

STORMWATER REPORT

**Grace Lighthouse Church
2703 Cranberry Highway (Route 28)
Wareham, MA 02571**

Construction of a New Church

Prepared by:



Has Joined **Tighe&Bond**

260 Cranberry Highway
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Checked by SMR

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Checklist for Stormwater Report

A. Introduction

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



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

The Stormwater Report must include:

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

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

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

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

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

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



Checklist for Stormwater Report

B. Stormwater Checklist and Certification

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

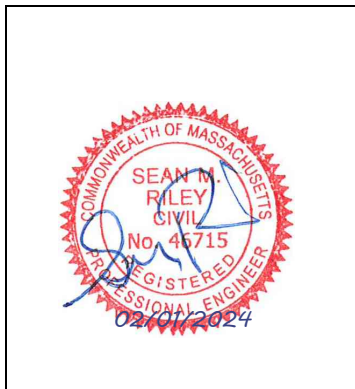
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the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

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

Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature



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): Pea stone diaphragm 24" x 12" at all parking edges adjacent to grass channel

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.

Narrative

Project Description

The project consists of site alterations and improvements that will allow the construction of a new church facility. The site is located directly off Cranberry Highway (Route 28). The locus of the site is included in appendix A.

The proposed Improvements include the construction of a building set on piles, gravel parking lot, concrete walkways, trash enclosure and pad, fences, lighting, utilities, landscaping, and stormwater management and drainage improvements.

The stormwater management system is designed to minimize the use of manmade conveyance structures (catch basins, manholes, pipes, etc...). Instead, the system was designed to utilize the topography to convey stormwater into the leaching basins via grass channels that will be planted with a native pollinator seed mix. This will not only provide a low impact stormwater system, but also provide a natural habitat for animals. The stormwater is designed to infiltrate all the impervious surface runoff into the ground, promoting peak rate and volume attenuation, as well as water quality treatment.

Existing Conditions

The existing site is approximately 2.4 acres. The site used to be fully developed and paved, however it has been abandoned for quite some time and the remanence of pavement remains. Currently there are no stormwater management practices capturing runoff employed on the property. The majority of runoff flows uncontrolled towards natural depressions either off site or on site. The impervious surface is approximately 7,613 s.f. The rest of the site consists of grasses, bare soil, and wooded areas. See appendix D-1 Existing Watershed Map for the existing hydrology, and an aerial map depicting the ground conditions. The aerial image was taken on 2019-03-25. Note that the site has been modified since 2019. The wooded areas have been removed, and gravel parking has been added as a temporary event space (see existing conditions plan by Coastal Engineering Company dated 12-27-23 for conditions after the clearing and gravel parking addition). In this analysis we will be utilizing the existing conditions as depicted in the aerial imagery. The intent is to restore the runoff to the preclearing condition and provide a better overall stormwater management system.

See Appendix D-1 for existing watershed map as depicted below:

Existing Watershed 1 is located at the upper northwest corner of the lot and is approximately 25,047 s.f. The Area includes 3,352 s.f. of pavement, 18,082 s.f. of poor condition grass, and 3,613 s.f. of a wooded area. The stormwater runoff collects at the edge of the property line via sheet flow, where it is collected in a natural depression and infiltrated into the ground (POA1).

Existing Watershed 2 is located at the north edge of the lot and is approximately 1,282 s.f. The Area consists of grass in poor condition. The stormwater runoff collects at the edge of the property line via sheet flow, where it flows into the Cranberry Highway right of way (POA2).

Existing Watershed 3 is located at the upper northeast corner of the lot and is approximately 43,212 s.f. The Area includes 1,282 s.f. of pavement, 16,853 s.f. of grass in poor condition, and 24,705 s.f. of a wooded area. The stormwater runoff collects at the edge of the property line via sheet flow and discharges overland to the neighboring commercial property (POA3).

Existing Watershed 4 is located at the bottom southeast corner of the lot and is approximately 6,540 s.f. The Area consists of a wooded area. The stormwater runoff collects at the edge of the property line via sheet flow and discharges overland to the neighboring residential property (POA4).

Existing Watershed 5 is located at the bottom southwest corner of the lot and is approximately 20,380 s.f. The Area includes 2,607 s.f. of pavement, 1,731 s.f. of grass in poor condition, and 16,042 s.f. of a wooded area. The stormwater runoff collects at the edge of the property line via sheet flow where it is collected in a natural depression and infiltrated into the ground (POA5).

Existing Watershed 6 is located at the west corner of the lot and is approximately 6,146 s.f. The Area consists of a wooded area. The stormwater runoff collects at the edge of the property line via sheet flow and discharges overland to the neighboring residential property (POA6).

Proposed Conditions

The proposed conditions will increase the impervious area of the site by approximately 33,570s.f. Impervious area consists of the following improvements roofs, graver parking, paved ADA parking, ADA ramps, dumpster pad, and sidewalks. To mitigate for the additional impervious area, the site will be regraded so that the parking lot runoff will be directed towards the peas stone diaphragm and the proposed grass channel swale. The swale is then directed towards two beehive grates that are connected to a leaching recharge basin. These BPM's will allow for groundwater recharge, attenuation of peak flows, and water quality treatment.

See Appendix D-2 for the proposed watershed map as depicted below:

Proposed Watershed 1 is approximately 13,459 s.f. The area includes 1,107 s.f. of pavement, 1,675 s.f. of roof, 7,850 s.f. of good condition grass, and 2,827 s.f. of a wooded/grass area. The stormwater runoff collects at the edge of the property line via sheet flow, where it is collected in a natural depression and infiltrated into the ground (POA1).

Proposed Watershed 2 is approximately 1,283 s.f. The area consists of a wooded/grass area. The watersheds exist due to the required berm adjacent to cranberry highway per town zoning bylaw. The stormwater runoff collects at the edge of the property line via sheet flow, where it discharges into the right of way and infiltrates into the ground (POA2).

Proposed Watershed 3 is approximately 27,907 s.f. The area includes 15,374 s.f. of pavement, 181 s.f. of roof, 11,843 s.f. of good condition grass, and 509 s.f. of a wooded/grass area. The stormwater runoff is graded so that it passes the pea stone diaphragm after the parking lot, enters the grass channel, and enters the leaching recharge basin - 2 for infiltration into the ground.

Proposed Watershed 4 is approximately 27,494 s.f. The area includes 16,346 s.f. of pavement, and 11,148 s.f. of good condition grass. The stormwater runoff is graded so that it passes the pea stone diaphragm after the parking lot, enters the grass channel, and then enters a deep sump catch basins that is routed to the leaching recharge basin – 2 for infiltration into the ground. Watershed 3 and 4 needed to be separated due to the proposed overflow access corridor. The only major difference is that watershed 4 proposes a catch basin.

Proposed Watershed 5 is approximately 4,267 s.f. The area consists of only the roof to the modular building. The clean stormwater will collect from the roof and be conveyed to a 6” roof drain that will be routed to the leaching recharge basin – 1(LRB-1) for infiltration into the ground. An overflow grate is proposed for LRB-1 that will discharge to the edge of the property line, where it will be collected in a natural depression and infiltrated into the ground (POA1).

Proposed Watershed 6 is approximately 2,910 s.f. The area consists of only a wood/grass combo. The stormwater runoff collects at the edge of the property line via sheet flow and discharges overland to the neighboring commercial property (POA3).

Proposed Watershed 7 is approximately 6,385 s.f. The area consists of 1,109 s.f of grass in good condition and 5,276 s.f. wood/grass combo. The stormwater runoff collects at the edge of the property line via sheet flow and discharges overland to the residential property (POA4).

Proposed Watershed 8 is approximately 18,395 s.f. The Area includes 2,414 s.f. of pavement and 15,981 s.f. of a wooded/grass combo area. The stormwater runoff collects at the edge of the property line via sheet flow where it is collected in a natural depression and infiltrated into the ground (POA5).

Proposed Watershed 8 is approximately 507 s.f. The area consists of only a wood/grass combo. The stormwater runoff collects at the edge of the property line via sheet flow and discharges overland to the neighboring residential property (POA6).

Stormwater Design

Pre- and post-development drainage calculations were prepared utilizing the U.S. Soil Conservation Service Technical Release 20 – Urban Hydrology for Small Watersheds, the U.S. Soil Conservation Service National Engineering Hydrology Handbook, NOAA Atlas 14 rainfall data (see Appendix A), and accepted engineering design practice. These standards were applied in the use of HydroCAD stormwater modeling software to generate a representative model of existing hydrology and proposed stormwater management features for the 2-year, 10-year, 25-year, and 100-year storm events.

Coastal Engineering performed an on-site soil suitability assessment on 04-12-2022 and discovered that the existing soil is sand (8.27in/hr. Rawls Rate for infiltration) down to 11 feet from finish grade (limit of excavator). No groundwater or redoximorphic features were observed at the time of excavation. The coincides with the NRCS web soil survey results. See Appendix B for NRCS data, and Appendix C for Coastal Engineering soil logs for additional information.

Where applicable, MA Department of Environmental Protection (DEP) Stormwater Handbook performance standards, along with accepted engineering practices, are utilized in preparing a stormwater management system design. Furthermore, local regulations and performance standards are applied to the design, except for any noted waiver requests.

The proposed stormwater management along with site grading is designed to reduce the volume of runoff generated on site from pre to post conditions to the abutting properties and the state highway layout. BMP’s are designed for 90% TSS removal within the redeveloped areas. The leaching systems was designed at a minimum to: provide the require recharge volume, provide a draw down to be less than 72 hours, and attenuate the 1” water quality volume. See appendix E for detailed calculations supporting the design.

Stage Storage Volume Peak Elevation and Outflow at LRB - 1

10’W X 20’L X 5.67’D stone with two 8’Dia X 4.67’D concrete leaching pits (LRB-1)

Rawls Rate = 8.27 inches/hour, grate outlet Elev.=100

Bottom of structure el. = 93.82

Top of structure el. = 99.48

Storage (Including riser) = 707 c.f.

Storm	Rainfall (in.)	Peak Elevation	Infiltration (cfs)	Outlet (cfs)	Storage(c.f.)
2-year	3.44	96.91	.04	0.00	359
10-year	5.05	98.89	.04	0.00	625
50-year	6.05	100.00	.04	0.14	707
100-year	7.59	100.00	.04	0.77	707

Stage Storage Volume Peak Elevation and Outflow at LRB - 2

12'W X 46'L X 7.67'D stone with five 8'Dia X 6.67'D concrete leaching pits (LRB-2)

Bottom of structure el. = 87.09

Top of structure el. = 94.76

Structure Storage = 2565 c.f.

Grass channel

Grass Channel Bottom el. = 96.00

Grass Channel top el. = 99.00

Grass Channel Storage = 7,512 c.f.

Additional Parking Lot Storage area

Parking Bottom el. = 99.00

Parking top el. = 99.50

Parking Storage = 3,790 c.f.

Rawls Rate = 8.27 inches/hour

Storm	Rainfall (in.)	Peak Elevation	Infiltration (cfs)	Outlet (cfs)	Storage(c.f.)
2-year	3.44	94.40	.11	0.00	2,384
10-year	5.05	98.28	.11	0.00	6,517
50-year	6.05	98.92	.11	0.00	9,612
100-year	7.59	99.40	.11	0.28	13,002

Stormwater Management Standards (MassDEP Checklist)

The following information summarizes compliance with the Stormwater Management Standards.

Standard 1: No New Untreated Discharges

There are no new untreated discharges.

Standard 2: Peak Rate Attenuation

The project standard has been met for peak runoff and peak volume. Calculations provided and summarized in Appendix E.

Standard 3: Recharge

The project standard has been met for recharge. Calculations provided and summarized in Appendix E.

Standard 4: Water Quality

The project standard has been met for water quality volume. Calculations provided and summarized in Appendix E.

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

The project site is not a LUHPPLs.

Standard 6: Critical Areas

The site is not located within any critical areas.

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

The project proposed to increase the impervious area; thus, it is not considered a redevelopment project, and was designed to comply with the stormwater management standards.

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

A detailed erosion and sediment control plan will be issued with construction documents that will incorporate the performance standards recommended in the DEP's Stormwater Management Policy. Additionally, the contractor will be required to procure the SWPPP prior to land disturbance.

Standard 9: Operation and Maintenance Plan

Operation and Maintenance plan is provided in Appendix F of this report.

Standard 10: Prohibition of Illicit Discharges

There are no known illicit discharges. See Appendix H for Illicit Discharge Compliance Statement

Appendices

Appendix A – Maps & Rainfall

- MassGIS Base Map
- Environmental Constraint Map
- FIRMette
- NOAA Atlas 14 Rainfall Data

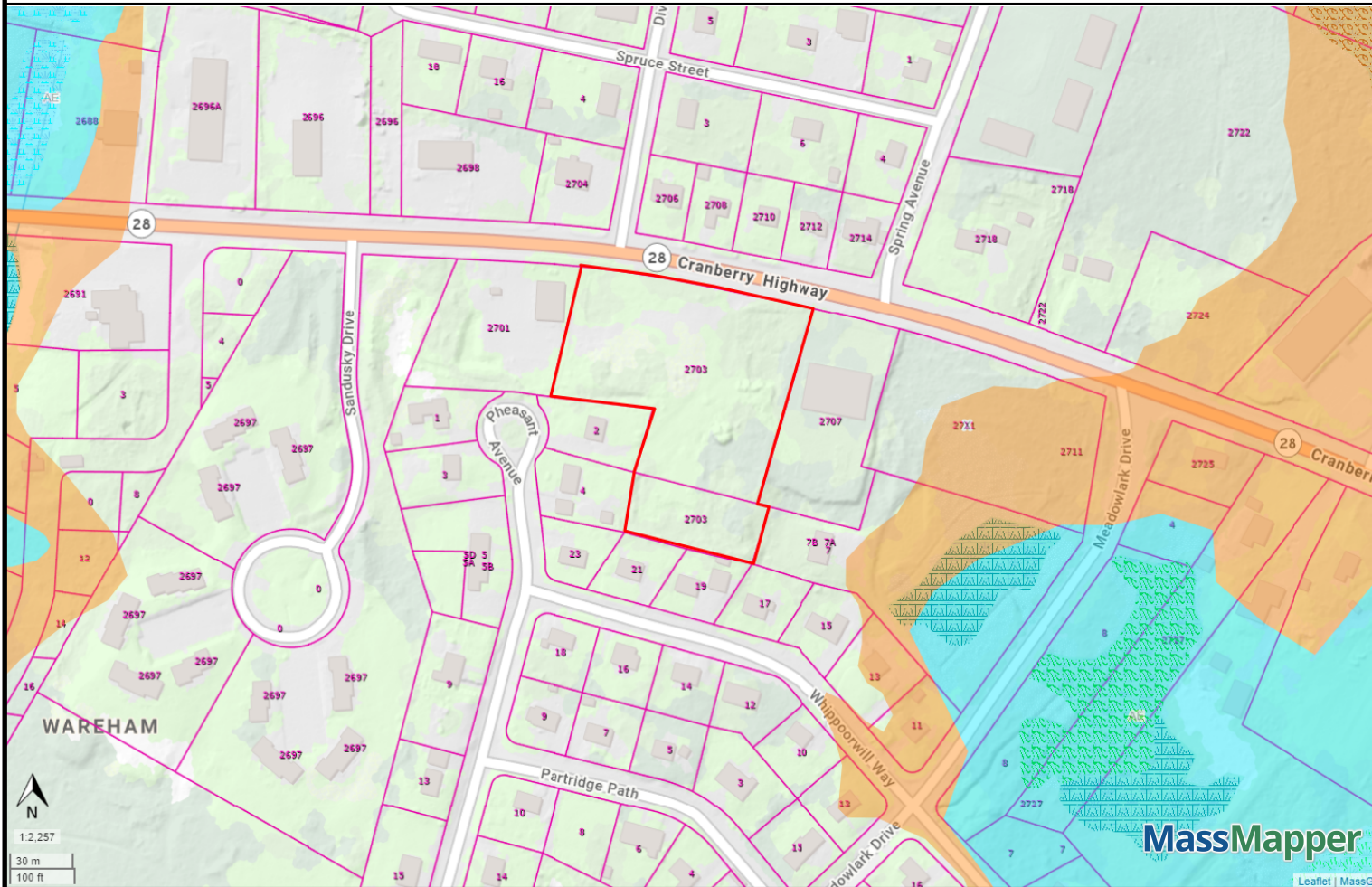
MassGIS Base Map



LEGEND

 Limit of Work / Locus

Environmental Constraint Map



LEGEND

NHESP Estimated Habitats of Rare Wildlife



FEMA National Flood Hazard Layer Polygons

- 1% Annual Chance Flood Hazard
- Regulatory Floodway
- Area of Undetermined Flood Hazard
- 0.2% Annual Chance Flood Hazard
- Area with Reduced Risk Due to Levee
- Area Not Included

DEP Wetlands Detailed

- Barrier Beach System
- Barrier Beach-Deep Marsh
- Barrier Beach-Wooded Swamp Mixed Trees
- Barrier Beach-Coastal Beach
- Barrier Beach-Coastal Dune
- Barrier Beach-Marsh
- Barrier Beach-Salt Marsh
- Barrier Beach-Shrub Swamp
- Barrier Beach-Wooded Swamp Coniferous
- Barrier Beach-Wooded Swamp Deciduous
- Bog
- Coastal Bank Bluff or Sea Cliff
- Coastal Beach
- Coastal Dune
- Cranberry Bog
- Deep Marsh
- Barrier Beach-Open Water
- Open Water
- Rocky Intertidal Shore
- Salt Marsh
- Shallow Marsh Meadow or Fen
- Shrub Swamp
- Tidal Flat
- Wooded Swamp Coniferous
- Wooded Swamp Deciduous
- Wooded Swamp Mixed Trees

National Flood Hazard Layer FIRMMette



70°42'18"W 41°46'24"N



Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

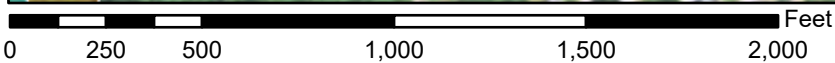
SPECIAL FLOOD HAZARD AREAS		Without Base Flood Elevation (BFE) <i>Zone A, V, A99</i>
		With BFE or Depth <i>Zone AE, AO, AH, VE, AR</i>
		Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD		0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile <i>Zone X</i>
		Future Conditions 1% Annual Chance Flood Hazard <i>Zone X</i>
		Area with Reduced Flood Risk due to Levee. See Notes. <i>Zone X</i>
		Area with Flood Risk due to Levee <i>Zone D</i>
OTHER AREAS		NO SCREEN Area of Minimal Flood Hazard <i>Zone X</i>
		Effective LOMRs
GENERAL STRUCTURES		Area of Undetermined Flood Hazard <i>Zone D</i>
		Channel, Culvert, or Storm Sewer
		Levee, Dike, or Floodwall
OTHER FEATURES		20.2 Cross Sections with 1% Annual Chance Water Surface Elevation 17.5
		Coastal Transect
		Base Flood Elevation Line (BFE)
		Limit of Study
		Jurisdiction Boundary
		Coastal Transect Baseline
MAP PANELS		Digital Data Available
		No Digital Data Available
		Unmapped
		The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.



This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on **12/28/2023 at 10:10 AM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.



1:6,000

70°41'40"W 41°45'57"N

Basemap Imagery Source: USGS National Map 2023



NOAA Atlas 14, Volume 10, Version 3
Location name: Wareham, Massachusetts, USA*
Latitude: 41.7695°, Longitude: -70.6997°
Elevation: 30 ft**
 * source: ESRI Maps
 ** source: USGS



POINT PRECIPITATION FREQUENCY ESTIMATES

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

NOAA, National Weather Service, Silver Spring, Maryland

[PF_tabular](#) | [PF_graphical](#) | [Maps & aerials](#)

PF tabular

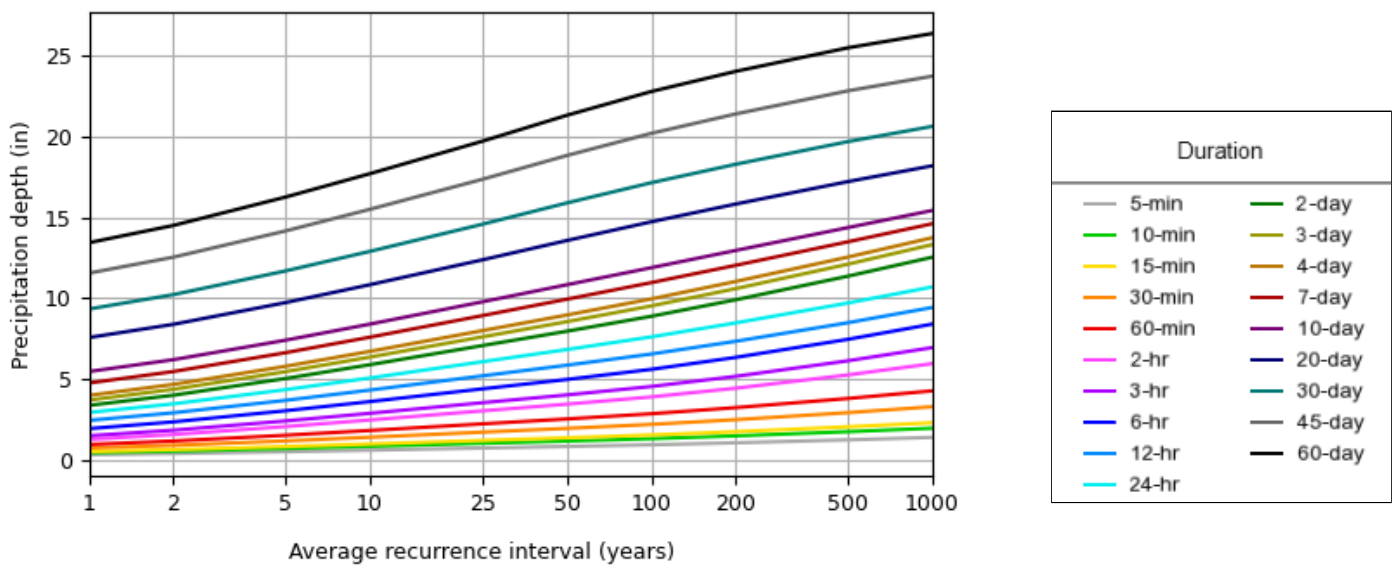
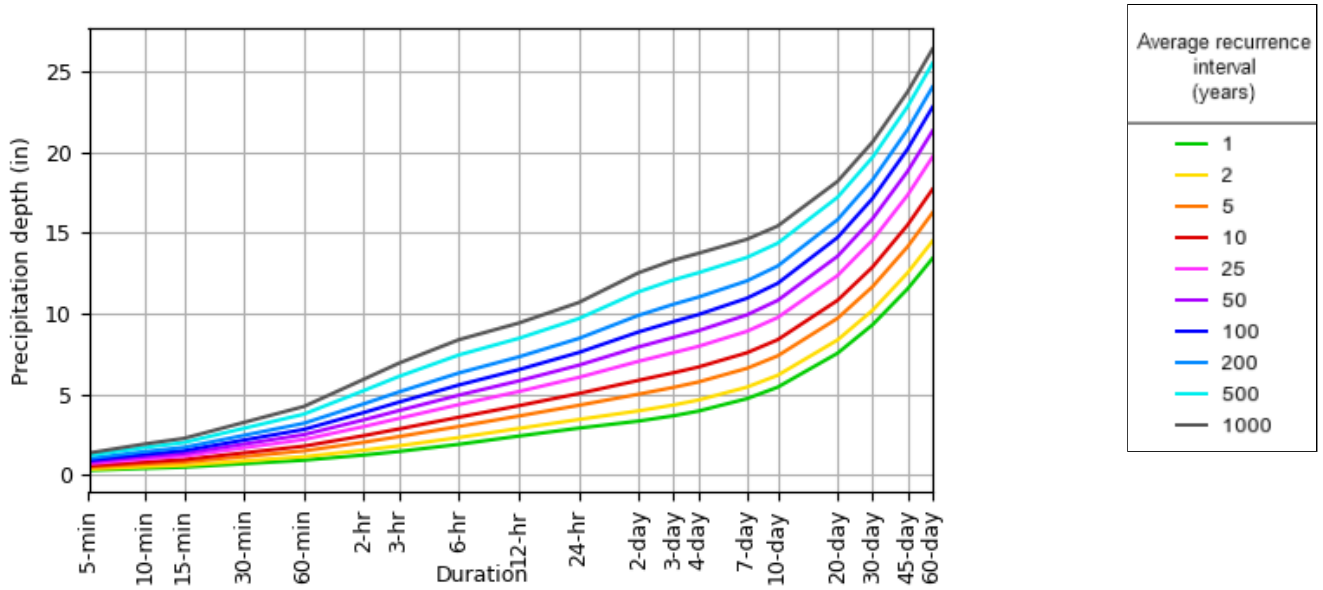
PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)¹										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.294 (0.238-0.359)	0.364 (0.295-0.445)	0.479 (0.386-0.587)	0.575 (0.461-0.705)	0.706 (0.550-0.898)	0.804 (0.615-1.04)	0.908 (0.679-1.21)	1.03 (0.727-1.38)	1.21 (0.826-1.66)	1.37 (0.911-1.90)
10-min	0.417 (0.337-0.508)	0.516 (0.418-0.630)	0.679 (0.547-0.830)	0.814 (0.653-1.00)	1.00 (0.780-1.27)	1.14 (0.873-1.47)	1.29 (0.963-1.71)	1.46 (1.03-1.95)	1.72 (1.17-2.35)	1.94 (1.29-2.68)
15-min	0.490 (0.397-0.598)	0.607 (0.491-0.742)	0.799 (0.644-0.978)	0.958 (0.768-1.18)	1.18 (0.917-1.50)	1.34 (1.03-1.73)	1.51 (1.13-2.02)	1.72 (1.21-2.30)	2.02 (1.38-2.77)	2.28 (1.52-3.16)
30-min	0.706 (0.572-0.862)	0.874 (0.707-1.07)	1.15 (0.925-1.41)	1.38 (1.10-1.69)	1.69 (1.32-2.15)	1.92 (1.47-2.48)	2.17 (1.62-2.89)	2.46 (1.74-3.29)	2.90 (1.97-3.97)	3.26 (2.18-4.53)
60-min	0.923 (0.747-1.13)	1.14 (0.922-1.39)	1.50 (1.21-1.83)	1.79 (1.44-2.20)	2.20 (1.72-2.80)	2.50 (1.92-3.24)	2.83 (2.12-3.76)	3.21 (2.27-4.29)	3.77 (2.57-5.16)	4.25 (2.83-5.90)
2-hr	1.24 (1.01-1.50)	1.54 (1.26-1.87)	2.03 (1.65-2.47)	2.44 (1.97-2.98)	3.00 (2.36-3.80)	3.42 (2.64-4.40)	3.87 (2.93-5.13)	4.41 (3.14-5.85)	5.23 (3.59-7.10)	5.93 (3.99-8.16)
3-hr	1.46 (1.20-1.77)	1.81 (1.48-2.19)	2.38 (1.94-2.88)	2.86 (2.31-3.47)	3.51 (2.77-4.42)	3.99 (3.10-5.11)	4.52 (3.43-5.96)	5.15 (3.68-6.79)	6.11 (4.21-8.25)	6.93 (4.68-9.48)
6-hr	1.91 (1.57-2.29)	2.33 (1.91-2.79)	3.01 (2.47-3.62)	3.58 (2.92-4.32)	4.37 (3.47-5.45)	4.95 (3.86-6.28)	5.58 (4.26-7.28)	6.32 (4.55-8.27)	7.44 (5.17-9.96)	8.38 (5.71-11.4)
12-hr	2.42 (2.00-2.88)	2.89 (2.39-3.44)	3.66 (3.02-4.37)	4.30 (3.53-5.15)	5.17 (4.13-6.39)	5.83 (4.57-7.31)	6.53 (4.99-8.40)	7.32 (5.32-9.49)	8.46 (5.94-11.2)	9.41 (6.46-12.7)
24-hr	2.91 (2.42-3.44)	3.44 (2.87-4.08)	4.32 (3.59-5.12)	5.05 (4.17-6.01)	6.05 (4.86-7.40)	6.80 (5.36-8.44)	7.59 (5.83-9.64)	8.46 (6.20-10.9)	9.69 (6.85-12.7)	10.7 (7.40-14.2)
2-day	3.34 (2.81-3.93)	3.98 (3.34-4.68)	5.01 (4.19-5.90)	5.87 (4.88-6.93)	7.04 (5.70-8.56)	7.94 (6.30-9.77)	8.86 (6.86-11.2)	9.89 (7.30-12.6)	11.3 (8.09-14.8)	12.5 (8.75-16.5)
3-day	3.67 (3.10-4.30)	4.34 (3.66-5.08)	5.43 (4.56-6.37)	6.34 (5.30-7.46)	7.58 (6.16-9.17)	8.53 (6.80-10.4)	9.50 (7.38-11.9)	10.6 (7.85-13.4)	12.1 (8.67-15.7)	13.3 (9.34-17.5)
4-day	3.96 (3.35-4.62)	4.65 (3.93-5.43)	5.77 (4.86-6.75)	6.69 (5.61-7.86)	7.97 (6.49-9.60)	8.94 (7.14-10.9)	9.94 (7.73-12.4)	11.0 (8.21-13.9)	12.5 (9.02-16.2)	13.7 (9.67-18.0)
7-day	4.73 (4.02-5.49)	5.44 (4.62-6.32)	6.61 (5.60-7.69)	7.57 (6.38-8.84)	8.90 (7.28-10.6)	9.92 (7.96-12.0)	10.9 (8.54-13.5)	12.0 (9.02-15.1)	13.5 (9.77-17.3)	14.6 (10.4-19.0)
10-day	5.44 (4.64-6.29)	6.18 (5.26-7.15)	7.38 (6.27-8.56)	8.38 (7.09-9.74)	9.75 (8.00-11.6)	10.8 (8.70-13.0)	11.9 (9.27-14.5)	12.9 (9.75-16.2)	14.4 (10.5-18.3)	15.4 (11.0-19.9)
20-day	7.55 (6.48-8.66)	8.37 (7.18-9.61)	9.71 (8.31-11.2)	10.8 (9.21-12.5)	12.4 (10.2-14.5)	13.6 (11.0-16.1)	14.7 (11.5-17.7)	15.8 (12.0-19.6)	17.2 (12.6-21.7)	18.2 (13.1-23.3)
30-day	9.31 (8.03-10.6)	10.2 (8.80-11.7)	11.7 (10.0-13.4)	12.9 (11.0-14.8)	14.6 (12.1-17.0)	15.9 (12.9-18.7)	17.1 (13.5-20.5)	18.3 (14.0-22.5)	19.7 (14.5-24.7)	20.6 (14.9-26.3)
45-day	11.5 (9.99-13.1)	12.5 (10.8-14.3)	14.1 (12.2-16.1)	15.5 (13.3-17.7)	17.3 (14.4-20.2)	18.8 (15.3-22.1)	20.2 (15.9-24.0)	21.4 (16.4-26.2)	22.8 (17.0-28.5)	23.7 (17.2-30.0)
60-day	13.4 (11.7-15.2)	14.5 (12.6-16.5)	16.2 (14.1-18.5)	17.7 (15.2-20.2)	19.7 (16.4-22.8)	21.3 (17.4-24.9)	22.8 (18.0-26.9)	24.0 (18.5-29.3)	25.5 (19.0-31.7)	26.4 (19.2-33.3)

¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS). Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values. Please refer to NOAA Atlas 14 document for more information.

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PF graphical

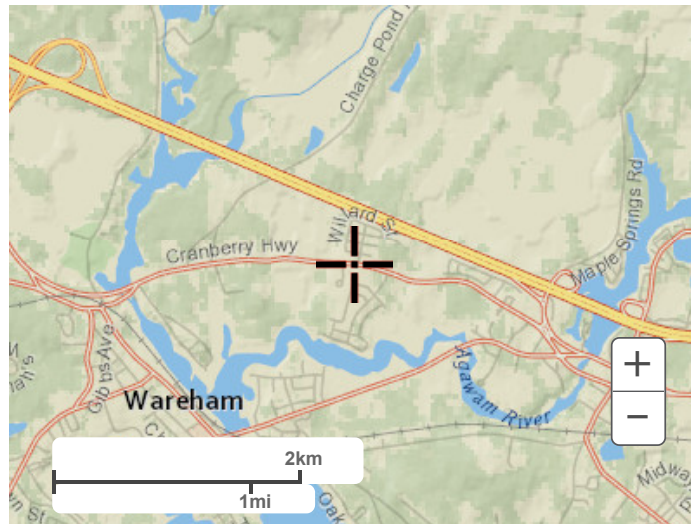
PDS-based depth-duration-frequency (DDF) curves Latitude: 41.7695°, Longitude: -70.6997°



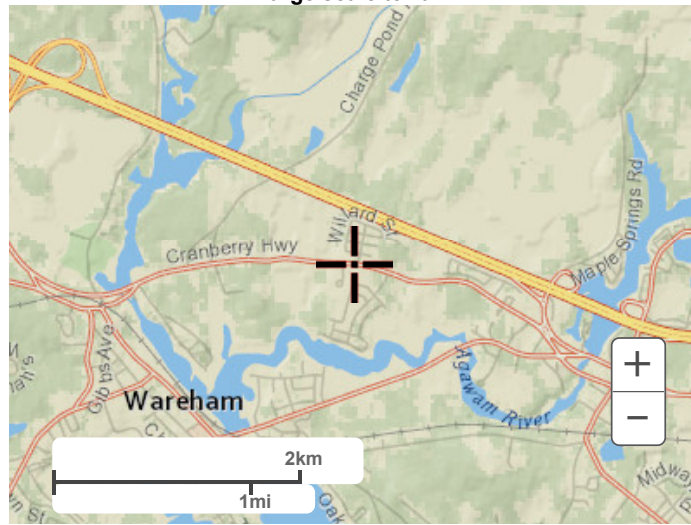
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Maps & aerials

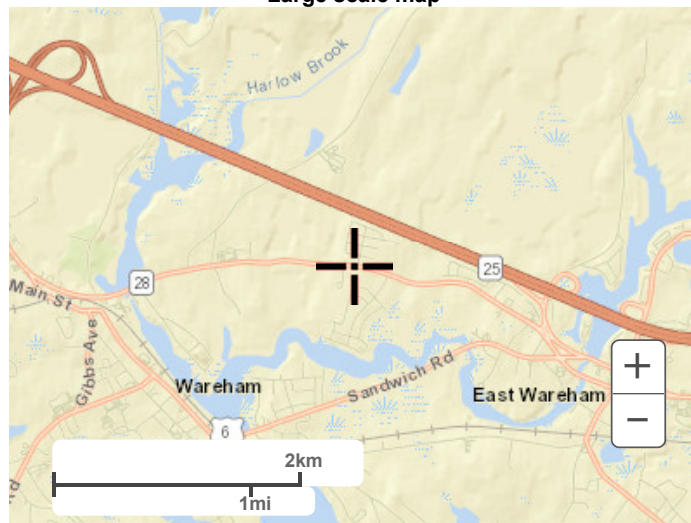
Small scale terrain



Large scale terrain



Large scale map



Large scale aerial



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1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

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Appendix B – NRCS Web Soil Survey


- Soil Map
- Soil Unit 255B
- Soil Unit 665B

Soil Map—Plymouth County, Massachusetts
(2703 Cranberry Highway)



MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features



Blowout



Borrow Pit



Clay Spot



Closed Depression



Gravel Pit



Gravelly Spot



Landfill



Lava Flow



Marsh or swamp



Mine or Quarry



Miscellaneous Water



Perennial Water



Rock Outcrop



Saline Spot



Sandy Spot



Severely Eroded Spot



Sinkhole



Slide or Slip



Sodic Spot



Spoil Area



Stony Spot



Very Stony Spot



Wet Spot



Other



Special Line Features

Water Features



Streams and Canals

Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

Background



Aerial Photography

MAP INFORMATION

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

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

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

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

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: Plymouth County, Massachusetts

Survey Area Data: Version 16, Sep 10, 2023

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

Date(s) aerial images were photographed: Jun 10, 2022—Jun 30, 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
255B	Windsor loamy sand, 3 to 8 percent slopes	0.5	19.2%
665B	Udipsamments, 0 to 8 percent slopes	1.9	80.8%
Totals for Area of Interest		2.4	100.0%

Plymouth County, Massachusetts

255B—Windsor loamy sand, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2svkf

Elevation: 0 to 1,210 feet

Mean annual precipitation: 36 to 71 inches

Mean annual air temperature: 39 to 55 degrees F

Frost-free period: 140 to 250 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Windsor and similar soils: 85 percent

Minor components: 15 percent

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

Description of Windsor

Setting

Landform: Outwash terraces

Landform position (three-dimensional): Tread

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Loose sandy glaciofluvial deposits derived from granite and/or schist and/or gneiss

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material

A - 1 to 3 inches: loamy sand

Bw - 3 to 25 inches: loamy sand

C - 25 to 65 inches: sand

Properties and qualities

Slope: 3 to 8 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Excessively drained

Runoff class: Negligible

Capacity of the most limiting layer to transmit water

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

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Available water supply, 0 to 60 inches: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 2s

Hydrologic Soil Group: A

Ecological site: F145XY008MA - Dry Outwash
Hydric soil rating: No

Minor Components

Hinckley

Percent of map unit: 10 percent
Landform: Eskers
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: F145XY008MA - Dry Outwash
Hydric soil rating: No

Deerfield, loamy sand

Percent of map unit: 5 percent
Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F144AY027MA - Moist Sandy Outwash
Hydric soil rating: No

Data Source Information

Soil Survey Area: Plymouth County, Massachusetts
Survey Area Data: Version 16, Sep 10, 2023

Plymouth County, Massachusetts

665B—Udipsamments, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2pr8k

Elevation: 0 to 390 feet

Mean annual precipitation: 41 to 54 inches

Mean annual air temperature: 43 to 54 degrees F

Frost-free period: 145 to 240 days

Farmland classification: Not prime farmland

Map Unit Composition

Udipsamments and similar soils: 80 percent

Minor components: 20 percent

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

Description of Udipsamments

Setting

Landform: Dikes

Landform position (two-dimensional): Summit

Landform position (three-dimensional): Tread

Down-slope shape: Linear, convex

Across-slope shape: Linear

Parent material: Sandy human transported material over sandy and gravelly glaciofluvial deposits

Typical profile

^Ap - 0 to 9 inches: loamy sand

C1 - 9 to 22 inches: sand

C2 - 22 to 49 inches: coarse sand

C3 - 49 to 54 inches: sand

C4 - 54 to 79 inches: coarse sand

Properties and qualities

Slope: 0 to 8 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Excessively drained

Runoff class: Very low

Capacity of the most limiting layer to transmit water

(Ksat): Moderately high to very high (1.42 to 14.17 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water supply, 0 to 60 inches: Low (about 3.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 3s

Hydrologic Soil Group: A

Ecological site: F149BY100NY - Urban Site Complex
Hydric soil rating: No

Minor Components

Udipsamments, wet substratum

Percent of map unit: 10 percent
Landform: Dikes
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear, convex
Across-slope shape: Linear
Hydric soil rating: No

Tihonet

Percent of map unit: 5 percent
Landform: Bogs
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: Yes

Udorthents, loamy

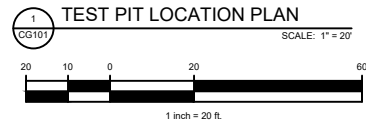
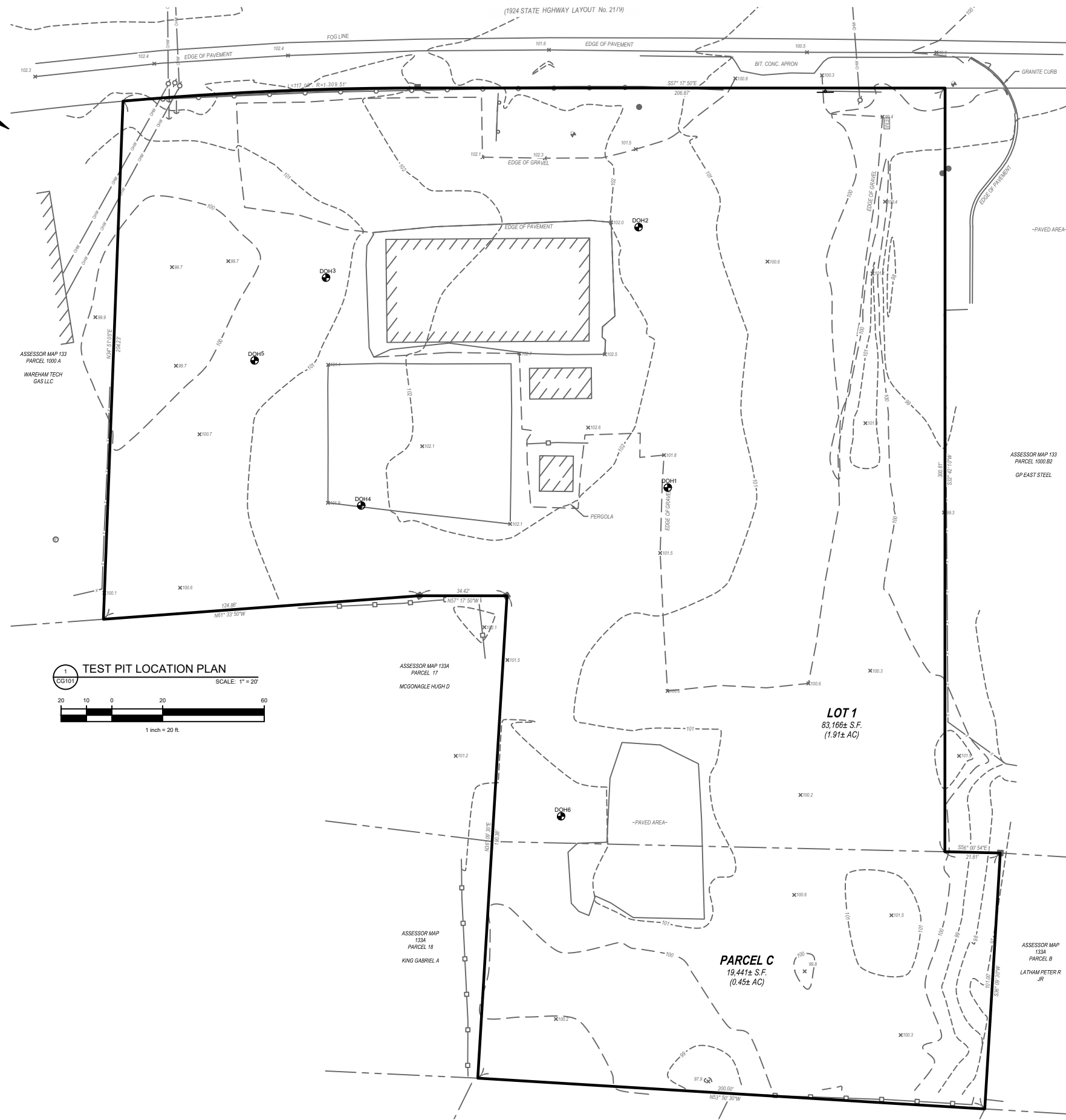
Percent of map unit: 5 percent
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Data Source Information

Soil Survey Area: Plymouth County, Massachusetts
Survey Area Data: Version 16, Sep 10, 2023

Appendix C – Soil Exploration

- Test Pit Location
- Soil Logs



REV	DATE	DESCRIPTION	DWN	CHK

PROJECT/CLIENT NAME
GRACE LIGHTHOUSE CHURCH

ADDRESS
2703 CRANBERRY HIGHWAY
WAREHAM, MA 02571

DATE
2023-12-29

DRAWN BY
DAV

CHECKED BY

PROJECT NUMBER
C19495.00

PROJECT STATUS
STORMWATER REPORT

SHEET DESCRIPTION
TEST PIT LOCATION PLAN

SHEET TITLE
SKC

SHEET NUMBER
SHEET 01 OF 01



Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

A. Facility Information

Grace Lighthouse Fellowship (Church)

Owner Name

2703 Cranberry Highway

Street Address

Wareham

City

MA

State

Parcel ID: 133-0-1000B1 (Map 133 / Lot 1000B1)

Map/Lot #

02571

Zip Code

B. Site Information

1. (Check one) New Construction Upgrade Repair

2. Soil Survey Available? Yes No If yes:

NRCS Web Soil
Source

665B
Soil Map Unit

Udipsammments, 0 to 8 percent slopes

Soil Name

None

Soil Limitations

Sandy and gravelly glaciofluvial deposits

Soil Parent material

Dikes

Landform

3. Surficial Geological Report Available? Yes No

If yes:

2018/Map 163 Wareham
Year Published/Source

Glacial Stratified Deposits/Coarse Deposits
Map Unit

Coarse deposits consist of gravel deposits, sand and gravel deposits, and sand deposits

Description of Geologic Map Unit:

4. Flood Rate Insurance Map Within a regulatory floodway? Yes No

5. Within a velocity zone? Yes No

6. Within a Mapped Wetland Area? Yes No

If yes, MassGIS Wetland Data Layer:

Wetland Type

7. Current Water Resource Conditions (USGS):

3/29/2022 WFW 51 Wareham
Month/Day/ Year

Range: Above Normal

Normal Below Normal

8. Other references reviewed:



Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 1 Hole # 4/12/2022 Date 10:30 am Time drizzle, cloudy 45 F Weather 41.769540 Latitude -70.700470 Longitude:

1. Land Use parking lot (gravel) (e.g., woodland, agricultural field, vacant lot, etc.) none Vegetation none Surface Stones (e.g., cobbles, stones, boulders, etc.) 2% Slope (%)

Description of Location: _____

2. Soil Parent Material: Sandy and gravelly glaciofluvial deposits Dikes Landform graded parking lot/ upland location Position on Landscape (SU, SH, BS, FS, TS)

3. Distances from: Open Water Body >200 feet Drainage Way >100 feet Wetlands >100 feet
 Property Line >50 feet Drinking Water Well >100 feet Other _____ feet

4. Unsuitable Materials Present: Yes No If Yes: Disturbed Soil Fill Material Weathered/Fractured Rock Bedrock

5. Groundwater Observed: Yes No If yes: _____ Depth Weeping from Pit _____ Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-26	Fill	Sand	10 YR 4/3						single grain	loose	
26-38	B	Sand	10 YR 5/6						single grain	loose	
38-120	C	Sand	2.5 Y 6/4						single grain	loose	

Additional Notes:

No mottles. No groundwater observed. Test Hole Existing Ground Elevation = 102+/-, Percolation Test at a depth of 66" (less than 2 MPI)



Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 2 4/12/22 11:00 am drizzle,cloudy 45 F 41.769540 -70.700470
Hole # Date Time Latitude Longitude:

1. Land Use: parking lot (gravel) none none 2%
(e.g., woodland, agricultural field, vacant lot, etc.) Vegetation Surface Stones (e.g., cobbles, stones, boulders, etc.) Slope (%)
 Description of Location: gravel parking lot

2. Soil Parent Material: Sandy and gravelly glaciofluvial deposits Dikes graded parking lot/ upland location
Landform Position on Landscape (SU, SH, BS, FS, TS)

3. Distances from: Open Water Body >200 feet Drainage Way >100 feet Wetlands >100 feet
 Property Line >50 feet Drinking Water Well >100 feet Other _____ feet

4. Unsuitable
 Materials Present: Yes No If Yes: Disturbed Soil Fill Material Weathered/Fractured Rock Bedrock

5. Groundwater Observed: Yes No If yes: _____ Depth Weeping from Pit _____ Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-36	Fill	Sand					10%		single grain	loose	
36-120	C	Sand	2.5 Y 6/4						single grain	loose	

Additional Notes:

No mottles. No groundwater observed. Test Hole Existing Ground Elevation = 102+/-, Percolation Test at a depth of 72" (less than 2 MPI)



**Commonwealth of Massachusetts
City/Town of Wareham**

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area*)

Deep Observation Hole Number: 3 Hole # 4/12/2022 Date 11:15 am Time cloudy 50 F Weather 41.769540 Latitude -70.700470 Longitude:

1. Land Use parking lot (gravel) (e.g., woodland, agricultural field, vacant lot, etc.) none Vegetation none Surface Stones (e.g., cobbles, stones, boulders, etc.) 4% Slope (%)

Description of Location: _____

2. Soil Parent Material: Sandy and gravelly glaciofluvial deposits Dikes Landform graded parking lot/ upland location Position on Landscape (SU, SH, BS, FS, TS)

3. Distances from: Open Water Body >200 feet Drainage Way >100 feet Wetlands >100 feet
 Property Line >50 feet Drinking Water Well >100 feet Other _____ feet

4. Unsuitable Materials Present: Yes No If Yes: Disturbed Soil Fill Material Weathered/Fractured Rock Bedrock

5. Groundwater Observed: Yes No If yes: _____ Depth Weeping from Pit _____ Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-24	Fill	Sand									
24-36	B	Sand	10 YR 5/8						weak	friable	
36-132	C	Sand	2.5 Y 6/4						single grain	loose	

Additional Notes:

No mottles. No groundwater observed. Test Hole Existing Ground Elevation = 101+/-



Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 4 4/12/22 11:30 am light rain 50 F 41.769540 -70.700470
Hole # Date Time Weather Latitude Longitude:

1. Land Use: wood chips next to playground none none 4%
(e.g., woodland, agricultural field, vacant lot, etc.) Vegetation Surface Stones (e.g., cobbles, stones, boulders, etc.) Slope (%)

Description of Location: wood chips next to playground

2. Soil Parent Material: Sandy and gravelly glaciofluvial deposits Dikes adjacent to parking lot/ upland location
Landform Position on Landscape (SU, SH, BS, FS, TS)

3. Distances from: Open Water Body >200 feet Drainage Way >100 feet Wetlands >100 feet
 Property Line >30 feet Drinking Water Well >100 feet Other _____ feet

4. Unsuitable
 Materials Present: Yes No If Yes: Disturbed Soil Fill Material Weathered/Fractured Rock Bedrock

5. Groundwater Observed: Yes No If yes: _____ Depth Weeping from Pit _____ Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-12	Fill										
12-30	B	Sand	10 YR 5/8						weak	friable	
30-120	C	Sand	2.5 Y 6/4						single grain	loose	

Additional Notes:
No mottles. No groundwater observed. Test Hole Existing Ground Elevation = 102+/-



**Commonwealth of Massachusetts
City/Town of Wareham**

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area*)

Deep Observation Hole Number: 5 Hole # 4/12/2022 Date 11:45 am Time cloudy 50 F Weather 41.769540 Latitude -70.700470 Longitude:

1. Land Use parking lot (gravel) (e.g., woodland, agricultural field, vacant lot, etc.) none Vegetation none Surface Stones (e.g., cobbles, stones, boulders, etc.) 2% Slope (%)

Description of Location: _____

2. Soil Parent Material: Sandy and gravelly glaciofluvial deposits Dikes Landform graded parking lot/ upland location Position on Landscape (SU, SH, BS, FS, TS)

3. Distances from: Open Water Body >200 feet Drainage Way >100 feet Wetlands >100 feet
 Property Line >50 feet Drinking Water Well >100 feet Other _____ feet

4. Unsuitable Materials Present: Yes No If Yes: Disturbed Soil Fill Material Weathered/Fractured Rock Bedrock

5. Groundwater Observed: Yes No If yes: _____ Depth Weeping from Pit _____ Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-20	Fill	Sand									
20-32	B	Sand	10 YR 5/6				10%		single grain	loose	
32-120	C	Sand	2.5 Y 6/4						single grain	loose	

Additional Notes:

Drainage Test Hole. No mottles. No groundwater observed. Test Hole Existing Ground Elevation = 100.5+/-



Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 6 4/12/22 12:00 pm cloudy 50 F 41.769540 -70.700470
Hole # Date Time Weather Latitude Longitude:

1. Land Use: rear of lot adjacent to basketball court none none 2%
(e.g., woodland, agricultural field, vacant lot, etc.) Vegetation Surface Stones (e.g., cobbles, stones, boulders, etc.) Slope (%)

Description of Location: rear of lot adjacent to basketball court

2. Soil Parent Material: Sandy and gravelly glaciofluvial deposits Dikes rear of lot adjacent to pavement
Landform Position on Landscape (SU, SH, BS, FS, TS)

3. Distances from: Open Water Body >200 feet Drainage Way >100 feet Wetlands >100 feet
 Property Line >20 feet Drinking Water Well >100 feet Other _____ feet

4. Unsuitable
 Materials Present: Yes No If Yes: Disturbed Soil Fill Material Weathered/Fractured Rock Bedrock

5. Groundwater Observed: Yes No If yes: _____ Depth Weeping from Pit _____ Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-8	Fill	Sand									
8-120	C	Sand	2.5 Y 6/4						single grain	loose	

Additional Notes:
Drainage Test Hole. No mottles. No groundwater observed. Test Hole Existing Ground Elevation = 101+/-



Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

- | | | |
|--|--------------------------------|--------------------------------|
| 1. Method Used: | Obs. Hole # <u>1</u> | Obs. Hole # <u>2</u> |
| <input type="checkbox"/> Depth observed standing water in observation hole | <u>>120" - No GW</u> inches | <u>>120" - No GW</u> inches |
| <input type="checkbox"/> Depth weeping from side of observation hole | _____ inches | _____ inches |
| <input type="checkbox"/> Depth to soil redoximorphic features (mottles) | _____ inches | _____ inches |
| <input type="checkbox"/> Depth to adjusted seasonal high groundwater (S_h)
(USGS methodology) | _____ inches | _____ inches |

_____ Index Well Number

_____ Reading Date

$$S_h = S_c - [S_r \times (OW_c - OW_{max}) / OW_r]$$

Obs. Hole/Well# _____ S_c _____ S_r _____ OW_c _____ OW_{max} _____ OW_r _____ S_h _____

2. Estimated Depth to High Groundwater: >120 inches

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?

Yes No

b. If yes, at what depth was it observed (exclude A and O Horizons)?

Upper boundary: 26 inches Lower boundary: 120 inches

c. If no, at what depth was impervious material observed?

Upper boundary: _____ inches Lower boundary: _____ inches



Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

- | | | |
|--|--------------------------------|--------------------------------|
| 1. Method Used: | Obs. Hole # <u>3</u> | Obs. Hole # <u>4</u> |
| <input type="checkbox"/> Depth observed standing water in observation hole | <u>>132" - No GW</u> inches | <u>>120" - No GW</u> inches |
| <input type="checkbox"/> Depth weeping from side of observation hole | _____ inches | _____ inches |
| <input type="checkbox"/> Depth to soil redoximorphic features (mottles) | _____ inches | _____ inches |
| <input type="checkbox"/> Depth to adjusted seasonal high groundwater (S_h)
(USGS methodology) | _____ inches | _____ inches |

_____ Index Well Number

_____ Reading Date

$$S_h = S_c - [S_r \times (OW_c - OW_{max}) / OW_r]$$

Obs. Hole/Well# _____ S_c _____ S_r _____ OW_c _____ OW_{max} _____ OW_r _____ S_h _____

2. Estimated Depth to High Groundwater: >132 inches

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?

Yes No

b. If yes, at what depth was it observed (exclude A and O Horizons)?

Upper boundary: 12 inches Lower boundary: 132 inches

c. If no, at what depth was impervious material observed?

Upper boundary: _____ inches Lower boundary: _____ inches



Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

- | | | |
|---|--------------------------------|--------------------------------|
| 1. Method Used: | Obs. Hole # <u>5</u> | Obs. Hole # <u>6</u> |
| <input type="checkbox"/> Depth observed standing water in observation hole | <u>>120" - No GW</u> inches | <u>>120" - No GW</u> inches |
| <input type="checkbox"/> Depth weeping from side of observation hole | _____ inches | _____ inches |
| <input type="checkbox"/> Depth to soil redoximorphic features (mottles) | _____ inches | _____ inches |
| <input type="checkbox"/> Depth to adjusted seasonal high groundwater (S_h) (USGS methodology) | _____ inches | _____ inches |

_____ Index Well Number

_____ Reading Date

$$S_h = S_c - [S_r \times (OW_c - OW_{max}) / OW_r]$$

Obs. Hole/Well# _____ S_c _____ S_r _____ OW_c _____ OW_{max} _____ OW_r _____ S_h _____

2. Estimated Depth to High Groundwater: >120 inches

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?

Yes No

b. If yes, at what depth was it observed (exclude A and O Horizons)?

Upper boundary: 8 inches Lower boundary: 120 inches

c. If no, at what depth was impervious material observed?

Upper boundary: _____ inches Lower boundary: _____ inches



Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

F. Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct soil evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.100 through 15.107.

Signature of Soil Evaluator
Bryan J. Weiner, P.E. / SE 2566

Typed or Printed Name of Soil Evaluator / License #

April 12, 2022
Date

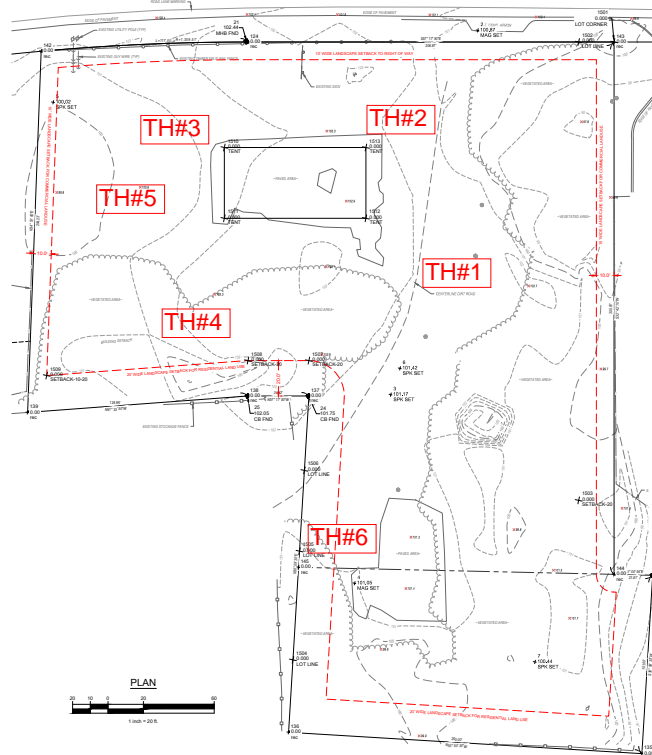
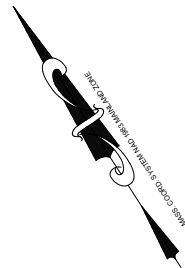
6/30/2022
Expiration Date of License

Name of Approving Authority Witness

Approving Authority

Note: In accordance with 310 CMR 15.018(2) this form must be submitted to the approving authority within 60 days of the date of field testing, and to the designer and the property owner with [Percolation Test Form 12](#).

Field Diagrams: Use this area for field diagrams:





Commonwealth of Massachusetts
 City/Town of Wareham
Percolation Test
Form 12

Percolation test results must be submitted with the Soil Suitability Assessment for On-site Sewage Disposal. DEP has provided this form for use by local Boards of Health. Other forms may be used, but the information must be substantially the same as that provided here. Before using this form, check with the local Board of Health to determine the form they use.

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



A. Site Information

Grace Lighthouse Fellowship (Church)

Owner Name

2703 Cranberry Highway

Street Address or Lot #

Wareham

City/Town

MA

State

02571

Zip Code

Coastal Engineering Company

Contact Person (if different from Owner)

508-255-6511

Telephone Number

B. Test Results

	4/12/2022 Date	11:30 am Time	4/12/2022 Date	11:45 am Time
Observation Hole #	1		2	
Depth of Perc	66"		72"	
Start Pre-Soak	0 min		0 min	
End Pre-Soak	12 min 3 sec		12 min 15 sec	
Time at 12"				
Time at 9"				
Time at 6"				
Time (9"-6")				
Rate (Min./Inch)	< 2 MPI		< 2 MPI	
	Test Passed: <input checked="" type="checkbox"/>		Test Passed: <input checked="" type="checkbox"/>	
	Test Failed: <input type="checkbox"/>		Test Failed: <input type="checkbox"/>	

Bryan J. Weiner, P.E. / SE2566

Test Performed By:

Elias Estevez, Health Inspector

Board of Health Witness

Comments:

Percolation Test performed in the C Horizon.

Appendix D – Watershed Map

- Existing Watershed Map
- Proposed Watershed Map



SEAL

CHK

DWN

DESCRIPTION

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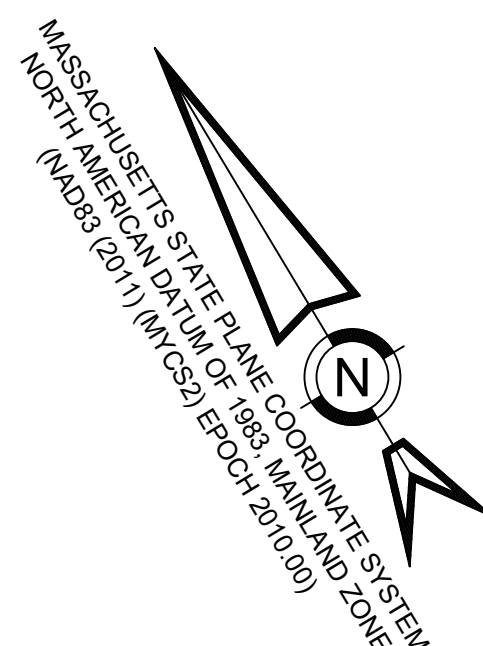
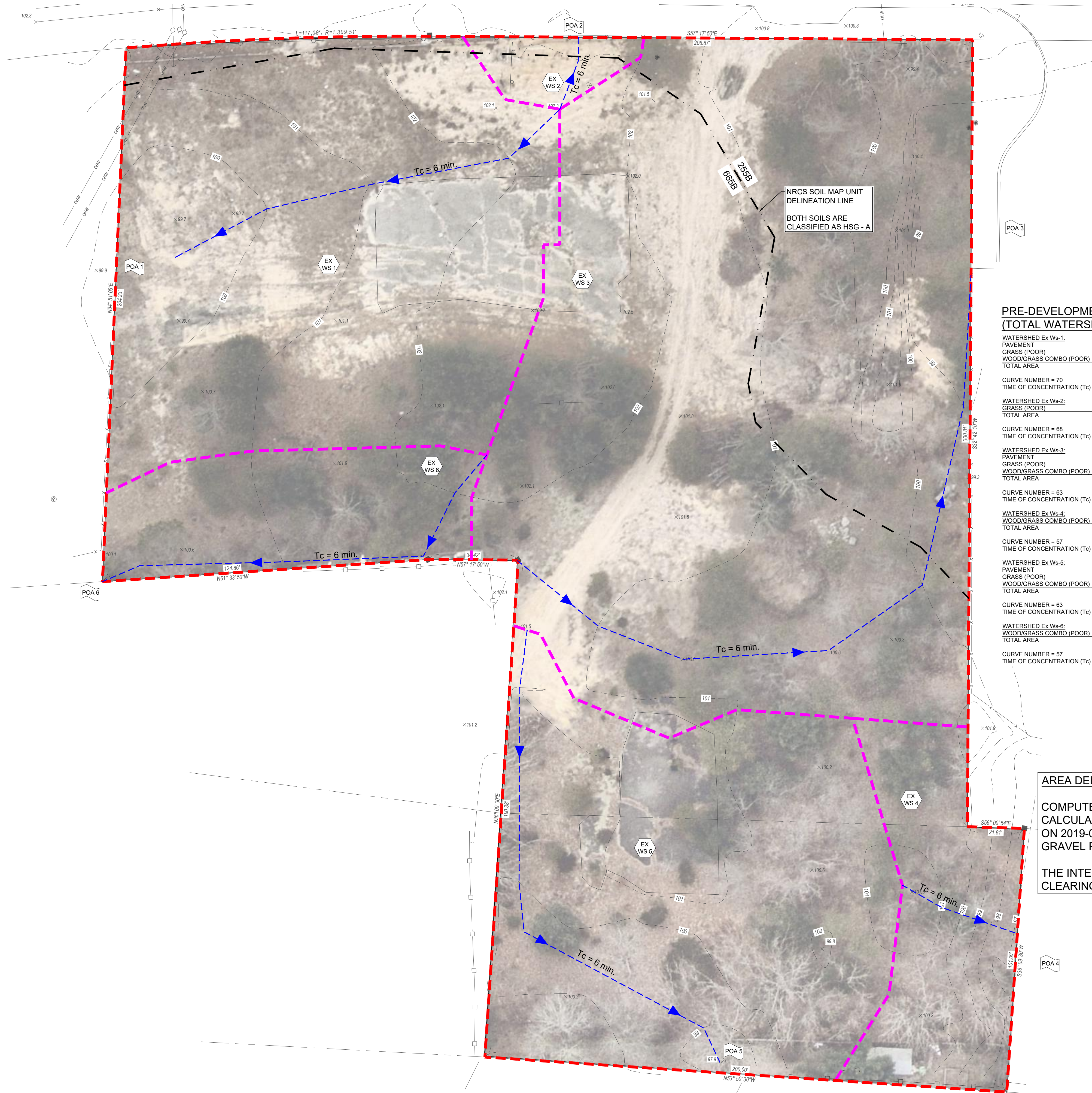
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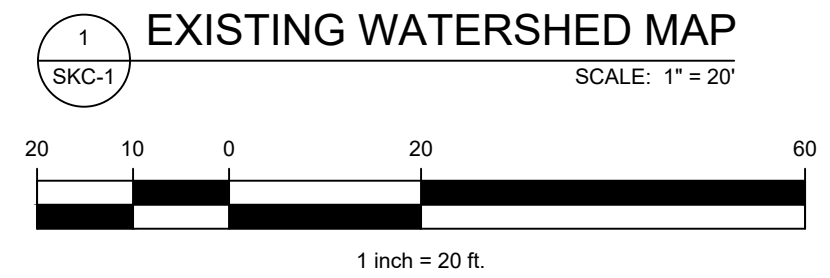
**PRE-DEVELOPMENT WATERSHED AREA SUMMARY
(TOTAL WATERSHED 102,607 S.F. - LOT AREA)**

WATERSHED Ex Ws-1:	
PAVEMENT	= 3,352 S.F.
GRASS (POOR)	= 18,082 S.F.
WOOD/GRASS COMBO (POOR)	= 3,613 S.F.
TOTAL AREA	= 25,047 S.F.
WATERSHED Ex Ws-2:	
PAVEMENT	= 1,282 S.F.
GRASS (POOR)	= 1,282 S.F.
TOTAL AREA	= 2,564 S.F.
WATERSHED Ex Ws-3:	
PAVEMENT	= 1,654 S.F.
GRASS (POOR)	= 16,853 S.F.
WOOD/GRASS COMBO (POOR)	= 24,705 S.F.
TOTAL AREA	= 43,212 S.F.
WATERSHED Ex Ws-4:	
PAVEMENT	= 6,540 S.F.
GRASS (POOR)	= 6,540 S.F.
WOOD/GRASS COMBO (POOR)	= 6,540 S.F.
TOTAL AREA	= 19,620 S.F.
WATERSHED Ex Ws-5:	
PAVEMENT	= 2,607 S.F.
GRASS (POOR)	= 1,731 S.F.
WOOD/GRASS COMBO (POOR)	= 16,042 S.F.
TOTAL AREA	= 20,380 S.F.
WATERSHED Ex Ws-6:	
PAVEMENT	= 6,146 S.F.
GRASS (POOR)	= 6,146 S.F.
WOOD/GRASS COMBO (POOR)	= 6,146 S.F.
TOTAL AREA	= 18,438 S.F.

LEGEND

- WATERSHED BOUNDARY
- SUBCATCHMENT AREA
- TIME OF CONCENTRATION
- ▶ TIME OF CONCENTRATION FLOW PATH
- NRCS SOIL DELINEATION LINE
- 255B SOIL CLASSIFICATION
- Ex WS 1 WATERSHED DESIGNATION
- POA-3 POINT OF ANALYSIS DESIGNATION

AREA DELINEATION NOTE:
 COMPUTED EXISTING AREAS FOR STORMWATER CALCULATIONS ARE BASED ON AERIAL IMAGERY SHOT ON 2019-03-25 PRIOR TO SITE CLEARING, ADDITION OF GRAVEL PARKING, AND BUILDINGS.
 THE INTENT IS TO RESTORE THE RUNOFF TO PRE CLEARING CONDITIONS FOR THIS SITE



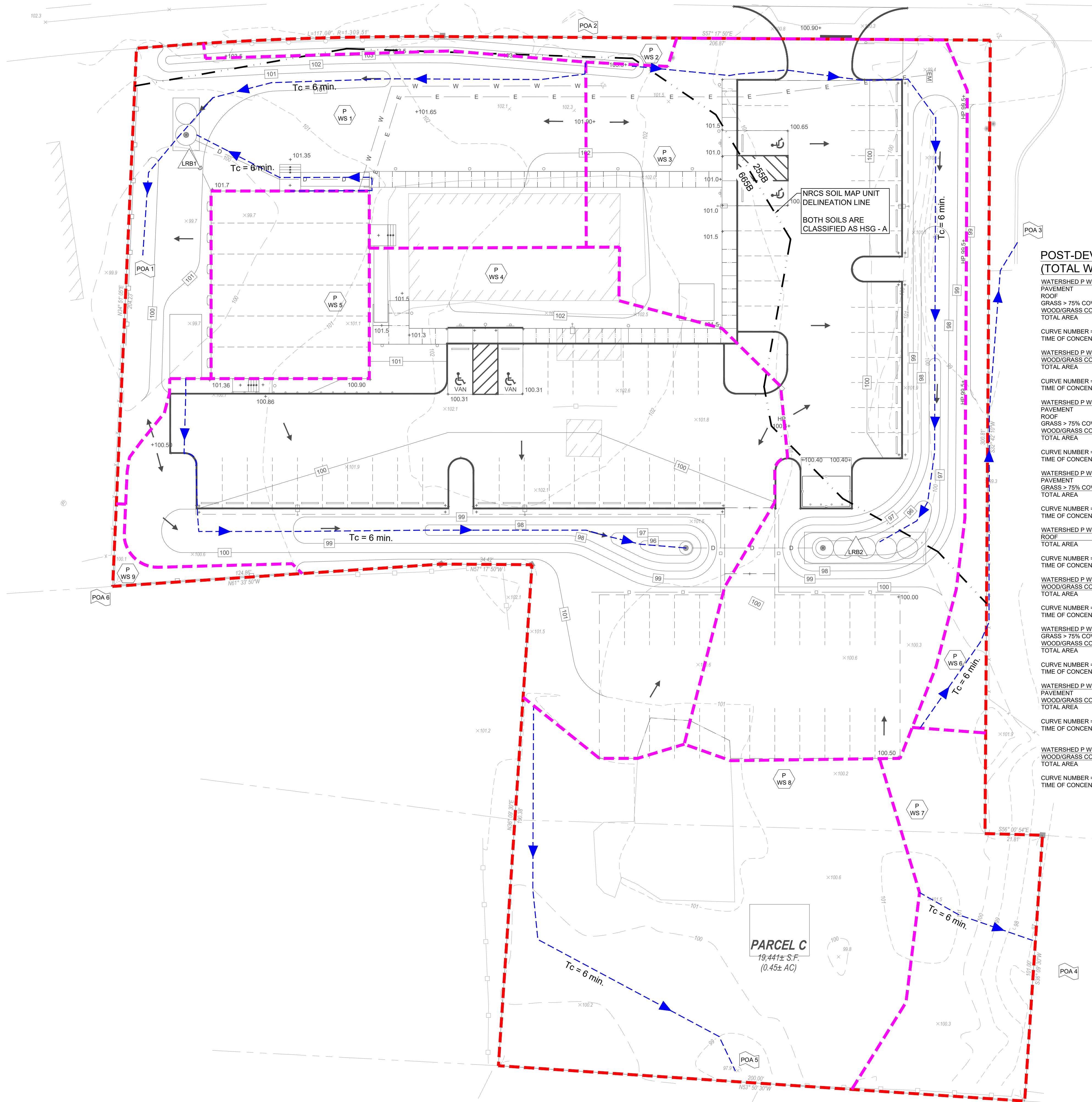
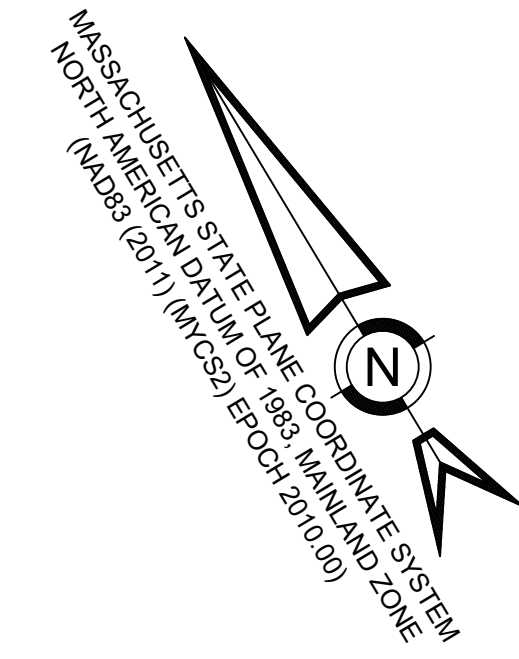
GRACE LIGHTHOUSE CHURCH
 2703 CRANBERRY HIGHWAY
 WAREHAM, MA 02571

DATE: 2024-01-12
 DRAWN BY: DAV
 CHECKED BY: SMR
 PROJECT NUMBER: C19495-00
 PROJECT STATUS: ISSUED FOR PERMIT

EXISTING WATERSHED MAP

SKC - 1

SHEET 01 OF 02



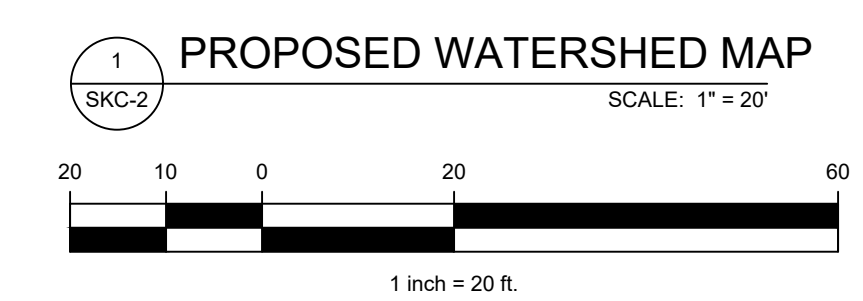
**POST-DEVELOPMENT WATERSHED AREA SUMMARY
(TOTAL WATERSHED 102,607 S.F. - LOT AREA)**

WATERSHED P WS-1:	= 1,107 S.F.
PAVEMENT	= 1,675 S.F.
GRASS > 75% COVER (GOOD)	= 7,850 S.F.
WOOD/GRASS COMBO (GOOD)	= 2,827 S.F.
TOTAL AREA	= 13,459 S.F.
CURVE NUMBER = 50	
TIME OF CONCENTRATION (Tc) = 6 MIN	
WATERSHED P WS-2:	= 1,283 S.F.
WOOD/GRASS COMBO (GOOD)	= 1,283 S.F.
TOTAL AREA	= 1,283 S.F.
CURVE NUMBER = 32	
TIME OF CONCENTRATION (Tc) = 6 MIN	
WATERSHED P WS-3:	= 15,374 S.F.
PAVEMENT	= 181 S.F.
GRASS > 75% COVER (GOOD)	= 11,843 S.F.
WOOD/GRASS COMBO (GOOD)	= 509 S.F.
TOTAL AREA	= 27,907 S.F.
CURVE NUMBER = 72	
TIME OF CONCENTRATION (Tc) = 6 MIN	
WATERSHED P WS-4:	= 16,348 S.F.
PAVEMENT	= 11,148 S.F.
GRASS > 75% COVER (GOOD)	= 27,494 S.F.
TOTAL AREA	= 27,494 S.F.
CURVE NUMBER = 74	
TIME OF CONCENTRATION (Tc) = 6 MIN	
WATERSHED P WS-5:	= 4,267 S.F.
ROOF	= 4,267 S.F.
TOTAL AREA	= 4,267 S.F.
CURVE NUMBER = 96	
TIME OF CONCENTRATION (Tc) = 6 MIN	
WATERSHED P WS-6:	= 2,910 S.F.
WOOD/GRASS COMBO (GOOD)	= 2,910 S.F.
TOTAL AREA	= 2,910 S.F.
CURVE NUMBER = 32	
TIME OF CONCENTRATION (Tc) = 6 MIN	
WATERSHED P WS-7:	= 1,109 S.F.
GRASS > 75% COVER (GOOD)	= 5,276 S.F.
WOOD/GRASS COMBO (GOOD)	= 6,385 S.F.
TOTAL AREA	= 6,385 S.F.
CURVE NUMBER = 33	
TIME OF CONCENTRATION (Tc) = 6 MIN	
WATERSHED P WS-8:	= 2,414 S.F.
PAVEMENT	= 15,981 S.F.
WOOD/GRASS COMBO (GOOD)	= 18,395 S.F.
TOTAL AREA	= 18,395 S.F.
CURVE NUMBER = 41	
TIME OF CONCENTRATION (Tc) = 6 MIN	
WATERSHED P WS-9:	= 507 S.F.
WOOD/GRASS COMBO (GOOD)	= 507 S.F.
TOTAL AREA	= 507 S.F.
CURVE NUMBER = 32	
TIME OF CONCENTRATION (Tc) = 6 MIN	

LEGEND

- - - WATERSHED BOUNDARY
- - - SUBCATCHMENT AREA
- - - TIME OF CONCENTRATION
- ▶ TIME OF CONCENTRATION FLOW PATH
- - - NRCS SOIL DELINEATION LINE
- ▨ SOIL CLASSIFICATION
- Ex
Ws 1 WATERSHED DESIGNATION
- LRB POND - LEACHING RECHARGE BASIN
- POA-3 POINT OF ANALYSIS DESIGNATION

PARCEL C
19,441± S.F.
(0.45± AC)



GRACE LIGHTHOUSE CHURCH

2703 CRANBERRY HIGHWAY
WAREHAM, MA 02571

DATE: 2024-01-12
DRAWN BY: DAV
CHECKED BY: SMR
PROJECT NUMBER: C19495-00
PROJECT STATUS: ISSUED FOR PERMIT

PROPOSED WATERSHED MAP

SKC - 2

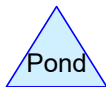
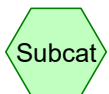
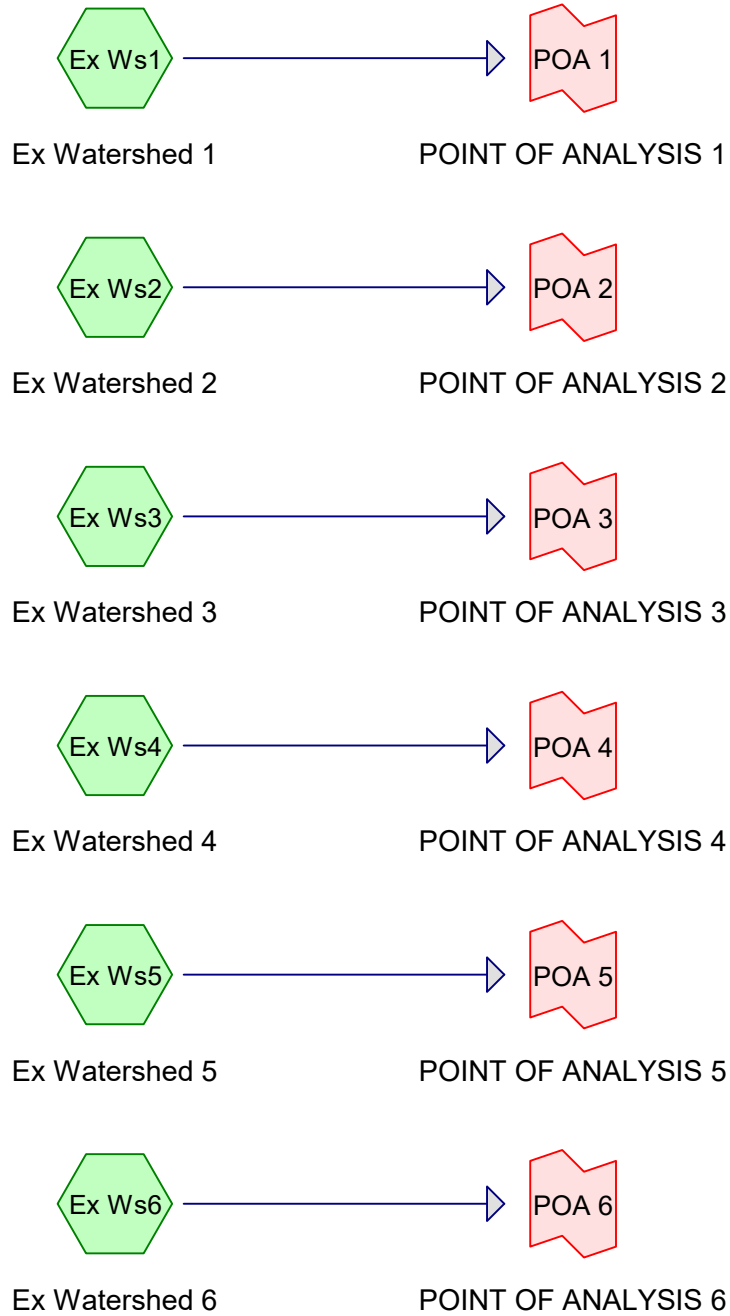
SHEET 02 OF 02

Appendix E – Calculations

- Pre and Post-Development Conditions Comparison
- Existing Conditions HydroCAD Calculations
- Proposed Conditions HydroCAD Calculations
- Recharge Calculations
- Drawdown Calculations
- Water Quality Calculations
- TSS Calculations

Pre and Post Flow Comparison for POA 1				
Storm event	Rainfall	Pre-Development	Post-Development	Reduction
2-year	3.44	0.6	0.02	0.58
10-year	5.05	1.37	0.16	1.21
25-year	6.05	1.91	0.34	1.57
100-year	7.59	2.78	1.29	1.49
Pre and Post Flow Comparison for POA 2				
Storm event	Rainfall	Pre-Development	Post-Development	Reduction
2-year	3.44	3	0.00	3
10-year	5.05	0.06	0.00	0.06
25-year	6.05	0.09	0.00	0.09
100-year	7.59	0.13	0.00	0.13
Pre and Post Flow Comparison for POA 3				
Storm event	Rainfall	Pre-Development	Post-Development	Reduction
2-year	3.44	0.57	0.00	0.57
10-year	5.05	1.68	0.00	1.68
25-year	6.05	2.49	0.00	2.49
100-year	7.59	3.86	0.28	3.58
Pre and Post Flow Comparison for POA 4				
Storm event	Rainfall	Pre-Development	Post-Development	Reduction
2-year	3.44	0.03	0.00	0.03
10-year	5.05	0.17	0.00	0.17
25-year	6.05	0.28	0.00	0.28
100-year	7.59	0.46	0.03	0.43
Pre and Post Flow Comparison for POA 5				
Storm event	Rainfall	Pre-Development	Post-Development	Reduction
2-year	3.44	0.27	0	0.27
10-year	5.05	0.79	0.04	0.75
25-year	6.05	1.17	0.11	1.06
100-year	7.59	1.82	0.39	1.43
Pre and Post Flow Comparison for POA 6				
Storm event	Rainfall	Pre-Development	Post-Development	Reduction
2-year	3.44	0.03	0.00	0.03
10-year	5.05	0.16	0.00	0.16
25-year	6.05	0.26	0.00	0.26
100-year	7.59	0.43	0.00	0.43

Pre Analysis



C19495

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Printed 1/29/2024

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Page 2

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	100-Yr	Type III 24-hr		Default	24.00	1	7.59	2
2	25-Yr	Type III 24-hr		Default	24.00	1	6.05	2
3	10-Yr	Type III 24-hr		Default	24.00	1	5.05	2
4	2-Yr	Type III 24-hr		Default	24.00	1	3.44	2

C19495

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Area Listing (selected nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
37,948	68	<50% Grass cover, Poor, HSG A (Ex Ws1, Ex Ws2, Ex Ws3, Ex Ws5)
7,613	98	Paved parking, HSG A (Ex Ws1, Ex Ws3, Ex Ws5)
57,042	57	Woods/grass comb., Poor, HSG A (Ex Ws1, Ex Ws3, Ex Ws4, Ex Ws5, Ex Ws6)
102,603	64	TOTAL AREA

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Soil Listing (selected nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
102,603	HSG A	Ex Ws1, Ex Ws2, Ex Ws3, Ex Ws4, Ex Ws5, Ex Ws6
0	HSG B	
0	HSG C	
0	HSG D	
0	Other	
102,603		TOTAL AREA

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Ground Covers (selected 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
37,948	0	0	0	0	37,948	<50% Grass cover, Poor
7,613	0	0	0	0	7,613	Paved parking
57,042	0	0	0	0	57,042	Woods/grass comb., Poor
102,603	0	0	0	0	102,603	TOTAL AREA

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Type III 24-hr 100-Yr Rainfall=7.59"

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Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 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 Ex Ws1: Ex Watershed 1	Runoff Area=25,047 sf 13.38% Impervious Runoff Depth>4.11" Tc=6.0 min CN=70 Runoff=2.78 cfs 8,577 cf
Subcatchment Ex Ws2: Ex Watershed 2	Runoff Area=1,282 sf 0.00% Impervious Runoff Depth>3.89" Tc=6.0 min CN=68 Runoff=0.13 cfs 415 cf
Subcatchment Ex Ws3: Ex Watershed 3	Runoff Area=43,212 sf 3.83% Impervious Runoff Depth>3.34" Tc=6.0 min CN=63 Runoff=3.86 cfs 12,045 cf
Subcatchment Ex Ws4: Ex Watershed 4	Runoff Area=6,536 sf 0.00% Impervious Runoff Depth>2.71" Tc=6.0 min CN=57 Runoff=0.46 cfs 1,476 cf
Subcatchment Ex Ws5: Ex Watershed 5	Runoff Area=20,380 sf 12.79% Impervious Runoff Depth>3.34" Tc=6.0 min CN=63 Runoff=1.82 cfs 5,681 cf
Subcatchment Ex Ws6: Ex Watershed 6	Runoff Area=6,146 sf 0.00% Impervious Runoff Depth>2.71" Tc=6.0 min CN=57 Runoff=0.43 cfs 1,388 cf
Link POA 1: POINT OF ANALYSIS 1	Inflow=2.78 cfs 8,577 cf Primary=2.78 cfs 8,577 cf
Link POA 2: POINT OF ANALYSIS 2	Inflow=0.13 cfs 415 cf Primary=0.13 cfs 415 cf
Link POA 3: POINT OF ANALYSIS 3	Inflow=3.86 cfs 12,045 cf Primary=3.86 cfs 12,045 cf
Link POA 4: POINT OF ANALYSIS 4	Inflow=0.46 cfs 1,476 cf Primary=0.46 cfs 1,476 cf
Link POA 5: POINT OF ANALYSIS 5	Inflow=1.82 cfs 5,681 cf Primary=1.82 cfs 5,681 cf
Link POA 6: POINT OF ANALYSIS 6	Inflow=0.43 cfs 1,388 cf Primary=0.43 cfs 1,388 cf

Total Runoff Area = 102,603 sf Runoff Volume = 29,582 cf Average Runoff Depth = 3.46"
92.58% Pervious = 94,990 sf 7.42% Impervious = 7,613 sf

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Type III 24-hr 100-Yr Rainfall=7.59"

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Summary for Subcatchment Ex Ws1: Ex Watershed 1

Runoff = 2.78 cfs @ 12.09 hrs, Volume= 8,577 cf, Depth> 4.11"

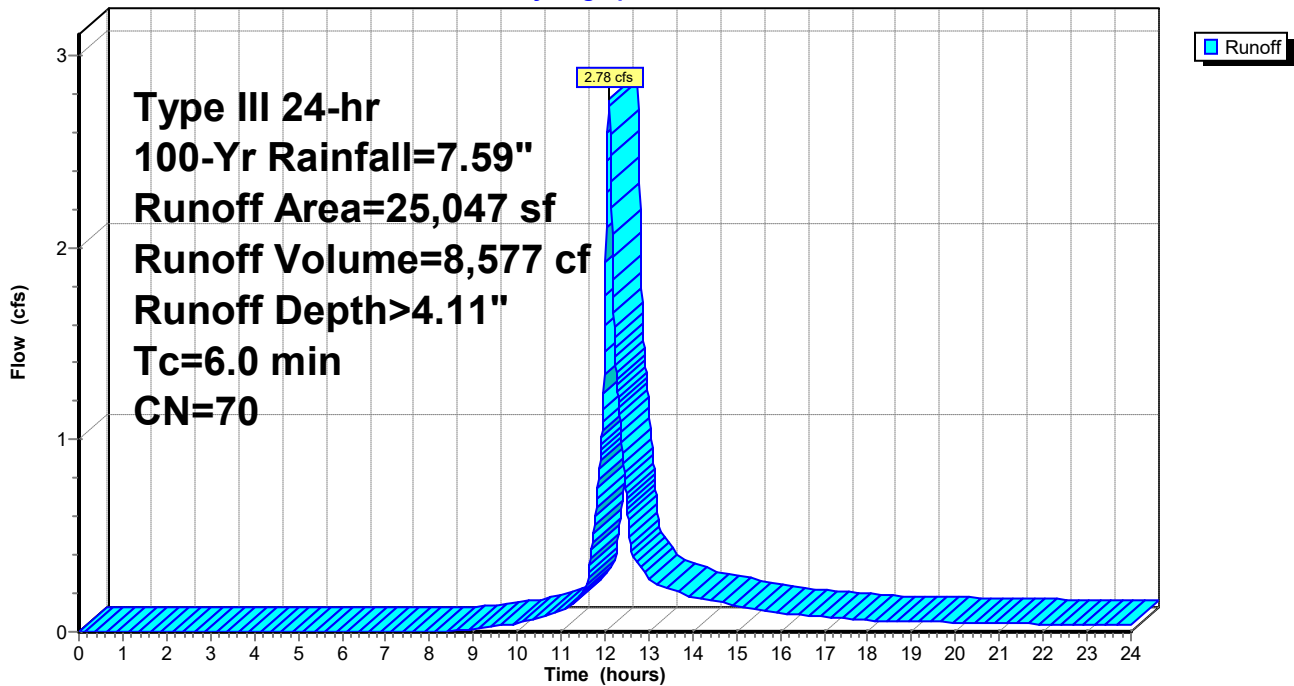
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr Rainfall=7.59"

Area (sf)	CN	Description
3,352	98	Paved parking, HSG A
18,082	68	<50% Grass cover, Poor, HSG A
3,613	57	Woods/grass comb., Poor, HSG A
25,047	70	Weighted Average
21,695		86.62% Pervious Area
3,352		13.38% Impervious Area

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

Subcatchment Ex Ws1: Ex Watershed 1

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Type III 24-hr 100-Yr Rainfall=7.59"

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Summary for Subcatchment Ex Ws2: Ex Watershed 2

Runoff = 0.13 cfs @ 12.09 hrs, Volume= 415 cf, Depth> 3.89"

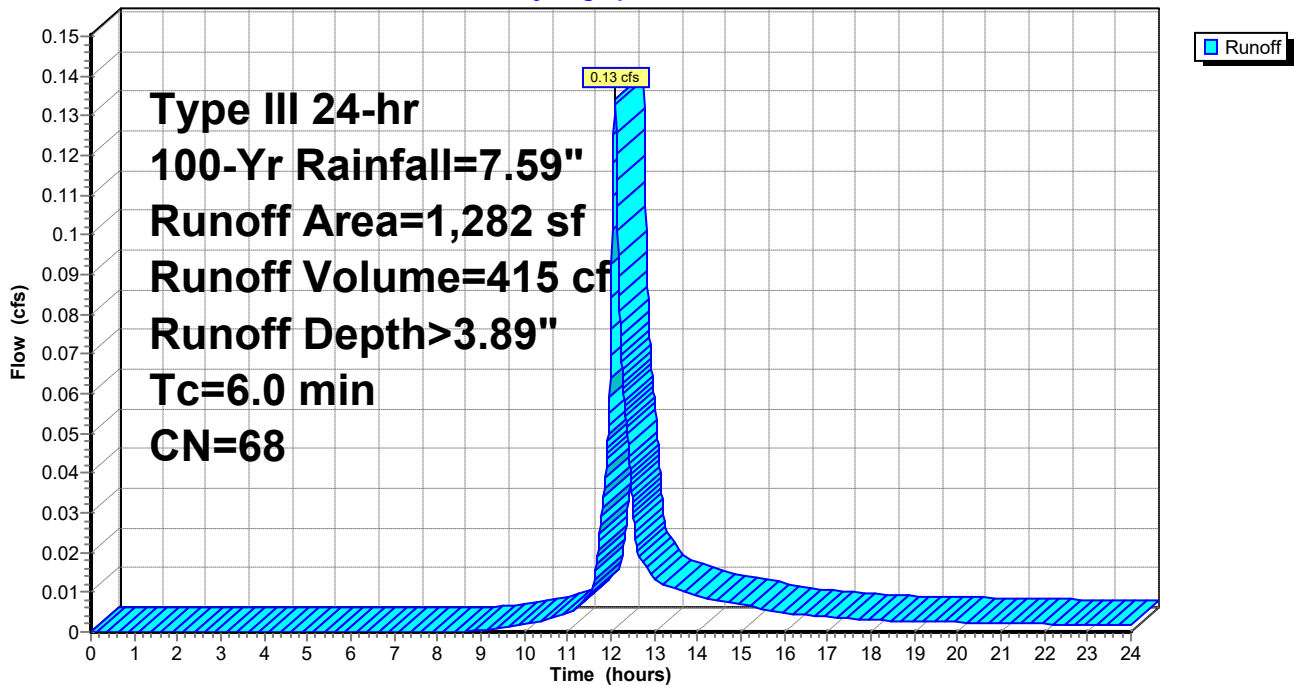
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr Rainfall=7.59"

Area (sf)	CN	Description
1,282	68	<50% Grass cover, Poor, HSG A
1,282		100.00% Pervious Area

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

Subcatchment Ex Ws2: Ex Watershed 2

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Type III 24-hr 100-Yr Rainfall=7.59"

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Summary for Subcatchment Ex Ws3: Ex Watershed 3

Runoff = 3.86 cfs @ 12.09 hrs, Volume= 12,045 cf, Depth> 3.34"

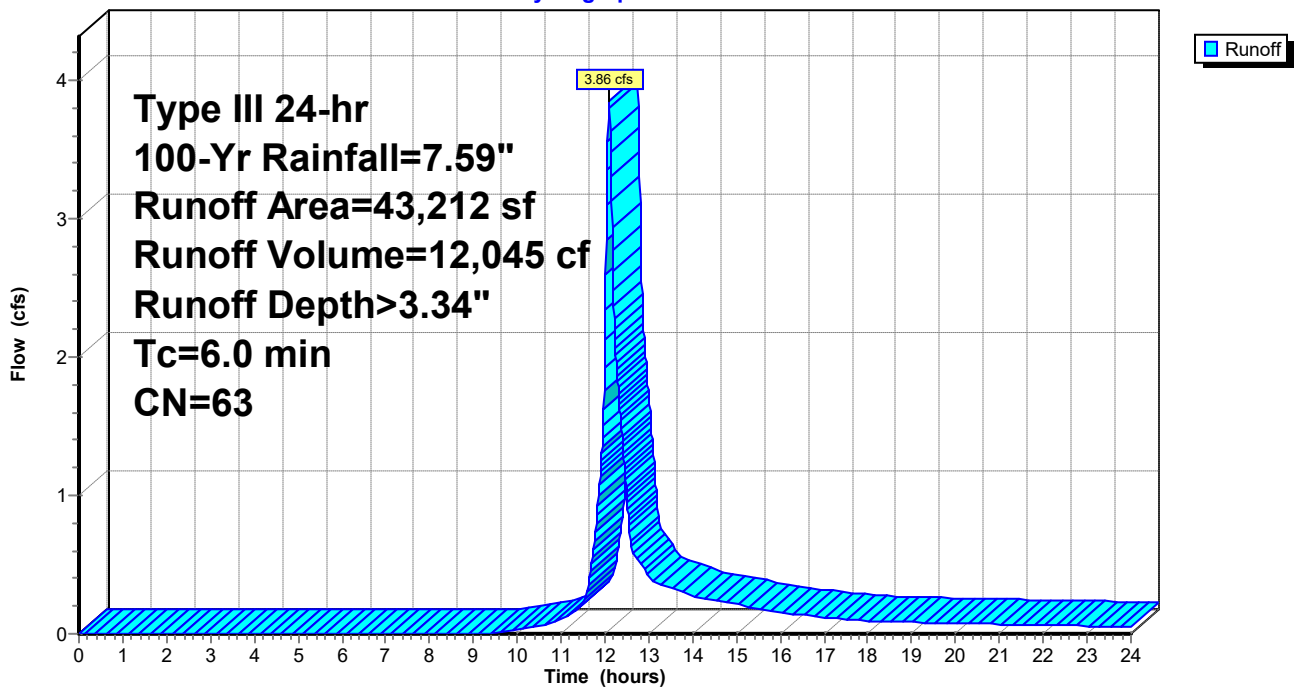
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr Rainfall=7.59"

Area (sf)	CN	Description
1,654	98	Paved parking, HSG A
16,853	68	<50% Grass cover, Poor, HSG A
24,705	57	Woods/grass comb., Poor, HSG A
43,212	63	Weighted Average
41,558		96.17% Pervious Area
1,654		3.83% Impervious Area

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

Subcatchment Ex Ws3: Ex Watershed 3

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Type III 24-hr 100-Yr Rainfall=7.59"

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Summary for Subcatchment Ex Ws4: Ex Watershed 4

Runoff = 0.46 cfs @ 12.09 hrs, Volume= 1,476 cf, Depth> 2.71"

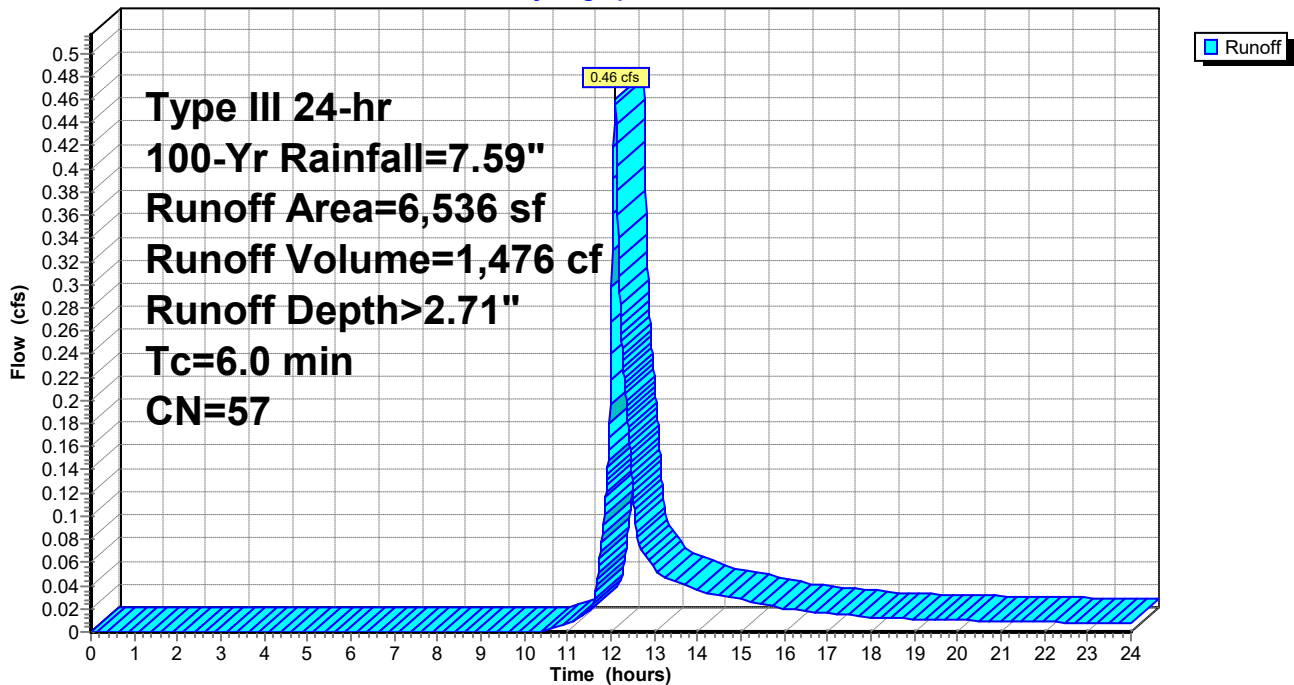
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr Rainfall=7.59"

Area (sf)	CN	Description
6,536	57	Woods/grass comb., Poor, HSG A
6,536		100.00% Pervious Area

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

Subcatchment Ex Ws4: Ex Watershed 4

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Type III 24-hr 100-Yr Rainfall=7.59"

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Summary for Subcatchment Ex Ws5: Ex Watershed 5

Runoff = 1.82 cfs @ 12.09 hrs, Volume= 5,681 cf, Depth> 3.34"

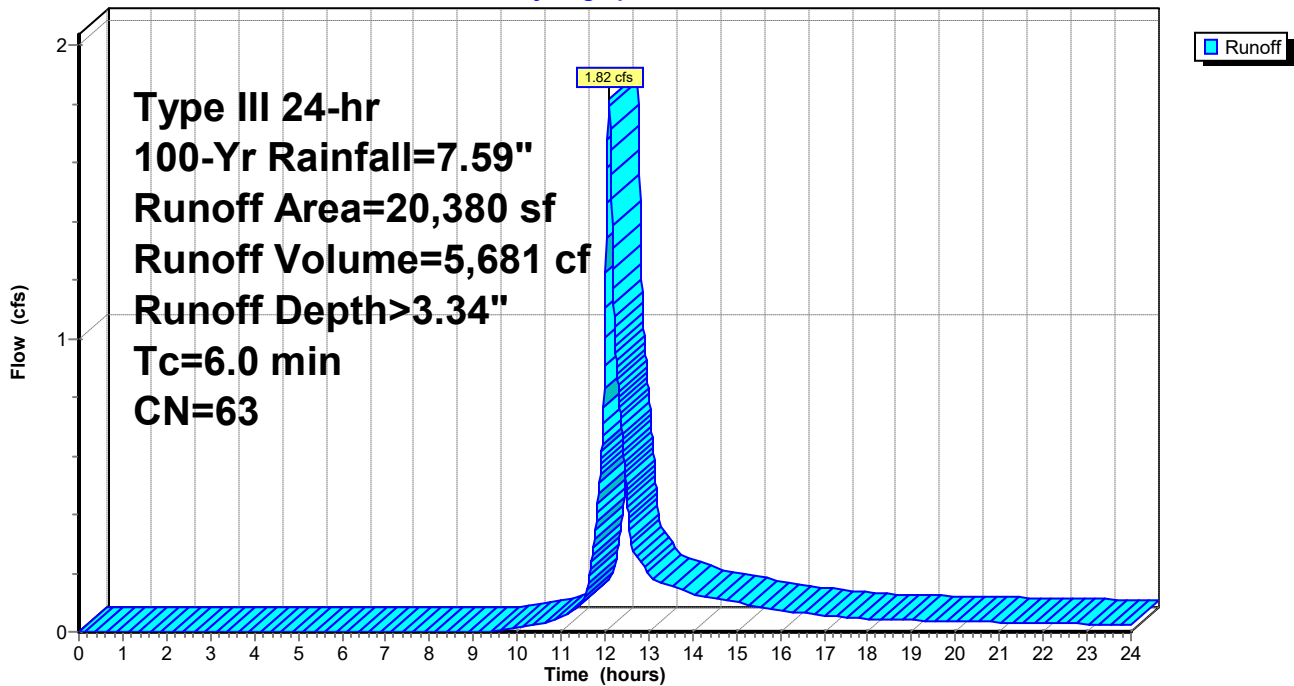
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr Rainfall=7.59"

Area (sf)	CN	Description
2,607	98	Paved parking, HSG A
1,731	68	<50% Grass cover, Poor, HSG A
16,042	57	Woods/grass comb., Poor, HSG A
20,380	63	Weighted Average
17,773		87.21% Pervious Area
2,607		12.79% Impervious Area

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

Subcatchment Ex Ws5: Ex Watershed 5

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Type III 24-hr 100-Yr Rainfall=7.59"

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Summary for Subcatchment Ex Ws6: Ex Watershed 6

Runoff = 0.43 cfs @ 12.09 hrs, Volume= 1,388 cf, Depth> 2.71"

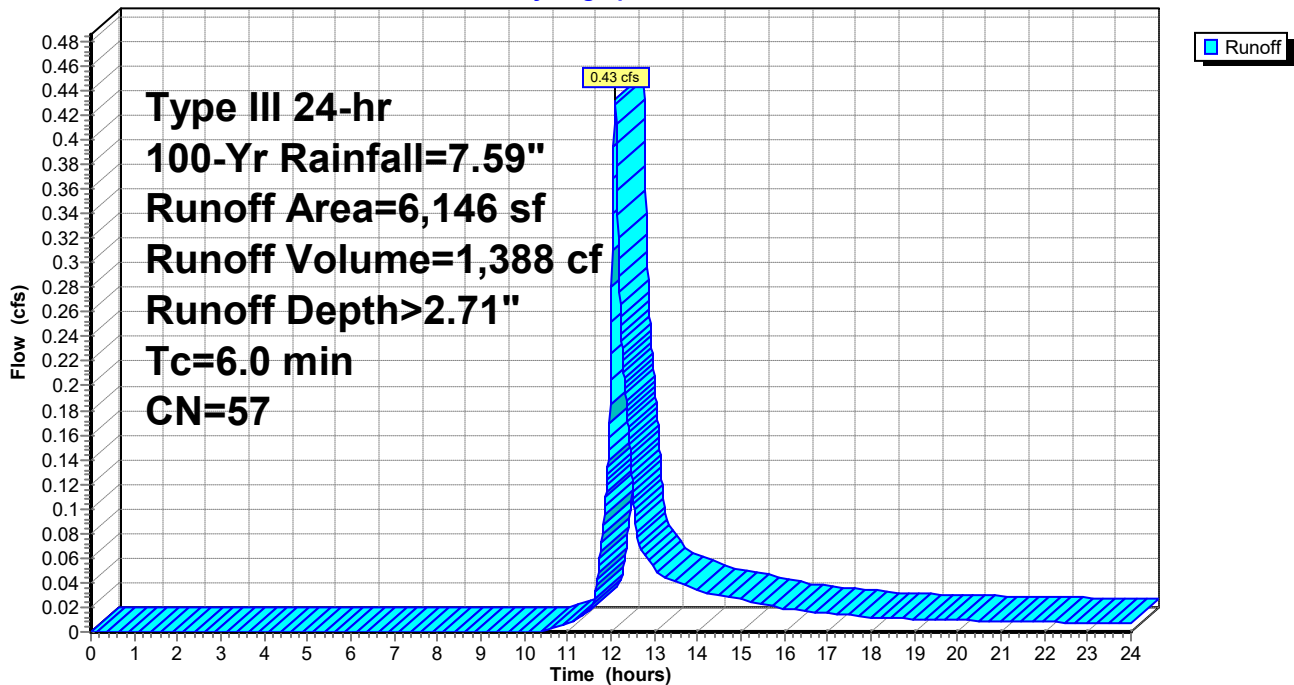
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr Rainfall=7.59"

Area (sf)	CN	Description
6,146	57	Woods/grass comb., Poor, HSG A
6,146		100.00% Pervious Area

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

Subcatchment Ex Ws6: Ex Watershed 6

Hydrograph

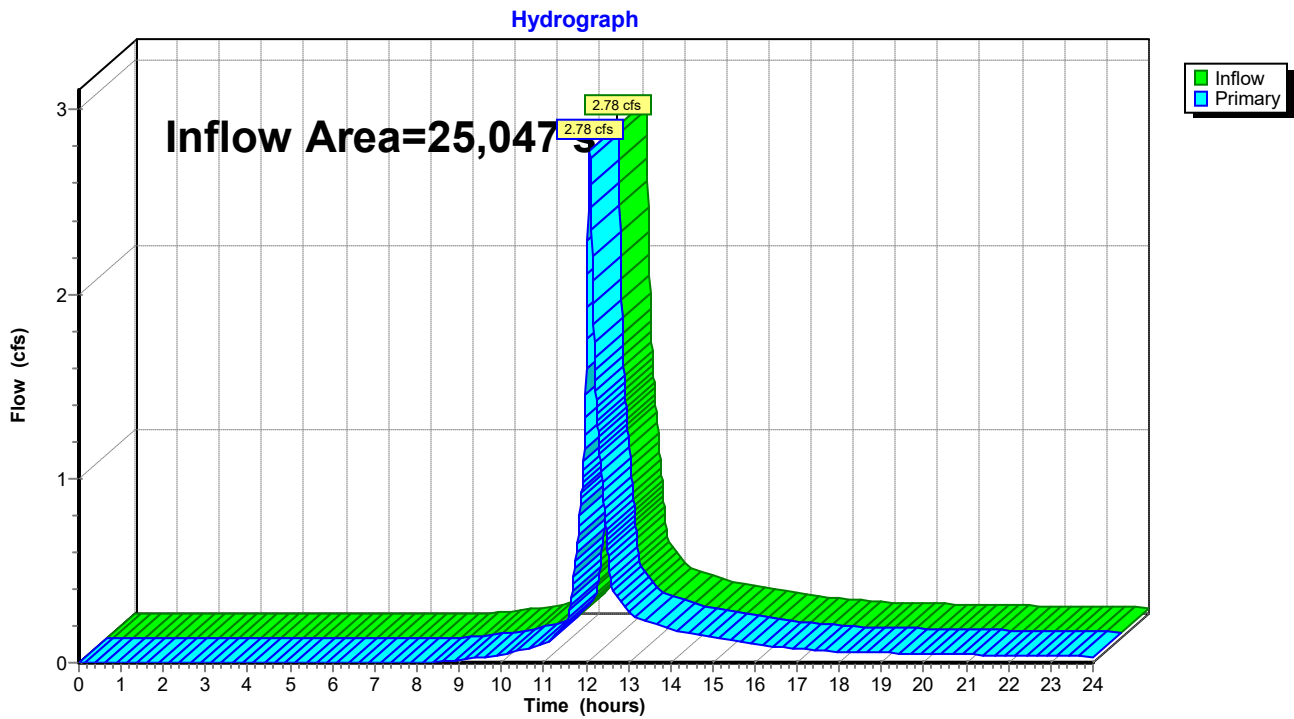


Summary for Link POA 1: POINT OF ANALYSIS 1

Inflow Area = 25,047 sf, 13.38% Impervious, Inflow Depth > 4.11" for 100-Yr event
Inflow = 2.78 cfs @ 12.09 hrs, Volume= 8,577 cf
Primary = 2.78 cfs @ 12.09 hrs, Volume= 8,577 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link POA 1: POINT OF ANALYSIS 1



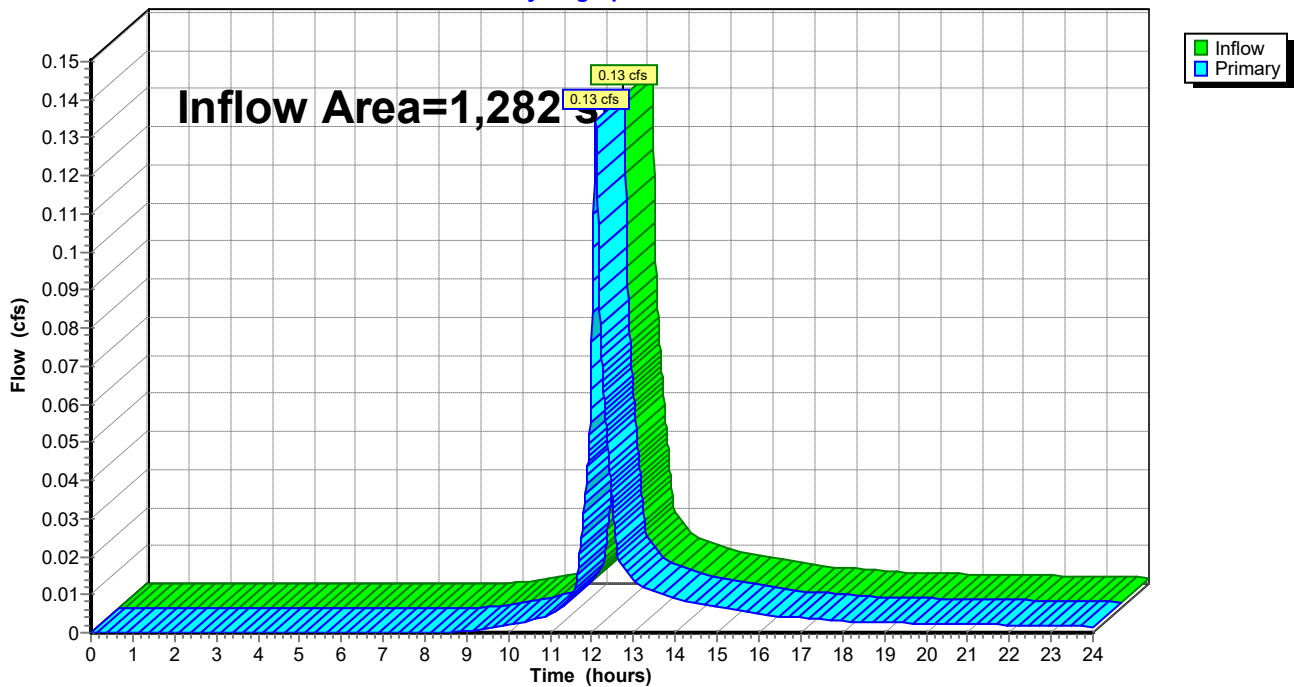
Summary for Link POA 2: POINT OF ANALYSIS 2

Inflow Area = 1,282 sf, 0.00% Impervious, Inflow Depth > 3.89" for 100-Yr event
Inflow = 0.13 cfs @ 12.09 hrs, Volume= 415 cf
Primary = 0.13 cfs @ 12.09 hrs, Volume= 415 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link POA 2: POINT OF ANALYSIS 2

Hydrograph

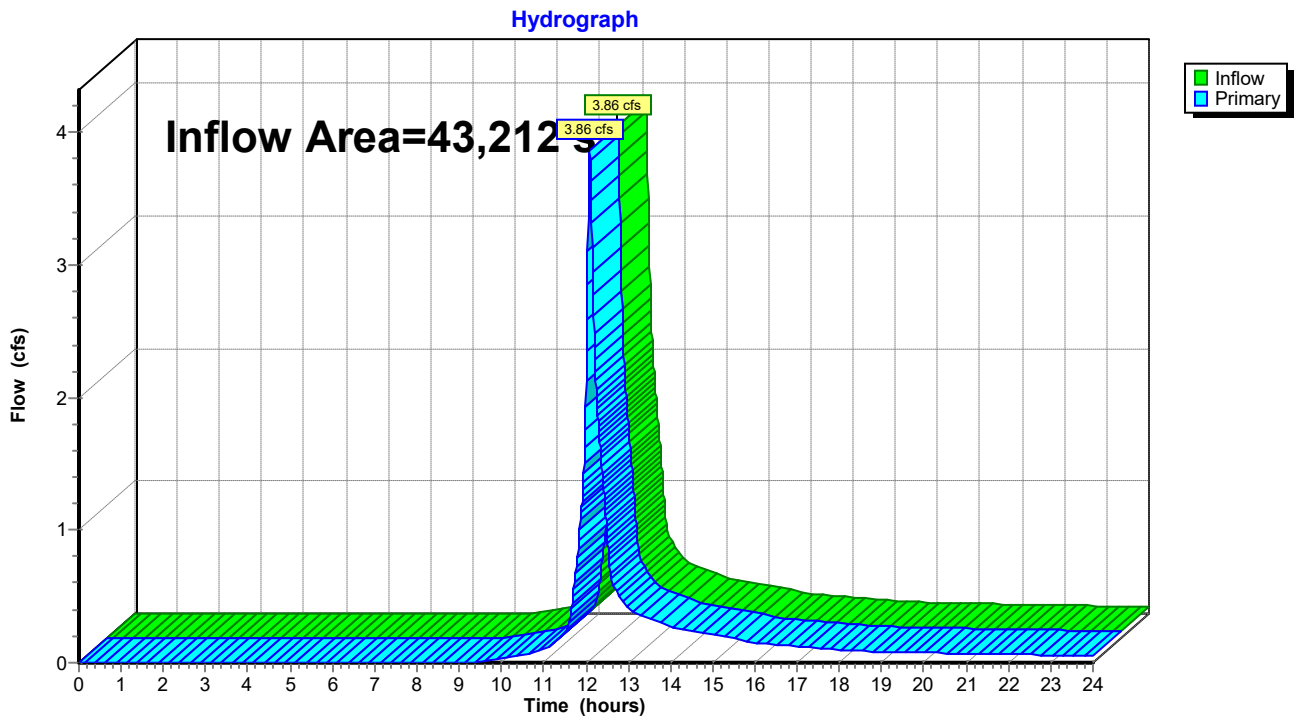


Summary for Link POA 3: POINT OF ANALYSIS 3

Inflow Area = 43,212 sf, 3.83% Impervious, Inflow Depth > 3.34" for 100-Yr event
Inflow = 3.86 cfs @ 12.09 hrs, Volume= 12,045 cf
Primary = 3.86 cfs @ 12.09 hrs, Volume= 12,045 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link POA 3: POINT OF ANALYSIS 3

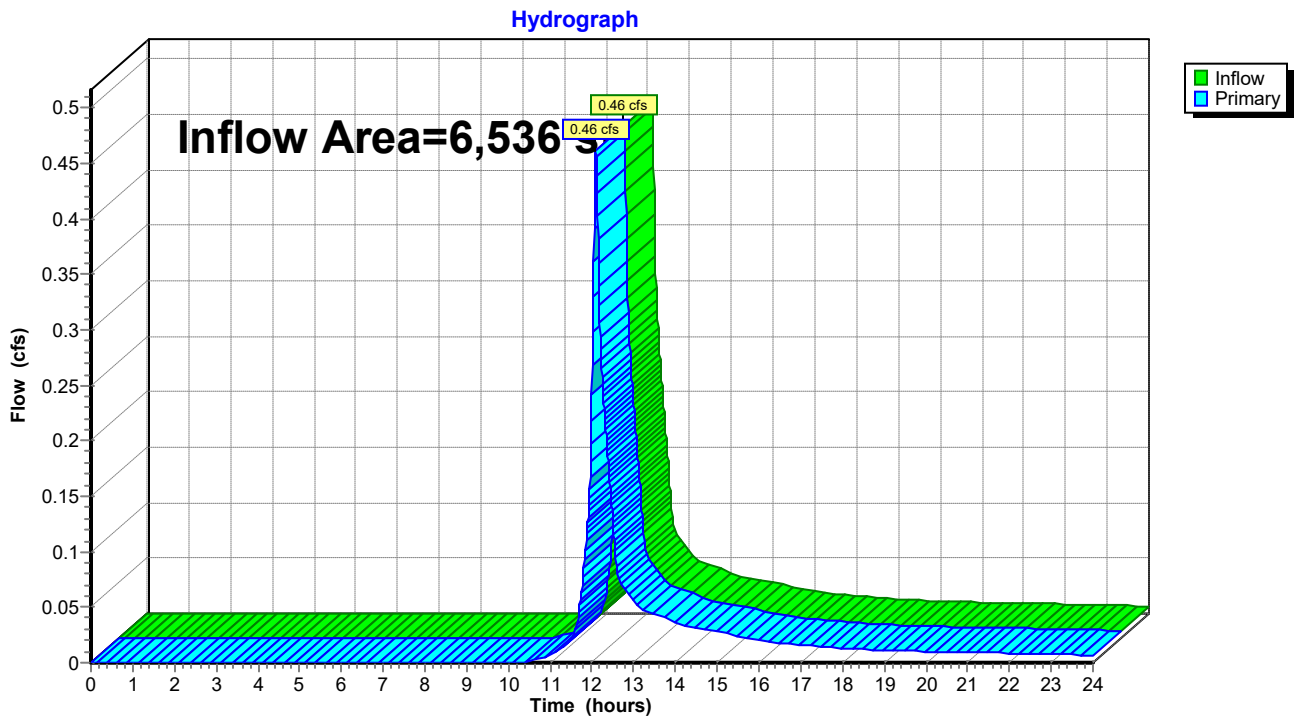


Summary for Link POA 4: POINT OF ANALYSIS 4

Inflow Area = 6,536 sf, 0.00% Impervious, Inflow Depth > 2.71" for 100-Yr event
Inflow = 0.46 cfs @ 12.09 hrs, Volume= 1,476 cf
Primary = 0.46 cfs @ 12.09 hrs, Volume= 1,476 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link POA 4: POINT OF ANALYSIS 4



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Type III 24-hr 100-Yr Rainfall=7.59"

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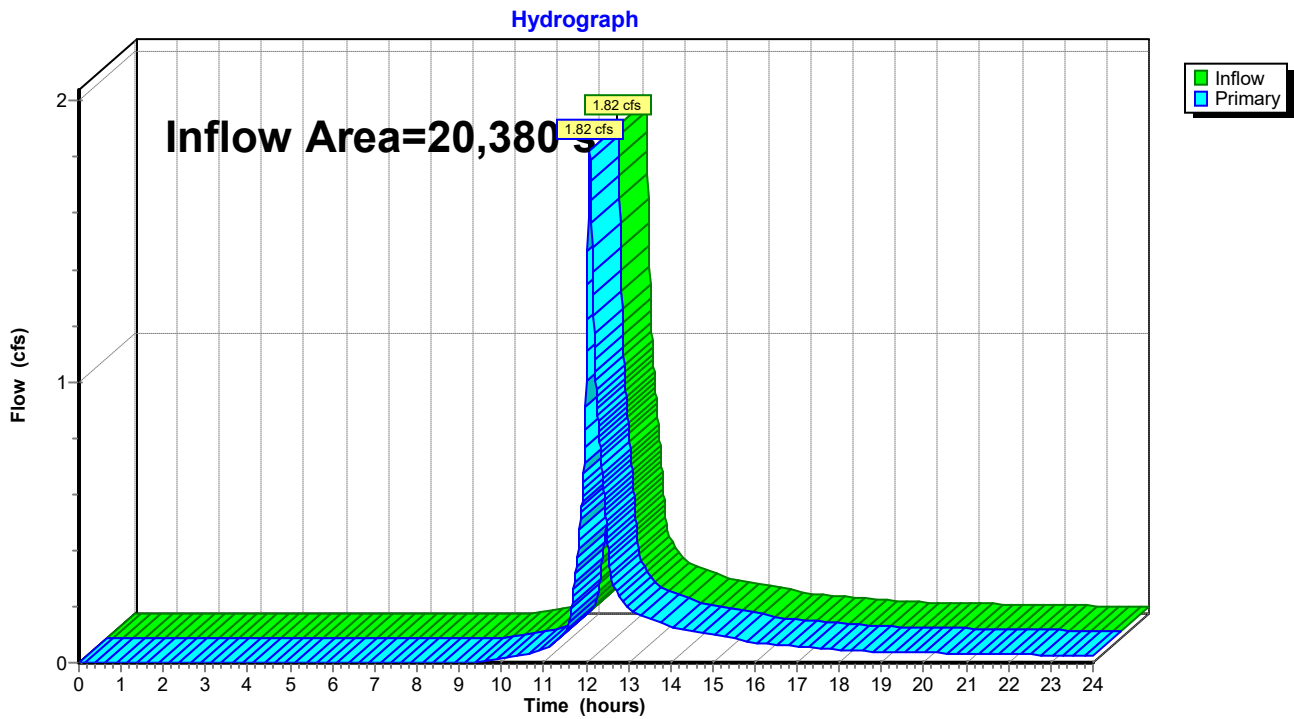
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Summary for Link POA 5: POINT OF ANALYSIS 5

Inflow Area = 20,380 sf, 12.79% Impervious, Inflow Depth > 3.34" for 100-Yr event
Inflow = 1.82 cfs @ 12.09 hrs, Volume= 5,681 cf
Primary = 1.82 cfs @ 12.09 hrs, Volume= 5,681 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link POA 5: POINT OF ANALYSIS 5



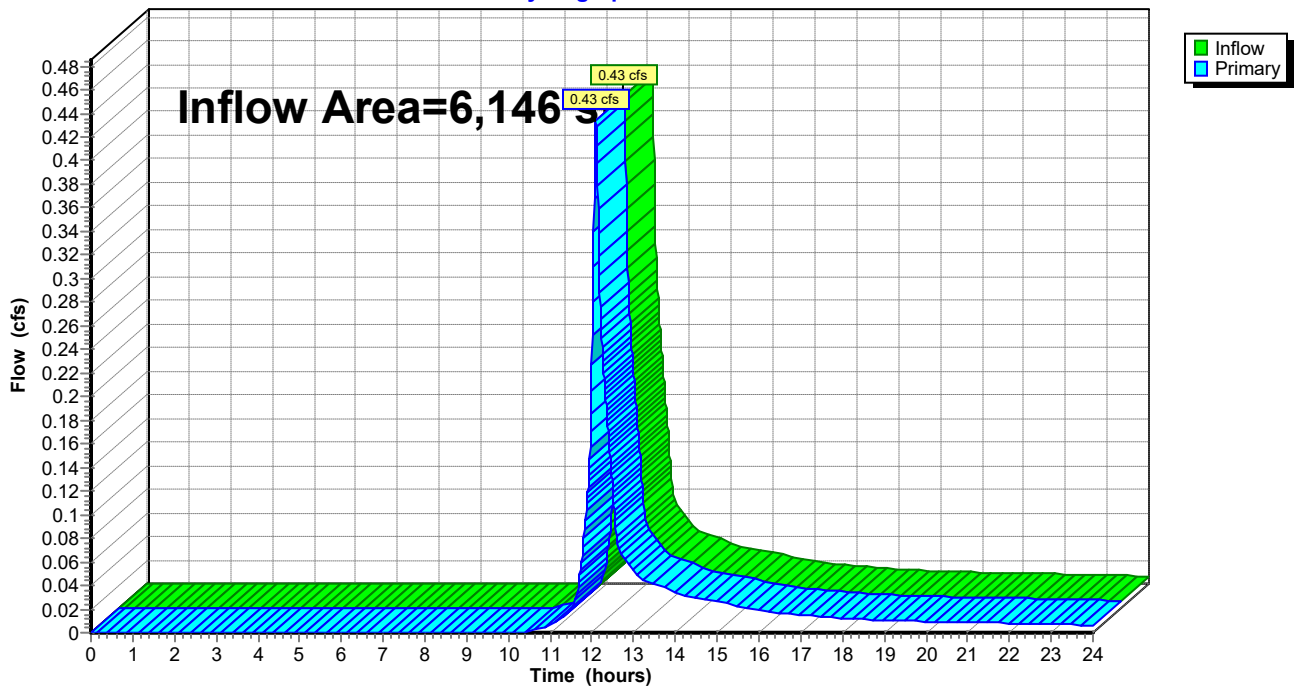
Summary for Link POA 6: POINT OF ANALYSIS 6

Inflow Area = 6,146 sf, 0.00% Impervious, Inflow Depth > 2.71" for 100-Yr event
Inflow = 0.43 cfs @ 12.09 hrs, Volume= 1,388 cf
Primary = 0.43 cfs @ 12.09 hrs, Volume= 1,388 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link POA 6: POINT OF ANALYSIS 6

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Type III 24-hr 25-Yr Rainfall=6.05"

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Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 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 Ex Ws1: Ex Watershed 1	Runoff Area=25,047 sf 13.38% Impervious Runoff Depth>2.84" Tc=6.0 min CN=70 Runoff=1.91 cfs 5,931 cf
Subcatchment Ex Ws2: Ex Watershed 2	Runoff Area=1,282 sf 0.00% Impervious Runoff Depth>2.66" Tc=6.0 min CN=68 Runoff=0.09 cfs 284 cf
Subcatchment Ex Ws3: Ex Watershed 3	Runoff Area=43,212 sf 3.83% Impervious Runoff Depth>2.21" Tc=6.0 min CN=63 Runoff=2.49 cfs 7,952 cf
Subcatchment Ex Ws4: Ex Watershed 4	Runoff Area=6,536 sf 0.00% Impervious Runoff Depth>1.70" Tc=6.0 min CN=57 Runoff=0.28 cfs 928 cf
Subcatchment Ex Ws5: Ex Watershed 5	Runoff Area=20,380 sf 12.79% Impervious Runoff Depth>2.21" Tc=6.0 min CN=63 Runoff=1.17 cfs 3,750 cf
Subcatchment Ex Ws6: Ex Watershed 6	Runoff Area=6,146 sf 0.00% Impervious Runoff Depth>1.70" Tc=6.0 min CN=57 Runoff=0.26 cfs 873 cf
Link POA 1: POINT OF ANALYSIS 1	Inflow=1.91 cfs 5,931 cf Primary=1.91 cfs 5,931 cf
Link POA 2: POINT OF ANALYSIS 2	Inflow=0.09 cfs 284 cf Primary=0.09 cfs 284 cf
Link POA 3: POINT OF ANALYSIS 3	Inflow=2.49 cfs 7,952 cf Primary=2.49 cfs 7,952 cf
Link POA 4: POINT OF ANALYSIS 4	Inflow=0.28 cfs 928 cf Primary=0.28 cfs 928 cf
Link POA 5: POINT OF ANALYSIS 5	Inflow=1.17 cfs 3,750 cf Primary=1.17 cfs 3,750 cf
Link POA 6: POINT OF ANALYSIS 6	Inflow=0.26 cfs 873 cf Primary=0.26 cfs 873 cf

Total Runoff Area = 102,603 sf Runoff Volume = 19,717 cf Average Runoff Depth = 2.31"
92.58% Pervious = 94,990 sf 7.42% Impervious = 7,613 sf

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Type III 24-hr 25-Yr Rainfall=6.05"

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Summary for Subcatchment Ex Ws1: Ex Watershed 1

Runoff = 1.91 cfs @ 12.09 hrs, Volume= 5,931 cf, Depth> 2.84"

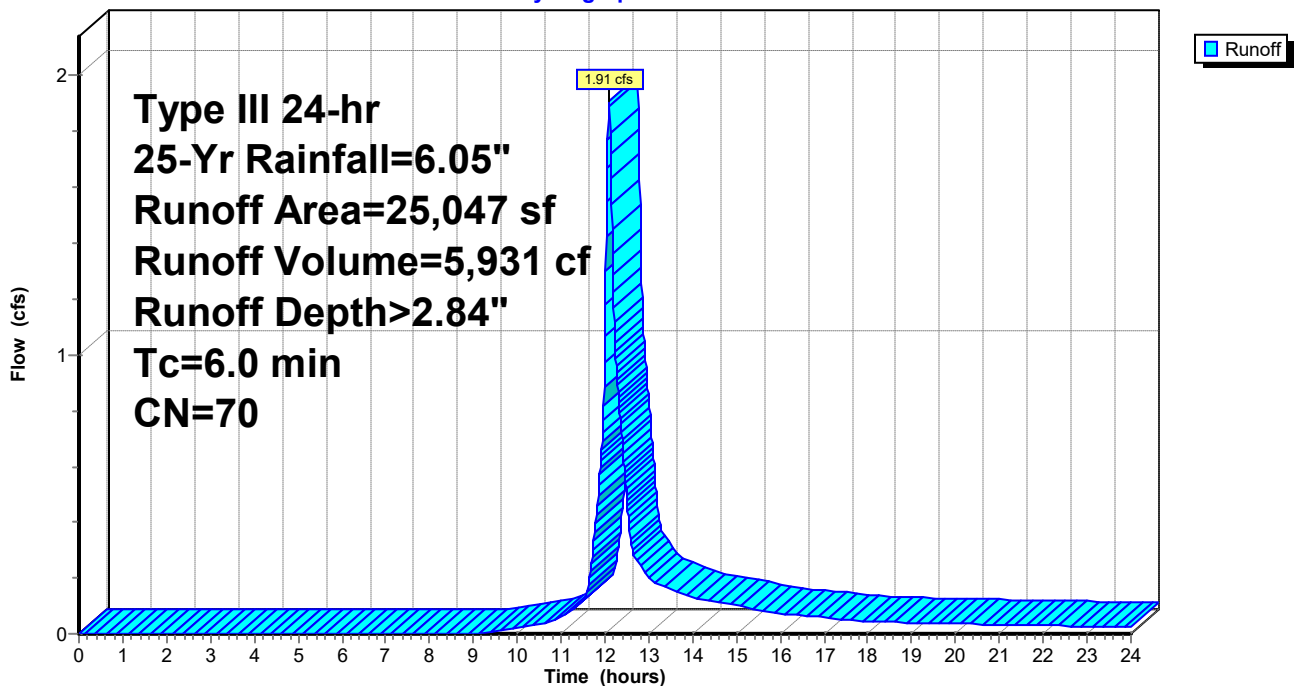
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr Rainfall=6.05"

Area (sf)	CN	Description
3,352	98	Paved parking, HSG A
18,082	68	<50% Grass cover, Poor, HSG A
3,613	57	Woods/grass comb., Poor, HSG A
25,047	70	Weighted Average
21,695		86.62% Pervious Area
3,352		13.38% Impervious Area

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

Subcatchment Ex Ws1: Ex Watershed 1

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Type III 24-hr 25-Yr Rainfall=6.05"

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Summary for Subcatchment Ex Ws2: Ex Watershed 2

Runoff = 0.09 cfs @ 12.09 hrs, Volume= 284 cf, Depth> 2.66"

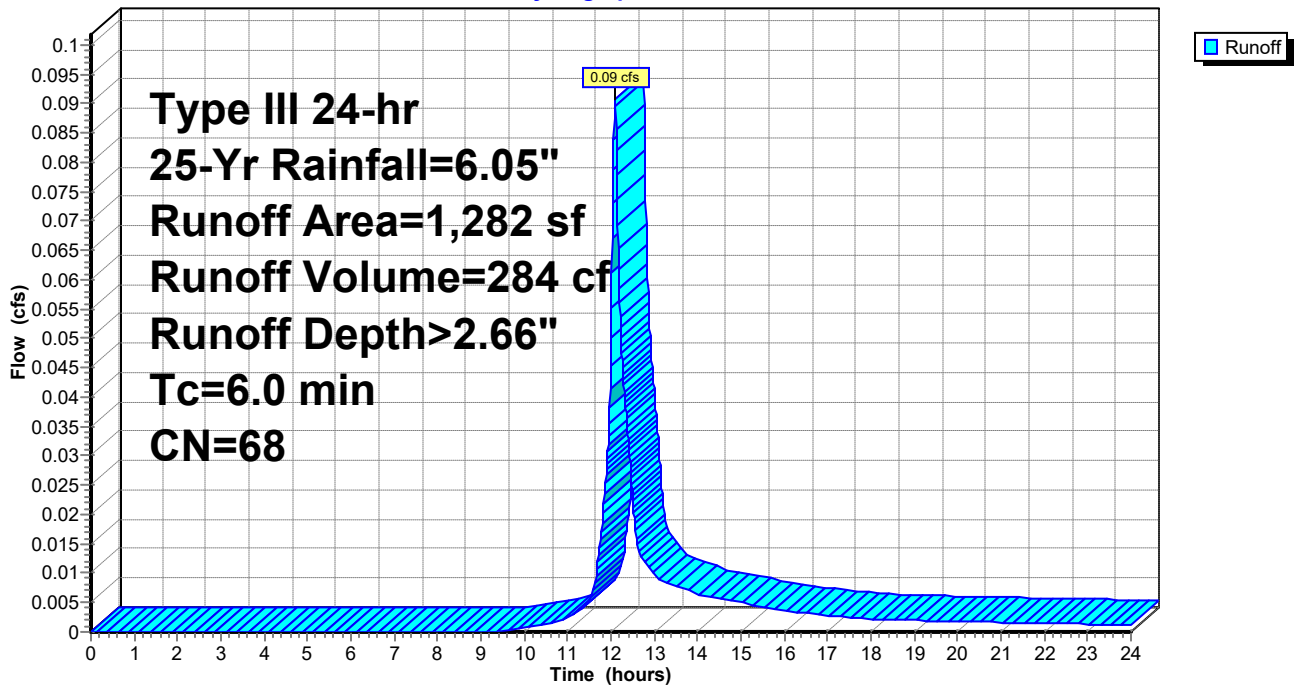
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr Rainfall=6.05"

Area (sf)	CN	Description
1,282	68	<50% Grass cover, Poor, HSG A
1,282		100.00% Pervious Area

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

Subcatchment Ex Ws2: Ex Watershed 2

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Summary for Subcatchment Ex Ws3: Ex Watershed 3

Runoff = 2.49 cfs @ 12.09 hrs, Volume= 7,952 cf, Depth> 2.21"

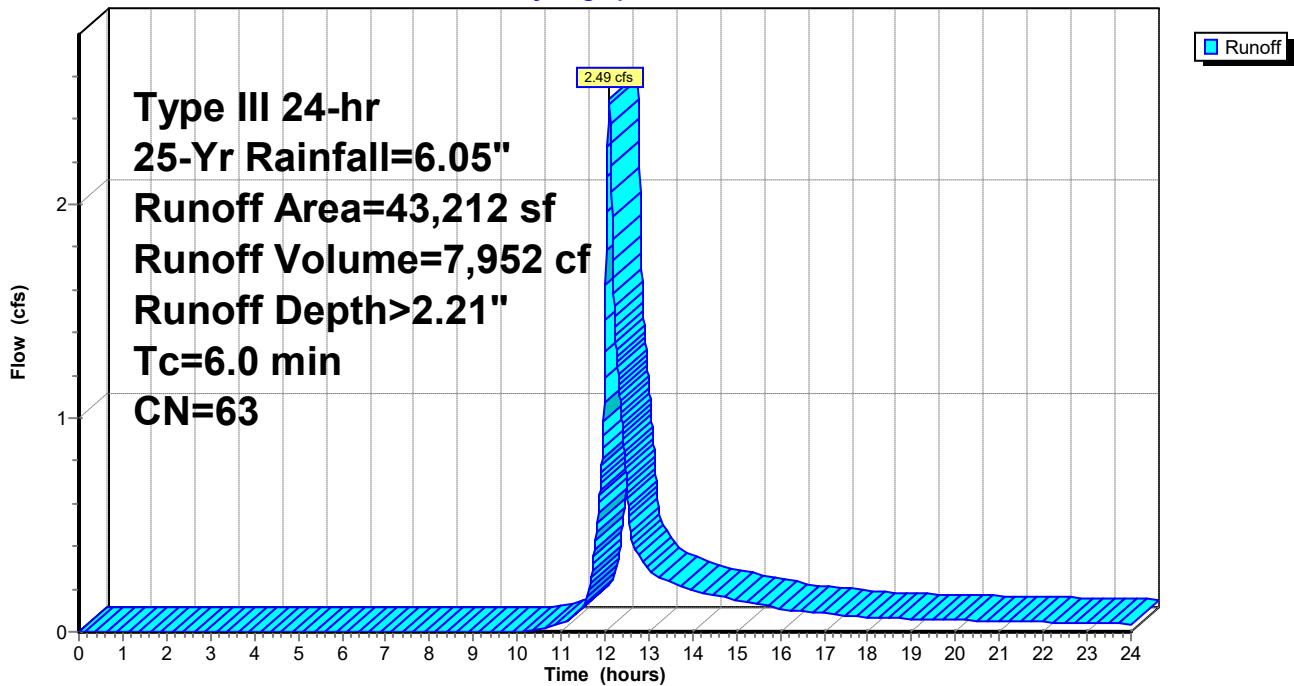
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr Rainfall=6.05"

Area (sf)	CN	Description
1,654	98	Paved parking, HSG A
16,853	68	<50% Grass cover, Poor, HSG A
24,705	57	Woods/grass comb., Poor, HSG A
43,212	63	Weighted Average
41,558		96.17% Pervious Area
1,654		3.83% Impervious Area

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

Subcatchment Ex Ws3: Ex Watershed 3

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Type III 24-hr 25-Yr Rainfall=6.05"

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Summary for Subcatchment Ex Ws4: Ex Watershed 4

Runoff = 0.28 cfs @ 12.10 hrs, Volume= 928 cf, Depth> 1.70"

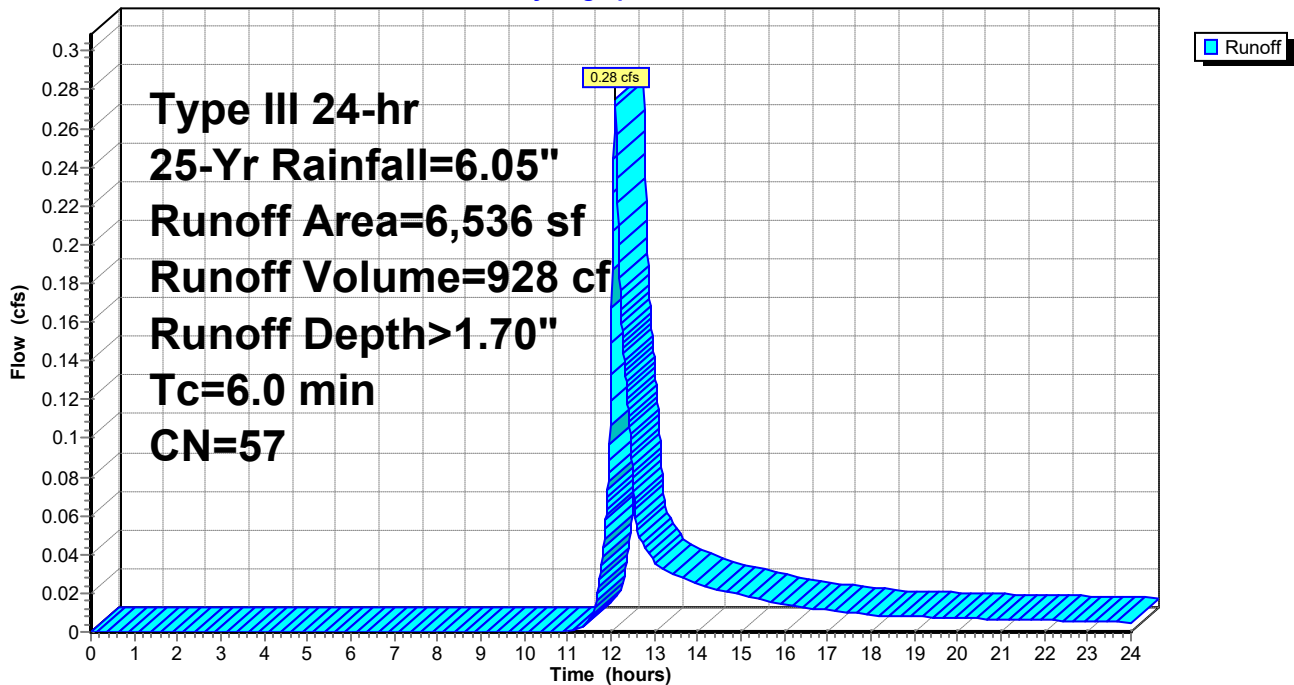
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr Rainfall=6.05"

Area (sf)	CN	Description
6,536	57	Woods/grass comb., Poor, HSG A
6,536		100.00% Pervious Area

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

Subcatchment Ex Ws4: Ex Watershed 4

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Summary for Subcatchment Ex Ws5: Ex Watershed 5

Runoff = 1.17 cfs @ 12.09 hrs, Volume= 3,750 cf, Depth> 2.21"

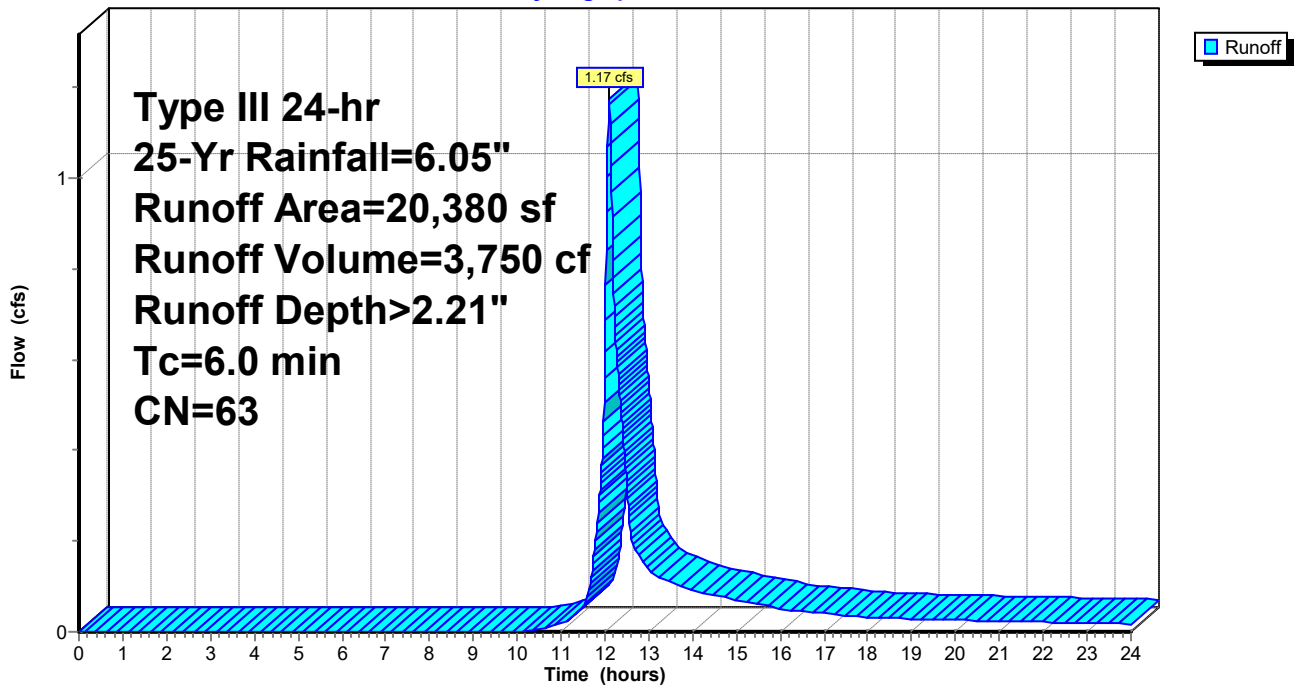
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr Rainfall=6.05"

Area (sf)	CN	Description
2,607	98	Paved parking, HSG A
1,731	68	<50% Grass cover, Poor, HSG A
16,042	57	Woods/grass comb., Poor, HSG A
20,380	63	Weighted Average
17,773		87.21% Pervious Area
2,607		12.79% Impervious Area

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

Subcatchment Ex Ws5: Ex Watershed 5

Hydrograph



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Type III 24-hr 25-Yr Rainfall=6.05"

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Summary for Subcatchment Ex Ws6: Ex Watershed 6

Runoff = 0.26 cfs @ 12.10 hrs, Volume= 873 cf, Depth> 1.70"

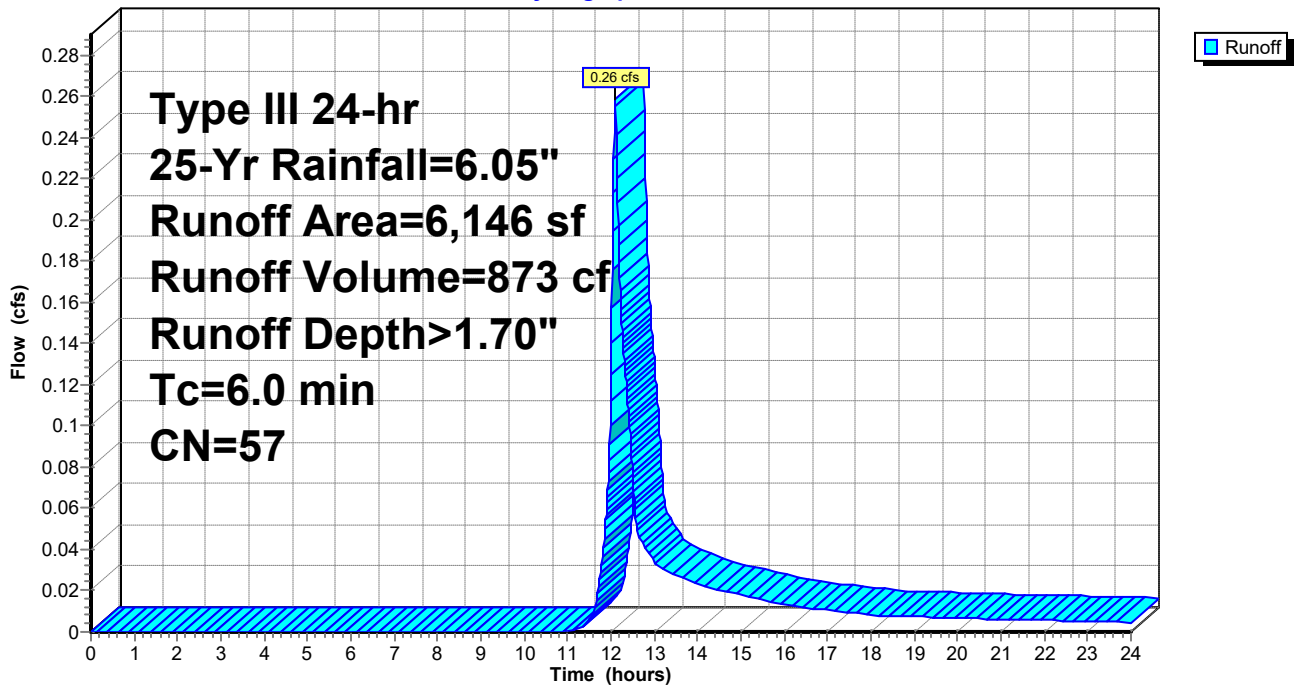
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr Rainfall=6.05"

Area (sf)	CN	Description
6,146	57	Woods/grass comb., Poor, HSG A
6,146		100.00% Pervious Area

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

Subcatchment Ex Ws6: Ex Watershed 6

Hydrograph

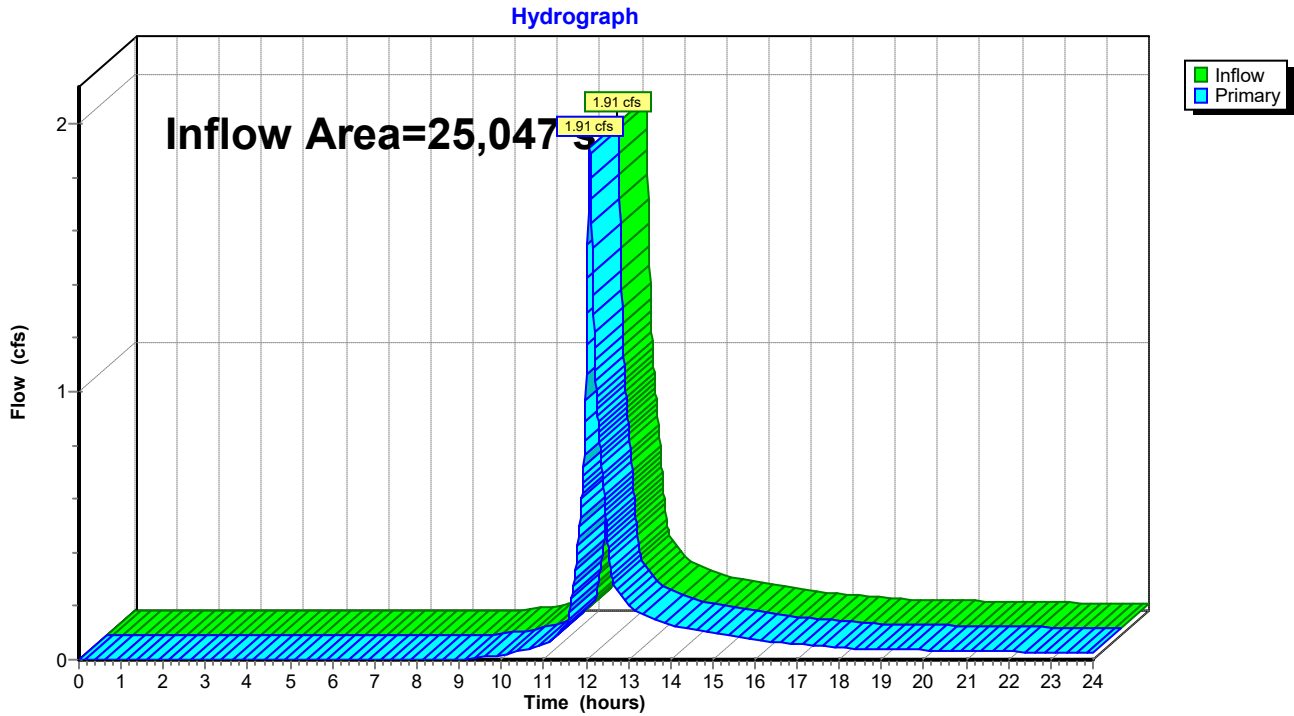


Summary for Link POA 1: POINT OF ANALYSIS 1

Inflow Area = 25,047 sf, 13.38% Impervious, Inflow Depth > 2.84" for 25-Yr event
Inflow = 1.91 cfs @ 12.09 hrs, Volume= 5,931 cf
Primary = 1.91 cfs @ 12.09 hrs, Volume= 5,931 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link POA 1: POINT OF ANALYSIS 1



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Type III 24-hr 25-Yr Rainfall=6.05"

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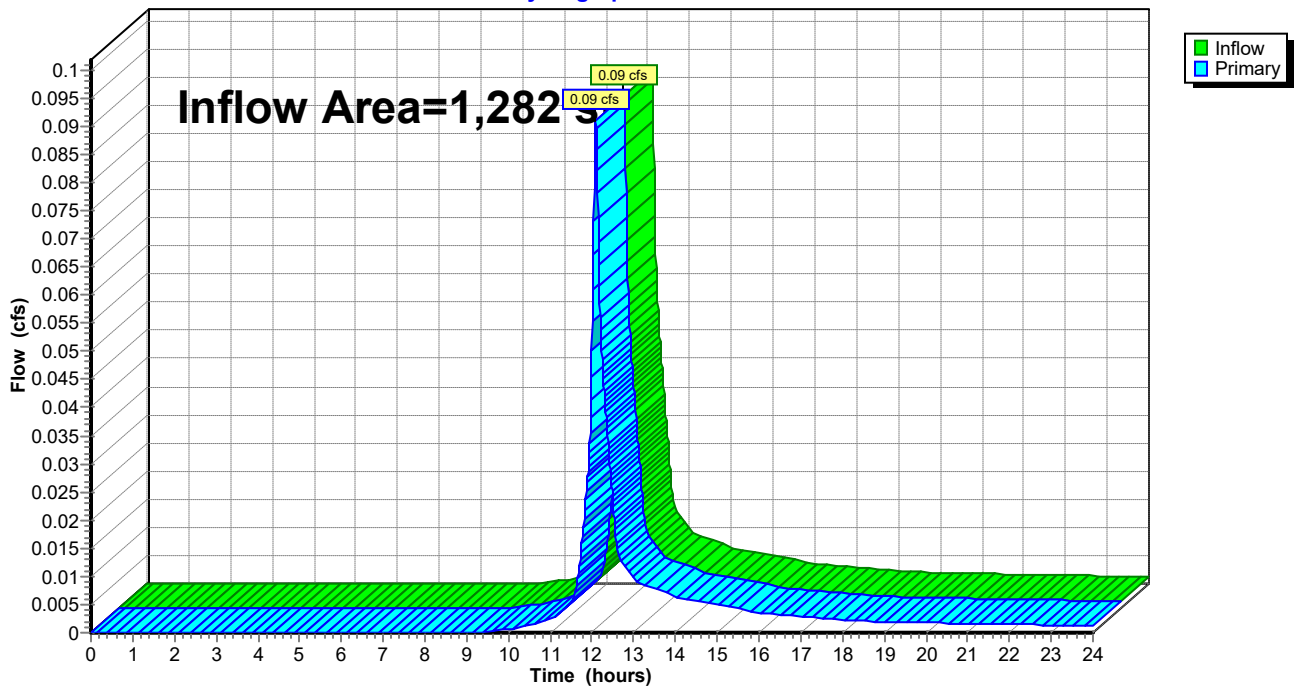
Summary for Link POA 2: POINT OF ANALYSIS 2

Inflow Area = 1,282 sf, 0.00% Impervious, Inflow Depth > 2.66" for 25-Yr event
Inflow = 0.09 cfs @ 12.09 hrs, Volume= 284 cf
Primary = 0.09 cfs @ 12.09 hrs, Volume= 284 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link POA 2: POINT OF ANALYSIS 2

Hydrograph



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Type III 24-hr 25-Yr Rainfall=6.05"

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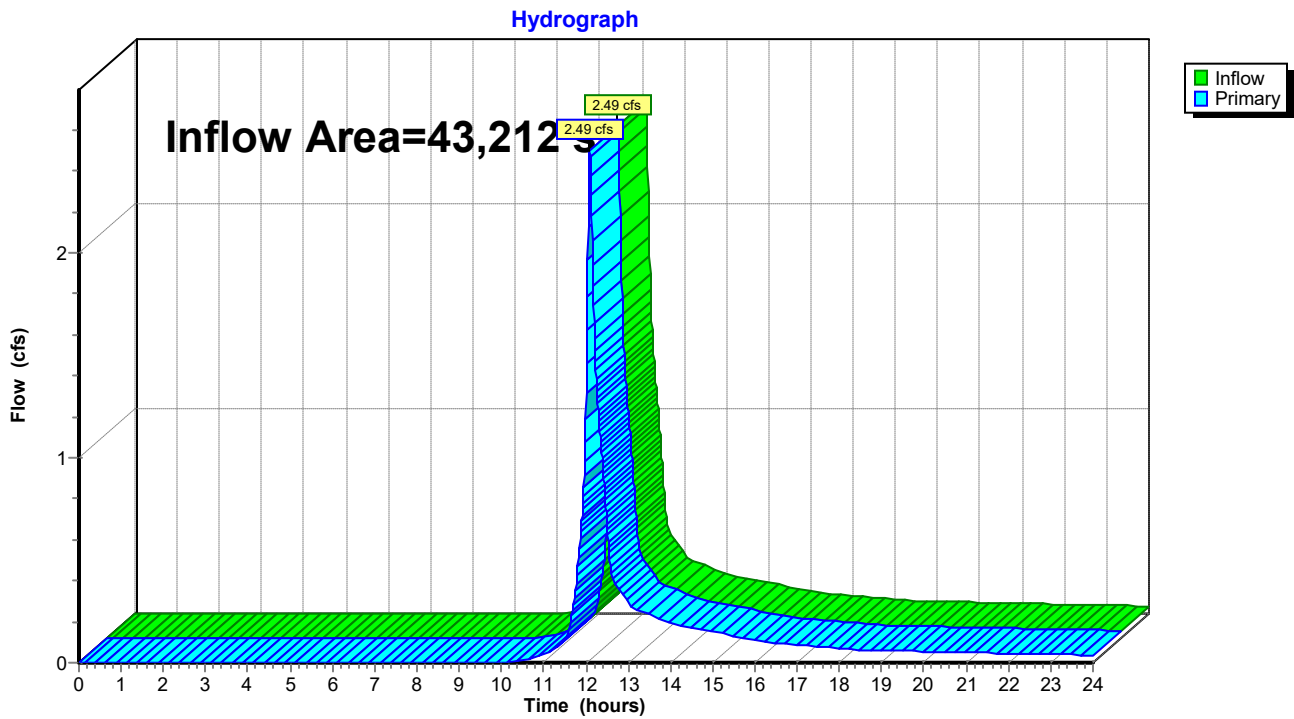
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Summary for Link POA 3: POINT OF ANALYSIS 3

Inflow Area = 43,212 sf, 3.83% Impervious, Inflow Depth > 2.21" for 25-Yr event
Inflow = 2.49 cfs @ 12.09 hrs, Volume= 7,952 cf
Primary = 2.49 cfs @ 12.09 hrs, Volume= 7,952 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link POA 3: POINT OF ANALYSIS 3



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Type III 24-hr 25-Yr Rainfall=6.05"

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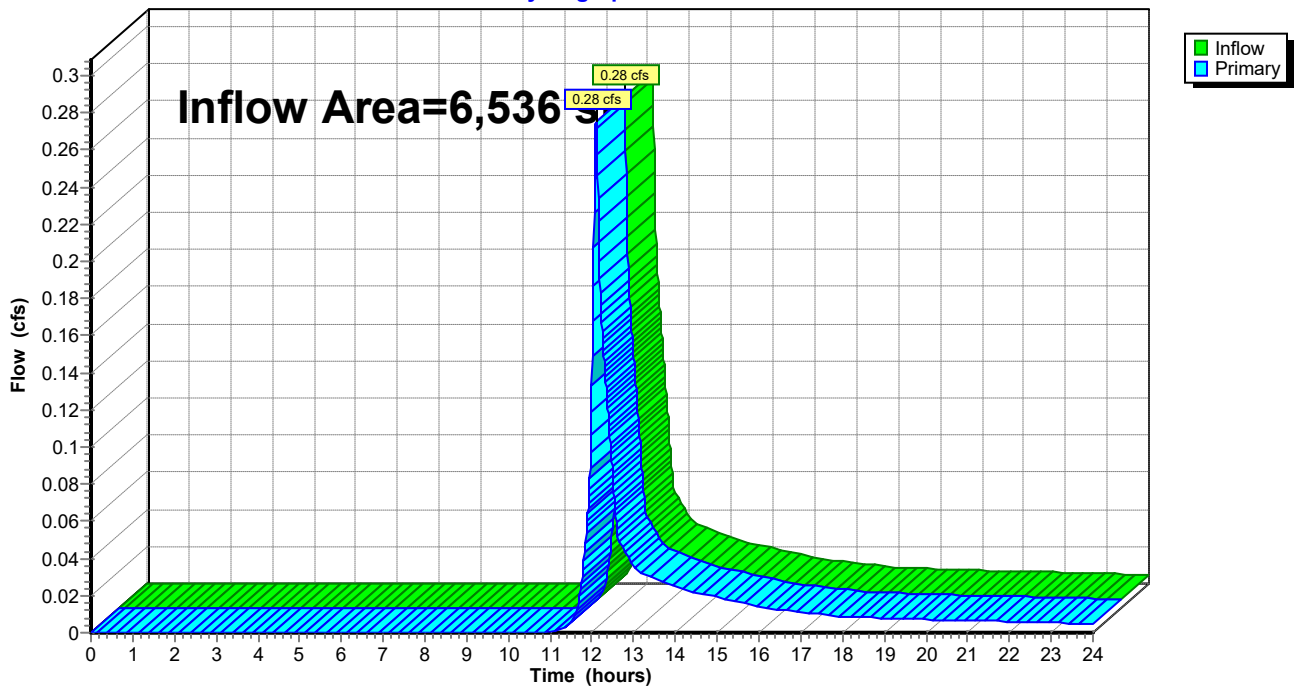
Summary for Link POA 4: POINT OF ANALYSIS 4

Inflow Area = 6,536 sf, 0.00% Impervious, Inflow Depth > 1.70" for 25-Yr event
Inflow = 0.28 cfs @ 12.10 hrs, Volume= 928 cf
Primary = 0.28 cfs @ 12.10 hrs, Volume= 928 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link POA 4: POINT OF ANALYSIS 4

Hydrograph



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Type III 24-hr 25-Yr Rainfall=6.05"

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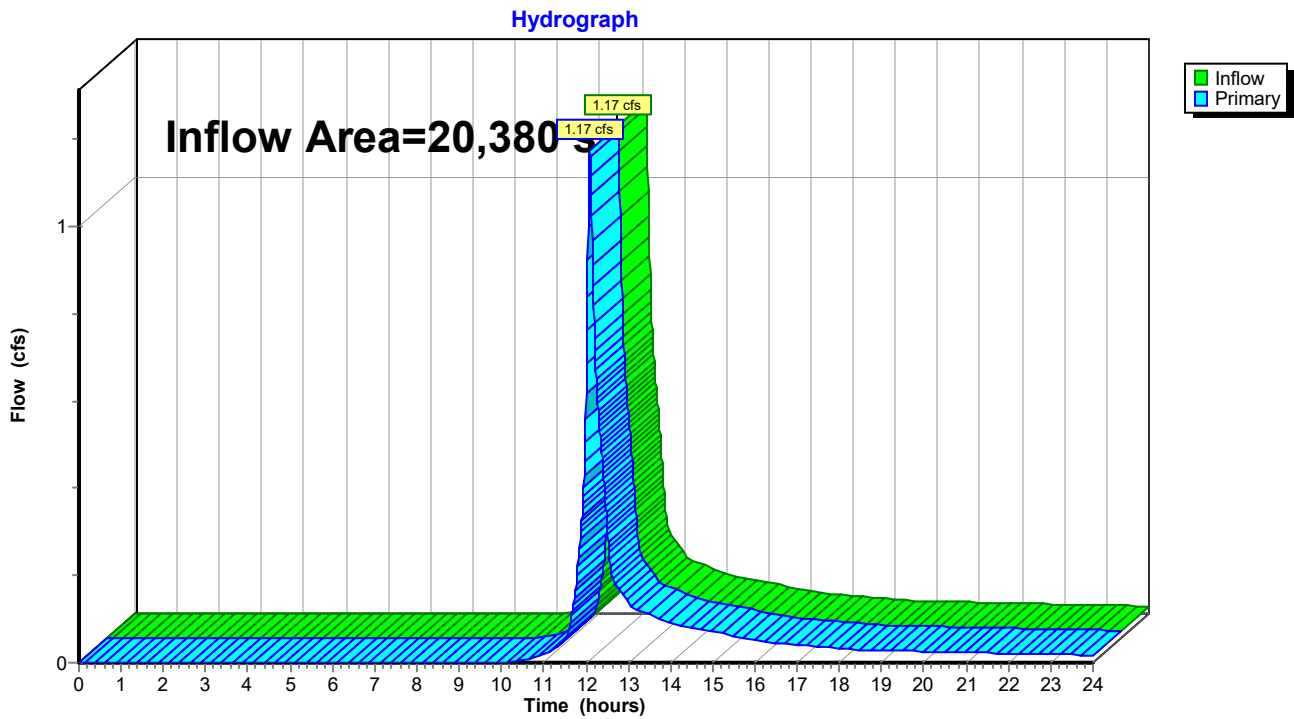
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Summary for Link POA 5: POINT OF ANALYSIS 5

Inflow Area = 20,380 sf, 12.79% Impervious, Inflow Depth > 2.21" for 25-Yr event
Inflow = 1.17 cfs @ 12.09 hrs, Volume= 3,750 cf
Primary = 1.17 cfs @ 12.09 hrs, Volume= 3,750 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link POA 5: POINT OF ANALYSIS 5

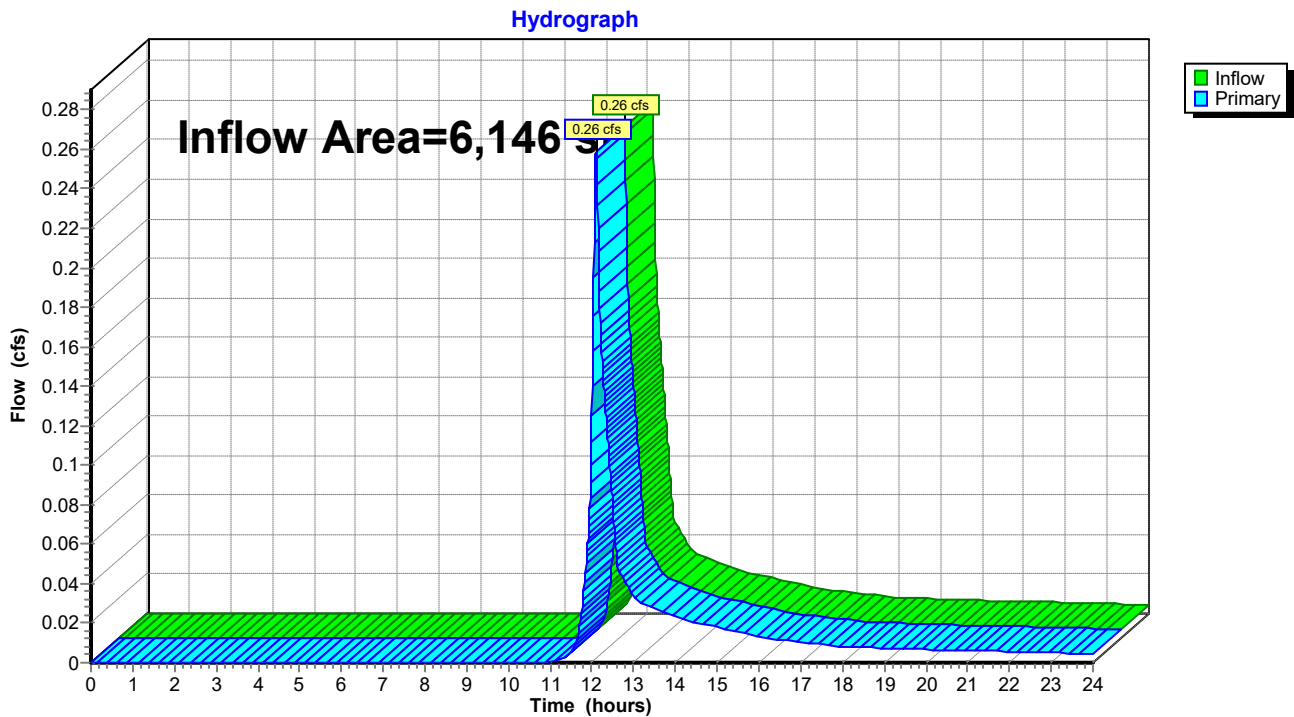


Summary for Link POA 6: POINT OF ANALYSIS 6

Inflow Area = 6,146 sf, 0.00% Impervious, Inflow Depth > 1.70" for 25-Yr event
Inflow = 0.26 cfs @ 12.10 hrs, Volume= 873 cf
Primary = 0.26 cfs @ 12.10 hrs, Volume= 873 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link POA 6: POINT OF ANALYSIS 6



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

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Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 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 Ex Ws1: Ex Watershed 1	Runoff Area=25,047 sf 13.38% Impervious Runoff Depth>2.07" Tc=6.0 min CN=70 Runoff=1.37 cfs 4,322 cf
Subcatchment Ex Ws2: Ex Watershed 2	Runoff Area=1,282 sf 0.00% Impervious Runoff Depth>1.91" Tc=6.0 min CN=68 Runoff=0.06 cfs 204 cf
Subcatchment Ex Ws3: Ex Watershed 3	Runoff Area=43,212 sf 3.83% Impervious Runoff Depth>1.54" Tc=6.0 min CN=63 Runoff=1.68 cfs 5,539 cf
Subcatchment Ex Ws4: Ex Watershed 4	Runoff Area=6,536 sf 0.00% Impervious Runoff Depth>1.13" Tc=6.0 min CN=57 Runoff=0.17 cfs 615 cf
Subcatchment Ex Ws5: Ex Watershed 5	Runoff Area=20,380 sf 12.79% Impervious Runoff Depth>1.54" Tc=6.0 min CN=63 Runoff=0.79 cfs 2,612 cf
Subcatchment Ex Ws6: Ex Watershed 6	Runoff Area=6,146 sf 0.00% Impervious Runoff Depth>1.13" Tc=6.0 min CN=57 Runoff=0.16 cfs 578 cf
Link POA 1: POINT OF ANALYSIS 1	Inflow=1.37 cfs 4,322 cf Primary=1.37 cfs 4,322 cf
Link POA 2: POINT OF ANALYSIS 2	Inflow=0.06 cfs 204 cf Primary=0.06 cfs 204 cf
Link POA 3: POINT OF ANALYSIS 3	Inflow=1.68 cfs 5,539 cf Primary=1.68 cfs 5,539 cf
Link POA 4: POINT OF ANALYSIS 4	Inflow=0.17 cfs 615 cf Primary=0.17 cfs 615 cf
Link POA 5: POINT OF ANALYSIS 5	Inflow=0.79 cfs 2,612 cf Primary=0.79 cfs 2,612 cf
Link POA 6: POINT OF ANALYSIS 6	Inflow=0.16 cfs 578 cf Primary=0.16 cfs 578 cf

Total Runoff Area = 102,603 sf Runoff Volume = 13,871 cf Average Runoff Depth = 1.62"
92.58% Pervious = 94,990 sf 7.42% Impervious = 7,613 sf

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

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Summary for Subcatchment Ex Ws1: Ex Watershed 1

Runoff = 1.37 cfs @ 12.09 hrs, Volume= 4,322 cf, Depth> 2.07"

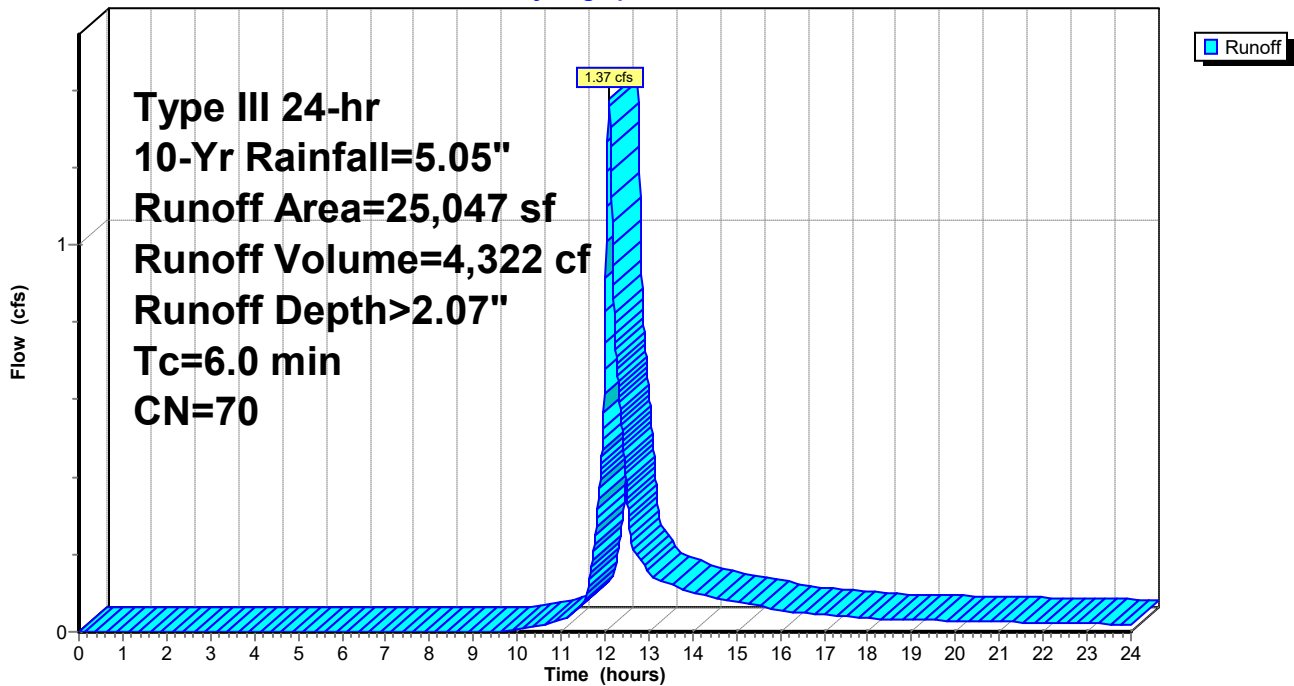
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr Rainfall=5.05"

Area (sf)	CN	Description
3,352	98	Paved parking, HSG A
18,082	68	<50% Grass cover, Poor, HSG A
3,613	57	Woods/grass comb., Poor, HSG A
25,047	70	Weighted Average
21,695		86.62% Pervious Area
3,352		13.38% Impervious Area

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

Subcatchment Ex Ws1: Ex Watershed 1

Hydrograph



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

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Summary for Subcatchment Ex Ws2: Ex Watershed 2

Runoff = 0.06 cfs @ 12.09 hrs, Volume= 204 cf, Depth> 1.91"

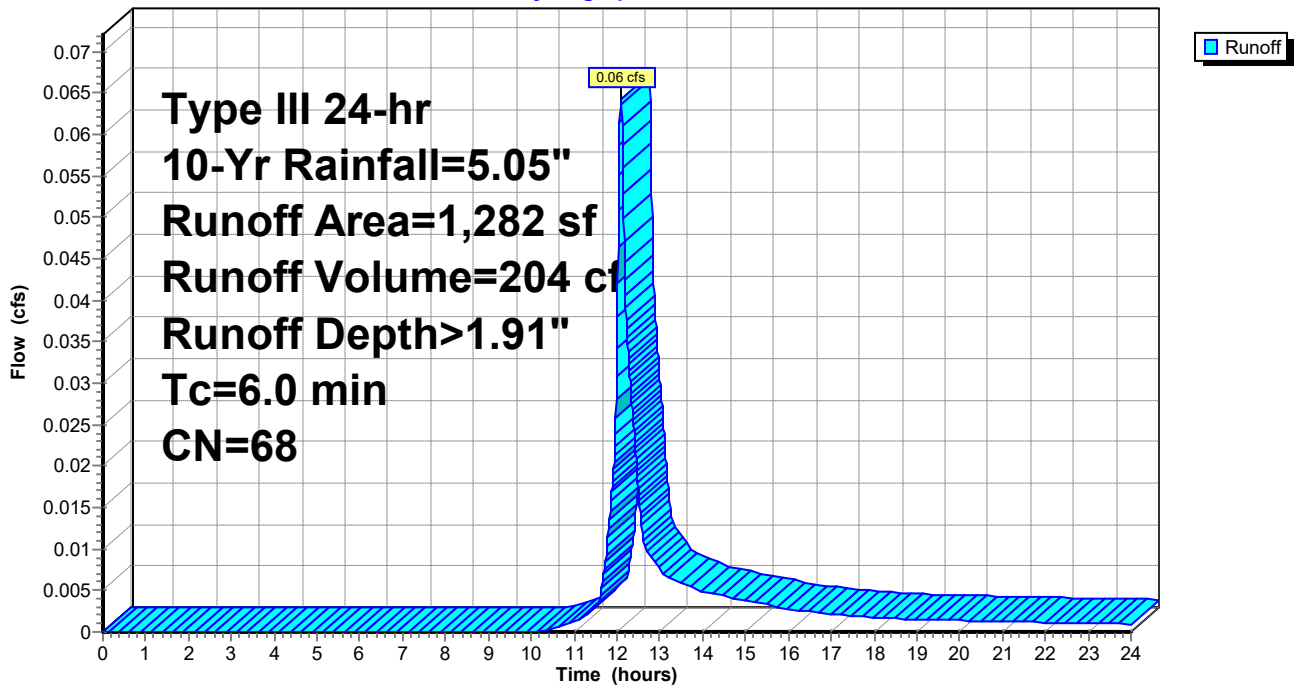
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr Rainfall=5.05"

Area (sf)	CN	Description
1,282	68	<50% Grass cover, Poor, HSG A
1,282		100.00% Pervious Area

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

Subcatchment Ex Ws2: Ex Watershed 2

Hydrograph



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

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Summary for Subcatchment Ex Ws3: Ex Watershed 3

Runoff = 1.68 cfs @ 12.10 hrs, Volume= 5,539 cf, Depth> 1.54"

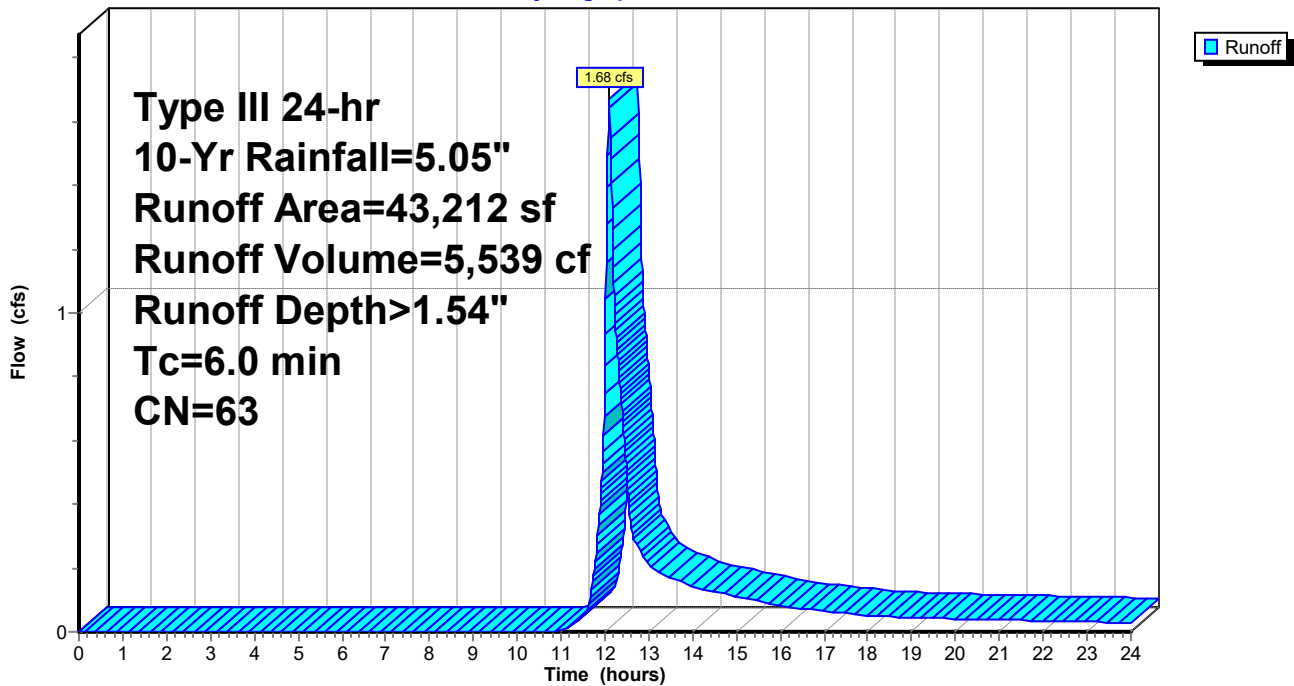
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr Rainfall=5.05"

Area (sf)	CN	Description
1,654	98	Paved parking, HSG A
16,853	68	<50% Grass cover, Poor, HSG A
24,705	57	Woods/grass comb., Poor, HSG A
43,212	63	Weighted Average
41,558		96.17% Pervious Area
1,654		3.83% Impervious Area

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

Subcatchment Ex Ws3: Ex Watershed 3

Hydrograph



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

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Summary for Subcatchment Ex Ws4: Ex Watershed 4

Runoff = 0.17 cfs @ 12.10 hrs, Volume= 615 cf, Depth> 1.13"

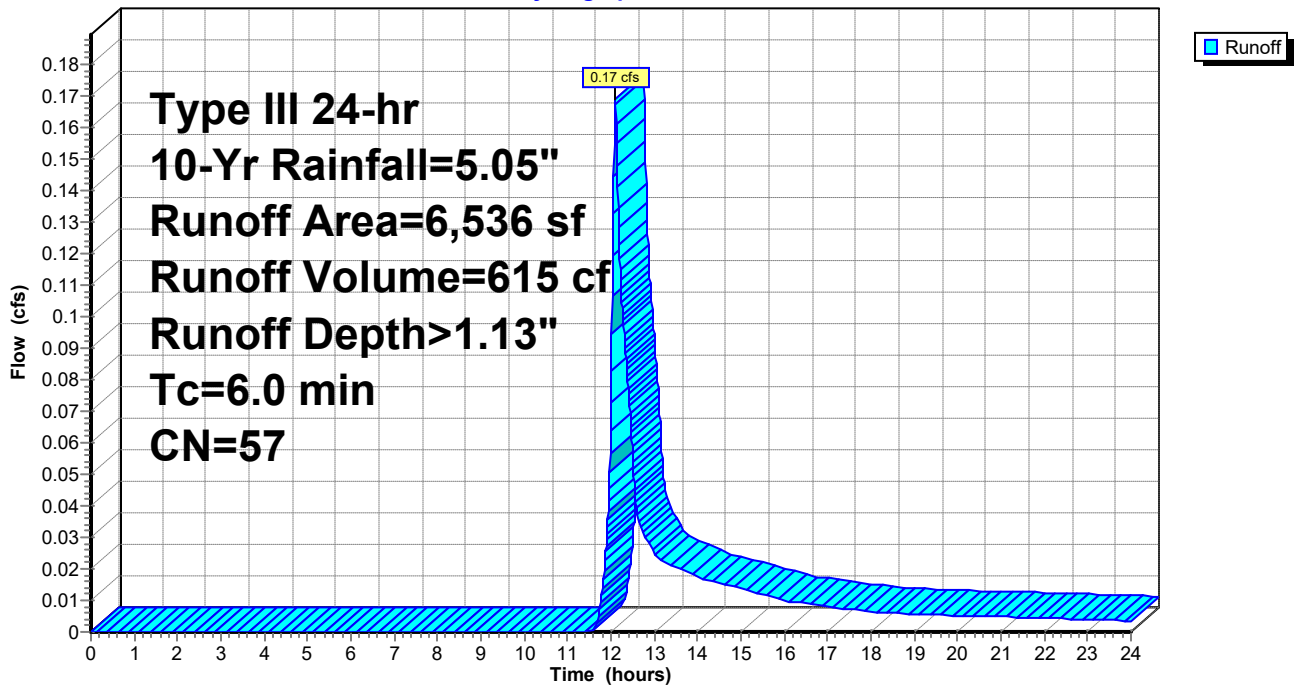
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr Rainfall=5.05"

Area (sf)	CN	Description
6,536	57	Woods/grass comb., Poor, HSG A
6,536		100.00% Pervious Area

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

Subcatchment Ex Ws4: Ex Watershed 4

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

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Summary for Subcatchment Ex Ws5: Ex Watershed 5

Runoff = 0.79 cfs @ 12.10 hrs, Volume= 2,612 cf, Depth> 1.54"

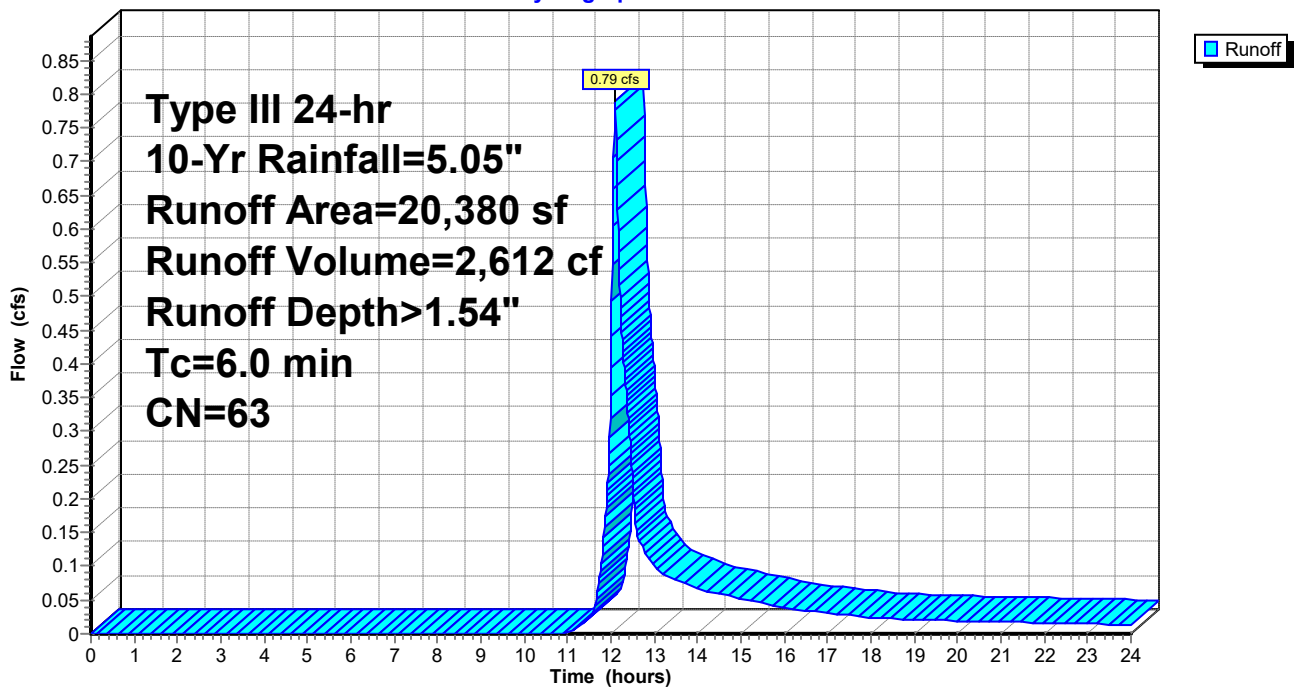
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr Rainfall=5.05"

Area (sf)	CN	Description
2,607	98	Paved parking, HSG A
1,731	68	<50% Grass cover, Poor, HSG A
16,042	57	Woods/grass comb., Poor, HSG A
20,380	63	Weighted Average
17,773		87.21% Pervious Area
2,607		12.79% Impervious Area

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

Subcatchment Ex Ws5: Ex Watershed 5

Hydrograph



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

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Summary for Subcatchment Ex Ws6: Ex Watershed 6

Runoff = 0.16 cfs @ 12.10 hrs, Volume= 578 cf, Depth> 1.13"

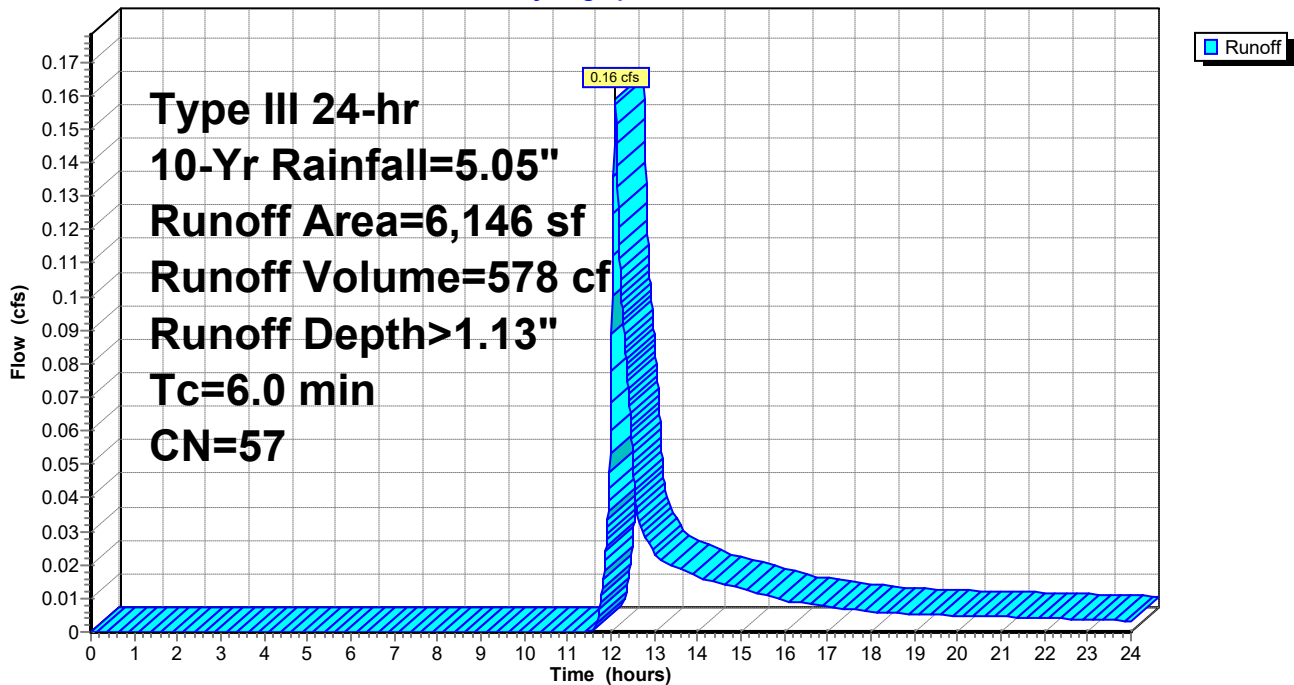
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr Rainfall=5.05"

Area (sf)	CN	Description
6,146	57	Woods/grass comb., Poor, HSG A
6,146		100.00% Pervious Area

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

Subcatchment Ex Ws6: Ex Watershed 6

Hydrograph

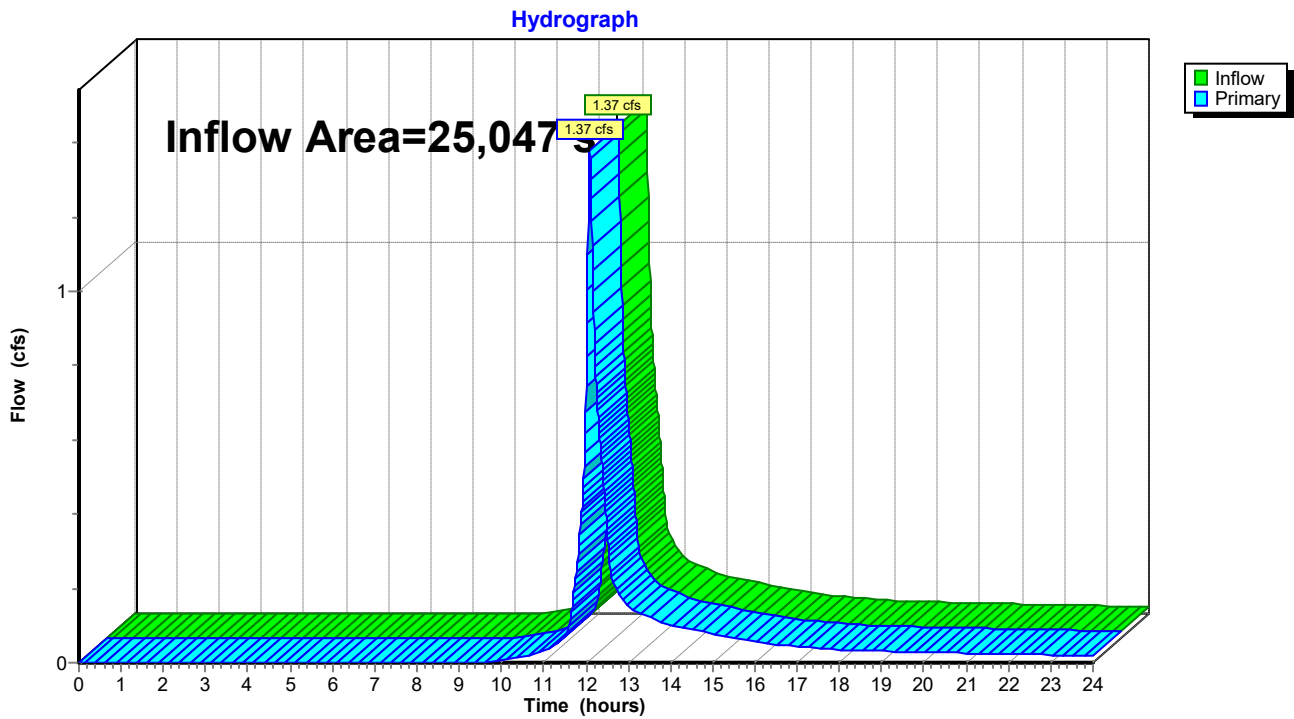


Summary for Link POA 1: POINT OF ANALYSIS 1

Inflow Area = 25,047 sf, 13.38% Impervious, Inflow Depth > 2.07" for 10-Yr event
Inflow = 1.37 cfs @ 12.09 hrs, Volume= 4,322 cf
Primary = 1.37 cfs @ 12.09 hrs, Volume= 4,322 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link POA 1: POINT OF ANALYSIS 1



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

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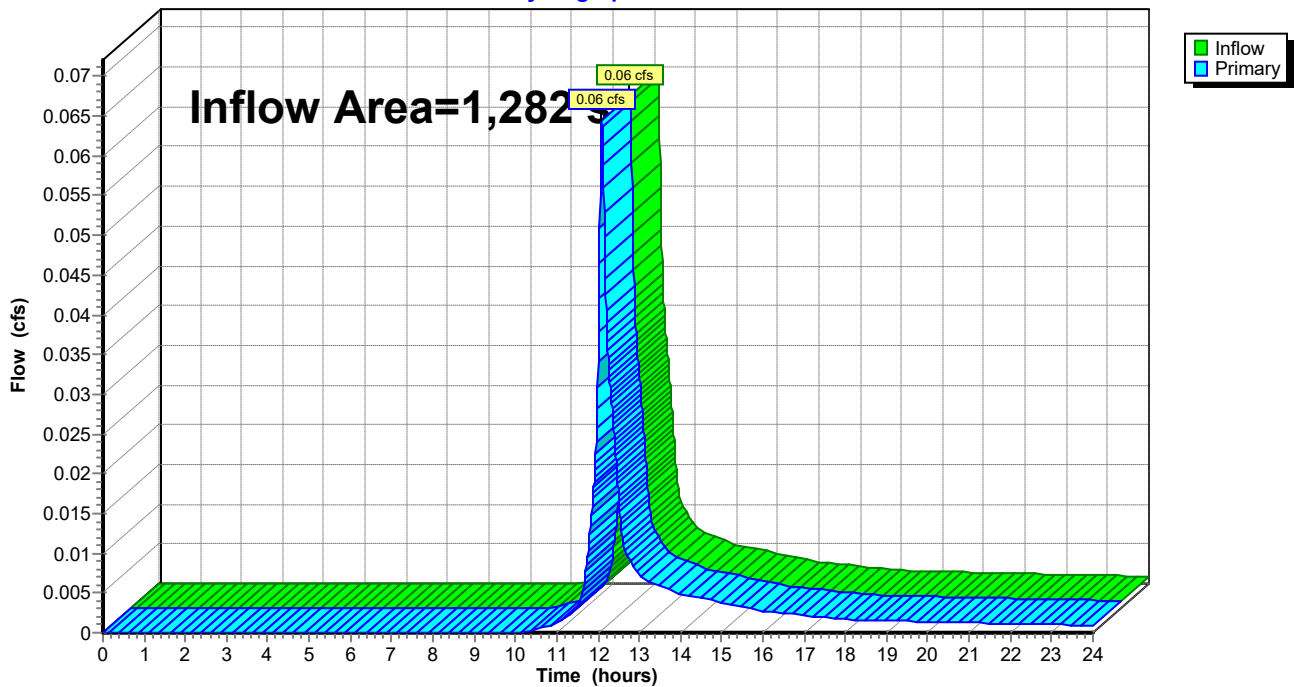
Summary for Link POA 2: POINT OF ANALYSIS 2

Inflow Area = 1,282 sf, 0.00% Impervious, Inflow Depth > 1.91" for 10-Yr event
Inflow = 0.06 cfs @ 12.09 hrs, Volume= 204 cf
Primary = 0.06 cfs @ 12.09 hrs, Volume= 204 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link POA 2: POINT OF ANALYSIS 2

Hydrograph

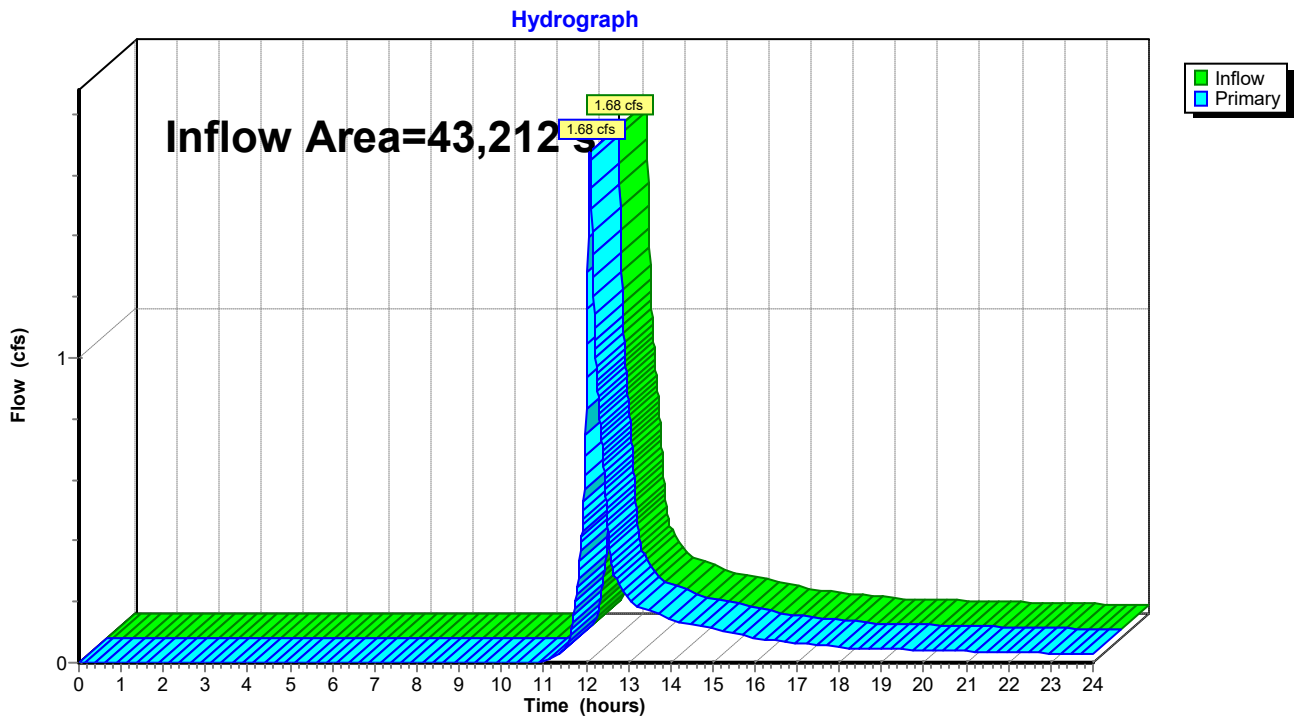


Summary for Link POA 3: POINT OF ANALYSIS 3

Inflow Area = 43,212 sf, 3.83% Impervious, Inflow Depth > 1.54" for 10-Yr event
Inflow = 1.68 cfs @ 12.10 hrs, Volume= 5,539 cf
Primary = 1.68 cfs @ 12.10 hrs, Volume= 5,539 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link POA 3: POINT OF ANALYSIS 3



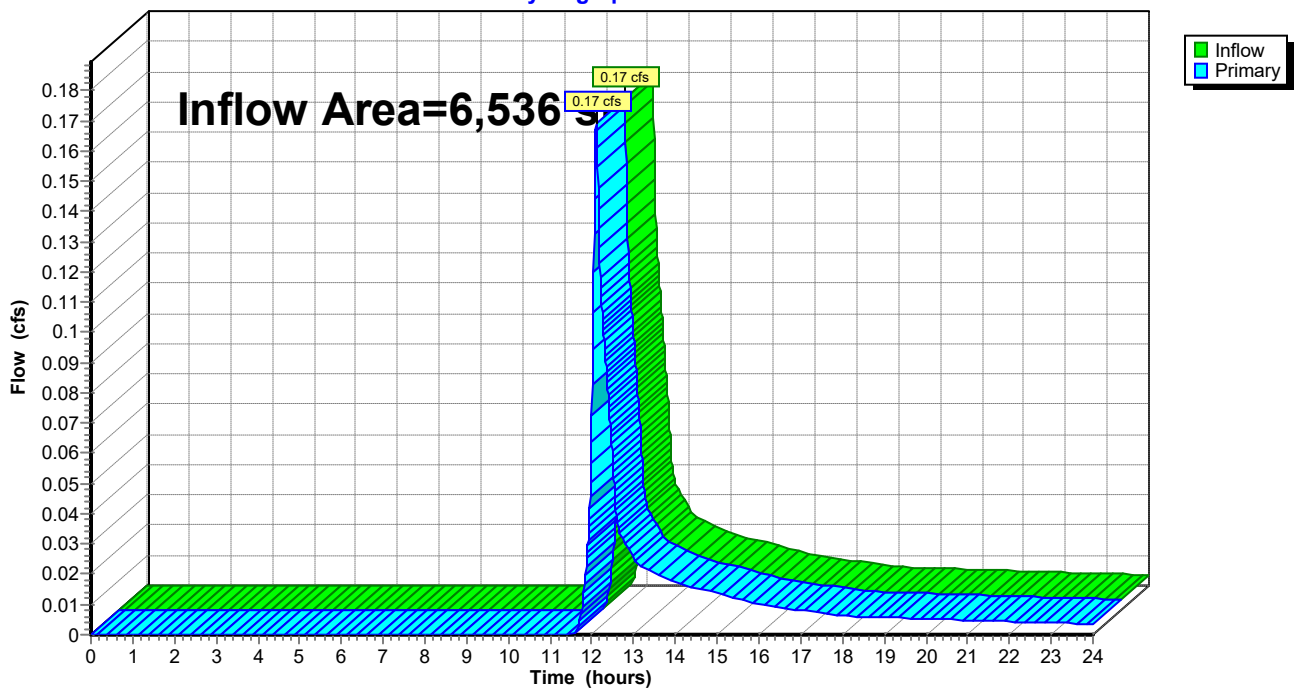
Summary for Link POA 4: POINT OF ANALYSIS 4

Inflow Area = 6,536 sf, 0.00% Impervious, Inflow Depth > 1.13" for 10-Yr event
Inflow = 0.17 cfs @ 12.10 hrs, Volume= 615 cf
Primary = 0.17 cfs @ 12.10 hrs, Volume= 615 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link POA 4: POINT OF ANALYSIS 4

Hydrograph



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

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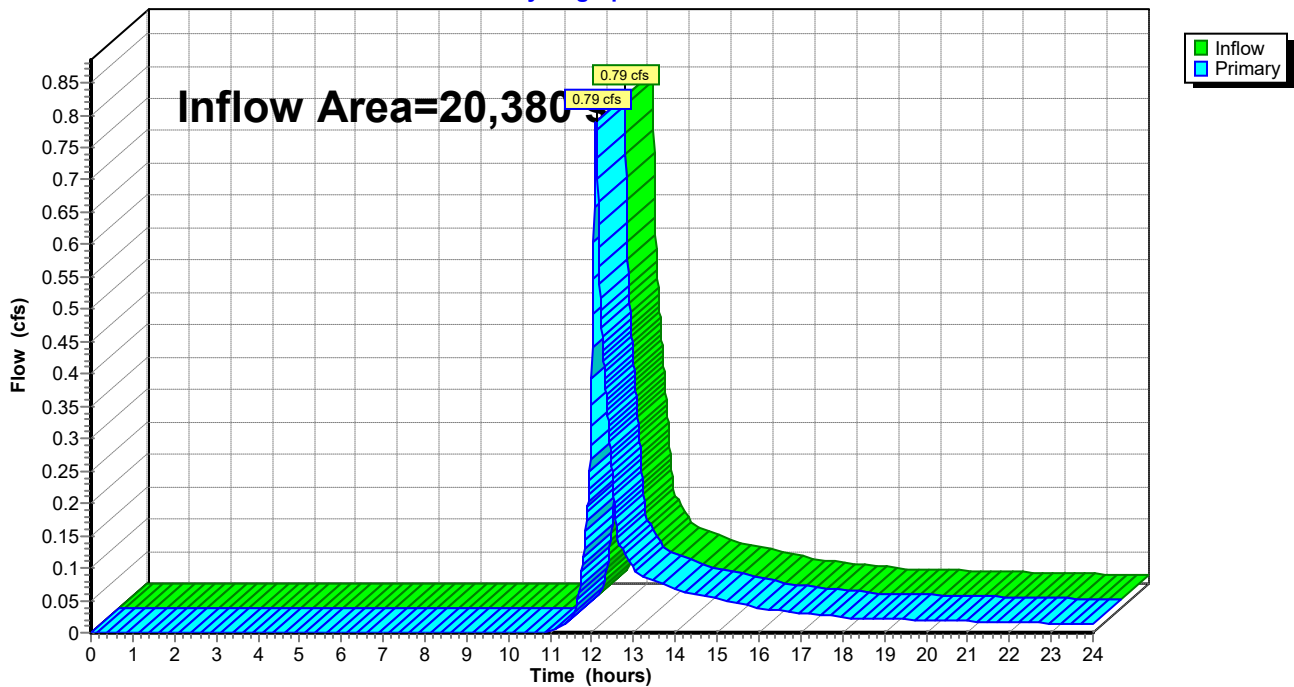
Summary for Link POA 5: POINT OF ANALYSIS 5

Inflow Area = 20,380 sf, 12.79% Impervious, Inflow Depth > 1.54" for 10-Yr event
Inflow = 0.79 cfs @ 12.10 hrs, Volume= 2,612 cf
Primary = 0.79 cfs @ 12.10 hrs, Volume= 2,612 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link POA 5: POINT OF ANALYSIS 5

Hydrograph



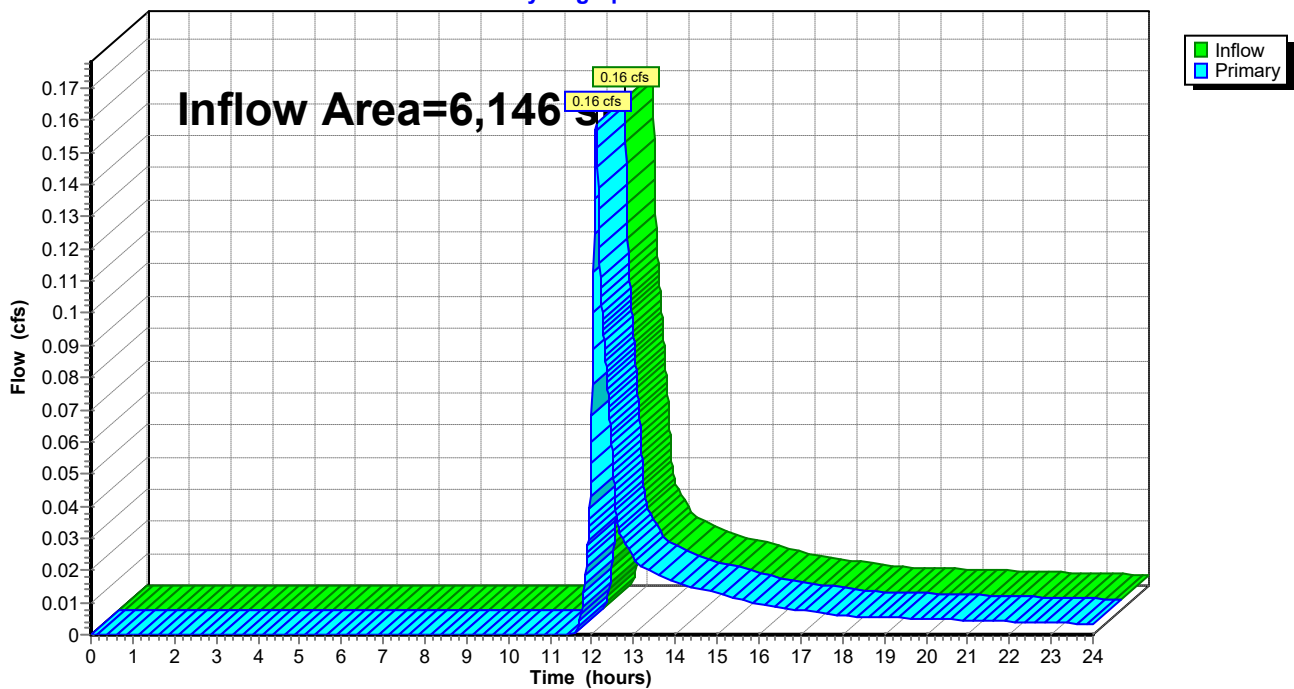
Summary for Link POA 6: POINT OF ANALYSIS 6

Inflow Area = 6,146 sf, 0.00% Impervious, Inflow Depth > 1.13" for 10-Yr event
Inflow = 0.16 cfs @ 12.10 hrs, Volume= 578 cf
Primary = 0.16 cfs @ 12.10 hrs, Volume= 578 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link POA 6: POINT OF ANALYSIS 6

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Type III 24-hr 2-Yr Rainfall=3.44"

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Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 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 Ex Ws1: Ex Watershed 1	Runoff Area=25,047 sf 13.38% Impervious Runoff Depth>0.97" Tc=6.0 min CN=70 Runoff=0.60 cfs 2,024 cf
Subcatchment Ex Ws2: Ex Watershed 2	Runoff Area=1,282 sf 0.00% Impervious Runoff Depth>0.87" Tc=6.0 min CN=68 Runoff=0.03 cfs 92 cf
Subcatchment Ex Ws3: Ex Watershed 3	Runoff Area=43,212 sf 3.83% Impervious Runoff Depth>0.63" Tc=6.0 min CN=63 Runoff=0.57 cfs 2,266 cf
Subcatchment Ex Ws4: Ex Watershed 4	Runoff Area=6,536 sf 0.00% Impervious Runoff Depth>0.39" Tc=6.0 min CN=57 Runoff=0.03 cfs 214 cf
Subcatchment Ex Ws5: Ex Watershed 5	Runoff Area=20,380 sf 12.79% Impervious Runoff Depth>0.63" Tc=6.0 min CN=63 Runoff=0.27 cfs 1,069 cf
Subcatchment Ex Ws6: Ex Watershed 6	Runoff Area=6,146 sf 0.00% Impervious Runoff Depth>0.39" Tc=6.0 min CN=57 Runoff=0.03 cfs 201 cf
Link POA 1: POINT OF ANALYSIS 1	Inflow=0.60 cfs 2,024 cf Primary=0.60 cfs 2,024 cf
Link POA 2: POINT OF ANALYSIS 2	Inflow=0.03 cfs 92 cf Primary=0.03 cfs 92 cf
Link POA 3: POINT OF ANALYSIS 3	Inflow=0.57 cfs 2,266 cf Primary=0.57 cfs 2,266 cf
Link POA 4: POINT OF ANALYSIS 4	Inflow=0.03 cfs 214 cf Primary=0.03 cfs 214 cf
Link POA 5: POINT OF ANALYSIS 5	Inflow=0.27 cfs 1,069 cf Primary=0.27 cfs 1,069 cf
Link POA 6: POINT OF ANALYSIS 6	Inflow=0.03 cfs 201 cf Primary=0.03 cfs 201 cf

Total Runoff Area = 102,603 sf Runoff Volume = 5,867 cf Average Runoff Depth = 0.69"
92.58% Pervious = 94,990 sf 7.42% Impervious = 7,613 sf

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Type III 24-hr 2-Yr Rainfall=3.44"

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Summary for Subcatchment Ex Ws1: Ex Watershed 1

Runoff = 0.60 cfs @ 12.10 hrs, Volume= 2,024 cf, Depth> 0.97"

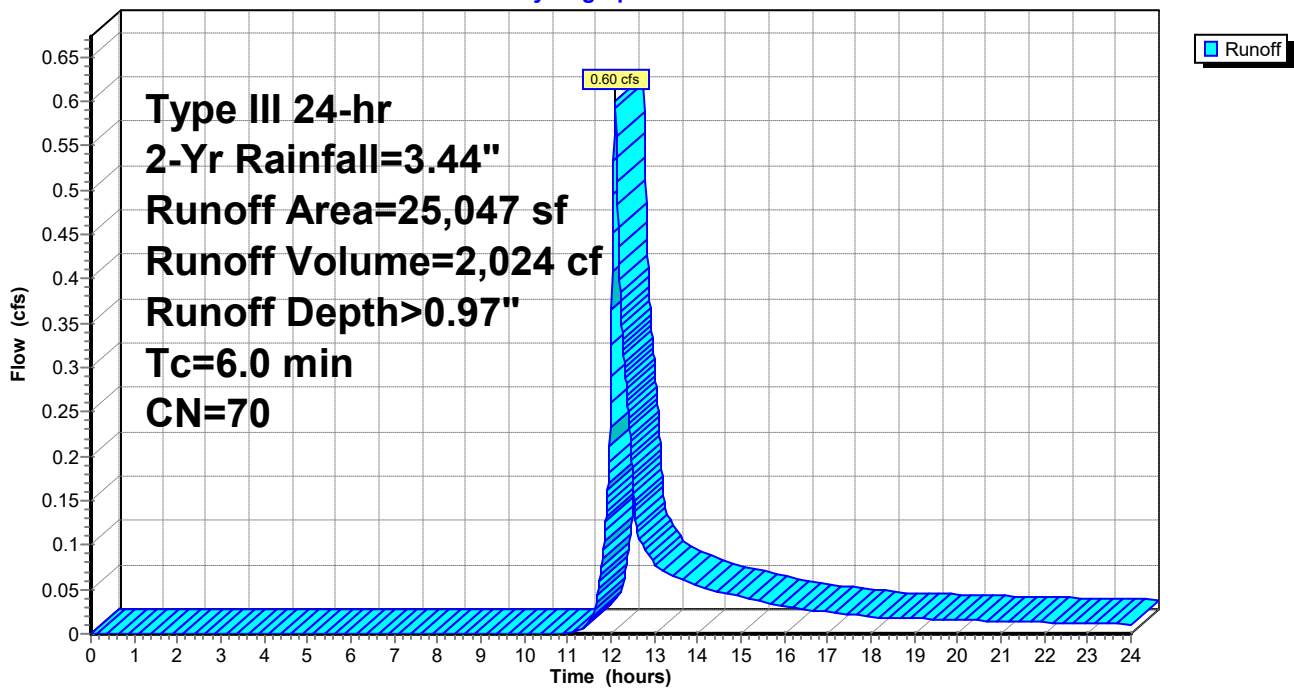
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr Rainfall=3.44"

Area (sf)	CN	Description
3,352	98	Paved parking, HSG A
18,082	68	<50% Grass cover, Poor, HSG A
3,613	57	Woods/grass comb., Poor, HSG A
25,047	70	Weighted Average
21,695		86.62% Pervious Area
3,352		13.38% Impervious Area

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

Subcatchment Ex Ws1: Ex Watershed 1

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Type III 24-hr 2-Yr Rainfall=3.44"

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Summary for Subcatchment Ex Ws2: Ex Watershed 2

Runoff = 0.03 cfs @ 12.10 hrs, Volume= 92 cf, Depth> 0.87"

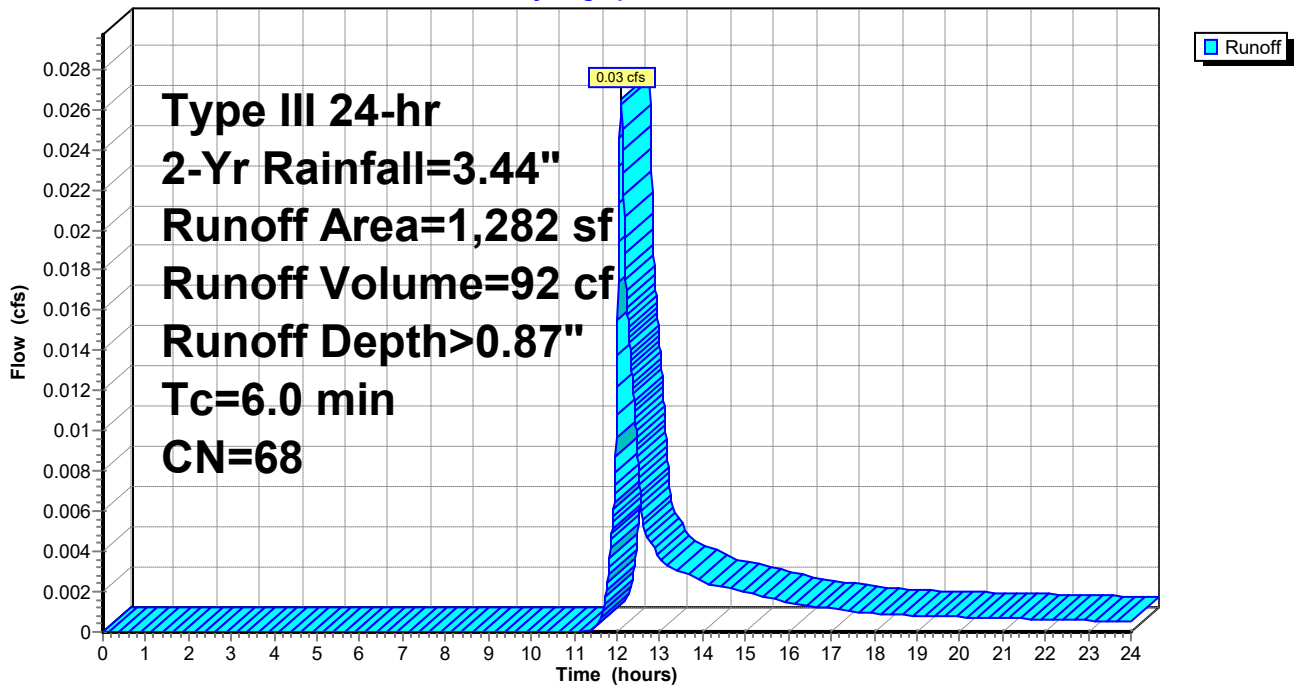
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr Rainfall=3.44"

Area (sf)	CN	Description
1,282	68	<50% Grass cover, Poor, HSG A
1,282		100.00% Pervious Area

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

Subcatchment Ex Ws2: Ex Watershed 2

Hydrograph



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Type III 24-hr 2-Yr Rainfall=3.44"

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Summary for Subcatchment Ex Ws3: Ex Watershed 3

Runoff = 0.57 cfs @ 12.11 hrs, Volume= 2,266 cf, Depth> 0.63"

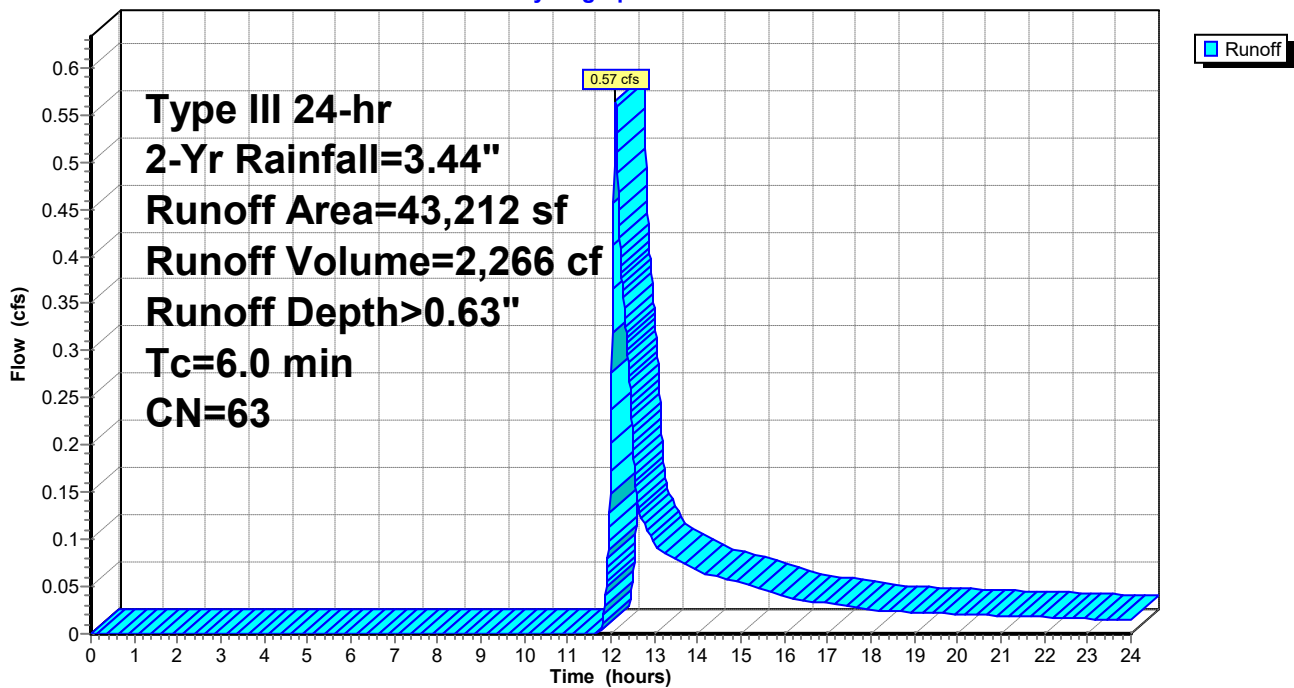
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr Rainfall=3.44"

Area (sf)	CN	Description
1,654	98	Paved parking, HSG A
16,853	68	<50% Grass cover, Poor, HSG A
24,705	57	Woods/grass comb., Poor, HSG A
43,212	63	Weighted Average
41,558		96.17% Pervious Area
1,654		3.83% Impervious Area

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

Subcatchment Ex Ws3: Ex Watershed 3

Hydrograph



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Type III 24-hr 2-Yr Rainfall=3.44"

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Summary for Subcatchment Ex Ws4: Ex Watershed 4

Runoff = 0.03 cfs @ 12.14 hrs, Volume= 214 cf, Depth> 0.39"

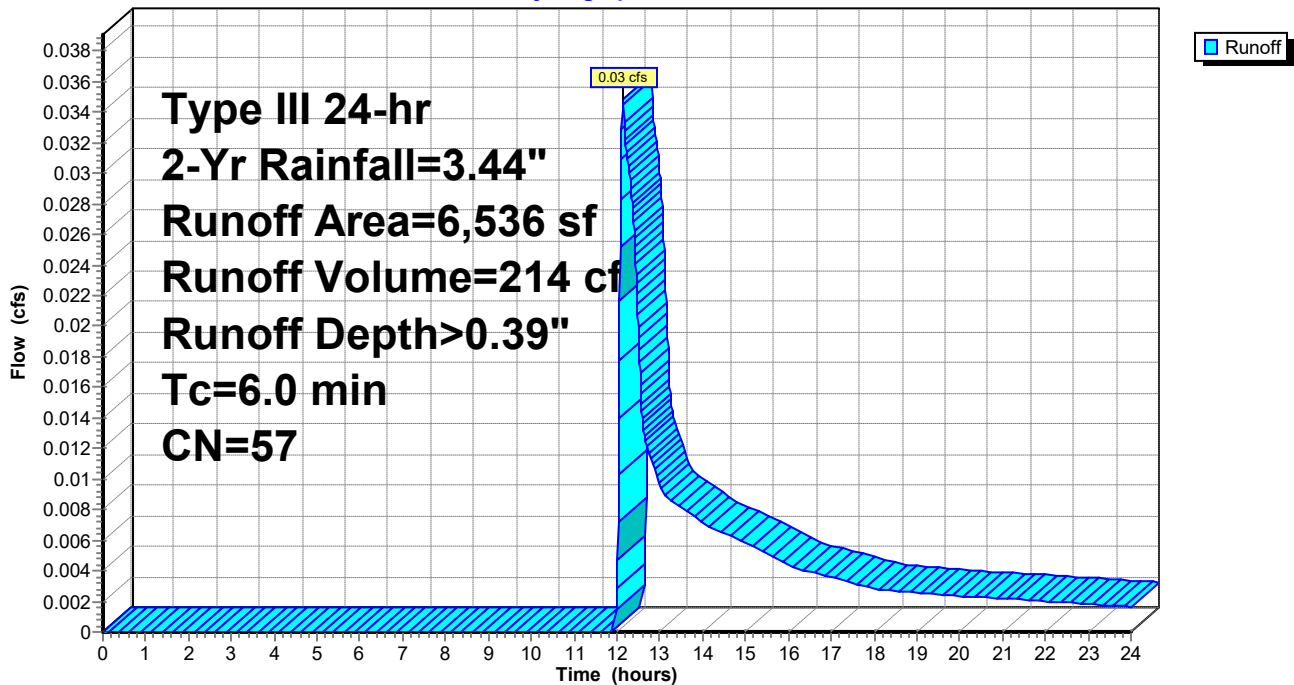
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr Rainfall=3.44"

Area (sf)	CN	Description
6,536	57	Woods/grass comb., Poor, HSG A
6,536		100.00% Pervious Area

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

Subcatchment Ex Ws4: Ex Watershed 4

Hydrograph



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Summary for Subcatchment Ex Ws5: Ex Watershed 5

Runoff = 0.27 cfs @ 12.11 hrs, Volume= 1,069 cf, Depth> 0.63"

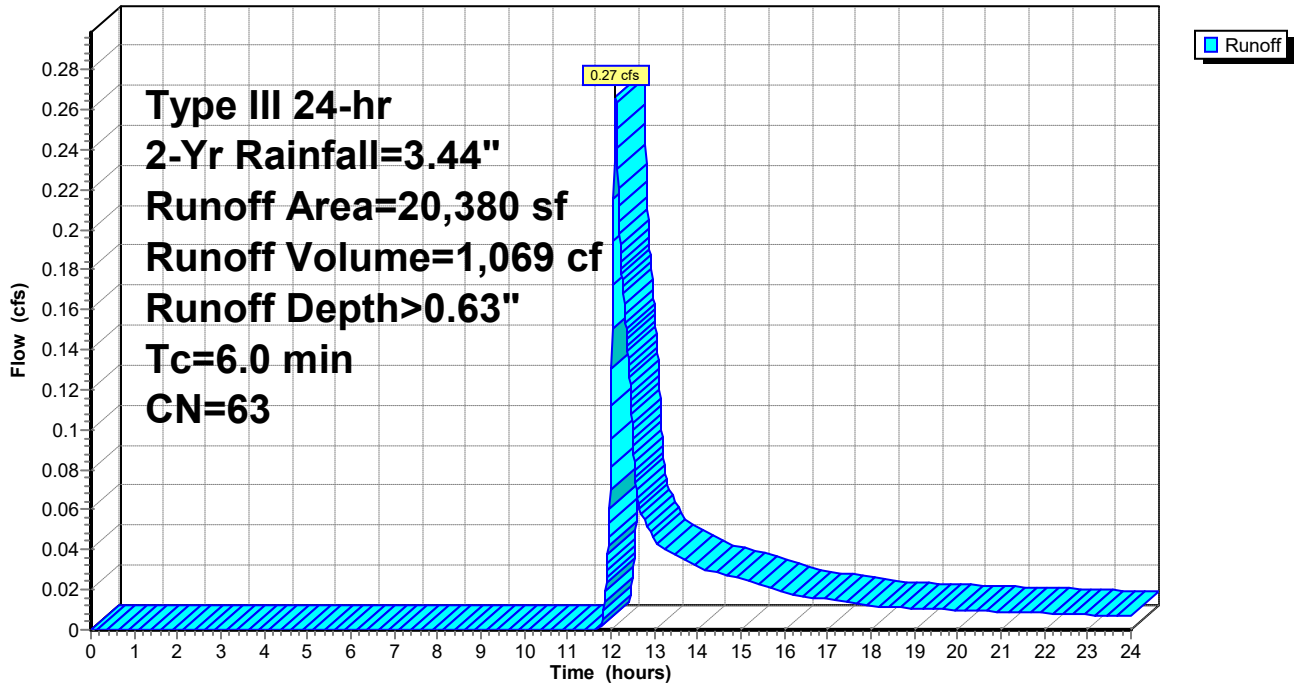
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr Rainfall=3.44"

Area (sf)	CN	Description
2,607	98	Paved parking, HSG A
1,731	68	<50% Grass cover, Poor, HSG A
16,042	57	Woods/grass comb., Poor, HSG A
20,380	63	Weighted Average
17,773		87.21% Pervious Area
2,607		12.79% Impervious Area

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

Subcatchment Ex Ws5: Ex Watershed 5

Hydrograph



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Type III 24-hr 2-Yr Rainfall=3.44"

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Summary for Subcatchment Ex Ws6: Ex Watershed 6

Runoff = 0.03 cfs @ 12.14 hrs, Volume= 201 cf, Depth> 0.39"

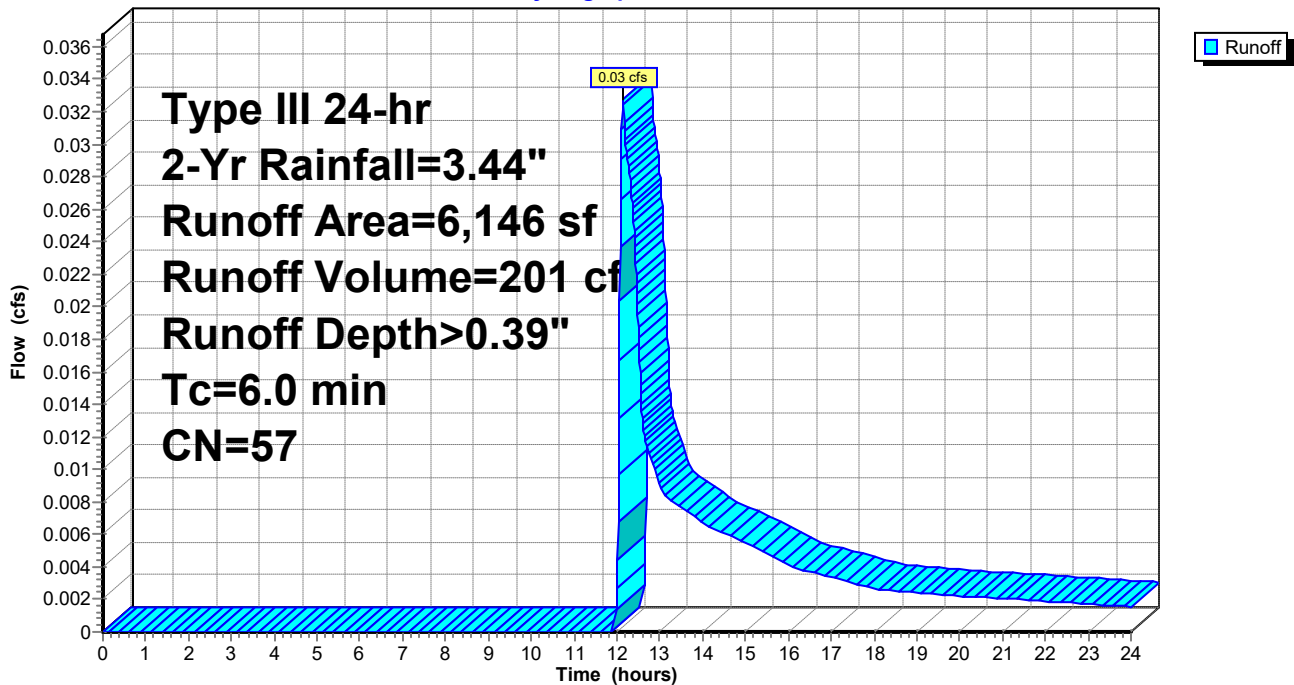
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr Rainfall=3.44"

Area (sf)	CN	Description
6,146	57	Woods/grass comb., Poor, HSG A
6,146		100.00% Pervious Area

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

Subcatchment Ex Ws6: Ex Watershed 6

Hydrograph



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Type III 24-hr 2-Yr Rainfall=3.44"

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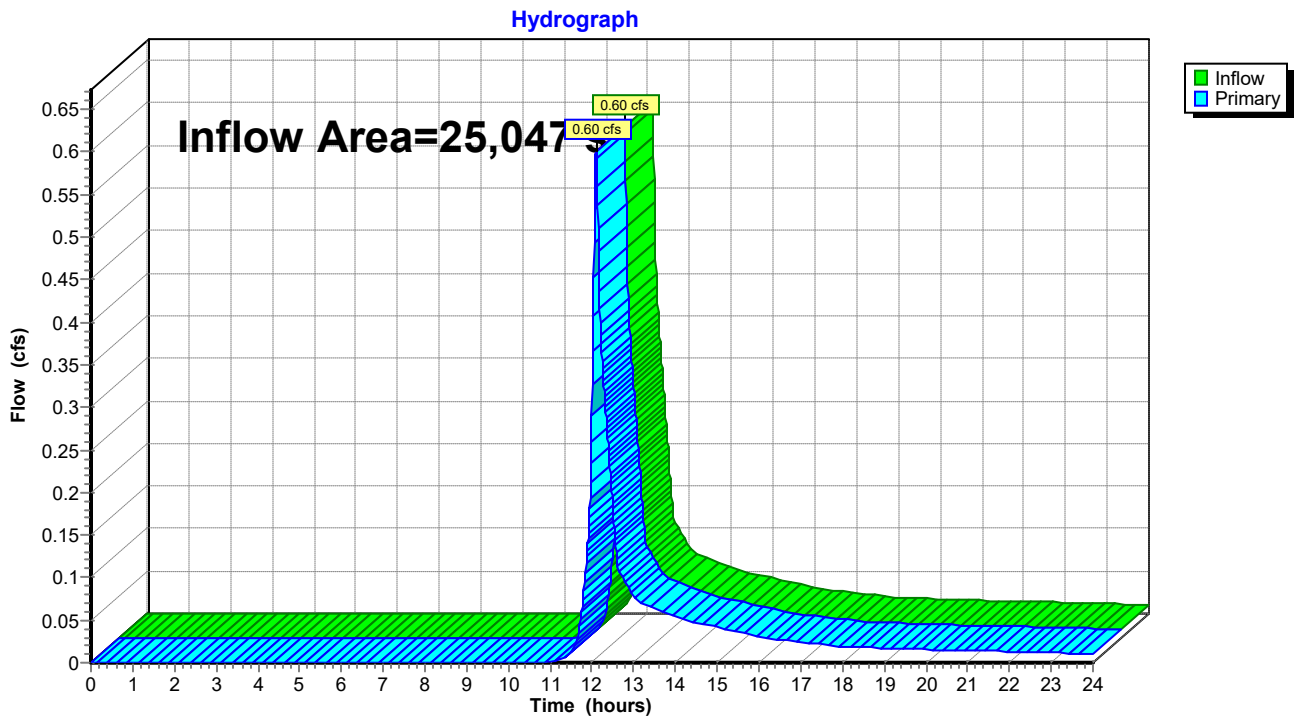
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Summary for Link POA 1: POINT OF ANALYSIS 1

Inflow Area = 25,047 sf, 13.38% Impervious, Inflow Depth > 0.97" for 2-Yr event
Inflow = 0.60 cfs @ 12.10 hrs, Volume= 2,024 cf
Primary = 0.60 cfs @ 12.10 hrs, Volume= 2,024 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link POA 1: POINT OF ANALYSIS 1



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Type III 24-hr 2-Yr Rainfall=3.44"

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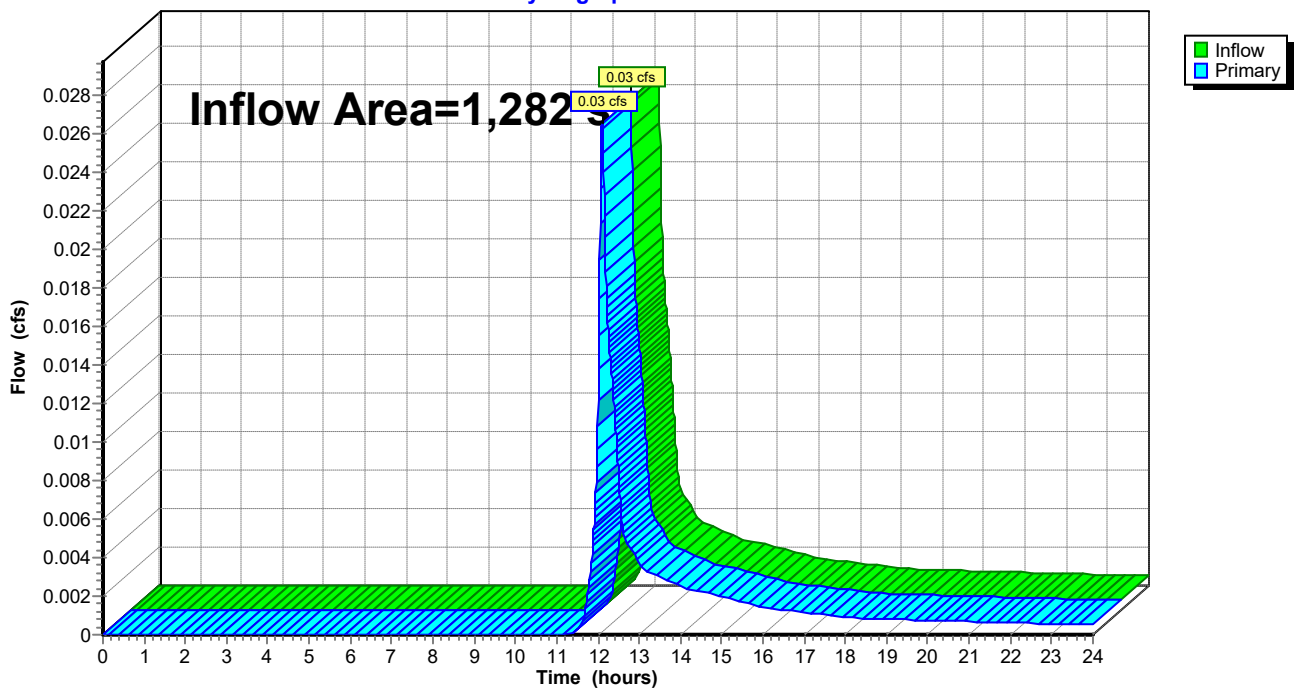
Summary for Link POA 2: POINT OF ANALYSIS 2

Inflow Area = 1,282 sf, 0.00% Impervious, Inflow Depth > 0.87" for 2-Yr event
Inflow = 0.03 cfs @ 12.10 hrs, Volume= 92 cf
Primary = 0.03 cfs @ 12.10 hrs, Volume= 92 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link POA 2: POINT OF ANALYSIS 2

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Type III 24-hr 2-Yr Rainfall=3.44"

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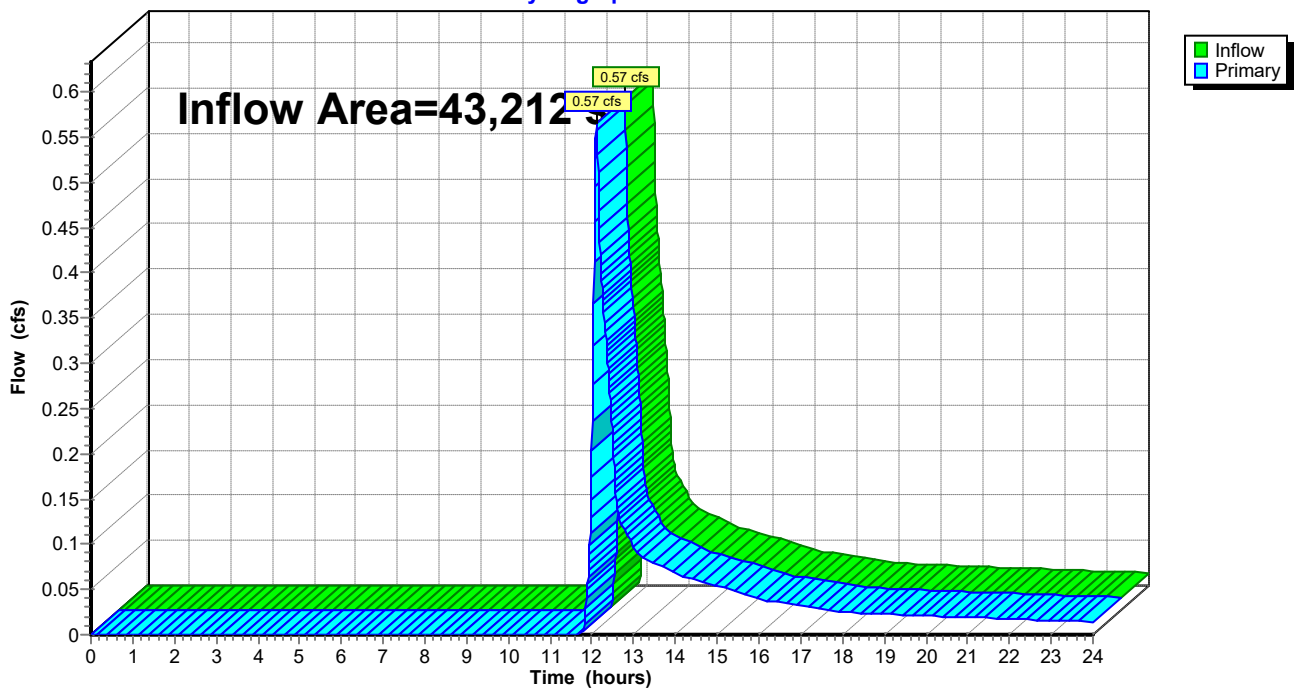
Summary for Link POA 3: POINT OF ANALYSIS 3

Inflow Area = 43,212 sf, 3.83% Impervious, Inflow Depth > 0.63" for 2-Yr event
Inflow = 0.57 cfs @ 12.11 hrs, Volume= 2,266 cf
Primary = 0.57 cfs @ 12.11 hrs, Volume= 2,266 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link POA 3: POINT OF ANALYSIS 3

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Type III 24-hr 2-Yr Rainfall=3.44"

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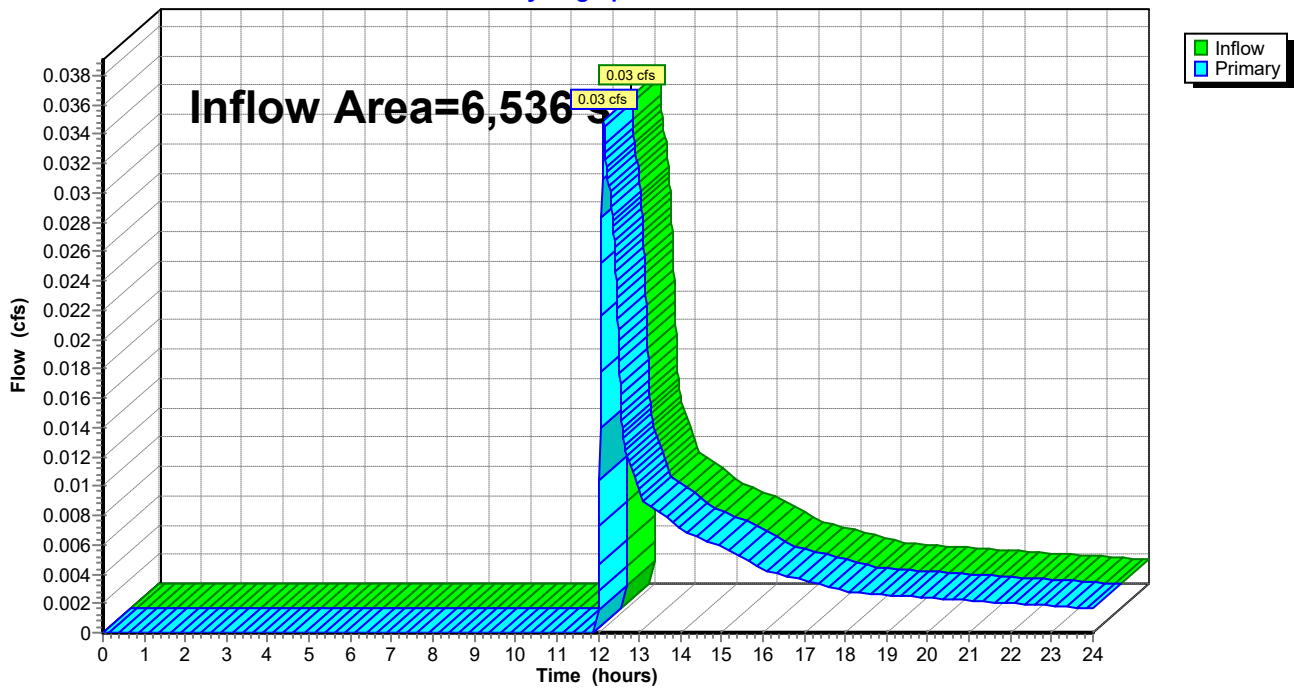
Summary for Link POA 4: POINT OF ANALYSIS 4

Inflow Area = 6,536 sf, 0.00% Impervious, Inflow Depth > 0.39" for 2-Yr event
Inflow = 0.03 cfs @ 12.14 hrs, Volume= 214 cf
Primary = 0.03 cfs @ 12.14 hrs, Volume= 214 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link POA 4: POINT OF ANALYSIS 4

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Type III 24-hr 2-Yr Rainfall=3.44"

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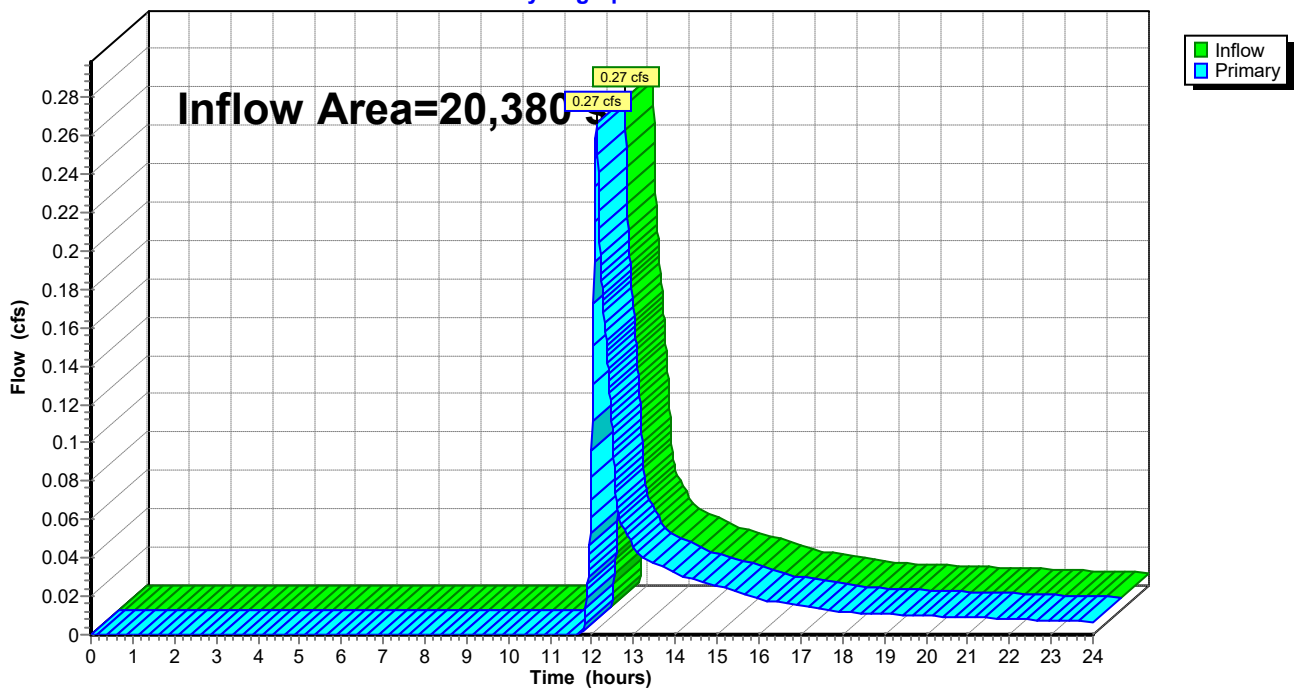
Summary for Link POA 5: POINT OF ANALYSIS 5

Inflow Area = 20,380 sf, 12.79% Impervious, Inflow Depth > 0.63" for 2-Yr event
Inflow = 0.27 cfs @ 12.11 hrs, Volume= 1,069 cf
Primary = 0.27 cfs @ 12.11 hrs, Volume= 1,069 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link POA 5: POINT OF ANALYSIS 5

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Type III 24-hr 2-Yr Rainfall=3.44"

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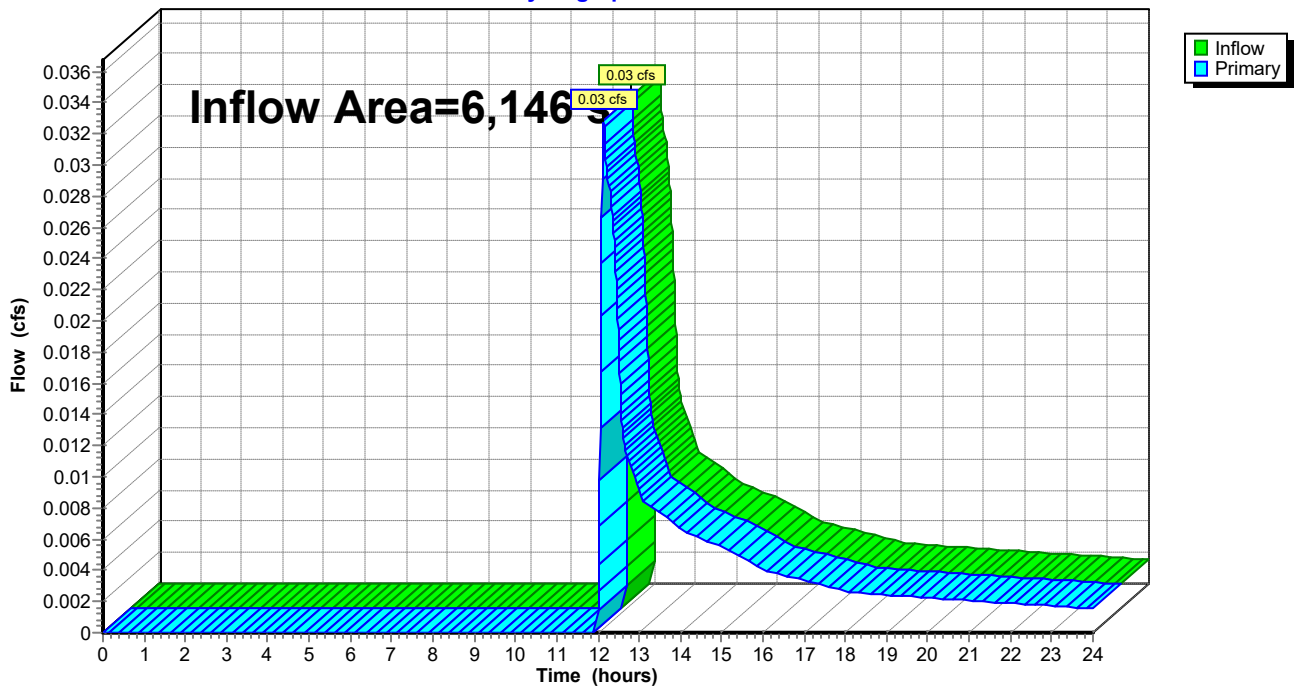
Summary for Link POA 6: POINT OF ANALYSIS 6

Inflow Area = 6,146 sf, 0.00% Impervious, Inflow Depth > 0.39" for 2-Yr event
Inflow = 0.03 cfs @ 12.14 hrs, Volume= 201 cf
Primary = 0.03 cfs @ 12.14 hrs, Volume= 201 cf, Atten= 0%, Lag= 0.0 min

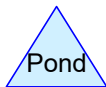
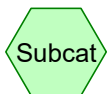
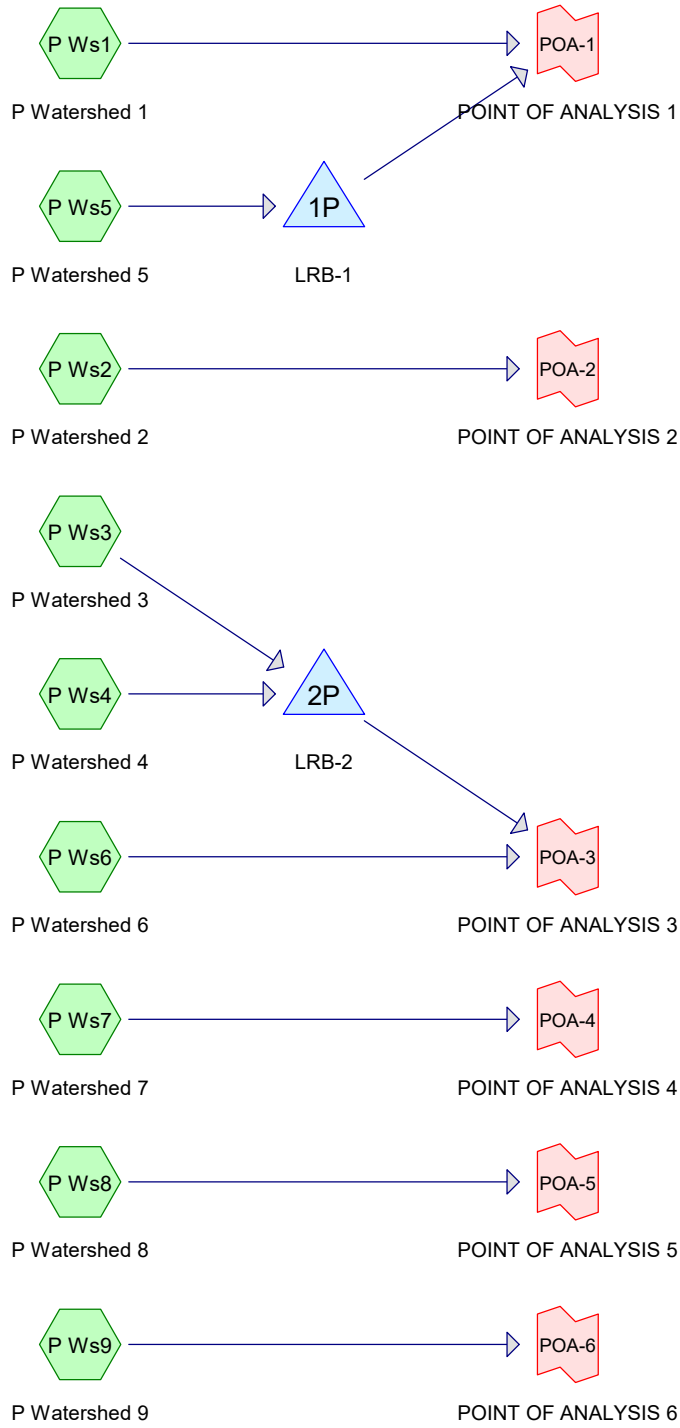
Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link POA 6: POINT OF ANALYSIS 6

Hydrograph



Post Analysis



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Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	100-Yr	Type III 24-hr		Default	24.00	1	7.59	2
2	25-Yr	Type III 24-hr		Default	24.00	1	6.05	2
3	10-Yr	Type III 24-hr		Default	24.00	1	5.05	2
4	2-Yr	Type III 24-hr		Default	24.00	1	3.44	2

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Area Listing (selected nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
31,950	39	>75% Grass cover, Good, HSG A (P Ws1, P Ws3, P Ws4, P Ws7)
35,241	98	Paved parking, HSG A (P Ws1, P Ws3, P Ws4, P Ws8)
6,123	98	Roofs, HSG A (P Ws1, P Ws3, P Ws5)
29,293	32	Woods/grass comb., Good, HSG A (P Ws1, P Ws2, P Ws3, P Ws6, P Ws7, P Ws8, P Ws9)
102,607	61	TOTAL AREA

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Soil Listing (selected nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
102,607	HSG A	P Ws1, P Ws2, P Ws3, P Ws4, P Ws5, P Ws6, P Ws7, P Ws8, P Ws9
0	HSG B	
0	HSG C	
0	HSG D	
0	Other	
102,607		TOTAL AREA

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Ground Covers (selected 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
31,950	0	0	0	0	31,950	>75% Grass cover, Good
35,241	0	0	0	0	35,241	Paved parking
6,123	0	0	0	0	6,123	Roofs
29,293	0	0	0	0	29,293	Woods/grass comb., Good
102,607	0	0	0	0	102,607	TOTAL AREA

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Type III 24-hr 100-Yr Rainfall=7.59"

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Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 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 P Ws1: P Watershed 1	Runoff Area=13,459 sf 20.67% Impervious Runoff Depth>2.00" Tc=6.0 min CN=50 Runoff=0.65 cfs 2,244 cf
Subcatchment P Ws2: P Watershed 2	Runoff Area=1,283 sf 0.00% Impervious Runoff Depth>0.45" Tc=6.0 min CN=32 Runoff=0.00 cfs 48 cf
Subcatchment P Ws3: P Watershed 3	Runoff Area=27,907 sf 55.74% Impervious Runoff Depth>4.33" Tc=6.0 min CN=72 Runoff=3.26 cfs 10,074 cf
Subcatchment P Ws4: P Watershed 4	Runoff Area=27,494 sf 59.45% Impervious Runoff Depth>4.56" Tc=6.0 min CN=74 Runoff=3.37 cfs 10,438 cf
Subcatchment P Ws5: P Watershed 5	Runoff Area=4,267 sf 100.00% Impervious Runoff Depth>7.34" Tc=6.0 min CN=98 Runoff=0.73 cfs 2,612 cf
Subcatchment P Ws6: P Watershed 6	Runoff Area=2,910 sf 0.00% Impervious Runoff Depth>0.45" Tc=6.0 min CN=32 Runoff=0.01 cfs 110 cf
Subcatchment P Ws7: P Watershed 7	Runoff Area=6,385 sf 0.00% Impervious Runoff Depth>0.52" Tc=6.0 min CN=33 Runoff=0.03 cfs 277 cf
Subcatchment P Ws8: P Watershed 8	Runoff Area=18,395 sf 13.12% Impervious Runoff Depth>1.16" Tc=6.0 min CN=41 Runoff=0.39 cfs 1,778 cf
Subcatchment P Ws9: P Watershed 9	Runoff Area=507 sf 0.00% Impervious Runoff Depth>0.45" Tc=6.0 min CN=32 Runoff=0.00 cfs 19 cf
Pond 1P: LRB-1	Peak Elev=100.01' Storage=707 cf Inflow=0.73 cfs 2,612 cf Discarded=0.04 cfs 2,190 cf Primary=0.77 cfs 743 cf Outflow=0.81 cfs 2,933 cf
Pond 2P: LRB-2	Peak Elev=99.40' Storage=13,002 cf Inflow=6.63 cfs 20,511 cf Discarded=0.11 cfs 5,753 cf Primary=0.28 cfs 1,970 cf Outflow=0.38 cfs 7,723 cf
Link POA-1: POINT OF ANALYSIS 1	Inflow=1.29 cfs 2,987 cf Primary=1.29 cfs 2,987 cf
Link POA-2: POINT OF ANALYSIS 2	Inflow=0.00 cfs 48 cf Primary=0.00 cfs 48 cf
Link POA-3: POINT OF ANALYSIS 3	Inflow=0.28 cfs 2,080 cf Primary=0.28 cfs 2,080 cf
Link POA-4: POINT OF ANALYSIS 4	Inflow=0.03 cfs 277 cf Primary=0.03 cfs 277 cf
Link POA-5: POINT OF ANALYSIS 5	Inflow=0.39 cfs 1,778 cf Primary=0.39 cfs 1,778 cf

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Type III 24-hr 100-Yr Rainfall=7.59"

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Link POA-6: POINT OF ANALYSIS 6

Inflow=0.00 cfs 19 cf

Primary=0.00 cfs 19 cf

Total Runoff Area = 102,607 sf Runoff Volume = 27,600 cf Average Runoff Depth = 3.23"
59.69% Pervious = 61,243 sf 40.31% Impervious = 41,364 sf

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Type III 24-hr 100-Yr Rainfall=7.59"

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Summary for Subcatchment P Ws1: P Watershed 1

Runoff = 0.65 cfs @ 12.10 hrs, Volume= 2,244 cf, Depth> 2.00"

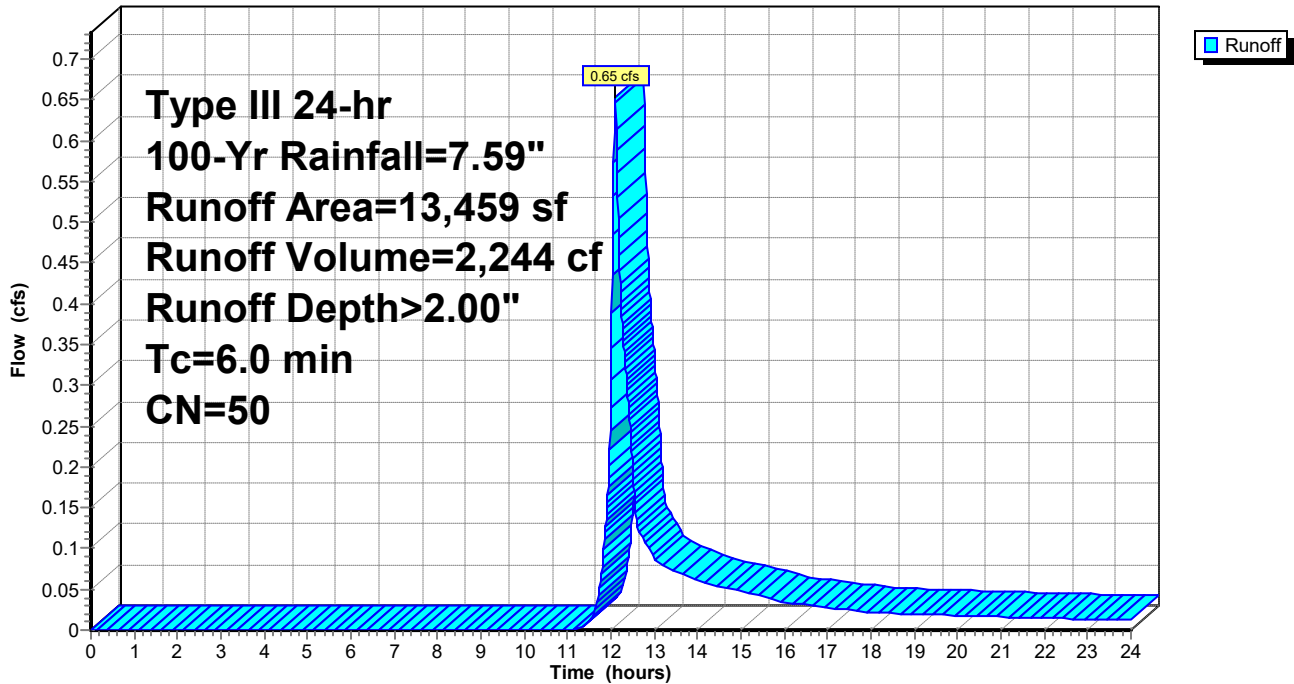
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr Rainfall=7.59"

Area (sf)	CN	Description
1,107	98	Paved parking, HSG A
1,675	98	Roofs, HSG A
7,850	39	>75% Grass cover, Good, HSG A
2,827	32	Woods/grass comb., Good, HSG A
13,459	50	Weighted Average
10,677		79.33% Pervious Area
2,782		20.67% Impervious Area

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

Subcatchment P Ws1: P Watershed 1

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Type III 24-hr 100-Yr Rainfall=7.59"

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Summary for Subcatchment P Ws2: P Watershed 2

Runoff = 0.00 cfs @ 12.39 hrs, Volume= 48 cf, Depth> 0.45"

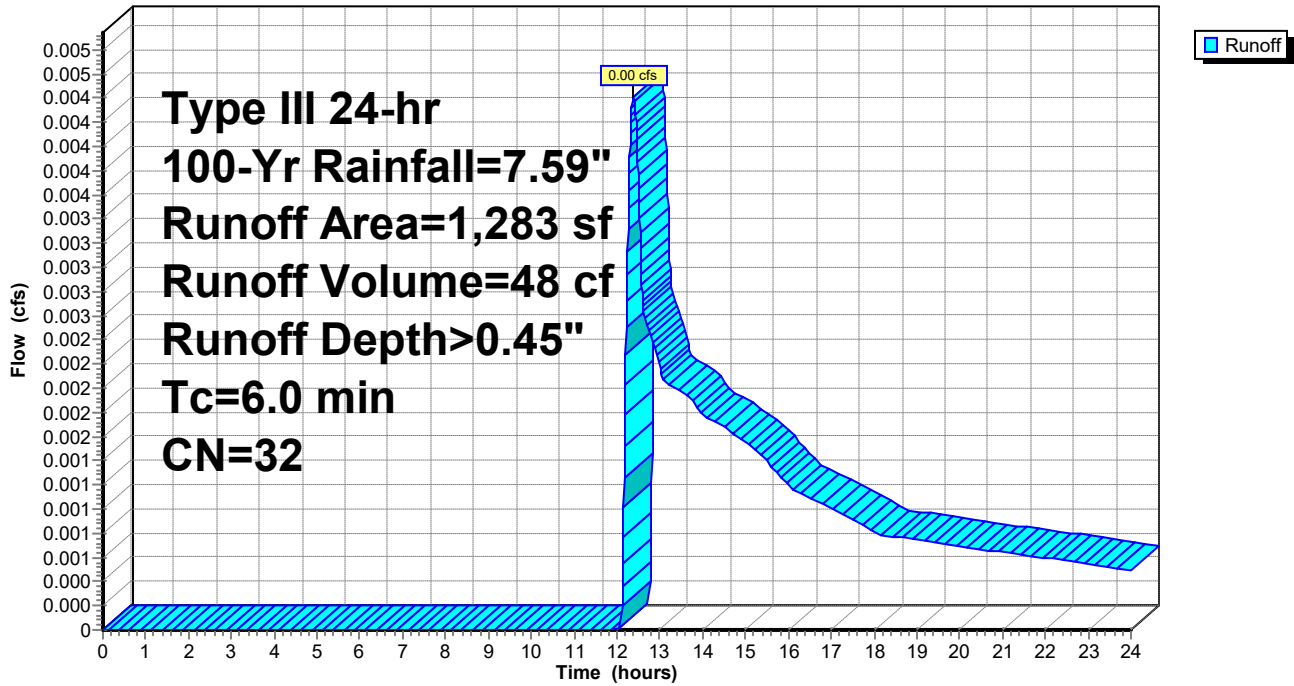
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr Rainfall=7.59"

Area (sf)	CN	Description
1,283	32	Woods/grass comb., Good, HSG A
1,283		100.00% Pervious Area

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

Subcatchment P Ws2: P Watershed 2

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Type III 24-hr 100-Yr Rainfall=7.59"

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Summary for Subcatchment P Ws3: P Watershed 3

Runoff = 3.26 cfs @ 12.09 hrs, Volume= 10,074 cf, Depth> 4.33"

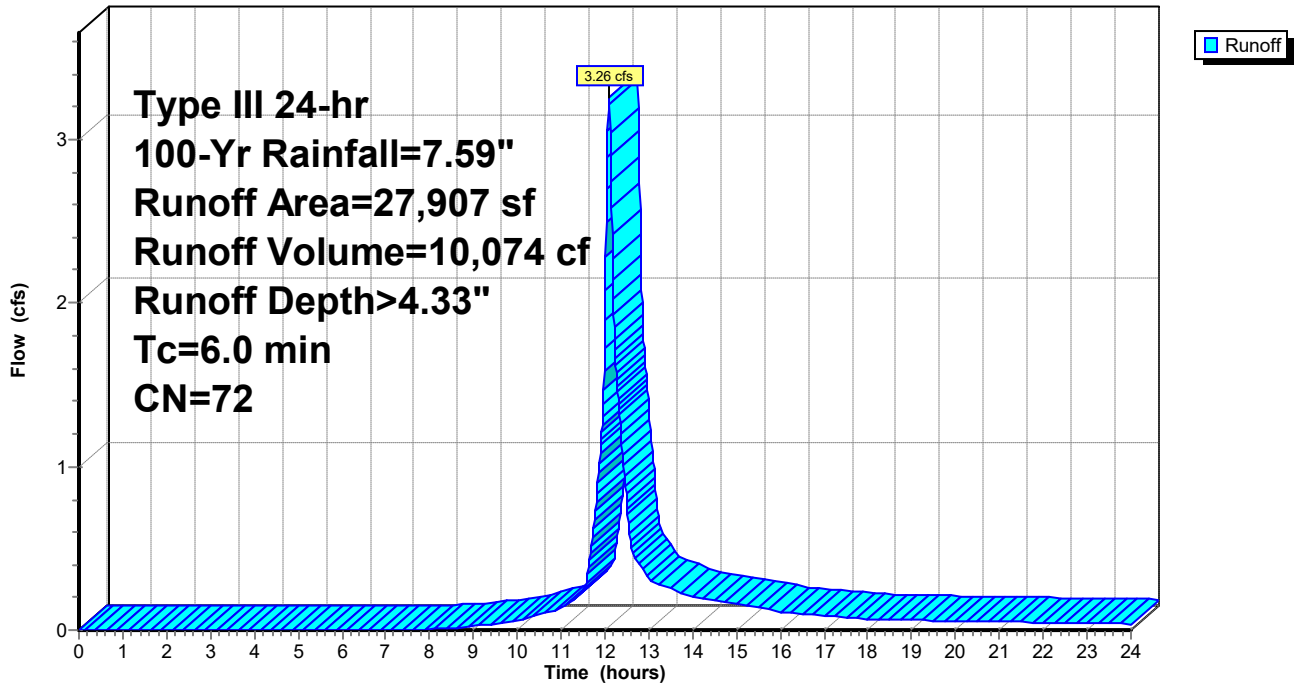
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr Rainfall=7.59"

Area (sf)	CN	Description
15,374	98	Paved parking, HSG A
181	98	Roofs, HSG A
11,843	39	>75% Grass cover, Good, HSG A
509	32	Woods/grass comb., Good, HSG A
27,907	72	Weighted Average
12,352		44.26% Pervious Area
15,555		55.74% Impervious Area

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

Subcatchment P Ws3: P Watershed 3

Hydrograph



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Type III 24-hr 100-Yr Rainfall=7.59"

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Summary for Subcatchment P Ws4: P Watershed 4

Runoff = 3.37 cfs @ 12.09 hrs, Volume= 10,438 cf, Depth> 4.56"

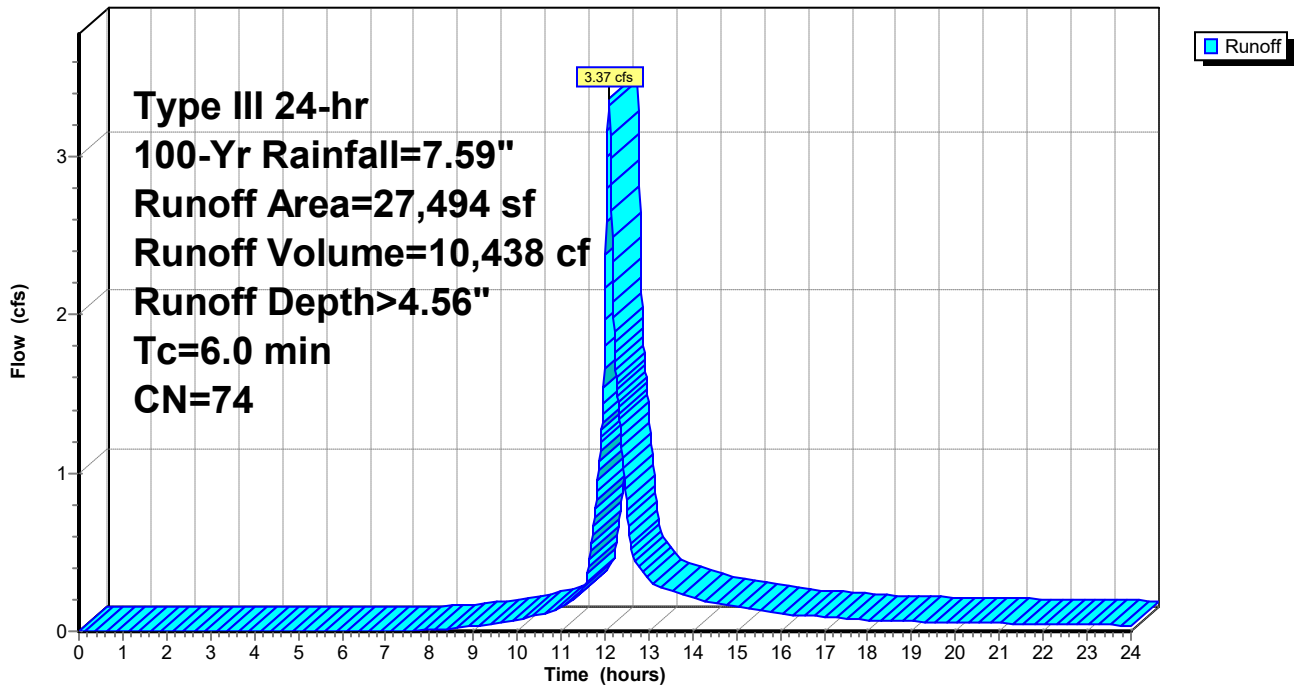
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr Rainfall=7.59"

Area (sf)	CN	Description
16,346	98	Paved parking, HSG A
11,148	39	>75% Grass cover, Good, HSG A
27,494	74	Weighted Average
11,148		40.55% Pervious Area
16,346		59.45% Impervious Area

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

Subcatchment P Ws4: P Watershed 4

Hydrograph



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Type III 24-hr 100-Yr Rainfall=7.59"

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Summary for Subcatchment P Ws5: P Watershed 5

Runoff = 0.73 cfs @ 12.08 hrs, Volume= 2,612 cf, Depth> 7.34"

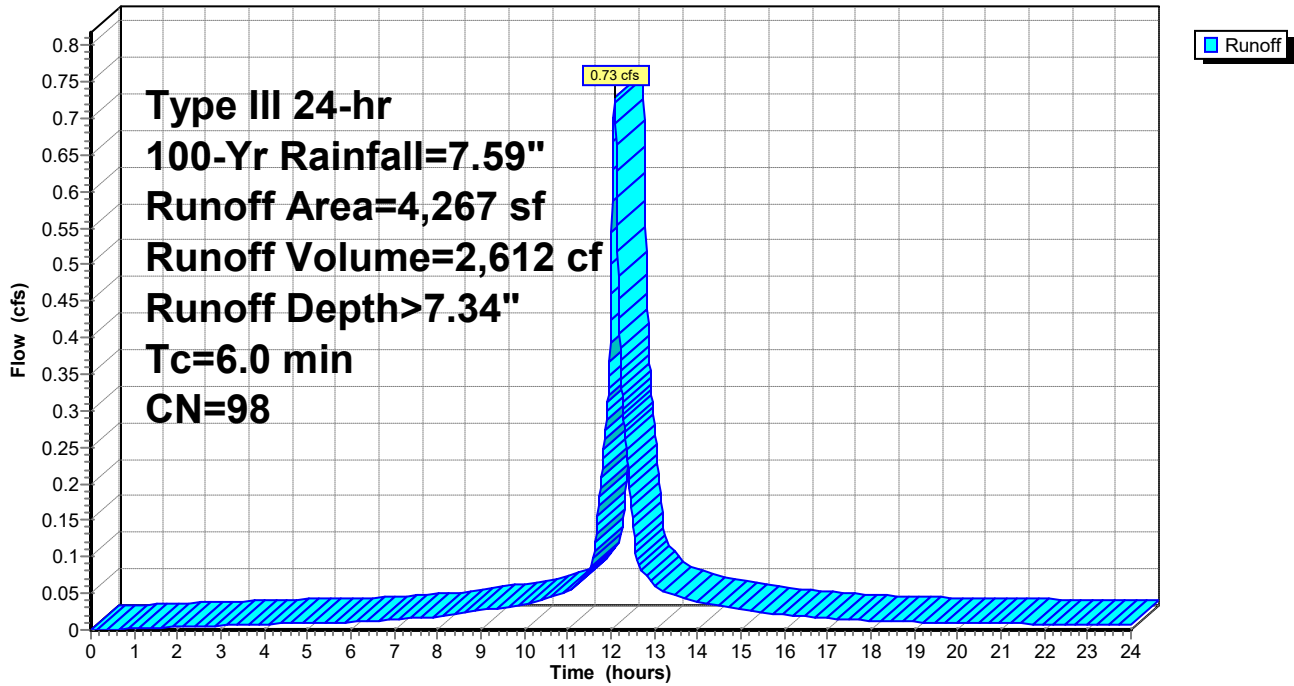
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr Rainfall=7.59"

Area (sf)	CN	Description
4,267	98	Roofs, HSG A
4,267		100.00% Impervious Area

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

Subcatchment P Ws5: P Watershed 5

Hydrograph



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Type III 24-hr 100-Yr Rainfall=7.59"

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Summary for Subcatchment P Ws6: P Watershed 6

Runoff = 0.01 cfs @ 12.39 hrs, Volume= 110 cf, Depth> 0.45"

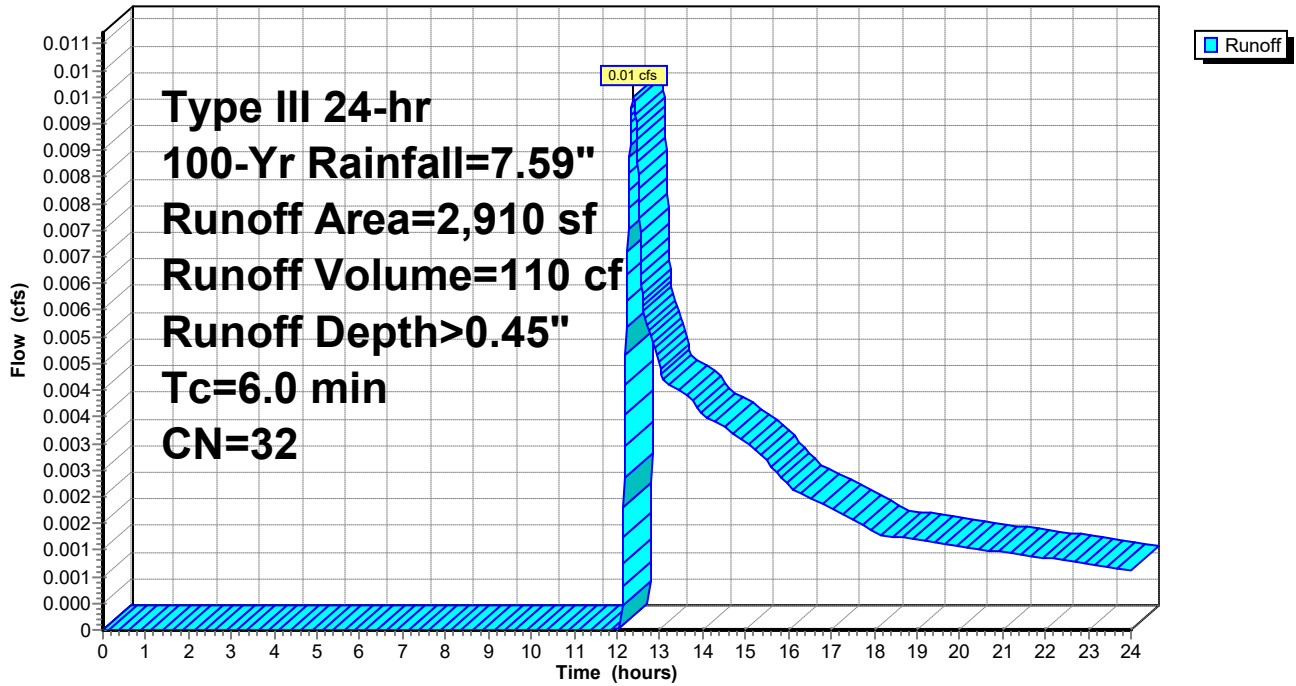
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr Rainfall=7.59"

Area (sf)	CN	Description
2,910	32	Woods/grass comb., Good, HSG A
2,910		100.00% Pervious Area

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

Subcatchment P Ws6: P Watershed 6

Hydrograph



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Type III 24-hr 100-Yr Rainfall=7.59"

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Summary for Subcatchment P Ws7: P Watershed 7

Runoff = 0.03 cfs @ 12.36 hrs, Volume= 277 cf, Depth> 0.52"

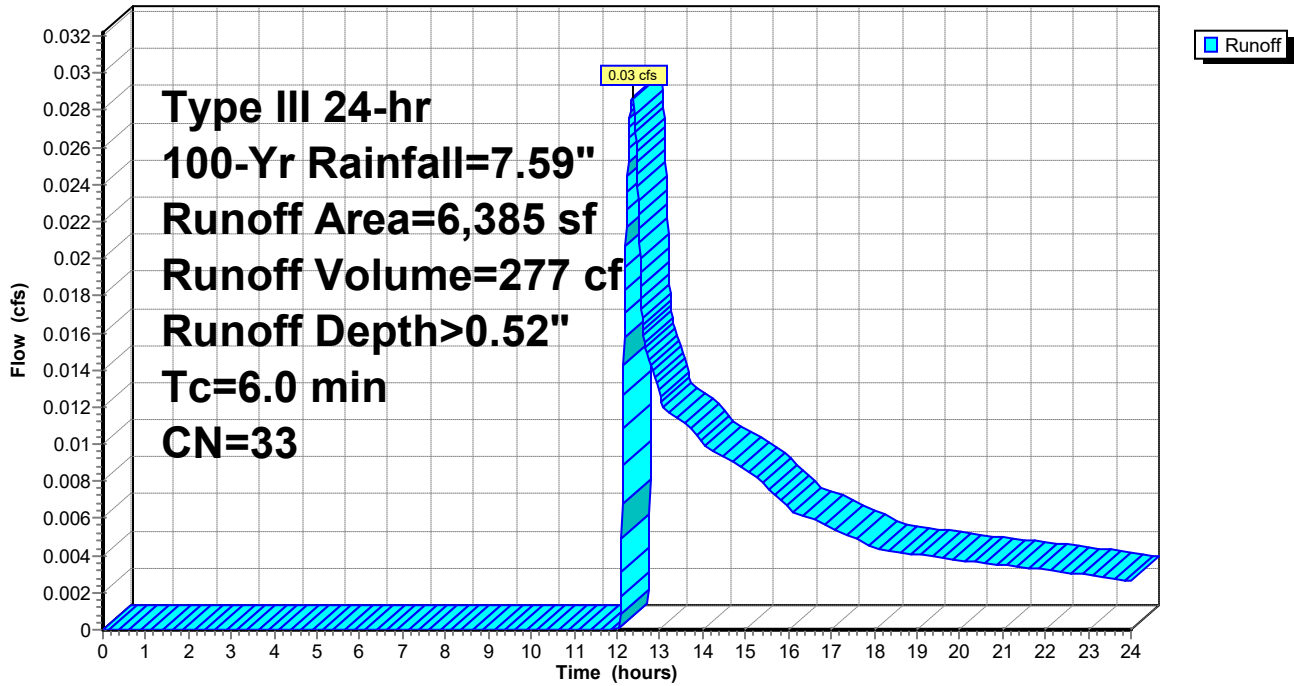
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr Rainfall=7.59"

Area (sf)	CN	Description
1,109	39	>75% Grass cover, Good, HSG A
5,276	32	Woods/grass comb., Good, HSG A
6,385	33	Weighted Average
6,385		100.00% Pervious Area

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

Subcatchment P Ws7: P Watershed 7

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Type III 24-hr 100-Yr Rainfall=7.59"

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Summary for Subcatchment P Ws8: P Watershed 8

Runoff = 0.39 cfs @ 12.12 hrs, Volume= 1,778 cf, Depth> 1.16"

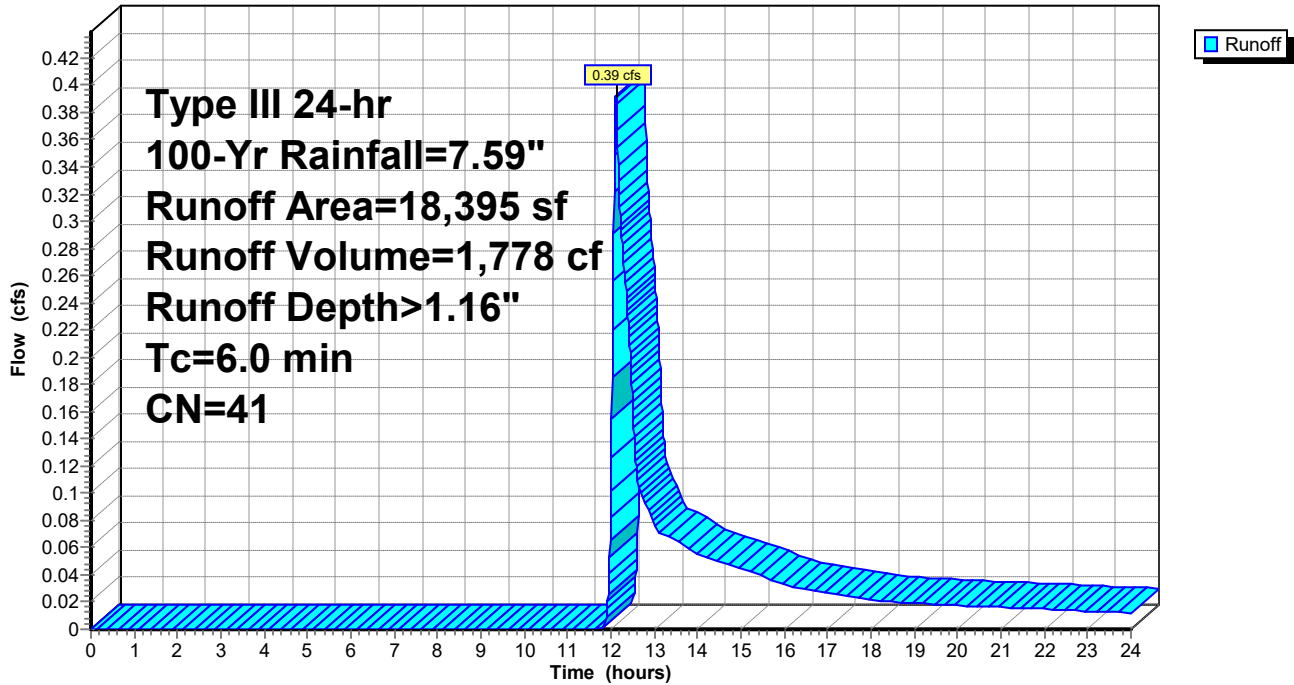
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr Rainfall=7.59"

Area (sf)	CN	Description
2,414	98	Paved parking, HSG A
15,981	32	Woods/grass comb., Good, HSG A
18,395	41	Weighted Average
15,981		86.88% Pervious Area
2,414		13.12% Impervious Area

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

Subcatchment P Ws8: P Watershed 8

Hydrograph



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Type III 24-hr 100-Yr Rainfall=7.59"

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Summary for Subcatchment P Ws9: P Watershed 9

Runoff = 0.00 cfs @ 12.39 hrs, Volume= 19 cf, Depth> 0.45"

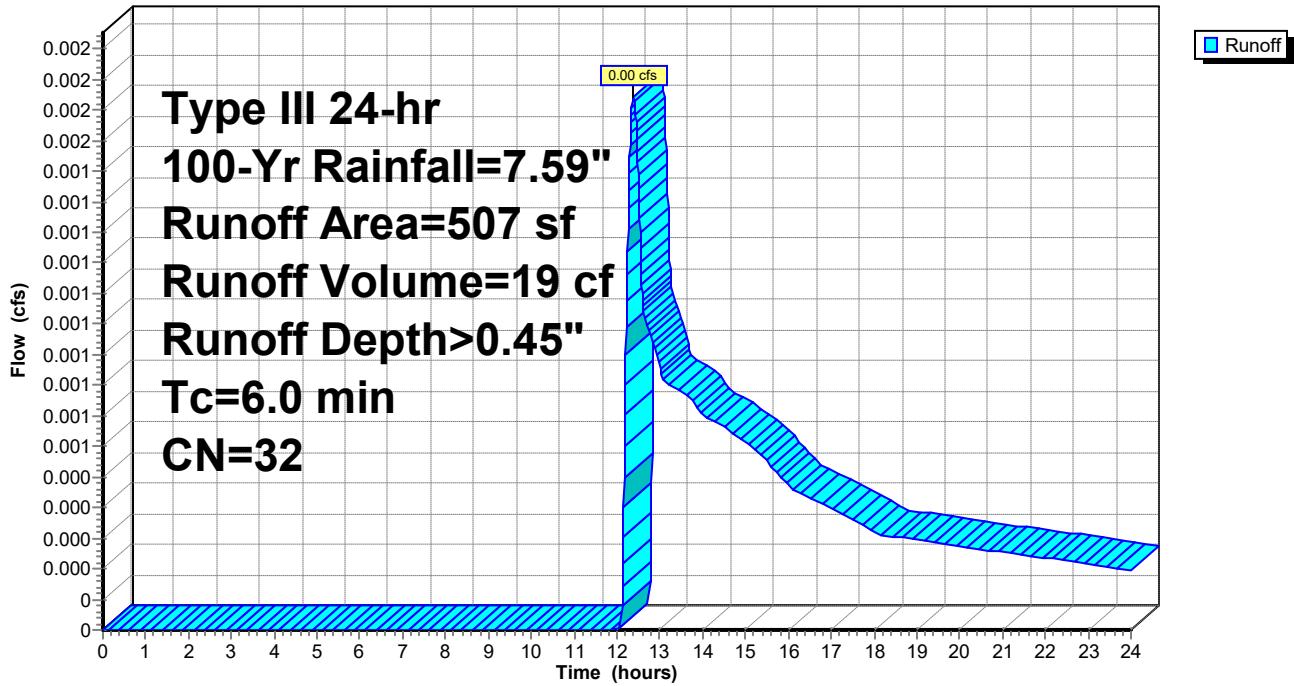
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr Rainfall=7.59"

Area (sf)	CN	Description
507	32	Woods/grass comb., Good, HSG A
507		100.00% Pervious Area

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

Subcatchment P Ws9: P Watershed 9

Hydrograph



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Summary for Pond 1P: LRB-1

Inflow Area = 4,267 sf, 100.00% Impervious, Inflow Depth > 7.34" for 100-Yr event
 Inflow = 0.73 cfs @ 12.08 hrs, Volume= 2,612 cf
 Outflow = 0.81 cfs @ 12.16 hrs, Volume= 2,933 cf, Atten= 0%, Lag= 4.9 min
 Discarded = 0.04 cfs @ 12.16 hrs, Volume= 2,190 cf
 Primary = 0.77 cfs @ 12.16 hrs, Volume= 743 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 100.01' @ 12.16 hrs Surf.Area= 203 sf Storage= 707 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 106.5 min (847.8 - 741.3)

Volume	Invert	Avail.Storage	Storage Description
#1	93.82'	236 cf	10.00'W x 20.00'L x 5.67'H Stone 1,134 cf Overall - 530 cf Embedded = 604 cf x 39.0% Voids
#2	94.82'	469 cf	8.00'D x 4.67'H PCC Leaching Unit 8' Dia x 2 Inside #1 530 cf Overall - 3.0" Wall Thickness = 469 cf
#3	99.48'	2 cf	2.00'D x 0.55'H Riser
		707 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	93.82'	8.270 in/hr Exfiltration over Surface area
#2	Primary	100.00'	24.0" Horiz. Overflow Grate C= 0.600 in 24.0" Grate (100% open area)

Discarded OutFlow Max=0.04 cfs @ 12.16 hrs HW=100.01' (Free Discharge)

↑**1=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=1.34 cfs @ 12.16 hrs HW=100.01' (Free Discharge)

↑**2=Overflow Grate** (Orifice Controls 1.34 cfs @ 0.43 fps)

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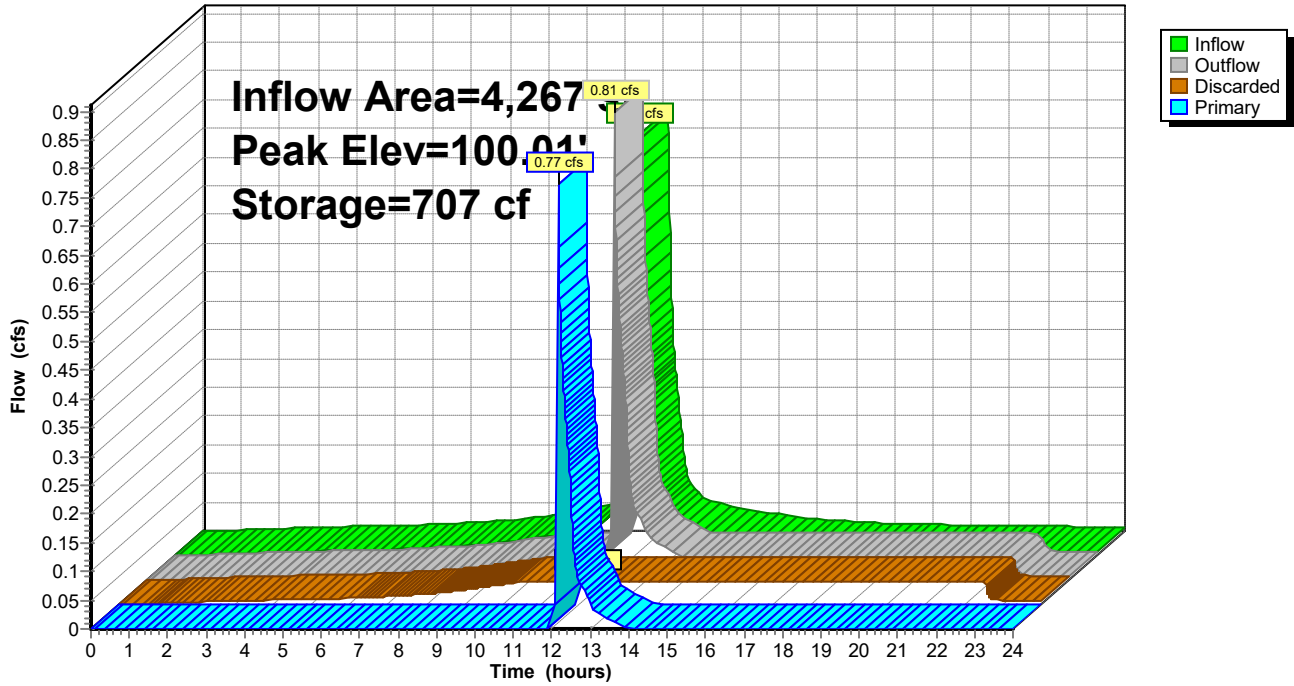
Type III 24-hr 100-Yr Rainfall=7.59"

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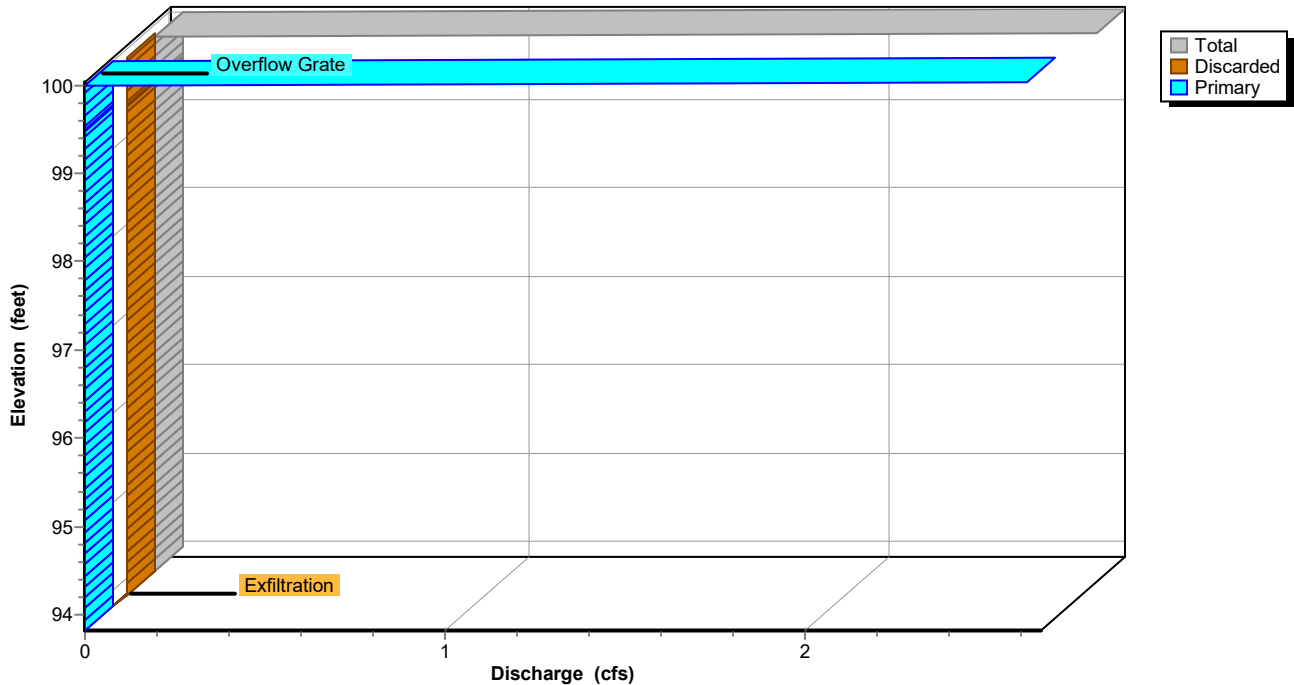
Pond 1P: LRB-1

Hydrograph



Pond 1P: LRB-1

Stage-Discharge



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Summary for Pond 2P: LRB-2

Inflow Area = 55,401 sf, 57.58% Impervious, Inflow Depth > 4.44" for 100-Yr event
 Inflow = 6.63 cfs @ 12.09 hrs, Volume= 20,511 cf
 Outflow = 0.38 cfs @ 14.28 hrs, Volume= 7,723 cf, Atten= 94%, Lag= 131.8 min
 Discarded = 0.11 cfs @ 9.77 hrs, Volume= 5,753 cf
 Primary = 0.28 cfs @ 14.28 hrs, Volume= 1,970 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 99.40' @ 14.28 hrs Surf.Area= 552 sf Storage= 13,002 cf

Plug-Flow detention time= 278.9 min calculated for 7,723 cf (38% of inflow)
 Center-of-Mass det. time= 155.4 min (975.4 - 819.9)

Volume	Invert	Avail.Storage	Storage Description
#1	87.09'	884 cf	12.00'W x 46.00'L x 7.67'H Stone 4,234 cf Overall - 1,967 cf Embedded = 2,266 cf x 39.0% Voids
#2	88.09'	1,676 cf	8.00'D x 6.67'H PCC Leaching Unit 8' Dia x 5 Inside #1 1,967 cf Overall - 4.0" Wall Thickness = 1,676 cf
#3	94.76'	5 cf	2.00'D x 1.74'H Riser -Impervious
#4	96.00'	7,512 cf	Grass Channel Storage (Irregular) Listed below (Recalc) -Impervious
#5	99.00'	3,790 cf	Parking Lot (Irregular) Listed below (Recalc) -Impervious
		13,867 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
96.00	453	152.0	0.0	0	0	453
97.00	1,309	311.0	100.0	844	844	6,316
98.00	3,094	576.0	100.0	2,138	2,983	25,026
99.00	6,137	801.0	100.0	4,530	7,512	49,691

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
99.00	6,137	801.0	0	0	6,137
99.50	9,120	932.0	3,790	3,790	24,208

Device	Routing	Invert	Outlet Devices
#0	Primary	99.50'	Automatic Storage Overflow (Discharged without head)
#1	Discarded	87.09'	8.270 in/hr Exfiltration over Surface area
#2	Primary	99.40'	Custom Weir/Orifice, Cv= 2.62 (C= 3.28) Head (feet) 0.00 0.10 Width (feet) 157.70 157.70

Discarded OutFlow Max=0.11 cfs @ 9.77 hrs HW=87.21' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.11 cfs)

Primary OutFlow Max=0.04 cfs @ 14.28 hrs HW=99.40' (Free Discharge)
 ↑2=Custom Weir/Orifice (Weir Controls 0.04 cfs @ 0.13 fps)

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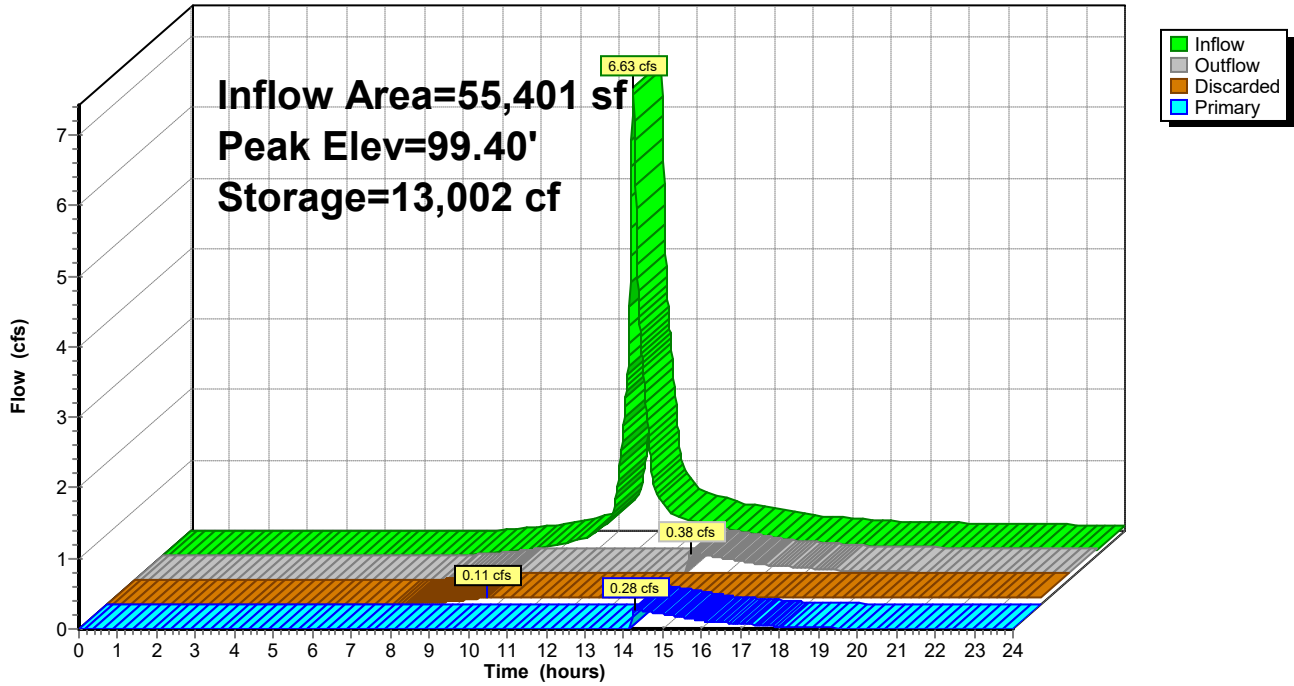
Type III 24-hr 100-Yr Rainfall=7.59"

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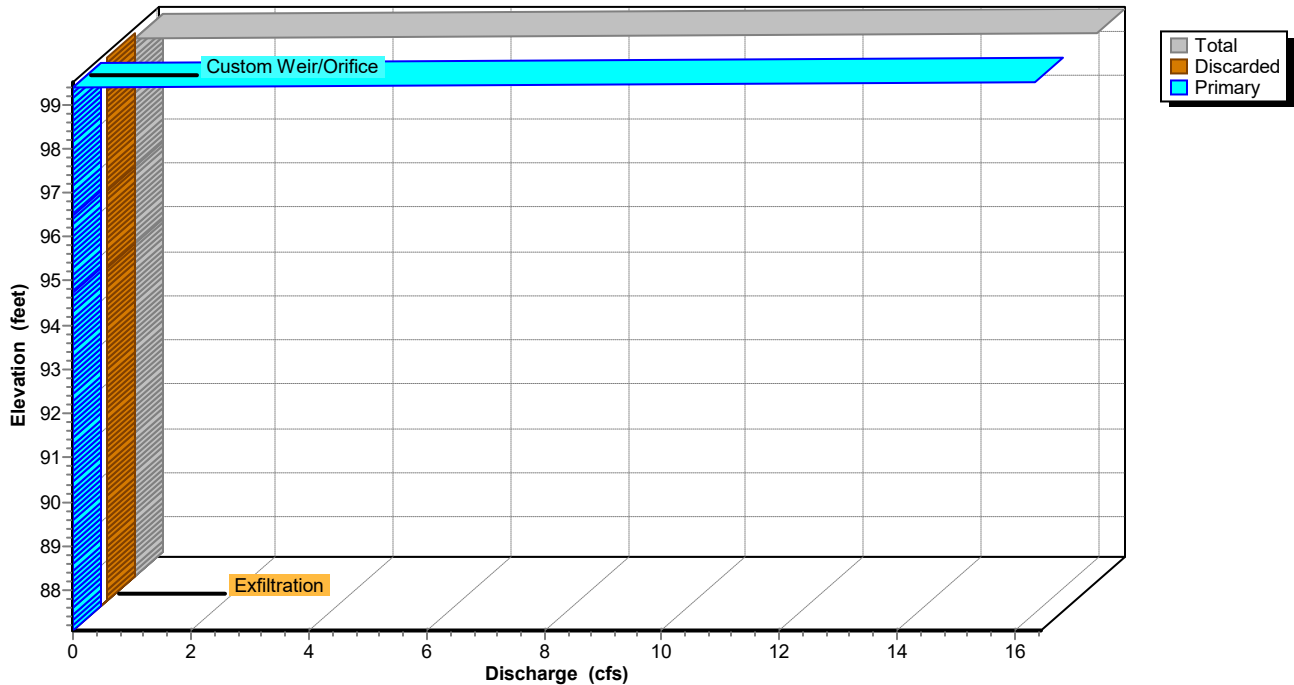
Pond 2P: LRB-2

Hydrograph



Pond 2P: LRB-2

Stage-Discharge

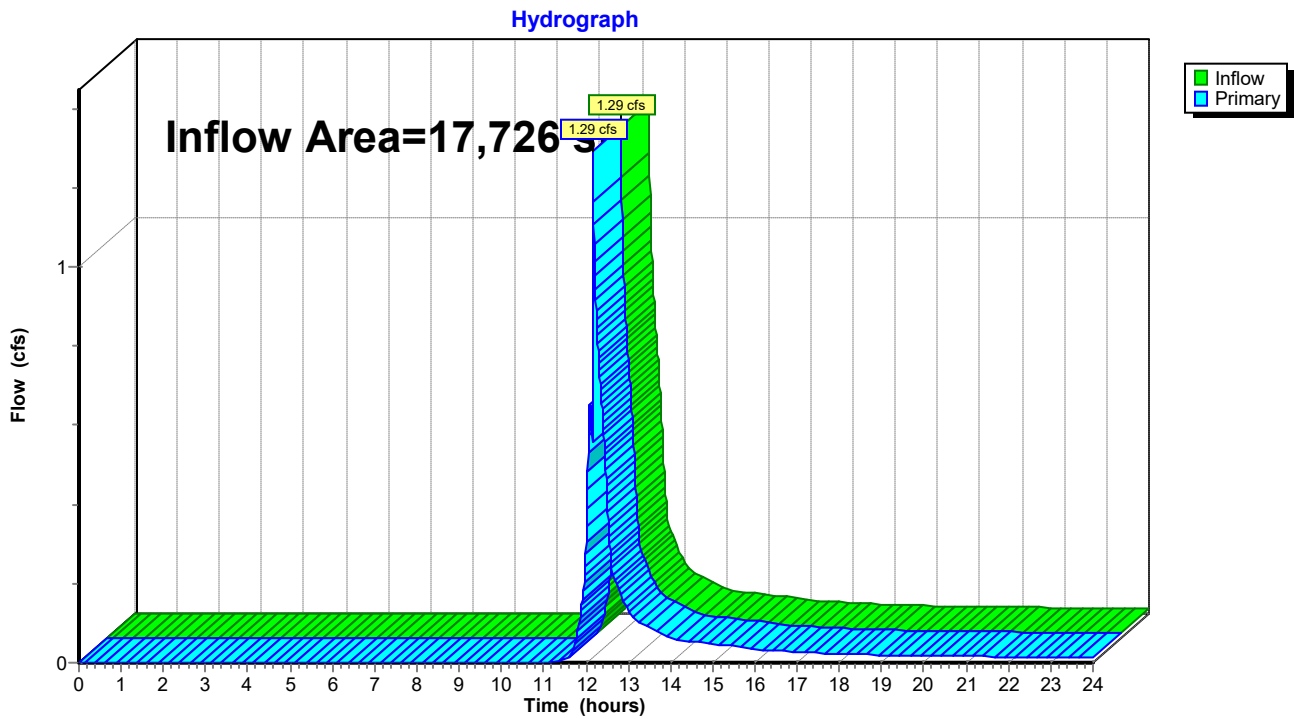


Summary for Link POA-1: POINT OF ANALYSIS 1

Inflow Area = 17,726 sf, 39.77% Impervious, Inflow Depth > 2.02" for 100-Yr event
Inflow = 1.29 cfs @ 12.16 hrs, Volume= 2,987 cf
Primary = 1.29 cfs @ 12.16 hrs, Volume= 2,987 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link POA-1: POINT OF ANALYSIS 1



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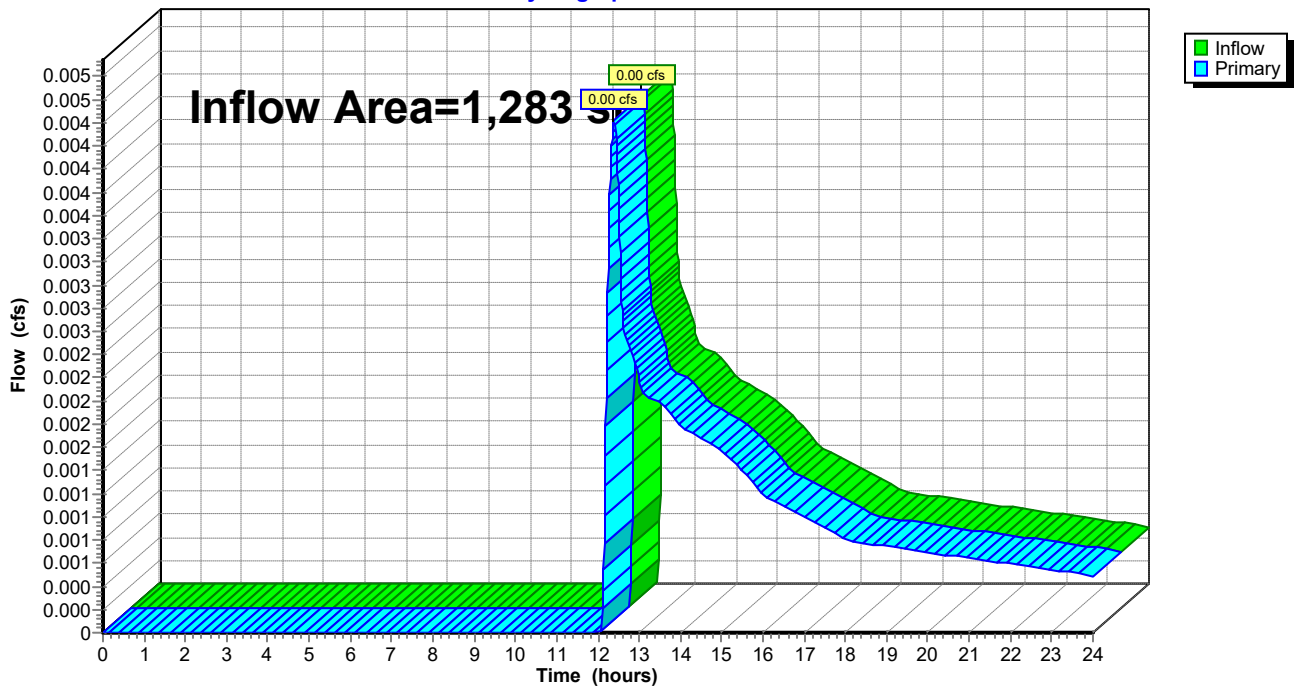
Summary for Link POA-2: POINT OF ANALYSIS 2

Inflow Area = 1,283 sf, 0.00% Impervious, Inflow Depth > 0.45" for 100-Yr event
Inflow = 0.00 cfs @ 12.39 hrs, Volume= 48 cf
Primary = 0.00 cfs @ 12.39 hrs, Volume= 48 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link POA-2: POINT OF ANALYSIS 2

Hydrograph



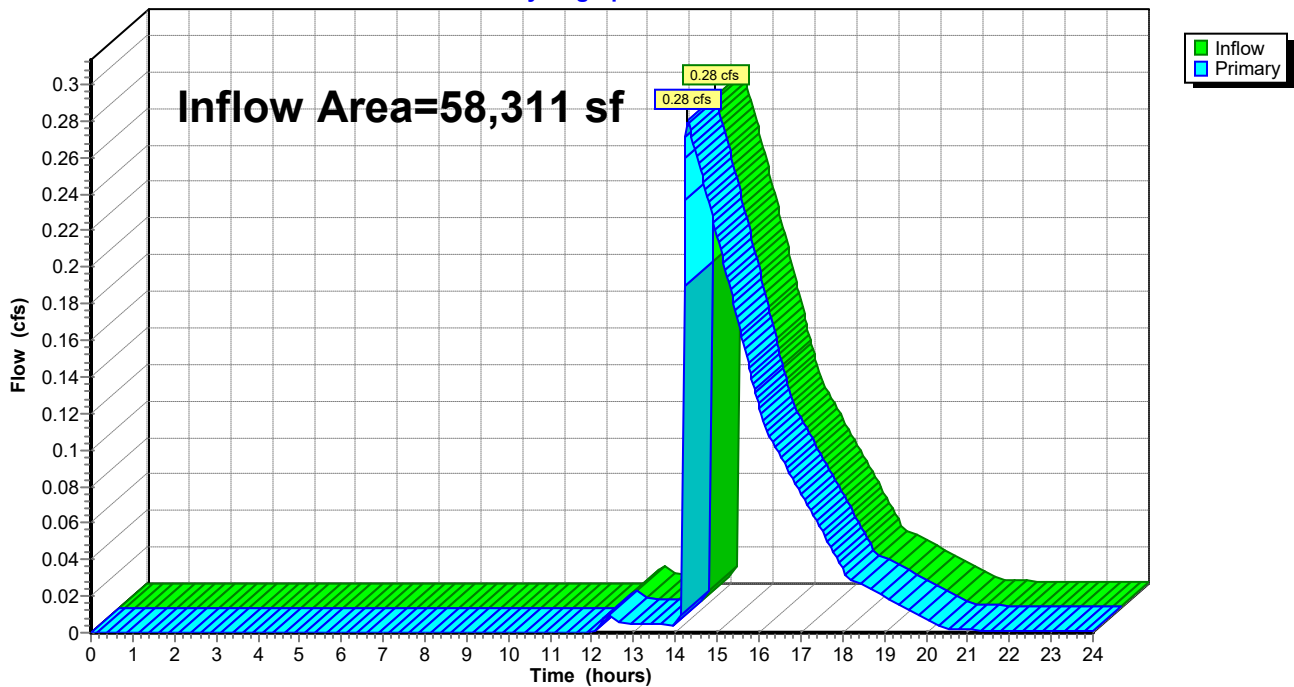
Summary for Link POA-3: POINT OF ANALYSIS 3

Inflow Area = 58,311 sf, 54.71% Impervious, Inflow Depth > 0.43" for 100-Yr event
Inflow = 0.28 cfs @ 14.28 hrs, Volume= 2,080 cf
Primary = 0.28 cfs @ 14.28 hrs, Volume= 2,080 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link POA-3: POINT OF ANALYSIS 3

Hydrograph



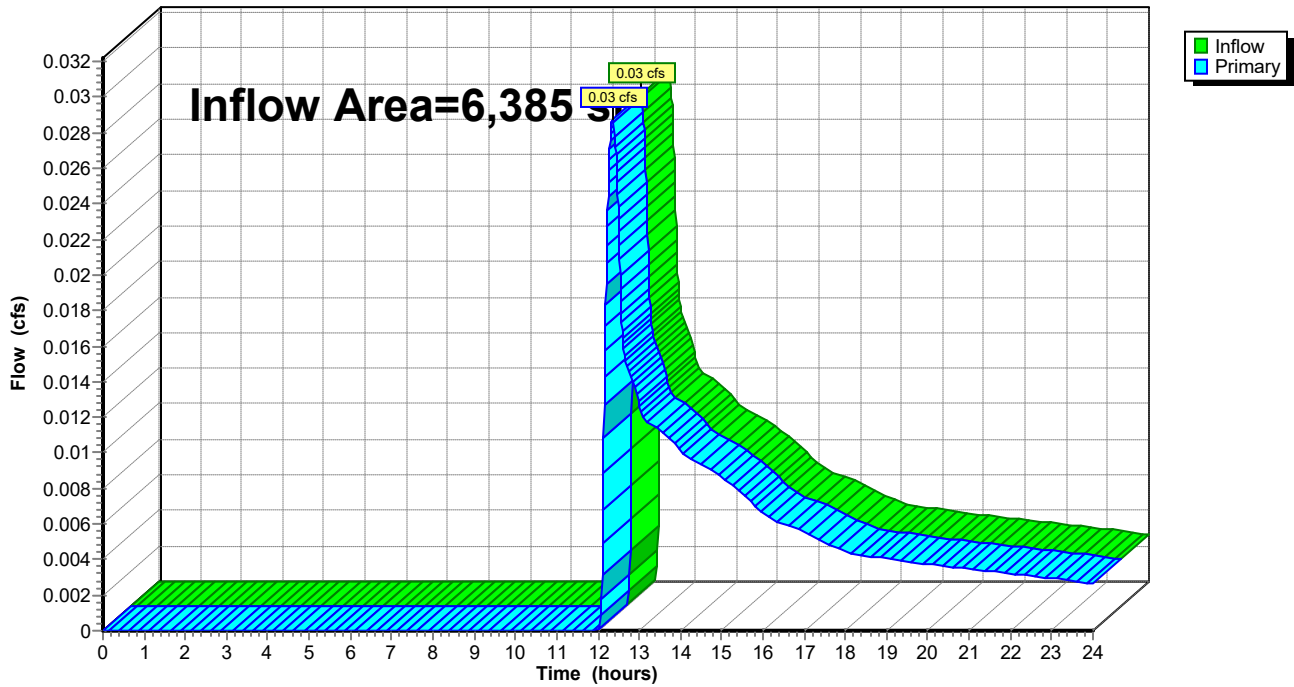
Summary for Link POA-4: POINT OF ANALYSIS 4

Inflow Area = 6,385 sf, 0.00% Impervious, Inflow Depth > 0.52" for 100-Yr event
Inflow = 0.03 cfs @ 12.36 hrs, Volume= 277 cf
Primary = 0.03 cfs @ 12.36 hrs, Volume= 277 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link POA-4: POINT OF ANALYSIS 4

Hydrograph



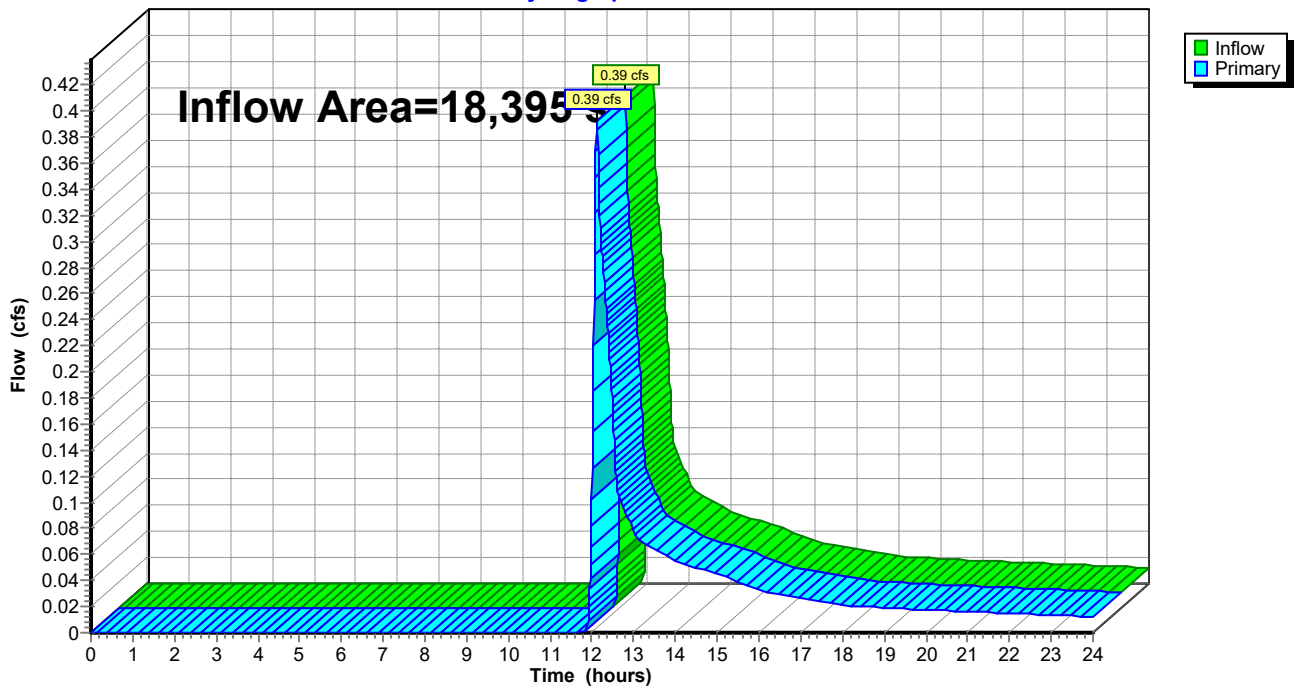
Summary for Link POA-5: POINT OF ANALYSIS 5

Inflow Area = 18,395 sf, 13.12% Impervious, Inflow Depth > 1.16" for 100-Yr event
Inflow = 0.39 cfs @ 12.12 hrs, Volume= 1,778 cf
Primary = 0.39 cfs @ 12.12 hrs, Volume= 1,778 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link POA-5: POINT OF ANALYSIS 5

Hydrograph



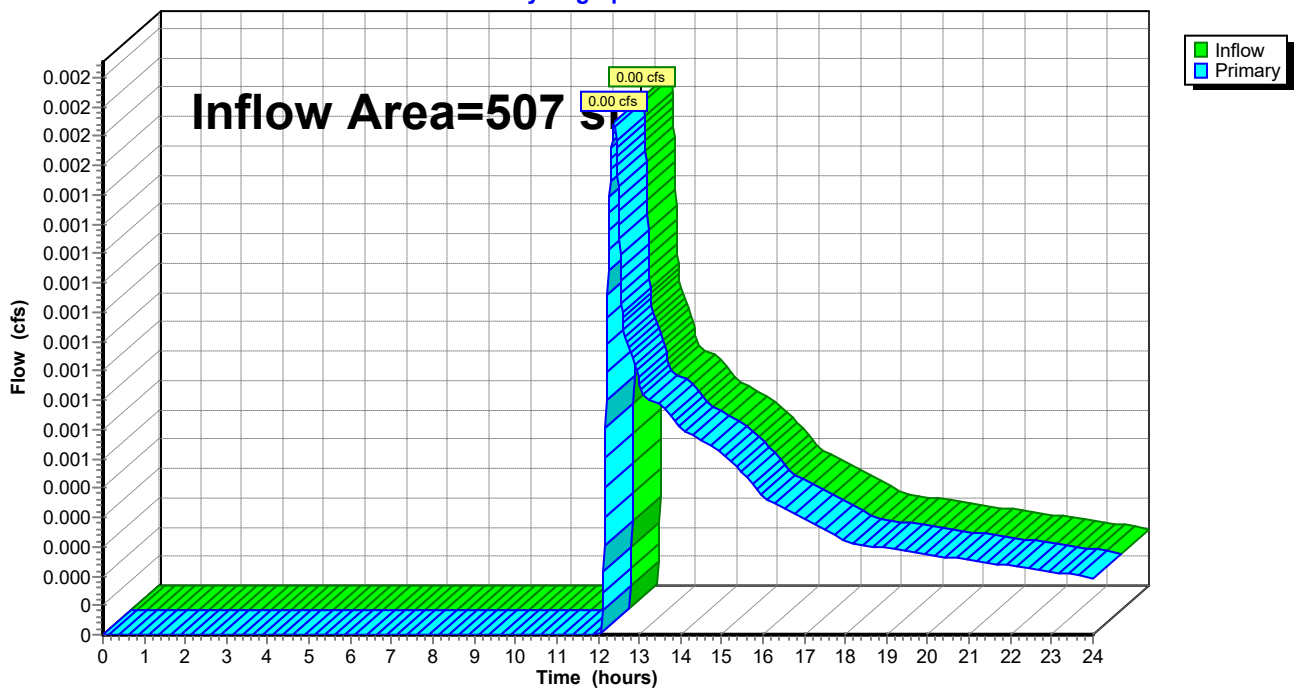
Summary for Link POA-6: POINT OF ANALYSIS 6

Inflow Area = 507 sf, 0.00% Impervious, Inflow Depth > 0.45" for 100-Yr event
Inflow = 0.00 cfs @ 12.39 hrs, Volume= 19 cf
Primary = 0.00 cfs @ 12.39 hrs, Volume= 19 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link POA-6: POINT OF ANALYSIS 6

Hydrograph



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Type III 24-hr 25-Yr Rainfall=6.05"

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Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 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 P Ws1: P Watershed 1	Runoff Area=13,459 sf 20.67% Impervious Runoff Depth>1.17" Tc=6.0 min CN=50 Runoff=0.34 cfs 1,307 cf
Subcatchment P Ws2: P Watershed 2	Runoff Area=1,283 sf 0.00% Impervious Runoff Depth>0.14" Tc=6.0 min CN=32 Runoff=0.00 cfs 15 cf
Subcatchment P Ws3: P Watershed 3	Runoff Area=27,907 sf 55.74% Impervious Runoff Depth>3.03" Tc=6.0 min CN=72 Runoff=2.28 cfs 7,048 cf
Subcatchment P Ws4: P Watershed 4	Runoff Area=27,494 sf 59.45% Impervious Runoff Depth>3.22" Tc=6.0 min CN=74 Runoff=2.39 cfs 7,385 cf
Subcatchment P Ws5: P Watershed 5	Runoff Area=4,267 sf 100.00% Impervious Runoff Depth>5.81" Tc=6.0 min CN=98 Runoff=0.58 cfs 2,065 cf
Subcatchment P Ws6: P Watershed 6	Runoff Area=2,910 sf 0.00% Impervious Runoff Depth>0.14" Tc=6.0 min CN=32 Runoff=0.00 cfs 34 cf
Subcatchment P Ws7: P Watershed 7	Runoff Area=6,385 sf 0.00% Impervious Runoff Depth>0.18" Tc=6.0 min CN=33 Runoff=0.00 cfs 94 cf
Subcatchment P Ws8: P Watershed 8	Runoff Area=18,395 sf 13.12% Impervious Runoff Depth>0.57" Tc=6.0 min CN=41 Runoff=0.11 cfs 876 cf
Subcatchment P Ws9: P Watershed 9	Runoff Area=507 sf 0.00% Impervious Runoff Depth>0.14" Tc=6.0 min CN=32 Runoff=0.00 cfs 6 cf
Pond 1P: LRB-1	Peak Elev=100.00' Storage=707 cf Inflow=0.58 cfs 2,065 cf Discarded=0.04 cfs 1,963 cf Primary=0.14 cfs 79 cf Outflow=0.18 cfs 2,042 cf
Pond 2P: LRB-2	Peak Elev=98.92' Storage=9,612 cf Inflow=4.67 cfs 14,432 cf Discarded=0.11 cfs 5,428 cf Primary=0.00 cfs 0 cf Outflow=0.11 cfs 5,428 cf
Link POA-1: POINT OF ANALYSIS 1	Inflow=0.34 cfs 1,386 cf Primary=0.34 cfs 1,386 cf
Link POA-2: POINT OF ANALYSIS 2	Inflow=0.00 cfs 15 cf Primary=0.00 cfs 15 cf
Link POA-3: POINT OF ANALYSIS 3	Inflow=0.00 cfs 34 cf Primary=0.00 cfs 34 cf
Link POA-4: POINT OF ANALYSIS 4	Inflow=0.00 cfs 94 cf Primary=0.00 cfs 94 cf
Link POA-5: POINT OF ANALYSIS 5	Inflow=0.11 cfs 876 cf Primary=0.11 cfs 876 cf

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Type III 24-hr 25-Yr Rainfall=6.05"

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Link POA-6: POINT OF ANALYSIS 6

Inflow=0.00 cfs 6 cf

Primary=0.00 cfs 6 cf

Total Runoff Area = 102,607 sf Runoff Volume = 18,829 cf Average Runoff Depth = 2.20"
59.69% Pervious = 61,243 sf 40.31% Impervious = 41,364 sf

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Type III 24-hr 25-Yr Rainfall=6.05"

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Summary for Subcatchment P Ws1: P Watershed 1

Runoff = 0.34 cfs @ 12.11 hrs, Volume= 1,307 cf, Depth> 1.17"

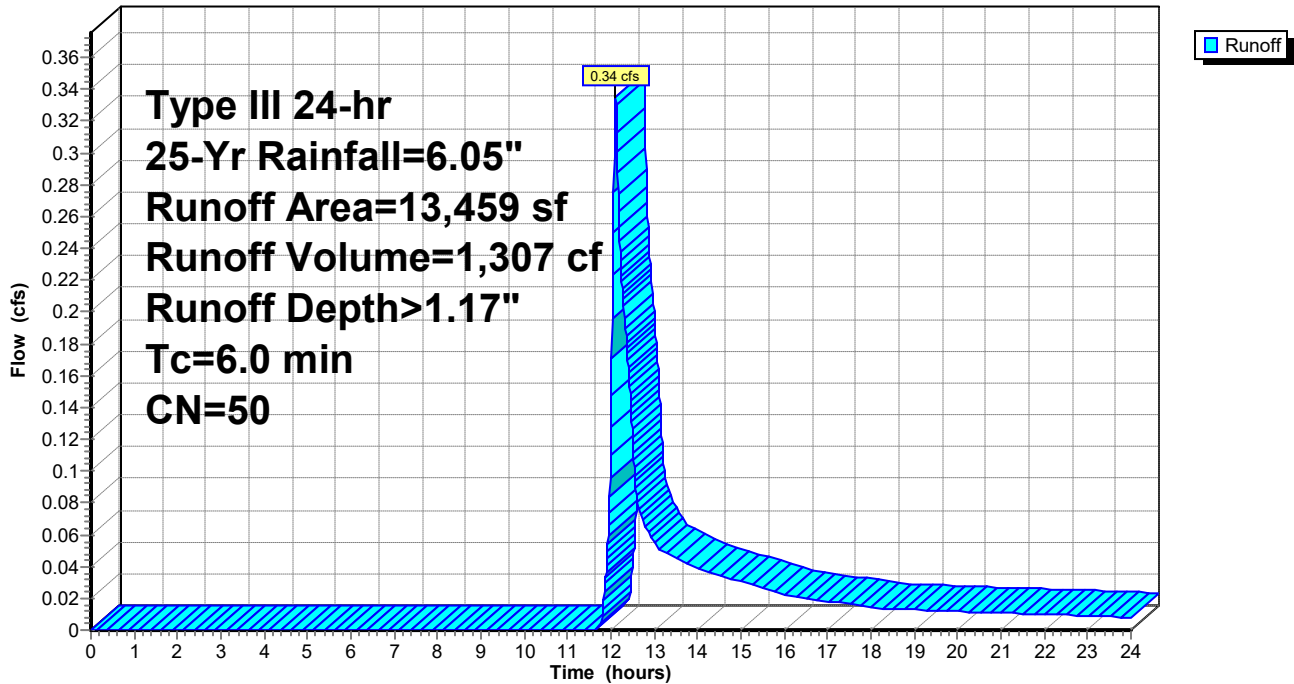
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr Rainfall=6.05"

Area (sf)	CN	Description
1,107	98	Paved parking, HSG A
1,675	98	Roofs, HSG A
7,850	39	>75% Grass cover, Good, HSG A
2,827	32	Woods/grass comb., Good, HSG A
13,459	50	Weighted Average
10,677		79.33% Pervious Area
2,782		20.67% Impervious Area

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

Subcatchment P Ws1: P Watershed 1

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Type III 24-hr 25-Yr Rainfall=6.05"

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Summary for Subcatchment P Ws2: P Watershed 2

Runoff = 0.00 cfs @ 14.78 hrs, Volume= 15 cf, Depth> 0.14"

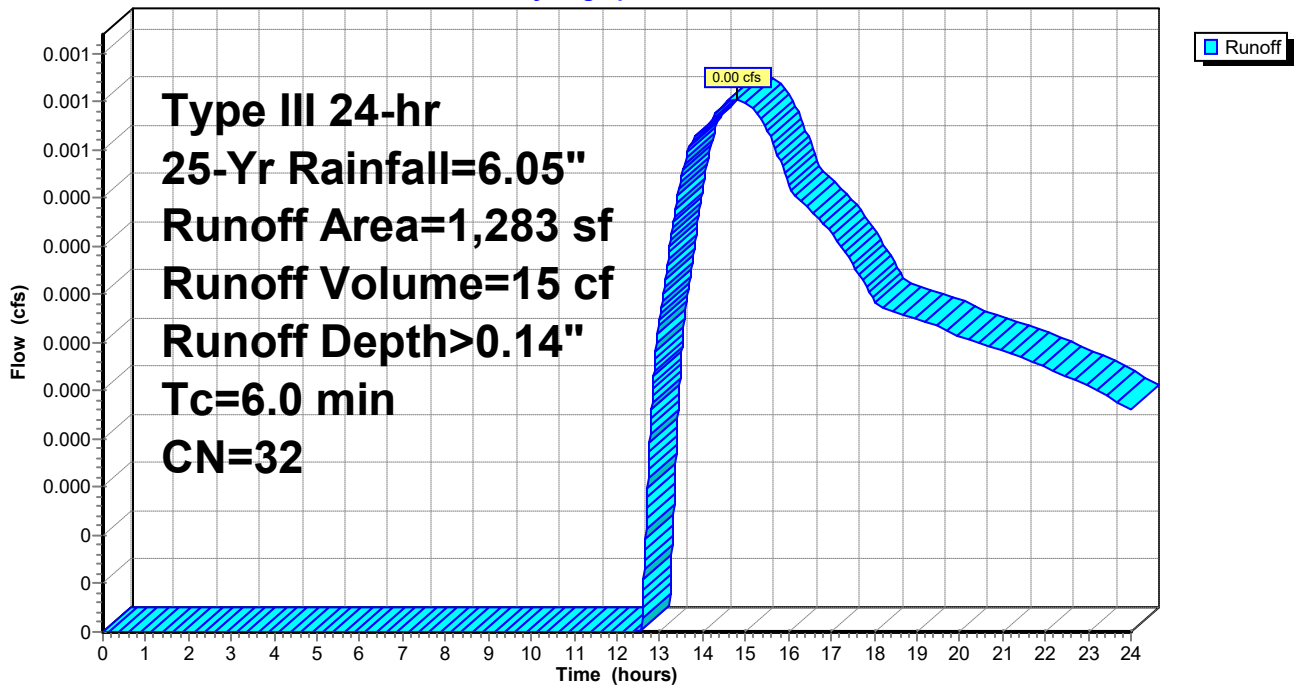
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr Rainfall=6.05"

Area (sf)	CN	Description
1,283	32	Woods/grass comb., Good, HSG A
1,283		100.00% Pervious Area

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

Subcatchment P Ws2: P Watershed 2

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Type III 24-hr 25-Yr Rainfall=6.05"

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Summary for Subcatchment P Ws3: P Watershed 3

Runoff = 2.28 cfs @ 12.09 hrs, Volume= 7,048 cf, Depth> 3.03"

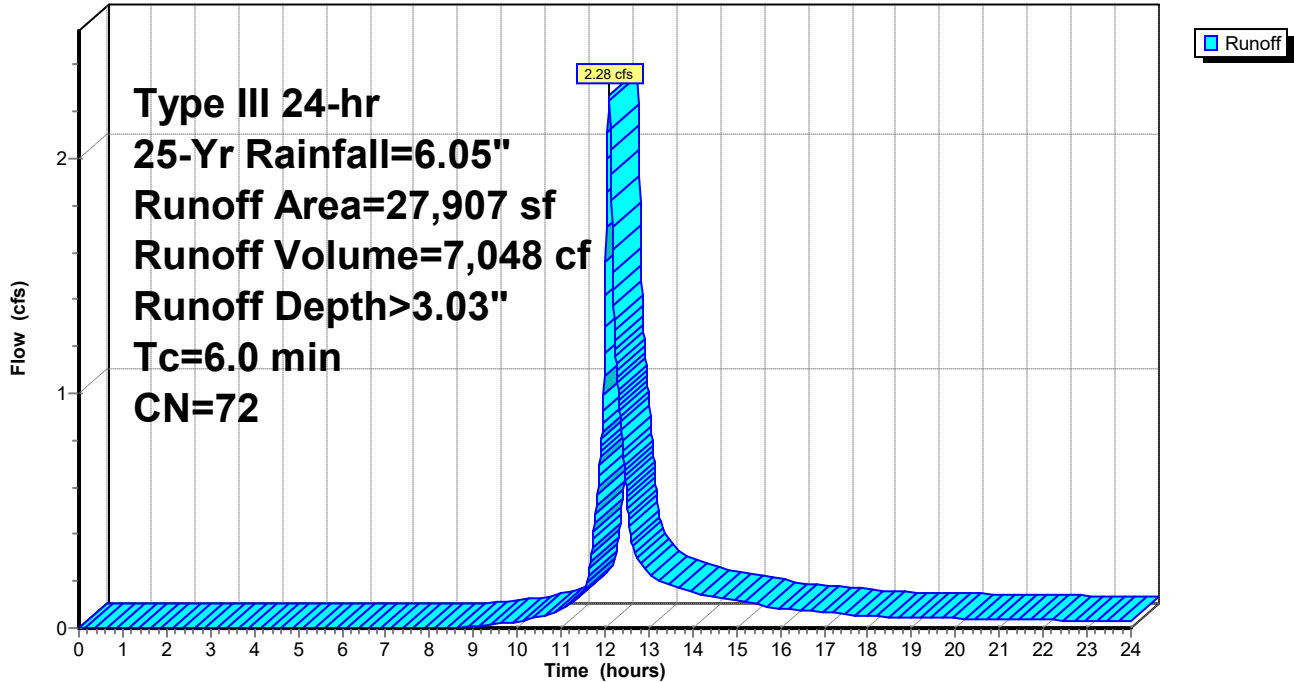
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr Rainfall=6.05"

Area (sf)	CN	Description
15,374	98	Paved parking, HSG A
181	98	Roofs, HSG A
11,843	39	>75% Grass cover, Good, HSG A
509	32	Woods/grass comb., Good, HSG A
27,907	72	Weighted Average
12,352		44.26% Pervious Area
15,555		55.74% Impervious Area

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

Subcatchment P Ws3: P Watershed 3

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Type III 24-hr 25-Yr Rainfall=6.05"

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Summary for Subcatchment P Ws4: P Watershed 4

Runoff = 2.39 cfs @ 12.09 hrs, Volume= 7,385 cf, Depth> 3.22"

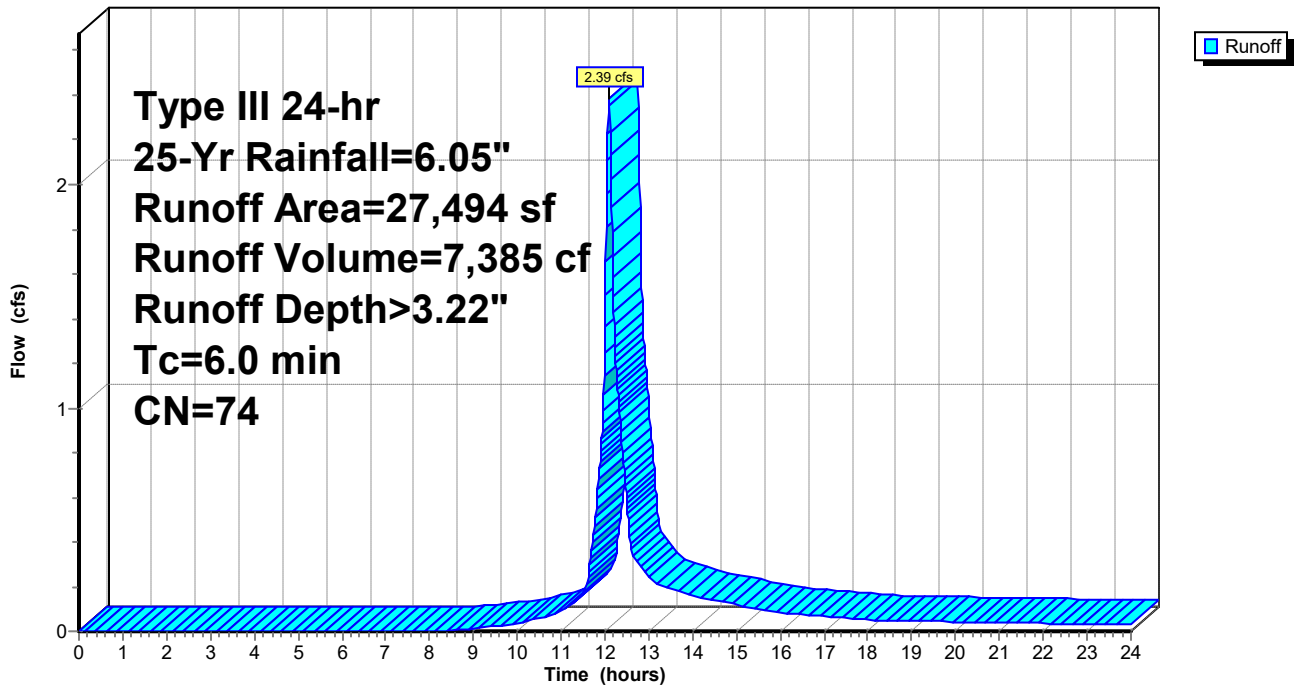
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr Rainfall=6.05"

Area (sf)	CN	Description
16,346	98	Paved parking, HSG A
11,148	39	>75% Grass cover, Good, HSG A
27,494	74	Weighted Average
11,148		40.55% Pervious Area
16,346		59.45% Impervious Area

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

Subcatchment P Ws4: P Watershed 4

Hydrograph



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Type III 24-hr 25-Yr Rainfall=6.05"

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Summary for Subcatchment P Ws5: P Watershed 5

Runoff = 0.58 cfs @ 12.08 hrs, Volume= 2,065 cf, Depth> 5.81"

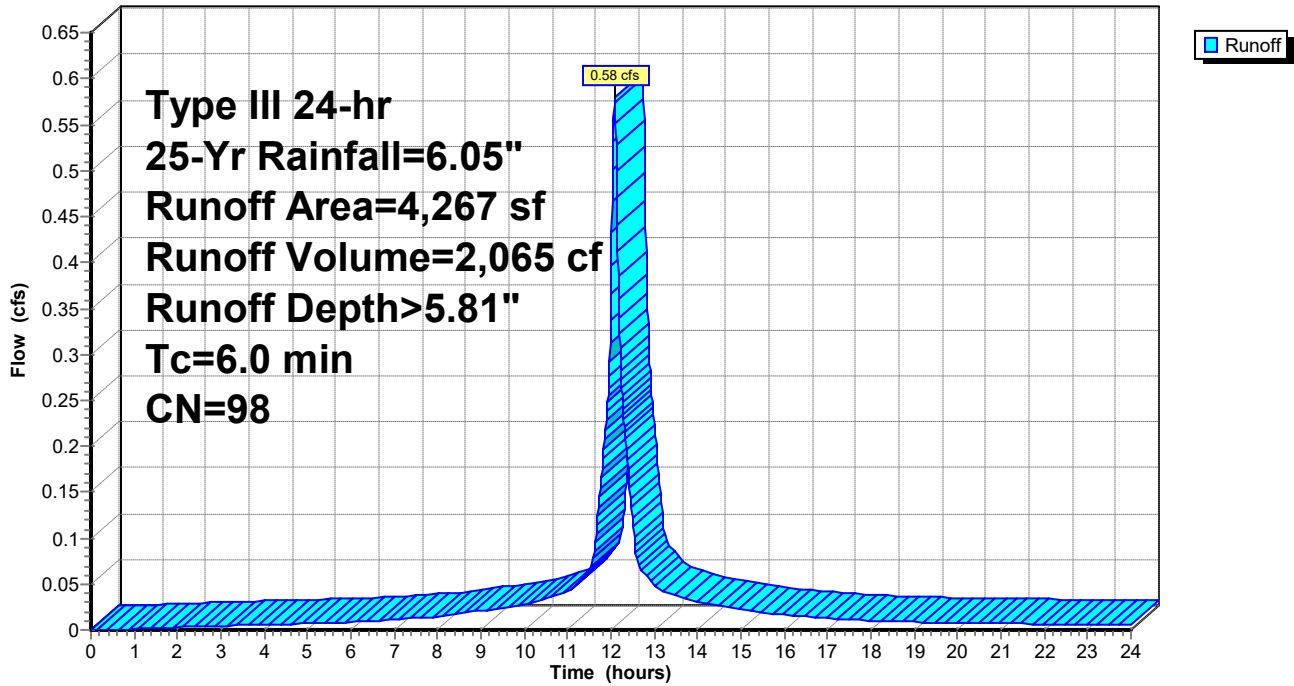
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr Rainfall=6.05"

Area (sf)	CN	Description
4,267	98	Roofs, HSG A
4,267		100.00% Impervious Area

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

Subcatchment P Ws5: P Watershed 5

Hydrograph



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Type III 24-hr 25-Yr Rainfall=6.05"

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Summary for Subcatchment P Ws6: P Watershed 6

Runoff = 0.00 cfs @ 14.78 hrs, Volume= 34 cf, Depth> 0.14"

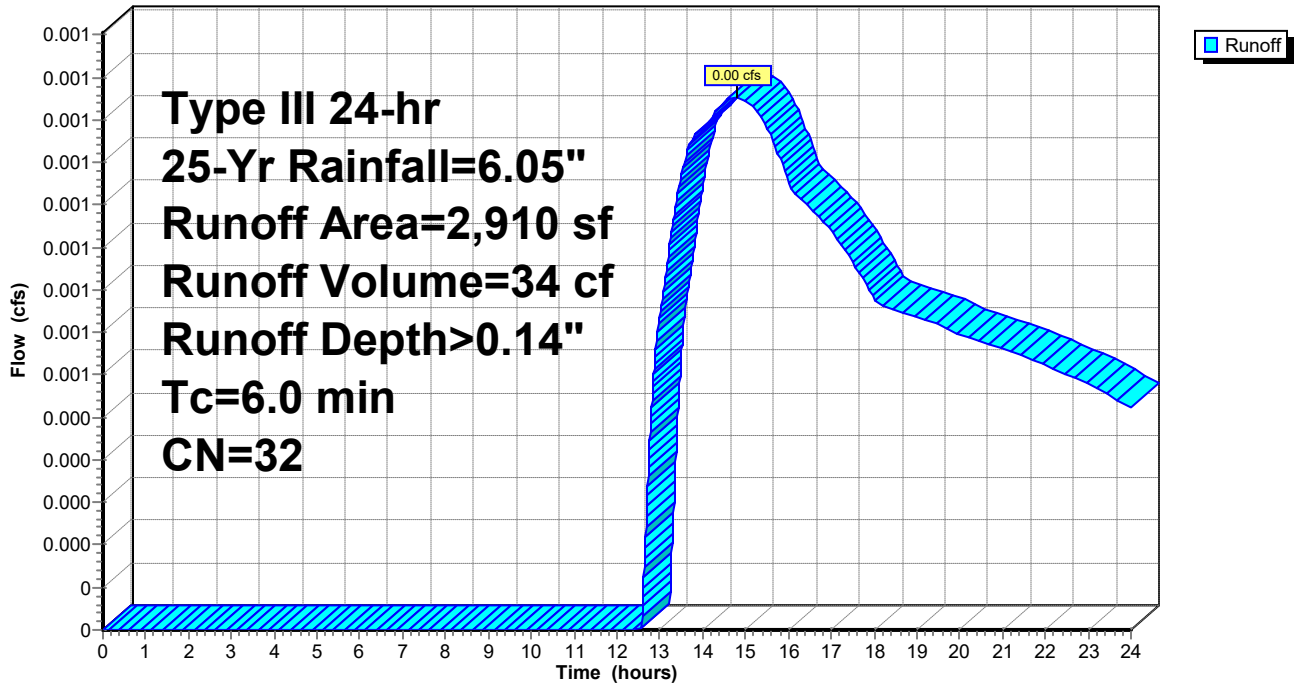
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr Rainfall=6.05"

Area (sf)	CN	Description
2,910	32	Woods/grass comb., Good, HSG A
2,910		100.00% Pervious Area

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

Subcatchment P Ws6: P Watershed 6

Hydrograph



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Type III 24-hr 25-Yr Rainfall=6.05"

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Summary for Subcatchment P Ws7: P Watershed 7

Runoff = 0.00 cfs @ 13.78 hrs, Volume= 94 cf, Depth> 0.18"

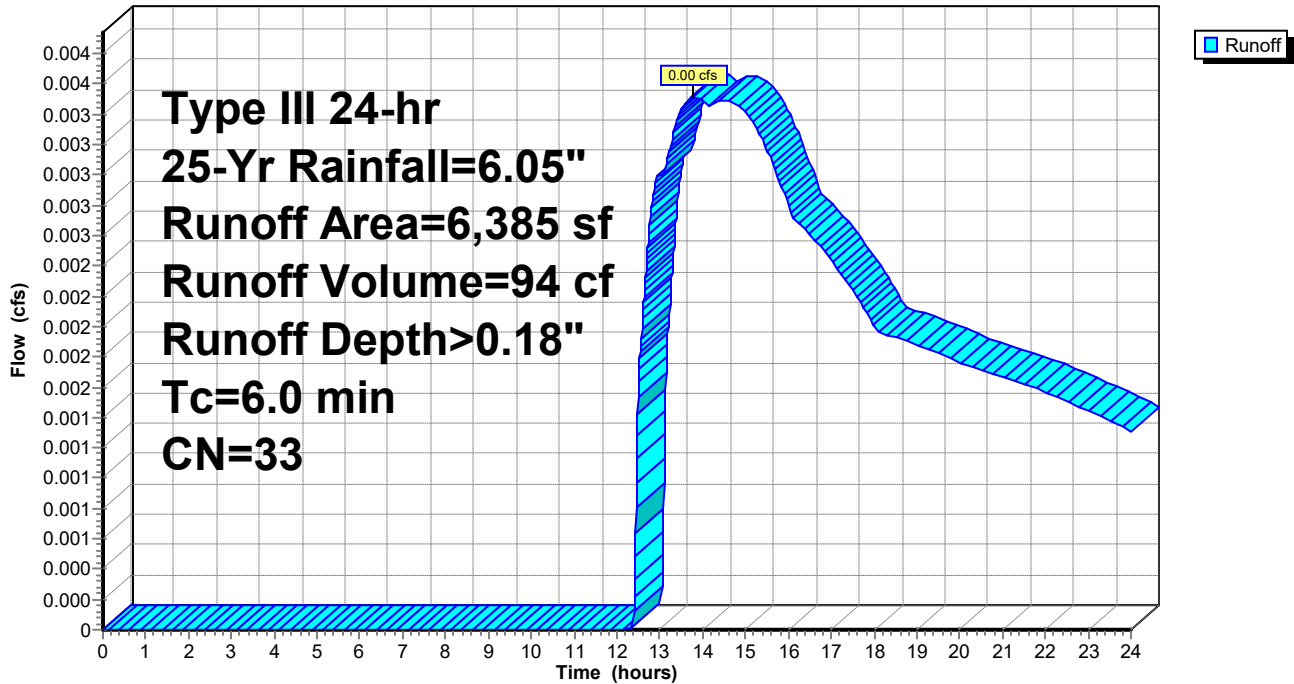
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr Rainfall=6.05"

Area (sf)	CN	Description
1,109	39	>75% Grass cover, Good, HSG A
5,276	32	Woods/grass comb., Good, HSG A
6,385	33	Weighted Average
6,385		100.00% Pervious Area

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

Subcatchment P Ws7: P Watershed 7

Hydrograph



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Type III 24-hr 25-Yr Rainfall=6.05"

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Summary for Subcatchment P Ws8: P Watershed 8

Runoff = 0.11 cfs @ 12.29 hrs, Volume= 876 cf, Depth> 0.57"

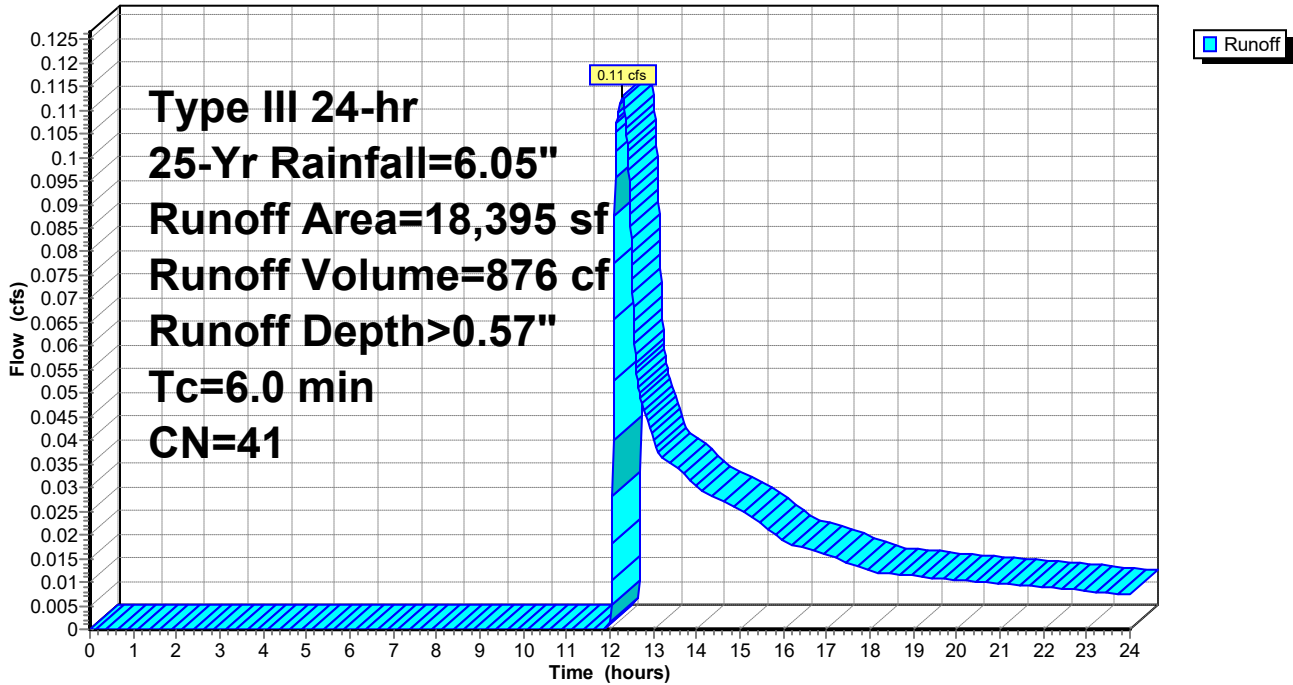
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr Rainfall=6.05"

Area (sf)	CN	Description
2,414	98	Paved parking, HSG A
15,981	32	Woods/grass comb., Good, HSG A
18,395	41	Weighted Average
15,981		86.88% Pervious Area
2,414		13.12% Impervious Area

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

Subcatchment P Ws8: P Watershed 8

Hydrograph



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Type III 24-hr 25-Yr Rainfall=6.05"

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Summary for Subcatchment P Ws9: P Watershed 9

Runoff = 0.00 cfs @ 14.78 hrs, Volume= 6 cf, Depth> 0.14"

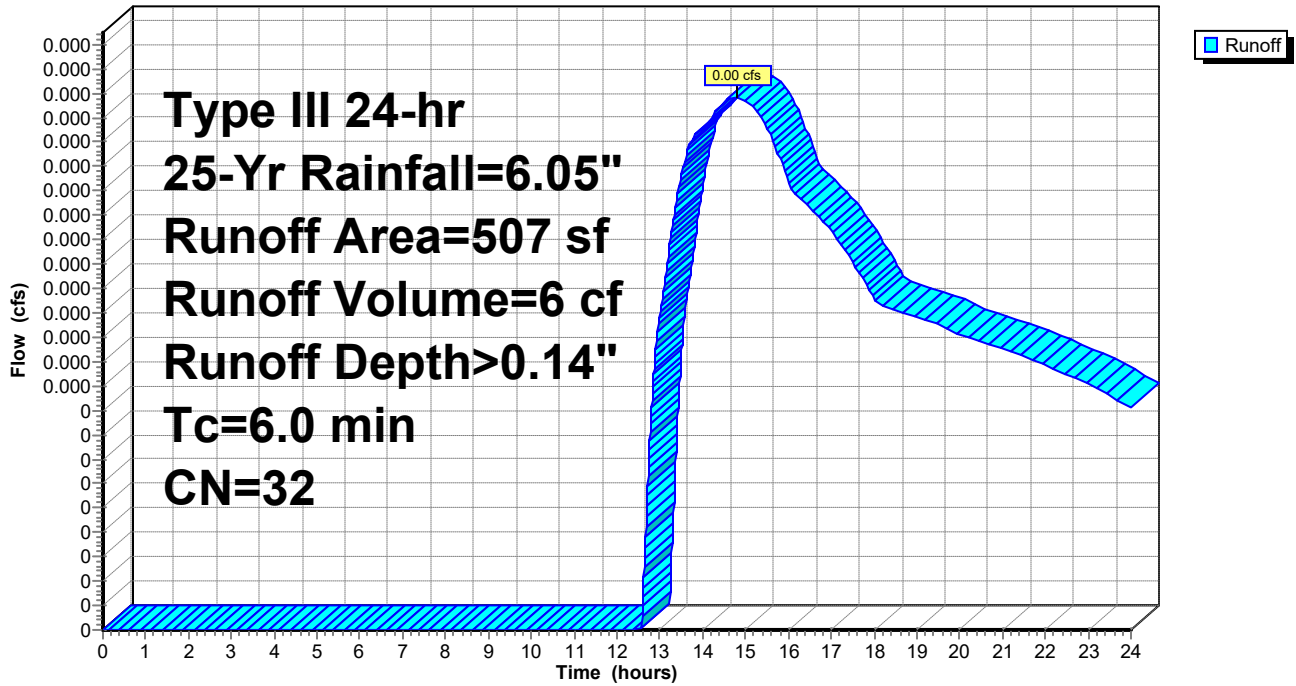
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr Rainfall=6.05"

Area (sf)	CN	Description
507	32	Woods/grass comb., Good, HSG A
507		100.00% Pervious Area

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

Subcatchment P Ws9: P Watershed 9

Hydrograph



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Summary for Pond 1P: LRB-1

Inflow Area = 4,267 sf, 100.00% Impervious, Inflow Depth > 5.81" for 25-Yr event
 Inflow = 0.58 cfs @ 12.08 hrs, Volume= 2,065 cf
 Outflow = 0.18 cfs @ 12.39 hrs, Volume= 2,042 cf, Atten= 69%, Lag= 18.7 min
 Discarded = 0.04 cfs @ 12.39 hrs, Volume= 1,963 cf
 Primary = 0.14 cfs @ 12.39 hrs, Volume= 79 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 100.00' @ 12.39 hrs Surf.Area= 203 sf Storage= 707 cf

Plug-Flow detention time= 139.2 min calculated for 2,041 cf (99% of inflow)
 Center-of-Mass det. time= 131.8 min (876.3 - 744.5)

Volume	Invert	Avail.Storage	Storage Description
#1	93.82'	236 cf	10.00'W x 20.00'L x 5.67'H Stone 1,134 cf Overall - 530 cf Embedded = 604 cf x 39.0% Voids
#2	94.82'	469 cf	8.00'D x 4.67'H PCC Leaching Unit 8' Dia x 2 Inside #1 530 cf Overall - 3.0" Wall Thickness = 469 cf
#3	99.48'	2 cf	2.00'D x 0.55'H Riser
		707 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	93.82'	8.270 in/hr Exfiltration over Surface area
#2	Primary	100.00'	24.0" Horiz. Overflow Grate C= 0.600 in 24.0" Grate (100% open area)

Discarded OutFlow Max=0.04 cfs @ 12.39 hrs HW=100.00' (Free Discharge)

↑**1=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.57 cfs @ 12.39 hrs HW=100.00' (Free Discharge)

↑**2=Overflow Grate** (Orifice Controls 0.57 cfs @ 0.18 fps)

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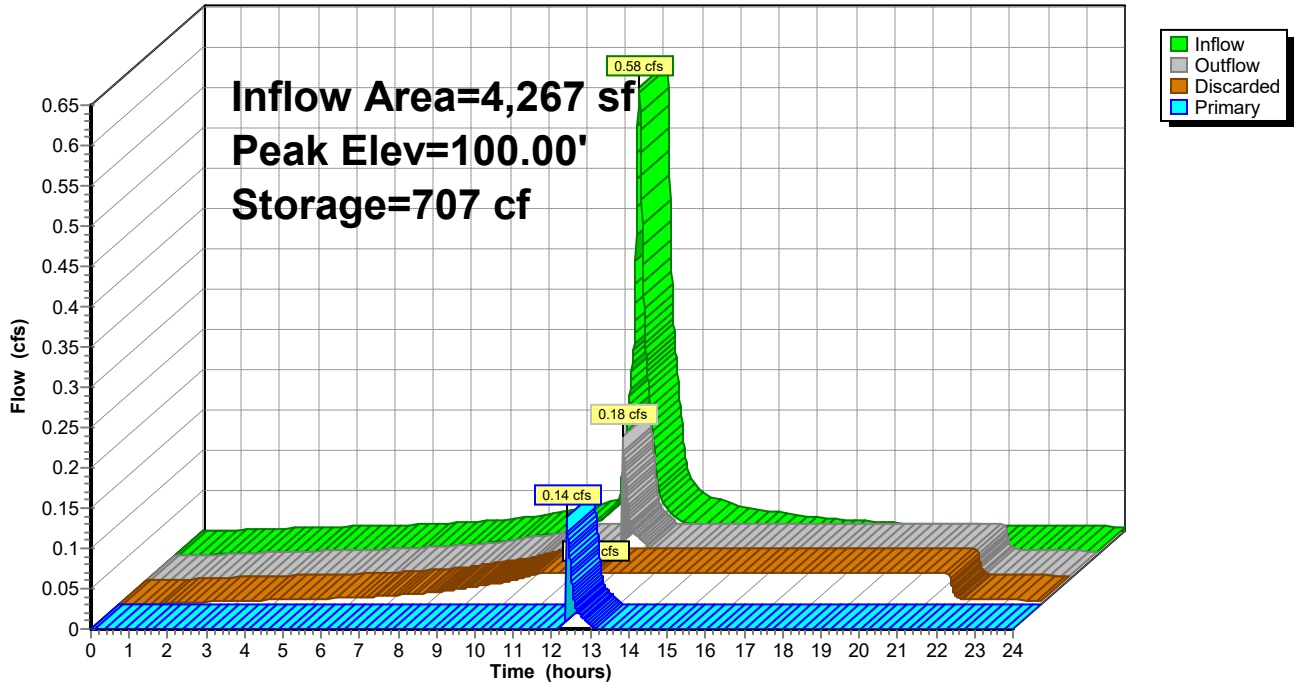
Type III 24-hr 25-Yr Rainfall=6.05"

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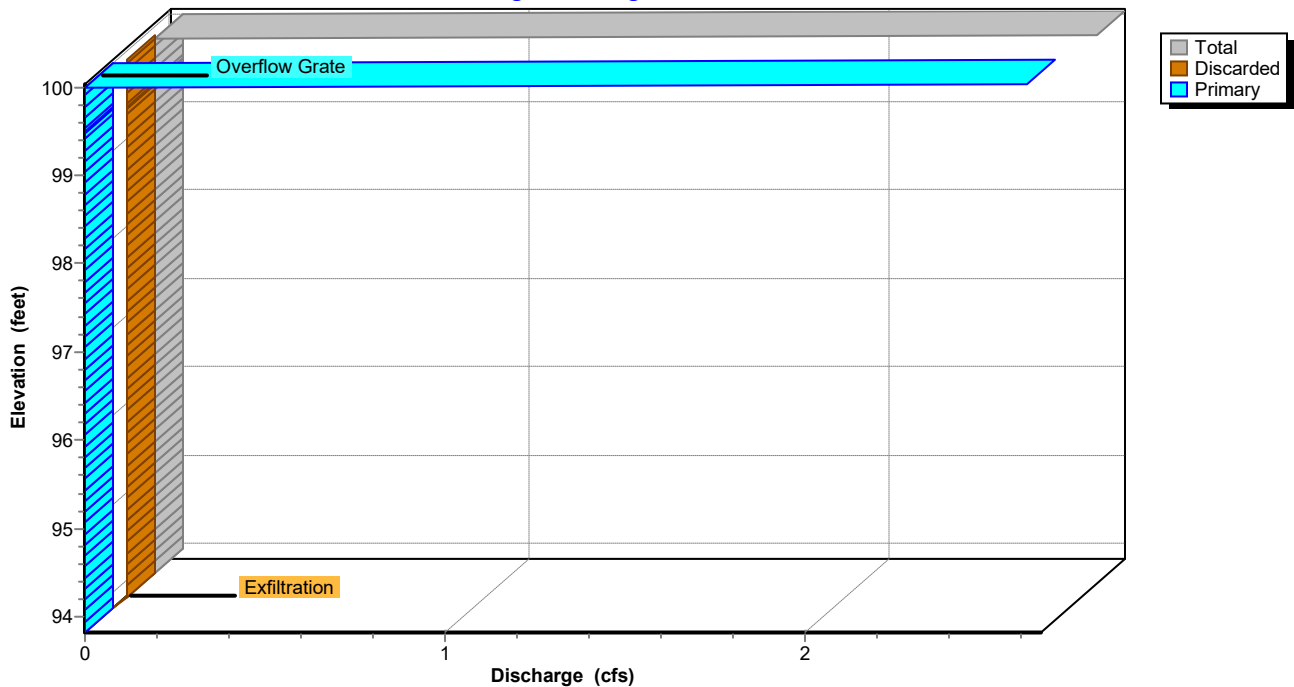
Pond 1P: LRB-1

Hydrograph



Pond 1P: LRB-1

Stage-Discharge



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Summary for Pond 2P: LRB-2

Inflow Area = 55,401 sf, 57.58% Impervious, Inflow Depth > 3.13" for 25-Yr event
 Inflow = 4.67 cfs @ 12.09 hrs, Volume= 14,432 cf
 Outflow = 0.11 cfs @ 10.55 hrs, Volume= 5,428 cf, Atten= 98%, Lag= 0.0 min
 Discarded = 0.11 cfs @ 10.55 hrs, Volume= 5,428 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 98.92' @ 17.94 hrs Surf.Area= 552 sf Storage= 9,612 cf

Plug-Flow detention time= 306.1 min calculated for 5,426 cf (38% of inflow)
 Center-of-Mass det. time= 181.5 min (1,011.5 - 830.0)

Volume	Invert	Avail.Storage	Storage Description
#1	87.09'	884 cf	12.00'W x 46.00'L x 7.67'H Stone 4,234 cf Overall - 1,967 cf Embedded = 2,266 cf x 39.0% Voids
#2	88.09'	1,676 cf	8.00'D x 6.67'H PCC Leaching Unit 8' Dia x 5 Inside #1 1,967 cf Overall - 4.0" Wall Thickness = 1,676 cf
#3	94.76'	5 cf	2.00'D x 1.74'H Riser -Impervious
#4	96.00'	7,512 cf	Grass Channel Storage (Irregular) Listed below (Recalc) -Impervious
#5	99.00'	3,790 cf	Parking Lot (Irregular) Listed below (Recalc) -Impervious
		13,867 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
96.00	453	152.0	0.0	0	0	453
97.00	1,309	311.0	100.0	844	844	6,316
98.00	3,094	576.0	100.0	2,138	2,983	25,026
99.00	6,137	801.0	100.0	4,530	7,512	49,691

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
99.00	6,137	801.0	0	0	6,137
99.50	9,120	932.0	3,790	3,790	24,208

Device	Routing	Invert	Outlet Devices
#0	Primary	99.50'	Automatic Storage Overflow (Discharged without head)
#1	Discarded	87.09'	8.270 in/hr Exfiltration over Surface area
#2	Primary	99.40'	Custom Weir/Orifice, Cv= 2.62 (C= 3.28) Head (feet) 0.00 0.10 Width (feet) 157.70 157.70

Discarded OutFlow Max=0.11 cfs @ 10.55 hrs HW=87.22' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.11 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=87.09' (Free Discharge)
 ↑2=Custom Weir/Orifice (Controls 0.00 cfs)

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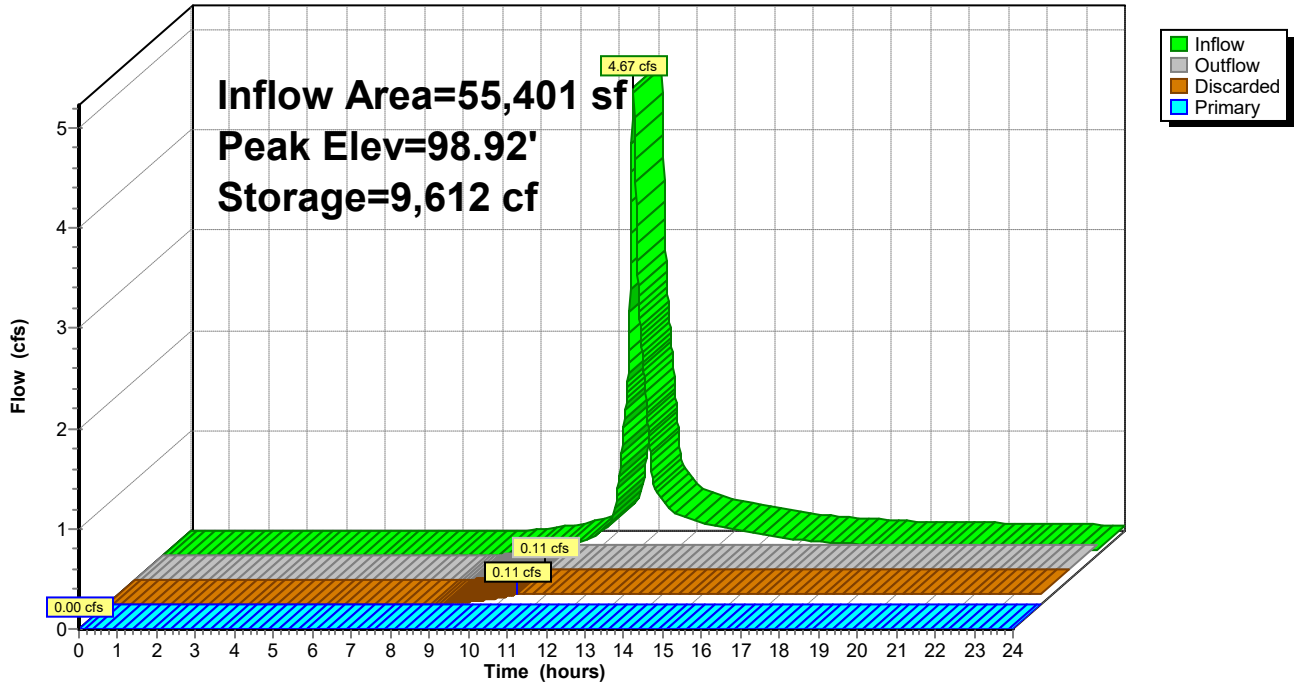
Type III 24-hr 25-Yr Rainfall=6.05"

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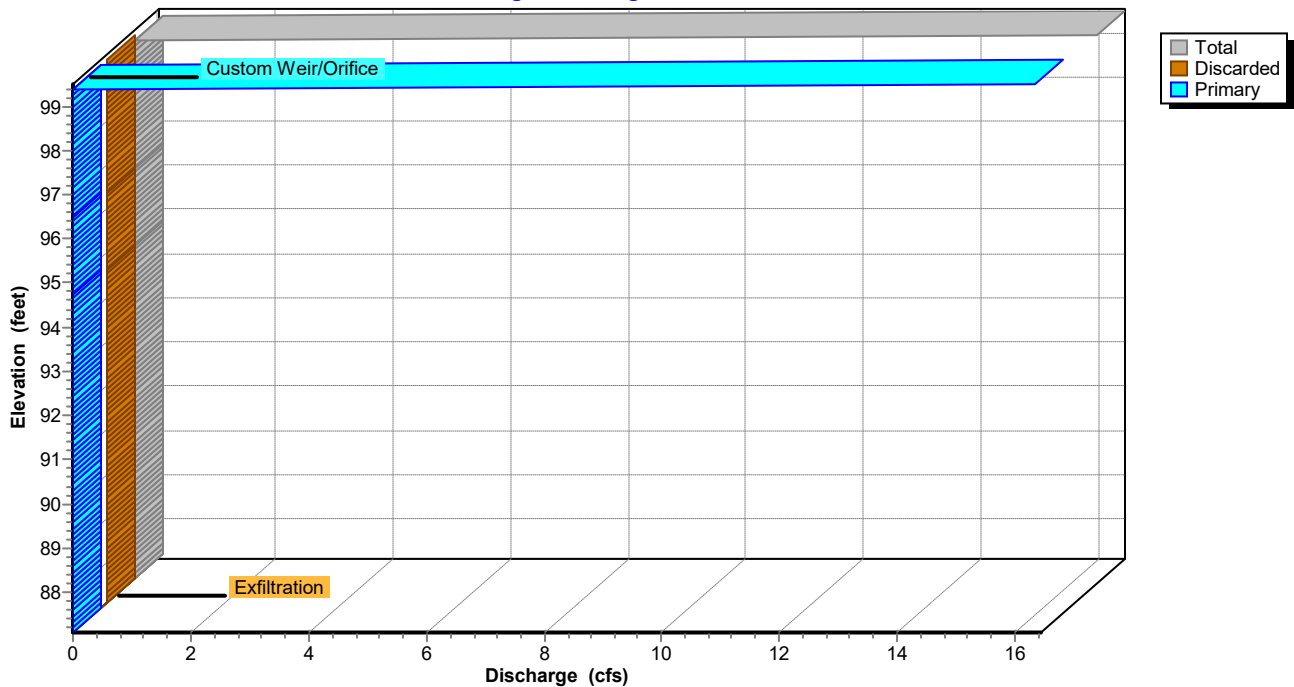
Pond 2P: LRB-2

Hydrograph



Pond 2P: LRB-2

Stage-Discharge



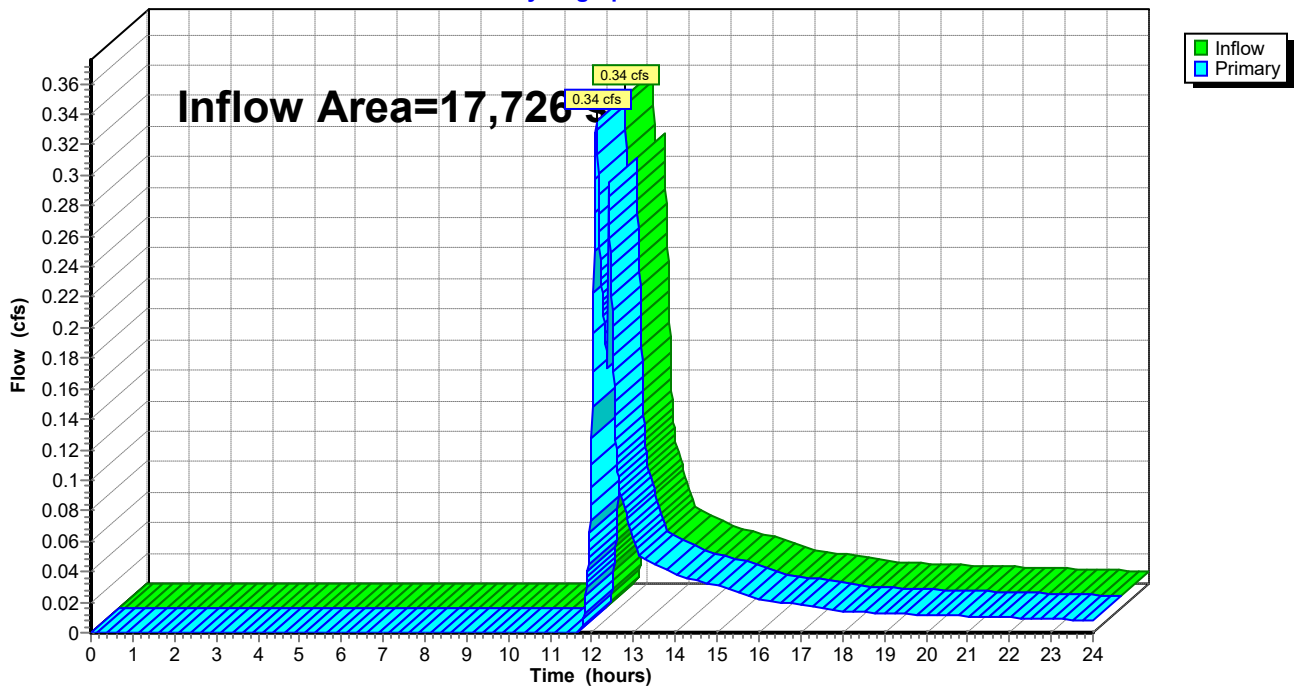
Summary for Link POA-1: POINT OF ANALYSIS 1

Inflow Area = 17,726 sf, 39.77% Impervious, Inflow Depth > 0.94" for 25-Yr event
Inflow = 0.34 cfs @ 12.11 hrs, Volume= 1,386 cf
Primary = 0.34 cfs @ 12.11 hrs, Volume= 1,386 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link POA-1: POINT OF ANALYSIS 1

Hydrograph



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Type III 24-hr 25-Yr Rainfall=6.05"

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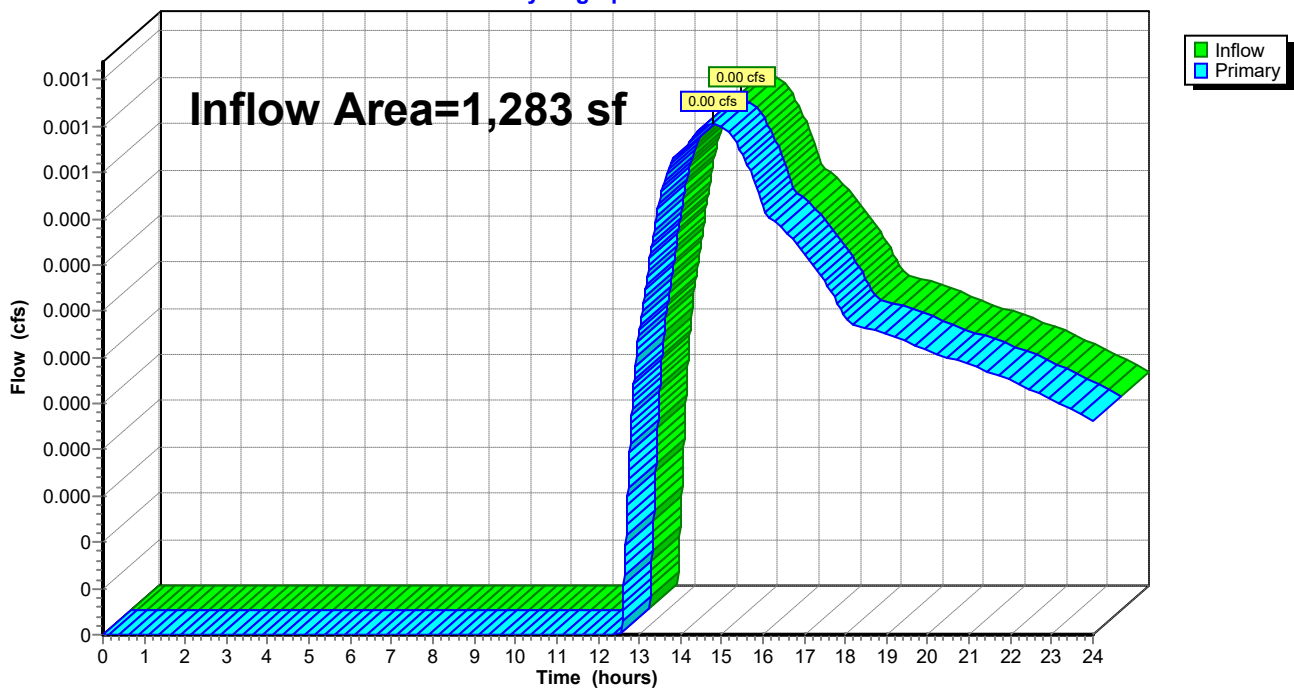
Summary for Link POA-2: POINT OF ANALYSIS 2

Inflow Area = 1,283 sf, 0.00% Impervious, Inflow Depth > 0.14" for 25-Yr event
Inflow = 0.00 cfs @ 14.78 hrs, Volume= 15 cf
Primary = 0.00 cfs @ 14.78 hrs, Volume= 15 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link POA-2: POINT OF ANALYSIS 2

Hydrograph



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Type III 24-hr 25-Yr Rainfall=6.05"

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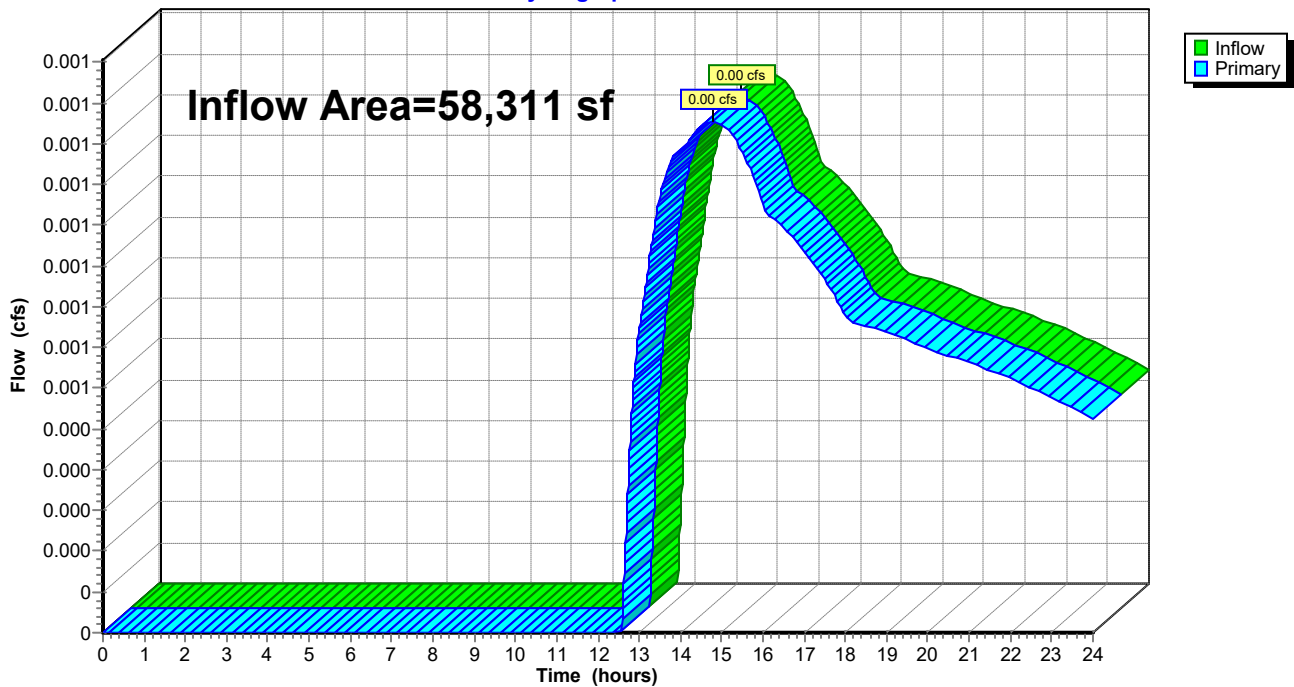
Summary for Link POA-3: POINT OF ANALYSIS 3

Inflow Area = 58,311 sf, 54.71% Impervious, Inflow Depth > 0.01" for 25-Yr event
Inflow = 0.00 cfs @ 14.78 hrs, Volume= 34 cf
Primary = 0.00 cfs @ 14.78 hrs, Volume= 34 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link POA-3: POINT OF ANALYSIS 3

Hydrograph



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Type III 24-hr 25-Yr Rainfall=6.05"

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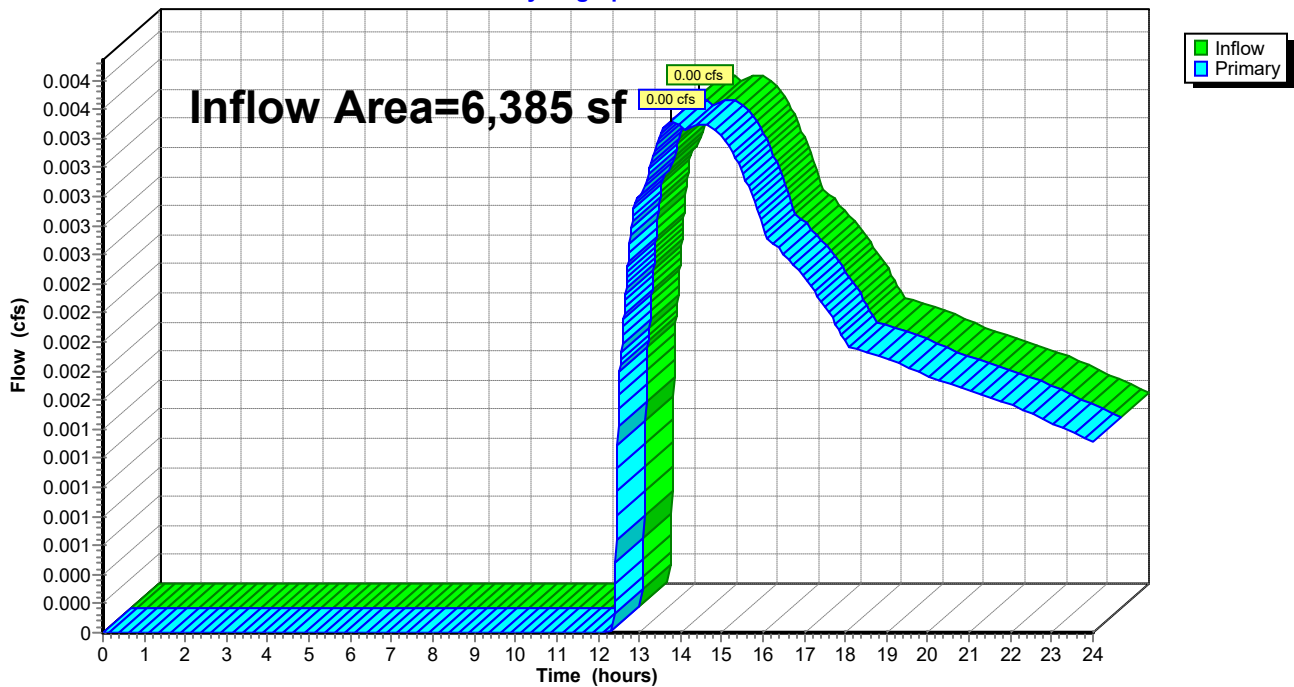
Summary for Link POA-4: POINT OF ANALYSIS 4

Inflow Area = 6,385 sf, 0.00% Impervious, Inflow Depth > 0.18" for 25-Yr event
Inflow = 0.00 cfs @ 13.78 hrs, Volume= 94 cf
Primary = 0.00 cfs @ 13.78 hrs, Volume= 94 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link POA-4: POINT OF ANALYSIS 4

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Type III 24-hr 25-Yr Rainfall=6.05"

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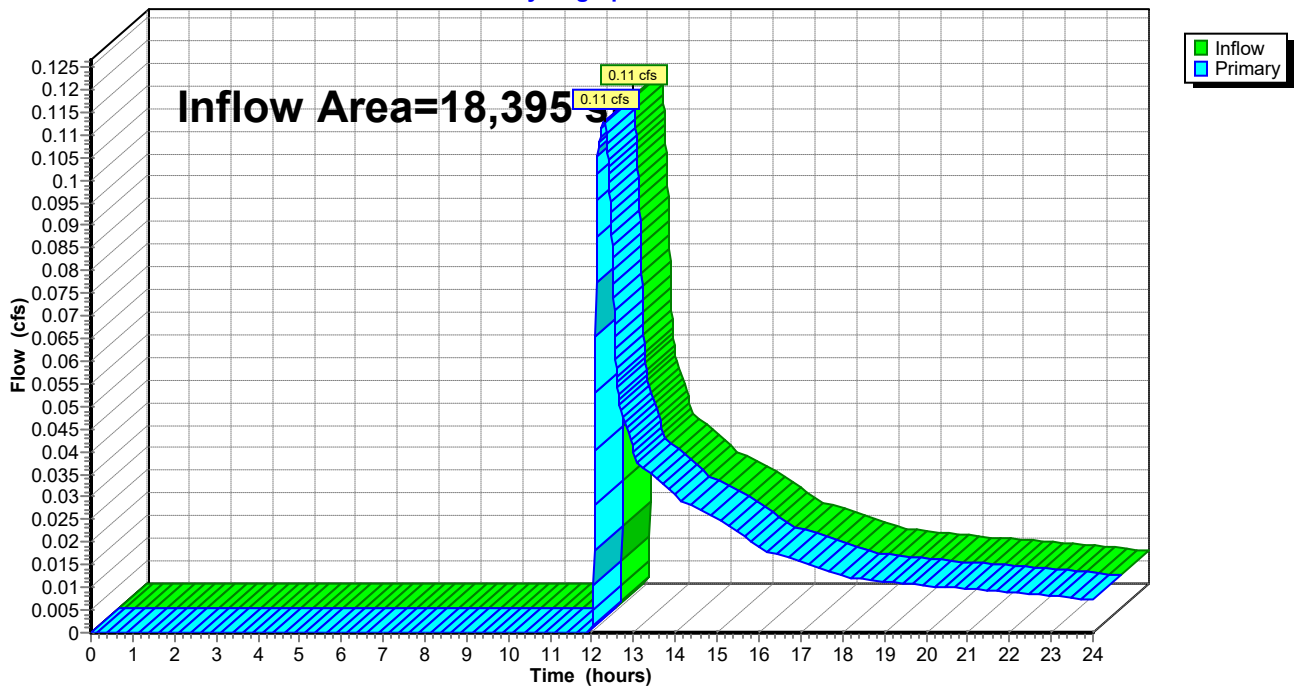
Summary for Link POA-5: POINT OF ANALYSIS 5

Inflow Area = 18,395 sf, 13.12% Impervious, Inflow Depth > 0.57" for 25-Yr event
Inflow = 0.11 cfs @ 12.29 hrs, Volume= 876 cf
Primary = 0.11 cfs @ 12.29 hrs, Volume= 876 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link POA-5: POINT OF ANALYSIS 5

Hydrograph



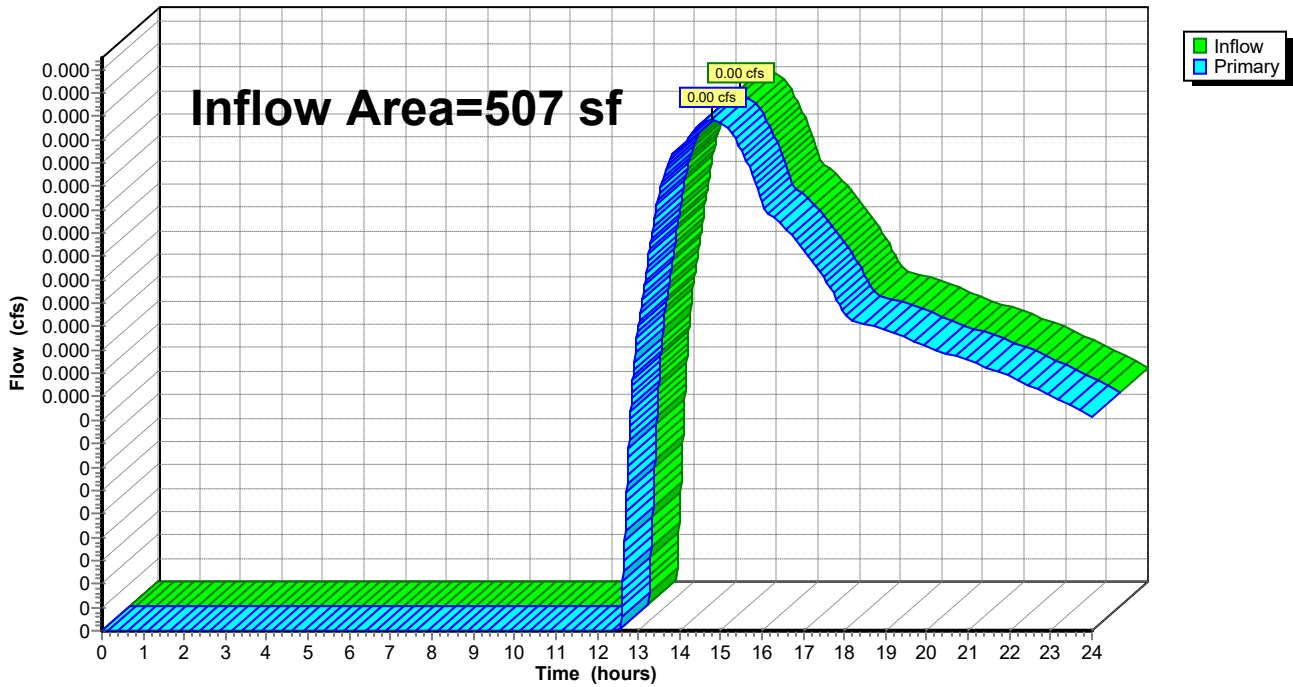
Summary for Link POA-6: POINT OF ANALYSIS 6

Inflow Area = 507 sf, 0.00% Impervious, Inflow Depth > 0.14" for 25-Yr event
Inflow = 0.00 cfs @ 14.78 hrs, Volume= 6 cf
Primary = 0.00 cfs @ 14.78 hrs, Volume= 6 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link POA-6: POINT OF ANALYSIS 6

Hydrograph



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

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Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 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 P Ws1: P Watershed 1	Runoff Area=13,459 sf 20.67% Impervious Runoff Depth>0.71" Tc=6.0 min CN=50 Runoff=0.16 cfs 798 cf
Subcatchment P Ws2: P Watershed 2	Runoff Area=1,283 sf 0.00% Impervious Runoff Depth>0.03" Tc=6.0 min CN=32 Runoff=0.00 cfs 3 cf
Subcatchment P Ws3: P Watershed 3	Runoff Area=27,907 sf 55.74% Impervious Runoff Depth>2.23" Tc=6.0 min CN=72 Runoff=1.66 cfs 5,194 cf
Subcatchment P Ws4: P Watershed 4	Runoff Area=27,494 sf 59.45% Impervious Runoff Depth>2.40" Tc=6.0 min CN=74 Runoff=1.77 cfs 5,501 cf
Subcatchment P Ws5: P Watershed 5	Runoff Area=4,267 sf 100.00% Impervious Runoff Depth>4.81" Tc=6.0 min CN=98 Runoff=0.48 cfs 1,710 cf
Subcatchment P Ws6: P Watershed 6	Runoff Area=2,910 sf 0.00% Impervious Runoff Depth>0.03" Tc=6.0 min CN=32 Runoff=0.00 cfs 7 cf
Subcatchment P Ws7: P Watershed 7	Runoff Area=6,385 sf 0.00% Impervious Runoff Depth>0.05" Tc=6.0 min CN=33 Runoff=0.00 cfs 24 cf
Subcatchment P Ws8: P Watershed 8	Runoff Area=18,395 sf 13.12% Impervious Runoff Depth>0.28" Tc=6.0 min CN=41 Runoff=0.04 cfs 435 cf
Subcatchment P Ws9: P Watershed 9	Runoff Area=507 sf 0.00% Impervious Runoff Depth>0.03" Tc=6.0 min CN=32 Runoff=0.00 cfs 1 cf
Pond 1P: LRB-1	Peak Elev=98.89' Storage=625 cf Inflow=0.48 cfs 1,710 cf Discarded=0.04 cfs 1,709 cf Primary=0.00 cfs 0 cf Outflow=0.04 cfs 1,709 cf
Pond 2P: LRB-2	Peak Elev=98.28' Storage=6,517 cf Inflow=3.44 cfs 10,696 cf Discarded=0.11 cfs 5,188 cf Primary=0.00 cfs 0 cf Outflow=0.11 cfs 5,188 cf
Link POA-1: POINT OF ANALYSIS 1	Inflow=0.16 cfs 798 cf Primary=0.16 cfs 798 cf
Link POA-2: POINT OF ANALYSIS 2	Inflow=0.00 cfs 3 cf Primary=0.00 cfs 3 cf
Link POA-3: POINT OF ANALYSIS 3	Inflow=0.00 cfs 7 cf Primary=0.00 cfs 7 cf
Link POA-4: POINT OF ANALYSIS 4	Inflow=0.00 cfs 24 cf Primary=0.00 cfs 24 cf
Link POA-5: POINT OF ANALYSIS 5	Inflow=0.04 cfs 435 cf Primary=0.04 cfs 435 cf

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

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Link POA-6: POINT OF ANALYSIS 6

Inflow=0.00 cfs 1 cf

Primary=0.00 cfs 1 cf

Total Runoff Area = 102,607 sf Runoff Volume = 13,674 cf Average Runoff Depth = 1.60"
59.69% Pervious = 61,243 sf 40.31% Impervious = 41,364 sf

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

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Summary for Subcatchment P Ws1: P Watershed 1

Runoff = 0.16 cfs @ 12.12 hrs, Volume= 798 cf, Depth> 0.71"

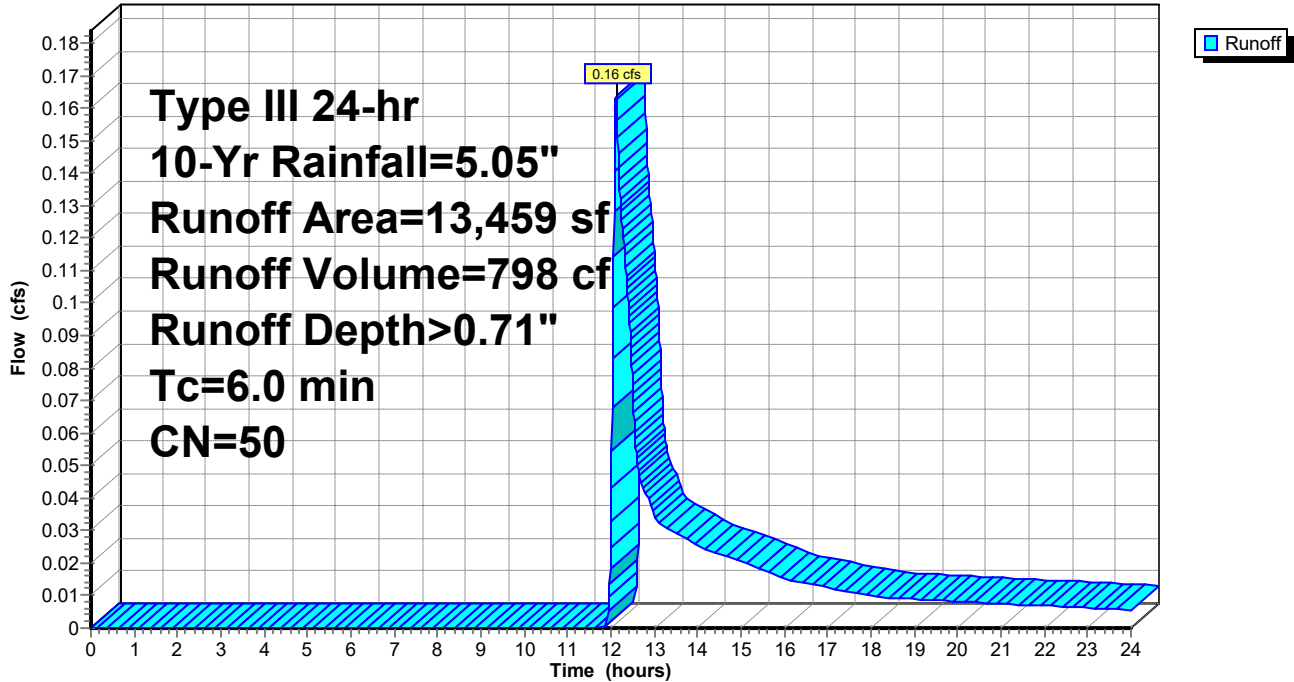
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr Rainfall=5.05"

Area (sf)	CN	Description
1,107	98	Paved parking, HSG A
1,675	98	Roofs, HSG A
7,850	39	>75% Grass cover, Good, HSG A
2,827	32	Woods/grass comb., Good, HSG A
13,459	50	Weighted Average
10,677		79.33% Pervious Area
2,782		20.67% Impervious Area

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

Subcatchment P Ws1: P Watershed 1

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

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Summary for Subcatchment P Ws2: P Watershed 2

Runoff = 0.00 cfs @ 20.86 hrs, Volume= 3 cf, Depth> 0.03"

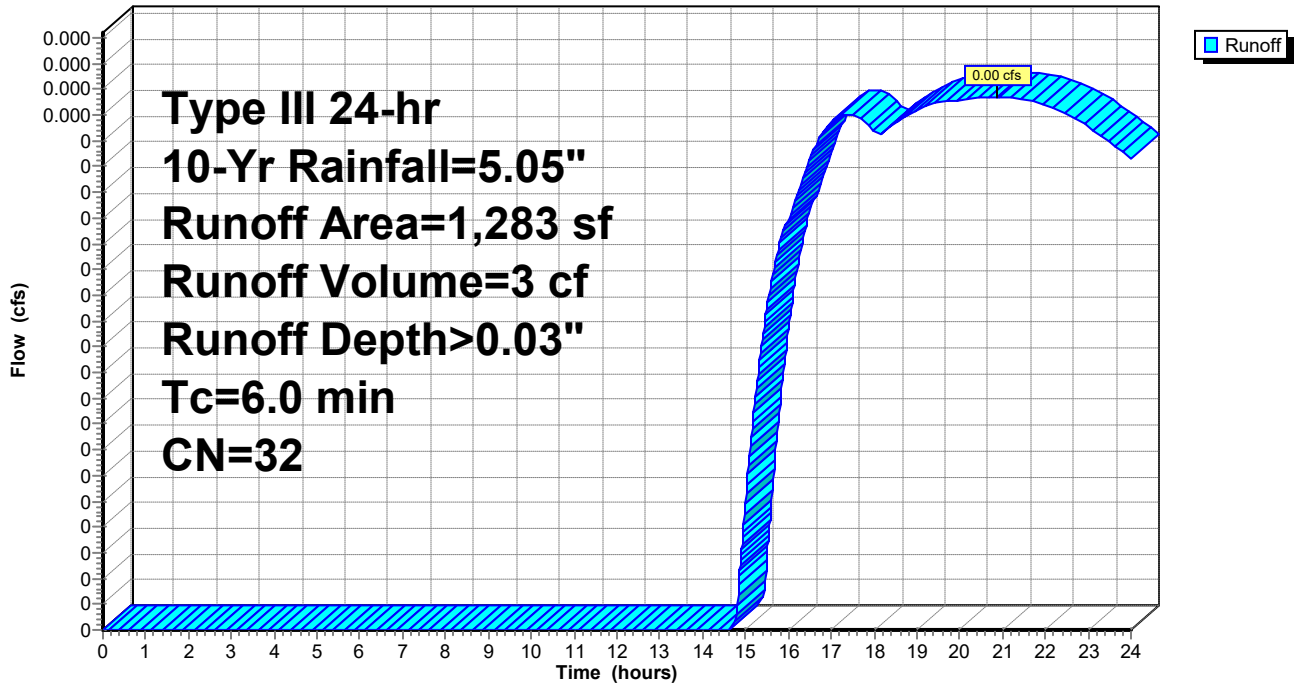
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr Rainfall=5.05"

Area (sf)	CN	Description
1,283	32	Woods/grass comb., Good, HSG A
1,283		100.00% Pervious Area

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

Subcatchment P Ws2: P Watershed 2

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

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Summary for Subcatchment P Ws3: P Watershed 3

Runoff = 1.66 cfs @ 12.09 hrs, Volume= 5,194 cf, Depth> 2.23"

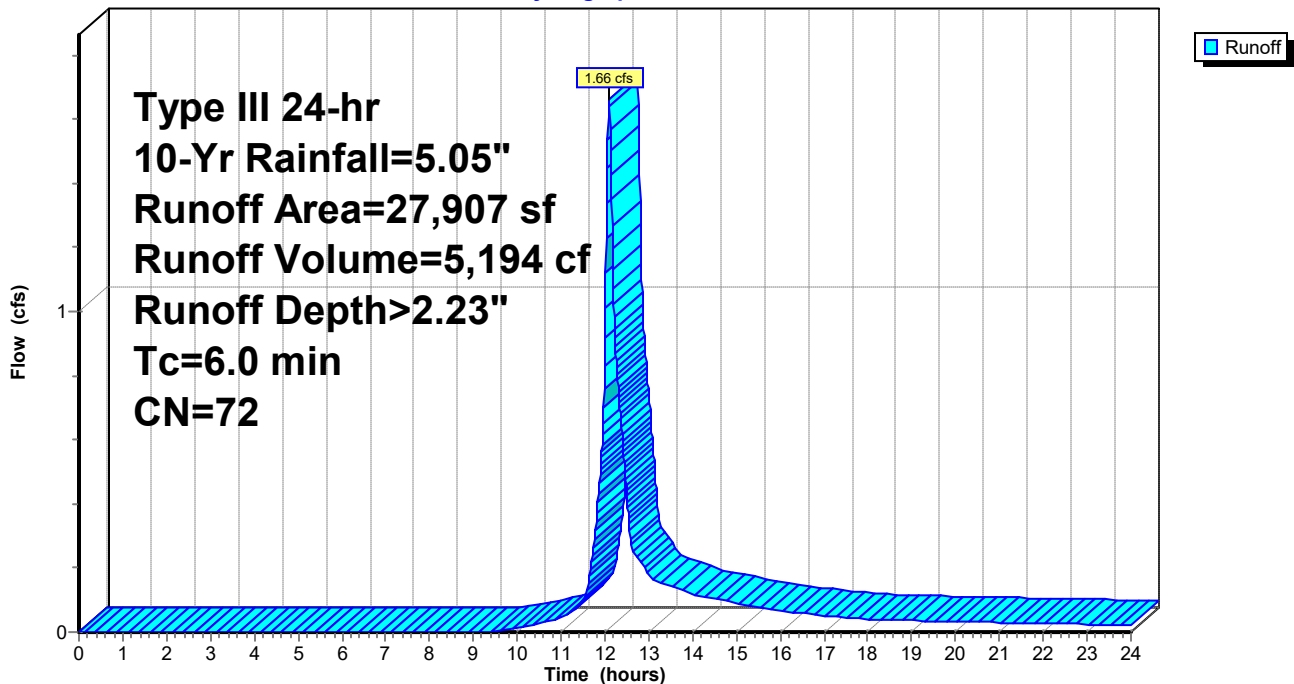
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr Rainfall=5.05"

Area (sf)	CN	Description
15,374	98	Paved parking, HSG A
181	98	Roofs, HSG A
11,843	39	>75% Grass cover, Good, HSG A
509	32	Woods/grass comb., Good, HSG A
27,907	72	Weighted Average
12,352		44.26% Pervious Area
15,555		55.74% Impervious Area

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

Subcatchment P Ws3: P Watershed 3

Hydrograph



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

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Summary for Subcatchment P Ws4: P Watershed 4

Runoff = 1.77 cfs @ 12.09 hrs, Volume= 5,501 cf, Depth> 2.40"

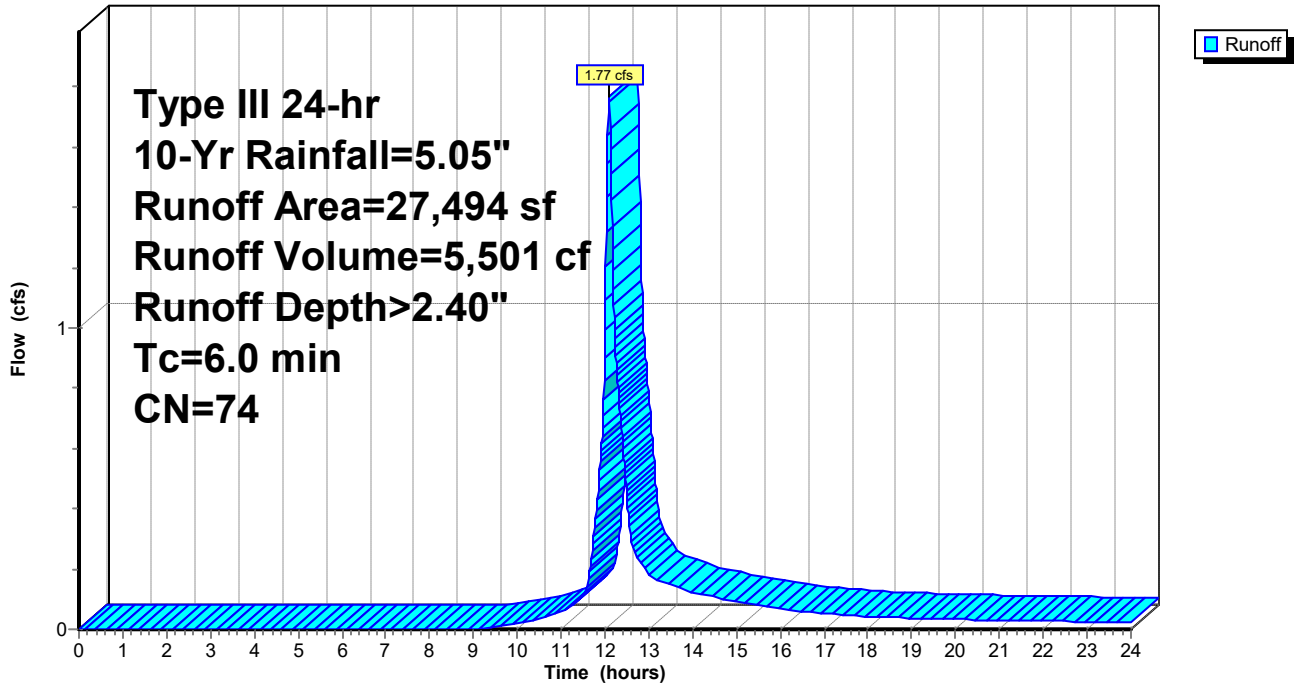
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr Rainfall=5.05"

Area (sf)	CN	Description
16,346	98	Paved parking, HSG A
11,148	39	>75% Grass cover, Good, HSG A
27,494	74	Weighted Average
11,148		40.55% Pervious Area
16,346		59.45% Impervious Area

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

Subcatchment P Ws4: P Watershed 4

Hydrograph



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

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Summary for Subcatchment P Ws5: P Watershed 5

Runoff = 0.48 cfs @ 12.08 hrs, Volume= 1,710 cf, Depth> 4.81"

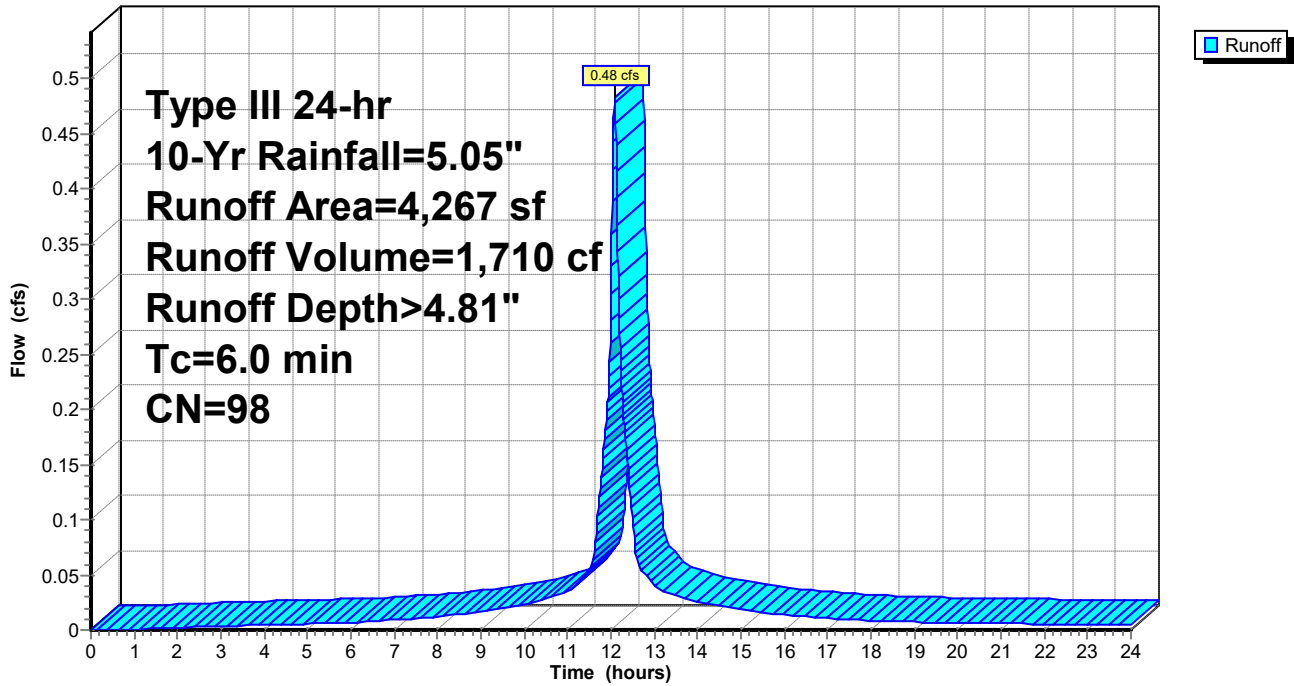
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr Rainfall=5.05"

Area (sf)	CN	Description
4,267	98	Roofs, HSG A
4,267		100.00% Impervious Area

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

Subcatchment P Ws5: P Watershed 5

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

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Summary for Subcatchment P Ws6: P Watershed 6

Runoff = 0.00 cfs @ 20.86 hrs, Volume= 7 cf, Depth> 0.03"

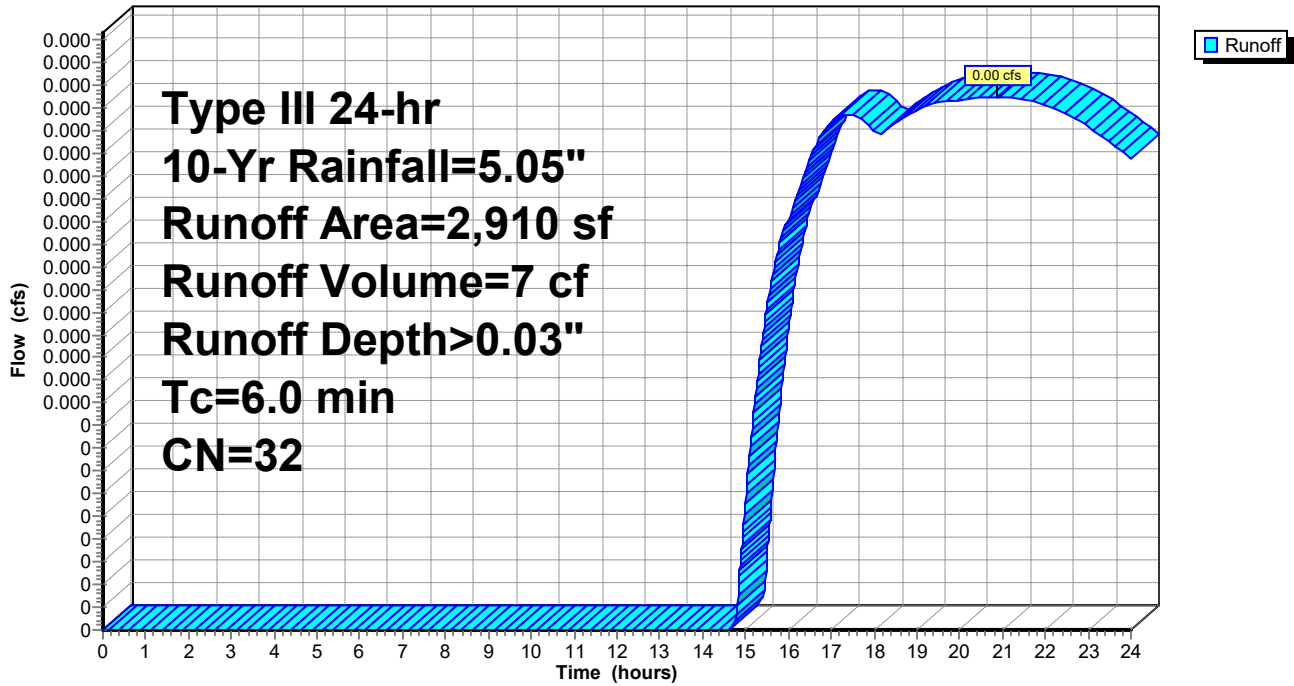
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr Rainfall=5.05"

Area (sf)	CN	Description
2,910	32	Woods/grass comb., Good, HSG A
2,910		100.00% Pervious Area

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

Subcatchment P Ws6: P Watershed 6

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

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Summary for Subcatchment P Ws7: P Watershed 7

Runoff = 0.00 cfs @ 16.78 hrs, Volume= 24 cf, Depth> 0.05"

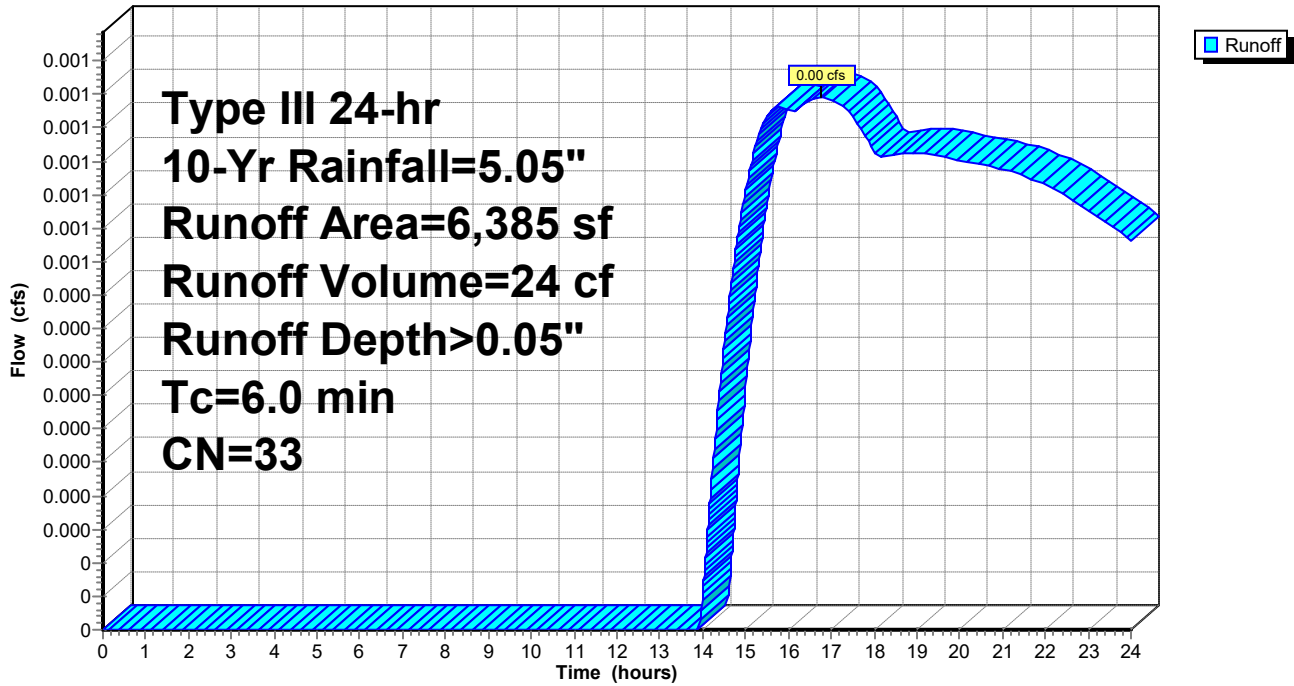
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr Rainfall=5.05"

Area (sf)	CN	Description
1,109	39	>75% Grass cover, Good, HSG A
5,276	32	Woods/grass comb., Good, HSG A
6,385	33	Weighted Average
6,385		100.00% Pervious Area

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

Subcatchment P Ws7: P Watershed 7

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

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Summary for Subcatchment P Ws8: P Watershed 8

Runoff = 0.04 cfs @ 12.40 hrs, Volume= 435 cf, Depth> 0.28"

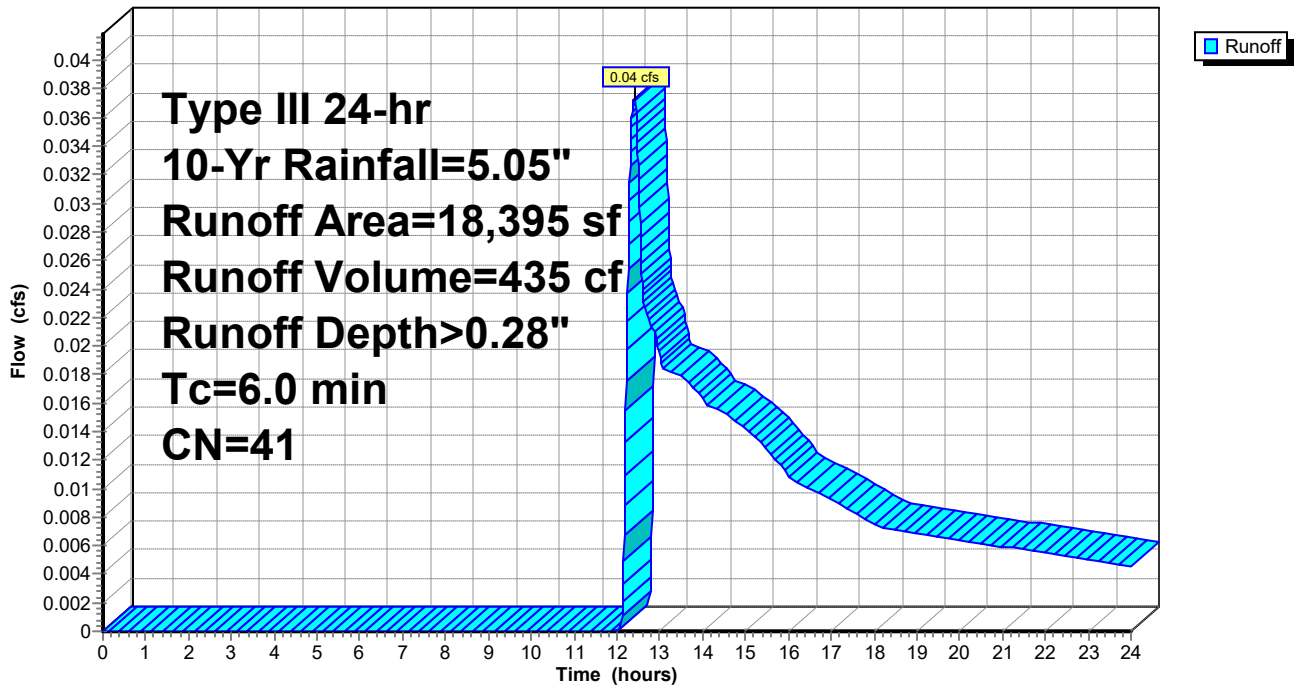
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr Rainfall=5.05"

Area (sf)	CN	Description
2,414	98	Paved parking, HSG A
15,981	32	Woods/grass comb., Good, HSG A
18,395	41	Weighted Average
15,981		86.88% Pervious Area
2,414		13.12% Impervious Area

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

Subcatchment P Ws8: P Watershed 8

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

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Summary for Subcatchment P Ws9: P Watershed 9

Runoff = 0.00 cfs @ 20.86 hrs, Volume= 1 cf, Depth> 0.03"

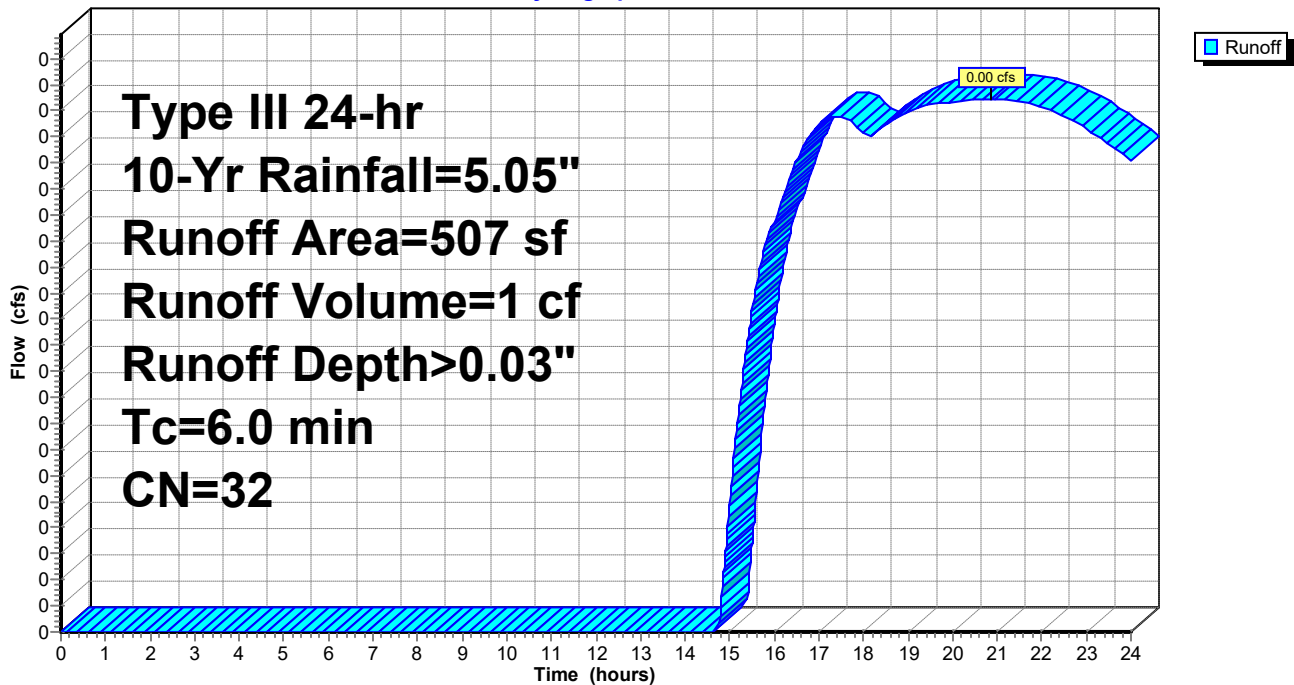
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr Rainfall=5.05"

Area (sf)	CN	Description
507	32	Woods/grass comb., Good, HSG A
507		100.00% Pervious Area

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

Subcatchment P Ws9: P Watershed 9

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Summary for Pond 1P: LRB-1

Inflow Area = 4,267 sf, 100.00% Impervious, Inflow Depth > 4.81" for 10-Yr event
 Inflow = 0.48 cfs @ 12.08 hrs, Volume= 1,710 cf
 Outflow = 0.04 cfs @ 11.21 hrs, Volume= 1,709 cf, Atten= 92%, Lag= 0.0 min
 Discarded = 0.04 cfs @ 11.21 hrs, Volume= 1,709 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 98.89' @ 13.05 hrs Surf.Area= 200 sf Storage= 625 cf

Plug-Flow detention time= 117.7 min calculated for 1,709 cf (100% of inflow)
 Center-of-Mass det. time= 117.2 min (864.5 - 747.3)

Volume	Invert	Avail.Storage	Storage Description
#1	93.82'	236 cf	10.00'W x 20.00'L x 5.67'H Stone 1,134 cf Overall - 530 cf Embedded = 604 cf x 39.0% Voids
#2	94.82'	469 cf	8.00'D x 4.67'H PCC Leaching Unit 8' Dia x 2 Inside #1 530 cf Overall - 3.0" Wall Thickness = 469 cf
#3	99.48'	2 cf	2.00'D x 0.55'H Riser
		707 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	93.82'	8.270 in/hr Exfiltration over Surface area
#2	Primary	100.00'	24.0" Horiz. Overflow Grate C= 0.600 in 24.0" Grate (100% open area)

Discarded OutFlow Max=0.04 cfs @ 11.21 hrs HW=93.94' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=93.82' (Free Discharge)
 ↑2=Overflow Grate (Controls 0.00 cfs)

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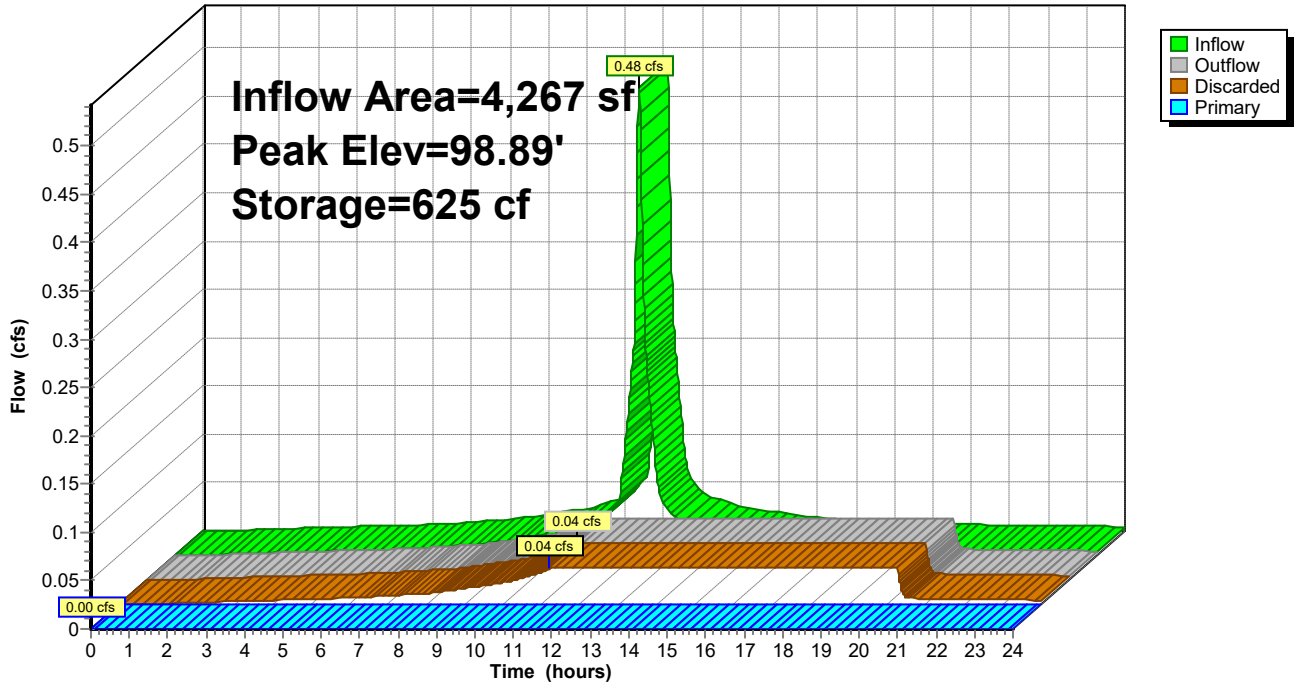
Type III 24-hr 10-Yr Rainfall=5.05"

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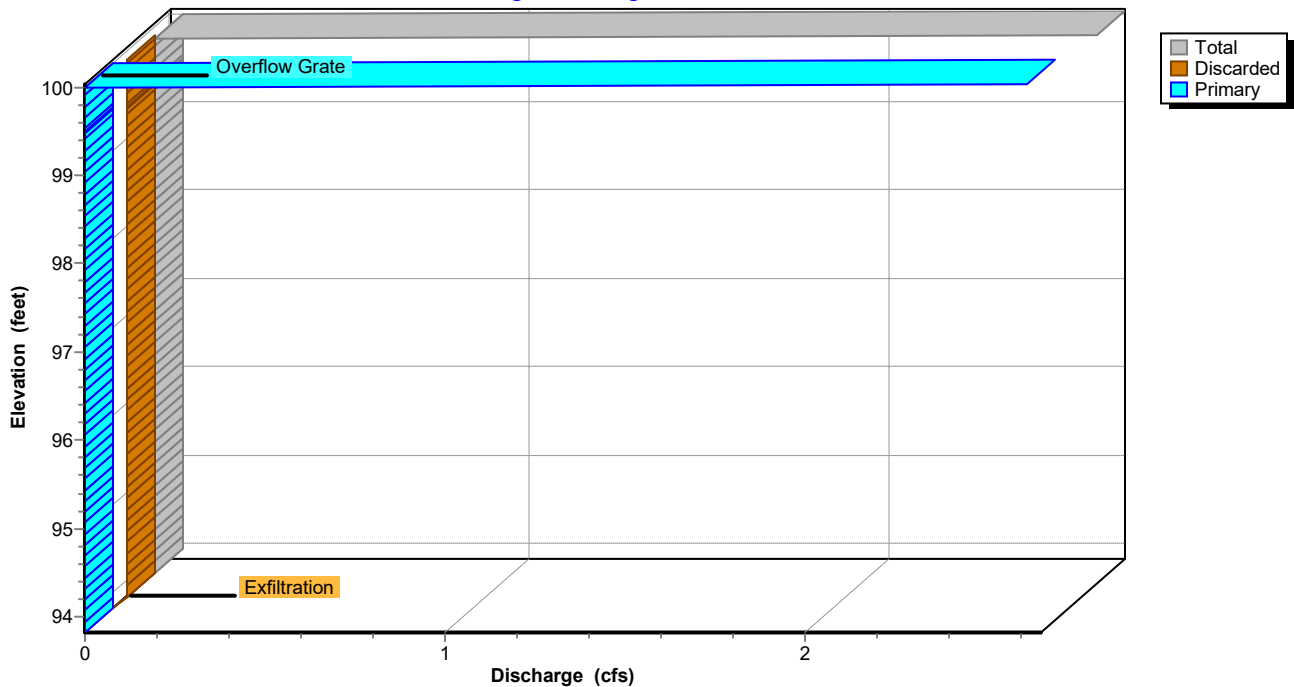
Pond 1P: LRB-1

Hydrograph



Pond 1P: LRB-1

Stage-Discharge



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Summary for Pond 2P: LRB-2

Inflow Area = 55,401 sf, 57.58% Impervious, Inflow Depth > 2.32" for 10-Yr event
 Inflow = 3.44 cfs @ 12.09 hrs, Volume= 10,696 cf
 Outflow = 0.11 cfs @ 11.11 hrs, Volume= 5,188 cf, Atten= 97%, Lag= 0.0 min
 Discarded = 0.11 cfs @ 11.11 hrs, Volume= 5,188 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 98.28' @ 16.99 hrs Surf.Area= 552 sf Storage= 6,517 cf

Plug-Flow detention time= 312.7 min calculated for 5,188 cf (49% of inflow)
 Center-of-Mass det. time= 191.9 min (1,030.6 - 838.6)

Volume	Invert	Avail.Storage	Storage Description
#1	87.09'	884 cf	12.00'W x 46.00'L x 7.67'H Stone 4,234 cf Overall - 1,967 cf Embedded = 2,266 cf x 39.0% Voids
#2	88.09'	1,676 cf	8.00'D x 6.67'H PCC Leaching Unit 8' Dia x 5 Inside #1 1,967 cf Overall - 4.0" Wall Thickness = 1,676 cf
#3	94.76'	5 cf	2.00'D x 1.74'H Riser -Impervious
#4	96.00'	7,512 cf	Grass Channel Storage (Irregular) Listed below (Recalc) -Impervious
#5	99.00'	3,790 cf	Parking Lot (Irregular) Listed below (Recalc) -Impervious
		13,867 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
96.00	453	152.0	0.0	0	0	453
97.00	1,309	311.0	100.0	844	844	6,316
98.00	3,094	576.0	100.0	2,138	2,983	25,026
99.00	6,137	801.0	100.0	4,530	7,512	49,691

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
99.00	6,137	801.0	0	0	6,137
99.50	9,120	932.0	3,790	3,790	24,208

Device	Routing	Invert	Outlet Devices
#0	Primary	99.50'	Automatic Storage Overflow (Discharged without head)
#1	Discarded	87.09'	8.270 in/hr Exfiltration over Surface area
#2	Primary	99.40'	Custom Weir/Orifice, Cv= 2.62 (C= 3.28) Head (feet) 0.00 0.10 Width (feet) 157.70 157.70

Discarded OutFlow Max=0.11 cfs @ 11.11 hrs HW=87.21' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.11 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=87.09' (Free Discharge)
 ↑2=Custom Weir/Orifice (Controls 0.00 cfs)

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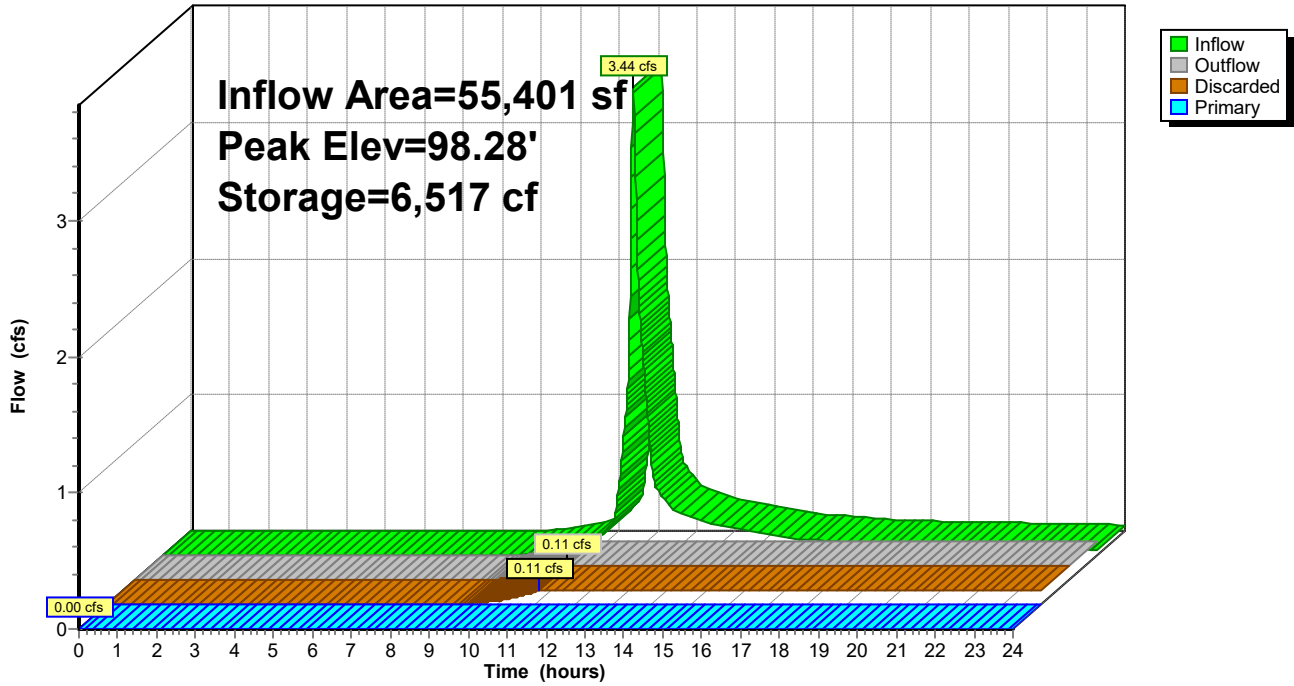
Type III 24-hr 10-Yr Rainfall=5.05"

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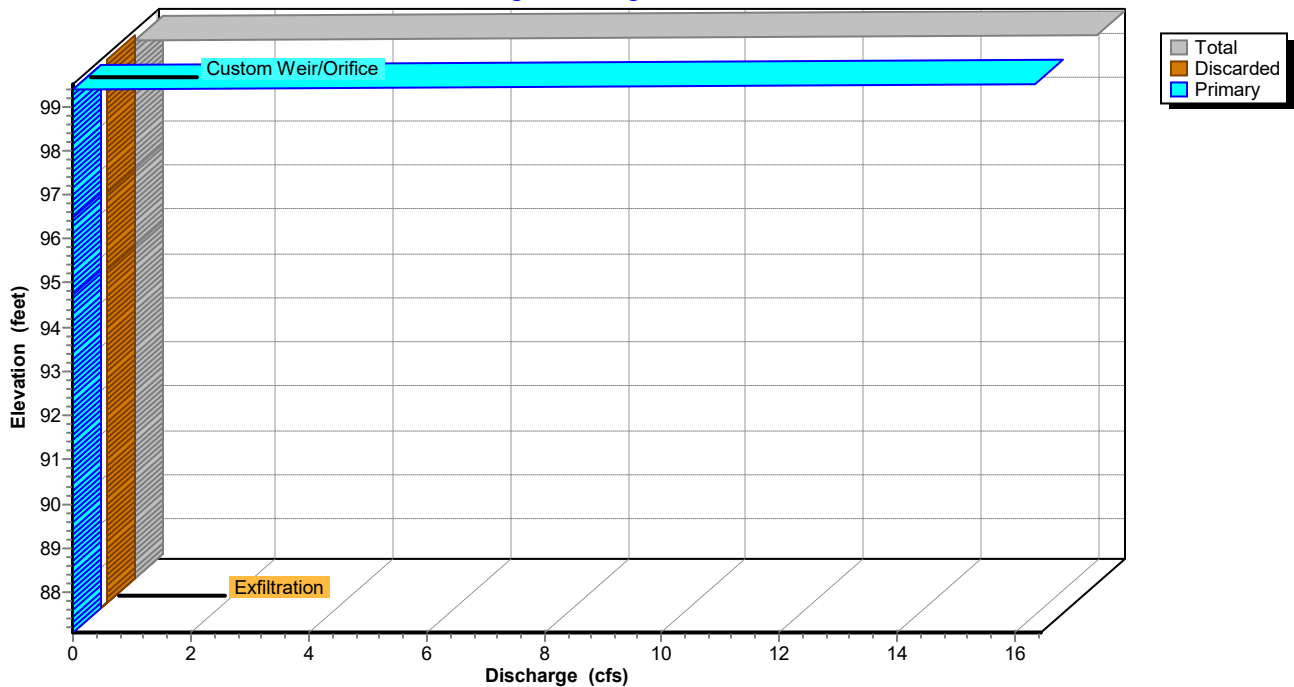
Pond 2P: LRB-2

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Pond 2P: LRB-2

Stage-Discharge



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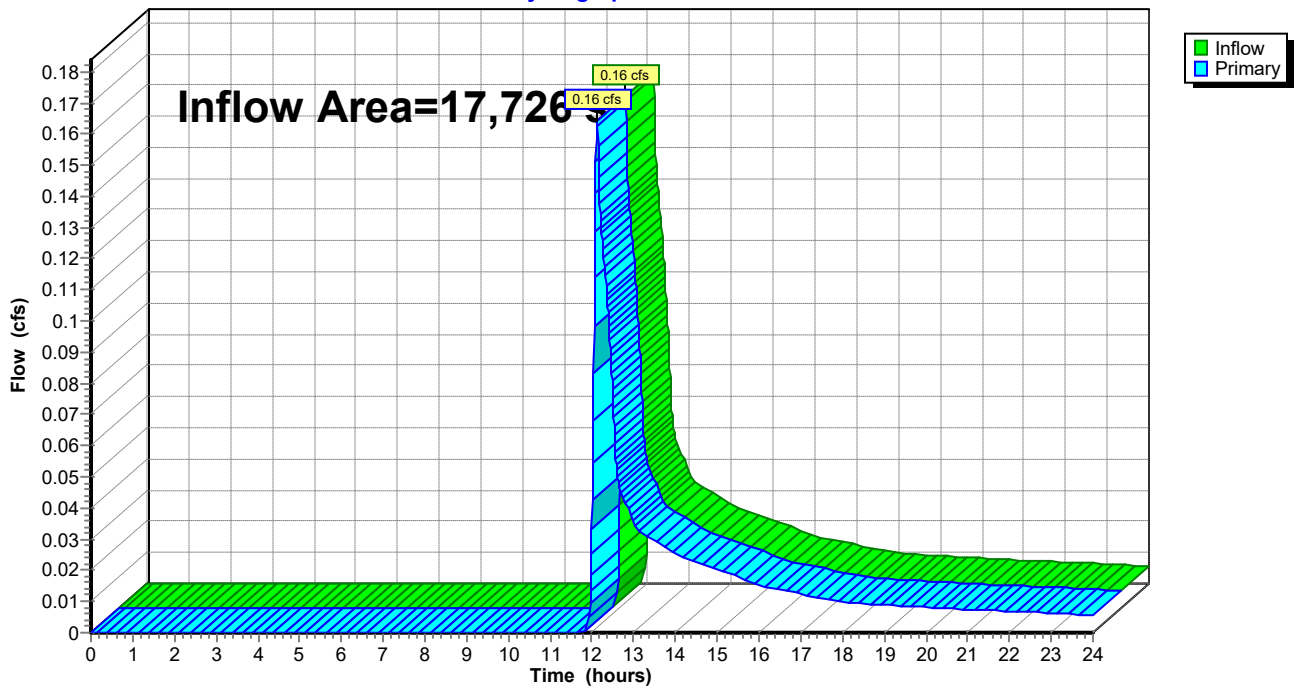
Summary for Link POA-1: POINT OF ANALYSIS 1

Inflow Area = 17,726 sf, 39.77% Impervious, Inflow Depth > 0.54" for 10-Yr event
Inflow = 0.16 cfs @ 12.12 hrs, Volume= 798 cf
Primary = 0.16 cfs @ 12.12 hrs, Volume= 798 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link POA-1: POINT OF ANALYSIS 1

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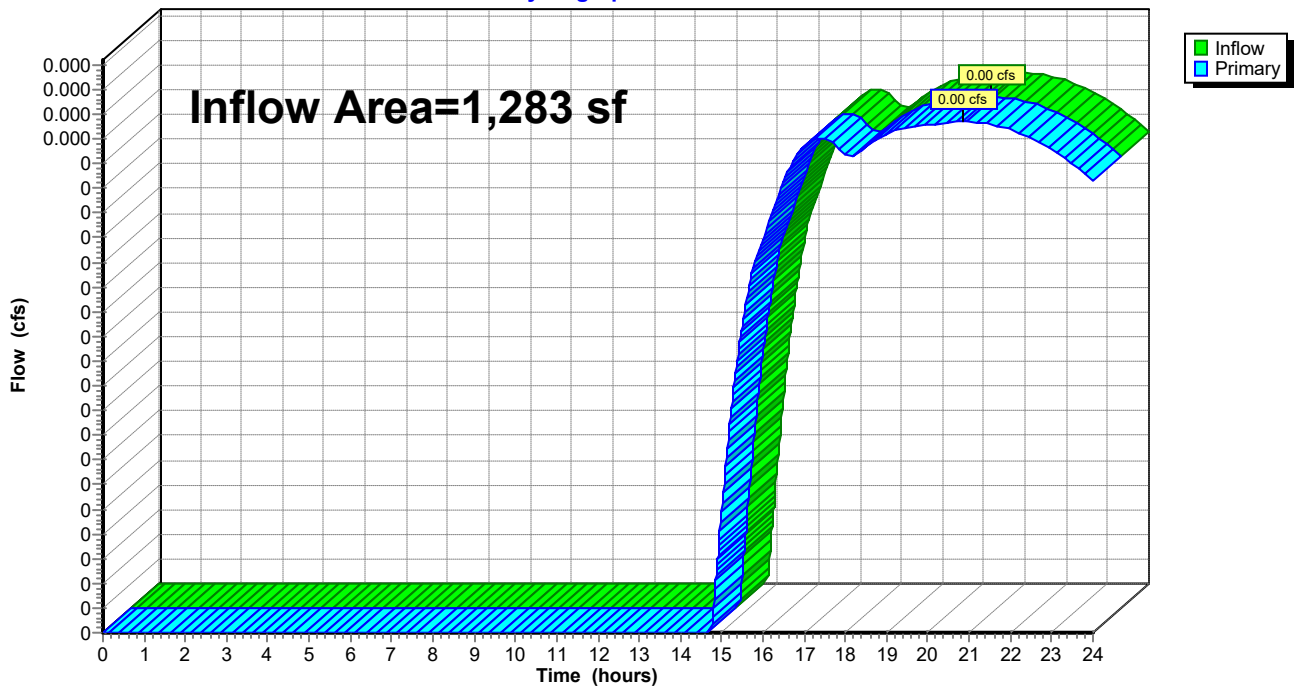
Summary for Link POA-2: POINT OF ANALYSIS 2

Inflow Area = 1,283 sf, 0.00% Impervious, Inflow Depth > 0.03" for 10-Yr event
Inflow = 0.00 cfs @ 20.86 hrs, Volume= 3 cf
Primary = 0.00 cfs @ 20.86 hrs, Volume= 3 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link POA-2: POINT OF ANALYSIS 2

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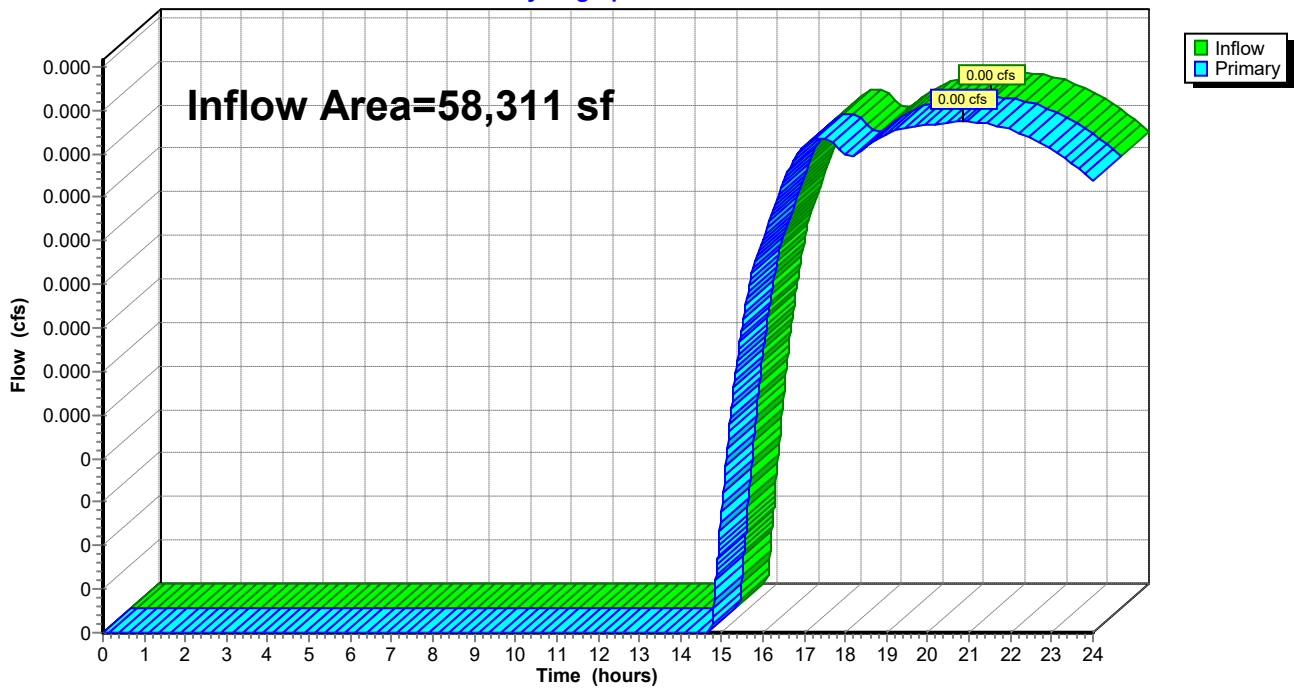
Summary for Link POA-3: POINT OF ANALYSIS 3

Inflow Area = 58,311 sf, 54.71% Impervious, Inflow Depth > 0.00" for 10-Yr event
Inflow = 0.00 cfs @ 20.86 hrs, Volume= 7 cf
Primary = 0.00 cfs @ 20.86 hrs, Volume= 7 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link POA-3: POINT OF ANALYSIS 3

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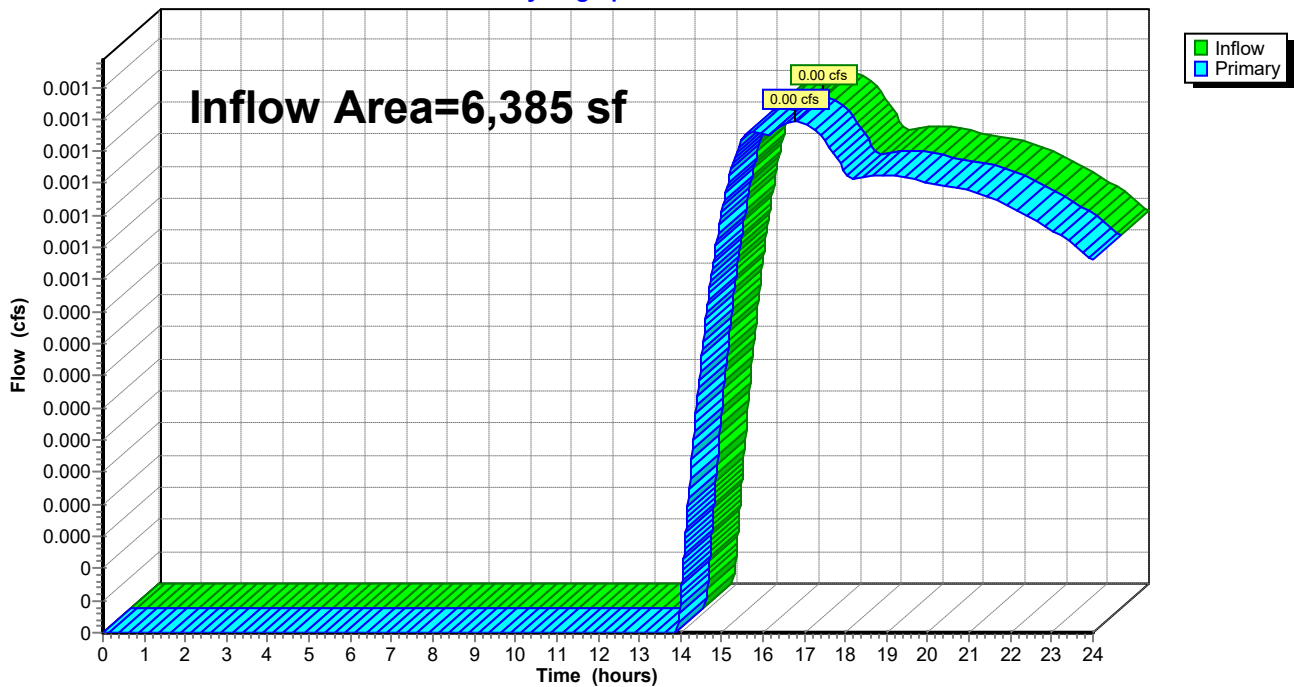
Summary for Link POA-4: POINT OF ANALYSIS 4

Inflow Area = 6,385 sf, 0.00% Impervious, Inflow Depth > 0.05" for 10-Yr event
Inflow = 0.00 cfs @ 16.78 hrs, Volume= 24 cf
Primary = 0.00 cfs @ 16.78 hrs, Volume= 24 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link POA-4: POINT OF ANALYSIS 4

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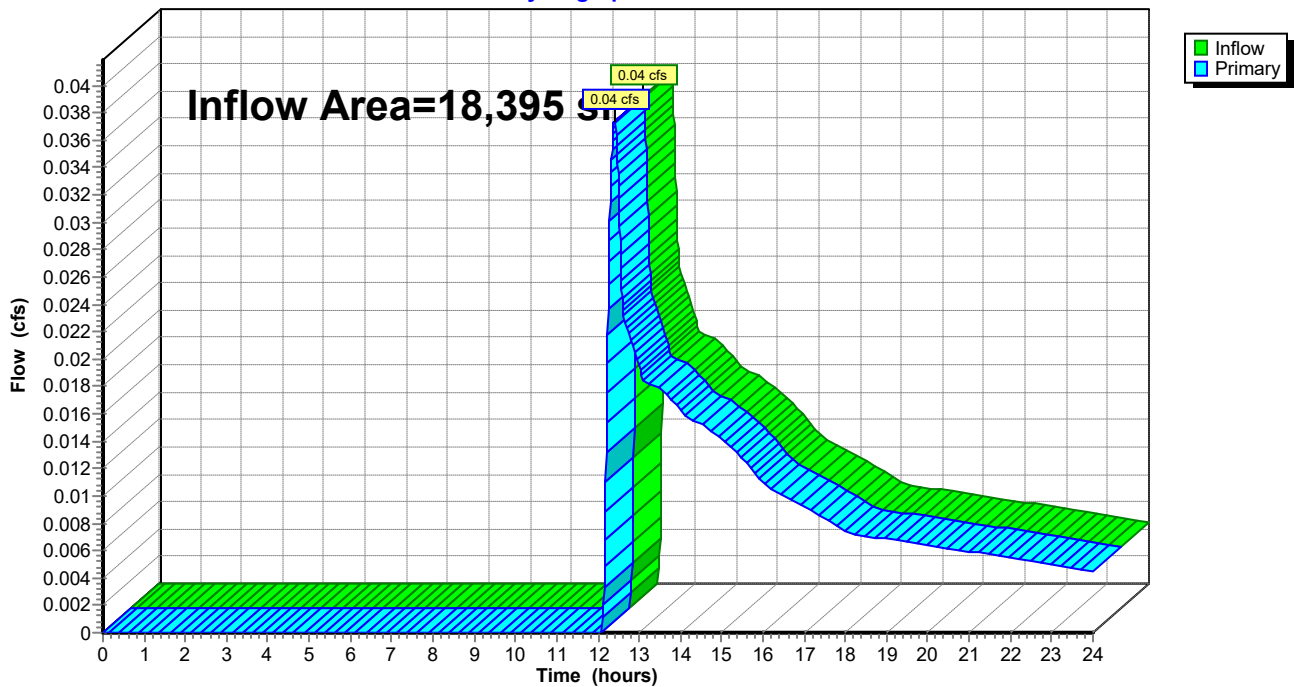
Summary for Link POA-5: POINT OF ANALYSIS 5

Inflow Area = 18,395 sf, 13.12% Impervious, Inflow Depth > 0.28" for 10-Yr event
Inflow = 0.04 cfs @ 12.40 hrs, Volume= 435 cf
Primary = 0.04 cfs @ 12.40 hrs, Volume= 435 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link POA-5: POINT OF ANALYSIS 5

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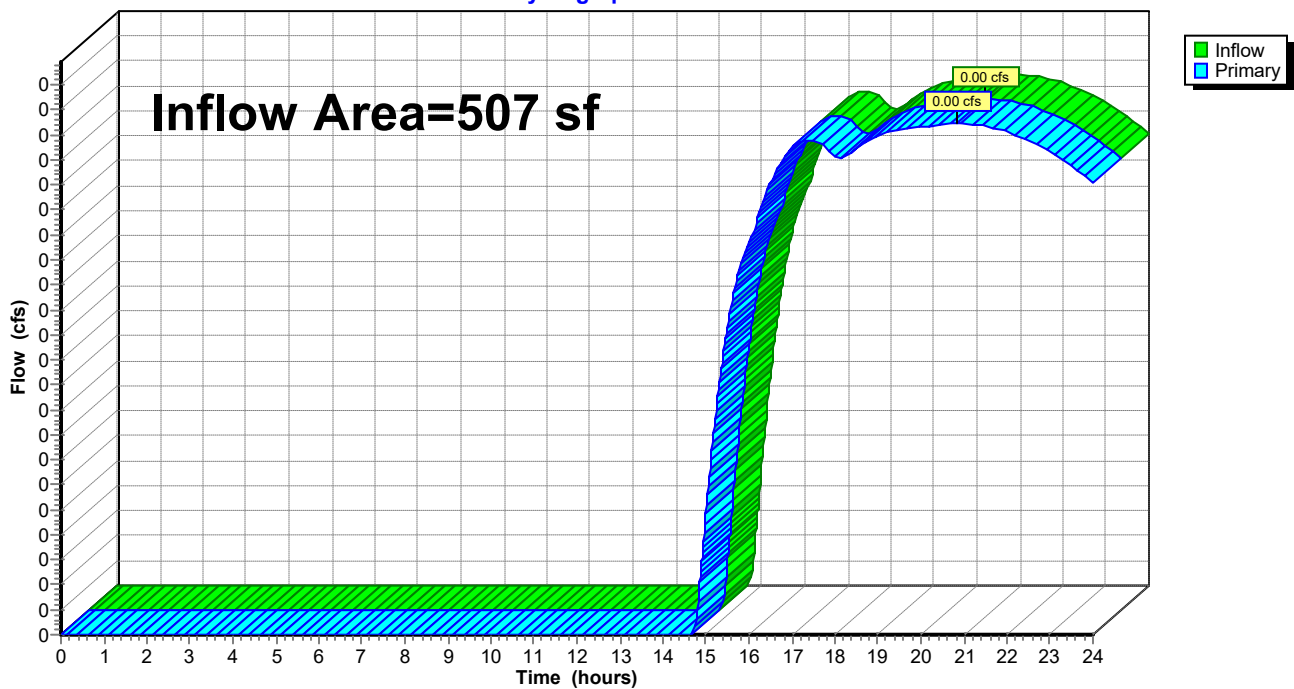
Summary for Link POA-6: POINT OF ANALYSIS 6

Inflow Area = 507 sf, 0.00% Impervious, Inflow Depth > 0.03" for 10-Yr event
Inflow = 0.00 cfs @ 20.86 hrs, Volume= 1 cf
Primary = 0.00 cfs @ 20.86 hrs, Volume= 1 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link POA-6: POINT OF ANALYSIS 6

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Type III 24-hr 2-Yr Rainfall=3.44"

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Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 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 P Ws1: P Watershed 1	Runoff Area=13,459 sf 20.67% Impervious Runoff Depth>0.18" Tc=6.0 min CN=50 Runoff=0.02 cfs 203 cf
Subcatchment P Ws2: P Watershed 2	Runoff Area=1,283 sf 0.00% Impervious Runoff Depth=0.00" Tc=6.0 min CN=32 Runoff=0.00 cfs 0 cf
Subcatchment P Ws3: P Watershed 3	Runoff Area=27,907 sf 55.74% Impervious Runoff Depth>1.08" Tc=6.0 min CN=72 Runoff=0.77 cfs 2,512 cf
Subcatchment P Ws4: P Watershed 4	Runoff Area=27,494 sf 59.45% Impervious Runoff Depth>1.20" Tc=6.0 min CN=74 Runoff=0.85 cfs 2,742 cf
Subcatchment P Ws5: P Watershed 5	Runoff Area=4,267 sf 100.00% Impervious Runoff Depth>3.20" Tc=6.0 min CN=98 Runoff=0.33 cfs 1,139 cf
Subcatchment P Ws6: P Watershed 6	Runoff Area=2,910 sf 0.00% Impervious Runoff Depth=0.00" Tc=6.0 min CN=32 Runoff=0.00 cfs 0 cf
Subcatchment P Ws7: P Watershed 7	Runoff Area=6,385 sf 0.00% Impervious Runoff Depth=0.00" Tc=6.0 min CN=33 Runoff=0.00 cfs 0 cf
Subcatchment P Ws8: P Watershed 8	Runoff Area=18,395 sf 13.12% Impervious Runoff Depth>0.02" Tc=6.0 min CN=41 Runoff=0.00 cfs 32 cf
Subcatchment P Ws9: P Watershed 9	Runoff Area=507 sf 0.00% Impervious Runoff Depth=0.00" Tc=6.0 min CN=32 Runoff=0.00 cfs 0 cf
Pond 1P: LRB-1	Peak Elev=96.91' Storage=359 cf Inflow=0.33 cfs 1,139 cf Discarded=0.04 cfs 1,139 cf Primary=0.00 cfs 0 cf Outflow=0.04 cfs 1,139 cf
Pond 2P: LRB-2	Peak Elev=94.26' Storage=2,384 cf Inflow=1.62 cfs 5,254 cf Discarded=0.11 cfs 4,795 cf Primary=0.00 cfs 0 cf Outflow=0.11 cfs 4,795 cf
Link POA-1: POINT OF ANALYSIS 1	Inflow=0.02 cfs 203 cf Primary=0.02 cfs 203 cf
Link POA-2: POINT OF ANALYSIS 2	Inflow=0.00 cfs 0 cf Primary=0.00 cfs 0 cf
Link POA-3: POINT OF ANALYSIS 3	Inflow=0.00 cfs 0 cf Primary=0.00 cfs 0 cf
Link POA-4: POINT OF ANALYSIS 4	Inflow=0.00 cfs 0 cf Primary=0.00 cfs 0 cf
Link POA-5: POINT OF ANALYSIS 5	Inflow=0.00 cfs 32 cf Primary=0.00 cfs 32 cf

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Type III 24-hr 2-Yr Rainfall=3.44"

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Link POA-6: POINT OF ANALYSIS 6

Inflow=0.00 cfs 0 cf

Primary=0.00 cfs 0 cf

Total Runoff Area = 102,607 sf Runoff Volume = 6,628 cf Average Runoff Depth = 0.78"
59.69% Pervious = 61,243 sf 40.31% Impervious = 41,364 sf

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Type III 24-hr 2-Yr Rainfall=3.44"

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Summary for Subcatchment P Ws1: P Watershed 1

Runoff = 0.02 cfs @ 12.42 hrs, Volume= 203 cf, Depth> 0.18"

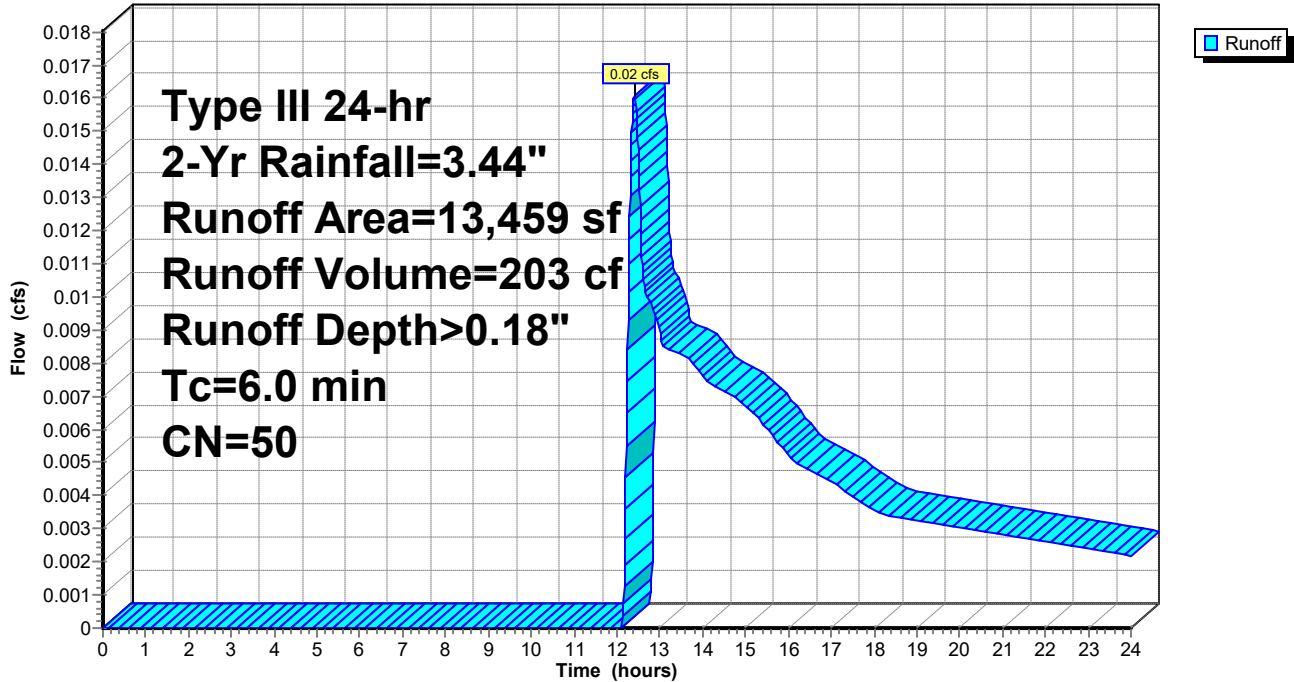
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr Rainfall=3.44"

Area (sf)	CN	Description
1,107	98	Paved parking, HSG A
1,675	98	Roofs, HSG A
7,850	39	>75% Grass cover, Good, HSG A
2,827	32	Woods/grass comb., Good, HSG A
13,459	50	Weighted Average
10,677		79.33% Pervious Area
2,782		20.67% Impervious Area

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

Subcatchment P Ws1: P Watershed 1

Hydrograph



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Type III 24-hr 2-Yr Rainfall=3.44"

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Summary for Subcatchment P Ws2: P Watershed 2

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

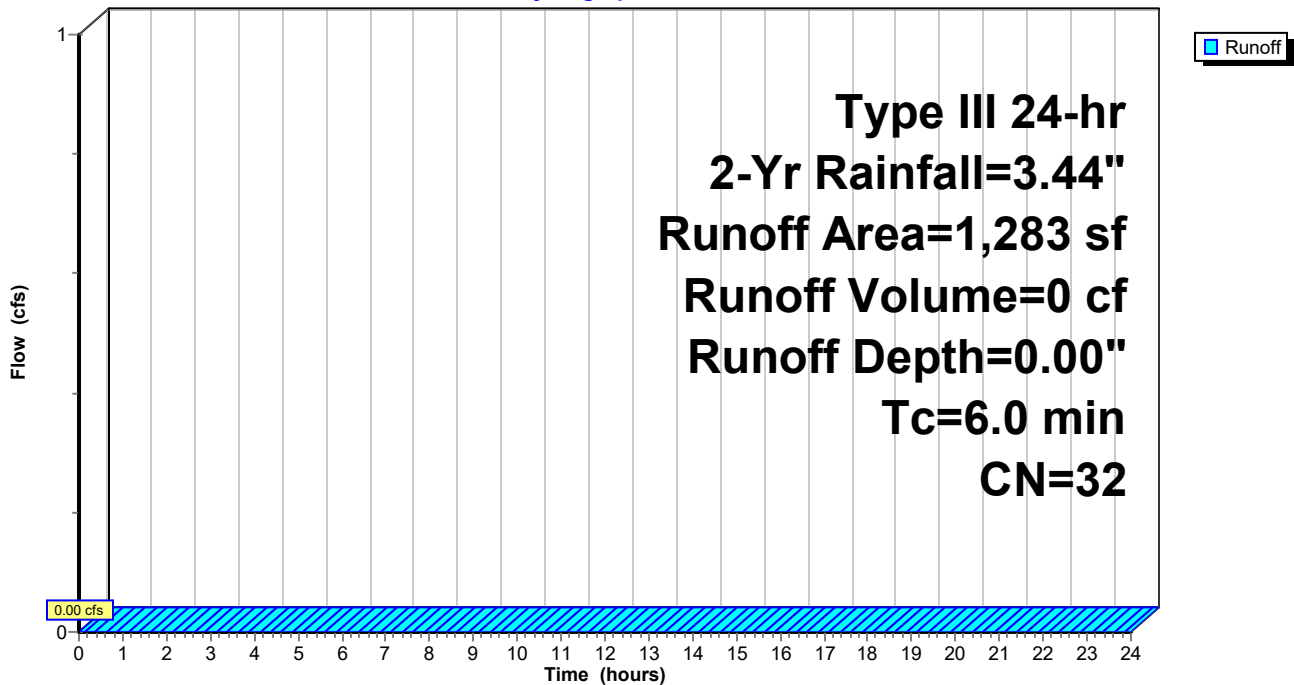
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr Rainfall=3.44"

Area (sf)	CN	Description
1,283	32	Woods/grass comb., Good, HSG A
1,283		100.00% Pervious Area

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

Subcatchment P Ws2: P Watershed 2

Hydrograph



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Type III 24-hr 2-Yr Rainfall=3.44"

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Summary for Subcatchment P Ws3: P Watershed 3

Runoff = 0.77 cfs @ 12.10 hrs, Volume= 2,512 cf, Depth> 1.08"

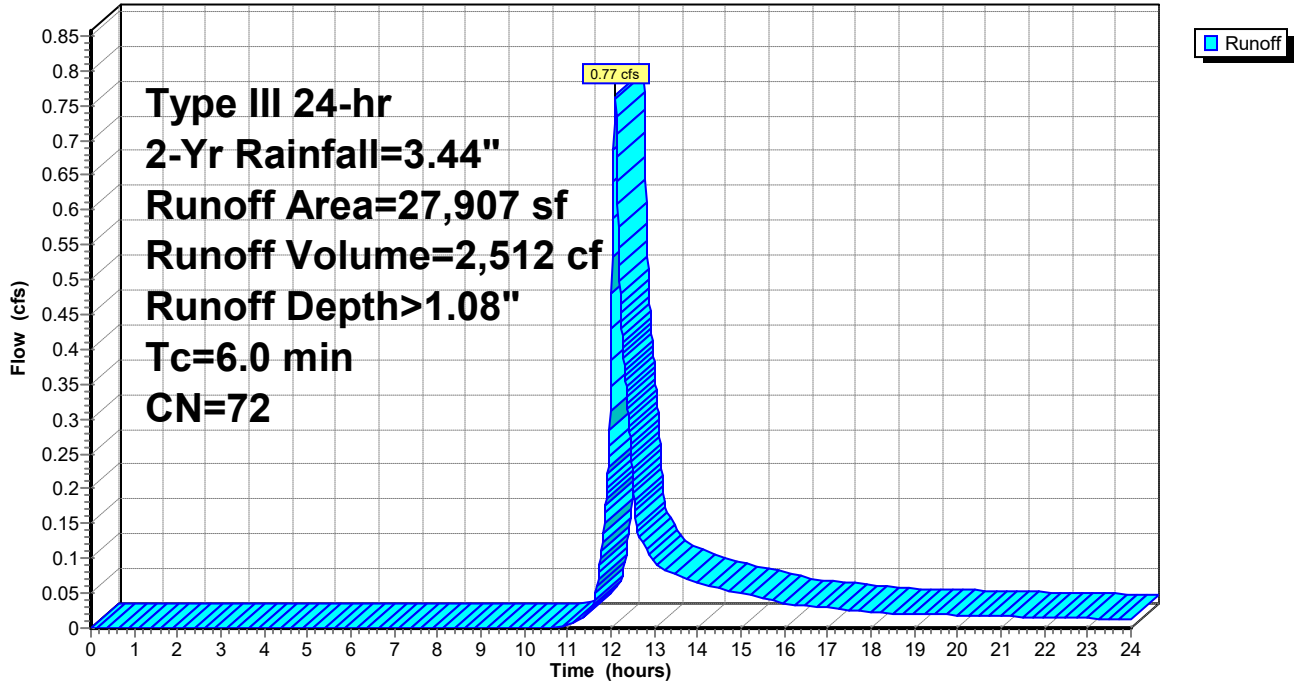
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr Rainfall=3.44"

Area (sf)	CN	Description
15,374	98	Paved parking, HSG A
181	98	Roofs, HSG A
11,843	39	>75% Grass cover, Good, HSG A
509	32	Woods/grass comb., Good, HSG A
27,907	72	Weighted Average
12,352		44.26% Pervious Area
15,555		55.74% Impervious Area

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

Subcatchment P Ws3: P Watershed 3

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Type III 24-hr 2-Yr Rainfall=3.44"

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Summary for Subcatchment P Ws4: P Watershed 4

Runoff = 0.85 cfs @ 12.09 hrs, Volume= 2,742 cf, Depth> 1.20"

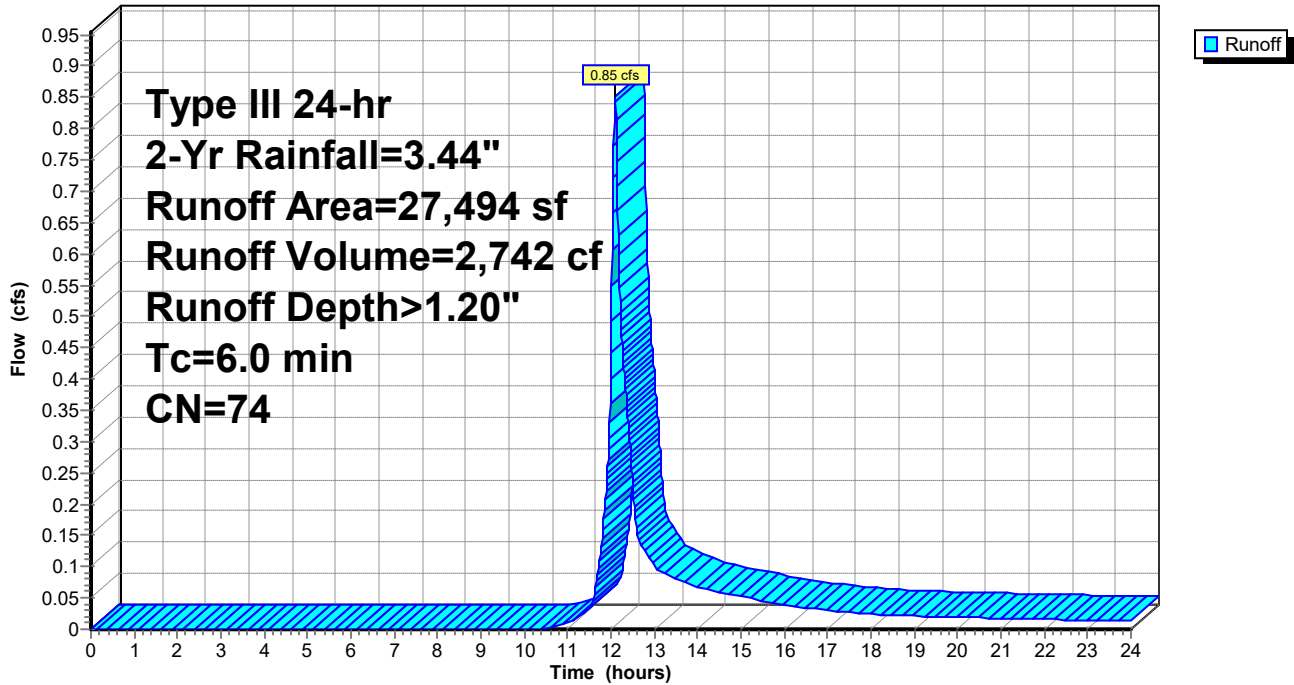
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr Rainfall=3.44"

Area (sf)	CN	Description
16,346	98	Paved parking, HSG A
11,148	39	>75% Grass cover, Good, HSG A
27,494	74	Weighted Average
11,148		40.55% Pervious Area
16,346		59.45% Impervious Area

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

Subcatchment P Ws4: P Watershed 4

Hydrograph



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Type III 24-hr 2-Yr Rainfall=3.44"

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Summary for Subcatchment P Ws5: P Watershed 5

Runoff = 0.33 cfs @ 12.08 hrs, Volume= 1,139 cf, Depth> 3.20"

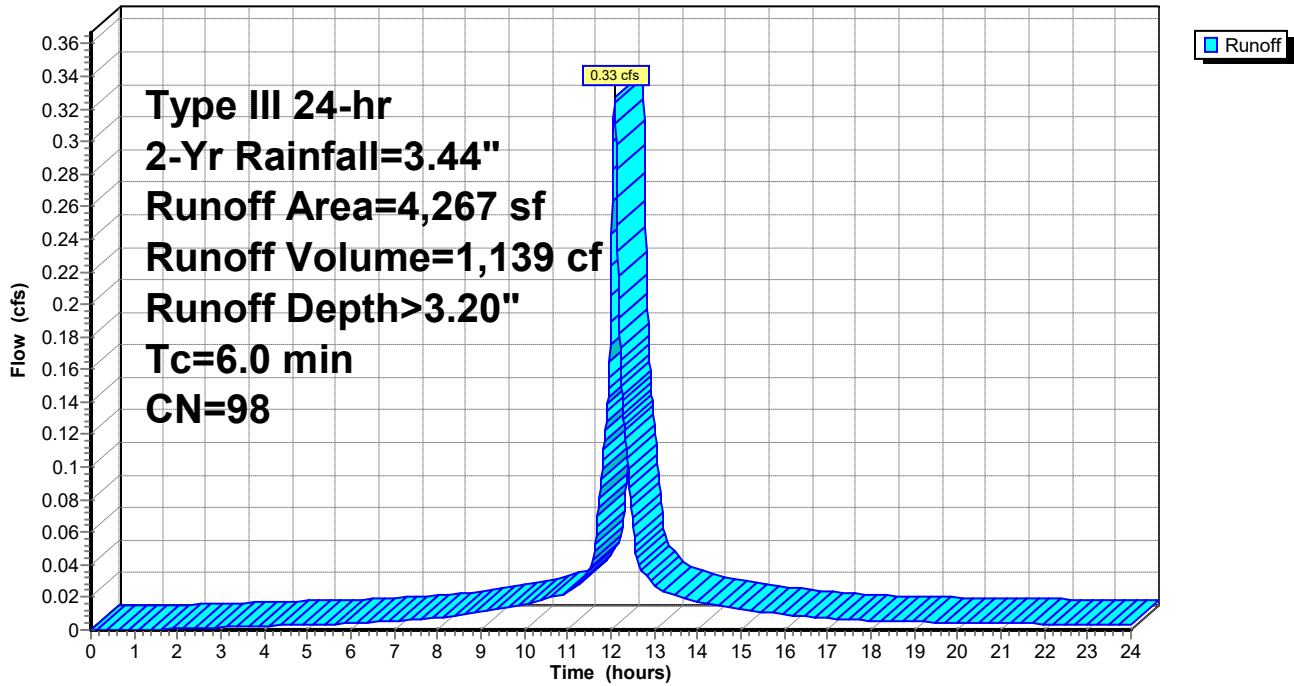
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr Rainfall=3.44"

Area (sf)	CN	Description
4,267	98	Roofs, HSG A
4,267		100.00% Impervious Area

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

Subcatchment P Ws5: P Watershed 5

Hydrograph



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Type III 24-hr 2-Yr Rainfall=3.44"

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Summary for Subcatchment P Ws6: P Watershed 6

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

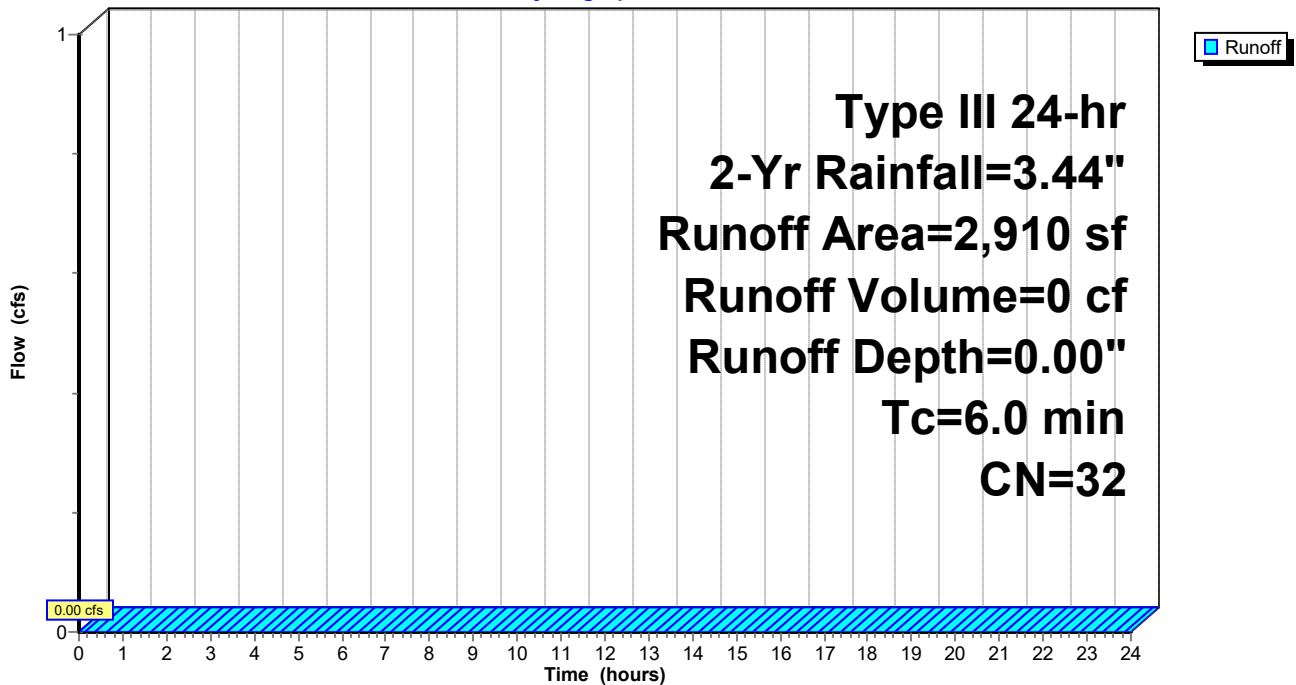
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr Rainfall=3.44"

Area (sf)	CN	Description
2,910	32	Woods/grass comb., Good, HSG A
2,910		100.00% Pervious Area

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

Subcatchment P Ws6: P Watershed 6

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Type III 24-hr 2-Yr Rainfall=3.44"

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Summary for Subcatchment P Ws7: P Watershed 7

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

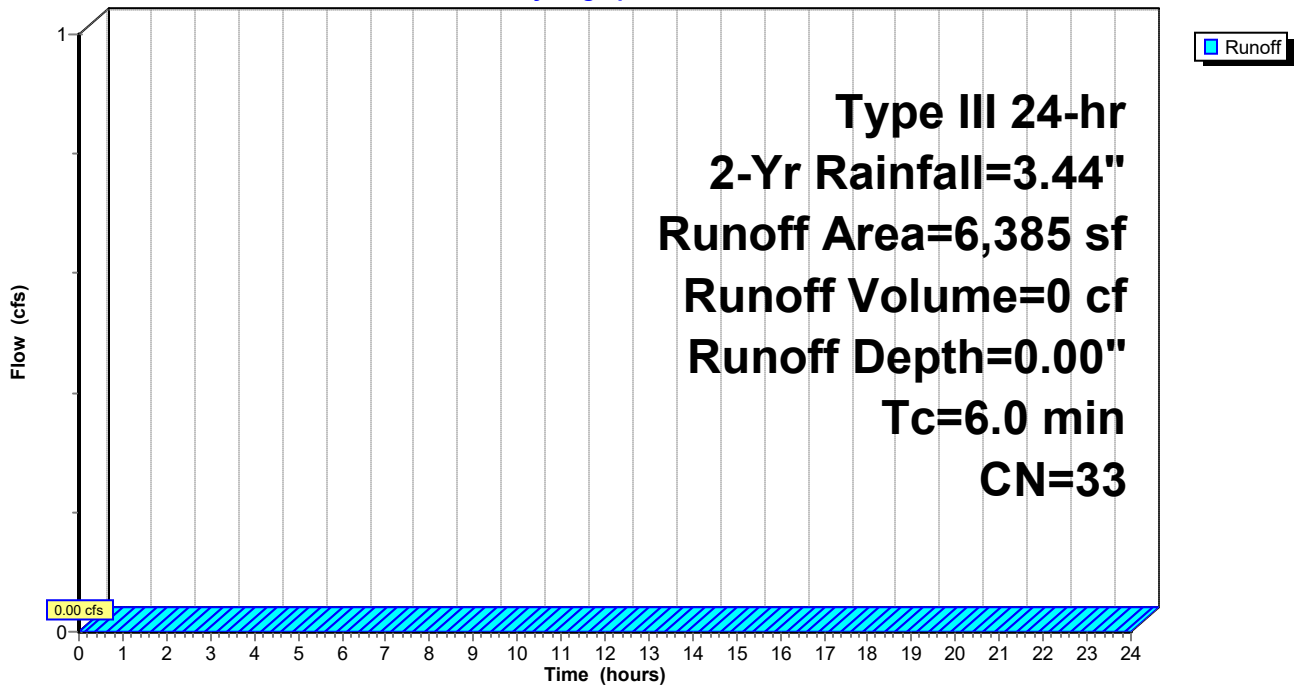
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr Rainfall=3.44"

Area (sf)	CN	Description
1,109	39	>75% Grass cover, Good, HSG A
5,276	32	Woods/grass comb., Good, HSG A
6,385	33	Weighted Average
6,385		100.00% Pervious Area

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

Subcatchment P Ws7: P Watershed 7

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Type III 24-hr 2-Yr Rainfall=3.44"

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Summary for Subcatchment P Ws8: P Watershed 8

Runoff = 0.00 cfs @ 20.74 hrs, Volume= 32 cf, Depth> 0.02"

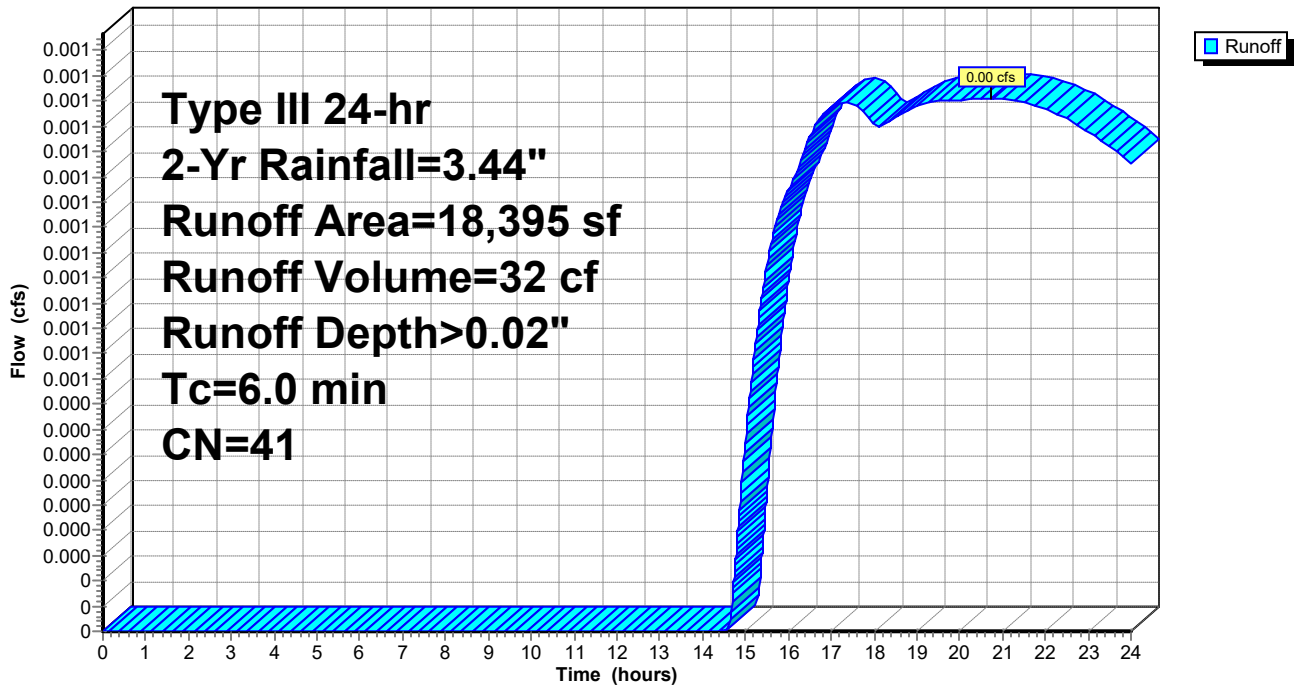
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr Rainfall=3.44"

Area (sf)	CN	Description
2,414	98	Paved parking, HSG A
15,981	32	Woods/grass comb., Good, HSG A
18,395	41	Weighted Average
15,981		86.88% Pervious Area
2,414		13.12% Impervious Area

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

Subcatchment P Ws8: P Watershed 8

Hydrograph



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Type III 24-hr 2-Yr Rainfall=3.44"

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Summary for Subcatchment P Ws9: P Watershed 9

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

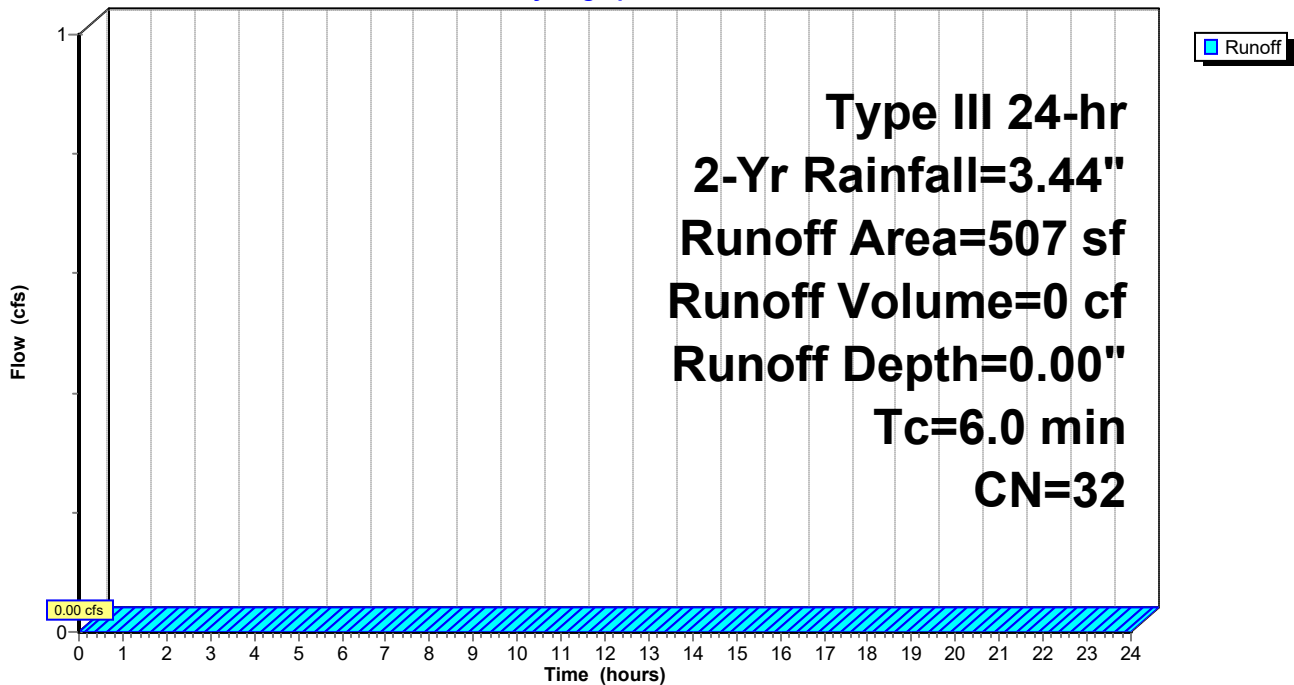
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr Rainfall=3.44"

Area (sf)	CN	Description
507	32	Woods/grass comb., Good, HSG A
507		100.00% Pervious Area

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

Subcatchment P Ws9: P Watershed 9

Hydrograph



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Summary for Pond 1P: LRB-1

Inflow Area = 4,267 sf, 100.00% Impervious, Inflow Depth > 3.20" for 2-Yr event
 Inflow = 0.33 cfs @ 12.08 hrs, Volume= 1,139 cf
 Outflow = 0.04 cfs @ 11.60 hrs, Volume= 1,139 cf, Atten= 88%, Lag= 0.0 min
 Discarded = 0.04 cfs @ 11.60 hrs, Volume= 1,139 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 96.91' @ 12.67 hrs Surf.Area= 200 sf Storage= 359 cf

Plug-Flow detention time= 60.5 min calculated for 1,139 cf (100% of inflow)
 Center-of-Mass det. time= 60.1 min (814.5 - 754.4)

Volume	Invert	Avail.Storage	Storage Description
#1	93.82'	236 cf	10.00'W x 20.00'L x 5.67'H Stone 1,134 cf Overall - 530 cf Embedded = 604 cf x 39.0% Voids
#2	94.82'	469 cf	8.00'D x 4.67'H PCC Leaching Unit 8' Dia x 2 Inside #1 530 cf Overall - 3.0" Wall Thickness = 469 cf
#3	99.48'	2 cf	2.00'D x 0.55'H Riser
		707 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	93.82'	8.270 in/hr Exfiltration over Surface area
#2	Primary	100.00'	24.0" Horiz. Overflow Grate C= 0.600 in 24.0" Grate (100% open area)

Discarded OutFlow Max=0.04 cfs @ 11.60 hrs HW=93.95' (Free Discharge)

↑**1=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=93.82' (Free Discharge)

↑**2=Overflow Grate** (Controls 0.00 cfs)

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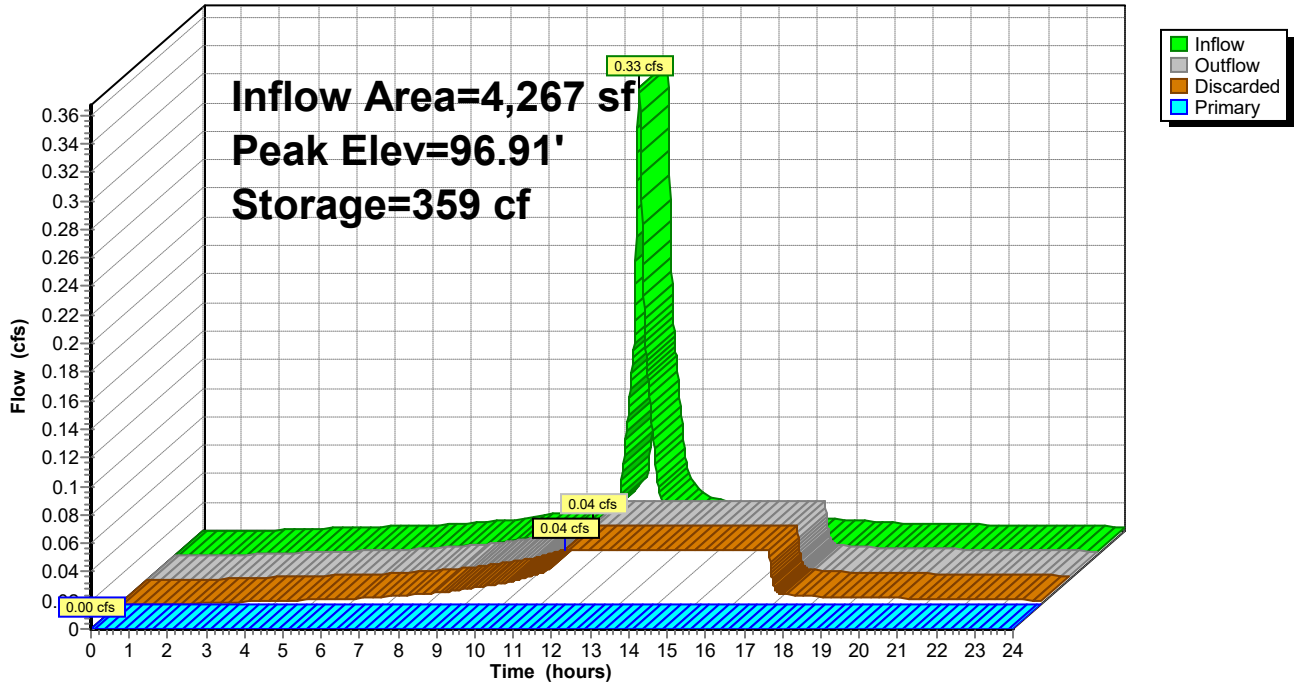
Type III 24-hr 2-Yr Rainfall=3.44"

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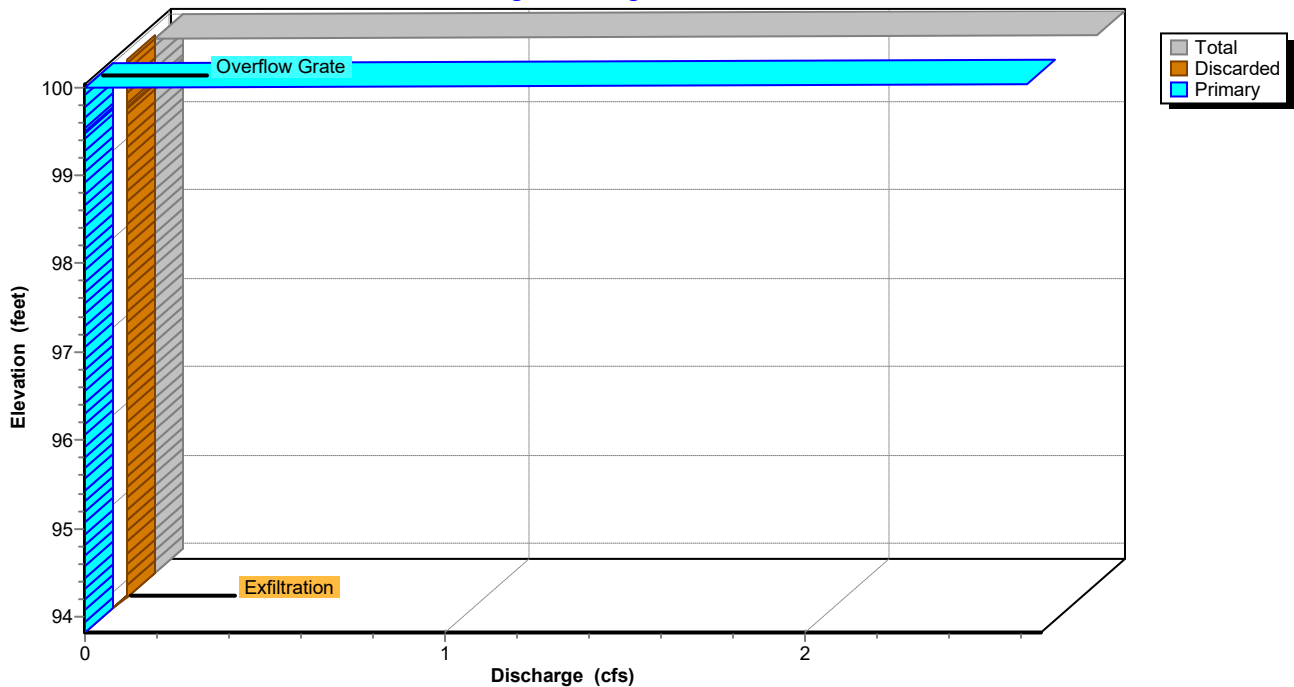
Pond 1P: LRB-1

Hydrograph



Pond 1P: LRB-1

Stage-Discharge



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Summary for Pond 2P: LRB-2

Inflow Area = 55,401 sf, 57.58% Impervious, Inflow Depth > 1.14" for 2-Yr event
 Inflow = 1.62 cfs @ 12.10 hrs, Volume= 5,254 cf
 Outflow = 0.11 cfs @ 11.69 hrs, Volume= 4,795 cf, Atten= 93%, Lag= 0.0 min
 Discarded = 0.11 cfs @ 11.69 hrs, Volume= 4,795 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 94.26' @ 14.90 hrs Surf.Area= 552 sf Storage= 2,384 cf

Plug-Flow detention time= 245.4 min calculated for 4,793 cf (91% of inflow)
 Center-of-Mass det. time= 202.2 min (1,062.0 - 859.8)

Volume	Invert	Avail.Storage	Storage Description
#1	87.09'	884 cf	12.00'W x 46.00'L x 7.67'H Stone 4,234 cf Overall - 1,967 cf Embedded = 2,266 cf x 39.0% Voids
#2	88.09'	1,676 cf	8.00'D x 6.67'H PCC Leaching Unit 8' Dia x 5 Inside #1 1,967 cf Overall - 4.0" Wall Thickness = 1,676 cf
#3	94.76'	5 cf	2.00'D x 1.74'H Riser -Impervious
#4	96.00'	7,512 cf	Grass Channel Storage (Irregular) Listed below (Recalc) -Impervious
#5	99.00'	3,790 cf	Parking Lot (Irregular) Listed below (Recalc) -Impervious
		13,867 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
96.00	453	152.0	0.0	0	0	453
97.00	1,309	311.0	100.0	844	844	6,316
98.00	3,094	576.0	100.0	2,138	2,983	25,026
99.00	6,137	801.0	100.0	4,530	7,512	49,691

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
99.00	6,137	801.0	0	0	6,137
99.50	9,120	932.0	3,790	3,790	24,208

Device	Routing	Invert	Outlet Devices
#0	Primary	99.50'	Automatic Storage Overflow (Discharged without head)
#1	Discarded	87.09'	8.270 in/hr Exfiltration over Surface area
#2	Primary	99.40'	Custom Weir/Orifice, Cv= 2.62 (C= 3.28) Head (feet) 0.00 0.10 Width (feet) 157.70 157.70

Discarded OutFlow Max=0.11 cfs @ 11.69 hrs HW=87.21' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.11 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=87.09' (Free Discharge)
 ↑2=Custom Weir/Orifice (Controls 0.00 cfs)

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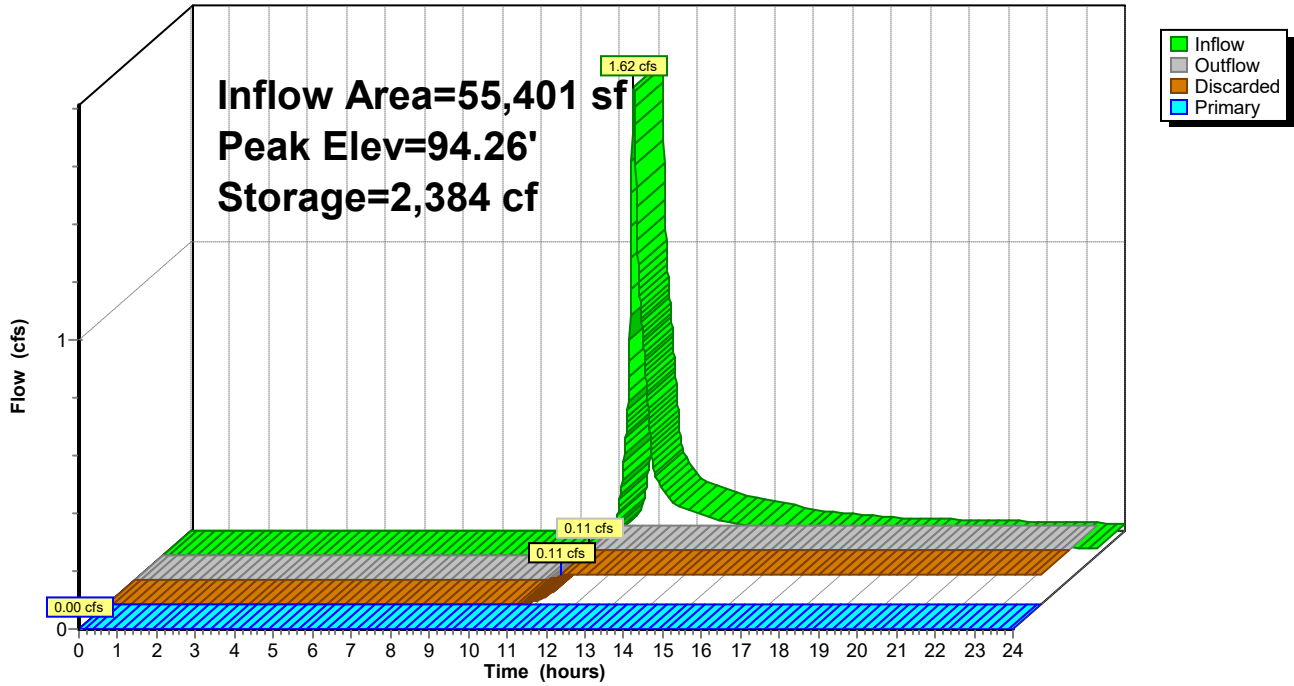
Type III 24-hr 2-Yr Rainfall=3.44"

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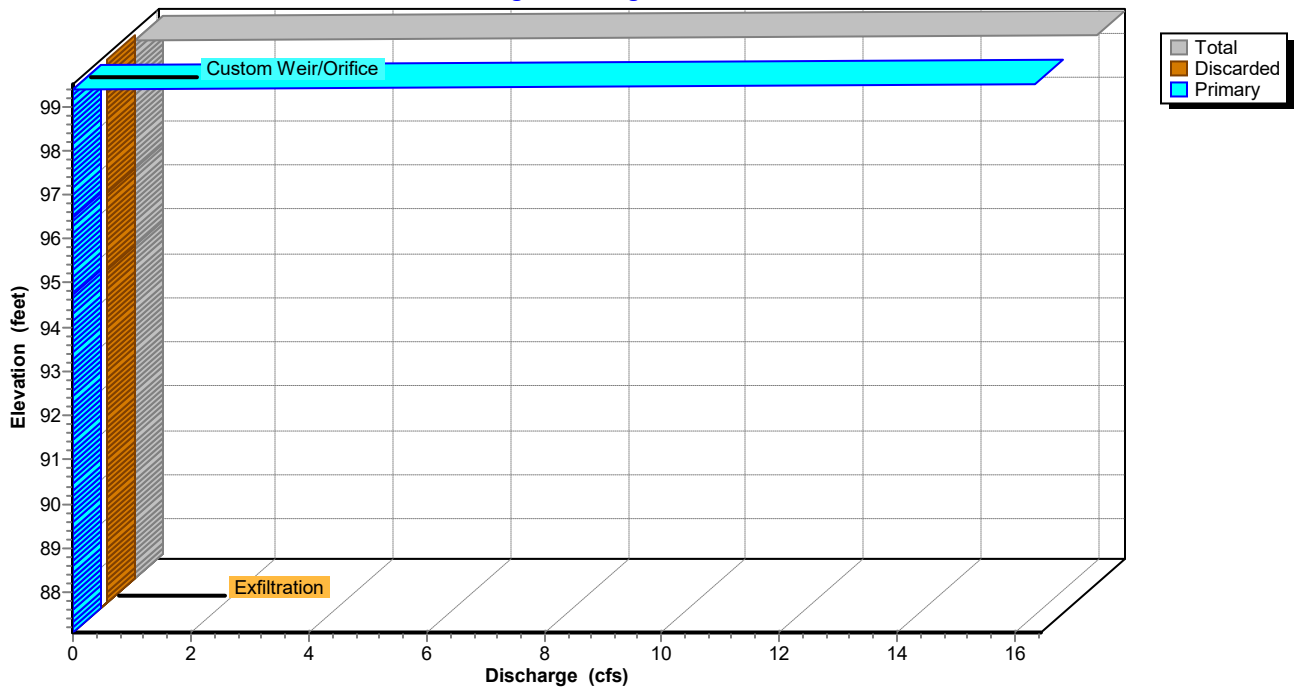
Pond 2P: LRB-2

Hydrograph



Pond 2P: LRB-2

Stage-Discharge



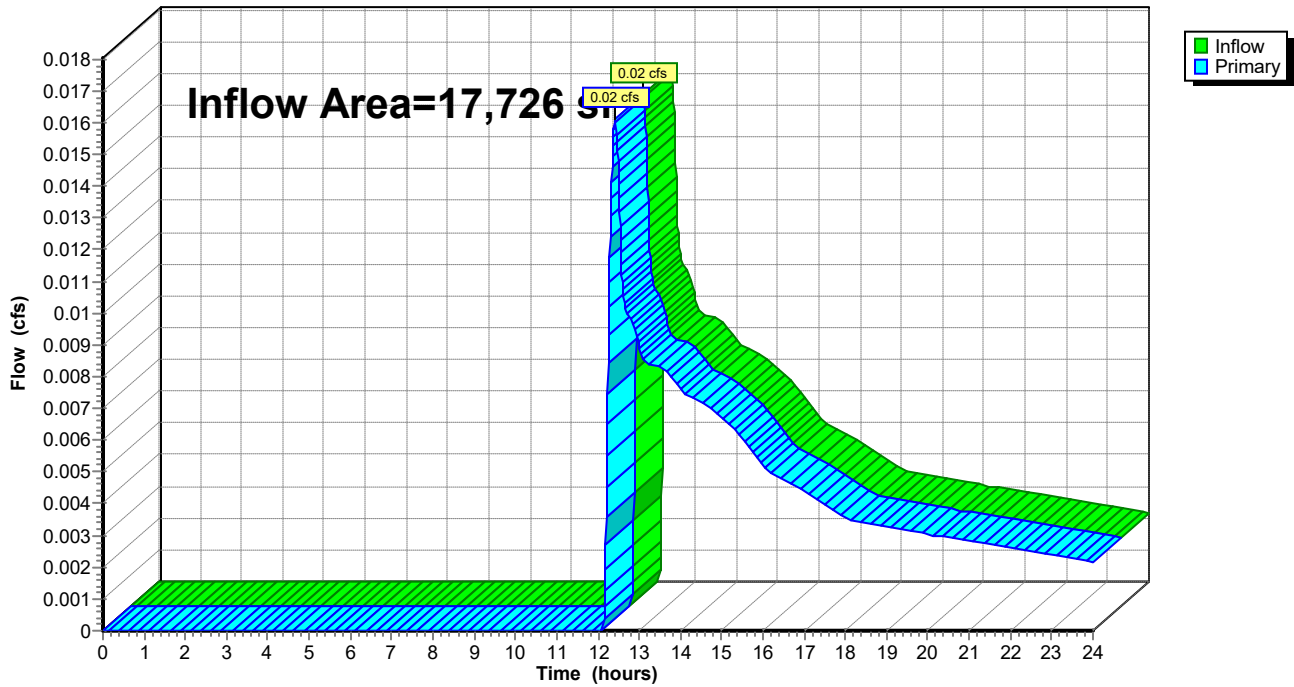
Summary for Link POA-1: POINT OF ANALYSIS 1

Inflow Area = 17,726 sf, 39.77% Impervious, Inflow Depth > 0.14" for 2-Yr event
Inflow = 0.02 cfs @ 12.42 hrs, Volume= 203 cf
Primary = 0.02 cfs @ 12.42 hrs, Volume= 203 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link POA-1: POINT OF ANALYSIS 1

Hydrograph



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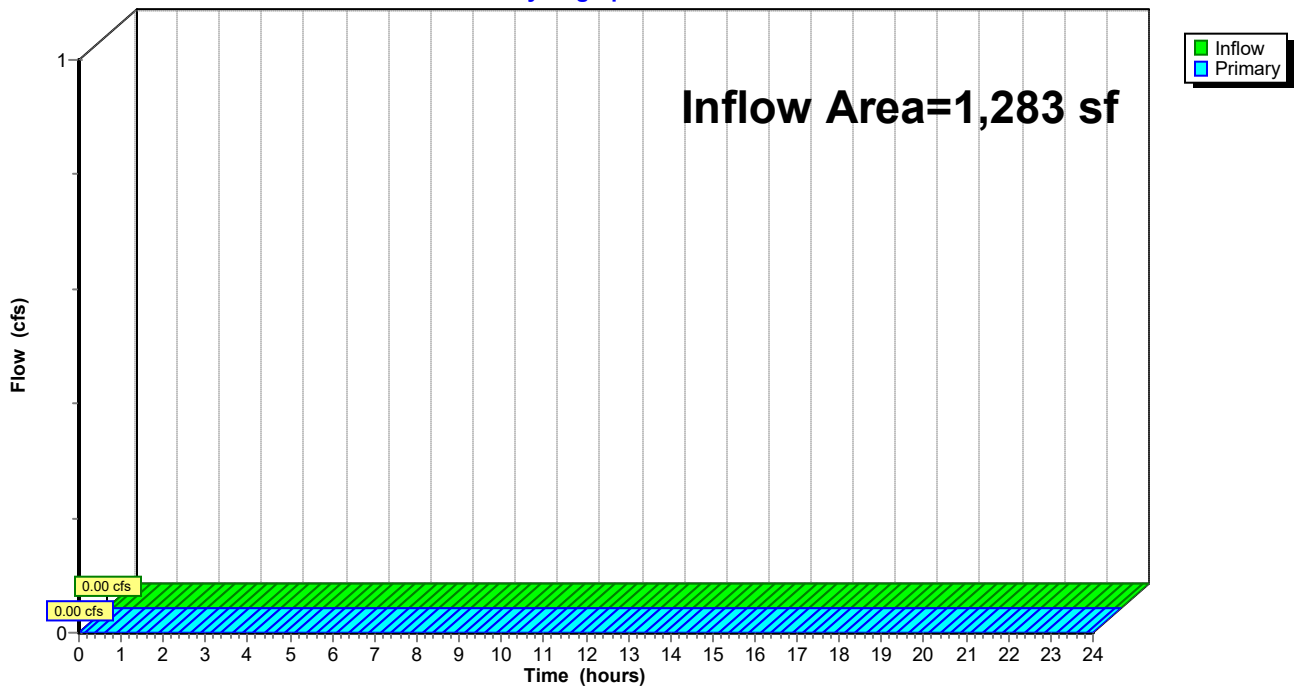
Summary for Link POA-2: POINT OF ANALYSIS 2

Inflow Area = 1,283 sf, 0.00% Impervious, Inflow Depth = 0.00" for 2-Yr event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link POA-2: POINT OF ANALYSIS 2

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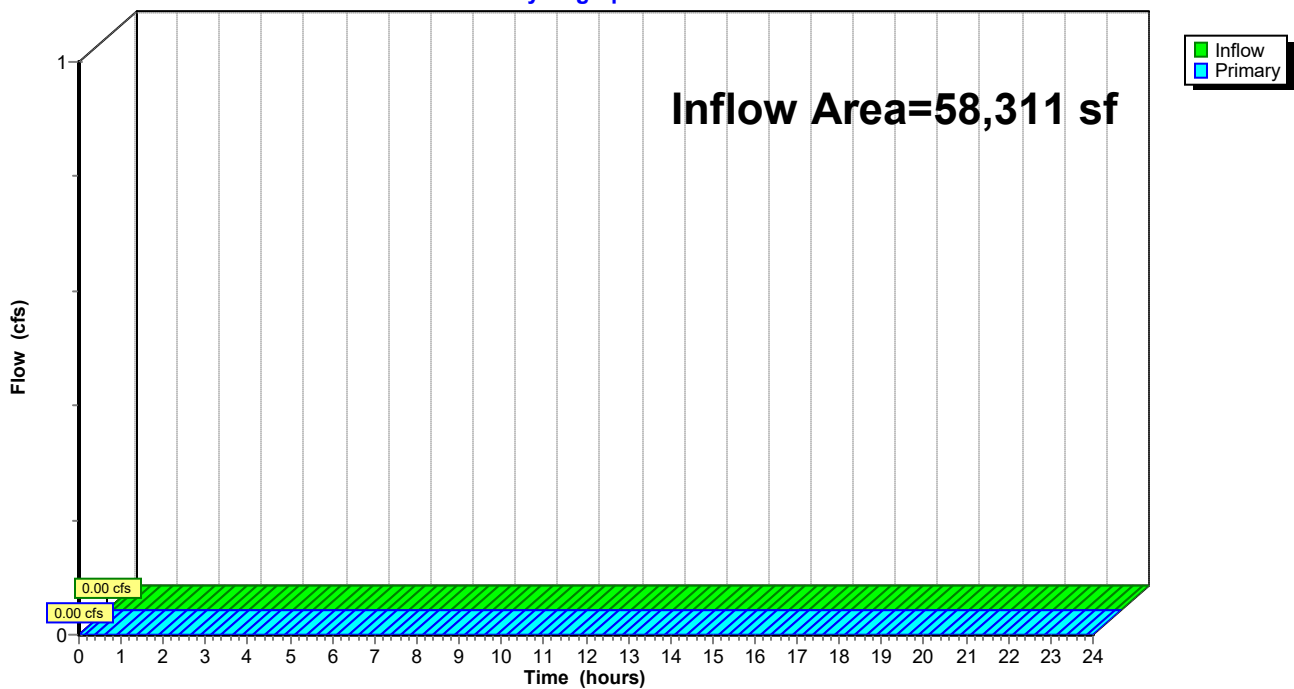
Summary for Link POA-3: POINT OF ANALYSIS 3

Inflow Area = 58,311 sf, 54.71% Impervious, Inflow Depth = 0.00" for 2-Yr event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link POA-3: POINT OF ANALYSIS 3

Hydrograph



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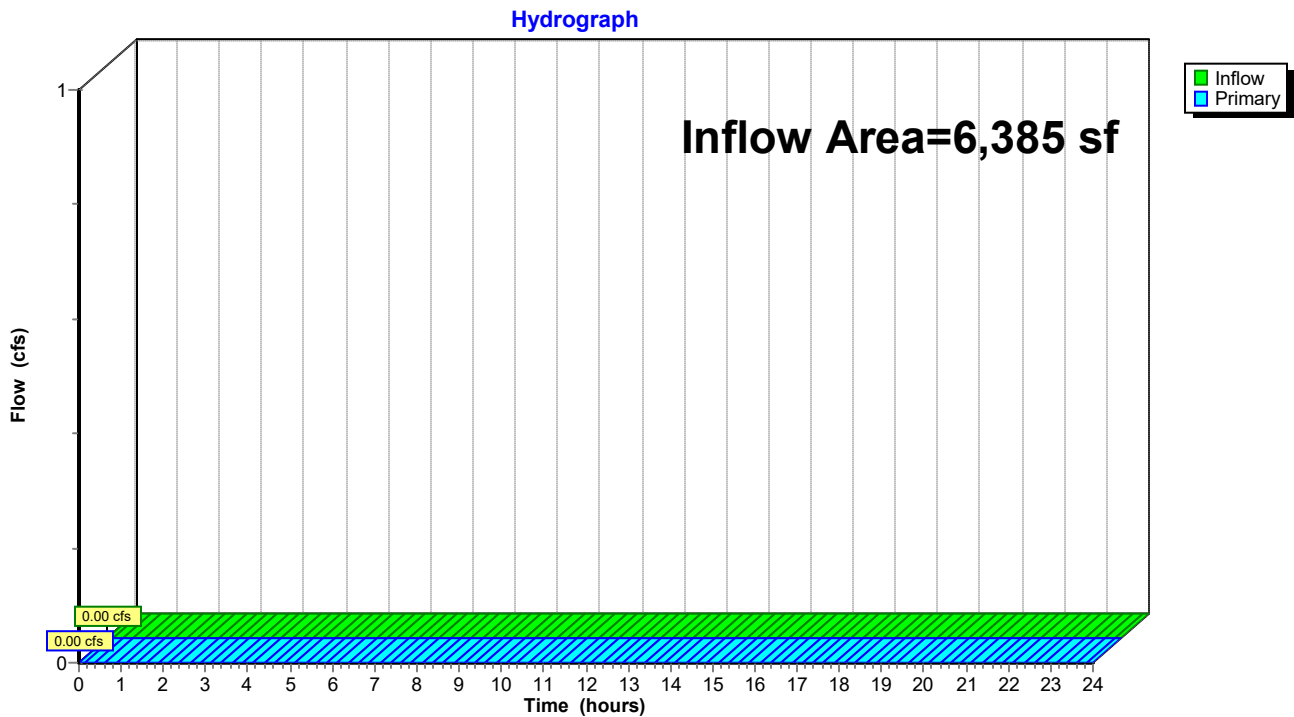
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Summary for Link POA-4: POINT OF ANALYSIS 4

Inflow Area = 6,385 sf, 0.00% Impervious, Inflow Depth = 0.00" for 2-Yr event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link POA-4: POINT OF ANALYSIS 4



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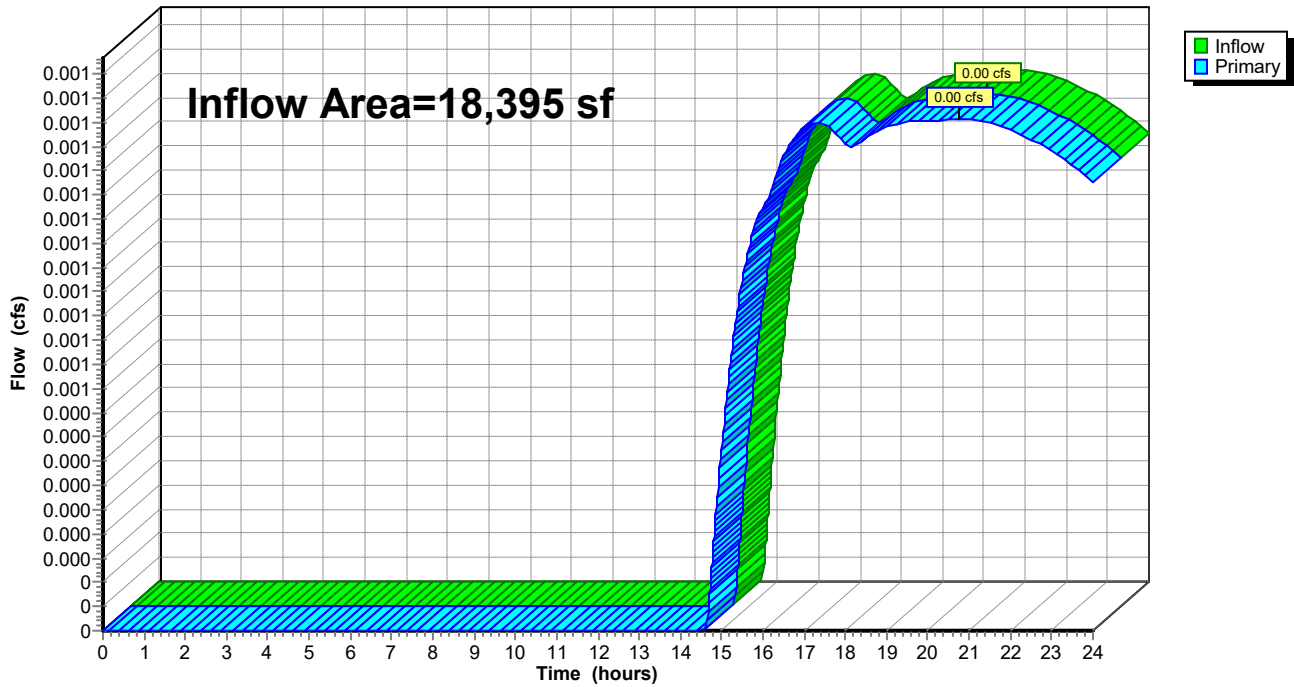
Summary for Link POA-5: POINT OF ANALYSIS 5

Inflow Area = 18,395 sf, 13.12% Impervious, Inflow Depth > 0.02" for 2-Yr event
Inflow = 0.00 cfs @ 20.74 hrs, Volume= 32 cf
Primary = 0.00 cfs @ 20.74 hrs, Volume= 32 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link POA-5: POINT OF ANALYSIS 5

Hydrograph



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Type III 24-hr 2-Yr Rainfall=3.44"

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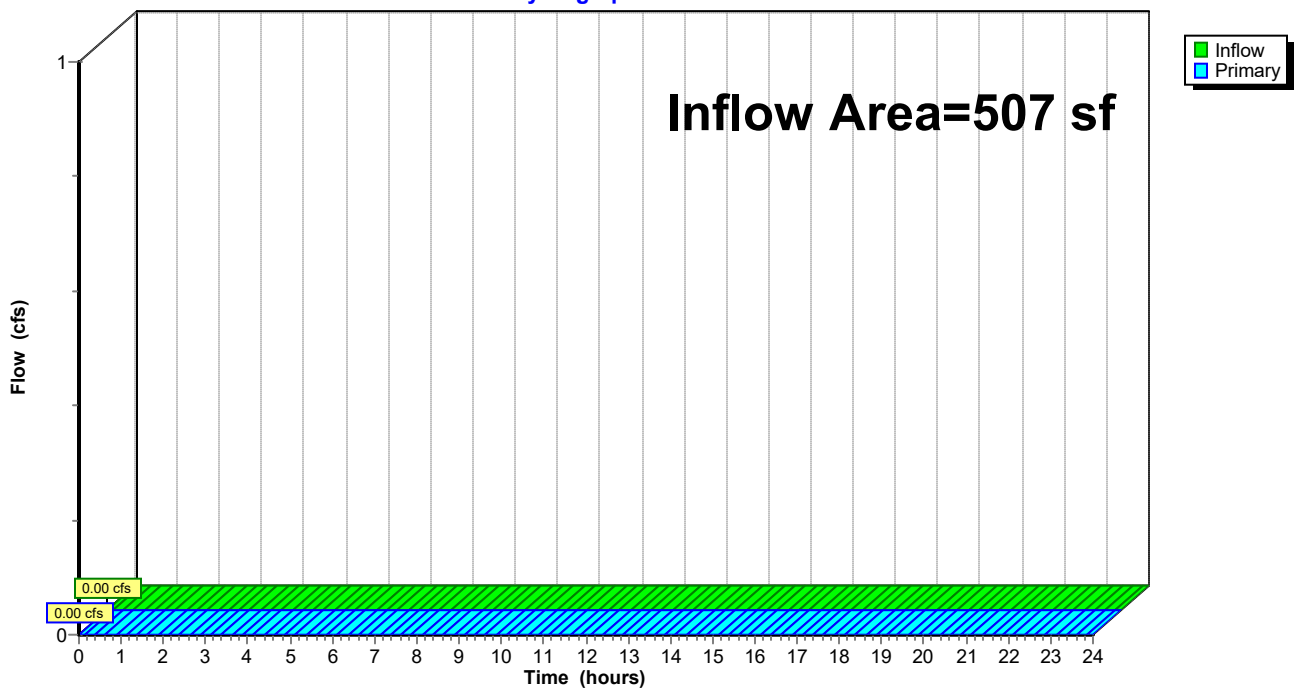
Summary for Link POA-6: POINT OF ANALYSIS 6

Inflow Area = 507 sf, 0.00% Impervious, Inflow Depth = 0.00" for 2-Yr event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link POA-6: POINT OF ANALYSIS 6

Hydrograph



Required Recharge		
NRCS Hydrologic Soil Type	Approximate Soil Texture	Target Depth Dactor (F) (in)
A	sand	0.6

Impervious Areas - LRB -1	
Type	Area (s.f.)
Pavement	0
Roofs	4,267
Total	4,267

Impervious Areas - LRB -2	
Type	Area (s.f.)
Pavement	31,720
Roofs	181
Total	31,901

Required Recharge Equation	
$R_v = F \times \text{impervious area}$	
Rv (LRB-1) =	213 c.f.
Rv (LRB-2) =	1,595 c.f.
Rv (total)	1,808 c.f.

Provided Recharge Volume (HydroCAD)		
Pv (LRB - 1)	707	c.f.
Pv (LRB - 2)*	2,560	c.f.
Pv (total)	3,267	c.f.

Provided > Required

Requirement is met

Draw Down Calculation (Static Method)	
$Time_{drawdown} = \frac{Rv}{(K)(Bottom\ Area)}$	
Rv = Required Recharge Volume	
k = Rawls Rate	8.27 (in/hr)
Bottom Area = Base area of structure	

Bottom Area			
Structure	B	L	Area (s.f.)
LRB - 1	10	20	200
LRB - 2	12	46	552

Draw Down Time		
Time (LRB-1) =	1.547884	hr
Time (LRB-2) =	4.192866	hr

Maximum allowable drawdown 72 hours

Requirement is met

Water Quality Equation		
$V_{WQ} = (D_{WQ} / 12 \text{ inches/foot}) * (A_{IMP} * 43,560 \text{ square feet/acre})$		
V _{WQ} = Required Water Quality Volume		
D _{WQ} = Water Quality Depth	0.083 ft	1" Required
A _{imp} = Impervious Area	36,168 s.f	
P _V = Provided Volume		

Required Water Quality Vol		
V _{WQ} =	3,002	c.f.
P _V	3,267	c.f.

1" required due to rapidly draining soils

Provided > Required

Requirement is met

INSTRUCTIONS:

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

Version 1, Automated: Mar. 4, 2008

Location:

TSS Removal Calculation Worksheet

B	C	D	E	F
BMP ¹	TSS Removal Rate ¹	Starting TSS Load*	Amount Removed (C*D)	Remaining Load (D-E)
Grass Channel	0.50	1.00	0.50	0.50
Infiltration Basin	0.80	0.50	0.40	0.10
	0.00	0.10	0.00	0.10
	0.00	0.10	0.00	0.10
	0.00	0.10	0.00	0.10

Total TSS Removal =

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

Project:
 Prepared By:
 Date:

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

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
 1. From MassDEP Stormwater Handbook Vol. 1

Appendix F – Operation and Maintenance Plan

OPERATION AND MAINTENANCE PLAN

**Grace Lighthouse Church
2703 Cranberry Highway (Route 28)
Wareham, MA 02571**

Construction of a New Church

Prepared by:



260 Cranberry Highway
Orleans, MA 02653

December 29, 2023

Prepared by DAV & DAP
Checked by SMR

Best Management Practices (BMPs) pursuant to the MA DEP Wetlands Protection Act and accepted design practice have been implemented and utilized for the project. The following information provided is to be used as a guideline for monitoring and maintaining the performance of the drainage facilities constructed as part of the site development. The structural Best Management Practices (BMPs) shall be inspected during rainfall conditions during the first year of operation to verify functionality. And to be inspected yearly.

Responsible Party

David Beguerie
3065 Cranberry Highway
Wareham, MA 02538

Town of Wareham Contact Information:

Municipal Maintenance
Dave Menard, Director of Municipal Maintenance
95 Charge Pond Road Wareham, MA 02571
Phone: (508)295-5300

Applied Stormwater Best Management Practices

The stormwater management system is designed to minimize the use of manmade conveyance structures (catch basins, manholes, pipes, etc...). Instead, the system was designed to utilize the topography to convey stormwater into the leaching basins via grass channels that will be planted with a native pollinator seed mix. This will not only provide a low impact stormwater system, but also provide a natural habitat for animals. The stormwater is designed to infiltrate most of the impervious surface runoff into the ground, promoting peak rate and volume attenuation, as well as water quality treatment.

The proposed stormwater management system consists of two grass channel swales that convey stormwater to two beehive grates set 6" above the lowest swale elevation. One of the grates is connected to a deep sump (4') catch basin that discharges into the sub surface infiltration basin. The other beehive is connected directly to the sub surface infiltration basin. The infiltration basin collects runoff from the entirety of the parking lot, and landscape areas. The system is located in the south easterly corner on the edge of the proposed parking lot. The infiltration system consists of 5 - 8' diameter precast concrete leaching chambers set in a bed of double-washed, crushed stone.

Additional roof drywell is proposed at the north westerly corner of the property and is only to receive clean runoff from the roof of the proposed modular building via gutters and conveyance pipe. The infiltration system consists of 1 - 8' diameter precast concrete leaching chambers set in a bed of double-washed, crushed stone.

Due to the parent soil texture and NRCS soil classification, an infiltration rate of 8.27 inches per hour was used in modeling this system based upon the Rawls table published in the DEP Stormwater Management Regulations and standard practice for soils classified as Hydrologic Soil Group A.

Maintenance

1. Infiltration System and Drywell— Proper maintenance of the subsurface infiltration system is essential to the long-term effectiveness of the infiltration function. The subsurface infiltration system shall have inspection ports and additional inspections should be scheduled during the first few months to ensure proper stabilization and function. Thereafter, they shall be checked semiannually and following heavy rainfalls, defined as a 1-year storm event exceeding 2.5 inches of rainfall within a twenty-four-hour period. Water levels in the chambers shall be checked to verify proper drainage. Ponding water in a chamber indicates failure from the bottom. If water remains within the chambers after 48-hours following a storm event, steps to restore the infiltration function shall be taken, as directed by a qualified stormwater management professional. To rectify the problem, accumulated sediment must be removed from the bottom of the chamber. The stone aggregate and filter fabric must be removed and replaced, and the underlying soil layer must be scarified to encourage proper

infiltration. Material removed from the system shall be disposed of in accordance with all applicable local, state, and federal regulations. Please refer to the Manufacturer's Manual for additional detail on proper inspection and maintenance of the ACF-R Tank chambers. Cost: The property owner should consult local landscape contractors for a detailed cost estimate.

2. The catch basins should be inspected or cleaned at least four times per year and at the end of foliage and snow removal seasons. Sediments must also be removed whenever the depth of deposits is greater than or equal to one half the depth of the sump.
3. The grass swales are to be cleared of trash and debris at all times. The accumulation of sediment is to be removed as needed using hand methods only. Swales are to be mown based on an as needed basis. The grass shall not exceed 6" nor be less than 4" in height. The swales are to be inspected at least semi annually for the first year, and yearly thereafter. Inspection shall be conducted for the health and growth of the grass, and any signs of erosion and the formation of rills and gullies. If the original grass cover is not successfully established, plant an alternate grass species.

Long Term Pollution Prevention Plan

- **Storage and disposal of Waste and Toxics:**

Failure to properly store hazardous materials dramatically increases the probability that they will end up in local waterways. Practices such as covering hazardous materials or even storing them properly, can have dramatic impacts.

The exterior storage of hazardous materials on site shall be prohibited. The following is a list of management considerations for hazardous materials as outlined by the EPA:

- Storing materials well away from high-traffic areas to reduce the likelihood of accidents that might cause spills or damage to drums, bags, or containers.
 - Stacking containers in accordance with the manufacturers' directions to avoid damaging the container or the product itself;
 - Storing containers on pallets or equivalent structures. This facilitates inspection for leaks and prevents the containers from coming into contact with wet floors, which can cause corrosion. This consideration also reduces the incidence of damage by pests.
- **Landscape Maintenance:**
- Using proper landscaping techniques can effectively increase the value of a property while benefiting the environment. These practices can benefit the environment by

reducing water use; decreasing energy use (because less water pumping and treatment is required); minimizing runoff of storm and irrigation water that transports soils, fertilizers, and pesticides; and creating additional habitat for plants and wildlife. The following lawn and landscaping management practices will be encouraged:

- Mow lawn areas at the highest recommended height.
 - Minimize lawn size and maintain existing native vegetation.
 - Abide by water restrictions and other conservation measures implemented by the Town of Wareham.
 - Water only when necessary.
 - Use automatic irrigation systems to reduce water use.
- Vehicle Washing:

This management measure involves educating the general public on the water quality impacts of the outdoor washing of automobiles and how to avoid allowing polluted runoff to enter the storm drain system. Outdoor car washing has the potential to result in high loads of nutrients, metals, and hydrocarbons during dry weather conditions in many watersheds, as the detergent-rich water used to wash the grime off our cars flows down the street and into the storm drain. The following management practices will be encouraged:

- Washing cars on gravel, grass, or other permeable surfaces.
- Blocking off the storm drain during car washing and redirecting wash water onto grass or landscaping to provide filtration.
- Using hoses with nozzles that automatically turn off when left unattended.
- Using only biodegradable soaps.
- Minimize the amounts of soap and water used. Wash cars less frequently.
- Promote use of commercial car wash services.

Appendix G – Construction Period - Operation and Maintenance Plan

CONSTRUCTION PERIOD OPERATION AND MAINTENANCE PLAN

**Grace Lighthouse Church
2703 Cranberry Highway (Route 28)
Wareham, MA 02571**

Construction of a New Church

Prepared by:



260 Cranberry Highway
Orleans, MA 02653

December 29, 2023

Prepared by DAV & DAP
Checked by SMR

Erosion and Sedimentation will be controlled at the site by utilizing Structural Practices, Stabilization Practices, and Dust Control. These practices correspond with plans entitled "Grace Lighthouse Church, Erosion and Sedimentation Control Plan, 2703 Cranberry Highway, Wareham, Massachusetts," dated December 29, 2023 and prepared by Coastal Engineering Company, Inc., hereinafter referred to as the Site Plans.

Responsible Party

David Beguerie
3065 Cranberry Highway
Wareham, MA 02538

Town of Wareham Contact Information:

Municipal Maintenance
Dave Menard, Director of Municipal Maintenance
95 Charge Pond Road Wareham, MA 02571
Phone: (508)295-5300

Emergency Contact Information:

Wareham Police Department
Phone: 508-295-1212
Emergency: 911

Wareham Fire Department
Phone: 508-295-2973
Emergency: 911

Massachusetts Department of Environmental Protection Emergency
Phone: 617-556-1133 Northeast Region
Phone: 978-694-3200 Wilmington Office

National Response Center
Phone: 800-424-8802

Municipal Maintenance
Dave Menard, Director of Municipal Maintenance
95 Charge Pond Road Wareham, MA 02571
Phone: 508-295-5300

Project Summary

The intent of the project is to construct a modular church building on a pile foundation with a parking lot and landscape features on the subject parcel (2.36 ac) at 2703 Cranberry Highway.

Site Description

The site is currently vacant with remanence of a parking lot, fences, and miscellaneous utilities. During the summer season the lot is used to host outdoor sermons in a temporary tent.

Existing utilities serving the parcel are limited to water and electricity. Public sewer is not available within the project area.

The existing topography is relatively flat with a minimum elevation 99.4' and maximum elevation of 102.7

There are no wetland resource areas that are jurisdictional under both MA DEP Wetland Protections Act and town of Wareham Wetlands Protection Bylaw.

Currently, there are no stormwater management practices capturing site runoff employed on the property and the majority of runoff flows uncontrolled toward the abutting properties.

Erosion and Sediment Control Practices

Structural Practices:

- **Sediment Silt Sock Barrier Controls** – A sediment silt sock barrier will be constructed along downward slopes at the limit of work in locations shown on the plans. This control will be installed prior to major soil disturbance on the site. The sediment silt sock should be installed as shown on the Erosion Control Detail Plan.

Sediment Silt Sock Design/Installation Requirements

- I. Locate the silt sock where identified on the plans.
- II. The silt sock line should be nearly level through most of its length to impound a broad, temporary pool. The last 10 to 20 feet at each end of the silt sock should be swung slightly uphill (approximately 0.5 feet in elevation) to provide storage capacity.
- III. The silt sock shall be staked every 8 linear feet with 1-inch by 1-inch stakes.
- IV. Sediment silt socks should be removed when they have served their useful purpose, but not before the upslope area has been permanently stabilized through one growing season. Retained sediment must be removed and properly disposed of, or mulched and seeded.

Sediment Silt Sock Inspection/Maintenance

- I. Silt socks should be inspected immediately after each rainfall event of 1-inch or greater, and at least daily during prolonged rainfall. Inspect the depth of sediment, fabric tears, and to see that the stakes are firmly in the ground. Repair or replace as necessary.
- II. Remove sediment deposits promptly after storm events to provide adequate storage volume for the next rain and to reduce pressure on the sock. Sediment will be removed from behind the silt sock when it becomes about ½ foot deep at the silt sock. Take care to avoid undermining the sock during cleanout.
- III. If the fabric tears, decomposes, or in any way becomes ineffective, replace it immediately.

Remove staking only after the contributing drainage areas have been properly stabilized. Sediment deposits and silt sock materials remaining after stakes have been removed should be graded to conform to the existing topography and vegetated.

- **Stabilized Construction Entrance** – A stabilized construction entrances will be placed at the entrance. The stabilized construction entrances will be installed immediately after the clearing and grubbing of the site entrance and associated roadway cut/fill to maintain access to the site are completed. The construction entrance will keep mud and sediment from being tracked off the construction site by vehicles leaving the site. The stabilized construction entrances shall be constructed as shown on the Erosion Control Plan.

Construction Entrance Design/Construction Requirements

- I. Stone for a stabilized construction entrance shall consist of 1 to 3-inch stone placed on a stable foundation.
- II. Pad dimensions: The minimum length of the gravel pad should be 50 feet. The pad should extend the full width of the proposed roadway, or wide enough so that the largest construction vehicle will fit in the entrance with room to spare; whichever is greater. If a large amount of traffic is expected at the entrance, then the stabilized construction entrance should be wide enough to fit two vehicles across with room to spare.
- III. A geotextile filter fabric shall be placed between the stone fill and the earth surface below the pad to reduce the migration of soil particles from the underlying soil into the stone and vice versa. The filter fabric should be Amoco woven polypropylene 1198 or equivalent.
- IV. Washing: If the site conditions are such that most of the mud is not removed from the vehicle tires by the gravel pad, then the tires should be washed before the vehicle enters the street. The wash area should be a level area with 3-inch washed stone minimum, or a commercial rack.
- V. Water employed in the washing process shall be directed to a sediment trap or approved sediment-trapping device prior to discharge to a temporary sedimentation basin along side the site entrance drive. Sediment should be prevented from entering any watercourses.

Construction Entrance Inspection/Maintenance

- I. The entrance should be maintained in a condition that will prevent tracking or flowing of sediment onto the street. This may require periodic topdressing with additional stone.

- II. The construction entrance and sediment disposal area shall be inspected weekly and after heavy rains or heavy use.
- III. Mud and sediment tracked or washed onto public road shall be immediately removed by sweeping.
- IV. Once mud and soil particles clog the voids in the gravel and the effectiveness of the gravel pad is no longer satisfactory, the pad must be toppedressed with new stone. Replacement of the entire pad may be necessary when the pad becomes completely clogged.
- V. If washing facilities are used, the sediment traps should be cleaned out as often as necessary to assure that adequate trapping efficiency and storage volume is available.
- VI. The pad shall be reshaped as needed for drainage and runoff control.
- VII. Broken road pavement on the access street shall be repaired immediately.
- VIII. All temporary erosion and sediment control measures shall be removed within 30 days after final site stabilization is achieved or after the temporary practices are no longer needed. Trapped sediment shall be removed or stabilized on site. Disturbed soil areas resulting from removal shall be permanently stabilized.

- **Inlet Protection** – Inlet Protection will be utilized around the catch basin grates. The inlet protection will allow the storm drain inlets to be used before final stabilization. This structural practice will allow early use of the drainage system if the detention basin is already stabilized. Siltsack or equivalent will be utilized for the inlet protection. Siltsack is manufactured by ACF Environmental. Regular flow siltsack will be utilized, and if it does not allow enough storm water flow, hi-flow silt sack will be utilized.

Silt Sack (or equivalent) Inlet Protection Inspection/Maintenance Requirements

- I. All trapping devices and the structures they protect should be inspected after every rainstorm and repairs made as necessary.
- II. Sediment should be removed from the trapping devices after the sediment has reached a maximum depth of one-half the depth of the trap.
- III. Sediment should be disposed of in a suitable area and protected from erosion by either structural or vegetative means. Sediment removed shall be disposed of in accordance with all applicable local, state, and federal regulations.
- IV. The silt sack must be replaced if it is ripped or torn in any way.
- V. Temporary traps should be removed and the area repaired as soon as the contributing drainage area to the inlet has been completely stabilized.

Stabilization Practices:

Stabilization measures shall be implemented as soon as practicable in portions of the site where construction activities have temporarily or permanently ceased, but in no case more than 14 days after the construction activity in that portion of the site has temporarily or permanently ceased, with the following exceptions.

Where the initiation of stabilization measures by the 14th day after construction activity temporary or permanently cease is precluded by snow cover, stabilization measures shall be initiated as soon as practicable.

Where construction activity will resume on a portion of the site within 21 days from when activities ceased, then stabilization measures do not have to be initiated on that portion of the site by the 14th day after construction activity temporarily ceased

- **Temporary Seeding** – Temporary seeding will allow a short-term vegetative cover on disturbed site areas that may be in danger of erosion. Temporary seeding will be done at stockpiles and disturbed portions of the site where construction activity will temporarily cease for at least 21 days. The temporary seedings will stabilize cleared

and unvegetated areas that will not be brought into final grade for several weeks or months.

- **Dust Control** – Dust control will be utilized throughout the entire construction process of the site. For example, keeping disturbed surfaces moist during windy periods will be an effective control measure, especially for construction haul roads. The use of dust control will prevent the movement of soil to offsite areas. However, care must be taken to not create runoff from excessive use of water to control dust. The following are methods of Dust Control that may be used on-site:
 - Vegetative Cover – The most practical method for disturbed areas not subject to traffic.
 - Calcium Chloride – Calcium chloride may be applied by mechanical spreader as loose, dry granules or flakes at a rate that keeps the surface moist but not so high as to cause water pollution or plant damage.
 - Sprinkling – The site may be sprinkled until the surface is wet. Sprinkling will be effective for dust control on haul roads and other traffic routes.
 - Stone – Stone will be used to stabilize construction roads; will also be effective for dust control.