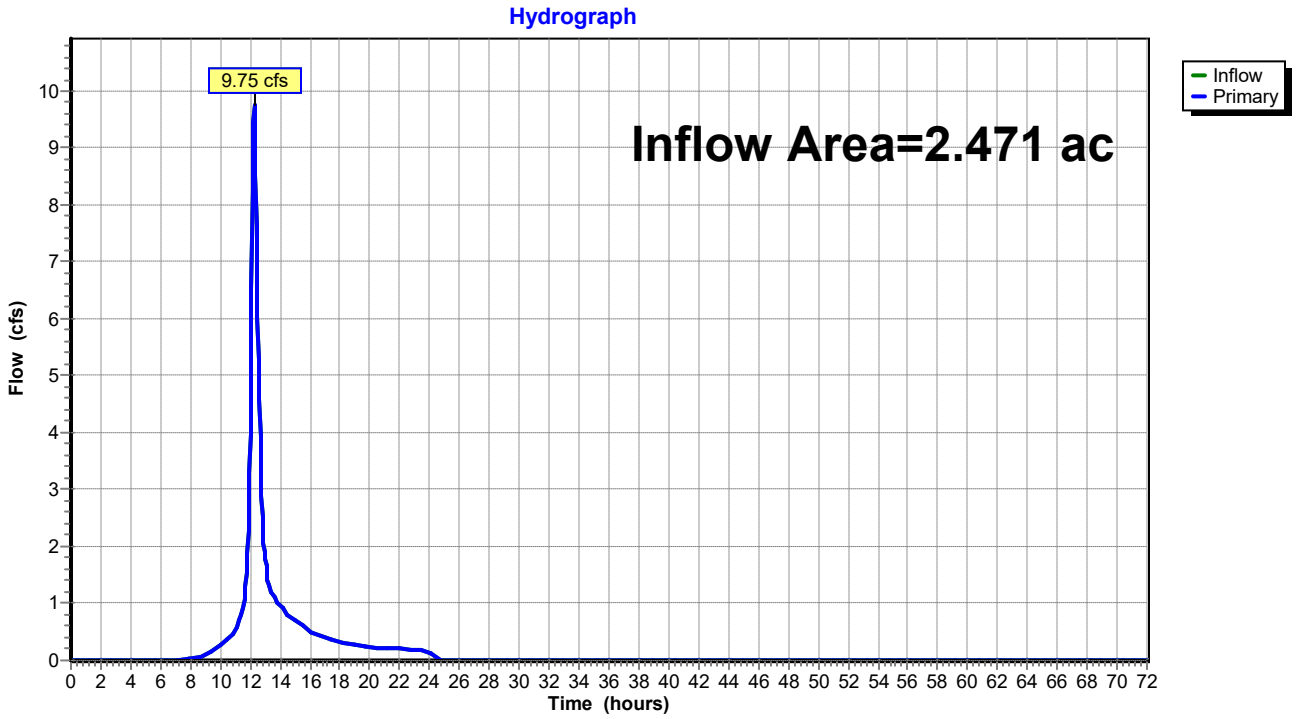


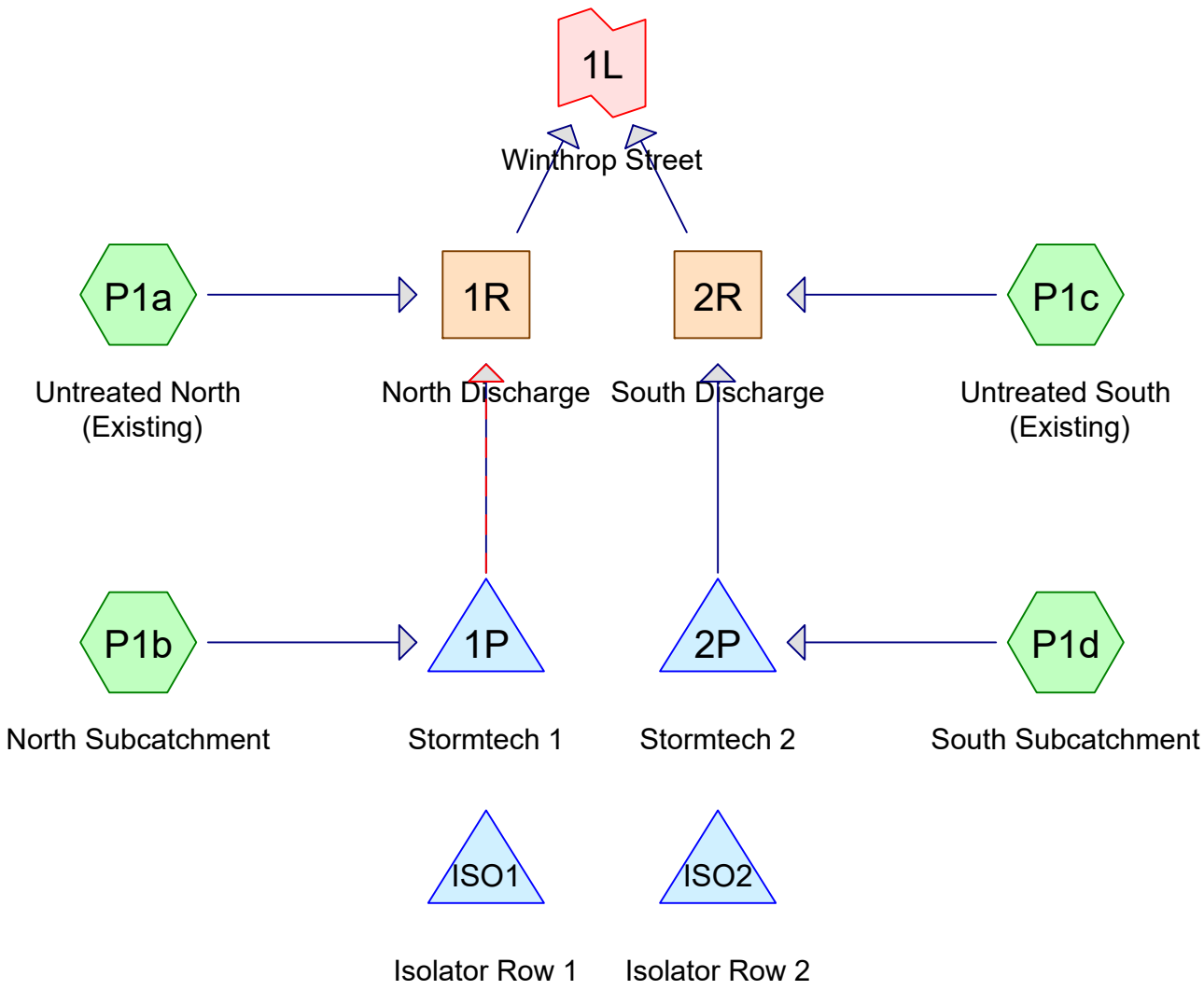
Summary for Link 1L: Winthrop Street

Inflow Area = 2.471 ac, 21.85% Impervious, Inflow Depth = 4.88" for 100-Year event
Inflow = 9.75 cfs @ 12.25 hrs, Volume= 1.005 af
Primary = 9.75 cfs @ 12.25 hrs, Volume= 1.005 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link 1L: Winthrop Street





Subcat Reach Pond Link

Routing Diagram for HydroCAD_Post-Dev
Prepared by Tetra Tech Inc, Printed 4/6/2022

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.906	61	>75% Grass cover, Good, HSG B (P1a, P1b, P1c, P1d)
0.107	82	Dirt roads, HSG B (P1b, P1d)
0.005	85	Gravel roads, HSG B (P1d)
0.910	98	Paved parking, HSG B (P1b, P1c, P1d)
0.621	60	Woods, Fair, HSG B (P1a, P1c, P1d)
2.549	**75**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
2.549	HSG B	P1a, P1b, P1c, P1d
0.000	HSG C	
0.000	HSG D	
0.000	Other	
2.549		**TOTAL AREA**

Pipe Listing (all 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	1P	206.60	206.00	125.0	0.0048	0.013	10.0	0.0	0.0

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P1a: Untreated North Runoff Area=0.747 ac 0.00% Impervious Runoff Depth=0.48"
Flow Length=334' Tc=18.6 min CN=60 Runoff=0.19 cfs 0.030 af

Subcatchment P1b: North Subcatchment Runoff Area=0.955 ac 37.59% Impervious Runoff Depth=1.33"
Flow Length=334' Tc=18.6 min CN=77 Runoff=1.01 cfs 0.106 af

Subcatchment P1c: Untreated South Runoff Area=0.236 ac 54.24% Impervious Runoff Depth=1.60"
Flow Length=334' Tc=18.6 min CN=81 Runoff=0.31 cfs 0.032 af

Subcatchment P1d: South Subcatchment Runoff Area=0.611 ac 69.23% Impervious Runoff Depth=2.07"
Flow Length=334' Tc=18.6 min CN=87 Runoff=1.03 cfs 0.105 af

Reach 1R: North Discharge Inflow=0.19 cfs 0.030 af
Outflow=0.19 cfs 0.030 af

Reach 2R: South Discharge Inflow=0.31 cfs 0.032 af
Outflow=0.31 cfs 0.032 af

Pond 1P: Stormtech 1 Peak Elev=206.55' Storage=1,693 cf Inflow=1.01 cfs 0.106 af
Discarded=0.15 cfs 0.106 af Primary=0.00 cfs 0.000 af Outflow=0.15 cfs 0.106 af

Pond 2P: Stormtech 2 Peak Elev=203.79' Storage=2,441 cf Inflow=1.03 cfs 0.105 af
Discarded=0.06 cfs 0.105 af Primary=0.00 cfs 0.000 af Outflow=0.06 cfs 0.105 af

Pond ISO1: Isolator Row 1 Peak Elev=0.00' Storage=0 cf

Pond ISO2: Isolator Row 2 Peak Elev=0.00' Storage=0 cf

Link 1L: Winthrop Street Inflow=0.48 cfs 0.061 af
Primary=0.48 cfs 0.061 af

Total Runoff Area = 2.549 ac Runoff Volume = 0.273 af Average Runoff Depth = 1.28"
64.30% Pervious = 1.639 ac 35.70% Impervious = 0.910 ac

Summary for Subcatchment P1a: Untreated North (Existing)

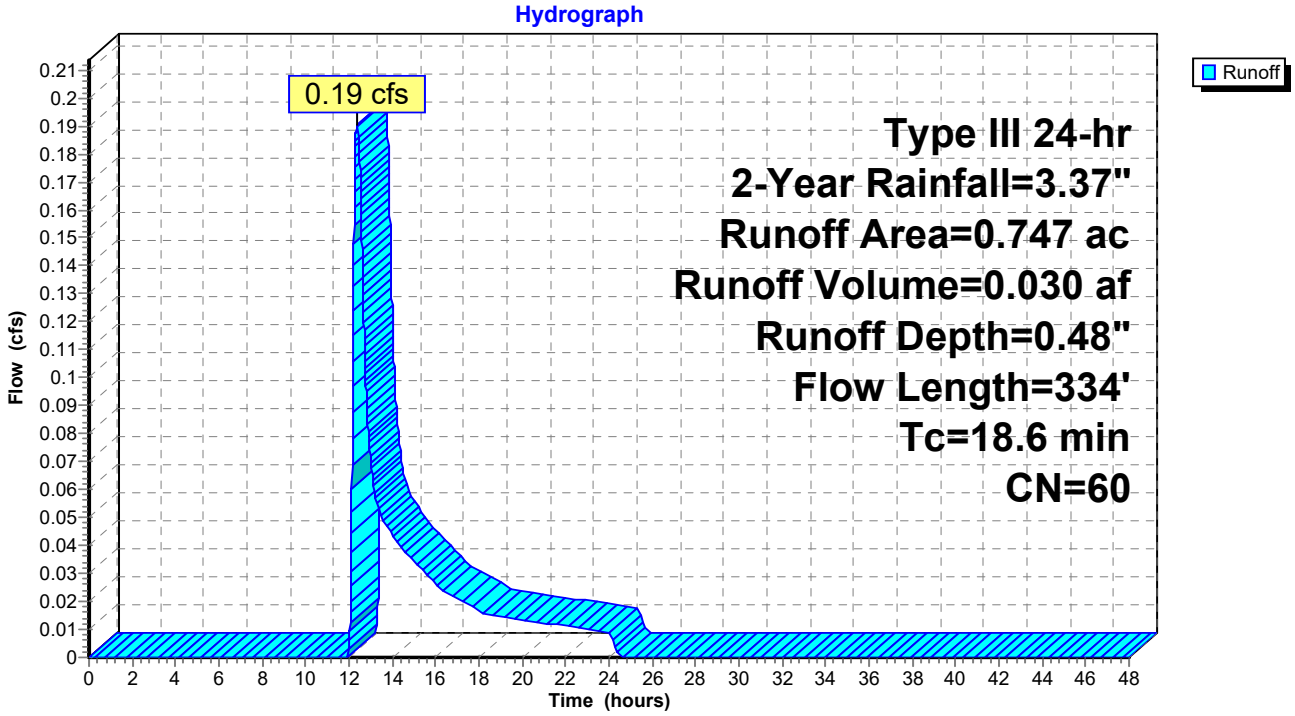
Runoff = 0.19 cfs @ 12.37 hrs, Volume= 0.030 af, Depth= 0.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.37"

Area (ac)	CN	Description
0.563	60	Woods, Fair, HSG B
0.184	61	>75% Grass cover, Good, HSG B
0.747	60	Weighted Average
0.747		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.5	50	0.0400	0.05		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.10"
1.2	142	0.0160	2.04		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.9	142	0.0160	2.57		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
18.6	334	Total			

Subcatchment P1a: Untreated North (Existing)



Summary for Subcatchment P1b: North Subcatchment

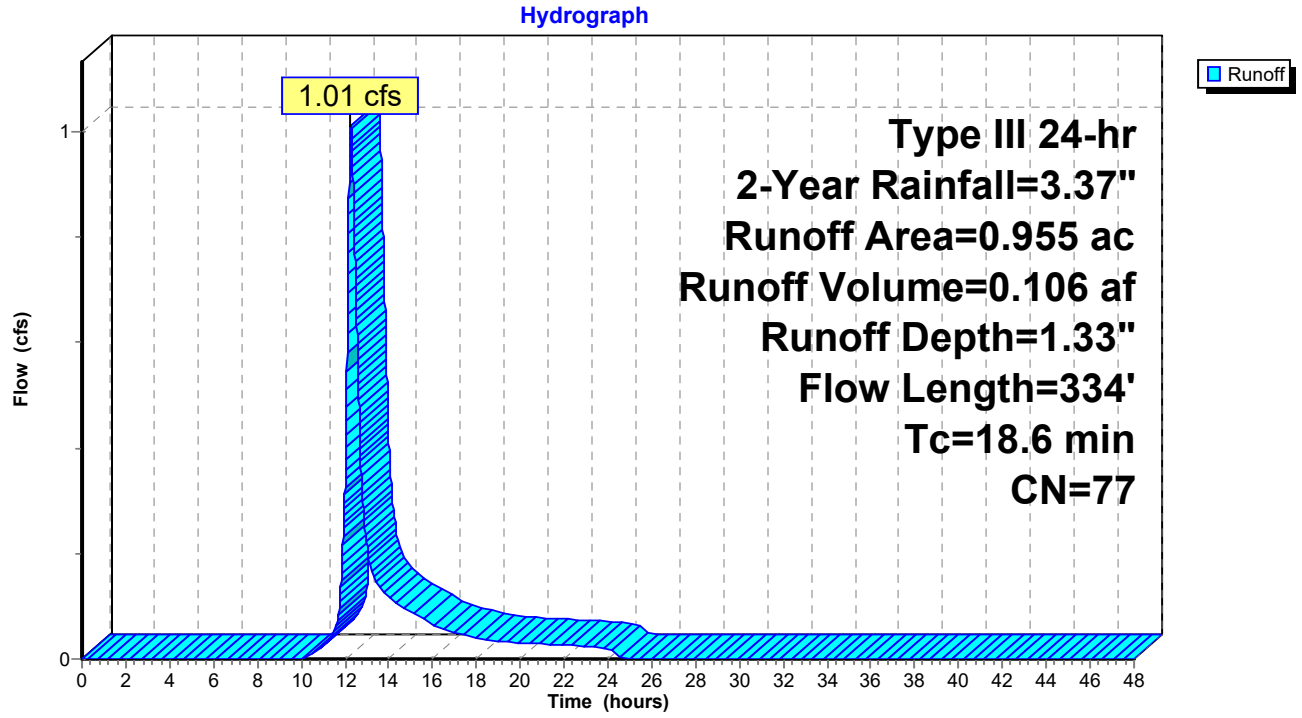
Runoff = 1.01 cfs @ 12.26 hrs, Volume= 0.106 af, Depth= 1.33"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.37"

Area (ac)	CN	Description
0.000	60	Woods, Fair, HSG B
0.494	61	>75% Grass cover, Good, HSG B
0.359	98	Paved parking, HSG B
0.102	82	Dirt roads, HSG B
0.955	77	Weighted Average
0.596		62.41% Pervious Area
0.359		37.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.5	50	0.0400	0.05		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.10"
1.2	142	0.0160	2.04		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.9	142	0.0160	2.57		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
18.6	334	Total			

Subcatchment P1b: North Subcatchment



Summary for Subcatchment P1c: Untreated South (Existing)

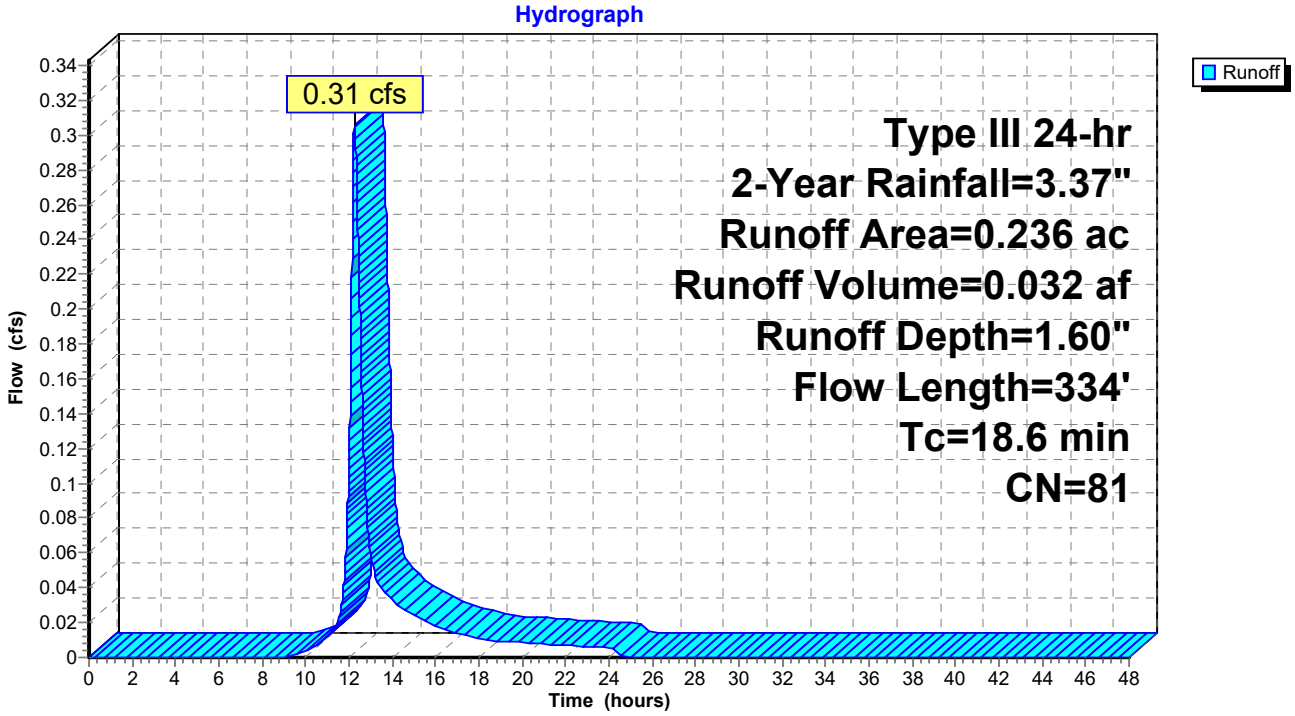
Runoff = 0.31 cfs @ 12.26 hrs, Volume= 0.032 af, Depth= 1.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.37"

Area (ac)	CN	Description
0.035	60	Woods, Fair, HSG B
0.073	61	>75% Grass cover, Good, HSG B
0.128	98	Paved parking, HSG B
0.236	81	Weighted Average
0.108		45.76% Pervious Area
0.128		54.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.5	50	0.0400	0.05		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.10"
1.2	142	0.0160	2.04		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.9	142	0.0160	2.57		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
18.6	334	Total			

Subcatchment P1c: Untreated South (Existing)



Summary for Subcatchment P1d: South Subcatchment

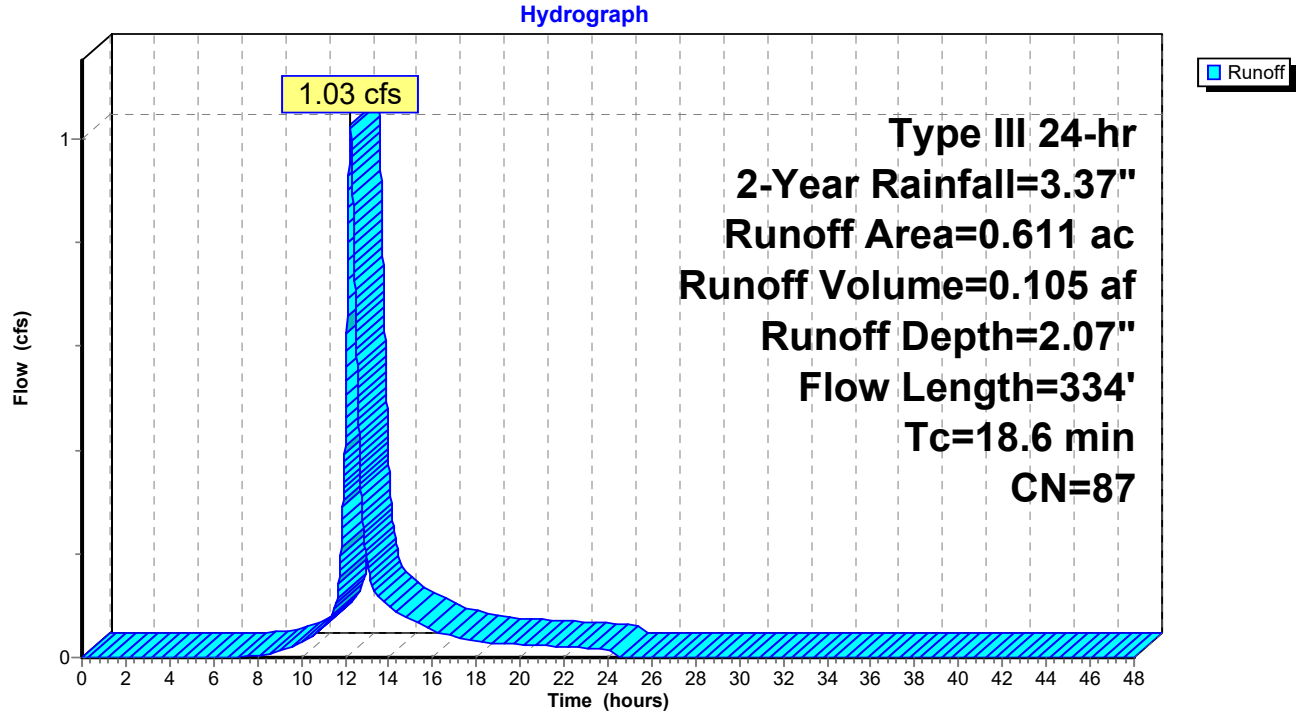
Runoff = 1.03 cfs @ 12.25 hrs, Volume= 0.105 af, Depth= 2.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.37"

Area (ac)	CN	Description
0.023	60	Woods, Fair, HSG B
0.155	61	>75% Grass cover, Good, HSG B
0.423	98	Paved parking, HSG B
0.005	85	Gravel roads, HSG B
0.005	82	Dirt roads, HSG B
0.611	87	Weighted Average
0.188		30.77% Pervious Area
0.423		69.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.5	50	0.0400	0.05		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.10"
1.2	142	0.0160	2.04		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.9	142	0.0160	2.57		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
18.6	334	Total			

Subcatchment P1d: South Subcatchment



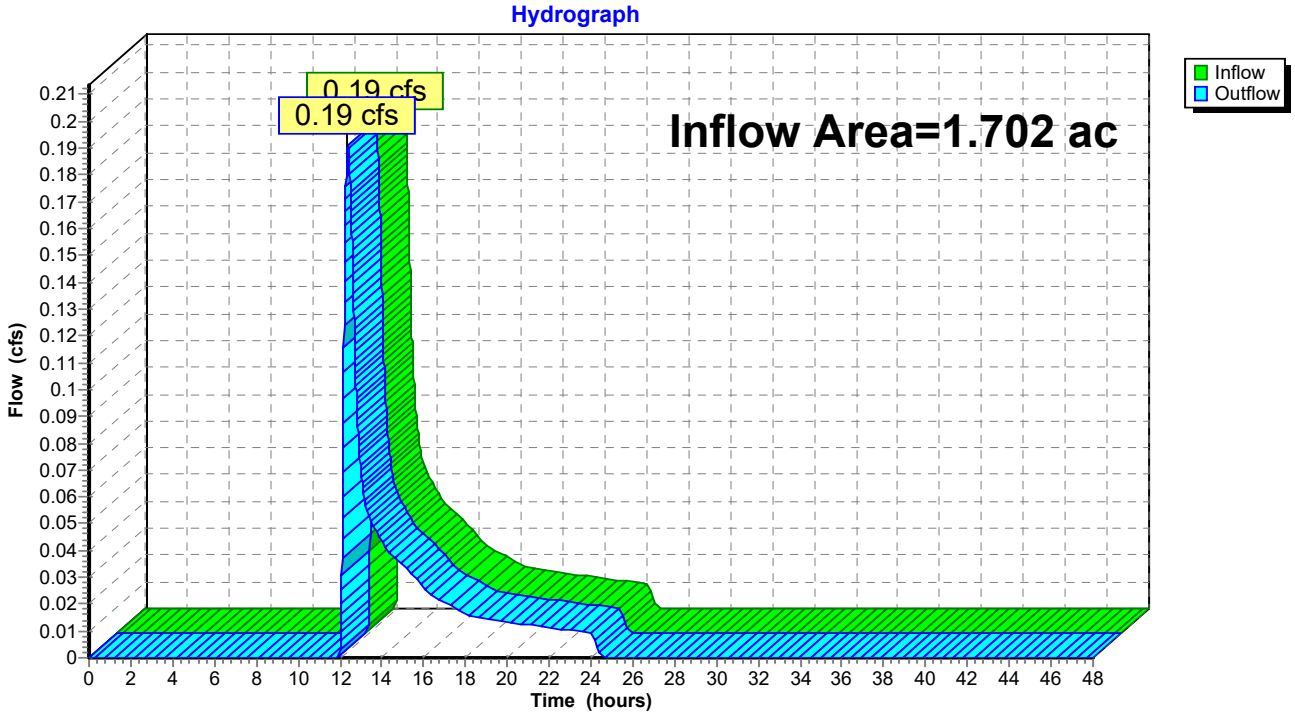
Summary for Reach 1R: North Discharge

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.702 ac, 21.09% Impervious, Inflow Depth = 0.21" for 2-Year event
Inflow = 0.19 cfs @ 12.37 hrs, Volume= 0.030 af
Outflow = 0.19 cfs @ 12.37 hrs, Volume= 0.030 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Reach 1R: North Discharge



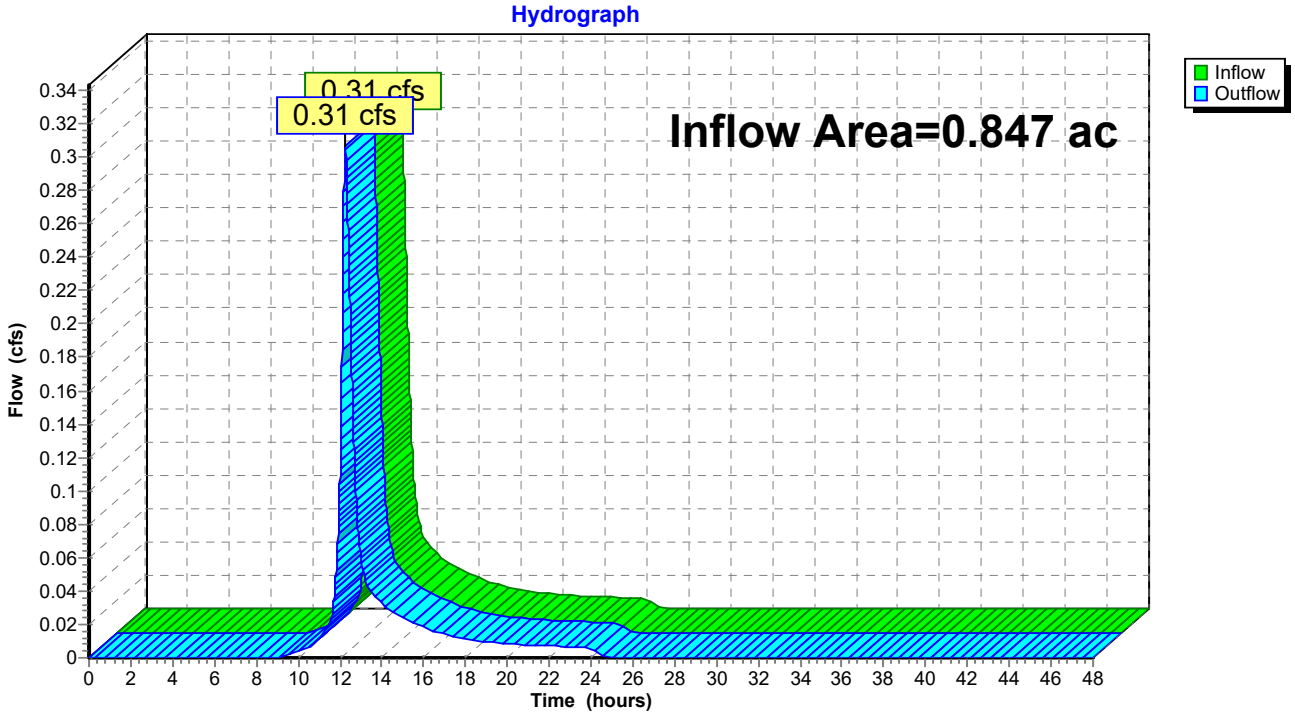
Summary for Reach 2R: South Discharge

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.847 ac, 65.05% Impervious, Inflow Depth = 0.45" for 2-Year event
Inflow = 0.31 cfs @ 12.26 hrs, Volume= 0.032 af
Outflow = 0.31 cfs @ 12.26 hrs, Volume= 0.032 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Reach 2R: South Discharge



Summary for Pond 1P: Stormtech 1

Inflow Area = 0.955 ac, 37.59% Impervious, Inflow Depth = 1.33" for 2-Year event
Inflow = 1.01 cfs @ 12.26 hrs, Volume= 0.106 af
Outflow = 0.15 cfs @ 11.88 hrs, Volume= 0.106 af, Atten= 86%, Lag= 0.0 min
Discarded = 0.15 cfs @ 11.88 hrs, Volume= 0.106 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 7
Peak Elev= 206.55' @ 13.44 hrs Surf.Area= 2,600 sf Storage= 1,693 cf

Plug-Flow detention time= 105.1 min calculated for 0.106 af (100% of inflow)
Center-of-Mass det. time= 105.1 min (966.3 - 861.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	205.50'	2,354 cf	**34.75'W x 74.82'L x 3.50'H Field A** 9,100 cf Overall - 3,216 cf Embedded = 5,884 cf x 40.0% Voids
#2A	206.00'	3,216 cf	**ADS_StormTech SC-740 +Cap** x 70 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 70 Chambers in 7 Rows
		5,569 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	205.50'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	206.60'	**10.0" Round Culvert** L= 125.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 206.60' / 206.00' S= 0.0048 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.55 sf
#3	Device 2	208.00'	**5.0' long Sharp-Crested Rectangular Weir** 0 End Contraction(s)
#4	Device 2	207.50'	**4.0" Vert. Orifice/Grate** C= 0.600
#5	Device 2	206.70'	**4.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.15 cfs @ 11.88 hrs HW=205.54' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.15 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=205.50' (Free Discharge)
└**2=Culvert** (Controls 0.00 cfs)
  ├**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
  ├**4=Orifice/Grate** (Controls 0.00 cfs)
  └**5=Orifice/Grate** (Controls 0.00 cfs)

Pond 1P: Stormtech 1 - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

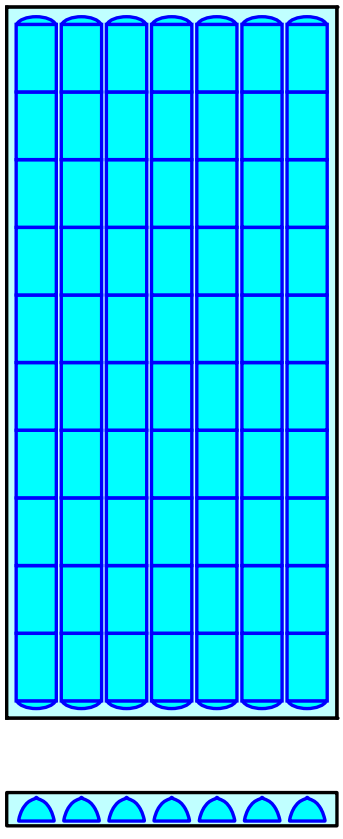
10 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 72.82' Row Length +12.0" End Stone x 2 = 74.82' Base Length
7 Rows x 51.0" Wide + 6.0" Spacing x 6 + 12.0" Side Stone x 2 = 34.75' Base Width
6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

70 Chambers x 45.9 cf = 3,215.8 cf Chamber Storage

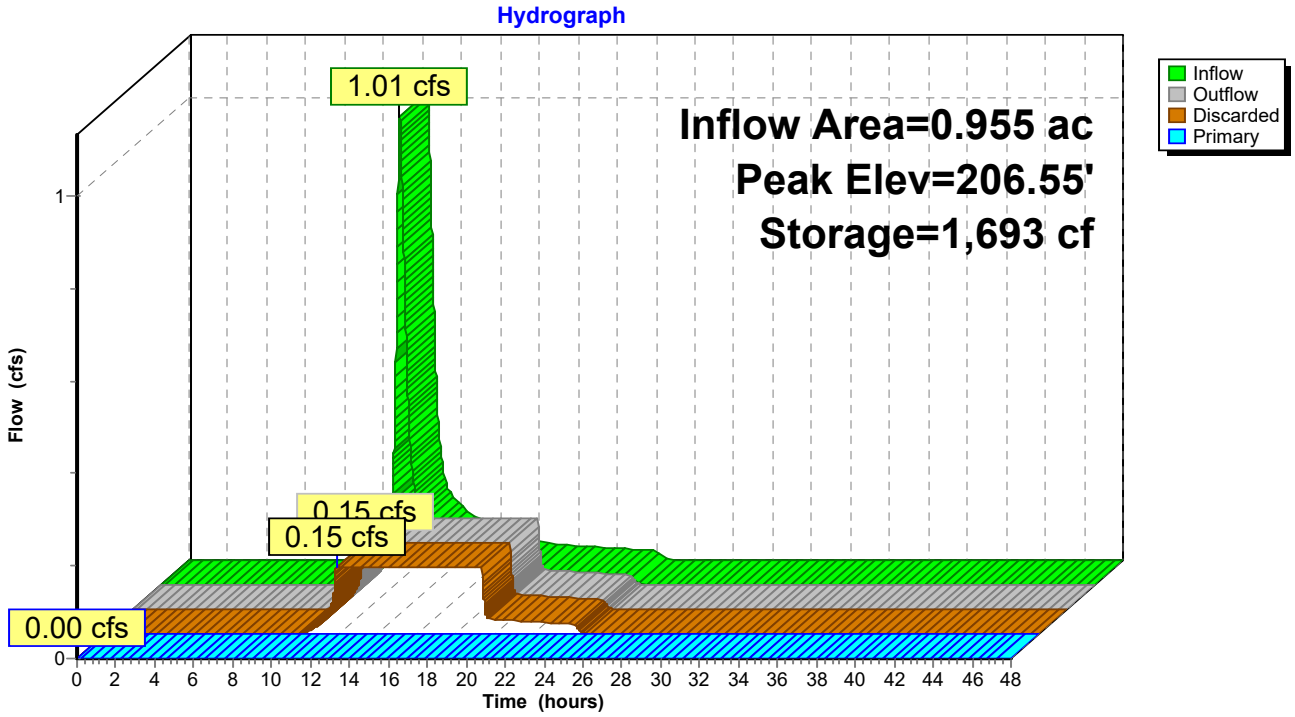
9,099.6 cf Field - 3,215.8 cf Chambers = 5,883.8 cf Stone x 40.0% Voids = 2,353.5 cf Stone Storage

Chamber Storage + Stone Storage = 5,569.3 cf = 0.128 af
Overall Storage Efficiency = 61.2%
Overall System Size = 74.82' x 34.75' x 3.50'

70 Chambers
337.0 cy Field
217.9 cy Stone



Pond 1P: Stormtech 1



Summary for Pond 2P: Stormtech 2

Inflow Area = 0.611 ac, 69.23% Impervious, Inflow Depth = 2.07" for 2-Year event
Inflow = 1.03 cfs @ 12.25 hrs, Volume= 0.105 af
Outflow = 0.06 cfs @ 11.09 hrs, Volume= 0.105 af, Atten= 94%, Lag= 0.0 min
Discarded = 0.06 cfs @ 11.09 hrs, Volume= 0.105 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 7
Peak Elev= 203.79' @ 15.56 hrs Surf.Area= 2,619 sf Storage= 2,441 cf

Plug-Flow detention time= 386.2 min calculated for 0.105 af (99% of inflow)
Center-of-Mass det. time= 382.8 min (1,211.2 - 828.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	202.40'	2,381 cf	**49.00'W x 53.46'L x 3.50'H Field A** 9,168 cf Overall - 3,216 cf Embedded = 5,952 cf x 40.0% Voids
#2A	202.90'	3,216 cf	**ADS_StormTech SC-740 +Cap** x 70 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 70 Chambers in 10 Rows
#3	200.30'	85 cf	**4.00'D x 6.75'H Vertical Cone/Cylinder**-Impervious
		5,681 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	202.40'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	206.80'	**8.0' long Sharp-Crested Rectangular Weir** 1 End Contraction(s)

Discarded OutFlow Max=0.06 cfs @ 11.09 hrs HW=202.40' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=200.30' (Free Discharge)
↑—**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 2P: Stormtech 2 - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

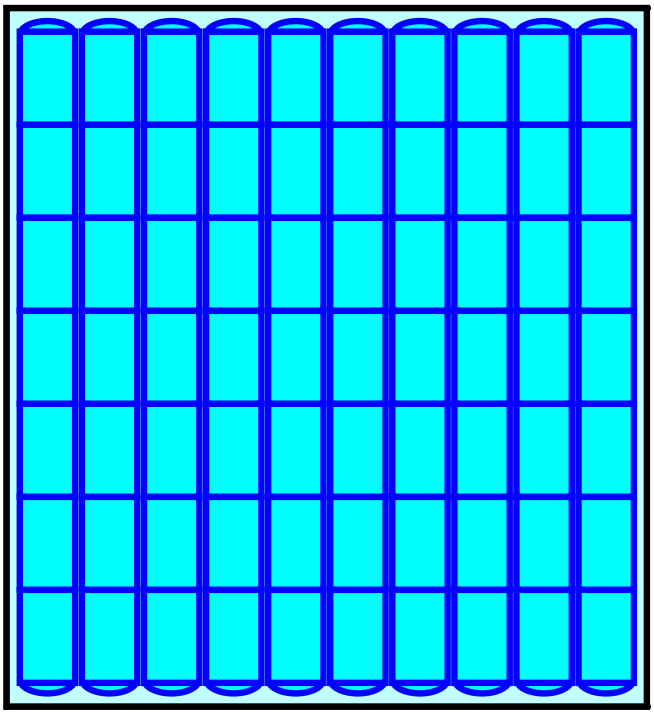
7 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 51.46' Row Length +12.0" End Stone x 2 = 53.46' Base Length
10 Rows x 51.0" Wide + 6.0" Spacing x 9 + 12.0" Side Stone x 2 = 49.00' Base Width
6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

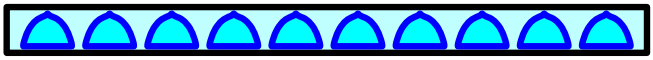
70 Chambers x 45.9 cf = 3,215.8 cf Chamber Storage

9,167.8 cf Field - 3,215.8 cf Chambers = 5,952.0 cf Stone x 40.0% Voids = 2,380.8 cf Stone Storage

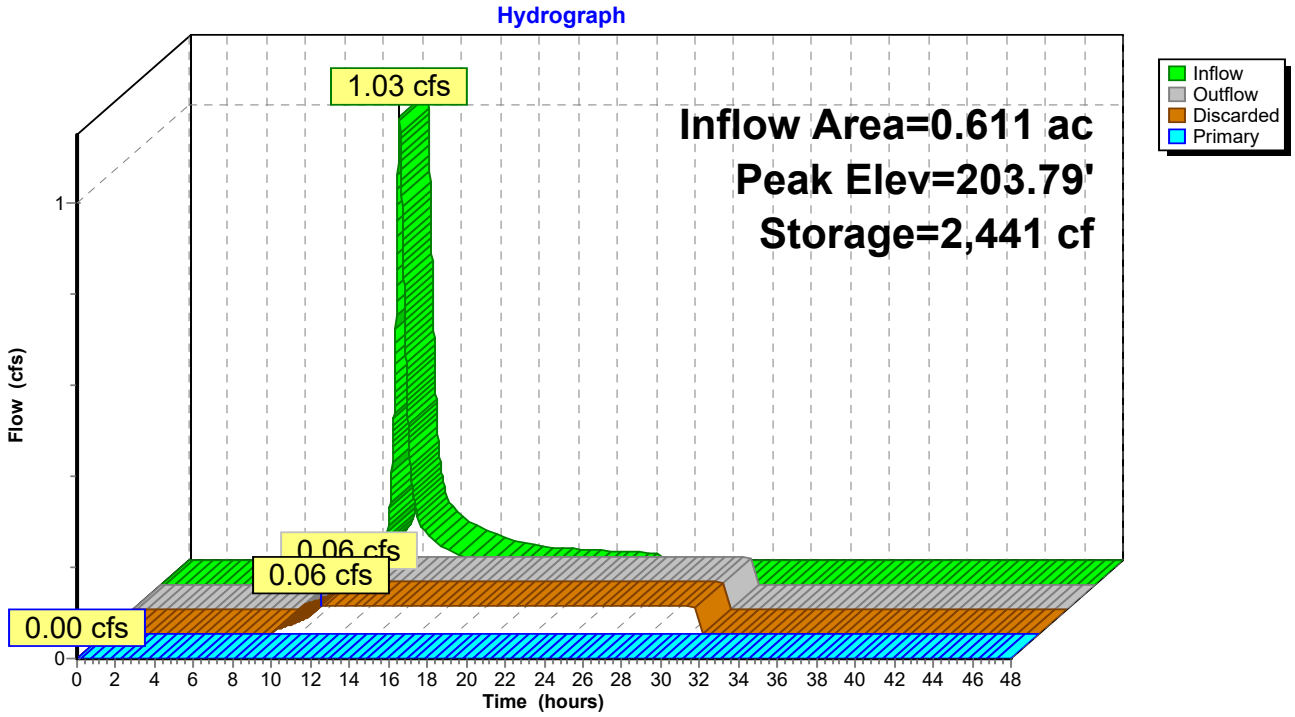
Chamber Storage + Stone Storage = 5,596.6 cf = 0.128 af
Overall Storage Efficiency = 61.0%
Overall System Size = 53.46' x 49.00' x 3.50'

70 Chambers
339.5 cy Field
220.4 cy Stone





Pond 2P: Stormtech 2



Summary for Pond ISO1: Isolator Row 1

[43] Hint: Has no inflow (Outflow=Zero)

Volume	Invert	Avail.Storage	Storage Description
#1A	205.50'	471 cf	**6.25'W x 74.82'L x 3.50'H Field A** 1,637 cf Overall - 459 cf Embedded = 1,177 cf x 40.0% Voids
#2A	206.00'	459 cf	**ADS_StormTech SC-740 +Cap** x 10 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
		930 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Pond ISO1: Isolator Row 1 - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

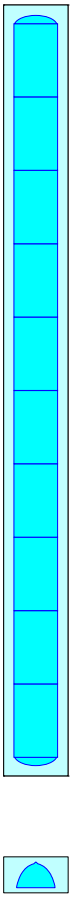
10 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 72.82' Row Length +12.0" End Stone x 2 = 74.82' Base Length
1 Rows x 51.0" Wide + 12.0" Side Stone x 2 = 6.25' Base Width
6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

10 Chambers x 45.9 cf = 459.4 cf Chamber Storage

1,636.6 cf Field - 459.4 cf Chambers = 1,177.2 cf Stone x 40.0% Voids = 470.9 cf Stone Storage

Chamber Storage + Stone Storage = 930.3 cf = 0.021 af
Overall Storage Efficiency = 56.8%
Overall System Size = 74.82' x 6.25' x 3.50'

10 Chambers
60.6 cy Field
43.6 cy Stone



Summary for Pond ISO2: Isolator Row 2

[43] Hint: Has no inflow (Outflow=Zero)

Volume	Invert	Avail.Storage	Storage Description
#1A	202.40'	339 cf	**6.25'W x 53.46'L x 3.50'H Field A** 1,169 cf Overall - 322 cf Embedded = 848 cf x 40.0% Voids
#2A	202.90'	322 cf	**ADS_StormTech SC-740 +Cap** x 7 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
		661 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Pond ISO2: Isolator Row 2 - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

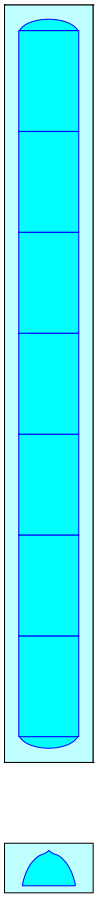
7 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 51.46' Row Length +12.0" End Stone x 2 = 53.46' Base Length
1 Rows x 51.0" Wide + 12.0" Side Stone x 2 = 6.25' Base Width
6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

7 Chambers x 45.9 cf = 321.6 cf Chamber Storage

1,169.4 cf Field - 321.6 cf Chambers = 847.8 cf Stone x 40.0% Voids = 339.1 cf Stone Storage

Chamber Storage + Stone Storage = 660.7 cf = 0.015 af
Overall Storage Efficiency = 56.5%
Overall System Size = 53.46' x 6.25' x 3.50'

7 Chambers
43.3 cy Field
31.4 cy Stone

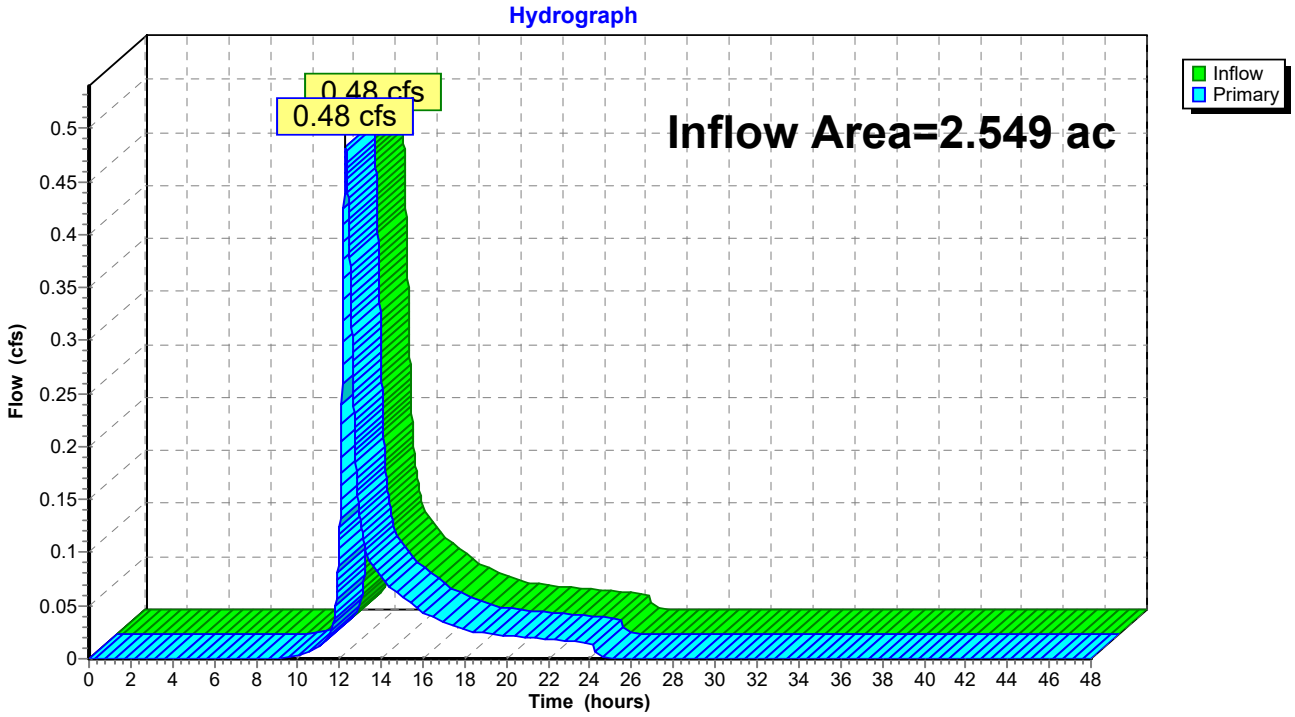


Summary for Link 1L: Winthrop Street

Inflow Area = 2.549 ac, 35.70% Impervious, Inflow Depth = 0.29" for 2-Year event
Inflow = 0.48 cfs @ 12.30 hrs, Volume= 0.061 af
Primary = 0.48 cfs @ 12.30 hrs, Volume= 0.061 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link 1L: Winthrop Street



Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P1a: Untreated North Runoff Area=0.747 ac 0.00% Impervious Runoff Depth=1.46"
Flow Length=334' Tc=18.6 min CN=60 Runoff=0.80 cfs 0.091 af

Subcatchment P1b: North Subcatchment Runoff Area=0.955 ac 37.59% Impervious Runoff Depth=2.85"
Flow Length=334' Tc=18.6 min CN=77 Runoff=2.22 cfs 0.227 af

Subcatchment P1c: Untreated South Runoff Area=0.236 ac 54.24% Impervious Runoff Depth=3.23"
Flow Length=334' Tc=18.6 min CN=81 Runoff=0.62 cfs 0.063 af

Subcatchment P1d: South Subcatchment Runoff Area=0.611 ac 69.23% Impervious Runoff Depth=3.82"
Flow Length=334' Tc=18.6 min CN=87 Runoff=1.87 cfs 0.195 af

Reach 1R: North Discharge Inflow=0.90 cfs 0.158 af
Outflow=0.90 cfs 0.158 af

Reach 2R: South Discharge Inflow=0.62 cfs 0.063 af
Outflow=0.62 cfs 0.063 af

Pond 1P: Stormtech 1 Peak Elev=207.58' Storage=3,710 cf Inflow=2.22 cfs 0.227 af
Discarded=0.15 cfs 0.160 af Primary=0.37 cfs 0.067 af Outflow=0.52 cfs 0.227 af

Pond 2P: Stormtech 2 Peak Elev=205.73' Storage=5,483 cf Inflow=1.87 cfs 0.195 af
Discarded=0.06 cfs 0.194 af Primary=0.00 cfs 0.000 af Outflow=0.06 cfs 0.194 af

Pond ISO1: Isolator Row 1 Peak Elev=0.00' Storage=0 cf

Pond ISO2: Isolator Row 2 Peak Elev=0.00' Storage=0 cf

Link 1L: Winthrop Street Inflow=1.42 cfs 0.221 af
Primary=1.42 cfs 0.221 af

Total Runoff Area = 2.549 ac Runoff Volume = 0.576 af Average Runoff Depth = 2.71"
64.30% Pervious = 1.639 ac 35.70% Impervious = 0.910 ac

Summary for Subcatchment P1a: Untreated North (Existing)

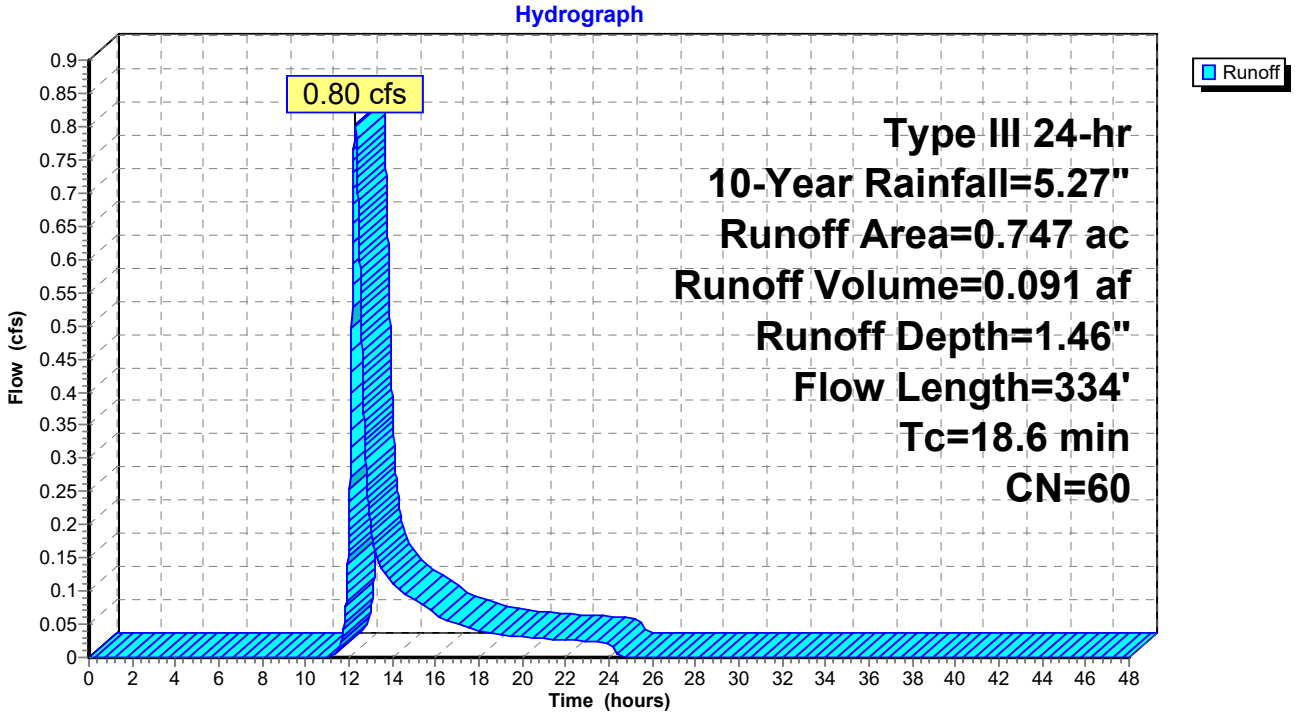
Runoff = 0.80 cfs @ 12.29 hrs, Volume= 0.091 af, Depth= 1.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.27"

Area (ac)	CN	Description
0.563	60	Woods, Fair, HSG B
0.184	61	>75% Grass cover, Good, HSG B
0.747	60	Weighted Average
0.747		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.5	50	0.0400	0.05		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.10"
1.2	142	0.0160	2.04		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.9	142	0.0160	2.57		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
18.6	334	Total			

Subcatchment P1a: Untreated North (Existing)



Summary for Subcatchment P1b: North Subcatchment

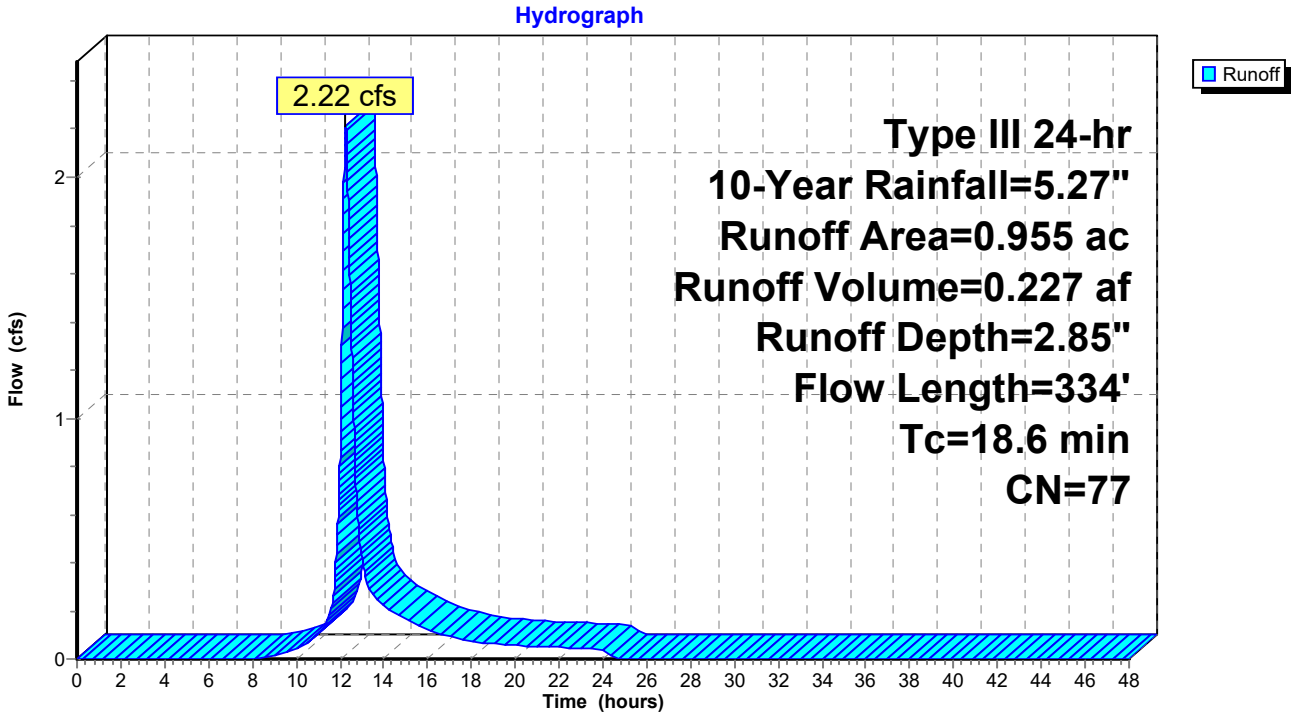
Runoff = 2.22 cfs @ 12.26 hrs, Volume= 0.227 af, Depth= 2.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.27"

Area (ac)	CN	Description
0.000	60	Woods, Fair, HSG B
0.494	61	>75% Grass cover, Good, HSG B
0.359	98	Paved parking, HSG B
0.102	82	Dirt roads, HSG B
0.955	77	Weighted Average
0.596		62.41% Pervious Area
0.359		37.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.5	50	0.0400	0.05		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.10"
1.2	142	0.0160	2.04		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.9	142	0.0160	2.57		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
18.6	334	Total			

Subcatchment P1b: North Subcatchment



Summary for Subcatchment P1c: Untreated South (Existing)

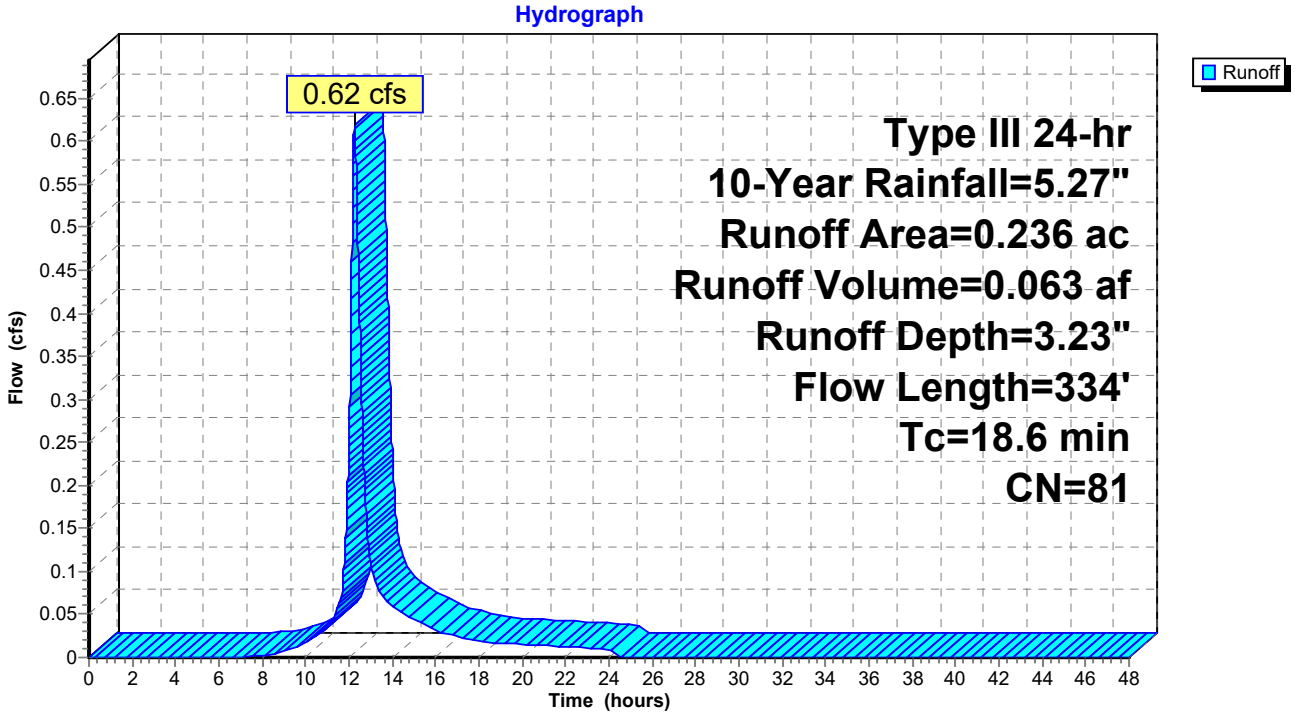
Runoff = 0.62 cfs @ 12.25 hrs, Volume= 0.063 af, Depth= 3.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.27"

Area (ac)	CN	Description
0.035	60	Woods, Fair, HSG B
0.073	61	>75% Grass cover, Good, HSG B
0.128	98	Paved parking, HSG B
0.236	81	Weighted Average
0.108		45.76% Pervious Area
0.128		54.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.5	50	0.0400	0.05		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.10"
1.2	142	0.0160	2.04		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.9	142	0.0160	2.57		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
18.6	334	Total			

Subcatchment P1c: Untreated South (Existing)



Summary for Subcatchment P1d: South Subcatchment

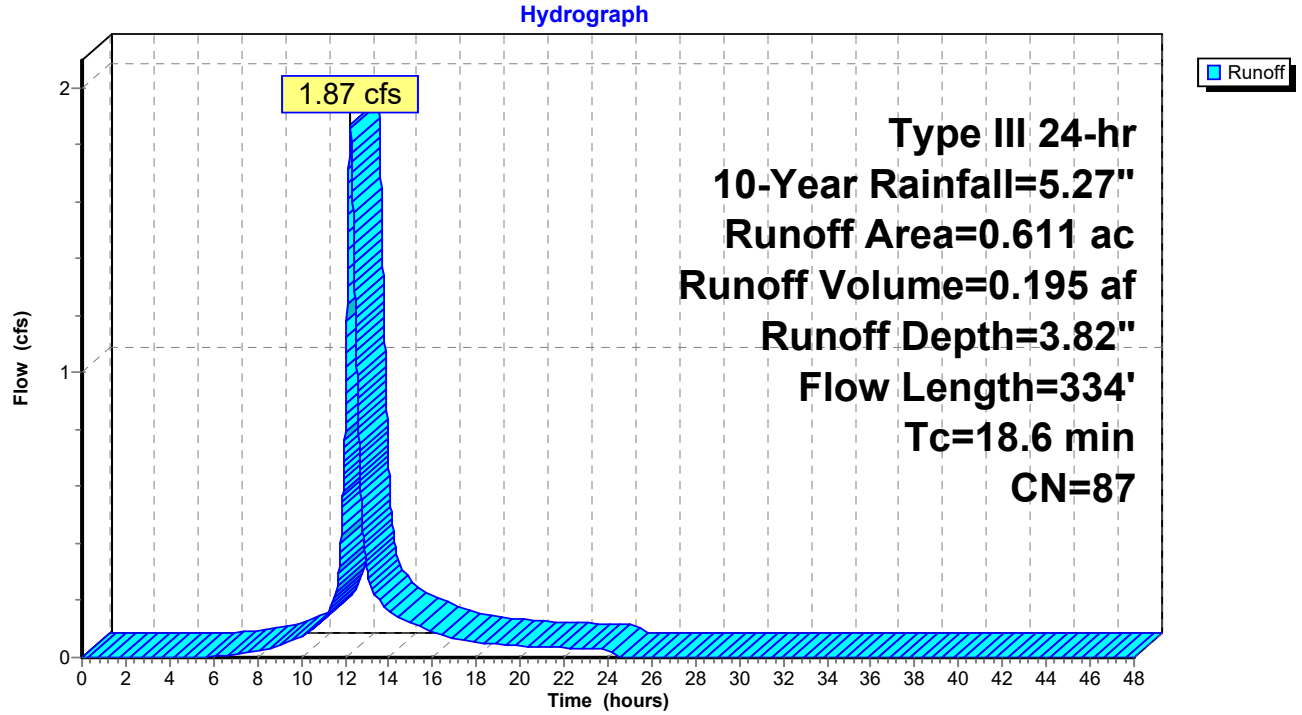
Runoff = 1.87 cfs @ 12.25 hrs, Volume= 0.195 af, Depth= 3.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.27"

Area (ac)	CN	Description
0.023	60	Woods, Fair, HSG B
0.155	61	>75% Grass cover, Good, HSG B
0.423	98	Paved parking, HSG B
0.005	85	Gravel roads, HSG B
0.005	82	Dirt roads, HSG B
0.611	87	Weighted Average
0.188		30.77% Pervious Area
0.423		69.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.5	50	0.0400	0.05		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.10"
1.2	142	0.0160	2.04		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.9	142	0.0160	2.57		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
18.6	334	Total			

Subcatchment P1d: South Subcatchment



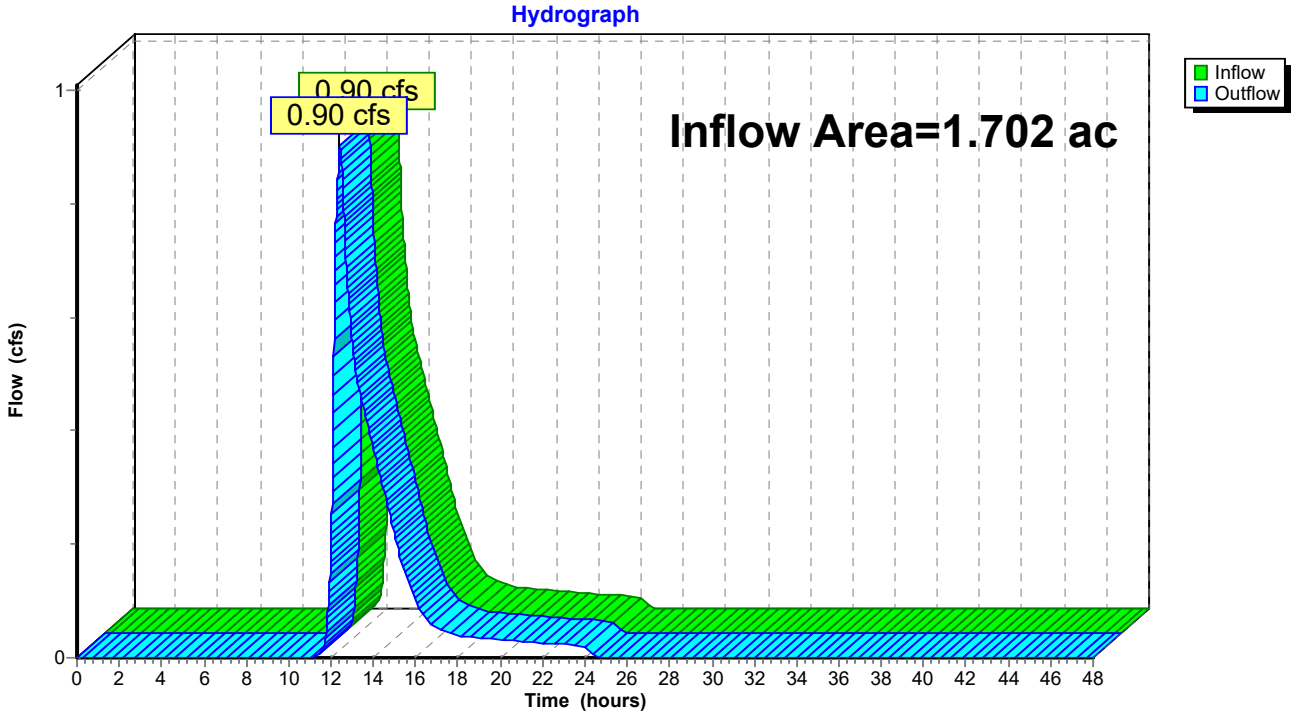
Summary for Reach 1R: North Discharge

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.702 ac, 21.09% Impervious, Inflow Depth = 1.11" for 10-Year event
Inflow = 0.90 cfs @ 12.41 hrs, Volume= 0.158 af
Outflow = 0.90 cfs @ 12.41 hrs, Volume= 0.158 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Reach 1R: North Discharge



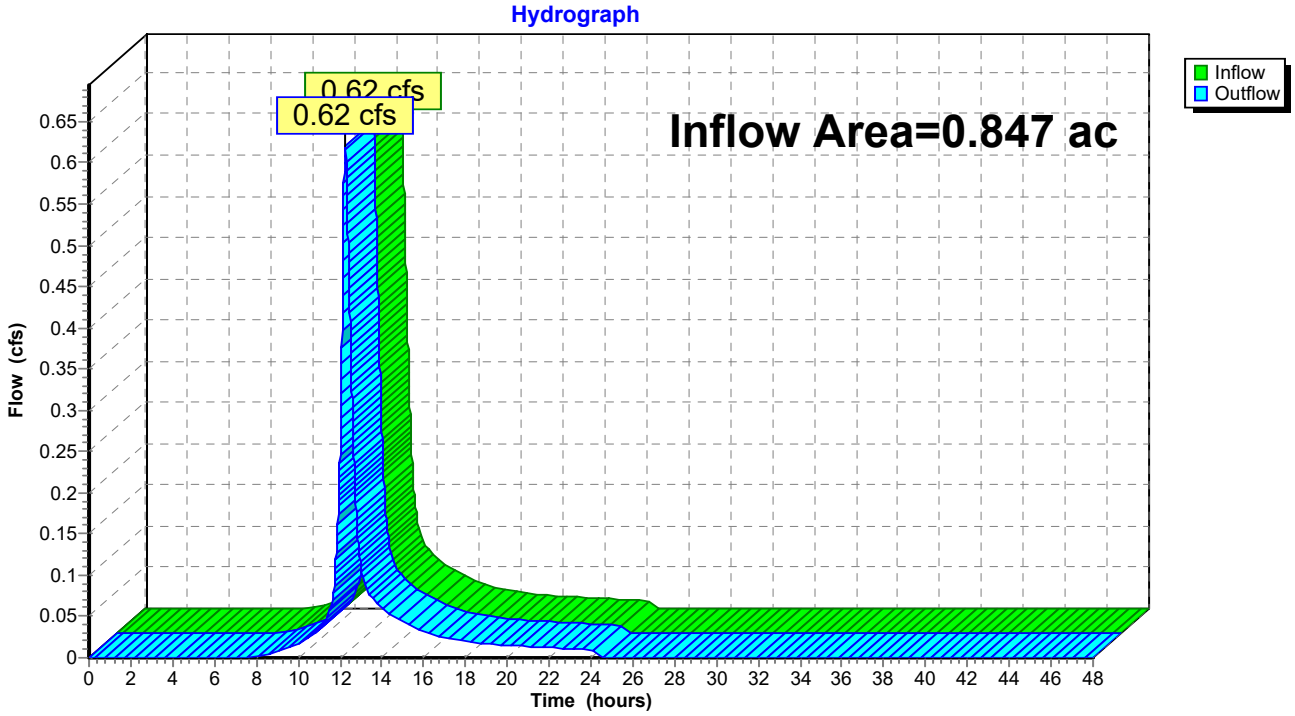
Summary for Reach 2R: South Discharge

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.847 ac, 65.05% Impervious, Inflow Depth = 0.90" for 10-Year event
Inflow = 0.62 cfs @ 12.25 hrs, Volume= 0.063 af
Outflow = 0.62 cfs @ 12.25 hrs, Volume= 0.063 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Reach 2R: South Discharge



Summary for Pond 1P: Stormtech 1

Inflow Area = 0.955 ac, 37.59% Impervious, Inflow Depth = 2.85" for 10-Year event
Inflow = 2.22 cfs @ 12.26 hrs, Volume= 0.227 af
Outflow = 0.52 cfs @ 12.87 hrs, Volume= 0.227 af, Atten= 77%, Lag= 36.6 min
Discarded = 0.15 cfs @ 11.40 hrs, Volume= 0.160 af
Primary = 0.37 cfs @ 12.87 hrs, Volume= 0.067 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 7
Peak Elev= 207.58' @ 12.87 hrs Surf.Area= 2,600 sf Storage= 3,710 cf

Plug-Flow detention time= 126.9 min calculated for 0.227 af (100% of inflow)
Center-of-Mass det. time= 126.9 min (965.9 - 839.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	205.50'	2,354 cf	**34.75'W x 74.82'L x 3.50'H Field A** 9,100 cf Overall - 3,216 cf Embedded = 5,884 cf x 40.0% Voids
#2A	206.00'	3,216 cf	**ADS_StormTech SC-740 +Cap** x 70 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 70 Chambers in 7 Rows
		5,569 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	205.50'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	206.60'	**10.0" Round Culvert** L= 125.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 206.60' / 206.00' S= 0.0048 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.55 sf
#3	Device 2	208.00'	**5.0' long Sharp-Crested Rectangular Weir** 0 End Contraction(s)
#4	Device 2	207.50'	**4.0" Vert. Orifice/Grate** C= 0.600
#5	Device 2	206.70'	**4.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.15 cfs @ 11.40 hrs HW=205.54' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.15 cfs)

Primary OutFlow Max=0.37 cfs @ 12.87 hrs HW=207.58' (Free Discharge)
└**2=Culvert** (Passes 0.37 cfs of 1.59 cfs potential flow)
  ├**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
  ├**4=Orifice/Grate** (Orifice Controls 0.02 cfs @ 0.98 fps)
  └**5=Orifice/Grate** (Orifice Controls 0.36 cfs @ 4.08 fps)

Pond 1P: Stormtech 1 - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

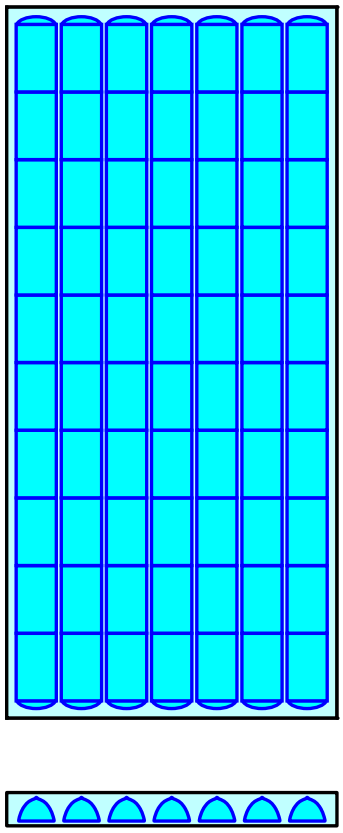
10 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 72.82' Row Length +12.0" End Stone x 2 = 74.82' Base Length
7 Rows x 51.0" Wide + 6.0" Spacing x 6 + 12.0" Side Stone x 2 = 34.75' Base Width
6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

70 Chambers x 45.9 cf = 3,215.8 cf Chamber Storage

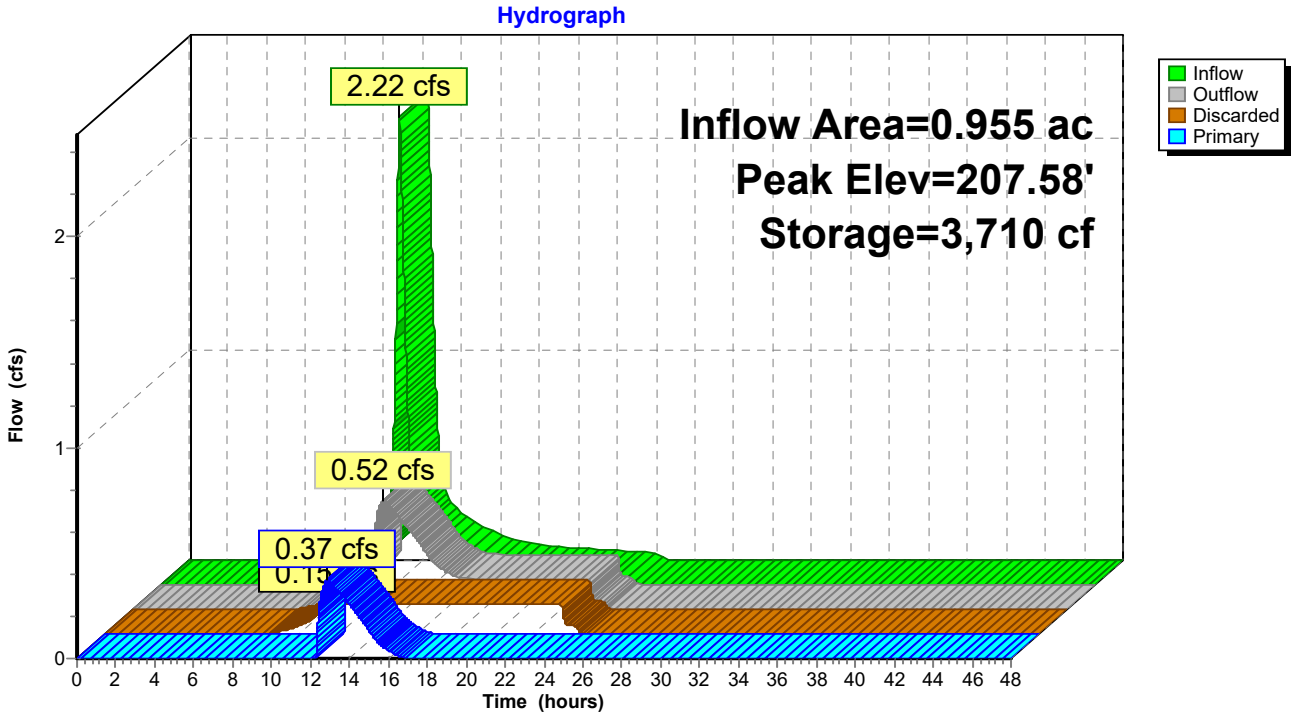
9,099.6 cf Field - 3,215.8 cf Chambers = 5,883.8 cf Stone x 40.0% Voids = 2,353.5 cf Stone Storage

Chamber Storage + Stone Storage = 5,569.3 cf = 0.128 af
Overall Storage Efficiency = 61.2%
Overall System Size = 74.82' x 34.75' x 3.50'

70 Chambers
337.0 cy Field
217.9 cy Stone



Pond 1P: Stormtech 1



Summary for Pond 2P: Stormtech 2

Inflow Area = 0.611 ac, 69.23% Impervious, Inflow Depth = 3.82" for 10-Year event
Inflow = 1.87 cfs @ 12.25 hrs, Volume= 0.195 af
Outflow = 0.06 cfs @ 9.63 hrs, Volume= 0.194 af, Atten= 97%, Lag= 0.0 min
Discarded = 0.06 cfs @ 9.63 hrs, Volume= 0.194 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 7
Peak Elev= 205.73' @ 17.43 hrs Surf.Area= 2,619 sf Storage= 5,483 cf

Plug-Flow detention time= 828.0 min calculated for 0.194 af (100% of inflow)
Center-of-Mass det. time= 826.0 min (1,637.0 - 811.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	202.40'	2,381 cf	**49.00'W x 53.46'L x 3.50'H Field A** 9,168 cf Overall - 3,216 cf Embedded = 5,952 cf x 40.0% Voids
#2A	202.90'	3,216 cf	**ADS_StormTech SC-740 +Cap** x 70 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 70 Chambers in 10 Rows
#3	200.30'	85 cf	**4.00'D x 6.75'H Vertical Cone/Cylinder**-Impervious
		5,681 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	202.40'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	206.80'	**8.0' long Sharp-Crested Rectangular Weir** 1 End Contraction(s)

Discarded OutFlow Max=0.06 cfs @ 9.63 hrs HW=202.40' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=200.30' (Free Discharge)
↑—**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 2P: Stormtech 2 - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

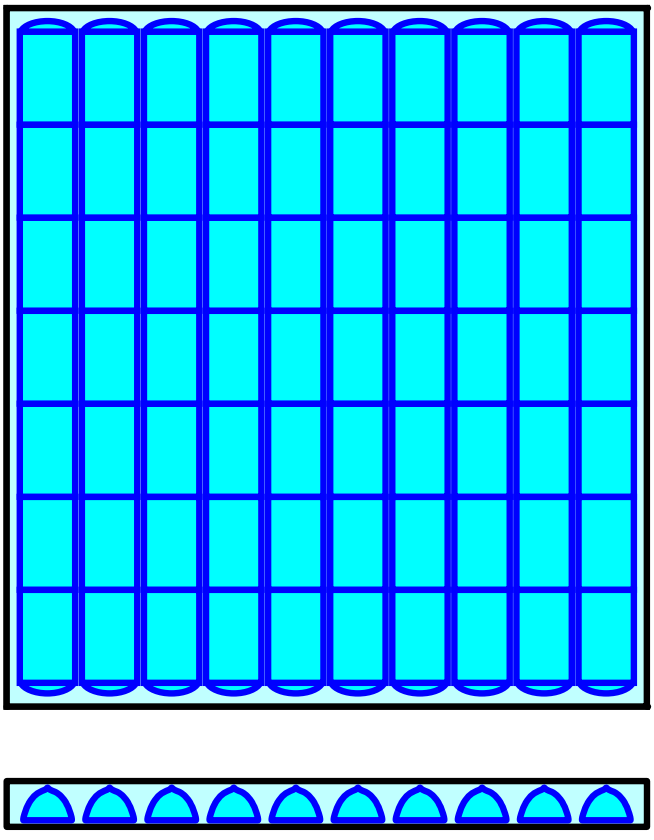
7 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 51.46' Row Length +12.0" End Stone x 2 = 53.46' Base Length
10 Rows x 51.0" Wide + 6.0" Spacing x 9 + 12.0" Side Stone x 2 = 49.00' Base Width
6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

70 Chambers x 45.9 cf = 3,215.8 cf Chamber Storage

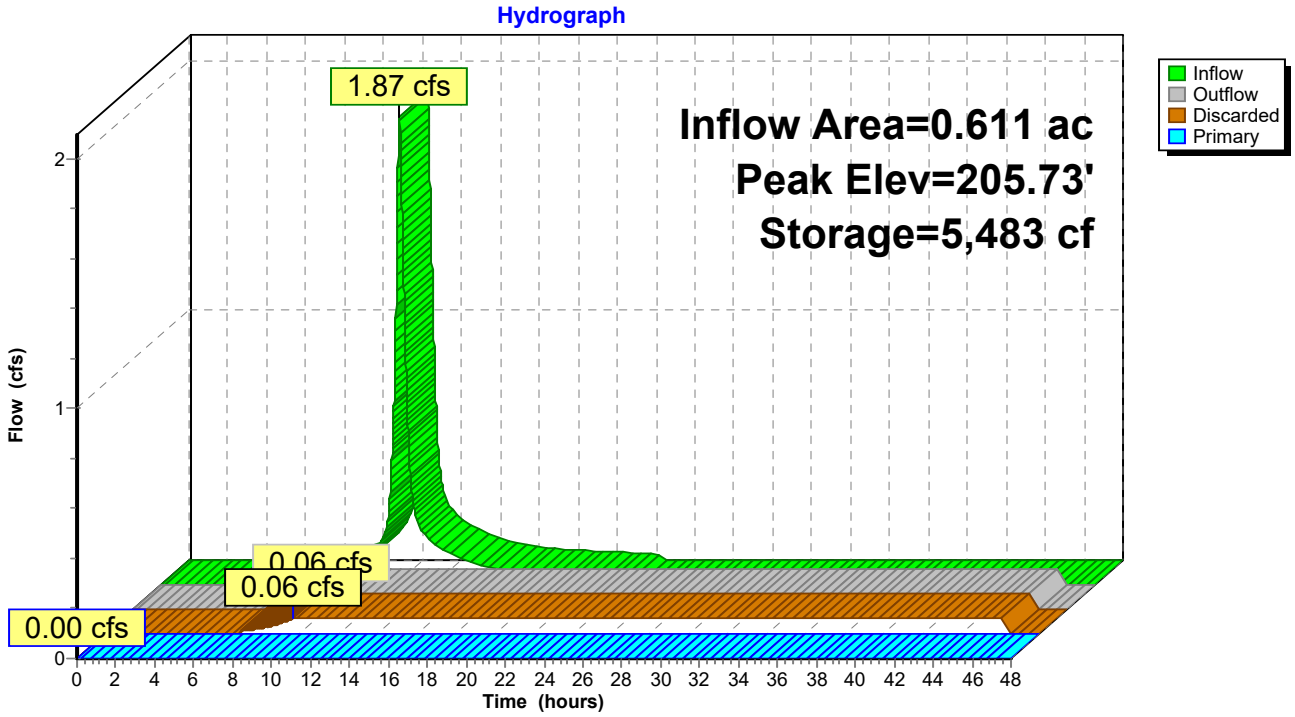
9,167.8 cf Field - 3,215.8 cf Chambers = 5,952.0 cf Stone x 40.0% Voids = 2,380.8 cf Stone Storage

Chamber Storage + Stone Storage = 5,596.6 cf = 0.128 af
Overall Storage Efficiency = 61.0%
Overall System Size = 53.46' x 49.00' x 3.50'

70 Chambers
339.5 cy Field
220.4 cy Stone



Pond 2P: Stormtech 2



Summary for Pond ISO1: Isolator Row 1

[43] Hint: Has no inflow (Outflow=Zero)

Volume	Invert	Avail.Storage	Storage Description
#1A	205.50'	471 cf	**6.25'W x 74.82'L x 3.50'H Field A** 1,637 cf Overall - 459 cf Embedded = 1,177 cf x 40.0% Voids
#2A	206.00'	459 cf	**ADS_StormTech SC-740 +Cap** x 10 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
		930 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Pond ISO1: Isolator Row 1 - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

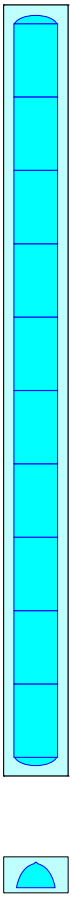
10 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 72.82' Row Length +12.0" End Stone x 2 = 74.82' Base Length
1 Rows x 51.0" Wide + 12.0" Side Stone x 2 = 6.25' Base Width
6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

10 Chambers x 45.9 cf = 459.4 cf Chamber Storage

1,636.6 cf Field - 459.4 cf Chambers = 1,177.2 cf Stone x 40.0% Voids = 470.9 cf Stone Storage

Chamber Storage + Stone Storage = 930.3 cf = 0.021 af
Overall Storage Efficiency = 56.8%
Overall System Size = 74.82' x 6.25' x 3.50'

10 Chambers
60.6 cy Field
43.6 cy Stone



Summary for Pond ISO2: Isolator Row 2

[43] Hint: Has no inflow (Outflow=Zero)

Volume	Invert	Avail.Storage	Storage Description
#1A	202.40'	339 cf	**6.25'W x 53.46'L x 3.50'H Field A** 1,169 cf Overall - 322 cf Embedded = 848 cf x 40.0% Voids
#2A	202.90'	322 cf	**ADS_StormTech SC-740 +Cap** x 7 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
		661 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Pond ISO2: Isolator Row 2 - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

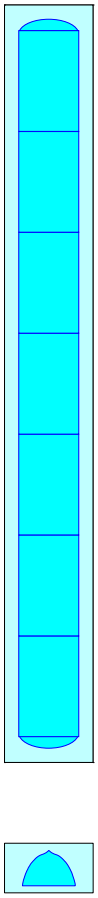
7 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 51.46' Row Length +12.0" End Stone x 2 = 53.46' Base Length
1 Rows x 51.0" Wide + 12.0" Side Stone x 2 = 6.25' Base Width
6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

7 Chambers x 45.9 cf = 321.6 cf Chamber Storage

1,169.4 cf Field - 321.6 cf Chambers = 847.8 cf Stone x 40.0% Voids = 339.1 cf Stone Storage

Chamber Storage + Stone Storage = 660.7 cf = 0.015 af
Overall Storage Efficiency = 56.5%
Overall System Size = 53.46' x 6.25' x 3.50'

7 Chambers
43.3 cy Field
31.4 cy Stone

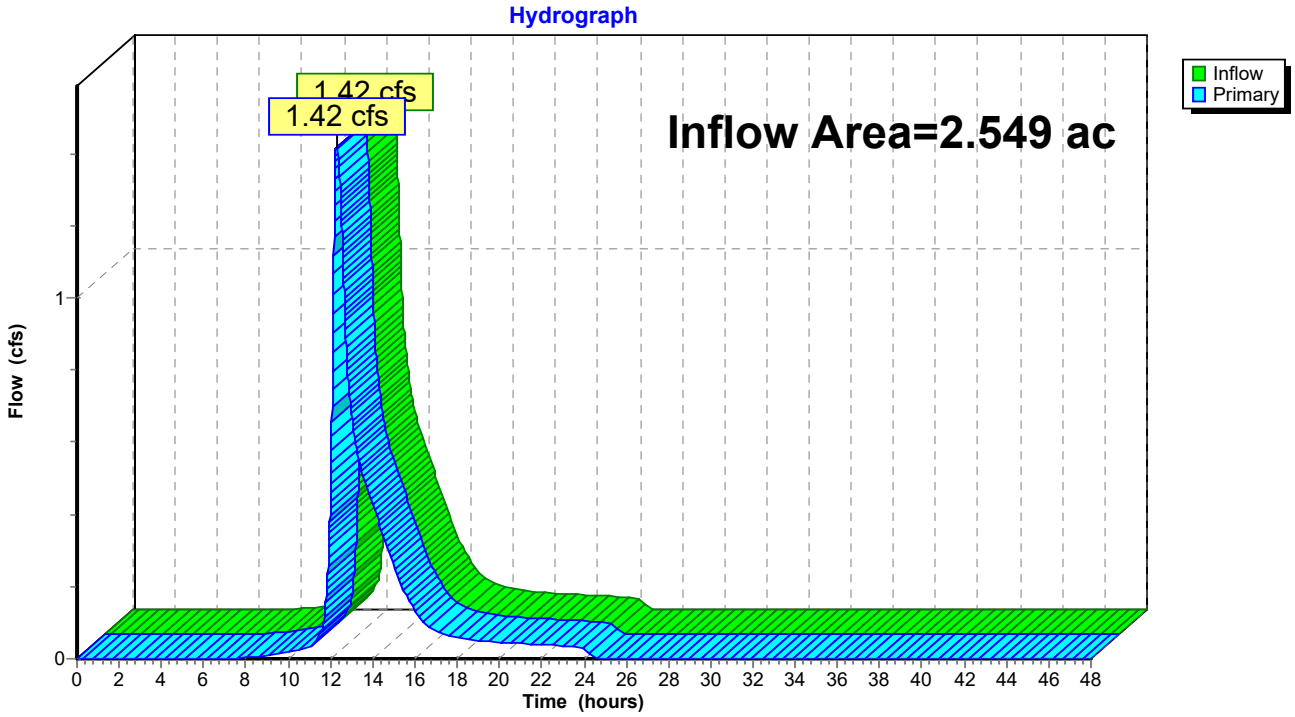


Summary for Link 1L: Winthrop Street

Inflow Area = 2.549 ac, 35.70% Impervious, Inflow Depth = 1.04" for 10-Year event
Inflow = 1.42 cfs @ 12.27 hrs, Volume= 0.221 af
Primary = 1.42 cfs @ 12.27 hrs, Volume= 0.221 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link 1L: Winthrop Street



Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P1a: Untreated North Runoff Area=0.747 ac 0.00% Impervious Runoff Depth=3.54"
Flow Length=334' Tc=18.6 min CN=60 Runoff=2.12 cfs 0.221 af

Subcatchment P1b: North Subcatchment Runoff Area=0.955 ac 37.59% Impervious Runoff Depth=5.53"
Flow Length=334' Tc=18.6 min CN=77 Runoff=4.28 cfs 0.440 af

Subcatchment P1c: Untreated South Runoff Area=0.236 ac 54.24% Impervious Runoff Depth=6.01"
Flow Length=334' Tc=18.6 min CN=81 Runoff=1.14 cfs 0.118 af

Subcatchment P1d: South Subcatchment Runoff Area=0.611 ac 69.23% Impervious Runoff Depth=6.72"
Flow Length=334' Tc=18.6 min CN=87 Runoff=3.21 cfs 0.342 af

Reach 1R: North Discharge Inflow=4.16 cfs 0.454 af
Outflow=4.16 cfs 0.454 af

Reach 2R: South Discharge Inflow=3.96 cfs 0.242 af
Outflow=3.96 cfs 0.242 af

Pond 1P: Stormtech 1 Peak Elev=208.90' Storage=5,462 cf Inflow=4.28 cfs 0.440 af
Discarded=0.15 cfs 0.207 af Primary=2.43 cfs 0.234 af Outflow=2.57 cfs 0.440 af

Pond 2P: Stormtech 2 Peak Elev=207.02' Storage=5,681 cf Inflow=3.21 cfs 0.342 af
Discarded=0.06 cfs 0.212 af Primary=3.00 cfs 0.124 af Outflow=3.06 cfs 0.336 af

Pond ISO1: Isolator Row 1 Peak Elev=0.00' Storage=0 cf

Pond ISO2: Isolator Row 2 Peak Elev=0.00' Storage=0 cf

Link 1L: Winthrop Street Inflow=8.10 cfs 0.696 af
Primary=8.10 cfs 0.696 af

Total Runoff Area = 2.549 ac Runoff Volume = 1.121 af Average Runoff Depth = 5.28"
64.30% Pervious = 1.639 ac 35.70% Impervious = 0.910 ac

Summary for Subcatchment P1a: Untreated North (Existing)

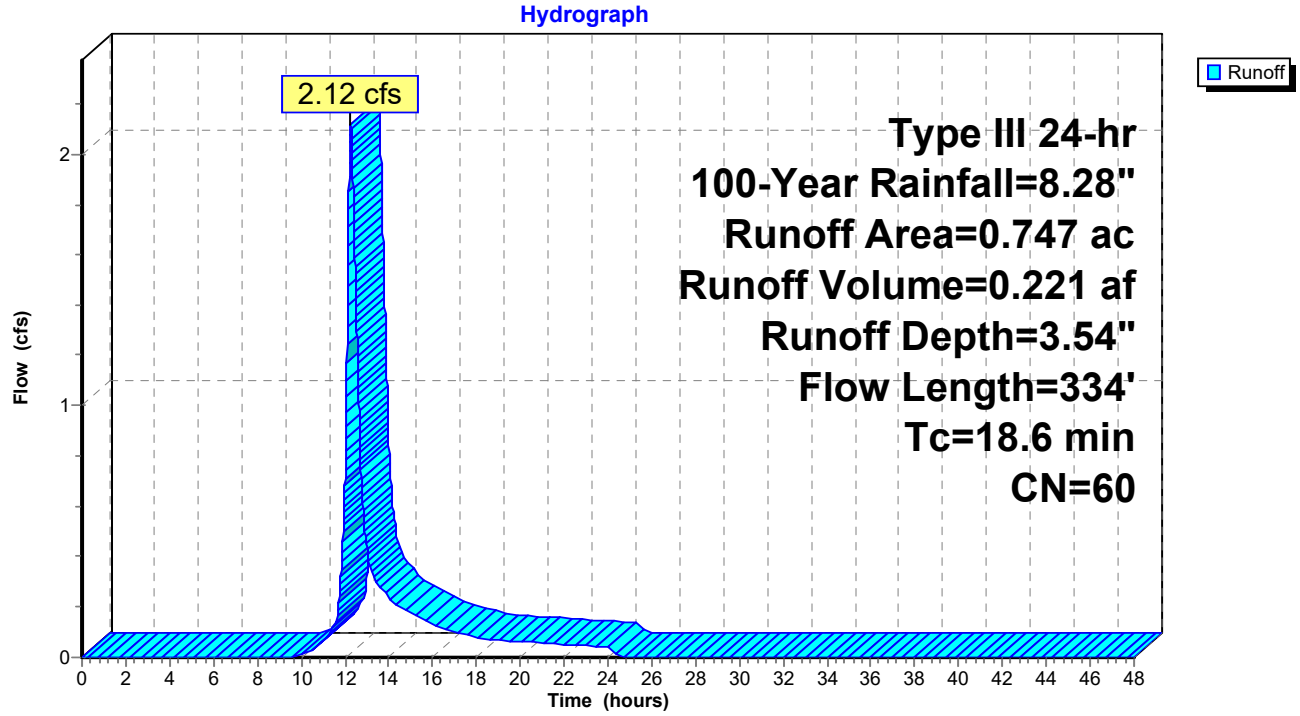
Runoff = 2.12 cfs @ 12.26 hrs, Volume= 0.221 af, Depth= 3.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.28"

Area (ac)	CN	Description
0.563	60	Woods, Fair, HSG B
0.184	61	>75% Grass cover, Good, HSG B
0.747	60	Weighted Average
0.747		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.5	50	0.0400	0.05		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.10"
1.2	142	0.0160	2.04		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.9	142	0.0160	2.57		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
18.6	334	Total			

Subcatchment P1a: Untreated North (Existing)



Summary for Subcatchment P1b: North Subcatchment

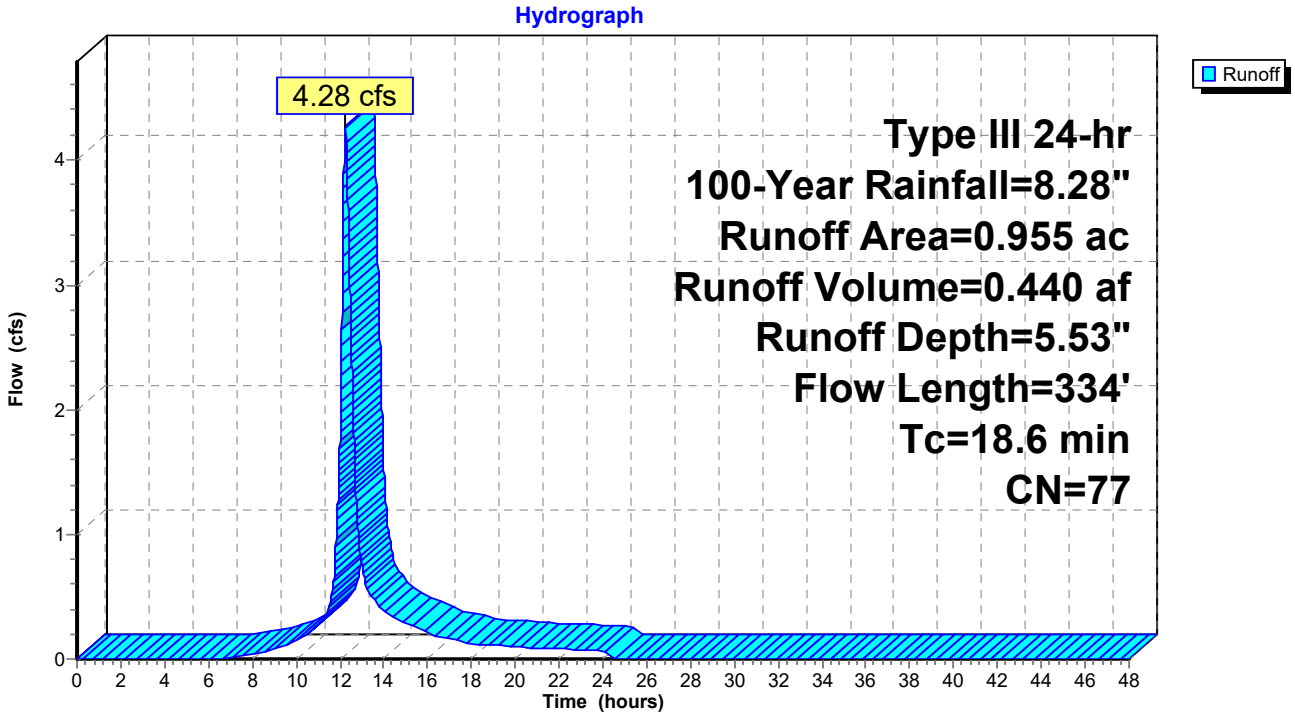
Runoff = 4.28 cfs @ 12.25 hrs, Volume= 0.440 af, Depth= 5.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.28"

Area (ac)	CN	Description
0.000	60	Woods, Fair, HSG B
0.494	61	>75% Grass cover, Good, HSG B
0.359	98	Paved parking, HSG B
0.102	82	Dirt roads, HSG B
0.955	77	Weighted Average
0.596		62.41% Pervious Area
0.359		37.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.5	50	0.0400	0.05		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.10"
1.2	142	0.0160	2.04		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.9	142	0.0160	2.57		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
18.6	334	Total			

Subcatchment P1b: North Subcatchment



Summary for Subcatchment P1c: Untreated South (Existing)

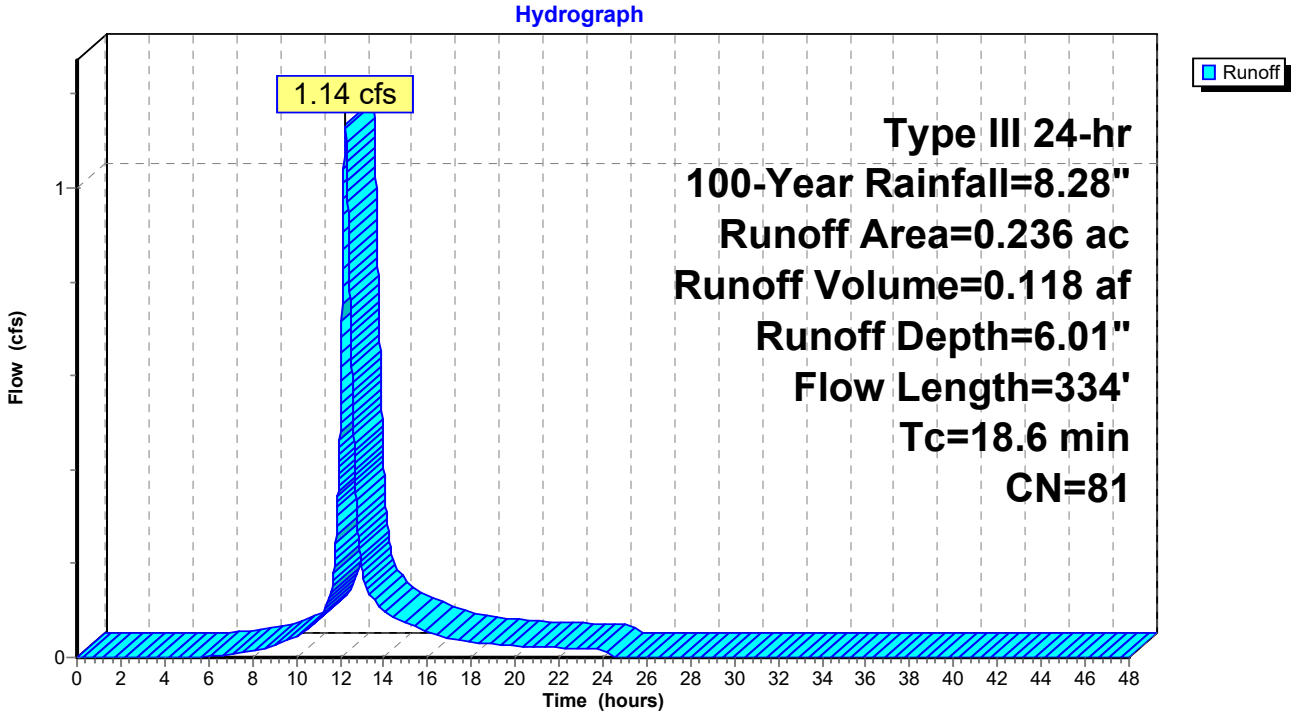
Runoff = 1.14 cfs @ 12.25 hrs, Volume= 0.118 af, Depth= 6.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.28"

Area (ac)	CN	Description
0.035	60	Woods, Fair, HSG B
0.073	61	>75% Grass cover, Good, HSG B
0.128	98	Paved parking, HSG B
0.236	81	Weighted Average
0.108		45.76% Pervious Area
0.128		54.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.5	50	0.0400	0.05		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.10"
1.2	142	0.0160	2.04		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.9	142	0.0160	2.57		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
18.6	334	Total			

Subcatchment P1c: Untreated South (Existing)



Summary for Subcatchment P1d: South Subcatchment

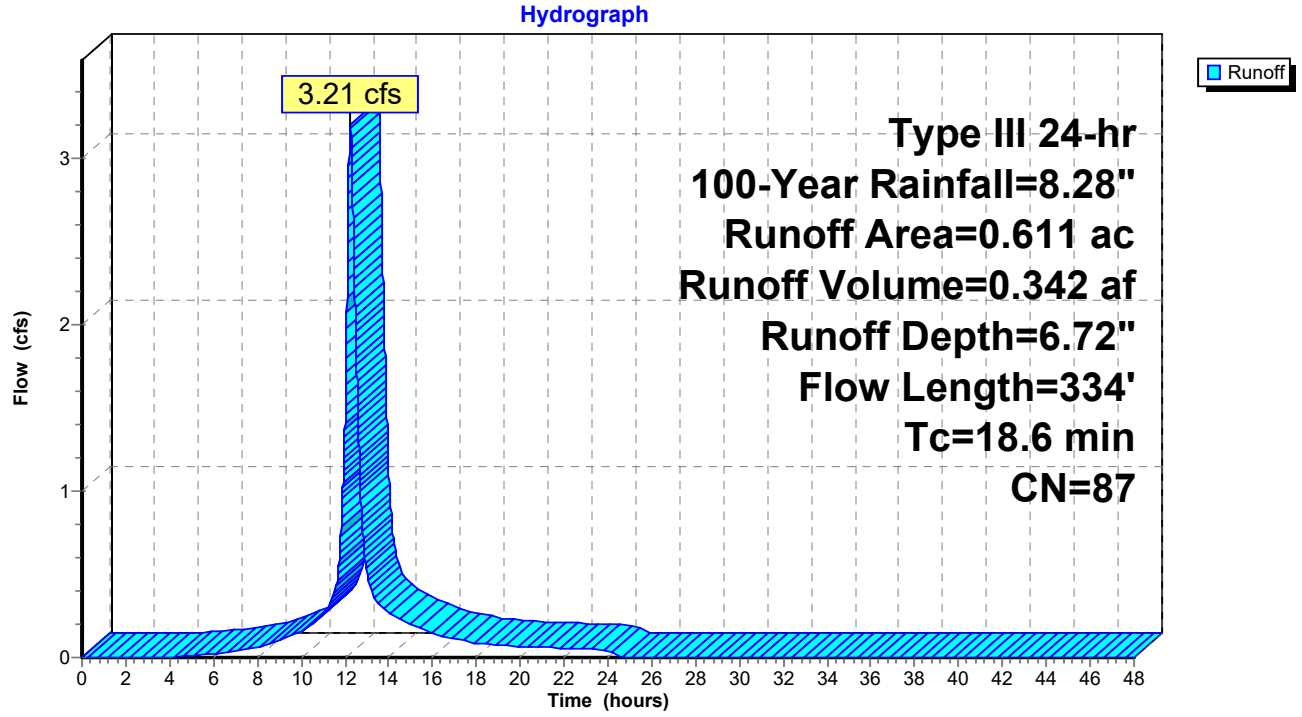
Runoff = 3.21 cfs @ 12.25 hrs, Volume= 0.342 af, Depth= 6.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.28"

Area (ac)	CN	Description
0.023	60	Woods, Fair, HSG B
0.155	61	>75% Grass cover, Good, HSG B
0.423	98	Paved parking, HSG B
0.005	85	Gravel roads, HSG B
0.005	82	Dirt roads, HSG B
0.611	87	Weighted Average
0.188		30.77% Pervious Area
0.423		69.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.5	50	0.0400	0.05		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.10"
1.2	142	0.0160	2.04		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.9	142	0.0160	2.57		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
18.6	334	Total			

Subcatchment P1d: South Subcatchment



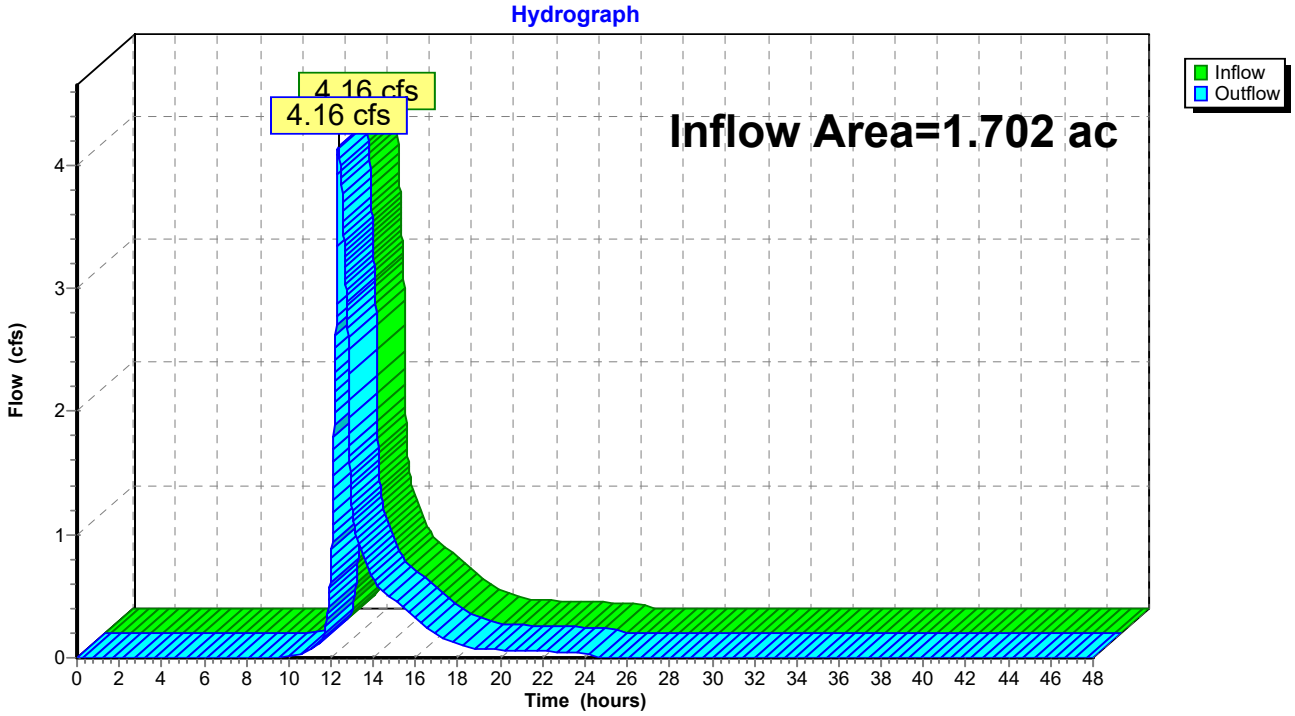
Summary for Reach 1R: North Discharge

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.702 ac, 21.09% Impervious, Inflow Depth = 3.20" for 100-Year event
Inflow = 4.16 cfs @ 12.34 hrs, Volume= 0.454 af
Outflow = 4.16 cfs @ 12.34 hrs, Volume= 0.454 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Reach 1R: North Discharge



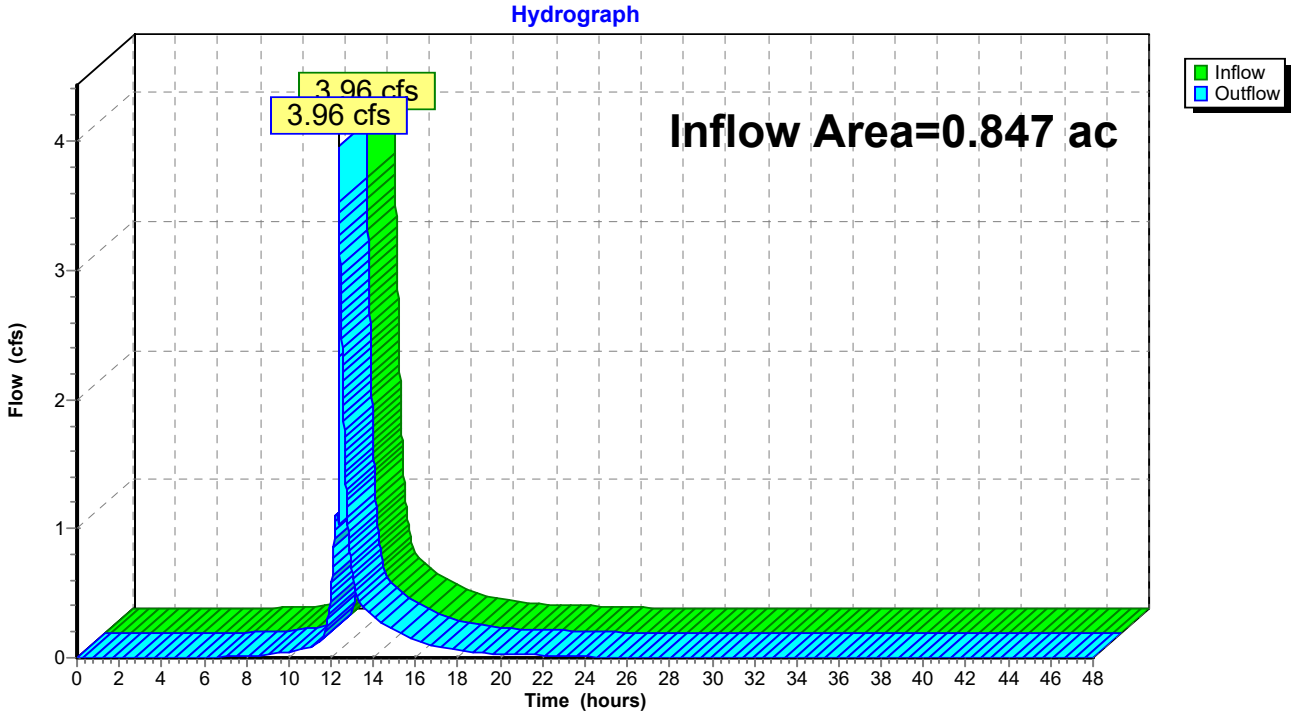
Summary for Reach 2R: South Discharge

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.847 ac, 65.05% Impervious, Inflow Depth = 3.43" for 100-Year event
Inflow = 3.96 cfs @ 12.36 hrs, Volume= 0.242 af
Outflow = 3.96 cfs @ 12.36 hrs, Volume= 0.242 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Reach 2R: South Discharge



Summary for Pond 1P: Stormtech 1

Inflow Area = 0.955 ac, 37.59% Impervious, Inflow Depth = 5.53" for 100-Year event
Inflow = 4.28 cfs @ 12.25 hrs, Volume= 0.440 af
Outflow = 2.57 cfs @ 12.51 hrs, Volume= 0.440 af, Atten= 40%, Lag= 15.4 min
Discarded = 0.15 cfs @ 10.08 hrs, Volume= 0.207 af
Primary = 2.43 cfs @ 12.51 hrs, Volume= 0.234 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 7
Peak Elev= 208.90' @ 12.51 hrs Surf.Area= 2,600 sf Storage= 5,462 cf

Plug-Flow detention time= 100.0 min calculated for 0.440 af (100% of inflow)
Center-of-Mass det. time= 100.0 min (920.1 - 820.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	205.50'	2,354 cf	**34.75'W x 74.82'L x 3.50'H Field A** 9,100 cf Overall - 3,216 cf Embedded = 5,884 cf x 40.0% Voids
#2A	206.00'	3,216 cf	**ADS_StormTech SC-740 +Cap** x 70 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 70 Chambers in 7 Rows
		5,569 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	205.50'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	206.60'	**10.0" Round Culvert** L= 125.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 206.60' / 206.00' S= 0.0048 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.55 sf
#3	Device 2	208.00'	**5.0' long Sharp-Crested Rectangular Weir** 0 End Contraction(s)
#4	Device 2	207.50'	**4.0" Vert. Orifice/Grate** C= 0.600
#5	Device 2	206.70'	**4.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.15 cfs @ 10.08 hrs HW=205.54' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.15 cfs)

Primary OutFlow Max=2.43 cfs @ 12.51 hrs HW=208.90' (Free Discharge)
└**2=Culvert** (Barrel Controls 2.43 cfs @ 4.45 fps)
  ├**3=Sharp-Crested Rectangular Weir** (Passes < 13.88 cfs potential flow)
  ├**4=Orifice/Grate** (Passes < 0.47 cfs potential flow)
  └**5=Orifice/Grate** (Passes < 0.60 cfs potential flow)

Pond 1P: Stormtech 1 - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

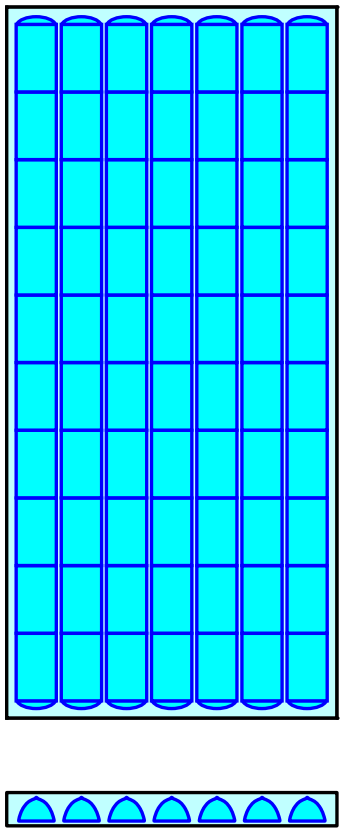
10 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 72.82' Row Length +12.0" End Stone x 2 = 74.82' Base Length
7 Rows x 51.0" Wide + 6.0" Spacing x 6 + 12.0" Side Stone x 2 = 34.75' Base Width
6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

70 Chambers x 45.9 cf = 3,215.8 cf Chamber Storage

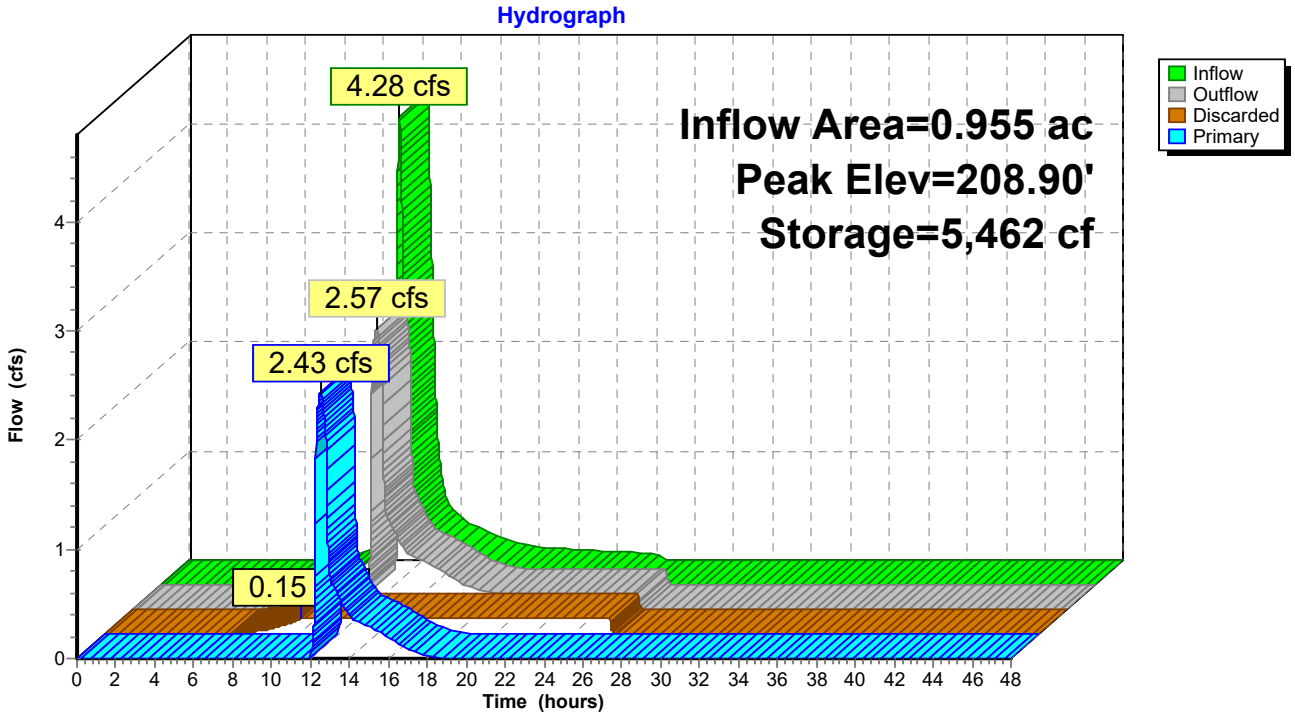
9,099.6 cf Field - 3,215.8 cf Chambers = 5,883.8 cf Stone x 40.0% Voids = 2,353.5 cf Stone Storage

Chamber Storage + Stone Storage = 5,569.3 cf = 0.128 af
Overall Storage Efficiency = 61.2%
Overall System Size = 74.82' x 34.75' x 3.50'

70 Chambers
337.0 cy Field
217.9 cy Stone



Pond 1P: Stormtech 1



Summary for Pond 2P: Stormtech 2

Inflow Area = 0.611 ac, 69.23% Impervious, Inflow Depth = 6.72" for 100-Year event
Inflow = 3.21 cfs @ 12.25 hrs, Volume= 0.342 af
Outflow = 3.06 cfs @ 12.36 hrs, Volume= 0.336 af, Atten= 5%, Lag= 7.0 min
Discarded = 0.06 cfs @ 8.05 hrs, Volume= 0.212 af
Primary = 3.00 cfs @ 12.36 hrs, Volume= 0.124 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 7
Peak Elev= 207.02' @ 12.36 hrs Surf.Area= 2,619 sf Storage= 5,681 cf

Plug-Flow detention time= 547.7 min calculated for 0.336 af (98% of inflow)
Center-of-Mass det. time= 536.3 min (1,331.9 - 795.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	202.40'	2,381 cf	**49.00'W x 53.46'L x 3.50'H Field A** 9,168 cf Overall - 3,216 cf Embedded = 5,952 cf x 40.0% Voids
#2A	202.90'	3,216 cf	**ADS_StormTech SC-740 +Cap** x 70 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 70 Chambers in 10 Rows
#3	200.30'	85 cf	**4.00'D x 6.75'H Vertical Cone/Cylinder**-Impervious
		5,681 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	202.40'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	206.80'	**8.0' long Sharp-Crested Rectangular Weir** 1 End Contraction(s)

Discarded OutFlow Max=0.06 cfs @ 8.05 hrs HW=202.40' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=2.63 cfs @ 12.36 hrs HW=207.02' (Free Discharge)
↑—**2=Sharp-Crested Rectangular Weir** (Weir Controls 2.63 cfs @ 1.52 fps)

Pond 2P: Stormtech 2 - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

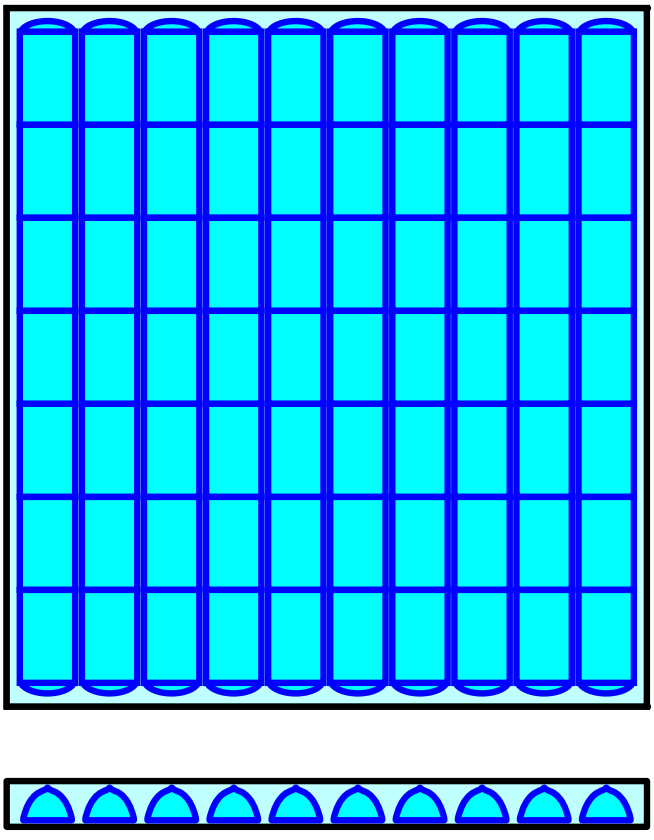
7 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 51.46' Row Length +12.0" End Stone x 2 = 53.46' Base Length
10 Rows x 51.0" Wide + 6.0" Spacing x 9 + 12.0" Side Stone x 2 = 49.00' Base Width
6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

70 Chambers x 45.9 cf = 3,215.8 cf Chamber Storage

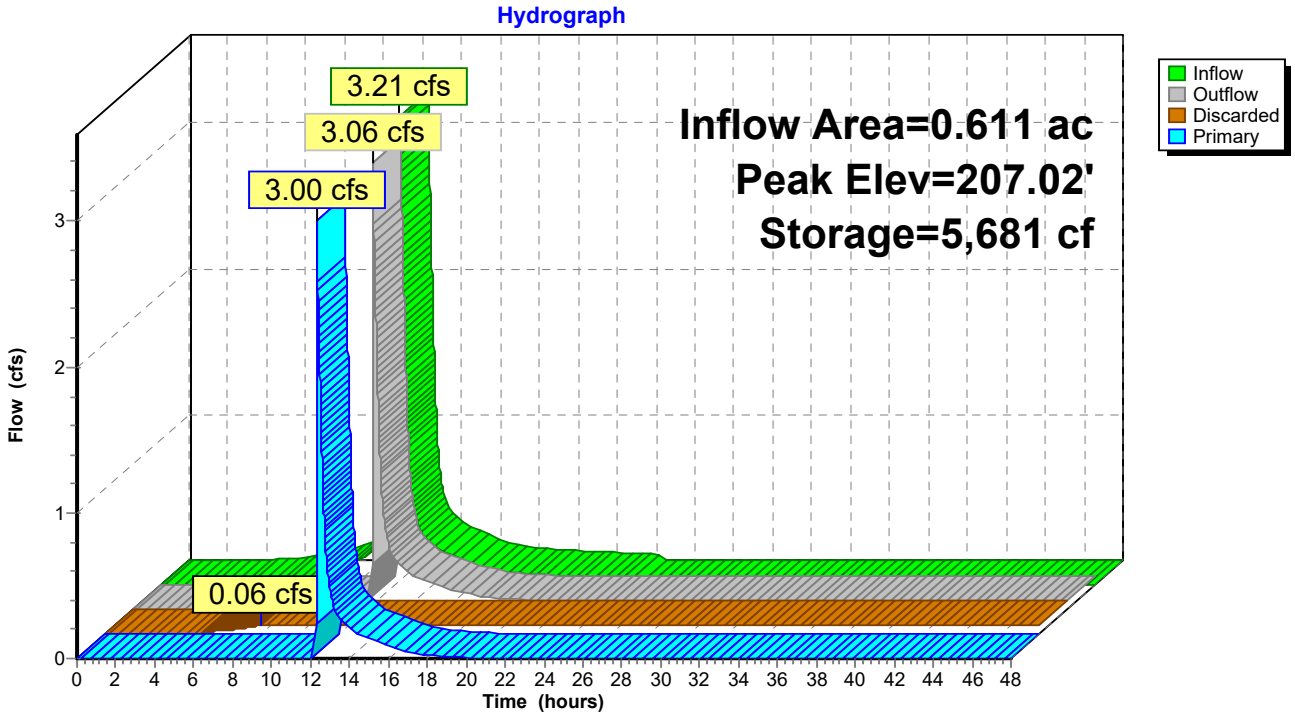
9,167.8 cf Field - 3,215.8 cf Chambers = 5,952.0 cf Stone x 40.0% Voids = 2,380.8 cf Stone Storage

Chamber Storage + Stone Storage = 5,596.6 cf = 0.128 af
Overall Storage Efficiency = 61.0%
Overall System Size = 53.46' x 49.00' x 3.50'

70 Chambers
339.5 cy Field
220.4 cy Stone



Pond 2P: Stormtech 2



Summary for Pond ISO1: Isolator Row 1

[43] Hint: Has no inflow (Outflow=Zero)

Volume	Invert	Avail.Storage	Storage Description
#1A	205.50'	471 cf	**6.25'W x 74.82'L x 3.50'H Field A** 1,637 cf Overall - 459 cf Embedded = 1,177 cf x 40.0% Voids
#2A	206.00'	459 cf	**ADS_StormTech SC-740 +Cap** x 10 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
		930 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Pond ISO1: Isolator Row 1 - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

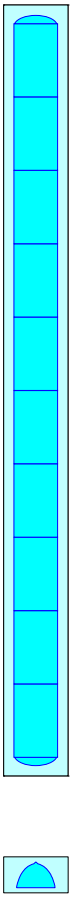
10 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 72.82' Row Length +12.0" End Stone x 2 = 74.82' Base Length
1 Rows x 51.0" Wide + 12.0" Side Stone x 2 = 6.25' Base Width
6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

10 Chambers x 45.9 cf = 459.4 cf Chamber Storage

1,636.6 cf Field - 459.4 cf Chambers = 1,177.2 cf Stone x 40.0% Voids = 470.9 cf Stone Storage

Chamber Storage + Stone Storage = 930.3 cf = 0.021 af
Overall Storage Efficiency = 56.8%
Overall System Size = 74.82' x 6.25' x 3.50'

10 Chambers
60.6 cy Field
43.6 cy Stone



Summary for Pond ISO2: Isolator Row 2

[43] Hint: Has no inflow (Outflow=Zero)

Volume	Invert	Avail.Storage	Storage Description
#1A	202.40'	339 cf	**6.25'W x 53.46'L x 3.50'H Field A** 1,169 cf Overall - 322 cf Embedded = 848 cf x 40.0% Voids
#2A	202.90'	322 cf	**ADS_StormTech SC-740 +Cap** x 7 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
		661 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Pond ISO2: Isolator Row 2 - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

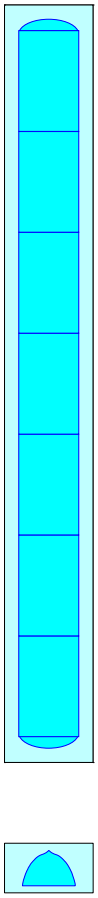
7 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 51.46' Row Length +12.0" End Stone x 2 = 53.46' Base Length
1 Rows x 51.0" Wide + 12.0" Side Stone x 2 = 6.25' Base Width
6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

7 Chambers x 45.9 cf = 321.6 cf Chamber Storage

1,169.4 cf Field - 321.6 cf Chambers = 847.8 cf Stone x 40.0% Voids = 339.1 cf Stone Storage

Chamber Storage + Stone Storage = 660.7 cf = 0.015 af
Overall Storage Efficiency = 56.5%
Overall System Size = 53.46' x 6.25' x 3.50'

7 Chambers
43.3 cy Field
31.4 cy Stone

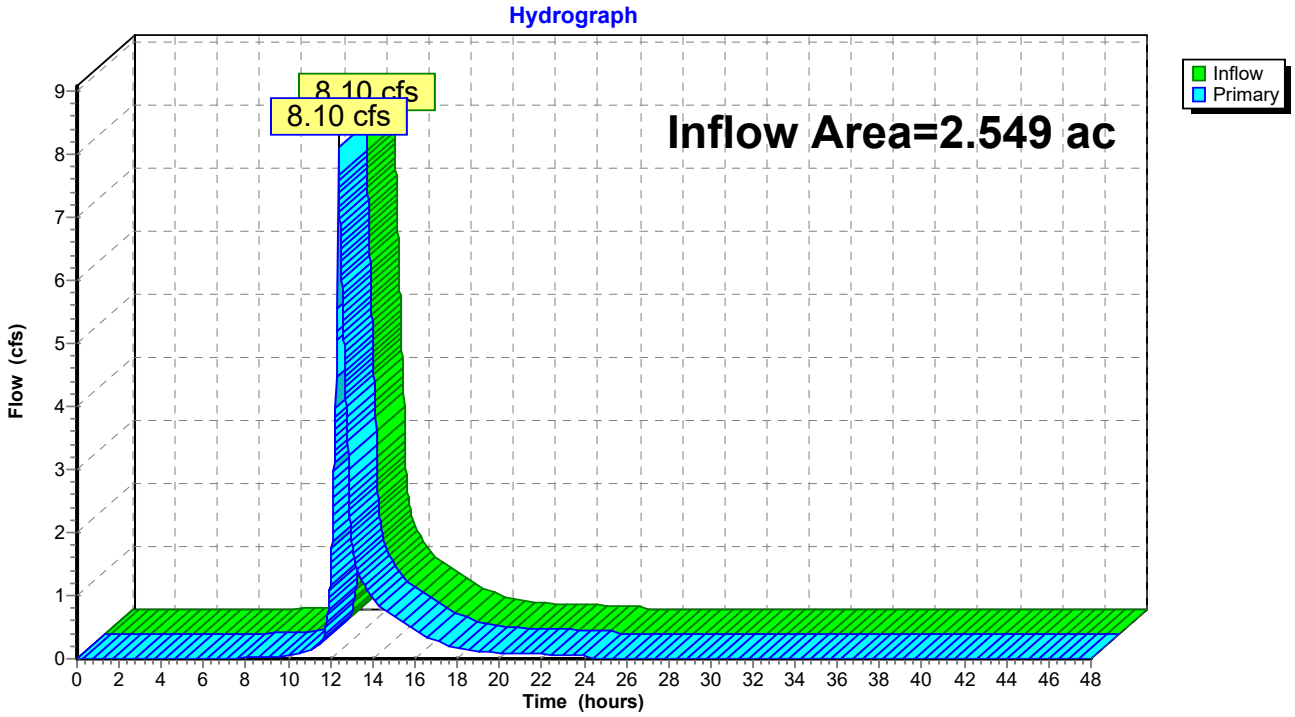


Summary for Link 1L: Winthrop Street

Inflow Area = 2.549 ac, 35.70% Impervious, Inflow Depth = 3.28" for 100-Year event
Inflow = 8.10 cfs @ 12.36 hrs, Volume= 0.696 af
Primary = 8.10 cfs @ 12.36 hrs, Volume= 0.696 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link 1L: Winthrop Street



Appendix C

Groundwater Recharge Calculations

Cassidy Field
Medway, MA

MassDEP Standard No. 3 - Groundwater Recharge Calculations

Minimum Required Recharge Volume *(if 100% of impervious area discharging to recharge BMP)*					
NRCS Hydrologic Soil Type	**Approx. Soil Texture**	**Target Depth Factor (inches)**	**Impervious Area (acres)**	**Required Recharge Volume (Rv)**	
				(ac-ft)	**(cf)**
A	sand	0.60	0.00	0.000	0
B	loam	0.35	1.01	0.029	1,283
C	silty loam	0.25	0.00	0.000	0
D	clay	0.10	0.00	0.000	0
		Totals =	**1.01**	**0.029**	**1,283**

Adjusted Minimum Required Recharge Volume *(if less than 100% of impervious area discharging to recharge BMP)*					
Total Impervious Area (acres)	**Impervious Area Draining to Recharge BMP**		**Ratio of Impervious Area**	**Required Recharge Volume (Rv)**	
	acres	**%**		**(ac-ft)**	**(cf)**
1.01	1.01	100.0%	1.00	0.029	1,283

Rv = F x impervious area x ratio of impervious area

Where: Rv = required recharge volume (acre-feet)
F = target depth factor associated with each hydrologic soil group (feet)
Impervious Area = pavement and rooftop area on site (acres)
Ratio of Impervious Area = total impervious area / impervious area discharging to recharge BMP

Notes:
1.) A minimum of 65% of impervious area is required to drain to recharge BMP.
2.) Refer to the 2008 Massachusetts Stormwater Handbook Volume 3, Chapter 1, pages 27-28 for required recharge requirement.

Cassidy Field
Medway, MA

MassDEP Standard No. 3 - Groundwater Recharge Calculations

Recharge BMP	SIS 1	SIS 2	Total Storage
Subsurface Infiltration System	1,793	5,569	7,362
Total	**1,793**	**5,569**	**7,362**

*Represents the maximum static storage volume

Required Recharge Volume =	1,283	cf
Provided Recharge Volume =	7,362	cf
Summary	**7,362 cf ≥ 1,283 cf**	**OK**

Notes:
1.) Static storage volume equals storage volume below outlet invert.

Cassidy Field
Medway, MA

MassDEP Standard No. 3 - Groundwater Recharge Calculations

Drawdown Time

$$Time_{drawdown} = \frac{Rv}{(K)\ (Bottom\ Area)}$$

Where: $Time_{drawdown}$ = time it takes the basin to drain completely (hours)
Rv = storage volume (cubic feet)
K = saturated hydraulic conductivity (feet/hour)
Bottom Area = bottom area of recharge structure (square feet)

Recharge BMP	Rv (cf)	K (in/hr)	K (ft/hr)	Bottom Area (sf)	Drawdown Time (hr)
SIS 1	1,793	2.41	0.20083	2,600	3.4
SIS 2	5,569	2.41	0.20083	2,600	10.7

*Rv provided represents the maximum static storage volume

Notes:

1.) Per the 2008 Massachusetts Stormwater Handbook Volume 1, Chapter 1, page 7, infiltration structures must be able to drain fully within 72 hours.
2.) Refer to Volume 3, Chapter 1, page 25 of the 2008 Massachusetts Stormwater Handbook for drawdown analysis guidelines.

Appendix D

Water Quality Calculations

INSTRUCTIONS:

Version 1, Automated: Mar. 4, 2008

1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Location: Cassidy Field, Winthrop Street, Medway, MA

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Street Sweeping - 5%	**0.05**	**1.00**	**0.05**	**0.95**
Deep Sump and Hooded Catch Basin	**0.25**	**0.95**	**0.24**	**0.71**
Sediment Forebay	**0.25**	**0.71**	**0.18**	**0.53**
	0.00	**0.53**	**0.00**	**0.53**
	0.00	**0.53**	**0.00**	**0.53**

Total TSS Removal = **47%**

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

Project: **Cassidy Field (Pre-Infiltration)**

Prepared By: **Bradley M. Picard, EIT**

Date: **4-Apr-22**

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

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed

1. From MassDEP Stormwater Handbook Vol. 1

INSTRUCTIONS:

Version 1, Automated: Mar. 4, 2008

1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Location: Cassidy Field, Winthrop Street, Medway, MA (SIS 1)

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Street Sweeping - 5%	**0.05**	**1.00**	**0.05**	**0.95**
Deep Sump and Hooded Catch Basin	**0.25**	**0.95**	**0.24**	**0.71**
Subsurface Infiltration Structure	**0.80**	**0.71**	**0.57**	**0.14**
	0.00	**0.14**	**0.00**	**0.14**
	0.00	**0.14**	**0.00**	**0.14**

Total TSS Removal = **86%**

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

Project: **Cassidy Field**

Prepared By: **Bradley M. Picard, EIT**

Date: **4-Apr-22**

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

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed

1. From MassDEP Stormwater Handbook Vol. 1

INSTRUCTIONS:

Version 1, Automated: Mar. 4, 2008

1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Location: Cassidy Field, Winthrop Street, Medway, MA (SIS 2)

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Street Sweeping - 5%	0.05	1.00	0.05	0.95
Deep Sump and Hooded Catch Basin	0.25	0.95	0.24	0.71
Subsurface Infiltration Structure	0.80	0.71	0.57	0.14
	0.00	0.14	0.00	0.14
	0.00	0.14	0.00	0.14

Total TSS Removal = 86%

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

Project: Cassidy Field

Prepared By: Bradley M. Picard, EIT

Date: 4-Apr-22

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

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed

1. From MassDEP Stormwater Handbook Vol. 1

Cassidy Field Parking Improvements
Winthrop Street
Medway, Massachusetts

BMP Forebay Volume and Water Quality Volume Calculations Summary

Description	Impervious Tributary Area (acres)	Forebay Runoff Depth* (inches)	Required Forebay Volume (cubic feet)	Provided Forebay Volume (cubic feet)	WQ Runoff Depth** (inches)	Required WQ Volume (cubic feet)	Provided WQ Volume (cubic feet)
BMP #1 - Subsurface Infiltration System 1	0.36	-	-	-	1.0	1,303	**1,793**
BMP #1 -Isolator Row	0.36	0.10	130	**265**	-	-	-
BMP #2 - Subsurface Infiltration System 2	0.42	-	-	-	1.0	1,535	**5,654**
BMP #2 -Isolator Row	0.42	0.10	154	**188**	-	-	-

Notes:

* Required Forebay Storage Volume = 0.10 inch per acre (Refer to Massachusetts Stormwater Handbook Volume 2, Chapter 2, Page 14 dated February 2008)

** Required Water Quality Volume = 1.0 inch of runoff times the total impervious area of the post-development project site (Refer to Massachusetts Stormwater Handbook Volume 1, Chapter 1, Page 9 dated Feruary 2008)

$V_{WQ} = (D_{WQ} / 12 \text{ inches/foot}) * (A_{IMP} * 43{,}560 \text{ square feet/acre})$

Where: V_{WQ} = Water Quality Volume (in cubic feet)
D_{WQ} = Water Quality Depth (in inches)
A_{IMP} = Impervious Area (in acres)

Subcat Reach Pond Link

Routing Diagram for HydroCAD_Post-Dev_SMB
Prepared by Tetra Tech Inc, Printed 4/4/2022

Summary for Pond ISO1: Isolator Row 1

[43] Hint: Has no inflow (Outflow=Zero)

Volume	Invert	Avail.Storage	Storage Description
#1A	205.50'	471 cf	**6.25'W x 74.82'L x 3.50'H Field A** 1,637 cf Overall - 459 cf Embedded = 1,177 cf x 40.0% Voids
#2A	206.00'	459 cf	**ADS_StormTech SC-740 +Cap** x 10 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
		930 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Pond ISO1: Isolator Row 1 - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

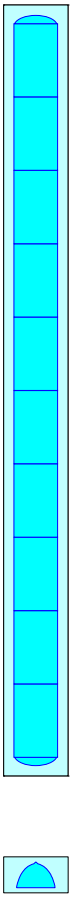
10 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 72.82' Row Length +12.0" End Stone x 2 = 74.82' Base Length
1 Rows x 51.0" Wide + 12.0" Side Stone x 2 = 6.25' Base Width
6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

10 Chambers x 45.9 cf = 459.4 cf Chamber Storage

1,636.6 cf Field - 459.4 cf Chambers = 1,177.2 cf Stone x 40.0% Voids = 470.9 cf Stone Storage

Chamber Storage + Stone Storage = 930.3 cf = 0.021 af
Overall Storage Efficiency = 56.8%
Overall System Size = 74.82' x 6.25' x 3.50'

10 Chambers
60.6 cy Field
43.6 cy Stone



Stage-Area-Storage for Pond ISO1: Isolator Row 1

Elevation (feet)	Storage (cubic-feet)
205.50	0
205.55	9
205.60	19
205.65	28
205.70	37
205.75	47
205.80	56
205.85	65
205.90	75
205.95	84
206.00	94
206.05	111
206.10	128
206.15	145
206.20	163
206.25	180
206.30	197
206.35	214
206.40	231
206.45	248
206.50	265
206.55	282
206.60	298
206.65	315
206.70	332
206.75	348
206.80	365
206.85	381
206.90	398
206.95	414
207.00	430
207.05	446
207.10	462
207.15	478
207.20	494
207.25	509
207.30	525
207.35	540
207.40	555
207.45	570
207.50	585
207.55	600
207.60	615
207.65	630
207.70	644
207.75	658
207.80	672
207.85	686
207.90	700
207.95	713
208.00	726
208.05	739
208.10	751
208.15	764
208.20	775
208.25	787
208.30	797
208.35	808
208.40	818
208.45	827
208.50	837
208.55	846
208.60	855
208.65	865
208.70	874
208.75	884
208.80	893
208.85	902
208.90	912
208.95	921
209.00	**930**

Summary for Pond ISO2: Isolator Row 2

[43] Hint: Has no inflow (Outflow=Zero)

Volume	Invert	Avail.Storage	Storage Description
#1A	202.40'	471 cf	**6.25'W x 74.82'L x 3.50'H Field A** 1,637 cf Overall - 459 cf Embedded = 1,177 cf x 40.0% Voids
#2A	202.90'	459 cf	**ADS_StormTech SC-740 +Cap** x 10 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
		930 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Pond ISO2: Isolator Row 2 - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

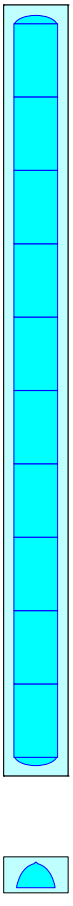
10 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 72.82' Row Length +12.0" End Stone x 2 = 74.82' Base Length
1 Rows x 51.0" Wide + 12.0" Side Stone x 2 = 6.25' Base Width
6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

10 Chambers x 45.9 cf = 459.4 cf Chamber Storage

1,636.6 cf Field - 459.4 cf Chambers = 1,177.2 cf Stone x 40.0% Voids = 470.9 cf Stone Storage

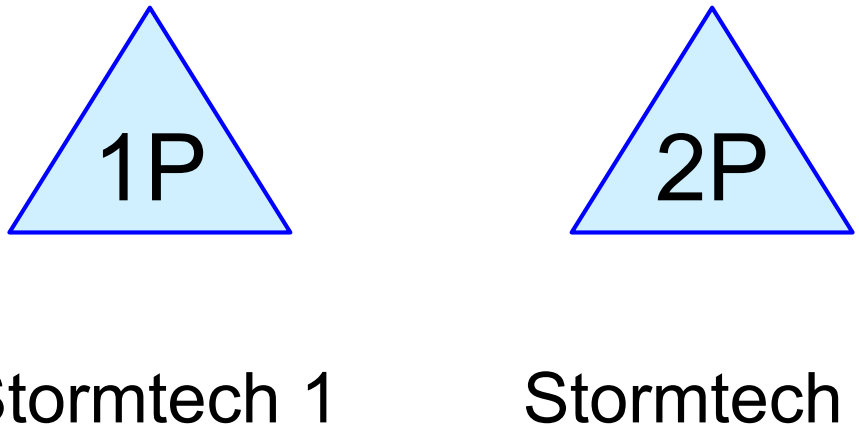
Chamber Storage + Stone Storage = 930.3 cf = 0.021 af
Overall Storage Efficiency = 56.8%
Overall System Size = 74.82' x 6.25' x 3.50'

10 Chambers
60.6 cy Field
43.6 cy Stone



Stage-Area-Storage for Pond ISO2: Isolator Row 2

Elevation (feet)	Storage (cubic-feet)
202.40	0
202.45	9
202.50	19
202.55	28
202.60	37
202.65	47
202.70	56
202.75	65
202.80	75
202.85	84
202.90	94
202.95	111
203.00	128
203.05	145
203.10	163
203.15	180
203.20	197
203.25	214
203.30	231
203.35	248
203.40	265
203.45	282
203.50	298
203.55	315
203.60	332
203.65	348
203.70	365
203.75	381
203.80	398
203.85	414
203.90	430
203.95	446
204.00	462
204.05	478
204.10	494
204.15	509
204.20	525
204.25	540
204.30	555
204.35	570
204.40	585
204.45	600
204.50	615
204.55	630
204.60	644
204.65	658
204.70	672
204.75	686
204.80	700
204.85	713
204.90	726
204.95	739
205.00	751
205.05	764
205.10	775
205.15	787
205.20	797
205.25	808
205.30	818
205.35	827
205.40	837
205.45	846
205.50	855
205.55	865
205.60	874
205.65	884
205.70	893
205.75	902
205.80	912
205.85	921
205.90	**930**



Subcat Reach Pond Link

Routing Diagram for HydroCAD_Post-Dev_SMB
Prepared by Tetra Tech Inc, Printed 4/4/2022

Summary for Pond 1P: Stormtech 1

[43] Hint: Has no inflow (Outflow=Zero)

Volume	Invert	Avail.Storage	Storage Description
#1A	205.50'	2,354 cf	**34.75'W x 74.82'L x 3.50'H Field A** 9,100 cf Overall - 3,216 cf Embedded = 5,884 cf x 40.0% Voids
#2A	206.00'	3,216 cf	**ADS_StormTech SC-740 +Cap** x 70 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 7 Rows of 10 Chambers
		5,569 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	205.50'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	206.60'	**10.0" Round Culvert** L= 125.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 206.60' / 206.00' S= 0.0048 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.55 sf
#3	Device 2	208.00'	**5.0' long Sharp-Crested Rectangular Weir** 0 End Contraction(s)
#4	Device 2	207.50'	**4.0" Vert. Orifice/Grate** C= 0.600
#5	Device 2	206.70'	**4.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.00 cfs @ 0.00 hrs HW=0.00' (Free Discharge)
└─**1=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=0.00' (Free Discharge)
└─**2=Culvert** (Controls 0.00 cfs)
  ├─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
  ├─**4=Orifice/Grate** (Controls 0.00 cfs)
  └─**5=Orifice/Grate** (Controls 0.00 cfs)

Pond 1P: Stormtech 1 - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

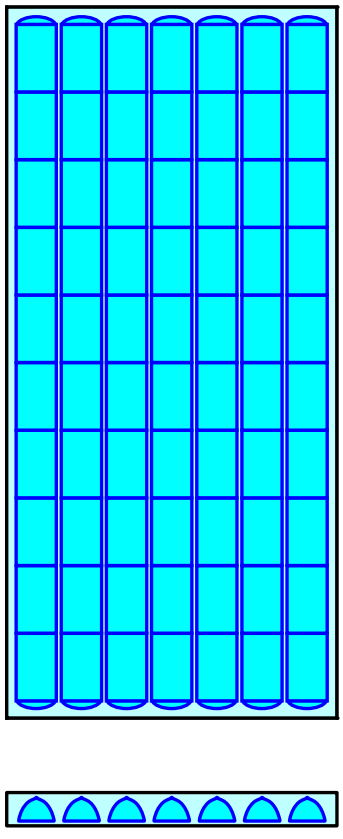
10 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 72.82' Row Length +12.0" End Stone x 2 = 74.82' Base Length
7 Rows x 51.0" Wide + 6.0" Spacing x 6 + 12.0" Side Stone x 2 = 34.75' Base Width
6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

70 Chambers x 45.9 cf = 3,215.8 cf Chamber Storage

9,099.6 cf Field - 3,215.8 cf Chambers = 5,883.8 cf Stone x 40.0% Voids = 2,353.5 cf Stone Storage

Chamber Storage + Stone Storage = 5,569.3 cf = 0.128 af
Overall Storage Efficiency = 61.2%
Overall System Size = 74.82' x 34.75' x 3.50'

70 Chambers
337.0 cy Field
217.9 cy Stone



Stage-Area-Storage for Pond 1P: Stormtech 1

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
205.50	**2,600**	0
205.55	2,600	52
205.60	2,600	104
205.65	2,600	156
205.70	2,600	208
205.75	2,600	260
205.80	2,600	312
205.85	2,600	364
205.90	2,600	416
205.95	2,600	468
206.00	2,600	520
206.05	2,600	628
206.10	2,600	735
206.15	2,600	842
206.20	2,600	950
206.25	2,600	1,056
206.30	2,600	1,163
206.35	2,600	1,269
206.40	2,600	1,375
206.45	2,600	1,480
206.50	2,600	1,585
206.55	2,600	1,689
206.60	2,600	1,793
206.65	2,600	1,897
206.70	2,600	1,999
206.75	2,600	2,102
206.80	2,600	2,204
206.85	2,600	2,305
206.90	2,600	2,406
206.95	2,600	2,506
207.00	2,600	2,606
207.05	2,600	2,705
207.10	2,600	2,803
207.15	2,600	2,900
207.20	2,600	2,997
207.25	2,600	3,093
207.30	2,600	3,188
207.35	2,600	3,282
207.40	2,600	3,375
207.45	2,600	3,468
207.50	2,600	3,560
207.55	2,600	3,650
207.60	2,600	3,740
207.65	2,600	3,828
207.70	2,600	3,915
207.75	2,600	4,001
207.80	2,600	4,085
207.85	2,600	4,168
207.90	2,600	4,250
207.95	2,600	4,330
208.00	2,600	4,409
208.05	2,600	4,485
208.10	2,600	4,560
208.15	2,600	4,632
208.20	2,600	4,701
208.25	2,600	4,766
208.30	2,600	4,827
208.35	2,600	4,886
208.40	2,600	4,942
208.45	2,600	4,996
208.50	2,600	5,049
208.55	2,600	5,101
208.60	2,600	5,153
208.65	2,600	5,205
208.70	2,600	5,257
208.75	2,600	5,309
208.80	2,600	5,361
208.85	2,600	5,413
208.90	2,600	5,465
208.95	2,600	5,517
209.00	2,600	**5,569**

Summary for Pond 2P: Stormtech 2

[43] Hint: Has no inflow (Outflow=Zero)

Volume	Invert	Avail.Storage	Storage Description
#1A	202.40'	2,354 cf	**34.75'W x 74.82'L x 3.50'H Field A** 9,100 cf Overall - 3,216 cf Embedded = 5,884 cf x 40.0% Voids
#2A	202.90'	3,216 cf	**ADS_StormTech SC-740 +Cap** x 70 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 7 Rows of 10 Chambers
#3	200.30'	85 cf	**4.00'D x 6.75'H Vertical Cone/Cylinder** -Impervious
		5,654 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	202.40'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	206.80'	**8.0' long Sharp-Crested Rectangular Weir** 1 End Contraction(s)

Discarded OutFlow Max=0.00 cfs @ 0.00 hrs HW=0.00' (Free Discharge)
↑—**1=Exfiltration** (Controls 0.00 cfs)

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

Pond 2P: Stormtech 2 - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

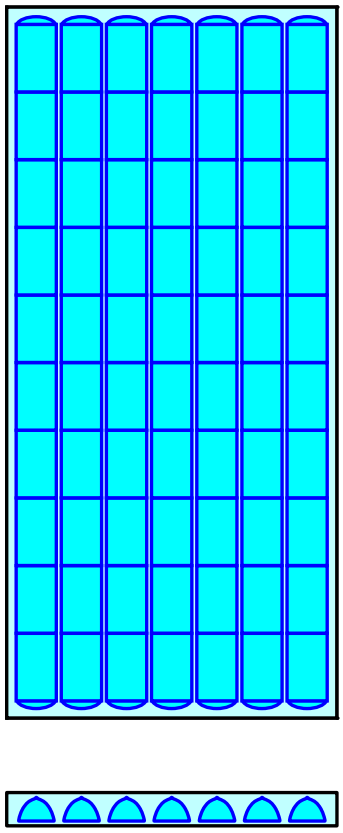
10 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 72.82' Row Length +12.0" End Stone x 2 = 74.82' Base Length
7 Rows x 51.0" Wide + 6.0" Spacing x 6 + 12.0" Side Stone x 2 = 34.75' Base Width
6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

70 Chambers x 45.9 cf = 3,215.8 cf Chamber Storage

9,099.6 cf Field - 3,215.8 cf Chambers = 5,883.8 cf Stone x 40.0% Voids = 2,353.5 cf Stone Storage

Chamber Storage + Stone Storage = 5,569.3 cf = 0.128 af
Overall Storage Efficiency = 61.2%
Overall System Size = 74.82' x 34.75' x 3.50'

70 Chambers
337.0 cy Field
217.9 cy Stone



Stage-Area-Storage for Pond 2P: Stormtech 2

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
200.30	0	0
200.40	0	1
200.50	0	3
200.60	0	4
200.70	0	5
200.80	0	6
200.90	0	8
201.00	0	9
201.10	0	10
201.20	0	11
201.30	0	13
201.40	0	14
201.50	0	15
201.60	0	16
201.70	0	18
201.80	0	19
201.90	0	20
202.00	0	21
202.10	0	23
202.20	0	24
202.30	0	25
202.40	**2,600**	26
202.50	2,600	132
202.60	2,600	237
202.70	2,600	342
202.80	2,600	447
202.90	2,600	553
203.00	2,600	769
203.10	2,600	985
203.20	2,600	1,199
203.30	2,600	1,412
203.40	2,600	1,624
203.50	2,600	1,833
203.60	2,600	2,041
203.70	2,600	2,246
203.80	2,600	2,450
203.90	2,600	2,651
204.00	2,600	2,849
204.10	2,600	3,045
204.20	2,600	3,237
204.30	2,600	3,426
204.40	2,600	3,611
204.50	2,600	3,793
204.60	2,600	3,969
204.70	2,600	4,141
204.80	2,600	4,307
204.90	2,600	4,467
205.00	2,600	4,619
205.10	2,600	4,761
205.20	2,600	4,889
205.30	2,600	5,005
205.40	2,600	5,113
205.50	2,600	5,219
205.60	2,600	5,324
205.70	2,600	5,429
205.80	2,600	5,534
205.90	2,600	5,640
206.00	2,600	5,641
206.10	2,600	5,642
206.20	2,600	5,643
206.30	2,600	5,645
206.40	2,600	5,646
206.50	2,600	5,647
206.60	2,600	5,648
206.70	2,600	5,650
206.80	2,600	5,651
206.90	2,600	5,652
207.00	2,600	**5,654**

Appendix E

Long-Term Pollution Prevention and Stormwater Operations & Maintenance Plan

Long-Term Pollution Prevention and Stormwater Operation & Maintenance Plan

Cassidy Field
Winthrop Street
Medway, Massachusetts

Prepared For:
Medway Department of Public Works
45B Holliston Street
Medway, MA 02053

Prepared By:
Tetra Tech, Inc.
100 Nickerson Road
Marlborough, MA 01752

Date:
April 7, 2022

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LIST OF ATTACHMENTS

1.0 INTRODUCTION

The Long-Term Pollution Prevention (LTPP) and Stormwater Operation and Maintenance (O&M) Plan, filed with the Town of Medway, shall be implemented at Cassidy Field located on Winthrop Street to ensure long-term functioning of the stormwater management system (System), and to provide suitable practices for source control of pollutants.

The System has been designed in accordance with the ten (10) MassDEP Stormwater Management Standards provided in the Stormwater Management Policy and Massachusetts Wetlands Protection Act, which relate to the protection of wetlands and water bodies, control of water quantity, recharge to groundwater, water quality and protection of critical areas, erosion/sedimentation control and stormwater maintenance. Preventative maintenance of the System is essential in the protection of these interests.

1.1 RESPONSIBILITY

The Medway Department of Public Works (DPW) possesses the primary responsibility for overseeing and implementing the LTPP and Stormwater O&M Plan. When necessary, Medway DPW shall designate responsibility to a professional engineer or other technical professional with expertise and experience with stormwater management facilities for the proper operation and maintenance of the System. In case of transfer of property ownership, future property owners shall be notified of the presence of the stormwater management system and the requirements for proper implementation of the LTPP and Stormwater O&M Plan.

Operator Name and Address:
Medway Department of Public Works
45B Holliston Street
Medway, MA 02053

1.2 TRAINING

Medway DPW will coordinate an annual in-house training session with qualified staff to discuss the LTPP and Stormwater O&M Plan. Annual training will include the following:

- Discuss the Stormwater Operations and Maintenance Plan
  - Explain the general operations of the stormwater management system and its Best Management Practices (BMP's).
  - Identify potential sources of stormwater pollution and measures/methods of reducing or eliminating that pollution.
  - Emphasize good housekeeping measures.

- Discuss the Spill Prevention and Response Plan
  - Explain the process in the event of a spill.
  - Identify potential sources of spills and the procedures for clean-up and/or reporting and notification.
  - Complete a yearly inventory of Materials Safety Data Sheets of all tenants and confirm that no potentially harmful chemicals are in use.

1.3 REFERENCES

The LTPP and Stormwater O&M Plan references the following documents:

Site Plans:
Plans titled "Cassidy Field Parking Improvements" dated April 6, 2022 (or as amended), prepared by Tetra Tech, Inc.

Stormwater Management Report:
Report titled "Stormwater Management Report, Cassidy Field, Winthrop Street, Medway MA" dated April 6, 2022 (or as amended), prepared by Tetra Tech, Inc.

1.4 PUBLIC SAFETY FEATURES

The following measures have been incorporated into the stormwater management system to promote the safety of the public:

- Drain manholes and catch basins have been provided with heavy duty covers and/or grates and designed to withstand H20 loading.
- Treatment of stormwater runoff from paved surfaces has been designed to remove 80% TSS.
- Reduction in peak rates of runoff from the site under post-development conditions.
- Development and implementation of an Operations and Maintenance Plan to promote the proper functioning of the stormwater management system.
- Development and implementation of good housekeeping practices identifying potential pollution sources and suitable practices to control them from impacting the environment and/or the public's health and safety.

2.0 PRACTICES FOR LONG-TERM POLLUTION PREVENTION

Medway DPW shall employ the use of good housekeeping practices by adhering to the maintenance schedules and procedures described in this Report. In general, the Project is not expected to generate significant amounts of hazardous waste nor will there be any outdoor storage of petroleum products or chemicals.

2.1 GOOD HOUSEKEEPING MEASURES

The designated responsible party shall implement the following good housekeeping measures to ensure long-term pollution prevention and provide suitable practices for source control of pollutants.

2.1.1 Storage of Materials and Waste

The storage of hazardous materials and waste is not anticipated at this site.

2.1.2 Vehicle Washing Controls

Commercial or non-routine washing of vehicles is not anticipated at this site.

2.1.3 Routine Inspection and Maintenance of Stormwater BMPs

Conduct inspection and maintenance of the stormwater BMPs in accordance with the Stormwater O&M Plan discussed in Section 3.0.

2.1.4 Spill Prevention and Response Plans

There is limited risk of a large spill requiring action at this site due to its use. Spills requiring action will most likely be associated with motor vehicle activity. The following good housekeeping practices shall be followed to reduce the risk of spills or other accidental exposure of hazardous materials to the stormwater management system:

- Store quantities of materials only required for the facility and not more.
- Store materials indoors or under cover in appropriate labeled containers.
- Follow manufactures recommendations for proper use and disposal of material.

A spill of greater than 10 gallons of oil or a spill of any quantity that has reached a surface water, into a sewer, storm drain, ditch, or culvert leading to a surface water, shall be immediately reported to one or more municipal, state, or federal authority. In the event of a hazardous waste spill on-site the following protocol should be followed.

- If it is safe to do so, employees (or on-site property manager) detecting an oil spill should immediately stop the release and use available materials to prevent the spread of oil, particularly trying to discharge to catch basins.
- If there is a potentially flammable, toxic, or explosive condition, evacuate the vicinity of the spill.
- If is believed that a reportable or dangerous condition exists, immediately call your local Fire Department to notify them of the release.

If is believed that a reportable condition exists, immediately call the Massachusetts Department of Environmental Protection (DEP) to notify them of the release. Call the DEP Emergency Response Section toll free statewide number, 1-888-304-1133. Be prepared to provide the following information to the DEP and the Fire Department:

- Identity of the caller
- Contact phone number
- Location of the spill
- Type of product spilled
- Approximate quantity or product spilled
- Extent of actual and/or potential water pollution
- Date and time of spill
- Cause of spill

Contact a Licensed Site Professional (LSP) to assist in further handling of the material(s) and DEP.

2.1.5 Maintenance of Landscaped Areas

Routine mowing shall be conducted on a consistent basis with grass cut to adequate height to maintain a healthy vegetative cover. Bare areas, areas of sparse growth, and signs of erosion shall be addressed in accordance with the Stormwater O&M Plan discussed in Section 3.0.

2.1.6 Storage and Use of Fertilizers, Herbicides, and Pesticides

Fertilizers, herbicides, and pesticides shall be stored in their original containers with the original labels in legible condition. These substances will be stored in covered, dry areas. Application and disposal of such materials will be completed in accordance with manufacturer's instructions. The use of fertilizers, herbicides, and pesticides will be minimized to the maximum extent practicable. If fertilizers must be used, only slow-release organic low-phosphorous fertilizers will be used in any landscaped areas to limit the amount of nutrients that could enter the stormwater system.

2.1.7 Pet Waste Management

Pet waste management involves using a combination of pet waste collection programs, pet awareness education to inform residents of the proper disposal techniques for pet droppings. Medway DPW will establish rules requiring residents to properly collect and dispose of pet waste.

2.1.8 Winter Maintenance

Medway DPW will be responsible for snow removal/winter conditions management to treat the paved parking and walking areas within the project site for safe access during winter conditions. It must be noted that snow removal shall not occur on the northern half of the parking area within the riverfront area. However, snow shall be cleared for proper access to proposed accessible parking spaces. Medway DPW is responsible to minimize de-icing applications while ensuring safe vehicle and pedestrian access throughout the site.

Snow piles shall be located adjacent to or on pervious surfaces in upland areas. In no case shall snow be disposed of or stored in resource areas (i.e. riverfront area, wetlands, floodplains, streams or other water bodies). If necessary stockpiled snow will be removed from the site and disposed of at an off-site location in accordance with all local, state and federal regulations.

2.1.9 Winter Road Salt/Sand Use and Storage Restrictions

It is not anticipated that salt or sand will be maintained on the property. Salting and sanding operationsa shall not occur within the riverfront area located in the northern portion of the project limits. Should salt or sand stockpiles be maintained on the property they shall be contained and stabilized to prevent the discharge of salt and sand to the wetlands and covered. De-icing chemicals shall be stored indoors or under cover.

2.1.10 Prevention of Illicit Discharges

Illicit discharges to the stormwater management system are discharges that are not entirely comprised of stormwater. No chemicals, trash, or other materials shall be dumped into or otherwise allowed to enter the stormwater management system. To the best of the engineer's knowledge there are no known or proposed illicit connections associated with the Project, however if a potential illicit discharge is detected it shall be investigated to determine the nature and source of the discharge, and if required action shall be taken to eliminate the illicit discharge.

2.1.11 Emergency Contacts

Name: Medway Fire Department
Address: 44 Milford Street
City, State: Medway, MA 02053
Contact: Jeffrey P. Lynch, Fire Chief
Telephone: 911 or 508-533-3211

Name: Medway Police Department
Address: 315 Village Street
City, State: Medway, MA 02053
Contact: Allen Tingley, Police Chief
Telephone: 911 or 508-533-3212

Name: Medway Conservation Commission
Address: Medway Town Hall, 155 Village Street
City, State: Medway, MA 02053
Telephone: 508-533-3292

Name: Medway Board of Health
Address: Medway Town Hall, 155 Village Street
City, State: Medway, MA 02053
Telephone: 508-533-3206

Name: MassDEP Northeast Regional Office
Address: 205B Lowell Street
City, State: Wilmington, MA 01887
Telephone: 978-694-3200
Emergency: 888-304-1133 (24-hour statewide number to report a spill of oil or hazardous material)

3.0 STORMWATER OPERATIONS AND MAINTENANCE PROGRAM

Medway DPW or designated responsible party shall conduct the Stormwater O&M Program set forth in this document, ensure that inspections and record keeping are timely and accurate, and that cleaning and maintenance are performed in accordance with the recommended frequency for each System component. Medway DPW or designated responsible party shall also maintain all System components to function as they were designed to. Estimated annual cost of the Maintenance Program is $2,000 to $4,000.

3.1 DOCUMENTATION

Inspection and Maintenance Log Forms shall include the date on which each inspection or maintenance task was performed, date and the amount of the last storm event in excess of 0.1 inches of rain in a 24-hour period, a description of the inspection findings or maintenance completed, and the name of the inspector or maintenance personnel performing the task. Inspection findings shall include items such as physical conditions of the System components, depth of sediment in structures, evidence of overtopping or debris blockage, and maintenance required for each System component. If a maintenance task requires the clean-out of any sediments or debris, the location where the sediment and debris was disposed after removal will be indicated. O&M Logs will be kept on file for a minimum of three years and copies will be

available to the Town of Medway upon request. Refer to **Attachment A**, Inspection and Maintenance Log Form for a sample form.

3.2 STORMWATER MANAGEMENT ACCESS

The proposed on-site stormwater management system consists of catch basins, manholes, drainpipes, and subsurface infiltration systems with isolator rows and shall be inspected and maintained by Medway DPW.

3.3 INSPECTION AND MAINTENANCE FREQUENCY

The following areas, facilities, and measures will be inspected/performed by Medway DPW or designated responsible party and maintained as specified below. Identified deficiencies will be corrected. Accumulated sediments and debris will be properly handled and disposed of off-site, in accordance with local, state, and federal guidelines and regulations. Refer to the Grading and Drainage Plans included with the Minor Site Plan Application for the components of the stormwater management system. A sample Operation and Maintenance Log form is included in **Appendix A.**

3.3.1 Street Sweeping

Accumulations of sand and debris will be cleared from parking lots and site access drives through street sweeping to control the amount of sediment that enters the drainage system. Street sweeping will be conducted quarterly, but primarily in late spring and the early fall seasons. Street sweeping will also occur after winter snowmelt when road sand and other sediments have accumulated.

3.3.2 Vegetated Areas

Inspect slopes and embankments early in the growing season to identify active or potential erosion problems. Replant bare areas or areas with sparse growth. Where rill erosion is evident, armor the area with an appropriate lining or divert the erosive flows to on-site areas able to withstand the concentrated flows.

3.3.3 Catch Basins

Catch basins will be inspected quarterly and cleaned when sediment reaches ½ full depth from the invert of the pipe to ensure that the catch basins are working in their intended fashion and that they are free of debris. Sediments and hydrocarbons will be properly handled and disposed of off-site, in accordance with local, state, and federal guidelines and regulations. The method of sediment removal will be by vacuum, and disposal must be documented. Any structural damage to the catch basins or to castings must be repaired upon discovery.

3.3.4 Subsurface Infiltration Systems (Isolator Rows)

Subsurface infiltration systems and isolator rows will be inspected twice in the first year, and annually thereafter. Additionally, inspections will be conducted following one major rainfall event (>0.5”) each year to verify that the systems drain within 72 hours. Isolator rows shall be cleaned and vacuumed when sediment reaches a depth of 3”. In accordance with MA DEP Standards an 80% TSS removal rate is credited for this BMP.

Attachment A

Operation and Maintenance Log
Cassidy Field, Medway, MA

Inspector's Name: _____ Date:_____

Maintenance:

- ☐ Routine
- ☐ Response to Rainfall Event _____ inches
- ☐ Other _____

BMP	Inspection Frequency	Description of Inspection Findings	Depth of Sediment	Description of Maintenance Completed
Vegetated Areas	Annually			
Deep Sump/Hooded Catch Basins	Monthly Inspections			
	Quarterly Cleaning			
Subsurface Infiltration Systems	Semi-Annual Inspections			
	Maintenance as required			
Misc.	Monthly Inspections			
	Maintenance as required			

** This is a rolling log in which the responsible party records all operation and maintenance activities for the past three years.

Appendix F

Supporting Documentation

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

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

Custom Soil Resource Report for Norfolk and Suffolk Counties, Massachusetts

March 11, 2022

Preface

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

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

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

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

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

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

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

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Contents

How Soil Surveys Are Made

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

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

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

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

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

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

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

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

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

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

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

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

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

Custom Soil Resource Report
Soil Map

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 1:25,000.

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: Norfolk and Suffolk Counties, Massachusetts
Survey Area Data: Version 17, Sep 3, 2021

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

Date(s) aerial images were photographed: Aug 31, 2020—Oct 22, 2020

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
1	Water	4.2	12.9%
70A	Ridgebury fine sandy loam, 0 to 3 percent slopes	2.3	7.1%
71B	Ridgebury fine sandy loam, 3 to 8 percent slopes, extremely stony	4.9	15.2%
254B	Merrimac fine sandy loam, 3 to 8 percent slopes	16.8	52.1%
317B	Scituate fine sandy loam, 3 to 8 percent slopes, extremely stony	0.6	1.8%
420B	Canton fine sandy loam, 3 to 8 percent slopes	2.9	9.0%
422B	Canton fine sandy loam, 0 to 8 percent slopes, extremely stony	0.3	0.9%
653	Udorthents, sandy	0.3	1.0%
Totals for Area of Interest		**32.3**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas

are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Norfolk and Suffolk Counties, Massachusetts

1—Water

Map Unit Setting

National map unit symbol: vkyp
Mean annual precipitation: 32 to 50 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 120 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Water: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

70A—Ridgebury fine sandy loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2w69f
Elevation: 0 to 1,480 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Ridgebury

Setting

Landform: Ground moraines, hills, drumlins, depressions, drainageways
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Head slope, base slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Coarse-loamy lodgment till derived from gneiss, granite, and/or schist

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 6 inches: fine sandy loam
Bw - 6 to 10 inches: sandy loam
Bg - 10 to 19 inches: gravelly sandy loam
Cd - 19 to 66 inches: gravelly sandy loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: 15 to 35 inches to densic material
Drainage class: Poorly drained

Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: D
Ecological site: F144AY009CT - Wet Till Depressions
Hydric soil rating: Yes

Minor Components

Woodbridge

Percent of map unit: 9 percent
Landform: Ground moraines, hills, drumlins
Landform position (two-dimensional): Summit, footslope
Landform position (three-dimensional): Base slope, crest
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Whitman

Percent of map unit: 5 percent
Landform: Hills, drainageways, drumlins, ground moraines, depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Leicester

Percent of map unit: 1 percent
Landform: Ground moraines, hills, drainageways, depressions
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave, linear
Across-slope shape: Concave
Hydric soil rating: Yes

71B—Ridgebury fine sandy loam, 3 to 8 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2w69c
Elevation: 0 to 1,290 feet
Mean annual precipitation: 36 to 71 inches

Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Ridgebury, extremely stony, and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ridgebury, Extremely Stony

Setting

Landform: Drumlins, depressions, ground moraines, hills, drainageways
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Head slope, base slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Coarse-loamy lodgment till derived from gneiss, granite, and/or schist

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 6 inches: fine sandy loam
Bw - 6 to 10 inches: sandy loam
Bg - 10 to 19 inches: gravelly sandy loam
Cd - 19 to 66 inches: gravelly sandy loam

Properties and qualities

Slope: 3 to 8 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: 15 to 35 inches to densic material
Drainage class: Poorly drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: F144AY009CT - Wet Till Depressions
Hydric soil rating: Yes

Minor Components

Woodbridge, extremely stony

Percent of map unit: 10 percent
Landform: Ground moraines, hills, drumlins
Landform position (two-dimensional): Summit, backslope, footslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex
Across-slope shape: Linear

Hydric soil rating: No

Whitman, extremely stony

Percent of map unit: 8 percent
Landform: Depressions
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Paxton, extremely stony

Percent of map unit: 2 percent
Landform: Ground moraines, hills, drumlins
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Linear, convex
Hydric soil rating: No

254B—Merrimac fine sandy loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2tyqs
Elevation: 0 to 1,290 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: All areas are prime farmland

Map Unit Composition

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

Description of Merrimac

Setting

Landform: Outwash plains, outwash terraces, moraines, eskers, kames
Landform position (two-dimensional): Summit, shoulder, backslope, footslope
Landform position (three-dimensional): Crest, side slope, 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: 3 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): 2s
Hydrologic Soil Group: A
Ecological site: F145XY008MA - Dry Outwash
Hydric soil rating: No

Minor Components

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, crest, side slope, 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

Windsor

Percent of map unit: 3 percent
Landform: Outwash terraces, dunes, deltas, outwash plains
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Tread, riser
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Hydric soil rating: No

Agawam

Percent of map unit: 2 percent
Landform: Outwash plains, outwash terraces, moraines, stream terraces, eskers, kames

Landform position (three-dimensional): Rise
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

317B—Scituate fine sandy loam, 3 to 8 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: vky2
Elevation: 20 to 360 feet
Mean annual precipitation: 45 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Scituate

Setting

Landform: Drumlins
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Friable coarse-loamy eolian deposits over dense sandy lodgment till derived from granite and gneiss

Typical profile

H1 - 0 to 4 inches: fine sandy loam
H2 - 4 to 24 inches: sandy loam
H3 - 24 to 60 inches: loamy sand

Properties and qualities

Slope: 3 to 8 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: 18 to 34 inches to densic material
Drainage class: Moderately well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 18 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: C
Ecological site: F144AY037MA - Moist Dense Till Uplands
Hydric soil rating: No

Minor Components

Woodbridge
Percent of map unit: 7 percent
Hydric soil rating: No

Montauk
Percent of map unit: 5 percent
Hydric soil rating: No

Ridgebury
Percent of map unit: 3 percent
Landform: Depressions
Hydric soil rating: Yes

420B—Canton fine sandy loam, 3 to 8 percent slopes

Map Unit Setting
National map unit symbol: 2w81b
Elevation: 0 to 1,180 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: All areas are prime farmland

Map Unit Composition
Canton and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Canton

Setting
Landform: Hills, moraines, ridges
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Parent material: Coarse-loamy over sandy melt-out till derived from gneiss, granite, and/or schist

Typical profile
Ap - 0 to 7 inches: fine sandy loam
Bw1 - 7 to 15 inches: fine sandy loam
Bw2 - 15 to 26 inches: gravelly fine sandy loam
2C - 26 to 65 inches: gravelly loamy sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 19 to 39 inches to strongly contrasting textural stratification
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 2.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: B
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Minor Components

Scituate

Percent of map unit: 10 percent
Landform: Hills, drumlins, ground moraines
Landform position (two-dimensional): Summit, backslope, footslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Montauk

Percent of map unit: 5 percent
Landform: Moraines, ground moraines, hills, drumlins
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Charlton

Percent of map unit: 4 percent
Landform: Ridges, ground moraines, hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Swansea

Percent of map unit: 1 percent
Landform: Marshes, depressions, bogs, swamps, kettles
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

422B—Canton fine sandy loam, 0 to 8 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2w818
Elevation: 0 to 1,180 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: Not prime farmland

Map Unit Composition

Canton, extremely stony, and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Canton, Extremely Stony

Setting

Landform: Moraines, hills, ridges
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Parent material: Coarse-loamy over sandy melt-out till derived from gneiss, granite, and/or schist

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
A - 2 to 5 inches: fine sandy loam
Bw1 - 5 to 16 inches: fine sandy loam
Bw2 - 16 to 22 inches: gravelly fine sandy loam
2C - 22 to 67 inches: gravelly loamy sand

Properties and qualities

Slope: 0 to 8 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: 19 to 39 inches to strongly contrasting textural stratification
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Minor Components

Charlton, extremely stony
Percent of map unit: 6 percent
Landform: Ridges, ground moraines, hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Scituate, extremely stony
Percent of map unit: 6 percent
Landform: Hills, ground moraines, drumlins
Landform position (two-dimensional): Summit, backslope, footslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Swansea
Percent of map unit: 4 percent
Landform: Marshes, depressions, bogs, swamps, kettles
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Montauk, extremely stony
Percent of map unit: 4 percent
Landform: Recessionial moraines, ground moraines, hills, drumlins
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

653—Udorthents, sandy

Map Unit Setting
National map unit symbol: vky8
Elevation: 0 to 3,000 feet
Mean annual precipitation: 45 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Udorthents

Setting

Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Tread, riser
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Parent material: Excavated and filled sandy glaciofluvial deposits

Typical profile

H1 - 0 to 6 inches: variable
H2 - 6 to 60 inches: variable

Properties and qualities

Slope: 0 to 25 percent
Depth to restrictive feature: More than 80 inches
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to very high (0.06 to 20.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: A
Hydric soil rating: Unranked

Minor Components

Udorthents

Percent of map unit: 8 percent
Hydric soil rating: Unranked

Urban land

Percent of map unit: 5 percent
Hydric soil rating: Unranked

Swansea

Percent of map unit: 2 percent
Landform: Bogs
Hydric soil rating: Yes

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

TEST PIT NUMBER _1___

TETRA TECH

CLIENT Medway DPW
PROJECT NAME Cassidy Field Parking Improvements
PROJECT NUMBER 143-21583-21012
PROJECT LOCATION Winthrop Street, Medway, MA

DATE 7/21/2021
SURFACE ELEVATION 210.30
EXCAVATION CONTRACTOR
GROUDNWATER ELEVATION NO GW OBSERVED
EXCAVATION METHOD Excavator
GROUNDWATER SYMBOLS
LOGGED BY Chris Stanton
ESTIMATED SEASONAL HIGH GROUNDWATER
WEATHER 75 Degrees
GROUNDWATER

DEPTH (ft)	SAMPLE NUMBER	REMARKS		SOIL TEXTURE (USDA)		SUBSURFACE DESCRIPTION
0.0				-	0.25	Asphalt Millings
				SL	0.75	SANDY LOAM, HSG B. 10YR 5/6
				GrLS	2.90	GRAVELLY LOAMY SAND, HSG A. 10YR 6/6
				S	4.00	SAND, HSG A. 10YR 6/4
5.0				FLS	8.00	GRAVELLY LOAMY SAND, HSG A. 10YR 6/3
10.0						Test pit terminated approximately 96" below ground surface.
15.0						

TEST PIT NUMBER _2___

TETRA TECH

CLIENT Medway DPW
PROJECT NAME Cassidy Field Parking Improvements
PROJECT NUMBER 143-21583-21012
PROJECT LOCATION Winthrop Street, Medway, MA

DATE 7/21/2021
SURFACE ELEVATION 210.80
EXCAVATION CONTRACTOR
GROUNDWATER ELEVATION 203.50
EXCAVATION METHOD Excavator
GROUNDWATER SYMBOLS
LOGGED BY Chris Stanton
▽ **ESTIMATED SEASONAL HIGH GROUNDWATER**
WEATHER 75 Degrees
▼ **GROUNDWATER**

DEPTH (ft)	SAMPLE NUMBER	REMARKS		SOIL TEXTURE (USDA)		SUBSURFACE DESCRIPTION
0.0				-	0.25	Asphalt Millings
				SL	0.92	SANDY LOAM, HSG B. 10YR 6/6
				GrLS		GRAVELLY LOAMY SAND, HSG A. 10YR 6/6
5.0					5.00	
						FINE LOAMY SAND, HSG A. 10YR 6/6
	▽	ESHWT at 88"		FLS	7.33	Redoximorphic features observed at 88" below ground surface. No weeping.
					8.50	
10.0						Test pit terminated approximately 102" below ground surface.
15.0						

TEST PIT NUMBER _3___

TETRA TECH

CLIENT Medway DPW
PROJECT NAME Cassidy Field Parking Improvements
PROJECT NUMBER 143-21583-21012
PROJECT LOCATION Winthrop Street, Medway, MA

DATE 7/21/2021
SURFACE ELEVATION 206.80
EXCAVATION CONTRACTOR
GROUNDWATER ELEVATION NO GW OBSERVED
EXCAVATION METHOD Excavator
GROUNDWATER SYMBOLS
LOGGED BY Chris Stanton
▽ **ESTIMATED SEASONAL HIGH GROUNDWATER**
WEATHER 75 Degrees
▼ **GROUNDWATER**

DEPTH (ft)	SAMPLE NUMBER	REMARKS		SOIL TEXTURE (USDA)	SUBSURFACE DESCRIPTION
0.0				-	0.30 Asphalt Millings
				SL	SANDY LOAM, HSG B. 10YR 4/4
5.0					3.75 SANDY LOAM, HSG B. 10YR 6/8
				GrLS	GRAVELLY LOAMY SAND, HSG A. 10YR 7/4
10.0					9.00 Test pit terminated approximately 108" below ground surface.
15.0					

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)

use consistent units (e.g. feet & days **or** inches & hours)

Input Values		
4.8200	***R***	**Recharge (infiltration) rate (feet/day)**
0.350	**Sy**	**Specific yield, Sy (dimensionless, between 0 and 1)**
60.00	**K**	**Horizontal hydraulic conductivity, Kh (feet/day)***
17.370	**x**	**1/2 length of basin (x direction, in feet)**
37.410	**y**	**1/2 width of basin (y direction, in feet)**
1.000	**t**	**duration of infiltration period (days)**
30.000	**hi(0)**	**initial thickness of saturated zone (feet)**

Conversion Table

inch/hour	feet/day
0.67	1.33
2.00	4.00

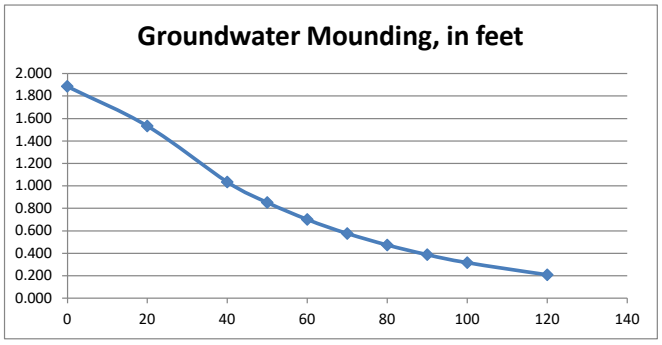
hours	days
36	1.50

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).

31.884	**h(max)**	**maximum thickness of saturated zone (beneath center of basin at end of infiltration period)**
1.884	**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
1.884	**0**
1.533	**20**
1.035	**40**
0.851	**50**
0.700	**60**
0.576	**70**
0.472	**80**
0.387	**90**
0.315	**100**
0.208	**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.

NOAA Atlas 14, Volume 10, Version 3
Location name: Medway, Massachusetts, USA*
Latitude: 42.1491°, Longitude: -71.4281°
Elevation: 197.08 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.329** (0.251-0.429)	**0.397** (0.303-0.518)	**0.508** (0.387-0.666)	**0.601** (0.455-0.792)	**0.728** (0.536-1.00)	**0.824** (0.596-1.16)	**0.924** (0.650-1.34)	**1.03** (0.693-1.54)	**1.19** (0.771-1.84)	**1.32** (0.835-2.07)
10-min	**0.466** (0.356-0.608)	**0.562** (0.430-0.734)	**0.720** (0.549-0.943)	**0.851** (0.645-1.12)	**1.03** (0.759-1.42)	**1.17** (0.843-1.64)	**1.31** (0.921-1.90)	**1.47** (0.982-2.18)	**1.69** (1.09-2.60)	**1.87** (1.18-2.94)
15-min	**0.548** (0.419-0.715)	**0.662** (0.505-0.864)	**0.848** (0.646-1.11)	**1.00** (0.760-1.32)	**1.21** (0.893-1.67)	**1.37** (0.992-1.93)	**1.54** (1.08-2.24)	**1.73** (1.16-2.57)	**1.99** (1.29-3.06)	**2.20** (1.39-3.45)
30-min	**0.750** (0.573-0.978)	**0.906** (0.692-1.18)	**1.16** (0.884-1.52)	**1.37** (1.04-1.81)	**1.66** (1.22-2.29)	**1.88** (1.36-2.64)	**2.11** (1.49-3.07)	**2.37** (1.59-3.52)	**2.72** (1.76-4.20)	**3.01** (1.91-4.73)
60-min	**0.952** (0.728-1.24)	**1.15** (0.879-1.50)	**1.48** (1.12-1.93)	**1.74** (1.32-2.30)	**2.12** (1.56-2.91)	**2.40** (1.73-3.36)	**2.69** (1.89-3.90)	**3.01** (2.02-4.48)	**3.46** (2.24-5.33)	**3.83** (2.42-6.01)
2-hr	**1.22** (0.940-1.59)	**1.48** (1.14-1.93)	**1.91** (1.46-2.48)	**2.26** (1.72-2.96)	**2.75** (2.04-3.77)	**3.11** (2.26-4.36)	**3.50** (2.49-5.11)	**3.96** (2.66-5.86)	**4.65** (3.01-7.12)	**5.23** (3.32-8.17)
3-hr	**1.41** (1.09-1.83)	**1.72** (1.32-2.22)	**2.21** (1.70-2.87)	**2.63** (2.01-3.43)	**3.19** (2.38-4.37)	**3.61** (2.64-5.06)	**4.07** (2.91-5.94)	**4.62** (3.11-6.82)	**5.47** (3.55-8.35)	**6.20** (3.94-9.65)
6-hr	**1.81** (1.40-2.33)	**2.20** (1.70-2.83)	**2.84** (2.19-3.66)	**3.37** (2.59-4.37)	**4.10** (3.07-5.59)	**4.64** (3.41-6.48)	**5.23** (3.77-7.62)	**5.96** (4.02-8.74)	**7.09** (4.62-10.8)	**8.07** (5.15-12.5)
12-hr	**2.29** (1.78-2.92)	**2.79** (2.17-3.56)	**3.60** (2.79-4.62)	**4.28** (3.30-5.51)	**5.21** (3.91-7.05)	**5.89** (4.35-8.17)	**6.64** (4.80-9.61)	**7.57** (5.12-11.0)	**8.99** (5.88-13.6)	**10.2** (6.55-15.7)
24-hr	**2.74** (2.14-3.47)	**3.37** (2.63-4.28)	**4.41** (3.43-5.61)	**5.27** (4.08-6.75)	**6.45** (4.87-8.69)	**7.32** (5.44-10.1)	**8.28** (6.02-11.9)	**9.47** (6.44-13.7)	**11.3** (7.43-17.0)	**13.0** (8.32-19.8)
2-day	**3.11** (2.44-3.92)	**3.89** (3.05-4.91)	**5.18** (4.05-6.55)	**6.24** (4.85-7.94)	**7.71** (5.85-10.3)	**8.77** (6.56-12.1)	**9.96** (7.32-14.4)	**11.5** (7.83-16.6)	**13.9** (9.16-20.8)	**16.1** (10.4-24.5)
3-day	**3.40** (2.68-4.26)	**4.24** (3.34-5.33)	**5.62** (4.41-7.09)	**6.77** (5.28-8.58)	**8.35** (6.36-11.2)	**9.50** (7.12-13.0)	**10.8** (7.94-15.5)	**12.4** (8.49-17.9)	**15.1** (9.94-22.4)	**17.4** (11.3-26.4)
4-day	**3.67** (2.89-4.59)	**4.54** (3.58-5.69)	**5.97** (4.69-7.51)	**7.16** (5.60-9.05)	**8.80** (6.71-11.7)	**9.99** (7.50-13.7)	**11.3** (8.34-16.2)	**13.0** (8.91-18.7)	**15.8** (10.4-23.4)	**18.2** (11.7-27.4)
7-day	**4.41** (3.49-5.49)	**5.34** (4.22-6.65)	**6.85** (5.40-8.57)	**8.11** (6.36-10.2)	**9.84** (7.52-13.0)	**11.1** (8.35-15.1)	**12.5** (9.19-17.7)	**14.3** (9.78-20.3)	**17.0** (11.2-25.0)	**19.4** (12.5-29.1)
10-day	**5.12** (4.07-6.36)	**6.08** (4.82-7.55)	**7.64** (6.04-9.52)	**8.94** (7.03-11.2)	**10.7** (8.20-14.1)	**12.0** (9.05-16.2)	**13.5** (9.88-18.9)	**15.2** (10.5-21.6)	**17.9** (11.9-26.3)	**20.2** (13.1-30.2)
20-day	**7.23** (5.77-8.91)	**8.26** (6.58-10.2)	**9.93** (7.89-12.3)	**11.3** (8.94-14.1)	**13.2** (10.1-17.1)	**14.7** (11.0-19.4)	**16.2** (11.8-22.2)	**17.8** (12.3-25.1)	**20.2** (13.5-29.5)	**22.2** (14.4-33.0)
30-day	**8.98** (7.18-11.0)	**10.0** (8.03-12.3)	**11.8** (9.39-14.5)	**13.2** (10.5-16.4)	**15.2** (11.7-19.6)	**16.8** (12.6-22.0)	**18.3** (13.3-24.8)	**19.9** (13.8-27.9)	**22.1** (14.8-32.0)	**23.8** (15.5-35.2)
45-day	**11.1** (8.94-13.6)	**12.3** (9.83-15.0)	**14.1** (11.2-17.3)	**15.6** (12.4-19.3)	**17.7** (13.6-22.6)	**19.3** (14.5-25.1)	**20.9** (15.1-28.0)	**22.4** (15.6-31.2)	**24.3** (16.3-35.1)	**25.7** (16.8-37.9)
60-day	**13.0** (10.4-15.8)	**14.1** (11.3-17.2)	**16.0** (12.8-19.6)	**17.5** (14.0-21.6)	**19.7** (15.1-25.0)	**21.4** (16.0-27.7)	**23.0** (16.6-30.6)	**24.4** (17.1-34.0)	**26.2** (17.6-37.7)	**27.3** (17.9-40.2)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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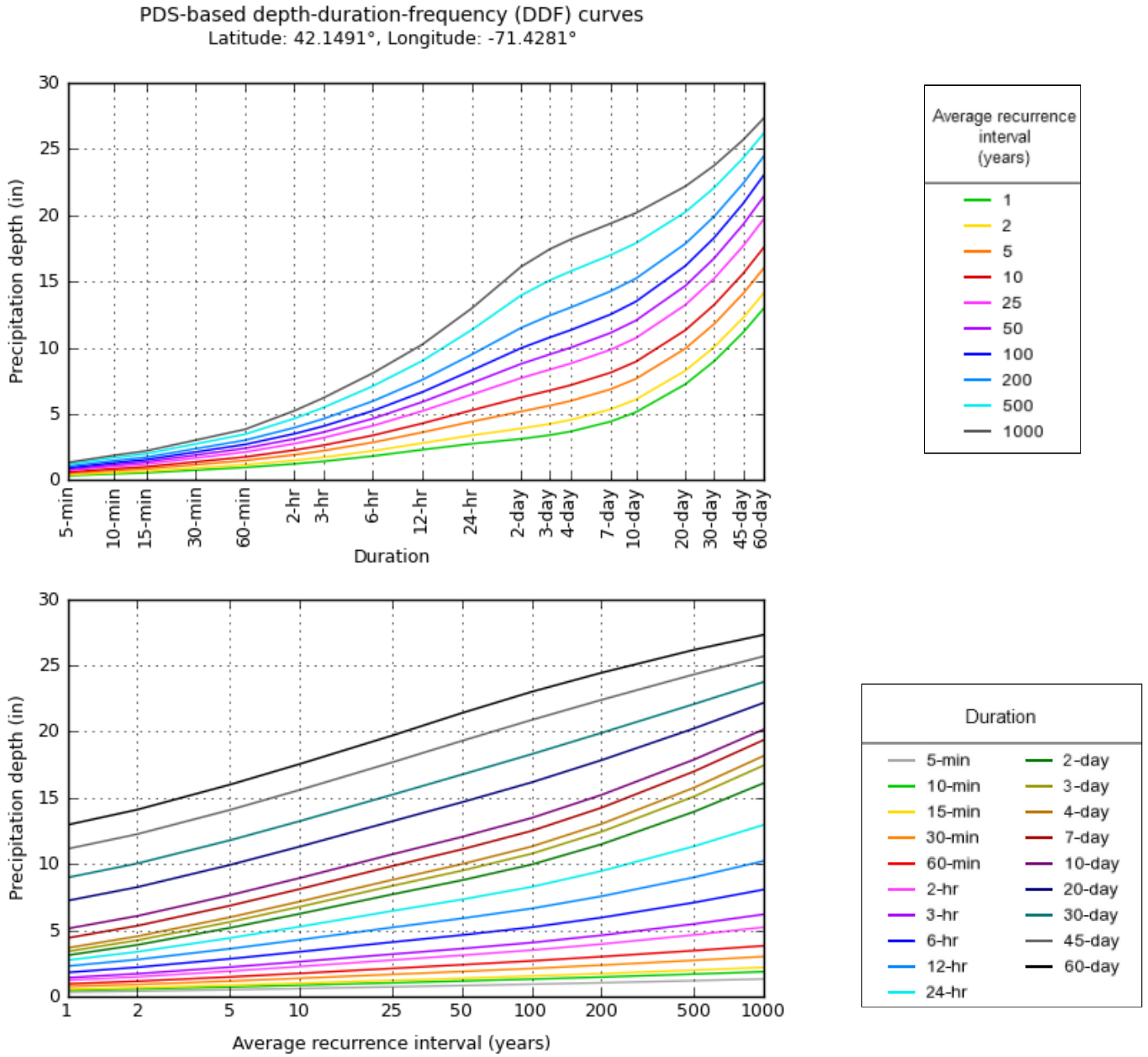
PF graphical



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Created (GMT): Mon Mar 7 15:41:55 2022

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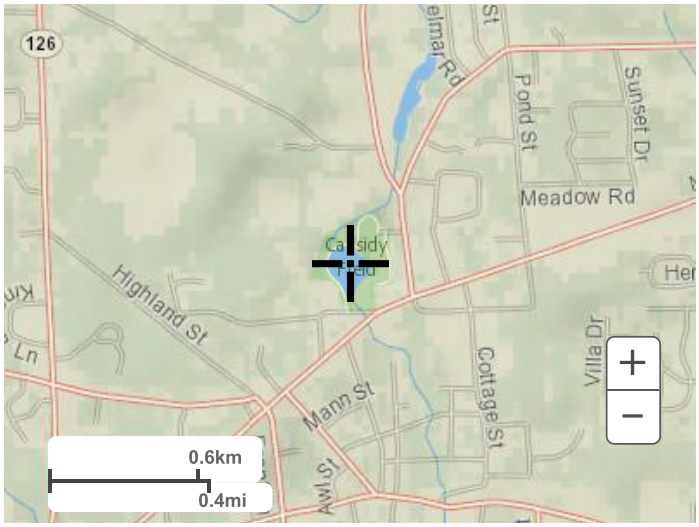
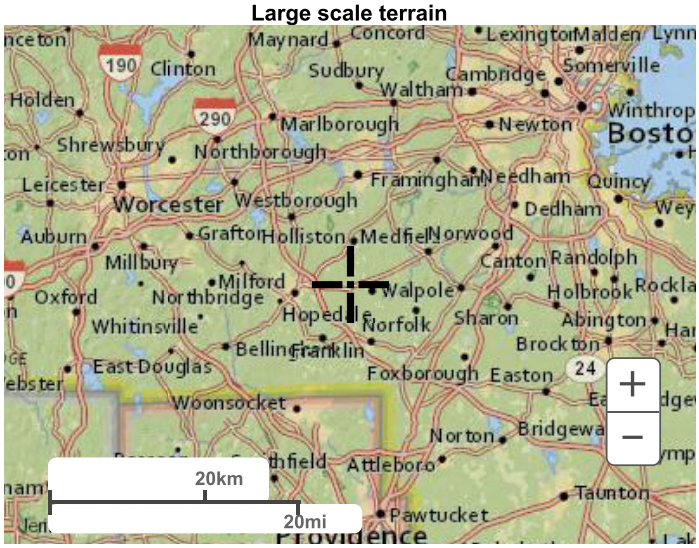
Maps & aerials

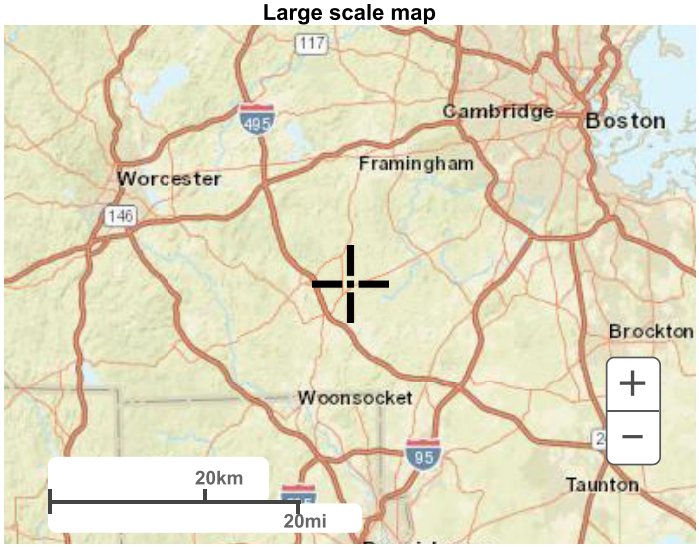
Small scale terrain



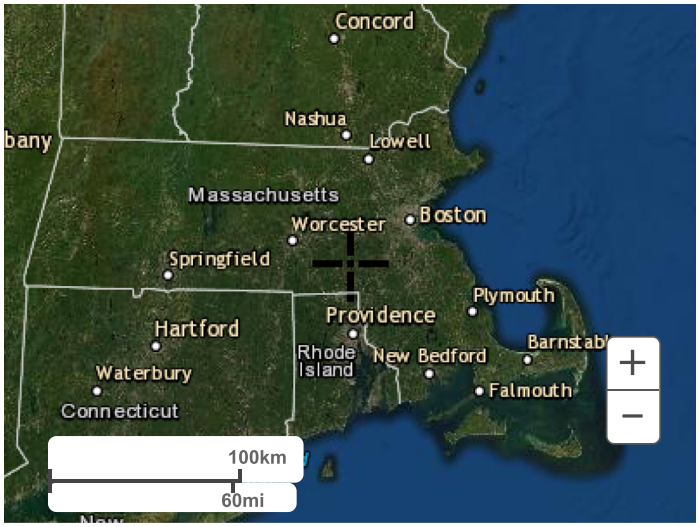
Large scale terrain



Large scale map



Large scale aerial



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US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

TETRA TECH

ILLICIT DISCHARGE COMPLIANCE STATEMENT

Owner Name: Medway Department of Public Works

Site Address: Cassidy Field, Winthrop Street, Medway, MA 02053

Date: April 7, 2022

This statement is provided in accordance with the provisions of Massachusetts Stormwater Management Standards (the Standards), Standard 10, and the Massachusetts Stormwater Handbook.

To the best of the Owners and Engineers knowledge, no illicit discharges exist on the Project Site and no illicit discharges are proposed as part of the Project. The facility's Operation & Maintenance Plans are designed to prevent non-stormwater discharge to on-site stormwater Best Management Practices. Any illicit discharges identified during or after construction will be immediately disconnected in accordance with the Standards.

Signed: Steven Bouley

Steven M. Bouley, P.E.
Project Manager

Tetra Tech
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