

HANCOCK ASSOCIATES



Stormwater Report

In Support Of

Notice of Intent Filling

For

**3 Old Merrill Street
(Map 101 Lot 11)
Amesbury, Ma**

PREPARED BY:

Hancock Associates
#28781

PREPARED FOR:

Andrea McKee
3 Old Merrill Street
Amesbury MA, 01913

Date:

May 11, 2026

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Introduction

This Stormwater Management Report has been prepared to demonstrate compliance with MA DEP stormwater standards as set forth in the Stormwater Management Handbook and the Town of Amesbury Stormwater Regulations as part of a Notice Intent for a proposed dwelling at 3 Old Merrill Street.

Andrea Mckee proposes to construct a detached accessory dwelling unit (DADU) at 3 Old Merrill Street. Associated improvements will include a peastone driveway, a subsurface infiltration system, mitigation planting areas, and new utility services. The site currently has an existing one story dwelling, patios, and landscaped areas that will remain. The lot is 19,722 sf and is bounded by residential dwellings to the east and west, undeveloped forest across Old Merrill Street to the north, and the Merrimac River to the south. The site slopes towards the bank of the Merrimac River with grades ranging between 4% and 16%. The bank slopes towards waterline at 1:1 slope.

According to the Web Soil Survey operated by the Natural Resource Conservation Service (NRCS), soil in the project area consists of Charlton-Hollis complex. This soil is classified into Hydrologic group "A" which allows for rapid infiltration. Two test pits were dug on the eastern side of the site in the vicinity of the DADU. The test pits identify a C layer consisting of Loamy Sand and Sand which is indicative of HSG 'A' soils. Groundwater was observed to be between 5' and 7' below existing grade.

In the pre-development conditions, stormwater runoff sheet flows towards the Merrimac. The proposed stormwater system will maintain the same drainage patterns by directing stormwater towards the Merrimac. The roof area of the DADU will be collected by a series of gutters and roof drains which discharge to a subsurface Stormtech SC-310 Chamber System which will attenuate peak flows and provide groundwater recharge. Overflow during large storm events will outlet via a 12" horizontal overflow grate within the inspection port of the system. Discharge will sheet flow towards the coastal bank approximately 75' away.

Hydrologic Analysis

Stormwater runoff calculations contained herein for site related runoff have been computed in accordance with methods developed by NRCS, as described in the "NRCS National Engineering Handbook, Section 5, Hydrology for Small Watersheds." Storm hydrographs were generated and routed using the NRCS TR-20/TR-55 methodologies (incorporated into the hydrologic modeling software HydroCAD) with Type III storm distribution.

For this analysis, hydrographs were developed to simulate peak storm runoff flows under existing and proposed conditions for the 2, 10, 25, and 100-year storm events. Data from the NOAA Atlas 14 Precipitation Frequency Data Server provided 24-hour rainfall rain fall depths for the respective storm events of 3.38, 5.35, 6.57, and 8.46 inches. These calculations indicate the order-of-magnitude of existing and proposed peak runoff rates anticipated from the project site.

Watersheds

The existing site generally slopes down from north to south towards the Merrimac River. Stormwater sheet flows overland and ultimately enters the Merrimac which is designated as Design Point 1 (DP1) on the Pre and Post development Watershed plans. Watershed EX1 represents the existing conditions on the property up to the 25' no disturb zone and is comprised of lawn, landscaping, and a low retaining wall. Stormwater runoff to DP1 is unmitigated under the existing conditions.

The proposed development will maintain the existing drainage patterns. PR1 contains the proposed roof area where runoff is collected by a series of gutters, downspouts, and HDPE roof drains and directed to the SC-310 chamber system. Treated overflow from the system will sheet flow towards DP1. Velocities will be very low as the distance between the overflow grate and the coastal bank is approximately 75' at 2-3% slope. Watershed PR2 contains the driveway area where stormwater infiltrates through the peastone and crushed stone base. Runoff that does not infiltrate will sheet flow towards the lawn area and ultimately DP1. PR3 contains the existing dwelling, patio areas, walkways, landscaping, and the proposed landscaping and lawn associated with the DADU. Stormwater from PR3 will flow towards DP1. The area along the coastal bank comprised of the proposed mitigation plantings was not included in the analysis as the plantings will slow stormwater runoff to a greater extent than the existing lawn will.

Standard 1: No New Untreated Discharges

The Massachusetts Stormwater Handbook states that no new stormwater conveyances may discharge untreated stormwater directly to or cause erosions in wetlands or waters of the Commonwealth. No new untreated discharges are proposed.

Standard 2: Peak Rate Attenuation

The Massachusetts Stormwater Handbook states that stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates.

Table 1: Peak Rate and volume of Runoff

Discharge Point	Peak Rate (cfs)							
	2-Year Storm		10-Year Storm		25-Year Storm		100-Year Storm	
	Existing	Proposed	Existing	Proposed	Existing	Proposed	Existing	Proposed
DP1	0.04	0.04	0.35	0.32	0.63	0.57	1.12	1.02

cfs – Cubic Feet per Second

Discharge Point	Volume (cf)							
	2-Year Storm		10-Year Storm		25-Year Storm		100-Year Storm	
	Existing	Proposed	Existing	Proposed	Existing	Proposed	Existing	Proposed
DP1	286	260	1,199	1,093	1,967	1,815	3,362	3,158

cf – Cubic Feet

Standard 3: Recharge

The Massachusetts Stormwater Handbook states that loss of annual recharge to groundwater shall be eliminated or minimized. The annual recharge from the post-development site shall approximate the annual recharge from the pre-development conditions based on soil type. Recharge volumes are provided for all of the proposed impervious areas.

Groundwater recharge calculations

$$RV = (A) \times 1.0''$$

Where:

A = impervious surface drainage area (in square feet)

RV = Recharge Volume

Subsurface System

The Sc-310 chambers hold stormwater below the lowest outlet. This allows stormwater to infiltrate into the ground. See attachment 3 for storage volumes. Since the chambers outlet at ground level, the entire system volume is used for calculating the recharge volume. Per section 7.10 of the Amesbury rules and regulations, infiltration systems must retain equal to, or greater to 1.0'' of runoff volume of the post construction impervious area.

$$\text{Required Recharge Volume} = (750 \text{ SF}) \times (1.0 \text{ inch.}) \times (1 \text{ ft} / 12 \text{ inches})$$

$$\text{Required Recharge Volume} = 62.5 \text{ cf}$$

$$\text{Provided Recharge Volume} = 136 \text{ cf} \rightarrow \text{The requirement is met}$$

System Draw Down Time

Infiltration systems are required to drain within 72 hours. The following calculation demonstrates system compliance with MA stormwater regulations.

Leaching Galley:

$$\text{Drawdown Time} = \text{System Volume} / (\text{Infiltration Rate} \times \text{Surface Area})$$

$$= 136 \text{ CF} / (2.41 \text{ in/hr} \times 1/12 \text{ in/ft} \times 126 \text{ SF}) = 5.37 \text{ Hours}$$

Standard 4: Water Quality

According to Amesbury Subdivision Rules and Regulations, stormwater management systems shall be designed to remove 90% of the average annual post construction load of Total Suspended Solids (TSS) and 60% of the annual load of total Phosphorus. According to the MA DEP Stormwater Standards, soils with rapid infiltration rates (>2.4''/hr) require 44% TSS pre-treatment removal before entering the infiltration system. As runoff from non-metal roofs is considered clean, the pretreatment requirement is considered satisfied. According to Section 7.10.B.3.a of the Amesbury Subdivision Rules and Regulations, average annual pollutant removal is achieved by Retaining the volume of runoff equivalent to, or greater than, one inch multiplied by the total post-construction impervious surface area on the new development site.

Water Quality Volume Calculations (Shea Concrete Leaching Galley)

Standard 4 requires a certain amount of stormwater to be infiltrated to remove sediment and nutrients from stormwater runoff. The required water quality volume (WQV) is 1'' because the BMP's are in soils with a rapid infiltration rate greater than 2.4''/hr. The calculations for compliance can be seen in Standard 3.

Standard 5: Land Uses with Higher Potential Pollutant Loads

The proposed project is not a Land Use with Higher Potential Pollutant Load (LUHPPL). Therefore, this standard is not applicable.

Standard 6: Critical Area

The proposed project discharges to Coastal Bank along the Merrimack and areas designated as NHESP Habitats which is considered a Critical Area. The infiltration basin has been sized to treat 1'' of stormwater volume over the contributing impervious areas as described under Standard 4. All stormwater that drains from the BMP will be treated for at least 80% TSS removal prior to discharge and will not contain pollutants.

Standard 7: Redevelopment

The proposed project is not a redevelopment.

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

Best management practices (BMP) for erosion and sedimentation control are staked, silt fences, compost wood fiber sock, hydro seeding, and phased development. Many stormwater BMP technologies (e.g., infiltration technologies) are not designed to handle the high concentrations of sediments typically found in construction runoff and must be protected from construction-related sediment loadings. Construction BMP's must be maintained. In developing the proposed project certain measures will be implemented to minimize impacts erosion and sedimentation could have on surrounding areas. This section addresses items that involve proper construction techniques, close surveillance of workmanship, and immediate response to emergency situations. The developer must be prepared to provide whatever reasonable measures are necessary to protect the environment during construction and to stabilize all disturbed areas as soon as construction ends.

Pre-Construction

1. The contractor shall have a stockpile of materials required to control erosion on-site to be used to supplement or repair erosion control devices. These materials shall include, but are not limited to compost wood fiber sock, silt fence, compost wood fiber sock and crushed stone.
2. The contractor is responsible for erosion control on site and shall utilize erosion control measures where needed, regardless of whether the measures are specified on the plan or in the order of conditions.

Preliminary Site Work

1. Excavated materials should be stockpiled, separating the topsoil for future use on the site. Erosion control shall be utilized along the down slope side of the piles and side slopes shall not exceed 2:1.
2. If intense rainfall is anticipated, the installation of supplemental straw bale dikes, silt fences, or armored dikes shall be considered.
3. Unsuitable excavated materials, demolition materials and invasive plant species shall be removed from the site and disposed of properly.
4. Construction entrance shall be installed and maintained. Rutting and erosion shall be repaired at the beginning of each workday.

Ongoing Site Work

1. Erosion control measures shall be regularly inspected and replaced as needed.
2. Dewatering shall be done in a manner so as not to transmit silt, sand or particulate matter to the receiving water or existing drainage system.
3. Vehicles shall be cleaned before exiting the site and pavement outside of the work zone shall be swept clean at the end of each workday.
4. Chemical and hazardous spills shall be remedied immediately.

Landscaping

1. Landscaping shall occur as soon as possible to provide permanent stabilization of disturbed surfaces.
2. If the season or adverse weather conditions do not allow the establishment of vegetation, temporary mulching with straw, wood chips weighted with snow fence or branches, or other methods shall be provided.
3. A minimum of 4 inches of topsoil shall be placed and its surface smoothed to the specified grades.
4. The use of herbicides is strongly discouraged.
5. Hydro seeding is encouraged for steep slopes. Application rates on slopes greater than 3:1 shall have a minimum seeding rate of 5-lbs/1000 SF. A latex or fiber tackifier shall be used on these slopes at a minimum rate of 50 lbs. of tackifier per 500 gallons of water used.

Standard 9: Operations and Maintenance Plan

The information provided herein is intended to provide the base information for operation and maintenance of the site in perpetuity subject to updates and revisions as required at a future date. As such all future property owners must be notified in writing of this plan and be provided with a copy of this plan, a complete set of the design drawings and/or a completed as-built plan showing all the drainage features as they were constructed, which are considered part of this document. Please see the attached Operations and Maintenance Log (Appendix IX).

Stormwater management system owner: Andrea Mckee
The party responsible for operation and maintenance: Andrea Mckee

Preliminary Stormwater Operation and Maintenance Budget

Quarterly Inspection and Maintenance x \$2,50 per visit = \$1,000 annually

Illicit Discharge - Practices to Minimize Storm Water Contamination

- All waste materials will be collected and stored in a securely lidded metal dumpster.
- All trash and debris from the site will be deposited in the dumpster. The dumpster will be emptied on a regular schedule prior to being over full.
- All personnel will be instructed regarding the correct procedure for waste disposal.
- Good housekeeping and spill control practices will be followed to minimize storm water contamination from petroleum products, paints, and cleaning products.
- All site vehicles will be monitored for leaks and receive regular preventive maintenance to reduce the chance of leakage.
- Spill kits will be provided with any activity that could provide contamination.
- All paint containers and curing compounds will be tightly sealed and stored when not required for use. Excess paint will not be discharged to the storm sewers, but will be properly disposed according to the manufacturer's instructions.
- All spills will be cleaned up immediately upon discovery. Spills large enough to reach the storm sewers will be reported to the Massachusetts Department of Environmental Protection Northeast Regional Office at 1-888-304-1133.

Infiltration BMP

The infiltration BMP (subsurface chambers) shall be inspected after every major storm for the first few months to ensure it is stabilized and functioning properly. If necessary, corrective action shall be taken until the system functions properly. Inspectors should note how long water remains standing in the inspection port after a storm; standing water within the basin 48 to 72 hours after a storm indicates that the infiltration capacity may have been overestimated. If the ponding is due to clogging, immediately address the reasons for the clogging. Thereafter, inspect the infiltration BMP at least twice per year. The 10" overflow grate shall be cleaned of leaves, grass, and other debris. It shall be inspected twice per year for signs of damage and repaired immediately.

Roof Drain Leaders

Routine roof inspections shall be performed two times per year. The roof shall be kept clean and free of debris, and the roof drainage systems shall be kept clear. Gutters and downspouts shall be cleaned at least twice per year, or more frequently as necessary.

Vegetated Areas Maintenance

Although not a structural component of the drainage system, the maintenance of vegetated areas may affect the functioning of stormwater management practices. This includes the health/density of vegetative cover and activities such as the application and disposal of lawn and garden care products, disposal of leaves and yard trimmings.

Initial Post-Construction Inspection

During the initial period of vegetation establishment pruning and weeding are required twice in first year by contractor or owner. Any dead vegetation/plantings found after the first year will be replaced. Proper mulching is mandatory and regular watering may be required initially to ensure proper establishment of new vegetation.

Long-Term Maintenance

The planted areas shall be inspected on a semi-annual basis and any litter removed. Weeds and invasive plant species shall be removed by hand. Maintain planted areas adjacent to pavement to prevent soil washout. Immediately clean any soil deposits on pavement. Leaf litter and other detritus shall be removed twice per year. If needed to maintain aesthetic appearance, perennial plantings may be trimmed at the end of the growing season.

Trees and shrubs shall be inspected twice per year to evaluate health and attended to as necessary. Seeded ground cover or grass areas shall not receive mulching. Re-seed bare areas; install appropriate erosion control measures when native soil is exposed or erosion channels are forming. Plant alternative mixtures of grass species in the event of unsuccessful establishment. The 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.

Attach additional pages as required to fully document conditions and maintenance performed.

*Receipts (if applicable) must be attached to report showing payment for maintenance performed.

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*Receipts (if applicable) must be attached to report showing payment for maintenance performed.

Standard 10: Prohibition of Illicit Discharges

No illicit discharges currently exist and no future illicit discharges will be allowed including wastewater discharges and discharges of stormwater contaminated by contact with process wastes, raw materials, toxic pollutants, hazardous substances, soil, or grease.

Signed by Owner

Date

Appendix 1 Locus Map

Locus Map 3 Old Merrill St



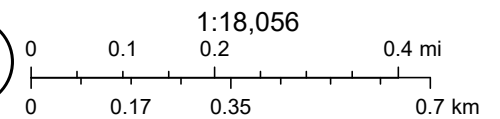
5/4/2026

USGSTopo

Red: Band_1

Green: Band_2

Blue: Band_3



USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography

Hancock Associates

Appendix 1 Locus Map



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.

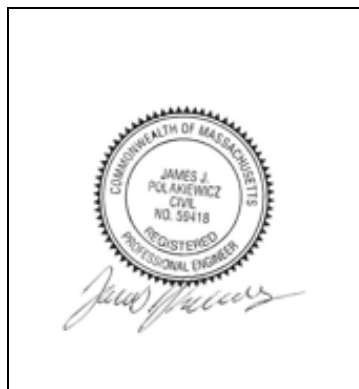
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the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



05/11/2026

Signature and Date

Checklist

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

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



Checklist for Stormwater Report

Checklist (continued)

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

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

Standard 1: No New Untreated Discharges

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



Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

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

Standard 3: Recharge

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

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



Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

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

Standard 4: Water Quality

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

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



Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

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

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

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

Standard 6: Critical Areas

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



Checklist for Stormwater Report

Checklist (continued)

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

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

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

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

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



Checklist for Stormwater Report

Checklist (continued)

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

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

Standard 9: Operation and Maintenance Plan

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

Standard 10: Prohibition of Illicit Discharges

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

Appendix 3 NRCS Soils Map

Soil Map—Essex County, Massachusetts, Northern Part



**Natural Resources
Conservation Service**

Web Soil Survey
National Cooperative Soil Survey

3/11/2026
Page 1 of 3

MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features



Blowout



Borrow Pit



Clay Spot



Closed Depression



Gravel Pit



Gravelly Spot



Landfill



Lava Flow



Marsh or swamp



Mine or Quarry



Miscellaneous Water



Perennial Water



Rock Outcrop



Saline Spot



Sandy Spot



Severely Eroded Spot



Sinkhole



Slide or Slip



Sodic Spot



Spoil Area



Stony Spot



Very Stony Spot



Wet Spot



Other



Special Line Features

Water Features



Streams and Canals

Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

Background



Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

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

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

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

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: Essex County, Massachusetts, Northern Part

Survey Area Data: Version 21, Sep 5, 2025

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

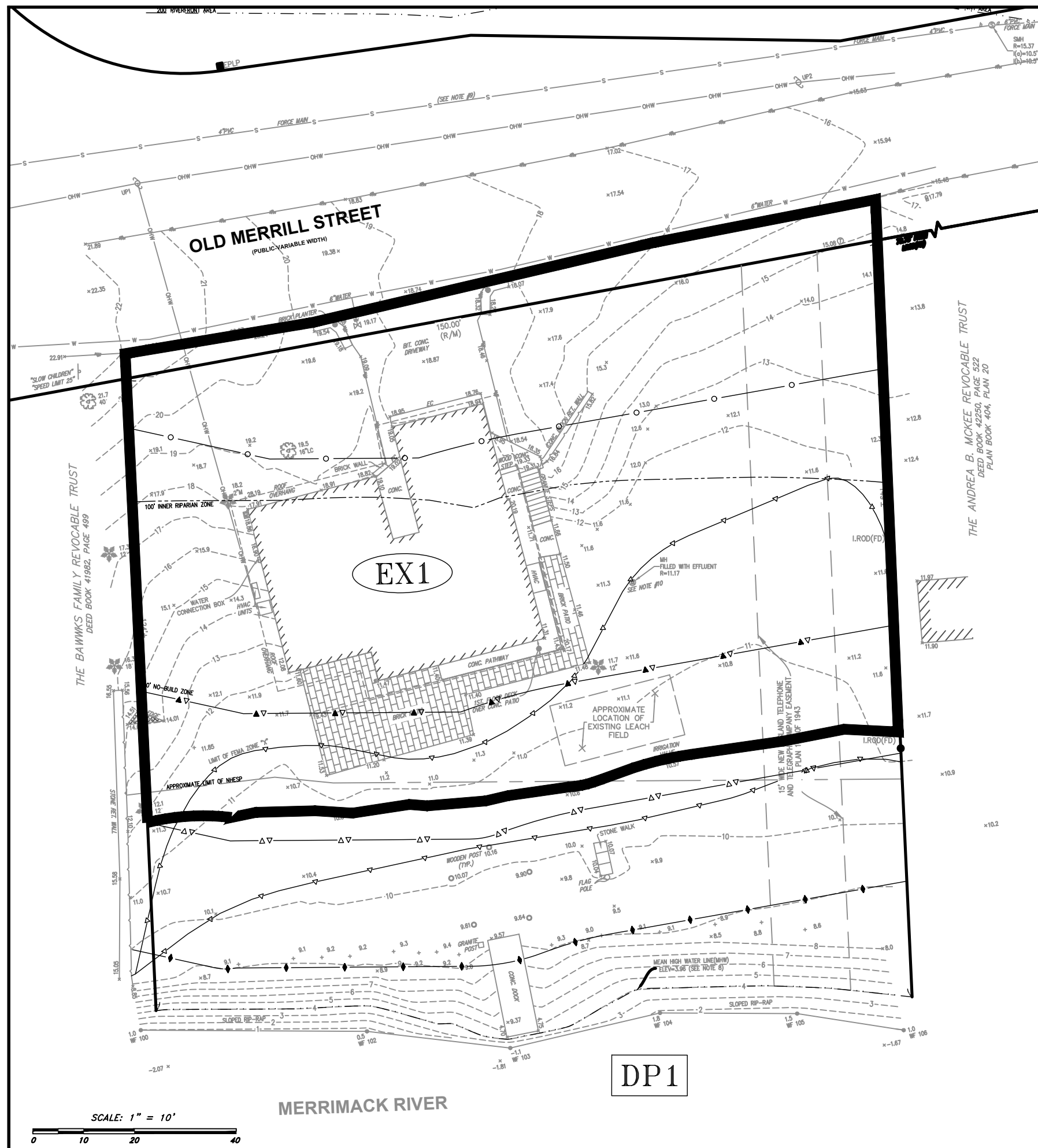
Date(s) aerial images were photographed: May 22, 2022—Jun 5, 2022

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
607	Water, saline	1.3	19.3%
717C	Rock outcrop-Charlton-Hollis complex, 3 to 15 percent slopes	4.8	73.8%
717E	Rock outcrop-Charlton-Hollis complex, 15 to 35 percent slopes	0.5	6.9%
Totals for Area of Interest		6.5	100.0%

Appendix 4 Existing and Proposed Drainage Figures



- LEGEND**
- USDA SOIL PROFILE BOUNDARY
 - SUBCATCHMENT BOUNDARY
 - DESIGN POINT
 - SUB CATCHMENT LABEL

3 OLD MERRILL STREET

3 OLD MERRILL STREET
AMESBURY MA, 01913

ASSESSOR'S

MAP BLOCK LOT
101 - 11

PREPARED FOR:

ANDREA MCKEE

3 OLD MERRILL STREET
AMESBURY MA, 01913

HANCOCK ASSOCIATES

Civil Engineers

Land Surveyors

Wetland Scientists

185 CENTRE STREET, DANVERS, MA 01923
VOICE (978) 777-3050, FAX (978) 774-7816
WWW.HANCOCKASSOCIATES.COM

NOT FOR
CONSTRUCTION

NO.	BY	APP	DATE	ISSUE/REVISION	DESCRIPTION
1	JUP		5/11/26	DESIGN BY:	OMR
2	JUP			DRAWN BY:	OMR
3	JUP			CHECK BY:	AD

**PRE DEVELOPMENT
DRAINAGE PLAN**

PLOT DATE: May 07, 2026 10:28 am

PATH: C:\Users\jrichter\AppData\Local\Temp\44836\

DWG: Pre-Post Dev.dwg

LAYOUT: ec

SHEET: 1 OF 5

PROJECT NO.:

C1

28781

Appendix 5 BMP Storage Table

Post Dev

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Type III 24-hr 100 year Rainfall=8.46"

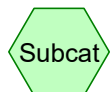
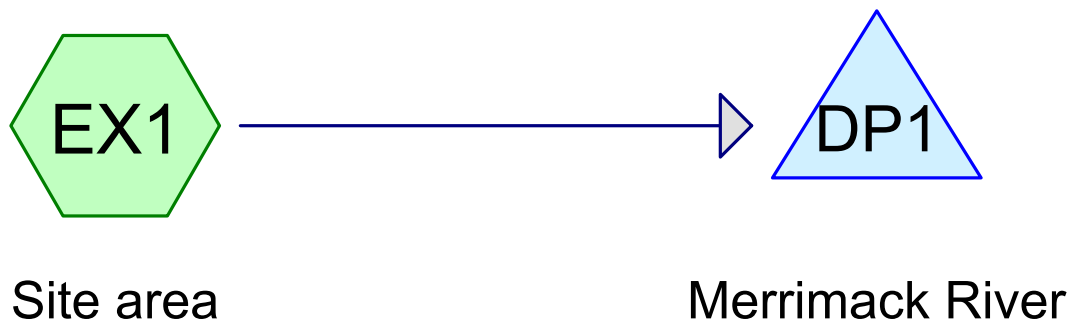
Printed 5/4/2026

Stage-Area-Storage for Pond 1P: Chambers

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
7.66	125	0	10.26	126	135
7.71	125	3	10.31	126	135
7.76	125	5	10.36	126	135
7.81	125	8	10.41	126	136
7.86	125	10	10.46	126	136
7.91	125	13	10.51	126	136
7.96	125	15	10.56	126	136
8.01	125	18	10.61	126	136
8.06	125	20	10.66	126	136
8.11	125	23	10.71	126	136
8.16	125	25	10.76	126	136
8.21	125	29	10.81	126	136
8.26	125	32	10.86	126	136
8.31	125	36	10.91	126	136
8.36	125	39	10.96	126	136
8.41	125	43	11.01	126	136
8.46	125	46	11.06	126	136
8.51	125	50	11.11	126	136
8.56	125	53	11.16	126	136
8.61	125	56	11.21	126	136
8.66	125	60	11.26	126	136
8.71	125	63			
8.76	125	66			
8.81	125	70			
8.86	125	73			
8.91	125	76			
8.96	125	79			
9.01	125	82			
9.06	125	86			
9.11	125	89			
9.16	125	92			
9.21	125	95			
9.26	125	97			
9.31	125	100			
9.36	125	103			
9.41	125	105			
9.46	125	108			
9.51	126	110			
9.56	126	113			
9.61	126	116			
9.66	126	118			
9.71	126	121			
9.76	126	123			
9.81	126	126			
9.86	126	128			
9.91	126	131			
9.96	126	133			
10.01	126	135			
10.06	126	135			
10.11	126	135			
10.16	126	135			
10.21	126	135			

**HIGHEST
OUTLET**

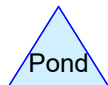
Appendix 6 Pre and Post Development HydroCAD Models



Subcat



Reach



Pond



Link

Routing Diagram for Pre Dev

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Pre Dev

Prepared by Hancock Associates

Printed 3/23/2026

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Page 2

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2 year	Type III 24-hr		Default	24.00	1	3.38	2
2	10 year	Type III 24-hr		Default	24.00	1	5.35	2
3	25 year	Type III 24-hr		Default	24.00	1	6.57	2
4	100 year	Type III 24-hr		Default	24.00	1	8.46	2

Pre Dev

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Page 3

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
10,825	39	>75% Grass cover, Good, HSG A (EX1)
625	80	Brick Patio (EX1)
2,425	98	Roofs, HSG A (EX1)
875	98	Walkways/Driveway (EX1)
14,750	54	TOTAL AREA

Pre Dev*Type III 24-hr 2 year Rainfall=3.38"*

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Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentEX1: Site area

Runoff Area=14,750 sf 22.37% Impervious Runoff Depth>0.23"

Tc=6.0 min CN=54 Runoff=0.04 cfs 286 cf

Pond DP1: Merrimack River

Inflow=0.04 cfs 286 cf

Primary=0.04 cfs 286 cf

Total Runoff Area = 14,750 sf Runoff Volume = 286 cf Average Runoff Depth = 0.23"
77.63% Pervious = 11,450 sf 22.37% Impervious = 3,300 sf

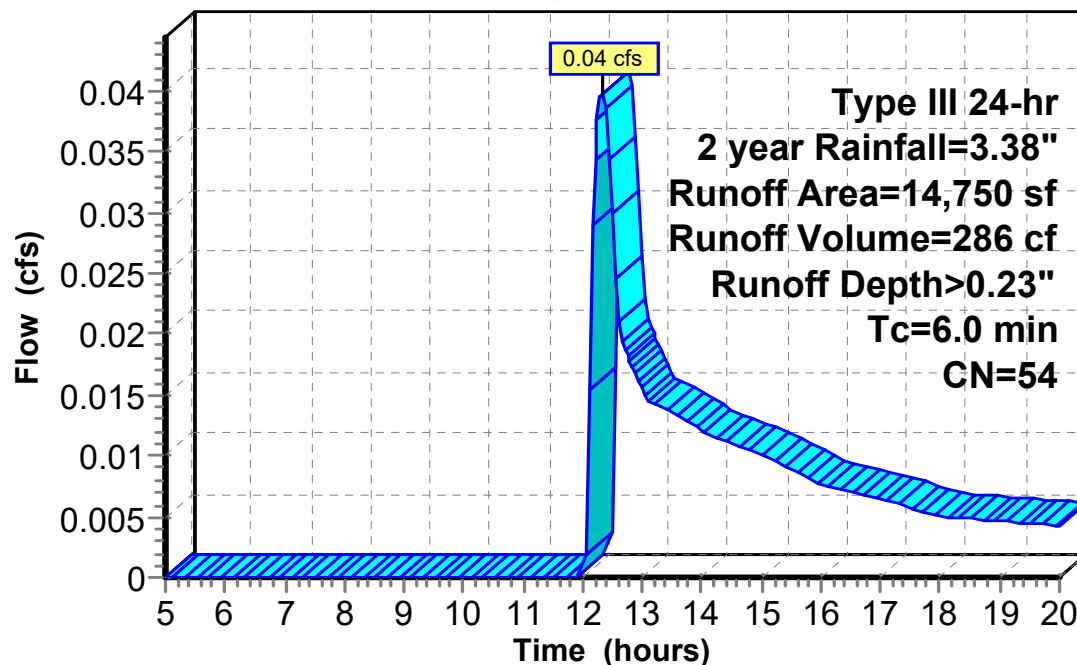
Summary for Subcatchment EX1: Site area

Runoff = 0.04 cfs @ 12.32 hrs, Volume= 286 cf, Depth> 0.23"
 Routed to Pond DP1 : Merrimack River

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 2 year Rainfall=3.38"

Area (sf)	CN	Description
10,825	39	>75% Grass cover, Good, HSG A
2,425	98	Roofs, HSG A
* 625	80	Brick Patio
* 875	98	Walkways/Driveway
14,750	54	Weighted Average
11,450		77.63% Pervious Area
3,300		22.37% Impervious Area

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

Subcatchment EX1: Site area**Hydrograph**

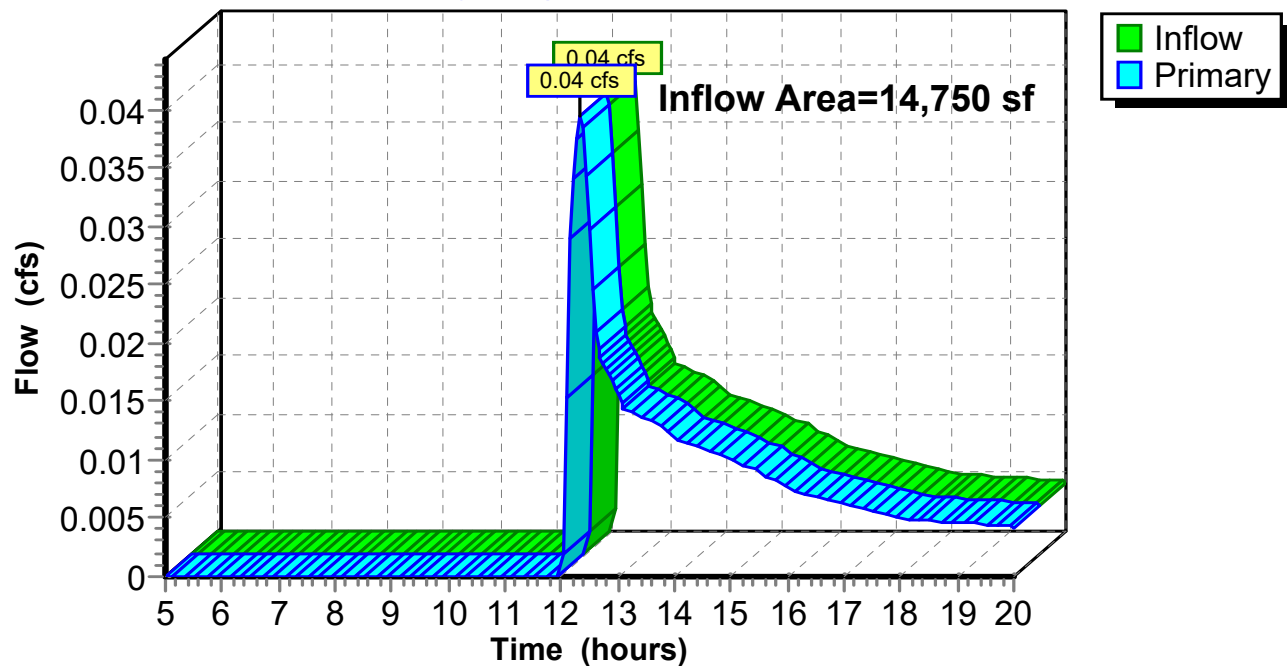
Runoff

Summary for Pond DP1: Merrimack River

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

Inflow Area = 14,750 sf, 22.37% Impervious, Inflow Depth > 0.23" for 2 year event
Inflow = 0.04 cfs @ 12.32 hrs, Volume= 286 cf
Primary = 0.04 cfs @ 12.32 hrs, Volume= 286 cf, Atten= 0%, Lag= 0.0 min

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

Pond DP1: Merrimack River**Hydrograph**

Pre Dev*Type III 24-hr 10 year Rainfall=5.35"*

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Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentEX1: Site area

Runoff Area=14,750 sf 22.37% Impervious Runoff Depth>0.98"

Tc=6.0 min CN=54 Runoff=0.35 cfs 1,199 cf

Pond DP1: Merrimack River

Inflow=0.35 cfs 1,199 cf

Primary=0.35 cfs 1,199 cf

Total Runoff Area = 14,750 sf Runoff Volume = 1,199 cf Average Runoff Depth = 0.98"
77.63% Pervious = 11,450 sf 22.37% Impervious = 3,300 sf

Pre Dev

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Type III 24-hr 10 year Rainfall=5.35"

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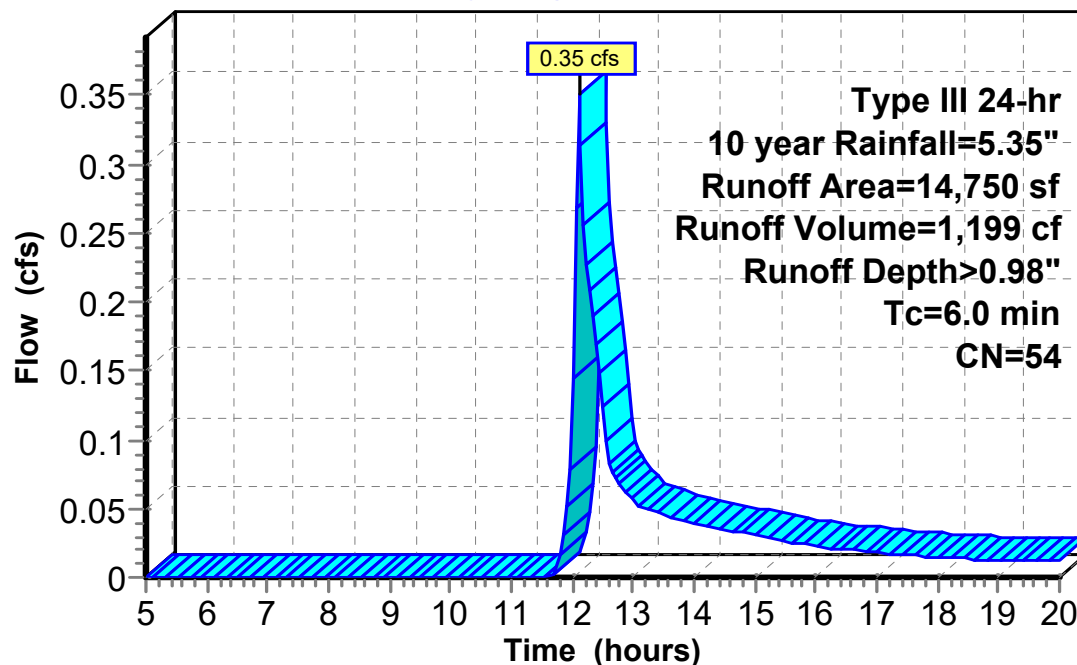
Summary for Subcatchment EX1: Site area

Runoff = 0.35 cfs @ 12.11 hrs, Volume= 1,199 cf, Depth> 0.98"
Routed to Pond DP1 : Merrimack River

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 year Rainfall=5.35"

Area (sf)	CN	Description
10,825	39	>75% Grass cover, Good, HSG A
2,425	98	Roofs, HSG A
* 625	80	Brick Patio
* 875	98	Walkways/Driveway
14,750	54	Weighted Average
11,450		77.63% Pervious Area
3,300		22.37% Impervious Area

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

Subcatchment EX1: Site area**Hydrograph**

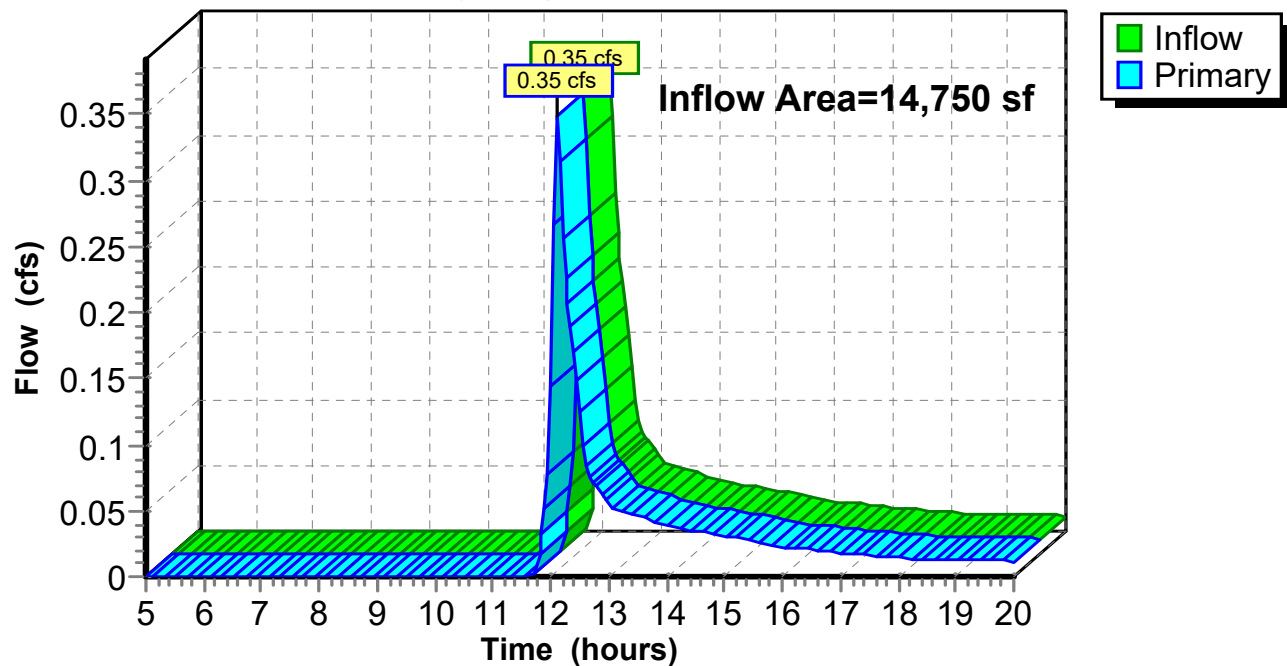
Runoff

Summary for Pond DP1: Merrimack River

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

Inflow Area = 14,750 sf, 22.37% Impervious, Inflow Depth > 0.98" for 10 year event
Inflow = 0.35 cfs @ 12.11 hrs, Volume= 1,199 cf
Primary = 0.35 cfs @ 12.11 hrs, Volume= 1,199 cf, Atten= 0%, Lag= 0.0 min

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

Pond DP1: Merrimack River**Hydrograph**

Pre Dev*Type III 24-hr 25 year Rainfall=6.57"*

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Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentEX1: Site area

Runoff Area=14,750 sf 22.37% Impervious Runoff Depth>1.60"

Tc=6.0 min CN=54 Runoff=0.63 cfs 1,967 cf

Pond DP1: Merrimack River

Inflow=0.63 cfs 1,967 cf

Primary=0.63 cfs 1,967 cf

Total Runoff Area = 14,750 sf Runoff Volume = 1,967 cf Average Runoff Depth = 1.60"
77.63% Pervious = 11,450 sf 22.37% Impervious = 3,300 sf

Pre Dev

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Type III 24-hr 25 year Rainfall=6.57"

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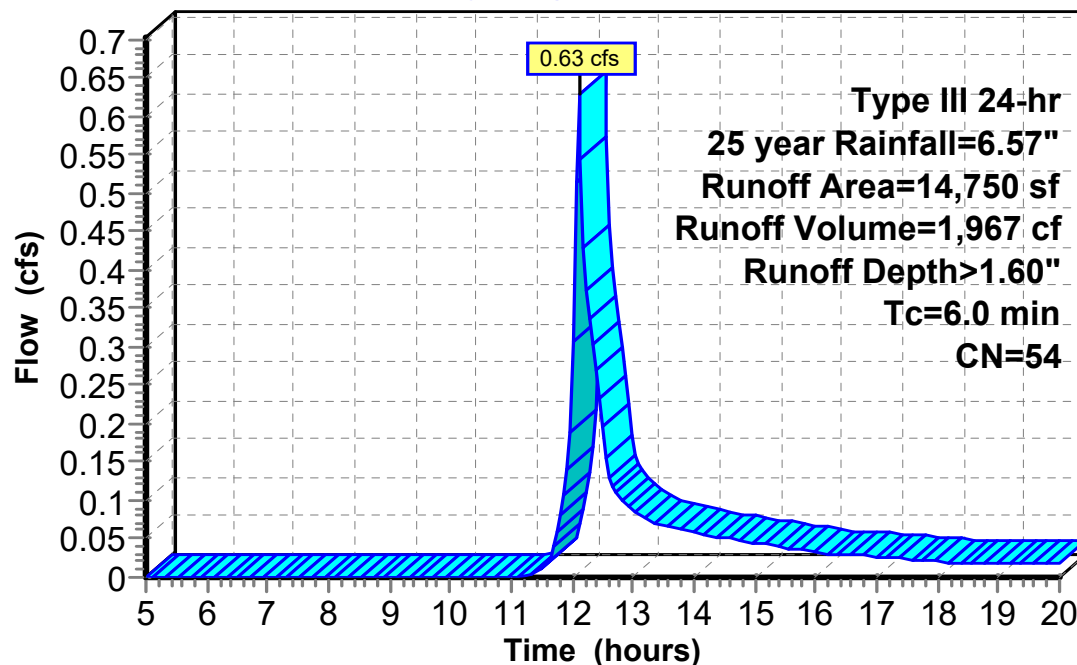
Summary for Subcatchment EX1: Site area

Runoff = 0.63 cfs @ 12.10 hrs, Volume= 1,967 cf, Depth> 1.60"
Routed to Pond DP1 : Merrimack River

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 year Rainfall=6.57"

Area (sf)	CN	Description
10,825	39	>75% Grass cover, Good, HSG A
2,425	98	Roofs, HSG A
* 625	80	Brick Patio
* 875	98	Walkways/Driveway
14,750	54	Weighted Average
11,450		77.63% Pervious Area
3,300		22.37% Impervious Area

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

Subcatchment EX1: Site area**Hydrograph**

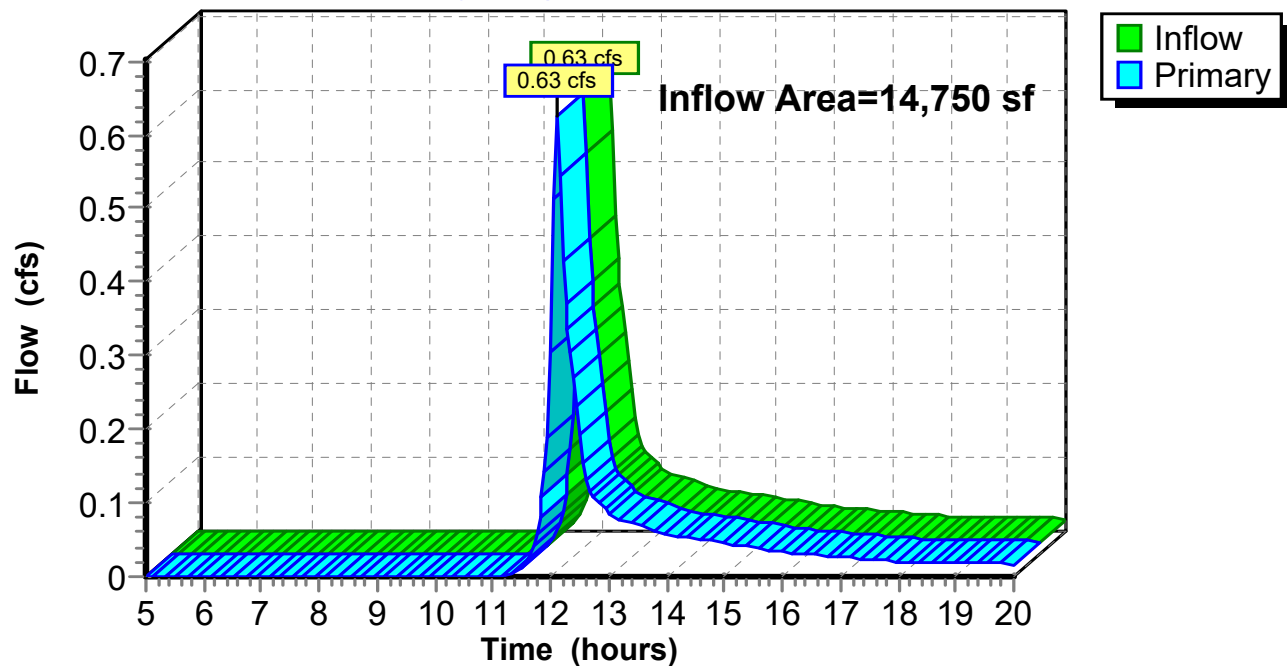
Runoff

Summary for Pond DP1: Merrimack River

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

Inflow Area = 14,750 sf, 22.37% Impervious, Inflow Depth > 1.60" for 25 year event
Inflow = 0.63 cfs @ 12.10 hrs, Volume= 1,967 cf
Primary = 0.63 cfs @ 12.10 hrs, Volume= 1,967 cf, Atten= 0%, Lag= 0.0 min

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

Pond DP1: Merrimack River**Hydrograph**

Pre Dev*Type III 24-hr 100 year Rainfall=8.46"*

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Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentEX1: Site area

Runoff Area=14,750 sf 22.37% Impervious Runoff Depth>2.74"

Tc=6.0 min CN=54 Runoff=1.12 cfs 3,362 cf

Pond DP1: Merrimack River

Inflow=1.12 cfs 3,362 cf

Primary=1.12 cfs 3,362 cf

Total Runoff Area = 14,750 sf Runoff Volume = 3,362 cf Average Runoff Depth = 2.74"
77.63% Pervious = 11,450 sf 22.37% Impervious = 3,300 sf

Pre Dev

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Type III 24-hr 100 year Rainfall=8.46"

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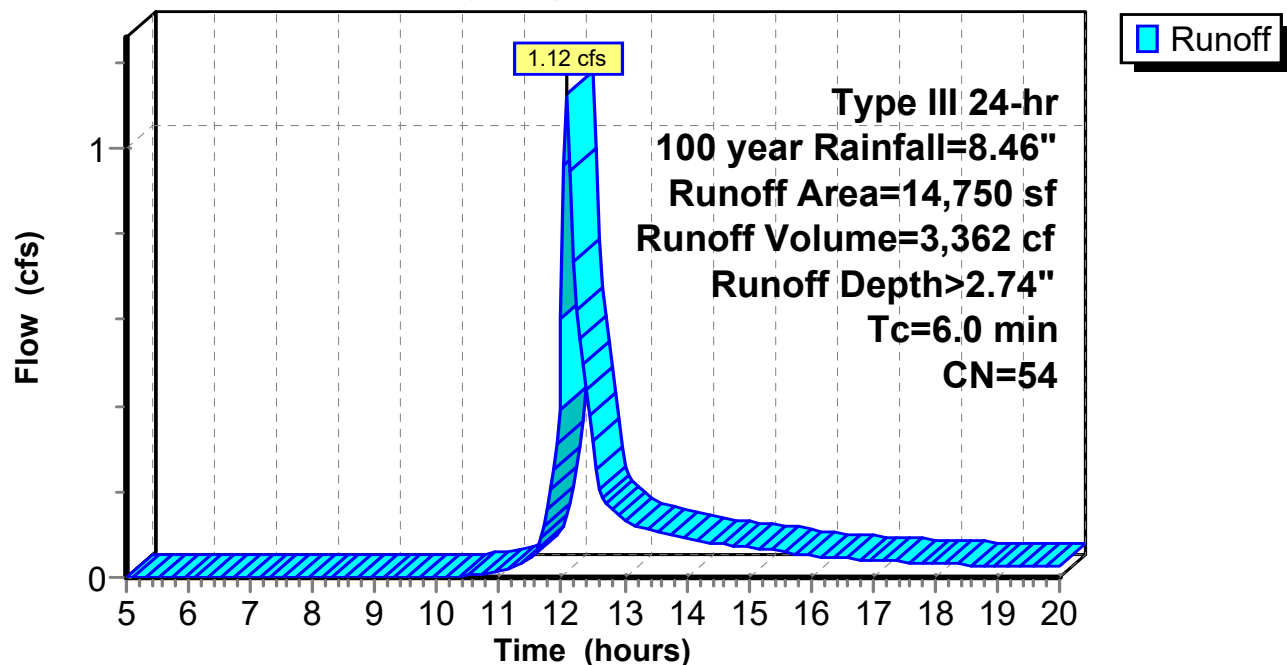
Summary for Subcatchment EX1: Site area

Runoff = 1.12 cfs @ 12.10 hrs, Volume= 3,362 cf, Depth> 2.74"
Routed to Pond DP1 : Merrimack River

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 year Rainfall=8.46"

Area (sf)	CN	Description
10,825	39	>75% Grass cover, Good, HSG A
2,425	98	Roofs, HSG A
* 625	80	Brick Patio
* 875	98	Walkways/Driveway
14,750	54	Weighted Average
11,450		77.63% Pervious Area
3,300		22.37% Impervious Area

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

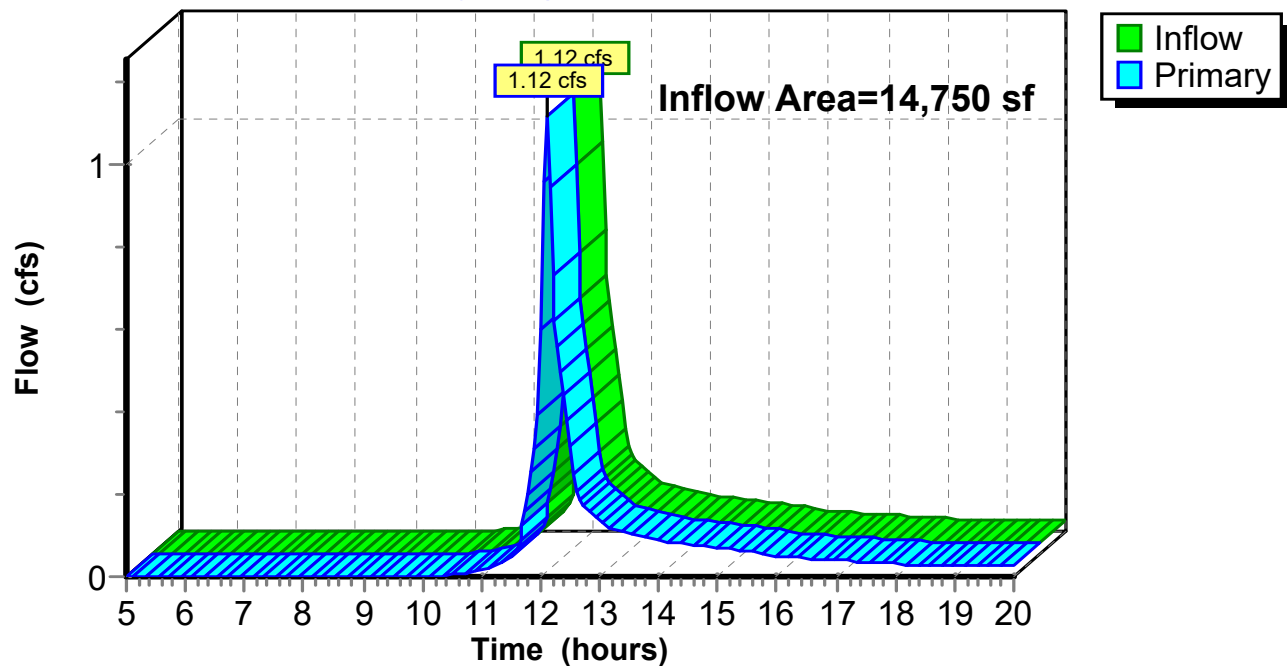
Subcatchment EX1: Site area**Hydrograph**

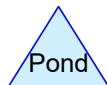
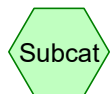
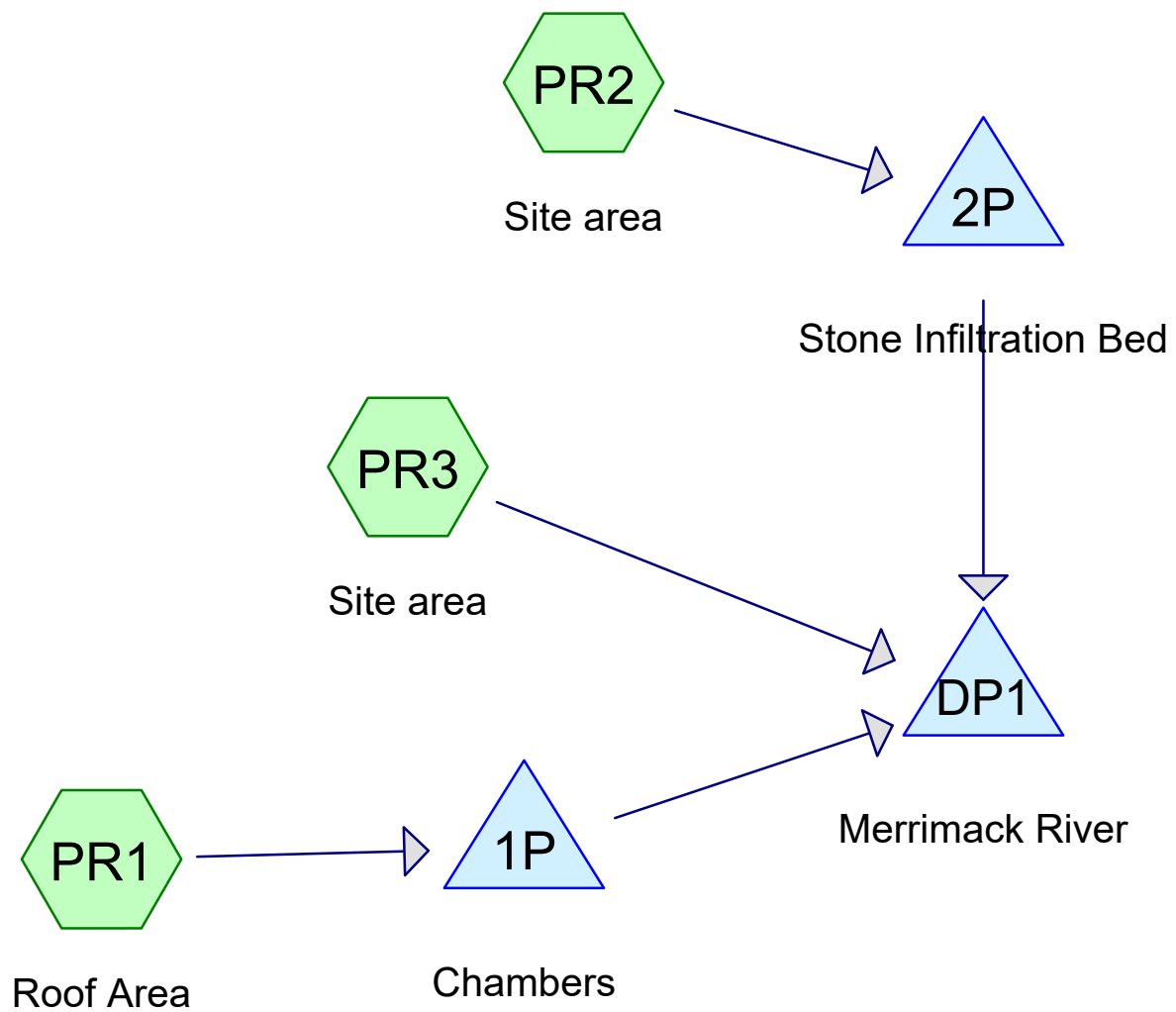
Summary for Pond DP1: Merrimack River

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

Inflow Area = 14,750 sf, 22.37% Impervious, Inflow Depth > 2.74" for 100 year event
Inflow = 1.12 cfs @ 12.10 hrs, Volume= 3,362 cf
Primary = 1.12 cfs @ 12.10 hrs, Volume= 3,362 cf, Atten= 0%, Lag= 0.0 min

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

Pond DP1: Merrimack River**Hydrograph**



Post Dev

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Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2 year	Type III 24-hr		Default	24.00	1	3.38	2
2	10 year	Type III 24-hr		Default	24.00	1	5.35	2
3	25 year	Type III 24-hr		Default	24.00	1	6.57	2
4	100 year	Type III 24-hr		Default	24.00	1	8.46	2

Post Dev

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Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
8,575	39	>75% Grass cover, Good, HSG A (PR3)
625	80	Brick Patio (PR3)
1,000	30	Brush, Good, HSG A (PR3)
550	80	Peastone Driveway (PR2)
2,425	98	Roofs, HSG A (PR3)
750	98	Unconnected roofs, HSG A (PR1)
825	98	Walkways/Driveway (PR3)
14,750	58	TOTAL AREA

Post Dev

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Type III 24-hr 2 year Rainfall=3.38"

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Summary for Subcatchment PR1: Roof Area

Runoff = 0.06 cfs @ 12.09 hrs, Volume= 184 cf, Depth> 2.94"
Routed to Pond 1P : Chambers

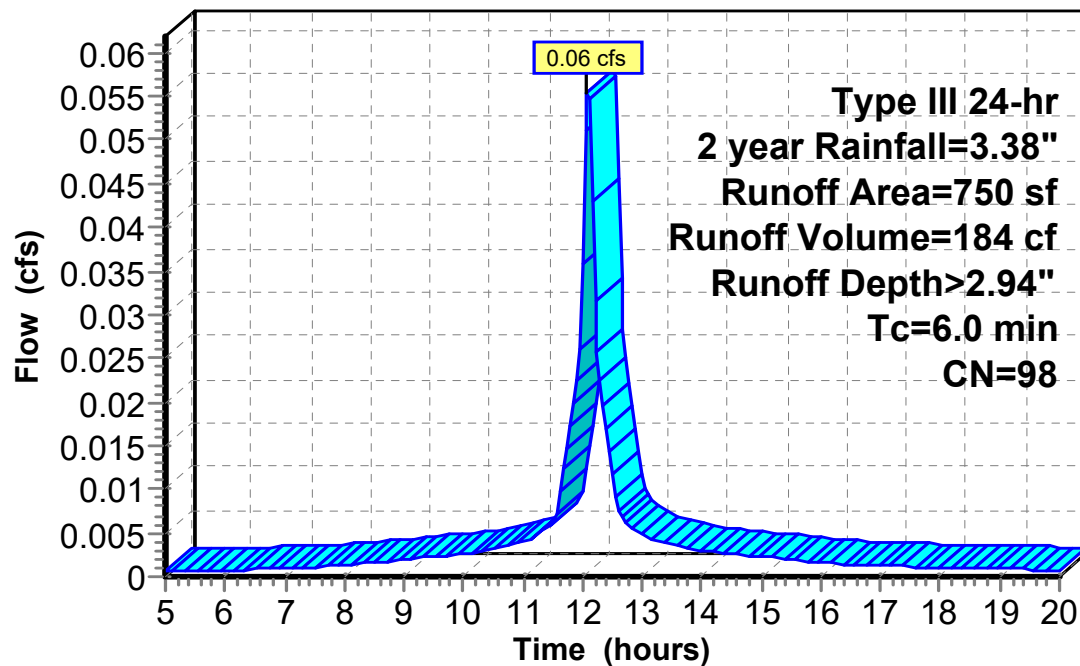
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year Rainfall=3.38"

Area (sf)	CN	Description
750	98	Unconnected roofs, HSG A
750		100.00% Impervious Area
750		100.00% Unconnected

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

Subcatchment PR1: Roof Area

Hydrograph



Runoff

Post Dev

Prepared by Hancock Associates

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Type III 24-hr 2 year Rainfall=3.38"

Printed 5/4/2026

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Summary for Subcatchment PR2: Site area

Runoff = 0.02 cfs @ 12.10 hrs, Volume= 65 cf, Depth> 1.43"
Routed to Pond 2P : Stone Infiltration Bed

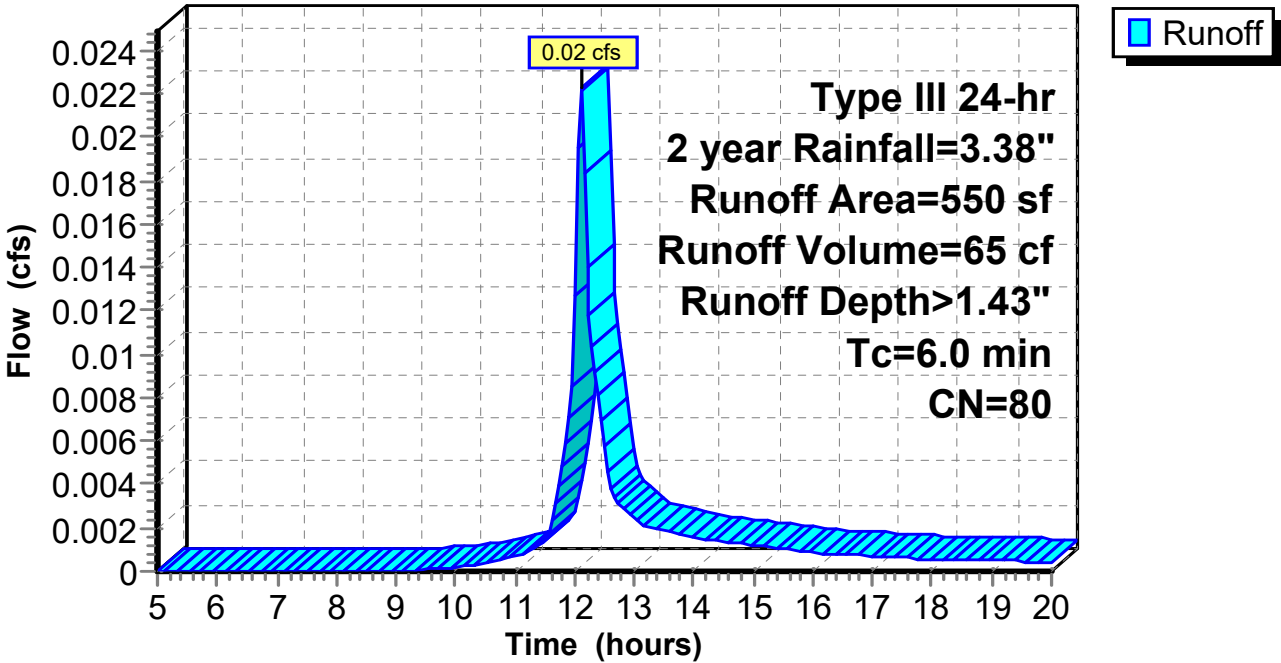
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year Rainfall=3.38"

	Area (sf)	CN	Description
*	550	80	Peastone Driveway
	550		100.00% Pervious Area

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

Subcatchment PR2: Site area

Hydrograph



Post Dev

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Type III 24-hr 2 year Rainfall=3.38"

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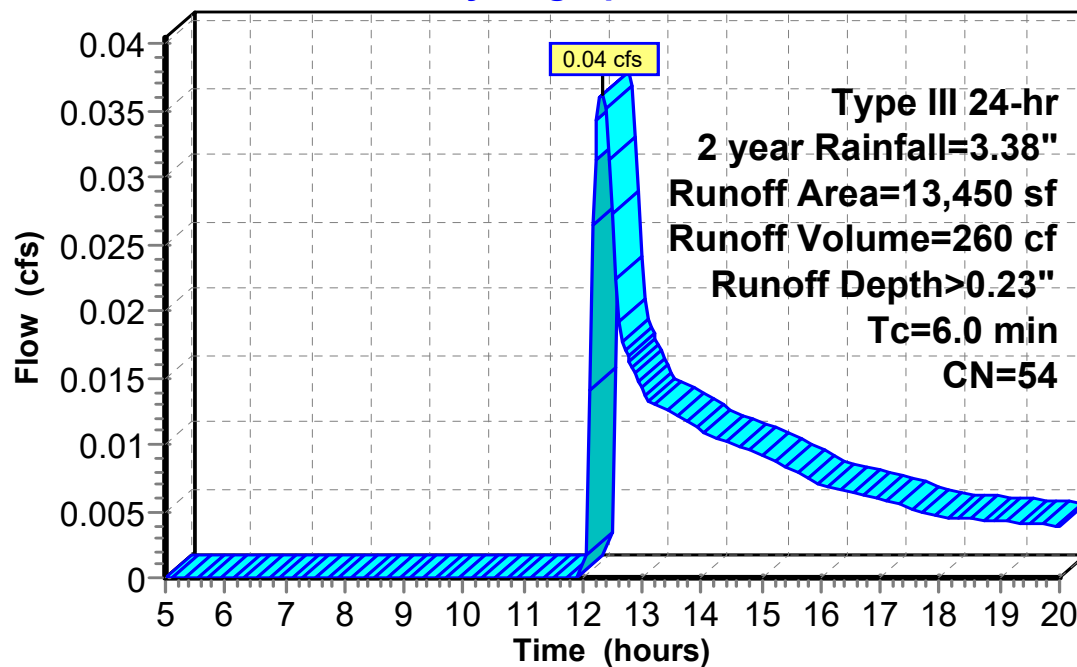
Summary for Subcatchment PR3: Site area

Runoff = 0.04 cfs @ 12.32 hrs, Volume= 260 cf, Depth> 0.23"
Routed to Pond DP1 : Merrimack River

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year Rainfall=3.38"

Area (sf)	CN	Description
8,575	39	>75% Grass cover, Good, HSG A
2,425	98	Roofs, HSG A
* 625	80	Brick Patio
* 825	98	Walkways/Driveway
1,000	30	Brush, Good, HSG A
13,450	54	Weighted Average
10,200		75.84% Pervious Area
3,250		24.16% Impervious Area

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

Subcatchment PR3: Site area**Hydrograph**

Runoff

Post Dev

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Type III 24-hr 2 year Rainfall=3.38"

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Summary for Pond 1P: Chambers

[82] Warning: Early inflow requires earlier time span

Inflow Area = 750 sf, 100.00% Impervious, Inflow Depth > 2.94" for 2 year event
 Inflow = 0.06 cfs @ 12.09 hrs, Volume= 184 cf
 Outflow = 0.01 cfs @ 11.65 hrs, Volume= 183 cf, Atten= 87%, Lag= 0.0 min
 Discarded = 0.01 cfs @ 11.65 hrs, Volume= 183 cf
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf
 Routed to Pond DP1 : Merrimack River

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 8.67' @ 12.64 hrs Surf.Area= 125 sf Storage= 61 cf

Plug-Flow detention time= 58.8 min calculated for 183 cf (100% of inflow)
 Center-of-Mass det. time= 58.1 min (796.1 - 738.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	7.66'	105 cf	10.17'W x 12.32'L x 2.33'H Field A 292 cf Overall - 29 cf Embedded = 263 cf x 40.0% Voids
#2A	8.16'	29 cf	ADS_StormTech SC-310 +Cap x 2 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap 2 Chambers in 2 Rows
#3	9.49'	2 cf	Inspection Port Grate (Prismatic) Listed below (Recalc)
		136 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
9.49	1	0	0
11.26	1	2	2

Device	Routing	Invert	Outlet Devices
#0	Primary	11.26'	Automatic Storage Overflow (Discharged without head)
#1	Discarded	7.66'	2.410 in/hr Exfiltration over Surface area
#2	Primary	11.25'	10.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.01 cfs @ 11.65 hrs HW=7.70' (Free Discharge)
 ↑ **1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=7.66' (Free Discharge)
 ↑ **2=Orifice/Grate** (Controls 0.00 cfs)

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Type III 24-hr 2 year Rainfall=3.38"

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Pond 1P: Chambers - Chamber Wizard Field A

Chamber Model = ADS_StormTechSC-310 +Cap (ADS StormTech®SC-310 with cap length)

Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf

Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap

34.0" Wide + 6.0" Spacing = 40.0" C-C Row Spacing

1 Chambers/Row x 7.12' Long +0.60' Cap Length x 2 = 8.32' Row Length +24.0" End Stone x 2 = 12.32' Base Length

2 Rows x 34.0" Wide + 6.0" Spacing x 1 + 24.0" Side Stone x 2 = 10.17' Base Width

6.0" Stone Base + 16.0" Chamber Height + 6.0" Stone Cover = 2.33' Field Height

2 Chambers x 14.7 cf = 29.5 cf Chamber Storage

292.3 cf Field - 29.5 cf Chambers = 262.8 cf Stone x 40.0% Voids = 105.1 cf Stone Storage

Chamber Storage + Stone Storage = 134.6 cf = 0.003 af

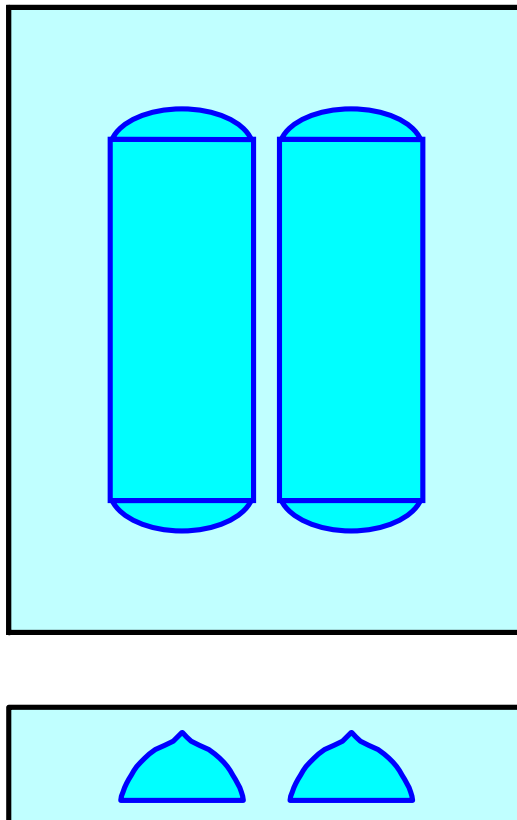
Overall Storage Efficiency = 46.1%

Overall System Size = 12.32' x 10.17' x 2.33'

2 Chambers

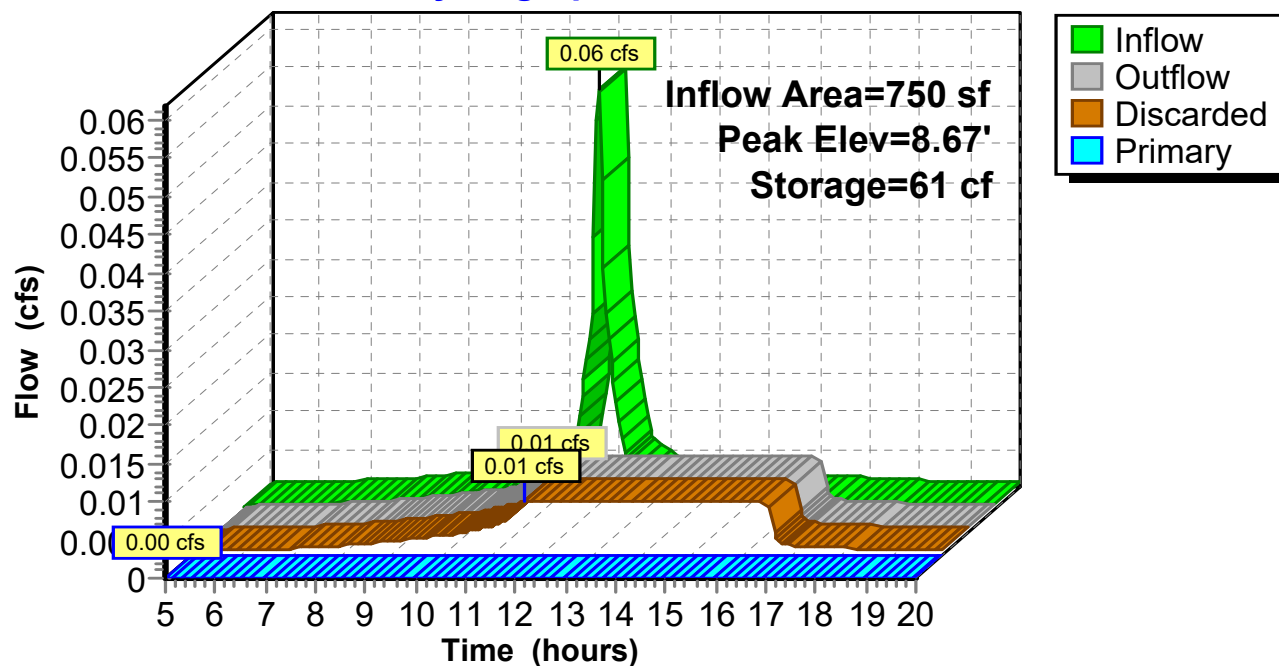
10.8 cy Field

9.7 cy Stone



Pond 1P: Chambers

Hydrograph



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Type III 24-hr 2 year Rainfall=3.38"

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Summary for Pond 2P: Stone Infiltration Bed

Inflow Area = 550 sf, 0.00% Impervious, Inflow Depth > 1.43" for 2 year event
 Inflow = 0.02 cfs @ 12.10 hrs, Volume= 65 cf
 Outflow = 0.02 cfs @ 12.13 hrs, Volume= 65 cf, Atten= 8%, Lag= 1.8 min
 Discarded = 0.02 cfs @ 12.13 hrs, Volume= 65 cf
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf
 Routed to Pond DP1 : Merrimack River

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 117.01' @ 12.13 hrs Surf.Area= 360 sf Storage= 1 cf
 Flood Elev= 118.00' Surf.Area= 360 sf Storage= 108 cf

Plug-Flow detention time= 0.9 min calculated for 65 cf (100% of inflow)
 Center-of-Mass det. time= 0.8 min (802.3 - 801.5)

Volume	Invert	Avail.Storage	Storage Description
#1	117.00'	108 cf	18.00'W x 20.00'L x 1.00'H Prismatoid 360 cf Overall x 30.0% Voids

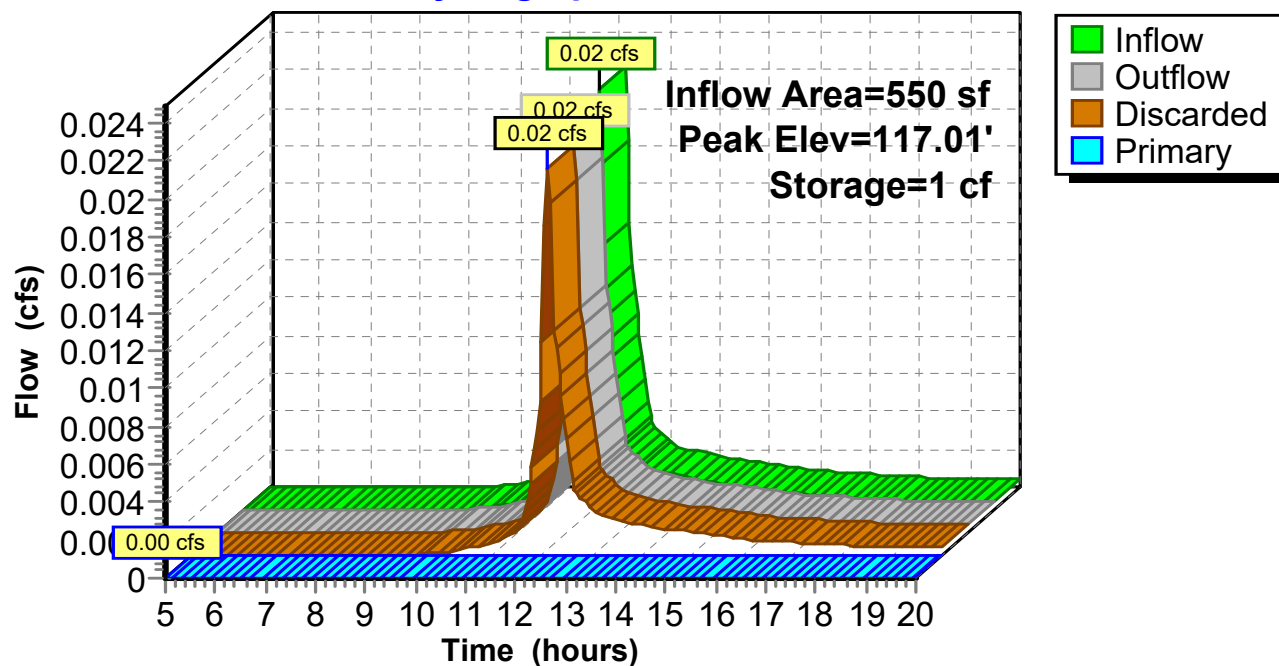
Device	Routing	Invert	Outlet Devices
#0	Primary	118.00'	Automatic Storage Overflow (Discharged without head)
#1	Discarded	117.00'	2.410 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.02 cfs @ 12.13 hrs HW=117.01' (Free Discharge)
 ↑**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=117.00' (Free Discharge)

Pond 2P: Stone Infiltration Bed

Hydrograph

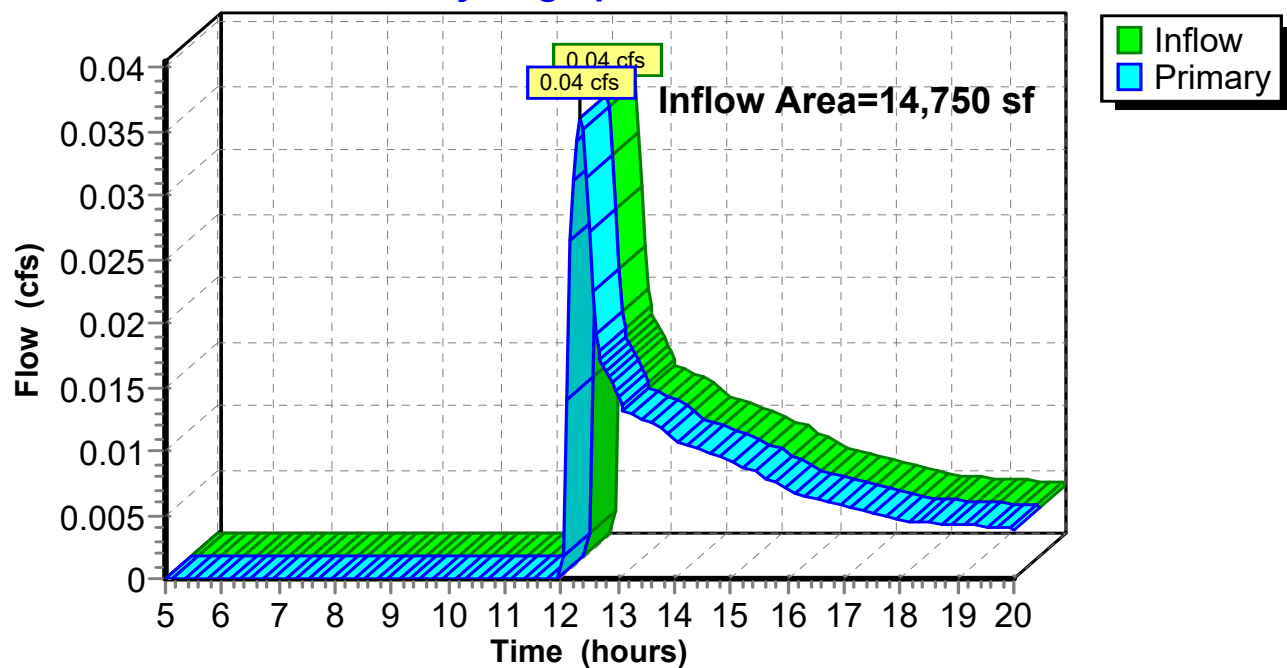


Summary for Pond DP1: Merrimack River

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

Inflow Area = 14,750 sf, 27.12% Impervious, Inflow Depth > 0.21" for 2 year event
Inflow = 0.04 cfs @ 12.32 hrs, Volume= 260 cf
Primary = 0.04 cfs @ 12.32 hrs, Volume= 260 cf, Atten= 0%, Lag= 0.0 min

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

Pond DP1: Merrimack River**Hydrograph**

Post Dev*Type III 24-hr 10 year Rainfall=5.35"*

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Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentPR1: Roof Area

Runoff Area=750 sf 100.00% Impervious Runoff Depth>4.74"
Tc=6.0 min CN=98 Runoff=0.09 cfs 296 cf

SubcatchmentPR2: Site area

Runoff Area=550 sf 0.00% Impervious Runoff Depth>2.99"
Tc=6.0 min CN=80 Runoff=0.05 cfs 137 cf

SubcatchmentPR3: Site area

Runoff Area=13,450 sf 24.16% Impervious Runoff Depth>0.98"
Tc=6.0 min CN=54 Runoff=0.32 cfs 1,093 cf

Pond 1P: Chambers

Peak Elev=9.65' Storage=117 cf Inflow=0.09 cfs 296 cf
Discarded=0.01 cfs 285 cf Primary=0.00 cfs 0 cf Outflow=0.01 cfs 285 cf

Pond 2P: Stone Infiltration Bed

Peak Elev=117.15' Storage=16 cf Inflow=0.05 cfs 137 cf
Discarded=0.02 cfs 137 cf Primary=0.00 cfs 0 cf Outflow=0.02 cfs 137 cf

Pond DP1: Merrimack River

Inflow=0.32 cfs 1,093 cf
Primary=0.32 cfs 1,093 cf

Total Runoff Area = 14,750 sf Runoff Volume = 1,527 cf Average Runoff Depth = 1.24"
72.88% Pervious = 10,750 sf 27.12% Impervious = 4,000 sf

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Type III 24-hr 10 year Rainfall=5.35"

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Summary for Subcatchment PR1: Roof Area

Runoff = 0.09 cfs @ 12.09 hrs, Volume= 296 cf, Depth> 4.74"
Routed to Pond 1P : Chambers

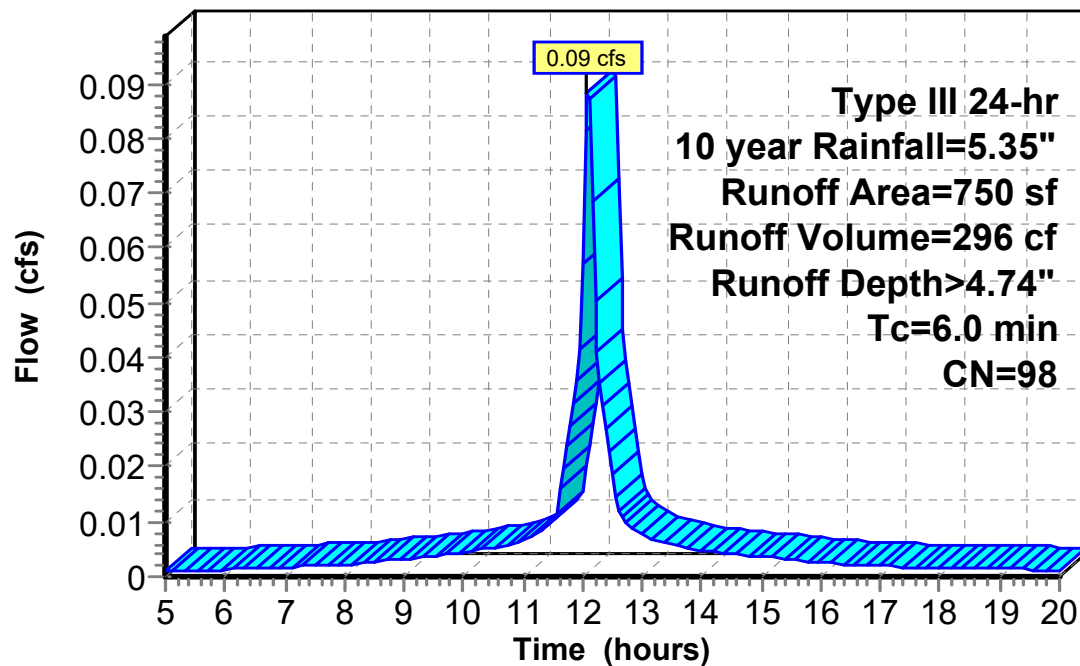
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 year Rainfall=5.35"

Area (sf)	CN	Description
750	98	Unconnected roofs, HSG A
750		100.00% Impervious Area
750		100.00% Unconnected

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

Subcatchment PR1: Roof Area

Hydrograph



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Type III 24-hr 10 year Rainfall=5.35"

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Summary for Subcatchment PR2: Site area

Runoff = 0.05 cfs @ 12.09 hrs, Volume= 137 cf, Depth> 2.99"
Routed to Pond 2P : Stone Infiltration Bed

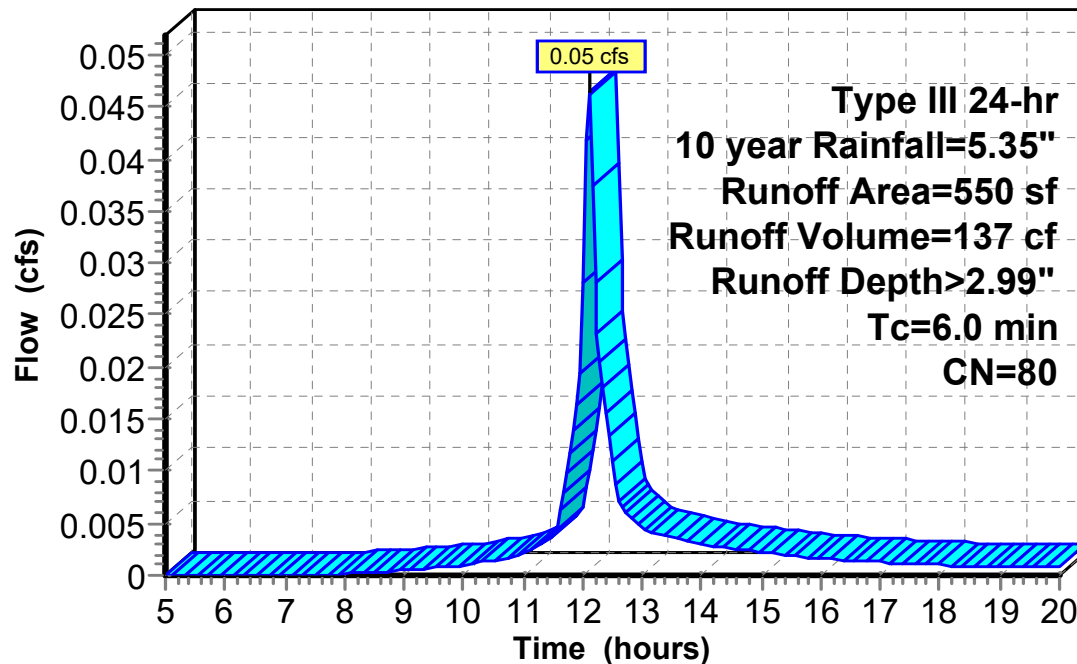
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 year Rainfall=5.35"

	Area (sf)	CN	Description
*	550	80	Peastone Driveway
	550		100.00% Pervious Area

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

Subcatchment PR2: Site area

Hydrograph



Runoff

Post Dev

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Type III 24-hr 10 year Rainfall=5.35"

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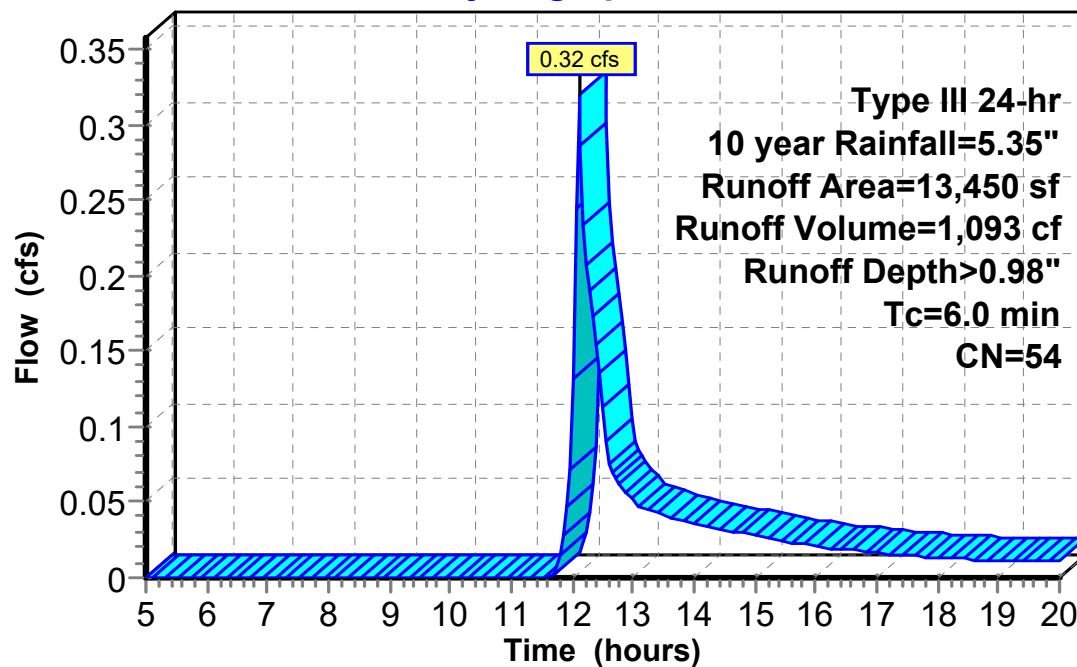
Summary for Subcatchment PR3: Site area

Runoff = 0.32 cfs @ 12.11 hrs, Volume= 1,093 cf, Depth> 0.98"
Routed to Pond DP1 : Merrimack River

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 year Rainfall=5.35"

Area (sf)	CN	Description
8,575	39	>75% Grass cover, Good, HSG A
2,425	98	Roofs, HSG A
* 625	80	Brick Patio
* 825	98	Walkways/Driveway
1,000	30	Brush, Good, HSG A
13,450	54	Weighted Average
10,200		75.84% Pervious Area
3,250		24.16% Impervious Area

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

Subcatchment PR3: Site area**Hydrograph**

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Type III 24-hr 10 year Rainfall=5.35"

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Summary for Pond 1P: Chambers

[82] Warning: Early inflow requires earlier time span

Inflow Area = 750 sf, 100.00% Impervious, Inflow Depth > 4.74" for 10 year event
 Inflow = 0.09 cfs @ 12.09 hrs, Volume= 296 cf
 Outflow = 0.01 cfs @ 12.50 hrs, Volume= 285 cf, Atten= 92%, Lag= 24.8 min
 Discarded = 0.01 cfs @ 12.50 hrs, Volume= 285 cf
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf
 Routed to Pond DP1 : Merrimack River

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 9.65' @ 13.07 hrs Surf.Area= 126 sf Storage= 117 cf

Plug-Flow detention time= 132.2 min calculated for 285 cf (96% of inflow)
 Center-of-Mass det. time= 116.0 min (850.8 - 734.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	7.66'	105 cf	10.17'W x 12.32'L x 2.33'H Field A 292 cf Overall - 29 cf Embedded = 263 cf x 40.0% Voids
#2A	8.16'	29 cf	ADS_StormTech SC-310 +Cap x 2 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap 2 Chambers in 2 Rows
#3	9.49'	2 cf	Inspection Port Grate (Prismatic) Listed below (Recalc)
		136 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
9.49	1	0	0
11.26	1	2	2

Device	Routing	Invert	Outlet Devices
#0	Primary	11.26'	Automatic Storage Overflow (Discharged without head)
#1	Discarded	7.66'	2.410 in/hr Exfiltration over Surface area
#2	Primary	11.25'	10.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.01 cfs @ 12.50 hrs HW=9.52' (Free Discharge)
 ↑ **1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=7.66' (Free Discharge)
 ↑ **2=Orifice/Grate** (Controls 0.00 cfs)

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Type III 24-hr 10 year Rainfall=5.35"

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Pond 1P: Chambers - Chamber Wizard Field A

Chamber Model = ADS_StormTechSC-310 +Cap (ADS StormTech®SC-310 with cap length)

Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf

Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap

34.0" Wide + 6.0" Spacing = 40.0" C-C Row Spacing

1 Chambers/Row x 7.12' Long +0.60' Cap Length x 2 = 8.32' Row Length +24.0" End Stone x 2 = 12.32' Base Length

2 Rows x 34.0" Wide + 6.0" Spacing x 1 + 24.0" Side Stone x 2 = 10.17' Base Width

6.0" Stone Base + 16.0" Chamber Height + 6.0" Stone Cover = 2.33' Field Height

2 Chambers x 14.7 cf = 29.5 cf Chamber Storage

292.3 cf Field - 29.5 cf Chambers = 262.8 cf Stone x 40.0% Voids = 105.1 cf Stone Storage

Chamber Storage + Stone Storage = 134.6 cf = 0.003 af

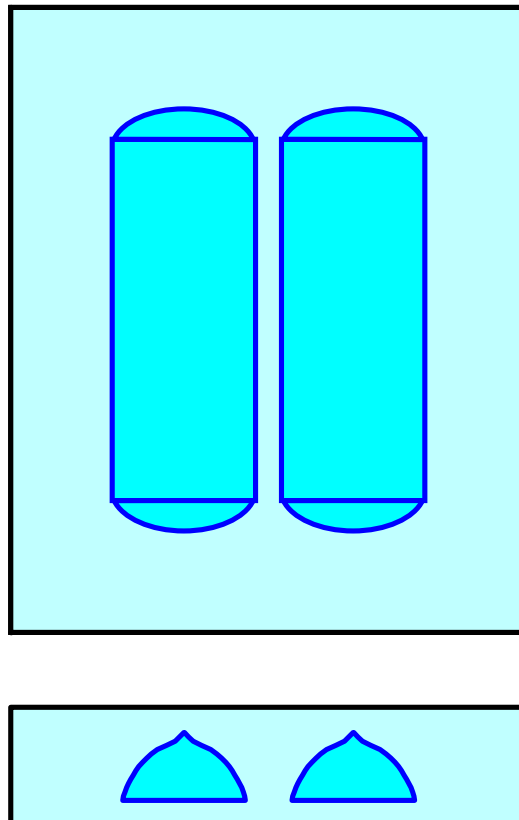
Overall Storage Efficiency = 46.1%

Overall System Size = 12.32' x 10.17' x 2.33'

2 Chambers

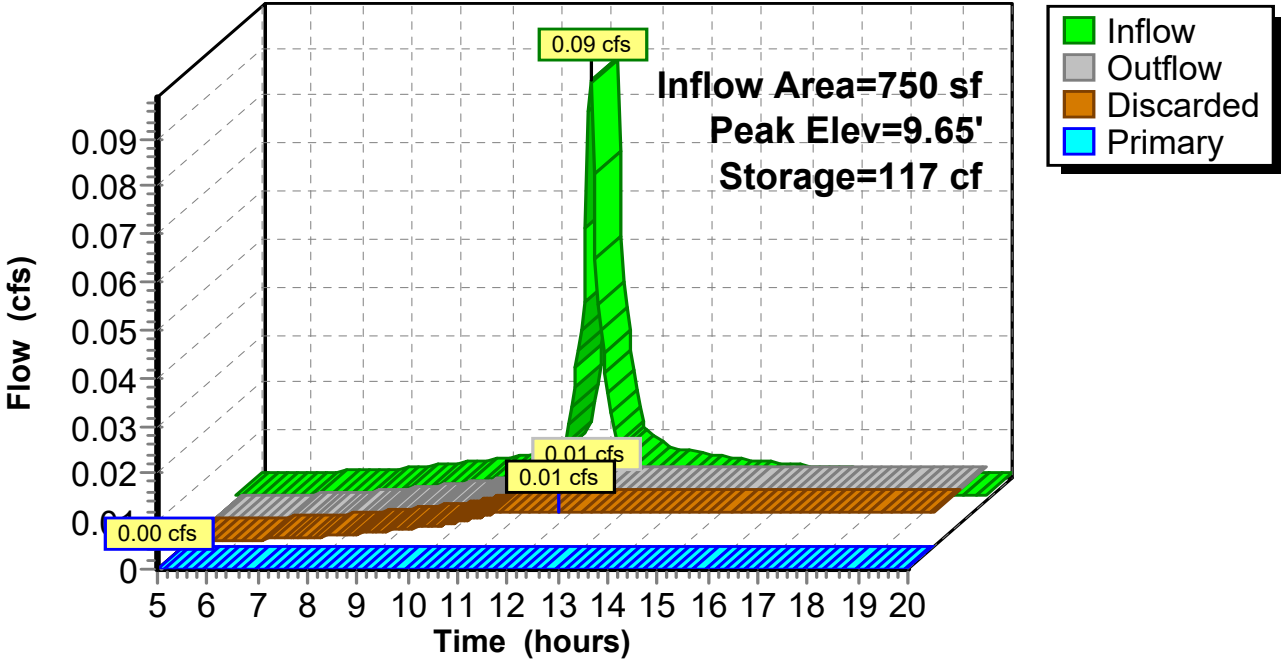
10.8 cy Field

9.7 cy Stone



Pond 1P: Chambers

Hydrograph



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Type III 24-hr 10 year Rainfall=5.35"

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Summary for Pond 2P: Stone Infiltration Bed

Inflow Area = 550 sf, 0.00% Impervious, Inflow Depth > 2.99" for 10 year event
 Inflow = 0.05 cfs @ 12.09 hrs, Volume= 137 cf
 Outflow = 0.02 cfs @ 12.00 hrs, Volume= 137 cf, Atten= 57%, Lag= 0.0 min
 Discarded = 0.02 cfs @ 12.00 hrs, Volume= 137 cf
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf
 Routed to Pond DP1 : Merrimack River

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 117.15' @ 12.31 hrs Surf.Area= 360 sf Storage= 16 cf
 Flood Elev= 118.00' Surf.Area= 360 sf Storage= 108 cf

Plug-Flow detention time= 4.2 min calculated for 137 cf (100% of inflow)
 Center-of-Mass det. time= 4.0 min (788.7 - 784.6)

Volume	Invert	Avail.Storage	Storage Description
#1	117.00'	108 cf	18.00'W x 20.00'L x 1.00'H Prismatic 360 cf Overall x 30.0% Voids

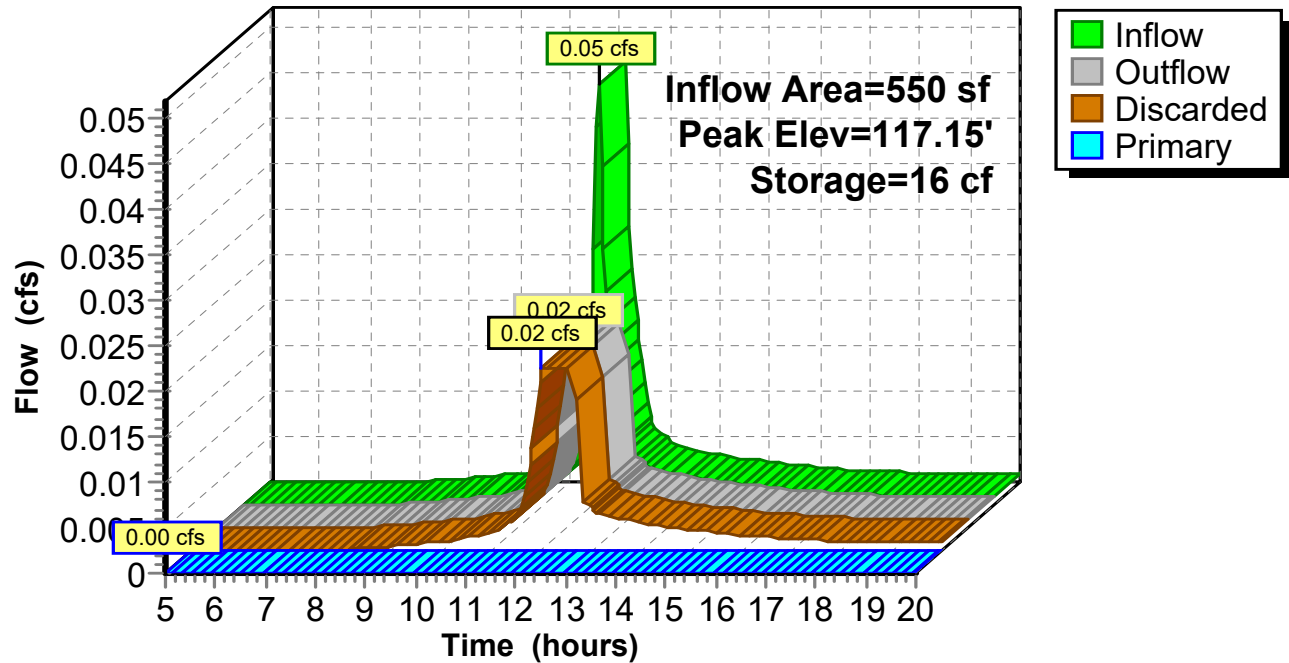
Device	Routing	Invert	Outlet Devices
#0	Primary	118.00'	Automatic Storage Overflow (Discharged without head)
#1	Discarded	117.00'	2.410 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.02 cfs @ 12.00 hrs HW=117.02' (Free Discharge)
 ↑**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=117.00' (Free Discharge)

Pond 2P: Stone Infiltration Bed

Hydrograph



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Type III 24-hr 10 year Rainfall=5.35"

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Summary for Pond DP1: Merrimack River

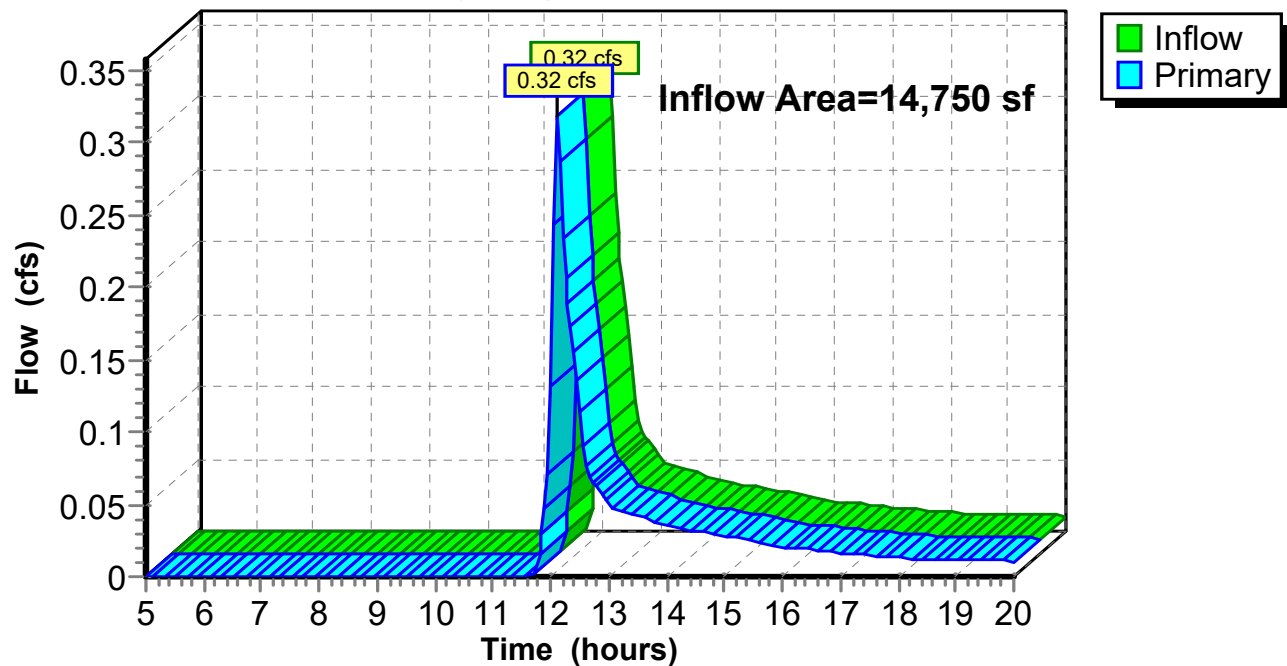
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 14,750 sf, 27.12% Impervious, Inflow Depth > 0.89" for 10 year event
Inflow = 0.32 cfs @ 12.11 hrs, Volume= 1,093 cf
Primary = 0.32 cfs @ 12.11 hrs, Volume= 1,093 cf, Atten= 0%, Lag= 0.0 min

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

Pond DP1: Merrimack River

Hydrograph



Post Dev*Type III 24-hr 25 year Rainfall=6.57"*

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Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentPR1: Roof Area

Runoff Area=750 sf 100.00% Impervious Runoff Depth>5.85"
Tc=6.0 min CN=98 Runoff=0.11 cfs 365 cf

SubcatchmentPR2: Site area

Runoff Area=550 sf 0.00% Impervious Runoff Depth>4.04"
Tc=6.0 min CN=80 Runoff=0.06 cfs 185 cf

SubcatchmentPR3: Site area

Runoff Area=13,450 sf 24.16% Impervious Runoff Depth>1.60"
Tc=6.0 min CN=54 Runoff=0.57 cfs 1,794 cf

Pond 1P: Chambers

Peak Elev=11.26' Storage=136 cf Inflow=0.11 cfs 365 cf
Discarded=0.01 cfs 299 cf Primary=0.02 cfs 21 cf Outflow=0.03 cfs 321 cf

Pond 2P: Stone Infiltration Bed

Peak Elev=117.30' Storage=32 cf Inflow=0.06 cfs 185 cf
Discarded=0.02 cfs 185 cf Primary=0.00 cfs 0 cf Outflow=0.02 cfs 185 cf

Pond DP1: Merrimack River

Inflow=0.57 cfs 1,815 cf
Primary=0.57 cfs 1,815 cf

Total Runoff Area = 14,750 sf Runoff Volume = 2,344 cf Average Runoff Depth = 1.91"
72.88% Pervious = 10,750 sf 27.12% Impervious = 4,000 sf

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Type III 24-hr 25 year Rainfall=6.57"

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Summary for Subcatchment PR1: Roof Area

Runoff = 0.11 cfs @ 12.09 hrs, Volume= 365 cf, Depth> 5.85"
Routed to Pond 1P : Chambers

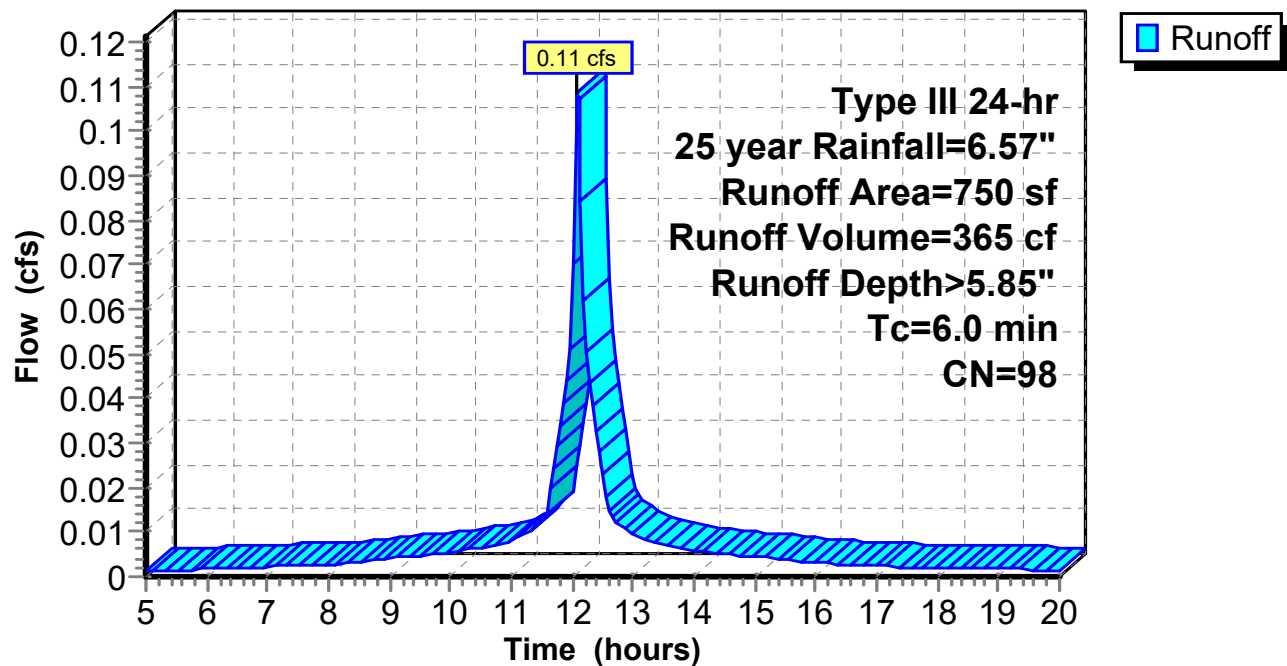
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 year Rainfall=6.57"

Area (sf)	CN	Description
750	98	Unconnected roofs, HSG A
750		100.00% Impervious Area
750		100.00% Unconnected

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

Subcatchment PR1: Roof Area

Hydrograph



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Type III 24-hr 25 year Rainfall=6.57"

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Summary for Subcatchment PR2: Site area

Runoff = 0.06 cfs @ 12.09 hrs, Volume= 185 cf, Depth> 4.04"
Routed to Pond 2P : Stone Infiltration Bed

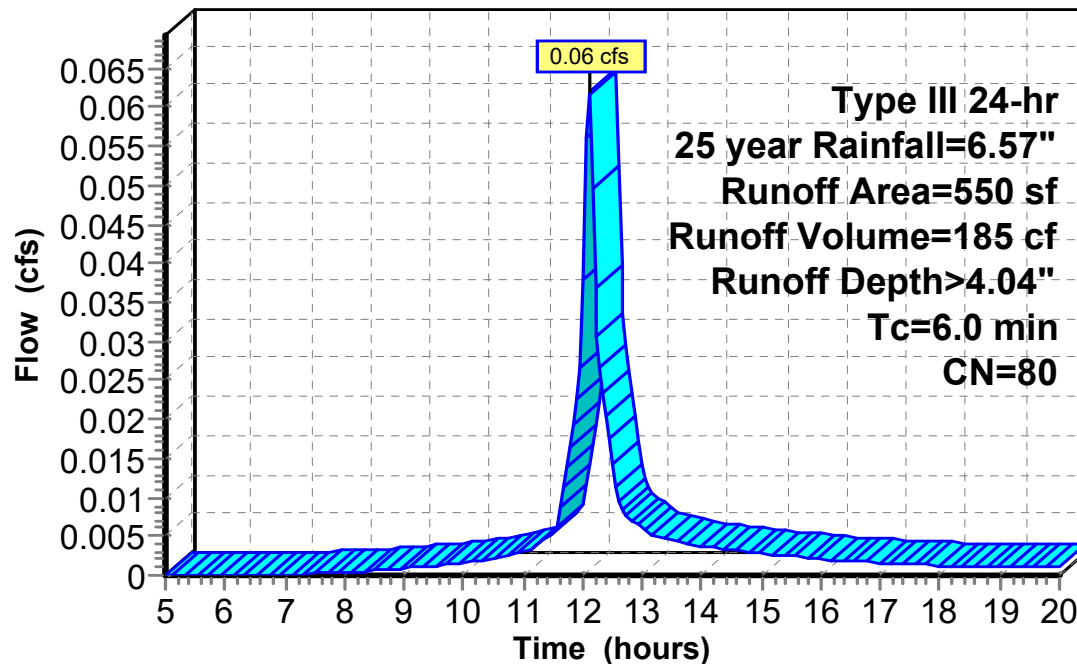
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 year Rainfall=6.57"

	Area (sf)	CN	Description
*	550	80	Peastone Driveway
	550		100.00% Pervious Area

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

Subcatchment PR2: Site area

Hydrograph



Runoff

Post Dev

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Type III 24-hr 25 year Rainfall=6.57"

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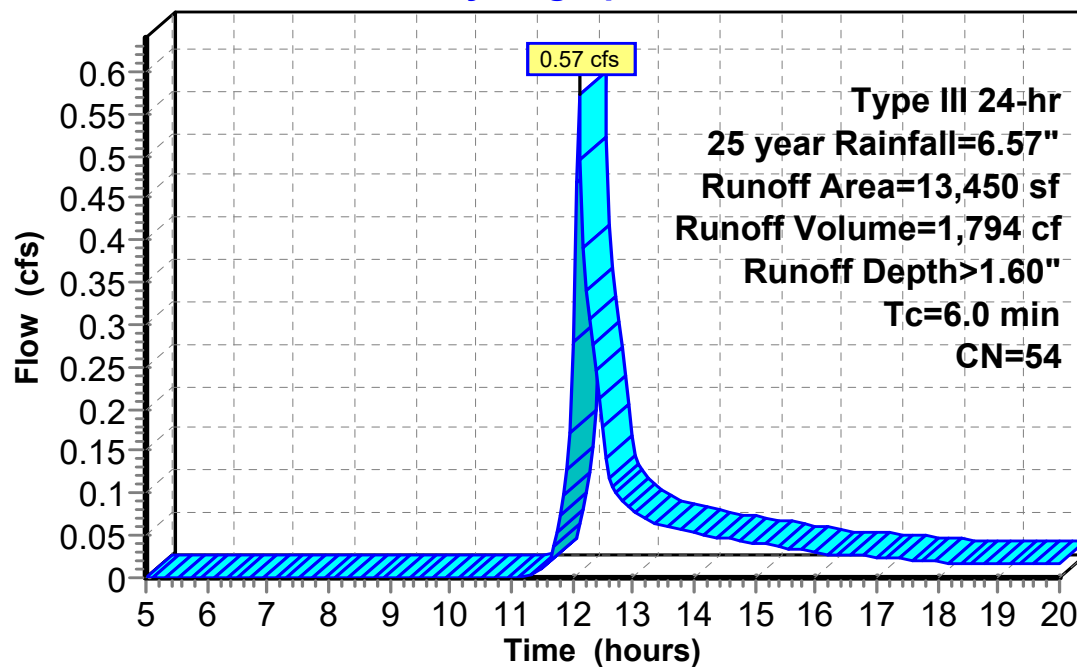
Summary for Subcatchment PR3: Site area

Runoff = 0.57 cfs @ 12.10 hrs, Volume= 1,794 cf, Depth> 1.60"
Routed to Pond DP1 : Merrimack River

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 year Rainfall=6.57"

Area (sf)	CN	Description
8,575	39	>75% Grass cover, Good, HSG A
2,425	98	Roofs, HSG A
* 625	80	Brick Patio
* 825	98	Walkways/Driveway
1,000	30	Brush, Good, HSG A
13,450	54	Weighted Average
10,200		75.84% Pervious Area
3,250		24.16% Impervious Area

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

Subcatchment PR3: Site area**Hydrograph**

Runoff

Post Dev

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Type III 24-hr 25 year Rainfall=6.57"

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Summary for Pond 1P: Chambers

[82] Warning: Early inflow requires earlier time span

[85] Warning: Oscillations may require smaller dt or Finer Routing (severity=7)

Inflow Area = 750 sf, 100.00% Impervious, Inflow Depth > 5.85" for 25 year event
 Inflow = 0.11 cfs @ 12.09 hrs, Volume= 365 cf
 Outflow = 0.03 cfs @ 12.46 hrs, Volume= 321 cf, Atten= 72%, Lag= 22.3 min
 Discarded = 0.01 cfs @ 12.20 hrs, Volume= 299 cf
 Primary = 0.02 cfs @ 12.46 hrs, Volume= 21 cf
 Routed to Pond DP1 : Merrimack River

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

Peak Elev= 11.26' @ 12.40 hrs Surf.Area= 126 sf Storage= 136 cf

Plug-Flow detention time= 136.4 min calculated for 321 cf (88% of inflow)

Center-of-Mass det. time= 96.5 min (830.2 - 733.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	7.66'	105 cf	10.17'W x 12.32'L x 2.33'H Field A 292 cf Overall - 29 cf Embedded = 263 cf x 40.0% Voids
#2A	8.16'	29 cf	ADS_StormTech SC-310 +Cap x 2 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap 2 Chambers in 2 Rows
#3	9.49'	2 cf	Inspection Port Grate (Prismatic) Listed below (Recalc)
		136 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
9.49	1	0	0
11.26	1	2	2

Device	Routing	Invert	Outlet Devices
#0	Primary	11.26'	Automatic Storage Overflow (Discharged without head)
#1	Discarded	7.66'	2.410 in/hr Exfiltration over Surface area
#2	Primary	11.25'	10.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.01 cfs @ 12.20 hrs HW=9.52' (Free Discharge)↑ **1=Exfiltration** (Exfiltration Controls 0.01 cfs)**Primary OutFlow** Max=0.01 cfs @ 12.46 hrs HW=11.26' (Free Discharge)↑ **2=Orifice/Grate** (Weir Controls 0.01 cfs @ 0.33 fps)

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Type III 24-hr 25 year Rainfall=6.57"

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Pond 1P: Chambers - Chamber Wizard Field A

Chamber Model = ADS_StormTechSC-310 +Cap (ADS StormTech®SC-310 with cap length)

Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf

Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap

34.0" Wide + 6.0" Spacing = 40.0" C-C Row Spacing

1 Chambers/Row x 7.12' Long +0.60' Cap Length x 2 = 8.32' Row Length +24.0" End Stone x 2 = 12.32' Base Length

2 Rows x 34.0" Wide + 6.0" Spacing x 1 + 24.0" Side Stone x 2 = 10.17' Base Width

6.0" Stone Base + 16.0" Chamber Height + 6.0" Stone Cover = 2.33' Field Height

2 Chambers x 14.7 cf = 29.5 cf Chamber Storage

292.3 cf Field - 29.5 cf Chambers = 262.8 cf Stone x 40.0% Voids = 105.1 cf Stone Storage

Chamber Storage + Stone Storage = 134.6 cf = 0.003 af

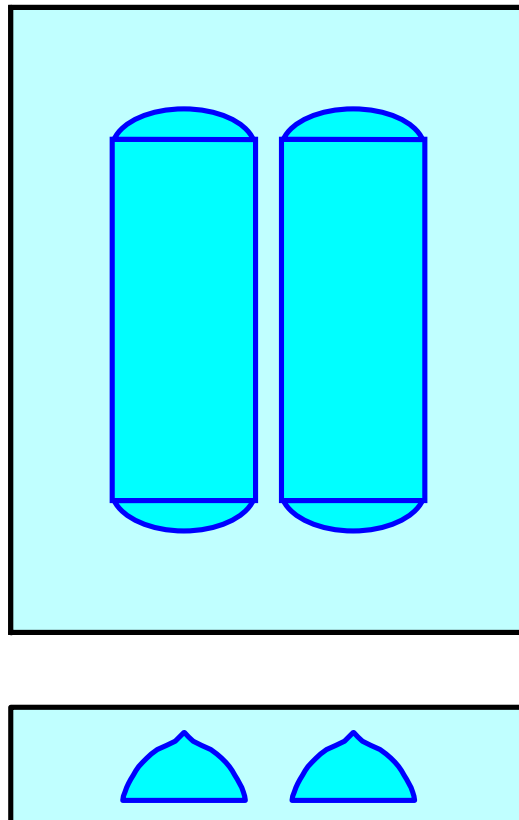
Overall Storage Efficiency = 46.1%

Overall System Size = 12.32' x 10.17' x 2.33'

2 Chambers

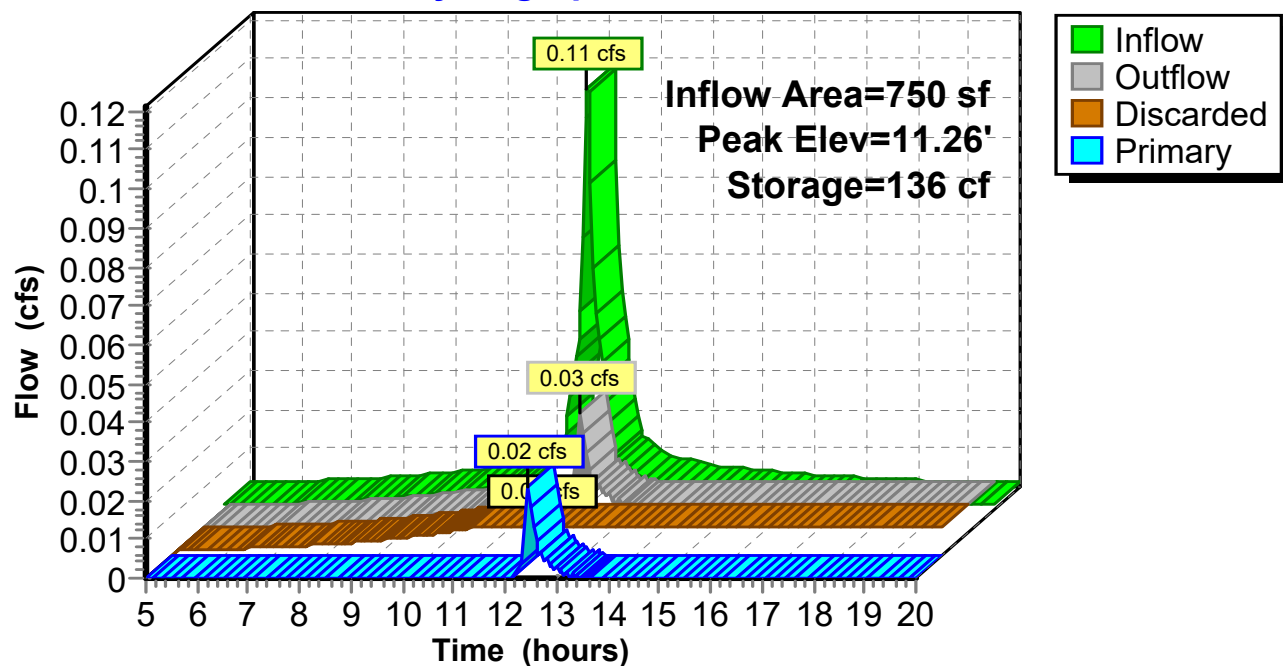
10.8 cy Field

9.7 cy Stone



Pond 1P: Chambers

Hydrograph



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Type III 24-hr 25 year Rainfall=6.57"

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Summary for Pond 2P: Stone Infiltration Bed

Inflow Area = 550 sf, 0.00% Impervious, Inflow Depth > 4.04" for 25 year event
 Inflow = 0.06 cfs @ 12.09 hrs, Volume= 185 cf
 Outflow = 0.02 cfs @ 11.90 hrs, Volume= 185 cf, Atten= 68%, Lag= 0.0 min
 Discarded = 0.02 cfs @ 11.90 hrs, Volume= 185 cf
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf
 Routed to Pond DP1 : Merrimack River

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 117.30' @ 12.41 hrs Surf.Area= 360 sf Storage= 32 cf
 Flood Elev= 118.00' Surf.Area= 360 sf Storage= 108 cf

Plug-Flow detention time= 8.3 min calculated for 184 cf (100% of inflow)
 Center-of-Mass det. time= 8.1 min (785.7 - 777.6)

Volume	Invert	Avail.Storage	Storage Description
#1	117.00'	108 cf	18.00'W x 20.00'L x 1.00'H Prismatic 360 cf Overall x 30.0% Voids

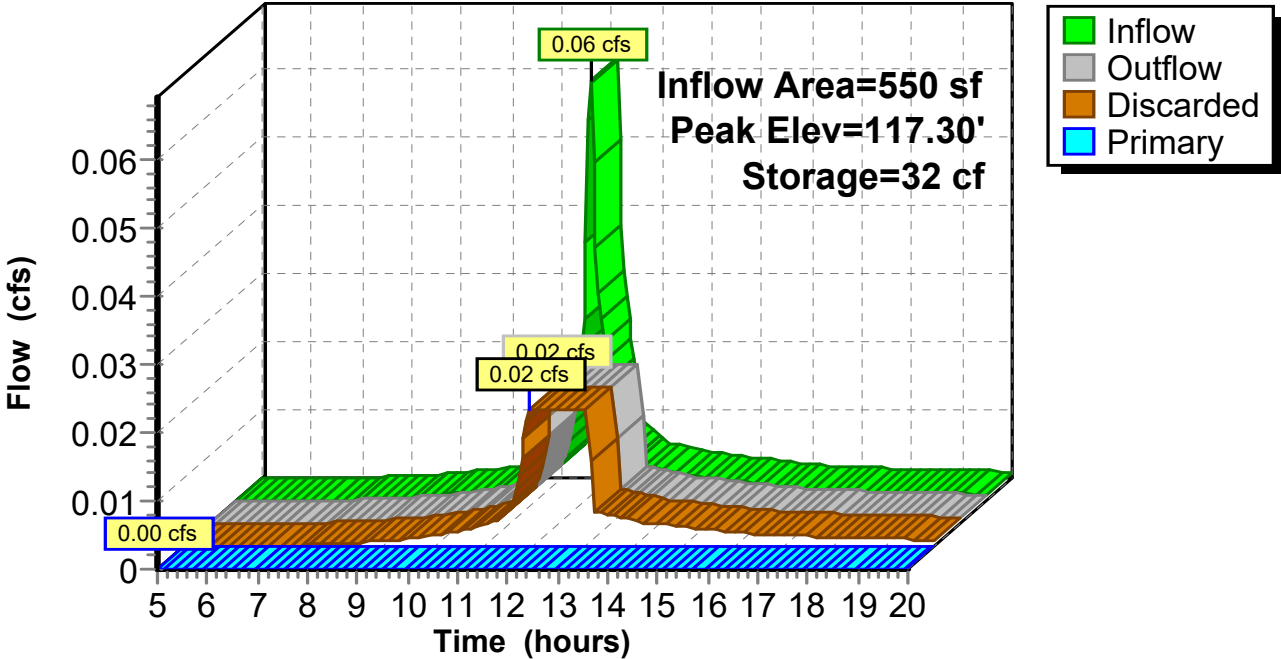
Device	Routing	Invert	Outlet Devices
#0	Primary	118.00'	Automatic Storage Overflow (Discharged without head)
#1	Discarded	117.00'	2.410 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.02 cfs @ 11.90 hrs HW=117.01' (Free Discharge)
 ↑**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=117.00' (Free Discharge)

Pond 2P: Stone Infiltration Bed

Hydrograph



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Type III 24-hr 25 year Rainfall=6.57"

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Summary for Pond DP1: Merrimack River

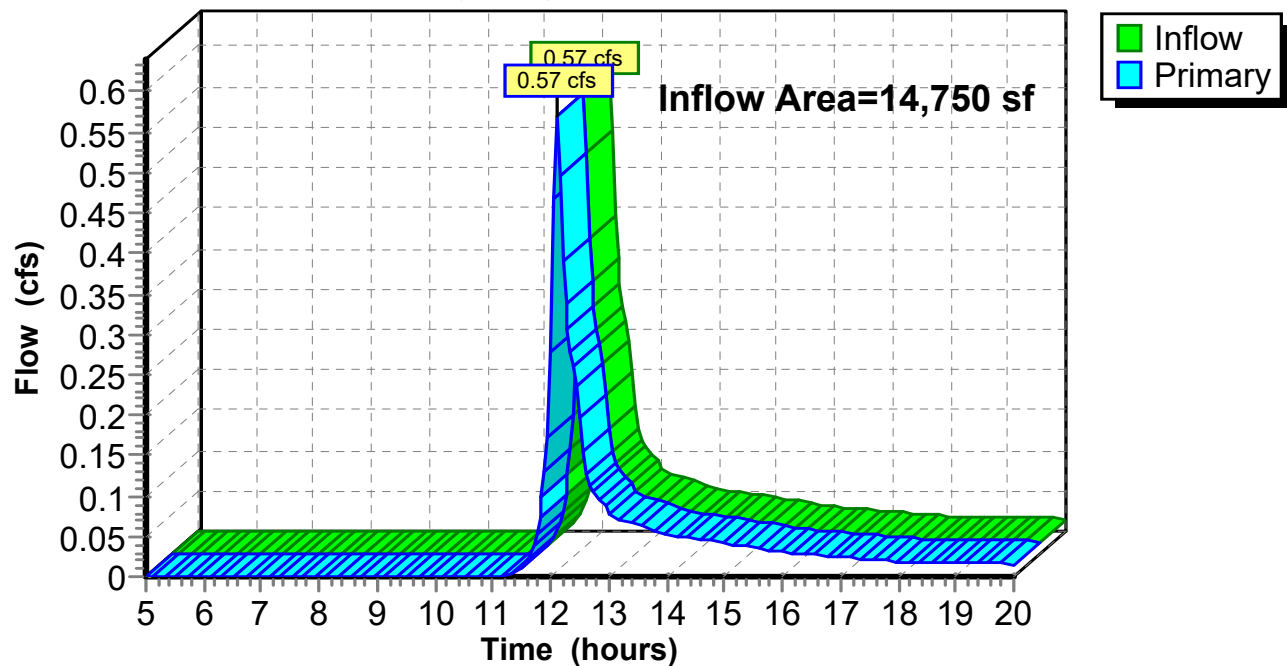
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 14,750 sf, 27.12% Impervious, Inflow Depth > 1.48" for 25 year event
Inflow = 0.57 cfs @ 12.10 hrs, Volume= 1,815 cf
Primary = 0.57 cfs @ 12.10 hrs, Volume= 1,815 cf, Atten= 0%, Lag= 0.0 min

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

Pond DP1: Merrimack River

Hydrograph



Post Dev*Type III 24-hr 100 year Rainfall=8.46"*

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Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentPR1: Roof Area

Runoff Area=750 sf 100.00% Impervious Runoff Depth>7.56"
Tc=6.0 min CN=98 Runoff=0.14 cfs 473 cf

SubcatchmentPR2: Site area

Runoff Area=550 sf 0.00% Impervious Runoff Depth>5.71"
Tc=6.0 min CN=80 Runoff=0.09 cfs 262 cf

SubcatchmentPR3: Site area

Runoff Area=13,450 sf 24.16% Impervious Runoff Depth>2.74"
Tc=6.0 min CN=54 Runoff=1.02 cfs 3,066 cf

Pond 1P: Chambers

Peak Elev=11.26' Storage=136 cf Inflow=0.14 cfs 473 cf
Discarded=0.01 cfs 317 cf Primary=0.09 cfs 92 cf Outflow=0.10 cfs 409 cf

Pond 2P: Stone Infiltration Bed

Peak Elev=117.58' Storage=62 cf Inflow=0.09 cfs 262 cf
Discarded=0.02 cfs 262 cf Primary=0.00 cfs 0 cf Outflow=0.02 cfs 262 cf

Pond DP1: Merrimack River

Inflow=1.02 cfs 3,158 cf
Primary=1.02 cfs 3,158 cf

Total Runoff Area = 14,750 sf Runoff Volume = 3,800 cf Average Runoff Depth = 3.09"
72.88% Pervious = 10,750 sf 27.12% Impervious = 4,000 sf

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Type III 24-hr 100 year Rainfall=8.46"

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Summary for Subcatchment PR1: Roof Area

Runoff = 0.14 cfs @ 12.09 hrs, Volume= 473 cf, Depth> 7.56"
Routed to Pond 1P : Chambers

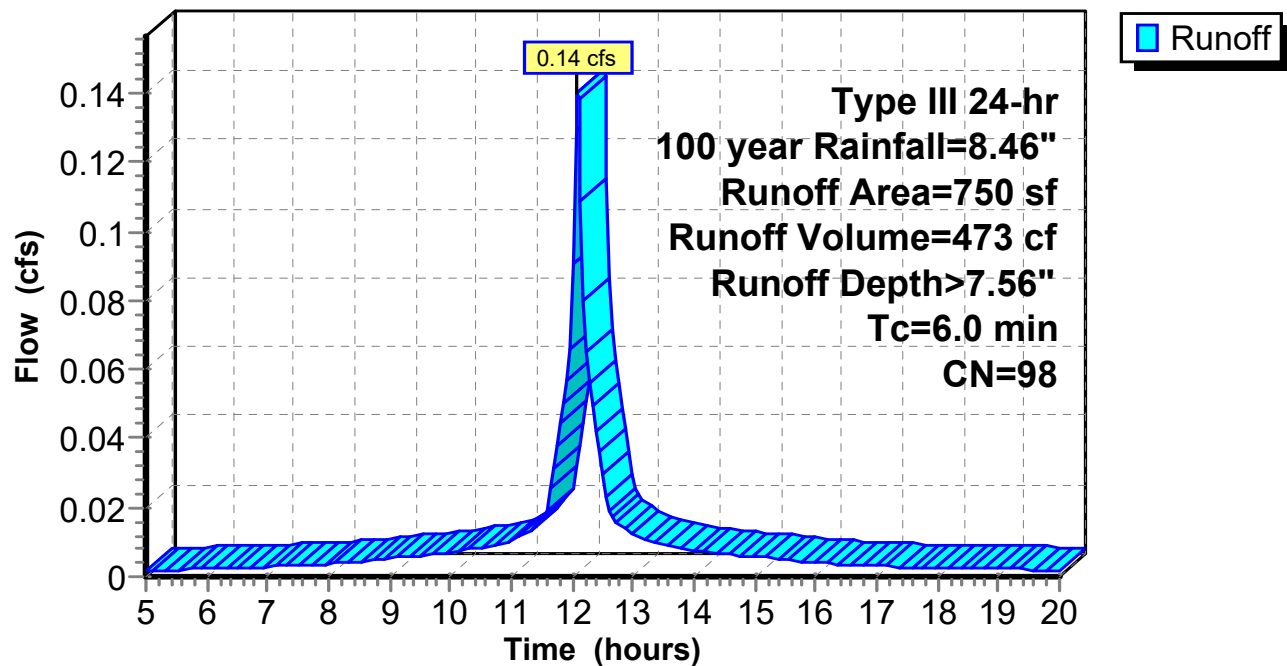
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 year Rainfall=8.46"

Area (sf)	CN	Description
750	98	Unconnected roofs, HSG A
750		100.00% Impervious Area
750		100.00% Unconnected

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

Subcatchment PR1: Roof Area

Hydrograph



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Type III 24-hr 100 year Rainfall=8.46"

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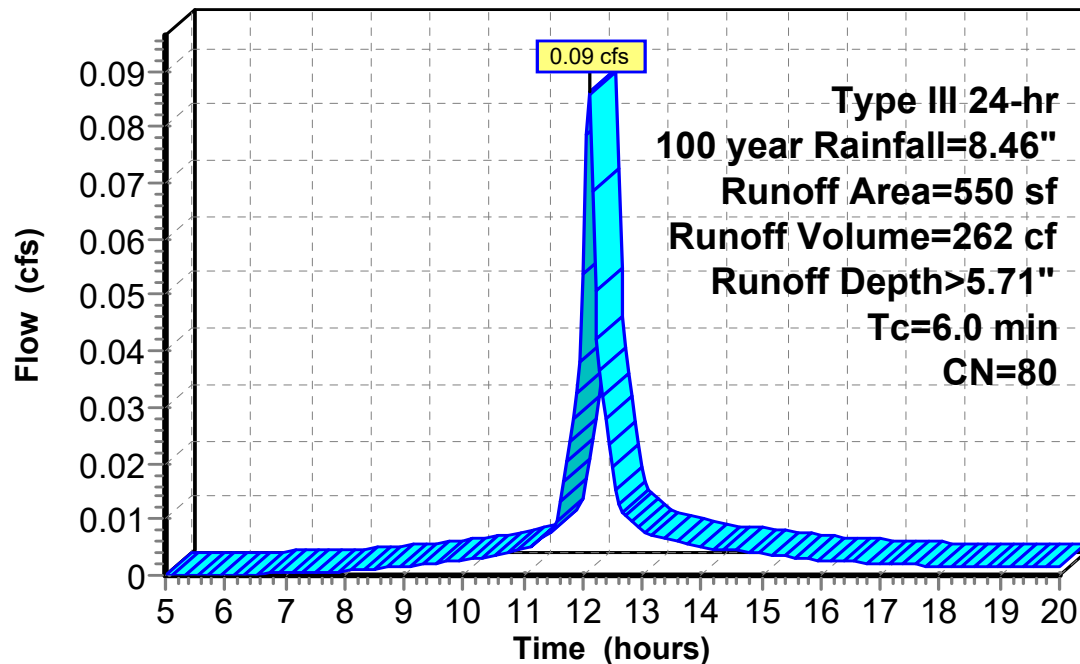
Summary for Subcatchment PR2: Site area

Runoff = 0.09 cfs @ 12.09 hrs, Volume= 262 cf, Depth> 5.71"
Routed to Pond 2P : Stone Infiltration Bed

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 year Rainfall=8.46"

	Area (sf)	CN	Description
*	550	80	Peastone Driveway
	550		100.00% Pervious Area

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

Subcatchment PR2: Site area**Hydrograph****Runoff**

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Type III 24-hr 100 year Rainfall=8.46"

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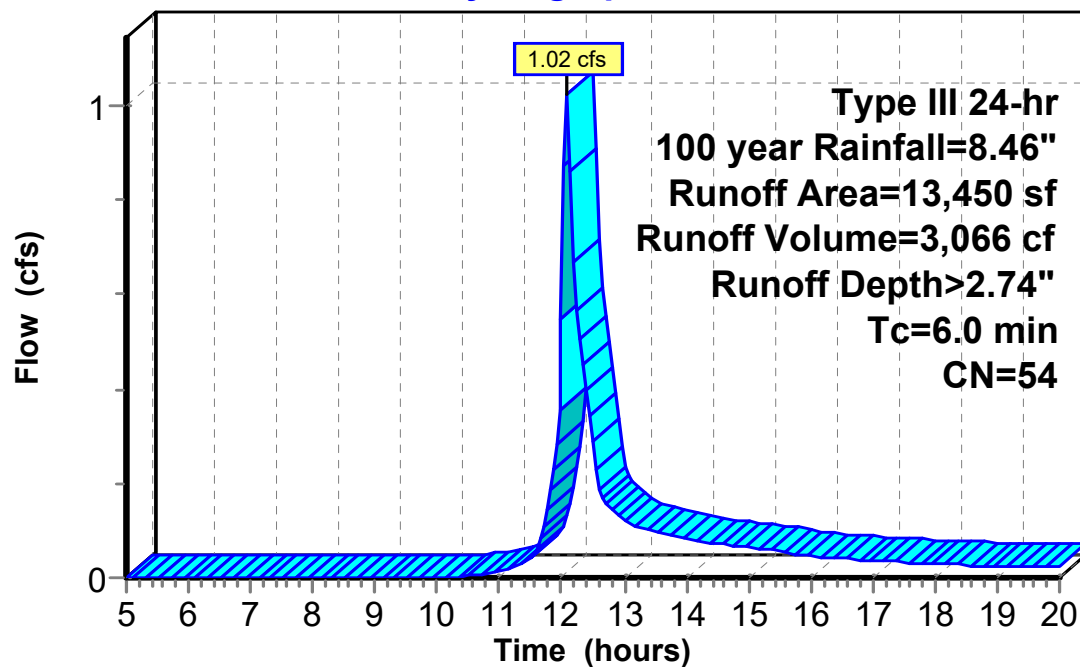
Summary for Subcatchment PR3: Site area

Runoff = 1.02 cfs @ 12.10 hrs, Volume= 3,066 cf, Depth> 2.74"
Routed to Pond DP1 : Merrimack River

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 year Rainfall=8.46"

Area (sf)	CN	Description
8,575	39	>75% Grass cover, Good, HSG A
2,425	98	Roofs, HSG A
* 625	80	Brick Patio
* 825	98	Walkways/Driveway
1,000	30	Brush, Good, HSG A
13,450	54	Weighted Average
10,200		75.84% Pervious Area
3,250		24.16% Impervious Area

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

Subcatchment PR3: Site area**Hydrograph****Runoff**

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Type III 24-hr 100 year Rainfall=8.46"

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Summary for Pond 1P: Chambers

[82] Warning: Early inflow requires earlier time span

Inflow Area = 750 sf, 100.00% Impervious, Inflow Depth > 7.56" for 100 year event
 Inflow = 0.14 cfs @ 12.09 hrs, Volume= 473 cf
 Outflow = 0.10 cfs @ 12.21 hrs, Volume= 409 cf, Atten= 31%, Lag= 7.5 min
 Discarded = 0.01 cfs @ 12.10 hrs, Volume= 317 cf
 Primary = 0.09 cfs @ 12.21 hrs, Volume= 92 cf
 Routed to Pond DP1 : Merrimack River

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 11.26' @ 12.15 hrs Surf.Area= 126 sf Storage= 136 cf

Plug-Flow detention time= 110.9 min calculated for 409 cf (87% of inflow)
 Center-of-Mass det. time= 68.4 min (801.3 - 732.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	7.66'	105 cf	10.17'W x 12.32'L x 2.33'H Field A 292 cf Overall - 29 cf Embedded = 263 cf x 40.0% Voids
#2A	8.16'	29 cf	ADS_StormTech SC-310 +Cap x 2 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap 2 Chambers in 2 Rows
#3	9.49'	2 cf	Inspection Port Grate (Prismatic) Listed below (Recalc)
		136 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
9.49	1	0	0
11.26	1	2	2

Device	Routing	Invert	Outlet Devices
#0	Primary	11.26'	Automatic Storage Overflow (Discharged without head)
#1	Discarded	7.66'	2.410 in/hr Exfiltration over Surface area
#2	Primary	11.25'	10.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.01 cfs @ 12.10 hrs HW=9.68' (Free Discharge)
 ↑ **1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.01 cfs @ 12.21 hrs HW=11.26' (Free Discharge)
 ↑ **2=Orifice/Grate** (Weir Controls 0.01 cfs @ 0.33 fps)

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Pond 1P: Chambers - Chamber Wizard Field A

Chamber Model = ADS_StormTechSC-310 +Cap (ADS StormTech®SC-310 with cap length)

Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf

Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap

34.0" Wide + 6.0" Spacing = 40.0" C-C Row Spacing

1 Chambers/Row x 7.12' Long +0.60' Cap Length x 2 = 8.32' Row Length +24.0" End Stone x 2 = 12.32' Base Length

2 Rows x 34.0" Wide + 6.0" Spacing x 1 + 24.0" Side Stone x 2 = 10.17' Base Width

6.0" Stone Base + 16.0" Chamber Height + 6.0" Stone Cover = 2.33' Field Height

2 Chambers x 14.7 cf = 29.5 cf Chamber Storage

292.3 cf Field - 29.5 cf Chambers = 262.8 cf Stone x 40.0% Voids = 105.1 cf Stone Storage

Chamber Storage + Stone Storage = 134.6 cf = 0.003 af

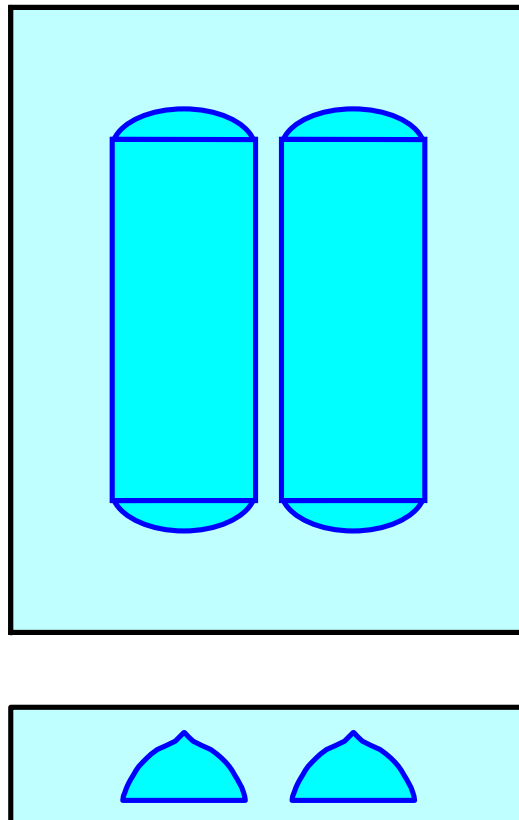
Overall Storage Efficiency = 46.1%

Overall System Size = 12.32' x 10.17' x 2.33'

2 Chambers

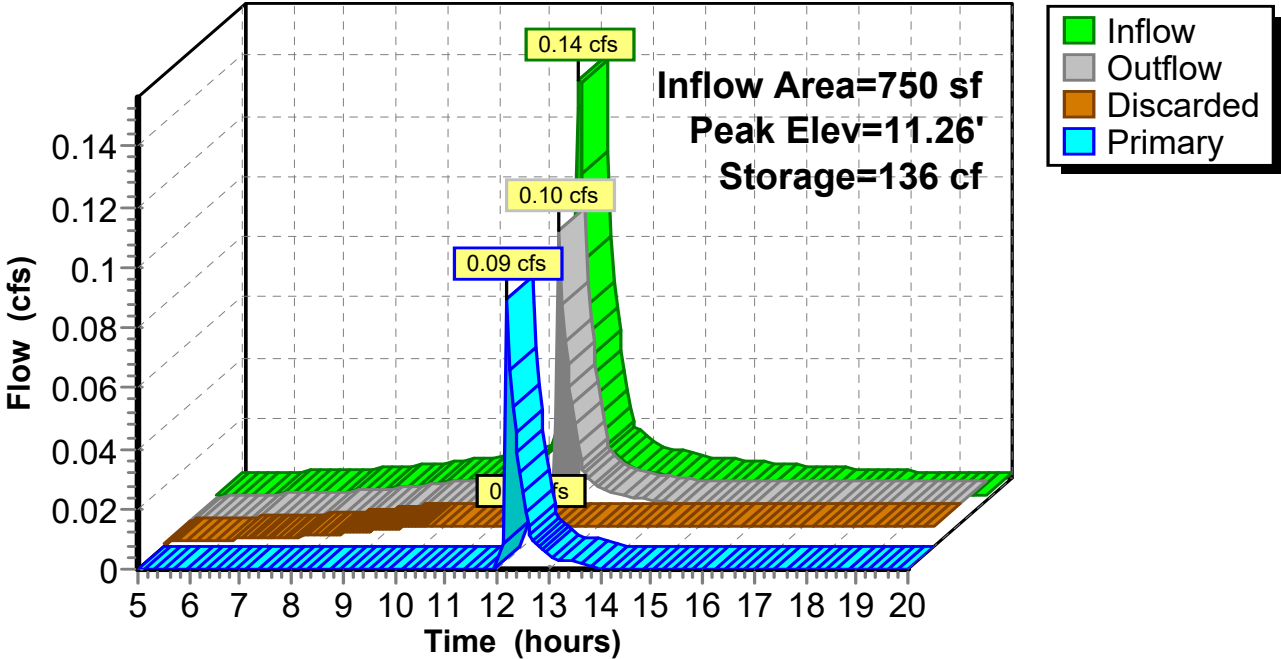
10.8 cy Field

9.7 cy Stone



Pond 1P: Chambers

Hydrograph



Post Dev

Type III 24-hr 100 year Rainfall=8.46"

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Summary for Pond 2P: Stone Infiltration Bed

Inflow Area = 550 sf, 0.00% Impervious, Inflow Depth > 5.71" for 100 year event
 Inflow = 0.09 cfs @ 12.09 hrs, Volume= 262 cf
 Outflow = 0.02 cfs @ 11.80 hrs, Volume= 262 cf, Atten= 77%, Lag= 0.0 min
 Discarded = 0.02 cfs @ 11.80 hrs, Volume= 262 cf
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf
 Routed to Pond DP1 : Merrimack River

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 117.58' @ 12.49 hrs Surf.Area= 360 sf Storage= 62 cf
 Flood Elev= 118.00' Surf.Area= 360 sf Storage= 108 cf

Plug-Flow detention time= 17.4 min calculated for 261 cf (100% of inflow)
 Center-of-Mass det. time= 17.3 min (786.6 - 769.3)

Volume	Invert	Avail.Storage	Storage Description
#1	117.00'	108 cf	18.00'W x 20.00'L x 1.00'H Prismatic 360 cf Overall x 30.0% Voids

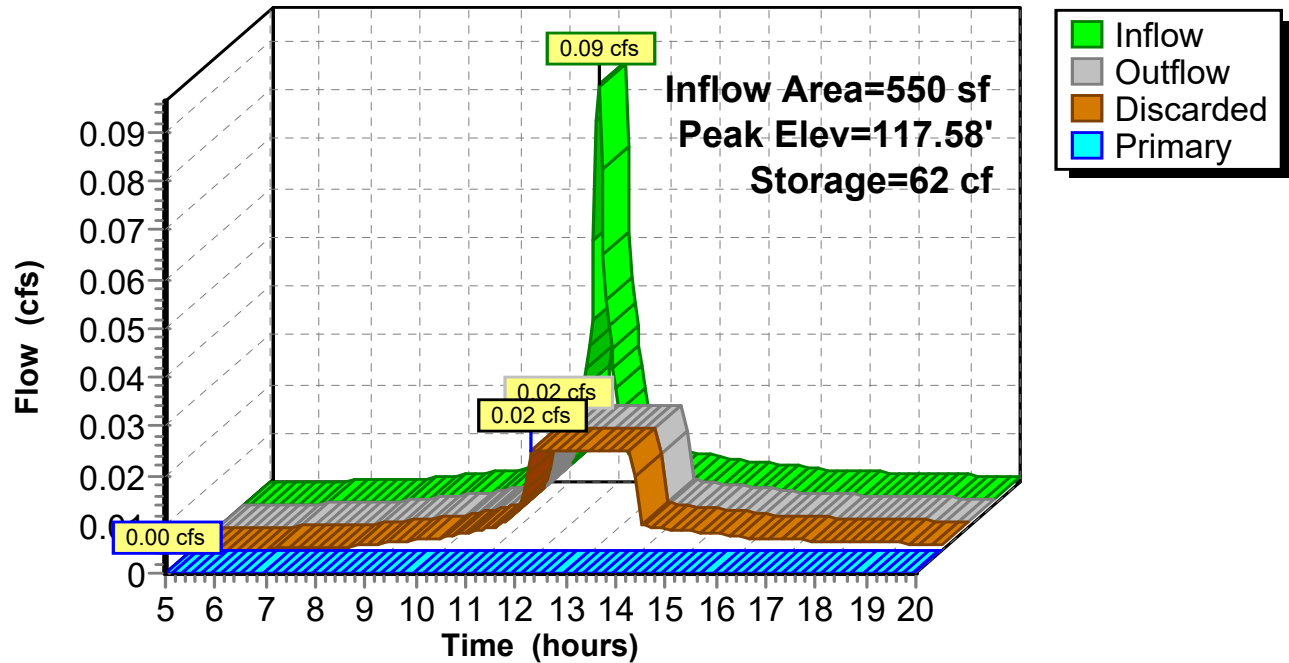
Device	Routing	Invert	Outlet Devices
#0	Primary	118.00'	Automatic Storage Overflow (Discharged without head)
#1	Discarded	117.00'	2.410 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.02 cfs @ 11.80 hrs HW=117.01' (Free Discharge)
 ↑**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=117.00' (Free Discharge)

Pond 2P: Stone Infiltration Bed

Hydrograph



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Type III 24-hr 100 year Rainfall=8.46"

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Summary for Pond DP1: Merrimack River

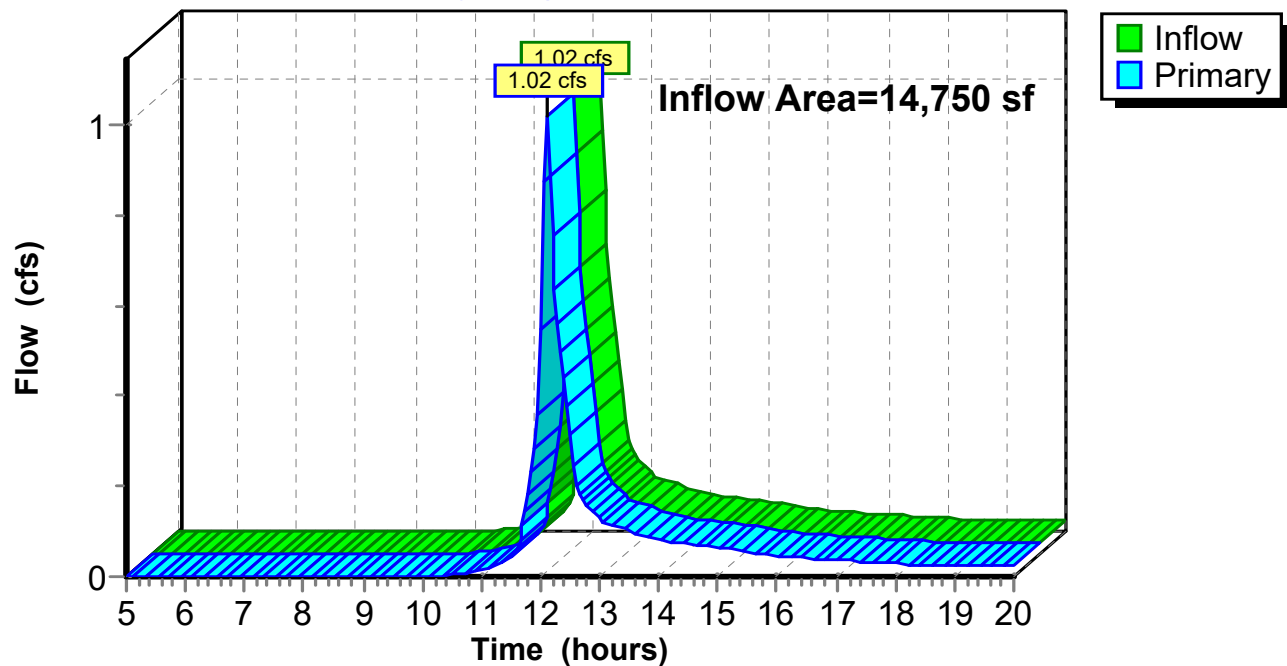
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 14,750 sf, 27.12% Impervious, Inflow Depth > 2.57" for 100 year event
Inflow = 1.02 cfs @ 12.10 hrs, Volume= 3,158 cf
Primary = 1.02 cfs @ 12.10 hrs, Volume= 3,158 cf, Atten= 0%, Lag= 0.0 min

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

Pond DP1: Merrimack River

Hydrograph



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