

STORMWATER MANAGEMENT REPORT

**PROJECT SITE:
NEPONSET VILLAGE
5 PLEASANT STREET
WALPOLE, MASSACHUSETTS 02081**

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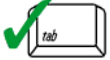
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Checklist for Stormwater Report

A. Introduction

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



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

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.¹ This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8²
- Operation and Maintenance Plan required by Standard 9

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

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

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

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

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



Checklist for Stormwater Report

B. Stormwater Checklist and Certification

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

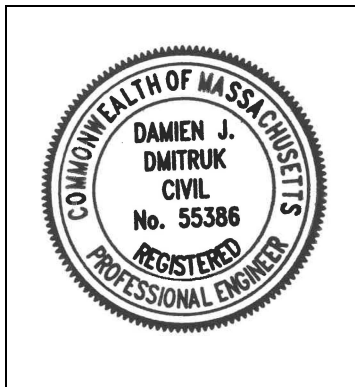
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the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

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

Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature



Damien Dmitruk

4/30/2024

Signature and Date

Checklist

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

- New development
- Redevelopment
- Mix of New Development and Redevelopment



Checklist for Stormwater Report

Checklist (continued)

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

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

Standard 1: No New Untreated Discharges

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



Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

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

Standard 3: Recharge

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

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



Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

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

Standard 4: Water Quality

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

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



Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

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

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

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

Standard 6: Critical Areas

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



Checklist for Stormwater Report

Checklist (continued)

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

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

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

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

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



Checklist for Stormwater Report

Checklist (continued)

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

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

Standard 9: Operation and Maintenance Plan

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

Standard 10: Prohibition of Illicit Discharges

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

INTRODUCTION

Coneco Engineers & Scientists, Incorporated (Coneco) has completed a drainage analysis of the subject site, located at 5 Pleasant Street in Walpole, Massachusetts, the results of which are contained herein. The purpose of this analysis is to quantitatively understand the impacts of the proposed development of the project site on the existing hydrologic conditions and to mitigate said impacts through the implementation of a stormwater management system that utilizes best management practices. This design is supported by an operations and maintenance plan as well as a long-term pollution prevention plan.

DEVELOPMENT SUMMARY

The existing site is a primarily wooded undeveloped lot. The proposed project is a Chapter 40B development supported by MassHousing to include seven buildings consisting of a total of 24 condominium units. In addition to the residential units, ancillary parking, walkways, landscaping, amenity structures, utilities, and a stormwater management system will be constructed as part of the development. The associated construction period pollution prevention, clearing, grading, and paving will be performed as required for the completion of the project.

STORMWATER MANAGEMENT SYSTEM OVERVIEW

The proposed stormwater management system consists of a series of deep sump hooded catch basins, roof leaders, underground piping, drain manholes, underground infiltration chambers, and outlet control structures, which will work in combination to collect, control, and treat runoff prior to it being discharged from the site. This project is located on an undeveloped lot and has been designed to meet the Massachusetts Stormwater Management Standards.

The site's stormwater flows will be captured by roof gutter and leader systems or travel overland through drainage channels and site grading features until captured by one of the site's catch basins. Catch basin structures will include four-foot deep sumps and oil/gas separator hoods. The deep sumps are intended to remove sediment, and the hoods are intended to remove oil and gas from the stormwater prior to release. Stormwater will then travel through a system of pipes and drain manholes to infiltration chamber systems. The closed drainage system has been designed to accommodate a 25-year rainfall event.

The site has been equipped with multiple subsurface infiltration chamber systems for the control and treatment of stormwater. The infiltration chamber systems have been designed to provide water quality treatment, groundwater recharge, and attenuation of the proposed peak flow rates and volumes to that of the existing conditions or less. The inlet row of each infiltration chamber system will be wrapped in a filter fabric creating an isolation row for the system to initiate the removal of suspended solids and contain them within the initial row. Emergency overflow piping and weir manholes have been incorporated to control and facilitate the discharge of stormwater during a high magnitude storm events.

The plunge pool at the system's outlet has been designed to include a depressed center and a level outer rim. The depressed center promotes the removal of any residual sediment, while the level outer rim dissipates the energy of the stormwater by reducing flow velocities and eliminating point discharges.

From an environmentally sensitive perspective, the aforementioned measures will result in a stormwater design that enhances the introduction of surface water into the ground while preserving the site's natural hydrologic conditions.

The remainder of this report demonstrates in detail how the proposed site conditions follow the design conditions set forth by Massachusetts Stormwater Standards as well as supplying calculations based on these standards.

METHODOLOGY

Drainage calculations are performed to demonstrate that there is no increase in the rate of runoff from the subject site due to the proposed project. The rate of runoff is compared at a common point, referred to as the design point, for both the pre and post development condition (or the existing and proposed condition in the case of a redevelopment project). The hydrologic and hydraulic model created to analyze the pre and post development condition was developed using the Soil Conservation Service (SCS) Technical Release No. 20 (TR 20, SCS unit hydrograph procedures), SCS Technical Release No. 55 (TR 55, Time of Concentration (T_c) and Curve Number (CN)), SCS Technical Paper No. 40 (TP 40, rainfall intensity), and the stormwater detention facilities were modeled using the SCS Storage Indication Method.

Time of Concentration (T_c) - is the time required for stormwater runoff to travel from the most hydraulically distant point in a drainage area or subcatchment to the design point. The T_c is calculated based upon slope, distance, surface cover and type of flow. A longer time of concentration will generally result in a smaller rate of runoff.

Curve Number (CN) - represents the amount of runoff expected from a particular segment of the drainage area. A higher curve number will be less permeable and therefore a larger rate of runoff. The CN is based upon three factors: soil type, soil cover, and cover condition. The soil type is graded A to D; A soil is the most permeable, D is the least. The soil cover (e.g. - vegetated, developed, farmland or impervious) ranges from 30-98, with more permeable soil covers having a lower value. The final factor is the condition of the vegetated soil cover (good, fair or poor), where vegetated cover in good condition is the most permeable and allows the least runoff.

The Hydrologic Soil Group (HSG) for the drainage areas was determined from the Soil Conservation Service Soil Survey of Norfolk County, Massachusetts. The soil survey contains maps which depict the extent of the various soil types. A soil type overlay plan is attached as Figure 6.

Design Software - To assist in the analysis, software entitled HydroCAD, Version 10.0 (developed by HydroCAD Software Solutions, L.L.C.) was utilized. The HydroCAD program calculates the runoff based on rainfall events and watershed characteristics, and produces a runoff hydrograph (a runoff rate versus time curve). If applicable, stage-storage-discharge curves for a specific detention facility are calculated.

Peak Attenuation - The peak rate of runoff at the design points was calculated for the existing and proposed conditions for the 2, 10, 25, and 100-year, 24-hour storm events. The peak rate of runoff was compared for each storm event to determine if there was an increase from the pre to post development condition.

Runoff Volume - The total volume of runoff for the entire site was calculated for the existing and proposed conditions for the 2, 10, 25, and 100-year, 24-hour storm events. The volume of runoff was compared for each storm event to determine if there was an increase from the pre to post development condition.

EXISTING CONDITIONS

The site is a mostly wooded lot located on the northwest side of Pleasant Street, along the Norwood-Walpole town line. The lot abuts residential homes along its southern and eastern borders, a commercial lot along its northern border, and railroad tracks along its western border. Existing drainage patterns and watershed areas were established from a topographic survey. A site visit was conducted by Coneco to

confirm this analysis. Topography generally slopes from the south and southeast sides of the site to the northwest at grades of approximately 1.5 to 6.5 percent. Runoff from storm events discharges from the site along the northwestern corner of the property.

The Soil Conservation Service map for the area indicates that the site is made of four soil types. Please refer to Table 1 for a summary of these soils.

Table 1
Existing Soil Classifications

SOIL MAP UNIT	<i>Norfolk County SOIL SURVEY MAP UNIT NAME AND DESCRIPTION</i>	HYDROLOGIC SOIL GROUP
420B	Canton fine sandy loam, 3 to 8 percent slopes	B
602	Urban Land, 0 to 15 percent slopes	Unclassified
628C	Canton-Urban land Complex, 3 to 15 percent slopes	A
654	Udorthents, loamy	A

PROPOSED CONDITIONS

The proposed development consists of seven new condominium buildings which will provide a total of 24 residential units. To support the new residential buildings, the project will also include an access drive, parking areas, pedestrian walkways, landscaped areas, utilities connections, and stormwater management systems. The main site entrance will be at the property’s frontage on Pleasant Street. As part of this work, the existing lot will be cleared and grubbed and all other existing onsite features will be removed from the site.

These changes increase the overall impervious area found at the site. However, the addition of underground infiltration chamber systems will promote recharge on the site and results in a reduction of the peak rate of runoff. Furthermore, with the addition of the stormwater management BMP’s, the runoff will be treated prior to being discharged from the site.

STORMWATER MANAGEMENT STANDARDS REVIEW

As part of this drainage analysis, Coneco has performed an in-depth review of the subject site for conformance with the Massachusetts Department of Environmental Protection’s Stormwater Management Standards. The project is a new construction project (as defined in Standard 7) within the Stormwater Management Standards. The following is a summary of our findings relative to our review of each of the standards. Please note that the actual text of each standard is italicized for clarity.

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

Stormwater shall be treated prior to release with deep sump catch basins with hoods and infiltration chambers with inlet isolation row. The deep sumps of the catch basin will capture sediment, and the hood will withhold oil and gas within the catch basin. The outlets of infiltration facilities have been designed to reduce erosion and eliminate scouring. A plunge pool will be installed at each discharge

point. The plunge pool will be lined with rip rap forming a depression which will enhance sediment removal prior to discharging runoff. It will also eliminate erosion by reducing flow velocities.

STANDARD 2: *Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates. This Standard may be waived for discharges to land subject to coastal storm flowage as defined in 310 CMR 10.04.*

The existing and proposed site conditions were analyzed for the 2, 10, 25 and 100-year 24-hour storm events using the aforementioned methodology (please refer to appendices A and B of this report for HydroCAD output support data). Due to stormwater being captured, controlled, attenuated, and infiltrated, there is no increase in peak discharge rates for all storm events analyzed (please refer to Appendix C of this report for Peak Rate of Runoff tables).

CLOSED DRAINAGE SYSTEM CALCULATIONS

Rational Method – Sizing pipes for the 25-year storm

The Rational Method was used to calculate the peak flow through the pipes, and the Manning equation was used to determine the minimum pipe size required to pass the required flow. The closed drainage system calculations determine the rate of runoff, the time of concentration and the rainfall intensity for the drainage subcatchment. The calculations were performed for a 25-year storm event. The following standards were used:

1. The Rational Formula ($Q = CIA$) was used to determine the flow to each structure.

Q = Flow cubic feet per second (CFS)
C = Runoff coefficients
I = Rainfall Intensity (inches per hour)
A = Drainage Area (acres)

2. The runoff coefficients used are as follows:

Impervious (pavement and roofs) = 0.85
Bare Ground and gravel = 0.50
Landscape = 0.4
Wooded = 0.2

3. The intensity for each area was determined by the Steel Formula for a 25-year frequency storm. The Steel Formula is:

$I = k/(t+b)$
I = Intensity
k = 230 (25 yr)
t = Time of Concentration
b = 30 (25 yr)

4. The times of concentration were calculated using a spreadsheet which calculates flow time in the pipe with the Manning equation. A minimum time of concentration of five (5) minutes was utilized.
5. The Manning's formula was utilized to calculate the capacity of the individual pipes in the closed drainage system. The Manning's formula is:

$$Q = (A_p) (1.486/n) (s^{1/2}) (h^{2/3})$$

Q = Flow in CFS
Ap = Cross-sectional area of the pipe (square feet)
n = Roughness coefficient
s = slope of the pipe (ft/ft)
h = hydraulic radius = area/wetted perimeter (sf/ft)

The closed drainage system is capable of handling the design flow as calculated, as well as maintaining a design velocity of between two feet per second (fps) and ten fps. Two fps is considered “self-cleansing velocity” and will prevent the pipes from accumulating sediment. Ten fps is considered a safe maximum velocity, to reduce scouring of the pipes. Please refer to Appendix C for the closed drainage system pipe sizing calculation spreadsheet.

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

Standard 3 requires that a specific volume of water be recharged to the site depending on existing soil types and the total impervious area over each soil type. Please refer to Appendix C Stormwater Management Standard 3 - Recharge Volume for a summary of the required recharge.

According to the required recharge volume calculation, the on-site infiltration systems must be designed to provide a minimum recharge volume of 2,416 cubic feet. The proposed design directs 99.3% of the impervious area within the project’s subcatchment areas to recharge facilities. This prompts the need for an adjustment factor and increases the required recharge volume to 2,433 cf. Soils in the locations of the proposed infiltration facilities are adequate for infiltration as determined by exploratory test pits. The bottoms of the infiltration facilities have been designed to provide four feet of separation to seasonal high groundwater elevations. Please refer to Appendix F for the test pit soil logs. The infiltration facilities as designed will provide a total static recharge volume of 21,819 cubic feet. Please refer to Appendix C for these calculations as well as 72-hour drawdown calculations.

Coneco has used the *Static* method for sizing the infiltration BMPs. See appendix C for the related calculations.

STANDARD 4: *Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS). This Standard is met when:*

- a) *Suitable practices for source control and pollution prevention are identified in a long-term pollution prevention plan, and thereafter are implemented and maintained;*
- b) *Structural stormwater best management practices are sized to capture the required water quality volume determined in accordance with the Massachusetts Stormwater Handbook; and*
- c) *Pretreatment is provided in accordance with the Massachusetts Stormwater Handbook.*

The proposed stormwater management system is primarily utilized to facilitate the recharge of groundwater due to the increase of impervious area on the site. The proposed system will achieve the 80% TSS removal requirement for all surface water captured by the system. Please refer to Table 2 for a TSS removal summary.

Please note that a long term pollution prevention plan has been developed as part of the analysis and can be found in Appendix D.

TREATMENT OF SUSPENDED SOLIDS:

Runoff from non-metal roofs does not require pretreatment but will be routed to infiltration facilities equipped with isolation rows. All other impervious area, such as pavement, will meet the treatment requirements of the Stormwater Standards. Pretreatment will be provided with deep sump catch basins and isolation rows.

As some of the site’s infiltration rates are greater than 2.4 in/hr, a pretreatment requirement of 44% is necessary to receive the 80% TSS removal rate for the infiltration facilities. This requirement is met by the use of isolation rows.

Catch basins will be equipped with hoods and four-foot sumps to limit sediment, oils, and grease from being discharged to the drainage system. Please refer to Table 2 – Total Suspended Solids Removal worksheet attached herein for this information.

The inlet rows of the infiltration chamber systems will be designed as isolation rows. Each isolation row of chambers will be wrapped in filter fabric, thus further filtering TSS from the stormwater. The isolation rows functions as pretreatment to the infiltration chambers, thus allowing 80% TSS removal for the systems.

Table 2
Total Suspended Solids Removal

<i>BMP</i>	<i>TSS Removal Rate</i>	<i>Starting TSS Load</i>	<i>TSS Removed</i>	<i>Remaining TSS Load</i>
Deep Sump Hooded Catch Basin	0.25	1.00	Pretreatment	1.00
Isolation Row	0.50	1.00	Pretreatment	1.00
Infiltration Chambers	0.80	1.00	0.80	0.20
Total Suspended Solids Removed:				80%

WATER QUALITY VOLUME

See Appendix C for required water quality volume calculations based on impervious area and the *Static* method calculations for sizing of the infiltration BMPs.

STANDARD 5: *For land uses with higher potential pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable. If through source control and/or pollution prevention all land uses with higher potential pollutant loads cannot be completely protected from exposure to rain, snow, snow melt, and stormwater runoff, the proponent shall use the specific structural stormwater BMPs determined by the Department to be suitable for such uses as provided in the Massachusetts Stormwater Handbook. Stormwater discharges from land uses with higher potential pollutant loads shall also comply with the requirements of the Massachusetts Clean Waters Act, M.G.L. c. 21, §§ 26-53 and the regulations promulgated thereunder at 314 CMR 3.00, 314 CMR 4.00 and 314 CMR 5.00.*

The project site is not a land use with higher potential pollutant loads, per the regulation.

STANDARD 6: *Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply, and stormwater discharges near or to any other critical area, require the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas, as provided in the Massachusetts Stormwater Handbook. A discharge is near a critical area if there is a strong likelihood of a significant impact occurring to said area, taking into account site-specific factors. Stormwater discharges to Outstanding Resource Waters and Special Resource Waters shall be removed and set back from the receiving water or wetland and receive the highest and best practical method of treatment. A “storm water discharge” as defined in 314 CMR 3.04(2)(a)1 or (b) to an Outstanding Resource Water or Special Resource Water shall comply with 314 CMR 3.00 and 314 CMR 4.00. Stormwater discharges to a Zone I or Zone A are prohibited unless essential to the operation of a public water supply.*

The project site is not within the Zone II or Interim Wellhead Protection Area of a public water supply and does not discharge near or to any other critical area. See Figure 5, Critical Areas.

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

This project is considered new development and has been designed to meet all the Massachusetts Stormwater Management Standards.

STANDARD 8: *A plan to control construction-related impacts including erosion, sedimentation and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) shall be developed and implemented.*

This project will disturb more than one acre of land and will therefore be required to obtain coverage under the NPDES Construction General Permit. A Stormwater Pollution Prevention Plan (SWPPP) will be required before earth-disturbing activities commence on the project site. The SWPPP will be prepared per EPA NPDES NOI guidelines and submitted under a separate cover.

STANDARD 9: *A long-term operation and maintenance plan shall be developed and implemented to ensure that stormwater management systems function as designed.*

Please refer to Appendix F for the Operation and Maintenance Plan for the proposed Stormwater Management System.

STANDARD 10: *All illicit discharges to the stormwater management system are prohibited.*

To our knowledge, no illicit discharges will be made to the stormwater management system. An Illicit Discharge Compliance Statement is attached in Appendix F.

CONCLUSION/SUMMARY:

Based on the HydroCAD analysis for the 2, 10, 25, and 100-year storm events, the peak rate of runoff will decrease from the existing to the proposed condition. Furthermore, stormwater will be treated prior to its discharge from the site and controlled infiltration has been introduced to previously uncontrolled areas, thereby promoting/preserving the natural hydrologic conditions. In addition to these improvements, all 10 of the DEP Stormwater Standards have been met.

LIST OF FIGURES

FIGURE 1 - AERIAL MAP

FIGURE 2 - USGS TOPOGRAPHIC MAP

FIGURE 3 - FLOOD INSURANCE RATE MAP

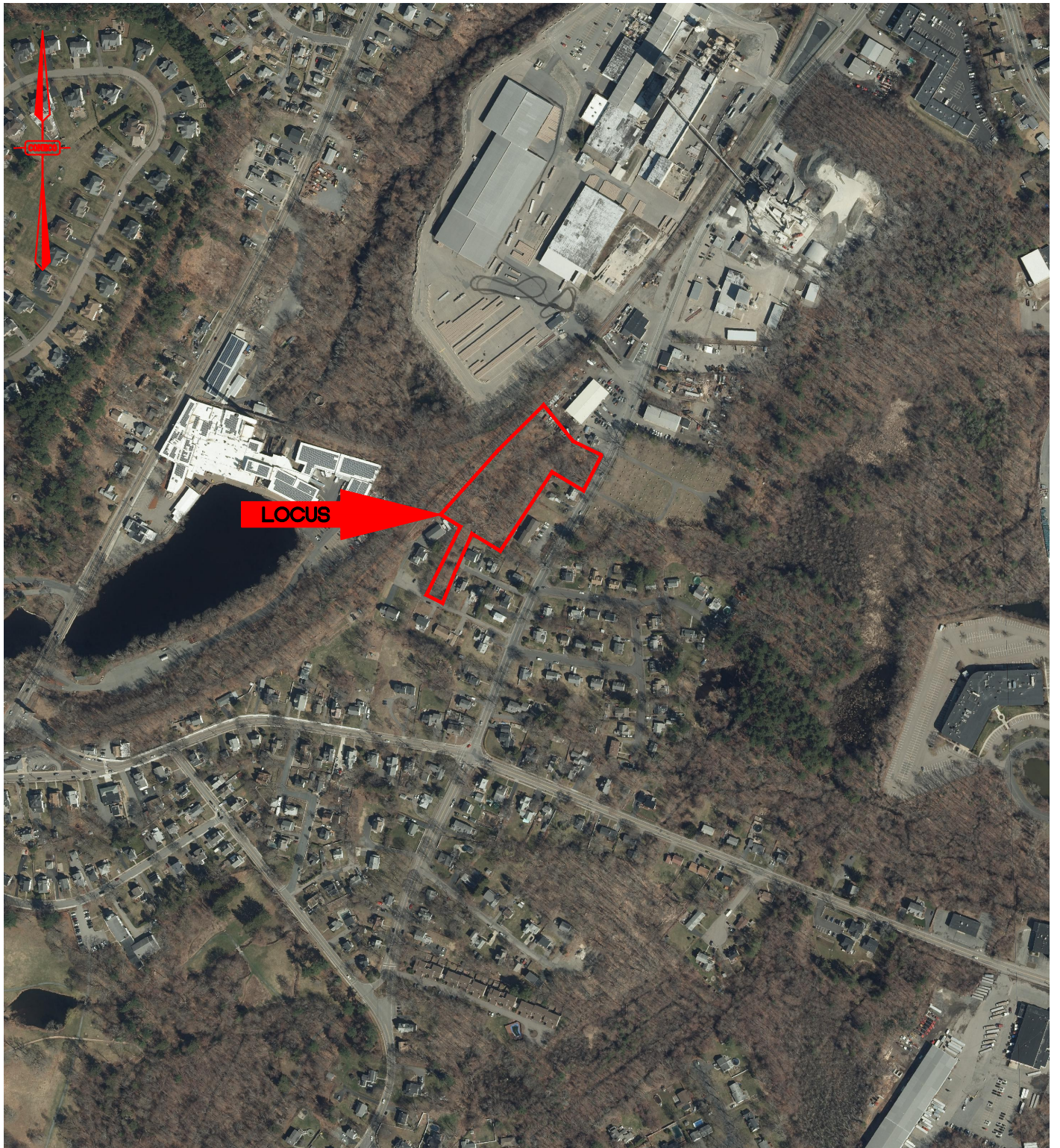
FIGURE 4 - NATURAL HERITAGE MAP

FIGURE 5 - CRITICAL AREAS

FIGURE 6 - SOIL SURVEY MAP

FIGURE 7 - EXISTING DRAINAGE AREAS

FIGURE 8 - PROPOSED DRAINAGE AREAS



NOTES:

1. INFORMATION ON THESE FIGURES WERE OBTAINED FROM BUREAU OF GEOGRAPHIC INFORMATION (MASSGIS), COMMONWEALTH OF MASSACHUSETTS, EXECUTIVE OFFICE OF TECHNOLOGY AND SECURITY SERVICES.
2. 2021 AERIAL IMAGERY, SPRING 2021.

5 PLEASANT STREET, WALPOLE, MA 02032



PREPARED FOR:

NEPONSET VILLAGE, LLC

PLAN SET:

REPORT FIGURES

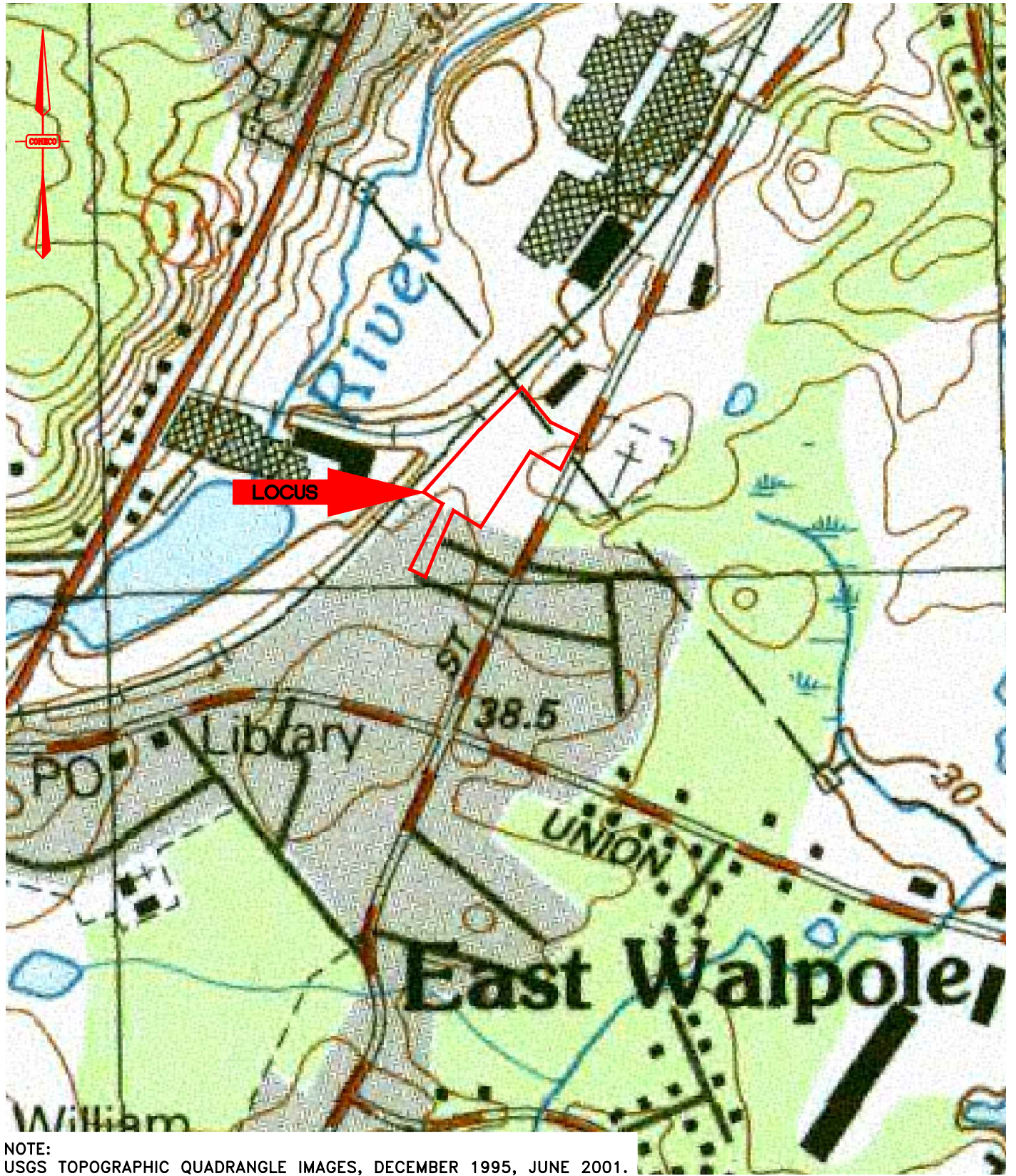
SCALE
1" = 500'

DATE
08/30/2023

PROJECT NO.
10365.0

TITLE:

FIGURE 1
AERIAL MAP



NOTE:
USGS TOPOGRAPHIC QUADRANGLE IMAGES, DECEMBER 1995, JUNE 2001.

5 PLEASANT STREET, WALPOLE, MA 02032



PREPARED FOR:
NEPONSET VILLAGE, LLC

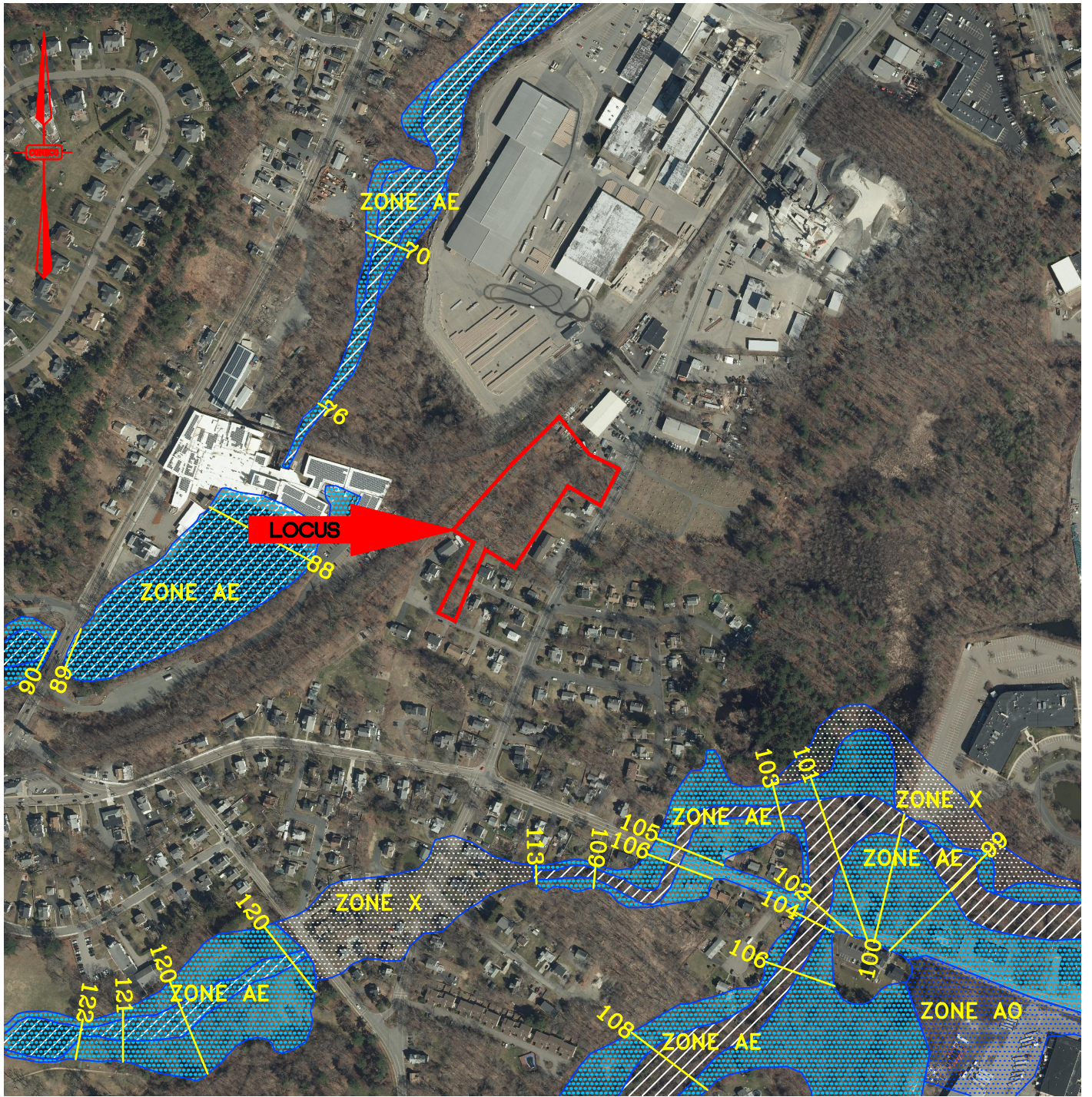
PLAN SET:
REPORT FIGURES





SCALE
1" = 500'

DATE
08/30/2023

PROJECT NO.
10365.0

TITLE:
FIGURE 2
USGS TOPOGRAPHIC
MAP



-  FLOOD ZONE X, AREAS BETWEEN THE LIMITS OF 100-YEAR AND 500-YEAR FLOODS
-  FLOOD ZONE AE, AREAS OF 100-YEAR FLOOD, BASE FLOOD ELEVATIONS DETERMINED
-  FLOODWAY AREAS IN ZONE AE
-  FLOOD ZONE AO, AREAS OF 100-YEAR FLOOD, SHEET FLOW FLOOD DEPTHS OF 1 TO 3 FEET

NOTE:

1. FEMA NATIONAL FLOOD HAZARD LAYER JULY 2017
2. FEMA FLOOD INSURANCE RATE MAP FOR NORFOLK COUNTY COMMUNITY MAP NO. 25021C0187E, EFFECTIVE JULY 17, 2012.

5 PLEASANT STREET, WALPOLE, MA 02032



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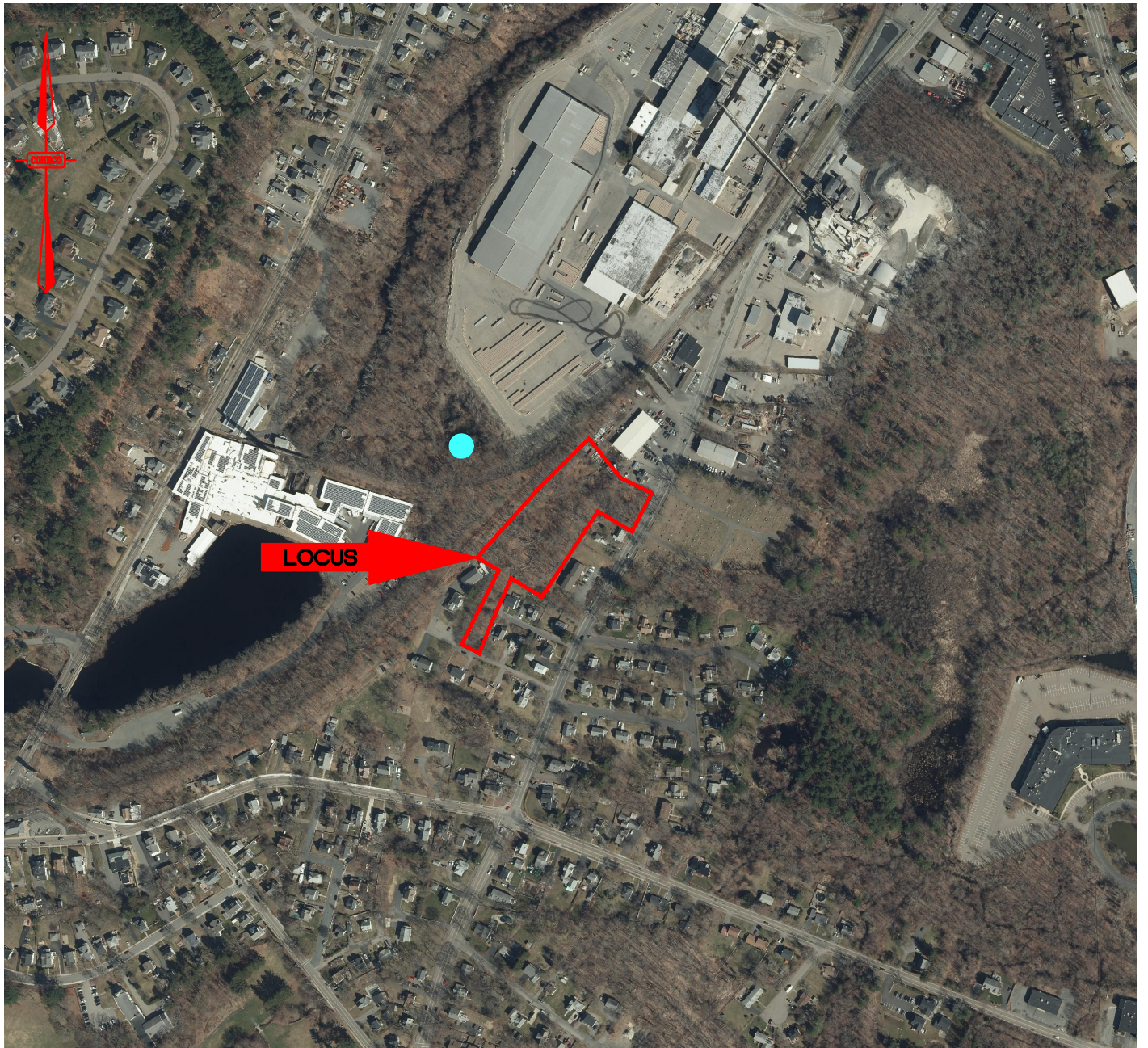
PLAN SET:
REPORT FIGURES

SCALE
1" = 500'

DATE
08/30/2023

PROJECT NO.
10365.0

TITLE:
FIGURE 3
FLOOD INSURANCE
RATE MAP



PRIORITY HABITAT OF RARE SPECIES



CERTIFIED VERNAL POOLS



ESTIMATED HABITATS OF RARE WILDLIFE



POTENTIAL VERNAL POOLS

NOTES:

1. ESTIMATED HABITATS OF RARE WILDLIFE AND PRIORITY HABITATS OF RARE SPECIES CAME FROM MASSGIS DATABASE LAST UPDATED AUGUST 2017.
2. CERTIFIED VERNAL POOL LOCATIONS WERE TAKEN FROM MASSGIS DATABASE ON JANUARY 18, 2023. THIS DATA IS UPDATED CONTINUALLY AND SHOWN CONDITIONS MAY VARY FROM THIS DATA.
3. POTENTIAL VERNAL POOL LOCATIONS WERE TAKEN FROM MASSGIS DATABASE LAST UPDATED DECEMBER 2000.
4. THERE ARE NO ESTIMATED HABITATS OF RARE WILDLIFE, PRIORITY HABITATS OF RARE SPECIES, POTENTIAL VERNAL POOLS, OR CERTIFIED VERNAL POOLS ON THE PROJECT SITE.

5 PLEASANT STREET, WALPOLE, MA 02032



PREPARED FOR:

NEPONSET VILLAGE, LLC

PLAN SET:

REPORT FIGURES

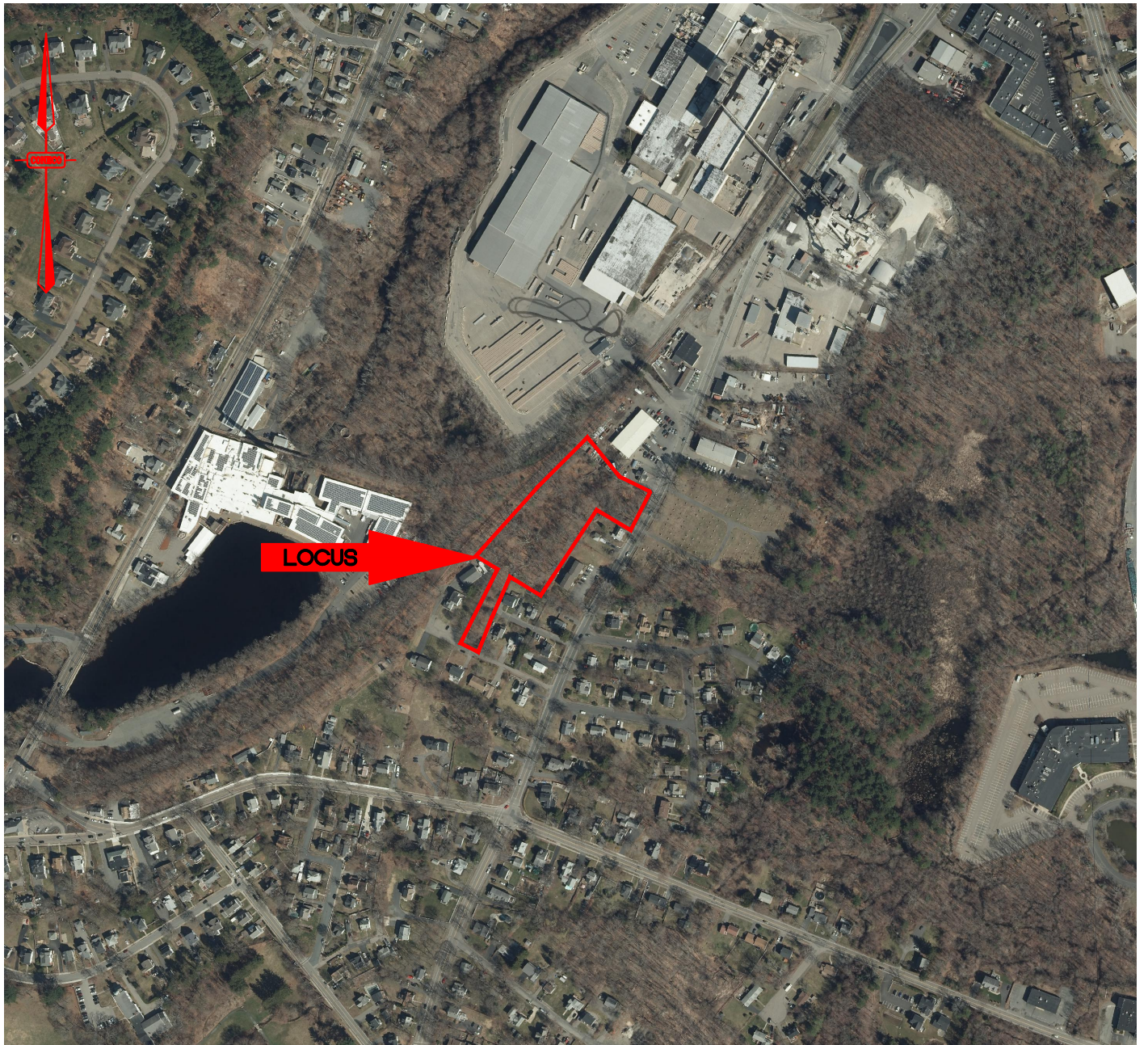
SCALE
1" = 500'

DATE
08/30/2023

PROJECT NO.
10365.0

TITLE:

FIGURE 4
NATURAL HERITAGE MAP

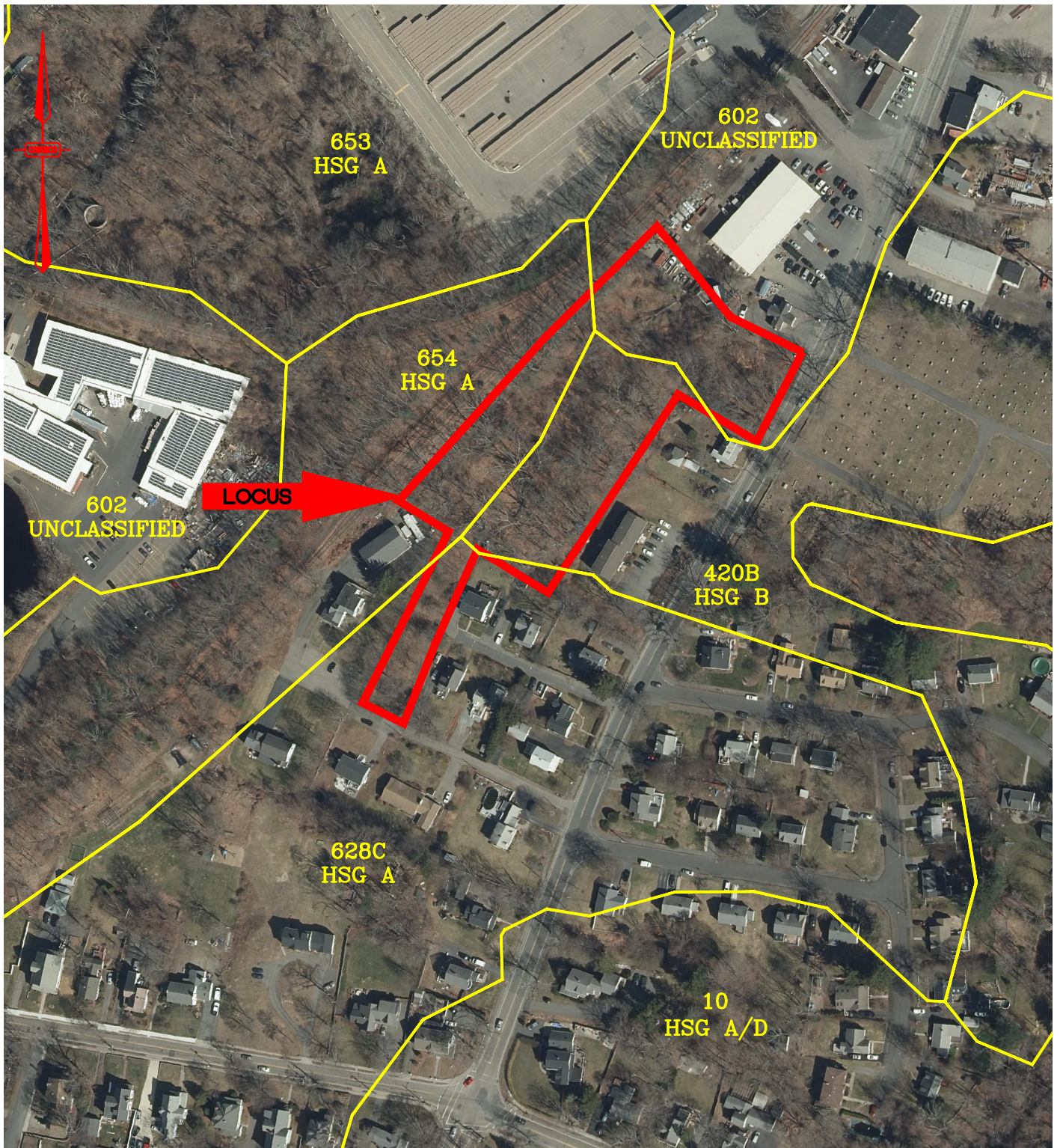


- NOTES:**
1. AREAS OF CRITICAL ENVIRONMENTAL CONCERN WERE TAKEN FROM MASSGIS DATABASE, LAST UPDATED APRIL 2009.
 2. WELLHEAD PROTECTION AREAS WERE TAKEN FROM MASSGIS DATEBASE, LAST UPDATED FEBRUARY 2023.
 3. OUTSTANDING RESOURCE WATERS WERE TAKEN FROM MASSGIS DATEBASE, LAST UPDATED MARCH 2010.
 4. SURFACE WATER SUPPLY PROTECTION AREAS WERE TAKEN FROM MASSGIS DATEBASE, LAST UPDATED APRIL 2017
 5. THERE ARE NO AREAS OF CRITICAL ENVIRONMENTAL CONCERN, WELLHEAD PROTECTION AREAS, OUTSTANDING RESOURCE WATERS, OR SURFACE WATER SUPPLY PROTECTION AREAS ON THIS PROJECT SITE.

5 PLEASANT STREET, WALPOLE, MA 02032



PREPARED FOR: NEPONSET VILLAGE, LLC		PLAN SET: REPORT FIGURES	
SCALE 1" = 500'	DATE 08/30/2023	PROJECT NO. 10365.0	TITLE: FIGURE 5 CRITICAL AREAS



NOTE:
 INFORMATION ON THIS PLAN WAS OBTAINED FROM THE MASSGIS DATABASE, NRCS SSURGO – CERTIFIED SOILS
 WHICH WAS LAST UPDATED NOVEMBER 2012.

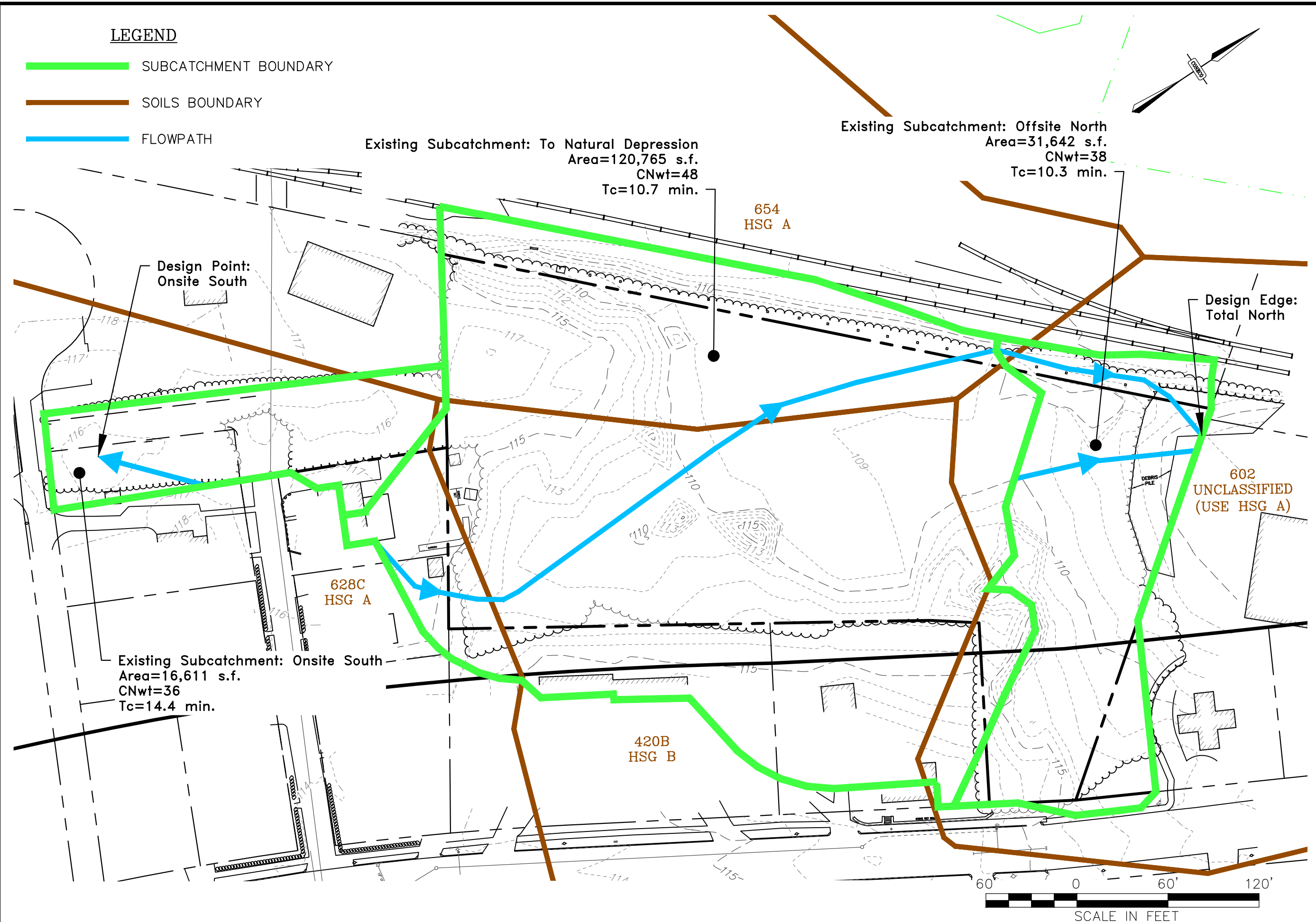
5 PLEASANT STREET, WALPOLE, MA 02032



PREPARED FOR: NEPONSET VILLAGE, LLC		PLAN SET: REPORT FIGURES	
SCALE 1" = 200'	DATE 08/30/2023	PROJECT NO. 10365.0	TITLE: FIGURE 6 SOIL SURVEY MAP

LEGEND

- SUBCATCHMENT BOUNDARY
- SOILS BOUNDARY
- FLOWPATH



NO.	DATE	DESCRIPTION
1	11/17/23	PEER REVIEW COMMENTS

PREPARED FOR:
NEPONSET VILLAGE, LLC
 P.O. BOX 206
 ABINGTON, MA 02351

PROJECT:
NEPONSET VILLAGE
 5 PLEASANT STREET
 WALPOLE, MA 02032

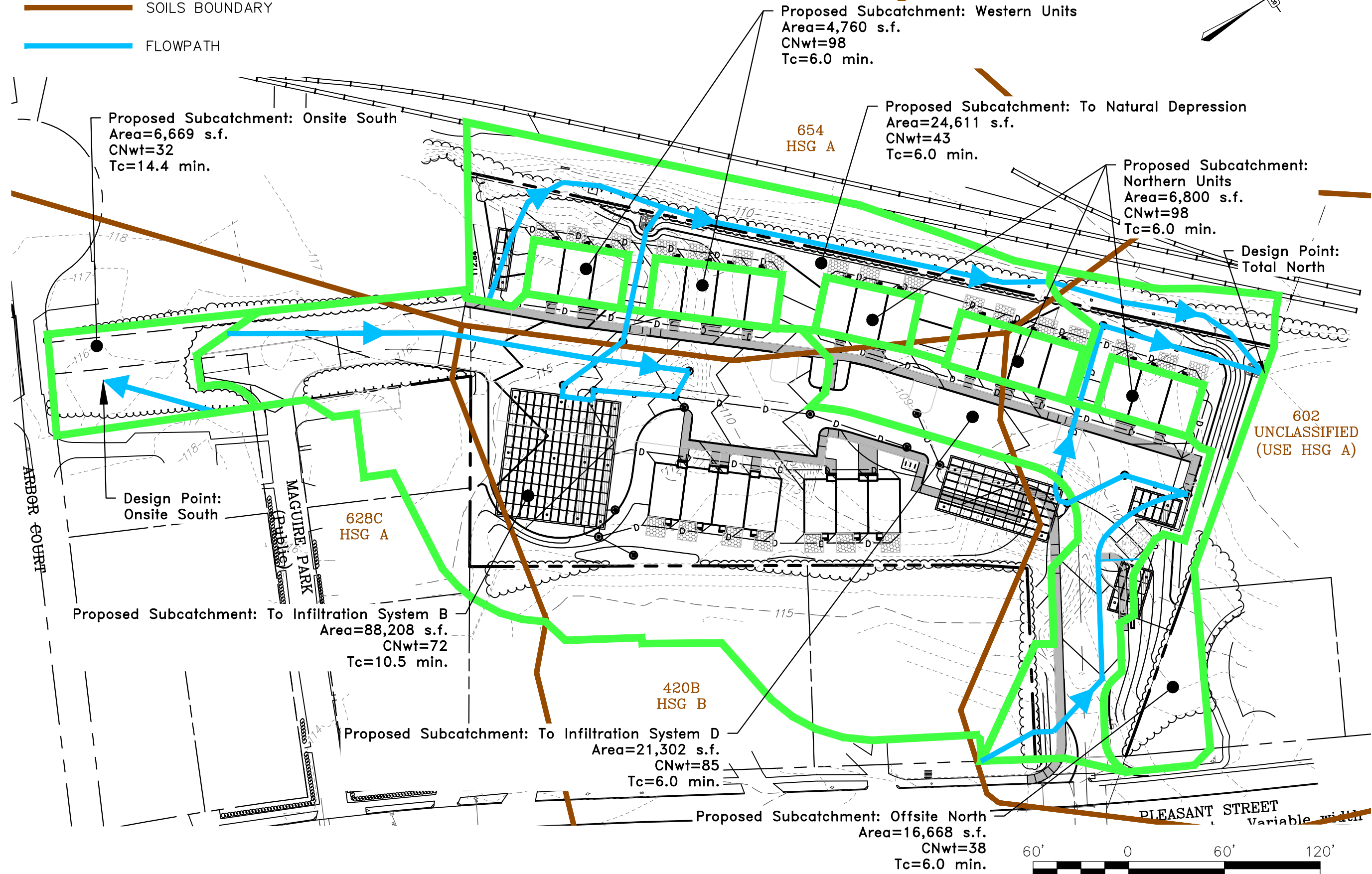
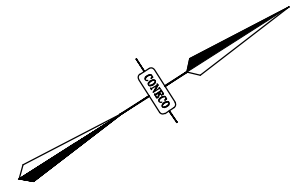
CONECO
 Engineers & Scientists
 PHONE: 800-548-3355 WEBSITE: www.coneco.com

DATE: 11/17/2023
 DRAWN/CHECK: BTM/DJD
 SCALE: 1" = 60'
 PROJECT NO. 10365.0

FIGURE NO.
Figure 7

LEGEND

- ▬ SUBCATCHMENT BOUNDARY
- ▬ SOILS BOUNDARY
- ▬ FLOWPATH



NO.	DATE	DESCRIPTION	DR/CK
1	11/17/23	PEER REVIEW COMMENTS	BTM/DJD
2	12/27/23	TOWN COMMENTS	MSD/DJD
3	4/30/24	ROADWAY LAYOUT MODIFICATIONS	DJD/MSD

PREPARED FOR:
NEPONSET VILLAGE, LLC
P.O. BOX 206
ABINGTON, MA 02351

PROJECT:
NEPONSET VILLAGE
5 PLEASANT STREET
WALPOLE, MA 02032

PLAN SET:
REPORT FIGURES

DRAWING:
PROPOSED DRAINAGE AREAS



DATE: 11/17/2023
DRAWN/CHECK: BTM/DJD
SCALE: 1" = 60'
PROJECT NO. 10365.0

FIGURE NO.
Figure 8

APPENDIX A

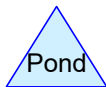
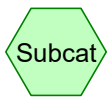
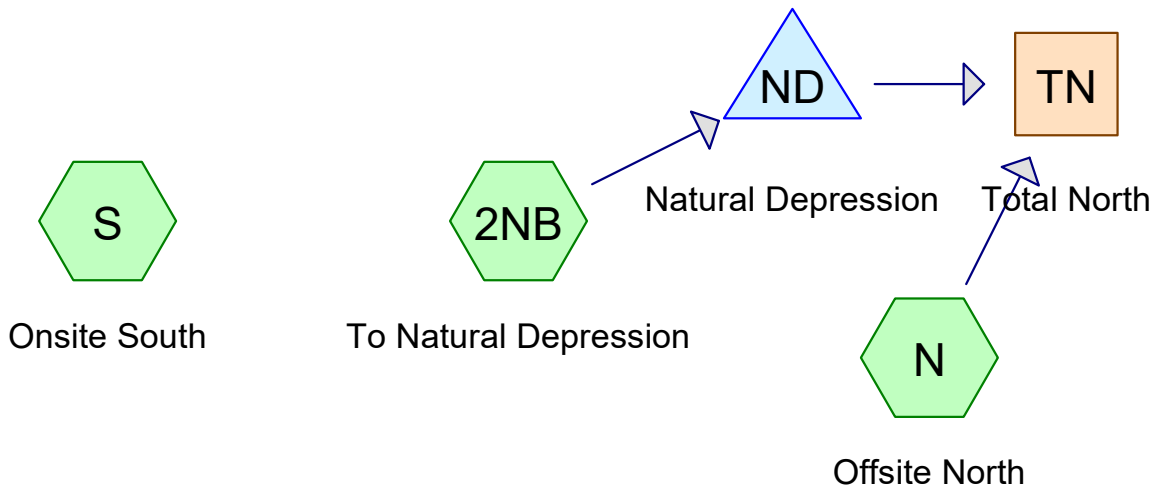
EXISTING HYDROLOGICAL CONDITIONS

2-YEAR STORM EVENT

10-YEAR STORM EVENT

25-YEAR STORM EVENT

100-YEAR STORM EVENT



10365 - Pleasant Street - Walpole -Existing Condition

Prepared by Coneco Engineers & Scientists

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Printed 4/29/2024

Page 2

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	Type III 24-hr		Default	24.00	1	3.20	2
2	10-Year	Type III 24-hr		Default	24.00	1	4.70	2
3	25-Year	Type III 24-hr		Default	24.00	1	5.50	2
4	100-Year	Type III 24-hr		Default	24.00	1	6.70	2

Summary for Subcatchment 2NB: To Natural Depression

Runoff = 0.03 cfs @ 14.87 hrs, Volume= 535 cf, Depth> 0.05"
 Routed to Pond ND : Natural Depression

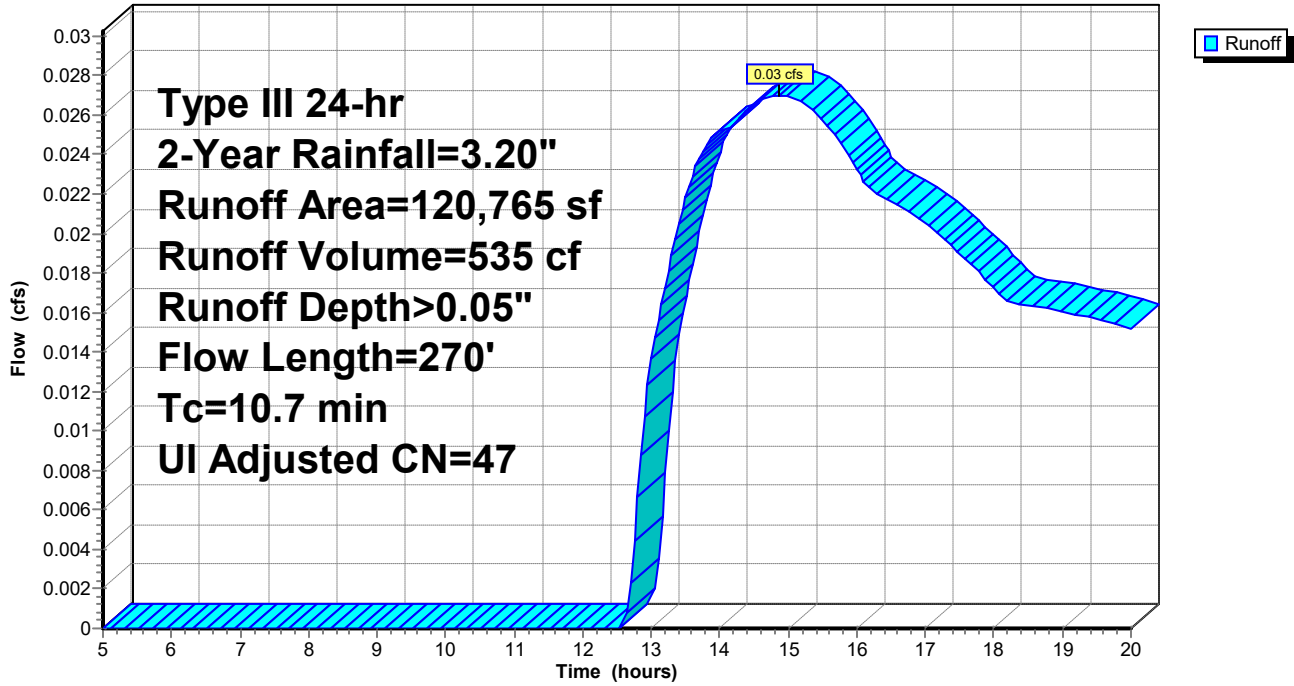
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Adj	Description
35,288	30		Woods, Good, HSG A
16,322	39		>75% Grass cover, Good, HSG A
1,290	98		Unconnected pavement, HSG A
45,809	55		Woods, Good, HSG B
19,907	61		>75% Grass cover, Good, HSG B
2,149	98		Unconnected roofs, HSG B
120,765	48	47	Weighted Average, UI Adjusted
117,326			97.15% Pervious Area
3,439			2.85% Impervious Area
3,439			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.20		Sheet Flow, AB-Grass Grass: Short n= 0.150 P2= 3.20"
1.1	76	0.0533	1.15		Shallow Concentrated Flow, BC-Woods Woodland Kv= 5.0 fps
5.3	144	0.0083	0.46		Shallow Concentrated Flow, CD-Woods Woodland Kv= 5.0 fps
10.7	270	Total			

Subcatchment 2NB: To Natural Depression

Hydrograph



Summary for Subcatchment N: Offsite North

Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Depth= 0.00"
 Routed to Reach TN : Total North

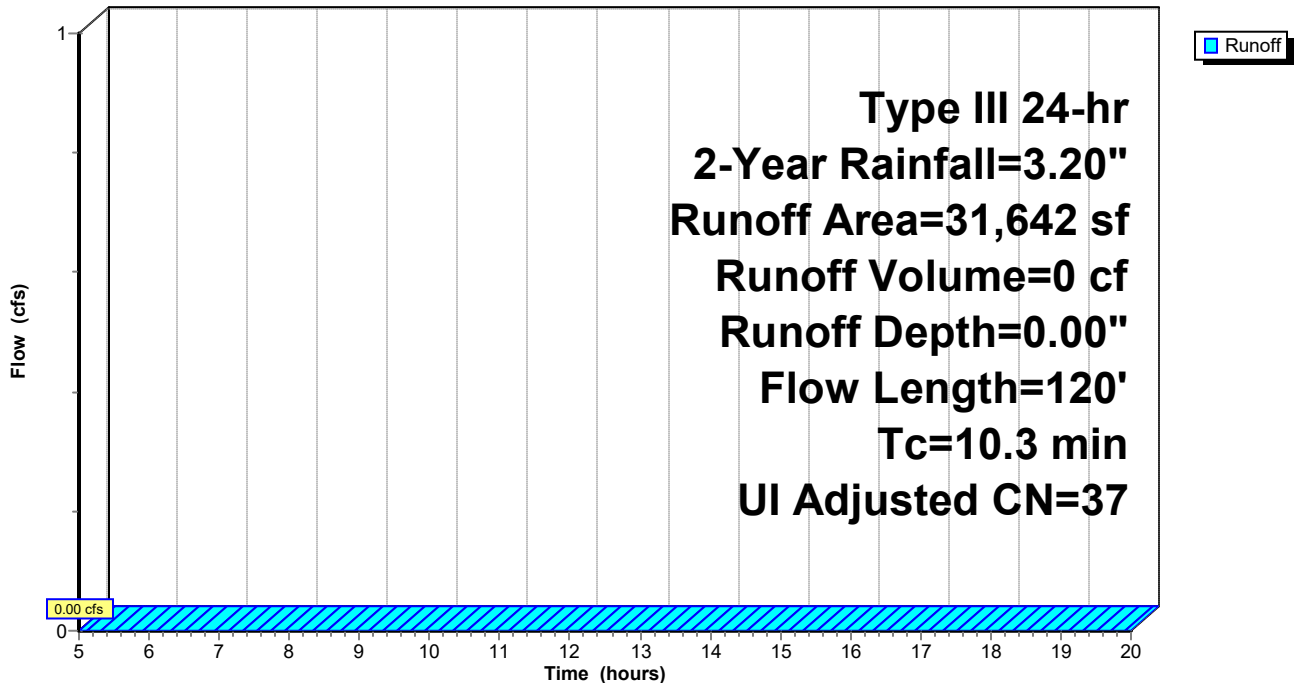
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Adj	Description
25,134	30		Woods, Good, HSG A
2,727	39		>75% Grass cover, Good, HSG A
3,154	85		Gravel roads, HSG B
627	98		Unconnected pavement, HSG A
31,642	38	37	Weighted Average, UI Adjusted
31,015			98.02% Pervious Area
627			1.98% Impervious Area
627			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		Sheet Flow, AB-Woods Woods: Light underbrush n= 0.400 P2= 3.20"
1.0	70	0.0500	1.12		Shallow Concentrated Flow, BC-Woods Woodland Kv= 5.0 fps
10.3	120	Total			

Subcatchment N: Offsite North

Hydrograph



Summary for Subcatchment S: Onsite South

Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Depth= 0.00"
 Routed to nonexistent node 2P

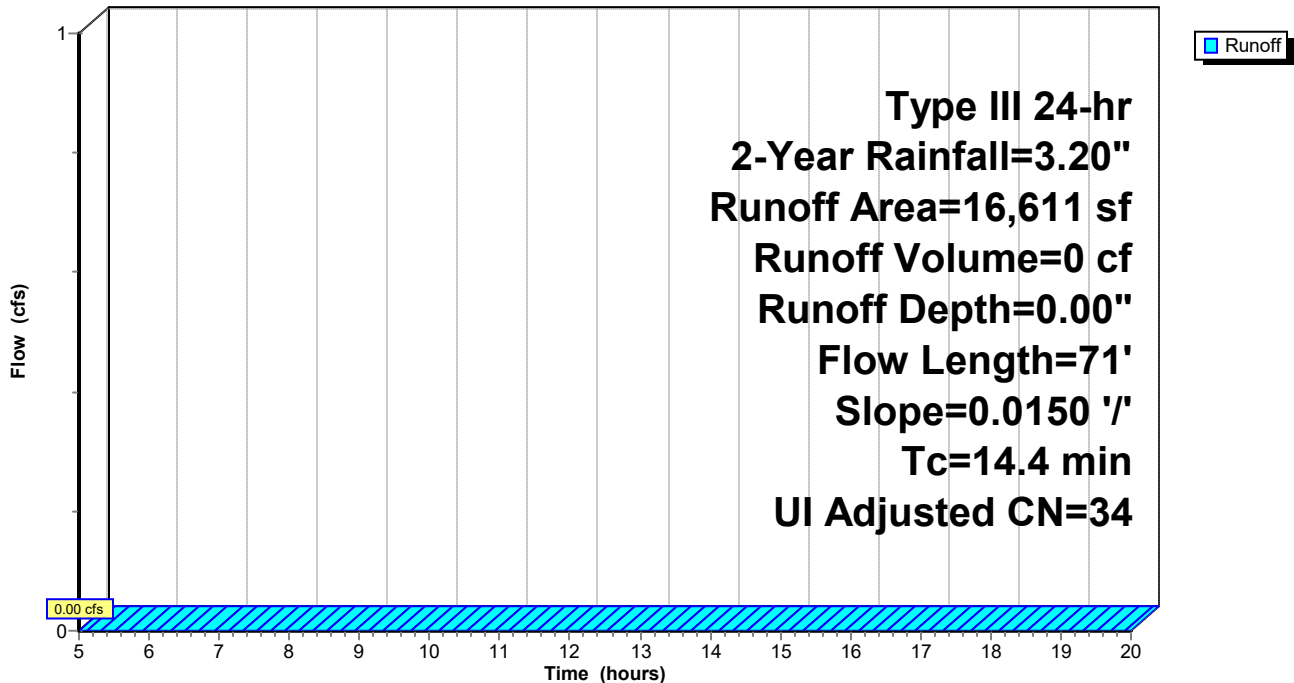
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Adj	Description
13,154	30		Woods, Good, HSG A
2,356	39		>75% Grass cover, Good, HSG A
1,033	98		Unconnected roofs, HSG A
68	55		Woods, Good, HSG B
16,611	36	34	Weighted Average, UI Adjusted
15,578			93.78% Pervious Area
1,033			6.22% Impervious Area
1,033			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.8	50	0.0150	0.06		Sheet Flow, AB-Woods Woods: Light underbrush n= 0.400 P2= 3.20"
0.6	21	0.0150	0.61		Shallow Concentrated Flow, BC-Woods Woodland Kv= 5.0 fps
14.4	71	Total			

Subcatchment S: Onsite South

Hydrograph

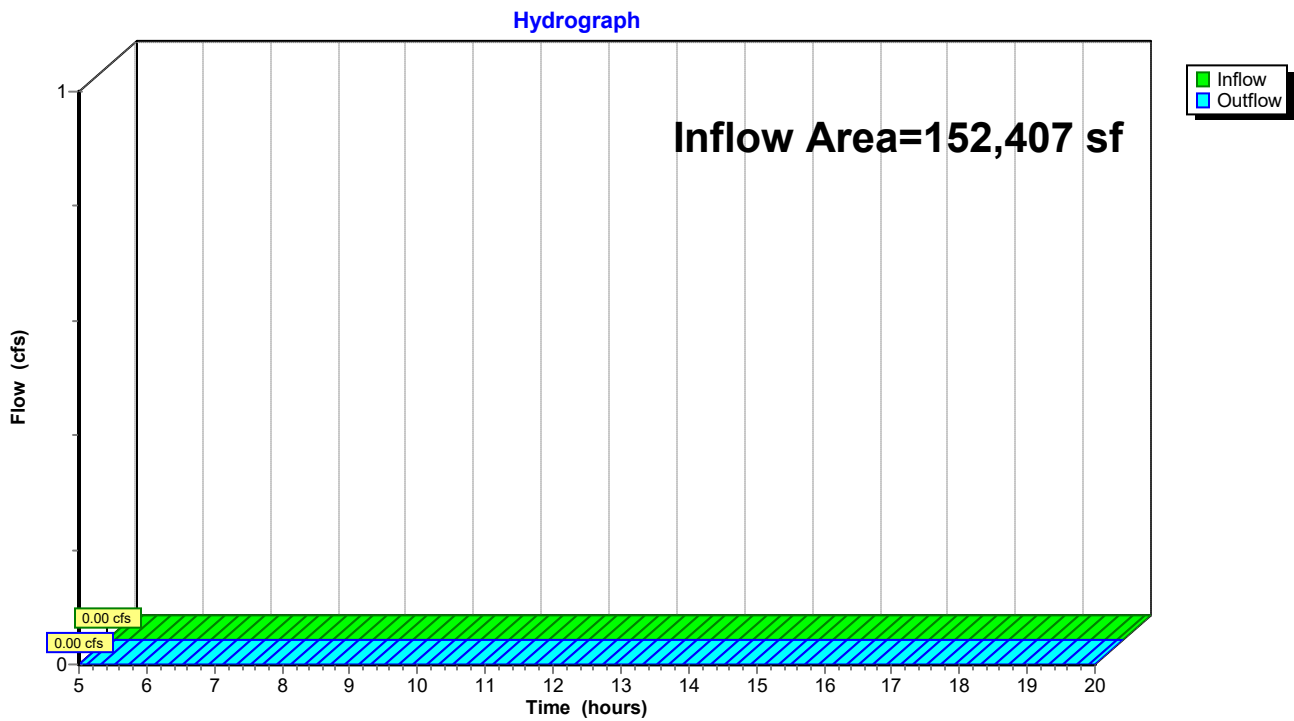


Summary for Reach TN: Total North

Inflow Area = 152,407 sf, 2.67% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0 cf
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach TN: Total North



Summary for Pond ND: Natural Depression

Inflow Area = 120,765 sf, 2.85% Impervious, Inflow Depth > 0.05" for 2-Year event
 Inflow = 0.03 cfs @ 14.87 hrs, Volume= 535 cf
 Outflow = 0.02 cfs @ 17.95 hrs, Volume= 355 cf, Atten= 36%, Lag= 185.2 min
 Discarded = 0.02 cfs @ 17.95 hrs, Volume= 355 cf
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf
 Routed to Reach TN : Total North

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 108.02' @ 17.95 hrs Surf.Area= 736 sf Storage= 188 cf

Plug-Flow detention time= 124.4 min calculated for 354 cf (66% of inflow)
 Center-of-Mass det. time= 54.2 min (1,023.8 - 969.6)

Volume	Invert	Avail.Storage	Storage Description			
#1	108.00'	15,537 cf	Custom Stage Data (Irregular) Listed below			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
108.00	235	88.4	0	0	235	
109.00	22,339	964.5	8,288	8,288	73,643	
109.30	26,033	945.2	7,249	15,537	76,590	

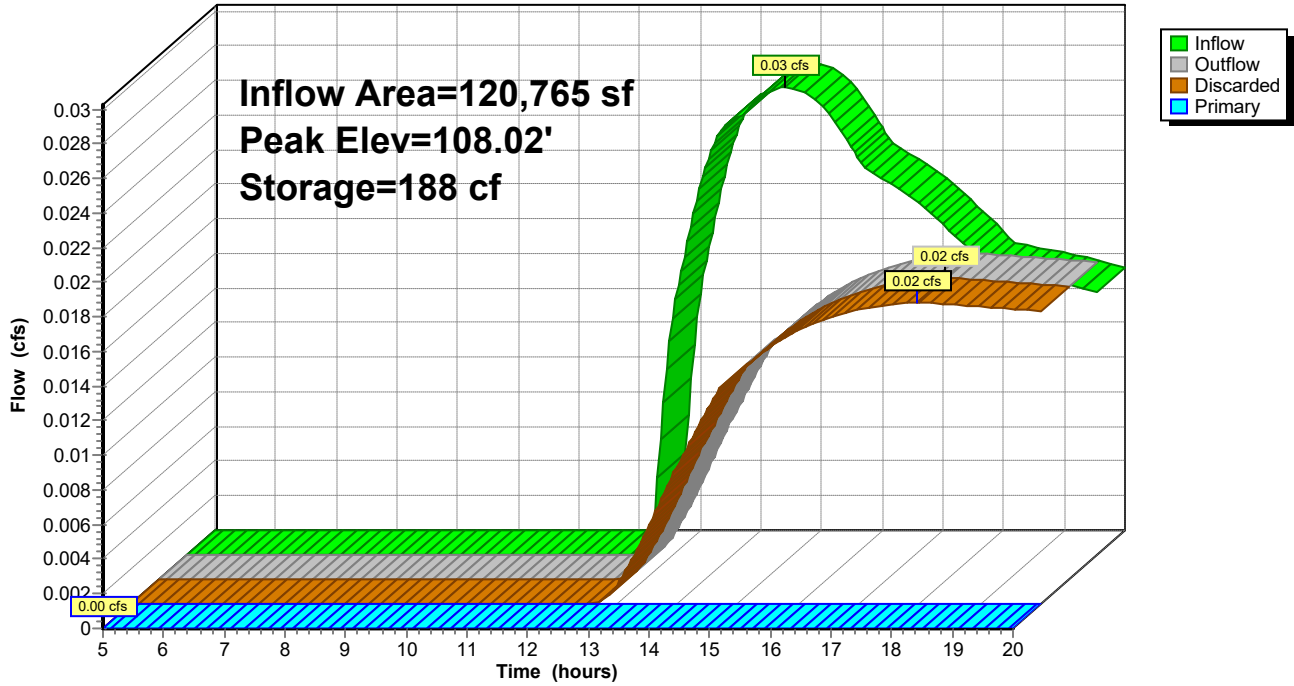
Device	Routing	Invert	Outlet Devices									
#1	Primary	109.00'	2.0' long x 10.0' breadth Broad-Crested Rectangular Weir									
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60									
			Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64									
#2	Discarded	108.00'	1.020 in/hr Exfiltration over Surface area									

Discarded OutFlow Max=0.02 cfs @ 17.95 hrs HW=108.02' (Free Discharge)
 ↑**2=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=108.00' (Free Discharge)
 ↑**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond ND: Natural Depression

Hydrograph



Stage-Area-Storage for Pond ND: Natural Depression

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
108.00	235	0	109.04	22,832	9,255
108.02	677	166	109.06	23,078	9,738
108.04	1,119	332	109.08	23,324	10,221
108.06	1,561	497	109.10	23,570	10,705
108.08	2,003	663	109.12	23,817	11,188
108.10	2,445	829	109.14	24,063	11,671
108.12	2,887	995	109.16	24,309	12,154
108.14	3,330	1,160	109.18	24,555	12,638
108.16	3,772	1,326	109.20	24,802	13,121
108.18	4,214	1,492	109.22	25,048	13,604
108.20	4,656	1,658	109.24	25,294	14,087
108.22	5,098	1,823	109.26	25,540	14,571
108.24	5,540	1,989	109.28	25,787	15,054
108.26	5,982	2,155	109.30	26,033	15,537
108.28	6,424	2,321			
108.30	6,866	2,487			
108.32	7,308	2,652			
108.34	7,750	2,818			
108.36	8,192	2,984			
108.38	8,635	3,150			
108.40	9,077	3,315			
108.42	9,519	3,481			
108.44	9,961	3,647			
108.46	10,403	3,813			
108.48	10,845	3,978			
108.50	11,287	4,144			
108.52	11,729	4,310			
108.54	12,171	4,476			
108.56	12,613	4,642			
108.58	13,055	4,807			
108.60	13,497	4,973			
108.62	13,939	5,139			
108.64	14,382	5,305			
108.66	14,824	5,470			
108.68	15,266	5,636			
108.70	15,708	5,802			
108.72	16,150	5,968			
108.74	16,592	6,133			
108.76	17,034	6,299			
108.78	17,476	6,465			
108.80	17,918	6,631			
108.82	18,360	6,796			
108.84	18,802	6,962			
108.86	19,244	7,128			
108.88	19,687	7,294			
108.90	20,129	7,460			
108.92	20,571	7,625			
108.94	21,013	7,791			
108.96	21,455	7,957			
108.98	21,897	8,123			
109.00	22,339	8,288			
109.02	22,585	8,772			

Summary for Subcatchment 2NB: To Natural Depression

Runoff = 0.54 cfs @ 12.37 hrs, Volume= 3,717 cf, Depth> 0.37"

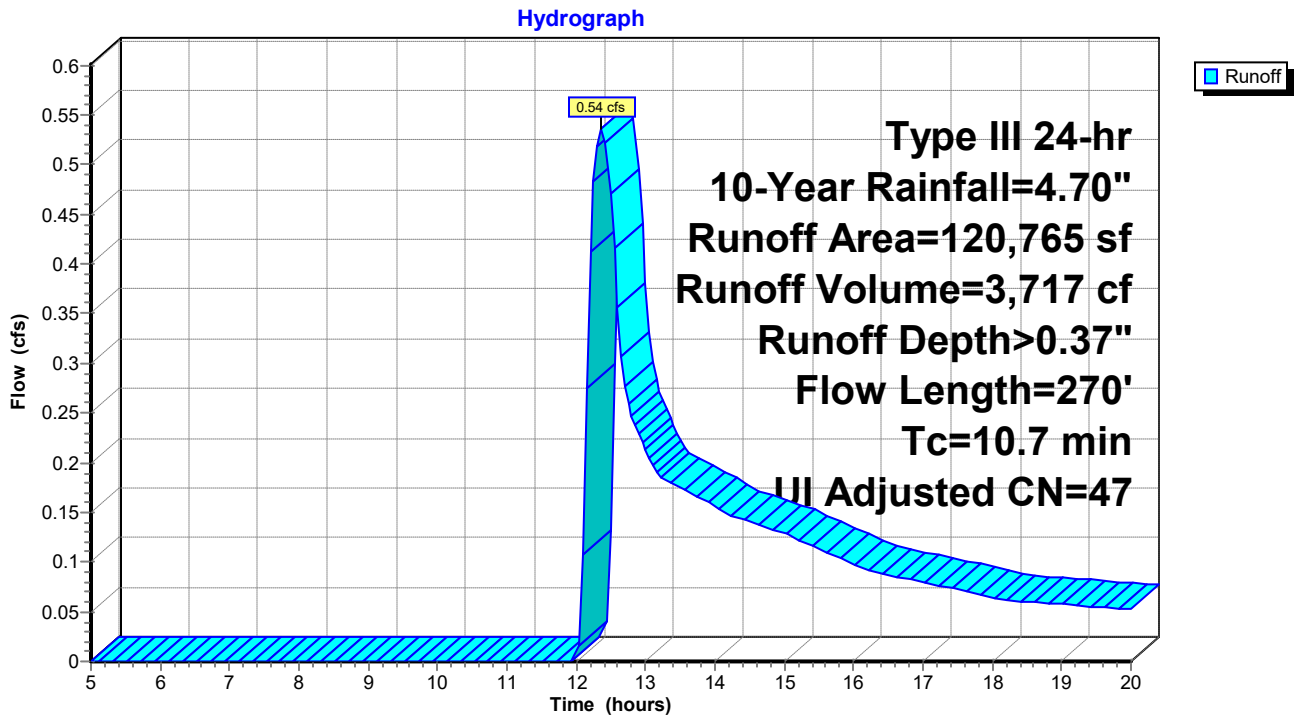
Routed to Pond ND : Natural Depression

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Adj	Description
35,288	30		Woods, Good, HSG A
16,322	39		>75% Grass cover, Good, HSG A
1,290	98		Unconnected pavement, HSG A
45,809	55		Woods, Good, HSG B
19,907	61		>75% Grass cover, Good, HSG B
2,149	98		Unconnected roofs, HSG B
120,765	48	47	Weighted Average, UI Adjusted
117,326			97.15% Pervious Area
3,439			2.85% Impervious Area
3,439			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.20		Sheet Flow, AB-Grass Grass: Short n= 0.150 P2= 3.20"
1.1	76	0.0533	1.15		Shallow Concentrated Flow, BC-Woods Woodland Kv= 5.0 fps
5.3	144	0.0083	0.46		Shallow Concentrated Flow, CD-Woods Woodland Kv= 5.0 fps
10.7	270	Total			

Subcatchment 2NB: To Natural Depression



Summary for Subcatchment N: Offsite North

Runoff = 0.01 cfs @ 15.04 hrs, Volume= 171 cf, Depth> 0.06"
 Routed to Reach TN : Total North

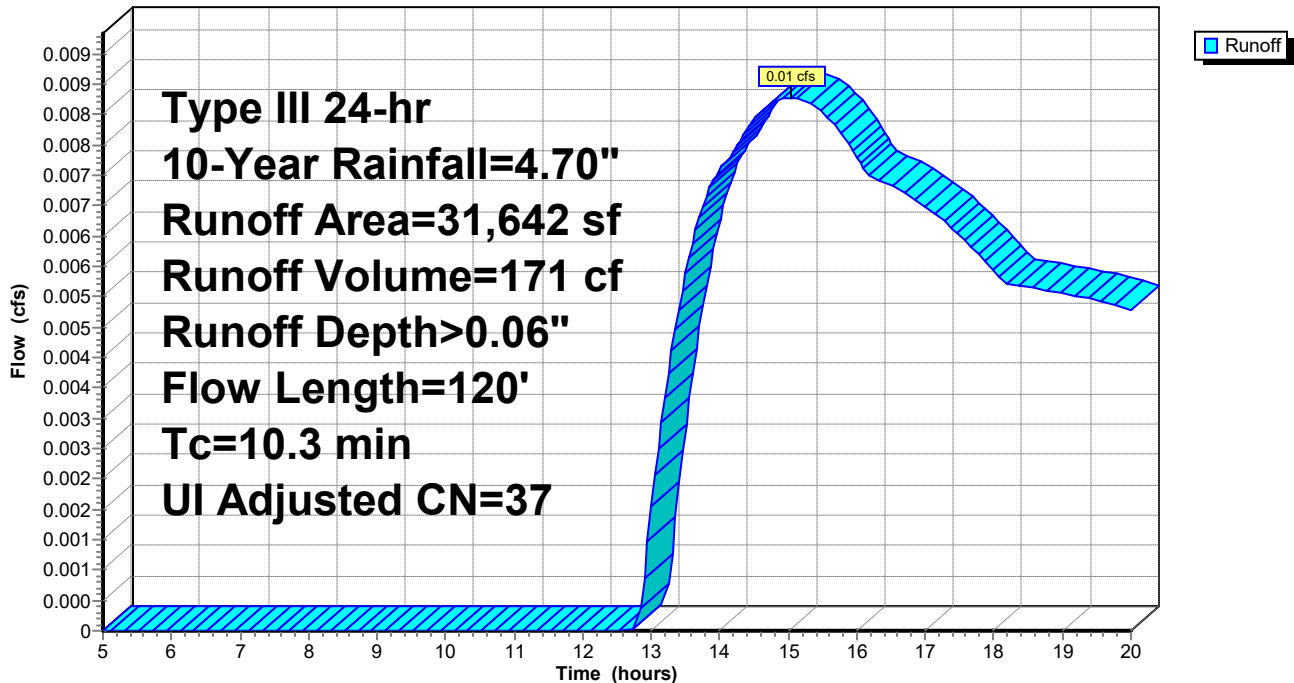
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Adj	Description
25,134	30		Woods, Good, HSG A
2,727	39		>75% Grass cover, Good, HSG A
3,154	85		Gravel roads, HSG B
627	98		Unconnected pavement, HSG A
31,642	38	37	Weighted Average, UI Adjusted
31,015			98.02% Pervious Area
627			1.98% Impervious Area
627			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		Sheet Flow, AB-Woods Woods: Light underbrush n= 0.400 P2= 3.20"
1.0	70	0.0500	1.12		Shallow Concentrated Flow, BC-Woods Woodland Kv= 5.0 fps
10.3	120	Total			

Subcatchment N: Offsite North

Hydrograph



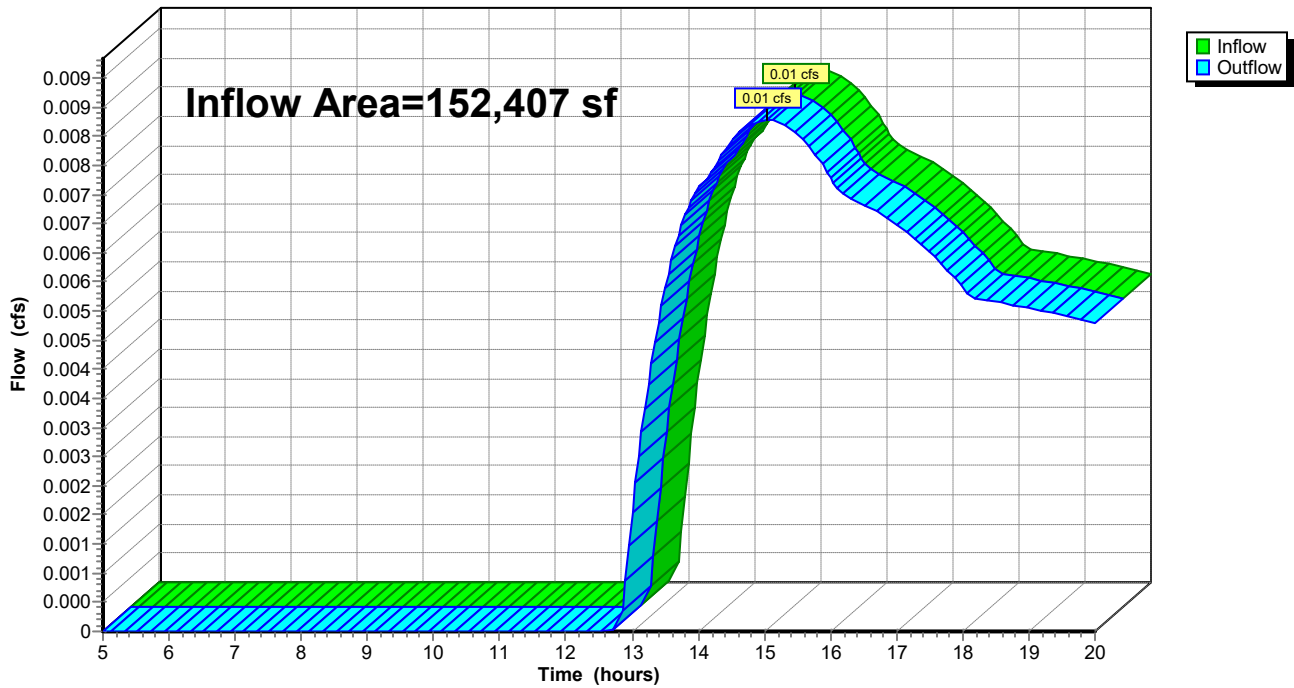
Summary for Reach TN: Total North

Inflow Area = 152,407 sf, 2.67% Impervious, Inflow Depth > 0.01" for 10-Year event
Inflow = 0.01 cfs @ 15.04 hrs, Volume= 171 cf
Outflow = 0.01 cfs @ 15.04 hrs, Volume= 171 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach TN: Total North

Hydrograph



Summary for Pond ND: Natural Depression

Inflow Area = 120,765 sf, 2.85% Impervious, Inflow Depth > 0.37" for 10-Year event
 Inflow = 0.54 cfs @ 12.37 hrs, Volume= 3,717 cf
 Outflow = 0.10 cfs @ 15.81 hrs, Volume= 2,521 cf, Atten= 81%, Lag= 206.4 min
 Discarded = 0.10 cfs @ 15.81 hrs, Volume= 2,521 cf
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf
 Routed to Reach TN : Total North

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 108.19' @ 15.81 hrs Surf.Area= 4,411 sf Storage= 1,566 cf

Plug-Flow detention time= 174.8 min calculated for 2,521 cf (68% of inflow)
 Center-of-Mass det. time= 96.0 min (976.8 - 880.8)

Volume	Invert	Avail.Storage	Storage Description			
#1	108.00'	15,537 cf	Custom Stage Data (Irregular) Listed below			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
108.00	235	88.4	0	0	235	
109.00	22,339	964.5	8,288	8,288	73,643	
109.30	26,033	945.2	7,249	15,537	76,590	

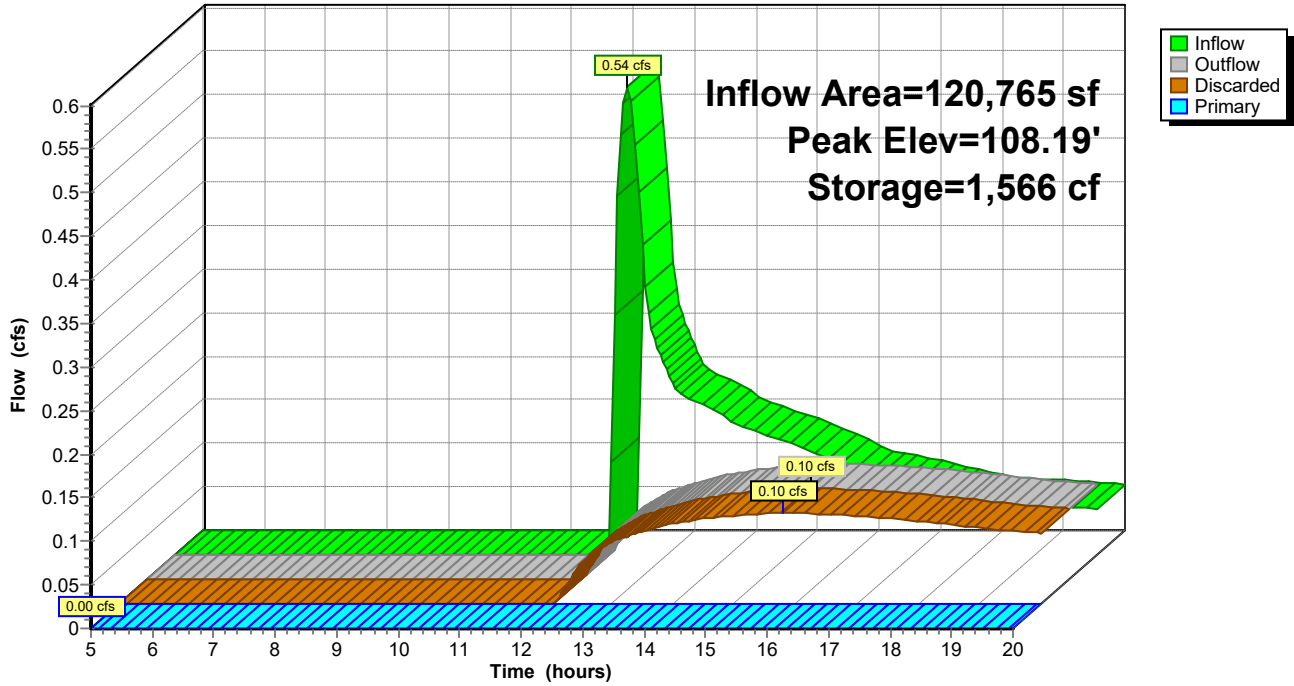
Device	Routing	Invert	Outlet Devices									
#1	Primary	109.00'	2.0' long x 10.0' breadth Broad-Crested Rectangular Weir									
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60									
			Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64									
#2	Discarded	108.00'	1.020 in/hr Exfiltration over Surface area									

Discarded OutFlow Max=0.10 cfs @ 15.81 hrs HW=108.19' (Free Discharge)
 ↑**2=Exfiltration** (Exfiltration Controls 0.10 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=108.00' (Free Discharge)
 ↑**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond ND: Natural Depression

Hydrograph



Stage-Area-Storage for Pond ND: Natural Depression

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
108.00	235	0	109.04	22,832	9,255
108.02	677	166	109.06	23,078	9,738
108.04	1,119	332	109.08	23,324	10,221
108.06	1,561	497	109.10	23,570	10,705
108.08	2,003	663	109.12	23,817	11,188
108.10	2,445	829	109.14	24,063	11,671
108.12	2,887	995	109.16	24,309	12,154
108.14	3,330	1,160	109.18	24,555	12,638
108.16	3,772	1,326	109.20	24,802	13,121
108.18	4,214	1,492	109.22	25,048	13,604
108.20	4,656	1,658	109.24	25,294	14,087
108.22	5,098	1,823	109.26	25,540	14,571
108.24	5,540	1,989	109.28	25,787	15,054
108.26	5,982	2,155	109.30	26,033	15,537
108.28	6,424	2,321			
108.30	6,866	2,487			
108.32	7,308	2,652			
108.34	7,750	2,818			
108.36	8,192	2,984			
108.38	8,635	3,150			
108.40	9,077	3,315			
108.42	9,519	3,481			
108.44	9,961	3,647			
108.46	10,403	3,813			
108.48	10,845	3,978			
108.50	11,287	4,144			
108.52	11,729	4,310			
108.54	12,171	4,476			
108.56	12,613	4,642			
108.58	13,055	4,807			
108.60	13,497	4,973			
108.62	13,939	5,139			
108.64	14,382	5,305			
108.66	14,824	5,470			
108.68	15,266	5,636			
108.70	15,708	5,802			
108.72	16,150	5,968			
108.74	16,592	6,133			
108.76	17,034	6,299			
108.78	17,476	6,465			
108.80	17,918	6,631			
108.82	18,360	6,796			
108.84	18,802	6,962			
108.86	19,244	7,128			
108.88	19,687	7,294			
108.90	20,129	7,460			
108.92	20,571	7,625			
108.94	21,013	7,791			
108.96	21,455	7,957			
108.98	21,897	8,123			
109.00	22,339	8,288			
109.02	22,585	8,772			

Summary for Subcatchment 2NB: To Natural Depression

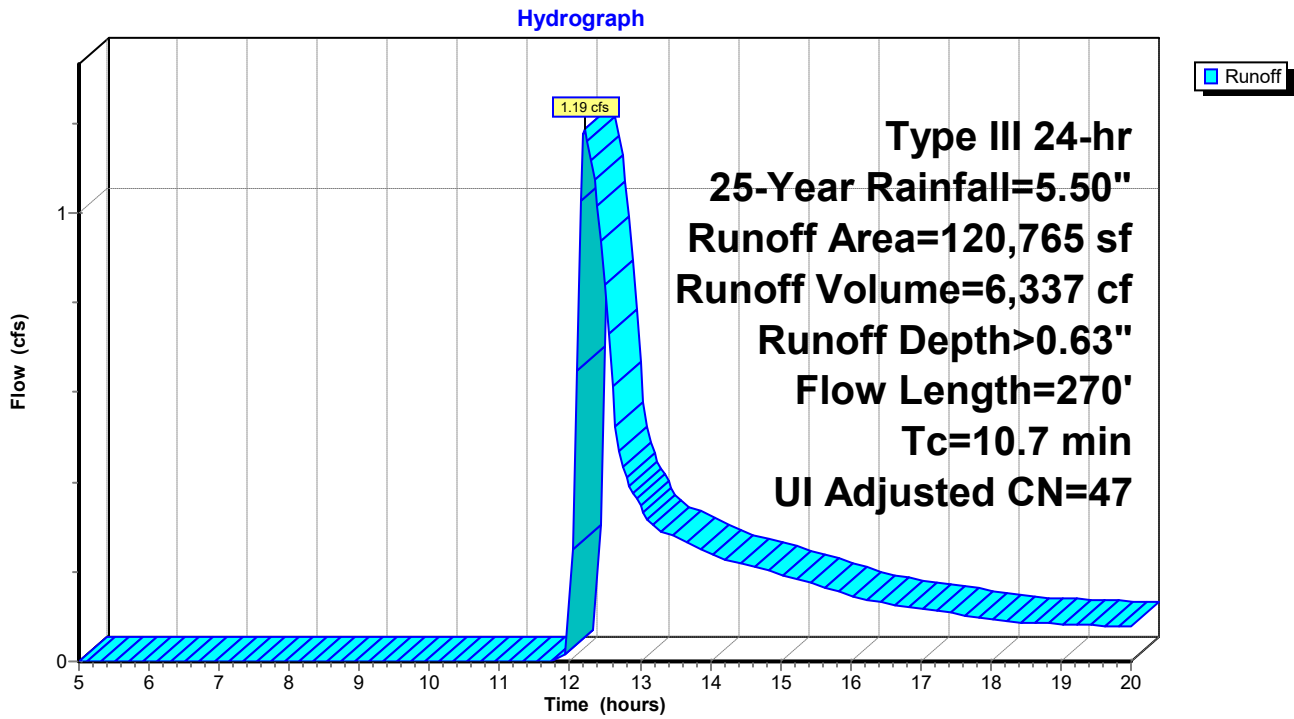
Runoff = 1.19 cfs @ 12.22 hrs, Volume= 6,337 cf, Depth> 0.63"
 Routed to Pond ND : Natural Depression

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Adj	Description
35,288	30		Woods, Good, HSG A
16,322	39		>75% Grass cover, Good, HSG A
1,290	98		Unconnected pavement, HSG A
45,809	55		Woods, Good, HSG B
19,907	61		>75% Grass cover, Good, HSG B
2,149	98		Unconnected roofs, HSG B
120,765	48	47	Weighted Average, UI Adjusted
117,326			97.15% Pervious Area
3,439			2.85% Impervious Area
3,439			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.20		Sheet Flow, AB-Grass Grass: Short n= 0.150 P2= 3.20"
1.1	76	0.0533	1.15		Shallow Concentrated Flow, BC-Woods Woodland Kv= 5.0 fps
5.3	144	0.0083	0.46		Shallow Concentrated Flow, CD-Woods Woodland Kv= 5.0 fps
10.7	270	Total			

Subcatchment 2NB: To Natural Depression



Summary for Subcatchment N: Offsite North

Runoff = 0.03 cfs @ 12.54 hrs, Volume= 477 cf, Depth> 0.18"
 Routed to Reach TN : Total North

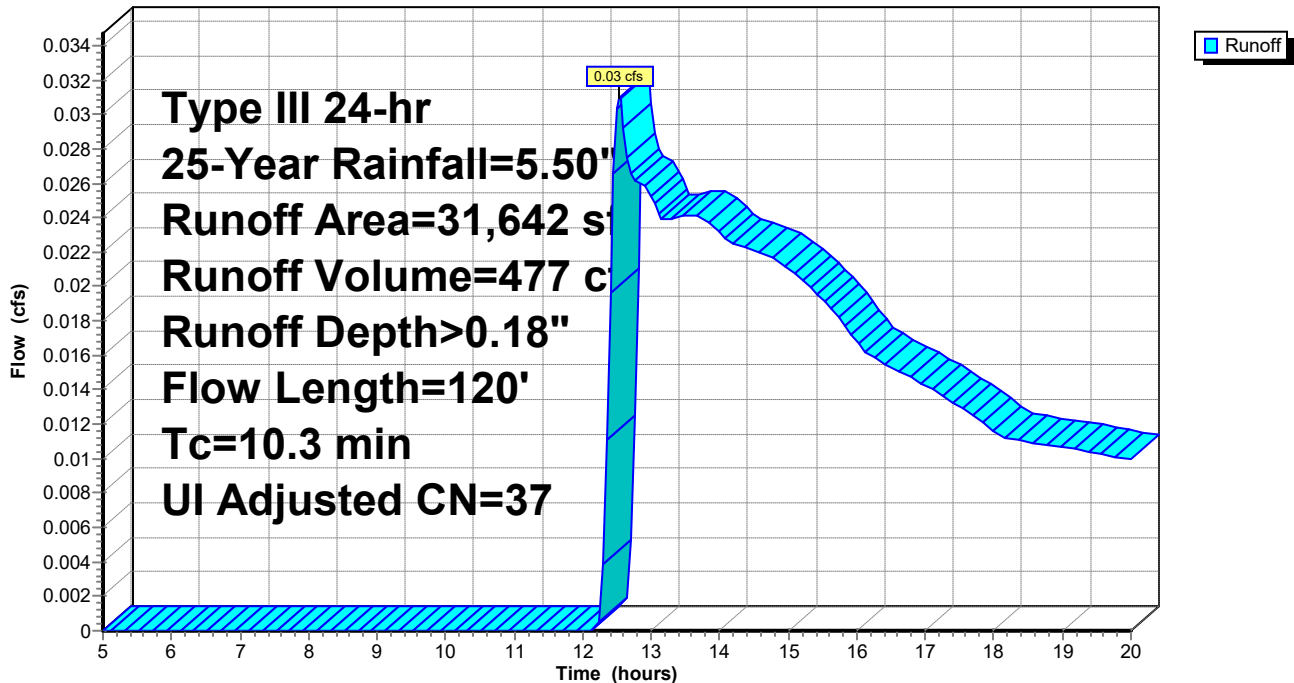
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Adj	Description
25,134	30		Woods, Good, HSG A
2,727	39		>75% Grass cover, Good, HSG A
3,154	85		Gravel roads, HSG B
627	98		Unconnected pavement, HSG A
31,642	38	37	Weighted Average, UI Adjusted
31,015			98.02% Pervious Area
627			1.98% Impervious Area
627			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		Sheet Flow, AB-Woods Woods: Light underbrush n= 0.400 P2= 3.20"
1.0	70	0.0500	1.12		Shallow Concentrated Flow, BC-Woods Woodland Kv= 5.0 fps
10.3	120	Total			

Subcatchment N: Offsite North

Hydrograph



Summary for Subcatchment S: Onsite South

Runoff = 0.01 cfs @ 14.94 hrs, Volume= 124 cf, Depth> 0.09"
 Routed to nonexistent node 2P

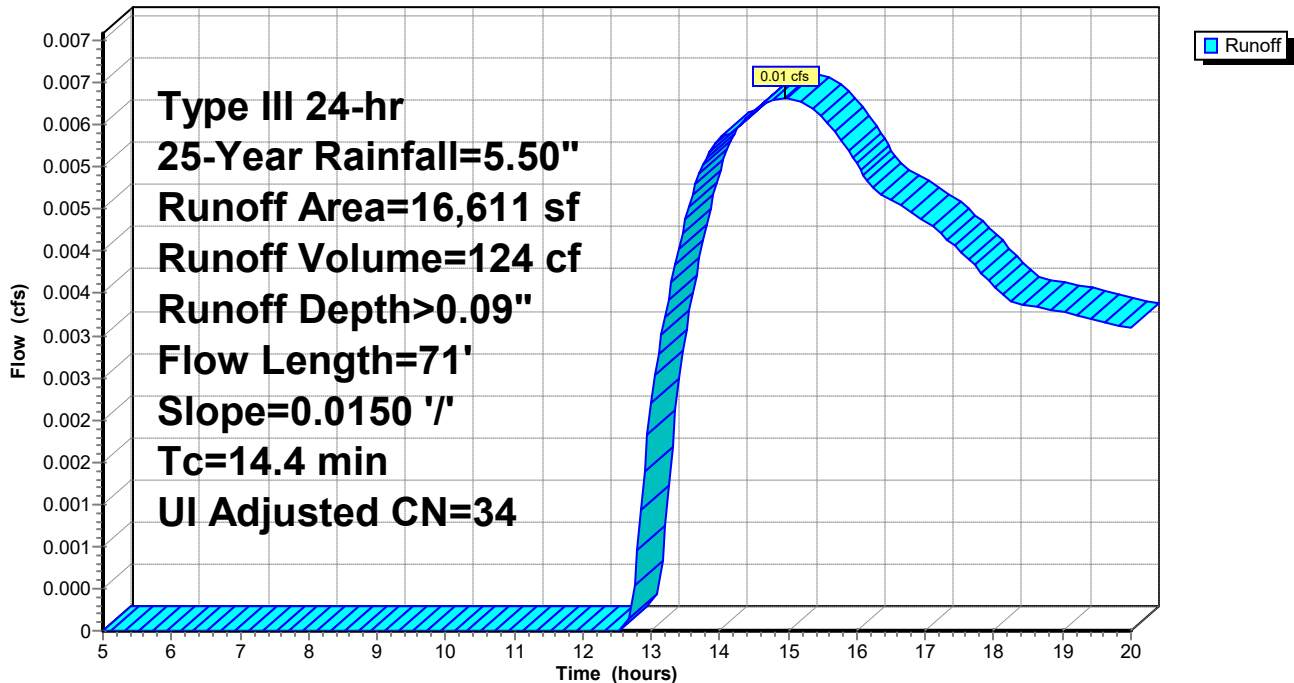
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Adj	Description
13,154	30		Woods, Good, HSG A
2,356	39		>75% Grass cover, Good, HSG A
1,033	98		Unconnected roofs, HSG A
68	55		Woods, Good, HSG B
16,611	36	34	Weighted Average, UI Adjusted
15,578			93.78% Pervious Area
1,033			6.22% Impervious Area
1,033			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.8	50	0.0150	0.06		Sheet Flow, AB-Woods Woods: Light underbrush n= 0.400 P2= 3.20"
0.6	21	0.0150	0.61		Shallow Concentrated Flow, BC-Woods Woodland Kv= 5.0 fps
14.4	71	Total			

Subcatchment S: Onsite South

Hydrograph



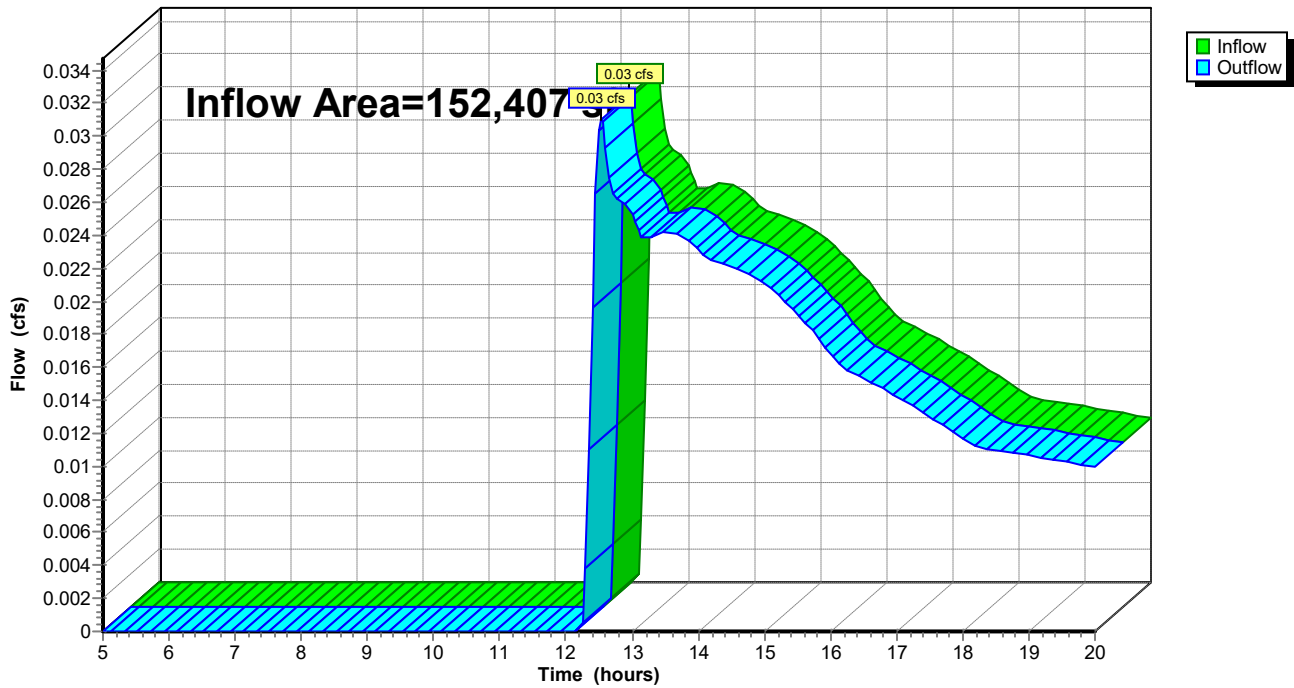
Summary for Reach TN: Total North

Inflow Area = 152,407 sf, 2.67% Impervious, Inflow Depth > 0.04" for 25-Year event
 Inflow = 0.03 cfs @ 12.54 hrs, Volume= 477 cf
 Outflow = 0.03 cfs @ 12.54 hrs, Volume= 477 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach TN: Total North

Hydrograph



Summary for Pond ND: Natural Depression

Inflow Area = 120,765 sf, 2.85% Impervious, Inflow Depth > 0.63" for 25-Year event
 Inflow = 1.19 cfs @ 12.22 hrs, Volume= 6,337 cf
 Outflow = 0.18 cfs @ 15.33 hrs, Volume= 4,386 cf, Atten= 85%, Lag= 186.5 min
 Discarded = 0.18 cfs @ 15.33 hrs, Volume= 4,386 cf
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf
 Routed to Reach TN : Total North

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 108.33' @ 15.33 hrs Surf.Area= 7,599 sf Storage= 2,761 cf

Plug-Flow detention time= 180.5 min calculated for 4,386 cf (69% of inflow)
 Center-of-Mass det. time= 104.4 min (967.1 - 862.7)

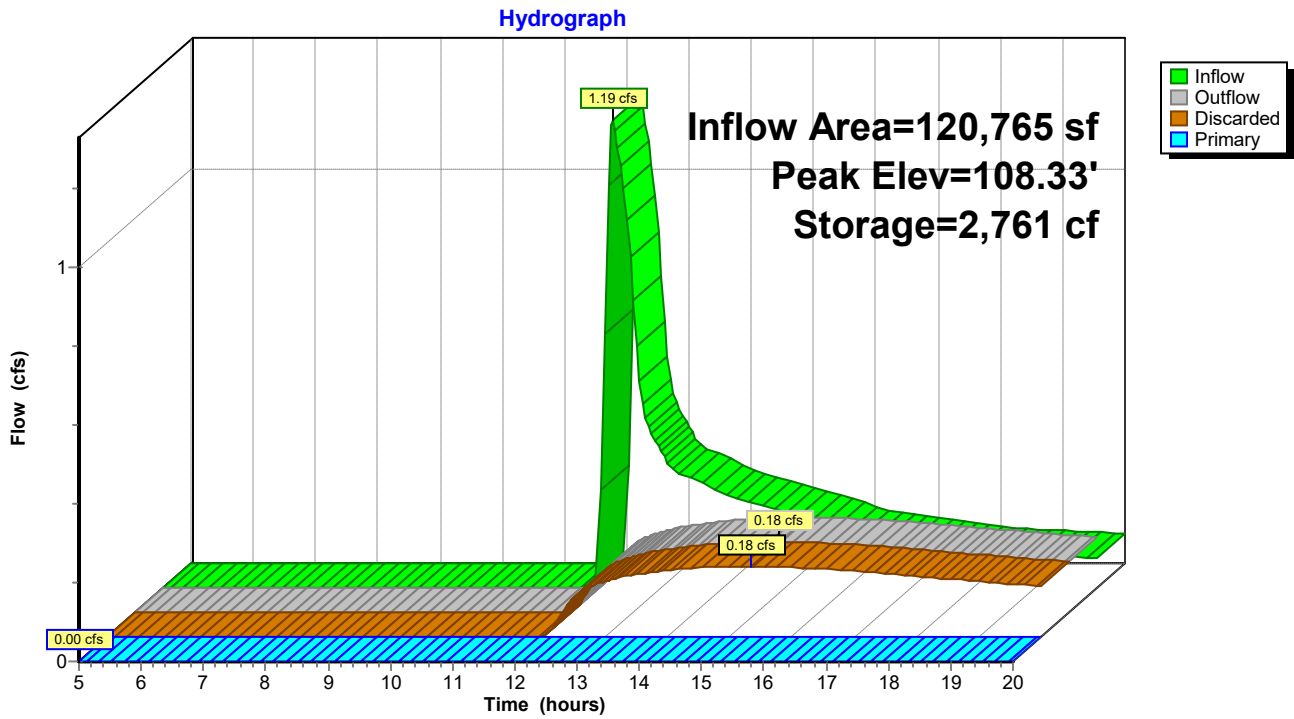
Volume	Invert	Avail.Storage	Storage Description			
#1	108.00'	15,537 cf	Custom Stage Data (Irregular) Listed below			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
108.00	235	88.4	0	0	235	
109.00	22,339	964.5	8,288	8,288	73,643	
109.30	26,033	945.2	7,249	15,537	76,590	

Device	Routing	Invert	Outlet Devices									
#1	Primary	109.00'	2.0' long x 10.0' breadth Broad-Crested Rectangular Weir									
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60									
			Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64									
#2	Discarded	108.00'	1.020 in/hr Exfiltration over Surface area									

Discarded OutFlow Max=0.18 cfs @ 15.33 hrs HW=108.33' (Free Discharge)
 ↑**2=Exfiltration** (Exfiltration Controls 0.18 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=108.00' (Free Discharge)
 ↑**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond ND: Natural Depression



Stage-Area-Storage for Pond ND: Natural Depression

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
108.00	235	0	109.04	22,832	9,255
108.02	677	166	109.06	23,078	9,738
108.04	1,119	332	109.08	23,324	10,221
108.06	1,561	497	109.10	23,570	10,705
108.08	2,003	663	109.12	23,817	11,188
108.10	2,445	829	109.14	24,063	11,671
108.12	2,887	995	109.16	24,309	12,154
108.14	3,330	1,160	109.18	24,555	12,638
108.16	3,772	1,326	109.20	24,802	13,121
108.18	4,214	1,492	109.22	25,048	13,604
108.20	4,656	1,658	109.24	25,294	14,087
108.22	5,098	1,823	109.26	25,540	14,571
108.24	5,540	1,989	109.28	25,787	15,054
108.26	5,982	2,155	109.30	26,033	15,537
108.28	6,424	2,321			
108.30	6,866	2,487			
108.32	7,308	2,652			
108.34	7,750	2,818			
108.36	8,192	2,984			
108.38	8,635	3,150			
108.40	9,077	3,315			
108.42	9,519	3,481			
108.44	9,961	3,647			
108.46	10,403	3,813			
108.48	10,845	3,978			
108.50	11,287	4,144			
108.52	11,729	4,310			
108.54	12,171	4,476			
108.56	12,613	4,642			
108.58	13,055	4,807			
108.60	13,497	4,973			
108.62	13,939	5,139			
108.64	14,382	5,305			
108.66	14,824	5,470			
108.68	15,266	5,636			
108.70	15,708	5,802			
108.72	16,150	5,968			
108.74	16,592	6,133			
108.76	17,034	6,299			
108.78	17,476	6,465			
108.80	17,918	6,631			
108.82	18,360	6,796			
108.84	18,802	6,962			
108.86	19,244	7,128			
108.88	19,687	7,294			
108.90	20,129	7,460			
108.92	20,571	7,625			
108.94	21,013	7,791			
108.96	21,455	7,957			
108.98	21,897	8,123			
109.00	22,339	8,288			
109.02	22,585	8,772			

Summary for Subcatchment 2NB: To Natural Depression

Runoff = 2.65 cfs @ 12.19 hrs, Volume= 11,208 cf, Depth> 1.11"

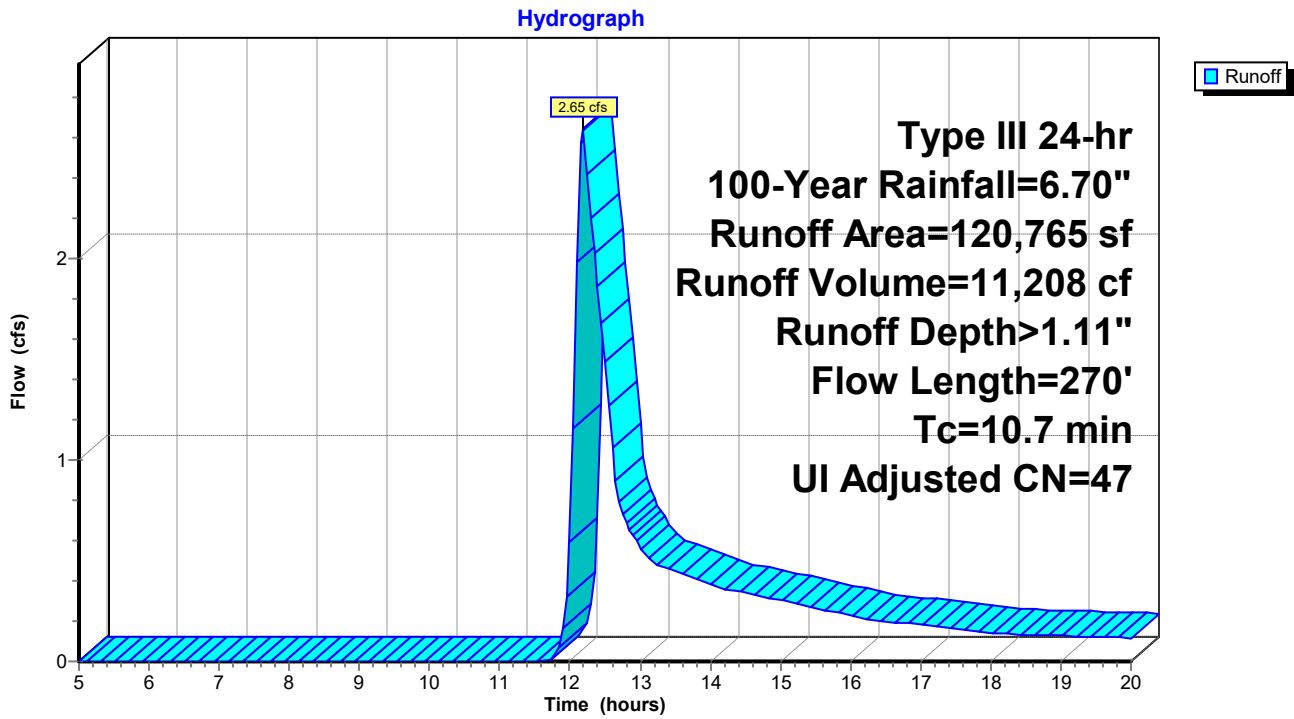
Routed to Pond ND : Natural Depression

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 100-Year Rainfall=6.70"

Area (sf)	CN	Adj	Description
35,288	30		Woods, Good, HSG A
16,322	39		>75% Grass cover, Good, HSG A
1,290	98		Unconnected pavement, HSG A
45,809	55		Woods, Good, HSG B
19,907	61		>75% Grass cover, Good, HSG B
2,149	98		Unconnected roofs, HSG B
120,765	48	47	Weighted Average, UI Adjusted
117,326			97.15% Pervious Area
3,439			2.85% Impervious Area
3,439			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.20		Sheet Flow, AB-Grass Grass: Short n= 0.150 P2= 3.20"
1.1	76	0.0533	1.15		Shallow Concentrated Flow, BC-Woods Woodland Kv= 5.0 fps
5.3	144	0.0083	0.46		Shallow Concentrated Flow, CD-Woods Woodland Kv= 5.0 fps
10.7	270	Total			

Subcatchment 2NB: To Natural Depression



Summary for Subcatchment N: Offsite North

Runoff = 0.16 cfs @ 12.40 hrs, Volume= 1,181 cf, Depth> 0.45"
 Routed to Reach TN : Total North

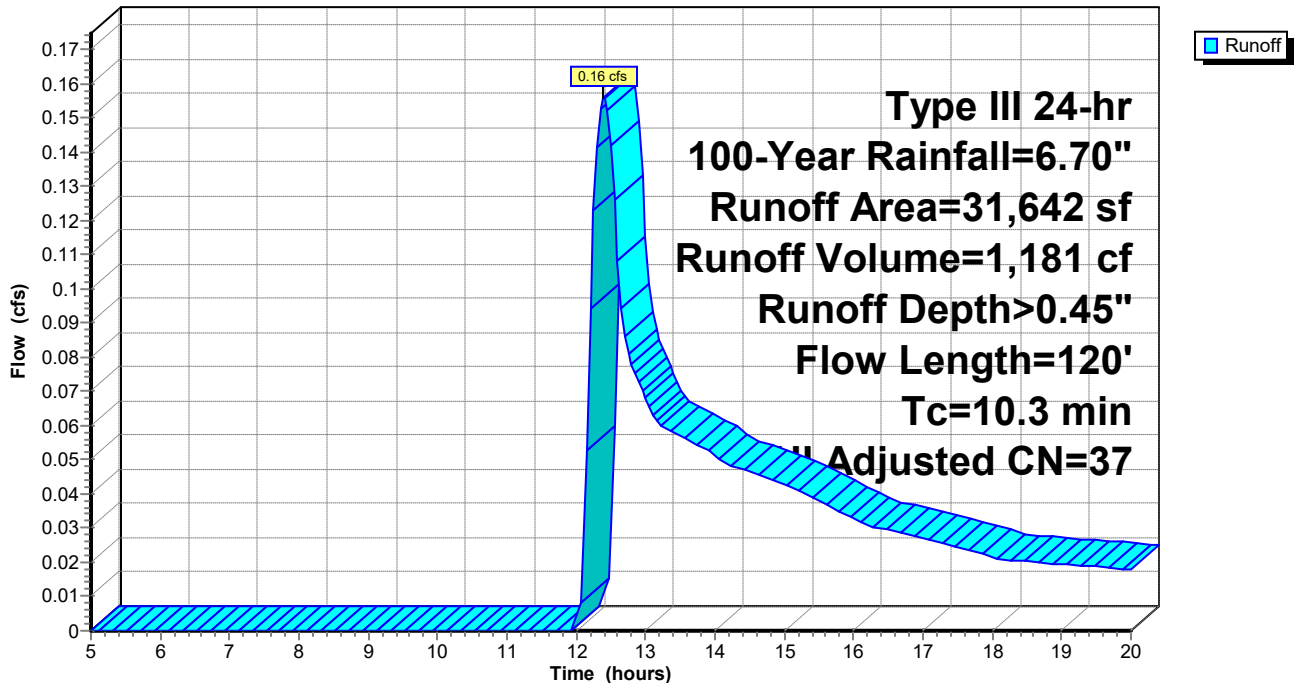
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 100-Year Rainfall=6.70"

Area (sf)	CN	Adj	Description
25,134	30		Woods, Good, HSG A
2,727	39		>75% Grass cover, Good, HSG A
3,154	85		Gravel roads, HSG B
627	98		Unconnected pavement, HSG A
31,642	38	37	Weighted Average, UI Adjusted
31,015			98.02% Pervious Area
627			1.98% Impervious Area
627			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		Sheet Flow, AB-Woods Woods: Light underbrush n= 0.400 P2= 3.20"
1.0	70	0.0500	1.12		Shallow Concentrated Flow, BC-Woods Woodland Kv= 5.0 fps
10.3	120	Total			

Subcatchment N: Offsite North

Hydrograph



Summary for Subcatchment S: Onsite South

Runoff = 0.03 cfs @ 12.54 hrs, Volume= 398 cf, Depth> 0.29"
 Routed to nonexistent node 2P

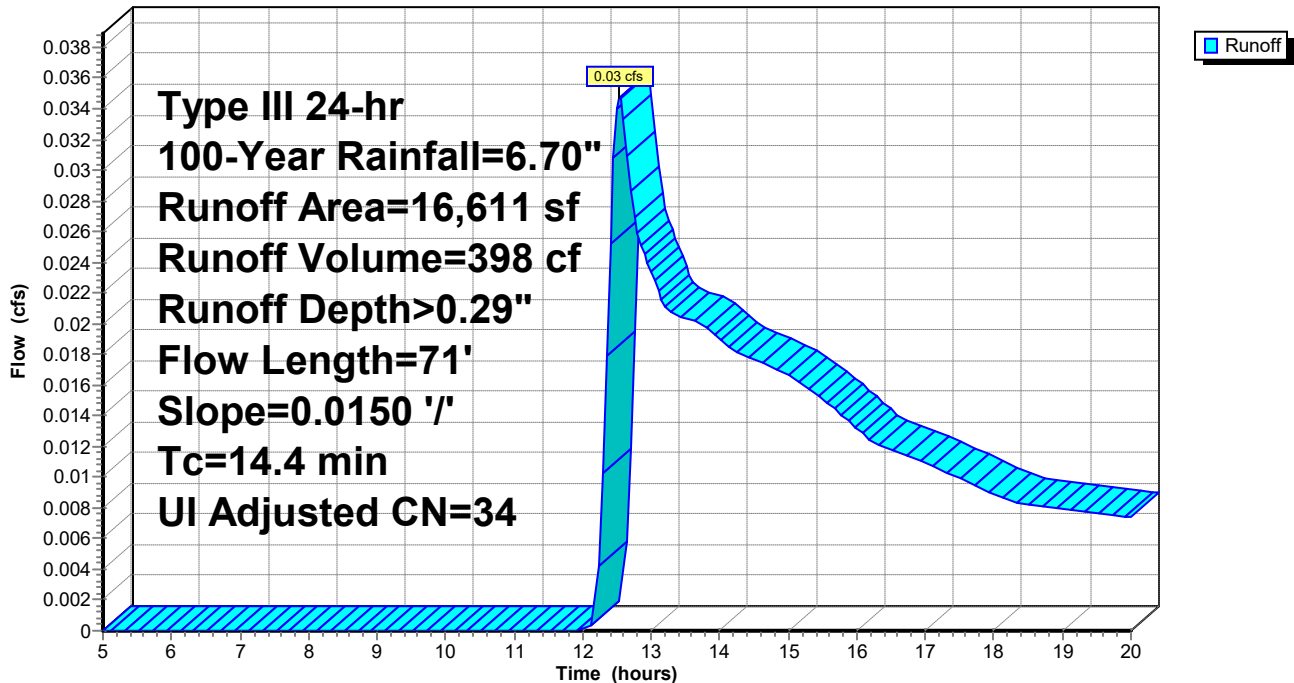
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 100-Year Rainfall=6.70"

Area (sf)	CN	Adj	Description
13,154	30		Woods, Good, HSG A
2,356	39		>75% Grass cover, Good, HSG A
1,033	98		Unconnected roofs, HSG A
68	55		Woods, Good, HSG B
16,611	36	34	Weighted Average, UI Adjusted
15,578			93.78% Pervious Area
1,033			6.22% Impervious Area
1,033			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.8	50	0.0150	0.06		Sheet Flow, AB-Woods Woods: Light underbrush n= 0.400 P2= 3.20"
0.6	21	0.0150	0.61		Shallow Concentrated Flow, BC-Woods Woodland Kv= 5.0 fps
14.4	71	Total			

Subcatchment S: Onsite South

Hydrograph



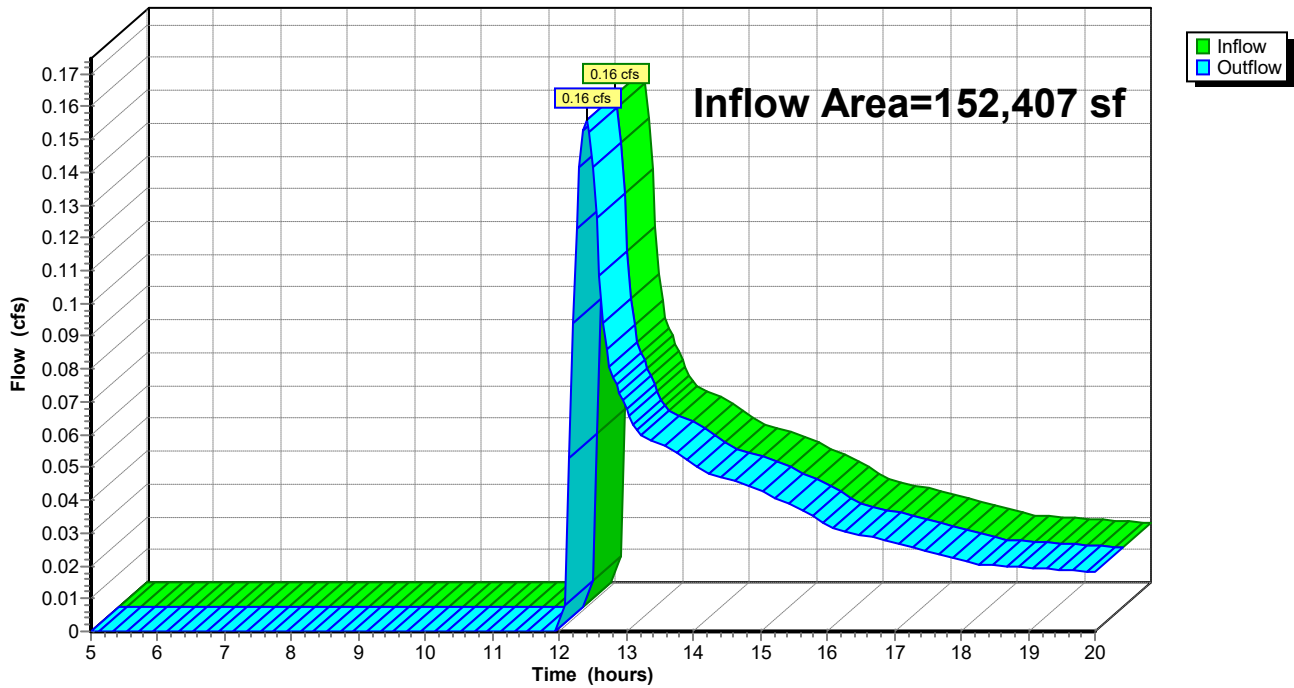
Summary for Reach TN: Total North

Inflow Area = 152,407 sf, 2.67% Impervious, Inflow Depth > 0.09" for 100-Year event
 Inflow = 0.16 cfs @ 12.40 hrs, Volume= 1,181 cf
 Outflow = 0.16 cfs @ 12.40 hrs, Volume= 1,181 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach TN: Total North

Hydrograph



Summary for Pond ND: Natural Depression

Inflow Area = 120,765 sf, 2.85% Impervious, Inflow Depth > 1.11" for 100-Year event
 Inflow = 2.65 cfs @ 12.19 hrs, Volume= 11,208 cf
 Outflow = 0.33 cfs @ 14.70 hrs, Volume= 7,921 cf, Atten= 88%, Lag= 150.8 min
 Discarded = 0.33 cfs @ 14.70 hrs, Volume= 7,921 cf
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf
 Routed to Reach TN : Total North

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 108.61' @ 14.70 hrs Surf.Area= 13,770 sf Storage= 5,075 cf

Plug-Flow detention time= 184.0 min calculated for 7,895 cf (70% of inflow)
 Center-of-Mass det. time= 111.8 min (958.0 - 846.1)

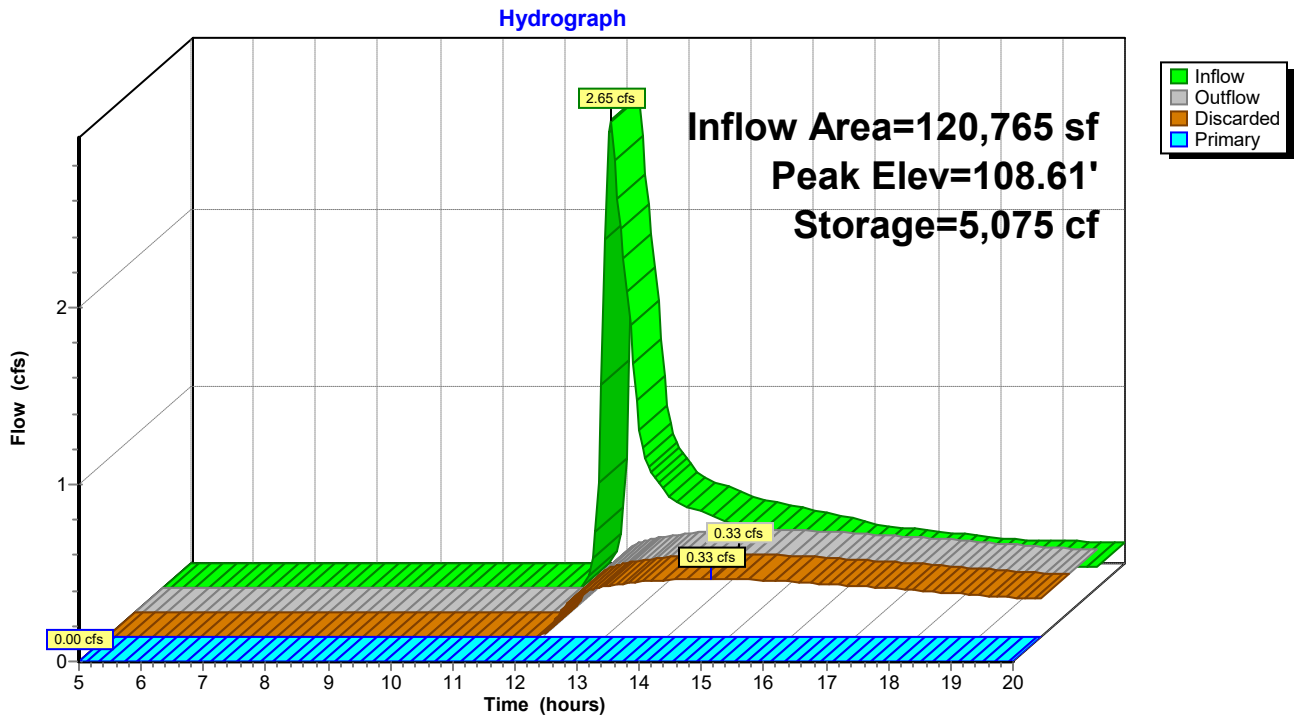
Volume	Invert	Avail.Storage	Storage Description			
#1	108.00'	15,537 cf	Custom Stage Data (Irregular) Listed below			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
108.00	235	88.4	0	0	235	
109.00	22,339	964.5	8,288	8,288	73,643	
109.30	26,033	945.2	7,249	15,537	76,590	

Device	Routing	Invert	Outlet Devices									
#1	Primary	109.00'	2.0' long x 10.0' breadth Broad-Crested Rectangular Weir									
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60									
			Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64									
#2	Discarded	108.00'	1.020 in/hr Exfiltration over Surface area									

Discarded OutFlow Max=0.33 cfs @ 14.70 hrs HW=108.61' (Free Discharge)
 ↑**2=Exfiltration** (Exfiltration Controls 0.33 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=108.00' (Free Discharge)
 ↑**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond ND: Natural Depression



Stage-Area-Storage for Pond ND: Natural Depression

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
108.00	235	0	109.04	22,832	9,255
108.02	677	166	109.06	23,078	9,738
108.04	1,119	332	109.08	23,324	10,221
108.06	1,561	497	109.10	23,570	10,705
108.08	2,003	663	109.12	23,817	11,188
108.10	2,445	829	109.14	24,063	11,671
108.12	2,887	995	109.16	24,309	12,154
108.14	3,330	1,160	109.18	24,555	12,638
108.16	3,772	1,326	109.20	24,802	13,121
108.18	4,214	1,492	109.22	25,048	13,604
108.20	4,656	1,658	109.24	25,294	14,087
108.22	5,098	1,823	109.26	25,540	14,571
108.24	5,540	1,989	109.28	25,787	15,054
108.26	5,982	2,155	109.30	26,033	15,537
108.28	6,424	2,321			
108.30	6,866	2,487			
108.32	7,308	2,652			
108.34	7,750	2,818			
108.36	8,192	2,984			
108.38	8,635	3,150			
108.40	9,077	3,315			
108.42	9,519	3,481			
108.44	9,961	3,647			
108.46	10,403	3,813			
108.48	10,845	3,978			
108.50	11,287	4,144			
108.52	11,729	4,310			
108.54	12,171	4,476			
108.56	12,613	4,642			
108.58	13,055	4,807			
108.60	13,497	4,973			
108.62	13,939	5,139			
108.64	14,382	5,305			
108.66	14,824	5,470			
108.68	15,266	5,636			
108.70	15,708	5,802			
108.72	16,150	5,968			
108.74	16,592	6,133			
108.76	17,034	6,299			
108.78	17,476	6,465			
108.80	17,918	6,631			
108.82	18,360	6,796			
108.84	18,802	6,962			
108.86	19,244	7,128			
108.88	19,687	7,294			
108.90	20,129	7,460			
108.92	20,571	7,625			
108.94	21,013	7,791			
108.96	21,455	7,957			
108.98	21,897	8,123			
109.00	22,339	8,288			
109.02	22,585	8,772			

APPENDIX B

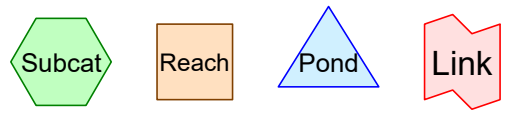
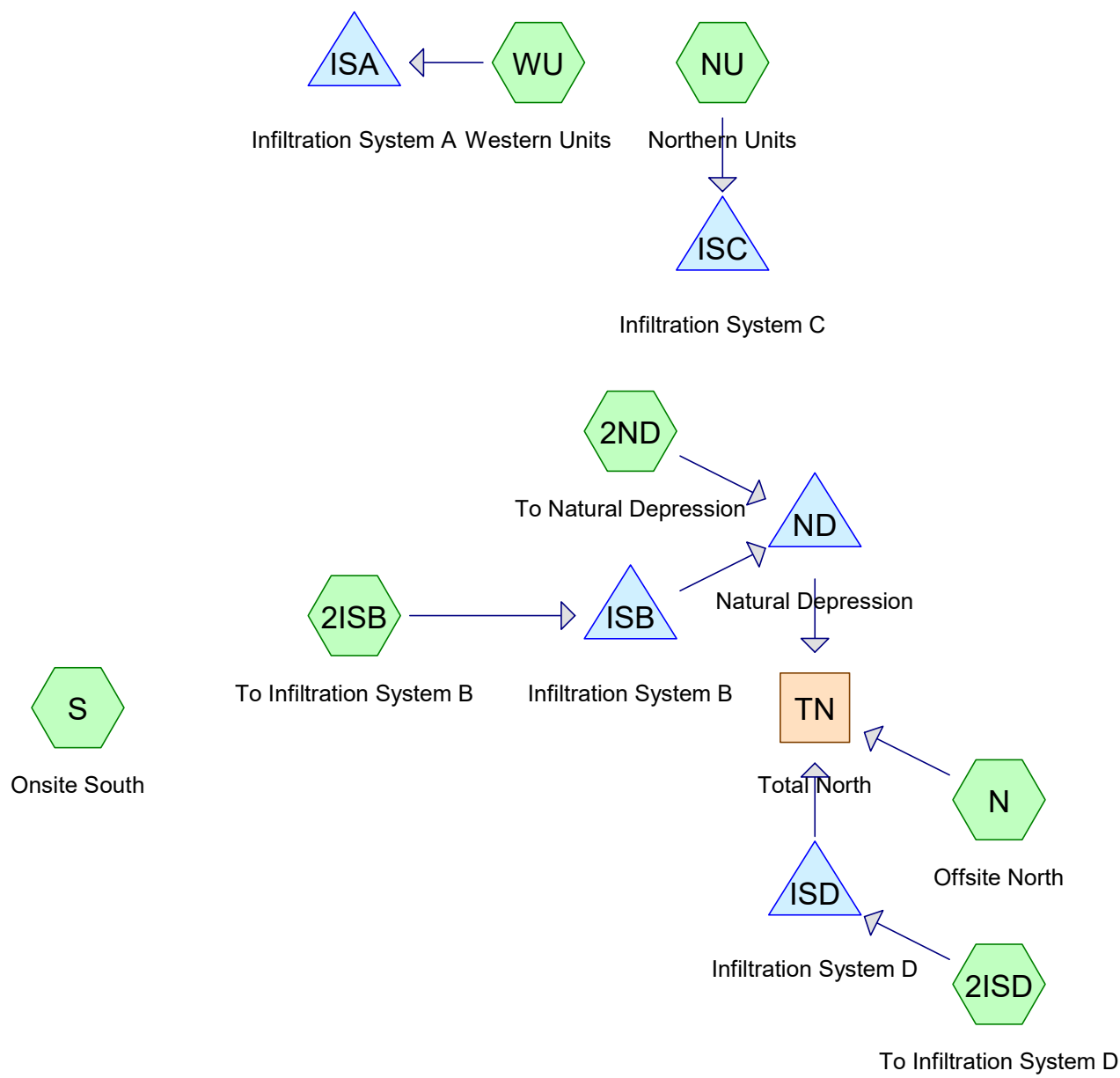
PROPOSED HYDROLOGICAL CONDITIONS

2-YEAR STORM EVENT

10-YEAR STORM EVENT

25-YEAR STORM EVENT

100-YEAR STORM EVENT



Routing Diagram for 10365 - Pleasant Street - Walpole - Proposed Condition
 Prepared by Coneco Engineers & Scientists, Printed 4/29/2024
 HydroCAD® 10.20-4b s/n 01046 © 2023 HydroCAD Software Solutions LLC

Summary for Subcatchment 2ISB: To Infiltration System B

Runoff = 1.73 cfs @ 12.16 hrs, Volume= 6,189 cf, Depth> 0.84"

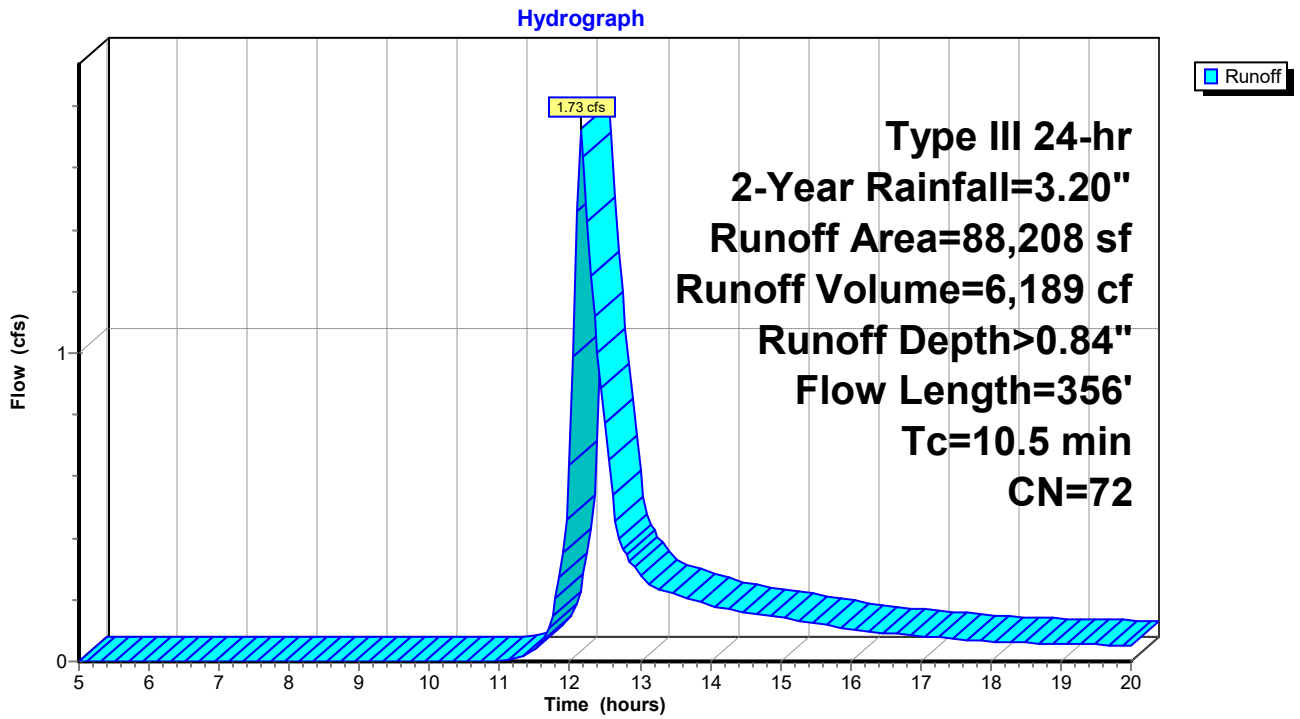
Routed to Pond ISB : Infiltration System B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
3,108	30	Woods, Good, HSG A
15,089	39	>75% Grass cover, Good, HSG A
8,413	98	Paved parking, HSG A
1,960	55	Woods, Good, HSG B
30,210	61	>75% Grass cover, Good, HSG B
973	85	Gravel roads, HSG B
4,757	98	Unconnected roofs, HSG B
23,698	98	Paved parking, HSG B
88,208	72	Weighted Average
51,340		58.20% Pervious Area
36,868		41.80% Impervious Area
4,757		12.90% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	50	0.0100	0.11		Sheet Flow, Grass AB Grass: Short n= 0.150 P2= 3.20"
2.0	86	0.0100	0.70		Shallow Concentrated Flow, Grass BC Short Grass Pasture Kv= 7.0 fps
0.9	156	0.0200	2.87		Shallow Concentrated Flow, Paved CD Paved Kv= 20.3 fps
0.2	64	0.0100	4.54	3.56	Pipe Channel, Pipe DE 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
10.5	356	Total			

Subcatchment 2ISB: To Infiltration System B



Summary for Subcatchment 2ISD: To Infiltration System D

Runoff = 0.99 cfs @ 12.09 hrs, Volume= 2,908 cf, Depth> 1.64"

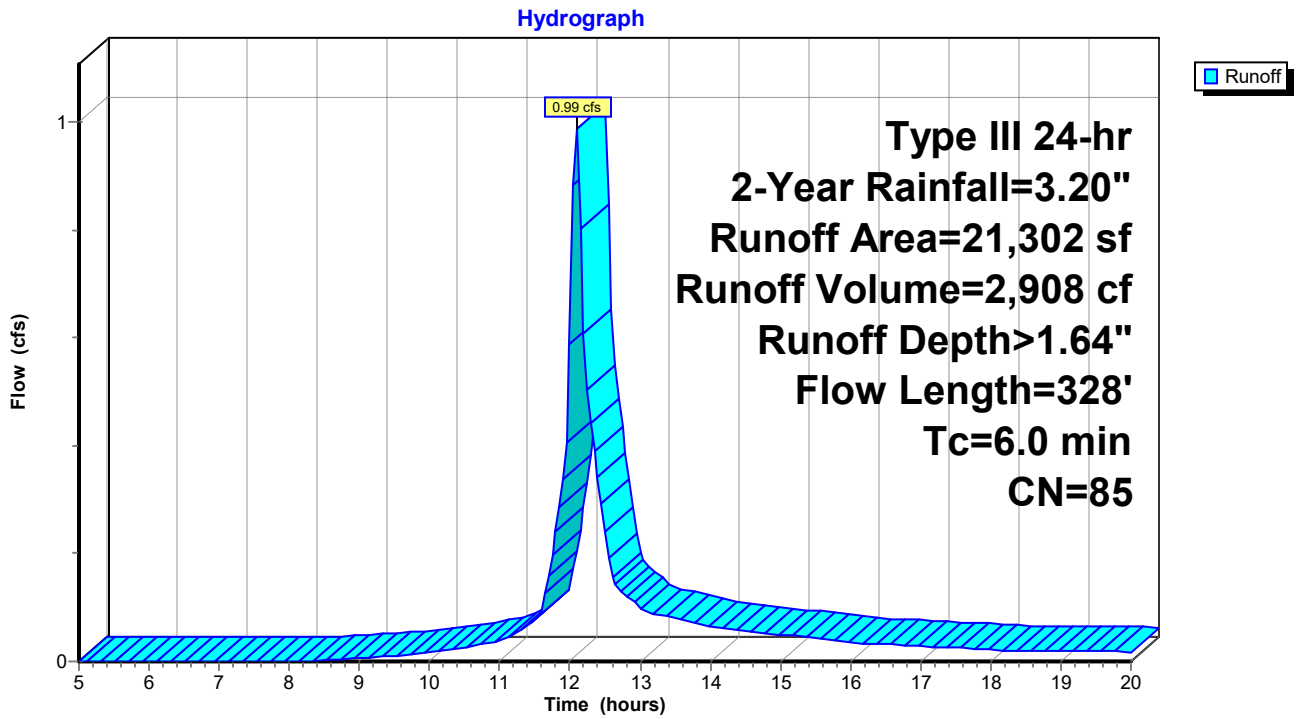
Routed to Pond ISD : Infiltration System D

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
701	30	Woods, Good, HSG A
3,511	39	>75% Grass cover, Good, HSG A
11,899	98	Paved parking, HSG A
756	61	>75% Grass cover, Good, HSG B
4,435	98	Paved parking, HSG B
21,302	85	Weighted Average
4,968		23.32% Pervious Area
16,334		76.68% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	29	0.0250	0.15		Sheet Flow, Grass AB Grass: Short n= 0.150 P2= 3.20"
1.3	22	0.1400	0.27		Sheet Flow, Grass AB Grass: Short n= 0.150 P2= 3.20"
1.1	195	0.0225	3.04		Shallow Concentrated Flow, Grass BC Paved Kv= 20.3 fps
0.3	82	0.0100	4.54	3.56	Pipe Channel, Pipe CD 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
6.0	328	Total			

Subcatchment 2ISD: To Infiltration System D



Summary for Subcatchment 2ND: To Natural Depression

Runoff = 0.00 cfs @ 17.17 hrs, Volume= 25 cf, Depth> 0.01"
 Routed to Pond ND : Natural Depression

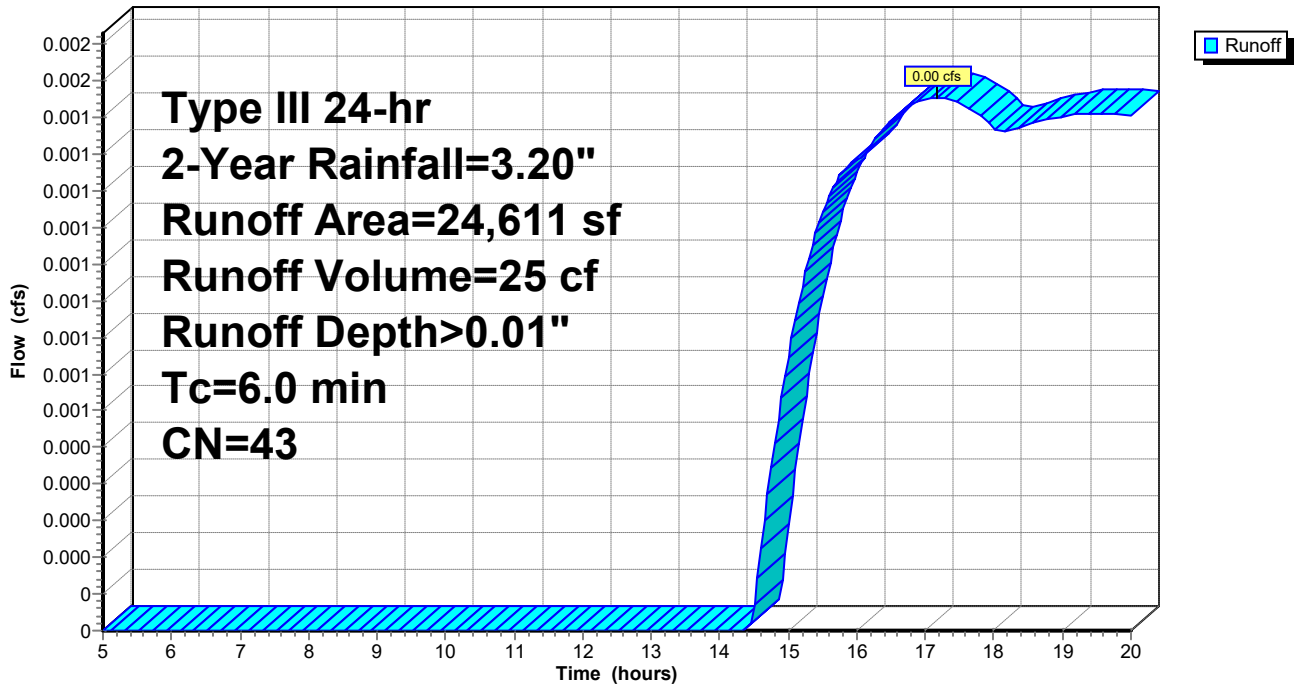
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
4,045	30	Woods, Good, HSG A
18,135	39	>75% Grass cover, Good, HSG A
1,946	96	Gravel surface, HSG A
224	98	Paved parking, HSG A
261	61	>75% Grass cover, Good, HSG B
24,611	43	Weighted Average
24,387		99.09% Pervious Area
224		0.91% Impervious Area

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

Subcatchment 2ND: To Natural Depression

Hydrograph



Summary for Subcatchment N: Offsite North

Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Depth= 0.00"
 Routed to Reach TN : Total North

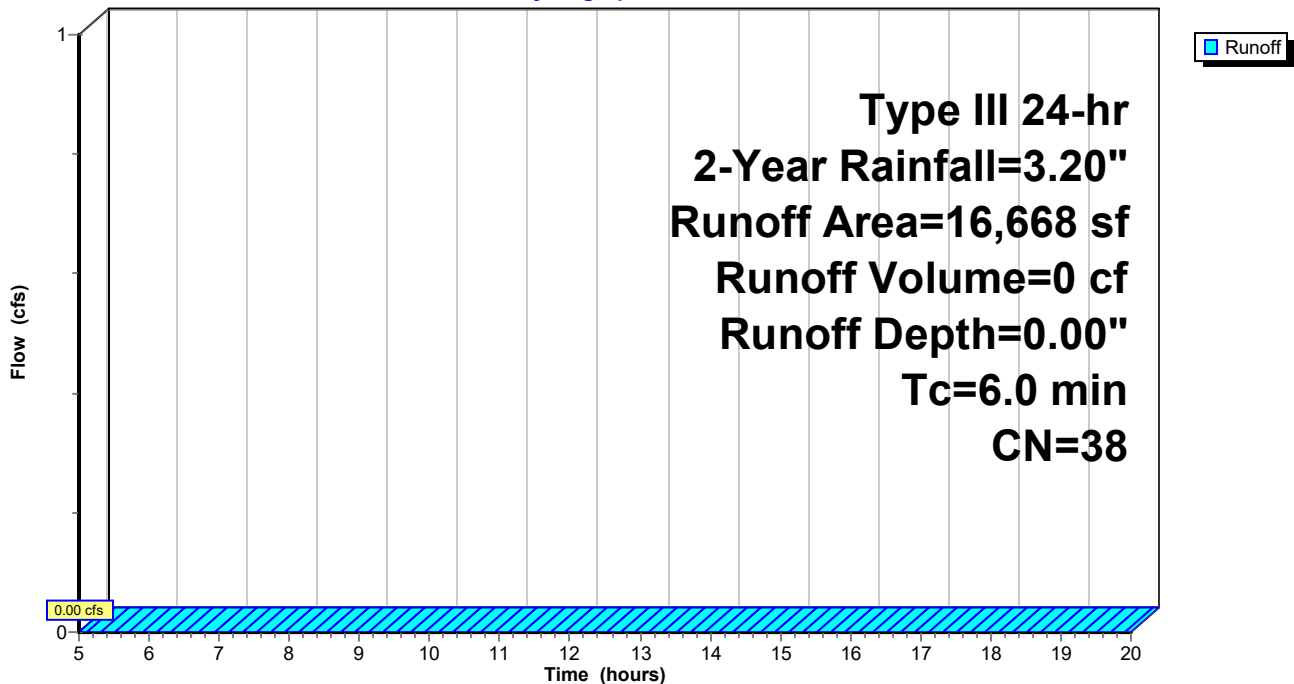
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
4,653	30	Woods, Good, HSG A
11,477	39	>75% Grass cover, Good, HSG A
417	96	Gravel surface, HSG A
121	98	Paved parking, HSG A
16,668	38	Weighted Average
16,547		99.27% Pervious Area
121		0.73% Impervious Area

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

Subcatchment N: Offsite North

Hydrograph



Summary for Subcatchment NU: Northern Units

Runoff = 0.47 cfs @ 12.09 hrs, Volume= 1,572 cf, Depth> 2.77"
 Routed to Pond ISC : Infiltration System C

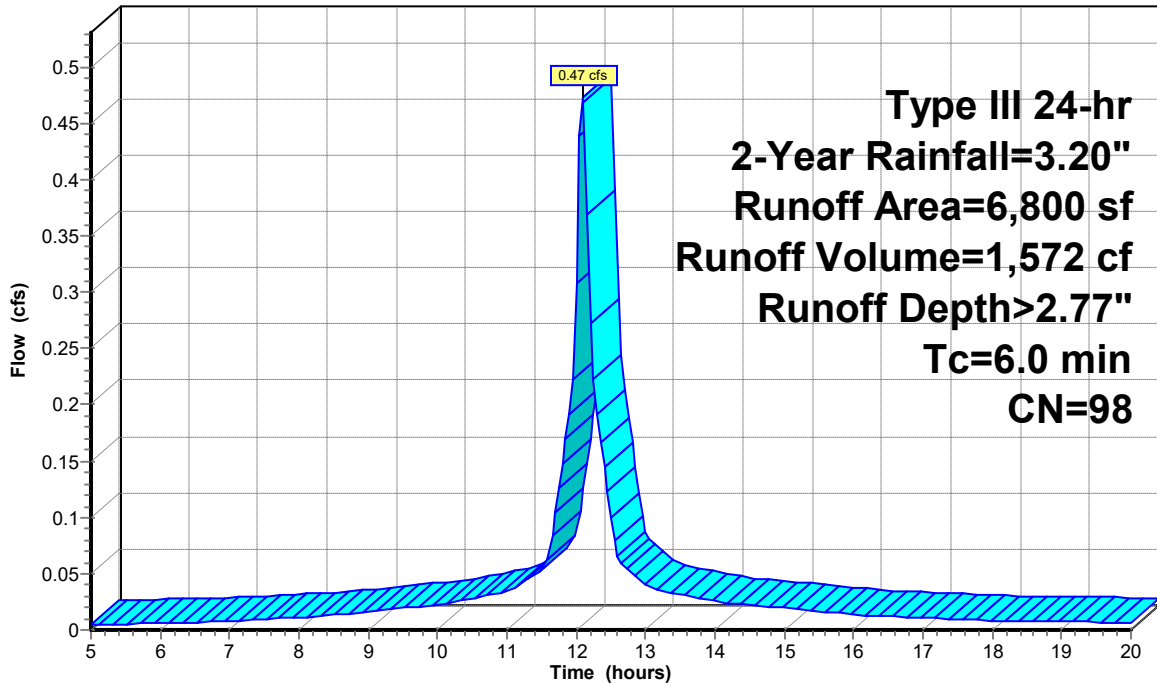
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
6,800	98	Roofs, HSG D
6,800		100.00% Impervious Area

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

Subcatchment NU: Northern Units

Hydrograph



**Type III 24-hr
 2-Year Rainfall=3.20"
 Runoff Area=6,800 sf
 Runoff Volume=1,572 cf
 Runoff Depth>2.77"
 Tc=6.0 min
 CN=98**

Summary for Subcatchment S: Onsite South

Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Depth= 0.00"

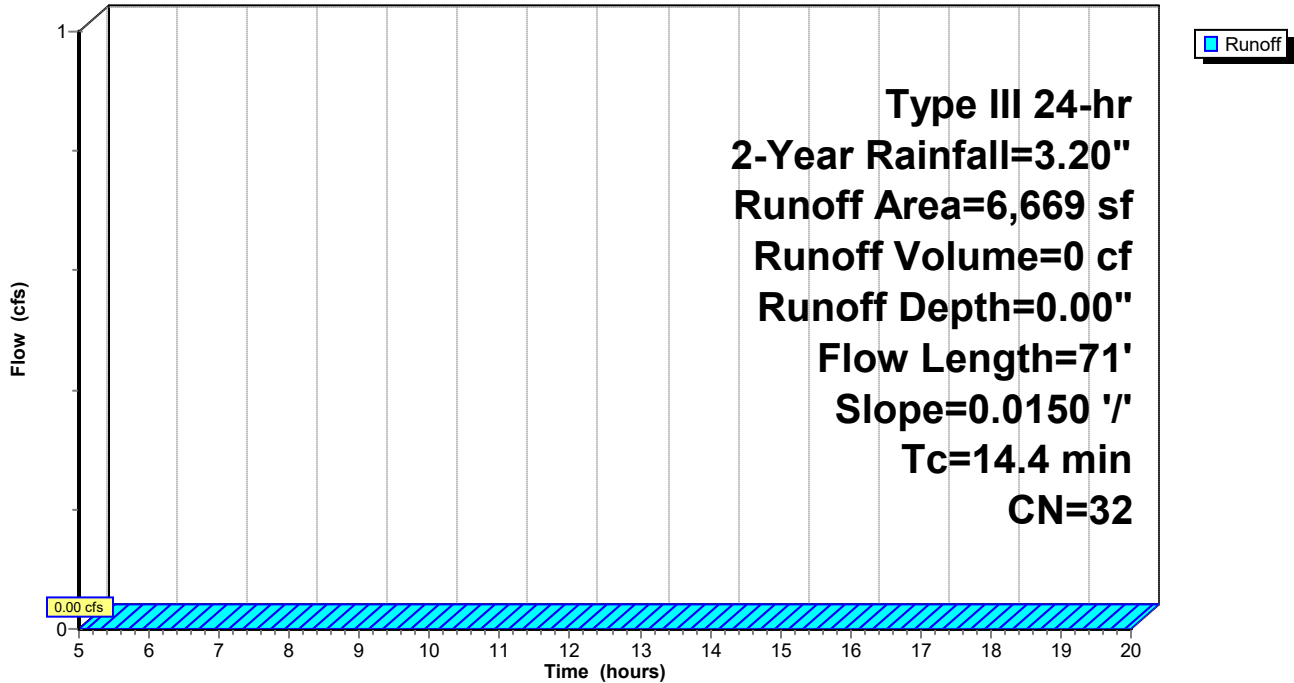
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
5,540	30	Woods, Good, HSG A
1,066	39	>75% Grass cover, Good, HSG A
63	98	Unconnected roofs, HSG A
6,669	32	Weighted Average
6,606		99.06% Pervious Area
63		0.94% Impervious Area
63		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.8	50	0.0150	0.06		Sheet Flow, AB-Woods Woods: Light underbrush n= 0.400 P2= 3.20"
0.6	21	0.0150	0.61		Shallow Concentrated Flow, BC-Woods Woodland Kv= 5.0 fps
14.4	71	Total			

Subcatchment S: Onsite South

Hydrograph



Summary for Subcatchment WU: Western Units

Runoff = 0.33 cfs @ 12.09 hrs, Volume= 1,100 cf, Depth> 2.77"
 Routed to Pond ISA : Infiltration System A

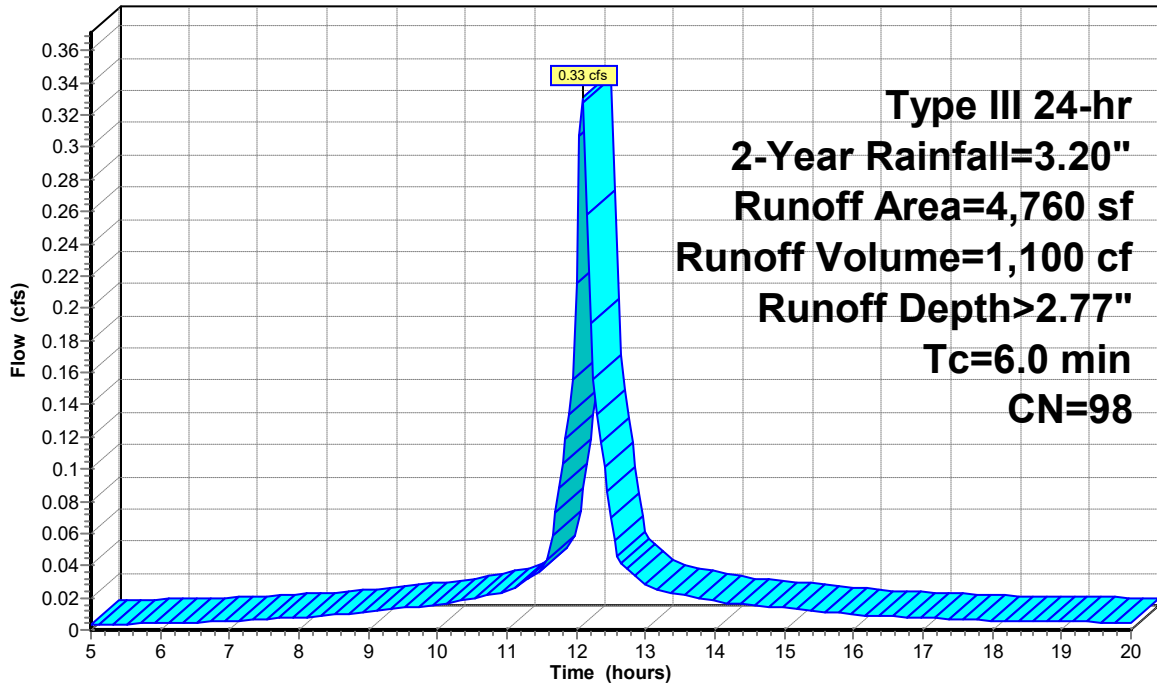
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
4,760	98	Roofs, HSG D
4,760		100.00% Impervious Area

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

Subcatchment WU: Western Units

Hydrograph

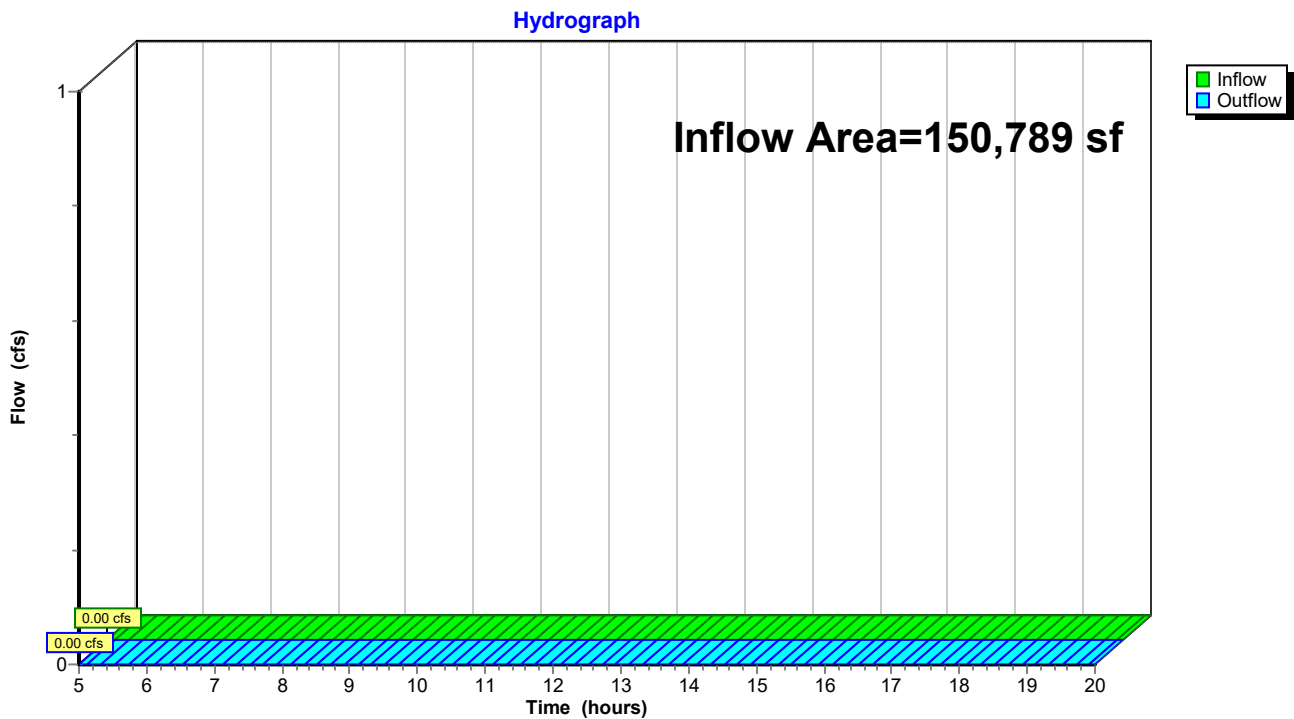


Summary for Reach TN: Total North

Inflow Area = 150,789 sf, 35.51% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0 cf
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach TN: Total North



Summary for Pond ISA: Infiltration System A

Inflow Area = 4,760 sf, 100.00% Impervious, Inflow Depth > 2.77" for 2-Year event
 Inflow = 0.33 cfs @ 12.09 hrs, Volume= 1,100 cf
 Outflow = 0.08 cfs @ 11.80 hrs, Volume= 1,100 cf, Atten= 75%, Lag= 0.0 min
 Discarded = 0.08 cfs @ 11.80 hrs, Volume= 1,100 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 106.92' @ 12.46 hrs Surf.Area= 430 sf Storage= 232 cf

Plug-Flow detention time= 14.4 min calculated for 1,100 cf (100% of inflow)
 Center-of-Mass det. time= 14.2 min (752.7 - 738.6)

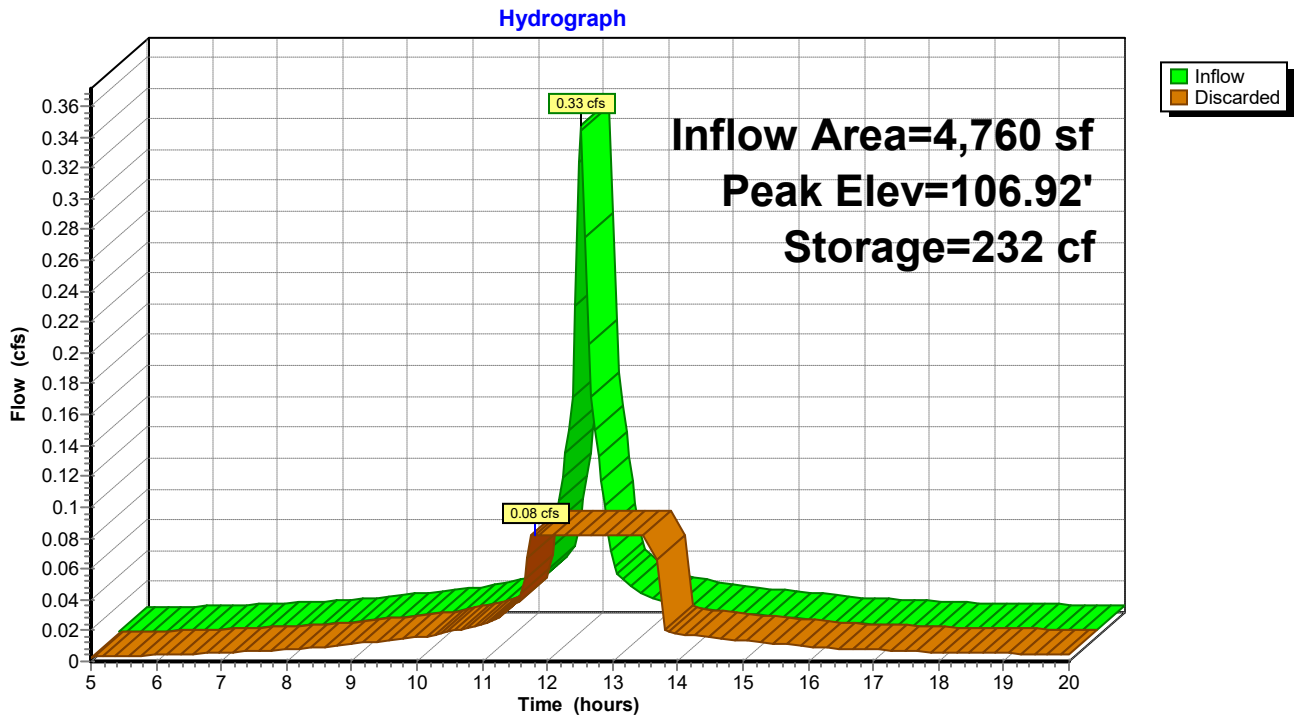
Volume	Invert	Avail.Storage	Storage Description
#1A	106.00'	391 cf	11.17'W x 38.50'L x 3.54'H Field A 1,523 cf Overall - 544 cf Embedded = 979 cf x 40.0% Voids
#2A	106.50'	544 cf	Cultec R-330XLHD x 10 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 2 rows
		935 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	106.00'	8.270 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.08 cfs @ 11.80 hrs HW=106.05' (Free Discharge)
 ↑**1=Exfiltration** (Exfiltration Controls 0.08 cfs)

Pond ISA: Infiltration System A



Stage-Area-Storage for Pond ISA: Infiltration System A

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
106.00	430	0	108.60	430	756
106.05	430	9	108.65	430	769
106.10	430	17	108.70	430	781
106.15	430	26	108.75	430	792
106.20	430	34	108.80	430	803
106.25	430	43	108.85	430	814
106.30	430	52	108.90	430	824
106.35	430	60	108.95	430	833
106.40	430	69	109.00	430	842
106.45	430	77	109.05	430	851
106.50	430	86	109.10	430	859
106.55	430	103	109.15	430	868
106.60	430	121	109.20	430	877
106.65	430	138	109.25	430	885
106.70	430	155	109.30	430	894
106.75	430	172	109.35	430	902
106.80	430	189	109.40	430	911
106.85	430	206	109.45	430	920
106.90	430	223	109.50	430	928
106.95	430	240			
107.00	430	257			
107.05	430	275			
107.10	430	291			
107.15	430	308			
107.20	430	325			
107.25	430	342			
107.30	430	358			
107.35	430	375			
107.40	430	391			
107.45	430	408			
107.50	430	424			
107.55	430	441			
107.60	430	457			
107.65	430	474			
107.70	430	490			
107.75	430	506			
107.80	430	522			
107.85	430	538			
107.90	430	554			
107.95	430	570			
108.00	430	585			
108.05	430	600			
108.10	430	616			
108.15	430	631			
108.20	430	645			
108.25	430	660			
108.30	430	675			
108.35	430	689			
108.40	430	703			
108.45	430	717			
108.50	430	730			
108.55	430	743			

Summary for Pond ISB: Infiltration System B

Inflow Area = 88,208 sf, 41.80% Impervious, Inflow Depth > 0.84" for 2-Year event
 Inflow = 1.73 cfs @ 12.16 hrs, Volume= 6,189 cf
 Outflow = 0.31 cfs @ 11.95 hrs, Volume= 6,175 cf, Atten= 82%, Lag= 0.0 min
 Discarded = 0.31 cfs @ 11.95 hrs, Volume= 6,175 cf
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf
 Routed to Pond ND : Natural Depression

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 106.68' @ 12.90 hrs Surf.Area= 5,568 sf Storage= 1,975 cf

Plug-Flow detention time= 55.3 min calculated for 6,175 cf (100% of inflow)
 Center-of-Mass det. time= 54.4 min (881.1 - 826.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	106.00'	4,612 cf	69.17"W x 80.50"L x 3.54'H Field A 19,720 cf Overall - 8,189 cf Embedded = 11,531 cf x 40.0% Voids
#2A	106.50'	8,189 cf	Cultec R-330XLHD x 154 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 14 rows
		12,801 cf	Total Available Storage

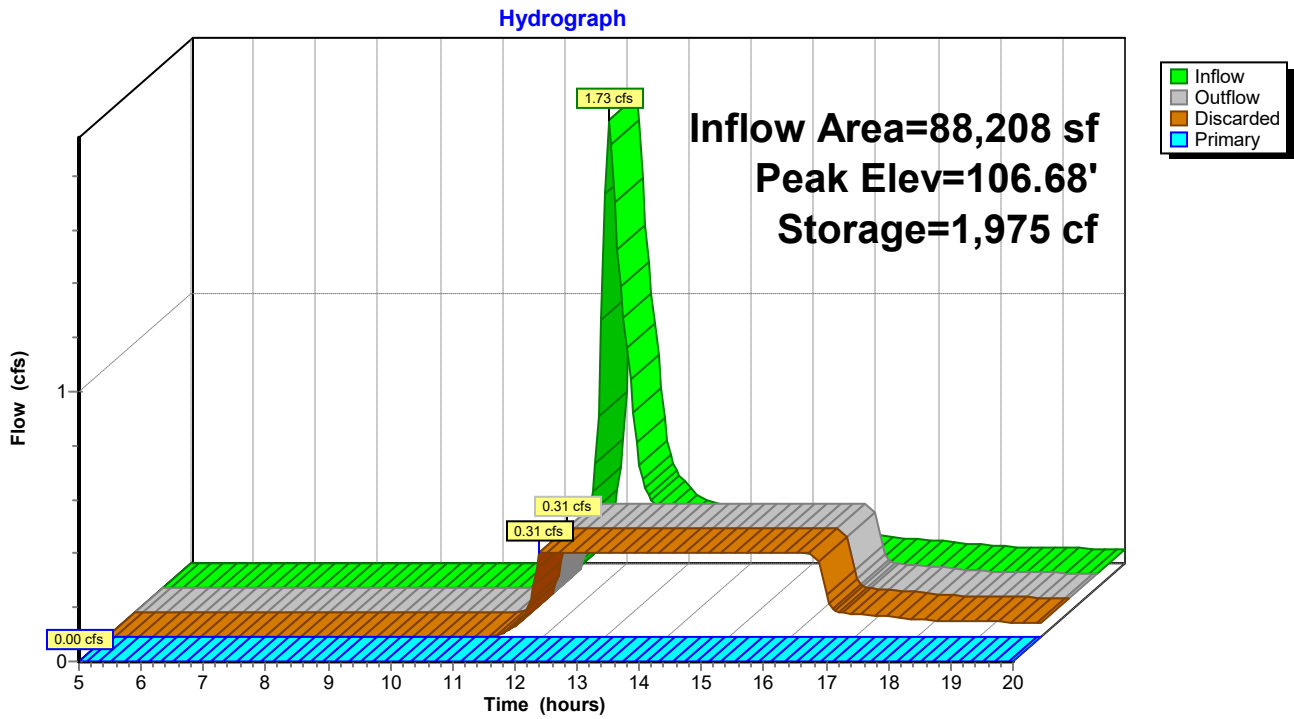
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	108.82'	12.0" Round Culvert L= 113.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 108.82' / 108.25' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	109.40'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 4.0' Crest Height
#3	Discarded	106.00'	2.410 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.31 cfs @ 11.95 hrs HW=106.04' (Free Discharge)
 ↑**3=Exfiltration** (Exfiltration Controls 0.31 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=106.00' (Free Discharge)
 ↑**1=Culvert** (Controls 0.00 cfs)
 ↑**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond ISB: Infiltration System B



Stage-Area-Storage for Pond ISB: Infiltration System B

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
106.00	5,568	0	108.60	5,568	10,444
106.05	5,568	111	108.65	5,568	10,614
106.10	5,568	223	108.70	5,568	10,779
106.15	5,568	334	108.75	5,568	10,935
106.20	5,568	445	108.80	5,568	11,083
106.25	5,568	557	108.85	5,568	11,223
106.30	5,568	668	108.90	5,568	11,354
106.35	5,568	780	108.95	5,568	11,478
106.40	5,568	891	109.00	5,568	11,595
106.45	5,568	1,002	109.05	5,568	11,706
106.50	5,568	1,114	109.10	5,568	11,817
106.55	5,568	1,356	109.15	5,568	11,929
106.60	5,568	1,598	109.20	5,568	12,040
106.65	5,568	1,839	109.25	5,568	12,151
106.70	5,568	2,079	109.30	5,568	12,263
106.75	5,568	2,319	109.35	5,568	12,374
106.80	5,568	2,559	109.40	5,568	12,486
106.85	5,568	2,798	109.45	5,568	12,597
106.90	5,568	3,037	109.50	5,568	12,708
106.95	5,568	3,276	109.55	5,568	12,801
107.00	5,568	3,515	109.60	5,568	12,801
107.05	5,568	3,753	109.65	5,568	12,801
107.10	5,568	3,990	109.70	5,568	12,801
107.15	5,568	4,225	109.75	5,568	12,801
107.20	5,568	4,459	109.80	5,568	12,801
107.25	5,568	4,691			
107.30	5,568	4,923			
107.35	5,568	5,155			
107.40	5,568	5,386			
107.45	5,568	5,617			
107.50	5,568	5,847			
107.55	5,568	6,077			
107.60	5,568	6,306			
107.65	5,568	6,534			
107.70	5,568	6,762			
107.75	5,568	6,988			
107.80	5,568	7,212			
107.85	5,568	7,434			
107.90	5,568	7,653			
107.95	5,568	7,870			
108.00	5,568	8,085			
108.05	5,568	8,297			
108.10	5,568	8,508			
108.15	5,568	8,715			
108.20	5,568	8,921			
108.25	5,568	9,123			
108.30	5,568	9,323			
108.35	5,568	9,519			
108.40	5,568	9,712			
108.45	5,568	9,902			
108.50	5,568	10,087			
108.55	5,568	10,268			

Summary for Pond ISC: Infiltration System C

Inflow Area = 6,800 sf, 100.00% Impervious, Inflow Depth > 2.77" for 2-Year event
 Inflow = 0.47 cfs @ 12.09 hrs, Volume= 1,572 cf
 Outflow = 0.03 cfs @ 10.70 hrs, Volume= 1,189 cf, Atten= 94%, Lag= 0.0 min
 Discarded = 0.03 cfs @ 10.70 hrs, Volume= 1,189 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 105.50' @ 13.80 hrs Surf.Area= 1,190 sf Storage= 723 cf

Plug-Flow detention time= 161.5 min calculated for 1,184 cf (75% of inflow)
 Center-of-Mass det. time= 101.2 min (839.8 - 738.6)

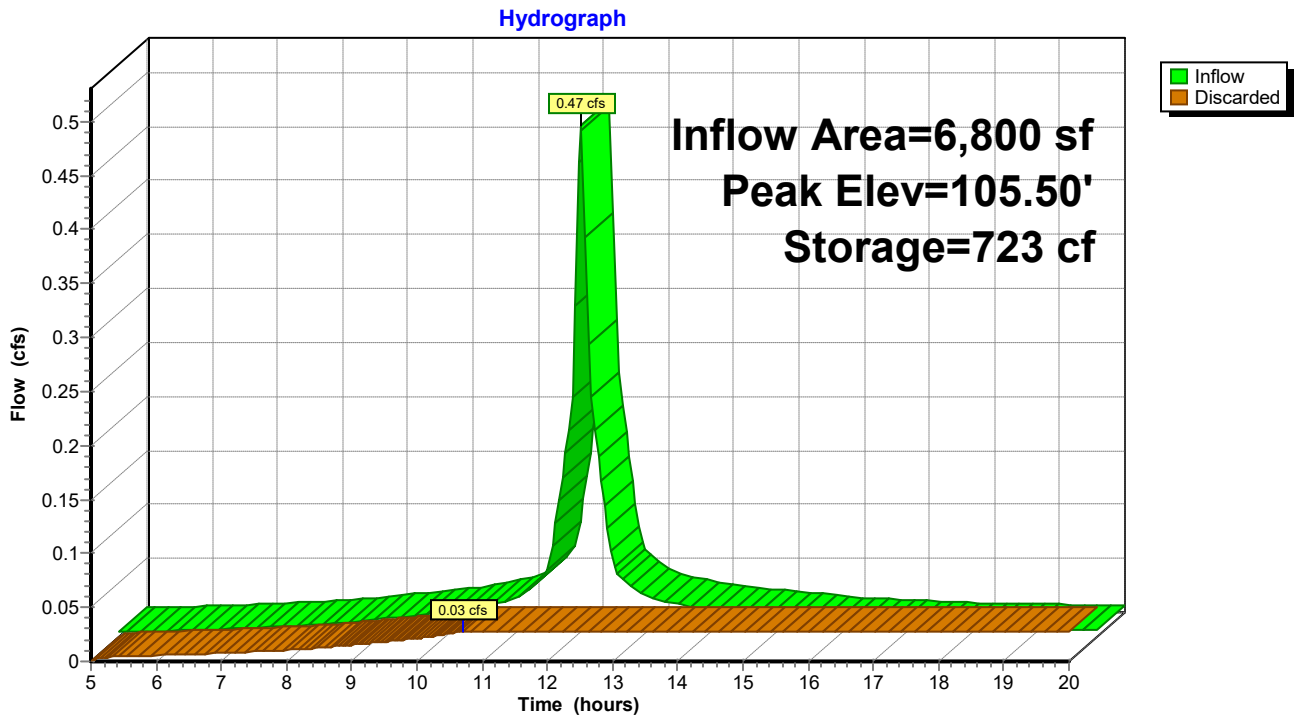
Volume	Invert	Avail.Storage	Storage Description
#1A	104.50'	578 cf	20.83'W x 31.50'L x 3.54'H Field A 2,324 cf Overall - 879 cf Embedded = 1,445 cf x 40.0% Voids
#2A	105.00'	879 cf	Cultec R-330XLHD x 16 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 4 rows
#3B	104.50'	479 cf	30.50'W x 17.50'L x 3.54'H Field B 1,890 cf Overall - 693 cf Embedded = 1,197 cf x 40.0% Voids
#4B	105.00'	693 cf	Cultec R-330XLHD x 12 Inside #3 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 6 rows
		2,629 cf	Total Available Storage

Storage Group A created with Chamber Wizard
 Storage Group B created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	104.50'	1.020 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.03 cfs @ 10.70 hrs HW=104.54' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.03 cfs)

Pond ISC: Infiltration System C



Stage-Area-Storage for Pond ISC: Infiltration System C

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
104.50	1,190	0	107.10	1,190	2,131
104.55	1,190	24	107.15	1,190	2,166
104.60	1,190	48	107.20	1,190	2,200
104.65	1,190	71	107.25	1,190	2,233
104.70	1,190	95	107.30	1,190	2,263
104.75	1,190	119	107.35	1,190	2,293
104.80	1,190	143	107.40	1,190	2,320
104.85	1,190	167	107.45	1,190	2,347
104.90	1,190	190	107.50	1,190	2,371
104.95	1,190	214	107.55	1,190	2,395
105.00	1,190	238	107.60	1,190	2,419
105.05	1,190	287	107.65	1,190	2,443
105.10	1,190	336	107.70	1,190	2,466
105.15	1,190	385	107.75	1,190	2,490
105.20	1,190	433	107.80	1,190	2,514
105.25	1,190	482	107.85	1,190	2,538
105.30	1,190	530	107.90	1,190	2,562
105.35	1,190	578	107.95	1,190	2,585
105.40	1,190	627	108.00	1,190	2,609
105.45	1,190	675			
105.50	1,190	723			
105.55	1,190	771			
105.60	1,190	819			
105.65	1,190	867			
105.70	1,190	914			
105.75	1,190	961			
105.80	1,190	1,008			
105.85	1,190	1,055			
105.90	1,190	1,102			
105.95	1,190	1,149			
106.00	1,190	1,195			
106.05	1,190	1,242			
106.10	1,190	1,288			
106.15	1,190	1,334			
106.20	1,190	1,381			
106.25	1,190	1,426			
106.30	1,190	1,472			
106.35	1,190	1,517			
106.40	1,190	1,561			
106.45	1,190	1,605			
106.50	1,190	1,649			
106.55	1,190	1,692			
106.60	1,190	1,735			
106.65	1,190	1,777			
106.70	1,190	1,819			
106.75	1,190	1,860			
106.80	1,190	1,901			
106.85	1,190	1,941			
106.90	1,190	1,981			
106.95	1,190	2,020			
107.00	1,190	2,058			
107.05	1,190	2,095			

Summary for Pond ISD: Infiltration System D

Inflow Area = 21,302 sf, 76.68% Impervious, Inflow Depth > 1.64" for 2-Year event
 Inflow = 0.99 cfs @ 12.09 hrs, Volume= 2,908 cf
 Outflow = 0.06 cfs @ 11.55 hrs, Volume= 2,090 cf, Atten= 94%, Lag= 0.0 min
 Discarded = 0.06 cfs @ 11.55 hrs, Volume= 2,090 cf
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf
 Routed to Reach TN : Total North

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 105.92' @ 14.17 hrs Surf.Area= 2,597 sf Storage= 1,447 cf

Plug-Flow detention time= 189.0 min calculated for 2,083 cf (72% of inflow)
 Center-of-Mass det. time= 124.5 min (915.0 - 790.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	105.00'	2,187 cf	35.33'W x 73.50'L x 3.54'H Field A 9,198 cf Overall - 3,729 cf Embedded = 5,468 cf x 40.0% Voids
#2A	105.50'	3,729 cf	Cultec R-330XLHD x 70 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 7 rows
		5,917 cf	Total Available Storage

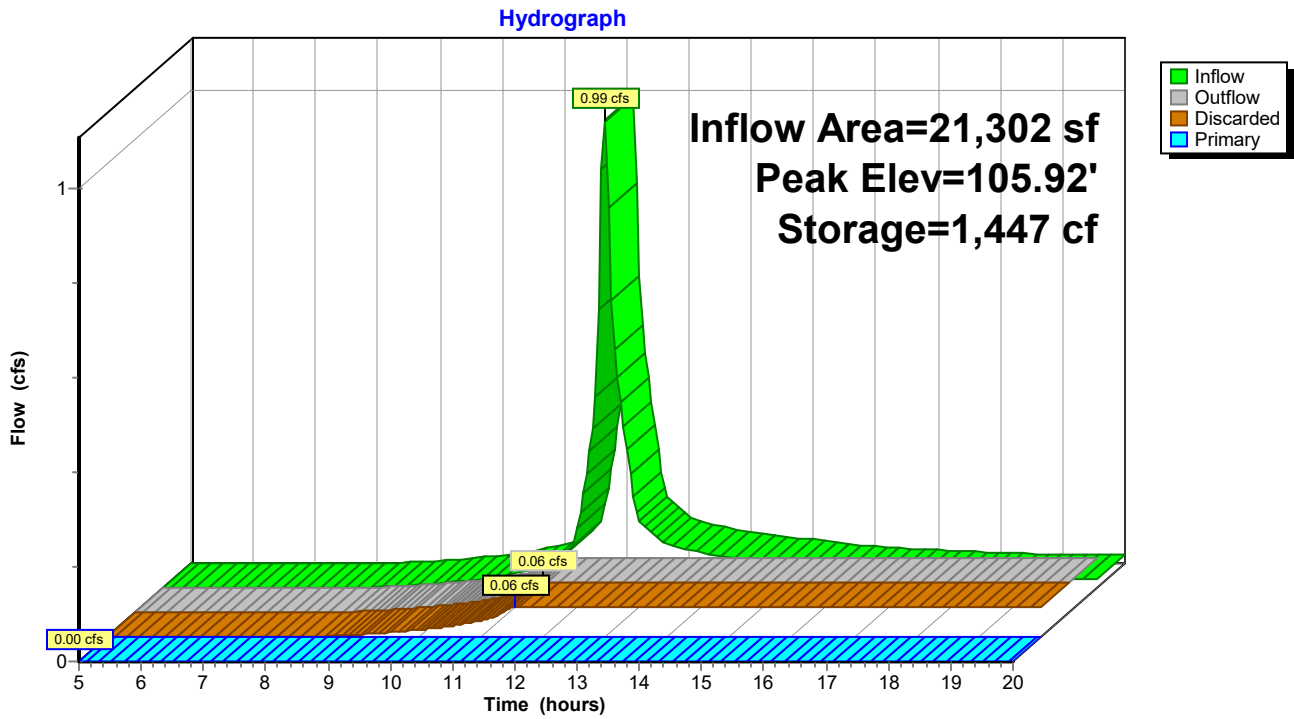
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	105.94'	12.0" Round Culvert L= 94.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 105.94' / 105.00' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	107.10'	12.0" Round Culvert L= 96.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 107.10' / 106.14' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	108.40'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 4.0' Crest Height
#4	Discarded	105.00'	1.020 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.06 cfs @ 11.55 hrs HW=105.04' (Free Discharge)
 ↑4=Exfiltration (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=105.00' (Free Discharge)
 ↑1=Culvert (Controls 0.00 cfs)
 ↑2=Culvert (Controls 0.00 cfs)
 ↑3=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)

Pond ISD: Infiltration System D



Stage-Area-Storage for Pond ISD: Infiltration System D

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
105.00	2,597	0	107.60	2,597	4,820
105.05	2,597	52	107.65	2,597	4,899
105.10	2,597	104	107.70	2,597	4,975
105.15	2,597	156	107.75	2,597	5,047
105.20	2,597	208	107.80	2,597	5,116
105.25	2,597	260	107.85	2,597	5,181
105.30	2,597	312	107.90	2,597	5,242
105.35	2,597	364	107.95	2,597	5,300
105.40	2,597	416	108.00	2,597	5,354
105.45	2,597	467	108.05	2,597	5,406
105.50	2,597	519	108.10	2,597	5,458
105.55	2,597	631	108.15	2,597	5,510
105.60	2,597	742	108.20	2,597	5,562
105.65	2,597	853	108.25	2,597	5,614
105.70	2,597	964	108.30	2,597	5,666
105.75	2,597	1,075	108.35	2,597	5,718
105.80	2,597	1,185	108.40	2,597	5,769
105.85	2,597	1,295	108.45	2,597	5,821
105.90	2,597	1,405	108.50	2,597	5,873
105.95	2,597	1,515			
106.00	2,597	1,625			
106.05	2,597	1,735			
106.10	2,597	1,844			
106.15	2,597	1,952			
106.20	2,597	2,060			
106.25	2,597	2,167			
106.30	2,597	2,274			
106.35	2,597	2,381			
106.40	2,597	2,487			
106.45	2,597	2,593			
106.50	2,597	2,699			
106.55	2,597	2,805			
106.60	2,597	2,911			
106.65	2,597	3,016			
106.70	2,597	3,121			
106.75	2,597	3,225			
106.80	2,597	3,329			
106.85	2,597	3,431			
106.90	2,597	3,532			
106.95	2,597	3,632			
107.00	2,597	3,731			
107.05	2,597	3,829			
107.10	2,597	3,926			
107.15	2,597	4,022			
107.20	2,597	4,117			
107.25	2,597	4,210			
107.30	2,597	4,302			
107.35	2,597	4,393			
107.40	2,597	4,482			
107.45	2,597	4,569			
107.50	2,597	4,655			
107.55	2,597	4,739			

Summary for Pond ND: Natural Depression

Inflow Area = 112,819 sf, 32.88% Impervious, Inflow Depth > 0.00" for 2-Year event
 Inflow = 0.00 cfs @ 17.17 hrs, Volume= 25 cf
 Outflow = 0.00 cfs @ 20.00 hrs, Volume= 20 cf, Atten= 4%, Lag= 169.6 min
 Discarded = 0.00 cfs @ 20.00 hrs, Volume= 20 cf
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf
 Routed to Reach TN : Total North

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 108.00' @ 20.00 hrs Surf.Area= 246 sf Storage= 5 cf

Plug-Flow detention time= 52.8 min calculated for 20 cf (80% of inflow)
 Center-of-Mass det. time= 22.5 min (1,074.1 - 1,051.6)

Volume	Invert	Avail.Storage	Storage Description			
#1	108.00'	3,433 cf	Custom Stage Data (Irregular) Listed below			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
108.00	235	88.4	0	0	235	
109.00	4,458	666.5	1,906	1,906	34,965	
109.30	5,751	684.5	1,527	3,433	36,911	

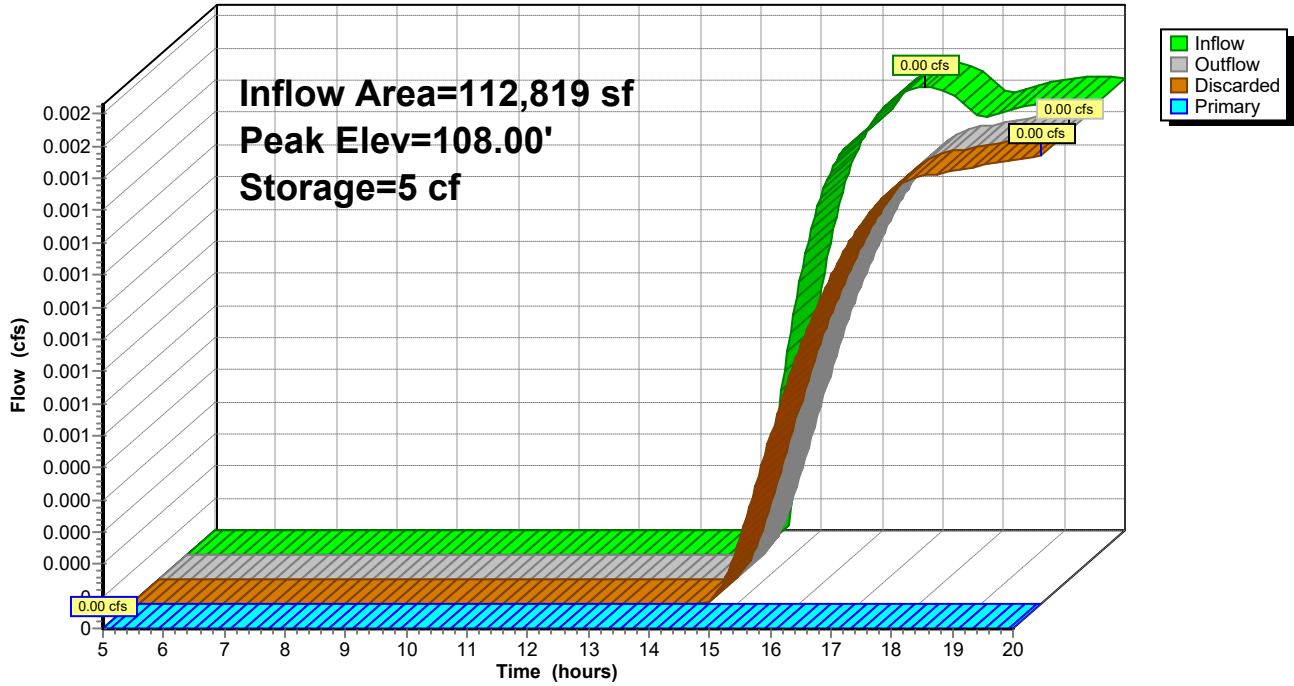
Device	Routing	Invert	Outlet Devices									
#1	Primary	109.00'	2.0' long x 10.0' breadth Broad-Crested Rectangular Weir									
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60									
			Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64									
#2	Discarded	108.00'	1.020 in/hr Exfiltration over Surface area									

Discarded OutFlow Max=0.01 cfs @ 20.00 hrs HW=108.00' (Free Discharge)
 ↑**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=108.00' (Free Discharge)
 ↑**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond ND: Natural Depression

Hydrograph



Stage-Area-Storage for Pond ND: Natural Depression

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
108.00	235	0	109.04	4,630	2,109
108.02	319	38	109.06	4,717	2,211
108.04	404	76	109.08	4,803	2,313
108.06	488	114	109.10	4,889	2,415
108.08	573	152	109.12	4,975	2,516
108.10	657	191	109.14	5,061	2,618
108.12	742	229	109.16	5,148	2,720
108.14	826	267	109.18	5,234	2,822
108.16	911	305	109.20	5,320	2,924
108.18	995	343	109.22	5,406	3,025
108.20	1,080	381	109.24	5,492	3,127
108.22	1,164	419	109.26	5,579	3,229
108.24	1,249	457	109.28	5,665	3,331
108.26	1,333	495	109.30	5,751	3,433
108.28	1,417	534			
108.30	1,502	572			
108.32	1,586	610			
108.34	1,671	648			
108.36	1,755	686			
108.38	1,840	724			
108.40	1,924	762			
108.42	2,009	800			
108.44	2,093	838			
108.46	2,178	877			
108.48	2,262	915			
108.50	2,347	953			
108.52	2,431	991			
108.54	2,515	1,029			
108.56	2,600	1,067			
108.58	2,684	1,105			
108.60	2,769	1,143			
108.62	2,853	1,181			
108.64	2,938	1,220			
108.66	3,022	1,258			
108.68	3,107	1,296			
108.70	3,191	1,334			
108.72	3,276	1,372			
108.74	3,360	1,410			
108.76	3,444	1,448			
108.78	3,529	1,486			
108.80	3,613	1,524			
108.82	3,698	1,563			
108.84	3,782	1,601			
108.86	3,867	1,639			
108.88	3,951	1,677			
108.90	4,036	1,715			
108.92	4,120	1,753			
108.94	4,205	1,791			
108.96	4,289	1,829			
108.98	4,374	1,867			
109.00	4,458	1,906			
109.02	4,544	2,007			

Summary for Subcatchment 2ISB: To Infiltration System B

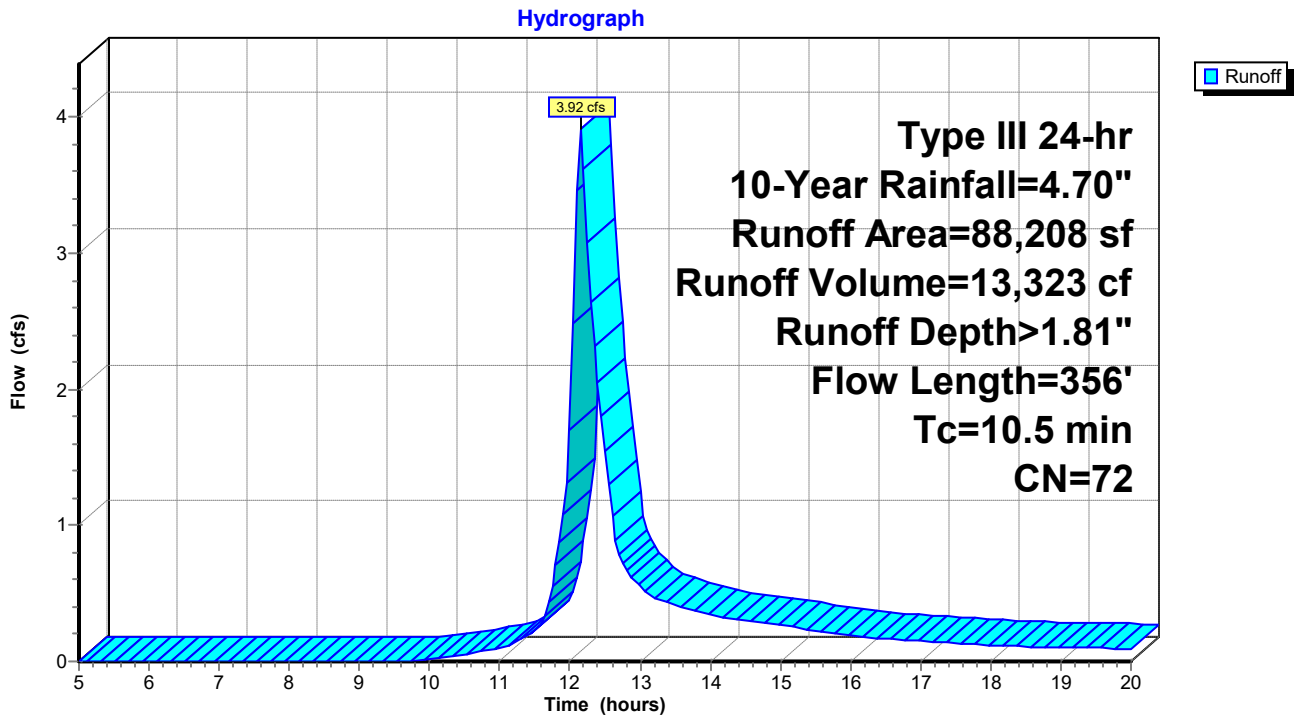
Runoff = 3.92 cfs @ 12.16 hrs, Volume= 13,323 cf, Depth> 1.81"
 Routed to Pond ISB : Infiltration System B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
3,108	30	Woods, Good, HSG A
15,089	39	>75% Grass cover, Good, HSG A
8,413	98	Paved parking, HSG A
1,960	55	Woods, Good, HSG B
30,210	61	>75% Grass cover, Good, HSG B
973	85	Gravel roads, HSG B
4,757	98	Unconnected roofs, HSG B
23,698	98	Paved parking, HSG B
88,208	72	Weighted Average
51,340		58.20% Pervious Area
36,868		41.80% Impervious Area
4,757		12.90% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	50	0.0100	0.11		Sheet Flow, Grass AB Grass: Short n= 0.150 P2= 3.20"
2.0	86	0.0100	0.70		Shallow Concentrated Flow, Grass BC Short Grass Pasture Kv= 7.0 fps
0.9	156	0.0200	2.87		Shallow Concentrated Flow, Paved CD Paved Kv= 20.3 fps
0.2	64	0.0100	4.54	3.56	Pipe Channel, Pipe DE 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
10.5	356	Total			

Subcatchment 2ISB: To Infiltration System B



Summary for Subcatchment 2ISD: To Infiltration System D

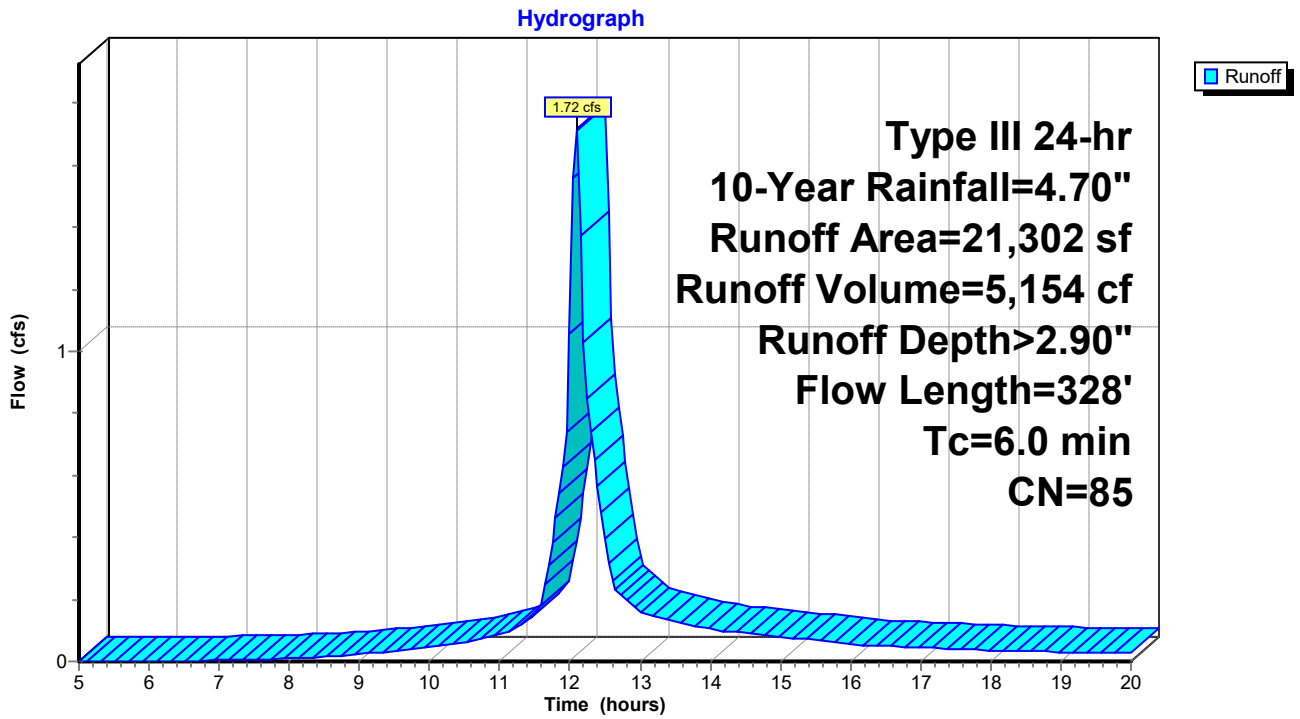
Runoff = 1.72 cfs @ 12.09 hrs, Volume= 5,154 cf, Depth> 2.90"
 Routed to Pond ISD : Infiltration System D

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
701	30	Woods, Good, HSG A
3,511	39	>75% Grass cover, Good, HSG A
11,899	98	Paved parking, HSG A
756	61	>75% Grass cover, Good, HSG B
4,435	98	Paved parking, HSG B
21,302	85	Weighted Average
4,968		23.32% Pervious Area
16,334		76.68% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	29	0.0250	0.15		Sheet Flow, Grass AB Grass: Short n= 0.150 P2= 3.20"
1.3	22	0.1400	0.27		Sheet Flow, Grass AB Grass: Short n= 0.150 P2= 3.20"
1.1	195	0.0225	3.04		Shallow Concentrated Flow, Grass BC Paved Kv= 20.3 fps
0.3	82	0.0100	4.54	3.56	Pipe Channel, Pipe CD 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
6.0	328	Total			

Subcatchment 2ISD: To Infiltration System D



Summary for Subcatchment 2ND: To Natural Depression

Runoff = 0.05 cfs @ 12.39 hrs, Volume= 461 cf, Depth> 0.22"
 Routed to Pond ND : Natural Depression

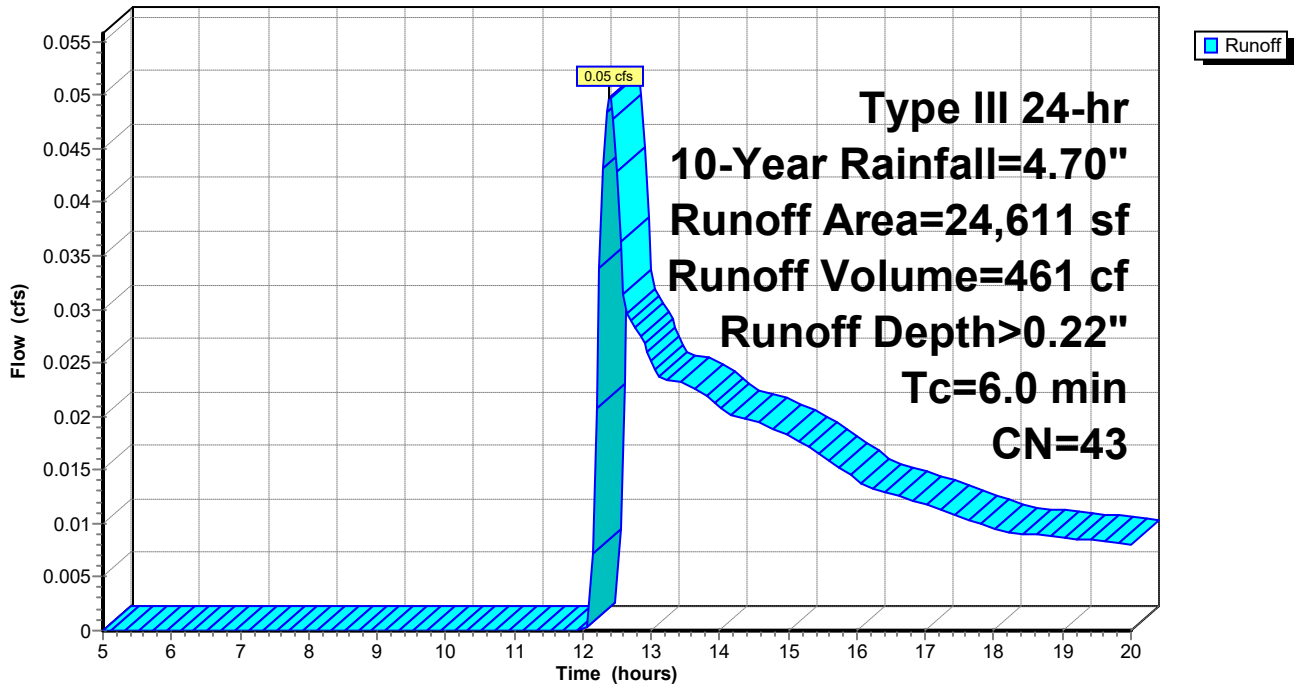
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
4,045	30	Woods, Good, HSG A
18,135	39	>75% Grass cover, Good, HSG A
1,946	96	Gravel surface, HSG A
224	98	Paved parking, HSG A
261	61	>75% Grass cover, Good, HSG B
24,611	43	Weighted Average
24,387		99.09% Pervious Area
224		0.91% Impervious Area

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

Subcatchment 2ND: To Natural Depression

Hydrograph



Summary for Subcatchment N: Offsite North

Runoff = 0.01 cfs @ 14.70 hrs, Volume= 120 cf, Depth> 0.09"
 Routed to Reach TN : Total North

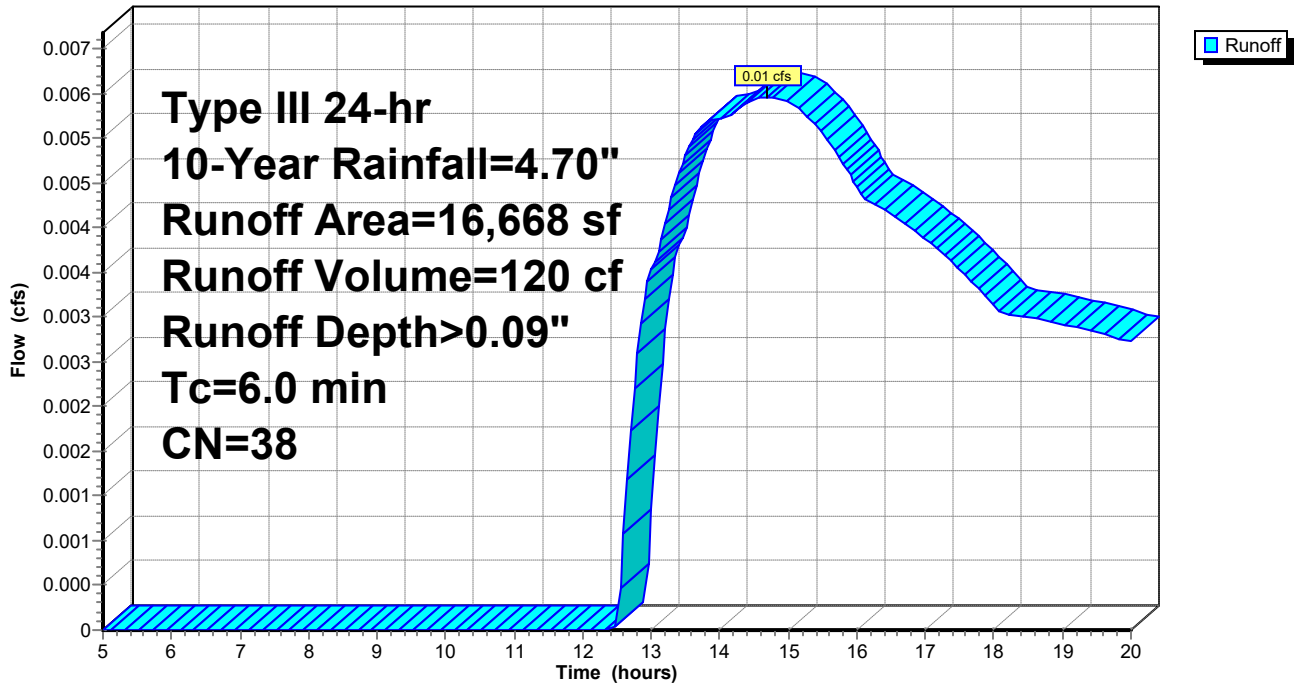
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
4,653	30	Woods, Good, HSG A
11,477	39	>75% Grass cover, Good, HSG A
417	96	Gravel surface, HSG A
121	98	Paved parking, HSG A
16,668	38	Weighted Average
16,547		99.27% Pervious Area
121		0.73% Impervious Area

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

Subcatchment N: Offsite North

Hydrograph



Summary for Subcatchment NU: Northern Units

Runoff = 0.70 cfs @ 12.09 hrs, Volume= 2,349 cf, Depth> 4.15"
 Routed to Pond ISC : Infiltration System C

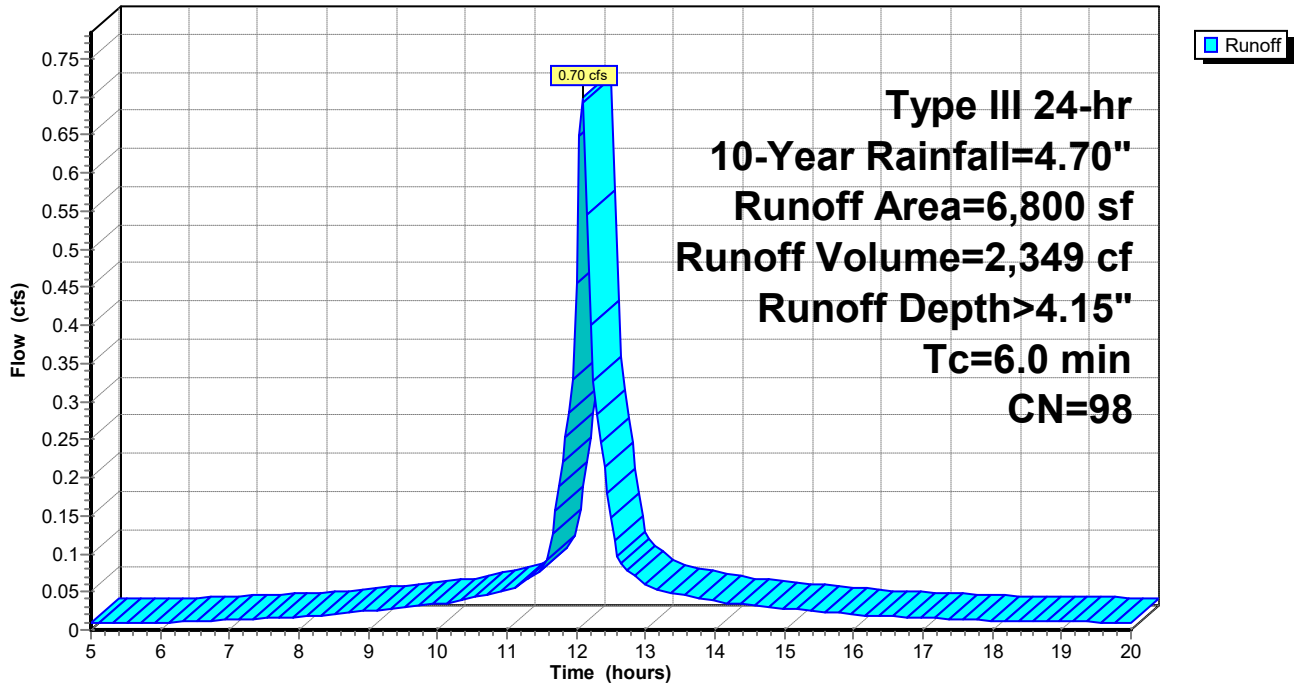
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
6,800	98	Roofs, HSG D
6,800		100.00% Impervious Area

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

Subcatchment NU: Northern Units

Hydrograph



Summary for Subcatchment S: Onsite South

Runoff = 0.00 cfs @ 20.00 hrs, Volume= 1 cf, Depth> 0.00"

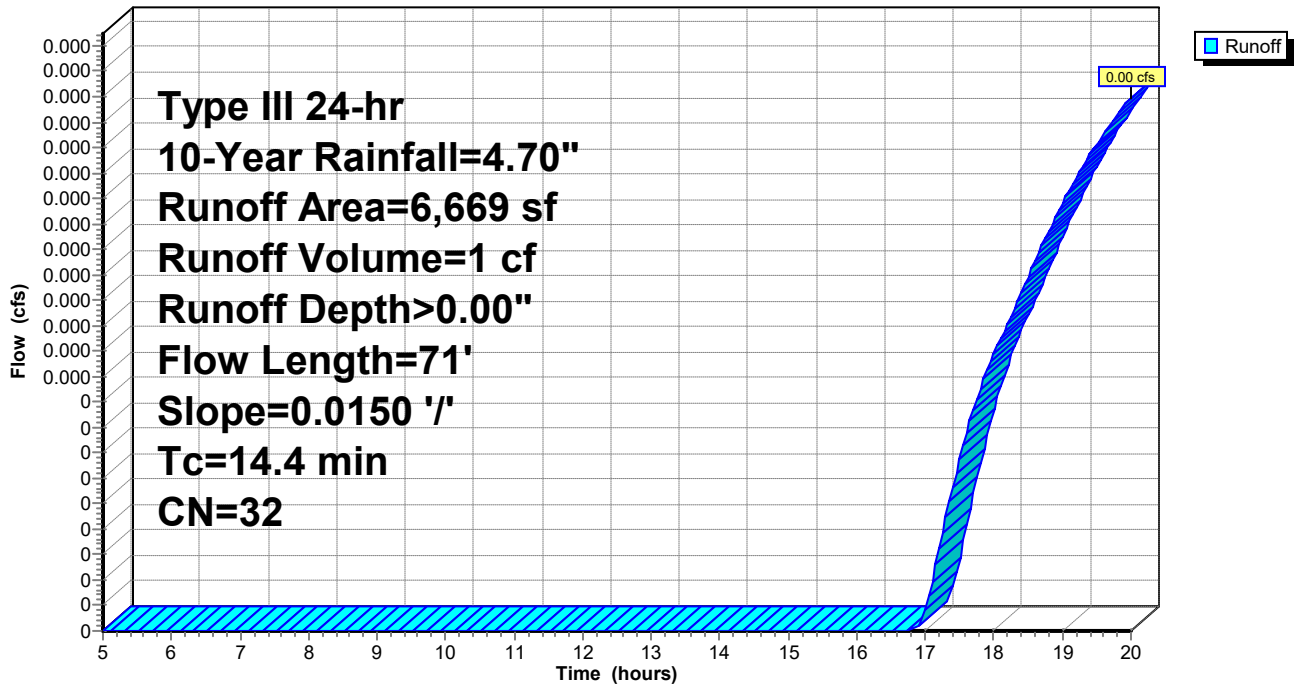
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
5,540	30	Woods, Good, HSG A
1,066	39	>75% Grass cover, Good, HSG A
63	98	Unconnected roofs, HSG A
6,669	32	Weighted Average
6,606		99.06% Pervious Area
63		0.94% Impervious Area
63		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.8	50	0.0150	0.06		Sheet Flow, AB-Woods Woods: Light underbrush n= 0.400 P2= 3.20"
0.6	21	0.0150	0.61		Shallow Concentrated Flow, BC-Woods Woodland Kv= 5.0 fps
14.4	71	Total			

Subcatchment S: Onsite South

Hydrograph



Summary for Subcatchment WU: Western Units

Runoff = 0.49 cfs @ 12.09 hrs, Volume= 1,644 cf, Depth> 4.15"
 Routed to Pond ISA : Infiltration System A

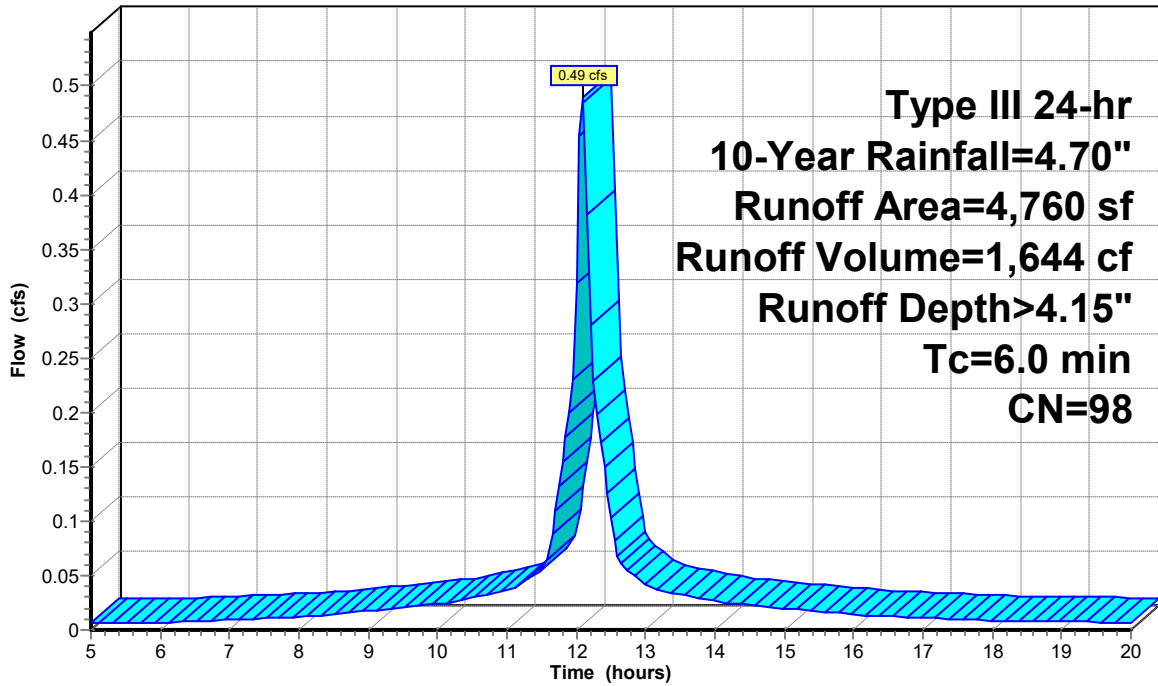
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
4,760	98	Roofs, HSG D
4,760		100.00% Impervious Area

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

Subcatchment WU: Western Units

Hydrograph



Runoff

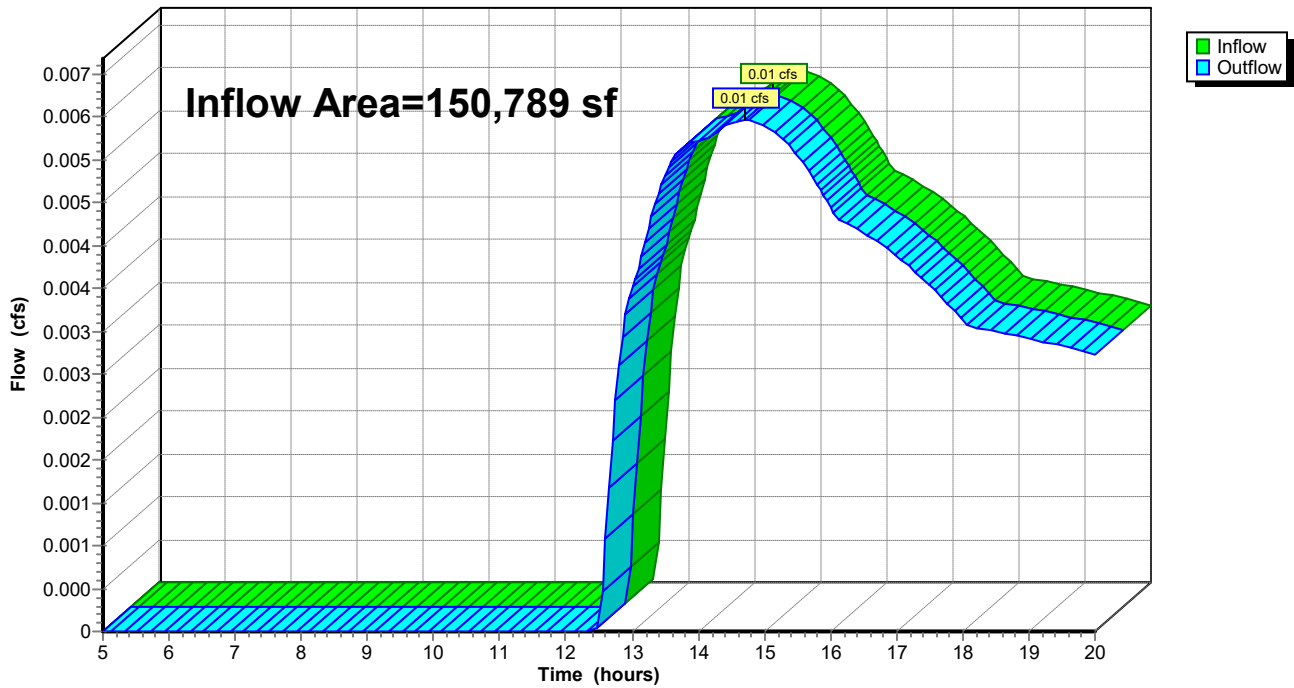
Summary for Reach TN: Total North

Inflow Area = 150,789 sf, 35.51% Impervious, Inflow Depth > 0.01" for 10-Year event
 Inflow = 0.01 cfs @ 14.70 hrs, Volume= 120 cf
 Outflow = 0.01 cfs @ 14.70 hrs, Volume= 120 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach TN: Total North

Hydrograph



Summary for Pond ISA: Infiltration System A

Inflow Area = 4,760 sf, 100.00% Impervious, Inflow Depth > 4.15" for 10-Year event
 Inflow = 0.49 cfs @ 12.09 hrs, Volume= 1,644 cf
 Outflow = 0.08 cfs @ 11.70 hrs, Volume= 1,644 cf, Atten= 83%, Lag= 0.0 min
 Discarded = 0.08 cfs @ 11.70 hrs, Volume= 1,644 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 107.60' @ 12.55 hrs Surf.Area= 430 sf Storage= 457 cf

Plug-Flow detention time= 32.3 min calculated for 1,638 cf (100% of inflow)
 Center-of-Mass det. time= 31.9 min (767.4 - 735.5)

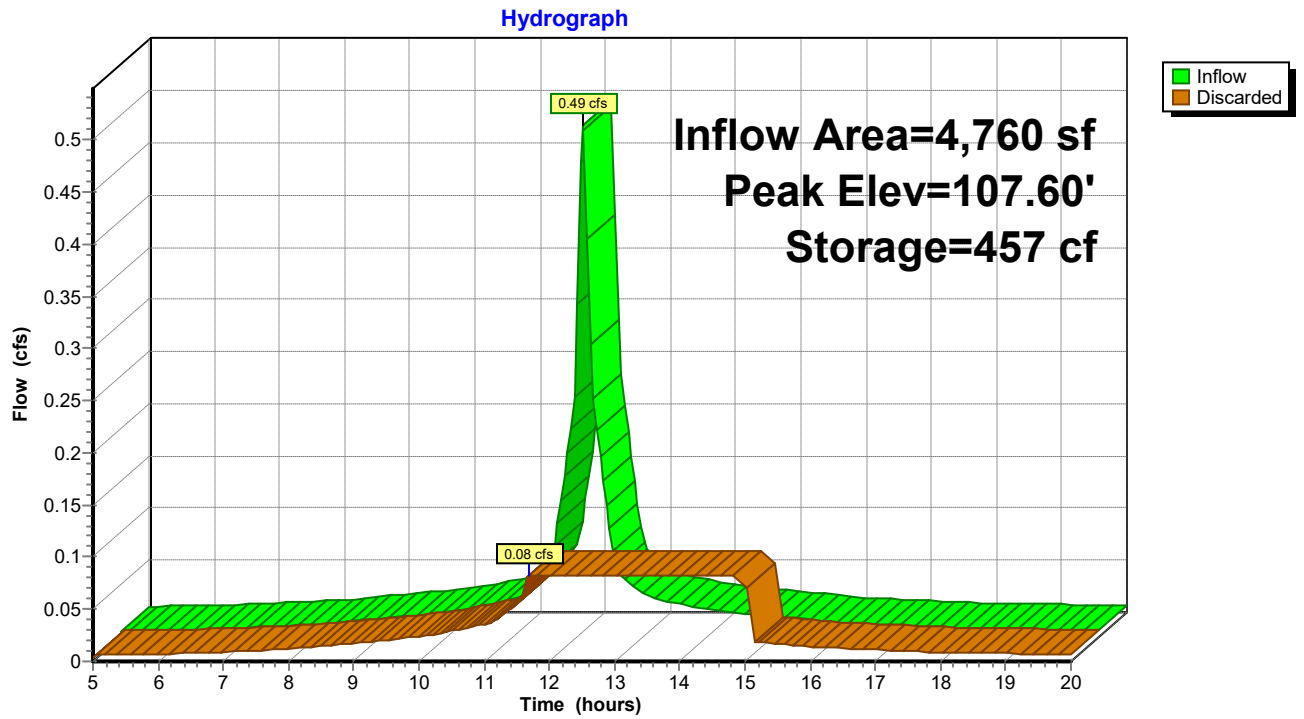
Volume	Invert	Avail.Storage	Storage Description
#1A	106.00'	391 cf	11.17'W x 38.50'L x 3.54'H Field A 1,523 cf Overall - 544 cf Embedded = 979 cf x 40.0% Voids
#2A	106.50'	544 cf	Cultec R-330XLHD x 10 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 2 rows
		935 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	106.00'	8.270 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.08 cfs @ 11.70 hrs HW=106.05' (Free Discharge)
 ↑**1=Exfiltration** (Exfiltration Controls 0.08 cfs)

Pond ISA: Infiltration System A



Stage-Area-Storage for Pond ISA: Infiltration System A

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
106.00	430	0	108.60	430	756
106.05	430	9	108.65	430	769
106.10	430	17	108.70	430	781
106.15	430	26	108.75	430	792
106.20	430	34	108.80	430	803
106.25	430	43	108.85	430	814
106.30	430	52	108.90	430	824
106.35	430	60	108.95	430	833
106.40	430	69	109.00	430	842
106.45	430	77	109.05	430	851
106.50	430	86	109.10	430	859
106.55	430	103	109.15	430	868
106.60	430	121	109.20	430	877
106.65	430	138	109.25	430	885
106.70	430	155	109.30	430	894
106.75	430	172	109.35	430	902
106.80	430	189	109.40	430	911
106.85	430	206	109.45	430	920
106.90	430	223	109.50	430	928
106.95	430	240			
107.00	430	257			
107.05	430	275			
107.10	430	291			
107.15	430	308			
107.20	430	325			
107.25	430	342			
107.30	430	358			
107.35	430	375			
107.40	430	391			
107.45	430	408			
107.50	430	424			
107.55	430	441			
107.60	430	457			
107.65	430	474			
107.70	430	490			
107.75	430	506			
107.80	430	522			
107.85	430	538			
107.90	430	554			
107.95	430	570			
108.00	430	585			
108.05	430	600			
108.10	430	616			
108.15	430	631			
108.20	430	645			
108.25	430	660			
108.30	430	675			
108.35	430	689			
108.40	430	703			
108.45	430	717			
108.50	430	730			
108.55	430	743			

Summary for Pond ISB: Infiltration System B

Inflow Area = 88,208 sf, 41.80% Impervious, Inflow Depth > 1.81" for 10-Year event
 Inflow = 3.92 cfs @ 12.16 hrs, Volume= 13,323 cf
 Outflow = 0.31 cfs @ 11.70 hrs, Volume= 9,917 cf, Atten= 92%, Lag= 0.0 min
 Discarded = 0.31 cfs @ 11.70 hrs, Volume= 9,917 cf
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf
 Routed to Pond ND : Natural Depression

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 107.62' @ 14.33 hrs Surf.Area= 5,568 sf Storage= 6,415 cf

Plug-Flow detention time= 187.7 min calculated for 9,917 cf (74% of inflow)
 Center-of-Mass det. time= 125.0 min (934.5 - 809.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	106.00'	4,612 cf	69.17"W x 80.50"L x 3.54'H Field A 19,720 cf Overall - 8,189 cf Embedded = 11,531 cf x 40.0% Voids
#2A	106.50'	8,189 cf	Cultec R-330XLHD x 154 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 14 rows
		12,801 cf	Total Available Storage

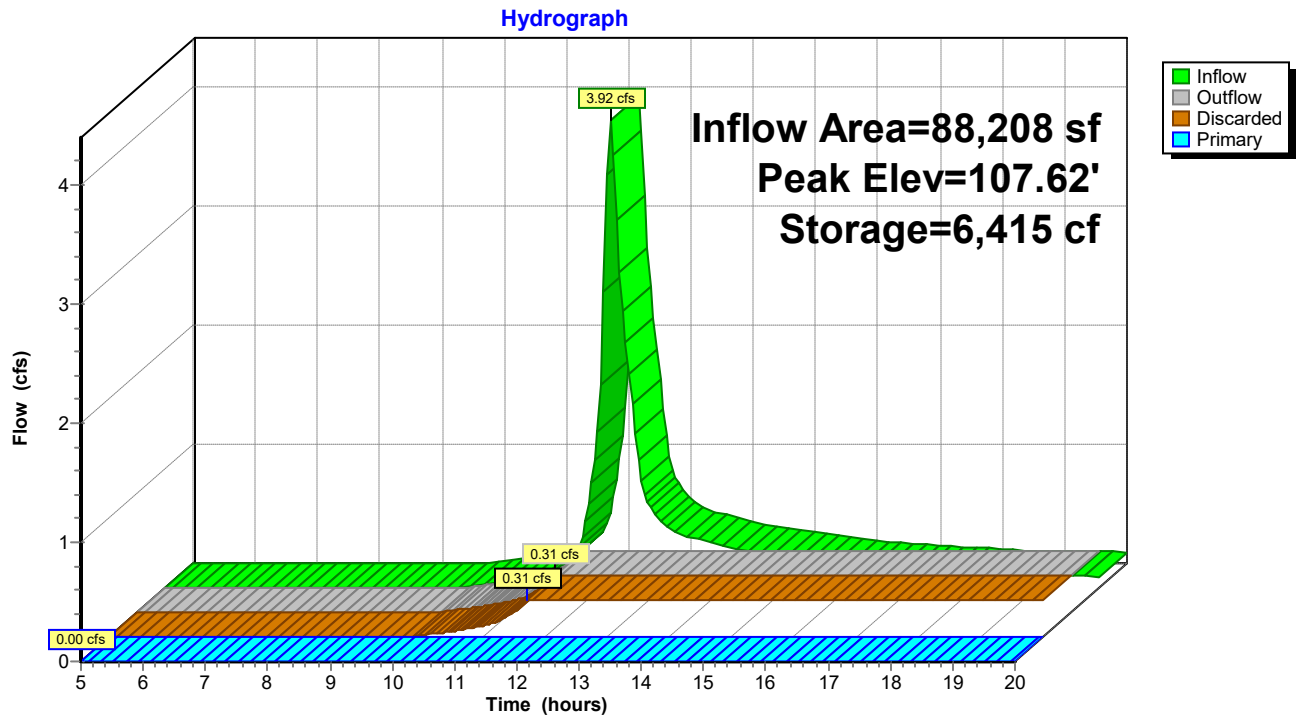
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	108.82'	12.0" Round Culvert L= 113.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 108.82' / 108.25' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	109.40'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 4.0' Crest Height
#3	Discarded	106.00'	2.410 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.31 cfs @ 11.70 hrs HW=106.04' (Free Discharge)
 ↑**3=Exfiltration** (Exfiltration Controls 0.31 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=106.00' (Free Discharge)
 ↑**1=Culvert** (Controls 0.00 cfs)
 ↑**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond ISB: Infiltration System B



Stage-Area-Storage for Pond ISB: Infiltration System B

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
106.00	5,568	0	108.60	5,568	10,444
106.05	5,568	111	108.65	5,568	10,614
106.10	5,568	223	108.70	5,568	10,779
106.15	5,568	334	108.75	5,568	10,935
106.20	5,568	445	108.80	5,568	11,083
106.25	5,568	557	108.85	5,568	11,223
106.30	5,568	668	108.90	5,568	11,354
106.35	5,568	780	108.95	5,568	11,478
106.40	5,568	891	109.00	5,568	11,595
106.45	5,568	1,002	109.05	5,568	11,706
106.50	5,568	1,114	109.10	5,568	11,817
106.55	5,568	1,356	109.15	5,568	11,929
106.60	5,568	1,598	109.20	5,568	12,040
106.65	5,568	1,839	109.25	5,568	12,151
106.70	5,568	2,079	109.30	5,568	12,263
106.75	5,568	2,319	109.35	5,568	12,374
106.80	5,568	2,559	109.40	5,568	12,486
106.85	5,568	2,798	109.45	5,568	12,597
106.90	5,568	3,037	109.50	5,568	12,708
106.95	5,568	3,276	109.55	5,568	12,801
107.00	5,568	3,515	109.60	5,568	12,801
107.05	5,568	3,753	109.65	5,568	12,801
107.10	5,568	3,990	109.70	5,568	12,801
107.15	5,568	4,225	109.75	5,568	12,801
107.20	5,568	4,459	109.80	5,568	12,801
107.25	5,568	4,691			
107.30	5,568	4,923			
107.35	5,568	5,155			
107.40	5,568	5,386			
107.45	5,568	5,617			
107.50	5,568	5,847			
107.55	5,568	6,077			
107.60	5,568	6,306			
107.65	5,568	6,534			
107.70	5,568	6,762			
107.75	5,568	6,988			
107.80	5,568	7,212			
107.85	5,568	7,434			
107.90	5,568	7,653			
107.95	5,568	7,870			
108.00	5,568	8,085			
108.05	5,568	8,297			
108.10	5,568	8,508			
108.15	5,568	8,715			
108.20	5,568	8,921			
108.25	5,568	9,123			
108.30	5,568	9,323			
108.35	5,568	9,519			
108.40	5,568	9,712			
108.45	5,568	9,902			
108.50	5,568	10,087			
108.55	5,568	10,268			

Summary for Pond ISC: Infiltration System C

Inflow Area = 6,800 sf, 100.00% Impervious, Inflow Depth > 4.15" for 10-Year event
 Inflow = 0.70 cfs @ 12.09 hrs, Volume= 2,349 cf
 Outflow = 0.03 cfs @ 9.50 hrs, Volume= 1,302 cf, Atten= 96%, Lag= 0.0 min
 Discarded = 0.03 cfs @ 9.50 hrs, Volume= 1,302 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 106.09' @ 15.04 hrs Surf.Area= 1,190 sf Storage= 1,275 cf

Plug-Flow detention time= 160.2 min calculated for 1,297 cf (55% of inflow)
 Center-of-Mass det. time= 73.8 min (809.3 - 735.5)

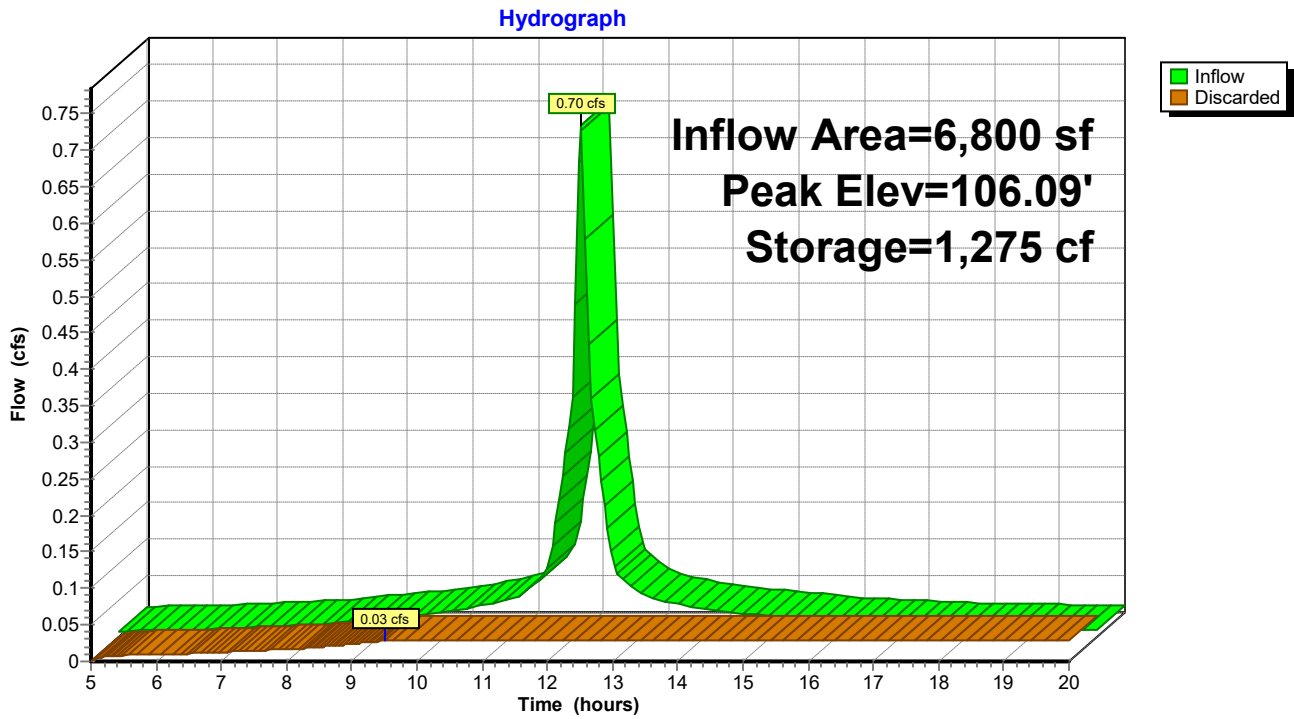
Volume	Invert	Avail.Storage	Storage Description
#1A	104.50'	578 cf	20.83'W x 31.50'L x 3.54'H Field A 2,324 cf Overall - 879 cf Embedded = 1,445 cf x 40.0% Voids
#2A	105.00'	879 cf	Cultec R-330XLHD x 16 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 4 rows
#3B	104.50'	479 cf	30.50'W x 17.50'L x 3.54'H Field B 1,890 cf Overall - 693 cf Embedded = 1,197 cf x 40.0% Voids
#4B	105.00'	693 cf	Cultec R-330XLHD x 12 Inside #3 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 6 rows
		2,629 cf	Total Available Storage

Storage Group A created with Chamber Wizard
 Storage Group B created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	104.50'	1.020 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.03 cfs @ 9.50 hrs HW=104.54' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.03 cfs)

Pond ISC: Infiltration System C



Stage-Area-Storage for Pond ISC: Infiltration System C

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
104.50	1,190	0	107.10	1,190	2,131
104.55	1,190	24	107.15	1,190	2,166
104.60	1,190	48	107.20	1,190	2,200
104.65	1,190	71	107.25	1,190	2,233
104.70	1,190	95	107.30	1,190	2,263
104.75	1,190	119	107.35	1,190	2,293
104.80	1,190	143	107.40	1,190	2,320
104.85	1,190	167	107.45	1,190	2,347
104.90	1,190	190	107.50	1,190	2,371
104.95	1,190	214	107.55	1,190	2,395
105.00	1,190	238	107.60	1,190	2,419
105.05	1,190	287	107.65	1,190	2,443
105.10	1,190	336	107.70	1,190	2,466
105.15	1,190	385	107.75	1,190	2,490
105.20	1,190	433	107.80	1,190	2,514
105.25	1,190	482	107.85	1,190	2,538
105.30	1,190	530	107.90	1,190	2,562
105.35	1,190	578	107.95	1,190	2,585
105.40	1,190	627	108.00	1,190	2,609
105.45	1,190	675			
105.50	1,190	723			
105.55	1,190	771			
105.60	1,190	819			
105.65	1,190	867			
105.70	1,190	914			
105.75	1,190	961			
105.80	1,190	1,008			
105.85	1,190	1,055			
105.90	1,190	1,102			
105.95	1,190	1,149			
106.00	1,190	1,195			
106.05	1,190	1,242			
106.10	1,190	1,288			
106.15	1,190	1,334			
106.20	1,190	1,381			
106.25	1,190	1,426			
106.30	1,190	1,472			
106.35	1,190	1,517			
106.40	1,190	1,561			
106.45	1,190	1,605			
106.50	1,190	1,649			
106.55	1,190	1,692			
106.60	1,190	1,735			
106.65	1,190	1,777			
106.70	1,190	1,819			
106.75	1,190	1,860			
106.80	1,190	1,901			
106.85	1,190	1,941			
106.90	1,190	1,981			
106.95	1,190	2,020			
107.00	1,190	2,058			
107.05	1,190	2,095			

Summary for Pond ISD: Infiltration System D

Inflow Area = 21,302 sf, 76.68% Impervious, Inflow Depth > 2.90" for 10-Year event
 Inflow = 1.72 cfs @ 12.09 hrs, Volume= 5,154 cf
 Outflow = 0.06 cfs @ 10.65 hrs, Volume= 2,369 cf, Atten= 96%, Lag= 0.0 min
 Discarded = 0.06 cfs @ 10.65 hrs, Volume= 2,369 cf
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf
 Routed to Reach TN : Total North

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 106.70' @ 15.79 hrs Surf.Area= 2,597 sf Storage= 3,127 cf

Plug-Flow detention time= 185.3 min calculated for 2,369 cf (46% of inflow)
 Center-of-Mass det. time= 99.2 min (876.4 - 777.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	105.00'	2,187 cf	35.33'W x 73.50'L x 3.54'H Field A 9,198 cf Overall - 3,729 cf Embedded = 5,468 cf x 40.0% Voids
#2A	105.50'	3,729 cf	Cultec R-330XLHD x 70 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 7 rows
		5,917 cf	Total Available Storage

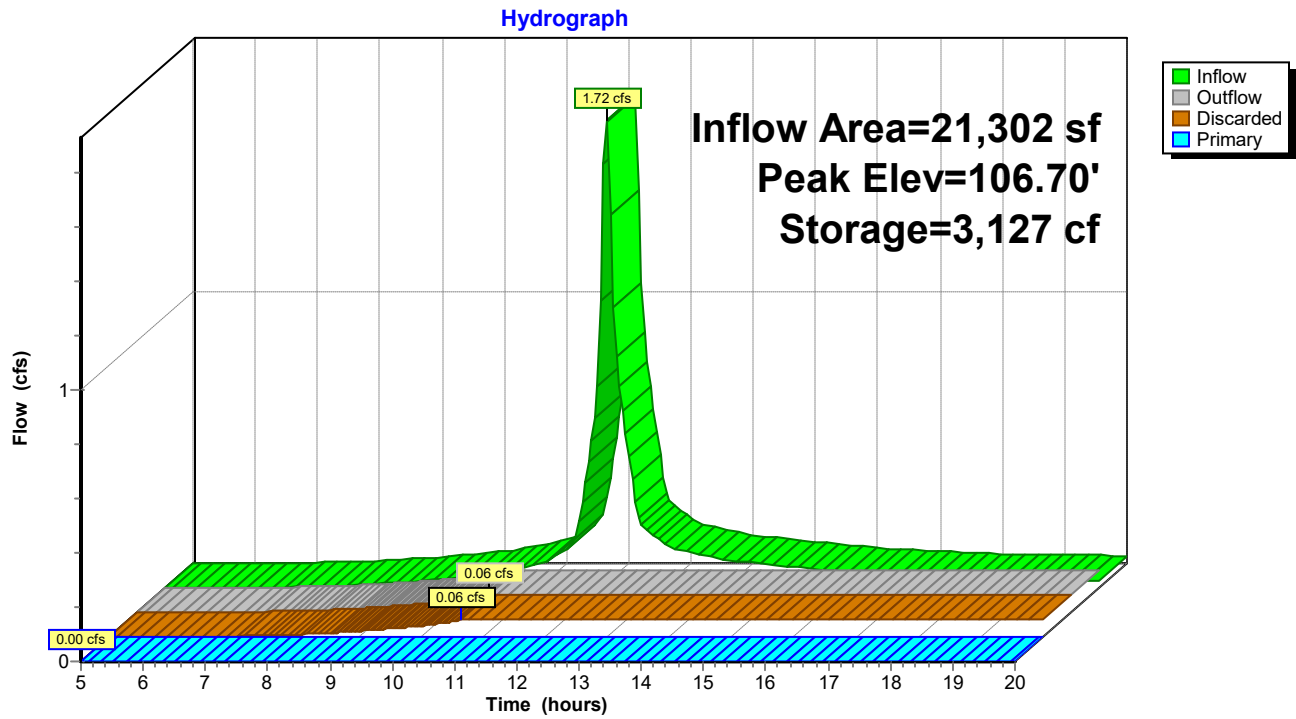
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	105.94'	12.0" Round Culvert L= 94.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 105.94' / 105.00' S= 0.0100 '/ Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	107.10'	12.0" Round Culvert L= 96.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 107.10' / 106.14' S= 0.0100 '/ Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	108.40'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 4.0' Crest Height
#4	Discarded	105.00'	1.020 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.06 cfs @ 10.65 hrs HW=105.04' (Free Discharge)
 ↑4=Exfiltration (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=105.00' (Free Discharge)
 ↑1=Culvert (Controls 0.00 cfs)
 ↑2=Culvert (Controls 0.00 cfs)
 ↑3=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)

Pond ISD: Infiltration System D



Stage-Area-Storage for Pond ISD: Infiltration System D

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
105.00	2,597	0	107.60	2,597	4,820
105.05	2,597	52	107.65	2,597	4,899
105.10	2,597	104	107.70	2,597	4,975
105.15	2,597	156	107.75	2,597	5,047
105.20	2,597	208	107.80	2,597	5,116
105.25	2,597	260	107.85	2,597	5,181
105.30	2,597	312	107.90	2,597	5,242
105.35	2,597	364	107.95	2,597	5,300
105.40	2,597	416	108.00	2,597	5,354
105.45	2,597	467	108.05	2,597	5,406
105.50	2,597	519	108.10	2,597	5,458
105.55	2,597	631	108.15	2,597	5,510
105.60	2,597	742	108.20	2,597	5,562
105.65	2,597	853	108.25	2,597	5,614
105.70	2,597	964	108.30	2,597	5,666
105.75	2,597	1,075	108.35	2,597	5,718
105.80	2,597	1,185	108.40	2,597	5,769
105.85	2,597	1,295	108.45	2,597	5,821
105.90	2,597	1,405	108.50	2,597	5,873
105.95	2,597	1,515			
106.00	2,597	1,625			
106.05	2,597	1,735			
106.10	2,597	1,844			
106.15	2,597	1,952			
106.20	2,597	2,060			
106.25	2,597	2,167			
106.30	2,597	2,274			
106.35	2,597	2,381			
106.40	2,597	2,487			
106.45	2,597	2,593			
106.50	2,597	2,699			
106.55	2,597	2,805			
106.60	2,597	2,911			
106.65	2,597	3,016			
106.70	2,597	3,121			
106.75	2,597	3,225			
106.80	2,597	3,329			
106.85	2,597	3,431			
106.90	2,597	3,532			
106.95	2,597	3,632			
107.00	2,597	3,731			
107.05	2,597	3,829			
107.10	2,597	3,926			
107.15	2,597	4,022			
107.20	2,597	4,117			
107.25	2,597	4,210			
107.30	2,597	4,302			
107.35	2,597	4,393			
107.40	2,597	4,482			
107.45	2,597	4,569			
107.50	2,597	4,655			
107.55	2,597	4,739			

Summary for Pond ND: Natural Depression

Inflow Area = 112,819 sf, 32.88% Impervious, Inflow Depth > 0.05" for 10-Year event
 Inflow = 0.05 cfs @ 12.39 hrs, Volume= 461 cf
 Outflow = 0.01 cfs @ 16.05 hrs, Volume= 344 cf, Atten= 72%, Lag= 219.1 min
 Discarded = 0.01 cfs @ 16.05 hrs, Volume= 344 cf
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf
 Routed to Reach TN : Total North

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 108.08' @ 16.05 hrs Surf.Area= 584 sf Storage= 157 cf

Plug-Flow detention time= 137.8 min calculated for 343 cf (74% of inflow)
 Center-of-Mass det. time= 73.8 min (978.1 - 904.3)

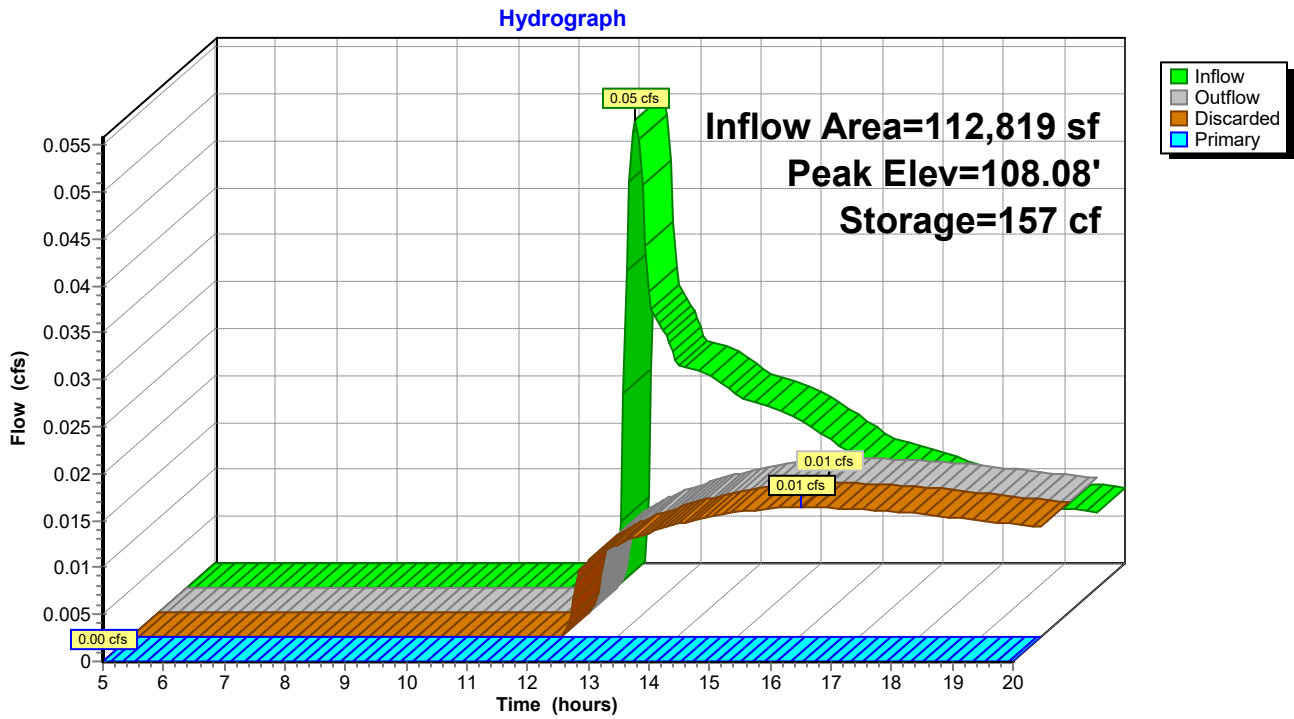
Volume	Invert	Avail.Storage	Storage Description			
#1	108.00'	3,433 cf	Custom Stage Data (Irregular) Listed below			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
108.00	235	88.4	0	0	235	
109.00	4,458	666.5	1,906	1,906	34,965	
109.30	5,751	684.5	1,527	3,433	36,911	

Device	Routing	Invert	Outlet Devices									
#1	Primary	109.00'	2.0' long x 10.0' breadth Broad-Crested Rectangular Weir									
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60									
			Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64									
#2	Discarded	108.00'	1.020 in/hr Exfiltration over Surface area									

Discarded OutFlow Max=0.01 cfs @ 16.05 hrs HW=108.08' (Free Discharge)
 ↑**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=108.00' (Free Discharge)
 ↑**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond ND: Natural Depression



Stage-Area-Storage for Pond ND: Natural Depression

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
108.00	235	0	109.04	4,630	2,109
108.02	319	38	109.06	4,717	2,211
108.04	404	76	109.08	4,803	2,313
108.06	488	114	109.10	4,889	2,415
108.08	573	152	109.12	4,975	2,516
108.10	657	191	109.14	5,061	2,618
108.12	742	229	109.16	5,148	2,720
108.14	826	267	109.18	5,234	2,822
108.16	911	305	109.20	5,320	2,924
108.18	995	343	109.22	5,406	3,025
108.20	1,080	381	109.24	5,492	3,127
108.22	1,164	419	109.26	5,579	3,229
108.24	1,249	457	109.28	5,665	3,331
108.26	1,333	495	109.30	5,751	3,433
108.28	1,417	534			
108.30	1,502	572			
108.32	1,586	610			
108.34	1,671	648			
108.36	1,755	686			
108.38	1,840	724			
108.40	1,924	762			
108.42	2,009	800			
108.44	2,093	838			
108.46	2,178	877			
108.48	2,262	915			
108.50	2,347	953			
108.52	2,431	991			
108.54	2,515	1,029			
108.56	2,600	1,067			
108.58	2,684	1,105			
108.60	2,769	1,143			
108.62	2,853	1,181			
108.64	2,938	1,220			
108.66	3,022	1,258			
108.68	3,107	1,296			
108.70	3,191	1,334			
108.72	3,276	1,372			
108.74	3,360	1,410			
108.76	3,444	1,448			
108.78	3,529	1,486			
108.80	3,613	1,524			
108.82	3,698	1,563			
108.84	3,782	1,601			
108.86	3,867	1,639			
108.88	3,951	1,677			
108.90	4,036	1,715			
108.92	4,120	1,753			
108.94	4,205	1,791			
108.96	4,289	1,829			
108.98	4,374	1,867			
109.00	4,458	1,906			
109.02	4,544	2,007			

Summary for Subcatchment 2ISB: To Infiltration System B

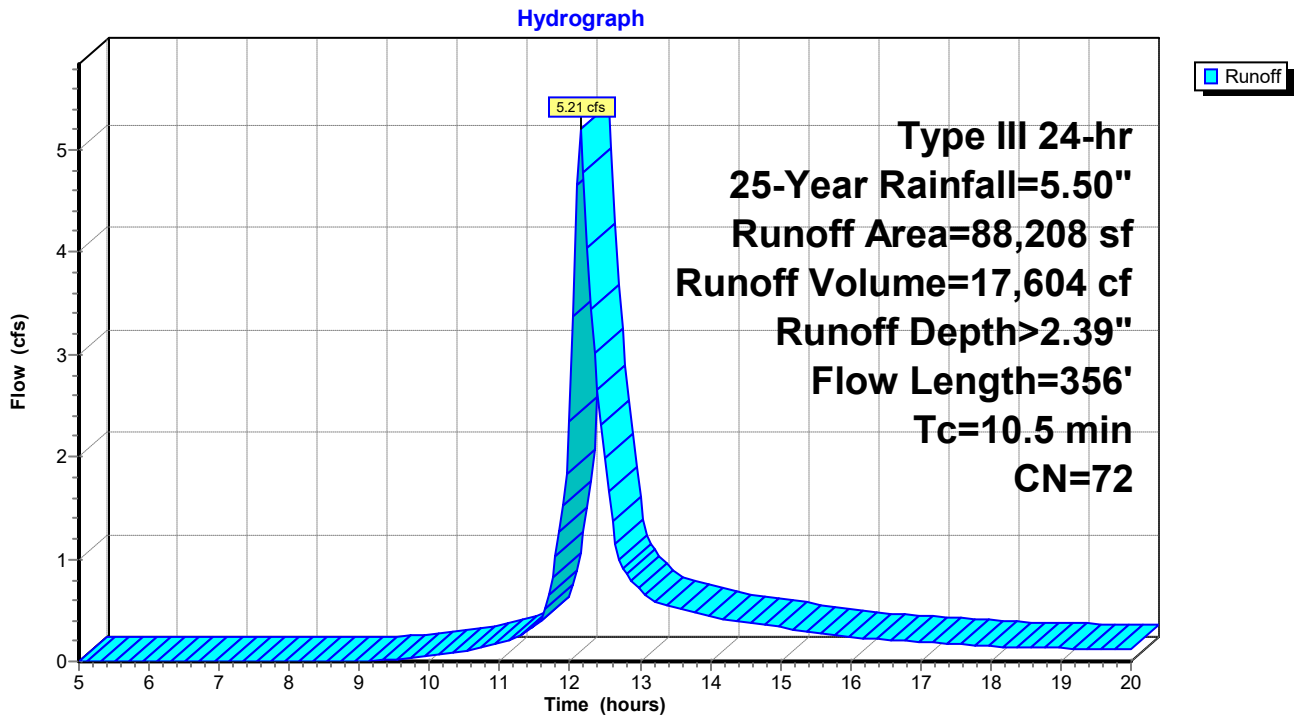
Runoff = 5.21 cfs @ 12.15 hrs, Volume= 17,604 cf, Depth> 2.39"
 Routed to Pond ISB : Infiltration System B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Description
3,108	30	Woods, Good, HSG A
15,089	39	>75% Grass cover, Good, HSG A
8,413	98	Paved parking, HSG A
1,960	55	Woods, Good, HSG B
30,210	61	>75% Grass cover, Good, HSG B
973	85	Gravel roads, HSG B
4,757	98	Unconnected roofs, HSG B
23,698	98	Paved parking, HSG B
88,208	72	Weighted Average
51,340		58.20% Pervious Area
36,868		41.80% Impervious Area
4,757		12.90% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	50	0.0100	0.11		Sheet Flow, Grass AB Grass: Short n= 0.150 P2= 3.20"
2.0	86	0.0100	0.70		Shallow Concentrated Flow, Grass BC Short Grass Pasture Kv= 7.0 fps
0.9	156	0.0200	2.87		Shallow Concentrated Flow, Paved CD Paved Kv= 20.3 fps
0.2	64	0.0100	4.54	3.56	Pipe Channel, Pipe DE 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
10.5	356	Total			

Subcatchment 2ISB: To Infiltration System B



Summary for Subcatchment 2ISD: To Infiltration System D

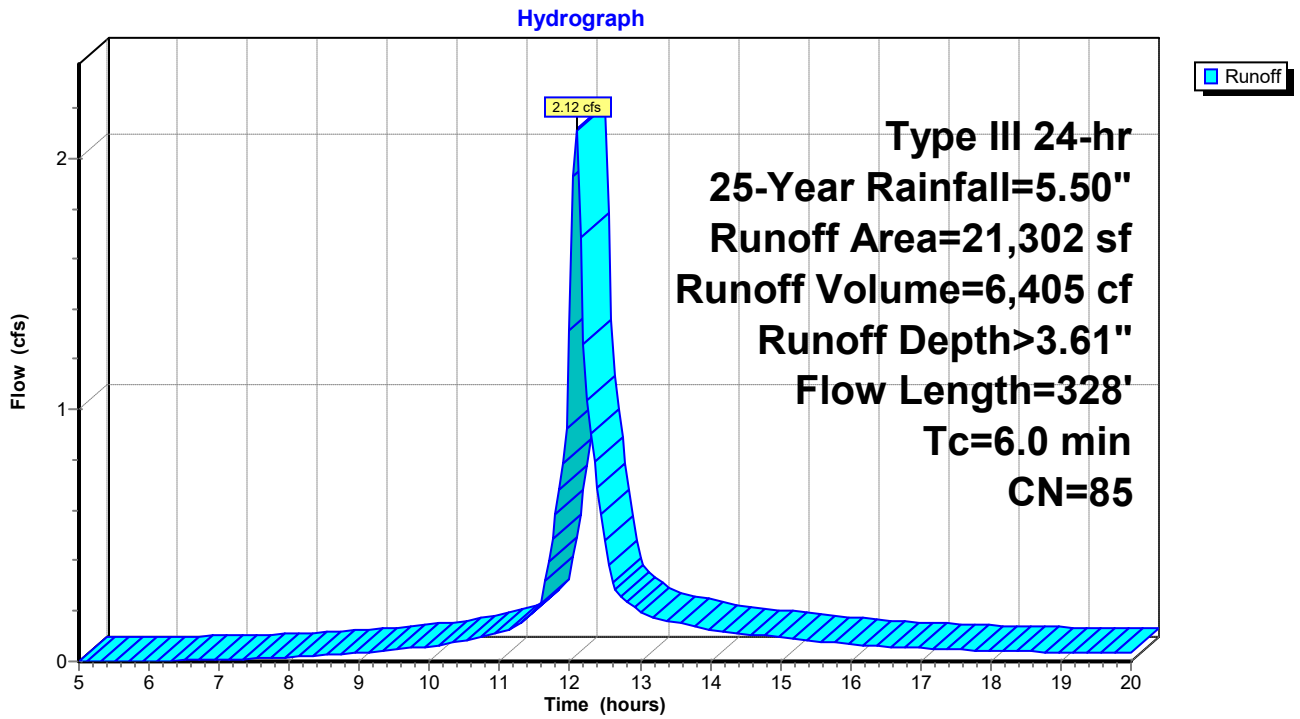
Runoff = 2.12 cfs @ 12.09 hrs, Volume= 6,405 cf, Depth> 3.61"
 Routed to Pond ISD : Infiltration System D

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Description
701	30	Woods, Good, HSG A
3,511	39	>75% Grass cover, Good, HSG A
11,899	98	Paved parking, HSG A
756	61	>75% Grass cover, Good, HSG B
4,435	98	Paved parking, HSG B
21,302	85	Weighted Average
4,968		23.32% Pervious Area
16,334		76.68% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	29	0.0250	0.15		Sheet Flow, Grass AB Grass: Short n= 0.150 P2= 3.20"
1.3	22	0.1400	0.27		Sheet Flow, Grass AB Grass: Short n= 0.150 P2= 3.20"
1.1	195	0.0225	3.04		Shallow Concentrated Flow, Grass BC Paved Kv= 20.3 fps
0.3	82	0.0100	4.54	3.56	Pipe Channel, Pipe CD 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
6.0	328	Total			

Subcatchment 2ISD: To Infiltration System D



Summary for Subcatchment 2ND: To Natural Depression

Runoff = 0.13 cfs @ 12.29 hrs, Volume= 879 cf, Depth> 0.43"
 Routed to Pond ND : Natural Depression

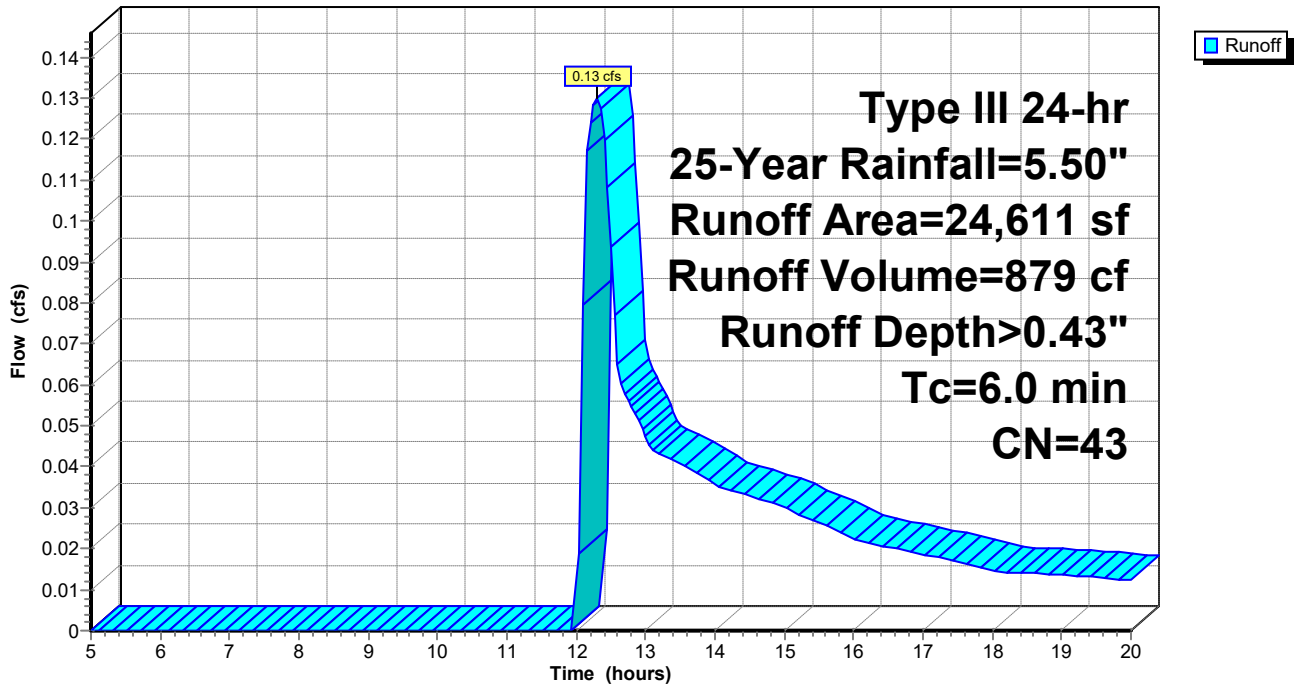
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Description
4,045	30	Woods, Good, HSG A
18,135	39	>75% Grass cover, Good, HSG A
1,946	96	Gravel surface, HSG A
224	98	Paved parking, HSG A
261	61	>75% Grass cover, Good, HSG B
24,611	43	Weighted Average
24,387		99.09% Pervious Area
224		0.91% Impervious Area

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

Subcatchment 2ND: To Natural Depression

Hydrograph



Summary for Subcatchment N: Offsite North

Runoff = 0.03 cfs @ 12.43 hrs, Volume= 302 cf, Depth> 0.22"
 Routed to Reach TN : Total North

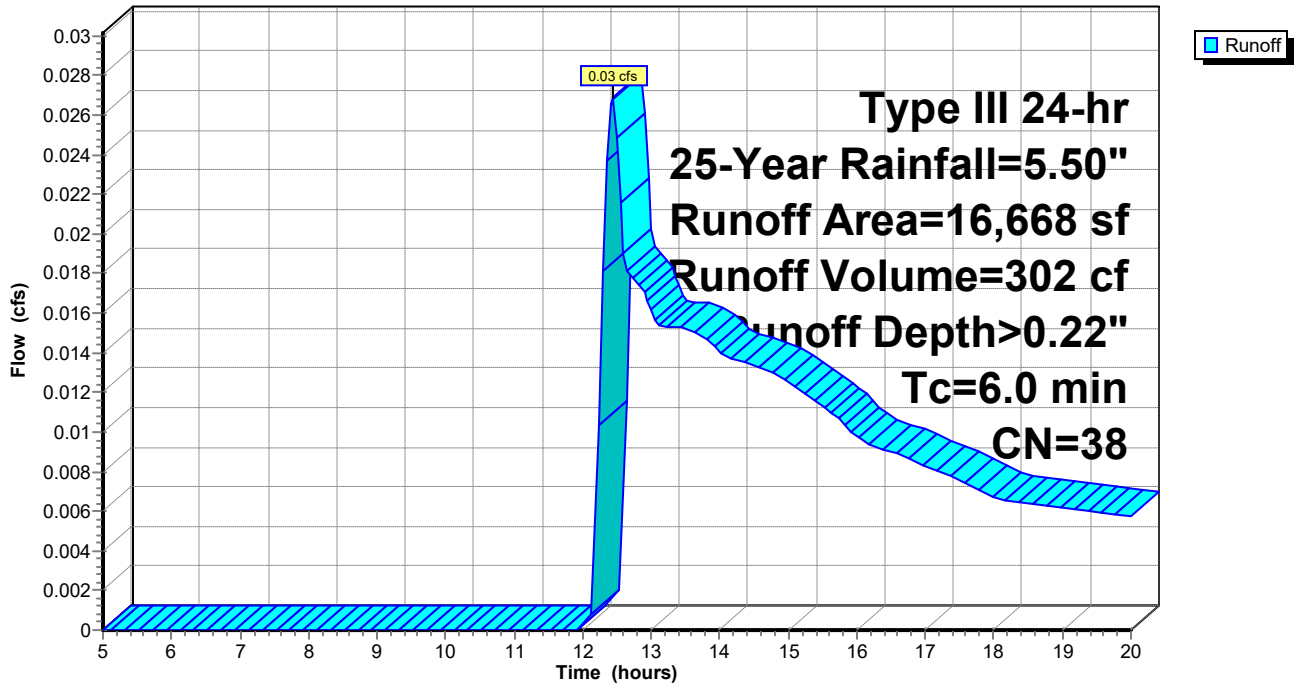
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Description
4,653	30	Woods, Good, HSG A
11,477	39	>75% Grass cover, Good, HSG A
417	96	Gravel surface, HSG A
121	98	Paved parking, HSG A
16,668	38	Weighted Average
16,547		99.27% Pervious Area
121		0.73% Impervious Area

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

Subcatchment N: Offsite North

Hydrograph



Summary for Subcatchment NU: Northern Units

Runoff = 0.82 cfs @ 12.09 hrs, Volume= 2,762 cf, Depth> 4.87"
 Routed to Pond ISC : Infiltration System C

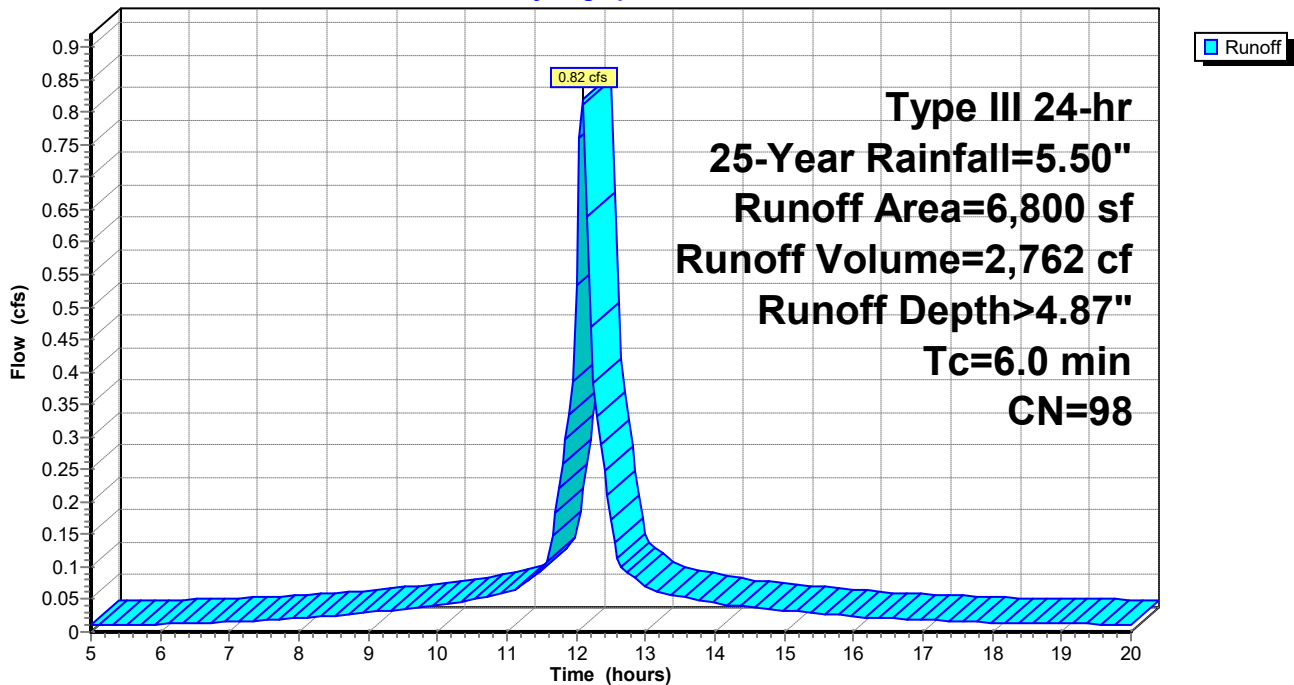
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Description
6,800	98	Roofs, HSG D
6,800		100.00% Impervious Area

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

Subcatchment NU: Northern Units

Hydrograph



Summary for Subcatchment WU: Western Units

Runoff = 0.57 cfs @ 12.09 hrs, Volume= 1,933 cf, Depth> 4.87"
 Routed to Pond ISA : Infiltration System A

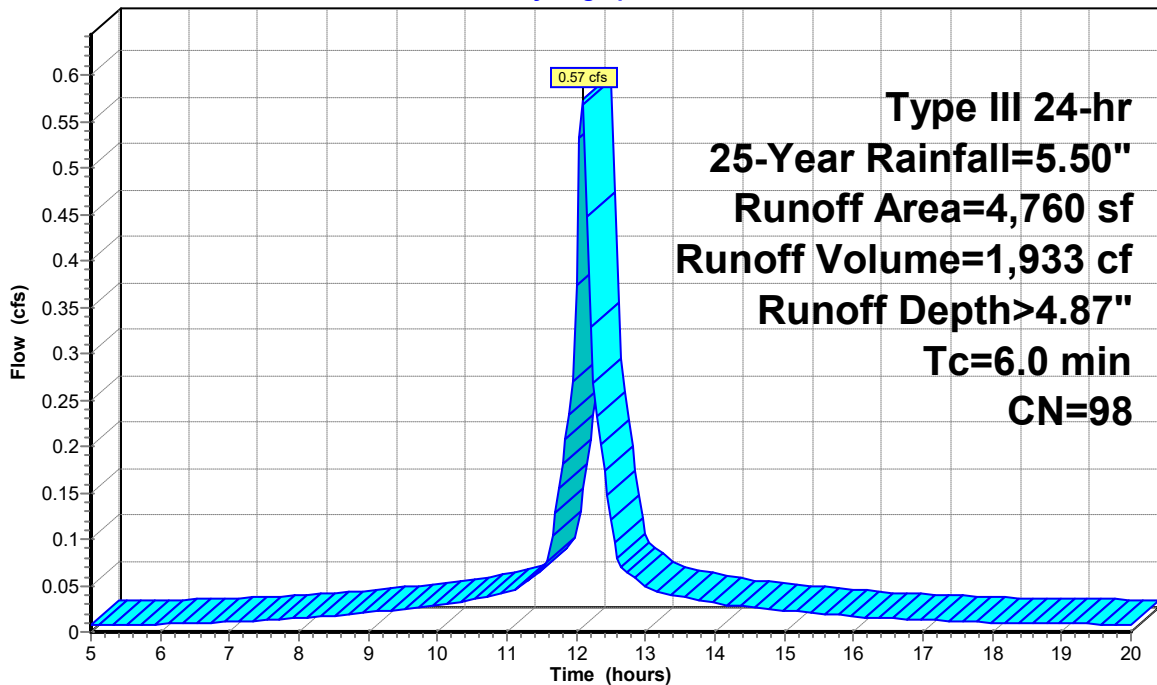
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Description
4,760	98	Roofs, HSG D
4,760		100.00% Impervious Area

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

Subcatchment WU: Western Units

Hydrograph



**Type III 24-hr
 25-Year Rainfall=5.50"
 Runoff Area=4,760 sf
 Runoff Volume=1,933 cf
 Runoff Depth>4.87"
 Tc=6.0 min
 CN=98**

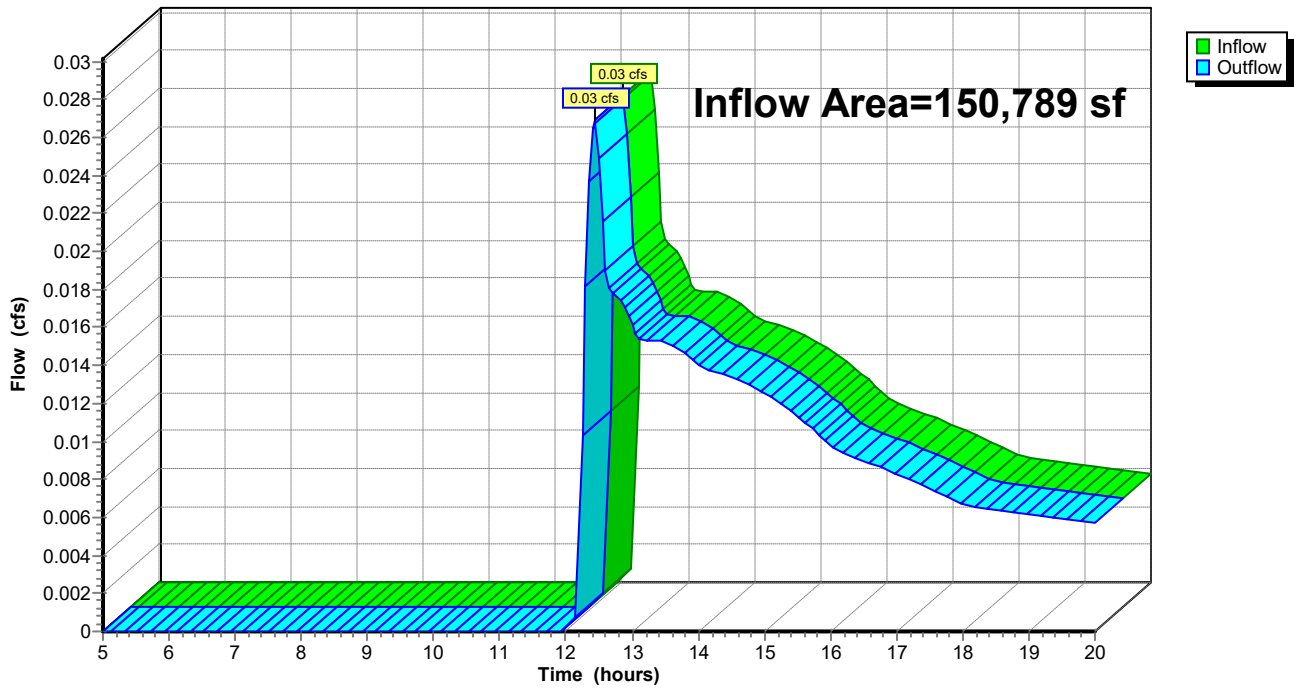
Summary for Reach TN: Total North

Inflow Area = 150,789 sf, 35.51% Impervious, Inflow Depth > 0.02" for 25-Year event
 Inflow = 0.03 cfs @ 12.43 hrs, Volume= 302 cf
 Outflow = 0.03 cfs @ 12.43 hrs, Volume= 302 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach TN: Total North

Hydrograph



Summary for Pond ISA: Infiltration System A

Inflow Area = 4,760 sf, 100.00% Impervious, Inflow Depth > 4.87" for 25-Year event
 Inflow = 0.57 cfs @ 12.09 hrs, Volume= 1,933 cf
 Outflow = 0.08 cfs @ 11.65 hrs, Volume= 1,933 cf, Atten= 86%, Lag= 0.0 min
 Discarded = 0.08 cfs @ 11.65 hrs, Volume= 1,933 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 107.99' @ 12.59 hrs Surf.Area= 430 sf Storage= 583 cf

Plug-Flow detention time= 43.7 min calculated for 1,933 cf (100% of inflow)
 Center-of-Mass det. time= 43.5 min (778.0 - 734.6)

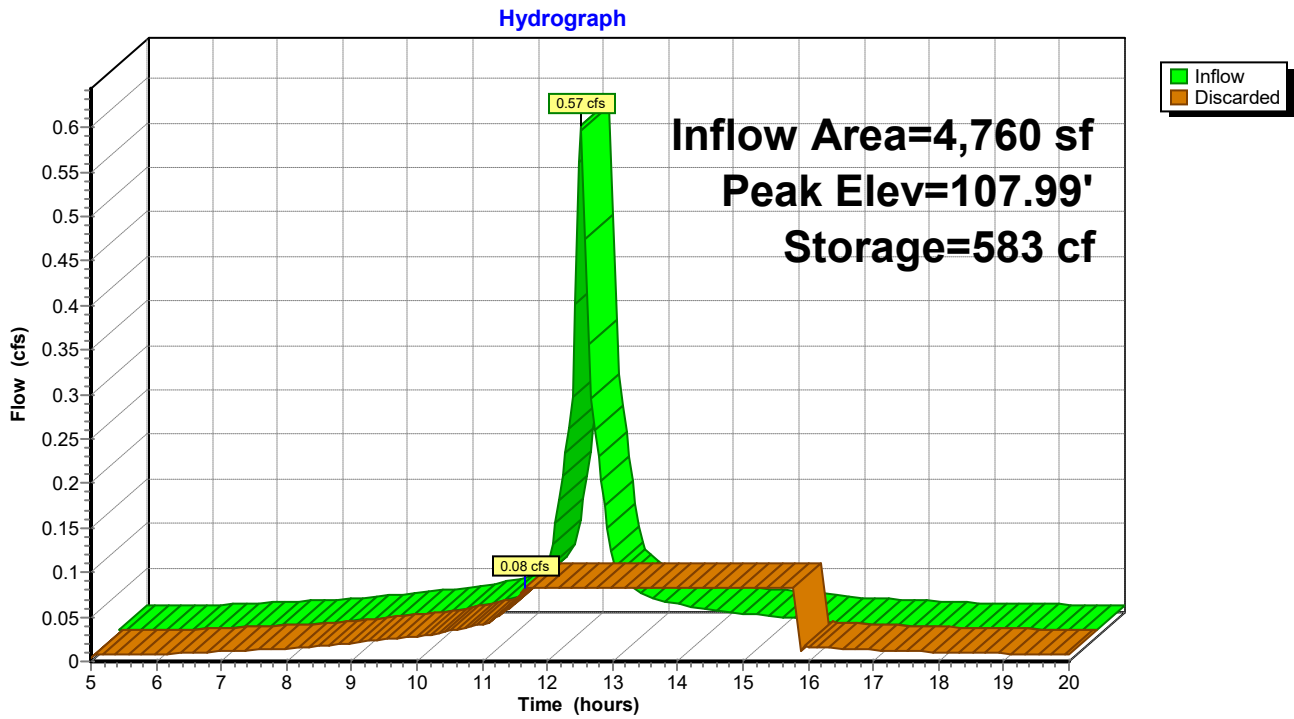
Volume	Invert	Avail.Storage	Storage Description
#1A	106.00'	391 cf	11.17'W x 38.50'L x 3.54'H Field A 1,523 cf Overall - 544 cf Embedded = 979 cf x 40.0% Voids
#2A	106.50'	544 cf	Cultec R-330XLHD x 10 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 2 rows
		935 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	106.00'	8.270 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.08 cfs @ 11.65 hrs HW=106.05' (Free Discharge)
 ↑**1=Exfiltration** (Exfiltration Controls 0.08 cfs)

Pond ISA: Infiltration System A



Stage-Area-Storage for Pond ISA: Infiltration System A

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
106.00	430	0	108.60	430	756
106.05	430	9	108.65	430	769
106.10	430	17	108.70	430	781
106.15	430	26	108.75	430	792
106.20	430	34	108.80	430	803
106.25	430	43	108.85	430	814
106.30	430	52	108.90	430	824
106.35	430	60	108.95	430	833
106.40	430	69	109.00	430	842
106.45	430	77	109.05	430	851
106.50	430	86	109.10	430	859
106.55	430	103	109.15	430	868
106.60	430	121	109.20	430	877
106.65	430	138	109.25	430	885
106.70	430	155	109.30	430	894
106.75	430	172	109.35	430	902
106.80	430	189	109.40	430	911
106.85	430	206	109.45	430	920
106.90	430	223	109.50	430	928
106.95	430	240			
107.00	430	257			
107.05	430	275			
107.10	430	291			
107.15	430	308			
107.20	430	325			
107.25	430	342			
107.30	430	358			
107.35	430	375			
107.40	430	391			
107.45	430	408			
107.50	430	424			
107.55	430	441			
107.60	430	457			
107.65	430	474			
107.70	430	490			
107.75	430	506			
107.80	430	522			
107.85	430	538			
107.90	430	554			
107.95	430	570			
108.00	430	585			
108.05	430	600			
108.10	430	616			
108.15	430	631			
108.20	430	645			
108.25	430	660			
108.30	430	675			
108.35	430	689			
108.40	430	703			
108.45	430	717			
108.50	430	730			
108.55	430	743			

Summary for Pond ISB: Infiltration System B

Inflow Area = 88,208 sf, 41.80% Impervious, Inflow Depth > 2.39" for 25-Year event
 Inflow = 5.21 cfs @ 12.15 hrs, Volume= 17,604 cf
 Outflow = 0.31 cfs @ 11.50 hrs, Volume= 10,368 cf, Atten= 94%, Lag= 0.0 min
 Discarded = 0.31 cfs @ 11.50 hrs, Volume= 10,368 cf
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf
 Routed to Pond ND : Natural Depression

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 108.35' @ 15.23 hrs Surf.Area= 5,568 sf Storage= 9,537 cf

Plug-Flow detention time= 196.9 min calculated for 10,368 cf (59% of inflow)
 Center-of-Mass det. time= 118.7 min (922.0 - 803.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	106.00'	4,612 cf	69.17"W x 80.50"L x 3.54'H Field A 19,720 cf Overall - 8,189 cf Embedded = 11,531 cf x 40.0% Voids
#2A	106.50'	8,189 cf	Cultec R-330XLHD x 154 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 14 rows
		12,801 cf	Total Available Storage

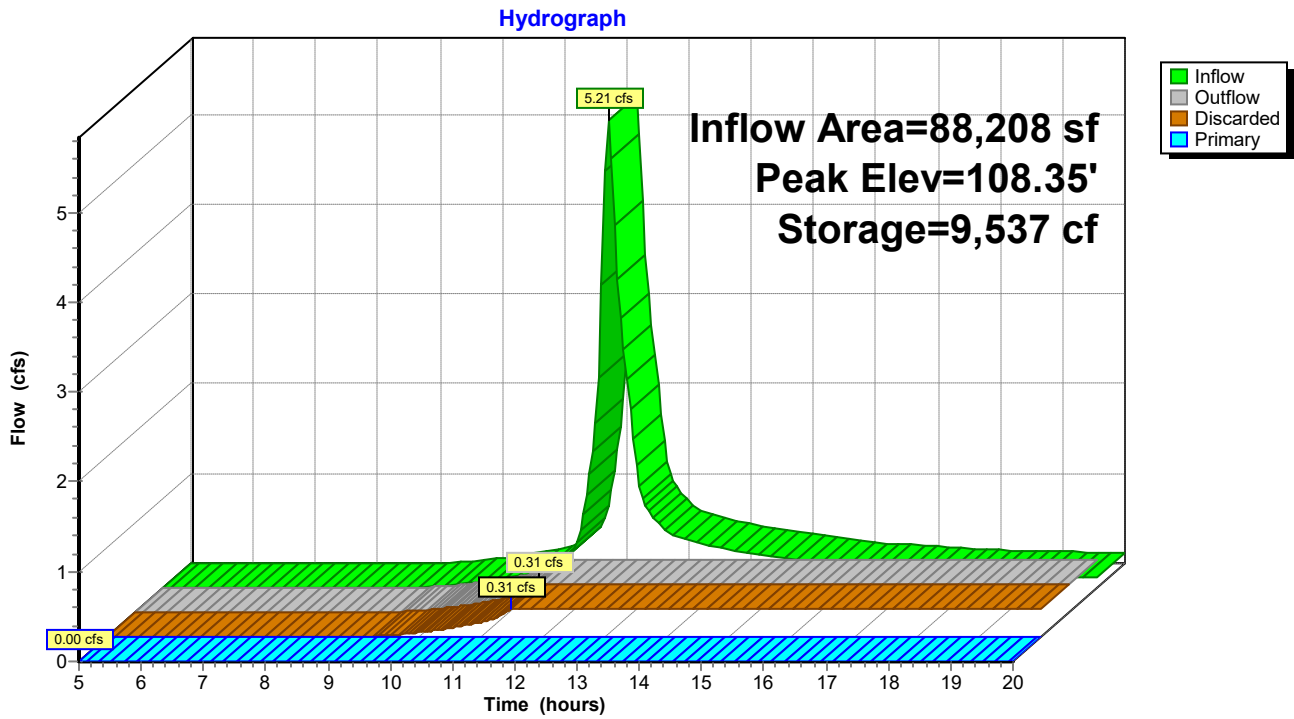
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	108.82'	12.0" Round Culvert L= 113.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 108.82' / 108.25' S= 0.0050 '/ Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	109.40'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 4.0' Crest Height
#3	Discarded	106.00'	2.410 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.31 cfs @ 11.50 hrs HW=106.04' (Free Discharge)
 ↑**3=Exfiltration** (Exfiltration Controls 0.31 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=106.00' (Free Discharge)
 ↑**1=Culvert** (Controls 0.00 cfs)
 ↑**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond ISB: Infiltration System B



Stage-Area-Storage for Pond ISB: Infiltration System B

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
106.00	5,568	0	108.60	5,568	10,444
106.05	5,568	111	108.65	5,568	10,614
106.10	5,568	223	108.70	5,568	10,779
106.15	5,568	334	108.75	5,568	10,935
106.20	5,568	445	108.80	5,568	11,083
106.25	5,568	557	108.85	5,568	11,223
106.30	5,568	668	108.90	5,568	11,354
106.35	5,568	780	108.95	5,568	11,478
106.40	5,568	891	109.00	5,568	11,595
106.45	5,568	1,002	109.05	5,568	11,706
106.50	5,568	1,114	109.10	5,568	11,817
106.55	5,568	1,356	109.15	5,568	11,929
106.60	5,568	1,598	109.20	5,568	12,040
106.65	5,568	1,839	109.25	5,568	12,151
106.70	5,568	2,079	109.30	5,568	12,263
106.75	5,568	2,319	109.35	5,568	12,374
106.80	5,568	2,559	109.40	5,568	12,486
106.85	5,568	2,798	109.45	5,568	12,597
106.90	5,568	3,037	109.50	5,568	12,708
106.95	5,568	3,276	109.55	5,568	12,801
107.00	5,568	3,515	109.60	5,568	12,801
107.05	5,568	3,753	109.65	5,568	12,801
107.10	5,568	3,990	109.70	5,568	12,801
107.15	5,568	4,225	109.75	5,568	12,801
107.20	5,568	4,459	109.80	5,568	12,801
107.25	5,568	4,691			
107.30	5,568	4,923			
107.35	5,568	5,155			
107.40	5,568	5,386			
107.45	5,568	5,617			
107.50	5,568	5,847			
107.55	5,568	6,077			
107.60	5,568	6,306			
107.65	5,568	6,534			
107.70	5,568	6,762			
107.75	5,568	6,988			
107.80	5,568	7,212			
107.85	5,568	7,434			
107.90	5,568	7,653			
107.95	5,568	7,870			
108.00	5,568	8,085			
108.05	5,568	8,297			
108.10	5,568	8,508			
108.15	5,568	8,715			
108.20	5,568	8,921			
108.25	5,568	9,123			
108.30	5,568	9,323			
108.35	5,568	9,519			
108.40	5,568	9,712			
108.45	5,568	9,902			
108.50	5,568	10,087			
108.55	5,568	10,268			

Summary for Pond ISC: Infiltration System C

Inflow Area = 6,800 sf, 100.00% Impervious, Inflow Depth > 4.87" for 25-Year event
 Inflow = 0.82 cfs @ 12.09 hrs, Volume= 2,762 cf
 Outflow = 0.03 cfs @ 9.00 hrs, Volume= 1,344 cf, Atten= 97%, Lag= 0.0 min
 Discarded = 0.03 cfs @ 9.00 hrs, Volume= 1,344 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 106.45' @ 15.53 hrs Surf.Area= 1,190 sf Storage= 1,603 cf

Plug-Flow detention time= 161.4 min calculated for 1,339 cf (48% of inflow)
 Center-of-Mass det. time= 63.4 min (798.0 - 734.6)

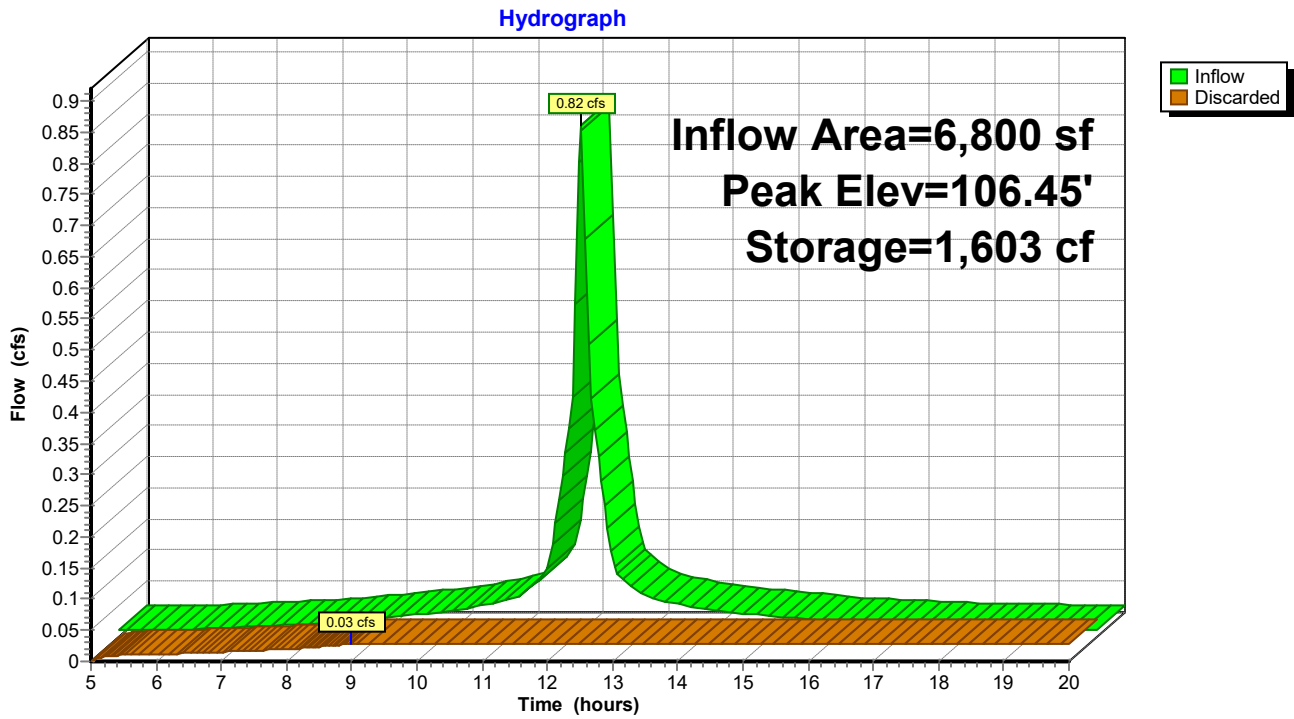
Volume	Invert	Avail.Storage	Storage Description
#1A	104.50'	578 cf	20.83'W x 31.50'L x 3.54'H Field A 2,324 cf Overall - 879 cf Embedded = 1,445 cf x 40.0% Voids
#2A	105.00'	879 cf	Cultec R-330XLHD x 16 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 4 rows
#3B	104.50'	479 cf	30.50'W x 17.50'L x 3.54'H Field B 1,890 cf Overall - 693 cf Embedded = 1,197 cf x 40.0% Voids
#4B	105.00'	693 cf	Cultec R-330XLHD x 12 Inside #3 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 6 rows
		2,629 cf	Total Available Storage

Storage Group A created with Chamber Wizard
 Storage Group B created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	104.50'	1.020 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.03 cfs @ 9.00 hrs HW=104.54' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.03 cfs)

Pond ISC: Infiltration System C



Stage-Area-Storage for Pond ISC: Infiltration System C

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
104.50	1,190	0	107.10	1,190	2,131
104.55	1,190	24	107.15	1,190	2,166
104.60	1,190	48	107.20	1,190	2,200
104.65	1,190	71	107.25	1,190	2,233
104.70	1,190	95	107.30	1,190	2,263
104.75	1,190	119	107.35	1,190	2,293
104.80	1,190	143	107.40	1,190	2,320
104.85	1,190	167	107.45	1,190	2,347
104.90	1,190	190	107.50	1,190	2,371
104.95	1,190	214	107.55	1,190	2,395
105.00	1,190	238	107.60	1,190	2,419
105.05	1,190	287	107.65	1,190	2,443
105.10	1,190	336	107.70	1,190	2,466
105.15	1,190	385	107.75	1,190	2,490
105.20	1,190	433	107.80	1,190	2,514
105.25	1,190	482	107.85	1,190	2,538
105.30	1,190	530	107.90	1,190	2,562
105.35	1,190	578	107.95	1,190	2,585
105.40	1,190	627	108.00	1,190	2,609
105.45	1,190	675			
105.50	1,190	723			
105.55	1,190	771			
105.60	1,190	819			
105.65	1,190	867			
105.70	1,190	914			
105.75	1,190	961			
105.80	1,190	1,008			
105.85	1,190	1,055			
105.90	1,190	1,102			
105.95	1,190	1,149			
106.00	1,190	1,195			
106.05	1,190	1,242			
106.10	1,190	1,288			
106.15	1,190	1,334			
106.20	1,190	1,381			
106.25	1,190	1,426			
106.30	1,190	1,472			
106.35	1,190	1,517			
106.40	1,190	1,561			
106.45	1,190	1,605			
106.50	1,190	1,649			
106.55	1,190	1,692			
106.60	1,190	1,735			
106.65	1,190	1,777			
106.70	1,190	1,819			
106.75	1,190	1,860			
106.80	1,190	1,901			
106.85	1,190	1,941			
106.90	1,190	1,981			
106.95	1,190	2,020			
107.00	1,190	2,058			
107.05	1,190	2,095			

Summary for Pond ISD: Infiltration System D

Inflow Area = 21,302 sf, 76.68% Impervious, Inflow Depth > 3.61" for 25-Year event
 Inflow = 2.12 cfs @ 12.09 hrs, Volume= 6,405 cf
 Outflow = 0.06 cfs @ 10.20 hrs, Volume= 2,498 cf, Atten= 97%, Lag= 0.0 min
 Discarded = 0.06 cfs @ 10.20 hrs, Volume= 2,498 cf
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf
 Routed to Reach TN : Total North

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 107.21' @ 16.39 hrs Surf.Area= 2,597 sf Storage= 4,143 cf

Plug-Flow detention time= 180.6 min calculated for 2,490 cf (39% of inflow)
 Center-of-Mass det. time= 86.7 min (858.7 - 772.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	105.00'	2,187 cf	35.33'W x 73.50'L x 3.54'H Field A 9,198 cf Overall - 3,729 cf Embedded = 5,468 cf x 40.0% Voids
#2A	105.50'	3,729 cf	Cultec R-330XLHD x 70 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 7 rows
		5,917 cf	Total Available Storage

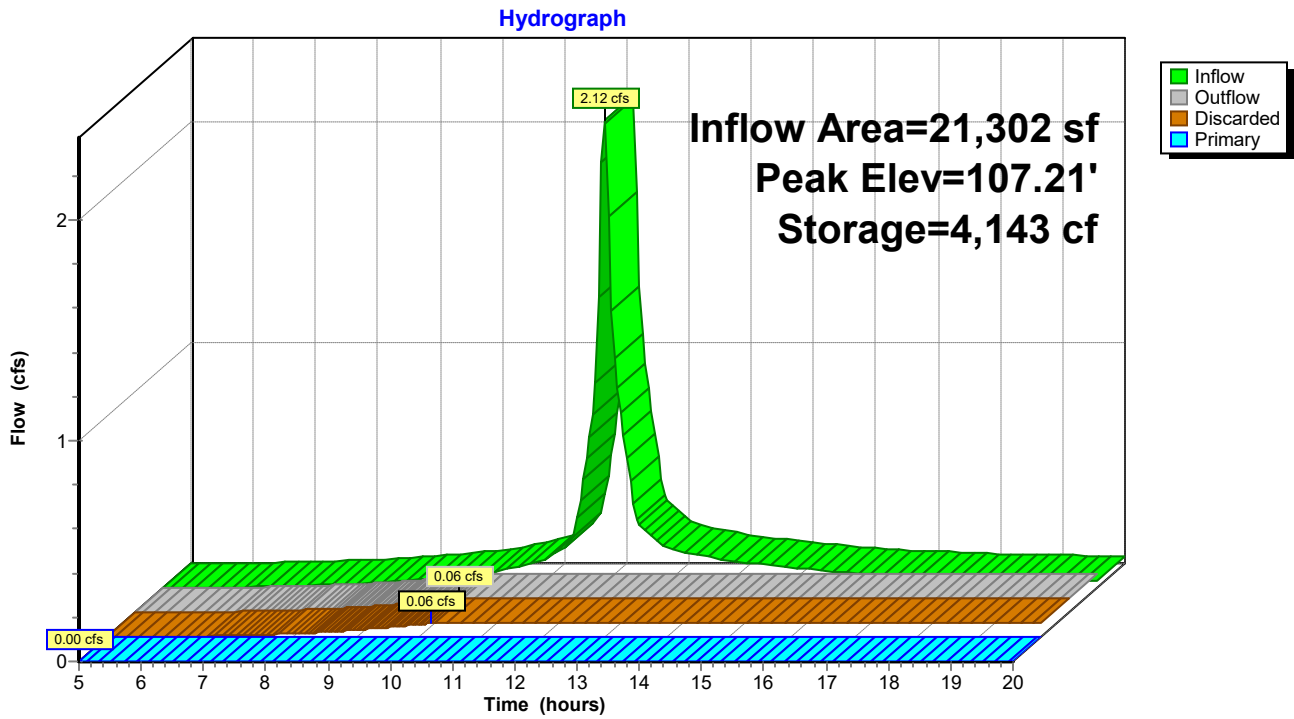
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	105.94'	12.0" Round Culvert L= 94.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 105.94' / 105.00' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	107.10'	12.0" Round Culvert L= 96.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 107.10' / 106.14' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	108.40'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 4.0' Crest Height
#4	Discarded	105.00'	1.020 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.06 cfs @ 10.20 hrs HW=105.04' (Free Discharge)
 ↑4=Exfiltration (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=105.00' (Free Discharge)
 ↑1=Culvert (Controls 0.00 cfs)
 ↑2=Culvert (Controls 0.00 cfs)
 ↑3=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)

Pond ISD: Infiltration System D



Stage-Area-Storage for Pond ISD: Infiltration System D

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
105.00	2,597	0	107.60	2,597	4,820
105.05	2,597	52	107.65	2,597	4,899
105.10	2,597	104	107.70	2,597	4,975
105.15	2,597	156	107.75	2,597	5,047
105.20	2,597	208	107.80	2,597	5,116
105.25	2,597	260	107.85	2,597	5,181
105.30	2,597	312	107.90	2,597	5,242
105.35	2,597	364	107.95	2,597	5,300
105.40	2,597	416	108.00	2,597	5,354
105.45	2,597	467	108.05	2,597	5,406
105.50	2,597	519	108.10	2,597	5,458
105.55	2,597	631	108.15	2,597	5,510
105.60	2,597	742	108.20	2,597	5,562
105.65	2,597	853	108.25	2,597	5,614
105.70	2,597	964	108.30	2,597	5,666
105.75	2,597	1,075	108.35	2,597	5,718
105.80	2,597	1,185	108.40	2,597	5,769
105.85	2,597	1,295	108.45	2,597	5,821
105.90	2,597	1,405	108.50	2,597	5,873
105.95	2,597	1,515			
106.00	2,597	1,625			
106.05	2,597	1,735			
106.10	2,597	1,844			
106.15	2,597	1,952			
106.20	2,597	2,060			
106.25	2,597	2,167			
106.30	2,597	2,274			
106.35	2,597	2,381			
106.40	2,597	2,487			
106.45	2,597	2,593			
106.50	2,597	2,699			
106.55	2,597	2,805			
106.60	2,597	2,911			
106.65	2,597	3,016			
106.70	2,597	3,121			
106.75	2,597	3,225			
106.80	2,597	3,329			
106.85	2,597	3,431			
106.90	2,597	3,532			
106.95	2,597	3,632			
107.00	2,597	3,731			
107.05	2,597	3,829			
107.10	2,597	3,926			
107.15	2,597	4,022			
107.20	2,597	4,117			
107.25	2,597	4,210			
107.30	2,597	4,302			
107.35	2,597	4,393			
107.40	2,597	4,482			
107.45	2,597	4,569			
107.50	2,597	4,655			
107.55	2,597	4,739			

Summary for Pond ND: Natural Depression

Inflow Area = 112,819 sf, 32.88% Impervious, Inflow Depth > 0.09" for 25-Year event
 Inflow = 0.13 cfs @ 12.29 hrs, Volume= 879 cf
 Outflow = 0.02 cfs @ 15.77 hrs, Volume= 611 cf, Atten= 81%, Lag= 208.7 min
 Discarded = 0.02 cfs @ 15.77 hrs, Volume= 611 cf
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf
 Routed to Reach TN : Total North

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 108.19' @ 15.77 hrs Surf.Area= 1,031 sf Storage= 359 cf

Plug-Flow detention time= 170.0 min calculated for 609 cf (69% of inflow)
 Center-of-Mass det. time= 94.0 min (972.2 - 878.2)

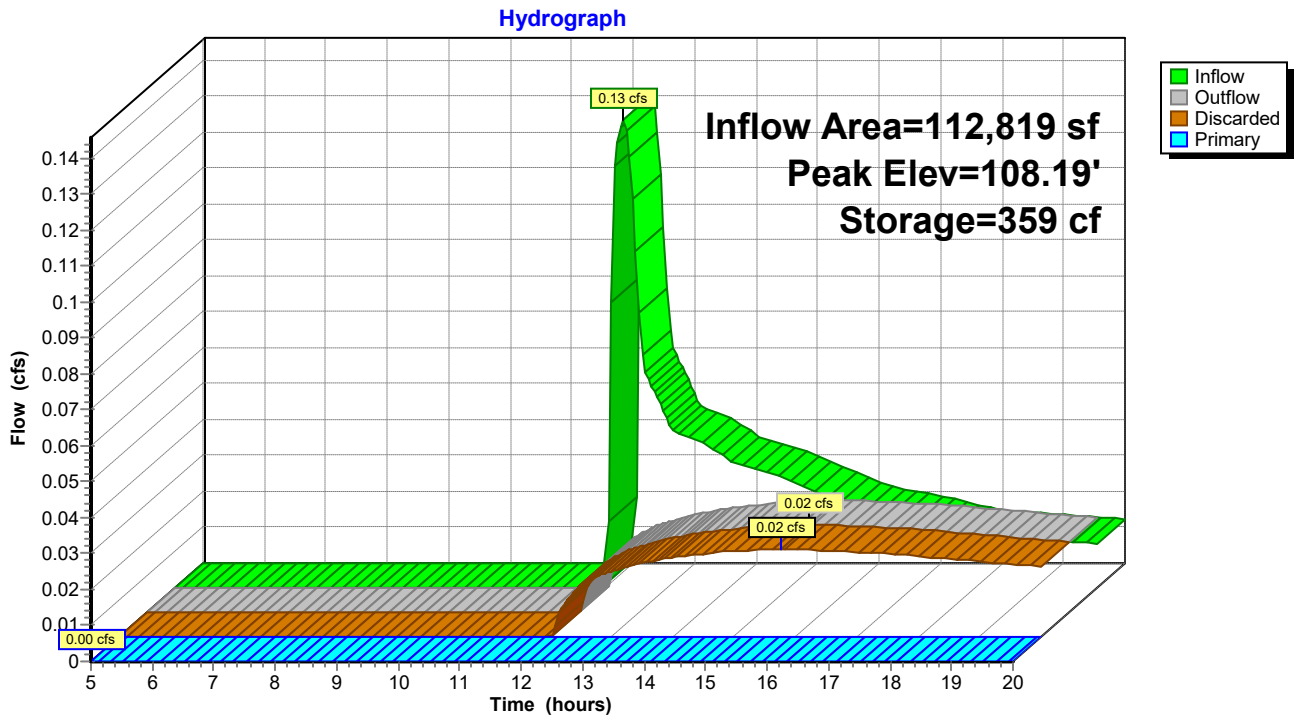
Volume	Invert	Avail.Storage	Storage Description			
#1	108.00'	3,433 cf	Custom Stage Data (Irregular) Listed below			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
108.00	235	88.4	0	0	235	
109.00	4,458	666.5	1,906	1,906	34,965	
109.30	5,751	684.5	1,527	3,433	36,911	

Device	Routing	Invert	Outlet Devices									
#1	Primary	109.00'	2.0' long x 10.0' breadth Broad-Crested Rectangular Weir									
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60									
			Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64									
#2	Discarded	108.00'	1.020 in/hr Exfiltration over Surface area									

Discarded OutFlow Max=0.02 cfs @ 15.77 hrs HW=108.19' (Free Discharge)
 ↑**2=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=108.00' (Free Discharge)
 ↑**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond ND: Natural Depression



Stage-Area-Storage for Pond ND: Natural Depression

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
108.00	235	0	109.04	4,630	2,109
108.02	319	38	109.06	4,717	2,211
108.04	404	76	109.08	4,803	2,313
108.06	488	114	109.10	4,889	2,415
108.08	573	152	109.12	4,975	2,516
108.10	657	191	109.14	5,061	2,618
108.12	742	229	109.16	5,148	2,720
108.14	826	267	109.18	5,234	2,822
108.16	911	305	109.20	5,320	2,924
108.18	995	343	109.22	5,406	3,025
108.20	1,080	381	109.24	5,492	3,127
108.22	1,164	419	109.26	5,579	3,229
108.24	1,249	457	109.28	5,665	3,331
108.26	1,333	495	109.30	5,751	3,433
108.28	1,417	534			
108.30	1,502	572			
108.32	1,586	610			
108.34	1,671	648			
108.36	1,755	686			
108.38	1,840	724			
108.40	1,924	762			
108.42	2,009	800			
108.44	2,093	838			
108.46	2,178	877			
108.48	2,262	915			
108.50	2,347	953			
108.52	2,431	991			
108.54	2,515	1,029			
108.56	2,600	1,067			
108.58	2,684	1,105			
108.60	2,769	1,143			
108.62	2,853	1,181			
108.64	2,938	1,220			
108.66	3,022	1,258			
108.68	3,107	1,296			
108.70	3,191	1,334			
108.72	3,276	1,372			
108.74	3,360	1,410			
108.76	3,444	1,448			
108.78	3,529	1,486			
108.80	3,613	1,524			
108.82	3,698	1,563			
108.84	3,782	1,601			
108.86	3,867	1,639			
108.88	3,951	1,677			
108.90	4,036	1,715			
108.92	4,120	1,753			
108.94	4,205	1,791			
108.96	4,289	1,829			
108.98	4,374	1,867			
109.00	4,458	1,906			
109.02	4,544	2,007			

Summary for Subcatchment 2ISB: To Infiltration System B

Runoff = 7.23 cfs @ 12.15 hrs, Volume= 24,428 cf, Depth> 3.32"

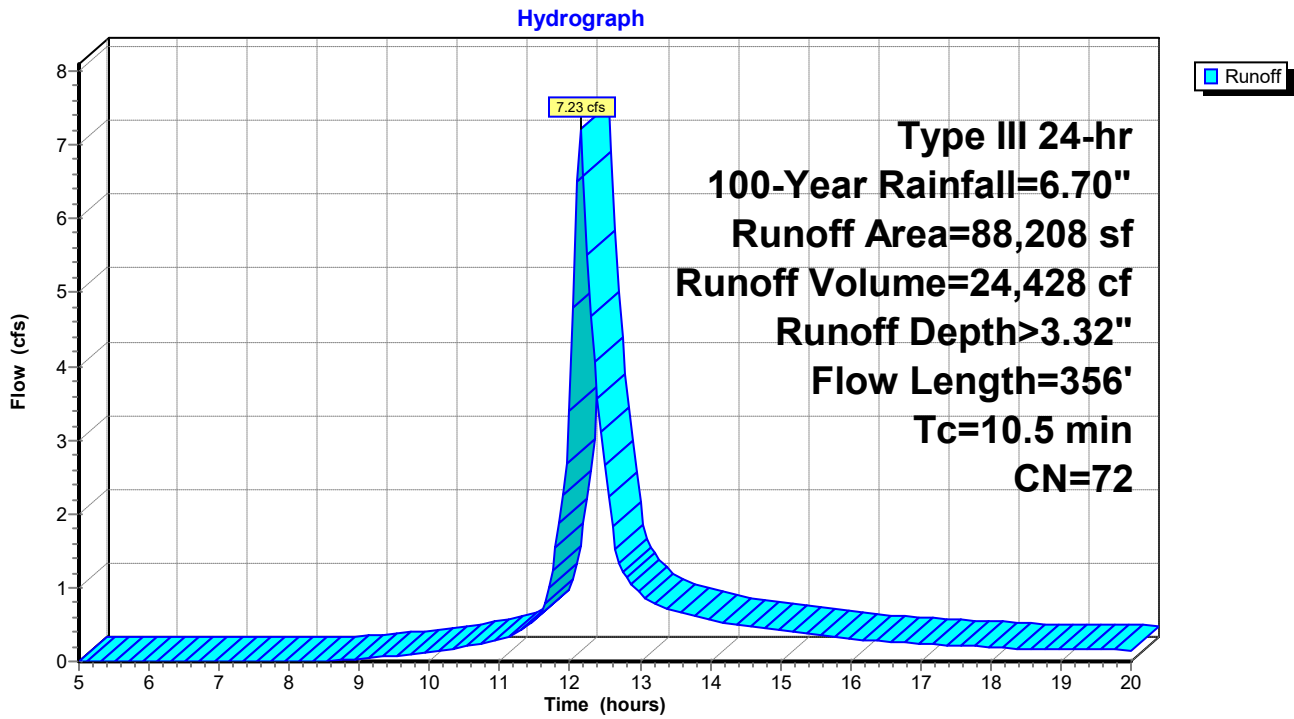
Routed to Pond ISB : Infiltration System B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 100-Year Rainfall=6.70"

Area (sf)	CN	Description
3,108	30	Woods, Good, HSG A
15,089	39	>75% Grass cover, Good, HSG A
8,413	98	Paved parking, HSG A
1,960	55	Woods, Good, HSG B
30,210	61	>75% Grass cover, Good, HSG B
973	85	Gravel roads, HSG B
4,757	98	Unconnected roofs, HSG B
23,698	98	Paved parking, HSG B
88,208	72	Weighted Average
51,340		58.20% Pervious Area
36,868		41.80% Impervious Area
4,757		12.90% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	50	0.0100	0.11		Sheet Flow, Grass AB Grass: Short n= 0.150 P2= 3.20"
2.0	86	0.0100	0.70		Shallow Concentrated Flow, Grass BC Short Grass Pasture Kv= 7.0 fps
0.9	156	0.0200	2.87		Shallow Concentrated Flow, Paved CD Paved Kv= 20.3 fps
0.2	64	0.0100	4.54	3.56	Pipe Channel, Pipe DE 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
10.5	356	Total			

Subcatchment 2ISB: To Infiltration System B



Summary for Subcatchment 2ISD: To Infiltration System D

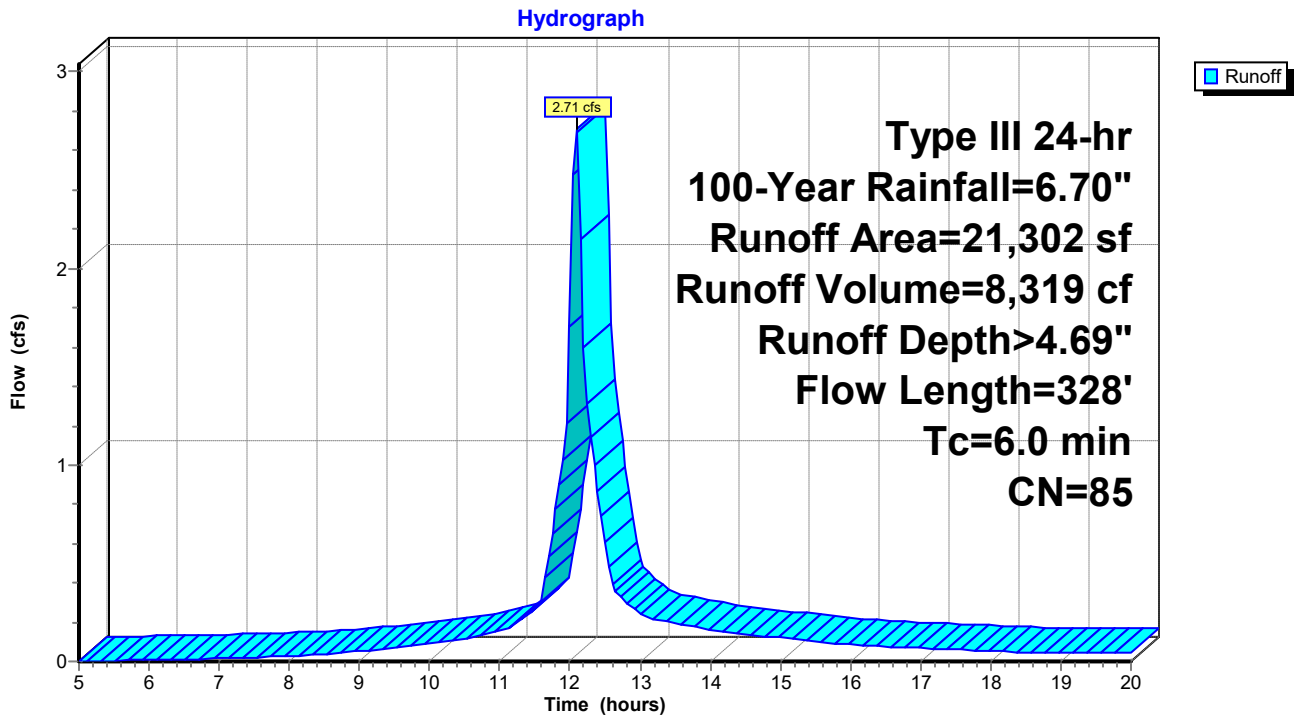
Runoff = 2.71 cfs @ 12.09 hrs, Volume= 8,319 cf, Depth> 4.69"
 Routed to Pond ISD : Infiltration System D

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 100-Year Rainfall=6.70"

Area (sf)	CN	Description
701	30	Woods, Good, HSG A
3,511	39	>75% Grass cover, Good, HSG A
11,899	98	Paved parking, HSG A
756	61	>75% Grass cover, Good, HSG B
4,435	98	Paved parking, HSG B
21,302	85	Weighted Average
4,968		23.32% Pervious Area
16,334		76.68% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	29	0.0250	0.15		Sheet Flow, Grass AB Grass: Short n= 0.150 P2= 3.20"
1.3	22	0.1400	0.27		Sheet Flow, Grass AB Grass: Short n= 0.150 P2= 3.20"
1.1	195	0.0225	3.04		Shallow Concentrated Flow, Grass BC Paved Kv= 20.3 fps
0.3	82	0.0100	4.54	3.56	Pipe Channel, Pipe CD 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
6.0	328	Total			

Subcatchment 2ISD: To Infiltration System D



Summary for Subcatchment 2ND: To Natural Depression

Runoff = 0.40 cfs @ 12.12 hrs, Volume= 1,700 cf, Depth> 0.83"
 Routed to Pond ND : Natural Depression

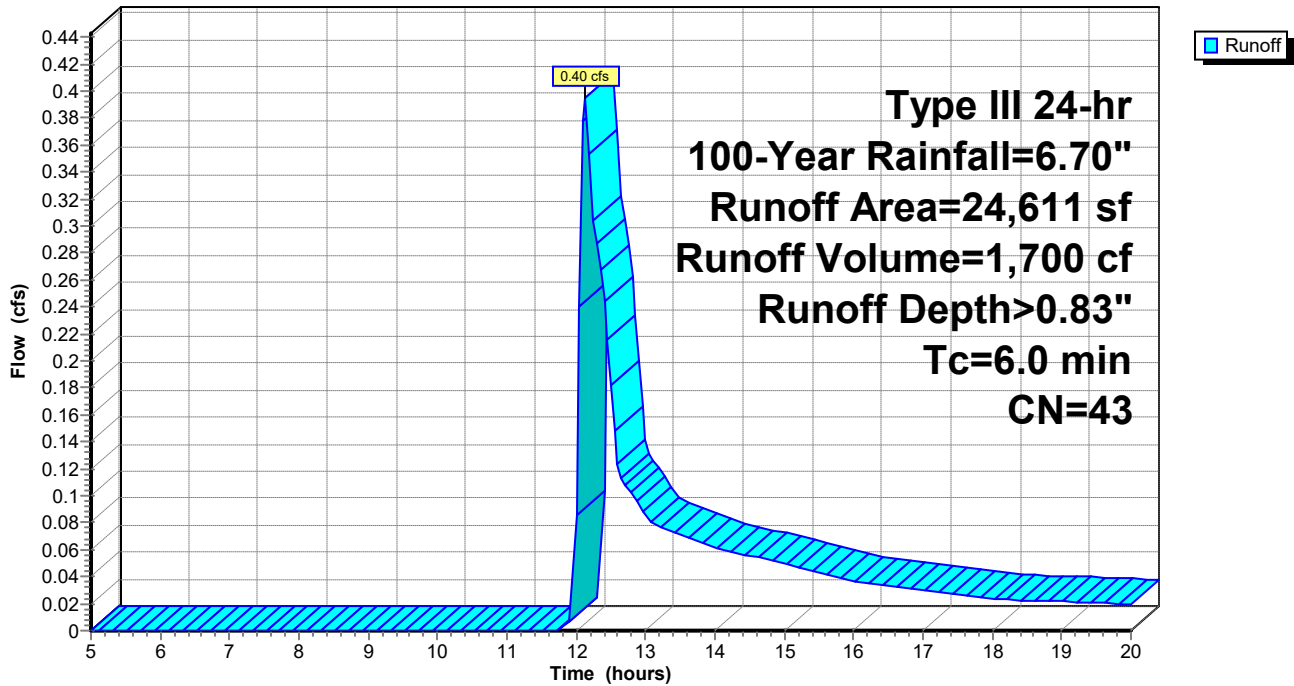
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 100-Year Rainfall=6.70"

Area (sf)	CN	Description
4,045	30	Woods, Good, HSG A
18,135	39	>75% Grass cover, Good, HSG A
1,946	96	Gravel surface, HSG A
224	98	Paved parking, HSG A
261	61	>75% Grass cover, Good, HSG B
24,611	43	Weighted Average
24,387		99.09% Pervious Area
224		0.91% Impervious Area

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

Subcatchment 2ND: To Natural Depression

Hydrograph



Summary for Subcatchment N: Offsite North

Runoff = 0.10 cfs @ 12.30 hrs, Volume= 705 cf, Depth> 0.51"
 Routed to Reach TN : Total North

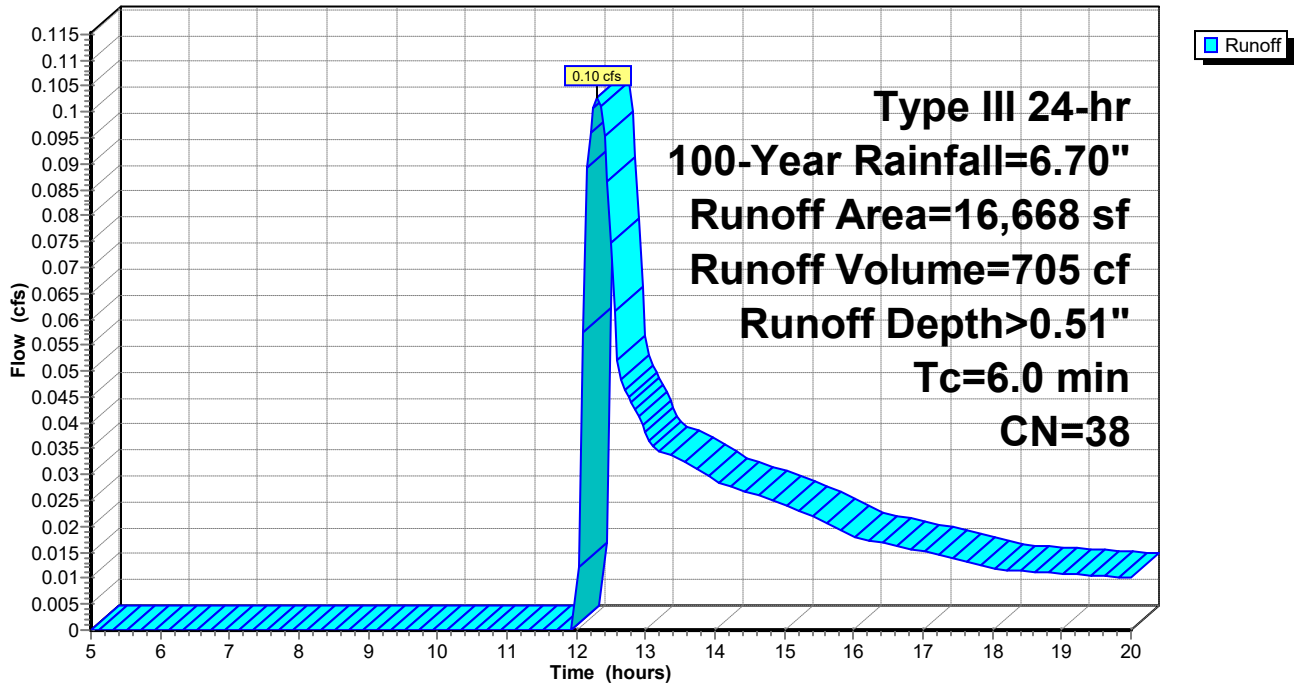
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 100-Year Rainfall=6.70"

Area (sf)	CN	Description
4,653	30	Woods, Good, HSG A
11,477	39	>75% Grass cover, Good, HSG A
417	96	Gravel surface, HSG A
121	98	Paved parking, HSG A
16,668	38	Weighted Average
16,547		99.27% Pervious Area
121		0.73% Impervious Area

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

Subcatchment N: Offsite North

Hydrograph



Summary for Subcatchment NU: Northern Units

Runoff = 1.00 cfs @ 12.09 hrs, Volume= 3,380 cf, Depth> 5.97"
 Routed to Pond ISC : Infiltration System C

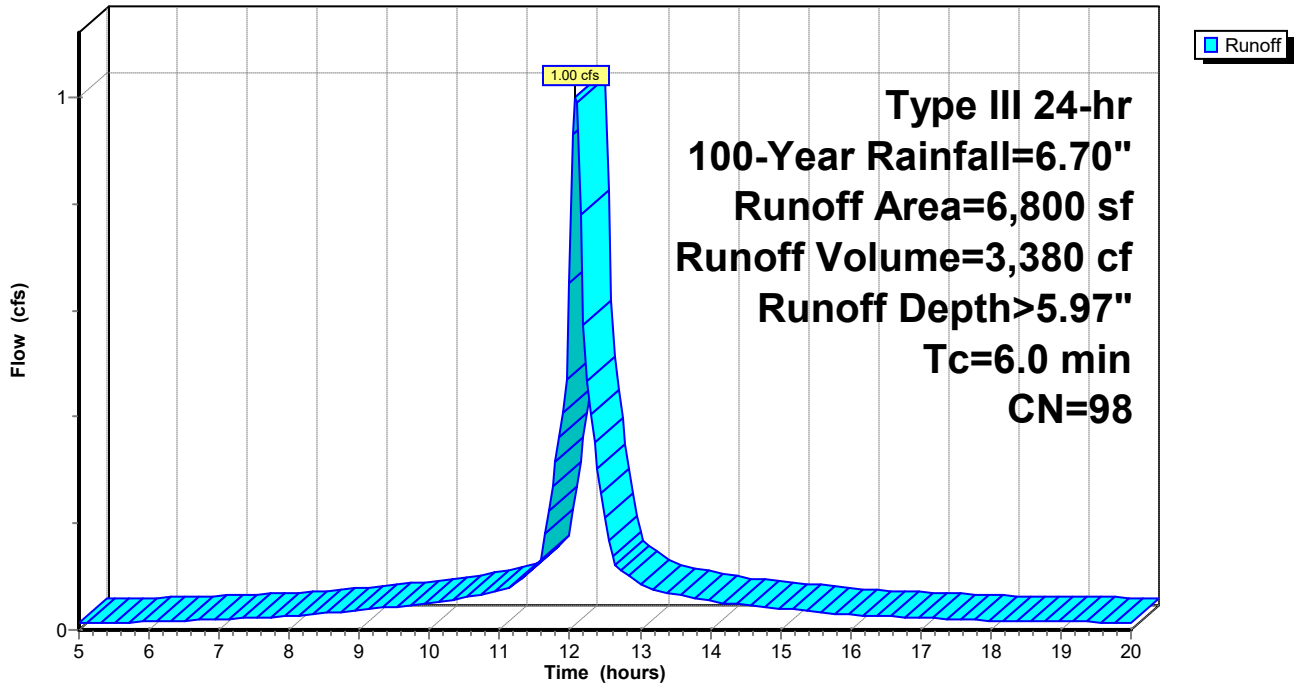
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 100-Year Rainfall=6.70"

Area (sf)	CN	Description
6,800	98	Roofs, HSG D
6,800		100.00% Impervious Area

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

Subcatchment NU: Northern Units

Hydrograph



Summary for Subcatchment S: Onsite South

Runoff = 0.01 cfs @ 12.96 hrs, Volume= 109 cf, Depth> 0.20"

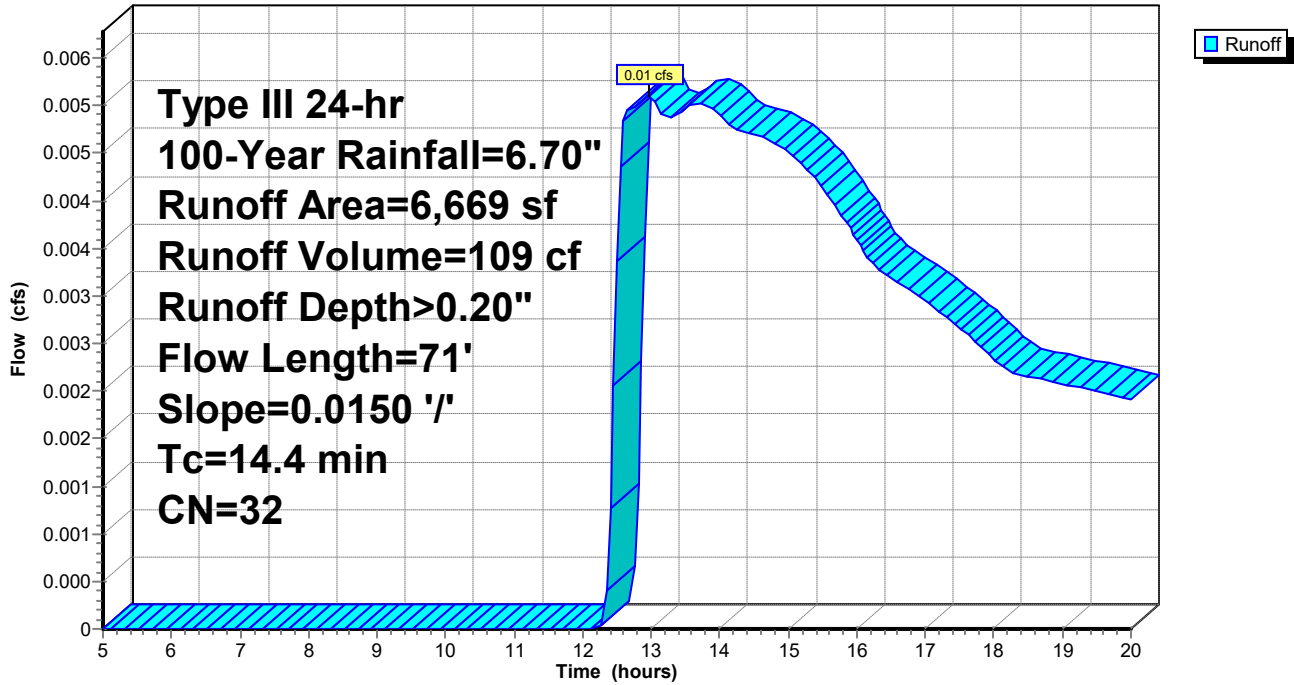
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 100-Year Rainfall=6.70"

Area (sf)	CN	Description
5,540	30	Woods, Good, HSG A
1,066	39	>75% Grass cover, Good, HSG A
63	98	Unconnected roofs, HSG A
6,669	32	Weighted Average
6,606		99.06% Pervious Area
63		0.94% Impervious Area
63		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.8	50	0.0150	0.06		Sheet Flow, AB-Woods Woods: Light underbrush n= 0.400 P2= 3.20"
0.6	21	0.0150	0.61		Shallow Concentrated Flow, BC-Woods Woodland Kv= 5.0 fps
14.4	71	Total			

Subcatchment S: Onsite South

Hydrograph



Summary for Subcatchment WU: Western Units

Runoff = 0.70 cfs @ 12.09 hrs, Volume= 2,366 cf, Depth> 5.97"
 Routed to Pond ISA : Infiltration System A

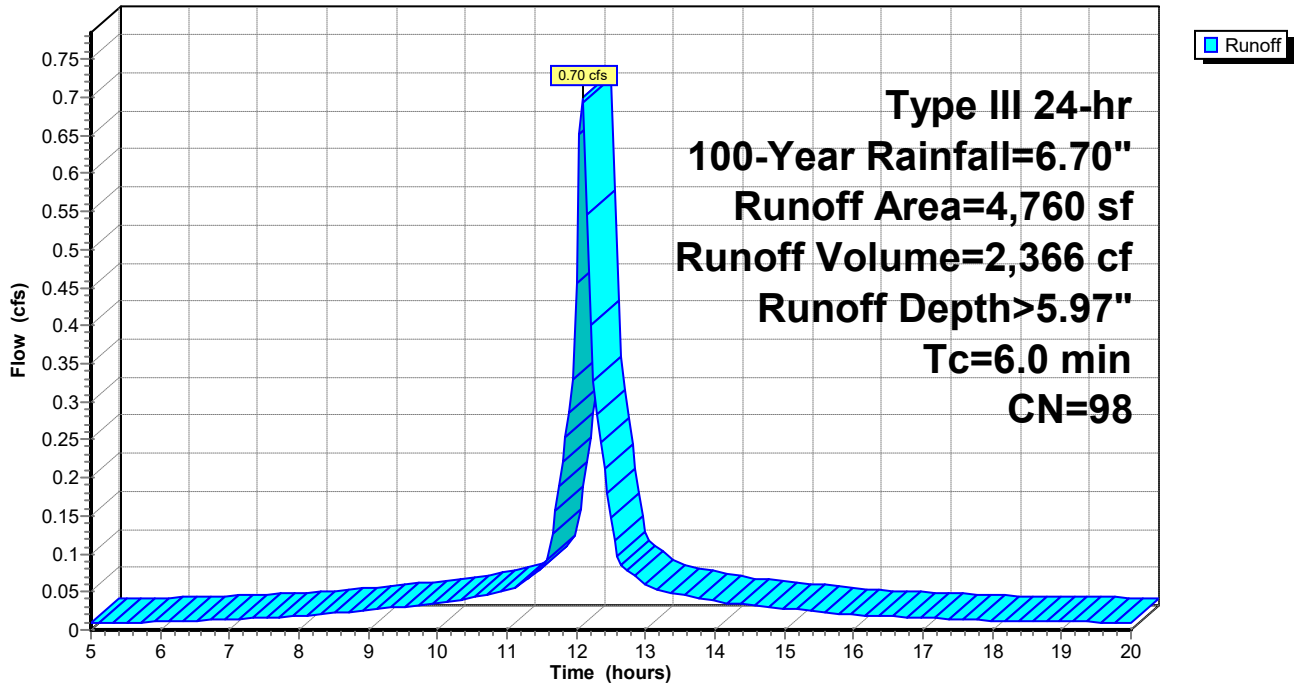
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 100-Year Rainfall=6.70"

Area (sf)	CN	Description
4,760	98	Roofs, HSG D
4,760		100.00% Impervious Area

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

Subcatchment WU: Western Units

Hydrograph



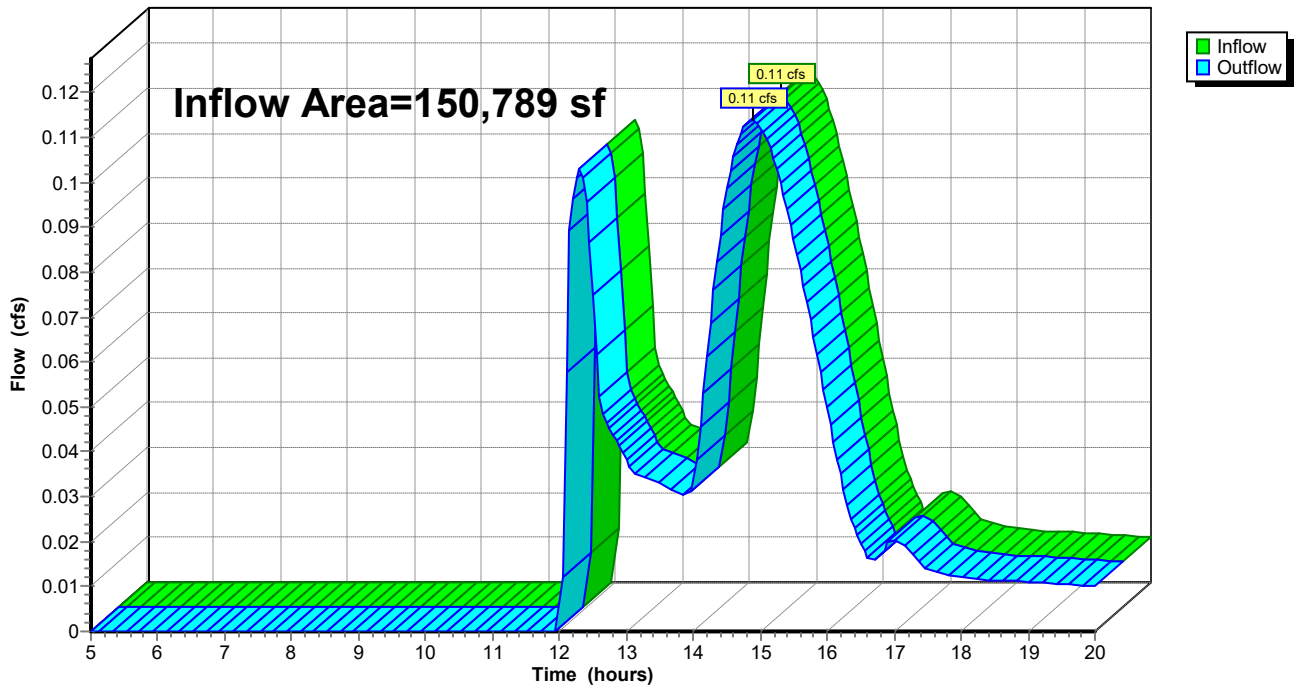
Summary for Reach TN: Total North

Inflow Area = 150,789 sf, 35.51% Impervious, Inflow Depth > 0.10" for 100-Year event
 Inflow = 0.11 cfs @ 14.88 hrs, Volume= 1,196 cf
 Outflow = 0.11 cfs @ 14.88 hrs, Volume= 1,196 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach TN: Total North

Hydrograph



Summary for Pond ISA: Infiltration System A

Inflow Area = 4,760 sf, 100.00% Impervious, Inflow Depth > 5.97" for 100-Year event
 Inflow = 0.70 cfs @ 12.09 hrs, Volume= 2,366 cf
 Outflow = 0.08 cfs @ 11.55 hrs, Volume= 2,365 cf, Atten= 88%, Lag= 0.0 min
 Discarded = 0.08 cfs @ 11.55 hrs, Volume= 2,365 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 108.70' @ 12.69 hrs Surf.Area= 430 sf Storage= 780 cf

Plug-Flow detention time= 63.1 min calculated for 2,365 cf (100% of inflow)
 Center-of-Mass det. time= 62.8 min (796.5 - 733.7)

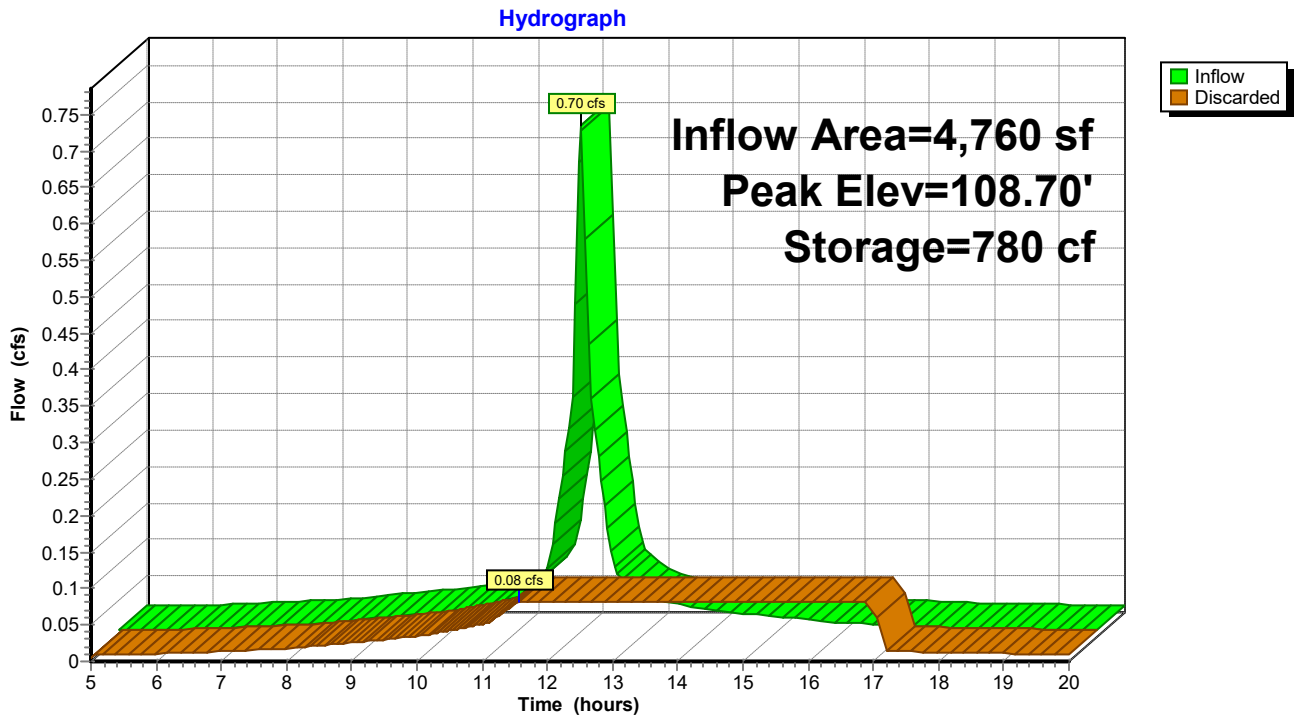
Volume	Invert	Avail.Storage	Storage Description
#1A	106.00'	391 cf	11.17'W x 38.50'L x 3.54'H Field A 1,523 cf Overall - 544 cf Embedded = 979 cf x 40.0% Voids
#2A	106.50'	544 cf	Cultec R-330XLHD x 10 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 2 rows
		935 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	106.00'	8.270 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.08 cfs @ 11.55 hrs HW=106.04' (Free Discharge)
 ↑**1=Exfiltration** (Exfiltration Controls 0.08 cfs)

Pond ISA: Infiltration System A



Stage-Area-Storage for Pond ISA: Infiltration System A

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
106.00	430	0	108.60	430	756
106.05	430	9	108.65	430	769
106.10	430	17	108.70	430	781
106.15	430	26	108.75	430	792
106.20	430	34	108.80	430	803
106.25	430	43	108.85	430	814
106.30	430	52	108.90	430	824
106.35	430	60	108.95	430	833
106.40	430	69	109.00	430	842
106.45	430	77	109.05	430	851
106.50	430	86	109.10	430	859
106.55	430	103	109.15	430	868
106.60	430	121	109.20	430	877
106.65	430	138	109.25	430	885
106.70	430	155	109.30	430	894
106.75	430	172	109.35	430	902
106.80	430	189	109.40	430	911
106.85	430	206	109.45	430	920
106.90	430	223	109.50	430	928
106.95	430	240			
107.00	430	257			
107.05	430	275			
107.10	430	291			
107.15	430	308			
107.20	430	325			
107.25	430	342			
107.30	430	358			
107.35	430	375			
107.40	430	391			
107.45	430	408			
107.50	430	424			
107.55	430	441			
107.60	430	457			
107.65	430	474			
107.70	430	490			
107.75	430	506			
107.80	430	522			
107.85	430	538			
107.90	430	554			
107.95	430	570			
108.00	430	585			
108.05	430	600			
108.10	430	616			
108.15	430	631			
108.20	430	645			
108.25	430	660			
108.30	430	675			
108.35	430	689			
108.40	430	703			
108.45	430	717			
108.50	430	730			
108.55	430	743			

Summary for Pond ISB: Infiltration System B

Inflow Area = 88,208 sf, 41.80% Impervious, Inflow Depth > 3.32" for 100-Year event
 Inflow = 7.23 cfs @ 12.15 hrs, Volume= 24,428 cf
 Outflow = 0.76 cfs @ 13.25 hrs, Volume= 13,445 cf, Atten= 90%, Lag= 66.1 min
 Discarded = 0.31 cfs @ 11.15 hrs, Volume= 11,061 cf
 Primary = 0.45 cfs @ 13.25 hrs, Volume= 2,384 cf

Routed to Pond ND : Natural Depression

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 109.50' @ 13.25 hrs Surf.Area= 5,568 sf Storage= 12,719 cf

Plug-Flow detention time= 175.6 min calculated for 13,445 cf (55% of inflow)
 Center-of-Mass det. time= 96.3 min (892.2 - 795.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	106.00'	4,612 cf	69.17"W x 80.50"L x 3.54'H Field A 19,720 cf Overall - 8,189 cf Embedded = 11,531 cf x 40.0% Voids
#2A	106.50'	8,189 cf	Cultec R-330XLHD x 154 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 14 rows
		12,801 cf	Total Available Storage

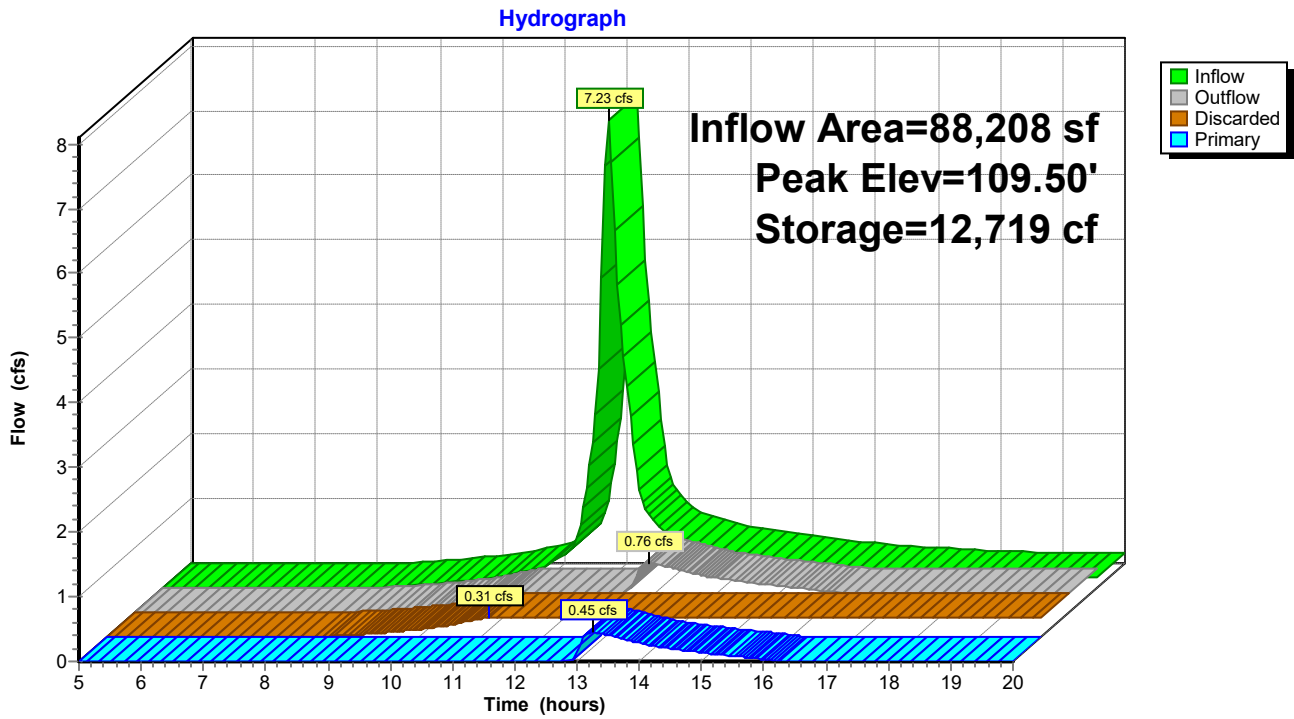
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	108.82'	12.0" Round Culvert L= 113.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 108.82' / 108.25' S= 0.0050 '/ Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	109.40'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 4.0' Crest Height
#3	Discarded	106.00'	2.410 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.31 cfs @ 11.15 hrs HW=106.04' (Free Discharge)
 ↑**3=Exfiltration** (Exfiltration Controls 0.31 cfs)

Primary OutFlow Max=0.44 cfs @ 13.25 hrs HW=109.50' (Free Discharge)
 ↑**1=Culvert** (Passes 0.44 cfs of 1.23 cfs potential flow)
 ↑**2=Sharp-Crested Rectangular Weir** (Weir Controls 0.44 cfs @ 1.06 fps)

Pond ISB: Infiltration System B



Stage-Area-Storage for Pond ISB: Infiltration System B

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
106.00	5,568	0	108.60	5,568	10,444
106.05	5,568	111	108.65	5,568	10,614
106.10	5,568	223	108.70	5,568	10,779
106.15	5,568	334	108.75	5,568	10,935
106.20	5,568	445	108.80	5,568	11,083
106.25	5,568	557	108.85	5,568	11,223
106.30	5,568	668	108.90	5,568	11,354
106.35	5,568	780	108.95	5,568	11,478
106.40	5,568	891	109.00	5,568	11,595
106.45	5,568	1,002	109.05	5,568	11,706
106.50	5,568	1,114	109.10	5,568	11,817
106.55	5,568	1,356	109.15	5,568	11,929
106.60	5,568	1,598	109.20	5,568	12,040
106.65	5,568	1,839	109.25	5,568	12,151
106.70	5,568	2,079	109.30	5,568	12,263
106.75	5,568	2,319	109.35	5,568	12,374
106.80	5,568	2,559	109.40	5,568	12,486
106.85	5,568	2,798	109.45	5,568	12,597
106.90	5,568	3,037	109.50	5,568	12,708
106.95	5,568	3,276	109.55	5,568	12,801
107.00	5,568	3,515	109.60	5,568	12,801
107.05	5,568	3,753	109.65	5,568	12,801
107.10	5,568	3,990	109.70	5,568	12,801
107.15	5,568	4,225	109.75	5,568	12,801
107.20	5,568	4,459	109.80	5,568	12,801
107.25	5,568	4,691			
107.30	5,568	4,923			
107.35	5,568	5,155			
107.40	5,568	5,386			
107.45	5,568	5,617			
107.50	5,568	5,847			
107.55	5,568	6,077			
107.60	5,568	6,306			
107.65	5,568	6,534			
107.70	5,568	6,762			
107.75	5,568	6,988			
107.80	5,568	7,212			
107.85	5,568	7,434			
107.90	5,568	7,653			
107.95	5,568	7,870			
108.00	5,568	8,085			
108.05	5,568	8,297			
108.10	5,568	8,508			
108.15	5,568	8,715			
108.20	5,568	8,921			
108.25	5,568	9,123			
108.30	5,568	9,323			
108.35	5,568	9,519			
108.40	5,568	9,712			
108.45	5,568	9,902			
108.50	5,568	10,087			
108.55	5,568	10,268			

Summary for Pond ISC: Infiltration System C

Inflow Area = 6,800 sf, 100.00% Impervious, Inflow Depth > 5.97" for 100-Year event
 Inflow = 1.00 cfs @ 12.09 hrs, Volume= 3,380 cf
 Outflow = 0.03 cfs @ 8.45 hrs, Volume= 1,395 cf, Atten= 97%, Lag= 0.0 min
 Discarded = 0.03 cfs @ 8.45 hrs, Volume= 1,395 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 107.08' @ 16.04 hrs Surf.Area= 1,190 sf Storage= 2,117 cf

Plug-Flow detention time= 165.4 min calculated for 1,389 cf (41% of inflow)
 Center-of-Mass det. time= 50.9 min (784.6 - 733.7)

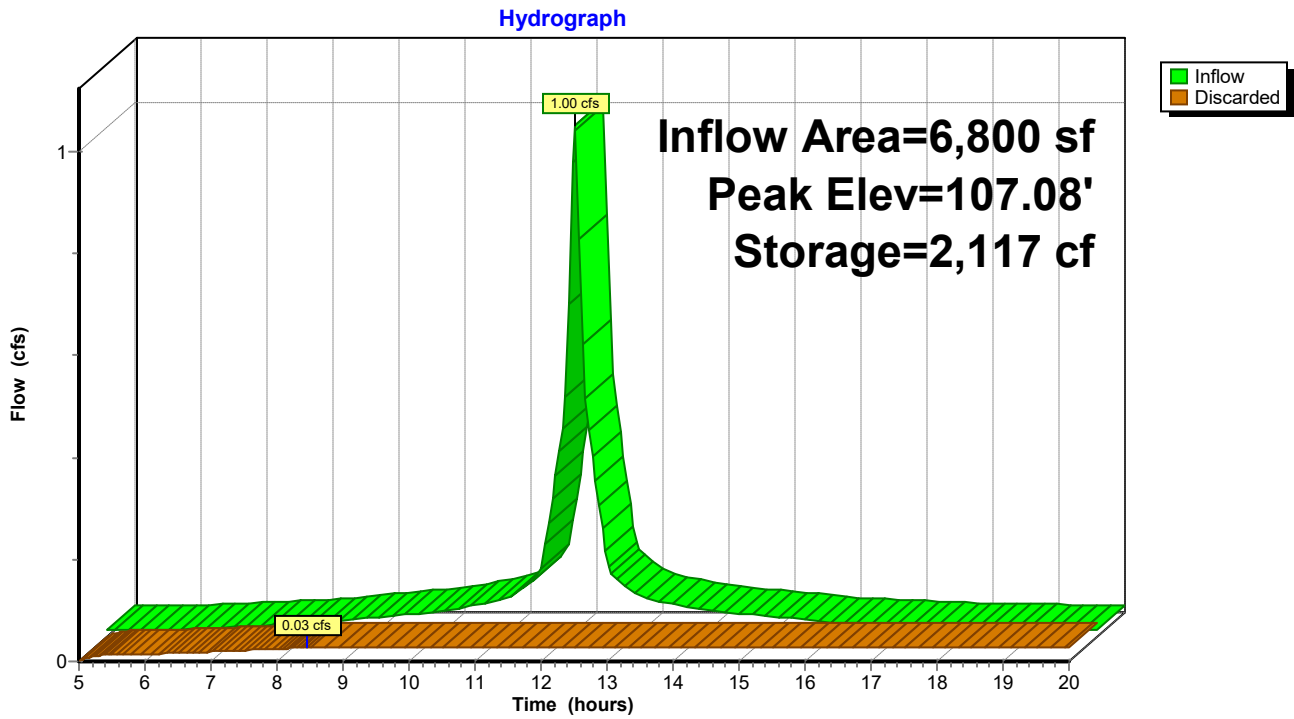
Volume	Invert	Avail.Storage	Storage Description
#1A	104.50'	578 cf	20.83'W x 31.50'L x 3.54'H Field A 2,324 cf Overall - 879 cf Embedded = 1,445 cf x 40.0% Voids
#2A	105.00'	879 cf	Cultec R-330XLHD x 16 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 4 rows
#3B	104.50'	479 cf	30.50'W x 17.50'L x 3.54'H Field B 1,890 cf Overall - 693 cf Embedded = 1,197 cf x 40.0% Voids
#4B	105.00'	693 cf	Cultec R-330XLHD x 12 Inside #3 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 6 rows
		2,629 cf	Total Available Storage

Storage Group A created with Chamber Wizard
 Storage Group B created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	104.50'	1.020 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.03 cfs @ 8.45 hrs HW=104.54' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.03 cfs)

Pond ISC: Infiltration System C



Stage-Area-Storage for Pond ISC: Infiltration System C

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
104.50	1,190	0	107.10	1,190	2,131
104.55	1,190	24	107.15	1,190	2,166
104.60	1,190	48	107.20	1,190	2,200
104.65	1,190	71	107.25	1,190	2,233
104.70	1,190	95	107.30	1,190	2,263
104.75	1,190	119	107.35	1,190	2,293
104.80	1,190	143	107.40	1,190	2,320
104.85	1,190	167	107.45	1,190	2,347
104.90	1,190	190	107.50	1,190	2,371
104.95	1,190	214	107.55	1,190	2,395
105.00	1,190	238	107.60	1,190	2,419
105.05	1,190	287	107.65	1,190	2,443
105.10	1,190	336	107.70	1,190	2,466
105.15	1,190	385	107.75	1,190	2,490
105.20	1,190	433	107.80	1,190	2,514
105.25	1,190	482	107.85	1,190	2,538
105.30	1,190	530	107.90	1,190	2,562
105.35	1,190	578	107.95	1,190	2,585
105.40	1,190	627	108.00	1,190	2,609
105.45	1,190	675			
105.50	1,190	723			
105.55	1,190	771			
105.60	1,190	819			
105.65	1,190	867			
105.70	1,190	914			
105.75	1,190	961			
105.80	1,190	1,008			
105.85	1,190	1,055			
105.90	1,190	1,102			
105.95	1,190	1,149			
106.00	1,190	1,195			
106.05	1,190	1,242			
106.10	1,190	1,288			
106.15	1,190	1,334			
106.20	1,190	1,381			
106.25	1,190	1,426			
106.30	1,190	1,472			
106.35	1,190	1,517			
106.40	1,190	1,561			
106.45	1,190	1,605			
106.50	1,190	1,649			
106.55	1,190	1,692			
106.60	1,190	1,735			
106.65	1,190	1,777			
106.70	1,190	1,819			
106.75	1,190	1,860			
106.80	1,190	1,901			
106.85	1,190	1,941			
106.90	1,190	1,981			
106.95	1,190	2,020			
107.00	1,190	2,058			
107.05	1,190	2,095			

Summary for Pond ISD: Infiltration System D

Inflow Area = 21,302 sf, 76.68% Impervious, Inflow Depth > 4.69" for 100-Year event
 Inflow = 2.71 cfs @ 12.09 hrs, Volume= 8,319 cf
 Outflow = 0.07 cfs @ 17.01 hrs, Volume= 2,674 cf, Atten= 98%, Lag= 295.5 min
 Discarded = 0.06 cfs @ 9.45 hrs, Volume= 2,665 cf
 Primary = 0.01 cfs @ 17.01 hrs, Volume= 8 cf
 Routed to Reach TN : Total North

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 108.40' @ 17.01 hrs Surf.Area= 2,597 sf Storage= 5,772 cf

Plug-Flow detention time= 180.6 min calculated for 2,674 cf (32% of inflow)
 Center-of-Mass det. time= 70.7 min (836.4 - 765.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	105.00'	2,187 cf	35.33'W x 73.50'L x 3.54'H Field A 9,198 cf Overall - 3,729 cf Embedded = 5,468 cf x 40.0% Voids
#2A	105.50'	3,729 cf	Cultec R-330XLHD x 70 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 7 rows
		5,917 cf	Total Available Storage

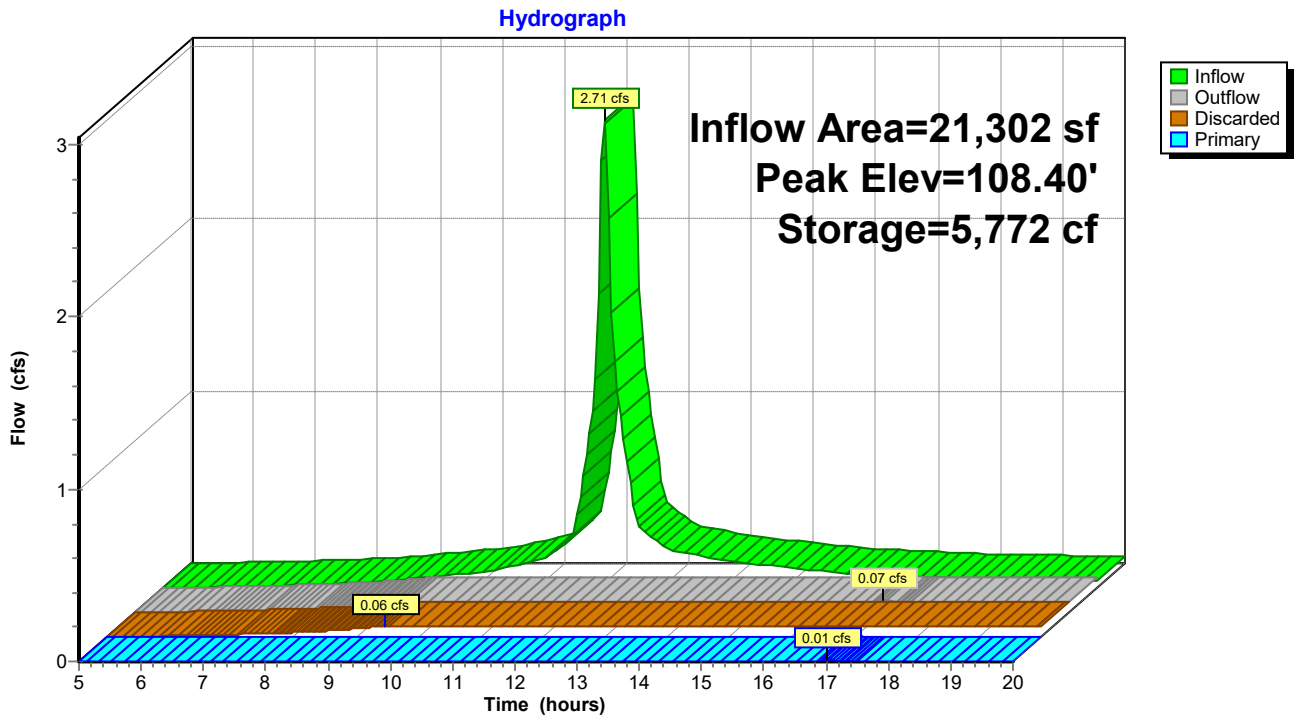
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	105.94'	12.0" Round Culvert L= 94.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 105.94' / 105.00' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	107.10'	12.0" Round Culvert L= 96.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 107.10' / 106.14' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	108.40'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s) 4.0' Crest Height
#4	Discarded	105.00'	1.020 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.06 cfs @ 9.45 hrs HW=105.04' (Free Discharge)
 ↑ **4=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.00 cfs @ 17.01 hrs HW=108.40' (Free Discharge)
 ↑ **1=Culvert** (Passes 0.00 cfs of 4.53 cfs potential flow)
 ↑ **2=Culvert** (Passes 0.00 cfs of 2.99 cfs potential flow)
 ↑ **3=Sharp-Crested Rectangular Weir** (Weir Controls 0.00 cfs @ 0.15 fps)

Pond ISD: Infiltration System D



Stage-Area-Storage for Pond ISD: Infiltration System D

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
105.00	2,597	0	107.60	2,597	4,820
105.05	2,597	52	107.65	2,597	4,899
105.10	2,597	104	107.70	2,597	4,975
105.15	2,597	156	107.75	2,597	5,047
105.20	2,597	208	107.80	2,597	5,116
105.25	2,597	260	107.85	2,597	5,181
105.30	2,597	312	107.90	2,597	5,242
105.35	2,597	364	107.95	2,597	5,300
105.40	2,597	416	108.00	2,597	5,354
105.45	2,597	467	108.05	2,597	5,406
105.50	2,597	519	108.10	2,597	5,458
105.55	2,597	631	108.15	2,597	5,510
105.60	2,597	742	108.20	2,597	5,562
105.65	2,597	853	108.25	2,597	5,614
105.70	2,597	964	108.30	2,597	5,666
105.75	2,597	1,075	108.35	2,597	5,718
105.80	2,597	1,185	108.40	2,597	5,769
105.85	2,597	1,295	108.45	2,597	5,821
105.90	2,597	1,405	108.50	2,597	5,873
105.95	2,597	1,515			
106.00	2,597	1,625			
106.05	2,597	1,735			
106.10	2,597	1,844			
106.15	2,597	1,952			
106.20	2,597	2,060			
106.25	2,597	2,167			
106.30	2,597	2,274			
106.35	2,597	2,381			
106.40	2,597	2,487			
106.45	2,597	2,593			
106.50	2,597	2,699			
106.55	2,597	2,805			
106.60	2,597	2,911			
106.65	2,597	3,016			
106.70	2,597	3,121			
106.75	2,597	3,225			
106.80	2,597	3,329			
106.85	2,597	3,431			
106.90	2,597	3,532			
106.95	2,597	3,632			
107.00	2,597	3,731			
107.05	2,597	3,829			
107.10	2,597	3,926			
107.15	2,597	4,022			
107.20	2,597	4,117			
107.25	2,597	4,210			
107.30	2,597	4,302			
107.35	2,597	4,393			
107.40	2,597	4,482			
107.45	2,597	4,569			
107.50	2,597	4,655			
107.55	2,597	4,739			

Summary for Pond ND: Natural Depression

Inflow Area = 112,819 sf, 32.88% Impervious, Inflow Depth > 0.43" for 100-Year event
 Inflow = 0.52 cfs @ 13.25 hrs, Volume= 4,084 cf
 Outflow = 0.20 cfs @ 14.90 hrs, Volume= 2,919 cf, Atten= 62%, Lag= 99.3 min
 Discarded = 0.11 cfs @ 14.90 hrs, Volume= 2,437 cf
 Primary = 0.09 cfs @ 14.90 hrs, Volume= 483 cf
 Routed to Reach TN : Total North

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 109.07' @ 14.90 hrs Surf.Area= 4,752 sf Storage= 2,253 cf

Plug-Flow detention time= 159.3 min calculated for 2,910 cf (71% of inflow)
 Center-of-Mass det. time= 114.8 min (962.6 - 847.8)

Volume	Invert	Avail.Storage	Storage Description			
#1	108.00'	3,433 cf	Custom Stage Data (Irregular) Listed below			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
108.00	235	88.4	0	0	235	
109.00	4,458	666.5	1,906	1,906	34,965	
109.30	5,751	684.5	1,527	3,433	36,911	

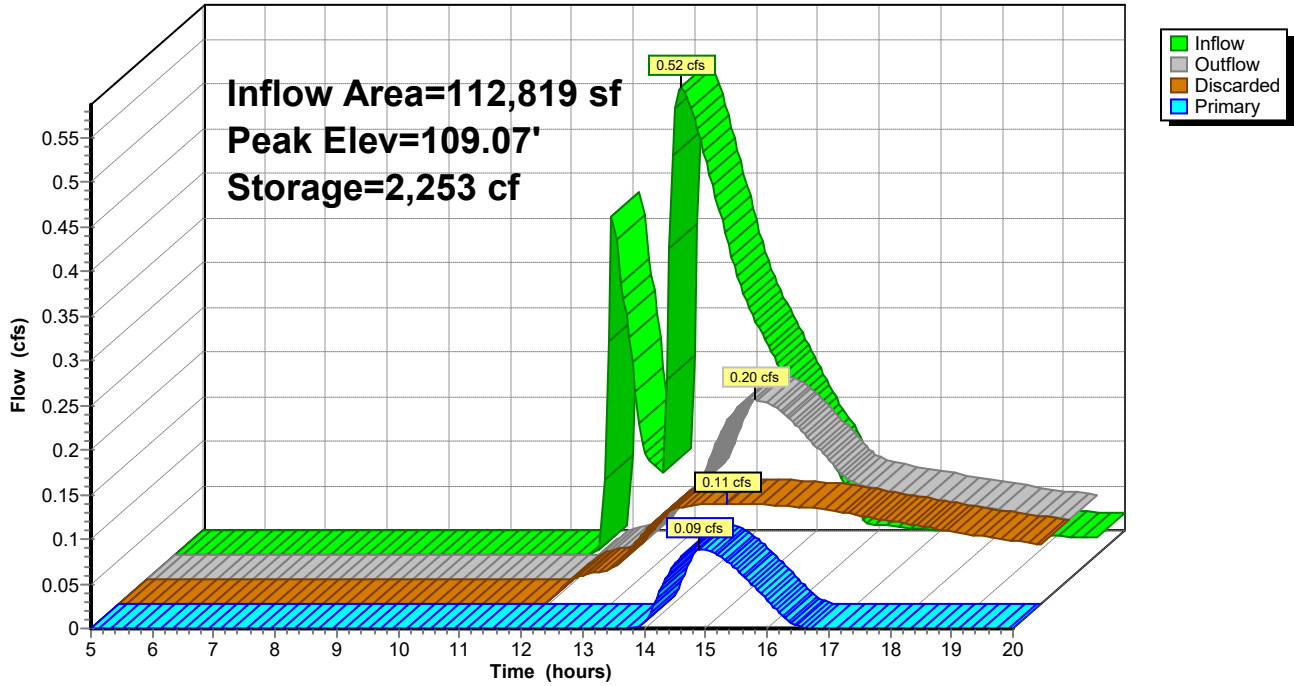
Device	Routing	Invert	Outlet Devices									
#1	Primary	109.00'	2.0' long x 10.0' breadth Broad-Crested Rectangular Weir									
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60									
			Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64									
#2	Discarded	108.00'	1.020 in/hr Exfiltration over Surface area									

Discarded OutFlow Max=0.11 cfs @ 14.90 hrs HW=109.07' (Free Discharge)
 ↗**2=Exfiltration** (Exfiltration Controls 0.11 cfs)

Primary OutFlow Max=0.09 cfs @ 14.90 hrs HW=109.07' (Free Discharge)
 ↗**1=Broad-Crested Rectangular Weir** (Weir Controls 0.09 cfs @ 0.65 fps)

Pond ND: Natural Depression

Hydrograph



Stage-Area-Storage for Pond ND: Natural Depression

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
108.00	235	0	109.04	4,630	2,109
108.02	319	38	109.06	4,717	2,211
108.04	404	76	109.08	4,803	2,313
108.06	488	114	109.10	4,889	2,415
108.08	573	152	109.12	4,975	2,516
108.10	657	191	109.14	5,061	2,618
108.12	742	229	109.16	5,148	2,720
108.14	826	267	109.18	5,234	2,822
108.16	911	305	109.20	5,320	2,924
108.18	995	343	109.22	5,406	3,025
108.20	1,080	381	109.24	5,492	3,127
108.22	1,164	419	109.26	5,579	3,229
108.24	1,249	457	109.28	5,665	3,331
108.26	1,333	495	109.30	5,751	3,433
108.28	1,417	534			
108.30	1,502	572			
108.32	1,586	610			
108.34	1,671	648			
108.36	1,755	686			
108.38	1,840	724			
108.40	1,924	762			
108.42	2,009	800			
108.44	2,093	838			
108.46	2,178	877			
108.48	2,262	915			
108.50	2,347	953			
108.52	2,431	991			
108.54	2,515	1,029			
108.56	2,600	1,067			
108.58	2,684	1,105			
108.60	2,769	1,143			
108.62	2,853	1,181			
108.64	2,938	1,220			
108.66	3,022	1,258			
108.68	3,107	1,296			
108.70	3,191	1,334			
108.72	3,276	1,372			
108.74	3,360	1,410			
108.76	3,444	1,448			
108.78	3,529	1,486			
108.80	3,613	1,524			
108.82	3,698	1,563			
108.84	3,782	1,601			
108.86	3,867	1,639			
108.88	3,951	1,677			
108.90	4,036	1,715			
108.92	4,120	1,753			
108.94	4,205	1,791			
108.96	4,289	1,829			
108.98	4,374	1,867			
109.00	4,458	1,906			
109.02	4,544	2,007			

APPENDIX C

DRAINAGE SYSTEM CALCULATIONS

STORMWATER MANAGEMENT STANDARD 2 – PEAK RATE OF RUNOFF

STORMWATER MANAGEMENT STANDARD 3 – RECHARGE VOLUME

DRAWDOWN CALCULATIONS

STORMWATER MANAGEMENT STANDARD 4 – WATER QUALITY VOLUME

CLOSED DRAINAGE SYSTEM/PIPE SIZING CALCULATIONS



Project Number:	10365.0	Date:	April 30, 2024
Project Name:	Neponset Village	Calculations by:	DJD
Project Address:	5 Pleasant St.	Calculations date:	April 29, 2024
Client:	McSharry Brothers, Inc.	Checked by:	MSD
Location:	Walpole, Massachusetts	Checked Date:	April 30, 2024

STORMWATER MANAGEMENT STANDARD 2 - PEAK RATE OF RUNOFF

ONSITE SOUTH

DESIGN STORM (YEAR)	EXISTING PEAK RUNOFF (CFS)	PROPOSED PEAK RUNOFF (CFS)	REDUCTION IN PEAK RUNOFF
2	0.00	0.00	N/A
10	0.00	0.00	N/A
25	0.01	0.00	100.0%
100	0.03	0.01	66.7%

TOTAL NORTH

DESIGN STORM (YEAR)	EXISTING PEAK RUNOFF (CFS)	PROPOSED PEAK RUNOFF (CFS)	REDUCTION IN PEAK RUNOFF
2	0.00	0.00	N/A
10	0.01	0.01	0.0%
25	0.03	0.03	0.0%
100	0.16	0.11	31.3%

NOTE: PEAK RATES AND VOLUMES SHOWN WERE TAKEN FROM THE EXISTING AND PROPOSED HYDROCAD ANALYSES.



Project Number: 10365.0
Project Name: Neponset Village
Project Address: 5 Pleasant St.
Client: McSharry Brothers, Inc.
Location: Walpole, Massachusetts

Date: April 30, 2024
Calculations by: DJD
Calculations date: April 29, 2024
Checked by: MSD
Checked Date: April 30, 2024

STORMWATER MANAGEMENT STANDARD 3 - RECHARGE VOLUME

	HYDROLOGIC SOIL GROUP				TOTAL
	A	B	C	D	
IMPERVIOUS AREA (S.F.)	31,398	33,772	0	0	65,170
INCHES OF RUNOFF TO BE RECHARGED	0.60	0.35	0.25	0.10	
REQUIRED RECHARGE VOLUME (FT³)	1,570	985	0	0	2,555

CAPTURE AREA ADJUSTMENT - ADJUSTED MINIMUM REQUIRED RECHARGE VOLUME

MINIMUM OF 65% OF IMPERVIOUS AREA MUST BE DIRECTED TO THE RECHARGE BMP; 65 % IS =	42,361	SF		
IMPERVIOUS SITE AREA DRAINING TO BMP =	64,762	SF	99.4%	PERCENTAGE OF IMPERVIOUS AREA DIVERTED TO INFILTRATION FACILITY
RATIO OF TOTAL IMPERVIOUS AREA TO IMPERVIOUS AREA DRAINING TO RECHARGE BMP =	1.01		= $\frac{\text{TOTAL IMPERVIOUS AREA}}{\text{IMPERVIOUS AREA DRAINING TO THE RECHARGE AREA}}$	
ADJUSTED REQUIRED RECHARGE VOLUME=	2,571	CF	= RATIO OF IMPERVIOUS AREA x REQUIRED RECHARGE VOLUME	
PROPOSED RECHARGE VOLUME	21,819	CF	TOTAL AVAILABLE STATIC RECHARGE VOLUME	



Project Number: 10365.0
Project Name: Neponset Village
Project Address: 5 Pleasant St.
Client: McSharry Brothers, Inc.
Location: Walpole, Massachusetts

Date: April 30, 2024
Calculations by: DJD
Calculations date: April 29, 2024
Checked by: MSD
Checked Date: April 30, 2024

PROPOSED DRAWDOWN FOR RECHARGE STRUCTURES

Infiltration Basin IS-A

A = AREA OF PROPOSED LEACHING STRUCTURE	430	SQ. FT.
R _v = STORAGE VOLUME =	935	CU. FT.
K= SATURATED HYDRAULIC CONDUCTIVITY (RAWLS RATE) = VALUE IS BASED ON A HYDRAULIC SOIL GROUP	8.27	INCHES/HOUR
T = ALLOWABLE DRAWDOWN DURING PEAK (USE 2 HRS) =	72	HRS

DRAWDOWN TIME $T = \frac{R_v}{K \times A} = 3.2$ HOURS TO EMPTY THE RECHARGE BMP
 <72 HOURS, SO DRAWDOWN IS OK

Infiltration Basin IS-B

A = AREA OF PROPOSED LEACHING STRUCTURE	5,568	SQ. FT.
R _v = STORAGE VOLUME =	12,486	CU. FT.
K= SATURATED HYDRAULIC CONDUCTIVITY (RAWLS RATE) = VALUE IS BASED ON A HYDRAULIC SOIL GROUP	2.41	INCHES/HOUR
T = ALLOWABLE DRAWDOWN DURING PEAK (USE 2 HRS) =	72	HRS

DRAWDOWN TIME $T = \frac{R_v}{K \times A} = 11.2$ HOURS TO EMPTY THE RECHARGE BMP
 <72 HOURS, SO DRAWDOWN IS OK

Infiltration Basin IS-C

A = AREA OF PROPOSED LEACHING STRUCTURE	1,190	SQ. FT.
R _v = STORAGE VOLUME =	2,629	CU. FT.
K= SATURATED HYDRAULIC CONDUCTIVITY (RAWLS RATE) = VALUE IS BASED ON A HYDRAULIC SOIL GROUP	1.02	INCHES/HOUR
T = ALLOWABLE DRAWDOWN DURING PEAK (USE 2 HRS) =	72	HRS

DRAWDOWN TIME $T = \frac{R_v}{K \times A} = 26.0$ HOURS TO EMPTY THE RECHARGE BMP
 <72 HOURS, SO DRAWDOWN IS OK

Infiltration Basin IS-D

A = AREA OF PROPOSED LEACHING STRUCTURE	2,597	SQ. FT.
R _v = STORAGE VOLUME =	5,769	CU. FT.
K= SATURATED HYDRAULIC CONDUCTIVITY (RAWLS RATE) = VALUE IS BASED ON A HYDRAULIC SOIL GROUP	1.02	INCHES/HOUR
T = ALLOWABLE DRAWDOWN DURING PEAK (USE 2 HRS) =	72	HRS

DRAWDOWN TIME $T = \frac{R_v}{K \times A} = 26.1$ HOURS TO EMPTY THE RECHARGE BMP
 <72 HOURS, SO DRAWDOWN IS OK



Project Number:	10365.0	Date:	December 27, 2023
Project Name:	Neponset Village	Calculations by:	DJD
Project Address:	5 Pleasant St.	Calculations date:	April 29, 2024
Client:	McSharry Brothers, Inc.	Checked by:	MSD
Location:	Walpole, Massachusetts	Checked Date:	April 30, 2024

STORMWATER MANAGEMENT STANDARD 4 - WATER QUALITY VOLUME

	DEPTH TO TREAT (IN.)	IMPERVIOUS AREA (SF)	WATER VOLUME (CF)
Infiltration System A (IS-A)	1	4,760	397
Infiltration System B (IS-B)	1	36,868	3,072
Infiltration System C (IS-C)	0.5	6,800	283
Infiltration System D (IS-D)	0.5	16,334	681
Natural Depression	0.5	224	9
Onsite South	0.5	63	3
Offsite North	0.5	121	5
NET WATER QUALITY VOLUME			4,450



Project Number: 10365
 Client: Mcsharry Brothers, INC
 Project Name: Neponsett Village
 Project Address: 5 Pleasant Street
 Location: Walpole, MA

Calculations by: DJD
 Calculations Date: 4/29/2024
 Checked By: MSD
 Checked Date: 4/30/2024

TO INFILTRATION CHAMBER SYSTEM A - 25 YEAR STORM

WATERSHED CHARACTERISTICS												PIPE CHARACTERISTICS										FLOW CHARACTERISTICS				
LOCATION			LAND USE			FLOW TIME			FLOW			R = hydraulic radius = area/wetted perimeter														
Description	Cover	Increm. (ACRE)	Total_A (ACRE)	C	CA	Total CA	To Inlet (MIN)	In Pipe (MIN)	Tc (MIN)	I (IPH)	Q (CFS)	Structure	Invert	Pipe	Size (IN)	Length (FT)	Area (SF)	R (FT)	Slope	n	Qf (CFS)	Vf (FT/S)	Q/Qf	V/Vf	V (FT/S)	Tc L/V (MIN)
WS RD-A1	LANDSCAPED IMPERVIOUS	0.000 0.055	0.400 0.850 0.055	0.400 0.850	0.046		6.00	NONE	6.00	6.39	0.3	From: RD-A1 To: IS-A	Out: In:	HDPE	6	183	0.20	0.125	0.010	0.013	0.56	2.86	0.53	0.87	2.49	1.23
WS RD-A2	LANDSCAPED IMPERVIOUS	0.000 0.055	0.400 0.850 0.055	0.400 0.850	0.046		6.00	NONE	6.00	6.39	0.3	From: RD-A2 To: IS-A	Out: In:	HDPE	6	178	0.20	0.125	0.010	0.013	0.56	2.86	0.53	0.87	2.49	1.19



Project Number: 10365
 Client: Mcsharry Brothers, INC
 Project Name: Neponsett Village
 Project Address: 5 Pleasant Street
 Location: Walpole, MA

Calculations by: DJD
 Calculations Date: 4/29/2024
 Checked By: MSD
 Checked Date: 4/30/2024

TO INFILTRATION CHAMBER SYSTEM B - 25 YEAR STORM

WATERSHED CHARACTERISTICS												PIPE CHARACTERISTICS								FLOW CHARACTERISTICS						
LOCATION			LAND USE			FLOW TIME			FLOW			R = hydraulic radius = area/wetted perimeter														
Description	Cover	Increm. (ACRE)	Total_A (ACRE)	C	CA	Total CA	To Inlet (MIN)	In Pipe (MIN)	Tc (MIN)	I (IPH)	Q (CFS)	Structure	Invert	Pipe	Size (IN)	Length (FT)	Area (SF)	R (FT)	Slope	n	Qf (CFS)	Vf (FT/S)	Q/Qf	V/Vf	V (FT/S)	Tc L/V (MIN)
WS RD-B1	LANDSCAPED IMPERVIOUS	0.000 0.055	0.400 0.850 0.055	0.400 0.850	0.046		6.00	NONE	6.00	6.39	0.30	From: RD-B1 To: IS-B	Out: In:	HDPE	6	184	0.20	0.125	0.010	0.013	0.56	2.86	0.53	0.87	2.49	1.23
WS RD-B2	LANDSCAPED IMPERVIOUS	0.000 0.055	0.400 0.850 0.055	0.400 0.850	0.046		6.00	NONE	6.00	6.39	0.30	From: RD-B2 To: DMH-B1	Out: In:	HDPE	6	192	0.20	0.125	0.010	0.013	0.56	2.86	0.53	0.87	2.49	1.29
WS CB-B1	LANDSCAPED IMPERVIOUS	0.414 0.043	0.400 0.850 0.457	0.400 0.850	0.202		6.00	NONE	6.00	6.39	1.29	From: CB-B1 To: DMH-B1	Out: In:	HDPE	12	21	0.79	0.250	0.040	0.013	7.13	9.07	0.18	0.64	5.79	0.06
DMH-B1 TO IS-B					0.249				7.29	6.17	1.54	From: DMH-B1 To: IS-B	Out: In:	HDPE	12	13	0.79	0.250	0.010	0.013	3.56	4.54	0.43	0.82	3.72	0.06
WS CB-B3	LANDSCAPED IMPERVIOUS	0.513 0.219	0.400 0.850 0.732	0.400 0.850	0.391		6.00	NONE	6.00	6.39	2.50	From: CB-B3 To: DMH-B2	Out: In:	HDPE	12	61	0.79	0.250	0.005	0.013	2.52	3.21	0.99	1.04	3.35	0.30
WS CB-B4	LANDSCAPED IMPERVIOUS	0.019 0.084	0.400 0.850 0.103	0.400 0.850	0.079		6.00	NONE	6.00	6.39	0.50	From: CB-B4 To: DMH-B2	Out: In:	HDPE	12	14	0.79	0.250	0.005	0.013	2.52	3.21	0.20	0.66	2.11	0.11
DMH-B2 TO DMH-B3					0.470		6.00	0.30	6.30	6.34	2.98	From: DMH-B2 To: DMH-B3	Out: In:	HDPE	18	82	1.77	0.375	0.005	0.013	7.43	4.20	0.40	0.80	3.38	0.40
WS CB-B5	LANDSCAPED IMPERVIOUS	0.082 0.125	0.400 0.850 0.207	0.400 0.850	0.139		6.00	NONE	6.00	6.39	0.89	From: CB-B5 To: DMH-B3	Out: In:	HDPE	12	5	0.79	0.250	0.030	0.013	6.17	7.86	0.14	0.60	4.69	0.02
WS CB-B6	LANDSCAPED IMPERVIOUS	0.132 0.172	0.400 0.850 0.304	0.400 0.850	0.199		6.00	NONE	6.00	6.39	1.27	From: CB-B6 To: DMH-B3	Out: In:	HDPE	12	15	0.79	0.250	0.030	0.013	6.17	7.86	0.21	0.66	5.20	0.05
DMH-B3 TO DMH-B4					0.808				6.71	6.27	5.06	From: DMH-B3 To: DMH-B4	Out: In:	HDPE	18	47	1.77	0.375	0.005	0.013	7.43	4.20	0.68	0.94	3.94	0.20
DMH-B4 TO IS-B					0.808				6.91	6.23	5.04	From: DMH-B4 To: IS-B	Out: In:	HDPE	18	4	1.77	0.375	0.005	0.013	7.43	4.20	0.68	0.94	3.93	0.02
WS CB-B2	LANDSCAPED IMPERVIOUS	0.000 0.112	0.400 0.850 0.112	0.400 0.850	0.095		6.00	NONE	6.00	6.39	0.61	From: CB-B2 To: IS-B	Out: In:	HDPE	12	4	0.79	0.250	0.040	0.013	7.13	9.07	0.09	0.51	4.66	0.01



Project Number: 10365
 Client: Mcsharry Brothers, INC
 Project Name: Neponsett Village
 Project Address: 5 Pleasant Street
 Location: Walpole, MA

Calculations by: DJD
 Calculations Date: 4/29/2024
 Checked By: MSD
 Checked Date: 4/30/2024

TO INFILTRATION CHAMBER SYSTEM C - 25 YEAR STORM

WATERSHED CHARACTERISTICS												PIPE CHARACTERISTICS								FLOW CHARACTERISTICS						
LOCATION			LAND USE			FLOW TIME			FLOW			R = hydraulic radius = area/wetted perimeter														
Description	Cover	Increm. (ACRE)	Total_A (ACRE)	C	CA	Total CA	To Inlet (MIN)	In Pipe (MIN)	Tc (MIN)	I (IPH)	Q (CFS)	Structure	Invert	Pipe	Size (IN)	Length (FT)	Area (SF)	R (FT)	Slope	n	Qf (CFS)	Vf (FT/S)	Q/Qf	V/Vf	V (FT/S)	Tc L/V (MIN)
WS RD-C1	LANDSCAPED IMPERVIOUS	0.000 0.078	0.400 0.850	0.400 0.850	0.066		6.00	NONE	6.00	6.39	0.42	From: RD-C1 To: IS-C	Out: In:	HDPE	6	248	0.20	0.125	0.010	0.013	0.56	2.86	0.76	0.97	2.76	1.50
WS RD-C2	LANDSCAPED IMPERVIOUS	0.000 0.078	0.400 0.850	0.400 0.850	0.066		6.00	NONE	6.00	6.39	0.42	From: RD-C2 To: IS-C	Out: In:	HDPE	6	304	0.20	0.125	0.010	0.013	0.56	2.86	0.76	0.97	2.76	1.84
RD-C3	TO IS-C					0.133	6.00	1.84	7.84	6.08	0.81	From: RD-C3 To: IS-C	Out: In:	HDPE	8	27	0.35	0.166667	0.010	0.013	1.21	3.46	0.67	0.93	3.22	0.14



Project Number: 10365
 Client: Mcsharry Brothers, INC
 Project Name: Neponsett Village
 Project Address: 5 Pleasant Street
 Location: Walpole, MA

Calculations by: DJD
 Calculations Date: 4/29/2024
 Checked By: MSD
 Checked Date: 4/30/2024

TO INFILTRATION CHAMBER SYSTEM D - 25 YEAR STORM

WATERSHED CHARACTERISTICS													PIPE CHARACTERISTICS										FLOW CHARACTERISTICS			
LOCATION				LAND USE			FLOW TIME			FLOW		Structure	Invert	Pipe	Size (IN)	Length (FT)	Area (SF)	R (FT)	Slope	n	Qf (CFS)	Vf (FT/S)	Q/Qf	V/Vf	V (FT/S)	Tc LV (MIN)
Description	Cover	Increment (ACRE)	Total_A (ACRE)	C	CA	Total CA	To Inlet (MIN)	In Pipe (MIN)	Tc (MIN)	I (IPH)	Q (CFS)															
WS CB-D1	LANDSCAPED IMPERVIOUS	0.036 0.179		0.400 0.850																						
			0.215	0.774	0.167		6.00	NONE	6.00	6.39	1.06	From: CB-D1 To: DMH-D1	Out: In:	HDPE	12	32	0.79	0.250	0.030	0.013	6.17	7.86	0.17	0.63	4.94	0.11
DMH-D1	TO IS-D					0.167	6.00	0.11	6.11	6.37	1.06	From: DMH-D1 To: IS-D	Out: In:	HDPE	12	4	0.79	0.25	0.030	0.013	6.17	7.86	0.17	0.63	4.94	0.01
WS CB-D2	LANDSCAPED IMPERVIOUS	0.074 0.200		0.400 0.850																						
			0.274	0.728	0.199		6.00	NONE	6.00	6.39	1.27	From: CB-D2 To: DMH-D2	Out: In:	HDPE	12	38	0.79	0.250	0.010	0.013	3.56	4.54	0.36	0.78	3.52	0.18
DMH-D2	TO DMH-D3					0.199	6.00	0.18	6.18	6.36	1.27	From: DMH-D2 To: DMH-D3	Out: In:	HDPE	12	36	0.79	0.25	0.020	0.013	5.04	6.42	0.25	0.70	4.50	0.13
DMH-D3	TO IS-D					0.199	6.18	0.13	6.31	6.33	1.26	From: DMH-D3 To: IS-D	Out: In:	HDPE	12	4	0.79	0.25	0.020	0.013	5.04	6.42	0.25	0.70	4.50	0.01

APPENDIX D

LONG TERM POLLUTION PREVENTION PLAN – REQUIRED BY STANDARDS 4-6

LONG TERM POLLUTION PREVENTION PLAN

To keep the Stormwater Management System (SMS) functioning properly and to ensure that the stormwater Total Suspended Solids (TSS) are reduced, a long-term pollution prevention is required. The owner/operator of the facility is responsible for the adherence to this long-term plan. The following is a guideline of the specific requirements of the plan to maintain the long term viability of the stormwater management system.

The Stormwater Pollution Prevention Plan for the site addresses many of the items in the Long Term Pollution Prevention Plan.

Good Housekeeping Practices

Residents, contractors, and facility managers shall be instructed in the importance of not spilling fluids and chemicals such as oil, antifreeze, etc. onto the bare ground. All areas exposed to the weather shall be kept clean.

Provisions for Storing Materials and Waste Products Inside or Under Cover

Liquid waste products shall be captured when draining from vehicles, and stored in sealed containers under cover until they are disposed of. Waste products shall be disposed of in a legal manner, at a state licensed recycling center or landfill.

Motor Vehicle controls

Repair, maintenance, and washing of motor vehicles is prohibited from being performed on the property.

Requirements for routine inspections and maintenance of stormwater BMPs

BMPs shall be inspected and maintained per the Operations and Maintenance Plan.

Pet waste management

Owners of pets shall be responsible for removal and disposal of their own pet's waste.

Provisions for solid waste management

Solid waste shall be collected at a minimum of once per week and disposed of in an appropriate dumpster or garbage truck. Waste shall be disposed of in a legal manner, at a state licensed recycling center or landfill.

Spill prevention and response plans

Due to the residential use of the property, commercial and industrial storage of hazardous materials are not anticipated to be stored on the property. In the event of a resident spilling hazardous materials, they should contact the homeowner's association and call the numbers listed below for assistance in containing the spill. Contractors bringing equipment onto the site that may contain hazardous materials shall have oil booms kept on site in a readily accessible area that has been demarcated and indicated to the personal on site (site maintenance shed or other approved alternative). If an oil spill occurs, the booms shall be placed and secured in front of the entrance to the drainage inlets (catch basins) and along the outer edge of the plunge pool outlets. Oil booms should remain in place until the system has been cleaned and inspected. Oil booms should be inspected once a year. All used and damaged booms should be replaced immediately. Refer to manufacturer's instructions on the lifespan of the oil booms.

<u>First responders</u>	<u>Phone Numbers</u>
• Walpole Fire Department	911 if emergency or (508) 668-0260
• Walpole Police Department	911 if emergency or (508) 668-1212
• Mass Department of Environmental Protection Emergency Response	1-888-304-1133

Requirements for storage and use of fertilizers, herbicides, and pesticides

All fertilizer, herbicides, and pesticides shall be used in accordance with the manufacturer guidelines. Excess materials shall be swept up from all impervious surfaces and not allowed to run into the drainage system. All fertilizer, herbicides, and pesticides shall be stored in a wrapped or sealed container and kept under cover out of the rain and snow.

Snow disposal and plowing plans relative to Wetland Resource Areas

Where possible, snow shall be placed onto grassed and landscaped areas adjacent to the area it was removed from. During snow events in which excessive snow cannot be stored within open landscaped areas, snow shall be stored in the designated "Overburden Snow Stockpile Area" as indicated on the Site Plans. During extreme snow events, in which snow cannot be stored on site, snow will be trucked off and disposed of in a legal manner.

Street sweeping schedule

Street sweeping shall be performed on paved surfaces no less than once per year, preferably in the spring months.

Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan.

Training shall be conducted during the incoming of all new site residents and the hiring of site maintenance contractors. Training shall be performed by the owner of the property or a qualified representative. Training records shall be kept on file.

APPENDIX E

OPERATION AND MAINTENANCE PLAN - REQUIRED BY STANDARD 9

OPERATION AND MAINTENANCE PLAN

NEPONSET VILLAGE

5 Pleasant Street, Walpole, Massachusetts

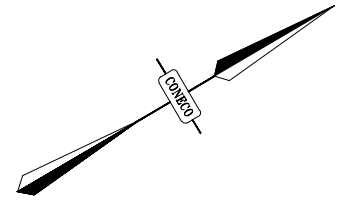
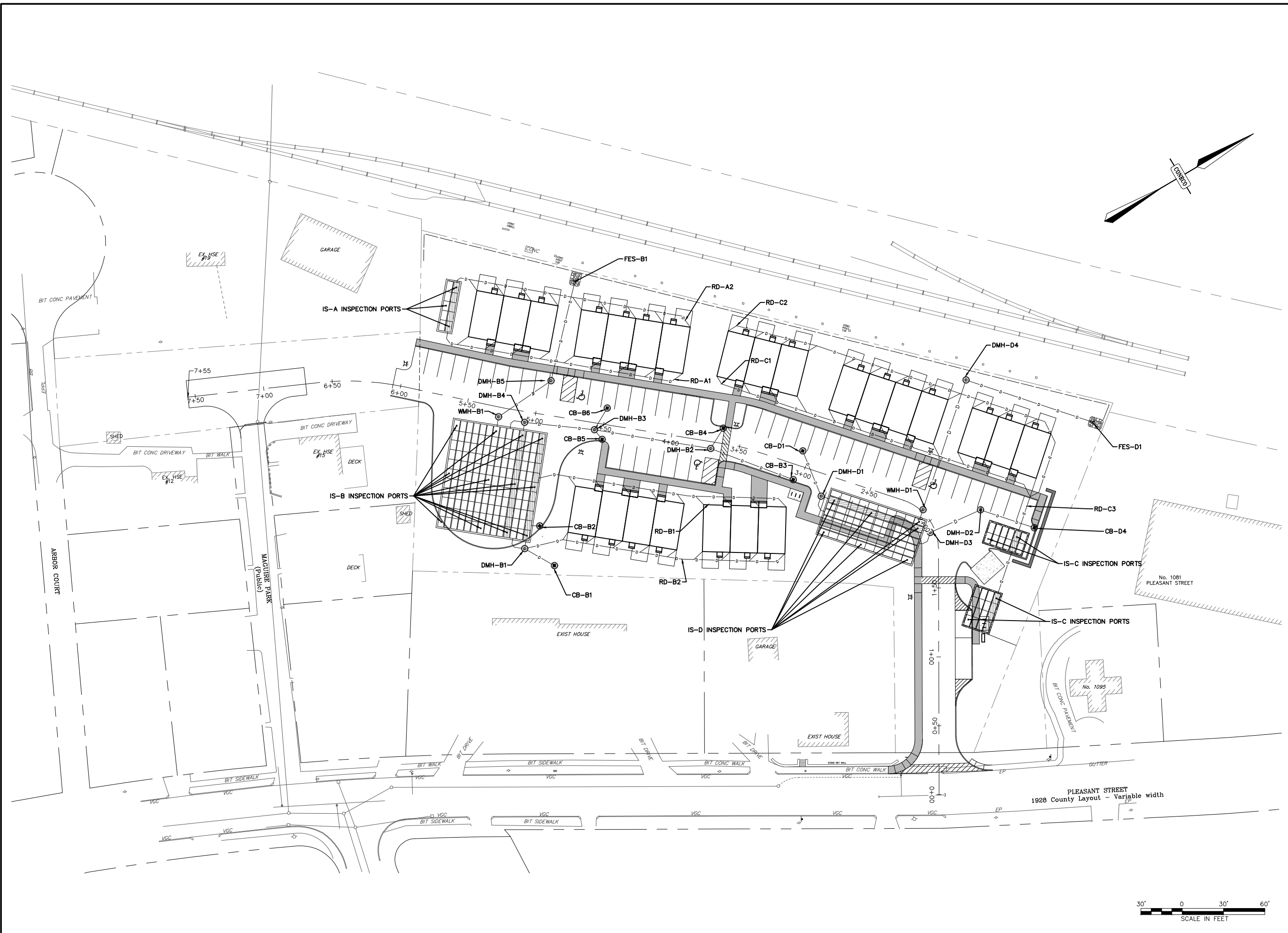
OWNER NAME: Neponset Village, LLC

ADDRESS: 4 First Street, Bridgewater, MA 02324

TEL. NUMBER: (508) 962-6291

To keep the Stormwater Management System (SMS) functioning properly and to ensure that the Total Suspended Solids (TSS) are reduced, periodic maintenance is required. The owner/operator of the facility is responsible for the periodic maintenance requirements of the SMS. Neponset Village, LLC is the owner and will be the party responsible for the maintenance of the SMS. The following is a guideline of the specific maintenance schedules and tasks required to keep the SMS functioning properly.

- Deep Sump Catch Basins
 - General Maintenance
 - Remove any accumulated debris from the grates during the fall and spring.
 - Quarterly Maintenance
 - Inspect sumps for accumulated sediment. If sediment has reached a depth of eighteen inches (18"), remove via clamshell bucket or vacuum truck and dispose of removed materials per local, state, and federal regulations.
 - Annual Maintenance
 - Inspect hood to ensure that it is properly secured.
 - Remove accumulated sediment via clamshell bucket or vacuum truck and dispose of removed materials per local, state, and federal regulations.
- Infiltration Chambers W/ Isolator Row
 - Semi-Annual
 - Inspect subsurface infiltration facilities twice a year by measuring the depth from grade to the top of the base stone/fabric within the chambers. Use a sampling device (I.e. Spoon or clamshell) to check for accumulated sediment within the isolation row.
 - General Maintenance
 - Accumulated sediment shall not exceed 3" of buildup within the system. Clean accumulated sediment within the isolation row with the use of jetwash, vacuum systems, and hand tools. (Reverse high pressure spray nozzles and a minimum 100' long retractable hose may be required for the cleaning of the system.)
 - Inspect and maintain unit in accordance with the manufacturer's operation and maintenance guidelines.
- Plunge Pools/Splash Pads
 - General Maintenance
 - During the fall and the spring remove any accumulated leaves or large debris.
 - Annual Maintenance
 - Check for signs of erosion and repair as needed.
 - Remove any branches, trash, or other large debris that could interfere with the proper operation of the inlet or outlet of the basin. Remove any accumulated sediment, by the use of hand tools (shovels, rakes, wheelbarrows, etc.) when it exceeds three inches (3") but not less than annually.



NO.	DATE	DESCRIPTION	DR/CHK

PREPARED FOR: NEPONSET VILLAGE LLC
 4 FIRST STREET
 BRIDGEWATER, MASSACHUSETTS 02324

PROJECT: NEPONSET VILLAGE
 5 PLEASANT STREET
 WALPOLE, MASSACHUSETTS 02081

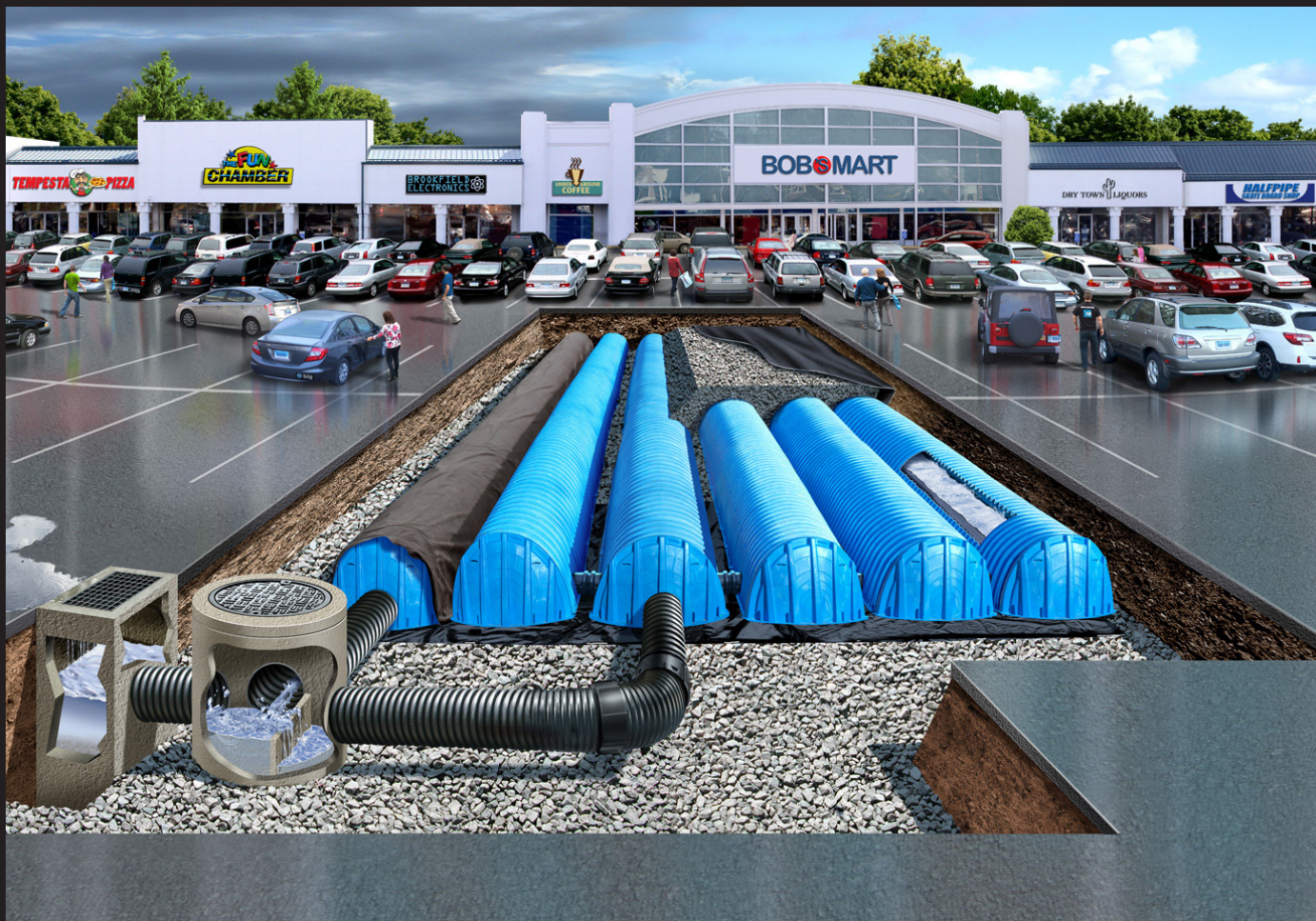
DRAWING: DRAINAGE REPORT
 OPERATIONS AND MAINTENANCE



DATE	12/22/2023
DESIGNED: D.J.D.	CHECKED: D.J.D.
DRAFTED: D.J.D.	IN CHARGE: D.J.D.
SCALE:	1" = 30'
PROJECT NO.	10365.0
SHEET NO.	1

CULTEC SEPARATOR™ ROW

WATER QUALITY SYSTEM



OPERATION & MAINTENANCE GUIDE

FOR CULTEC STORMWATER MANAGEMENT SYSTEMS



STORMWATER MANAGEMENT SOLUTIONS



CULTEC



Published by

CULTEC, Inc.

P.O. Box 280

878 Federal Road

Brookfield, Connecticut 06804 USA

www.cultec.com

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For technical support, please call (203)775-4416 ext. 203 or e-mail tech@cultec.com.

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Doc ID: CLT043 02-22

Feb 2022

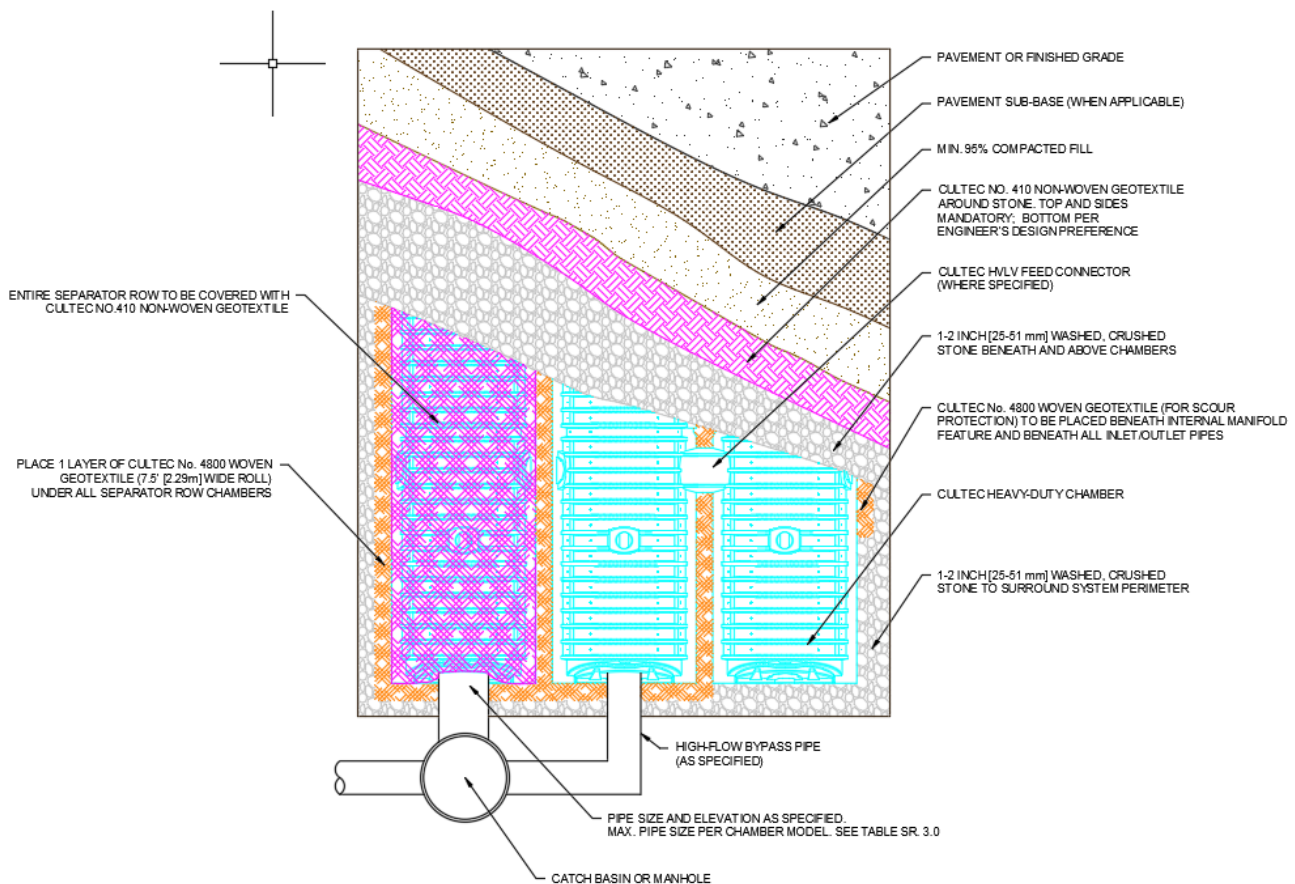
Introduction

CULTEC's Separator™ Row is an inexpensive means of removing Total Suspended Solids from the CULTEC chamber system, as well as providing easier access for inspection and maintenance. The Separator Row is designed to capture the First Flush of a rain event and is typically included as part of the "Treatment Train" for water quality.

The CULTEC Separator Row is a row of CULTEC Contactor or Recharger Chambers that are surrounded on all sides by filter fabric. One layer of CULTEC No. 4800™ Woven Geotextile are placed between the clean foundation stone and the chamber feet. The chambers are then completely wrapped with CULTEC No. 410™ non-woven geotextile. This configuration is designed to trap any sediment and/or debris that may pass through the upstream water-quality structures and into the chamber system.

A manhole is typically located adjacent to the separator row for ease of inspection and maintenance. This manhole is placed upstream of the system and can include a high-flow bypass pipe to pass peak-flows onto adjacent rows of chambers. The upstream manhole is designed with a sump to trap heavier sediment and allow for proper cleaning of the Separator Row. A JetVac process with a high pressure water nozzle is introduced down the Separator Row via the access manhole to clean all sediment and debris from the Separator Row. Captured pollutants are flushed into the sumped access manhole for vacuuming, and the process is repeated until the Separator Row is completely free of sediment and debris.

The Separator Row performance has been tested and verified to the protocols and procedures as defined by Environmental Technology Verification (ETV) Canada to achieve 80% TSS removal.



Design

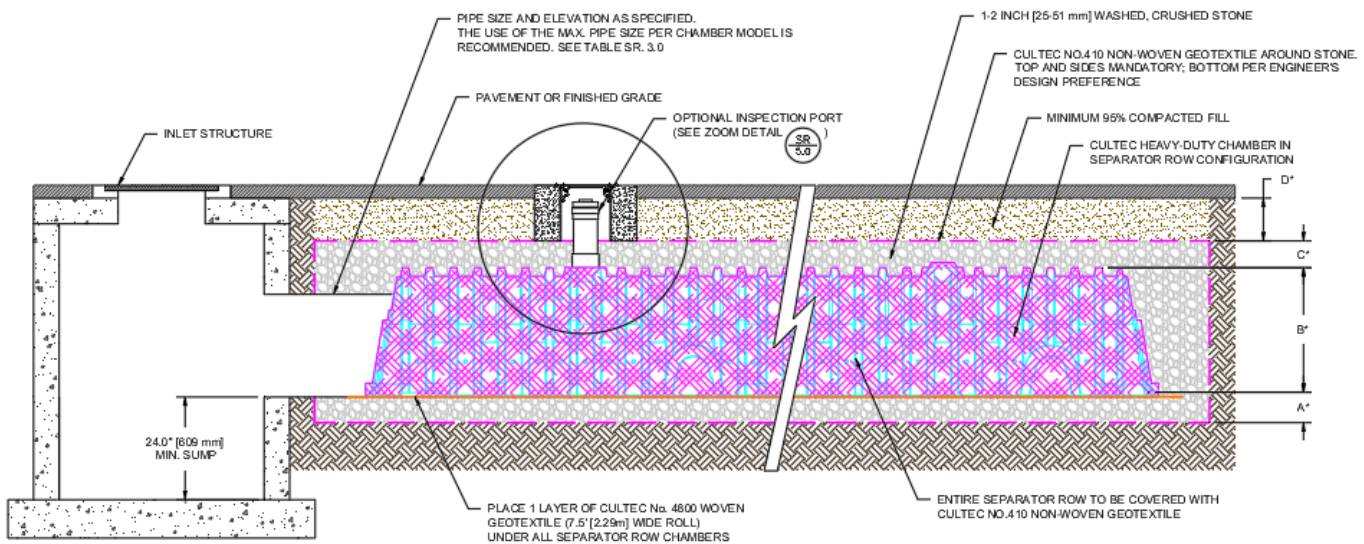
There is no single design to achieve a high level of water quality. The CULTEC Separator Row should be designed as part of an overall best management practices water quality system. Pre-treatment devices such as sump catch basins, inlet baffles and proprietary oil-grit separators and filter systems can all be incorporated upstream of the CULTEC Separator Row. Sumped access/diversion manholes should be installed directly upstream of the Separator Row.

The following is a list of recommended design practices to ensure proper maintenance for the life of the system:

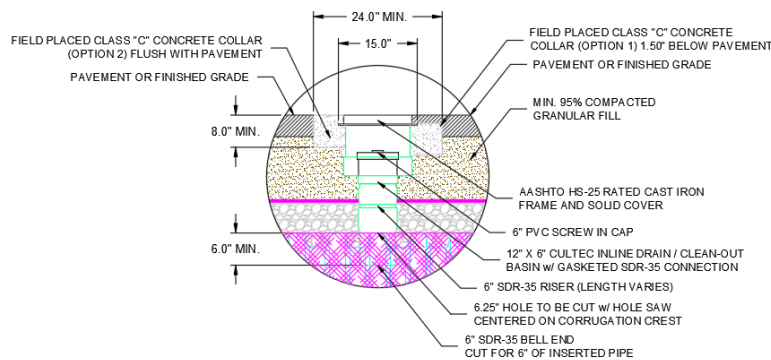
- Install sumped access/diversion manholes, including a minimum 24" (600 mm) sump, directly upstream of the Separator Row.

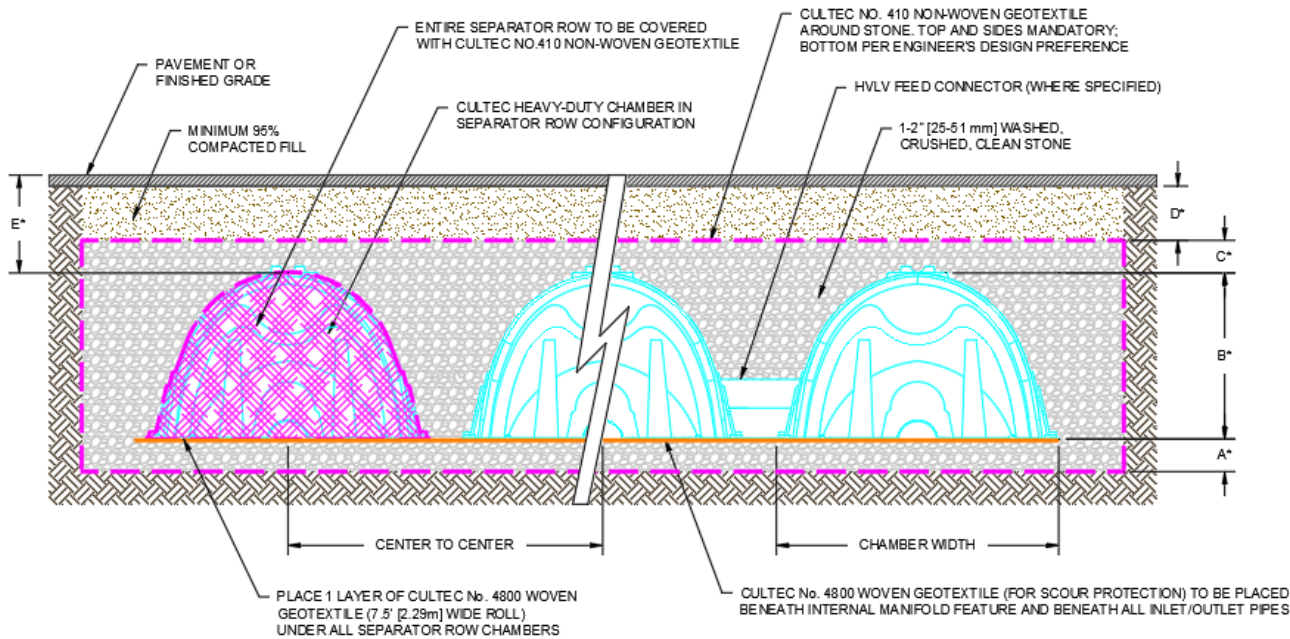
- Include a high-flow bypass pipe to divert peak flows that exceed the capacity of the Separator Row to adjacent rows.
- Connect the access manhole to the Separator Row with the largest diameter pipe allowable based on the CULTEC chamber model used.
- Maintain a minimum distance between the access manhole and the Separator Row to promote efficient maintenance.
- Include at least one inspection port per Separator Row for periodic inspection.

Note: Typical JetVac maintenance reels have a maximum of 400 feet (121.9 m) of available hose. Consider this when designing the length of the CULTEC Separator Rows.



*SEE SR 3.0 - CROSS SECTION TABLE REFERENCE





*SEE SR 3.0 - CROSS SECTION TABLE REFERENCE

Table SR 3.0

Description	Contactor 100HD	Recharger 150XLHD	Recharger 280HD	Recharger 330XLHD	Recharger 360HD	Recharger 902HD
A Min. depth of stone base	6" 152 mm	6" 152 mm	6" 152 mm	6" 152 mm	6" 152 mm	9" 229 m
B Chamber height	12.5" 318 mm	18.5" 470 mm	26.5" 673 mm	30.5" 775 mm	36" 914 mm	48" 1219 mm
C Min. depth of stone required above units for traffic applications	6" 152 mm	6" 152 mm	6" 152 mm	6" 152 mm	6" 152 mm	12" 305 mm
D Min. depth required of 95% compacted fill for paved traffic application	8" 203 mm	8" 203 mm	8" 203 mm	10" 254 mm	12" 305 mm	12" 305 mm
E Max. depth of cover allowed above crown of chamber	12' 3.65 m	12' 3.65 m	12' 3.65 m	12' 3.65 m	12' 3.65 m	8.5' 2.59 m
Max. allowable pipe size into chamber end wall/end cap	10" 250 mm	12" 300 mm	18" 450 mm	24" 600 mm	24" 600 mm	24" 600 mm

For more information, contact CULTEC at (203) 775-4416 or visit www.cultec.com.

Inspection and Maintenance

CULTEC recommends inspection of the Separator Row to be performed every six months for the first year of service. Future inspection frequency can be adjusted based upon previous inspection observations. However annual inspections are recommended. Inspection of the Separator Row can be achieved via an inspection port riser installed during construction. This inspection port riser will connect the top of the Separator Row chambers to finished grade with a removable lid. Alternatively the Separator Row may be inspected via the manhole(s) located at the end(s) of the Separator Row. However this method of inspection requires confined space entry. If entry into the manhole is required, all local and OSHA rules for confined space entries must be strictly followed.

To inspect:

- Remove the inspection port lid from the floor box frame.

- Remove the riser pipe cap.
- With a flashlight and stadia rod, measure the depth of sediment.
- Record results in a maintenance log.
- When depth of sediment exceeds 3" (76 mm), use the JetVac procedure described below.

The JetVac process utilizes a high pressure water nozzle controlled from the surface. The high pressure nozzle is introduced down the Separator Row via the access manhole(s). The high pressure water cleans all sediment and debris from the Separator Row as the nozzle is retrieved. Captured pollutants are flushed into the sumped access manhole for vacuuming. This process is repeated until the Separator Row is completely free of sediment and debris. A small diameter culvert cleaning nozzle is recommended for this procedure.



High pressure water nozzle



Cleaning Separator Row and pipes with high pressure water nozzle



SEPARATOR ROW: Separator Row prior to cleaning



ADJACENT ROW: When the Separator Row is working properly, the adjacent rows will not show signs of sediment.

Inspection and Maintenance Record

Date	Mode of Access	Frequency	Depth of Sediment	Actions	Expenses	Inspector	Notes
Ex.	Inspection Port	Semi-annually	2"	Measure sediment depth with stadia rod. Visually inspect	\$100	DPG	Depth of Sediment was measured via Northeast Inspection Port Adjacent to MH-1. Sediment depth was found to be 2". No further action required at this time.
Ex.	Access Manhole	Annually					



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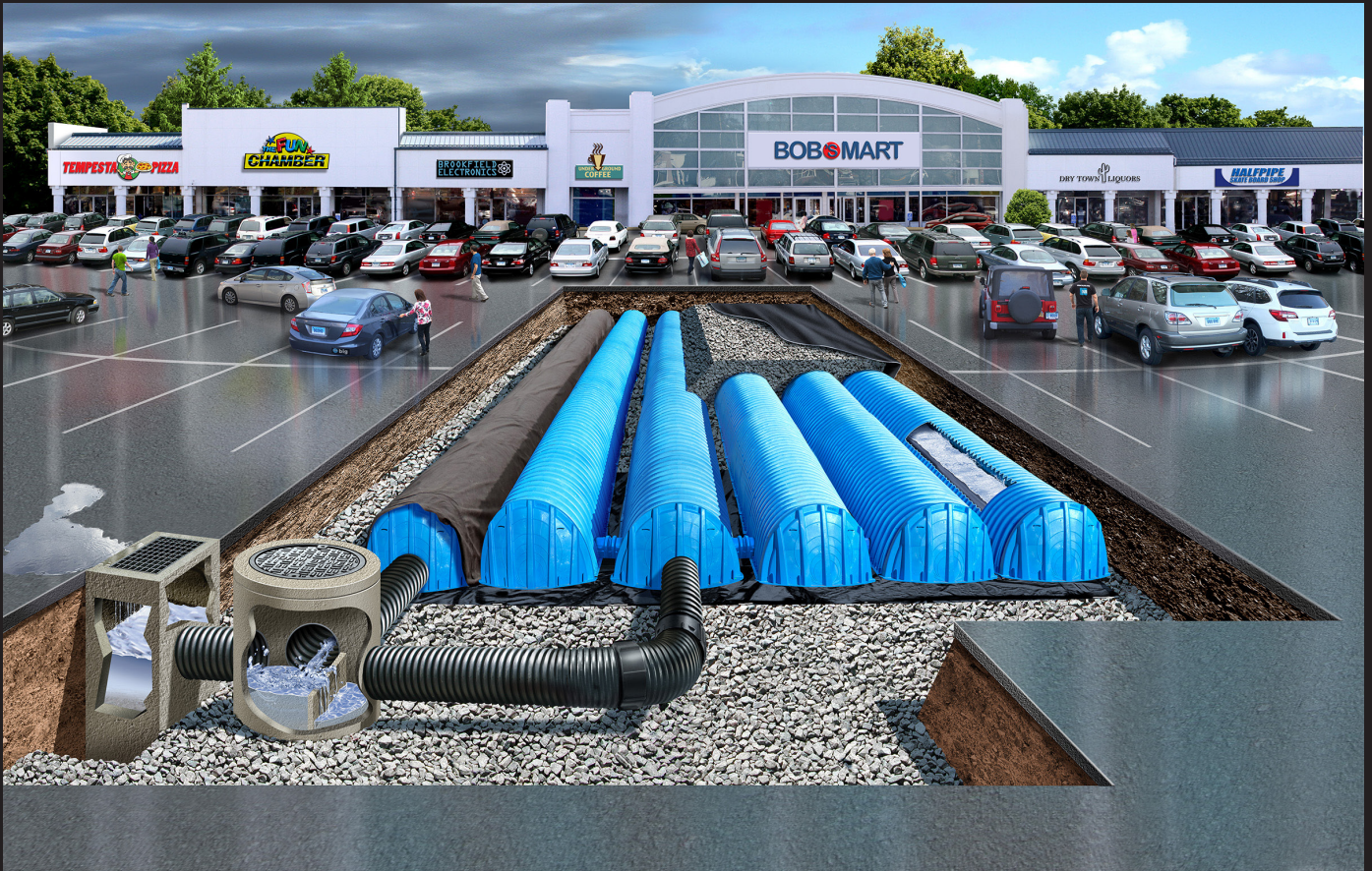
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CONTACTOR® & RECHARGER®

STORMWATER MANAGEMENT SOLUTIONS



OPERATION & MAINTENANCE GUIDELINES FOR CULTEC STORMWATER MANAGEMENT SYSTEMS



OPERATIONS AND MAINTENANCE GUIDELINES

Published by

CULTEC

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Contact Information:

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Visit www.cultec.com/downloads.html for Product Downloads and CAD details.

Doc ID: CLT057 11-23

November 2023

These instructions are for single-layer traffic applications only. For multi-layer applications, contact CULTEC. All illustrations and photos shown herein are examples of typical situations. Be sure to follow the engineer's drawings. Actual designs may vary.

This manual contains guidelines recommended by CULTEC and may be used in conjunction with, but not to supersede, local regulations or regulatory authorities. OSHA Guidelines must be followed when inspecting or cleaning any structure.

Introduction

The CULTEC Subsurface Stormwater Management System is a high-density polyethylene (HDPE) chamber system arranged in parallel rows surrounded by washed stone. The CULTEC chambers create arch-shaped voids within the washed stone to provide stormwater detention, retention, infiltration, and reclamation. Filter fabric is placed between the native soil and stone interface to prevent the intrusion of fines into the system. In order to minimize the amount of sediment which may enter the CULTEC system, a sediment collection device (stormwater pretreatment device) is recommended upstream from the CULTEC chamber system. Examples of pretreatment devices include, but are not limited to, an appropriately sized catch basin with sump, pretreatment catchment device, oil grit separator, or baffled distribution box. Manufactured pretreatment devices may also be used in accordance with CULTEC chambers. Installation, operation, and maintenance of these devices shall be in accordance with manufacturer's recommendations. Almost all of the sediment entering the stormwater management system will be collected within the pretreatment device.

Best Management Practices allow for the maintenance of the preliminary collection systems prior to feeding the CULTEC chambers. The pretreatment structures shall be inspected for any debris that will restrict inlet flow rates. Outfall structures, if any, such as outlet control must also be inspected for any obstructions that would restrict outlet flow rates. OSHA Guidelines must be followed when inspecting or cleaning any structure.

Operation and Maintenance Requirements

I. Operation

CULTEC stormwater management systems shall be operated to receive only stormwater run-off in accordance with applicable local regulations. CULTEC subsurface stormwater management chambers operate at peak performance when installed in series with pretreatment. Pretreatment of suspended solids is superior to treatment of solids once they have been introduced into the system. The use of pretreatment is adequate as long as the structure is maintained and the site remains stable with finished impervious surfaces such as parking lots, walkways, and pervious areas are properly maintained. If there is to be an unstable condition, such as improvements to buildings or parking areas, all proper silt control measures shall be implemented according to local regulations.

II. Inspection and Maintenance Options

- A. The CULTEC system may be equipped with an inspection port located on the inlet row. The inspection port is a circular cast box placed in a rectangular concrete collar. When the lid is removed, a 6-inch (150 mm) pipe with a screw-in plug will be exposed. Remove the plug. This will provide access to the CULTEC Chamber row below. From the surface, through this access, the sediment may be measured at this location. A stadia rod may be used to measure the depth of sediment if any in this row. If the depth of sediment is in excess of 3 inches (76 mm), then this row should be cleaned with high pressure water through a culvert cleaning nozzle. This would be carried out through an upstream manhole or through the CULTEC StormFilter Unit (or other pretreatment device). CCTV inspection of this row can be deployed through this access port to determine if any sediment has accumulated in the inlet row.
- B. If the CULTEC bed is not equipped with an inspection port, then access to the inlet row will be through an upstream manhole or the CULTEC StormFilter.
 1. **Manhole Access**
This inspection should only be carried out by persons trained in confined space entry and sewer inspection services. After the manhole cover has been removed a gas detector must be lowered into the manhole to ensure that there are not high concentrations of toxic gases present. The inspector should be lowered into the manhole with the proper safety equipment as per OSHA requirements. The inspector may be able to observe sediment from this location. If this is not possible, the inspector will need to deploy a CCTV robot to permit viewing of the sediment.

2. StormFilter Access

Remove the manhole cover to allow access to the unit. Typically a 30-inch (750 mm) pipe is used as a riser from the StormFilter to the surface. As in the case with manhole access, this access point requires a technician trained in confined space entry with proper gas detection equipment. This individual must be equipped with the proper safety equipment for entry into the StormFilter. The technician will be lowered onto the StormFilter unit. The hatch on the unit must be removed. Inside the unit are two filters which may be removed according to StormFilter maintenance guidelines. Once these filters are removed the inspector can enter the StormFilter unit to launch the CCTV camera robot.

- C. The inlet row of the CULTEC system is placed on a polyethylene liner to prevent scouring of the washed stone beneath this row. This also facilitates the flushing of this row with high pressure water through a culvert cleaning nozzle. The nozzle is deployed through a manhole or the StormFilter and extended to the end of the row. The water is turned on and the inlet row is back-flushed into the manhole or StormFilter. This water is to be removed from the manhole or StormFilter using a vacuum truck.

III. Maintenance Guidelines

The following guidelines shall be adhered to for the operation and maintenance of the CULTEC stormwater management system:

- A. The owner shall keep a maintenance log which shall include details of any events which would have an effect on the system's operational capacity.
- B. The operation and maintenance procedure shall be reviewed periodically and changed to meet site conditions.
- C. Maintenance of the stormwater management system shall be performed by qualified workers and shall follow applicable occupational health and safety requirements.
- D. Debris removed from the stormwater management system shall be disposed of in accordance with applicable laws and regulations.

IV. Suggested Maintenance Schedules

A. Minor Maintenance

The following suggested schedule shall be followed for routine maintenance during the regular operation of the stormwater system:

Frequency	Action
Monthly in first year	Check inlets and outlets for clogging and remove any debris, as required.
Spring and Fall	Check inlets and outlets for clogging and remove any debris, as required.
One year after commissioning and every third year following	Check inlets and outlets for clogging and remove any debris, as required.

B. Major Maintenance

The following suggested maintenance schedule shall be followed to maintain the performance of the CULTEC stormwater management chambers. Additional work may be necessary due to insufficient performance and other issues that might be found during the inspection of the stormwater management chambers. (See table on next page)

	Frequency	Action
Inlets and Outlets	Every 3 years	<ul style="list-style-type: none"> Obtain documentation that the inlets, outlets and vents have been cleaned and will function as intended.
	Spring and Fall	<ul style="list-style-type: none"> Check inlet and outlets for clogging and remove any debris as required.
CULTEC Stormwater Chambers	2 years after commissioning	<ul style="list-style-type: none"> Inspect the interior of the stormwater management chambers through inspection port for deficiencies using CCTV or comparable technique. Obtain documentation that the stormwater management chambers and feed connectors will function as anticipated.
	9 years after commissioning every 9 years following	<ul style="list-style-type: none"> Clean stormwater management chambers and feed connectors of any debris. Inspect the interior of the stormwater management structures for deficiencies using CCTV or comparable technique. Obtain documentation that the stormwater management chambers and feed connectors have been cleaned and will function as intended.
	45 years after commissioning	<ul style="list-style-type: none"> Clean stormwater management chambers and feed connectors of any debris. Determine the remaining life expectancy of the stormwater management chambers and recommended schedule and actions to rehabilitate the stormwater management chambers as required. Inspect the interior of the stormwater management chambers for deficiencies using CCTV or comparable technique. Replace or restore the stormwater management chambers in accordance with the schedule determined at the 45-year inspection. Attain the appropriate approvals as required. Establish a new operation and maintenance schedule.
Surrounding Site	Monthly in 1 st year	<ul style="list-style-type: none"> Check for depressions in areas over and surrounding the stormwater management system.
	Spring and Fall	<ul style="list-style-type: none"> Check for depressions in areas over and surrounding the stormwater management system.
	Yearly	<ul style="list-style-type: none"> Confirm that no unauthorized modifications have been performed to the site.

For additional information concerning the maintenance of CULTEC Subsurface Stormwater Management Chambers, please contact CULTEC at 1-800-428-5832.

WQMP Operation & Maintenance (O&M) Plan

Project Name: _____

Prepared for:

Project Name: _____

Address: _____

City, State Zip: _____

Prepared on:

Date: _____

This O&M Plan describes the designated responsible party for implementation of this WQMP, including: operation and maintenance of all the structural BMP(s), conducting the training/educational program and duties, and any other necessary activities. The O&M Plan includes detailed inspection and maintenance requirements for all structural BMPs, including copies of any maintenance contract agreements, manufacturer’s maintenance requirements, permits, etc.

8.1.1 Project Information

Project name	
Address	
City, State Zip	
Site size	
List of structural BMPs, number of each	
Other notes	

8.1.2 Responsible Party

The responsible party for implementation of this WQMP is:

Name of Person or HOA Property Manager	
Address	
City, State Zip	
Phone number	
24-Hour Emergency Contact number	
Email	

8.1.3 Record Keeping

Parties responsible for the O&M plan shall retain records for at least 5 years.

All training and educational activities and BMP operation and maintenance shall be documented to verify compliance with this O&M Plan. A sample Training Log and Inspection and Maintenance Log are included in this document.

8.1.4 Electronic Data Submittal

This document along with the Site Plan and Attachments shall be provided in PDF format. AutoCAD files and/or GIS coordinates of BMPs shall also be submitted to the City.

Appendix ____

BMP SITE PLAN

Site plan is preferred on minimum 11" by 17" colored sheets, as long as legible.



Minor Maintenance

Frequency		Action
Monthly in first year		Check inlets and outlets for clogging and remove any debris, as required.
		Notes
<input type="checkbox"/> Month 1	Date:	
<input type="checkbox"/> Month 2	Date:	
<input type="checkbox"/> Month 3	Date:	
<input type="checkbox"/> Month 4	Date:	
<input type="checkbox"/> Month 5	Date:	
<input type="checkbox"/> Month 6	Date:	
<input type="checkbox"/> Month 7	Date:	
<input type="checkbox"/> Month 8	Date:	
<input type="checkbox"/> Month 9	Date:	
<input type="checkbox"/> Month 10	Date:	
<input type="checkbox"/> Month 11	Date:	
<input type="checkbox"/> Month 12	Date:	
Spring and Fall		Check inlets and outlets for clogging and remove any debris, as required.
		Notes
<input type="checkbox"/> Spring	Date:	
<input type="checkbox"/> Fall	Date:	
<input type="checkbox"/> Spring	Date:	
<input type="checkbox"/> Fall	Date:	
<input type="checkbox"/> Spring	Date:	
<input type="checkbox"/> Fall	Date:	
<input type="checkbox"/> Spring	Date:	
<input type="checkbox"/> Fall	Date:	
<input type="checkbox"/> Spring	Date:	
<input type="checkbox"/> Fall	Date:	
<input type="checkbox"/> Spring	Date:	
<input type="checkbox"/> Fall	Date:	
One year after commissioning and every third year following		Check inlets and outlets for clogging and remove any debris, as required.
		Notes
<input type="checkbox"/> Year 1	Date:	
<input type="checkbox"/> Year 4	Date:	
<input type="checkbox"/> Year 7	Date:	
<input type="checkbox"/> Year 10	Date:	
<input type="checkbox"/> Year 13	Date:	
<input type="checkbox"/> Year 16	Date:	
<input type="checkbox"/> Year 19	Date:	
<input type="checkbox"/> Year 22	Date:	

Major Maintenance

Frequency		Action
Inlets and Outlets	Every 3 years	
	Obtain documentation that the inlets, outlets and vents have been cleaned and will function as intended.	
	Notes	
	<input type="checkbox"/> Year 1	Date:
	<input type="checkbox"/> Year 4	Date:
	<input type="checkbox"/> Year 7	Date:
	<input type="checkbox"/> Year 10	Date:
	<input type="checkbox"/> Year 13	Date:
	<input type="checkbox"/> Year 16	Date:
	<input type="checkbox"/> Year 19	Date:
	<input type="checkbox"/> Year 22	Date:
	Spring and Fall	
	Check inlet and outlets for clogging and remove any debris, as required.	
	Notes	
	<input type="checkbox"/> Spring	Date:
	<input type="checkbox"/> Fall	Date:
	<input type="checkbox"/> Spring	Date:
<input type="checkbox"/> Fall	Date:	
<input type="checkbox"/> Spring	Date:	
<input type="checkbox"/> Fall	Date:	
<input type="checkbox"/> Spring	Date:	
<input type="checkbox"/> Fall	Date:	
<input type="checkbox"/> Spring	Date:	
<input type="checkbox"/> Fall	Date:	
CULTEC Stormwater Chambers	2 years after commissioning	
	<input type="checkbox"/> Inspect the interior of the stormwater management chambers through inspection port for deficiencies using CCTV or comparable technique. <input type="checkbox"/> Obtain documentation that the stormwater management chambers and feed connectors will function as anticipated.	
	Notes	
<input type="checkbox"/> Year 2	Date:	

Major Maintenance

Frequency		Action	
CULTEC Stormwater Chambers	9 years after commissioning every 9 years following		
	<ul style="list-style-type: none"> <input type="checkbox"/> Clean stormwater management chambers and feed connectors of any debris. <input type="checkbox"/> Inspect the interior of the stormwater management structures for deficiencies using CCTV or comparable technique. <input type="checkbox"/> Obtain documentation that the stormwater management chambers and feed connectors have been cleaned and will function as intended. 		
	Notes		
	<input type="checkbox"/> Year 9	Date:	
	<input type="checkbox"/> Year 18	Date:	
	<input type="checkbox"/> Year 27	Date:	
	<input type="checkbox"/> Year 36	Date:	
45 years after commissioning			
<ul style="list-style-type: none"> <input type="checkbox"/> Clean stormwater management chambers and feed connectors of any debris. <input type="checkbox"/> Determine the remaining life expectancy of the stormwater management chambers and recommended schedule and actions to rehabilitate the stormwater management chambers as required. <input type="checkbox"/> Inspect the interior of the stormwater management chambers for deficiencies using CCTV or comparable technique. <input type="checkbox"/> Replace or restore the stormwater management chambers in accordance with the schedule determined at the 45-year inspection. <input type="checkbox"/> Attain the appropriate approvals as required. <input type="checkbox"/> Establish a new operation and maintenance schedule. 			
Notes			
<input type="checkbox"/> Year 45	Date:		

Major Maintenance

Frequency		Action	
Surrounding Site	Monthly in 1st year		
	<input type="checkbox"/> Check for depressions in areas over and surrounding the stormwater management system.		
	Notes		
	<input type="checkbox"/> Month 1	Date:	
	<input type="checkbox"/> Month 2	Date:	
	<input type="checkbox"/> Month 3	Date:	
	<input type="checkbox"/> Month 4	Date:	
	<input type="checkbox"/> Month 5	Date:	
	<input type="checkbox"/> Month 6	Date:	
	<input type="checkbox"/> Month 7	Date:	
	<input type="checkbox"/> Month 8	Date:	
	<input type="checkbox"/> Month 9	Date:	
	<input type="checkbox"/> Month 10	Date:	
	<input type="checkbox"/> Month 11	Date:	
	<input type="checkbox"/> Month 12	Date:	
	Spring and Fall		
	<input type="checkbox"/> Check for depressions in areas over and surrounding the stormwater management system.		
	Notes		
	<input type="checkbox"/> Spring	Date:	
	<input type="checkbox"/> Fall	Date:	
	<input type="checkbox"/> Spring	Date:	
	<input type="checkbox"/> Fall	Date:	
	<input type="checkbox"/> Spring	Date:	
	<input type="checkbox"/> Fall	Date:	
	<input type="checkbox"/> Spring	Date:	
	<input type="checkbox"/> Fall	Date:	
	<input type="checkbox"/> Spring	Date:	
	<input type="checkbox"/> Fall	Date:	
	<input type="checkbox"/> Spring	Date:	
	<input type="checkbox"/> Fall	Date:	
	Yearly		
	<input type="checkbox"/> Confirm that no unauthorized modifications have been performed to the site.		
Notes			
<input type="checkbox"/> Year 1	Date:		
<input type="checkbox"/> Year 2	Date:		
<input type="checkbox"/> Year 3	Date:		
<input type="checkbox"/> Year 4	Date:		
<input type="checkbox"/> Year 5	Date:		
<input type="checkbox"/> Year 6	Date:		
<input type="checkbox"/> Year 7	Date:		



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APPENDIX F

ILLICIT DISCHARGE COMPLIANCE STATEMENT- REQUIRED BY STANDARD 10

Illicit Discharge Compliance Statement

Responsibility:

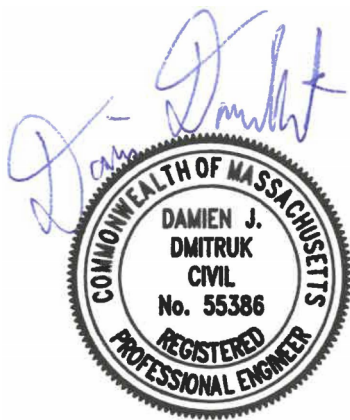
The Owner is responsible for ultimate compliance with all provisions of the Massachusetts Stormwater Management Policy, the USEPA NPDES Construction General Permit and responsible for identifying and eliminating illicit discharges (as defined by the USEPA).

OWNER NAME: Neponset Village, LLC
ADDRESS: 5 Pleasant St
Walpole, MA, 02081
TEL. NUMBER: (508) 697-3191

Engineer's Compliance Statement:

To the best of my knowledge, the attached plans, computations and specifications meet the requirements of Standard 10 of the Massachusetts Stormwater Handbook regarding illicit discharges to the stormwater management system and that no detectable illicit discharges exist on the site. All documents and attachments were prepared under my direction and qualified personnel properly gathered and evaluated the information submitted, to the best of my knowledge.

Included with this statement are site plans, drawn to scale, that identify the location of systems for conveying stormwater on the site and show that these systems do not allow the entry of any illicit discharges into the stormwater management system. The plans also show any systems for conveying wastewater and/or groundwater on the site and show that there are no connections between the stormwater and wastewater systems.



Damien J. Dmitruk, P.E.
Civil Engineer

APPENDIX G

SOIL LOGS

Job No.: 10365.0

Soil Evaluator: Brannon McMullen, E.I.T.

Client: Neponset Village LLC

Witness: Carl Balduf, P.E.

Site Location: 5 Pleasant St., Walpole, MA

Excavator: ADH Contracting

Land Use: Vacant lot

Date: August 31, 2019

Parent Material: _____

Weather: Sunny, 75°

Water Resource Conditions: Normal: _____ Above: _____ Below: _____

TP # 1

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
					Depth		Mottling	
0-2	O				0-15 Min.		Mottling	N/E
2-8	Ap	Course Sand	10YR 5/4		15-30 Min.		Weeping	N/E
8-28	Bw	Course Sand	10YR 3/4	10% Gravel, 25% Cob./Stones	30-45 Min.		Standing	N/E
28-126	C1	Coarse Sand	10YR 4/3	20% Cob./Stones	45-60 Min.			
126-176	C2	Sand			60-75 Min.			

Rate 8.27 "/hr

TP # 2

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
					Depth		Mottling	
0-5	O				0-15 Min.		Mottling	N/E
5-11	Ap	Loamy Sand	10YR 5/2		15-30 Min.		Weeping	139"
11-40	Bw	Loamy Sand	10YR 4/4		30-45 Min.		Standing	N/E
40-102	C1	Loamy Sand	10YR 6/4		45-60 Min.			
102-140	C2	Loamy Sand			60-75 Min.			

Rate 2.41 "/hr

TP # 3

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
					Depth		Mottling	
0-6	O				0-15 Min.		Mottling	N/E
6-11	Ap	Loamy Sand	10YR 4/6		15-30 Min.		Weeping	N/E
11-41	Bw	Loamy Sand	10YR 5/6		30-45 Min.		Standing	N/E
41-68	C1	Loamy Sand	10YR 6/1		45-60 Min.			
68-102	C2	Loamy Sand	10YR 6/4	10% Gravel, 10% Cob./Stones	60-75 Min.			
102-142	C3	Sandy Loam		10% Gravel, 10% Cob./Stones				

Rate 2.41 "/hr

TP # 4

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
					Depth		Mottling	
0-108	Fill				0-15 Min.		Mottling	N/E
108-141	C	Sandy Loam			15-30 Min.		Weeping	N/E
					30-45 Min.		Standing	N/E
					45-60 Min.			
					60-75 Min.			

Rate 1.02 "/hr

TP # 5

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-5	O				Depth		Mottling	N/E
5-14	Ap	Sandy Loam	10YR 5/2		0-15 Min.			
14-41	Bw	Sandy Loam	10YR 4/3		15-30 Min.		Weeping	N/E
41-60	C1	Sandy Loam	10YR 4/4		30-45 Min.			
60-128	C2	Sandy Loam			45-60 Min.		Standing	N/E
					60-75 Min.			

Rate 1.02 "/hr

TP # 7

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-14	A	Sandy Loam	10YR 5/2		Depth		Mottling	N/E
14-31	Bw	Sandy Loam	10YR 4/4		0-15 Min.			
31-128	C1	Sandy Loam	10YR 3/4		15-30 Min.		Weeping	N/E
					30-45 Min.			
					45-60 Min.		Standing	N/E
					60-75 Min.			

Rate 2.41 "/hr

