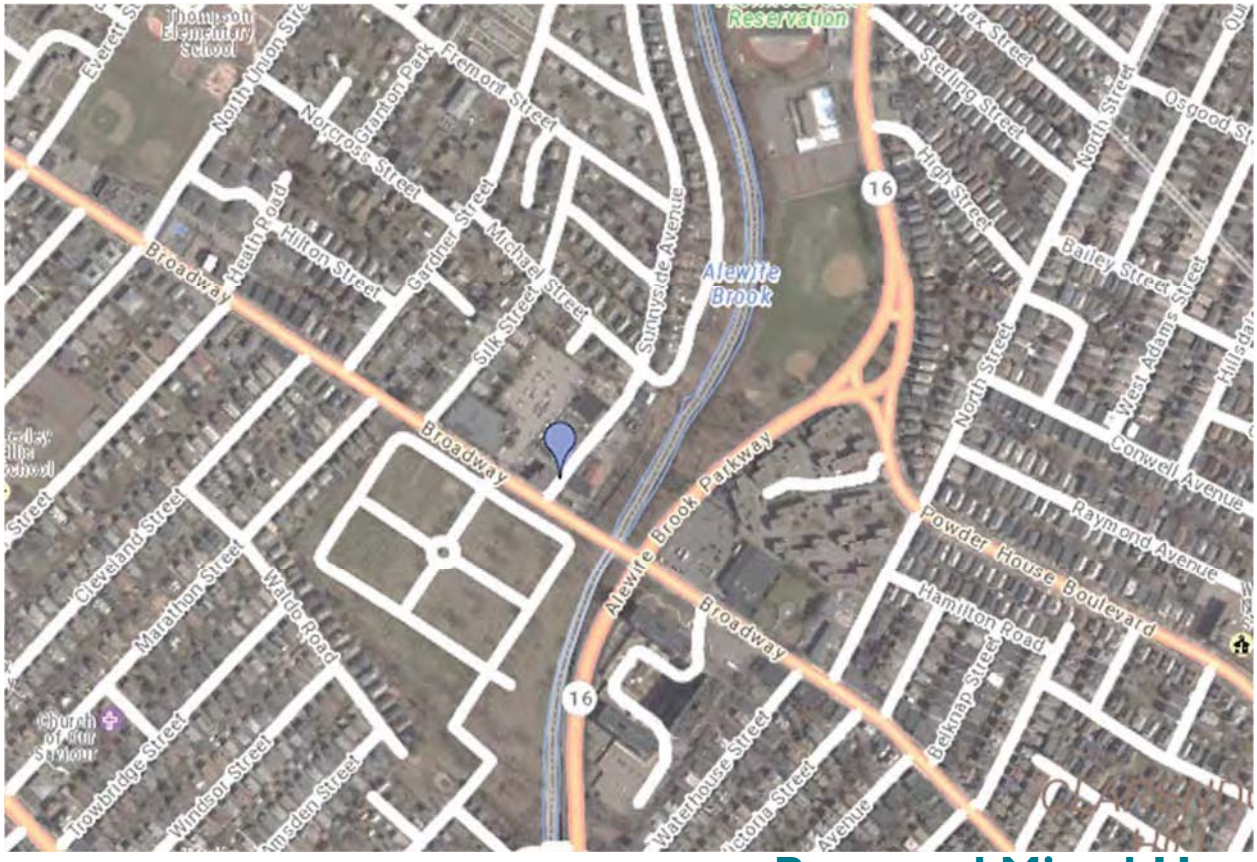
STORMWATER MANAGEMENT REPORT



Proposed Mixed-Use Redevelopment

10 Sunnyside Avenue
Arlington, Massachusetts 02474

COMMONWEALTH OF MASSACHUSETTS
MICHAEL F. CLARK
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REGISTERED PROFESSIONAL ENGINEER

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Project Number: 1620000049
Submitted: November 17, 2020

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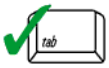
Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

A. Introduction

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



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

The Stormwater Report must include:

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

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

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

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

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

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

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

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

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

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

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

Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature

Signature and Date

Checklist

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

☐ New development

☒ Redevelopment

☐ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

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

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

Standard 1: No New Untreated Discharges

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

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

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

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

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

Standard 3: Recharge

☒ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

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

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

☒ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

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

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

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

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

Standard 4: Water Quality

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

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

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

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

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

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

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

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

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

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

☐ All exposure has been eliminated.

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

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

Standard 6: Critical Areas

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

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

Checklist for Stormwater Report

Checklist (continued)

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

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

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

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

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

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

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

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

Standard 9: Operation and Maintenance Plan

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

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

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

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

Standard 10: Prohibition of Illicit Discharges

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

☐ An Illicit Discharge Compliance Statement is attached;

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

STORMWATER MANAGEMENT REPORT NARRATIVE

This Stormwater Management Report has been prepared to demonstrate compliance with the Massachusetts Department of Environmental Protection (MassDEP) Stormwater Management Standards in accordance with the Massachusetts Wetlands Protection Act Regulations (310 CMR 10.00) and Water Quality Certification Regulations (314 CMR 9.00). This report also demonstrates compliance with the Town of Arlington Stormwater Management Guidelines

PROJECT DESCRIPTION

The Applicant, Column Health, LLC, is proposing to redevelop an existing parcel of land located at 10 Sunnyside Avenue in Arlington, MA. The Site currently consists of an existing building and a parking lot. The Applicant proposes to redevelop the Site in order to construct two buildings and six surface parking spaces. (the Project). As proposed, the Project consists of a 5,972 square foot (sf) residential building (roof area), a 5,876 sf office building, ancillary parking spaces (15), landscape improvements, and utility and stormwater management improvements to support the redevelopment.

SITE DESCRIPTION

The Site is an approximately 0.38-acre parcel of land located at 10 Sunnyside Avenue in Arlington, Massachusetts and is bounded by vehicle-oriented business properties to the north and east, and major business properties to the south and west (see Exhibit 1). The Site lies within the Alewife Brook Watershed (see Exhibit 2).

The Site is not located within the 100-year flood plain, and is not located within a flood zone, as shown on the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) for the Town of Arlington, Map # 25017C0419E, dated June 4, 2010 (see Exhibit 3).

Existing topography within the site ranges from approximately elevation 16 in the west corner to elevation 13 at the eastern property line along Sunnyside Ave. The northwest and northeast sides of the property are bound by a retaining wall, varying in height from one to five feet in height, with the subject site being lower than the abutting properties. Please refer to the Existing Conditions Plan, which is included as part of the Site Plans.

Based on available information and field observations, there are no known wetland resource areas or associated buffers located on the Site.

Test Borings show site soils to be glacial outwash comprised of loose, wet silt to a depth of approximately 25 feet below existing surface. Approximate groundwater elevation is seven feet below existing surface. Based on the geotechnical information, for calculation purposes an HSG of C was used for all subsurface soils. HSG C is classified as having high runoff potential and low infiltration rates.
Please refer to Appendix B for Boring Logs.

HYDROLOGIC ANALYSIS

The hydrologic analysis was performed using the HydroCAD computer program. The HydroCAD model is based on the Natural Resources Conservation Service (NRCS) Technical Release 20 (TR-20) Model for Project Formulation Hydrology. Runoff coefficients for the existing and proposed development conditions, as shown below in Tables 1 and 2 respectively, were determined using NRCS Technical Release 55 (TR-55) methodology as provided in HydroCAD. Rainfall volumes used for this analysis are based on the NRCS Type III, 24-hour storm event for Norfolk and Suffolk Counties.

Existing Conditions

Under existing conditions, the Site is slopes gently to the east towards Sunnyside Avenue. The surface consists of the existing building, pavement, and some landscape area. Runoff from the existing Site flows overland toward Sunnyside Avenue where it is collected within the municipal sewer system. Figure 1 illustrates the existing drainage patterns on the Site.

Currently, the Site is one (1) drainage area and stormwater runoff flows to one (1) design point, which has been identified as the 8" PVC Sewer Main in Sunnyside Avenue. Descriptions of the existing drainage areas are listed below:

- Drainage Area 1S is a 16,500 square foot area that is comprised of the entire Site. The area includes the building roof, a paved parking area, and landscape. Stormwater runoff from this drainage area flows overland and untreated directly into the catch basins in Sunnyside Ave that connect to the 8" sanitary sewer.

Table 1 below provides a summary of the existing conditions hydrologic data:

Table 1: Existing Conditions Hydrologic Data

Drainage Area	Discharge Location	Design Point	Area (sq.ft.)	Curve Number	Time of Concentration (min.)
EX: 1S	8" Sewer	1	16,500	96	6.0

Proposed Conditions

In the proposed condition, previously untreated runoff from the Site will be directed to new control measures to provide the required water quality treatment. The proposed Site layout will direct runoff to drainage structures within the paved driveway. The Project will result in a decrease in impervious area. Figure 2 illustrates the proposed post construction drainage conditions for the Site.

In the proposed condition, the Site will be divided into three (3) drainage areas that discharge treated stormwater to the one (1) existing design point. Descriptions of the proposed drainage areas are listed below:

- Drainage Area 1S is a 11,728 square foot area including the residential building roof, a portion of the office building roof, the paved driveway, and landscape area. This area is collected by catch basins, or roof drain, and routed through the infiltration trench. Overflow discharges to the 8" sanitary sewer in Sunnyside Ave.
- Drainage Area 2S is a 310 square foot area that represents uncovered permeable paver areas. Pavers are to be set on a stone base capable of capturing and infiltrating the 100 year storm.
- Drainage Area 3S is a 4,462 square foot area that includes a portion of the office building roof, paved and unpaved areas that is not practical to route to the infiltration trench. Runoff from this area flows into a catch basin in Sunnyside Ave that connects to the 8" sanitary sewer.

Table 2 below provides a summary of the proposed conditions hydrologic data:

Table 2: Proposed Conditions Hydrologic Data

Drainage Area	Discharge Location	Design Point	Area (sq.ft.)	Curve Number	Time of Concentration (min.)
PR: 1S	8" Sewer	1	11,728	97	6.0
PR: 2S	8" Sewer	1	310	98	6.0
PR: 3S	8" Sewer	1	4,462	95	6.0

Please refer to Appendix A for detailed printouts of the HydroCAD analysis. Hydrologic results are summarized in the Regulatory Compliance section of this report.

WATER QUALITY

The site is not located in a protect surface or groundwater area. Therefore, the proposed stormwater management system has been designed to treat the ½" Water Quality Volume while meeting the 80% TSS removal standard, to the extent practicable, prior to discharging to the municipal system.

Stormwater runoff from the proposed drive aisle, exterior parking spaces, and a portion of the Office Building roof will be collected in a deep sump catch basin and routed through an infiltration trench (StormTech SC-740). Runoff from the Residential Building roof will be collected and piped directly into the infiltration trench.

Source Control
A comprehensive source control program will be implemented at the Site, which includes routine inspection and maintenance of the stormwater management system. Further discussion of the Site maintenance is included in the Regulatory Compliance section.

Management of Snow and Ice
A private contractor will be hired to remove snow and discard off site.

Water Quality Control Measures
The proposed stormwater management system implements a treatment train of Best Management Practices (BMPs) that has been designed to provide 80% TSS (total suspended solids) removal for stormwater runoff from the proposed parking lots and drive aisles. TSS removal is proposed to be obtained by deep sump, hooded catch basins and infiltration. Calculations for the provided TSS removal are provided in Appendix C.

Stormwater Recharge
Stormwater recharge for the proposed redevelopment is provided through the infiltration of pavement and roof runoff. Runoff from 71% of the site is collected and routed to the infiltration system which is comprised of 4 StormTech SC-740 chambers.

HYDRAULIC ANALYSIS

The onsite closed pipe drainage system has been designed for the 25-year storm event in accordance with the Town of Arlington requirements. The drainage pipes were sized using the direct step method based on Manning's Equation for full-flow capacity and the NRCS TR-20 and TR-55 methodology to determine the corresponding runoff for the 25-year Type III 24-hour storm event for Suffolk County. Calculations for pipe sizing are included in Appendix F.

CONCLUSION

The stormwater management plan presented herein and as shown on the Site Plans has been prepared in accordance with applicable local, state, and federal regulations. The design includes Best Management Practices for maintaining stormwater runoff quality both during and after construction, and is designed to protect downstream and underlying receiving waters from stormwater related impacts. The redevelopment Project will result in an improvement of stormwater runoff quality and quantity.

REGULATORY COMPLIANCE

MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION (MASSDEP) STORMWATER MANAGEMENT STANDARDS

As demonstrated below, the Project complies with the MassDEP Stormwater Management Standards for a redevelopment project.

Standard 1

No new stormwater conveyances may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.

The redevelopment Project has been designed to fully comply with Standard 1.

No new untreated stormwater discharges are proposed under the redevelopment. All proposed stormwater conveyances for the Project will not cause erosion or scour to wetlands or receiving waters.

The Best Management Practices (BMPs) included in the proposed stormwater management system have been designed in accordance with the Massachusetts Stormwater Handbook. Supporting information and computations demonstrating that no new untreated discharges will result from the Project are presented below as part of Standards 4 through 6.

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 redevelopment Project has been designed to fully comply with Standard 2.

The rainfall-runoff response of the Site under existing and proposed conditions was analyzed for storm events with recurrence intervals of 2, 10, 25, and 100 years, per the Town of Arlington Stormwater Management Regulations. Rainfall volumes used for this analysis were based on the NRCS Type III, 24-hour storm event for Middlesex County; they were 3.16, 4.77, 6.03, and 8.62 inches, respectively. The results of the analysis, as summarized in Table 3 below, indicate that the post-development discharge rates do not exceed the pre-development discharge rates. Due to the reduction in impervious area and proposed infiltration, the post-development discharge rates are less than the pre-development discharge rates for all storm events analyzed.

Table 3: Peak Discharge Rates (cubic feet per second)

Design Point	2-year	10-year	25-year	100-year
1: 8" Sewer Main				
Existing Conditions	1.01	1.55	1.98	2.85
Proposed Conditions	0.97	1.46	1.85	2.67

Additionally, stormwater volumes were analyzed for all storm events to ensure the Project will not cause any downstream flooding impacts. Again, due to the reduction in impervious area and proposed infiltration, the post-development stormwater volumes are less than the pre-development stormwater volumes for all storm events analyzed. Table 4 below summarizes the stormwater volume analysis.

Table 4: Stormwater Volume Analysis (cubic-feet)

Design Point	2-year	10-year	25-year	100-year
1: 8" Sewer Main				
Existing Conditions	3,726	5,918	7,641	11,192
Proposed Conditions	3,372	5,512	7,198	10,674

Please refer to Appendix A for detailed printouts of the HydroCAD analysis.

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.

The redevelopment Project has been designed to fully comply with Standard 3.

Stormwater recharge for the proposed redevelopment is provided through a reduction and conversion of impervious area to landscaping. Additionally, stormwater recharge is provided through a proposed infiltration trench. The Project proposes a net decrease in impervious surfaces on-site of approximately 258 square feet, which is an approximately 1.5% decrease from the existing condition. The decrease in impervious surfaces and the infiltration trench will greatly improve the post-development groundwater recharge from the pre-development condition.

Table 5 below summarizes the surface cover type areas for the Project.

Table 5: Surface Cover Type Areas (square feet)

Surface Cover Type	Existing	Proposed	Delta
Impervious Surfaces			
Building	5,399	11,848	+ 6449
Pavement	8,568	2,975	- 5593
Sidewalk	0	353	+ 353
Gravel	1467	0	- 1,467
Total Impervious	15,434	15,176	- 258
Open Space	1,066	1,324	+ 258

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 redevelopment Project has been designed to comply with Standard 4 to the extent practical.

The proposed stormwater management system implements a treatment train of BMPs that has been designed to provide 85% TSS removal for stormwater runoff from the proposed drive aisle and parking spaces, as well as roof areas, representing 71% of the total site area.

Due to site grading limitations, some impervious areas cannot be treated in a practical manner. A 300 sf area of paved parking flows across a 65ft long grass strip before reaching permeable pavers where runoff can infiltrate. Other isolated areas, such as the concrete pavement between the front of the Office Building and the back of the public sidewalk are not practical to collect and treat.

Please refer to Appendix C for computations and supporting information regarding water quality.

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 redevelopment Project will not generate more than 1,000 vehicle trips per day and therefore is not

considered a land use with higher potential pollutant loads (LUHPPL).

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 redevelopment Project does not discharge to and is not located within a Zone II or Interim Wellhead Protection Area of a public water supply or near any other critical area.

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.

he Project has been designed to fully comply with Standards 1-3 and 5-10.

Please refer directly to each Standard for demonstration of compliance and for applicable computations and supporting information.

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.

The redevelopment Project will comply with Standard 8.

The Project will disturb less than one (1) acre of land and therefore is not required to obtain coverage under the Environmental Protection Agency (EPA) National Pollutant Discharge Elimination System (NPDES) Construction General Permit. In lieu of the Stormwater Pollution Prevention Plan (SWPPP) required under NPDES, a Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan has been prepared and is included in Appendix D.

Standard 9

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

The redevelopment Project will comply with Standard 9.

A Stormwater Operation and Maintenance (O&M) Plan has been developed for the Project and is included in Appendix E.

Standard 10

All illicit discharges to the stormwater management system are prohibited.

The redevelopment Project will comply with Standard 10.

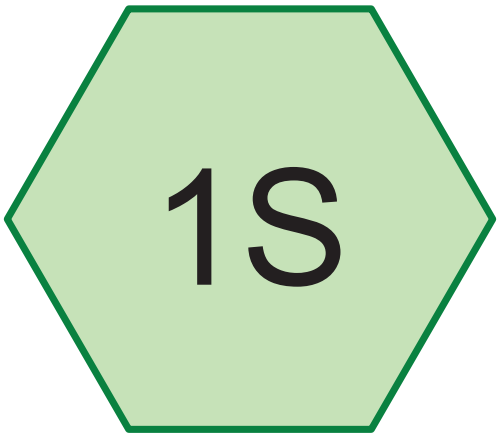
Sanitary sewer and storm drainage structures from prior development on this Site are to be completely removed during the site redevelopment. The Site Plans submitted with this report have been designed so that the components included therein are in full compliance with current standards. The Long-Term Pollution Prevention Plan has been provided along with the Stormwater Operation and Maintenance Plan to include measures for prevention of illicit discharges.

APPENDIX A

STANDARD 2 – SUPPORTING INFORMATION

Included in this section:

- HydroCAD Analysis
  - Existing Conditions Analysis
  - Proposed Conditions Analysis



1- Existing

Subcat Reach Pond Link

Routing Diagram for 1620000049 EX
Prepared by EBI Consulting, Printed 11/16/2020
HydroCAD® 10.10-3a s/n 07549 © 2020 HydroCAD Software Solutions LLC

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	NRCC 24-hr	D	Default	24.00	1	3.16	2
2	10-Year	NRCC 24-hr	D	Default	24.00	1	4.77	2
3	25-Year	NRCC 24-hr	D	Default	24.00	1	6.03	2
4	100-Year	NRCC 24-hr	D	Default	24.00	1	8.62	2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
1,066	74	>75% Grass cover, Good, HSG C (1S)
1,467	96	Gravel surface, HSG C (1S)
8,568	98	Paved parking, HSG C (1S)
5,399	98	Unconnected roofs, HSG C (1S)
16,500	**96**	**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Sub Num
0	0	1,066	0	0	1,066	>75% Grass cover, Good	
0	0	1,467	0	0	1,467	Gravel surface	
0	0	8,568	0	0	8,568	Paved parking	
0	0	5,399	0	0	5,399	Unconnected roofs	
0	**0**	**16,500**	**0**	**0**	**16,500**	**TOTAL AREA**	

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: 1- Existing Runoff Area=16,500 sf 84.65% Impervious Runoff Depth=2.71"
Tc=6.0 min CN=96 Runoff=1.01 cfs 3,726 cf

Total Runoff Area = 16,500 sf Runoff Volume = 3,726 cf Average Runoff Depth = 2.71"
15.35% Pervious = 2,533 sf 84.65% Impervious = 13,967 sf

Summary for Subcatchment 1S: 1- Existing

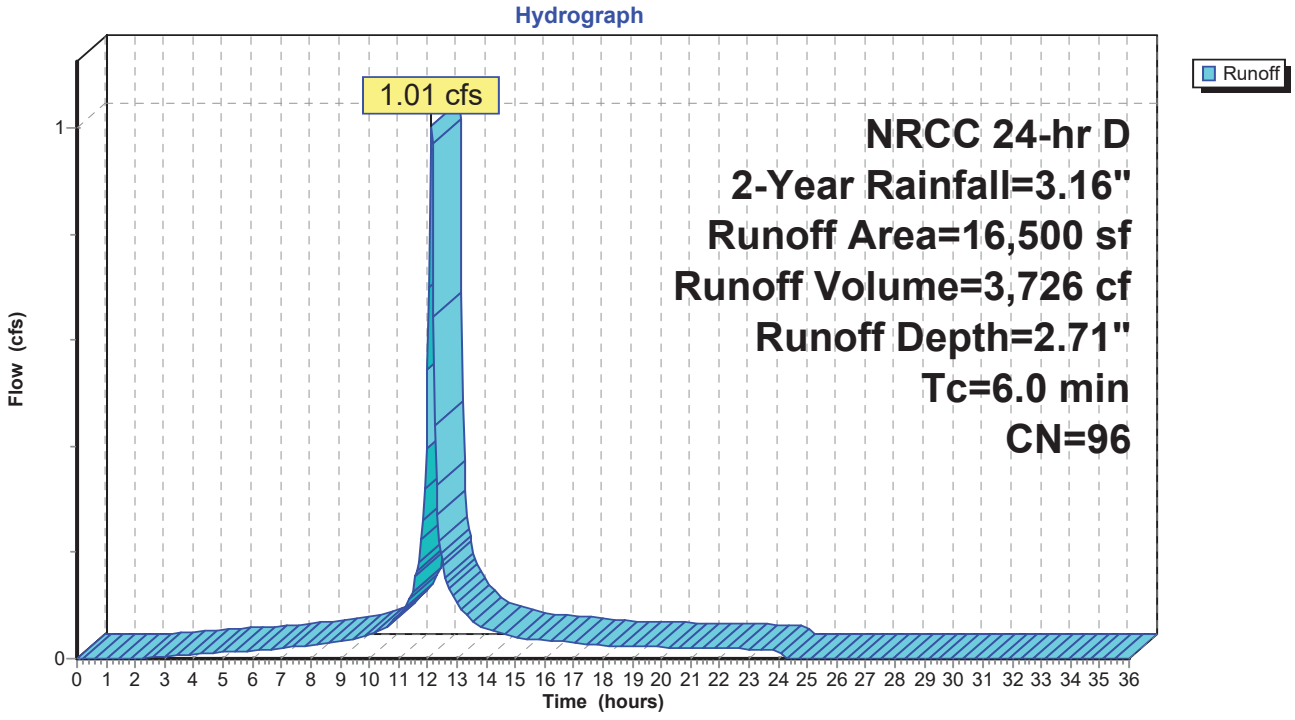
Runoff = 1.01 cfs @ 12.13 hrs, Volume= 3,726 cf, Depth= 2.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-Year Rainfall=3.16"

Area (sf)	CN	Description
5,399	98	Unconnected roofs, HSG C
8,568	98	Paved parking, HSG C
1,467	96	Gravel surface, HSG C
1,066	74	>75% Grass cover, Good, HSG C
16,500	96	Weighted Average
2,533		15.35% Pervious Area
13,967		84.65% Impervious Area
5,399		38.66% Unconnected

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

Subcatchment 1S: 1- Existing



Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: 1- Existing Runoff Area=16,500 sf 84.65% Impervious Runoff Depth=4.30"
Tc=6.0 min CN=96 Runoff=1.55 cfs 5,918 cf

Total Runoff Area = 16,500 sf Runoff Volume = 5,918 cf Average Runoff Depth = 4.30"
15.35% Pervious = 2,533 sf 84.65% Impervious = 13,967 sf

Summary for Subcatchment 1S: 1- Existing

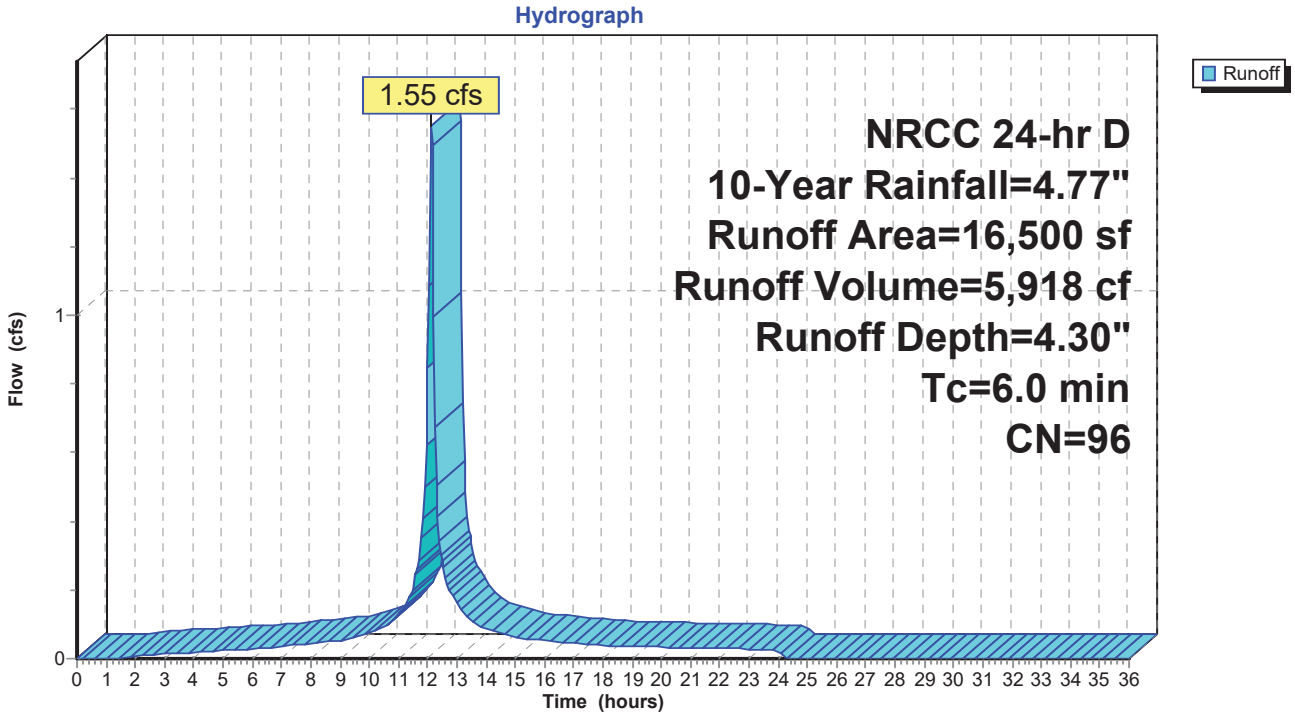
Runoff = 1.55 cfs @ 12.13 hrs, Volume= 5,918 cf, Depth= 4.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-Year Rainfall=4.77"

Area (sf)	CN	Description
5,399	98	Unconnected roofs, HSG C
8,568	98	Paved parking, HSG C
1,467	96	Gravel surface, HSG C
1,066	74	>75% Grass cover, Good, HSG C
16,500	96	Weighted Average
2,533		15.35% Pervious Area
13,967		84.65% Impervious Area
5,399		38.66% Unconnected

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

Subcatchment 1S: 1- Existing



Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: 1- Existing Runoff Area=16,500 sf 84.65% Impervious Runoff Depth=5.56"
Tc=6.0 min CN=96 Runoff=1.98 cfs 7,641 cf

Total Runoff Area = 16,500 sf Runoff Volume = 7,641 cf Average Runoff Depth = 5.56"
15.35% Pervious = 2,533 sf 84.65% Impervious = 13,967 sf

Summary for Subcatchment 1S: 1- Existing

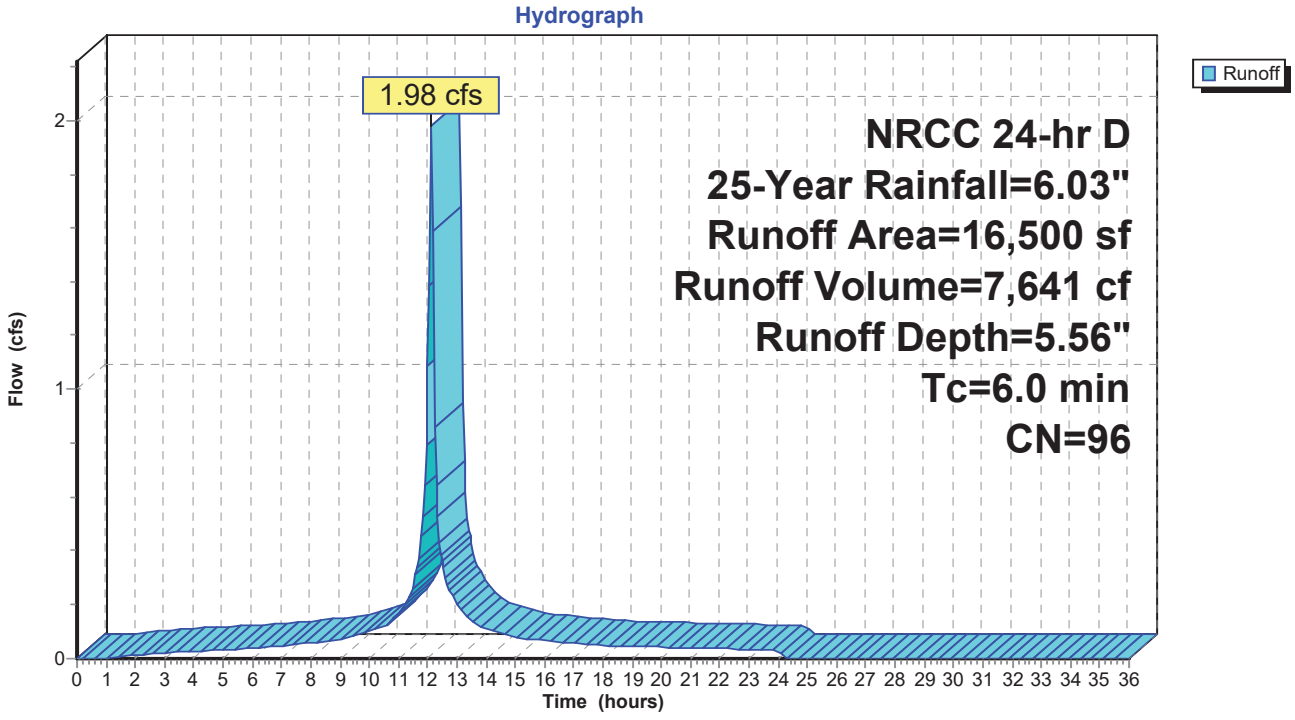
Runoff = 1.98 cfs @ 12.13 hrs, Volume= 7,641 cf, Depth= 5.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 25-Year Rainfall=6.03"

Area (sf)	CN	Description
5,399	98	Unconnected roofs, HSG C
8,568	98	Paved parking, HSG C
1,467	96	Gravel surface, HSG C
1,066	74	>75% Grass cover, Good, HSG C
16,500	96	Weighted Average
2,533		15.35% Pervious Area
13,967		84.65% Impervious Area
5,399		38.66% Unconnected

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

Subcatchment 1S: 1- Existing



Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: 1- Existing Runoff Area=16,500 sf 84.65% Impervious Runoff Depth=8.14"
Tc=6.0 min CN=96 Runoff=2.85 cfs 11,192 cf

Total Runoff Area = 16,500 sf Runoff Volume = 11,192 cf Average Runoff Depth = 8.14"
15.35% Pervious = 2,533 sf 84.65% Impervious = 13,967 sf

Summary for Subcatchment 1S: 1- Existing

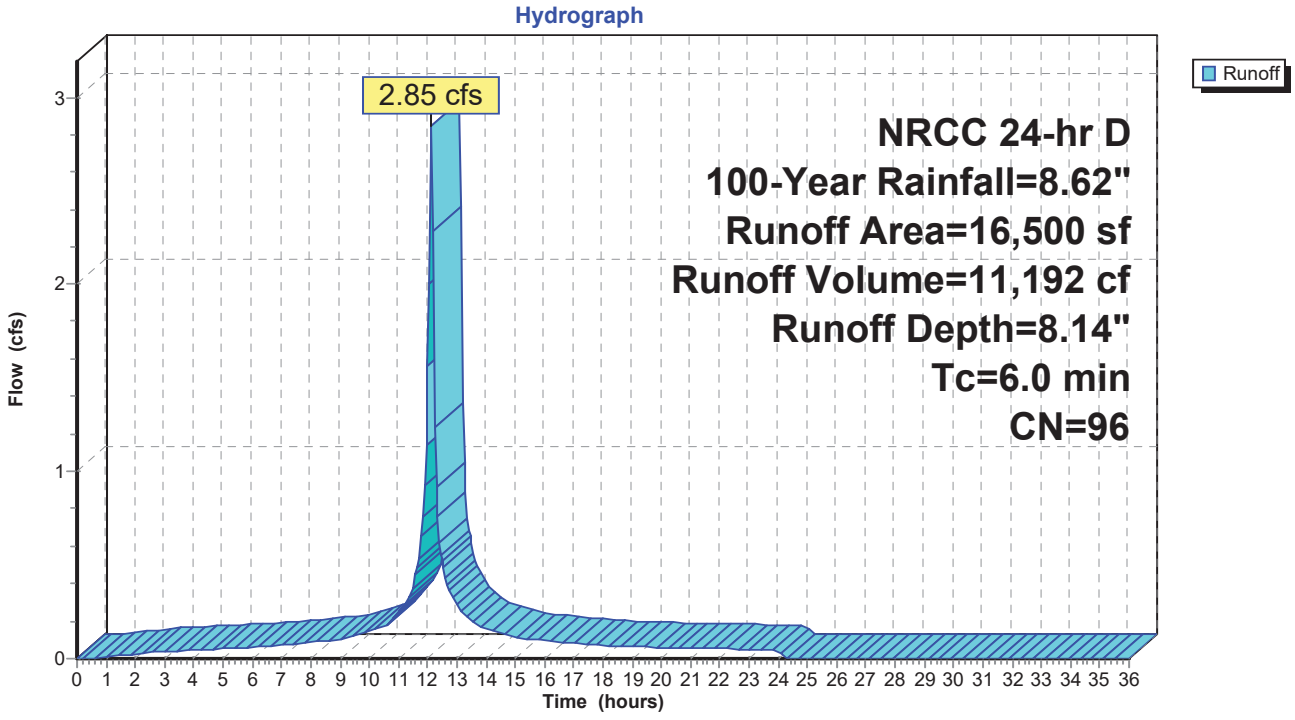
Runoff = 2.85 cfs @ 12.13 hrs, Volume= 11,192 cf, Depth= 8.14"

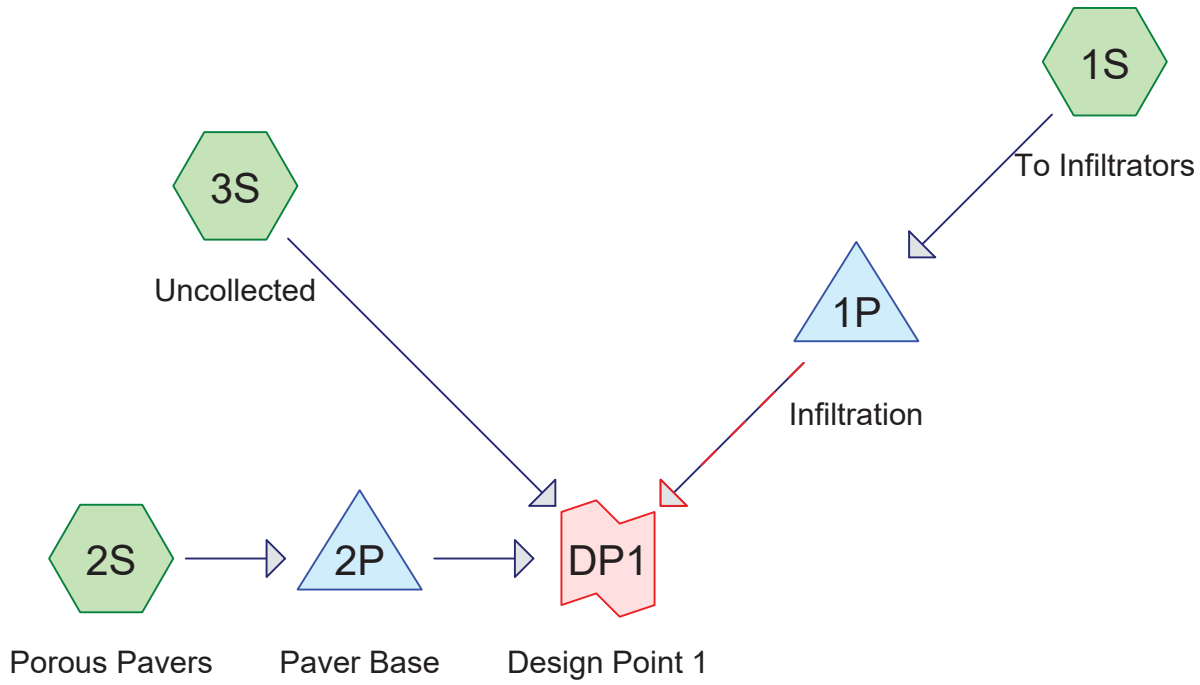
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.62"

Area (sf)	CN	Description
5,399	98	Unconnected roofs, HSG C
8,568	98	Paved parking, HSG C
1,467	96	Gravel surface, HSG C
1,066	74	>75% Grass cover, Good, HSG C
16,500	96	Weighted Average
2,533		15.35% Pervious Area
13,967		84.65% Impervious Area
5,399		38.66% Unconnected

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

Subcatchment 1S: 1- Existing





Subcat Reach Pond Link

Routing Diagram for 1620000049 PR
Prepared by EBI Consulting, Printed 11/17/2020
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Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	NRCC 24-hr	D	Default	24.00	1	3.16	2
2	10-Year	NRCC 24-hr	D	Default	24.00	1	4.77	2
3	25-Year	NRCC 24-hr	D	Default	24.00	1	6.03	2
4	100-Year	NRCC 24-hr	D	Default	24.00	1	8.62	2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
1,155	74	>75% Grass cover, Good, HSG C (1S, 3S)
260	98	Concrete Pavement (3S)
2,780	98	Office Roof (partial), HSG C (1S)
2,384	98	Paved parking, HSG C (1S)
310	98	Porous Pavment (2S)
5,973	98	Residential Roof, HSG C (1S)
330	98	Retaining wall (3S)
300	98	Unconnected pavement, HSG C (3S)
3,008	98	Unconnected roofs, HSG C (3S)
16,500	**96**	**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Sub Num
0	0	1,155	0	0	1,155	>75% Grass cover, Good	
0	0	0	0	260	260	Concrete Pavement	
0	0	2,780	0	0	2,780	Office Roof (partial)	
0	0	2,384	0	0	2,384	Paved parking	
0	0	0	0	310	310	Porous Pavment	
0	0	5,973	0	0	5,973	Residential Roof	
0	0	0	0	330	330	Retaining wall	
0	0	300	0	0	300	Unconnected pavement	
0	0	3,008	0	0	3,008	Unconnected roofs	
0	**0**	**15,600**	**0**	**900**	**16,500**	**TOTAL AREA**	

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: To Infiltrators Runoff Area=11,728 sf 94.96% Impervious Runoff Depth=2.82"
Tc=6.0 min CN=97 Runoff=0.73 cfs 2,753 cf

Subcatchment 2S: Porous Pavers Runoff Area=310 sf 100.00% Impervious Runoff Depth=2.93"
Tc=6.0 min CN=98 Runoff=0.02 cfs 76 cf

Subcatchment 3S: Uncollected Runoff Area=4,462 sf 87.36% Impervious Runoff Depth=2.61"
Tc=6.0 min CN=95 Runoff=0.27 cfs 969 cf

Pond 1P: Infiltration Peak Elev=10.06' Storage=168 cf Inflow=0.73 cfs 2,753 cf
Discarded=0.00 cfs 286 cf Primary=0.71 cfs 2,455 cf Outflow=0.71 cfs 2,741 cf

Pond 2P: Paver Base Peak Elev=12.98' Storage=22 cf Inflow=0.02 cfs 76 cf
Discarded=0.00 cfs 76 cf Primary=0.00 cfs 0 cf Outflow=0.00 cfs 76 cf

Link DP1: Design Point 1 Inflow=0.97 cfs 3,424 cf
Primary=0.97 cfs 3,424 cf

Total Runoff Area = 16,500 sf Runoff Volume = 3,798 cf Average Runoff Depth = 2.76"
7.00% Pervious = 1,155 sf 93.00% Impervious = 15,345 sf

Summary for Subcatchment 1S: To Infiltrators

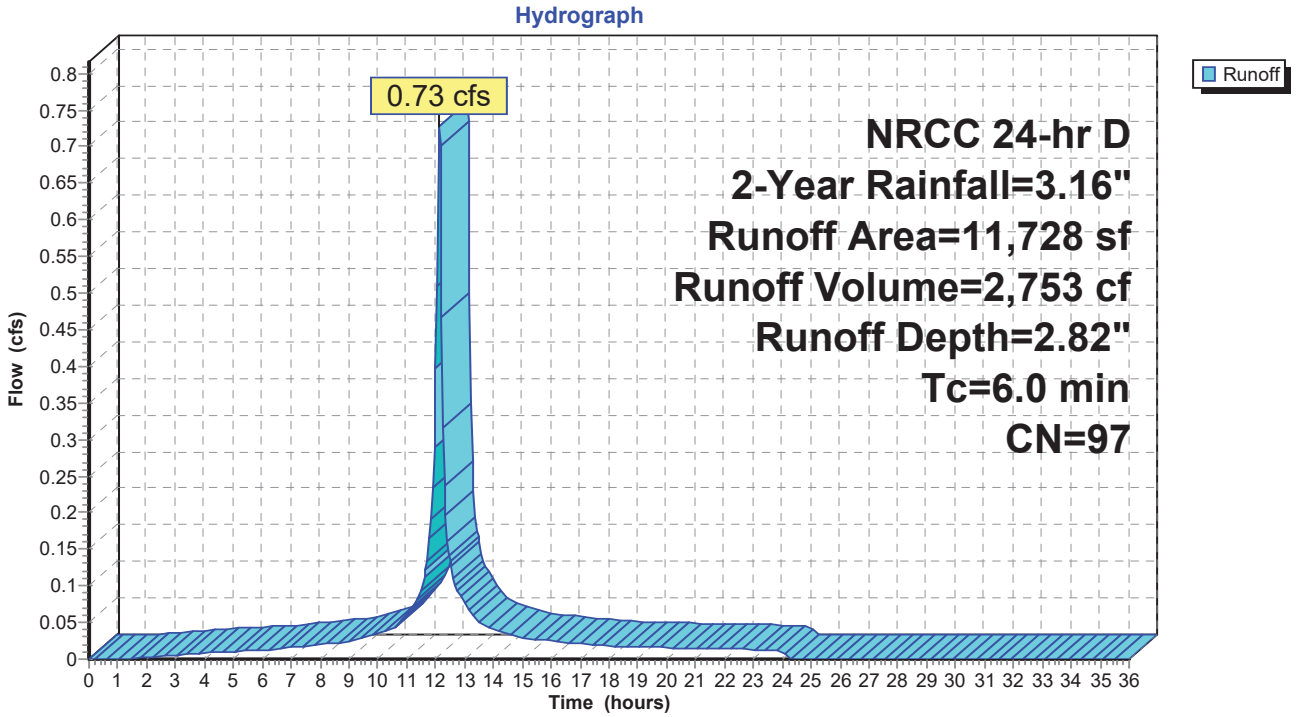
Runoff = 0.73 cfs @ 12.13 hrs, Volume= 2,753 cf, Depth= 2.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-Year Rainfall=3.16"

	Area (sf)	CN	Description
*	5,973	98	Residential Roof, HSG C
*	2,780	98	Office Roof (partial), HSG C
	2,384	98	Paved parking, HSG C
	591	74	>75% Grass cover, Good, HSG C
	11,728	97	Weighted Average
	591		5.04% Pervious Area
	11,137		94.96% Impervious Area

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

Subcatchment 1S: To Infiltrators



Summary for Subcatchment 2S: Porous Pavers

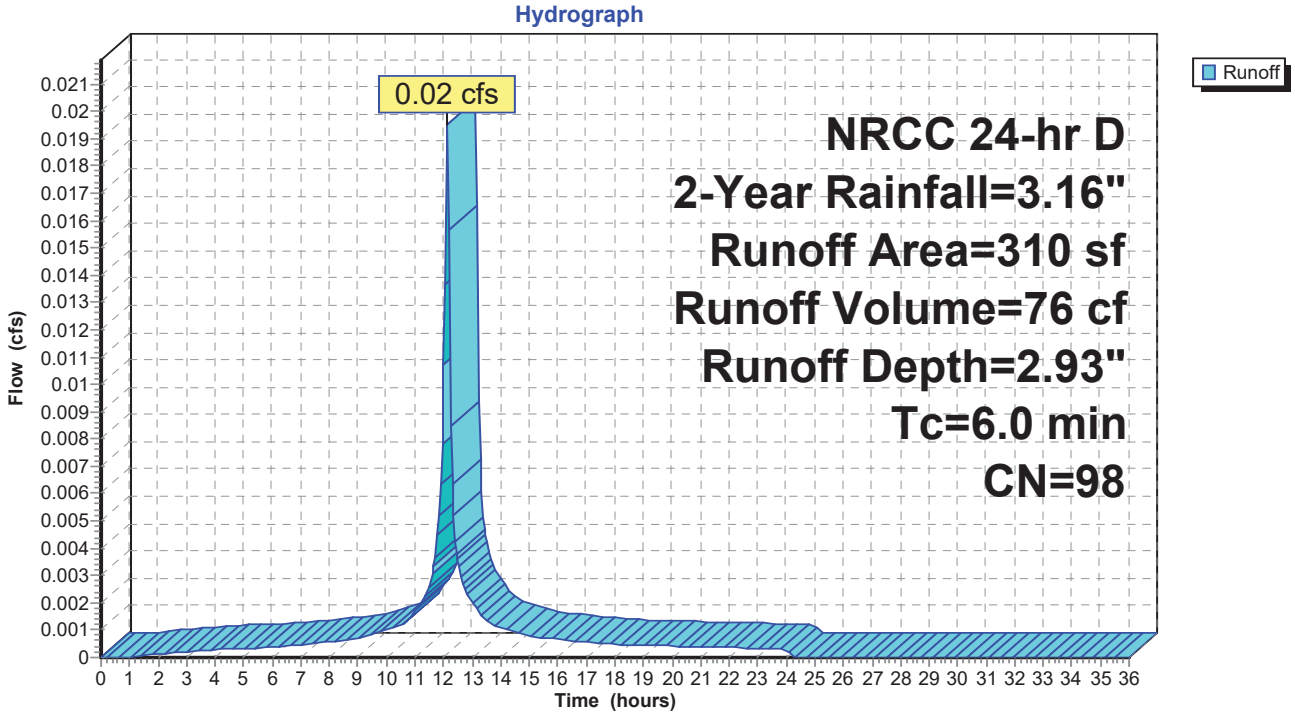
Runoff = 0.02 cfs @ 12.13 hrs, Volume= 76 cf, Depth= 2.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-Year Rainfall=3.16"

	Area (sf)	CN	Description
*	310	98	Porous Pavment
	310		100.00% Impervious Area

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

Subcatchment 2S: Porous Pavers



Summary for Subcatchment 3S: Uncollected

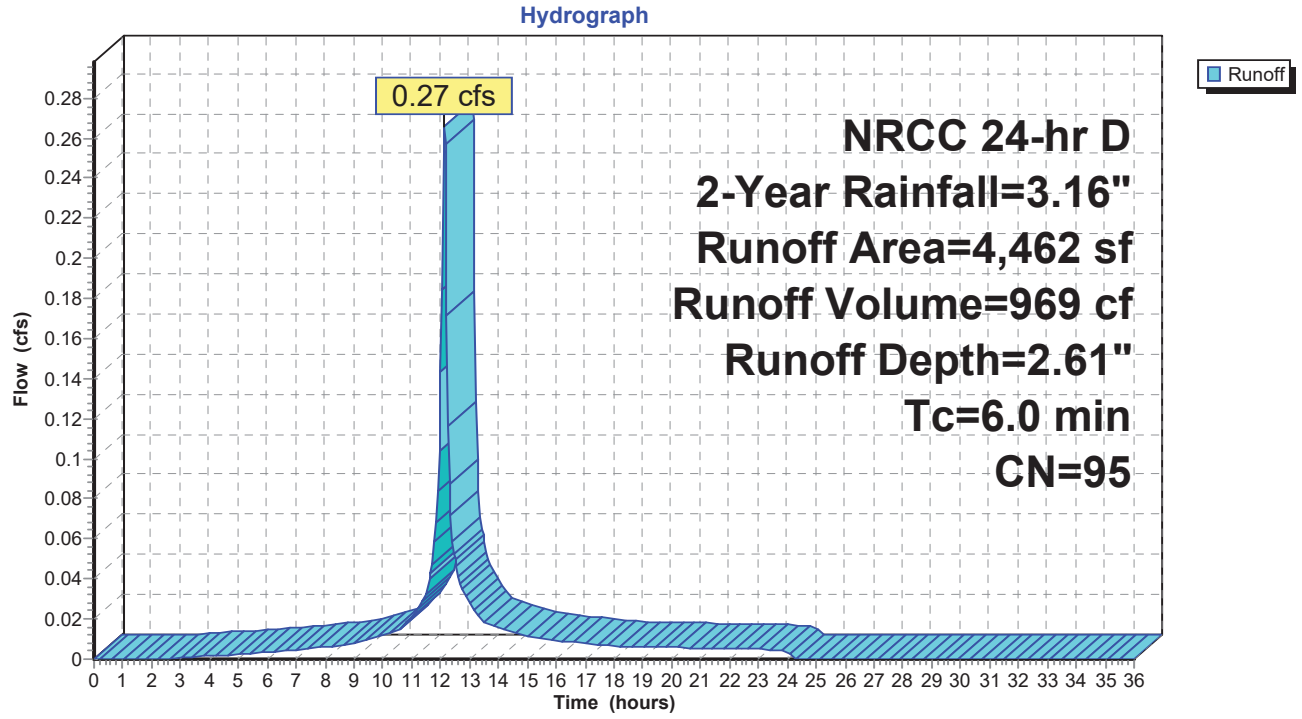
Runoff = 0.27 cfs @ 12.13 hrs, Volume= 969 cf, Depth= 2.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-Year Rainfall=3.16"

	Area (sf)	CN	Description
	3,008	98	Unconnected roofs, HSG C
*	330	98	Retaining wall
*	260	98	Concrete Pavement
	300	98	Unconnected pavement, HSG C
	564	74	>75% Grass cover, Good, HSG C
	4,462	95	Weighted Average
	564		12.64% Pervious Area
	3,898		87.36% Impervious Area
	3,308		84.86% Unconnected

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

Subcatchment 3S: Uncollected



Summary for Pond 1P: Infiltration

Inflow Area = 11,728 sf, 94.96% Impervious, Inflow Depth = 2.82" for 2-Year event
Inflow = 0.73 cfs @ 12.13 hrs, Volume= 2,753 cf
Outflow = 0.71 cfs @ 12.14 hrs, Volume= 2,741 cf, Atten= 3%, Lag= 1.1 min
Discarded = 0.00 cfs @ 12.14 hrs, Volume= 286 cf
Primary = 0.71 cfs @ 12.14 hrs, Volume= 2,455 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 10.06' @ 12.14 hrs Surf.Area= 201 sf Storage= 168 cf

Plug-Flow detention time= 56.6 min calculated for 2,741 cf (100% of inflow)
Center-of-Mass det. time= 53.8 min (826.3 - 772.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	8.50'	156 cf	**6.25'W x 32.10'L x 3.50'H Field A** 702 cf Overall - 184 cf Embedded = 518 cf x 30.0% Voids
#2A	9.00'	184 cf	**ADS_StormTech SC-740 +Cap** x 4 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
		339 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	8.50'	**0.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 7.50'
#2	Primary	9.50'	**8.0" Round Overflow** L= 34.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 9.50' / 8.82' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf

Discarded OutFlow Max=0.00 cfs @ 12.14 hrs HW=10.06' (Free Discharge)
↑—**1=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=0.70 cfs @ 12.14 hrs HW=10.06' (Free Discharge)
↑—**2=Overflow** (Inlet Controls 0.70 cfs @ 2.24 fps)

Pond 1P: Infiltration - Chamber Wizard Field A

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

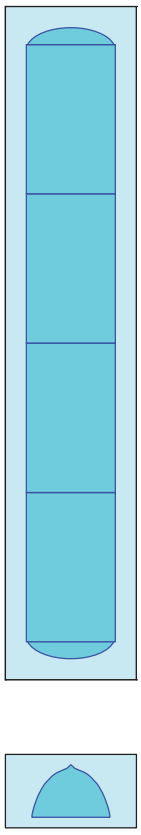
4 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 30.10' Row Length +12.0" End Stone x 2 = 32.10' Base Length
1 Rows x 51.0" Wide + 12.0" Side Stone x 2 = 6.25' Base Width
6.0" Stone Base + 30.0" Chamber Height + 6.0" Stone Cover = 3.50' Field Height

4 Chambers x 45.9 cf = 183.8 cf Chamber Storage

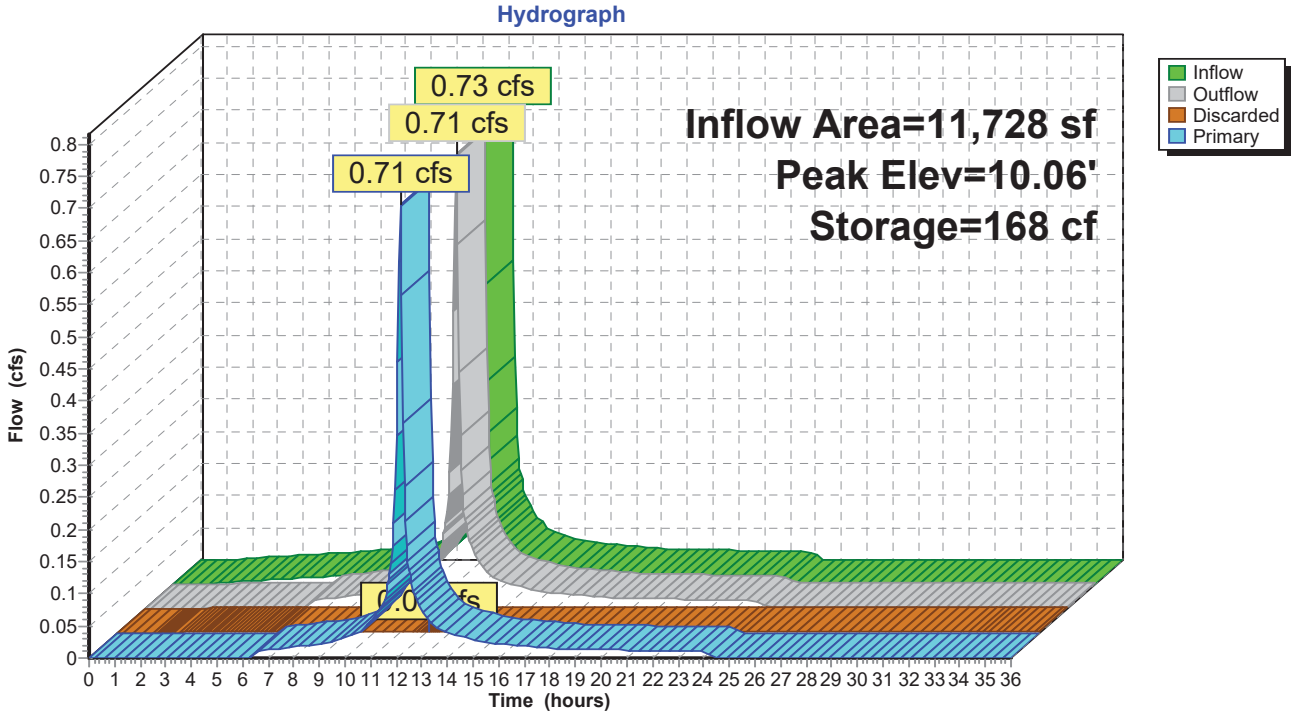
702.1 cf Field - 183.8 cf Chambers = 518.4 cf Stone x 30.0% Voids = 155.5 cf Stone Storage

Chamber Storage + Stone Storage = 339.3 cf = 0.008 af
Overall Storage Efficiency = 48.3%
Overall System Size = 32.10' x 6.25' x 3.50'

4 Chambers @ $ 300.00 /ea = $ 1,200.00
26.0 cy Field Excavation @ $ 30.00 /cy = $ 780.13
19.2 cy Stone @ $ 30.00 /cy = $ 575.95
Total Cost = $ 2,556.08



Pond 1P: Infiltration



Summary for Pond 2P: Paver Base

Inflow Area = 310 sf,100.00% Impervious, Inflow Depth = 2.93" for 2-Year event
Inflow = 0.02 cfs @ 12.13 hrs, Volume= 76 cf
Outflow = 0.00 cfs @ 13.00 hrs, Volume= 76 cf, Atten= 90%, Lag= 52.2 min
Discarded = 0.00 cfs @ 13.00 hrs, Volume= 76 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 12.98' @ 13.00 hrs Surf.Area= 310 sf Storage= 22 cf

Plug-Flow detention time= 70.3 min calculated for 76 cf (100% of inflow)
Center-of-Mass det. time= 70.3 min (831.0 - 760.7)

Volume	Invert	Avail.Storage	Storage Description
#1	12.75'	116 cf	**Stone storage (Prismatic)**Listed below (Recalc) 388 cf Overall x 30.0% Voids

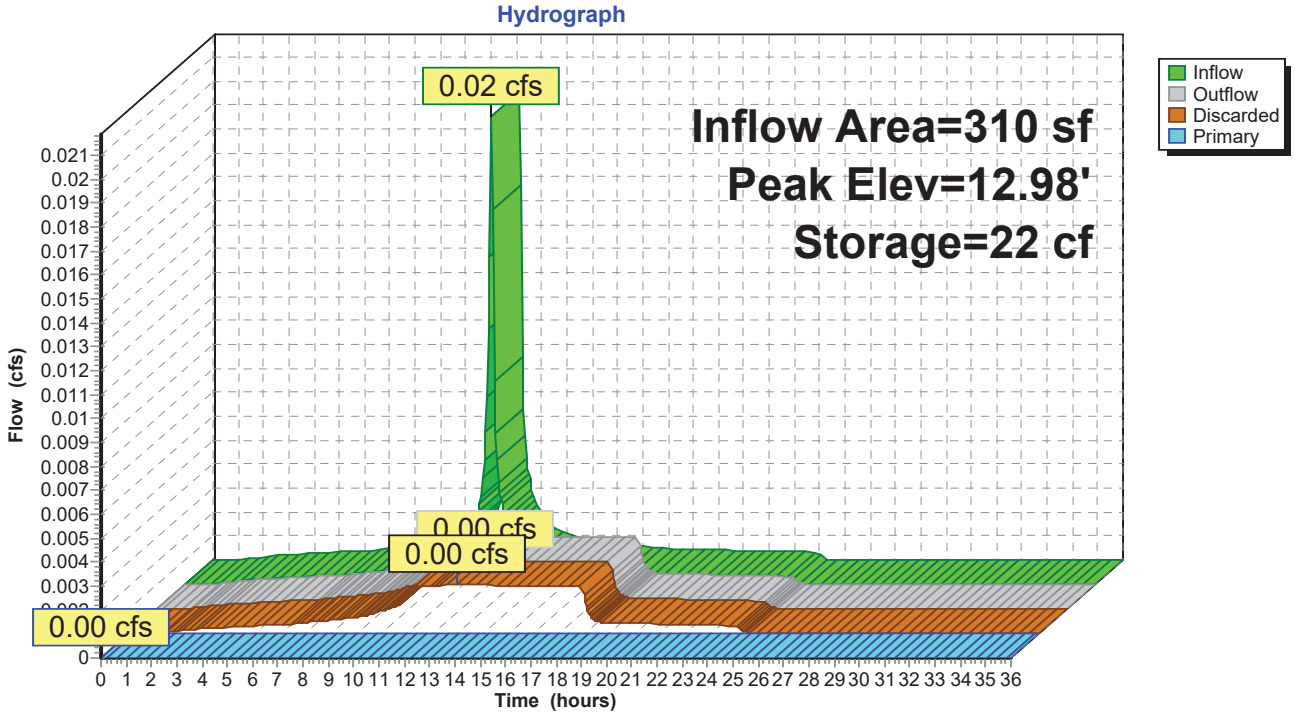
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
12.75	310	0	0
14.00	310	388	388

Device	Routing	Invert	Outlet Devices
#0	Primary	14.00'	**Automatic Storage Overflow** (Discharged without head)
#1	Discarded	12.75'	**0.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 7.50'

Discarded OutFlow Max=0.00 cfs @ 13.00 hrs HW=12.98' (Free Discharge)
↑—**1=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=12.75' (Free Discharge)

Pond 2P: Paver Base

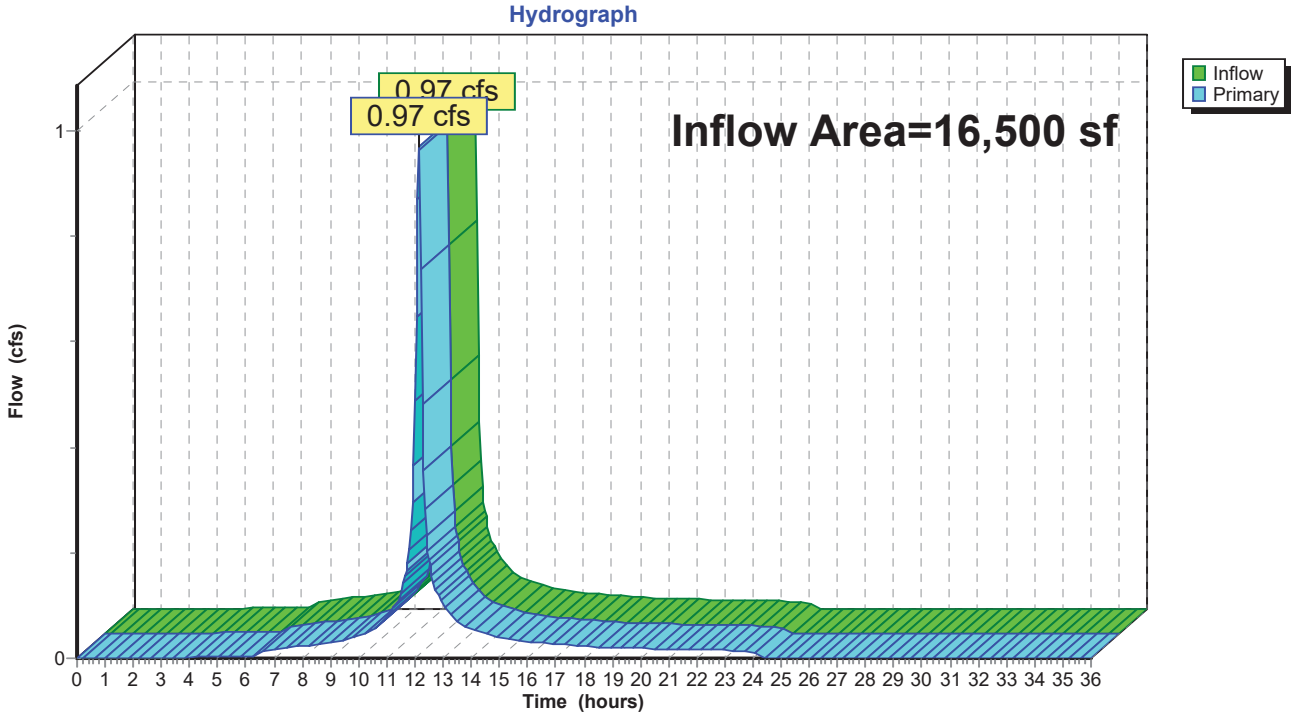


Summary for Link DP1: Design Point 1

Inflow Area = 16,500 sf, 93.00% Impervious, Inflow Depth = 2.49" for 2-Year event
Inflow = 0.97 cfs @ 12.14 hrs, Volume= 3,424 cf
Primary = 0.97 cfs @ 12.14 hrs, Volume= 3,424 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link DP1: Design Point 1



Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: To Infiltrators Runoff Area=11,728 sf 94.96% Impervious Runoff Depth=4.42"
Tc=6.0 min CN=97 Runoff=1.12 cfs 4,318 cf

Subcatchment 2S: Porous Pavers Runoff Area=310 sf 100.00% Impervious Runoff Depth=4.53"
Tc=6.0 min CN=98 Runoff=0.03 cfs 117 cf

Subcatchment 3S: Uncollected Runoff Area=4,462 sf 87.36% Impervious Runoff Depth=4.19"
Tc=6.0 min CN=95 Runoff=0.42 cfs 1,559 cf

Pond 1P: Infiltration Peak Elev=10.34' Storage=201 cf Inflow=1.12 cfs 4,318 cf
Discarded=0.00 cfs 298 cf Primary=1.05 cfs 4,008 cf Outflow=1.06 cfs 4,306 cf

Pond 2P: Paver Base Peak Elev=13.19' Storage=40 cf Inflow=0.03 cfs 117 cf
Discarded=0.00 cfs 117 cf Primary=0.00 cfs 0 cf Outflow=0.00 cfs 117 cf

Link DP1: Design Point 1 Inflow=1.46 cfs 5,566 cf
Primary=1.46 cfs 5,566 cf

Total Runoff Area = 16,500 sf Runoff Volume = 5,994 cf Average Runoff Depth = 4.36"
7.00% Pervious = 1,155 sf 93.00% Impervious = 15,345 sf

Summary for Subcatchment 1S: To Infiltrators

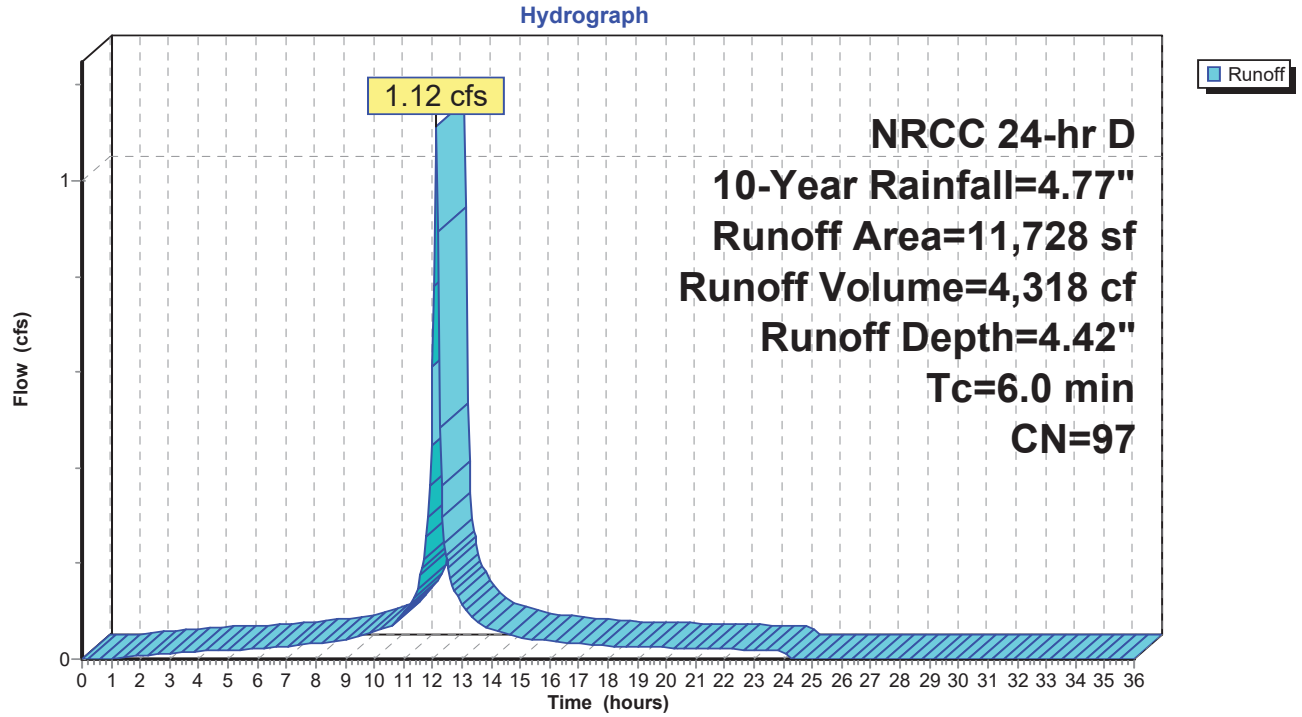
Runoff = 1.12 cfs @ 12.13 hrs, Volume= 4,318 cf, Depth= 4.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-Year Rainfall=4.77"

	Area (sf)	CN	Description
*	5,973	98	Residential Roof, HSG C
*	2,780	98	Office Roof (partial), HSG C
	2,384	98	Paved parking, HSG C
	591	74	>75% Grass cover, Good, HSG C
	11,728	97	Weighted Average
	591		5.04% Pervious Area
	11,137		94.96% Impervious Area

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

Subcatchment 1S: To Infiltrators



Summary for Subcatchment 2S: Porous Pavers

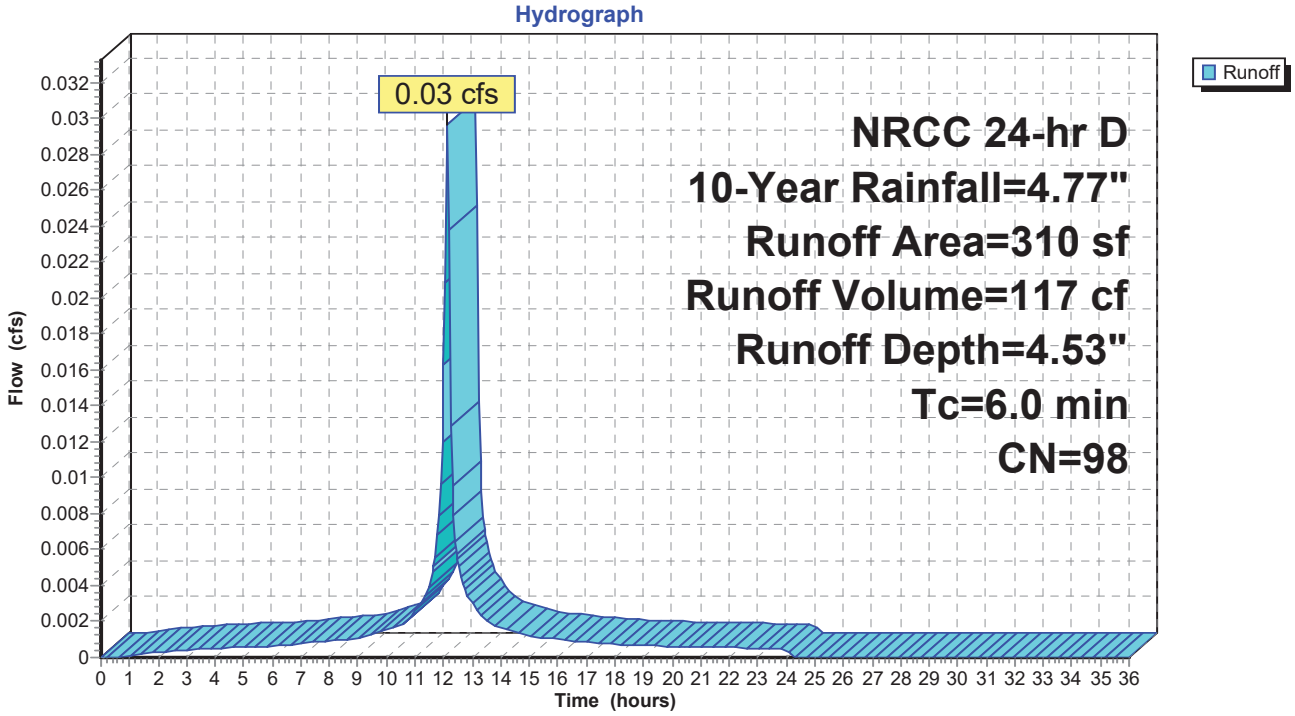
Runoff = 0.03 cfs @ 12.13 hrs, Volume= 117 cf, Depth= 4.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-Year Rainfall=4.77"

	Area (sf)	CN	Description
*	310	98	Porous Pavment
	310		100.00% Impervious Area

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

Subcatchment 2S: Porous Pavers



Summary for Subcatchment 3S: Uncollected

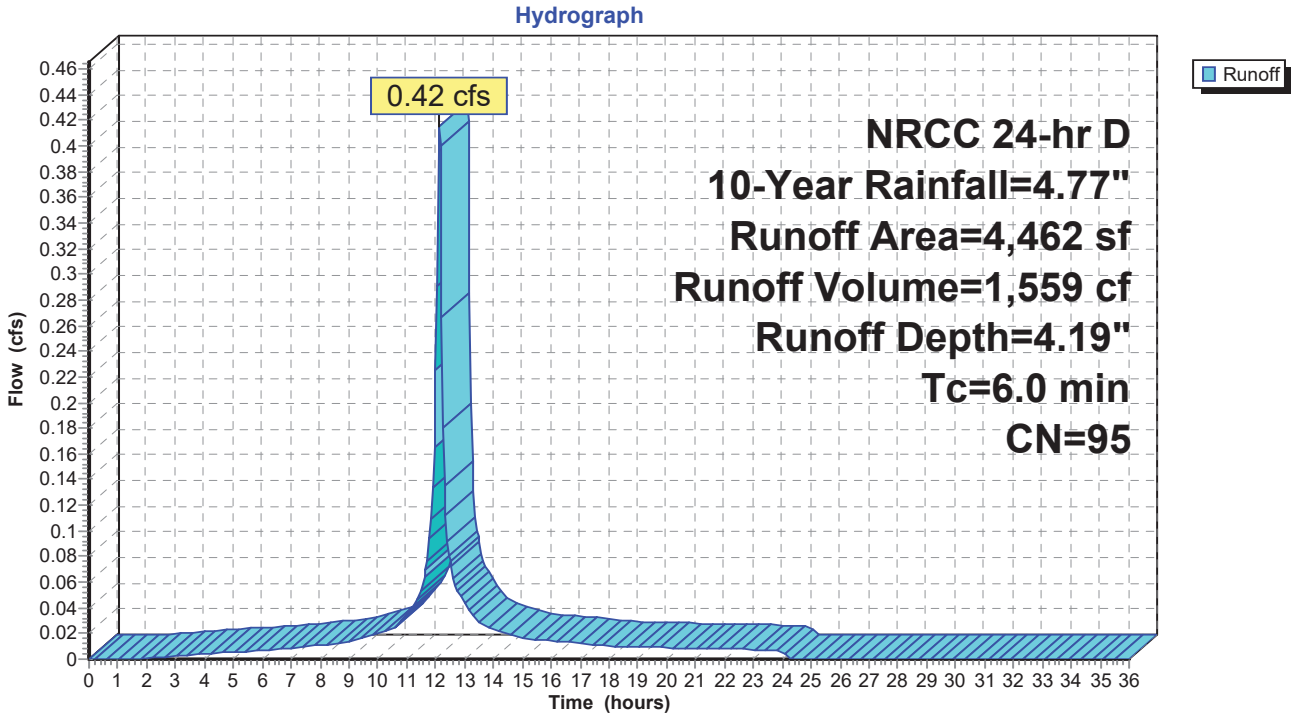
Runoff = 0.42 cfs @ 12.13 hrs, Volume= 1,559 cf, Depth= 4.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-Year Rainfall=4.77"

	Area (sf)	CN	Description
	3,008	98	Unconnected roofs, HSG C
*	330	98	Retaining wall
*	260	98	Concrete Pavement
	300	98	Unconnected pavement, HSG C
	564	74	>75% Grass cover, Good, HSG C
	4,462	95	Weighted Average
	564		12.64% Pervious Area
	3,898		87.36% Impervious Area
	3,308		84.86% Unconnected

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

Subcatchment 3S: Uncollected



Summary for Pond 1P: Infiltration

Inflow Area = 11,728 sf, 94.96% Impervious, Inflow Depth = 4.42" for 10-Year event
Inflow = 1.12 cfs @ 12.13 hrs, Volume= 4,318 cf
Outflow = 1.06 cfs @ 12.15 hrs, Volume= 4,306 cf, Atten= 5%, Lag= 1.3 min
Discarded = 0.00 cfs @ 12.15 hrs, Volume= 298 cf
Primary = 1.05 cfs @ 12.15 hrs, Volume= 4,008 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 10.34' @ 12.15 hrs Surf.Area= 201 sf Storage= 201 cf

Plug-Flow detention time= 39.2 min calculated for 4,306 cf (100% of inflow)
Center-of-Mass det. time= 37.3 min (798.2 - 760.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	8.50'	156 cf	**6.25'W x 32.10'L x 3.50'H Field A** 702 cf Overall - 184 cf Embedded = 518 cf x 30.0% Voids
#2A	9.00'	184 cf	**ADS_StormTech SC-740 +Cap** x 4 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
		339 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	8.50'	**0.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 7.50'
#2	Primary	9.50'	**8.0" Round Overflow** L= 34.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 9.50' / 8.82' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf

Discarded OutFlow Max=0.00 cfs @ 12.15 hrs HW=10.33' (Free Discharge)
↑—**1=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=1.05 cfs @ 12.15 hrs HW=10.33' (Free Discharge)
↑—**2=Overflow** (Inlet Controls 1.05 cfs @ 3.01 fps)

Pond 1P: Infiltration - Chamber Wizard Field A

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

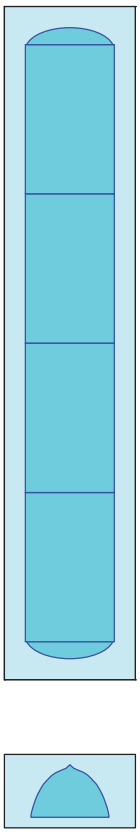
4 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 30.10' Row Length +12.0" End Stone x 2 = 32.10' Base Length
1 Rows x 51.0" Wide + 12.0" Side Stone x 2 = 6.25' Base Width
6.0" Stone Base + 30.0" Chamber Height + 6.0" Stone Cover = 3.50' Field Height

4 Chambers x 45.9 cf = 183.8 cf Chamber Storage

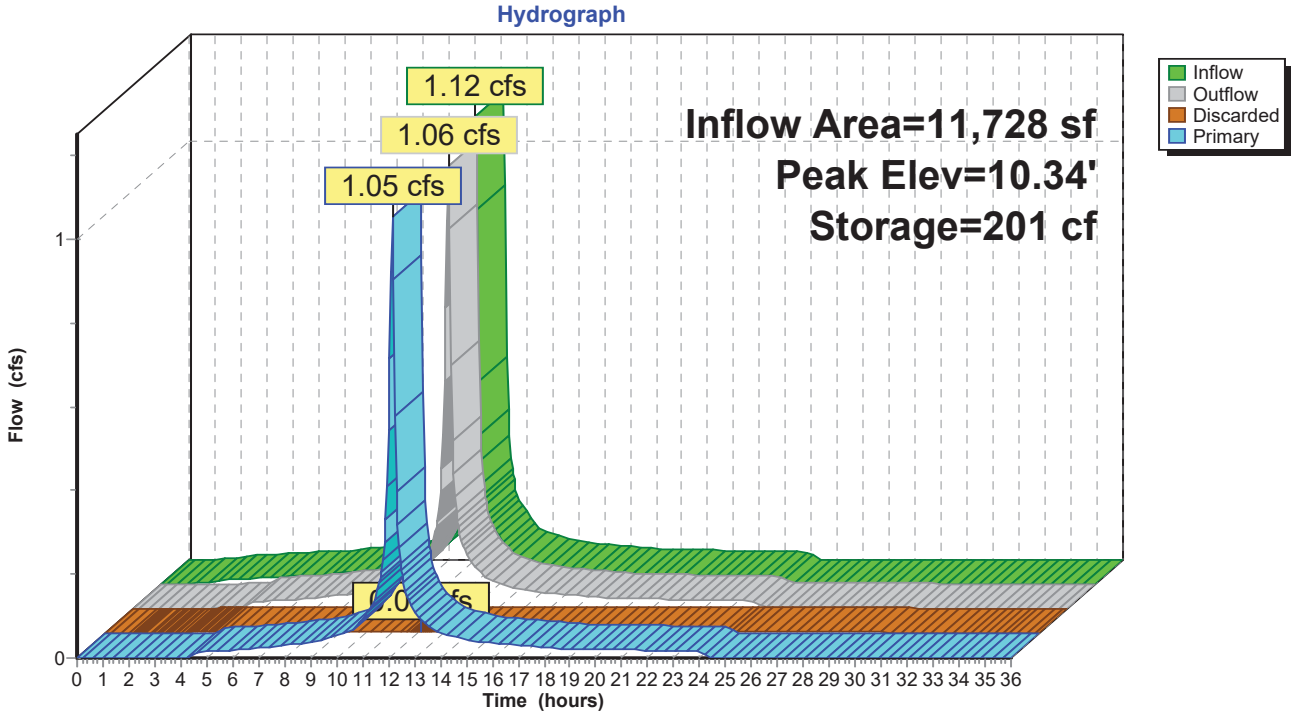
702.1 cf Field - 183.8 cf Chambers = 518.4 cf Stone x 30.0% Voids = 155.5 cf Stone Storage

Chamber Storage + Stone Storage = 339.3 cf = 0.008 af
Overall Storage Efficiency = 48.3%
Overall System Size = 32.10' x 6.25' x 3.50'

4 Chambers @ $ 300.00 /ea = $ 1,200.00
26.0 cy Field Excavation @ $ 30.00 /cy = $ 780.13
19.2 cy Stone @ $ 30.00 /cy = $ 575.95
Total Cost = $ 2,556.08



Pond 1P: Infiltration



Summary for Pond 2P: Paver Base

Inflow Area = 310 sf,100.00% Impervious, Inflow Depth = 4.53" for 10-Year event
Inflow = 0.03 cfs @ 12.13 hrs, Volume= 117 cf
Outflow = 0.00 cfs @ 13.49 hrs, Volume= 117 cf, Atten= 93%, Lag= 81.7 min
Discarded = 0.00 cfs @ 13.49 hrs, Volume= 117 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 13.19' @ 13.49 hrs Surf.Area= 310 sf Storage= 40 cf

Plug-Flow detention time= 145.1 min calculated for 117 cf (100% of inflow)
Center-of-Mass det. time= 144.9 min (896.4 - 751.4)

Volume	Invert	Avail.Storage	Storage Description
#1	12.75'	116 cf	**Stone storage (Prismatic)**Listed below (Recalc) 388 cf Overall x 30.0% Voids

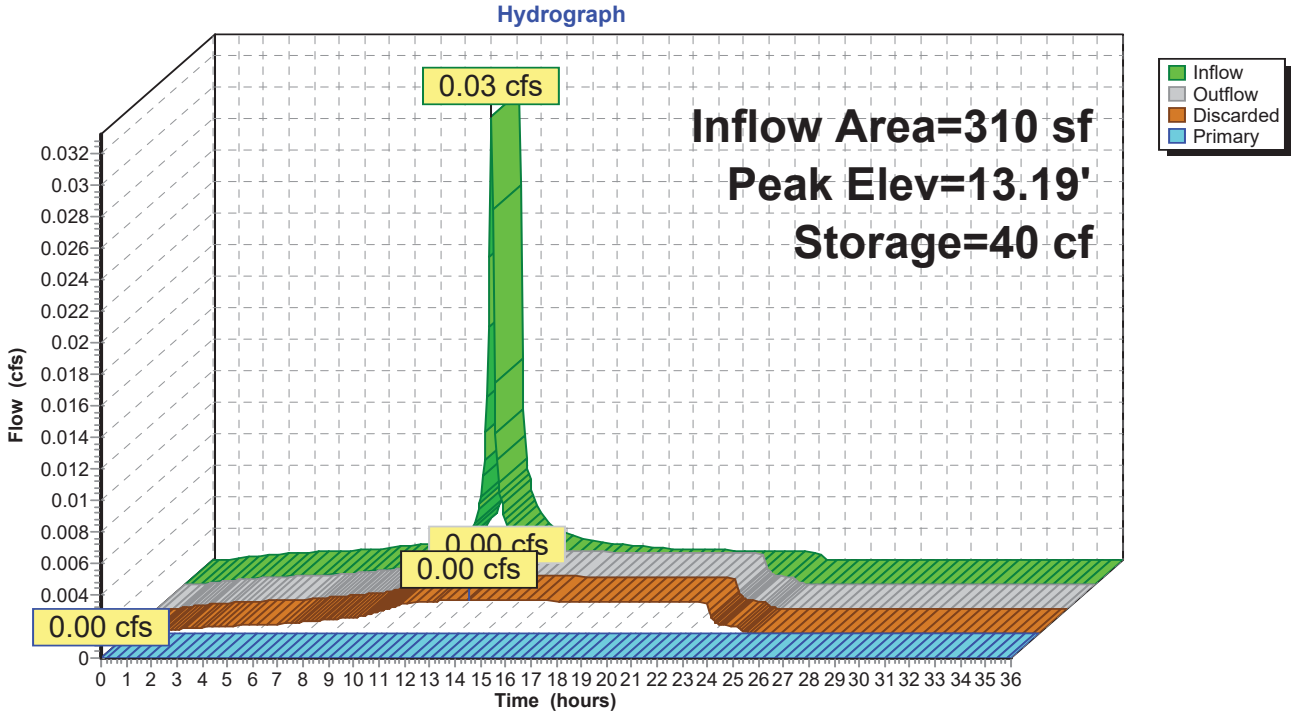
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
12.75	310	0	0
14.00	310	388	388

Device	Routing	Invert	Outlet Devices
#0	Primary	14.00'	**Automatic Storage Overflow** (Discharged without head)
#1	Discarded	12.75'	**0.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 7.50'

Discarded OutFlow Max=0.00 cfs @ 13.49 hrs HW=13.19' (Free Discharge)
↑—**1=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=12.75' (Free Discharge)

Pond 2P: Paver Base

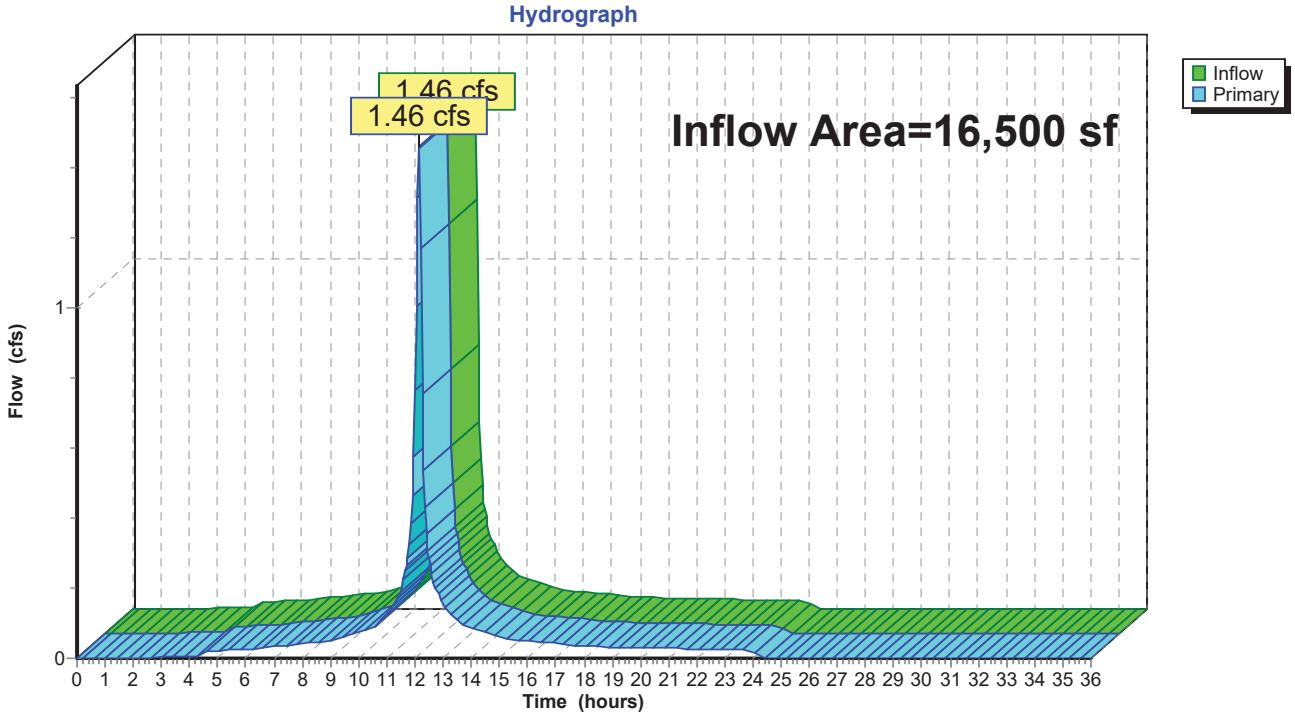


Summary for Link DP1: Design Point 1

Inflow Area = 16,500 sf, 93.00% Impervious, Inflow Depth = 4.05" for 10-Year event
Inflow = 1.46 cfs @ 12.14 hrs, Volume= 5,566 cf
Primary = 1.46 cfs @ 12.14 hrs, Volume= 5,566 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link DP1: Design Point 1



Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: To Infiltrators Runoff Area=11,728 sf 94.96% Impervious Runoff Depth=5.67"
Tc=6.0 min CN=97 Runoff=1.42 cfs 5,545 cf

Subcatchment 2S: Porous Pavers Runoff Area=310 sf 100.00% Impervious Runoff Depth=5.79"
Tc=6.0 min CN=98 Runoff=0.04 cfs 150 cf

Subcatchment 3S: Uncollected Runoff Area=4,462 sf 87.36% Impervious Runoff Depth=5.44"
Tc=6.0 min CN=95 Runoff=0.53 cfs 2,023 cf

Pond 1P: Infiltration Peak Elev=10.62' Storage=233 cf Inflow=1.42 cfs 5,545 cf
Discarded=0.00 cfs 304 cf Primary=1.32 cfs 5,229 cf Outflow=1.32 cfs 5,534 cf

Pond 2P: Paver Base Peak Elev=13.36' Storage=57 cf Inflow=0.04 cfs 150 cf
Discarded=0.00 cfs 150 cf Primary=0.00 cfs 0 cf Outflow=0.00 cfs 150 cf

Link DP1: Design Point 1 Inflow=1.84 cfs 7,253 cf
Primary=1.84 cfs 7,253 cf

Total Runoff Area = 16,500 sf Runoff Volume = 7,718 cf Average Runoff Depth = 5.61"
7.00% Pervious = 1,155 sf 93.00% Impervious = 15,345 sf

Summary for Subcatchment 1S: To Infiltrators

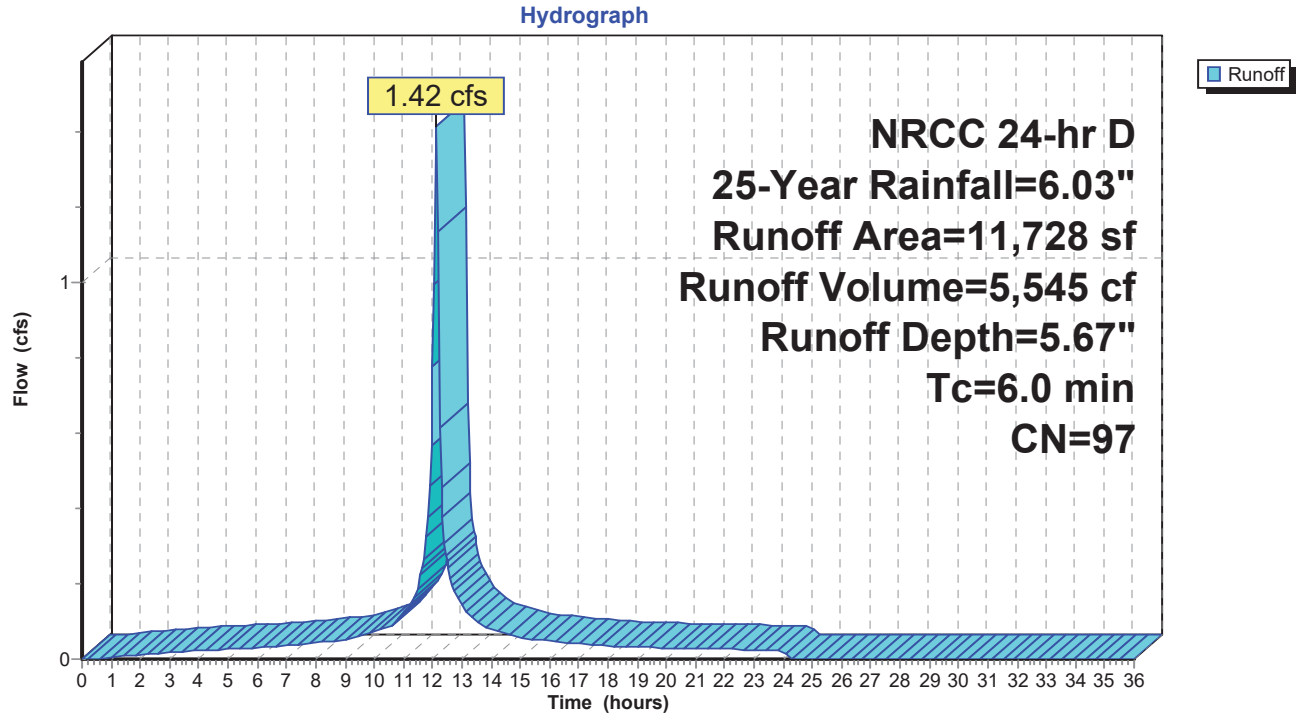
Runoff = 1.42 cfs @ 12.13 hrs, Volume= 5,545 cf, Depth= 5.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 25-Year Rainfall=6.03"

	Area (sf)	CN	Description
*	5,973	98	Residential Roof, HSG C
*	2,780	98	Office Roof (partial), HSG C
	2,384	98	Paved parking, HSG C
	591	74	>75% Grass cover, Good, HSG C
	11,728	97	Weighted Average
	591		5.04% Pervious Area
	11,137		94.96% Impervious Area

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

Subcatchment 1S: To Infiltrators



Summary for Subcatchment 2S: Porous Pavers

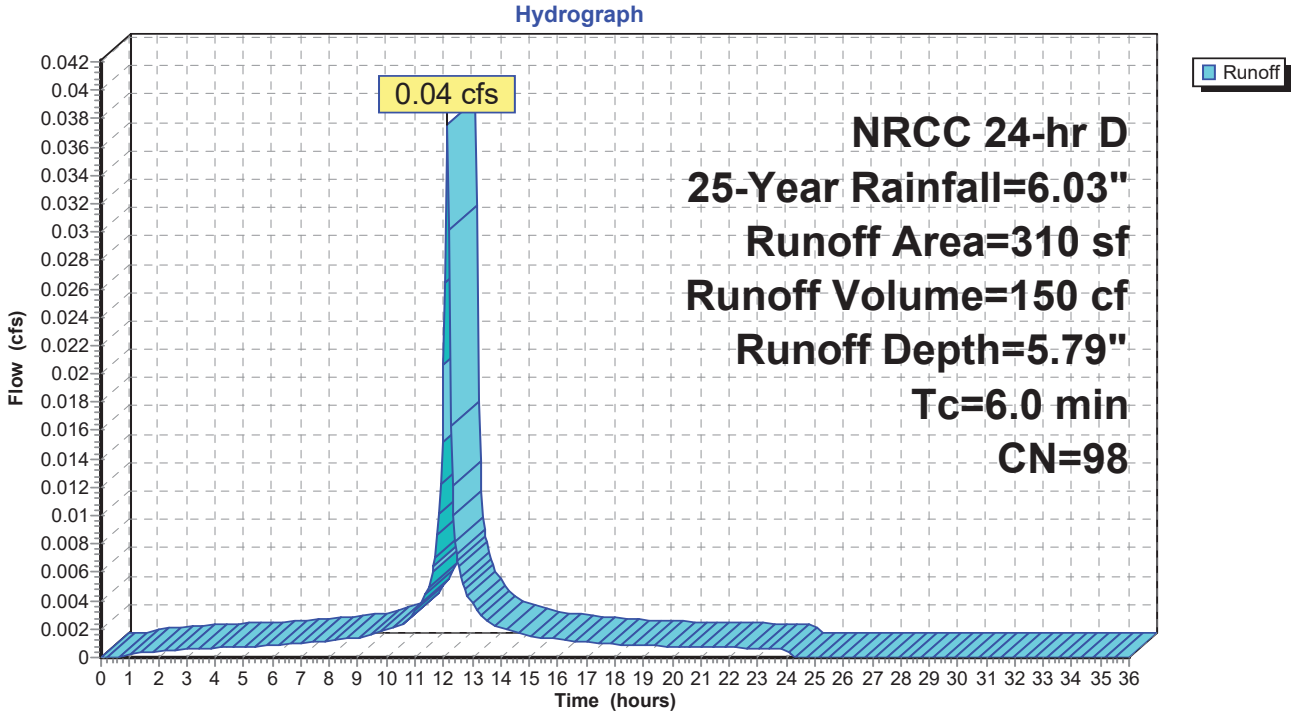
Runoff = 0.04 cfs @ 12.13 hrs, Volume= 150 cf, Depth= 5.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 25-Year Rainfall=6.03"

	Area (sf)	CN	Description
*	310	98	Porous Pavment
	310		100.00% Impervious Area

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

Subcatchment 2S: Porous Pavers



Summary for Subcatchment 3S: Uncollected

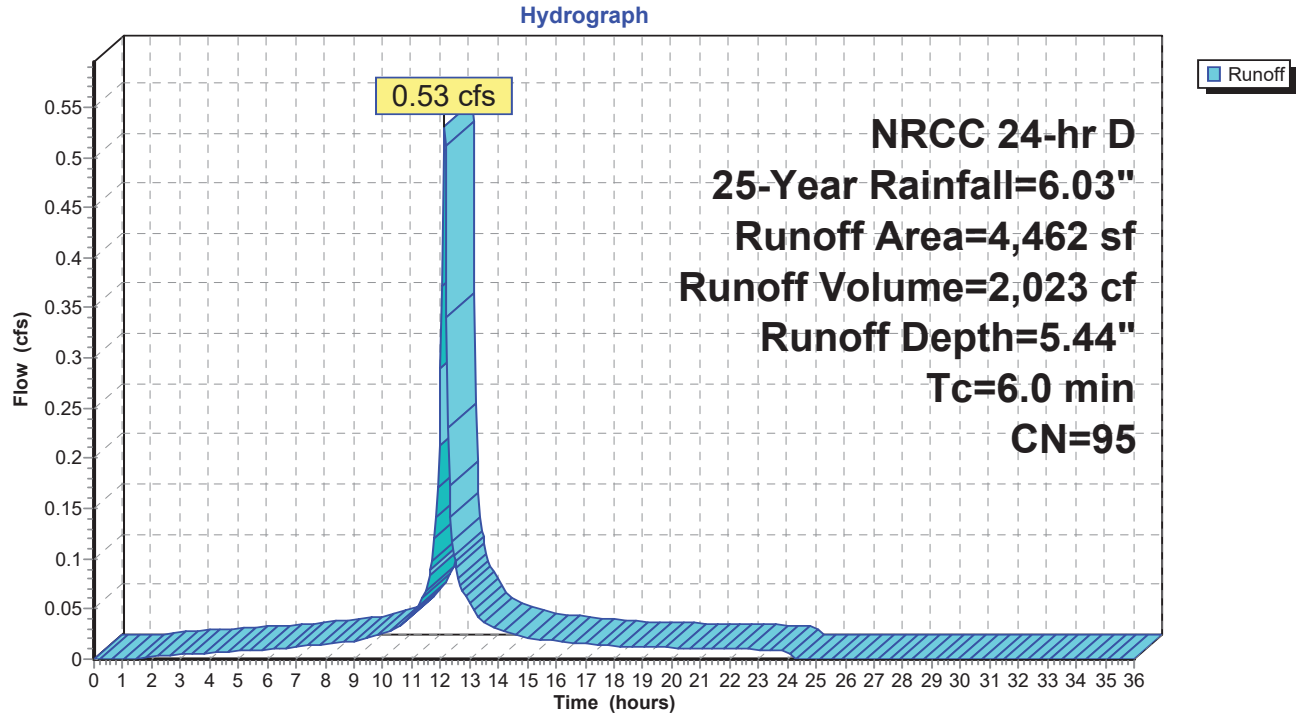
Runoff = 0.53 cfs @ 12.13 hrs, Volume= 2,023 cf, Depth= 5.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 25-Year Rainfall=6.03"

	Area (sf)	CN	Description
	3,008	98	Unconnected roofs, HSG C
*	330	98	Retaining wall
*	260	98	Concrete Pavement
	300	98	Unconnected pavement, HSG C
	564	74	>75% Grass cover, Good, HSG C
	4,462	95	Weighted Average
	564		12.64% Pervious Area
	3,898		87.36% Impervious Area
	3,308		84.86% Unconnected

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

Subcatchment 3S: Uncollected



Summary for Pond 1P: Infiltration

Inflow Area = 11,728 sf, 94.96% Impervious, Inflow Depth = 5.67" for 25-Year event
Inflow = 1.42 cfs @ 12.13 hrs, Volume= 5,545 cf
Outflow = 1.32 cfs @ 12.15 hrs, Volume= 5,534 cf, Atten= 7%, Lag= 1.5 min
Discarded = 0.00 cfs @ 12.15 hrs, Volume= 304 cf
Primary = 1.32 cfs @ 12.15 hrs, Volume= 5,229 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 10.62' @ 12.15 hrs Surf.Area= 201 sf Storage= 233 cf

Plug-Flow detention time= 31.8 min calculated for 5,534 cf (100% of inflow)
Center-of-Mass det. time= 30.3 min (785.6 - 755.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	8.50'	156 cf	**6.25'W x 32.10'L x 3.50'H Field A** 702 cf Overall - 184 cf Embedded = 518 cf x 30.0% Voids
#2A	9.00'	184 cf	**ADS_StormTech SC-740 +Cap** x 4 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
		339 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	8.50'	**0.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 7.50'
#2	Primary	9.50'	**8.0" Round Overflow** L= 34.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 9.50' / 8.82' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf

Discarded OutFlow Max=0.00 cfs @ 12.15 hrs HW=10.62' (Free Discharge)
↑—**1=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=1.32 cfs @ 12.15 hrs HW=10.62' (Free Discharge)
↑—**2=Overflow** (Inlet Controls 1.32 cfs @ 3.77 fps)

Pond 1P: Infiltration - Chamber Wizard Field A

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

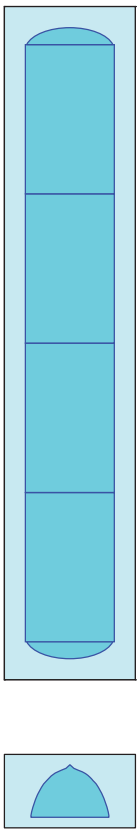
4 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 30.10' Row Length +12.0" End Stone x 2 = 32.10' Base Length
1 Rows x 51.0" Wide + 12.0" Side Stone x 2 = 6.25' Base Width
6.0" Stone Base + 30.0" Chamber Height + 6.0" Stone Cover = 3.50' Field Height

4 Chambers x 45.9 cf = 183.8 cf Chamber Storage

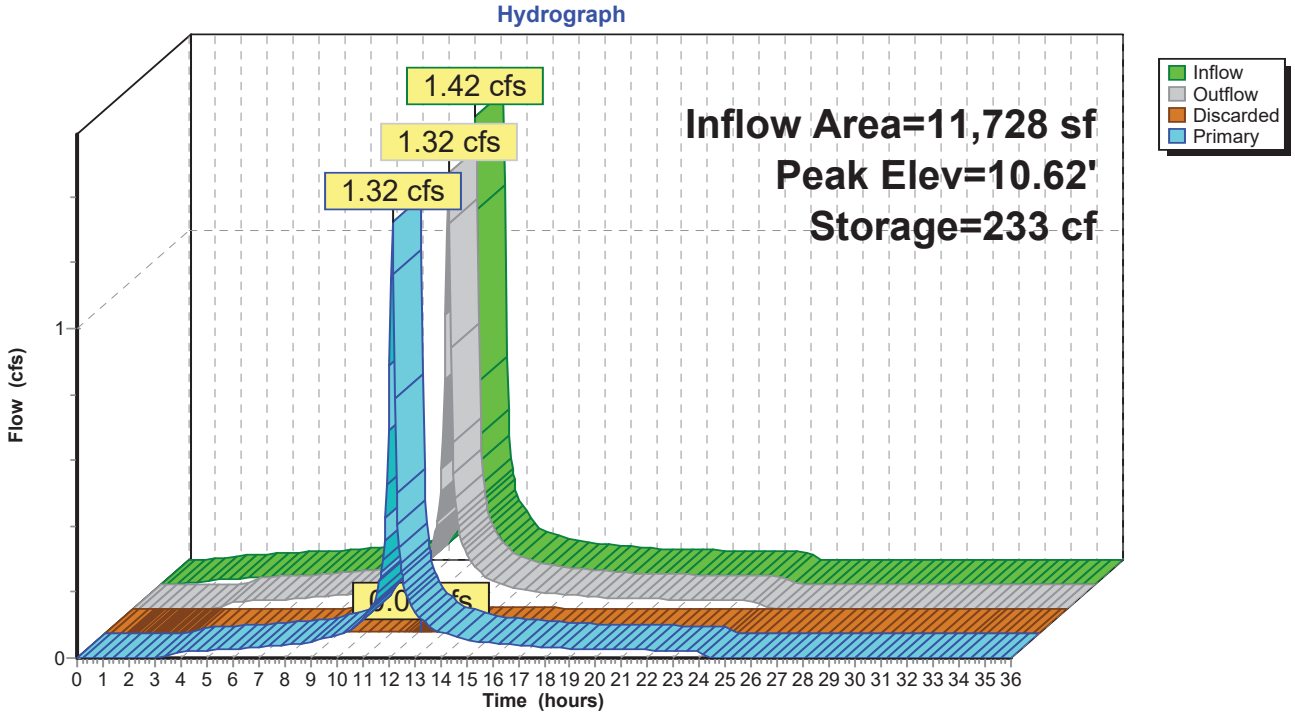
702.1 cf Field - 183.8 cf Chambers = 518.4 cf Stone x 30.0% Voids = 155.5 cf Stone Storage

Chamber Storage + Stone Storage = 339.3 cf = 0.008 af
Overall Storage Efficiency = 48.3%
Overall System Size = 32.10' x 6.25' x 3.50'

4 Chambers @ $ 300.00 /ea = $ 1,200.00
26.0 cy Field Excavation @ $ 30.00 /cy = $ 780.13
19.2 cy Stone @ $ 30.00 /cy = $ 575.95
Total Cost = $ 2,556.08



Pond 1P: Infiltration



Summary for Pond 2P: Paver Base

Inflow Area = 310 sf,100.00% Impervious, Inflow Depth = 5.79" for 25-Year event
Inflow = 0.04 cfs @ 12.13 hrs, Volume= 150 cf
Outflow = 0.00 cfs @ 13.92 hrs, Volume= 150 cf, Atten= 94%, Lag= 107.6 min
Discarded = 0.00 cfs @ 13.92 hrs, Volume= 150 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 13.36' @ 13.92 hrs Surf.Area= 310 sf Storage= 57 cf

Plug-Flow detention time= 214.9 min calculated for 149 cf (100% of inflow)
Center-of-Mass det. time= 214.9 min (962.0 - 747.1)

Volume	Invert	Avail.Storage	Storage Description
#1	12.75'	116 cf	**Stone storage (Prismatic)**Listed below (Recalc) 388 cf Overall x 30.0% Voids

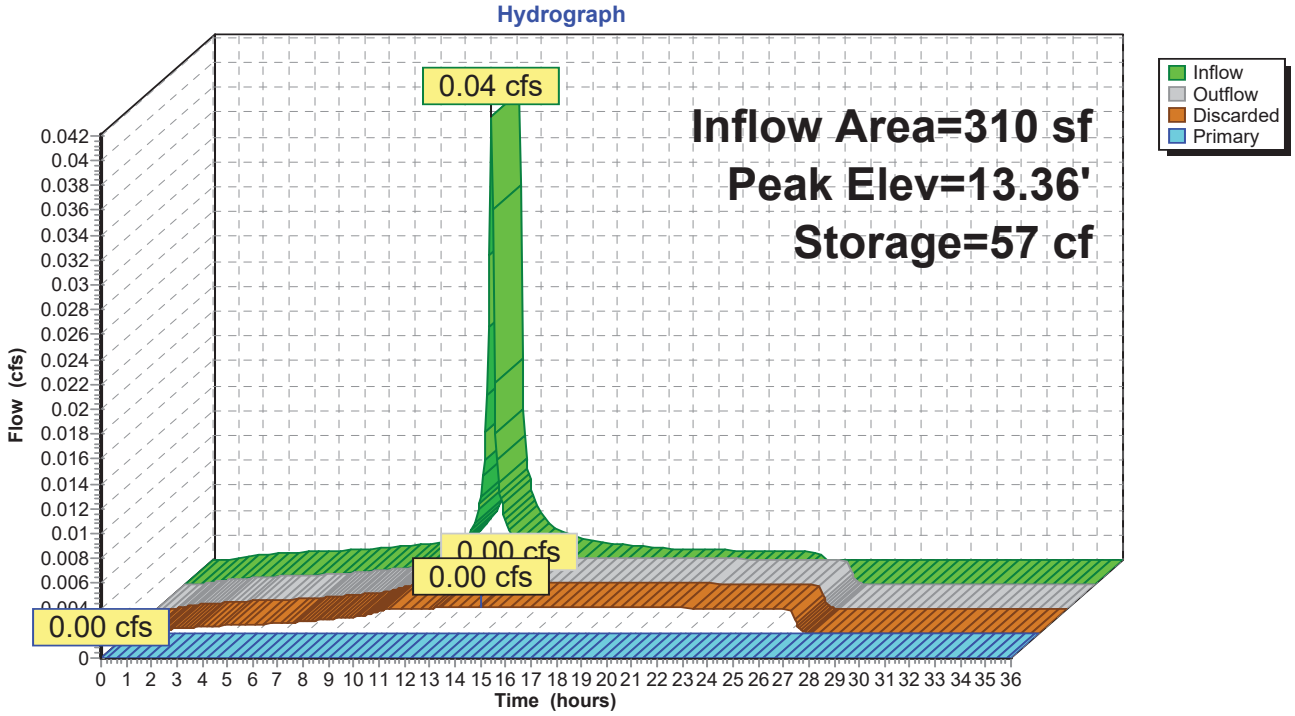
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
12.75	310	0	0
14.00	310	388	388

Device	Routing	Invert	Outlet Devices
#0	Primary	14.00'	**Automatic Storage Overflow** (Discharged without head)
#1	Discarded	12.75'	**0.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 7.50'

Discarded OutFlow Max=0.00 cfs @ 13.92 hrs HW=13.36' (Free Discharge)
↑—**1=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=12.75' (Free Discharge)

Pond 2P: Paver Base

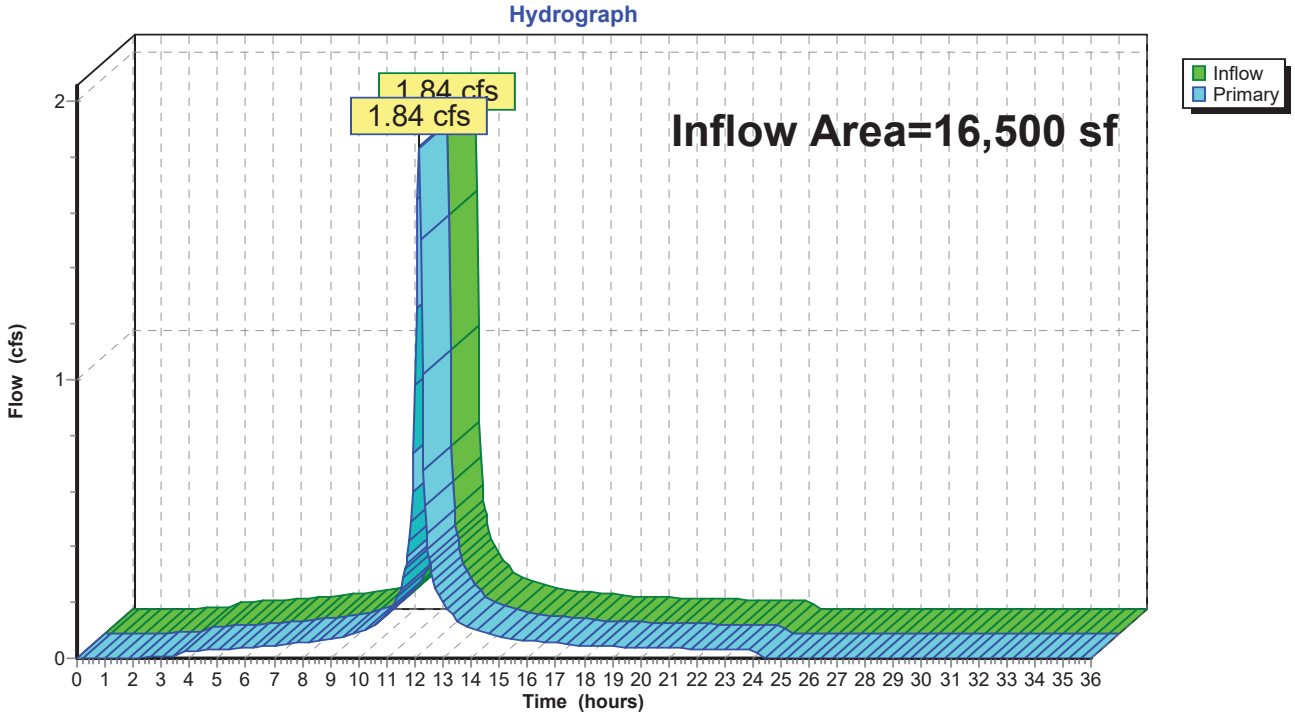


Summary for Link DP1: Design Point 1

Inflow Area = 16,500 sf, 93.00% Impervious, Inflow Depth = 5.27" for 25-Year event
Inflow = 1.84 cfs @ 12.14 hrs, Volume= 7,253 cf
Primary = 1.84 cfs @ 12.14 hrs, Volume= 7,253 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link DP1: Design Point 1



Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: To Infiltrators Runoff Area=11,728 sf 94.96% Impervious Runoff Depth=8.26"
Tc=6.0 min CN=97 Runoff=2.03 cfs 8,072 cf

Subcatchment 2S: Porous Pavers Runoff Area=310 sf 100.00% Impervious Runoff Depth=8.38"
Tc=6.0 min CN=98 Runoff=0.05 cfs 216 cf

Subcatchment 3S: Uncollected Runoff Area=4,462 sf 87.36% Impervious Runoff Depth=8.02"
Tc=6.0 min CN=95 Runoff=0.77 cfs 2,982 cf

Pond 1P: Infiltration Peak Elev=11.46' Storage=306 cf Inflow=2.03 cfs 8,072 cf
Discarded=0.00 cfs 312 cf Primary=1.89 cfs 7,748 cf Outflow=1.89 cfs 8,060 cf

Pond 2P: Paver Base Peak Elev=13.78' Storage=96 cf Inflow=0.05 cfs 216 cf
Discarded=0.00 cfs 216 cf Primary=0.00 cfs 0 cf Outflow=0.00 cfs 216 cf

Link DP1: Design Point 1 Inflow=2.63 cfs 10,730 cf
Primary=2.63 cfs 10,730 cf

Total Runoff Area = 16,500 sf Runoff Volume = 11,271 cf Average Runoff Depth = 8.20"
7.00% Pervious = 1,155 sf 93.00% Impervious = 15,345 sf

Summary for Subcatchment 1S: To Infiltrators

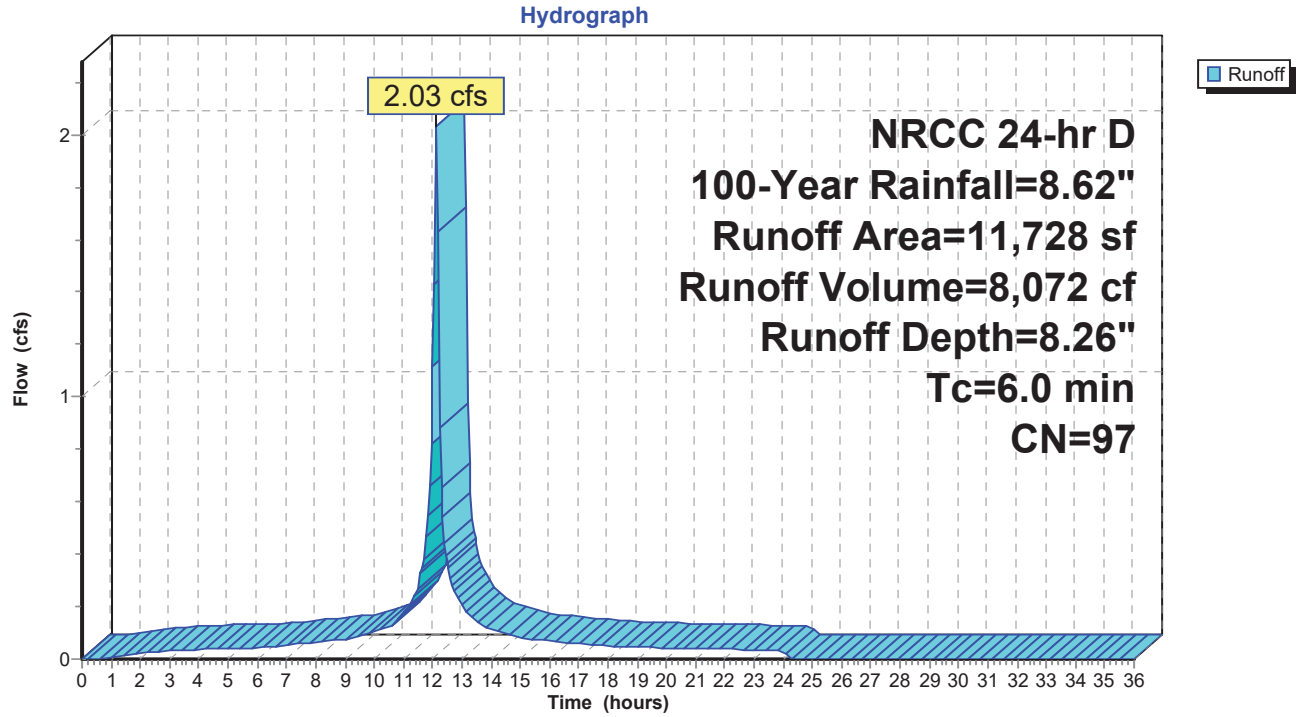
Runoff = 2.03 cfs @ 12.13 hrs, Volume= 8,072 cf, Depth= 8.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.62"

	Area (sf)	CN	Description
*	5,973	98	Residential Roof, HSG C
*	2,780	98	Office Roof (partial), HSG C
	2,384	98	Paved parking, HSG C
	591	74	>75% Grass cover, Good, HSG C
	11,728	97	Weighted Average
	591		5.04% Pervious Area
	11,137		94.96% Impervious Area

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

Subcatchment 1S: To Infiltrators



Summary for Subcatchment 2S: Porous Pavers

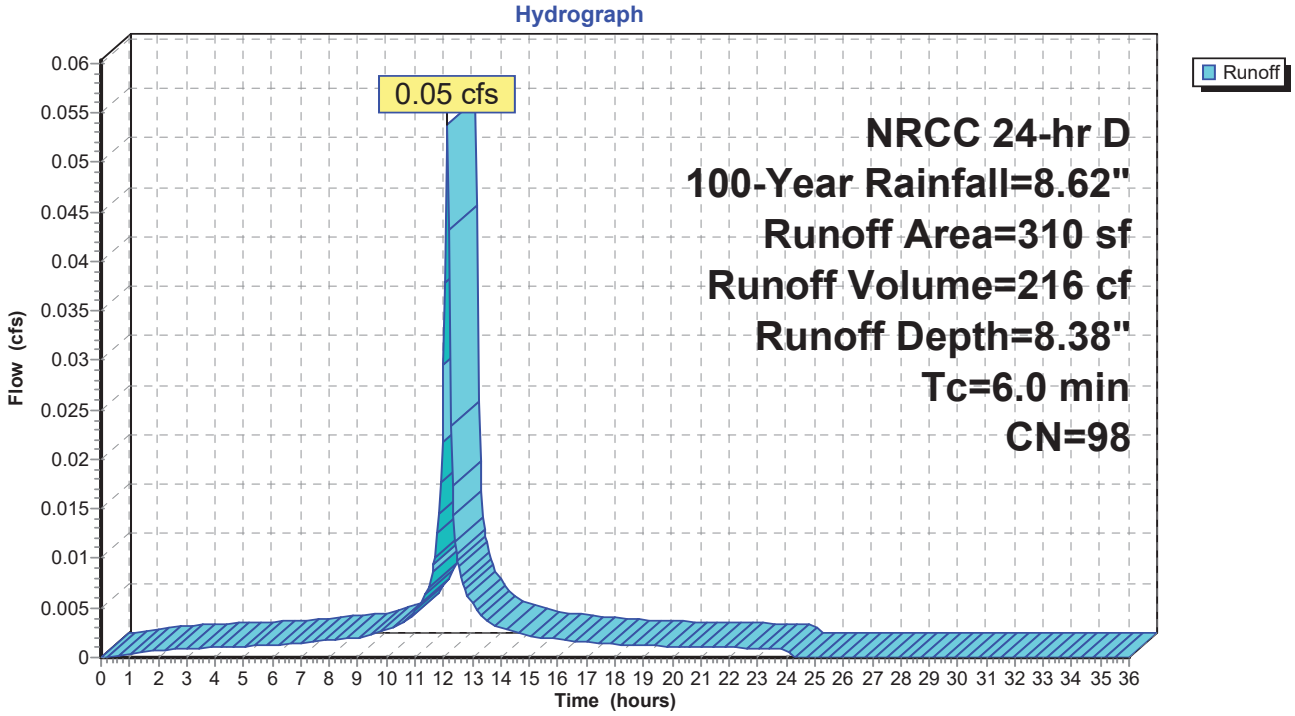
Runoff = 0.05 cfs @ 12.13 hrs, Volume= 216 cf, Depth= 8.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.62"

	Area (sf)	CN	Description
*	310	98	Porous Pavment
	310		100.00% Impervious Area

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

Subcatchment 2S: Porous Pavers



Summary for Subcatchment 3S: Uncollected

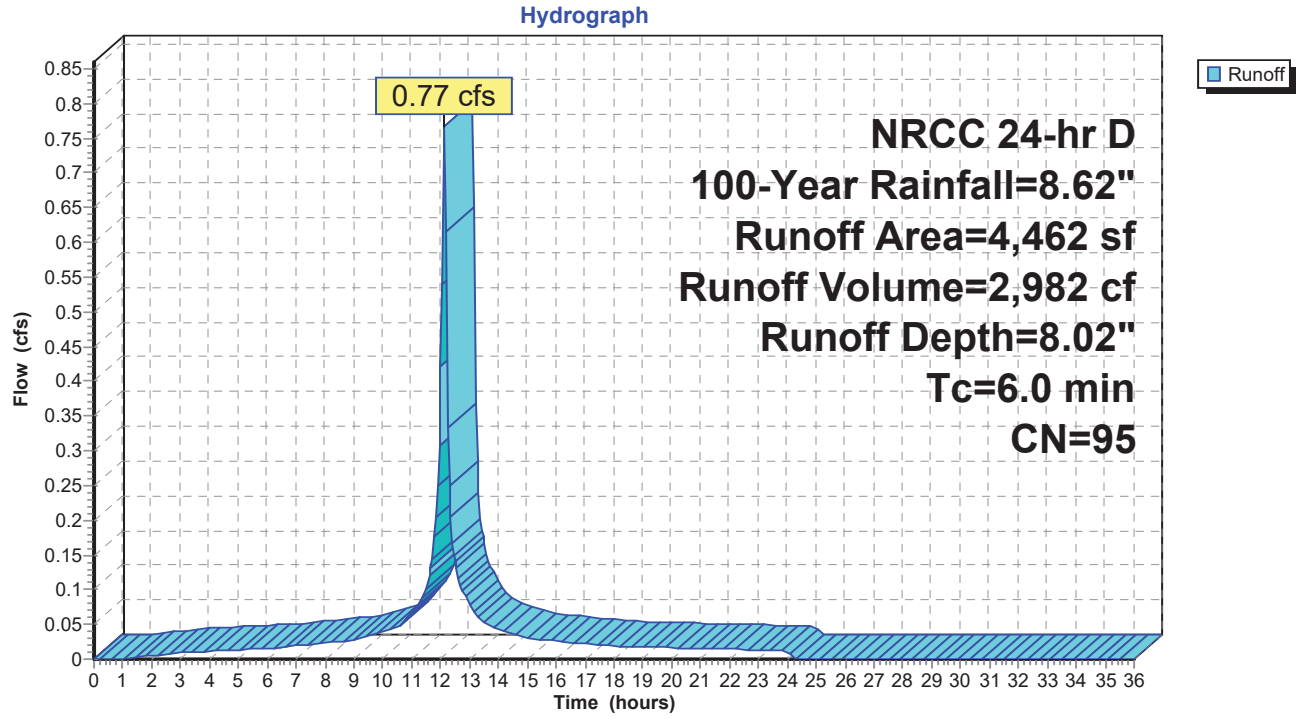
Runoff = 0.77 cfs @ 12.13 hrs, Volume= 2,982 cf, Depth= 8.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.62"

	Area (sf)	CN	Description
	3,008	98	Unconnected roofs, HSG C
*	330	98	Retaining wall
*	260	98	Concrete Pavement
	300	98	Unconnected pavement, HSG C
	564	74	>75% Grass cover, Good, HSG C
	4,462	95	Weighted Average
	564		12.64% Pervious Area
	3,898		87.36% Impervious Area
	3,308		84.86% Unconnected

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

Subcatchment 3S: Uncollected



Summary for Pond 1P: Infiltration

Inflow Area = 11,728 sf, 94.96% Impervious, Inflow Depth = 8.26" for 100-Year event
Inflow = 2.03 cfs @ 12.13 hrs, Volume= 8,072 cf
Outflow = 1.89 cfs @ 12.15 hrs, Volume= 8,060 cf, Atten= 7%, Lag= 1.6 min
Discarded = 0.00 cfs @ 12.15 hrs, Volume= 312 cf
Primary = 1.89 cfs @ 12.15 hrs, Volume= 7,748 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 11.46' @ 12.15 hrs Surf.Area= 201 sf Storage= 306 cf

Plug-Flow detention time= 22.2 min calculated for 8,049 cf (100% of inflow)
Center-of-Mass det. time= 22.1 min (770.2 - 748.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	8.50'	156 cf	**6.25'W x 32.10'L x 3.50'H Field A** 702 cf Overall - 184 cf Embedded = 518 cf x 30.0% Voids
#2A	9.00'	184 cf	**ADS_StormTech SC-740 +Cap** x 4 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
		339 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	8.50'	**0.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 7.50'
#2	Primary	9.50'	**8.0" Round Overflow** L= 34.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 9.50' / 8.82' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf

Discarded OutFlow Max=0.00 cfs @ 12.15 hrs HW=11.43' (Free Discharge)
↑—**1=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=1.87 cfs @ 12.15 hrs HW=11.43' (Free Discharge)
↑—**2=Overflow** (Inlet Controls 1.87 cfs @ 5.37 fps)

Pond 1P: Infiltration - Chamber Wizard Field A

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

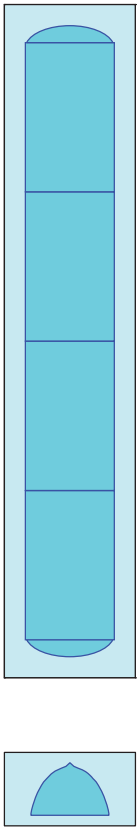
4 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 30.10' Row Length +12.0" End Stone x 2 = 32.10' Base Length
1 Rows x 51.0" Wide + 12.0" Side Stone x 2 = 6.25' Base Width
6.0" Stone Base + 30.0" Chamber Height + 6.0" Stone Cover = 3.50' Field Height

4 Chambers x 45.9 cf = 183.8 cf Chamber Storage

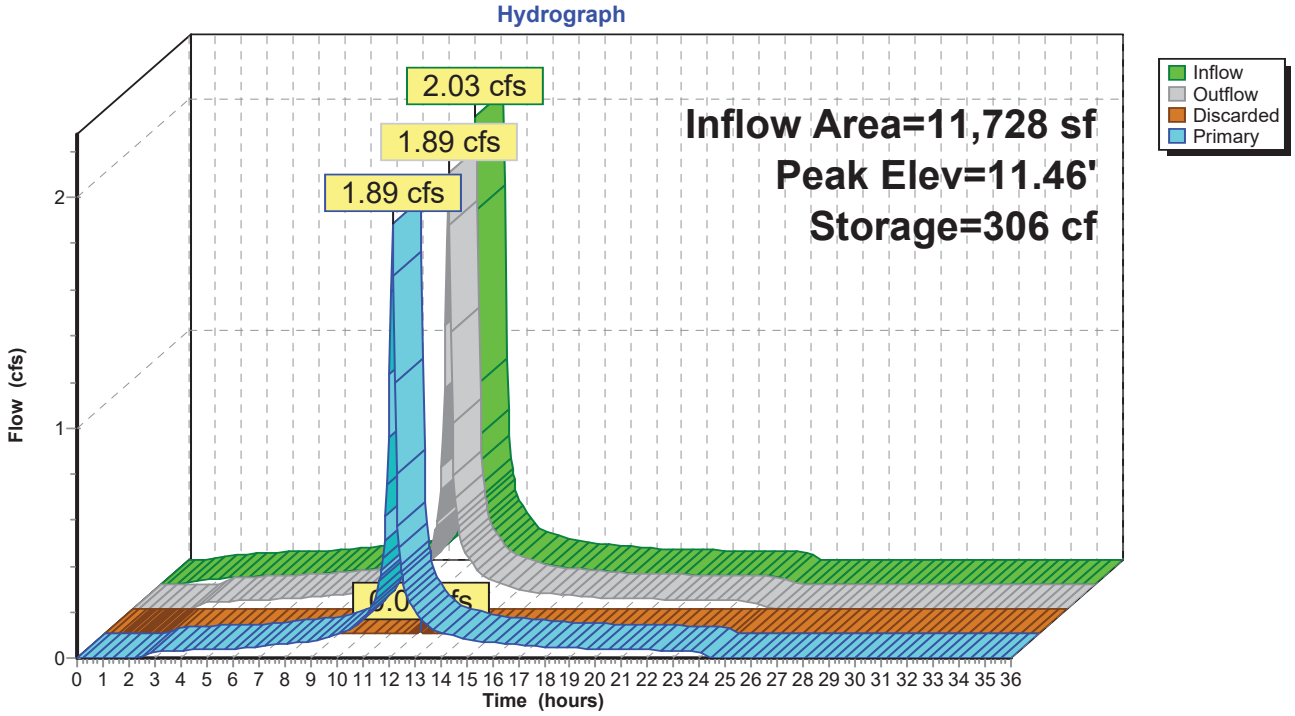
702.1 cf Field - 183.8 cf Chambers = 518.4 cf Stone x 30.0% Voids = 155.5 cf Stone Storage

Chamber Storage + Stone Storage = 339.3 cf = 0.008 af
Overall Storage Efficiency = 48.3%
Overall System Size = 32.10' x 6.25' x 3.50'

4 Chambers @ $ 300.00 /ea = $ 1,200.00
26.0 cy Field Excavation @ $ 30.00 /cy = $ 780.13
19.2 cy Stone @ $ 30.00 /cy = $ 575.95
Total Cost = $ 2,556.08



Pond 1P: Infiltration



Summary for Pond 2P: Paver Base

Inflow Area = 310 sf,100.00% Impervious, Inflow Depth = 8.38" for 100-Year event
Inflow = 0.05 cfs @ 12.13 hrs, Volume= 216 cf
Outflow = 0.00 cfs @ 14.82 hrs, Volume= 216 cf, Atten= 96%, Lag= 161.7 min
Discarded = 0.00 cfs @ 14.82 hrs, Volume= 216 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 13.78' @ 14.82 hrs Surf.Area= 310 sf Storage= 96 cf

Plug-Flow detention time= 360.7 min calculated for 216 cf (100% of inflow)
Center-of-Mass det. time= 360.6 min (1,102.3 - 741.7)

Volume	Invert	Avail.Storage	Storage Description
#1	12.75'	116 cf	**Stone storage (Prismatic)**Listed below (Recalc) 388 cf Overall x 30.0% Voids

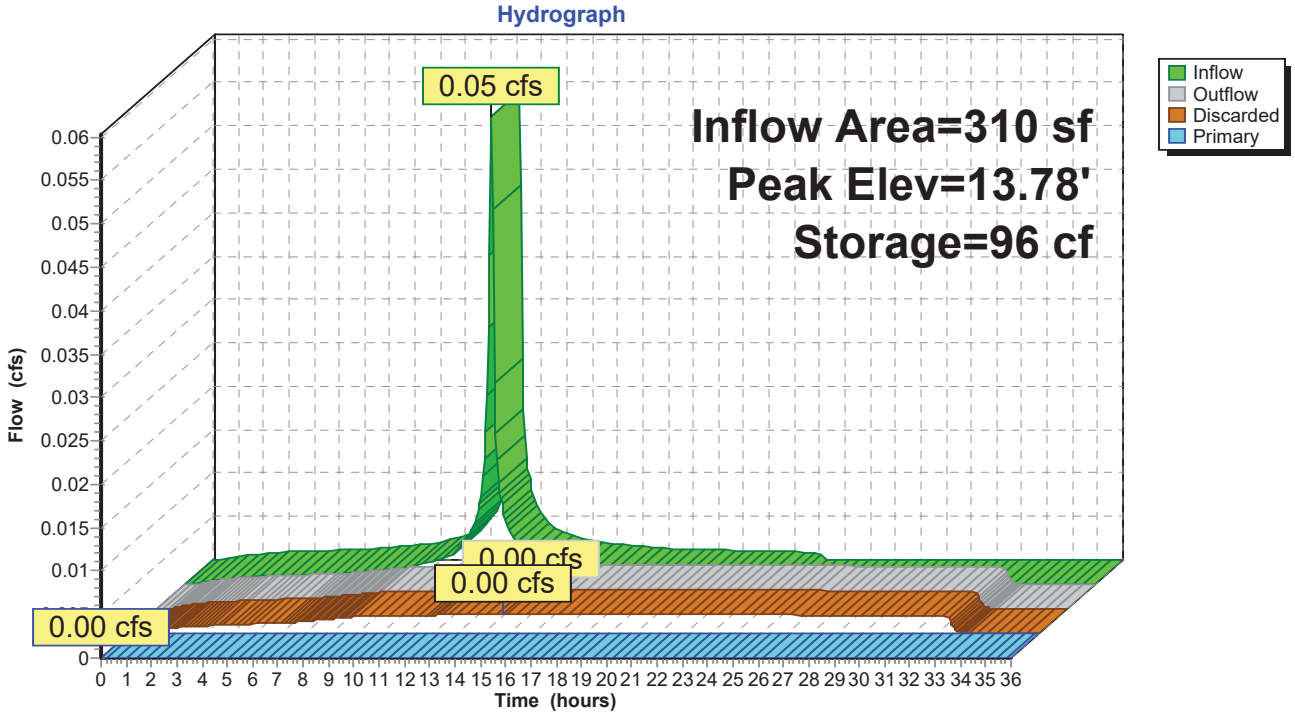
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
12.75	310	0	0
14.00	310	388	388

Device	Routing	Invert	Outlet Devices
#0	Primary	14.00'	**Automatic Storage Overflow** (Discharged without head)
#1	Discarded	12.75'	**0.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 7.50'

Discarded OutFlow Max=0.00 cfs @ 14.82 hrs HW=13.78' (Free Discharge)
↑—**1=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=12.75' (Free Discharge)

Pond 2P: Paver Base

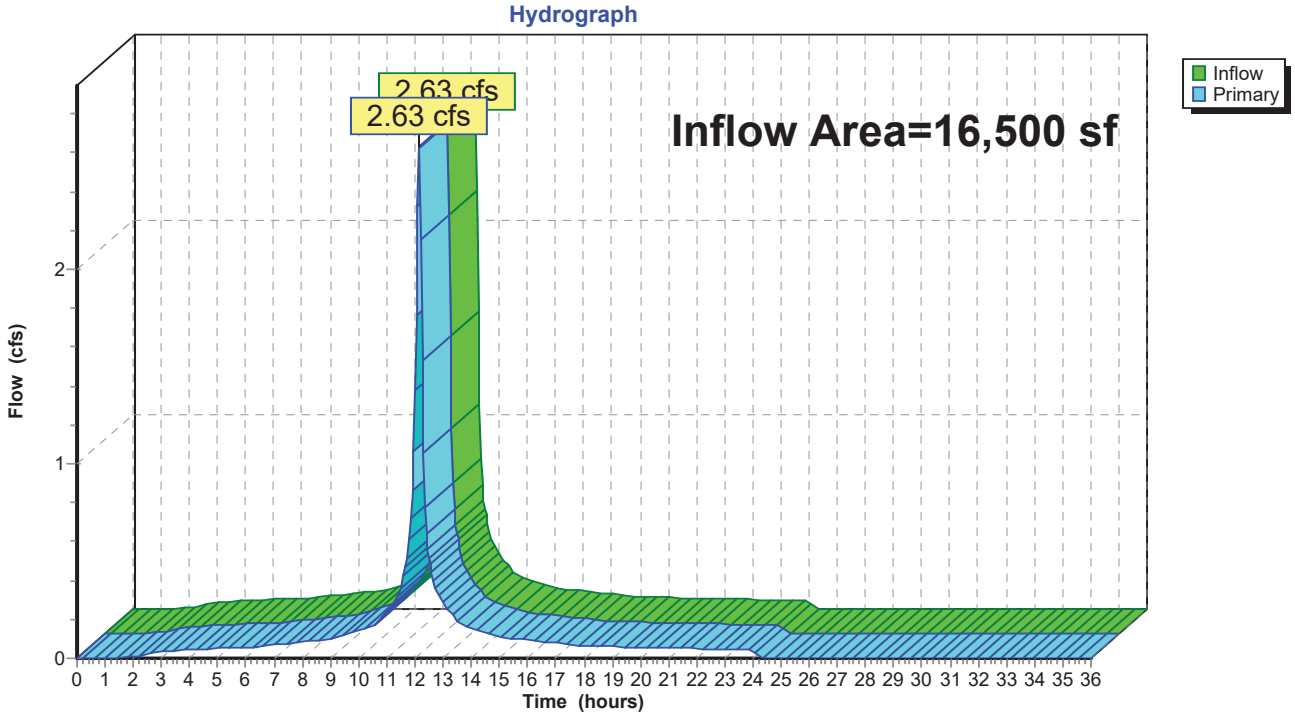


Summary for Link DP1: Design Point 1

Inflow Area = 16,500 sf, 93.00% Impervious, Inflow Depth = 7.80" for 100-Year event
Inflow = 2.63 cfs @ 12.14 hrs, Volume= 10,730 cf
Primary = 2.63 cfs @ 12.14 hrs, Volume= 10,730 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link DP1: Design Point 1

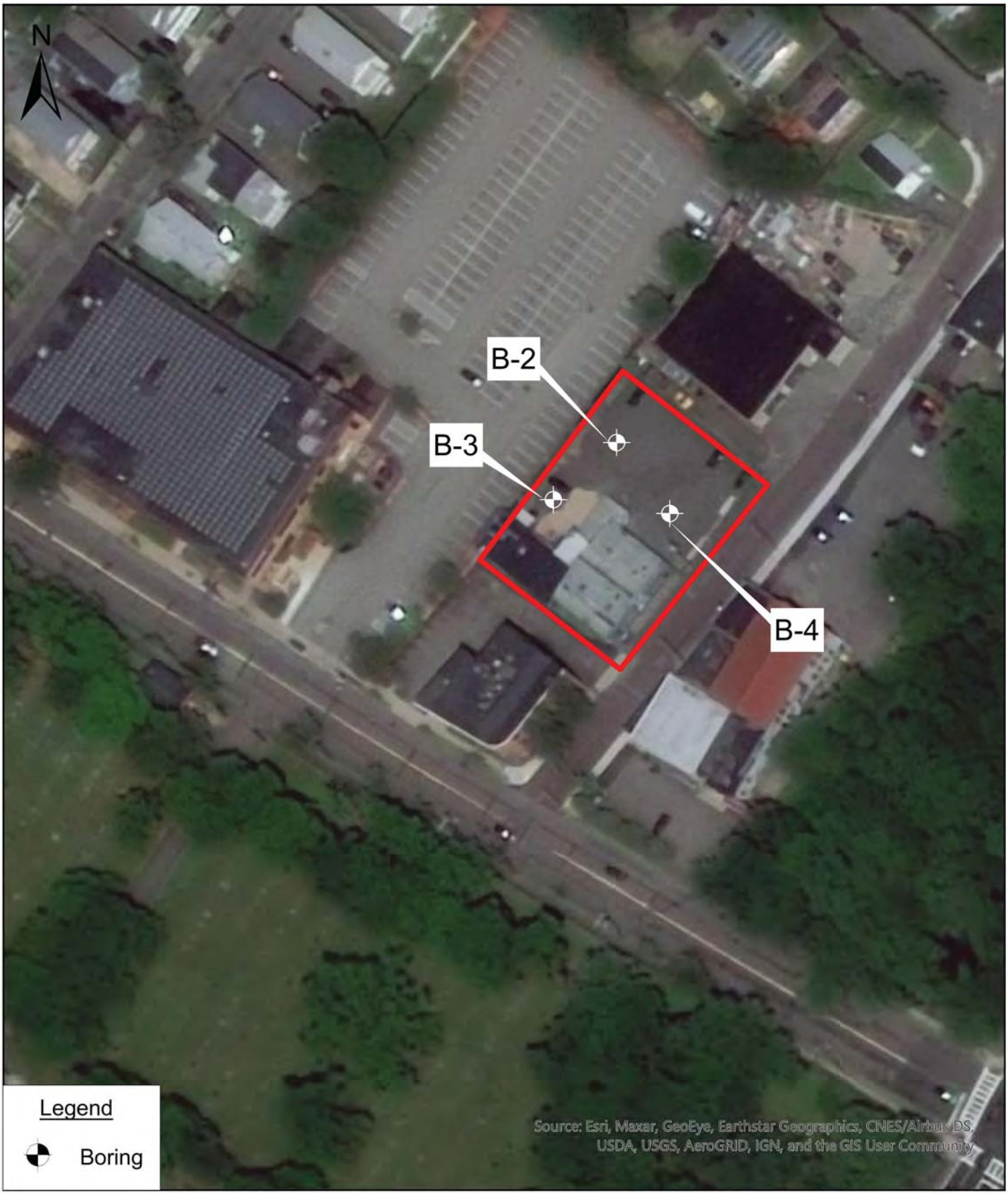


APPENDIX B

STANDARD 3 – SUPPORTING INFORMATION

Included in this section:

- Water Quality Recharge Calculations
- Boring Logs



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Title: Figure 1
Boring Location Plan

Date: October 19, 2020

Project: Column Health
Offices and Residents
10 Sunnyside Avenue
Arlington, MA 02474

Job Number: 1620000049

BORING LOG

Project:	**Cloumn Health Offices & Residents**		
Location:	**10 Sunnyside Ave**		
Client:	**Column Health LLC**		
Driller:	**Soil Exploration**		
Drilling Methods:	**Hollow Stem Auger**		
Weather:	**47, Partly Cloudy**		
Performed By:	**MRG**	Date: **10/19/2020**	
Checked By:	**MFC**	Date:	

EBI Consulting

Boring No:	**B-2**
Location:	
Approx. Ground Elevation:	**7 ft**
Approx. Groundwater Elevation:	
Date/Time of Groundwater Elevation:	
Datum:	**NAVD88**
Project No.	**1620000050**

Depth (feet)	*Sample No.*	*Blows per 6-inch*	*Pen./ Rec.*	*Soil Description*	*Stratum Change Depth (feet)*	*STRATUM*	*Note No.*
1	S-1	5 6 6 6	18"/24"	S-1 Grey, Fine to Medium SAND some SILT, Medium Dense, Damp. (SM)			
2							
3	S-2	12 7 9 11	19"/24"	S-2a 4" Grey, SILT, Wet. S-2b Brown, Fine to Medium SAND some SILT, Medium Dense, Damp.			
4							
5							
6	S-3	WOR/24"	7"/24"	S-3 Grey, Fine SAND, some Silt, Loose, Wet. (SM)			1
7							
8							
9							
10						GLACIAL OUTWASH	
11	S-4	WOH/12" 1 1	24"/24"	S-4 Grey, SILT trace Fine Sand, Loose, Wet. (ML)			2
12							
13							
14							
15							
16							
17							
18							
19							

NOTES:

1. WOR - Weight of Rod
2. WOH - Weight of Hammer

LEGEND

S - Split Spoon Sample	O/A - Sample Collected Off the Augers	
UT - Undisturbed Tube Sample		
Trace - Approximately 0 to 10%	Some - Approximately 20 to 35%	
Little - Approximately 10 to 20%	And - Approximately 35 to 50%	
0-10 Coarse Soil N Value - Loose	30-50 Coarse Soil N Value - Dense	
10-30 Coarse Soil N Value - Medium Dense	>50 Coarse Soil N Value - Very Dense	
0-4 Fine Soil N Value - Soft	8-15 Fine Soil N Value - Stiff	>30 Fine Soil N Value - Hard
4-8 Fine Soil N Value - Medium Stiff	15-30 Fine Soil N Value - Very Stiff	

BORING LOG

Project:	Cloumn Health Offices & Residents	Boring No:	B-2
Location:	10 Sunnyside Ave	Location:	
Client:	Column Health LLC	Approx. Ground Elevation:	7 ft
Driller:	Soil Exploration	Approx. Groundwater Elevation:	
Drilling Methods:	Hollow Stem Auger	Date/Time of Groundwater Elevation:	
Weather:	47, Partly Cloudy	Datum:	NAVD88
Performed By: MRG	Date: 10/19/2020	Project No.	1620000050
Checked By: MFC	Date:		

Depth (feet)	Sample No.	Blows per 6-inch	Pen./ Rec.	Soil Description	Stratum Change Depth (feet)	STRATUM	Note No.
21							
22							
23							
24							
25		8		S-5 Grey, Fine to Coarse SAND, some Silt,			
26	S-5	9	22"/24"	Medium Dense, Wet. (SM)			
27		10 20					
28						GLACIAL OUTWASH	
29							
30		5		S-6 Grey, Similar to S-5, Loose, Damp.			
31	S-6	8	17"/24"				
32		10 13					
33							
34							
35		15		S-7 Grey, Similar to S-6, Dense, Wet.			
36	S-7	14	14"/24"				
37		20 26				Boring Terminated at 37 Feet	
38							
39							
40							

NOTES:

LEGEND

S - Split Spoon Sample	O/A - Sample Collected Off the Augers
UT - Undisturbed Tube Sample	
Trace - Approximately 0 to 10%	Some - Approximately 20 to 35%
Little - Approximately 10 to 20%	And - Approximately 35 to 50%
0-10 Coarse Soil N Value - Loose	30-50 Coarse Soil N Value - Dense
10-30 Coarse Soil N Value - Medium Dense	>50 Coarse Soil N Value - Very Dense
0-4 Fine Soil N Value - Soft	8-15 Fine Soil N Value - Stiff
4-8 Fine Soil N Value - Medium Stiff	15-30 Fine Soil N Value - Very Stiff

>30 Fine Soil N Value - Hard

BORING LOG

Project:	**Cloumn Health Offices & Residents**		
Location:	**10 Sunnyside Ave**		
Client:	**Column Health LLC**		
Driller:	**Soil Exploration**		
Drilling Methods:	**Hollow Stem Auger**		
Weather:	**40, Cloudy**		
Performed By:	**MRG**	Date:	**10/19/2020**
Checked By:	**MFC**	Date:	

EBI Consulting

Boring No:	**B-3**
Location:	
Approx. Ground Elevation:	**7 ft**
Approx. Groundwater Elevation:	
Date/Time of Groundwater Elevation:	
Datum:	**NAVD88**
Project No.	**1620000050**

Depth (feet)	*Sample No.*	*Blows per 6-inch*	*Pen./ Rec.*	*Soil Description*	*Stratum Change Depth (feet)*	*STRATUM*	*Note No.*
1	S-1	5 5 3 3	12"/24"	S-1 Tan, SILT and Gravel, loose, Wet. (ML)			
2							
3							
4							
5							
6	S-2	2 2 2 2	22"/24"	S-2 Tan, SILT, Loose, Wet. (ML)			
7							
8							
9							
10						GLACIAL OUTWASH	
11	S-3	1 2 2 3	24"/24"	S-4 Grey, Similar to S-2, Loose, Wet.			
12							
13							
14							
15							
16							
17							
18							
19							

NOTES:

LEGEND

S - Split Spoon Sample	O/A - Sample Collected Off the Augers	
UT - Undisturbed Tube Sample		
Trace - Approximately 0 to 10%	Some - Approximately 20 to 35%	
Little - Approximately 10 to 20%	And - Approximately 35 to 50%	
0-10 Coarse Soil N Value - Loose	30-50 Coarse Soil N Value - Dense	
10-30 Coarse Soil N Value - Medium Dense	>50 Coarse Soil N Value - Very Dense	
0-4 Fine Soil N Value - Soft	8-15 Fine Soil N Value - Stiff	>30 Fine Soil N Value - Hard
4-8 Fine Soil N Value - Medium Stiff	15-30 Fine Soil N Value - Very Stiff	

BORING LOG

Project:	**Cloumn Health Offices & Residents**		
Location:	**10 Sunnyside Ave**		
Client:	**Column Health LLC**		
Driller:	**Soil Exploration**		
Drilling Methods:	**Hollow Stem Auger**		
Weather:	**40, Cloudy**		
Performed By:	**MRG**	Date:	**10/19/2020**
Checked By:	**MFC**	Date:	

EBI Consulting

Boring No:	**B-3**
Location:	
Approx. Ground Elevation:	**7 ft**
Approx. Groundwater Elevation:	
Date/Time of Groundwater Elevation:	
Datum:	**NAVD88**
Project No.	**1620000050**

Depth (feet)	*Sample No.*	*Blows per 6-inch*	*Pen./ Rec.*	*Soil Description*	*Stratum Change Depth (feet)*	*STRATUM*	*Note No.*
21							
22							
23						GLACIAL OUTWASH	
24							
25		5		S-4 Medium Dense.			
26	S-4	8	0"/24"				
27		8 14				Boring Terminated at 37 Feet	
28							
29							
30				-			
31							
32							
33							
34							
35							
36							
37							
38							
39							
40							

NOTES:

LEGEND

S - Split Spoon Sample	O/A - Sample Collected Off the Augers	
UT - Undisturbed Tube Sample		
Trace - Approximately 0 to 10%	Some - Approximately 20 to 35%	
Little - Approximately 10 to 20%	And - Approximately 35 to 50%	
0-10 Coarse Soil N Value - Loose	30-50 Coarse Soil N Value - Dense	
10-30 Coarse Soil N Value - Medium Dense	>50 Coarse Soil N Value - Very Dense	
0-4 Fine Soil N Value - Soft	8-15 Fine Soil N Value - Stiff	>30 Fine Soil N Value - Hard
4-8 Fine Soil N Value - Medium Stiff	15-30 Fine Soil N Value - Very Stiff	

BORING LOG

Project:	Cloumn Health Offices & Residents	Boring No:	B-4
Location:	10 Sunnyside Ave	Location:	
Client:	Column Health LLC	Approx. Ground Elevation:	7 ft
Driller:	Soil Exploration	Approx. Groundwater Elevation:	
Drilling Methods:	Hollow Stem Auger	Date/Time of Groundwater Elevation:	
Weather:	57, Sunny	Datum:	NAVD88
Performed By: MRG	Date: 10/19/2020	Project No.	1620000050
Checked By: MFC	Date:		

Depth (feet)	Sample No.	Blows per 6-inch	Pen./ Rec.	Soil Description	Stratum Change Depth (feet)	STRATUM	Note No.
1	S-1	5 6 6 4	19"/24"	S-1a 2" Fill. S-1B CLAY some Fine to Coarse GRAVEL, Brown, Medium Dense, Damp. (OH)	0.17	FILL	
2 3	S-2	3 2 2 3	17"/24"	S-2 CLAY some Fine to Medium SAND, Brown, Loose, Wet.			
4 5							
6	S-3	2 3 2 3	18"/24"	S-3 Fine to Medium SAND some CLAY, Brown, Loose, Wet.			
7 8	S-4	5 3 2 1	17"/24"	S-4 Same as S-3, Brown, Loose, Wet.			
9 10							
11	S-5	4 6 4 6	23"/24"	S-4 Similar to S-3, Grey, Loose, Wet. S-5b Fine SAND trace SILT, Brown, Loose, Saturated.		GLACIAL OUTWASH	
12 13 14 15							
16	S-6	5 7 13 15	19"/24"	S-6a 6" CLAY. (OH) S-6b Similar to S-5b, trace CLAY, Grey, Medium Dense, Wet.			
17 18 19							

NOTES:

LEGEND

S - Split Spoon Sample	O/A - Sample Collected Off the Augers	
UT - Undisturbed Tube Sample		
Trace - Approximately 0 to 10%	Some - Approximately 20 to 35%	
Little - Approximately 10 to 20%	And - Approximately 35 to 50%	
0-10 Coarse Soil N Value - Loose	30-50 Coarse Soil N Value - Dense	
10-30 Coarse Soil N Value - Medium Dense	>50 Coarse Soil N Value - Very Dense	
0-4 Fine Soil N Value - Soft	8-15 Fine Soil N Value - Stiff	>30 Fine Soil N Value - Hard
4-8 Fine Soil N Value - Medium Stiff	15-30 Fine Soil N Value - Very Stiff	

BORING LOG

Project:	**Cloumn Health Offices & Residents**		
Location:	**10 Sunnyside Ave**		
Client:	**Column Health LLC**		
Driller:	**Soil Exploration**		
Drilling Methods:	**Hollow Stem Auger**		
Weather:	**57, Sunny**		
Performed By:	**MRG**	Date:	**10/19/2020**
Checked By:	**MFC**	Date:	

EBI Consulting

Boring No:	**B-4**
Location:	
Approx. Ground Elevation:	**7 ft**
Approx. Groundwater Elevation:	
Date/Time of Groundwater Elevation:	
Datum:	**NAVD88**
Project No.	**1620000050**

Depth (feet)	*Sample No.*	*Blows per 6-inch*	*Pen./ Rec.*	*Soil Description*	*Stratum Change Depth (feet)*	*STRATUM*	*Note No.*
21	S-7	5 12 15 20	16"/24"	S-7 Fine to Coarse GRAVEL, little Fine to Coarse SAND, Brown, Medium Dense, Wet.			
22							
23							
24							
25							
26	S-8	10 26 29 33	16"/24"	S-8a 5" Fine to Medium SAND S-8b Fine to Coarse GRAVEL, trace fine to Coarse SAND, Brown, Very Dense, Wet.			
27							
28							
29						GLACIAL OUTWASH	
30							
31	S-9	9 12 13 19	14"/24"	S-4 Similar to S-3, Grey, Loose, Wet. Brown, Medium Dense, Wet.			
32							
33							
34							
35							
36	S-10	14 24 54 73	10"/24"	S-10 CLAY and Fine to Coarse GRAVEL, Brown, Very Dense, Wet.			
37						Boring Terminated at 37 Feet	
38							
39							
40							

NOTES:

LEGEND

S - Split Spoon Sample	O/A - Sample Collected Off the Augers	
UT - Undisturbed Tube Sample		
Trace - Approximately 0 to 10%	Some - Approximately 20 to 35%	
Little - Approximately 10 to 20%	And - Approximately 35 to 50%	
0-10 Coarse Soil N Value - Loose	30-50 Coarse Soil N Value - Dense	
10-30 Coarse Soil N Value - Medium Dense	>50 Coarse Soil N Value - Very Dense	
0-4 Fine Soil N Value - Soft	8-15 Fine Soil N Value - Stiff	>30 Fine Soil N Value - Hard
4-8 Fine Soil N Value - Medium Stiff	15-30 Fine Soil N Value - Very Stiff	

APPENDIX C

STANDARD 4 – SUPPORTING INFORMATION

Included in this section:

- Long-Term Pollution Prevention Plan

LONG-TERM POLLUTION PREVENTION PLAN

The purpose of the Long-Term Pollution Prevention Plan (LTPPP) is to identify potential sources of pollution that may affect the quality of stormwater discharges, and to describe the implementation of practices to reduce potential pollutants in stormwater discharge. The owner and/or its designee are responsible for adherence to the operation and maintenance plan in a rigorous and complete manner. This LTPPP has been prepared in accordance with Standard 4 of the Massachusetts Department of Environmental Protection (MassDEP) Stormwater Management Standards.

The Site Plans for Post at 10 Sunnyside Avenue in Arlington, MA and the Stormwater Operation and Maintenance Plan are made part of this LTPPP by reference.

Stormwater Management System Owner:
Column Health, LLC
339 Massachusetts Avenue
Arlington, MA 02474
617-539-6780

Emergency Contact Information:
EBI Consulting, Inc. – Telephone: 781-273-2500 x1304

The following maintenance program is proposed to ensure the continued effectiveness of the structural water quality controls proposed as part of the development of 10 Sunnyside Avenue in Arlington, MA. The maintenance program is also developed specifically for the proposed use as a mixed-use development.

MAINTENANCE OF PAVEMENT SYSTEMS

Regular maintenance of pavement surfaces will prevent pollutants such as oil and grease, trash, and sediments from entering the stormwater management system. The following practices should be performed:

- Utilize high efficiency vacuum sweepers to sweep and vacuum asphalt pavement areas seasonally. Dispose of collected materials in accordance with appropriate local, state and federal regulations.
- Check loading and dumpster areas frequently for spillage and/or pavement staining and clean as necessary.
- Routinely pick up and remove litter from the parking areas, islands, and perimeter landscaping.

MAINTENANCE OF VEGETATED AREAS

Proper maintenance of vegetated areas can prevent the pollution of stormwater runoff by controlling the source of pollutants such as suspended sediments, excess nutrients, and chemicals from landscape care products. Practices that should be followed under the regular maintenance of the vegetated landscape include:

- Inspect planted areas on a semi-annual basis and remove any litter.
- Maintain planted areas adjacent to pavement to prevent soil washout.
- Immediately clean any soil deposited on pavement.
- Re-seed bare areas; install appropriate erosion control measures when native soil is exposed or erosion channels are forming.
- Plant alternative mixture of grass species in the event of unsuccessful establishment.
- Grass vegetation should not be cut to a height less than four inches.
- Pesticide/Herbicide Usage
    - No pesticides are to be used unless a single spot treatment is required for a specific control application.

- No herbicides shall be applied within 100-feet of any wetland or stream.

- Fertilizer usage should be avoided. If deemed necessary, slow release, phosphorous-free fertilizer with low nitrogen content should be used in moderation. Fertilizer may be used to begin the establishment of vegetation in bare or damaged areas but should not be applied on a regular basis unless necessary.

MANAGEMENT OF SNOW AND ICE

Storage and Disposal

A private contractor will be hired to remove snow and discard off site.

Salt and Deicing Chemicals

The amount of deicing chemicals to be used on the site shall be reduced to the minimum amount needed to provide safe pedestrian and vehicle travel. The following practices should be followed to control the amount of deicing materials that come into contact with stormwater runoff:

- Devices used for spreading deicing chemicals should be capable of varying the rate of application based on the site specific conditions.
- No oil or sodium chloride shall be used during or after construction for the control of dust or ice and snow.
- Alternate materials should be used in place of standard salt and deicing chemicals.
- Sand should be stockpiled under covered storage facilities that prevent precipitation and adjacent runoff from coming in contact with the deicing materials.

APPENDIX D

STANDARD 8 – SUPPORTING INFORMATION

Included in this section:

- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan
- Construction Best Management Practices Maintenance Checklist

CONSTRUCTION PERIOD POLLUTION PREVENTION AND EROSION AND SEDIMENTATION CONTROL PLAN

The following erosion and sedimentation controls are for use during the demolition, earthwork, and construction phases of the redevelopment of **10 Sunnyside Avenue in Arlington, MA**. Attached to this plan is a Construction Best Management Practices Maintenance Checklist for use during the demolition, earthwork, and construction phases of the project. This Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan has been prepared in accordance with the Massachusetts Department of Environmental Protection (MassDEP) Stormwater Management Standards and the Town of Arlington Stormwater Management Standards.

Erosion and sedimentation controls shall be installed and maintained as identified on the Site Plans for Post at 10 Sunnyside Avenue, Arlington, MA.

Responsible Party for Plan Compliance:
Column Health, LLC
339 Massachusetts Avenue
Arlington, MA 02474
617-539-6780

Emergency Contact Information:
EBI Consulting, Inc. – Telephone: 781-273-2500 x1304

EROSION AND SEDIMENTATION CONTROLS

Erosion Control Barriers
Erosion Control Barriers shall be placed at the perimeter of the work area, at the toe of slope and as shown on the plans to prevent sediment laden surface runoff from leaving the Site. The barriers will be replaced as determined by periodic field inspections.

Catch Basin Inlet Protection
Newly constructed and existing catch basins will be protected with silt sacks (where appropriate) or straw bale barriers throughout construction.

Stabilized Construction Exit
A temporary stabilized construction exit will be constructed. A cross slope will be placed at the entrance to direct runoff to a protected catch basin inlet or settling area. If deemed necessary after construction begins, a wash pad may be included to wash off vehicle wheels before leaving the Site.

Vegetative Slope Stabilization
Stabilization of open soil surfaces will be implemented within 14 days after grading or construction activities have temporarily or permanently ceased, unless there is sufficient snow cover to prohibit implementation. Vegetative slope stabilization will be used to minimize erosion on slopes of 3:1 or steeper. Annual grasses, such as annual rye, will be used to ensure rapid germination and production of root mass. Permanent stabilization will be completed with the planting of perennial grasses or legumes. Establishment of temporary and permanent vegetative cover may be provided by hydro-seeding or sodding. A suitable topsoil, good seedbed preparation, and adequate lime, fertilizer and water will be provided for effective establishment of these vegetative stabilization methods. Mulch or hay can be used after permanent seeding to protect soil from the impact of falling rain and to increase the capacity of the soil to absorb water.

Maintenance

- The site contractor will be responsible for implementing each control identified as part of this Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan.
- The site contractor will be responsible for inspecting all sediment and erosion controls periodically and after each rainfall event. Records of the inspections shall be prepared and maintained on-site by the contractor.
- Damaged or deteriorated items will be repaired immediately after identification or at the direction of the owner's engineer or the City of Brockton DPW.
- The site contractor shall comply with the General Notes regarding Erosion Control as shown on the Site Plans.
- Sediment shall be removed from behind barriers when it reaches one-half the height of the barrier or as determined by periodic field inspections or manufacturer's recommendations.
- Sediment that is collected in structures shall be disposed of properly and covered if stored on-site.
- The stabilized construction exits shall be inspected weekly. The exits shall be maintained by adding additional clean, angular, durable stone to remove sediment from the tires of construction vehicles when exiting the Site. Adjacent roadways shall be kept clean and swept as needed to avoid deposition of sediment as a result of construction traffic exiting the Site.
- Dust pollution shall be controlled using an on-site water source and/or an approved soil stabilization product.
- Erosion control structures shall remain in place until all disturbed earth has been securely stabilized. After removal of structures, disturbed areas shall be re-graded and stabilized as necessary.

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Construction Best Management Practices Maintenance Checklist

Project Name: Proposed Mixed-Use Redevelopment
Project Location: 10 Sunnyside Ave | Arlington, MA
Project Number: 1620000049

Date: 11/18/2020
Calculated By: RLB
Checked By: MFC

Best Management Practice	Inspection Frequency	Date Inspected	Inspector	Minimum Maintenance and Key Items to Check	Cleaning or Repair Needed (List Items if Required)	Date of Cleaning or Repair	Performed by
Pavement Sweeping	To be monitored as needed			Paved areas within the active construction site can be swept on a regular basis to remove larger sediment particles from construction activities. Pavement areas adjacent to the Site will be swept if dirt and debris is tracked from the active constructions site.			
Catch Basin Inlet Protection (Silt Sack Sediment Trap)	Inspect at least once per week and after each rainstorm of 1-inch or greater.			Inspect for proper operation. If clogged, remove accumulated sediment and properly dispose of to maintain the capacity of the catch basin.			
Silt Sock Barrier	Inspect at least once per week and after each rainstorm of 1-inch or greater.			Inspect periodically and after all storm events. Repair or replacement shall be performed promptly, as needed. Ensure that the filter sock is intact and the area behind the sock is not filled with sediment. If there is excessive ponding behind the filter sock or accumulated sediments reach the top of the sock, an additional sock should be added on top or in front of the existing filter sock without disturbing the soil or accumulated sediment. If the filter sock was overtopped during a storm event, the operator should install an additional filter sock on top of the original or place an additional filter sock further up the slope.			
Stabilized Construction Exit	Inspect at least once per week and after each rainstorm of 1-inch or greater.			The exit shall be maintained in a condition that will prevent tracking of sediment onto public rights-of-way. The contractor shall sweep or wash pavement at exits which have experienced mud-tracking onto the pavement or traveled way. When washing is required, it shall be done on an area stabilized with aggregate that drains into an approved sediment trapping device. When the construction exit becomes ineffective, the stone shall be removed along with the collected soil material and redistributed on-site in a stable manner. The exit should then be reconstructed. All sediment shall be prevented from entering storm drains, ditches, or waterways.			

Stormwater Supervisor Contact Information: _____

APPENDIX E

STANDARD 9 – SUPPORTING INFORMATION

Included in this section:

- Stormwater Operation and Maintenance (O&M) Plan
- Stormwater Best Management Practices Maintenance Checklist

STORMWATER OPERATION AND MAINTENANCE (O&M) PLAN

The following Stormwater Operation and Maintenance (O&M) Plan is proposed to ensure the continued effectiveness of the stormwater management system designed for the redevelopment of **10 Sunnyside Avenue in Arlington, MA**. This O&M Plan has been developed to provide a comprehensive O&M Plan for the Site, including previously developed procedures and supplementing them with additional inspection and maintenance measures for new stormwater BMPs.

Attached to this plan is a Stormwater Best Management Practices Maintenance Checklist for use during the long term operation and maintenance of the stormwater management system. This Stormwater O&M Plan has been prepared in accordance with the Massachusetts Department of Environmental Protection (MassDEP) Stormwater Management Standards and the Town of Arlington Ordinances.

The Site Plans for Post at 10 Sunnyside Avenue, Arlington, MA dated November 17, 2020 are made part of this Stormwater O&M Plan by reference.

Stormwater Management System Owner:
Column Health, LLC
339 Massachusetts Avenue
Arlington, MA 02474
617-539-6780

Emergency Contact Information:
EBI Consulting, Inc. – Telephone: 781-273-2500 x1304

DESCRIPTION OF STORMWATER MAINTENANCE MEASURES

Deep Sump and Hooded Catch Basins

- All catch basins shall be inspected a minimum of at least four times per year.
- Sediment, if more than two (2) feet deep, and/or floatable pollutants shall be pumped from the basin and disposed of at an approved offsite facility in accordance with all applicable regulations.
- Any structural damage or other indication of malfunction will be reported to the site manager and repaired as necessary.
- During cleanings, confirm the oil/debris trap (hood) is installed properly, is free of clogs, and is functional. Reinstall or replace as needed.
- During colder periods, the catch basin grates must be kept free of snow and ice.
- During warmer periods, the catch basin grates must be kept free of leaves, litter, sand, and debris.

Catch Basin Inserts

- Fabco® StormBasin (or approved equal) inserts are to be inspected semiannually and are to be cleaned in accordance with the manufacturer's maintenance requirements. A copy of the manufacturer's maintenance guidelines are provided in this report.

Roof Drain Leaders

- Perform routine roof inspections twice per year, typically in the spring and fall.
- Inspect for blockage and remove debris if required.
- Keep roofs clean and free of debris.
- Keep roof drainage systems clear.
- Keep roof access limited to authorized personnel.

Subsurface Infiltration System

- See the attached Manufacturer's instructions on operation and maintenance requirements and methodology.
- Perform routine inspections on a monthly basis for the first three months after installation. Then, at a minimum, the treatment structure is to be inspected twice annually and the infiltrating structure is to be inspected annually.
- The subsurface infiltration system will be inspected twice during for the first year and annually thereafter by removing the manhole/access port covers and determining the thickness of sediment that has accumulated.
- If sediment is more than two inches deep, it must be suspended via flushing with clean water and removed using a vactor truck.
- Emergency overflow pipes will be examined at least once each year and verified that no blockage has occurred.

Pavement Sweeping of Parking Lot

- Sweeping of pavement shall be conducted seasonally at least four times per year, or more often as necessary to minimize accumulation of sediment and other debris in catch basins and the detection basins.

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Stormwater Best Management Practices Maintenance Checklist

Project Name: Proposed Mixed-Use Red\evelopment
Project Location: 10 Sunnyside Ave |Arlington, MA
Project Number: 1620000015

Date: 11/17/2020
Calculated By: RLB
Checked By: MFC

Best Management Practice	Inspection Frequency	Date Inspected	Inspector	Minimum Maintenance and Key Items to Check	Cleaning or Repair Needed (List Items if Required)	Date of Cleaning or Repair	Performed by
Pavement Sweeping	Inspect twice per year, typically in the spring and fall.			Paved areas will be swept at least twice per year or as needed, primarily in the spring and/or fall with vacuum truck or similar.			
Deep Sump and Hooded Catch Basins	Inspect four times per year. Clean four times per year, in the spring and fall, or whenever sediment buildup exceeds two (2) feet in depth.			Remove trash and deposits. During cleanings, confirm the oil/debris trap (hood) is installed properly, is free of clogs, and is functional. Reinstall or replace as needed. Take care not to damage the oil/debris trap (hood) during cleaning.			
Roof Drain leaders	Inspect twice per year, typically in the spring and fall.			Inspect for blockage and remove debris if required.			
Subsurface Infiltration System	Inspect monthly for the first three months. Then, at a minimum, the treatment structure is to be inspected twice annually and the infiltrating structure is to be inspected annually as required by the manufacturer.			Inspect the system twice in the first year for proper function. Remove sediment once per year or when buildup exceeds two (2) inches in depth.			

Stormwater Supervisor Contact Information: _____

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APPENDIX F

HYDRAULIC ANALYSIS – SUPPORTING INFORMATION

Included in this section:

- Storm Drainage Calculations

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Storm Drainage Calculations

Project Name: Proposed Redevelopment
Project Location: 10 Sunnyside Ave, Arlington, MA
Project Number: 1620000049

Date: 11/17/2020
Calculated by: RLB
Checked by: MFC

Design Parameters:
25 **Year Storm** Boston **IDF Curve**

k_e= **0.5**

	LOCATION		AREA	C	C x A	SUM	FLOW TIME (MIN)		i*	DESIGN					CAPACITY		PROFILE							INLET CONTROL		OUTLET CONTROL			JUNCTION LOSSES		
DESCRIPTION	FROM	TO	(AC.)			C x A	PIPE	CONC TIME		Q	V	n	PIPE SIZE	SLOPE	Q full	V full	LENGTH	FALL	RIM	INV UPPER	INV LOWER	W.S.E.	Freeboard	HW/D	HW	H	TW or h_o	HW	K_m	K_d	H loss
										cfs	fps				ft^3/s	ft/s	ft	ft				ft	ft	ft	ft	ft	ft	ft	junction	junction	junction
	CB-1	Infiltration Basin	0.063	0.83	0.05	0.05	0.28	6.0	5.7	0.3	3.2	0.011	8	0.017	1.9	5.4	53	0.92	14.75	11.75	10.83	11.6	3.1	0.00	0.00	0.0	0.0	0.00	0.20	0.00	0.03
	CB-2	Infiltration Basin	0.195	0.95	0.19	0.19	0.02	6.0	5.7	1.1	4.6	0.011	8	0.017	1.8	5.3	6	0.10	13.27	9.25	9.15	9.0	4.3	0.00	0.00	0.0	0.0	0.00	0.20	0.00	0.07
	CB-2	Main	0.258	0.92	0.24	0.24	0.11	6.0	5.7	1.4	4.3	0.011	8	0.010	1.4	4.1	27	0.27	13.27	9.50	9.23	9.3	4.0	0.00	0.00	0.0	0.0	0.00	0.20	0.00	0.06