STORMWATER MANAGEMENT REPORT

MAILLET, SOMMES & MORGAN LAND
0 WILLOW ST and 0 LOWELL ST
Reading, MA

Prepared for:

Town of Reading Engineering Department
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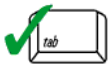
Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

A. Introduction

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



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

The Stormwater Report must include:

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

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

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

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

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

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

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

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

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

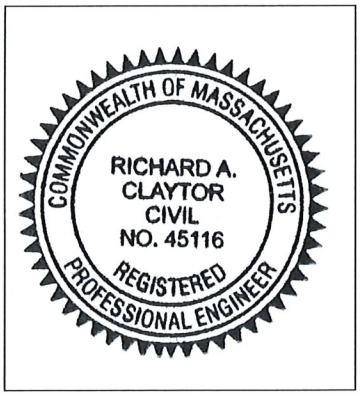
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the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

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

Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature



5-28-2021

Signature and Date

Checklist

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

☐ New development

☒ Redevelopment

☐ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

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

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

Standard 1: No New Untreated Discharges

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

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

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

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

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

Standard 3: Recharge

☒ Soil Analysis provided.

☐ Required Recharge Volume calculation provided.

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

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

☐ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

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

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

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

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

☒ Site is comprised solely of C and D soils and/or bedrock at the land surface

☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000

☐ Solid Waste Landfill pursuant to 310 CMR 19.000

☒ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

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

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

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

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

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

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

Standard 4: Water Quality

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

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

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

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

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

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

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

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

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

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

☐ All exposure has been eliminated.

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

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

Standard 6: Critical Areas

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

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

Checklist for Stormwater Report

Checklist (continued)

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

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

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

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

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

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

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

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

Standard 9: Operation and Maintenance Plan

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

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

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

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

Standard 10: Prohibition of Illicit Discharges

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

☐ An Illicit Discharge Compliance Statement is attached;

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

STORMWATER MANAGEMENT REPORT

MAILLET, SOMMES & MORGAN LAND
0 Willow Street and 0 Lowell Street
Reading, MA

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1.0 STORMWATER AND DRAINAGE NARRATIVE

The Stormwater Analysis and Drainage Report provides a summary of the stormwater management systems proposed for the Maillet, Sommes and Morgan Land, known as the Maillet Conservation Land, at 0 Willow Street and 0 Lowell Street, Reading, MA. The main goals for this project are to: manage and treat stormwater runoff from Lowell Street prior to entering the Aberjona River, address flooding upstream and downstream of the site, improve pedestrian and vehicular access to the conservation area, and create amenities and educational opportunities for visitors.

The primary proposed stormwater management system is a constructed wetland with pretreatment sediment forebays and a series of wet pools with a variety of vegetation at a various depths. A smaller pretreatment forebays will manage the access drive and proposed parking area. This green stormwater infrastructure (GSI) system is designed within the upland areas, with the exception of a single crossing for a reverse sloped pipe between proposed wetland pools and a 10-ft wide boardwalk crossing. A system of permeable pathways and boardwalks will allow access for pedestrians and bicyclists to enjoy the views of the Aberjona River and wetland areas. The project also aims to provide public outreach on both the value of the natural resources and the benefits of stormwater management practices using interpretive signage, overlook areas, and other creative components to engage the community.

The proposed stormwater constructed wetland is a retrofit to improve treatment of runoff from existing impervious surfaces draining to Lowell Street as well as managing flood waters from upstream areas off of the Aberjona River. It was designed in accordance with the Massachusetts Stormwater Management Standards (MASMS), as described in Massachusetts Stormwater Handbook, Volume 1 Chapter 1, as a redevelopment project. The proposed best management practices (BMPs) are designed to capture and treat the first one inch of runoff, as required in the MASMS. Construction and post-construction operation and maintenance (O&M) plans have been created and will be refined upon the completion of the design. The post-construction plan is attached as a separate document to this stormwater report.

1.1 Existing Conditions

The Maillet Conservation Land is located in the upper watershed of the Aberjona River. The project site is a 5.5-acre site accessed directly off of Willow Street on the north side of property by an existing access drive and off of Lowell Street to the east via a cleared pedestrian path. The site is bounded to the north by residential homes, to the west by an MBTA railroad, to the south by the Aberjona River and to the east by Lowell Street. The site has an existing dirt trail that connects the Willow Street and Lowell Street access points as well as a dirt trail coming from Hunt Street. Refer to **Figures 1 and 2**.

The general topography of the project site varies between 100 feet at the top of the site near Willow Street to 85 feet at the existing resource areas.

1.1.1 Soils Data

Soils data from the Natural Resources Conservation Service (NRCS) indicate that the soils within the project site are Freetown Muck (0 to 1% slopes), Canton-Charlton-Urban land complex (3 to 15% slopes), and Merrimac-Urban land complex (0 to 8% slopes). See **Appendix A** and **Figure 3** for further information.

Soil borings were conducted at the site on April 19th, 2021, to confirm soil textures and groundwater conditions in the locations of the proposed GSI. Four soil borings were located in the open space with access from Willow Street. Borings 1, 2, and 4 were advanced to a total depth of 17 ft with split spoon samples at 5-ft intervals. Boring 3 was advanced to 15 ft with continuous split spoon sampling. Wet soil was observed between 5 ft and 7 ft below surface grade in Borings 1, 2, and 3. Boring 4 had wet soil between 10 ft and 12 ft below grade. Soils in all borings were generally fine silty sand. Dense well-mixed sand/silt/gravel material was observed at depths starting at 10 ft below grade. See **Appendix B** for the soil boring logs and **Figure 3** for the boring locations.

HW installed one two-inch PVC tube as a piezometer at Boring 3 on April 22nd to establish long-term groundwater monitoring wells. Within the two-inch tube, HW installed a pressure transducer to record hourly readings. The pressure transducer was retrieved after three weeks of monitoring for initial data analysis and was subsequently reinstalled for further data collection. HW staff measured depths to water levels to calibrate collected data upon installation and retrieval. Depth measurements of groundwater levels were between 4.36 ft and 4.53 feet below the ground surface, which is approximately elevation 84.5. Data will continue to be collected through early summer 2021 to verify the groundwater elevation.

1.1.2 Resource Areas

According to the most recent Massachusetts Natural Heritage Atlas (Massachusetts Natural Heritage & Endangered Species Program or NHESP), the project site does not have habitat areas for rare or endangered species or vernal pools. The area is not located within a FEMA Flood Hazard Zone (**Figure 4**).

The resource areas were delineated by Weston & Sampson in November 2020. The wetland resource areas include Bordering Vegetated Wetlands (BVWs) located in the interior of the parcel, generally bisecting the upland areas. BVW also exists along the Aberjona River. The wetland scientists also flagged top of bank ("bank") in discontinuous flag lines due to the nature of the stream. The United States Geographical Survey (USGS) map identifies it as a perennial stream and USGS Stream Stats indicates that it is greater than the 0.5 square mile threshold for a perennial stream. However, the river along this parcel has been determined by the Conservation Commission as intermittent stream due to the seasonal low flows observed under historical conditions. A 100-foot buffer zone is associated with the BVW area while a 200-foot buffer zone is associated with the bank, identified as Riverfront Area. Existing resource areas are indicated on **Figure 5**.

Both resource areas and the buffer zone support non-native invasive and nuisance or weedy species, the most prevalent of which is Japanese knotweed (*Fallopia japonica*), found most predominantly in the western part of the site and in areas along the Aberjona River. Other

invasive species identified include Black locust (*Robinia pseudoacacia*), Norway maple (*Acer platanoides*), common buckthorn (*Rhamnus cathartica*), grey willow (*Salix cinerea*), and a single Amur cork tree (*Phellodendron amurense*). Other non-native species observed at the project site include clumps and individuals of multiflora rose (*Rosa multiflora*), Japanese barberry (*Berberis thunbergii*), winged euonymus (*Euonymus alatus*), honeysuckle (*Lonicera* sp.), Oriental bittersweet (*Celastrus orbiculatus*), and carpets of garlic mustard (*Alliaria petiolata*).

Native species diversity and abundance is low within resource areas at the project site, although the adjacent shrub swamp supports a more robust native plant community with the exception of patches of common reed (*Phragmites australis*). Significant sediment deposits are visible within the river channel.

1.1.3 Existing Wildlife Habitat Observations

Vegetation at the site is predominantly invasive plants, particularly in wetland resource areas and buffer zone, which diminishes the habitat values for local wildlife. Japanese knotweed is the most prevalent invasive plant and is found in both wetland and upland areas at the project site. Evidence of its management was observed in the open field in the western part of the site. In addition, many of the native shrubs have been overtaken by invasive plants. In addition, HW observed areas of dumping (soil, gravel, rocks, and other debris) in the eastern part of the site adjacent to the river. Native trees observed at the site include cherry, red maple, ash. HW observed scattered woody debris, piled rocks, and fallen logs, as well as a few snags (upright dead trees), which provide habitat niches for local wildlife species. HW heard and/or observed many bird species within the adjacent shrub swamp and observed two larger predatory birds within the project site (broad-winged and red-tailed hawks).

1.1.4 Drainage Description

The existing local contributing drainage area to the site coming from Lowell Street and Willow Street is approximately 2,157,500 SF (49.5 acres). The site itself and portions of offsite lots are composed of mainly permeable surfaces and resource areas while the contributing drainage area is comprised of roads) and residential lots. The total impervious cover is roughly 13.5 acres (27%) comprising of roofs, roadways, while the remaining 36 acres is pervious area consisting of woods within the Maillet Conservation Land (5.5 acres), lawns and other open space. Currently stormwater runoff from Lowell Street and Willow Street enters the resource areas through two reinforced concrete pipes (RCPs) (12-inch and 18-inch) that discharge into the Aberjona River untreated at the Lowell Street culvert. During field observations, HW staff noted that the water level of the Aberjona was up to 50% of the pipe depth. Sediment deposits at the culvert were estimated to be between 6 to 12 inches in depth.

The larger regional contributing drainage area coming through the site via the Aberjona River, including the local drainage, is of approximately 400 acres, of which approximately140 acres (35%) is impervious.

There are two culverts which define the upstream and downstream sections of the Aberjona River at the site. At the upstream end of the site, a 6’-5” wide X 36” tall reinforced concrete box culvert connects the Aberjona River underneath Lowell Street. The upstream culvert has three

inlets from closed drainage networks: one from a catch basin that inlets directly above the culvert, and two from RCP pipes (12-inch and 18-inch) that inlet from the drainage system along Lowell Street. At the downstream end of the site, the Aberjona River is culverted underneath the Haverhill Line of the MBTA Commuter Rail.

1.2 Proposed Conditions

The proposed project consists of the following site development improvements:

- Sediment forebays for pretreatment of runoff from Lowell Street
- Stormwater constructed wetland system;
- Improved access road and parking lot area;
- A sediment forebay for managing and pretreating runoff from the new parking area and improved access driveway;
- Improved trail system, including an 8-ft wide permeable path with 2-ft shoulders, boardwalks and overlooks as well as a 5-ft wide mulched path;
- Improved buffers to resource areas through invasive species management and native landscaping; and
- Interpretive signage and wayfinding to enhance public access and provide educational outreach opportunities.

The proposed GSI practices for the proposed site were designed to fit into the existing site with minimal impact to the environmental resource areas while maximizing the water quality benefits. The systems are described further below in Section 1.3. The systems were designed in accordance with the MASWMS.

1.3 Stormwater Management

The proposed stormwater management includes an approach to capture, treat, and detain runoff by using the following BMPs.

Pretreatment - Sediment Forebays

Porous sediment forebays are provided for pretreatment of the surface water runoff from the proposed impervious surfaces to allow for sediment to settle from the incoming stormwater runoff prior to conveyance to the stormwater constructed wetland.

Stormwater Constructed Wetland

The stormwater constructed wetlands manage and treat stormwater by allowing settling of sediments and filtering the stormwater through a mix of native vegetation. The system consists of an inflow component, a series of pools of varying depths with a reverse slope pipe and stone channel to allow for equilibrium between pools, and overflow spillways.

Stormwater is designed to be directed to the stormwater constructed wetland off of Lowell Street through a diversion structure. High flows from the Aberjona River during storm events equal to or greater than the 50-year return period will be directed to the stormwater constructed wetland

through a graded opening in the existing bank, roughly at elevation 86.5 feet. Additional stormwater runoff from Willow Street, the access path and proposed parking area will be directed to the stormwater constructed wetland through an opening in the parking lot curb.

1.4 Drainage Areas and Design Methodology

The drainage design was completed by performing a series of tasks that included:

- Preliminary overall assessment of the contributing drainage areas;
- Determining the total drainage areas, land coverage and individual subcatchments within the project area;
- Sizing the GSI practices;
- Modeling the proposed drainage network with HydroCAD® software.

Existing and proposed drainage area maps are provided in **Appendix C**.

The existing conditions drainage analysis focused on the area within the project site. A pre and post analysis of the runoff generated with the project area was completed. The existing drainage area is approximately 2,157,500 SF (49.5 acres) and is comprised of three subcatchments. The subcatchments are:

- **DA 1**: This is a 4.8-acre (48% impervious) subcatchment comprised of residential drainage along Willow Street and a small portion of Lowell Street northwest of the Aberjona River;
- **DA 2**: This is a 7.2-acre (15.9% impervious) subcatchment comprised of drainage from the rear of the residential lots along Willow Street as well as the Maillet Conservation Land;
- **DA 3**: This is a 37.5-acre (26.8% impervious) subcatchment comprised of drainage from Lowell Street southeast of the Aberjona River, as well as abutting streets and residential lots upgradient of Lowell Street.

The proposed project drainage area is the same as existing conditions at 49.5 acres and is comprised of six subcatchments along the same overall drainage boundary as that of the existing drainage area. Proposed subcatchments DA 1 and DA 3 are unchanged relative to existing conditions. DA 2 is split into four separate subcatchments to be able to approximate the flows to the constructed wetland cells and the existing BVW:

- **DA 2A** (3.1 acres, 25.8% impervious) is the northeast portion of DA 2 that will drain overland to the forebays.
- **DA 2B** (1.2 acres, 24.6% impervious), which currently drains to the BVW will continue to drain directly to the BVW.
- **DA 2C** (2.79 acres, 24% impervious) is the southwest portion of DA 2 that will drain directly to the west constructed wetland pools.
- **DA 2D** (0.16 acres, 100% impervious) is the access road and parking area off of Willow Street.

Based on the proposed design, DA 2 will have an increase in impervious cover associated with the proposed parking area (designated as DA 2A) and the permanent pools of the constructed stormwater wetlands. However, the proposed native plantings and trees and wetland restoration for the site will provide root systems to better manage runoff and support filtration and uptake at the site.

The GSI practices were sized to treat the first one inch of contributing runoff for water quality**.** Sizing calculations for the constructed wetland are provided in **Appendix D**. Sizing and runoff conditions were evaluated for the 2-, 10-, 25- and 100-year 24-hour Type III storm events for pre- and post-development conditions for the project area to demonstrate that the proposed improvements will reduce peak flows and volumes. Updated rainfall values from the NRCC Extreme Precipitation for New England database were utilized for this analysis to better account for changing climate patterns than the formerly used and outdated Rainfall Frequency Atlas of the United States (TP40). The 10-year and 100-year 24-hour climate events estimated for 2070 were also evaluated to confirm benefits and vulnerabilities to future climate conditions. The 2070 design storm was based on data provided in the Cambridge Climate Change Vulnerability Assessment Report (City of Cambridge, 2015). Rainfall depths used for existing and proposed conditions are provided in **Table 1**.

Table 1. Summary of 24-hour, Type III design storms

Storm Frequency	Depth, in
2-Year	3.22
10-Year	4.89
25-Year	6.22
10-Year (2070)	6.38
100-Year	8.94
100-Year (2070)	11.70

Existing and proposed conditions for the project area and the larger contributing drainage area were modeled using HydroCAD software, which combines USDA Soil Conservation Service hydrology and hydraulic techniques (commonly known as SCS TR-55 and TR-20) to generate hydrographs. A summary of the existing and proposed conditions at the intermittent stream (SP-1) are shown in **Table 2**. The complete pre and post HydroCAD analyses for the project area are included in **Appendix E** of this report.

Table 2. Summary of Pre- and Post-development flow rates and volumes for Maillet Conservation Land

SITE		Flow, cfs					Volume, acre-ft				
		2-yr	10-yr	25-yr	100 - yr	10-yr (2070)	2-yr	10-yr	25-yr	100 - yr	10-yr (2070)
SP 1	PRE	7.21	25.52	49.52	110.04	53.12	1.226	3.610	6.114	12.405	6.488
	POST	0.00	9.90	29.92	74.63	32.71	0.000	0.277	1.159	3.809	1.301
Difference	**%**	100	61.2	39.6	32.2	38.4	100	92.3	81	69.3	79.9
SP 2	PRE	7.21	27.61	55.13	125.55	59.29	1.292	3.968	6.818	14.042	7.245
	POST	6.16	23.88	54.91	127.22	59.48	1.320	4.108	7.041	14.412	7.479
Difference	**%**	14.6	13.5	0.4	-1.3	-0.3	-2.2	-3.5	-3.3	-2.6	-3.2

1.5 General Construction Sequence

A summary of the general sequence of site work construction activities is as follows:

1. A pre-construction kick-off meeting will be held on-site with the owner, engineer, and contractor to review the project schedule and to establish proper lines of communication prior to the commencement of the work.
2. Survey and stake the proposed limit of disturbance and the limit of sedimentation barriers. Install temporary fencing and establish tree protection as indicated on drawings.
3. Place sedimentation barriers (silt fence, silt socks, etc.) as indicated on drawings and staked out in the field. Under no circumstances is the limit of work to extend beyond the sedimentation barriers/limit of disturbance, as indicated on drawings.
4. Existing utility information was limited, confirm all existing utilities prior to any excavation through Dig-Safe and if necessary, the use of Ground Penetrating Radar.
5. Begin clearing the site as required.
6. Survey and stake stormwater management areas and drainage lines.
7. Sawcut and remove existing pavement as indicated.
8. Excavate and rough grade the proposed stormwater constructed wetland and any additional temporary basins necessary to control site runoff and sediments.
9. Begin rough grading for roadways and parking areas. Bring rough grading to proper elevations as soon as practicable. Coordinate work to minimize time soils are un-stabilized.
10. Install drainage pipes and drainage structures. Begin work at the stormwater management areas and progress up-gradient. Protect discharge outlets with rip-rap aprons. The stormwater management areas are to be protected from sedimentation with silt fence and/or silt socks until all un-stabilized areas are stabilized with stone sub-base or vegetation. Install sediment barriers at all points of entry into the drainage network. Keep the existing drainage infrastructure online until engineer has approved stormwater management area construction.
11. Permanently seed all disturbed areas outside of the area to be paved or planted.

12. Upon completion of underground drainage installation, place compacted gravel foundation and rough grade the roadways/parking areas in accordance with the site plans and in accordance with applicable state and local regulations as soon as possible.
13. Begin road and parking construction per site plans and in accordance with applicable state and local regulations. Roads and parking areas are not to be paved until the entire permanent drainage system has been installed and all pipe connections complete.
14. Finish permanent stabilization. Complete permanent stormwater management area seeding and planting after the contributing area to the basin has reached a minimum of 80% stabilization and is no longer required as a construction sedimentation basin.
15. Complete all remaining planting and seeding.
16. Sweep pavement to remove all sediments.
17. Repair drainage outlets and GSI practice areas as required. Clean and flush all drainage structures and pipes at the end of construction to remove all accumulated sediments in the stormwater management areas. Contractor must inspect the drainage network and repair any damage immediately.
18. Upon approval, convert catch basin cover to solid grate & remove silt sack and silt sock as required.
19. Complete all remaining planting and seeding. Install GSI plantings as indicated on the drawings.
20. Install all site furnishings (signage, benches, etc.).
21. Engineer to approve the removal of all temporary soil erosion and sediment control measures following vegetative establishment of all disturbed areas and determine when the contributing area has reached a minimum of 80% stabilization.

2.0 COMPLIANCE WITH MADEP MINIMUM STORMWATER MANAGEMENT STANDARDS

The Massachusetts Stormwater Handbook, Volume 1 Chapter 1, provides the following ten Stormwater Management Standards. The Stormwater Management System proposed for the PHP improvements were designed to comply with these standards.

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

No new untreated stormwater will discharge to wetland areas. The proposed primary GSI practice (stormwater constructed wetland) has been sized to meet the water quality volume (WQV). Stormwater runoff will flow through the GSI practice before reaching the study point (Aberjona River).

Minimum Standard 2: Stormwater management systems shall be designed so that the post-development peak discharge rates do not exceed pre-development peak discharge rates.

Discharge rates for existing and proposed conditions were calculated using HydroCAD® 2010, and SCS-TR20 based stormwater modeling computer program (**Appendix E**). Post-development peak discharge rates are less than pre-development rates for the 2-, 10-, 25- and 100-year storms, as well as for the projected 2070 10-year storm. A summary table of these precipitation events is provided in **Table 2.**

Minimum Standard 3: Loss of annual recharge to groundwater shall be eliminated or minimized through the use of environmentally sensitive site design, low impact development techniques, stormwater best management practices, and good operation and maintenance.

The proposed GSI practices used for the retrofit project will not provide infiltration to groundwater. Further, groundwater elevations on site are shallow (approximately 4.5 feet below the surface) and prevent adequate separation to groundwater required by MADEP for infiltrative practices. However, the infiltration volumes are generally consistent with existing conditions. The minimal increase in impervious area of the access road and parking lot is being managed through a sediment forebay with a permeable bottom surface. All other improved surfaces are either planted with native vegetation or are permeable path surfaces (e.g., stone dust, mulch) to promote infiltration to the extent possible.

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

The stormwater management pretreatment and treatment systems for the sites have been selected and sized for the most removal of the average annual load of TSS possible. These removal rates were taken MA Stormwater Handbook and based on the use of a pretreatment practice for each GSI (sediment forebays).

Sediment Forebay:	Recommended design rate:	25%
Stormwater Constructed Wetland:	Recommended design rate:	80%
	Total TSS Removed:	85%

TSS calculations are provided in **Appendix F.** Estimated phosphorus removal calculations are also provided in **Appendix F**. The proposed Operation and Maintenance Plan in **Appendix G** was developed to ensure that the stormwater system continues to function as it was designed into the future.

Minimum Standard 5: For land uses with higher potential pollution loads.

Not applicable.

Minimum Standard 6: Stormwater discharges within the Zone II or interim Wellhead Protection Area of a public water supply and stormwater discharges near or to any critical areas requiring the use of specific source controls.

Not applicable.

Minimum Standard 7: Redevelopment projects

The project at Maillet Conservation Land is a retrofit project that intends improve existing site conditions for water quality treatment prior to discharging into the upper reach of the Aberjona River. The proposed constructed stormwater wetland is designed to maximize the removal of pollutants through the use of vegetated marshes and micropools for settling, uptake and filtration. This system also provides stormwater storage and slows the stormwater conveyance. The project qualifies as a redevelopment project. This project complies with the redevelopment standard by meeting all standards to the maximum extent practicable given site constraints as described in this report.

Minimum Standard 8: A plan to control construction-related impacts, including erosion, sedimentation, and other pollutant sources during construction and land disturbance activities shall be developed and implemented.

An Erosion and Sediment Control Plan is included in construction documents, and a Pollutant Prevention Plan is included in this Report. Silt socks are proposed at the limit of work; silt socks are proposed along the downgradient edges of the area of disturbance. Staging and stockpile areas will be contained within silt socks and will be located a minimum of 50-feet from wetland resource areas to minimize erosion and sedimentation. Disturbed areas will be stabilized with seeding and/or erosion control blankets, if necessary, as soon as possible to minimize erosion and sedimentation. A Stormwater Pollution Plan (SWPPP) is required as part of the NPDES Construction General Permit and will be submitted prior to construction.

The contractor will be required to establish erosion controls prior to beginning any other project-related work. The Erosion and Sediment Control Plan will also establish the limit of work,

beyond which the contractor will not be allowed to perform any project work. It is the contractor's responsibility to monitor and correct erosion control practices throughout the duration of the project. Erosion control measures will not be removed until the project reaches completion as directed by the project engineer or landscape architect.

Minimum Standard 9: A Long-Term Operation and Maintenance Plan shall be developed and implemented to ensure that stormwater management systems function as designed.

An Operation and Maintenance Plan (O&M) is included with specific needs for each best management practice. See **Appendix G** for the O&M plan.

Minimum Standard 10: All illicit discharges to the stormwater management system are prohibited.

There will be no illicit discharges to the proposed system. The Long-Term Pollution Prevention Plan provided includes measures to prevent illicit discharges.

3.0 POLLUTANT CONTROLS DURING CONSTRUCTION

3.1 Structural Practices

The following are the structural practices that will be implemented as part of the construction activity.

- Sediment Silt Sock Barrier will be installed prior to commencement of construction. This type of barrier allows water to flow through it while keeping sediment on site. The Town will be informed upon their installation so that they may inspect these barriers prior to construction. Portions of the erosion control barriers will be replaced and/or repaired as necessary to prevent erosion. Barriers will be installed parallel to land slope at the perimeter of the work site, as shown on the Plans. Details are provided in the Plans.

- Silt Sacks (or approved equivalent) will be installed at identified existing catch basins and following construction of the proposed catch basins to prevent sedimentation during construction. The silt sack will be emptied/replaced and disposed of off-site if damage is observed.

- Stormwater Constructed Wetland will be graded to within one foot of design elevations until site is fully stabilized to capture sediment during construction. Light earth-moving equipment will be used for excavation and construction of the systems. All excavated materials from the area will be removed and disposed of in an approved location. Stormwater basins will be temporarily stabilized and/or seeded to limit erosion of side slopes and accumulation of sediment during construction.

- Slope Stabilization will occur immediately upon obtaining final grades as shown on the project site plans. Areas that fail to stabilize will be re-graded to final grade and stabilized as necessary. Amount of land disturbed will be minimized to reduce potential

for erosion and sedimentation. Stabilization measures shall be initiated within 14 days following the end of construction at each portion of the site and as soon as practicable.

The entire stormwater management system including culverts, pipe, structures, and GSI will be inspected upon completion of construction. Sediment will be removed from all elements of the stormwater management system. All control measures must be installed and maintained in accordance with manufacturer's specifications, good engineering practices, and in accordance with this report (every seven calendar days and after storm events). If inspections show that a control has failed or been installed incorrectly, the Operator must replace or modify it within 24 hours.

3.2 Stabilization Practices

The amount of land disturbed during construction will be minimized to reduce the potential for erosion and sedimentation. Prompt surface stabilization will be provided to control erosion in areas where disturbances cannot be avoided during construction. Stabilization measures shall be initiated within 14 days following the end of construction at each portion of the site. Exceptions to this requirement are allowable when snow cover prevents the initiation of stabilization within 14 days, in which case such measures shall be undertaken as soon as possible.

Stabilization measures that will be, or may be, used during construction are described below:

- Temporary Seeding – Temporary seeding of disturbed surfaces with fast-growing grasses (annual rye) to provide greater resistance to stormwater runoff and/or wind erosion for areas where construction has temporarily ceased.
- Permanent Seeding – Permanent seeding of surfaces with vegetation, including but not limited to grass, trees, bushes, and shrubs, to stabilize the soil. Establishing a permanent and sustainable ground cover at a site stabilizes the soil while reducing the sediment content in runoff.
- Permanent Planting –establish all planting as required at the completion of the project.
- Erosion Control Blankets- install erosion control blankets along all 3:1 slopes or greater.
- Mulching – materials, including but not limited to hay, grass, woodchips, straw, and gravel will be placed on the soil surface to cover and hold in place disturbed soils.

Temporary seeding or other soil stabilization measures will be provided where construction activities have ceased at the site. Topsoil stockpiles will be temporarily seeded or covered to prevent erosion and will be surrounded with silt fence or strawbales. When the site's final grade has been established, permanent vegetation will be planted on the disturbed areas. The vegetation will consist of grass, shrubs, bushes, and trees in the locations indicate on the plans.

3.3 Other Types of Controls

Additional controls/practices will be undertaken to reduce pollution in stormwater runoff flows which include, but are not limited to, control of off-site mud tracking from construction site, dust suppression, proper sanitary waste disposal, earthwork procedures timed and conducted in manners aimed to minimize erosion and sedimentation, snow removal plans, proper management of waste materials, proper management of hazardous waste, proper material stockpiling, and spill prevention and control measures.

- Off-site Construction Vehicle Mud Tracking – A stabilized construction entrance will be provided to help minimize excess mud, dirt or rock tracked from the site, as required. The paved roads that provide access to the site will be swept to remove any excess sediment or debris, if necessary. Trucks hauling material to or from the construction site will be covered with a tarpaulin as necessary.

- Dust Suppression – Water sprays shall be used to control dust during extended dry periods during construction.

- Earthwork – The exposure of disturbed surfaces to stormwater and potential stormwater erosion will be minimized by well-organized earthwork procedures. Stabilization procedures shall be undertaken in accordance with this report. Grubbing during wet seasons will be avoided if feasible.

- Snow Removal Plan – Plowed snow collected from the roadway and parking areas will be deposited onto free draining, pervious surfaces, away from the sites drainage conveyance structures to maximize infiltration.

- Waste Materials – Dumpsters rented from a licensed solid waste management company will be used to store solid waste and debris that cannot be recycled, reused or salvaged. The dumpsters will meet all local and state solid waste management regulations. Dumpsters will be covered when refuse is not being directly deposited or withdrawn from them. Potentially hazardous wastes will be separated from normal wastes, including segregation of storage areas and proper labeling of containers. Removal of all waste from the site will be performed by licensed contractors in accordance with applicable regulatory requirements and disposed of at either local or regional approved facilities. Waste materials will not be buried on-site. All site personnel will be instructed regarding the correct procedures for waste disposal. Notices stating these procedures will be posted at the site. Solvents and flushing materials used during construction and pre-operational cleaning will be provided, handled, managed, and removed by the contractor for appropriate off-site disposal.

- Hazardous Waste Materials – Any disposal of hazardous materials will be completed using the required paperwork. Copies will be provided to the Engineer and to the Town.

- Spill Prevention and Control Measures – To minimize the risk of spills or other accidental exposure of materials and substances to stormwater runoff, the following material management practices will be used throughout the project:

- An effort will be made to store only enough products required to do the job.
- All materials stored on-site will be stored in a neat, orderly manner in their appropriate containers and, if possible, under a roof or other enclosure.
- Products will be kept in their original containers with the original manufacturer's label.
- Substances will not be mixed with one another unless recommended by the manufacturer.
- Whenever possible, the maximum amount of a product will be used before disposing of the container.
- Manufacturers' recommendations for proper use and disposal will be followed.
- The site superintendent will conduct daily inspections to ensure proper use and disposal of materials.

To reduce the risk associated with hazardous materials used on the site, the following practices will be used:

- Products will be kept in original containers unless they are not resealable.
- Original labels and material safety data sheets will be retained and kept on-site; they contain important product information.
- If surplus product must be disposed of, manufacturers' or local and state recommended methods for proper disposal will be followed.

- Materials List - Materials or substances listed below are expected to be present on-site during construction:

  - Concrete
  - Asphalt
  - Paints (enamel and latex)
  - Wood
  - Concrete
  - Sealants
  - Fertilizers
  - Petroleum Based Products
  - Cleaning Solvents
  - Adhesives
  - Tar

  The following product-specific practices will be followed on-site:

  Petroleum Products - All on-site vehicles will be monitored for leaks and receive preventative maintenance to reduce the chance of leakage. Petroleum products will be stored in tightly sealed containers which area clearly labeled. Any asphalt substances used on-site will be applied according to the manufacturers' recommendations.

Paints – All containers will be tightly sealed and stored indoors when not required for use. Excess paint will not be discharged to the storm sewer system but will be properly disposed of according to the manufacturers' instructions or state and local regulations.

Concrete Trucks – Concrete trucks will not be allowed to wash out or discharge surplus concrete or drum wash water on the site.

In addition to the good housekeeping and material management practices discussed in the previous sections of this plan, the following practices will be followed for spill prevention and cleanup:

- Manufacturers' recommended methods for spill cleanup will be clearly posted, and site personnel will be made aware of the procedures and location of the information and cleanup supplies.
- Materials and equipment necessary for spill cleanup will be kept in the material storage area on-site. Equipment and materials will include, but not be limited to, brooms, dust pans, mops, rags, gloves, goggles, speedi-dry, sand, sawdust, and plastic and metal trash containers specifically for this purpose.
- All spills will be cleaned up immediately after discovery. Spills large enough to reach the storm water system will be reported to the National Response Center at 1-800-424-8802.
- The spill area will be kept well ventilated, and personnel will wear appropriate protective clothing to prevent injury from contact with a hazardous substance.
- Spills of toxic or hazardous material will be reported to the appropriate state or local government agency, regardless of the size.
- The site superintendent responsible for the day-to-day site operations will be the spill prevention and clean-up coordinator. He will designate at least three other site personnel who will receive spill prevention and cleanup training. These individuals will each become responsible for a particular phase of prevention and cleanup. The names of responsible spill personnel will be posted in the material storage area and in the on-site office trailer.

4.0 STORMWATER OPERATION AND MAINTENANCE PLAN

All stormwater management measures and controls identified in **Section 3.0** of this Drainage Report shall be operated and maintained appropriately during the construction phase of the project and during regular operation of the site in the post-construction period as required on the construction drawings and O&M plan (provided in **Appendix G**).

5.0 REFERENCES

1. City of Cambridge, Massachusetts. 2015. Climate Change Vulnerability Assessment. https://www.cambridgema.gov/CDD/Projects/Climate/climatechangeresilianceandadaptation

2. MADEP (Massachusetts Department of Environmental Protection). 2008. Massachusetts Stormwater Standards Manual.

3. MADEP (Massachusetts Department of Environmental Protection). 2019. See their homepage at www.state.ma.gov/dep.

4. MassGIS (Massachusetts Office of Geographic and Environmental Information). 2019. See their homepage at: http://www.mass.gov/mgis/.

5. Northeast Regional Climate Center and Natural Resources Conservation Service. 2010-2019. Extreme Precipitation for New York and New England. Version 1.12. http://precip.eas.cornell.edu/

6. USEPA (United States Environmental Protection Agency). 2019. National Pollutant Discharge Elimination System (NPDES). See their homepage at: http://cfpub.epa.gov/NPDES/.

7. USGS (United States Geological Survey. 2021. StreamStats Report. See their homepage at https://streamstats.usgs.gov/ss/

FIGURES

USGS Locus Map
Aerial Locus Map
Site Soils Map
FEMA National Flood Hazard Layer
Environmental Constraints

Horsley Witten Group
Sustainable Environmental Solutions
112 Water Street • 6th Floor • Boston, MA 02109
857-263-8193 • horsleywitten.com

Date: 5/20/2021
Data Sources: Bureau of Geographic Information (MassGIS), ESRI

This map is for informational purposes and may not be suitable for legal, engineering, or surveying purposes.

Project Location

Municipal Boundary

Mystic River Watershed
Town of Reading - Maillet Conservation Area

Figure 1
USGS Locus Map

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Sustainable Environmental Solutions
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Path: H:\Projects\2021\21008 Upper Mystic River Watershed\GIS\Maps\NOIs\210520_ReadingAerial.mxd

Date: 5/21/2021
Data Sources: Bureau of Geographic Information (MassGIS), ESRI

This map is for informational purposes and may not be suitable for legal, engineering, or surveying purposes.

General Project Extent
Parcel Boundary (MassGIS)

Mystic River Watershed
Town of Reading - Maillet Conservation Area

Figure 2
Aerial Locus Map

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Sustainable Environmental Solutions
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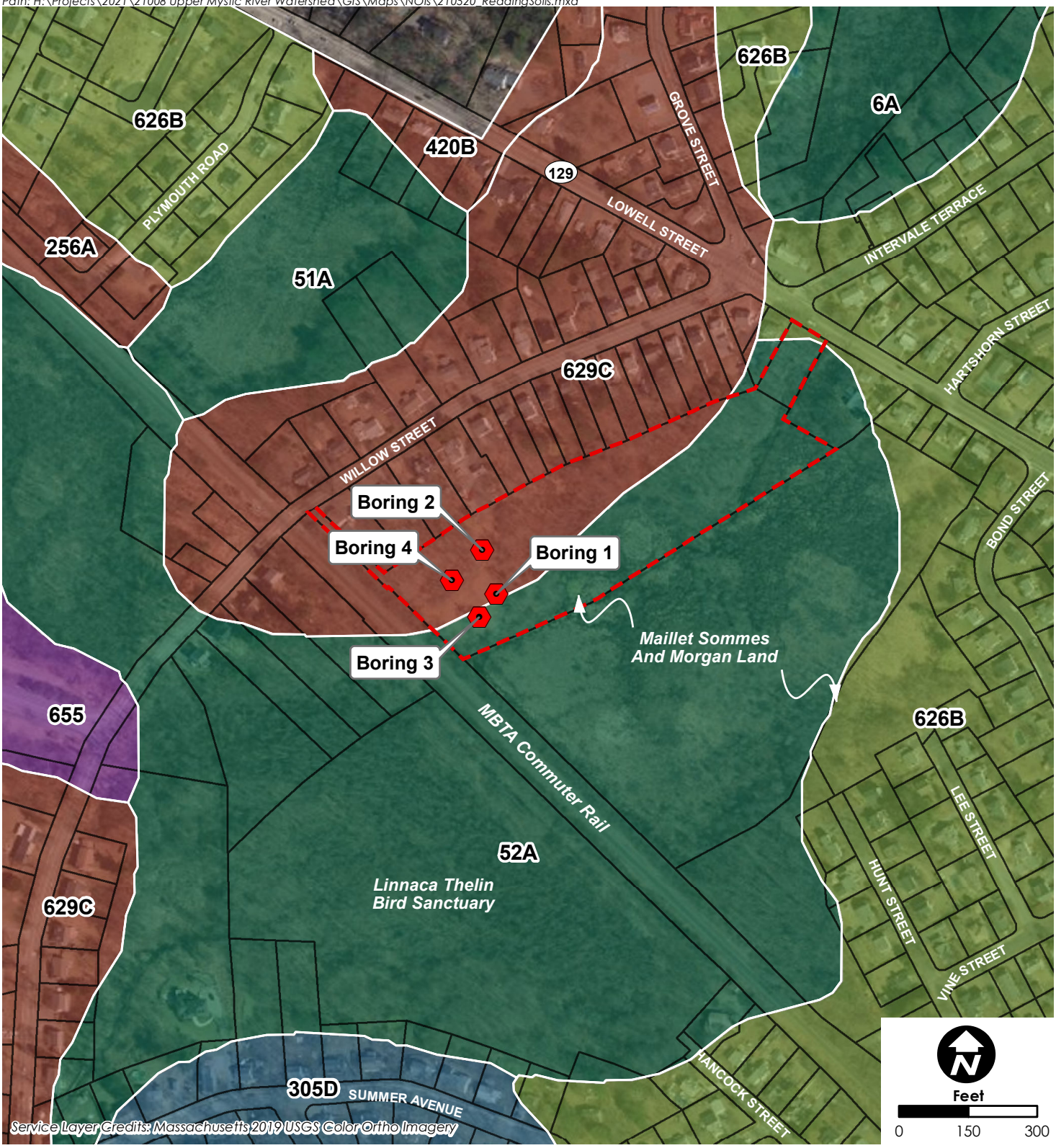
857-263-8193 • horsleywitten.com

Path: H:\Projects\2021\21008 Upper Mystic River Watershed\GIS\Maps\NOIs\210520_ReadingSoils.mxd



Date: 5/20/2021
Data Sources: Bureau of Geographic Information (MassGIS), ESRI

This map is for informational purposes and may not be suitable for legal, engineering, or surveying purposes.

Soil Boring Location
General Project Extent
Parcel Boundary (MassGIS)

NRCS SSURGO-Certified Soils (Map Unit)
Hydrologic Group
Udorthents
A
B
C
D

Mystic River Watershed
Town of Reading - Maillet Conservation Area

Figure 3
Site Soils Map

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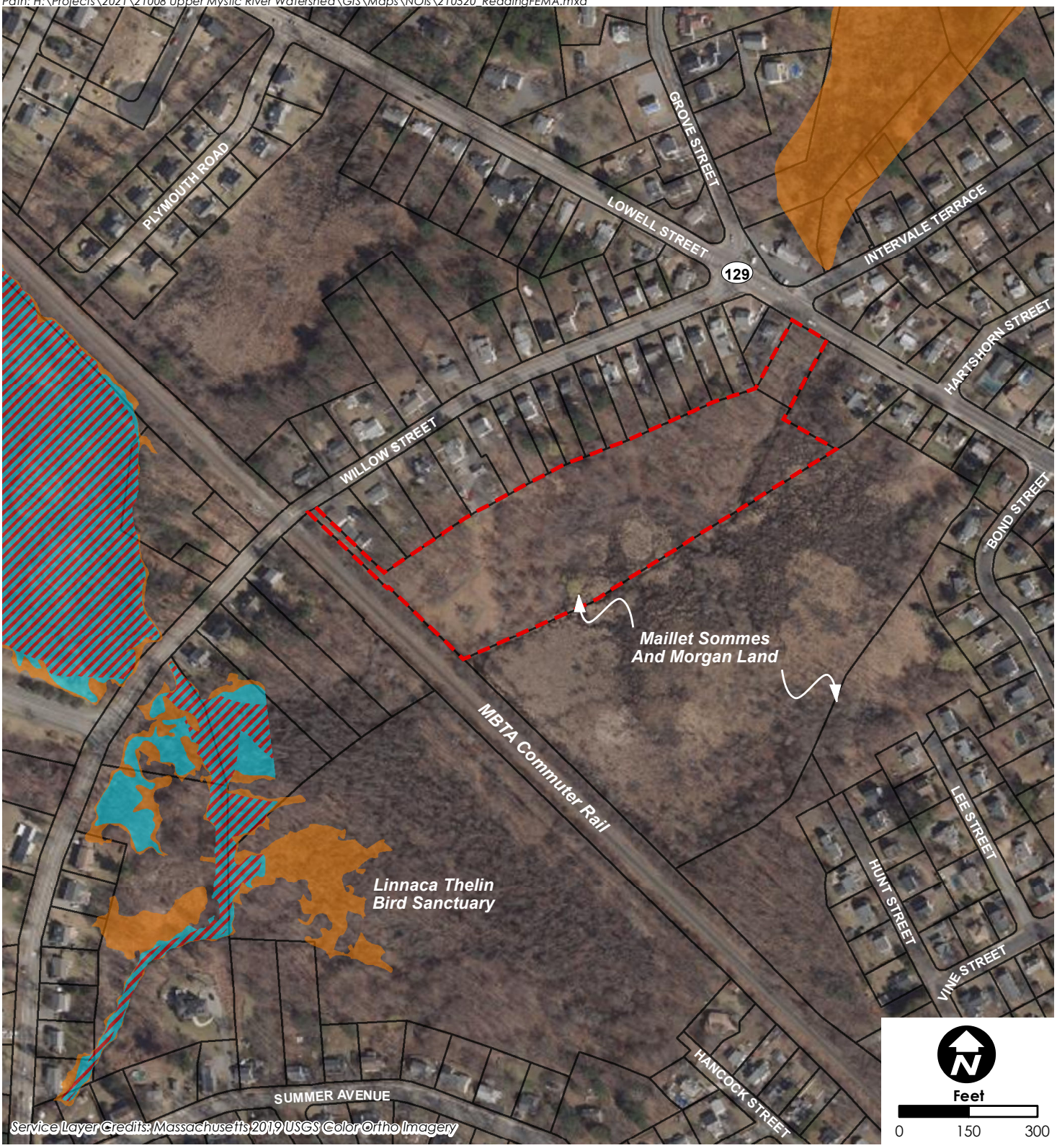

Date: 5/20/2021
Data Sources: Bureau of Geographic Information (MassGIS), ESRI

This map is for informational purposes and may not be suitable for legal, engineering, or surveying purposes.

General Project Extent
Parcel Boundary (MassGIS)

FEMA National Flood Hazard Layer
Zone AE: 1% Annual Chance of Flooding, with BFE
Zone AE: Regulatory Floodway
Zone X: 0.2% Annual Chance of Flooding

Mystic River Watershed
Town of Reading - Maillet Conservation Area

Figure 4
FEMA National Flood Hazard Layer

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Path: H:\Projects\2021\21008 Upper Mystic River Watershed\GIS\Maps\NOIs\210520_ReadingConstraints.mxd

Date: 5/20/2021
Data Sources: Bureau of Geographic Information (MassGIS), ESRI

This map is for informational purposes and may not be suitable for legal, engineering, or surveying purposes.

- General Project Extent
- NHESP Certified Vernal Pools
- NHESP Potential Vernal Pools

Wellhead Protection Areas
- DEP Approved Zone II

DEP Wetlands (2005)
- Hydrologic Connection
- Marsh/Bog
- Wooded marsh
- Open Water

- Article 97 Land
- Protected Open Space

Mystic River Watershed
Town of Reading - Maillet Conservation Area

Figure 5
Environmental Constraints

APPENDIX A

NRCS Soils Data

Map Scale: 1:8,780 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 100 200 400 600

Feet: 0 400 800 1600 2400

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:25,000.

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 20, Jun 9, 2020

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

Date(s) aerial images were photographed: Sep 13, 2019—Oct 5, 2019

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
6A	Scarboro mucky fine sandy loam, 0 to 3 percent slopes	13.6	3.4%
51A	Swansea muck, 0 to 1 percent slopes	14.9	3.8%
52A	Freetown muck, 0 to 1 percent slopes	38.6	9.8%
103B	Charlton-Hollis-Rock outcrop complex, 3 to 8 percent slopes	17.8	4.5%
103C	Charlton-Hollis-Rock outcrop complex, 8 to 15 percent slopes	0.6	0.2%
104C	Hollis-Rock outcrop-Charlton complex, 0 to 15 percent slopes	8.7	2.2%
256A	Deerfield loamy fine sand, 0 to 3 percent slopes	0.8	0.2%
305B	Paxton fine sandy loam, 3 to 8 percent slopes	16.3	4.1%
305C	Paxton fine sandy loam, 8 to 15 percent slopes	2.7	0.7%
420B	Canton fine sandy loam, 3 to 8 percent slopes	19.4	4.9%
420C	Canton fine sandy loam, 8 to 15 percent slopes	4.9	1.2%
602	Urban land	17.5	4.4%
622C	Paxton-Urban land complex, 3 to 15 percent slopes	1.1	0.3%
626B	Merrimac-Urban land complex, 0 to 8 percent slopes	83.2	21.2%
629C	Canton-Charlton-Urban land complex, 3 to 15 percent slopes	119.8	30.5%
631C	Charlton-Urban land-Hollis complex, 3 to 15 percent slopes, rocky	0.2	0.1%
655	Udorthents, wet substratum	32.9	8.4%
Totals for Area of Interest		**393.0**	**100.0%**

Map Unit Description

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

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

Most of the soils similar to the major components have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Some minor components, however, have properties and behavior characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

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

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

Soils that have profiles that are almost alike make up a *soil series*. All the soils of a series have major horizons that are similar in composition, thickness, and arrangement. Soils of a given series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

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

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

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

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

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

Additional information about the map units described in this report is available in other soil reports, which give properties of the soils and the limitations, capabilities, and potentials for many uses. Also, the narratives that accompany the soil reports define some of the properties included in the map unit descriptions.

Report—Map Unit Description

Middlesex County, Massachusetts

6A—Scarboro mucky fine sandy loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2svky
Elevation: 0 to 1,320 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: Not prime farmland

Map Unit Composition

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

Description of Scarboro

Setting

Landform: Outwash terraces, outwash deltas, drainageways, depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope, tread, dip
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Sandy glaciofluvial deposits derived from schist and/or sandy glaciofluvial deposits derived from gneiss and/or sandy glaciofluvial deposits derived from granite

Typical profile

Oe - 0 to 3 inches: mucky peat
A - 3 to 11 inches: mucky fine sandy loam
Cg1 - 11 to 21 inches: sand
Cg2 - 21 to 65 inches: gravelly coarse sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (1.42 to 14.17 in/hr)
Depth to water table: About 0 to 2 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water capacity: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: A/D
Ecological site: F144AY031MA - Very Wet Outwash
Hydric soil rating: Yes

Minor Components

Swansea

Percent of map unit: 10 percent

Landform: Swamps, bogs
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Walpole

Percent of map unit: 5 percent
Landform: Depressions, deltas, outwash plains, depressions, outwash terraces
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread, dip, talf
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Wareham

Percent of map unit: 5 percent
Landform: Depressions
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

51A—Swansea muck, 0 to 1 percent slopes

Map Unit Setting

National map unit symbol: 2trl2
Elevation: 0 to 1,140 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Swansea

Setting

Landform: Swamps, bogs
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Highly decomposed organic material over loose sandy and gravelly glaciofluvial deposits

Typical profile

Oa1 - 0 to 24 inches: muck
Oa2 - 24 to 34 inches: muck
Cg - 34 to 79 inches: coarse sand

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: Rare
Frequency of ponding: Frequent
Available water capacity: Very high (about 16.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8w
Hydrologic Soil Group: B/D
Ecological site: F144AY043MA - Acidic Organic Wetlands
Hydric soil rating: Yes

Minor Components

Freetown

Percent of map unit: 10 percent
Landform: Bogs, swamps
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Whitman

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

Scarboro

Percent of map unit: 5 percent
Landform: Drainageways, depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope, tread, dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

52A—Freetown muck, 0 to 1 percent slopes

Map Unit Setting

National map unit symbol: 2t2q9
Elevation: 0 to 1,110 feet

Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Freetown

Setting

Landform: Depressions, depressions, bogs, marshes, kettles, swamps
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Highly decomposed organic material

Typical profile

Oe - 0 to 2 inches: mucky peat
Oa - 2 to 79 inches: muck

Properties and qualities

Slope: 0 to 1 percent
Surface area covered with cobbles, stones or boulders: 0.0 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: Rare
Frequency of ponding: Frequent
Available water capacity: Very high (about 19.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B/D
Ecological site: F144AY043MA - Acidic Organic Wetlands
Hydric soil rating: Yes

Minor Components

Swansea

Percent of map unit: 5 percent
Landform: Kettles, depressions, depressions, marshes, swamps, bogs
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread, dip

Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Scarboro

Percent of map unit: 5 percent
Landform: Depressions, drainageways
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope, tread, dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Whitman

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

103B—Charlton-Hollis-Rock outcrop complex, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 98yc
Elevation: 0 to 1,490 feet
Mean annual precipitation: 45 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 110 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Charlton and similar soils: 50 percent
Hollis and similar soils: 25 percent
Rock outcrop: 15 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Charlton

Setting

Landform: Ground moraines, drumlins
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Friable loamy eolian deposits over friable loamy basal till derived from granite and gneiss

Typical profile

H1 - 0 to 5 inches: fine sandy loam
H2 - 5 to 22 inches: sandy loam
H3 - 22 to 65 inches: gravelly sandy loam

Properties and qualities

Slope: 3 to 8 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 7.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: A
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Description of Hollis

Setting

Landform: Ridges, hills
Landform position (two-dimensional): Shoulder, summit
Landform position (three-dimensional): Crest
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Friable, shallow loamy basal till over granite and gneiss

Typical profile

H1 - 0 to 2 inches: fine sandy loam
H2 - 2 to 14 inches: fine sandy loam
H3 - 14 to 18 inches: unweathered bedrock

Properties and qualities

Slope: 3 to 8 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: 8 to 20 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 2.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Ecological site: F144AY033MA - Shallow Dry Till Uplands
Hydric soil rating: No

Description of Rock Outcrop

Setting

Landform: Ledges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Head slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Granite and gneiss

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 0 inches to lithic bedrock

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s

Minor Components

Canton

Percent of map unit: 2 percent
Landform: Hills
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Head slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Woodbridge

Percent of map unit: 2 percent
Landform: Hillslopes
Landform position (two-dimensional): Shoulder, toeslope, summit
Landform position (three-dimensional): Head slope, base slope, nose slope
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: No

Scituate

Percent of map unit: 2 percent
Landform: Hillslopes, depressions
Landform position (two-dimensional): Toeslope, summit
Landform position (three-dimensional): Head slope, base slope
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: No

Narragansett

Percent of map unit: 2 percent

Landform: Ridges, hills
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Convex
Hydric soil rating: No

Unnamed

Percent of map unit: 1 percent

Montauk

Percent of map unit: 1 percent
Landform: Hillslopes
Landform position (two-dimensional): Shoulder, summit
Landform position (three-dimensional): Head slope, nose slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

103C—Charlton-Hollis-Rock outcrop complex, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2wzp1
Elevation: 0 to 1,390 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Charlton, extremely stony, and similar soils: 50 percent
Hollis, extremely stony, and similar soils: 20 percent
Rock outcrop: 10 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Charlton, Extremely Stony

Setting

Landform: Hills, ridges
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear, convex
Across-slope shape: Convex
Parent material: Coarse-loamy melt-out till derived from granite, gneiss, and/or schist

Typical profile

Oe - 0 to 2 inches: moderately decomposed plant material
A - 2 to 4 inches: fine sandy loam
Bw - 4 to 27 inches: gravelly fine sandy loam

C - 27 to 65 inches: gravelly fine sandy loam

Properties and qualities

Slope: 8 to 15 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water capacity: Moderate (about 8.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Description of Hollis, Extremely Stony

Setting

Landform: Hills, ridges
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Crest, side slope, nose slope
Down-slope shape: Convex
Across-slope shape: Linear, convex
Parent material: Coarse-loamy melt-out till derived from granite, gneiss, and/or schist

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
A - 2 to 7 inches: gravelly fine sandy loam
Bw - 7 to 16 inches: gravelly fine sandy loam
2R - 16 to 26 inches: bedrock

Properties and qualities

Slope: 8 to 15 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: 8 to 23 inches to lithic bedrock
Drainage class: Somewhat excessively drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water capacity: Very low (about 2.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: F144AY033MA - Shallow Dry Till Uplands
Hydric soil rating: No

Description of Rock Outcrop

Setting

Landform: Hills, ridges
Parent material: Igneous and metamorphic rock

Typical profile

R - 0 to 79 inches: bedrock

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: 0 inches to lithic bedrock
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Available water capacity: Very low (about 0.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Woodbridge, extremely stony

Percent of map unit: 8 percent
Landform: Drumlins, hills, ground moraines
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Canton, extremely stony

Percent of map unit: 5 percent
Landform: Moraines, ridges, hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Chatfield, extremely stony

Percent of map unit: 5 percent
Landform: Hills, ridges
Landform position (two-dimensional): Summit, backslope, shoulder

Landform position (three-dimensional): Crest, side slope, nose slope
Down-slope shape: Convex
Across-slope shape: Linear, convex
Hydric soil rating: No

Ridgebury, extremely stony
Percent of map unit: 2 percent
Landform: Hills, ground moraines, depressions, drumlins, drainageways
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Base slope, head slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

104C—Hollis-Rock outcrop-Charlton complex, 0 to 15 percent slopes

Map Unit Setting
National map unit symbol: 2w69p
Elevation: 0 to 1,270 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition
Hollis, extremely stony, and similar soils: 35 percent
Charlton, extremely stony, and similar soils: 25 percent
Rock outcrop: 25 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hollis, Extremely Stony

Setting
Landform: Hills, ridges
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Crest, side slope, nose slope
Down-slope shape: Convex
Across-slope shape: Linear, convex
Parent material: Coarse-loamy melt-out till derived from granite, gneiss, and/or schist

Typical profile
Oi - 0 to 2 inches: slightly decomposed plant material
A - 2 to 7 inches: gravelly fine sandy loam
Bw - 7 to 16 inches: gravelly fine sandy loam
2R - 16 to 26 inches: bedrock

Properties and qualities

Slope: 0 to 15 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: 8 to 23 inches to lithic bedrock
Drainage class: Somewhat excessively drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water capacity: Very low (about 2.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: F144AY033MA - Shallow Dry Till Uplands
Hydric soil rating: No

Description of Charlton, Extremely Stony

Setting

Landform: Ridges, hills
Landform position (two-dimensional): Summit, backslope, shoulder
Landform position (three-dimensional): Crest, side slope
Down-slope shape: Linear, convex
Across-slope shape: Convex
Parent material: Coarse-loamy melt-out till derived from granite, gneiss, and/or schist

Typical profile

Oe - 0 to 2 inches: moderately decomposed plant material
A - 2 to 4 inches: fine sandy loam
Bw - 4 to 27 inches: gravelly fine sandy loam
C - 27 to 65 inches: gravelly fine sandy loam

Properties and qualities

Slope: 0 to 15 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water capacity: Moderate (about 8.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Description of Rock Outcrop

Setting

Landform: Hills, ridges
Parent material: Igneous and metamorphic rock

Typical profile

R - 0 to 79 inches: bedrock

Properties and qualities

Slope: 0 to 15 percent
Depth to restrictive feature: 0 inches to lithic bedrock
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Available water capacity: Very low (about 0.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Canton, extremely stony

Percent of map unit: 7 percent
Landform: Hills, moraines, ridges
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Chatfield, extremely stony

Percent of map unit: 6 percent
Landform: Hills, ridges
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Crest, side slope, nose slope
Down-slope shape: Convex
Across-slope shape: Linear, convex
Hydric soil rating: No

Montauk, extremely stony

Percent of map unit: 1 percent
Landform: Recessionial moraines, hills, drumlins, ground moraines

Landform position (two-dimensional): Summit, backslope, shoulder
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Linear, convex
Across-slope shape: Convex
Hydric soil rating: No

Scituate, extremely stony

Percent of map unit: 1 percent
Landform: Drumlins, hills, ground moraines
Landform position (two-dimensional): Footslope, backslope, summit
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Linear, convex
Across-slope shape: Convex
Hydric soil rating: No

256A—Deerfield loamy fine sand, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2xfg8
Elevation: 0 to 1,100 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

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

Description of Deerfield

Setting

Landform: Kame terraces, outwash plains, outwash deltas, outwash terraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex, linear, concave
Across-slope shape: Concave, linear, convex
Parent material: Sandy outwash derived from granite, gneiss, and/or quartzite

Typical profile

Ap - 0 to 9 inches: loamy fine sand
Bw - 9 to 25 inches: loamy fine sand
BC - 25 to 33 inches: fine sand
Cg - 33 to 60 inches: sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well 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: About 15 to 37 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Sodium adsorption ratio, maximum: 11.0
Available water capacity: Moderate (about 6.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: A
Ecological site: F144AY027MA - Moist Sandy Outwash
Hydric soil rating: No

Minor Components

Windsor

Percent of map unit: 7 percent
Landform: Kame terraces, outwash terraces, outwash plains, outwash deltas
Landform position (three-dimensional): Tread
Down-slope shape: Convex, linear, concave
Across-slope shape: Concave, linear, convex
Hydric soil rating: No

Wareham

Percent of map unit: 5 percent
Landform: Depressions, drainageways
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Sudbury

Percent of map unit: 2 percent
Landform: Outwash plains, outwash terraces, outwash deltas, kame terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear, convex, concave
Across-slope shape: Concave, linear, convex
Hydric soil rating: No

Ninigret

Percent of map unit: 1 percent
Landform: Outwash terraces, outwash plains, kame terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear, convex
Across-slope shape: Concave, convex
Hydric soil rating: No

305B—Paxton fine sandy loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2t2qp
Elevation: 0 to 1,570 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: All areas are prime farmland

Map Unit Composition

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

Description of Paxton

Setting

Landform: Hills, drumlins, ground moraines
Landform position (two-dimensional): Backslope, summit, shoulder
Landform position (three-dimensional): Side slope, crest, nose slope
Down-slope shape: Linear, convex
Across-slope shape: Convex
Parent material: Coarse-loamy lodgment till derived from gneiss, granite, and/or schist

Typical profile

Ap - 0 to 8 inches: fine sandy loam
Bw1 - 8 to 15 inches: fine sandy loam
Bw2 - 15 to 26 inches: fine sandy loam
Cd - 26 to 65 inches: gravelly fine sandy loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 18 to 39 inches to densic material
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 18 to 37 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water capacity: Low (about 3.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: C
Ecological site: F144AY007CT - Well Drained Dense Till Uplands

Hydric soil rating: No

Minor Components

Woodbridge

Percent of map unit: 9 percent
Landform: Hills, drumlins, ground moraines
Landform position (two-dimensional): Backslope, footslope, summit
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Ridgebury

Percent of map unit: 6 percent
Landform: Drainageways, hills, ground moraines, depressions
Landform position (two-dimensional): Backslope, footslope, toeslope
Landform position (three-dimensional): Head slope, base slope, dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Charlton

Percent of map unit: 5 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

305C—Paxton fine sandy loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2w66y
Elevation: 0 to 1,320 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

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

Description of Paxton

Setting

Landform: Drumlins, hills, ground moraines
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear, convex

Across-slope shape: Convex
Parent material: Coarse-loamy lodgment till derived from gneiss, granite, and/or schist

Typical profile

Ap - 0 to 8 inches: fine sandy loam
Bw1 - 8 to 15 inches: fine sandy loam
Bw2 - 15 to 26 inches: fine sandy loam
Cd - 26 to 65 inches: gravelly fine sandy loam

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: 20 to 39 inches to densic material
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 18 to 37 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water capacity: Low (about 4.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: F144AY007CT - Well Drained Dense Till Uplands
Hydric soil rating: No

Minor Components

Charlton

Percent of map unit: 7 percent
Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Woodbridge

Percent of map unit: 6 percent
Landform: Ground moraines, drumlins, hills
Landform position (two-dimensional): Backslope, footslope, summit
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Ridgebury

Percent of map unit: 2 percent
Landform: Hills, ground moraines, depressions, drainageways, drumlins

Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Base slope, head slope
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Hydric soil rating: Yes

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

Map Unit Setting

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

Map Unit Composition

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

Description of Canton

Setting

Landform: Ridges, moraines, hills
Landform position (two-dimensional): Backslope, summit, shoulder
Landform position (three-dimensional): Side slope, crest, nose slope
Down-slope shape: Convex, linear
Across-slope shape: Convex
Parent material: Coarse-loamy over sandy melt-out till derived from gneiss, granite, and/or schist

Typical profile

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

Properties and qualities

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

Interpretive groups

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

Minor Components

Scituate

Percent of map unit: 10 percent
Landform: Drumlins, hills, ground moraines
Landform position (two-dimensional): Footslope, backslope, summit
Landform position (three-dimensional): Crest, side slope
Down-slope shape: Linear, convex
Across-slope shape: Convex
Hydric soil rating: No

Montauk

Percent of map unit: 5 percent
Landform: Drumlins, hills, ground moraines, moraines
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Linear, convex
Across-slope shape: Convex
Hydric soil rating: No

Charlton

Percent of map unit: 4 percent
Landform: Hills, ground moraines, ridges
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Crest, side slope
Down-slope shape: Linear, convex
Across-slope shape: Convex
Hydric soil rating: No

Swansea

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

420C—Canton fine sandy loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2w817
Elevation: 0 to 1,330 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

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

Description of Canton

Setting

Landform: Ridges, moraines, hills
Landform position (two-dimensional): Backslope, summit, shoulder
Landform position (three-dimensional): Side slope, crest, nose slope
Down-slope shape: Convex, linear
Across-slope shape: Convex
Parent material: Coarse-loamy over sandy melt-out till derived from gneiss, granite, and/or schist

Typical profile

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

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: 19 to 39 inches to strongly contrasting textural stratification
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 2.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Minor Components

Scituate

Percent of map unit: 6 percent
Landform: Ground moraines, drumlins, hills
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear, convex
Across-slope shape: Convex

Hydric soil rating: No

Montauk

Percent of map unit: 6 percent
Landform: Moraines, drumlins, hills, ground moraines
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear, convex
Across-slope shape: Convex
Hydric soil rating: No

Newfields

Percent of map unit: 4 percent
Landform: Moraines, hills, ground moraines
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: No

Charlton

Percent of map unit: 4 percent
Landform: Hills, ground moraines, ridges
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear, convex
Across-slope shape: Convex
Hydric soil rating: No

602—Urban land

Map Unit Setting

National map unit symbol: 9950
Elevation: 0 to 3,000 feet
Mean annual precipitation: 32 to 50 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 110 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting

Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Excavated and filled land

Minor Components

Rock outcrop
Percent of map unit: 5 percent
Landform: Ledges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Head slope
Down-slope shape: Concave
Across-slope shape: Concave

Udorthents, wet substratum
Percent of map unit: 5 percent
Hydric soil rating: No

Udorthents, loamy
Percent of map unit: 5 percent
Hydric soil rating: No

622C—Paxton-Urban land complex, 3 to 15 percent slopes

Map Unit Setting
National map unit symbol: 2w67k
Elevation: 0 to 930 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition
Paxton and similar soils: 45 percent
Urban land: 35 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Paxton

Setting
Landform: Drumlins, hills, ground moraines
Landform position (two-dimensional): Shoulder, summit, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Linear, convex
Across-slope shape: Convex
Parent material: Coarse-loamy lodgment till derived from gneiss, granite, and/or schist

Typical profile
Ap - 0 to 8 inches: fine sandy loam
Bw1 - 8 to 15 inches: fine sandy loam
Bw2 - 15 to 26 inches: fine sandy loam
Cd - 26 to 65 inches: gravelly fine sandy loam

Properties and qualities

Slope: 3 to 15 percent
Depth to restrictive feature: 20 to 39 inches to densic material
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 18 to 37 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water capacity: Low (about 4.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: F144AY007CT - Well Drained Dense Till Uplands
Hydric soil rating: No

Description of Urban Land

Typical profile

M - 0 to 10 inches: cemented material

Properties and qualities

Slope: 3 to 15 percent
Depth to restrictive feature: 0 inches to manufactured layer
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Available water capacity: Very low (about 0.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydrologic Soil Group: D
Hydric soil rating: Unranked

Minor Components

Woodbridge

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

Charlton

Percent of map unit: 6 percent
Landform: Hills
Landform position (two-dimensional): Shoulder, backslope, summit

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

Udorthents

Percent of map unit: 4 percent
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Ridgebury

Percent of map unit: 1 percent
Landform: Ground moraines, depressions, drumlins, drainageways, hills
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Head slope, base slope
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Hydric soil rating: Yes

626B—Merrimac-Urban land complex, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2tyr9
Elevation: 0 to 820 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: Not prime farmland

Map Unit Composition

Merrimac and similar soils: 45 percent
Urban land: 40 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Merrimac

Setting

Landform: Eskers, moraines, outwash terraces, outwash plains, kames
Landform position (two-dimensional): Backslope, footslope, summit, shoulder
Landform position (three-dimensional): Side slope, crest, riser, tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy glaciofluvial deposits derived from granite, schist, and gneiss over sandy and gravelly glaciofluvial deposits derived from granite, schist, and gneiss

Typical profile

Ap - 0 to 10 inches: fine sandy loam
Bw1 - 10 to 22 inches: fine sandy loam
Bw2 - 22 to 26 inches: stratified gravel to gravelly loamy sand
2C - 26 to 65 inches: stratified gravel to very gravelly sand

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 2 percent
Maximum salinity: Nonsaline (0.0 to 1.4 mmhos/cm)
Sodium adsorption ratio, maximum: 1.0
Available water capacity: Low (about 4.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: A
Ecological site: F144AY022MA - Dry Outwash
Hydric soil rating: No

Description of Urban Land

Typical profile

M - 0 to 10 inches: cemented material

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: 0 inches to manufactured layer
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Available water capacity: Very low (about 0.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydrologic Soil Group: D
Hydric soil rating: Unranked

Minor Components

Windsor

Percent of map unit: 5 percent
Landform: Dunes, outwash terraces, deltas, outwash plains
Landform position (three-dimensional): Tread, riser
Down-slope shape: Convex, linear

Across-slope shape: Convex, linear
Hydric soil rating: No

Sudbury

Percent of map unit: 5 percent
Landform: Outwash plains, terraces, deltas
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Hinckley

Percent of map unit: 5 percent
Landform: Eskers, kames, deltas, outwash plains
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope, crest, head slope, rise
Down-slope shape: Convex
Across-slope shape: Convex, linear
Hydric soil rating: No

629C—Canton-Charlton-Urban land complex, 3 to 15 percent slopes

Map Unit Setting

National map unit symbol: 9959
Elevation: 0 to 1,000 feet
Mean annual precipitation: 32 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 110 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Canton and similar soils: 40 percent
Charlton and similar soils: 30 percent
Urban land: 25 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Canton

Setting

Landform: Hills
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Base slope, side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Friable loamy eolian deposits over friable sandy basal till derived from granite and gneiss

Typical profile

H1 - 0 to 8 inches: fine sandy loam
H2 - 8 to 21 inches: fine sandy loam
H3 - 21 to 65 inches: gravelly loamy sand

Properties and qualities

Slope: 3 to 15 percent
Depth to restrictive feature: 18 to 30 inches to strongly contrasting textural stratification
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 2.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: A
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Description of Charlton

Setting

Landform: Drumlins, ground moraines
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Friable loamy eolian deposits over friable loamy basal till derived from granite and gneiss

Typical profile

H1 - 0 to 5 inches: fine sandy loam
H2 - 5 to 22 inches: sandy loam
H3 - 22 to 65 inches: gravelly sandy loam

Properties and qualities

Slope: 3 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 7.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e

Hydrologic Soil Group: A
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Description of Urban Land

Setting

Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Excavated and filled land

Minor Components

Montauk

Percent of map unit: 2 percent
Landform: Hillslopes
Landform position (two-dimensional): Shoulder, summit
Landform position (three-dimensional): Nose slope, head slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Scituate

Percent of map unit: 2 percent
Landform: Depressions, hillslopes
Landform position (two-dimensional): Toeslope, summit
Landform position (three-dimensional): Head slope, base slope
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: No

Udorthents, loamy

Percent of map unit: 1 percent
Hydric soil rating: No

631C—Charlton-Urban land-Hollis complex, 3 to 15 percent slopes, rocky

Map Unit Setting

National map unit symbol: vr1g
Elevation: 0 to 1,000 feet
Mean annual precipitation: 32 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 110 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Charlton and similar soils: 45 percent
Urban land: 35 percent
Hollis and similar soils: 10 percent
Minor components: 10 percent

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

Description of Charlton

Setting

Landform: Drumlins, ground moraines
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Friable loamy eolian deposits over friable loamy basal till derived from granite and gneiss

Typical profile

H1 - 0 to 5 inches: fine sandy loam
H2 - 5 to 22 inches: sandy loam
H3 - 22 to 65 inches: gravelly sandy loam

Properties and qualities

Slope: 3 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 7.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: A
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Description of Urban Land

Setting

Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Excavated and filled land

Description of Hollis

Setting

Landform: Ridges, hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex

Parent material: Friable, shallow loamy basal till over granite and gneiss

Typical profile

H1 - 0 to 2 inches: fine sandy loam
H2 - 2 to 14 inches: fine sandy loam
H3 - 14 to 18 inches: unweathered bedrock

Properties and qualities

Slope: 3 to 15 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: 8 to 20 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 2.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Ecological site: F144AY033MA - Shallow Dry Till Uplands
Hydric soil rating: No

Minor Components

Canton

Percent of map unit: 4 percent
Landform: Hills
Landform position (two-dimensional): Backslope, toeslope
Landform position (three-dimensional): Side slope, base slope
Down-slope shape: Linear
Across-slope shape: Convex
Hydric soil rating: No

Udorthents, loamy

Percent of map unit: 2 percent
Hydric soil rating: No

Rock outcrop

Percent of map unit: 2 percent
Landform: Ledges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Head slope
Down-slope shape: Concave
Across-slope shape: Concave

Scituate

Percent of map unit: 1 percent
Landform: Depressions, hillslopes
Landform position (two-dimensional): Toeslope, summit
Landform position (three-dimensional): Base slope, head slope

Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: No

Montauk

Percent of map unit: 1 percent
Landform: Hillslopes
Landform position (two-dimensional): Shoulder, summit
Landform position (three-dimensional): Nose slope, head slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

655—Udorthents, wet substratum

Map Unit Setting

National map unit symbol: vr1n
Elevation: 0 to 3,000 feet
Mean annual precipitation: 32 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 110 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Udorthents, Wet Substratum

Setting

Parent material: Loamy alluvium and/or sandy glaciofluvial deposits and/or loamy glaciolacustrine deposits and/or loamy marine deposits and/or loamy basal till and/or loamy lodgment till

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: More than 80 inches
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Minor Components

Urban land

Percent of map unit: 8 percent
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear

Freetown

Percent of map unit: 4 percent
Landform: Depressions, bogs
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Swansea

Percent of map unit: 3 percent
Landform: Bogs, depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Data Source Information

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 20, Jun 9, 2020

APPENDIX B

Soil Boring Data

Horsley Witten Group
Sustainable Environmental Solutions
90 Route 6A • Sandwich, MA • 02563
Tel: 508-833-6600 • Fax: 508-833-3150 • www.horsleywitten.com

BORING LOG B-1

Project: Upper Mystic Stormwater Wetland Project
Client: Town of Reading
Boring Contractor: Geoserach Environmental Contractors
Boring Equipment: Geoprobe - 6620DT

Date: 4/19/2021
Completion Depth: 17'
Elevation:
Inspector: J. Henderson

Proportions Used:

		Color	Misc.	Size
trace (tr)	0 - 10%	Blue (Bl)	Fragments (frag.)	Fine = (f) Fine to Coarse = (f-c)
little (li)	10 - 20%	Red (R)	Cement (cem.)	Medium = (m) Very = (v)
some (so)	20 - 35%	Light (lt)	Well-Graded Sand (SW)	Coarse = (c) More/Less = (+/-)
and	35 - 50%	Dark (dk)	Poorly-Graded Sand (SP)	Dark = (dk)
		Rust (Ru)	Well-Graded Gravel (GW)	
			Poorly-Graded Gravel (GP)	
			Below Land Surface (BLS)	
Bold indicates soil sample submitted for laboratory analysis.			Not Available (N/A)	

Depth Feet	Description	Penetration (in)	Recovery (in)	PID	Blow Counts	Comments
0-2	Br fs, so silt	24	6	NA	1-2-2-1	
5-7	Br fs, li silt	24	20	NA	WH-3-5-4	Wet
10-12	Gy m-cs, so silt, so gravel	24	10	NA	19-16-15-14	Wet (Dense)
15-17	Gy m-cs, so silt, so gravel	24	8	NA	19-25-25-27	Wet (Dense)

Horsley Witten Group
Sustainable Environmental Solutions
90 Route 6A • Sandwich, MA • 02563
Tel: 508-833-6600 • Fax: 508-833-3150 • www.horsleywitten.com

BORING LOG B-2

Project: Upper Mystic Stormwater Wetland Project
Client: Town of Reading
Boring Contractor: Geoserach Environmental Contractors
Boring Equipment: Geoprobe - 6620DT

Date: 4/19/2021
Completion Depth: 17'
Elevation:
Inspector: J. Henderson

Proportions Used:

		Color	Misc.	Size
trace (tr)	0 - 10%	Blue (Bl)	Fragments (frag.)	Fine = (f) Fine to Coarse = (f-c)
little (li)	10 - 20%	Red (R)	Cement (cem.)	Medium = (m) Very = (v)
some (so)	20 - 35%	Light (lt)	Well-Graded Sand (SW)	Coarse = (c) More/Less = (+/-)
and	35 - 50%	Dark (dk)	Poorly-Graded Sand (SP)	Dark = (dk)
		Rust (Ru)	Well-Graded Gravel (GW)	
			Poorly-Graded Gravel (GP)	
			Below Land Surface (BLS)	
Bold indicates soil sample submitted for laboratory analysis.			Not Available (N/A)	

Depth Feet	Description	Penetration (in)	Recovery (in)	PID	Blow Counts	Comments
0-2	Br f-ms, li silt	24	14	NA	WH-6-17-6	
5-7	Br m-cs, so gravel, tr silt	24	10	NA	6-5-5-6	Wet
10-12	Br fs, tr silt	24	12	NA	2-3-2-3	Wet
15-17	Gy m-cs and silt, so gravel	24	14	NA	20-20-20-22	Wet (dense)

Horsley Witten Group
Sustainable Environmental Solutions
90 Route 6A • Sandwich, MA • 02563
Tel: 508-833-6600 • Fax: 508-833-3150 • www.horsleywitten.com

BORING LOG B-3

Project: Upper Mystic Stormwater Wetland Project
Client: Town of Reading
Boring Contractor: Geoserach Environmental Contractors
Boring Equipment: Geoprobe - 6620DT
Date: 4/19/2021
Completion Depth: 15'
Elevation:
Inspector: J. Henderson

Proportions Used:

		Color	Misc.	Size
trace (tr)	0 - 10%	Blue (Bl)	Fragments (frag.)	Fine = (f) Fine to Coarse = (f-c)
little (li)	10 - 20%	Red (R)	Cement (cem.)	Medium = (m) Very = (v)
some (so)	20 - 35%	Light (lt)	Well-Graded Sand (SW)	Coarse = (c) More/Less = (+/-)
and	35 - 50%	Dark (dk)	Poorly-Graded Sand (SP)	Dark = (dk)
		Rust (Ru)	Well-Graded Gravel (GW)	
			Poorly-Graded Gravel (GP)	
			Below Land Surface (BLS)	
Bold indicates soil sample submitted for laboratory analysis.			Not Available (N/A)	

Depth Feet	Description	Penetration (in)	Recovery (in)	PID	Blow Counts	Comments
0-2	Ms, tr silt, tr gravel	24	6	0	1-2-1-1	
2-4	No sample	24	NR	-	WH-WH-WH-WH	
4-6	organics	24	20	0	WH-WH-WH-2	BOT. 2" s, tr gravel, Wet
6-8	Br f-ms, tr silt	24	24	0.9	2-3-4-4	Wet
8-10	Gy fs, tr silt	24	24	0.8	4-4-9-4	Wet
10-12	Br vfs, tr silt	24	18	0.1	4-6-9-7	Wet
12-15	f-ms, so gravel, so silt	24	10	0	6-6-9-9	Wet (dense)

Notes:
2" well installed - 10 slot screen, sand pack, total depth 12', screen set 2' - 12', estimate water table 6' below grade, 2' PVC stick up

Horsley Witten Group
Sustainable Environmental Solutions
90 Route 6A • Sandwich, MA • 02563
Tel: 508-833-6600 • Fax: 508-833-3150 • www.horsleywitten.com

BORING LOG B-4

Project: Upper Mystic Stormwater Wetland Project
Client: Town of Reading
Boring Contractor: Geoserach Environmental Contractors
Boring Equipment: Geoprobe - 6620DT

Date: 4/19/2021
Completion Depth: 17'
Elevation:
Inspector: J. Henderson

Proportions Used:

		Color	Misc.	Size
trace (tr)	0 - 10%	Blue (Bl)	Fragments (frag.)	Fine = (f) Fine to Coarse = (f-c)
little (li)	10 - 20%	Red (R)	Cement (cem.)	Medium = (m) Very = (v)
some (so)	20 - 35%	Light (lt)	Well-Graded Sand (SW)	Coarse = (c) More/Less = (+/-)
and	35 - 50%	Dark (dk)	Poorly-Graded Sand (SP)	Dark = (dk)
		Rust (Ru)	Well-Graded Gravel (GW)	
			Poorly-Graded Gravel (GP)	
			Below Land Surface (BLS)	
Bold indicates soil sample submitted for laboratory analysis.			Not Available (N/A)	

Depth Feet	Description	Penetration (in)	Recovery (in)	PID	Blow Counts	Comments
0-2	Dk Br f-ms, li silt	24	4	NA	5-7-8-5	
5-7	Br m-cs, so gravel	24	18	NA	13-9-9-7	
10-12	Br/Gy m-cs, so silt, so gravel	24	12	NA	19-21-25-50	Wet (dense)
15-17	Br m-cs, so silt, so gravel	24	18	NA	14-16-19-24	Wet (dense)

APPENDIX C

Drainage Area Maps

LEGEND

DRAINAGE AREA BOUNDARY

IMP. AREA / **TOTAL AREA** (ACRES)

DA1 — *1.00* / **2.50**

WOODS
ROOFTOPS
GRASS
PAVEMENT

SP1 — STUDY POINT

SOIL BOUNDARY

450C — SOIL DESIGNATION

TIME OF CONCENTRATION FLOW PATH

2' CONTOURS (MASS GIS)

EXISTING DRAINAGE NETWORK

0 250
SCALE IN FEET

SOIL TYPES

629C	CANTON-CHARLTON-URBAN LAND COMPLEX (HSG A)
626B	MERRIMAC- URBAN LAND COMPLEX (HSG A/D)
52A	FREETOWN MUCK (HSG B/D)

Revisions

Rev	Date	By	Appr	Description

Horsley Witten Group, Inc.
Sustainable Environmental Solutions
90 Route 6A
Sandwich, MA 02563
508-833-6600 voice
508-833-3150 fax

Checked By: RAC
Drawn By: GSG/JMP
Design By: GSG
Date: MAY 2021

MYSTIC RIVER WATERSHED
TOWN OF READING
MAILLET CONSERVATION AREA

Plan Set:

Plan Title: EXISTING DRAINAGE MAP

Prepared For:
Town of Reading
16 Lowell Street
Reading, MA 01867
Phone:(781) 942-9082
Fax: —

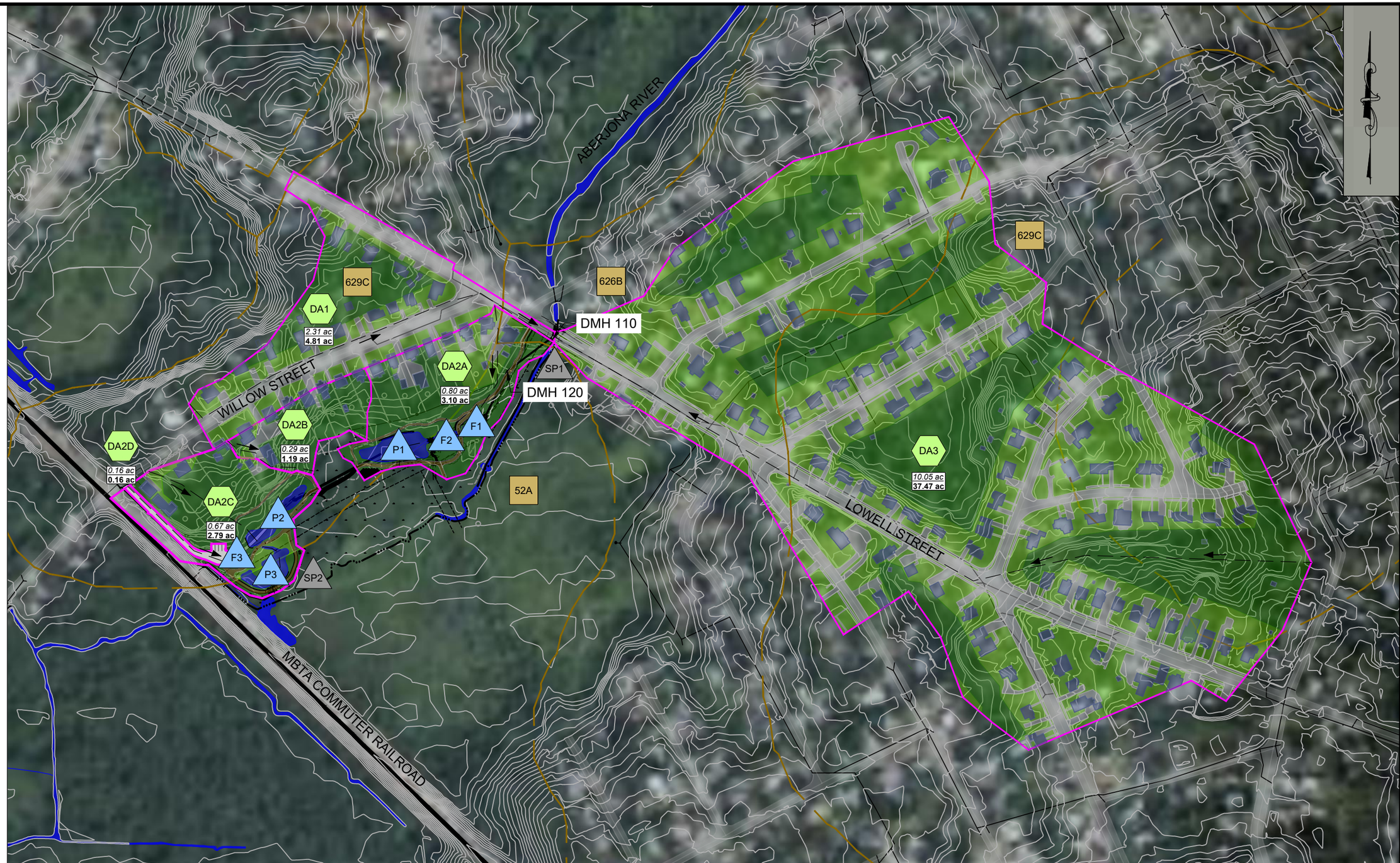
Survey Provided By:
Horsley Witten Group, Inc.
90 Route 6A
Phone(508) 833-6600
Fax:(508) 833-3150
Dated: —

Registration:

Project Number: 21008

Sheet Number: 1 of 2

last modified: 05/21/21 printed: 05/27/21 by jp H:\Projects\2021\21008 Upper Mystic River Watershed\Drawings_Reading\21008 READING DR.dwg



LEGEND

- DRAINAGE AREA BOUNDARY
- IMP. AREA / TOTAL AREA (ACRES)
- WATER
- WOODS
- DIRT PATH
- ROOFTOPS
- GRASS
- PAVEMENT
- STUDY POINT
- SOIL BOUNDARY
- SOIL DESIGNATION
- TIME OF CONCENTRATION FLOW PATH
- 2' CONTOURS (MASS GIS)
- EXISTING DRAINAGE NETWORK
- POND
- SCALE IN FEET: 0 – 250

SOIL TYPES

629C	CANTON-CHARLTON-URBAN LAND COMPLEX (HSG A)
626B	MERRIMAC- URBAN LAND COMPLEX (HSG A/D)
52A	FREETOWN MUCK (HSG B/D)

Revisions

Rev	Date	By	Appr	Description

Horsley Witten Group, Inc.
Sustainable Environmental Solutions
90 Route 6A
Sandwich, MA 02563
508-833-6600 voice
508-833-3150 fax

Date: MAY 2021
Design By: GSG
Drawn By: GSG/JMP
Checked By: RAC

Plan Set: MYSTIC RIVER WATERSHED
TOWN OF READING
MAILLET CONSERVATION AREA

Plan Title: PROPOSED DRAINAGE MAP

Prepared For:
Town of Reading
16 Lowell Street
Reading, MA 01867
Phone:(781) 942-9082
Fax: —

Survey Provided By:
Horsley Witten Group, Inc.
90 Route 6A
Phone(508) 833-6600
Fax:(508) 833-3150
Dated: —

Registration:

Project Number: 21008

Sheet Number: 2 of 2

last modified: 05/27/21 printed: 05/27/21 by jp H:\Projects\2021\21008 Upper Mystic River Watershed\Drawings_Reading\21008 READING DR.dwg

APPENDIX D

BMP Sizing Calculations

Horsley Witten Group, Inc.
Sustainable Environmental Solutions
www.horsleywitten.com
Date: May 28, 2021

WVTS CALCULATIONS
Project: Mystic River Watershed Associa
Project No: 21008
Calculated By: GSG
Checked By: JR

WET VEGETATED TREATMENT SYSTEM CALCULATIONS	REQUIRED	PROVIDED	UNITS
DRAINAGE AREAS AND WATER QUALITY VOLUME			
TOTAL CONTRIBUTING DRAINAGE AREA (10 Ac. MIN.)	n/a	2,156,656	sf
	n/a	49.5	acres
TOTAL IMPERVIOUS AREA	n/a	588,120	sf
	n/a	13.5	acres
TOTAL IMPERVIOUS AREA	n/a	588,120	sf
	n/a	13.5	acres
RUNOFF DEPTH FOR WATER QUALITY VOLUME (WQv)	1.00	1.00	in
TREATMENT VOLUME REQUIRED (WQv)	**1.13**		ac-ft
	49,010		cf
TREATMENT VOLUME PROVIDED (WQv)			
SEDIMENT FOREBAY (10% OF WQv)	4,901	4,867	cf
	0.11	0.11	ac-ft
PERMANENT POOL (40%-90% OF WQv)	29,406	28,901	cf
		0.66	ac-ft
EXTENDED DETENTION (0%-50% OF WQv)	19,604	24,246	cf
		0.56	ac-ft
TOTAL TREATMENT VOLUME PROVIDED (WQv)	49,010	**58,014**	cf
	1.13	**1.33**	ac-ft
WVTS AREA AND VOLUME CHARACTERISTICS			
MIN. SURFACE AREA OF WVTS (1.5% of Drainage area)	32,350	30,376	sf
	0.74	0.70	acres
DEEPWATER ZONE VOLUME (25% of WQv)	12,253	12,545	cf
	0.28	0.29	ac-ft
HIGH MARSH AREA - 0"-6" DEPTH (35% of total surface area)	11,322	8,448	sf
	0.26	0.19	acres
TOTAL MARSH AREA - 0"-18" DEPTH (65% of Total Surface Area)	21,027	19,676	sf
	0.48	0.45	acres
GEOMETRY			
LENGTH	n/a	185	ft
WIDTH (average)	n/a	45	ft
WIDTH (maximum)	n/a	80	ft
RATIO (average)	2 to 1	3 to 1	L:W
RATIO (maximum)	2 to 1	3 to 1	L:W

Horsley Witten Group, Inc.				**STORAGE VOLUME CALCULATIONS**		
Sustainable Environmental Solutions				Project: Mystic River Watershed: Reading		
www.horsleywitten.com				Project No: 21008		
Date: May 28, 2021				Calculated By: GSG		
				Checked By: JR		
Forebay 1						
	Elevation	**Surface Area**	**Incremental Storage**	**Cumulative Storage**		
	(feet)	**(sq. feet)**	**(cubic feet)**	**(cubic feet)**		
	83.50	1040	0	0		
	84.00	1321	590	590		
	84.50	1701	756	1346		
	85.00	1843	886	2232		
Forebay 2						
	Elevation	**Surface Area**	**Incremental Storage**	**Cumulative Storage**		
	(feet)	**(sq. feet)**	**(cubic feet)**	**(cubic feet)**		
	83.50	1266	0	0		
	84.00	1481	687	687		
	84.50	2013	874	1560		
	85.00	2288	1075	2636		
East Deep Water Zone						
	Elevation	**Surface Area**	**Incremental Storage**	**Cumulative Storage**		
	(feet)	**(sq. feet)**	**(cubic feet)**	**(cubic feet)**		
PERMANENT POOL	79.00	350	0	0	**DEEP WATER**	
	80.00	761	556	556		
	81.00	1501	1131	1687		
	82.00	2224	1863	3549		
	83.00	3057	2641	6190		
	84.00	6780	4919	11108		
	84.50	9440	4055	15163		
FLOOD STORAGE	85.00	10111	4888	4888		
	85.50	10800	5228	10116		

Horsley Witten Group, Inc.				**STORAGE VOLUME CALCULATIONS**		
Sustainable Environmental Solutions				Project: Mystic River Watershed: Reading		
www.horsleywitten.com				Project No: 21008		
Date: May 28, 2021				Calculated By: GSG		
				Checked By: JR		
West Deep Water Zone 1						
	Elevation	**Surface Area**	**Incremental Storage**	**Cumulative Storage**		
	(feet)	**(sq. feet)**	**(cubic feet)**	**(cubic feet)**		
PERMANENT POOL	79.00	2	0	0	DEEP WATER	
	80.00	92	47	47		
	81.00	292	192	239		
	82.00	731	512	751		
	83.00	1320	1026	1776		
	84.00	3600	2460	4236		
	84.50	5620	2305	6541		
FLOOD STORAGE	85.00	7000	3155	3155		
	85.50	8000	3750	6905		
West Deep Water Zone 2						
	Elevation	**Surface Area**	**Incremental Storage**	**Cumulative Storage**		
	(feet)	**(sq. feet)**	**(cubic feet)**	**(cubic feet)**		
PERMANENT POOL	79.00	14	0	0	DEEP WATER	
	80.00	85	50	50		
	81.00	375	230	280		
	82.00	826	601	880		
	83.00	1383	1105	1985		
	84.00	3807	2595	4580		
	84.50	6663	2618	7197		
FLOOD STORAGE	85.00	7397	3515	3515		
	85.50	7445	3711	7226		

Horsley Witten Group, Inc.				**STORAGE VOLUME CALCULATIONS**		
Sustainable Environmental Solutions				Project: Mystic River Watershed: Reading		
www.horsleywitten.com				Project No: 21008		
Date: May 28, 2021				Calculated By: GSG		
				Checked By: JR		
Permanent Pool Whole Basin			**Cumulative Surface Area - Perm Pool (square foot)**	**Cumulative Storage (cubic feet)**	**Cumulative Surface Area - Flood Storage**	
Forebay 1			1701	2232	1843	
Forebay 2			2013	2636	2288	
Cell 1			9440	15163	10800	
Cell 2			5620	6541	8000	
Cell 3			6663	7197	7445	
		Total	**23736**	**28901**	30376	
Flood Storage Total				**Cumulative Storage (cubic feet)**		
Cell 1				10116		
Cell 2				6905		
Cell 3				7226		
				24246		

APPENDIX E

HydroCAD® Drainage Calculations

NRCC EXTREME PRECIPITATION TABLES

EXISTING CONDITIONS
2-YEAR EVENT
10-YEAR EVENT
10-YEAR EVENT (2070)
25-YEAR EVENT
100-YEAR EVENT
100-YEAR EVENT (2070)
WQv

PROPOSED CONDITIONS
2-YEAR EVENT
10-YEAR EVENT
10-YEAR EVENT (2070)
25-YEAR EVENT
100-YEAR EVENT
100-YEAR EVENT (2070)
WQv

Extreme Precipitation Tables

Northeast Regional Climate Center

Data represents point estimates calculated from partial duration series. All precipitation amounts are displayed in inches.

Smoothing	Yes
State	Massachusetts
Location	
Longitude	71.095 degrees West
Latitude	42.526 degrees North
Elevation	0 feet
Date/Time	Thu, 27 May 2021 14:18:24 -0400

Extreme Precipitation Estimates

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.28	0.42	0.53	0.69	0.86	1.09	**1yr**	0.74	1.03	1.27	1.62	2.07	2.68	2.94	**1yr**	2.37	2.82	3.26	3.95	4.61	**1yr**
2yr	0.34	0.53	0.66	0.87	1.09	1.38	**2yr**	0.94	1.26	1.60	2.01	2.54	3.22	3.56	**2yr**	2.85	3.42	3.93	4.67	5.32	**2yr**
5yr	0.41	0.63	0.79	1.06	1.36	1.74	**5yr**	1.17	1.58	2.02	2.56	3.23	4.08	4.53	**5yr**	3.62	4.36	4.98	5.93	6.68	**5yr**
10yr	0.46	0.72	0.91	1.23	1.60	2.07	**10yr**	1.38	1.88	2.42	3.07	3.88	4.89	5.45	**10yr**	4.33	5.24	5.96	7.10	7.93	**10yr**
25yr	0.54	0.86	1.09	1.51	2.00	2.60	**25yr**	1.73	2.36	3.06	3.90	4.94	6.22	6.95	**25yr**	5.50	6.68	7.55	9.02	9.97	**25yr**
50yr	0.61	0.98	1.25	1.76	2.37	3.12	**50yr**	2.04	2.81	3.67	4.69	5.94	7.46	8.36	**50yr**	6.60	8.04	9.04	10.82	11.86	**50yr**
100yr	0.70	1.13	1.46	2.06	2.80	3.71	**100yr**	2.42	3.34	4.39	5.62	7.12	8.94	10.06	**100yr**	7.92	9.68	10.83	12.98	14.11	**100yr**
200yr	0.79	1.29	1.68	2.41	3.32	4.43	**200yr**	2.87	3.98	5.26	6.75	8.55	10.73	12.12	**200yr**	9.50	11.65	12.98	15.57	16.79	**200yr**
500yr	0.95	1.57	2.05	2.97	4.17	5.60	**500yr**	3.59	5.01	6.67	8.59	10.89	13.67	15.50	**500yr**	12.10	14.91	16.48	19.82	21.15	**500yr**

Lower Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.25	0.38	0.46	0.63	0.77	0.87	**1yr**	0.66	0.85	1.15	1.40	1.73	2.42	2.35	**1yr**	2.15	2.26	2.75	3.48	4.13	**1yr**
2yr	0.33	0.51	0.62	0.84	1.04	1.24	**2yr**	0.90	1.21	1.43	1.89	2.43	3.07	3.40	**2yr**	2.72	3.27	3.77	4.49	5.14	**2yr**
5yr	0.38	0.59	0.73	1.00	1.28	1.49	**5yr**	1.10	1.46	1.70	2.20	2.82	3.64	4.09	**5yr**	3.22	3.93	4.51	5.37	6.09	**5yr**
10yr	0.42	0.65	0.81	1.13	1.46	1.71	**10yr**	1.26	1.67	1.94	2.48	3.16	4.11	4.66	**10yr**	3.64	4.48	5.14	6.13	6.92	**10yr**
25yr	0.49	0.74	0.93	1.32	1.74	2.03	**25yr**	1.50	1.99	2.30	2.89	3.68	4.80	5.57	**25yr**	4.25	5.36	6.13	7.28	8.22	**25yr**
50yr	0.54	0.83	1.03	1.48	1.99	2.33	**50yr**	1.72	2.28	2.61	3.26	4.14	5.38	6.40	**50yr**	4.76	6.16	7.03	8.25	9.36	**50yr**
100yr	0.61	0.92	1.16	1.67	2.29	2.66	**100yr**	1.98	2.60	2.97	3.68	4.65	6.00	7.39	**100yr**	5.31	7.10	8.07	9.37	10.68	**100yr**
200yr	0.68	1.03	1.31	1.89	2.64	3.04	**200yr**	2.27	2.97	3.37	4.14	5.23	6.66	8.54	**200yr**	5.90	8.21	9.28	10.61	12.20	**200yr**
500yr	0.80	1.19	1.53	2.23	3.17	3.62	**500yr**	2.74	3.54	3.99	4.85	6.12	7.60	10.42	**500yr**	6.73	10.02	11.19	12.43	14.52	**500yr**

Upper Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.30	0.47	0.57	0.77	0.95	1.11	**1yr**	0.82	1.08	1.29	1.72	2.20	2.85	3.25	**1yr**	2.53	3.12	3.54	4.28	5.05	**1yr**
2yr	0.35	0.55	0.67	0.91	1.13	1.33	**2yr**	0.97	1.30	1.54	2.03	2.61	3.39	3.75	**2yr**	3.00	3.61	4.13	4.94	5.56	**2yr**
5yr	0.44	0.68	0.84	1.16	1.47	1.74	**5yr**	1.27	1.70	2.02	2.61	3.32	4.50	5.03	**5yr**	3.98	4.84	5.55	6.57	7.33	**5yr**
10yr	0.54	0.82	1.02	1.43	1.84	2.14	**10yr**	1.59	2.09	2.47	3.16	3.99	5.61	6.31	**10yr**	4.96	6.07	6.93	8.21	9.01	**10yr**
25yr	0.70	1.06	1.32	1.88	2.47	2.81	**25yr**	2.13	2.74	3.27	4.09	5.10	7.54	8.50	**25yr**	6.67	8.18	9.27	11.00	11.88	**25yr**
50yr	0.84	1.28	1.59	2.29	3.08	3.46	**50yr**	2.66	3.38	4.03	4.97	6.14	9.45	10.65	**50yr**	8.36	10.24	11.51	13.76	14.63	**50yr**
100yr	1.03	1.55	1.94	2.81	3.85	4.25	**100yr**	3.32	4.16	4.98	6.04	7.39	11.86	13.31	**100yr**	10.50	12.79	14.34	17.26	18.03	**100yr**
200yr	1.25	1.88	2.38	3.45	4.81	5.24	**200yr**	4.15	5.12	6.16	7.33	8.88	14.91	16.61	**200yr**	13.19	15.97	17.85	21.66	22.23	**200yr**
500yr	1.63	2.42	3.11	4.52	6.43	6.91	**500yr**	5.55	6.75	8.17	9.49	11.36	20.21	22.24	**500yr**	17.89	21.39	23.85	29.25	29.28	**500yr**

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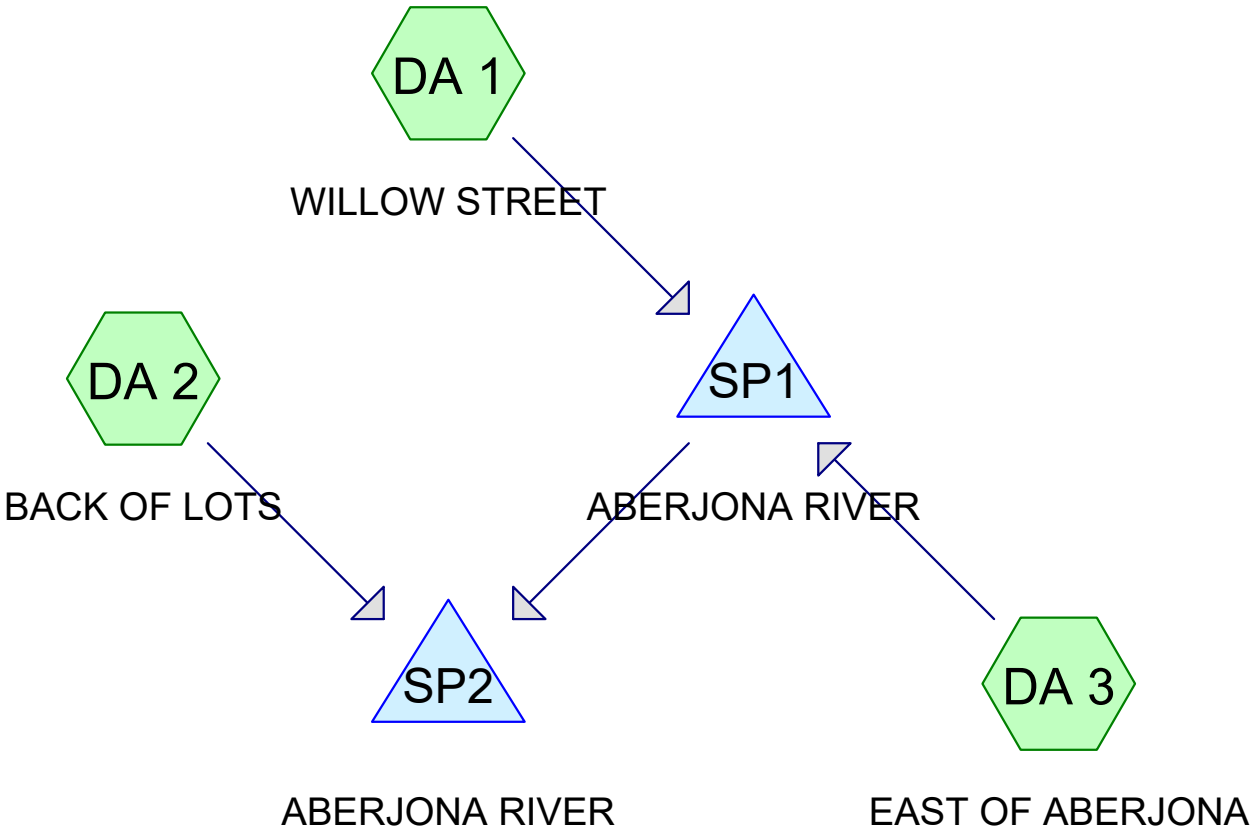


Subcat Reach Pond Link

Routing Diagram for Reading EX
Prepared by Horsley Witten Group, Printed 5/24/2021

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	1 YR	Type III 24-hr		Default	24.00	1	2.67	2
2	2 YR	Type III 24-hr		Default	24.00	1	3.21	2
3	10 YR	Type III 24-hr		Default	24.00	1	4.88	2
4	10 YR (2070)	Type III 24-hr		Default	24.00	1	6.38	2
5	25 YR	Type III 24-hr		Default	24.00	1	6.20	2
6	50 YR	Type III 24-hr		Default	24.00	1	7.44	2
7	100 YR	Type III 24-hr		Default	24.00	1	8.93	2
8	100 YR (2070)	Type III 24-hr		Default	24.00	1	11.70	2
9	WQV	Type III 24-hr		Default	24.00	1	1.22	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
17.870	39	Pasture/grassland/range, Good, HSG A (DA 2, DA 3)
1.370	74	Pasture/grassland/range, Good, HSG C (DA 1, DA 2)
9.170	98	Paved parking, HSG C (DA 1, DA 2, DA 3)
4.330	98	Roofs, HSG C (DA 1, DA 2, DA 3)
14.280	30	Woods, Good, HSG A (DA 2, DA 3)
2.490	70	Woods, Good, HSG C (DA 1, DA 2)
49.510	**55**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
32.150	HSG A	DA 2, DA 3
0.000	HSG B	
17.360	HSG C	DA 1, DA 2, DA 3
0.000	HSG D	
0.000	Other	
49.510		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
17.870	0.000	1.370	0.000	0.000	19.240	Pasture/grassland/range, Good	DA 1, DA 2, DA 3
0.000	0.000	9.170	0.000	0.000	9.170	Paved parking	DA 1, DA 2, DA 3
0.000	0.000	4.330	0.000	0.000	4.330	Roofs	DA 1, DA 2, DA 3
14.280	0.000	2.490	0.000	0.000	16.770	Woods, Good	DA 1, DA 2, DA 3
32.150	**0.000**	**17.360**	**0.000**	**0.000**	**49.510**	**TOTAL AREA**	

Time span=5.00-48.00 hrs, dt=0.03 hrs, 1434 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 DA 1: WILLOW STREET Runoff Area=4.810 ac 47.82% Impervious Runoff Depth=1.25"
Flow Length=1,080' Tc=15.1 min CN=84 Runoff=5.27 cfs 0.501 af

Subcatchment DA 2: BACK OF LOTS Runoff Area=7.230 ac 15.91% Impervious Runoff Depth=0.03"
Flow Length=415' Tc=16.1 min CN=49 Runoff=0.03 cfs 0.019 af

Subcatchment DA 3: EAST OF ABERJONA Runoff Area=37.470 ac 26.82% Impervious Runoff Depth=0.07"
Flow Length=2,160' Tc=20.7 min CN=52 Runoff=0.34 cfs 0.211 af

Pond SP1: ABERJONA RIVER Inflow=5.27 cfs 0.712 af
Primary=5.27 cfs 0.712 af

Pond SP2: ABERJONA RIVER Inflow=5.27 cfs 0.731 af
Primary=5.27 cfs 0.731 af

Total Runoff Area = 49.510 ac Runoff Volume = 0.731 af Average Runoff Depth = 0.18"
72.73% Pervious = 36.010 ac 27.27% Impervious = 13.500 ac

Summary for Subcatchment DA 1: WILLOW STREET

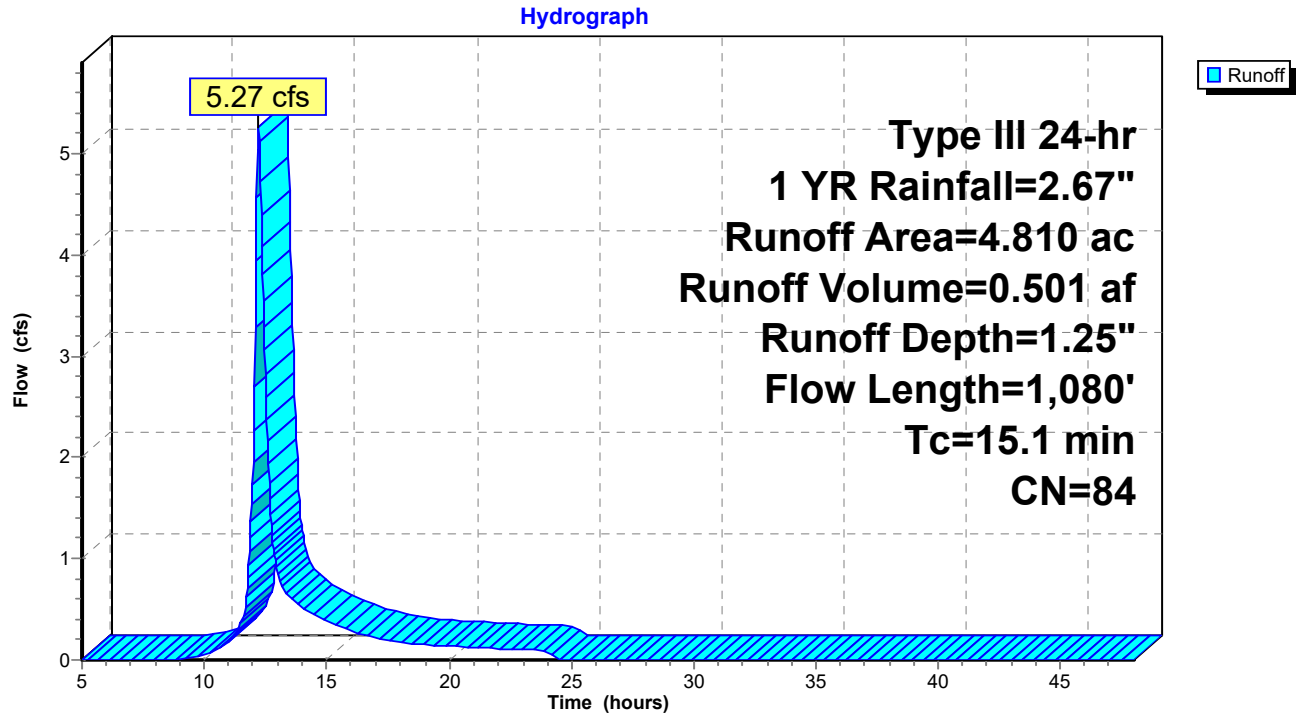
Runoff = 5.27 cfs @ 12.21 hrs, Volume= 0.501 af, Depth= 1.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 1 YR Rainfall=2.67"

Area (ac)	CN	Description
1.800	98	Paved parking, HSG C
0.500	98	Roofs, HSG C
1.250	70	Woods, Good, HSG C
1.260	74	Pasture/grassland/range, Good, HSG C
4.810	84	Weighted Average
2.510		52.18% Pervious Area
2.300		47.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
5.8	1,030	0.0210	2.94		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
15.1	1,080	Total			

Subcatchment DA 1: WILLOW STREET



Summary for Subcatchment DA 2: BACK OF LOTS

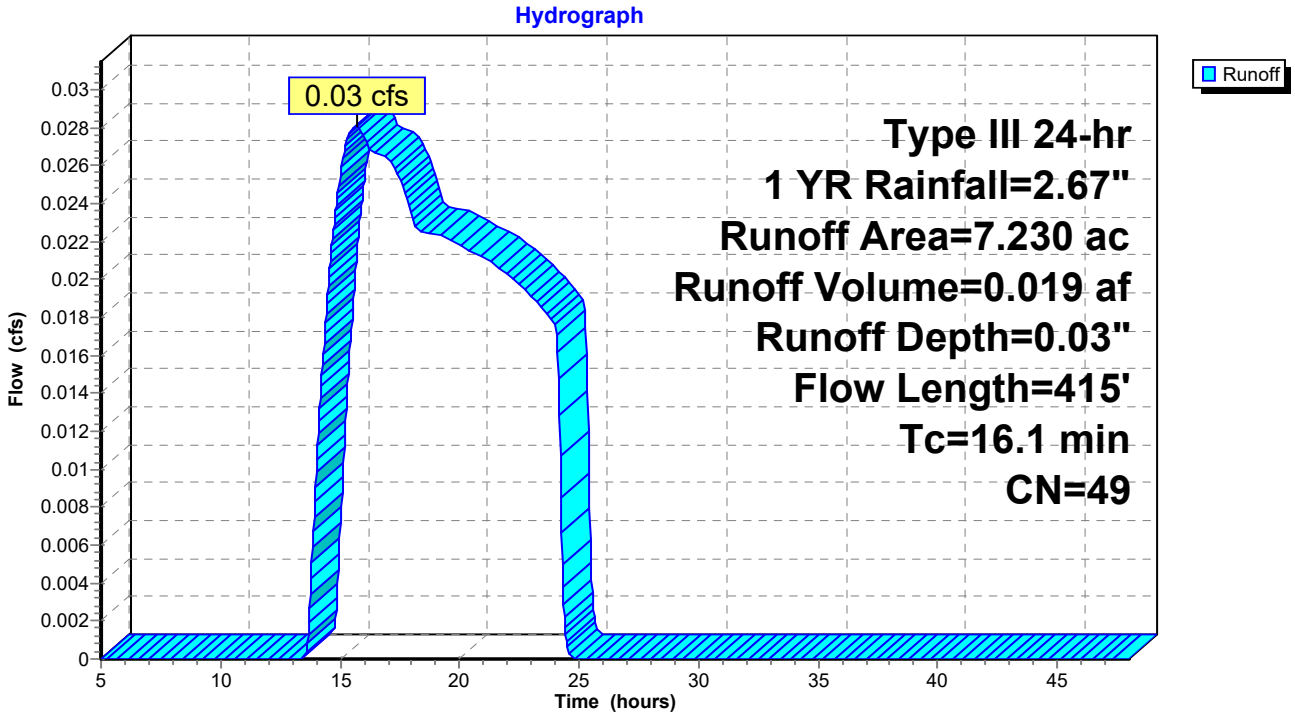
Runoff = 0.03 cfs @ 15.67 hrs, Volume= 0.019 af, Depth= 0.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 1 YR Rainfall=2.67"

Area (ac)	CN	Description
0.610	98	Paved parking, HSG C
0.540	98	Roofs, HSG C
4.320	30	Woods, Good, HSG A
1.240	70	Woods, Good, HSG C
0.410	39	Pasture/grassland/range, Good, HSG A
0.110	74	Pasture/grassland/range, Good, HSG C
7.230	49	Weighted Average
6.080		84.09% Pervious Area
1.150		15.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
3.8	365	0.1040	1.61		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
16.1	415	Total			

Subcatchment DA 2: BACK OF LOTS



Summary for Subcatchment DA 3: EAST OF ABERJONA

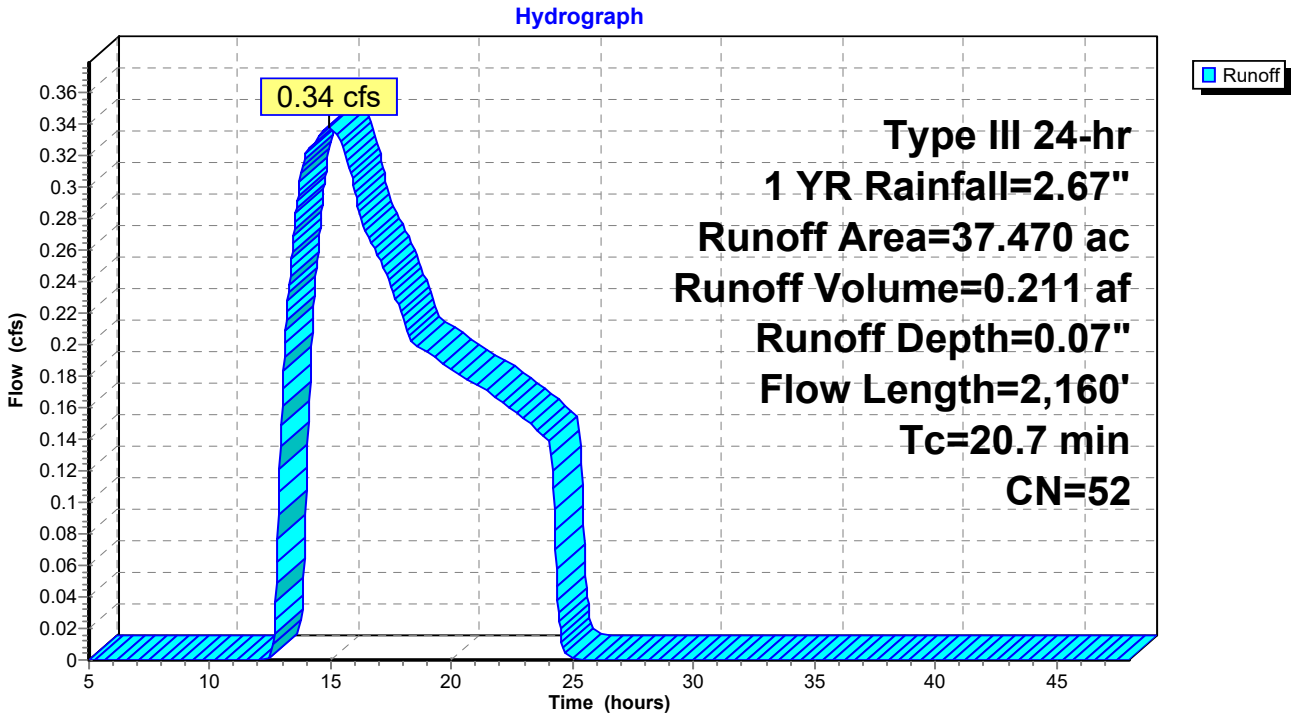
Runoff = 0.34 cfs @ 14.93 hrs, Volume= 0.211 af, Depth= 0.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 1 YR Rainfall=2.67"

Area (ac)	CN	Description
6.760	98	Paved parking, HSG C
3.290	98	Roofs, HSG C
9.960	30	Woods, Good, HSG A
17.460	39	Pasture/grassland/range, Good, HSG A
37.470	52	Weighted Average
27.420		73.18% Pervious Area
10.050		26.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
11.4	2,110	0.0230	3.08		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
20.7	2,160	Total			

Subcatchment DA 3: EAST OF ABERJONA

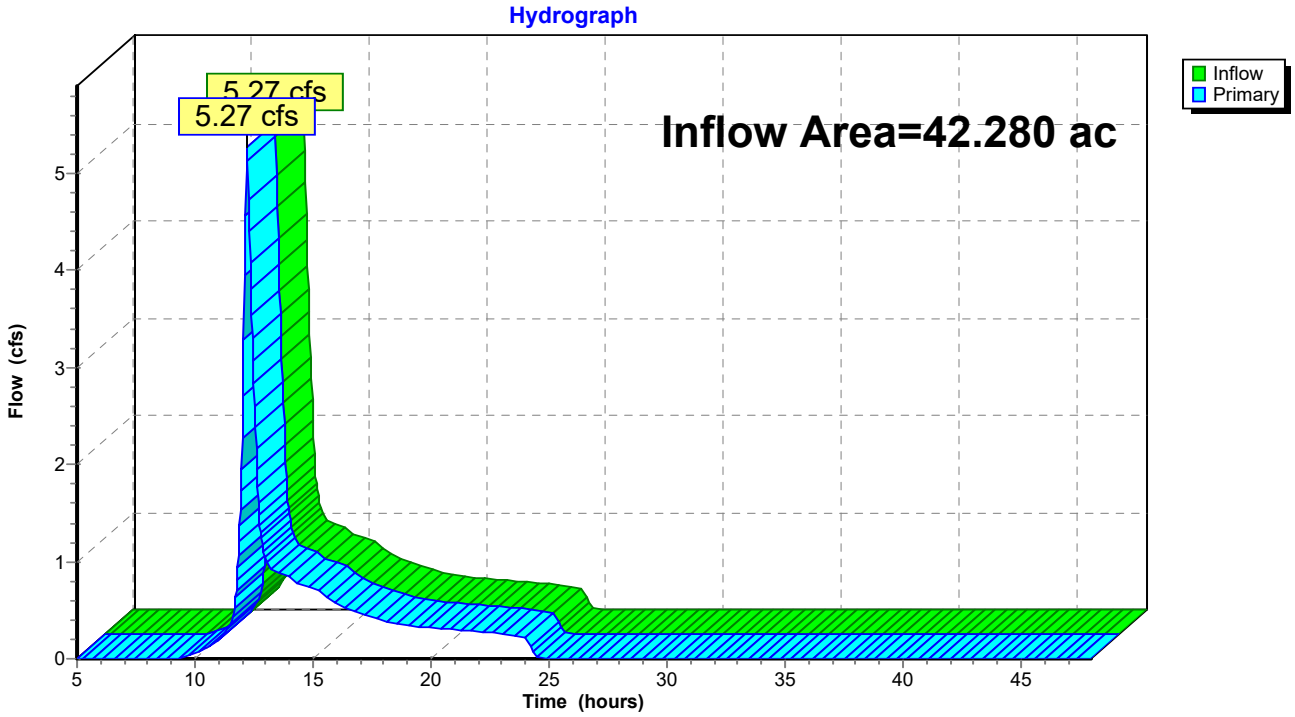


Summary for Pond SP1: ABERJONA RIVER

Inflow Area = 42.280 ac, 29.21% Impervious, Inflow Depth = 0.20" for 1 YR event
Inflow = 5.27 cfs @ 12.21 hrs, Volume= 0.712 af
Primary = 5.27 cfs @ 12.21 hrs, Volume= 0.712 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs

Pond SP1: ABERJONA RIVER

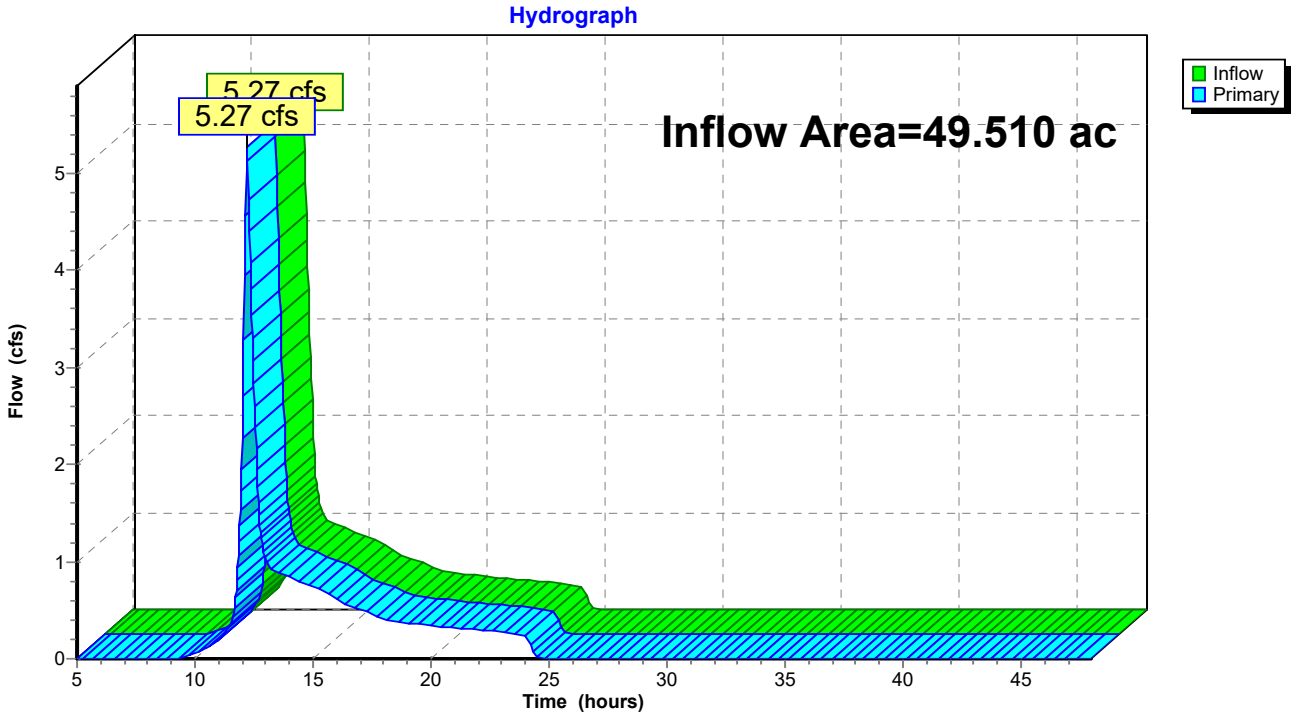


Summary for Pond SP2: ABERJONA RIVER

Inflow Area = 49.510 ac, 27.27% Impervious, Inflow Depth = 0.18" for 1 YR event
Inflow = 5.27 cfs @ 12.21 hrs, Volume= 0.731 af
Primary = 5.27 cfs @ 12.21 hrs, Volume= 0.731 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs

Pond SP2: ABERJONA RIVER



Time span=5.00-48.00 hrs, dt=0.03 hrs, 1434 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 DA 1: WILLOW STREET Runoff Area=4.810 ac 47.82% Impervious Runoff Depth=1.69"
Flow Length=1,080' Tc=15.1 min CN=84 Runoff=7.18 cfs 0.678 af

Subcatchment DA 2: BACK OF LOTS Runoff Area=7.230 ac 15.91% Impervious Runoff Depth=0.11"
Flow Length=415' Tc=16.1 min CN=49 Runoff=0.11 cfs 0.066 af

Subcatchment DA 3: EAST OF ABERJONA Runoff Area=37.470 ac 26.82% Impervious Runoff Depth=0.18"
Flow Length=2,160' Tc=20.7 min CN=52 Runoff=1.56 cfs 0.548 af

Pond SP1: ABERJONA RIVER Inflow=7.21 cfs 1.226 af
Primary=7.21 cfs 1.226 af

Pond SP2: ABERJONA RIVER Inflow=7.21 cfs 1.292 af
Primary=7.21 cfs 1.292 af

Total Runoff Area = 49.510 ac Runoff Volume = 1.292 af Average Runoff Depth = 0.31"
72.73% Pervious = 36.010 ac 27.27% Impervious = 13.500 ac

Summary for Subcatchment DA 1: WILLOW STREET

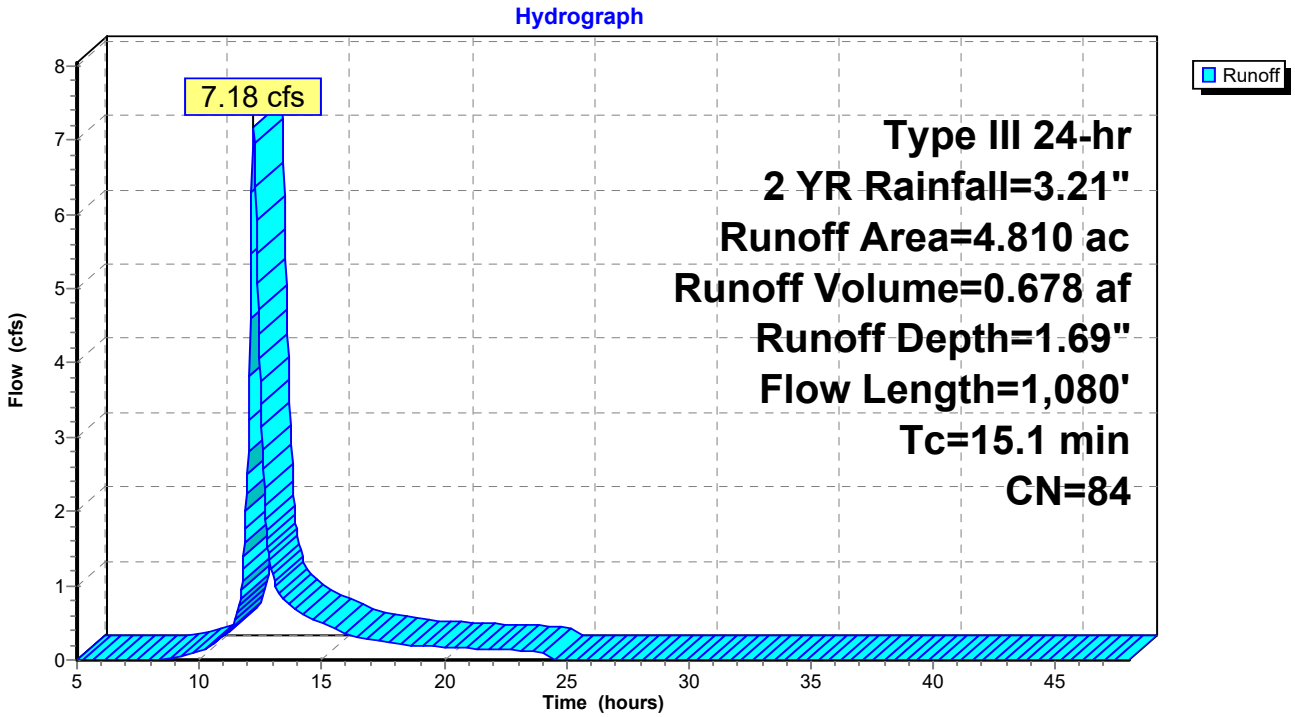
Runoff = 7.18 cfs @ 12.21 hrs, Volume= 0.678 af, Depth= 1.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 2 YR Rainfall=3.21"

Area (ac)	CN	Description
1.800	98	Paved parking, HSG C
0.500	98	Roofs, HSG C
1.250	70	Woods, Good, HSG C
1.260	74	Pasture/grassland/range, Good, HSG C
4.810	84	Weighted Average
2.510		52.18% Pervious Area
2.300		47.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
5.8	1,030	0.0210	2.94		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
15.1	1,080	Total			

Subcatchment DA 1: WILLOW STREET



Summary for Subcatchment DA 2: BACK OF LOTS

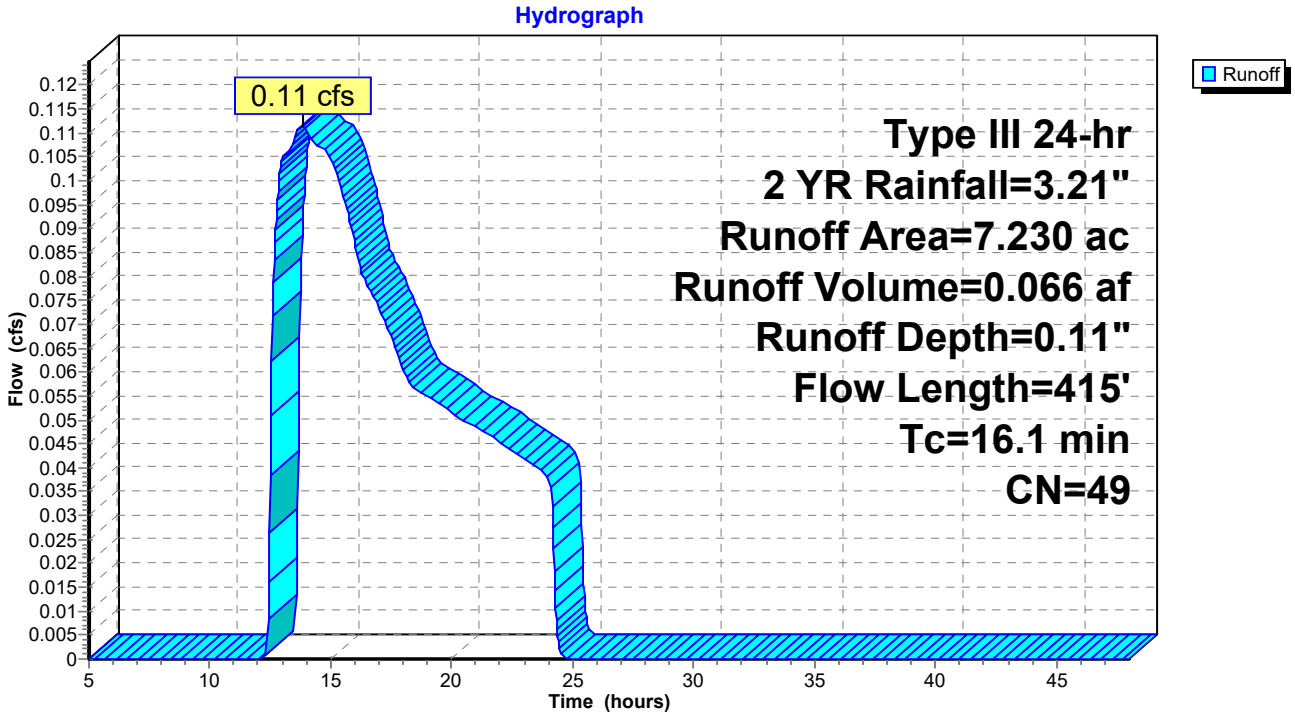
Runoff = 0.11 cfs @ 13.80 hrs, Volume= 0.066 af, Depth= 0.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 2 YR Rainfall=3.21"

Area (ac)	CN	Description
0.610	98	Paved parking, HSG C
0.540	98	Roofs, HSG C
4.320	30	Woods, Good, HSG A
1.240	70	Woods, Good, HSG C
0.410	39	Pasture/grassland/range, Good, HSG A
0.110	74	Pasture/grassland/range, Good, HSG C
7.230	49	Weighted Average
6.080		84.09% Pervious Area
1.150		15.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
3.8	365	0.1040	1.61		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
16.1	415	Total			

Subcatchment DA 2: BACK OF LOTS



Summary for Subcatchment DA 3: EAST OF ABERJONA

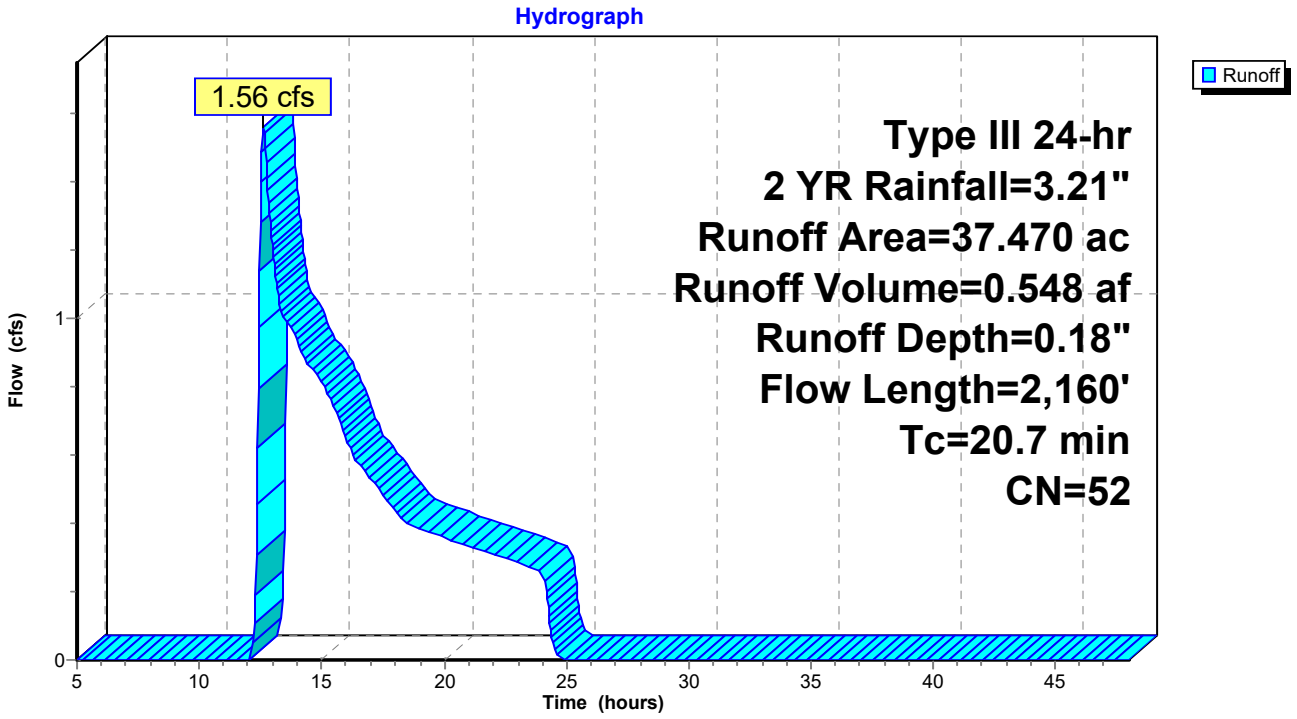
Runoff = 1.56 cfs @ 12.63 hrs, Volume= 0.548 af, Depth= 0.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 2 YR Rainfall=3.21"

Area (ac)	CN	Description
6.760	98	Paved parking, HSG C
3.290	98	Roofs, HSG C
9.960	30	Woods, Good, HSG A
17.460	39	Pasture/grassland/range, Good, HSG A
37.470	52	Weighted Average
27.420		73.18% Pervious Area
10.050		26.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
11.4	2,110	0.0230	3.08		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
20.7	2,160	Total			

Subcatchment DA 3: EAST OF ABERJONA

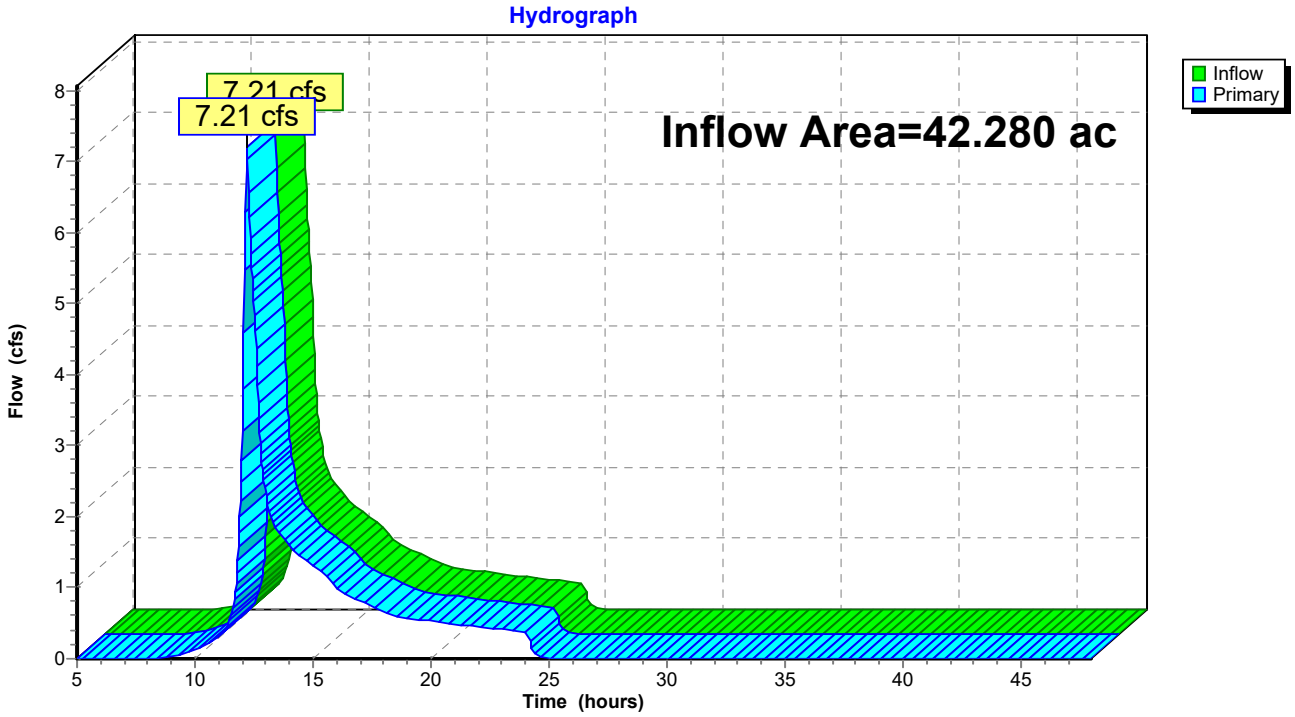


Summary for Pond SP1: ABERJONA RIVER

Inflow Area = 42.280 ac, 29.21% Impervious, Inflow Depth = 0.35" for 2 YR event
Inflow = 7.21 cfs @ 12.21 hrs, Volume= 1.226 af
Primary = 7.21 cfs @ 12.21 hrs, Volume= 1.226 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs

Pond SP1: ABERJONA RIVER

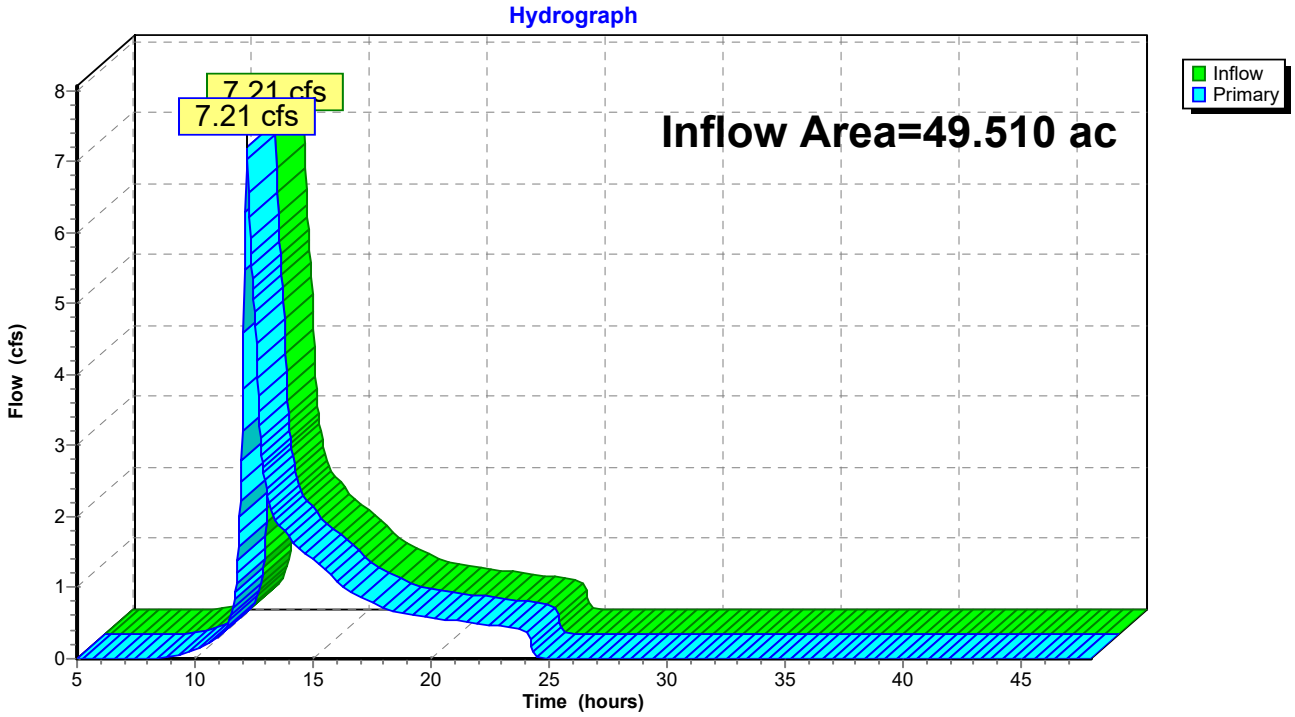


Summary for Pond SP2: ABERJONA RIVER

Inflow Area = 49.510 ac, 27.27% Impervious, Inflow Depth = 0.31" for 2 YR event
Inflow = 7.21 cfs @ 12.21 hrs, Volume= 1.292 af
Primary = 7.21 cfs @ 12.21 hrs, Volume= 1.292 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs

Pond SP2: ABERJONA RIVER



Time span=5.00-48.00 hrs, dt=0.03 hrs, 1434 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 DA 1: WILLOW STREET Runoff Area=4.810 ac 47.82% Impervious Runoff Depth=3.16"
Flow Length=1,080' Tc=15.1 min CN=84 Runoff=13.38 cfs 1.267 af

Subcatchment DA 2: BACK OF LOTS Runoff Area=7.230 ac 15.91% Impervious Runoff Depth=0.59"
Flow Length=415' Tc=16.1 min CN=49 Runoff=2.14 cfs 0.357 af

Subcatchment DA 3: EAST OF ABERJONA Runoff Area=37.470 ac 26.82% Impervious Runoff Depth=0.75"
Flow Length=2,160' Tc=20.7 min CN=52 Runoff=15.36 cfs 2.343 af

Pond SP1: ABERJONA RIVER Inflow=25.52 cfs 3.610 af
Primary=25.52 cfs 3.610 af

Pond SP2: ABERJONA RIVER Inflow=27.61 cfs 3.968 af
Primary=27.61 cfs 3.968 af

Total Runoff Area = 49.510 ac Runoff Volume = 3.968 af Average Runoff Depth = 0.96"
72.73% Pervious = 36.010 ac 27.27% Impervious = 13.500 ac

Summary for Subcatchment DA 1: WILLOW STREET

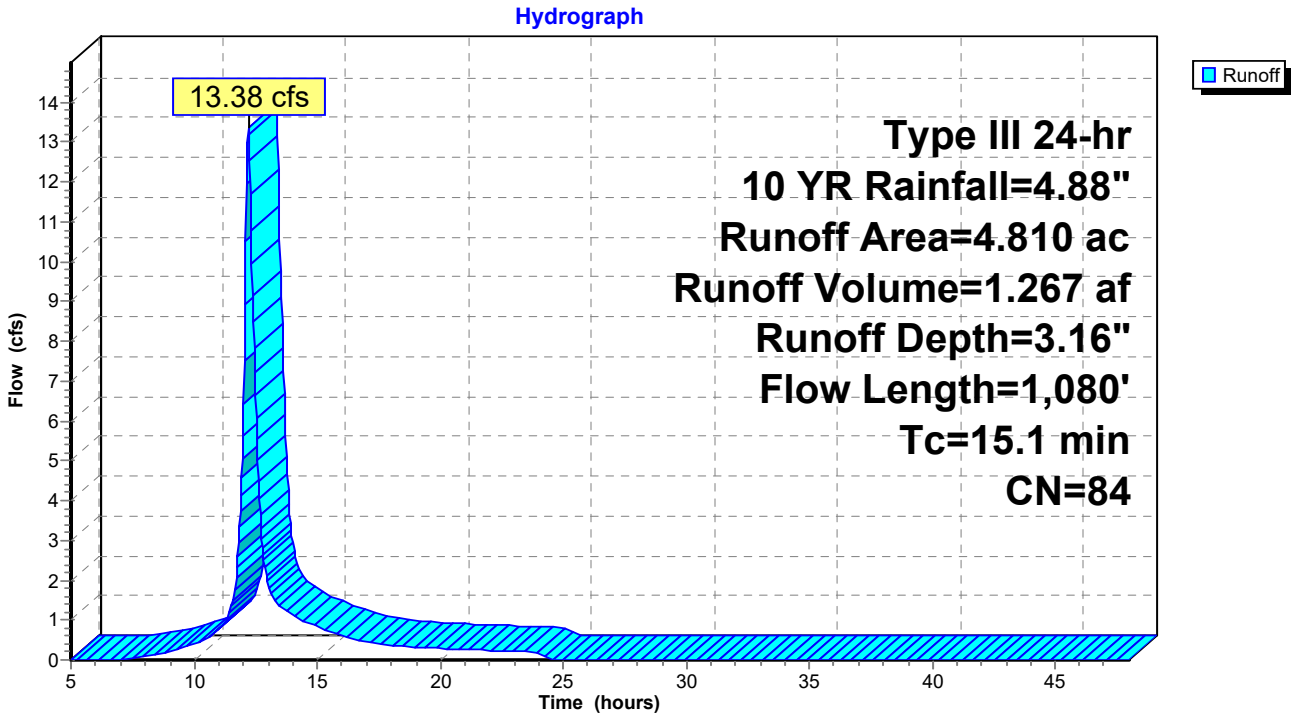
Runoff = 13.38 cfs @ 12.21 hrs, Volume= 1.267 af, Depth= 3.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 10 YR Rainfall=4.88"

Area (ac)	CN	Description
1.800	98	Paved parking, HSG C
0.500	98	Roofs, HSG C
1.250	70	Woods, Good, HSG C
1.260	74	Pasture/grassland/range, Good, HSG C
4.810	84	Weighted Average
2.510		52.18% Pervious Area
2.300		47.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
5.8	1,030	0.0210	2.94		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
15.1	1,080	Total			

Subcatchment DA 1: WILLOW STREET



Summary for Subcatchment DA 2: BACK OF LOTS

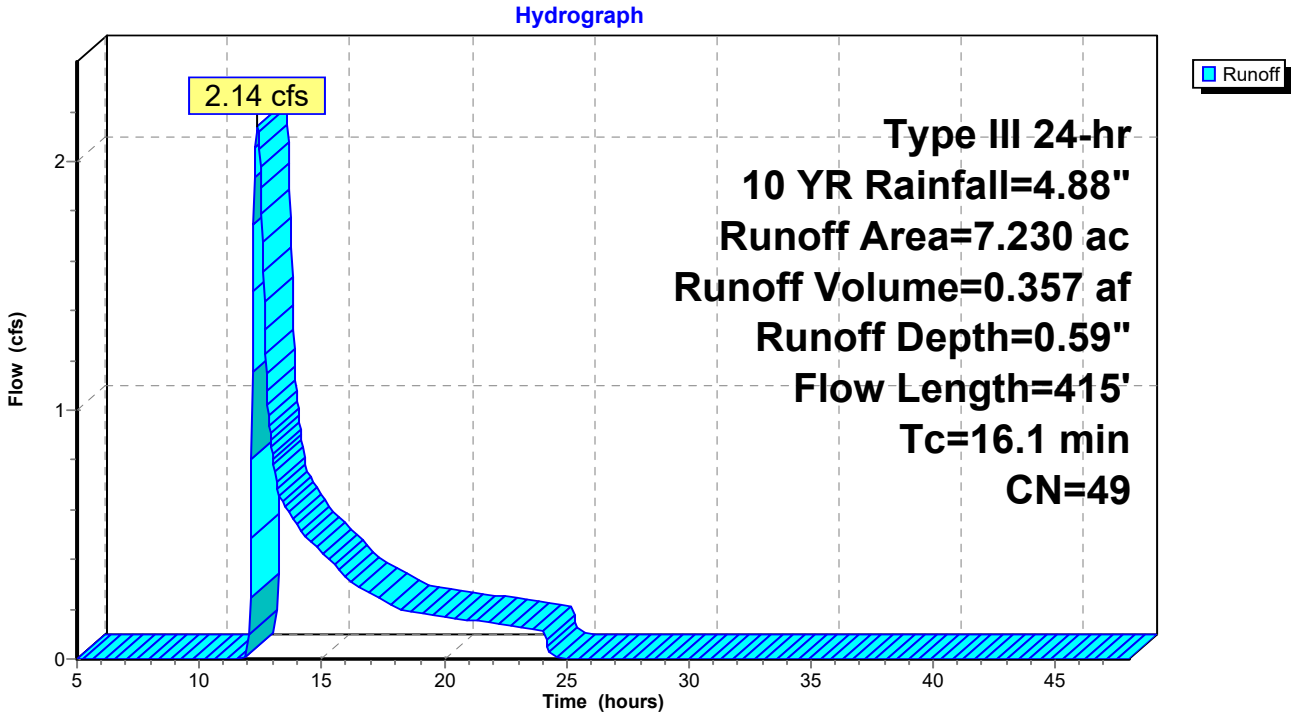
Runoff = 2.14 cfs @ 12.37 hrs, Volume= 0.357 af, Depth= 0.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 10 YR Rainfall=4.88"

Area (ac)	CN	Description
0.610	98	Paved parking, HSG C
0.540	98	Roofs, HSG C
4.320	30	Woods, Good, HSG A
1.240	70	Woods, Good, HSG C
0.410	39	Pasture/grassland/range, Good, HSG A
0.110	74	Pasture/grassland/range, Good, HSG C
7.230	49	Weighted Average
6.080		84.09% Pervious Area
1.150		15.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
3.8	365	0.1040	1.61		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
16.1	415	Total			

Subcatchment DA 2: BACK OF LOTS



Summary for Subcatchment DA 3: EAST OF ABERJONA

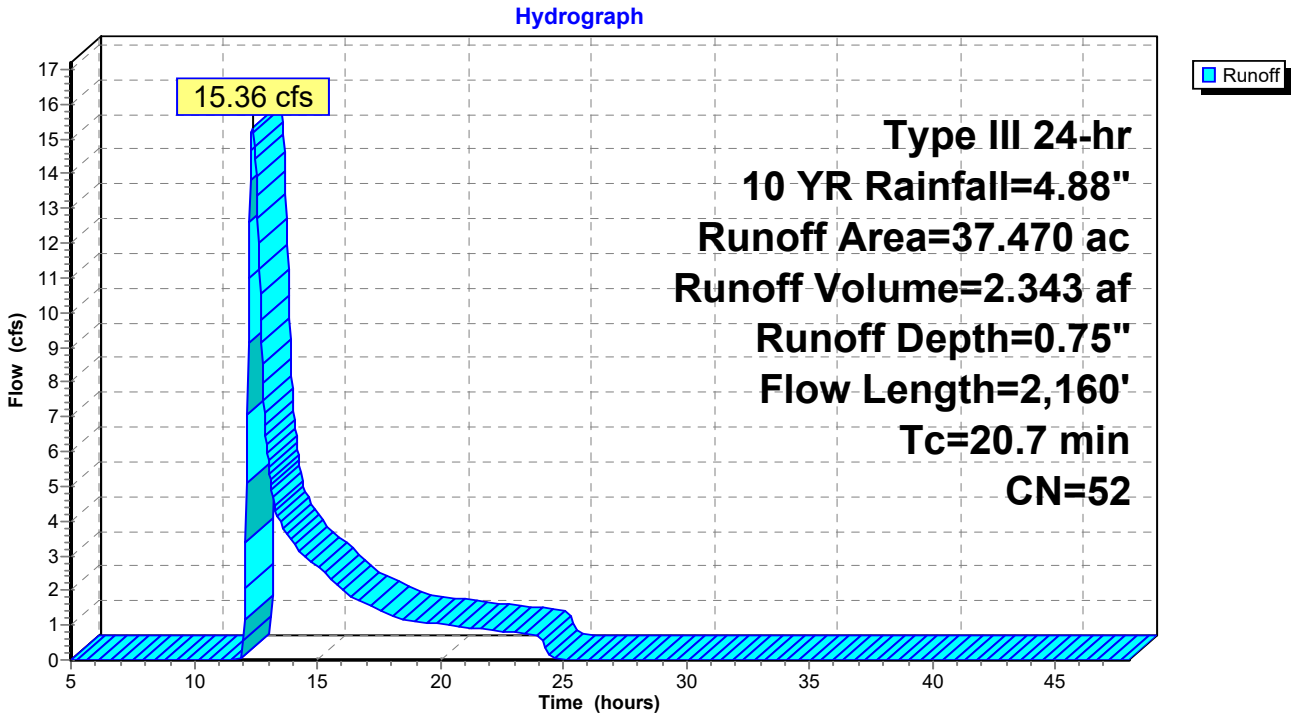
Runoff = 15.36 cfs @ 12.39 hrs, Volume= 2.343 af, Depth= 0.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 10 YR Rainfall=4.88"

Area (ac)	CN	Description
6.760	98	Paved parking, HSG C
3.290	98	Roofs, HSG C
9.960	30	Woods, Good, HSG A
17.460	39	Pasture/grassland/range, Good, HSG A
37.470	52	Weighted Average
27.420		73.18% Pervious Area
10.050		26.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
11.4	2,110	0.0230	3.08		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
20.7	2,160	Total			

Subcatchment DA 3: EAST OF ABERJONA

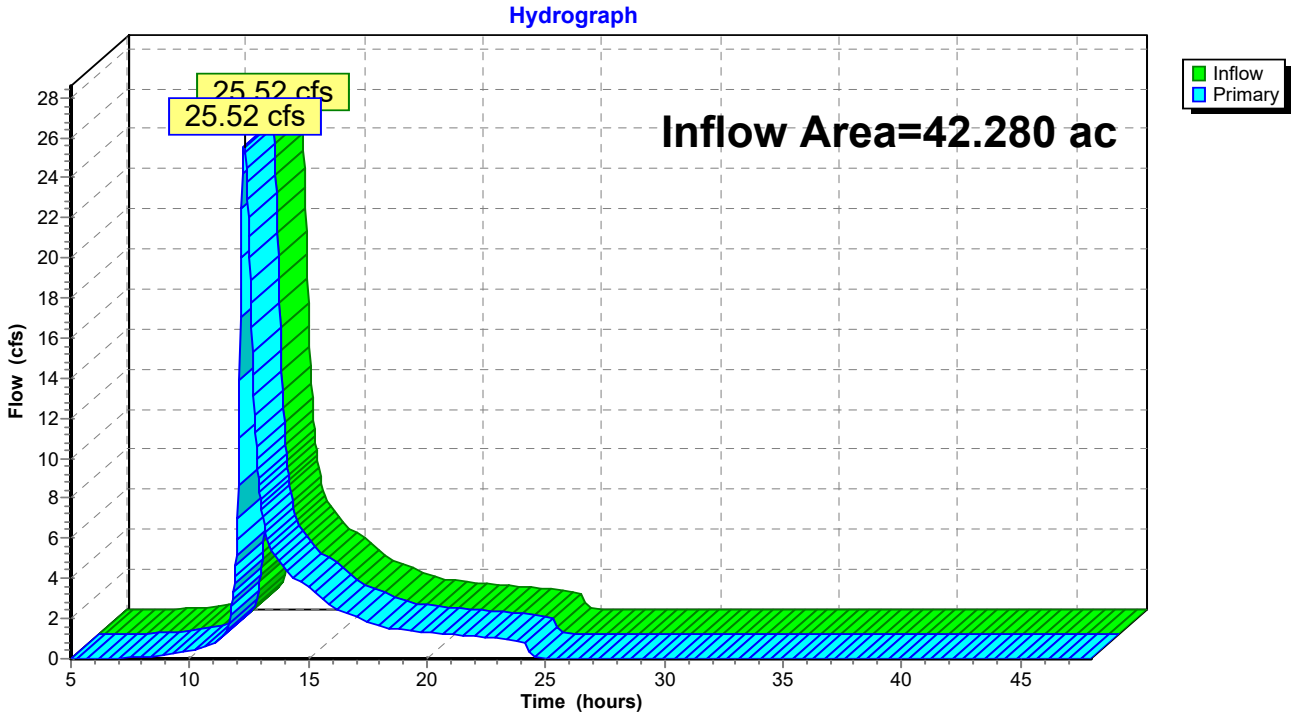


Summary for Pond SP1: ABERJONA RIVER

Inflow Area = 42.280 ac, 29.21% Impervious, Inflow Depth = 1.02" for 10 YR event
Inflow = 25.52 cfs @ 12.30 hrs, Volume= 3.610 af
Primary = 25.52 cfs @ 12.30 hrs, Volume= 3.610 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs

Pond SP1: ABERJONA RIVER

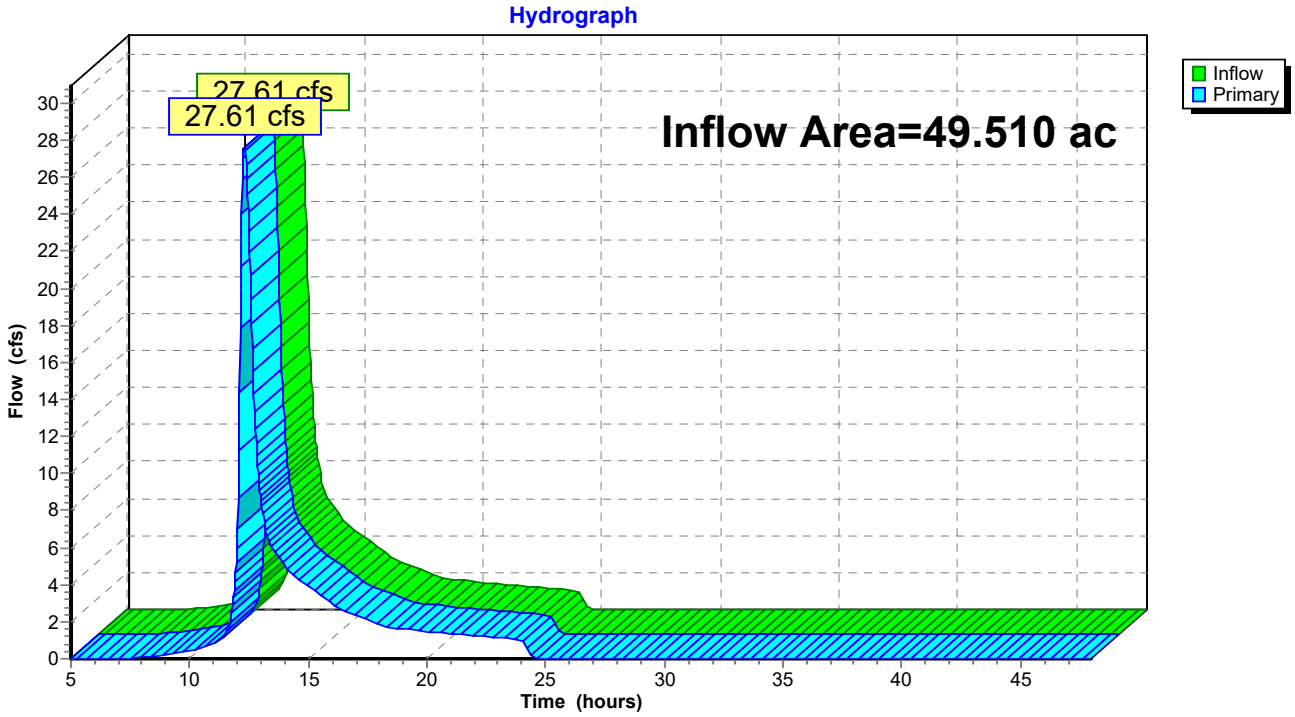


Summary for Pond SP2: ABERJONA RIVER

Inflow Area = 49.510 ac, 27.27% Impervious, Inflow Depth = 0.96" for 10 YR event
Inflow = 27.61 cfs @ 12.30 hrs, Volume= 3.968 af
Primary = 27.61 cfs @ 12.30 hrs, Volume= 3.968 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs

Pond SP2: ABERJONA RIVER



Time span=5.00-48.00 hrs, dt=0.03 hrs, 1434 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 DA 1: WILLOW STREET Runoff Area=4.810 ac 47.82% Impervious Runoff Depth=4.55"
Flow Length=1,080' Tc=15.1 min CN=84 Runoff=19.08 cfs 1.825 af

Subcatchment DA 2: BACK OF LOTS Runoff Area=7.230 ac 15.91% Impervious Runoff Depth=1.26"
Flow Length=415' Tc=16.1 min CN=49 Runoff=6.20 cfs 0.757 af

Subcatchment DA 3: EAST OF ABERJONA Runoff Area=37.470 ac 26.82% Impervious Runoff Depth=1.49"
Flow Length=2,160' Tc=20.7 min CN=52 Runoff=37.41 cfs 4.663 af

Pond SP1: ABERJONA RIVER Inflow=53.12 cfs 6.488 af
Primary=53.12 cfs 6.488 af

Pond SP2: ABERJONA RIVER Inflow=59.29 cfs 7.245 af
Primary=59.29 cfs 7.245 af

Total Runoff Area = 49.510 ac Runoff Volume = 7.245 af Average Runoff Depth = 1.76"
72.73% Pervious = 36.010 ac 27.27% Impervious = 13.500 ac

Summary for Subcatchment DA 1: WILLOW STREET

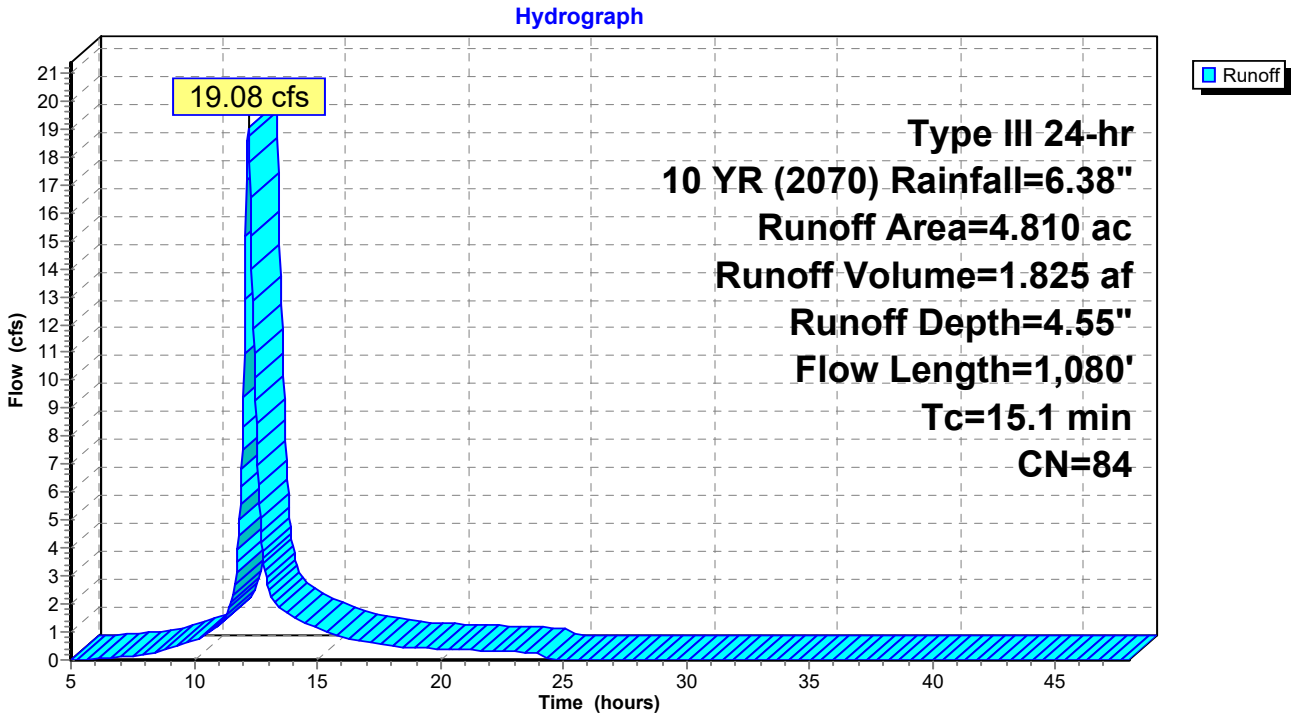
Runoff = 19.08 cfs @ 12.20 hrs, Volume= 1.825 af, Depth= 4.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 10 YR (2070) Rainfall=6.38"

Area (ac)	CN	Description
1.800	98	Paved parking, HSG C
0.500	98	Roofs, HSG C
1.250	70	Woods, Good, HSG C
1.260	74	Pasture/grassland/range, Good, HSG C
4.810	84	Weighted Average
2.510		52.18% Pervious Area
2.300		47.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
5.8	1,030	0.0210	2.94		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
15.1	1,080	Total			

Subcatchment DA 1: WILLOW STREET



Summary for Subcatchment DA 2: BACK OF LOTS

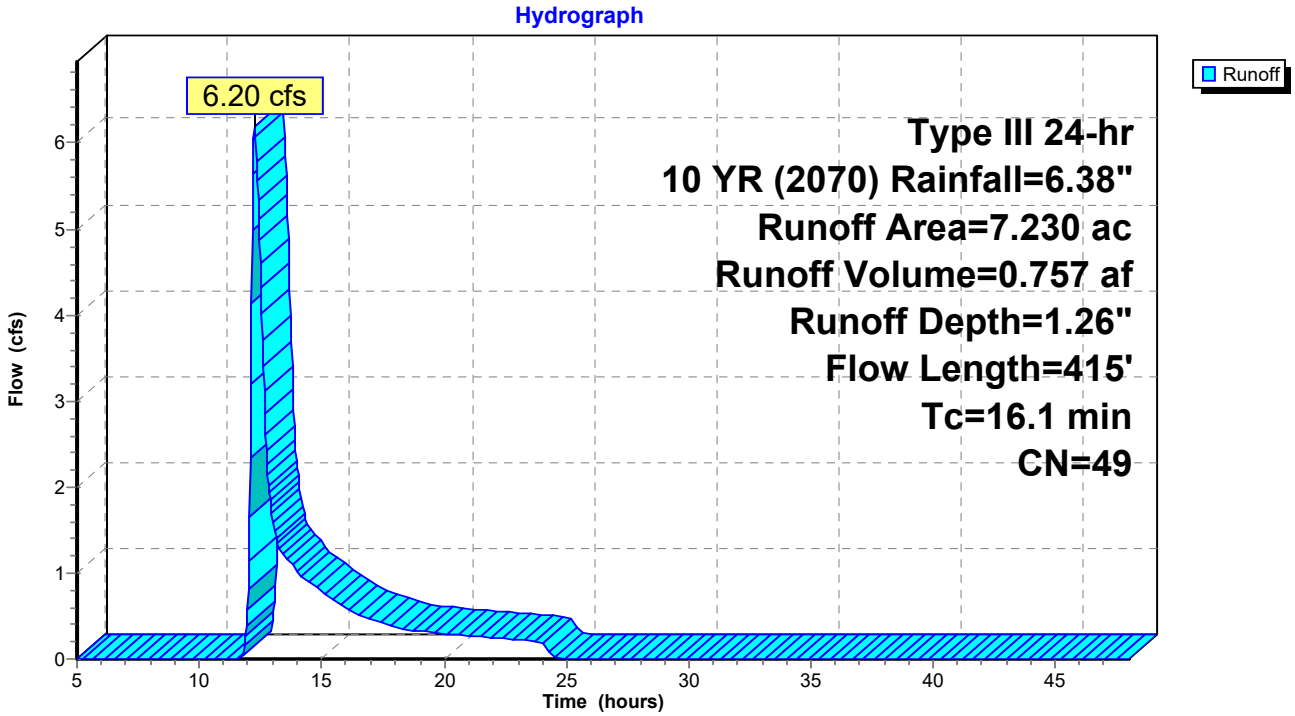
Runoff = 6.20 cfs @ 12.27 hrs, Volume= 0.757 af, Depth= 1.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 10 YR (2070) Rainfall=6.38"

Area (ac)	CN	Description
0.610	98	Paved parking, HSG C
0.540	98	Roofs, HSG C
4.320	30	Woods, Good, HSG A
1.240	70	Woods, Good, HSG C
0.410	39	Pasture/grassland/range, Good, HSG A
0.110	74	Pasture/grassland/range, Good, HSG C
7.230	49	Weighted Average
6.080		84.09% Pervious Area
1.150		15.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
3.8	365	0.1040	1.61		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
16.1	415	Total			

Subcatchment DA 2: BACK OF LOTS



Summary for Subcatchment DA 3: EAST OF ABERJONA

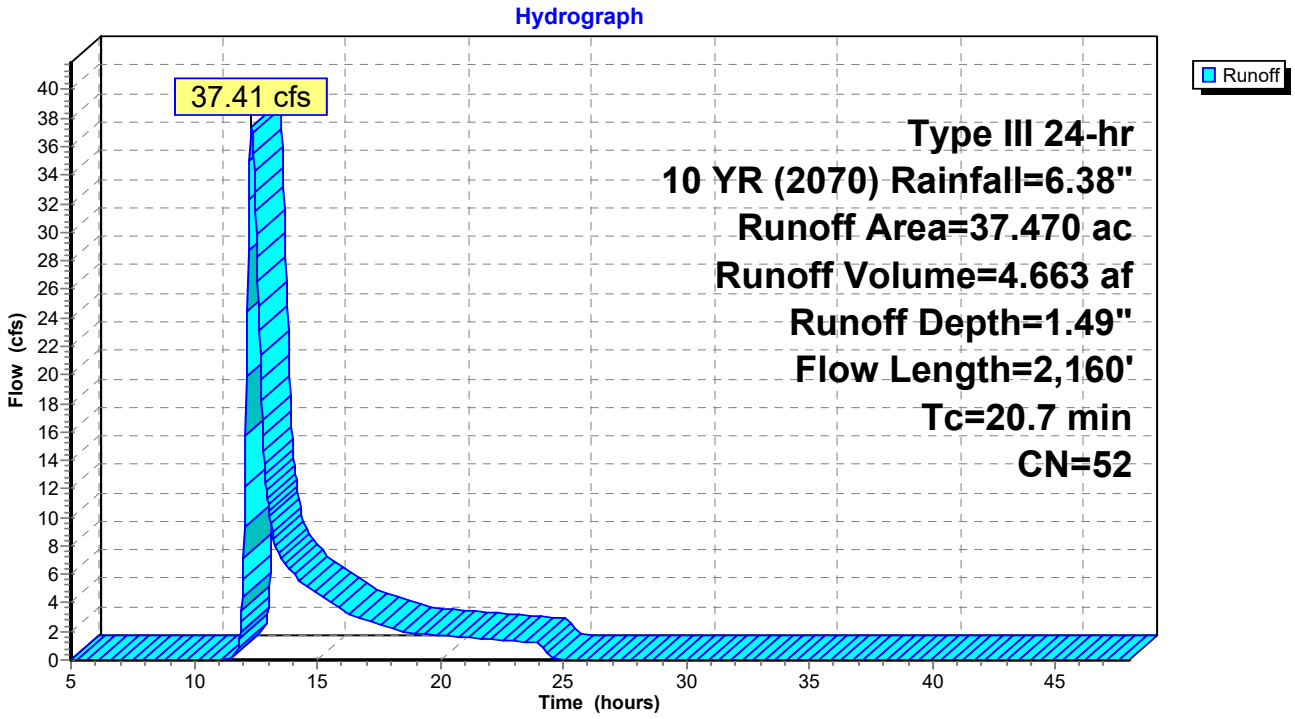
Runoff = 37.41 cfs @ 12.33 hrs, Volume= 4.663 af, Depth= 1.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 10 YR (2070) Rainfall=6.38"

Area (ac)	CN	Description
6.760	98	Paved parking, HSG C
3.290	98	Roofs, HSG C
9.960	30	Woods, Good, HSG A
17.460	39	Pasture/grassland/range, Good, HSG A
37.470	52	Weighted Average
27.420		73.18% Pervious Area
10.050		26.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
11.4	2,110	0.0230	3.08		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
20.7	2,160	Total			

Subcatchment DA 3: EAST OF ABERJONA

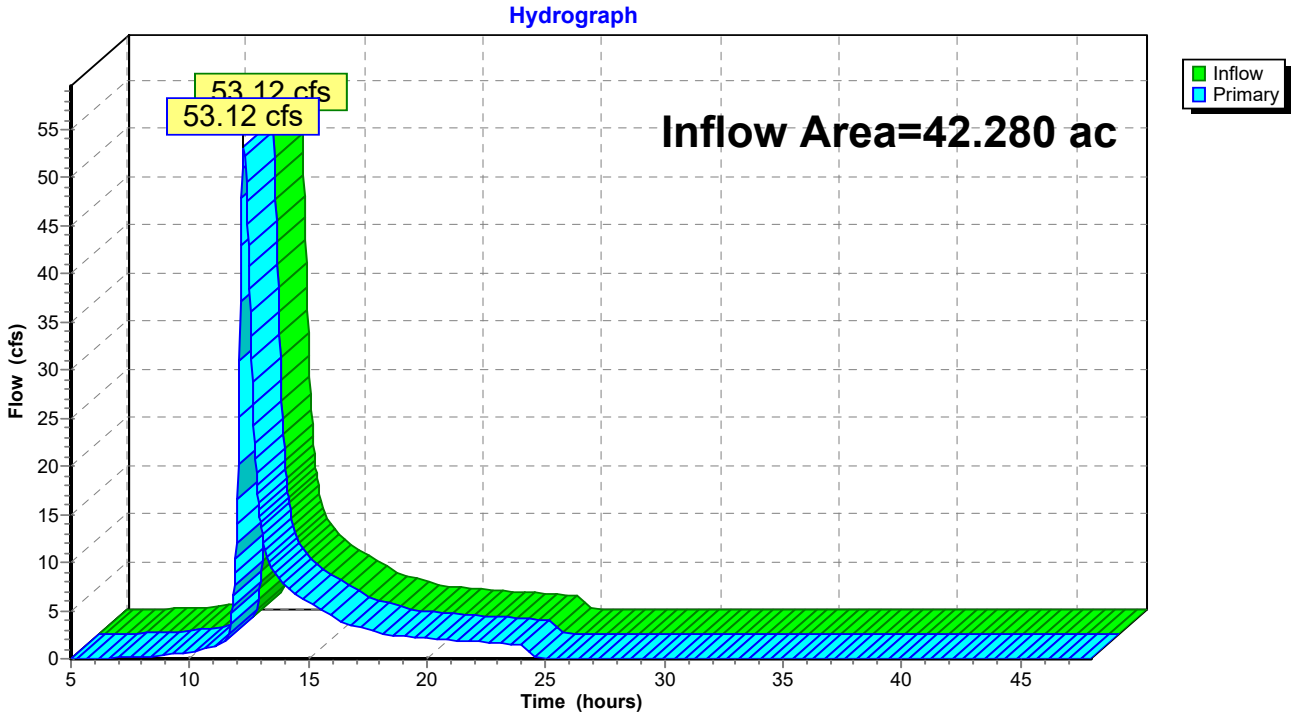


Summary for Pond SP1: ABERJONA RIVER

Inflow Area = 42.280 ac, 29.21% Impervious, Inflow Depth = 1.84" for 10 YR (2070) event
Inflow = 53.12 cfs @ 12.29 hrs, Volume= 6.488 af
Primary = 53.12 cfs @ 12.29 hrs, Volume= 6.488 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs

Pond SP1: ABERJONA RIVER

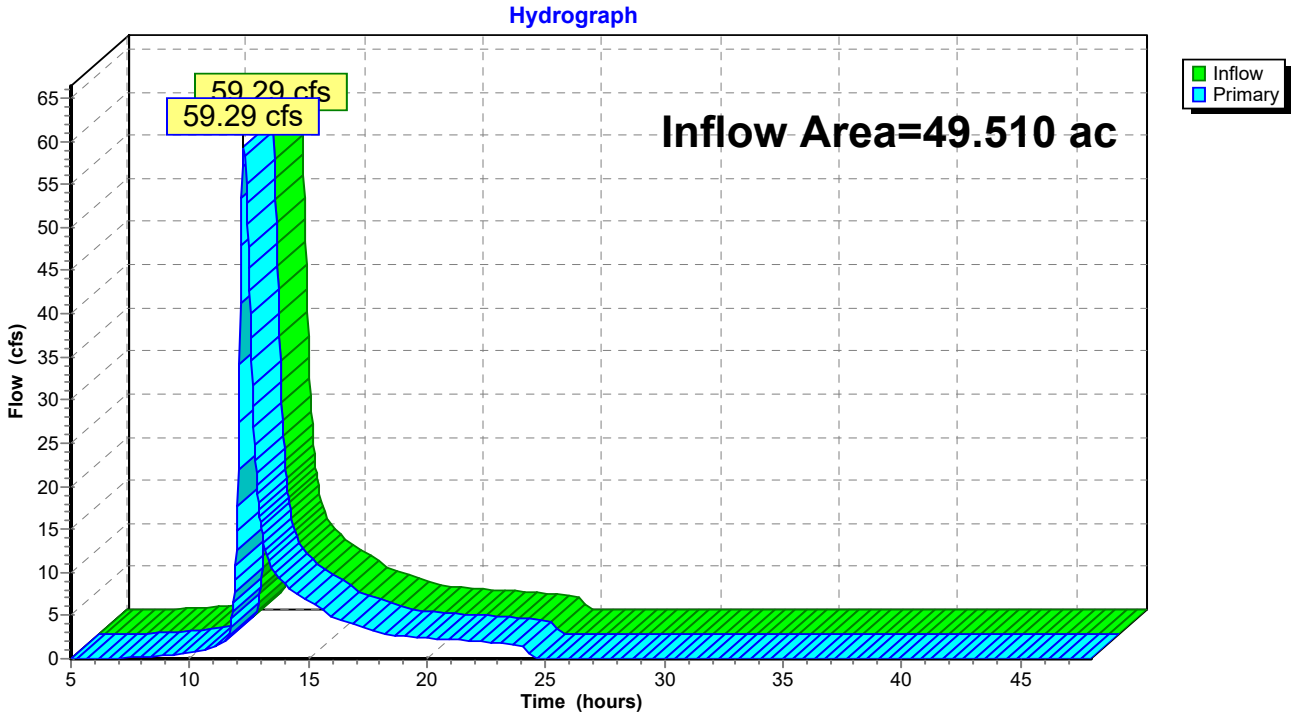


Summary for Pond SP2: ABERJONA RIVER

Inflow Area = 49.510 ac, 27.27% Impervious, Inflow Depth = 1.76" for 10 YR (2070) event
Inflow = 59.29 cfs @ 12.28 hrs, Volume= 7.245 af
Primary = 59.29 cfs @ 12.28 hrs, Volume= 7.245 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs

Pond SP2: ABERJONA RIVER



Time span=5.00-48.00 hrs, dt=0.03 hrs, 1434 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 DA 1: WILLOW STREET Runoff Area=4.810 ac 47.82% Impervious Runoff Depth=4.38"
Flow Length=1,080' Tc=15.1 min CN=84 Runoff=18.40 cfs 1.757 af

Subcatchment DA 2: BACK OF LOTS Runoff Area=7.230 ac 15.91% Impervious Runoff Depth=1.17"
Flow Length=415' Tc=16.1 min CN=49 Runoff=5.63 cfs 0.703 af

Subcatchment DA 3: EAST OF ABERJONA Runoff Area=37.470 ac 26.82% Impervious Runoff Depth=1.40"
Flow Length=2,160' Tc=20.7 min CN=52 Runoff=34.44 cfs 4.357 af

Pond SP1: ABERJONA RIVER Inflow=49.52 cfs 6.114 af
Primary=49.52 cfs 6.114 af

Pond SP2: ABERJONA RIVER Inflow=55.13 cfs 6.818 af
Primary=55.13 cfs 6.818 af

Total Runoff Area = 49.510 ac Runoff Volume = 6.818 af Average Runoff Depth = 1.65"
72.73% Pervious = 36.010 ac 27.27% Impervious = 13.500 ac

Summary for Subcatchment DA 1: WILLOW STREET

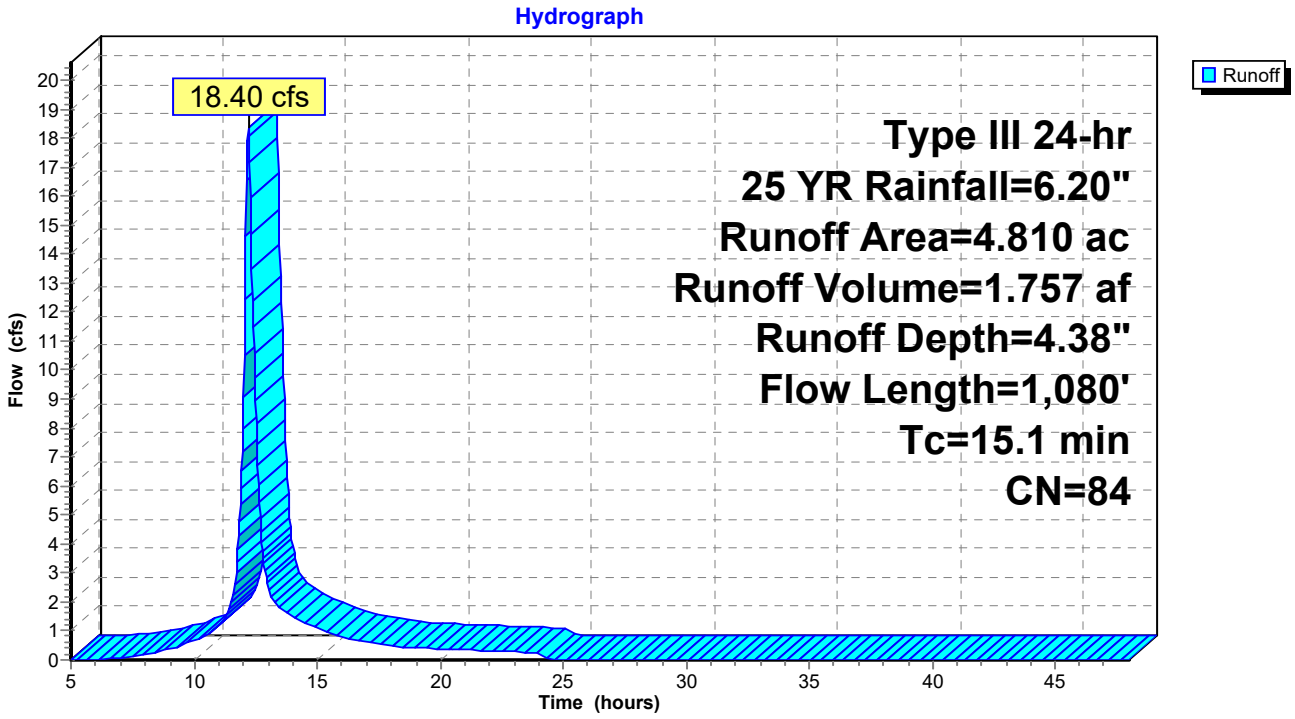
Runoff = 18.40 cfs @ 12.20 hrs, Volume= 1.757 af, Depth= 4.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 25 YR Rainfall=6.20"

Area (ac)	CN	Description
1.800	98	Paved parking, HSG C
0.500	98	Roofs, HSG C
1.250	70	Woods, Good, HSG C
1.260	74	Pasture/grassland/range, Good, HSG C
4.810	84	Weighted Average
2.510		52.18% Pervious Area
2.300		47.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
5.8	1,030	0.0210	2.94		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
15.1	1,080	Total			

Subcatchment DA 1: WILLOW STREET



Summary for Subcatchment DA 2: BACK OF LOTS

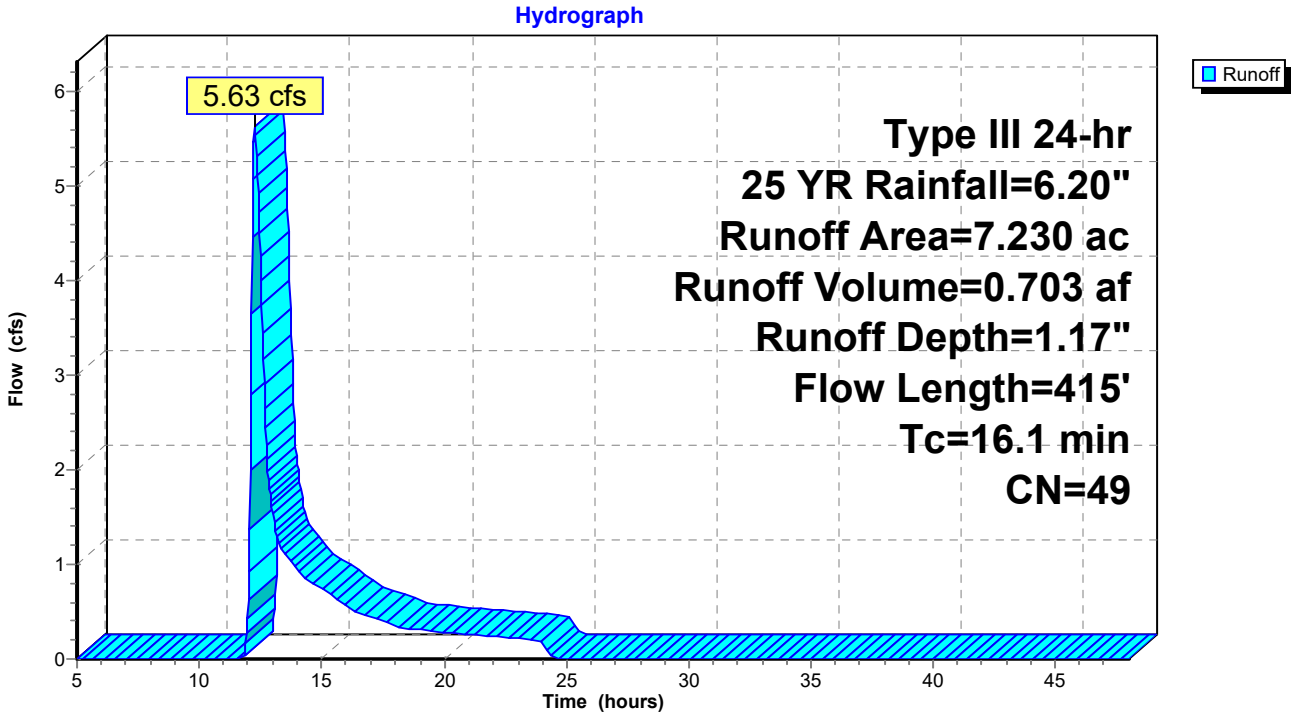
Runoff = 5.63 cfs @ 12.27 hrs, Volume= 0.703 af, Depth= 1.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 25 YR Rainfall=6.20"

Area (ac)	CN	Description
0.610	98	Paved parking, HSG C
0.540	98	Roofs, HSG C
4.320	30	Woods, Good, HSG A
1.240	70	Woods, Good, HSG C
0.410	39	Pasture/grassland/range, Good, HSG A
0.110	74	Pasture/grassland/range, Good, HSG C
7.230	49	Weighted Average
6.080		84.09% Pervious Area
1.150		15.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
3.8	365	0.1040	1.61		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
16.1	415	Total			

Subcatchment DA 2: BACK OF LOTS



Summary for Subcatchment DA 3: EAST OF ABERJONA

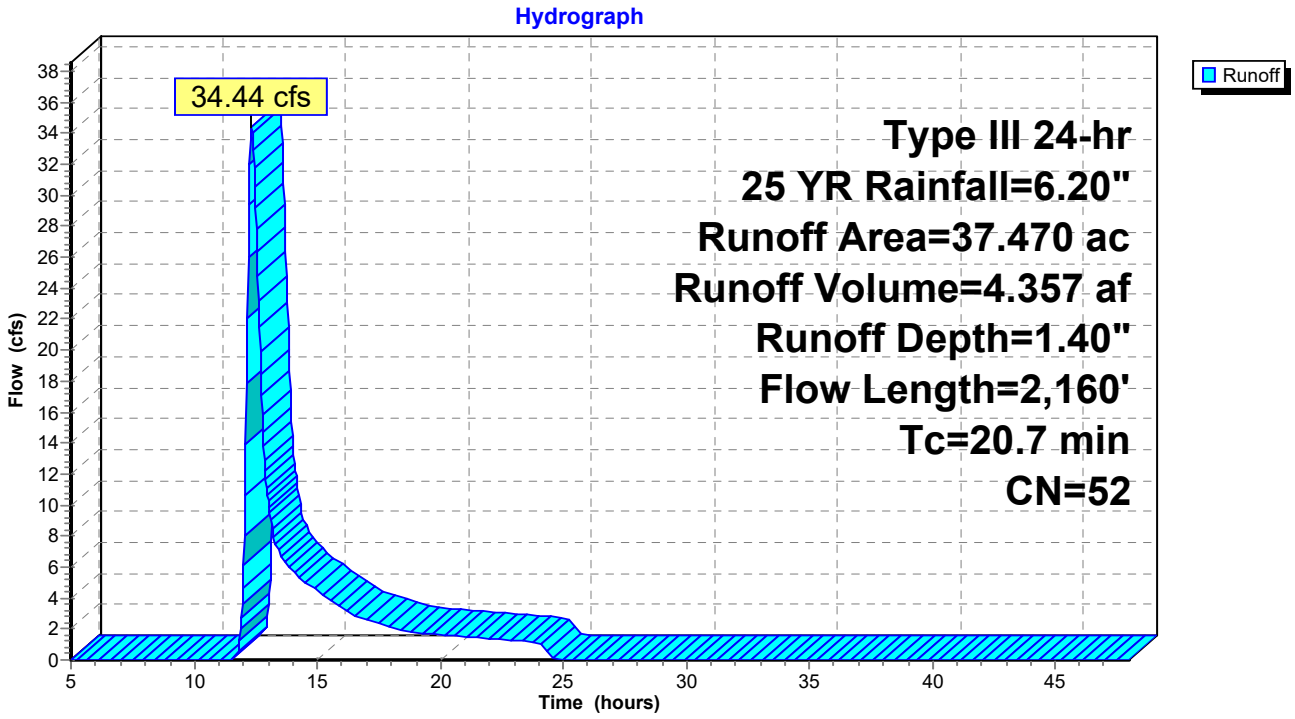
Runoff = 34.44 cfs @ 12.34 hrs, Volume= 4.357 af, Depth= 1.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 25 YR Rainfall=6.20"

Area (ac)	CN	Description
6.760	98	Paved parking, HSG C
3.290	98	Roofs, HSG C
9.960	30	Woods, Good, HSG A
17.460	39	Pasture/grassland/range, Good, HSG A
37.470	52	Weighted Average
27.420		73.18% Pervious Area
10.050		26.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
11.4	2,110	0.0230	3.08		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
20.7	2,160	Total			

Subcatchment DA 3: EAST OF ABERJONA

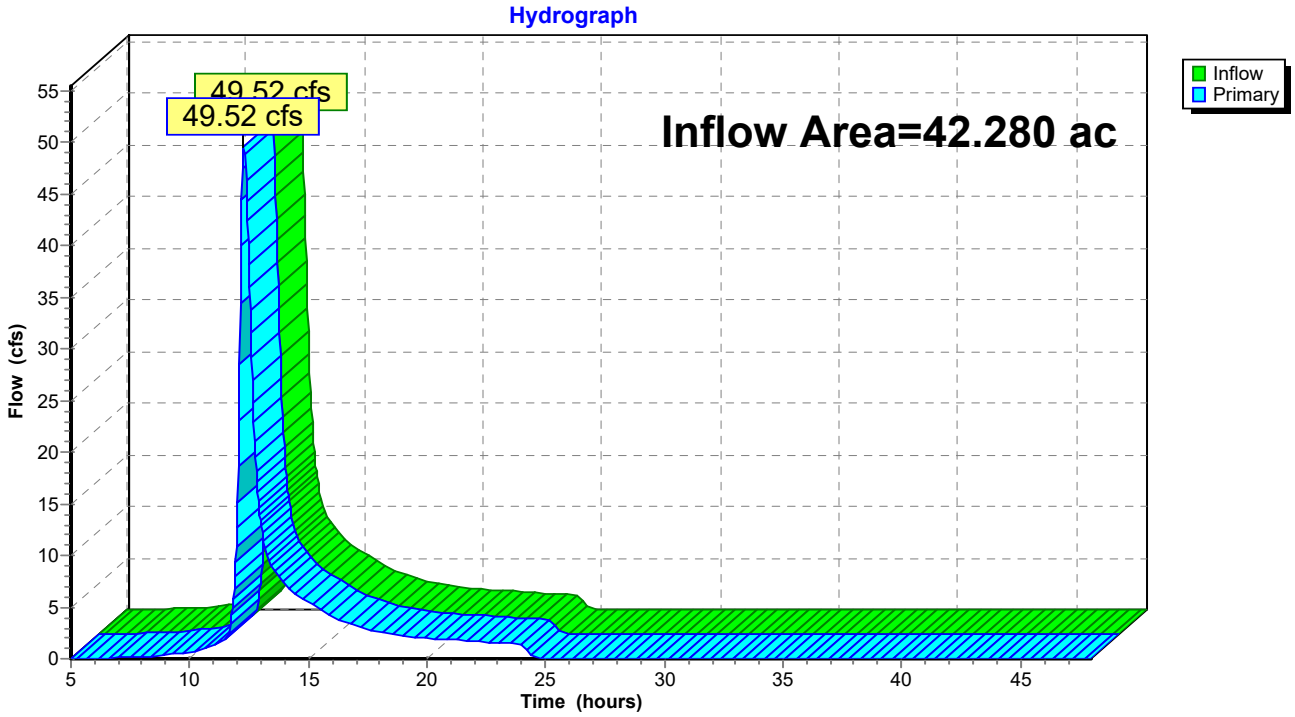


Summary for Pond SP1: ABERJONA RIVER

Inflow Area = 42.280 ac, 29.21% Impervious, Inflow Depth = 1.74" for 25 YR event
Inflow = 49.52 cfs @ 12.29 hrs, Volume= 6.114 af
Primary = 49.52 cfs @ 12.29 hrs, Volume= 6.114 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs

Pond SP1: ABERJONA RIVER

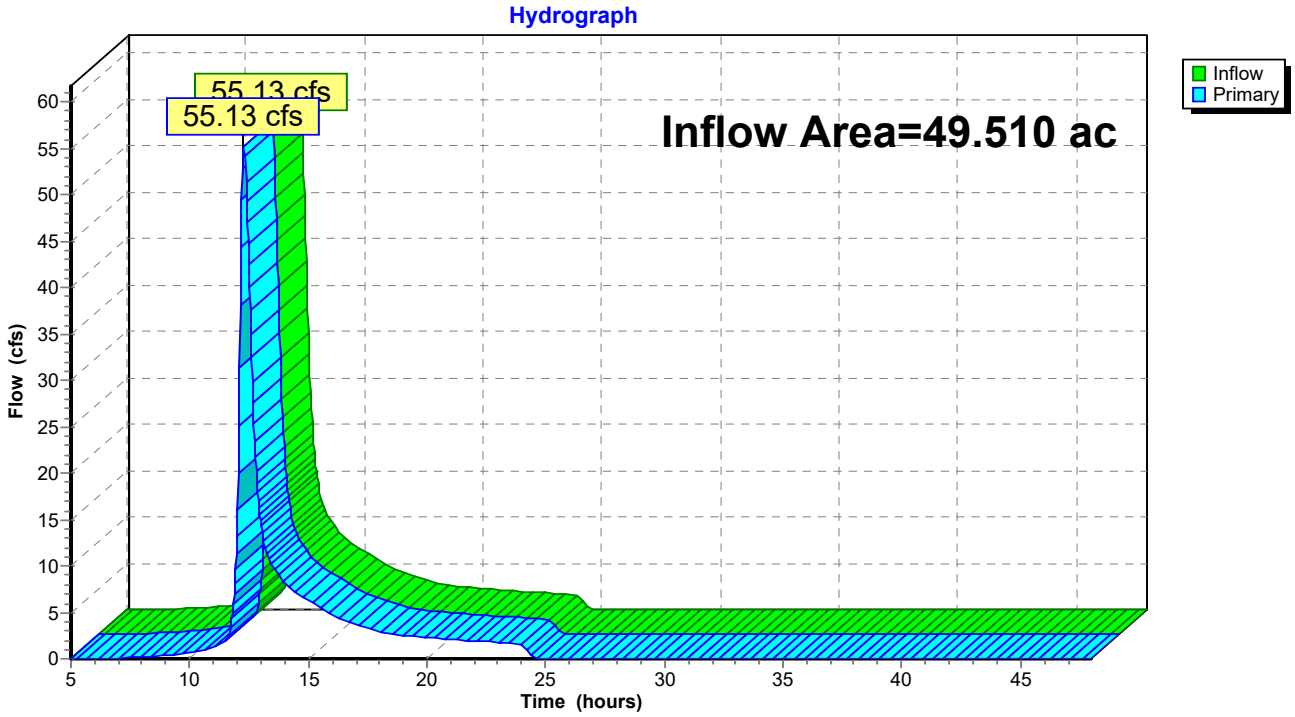


Summary for Pond SP2: ABERJONA RIVER

Inflow Area = 49.510 ac, 27.27% Impervious, Inflow Depth = 1.65" for 25 YR event
Inflow = 55.13 cfs @ 12.29 hrs, Volume= 6.818 af
Primary = 55.13 cfs @ 12.29 hrs, Volume= 6.818 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs

Pond SP2: ABERJONA RIVER



Time span=5.00-48.00 hrs, dt=0.03 hrs, 1434 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 DA 1: WILLOW STREET Runoff Area=4.810 ac 47.82% Impervious Runoff Depth>5.56"
Flow Length=1,080' Tc=15.1 min CN=84 Runoff=23.11 cfs 2.228 af

Subcatchment DA 2: BACK OF LOTS Runoff Area=7.230 ac 15.91% Impervious Runoff Depth=1.82"
Flow Length=415' Tc=16.1 min CN=49 Runoff=9.85 cfs 1.097 af

Subcatchment DA 3: EAST OF ABERJONA Runoff Area=37.470 ac 26.82% Impervious Runoff Depth=2.11"
Flow Length=2,160' Tc=20.7 min CN=52 Runoff=56.13 cfs 6.591 af

Pond SP1: ABERJONA RIVER Inflow=75.59 cfs 8.819 af
Primary=75.59 cfs 8.819 af

Pond SP2: ABERJONA RIVER Inflow=85.32 cfs 9.916 af
Primary=85.32 cfs 9.916 af

Total Runoff Area = 49.510 ac Runoff Volume = 9.916 af Average Runoff Depth = 2.40"
72.73% Pervious = 36.010 ac 27.27% Impervious = 13.500 ac

Summary for Subcatchment DA 1: WILLOW STREET

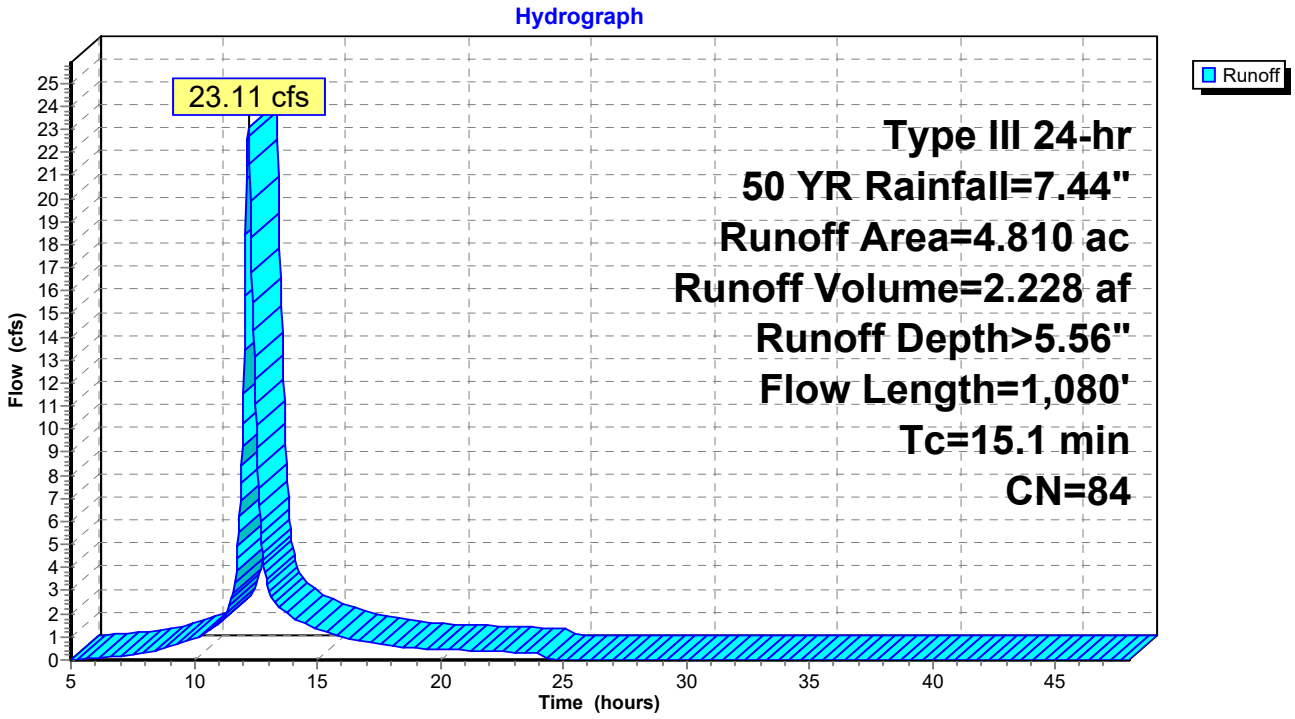
Runoff = 23.11 cfs @ 12.20 hrs, Volume= 2.228 af, Depth> 5.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 50 YR Rainfall=7.44"

Area (ac)	CN	Description
1.800	98	Paved parking, HSG C
0.500	98	Roofs, HSG C
1.250	70	Woods, Good, HSG C
1.260	74	Pasture/grassland/range, Good, HSG C
4.810	84	Weighted Average
2.510		52.18% Pervious Area
2.300		47.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
5.8	1,030	0.0210	2.94		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
15.1	1,080	Total			

Subcatchment DA 1: WILLOW STREET



Summary for Subcatchment DA 2: BACK OF LOTS

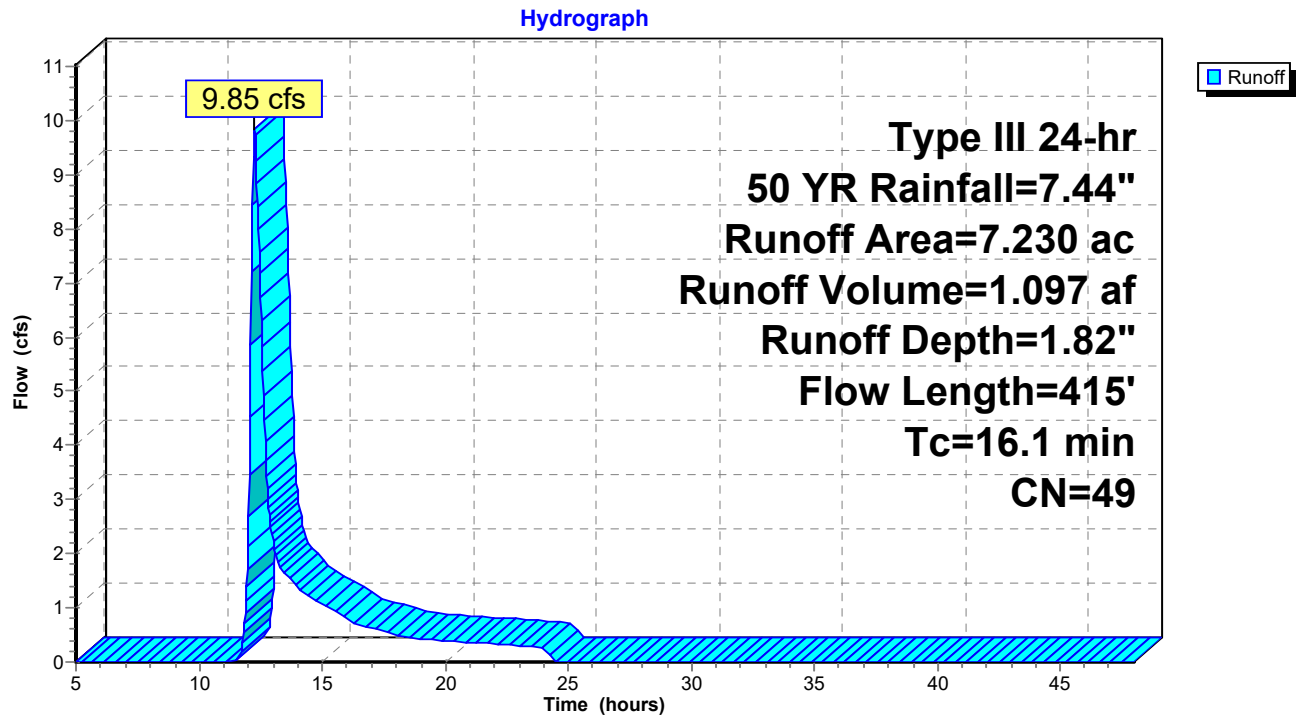
Runoff = 9.85 cfs @ 12.25 hrs, Volume= 1.097 af, Depth= 1.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 50 YR Rainfall=7.44"

Area (ac)	CN	Description
0.610	98	Paved parking, HSG C
0.540	98	Roofs, HSG C
4.320	30	Woods, Good, HSG A
1.240	70	Woods, Good, HSG C
0.410	39	Pasture/grassland/range, Good, HSG A
0.110	74	Pasture/grassland/range, Good, HSG C
7.230	49	Weighted Average
6.080		84.09% Pervious Area
1.150		15.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
3.8	365	0.1040	1.61		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
16.1	415	Total			

Subcatchment DA 2: BACK OF LOTS



Summary for Subcatchment DA 3: EAST OF ABERJONA

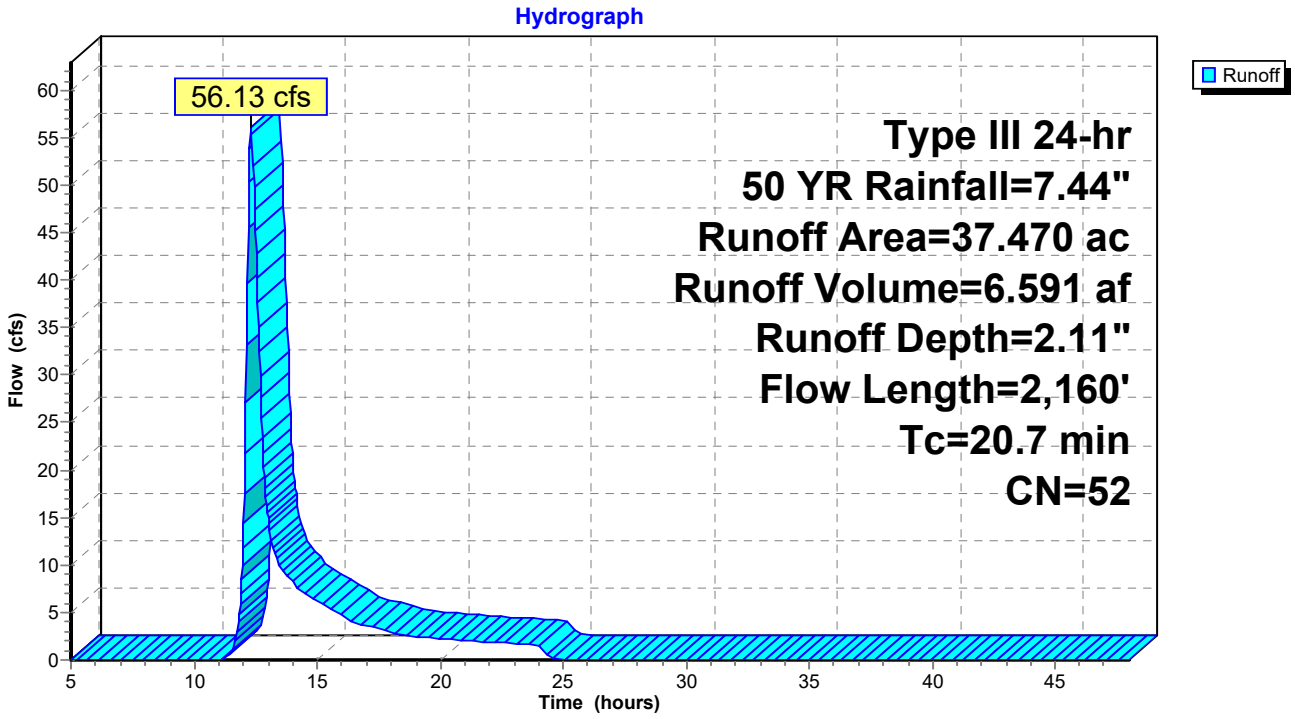
Runoff = 56.13 cfs @ 12.32 hrs, Volume= 6.591 af, Depth= 2.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 50 YR Rainfall=7.44"

Area (ac)	CN	Description
6.760	98	Paved parking, HSG C
3.290	98	Roofs, HSG C
9.960	30	Woods, Good, HSG A
17.460	39	Pasture/grassland/range, Good, HSG A
37.470	52	Weighted Average
27.420		73.18% Pervious Area
10.050		26.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
11.4	2,110	0.0230	3.08		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
20.7	2,160	Total			

Subcatchment DA 3: EAST OF ABERJONA

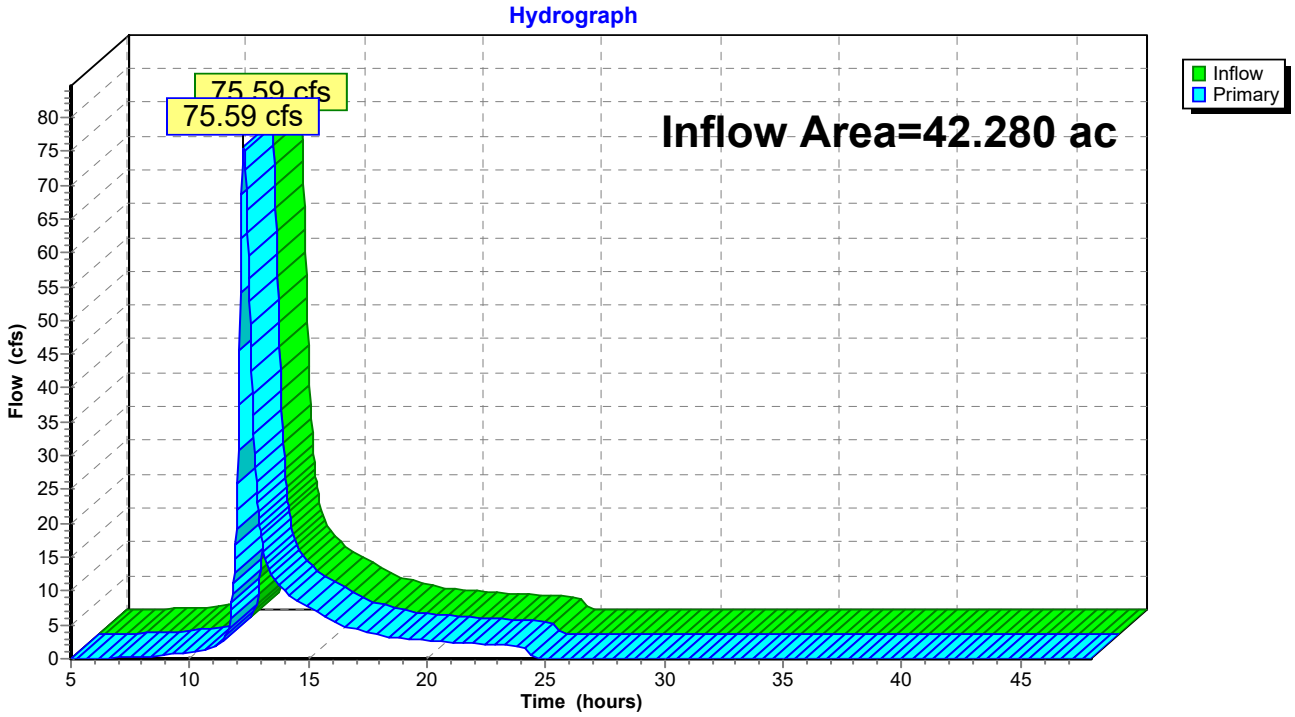


Summary for Pond SP1: ABERJONA RIVER

Inflow Area = 42.280 ac, 29.21% Impervious, Inflow Depth > 2.50" for 50 YR event
Inflow = 75.59 cfs @ 12.28 hrs, Volume= 8.819 af
Primary = 75.59 cfs @ 12.28 hrs, Volume= 8.819 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs

Pond SP1: ABERJONA RIVER

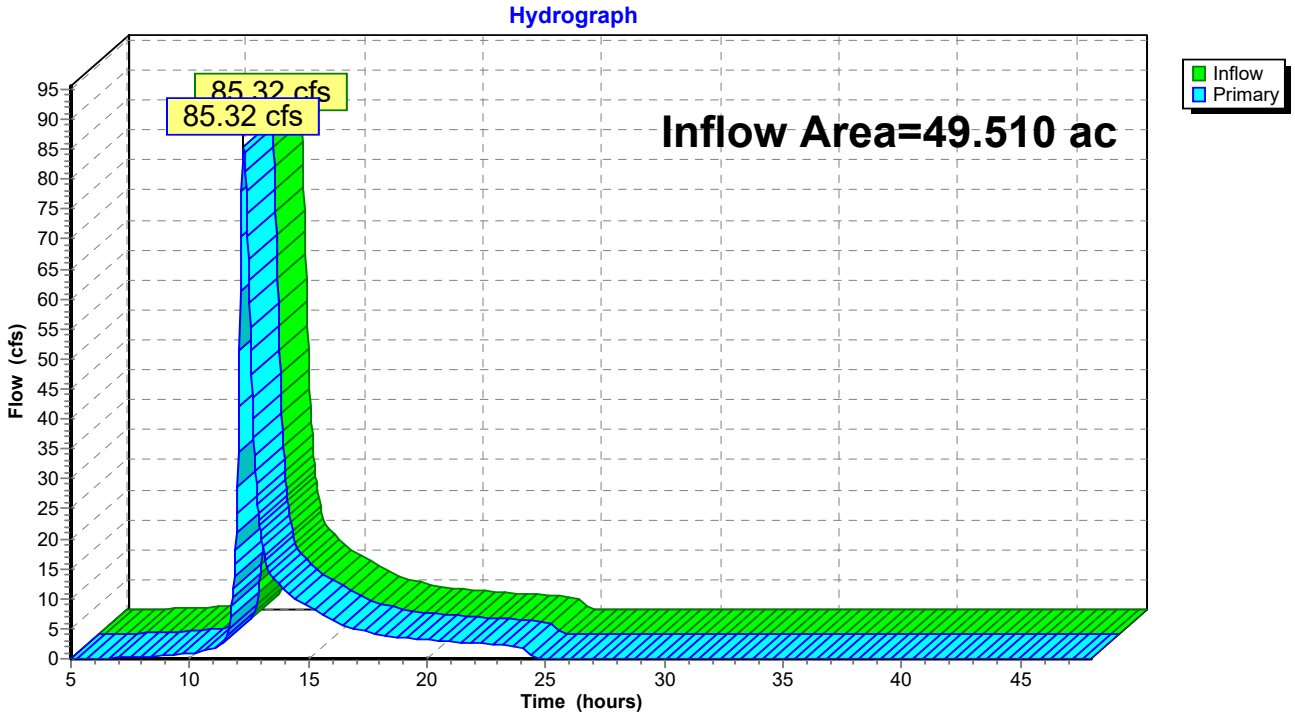


Summary for Pond SP2: ABERJONA RIVER

Inflow Area = 49.510 ac, 27.27% Impervious, Inflow Depth > 2.40" for 50 YR event
Inflow = 85.32 cfs @ 12.28 hrs, Volume= 9.916 af
Primary = 85.32 cfs @ 12.28 hrs, Volume= 9.916 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs

Pond SP2: ABERJONA RIVER



Time span=5.00-48.00 hrs, dt=0.03 hrs, 1434 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 DA 1: WILLOW STREET Runoff Area=4.810 ac 47.82% Impervious Runoff Depth>6.99"
Flow Length=1,080' Tc=15.1 min CN=84 Runoff=28.76 cfs 2.801 af

Subcatchment DA 2: BACK OF LOTS Runoff Area=7.230 ac 15.91% Impervious Runoff Depth=2.72"
Flow Length=415' Tc=16.1 min CN=49 Runoff=15.69 cfs 1.637 af

Subcatchment DA 3: EAST OF ABERJONA Runoff Area=37.470 ac 26.82% Impervious Runoff Depth=3.08"
Flow Length=2,160' Tc=20.7 min CN=52 Runoff=85.40 cfs 9.604 af

Pond SP1: ABERJONA RIVER Inflow=110.04 cfs 12.405 af
Primary=110.04 cfs 12.405 af

Pond SP2: ABERJONA RIVER Inflow=125.55 cfs 14.042 af
Primary=125.55 cfs 14.042 af

Total Runoff Area = 49.510 ac Runoff Volume = 14.042 af Average Runoff Depth = 3.40"
72.73% Pervious = 36.010 ac 27.27% Impervious = 13.500 ac

Summary for Subcatchment DA 1: WILLOW STREET

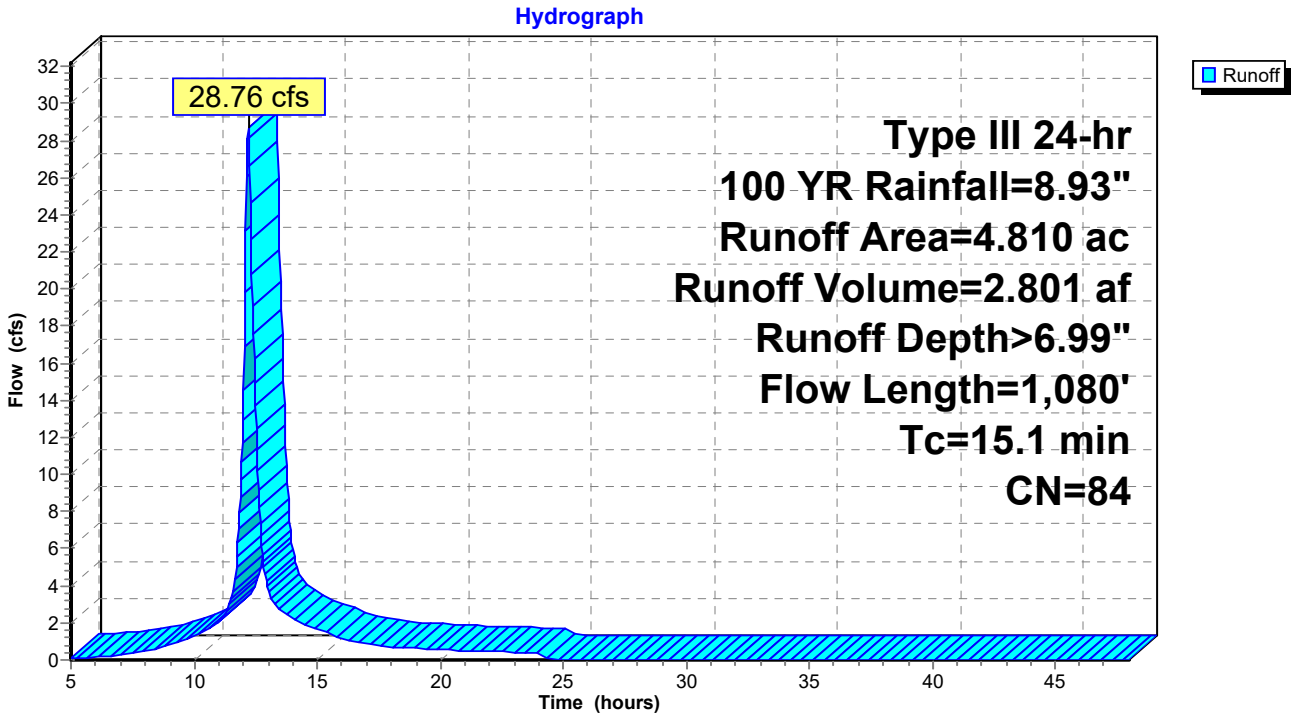
Runoff = 28.76 cfs @ 12.20 hrs, Volume= 2.801 af, Depth> 6.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 100 YR Rainfall=8.93"

Area (ac)	CN	Description
1.800	98	Paved parking, HSG C
0.500	98	Roofs, HSG C
1.250	70	Woods, Good, HSG C
1.260	74	Pasture/grassland/range, Good, HSG C
4.810	84	Weighted Average
2.510		52.18% Pervious Area
2.300		47.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
5.8	1,030	0.0210	2.94		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
15.1	1,080	Total			

Subcatchment DA 1: WILLOW STREET



Summary for Subcatchment DA 2: BACK OF LOTS

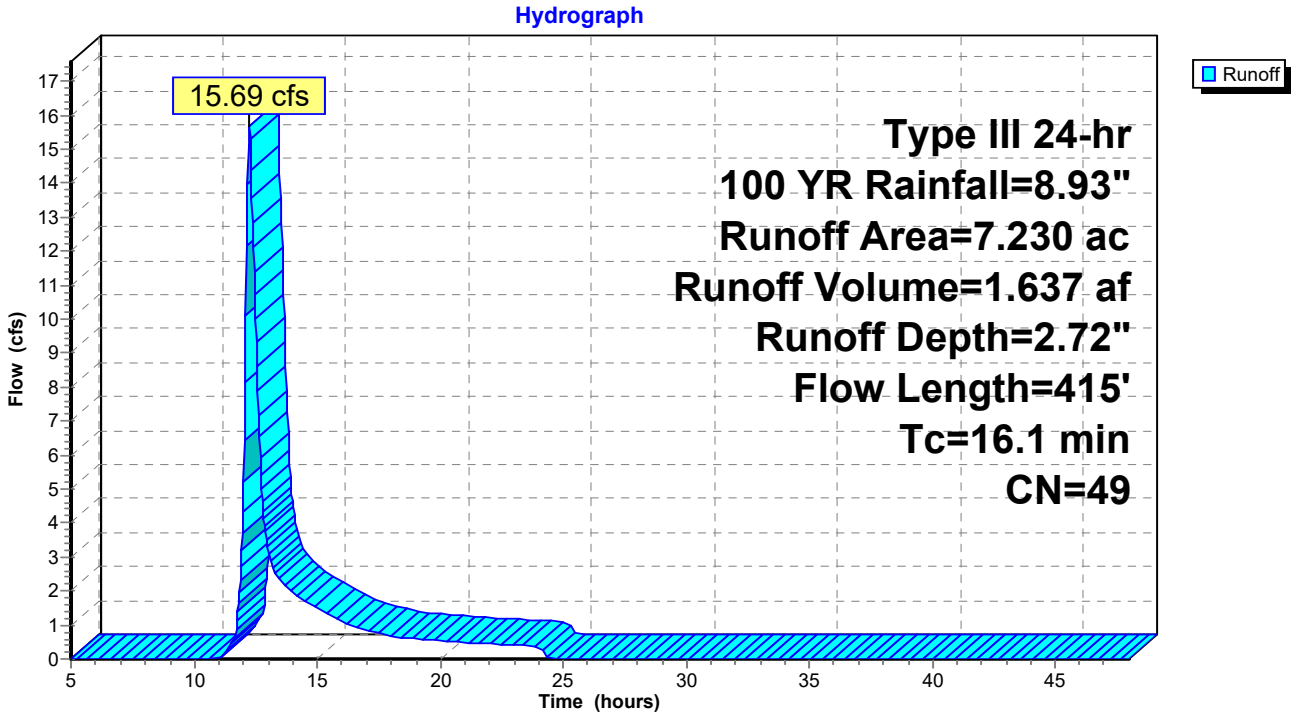
Runoff = 15.69 cfs @ 12.24 hrs, Volume= 1.637 af, Depth= 2.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 100 YR Rainfall=8.93"

Area (ac)	CN	Description
0.610	98	Paved parking, HSG C
0.540	98	Roofs, HSG C
4.320	30	Woods, Good, HSG A
1.240	70	Woods, Good, HSG C
0.410	39	Pasture/grassland/range, Good, HSG A
0.110	74	Pasture/grassland/range, Good, HSG C
7.230	49	Weighted Average
6.080		84.09% Pervious Area
1.150		15.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
3.8	365	0.1040	1.61		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
16.1	415	Total			

Subcatchment DA 2: BACK OF LOTS



Summary for Subcatchment DA 3: EAST OF ABERJONA

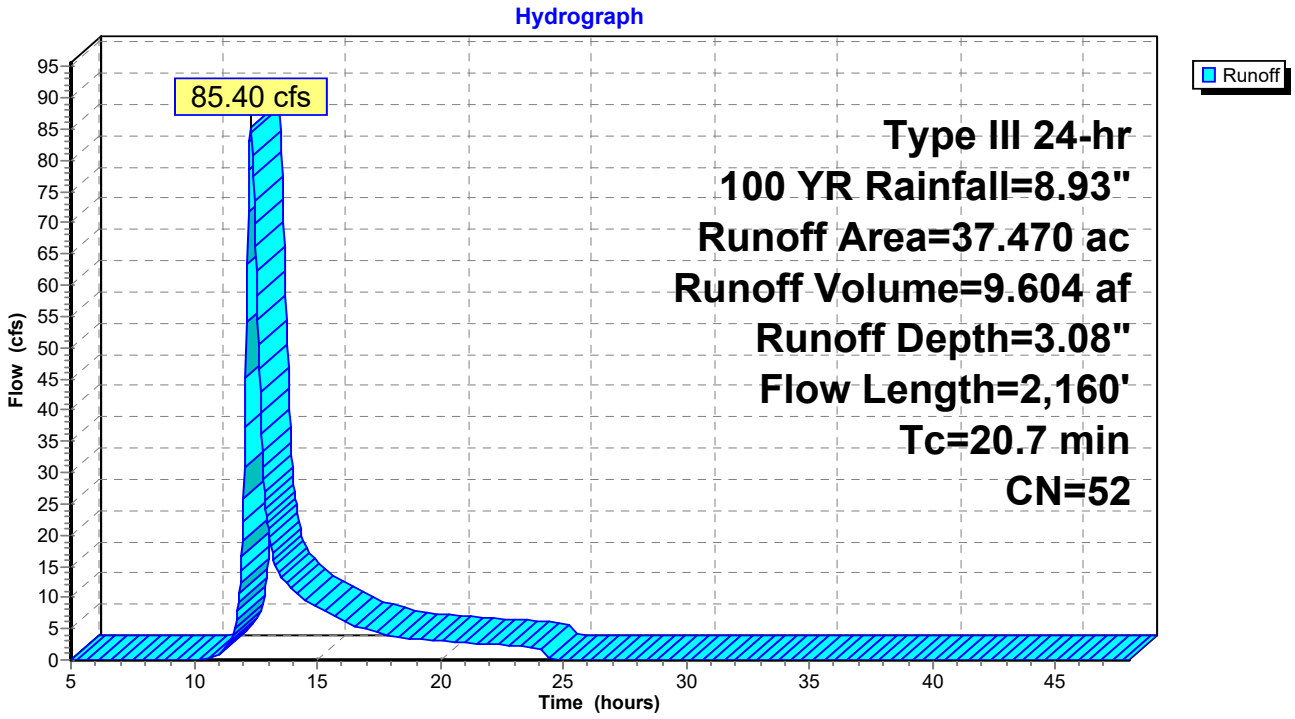
Runoff = 85.40 cfs @ 12.31 hrs, Volume= 9.604 af, Depth= 3.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 100 YR Rainfall=8.93"

Area (ac)	CN	Description
6.760	98	Paved parking, HSG C
3.290	98	Roofs, HSG C
9.960	30	Woods, Good, HSG A
17.460	39	Pasture/grassland/range, Good, HSG A
37.470	52	Weighted Average
27.420		73.18% Pervious Area
10.050		26.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
11.4	2,110	0.0230	3.08		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
20.7	2,160	Total			

Subcatchment DA 3: EAST OF ABERJONA

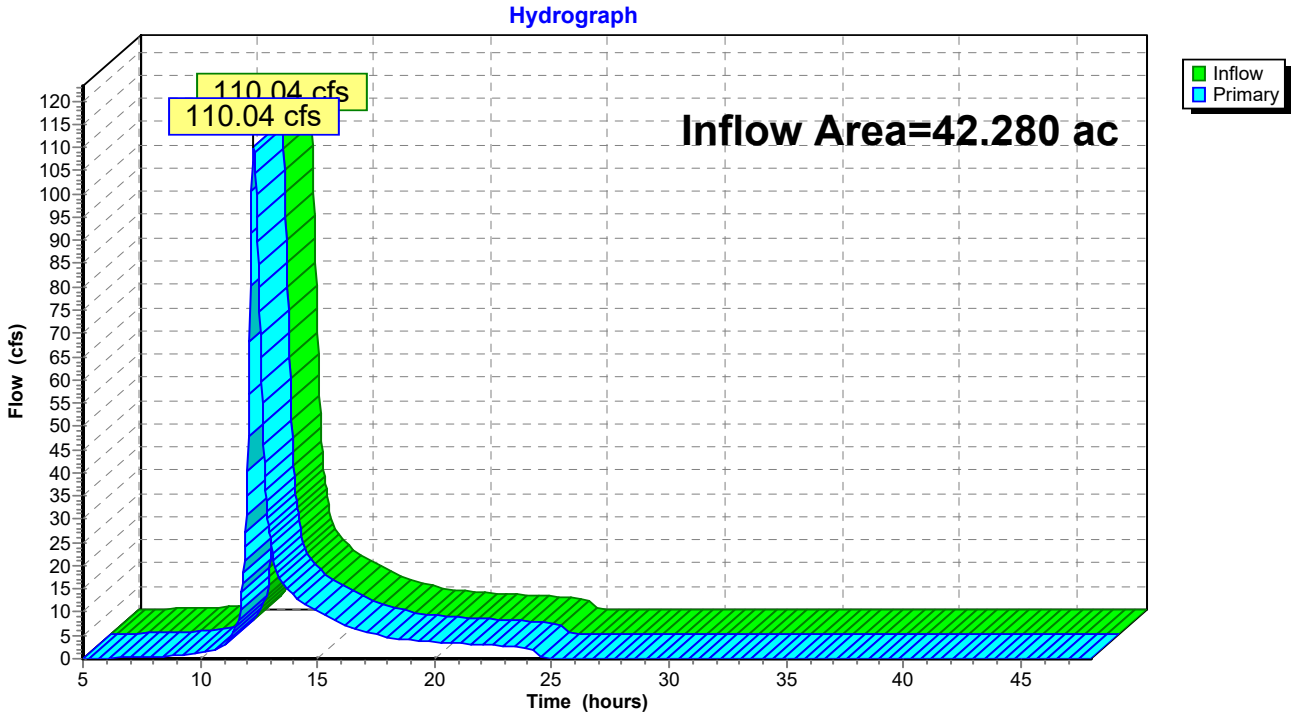


Summary for Pond SP1: ABERJONA RIVER

Inflow Area = 42.280 ac, 29.21% Impervious, Inflow Depth > 3.52" for 100 YR event
Inflow = 110.04 cfs @ 12.28 hrs, Volume= 12.405 af
Primary = 110.04 cfs @ 12.28 hrs, Volume= 12.405 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs

Pond SP1: ABERJONA RIVER

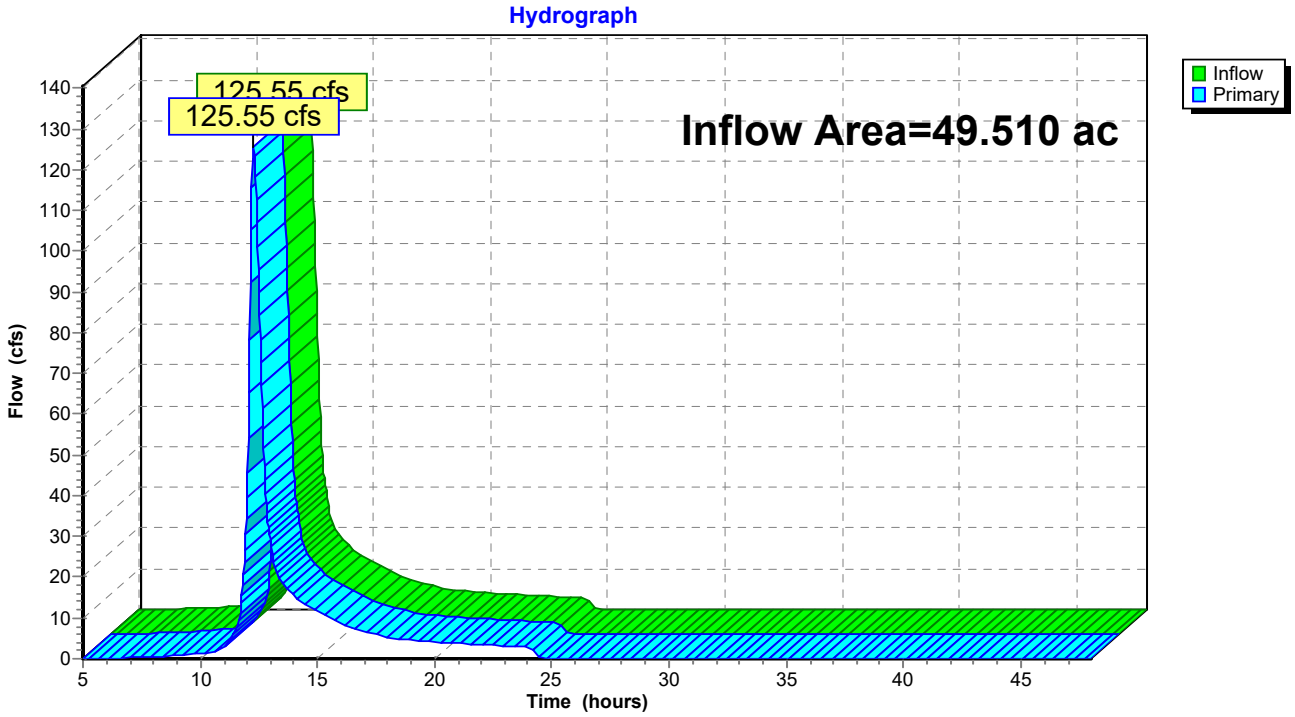


Summary for Pond SP2: ABERJONA RIVER

Inflow Area = 49.510 ac, 27.27% Impervious, Inflow Depth > 3.40" for 100 YR event
Inflow = 125.55 cfs @ 12.27 hrs, Volume= 14.042 af
Primary = 125.55 cfs @ 12.27 hrs, Volume= 14.042 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs

Pond SP2: ABERJONA RIVER



Time span=5.00-48.00 hrs, dt=0.03 hrs, 1434 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 DA 1: WILLOW STREET Runoff Area=4.810 ac 47.82% Impervious Runoff Depth>9.66"
Flow Length=1,080' Tc=15.1 min CN=84 Runoff=39.19 cfs 3.873 af

Subcatchment DA 2: BACK OF LOTS Runoff Area=7.230 ac 15.91% Impervious Runoff Depth=4.62"
Flow Length=415' Tc=16.1 min CN=49 Runoff=28.02 cfs 2.783 af

Subcatchment DA 3: EAST OF ABERJONA Runoff Area=37.470 ac 26.82% Impervious Runoff Depth=5.09"
Flow Length=2,160' Tc=20.7 min CN=52 Runoff=146.17 cfs 15.887 af

Pond SP1: ABERJONA RIVER Inflow=180.41 cfs 19.759 af
Primary=180.41 cfs 19.759 af

Pond SP2: ABERJONA RIVER Inflow=207.71 cfs 22.542 af
Primary=207.71 cfs 22.542 af

Total Runoff Area = 49.510 ac Runoff Volume = 22.542 af Average Runoff Depth = 5.46"
72.73% Pervious = 36.010 ac 27.27% Impervious = 13.500 ac

Summary for Subcatchment DA 1: WILLOW STREET

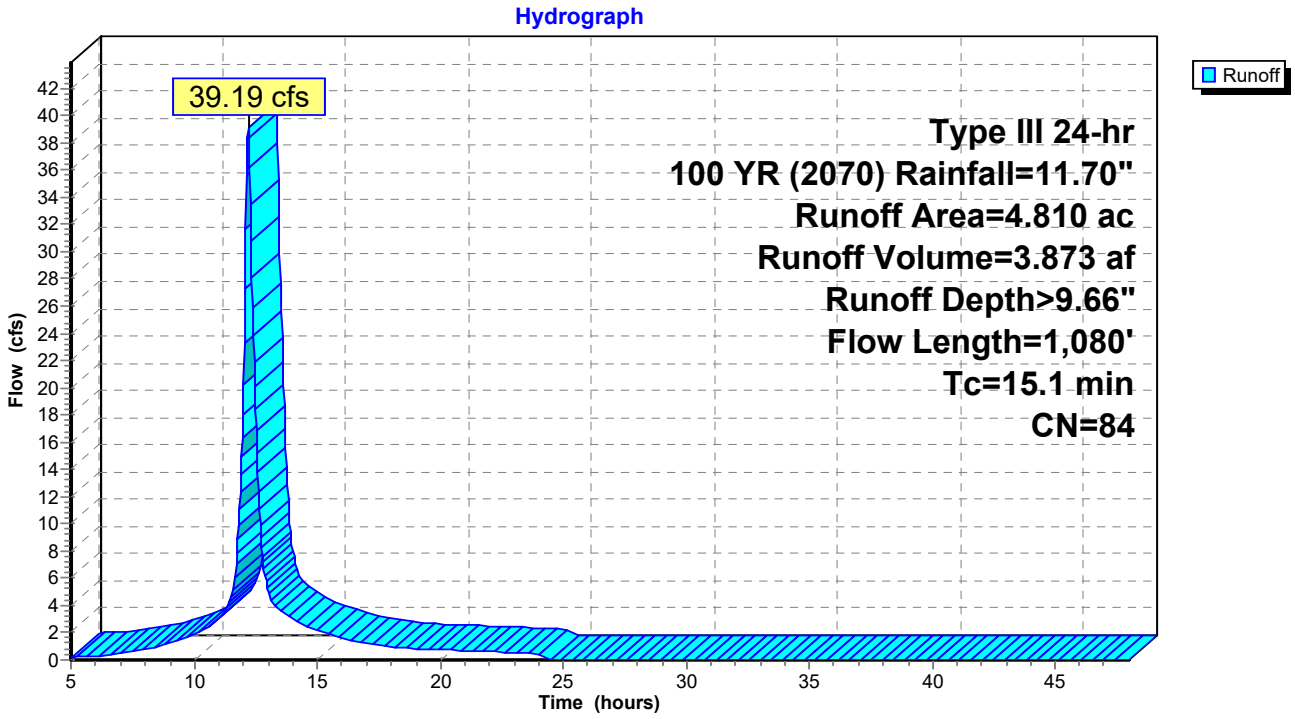
Runoff = 39.19 cfs @ 12.20 hrs, Volume= 3.873 af, Depth> 9.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 100 YR (2070) Rainfall=11.70"

Area (ac)	CN	Description
1.800	98	Paved parking, HSG C
0.500	98	Roofs, HSG C
1.250	70	Woods, Good, HSG C
1.260	74	Pasture/grassland/range, Good, HSG C
4.810	84	Weighted Average
2.510		52.18% Pervious Area
2.300		47.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
5.8	1,030	0.0210	2.94		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
15.1	1,080	Total			

Subcatchment DA 1: WILLOW STREET



Summary for Subcatchment DA 2: BACK OF LOTS

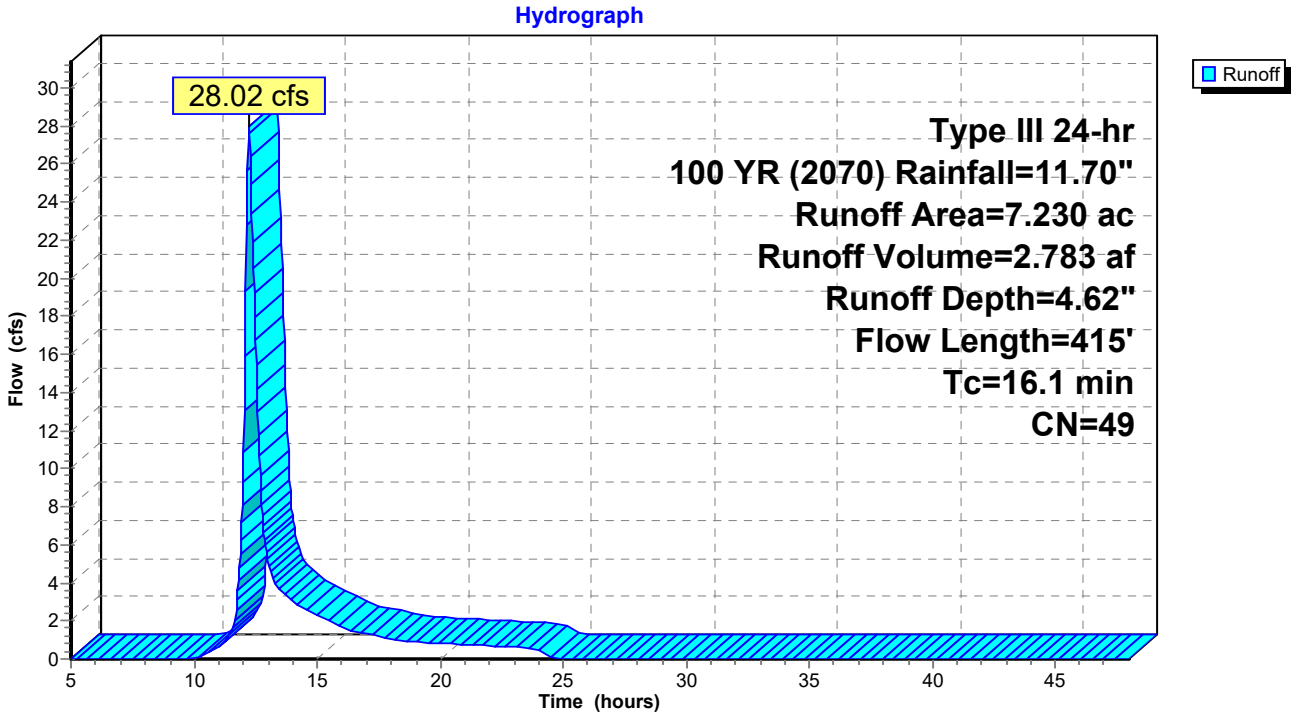
Runoff = 28.02 cfs @ 12.23 hrs, Volume= 2.783 af, Depth= 4.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 100 YR (2070) Rainfall=11.70"

Area (ac)	CN	Description
0.610	98	Paved parking, HSG C
0.540	98	Roofs, HSG C
4.320	30	Woods, Good, HSG A
1.240	70	Woods, Good, HSG C
0.410	39	Pasture/grassland/range, Good, HSG A
0.110	74	Pasture/grassland/range, Good, HSG C
7.230	49	Weighted Average
6.080		84.09% Pervious Area
1.150		15.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
3.8	365	0.1040	1.61		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
16.1	415	Total			

Subcatchment DA 2: BACK OF LOTS



Summary for Subcatchment DA 3: EAST OF ABERJONA

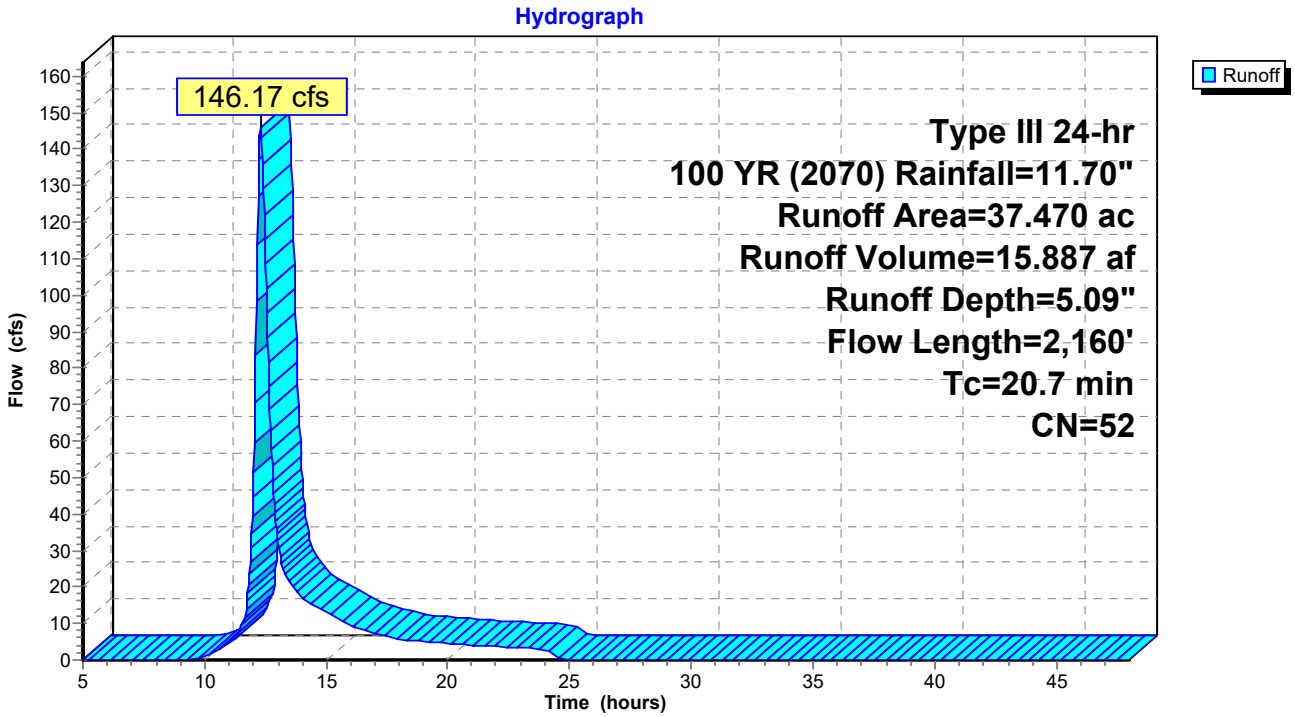
Runoff = 146.17 cfs @ 12.30 hrs, Volume= 15.887 af, Depth= 5.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 100 YR (2070) Rainfall=11.70"

Area (ac)	CN	Description
6.760	98	Paved parking, HSG C
3.290	98	Roofs, HSG C
9.960	30	Woods, Good, HSG A
17.460	39	Pasture/grassland/range, Good, HSG A
37.470	52	Weighted Average
27.420		73.18% Pervious Area
10.050		26.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
11.4	2,110	0.0230	3.08		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
20.7	2,160	Total			

Subcatchment DA 3: EAST OF ABERJONA

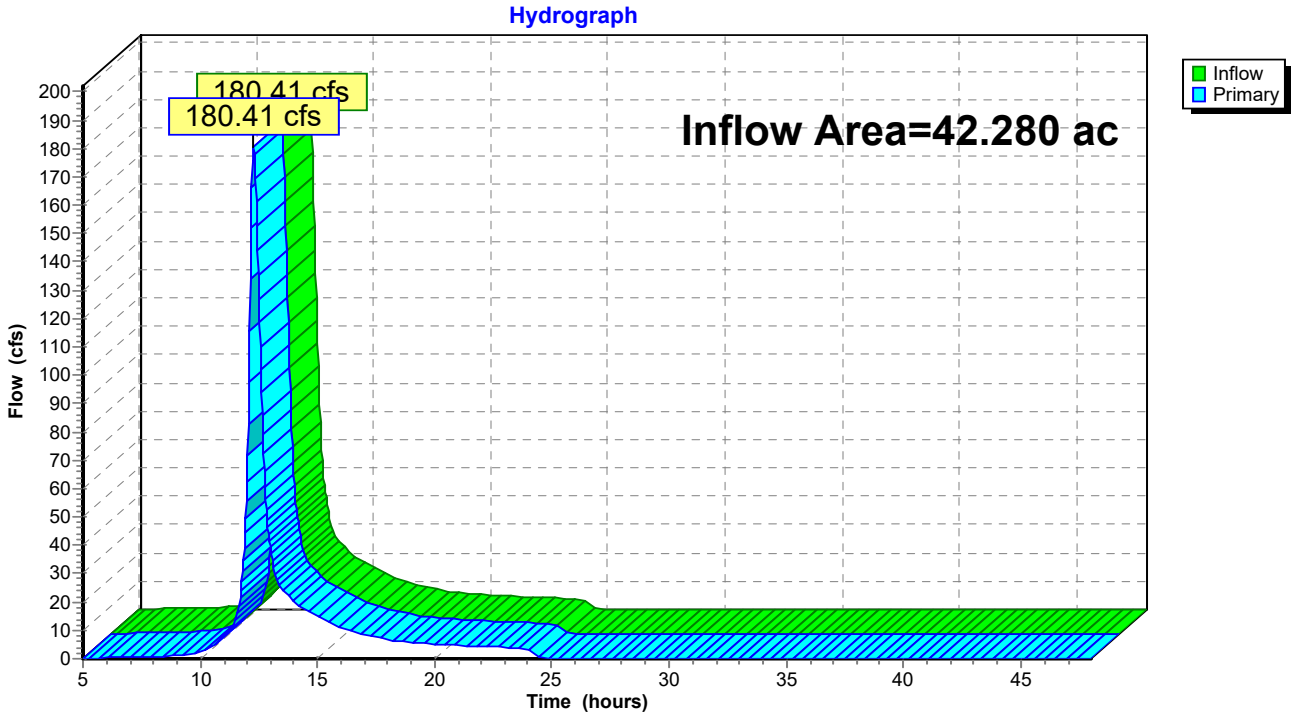


Summary for Pond SP1: ABERJONA RIVER

Inflow Area = 42.280 ac, 29.21% Impervious, Inflow Depth > 5.61" for 100 YR (2070) event
Inflow = 180.41 cfs @ 12.27 hrs, Volume= 19.759 af
Primary = 180.41 cfs @ 12.27 hrs, Volume= 19.759 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs

Pond SP1: ABERJONA RIVER

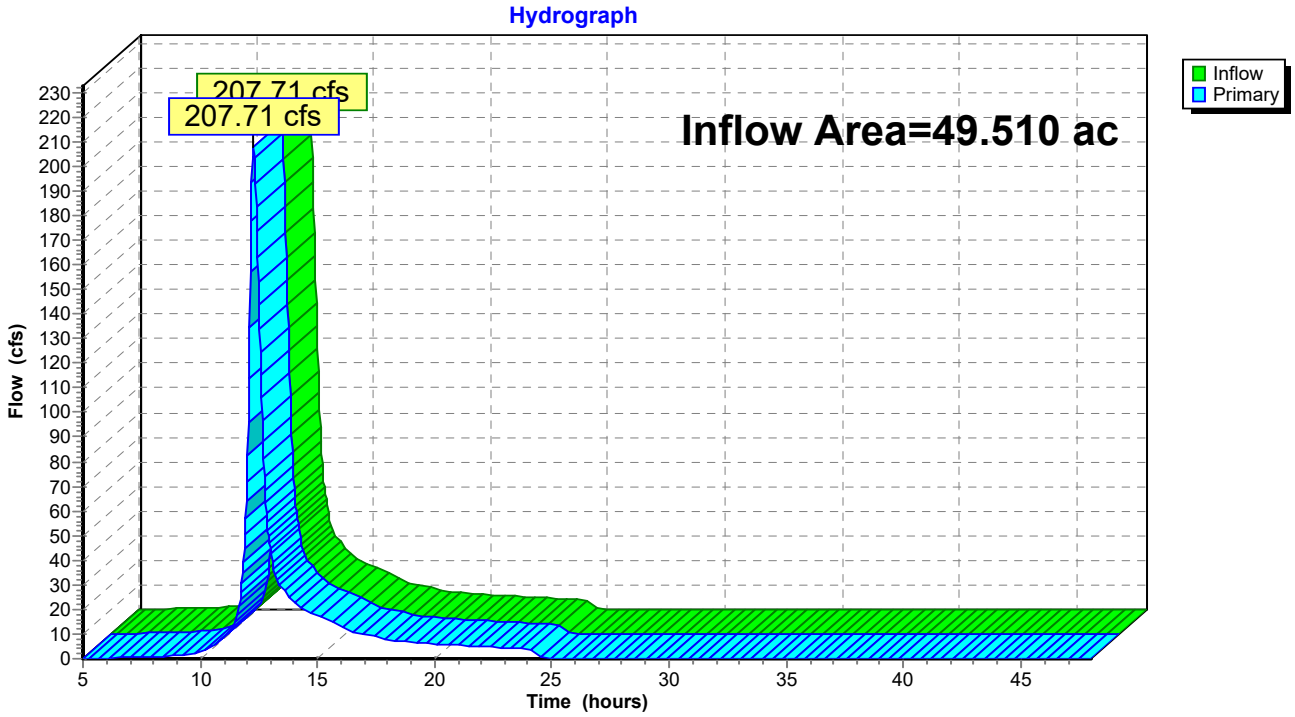


Summary for Pond SP2: ABERJONA RIVER

Inflow Area = 49.510 ac, 27.27% Impervious, Inflow Depth > 5.46" for 100 YR (2070) event
Inflow = 207.71 cfs @ 12.27 hrs, Volume= 22.542 af
Primary = 207.71 cfs @ 12.27 hrs, Volume= 22.542 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs

Pond SP2: ABERJONA RIVER



Time span=5.00-48.00 hrs, dt=0.03 hrs, 1434 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 DA 1: WILLOW STREET Runoff Area=4.810 ac 47.82% Impervious Runoff Depth=0.26"
Flow Length=1,080' Tc=15.1 min CN=84 Runoff=0.89 cfs 0.103 af

Subcatchment DA 2: BACK OF LOTS Runoff Area=7.230 ac 15.91% Impervious Runoff Depth=0.00"
Flow Length=415' Tc=16.1 min CN=49 Runoff=0.00 cfs 0.000 af

Subcatchment DA 3: EAST OF ABERJONA Runoff Area=37.470 ac 26.82% Impervious Runoff Depth=0.00"
Flow Length=2,160' Tc=20.7 min CN=52 Runoff=0.00 cfs 0.000 af

Pond SP1: ABERJONA RIVER Inflow=0.89 cfs 0.103 af
Primary=0.89 cfs 0.103 af

Pond SP2: ABERJONA RIVER Inflow=0.89 cfs 0.103 af
Primary=0.89 cfs 0.103 af

Total Runoff Area = 49.510 ac Runoff Volume = 0.103 af Average Runoff Depth = 0.02"
72.73% Pervious = 36.010 ac 27.27% Impervious = 13.500 ac

Summary for Subcatchment DA 1: WILLOW STREET

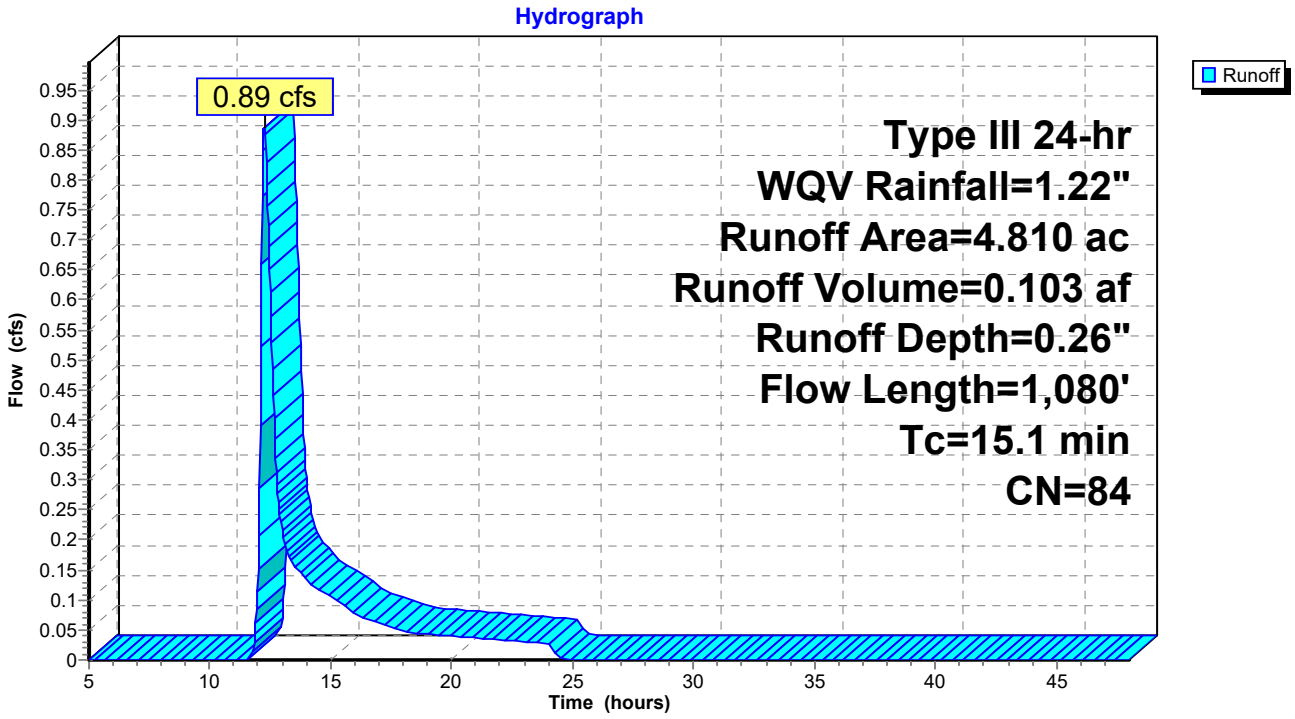
Runoff = 0.89 cfs @ 12.25 hrs, Volume= 0.103 af, Depth= 0.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr WQV Rainfall=1.22"

Area (ac)	CN	Description
1.800	98	Paved parking, HSG C
0.500	98	Roofs, HSG C
1.250	70	Woods, Good, HSG C
1.260	74	Pasture/grassland/range, Good, HSG C
4.810	84	Weighted Average
2.510		52.18% Pervious Area
2.300		47.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
5.8	1,030	0.0210	2.94		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
15.1	1,080	Total			

Subcatchment DA 1: WILLOW STREET



Summary for Subcatchment DA 2: BACK OF LOTS

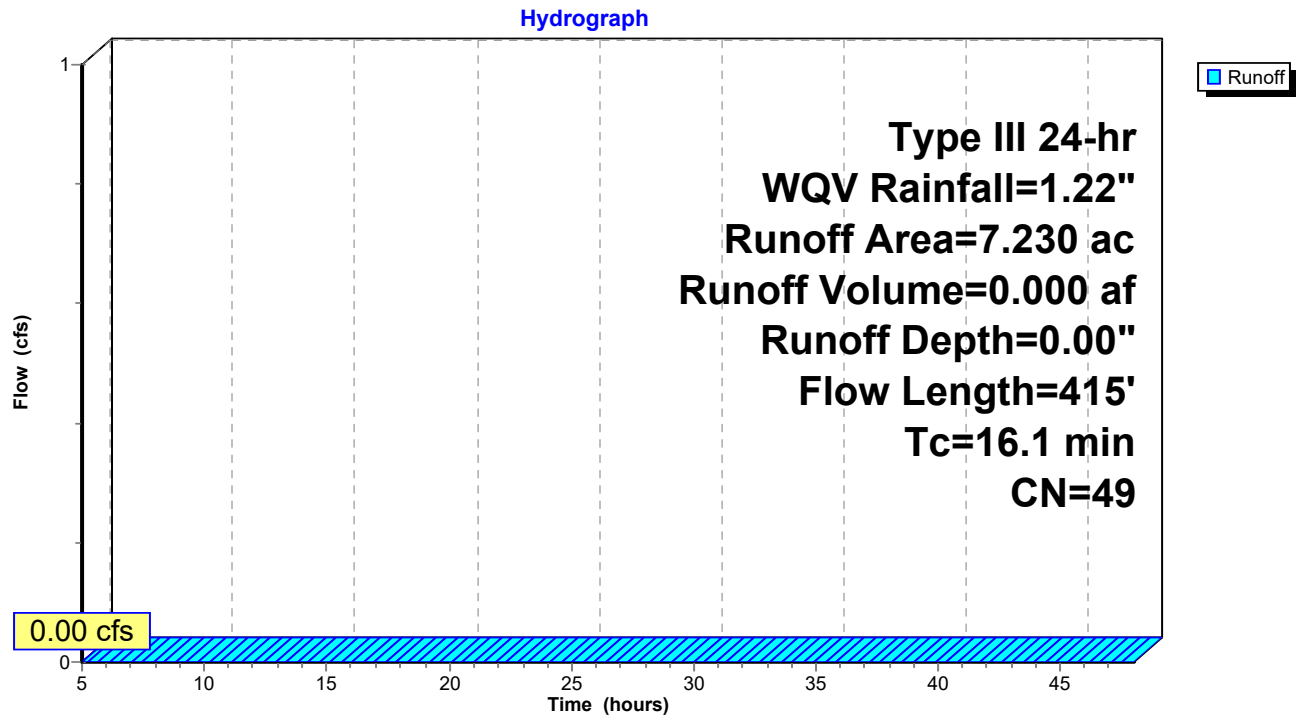
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr WQV Rainfall=1.22"

Area (ac)	CN	Description
0.610	98	Paved parking, HSG C
0.540	98	Roofs, HSG C
4.320	30	Woods, Good, HSG A
1.240	70	Woods, Good, HSG C
0.410	39	Pasture/grassland/range, Good, HSG A
0.110	74	Pasture/grassland/range, Good, HSG C
7.230	49	Weighted Average
6.080		84.09% Pervious Area
1.150		15.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
3.8	365	0.1040	1.61		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
16.1	415	Total			

Subcatchment DA 2: BACK OF LOTS



Summary for Subcatchment DA 3: EAST OF ABERJONA

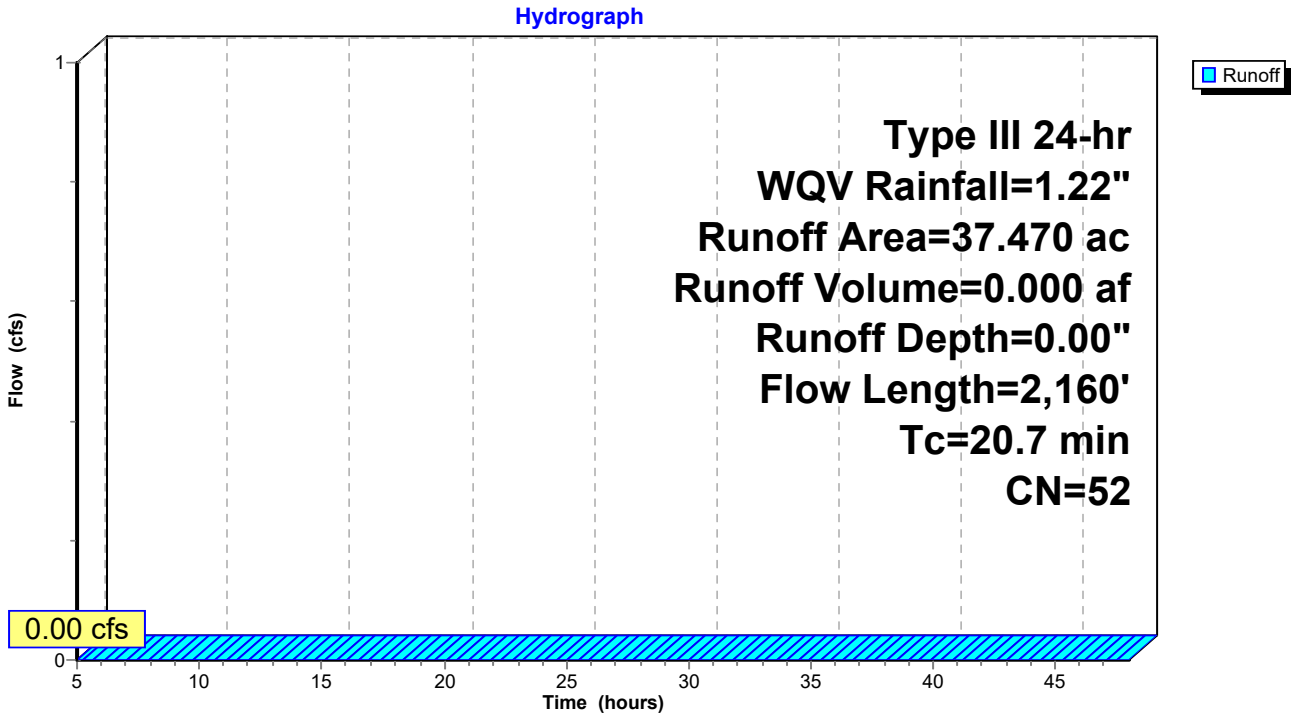
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr WQV Rainfall=1.22"

Area (ac)	CN	Description
6.760	98	Paved parking, HSG C
3.290	98	Roofs, HSG C
9.960	30	Woods, Good, HSG A
17.460	39	Pasture/grassland/range, Good, HSG A
37.470	52	Weighted Average
27.420		73.18% Pervious Area
10.050		26.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
11.4	2,110	0.0230	3.08		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
20.7	2,160	Total			

Subcatchment DA 3: EAST OF ABERJONA

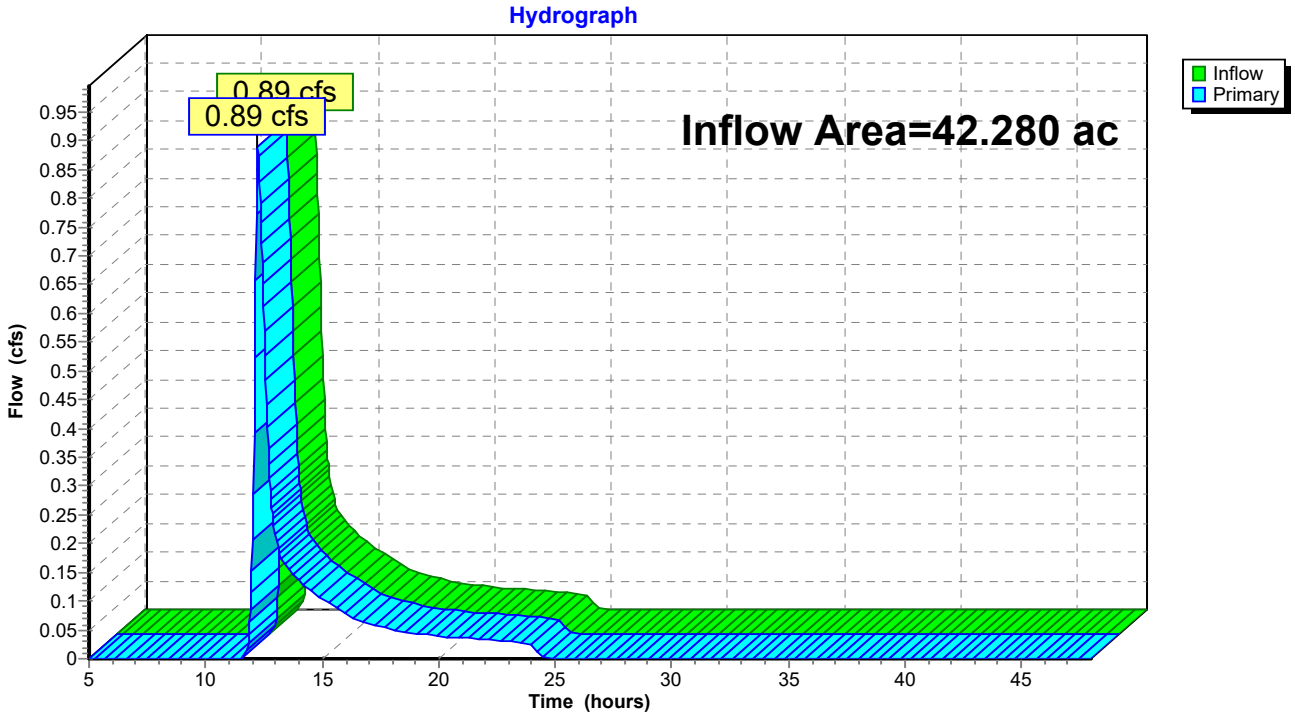


Summary for Pond SP1: ABERJONA RIVER

Inflow Area = 42.280 ac, 29.21% Impervious, Inflow Depth = 0.03" for WQV event
Inflow = 0.89 cfs @ 12.25 hrs, Volume= 0.103 af
Primary = 0.89 cfs @ 12.25 hrs, Volume= 0.103 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs

Pond SP1: ABERJONA RIVER

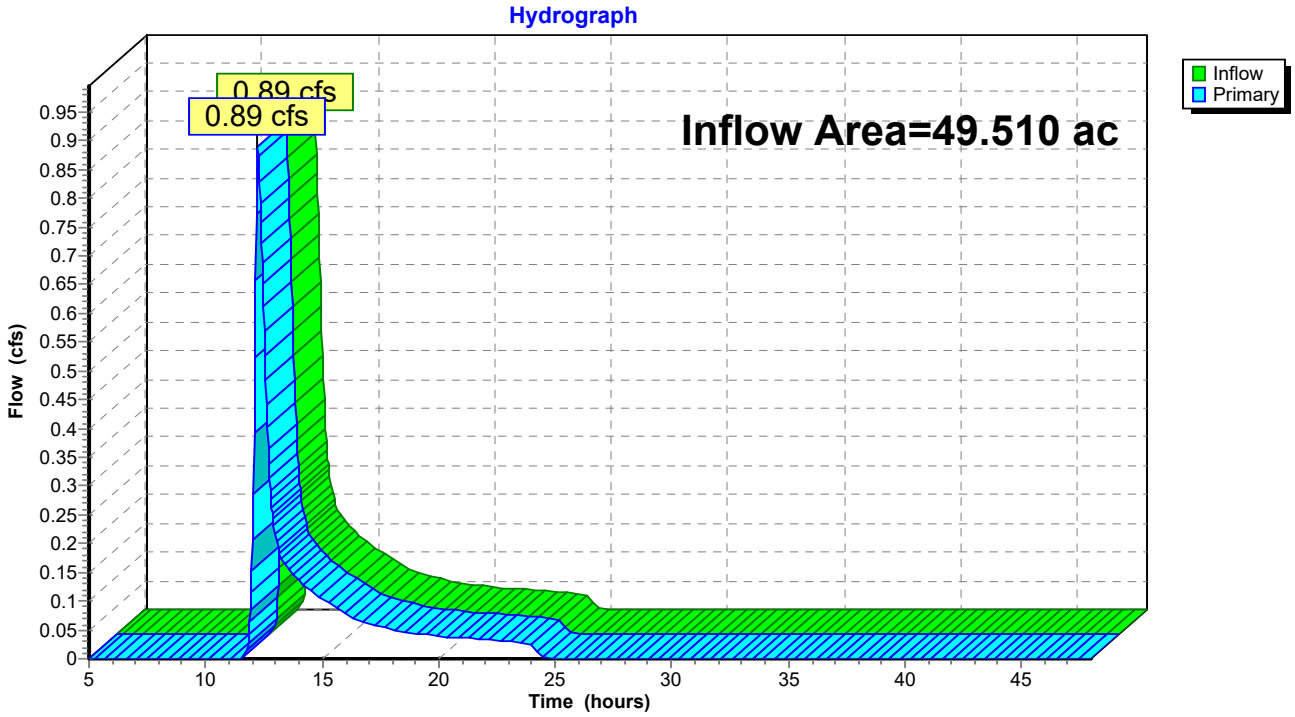


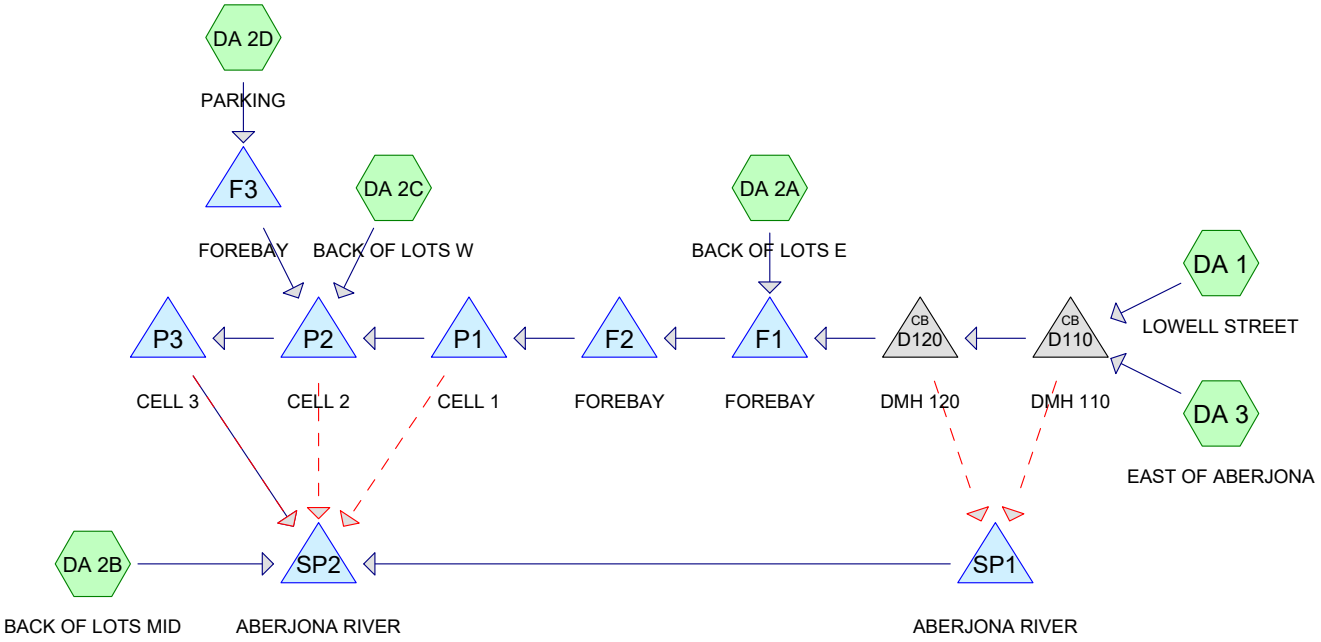
Summary for Pond SP2: ABERJONA RIVER

Inflow Area = 49.510 ac, 27.27% Impervious, Inflow Depth = 0.02" for WQV event
Inflow = 0.89 cfs @ 12.25 hrs, Volume= 0.103 af
Primary = 0.89 cfs @ 12.25 hrs, Volume= 0.103 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs

Pond SP2: ABERJONA RIVER





Subcat Reach Pond Link

Routing Diagram for Reading PR
Prepared by Horsley Witten Group, Printed 5/24/2021

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	1 YR	Type III 24-hr		Default	24.00	1	2.67	2
2	2 YR	Type III 24-hr		Default	24.00	1	3.21	2
3	10 YR	Type III 24-hr		Default	24.00	1	4.88	2
4	10 YR (2070)	Type III 24-hr		Default	24.00	1	6.38	2
5	25 YR	Type III 24-hr		Default	24.00	1	6.20	2
6	50 YR	Type III 24-hr		Default	24.00	1	7.44	2
7	100 YR	Type III 24-hr		Default	24.00	1	8.93	2
8	100 YR (2070)	Type III 24-hr		Default	24.00	1	11.70	2
9	WQV	Type III 24-hr		Default	24.00	1	1.22	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.110	72	Dirt roads, HSG A (DA 2A, DA 2C)
0.150	87	Dirt roads, HSG C (DA 2A, DA 2C)
17.970	39	Pasture/grassland/range, Good, HSG A (DA 2A, DA 2B, DA 2C, DA 3)
1.370	74	Pasture/grassland/range, Good, HSG C (DA 1, DA 2A)
9.352	98	Paved parking, HSG C (DA 1, DA 2A, DA 2B, DA 2C, DA 2D, DA 3)
4.330	98	Roofs, HSG C (DA 1, DA 2A, DA 2B, DA 2C, DA 3)
0.590	98	Water Surface, HSG C (DA 2A, DA 2C)
13.568	30	Woods, Good, HSG A (DA 2A, DA 2B, DA 2C, DA 3)
2.070	70	Woods, Good, HSG C (DA 1, DA 2A, DA 2C)
49.510	**56**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
31.648	HSG A	DA 2A, DA 2B, DA 2C, DA 3
0.000	HSG B	
17.862	HSG C	DA 1, DA 2A, DA 2B, DA 2C, DA 2D, DA 3
0.000	HSG D	
0.000	Other	
49.510		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.110	0.000	0.150	0.000	0.000	0.260	Dirt roads	DA 2A, DA 2C
17.970	0.000	1.370	0.000	0.000	19.340	Pasture/grassland/range, Good	DA 1, DA 2A, DA 2B, DA 2C, DA 3
0.000	0.000	9.352	0.000	0.000	9.352	Paved parking	DA 1, DA 2A, DA 2B, DA 2C, DA 2D, DA 3
0.000	0.000	4.330	0.000	0.000	4.330	Roofs	DA 1, DA 2A, DA 2B, DA 2C, DA 3
0.000	0.000	0.590	0.000	0.000	0.590	Water Surface	DA 2A, DA 2C
13.568	0.000	2.070	0.000	0.000	15.638	Woods, Good	DA 1, DA 2A, DA 2B,

Ground Covers (all nodes) (continued)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
31.648	**0.000**	**17.862**	**0.000**	**0.000**	**49.510**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	D110	85.30	84.60	143.0	0.0049	0.013	18.0	0.0	0.0
2	D120	84.60	84.00	126.0	0.0048	0.013	18.0	0.0	0.0
3	P1	80.50	82.50	250.0	-0.0080	0.013	24.0	0.0	0.0

Time span=5.00-48.00 hrs, dt=0.03 hrs, 1434 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 DA 1: LOWELL STREET Runoff Area=4.810 ac 47.82% Impervious Runoff Depth=1.25"
Flow Length=1,080' Tc=15.1 min CN=84 Runoff=5.27 cfs 0.501 af

Subcatchment DA 2A: BACK OF LOTS E Runoff Area=3.100 ac 25.81% Impervious Runoff Depth=0.20"
Flow Length=614' Tc=18.1 min CN=59 Runoff=0.21 cfs 0.051 af

Subcatchment DA 2B: BACK OF LOTS MID Runoff Area=1.178 ac 24.62% Impervious Runoff Depth=0.01"
Flow Length=250' Tc=8.5 min CN=47 Runoff=0.00 cfs 0.001 af

Subcatchment DA 2C: BACK OF LOTS W Runoff Area=2.790 ac 24.01% Impervious Runoff Depth=0.08"
Flow Length=522' Tc=16.3 min CN=53 Runoff=0.03 cfs 0.019 af

Subcatchment DA 2D: PARKING Runoff Area=7,066 sf 100.00% Impervious Runoff Depth>2.40"
Tc=5.0 min CN=98 Runoff=0.43 cfs 0.032 af

Subcatchment DA 3: EAST OF ABERJONA Runoff Area=37.470 ac 26.82% Impervious Runoff Depth=0.07"
Flow Length=2,160' Tc=20.7 min CN=52 Runoff=0.34 cfs 0.211 af

Pond D110: DMH 110 Peak Elev=86.67' Inflow=5.27 cfs 0.712 af
Primary=5.27 cfs 0.712 af Secondary=0.00 cfs 0.000 af Outflow=5.27 cfs 0.712 af

Pond D120: DMH 120 Peak Elev=85.99' Inflow=5.27 cfs 0.712 af
Primary=5.27 cfs 0.712 af Secondary=0.00 cfs 0.000 af Outflow=5.27 cfs 0.712 af

Pond F1: FOREBAY Peak Elev=84.76' Storage=1,793 cf Inflow=5.31 cfs 0.763 af
Discarded=0.01 cfs 0.031 af Primary=5.27 cfs 0.719 af Outflow=5.28 cfs 0.750 af

Pond F2: FOREBAY Peak Elev=84.76' Storage=2,092 cf Inflow=5.27 cfs 0.719 af
Discarded=0.01 cfs 0.034 af Primary=5.20 cfs 0.670 af Outflow=5.22 cfs 0.704 af

Pond F3: FOREBAY Peak Elev=86.85' Storage=152 cf Inflow=0.43 cfs 0.032 af
Outflow=0.41 cfs 0.030 af

Pond P1: CELL 1 Peak Elev=84.64' Storage=16,518 cf Inflow=5.20 cfs 0.670 af
Primary=4.22 cfs 0.670 af Secondary=0.00 cfs 0.000 af Outflow=4.22 cfs 0.670 af

Pond P2: CELL 2 Peak Elev=84.65' Storage=7,414 cf Inflow=4.36 cfs 0.719 af
Primary=4.30 cfs 0.719 af Secondary=0.00 cfs 0.000 af Outflow=4.30 cfs 0.719 af

Pond P3: CELL 3 Peak Elev=84.66' Storage=8,267 cf Inflow=4.30 cfs 0.719 af
Primary=4.22 cfs 0.719 af Secondary=0.00 cfs 0.000 af Outflow=4.22 cfs 0.719 af

Pond SP1: ABERJONA RIVER Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Pond SP2: ABERJONA RIVER Inflow=4.22 cfs 0.721 af
Primary=4.22 cfs 0.721 af

Total Runoff Area = 49.510 ac Runoff Volume = 0.816 af Average Runoff Depth = 0.20"
71.17% Pervious = 35.238 ac 28.83% Impervious = 14.272 ac

Summary for Subcatchment DA 1: LOWELL STREET

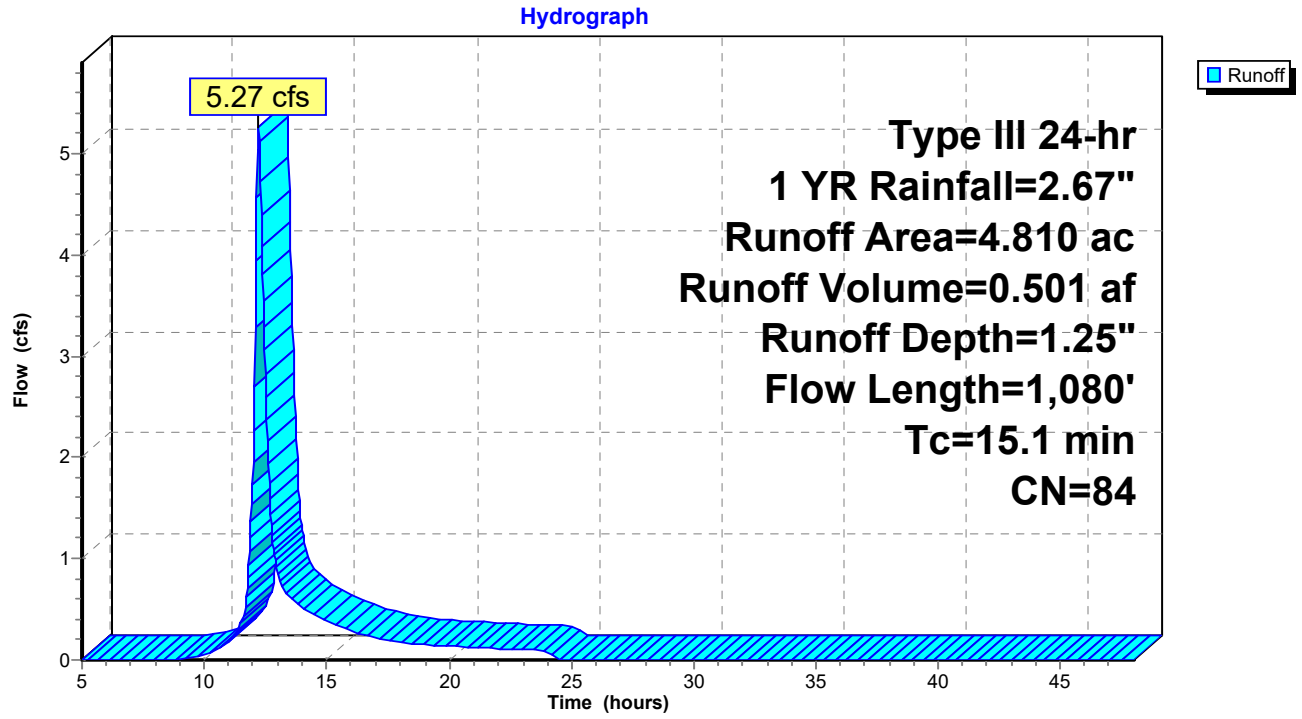
Runoff = 5.27 cfs @ 12.21 hrs, Volume= 0.501 af, Depth= 1.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 1 YR Rainfall=2.67"

Area (ac)	CN	Description
1.800	98	Paved parking, HSG C
0.500	98	Roofs, HSG C
1.250	70	Woods, Good, HSG C
1.260	74	Pasture/grassland/range, Good, HSG C
4.810	84	Weighted Average
2.510		52.18% Pervious Area
2.300		47.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
5.8	1,030	0.0210	2.94		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
15.1	1,080	Total			

Subcatchment DA 1: LOWELL STREET



Summary for Subcatchment DA 2A: BACK OF LOTS E

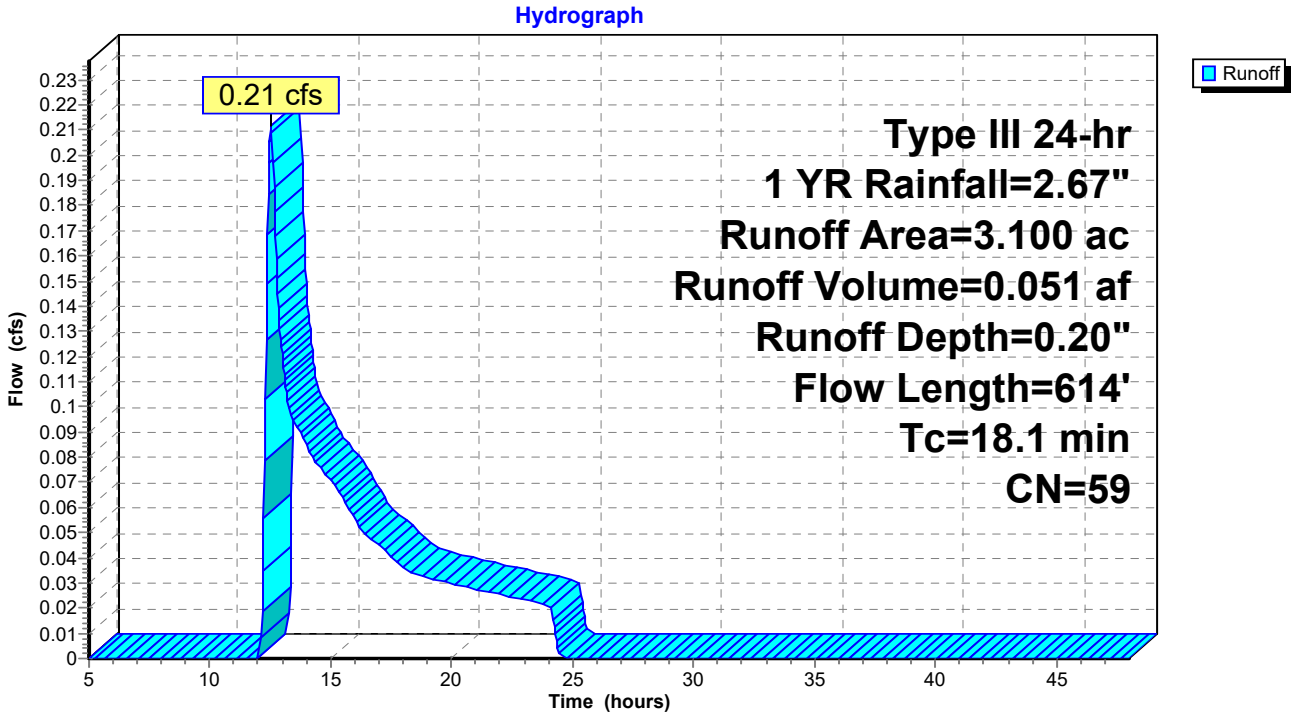
Runoff = 0.21 cfs @ 12.53 hrs, Volume= 0.051 af, Depth= 0.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 1 YR Rainfall=2.67"

Area (ac)	CN	Description
0.250	98	Paved parking, HSG C
0.020	72	Dirt roads, HSG A
0.110	87	Dirt roads, HSG C
0.260	98	Roofs, HSG C
0.290	98	Water Surface, HSG C
1.220	30	Woods, Good, HSG A
0.550	70	Woods, Good, HSG C
0.290	39	Pasture/grassland/range, Good, HSG A
0.110	74	Pasture/grassland/range, Good, HSG C
3.100	59	Weighted Average
2.300		74.19% Pervious Area
0.800		25.81% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
5.8	564	0.1040	1.61		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
18.1	614	Total			

Subcatchment DA 2A: BACK OF LOTS E



Summary for Subcatchment DA 2B: BACK OF LOTS MID

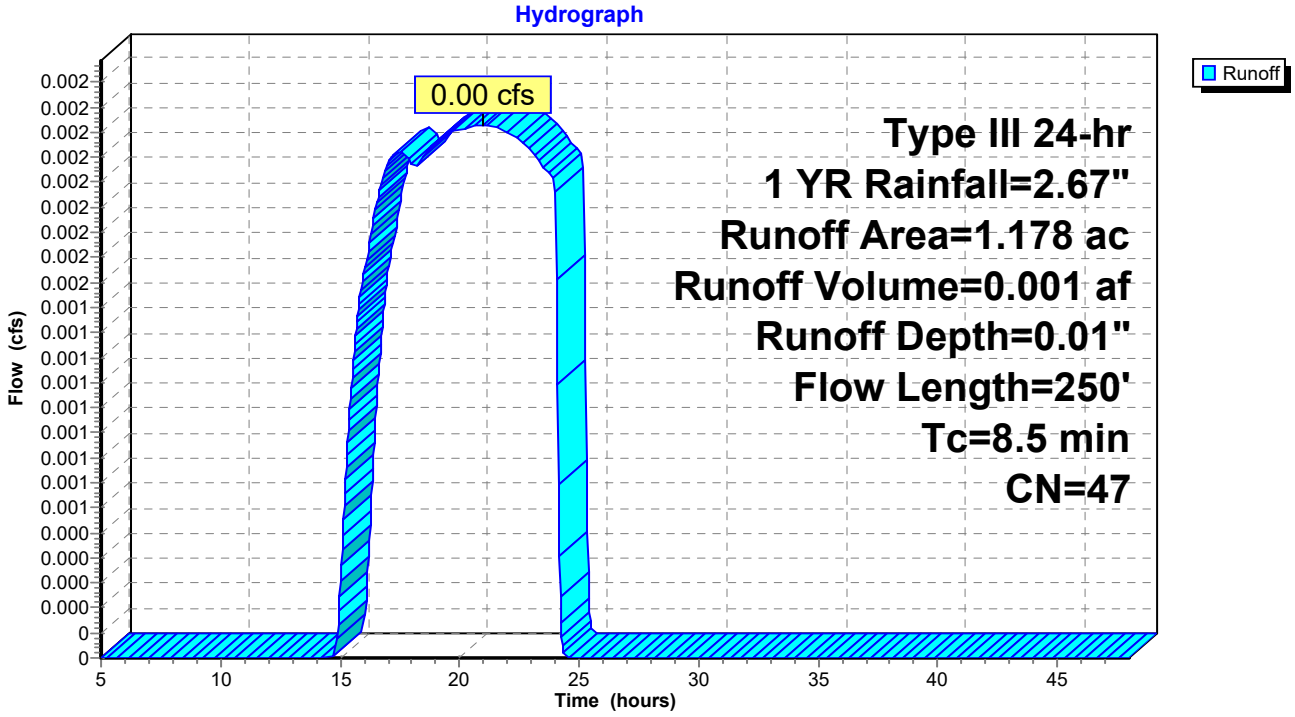
Runoff = 0.00 cfs @ 20.93 hrs, Volume= 0.001 af, Depth= 0.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 1 YR Rainfall=2.67"

Area (ac)	CN	Description
0.130	98	Paved parking, HSG C
0.160	98	Roofs, HSG C
0.868	30	Woods, Good, HSG A
0.020	39	Pasture/grassland/range, Good, HSG A
1.178	47	Weighted Average
0.888		75.38% Pervious Area
0.290		24.62% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.1000	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
2.0	200	0.1150	1.70		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.5	250	Total			

Subcatchment DA 2B: BACK OF LOTS MID



Summary for Subcatchment DA 2C: BACK OF LOTS W

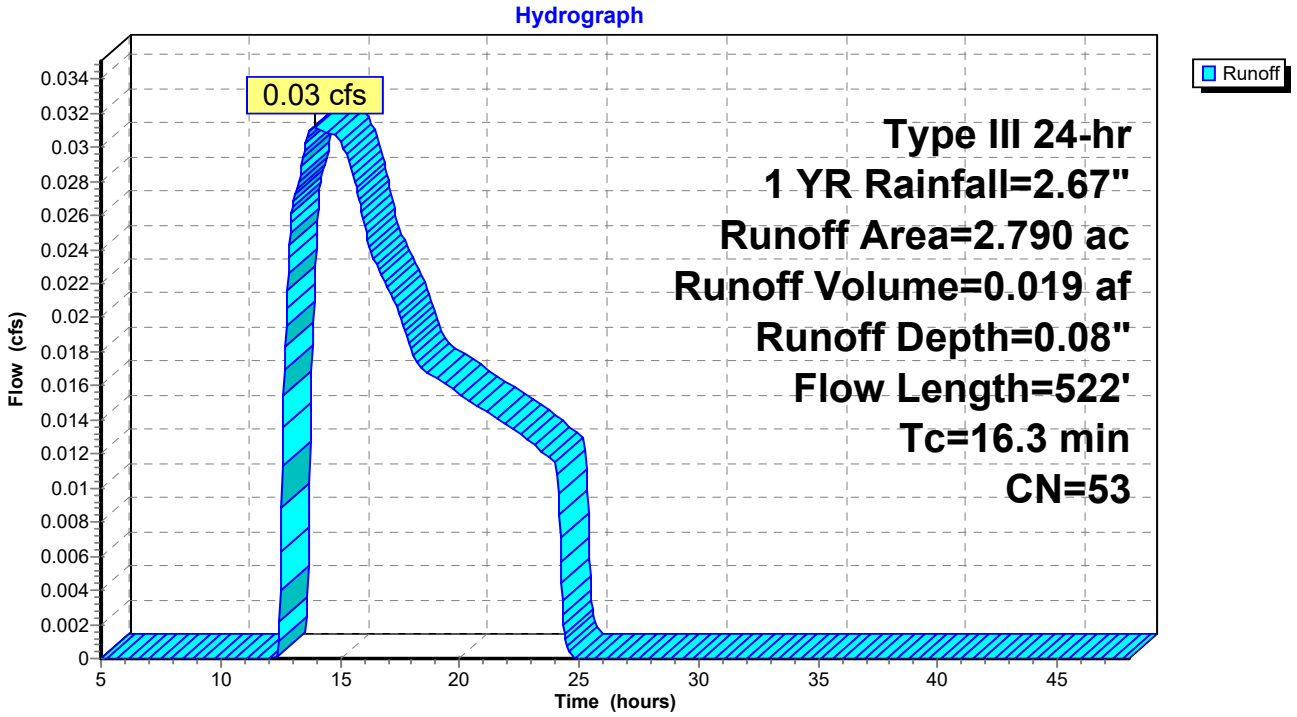
Runoff = 0.03 cfs @ 13.92 hrs, Volume= 0.019 af, Depth= 0.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 1 YR Rainfall=2.67"

Area (ac)	CN	Description
0.250	98	Paved parking, HSG C
0.090	72	Dirt roads, HSG A
0.040	87	Dirt roads, HSG C
0.120	98	Roofs, HSG C
0.300	98	Water Surface, HSG C
1.520	30	Woods, Good, HSG A
0.270	70	Woods, Good, HSG C
0.200	39	Pasture/grassland/range, Good, HSG A
0.000	74	Pasture/grassland/range, Good, HSG C
2.790	53	Weighted Average
2.120		75.99% Pervious Area
0.670		24.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
7.0	472	0.0510	1.13		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
16.3	522	Total			

Subcatchment DA 2C: BACK OF LOTS W



Summary for Subcatchment DA 2D: PARKING

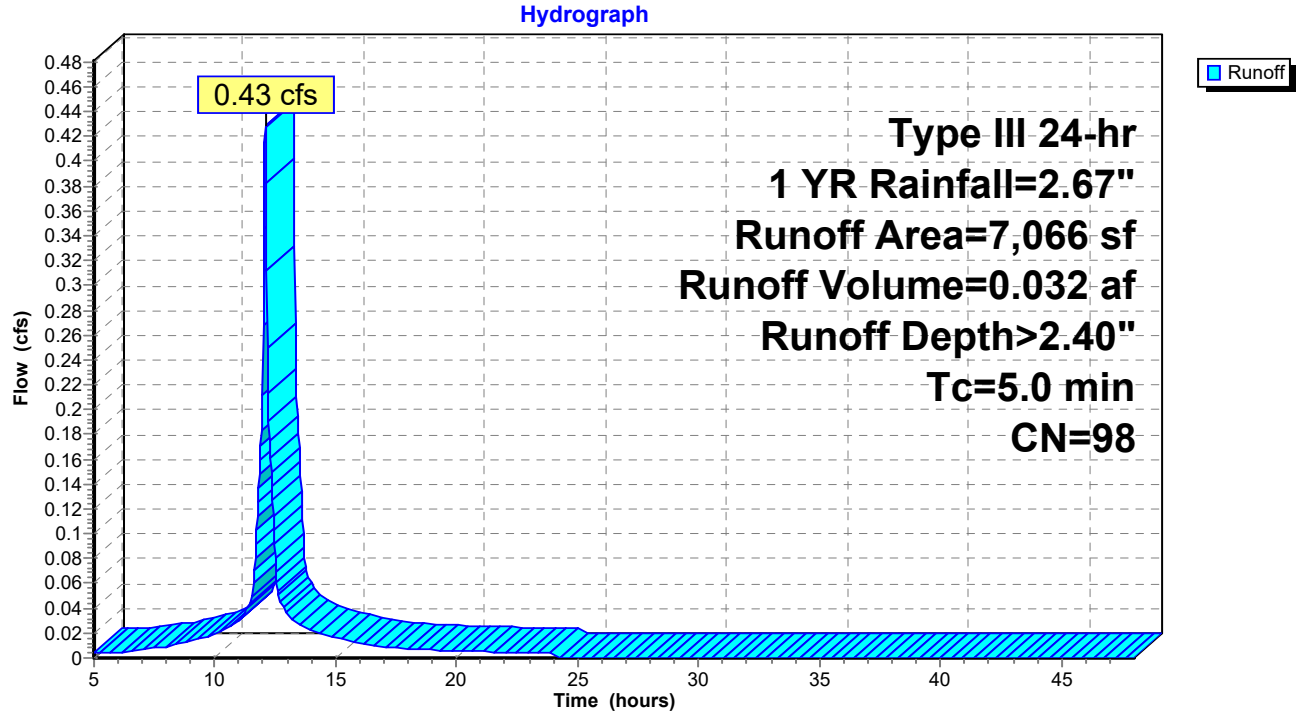
Runoff = 0.43 cfs @ 12.07 hrs, Volume= 0.032 af, Depth> 2.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 1 YR Rainfall=2.67"

Area (sf)	CN	Description
7,066	98	Paved parking, HSG C
7,066		100.00% Impervious Area

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

Subcatchment DA 2D: PARKING



Summary for Subcatchment DA 3: EAST OF ABERJONA

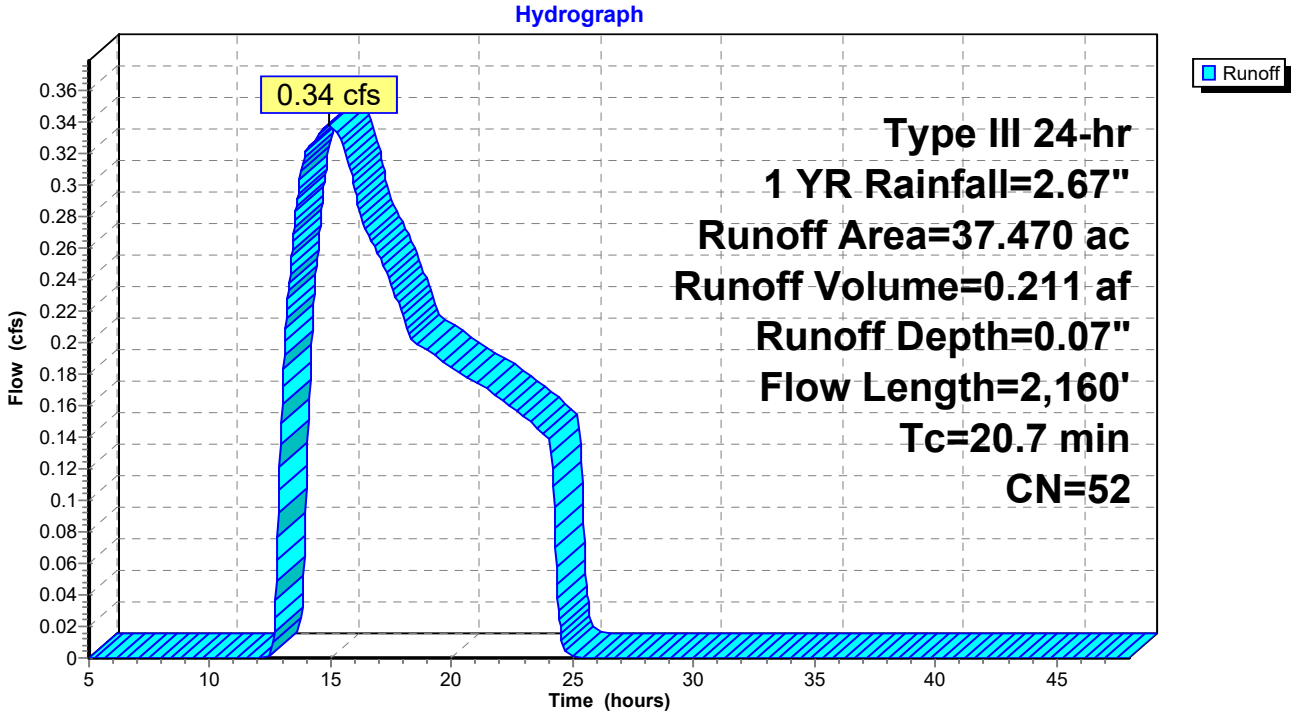
Runoff = 0.34 cfs @ 14.93 hrs, Volume= 0.211 af, Depth= 0.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 1 YR Rainfall=2.67"

Area (ac)	CN	Description
6.760	98	Paved parking, HSG C
3.290	98	Roofs, HSG C
9.960	30	Woods, Good, HSG A
17.460	39	Pasture/grassland/range, Good, HSG A
37.470	52	Weighted Average
27.420		73.18% Pervious Area
10.050		26.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
11.4	2,110	0.0230	3.08		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
20.7	2,160	Total			

Subcatchment DA 3: EAST OF ABERJONA



Summary for Pond D110: DMH 110

Inflow Area = 42.280 ac, 29.21% Impervious, Inflow Depth = 0.20" for 1 YR event
Inflow = 5.27 cfs @ 12.21 hrs, Volume= 0.712 af
Outflow = 5.27 cfs @ 12.21 hrs, Volume= 0.712 af, Atten= 0%, Lag= 0.0 min
Primary = 5.27 cfs @ 12.21 hrs, Volume= 0.712 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

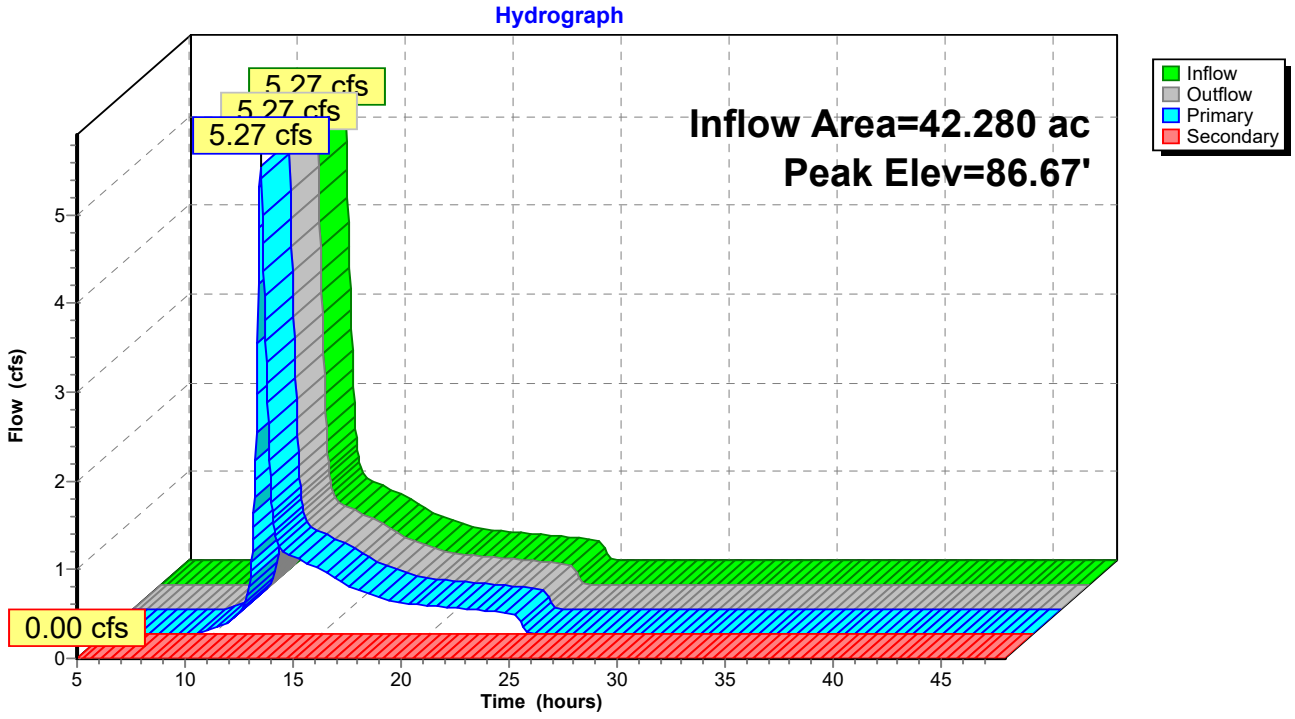
Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Peak Elev= 86.67' @ 12.21 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	85.30'	**18.0" Round Culvert** L= 143.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 85.30' / 84.60' S= 0.0049 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Secondary	91.10'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=5.24 cfs @ 12.21 hrs HW=86.66' (Free Discharge)
└**1=Culvert** (Barrel Controls 5.24 cfs @ 4.09 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=85.30' (Free Discharge)
└**2=Orifice/Grate** (Controls 0.00 cfs)

Pond D110: DMH 110



Summary for Pond D120: DMH 120

Inflow Area = 42.280 ac, 29.21% Impervious, Inflow Depth = 0.20" for 1 YR event
Inflow = 5.27 cfs @ 12.21 hrs, Volume= 0.712 af
Outflow = 5.27 cfs @ 12.21 hrs, Volume= 0.712 af, Atten= 0%, Lag= 0.0 min
Primary = 5.27 cfs @ 12.21 hrs, Volume= 0.712 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

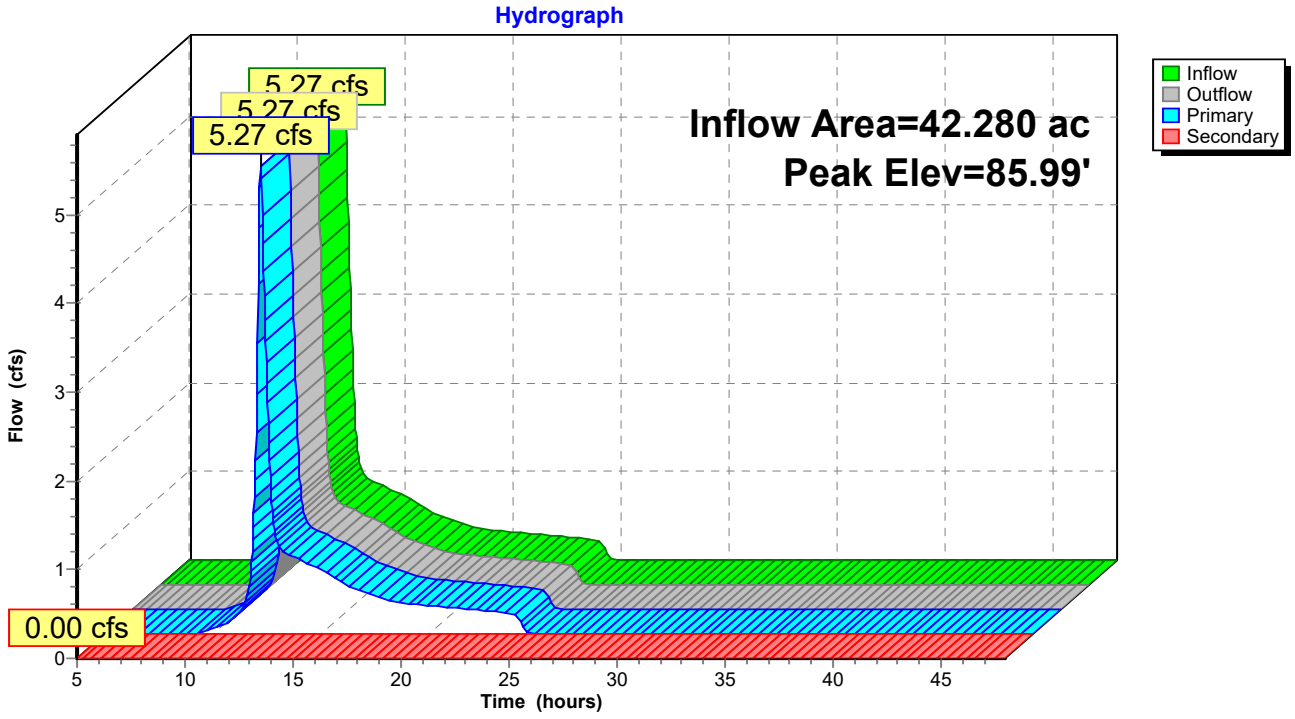
Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Peak Elev= 85.99' @ 12.21 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	84.60'	**18.0" Round Culvert** L= 126.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 84.60' / 84.00' S= 0.0048 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Secondary	88.01'	**2.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=5.24 cfs @ 12.21 hrs HW=85.98' (Free Discharge)
└**1=Culvert** (Barrel Controls 5.24 cfs @ 4.03 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=84.60' (Free Discharge)
└**2=Orifice/Grate** (Controls 0.00 cfs)

Pond D120: DMH 120



Summary for Pond F1: FOREBAY

Inflow Area = 45.380 ac, 28.98% Impervious, Inflow Depth = 0.20" for 1 YR event
Inflow = 5.31 cfs @ 12.21 hrs, Volume= 0.763 af
Outflow = 5.28 cfs @ 12.23 hrs, Volume= 0.750 af, Atten= 1%, Lag= 1.1 min
Discarded = 0.01 cfs @ 12.23 hrs, Volume= 0.031 af
Primary = 5.27 cfs @ 12.23 hrs, Volume= 0.719 af

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Peak Elev= 84.76' @ 12.23 hrs Surf.Area= 1,774 sf Storage= 1,793 cf

Plug-Flow detention time= 51.3 min calculated for 0.750 af (98% of inflow)
Center-of-Mass det. time= 42.3 min (957.6 - 915.3)

Volume	Invert	Avail.Storage	Storage Description
#1	83.50'	12,853 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

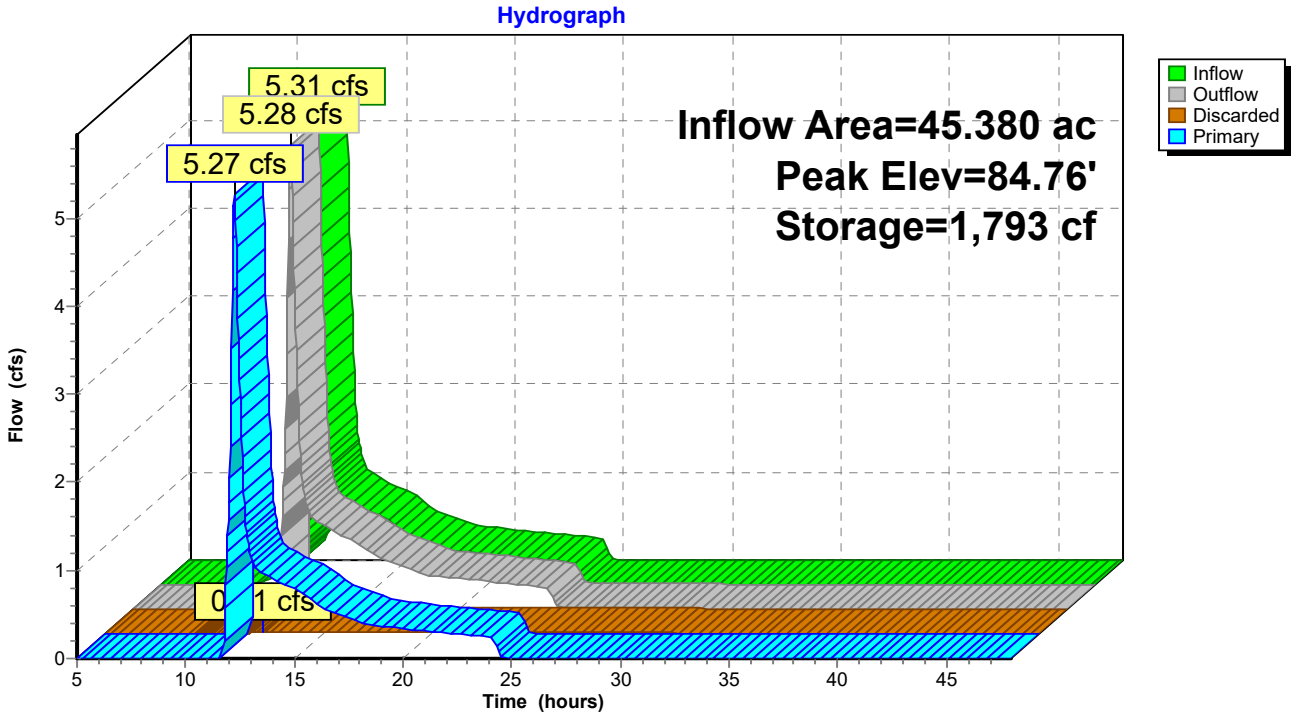
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
83.50	1,040	0	0
84.00	1,321	590	590
84.50	1,701	756	1,346
85.00	1,843	886	2,232
86.00	2,700	2,272	4,503
87.00	4,000	3,350	7,853
88.00	6,000	5,000	12,853

Device	Routing	Invert	Outlet Devices
#1	Primary	84.50'	**15.0' long x 20.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Discarded	83.50'	**0.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.01 cfs @ 12.23 hrs HW=84.76' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=5.25 cfs @ 12.23 hrs HW=84.76' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 5.25 cfs @ 1.36 fps)

Pond F1: FOREBAY



Summary for Pond F2: FOREBAY

Inflow Area = 45.380 ac, 28.98% Impervious, Inflow Depth = 0.19" for 1 YR event
Inflow = 5.27 cfs @ 12.23 hrs, Volume= 0.719 af
Outflow = 5.22 cfs @ 12.26 hrs, Volume= 0.704 af, Atten= 1%, Lag= 1.3 min
Discarded = 0.01 cfs @ 12.26 hrs, Volume= 0.034 af
Primary = 5.20 cfs @ 12.26 hrs, Volume= 0.670 af

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Peak Elev= 84.76' @ 12.26 hrs Surf.Area= 2,153 sf Storage= 2,092 cf

Plug-Flow detention time= 59.4 min calculated for 0.704 af (98% of inflow)
Center-of-Mass det. time= 49.5 min (975.6 - 926.0)

Volume	Invert	Avail.Storage	Storage Description
#1	83.50'	14,130 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

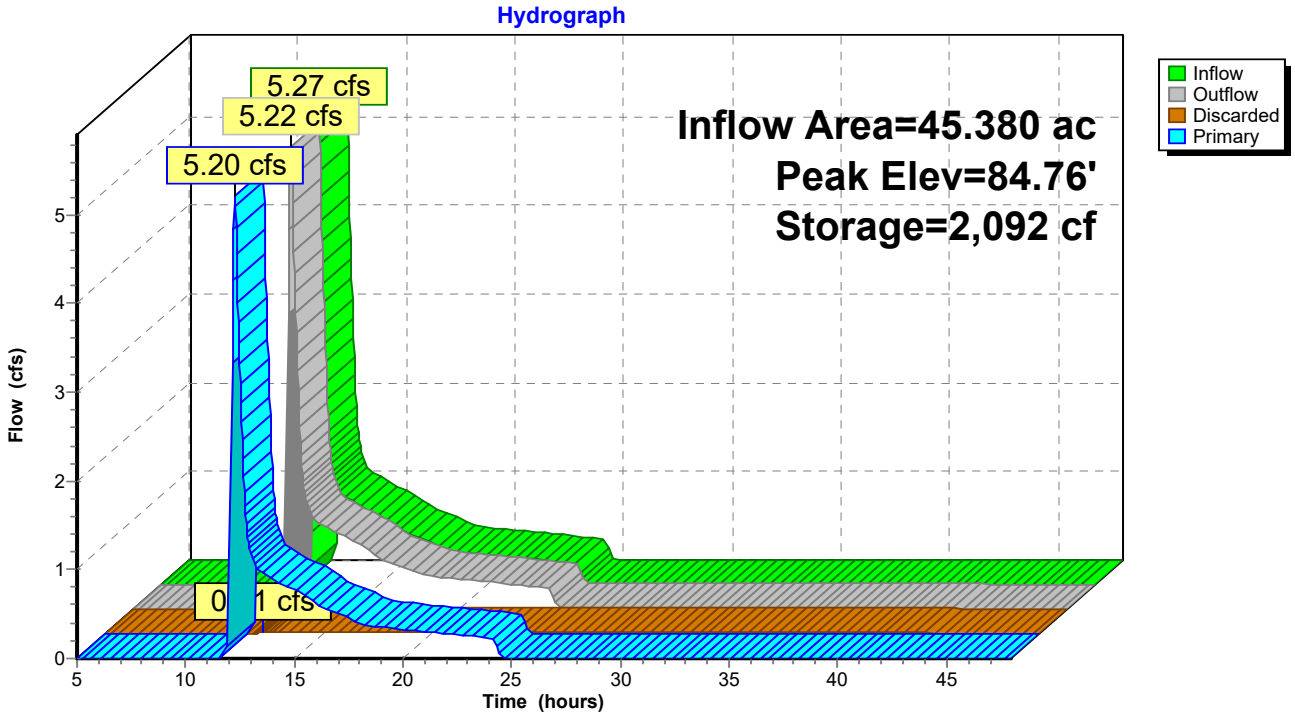
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
83.50	1,266	0	0
84.00	1,481	687	687
84.50	2,013	874	1,560
85.00	2,288	1,075	2,636
86.00	3,000	2,644	5,280
87.00	4,500	3,750	9,030
88.00	5,700	5,100	14,130

Device	Routing	Invert	Outlet Devices
#1	Primary	84.50'	**15.0' long x 20.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Discarded	83.50'	**0.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.01 cfs @ 12.26 hrs HW=84.75' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=5.19 cfs @ 12.26 hrs HW=84.75' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 5.19 cfs @ 1.36 fps)

Pond F2: FOREBAY



Summary for Pond F3: FOREBAY

Inflow Area = 0.162 ac,100.00% Impervious, Inflow Depth > 2.40" for 1 YR event
Inflow = 0.43 cfs @ 12.07 hrs, Volume= 0.032 af
Outflow = 0.41 cfs @ 12.09 hrs, Volume= 0.030 af, Atten= 3%, Lag= 1.3 min
Primary = 0.41 cfs @ 12.09 hrs, Volume= 0.030 af

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Peak Elev= 86.85' @ 12.09 hrs Surf.Area= 480 sf Storage= 152 cf

Plug-Flow detention time= 69.5 min calculated for 0.030 af (92% of inflow)
Center-of-Mass det. time= 29.7 min (797.3 - 767.6)

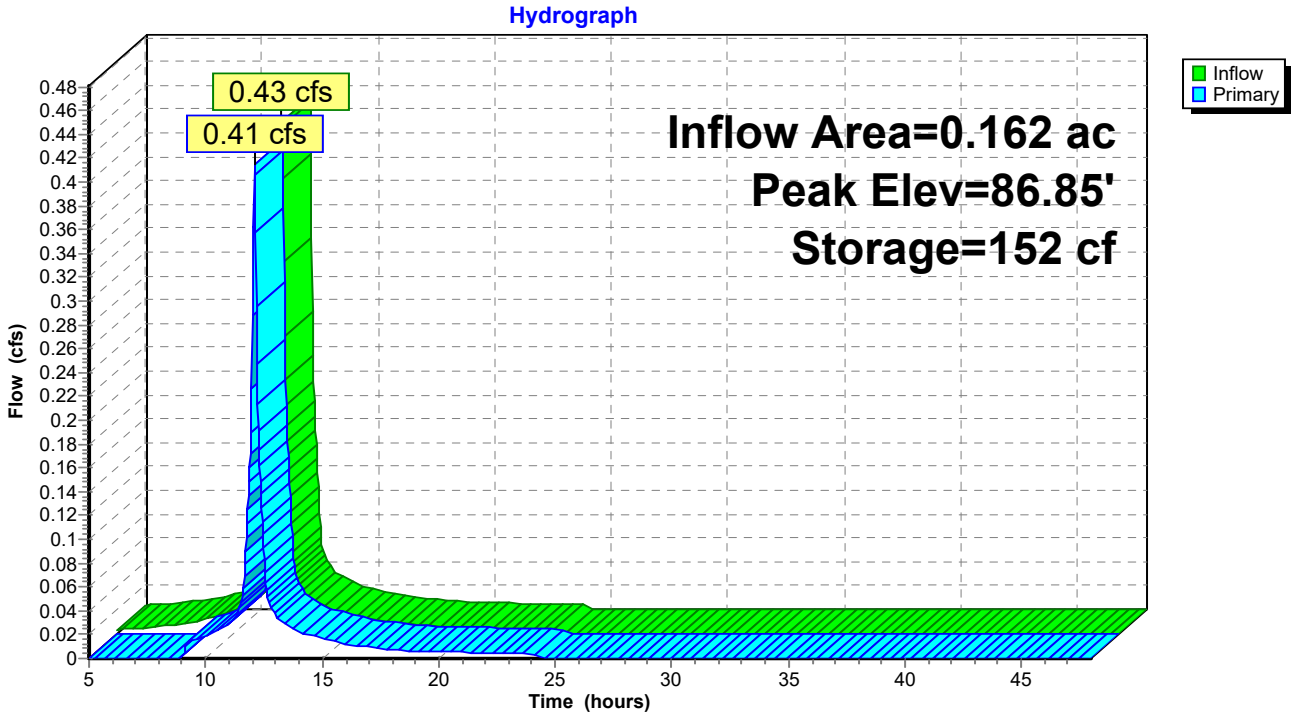
Volume	Invert	Avail.Storage	Storage Description
#1	86.50'	369 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
86.50	400	0	0
86.75	450	106	106
87.25	600	263	369

Device	Routing	Invert	Outlet Devices
#1	Primary	86.75'	**5.0' long x 15.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.41 cfs @ 12.09 hrs HW=86.85' (Free Discharge)
↑**1=Broad-Crested Rectangular Weir** (Weir Controls 0.41 cfs @ 0.84 fps)

Pond F3: FOREBAY



Summary for Pond P1: CELL 1

Inflow Area = 45.380 ac, 28.98% Impervious, Inflow Depth = 0.18" for 1 YR event
Inflow = 5.20 cfs @ 12.26 hrs, Volume= 0.670 af
Outflow = 4.22 cfs @ 12.39 hrs, Volume= 0.670 af, Atten= 19%, Lag= 7.9 min
Primary = 4.22 cfs @ 12.39 hrs, Volume= 0.670 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Starting Elev= 84.50' Surf.Area= 9,400 sf Storage= 15,153 cf
Peak Elev= 84.64' @ 12.39 hrs Surf.Area= 9,601 sf Storage= 16,518 cf (1,365 cf above start)

Plug-Flow detention time= 342.1 min calculated for 0.322 af (48% of inflow)
Center-of-Mass det. time= 2.7 min (939.5 - 936.8)

Volume	Invert	Avail.Storage	Storage Description
#1	79.00'	46,228 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

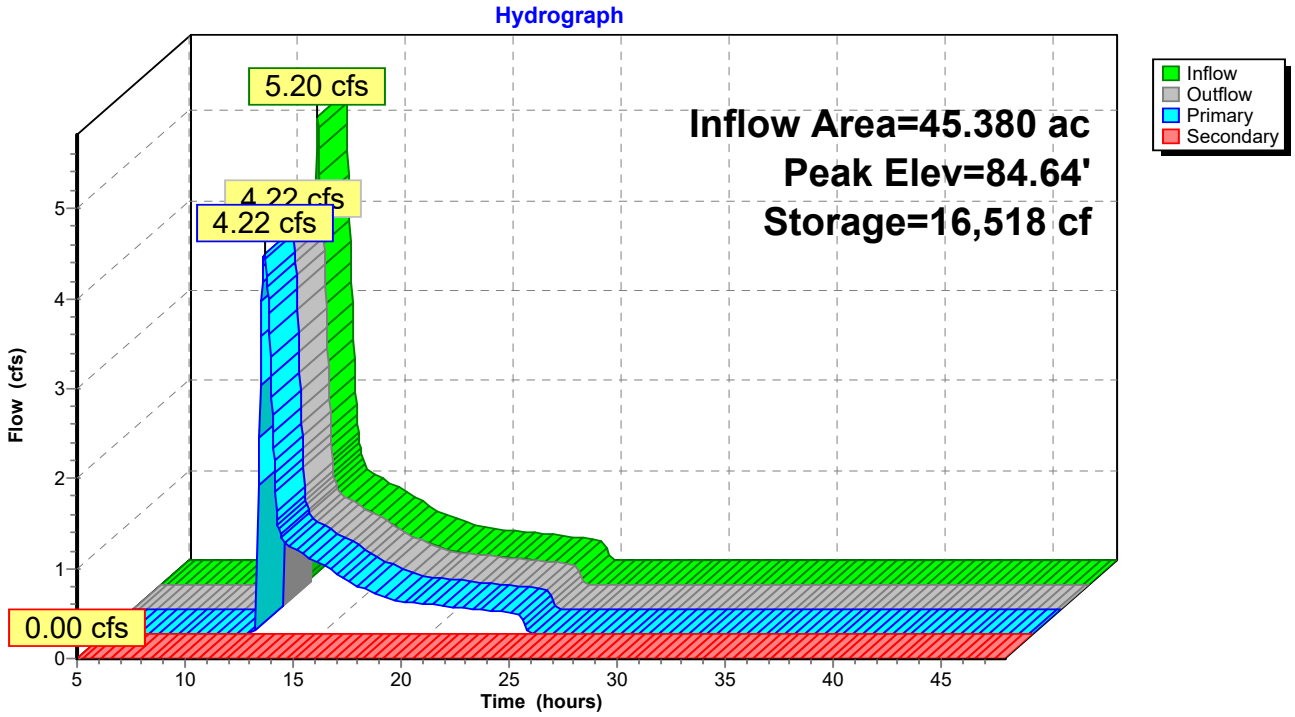
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
79.00	350	0	0
80.00	761	556	556
81.00	1,501	1,131	1,687
82.00	2,224	1,863	3,549
83.00	3,057	2,641	6,190
84.00	6,780	4,919	11,108
84.50	9,400	4,045	15,153
85.00	10,100	4,875	20,028
85.50	10,800	5,225	25,253
86.00	11,700	5,625	30,878
87.00	19,000	15,350	46,228

Device	Routing	Invert	Outlet Devices
#1	Primary	82.50'	**24.0" Round Culvert** L= 250.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 80.50' / 82.50' S= -0.0080 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#2	Secondary	85.50'	**30.0' long x 15.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=4.26 cfs @ 12.39 hrs HW=84.64' TW=84.50' (Fixed TW Elev= 84.50')
↑—**1=Culvert** (Outlet Controls 4.26 cfs @ 1.36 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=84.50' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond P1: CELL 1



Summary for Pond P2: CELL 2

Inflow Area = 48.332 ac, 28.93% Impervious, Inflow Depth = 0.18" for 1 YR event
Inflow = 4.36 cfs @ 12.38 hrs, Volume= 0.719 af
Outflow = 4.30 cfs @ 12.43 hrs, Volume= 0.719 af, Atten= 1%, Lag= 2.9 min
Primary = 4.30 cfs @ 12.43 hrs, Volume= 0.719 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Starting Elev= 84.50' Surf.Area= 5,620 sf Storage= 6,541 cf
Peak Elev= 84.65' @ 12.43 hrs Surf.Area= 6,034 sf Storage= 7,414 cf (873 cf above start)

Plug-Flow detention time= 148.4 min calculated for 0.569 af (79% of inflow)
Center-of-Mass det. time= 5.4 min (941.7 - 936.3)

Volume	Invert	Avail.Storage	Storage Description
#1	79.00'	17,196 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

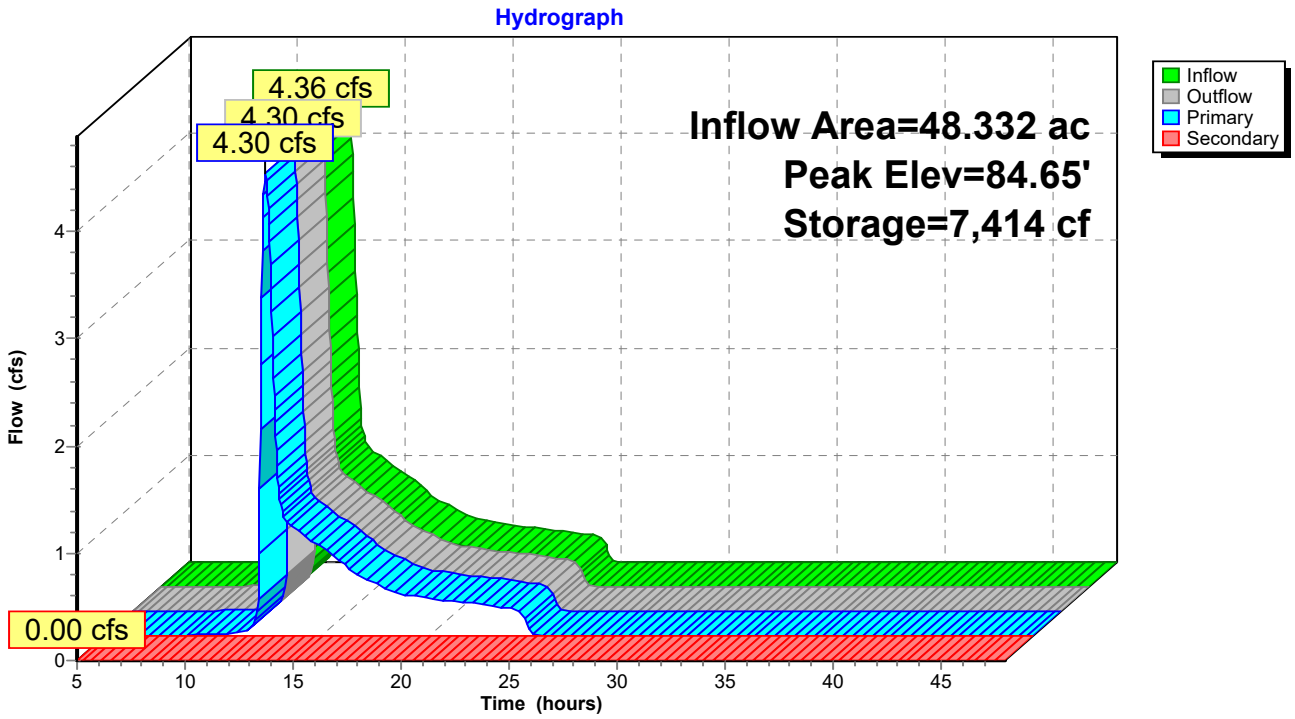
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
79.00	2	0	0
80.00	92	47	47
81.00	292	192	239
82.00	731	512	751
83.00	1,320	1,026	1,776
84.00	3,600	2,460	4,236
84.50	5,620	2,305	6,541
85.00	7,000	3,155	9,696
86.00	8,000	7,500	17,196

Device	Routing	Invert	Outlet Devices
#1	Primary	84.50'	**30.0' long x 8.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74
#2	Secondary	85.50'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=4.22 cfs @ 12.43 hrs HW=84.65' TW=84.50' (Fixed TW Elev= 84.50')
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 4.22 cfs @ 0.94 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=84.50' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond P2: CELL 2



Summary for Pond P3: CELL 3

Inflow Area = 48.332 ac, 28.93% Impervious, Inflow Depth = 0.18" for 1 YR event
Inflow = 4.30 cfs @ 12.43 hrs, Volume= 0.719 af
Outflow = 4.22 cfs @ 12.49 hrs, Volume= 0.719 af, Atten= 2%, Lag= 3.9 min
Primary = 4.22 cfs @ 12.49 hrs, Volume= 0.719 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Starting Elev= 84.50' Surf.Area= 6,663 sf Storage= 7,197 cf
Peak Elev= 84.66' @ 12.49 hrs Surf.Area= 6,895 sf Storage= 8,267 cf (1,070 cf above start)

Plug-Flow detention time= 163.9 min calculated for 0.554 af (77% of inflow)
Center-of-Mass det. time= 6.3 min (948.0 - 941.7)

Volume	Invert	Avail.Storage	Storage Description
#1	79.00'	18,411 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

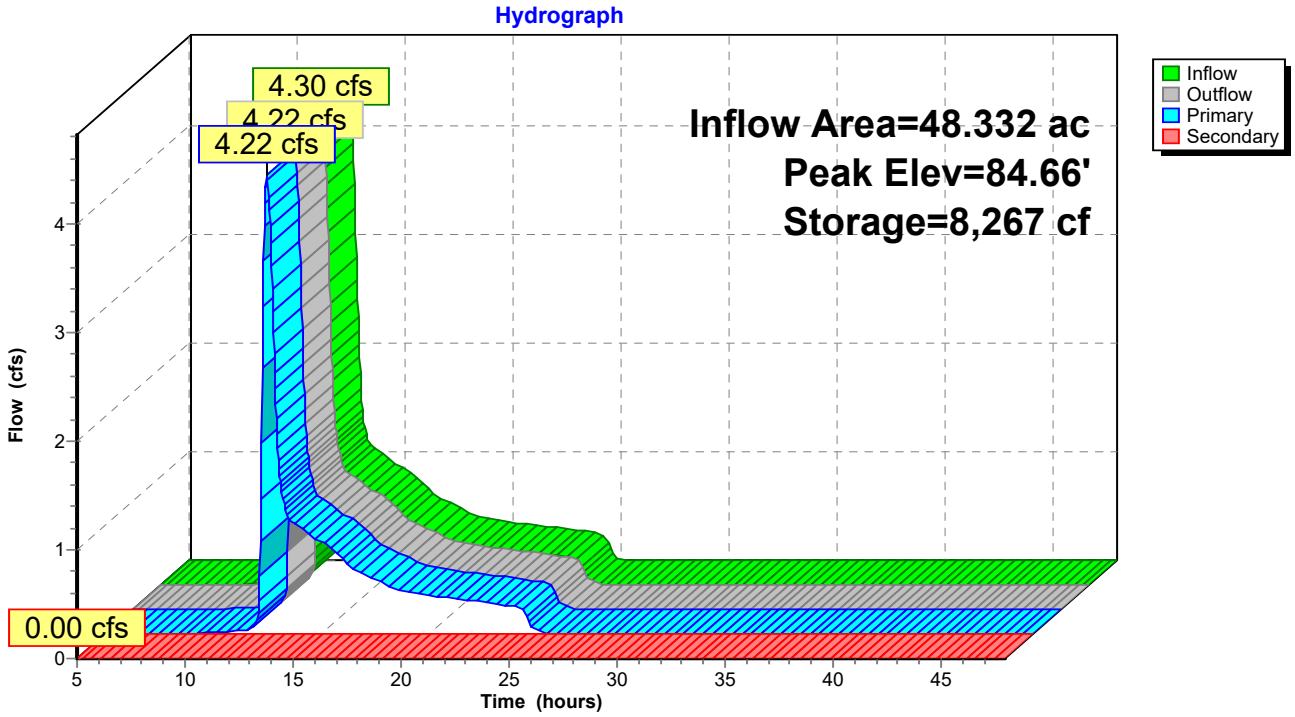
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
79.00	14	0	0
80.00	85	50	50
81.00	375	230	280
82.00	826	601	880
83.00	1,383	1,105	1,985
84.00	3,807	2,595	4,580
84.50	6,663	2,618	7,197
85.00	7,397	3,515	10,712
86.00	8,000	7,699	18,411

Device	Routing	Invert	Outlet Devices
#1	Primary	84.50'	**25.0' long x 17.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Secondary	86.25'	**100.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=4.20 cfs @ 12.49 hrs HW=84.66' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 4.20 cfs @ 1.06 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=84.50' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond P3: CELL 3

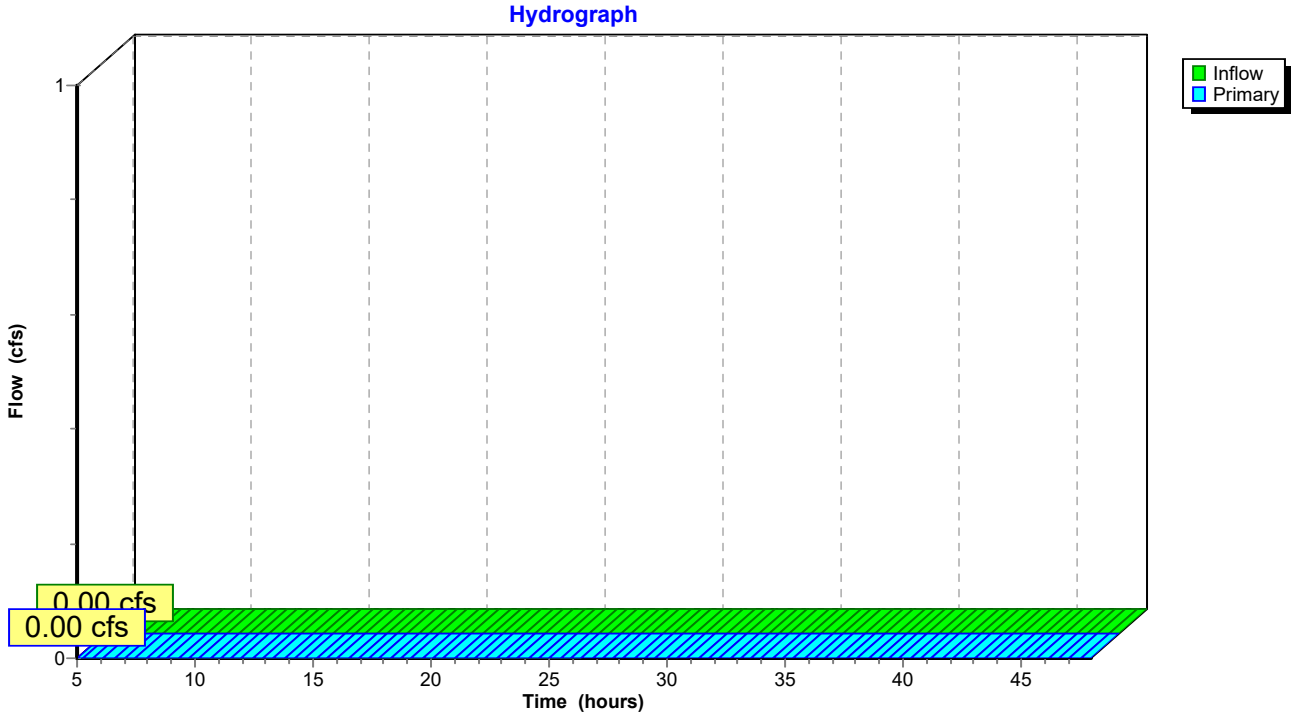


Summary for Pond SP1: ABERJONA RIVER

Inflow	=	0.00 cfs @	5.00 hrs, Volume=	0.000 af
Primary	=	0.00 cfs @	5.00 hrs, Volume=	0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs

Pond SP1: ABERJONA RIVER

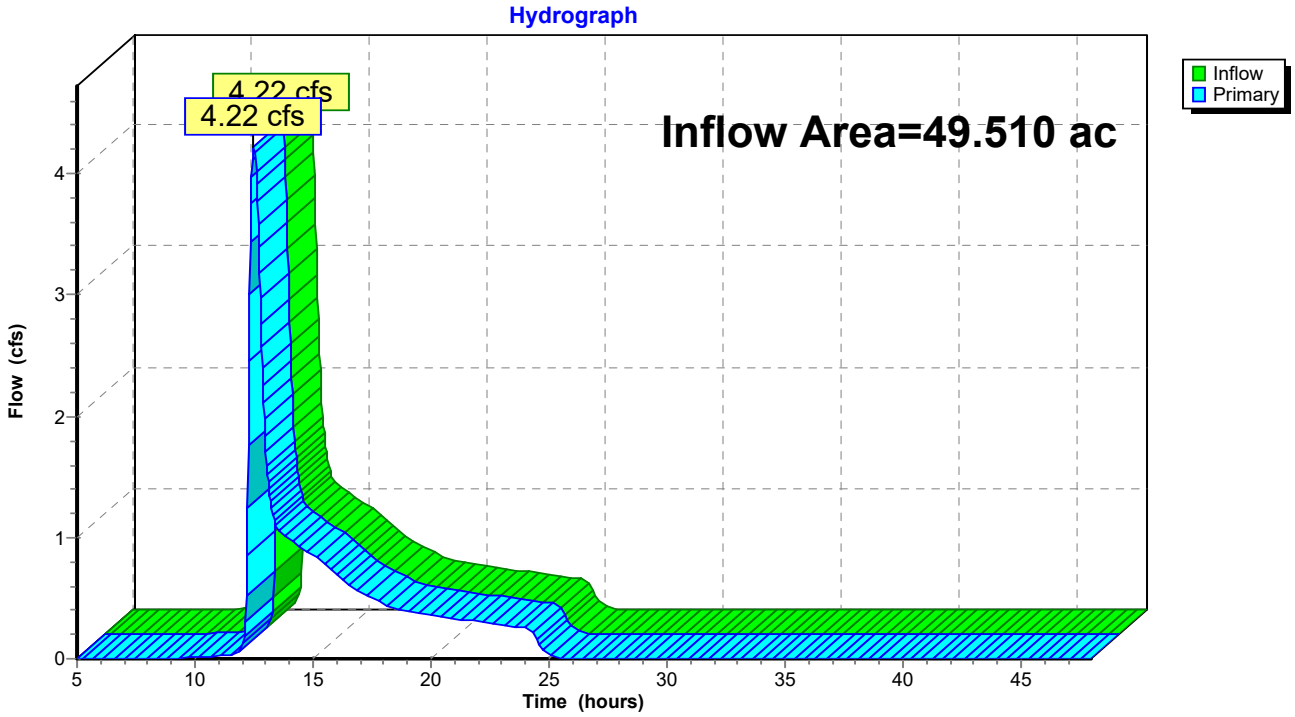


Summary for Pond SP2: ABERJONA RIVER

Inflow Area = 49.510 ac, 28.83% Impervious, Inflow Depth = 0.17" for 1 YR event
Inflow = 4.22 cfs @ 12.49 hrs, Volume= 0.721 af
Primary = 4.22 cfs @ 12.49 hrs, Volume= 0.721 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs

Pond SP2: ABERJONA RIVER



Time span=5.00-48.00 hrs, dt=0.03 hrs, 1434 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 DA 1: LOWELL STREET Runoff Area=4.810 ac 47.82% Impervious Runoff Depth=1.69"
Flow Length=1,080' Tc=15.1 min CN=84 Runoff=7.18 cfs 0.678 af

Subcatchment DA 2A: BACK OF LOTS E Runoff Area=3.100 ac 25.81% Impervious Runoff Depth=0.38"
Flow Length=614' Tc=18.1 min CN=59 Runoff=0.56 cfs 0.098 af

Subcatchment DA 2B: BACK OF LOTS MID Runoff Area=1.178 ac 24.62% Impervious Runoff Depth=0.07"
Flow Length=250' Tc=8.5 min CN=47 Runoff=0.01 cfs 0.007 af

Subcatchment DA 2C: BACK OF LOTS W Runoff Area=2.790 ac 24.01% Impervious Runoff Depth=0.20"
Flow Length=522' Tc=16.3 min CN=53 Runoff=0.17 cfs 0.047 af

Subcatchment DA 2D: PARKING Runoff Area=7,066 sf 100.00% Impervious Runoff Depth>2.92"
Tc=5.0 min CN=98 Runoff=0.52 cfs 0.040 af

Subcatchment DA 3: EAST OF ABERJONA Runoff Area=37.470 ac 26.82% Impervious Runoff Depth=0.18"
Flow Length=2,160' Tc=20.7 min CN=52 Runoff=1.56 cfs 0.548 af

Pond D110: DMH 110 Peak Elev=87.20' Inflow=7.21 cfs 1.226 af
Primary=7.21 cfs 1.226 af Secondary=0.00 cfs 0.000 af Outflow=7.21 cfs 1.226 af

Pond D120: DMH 120 Peak Elev=86.50' Inflow=7.21 cfs 1.226 af
Primary=7.21 cfs 1.226 af Secondary=0.00 cfs 0.000 af Outflow=7.21 cfs 1.226 af

Pond F1: FOREBAY Peak Elev=84.83' Storage=1,914 cf Inflow=7.54 cfs 1.324 af
Discarded=0.01 cfs 0.032 af Primary=7.51 cfs 1.279 af Outflow=7.52 cfs 1.311 af

Pond F2: FOREBAY Peak Elev=84.82' Storage=2,240 cf Inflow=7.51 cfs 1.279 af
Discarded=0.01 cfs 0.035 af Primary=7.45 cfs 1.229 af Outflow=7.46 cfs 1.264 af

Pond F3: FOREBAY Peak Elev=86.86' Storage=159 cf Inflow=0.52 cfs 0.040 af
Outflow=0.50 cfs 0.037 af

Pond P1: CELL 1 Peak Elev=84.78' Storage=17,823 cf Inflow=7.45 cfs 1.229 af
Primary=5.93 cfs 1.229 af Secondary=0.00 cfs 0.000 af Outflow=5.93 cfs 1.229 af

Pond P2: CELL 2 Peak Elev=84.69' Storage=7,668 cf Inflow=6.21 cfs 1.313 af
Primary=6.20 cfs 1.313 af Secondary=0.00 cfs 0.000 af Outflow=6.20 cfs 1.313 af

Pond P3: CELL 3 Peak Elev=84.70' Storage=8,574 cf Inflow=6.20 cfs 1.313 af
Primary=6.16 cfs 1.313 af Secondary=0.00 cfs 0.000 af Outflow=6.16 cfs 1.313 af

Pond SP1: ABERJONA RIVER Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Pond SP2: ABERJONA RIVER Inflow=6.16 cfs 1.320 af
Primary=6.16 cfs 1.320 af

Total Runoff Area = 49.510 ac Runoff Volume = 1.417 af Average Runoff Depth = 0.34"
71.17% Pervious = 35.238 ac 28.83% Impervious = 14.272 ac

Summary for Subcatchment DA 1: LOWELL STREET

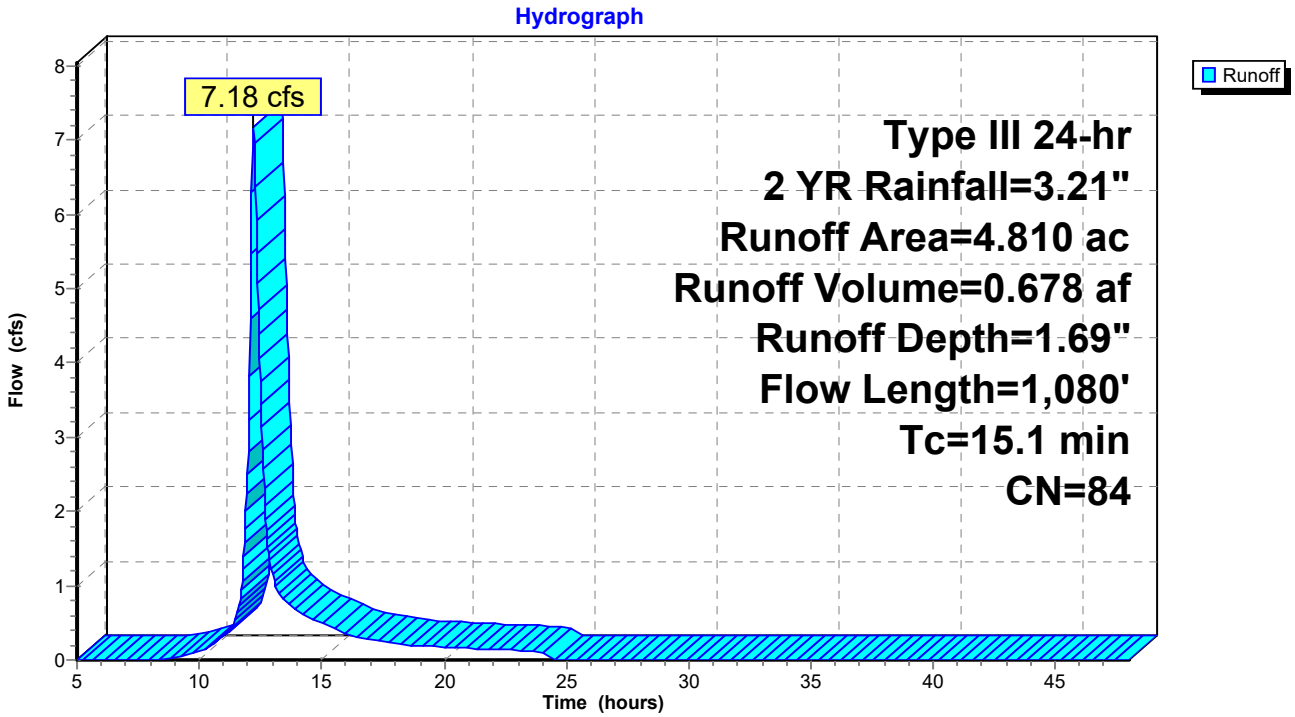
Runoff = 7.18 cfs @ 12.21 hrs, Volume= 0.678 af, Depth= 1.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 2 YR Rainfall=3.21"

Area (ac)	CN	Description
1.800	98	Paved parking, HSG C
0.500	98	Roofs, HSG C
1.250	70	Woods, Good, HSG C
1.260	74	Pasture/grassland/range, Good, HSG C
4.810	84	Weighted Average
2.510		52.18% Pervious Area
2.300		47.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
5.8	1,030	0.0210	2.94		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
15.1	1,080	Total			

Subcatchment DA 1: LOWELL STREET



Summary for Subcatchment DA 2A: BACK OF LOTS E

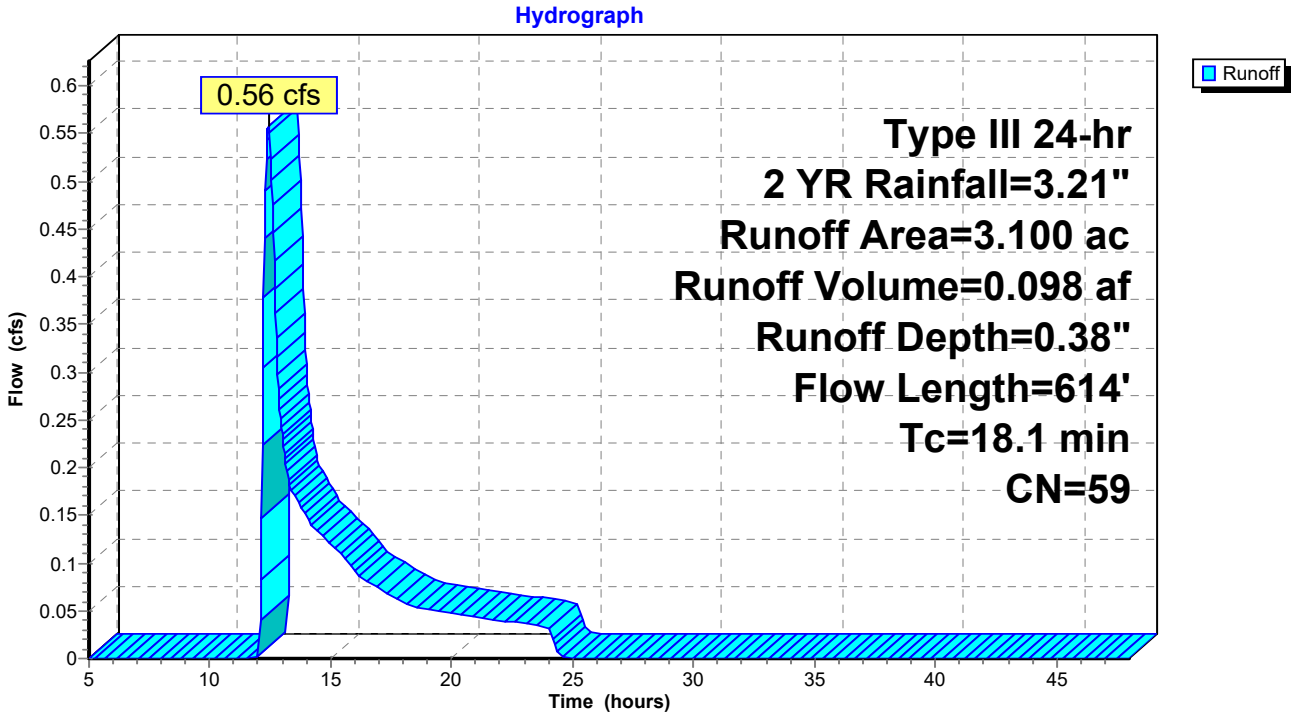
Runoff = 0.56 cfs @ 12.42 hrs, Volume= 0.098 af, Depth= 0.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 2 YR Rainfall=3.21"

Area (ac)	CN	Description
0.250	98	Paved parking, HSG C
0.020	72	Dirt roads, HSG A
0.110	87	Dirt roads, HSG C
0.260	98	Roofs, HSG C
0.290	98	Water Surface, HSG C
1.220	30	Woods, Good, HSG A
0.550	70	Woods, Good, HSG C
0.290	39	Pasture/grassland/range, Good, HSG A
0.110	74	Pasture/grassland/range, Good, HSG C
3.100	59	Weighted Average
2.300		74.19% Pervious Area
0.800		25.81% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
5.8	564	0.1040	1.61		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
18.1	614	Total			

Subcatchment DA 2A: BACK OF LOTS E



Summary for Subcatchment DA 2B: BACK OF LOTS MID

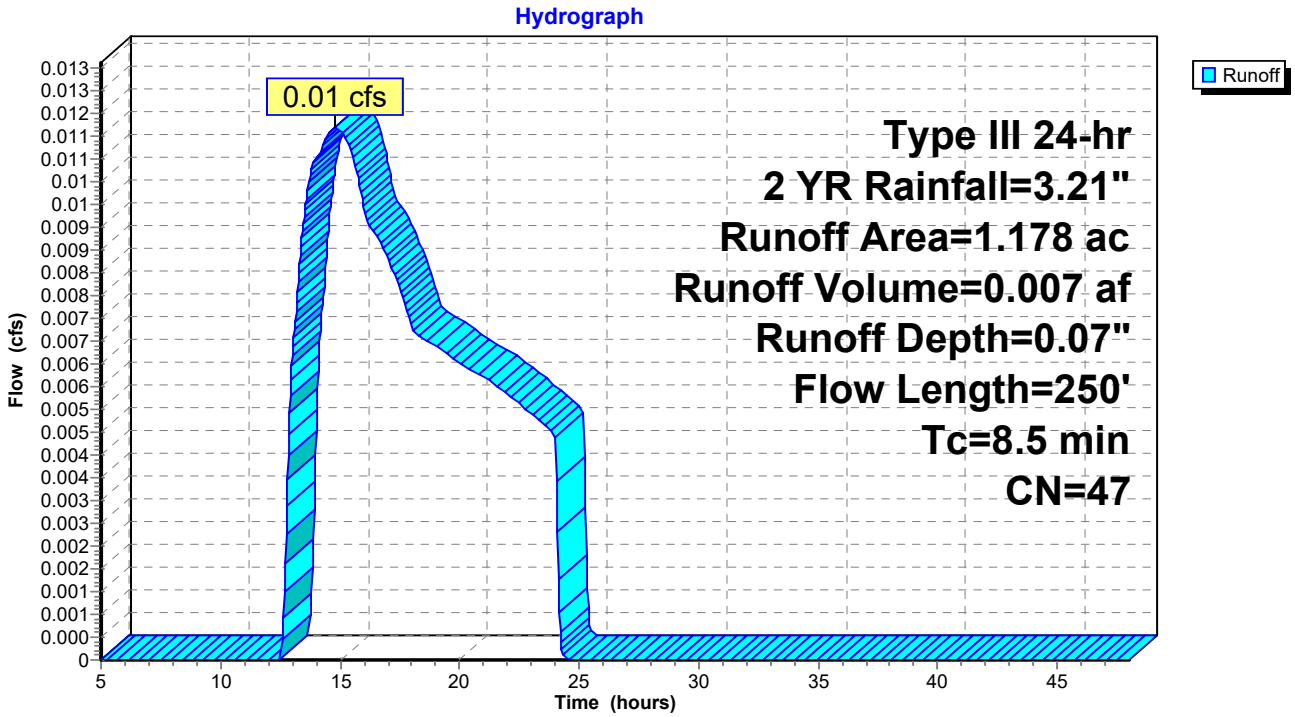
Runoff = 0.01 cfs @ 14.81 hrs, Volume= 0.007 af, Depth= 0.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 2 YR Rainfall=3.21"

Area (ac)	CN	Description
0.130	98	Paved parking, HSG C
0.160	98	Roofs, HSG C
0.868	30	Woods, Good, HSG A
0.020	39	Pasture/grassland/range, Good, HSG A
1.178	47	Weighted Average
0.888		75.38% Pervious Area
0.290		24.62% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.1000	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
2.0	200	0.1150	1.70		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.5	250	Total			

Subcatchment DA 2B: BACK OF LOTS MID



Summary for Subcatchment DA 2C: BACK OF LOTS W

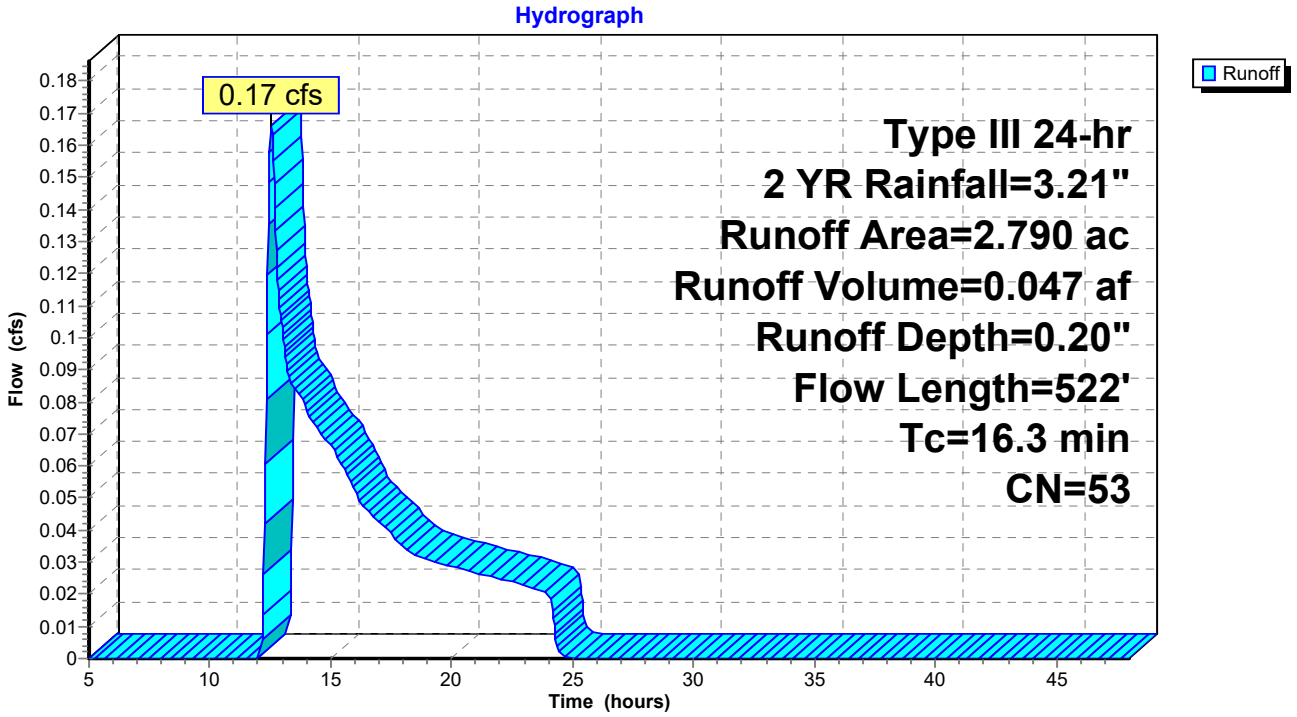
Runoff = 0.17 cfs @ 12.54 hrs, Volume= 0.047 af, Depth= 0.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 2 YR Rainfall=3.21"

Area (ac)	CN	Description
0.250	98	Paved parking, HSG C
0.090	72	Dirt roads, HSG A
0.040	87	Dirt roads, HSG C
0.120	98	Roofs, HSG C
0.300	98	Water Surface, HSG C
1.520	30	Woods, Good, HSG A
0.270	70	Woods, Good, HSG C
0.200	39	Pasture/grassland/range, Good, HSG A
0.000	74	Pasture/grassland/range, Good, HSG C
2.790	53	Weighted Average
2.120		75.99% Pervious Area
0.670		24.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
7.0	472	0.0510	1.13		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
16.3	522	Total			

Subcatchment DA 2C: BACK OF LOTS W



Summary for Subcatchment DA 2D: PARKING

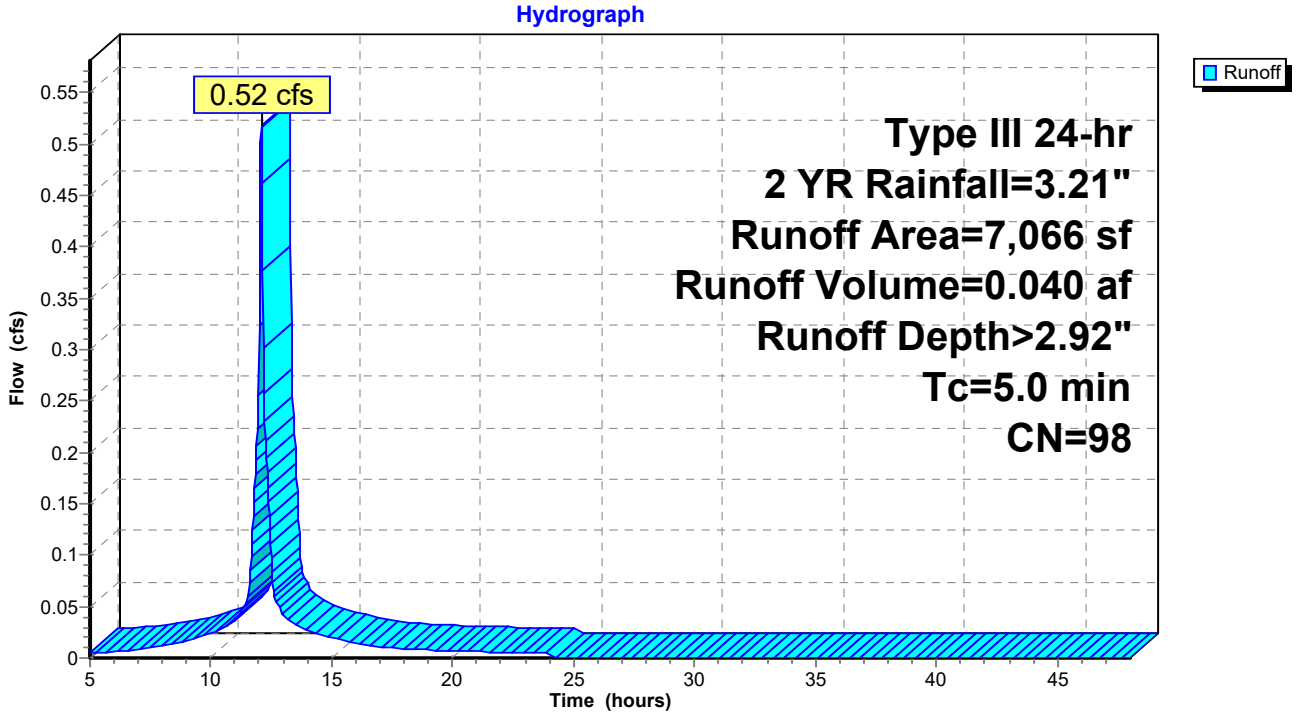
Runoff = 0.52 cfs @ 12.07 hrs, Volume= 0.040 af, Depth> 2.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 2 YR Rainfall=3.21"

Area (sf)	CN	Description
7,066	98	Paved parking, HSG C
7,066		100.00% Impervious Area

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

Subcatchment DA 2D: PARKING



Summary for Subcatchment DA 3: EAST OF ABERJONA

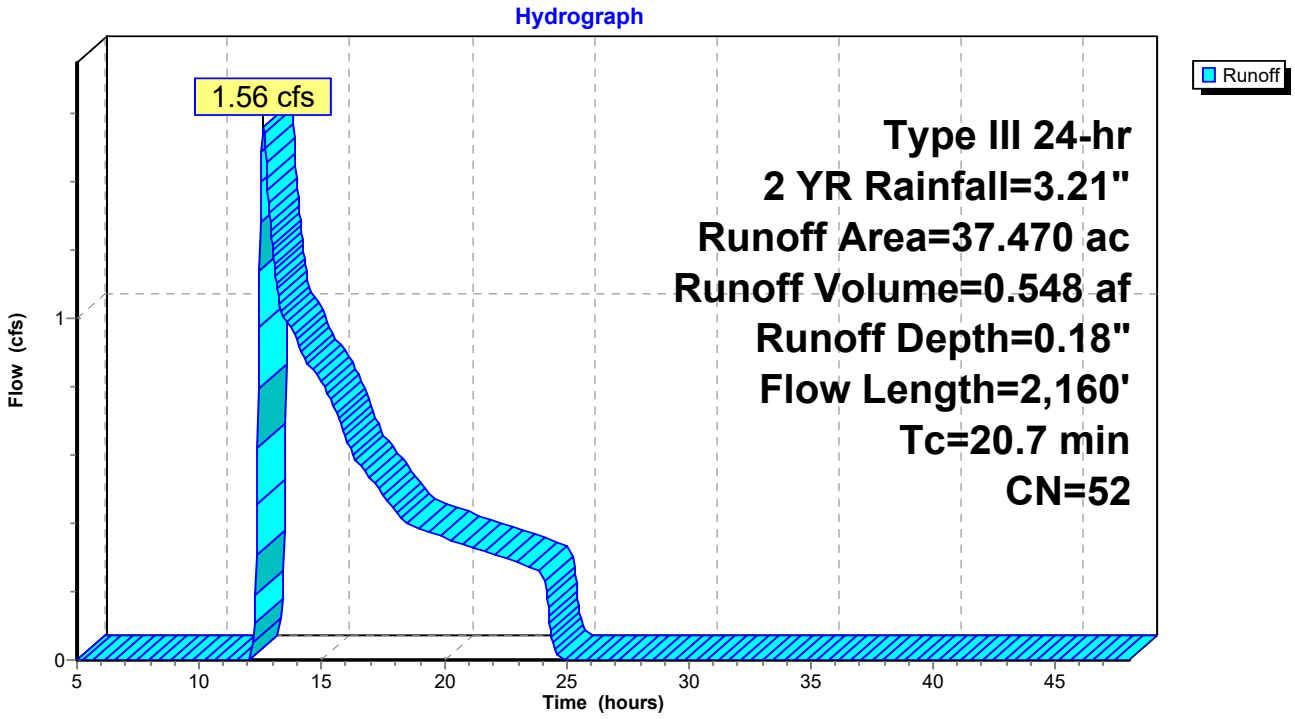
Runoff = 1.56 cfs @ 12.63 hrs, Volume= 0.548 af, Depth= 0.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 2 YR Rainfall=3.21"

Area (ac)	CN	Description
6.760	98	Paved parking, HSG C
3.290	98	Roofs, HSG C
9.960	30	Woods, Good, HSG A
17.460	39	Pasture/grassland/range, Good, HSG A
37.470	52	Weighted Average
27.420		73.18% Pervious Area
10.050		26.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
11.4	2,110	0.0230	3.08		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
20.7	2,160	Total			

Subcatchment DA 3: EAST OF ABERJONA



Summary for Pond D110: DMH 110

Inflow Area = 42.280 ac, 29.21% Impervious, Inflow Depth = 0.35" for 2 YR event
Inflow = 7.21 cfs @ 12.21 hrs, Volume= 1.226 af
Outflow = 7.21 cfs @ 12.21 hrs, Volume= 1.226 af, Atten= 0%, Lag= 0.0 min
Primary = 7.21 cfs @ 12.21 hrs, Volume= 1.226 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

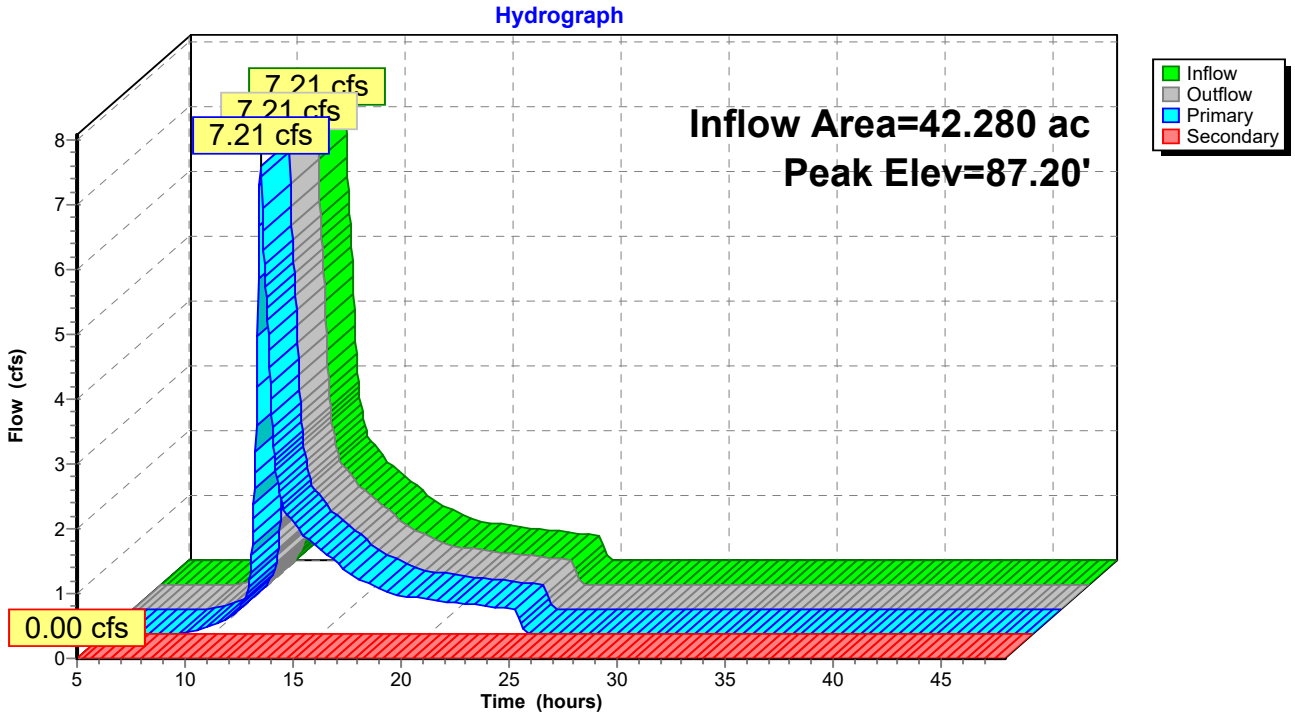
Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Peak Elev= 87.20' @ 12.21 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	85.30'	**18.0" Round Culvert** L= 143.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 85.30' / 84.60' S= 0.0049 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Secondary	91.10'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=7.17 cfs @ 12.21 hrs HW=87.19' (Free Discharge)
└**1=Culvert** (Inlet Controls 7.17 cfs @ 4.06 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=85.30' (Free Discharge)
└**2=Orifice/Grate** (Controls 0.00 cfs)

Pond D110: DMH 110



Summary for Pond D120: DMH 120

Inflow Area = 42.280 ac, 29.21% Impervious, Inflow Depth = 0.35" for 2 YR event
Inflow = 7.21 cfs @ 12.21 hrs, Volume= 1.226 af
Outflow = 7.21 cfs @ 12.21 hrs, Volume= 1.226 af, Atten= 0%, Lag= 0.0 min
Primary = 7.21 cfs @ 12.21 hrs, Volume= 1.226 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

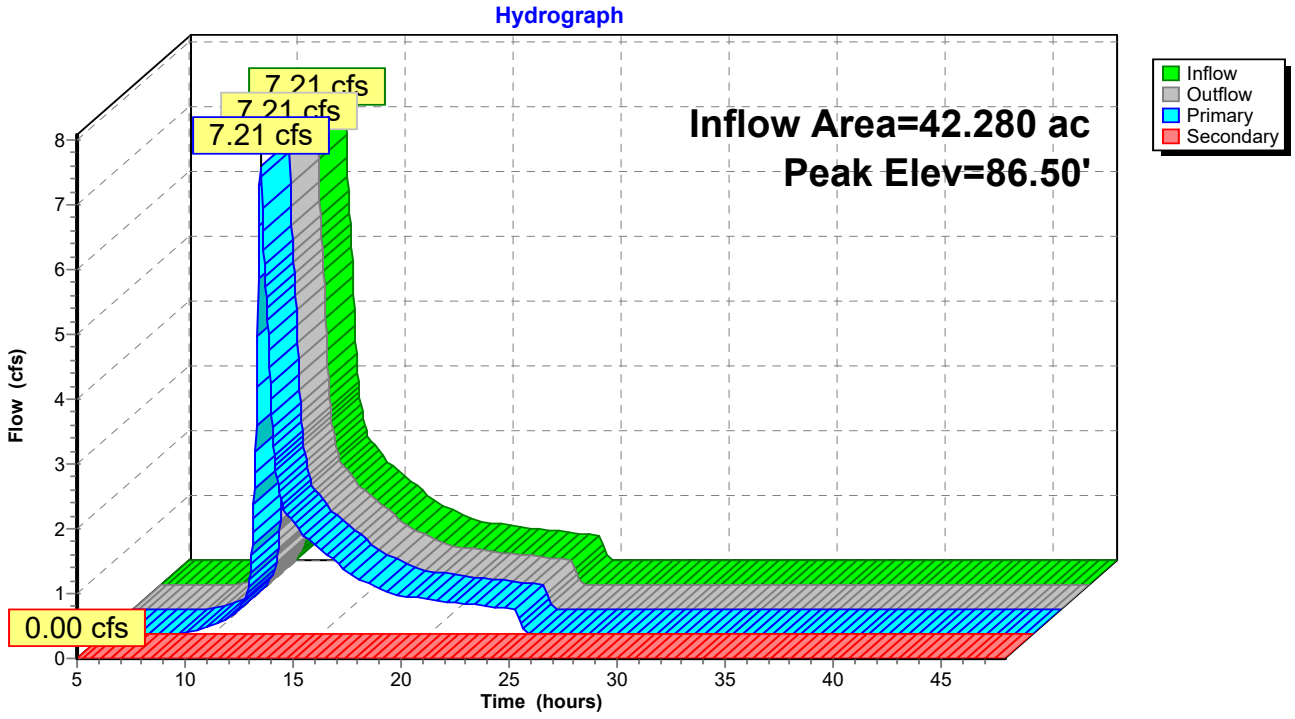
Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Peak Elev= 86.50' @ 12.21 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	84.60'	**18.0" Round Culvert** L= 126.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 84.60' / 84.00' S= 0.0048 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Secondary	88.01'	**2.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=7.17 cfs @ 12.21 hrs HW=86.49' (Free Discharge)
└**1=Culvert** (Inlet Controls 7.17 cfs @ 4.06 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=84.60' (Free Discharge)
└**2=Orifice/Grate** (Controls 0.00 cfs)

Pond D120: DMH 120



Summary for Pond F1: FOREBAY

Inflow Area = 45.380 ac, 28.98% Impervious, Inflow Depth = 0.35" for 2 YR event
Inflow = 7.54 cfs @ 12.22 hrs, Volume= 1.324 af
Outflow = 7.52 cfs @ 12.24 hrs, Volume= 1.311 af, Atten= 0%, Lag= 0.9 min
Discarded = 0.01 cfs @ 12.24 hrs, Volume= 0.032 af
Primary = 7.51 cfs @ 12.24 hrs, Volume= 1.279 af

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Peak Elev= 84.83' @ 12.24 hrs Surf.Area= 1,793 sf Storage= 1,914 cf

Plug-Flow detention time= 30.0 min calculated for 1.310 af (99% of inflow)
Center-of-Mass det. time= 25.7 min (937.1 - 911.3)

Volume	Invert	Avail.Storage	Storage Description
#1	83.50'	12,853 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

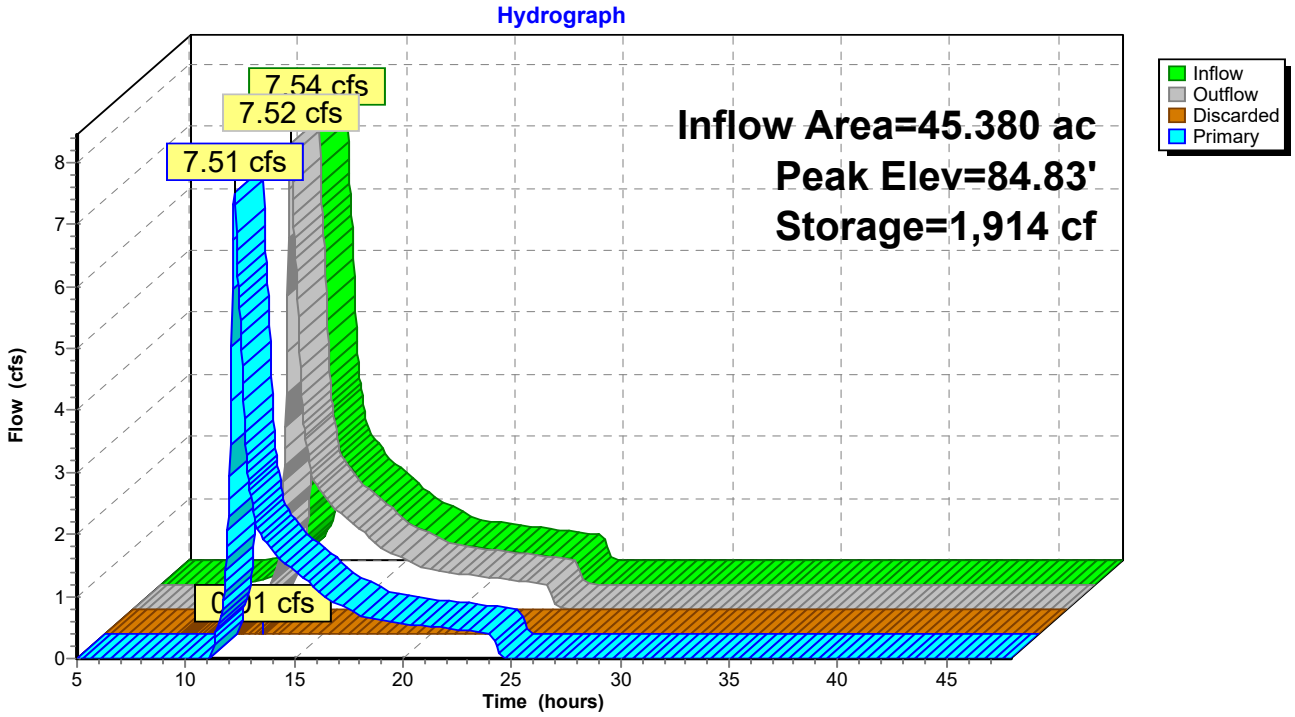
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
83.50	1,040	0	0
84.00	1,321	590	590
84.50	1,701	756	1,346
85.00	1,843	886	2,232
86.00	2,700	2,272	4,503
87.00	4,000	3,350	7,853
88.00	6,000	5,000	12,853

Device	Routing	Invert	Outlet Devices
#1	Primary	84.50'	**15.0' long x 20.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Discarded	83.50'	**0.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.01 cfs @ 12.24 hrs HW=84.82' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=7.47 cfs @ 12.24 hrs HW=84.82' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 7.47 cfs @ 1.53 fps)

Pond F1: FOREBAY



Summary for Pond F2: FOREBAY

Inflow Area = 45.380 ac, 28.98% Impervious, Inflow Depth = 0.34" for 2 YR event
Inflow = 7.51 cfs @ 12.24 hrs, Volume= 1.279 af
Outflow = 7.46 cfs @ 12.26 hrs, Volume= 1.264 af, Atten= 1%, Lag= 1.2 min
Discarded = 0.01 cfs @ 12.26 hrs, Volume= 0.035 af
Primary = 7.45 cfs @ 12.26 hrs, Volume= 1.229 af

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Peak Elev= 84.82' @ 12.26 hrs Surf.Area= 2,191 sf Storage= 2,240 cf

Plug-Flow detention time= 34.1 min calculated for 1.263 af (99% of inflow)
Center-of-Mass det. time= 28.8 min (947.8 - 919.0)

Volume	Invert	Avail.Storage	Storage Description
#1	83.50'	14,130 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

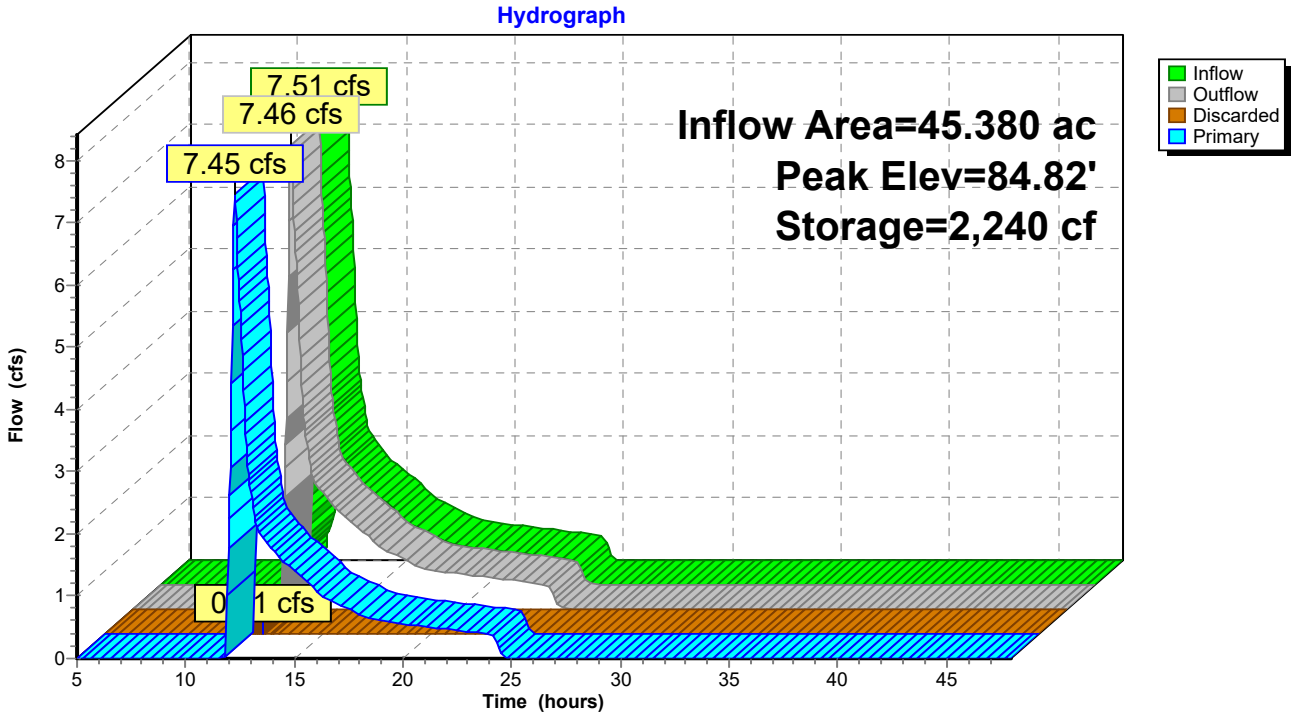
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
83.50	1,266	0	0
84.00	1,481	687	687
84.50	2,013	874	1,560
85.00	2,288	1,075	2,636
86.00	3,000	2,644	5,280
87.00	4,500	3,750	9,030
88.00	5,700	5,100	14,130

Device	Routing	Invert	Outlet Devices
#1	Primary	84.50'	**15.0' long x 20.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Discarded	83.50'	**0.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.01 cfs @ 12.26 hrs HW=84.82' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=7.42 cfs @ 12.26 hrs HW=84.82' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 7.42 cfs @ 1.53 fps)

Pond F2: FOREBAY



Summary for Pond F3: FOREBAY

Inflow Area = 0.162 ac,100.00% Impervious, Inflow Depth > 2.92" for 2 YR event
Inflow = 0.52 cfs @ 12.07 hrs, Volume= 0.040 af
Outflow = 0.50 cfs @ 12.09 hrs, Volume= 0.037 af, Atten= 3%, Lag= 1.2 min
Primary = 0.50 cfs @ 12.09 hrs, Volume= 0.037 af

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Peak Elev= 86.86' @ 12.09 hrs Surf.Area= 484 sf Storage= 159 cf

Plug-Flow detention time= 60.0 min calculated for 0.037 af (94% of inflow)
Center-of-Mass det. time= 26.1 min (791.5 - 765.4)

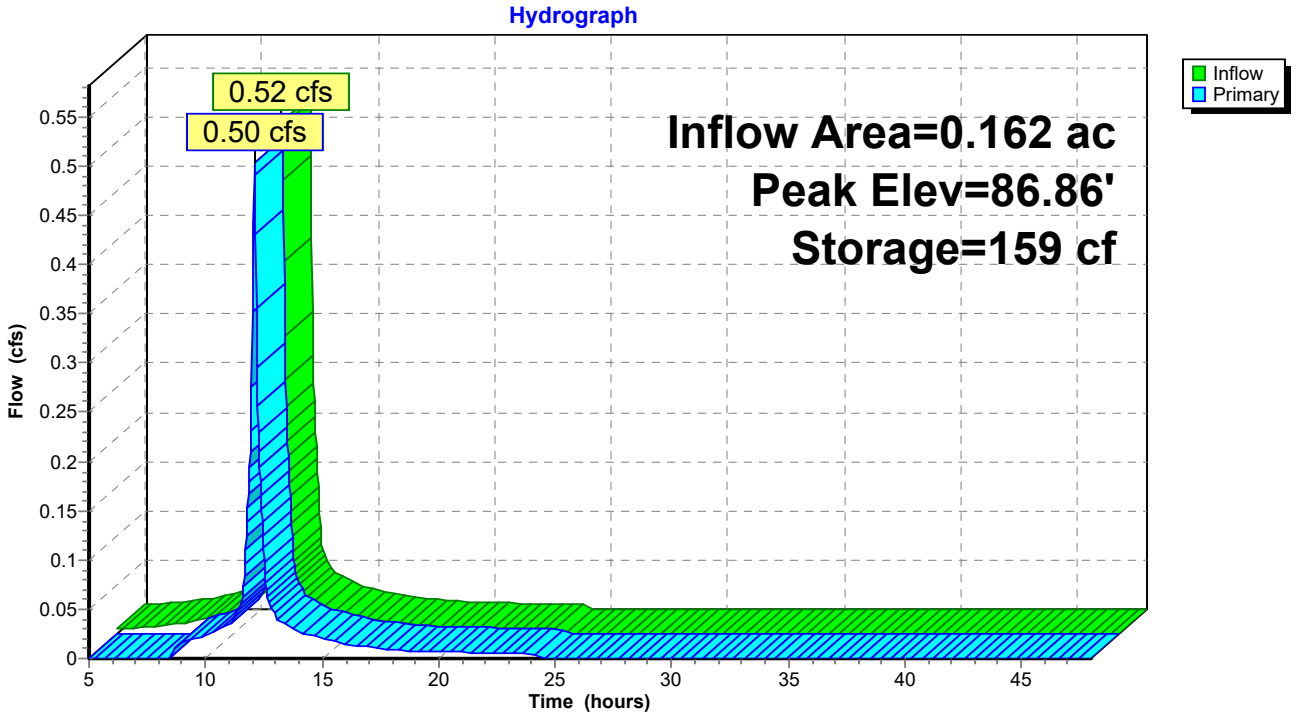
Volume	Invert	Avail.Storage	Storage Description
#1	86.50'	369 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
86.50	400	0	0
86.75	450	106	106
87.25	600	263	369

Device	Routing	Invert	Outlet Devices
#1	Primary	86.75'	**5.0' long x 15.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.50 cfs @ 12.09 hrs HW=86.86' (Free Discharge)
↑**1=Broad-Crested Rectangular Weir** (Weir Controls 0.50 cfs @ 0.89 fps)

Pond F3: FOREBAY



Summary for Pond P1: CELL 1

Inflow Area = 45.380 ac, 28.98% Impervious, Inflow Depth = 0.33" for 2 YR event
Inflow = 7.45 cfs @ 12.26 hrs, Volume= 1.229 af
Outflow = 5.93 cfs @ 12.47 hrs, Volume= 1.229 af, Atten= 20%, Lag= 12.6 min
Primary = 5.93 cfs @ 12.47 hrs, Volume= 1.229 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Starting Elev= 84.50' Surf.Area= 9,400 sf Storage= 15,153 cf
Peak Elev= 84.78' @ 12.47 hrs Surf.Area= 9,790 sf Storage= 17,823 cf (2,670 cf above start)

Plug-Flow detention time= 185.8 min calculated for 0.881 af (72% of inflow)
Center-of-Mass det. time= 3.5 min (929.5 - 925.9)

Volume	Invert	Avail.Storage	Storage Description
#1	79.00'	46,228 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

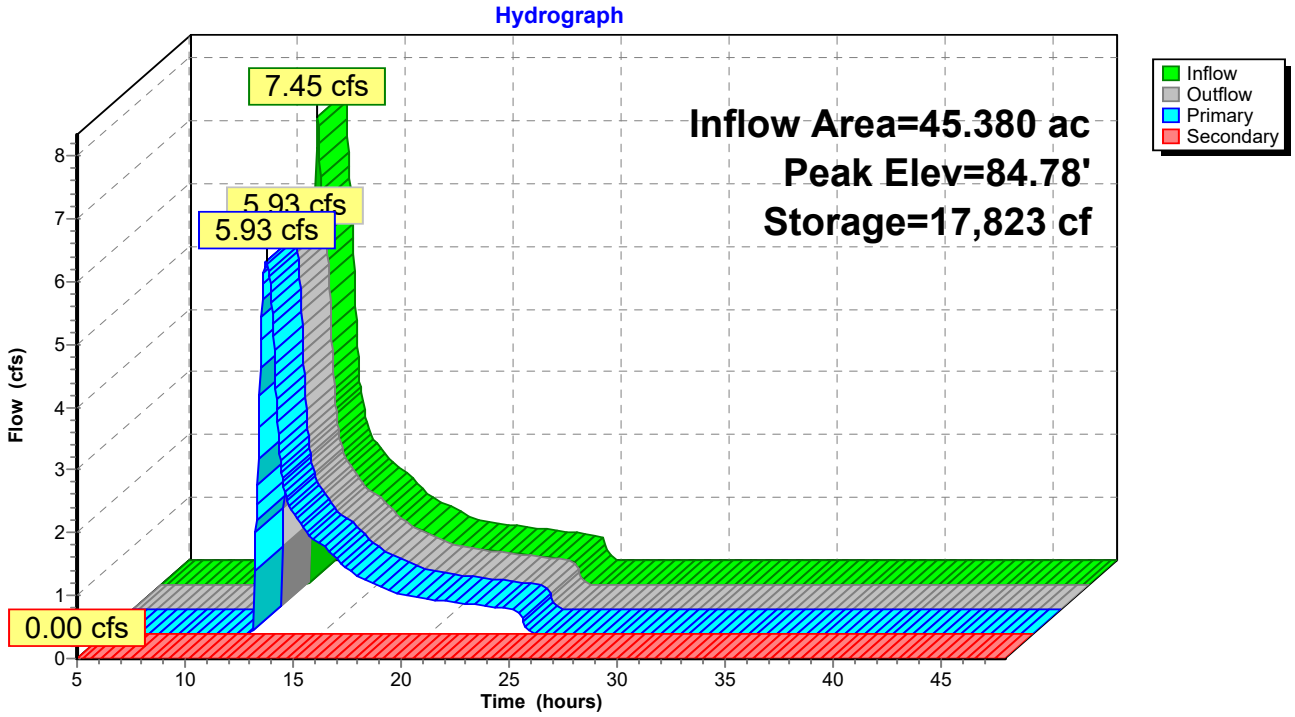
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
79.00	350	0	0
80.00	761	556	556
81.00	1,501	1,131	1,687
82.00	2,224	1,863	3,549
83.00	3,057	2,641	6,190
84.00	6,780	4,919	11,108
84.50	9,400	4,045	15,153
85.00	10,100	4,875	20,028
85.50	10,800	5,225	25,253
86.00	11,700	5,625	30,878
87.00	19,000	15,350	46,228

Device	Routing	Invert	Outlet Devices
#1	Primary	82.50'	**24.0" Round Culvert** L= 250.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 80.50' / 82.50' S= -0.0080 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#2	Secondary	85.50'	**30.0' long x 15.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=5.94 cfs @ 12.47 hrs HW=84.78' TW=84.50' (Fixed TW Elev= 84.50')
↑—**1=Culvert** (Outlet Controls 5.94 cfs @ 1.89 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=84.50' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond P1: CELL 1



Summary for Pond P2: CELL 2

Inflow Area = 48.332 ac, 28.93% Impervious, Inflow Depth = 0.33" for 2 YR event
Inflow = 6.21 cfs @ 12.46 hrs, Volume= 1.313 af
Outflow = 6.20 cfs @ 12.50 hrs, Volume= 1.313 af, Atten= 0%, Lag= 2.3 min
Primary = 6.20 cfs @ 12.50 hrs, Volume= 1.313 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Starting Elev= 84.50' Surf.Area= 5,620 sf Storage= 6,541 cf
Peak Elev= 84.69' @ 12.50 hrs Surf.Area= 6,148 sf Storage= 7,668 cf (1,127 cf above start)

Plug-Flow detention time= 84.6 min calculated for 1.163 af (89% of inflow)
Center-of-Mass det. time= 4.5 min (932.0 - 927.5)

Volume	Invert	Avail.Storage	Storage Description
#1	79.00'	17,196 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

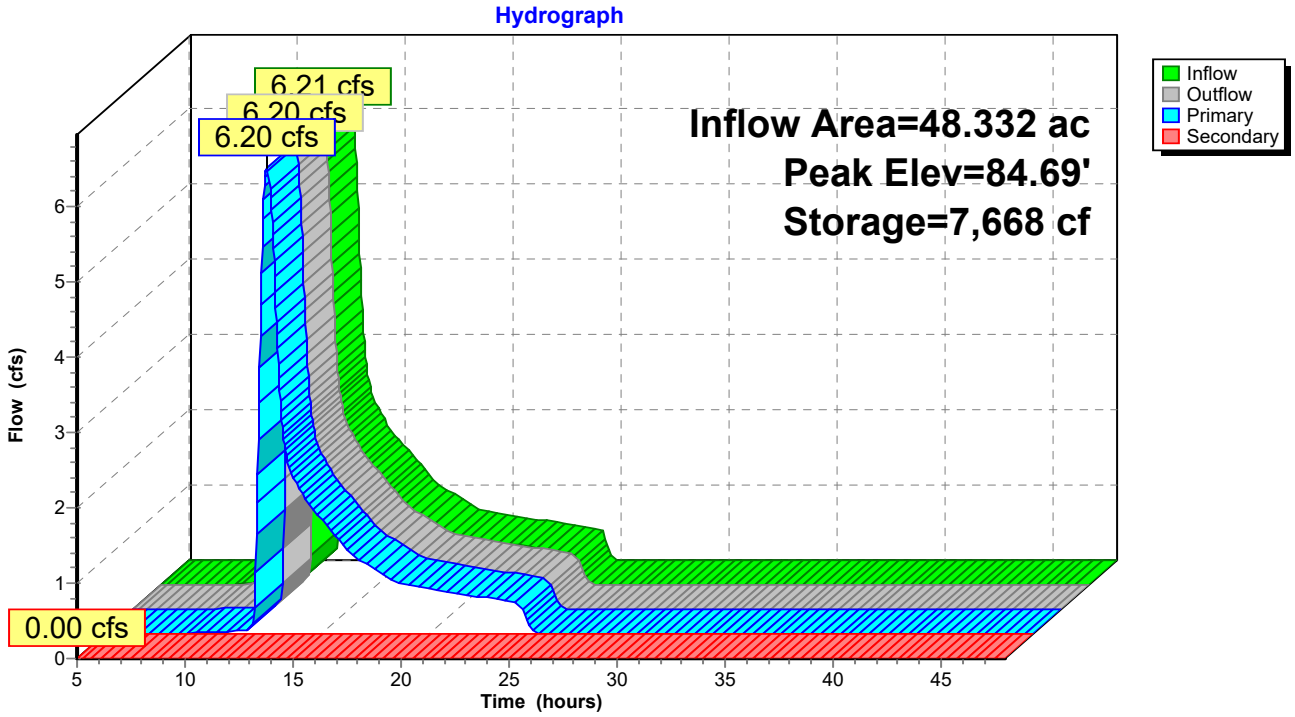
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
79.00	2	0	0
80.00	92	47	47
81.00	292	192	239
82.00	731	512	751
83.00	1,320	1,026	1,776
84.00	3,600	2,460	4,236
84.50	5,620	2,305	6,541
85.00	7,000	3,155	9,696
86.00	8,000	7,500	17,196

Device	Routing	Invert	Outlet Devices
#1	Primary	84.50'	**30.0' long x 8.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74
#2	Secondary	85.50'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=6.11 cfs @ 12.50 hrs HW=84.69' TW=84.50' (Fixed TW Elev= 84.50')
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 6.11 cfs @ 1.06 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=84.50' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond P2: CELL 2



Summary for Pond P3: CELL 3

Inflow Area = 48.332 ac, 28.93% Impervious, Inflow Depth = 0.33" for 2 YR event
Inflow = 6.20 cfs @ 12.50 hrs, Volume= 1.313 af
Outflow = 6.16 cfs @ 12.55 hrs, Volume= 1.313 af, Atten= 1%, Lag= 3.0 min
Primary = 6.16 cfs @ 12.55 hrs, Volume= 1.313 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Starting Elev= 84.50' Surf.Area= 6,663 sf Storage= 7,197 cf
Peak Elev= 84.70' @ 12.55 hrs Surf.Area= 6,960 sf Storage= 8,574 cf (1,377 cf above start)

Plug-Flow detention time= 93.7 min calculated for 1.148 af (87% of inflow)
Center-of-Mass det. time= 5.5 min (937.5 - 932.0)

Volume	Invert	Avail.Storage	Storage Description
#1	79.00'	18,411 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

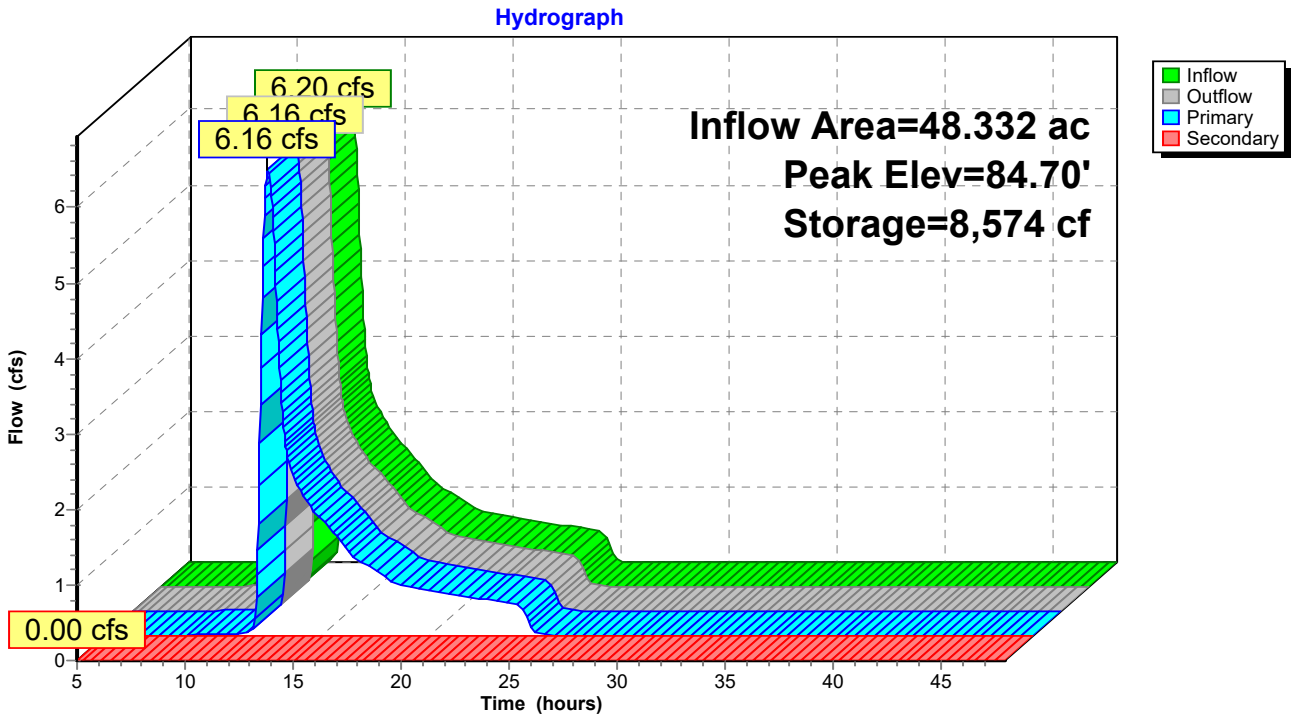
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
79.00	14	0	0
80.00	85	50	50
81.00	375	230	280
82.00	826	601	880
83.00	1,383	1,105	1,985
84.00	3,807	2,595	4,580
84.50	6,663	2,618	7,197
85.00	7,397	3,515	10,712
86.00	8,000	7,699	18,411

Device	Routing	Invert	Outlet Devices
#1	Primary	84.50'	**25.0' long x 17.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Secondary	86.25'	**100.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=6.09 cfs @ 12.55 hrs HW=84.70' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 6.09 cfs @ 1.20 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=84.50' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond P3: CELL 3

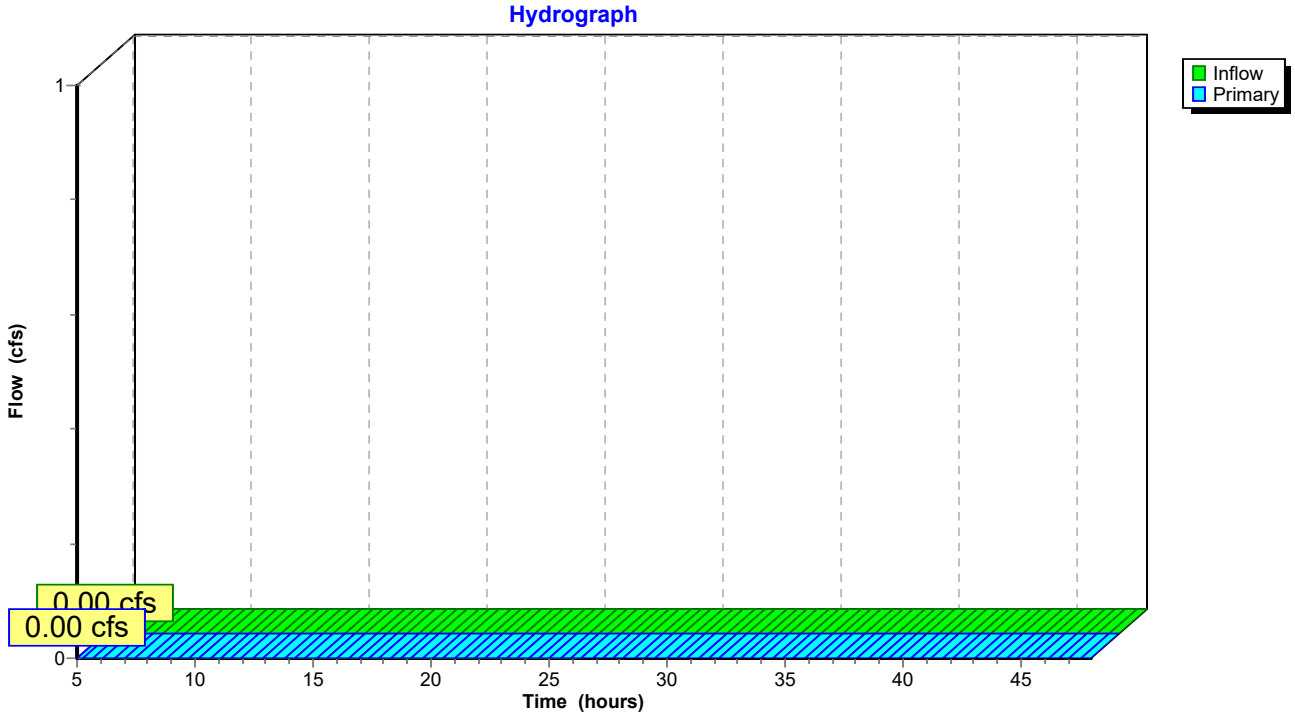


Summary for Pond SP1: ABERJONA RIVER

Inflow	=	0.00 cfs @	5.00 hrs, Volume=	0.000 af
Primary	=	0.00 cfs @	5.00 hrs, Volume=	0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs

Pond SP1: ABERJONA RIVER

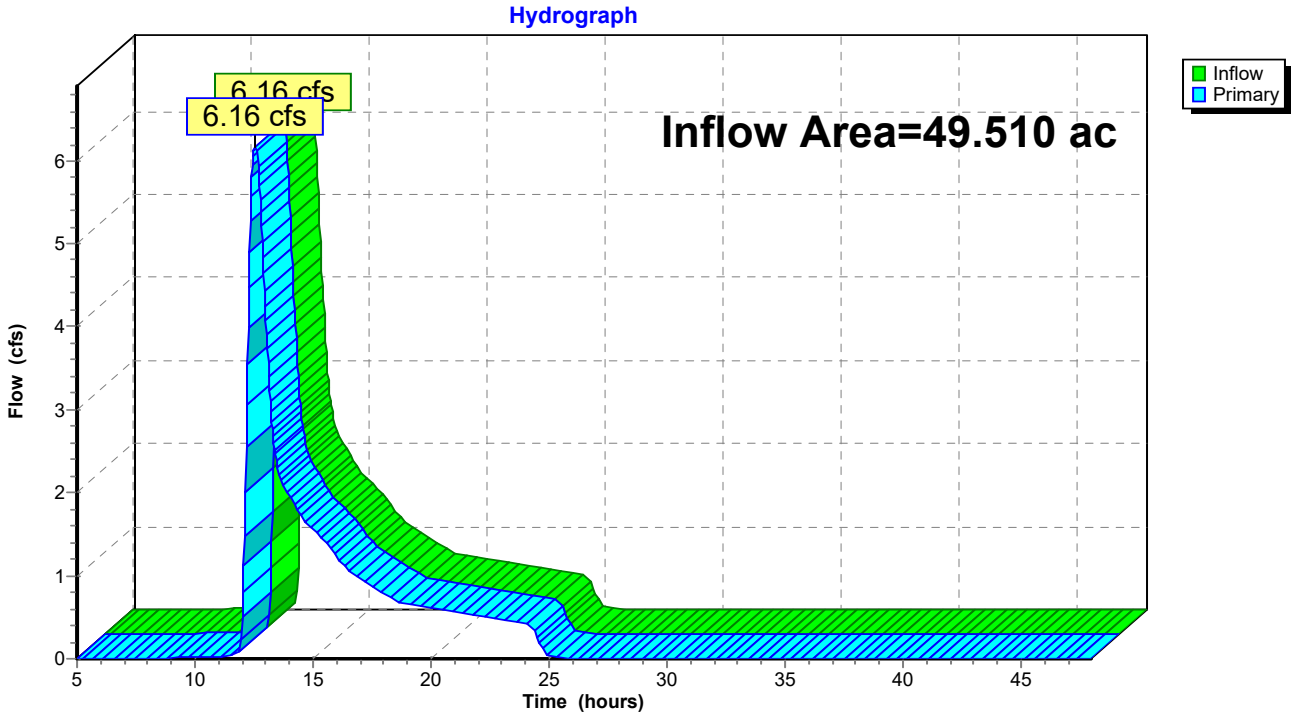


Summary for Pond SP2: ABERJONA RIVER

Inflow Area = 49.510 ac, 28.83% Impervious, Inflow Depth = 0.32" for 2 YR event
Inflow = 6.16 cfs @ 12.55 hrs, Volume= 1.320 af
Primary = 6.16 cfs @ 12.55 hrs, Volume= 1.320 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs

Pond SP2: ABERJONA RIVER



Time span=5.00-48.00 hrs, dt=0.03 hrs, 1434 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 DA 1: LOWELL STREET Runoff Area=4.810 ac 47.82% Impervious Runoff Depth=3.16"
Flow Length=1,080' Tc=15.1 min CN=84 Runoff=13.38 cfs 1.267 af

Subcatchment DA 2A: BACK OF LOTS E Runoff Area=3.100 ac 25.81% Impervious Runoff Depth=1.17"
Flow Length=614' Tc=18.1 min CN=59 Runoff=2.57 cfs 0.301 af

Subcatchment DA 2B: BACK OF LOTS MID Runoff Area=1.178 ac 24.62% Impervious Runoff Depth=0.50"
Flow Length=250' Tc=8.5 min CN=47 Runoff=0.28 cfs 0.049 af

Subcatchment DA 2C: BACK OF LOTS W Runoff Area=2.790 ac 24.01% Impervious Runoff Depth=0.81"
Flow Length=522' Tc=16.3 min CN=53 Runoff=1.38 cfs 0.187 af

Subcatchment DA 2D: PARKING Runoff Area=7,066 sf 100.00% Impervious Runoff Depth>4.52"
Tc=5.0 min CN=98 Runoff=0.80 cfs 0.061 af

Subcatchment DA 3: EAST OF ABERJONA Runoff Area=37.470 ac 26.82% Impervious Runoff Depth=0.75"
Flow Length=2,160' Tc=20.7 min CN=52 Runoff=15.36 cfs 2.343 af

Pond D110: DMH 110 Peak Elev=91.71' Inflow=25.52 cfs 3.610 af
Primary=15.80 cfs 3.342 af Secondary=9.72 cfs 0.268 af Outflow=25.52 cfs 3.610 af

Pond D120: DMH 120 Peak Elev=90.76' Inflow=15.80 cfs 3.342 af
Primary=15.63 cfs 3.334 af Secondary=0.17 cfs 0.009 af Outflow=15.80 cfs 3.342 af

Pond F1: FOREBAY Peak Elev=85.09' Storage=2,394 cf Inflow=18.19 cfs 3.635 af
Discarded=0.01 cfs 0.033 af Primary=18.18 cfs 3.589 af Outflow=18.19 cfs 3.622 af

Pond F2: FOREBAY Peak Elev=85.09' Storage=2,834 cf Inflow=18.18 cfs 3.589 af
Discarded=0.01 cfs 0.037 af Primary=18.15 cfs 3.537 af Outflow=18.17 cfs 3.574 af

Pond F3: FOREBAY Peak Elev=86.90' Storage=177 cf Inflow=0.80 cfs 0.061 af
Outflow=0.78 cfs 0.059 af

Pond P1: CELL 1 Peak Elev=85.65' Storage=26,937 cf Inflow=18.15 cfs 3.537 af
Primary=12.09 cfs 3.390 af Secondary=4.93 cfs 0.147 af Outflow=17.02 cfs 3.537 af

Pond P2: CELL 2 Peak Elev=84.82' Storage=8,456 cf Inflow=13.35 cfs 3.636 af
Primary=13.33 cfs 3.636 af Secondary=0.00 cfs 0.000 af Outflow=13.33 cfs 3.636 af

Pond P3: CELL 3 Peak Elev=84.84' Storage=9,532 cf Inflow=13.33 cfs 3.636 af
Primary=13.29 cfs 3.636 af Secondary=0.00 cfs 0.000 af Outflow=13.29 cfs 3.636 af

Pond SP1: ABERJONA RIVER Inflow=9.90 cfs 0.277 af
Primary=9.90 cfs 0.277 af

Pond SP2: ABERJONA RIVER Inflow=23.88 cfs 4.108 af
Primary=23.88 cfs 4.108 af

Total Runoff Area = 49.510 ac Runoff Volume = 4.209 af Average Runoff Depth = 1.02"
71.17% Pervious = 35.238 ac 28.83% Impervious = 14.272 ac

Summary for Subcatchment DA 1: LOWELL STREET

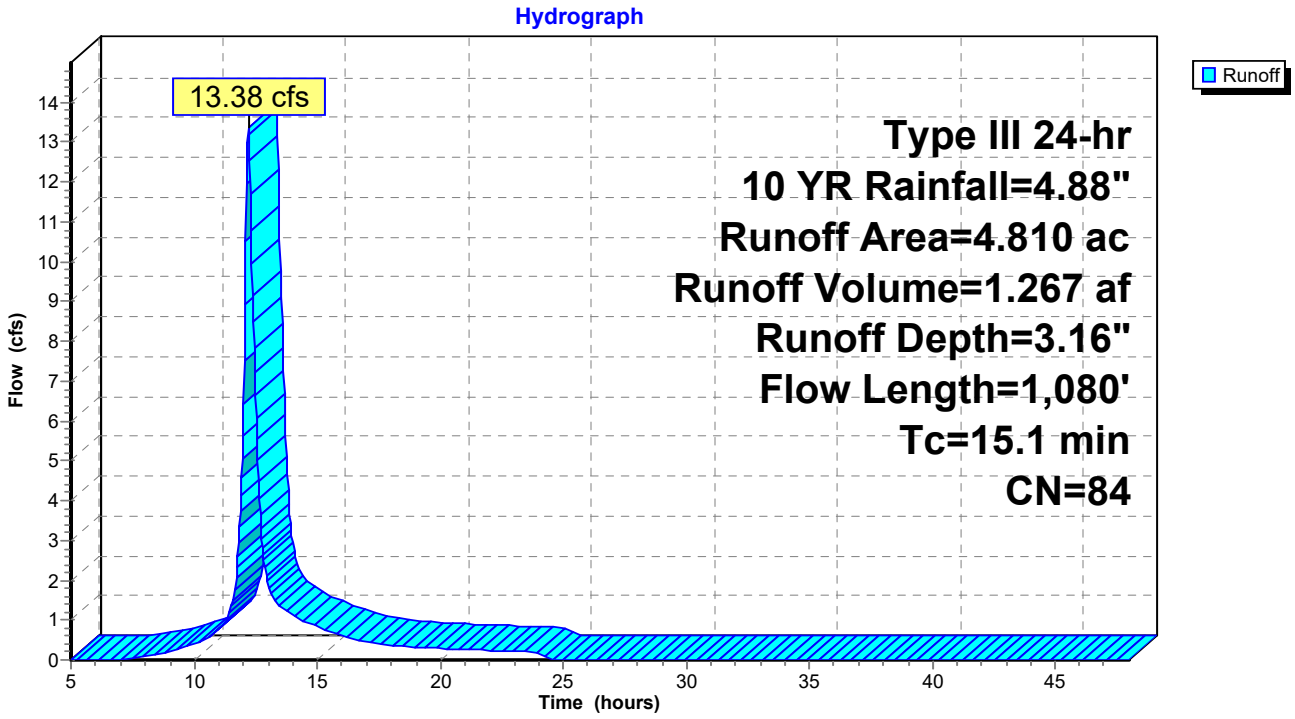
Runoff = 13.38 cfs @ 12.21 hrs, Volume= 1.267 af, Depth= 3.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 10 YR Rainfall=4.88"

Area (ac)	CN	Description
1.800	98	Paved parking, HSG C
0.500	98	Roofs, HSG C
1.250	70	Woods, Good, HSG C
1.260	74	Pasture/grassland/range, Good, HSG C
4.810	84	Weighted Average
2.510		52.18% Pervious Area
2.300		47.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
5.8	1,030	0.0210	2.94		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
15.1	1,080	Total			

Subcatchment DA 1: LOWELL STREET



Summary for Subcatchment DA 2A: BACK OF LOTS E

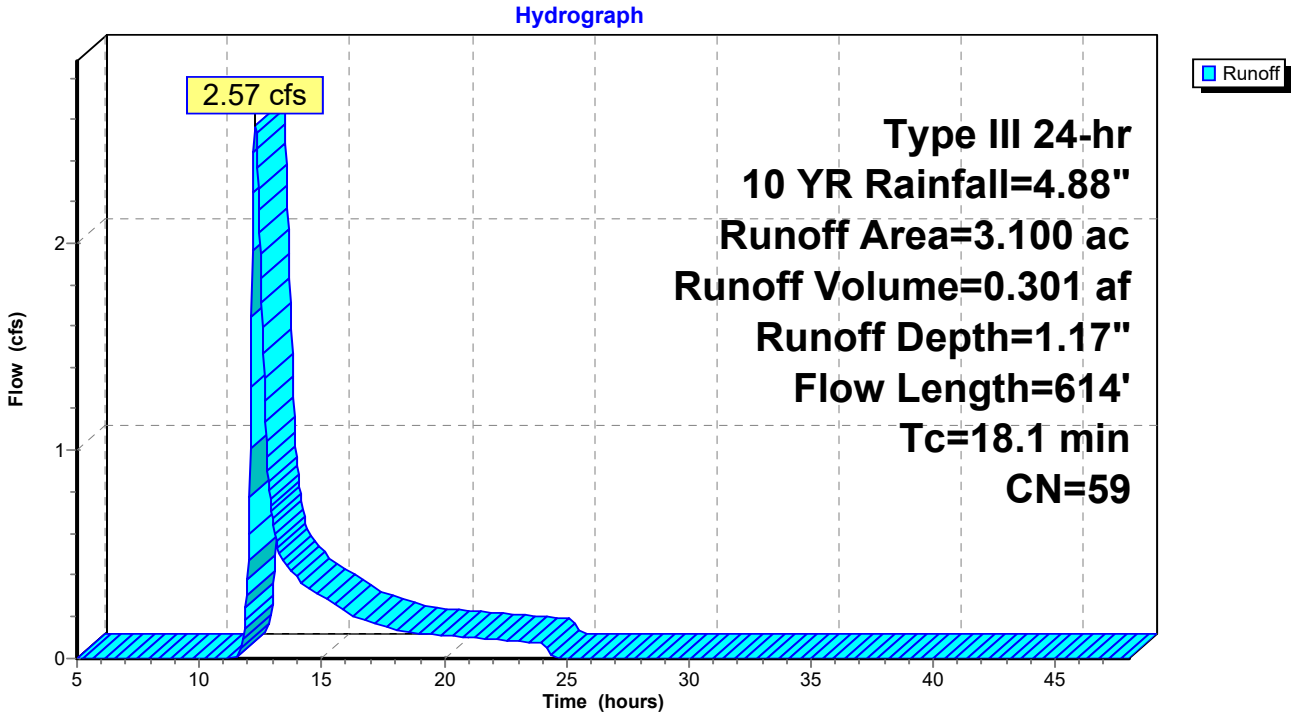
Runoff = 2.57 cfs @ 12.29 hrs, Volume= 0.301 af, Depth= 1.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 10 YR Rainfall=4.88"

Area (ac)	CN	Description
0.250	98	Paved parking, HSG C
0.020	72	Dirt roads, HSG A
0.110	87	Dirt roads, HSG C
0.260	98	Roofs, HSG C
0.290	98	Water Surface, HSG C
1.220	30	Woods, Good, HSG A
0.550	70	Woods, Good, HSG C
0.290	39	Pasture/grassland/range, Good, HSG A
0.110	74	Pasture/grassland/range, Good, HSG C
3.100	59	Weighted Average
2.300		74.19% Pervious Area
0.800		25.81% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
5.8	564	0.1040	1.61		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
18.1	614	Total			

Subcatchment DA 2A: BACK OF LOTS E



Summary for Subcatchment DA 2B: BACK OF LOTS MID

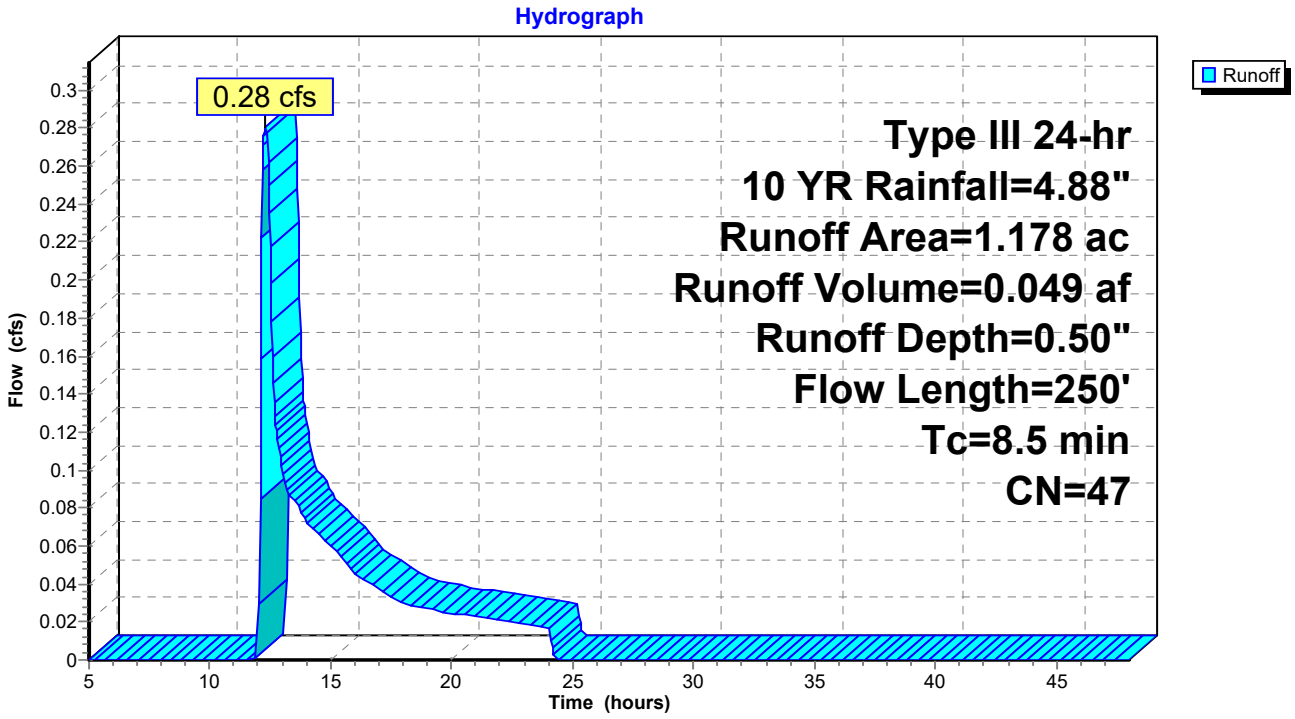
Runoff = 0.28 cfs @ 12.30 hrs, Volume= 0.049 af, Depth= 0.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 10 YR Rainfall=4.88"

Area (ac)	CN	Description
0.130	98	Paved parking, HSG C
0.160	98	Roofs, HSG C
0.868	30	Woods, Good, HSG A
0.020	39	Pasture/grassland/range, Good, HSG A
1.178	47	Weighted Average
0.888		75.38% Pervious Area
0.290		24.62% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.1000	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
2.0	200	0.1150	1.70		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.5	250	Total			

Subcatchment DA 2B: BACK OF LOTS MID



Summary for Subcatchment DA 2C: BACK OF LOTS W

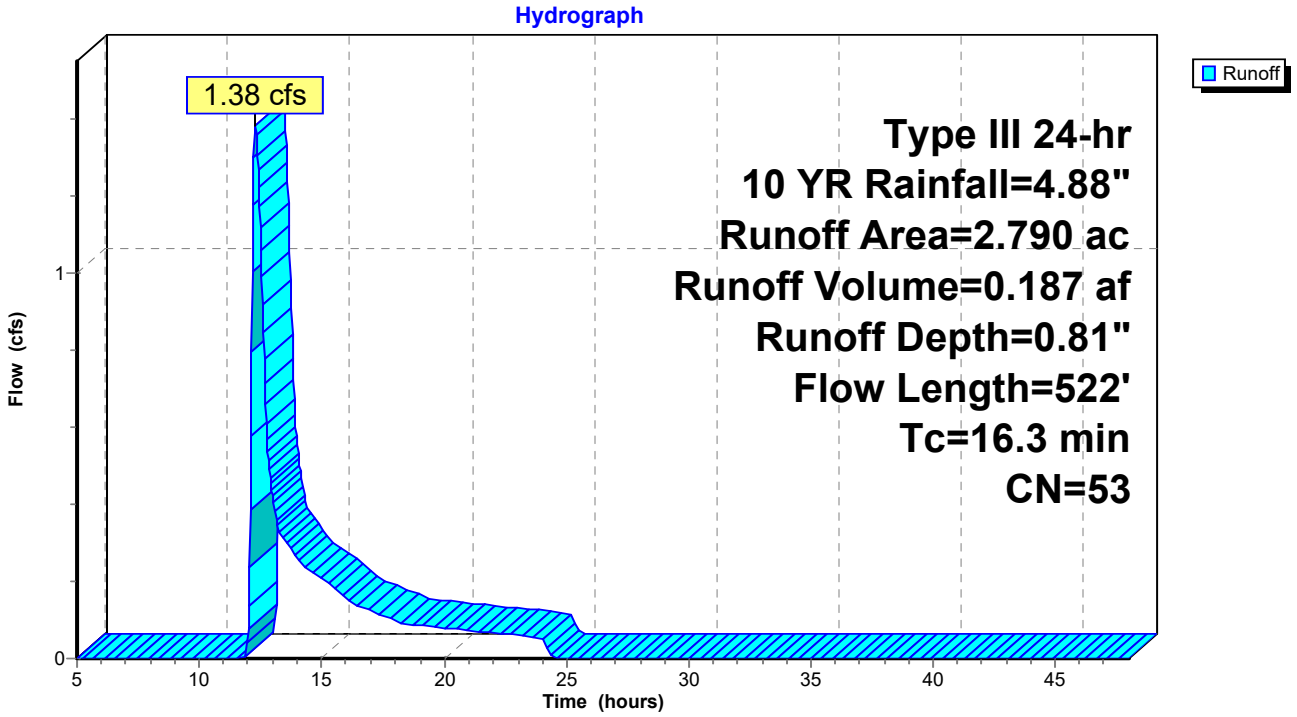
Runoff = 1.38 cfs @ 12.29 hrs, Volume= 0.187 af, Depth= 0.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 10 YR Rainfall=4.88"

Area (ac)	CN	Description
0.250	98	Paved parking, HSG C
0.090	72	Dirt roads, HSG A
0.040	87	Dirt roads, HSG C
0.120	98	Roofs, HSG C
0.300	98	Water Surface, HSG C
1.520	30	Woods, Good, HSG A
0.270	70	Woods, Good, HSG C
0.200	39	Pasture/grassland/range, Good, HSG A
0.000	74	Pasture/grassland/range, Good, HSG C
2.790	53	Weighted Average
2.120		75.99% Pervious Area
0.670		24.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
7.0	472	0.0510	1.13		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
16.3	522	Total			

Subcatchment DA 2C: BACK OF LOTS W



Summary for Subcatchment DA 2D: PARKING

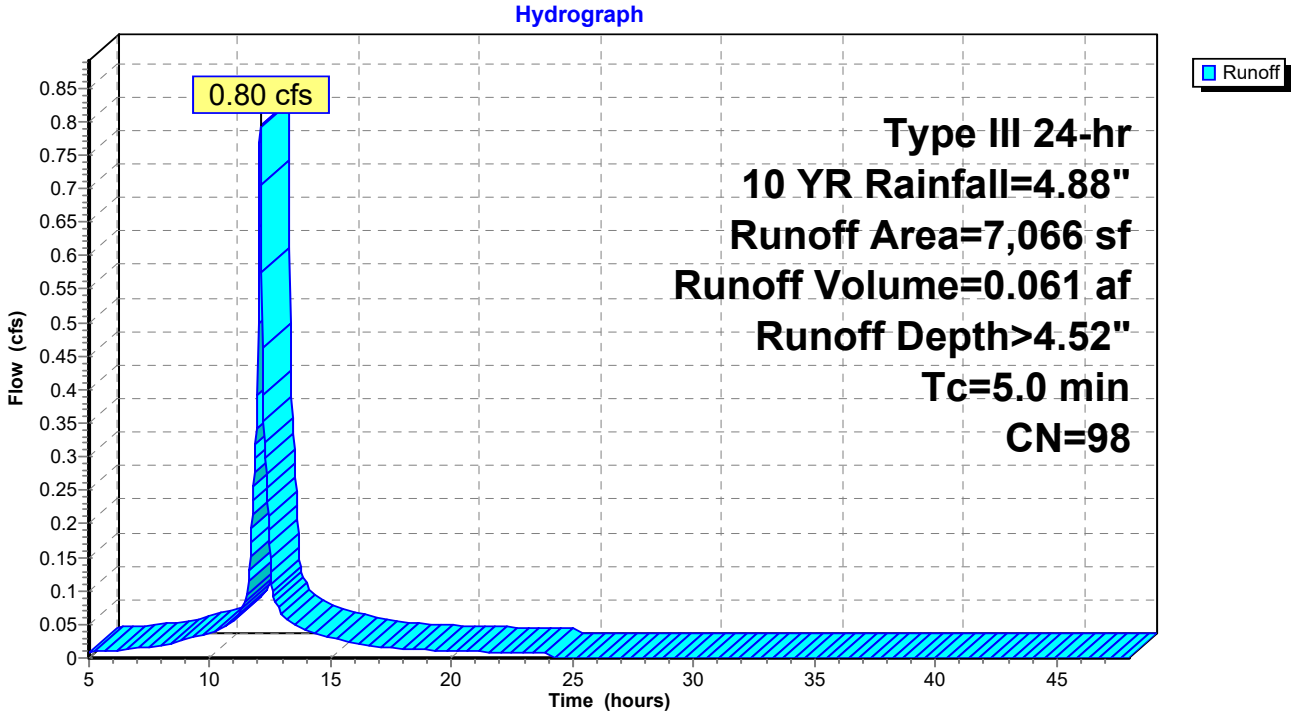
Runoff = 0.80 cfs @ 12.07 hrs, Volume= 0.061 af, Depth> 4.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 10 YR Rainfall=4.88"

Area (sf)	CN	Description
7,066	98	Paved parking, HSG C
7,066		100.00% Impervious Area

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

Subcatchment DA 2D: PARKING



Summary for Subcatchment DA 3: EAST OF ABERJONA

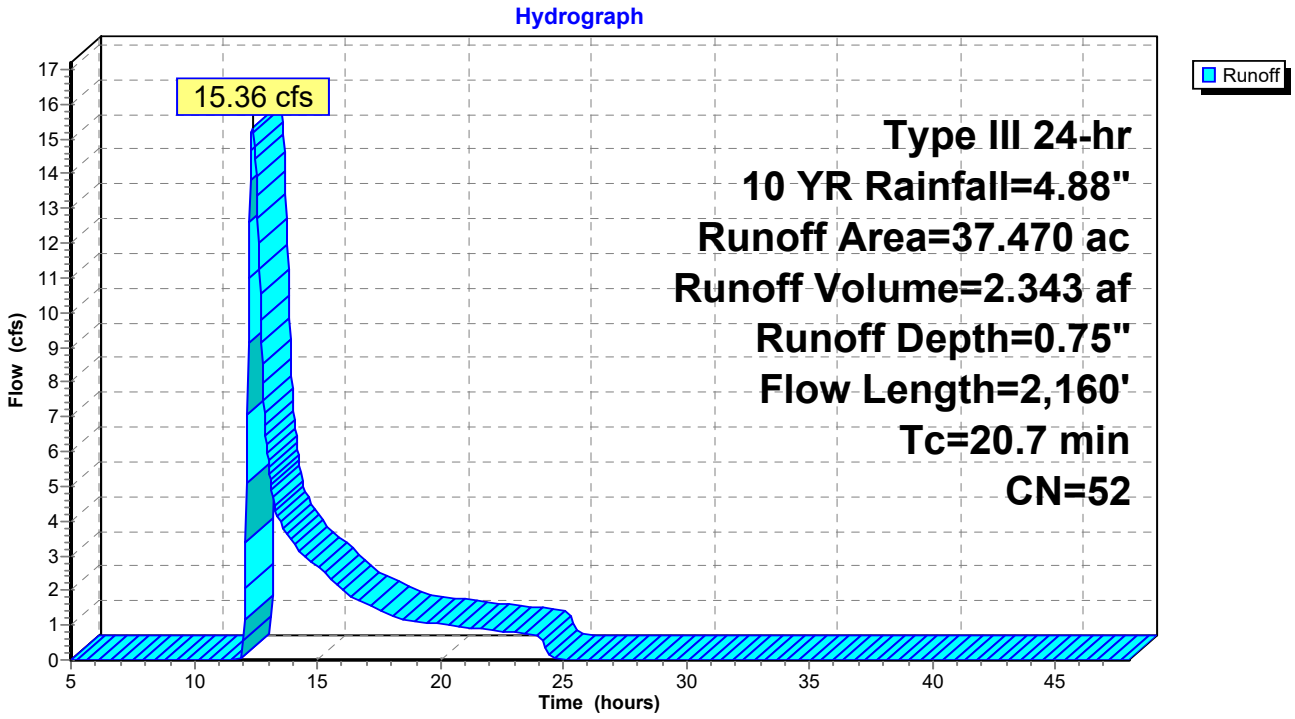
Runoff = 15.36 cfs @ 12.39 hrs, Volume= 2.343 af, Depth= 0.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 10 YR Rainfall=4.88"

Area (ac)	CN	Description
6.760	98	Paved parking, HSG C
3.290	98	Roofs, HSG C
9.960	30	Woods, Good, HSG A
17.460	39	Pasture/grassland/range, Good, HSG A
37.470	52	Weighted Average
27.420		73.18% Pervious Area
10.050		26.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
11.4	2,110	0.0230	3.08		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
20.7	2,160	Total			

Subcatchment DA 3: EAST OF ABERJONA



Summary for Pond D110: DMH 110

Inflow Area = 42.280 ac, 29.21% Impervious, Inflow Depth = 1.02" for 10 YR event
Inflow = 25.52 cfs @ 12.30 hrs, Volume= 3.610 af
Outflow = 25.52 cfs @ 12.30 hrs, Volume= 3.610 af, Atten= 0%, Lag= 0.0 min
Primary = 15.80 cfs @ 12.30 hrs, Volume= 3.342 af
Secondary = 9.72 cfs @ 12.30 hrs, Volume= 0.268 af

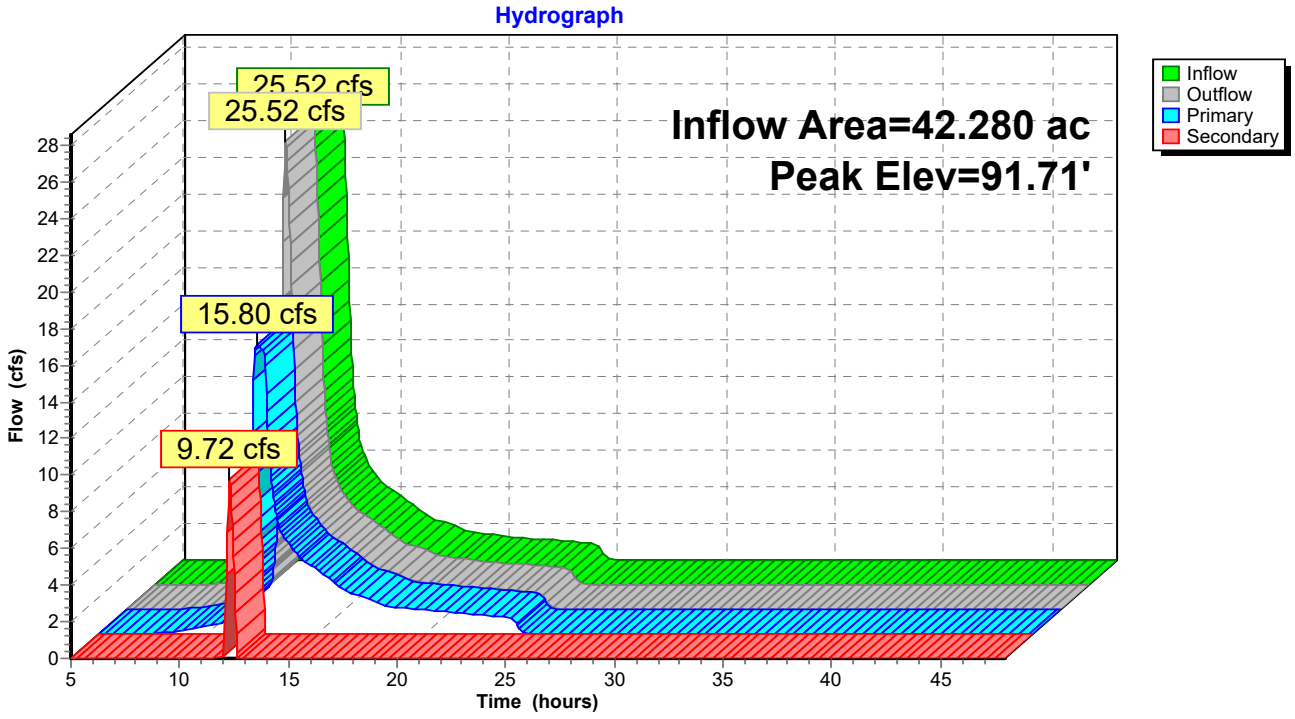
Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Peak Elev= 91.71' @ 12.30 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	85.30'	**18.0" Round Culvert** L= 143.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 85.30' / 84.60' S= 0.0049 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Secondary	91.10'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=15.80 cfs @ 12.30 hrs HW=91.71' (Free Discharge)
└**1=Culvert** (Barrel Controls 15.80 cfs @ 8.94 fps)

Secondary OutFlow Max=9.67 cfs @ 12.30 hrs HW=91.71' (Free Discharge)
└**2=Orifice/Grate** (Weir Controls 9.67 cfs @ 2.54 fps)

Pond D110: DMH 110



Summary for Pond D120: DMH 120

Inflow Area = 42.280 ac, 29.21% Impervious, Inflow Depth = 0.95" for 10 YR event
Inflow = 15.80 cfs @ 12.30 hrs, Volume= 3.342 af
Outflow = 15.80 cfs @ 12.30 hrs, Volume= 3.342 af, Atten= 0%, Lag= 0.0 min
Primary = 15.63 cfs @ 12.30 hrs, Volume= 3.334 af
Secondary = 0.17 cfs @ 12.30 hrs, Volume= 0.009 af

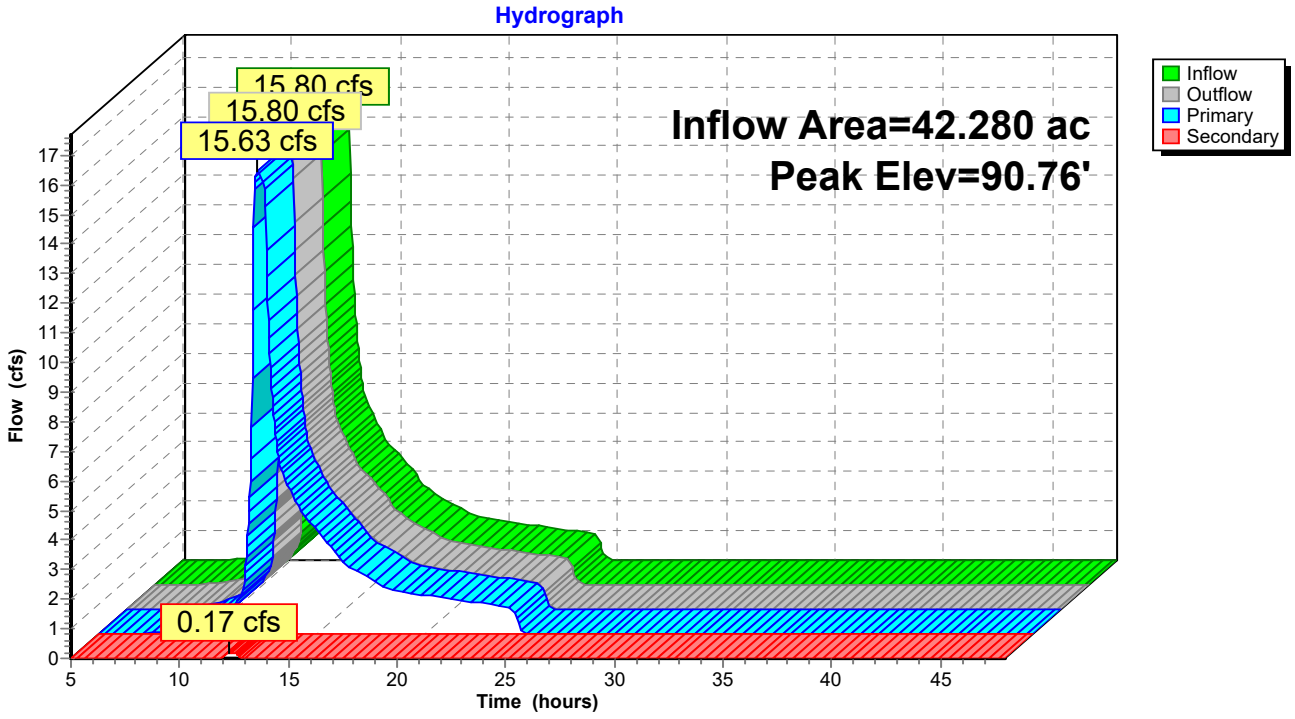
Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Peak Elev= 90.76' @ 12.30 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	84.60'	**18.0" Round Culvert** L= 126.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 84.60' / 84.00' S= 0.0048 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Secondary	88.01'	**2.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=15.63 cfs @ 12.30 hrs HW=90.76' (Free Discharge)
└**1=Culvert** (Inlet Controls 15.63 cfs @ 8.84 fps)

Secondary OutFlow Max=0.17 cfs @ 12.30 hrs HW=90.76' (Free Discharge)
└**2=Orifice/Grate** (Orifice Controls 0.17 cfs @ 7.99 fps)

Pond D120: DMH 120



Summary for Pond F1: FOREBAY

Inflow Area = 45.380 ac, 28.98% Impervious, Inflow Depth = 0.96" for 10 YR event
Inflow = 18.19 cfs @ 12.29 hrs, Volume= 3.635 af
Outflow = 18.19 cfs @ 12.30 hrs, Volume= 3.622 af, Atten= 0%, Lag= 0.7 min
Discarded = 0.01 cfs @ 12.30 hrs, Volume= 0.033 af
Primary = 18.18 cfs @ 12.30 hrs, Volume= 3.589 af

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Peak Elev= 85.09' @ 12.30 hrs Surf.Area= 1,917 sf Storage= 2,394 cf

Plug-Flow detention time= 12.9 min calculated for 3.622 af (100% of inflow)
Center-of-Mass det. time= 10.9 min (908.3 - 897.4)

Volume	Invert	Avail.Storage	Storage Description
#1	83.50'	12,853 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

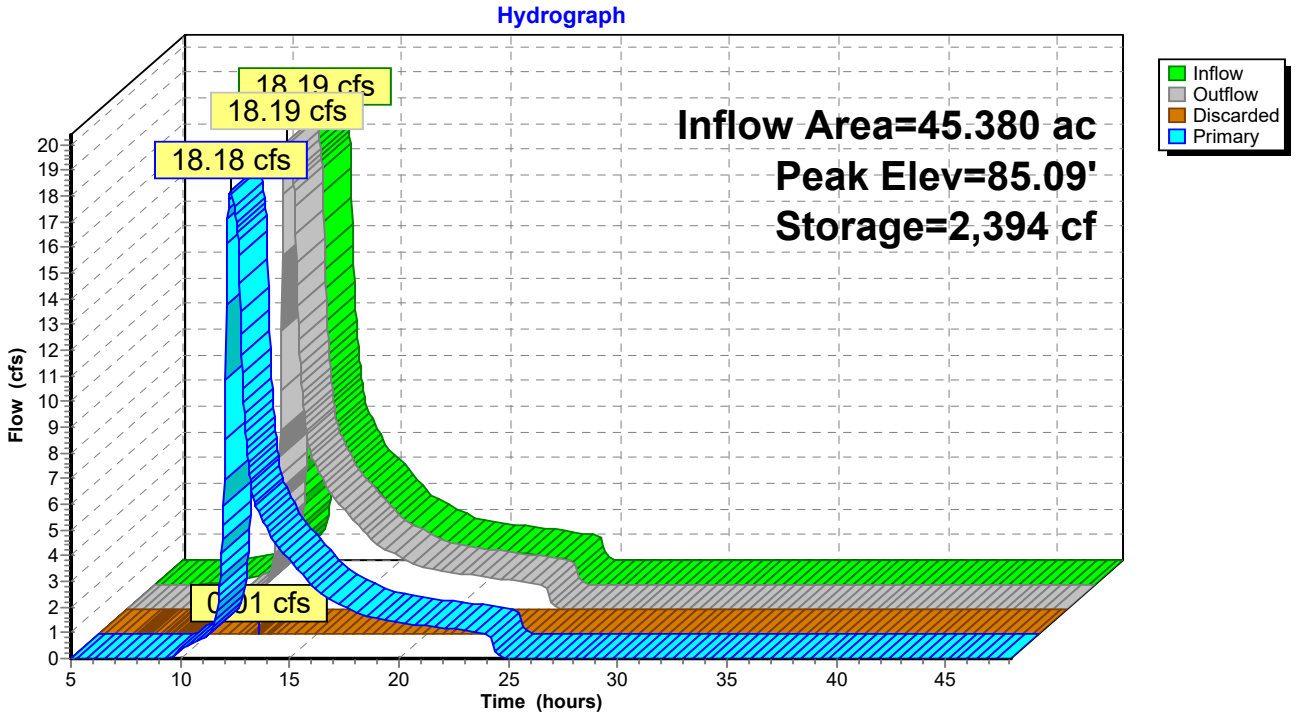
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
83.50	1,040	0	0
84.00	1,321	590	590
84.50	1,701	756	1,346
85.00	1,843	886	2,232
86.00	2,700	2,272	4,503
87.00	4,000	3,350	7,853
88.00	6,000	5,000	12,853

Device	Routing	Invert	Outlet Devices
#1	Primary	84.50'	**15.0' long x 20.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Discarded	83.50'	**0.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.01 cfs @ 12.30 hrs HW=85.09' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=18.17 cfs @ 12.30 hrs HW=85.09' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 18.17 cfs @ 2.07 fps)

Pond F1: FOREBAY



Summary for Pond F2: FOREBAY

Inflow Area = 45.380 ac, 28.98% Impervious, Inflow Depth = 0.95" for 10 YR event
Inflow = 18.18 cfs @ 12.30 hrs, Volume= 3.589 af
Outflow = 18.17 cfs @ 12.32 hrs, Volume= 3.574 af, Atten= 0%, Lag= 1.0 min
Discarded = 0.01 cfs @ 12.32 hrs, Volume= 0.037 af
Primary = 18.15 cfs @ 12.32 hrs, Volume= 3.537 af

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Peak Elev= 85.09' @ 12.32 hrs Surf.Area= 2,349 sf Storage= 2,834 cf

Plug-Flow detention time= 13.3 min calculated for 3.571 af (100% of inflow)
Center-of-Mass det. time= 11.9 min (913.6 - 901.7)

Volume	Invert	Avail.Storage	Storage Description
#1	83.50'	14,130 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

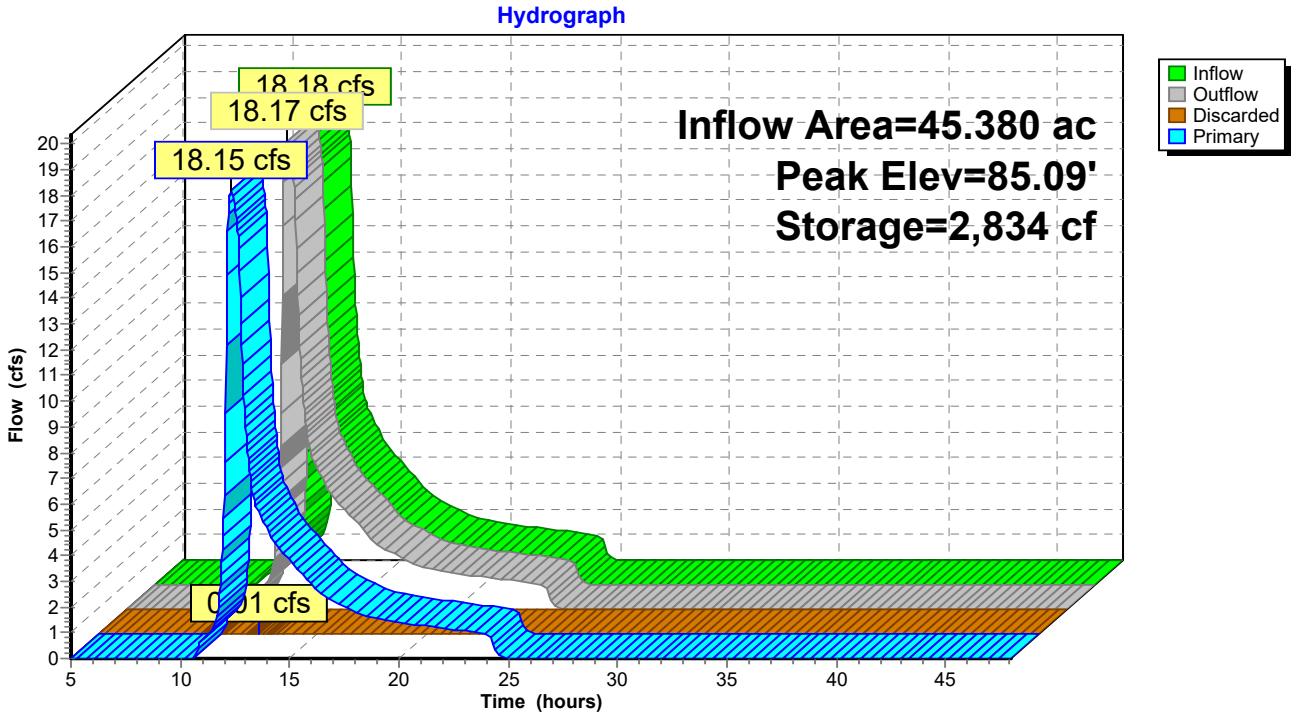
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
83.50	1,266	0	0
84.00	1,481	687	687
84.50	2,013	874	1,560
85.00	2,288	1,075	2,636
86.00	3,000	2,644	5,280
87.00	4,500	3,750	9,030
88.00	5,700	5,100	14,130

Device	Routing	Invert	Outlet Devices
#1	Primary	84.50'	**15.0' long x 20.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Discarded	83.50'	**0.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.01 cfs @ 12.32 hrs HW=85.09' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=18.15 cfs @ 12.32 hrs HW=85.09' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 18.15 cfs @ 2.07 fps)

Pond F2: FOREBAY



Summary for Pond F3: FOREBAY

Inflow Area = 0.162 ac,100.00% Impervious, Inflow Depth > 4.52" for 10 YR event
Inflow = 0.80 cfs @ 12.07 hrs, Volume= 0.061 af
Outflow = 0.78 cfs @ 12.09 hrs, Volume= 0.059 af, Atten= 2%, Lag= 1.1 min
Primary = 0.78 cfs @ 12.09 hrs, Volume= 0.059 af

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Peak Elev= 86.90' @ 12.09 hrs Surf.Area= 495 sf Storage= 177 cf

Plug-Flow detention time= 42.8 min calculated for 0.059 af (96% of inflow)
Center-of-Mass det. time= 19.0 min (780.9 - 761.9)

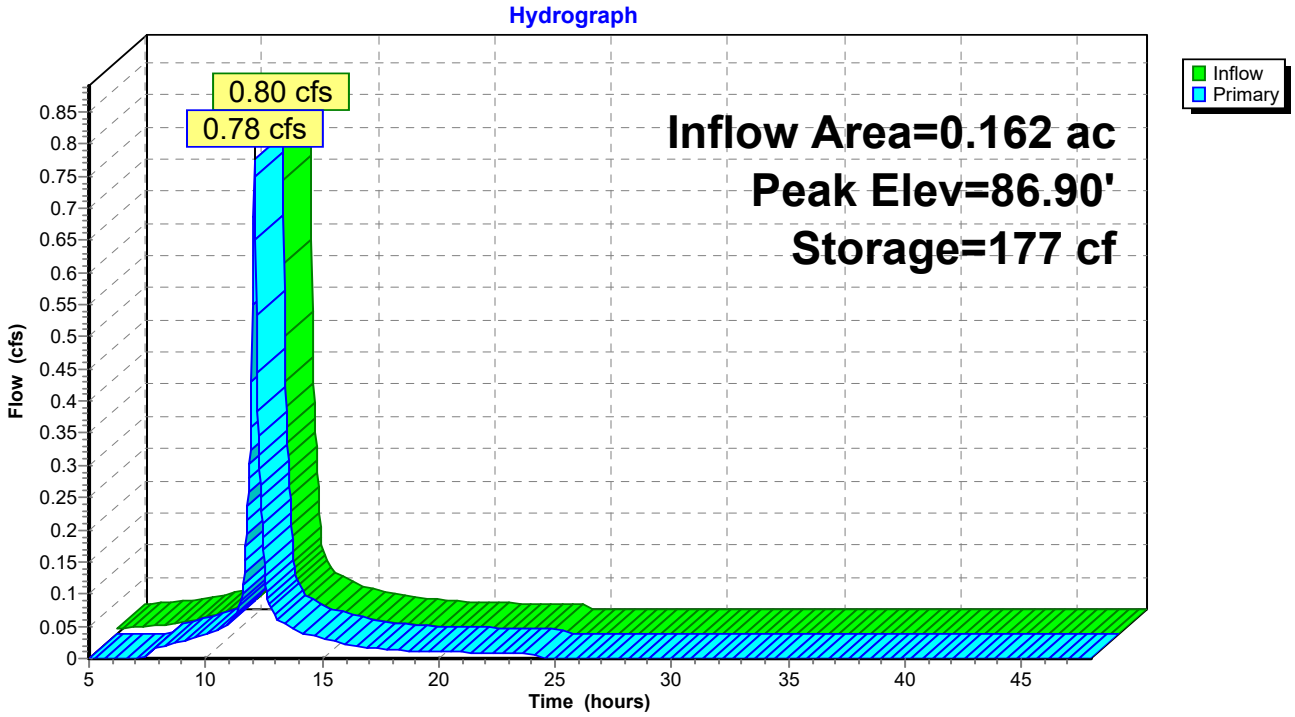
Volume	Invert	Avail.Storage	Storage Description
#1	86.50'	369 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
86.50	400	0	0
86.75	450	106	106
87.25	600	263	369

Device	Routing	Invert	Outlet Devices
#1	Primary	86.75'	**5.0' long x 15.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.76 cfs @ 12.09 hrs HW=86.90' (Free Discharge)
↑**1=Broad-Crested Rectangular Weir** (Weir Controls 0.76 cfs @ 1.03 fps)

Pond F3: FOREBAY



Summary for Pond P1: CELL 1

Inflow Area = 45.380 ac, 28.98% Impervious, Inflow Depth = 0.94" for 10 YR event
Inflow = 18.15 cfs @ 12.32 hrs, Volume= 3.537 af
Outflow = 17.02 cfs @ 12.57 hrs, Volume= 3.537 af, Atten= 6%, Lag= 15.1 min
Primary = 12.09 cfs @ 12.57 hrs, Volume= 3.390 af
Secondary = 4.93 cfs @ 12.57 hrs, Volume= 0.147 af

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Starting Elev= 84.50' Surf.Area= 9,400 sf Storage= 15,153 cf
Peak Elev= 85.65' @ 12.57 hrs Surf.Area= 11,077 sf Storage= 26,937 cf (11,784 cf above start)

Plug-Flow detention time= 76.3 min calculated for 3.187 af (90% of inflow)
Center-of-Mass det. time= 7.4 min (913.2 - 905.8)

Volume	Invert	Avail.Storage	Storage Description
#1	79.00'	46,228 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

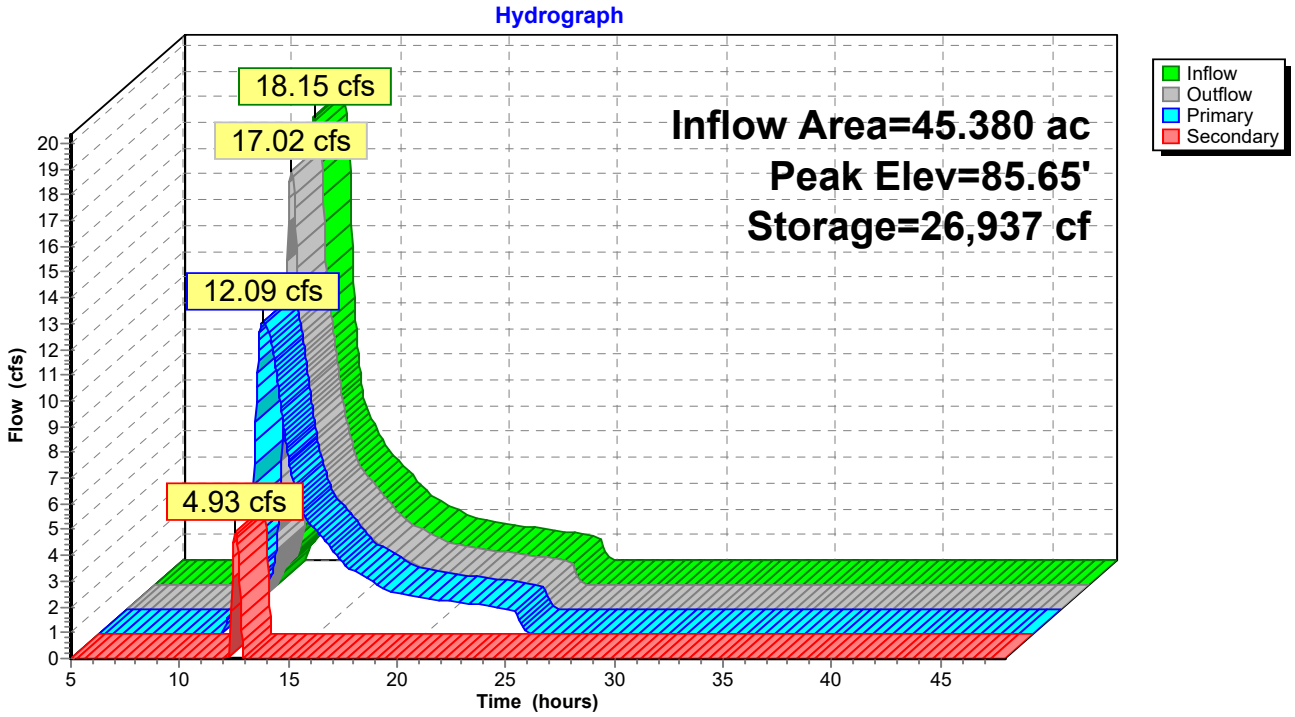
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
79.00	350	0	0
80.00	761	556	556
81.00	1,501	1,131	1,687
82.00	2,224	1,863	3,549
83.00	3,057	2,641	6,190
84.00	6,780	4,919	11,108
84.50	9,400	4,045	15,153
85.00	10,100	4,875	20,028
85.50	10,800	5,225	25,253
86.00	11,700	5,625	30,878
87.00	19,000	15,350	46,228

Device	Routing	Invert	Outlet Devices
#1	Primary	82.50'	**24.0" Round Culvert** L= 250.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 80.50' / 82.50' S= -0.0080 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#2	Secondary	85.50'	**30.0' long x 15.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=12.09 cfs @ 12.57 hrs HW=85.65' TW=84.50' (Fixed TW Elev= 84.50')
↑—**1=Culvert** (Outlet Controls 12.09 cfs @ 3.85 fps)

Secondary OutFlow Max=4.85 cfs @ 12.57 hrs HW=85.65' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 4.85 cfs @ 1.05 fps)

Pond P1: CELL 1



Summary for Pond P2: CELL 2

Inflow Area = 48.332 ac, 28.93% Impervious, Inflow Depth = 0.90" for 10 YR event
Inflow = 13.35 cfs @ 12.48 hrs, Volume= 3.636 af
Outflow = 13.33 cfs @ 12.51 hrs, Volume= 3.636 af, Atten= 0%, Lag= 1.8 min
Primary = 13.33 cfs @ 12.51 hrs, Volume= 3.636 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Starting Elev= 84.50' Surf.Area= 5,620 sf Storage= 6,541 cf
Peak Elev= 84.82' @ 12.51 hrs Surf.Area= 6,493 sf Storage= 8,456 cf (1,915 cf above start)

Plug-Flow detention time= 34.6 min calculated for 3.486 af (96% of inflow)
Center-of-Mass det. time= 3.4 min (920.8 - 917.4)

Volume	Invert	Avail.Storage	Storage Description
#1	79.00'	17,196 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

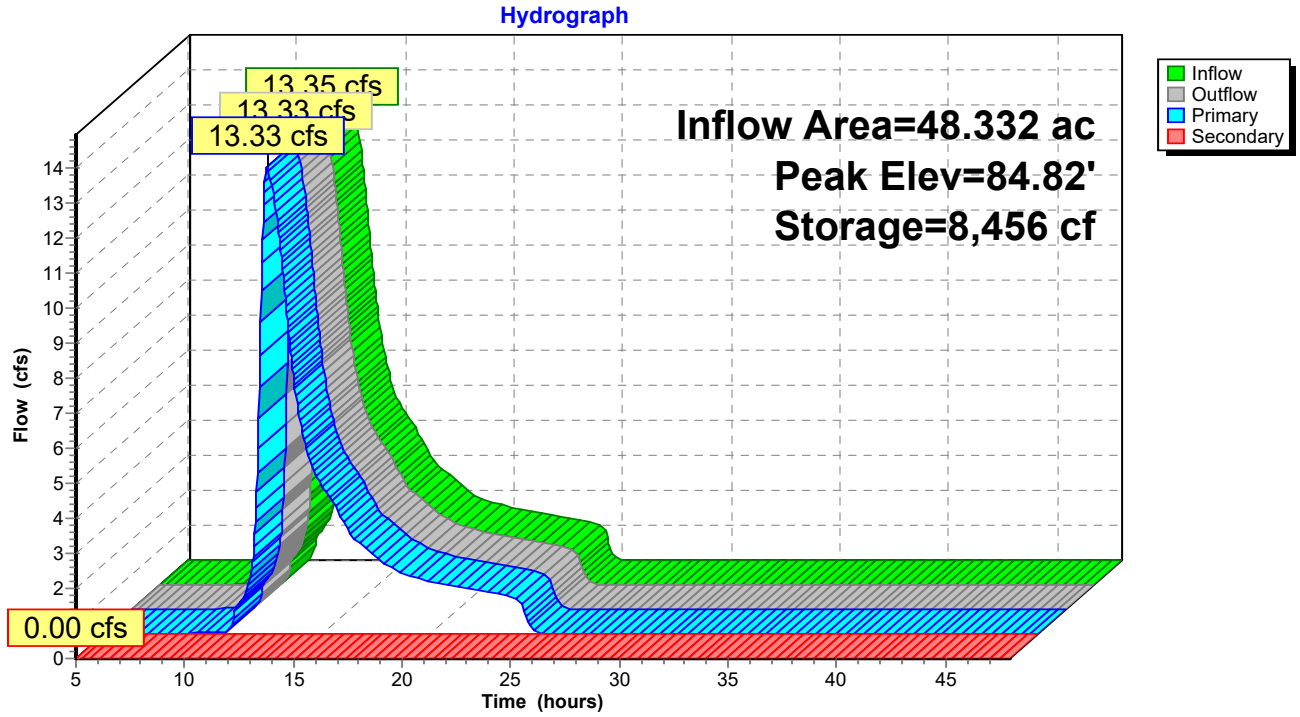
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
79.00	2	0	0
80.00	92	47	47
81.00	292	192	239
82.00	731	512	751
83.00	1,320	1,026	1,776
84.00	3,600	2,460	4,236
84.50	5,620	2,305	6,541
85.00	7,000	3,155	9,696
86.00	8,000	7,500	17,196

Device	Routing	Invert	Outlet Devices
#1	Primary	84.50'	**30.0' long x 8.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74
#2	Secondary	85.50'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=13.30 cfs @ 12.51 hrs HW=84.82' TW=84.50' (Fixed TW Elev= 84.50')
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 13.30 cfs @ 1.40 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=84.50' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond P2: CELL 2



Summary for Pond P3: CELL 3

Inflow Area = 48.332 ac, 28.93% Impervious, Inflow Depth = 0.90" for 10 YR event
Inflow = 13.33 cfs @ 12.51 hrs, Volume= 3.636 af
Outflow = 13.29 cfs @ 12.55 hrs, Volume= 3.636 af, Atten= 0%, Lag= 2.4 min
Primary = 13.29 cfs @ 12.55 hrs, Volume= 3.636 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Starting Elev= 84.50' Surf.Area= 6,663 sf Storage= 7,197 cf
Peak Elev= 84.84' @ 12.55 hrs Surf.Area= 7,159 sf Storage= 9,532 cf (2,335 cf above start)

Plug-Flow detention time= 38.2 min calculated for 3.468 af (95% of inflow)
Center-of-Mass det. time= 4.2 min (925.0 - 920.8)

Volume	Invert	Avail.Storage	Storage Description
#1	79.00'	18,411 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

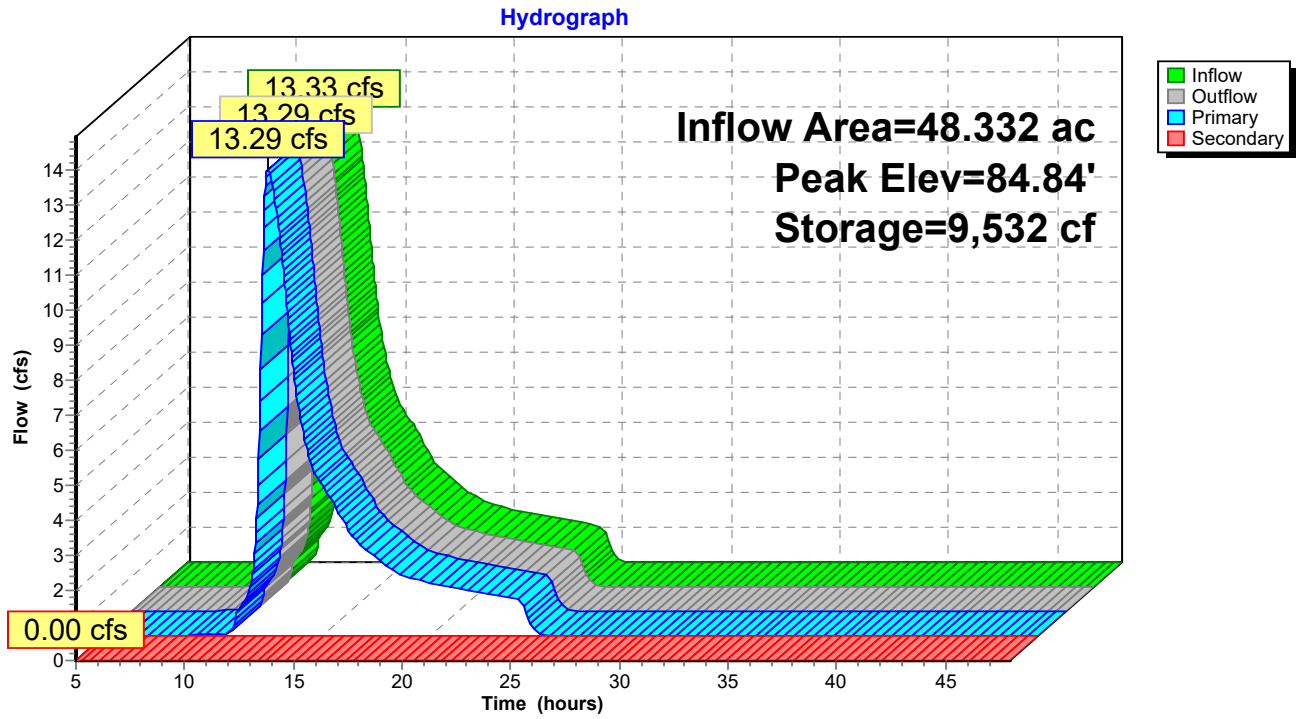
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
79.00	14	0	0
80.00	85	50	50
81.00	375	230	280
82.00	826	601	880
83.00	1,383	1,105	1,985
84.00	3,807	2,595	4,580
84.50	6,663	2,618	7,197
85.00	7,397	3,515	10,712
86.00	8,000	7,699	18,411

Device	Routing	Invert	Outlet Devices
#1	Primary	84.50'	**25.0' long x 17.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Secondary	86.25'	**100.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=13.22 cfs @ 12.55 hrs HW=84.84' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 13.22 cfs @ 1.57 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=84.50' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond P3: CELL 3

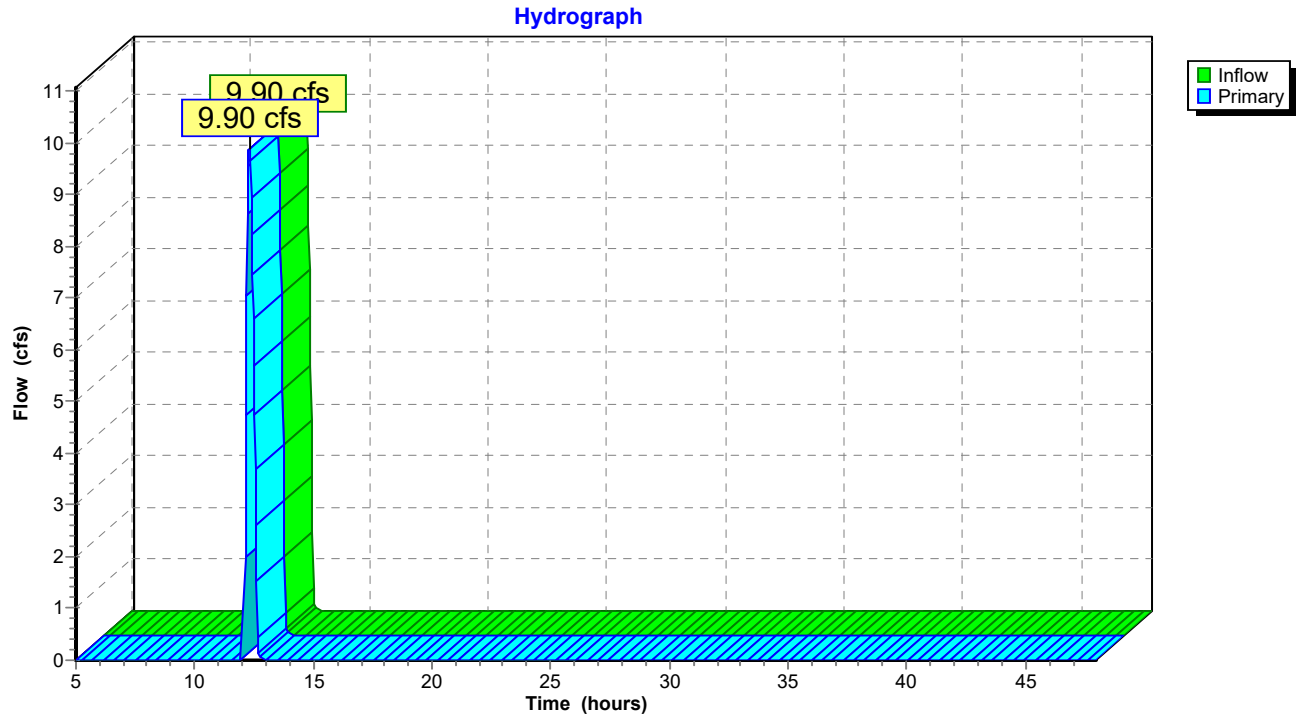


Summary for Pond SP1: ABERJONA RIVER

Inflow	=	9.90 cfs @	12.30 hrs, Volume=	0.277 af
Primary	=	9.90 cfs @	12.30 hrs, Volume=	0.277 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs

Pond SP1: ABERJONA RIVER

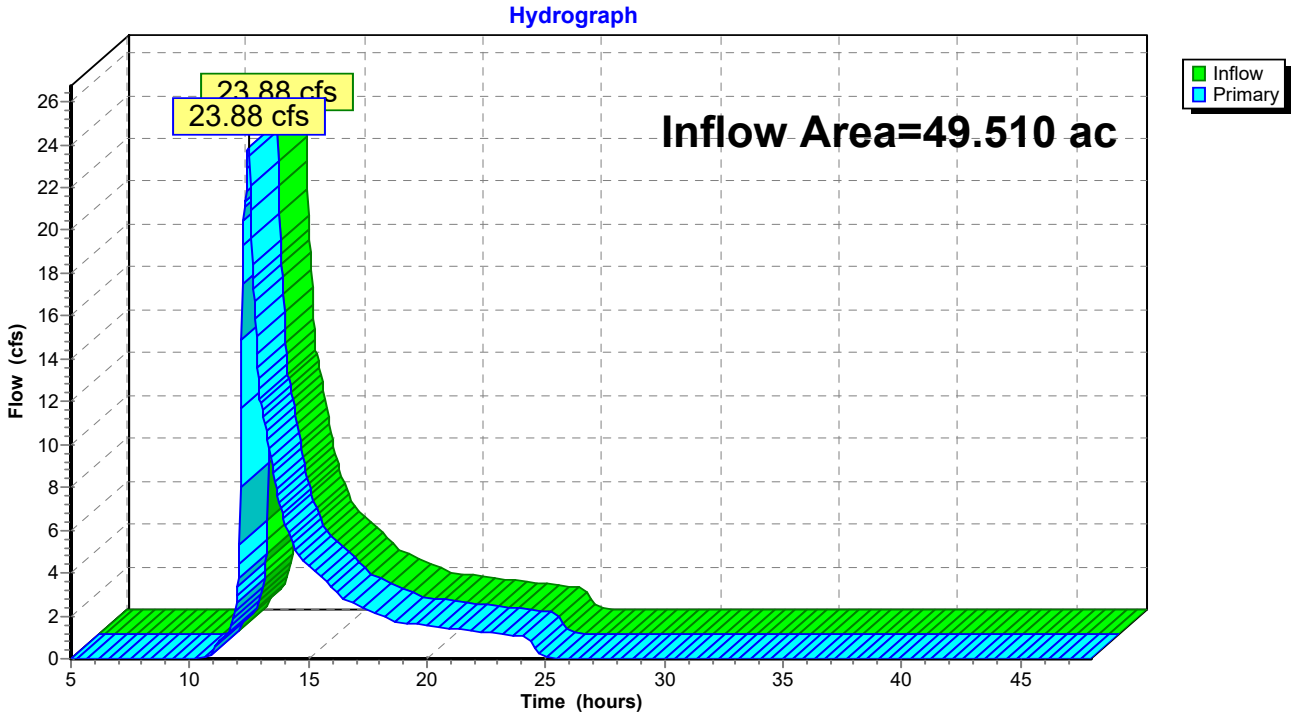


Summary for Pond SP2: ABERJONA RIVER

Inflow Area = 49.510 ac, 28.83% Impervious, Inflow Depth = 1.00" for 10 YR event
Inflow = 23.88 cfs @ 12.47 hrs, Volume= 4.108 af
Primary = 23.88 cfs @ 12.47 hrs, Volume= 4.108 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs

Pond SP2: ABERJONA RIVER



Time span=5.00-48.00 hrs, dt=0.03 hrs, 1434 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 DA 1: LOWELL STREET Runoff Area=4.810 ac 47.82% Impervious Runoff Depth=4.55"
Flow Length=1,080' Tc=15.1 min CN=84 Runoff=19.08 cfs 1.825 af

Subcatchment DA 2A: BACK OF LOTS E Runoff Area=3.100 ac 25.81% Impervious Runoff Depth=2.09"
Flow Length=614' Tc=18.1 min CN=59 Runoff=5.01 cfs 0.539 af

Subcatchment DA 2B: BACK OF LOTS MID Runoff Area=1.178 ac 24.62% Impervious Runoff Depth=1.10"
Flow Length=250' Tc=8.5 min CN=47 Runoff=1.03 cfs 0.108 af

Subcatchment DA 2C: BACK OF LOTS W Runoff Area=2.790 ac 24.01% Impervious Runoff Depth=1.57"
Flow Length=522' Tc=16.3 min CN=53 Runoff=3.28 cfs 0.366 af

Subcatchment DA 2D: PARKING Runoff Area=7,066 sf 100.00% Impervious Runoff Depth>5.95"
Tc=5.0 min CN=98 Runoff=1.04 cfs 0.080 af

Subcatchment DA 3: EAST OF ABERJONA Runoff Area=37.470 ac 26.82% Impervious Runoff Depth=1.49"
Flow Length=2,160' Tc=20.7 min CN=52 Runoff=37.41 cfs 4.663 af

Pond D110: DMH 110 Peak Elev=95.70' Inflow=53.12 cfs 6.488 af
Primary=20.68 cfs 5.205 af Secondary=32.44 cfs 1.283 af Outflow=53.12 cfs 6.488 af

Pond D120: DMH 120 Peak Elev=94.58' Inflow=20.68 cfs 5.205 af
Primary=20.41 cfs 5.187 af Secondary=0.27 cfs 0.018 af Outflow=20.68 cfs 5.205 af

Pond F1: FOREBAY Peak Elev=85.24' Storage=2,698 cf Inflow=25.40 cfs 5.726 af
Discarded=0.01 cfs 0.034 af Primary=25.37 cfs 5.678 af Outflow=25.38 cfs 5.713 af

Pond F2: FOREBAY Peak Elev=85.24' Storage=3,201 cf Inflow=25.37 cfs 5.678 af
Discarded=0.02 cfs 0.038 af Primary=25.31 cfs 5.625 af Outflow=25.32 cfs 5.663 af

Pond F3: FOREBAY Peak Elev=86.93' Storage=192 cf Inflow=1.04 cfs 0.080 af
Outflow=1.02 cfs 0.078 af

Pond P1: CELL 1 Peak Elev=85.78' Storage=28,293 cf Inflow=25.31 cfs 5.625 af
Primary=12.71 cfs 5.083 af Secondary=11.72 cfs 0.542 af Outflow=24.43 cfs 5.625 af

Pond P2: CELL 2 Peak Elev=84.86' Storage=8,713 cf Inflow=16.12 cfs 5.527 af
Primary=16.06 cfs 5.527 af Secondary=0.00 cfs 0.000 af Outflow=16.06 cfs 5.527 af

Pond P3: CELL 3 Peak Elev=84.88' Storage=9,853 cf Inflow=16.06 cfs 5.527 af
Primary=15.98 cfs 5.527 af Secondary=0.00 cfs 0.000 af Outflow=15.98 cfs 5.527 af

Pond SP1: ABERJONA RIVER Inflow=32.71 cfs 1.301 af
Primary=32.71 cfs 1.301 af

Pond SP2: ABERJONA RIVER Inflow=59.48 cfs 7.479 af
Primary=59.48 cfs 7.479 af

Total Runoff Area = 49.510 ac Runoff Volume = 7.582 af Average Runoff Depth = 1.84"
71.17% Pervious = 35.238 ac 28.83% Impervious = 14.272 ac

Summary for Subcatchment DA 1: LOWELL STREET

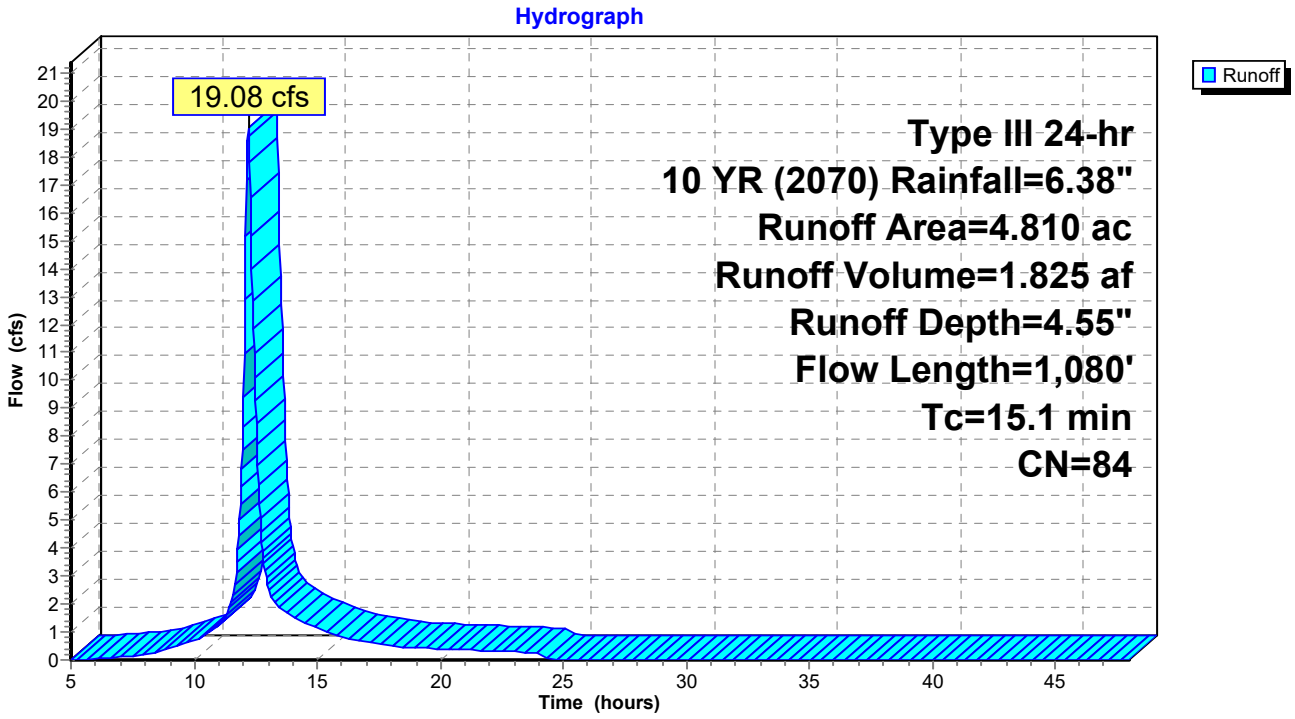
Runoff = 19.08 cfs @ 12.20 hrs, Volume= 1.825 af, Depth= 4.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 10 YR (2070) Rainfall=6.38"

Area (ac)	CN	Description
1.800	98	Paved parking, HSG C
0.500	98	Roofs, HSG C
1.250	70	Woods, Good, HSG C
1.260	74	Pasture/grassland/range, Good, HSG C
4.810	84	Weighted Average
2.510		52.18% Pervious Area
2.300		47.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
5.8	1,030	0.0210	2.94		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
15.1	1,080	Total			

Subcatchment DA 1: LOWELL STREET



Summary for Subcatchment DA 2A: BACK OF LOTS E

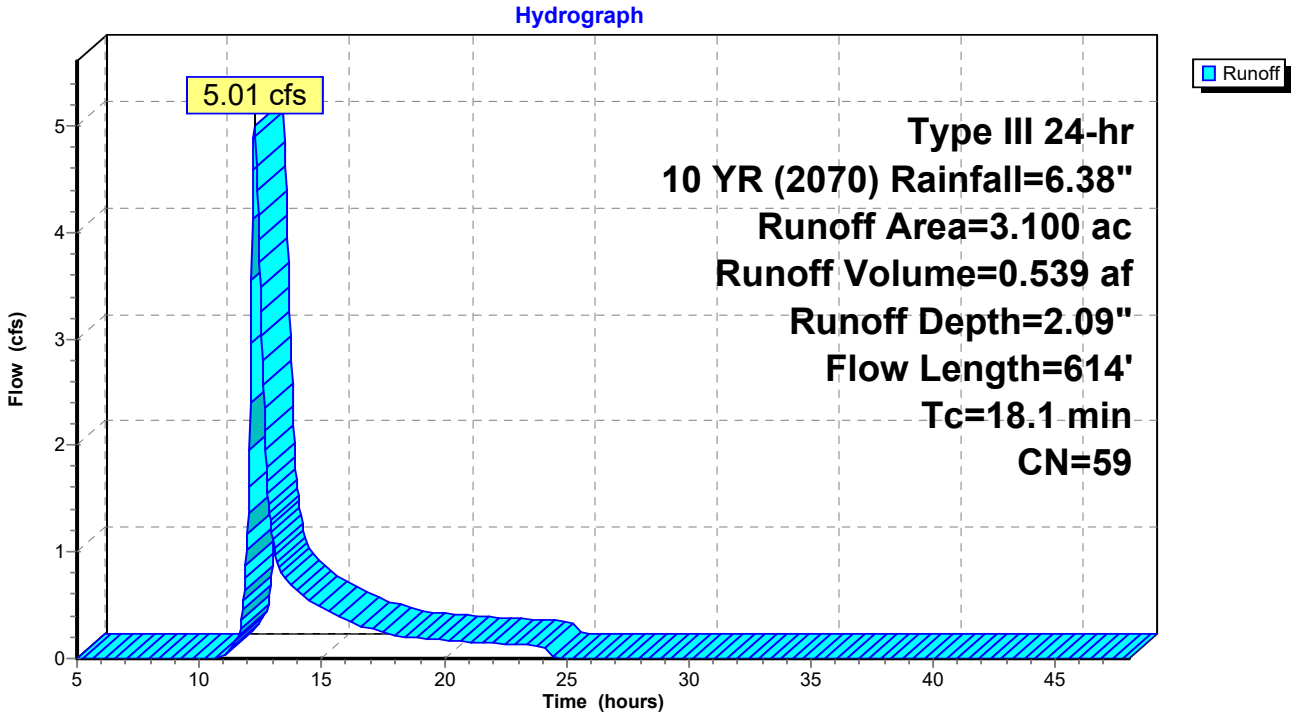
Runoff = 5.01 cfs @ 12.27 hrs, Volume= 0.539 af, Depth= 2.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 10 YR (2070) Rainfall=6.38"

Area (ac)	CN	Description
0.250	98	Paved parking, HSG C
0.020	72	Dirt roads, HSG A
0.110	87	Dirt roads, HSG C
0.260	98	Roofs, HSG C
0.290	98	Water Surface, HSG C
1.220	30	Woods, Good, HSG A
0.550	70	Woods, Good, HSG C
0.290	39	Pasture/grassland/range, Good, HSG A
0.110	74	Pasture/grassland/range, Good, HSG C
3.100	59	Weighted Average
2.300		74.19% Pervious Area
0.800		25.81% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
5.8	564	0.1040	1.61		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
18.1	614	Total			

Subcatchment DA 2A: BACK OF LOTS E



Summary for Subcatchment DA 2B: BACK OF LOTS MID

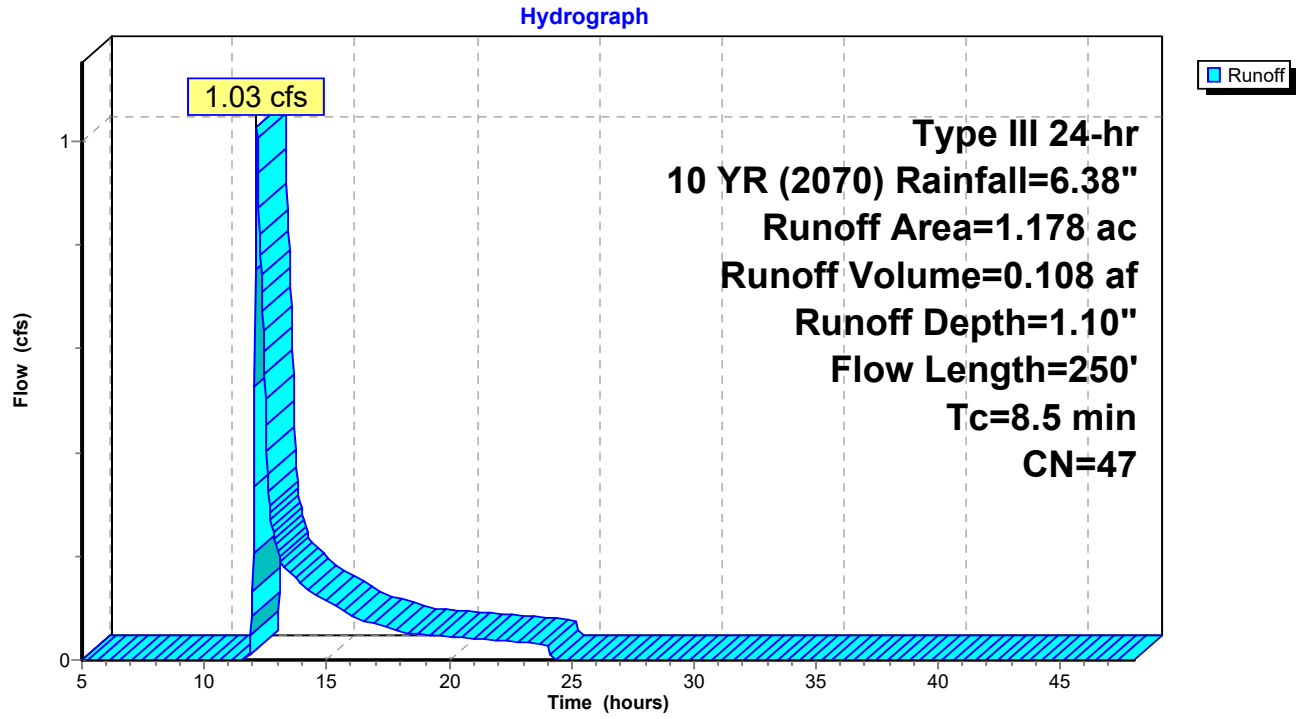
Runoff = 1.03 cfs @ 12.15 hrs, Volume= 0.108 af, Depth= 1.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 10 YR (2070) Rainfall=6.38"

Area (ac)	CN	Description
0.130	98	Paved parking, HSG C
0.160	98	Roofs, HSG C
0.868	30	Woods, Good, HSG A
0.020	39	Pasture/grassland/range, Good, HSG A
1.178	47	Weighted Average
0.888		75.38% Pervious Area
0.290		24.62% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.1000	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
2.0	200	0.1150	1.70		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.5	250	Total			

Subcatchment DA 2B: BACK OF LOTS MID



Summary for Subcatchment DA 2C: BACK OF LOTS W

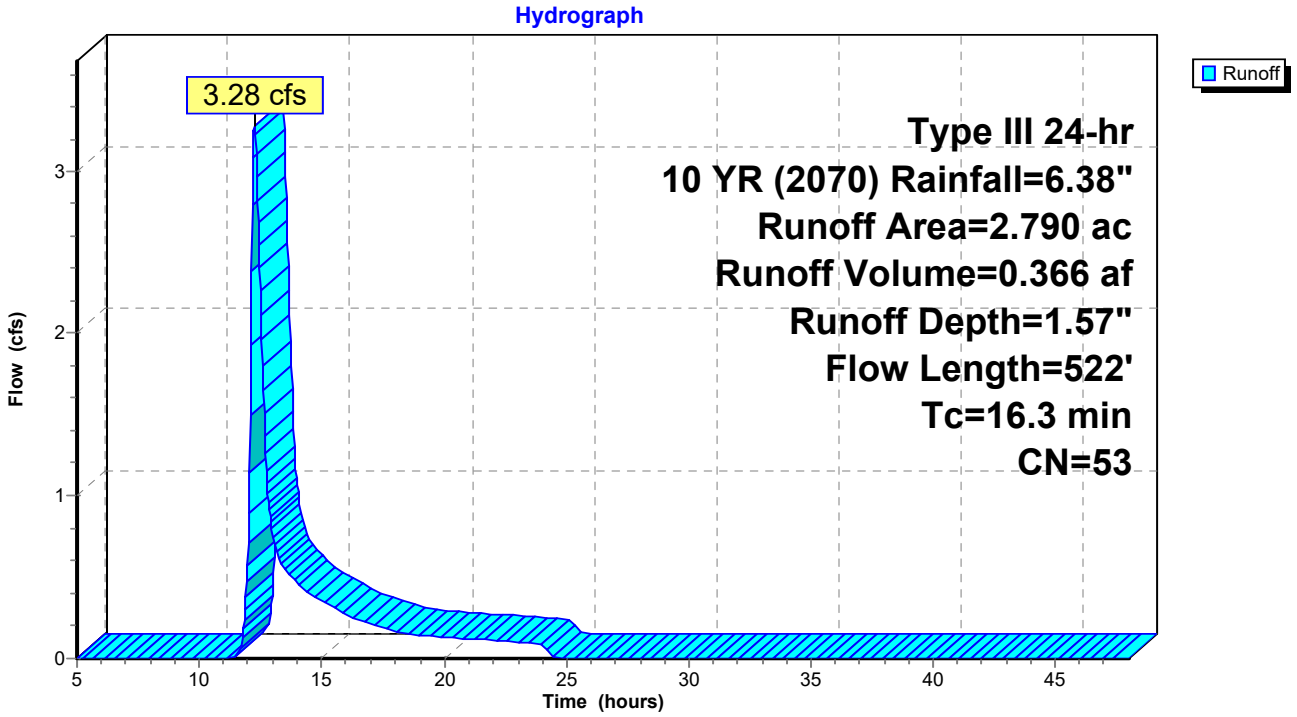
Runoff = 3.28 cfs @ 12.26 hrs, Volume= 0.366 af, Depth= 1.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 10 YR (2070) Rainfall=6.38"

Area (ac)	CN	Description
0.250	98	Paved parking, HSG C
0.090	72	Dirt roads, HSG A
0.040	87	Dirt roads, HSG C
0.120	98	Roofs, HSG C
0.300	98	Water Surface, HSG C
1.520	30	Woods, Good, HSG A
0.270	70	Woods, Good, HSG C
0.200	39	Pasture/grassland/range, Good, HSG A
0.000	74	Pasture/grassland/range, Good, HSG C
2.790	53	Weighted Average
2.120		75.99% Pervious Area
0.670		24.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
7.0	472	0.0510	1.13		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
16.3	522	Total			

Subcatchment DA 2C: BACK OF LOTS W



Summary for Subcatchment DA 2D: PARKING

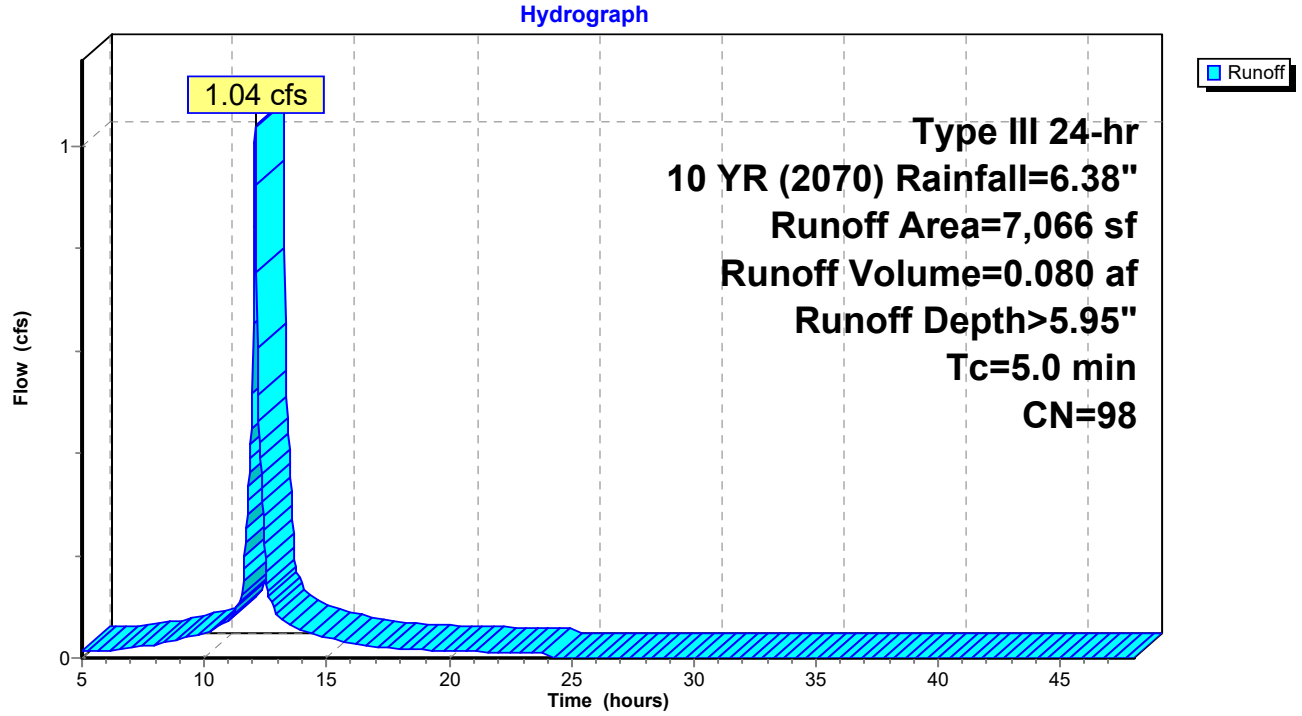
Runoff = 1.04 cfs @ 12.07 hrs, Volume= 0.080 af, Depth> 5.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 10 YR (2070) Rainfall=6.38"

Area (sf)	CN	Description
7,066	98	Paved parking, HSG C
7,066		100.00% Impervious Area

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

Subcatchment DA 2D: PARKING



Summary for Subcatchment DA 3: EAST OF ABERJONA

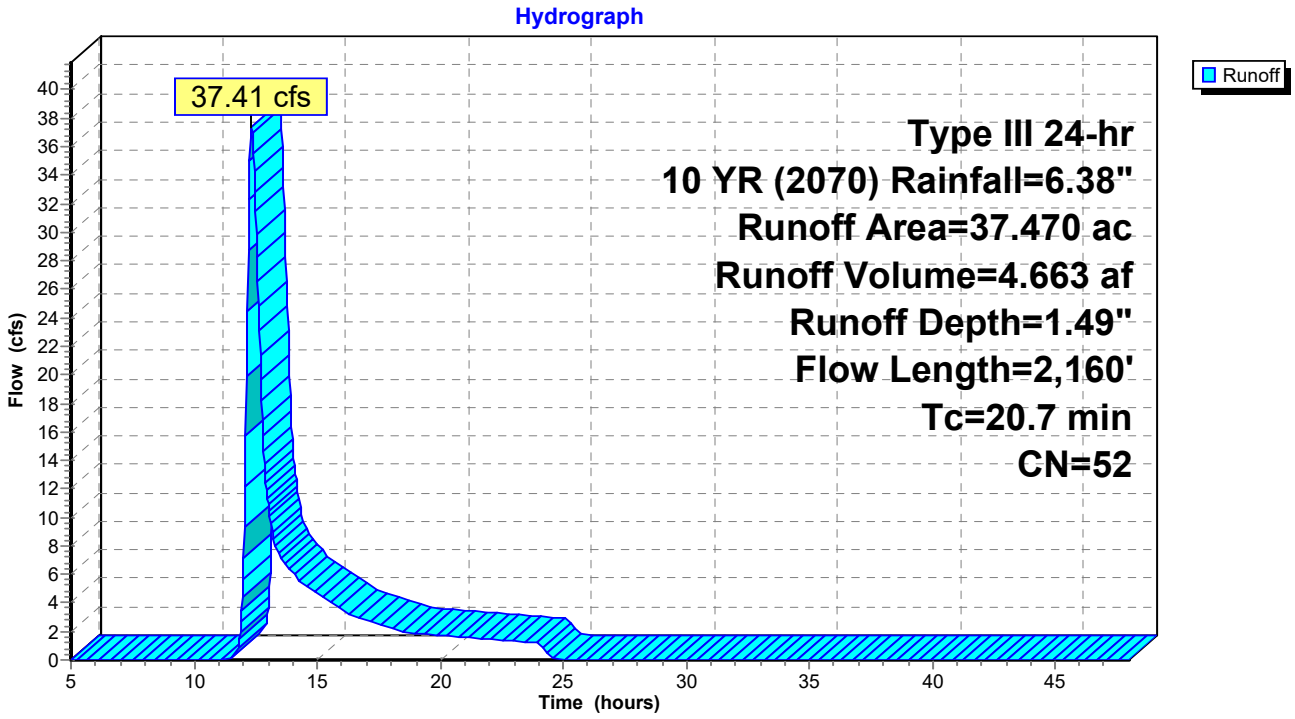
Runoff = 37.41 cfs @ 12.33 hrs, Volume= 4.663 af, Depth= 1.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 10 YR (2070) Rainfall=6.38"

Area (ac)	CN	Description
6.760	98	Paved parking, HSG C
3.290	98	Roofs, HSG C
9.960	30	Woods, Good, HSG A
17.460	39	Pasture/grassland/range, Good, HSG A
37.470	52	Weighted Average
27.420		73.18% Pervious Area
10.050		26.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
11.4	2,110	0.0230	3.08		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
20.7	2,160	Total			

Subcatchment DA 3: EAST OF ABERJONA



Summary for Pond D110: DMH 110

Inflow Area = 42.280 ac, 29.21% Impervious, Inflow Depth = 1.84" for 10 YR (2070) event
Inflow = 53.12 cfs @ 12.29 hrs, Volume= 6.488 af
Outflow = 53.12 cfs @ 12.29 hrs, Volume= 6.488 af, Atten= 0%, Lag= 0.0 min
Primary = 20.68 cfs @ 12.29 hrs, Volume= 5.205 af
Secondary = 32.44 cfs @ 12.29 hrs, Volume= 1.283 af

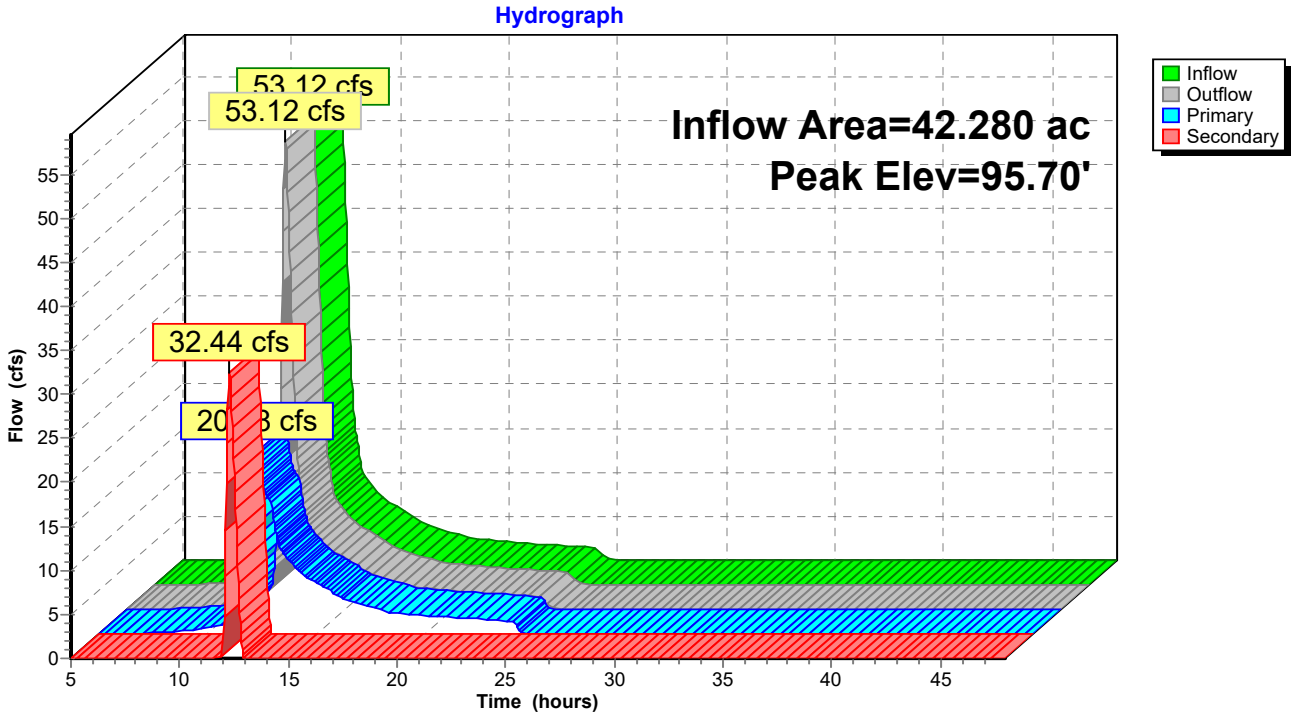
Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Peak Elev= 95.70' @ 12.29 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	85.30'	**18.0" Round Culvert** L= 143.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 85.30' / 84.60' S= 0.0049 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Secondary	91.10'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=20.67 cfs @ 12.29 hrs HW=95.69' (Free Discharge)
└**1=Culvert** (Barrel Controls 20.67 cfs @ 11.69 fps)

Secondary OutFlow Max=32.40 cfs @ 12.29 hrs HW=95.69' (Free Discharge)
└**2=Orifice/Grate** (Orifice Controls 32.40 cfs @ 10.31 fps)

Pond D110: DMH 110



Summary for Pond D120: DMH 120

Inflow Area = 42.280 ac, 29.21% Impervious, Inflow Depth = 1.48" for 10 YR (2070) event
Inflow = 20.68 cfs @ 12.29 hrs, Volume= 5.205 af
Outflow = 20.68 cfs @ 12.29 hrs, Volume= 5.205 af, Atten= 0%, Lag= 0.0 min
Primary = 20.41 cfs @ 12.29 hrs, Volume= 5.187 af
Secondary = 0.27 cfs @ 12.29 hrs, Volume= 0.018 af

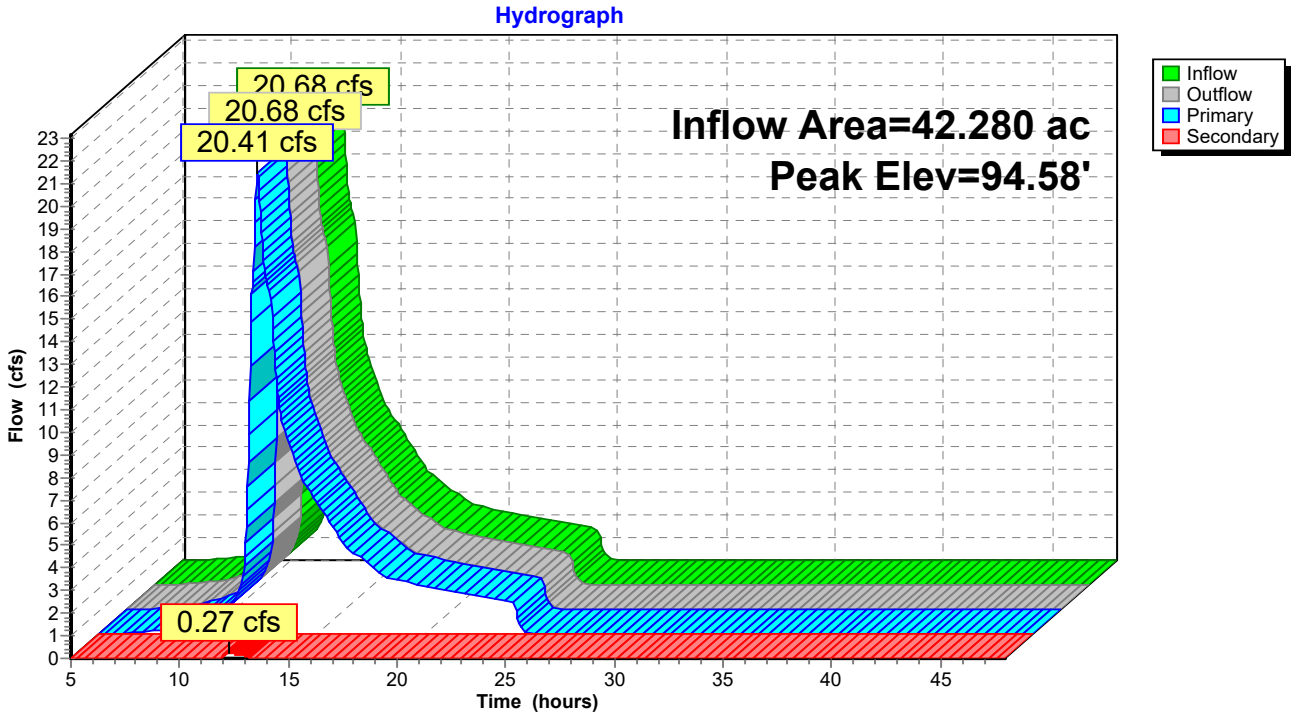
Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Peak Elev= 94.58' @ 12.29 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	84.60'	**18.0" Round Culvert** L= 126.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 84.60' / 84.00' S= 0.0048 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Secondary	88.01'	**2.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=20.40 cfs @ 12.29 hrs HW=94.57' (Free Discharge)
└**1=Culvert** (Inlet Controls 20.40 cfs @ 11.54 fps)

Secondary OutFlow Max=0.27 cfs @ 12.29 hrs HW=94.57' (Free Discharge)
└**2=Orifice/Grate** (Orifice Controls 0.27 cfs @ 12.33 fps)

Pond D120: DMH 120



Summary for Pond F1: FOREBAY

Inflow Area = 45.380 ac, 28.98% Impervious, Inflow Depth = 1.51" for 10 YR (2070) event
Inflow = 25.40 cfs @ 12.28 hrs, Volume= 5.726 af
Outflow = 25.38 cfs @ 12.29 hrs, Volume= 5.713 af, Atten= 0%, Lag= 0.8 min
Discarded = 0.01 cfs @ 12.29 hrs, Volume= 0.034 af
Primary = 25.37 cfs @ 12.29 hrs, Volume= 5.678 af

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Peak Elev= 85.24' @ 12.29 hrs Surf.Area= 2,048 sf Storage= 2,698 cf

Plug-Flow detention time= 8.9 min calculated for 5.713 af (100% of inflow)
Center-of-Mass det. time= 7.6 min (908.2 - 900.6)

Volume	Invert	Avail.Storage	Storage Description
#1	83.50'	12,853 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

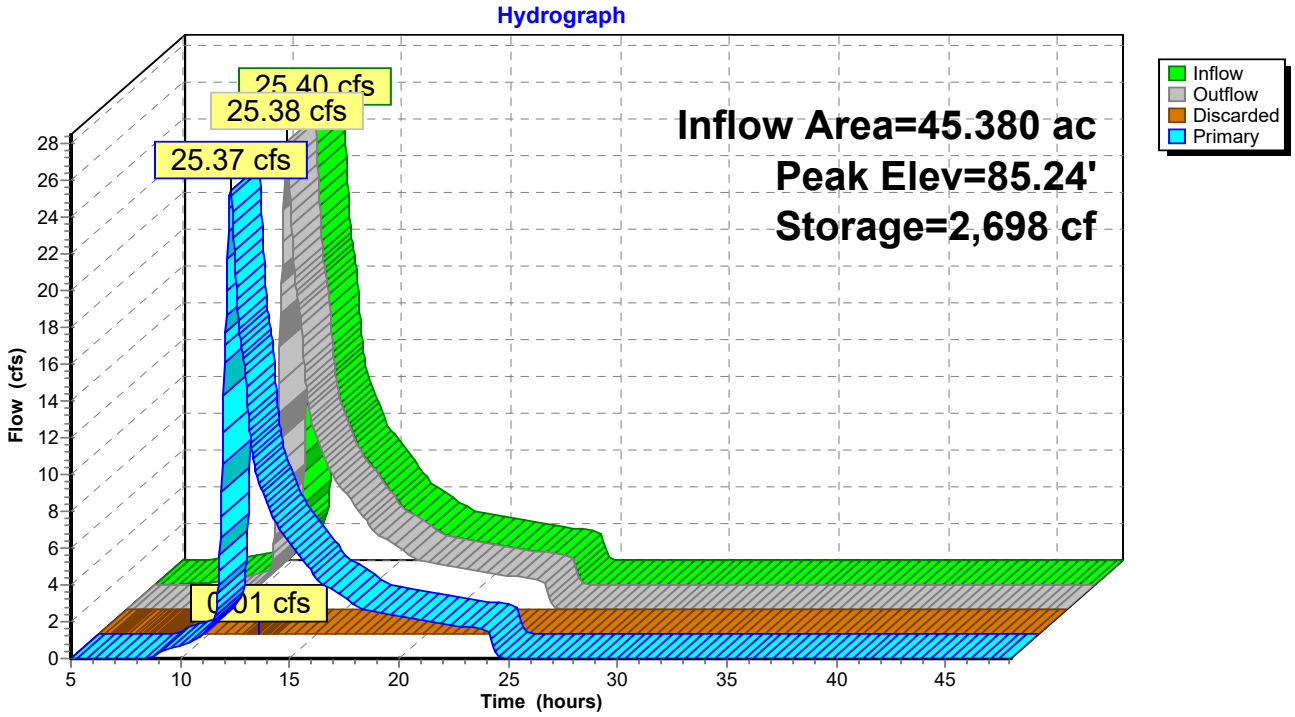
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
83.50	1,040	0	0
84.00	1,321	590	590
84.50	1,701	756	1,346
85.00	1,843	886	2,232
86.00	2,700	2,272	4,503
87.00	4,000	3,350	7,853
88.00	6,000	5,000	12,853

Device	Routing	Invert	Outlet Devices
#1	Primary	84.50'	**15.0' long x 20.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Discarded	83.50'	**0.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.01 cfs @ 12.29 hrs HW=85.24' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=25.35 cfs @ 12.29 hrs HW=85.24' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 25.35 cfs @ 2.29 fps)

Pond F1: FOREBAY



Summary for Pond F2: FOREBAY

Inflow Area = 45.380 ac, 28.98% Impervious, Inflow Depth = 1.50" for 10 YR (2070) event
Inflow = 25.37 cfs @ 12.29 hrs, Volume= 5.678 af
Outflow = 25.32 cfs @ 12.31 hrs, Volume= 5.663 af, Atten= 0%, Lag= 0.9 min
Discarded = 0.02 cfs @ 12.31 hrs, Volume= 0.038 af
Primary = 25.31 cfs @ 12.31 hrs, Volume= 5.625 af

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Peak Elev= 85.24' @ 12.31 hrs Surf.Area= 2,458 sf Storage= 3,201 cf

Plug-Flow detention time= 9.0 min calculated for 5.659 af (100% of inflow)
Center-of-Mass det. time= 8.4 min (912.5 - 904.2)

Volume	Invert	Avail.Storage	Storage Description
#1	83.50'	14,130 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

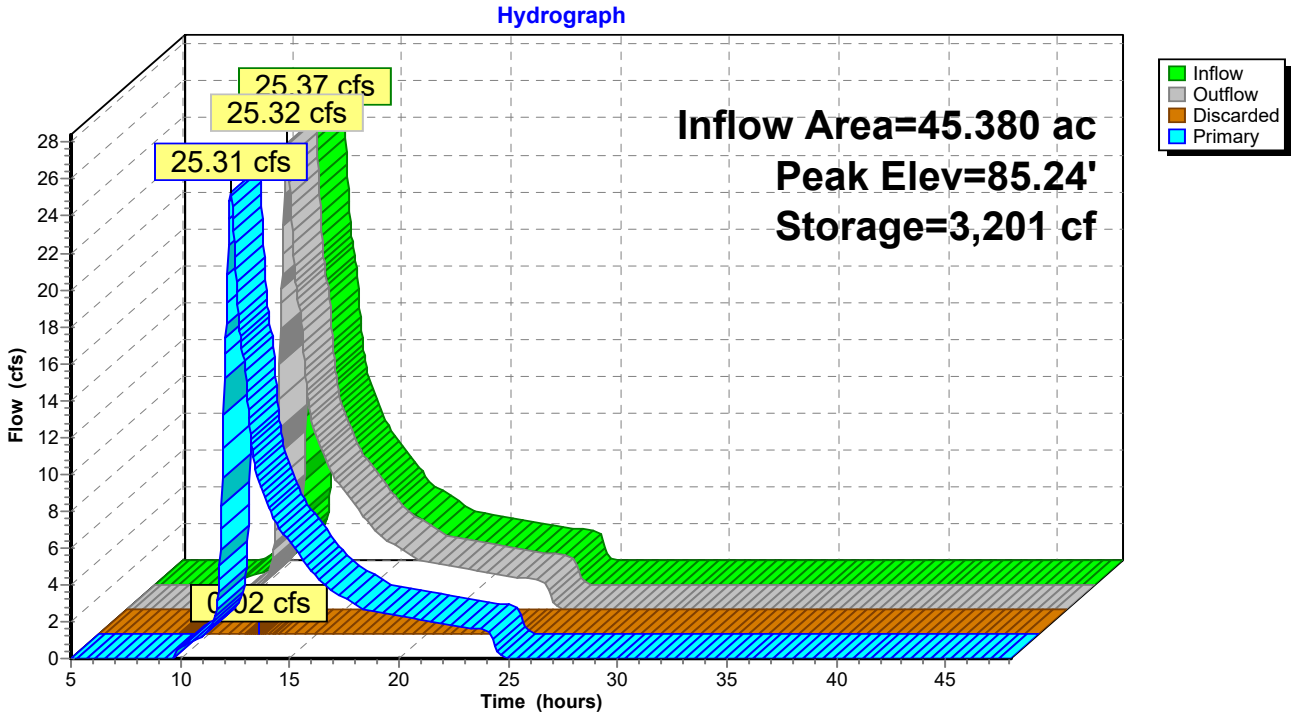
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
83.50	1,266	0	0
84.00	1,481	687	687
84.50	2,013	874	1,560
85.00	2,288	1,075	2,636
86.00	3,000	2,644	5,280
87.00	4,500	3,750	9,030
88.00	5,700	5,100	14,130

Device	Routing	Invert	Outlet Devices
#1	Primary	84.50'	**15.0' long x 20.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Discarded	83.50'	**0.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.02 cfs @ 12.31 hrs HW=85.24' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=25.26 cfs @ 12.31 hrs HW=85.24' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 25.26 cfs @ 2.28 fps)

Pond F2: FOREBAY



Summary for Pond F3: FOREBAY

Inflow Area = 0.162 ac,100.00% Impervious, Inflow Depth > 5.95" for 10 YR (2070) event
Inflow = 1.04 cfs @ 12.07 hrs, Volume= 0.080 af
Outflow = 1.02 cfs @ 12.09 hrs, Volume= 0.078 af, Atten= 2%, Lag= 1.0 min
Primary = 1.02 cfs @ 12.09 hrs, Volume= 0.078 af

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Peak Elev= 86.93' @ 12.09 hrs Surf.Area= 504 sf Storage= 192 cf

Plug-Flow detention time= 34.1 min calculated for 0.078 af (97% of inflow)
Center-of-Mass det. time= 15.5 min (775.9 - 760.4)

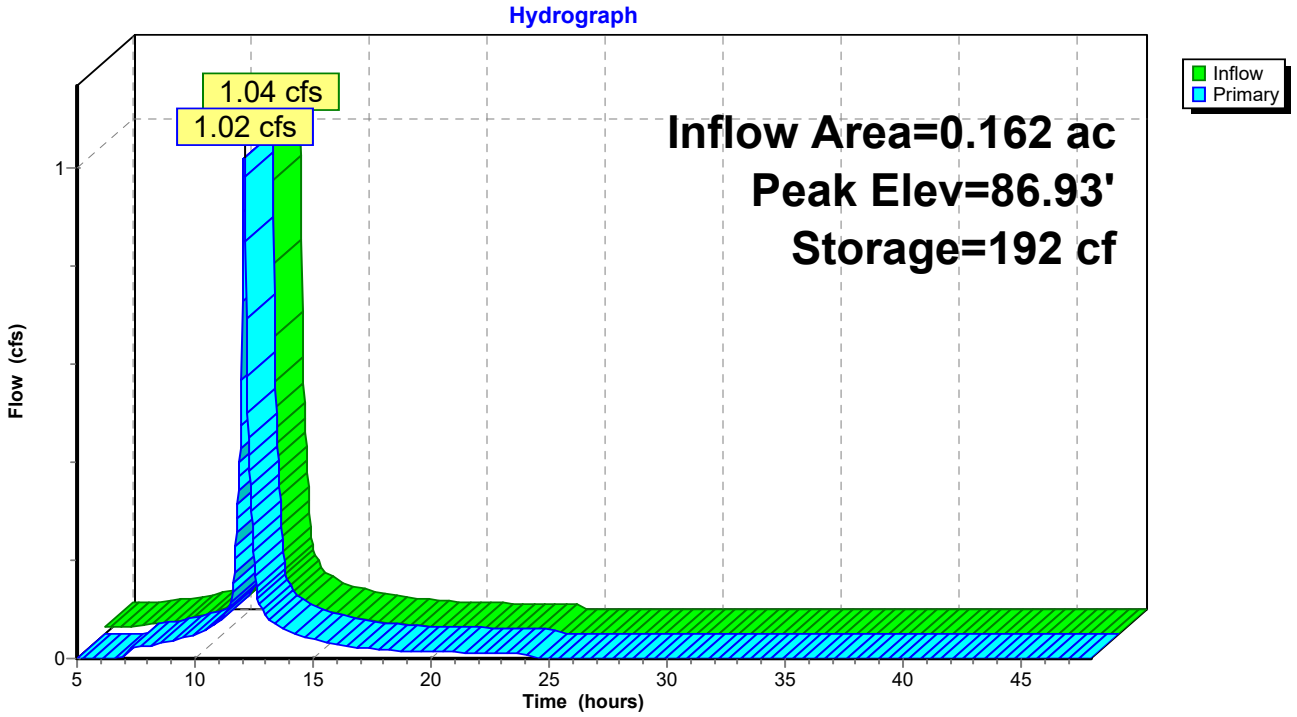
Volume	Invert	Avail.Storage	Storage Description
#1	86.50'	369 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
86.50	400	0	0
86.75	450	106	106
87.25	600	263	369

Device	Routing	Invert	Outlet Devices
#1	Primary	86.75'	**5.0' long x 15.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=1.01 cfs @ 12.09 hrs HW=86.93' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 1.01 cfs @ 1.13 fps)

Pond F3: FOREBAY



Summary for Pond P1: CELL 1

Inflow Area = 45.380 ac, 28.98% Impervious, Inflow Depth = 1.49" for 10 YR (2070) event
Inflow = 25.31 cfs @ 12.31 hrs, Volume= 5.625 af
Outflow = 24.43 cfs @ 12.39 hrs, Volume= 5.625 af, Atten= 3%, Lag= 4.7 min
Primary = 12.71 cfs @ 12.39 hrs, Volume= 5.083 af
Secondary = 11.72 cfs @ 12.39 hrs, Volume= 0.542 af

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Starting Elev= 84.50' Surf.Area= 9,400 sf Storage= 15,153 cf
Peak Elev= 85.78' @ 12.39 hrs Surf.Area= 11,295 sf Storage= 28,293 cf (13,140 cf above start)

Plug-Flow detention time= 55.0 min calculated for 5.273 af (94% of inflow)
Center-of-Mass det. time= 8.4 min (916.1 - 907.6)

Volume	Invert	Avail.Storage	Storage Description
#1	79.00'	46,228 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

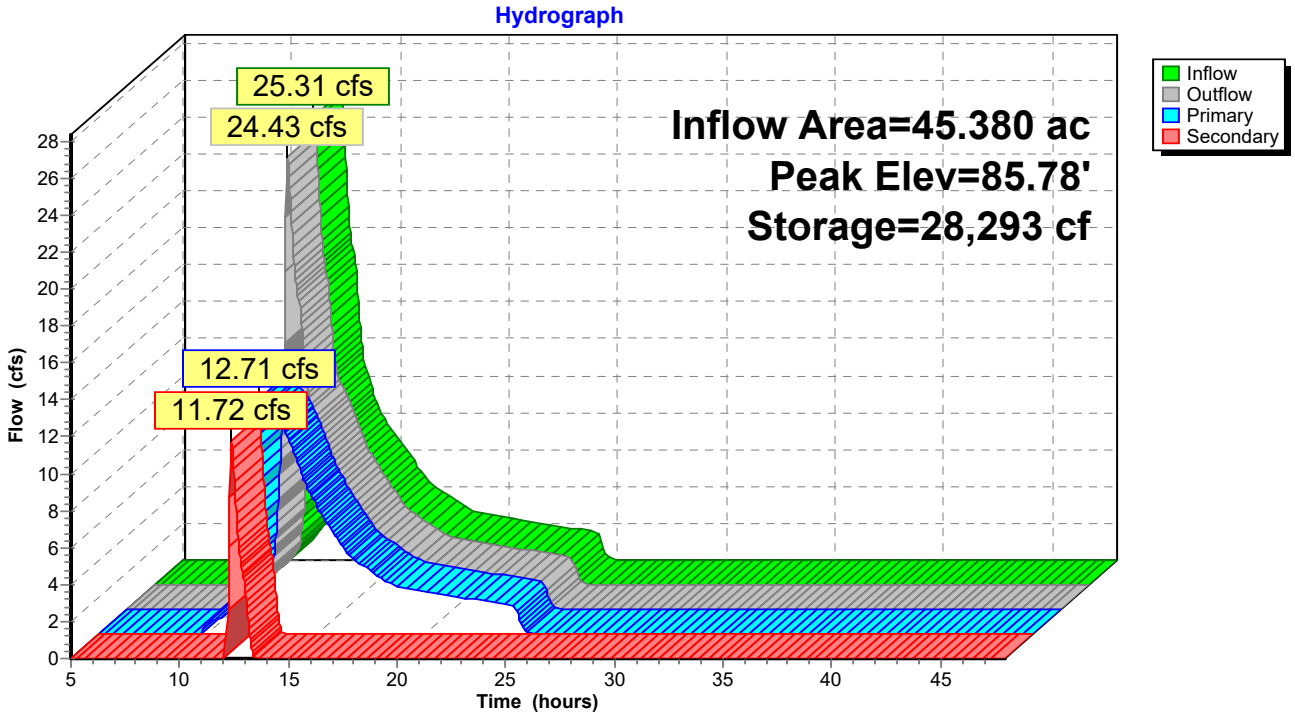
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
79.00	350	0	0
80.00	761	556	556
81.00	1,501	1,131	1,687
82.00	2,224	1,863	3,549
83.00	3,057	2,641	6,190
84.00	6,780	4,919	11,108
84.50	9,400	4,045	15,153
85.00	10,100	4,875	20,028
85.50	10,800	5,225	25,253
86.00	11,700	5,625	30,878
87.00	19,000	15,350	46,228

Device	Routing	Invert	Outlet Devices
#1	Primary	82.50'	**24.0" Round Culvert** L= 250.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 80.50' / 82.50' S= -0.0080 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#2	Secondary	85.50'	**30.0' long x 15.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=12.71 cfs @ 12.39 hrs HW=85.77' TW=84.50' (Fixed TW Elev= 84.50')
↑—**1=Culvert** (Outlet Controls 12.71 cfs @ 4.05 fps)

Secondary OutFlow Max=11.61 cfs @ 12.39 hrs HW=85.77' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 11.61 cfs @ 1.41 fps)

Pond P1: CELL 1



Summary for Pond P2: CELL 2

Inflow Area = 48.332 ac, 28.93% Impervious, Inflow Depth = 1.37" for 10 YR (2070) event
Inflow = 16.12 cfs @ 12.30 hrs, Volume= 5.527 af
Outflow = 16.06 cfs @ 12.34 hrs, Volume= 5.527 af, Atten= 0%, Lag= 1.9 min
Primary = 16.06 cfs @ 12.34 hrs, Volume= 5.527 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Starting Elev= 84.50' Surf.Area= 5,620 sf Storage= 6,541 cf
Peak Elev= 84.86' @ 12.34 hrs Surf.Area= 6,601 sf Storage= 8,713 cf (2,172 cf above start)

Plug-Flow detention time= 25.1 min calculated for 5.373 af (97% of inflow)
Center-of-Mass det. time= 3.1 min (931.0 - 927.9)

Volume	Invert	Avail.Storage	Storage Description
#1	79.00'	17,196 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

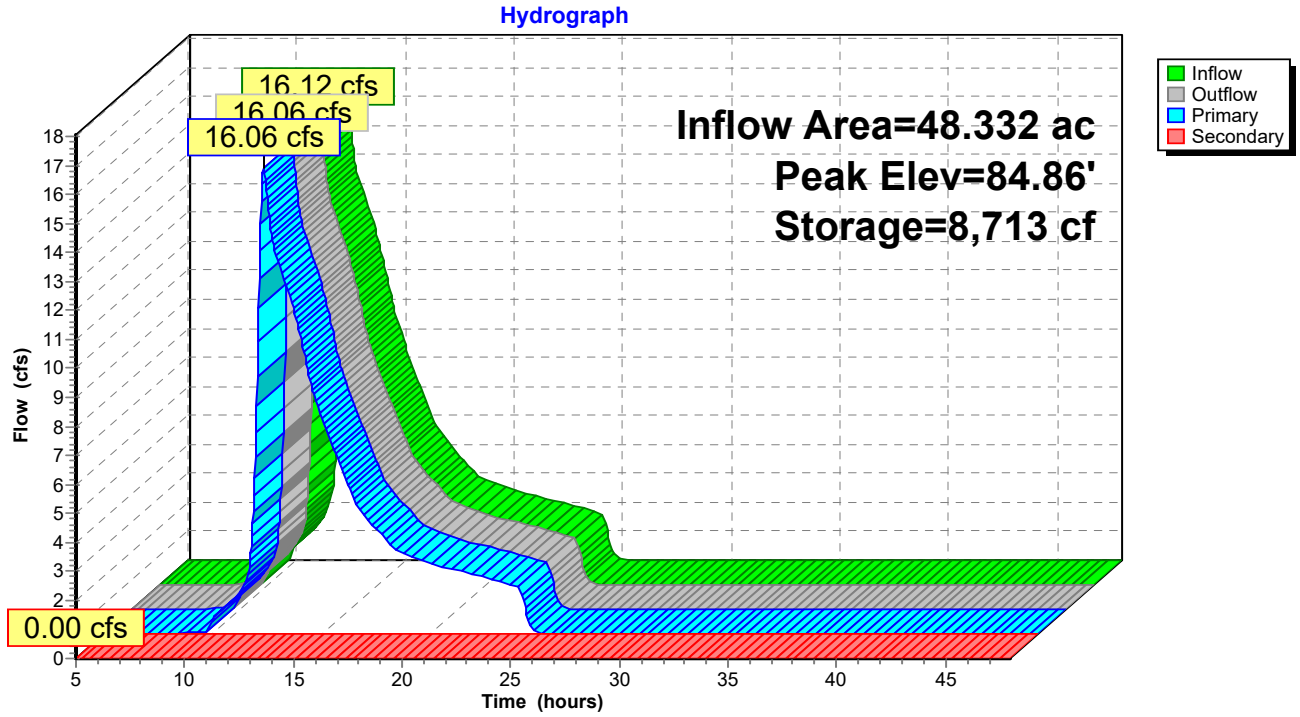
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
79.00	2	0	0
80.00	92	47	47
81.00	292	192	239
82.00	731	512	751
83.00	1,320	1,026	1,776
84.00	3,600	2,460	4,236
84.50	5,620	2,305	6,541
85.00	7,000	3,155	9,696
86.00	8,000	7,500	17,196

Device	Routing	Invert	Outlet Devices
#1	Primary	84.50'	**30.0' long x 8.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74
#2	Secondary	85.50'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=15.98 cfs @ 12.34 hrs HW=84.86' TW=84.50' (Fixed TW Elev= 84.50')
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 15.98 cfs @ 1.50 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=84.50' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond P2: CELL 2



Summary for Pond P3: CELL 3

Inflow Area = 48.332 ac, 28.93% Impervious, Inflow Depth = 1.37" for 10 YR (2070) event
Inflow = 16.06 cfs @ 12.34 hrs, Volume= 5.527 af
Outflow = 15.98 cfs @ 12.38 hrs, Volume= 5.527 af, Atten= 0%, Lag= 2.4 min
Primary = 15.98 cfs @ 12.38 hrs, Volume= 5.527 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Starting Elev= 84.50' Surf.Area= 6,663 sf Storage= 7,197 cf
Peak Elev= 84.88' @ 12.38 hrs Surf.Area= 7,225 sf Storage= 9,853 cf (2,656 cf above start)

Plug-Flow detention time= 27.9 min calculated for 5.358 af (97% of inflow)
Center-of-Mass det. time= 3.8 min (934.8 - 931.0)

Volume	Invert	Avail.Storage	Storage Description
#1	79.00'	18,411 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

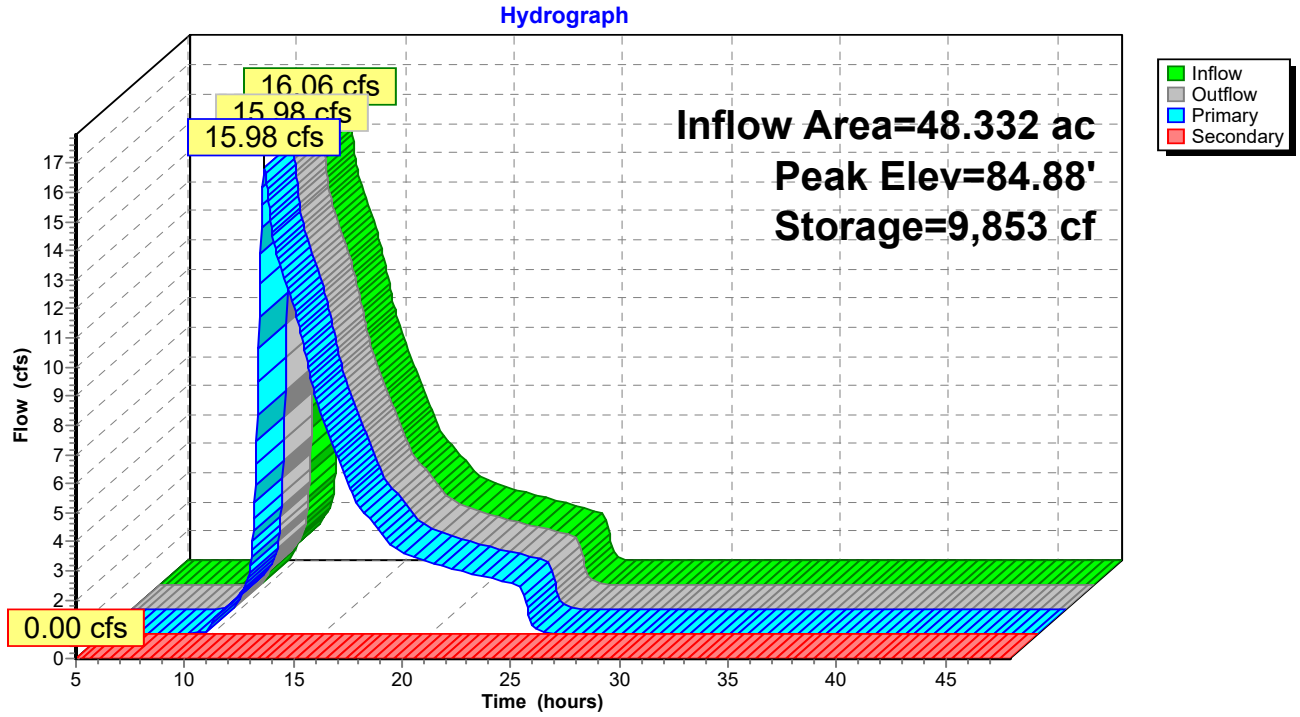
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
79.00	14	0	0
80.00	85	50	50
81.00	375	230	280
82.00	826	601	880
83.00	1,383	1,105	1,985
84.00	3,807	2,595	4,580
84.50	6,663	2,618	7,197
85.00	7,397	3,515	10,712
86.00	8,000	7,699	18,411

Device	Routing	Invert	Outlet Devices
#1	Primary	84.50'	**25.0' long x 17.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Secondary	86.25'	**100.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=15.96 cfs @ 12.38 hrs HW=84.88' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 15.96 cfs @ 1.67 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=84.50' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond P3: CELL 3

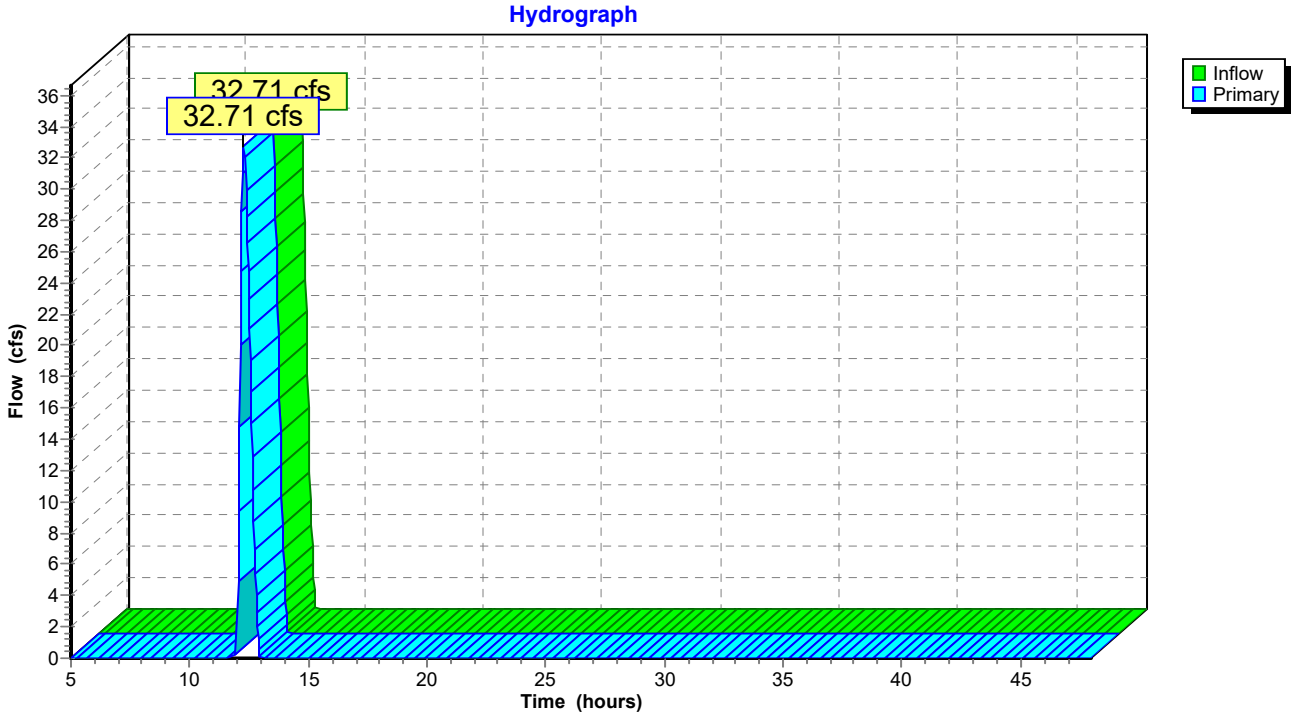


Summary for Pond SP1: ABERJONA RIVER

Inflow = 32.71 cfs @ 12.29 hrs, Volume= 1.301 af
Primary = 32.71 cfs @ 12.29 hrs, Volume= 1.301 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs

Pond SP1: ABERJONA RIVER

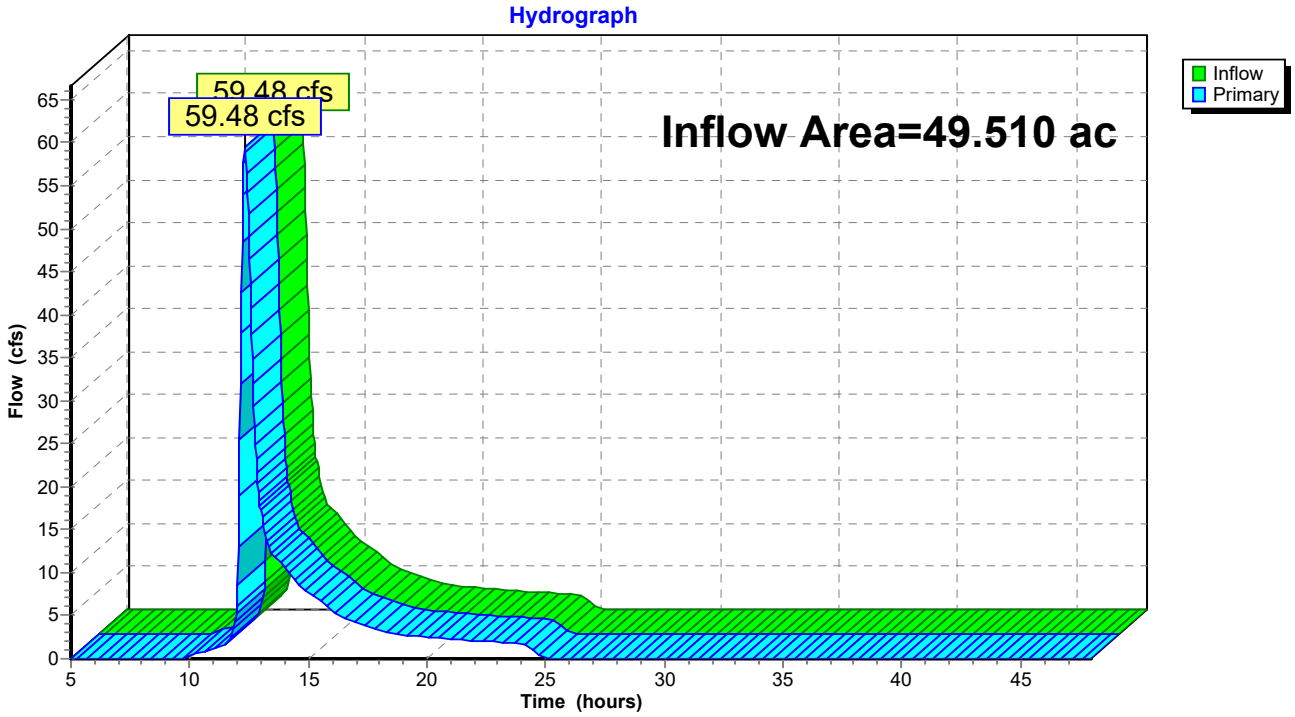


Summary for Pond SP2: ABERJONA RIVER

Inflow Area = 49.510 ac, 28.83% Impervious, Inflow Depth = 1.81" for 10 YR (2070) event
Inflow = 59.48 cfs @ 12.34 hrs, Volume= 7.479 af
Primary = 59.48 cfs @ 12.34 hrs, Volume= 7.479 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs

Pond SP2: ABERJONA RIVER



Time span=5.00-48.00 hrs, dt=0.03 hrs, 1434 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 DA 1: LOWELL STREET Runoff Area=4.810 ac 47.82% Impervious Runoff Depth=4.38"
Flow Length=1,080' Tc=15.1 min CN=84 Runoff=18.40 cfs 1.757 af

Subcatchment DA 2A: BACK OF LOTS E Runoff Area=3.100 ac 25.81% Impervious Runoff Depth=1.97"
Flow Length=614' Tc=18.1 min CN=59 Runoff=4.70 cfs 0.508 af

Subcatchment DA 2B: BACK OF LOTS MID Runoff Area=1.178 ac 24.62% Impervious Runoff Depth=1.02"
Flow Length=250' Tc=8.5 min CN=47 Runoff=0.92 cfs 0.100 af

Subcatchment DA 2C: BACK OF LOTS W Runoff Area=2.790 ac 24.01% Impervious Runoff Depth=1.47"
Flow Length=522' Tc=16.3 min CN=53 Runoff=3.03 cfs 0.343 af

Subcatchment DA 2D: PARKING Runoff Area=7,066 sf 100.00% Impervious Runoff Depth>5.78"
Tc=5.0 min CN=98 Runoff=1.01 cfs 0.078 af

Subcatchment DA 3: EAST OF ABERJONA Runoff Area=37.470 ac 26.82% Impervious Runoff Depth=1.40"
Flow Length=2,160' Tc=20.7 min CN=52 Runoff=34.44 cfs 4.357 af

Pond D110: DMH 110 Peak Elev=94.95' Inflow=49.52 cfs 6.114 af
Primary=19.85 cfs 4.972 af Secondary=29.67 cfs 1.142 af Outflow=49.52 cfs 6.114 af

Pond D120: DMH 120 Peak Elev=93.86' Inflow=19.85 cfs 4.972 af
Primary=19.60 cfs 4.955 af Secondary=0.25 cfs 0.017 af Outflow=19.85 cfs 4.972 af

Pond F1: FOREBAY Peak Elev=85.22' Storage=2,651 cf Inflow=24.28 cfs 5.463 af
Discarded=0.01 cfs 0.034 af Primary=24.25 cfs 5.416 af Outflow=24.26 cfs 5.450 af

Pond F2: FOREBAY Peak Elev=85.22' Storage=3,144 cf Inflow=24.25 cfs 5.416 af
Discarded=0.02 cfs 0.038 af Primary=24.19 cfs 5.363 af Outflow=24.20 cfs 5.401 af

Pond F3: FOREBAY Peak Elev=86.93' Storage=190 cf Inflow=1.01 cfs 0.078 af
Outflow=0.99 cfs 0.076 af

Pond P1: CELL 1 Peak Elev=85.76' Storage=28,089 cf Inflow=24.19 cfs 5.363 af
Primary=12.62 cfs 4.883 af Secondary=10.60 cfs 0.480 af Outflow=23.22 cfs 5.363 af

Pond P2: CELL 2 Peak Elev=84.85' Storage=8,677 cf Inflow=15.73 cfs 5.301 af
Primary=15.68 cfs 5.301 af Secondary=0.00 cfs 0.000 af Outflow=15.68 cfs 5.301 af

Pond P3: CELL 3 Peak Elev=84.88' Storage=9,812 cf Inflow=15.68 cfs 5.301 af
Primary=15.61 cfs 5.301 af Secondary=0.00 cfs 0.000 af Outflow=15.61 cfs 5.301 af

Pond SP1: ABERJONA RIVER Inflow=29.92 cfs 1.159 af
Primary=29.92 cfs 1.159 af

Pond SP2: ABERJONA RIVER Inflow=54.91 cfs 7.041 af
Primary=54.91 cfs 7.041 af

Total Runoff Area = 49.510 ac Runoff Volume = 7.144 af Average Runoff Depth = 1.73"
71.17% Pervious = 35.238 ac 28.83% Impervious = 14.272 ac

Summary for Subcatchment DA 1: LOWELL STREET

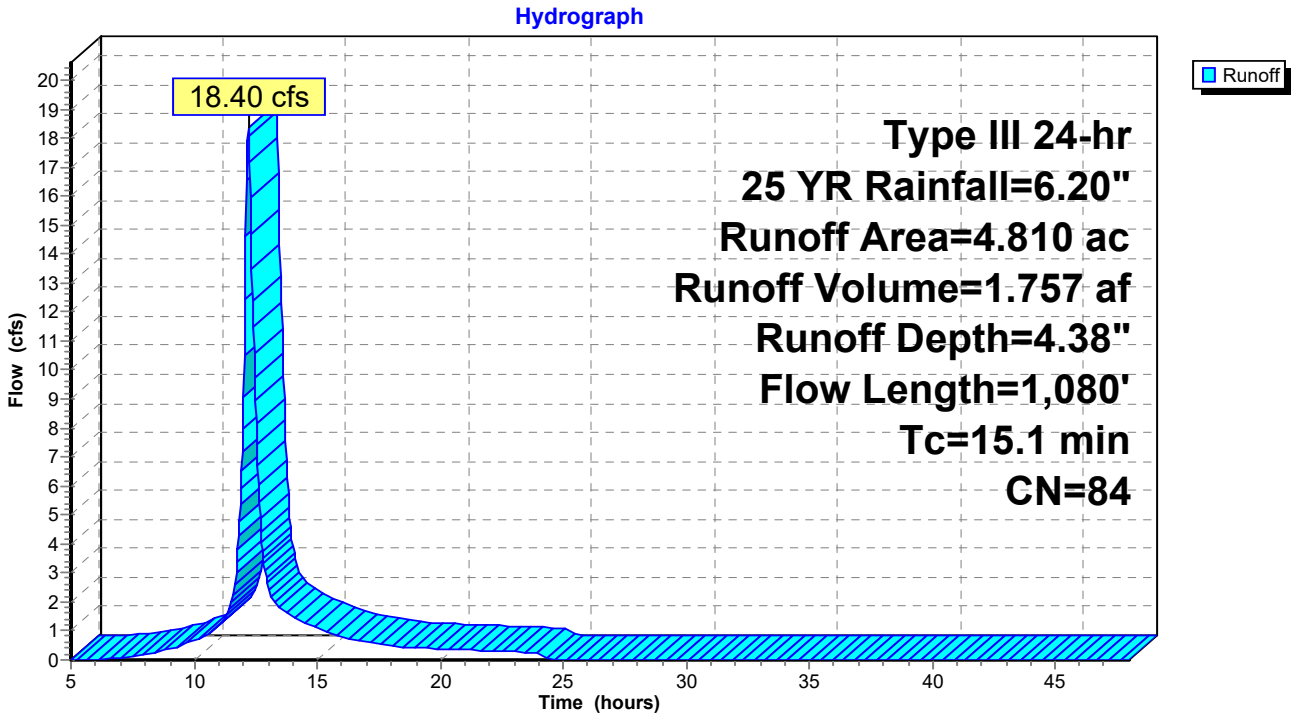
Runoff = 18.40 cfs @ 12.20 hrs, Volume= 1.757 af, Depth= 4.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 25 YR Rainfall=6.20"

Area (ac)	CN	Description
1.800	98	Paved parking, HSG C
0.500	98	Roofs, HSG C
1.250	70	Woods, Good, HSG C
1.260	74	Pasture/grassland/range, Good, HSG C
4.810	84	Weighted Average
2.510		52.18% Pervious Area
2.300		47.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
5.8	1,030	0.0210	2.94		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
15.1	1,080	Total			

Subcatchment DA 1: LOWELL STREET



Summary for Subcatchment DA 2A: BACK OF LOTS E

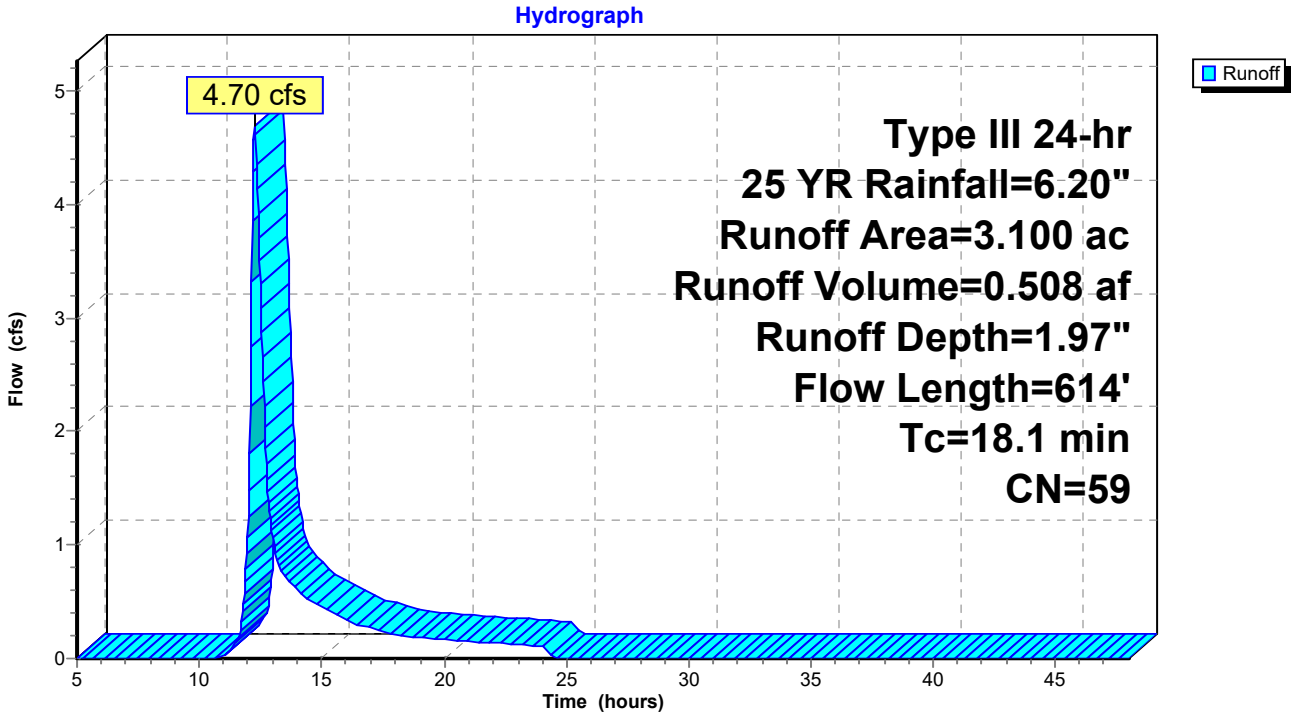
Runoff = 4.70 cfs @ 12.27 hrs, Volume= 0.508 af, Depth= 1.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 25 YR Rainfall=6.20"

Area (ac)	CN	Description
0.250	98	Paved parking, HSG C
0.020	72	Dirt roads, HSG A
0.110	87	Dirt roads, HSG C
0.260	98	Roofs, HSG C
0.290	98	Water Surface, HSG C
1.220	30	Woods, Good, HSG A
0.550	70	Woods, Good, HSG C
0.290	39	Pasture/grassland/range, Good, HSG A
0.110	74	Pasture/grassland/range, Good, HSG C
3.100	59	Weighted Average
2.300		74.19% Pervious Area
0.800		25.81% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
5.8	564	0.1040	1.61		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
18.1	614	Total			

Subcatchment DA 2A: BACK OF LOTS E



Summary for Subcatchment DA 2B: BACK OF LOTS MID

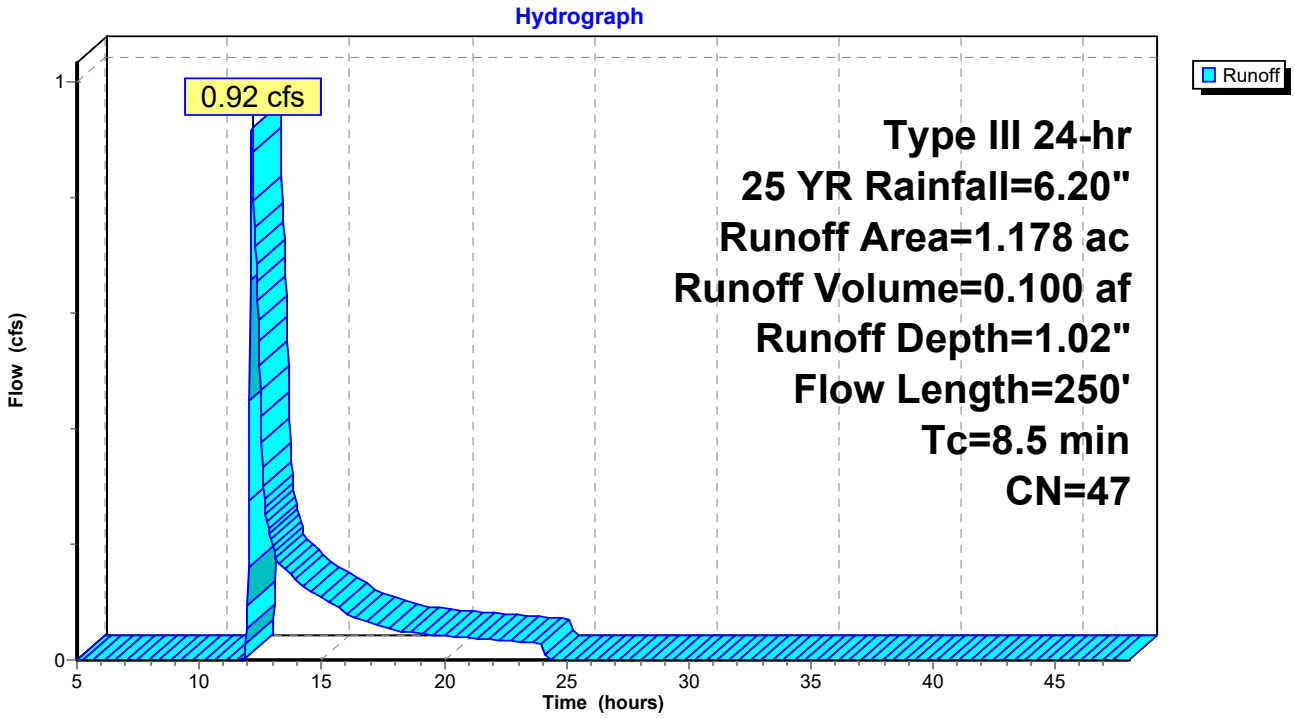
Runoff = 0.92 cfs @ 12.15 hrs, Volume= 0.100 af, Depth= 1.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 25 YR Rainfall=6.20"

Area (ac)	CN	Description
0.130	98	Paved parking, HSG C
0.160	98	Roofs, HSG C
0.868	30	Woods, Good, HSG A
0.020	39	Pasture/grassland/range, Good, HSG A
1.178	47	Weighted Average
0.888		75.38% Pervious Area
0.290		24.62% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.1000	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
2.0	200	0.1150	1.70		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.5	250	Total			

Subcatchment DA 2B: BACK OF LOTS MID



Summary for Subcatchment DA 2C: BACK OF LOTS W

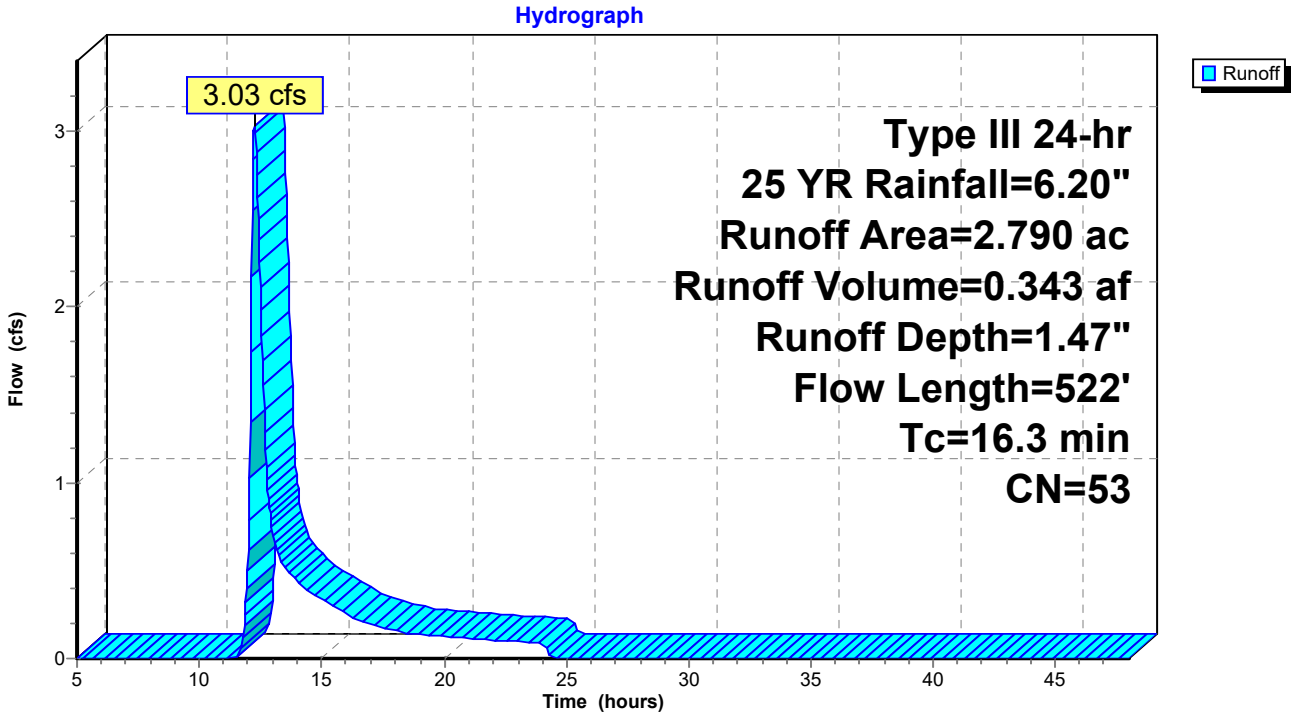
Runoff = 3.03 cfs @ 12.26 hrs, Volume= 0.343 af, Depth= 1.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 25 YR Rainfall=6.20"

Area (ac)	CN	Description
0.250	98	Paved parking, HSG C
0.090	72	Dirt roads, HSG A
0.040	87	Dirt roads, HSG C
0.120	98	Roofs, HSG C
0.300	98	Water Surface, HSG C
1.520	30	Woods, Good, HSG A
0.270	70	Woods, Good, HSG C
0.200	39	Pasture/grassland/range, Good, HSG A
0.000	74	Pasture/grassland/range, Good, HSG C
2.790	53	Weighted Average
2.120		75.99% Pervious Area
0.670		24.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
7.0	472	0.0510	1.13		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
16.3	522	Total			

Subcatchment DA 2C: BACK OF LOTS W



Summary for Subcatchment DA 2D: PARKING

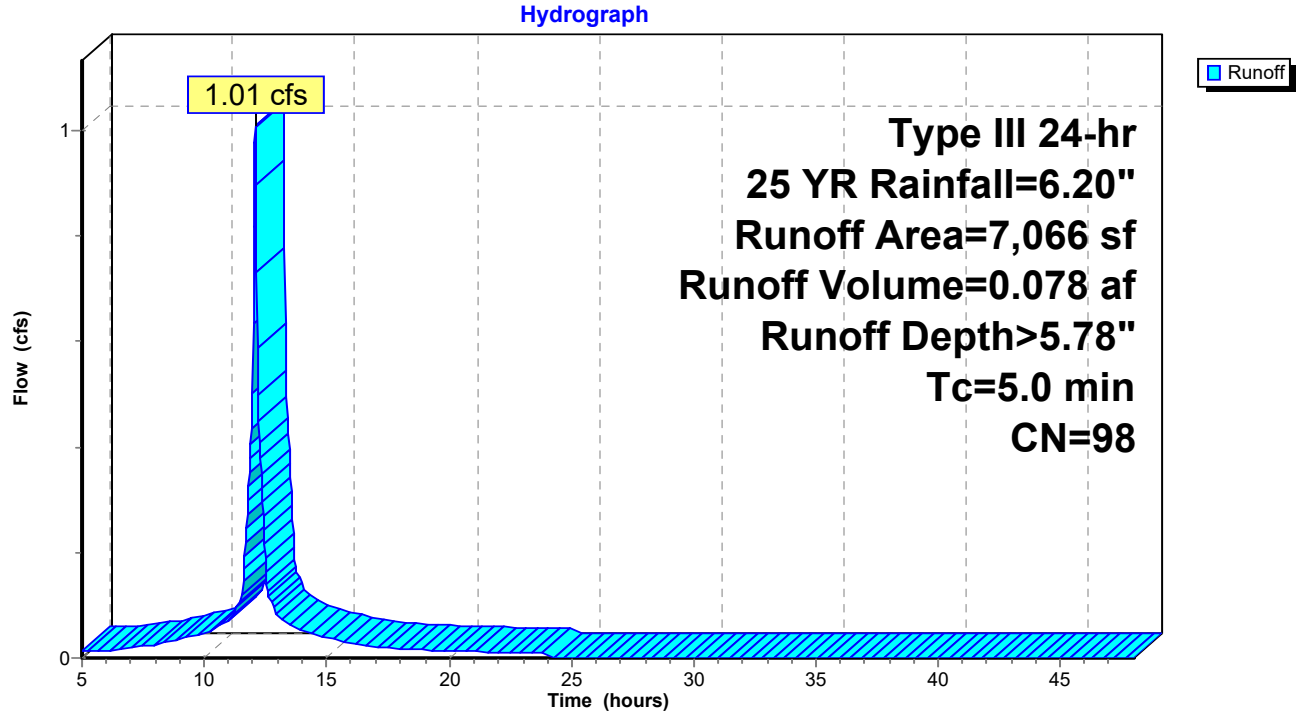
Runoff = 1.01 cfs @ 12.07 hrs, Volume= 0.078 af, Depth> 5.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 25 YR Rainfall=6.20"

Area (sf)	CN	Description
7,066	98	Paved parking, HSG C
7,066		100.00% Impervious Area

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

Subcatchment DA 2D: PARKING



Summary for Subcatchment DA 3: EAST OF ABERJONA

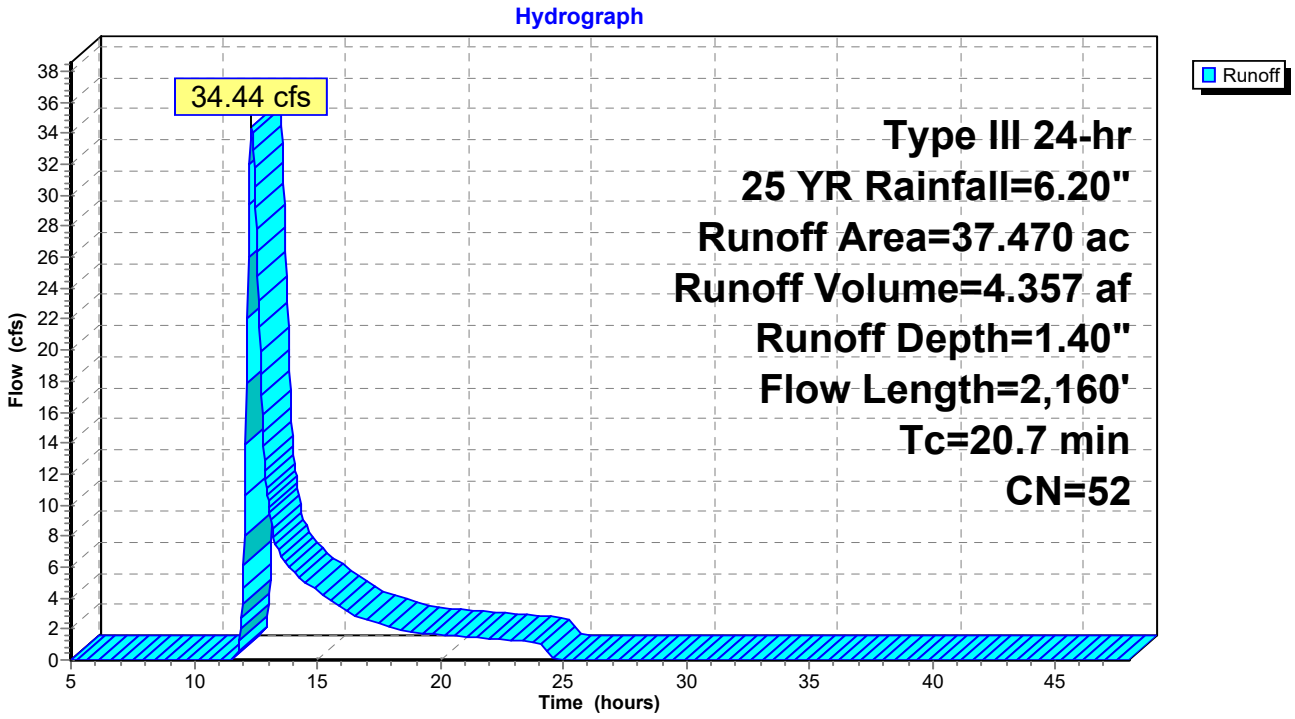
Runoff = 34.44 cfs @ 12.34 hrs, Volume= 4.357 af, Depth= 1.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 25 YR Rainfall=6.20"

Area (ac)	CN	Description
6.760	98	Paved parking, HSG C
3.290	98	Roofs, HSG C
9.960	30	Woods, Good, HSG A
17.460	39	Pasture/grassland/range, Good, HSG A
37.470	52	Weighted Average
27.420		73.18% Pervious Area
10.050		26.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
11.4	2,110	0.0230	3.08		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
20.7	2,160	Total			

Subcatchment DA 3: EAST OF ABERJONA



Summary for Pond D110: DMH 110

Inflow Area = 42.280 ac, 29.21% Impervious, Inflow Depth = 1.74" for 25 YR event
Inflow = 49.52 cfs @ 12.29 hrs, Volume= 6.114 af
Outflow = 49.52 cfs @ 12.29 hrs, Volume= 6.114 af, Atten= 0%, Lag= 0.0 min
Primary = 19.85 cfs @ 12.29 hrs, Volume= 4.972 af
Secondary = 29.67 cfs @ 12.29 hrs, Volume= 1.142 af

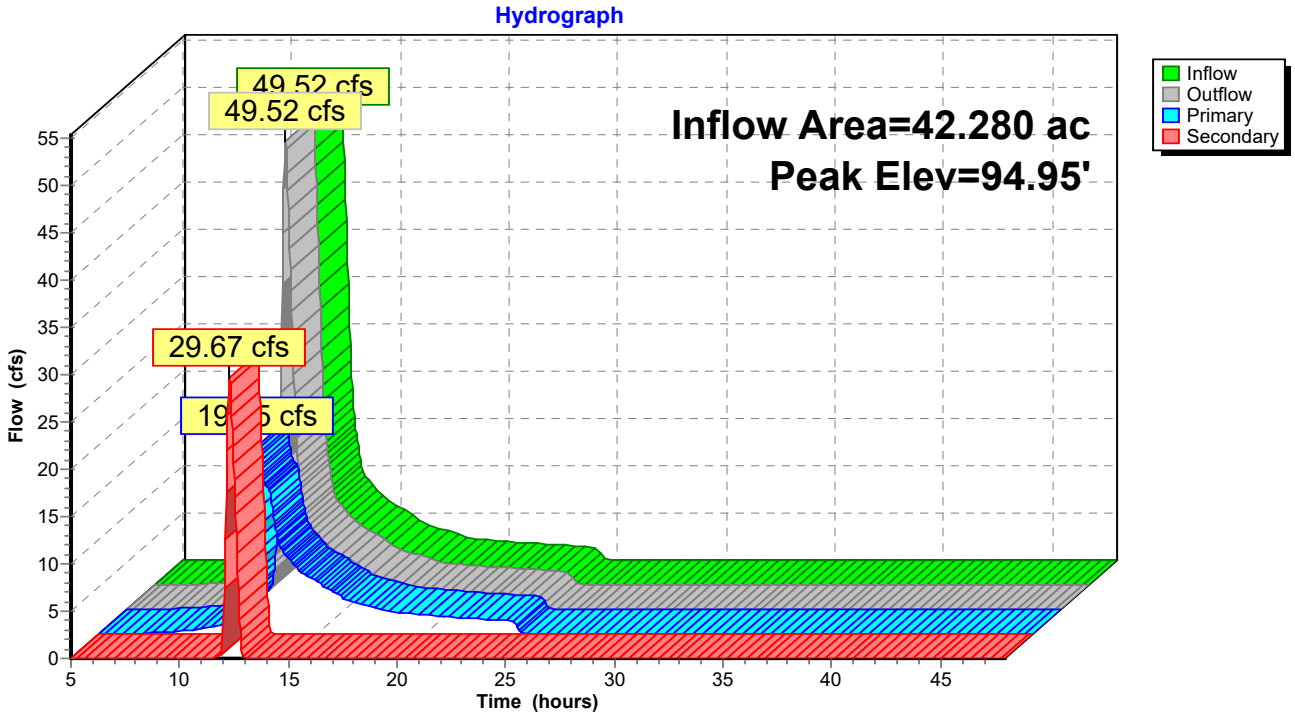
Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Peak Elev= 94.95' @ 12.29 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	85.30'	**18.0" Round Culvert** L= 143.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 85.30' / 84.60' S= 0.0049 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Secondary	91.10'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=19.84 cfs @ 12.29 hrs HW=94.94' (Free Discharge)
└**1=Culvert** (Barrel Controls 19.84 cfs @ 11.23 fps)

Secondary OutFlow Max=29.64 cfs @ 12.29 hrs HW=94.94' (Free Discharge)
└**2=Orifice/Grate** (Orifice Controls 29.64 cfs @ 9.43 fps)

Pond D110: DMH 110



Summary for Pond D120: DMH 120

Inflow Area = 42.280 ac, 29.21% Impervious, Inflow Depth = 1.41" for 25 YR event
Inflow = 19.85 cfs @ 12.29 hrs, Volume= 4.972 af
Outflow = 19.85 cfs @ 12.29 hrs, Volume= 4.972 af, Atten= 0%, Lag= 0.0 min
Primary = 19.60 cfs @ 12.29 hrs, Volume= 4.955 af
Secondary = 0.25 cfs @ 12.29 hrs, Volume= 0.017 af

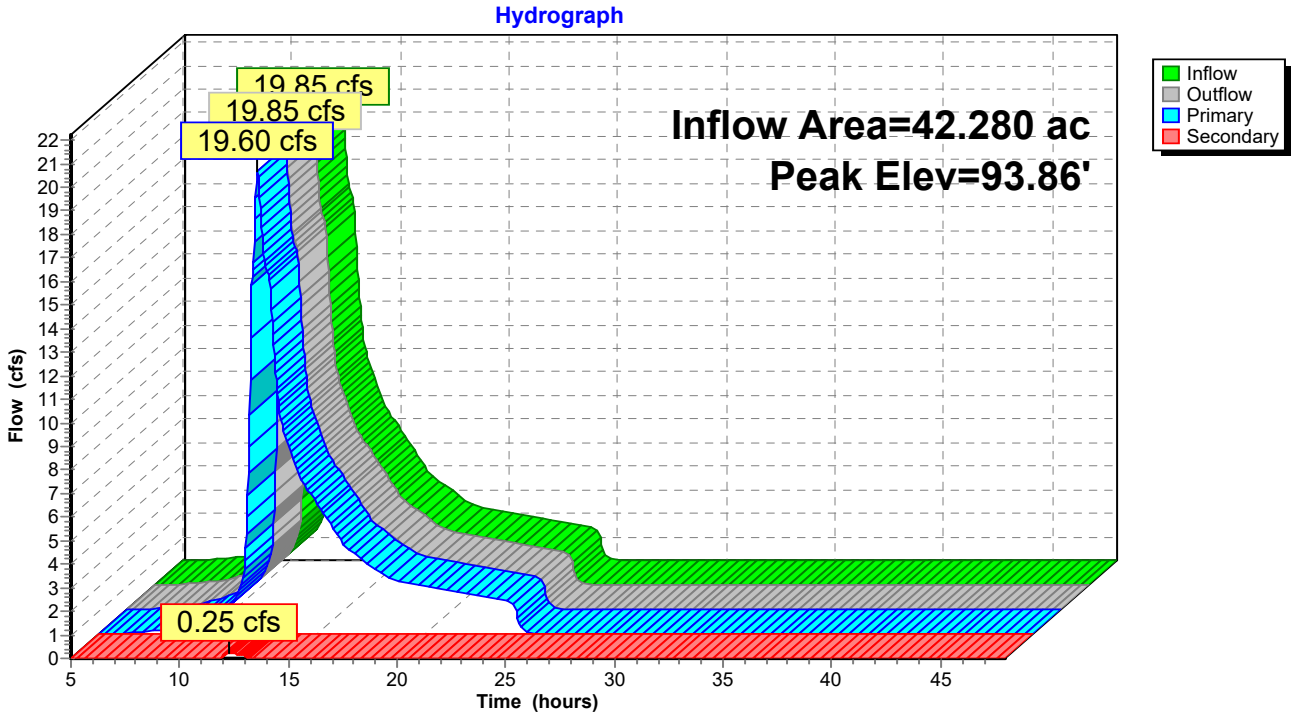
Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Peak Elev= 93.86' @ 12.29 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	84.60'	**18.0" Round Culvert** L= 126.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 84.60' / 84.00' S= 0.0048 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Secondary	88.01'	**2.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=19.59 cfs @ 12.29 hrs HW=93.85' (Free Discharge)
└**1=Culvert** (Inlet Controls 19.59 cfs @ 11.08 fps)

Secondary OutFlow Max=0.25 cfs @ 12.29 hrs HW=93.85' (Free Discharge)
└**2=Orifice/Grate** (Orifice Controls 0.25 cfs @ 11.64 fps)

Pond D120: DMH 120



Summary for Pond F1: FOREBAY

Inflow Area = 45.380 ac, 28.98% Impervious, Inflow Depth = 1.44" for 25 YR event
Inflow = 24.28 cfs @ 12.28 hrs, Volume= 5.463 af
Outflow = 24.26 cfs @ 12.29 hrs, Volume= 5.450 af, Atten= 0%, Lag= 0.8 min
Discarded = 0.01 cfs @ 12.29 hrs, Volume= 0.034 af
Primary = 24.25 cfs @ 12.29 hrs, Volume= 5.416 af

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Peak Elev= 85.22' @ 12.29 hrs Surf.Area= 2,029 sf Storage= 2,651 cf

Plug-Flow detention time= 8.4 min calculated for 5.447 af (100% of inflow)
Center-of-Mass det. time= 7.9 min (908.4 - 900.5)

Volume	Invert	Avail.Storage	Storage Description
#1	83.50'	12,853 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

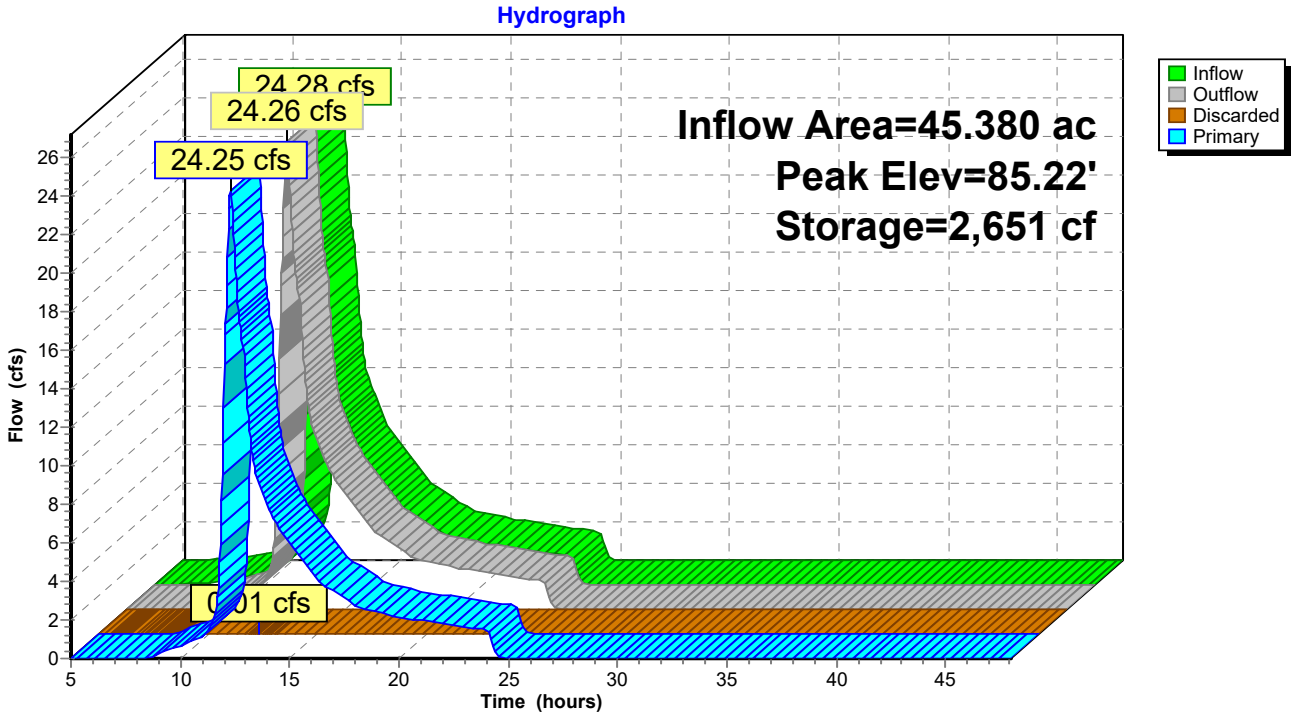
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
83.50	1,040	0	0
84.00	1,321	590	590
84.50	1,701	756	1,346
85.00	1,843	886	2,232
86.00	2,700	2,272	4,503
87.00	4,000	3,350	7,853
88.00	6,000	5,000	12,853

Device	Routing	Invert	Outlet Devices
#1	Primary	84.50'	**15.0' long x 20.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Discarded	83.50'	**0.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.01 cfs @ 12.29 hrs HW=85.22' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=24.22 cfs @ 12.29 hrs HW=85.22' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 24.22 cfs @ 2.26 fps)

Pond F1: FOREBAY



Summary for Pond F2: FOREBAY

Inflow Area = 45.380 ac, 28.98% Impervious, Inflow Depth = 1.43" for 25 YR event
Inflow = 24.25 cfs @ 12.29 hrs, Volume= 5.416 af
Outflow = 24.20 cfs @ 12.31 hrs, Volume= 5.401 af, Atten= 0%, Lag= 0.9 min
Discarded = 0.02 cfs @ 12.31 hrs, Volume= 0.038 af
Primary = 24.19 cfs @ 12.31 hrs, Volume= 5.363 af

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Peak Elev= 85.22' @ 12.31 hrs Surf.Area= 2,441 sf Storage= 3,144 cf

Plug-Flow detention time= 9.3 min calculated for 5.397 af (100% of inflow)
Center-of-Mass det. time= 8.7 min (912.8 - 904.1)

Volume	Invert	Avail.Storage	Storage Description
#1	83.50'	14,130 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

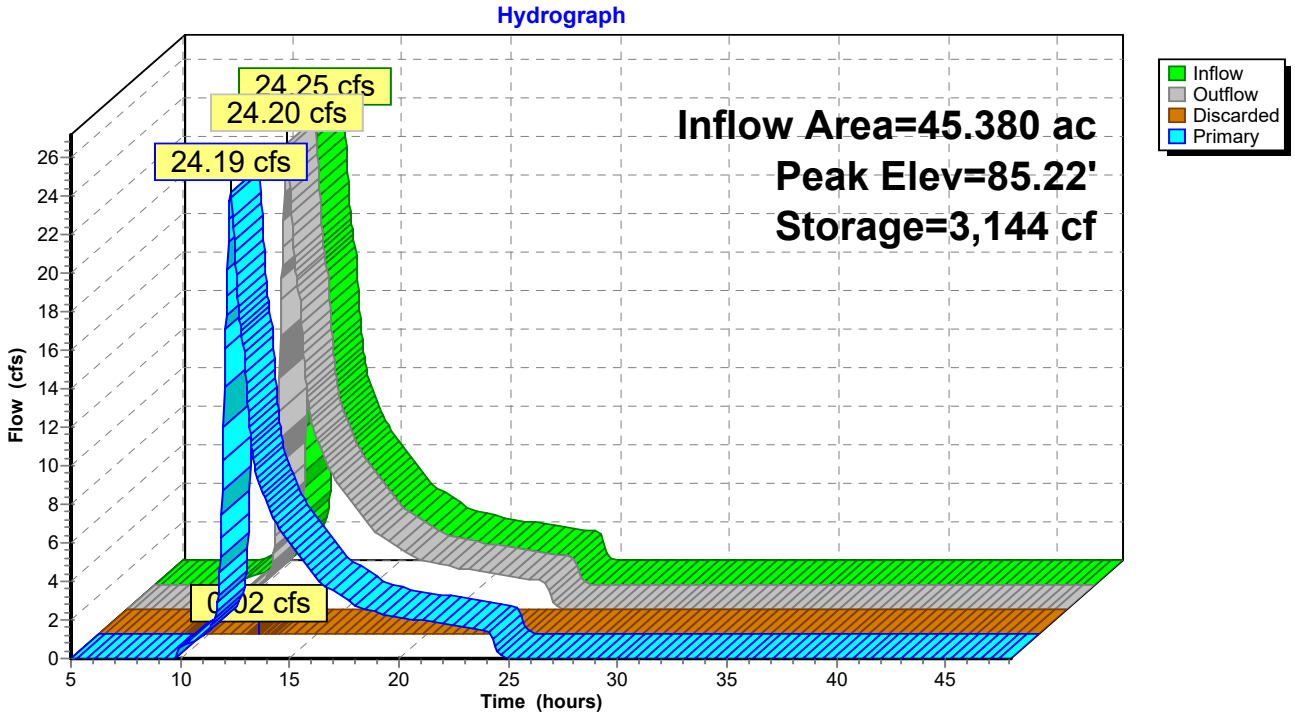
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
83.50	1,266	0	0
84.00	1,481	687	687
84.50	2,013	874	1,560
85.00	2,288	1,075	2,636
86.00	3,000	2,644	5,280
87.00	4,500	3,750	9,030
88.00	5,700	5,100	14,130

Device	Routing	Invert	Outlet Devices
#1	Primary	84.50'	**15.0' long x 20.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Discarded	83.50'	**0.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.02 cfs @ 12.31 hrs HW=85.21' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=24.15 cfs @ 12.31 hrs HW=85.21' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 24.15 cfs @ 2.25 fps)

Pond F2: FOREBAY



Summary for Pond F3: FOREBAY

Inflow Area = 0.162 ac,100.00% Impervious, Inflow Depth > 5.78" for 25 YR event
Inflow = 1.01 cfs @ 12.07 hrs, Volume= 0.078 af
Outflow = 0.99 cfs @ 12.09 hrs, Volume= 0.076 af, Atten= 2%, Lag= 1.0 min
Primary = 0.99 cfs @ 12.09 hrs, Volume= 0.076 af

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Peak Elev= 86.93' @ 12.09 hrs Surf.Area= 503 sf Storage= 190 cf

Plug-Flow detention time= 35.0 min calculated for 0.076 af (97% of inflow)
Center-of-Mass det. time= 15.8 min (776.3 - 760.5)

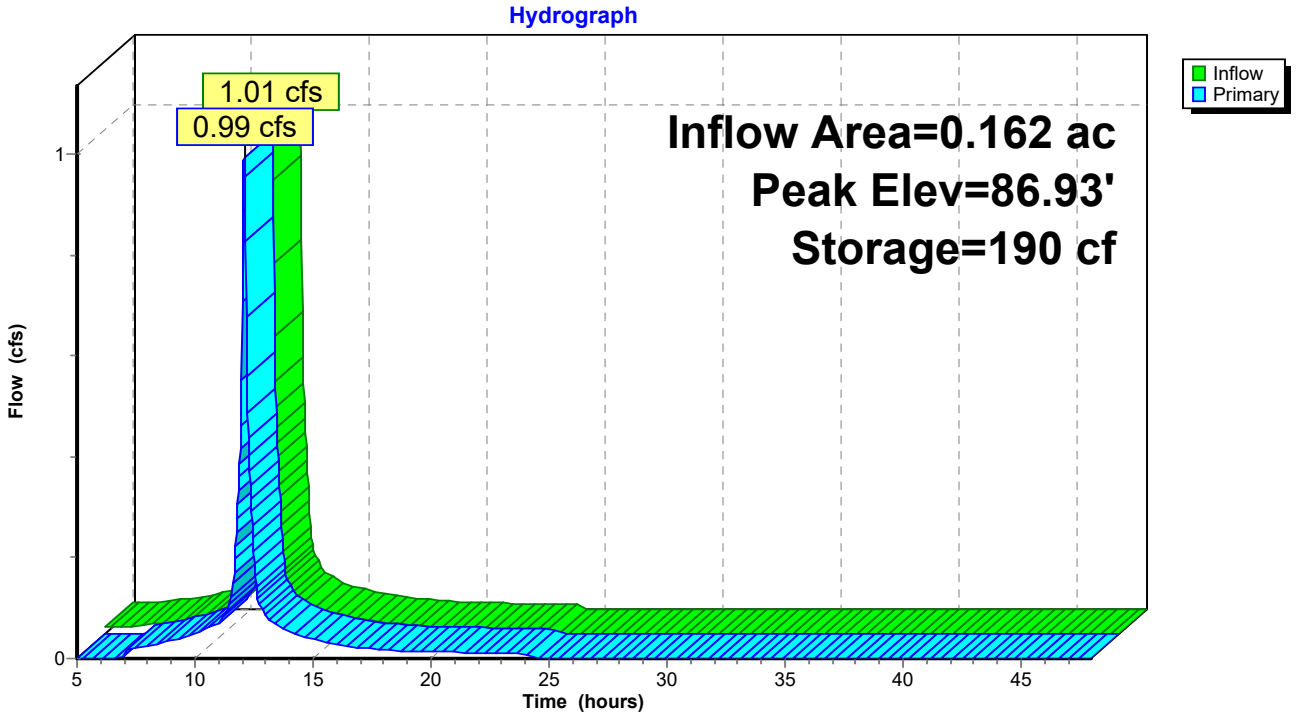
Volume	Invert	Avail.Storage	Storage Description
#1	86.50'	369 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
86.50	400	0	0
86.75	450	106	106
87.25	600	263	369

Device	Routing	Invert	Outlet Devices
#1	Primary	86.75'	**5.0' long x 15.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.98 cfs @ 12.09 hrs HW=86.92' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 0.98 cfs @ 1.12 fps)

Pond F3: FOREBAY



Summary for Pond P1: CELL 1

Inflow Area = 45.380 ac, 28.98% Impervious, Inflow Depth = 1.42" for 25 YR event
Inflow = 24.19 cfs @ 12.31 hrs, Volume= 5.363 af
Outflow = 23.22 cfs @ 12.40 hrs, Volume= 5.363 af, Atten= 4%, Lag= 5.2 min
Primary = 12.62 cfs @ 12.40 hrs, Volume= 4.883 af
Secondary = 10.60 cfs @ 12.40 hrs, Volume= 0.480 af

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Starting Elev= 84.50' Surf.Area= 9,400 sf Storage= 15,153 cf
Peak Elev= 85.76' @ 12.40 hrs Surf.Area= 11,263 sf Storage= 28,089 cf (12,936 cf above start)

Plug-Flow detention time= 56.8 min calculated for 5.015 af (94% of inflow)
Center-of-Mass det. time= 8.3 min (916.0 - 907.7)

Volume	Invert	Avail.Storage	Storage Description
#1	79.00'	46,228 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

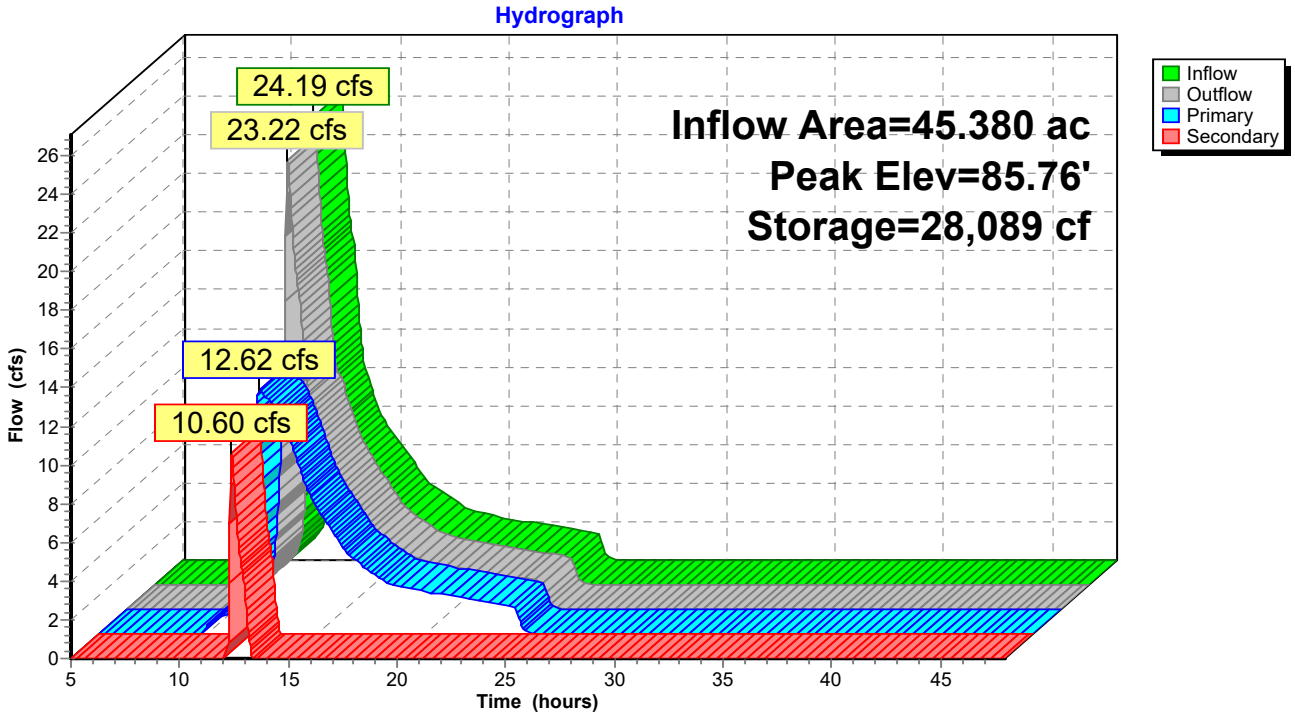
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
79.00	350	0	0
80.00	761	556	556
81.00	1,501	1,131	1,687
82.00	2,224	1,863	3,549
83.00	3,057	2,641	6,190
84.00	6,780	4,919	11,108
84.50	9,400	4,045	15,153
85.00	10,100	4,875	20,028
85.50	10,800	5,225	25,253
86.00	11,700	5,625	30,878
87.00	19,000	15,350	46,228

Device	Routing	Invert	Outlet Devices
#1	Primary	82.50'	**24.0" Round Culvert** L= 250.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 80.50' / 82.50' S= -0.0080 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#2	Secondary	85.50'	**30.0' long x 15.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=12.62 cfs @ 12.40 hrs HW=85.76' TW=84.50' (Fixed TW Elev= 84.50')
↑—**1=Culvert** (Outlet Controls 12.62 cfs @ 4.02 fps)

Secondary OutFlow Max=10.47 cfs @ 12.40 hrs HW=85.76' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 10.47 cfs @ 1.36 fps)

Pond P1: CELL 1



Summary for Pond P2: CELL 2

Inflow Area = 48.332 ac, 28.93% Impervious, Inflow Depth = 1.32" for 25 YR event
Inflow = 15.73 cfs @ 12.32 hrs, Volume= 5.301 af
Outflow = 15.68 cfs @ 12.35 hrs, Volume= 5.301 af, Atten= 0%, Lag= 1.9 min
Primary = 15.68 cfs @ 12.35 hrs, Volume= 5.301 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Starting Elev= 84.50' Surf.Area= 5,620 sf Storage= 6,541 cf
Peak Elev= 84.85' @ 12.35 hrs Surf.Area= 6,586 sf Storage= 8,677 cf (2,136 cf above start)

Plug-Flow detention time= 26.0 min calculated for 5.151 af (97% of inflow)
Center-of-Mass det. time= 3.1 min (929.9 - 926.8)

Volume	Invert	Avail.Storage	Storage Description
#1	79.00'	17,196 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

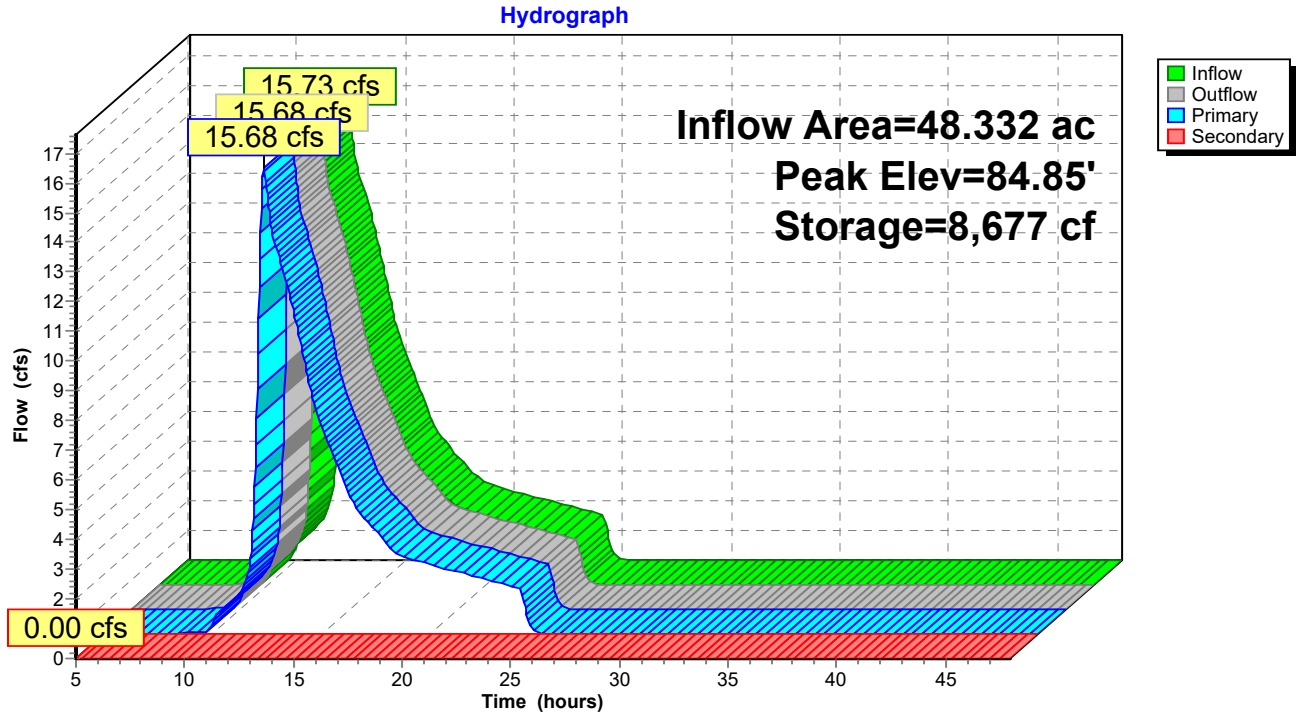
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
79.00	2	0	0
80.00	92	47	47
81.00	292	192	239
82.00	731	512	751
83.00	1,320	1,026	1,776
84.00	3,600	2,460	4,236
84.50	5,620	2,305	6,541
85.00	7,000	3,155	9,696
86.00	8,000	7,500	17,196

Device	Routing	Invert	Outlet Devices
#1	Primary	84.50'	**30.0' long x 8.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74
#2	Secondary	85.50'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=15.61 cfs @ 12.35 hrs HW=84.85' TW=84.50' (Fixed TW Elev= 84.50')
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 15.61 cfs @ 1.49 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=84.50' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond P2: CELL 2



Summary for Pond P3: CELL 3

Inflow Area = 48.332 ac, 28.93% Impervious, Inflow Depth = 1.32" for 25 YR event
Inflow = 15.68 cfs @ 12.35 hrs, Volume= 5.301 af
Outflow = 15.61 cfs @ 12.39 hrs, Volume= 5.301 af, Atten= 0%, Lag= 2.4 min
Primary = 15.61 cfs @ 12.39 hrs, Volume= 5.301 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Starting Elev= 84.50' Surf.Area= 6,663 sf Storage= 7,197 cf
Peak Elev= 84.88' @ 12.39 hrs Surf.Area= 7,216 sf Storage= 9,812 cf (2,615 cf above start)

Plug-Flow detention time= 28.9 min calculated for 5.136 af (97% of inflow)
Center-of-Mass det. time= 3.9 min (933.8 - 929.9)

Volume	Invert	Avail.Storage	Storage Description
#1	79.00'	18,411 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

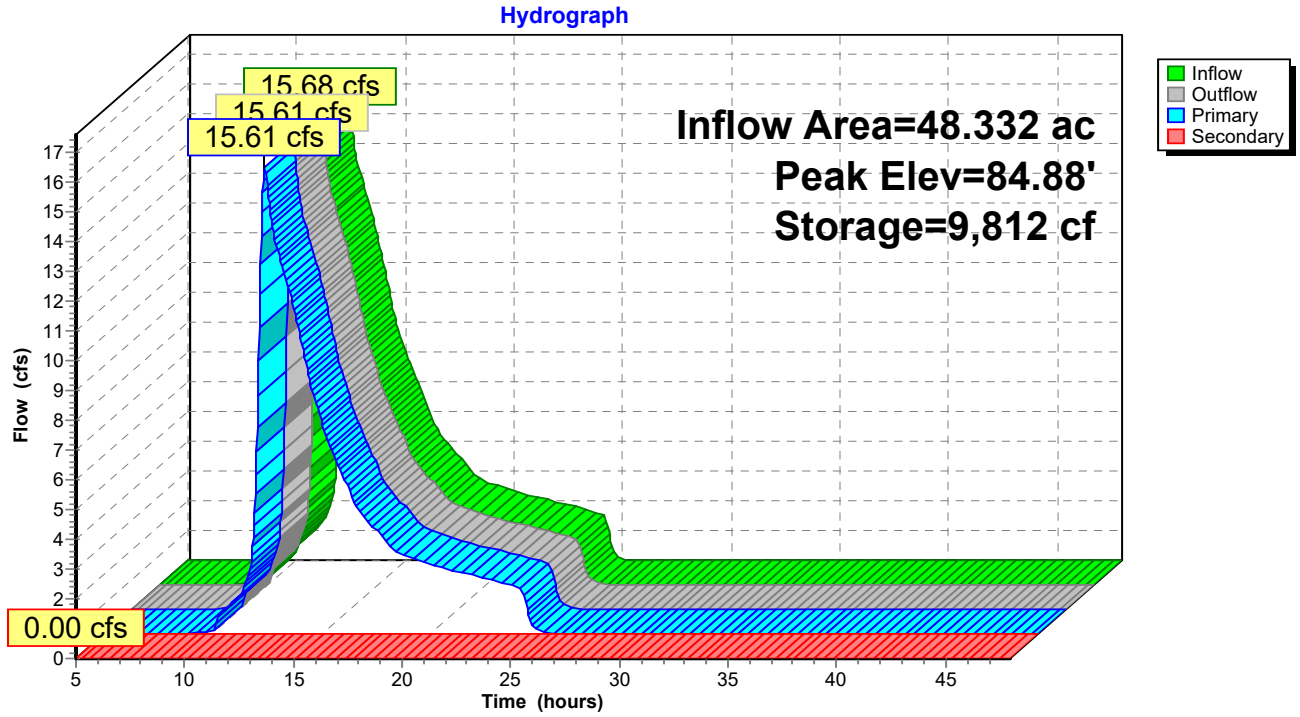
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
79.00	14	0	0
80.00	85	50	50
81.00	375	230	280
82.00	826	601	880
83.00	1,383	1,105	1,985
84.00	3,807	2,595	4,580
84.50	6,663	2,618	7,197
85.00	7,397	3,515	10,712
86.00	8,000	7,699	18,411

Device	Routing	Invert	Outlet Devices
#1	Primary	84.50'	**25.0' long x 17.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Secondary	86.25'	**100.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=15.59 cfs @ 12.39 hrs HW=84.88' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 15.59 cfs @ 1.66 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=84.50' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond P3: CELL 3

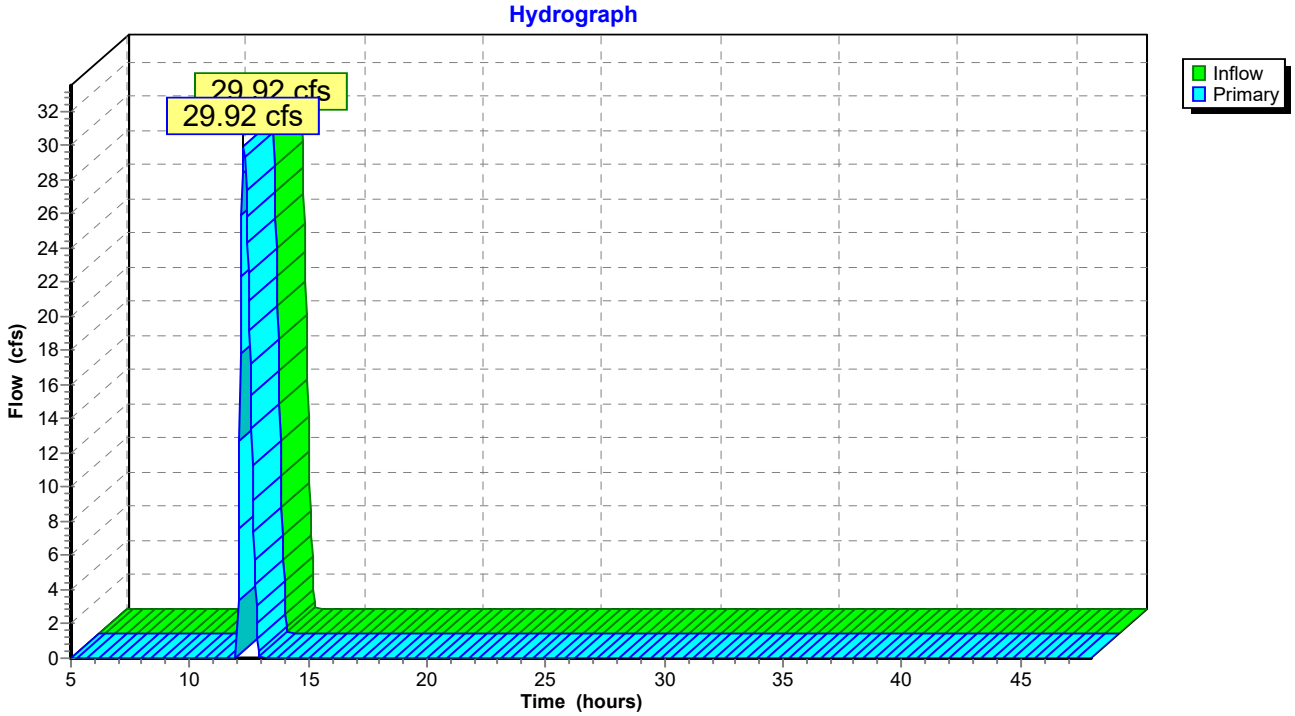


Summary for Pond SP1: ABERJONA RIVER

Inflow	=	29.92 cfs @	12.29 hrs, Volume=	1.159 af
Primary	=	29.92 cfs @	12.29 hrs, Volume=	1.159 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs

Pond SP1: ABERJONA RIVER

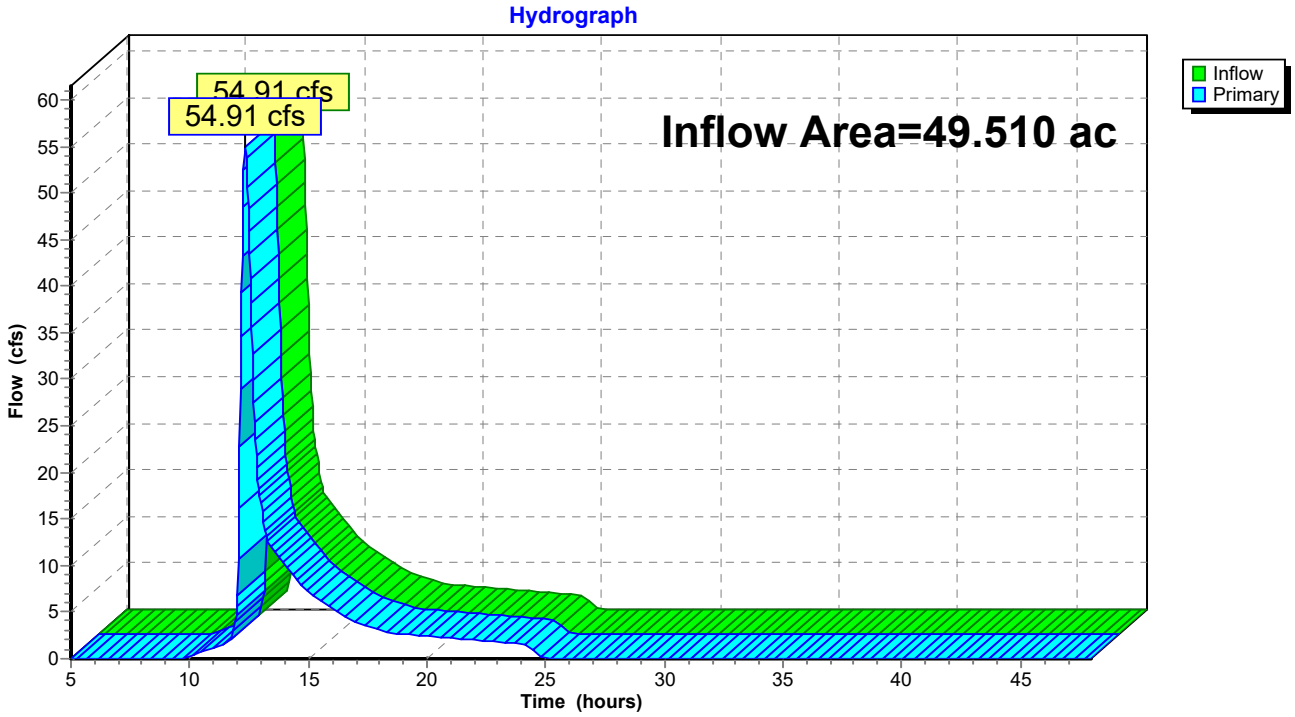


Summary for Pond SP2: ABERJONA RIVER

Inflow Area = 49.510 ac, 28.83% Impervious, Inflow Depth = 1.71" for 25 YR event
Inflow = 54.91 cfs @ 12.35 hrs, Volume= 7.041 af
Primary = 54.91 cfs @ 12.35 hrs, Volume= 7.041 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs

Pond SP2: ABERJONA RIVER



Time span=5.00-48.00 hrs, dt=0.03 hrs, 1434 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 DA 1: LOWELL STREET Runoff Area=4.810 ac 47.82% Impervious Runoff Depth>5.56"
Flow Length=1,080' Tc=15.1 min CN=84 Runoff=23.11 cfs 2.228 af

Subcatchment DA 2A: BACK OF LOTS E Runoff Area=3.100 ac 25.81% Impervious Runoff Depth=2.82"
Flow Length=614' Tc=18.1 min CN=59 Runoff=6.95 cfs 0.727 af

Subcatchment DA 2B: BACK OF LOTS MID Runoff Area=1.178 ac 24.62% Impervious Runoff Depth=1.63"
Flow Length=250' Tc=8.5 min CN=47 Runoff=1.73 cfs 0.160 af

Subcatchment DA 2C: BACK OF LOTS W Runoff Area=2.790 ac 24.01% Impervious Runoff Depth=2.21"
Flow Length=522' Tc=16.3 min CN=53 Runoff=4.86 cfs 0.514 af

Subcatchment DA 2D: PARKING Runoff Area=7,066 sf 100.00% Impervious Runoff Depth>6.96"
Tc=5.0 min CN=98 Runoff=1.22 cfs 0.094 af

Subcatchment DA 3: EAST OF ABERJONA Runoff Area=37.470 ac 26.82% Impervious Runoff Depth=2.11"
Flow Length=2,160' Tc=20.7 min CN=52 Runoff=56.13 cfs 6.591 af

Pond D110: DMH 110 Peak Elev=101.69' Inflow=75.59 cfs 8.819 af
Primary=26.35 cfs 6.613 af Secondary=49.23 cfs 2.206 af Outflow=75.59 cfs 8.819 af

Pond D120: DMH 120 Peak Elev=100.31' Inflow=26.35 cfs 6.613 af
Primary=25.99 cfs 6.585 af Secondary=0.37 cfs 0.029 af Outflow=26.35 cfs 6.613 af

Pond F1: FOREBAY Peak Elev=85.38' Storage=3,002 cf Inflow=32.93 cfs 7.312 af
Discarded=0.01 cfs 0.035 af Primary=32.86 cfs 7.264 af Outflow=32.87 cfs 7.299 af

Pond F2: FOREBAY Peak Elev=85.38' Storage=3,563 cf Inflow=32.86 cfs 7.264 af
Discarded=0.02 cfs 0.039 af Primary=32.80 cfs 7.210 af Outflow=32.81 cfs 7.249 af

Pond F3: FOREBAY Peak Elev=86.95' Storage=202 cf Inflow=1.22 cfs 0.094 af
Outflow=1.19 cfs 0.092 af

Pond P1: CELL 1 Peak Elev=85.88' Storage=29,476 cf Inflow=32.80 cfs 7.210 af
Primary=13.22 cfs 6.223 af Secondary=18.89 cfs 0.987 af Outflow=32.11 cfs 7.210 af

Pond P2: CELL 2 Peak Elev=84.89' Storage=8,922 cf Inflow=18.39 cfs 6.828 af
Primary=18.33 cfs 6.828 af Secondary=0.00 cfs 0.000 af Outflow=18.33 cfs 6.828 af

Pond P3: CELL 3 Peak Elev=84.92' Storage=10,104 cf Inflow=18.33 cfs 6.828 af
Primary=18.22 cfs 6.828 af Secondary=0.00 cfs 0.000 af Outflow=18.22 cfs 6.828 af

Pond SP1: ABERJONA RIVER Inflow=49.60 cfs 2.234 af
Primary=49.60 cfs 2.234 af

Pond SP2: ABERJONA RIVER Inflow=86.80 cfs 10.210 af
Primary=86.80 cfs 10.210 af

Total Runoff Area = 49.510 ac Runoff Volume = 10.314 af Average Runoff Depth = 2.50"
71.17% Pervious = 35.238 ac 28.83% Impervious = 14.272 ac

Summary for Subcatchment DA 1: LOWELL STREET

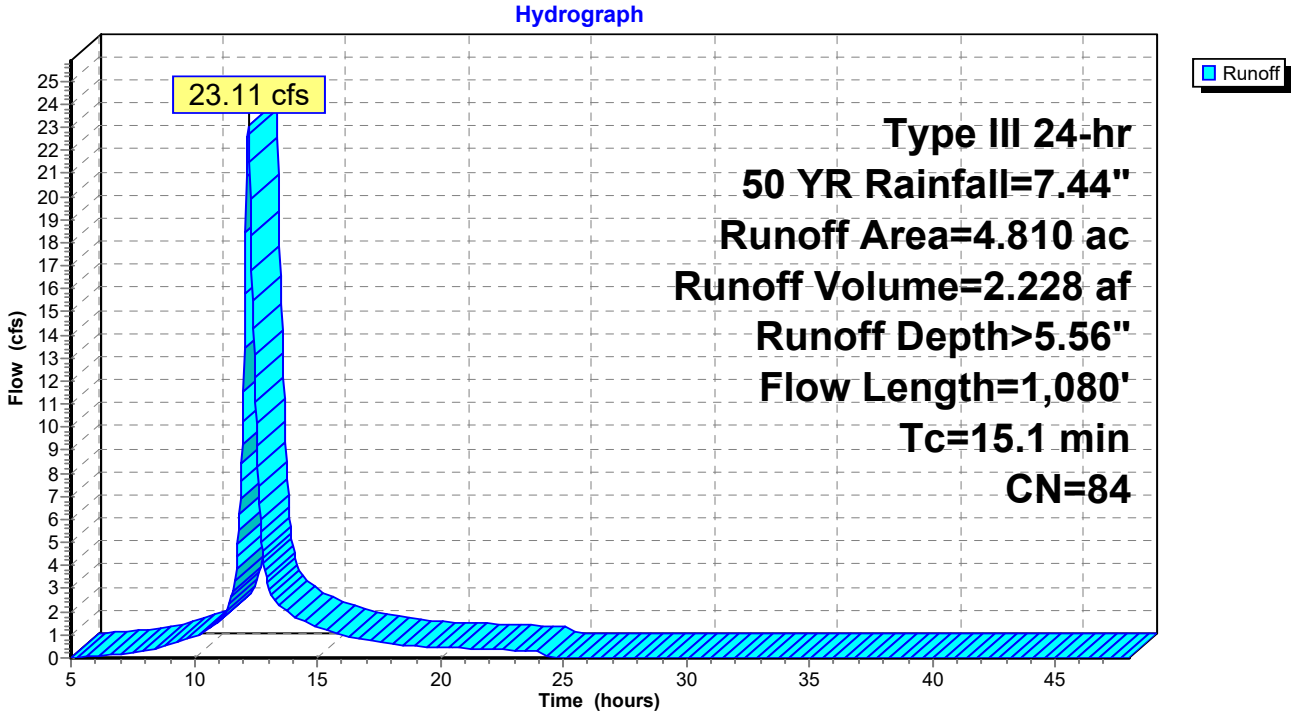
Runoff = 23.11 cfs @ 12.20 hrs, Volume= 2.228 af, Depth> 5.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 50 YR Rainfall=7.44"

Area (ac)	CN	Description
1.800	98	Paved parking, HSG C
0.500	98	Roofs, HSG C
1.250	70	Woods, Good, HSG C
1.260	74	Pasture/grassland/range, Good, HSG C
4.810	84	Weighted Average
2.510		52.18% Pervious Area
2.300		47.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
5.8	1,030	0.0210	2.94		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
15.1	1,080	Total			

Subcatchment DA 1: LOWELL STREET



Summary for Subcatchment DA 2A: BACK OF LOTS E

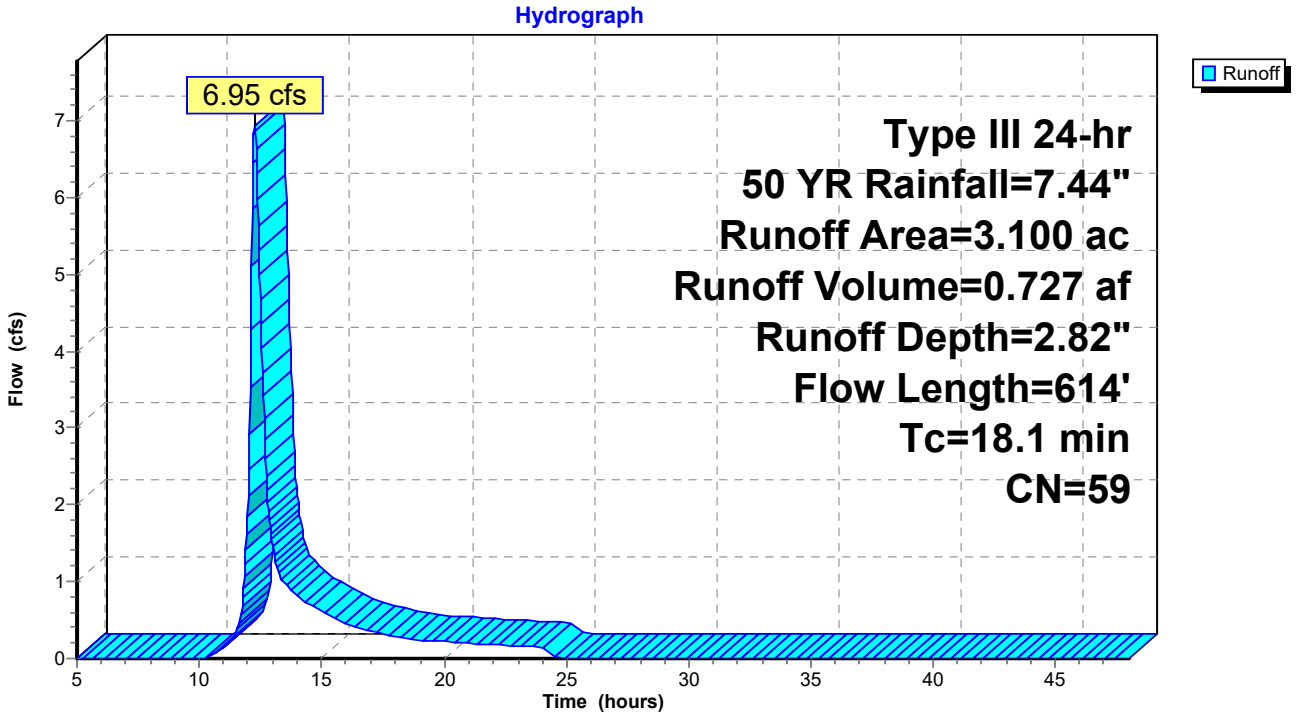
Runoff = 6.95 cfs @ 12.26 hrs, Volume= 0.727 af, Depth= 2.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 50 YR Rainfall=7.44"

Area (ac)	CN	Description
0.250	98	Paved parking, HSG C
0.020	72	Dirt roads, HSG A
0.110	87	Dirt roads, HSG C
0.260	98	Roofs, HSG C
0.290	98	Water Surface, HSG C
1.220	30	Woods, Good, HSG A
0.550	70	Woods, Good, HSG C
0.290	39	Pasture/grassland/range, Good, HSG A
0.110	74	Pasture/grassland/range, Good, HSG C
3.100	59	Weighted Average
2.300		74.19% Pervious Area
0.800		25.81% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
5.8	564	0.1040	1.61		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
18.1	614	Total			

Subcatchment DA 2A: BACK OF LOTS E



Summary for Subcatchment DA 2B: BACK OF LOTS MID

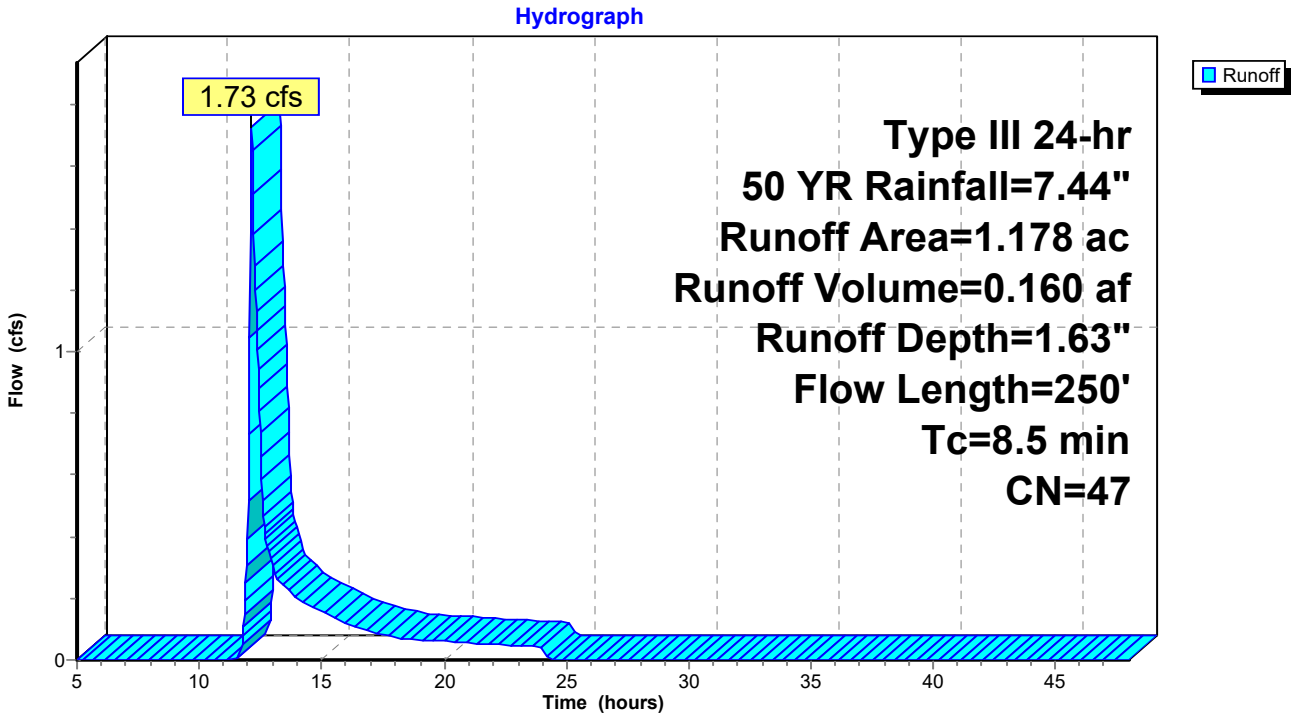
Runoff = 1.73 cfs @ 12.14 hrs, Volume= 0.160 af, Depth= 1.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 50 YR Rainfall=7.44"

Area (ac)	CN	Description
0.130	98	Paved parking, HSG C
0.160	98	Roofs, HSG C
0.868	30	Woods, Good, HSG A
0.020	39	Pasture/grassland/range, Good, HSG A
1.178	47	Weighted Average
0.888		75.38% Pervious Area
0.290		24.62% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.1000	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
2.0	200	0.1150	1.70		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.5	250	Total			

Subcatchment DA 2B: BACK OF LOTS MID



Summary for Subcatchment DA 2C: BACK OF LOTS W

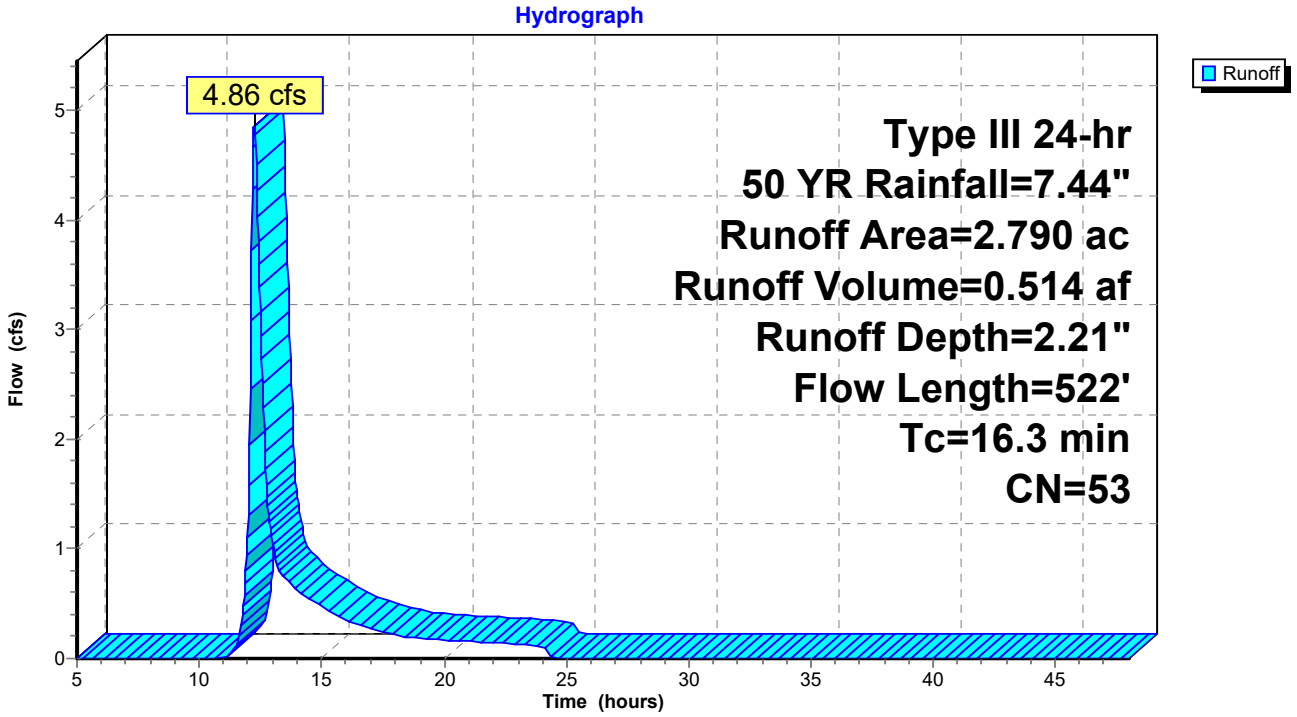
Runoff = 4.86 cfs @ 12.25 hrs, Volume= 0.514 af, Depth= 2.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 50 YR Rainfall=7.44"

Area (ac)	CN	Description
0.250	98	Paved parking, HSG C
0.090	72	Dirt roads, HSG A
0.040	87	Dirt roads, HSG C
0.120	98	Roofs, HSG C
0.300	98	Water Surface, HSG C
1.520	30	Woods, Good, HSG A
0.270	70	Woods, Good, HSG C
0.200	39	Pasture/grassland/range, Good, HSG A
0.000	74	Pasture/grassland/range, Good, HSG C
2.790	53	Weighted Average
2.120		75.99% Pervious Area
0.670		24.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
7.0	472	0.0510	1.13		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
16.3	522	Total			

Subcatchment DA 2C: BACK OF LOTS W



Summary for Subcatchment DA 2D: PARKING

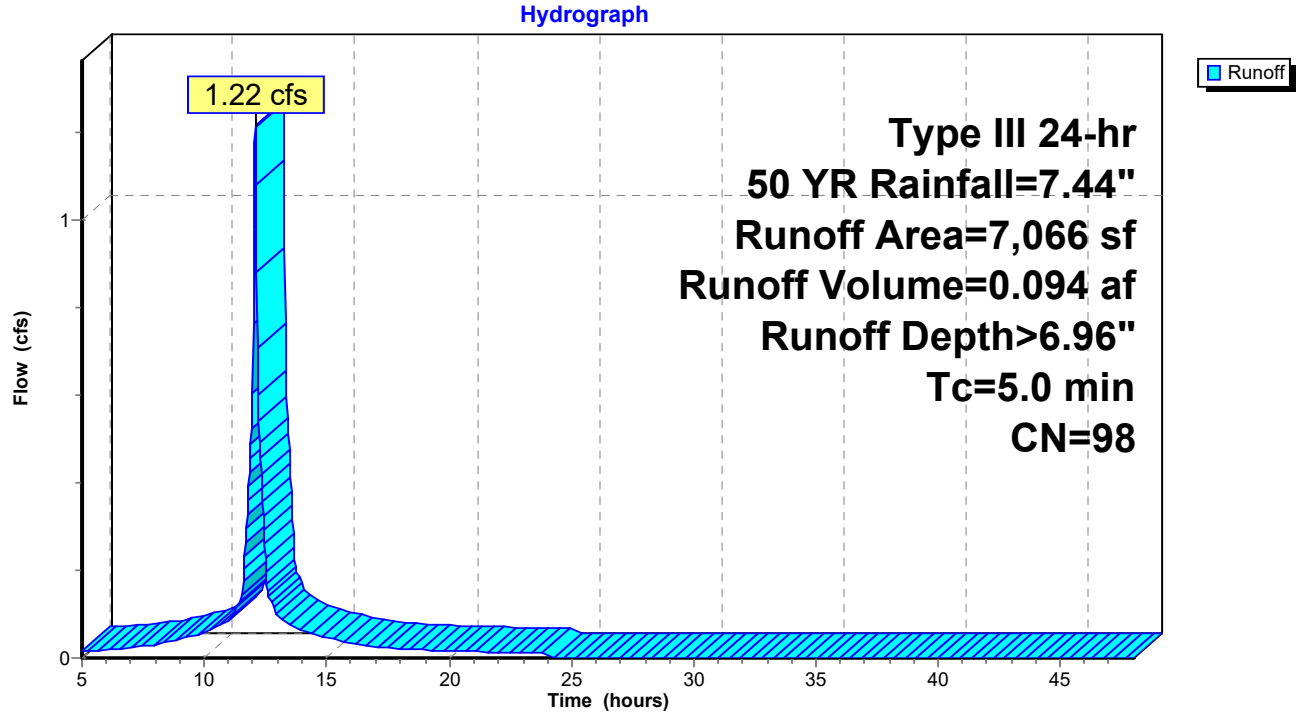
Runoff = 1.22 cfs @ 12.07 hrs, Volume= 0.094 af, Depth> 6.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 50 YR Rainfall=7.44"

Area (sf)	CN	Description
7,066	98	Paved parking, HSG C
7,066		100.00% Impervious Area

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

Subcatchment DA 2D: PARKING



Summary for Subcatchment DA 3: EAST OF ABERJONA

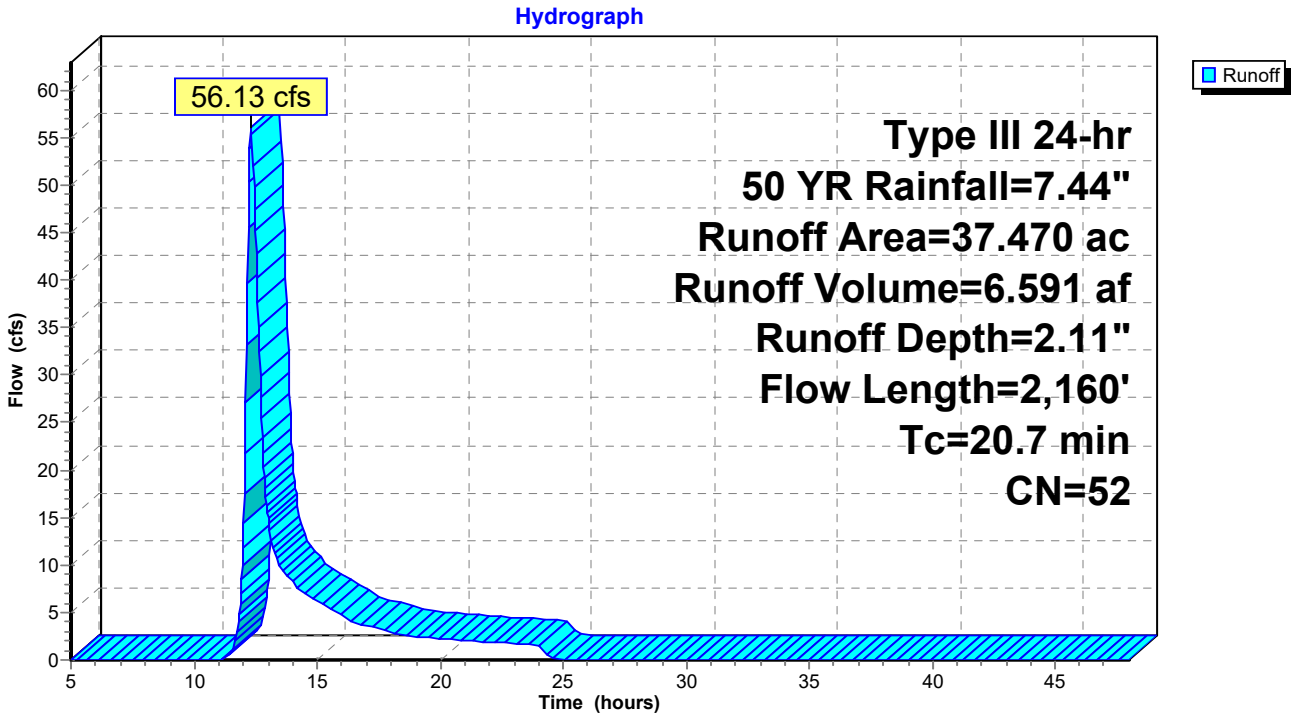
Runoff = 56.13 cfs @ 12.32 hrs, Volume= 6.591 af, Depth= 2.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 50 YR Rainfall=7.44"

Area (ac)	CN	Description
6.760	98	Paved parking, HSG C
3.290	98	Roofs, HSG C
9.960	30	Woods, Good, HSG A
17.460	39	Pasture/grassland/range, Good, HSG A
37.470	52	Weighted Average
27.420		73.18% Pervious Area
10.050		26.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
11.4	2,110	0.0230	3.08		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
20.7	2,160	Total			

Subcatchment DA 3: EAST OF ABERJONA



Summary for Pond D110: DMH 110

Inflow Area = 42.280 ac, 29.21% Impervious, Inflow Depth > 2.50" for 50 YR event
Inflow = 75.59 cfs @ 12.28 hrs, Volume= 8.819 af
Outflow = 75.59 cfs @ 12.28 hrs, Volume= 8.819 af, Atten= 0%, Lag= 0.0 min
Primary = 26.35 cfs @ 12.28 hrs, Volume= 6.613 af
Secondary = 49.23 cfs @ 12.28 hrs, Volume= 2.206 af

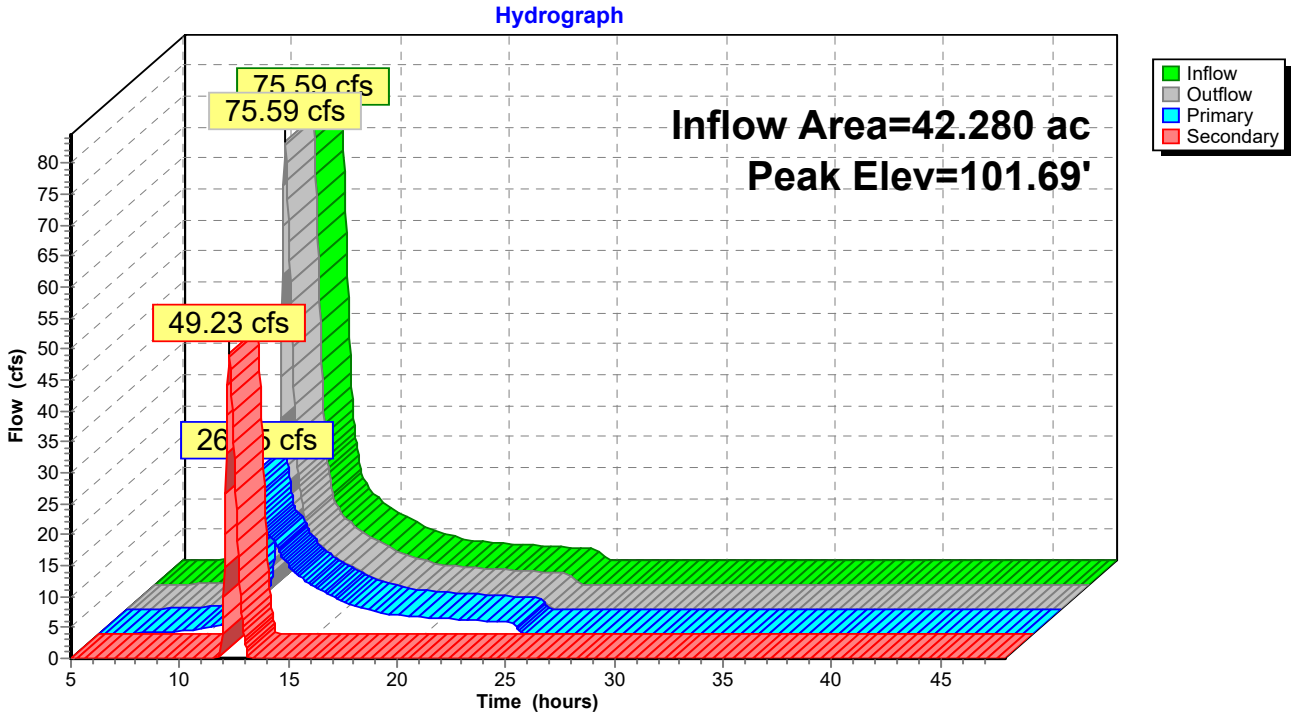
Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Peak Elev= 101.69' @ 12.28 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	85.30'	**18.0" Round Culvert** L= 143.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 85.30' / 84.60' S= 0.0049 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Secondary	91.10'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=26.32 cfs @ 12.28 hrs HW=101.65' (Free Discharge)
└**1=Culvert** (Barrel Controls 26.32 cfs @ 14.89 fps)

Secondary OutFlow Max=49.13 cfs @ 12.28 hrs HW=101.65' (Free Discharge)
└**2=Orifice/Grate** (Orifice Controls 49.13 cfs @ 15.64 fps)

Pond D110: DMH 110



Summary for Pond D120: DMH 120

Inflow Area = 42.280 ac, 29.21% Impervious, Inflow Depth > 1.88" for 50 YR event
Inflow = 26.35 cfs @ 12.28 hrs, Volume= 6.613 af
Outflow = 26.35 cfs @ 12.28 hrs, Volume= 6.613 af, Atten= 0%, Lag= 0.0 min
Primary = 25.99 cfs @ 12.28 hrs, Volume= 6.585 af
Secondary = 0.37 cfs @ 12.28 hrs, Volume= 0.029 af

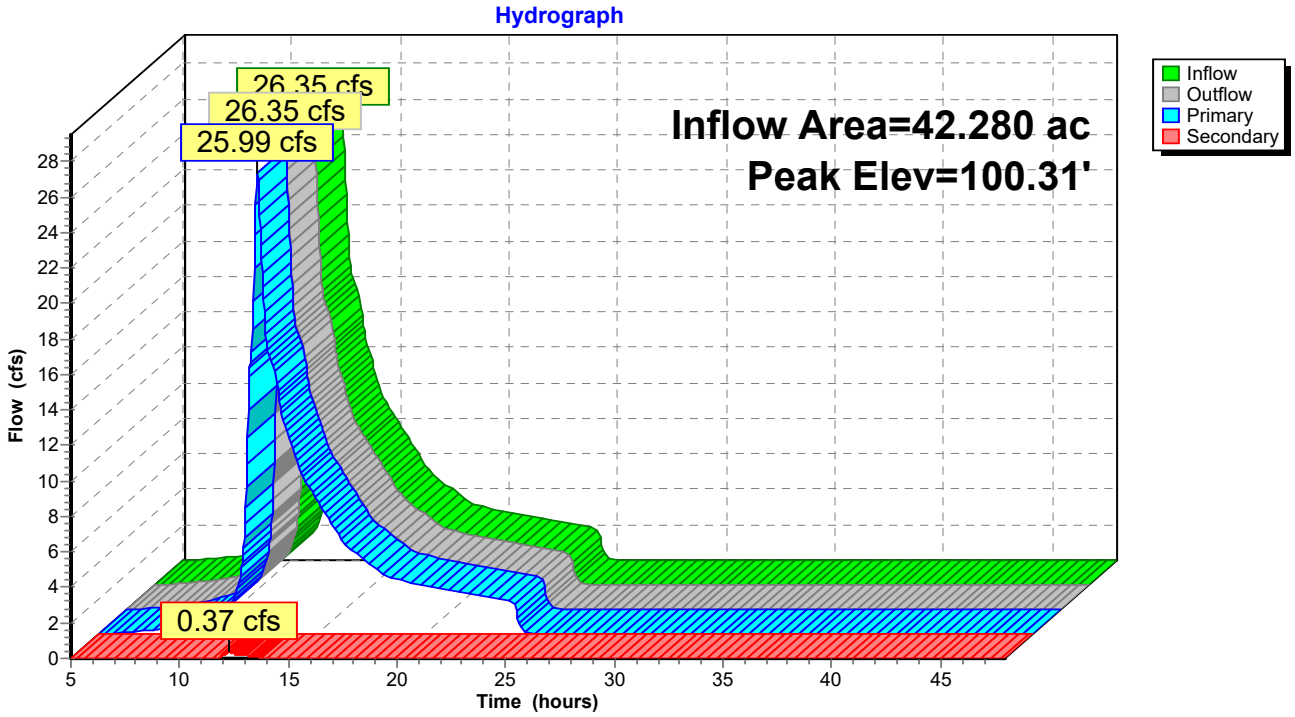
Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Peak Elev= 100.31' @ 12.28 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	84.60'	**18.0" Round Culvert** L= 126.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 84.60' / 84.00' S= 0.0048 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Secondary	88.01'	**2.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=25.95 cfs @ 12.28 hrs HW=100.27' (Free Discharge)
└**1=Culvert** (Inlet Controls 25.95 cfs @ 14.68 fps)

Secondary OutFlow Max=0.37 cfs @ 12.28 hrs HW=100.27' (Free Discharge)
└**2=Orifice/Grate** (Orifice Controls 0.37 cfs @ 16.86 fps)

Pond D120: DMH 120



Summary for Pond F1: FOREBAY

Inflow Area = 45.380 ac, 28.98% Impervious, Inflow Depth > 1.93" for 50 YR event
Inflow = 32.93 cfs @ 12.27 hrs, Volume= 7.312 af
Outflow = 32.87 cfs @ 12.29 hrs, Volume= 7.299 af, Atten= 0%, Lag= 0.8 min
Discarded = 0.01 cfs @ 12.29 hrs, Volume= 0.035 af
Primary = 32.86 cfs @ 12.29 hrs, Volume= 7.264 af

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Peak Elev= 85.38' @ 12.29 hrs Surf.Area= 2,172 sf Storage= 3,002 cf

Plug-Flow detention time= 7.4 min calculated for 7.299 af (100% of inflow)
Center-of-Mass det. time= 6.4 min (906.6 - 900.2)

Volume	Invert	Avail.Storage	Storage Description
#1	83.50'	12,853 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

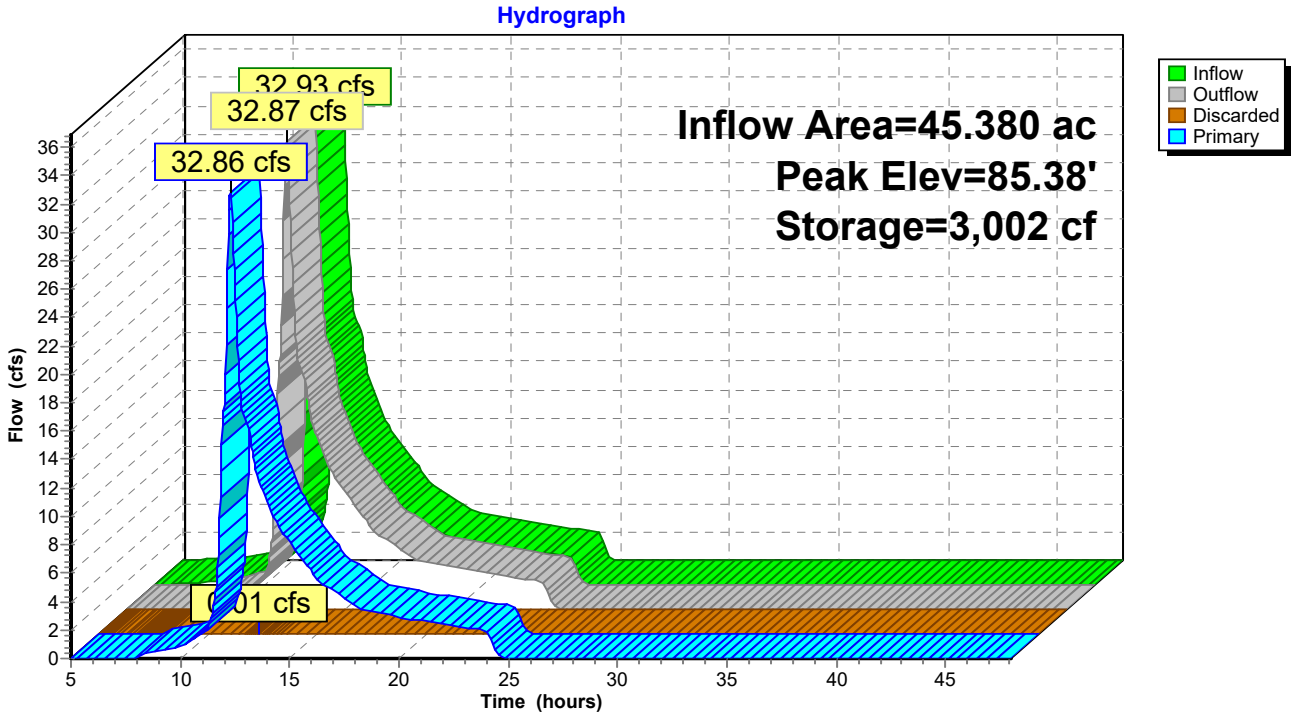
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
83.50	1,040	0	0
84.00	1,321	590	590
84.50	1,701	756	1,346
85.00	1,843	886	2,232
86.00	2,700	2,272	4,503
87.00	4,000	3,350	7,853
88.00	6,000	5,000	12,853

Device	Routing	Invert	Outlet Devices
#1	Primary	84.50'	**15.0' long x 20.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Discarded	83.50'	**0.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.01 cfs @ 12.29 hrs HW=85.38' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=32.84 cfs @ 12.29 hrs HW=85.38' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 32.84 cfs @ 2.48 fps)

Pond F1: FOREBAY



Summary for Pond F2: FOREBAY

Inflow Area = 45.380 ac, 28.98% Impervious, Inflow Depth = 1.92" for 50 YR event
Inflow = 32.86 cfs @ 12.29 hrs, Volume= 7.264 af
Outflow = 32.81 cfs @ 12.30 hrs, Volume= 7.249 af, Atten= 0%, Lag= 0.8 min
Discarded = 0.02 cfs @ 12.30 hrs, Volume= 0.039 af
Primary = 32.80 cfs @ 12.30 hrs, Volume= 7.210 af

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Peak Elev= 85.38' @ 12.30 hrs Surf.Area= 2,561 sf Storage= 3,563 cf

Plug-Flow detention time= 8.1 min calculated for 7.249 af (100% of inflow)
Center-of-Mass det. time= 7.0 min (910.4 - 903.5)

Volume	Invert	Avail.Storage	Storage Description
#1	83.50'	14,130 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

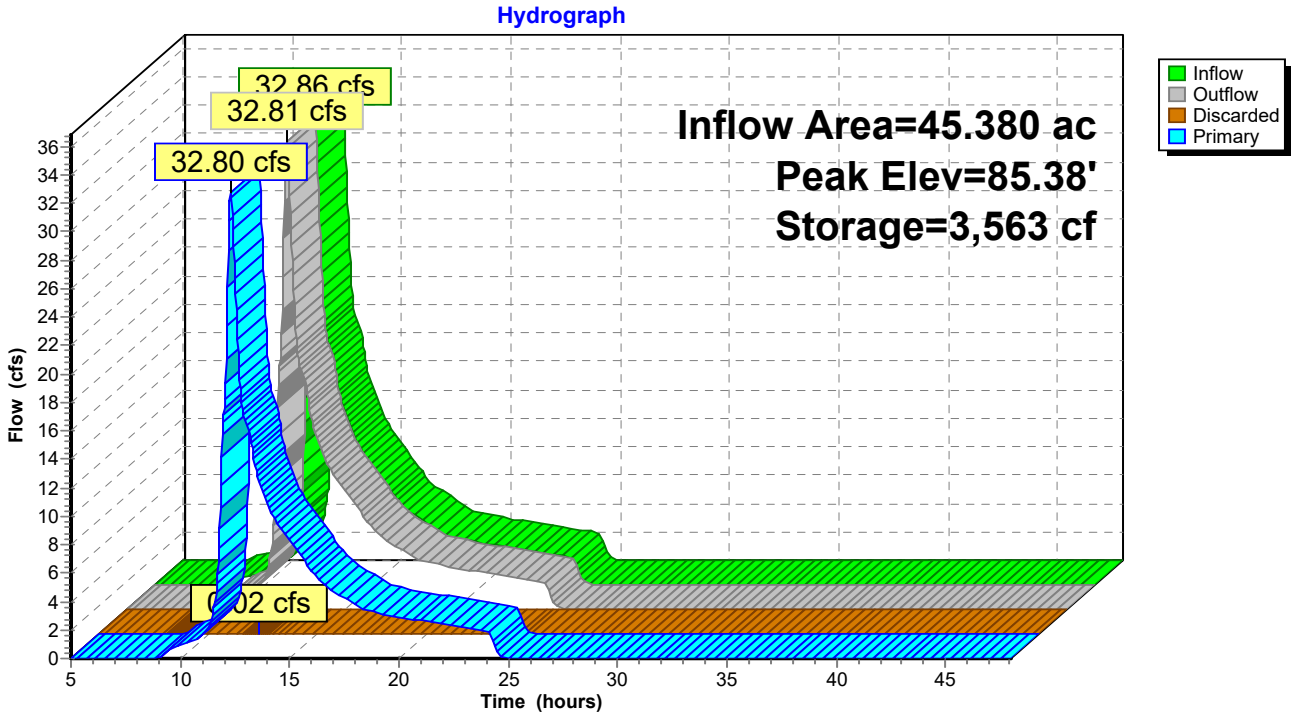
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
83.50	1,266	0	0
84.00	1,481	687	687
84.50	2,013	874	1,560
85.00	2,288	1,075	2,636
86.00	3,000	2,644	5,280
87.00	4,500	3,750	9,030
88.00	5,700	5,100	14,130

Device	Routing	Invert	Outlet Devices
#1	Primary	84.50'	**15.0' long x 20.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Discarded	83.50'	**0.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.02 cfs @ 12.30 hrs HW=85.38' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=32.72 cfs @ 12.30 hrs HW=85.38' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 32.72 cfs @ 2.47 fps)

Pond F2: FOREBAY



Summary for Pond F3: FOREBAY

Inflow Area = 0.162 ac,100.00% Impervious, Inflow Depth > 6.96" for 50 YR event
Inflow = 1.22 cfs @ 12.07 hrs, Volume= 0.094 af
Outflow = 1.19 cfs @ 12.09 hrs, Volume= 0.092 af, Atten= 2%, Lag= 1.0 min
Primary = 1.19 cfs @ 12.09 hrs, Volume= 0.092 af

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Peak Elev= 86.95' @ 12.09 hrs Surf.Area= 510 sf Storage= 202 cf

Plug-Flow detention time= 30.1 min calculated for 0.092 af (97% of inflow)
Center-of-Mass det. time= 13.7 min (773.5 - 759.8)

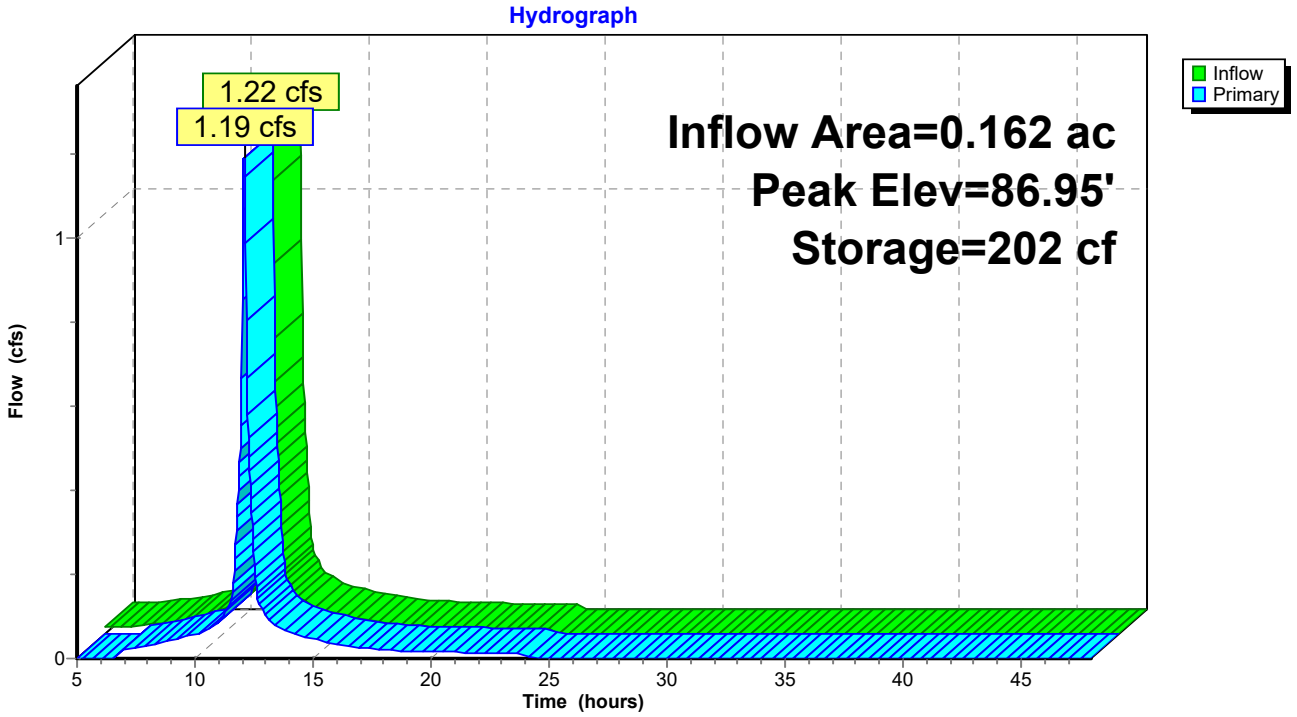
Volume	Invert	Avail.Storage	Storage Description
#1	86.50'	369 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
86.50	400	0	0
86.75	450	106	106
87.25	600	263	369

Device	Routing	Invert	Outlet Devices
#1	Primary	86.75'	**5.0' long x 15.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=1.18 cfs @ 12.09 hrs HW=86.95' (Free Discharge)
↑**1=Broad-Crested Rectangular Weir** (Weir Controls 1.18 cfs @ 1.19 fps)

Pond F3: FOREBAY



Summary for Pond P1: CELL 1

Inflow Area = 45.380 ac, 28.98% Impervious, Inflow Depth = 1.91" for 50 YR event
Inflow = 32.80 cfs @ 12.30 hrs, Volume= 7.210 af
Outflow = 32.11 cfs @ 12.35 hrs, Volume= 7.210 af, Atten= 2%, Lag= 3.0 min
Primary = 13.22 cfs @ 12.35 hrs, Volume= 6.223 af
Secondary = 18.89 cfs @ 12.35 hrs, Volume= 0.987 af

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Starting Elev= 84.50' Surf.Area= 9,400 sf Storage= 15,153 cf
Peak Elev= 85.88' @ 12.35 hrs Surf.Area= 11,482 sf Storage= 29,476 cf (14,323 cf above start)

Plug-Flow detention time= 47.3 min calculated for 6.862 af (95% of inflow)
Center-of-Mass det. time= 8.9 min (915.6 - 906.6)

Volume	Invert	Avail.Storage	Storage Description
#1	79.00'	46,228 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

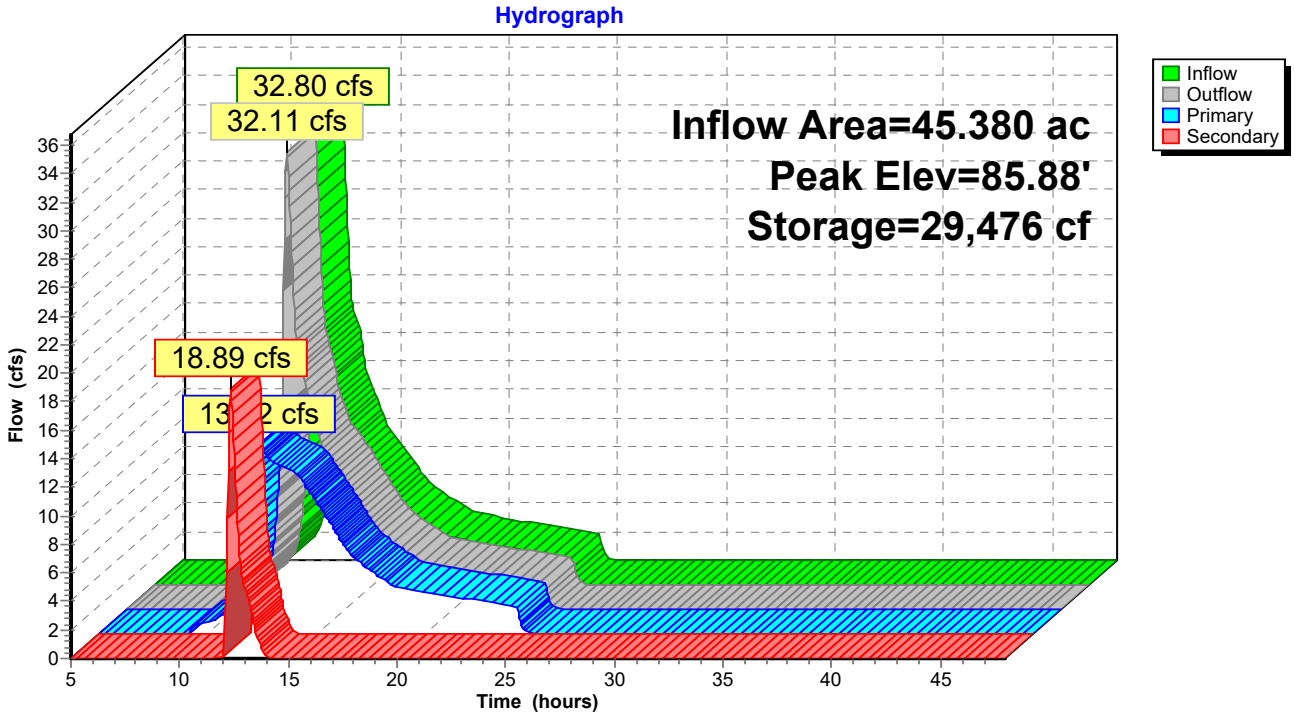
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
79.00	350	0	0
80.00	761	556	556
81.00	1,501	1,131	1,687
82.00	2,224	1,863	3,549
83.00	3,057	2,641	6,190
84.00	6,780	4,919	11,108
84.50	9,400	4,045	15,153
85.00	10,100	4,875	20,028
85.50	10,800	5,225	25,253
86.00	11,700	5,625	30,878
87.00	19,000	15,350	46,228

Device	Routing	Invert	Outlet Devices
#1	Primary	82.50'	**24.0" Round Culvert** L= 250.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 80.50' / 82.50' S= -0.0080 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#2	Secondary	85.50'	**30.0' long x 15.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=13.22 cfs @ 12.35 hrs HW=85.88' TW=84.50' (Fixed TW Elev= 84.50')
↑—**1=Culvert** (Outlet Controls 13.22 cfs @ 4.21 fps)

Secondary OutFlow Max=18.87 cfs @ 12.35 hrs HW=85.88' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 18.87 cfs @ 1.66 fps)

Pond P1: CELL 1



Summary for Pond P2: CELL 2

Inflow Area = 48.332 ac, 28.93% Impervious, Inflow Depth = 1.70" for 50 YR event
Inflow = 18.39 cfs @ 12.27 hrs, Volume= 6.828 af
Outflow = 18.33 cfs @ 12.29 hrs, Volume= 6.828 af, Atten= 0%, Lag= 1.6 min
Primary = 18.33 cfs @ 12.29 hrs, Volume= 6.828 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Starting Elev= 84.50' Surf.Area= 5,620 sf Storage= 6,541 cf
Peak Elev= 84.89' @ 12.29 hrs Surf.Area= 6,688 sf Storage= 8,922 cf (2,381 cf above start)

Plug-Flow detention time= 21.8 min calculated for 6.678 af (98% of inflow)
Center-of-Mass det. time= 3.0 min (936.3 - 933.4)

Volume	Invert	Avail.Storage	Storage Description
#1	79.00'	17,196 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

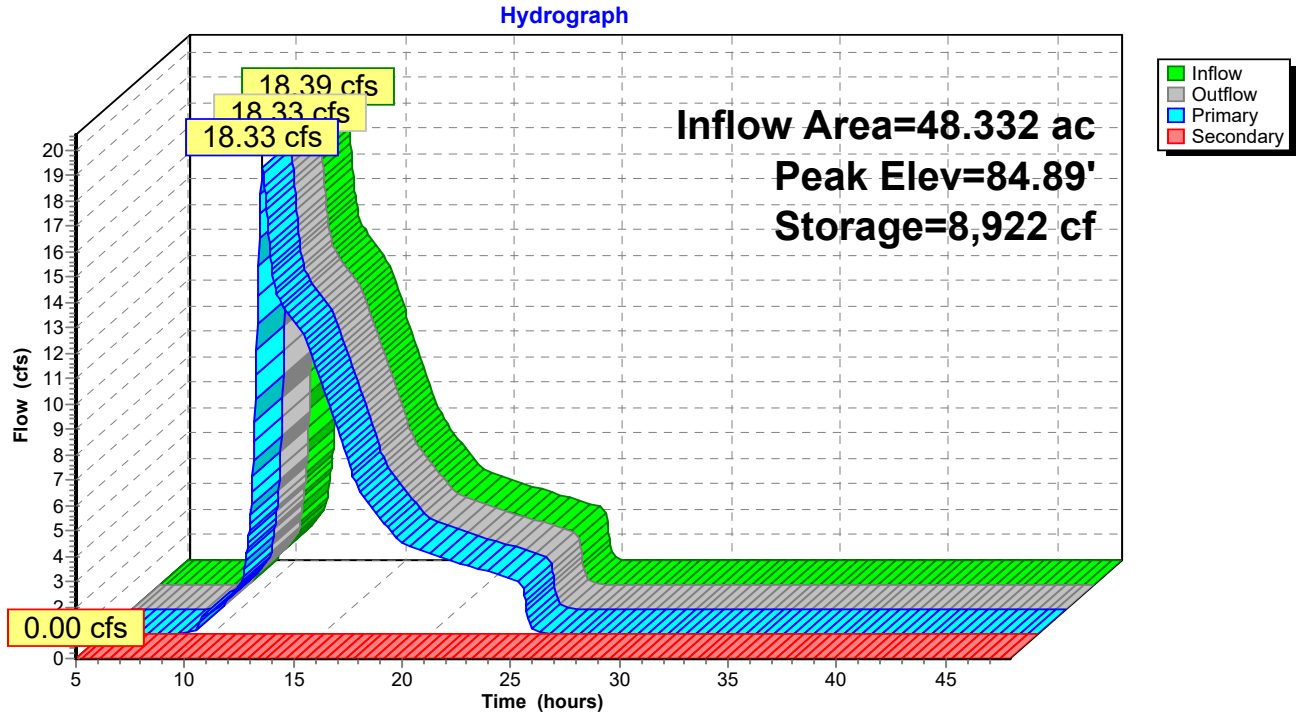
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
79.00	2	0	0
80.00	92	47	47
81.00	292	192	239
82.00	731	512	751
83.00	1,320	1,026	1,776
84.00	3,600	2,460	4,236
84.50	5,620	2,305	6,541
85.00	7,000	3,155	9,696
86.00	8,000	7,500	17,196

Device	Routing	Invert	Outlet Devices
#1	Primary	84.50'	**30.0' long x 8.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74
#2	Secondary	85.50'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=18.28 cfs @ 12.29 hrs HW=84.89' TW=84.50' (Fixed TW Elev= 84.50')
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 18.28 cfs @ 1.58 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=84.50' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond P2: CELL 2



Summary for Pond P3: CELL 3

Inflow Area = 48.332 ac, 28.93% Impervious, Inflow Depth = 1.70" for 50 YR event
Inflow = 18.33 cfs @ 12.29 hrs, Volume= 6.828 af
Outflow = 18.22 cfs @ 12.33 hrs, Volume= 6.828 af, Atten= 1%, Lag= 2.1 min
Primary = 18.22 cfs @ 12.33 hrs, Volume= 6.828 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Starting Elev= 84.50' Surf.Area= 6,663 sf Storage= 7,197 cf
Peak Elev= 84.92' @ 12.33 hrs Surf.Area= 7,275 sf Storage= 10,104 cf (2,907 cf above start)

Plug-Flow detention time= 24.2 min calculated for 6.663 af (98% of inflow)
Center-of-Mass det. time= 3.6 min (940.0 - 936.3)

Volume	Invert	Avail.Storage	Storage Description
#1	79.00'	18,411 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

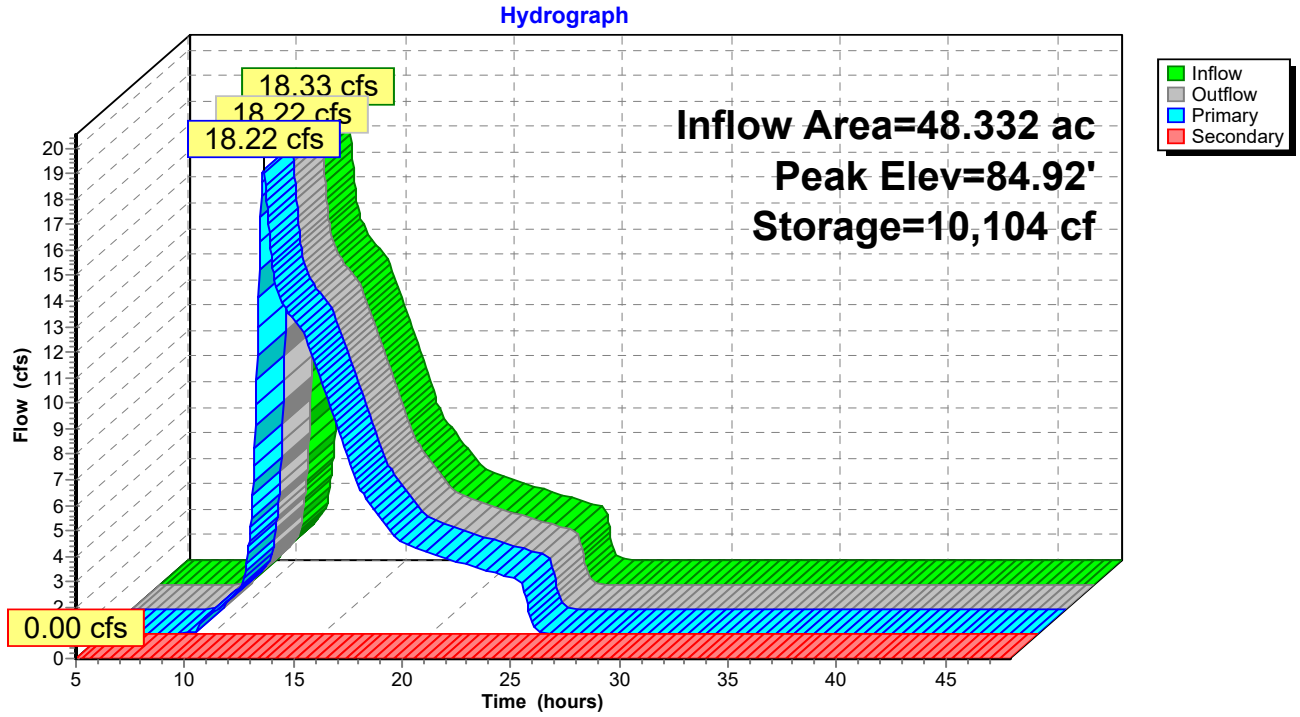
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
79.00	14	0	0
80.00	85	50	50
81.00	375	230	280
82.00	826	601	880
83.00	1,383	1,105	1,985
84.00	3,807	2,595	4,580
84.50	6,663	2,618	7,197
85.00	7,397	3,515	10,712
86.00	8,000	7,699	18,411

Device	Routing	Invert	Outlet Devices
#1	Primary	84.50'	**25.0' long x 17.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Secondary	86.25'	**100.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=18.16 cfs @ 12.33 hrs HW=84.92' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 18.16 cfs @ 1.74 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=84.50' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond P3: CELL 3

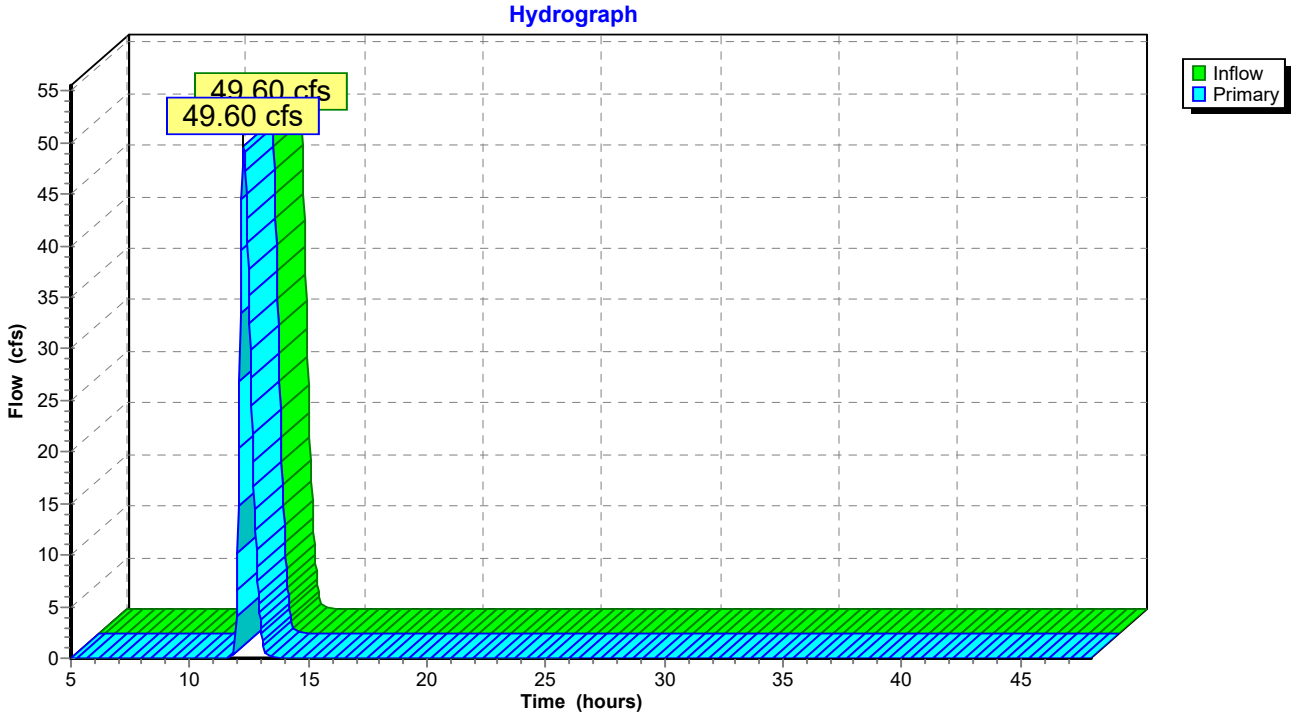


Summary for Pond SP1: ABERJONA RIVER

Inflow = 49.60 cfs @ 12.28 hrs, Volume= 2.234 af
Primary = 49.60 cfs @ 12.28 hrs, Volume= 2.234 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs

Pond SP1: ABERJONA RIVER

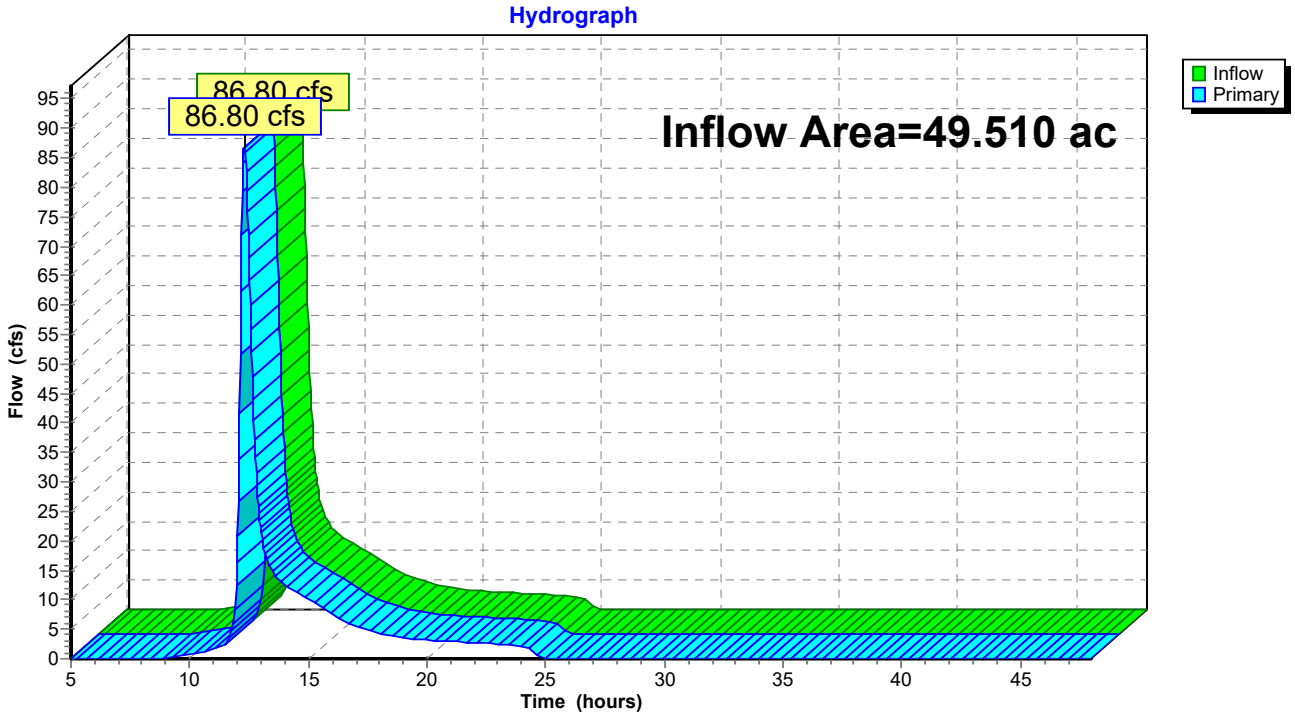


Summary for Pond SP2: ABERJONA RIVER

Inflow Area = 49.510 ac, 28.83% Impervious, Inflow Depth = 2.47" for 50 YR event
Inflow = 86.80 cfs @ 12.31 hrs, Volume= 10.210 af
Primary = 86.80 cfs @ 12.31 hrs, Volume= 10.210 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs

Pond SP2: ABERJONA RIVER



Time span=5.00-48.00 hrs, dt=0.03 hrs, 1434 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 DA 1: LOWELL STREET Runoff Area=4.810 ac 47.82% Impervious Runoff Depth>6.99"
Flow Length=1,080' Tc=15.1 min CN=84 Runoff=28.76 cfs 2.801 af

Subcatchment DA 2A: BACK OF LOTS E Runoff Area=3.100 ac 25.81% Impervious Runoff Depth=3.92"
Flow Length=614' Tc=18.1 min CN=59 Runoff=9.86 cfs 1.014 af

Subcatchment DA 2B: BACK OF LOTS MID Runoff Area=1.178 ac 24.62% Impervious Runoff Depth=2.48"
Flow Length=250' Tc=8.5 min CN=47 Runoff=2.85 cfs 0.244 af

Subcatchment DA 2C: BACK OF LOTS W Runoff Area=2.790 ac 24.01% Impervious Runoff Depth=3.20"
Flow Length=522' Tc=16.3 min CN=53 Runoff=7.33 cfs 0.743 af

Subcatchment DA 2D: PARKING Runoff Area=7,066 sf 100.00% Impervious Runoff Depth>8.38"
Tc=5.0 min CN=98 Runoff=1.46 cfs 0.113 af

Subcatchment DA 3: EAST OF ABERJONA Runoff Area=37.470 ac 26.82% Impervious Runoff Depth=3.08"
Flow Length=2,160' Tc=20.7 min CN=52 Runoff=85.40 cfs 9.604 af

Pond D110: DMH 110 Peak Elev=115.10' Inflow=110.04 cfs 12.405 af
Primary=35.94 cfs 8.644 af Secondary=74.10 cfs 3.761 af Outflow=110.04 cfs 12.405 af

Pond D120: DMH 120 Peak Elev=113.14' Inflow=35.94 cfs 8.644 af
Primary=35.41 cfs 8.596 af Secondary=0.53 cfs 0.048 af Outflow=35.94 cfs 8.644 af

Pond F1: FOREBAY Peak Elev=85.59' Storage=3,475 cf Inflow=45.27 cfs 9.610 af
Discarded=0.01 cfs 0.036 af Primary=45.17 cfs 9.561 af Outflow=45.18 cfs 9.597 af

Pond F2: FOREBAY Peak Elev=85.59' Storage=4,114 cf Inflow=45.17 cfs 9.561 af
Discarded=0.02 cfs 0.040 af Primary=45.09 cfs 9.506 af Outflow=45.11 cfs 9.546 af

Pond F3: FOREBAY Peak Elev=86.98' Storage=215 cf Inflow=1.46 cfs 0.113 af
Outflow=1.44 cfs 0.111 af

Pond P1: CELL 1 Peak Elev=86.02' Storage=31,121 cf Inflow=45.09 cfs 9.506 af
Primary=13.88 cfs 7.676 af Secondary=30.45 cfs 1.829 af Outflow=44.33 cfs 9.506 af

Pond P2: CELL 2 Peak Elev=84.93' Storage=9,193 cf Inflow=21.61 cfs 8.530 af
Primary=21.53 cfs 8.530 af Secondary=0.00 cfs 0.000 af Outflow=21.53 cfs 8.530 af

Pond P3: CELL 3 Peak Elev=84.96' Storage=10,452 cf Inflow=21.53 cfs 8.530 af
Primary=21.41 cfs 8.530 af Secondary=0.00 cfs 0.000 af Outflow=21.41 cfs 8.530 af

Pond SP1: ABERJONA RIVER Inflow=74.63 cfs 3.809 af
Primary=74.63 cfs 3.809 af

Pond SP2: ABERJONA RIVER Inflow=127.22 cfs 14.412 af
Primary=127.22 cfs 14.412 af

Total Runoff Area = 49.510 ac Runoff Volume = 14.518 af Average Runoff Depth = 3.52"
71.17% Pervious = 35.238 ac 28.83% Impervious = 14.272 ac

Summary for Subcatchment DA 1: LOWELL STREET

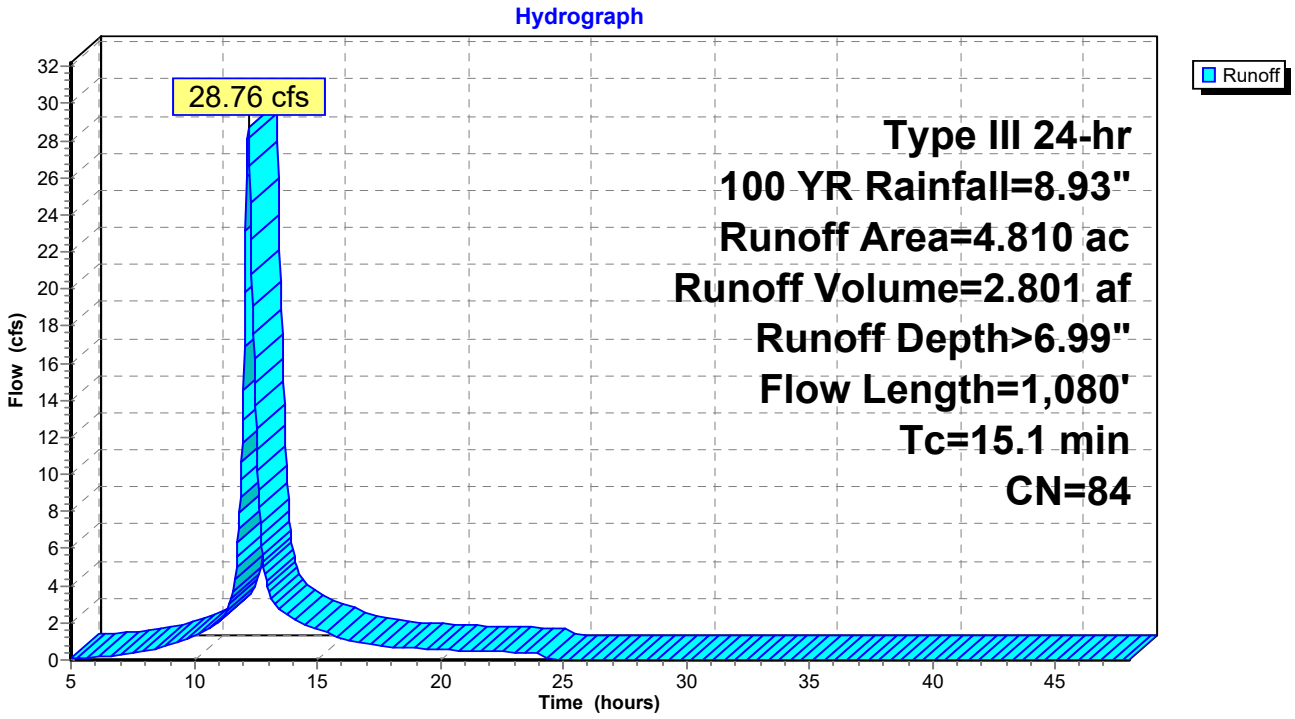
Runoff = 28.76 cfs @ 12.20 hrs, Volume= 2.801 af, Depth> 6.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 100 YR Rainfall=8.93"

Area (ac)	CN	Description
1.800	98	Paved parking, HSG C
0.500	98	Roofs, HSG C
1.250	70	Woods, Good, HSG C
1.260	74	Pasture/grassland/range, Good, HSG C
4.810	84	Weighted Average
2.510		52.18% Pervious Area
2.300		47.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
5.8	1,030	0.0210	2.94		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
15.1	1,080	Total			

Subcatchment DA 1: LOWELL STREET



Summary for Subcatchment DA 2A: BACK OF LOTS E

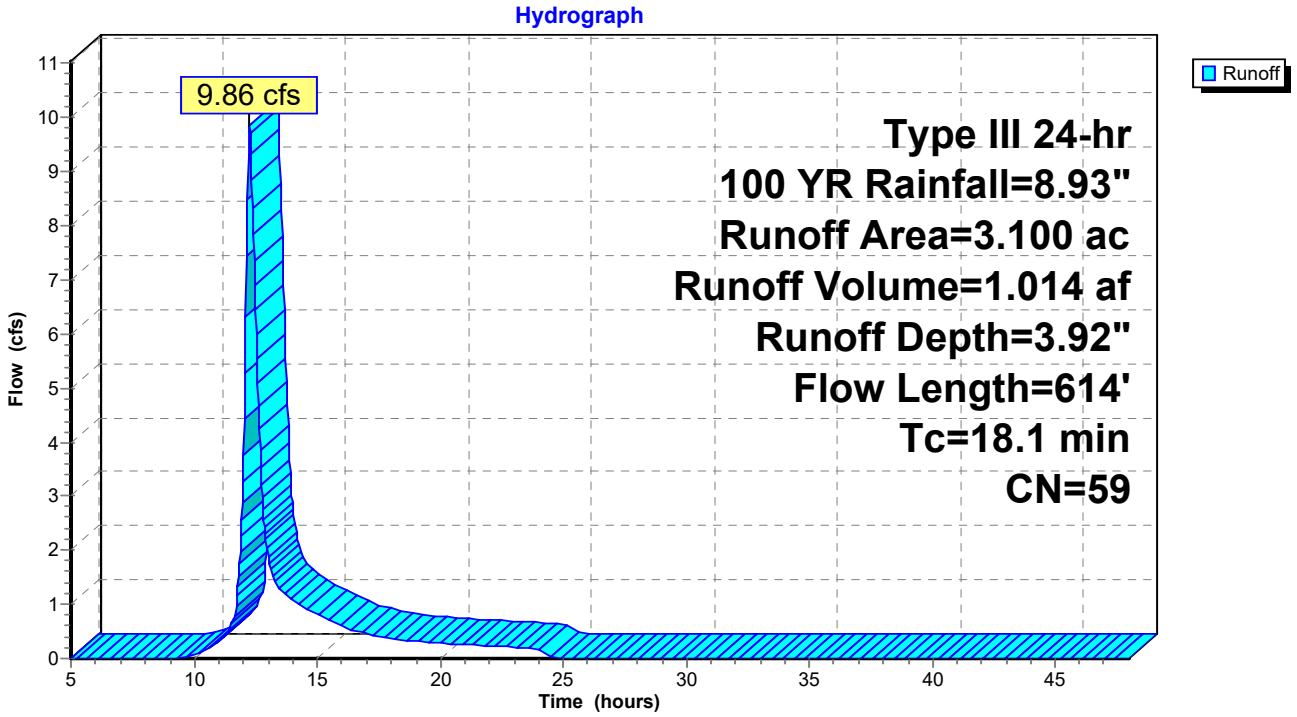
Runoff = 9.86 cfs @ 12.26 hrs, Volume= 1.014 af, Depth= 3.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 100 YR Rainfall=8.93"

Area (ac)	CN	Description
0.250	98	Paved parking, HSG C
0.020	72	Dirt roads, HSG A
0.110	87	Dirt roads, HSG C
0.260	98	Roofs, HSG C
0.290	98	Water Surface, HSG C
1.220	30	Woods, Good, HSG A
0.550	70	Woods, Good, HSG C
0.290	39	Pasture/grassland/range, Good, HSG A
0.110	74	Pasture/grassland/range, Good, HSG C
3.100	59	Weighted Average
2.300		74.19% Pervious Area
0.800		25.81% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
5.8	564	0.1040	1.61		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
18.1	614	Total			

Subcatchment DA 2A: BACK OF LOTS E



Summary for Subcatchment DA 2B: BACK OF LOTS MID

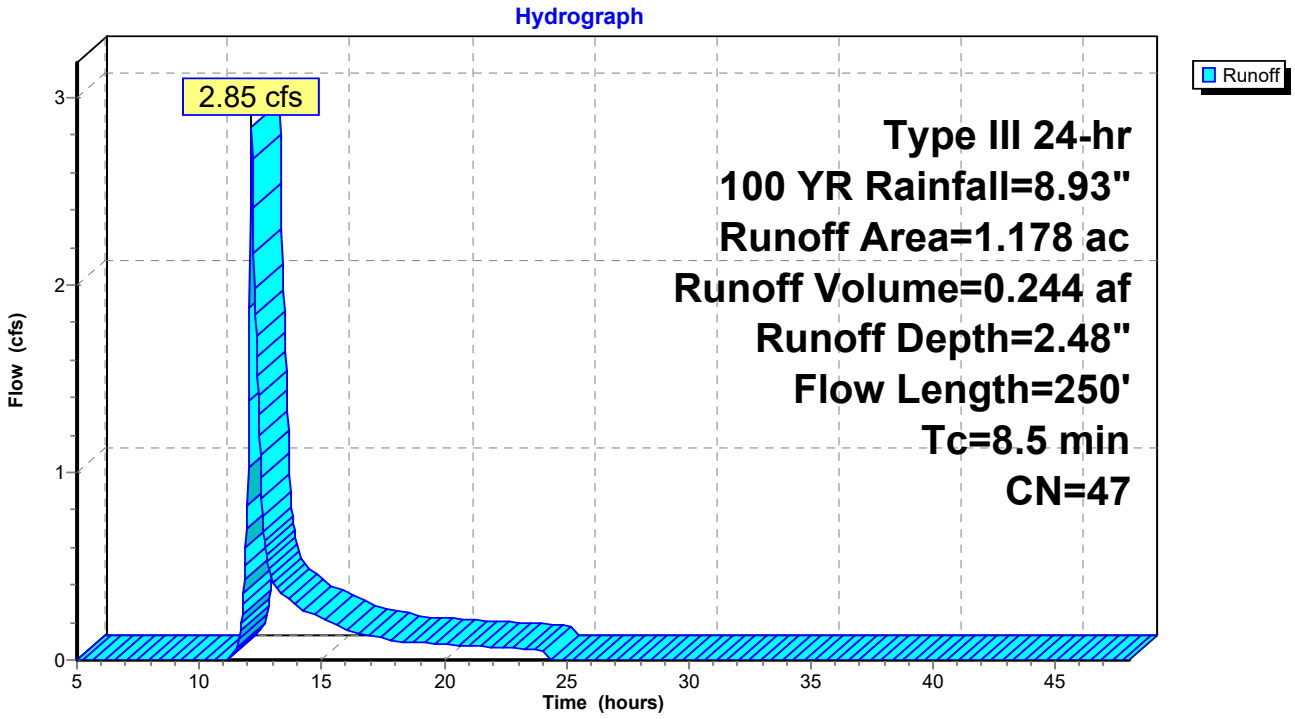
Runoff = 2.85 cfs @ 12.13 hrs, Volume= 0.244 af, Depth= 2.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 100 YR Rainfall=8.93"

Area (ac)	CN	Description
0.130	98	Paved parking, HSG C
0.160	98	Roofs, HSG C
0.868	30	Woods, Good, HSG A
0.020	39	Pasture/grassland/range, Good, HSG A
1.178	47	Weighted Average
0.888		75.38% Pervious Area
0.290		24.62% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.1000	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
2.0	200	0.1150	1.70		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.5	250	Total			

Subcatchment DA 2B: BACK OF LOTS MID



Summary for Subcatchment DA 2C: BACK OF LOTS W

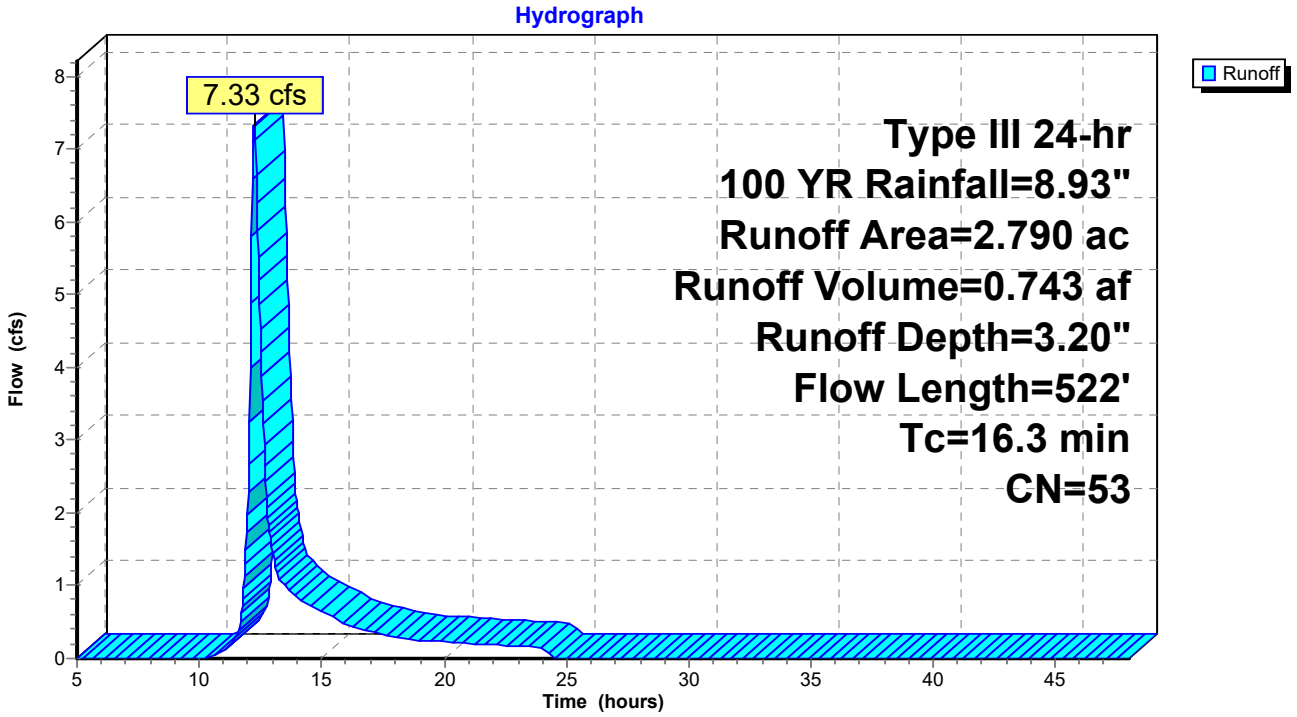
Runoff = 7.33 cfs @ 12.24 hrs, Volume= 0.743 af, Depth= 3.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 100 YR Rainfall=8.93"

Area (ac)	CN	Description
0.250	98	Paved parking, HSG C
0.090	72	Dirt roads, HSG A
0.040	87	Dirt roads, HSG C
0.120	98	Roofs, HSG C
0.300	98	Water Surface, HSG C
1.520	30	Woods, Good, HSG A
0.270	70	Woods, Good, HSG C
0.200	39	Pasture/grassland/range, Good, HSG A
0.000	74	Pasture/grassland/range, Good, HSG C
2.790	53	Weighted Average
2.120		75.99% Pervious Area
0.670		24.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
7.0	472	0.0510	1.13		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
16.3	522	Total			

Subcatchment DA 2C: BACK OF LOTS W



Summary for Subcatchment DA 2D: PARKING

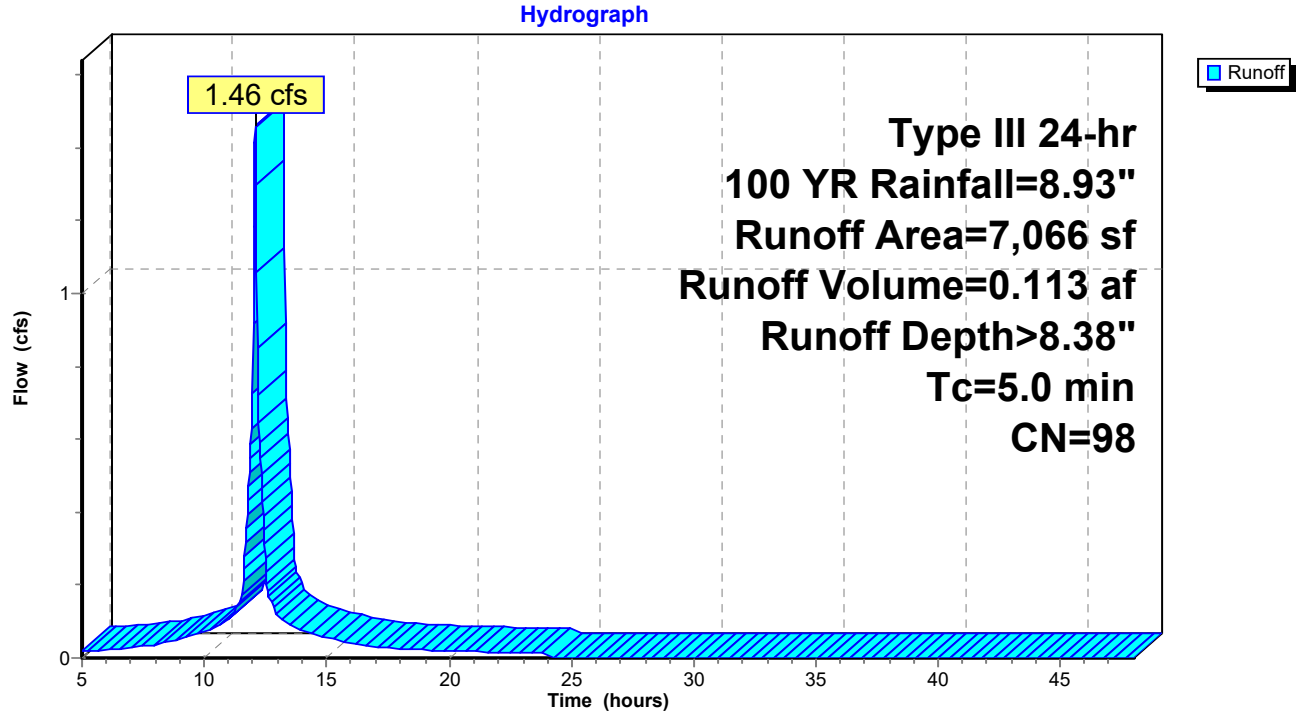
Runoff = 1.46 cfs @ 12.07 hrs, Volume= 0.113 af, Depth> 8.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 100 YR Rainfall=8.93"

Area (sf)	CN	Description
7,066	98	Paved parking, HSG C
7,066		100.00% Impervious Area

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

Subcatchment DA 2D: PARKING



Summary for Subcatchment DA 3: EAST OF ABERJONA

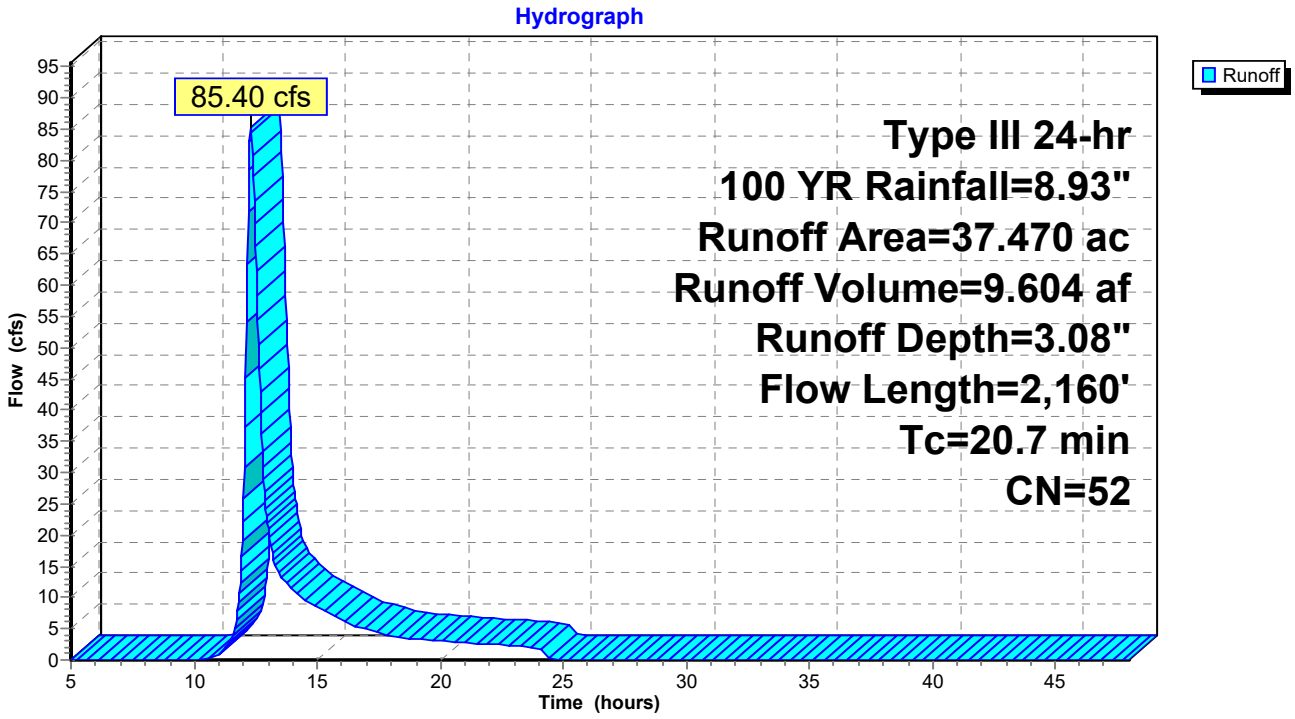
Runoff = 85.40 cfs @ 12.31 hrs, Volume= 9.604 af, Depth= 3.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 100 YR Rainfall=8.93"

Area (ac)	CN	Description
6.760	98	Paved parking, HSG C
3.290	98	Roofs, HSG C
9.960	30	Woods, Good, HSG A
17.460	39	Pasture/grassland/range, Good, HSG A
37.470	52	Weighted Average
27.420		73.18% Pervious Area
10.050		26.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
11.4	2,110	0.0230	3.08		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
20.7	2,160	Total			

Subcatchment DA 3: EAST OF ABERJONA



Summary for Pond D110: DMH 110

Inflow Area = 42.280 ac, 29.21% Impervious, Inflow Depth > 3.52" for 100 YR event
Inflow = 110.04 cfs @ 12.28 hrs, Volume= 12.405 af
Outflow = 110.04 cfs @ 12.28 hrs, Volume= 12.405 af, Atten= 0%, Lag= 0.0 min
Primary = 35.94 cfs @ 12.28 hrs, Volume= 8.644 af
Secondary = 74.10 cfs @ 12.28 hrs, Volume= 3.761 af

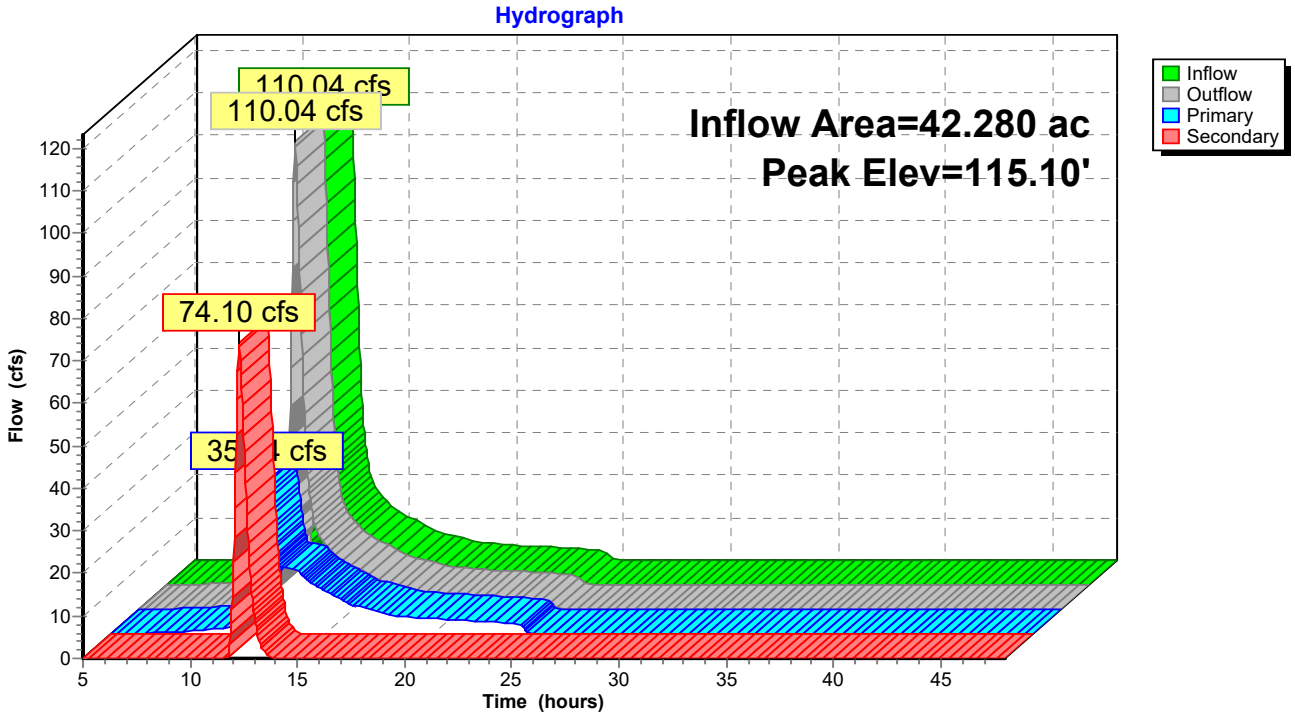
Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Peak Elev= 115.10' @ 12.28 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	85.30'	**18.0" Round Culvert** L= 143.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 85.30' / 84.60' S= 0.0049 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Secondary	91.10'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=35.87 cfs @ 12.28 hrs HW=114.98' (Free Discharge)
└**1=Culvert** (Barrel Controls 35.87 cfs @ 20.30 fps)

Secondary OutFlow Max=73.92 cfs @ 12.28 hrs HW=114.98' (Free Discharge)
└**2=Orifice/Grate** (Orifice Controls 73.92 cfs @ 23.53 fps)

Pond D110: DMH 110



Summary for Pond D120: DMH 120

Inflow Area = 42.280 ac, 29.21% Impervious, Inflow Depth > 2.45" for 100 YR event
Inflow = 35.94 cfs @ 12.28 hrs, Volume= 8.644 af
Outflow = 35.94 cfs @ 12.28 hrs, Volume= 8.644 af, Atten= 0%, Lag= 0.0 min
Primary = 35.41 cfs @ 12.28 hrs, Volume= 8.596 af
Secondary = 0.53 cfs @ 12.28 hrs, Volume= 0.048 af

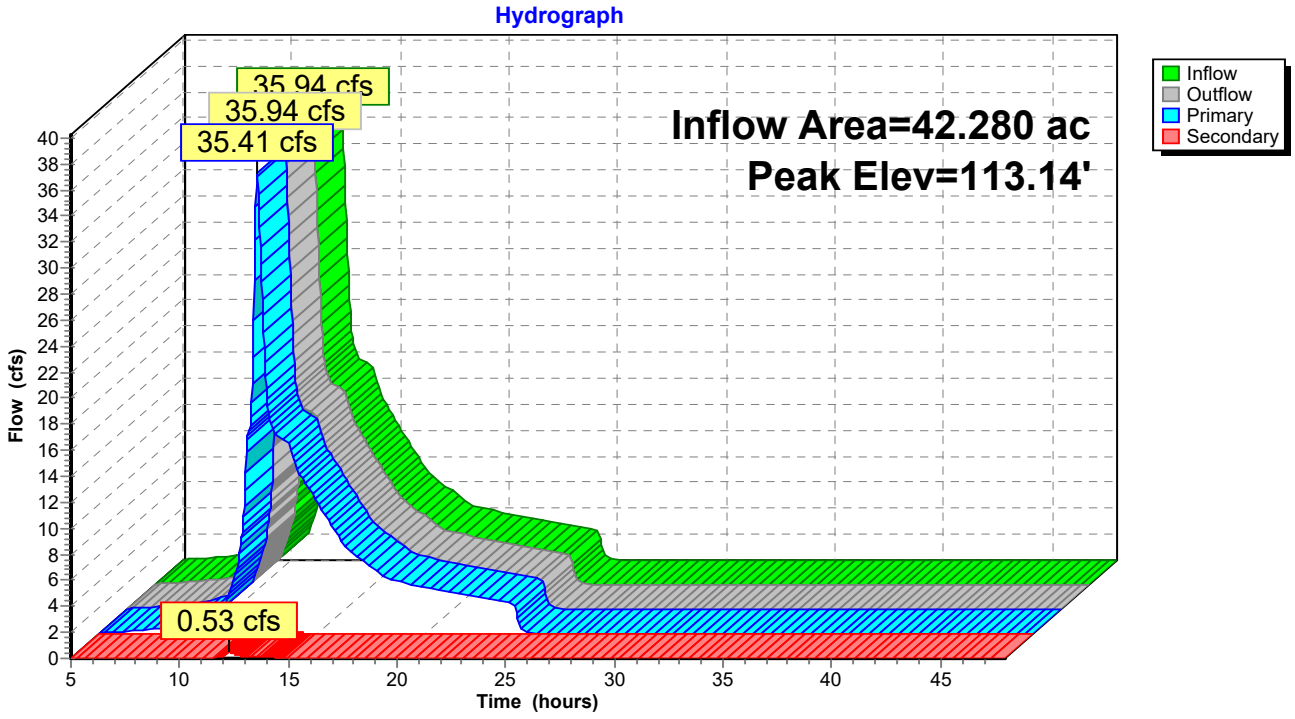
Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Peak Elev= 113.14' @ 12.28 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	84.60'	**18.0" Round Culvert** L= 126.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 84.60' / 84.00' S= 0.0048 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Secondary	88.01'	**2.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=35.34 cfs @ 12.28 hrs HW=113.03' (Free Discharge)
└**1=Culvert** (Inlet Controls 35.34 cfs @ 20.00 fps)

Secondary OutFlow Max=0.53 cfs @ 12.28 hrs HW=113.03' (Free Discharge)
└**2=Orifice/Grate** (Orifice Controls 0.53 cfs @ 24.08 fps)

Pond D120: DMH 120



Summary for Pond F1: FOREBAY

Inflow Area = 45.380 ac, 28.98% Impervious, Inflow Depth > 2.54" for 100 YR event
Inflow = 45.27 cfs @ 12.27 hrs, Volume= 9.610 af
Outflow = 45.18 cfs @ 12.28 hrs, Volume= 9.597 af, Atten= 0%, Lag= 0.7 min
Discarded = 0.01 cfs @ 12.28 hrs, Volume= 0.036 af
Primary = 45.17 cfs @ 12.28 hrs, Volume= 9.561 af

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Peak Elev= 85.59' @ 12.28 hrs Surf.Area= 2,351 sf Storage= 3,475 cf

Plug-Flow detention time= 5.2 min calculated for 9.590 af (100% of inflow)
Center-of-Mass det. time= 5.2 min (903.7 - 898.6)

Volume	Invert	Avail.Storage	Storage Description
#1	83.50'	12,853 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

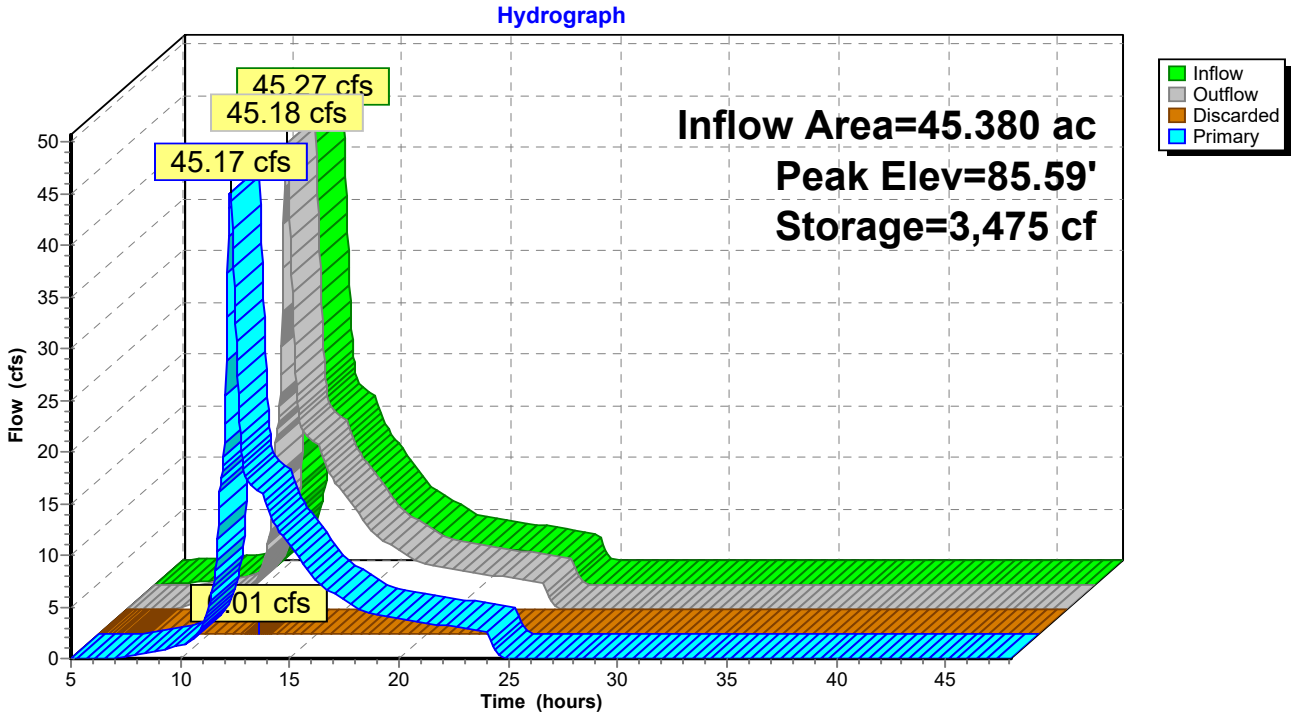
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
83.50	1,040	0	0
84.00	1,321	590	590
84.50	1,701	756	1,346
85.00	1,843	886	2,232
86.00	2,700	2,272	4,503
87.00	4,000	3,350	7,853
88.00	6,000	5,000	12,853

Device	Routing	Invert	Outlet Devices
#1	Primary	84.50'	**15.0' long x 20.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Discarded	83.50'	**0.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.01 cfs @ 12.28 hrs HW=85.59' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=45.08 cfs @ 12.28 hrs HW=85.59' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 45.08 cfs @ 2.75 fps)

Pond F1: FOREBAY



Summary for Pond F2: FOREBAY

Inflow Area = 45.380 ac, 28.98% Impervious, Inflow Depth = 2.53" for 100 YR event
Inflow = 45.17 cfs @ 12.28 hrs, Volume= 9.561 af
Outflow = 45.11 cfs @ 12.30 hrs, Volume= 9.546 af, Atten= 0%, Lag= 0.8 min
Discarded = 0.02 cfs @ 12.30 hrs, Volume= 0.040 af
Primary = 45.09 cfs @ 12.30 hrs, Volume= 9.506 af

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Peak Elev= 85.59' @ 12.30 hrs Surf.Area= 2,709 sf Storage= 4,114 cf

Plug-Flow detention time= 6.6 min calculated for 9.546 af (100% of inflow)
Center-of-Mass det. time= 5.7 min (907.1 - 901.4)

Volume	Invert	Avail.Storage	Storage Description
#1	83.50'	14,130 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

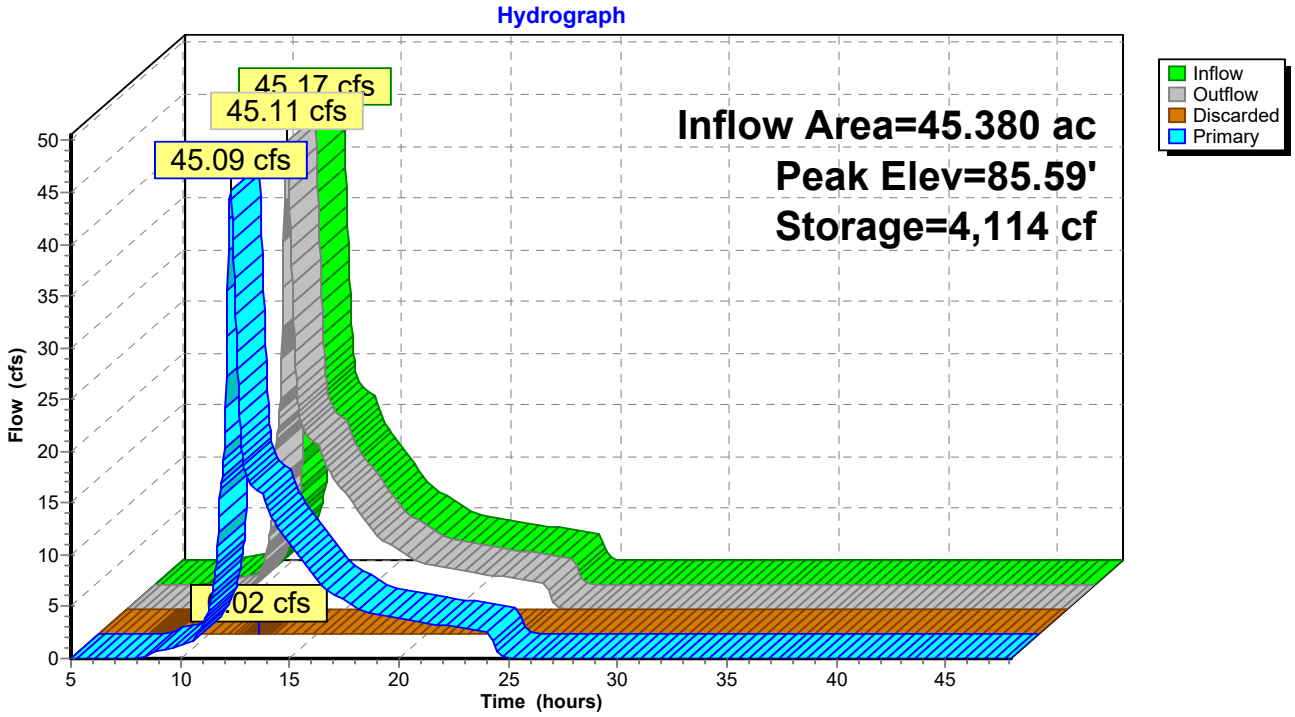
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
83.50	1,266	0	0
84.00	1,481	687	687
84.50	2,013	874	1,560
85.00	2,288	1,075	2,636
86.00	3,000	2,644	5,280
87.00	4,500	3,750	9,030
88.00	5,700	5,100	14,130

Device	Routing	Invert	Outlet Devices
#1	Primary	84.50'	**15.0' long x 20.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Discarded	83.50'	**0.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.02 cfs @ 12.30 hrs HW=85.59' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=45.01 cfs @ 12.30 hrs HW=85.59' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 45.01 cfs @ 2.75 fps)

Pond F2: FOREBAY



Summary for Pond F3: FOREBAY

Inflow Area = 0.162 ac,100.00% Impervious, Inflow Depth > 8.38" for 100 YR event
Inflow = 1.46 cfs @ 12.07 hrs, Volume= 0.113 af
Outflow = 1.44 cfs @ 12.09 hrs, Volume= 0.111 af, Atten= 2%, Lag= 0.9 min
Primary = 1.44 cfs @ 12.09 hrs, Volume= 0.111 af

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Peak Elev= 86.98' @ 12.09 hrs Surf.Area= 518 sf Storage= 215 cf

Plug-Flow detention time= 25.8 min calculated for 0.111 af (98% of inflow)
Center-of-Mass det. time= 11.9 min (771.1 - 759.2)

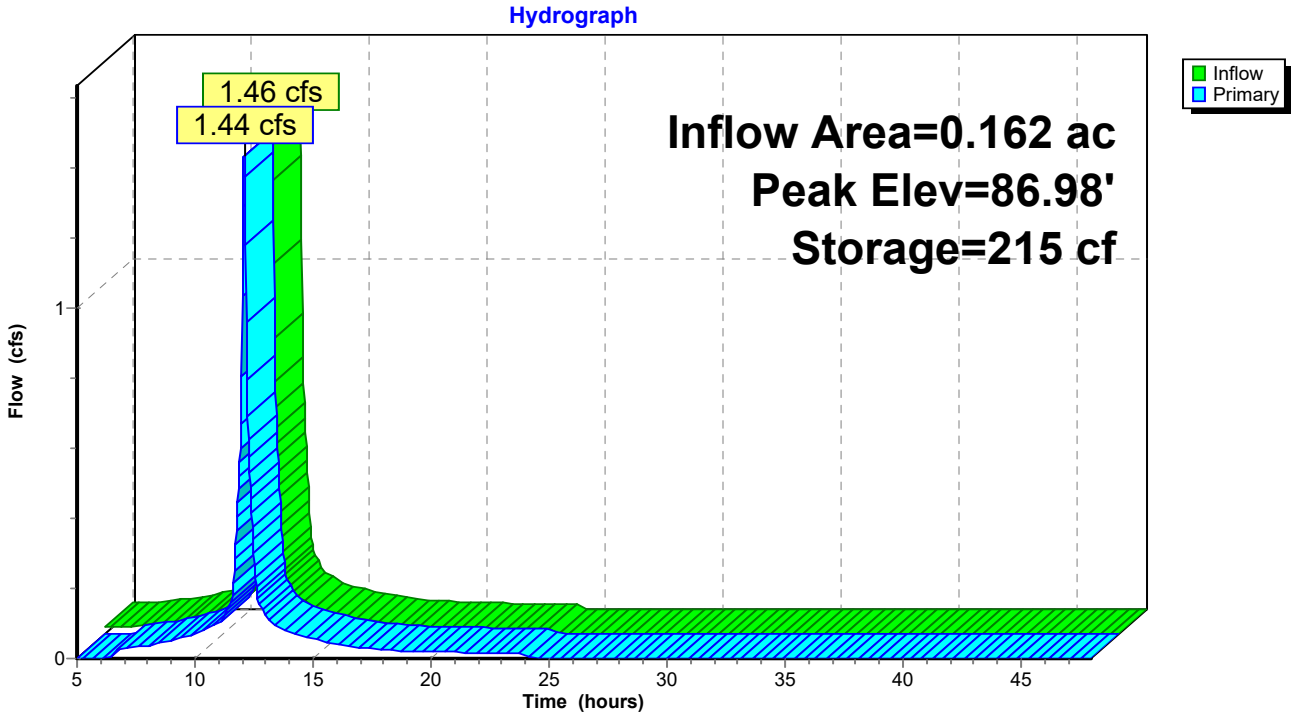
Volume	Invert	Avail.Storage	Storage Description
#1	86.50'	369 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
86.50	400	0	0
86.75	450	106	106
87.25	600	263	369

Device	Routing	Invert	Outlet Devices
#1	Primary	86.75'	**5.0' long x 15.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=1.42 cfs @ 12.09 hrs HW=86.97' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 1.42 cfs @ 1.27 fps)

Pond F3: FOREBAY



Summary for Pond P1: CELL 1

Inflow Area = 45.380 ac, 28.98% Impervious, Inflow Depth = 2.51" for 100 YR event
Inflow = 45.09 cfs @ 12.30 hrs, Volume= 9.506 af
Outflow = 44.33 cfs @ 12.34 hrs, Volume= 9.506 af, Atten= 2%, Lag= 2.4 min
Primary = 13.88 cfs @ 12.34 hrs, Volume= 7.676 af
Secondary = 30.45 cfs @ 12.34 hrs, Volume= 1.829 af

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Starting Elev= 84.50' Surf.Area= 9,400 sf Storage= 15,153 cf
Peak Elev= 86.02' @ 12.34 hrs Surf.Area= 11,851 sf Storage= 31,121 cf (15,968 cf above start)

Plug-Flow detention time= 39.5 min calculated for 9.151 af (96% of inflow)
Center-of-Mass det. time= 9.1 min (913.3 - 904.2)

Volume	Invert	Avail.Storage	Storage Description
#1	79.00'	46,228 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

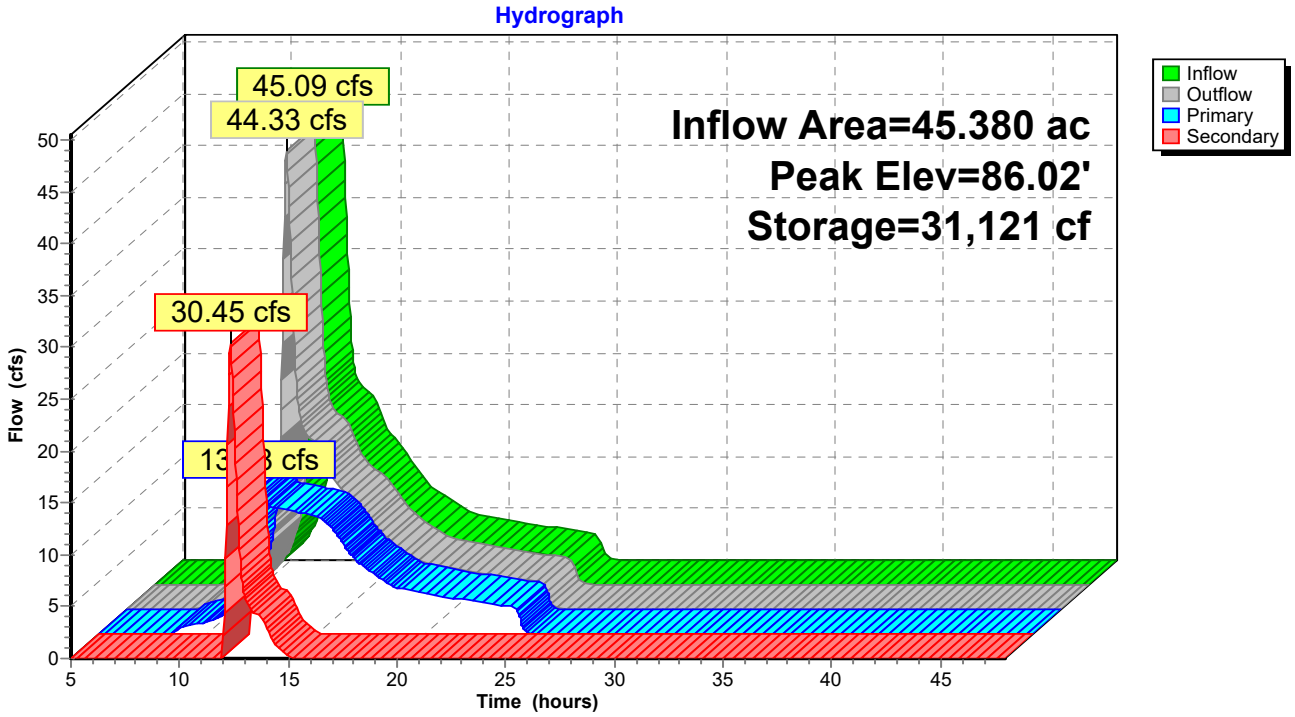
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
79.00	350	0	0
80.00	761	556	556
81.00	1,501	1,131	1,687
82.00	2,224	1,863	3,549
83.00	3,057	2,641	6,190
84.00	6,780	4,919	11,108
84.50	9,400	4,045	15,153
85.00	10,100	4,875	20,028
85.50	10,800	5,225	25,253
86.00	11,700	5,625	30,878
87.00	19,000	15,350	46,228

Device	Routing	Invert	Outlet Devices
#1	Primary	82.50'	**24.0" Round Culvert** L= 250.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 80.50' / 82.50' S= -0.0080 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#2	Secondary	85.50'	**30.0' long x 15.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=13.88 cfs @ 12.34 hrs HW=86.02' TW=84.50' (Fixed TW Elev= 84.50')
↑—**1=Culvert** (Outlet Controls 13.88 cfs @ 4.42 fps)

Secondary OutFlow Max=30.34 cfs @ 12.34 hrs HW=86.02' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 30.34 cfs @ 1.95 fps)

Pond P1: CELL 1



Summary for Pond P2: CELL 2

Inflow Area = 48.332 ac, 28.93% Impervious, Inflow Depth = 2.12" for 100 YR event
Inflow = 21.61 cfs @ 12.25 hrs, Volume= 8.530 af
Outflow = 21.53 cfs @ 12.28 hrs, Volume= 8.530 af, Atten= 0%, Lag= 1.5 min
Primary = 21.53 cfs @ 12.28 hrs, Volume= 8.530 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Starting Elev= 84.50' Surf.Area= 5,620 sf Storage= 6,541 cf
Peak Elev= 84.93' @ 12.28 hrs Surf.Area= 6,799 sf Storage= 9,193 cf (2,652 cf above start)

Plug-Flow detention time= 18.5 min calculated for 8.374 af (98% of inflow)
Center-of-Mass det. time= 2.8 min (941.7 - 938.9)

Volume	Invert	Avail.Storage	Storage Description
#1	79.00'	17,196 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

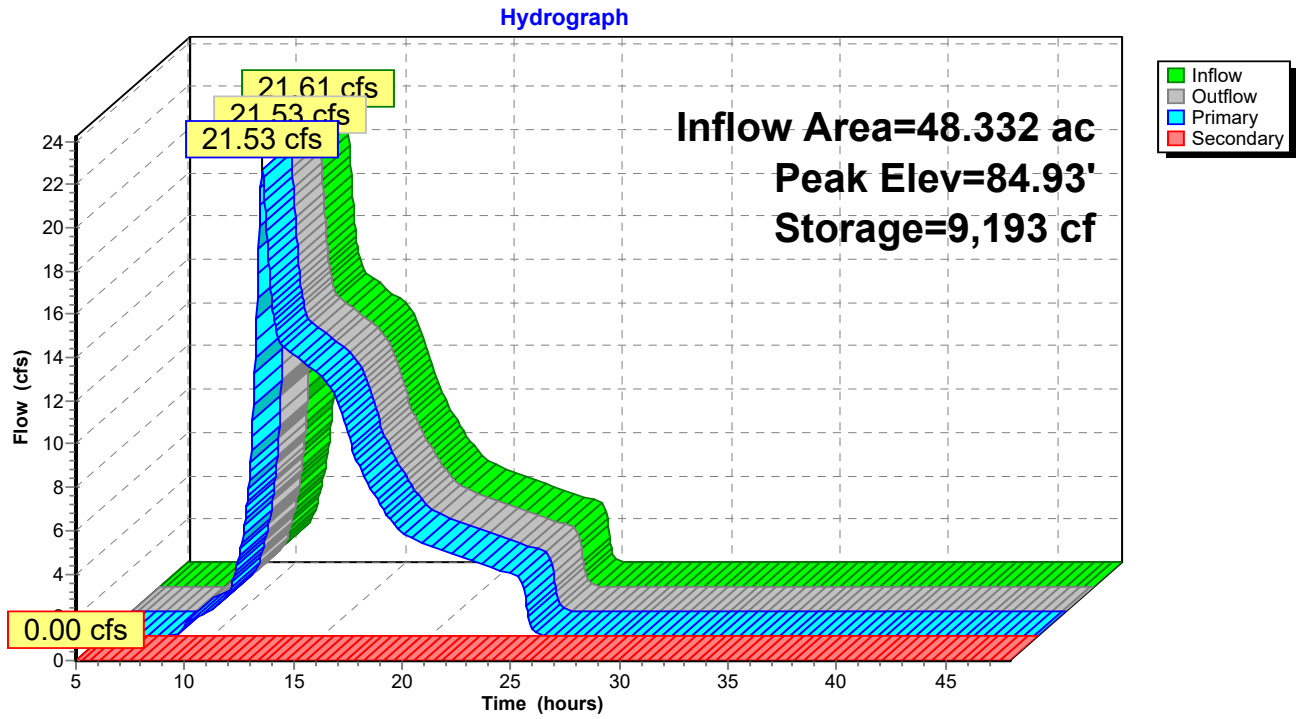
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
79.00	2	0	0
80.00	92	47	47
81.00	292	192	239
82.00	731	512	751
83.00	1,320	1,026	1,776
84.00	3,600	2,460	4,236
84.50	5,620	2,305	6,541
85.00	7,000	3,155	9,696
86.00	8,000	7,500	17,196

Device	Routing	Invert	Outlet Devices
#1	Primary	84.50'	**30.0' long x 8.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74
#2	Secondary	85.50'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=21.42 cfs @ 12.28 hrs HW=84.93' TW=84.50' (Fixed TW Elev= 84.50')
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 21.42 cfs @ 1.67 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=84.50' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond P2: CELL 2



Summary for Pond P3: CELL 3

Inflow Area = 48.332 ac, 28.93% Impervious, Inflow Depth = 2.12" for 100 YR event
Inflow = 21.53 cfs @ 12.28 hrs, Volume= 8.530 af
Outflow = 21.41 cfs @ 12.31 hrs, Volume= 8.530 af, Atten= 1%, Lag= 1.9 min
Primary = 21.41 cfs @ 12.31 hrs, Volume= 8.530 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Starting Elev= 84.50' Surf.Area= 6,663 sf Storage= 7,197 cf
Peak Elev= 84.96' @ 12.31 hrs Surf.Area= 7,345 sf Storage= 10,452 cf (3,255 cf above start)

Plug-Flow detention time= 20.8 min calculated for 8.365 af (98% of inflow)
Center-of-Mass det. time= 3.5 min (945.2 - 941.7)

Volume	Invert	Avail.Storage	Storage Description
#1	79.00'	18,411 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

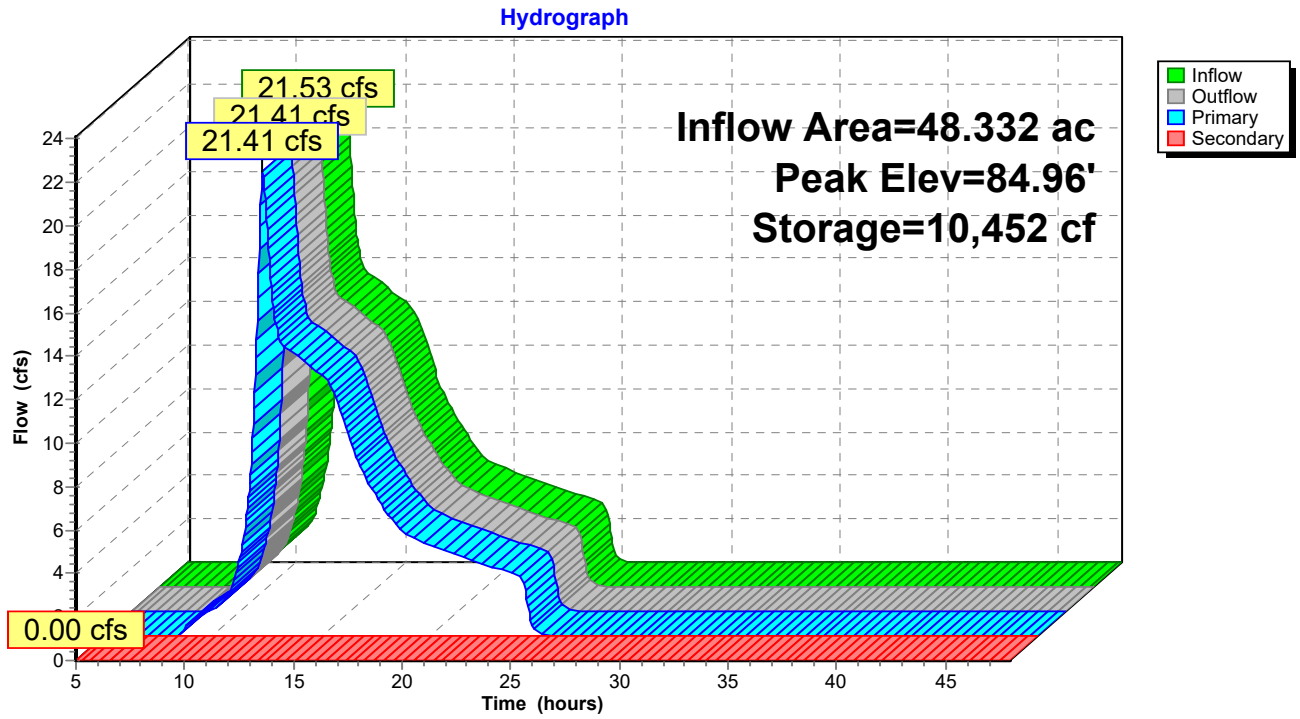
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
79.00	14	0	0
80.00	85	50	50
81.00	375	230	280
82.00	826	601	880
83.00	1,383	1,105	1,985
84.00	3,807	2,595	4,580
84.50	6,663	2,618	7,197
85.00	7,397	3,515	10,712
86.00	8,000	7,699	18,411

Device	Routing	Invert	Outlet Devices
#1	Primary	84.50'	**25.0' long x 17.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Secondary	86.25'	**100.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=21.36 cfs @ 12.31 hrs HW=84.96' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 21.36 cfs @ 1.84 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=84.50' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond P3: CELL 3

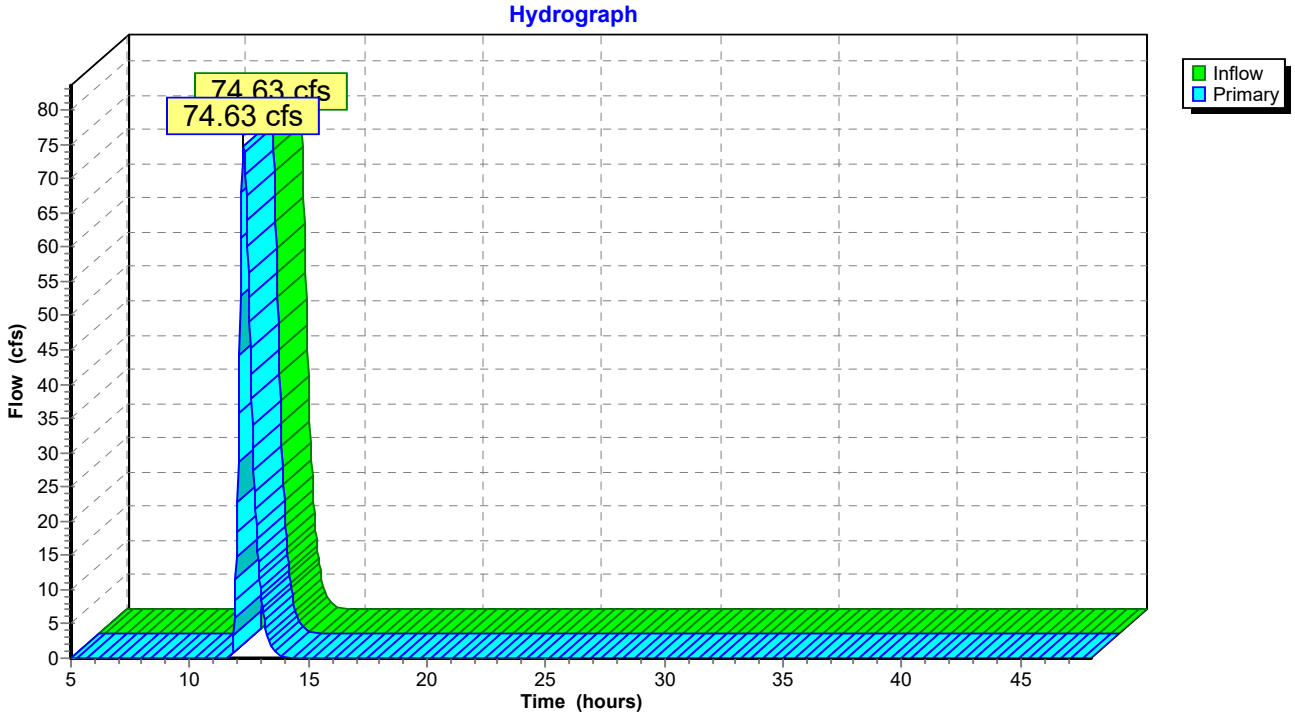


Summary for Pond SP1: ABERJONA RIVER

Inflow = 74.63 cfs @ 12.28 hrs, Volume= 3.809 af
Primary = 74.63 cfs @ 12.28 hrs, Volume= 3.809 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs

Pond SP1: ABERJONA RIVER

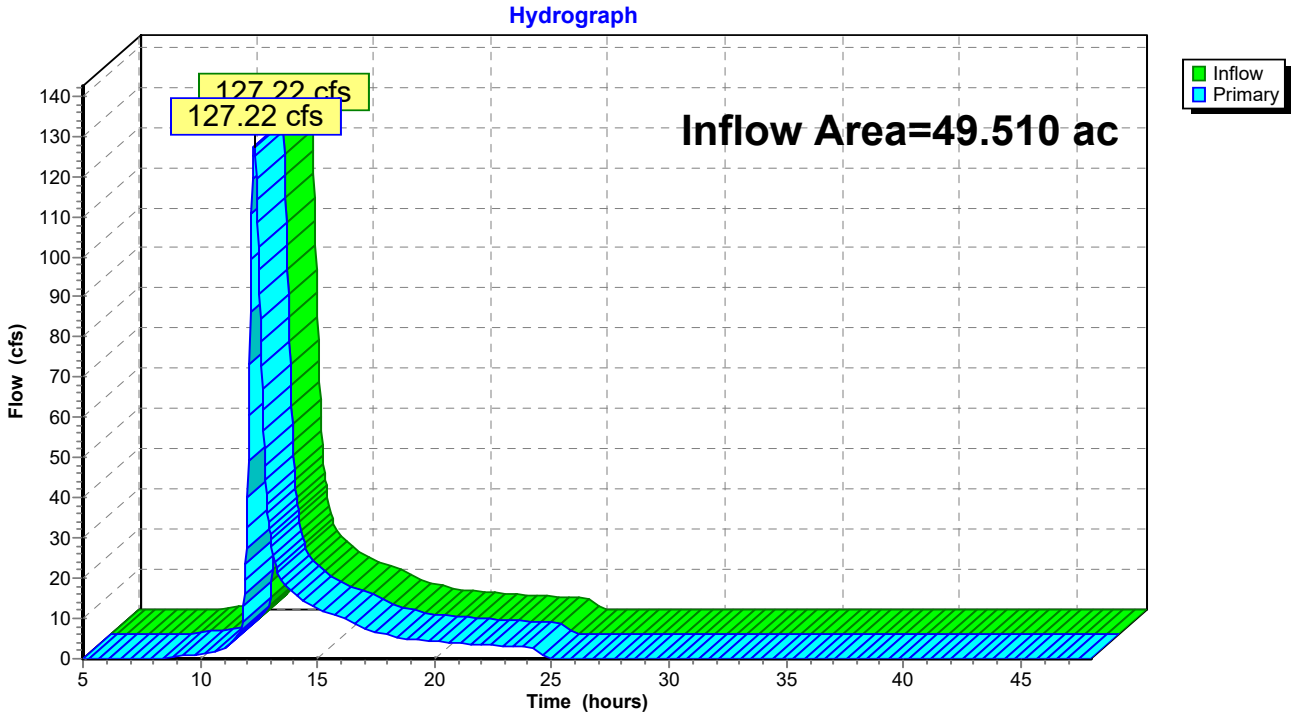


Summary for Pond SP2: ABERJONA RIVER

Inflow Area = 49.510 ac, 28.83% Impervious, Inflow Depth = 3.49" for 100 YR event
Inflow = 127.22 cfs @ 12.30 hrs, Volume= 14.412 af
Primary = 127.22 cfs @ 12.30 hrs, Volume= 14.412 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs

Pond SP2: ABERJONA RIVER



Time span=5.00-48.00 hrs, dt=0.03 hrs, 1434 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 DA 1: LOWELL STREET Runoff Area=4.810 ac 47.82% Impervious Runoff Depth>9.66"
Flow Length=1,080' Tc=15.1 min CN=84 Runoff=39.19 cfs 3.873 af

Subcatchment DA 2A: BACK OF LOTS E Runoff Area=3.100 ac 25.81% Impervious Runoff Depth=6.16"
Flow Length=614' Tc=18.1 min CN=59 Runoff=15.68 cfs 1.591 af

Subcatchment DA 2B: BACK OF LOTS MID Runoff Area=1.178 ac 24.62% Impervious Runoff Depth=4.30"
Flow Length=250' Tc=8.5 min CN=47 Runoff=5.24 cfs 0.423 af

Subcatchment DA 2C: BACK OF LOTS W Runoff Area=2.790 ac 24.01% Impervious Runoff Depth=5.24"
Flow Length=522' Tc=16.3 min CN=53 Runoff=12.40 cfs 1.219 af

Subcatchment DA 2D: PARKING Runoff Area=7,066 sf 100.00% Impervious Runoff Depth>11.00"
Tc=5.0 min CN=98 Runoff=1.92 cfs 0.149 af

Subcatchment DA 3: EAST OF ABERJONA Runoff Area=37.470 ac 26.82% Impervious Runoff Depth=5.09"
Flow Length=2,160' Tc=20.7 min CN=52 Runoff=146.17 cfs 15.887 af

Pond D110: DMH 110 Peak Elev=158.07' Inflow=180.41 cfs 19.759 af
Primary=56.62 cfs 12.334 af Secondary=123.79 cfs 7.425 af Outflow=180.41 cfs 19.759 af

Pond D120: DMH 120 Peak Elev=154.26' Inflow=56.62 cfs 12.334 af
Primary=55.76 cfs 12.246 af Secondary=0.86 cfs 0.088 af Outflow=56.62 cfs 12.334 af

Pond F1: FOREBAY Peak Elev=85.98' Storage=4,450 cf Inflow=71.36 cfs 13.837 af
Discarded=0.02 cfs 0.036 af Primary=71.20 cfs 13.788 af Outflow=71.22 cfs 13.824 af

Pond F2: FOREBAY Peak Elev=85.98' Storage=5,215 cf Inflow=71.20 cfs 13.788 af
Discarded=0.02 cfs 0.041 af Primary=71.08 cfs 13.732 af Outflow=71.10 cfs 13.773 af

Pond F3: FOREBAY Peak Elev=87.02' Storage=239 cf Inflow=1.92 cfs 0.149 af
Outflow=1.89 cfs 0.146 af

Pond P1: CELL 1 Peak Elev=86.28' Storage=34,457 cf Inflow=71.08 cfs 13.732 af
Primary=15.02 cfs 9.995 af Secondary=54.80 cfs 3.736 af Outflow=69.83 cfs 13.732 af

Pond P2: CELL 2 Peak Elev=85.00' Storage=9,700 cf Inflow=27.96 cfs 11.361 af
Primary=27.84 cfs 11.361 af Secondary=0.00 cfs 0.000 af Outflow=27.84 cfs 11.361 af

Pond P3: CELL 3 Peak Elev=85.05' Storage=11,090 cf Inflow=27.84 cfs 11.361 af
Primary=27.66 cfs 11.361 af Secondary=0.00 cfs 0.000 af Outflow=27.66 cfs 11.361 af

Pond SP1: ABERJONA RIVER Inflow=124.65 cfs 7.513 af
Primary=124.65 cfs 7.513 af

Pond SP2: ABERJONA RIVER Inflow=208.37 cfs 23.032 af
Primary=208.37 cfs 23.032 af

Total Runoff Area = 49.510 ac Runoff Volume = 23.141 af Average Runoff Depth = 5.61"
71.17% Pervious = 35.238 ac 28.83% Impervious = 14.272 ac

Summary for Subcatchment DA 1: LOWELL STREET

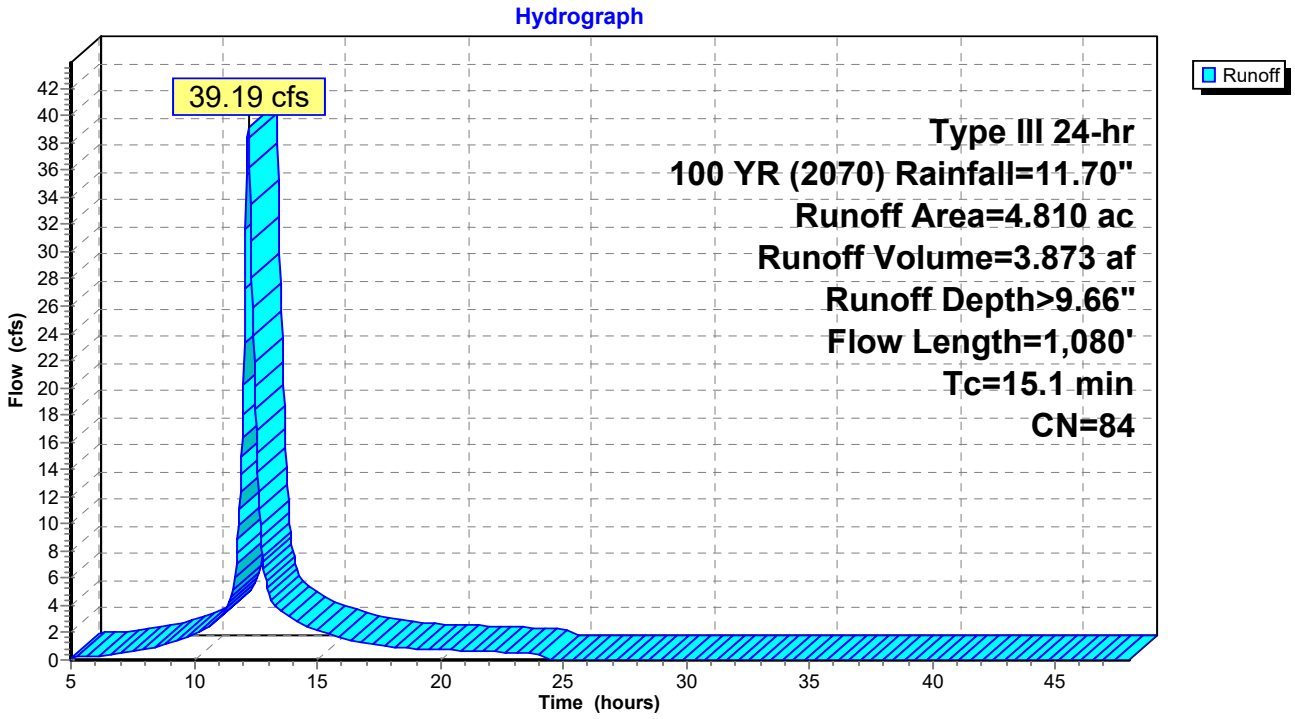
Runoff = 39.19 cfs @ 12.20 hrs, Volume= 3.873 af, Depth> 9.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 100 YR (2070) Rainfall=11.70"

Area (ac)	CN	Description
1.800	98	Paved parking, HSG C
0.500	98	Roofs, HSG C
1.250	70	Woods, Good, HSG C
1.260	74	Pasture/grassland/range, Good, HSG C
4.810	84	Weighted Average
2.510		52.18% Pervious Area
2.300		47.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
5.8	1,030	0.0210	2.94		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
15.1	1,080	Total			

Subcatchment DA 1: LOWELL STREET



Summary for Subcatchment DA 2A: BACK OF LOTS E

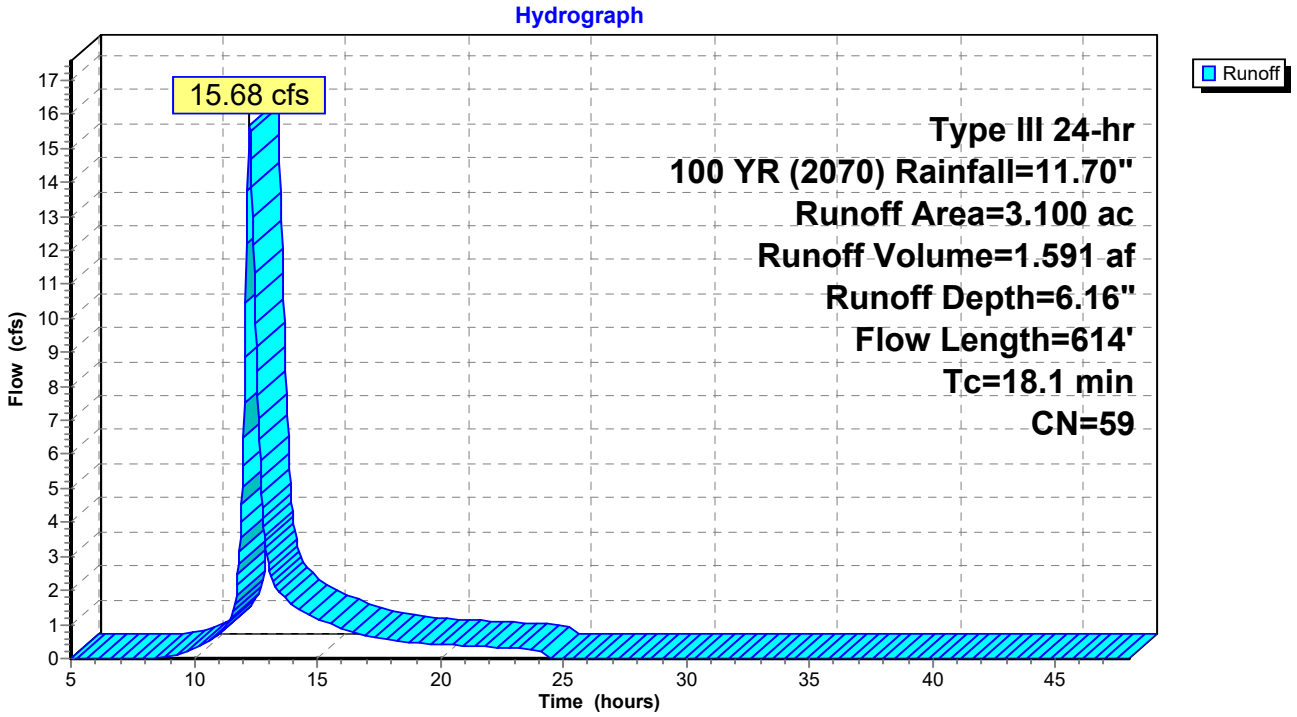
Runoff = 15.68 cfs @ 12.25 hrs, Volume= 1.591 af, Depth= 6.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 100 YR (2070) Rainfall=11.70"

Area (ac)	CN	Description
0.250	98	Paved parking, HSG C
0.020	72	Dirt roads, HSG A
0.110	87	Dirt roads, HSG C
0.260	98	Roofs, HSG C
0.290	98	Water Surface, HSG C
1.220	30	Woods, Good, HSG A
0.550	70	Woods, Good, HSG C
0.290	39	Pasture/grassland/range, Good, HSG A
0.110	74	Pasture/grassland/range, Good, HSG C
3.100	59	Weighted Average
2.300		74.19% Pervious Area
0.800		25.81% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
5.8	564	0.1040	1.61		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
18.1	614	Total			

Subcatchment DA 2A: BACK OF LOTS E



Summary for Subcatchment DA 2B: BACK OF LOTS MID

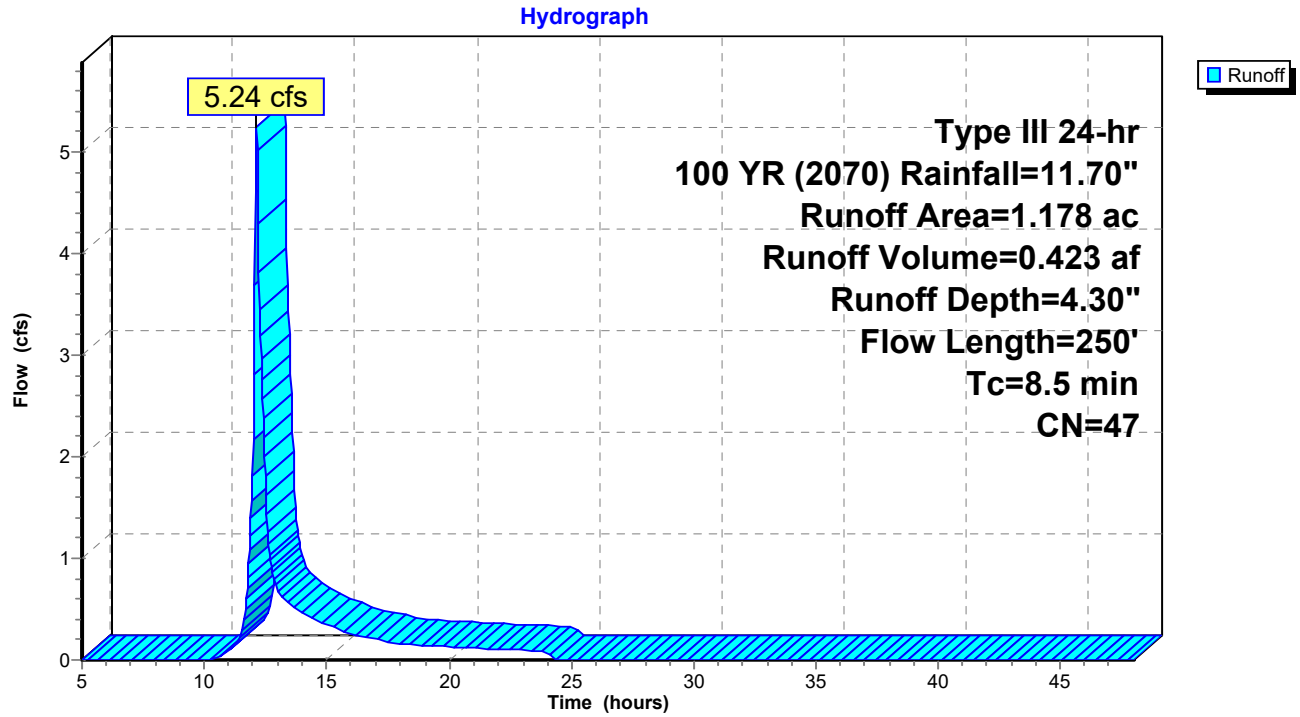
Runoff = 5.24 cfs @ 12.13 hrs, Volume= 0.423 af, Depth= 4.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 100 YR (2070) Rainfall=11.70"

Area (ac)	CN	Description
0.130	98	Paved parking, HSG C
0.160	98	Roofs, HSG C
0.868	30	Woods, Good, HSG A
0.020	39	Pasture/grassland/range, Good, HSG A
1.178	47	Weighted Average
0.888		75.38% Pervious Area
0.290		24.62% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.1000	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
2.0	200	0.1150	1.70		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.5	250	Total			

Subcatchment DA 2B: BACK OF LOTS MID



Summary for Subcatchment DA 2C: BACK OF LOTS W

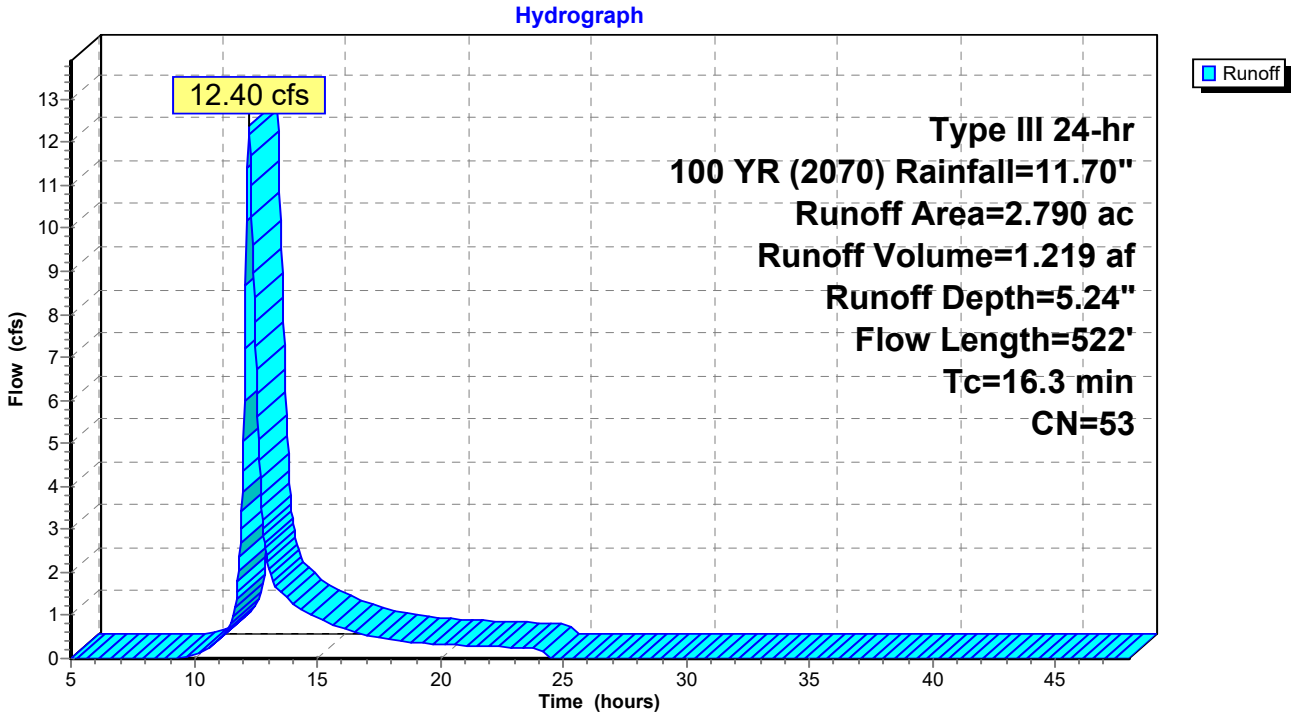
Runoff = 12.40 cfs @ 12.23 hrs, Volume= 1.219 af, Depth= 5.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 100 YR (2070) Rainfall=11.70"

Area (ac)	CN	Description
0.250	98	Paved parking, HSG C
0.090	72	Dirt roads, HSG A
0.040	87	Dirt roads, HSG C
0.120	98	Roofs, HSG C
0.300	98	Water Surface, HSG C
1.520	30	Woods, Good, HSG A
0.270	70	Woods, Good, HSG C
0.200	39	Pasture/grassland/range, Good, HSG A
0.000	74	Pasture/grassland/range, Good, HSG C
2.790	53	Weighted Average
2.120		75.99% Pervious Area
0.670		24.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
7.0	472	0.0510	1.13		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
16.3	522	Total			

Subcatchment DA 2C: BACK OF LOTS W



Summary for Subcatchment DA 2D: PARKING

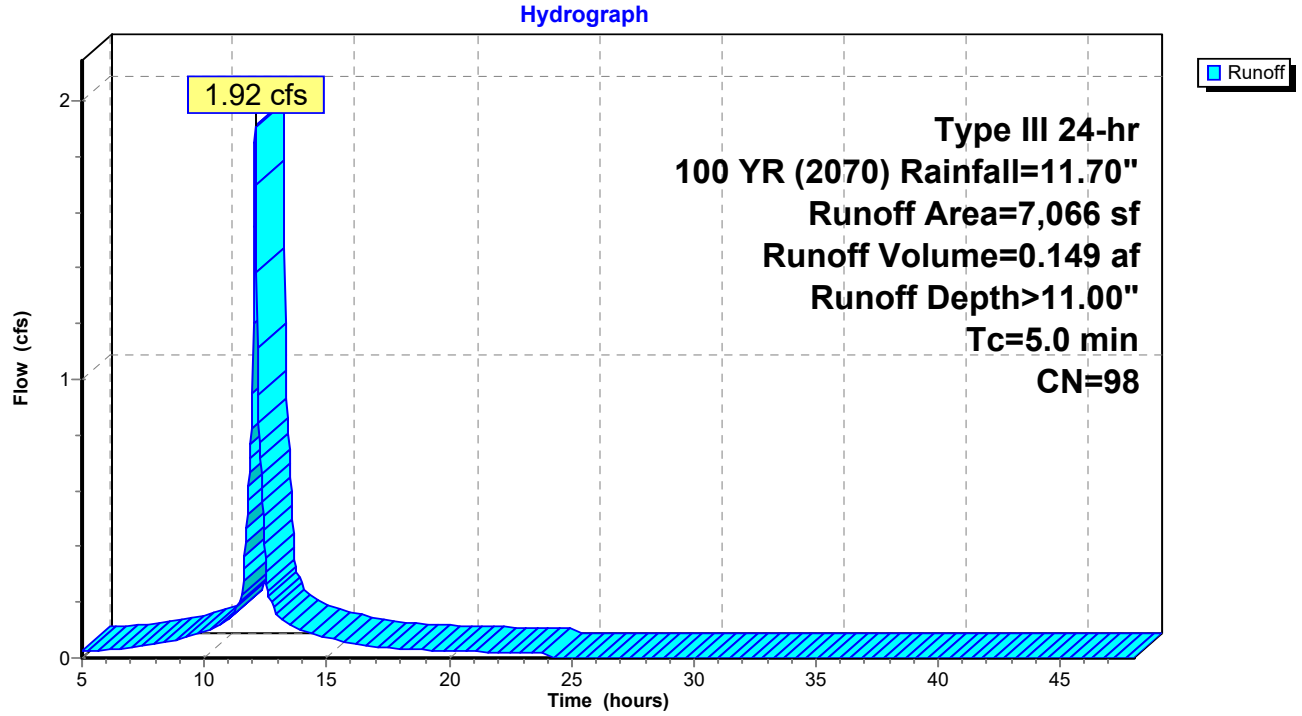
Runoff = 1.92 cfs @ 12.07 hrs, Volume= 0.149 af, Depth>11.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 100 YR (2070) Rainfall=11.70"

Area (sf)	CN	Description
7,066	98	Paved parking, HSG C
7,066		100.00% Impervious Area

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

Subcatchment DA 2D: PARKING



Summary for Subcatchment DA 3: EAST OF ABERJONA

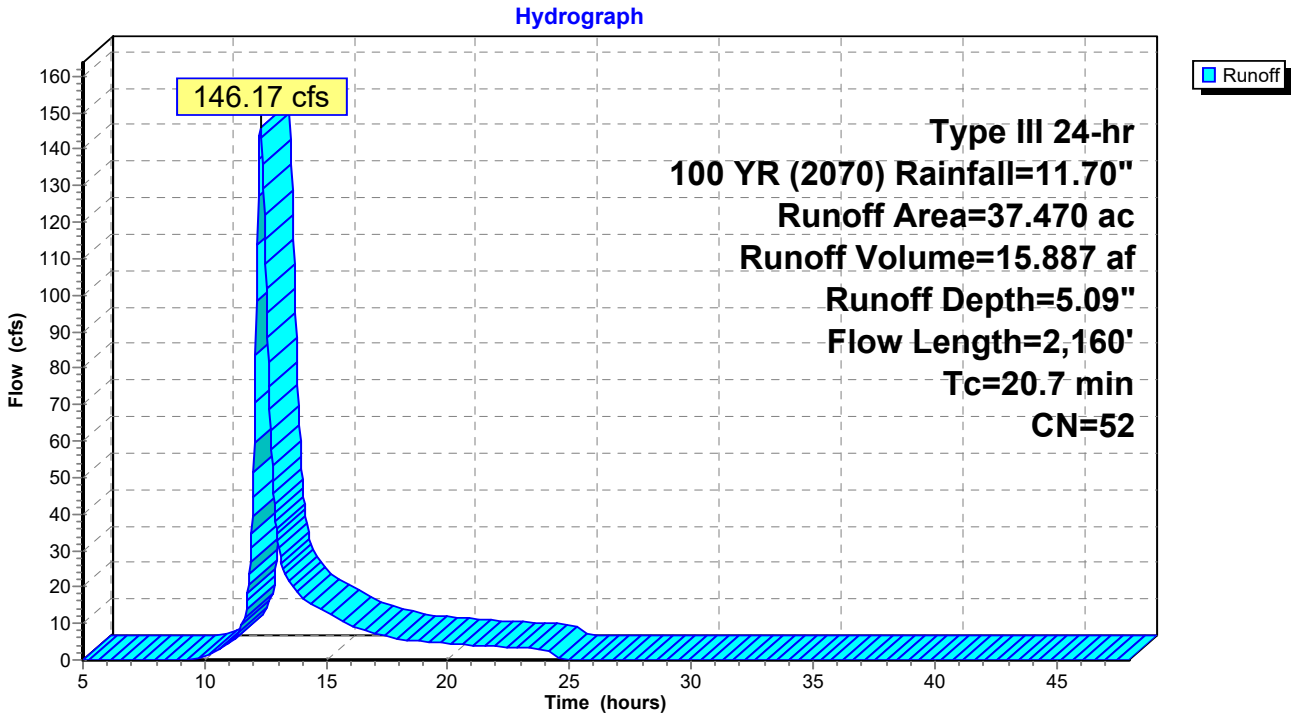
Runoff = 146.17 cfs @ 12.30 hrs, Volume= 15.887 af, Depth= 5.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr 100 YR (2070) Rainfall=11.70"

Area (ac)	CN	Description
6.760	98	Paved parking, HSG C
3.290	98	Roofs, HSG C
9.960	30	Woods, Good, HSG A
17.460	39	Pasture/grassland/range, Good, HSG A
37.470	52	Weighted Average
27.420		73.18% Pervious Area
10.050		26.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
11.4	2,110	0.0230	3.08		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
20.7	2,160	Total			

Subcatchment DA 3: EAST OF ABERJONA



Summary for Pond D110: DMH 110

Inflow Area = 42.280 ac, 29.21% Impervious, Inflow Depth > 5.61" for 100 YR (2070) event
Inflow = 180.41 cfs @ 12.27 hrs, Volume= 19.759 af
Outflow = 180.41 cfs @ 12.27 hrs, Volume= 19.759 af, Atten= 0%, Lag= 0.0 min
Primary = 56.62 cfs @ 12.27 hrs, Volume= 12.334 af
Secondary = 123.79 cfs @ 12.27 hrs, Volume= 7.425 af

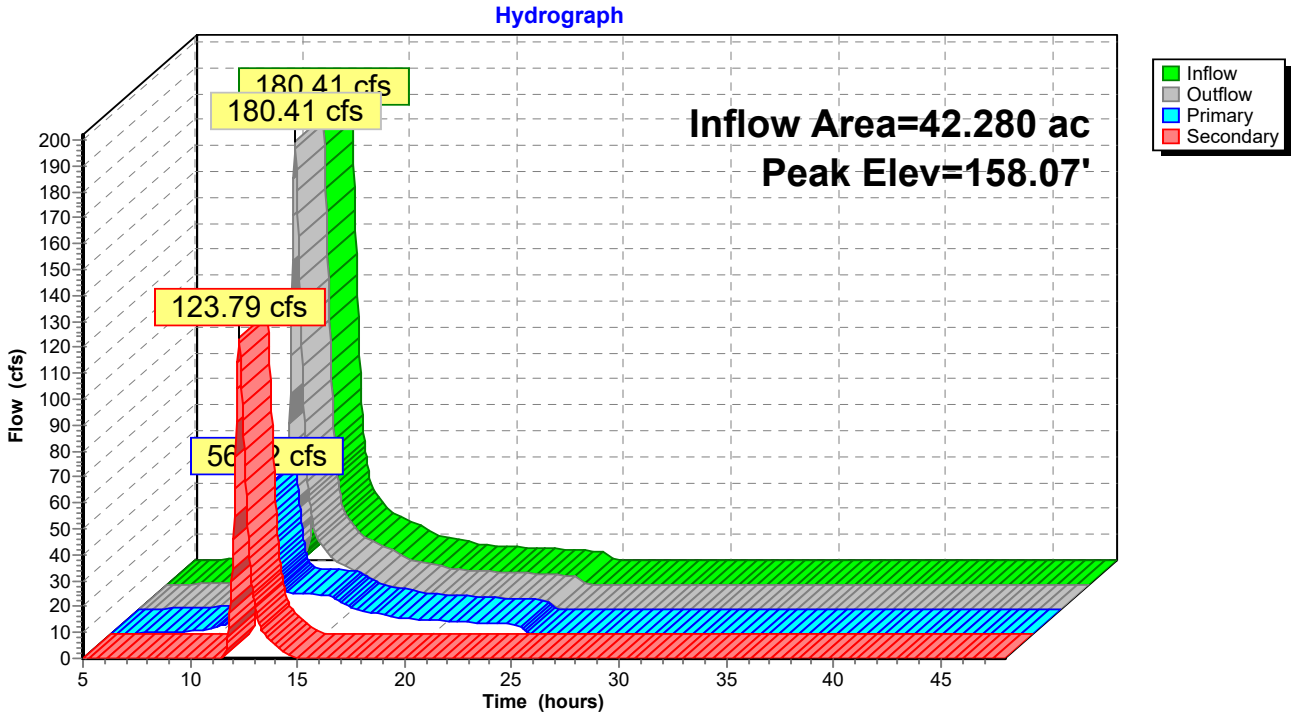
Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Peak Elev= 158.07' @ 12.27 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	85.30'	**18.0" Round Culvert** L= 143.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 85.30' / 84.60' S= 0.0049 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Secondary	91.10'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=56.45 cfs @ 12.27 hrs HW=157.63' (Free Discharge)
└**1=Culvert** (Barrel Controls 56.45 cfs @ 31.94 fps)

Secondary OutFlow Max=123.39 cfs @ 12.27 hrs HW=157.63' (Free Discharge)
└**2=Orifice/Grate** (Orifice Controls 123.39 cfs @ 39.28 fps)

Pond D110: DMH 110



Summary for Pond D120: DMH 120

Inflow Area = 42.280 ac, 29.21% Impervious, Inflow Depth > 3.50" for 100 YR (2070) event
Inflow = 56.62 cfs @ 12.27 hrs, Volume= 12.334 af
Outflow = 56.62 cfs @ 12.27 hrs, Volume= 12.334 af, Atten= 0%, Lag= 0.0 min
Primary = 55.76 cfs @ 12.27 hrs, Volume= 12.246 af
Secondary = 0.86 cfs @ 12.27 hrs, Volume= 0.088 af

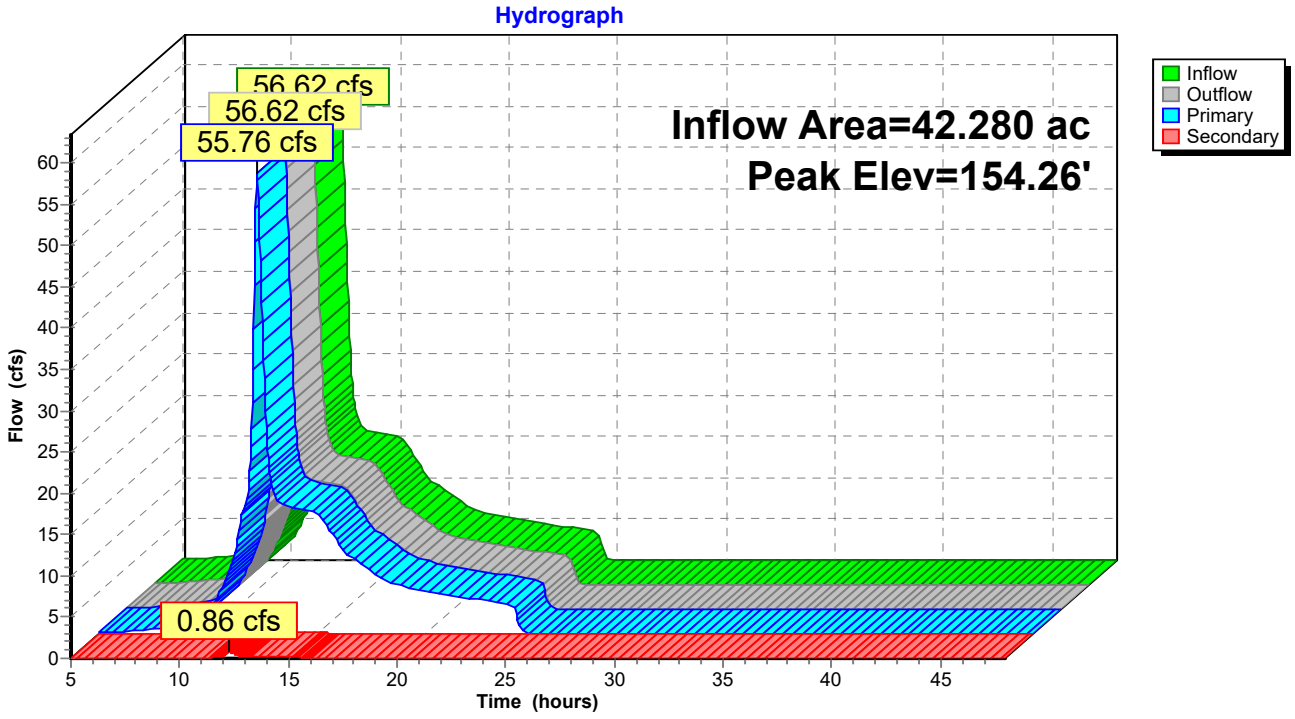
Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Peak Elev= 154.26' @ 12.27 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	84.60'	**18.0" Round Culvert** L= 126.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 84.60' / 84.00' S= 0.0048 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Secondary	88.01'	**2.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=55.59 cfs @ 12.27 hrs HW=153.84' (Free Discharge)
└**1=Culvert** (Inlet Controls 55.59 cfs @ 31.46 fps)

Secondary OutFlow Max=0.85 cfs @ 12.27 hrs HW=153.84' (Free Discharge)
└**2=Orifice/Grate** (Orifice Controls 0.85 cfs @ 39.07 fps)

Pond D120: DMH 120



Summary for Pond F1: FOREBAY

Inflow Area = 45.380 ac, 28.98% Impervious, Inflow Depth > 3.66" for 100 YR (2070) event
Inflow = 71.36 cfs @ 12.27 hrs, Volume= 13.837 af
Outflow = 71.22 cfs @ 12.28 hrs, Volume= 13.824 af, Atten= 0%, Lag= 0.7 min
Discarded = 0.02 cfs @ 12.28 hrs, Volume= 0.036 af
Primary = 71.20 cfs @ 12.28 hrs, Volume= 13.788 af

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Peak Elev= 85.98' @ 12.28 hrs Surf.Area= 2,683 sf Storage= 4,450 cf

Plug-Flow detention time= 4.5 min calculated for 13.824 af (100% of inflow)
Center-of-Mass det. time= 3.9 min (897.4 - 893.4)

Volume	Invert	Avail.Storage	Storage Description
#1	83.50'	12,853 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

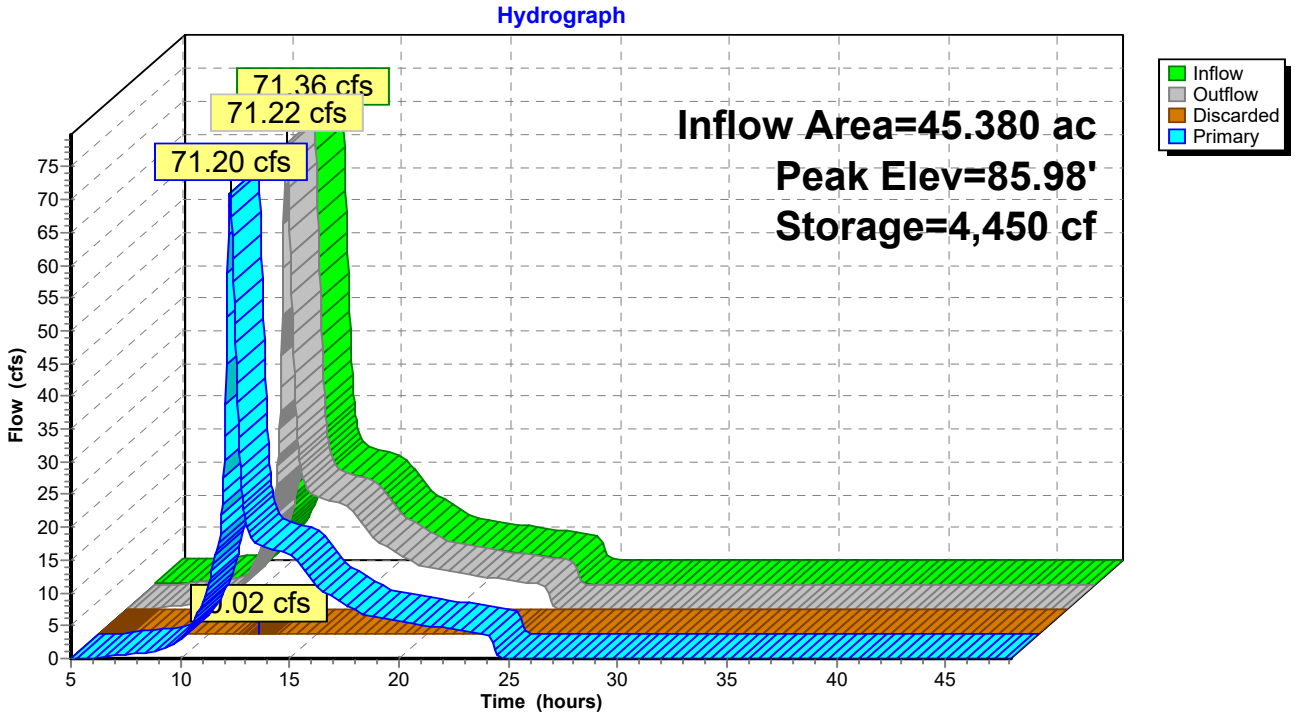
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
83.50	1,040	0	0
84.00	1,321	590	590
84.50	1,701	756	1,346
85.00	1,843	886	2,232
86.00	2,700	2,272	4,503
87.00	4,000	3,350	7,853
88.00	6,000	5,000	12,853

Device	Routing	Invert	Outlet Devices
#1	Primary	84.50'	**15.0' long x 20.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Discarded	83.50'	**0.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.02 cfs @ 12.28 hrs HW=85.98' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=71.02 cfs @ 12.28 hrs HW=85.98' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 71.02 cfs @ 3.20 fps)

Pond F1: FOREBAY



Summary for Pond F2: FOREBAY

Inflow Area = 45.380 ac, 28.98% Impervious, Inflow Depth = 3.65" for 100 YR (2070) event
Inflow = 71.20 cfs @ 12.28 hrs, Volume= 13.788 af
Outflow = 71.10 cfs @ 12.29 hrs, Volume= 13.773 af, Atten= 0%, Lag= 0.8 min
Discarded = 0.02 cfs @ 12.29 hrs, Volume= 0.041 af
Primary = 71.08 cfs @ 12.29 hrs, Volume= 13.732 af

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Peak Elev= 85.98' @ 12.29 hrs Surf.Area= 2,985 sf Storage= 5,215 cf

Plug-Flow detention time= 5.1 min calculated for 13.773 af (100% of inflow)
Center-of-Mass det. time= 4.4 min (900.1 - 895.7)

Volume	Invert	Avail.Storage	Storage Description
#1	83.50'	14,130 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

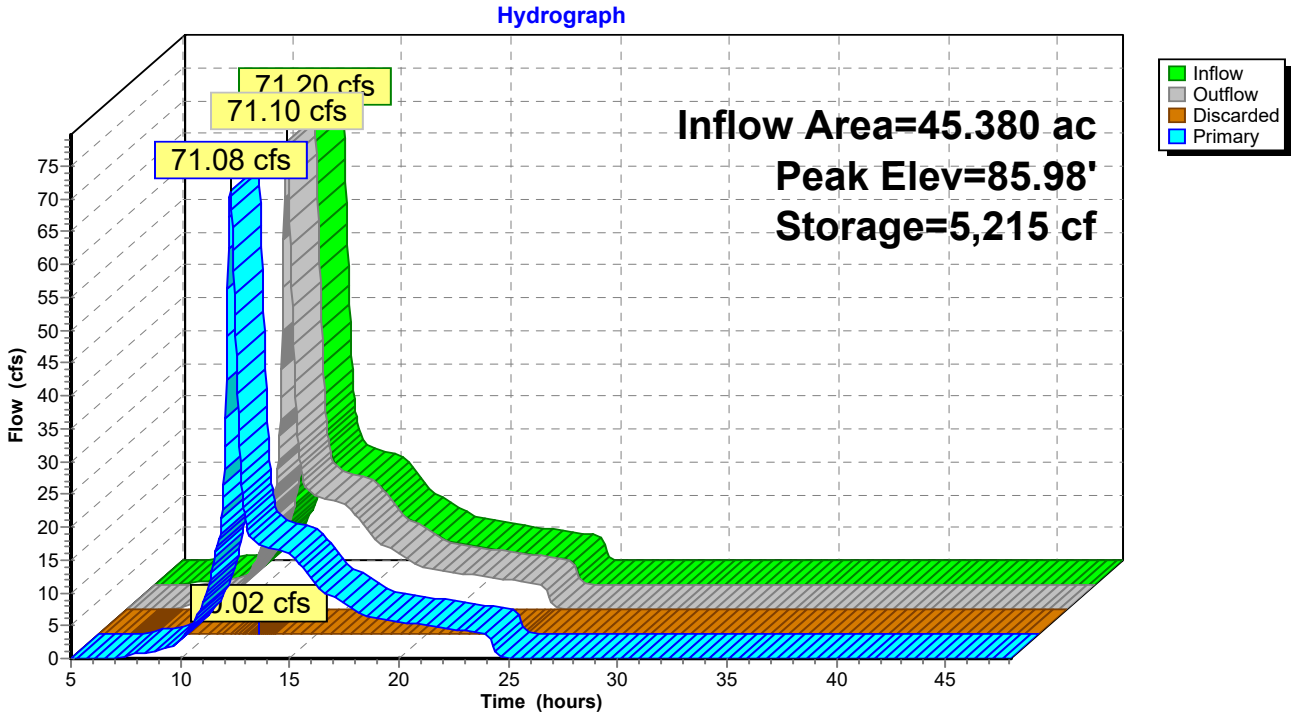
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
83.50	1,266	0	0
84.00	1,481	687	687
84.50	2,013	874	1,560
85.00	2,288	1,075	2,636
86.00	3,000	2,644	5,280
87.00	4,500	3,750	9,030
88.00	5,700	5,100	14,130

Device	Routing	Invert	Outlet Devices
#1	Primary	84.50'	**15.0' long x 20.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Discarded	83.50'	**0.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.02 cfs @ 12.29 hrs HW=85.98' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=71.04 cfs @ 12.29 hrs HW=85.98' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 71.04 cfs @ 3.20 fps)

Pond F2: FOREBAY



Summary for Pond F3: FOREBAY

Inflow Area = 0.162 ac,100.00% Impervious, Inflow Depth > 11.00" for 100 YR (2070) event
Inflow = 1.92 cfs @ 12.07 hrs, Volume= 0.149 af
Outflow = 1.89 cfs @ 12.09 hrs, Volume= 0.146 af, Atten= 1%, Lag= 0.9 min
Primary = 1.89 cfs @ 12.09 hrs, Volume= 0.146 af

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Peak Elev= 87.02' @ 12.09 hrs Surf.Area= 531 sf Storage= 239 cf

Plug-Flow detention time= 20.3 min calculated for 0.146 af (98% of inflow)
Center-of-Mass det. time= 9.6 min (768.2 - 758.6)

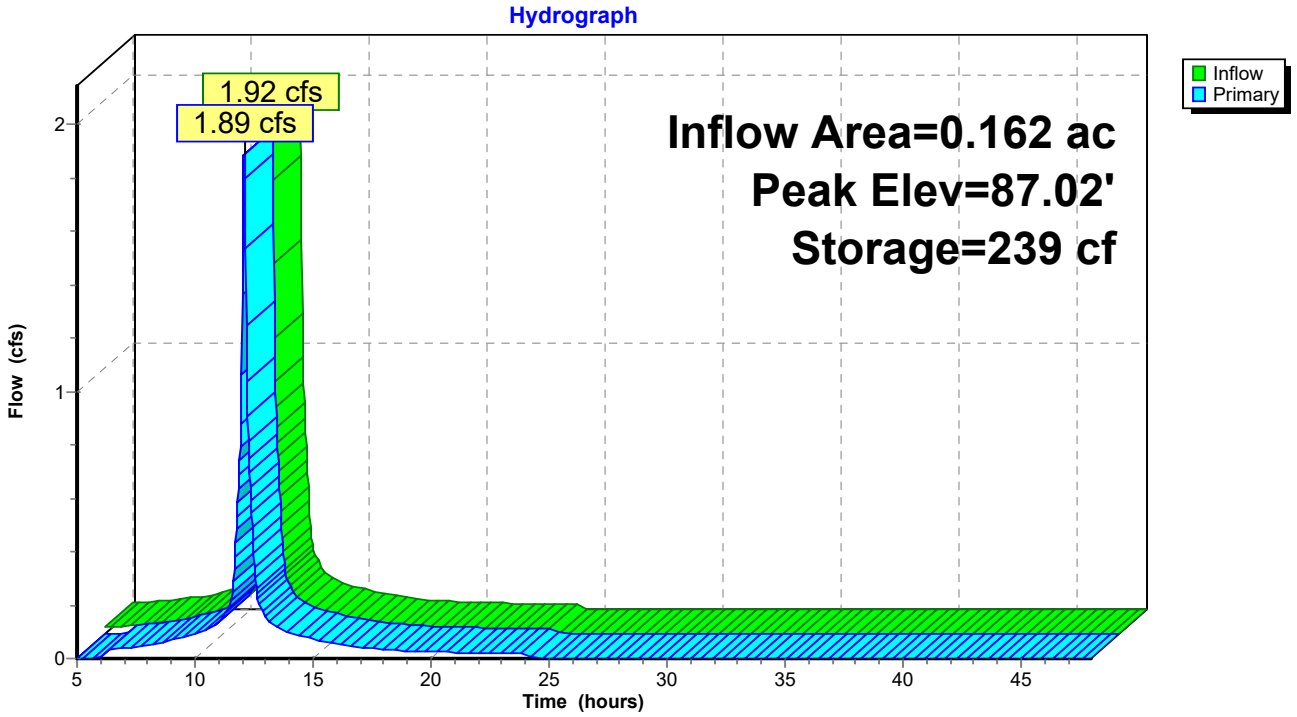
Volume	Invert	Avail.Storage	Storage Description
#1	86.50'	369 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
86.50	400	0	0
86.75	450	106	106
87.25	600	263	369

Device	Routing	Invert	Outlet Devices
#1	Primary	86.75'	**5.0' long x 15.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=1.87 cfs @ 12.09 hrs HW=87.02' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 1.87 cfs @ 1.39 fps)

Pond F3: FOREBAY



Summary for Pond P1: CELL 1

Inflow Area = 45.380 ac, 28.98% Impervious, Inflow Depth = 3.63" for 100 YR (2070) event
Inflow = 71.08 cfs @ 12.29 hrs, Volume= 13.732 af
Outflow = 69.83 cfs @ 12.33 hrs, Volume= 13.732 af, Atten= 2%, Lag= 2.3 min
Primary = 15.02 cfs @ 12.33 hrs, Volume= 9.995 af
Secondary = 54.80 cfs @ 12.33 hrs, Volume= 3.736 af

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Starting Elev= 84.50' Surf.Area= 9,400 sf Storage= 15,153 cf
Peak Elev= 86.28' @ 12.33 hrs Surf.Area= 13,753 sf Storage= 34,457 cf (19,304 cf above start)

Plug-Flow detention time= 31.9 min calculated for 13.384 af (97% of inflow)
Center-of-Mass det. time= 9.1 min (907.3 - 898.2)

Volume	Invert	Avail.Storage	Storage Description
#1	79.00'	46,228 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

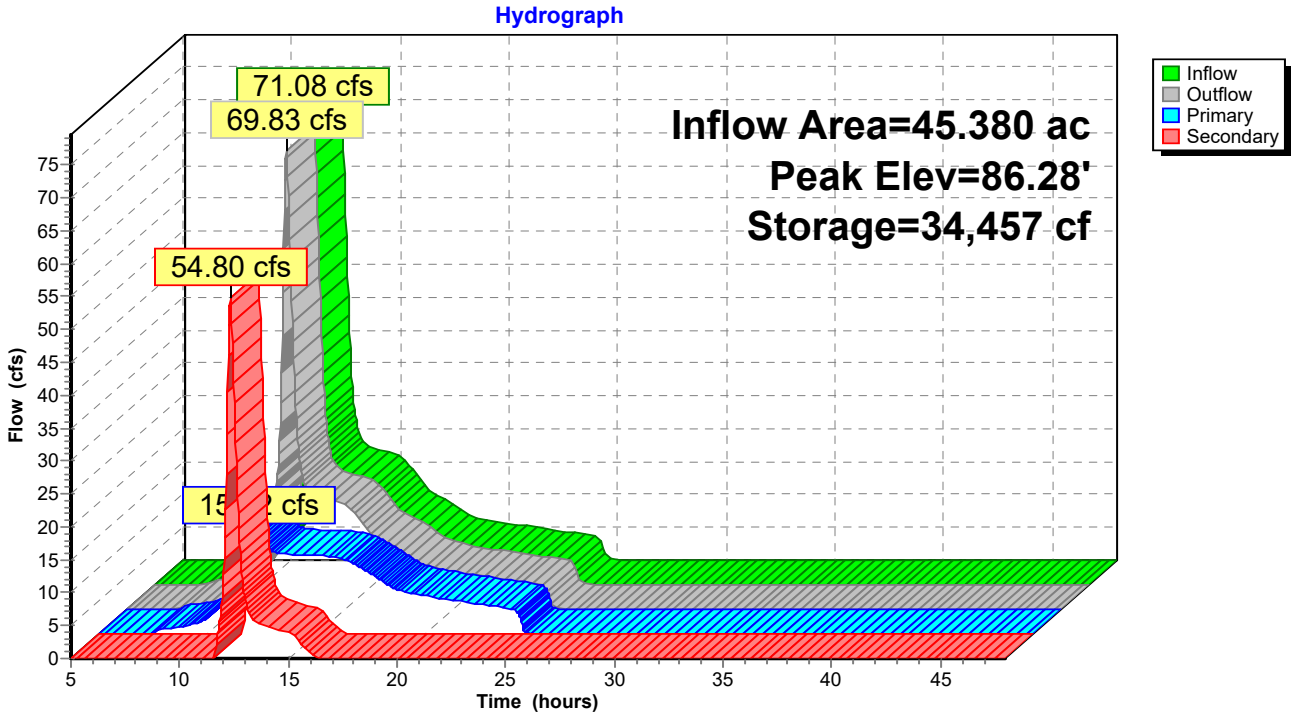
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
79.00	350	0	0
80.00	761	556	556
81.00	1,501	1,131	1,687
82.00	2,224	1,863	3,549
83.00	3,057	2,641	6,190
84.00	6,780	4,919	11,108
84.50	9,400	4,045	15,153
85.00	10,100	4,875	20,028
85.50	10,800	5,225	25,253
86.00	11,700	5,625	30,878
87.00	19,000	15,350	46,228

Device	Routing	Invert	Outlet Devices
#1	Primary	82.50'	**24.0" Round Culvert** L= 250.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 80.50' / 82.50' S= -0.0080 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#2	Secondary	85.50'	**30.0' long x 15.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=15.02 cfs @ 12.33 hrs HW=86.28' TW=84.50' (Fixed TW Elev= 84.50')
↑—**1=Culvert** (Outlet Controls 15.02 cfs @ 4.78 fps)

Secondary OutFlow Max=54.63 cfs @ 12.33 hrs HW=86.28' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 54.63 cfs @ 2.34 fps)

Pond P1: CELL 1



Summary for Pond P2: CELL 2

Inflow Area = 48.332 ac, 28.93% Impervious, Inflow Depth = 2.82" for 100 YR (2070) event
Inflow = 27.96 cfs @ 12.24 hrs, Volume= 11.361 af
Outflow = 27.84 cfs @ 12.26 hrs, Volume= 11.361 af, Atten= 0%, Lag= 1.4 min
Primary = 27.84 cfs @ 12.26 hrs, Volume= 11.361 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Starting Elev= 84.50' Surf.Area= 5,620 sf Storage= 6,541 cf
Peak Elev= 85.00' @ 12.26 hrs Surf.Area= 7,001 sf Storage= 9,700 cf (3,159 cf above start)

Plug-Flow detention time= 15.2 min calculated for 11.203 af (99% of inflow)
Center-of-Mass det. time= 2.7 min (945.4 - 942.7)

Volume	Invert	Avail.Storage	Storage Description
#1	79.00'	17,196 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

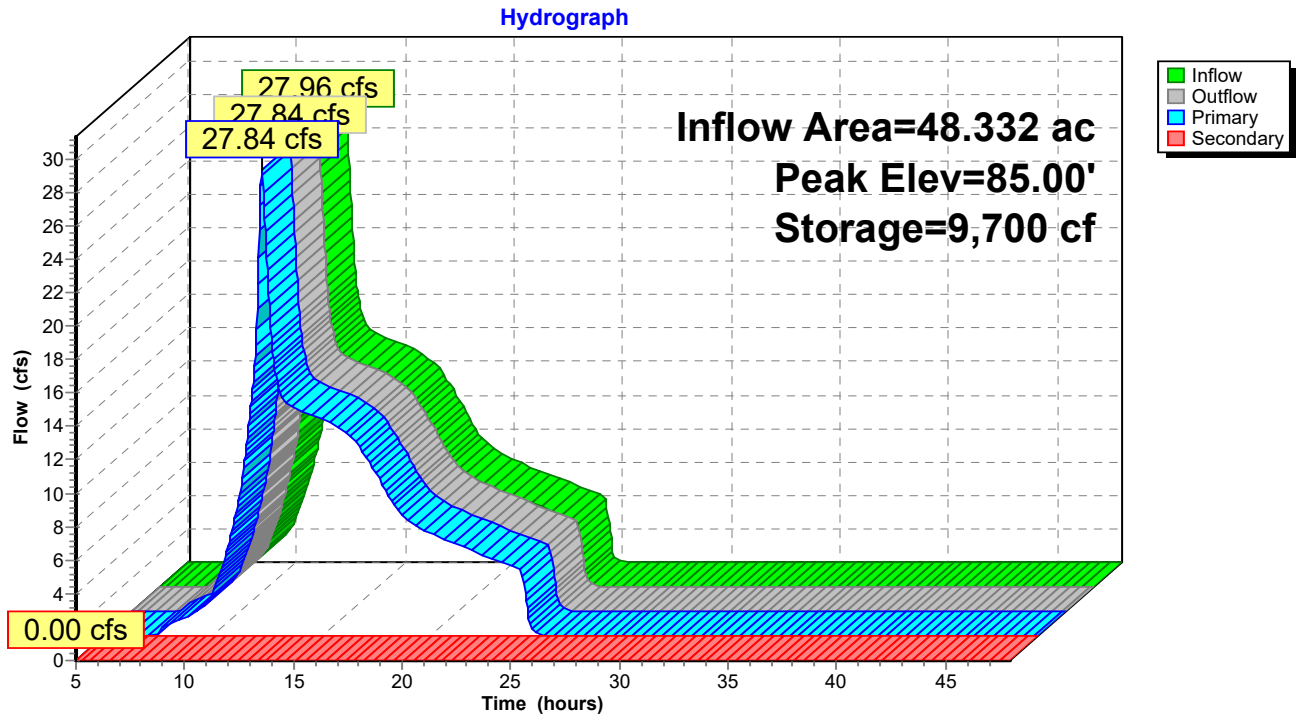
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
79.00	2	0	0
80.00	92	47	47
81.00	292	192	239
82.00	731	512	751
83.00	1,320	1,026	1,776
84.00	3,600	2,460	4,236
84.50	5,620	2,305	6,541
85.00	7,000	3,155	9,696
86.00	8,000	7,500	17,196

Device	Routing	Invert	Outlet Devices
#1	Primary	84.50'	**30.0' long x 8.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74
#2	Secondary	85.50'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=27.82 cfs @ 12.26 hrs HW=85.00' TW=84.50' (Fixed TW Elev= 84.50')
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 27.82 cfs @ 1.85 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=84.50' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond P2: CELL 2



Summary for Pond P3: CELL 3

Inflow Area = 48.332 ac, 28.93% Impervious, Inflow Depth = 2.82" for 100 YR (2070) event
Inflow = 27.84 cfs @ 12.26 hrs, Volume= 11.361 af
Outflow = 27.66 cfs @ 12.29 hrs, Volume= 11.361 af, Atten= 1%, Lag= 1.7 min
Primary = 27.66 cfs @ 12.29 hrs, Volume= 11.361 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Starting Elev= 84.50' Surf.Area= 6,663 sf Storage= 7,197 cf
Peak Elev= 85.05' @ 12.29 hrs Surf.Area= 7,428 sf Storage= 11,090 cf (3,893 cf above start)

Plug-Flow detention time= 17.0 min calculated for 11.188 af (98% of inflow)
Center-of-Mass det. time= 3.3 min (948.6 - 945.4)

Volume	Invert	Avail.Storage	Storage Description
#1	79.00'	18,411 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

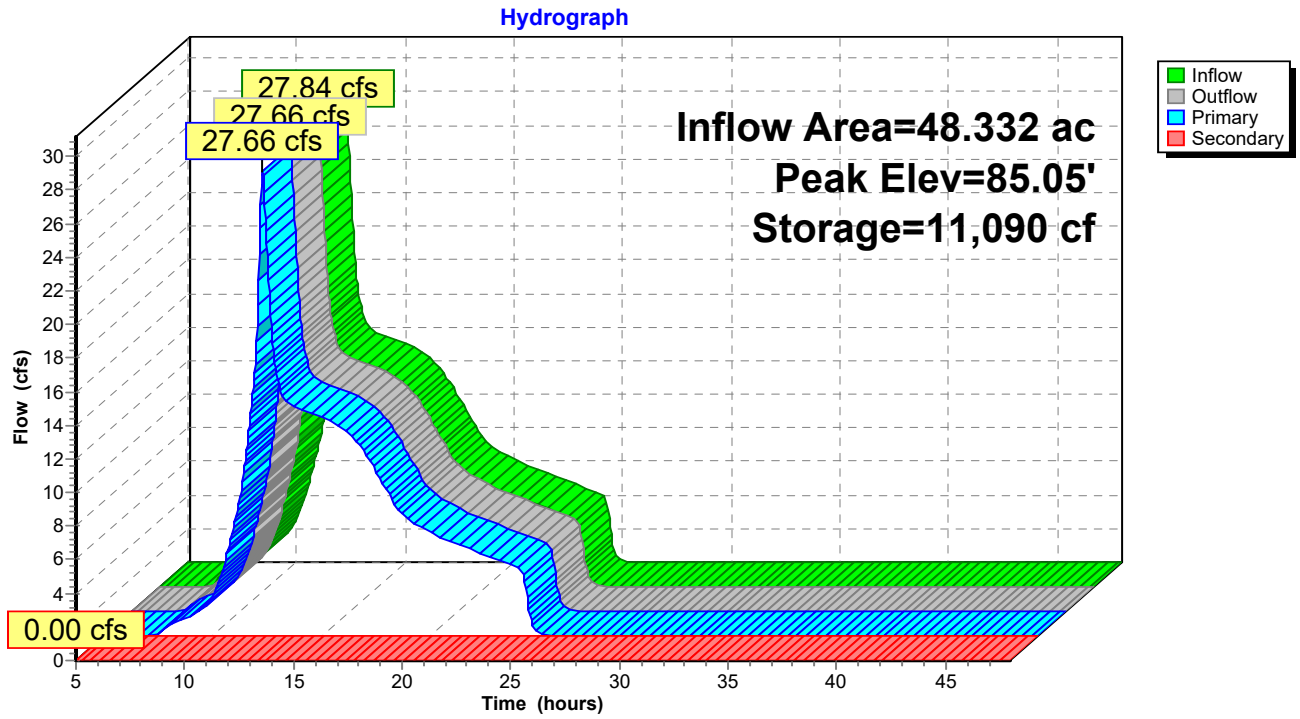
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
79.00	14	0	0
80.00	85	50	50
81.00	375	230	280
82.00	826	601	880
83.00	1,383	1,105	1,985
84.00	3,807	2,595	4,580
84.50	6,663	2,618	7,197
85.00	7,397	3,515	10,712
86.00	8,000	7,699	18,411

Device	Routing	Invert	Outlet Devices
#1	Primary	84.50'	**25.0' long x 17.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Secondary	86.25'	**100.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=27.60 cfs @ 12.29 hrs HW=85.05' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 27.60 cfs @ 2.00 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=84.50' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond P3: CELL 3

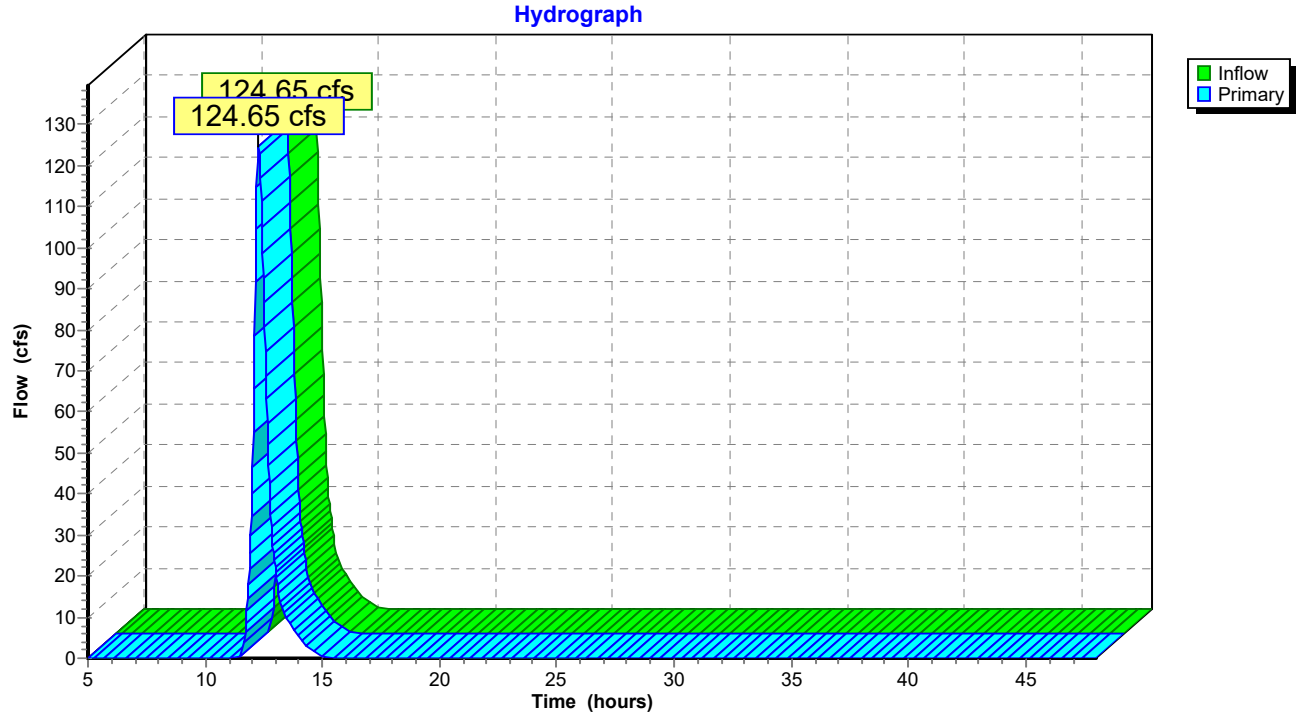


Summary for Pond SP1: ABERJONA RIVER

Inflow = 124.65 cfs @ 12.27 hrs, Volume= 7.513 af
Primary = 124.65 cfs @ 12.27 hrs, Volume= 7.513 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs

Pond SP1: ABERJONA RIVER

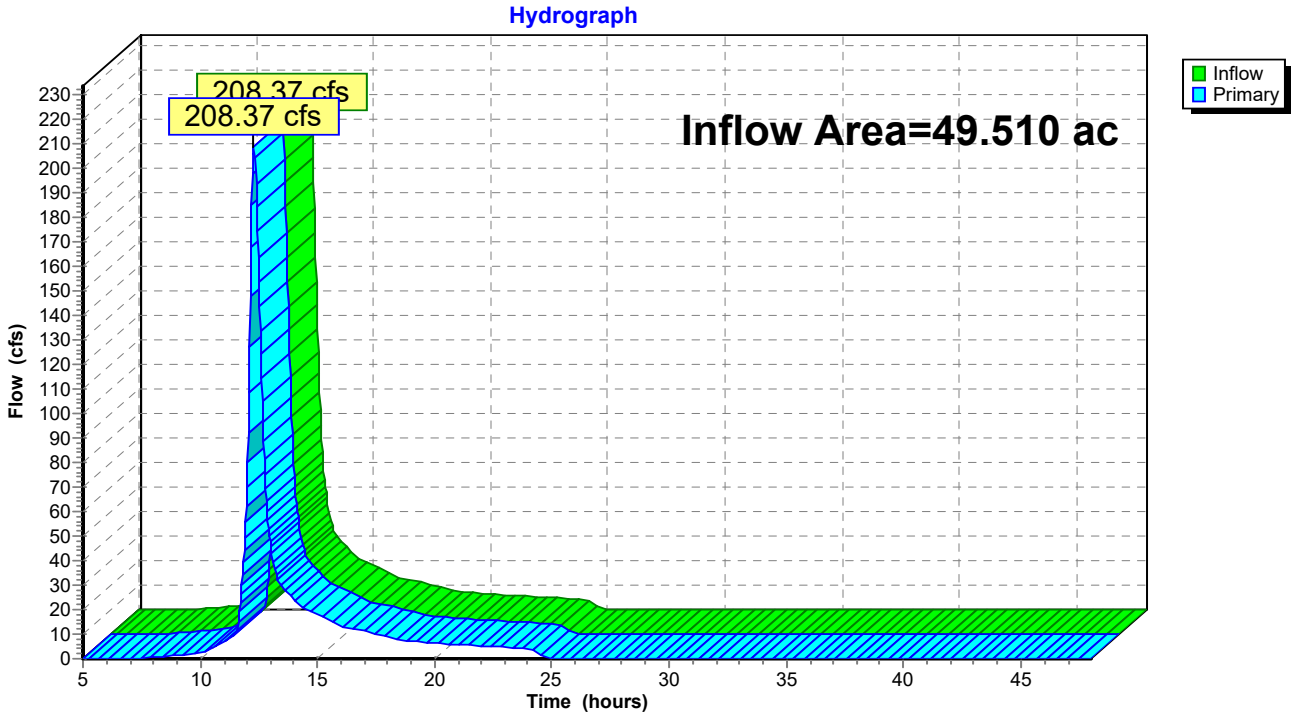


Summary for Pond SP2: ABERJONA RIVER

Inflow Area = 49.510 ac, 28.83% Impervious, Inflow Depth = 5.58" for 100 YR (2070) event
Inflow = 208.37 cfs @ 12.29 hrs, Volume= 23.032 af
Primary = 208.37 cfs @ 12.29 hrs, Volume= 23.032 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs

Pond SP2: ABERJONA RIVER



Time span=5.00-48.00 hrs, dt=0.03 hrs, 1434 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 DA 1: LOWELL STREET Runoff Area=4.810 ac 47.82% Impervious Runoff Depth=0.26"
Flow Length=1,080' Tc=15.1 min CN=84 Runoff=0.89 cfs 0.103 af

Subcatchment DA 2A: BACK OF LOTS E Runoff Area=3.100 ac 25.81% Impervious Runoff Depth=0.00"
Flow Length=614' Tc=18.1 min CN=59 Runoff=0.00 cfs 0.000 af

Subcatchment DA 2B: BACK OF LOTS MID Runoff Area=1.178 ac 24.62% Impervious Runoff Depth=0.00"
Flow Length=250' Tc=8.5 min CN=47 Runoff=0.00 cfs 0.000 af

Subcatchment DA 2C: BACK OF LOTS W Runoff Area=2.790 ac 24.01% Impervious Runoff Depth=0.00"
Flow Length=522' Tc=16.3 min CN=53 Runoff=0.00 cfs 0.000 af

Subcatchment DA 2D: PARKING Runoff Area=7,066 sf 100.00% Impervious Runoff Depth>1.00"
Tc=5.0 min CN=98 Runoff=0.19 cfs 0.014 af

Subcatchment DA 3: EAST OF ABERJONA Runoff Area=37.470 ac 26.82% Impervious Runoff Depth=0.00"
Flow Length=2,160' Tc=20.7 min CN=52 Runoff=0.00 cfs 0.000 af

Pond D110: DMH 110 Peak Elev=85.79' Inflow=0.89 cfs 0.103 af
Primary=0.89 cfs 0.103 af Secondary=0.00 cfs 0.000 af Outflow=0.89 cfs 0.103 af

Pond D120: DMH 120 Peak Elev=85.09' Inflow=0.89 cfs 0.103 af
Primary=0.89 cfs 0.103 af Secondary=0.00 cfs 0.000 af Outflow=0.89 cfs 0.103 af

Pond F1: FOREBAY Peak Elev=84.54' Storage=1,420 cf Inflow=0.89 cfs 0.103 af
Discarded=0.01 cfs 0.029 af Primary=0.39 cfs 0.061 af Outflow=0.40 cfs 0.090 af

Pond F2: FOREBAY Peak Elev=84.51' Storage=1,574 cf Inflow=0.39 cfs 0.061 af
Discarded=0.01 cfs 0.033 af Primary=0.05 cfs 0.014 af Outflow=0.06 cfs 0.047 af

Pond F3: FOREBAY Peak Elev=86.81' Storage=132 cf Inflow=0.19 cfs 0.014 af
Outflow=0.18 cfs 0.011 af

Pond P1: CELL 1 Peak Elev=84.50' Storage=15,159 cf Inflow=0.05 cfs 0.014 af
Primary=0.05 cfs 0.014 af Secondary=0.00 cfs 0.000 af Outflow=0.05 cfs 0.014 af

Pond P2: CELL 2 Peak Elev=84.51' Storage=6,600 cf Inflow=0.18 cfs 0.025 af
Primary=0.13 cfs 0.025 af Secondary=0.00 cfs 0.000 af Outflow=0.13 cfs 0.025 af

Pond P3: CELL 3 Peak Elev=84.51' Storage=7,276 cf Inflow=0.13 cfs 0.025 af
Primary=0.11 cfs 0.025 af Secondary=0.00 cfs 0.000 af Outflow=0.11 cfs 0.025 af

Pond SP1: ABERJONA RIVER Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Pond SP2: ABERJONA RIVER Inflow=0.11 cfs 0.025 af
Primary=0.11 cfs 0.025 af

Total Runoff Area = 49.510 ac Runoff Volume = 0.116 af Average Runoff Depth = 0.03"
71.17% Pervious = 35.238 ac 28.83% Impervious = 14.272 ac

Summary for Subcatchment DA 1: LOWELL STREET

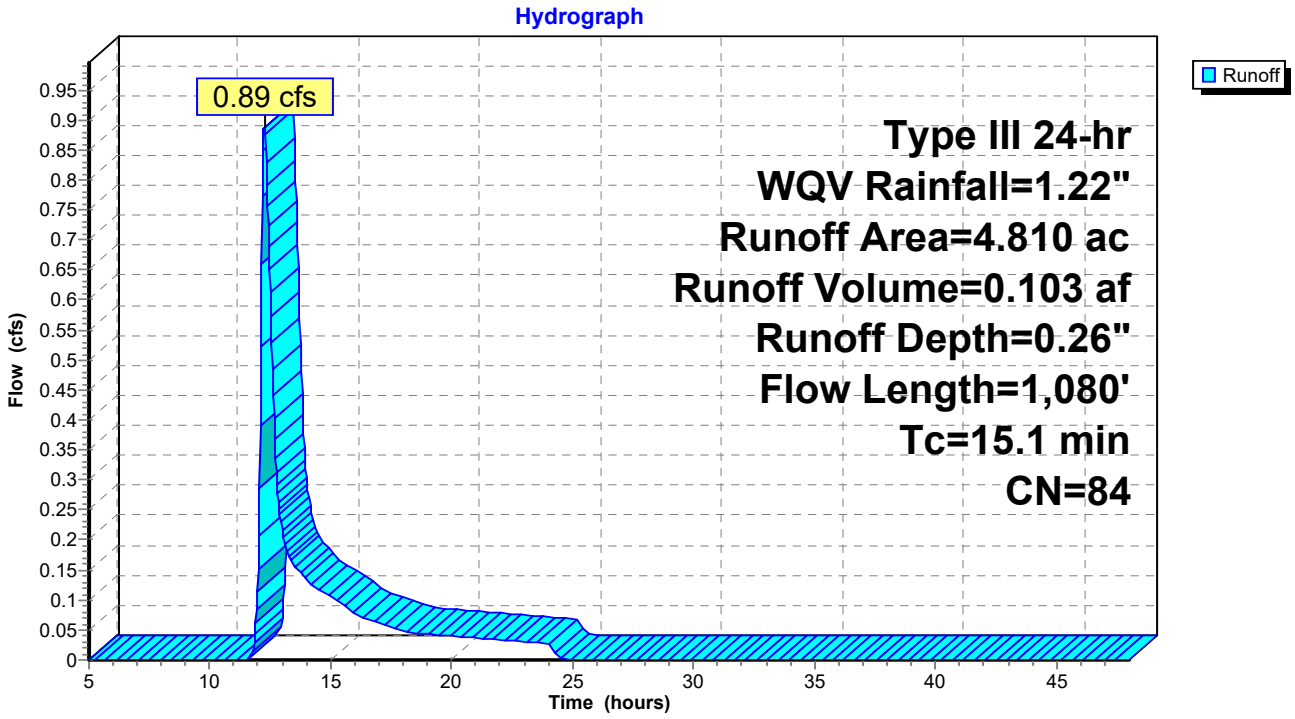
Runoff = 0.89 cfs @ 12.25 hrs, Volume= 0.103 af, Depth= 0.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr WQV Rainfall=1.22"

Area (ac)	CN	Description
1.800	98	Paved parking, HSG C
0.500	98	Roofs, HSG C
1.250	70	Woods, Good, HSG C
1.260	74	Pasture/grassland/range, Good, HSG C
4.810	84	Weighted Average
2.510		52.18% Pervious Area
2.300		47.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
5.8	1,030	0.0210	2.94		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
15.1	1,080	Total			

Subcatchment DA 1: LOWELL STREET



Summary for Subcatchment DA 2A: BACK OF LOTS E

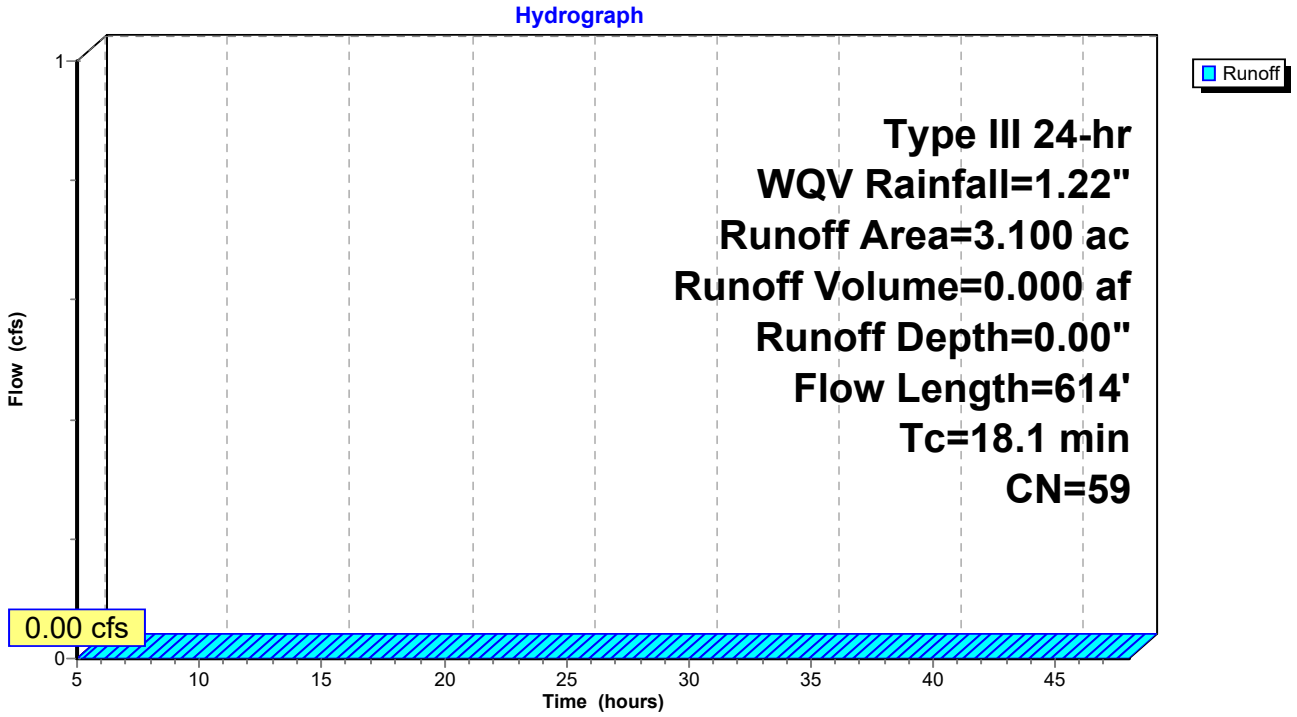
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr WQV Rainfall=1.22"

Area (ac)	CN	Description
0.250	98	Paved parking, HSG C
0.020	72	Dirt roads, HSG A
0.110	87	Dirt roads, HSG C
0.260	98	Roofs, HSG C
0.290	98	Water Surface, HSG C
1.220	30	Woods, Good, HSG A
0.550	70	Woods, Good, HSG C
0.290	39	Pasture/grassland/range, Good, HSG A
0.110	74	Pasture/grassland/range, Good, HSG C
3.100	59	Weighted Average
2.300		74.19% Pervious Area
0.800		25.81% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
5.8	564	0.1040	1.61		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
18.1	614	Total			

Subcatchment DA 2A: BACK OF LOTS E



Summary for Subcatchment DA 2B: BACK OF LOTS MID

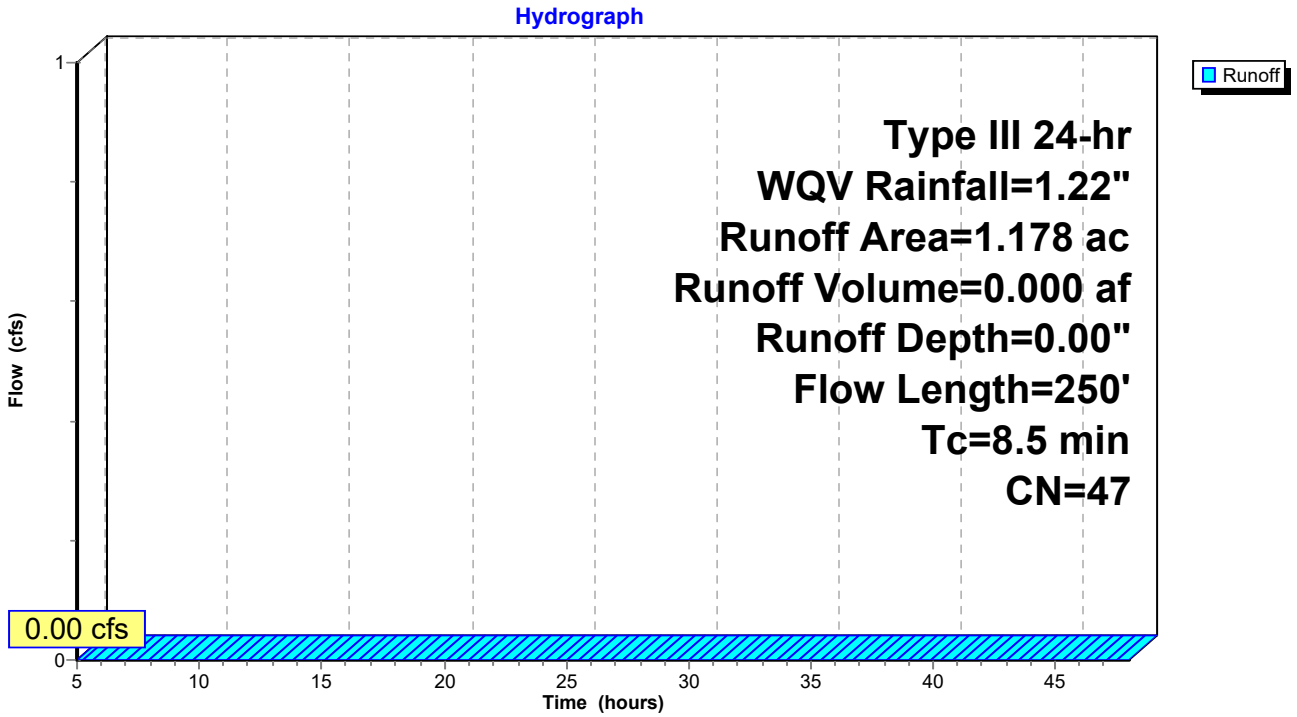
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr WQV Rainfall=1.22"

Area (ac)	CN	Description
0.130	98	Paved parking, HSG C
0.160	98	Roofs, HSG C
0.868	30	Woods, Good, HSG A
0.020	39	Pasture/grassland/range, Good, HSG A
1.178	47	Weighted Average
0.888		75.38% Pervious Area
0.290		24.62% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.1000	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
2.0	200	0.1150	1.70		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.5	250	Total			

Subcatchment DA 2B: BACK OF LOTS MID



Summary for Subcatchment DA 2C: BACK OF LOTS W

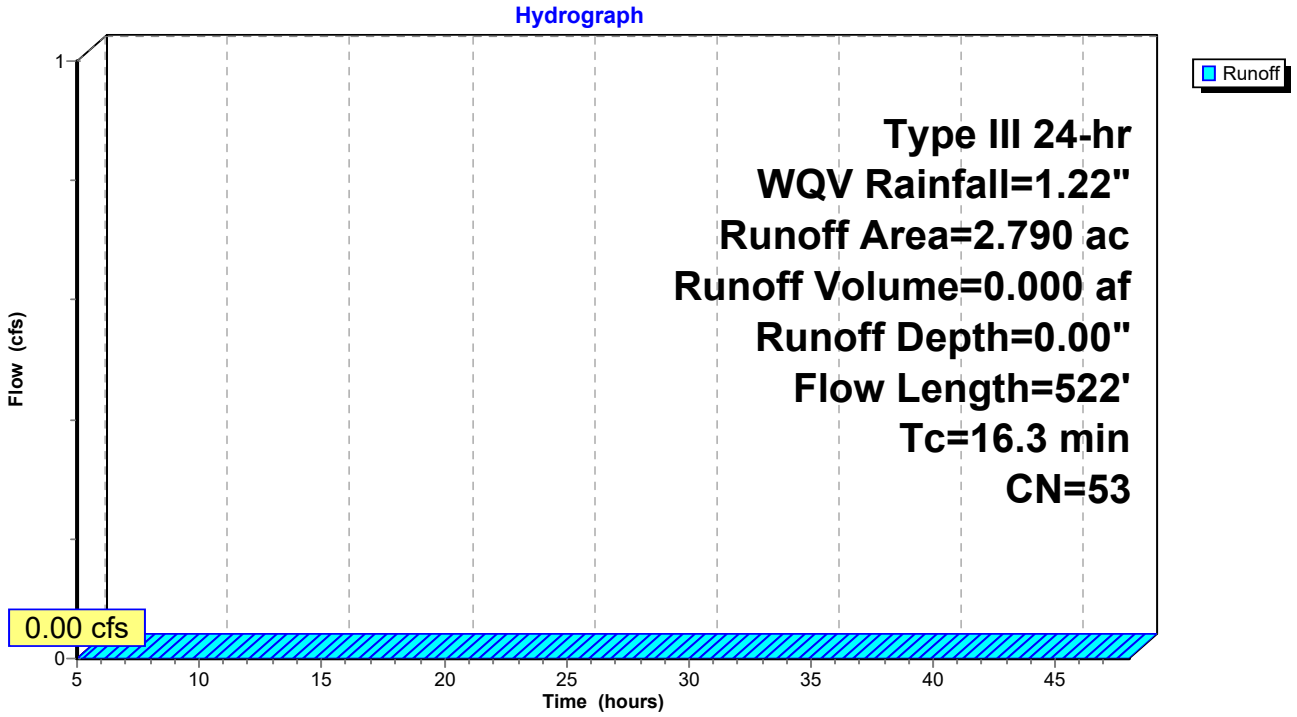
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr WQV Rainfall=1.22"

Area (ac)	CN	Description
0.250	98	Paved parking, HSG C
0.090	72	Dirt roads, HSG A
0.040	87	Dirt roads, HSG C
0.120	98	Roofs, HSG C
0.300	98	Water Surface, HSG C
1.520	30	Woods, Good, HSG A
0.270	70	Woods, Good, HSG C
0.200	39	Pasture/grassland/range, Good, HSG A
0.000	74	Pasture/grassland/range, Good, HSG C
2.790	53	Weighted Average
2.120		75.99% Pervious Area
0.670		24.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
7.0	472	0.0510	1.13		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
16.3	522	Total			

Subcatchment DA 2C: BACK OF LOTS W



Summary for Subcatchment DA 2D: PARKING

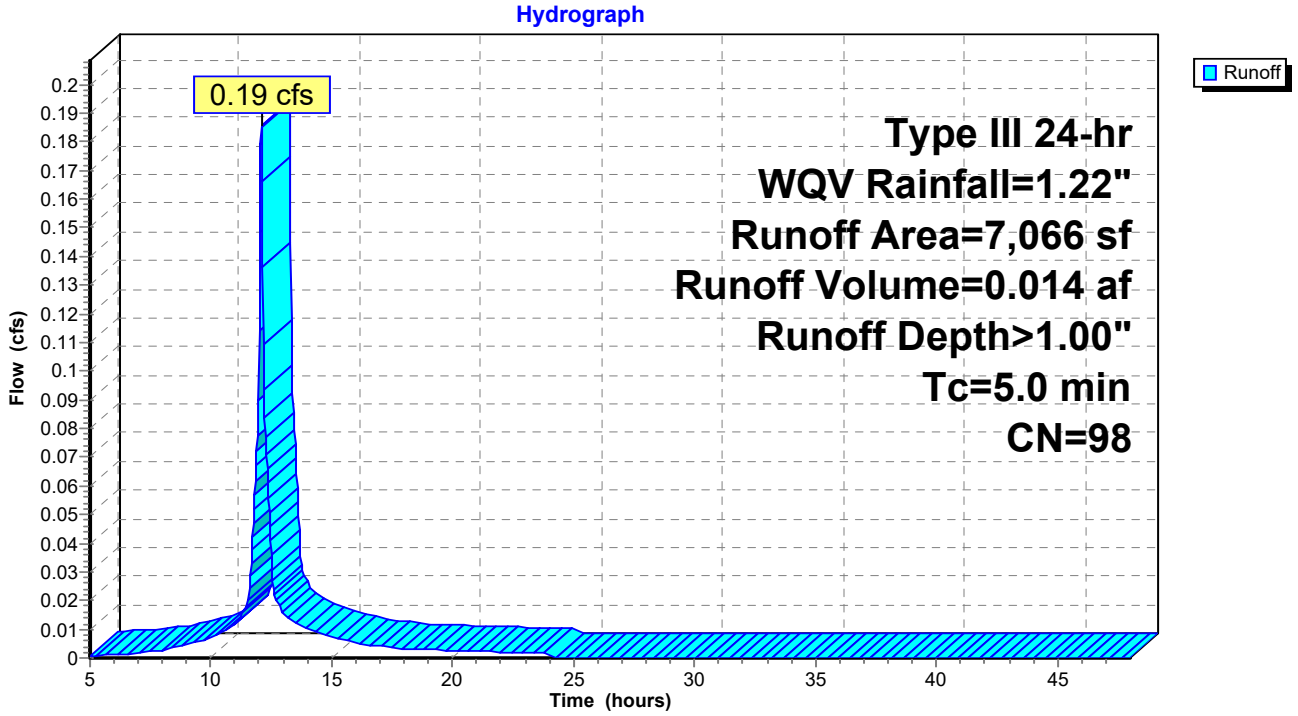
Runoff = 0.19 cfs @ 12.07 hrs, Volume= 0.014 af, Depth> 1.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr WQV Rainfall=1.22"

Area (sf)	CN	Description
7,066	98	Paved parking, HSG C
7,066		100.00% Impervious Area

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

Subcatchment DA 2D: PARKING



Summary for Subcatchment DA 3: EAST OF ABERJONA

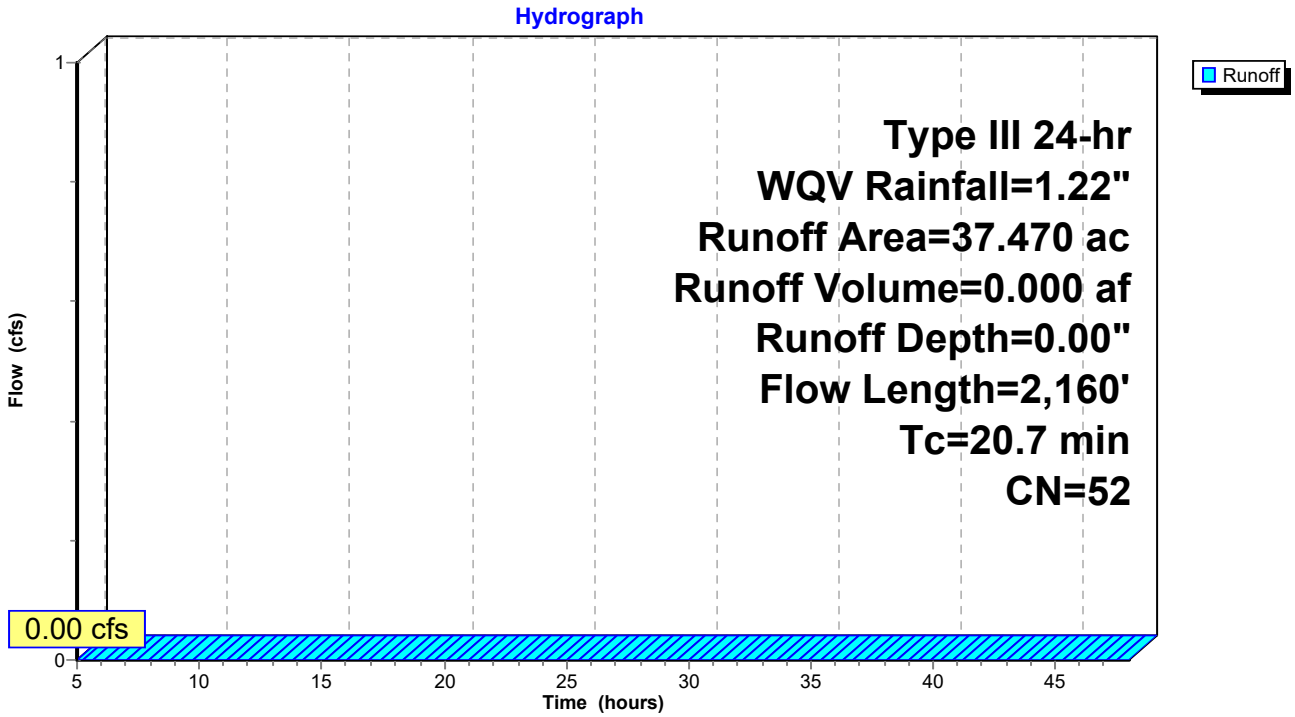
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Type III 24-hr WQV Rainfall=1.22"

Area (ac)	CN	Description
6.760	98	Paved parking, HSG C
3.290	98	Roofs, HSG C
9.960	30	Woods, Good, HSG A
17.460	39	Pasture/grassland/range, Good, HSG A
37.470	52	Weighted Average
27.420		73.18% Pervious Area
10.050		26.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
11.4	2,110	0.0230	3.08		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
20.7	2,160	Total			

Subcatchment DA 3: EAST OF ABERJONA



Summary for Pond D110: DMH 110

Inflow Area = 42.280 ac, 29.21% Impervious, Inflow Depth = 0.03" for WQV event
Inflow = 0.89 cfs @ 12.25 hrs, Volume= 0.103 af
Outflow = 0.89 cfs @ 12.25 hrs, Volume= 0.103 af, Atten= 0%, Lag= 0.0 min
Primary = 0.89 cfs @ 12.25 hrs, Volume= 0.103 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

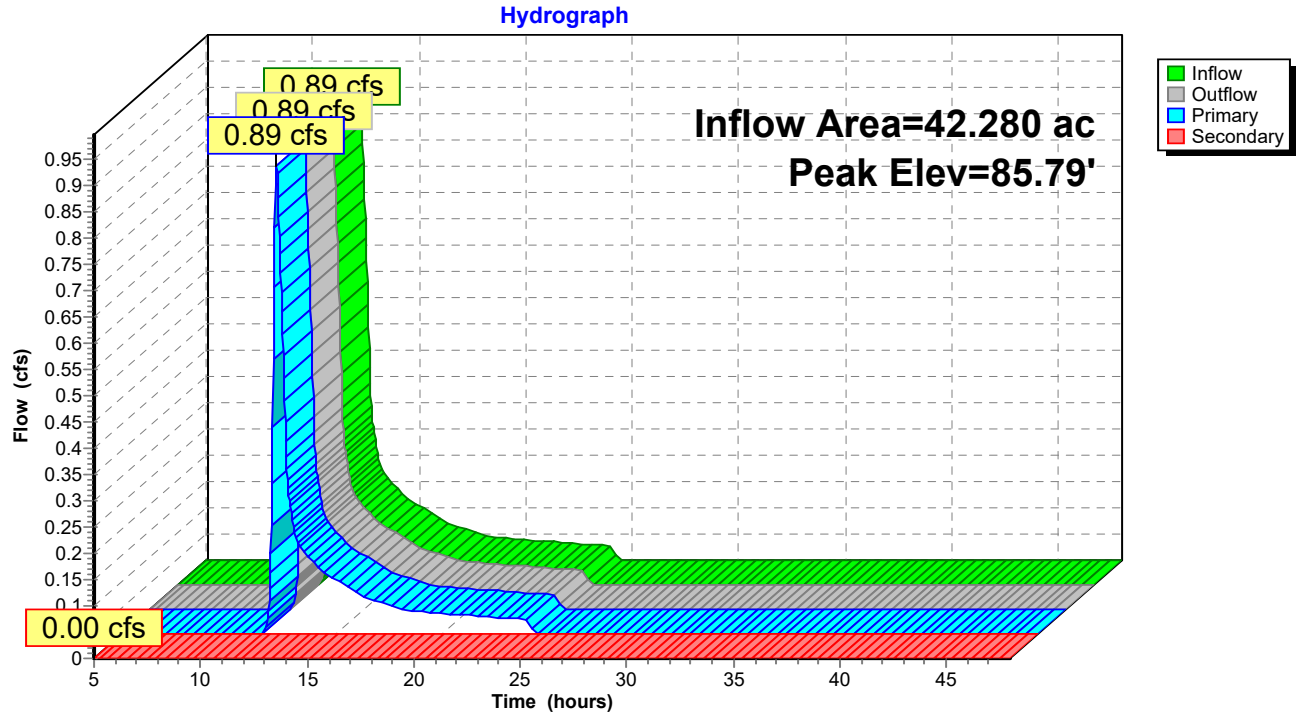
Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Peak Elev= 85.79' @ 12.25 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	85.30'	**18.0" Round Culvert** L= 143.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 85.30' / 84.60' S= 0.0049 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Secondary	91.10'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.88 cfs @ 12.25 hrs HW=85.78' (Free Discharge)
└**1=Culvert** (Barrel Controls 0.88 cfs @ 2.67 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=85.30' (Free Discharge)
└**2=Orifice/Grate** (Controls 0.00 cfs)

Pond D110: DMH 110



Summary for Pond D120: DMH 120

Inflow Area = 42.280 ac, 29.21% Impervious, Inflow Depth = 0.03" for WQV event
Inflow = 0.89 cfs @ 12.25 hrs, Volume= 0.103 af
Outflow = 0.89 cfs @ 12.25 hrs, Volume= 0.103 af, Atten= 0%, Lag= 0.0 min
Primary = 0.89 cfs @ 12.25 hrs, Volume= 0.103 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

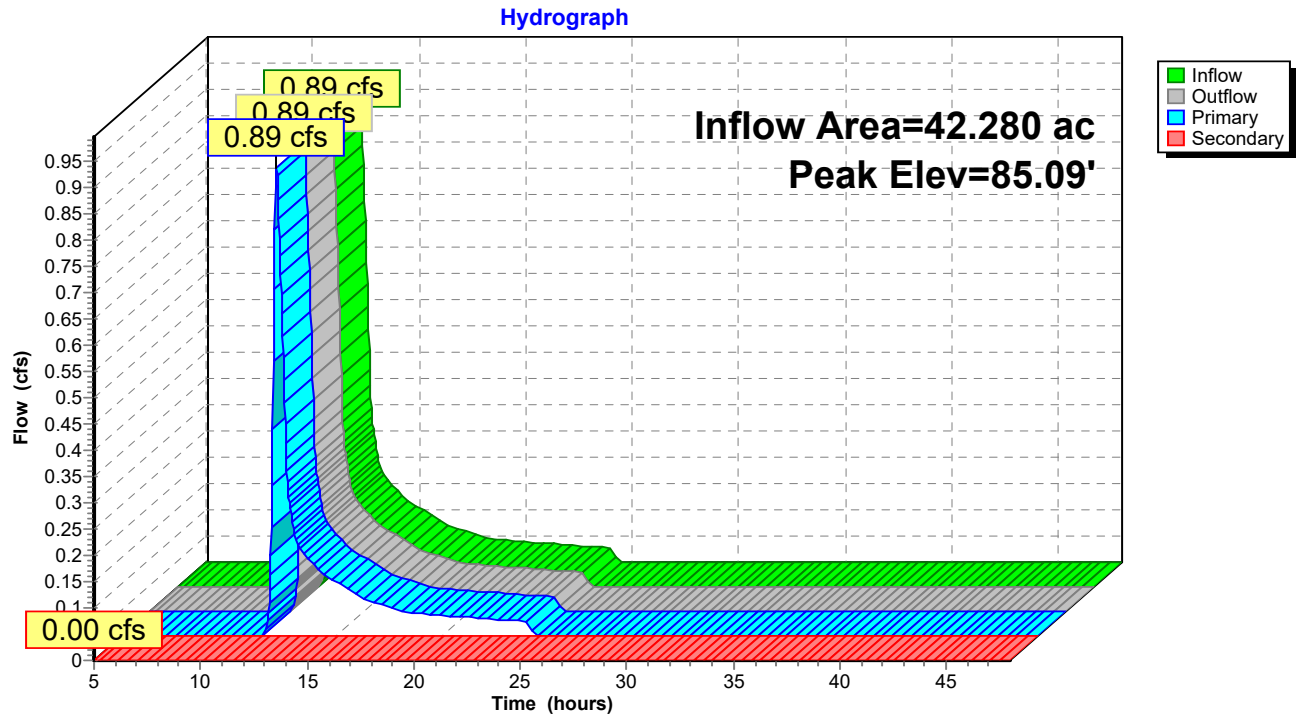
Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Peak Elev= 85.09' @ 12.25 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	84.60'	**18.0" Round Culvert** L= 126.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 84.60' / 84.00' S= 0.0048 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Secondary	88.01'	**2.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.89 cfs @ 12.25 hrs HW=85.09' (Free Discharge)
└**1=Culvert** (Barrel Controls 0.89 cfs @ 2.64 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=84.60' (Free Discharge)
└**2=Orifice/Grate** (Controls 0.00 cfs)

Pond D120: DMH 120



Summary for Pond F1: FOREBAY

Inflow Area = 45.380 ac, 28.98% Impervious, Inflow Depth = 0.03" for WQV event
Inflow = 0.89 cfs @ 12.25 hrs, Volume= 0.103 af
Outflow = 0.40 cfs @ 12.66 hrs, Volume= 0.090 af, Atten= 55%, Lag= 25.0 min
Discarded = 0.01 cfs @ 12.66 hrs, Volume= 0.029 af
Primary = 0.39 cfs @ 12.66 hrs, Volume= 0.061 af

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Peak Elev= 84.54' @ 12.66 hrs Surf.Area= 1,713 sf Storage= 1,420 cf

Plug-Flow detention time= 366.4 min calculated for 0.090 af (88% of inflow)
Center-of-Mass det. time= 309.2 min (1,206.0 - 896.7)

Volume	Invert	Avail.Storage	Storage Description
#1	83.50'	12,853 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

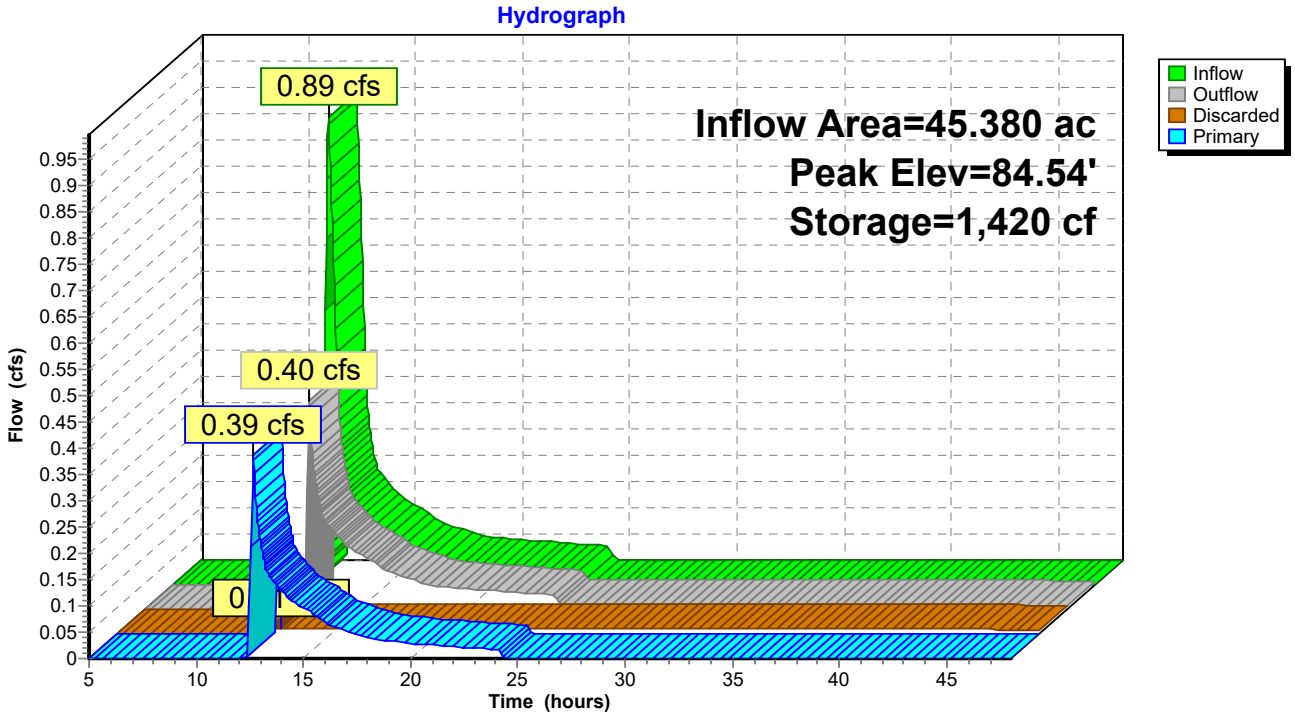
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
83.50	1,040	0	0
84.00	1,321	590	590
84.50	1,701	756	1,346
85.00	1,843	886	2,232
86.00	2,700	2,272	4,503
87.00	4,000	3,350	7,853
88.00	6,000	5,000	12,853

Device	Routing	Invert	Outlet Devices
#1	Primary	84.50'	**15.0' long x 20.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Discarded	83.50'	**0.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.01 cfs @ 12.66 hrs HW=84.54' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.36 cfs @ 12.66 hrs HW=84.54' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 0.36 cfs @ 0.56 fps)

Pond F1: FOREBAY



Summary for Pond F2: FOREBAY

Inflow Area = 45.380 ac, 28.98% Impervious, Inflow Depth = 0.02" for WQV event
Inflow = 0.39 cfs @ 12.66 hrs, Volume= 0.061 af
Outflow = 0.06 cfs @ 16.17 hrs, Volume= 0.047 af, Atten= 83%, Lag= 210.4 min
Discarded = 0.01 cfs @ 16.17 hrs, Volume= 0.033 af
Primary = 0.05 cfs @ 16.17 hrs, Volume= 0.014 af

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Peak Elev= 84.51' @ 16.17 hrs Surf.Area= 2,017 sf Storage= 1,574 cf

Plug-Flow detention time= 718.2 min calculated for 0.047 af (76% of inflow)
Center-of-Mass det. time= 631.7 min (1,578.3 - 946.6)

Volume	Invert	Avail.Storage	Storage Description
#1	83.50'	14,130 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

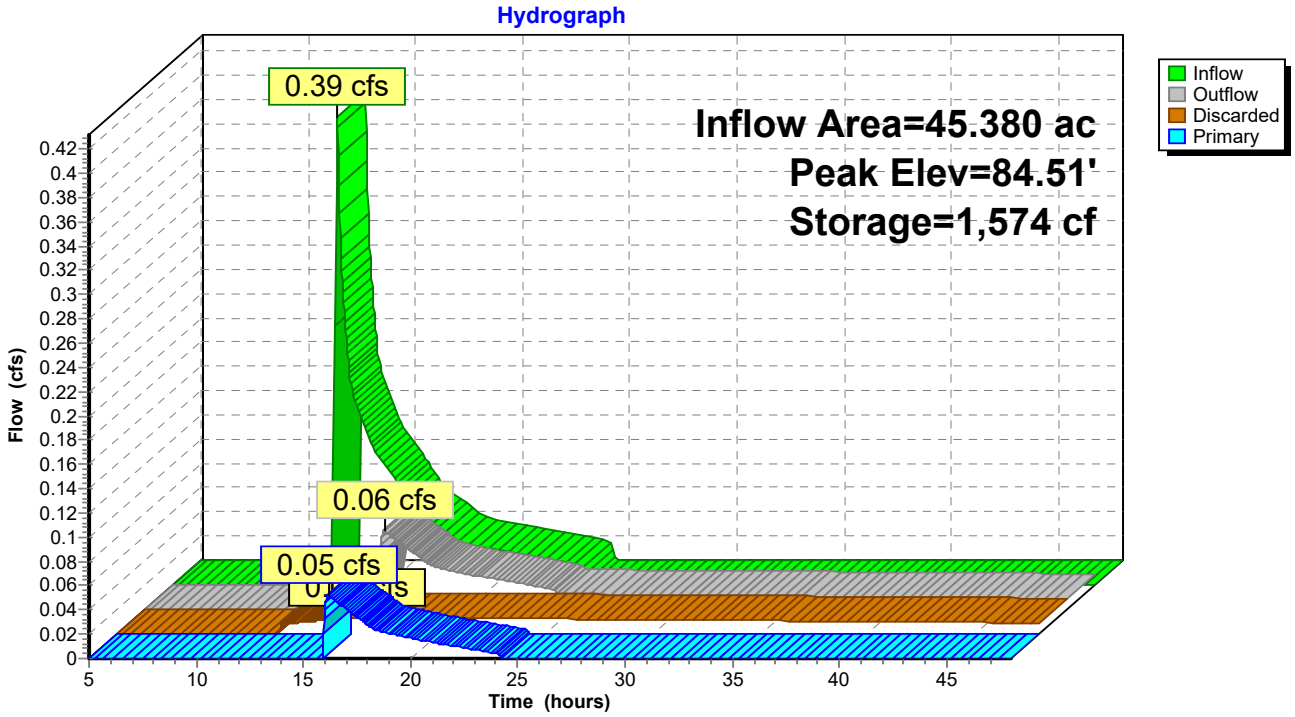
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
83.50	1,266	0	0
84.00	1,481	687	687
84.50	2,013	874	1,560
85.00	2,288	1,075	2,636
86.00	3,000	2,644	5,280
87.00	4,500	3,750	9,030
88.00	5,700	5,100	14,130

Device	Routing	Invert	Outlet Devices
#1	Primary	84.50'	**15.0' long x 20.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Discarded	83.50'	**0.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.01 cfs @ 16.17 hrs HW=84.51' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.02 cfs @ 16.17 hrs HW=84.51' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 0.02 cfs @ 0.22 fps)

Pond F2: FOREBAY



Summary for Pond F3: FOREBAY

Inflow Area = 0.162 ac,100.00% Impervious, Inflow Depth > 1.00" for WQV event
Inflow = 0.19 cfs @ 12.07 hrs, Volume= 0.014 af
Outflow = 0.18 cfs @ 12.10 hrs, Volume= 0.011 af, Atten= 5%, Lag= 1.6 min
Primary = 0.18 cfs @ 12.10 hrs, Volume= 0.011 af

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Peak Elev= 86.81' @ 12.10 hrs Surf.Area= 467 sf Storage= 132 cf

Plug-Flow detention time= 119.6 min calculated for 0.011 af (82% of inflow)
Center-of-Mass det. time= 48.7 min (830.9 - 782.2)

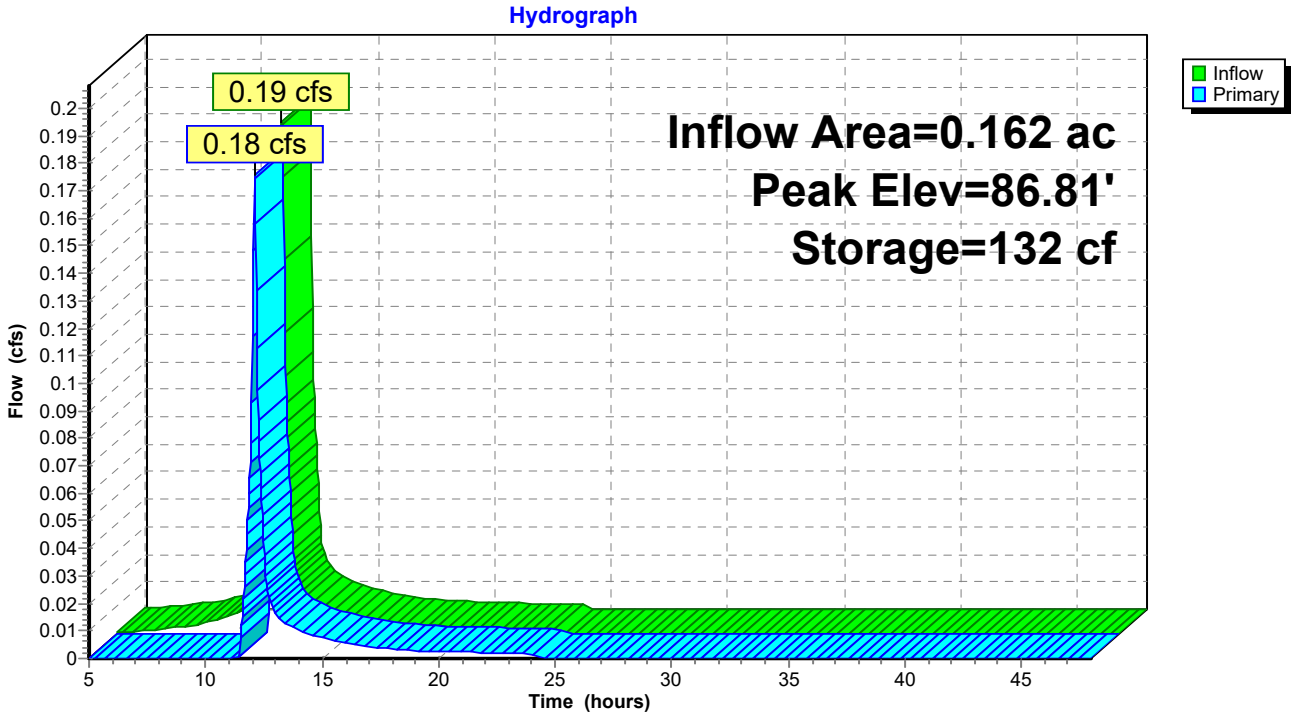
Volume	Invert	Avail.Storage	Storage Description
#1	86.50'	369 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
86.50	400	0	0
86.75	450	106	106
87.25	600	263	369

Device	Routing	Invert	Outlet Devices
#1	Primary	86.75'	**5.0' long x 15.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.17 cfs @ 12.10 hrs HW=86.81' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 0.17 cfs @ 0.63 fps)

Pond F3: FOREBAY



Summary for Pond P1: CELL 1

Inflow Area = 45.380 ac, 28.98% Impervious, Inflow Depth = 0.00" for WQV event
Inflow = 0.05 cfs @ 16.17 hrs, Volume= 0.014 af
Outflow = 0.05 cfs @ 16.21 hrs, Volume= 0.014 af, Atten= 1%, Lag= 2.6 min
Primary = 0.05 cfs @ 16.21 hrs, Volume= 0.014 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Starting Elev= 84.50' Surf.Area= 9,400 sf Storage= 15,153 cf
Peak Elev= 84.50' @ 16.21 hrs Surf.Area= 9,401 sf Storage= 15,159 cf (6 cf above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 2.0 min (1,117.3 - 1,115.4)

Volume	Invert	Avail.Storage	Storage Description
#1	79.00'	46,228 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

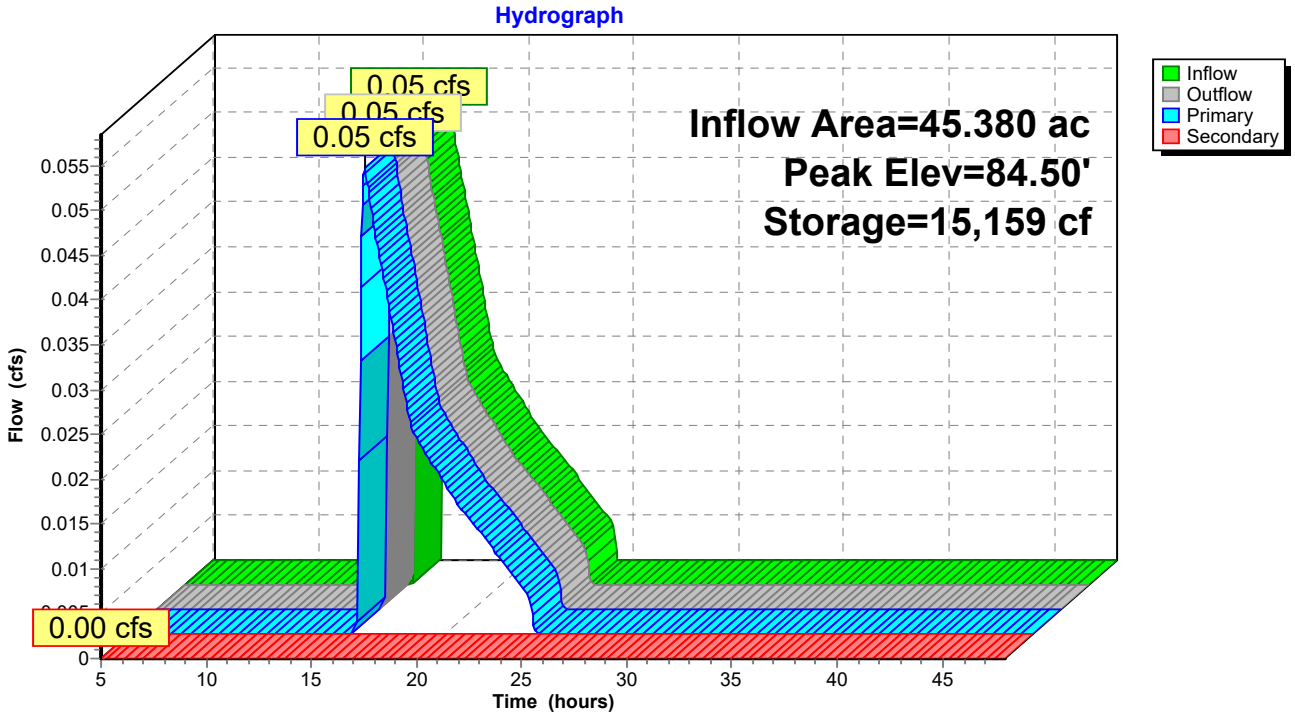
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
79.00	350	0	0
80.00	761	556	556
81.00	1,501	1,131	1,687
82.00	2,224	1,863	3,549
83.00	3,057	2,641	6,190
84.00	6,780	4,919	11,108
84.50	9,400	4,045	15,153
85.00	10,100	4,875	20,028
85.50	10,800	5,225	25,253
86.00	11,700	5,625	30,878
87.00	19,000	15,350	46,228

Device	Routing	Invert	Outlet Devices
#1	Primary	82.50'	**24.0" Round Culvert** L= 250.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 80.50' / 82.50' S= -0.0080 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#2	Secondary	85.50'	**30.0' long x 15.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.29 cfs @ 16.21 hrs HW=84.50' TW=84.50' (Fixed TW Elev= 84.50')
↑—**1=Culvert** (Outlet Controls 0.29 cfs @ 0.09 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=84.50' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond P1: CELL 1



Summary for Pond P2: CELL 2

Inflow Area = 48.332 ac, 28.93% Impervious, Inflow Depth = 0.01" for WQV event
Inflow = 0.18 cfs @ 12.10 hrs, Volume= 0.025 af
Outflow = 0.13 cfs @ 12.18 hrs, Volume= 0.025 af, Atten= 25%, Lag= 4.6 min
Primary = 0.13 cfs @ 12.18 hrs, Volume= 0.025 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Starting Elev= 84.50' Surf.Area= 5,620 sf Storage= 6,541 cf
Peak Elev= 84.51' @ 12.18 hrs Surf.Area= 5,649 sf Storage= 6,600 cf (59 cf above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 7.5 min (996.8 - 989.3)

Volume	Invert	Avail.Storage	Storage Description
#1	79.00'	17,196 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

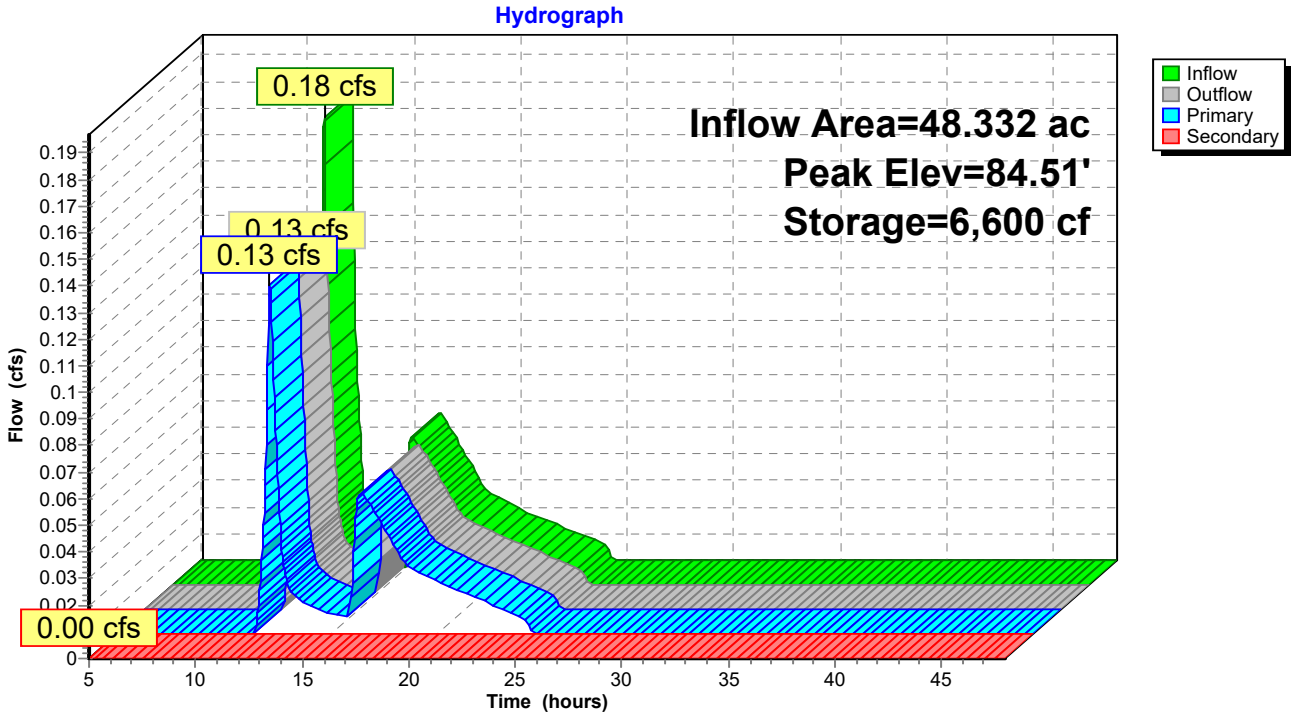
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
79.00	2	0	0
80.00	92	47	47
81.00	292	192	239
82.00	731	512	751
83.00	1,320	1,026	1,776
84.00	3,600	2,460	4,236
84.50	5,620	2,305	6,541
85.00	7,000	3,155	9,696
86.00	8,000	7,500	17,196

Device	Routing	Invert	Outlet Devices
#1	Primary	84.50'	**30.0' long x 8.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74
#2	Secondary	85.50'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=0.08 cfs @ 12.18 hrs HW=84.51' TW=84.50' (Fixed TW Elev= 84.50')
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 0.08 cfs @ 0.25 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=84.50' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond P2: CELL 2



Summary for Pond P3: CELL 3

Inflow Area = 48.332 ac, 28.93% Impervious, Inflow Depth = 0.01" for WQV event
Inflow = 0.13 cfs @ 12.18 hrs, Volume= 0.025 af
Outflow = 0.11 cfs @ 12.31 hrs, Volume= 0.025 af, Atten= 20%, Lag= 8.1 min
Primary = 0.11 cfs @ 12.31 hrs, Volume= 0.025 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs
Starting Elev= 84.50' Surf.Area= 6,663 sf Storage= 7,197 cf
Peak Elev= 84.51' @ 12.31 hrs Surf.Area= 6,680 sf Storage= 7,276 cf (79 cf above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 16.2 min (1,013.0 - 996.8)

Volume	Invert	Avail.Storage	Storage Description
#1	79.00'	18,411 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

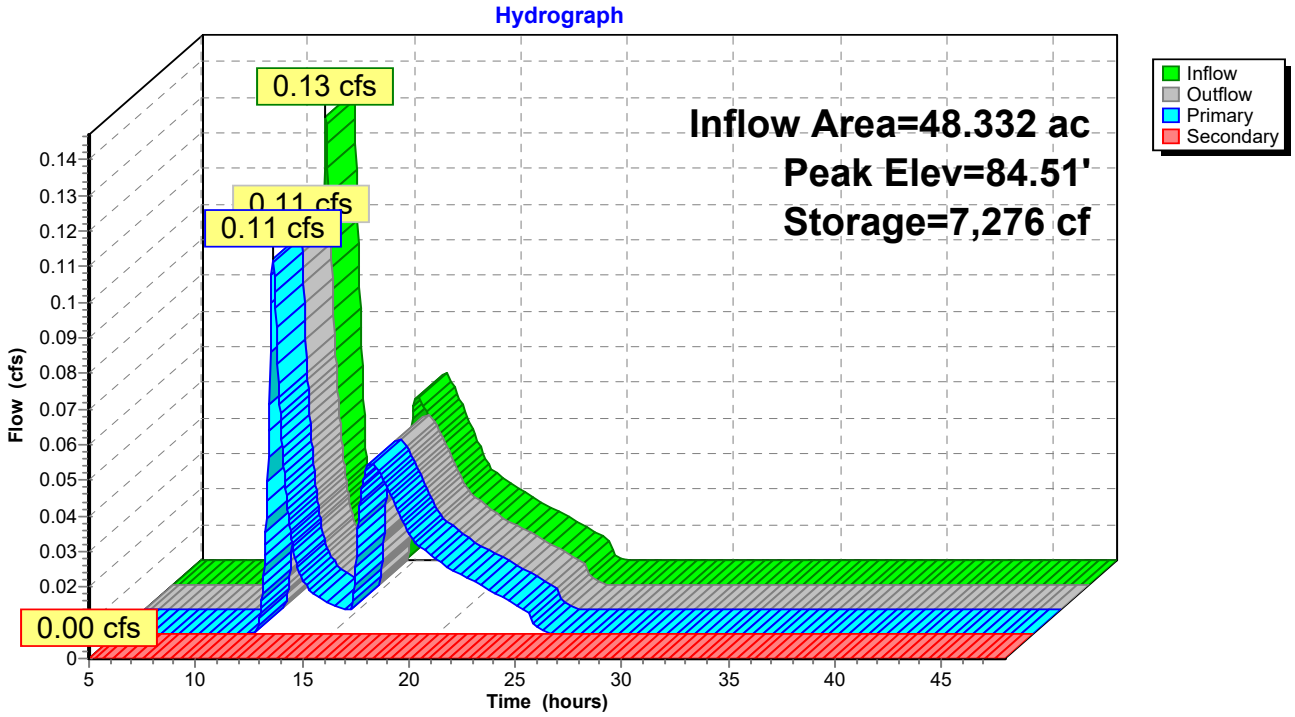
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
79.00	14	0	0
80.00	85	50	50
81.00	375	230	280
82.00	826	601	880
83.00	1,383	1,105	1,985
84.00	3,807	2,595	4,580
84.50	6,663	2,618	7,197
85.00	7,397	3,515	10,712
86.00	8,000	7,699	18,411

Device	Routing	Invert	Outlet Devices
#1	Primary	84.50'	**25.0' long x 17.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Secondary	86.25'	**100.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=0.09 cfs @ 12.31 hrs HW=84.51' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 0.09 cfs @ 0.29 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=84.50' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond P3: CELL 3

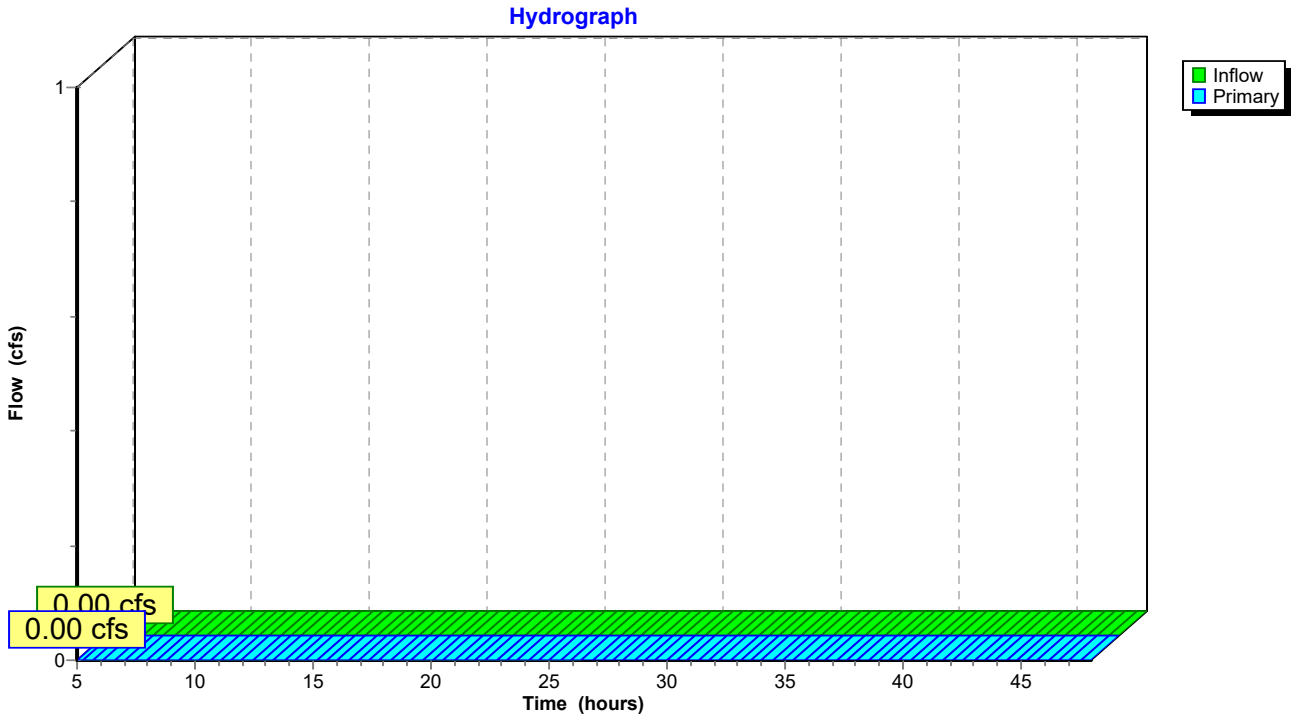


Summary for Pond SP1: ABERJONA RIVER

Inflow	=	0.00 cfs @	5.00 hrs, Volume=	0.000 af
Primary	=	0.00 cfs @	5.00 hrs, Volume=	0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs

Pond SP1: ABERJONA RIVER

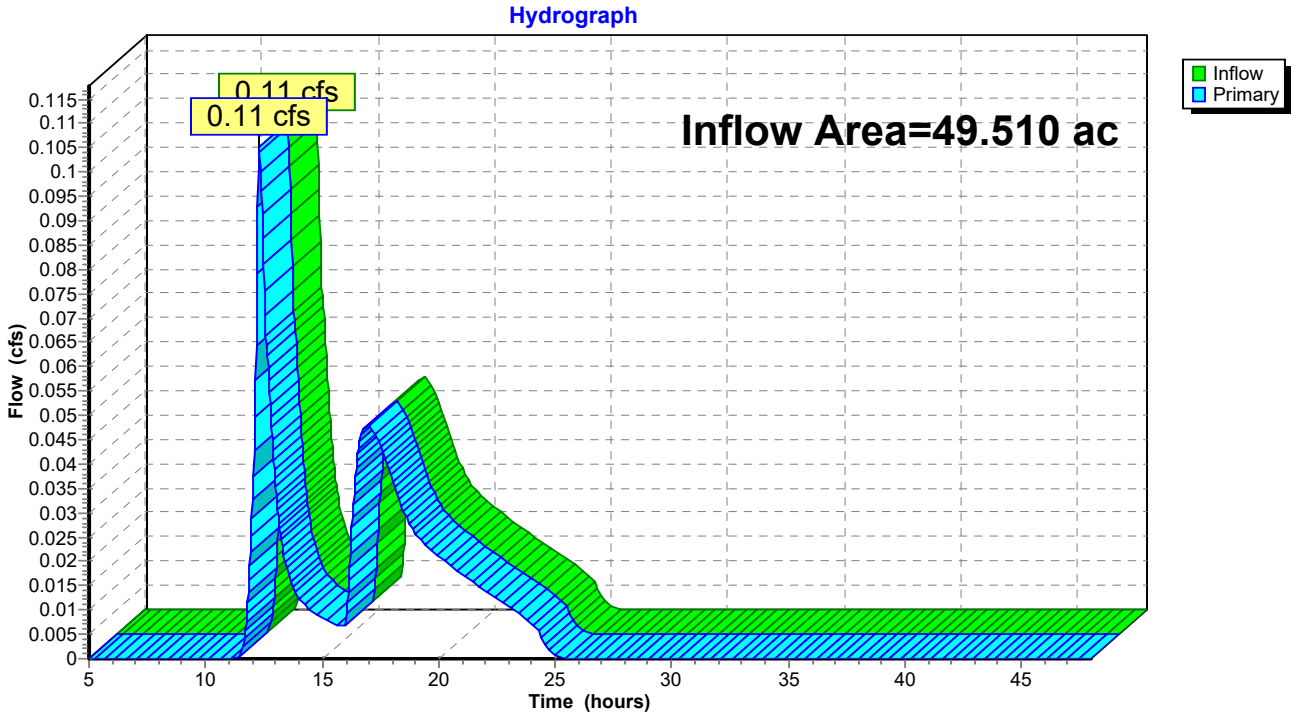


Summary for Pond SP2: ABERJONA RIVER

Inflow Area = 49.510 ac, 28.83% Impervious, Inflow Depth = 0.01" for WQV event
Inflow = 0.11 cfs @ 12.31 hrs, Volume= 0.025 af
Primary = 0.11 cfs @ 12.31 hrs, Volume= 0.025 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-47.99 hrs, dt= 0.03 hrs

Pond SP2: ABERJONA RIVER



APPENDIX F

TSS Removal Calculations
Pollutant Removal Calculations

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: READING, MA

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Sediment Forebay	**0.25**	**1.00**	**0.25**	**0.75**
Constructed Stormwater Wetland	**0.80**	**0.75**	**0.60**	**0.15**
	0.00	**0.15**	**0.00**	**0.15**
	0.00	**0.15**	**0.00**	**0.15**
	0.00	**0.15**	**0.00**	**0.15**

Total TSS Removal = **85%**

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

Project: **21008 - Mystic River Watershed - Reading**
Prepared By: **JMP**
Date: **5/28/2021**

*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

Horsley Witten Group, Inc.

Sustainable Environmental Solutions
www.horsleywitten.com
Date: 5/28/2021

BMP Pollutant Load Reduction Estimates

Project:	Mystic River Watershed - Reading
Project No:	21008
Calculated By:	SS/JMP
Checked By:	JR

Table 1 **Existing Conditions Phosphorus Loading**

Drainage Area ID	Site Use	Land Cover within Use	Phosphorus Load Export Rate(lbs/ac/year)*	Area (acres)	Existing Phosphorus Load Export (lb/yr)
1	High Density Residential	Directly Connected impervious	2.32	2.30	5.34
		Pervious (HSG C)	0.21	2.51	0.53
2	High Density Residential	Directly Connected impervious	2.32	1.15	2.67
		Pervious (HSG A)	0.03	4.73	0.14
		Pervious (HSG C)	0.21	1.35	0.28
3	High Density Residential	Directly Connected impervious	2.32	10.05	23.32
		Pervious (HSG A)	0.03	27.42	0.82
	Totals			49.51	33.10

* Per MA MS4 General Permit, Table 3-1 - Average annual distinct phosphorus load (P Load) export rates for use in estimating phosphorus load reduction credits the MA MS4 Permit.

Table 2 **Proposed Conditions Phosphorus Loading**

Drainage Area ID	Site Use	Land Cover within Use	Phosphorus Load Export Rate(Llbs/ac/year)*	Area (acres)	Proposed Phosphorus Load Export (lb/yr)
1	High Density Residential	Directly Connected impervious	2.32	2.30	5.34
		Pervious (HSG C)	0.21	2.51	0.53
2	High Density Residential	Directly Connected impervious	2.32	1.15	2.67
		Pervious (HSG A)	0.03	4.73	0.14
		Pervious (HSG C)	0.21	1.35	0.28
3	High Density Residential	Directly Connected impervious	2.32	10.05	23.32
		Pervious (HSG A)	0.03	27.42	0.82
	Totals			49.51	33.10

Table 3 **Proposed Conditions Phosphorus Reduction**

Drainage Area ID	**Drainage Area BMP Type**	**Drainage Area Treated (ac.)** [a]	**Design Storage Volume (ac-ft.)**	**Phosphorus Load to BMP (lb/yr)**	**BMP Removal %** [b]	**Proposed Phosphorus Load After BMP (lb/yr)**
1 - Willow Street	Constructed Stormwater Wetland	4.81	0.2200	5.86	63%	2.17
2 - West of Aberjona	Constructed Stormwater Wetland	6.05	0.2200	2.39	63%	0.89
3 - Lowell St (E of Aberjona)	Constructed Stormwater Wetland	37.47	0.2200	24.14	63%	8.93
	Totals	**48.33**	**0.6600**	**32.40**	63%	**11.99**
	Total Phosphorus removed					**20.41**
	Composite Load Reduction %				63%	

a) Drainage Area 2 does not include a portion of the proposed drainage area (DA 2B) which drains directly to the existing wetland, and will not be treated through the proposed stormwater wetlands.
b) Per MA MS4 General Permit Appendix F Attachment 3, Table 3-16.

APPENDIX G

Operation and Maintenance Plan

OPERATIONS & MAINTENANCE PLAN

MAILLET, SOMMES & MORGAN LAND
0 WILLOW ST and 0 LOWELL ST
Reading, MA

Prepared for:

Town of Reading Engineering Department

16 Lowell Street

Reading, MA 01867

Prepared by:

Horsley Witten Group, Inc.

May 2021

Horsley Witten Group
Sustainable Environmental Solutions
90 Route 6A • Unit 1 • Sandwich, MA 02563
508-833-6600 • horsleywitten.com

Operations & Maintenance Plan
Maillet, Sommes and Morgan Land
0 Willow St and 0 Lowell St
Reading, MA

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3.0	FUNCTION OF GREEN STORMWATER INFRASTRUCTURE	4
4.0	LANDSCAPE MAINTENANCE	10
5.0	ROUTINE MAINTENANCE	25
6.0	SNOW REMOVAL	25
7.0	LONG-TERM POLLUTION PREVENTION PLAN	25
8.0	ESTIMATED OPERATION AND MAINTENANCE BUDGET	27

1.0 OWNER AND RESPONSIBILITY FOR MAINTENANCE

The Town of Reading is responsible for the financing and continuous operation, maintenance and required emergency repair for the stormwater management system and associated drainage network.

Owner: Town of Reading, MA

Contact: Department of Public Works
Name: Jane Kinsella
Email: jkinsella@ci.reading.ma.us
Ph: (781)942-6673

Signed:_____

Date:_____

2.0 INTRODUCTION

This Guide provides a general description of the function and maintenance requirements for the Green Infrastructure Stormwater Management Improvements for the conservation area within the Maillet, Sommes, & Morgan (Maillet) Conservation Land, located within two parcels at 0 Willow St and 0 Lowell Street in Reading, MA. Proper maintenance is vital to GSI long-term success.

The proposed stormwater management includes a green stormwater infrastructure (GSI) approach to collect, capture, filter, store and infiltrate stormwater prior to discharge the upper reaches of the Aberjona River. The Town or its contracted maintenance provider are required to familiarize themselves with this Guide and inspect and maintain the following practices as outlined in this maintenance guide throughout the year.

3.0 FUNCTION OF GREEN STORMWATER INFRASTRUCTURE

How Does Green Infrastructure Work?

GSI is nature-based approach to stormwater treatment and management. These stormwater practices or "treatment areas" are designed to mimic nature and use the natural filtration properties of soil and plants to remove pollutants from stormwater prior to discharging to the drainage system. GSI relies on the following five basic design elements, or steps, to function properly.

1. **Collect (inlets)** the stormwater.
2. **Capture (sediment forebays and WQUs)** the sediment and debris.
3. **Move (pipes and swales)** the water to where you want it to go.
4. **Store, Filter and Infiltrate (treatment areas)** the water.
5. **Overflow (outlet structure)** to by-pass for larger storms.

These five steps will be referenced throughout this Guide. If one of these steps does not function properly, the entire system can be compromised and the GSI practice itself could be contributing to maintenance problems. This can lead to a landscape nuisances, more frequent maintenance, and costly repairs/improvement.

What is required for Maintenance?

As these are nature-based systems that often rely on plant care, the maintenance for GSI typically falls under landscape and general site maintenance services. The regularly scheduled maintenance as outlined in this Guide is critical to ensure proper function, maintain infiltration rates and storage capacity and preserve the pollutant removal capabilities as well as the visual appearance. Regularly scheduled maintenance can prevent deficiencies in the effectiveness of the systems, due to sediment build-up, damage, or deterioration.

General maintenance includes the following:

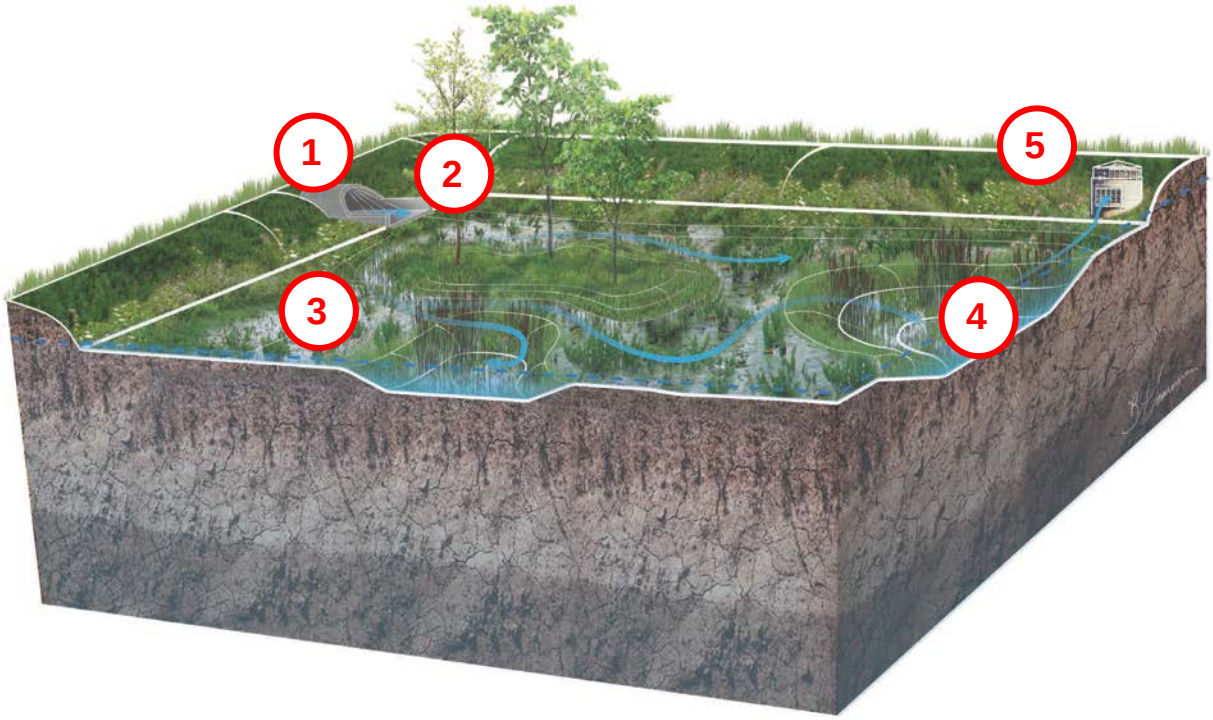
1. Removing sediment from the pretreatment practices used to capture sediment.
2. Maintaining the proper drainage function and pollutant removal capacity of the systems.
3. Maintaining healthy native trees, plants, and vegetative cover as well as the removal of unwanted weeds and invasive species.

It is recommended that all practices be maintained regularly as part of the routine landscape maintenance or at a minimum four times per year and after major rain events of 2-inches or greater.

- **Early Spring**: during spring cleanup
- **Summer:** during grass mowing and other routine maintenance
- **Early Fall:** when leaves begin to fall
- **Late Fall/Early Winter:** after all the leaves have fallen during leaf removal.

The following sections describes the general function and maintenance of each practice.

CONSTRUCTED WETLAND STRUCTURAL COMPONENTS



FUNCTION:

1. COLLECT *Pipe Inlet Area*
   Stormwater is directed via the pipe routing to the initial stabilized outfall and wetland cell where stormwater enters the system.
2. CAPTURE – *Stabilized Outfall and Sediment Forebay*
   Stormwater is captured and designed to settle out sediment, sand, and debris within the sediment forebay area.
3. FILTER- *Low Marsh with Permanent Pools*
   Plants in the constructed wetland help to slow the water down and water is treated when it filters through the soil and plant roots. Planted vegetation remove phosphorous and bacteria and allow stormwater to infiltrate into the soil.
4. MOVE –*Micropools*
   Stormwater moves from low marsh areas to micropools which provide additional treatment through sedimentation as well as plant uptake. Water can move between micropools by flowing over a riprap berm or entering a reverse slope pipe connection.
5. OVERFLOW – *Emergency Spillway*
   Stormwater from larger storms will flow over a riprap weir into the existing wetland. When capacity is reached stormwater flushes out existing water in the wetland to replace it with new water to be filtered.

CONSTRUCTED WETLAND MAINTENANCE CHECKLIST

Date:

Time:

Inspector:

Maintenance Item	Description	Maintenance (Y/N)
1. COLLECT **Includes:** Pipe Inlet Area **Frequency:** Inspect four times per years during regular park maintenance and after major storm events (2" of rain or greater) **When:** March, June, September, November		
Surface Debris Cleaning	Remove all trash, leaf litter and inlet clogging.	
Inlets	Check for clogging and sediment accumulation that impacts inflow. If sediment/debris accumulation is observed, remove and dispose.	
Actions to be taken:		
2. CAPTURE **Includes:** Stabilized outfall and Sediment Forebay **Frequency:** Inspect four times per year and after major storm events the first year; then annually and after major storm events (2" of rain or greater) **When:** March, June, September, November		
Debris Cleanout	Remove all trash and debris.	
Side Slopes	Signs of erosion gullies, animal burrowing, overtopping, or slumping are observed. Repair, as necessary.	
Sediment/Organic Debris Removal	Remove sediment accumulation and properly dispose when accumulation is greater than or equal to 3 inches or you cannot see stones.*	
Actions to be taken:		
3 & 4. MOVES & FILTERS **Includes:** Low Marsh with Permanent pools and Micropools **Frequency:** Inspect four times per years during regular park maintenance and after major storm events (2" of rain or greater) **When:** March, June, September, November		
Debris Cleanout	Remove trash and debris from the wetland. Remove any fallen branches that prevent free hydraulic movement between the micropools.	

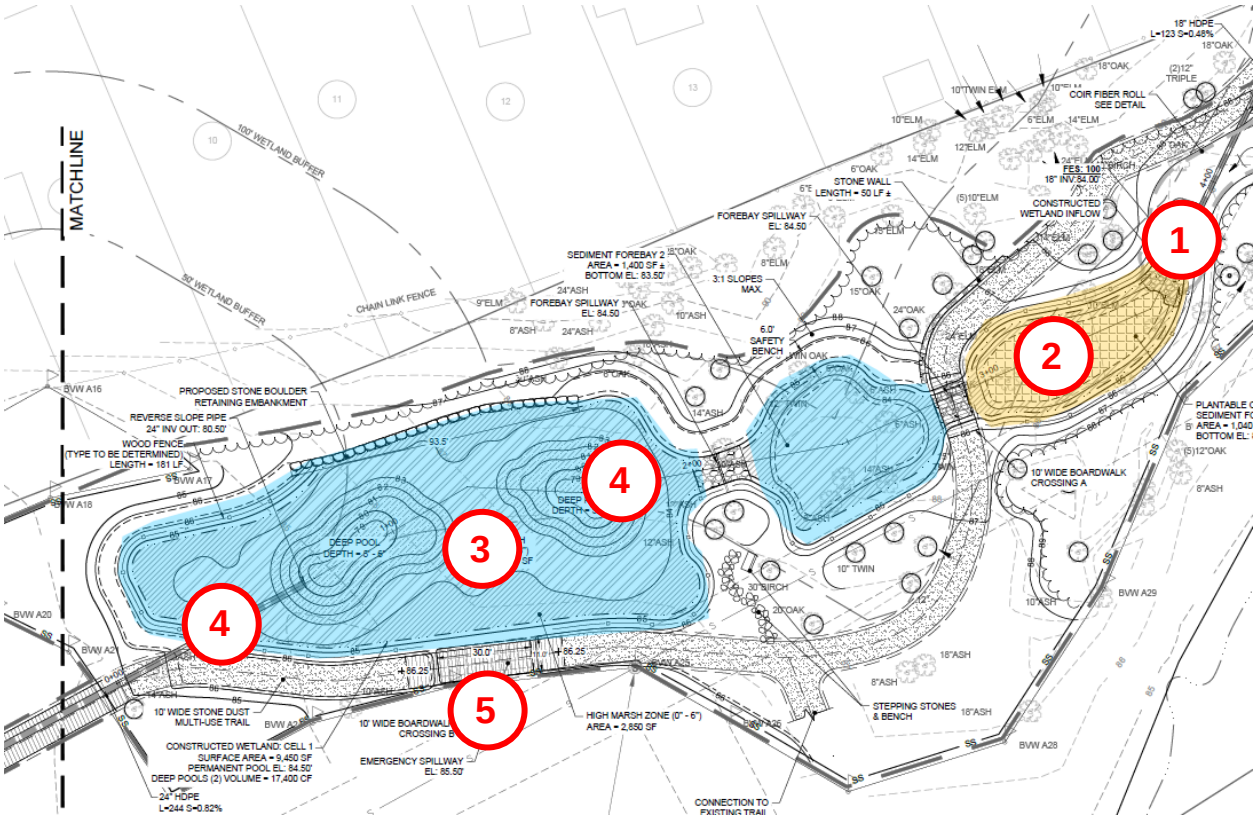
Maintenance Item	Description	Maintenance (Y/N)
Sediment/Organic Debris Removal	Remove and properly disposed of when build-up is greater than or equal to 3 inches.*	
Erosion	Check for areas of erosion/ gullies, particularly along the bottom. Repair/reseed as necessary	
Vegetation Maintenance Replacement	See Landscape Maintenance	
Actions to be taken:		
5. OVERFLOW **Includes:** Emergency Spillway **Frequency:** Inspect bi-annually and after major storm events (2" of rain or greater) **When:** March and September		
Emergency Spillways	Water level should be below the spillway. Check for sediment accumulation that impacts outflow. Check for leaf litter, debris, and inlet clogging. If sediment, litter or debris has accumulated, schedule cleaning.	
Actions to be taken:		
Other Routine Grounds Maintenance **Includes:** Surrounding landscape beyond the practice. **Frequency:** Inspect four times per year during regular park maintenance and after major storm events **When:** March, June, September, November		
Debris Removal	Remove trash from perimeter areas.	
Contributing drainage area	Look for sediment sources from erosion in the surrounding area.	
Drainage Network	Ensure proper operation.	
Path Repairs	Check path for ponding and other obstructions. Repair paths as needed to ensure positive drainage. Remove obstructions as needed.	
Pavement Sweeping	Sweep the access road and parking lot once a year after spring thaw.	
Actions to be taken:		

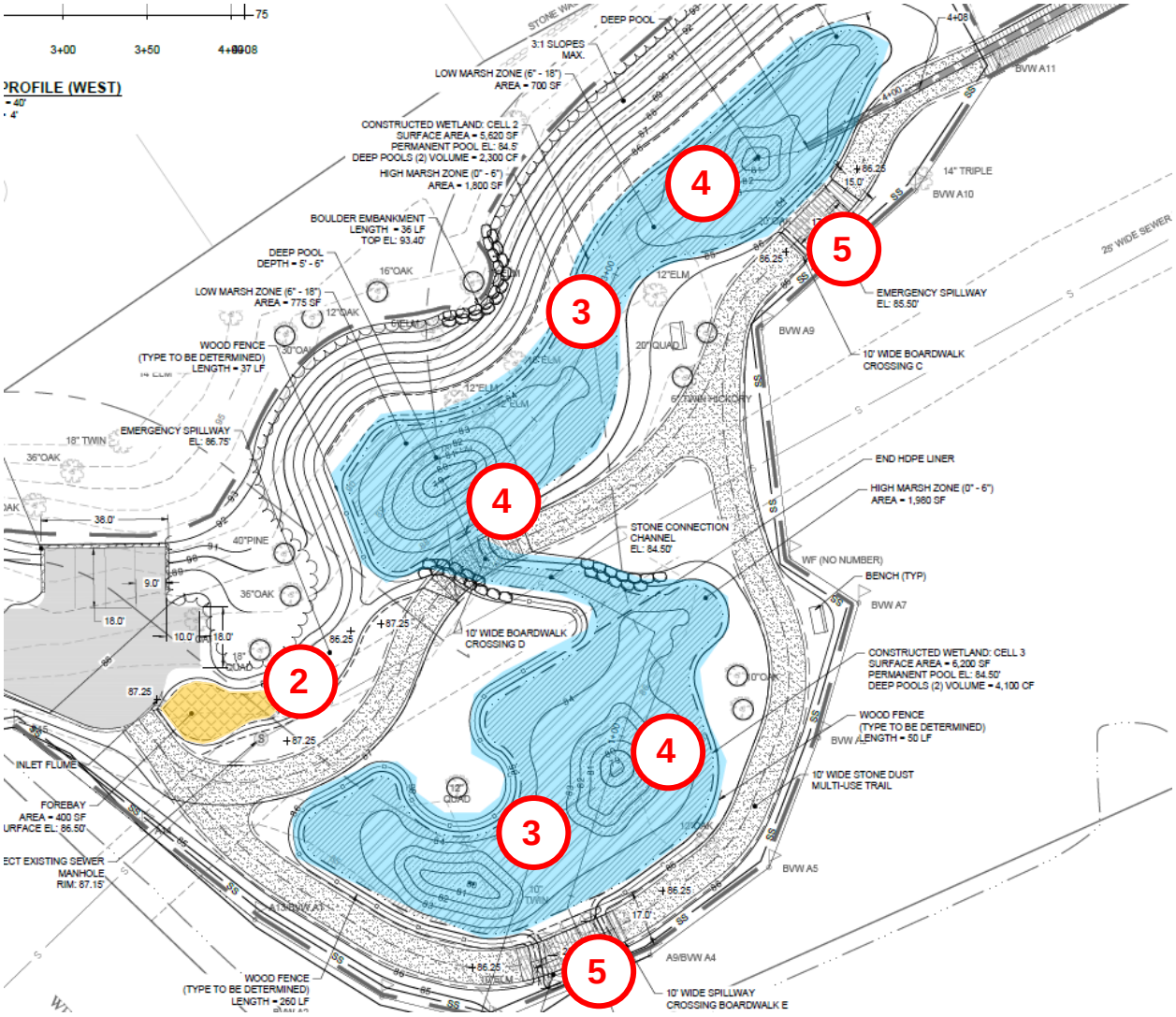
*Sediment shall be disposed of offsite in a pre-approved location.

WETLAND AREA PLANS

Constructed Wetland Area

Sediment Forebay (Concrete Grass Pavers)




PROFILE (WEST)
3+00
3+50
DEEP POOL
3:1 SLOPES MAX.
LOW MARSH ZONE (6" - 18")
AREA = 700 SF
CONSTRUCTED WETLAND: CELL 2
SURFACE AREA = 5,620 SF
PERMANENT POOL EL: 84.5'
DEEP POOLS (2) VOLUME = 2,300 CF
HIGH MARSH ZONE (0" - 6")
AREA = 1,800 SF
BOULDER EMBANKMENT
LENGTH = 36 LF
TOP EL: 93.40'
DEEP POOL
DEPTH = 5' - 6"
LOW MARSH ZONE (6" - 18")
AREA = 775 SF
WOOD FENCE
(TYPE TO BE DETERMINED)
LENGTH = 37 LF
EMERGENCY SPILLWAY
EL: 86.75'
EMERGENCY SPILLWAY
EL: 85.50'
10' WIDE BOARDWALK
CROSSING C
END HDPE LINER
HIGH MARSH ZONE (0" - 6")
AREA = 1,980 SF
STONE CONNECTION
CHANNEL
EL: 84.50'
BENCH (TYP)
10' WIDE BOARDWALK
CROSSING D
CONSTRUCTED WETLAND: CELL 3
SURFACE AREA = 6,200 SF
PERMANENT POOL EL: 84.50'
DEEP POOLS (2) VOLUME = 4,100 CF
WOOD FENCE
(TYPE TO BE DETERMINED)
LENGTH = 50 LF
10' WIDE STONE DUST
MULTI-USE TRAIL
INLET FLUME
FOREBAY
AREA = 400 SF
WOOD FENCE
(TYPE TO BE DETERMINED)
LENGTH = 260 LF
10' WIDE SPILLWAY
CROSSING BOARDWALK E
25' WIDE SEWER
14" TRIPLE
2
3
4
5

4.0 LANDSCAPE MAINTENANCE

By design, plants in the GSI practices are meant to help filter the stormwater and flourish throughout the growing season. These plants do not require fertilizers, watering and/or mowing. Remove and replace vegetation as necessary, using the appropriate species as shown on the plans.

Landscape Maintenance Activities			
Task	**Frequency**	**Requirement**	**Time of Year**
Watering	First three months after planting or drought	• During establishment or drought conditions, plants should be watered a minimum of once every seven to ten days.	• June-Sept.
Seeding	As required	• Loam and reseed bare spots with the specified seed mixes as shown on the Planting Plan.	• Early Spring or Late Fall
Plant Cutting & Pruning	Annually	• Leave dry standing stalks during the dormant months and remove in the spring. • Cut back grasses, sedges, and rushes in the spring. • Prune trees to remove deadwood and low hanging branches.	• Early Spring
Plant Thinning	Once every 3 years	• Separation of herbaceous vegetation rootstock should occur when over-crowding is observed	• Early Spring or Late Fall
Plant Replacement	As required	• Replace/replant diseases, unhealthy or dead plans to maintain a healthy plant community	• Early Spring or Fall
Mowing	Bi-annually	• Remove grass clippings	• May • October
Weed and Invasive Species Removal	As required	• Use non-chemical methods (hand pulling and hoeing) where applicable and avoid chemical herbicides where possible. See Invasive Species Management for more details.	• Early Spring
Debris and Trash	As required	• Remove and properly dispose of debris and other litter prior to mowing and cutting.	• Early Spring or Fall
Monitoring	During the establishment period	• Observe for invasive species, bare spots and potential pest/disease problems.	• June-Sept.
Snow Removal	NOT REQUIRED	• NONE	• NA
Fertilizing	NOT REQUIRED	• NONE	• NA
Mulch	NOT REQUIRED	• NONE	• NA

INVASIVE SPECIES MANAGEMENT

Selected management techniques are generally based upon the extent of a given species within the vegetation community at a site and employ a strategy that best controls the invasive species, while minimizing the potential for adverse impacts to other desirable (i.e., native) species and the surrounding, integrated environment.

Methods for the management of invasive species fall into three basic categories:

- Physical/Mechanical (cutting, pulling, grubbing, covering, etc.);
- Chemical (use of herbicides); and
- Biological (using living organisms such as insects or domestic grazing animals).

In general, mechanical controls, such as cutting or pulling, have the least adverse impacts on the adjacent, native communities; however, mechanical methods are often not as effective in the control of certain plant species. When warranted and appropriate, chemical controls (through the use of herbicides) are most effective through modest, precisely targeted applications of specific herbicides. Selective application of herbicides also functions to reduce adverse effects on desirable native species from herbicide use. While not applicable for the Reading site, biological control, or use of living organisms as a control agent, has also been proven effective on certain species. Upon effective removal or control of invasive species, native plant species are then planted and/or promoted (via existing native populations and seed banks) in order to restore a native plant community, which provides a number of ecological benefits, and serves as the primary factor for limiting invasive plant establishment and spread in the future. With establishment of a robust and diverse native plant community, the system becomes more resilient to potential future invasions, and only minor ongoing invasive plant management efforts/interventions are required to maintain the long-term ecological integrity of the site.

Invasive Species at this Site

Several invasive species have been identified at this site including trees, shrubs, and herbaceous species. Most abundant is the highly aggressive Japanese knotweed (*Fallopia* japonica), which is concentrated in dense stands adjacent to the open/mown and woodland areas at the southwestern section of the site. With an adaptive invasive plant management plan the site will continue to be monitored for the presence of any existing or newly arriving Massachusetts State-listed invasive species. Any newly identified invasive species will be documented and added to the targeted management list. Currently, the below species have been identified and targeted for management at this site:

Species of Primary Concern (abundant occurrence)

- Japanese Knotweed (*Fallopia japonica*);

Species of Secondary Concern (sporadic occurrence)

- Black Locust (*Robinia pseudoacacia*);
- Norway Maple (*Acer platanoides*);
- Common Buckthorn (*Rhamnus cathartica*);
- Grey Willow (*Salix cinerea*);
- Amur Corktree (*Phellodendron amurense*);
- Multiflora Rose (*Rosa multiflora*);
- Japanese Barberry (*berberis thunbergii*);
- Burning Bush (*Euonymus alatus*);
- Shrub Honeysuckle (*Lonicera spp.*);

- Common Reed (*Phragmites australis*);
- Purple Loosestrife (*Lythrum salicaria*);
- Asiatic Bittersweet (*Celastrus orbiculatus*);
- Garlic Mustard (*Allaria petiolate*);

Example Photos of Invasive Species

Photo 1. Example of young purple loosestrife seedlings.

Photo 2. Example of mature purple loosestrife stands in flower.

Photo 3. Example of Asiatic bittersweet.

Photo 4. Example of Multiflora rose (in flower).

Photo 5. Example of Garlic mustard.

Photo 6. Example of a mature Black locust tree.

Photo 7. Example of a mature Amur corktree.

Photo 8. Examples of mature Norway maple (center-left) and black locust (center-right).

Photo 9. Example of an established Japanese knotweed stand.

Photo 10. Example of common reed (Phragmites).

Photo 1. Example of Japanese barberry.

Photo 12. Example of shrub honeysuckle.

Photo 132. Example of common buckthorn.

Photo 14. Example of burning bush shrub.

Photo 15. Example of grey willow tree.

Recommended Management Approach for Species of Primary Concern

Japanese Knotweed (*Fallopia japonica*)

Japanese knotweed is an upright, herbaceous, shrub-like perennial native to eastern Asia. Its stems are hollow, smooth, and swollen at the joints. The alternate leaves are broad and oval, triangular, or heart-shaped with a pointed tip and may become six inches long and three to four inches wide. It has greenish white flowers and can spread by seed as well as via rhizomes, runners, and stems (vegetative growth). Damaged stem segments are able to re-grow if the

buds at the nodes are viable. Once a population of knotweed becomes established, it spreads primarily by growth along its large rhizomes, which can become up to 30 feet long. Japanese knotweed flowers in August and September, with seeds emerging two weeks following flowering. Japanese knotweed requires high amounts of sunlight and normally does not establish within forest understory.

Physical/Mechanical Control

Removal of early growth is recommended early in the growing season (late-April to mid-May), where new growth of knotweed canes will be flush cut to the ground and all cut vegetation is bagged, removed from the site, and disposed of at an appropriate facility. At this time, older, dead growth of Japanese knotweed should also be removed, bagged and disposed of similarly to allow for growth of understory to continue with fewer impediments. Cutting is repeated later in the growing season (mid-July to mid-August), and cut growth is again disposed of in a similar manner. Once regrowth of Japanese knotweed develops leaves, during this final (third) flush, it may be effectively treated with herbicides (see 'Chemical Control' below).

Chemical Control

For the best control results, systemic herbicide treatments should be performed in the fall when plants are translocating nutrients to the rhizomes.

To reduce the risk to non-target species, use *cut-stem treatments* rather than foliar sprays. Cut stalks about 2 inches above ground level and immediately apply a solution of glyphosate (or triclopyr) and water to the cut. A follow-up foliar spray maybe needed to control resprouts. Additionally, in areas where knotweed is in close proximity to non-target desirable (native) vegetation, foliar and stem application of the herbicide solution with the use of a "weed glove" is also an option to avoid herbicide application on non-target plants and to reduce the potential for herbicides within the aquatic environment. Cut-stum treatments with glyphosate or triclopyr formulations should be applied as directed by the label of the specific product used (typically at concentrations ranging from 20-100%, mixed with water).

Recommended Management Approach for Species of Secondary Concern

For the invasive species of secondary concern, the preferred management approach will be mechanical removal methods, as much as is feasible. For the larger, more established invasive plants that are more difficult to remove mechanically without significant site disturbance, precision cut stump/stem herbicide treatments will provide reliable control while minimizing overall use of chemicals. The cut stump/stem treatments involve cutting the plant at the base, removing and disposing of the plant at an authorized facility or chipping/stockpiling the plant material on-site for monitoring, then applying a small amount of herbicide to the cambium layer of the freshly cut stem/stump.

Notes on Herbicide Use

Any all herbicides used for the control of the plant species noted/targeted in this invasive management plan, MUST be an aquatic approved formulation, given the sensitive wetland areas at and/or near the site. Anyone applying herbicides to control invasive plant species for the Reading project MUST possess a valid Massachusetts Commercial Pesticide Applicator License and any required Commercial Certification categories needed to perform the noted invasive plant management work for the designated site areas.

Maintenance and Monitoring

Initial implementation of invasive species management efforts will only address the immediate issues. Because of the pervasiveness of invasive species and their ability to aggressively re-colonize through seeds and root fragments, long-term management and monitoring will be necessary. The control methods described above are likely to be successful in controlling many

of these species for one to two years without additional action. However, invasive plants often begin to recover within a few years after treatment and will become re-established if follow-up monitoring and management efforts are not undertaken. Neighboring populations of invasive plants and existing dormant seeds within the soil often reintroduce a species. Annual maintenance is essential to the success of any management plan and should focus on the following:

- Prevention;
- Early detection/rapid response;
- Monitoring managed areas; and
- Preventing the spread of established populations.

Maintenance Plan

Annual maintenance includes monitoring the area and applying recommended treatments as necessary to prevent re-growth. The recommended best practice for invasive plant maintenance, after initial treatments are completed, is to perform follow-up treatments at least two times per year (late-June & late-September are generally recommended) for three to five years after the initial treatments. The exact timing and number of each year's visits and number of years of follow-up maintenance needed to achieve adequate control of the invasive plants is subject to a number of site-specific variables (existing invasive seed bank, effectiveness of initial treatments, etc.) which can be difficult to predict in advance. For the best long-term results, the maintenance phase should be approached in an adaptive manner and utilize site condition feed-back from monitoring visits to inform and develop the scope and strategy for each year's maintenance work. Note that the maintenance phase should generally be viewed as an ongoing process, even after successful control has been achieved after a 3-5 year effort, but that the time and cost requirements typically follow a descending trajectory until a modest, minimum annual (or biannual) "bench/floor" level is reached.

Monitoring Plan

Following the implementation of invasive species management and the introduction of native plant species, HW recommends that the site be monitored for a minimum of three growing seasons to ensure successful restoration of the river corridor and buffer areas. Monitoring should occur at least twice annually (approximately mid-June and mid-September) to assess the relative success of the restored areas. Semi-annual site inspections conducted during late spring and late summer will include an evaluation of the relative health and vigor of the planted vegetation, overall percent of vegetation cover, extent of invasive species regrowth if any, and general compliance with overall restoration plan goals. Additional measures should be taken during construction and monitoring of the restoration area to discourage the invasion of exotic species within the newly disturbed soils. If additional growth of invasive species is encountered, these details will be documented, and recommendations will be provided to the Project Team to facilitate the effectiveness of the adaptive maintenance approach.

MOSQUITO MANAGEMENT

Mosquitoes are common in natural wetlands and can be expected in constructed wetlands. Immediately after construction has completed, prior to emergence and maturation of vegetative communities, it is difficult to forecast the degree to which nuisance insects will be an issue. The best approach to avoiding mosquito problems in constructed wetlands is to eliminate areas of open, stagnant water. Flowing water, shaded water, and vegetated areas discourage mosquito larval growth. Removing sticks, branches, or fallen vegetation that inhibits free hydrological movement between deep pools or that block the outlet snout will help keep water freely flowing throughout the system.

Other insect larvae that naturally occur in wetlands, such as those of dragonflies, prey on mosquito larvae. Tree swallows and bats can eat thousands of adult mosquitoes every day. Adding bird or bat habitats can reduce the numbers of adult mosquitoes significantly. The Pumpkinseed (*Lepomis gibbosus*) is a small sunfish, native to Massachusetts, that feeds primarily on insects, also feeding on crustaceans, very small fish, and aquatic vegetation.

If these strategies fail to adequately curb the nuisance of mosquito populations breeding in the constructed wetland, insecticides, oils, or bacterial agents can be used, although the effects on the wetland and downstream ecosystems are not well understood, and these methods should be used only as a last resort. *Bacillus thuringiensis isroelensis* (Bti) is a group of bacteria that can be used as a biological control agent, killing the larvae of various species of mosquito, gnat, and black fly.

5.0 ROUTINE MAINTENANCE

Other routine maintenance should include the following:

- Remove of trash and litter from paved and perimeter areas.
- Pavement Sweeping:
    - Minimum of once per year after the spring thaw.
- Check for erosions problems and sediment source(s) along the GSI practice sidewalls if excessive, frequent sediment accumulation occurs in practice area.
- Check for erosions problems and sediment source(s) in the contributing drainage area if excessive, frequent sediment accumulation occurs at inlet flume of sediment forebay.
- Contributing drainage pipes:
    - Inspect annually for proper operation.

6.0 SNOW REMOVAL

Snow removal from the practice is not necessary. Plowed or shoveled snow piles should not be placed within the GSI practice areas or block inlets to these practices.

Excessive salting, sanding or other de-icing practices should be avoided on impervious surfaces. Use of large amounts of sand should also be avoided to avoid obstructing/clogging the conveyance system.

7.0 LONG-TERM POLLUTION PREVENTION PLAN

Long-term pollution prevention measures implemented throughout the development site will further reduce pollutants in stormwater discharges after construction.

Spill Prevention and Control Measures

To minimize the risk of spills or other accidental exposure of materials and substances to stormwater runoff, the following material management practices will be used throughout the project:

- An effort will be made to store only enough products required for operation and maintenance of the facility.
- All materials stored on-site will be stored in a neat, orderly manner in their appropriate containers and, if possible, under a roof or other enclosure.
- Products will be kept in their original containers with the original manufacturer's label.
- Substances will not be mixed with one another unless recommended by the manufacturer.
- Whenever possible, the maximum amount of a product will be used before disposing of the container.
- Manufacturers' recommendations for proper use and disposal will be followed.
- The site superintendent will be issued the O&M to ensure proper use and disposal of materials.

To reduce the risk associated with hazardous materials used on the site, the following practices will be used:

- Products will be kept in original containers unless they are not resealable.
- Original labels and material safety data sheets will be retained and kept on-site; they contain important product information.

- If surplus product must be disposed of, manufacturers' or local and state recommended methods for proper disposal will be followed.

Materials or substances listed below may be present on-site for operation and maintenance:

- Materials List:
  - Concrete
  - Fertilizers
  - Asphalt
  - Petroleum Based Products
  - Paints (enamel and latex)
  - Cleaning Solvents
  - Wood
  - Tar
  - Adhesives
  - Sealants

The following product-specific practices will be followed on-site:

- Petroleum Products - All on-site vehicles will be monitored for leaks and receive preventative maintenance to reduce the chance of leakage. Petroleum products will be stored in tightly sealed containers which area clearly labeled. Any asphalt substances used on-site will be applied according to the manufacturers' recommendations.
- Fertilizers – Fertilizers shall be slow release, low-nitrogen types (< 5%) and phosphorous free and shall not be used within 25 feet of a resource area. Fertilizers used will be applied only in the minimum amounts recommended by the manufacturer. Once applied, fertilizer will be worked into the soil to limit exposure to stormwater. Products will be stored in a covered shed. The contents of any partially used bags of fertilizer will be transferred to a sealable plastic bin to avoid spills.
- Paints – All containers will be tightly sealed and stored indoors when not required for use. Excess paint will not be discharged to the storm and/or sewer system but will be properly disposed of according to the manufacturers' instructions or state and local regulations.
- Concrete Trucks – Concrete trucks will not be allowed to wash out or discharge surplus concrete or drum wash water on the site.

Lawn/Landscaping Maintenance

Lawn and landscaping maintenance should be conducted with minimal use of fertilizers and pesticides to protect the nearby wetland and water resources. In particular, phosphate-based fertilizers are not to be used. Prior to applying fertilizers to the lawn and landscape, a soil analysis should be completed,

Pet Waste Management

Residents and visitors will be encouraged to pick up after their pets with signage along lawn areas.

Solid Waste Management

An enclosed dumpster with a lid will be provided on-site for solid waste management at the site.

Pavement Sweeping Schedules

The driveway and parking area will be, at a minimum, swept annually after spring snowmelt.

Illicit Discharges

No sewer pipes, floor drains or other new pipe connections will be connected to the drainage system. All wastewater will be connected to the municipal sewer.

Personnel Training

All staff/ personnel responsible for maintaining the practices will be given a copy of this Guide and will receive training in the applicable practices and implementation described in herein.

8.0 ESTIMATED OPERATION AND MAINTENANCE BUDGET

The estimated average annual operating and maintenance budget for the proposed system is shown below:

Constructed Wetland Area: Source: Center for Watershed Protection (CWP)	**$1,000**
Catch Basins, Drainage Manholes (4): Source: Massachusetts Highway Department ($200/manhole)	**$ 8000**
Diversion Chamber (1): Source: Massachusetts Highway Department ($200/basin)	**$200**
Other Routine Maintenance: Removal of trash and litter Pipe network/outlet inspections	**$1000**
Total:	**$3,000**