SMMA

TECHNICAL REPORT

The Residences at Stone Ridge – Comprehensive Permit Application Milford, Massachusetts

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March 9, 2018

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Comprehensive Permit Application

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Project Summary

1. PROJECT SUMMARY

The Gutierrez Company ("TGC") has investigated development opportunities associated with the Stone Ridge development for more than 15 years, beginning with the approval of a subdivision road and Master Plan that included 625,000 square feet of office space. Following a lengthy permitting effort described below, The Gutierrez Company began marketing the site for office tenants. The economic climate has not presented opportunities for development of office space, however there is an opportunity to adjust the development of the site to incorporate residential housing to create a mixed-use development. The proposed residential component will only displace 26% of the originally approved master plan square footage, leaving ample land for future office development.

PERMITTING HISTORY

There is an extensive permitting and development history on the Stone Ridge project site which began in 2002 with the rezoning of the site to Business Park which allowed for the development of the parcel as a business park including 625,000 square feet of office space. A Master Plan was reviewed and approved by the following the agencies below:

- Milford Planning Board
- Milford Conservation Commission
- Executive Office of Energy and Environment Affairs (MEPA)
- Milford Board of Sewer Commissioners
- Massachusetts Department of Environmental Protection (MA DEP)
- Massachusetts Natural Heritage and Endangered Species Program (NHESP)
- U.S. Corps of Engineers (ACOE)
- Massachusetts Historical Commission (MHC)

In 2016, the Gutierrez Company successfully worked with the Milford Zoning Board to amend the zoning bylaw to allow (by Special Permit) wholesaling uses within a Business Park Zone. This resulted in TGC being able to secure Restaurant Depot as the first tenant to the site. The site work and roadway construction for the 63,000 sf Restaurant Depot project is currently underway. It is anticipated that much of the proposed residential development will provide a consistent scale of development and protection of surrounding resources as the previously approved development.

PROPOSED DEVELOPMENT

The Gutierrez Company proposes to construct a luxury residential development on a portion of the previously approved Master Plan in lieu of approximately 160,000 sf office space. The proposed project consists of the development of three residential buildings, an amenity area contained within one residential building, a community pool, various support accessory buildings, and associated site development. The remaining portion of the previously approved Master Plan will remain developable as an office use.

The three residential buildings will include a total of 272 units and 426 total bedrooms. The site development conditions include the construction of 476 parking spaces, of which 38 are covered garage spaces, yielding 1.75 parking spaces per unit.

Proposed Design

The site layout and architectural design for this three building cluster of apartment buildings have been influenced by their location near the center of a suburban office park. The three buildings are arranged linearly, following the contours of the rolling site, and set above wetlands and land conservation areas. The buildings are separated by green space, with parking at their perimeters to allow access from both sides for entry into the buildings. The centrally located amenity space contains a swimming pool, with tenant common space located at the first floor of the middle building overlooking this area. This amenity space offers opportunities for outdoor activities for all tenants. Parking is distributed around the perimeter of the site, allowing front and rear access to building entries.

Each building contains a mix of one, two, and three bedroom apartments on five floors. There are three building plans. The smallest building contains 75 units and two larger buildings, one with 99 units and one with 98 units, providing 272 apartments on site. There are two formal entrances at grade to each building, providing direct access from all parking areas. The main entrance into each building is facing inward to optimize views into the natural resource areas. The footprints of the buildings are broken up by a series of projecting bays, with larger bays accenting the entry area at each building.

The exterior design utilizes residential type construction materials – lap siding, a flat panel system at the projecting bays, brick at the entries, and double-hung windows throughout. The facades are varied, with the fiber cement lap siding in two sizes with horizontal trim bands framing the bays with their pattern of flat panels. The buildings have a flat-roofed design, with the paneled bays having a higher roofline to further break up the massing of the buildings.

Future Development Potential

The proposed residential development serves as the second phase of the development of Stone Ridge. It is anticipated that, with the creation of the proposed luxury rental project, the site will attract corporate tenants to allow the further development of the site in accordance with the previous permitting that was approved by the Town of Milford. The remaining developable lots would include the previously approved Building 4 (295,000 sf) and reduced Building 2 (approximately 90,000 sf) for a total of 385,000 sf of office space along with supporting site elements such as roadways, parking, utilities, stormwater management and other site amenities. The timing for this future development is unknown, however the intent is to maintain the existing permits for that future work.

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Existing Conditions Description

2. EXISTING CONDITIONS DESCRIPTION

The Stone Ridge project site consists of four lots bound to the south by Cedar Street and to the west by I-495 northbound. Portions of the project site are currently under construction including the subdivision road and primary utilities and Lot 1B where the Restaurant Depot project is under construction. The remainder of the project site is undeveloped woodlands.

TOPOGRAPHY

The site in the vicinity of the proposed residential development slopes from north to south (towards Cedar Street) and west to east (from I-495 to Deer Street) with slopes ranging from 5% - 50%. The grade change across the site is approximately 70 ft of elevation. The high point is located in the northern portion of the site near Wetland 5 at elevation 370±, the low points are located in the southern portion of the site near Wetland 2 at 322± and Wetland 3 at 300±.

SOILS

The Natural Resources Conservation Service (NRCS) Web Soil Survey for Worcester County soil classifications, Hydrologic Soil Group (HSG), and the Soil Erosion K-Factor for site soils are presented in the table below and are shown on Figure XX and Figure XX drainage area maps:

Table 2.1 – Site Soils

Symbol	Name	Slope	HSG	K-Factor
73	Whitman fine sandy loam, extremely stony	0-3%	D	0.49
102	Chatfield-Hollis-Rock outcrop complex	0-35%	B	0.28
245	Hinckley loamy sand	8-35%	A	0.10
422	Canton fine sandy loam, extremely stony	8-35%	B	0.43

The NRCS soil classifications are consistent with onsite test pits performed in 2008 for the Applicant. The test pits were located in proposed locations of the stormwater management basins and wetland replacement areas and observed the soil and groundwater conditions. The Subsurface Data Report prepared by Sanborn, Head, & Associates, Inc. (SHA) can be found in Appendix 4. Note that the report was prepared for the previous development concept and descriptions of stormwater systems and other site components may have changed.

NATURAL RESOURCES

The Stone Ridge project site contains many natural resources that have been the subject of extensive permitting efforts. According to the Surface Water Quality Standards (314 CMR 4.00), the 1990 Designated Outstanding Resource Waters (ORW) of Massachusetts, and the MassGIS and Town of Milford databases, the site lies entirely within an ORW.

Resources in the vicinity of the Stone Ridge development defined by and subject to protection under WPA Regulations (310 CMR 10.00) include:

- Bordering Vegetated Wetlands (BVW)
- Bank
- Riverfront Area (RA)
- Land Under Waterbodies and Waterways (LUWW)
- Bordering Land Subject to Flooding (BSLF)
- Isolated Land Subject to Flooding (ILSF)
- Isolated Vegetated Wetlands (IVW)

Wetland resource areas within the development were approved through the issuance of an Order of Resource Area Delineation (DEP File #233-966). Refer to the site plans for locations of various wetland and natural resource areas. The table below summarizes the approved wetland resource areas:

Table 2.2 – Wetland Resource Areas

Wetland	Cover Type	Resource Area
2	Forested Swamp, Intermittent Stream	BVW, Bank
3	Forested Swamp, Charles River	BVW, Bank, LUWW, BLSF, Riverfront Area
4	Forested Swamp, Deer Brook	BVW, Bank, LUWW, Riverfront Area
5	Forested Swamp, Ephemeral Open Water	ILSF
6	Forested Swamp	ILSF
7/8	Forested Swamp	BVW
9	Forested Depression	Locally regulated IVW

The pervious approvals included temporary and permanent impacts to BVW's, Bank, LUWW, and IVW that required mitigation including two Wetland Replacement Areas. The wetland resource impacts in the vicinity of the proposed residential development include the loss of Wetland 9 in its entirety and the construction of Replacement Area 2 adjacent to Wetland 7/8 in the northern portion of the site. The proposed residential project is also located within the 100-ft buffer zones of Wetlands 2 and 5.

Additional natural resources in the vicinity of the project site include Wildcat Pond, Charles River, Deer Brook, and an intermittent stream upstream of Wildcat Pond.

The Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Map Number 25027C0867E, dated July 4, 2011, shows a Zone X along Deer Brook and the Charles River. The Zone X does not extend into the proposed residential development area. Refer to Figure 4 for the FIRM map.

The Natural Heritage and Endangered Species Program (NHESP) maps habitat for the wood turtle in the southern portions of the site, not in the vicinity of the proposed residential development. The Gutierrez Company worked with NHESP to obtain a Conservation and Management Permit that included placement of approximately 29 acres of permanent Conservation Restriction areas throughout the Stone Ridge site. Refer to Figure 4: Constraints Plan for the location of the Conservation Restriction areas.

HISTORICAL/CULTURAL RESOURCES

The Gutierrez Company worked with the Massachusetts Historical Commission (MHC) and U.S. Army Corps of Engineers to prepare an Archeological Site Avoidance and Protection Plan in order to preserve five Historic Properties on the Stone Ridge site. The Stone Ridge site plan was revised to preserve these areas shown on Figure 4: Constraints Plan.

PERMITTING HISTORY

There is an extensive permitting and development history on the Stone Ridge project site which began in 2002 with the rezoning of the site to Business Park which allowed for the development of the parcel as a business park including 625,000 square feet of office space. A Master Plan was reviewed and approved by various state and local agencies. The following approvals were received:

- August 2006 - Definitive Subdivision Plan approved by Milford Planning Board with subsequent modifications
- October 2006 - Order of Conditions issued by the Milford Conservation Commission for subdivision roadway (MA DEP #223-954)
- December 2007 – Environmental Notification Form (ENF) Certificate issued by the Executive Office of Energy and Environment Affairs
- May 2008 – Site Plan Approval – with subsequent modifications- and Modification to Definitive Subdivision issued by the Milford Planning Board
- June 2008 – Order of Conditions issued by the Milford Conservation Commission for site (MA DEP #223-987)
- June 2008 – MEPA Certificate for DEIR issued
- September 2008 – Sewer Connection/Extension Permit approved by the Milford Board of Sewer Commissioners
- October 2008 – MEPA Certificate for FEIR issued
- March 2009 – 401 Water Quality Certificate (WQC) issued by the Massachusetts Department of Environmental Protection (MA DEP #223-964 and #223-987)
- November 2009 – Conservation and Management Permit issued by the Massachusetts Natural Heritage and Endangered Species Program (NHESP)
- February 2011 – Negative determination issued by U.S. Corps of Engineers (ACOE) for Wetlands 5 and 9 stating these areas are not federally regulated
- February 2011 – Letter from ACOE formally identifying culturally significant site features to be avoided based on Section 404 Category II Permit submitted September 2008; Public Archeology Laboratory (PAL), Intensive Survey Report for Approval, Archeological Site Avoidance and Protection Plan (ASAPP) prepared and submitted by the Gutierrez Company; and correspondence and approvals with the Massachusetts Commission on Indian Affairs, the Mashpee Wampanoag Tribe (the Tribe), and the Massachusetts Historical Commission (MHC)
- October 2016 – Town of Milford zoning change to allow a wholesale use in the Business Park Zone.

The goal of the design of the residential project is to provide consistent protection to natural and cultural resources as provided by the previously proposed development.

3

Proposed Development

3. PROPOSED DEVELOPMENT

The Gutierrez Company proposes to construct a luxury residential development on a portion of the previously approved Master Plan in lieu of approximately 160,000 sf of office space. The proposed project consists of the development of three residential buildings, an amenity area contained within one residential building, a community pool, parking garages with bike storage units, various support accessory buildings, and associated site development. The remaining portion of the previously approved Master Plan will remain developable as an office use.

Project Description

The site layout and architectural design for this three building cluster of apartment buildings have been influenced by their location near the center of a suburban office park. The three buildings are arranged linearly, following the contours of the rolling site, and set above wetlands and land conservation areas. The buildings are separated by green space, with parking at their perimeters to allow access from both sides for entry into the buildings. The centrally located amenity space contains a swimming pool, with tenant common space located at the first floor of the middle building overlooking this area. This amenity space offers opportunities for outdoor activities for all tenants. Parking is distributed around the perimeter of the site, allowing front and rear access to building entries.

Each building contains a mix of one, two, and three bedroom apartments on five floors. There are three unique building plans. The smallest building contains 75 units and two larger buildings, one with 99 units and one with 98 units, providing 272 apartments on site. There are two formal entrances at grade to each building, providing direct access from all parking areas. The main entrance into each building is facing inward to optimize views into the natural resource areas. The footprints of the buildings are broken up by a series of projecting bays, with larger bays accenting the entry area at each building.

The exterior design utilizes residential type construction materials – lap siding, a flat panel system at the projecting bays, brick at the entries, and double-hung windows throughout. The facades are varied, with the fiber cement lap siding in two sizes with horizontal trim bands framing the bays with their pattern of flat panels. The buildings have a flat-roofed design, with the paneled bays having a higher roofline to further break up the massing of the buildings.

The following table shows the unit and bedroom counts for each of the three proposed residential buildings.

Table 3.1: Building Summary

Building	Units	Bedrooms
A	99	158
B	75	119
C	98	149
Total	272	426

The site development conditions include the construction of 476 parking spaces, of which 38 are covered garage spaces, yielding 1.75 parking spaces per unit.

Wetland Impacts

The limit of work in the proposed development respects the Town's 15-ft no disturb buffer and is consistent with the limit of work from the previously approved development. The limit of work adjacent to Wetland 5 is moved closer to the southeast of the wetland but moved further away to the south. The disturbance of Wetland 9 and the construction, schedule, and monitoring of Wetland Replacement Area (WRA) #2 will be consistent with the previous Order of Conditions. The project will obtain approvals from the Milford Conservation Commission for the proposed project.

Lot Reconfiguration

The location of proposed residential project is located on three lots under the current lot configuration including Lots 2A, 3, and 4. The Applicant plans to submit an Approval Not Required (ANR) Plan to reconfigure these lots so the residential project is located entirely within Lot 2 (referred to as Lot 2B in this application). The remaining reconfigured Lots 3A and 4A will provide the minimum lot requirements of the Business Park (BP) zoning district. Refer to Figure 5: Proposed Property Line Revisions for the existing and proposed property line locations.

ZONING COMPLIANCE

The project proposes the construction of a residential development under the Affordable Housing, Mass General Law Chapter 40B. In accordance with the 40B requirements, the development is seeking approval of a Comprehensive Permit through the Town of Milford's Zoning Board of Appeals.

Proposed Project's Compliance with Zoning Requirements

The project site is located within the Business Park (BP) Zone within which a residential use is generally not a permitted use. The intent of the site design is to comply with the dimensional requirements for the Business Park Zone. The following table shows the required and provided dimensions for the proposed development.

Table 3.2: Dimensional Zoning Requirements

	Required (BP)	Provided
Minimum Lot Requirements		
Area (sf)	---	722,435
Width (ft)	---	N/A
Frontage (ft)	---	N/A
Minimum Yard Requirements		
Front (ft)	25	174.9
Side (ft)	0	81.9*
Rear (ft)	0	70.0*
Maximum Building		
Building Coverage (% Lot Area)	35	8.7
Ratio, gross floor area to lot area (F.A.R.)	0.50	0.44
Width	---	N/A
Minimum Open Space		

Per Dwelling Unit (sf)	---	N/A
Percent of Lot Area	20	62.5
Height Requirements		
Maximum Building Height (ft)	60	60
Maximum Building Height (stories)	5	5
Landscape Requirements		
Interior Parking Lot Landscape (%)	10	>10
Landscape Buffer Strip (ft)	15	>15
Parking Lot Setback (ft)	20	>20

* Principal use structures only

It is important to note that the project exceeds the amount of open space provided in the previously approved development and decreases the amount of land taken up by buildings. Although this development is proceeding through the 40B Development process, the project does not seek to propose a density that is more intensive than previously approved projects at this site.

Landscaping

The site and landscape design is intended to complement the architectural design of the residential buildings. The plan provides for efficient circulation, distribution of parking, access to amenity spaces and protection of natural resources.

The proposed site plan meets or exceeds all requirements set forth in the zoning by-law for landscaping. The street frontage along the parking lot is approximately 220 linear feet. Based on the by-law, the buffer should be a minimum of 2,420 square feet (at 15' depth) and contain at least eight 8 trees and 24 shrubs. The proposed landscaped buffer strip surpasses the minimum area and contains a blend of 9 shade and ornamental trees. The requirement for shrubs in the buffer strip has been achieved through use of a hedge along most of the frontage and two landscaping beds on either side of the main entry drive.

The landscaping within the parking lot itself is required to be 10% of the total area. In the proposed plan, 11% of the parking lot is composed of size-compliant landscaped areas. The landscaped areas contain 51 trees, areas of shrubs, perennials, groundcover, lawn, and some pedestrian paving. The allowed percentage of space dedicated to pedestrian pavement within the parking lot landscaping area is 30%. The proposed plan delineates only 15% of the landscaped area for pedestrian pavements. In addition to the landscaped area required within the parking lot, each edge is composed of trees, lawn, planting areas, and pedestrian pavements. All slopes are adequately planted to prevent erosion with a mix of native grasses and wildflowers. Mown lawn areas are confined to the center of the development and major travel routes. Native grasses and wildflowers are planned in edge conditions between forest, wetlands, and detention basin areas.

UTILITIES

The project proposes to utilize connections to existing utilities located within the Stone Ridge development, recently installed as part of the subdivision road construction, to provide service to the proposed development.

Gas, Electrical & Telecommunications

The project proposes to connect to the water, gas, electric and telecommunications services being constructed along the subdivision road (aka Deer Street) to support the development. The Applicant will coordinate the connection with the local utility providers.

Sanitary Sewer

Wastewater from the Stone Ridge development site will be collected and flow via gravity sanitary sewer beneath the subdivision road and discharge into the pump station that was recently installed at the southeast end of Deer Street, east of the Upper Charles Trail bike path crossing. The pump station utilizes dual 5 HP, 250 gpm pumps that discharge to a new 6-inch ductile iron force main beneath Cedar Street. The new force main that will run approximately 2,000 linear feet along Cedar Street is scheduled to be installed in Spring 2018. The force main will discharge to an existing manhole and 8-inch gravity sewer owned and maintained by the Town of Milford approximately 2,000 feet south of the Deer Street intersection. The town owned gravity sewer eventually discharges to the Town of Milford Waste Water Treatment Facility. The Gutierrez Company will own and maintain the pump station and force main.

The Stone Ridge development Master Plan received MA DEP Sewer Connection/Extension Permit #x223659 for the installation of the gravity sewer, pump station, and force main and a design flow of 46,875 gallons per day (gpd). In 2014 the MA DEP 314 CMR Sewer System Extension and Connection Permit Program was revised to state that any increase in flow above a permitted discharge is authorized without a MA DEP permit but must meet all federal and local requirements. Therefore, the Applicant will submit a Class I – Residential Connection Permit Application to the Zoning Board of Appeals for the increase in flows from the proposed residential development. Refer to Appendix 5 for the permitting and pump station design flows under the previously approved, currently proposed – short term, and currently proposed – long term scenarios.

The previously approved gravity sanitary sewer, pump station, and force main are adequately sized for the anticipated peak flows from the short term Restaurant Depot development and residential development as well as the long term future office buildings. The previously approved pump station and pump design has adequate capacity for the currently proposed short term development. However, the anticipated flows from the future office development will require replacing the existing 5 HP dual pumps with dual 7.5 HP, 350 gpm pumps while utilizing the existing pump station wet well.

Water

The project proposes to utilize an 8-inch water main and connect to the existing 12-inch water main beneath the subdivision road that connects to the 10-inch water main beneath Cedar Street that is privately owned by the Milford Water Company (MWC). In the future if the MWC water main size is increased, the development water connection will upgrade a section of the existing MWC 10-inch water main to 12-inch using reducer fittings and a tee in lieu of a tapping sleeve and valve. Fire hydrants will be provided at 500-ft intervals with isolation valves provided at 1000-ft intervals.

The Town of Milford's consultant, Tata & Howard, Inc., prepared a memo to the Milford Water Company, dated January 22, 2018, evaluating the proposed water service in relation the Town's existing water distribution system. Using conservative flow rates in accordance with the Massachusetts Water Resource Commission (MWRC), Tata & Howard conducted a hydraulic simulation of the proposed residential development using the model of the existing Milford water distribution system. The results indicate the static pressure a residential buldings will be approximately 79 pounds per square inch (psi) under Average Daily Demand (ADD) and Maximum Daily Demand scenarios. Additionaly, the results indicate that sufficient 1,700 gpm of fire flow will be available while maintaining the minimum required pressure of 20 psi during a fire event. If required upon completion of the water main installation, the design team will perform additional hydrant flow tests in order to confirm the hydraulic model results and proposed fire protection infrastructure.

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Stormwater Management

4. STORMWATER MANAGEMENT

The proposed stormwater management system for the development builds on the success of previously-approved plans. Peak flowrates of runoff in the proposed conditions will be reduced in comparison with the existing conditions. Runoff from the project site will be captured, treated, and recharged consistent with previous approvals which meet or exceed State minimum requirements.

The following text describes the stormwater management within the proposed residential development. Generally, the previously approved stormwater management of the remaining site master plan remains unchanged. The impact of changes to contributing drainage areas, detention, and treatment have been checked for consistency with previous approvals.

INTRODUCTION

The existing drainage patterns of the development remain as previously described: flow generally follows the existing topography overland to various low-point wetlands which overflow to either Deer Brook to the east or the Charles River to the south.

The proposed stormwater system will consist of a street sweeping program, series of deep-sump catch basins, sediment forebays, detention basins, subsurface storage structures, and a constructed wetland.

Detailed stormwater calculations including hydrology, TSS removal, and recharge/infiltration for the project are included in this filing. These calculations document compliance with the previous approval granted by the Milford Conservation Commission and will be included in a separate submission to the Milford Conservation Commission to amend previous approvals.

Hydraulic calculations will be submitted at a later date once the site layout is generally approved by the ZBA. The closed drainage system will be sized using the Rational Method and Manning's Equation to convey the 10-year storm event.

The proposed project remains consistent with the previous approvals as they relate to the Standards of the Department of Environmental Protection (DEP) Stormwater Management Policy. The approach to comply with each standard is discussed below.

CONSISTENCY WITH DEP STORMWATER MANAGEMENT POLICY

Standard 1 – Untreated Stormwater

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

The project was designed to treat all stormwater runoff prior to discharge. Improved capacity for stormwater treatment will also be provided via grading/hydrologic and vegetative enhancements. The current proposal is consistent with the previously approved project and remains in compliance with Standard 1.

Standard 2 – Post-Development Peak Discharge Rates

Standard 2 stated: Stormwater management systems must be designed so that post-development peak rate discharge rates do not exceed pre-development peak discharge rates.

The proposed project is designed so that post-development peak discharge rates do not exceed the pre-development rates for the 2-, 10-, 25-, and 100-year storm events. The current proposal is nearly all within the subcatchment areas contributing to Design Points 1 (Wetland 3/Charles River) and 3 (Wetland 2); therefore only analysis of Design Points 1 and 3 are included. A portion of the proposed development extends onto the former area tributary to Design Point 2 (Wetland 4/Deer Brook); however given the tributary area to Design Point 2 is reduced, the peak rates would be proportionally reduced as well. For reference, the hydrology model includes the entire Stone Ridge with assumptions of future office development impacts to show compliance with previous approvals is achievable.

The existing and proposed hydrologic conditions were modeled using HydroCAD to compare existing and proposed conditions. A detailed description of the hydrology, including a comparison of existing, previously approved, and currently proposed conditions of peak rate of runoff is included in the next section. A summary of pre-development and post-development peak discharge rates can be found in Appendix 3: Stormwater Calculations.

The current proposal is consistent with the previously approved project and is in compliance with Standard 2.

Standard 3 – Recharge to Groundwater

Standard 3 stated: Loss of annual recharge to groundwater should be minimized through the use of infiltration measures to the maximum extent practicable. The annual recharge from the post-development site should approximate the annual recharge from the pre-development or existing site conditions, based on soil types.

The required recharge volume calculations are based on the existing hydrological soil groups of the site and the impervious surfaces proposed by the project. The total required recharge volume is 20,022 cubic feet. The proposed recharge systems have a total volume of 30,718 cubic feet, 153% of the requirement.

The recharge systems have been carefully located on the site to minimize proposed earthwork, maintain safe distance from protected natural and cultural resources, and provide pleasant views for future residents.

Each recharge structure also serves as detention for stormwater flow, and has been designed using DEP's "static method." This method conservatively assumes that a basin will fill before any infiltration occurs and that the recharge volume provided by a basin has a height of the lowest outlet. Rawls Rates were used to verify that complete draw-down would occur within 72 hours. Recharge and draw-down calculations can be found in Appendix 3: Stormwater Calculations.

The project's provided required recharge volume is in compliance with Standard 3.

Standard 4 – Removal of Total Suspended Solids

Standard 4 stated: For new development, stormwater management systems must be designed to remove 80% of the average annual load (post-development conditions) of Total Suspended Solids (TSS). It is presumed that this standard is met when: (a) Suitable nonstructural practices for source control and pollution prevention are implemented; (b) Stormwater management best practices (BMPs) are sized to capture the prescribed runoff volume; and (c) Stormwater management BMPs are maintained as designed.

Removal of Total Suspended Solids (TSS) was originally proposed for the site and accomplished by the combination of structural and non-structural Best Management Practices:

- Street Sweeping
- Deep Sump Catch Basin
- Sediment Forebay
- Constructed Stormwater Wetlands
- Infiltration

Additionally, because the project site is located in an Outstanding Resource Water (ORW) critical area, 44% TSS removal is provided through pre-treatment prior to discharging into infiltration BMPs. TSS removal was calculated for each treatment train and are provided in Appendix A and demonstrate compliance with Standard 4. In summary, BMP Train 1 achieves 97% TSS removal, BMP Train 2 achieves 98% TSS removal, and BMP Train 3 achieves 85% TSS removal.

Water quality volume calculations are provided for structural BMPs as required in Appendix 3. Proposed Contech CDS ® Units (or approved equivalent) have been sized to capture and treat 1.0" from impervious surface from all areas of the project because it is located within an ORW.

The current proposal is consistent with the previously approved project and is in compliance with Standard 4.

Standard 5 – Land Uses with Higher Potential Pollutant Loads

Standard 5 stated: Stormwater discharges from areas with higher potential pollutant loads require the use of specific stormwater management BMPs. The use of infiltration practices without pretreatment is prohibited.

A portion of the project site is characterized as a Land Use of Higher Potential Pollutant Load (LUHPPL) due to the fact that the residential development alone anticipates approximately 1,772 vehicle trips/day, see Traffic Report prepared by The Engineering Corp under separate submission. All BMPs proposed, including these within this area, have been designed to pre-treat stormwater before infiltration so that the project complies with this standard.

Standard 6 – Critical Areas

Standard 6 stated: Stormwater discharges to critical areas must utilize certain stormwater management BMPs approved for critical areas… Critical areas are … recharge areas for public water supplies."

As previously stated, the project is located within an ORW critical area therefore the required Water Quality Volume for the proposed project represents 1-inch times the total post-development impervious area. Water Quality Volume calculations can be found in Appendix 3: Stormwater Calculations . The current proposal is consistent with the previously approved project and is in compliance with Standard 6.

Standard 7 – Redevelopment Projects

The project is not a redevelopment project, therefore Standard 7 is not applicable to this project.

Standard 8 – Erosion and Sedimentation Controls

Standard 8 stated: Erosion and sediment controls must be implemented to prevent impacts during construction or land disturbance activities.

The following erosion and sediment controls will be implemented to prevent impacts during construction or land disturbance activities:

- Silt fence barriers
- Vegetative slope stabilization
- Temporary swales and sedimentation basins
- Construction entrances

A Stormwater Pollution Prevention Plan (SWPPP) will be prepared for this project and will be submitted as part of the National Pollutant Discharge Elimination System (NPDES) permit process.

The current proposal is consistent with the previously approved project and is in compliance with Standard 8.

Standard 9 – Operation and Maintenance Plan

Standard 9 states: All stormwater management systems must have an operation and maintenance plan to ensure that systems function as designed.

A post-construction operation and maintenance plan was developed for the original submission of the project and shall continue to be utilized for the proposed development. Refer to Appendix 2 for the Operation and Maintenance Plan.

The current proposal is consistent with the previously approved project and is in compliance with Standard 9.

HYDROLOGIC MODELING

The hydrology of existing (pre-development) and proposed (post-development) conditions were modeled using HydroCAD. A summary of peak flowrates at the four design points for the existing, previously approved, and proposed conditions can be found in Appendix 3: Stormwater Calculations. Subcatchment plans for existing and proposed conditions are included as Figure 6 and Figure 7, respectively.

Methodology

The project site was divided into the subcatchment areas described below, and the hydrology of the site was modeled using these as subcatchment nodes. A time of concentration (Tc) of 5 minutes was used in subcatchment areas where runoff flows across impervious surfaces into a pipe network, following typical convention.

Each proposed subcatchment is routed to a Design Point either directly or via a pond. Ponds were used to model potential stormwater storage volume. The HydroCAD routing methods have been set to Storage-Indication+Translation, which is consistent with previously filed applications.

All subcatchment areas in the proposed conditions have appropriate curve numbers associated with ground cover of impervious surface (building and pavement), grass, wooded, wetlands, or detention basins. The NRCS

identifies the project site with hydrologic soil groups A, B, and D. The HydroCAD rainfall distribution is Type III 24-hour, consistent with previous applications.

A portion of the model includes nodes and subcatchments from a previously approved model, including all nodes discharging to Design Point 4. Additionally, Subcatchments PR 1.1, PR 1.2, PR 1.6, PR 2.1, and PR 3.4 remain unchanged from the previously approved model. All other subcatchments have been modified to model the drainage conditions associated with the proposed development.

Proposed Conditions

Runoff in the proposed conditions generally follows the previously approved flow patterns as described below. Design Point 3 receives flow from various subcatchment areas located within the proposed development as well as from a portion of the site developed since the master plan was last approved. North of Wetland 6, the areas for future development (PR 2.2A, PR 2.2B) deliver stormwater to Design Point 2 through Basins 5A and 5B. Unchanged from the previously approved model, the roof of Building 4 in the northwest corner of the site delivers flow to Design Point 4 through Basin 6.

Subcatchments

Subcatchment PR 1.1 is approximately 3.50 acres of subdivision road, parking, and vegetative landscapes that drain into Basin 1.

Subcatchment PR 1.2 is approximately 1.4 acres of vegetated perimeter grading around the subdivision road and Basin 1. Consistent with the previously approved design, stormwater runoff from this area drains directly to the wetlands adjacent to the Charles River.

Subcatchment PR 1.3 is approximately 3.5 acres of residential buildings, landscaped areas, and parking. Stormwater is delivered to Basin 2 before discharging into the wetlands surrounding the Charles River.

Subcatchment PR 1.4 is approximately 0.6 acres of vegetated perimeter grading associated Buildings 4 and C. Stormwater runoff drains directly into the wetlands of the Charles River.

Subcatchment PR 1.6 is approximately 1.7 acres of building, landscaped areas, and parking. Consistent with the previously approved design, this area drains into Basin 7.

Subcatchment PR 2.1 is approximately 0.2 acres of vegetated perimeter grading along the subdivision road. Consistent with the previously approved design, this area drains toward Design Point 2 through Wetland 4.

Subcatchment PR 2.2A is approximately 1.6 acres of paved parking and vegetated landscape areas. Stormwater drains to Basin 5A before discharging north toward the Charles River wetlands and Design Point 2.

Subcatchment PR 2.2B is approximately 1.3 acres of paved road, landscaped areas, and wooded areas. This area drains to Basin 5B before discharging north toward the Charles River wetlands and Design Point 2.

Subcatchment PR 2.3 is approximately 4.3 acres of Building 2 paved parking area and roads, vegetated landscape areas, perimeter vegetated grading, and undisturbed woods and Wetland 6. Overflow from Wetland 6 is directed to Basin 5A, which overflows to Design Point 2.

Subcatchment PR 2.4 is approximately 0.7 acres of vegetated perimeter grading bordering Basins 5A and 5B. Stormwater drains north toward Wetland 4 and Design Point 2.

Subcatchment PR 3.1 is approximately 0.6 acres of vegetated perimeter grading along the north edge of the Building 4 parking area and the south edge of Basin 4, the constructed wetland. Stormwater drains toward Wetland 2 and Design Point 3.

Subcatchment PR 3.2 is approximately 4.1 acres of Building A, a future office building, paved roads and parking areas, and vegetated landscape areas. Stormwater is directed via a drainage system to Basin 4.

Subcatchment PR 3.3A is approximately 2.1 acres of paved parking for a future office building, paved roads, and vegetated landscape areas. Stormwater is directed to Basin 3A, an underground detention system, which overflows to Design Point 3 via Basin 8.

Subcatchment PR 3.3B is approximately 1.5 acres of paved parking and vegetated landscape areas for Building 2. Stormwater is directed to Basin 3B, an underground detention system, which overflows to Basin 8.

Subcatchment PR 3.3C is approximately 1.6 acres of vegetated perimeter grading and undisturbed woodlands. Stormwater is directed to Basin 8 before discharging to Design Point 3.

Subcatchment PR 3.4 is approximately 4.6 acres of paved highway, vegetated perimeter grading, and Wetland 5. Consistent with the previously approved design, flow is directed toward Wetland 5. Overflow from Wetland 5 is directed to Basin 8.

Subcatchment PR 3.5 is approximately 3.0 acres of paved parking areas and vegetated landscape and perimeter grading areas. Stormwater is directed via a closed drainage system to the underground detention system, Basin 3C, which overflows to Design Point 3.

Subcatchment PR 4.1 is approximately 0.4 acres of vegetated perimeter grading to the north of the future Building 2. Stormwater drains toward Wetland 7/8.

Subcatchment PR 4.2 is approximately 1.6 acres of Building 2 and its associated paved parking areas and vegetated landscape areas. Stormwater is directed via a closed drainage system to Basin 6, which overflows toward Wetland 7/8.

Buildings

Building A has a footprint of approximately 0.5 acres and is considered within Subcatchment PR 3.2. Runoff from the building roof is delivered via a closed drainage system to Basin 4, which overflows to Design Point 3.

Building B has a footprint of approximately 0.4 acres and is considered within Subcatchment PR 1.3. Runoff from the building roof is delivered via a closed drainage system to Basin 2, which overflows to Design Point 1.

Building C has a footprint of approximately 0.5 acres and is considered within Subcatchment PR 1.3. Runoff from the building roof is delivered via a closed drainage system to Basin 2, which overflows to Design Point 1.

EROSION AND SEDIMENTATION CONTROL

An erosion and sedimentation control program will minimize the risk of impacts to wetland resource areas during construction of the Project. The program incorporates Best Management Practices specified in the guidelines developed by the DEP and the United States Environmental Protection Agency (US EPA) and complies with the requirements of the National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharges from Construction Activities. These measures include the installation of temporary erosion and

sedimentation controls and construction sequencing. Areas of exposed soil will be kept to a minimum, and permanent vegetative cover (or binder coat of pavement) will be established after final grading or as soon as practicable. Erosion and sediment control measure proposed for site preparation and development phases will include the following components.

Temporary Construction Entrance

A temporary construction entrance consisting of 6 inches of gravel over a filter fabric will be installed to minimize the migration of sediment on and off the site by construction equipment.

Haybales with Silt Fence

Haybales with silt fence will be installed around the perimeter of the site to prevent the migration of sediment on and off the site from overland flow.

Sediment Bag at Catch Basins

Sediment bags will be installed in existing and newly constructed catch basins to capture and remove sediment in stormwater runoff prior to discharge from the site.

Temporary Diversion Swales with Check Dams

Swales will be installed prior to major earth disturbance to convey runoff to temporary sediment basins. The contractor will modify the location of the swales according to construction sequencing.

Temporary Sediment Basins

Temporary sediment basins will receive runoff from the diversion swales and will provide detention to allow sediment to settle out of the runoff prior to discharge.

6

Figures

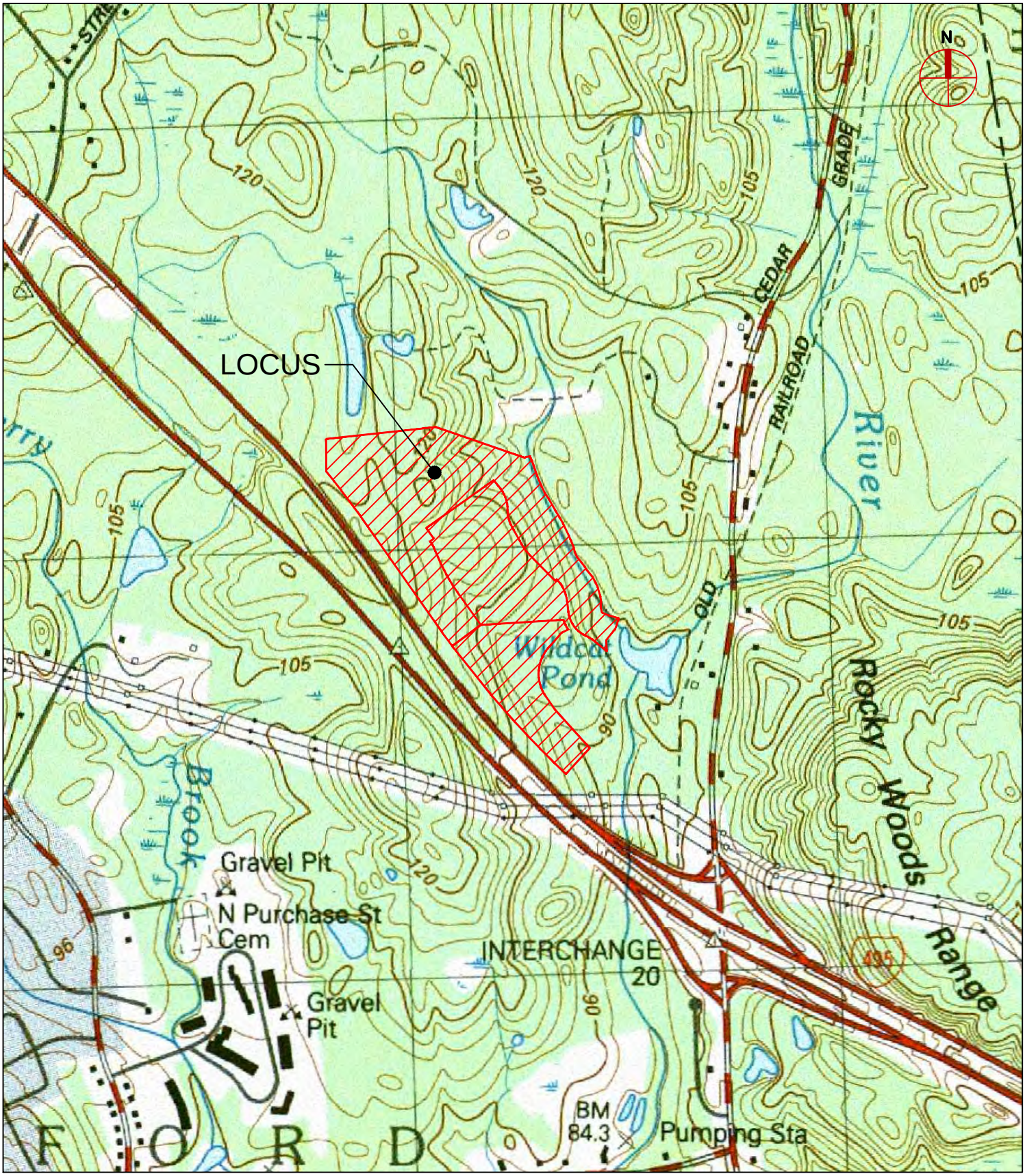

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Figure 1

USGS MAP

DATE:	11/21/2017
ISSUE:	
SCALE:	1"=1,000'±
REF:	
DR BY:	EFP
CK BY:	WWP

THE GUTIERREZ COMPANY
RESIDENCES AT STONE RIDGE

200-300 DEER STREET
MILFORD, MA

JOB NO.: 17095

SMMA

SYMMES MAINI & McKEE ASSOCIATES
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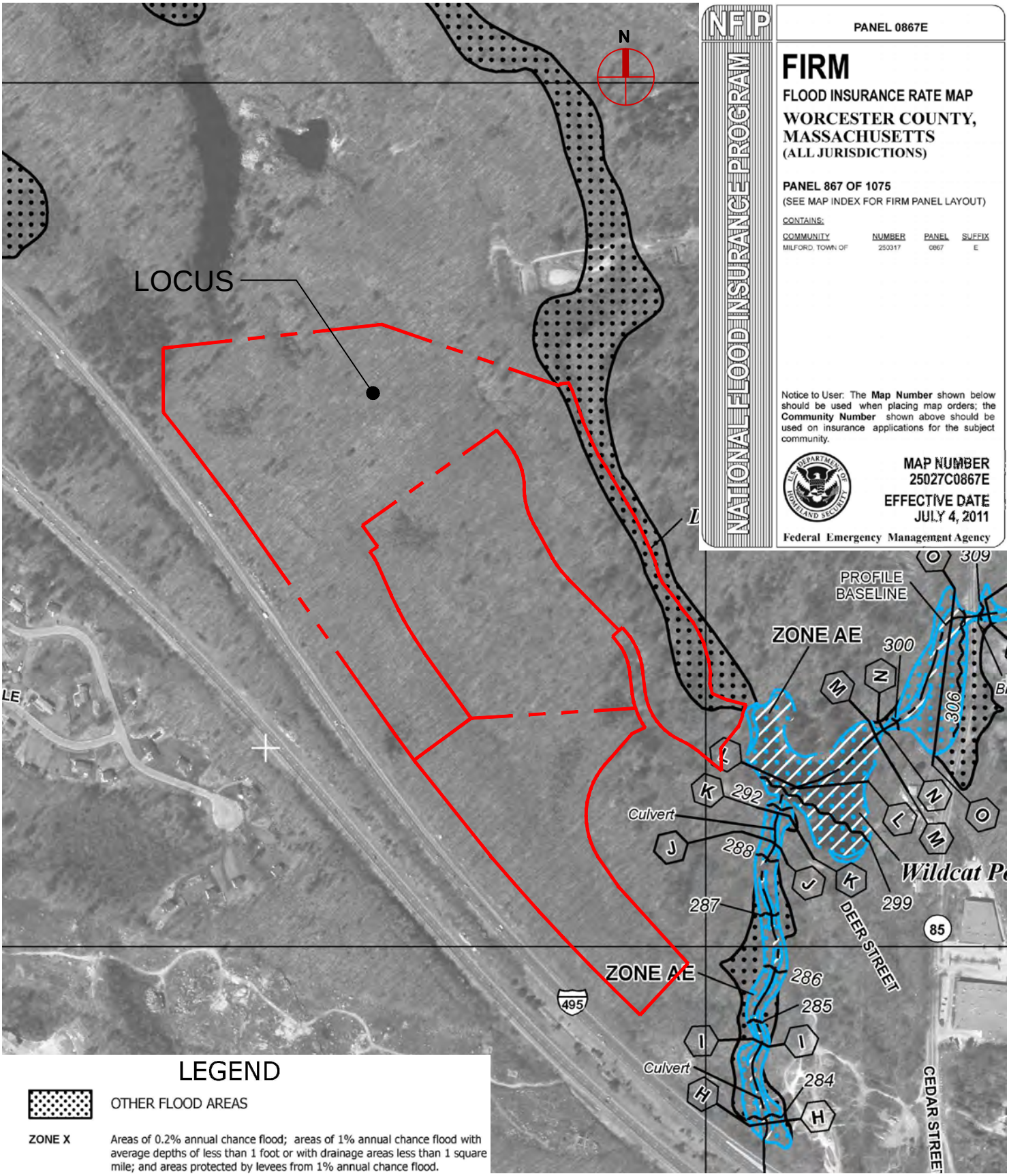
Cambridge, Massachusetts 02138
P:617.547.5400 F:617.648.4920



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LEGEND

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

Figure 2

FEMA FLOOD MAP

DATE:	11/21/2017
ISSUE:	
SCALE:	1"=500'±
REF:	
DR BY:	EFP
CK BY:	WWP

THE GUTIERREZ COMPANY
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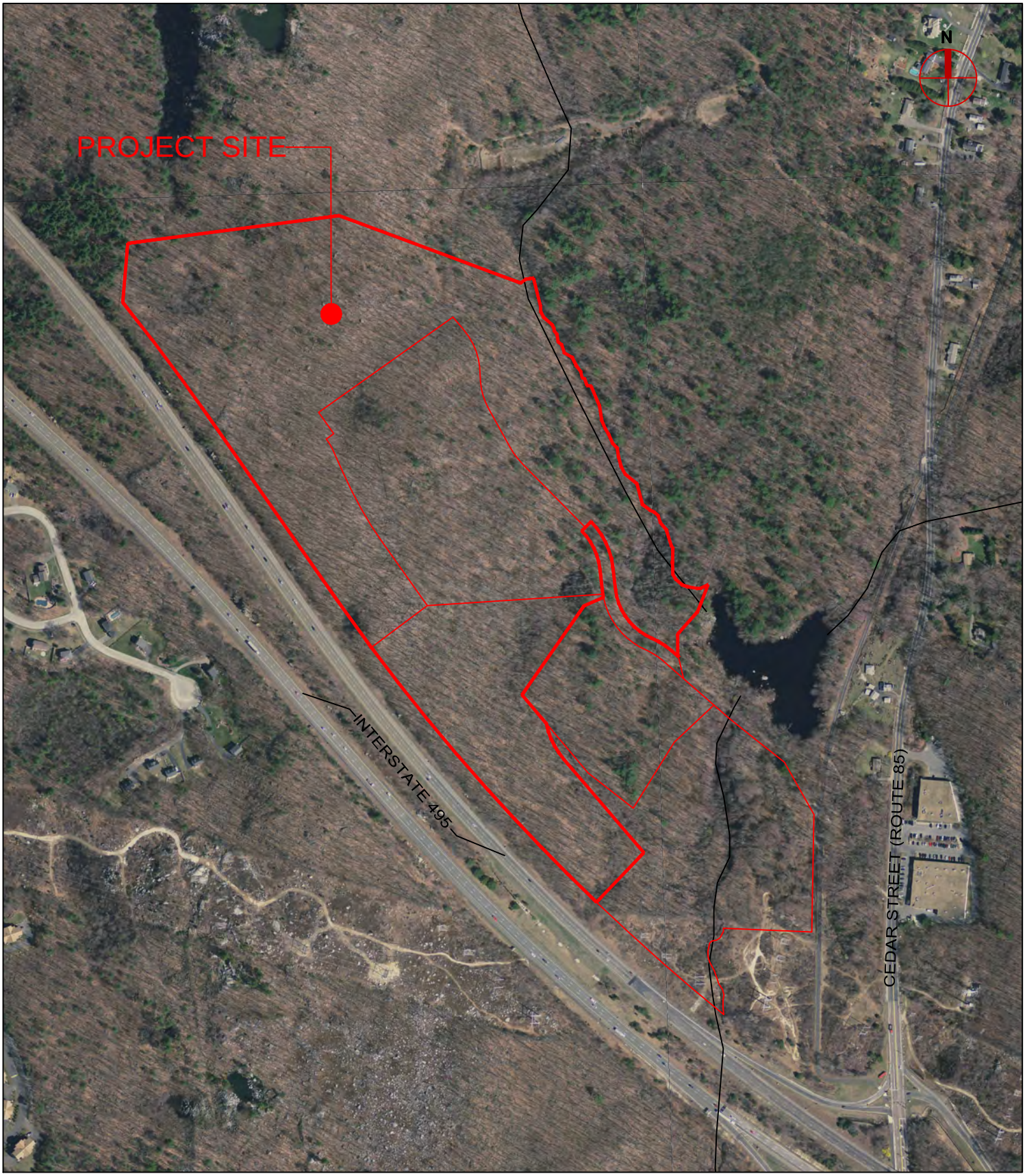

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Figure 3

AERIAL MAP

DATE:	12/08/2017
ISSUE:	
SCALE:	1"=500'±
REF:	
DR BY:	EFP
CK BY:	WWP

THE GUTIERREZ COMPANY
RESIDENCES AT STONE RIDGE

200-300 DEER STREET
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JOB NO.: 17095

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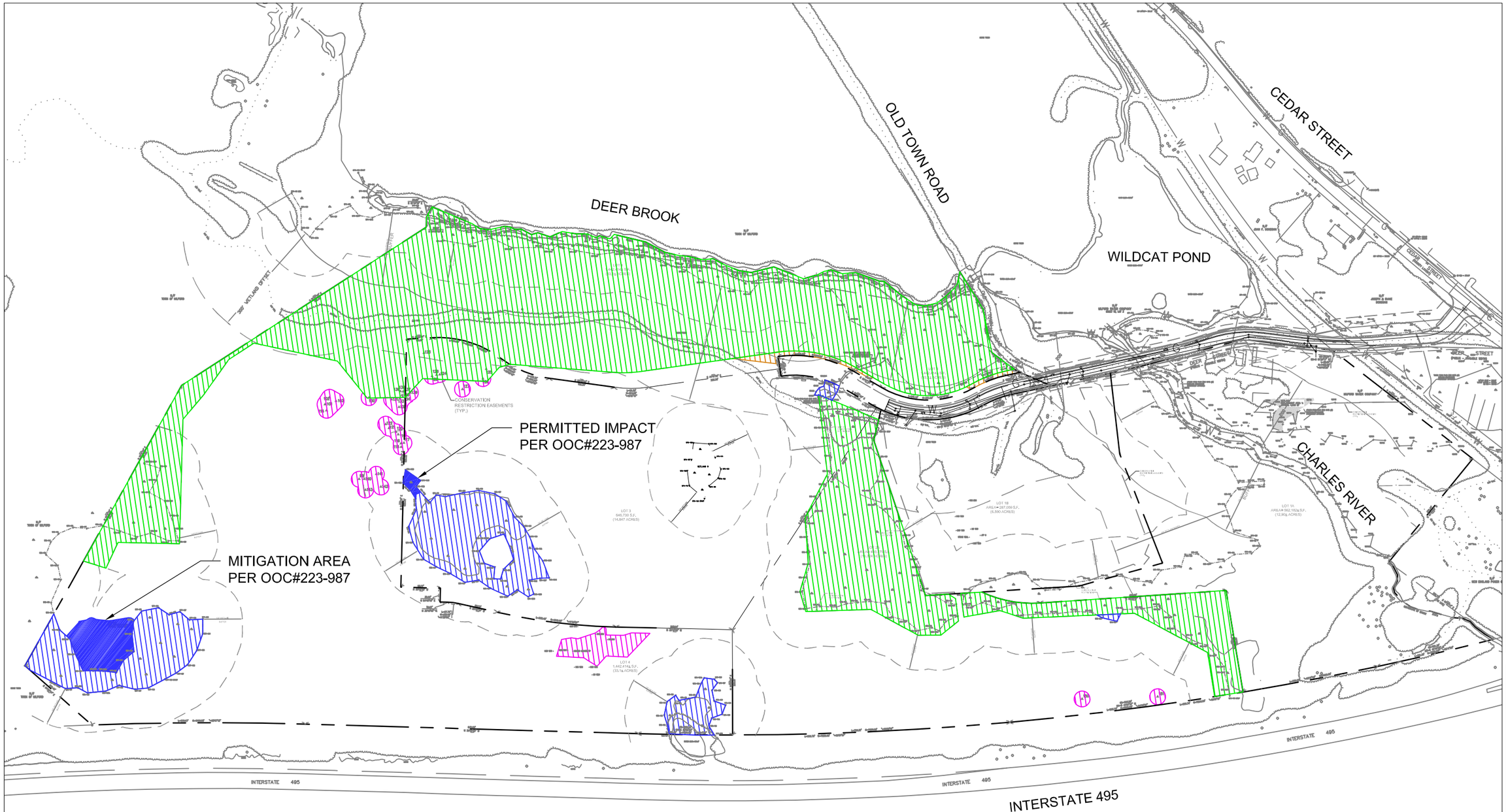

NOTES:
1. THE EXISTING CONDITIONS SHOWN ON THIS PLAN ARE COMPLIED FROM PLANS BY GUERRIERE & HANLON, INC. AND FIELD VERIFIED BY VHB IN JANUARY 2007.

2. THE WETLAND FLAGS WERE DELINEATED AND FIELD LOCATED BY VHB IN JANUARY 2007.

3. ZONE A LINES SHOWN PER DEER STREET EXTENSION PLANS AND APPROVED ORDER OF CONDITIONS DATED SEPTEMBER 17, 2009.

4. CULTURAL RESOURCE AREAS TO REMAIN SHOWN PER "HISTORIC PROPERTIES AVOIDANCE AND PROTECTION PLAN" LAST REVISED AUGUST 2012.

TOTAL LOT AREA= 59.28 ACRES

CONSERVATION RESTRICTION AREA= 16.82 ACRES

WETLAND AREA= 2.89 ACRES

CULTURAL RESOURCE AREA TO REMAIN (OUTSIDE CR)= 0.75 ACRES

ZONE A (OUTSIDE OTHER CONSTRAINTS)= 0.13 ACRES

REMAINING ON-SITE AREA= 38.69 ACRES

0 250'–0"

N

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THE GUTIERREZ COMPANY
RESIDENCES AT STONE RIDGE

200-300 DEER STREET
MILFORD, MA

JOB NO.: 17095

DATE: 12/08/2017
ISSUE:
SCALE: 1"=250'
REF:
DR BY: SEB
CK BY: WWP

Figure 4

SITE CONSTRAINTS

LEGEND

- PROPERTY LINE
- EXISTING PROPERTY LINE TO BE SHIFTED
- PROPOSED INTERNAL PROPERTY LINE SHIFT
- FUTURE DEVELOPMENT

GRAPHIC SCALE

300 0 150 300 600 1200

(IN FEET)
1 inch = 300 ft.

N

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RESIDENCES AT STONE RIDGE

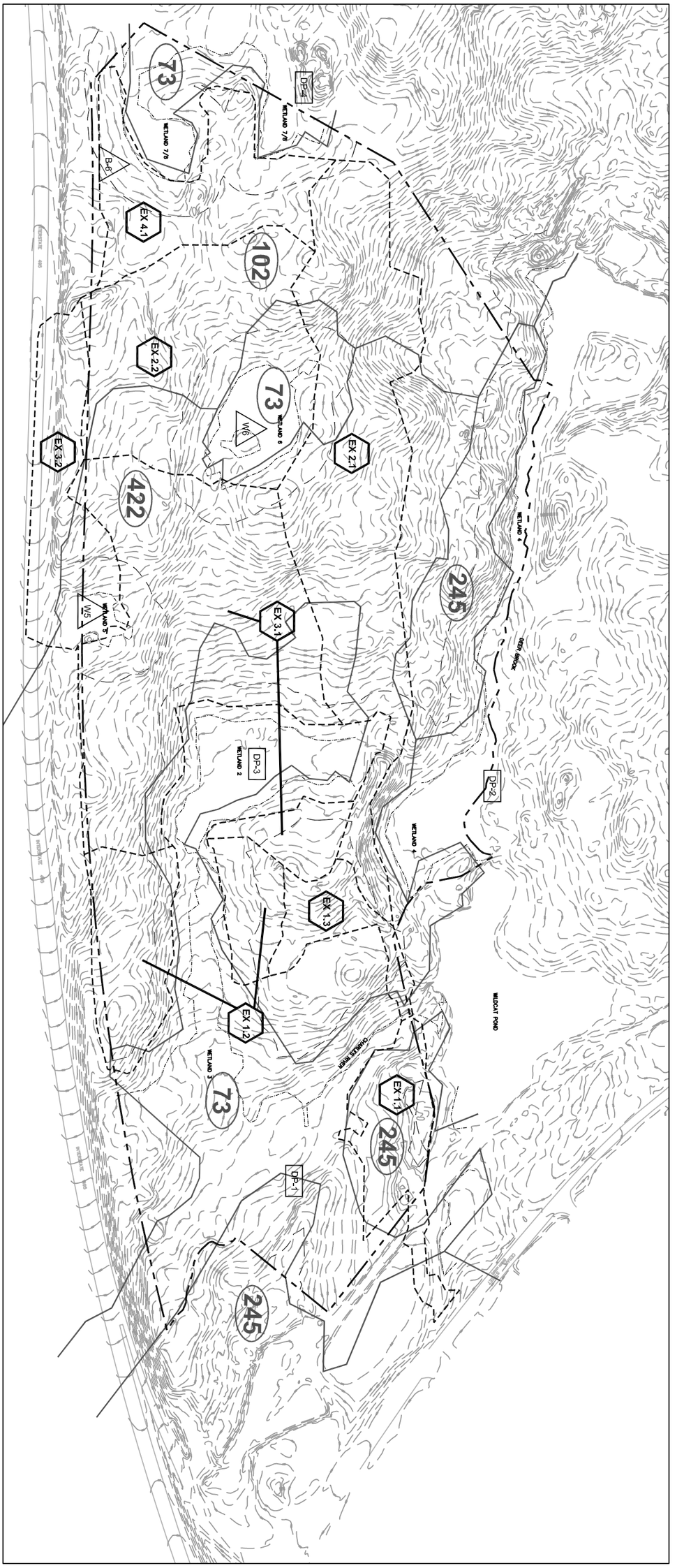
200-300 DEER STREET
MILFORD, MA

JOB NO.: 17093

DATE:
ISSUE:
SCALE: 1" = 300'
REF:
DR BY: WWP
CK BY: JAH

Figure 5

PROPOSED PROPERTY LINE REVISIONS



LEGEND

- SUBCATCHMENT LIMITS
- PROPERTY LINE
- WETLAND
- 100' WETLAND BUFFER
- EX 1.1 — SUBCATCHMENT AREA (1.1)
- DP-1 — DESIGN POINT (1)
- B-1 — BASIN (1)
- SOIL LIMITS
- 73 — SOIL TYPE (73)

SOIL	NAME	HYDROLOGICAL SOIL GROUP
73	WHITMAN FINE SANDY LOAM, 0 TO 3 PERCENT SLOPES, EXTREMELY STONY	D
102	CHATFIELD-HOLLIS-ROCK OUTCROP COMPLEX, 0 TO 35 PERCENT SLOPES	B
245	HINCKLEY LOAMY SAND, 8 TO 35 PERCENT SLOPES	A
422	CANTON FINE SANDY LOAM, 8 TO 35 PERCENT SLOPES, EXTREMELY STONY	B

FIGURE 6

EXISTING DRAINAGE AREAS

DATE:	02/26/2018
ISSUE:	
SCALE:	1"=300'
REF:	
DR BY:	WWP
CK BY:	JAH

THE GUTIERREZ COMPANY
RESIDENCES AT STONE RIDGE

200-300 DEER STREET
MILFORD, MA

JOB NO.: 17095

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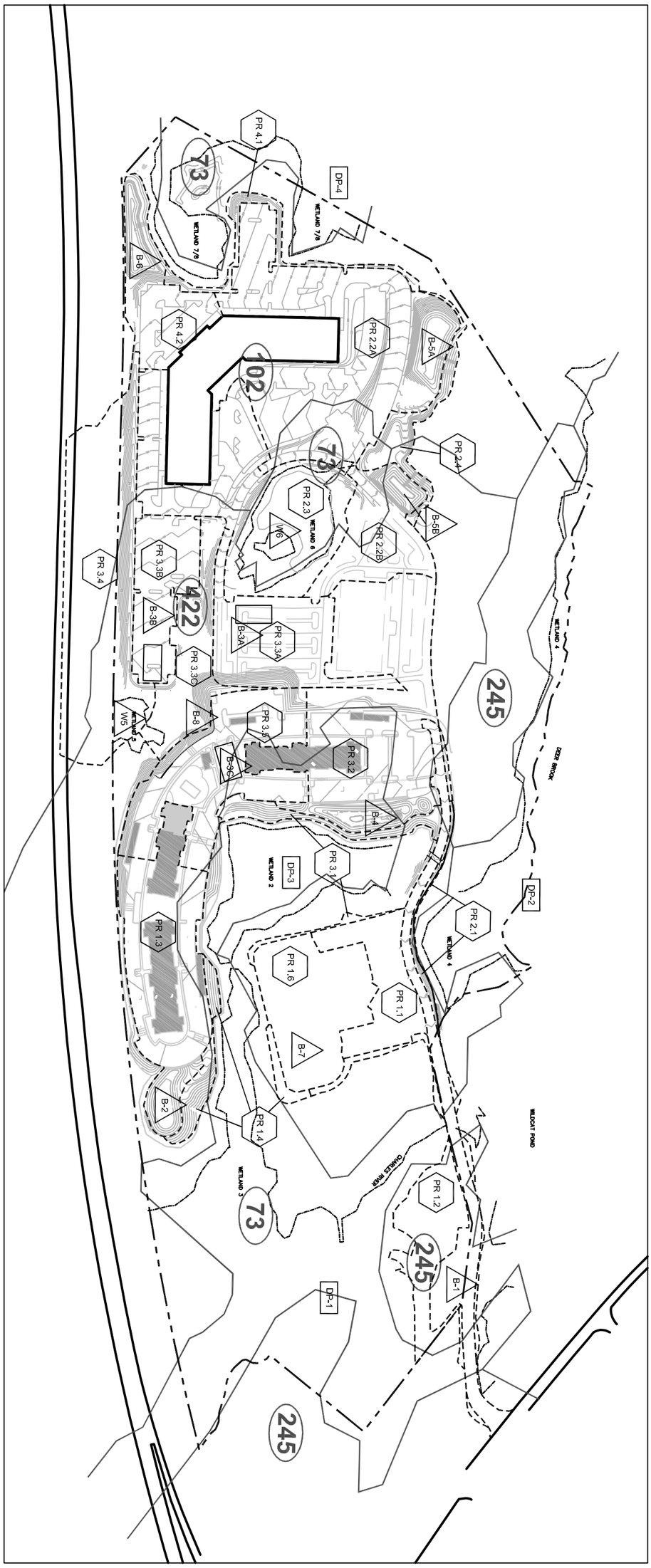

N

LEGEND

- - - - - - - - - -	SUBCATCHMENT LIMITS
— — —	PROPERTY LINE
-·-·-·-·-	WETLAND BOUNDARIES
PR 1.1	SUBCATCHMENT AREA (1.1)
DP-1	DESIGN POINT (1)
B-1	BASIN (1)
———	SOIL LIMITS
73	SOIL TYPE (73)

SOIL	NAME	HYDROLOGICAL SOIL GROUP
73	WHITMAN FINE SANDY LOAM, 0 TO 3 PERCENT SLOPES, EXTREMELY STONY	D
102	CHATFIELD-HOLLIS-ROCK OUTCROP COMPLEX, 0 TO 35 PERCENT SLOPES	B
245	HINCKLEY LOAMY SAND, 8 TO 35 PERCENT SLOPES	A
422	CANTON FINE SANDY LOAM, 8 TO 35 PERCENT SLOPES, EXTREMELY STONY	B

FIGURE 7

PROPOSED DRAINAGE AREAS

DATE:	02/26/2018
ISSUE:	
SCALE:	1"=300'
REF:	
DR BY:	WWP
CK BY:	JAH

THE GUTIERREZ COMPANY
RESIDENCES AT STONE RIDGE

200-300 DEER STREET
MILFORD, MA

JOB NO.: 17095

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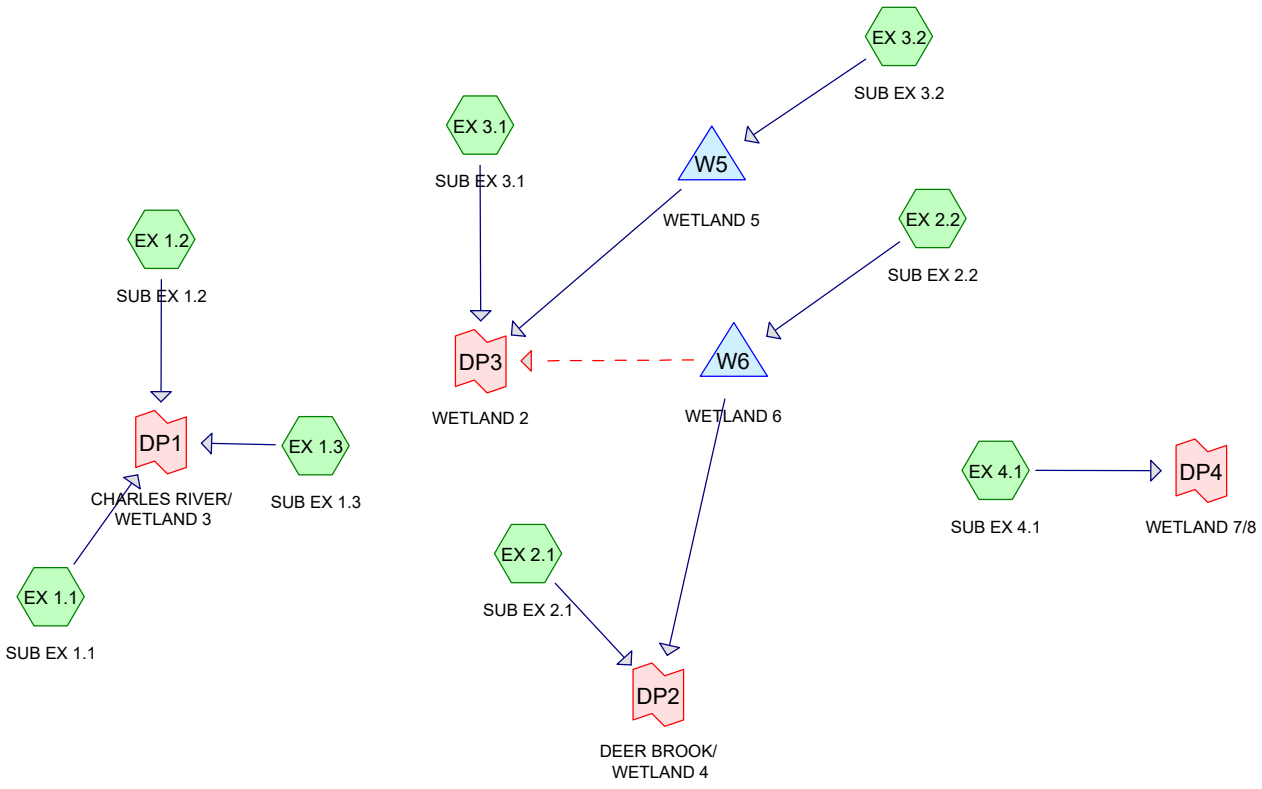
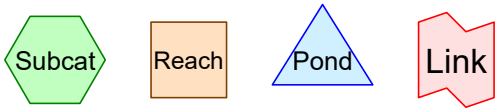
7.1

Appendix 1: Hydrology Calculations





Routing Diagram for 08921.02-EX
Prepared by {enter your company name here}, Printed 3/9/2018
HydroCAD® 10.00-13 s/n 00853 © 2014 HydroCAD Software Solutions LLC

Summary for Subcatchment EX 1.1: SUB EX 1.1

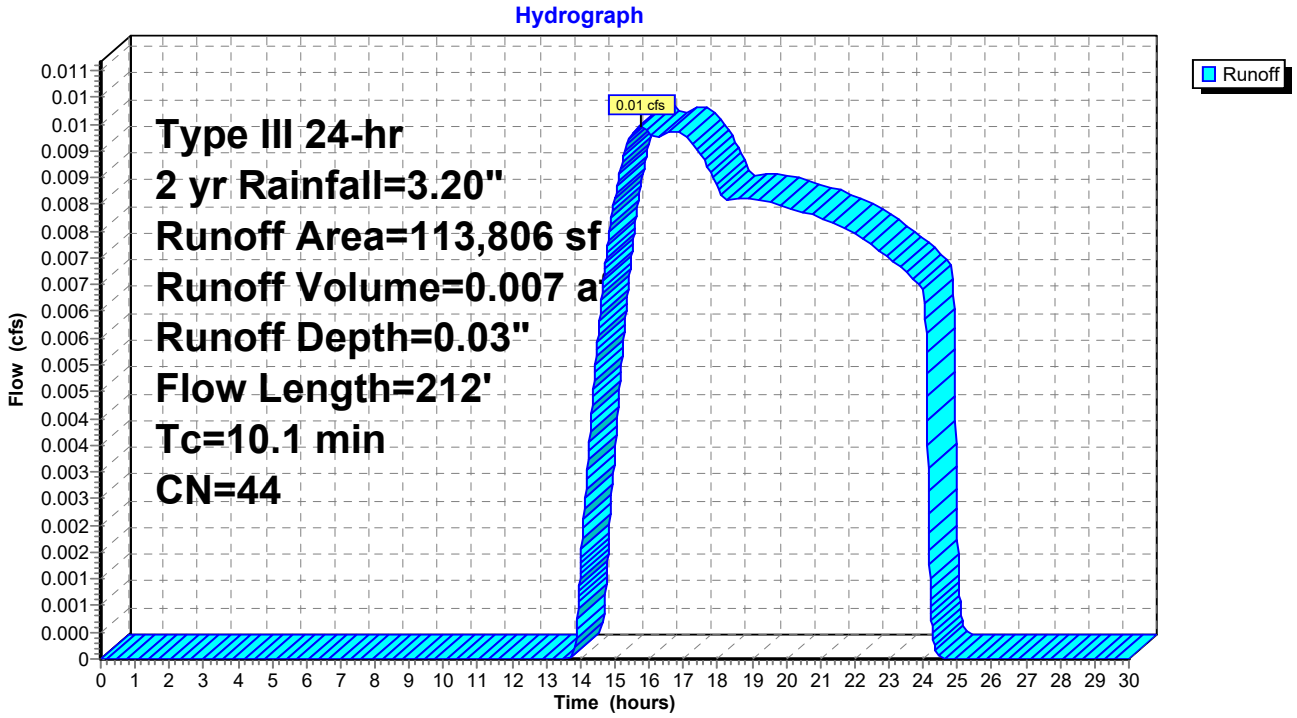
Runoff = 0.01 cfs @ 15.77 hrs, Volume= 0.007 af, Depth= 0.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.20"

	Area (sf)	CN	Description
	17,674	72	Dirt roads, HSG A
	80,296	30	Woods, Good, HSG A
	2,996	89	Dirt roads, HSG D
	8,812	77	Woods, Good, HSG D
*	4,028	98	FOUNDATIONS
	113,806	44	Weighted Average
	109,778		96.46% Pervious Area
	4,028		3.54% 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= 3.20"
0.6	87	0.0230	2.44		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.2	75	0.1867	6.96		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
10.1	212	Total			

Subcatchment EX 1.1: SUB EX 1.1



Summary for Subcatchment EX 1.2: SUB EX 1.2

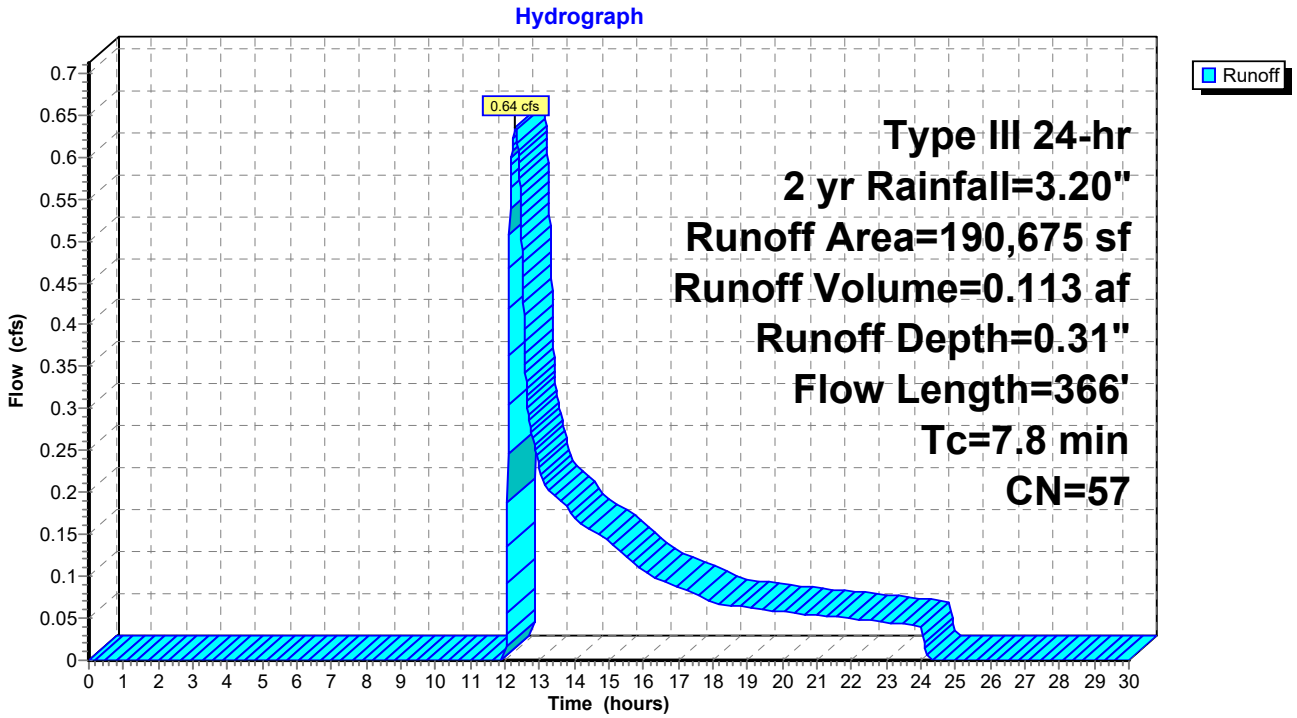
Runoff = 0.64 cfs @ 12.30 hrs, Volume= 0.113 af, Depth= 0.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.20"

Area (sf)	CN	Description
177,149	55	Woods, Good, HSG B
13,526	77	Woods, Good, HSG D
190,675	57	Weighted Average
190,675		100.00% Pervious 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= 3.20"
0.4	117	0.0855	4.71		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.9	199	0.0503	3.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
7.8	366	Total			

Subcatchment EX 1.2: SUB EX 1.2



Summary for Subcatchment EX 1.3: SUB EX 1.3

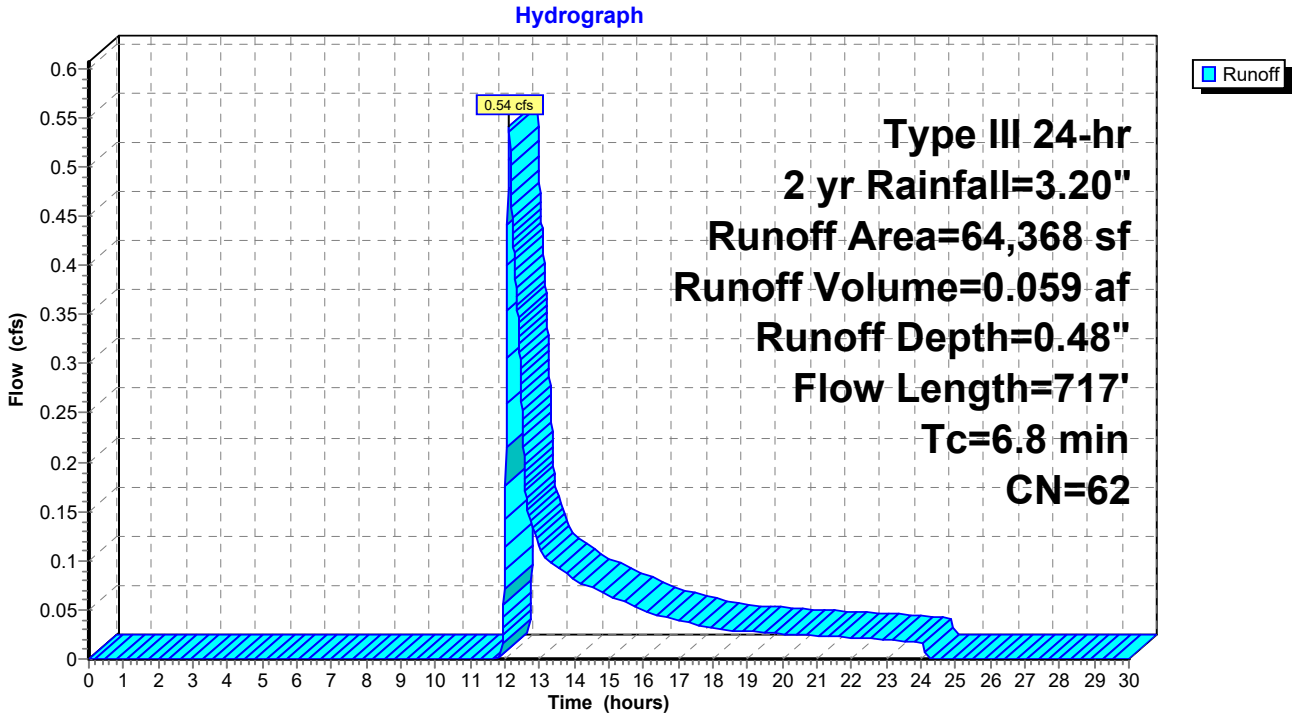
Runoff = 0.54 cfs @ 12.13 hrs, Volume= 0.059 af, Depth= 0.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.20"

Area (sf)	CN	Description
47,310	55	Woods, Good, HSG B
15,358	82	Dirt roads, HSG B
878	77	Woods, Good, HSG D
822	89	Dirt roads, HSG D
64,368	62	Weighted Average
64,368		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.2	50	0.6000	0.26		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.8	195	0.0667	4.16		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.2	297	0.0202	2.29		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.6	175	0.0800	4.55		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.8	717	Total			

Subcatchment EX 1.3: SUB EX 1.3



Summary for Subcatchment EX 2.1: SUB EX 2.1

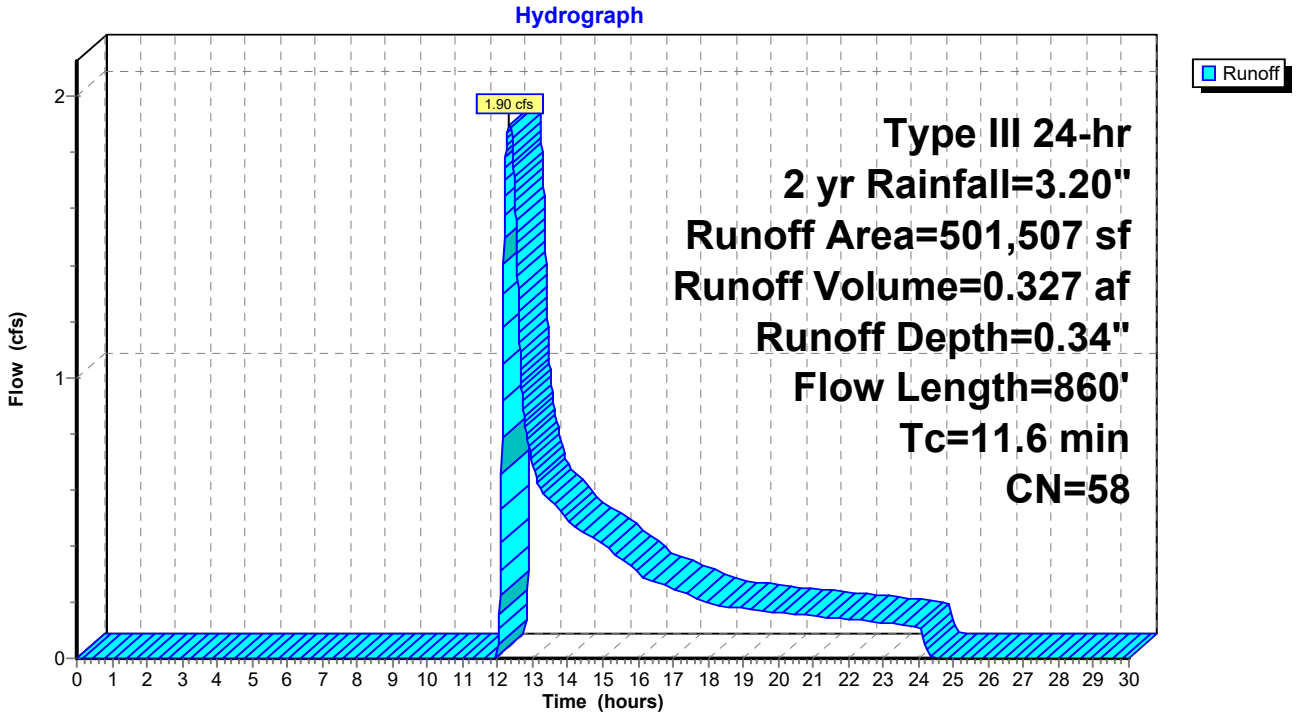
Runoff = 1.90 cfs @ 12.34 hrs, Volume= 0.327 af, Depth= 0.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.20"

	Area (sf)	CN	Description
	1,416	72	Dirt roads, HSG A
	5,141	30	Woods, Good, HSG A
	8,064	82	Dirt roads, HSG B
	416,679	55	Woods, Good, HSG B
	625	89	Dirt roads, HSG D
	65,732	77	Woods, Good, HSG D
*	3,850	77	WETLAND AREA (Woods, HSG D)
	501,507	58	Weighted Average
	501,507		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.1	50	0.0580	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
1.2	355	0.0958	4.98		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.1	130	0.0154	2.00		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.2	325	0.0800	4.55		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
11.6	860	Total			

Subcatchment EX 2.1: SUB EX 2.1



Summary for Subcatchment EX 2.2: SUB EX 2.2

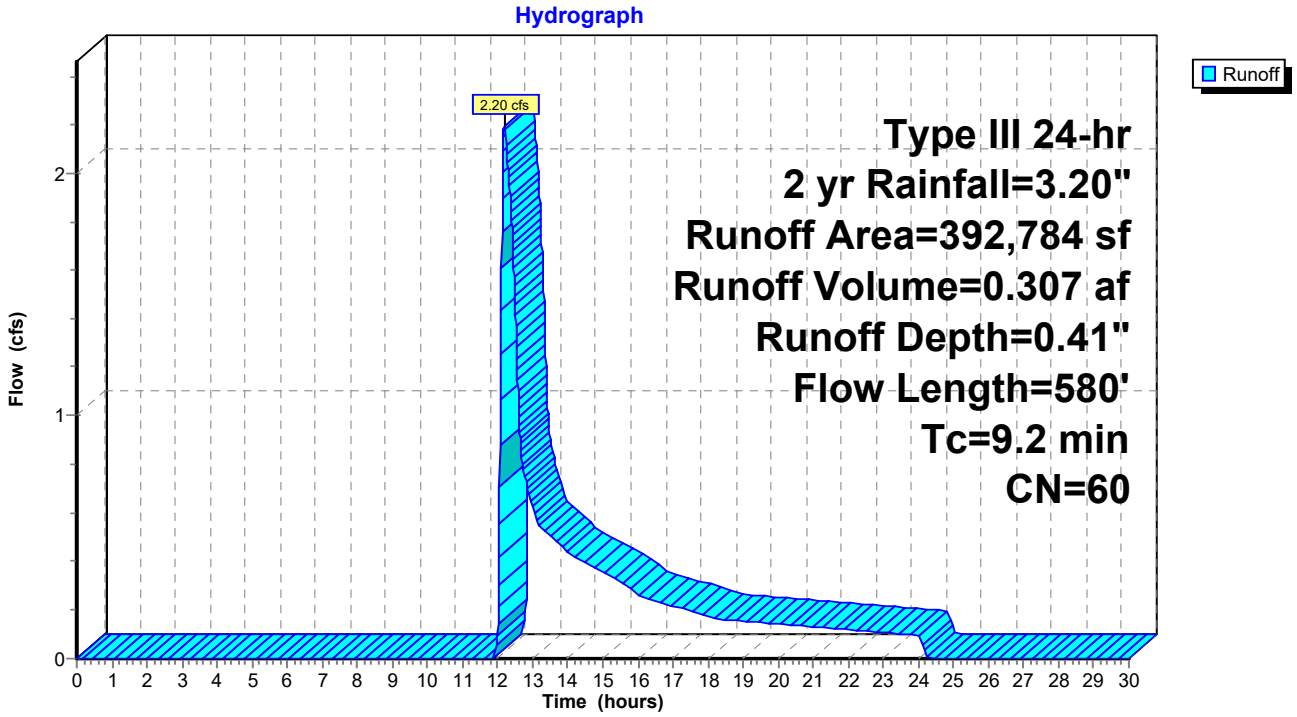
Runoff = 2.20 cfs @ 12.18 hrs, Volume= 0.307 af, Depth= 0.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.20"

	Area (sf)	CN	Description
	296,618	55	Woods, Good, HSG B
	38,348	77	Woods, Good, HSG D
*	57,818	77	WETLAND AREA (Woods, HSG D)
	392,784	60	Weighted Average
	392,784		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0800	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
2.1	530	0.0660	4.14		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
9.2	580	Total			

Subcatchment EX 2.2: SUB EX 2.2



Summary for Subcatchment EX 3.1: SUB EX 3.1

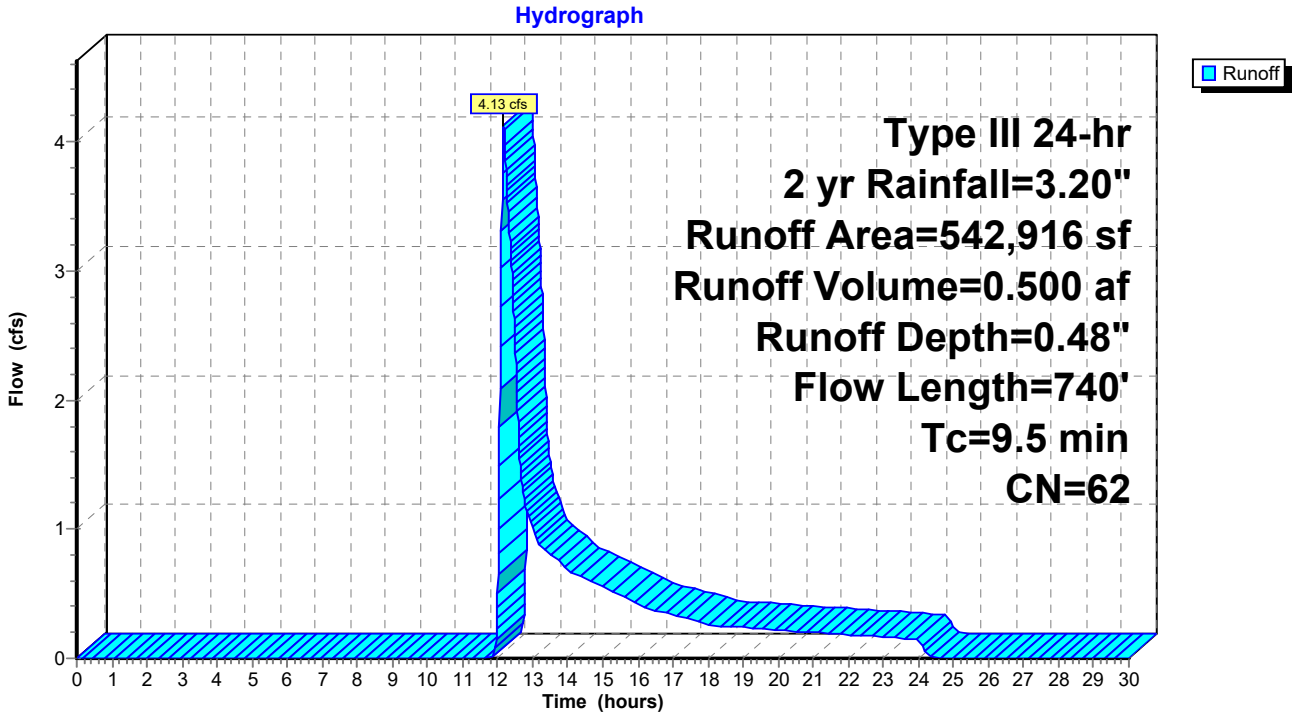
Runoff = 4.13 cfs @ 12.17 hrs, Volume= 0.500 af, Depth= 0.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.20"

	Area (sf)	CN	Description
	412,144	55	Woods, Good, HSG B
	77,565	77	Woods, Good, HSG D
*	3,828	77	WETLAND AREA (Woods, HSG D)
*	49,379	98	LEDGE
	542,916	62	Weighted Average
	493,537		90.90% Pervious Area
	49,379		9.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0800	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
1.0	285	0.0842	4.67		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.3	100	0.0852	5.93		**Shallow Concentrated Flow, (LEDGE)** Paved Kv= 20.3 fps
1.1	305	0.0852	4.70		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
9.5	740	Total			

Subcatchment EX 3.1: SUB EX 3.1



Summary for Subcatchment EX 3.2: SUB EX 3.2

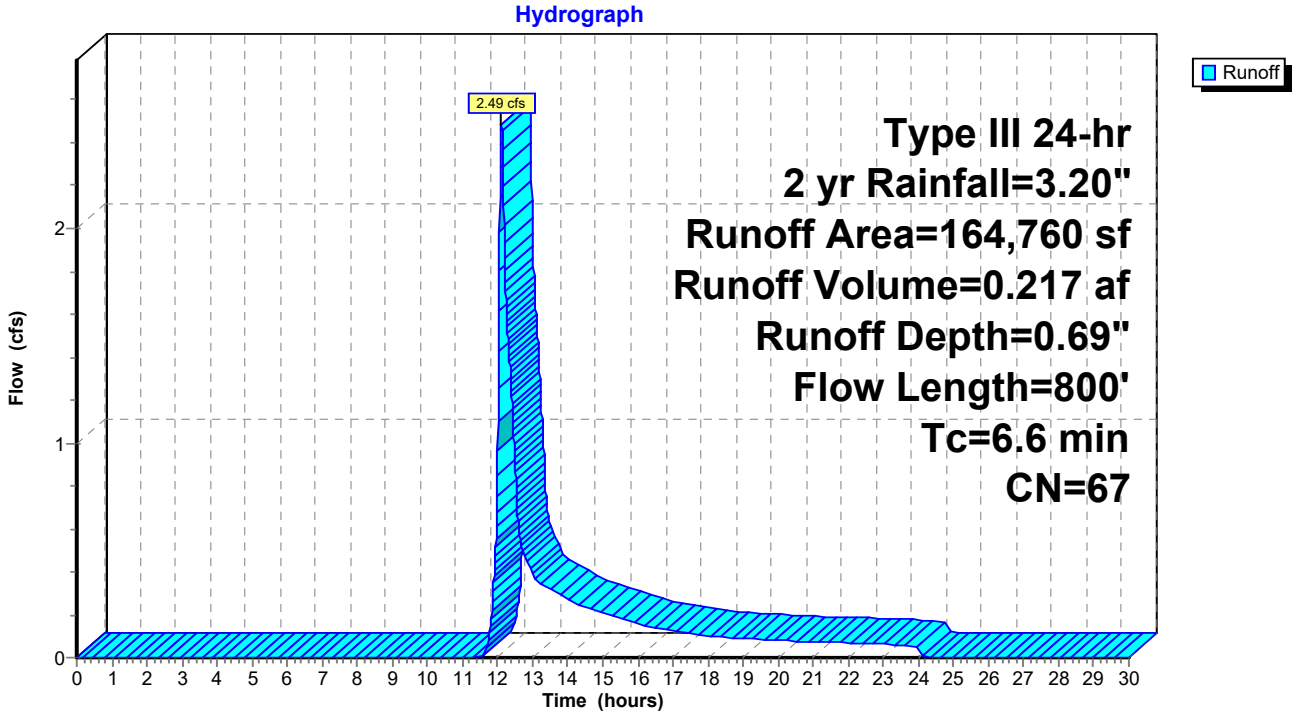
Runoff = 2.49 cfs @ 12.11 hrs, Volume= 0.217 af, Depth= 0.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.20"

	Area (sf)	CN	Description
	41,275	61	>75% Grass cover, Good, HSG B
	73,438	55	Woods, Good, HSG B
*	21,288	77	WETLAND AREA (Woods, HSG D)
*	28,759	98	IMP. HWY
	164,760	67	Weighted Average
	136,001		82.54% Pervious Area
	28,759		17.46% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.20		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
5.7	675	0.0148	1.96		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.2	75	0.1333	5.88		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.6	800	Total			

Subcatchment EX 3.2: SUB EX 3.2



Summary for Subcatchment EX 4.1: SUB EX 4.1

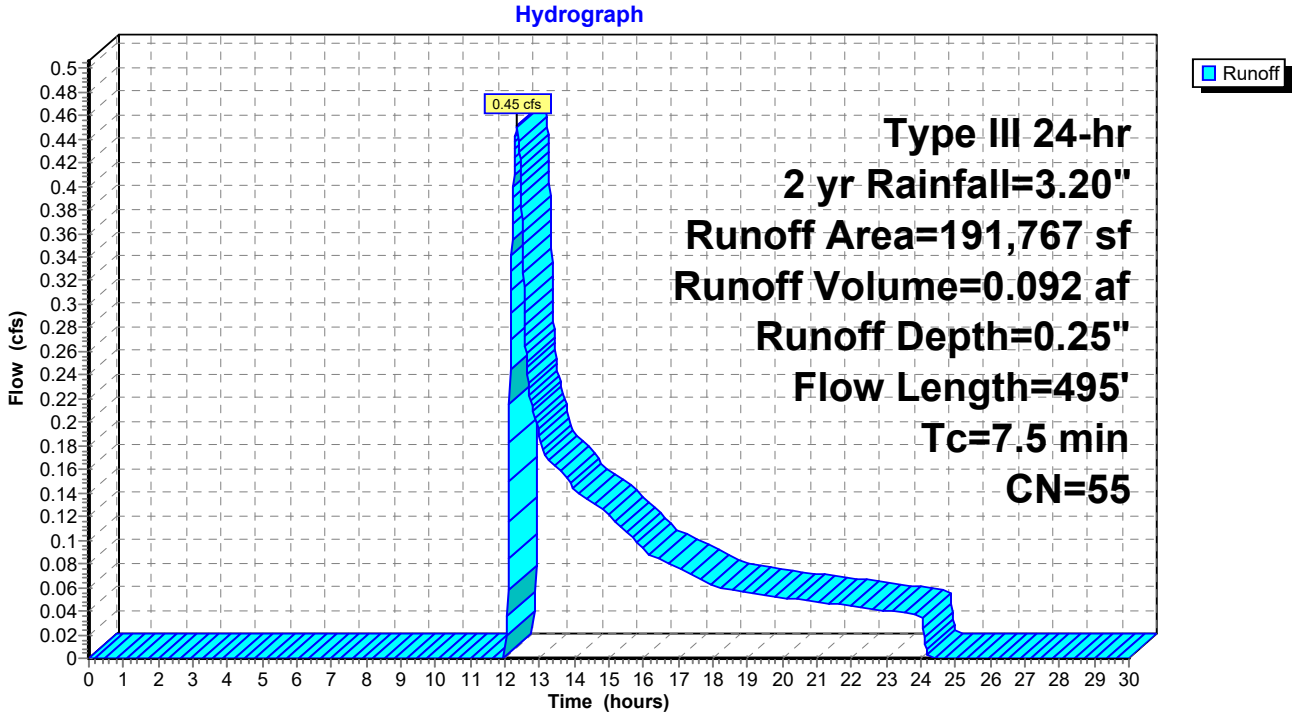
Runoff = 0.45 cfs @ 12.36 hrs, Volume= 0.092 af, Depth= 0.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.20"

Area (sf)	CN	Description
191,767	55	Woods, Good, HSG B
191,767		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	50	0.1600	0.16		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
1.0	190	0.0421	3.30		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.1	255	0.0627	4.03		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
7.5	495	Total			

Subcatchment EX 4.1: SUB EX 4.1



Summary for Pond W5: WETLAND 5

Inflow Area = 3.782 ac, 17.46% Impervious, Inflow Depth = 0.69" for 2 yr event
Inflow = 2.49 cfs @ 12.11 hrs, Volume= 0.217 af
Outflow = 0.22 cfs @ 14.89 hrs, Volume= 0.094 af, Atten= 91%, Lag= 166.7 min
Primary = 0.22 cfs @ 14.89 hrs, Volume= 0.094 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 369.14' @ 14.89 hrs Surf.Area= 7,305 sf Storage= 5,625 cf

Plug-Flow detention time= 350.9 min calculated for 0.094 af (43% of inflow)
Center-of-Mass det. time= 200.8 min (1,088.4 - 887.6)

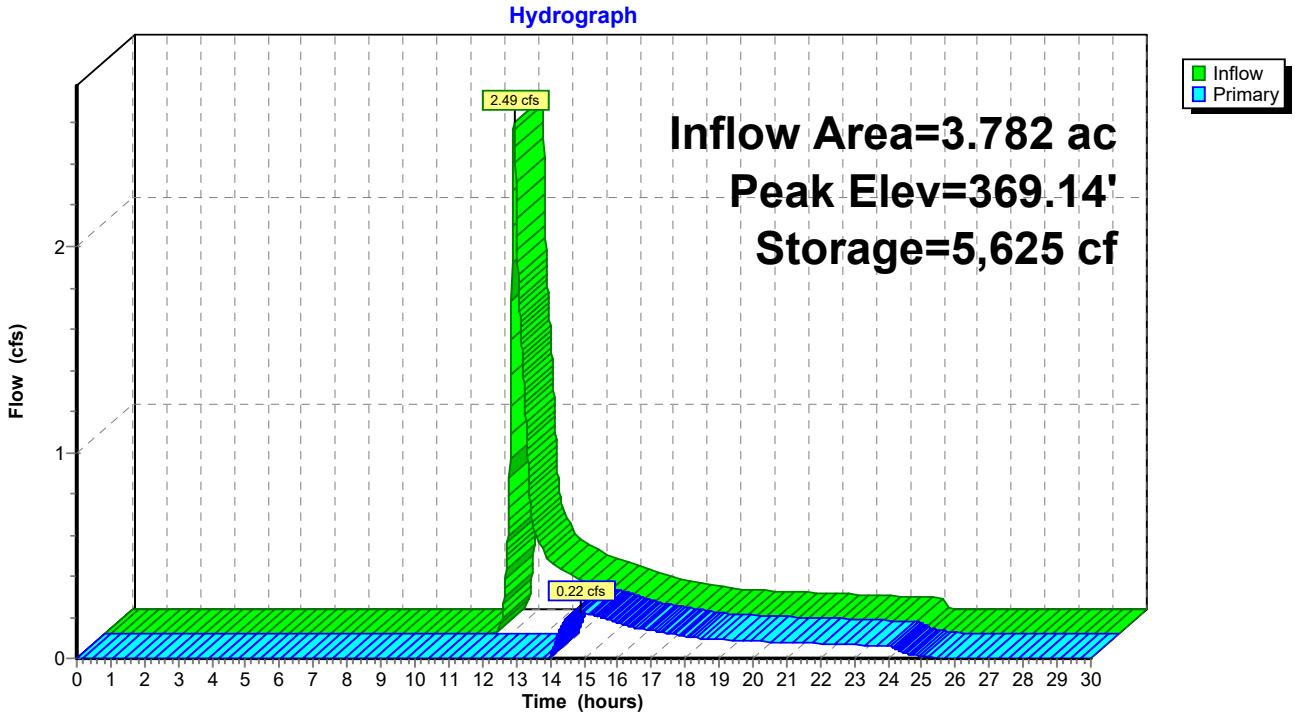
Volume	Invert	Avail.Storage	Storage Description
#1	367.80'	13,194 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
367.80	3,000	0	0
369.00	4,940	4,764	4,764
369.20	8,304	1,324	6,088
369.40	10,950	1,925	8,014
369.60	12,950	2,390	10,404
369.80	14,954	2,790	13,194

Device	Routing	Invert	Outlet Devices
#1	Primary	369.10'	**10.0' long x 64.0' 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=0.22 cfs @ 14.89 hrs HW=369.14' (Free Discharge)
└**1=Broad-Crested Rectangular Weir** (Weir Controls 0.22 cfs @ 0.54 fps)

Pond W5: WETLAND 5



Summary for Pond W6: WETLAND 6

Inflow Area =	9.017 ac,	0.00% Impervious,	Inflow Depth =	0.41"	for 2 yr event
Inflow =	2.20 cfs @	12.18 hrs,	Volume=	0.307 af	
Outflow =	0.50 cfs @	13.59 hrs,	Volume=	0.220 af,	Atten= 77%, Lag= 84.3 min
Primary =	0.50 cfs @	13.59 hrs,	Volume=	0.220 af	
Secondary =	0.00 cfs @	0.00 hrs,	Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 372.54' @ 13.59 hrs Surf.Area= 20,669 sf Storage= 4,526 cf

Plug-Flow detention time= 212.4 min calculated for 0.220 af (72% of inflow)
Center-of-Mass det. time= 103.4 min (1,026.7 - 923.3)

Volume	Invert	Avail.Storage	Storage Description
#1	372.20'	18,754 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

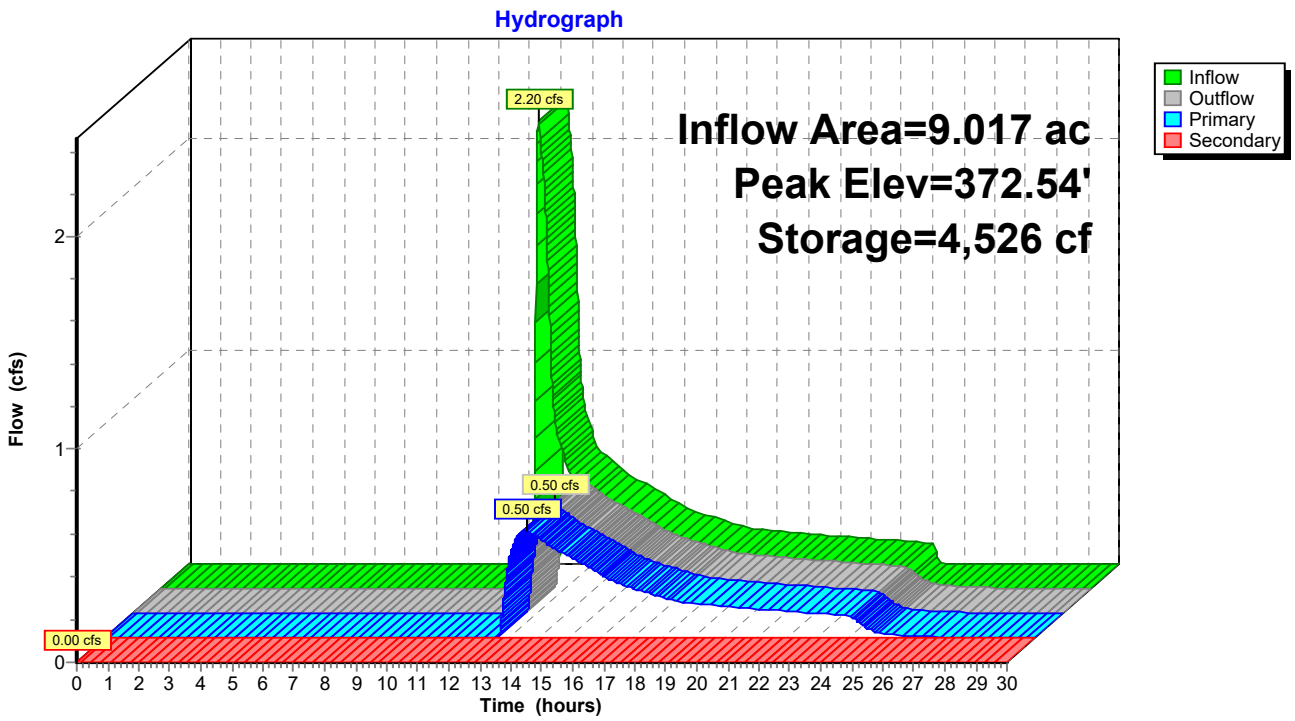
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
372.20	5,774	0	0
372.40	15,024	2,080	2,080
372.60	23,262	3,829	5,908
372.80	33,082	5,634	11,543
373.00	39,034	7,212	18,754

Device	Routing	Invert	Outlet Devices
#1	Primary	372.50'	**26.0' long x 16.0' 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	372.70'	**18.0' long x 18.0' 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 @ 13.59 hrs HW=372.54' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** (Weir Controls 0.50 cfs @ 0.52 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=372.20' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond W6: WETLAND 6

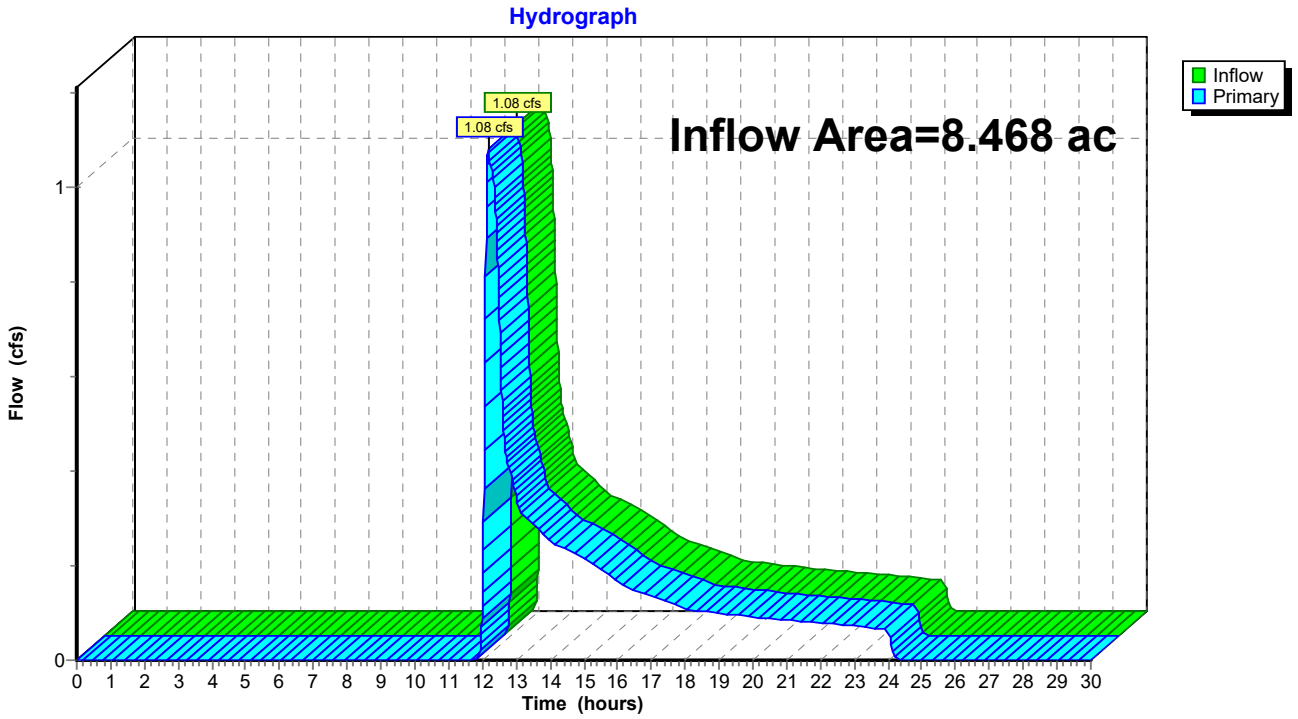


Summary for Link DP1: CHARLES RIVER/ WETLAND 3

Inflow Area = 8.468 ac, 1.09% Impervious, Inflow Depth = 0.25" for 2 yr event
Inflow = 1.08 cfs @ 12.17 hrs, Volume= 0.179 af
Primary = 1.08 cfs @ 12.17 hrs, Volume= 0.179 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link DP1: CHARLES RIVER/ WETLAND 3

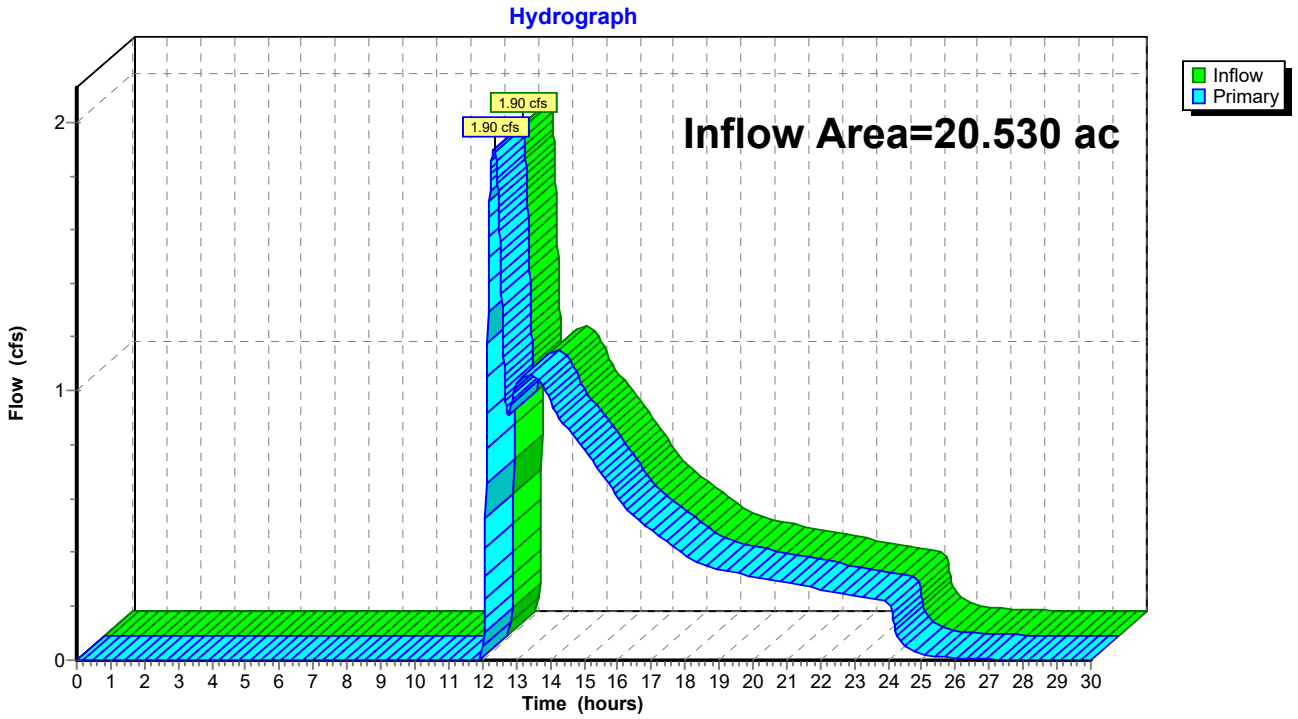


Summary for Link DP2: DEER BROOK/ WETLAND 4

Inflow Area = 20.530 ac, 0.00% Impervious, Inflow Depth > 0.32" for 2 yr event
Inflow = 1.90 cfs @ 12.34 hrs, Volume= 0.547 af
Primary = 1.90 cfs @ 12.34 hrs, Volume= 0.547 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link DP2: DEER BROOK/ WETLAND 4

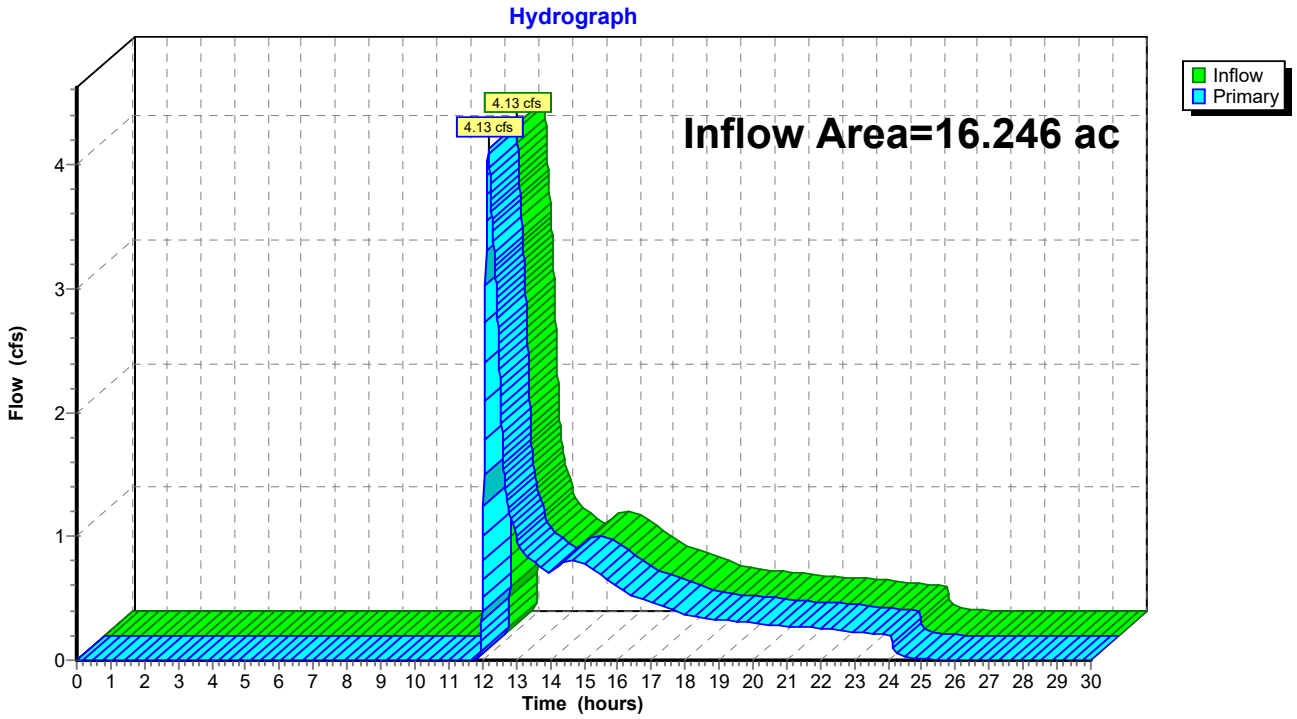


Summary for Link DP3: WETLAND 2

Inflow Area = 16.246 ac, 11.04% Impervious, Inflow Depth = 0.44" for 2 yr event
Inflow = 4.13 cfs @ 12.17 hrs, Volume= 0.593 af
Primary = 4.13 cfs @ 12.17 hrs, Volume= 0.593 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link DP3: WETLAND 2

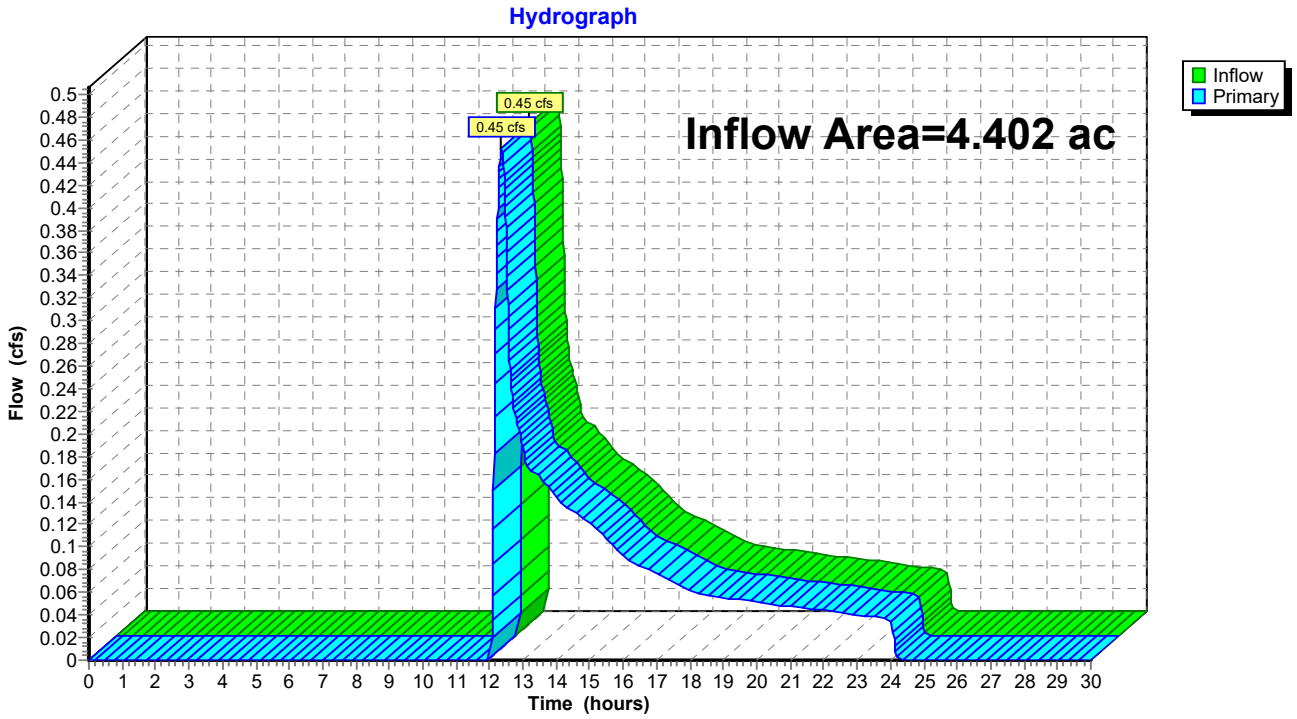


Summary for Link DP4: WETLAND 7/8

Inflow Area = 4.402 ac, 0.00% Impervious, Inflow Depth = 0.25" for 2 yr event
Inflow = 0.45 cfs @ 12.36 hrs, Volume= 0.092 af
Primary = 0.45 cfs @ 12.36 hrs, Volume= 0.092 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link DP4: WETLAND 7/8



Summary for Subcatchment EX 1.1: SUB EX 1.1

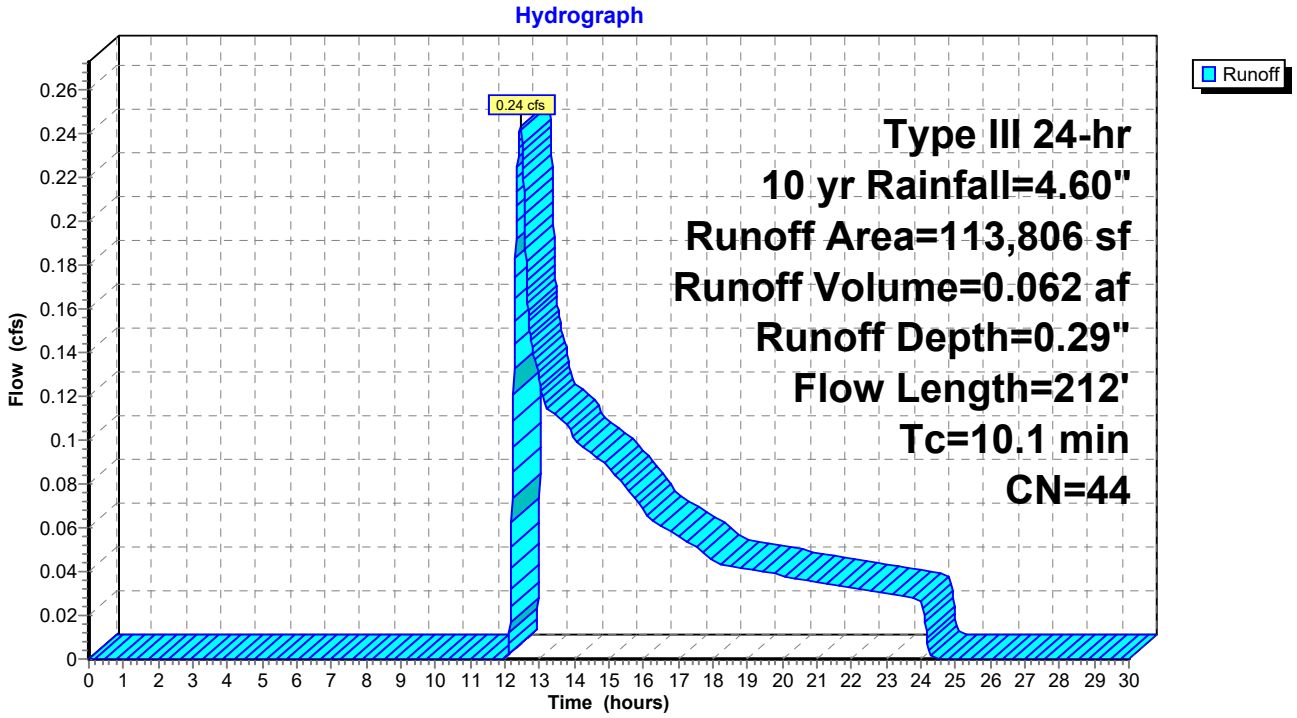
Runoff = 0.24 cfs @ 12.45 hrs, Volume= 0.062 af, Depth= 0.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.60"

	Area (sf)	CN	Description
	17,674	72	Dirt roads, HSG A
	80,296	30	Woods, Good, HSG A
	2,996	89	Dirt roads, HSG D
	8,812	77	Woods, Good, HSG D
*	4,028	98	FOUNDATIONS
	113,806	44	Weighted Average
	109,778		96.46% Pervious Area
	4,028		3.54% 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= 3.20"
0.6	87	0.0230	2.44		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.2	75	0.1867	6.96		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
10.1	212	Total			

Subcatchment EX 1.1: SUB EX 1.1



Summary for Subcatchment EX 1.2: SUB EX 1.2

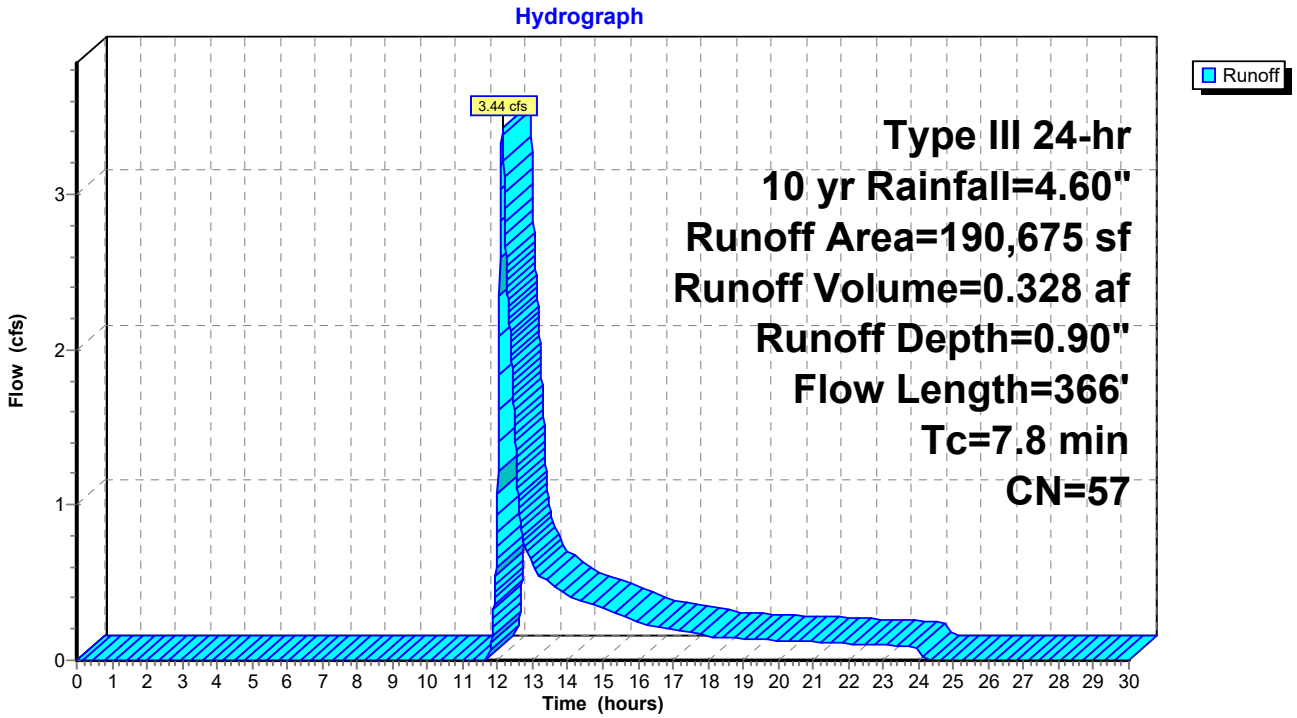
Runoff = 3.44 cfs @ 12.13 hrs, Volume= 0.328 af, Depth= 0.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.60"

Area (sf)	CN	Description
177,149	55	Woods, Good, HSG B
13,526	77	Woods, Good, HSG D
190,675	57	Weighted Average
190,675		100.00% Pervious 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= 3.20"
0.4	117	0.0855	4.71		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.9	199	0.0503	3.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
7.8	366	Total			

Subcatchment EX 1.2: SUB EX 1.2



Summary for Subcatchment EX 1.3: SUB EX 1.3

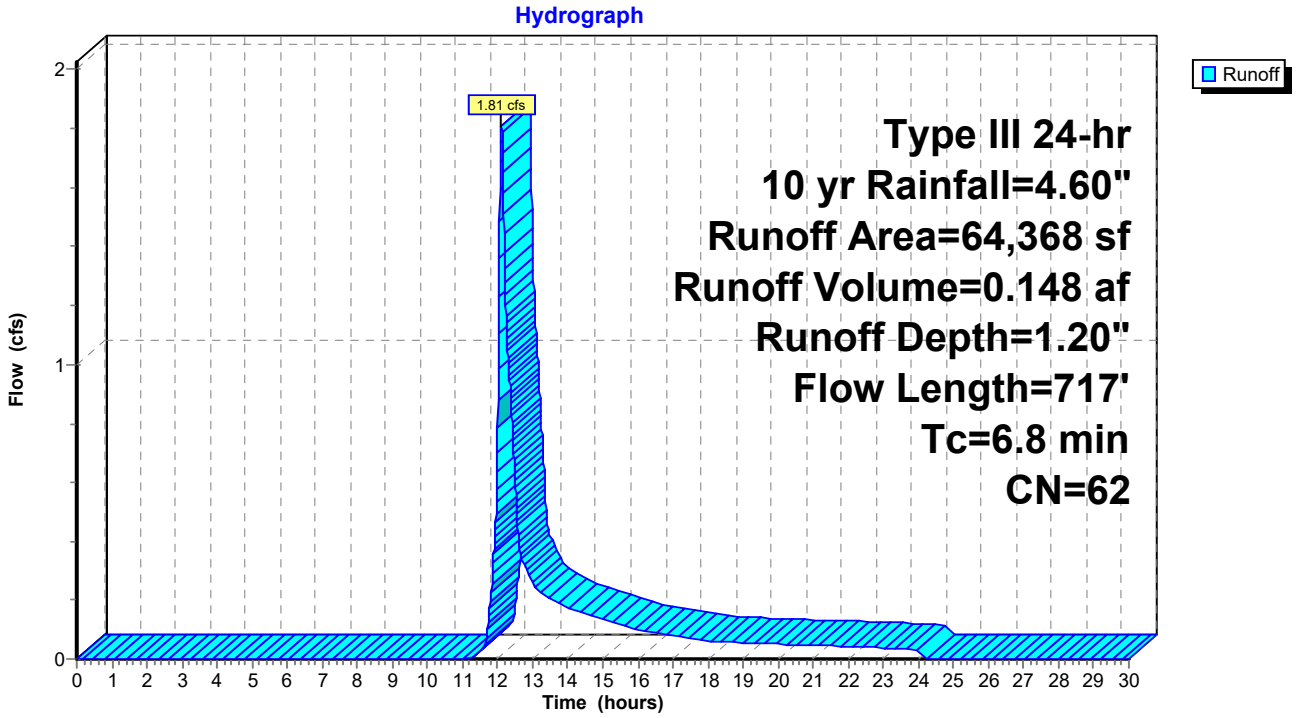
Runoff = 1.81 cfs @ 12.11 hrs, Volume= 0.148 af, Depth= 1.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.60"

Area (sf)	CN	Description
47,310	55	Woods, Good, HSG B
15,358	82	Dirt roads, HSG B
878	77	Woods, Good, HSG D
822	89	Dirt roads, HSG D
64,368	62	Weighted Average
64,368		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.2	50	0.6000	0.26		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.8	195	0.0667	4.16		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.2	297	0.0202	2.29		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.6	175	0.0800	4.55		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.8	717	Total			

Subcatchment EX 1.3: SUB EX 1.3



Summary for Subcatchment EX 2.1: SUB EX 2.1

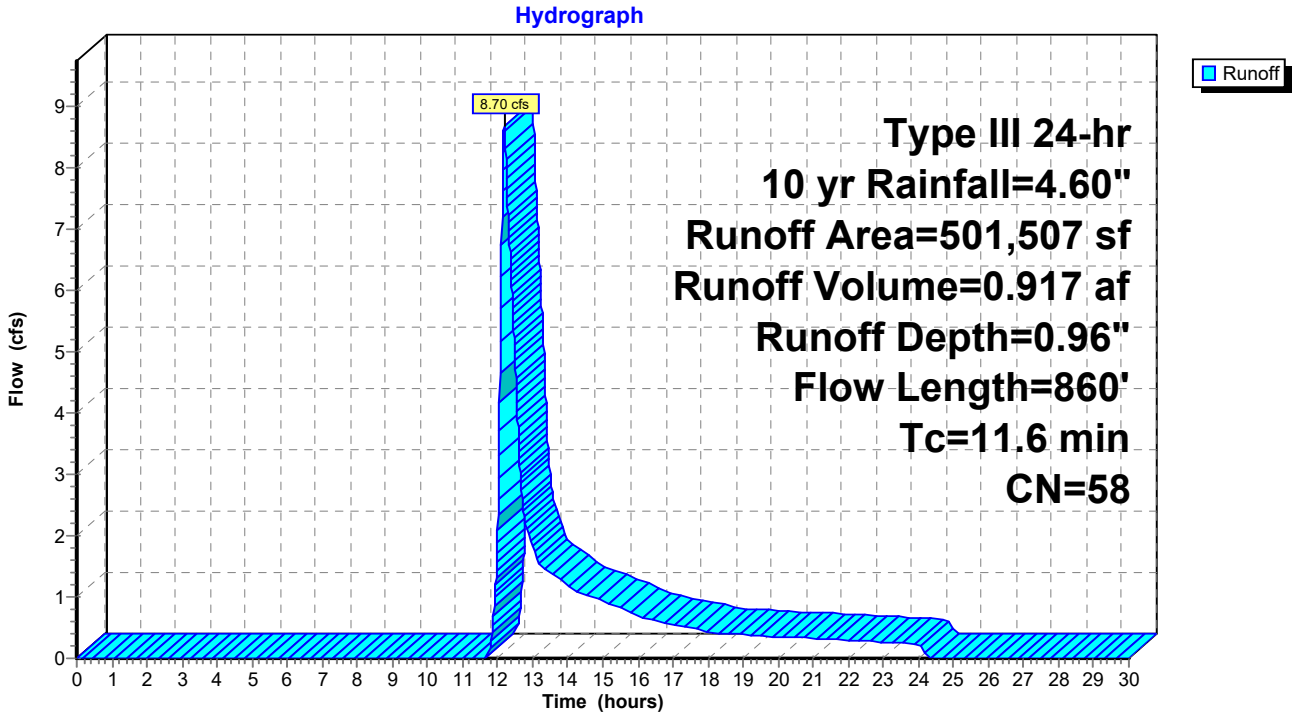
Runoff = 8.70 cfs @ 12.19 hrs, Volume= 0.917 af, Depth= 0.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.60"

	Area (sf)	CN	Description
	1,416	72	Dirt roads, HSG A
	5,141	30	Woods, Good, HSG A
	8,064	82	Dirt roads, HSG B
	416,679	55	Woods, Good, HSG B
	625	89	Dirt roads, HSG D
	65,732	77	Woods, Good, HSG D
*	3,850	77	WETLAND AREA (Woods, HSG D)
	501,507	58	Weighted Average
	501,507		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.1	50	0.0580	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
1.2	355	0.0958	4.98		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.1	130	0.0154	2.00		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.2	325	0.0800	4.55		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
11.6	860	Total			

Subcatchment EX 2.1: SUB EX 2.1



Summary for Subcatchment EX 2.2: SUB EX 2.2

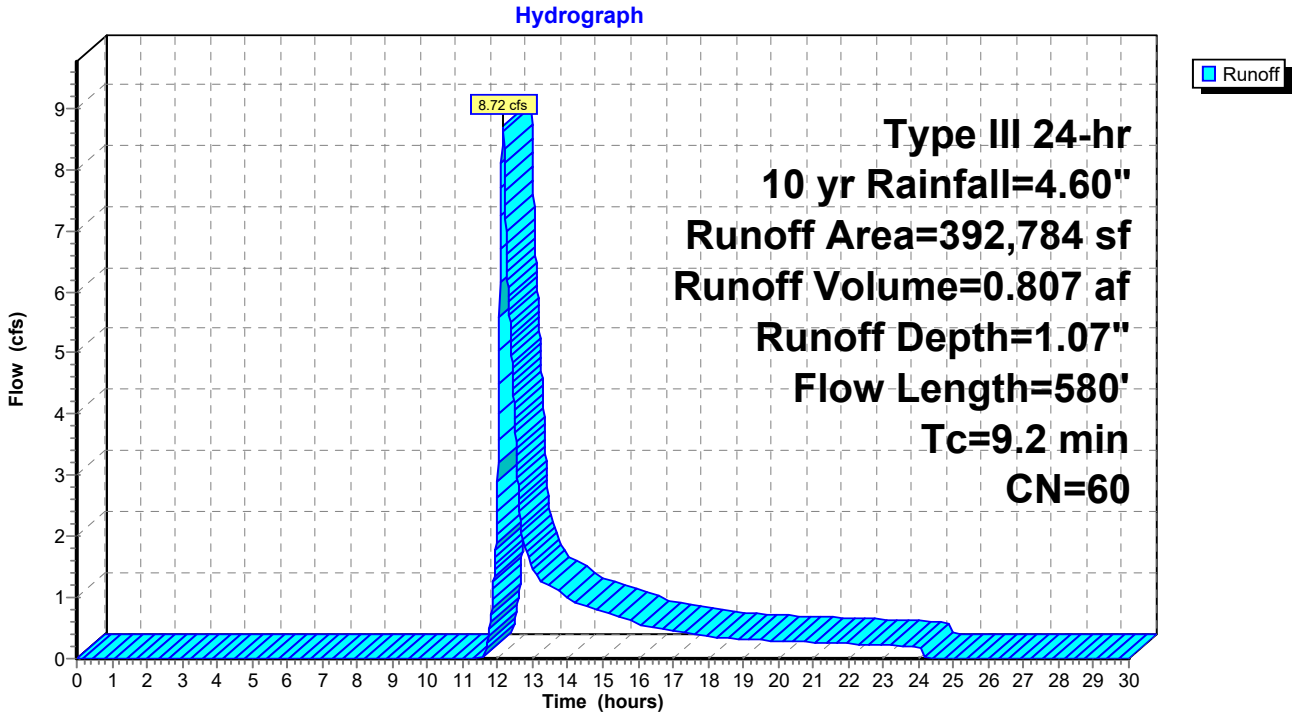
Runoff = 8.72 cfs @ 12.15 hrs, Volume= 0.807 af, Depth= 1.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.60"

	Area (sf)	CN	Description
	296,618	55	Woods, Good, HSG B
	38,348	77	Woods, Good, HSG D
*	57,818	77	WETLAND AREA (Woods, HSG D)
	392,784	60	Weighted Average
	392,784		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0800	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
2.1	530	0.0660	4.14		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
9.2	580	Total			

Subcatchment EX 2.2: SUB EX 2.2



Summary for Subcatchment EX 3.1: SUB EX 3.1

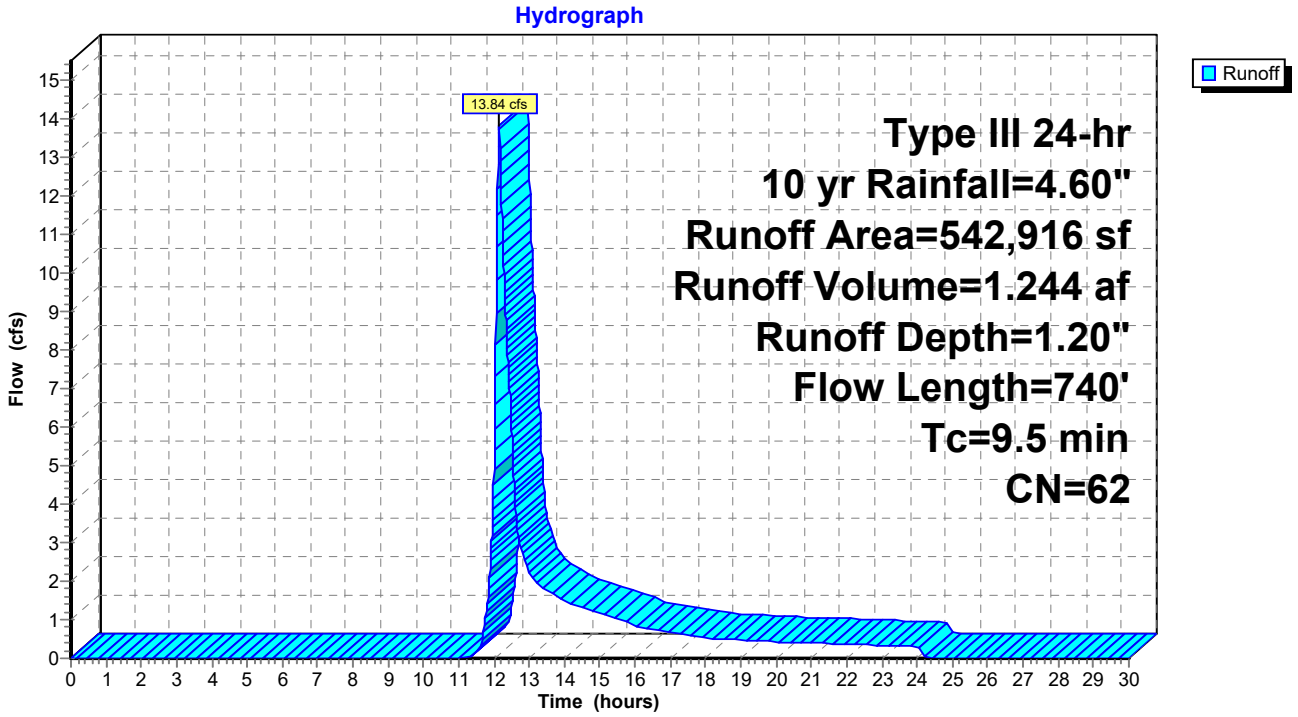
Runoff = 13.84 cfs @ 12.15 hrs, Volume= 1.244 af, Depth= 1.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.60"

	Area (sf)	CN	Description
	412,144	55	Woods, Good, HSG B
	77,565	77	Woods, Good, HSG D
*	3,828	77	WETLAND AREA (Woods, HSG D)
*	49,379	98	LEDGE
	542,916	62	Weighted Average
	493,537		90.90% Pervious Area
	49,379		9.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0800	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
1.0	285	0.0842	4.67		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.3	100	0.0852	5.93		**Shallow Concentrated Flow, (LEDGE)** Paved Kv= 20.3 fps
1.1	305	0.0852	4.70		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
9.5	740	Total			

Subcatchment EX 3.1: SUB EX 3.1



Summary for Subcatchment EX 3.2: SUB EX 3.2

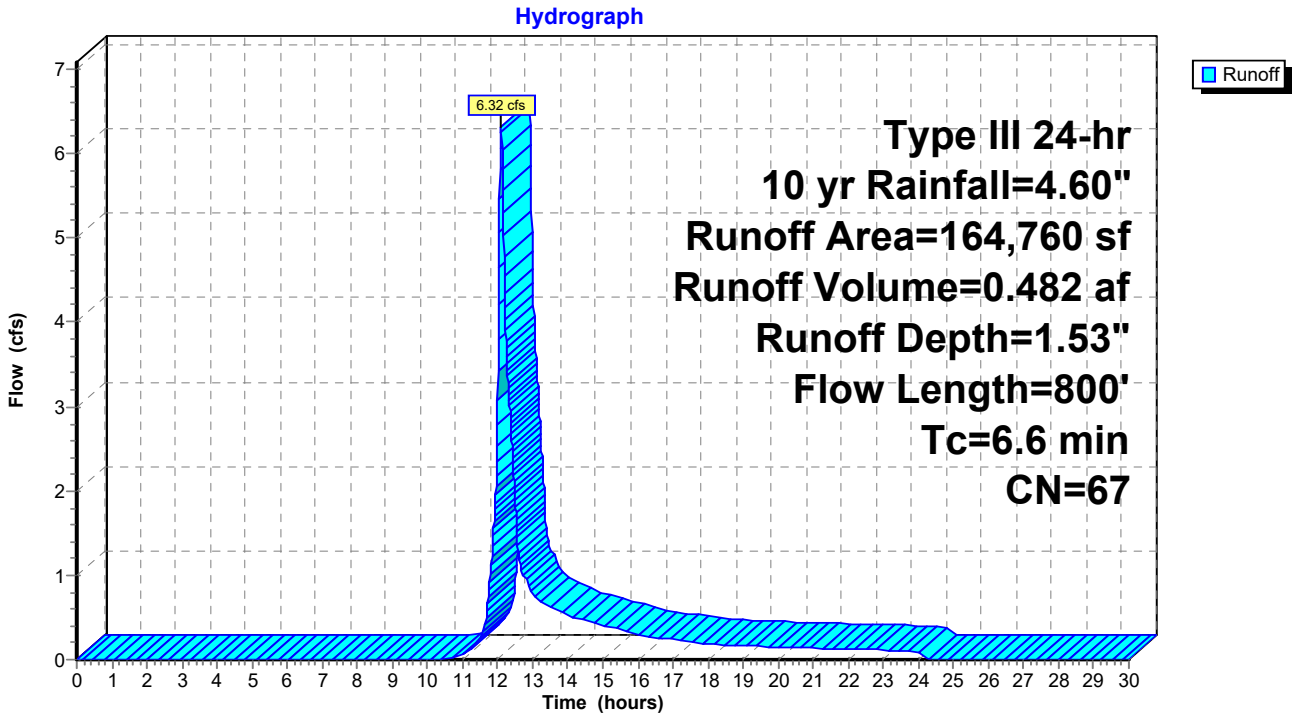
Runoff = 6.32 cfs @ 12.10 hrs, Volume= 0.482 af, Depth= 1.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.60"

	Area (sf)	CN	Description
	41,275	61	>75% Grass cover, Good, HSG B
	73,438	55	Woods, Good, HSG B
*	21,288	77	WETLAND AREA (Woods, HSG D)
*	28,759	98	IMP. HWY
	164,760	67	Weighted Average
	136,001		82.54% Pervious Area
	28,759		17.46% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.20		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
5.7	675	0.0148	1.96		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.2	75	0.1333	5.88		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.6	800	Total			

Subcatchment EX 3.2: SUB EX 3.2



Summary for Subcatchment EX 4.1: SUB EX 4.1

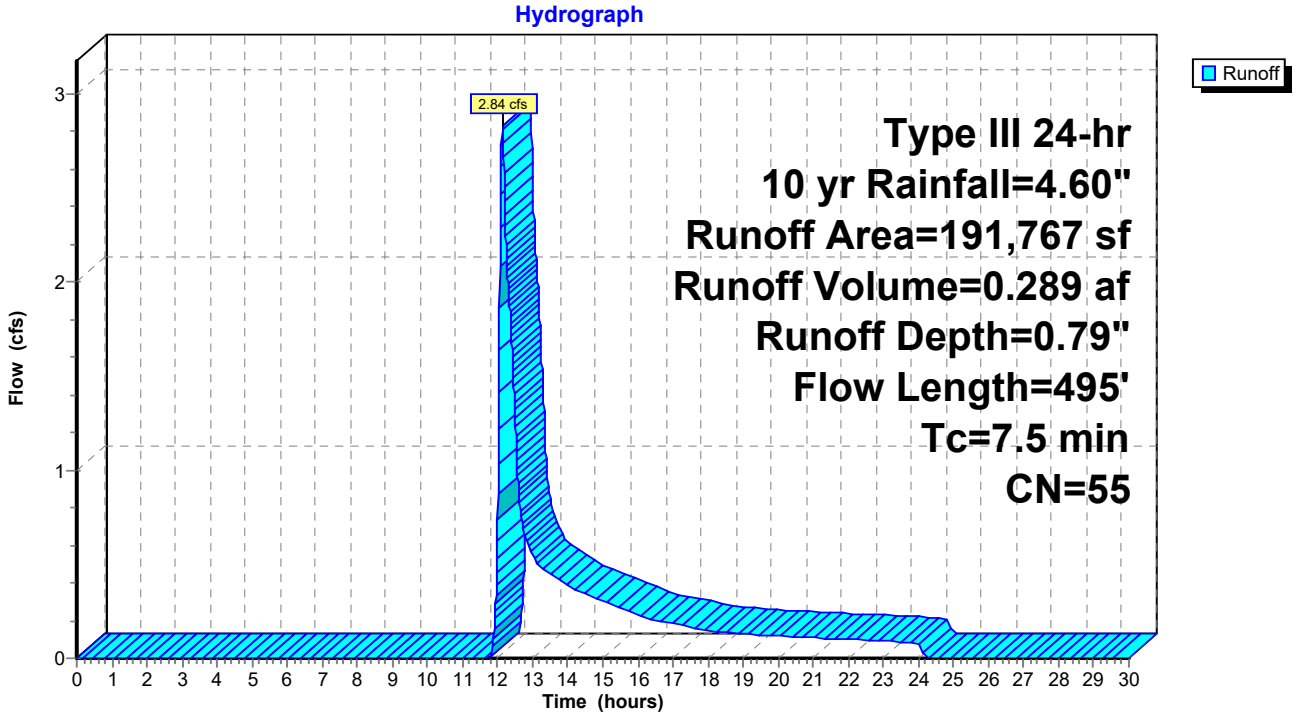
Runoff = 2.84 cfs @ 12.13 hrs, Volume= 0.289 af, Depth= 0.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.60"

Area (sf)	CN	Description
191,767	55	Woods, Good, HSG B
191,767		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	50	0.1600	0.16		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
1.0	190	0.0421	3.30		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.1	255	0.0627	4.03		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
7.5	495	Total			

Subcatchment EX 4.1: SUB EX 4.1



Summary for Pond W5: WETLAND 5

Inflow Area = 3.782 ac, 17.46% Impervious, Inflow Depth = 1.53" for 10 yr event
Inflow = 6.32 cfs @ 12.10 hrs, Volume= 0.482 af
Outflow = 2.40 cfs @ 12.43 hrs, Volume= 0.360 af, Atten= 62%, Lag= 19.5 min
Primary = 2.40 cfs @ 12.43 hrs, Volume= 0.360 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 369.30' @ 12.43 hrs Surf.Area= 9,632 sf Storage= 6,989 cf

Plug-Flow detention time= 160.8 min calculated for 0.360 af (75% of inflow)
Center-of-Mass det. time= 66.2 min (927.2 - 861.1)

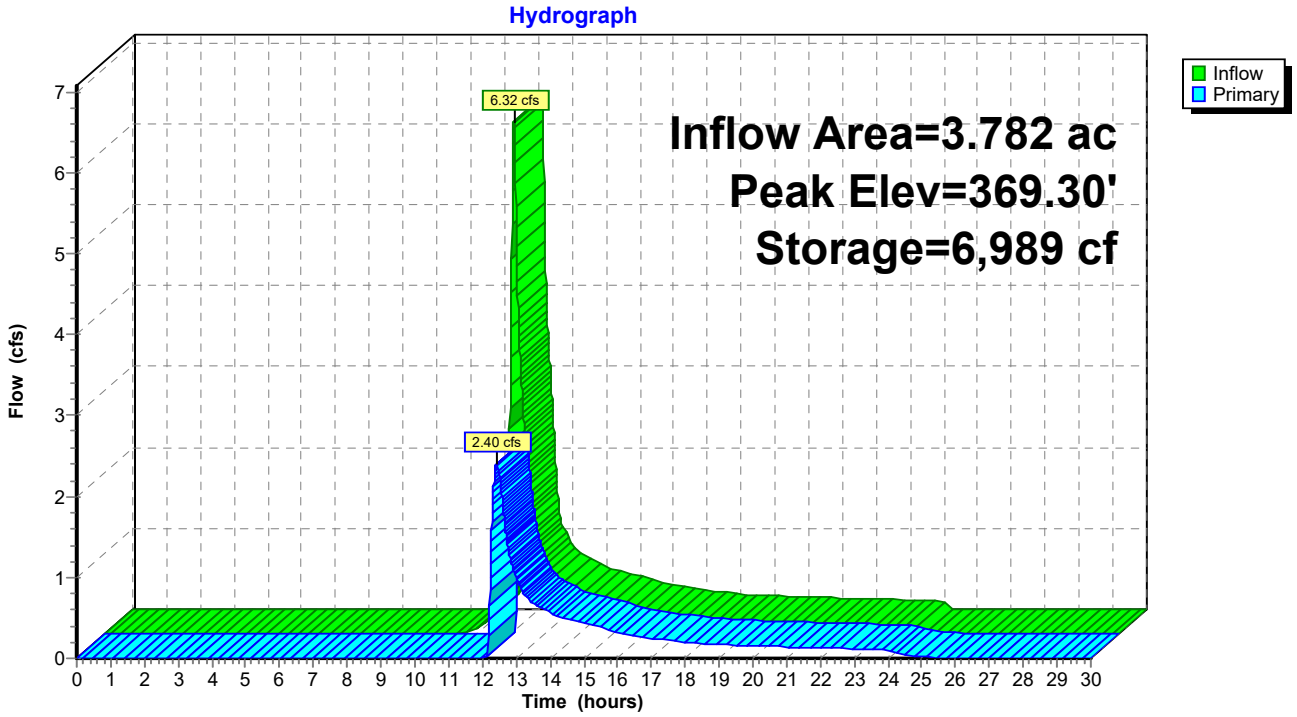
Volume	Invert	Avail.Storage	Storage Description
#1	367.80'	13,194 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
367.80	3,000	0	0
369.00	4,940	4,764	4,764
369.20	8,304	1,324	6,088
369.40	10,950	1,925	8,014
369.60	12,950	2,390	10,404
369.80	14,954	2,790	13,194

Device	Routing	Invert	Outlet Devices
#1	Primary	369.10'	**10.0' long x 64.0' 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=2.40 cfs @ 12.43 hrs HW=369.30' (Free Discharge)
└**1=Broad-Crested Rectangular Weir** (Weir Controls 2.40 cfs @ 1.20 fps)

Pond W5: WETLAND 5



Summary for Pond W6: WETLAND 6

Inflow Area = 9.017 ac, 0.00% Impervious, Inflow Depth = 1.07" for 10 yr event
Inflow = 8.72 cfs @ 12.15 hrs, Volume= 0.807 af
Outflow = 4.69 cfs @ 12.42 hrs, Volume= 0.720 af, Atten= 46%, Lag= 16.6 min
Primary = 4.69 cfs @ 12.42 hrs, Volume= 0.720 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 372.67' @ 12.42 hrs Surf.Area= 26,481 sf Storage= 7,539 cf

Plug-Flow detention time= 92.1 min calculated for 0.720 af (89% of inflow)
Center-of-Mass det. time= 40.6 min (925.5 - 884.9)

Volume	Invert	Avail.Storage	Storage Description
#1	372.20'	18,754 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

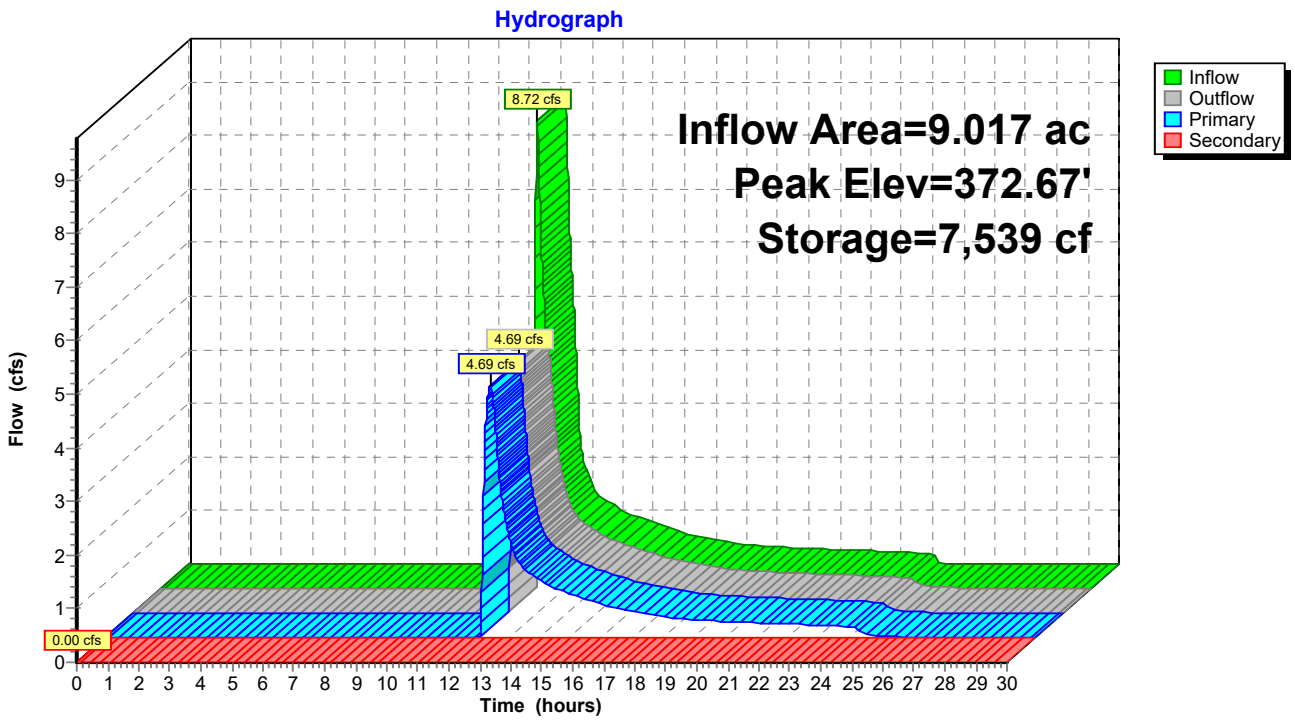
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
372.20	5,774	0	0
372.40	15,024	2,080	2,080
372.60	23,262	3,829	5,908
372.80	33,082	5,634	11,543
373.00	39,034	7,212	18,754

Device	Routing	Invert	Outlet Devices
#1	Primary	372.50'	**26.0' long x 16.0' 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	372.70'	**18.0' long x 18.0' 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=4.69 cfs @ 12.42 hrs HW=372.67' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** (Weir Controls 4.69 cfs @ 1.09 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=372.20' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond W6: WETLAND 6

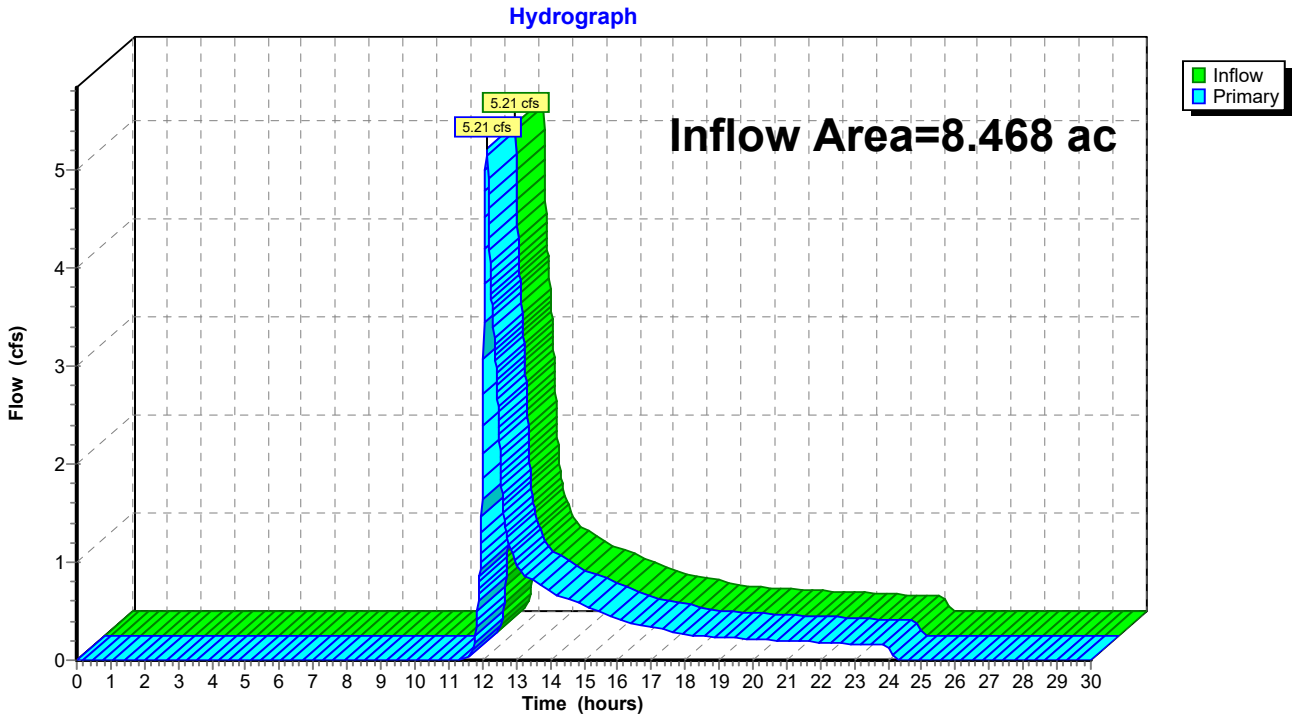


Summary for Link DP1: CHARLES RIVER/ WETLAND 3

Inflow Area = 8.468 ac, 1.09% Impervious, Inflow Depth = 0.76" for 10 yr event
Inflow = 5.21 cfs @ 12.13 hrs, Volume= 0.537 af
Primary = 5.21 cfs @ 12.13 hrs, Volume= 0.537 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link DP1: CHARLES RIVER/ WETLAND 3

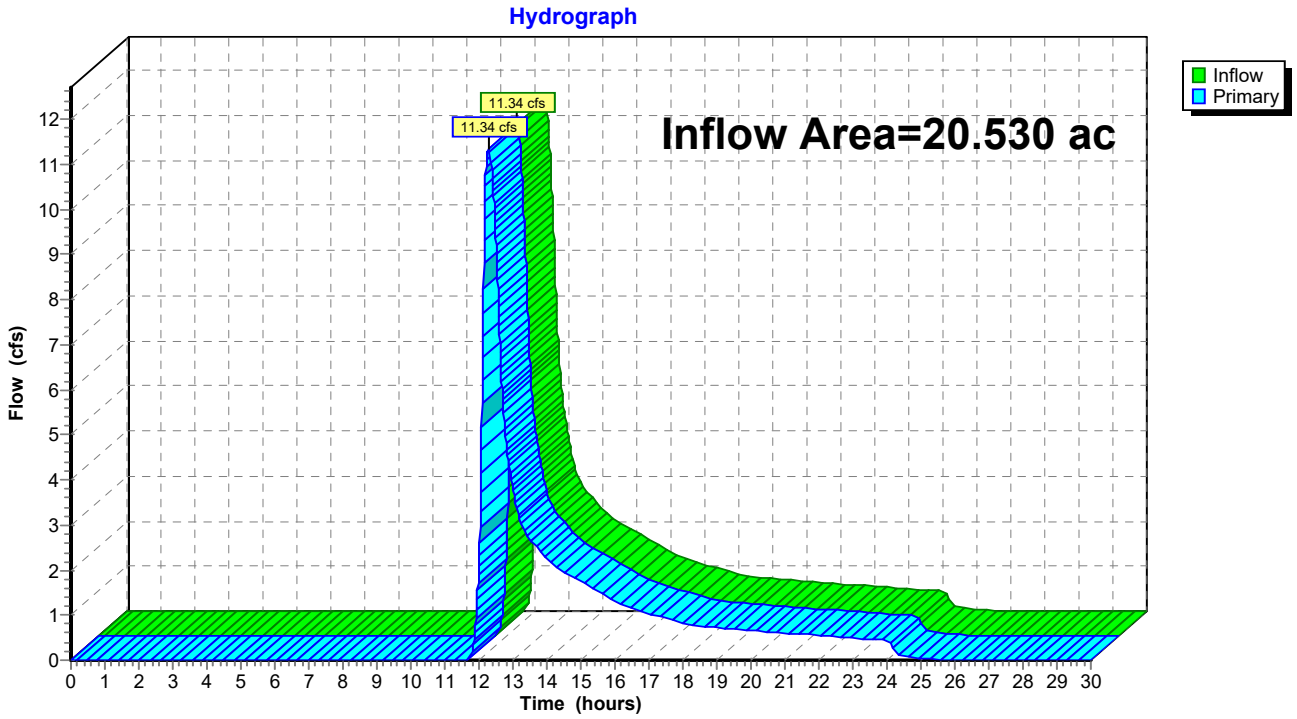


Summary for Link DP2: DEER BROOK/ WETLAND 4

Inflow Area = 20.530 ac, 0.00% Impervious, Inflow Depth = 0.96" for 10 yr event
Inflow = 11.34 cfs @ 12.28 hrs, Volume= 1.637 af
Primary = 11.34 cfs @ 12.28 hrs, Volume= 1.637 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link DP2: DEER BROOK/ WETLAND 4

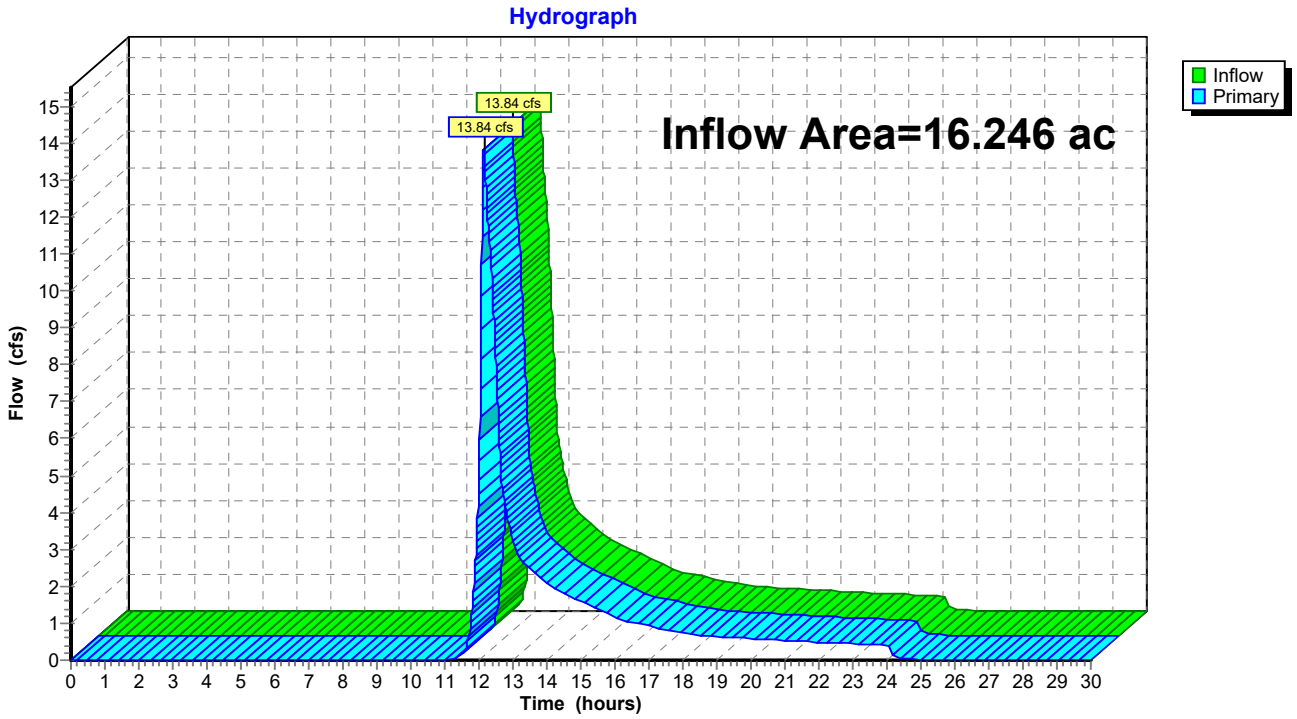


Summary for Link DP3: WETLAND 2

Inflow Area = 16.246 ac, 11.04% Impervious, Inflow Depth = 1.18" for 10 yr event
Inflow = 13.84 cfs @ 12.15 hrs, Volume= 1.604 af
Primary = 13.84 cfs @ 12.15 hrs, Volume= 1.604 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link DP3: WETLAND 2

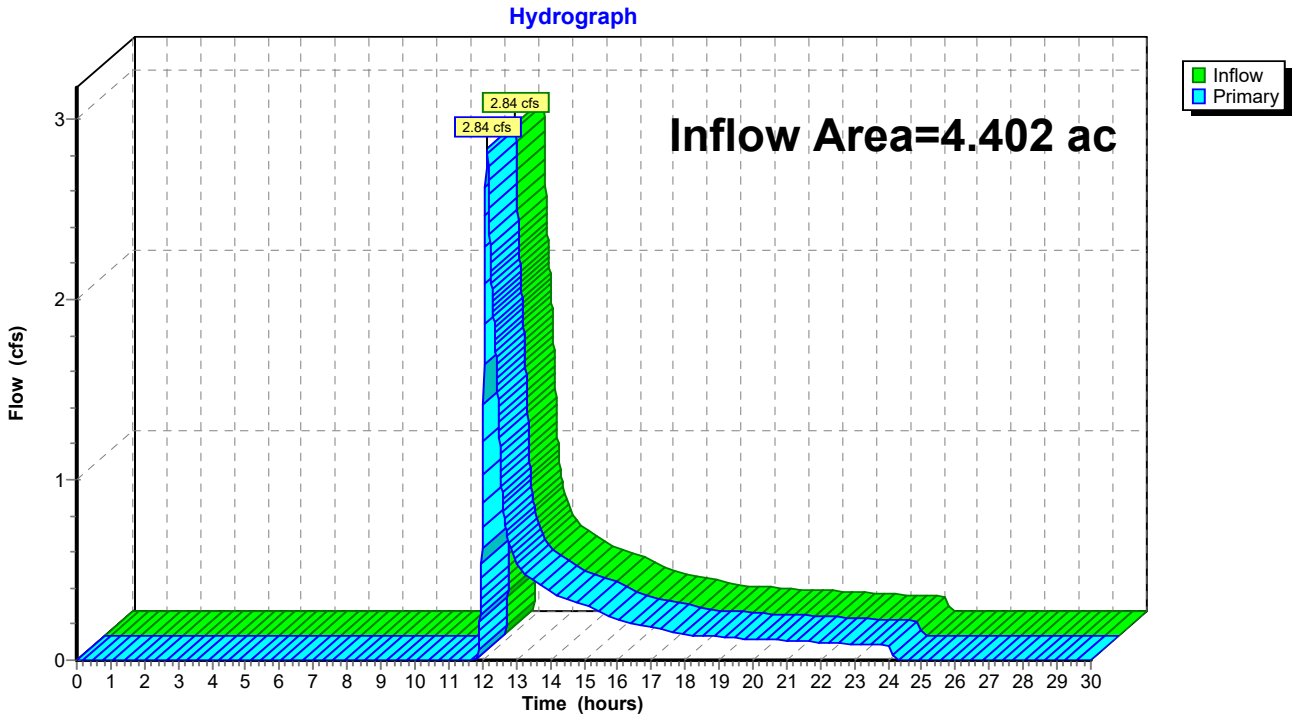


Summary for Link DP4: WETLAND 7/8

Inflow Area = 4.402 ac, 0.00% Impervious, Inflow Depth = 0.79" for 10 yr event
Inflow = 2.84 cfs @ 12.13 hrs, Volume= 0.289 af
Primary = 2.84 cfs @ 12.13 hrs, Volume= 0.289 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link DP4: WETLAND 7/8



Summary for Subcatchment EX 1.1: SUB EX 1.1

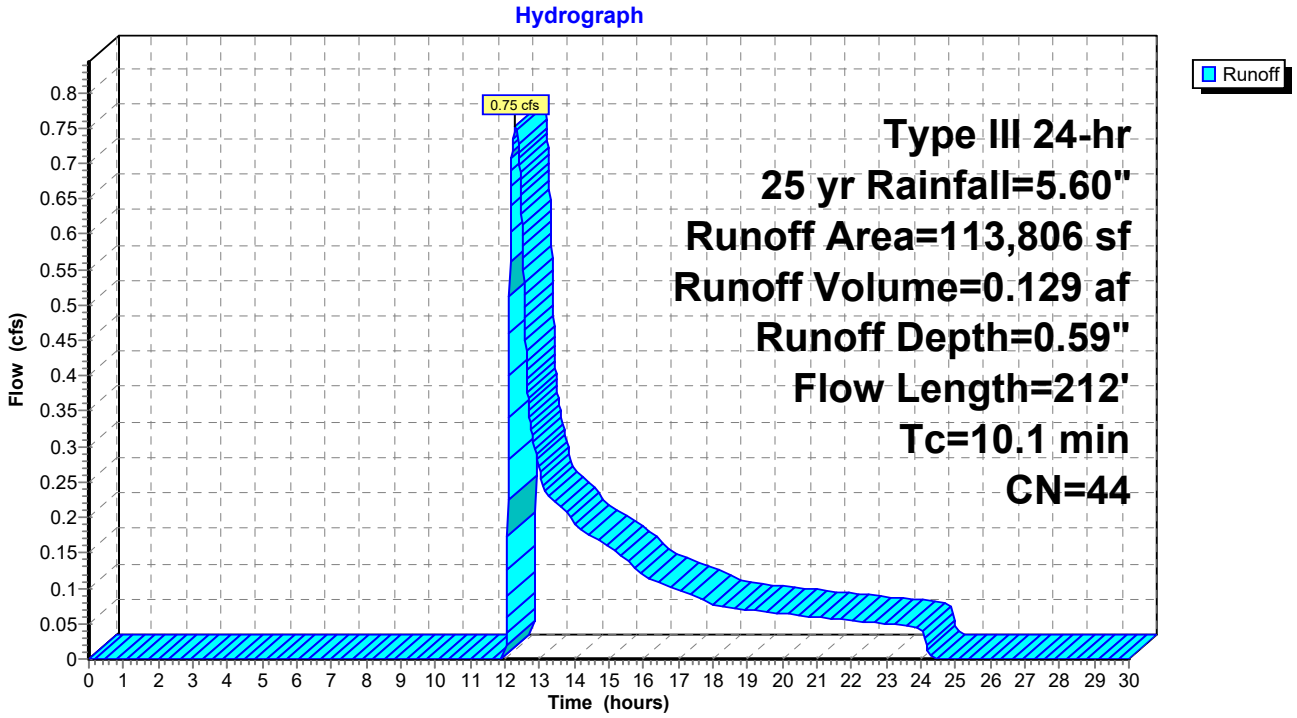
Runoff = 0.75 cfs @ 12.31 hrs, Volume= 0.129 af, Depth= 0.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 yr Rainfall=5.60"

	Area (sf)	CN	Description
	17,674	72	Dirt roads, HSG A
	80,296	30	Woods, Good, HSG A
	2,996	89	Dirt roads, HSG D
	8,812	77	Woods, Good, HSG D
*	4,028	98	FOUNDATIONS
	113,806	44	Weighted Average
	109,778		96.46% Pervious Area
	4,028		3.54% 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= 3.20"
0.6	87	0.0230	2.44		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.2	75	0.1867	6.96		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
10.1	212	Total			

Subcatchment EX 1.1: SUB EX 1.1



Summary for Subcatchment EX 1.2: SUB EX 1.2

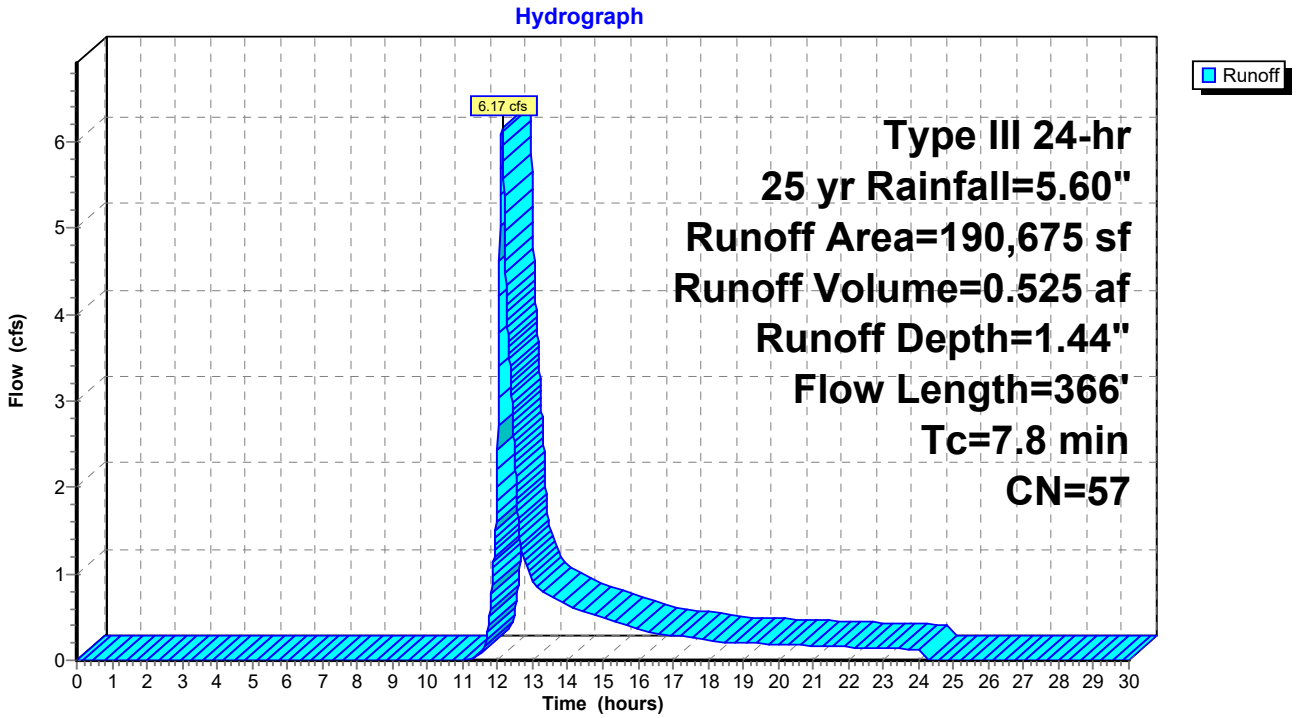
Runoff = 6.17 cfs @ 12.12 hrs, Volume= 0.525 af, Depth= 1.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 yr Rainfall=5.60"

Area (sf)	CN	Description
177,149	55	Woods, Good, HSG B
13,526	77	Woods, Good, HSG D
190,675	57	Weighted Average
190,675		100.00% Pervious 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= 3.20"
0.4	117	0.0855	4.71		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.9	199	0.0503	3.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
7.8	366	Total			

Subcatchment EX 1.2: SUB EX 1.2



Summary for Subcatchment EX 1.3: SUB EX 1.3

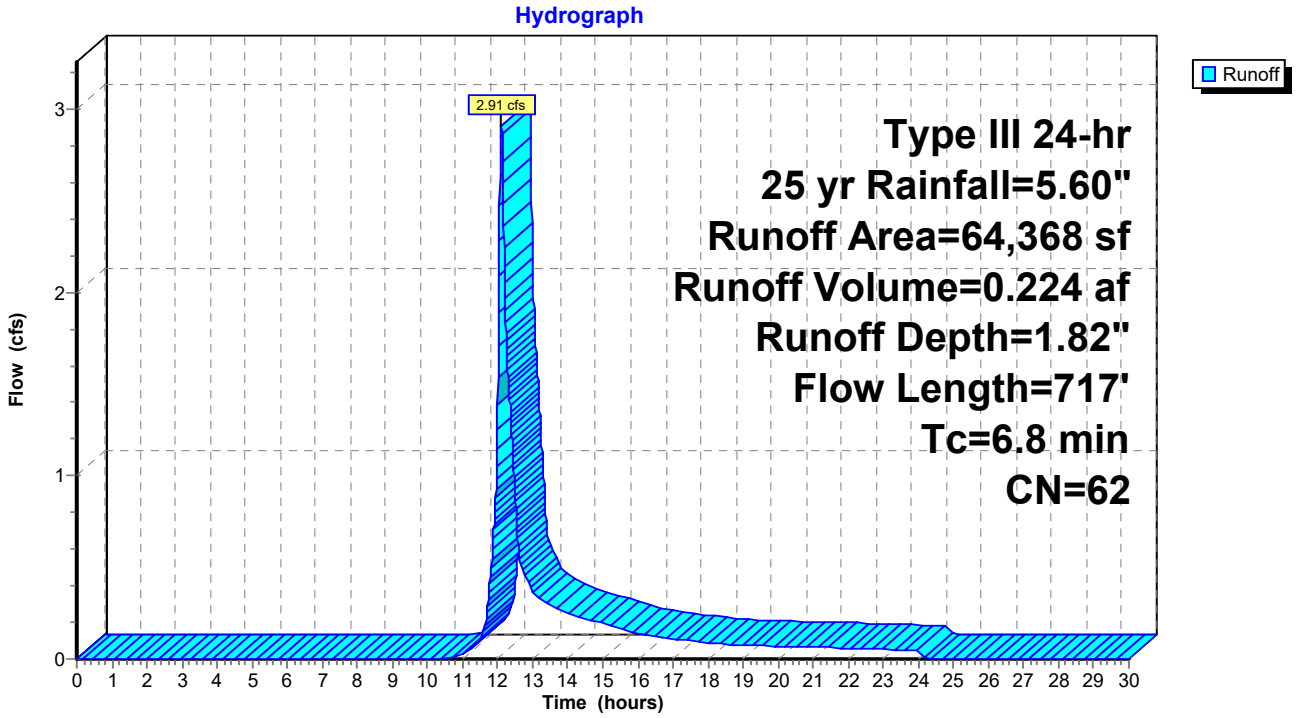
Runoff = 2.91 cfs @ 12.11 hrs, Volume= 0.224 af, Depth= 1.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 yr Rainfall=5.60"

Area (sf)	CN	Description
47,310	55	Woods, Good, HSG B
15,358	82	Dirt roads, HSG B
878	77	Woods, Good, HSG D
822	89	Dirt roads, HSG D
64,368	62	Weighted Average
64,368		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.2	50	0.6000	0.26		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.8	195	0.0667	4.16		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.2	297	0.0202	2.29		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.6	175	0.0800	4.55		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.8	717	Total			

Subcatchment EX 1.3: SUB EX 1.3



Summary for Subcatchment EX 2.1: SUB EX 2.1

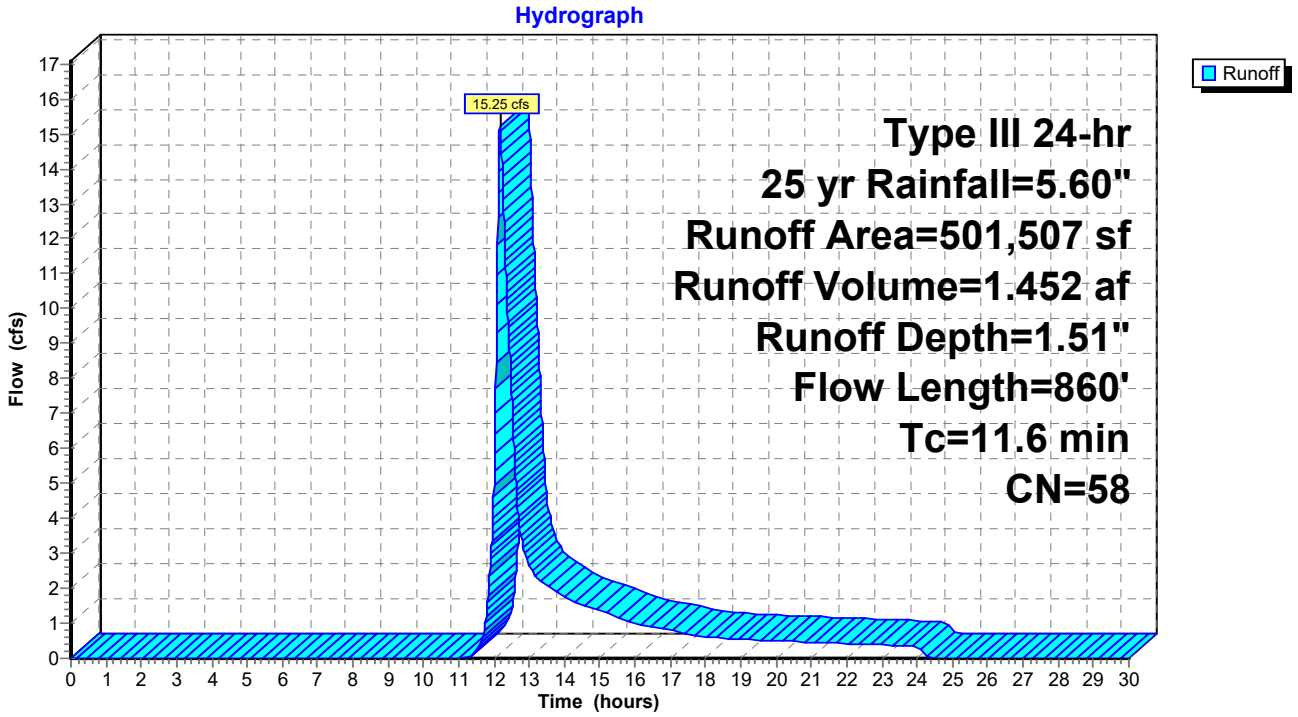
Runoff = 15.25 cfs @ 12.18 hrs, Volume= 1.452 af, Depth= 1.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 yr Rainfall=5.60"

	Area (sf)	CN	Description
	1,416	72	Dirt roads, HSG A
	5,141	30	Woods, Good, HSG A
	8,064	82	Dirt roads, HSG B
	416,679	55	Woods, Good, HSG B
	625	89	Dirt roads, HSG D
	65,732	77	Woods, Good, HSG D
*	3,850	77	WETLAND AREA (Woods, HSG D)
	501,507	58	Weighted Average
	501,507		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.1	50	0.0580	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
1.2	355	0.0958	4.98		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.1	130	0.0154	2.00		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.2	325	0.0800	4.55		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
11.6	860	Total			

Subcatchment EX 2.1: SUB EX 2.1



Summary for Subcatchment EX 2.2: SUB EX 2.2

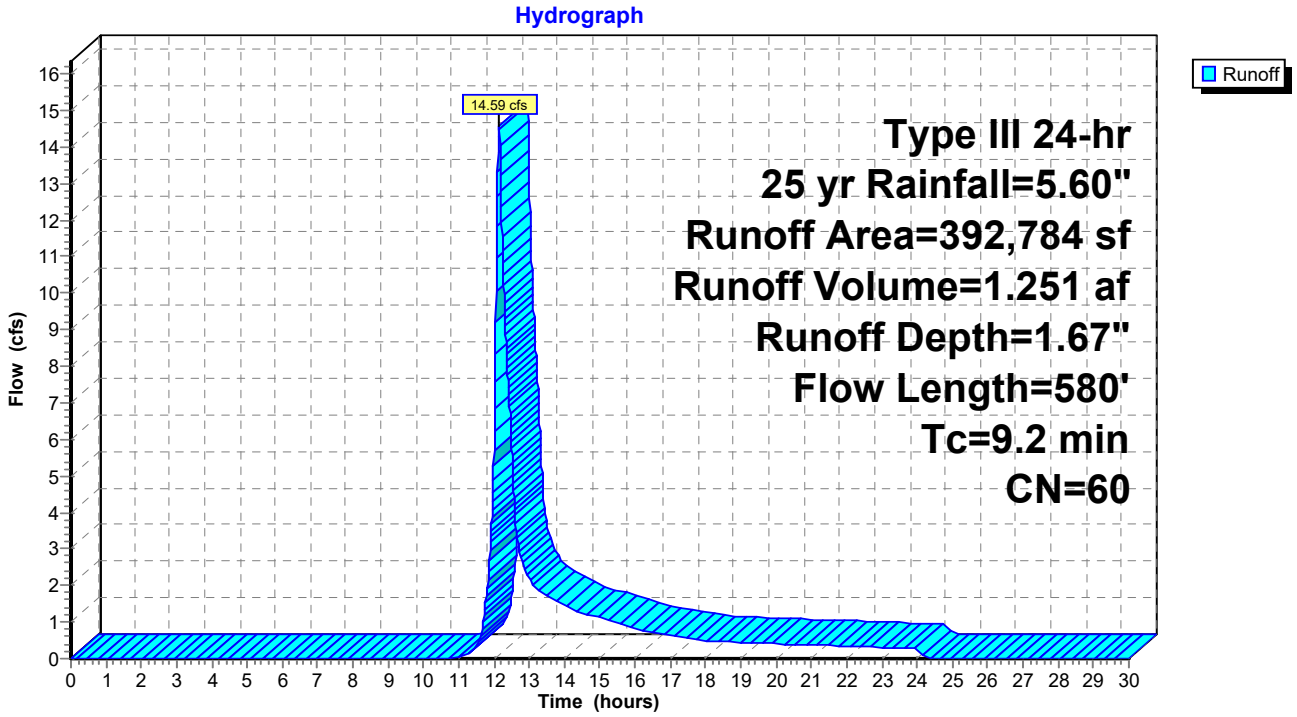
Runoff = 14.59 cfs @ 12.14 hrs, Volume= 1.251 af, Depth= 1.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 yr Rainfall=5.60"

	Area (sf)	CN	Description
	296,618	55	Woods, Good, HSG B
	38,348	77	Woods, Good, HSG D
*	57,818	77	WETLAND AREA (Woods, HSG D)
	392,784	60	Weighted Average
	392,784		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0800	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
2.1	530	0.0660	4.14		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
9.2	580	Total			

Subcatchment EX 2.2: SUB EX 2.2



Summary for Subcatchment EX 3.1: SUB EX 3.1

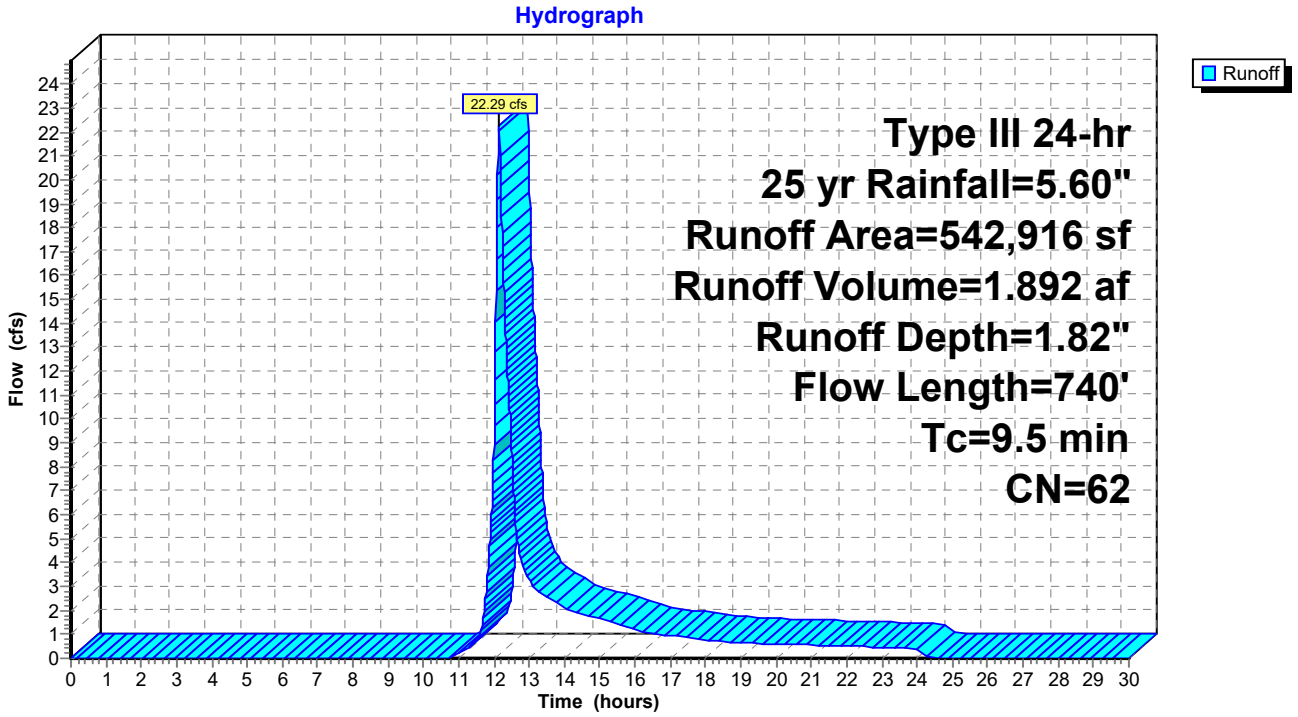
Runoff = 22.29 cfs @ 12.14 hrs, Volume= 1.892 af, Depth= 1.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 yr Rainfall=5.60"

	Area (sf)	CN	Description
	412,144	55	Woods, Good, HSG B
	77,565	77	Woods, Good, HSG D
*	3,828	77	WETLAND AREA (Woods, HSG D)
*	49,379	98	LEDGE
	542,916	62	Weighted Average
	493,537		90.90% Pervious Area
	49,379		9.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0800	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
1.0	285	0.0842	4.67		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.3	100	0.0852	5.93		**Shallow Concentrated Flow, (LEDGE)** Paved Kv= 20.3 fps
1.1	305	0.0852	4.70		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
9.5	740	Total			

Subcatchment EX 3.1: SUB EX 3.1



Summary for Subcatchment EX 3.2: SUB EX 3.2

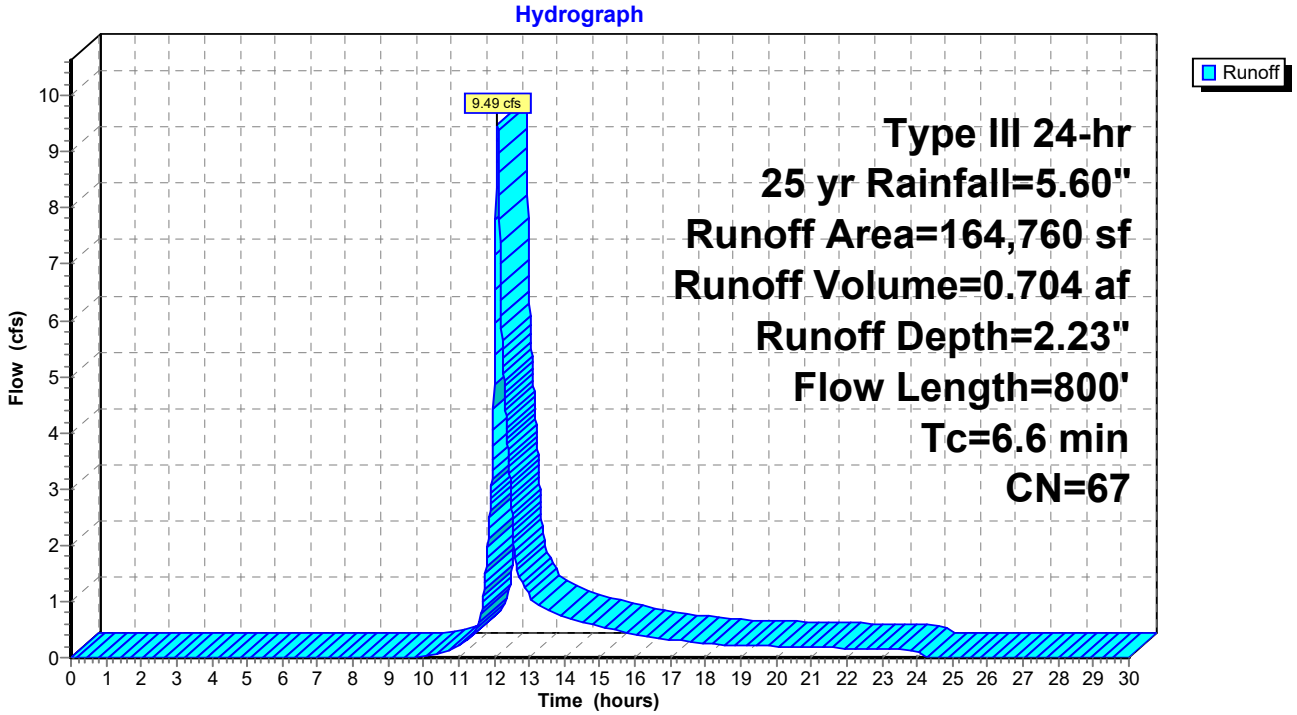
Runoff = 9.49 cfs @ 12.10 hrs, Volume= 0.704 af, Depth= 2.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 yr Rainfall=5.60"

	Area (sf)	CN	Description
	41,275	61	>75% Grass cover, Good, HSG B
	73,438	55	Woods, Good, HSG B
*	21,288	77	WETLAND AREA (Woods, HSG D)
*	28,759	98	IMP. HWY
	164,760	67	Weighted Average
	136,001		82.54% Pervious Area
	28,759		17.46% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.20		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
5.7	675	0.0148	1.96		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.2	75	0.1333	5.88		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.6	800	Total			

Subcatchment EX 3.2: SUB EX 3.2



Summary for Subcatchment EX 4.1: SUB EX 4.1

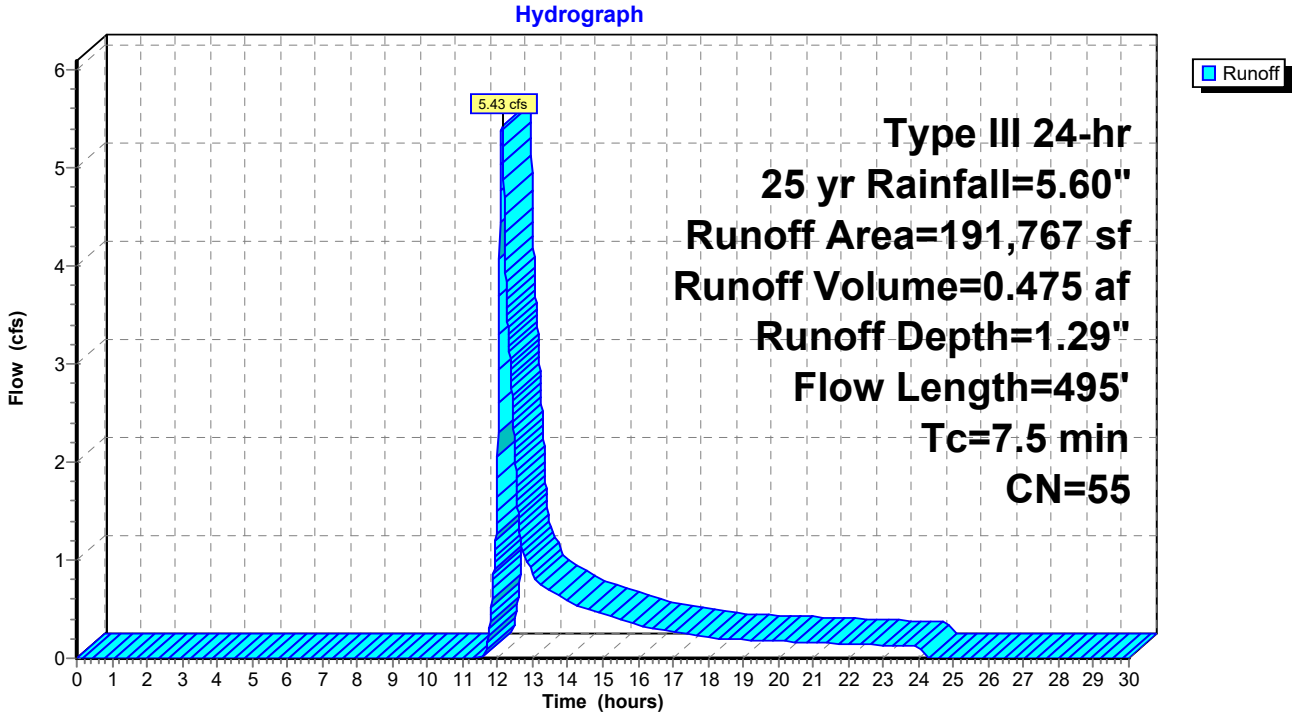
Runoff = 5.43 cfs @ 12.12 hrs, Volume= 0.475 af, Depth= 1.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 yr Rainfall=5.60"

Area (sf)	CN	Description
191,767	55	Woods, Good, HSG B
191,767		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	50	0.1600	0.16		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
1.0	190	0.0421	3.30		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.1	255	0.0627	4.03		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
7.5	495	Total			

Subcatchment EX 4.1: SUB EX 4.1



Summary for Pond W5: WETLAND 5

Inflow Area = 3.782 ac, 17.46% Impervious, Inflow Depth = 2.23" for 25 yr event
Inflow = 9.49 cfs @ 12.10 hrs, Volume= 0.704 af
Outflow = 5.18 cfs @ 12.26 hrs, Volume= 0.581 af, Atten= 45%, Lag= 9.6 min
Primary = 5.18 cfs @ 12.26 hrs, Volume= 0.581 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 369.43' @ 12.26 hrs Surf.Area= 11,282 sf Storage= 8,382 cf

Plug-Flow detention time= 118.8 min calculated for 0.581 af (83% of inflow)
Center-of-Mass det. time= 45.5 min (895.1 - 849.6)

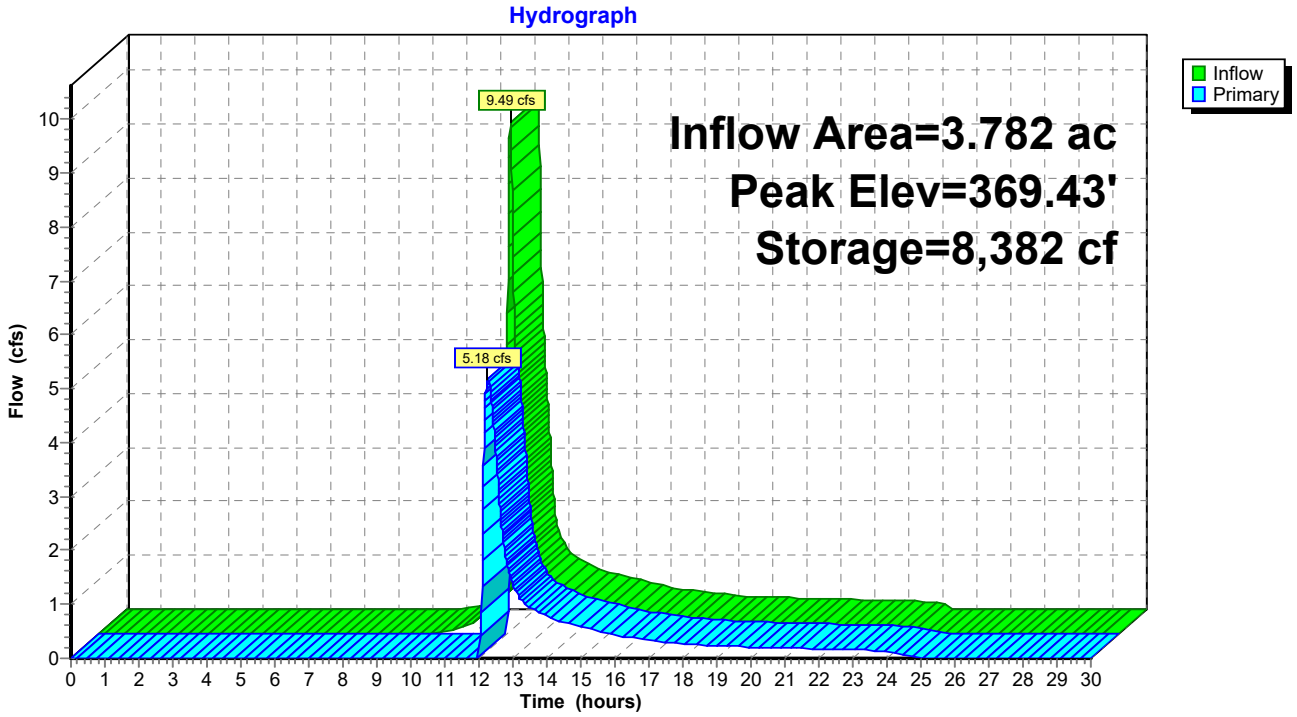
Volume	Invert	Avail.Storage	Storage Description
#1	367.80'	13,194 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
367.80	3,000	0	0
369.00	4,940	4,764	4,764
369.20	8,304	1,324	6,088
369.40	10,950	1,925	8,014
369.60	12,950	2,390	10,404
369.80	14,954	2,790	13,194

Device	Routing	Invert	Outlet Devices
#1	Primary	369.10'	**10.0' long x 64.0' 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=5.18 cfs @ 12.26 hrs HW=369.43' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** (Weir Controls 5.18 cfs @ 1.55 fps)

Pond W5: WETLAND 5



Summary for Pond W6: WETLAND 6

Inflow Area =	9.017 ac,	0.00% Impervious,	Inflow Depth =	1.67"	for 25 yr event
Inflow =	14.59 cfs @	12.14 hrs,	Volume=	1.251 af	
Outflow =	9.63 cfs @	12.29 hrs,	Volume=	1.164 af,	Atten= 34%, Lag= 9.2 min
Primary =	9.01 cfs @	12.29 hrs,	Volume=	1.151 af	
Secondary =	0.63 cfs @	12.29 hrs,	Volume=	0.013 af	

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 372.76' @ 12.29 hrs Surf.Area= 30,886 sf Storage= 10,112 cf

Plug-Flow detention time= 65.3 min calculated for 1.164 af (93% of inflow)
Center-of-Mass det. time= 29.7 min (900.1 - 870.3)

Volume	Invert	Avail.Storage	Storage Description
#1	372.20'	18,754 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

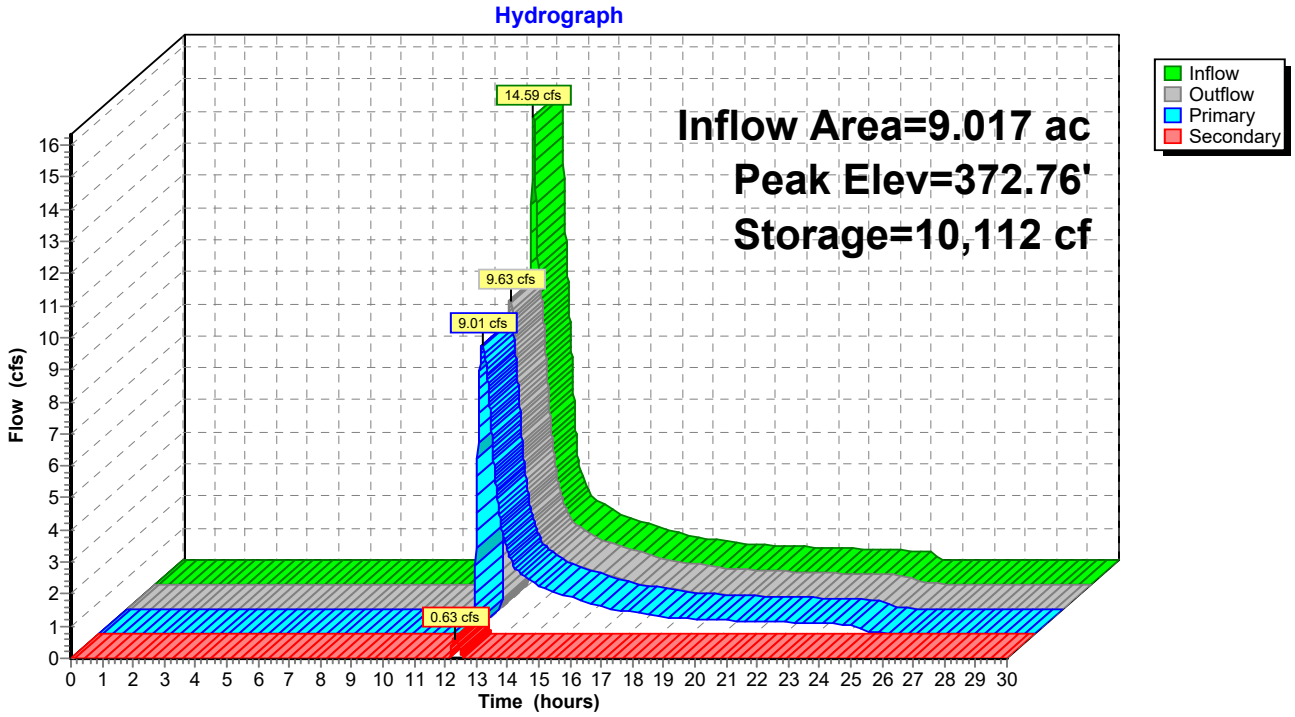
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
372.20	5,774	0	0
372.40	15,024	2,080	2,080
372.60	23,262	3,829	5,908
372.80	33,082	5,634	11,543
373.00	39,034	7,212	18,754

Device	Routing	Invert	Outlet Devices
#1	Primary	372.50'	**26.0' long x 16.0' 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	372.70'	**18.0' long x 18.0' 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=9.00 cfs @ 12.29 hrs HW=372.76' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** (Weir Controls 9.00 cfs @ 1.36 fps)

Secondary OutFlow Max=0.63 cfs @ 12.29 hrs HW=372.76' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 0.63 cfs @ 0.63 fps)

Pond W6: WETLAND 6

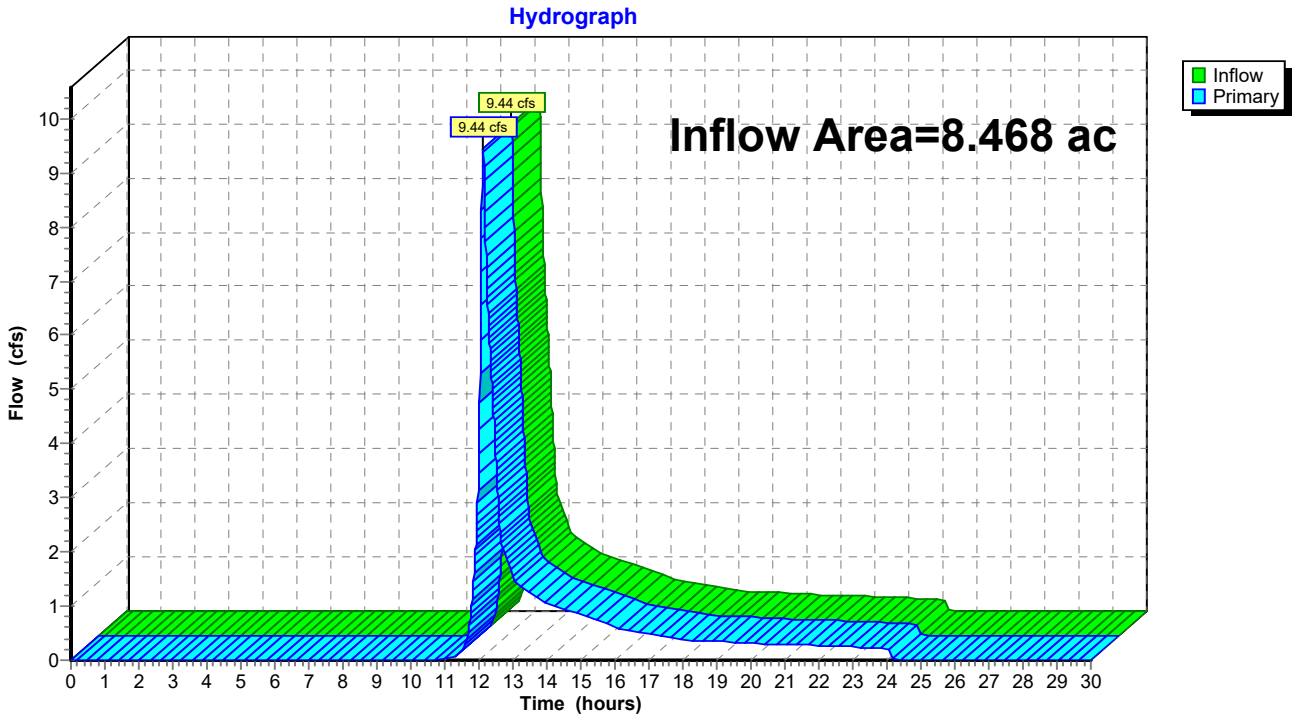


Summary for Link DP1: CHARLES RIVER/ WETLAND 3

Inflow Area = 8.468 ac, 1.09% Impervious, Inflow Depth = 1.24" for 25 yr event
Inflow = 9.44 cfs @ 12.12 hrs, Volume= 0.878 af
Primary = 9.44 cfs @ 12.12 hrs, Volume= 0.878 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link DP1: CHARLES RIVER/ WETLAND 3

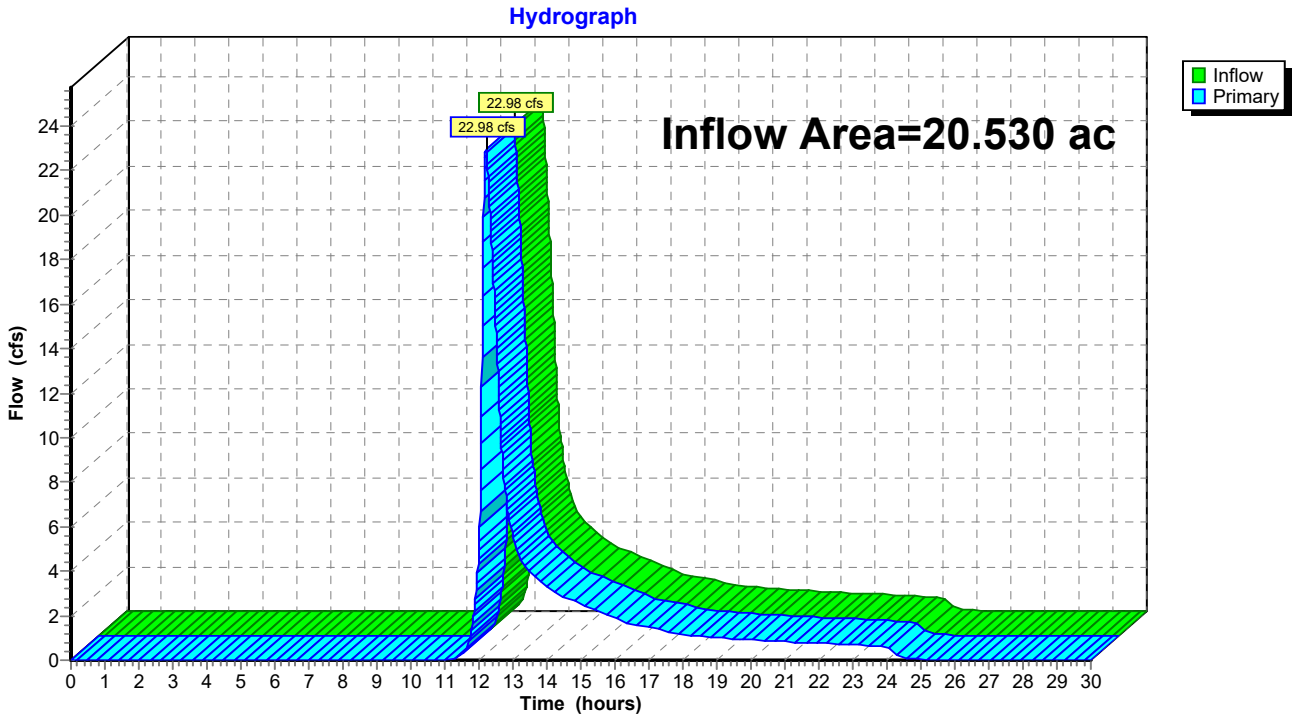


Summary for Link DP2: DEER BROOK/ WETLAND 4

Inflow Area = 20.530 ac, 0.00% Impervious, Inflow Depth = 1.52" for 25 yr event
Inflow = 22.98 cfs @ 12.21 hrs, Volume= 2.603 af
Primary = 22.98 cfs @ 12.21 hrs, Volume= 2.603 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link DP2: DEER BROOK/ WETLAND 4

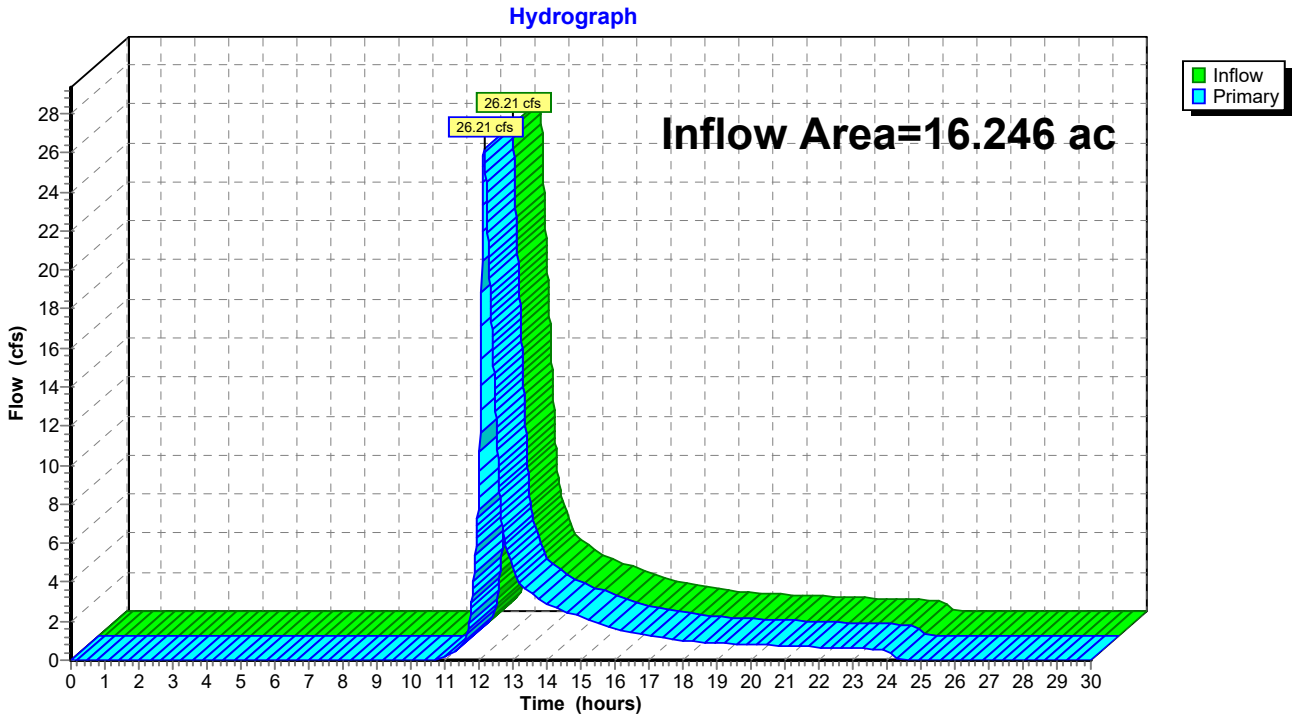


Summary for Link DP3: WETLAND 2

Inflow Area = 16.246 ac, 11.04% Impervious, Inflow Depth = 1.84" for 25 yr event
Inflow = 26.21 cfs @ 12.16 hrs, Volume= 2.486 af
Primary = 26.21 cfs @ 12.16 hrs, Volume= 2.486 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link DP3: WETLAND 2

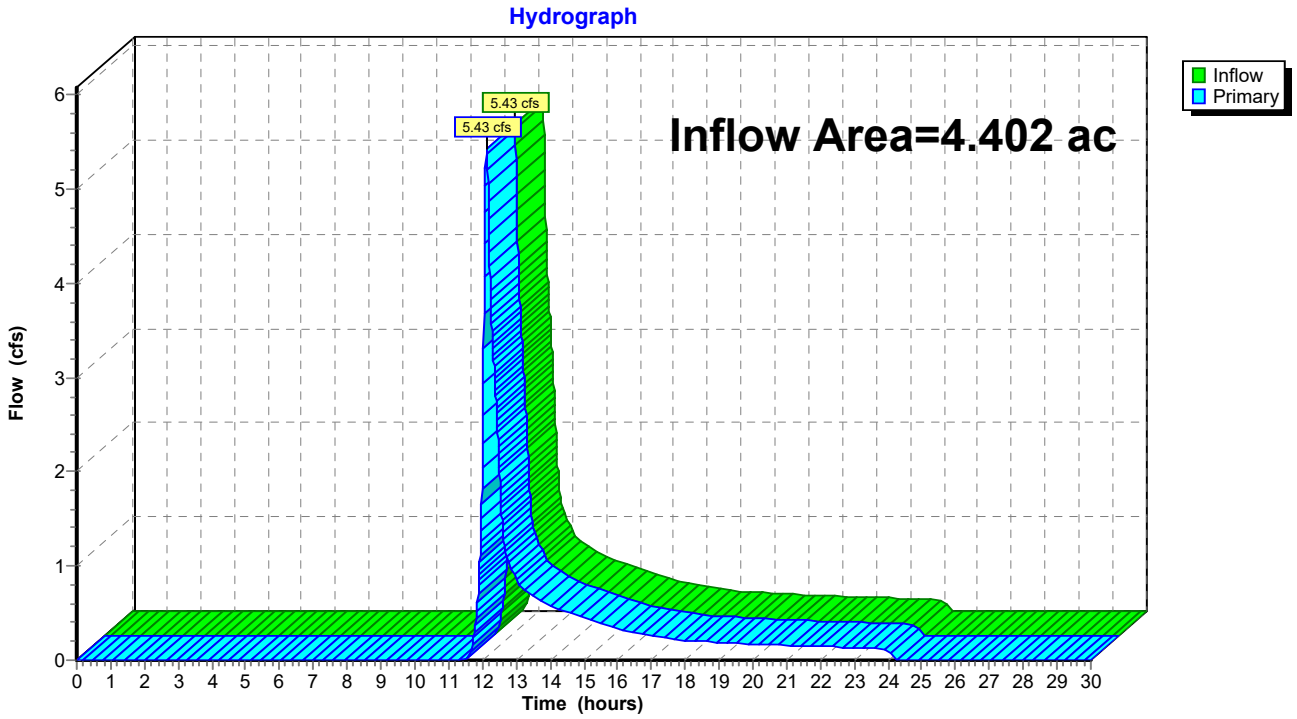


Summary for Link DP4: WETLAND 7/8

Inflow Area = 4.402 ac, 0.00% Impervious, Inflow Depth = 1.29" for 25 yr event
Inflow = 5.43 cfs @ 12.12 hrs, Volume= 0.475 af
Primary = 5.43 cfs @ 12.12 hrs, Volume= 0.475 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link DP4: WETLAND 7/8



Summary for Subcatchment EX 1.1: SUB EX 1.1

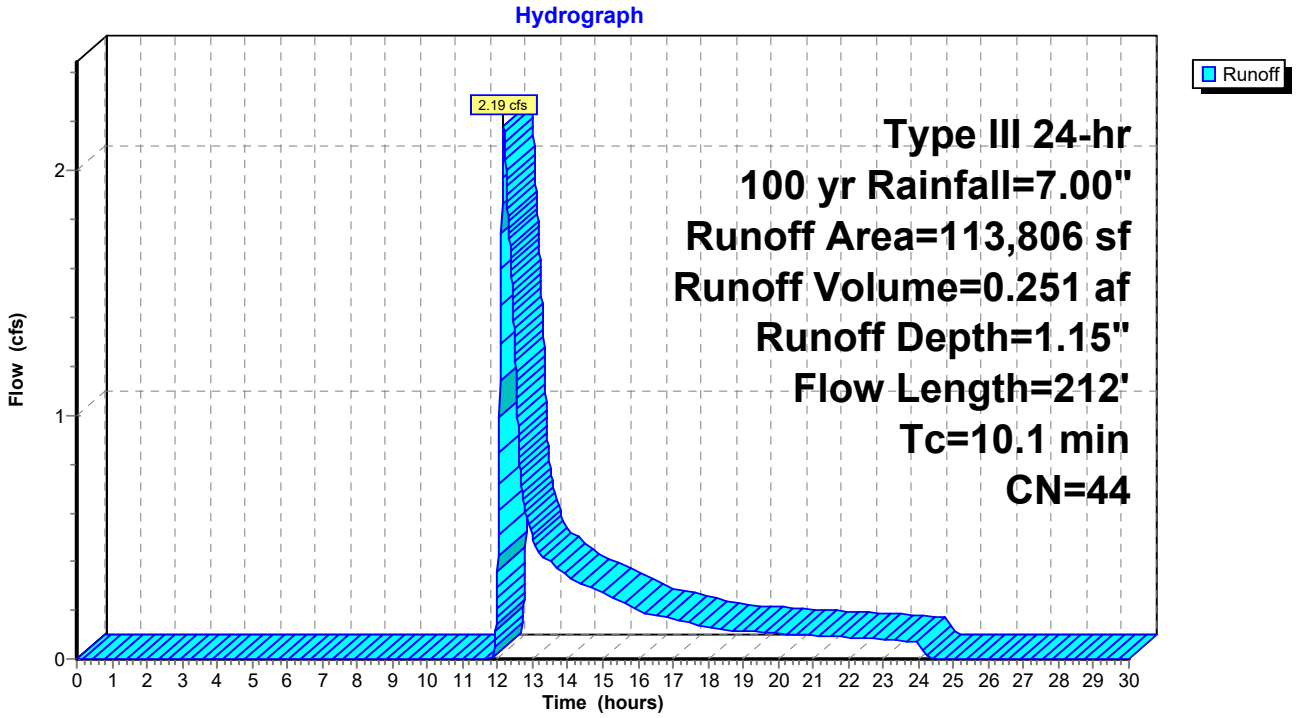
Runoff = 2.19 cfs @ 12.18 hrs, Volume= 0.251 af, Depth= 1.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=7.00"

	Area (sf)	CN	Description
	17,674	72	Dirt roads, HSG A
	80,296	30	Woods, Good, HSG A
	2,996	89	Dirt roads, HSG D
	8,812	77	Woods, Good, HSG D
*	4,028	98	FOUNDATIONS
	113,806	44	Weighted Average
	109,778		96.46% Pervious Area
	4,028		3.54% 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= 3.20"
0.6	87	0.0230	2.44		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.2	75	0.1867	6.96		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
10.1	212	Total			

Subcatchment EX 1.1: SUB EX 1.1



Summary for Subcatchment EX 1.2: SUB EX 1.2

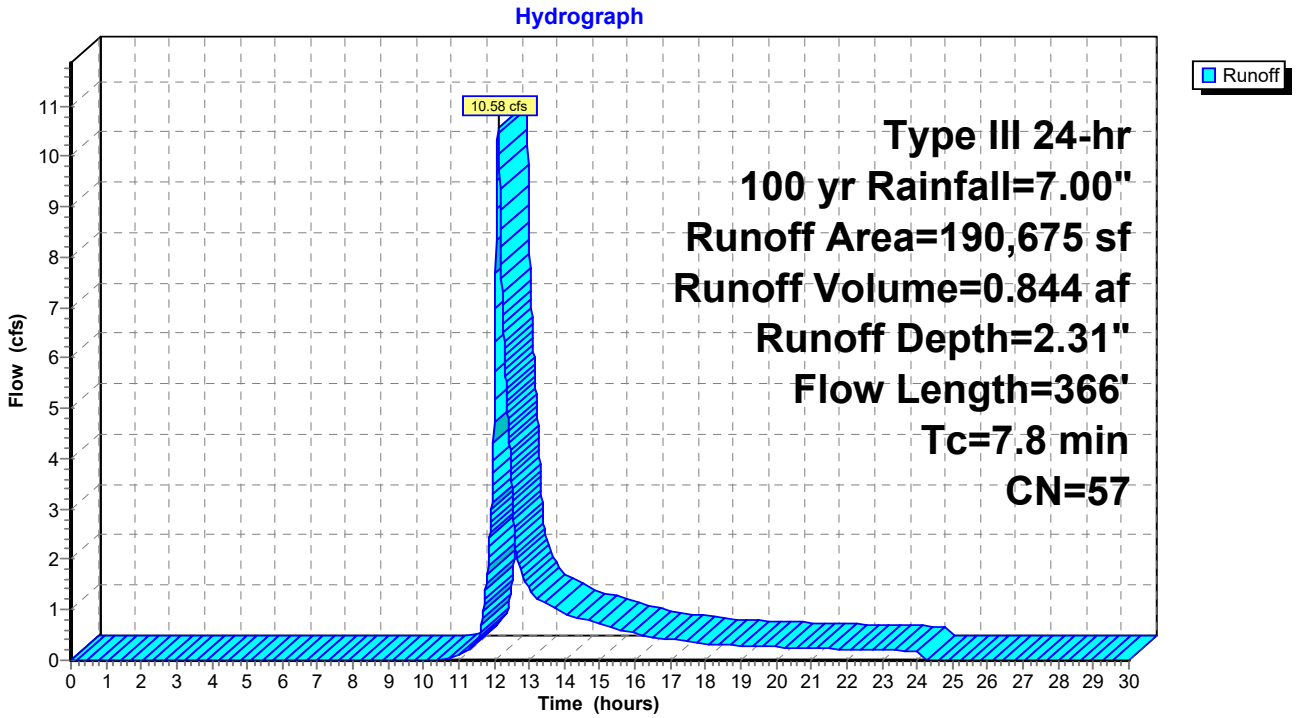
Runoff = 10.58 cfs @ 12.12 hrs, Volume= 0.844 af, Depth= 2.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=7.00"

Area (sf)	CN	Description
177,149	55	Woods, Good, HSG B
13,526	77	Woods, Good, HSG D
190,675	57	Weighted Average
190,675		100.00% Pervious 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= 3.20"
0.4	117	0.0855	4.71		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.9	199	0.0503	3.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
7.8	366	Total			

Subcatchment EX 1.2: SUB EX 1.2



Summary for Subcatchment EX 1.3: SUB EX 1.3

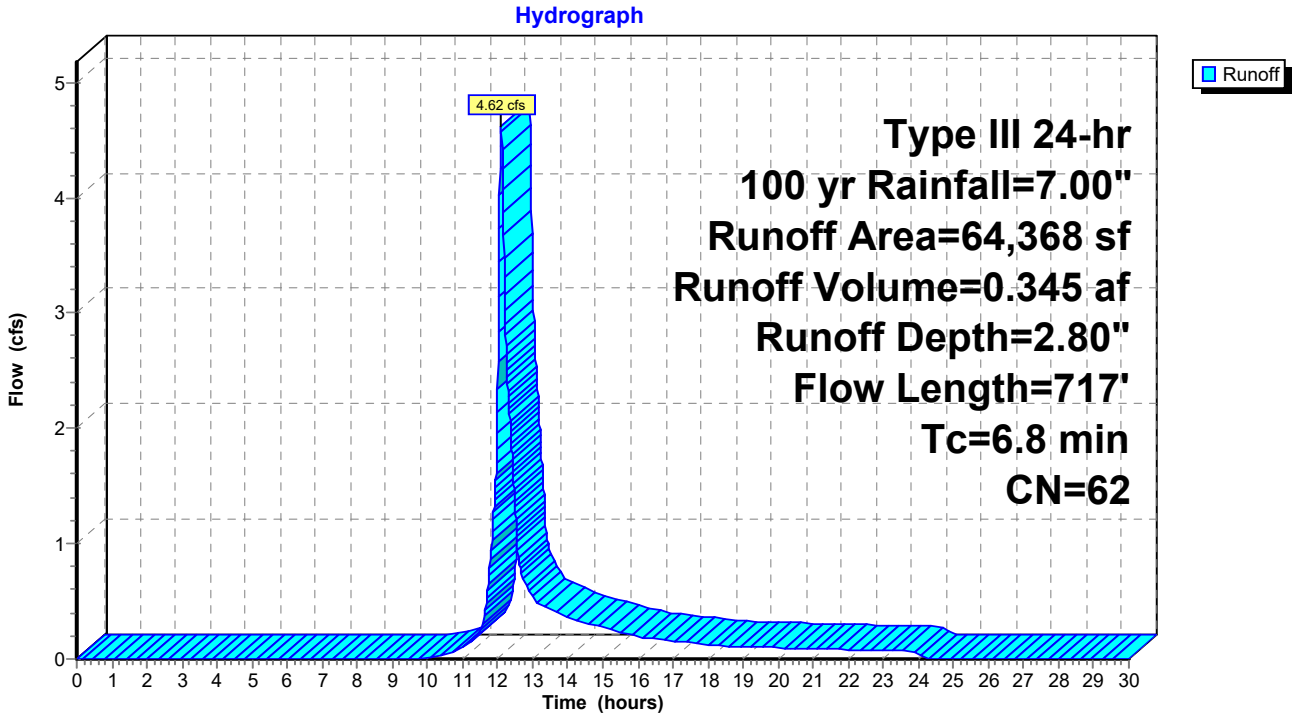
Runoff = 4.62 cfs @ 12.10 hrs, Volume= 0.345 af, Depth= 2.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=7.00"

Area (sf)	CN	Description
47,310	55	Woods, Good, HSG B
15,358	82	Dirt roads, HSG B
878	77	Woods, Good, HSG D
822	89	Dirt roads, HSG D
64,368	62	Weighted Average
64,368		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.2	50	0.6000	0.26		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.8	195	0.0667	4.16		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.2	297	0.0202	2.29		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.6	175	0.0800	4.55		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.8	717	Total			

Subcatchment EX 1.3: SUB EX 1.3



Summary for Subcatchment EX 2.1: SUB EX 2.1

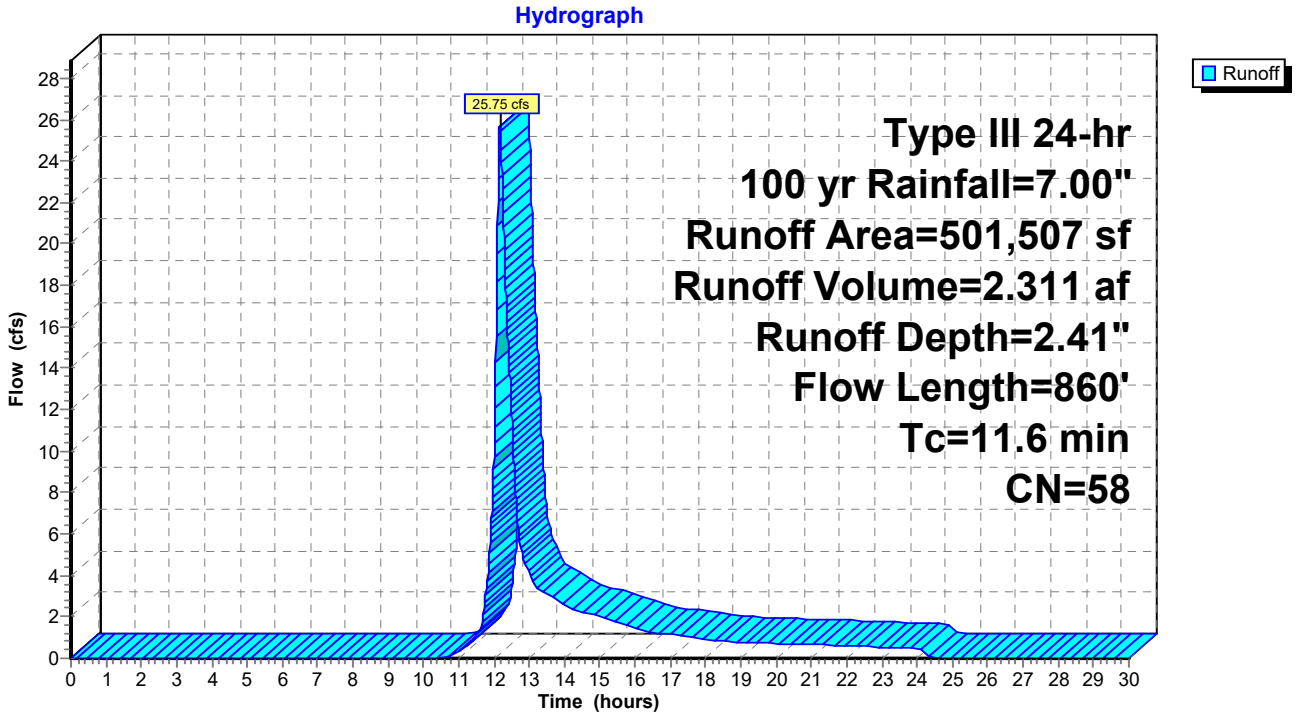
Runoff = 25.75 cfs @ 12.17 hrs, Volume= 2.311 af, Depth= 2.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=7.00"

	Area (sf)	CN	Description
	1,416	72	Dirt roads, HSG A
	5,141	30	Woods, Good, HSG A
	8,064	82	Dirt roads, HSG B
	416,679	55	Woods, Good, HSG B
	625	89	Dirt roads, HSG D
	65,732	77	Woods, Good, HSG D
*	3,850	77	WETLAND AREA (Woods, HSG D)
	501,507	58	Weighted Average
	501,507		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.1	50	0.0580	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
1.2	355	0.0958	4.98		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.1	130	0.0154	2.00		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.2	325	0.0800	4.55		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
11.6	860	Total			

Subcatchment EX 2.1: SUB EX 2.1



Summary for Subcatchment EX 2.2: SUB EX 2.2

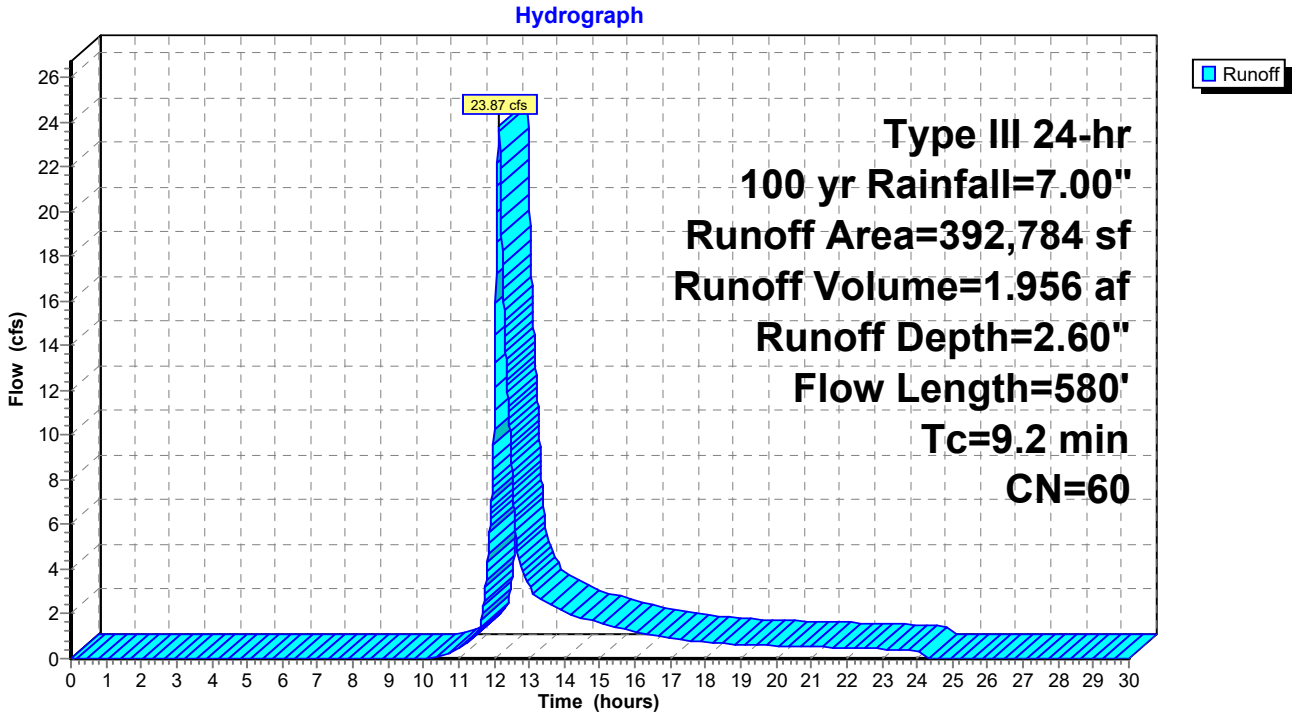
Runoff = 23.87 cfs @ 12.14 hrs, Volume= 1.956 af, Depth= 2.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=7.00"

	Area (sf)	CN	Description
	296,618	55	Woods, Good, HSG B
	38,348	77	Woods, Good, HSG D
*	57,818	77	WETLAND AREA (Woods, HSG D)
	392,784	60	Weighted Average
	392,784		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0800	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
2.1	530	0.0660	4.14		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
9.2	580	Total			

Subcatchment EX 2.2: SUB EX 2.2



Summary for Subcatchment EX 3.1: SUB EX 3.1

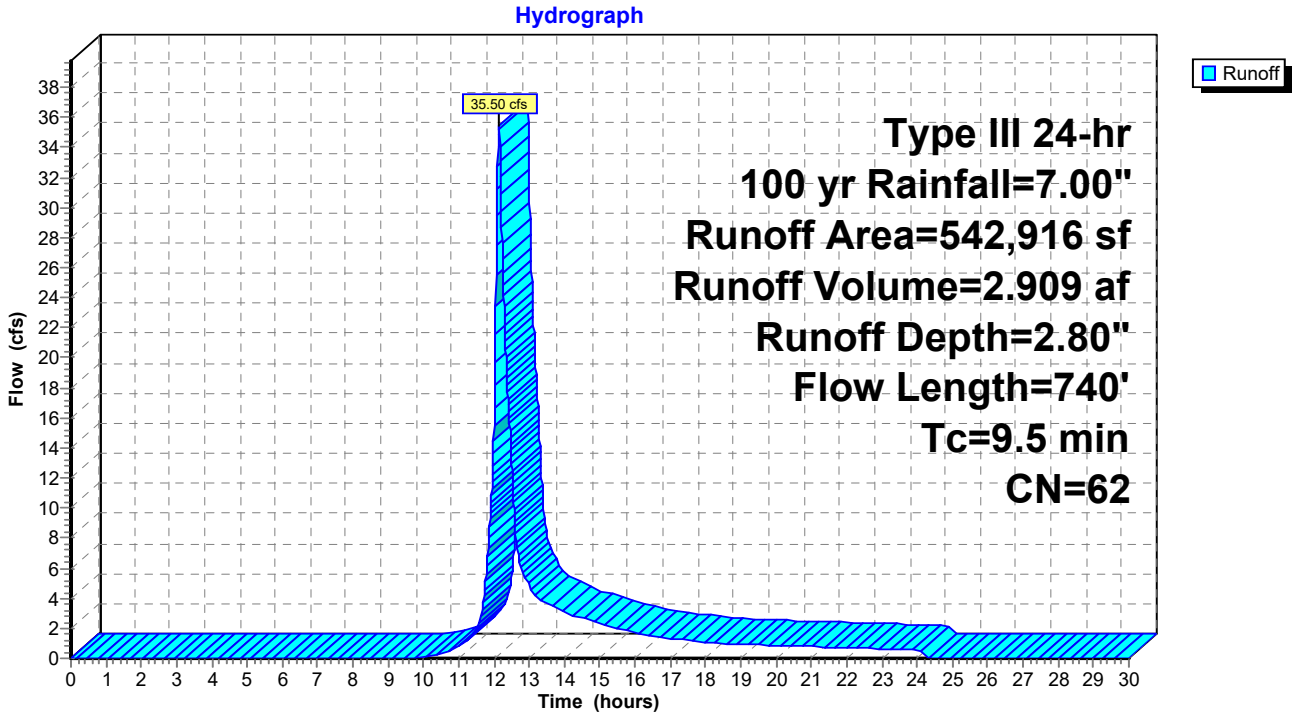
Runoff = 35.50 cfs @ 12.14 hrs, Volume= 2.909 af, Depth= 2.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=7.00"

	Area (sf)	CN	Description
	412,144	55	Woods, Good, HSG B
	77,565	77	Woods, Good, HSG D
*	3,828	77	WETLAND AREA (Woods, HSG D)
*	49,379	98	LEDGE
	542,916	62	Weighted Average
	493,537		90.90% Pervious Area
	49,379		9.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0800	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
1.0	285	0.0842	4.67		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.3	100	0.0852	5.93		**Shallow Concentrated Flow, (LEDGE)** Paved Kv= 20.3 fps
1.1	305	0.0852	4.70		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
9.5	740	Total			

Subcatchment EX 3.1: SUB EX 3.1



Summary for Subcatchment EX 3.2: SUB EX 3.2

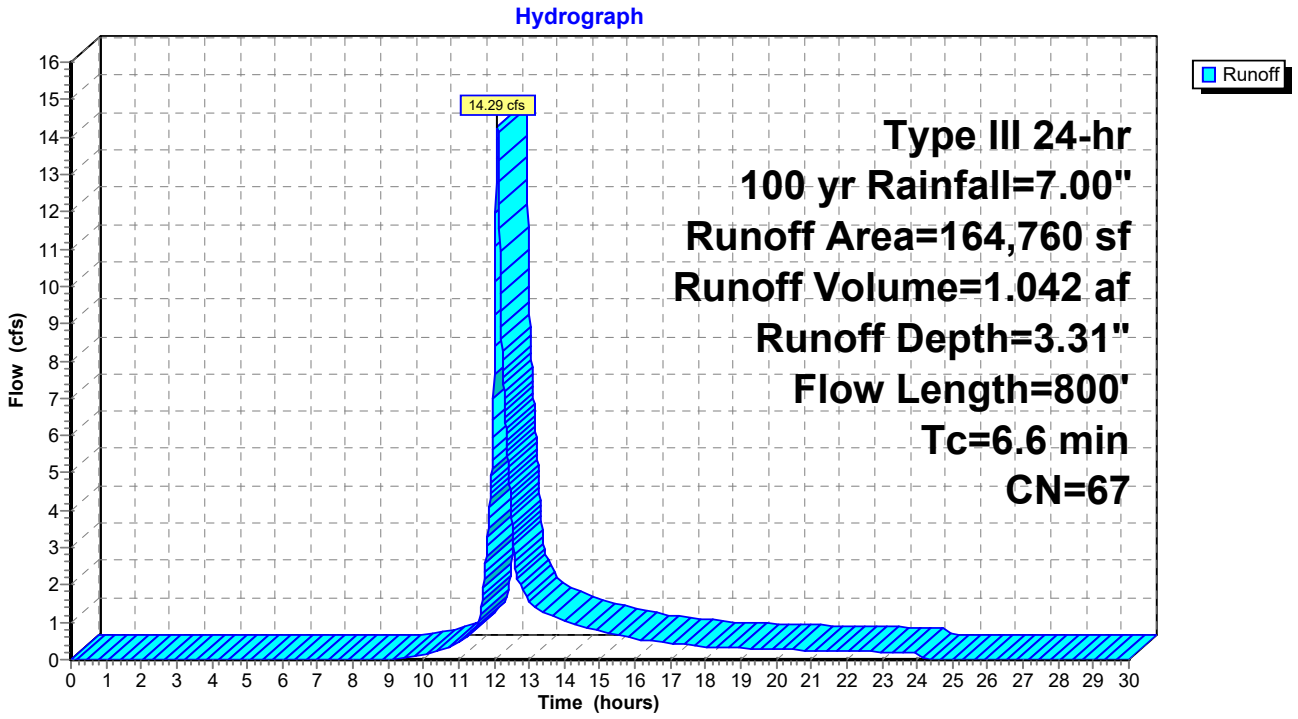
Runoff = 14.29 cfs @ 12.10 hrs, Volume= 1.042 af, Depth= 3.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=7.00"

	Area (sf)	CN	Description
	41,275	61	>75% Grass cover, Good, HSG B
	73,438	55	Woods, Good, HSG B
*	21,288	77	WETLAND AREA (Woods, HSG D)
*	28,759	98	IMP. HWY
	164,760	67	Weighted Average
	136,001		82.54% Pervious Area
	28,759		17.46% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.20		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
5.7	675	0.0148	1.96		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.2	75	0.1333	5.88		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.6	800	Total			

Subcatchment EX 3.2: SUB EX 3.2



Summary for Subcatchment EX 4.1: SUB EX 4.1

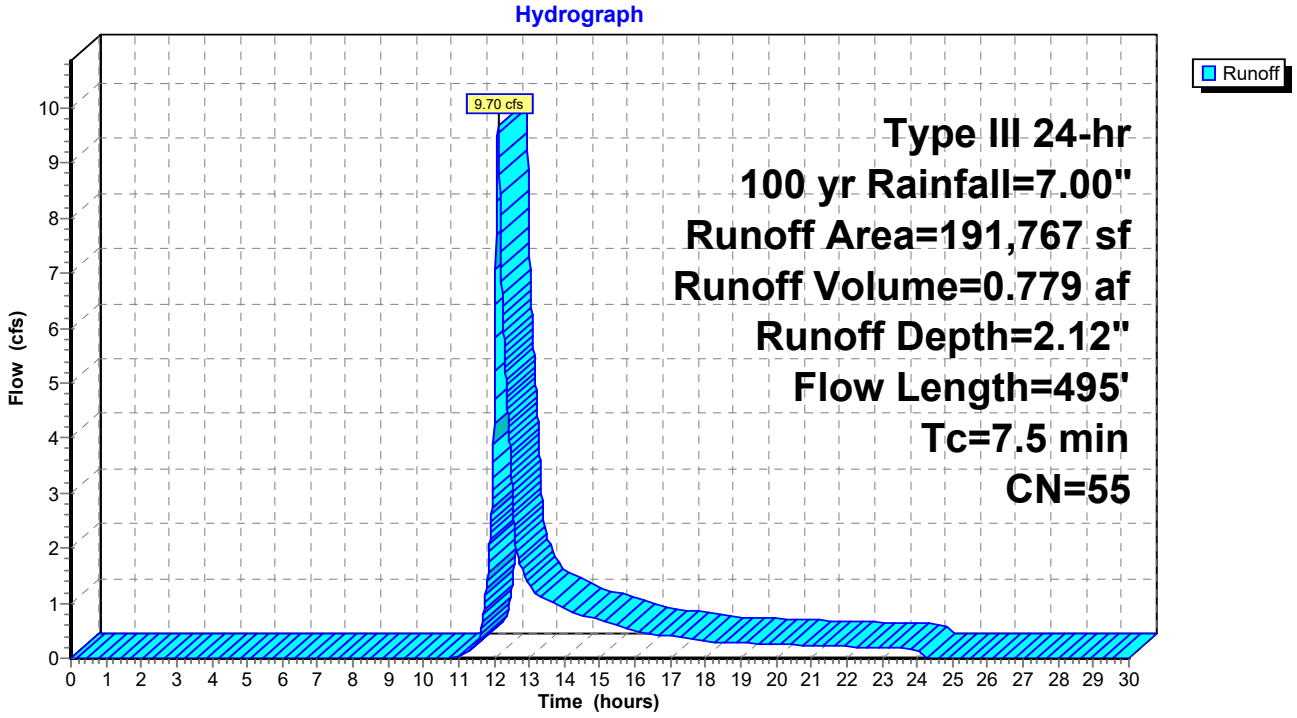
Runoff = 9.70 cfs @ 12.12 hrs, Volume= 0.779 af, Depth= 2.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=7.00"

Area (sf)	CN	Description
191,767	55	Woods, Good, HSG B
191,767		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	50	0.1600	0.16		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
1.0	190	0.0421	3.30		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.1	255	0.0627	4.03		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
7.5	495	Total			

Subcatchment EX 4.1: SUB EX 4.1



Summary for Pond W5: WETLAND 5

Inflow Area = 3.782 ac, 17.46% Impervious, Inflow Depth = 3.31" for 100 yr event
Inflow = 14.29 cfs @ 12.10 hrs, Volume= 1.042 af
Outflow = 9.89 cfs @ 12.19 hrs, Volume= 0.920 af, Atten= 31%, Lag= 5.4 min
Primary = 9.89 cfs @ 12.19 hrs, Volume= 0.920 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 369.61' @ 12.19 hrs Surf.Area= 13,069 sf Storage= 10,559 cf

Plug-Flow detention time= 89.3 min calculated for 0.920 af (88% of inflow)
Center-of-Mass det. time= 34.1 min (872.2 - 838.1)

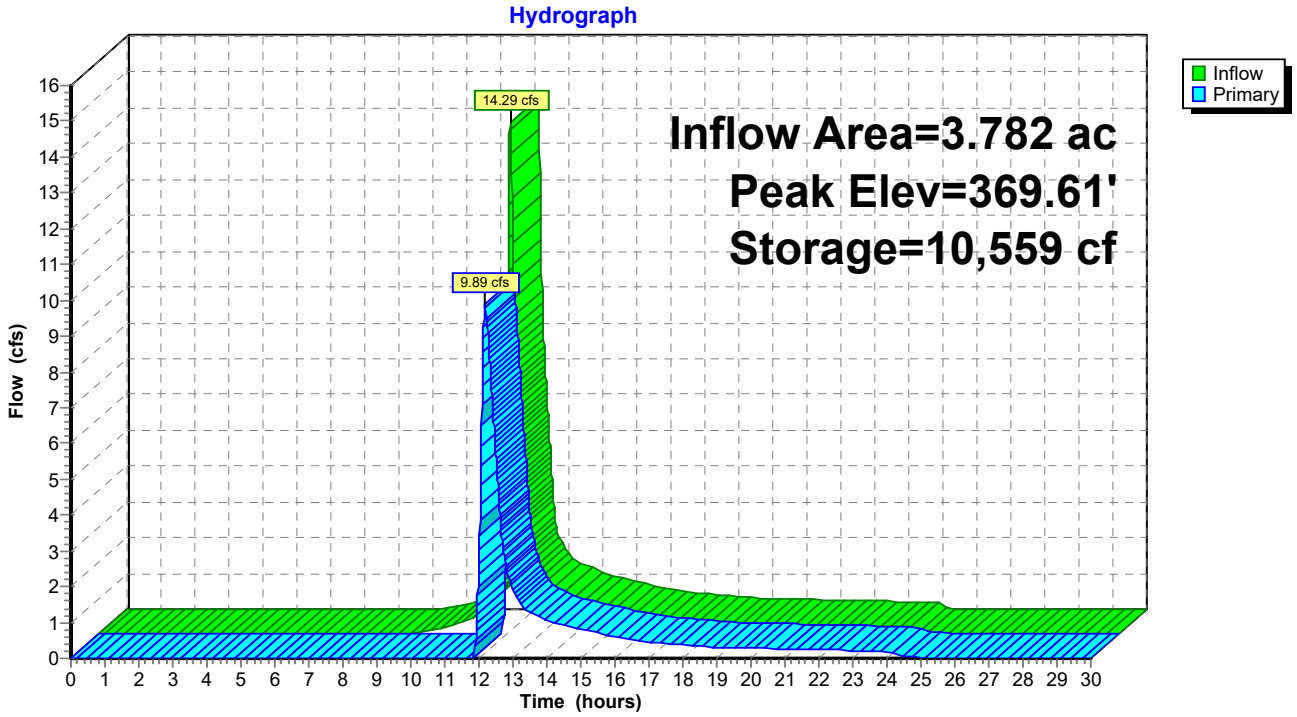
Volume	Invert	Avail.Storage	Storage Description
#1	367.80'	13,194 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
367.80	3,000	0	0
369.00	4,940	4,764	4,764
369.20	8,304	1,324	6,088
369.40	10,950	1,925	8,014
369.60	12,950	2,390	10,404
369.80	14,954	2,790	13,194

Device	Routing	Invert	Outlet Devices
#1	Primary	369.10'	**10.0' long x 64.0' 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=9.89 cfs @ 12.19 hrs HW=369.61' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** (Weir Controls 9.89 cfs @ 1.93 fps)

Pond W5: WETLAND 5



Summary for Pond W6: WETLAND 6

Inflow Area =	9.017 ac,	0.00% Impervious,	Inflow Depth =	2.60"	for 100 yr event
Inflow =	23.87 cfs @	12.14 hrs,	Volume=	1.956 af	
Outflow =	18.22 cfs @	12.23 hrs,	Volume=	1.869 af,	Atten= 24%, Lag= 5.7 min
Primary =	15.13 cfs @	12.23 hrs,	Volume=	1.783 af	
Secondary =	3.08 cfs @	12.23 hrs,	Volume=	0.086 af	

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 372.86' @ 12.23 hrs Surf.Area= 34,864 sf Storage= 13,577 cf

Plug-Flow detention time= 47.3 min calculated for 1.869 af (96% of inflow)
Center-of-Mass det. time= 23.2 min (879.7 - 856.5)

Volume	Invert	Avail.Storage	Storage Description
#1	372.20'	18,754 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

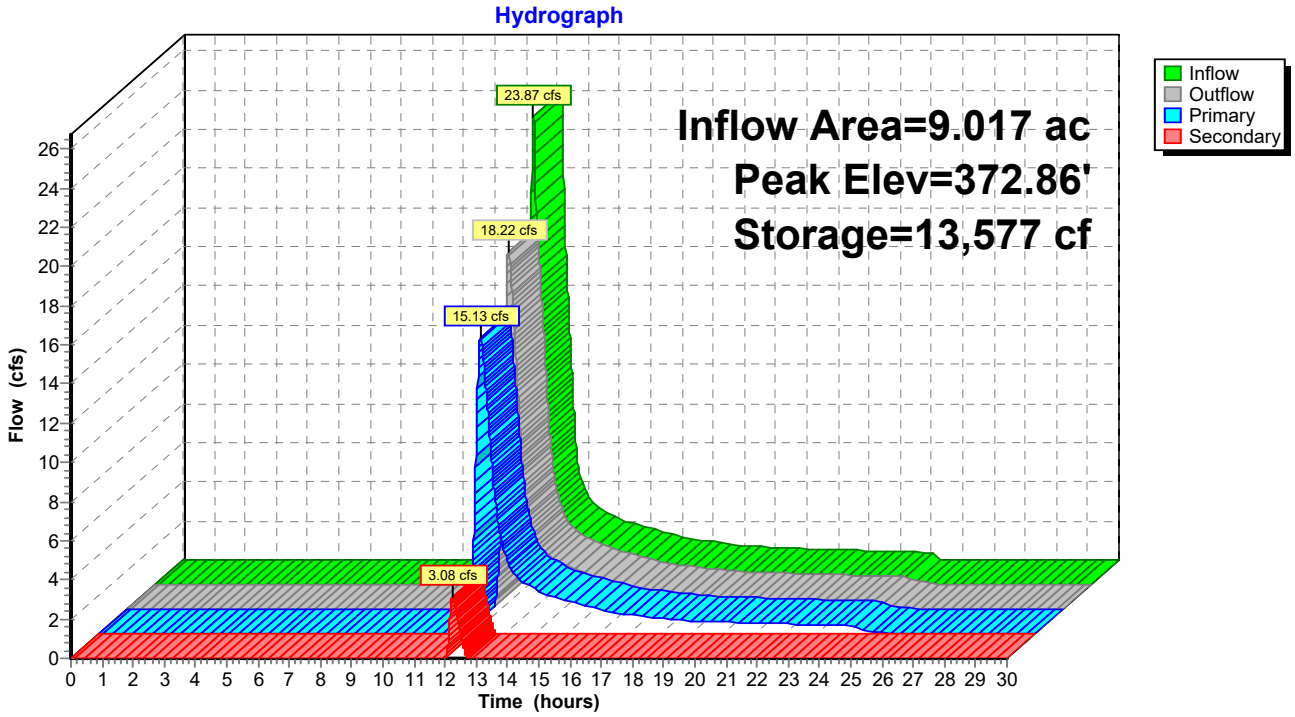
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
372.20	5,774	0	0
372.40	15,024	2,080	2,080
372.60	23,262	3,829	5,908
372.80	33,082	5,634	11,543
373.00	39,034	7,212	18,754

Device	Routing	Invert	Outlet Devices
#1	Primary	372.50'	**26.0' long x 16.0' 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	372.70'	**18.0' long x 18.0' 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=15.13 cfs @ 12.23 hrs HW=372.86' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** (Weir Controls 15.13 cfs @ 1.62 fps)

Secondary OutFlow Max=3.08 cfs @ 12.23 hrs HW=372.86' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 3.08 cfs @ 1.07 fps)

Pond W6: WETLAND 6

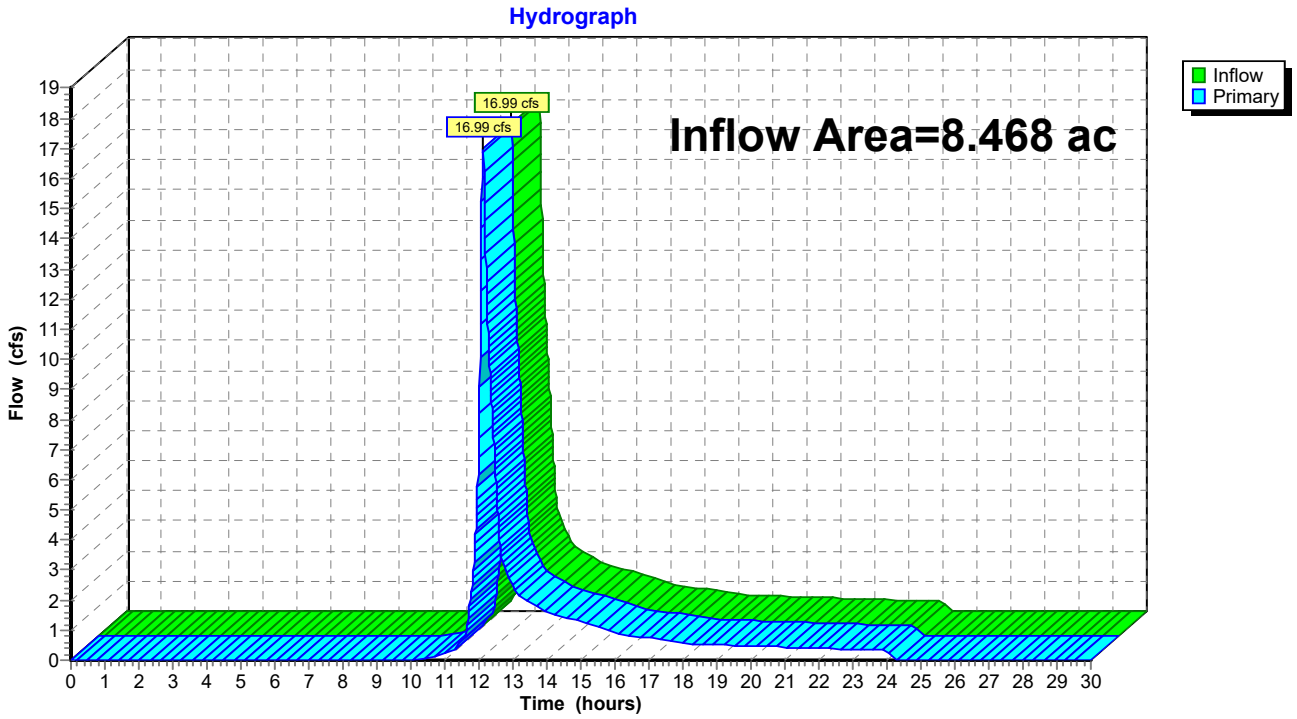


Summary for Link DP1: CHARLES RIVER/ WETLAND 3

Inflow Area = 8.468 ac, 1.09% Impervious, Inflow Depth = 2.04" for 100 yr event
Inflow = 16.99 cfs @ 12.12 hrs, Volume= 1.440 af
Primary = 16.99 cfs @ 12.12 hrs, Volume= 1.440 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link DP1: CHARLES RIVER/ WETLAND 3

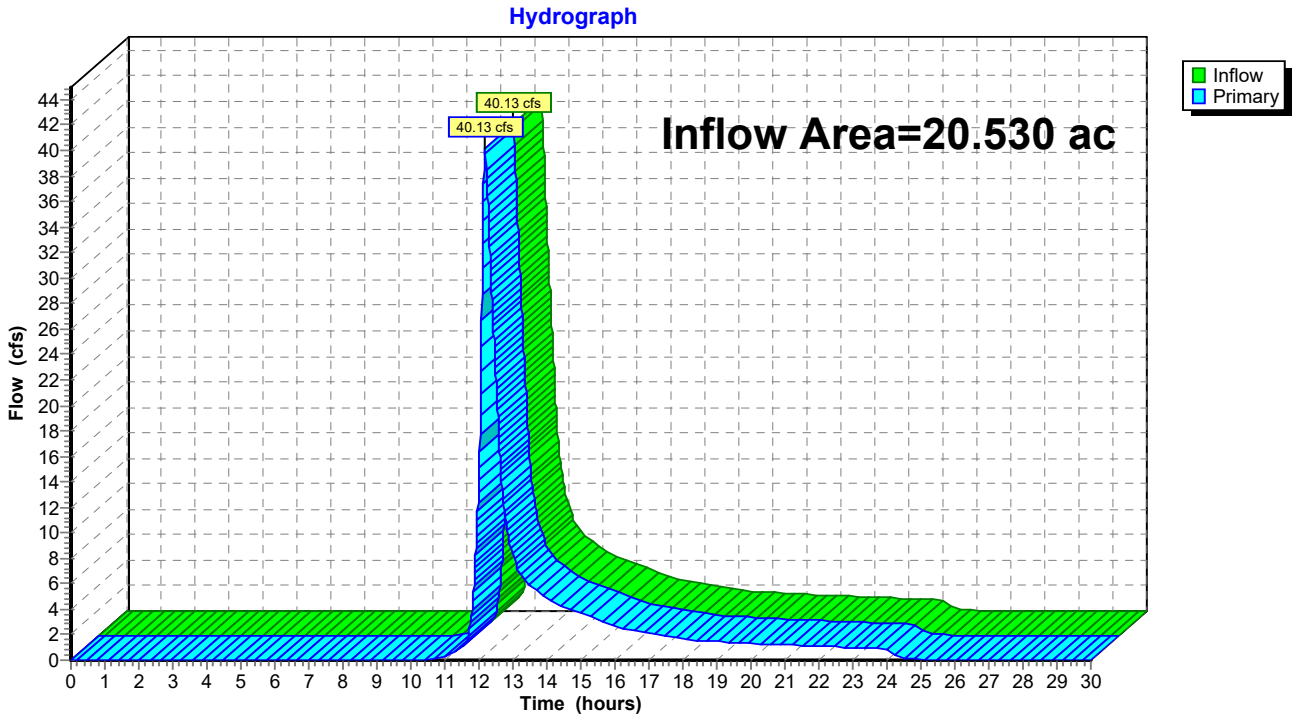


Summary for Link DP2: DEER BROOK/ WETLAND 4

Inflow Area = 20.530 ac, 0.00% Impervious, Inflow Depth = 2.39" for 100 yr event
Inflow = 40.13 cfs @ 12.18 hrs, Volume= 4.095 af
Primary = 40.13 cfs @ 12.18 hrs, Volume= 4.095 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link DP2: DEER BROOK/ WETLAND 4

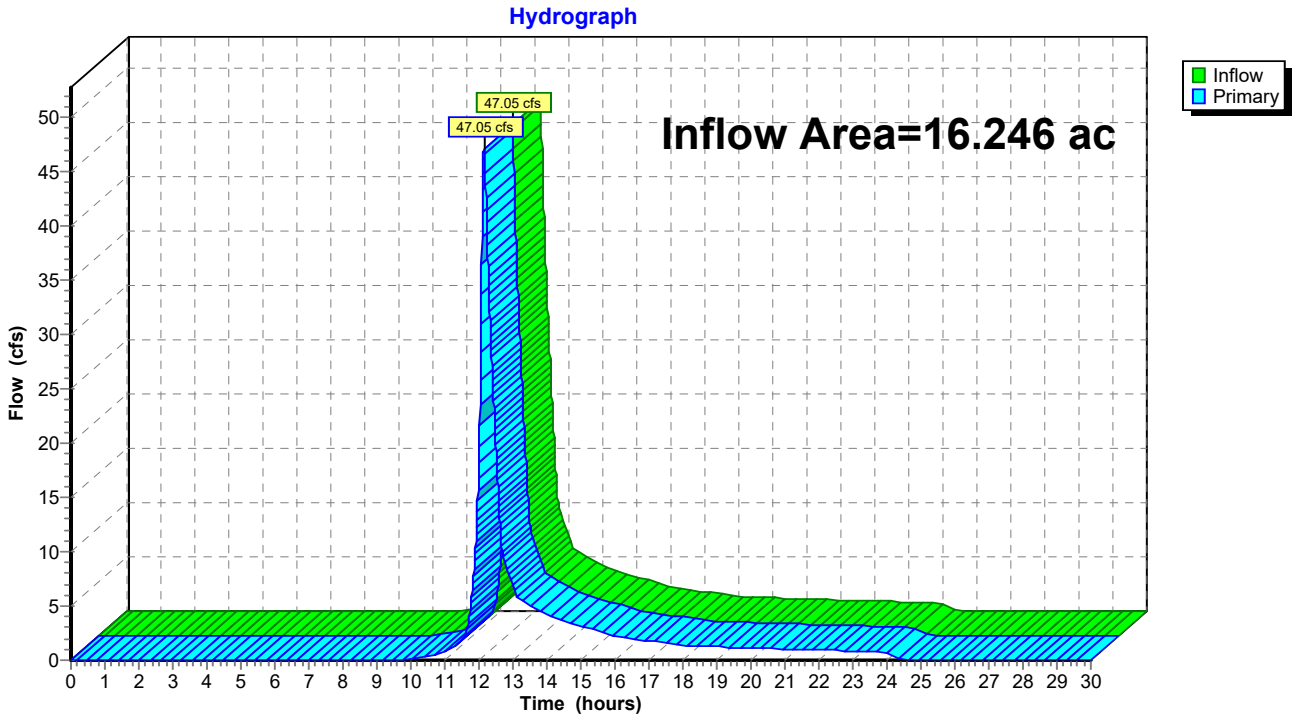


Summary for Link DP3: WETLAND 2

Inflow Area = 16.246 ac, 11.04% Impervious, Inflow Depth = 2.89" for 100 yr event
Inflow = 47.05 cfs @ 12.15 hrs, Volume= 3.915 af
Primary = 47.05 cfs @ 12.15 hrs, Volume= 3.915 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link DP3: WETLAND 2

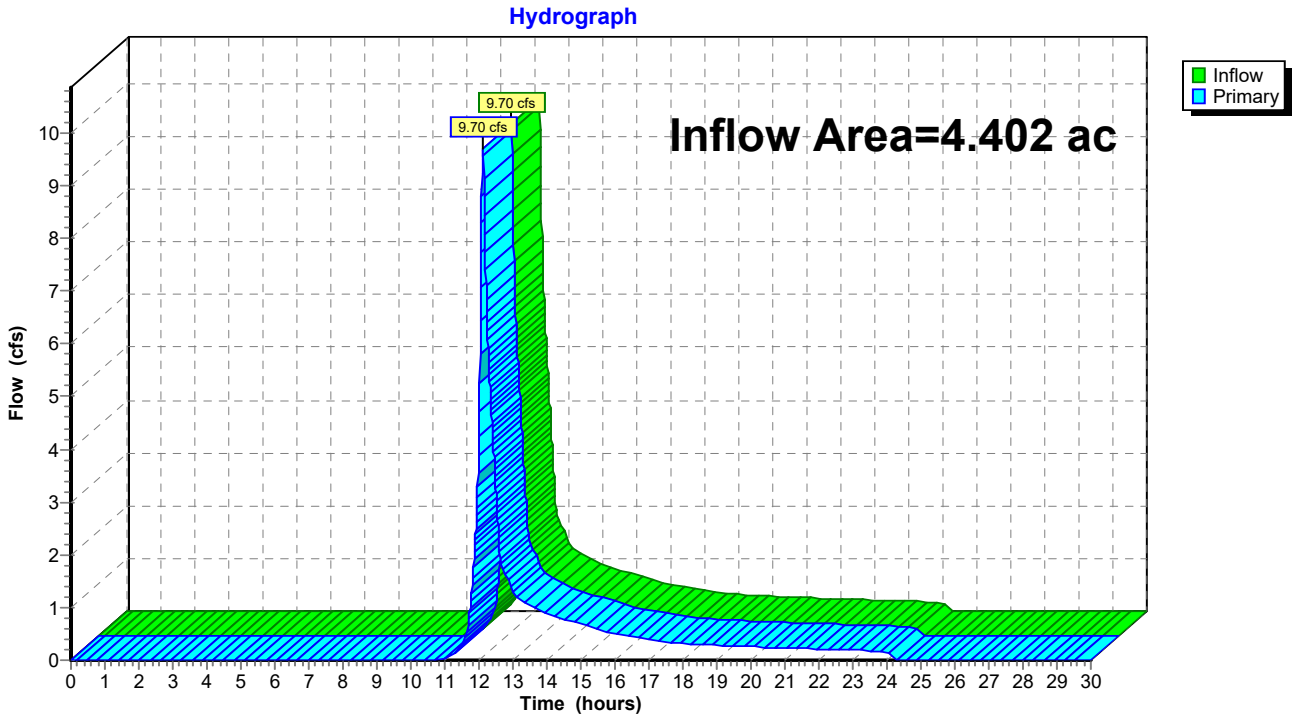


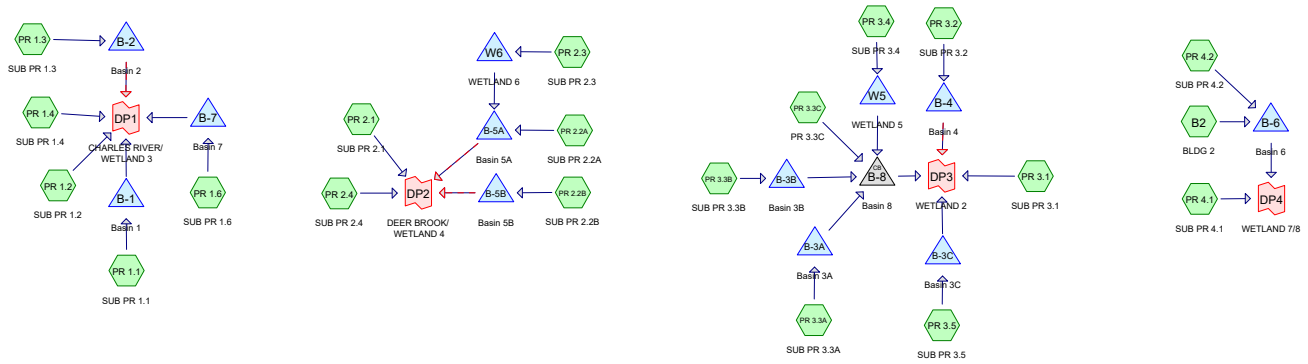
Summary for Link DP4: WETLAND 7/8

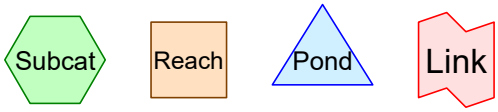
Inflow Area = 4.402 ac, 0.00% Impervious, Inflow Depth = 2.12" for 100 yr event
Inflow = 9.70 cfs @ 12.12 hrs, Volume= 0.779 af
Primary = 9.70 cfs @ 12.12 hrs, Volume= 0.779 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link DP4: WETLAND 7/8







Routing Diagram for PROPOSED
Prepared by {enter your company name here}, Printed 3/9/2018
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Summary for Subcatchment B2: BLDG 2

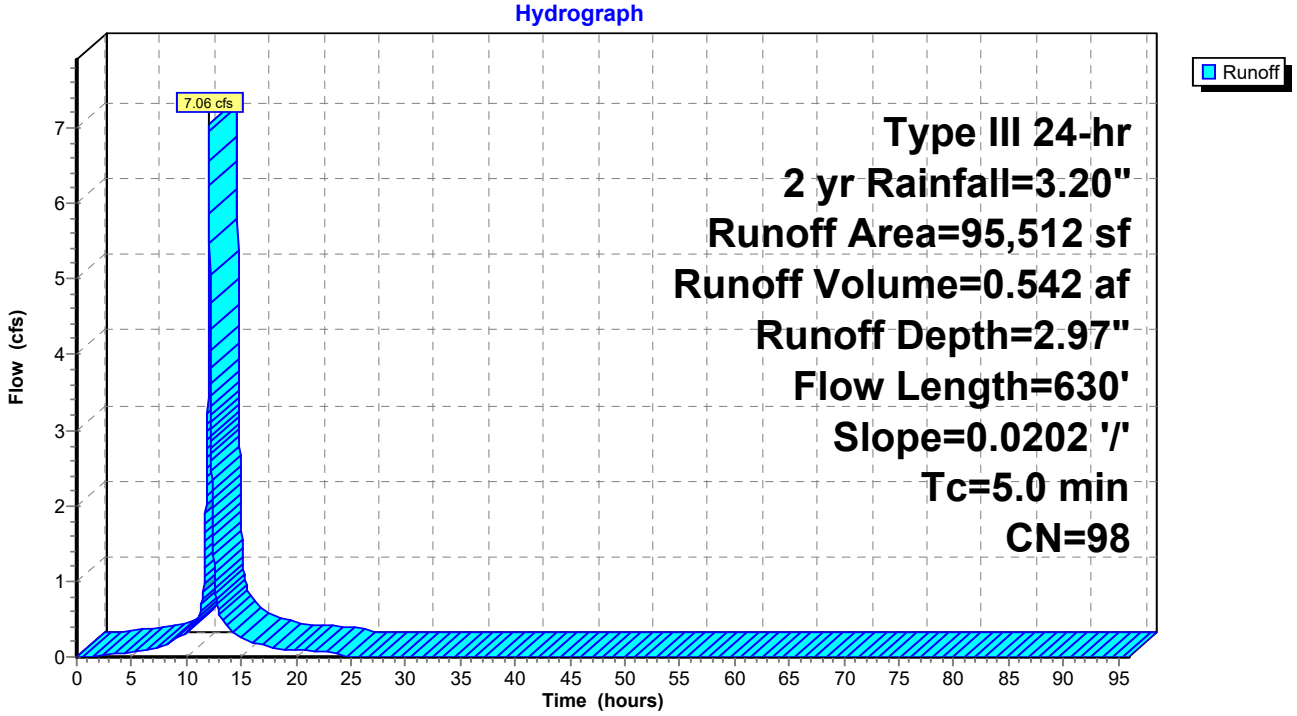
Runoff = 7.06 cfs @ 12.07 hrs, Volume= 0.542 af, Depth= 2.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.20"

	Area (sf)	CN	Description
*	95,512	98	Building
	95,512		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.4	630	0.0202	7.48	9.18	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013
1.4	630	Total, Increased to minimum Tc = 5.0 min			

Subcatchment B2: BLDG 2



Summary for Subcatchment PR 1.1: SUB PR 1.1

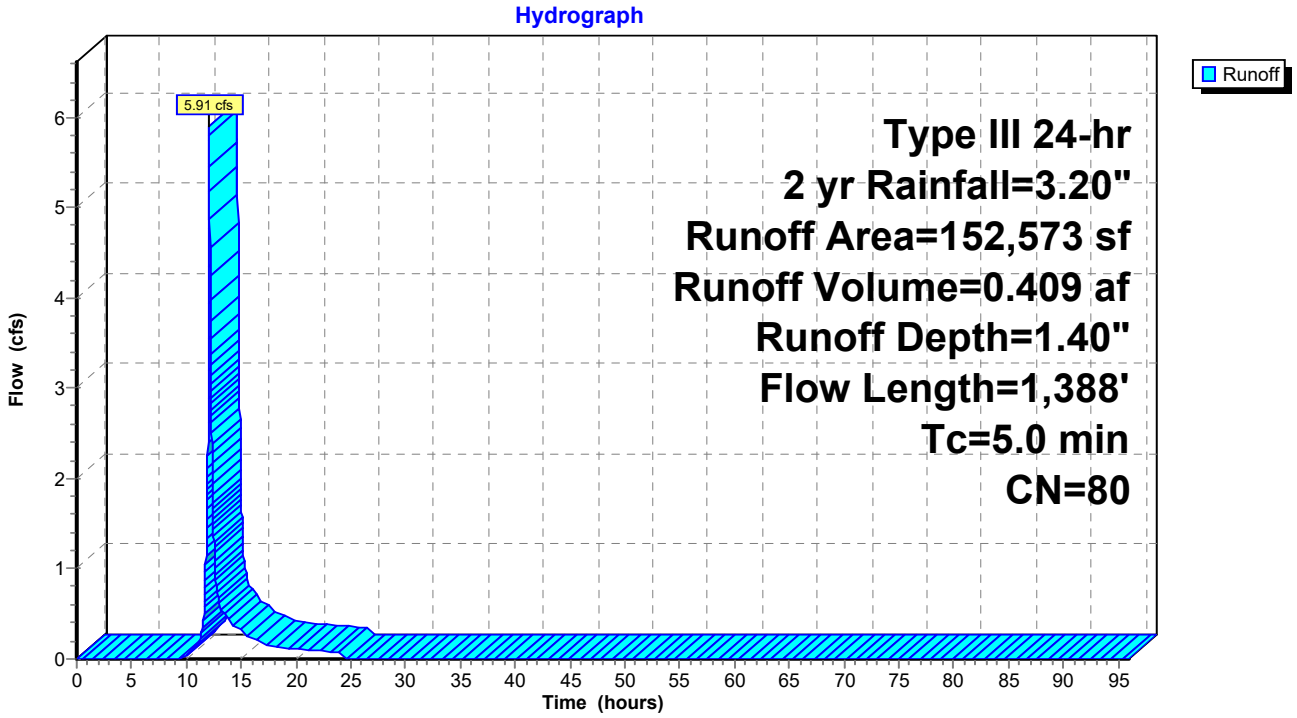
Runoff = 5.91 cfs @ 12.08 hrs, Volume= 0.409 af, Depth= 1.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.20"

Area (sf)	CN	Description
97,308	98	Paved parking & roofs
33,365	39	>75% Grass cover, Good, HSG A
21,353	61	>75% Grass cover, Good, HSG B
547	80	>75% Grass cover, Good, HSG D
152,573	80	Weighted Average
55,265		36.22% Pervious Area
97,308		63.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0294	1.40		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
1.4	243	0.0192	2.81		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.6	1,095	0.0183	7.12	8.74	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Concrete pipe, bends & connections
4.6	1,388	Total, Increased to minimum Tc = 5.0 min			

Subcatchment PR 1.1: SUB PR 1.1



Summary for Subcatchment PR 1.2: SUB PR 1.2

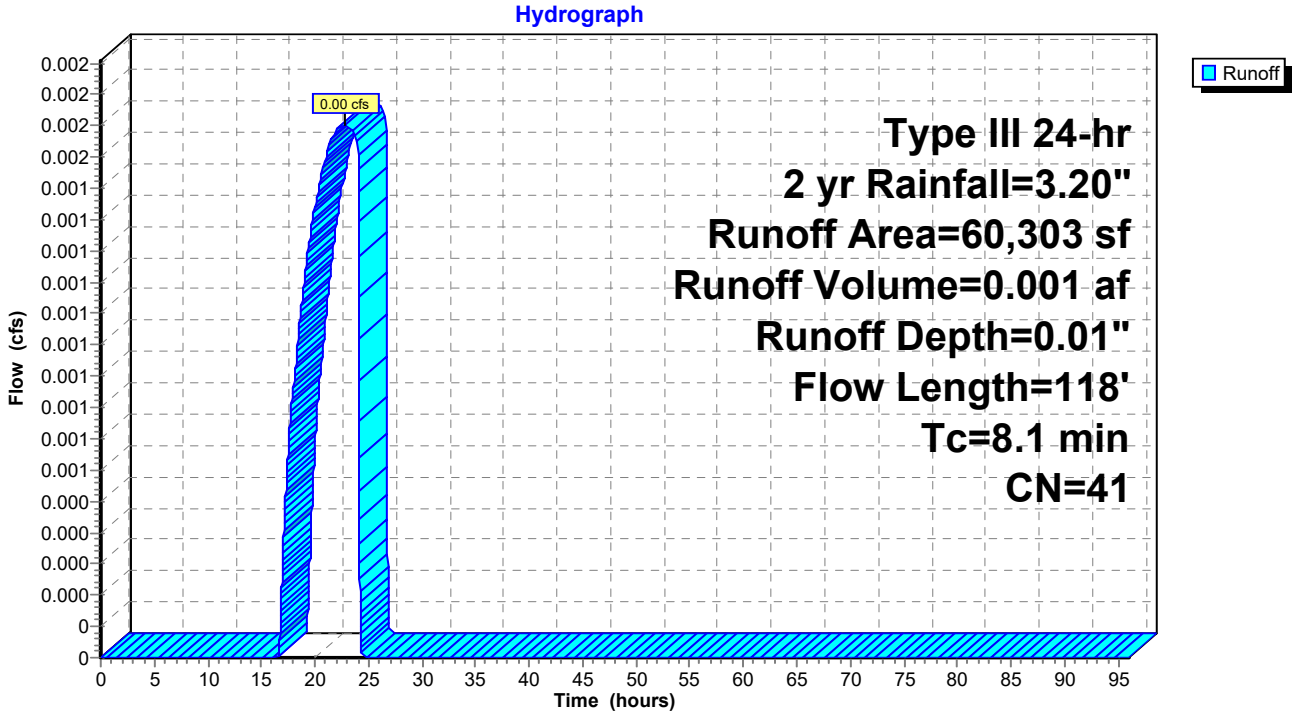
Runoff = 0.00 cfs @ 22.76 hrs, Volume= 0.001 af, Depth= 0.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.20"

Area (sf)	CN	Description
6,527	39	>75% Grass cover, Good, HSG A
38,151	30	Woods, Good, HSG A
8,676	61	>75% Grass cover, Good, HSG B
2,606	80	>75% Grass cover, Good, HSG D
4,343	77	Woods, Good, HSG D
60,303	41	Weighted Average
60,303		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0600	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.2	68	0.0880	4.78		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
8.1	118	Total			

Subcatchment PR 1.2: SUB PR 1.2



Summary for Subcatchment PR 1.3: SUB PR 1.3

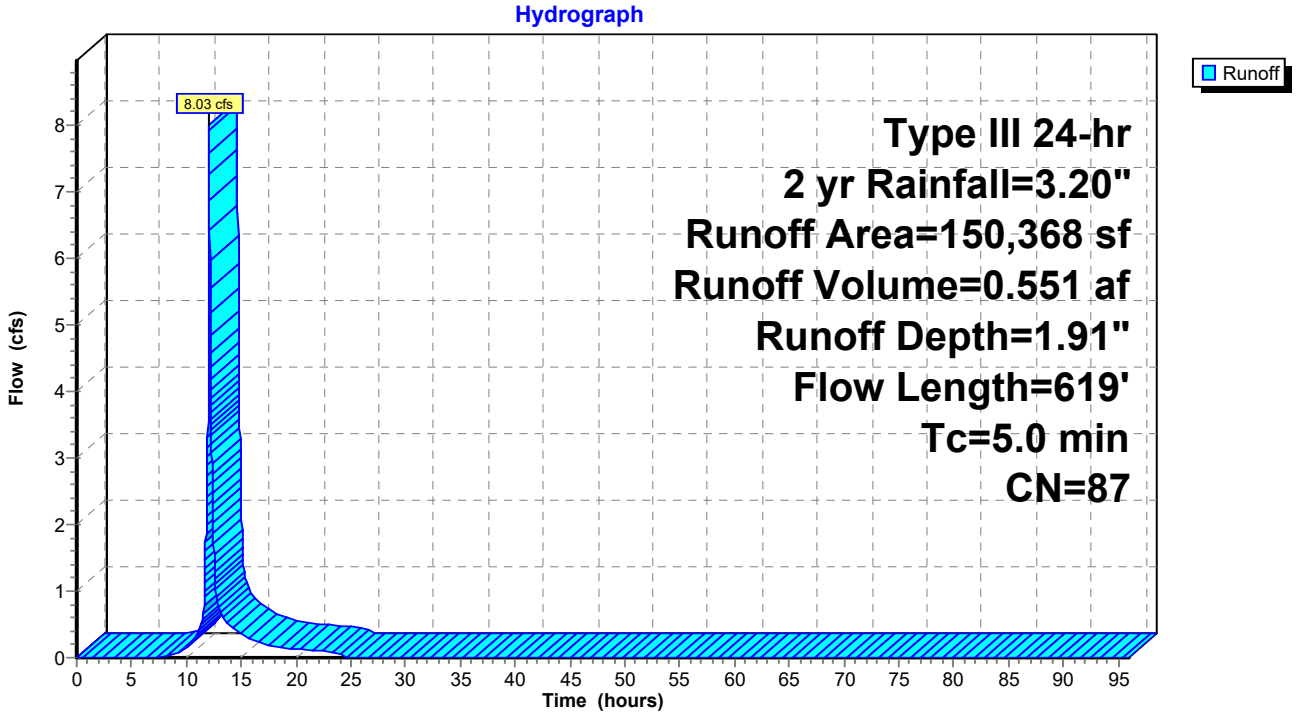
Runoff = 8.03 cfs @ 12.07 hrs, Volume= 0.551 af, Depth= 1.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.20"

	Area (sf)	CN	Description
*	106,654	98	Paved parking, Roofs, HSG B
	25,272	61	>75% Grass cover, Good, HSG B
*	18,442	61	Inf. Basin; >75% Grass cover, Good, HSG B
	150,368	87	Weighted Average
	43,714		29.07% Pervious Area
	106,654		70.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	50	0.0125	0.99		**Sheet Flow, Sheet - ESTIMATE** Smooth surfaces n= 0.011 P2= 3.20"
1.5	569	0.0200	6.42	5.04	**Pipe Channel, Pipe - ESTIMATE** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Concrete pipe, bends & connections
2.3	619	Total, Increased to minimum Tc = 5.0 min			

Subcatchment PR 1.3: SUB PR 1.3



Summary for Subcatchment PR 1.4: SUB PR 1.4

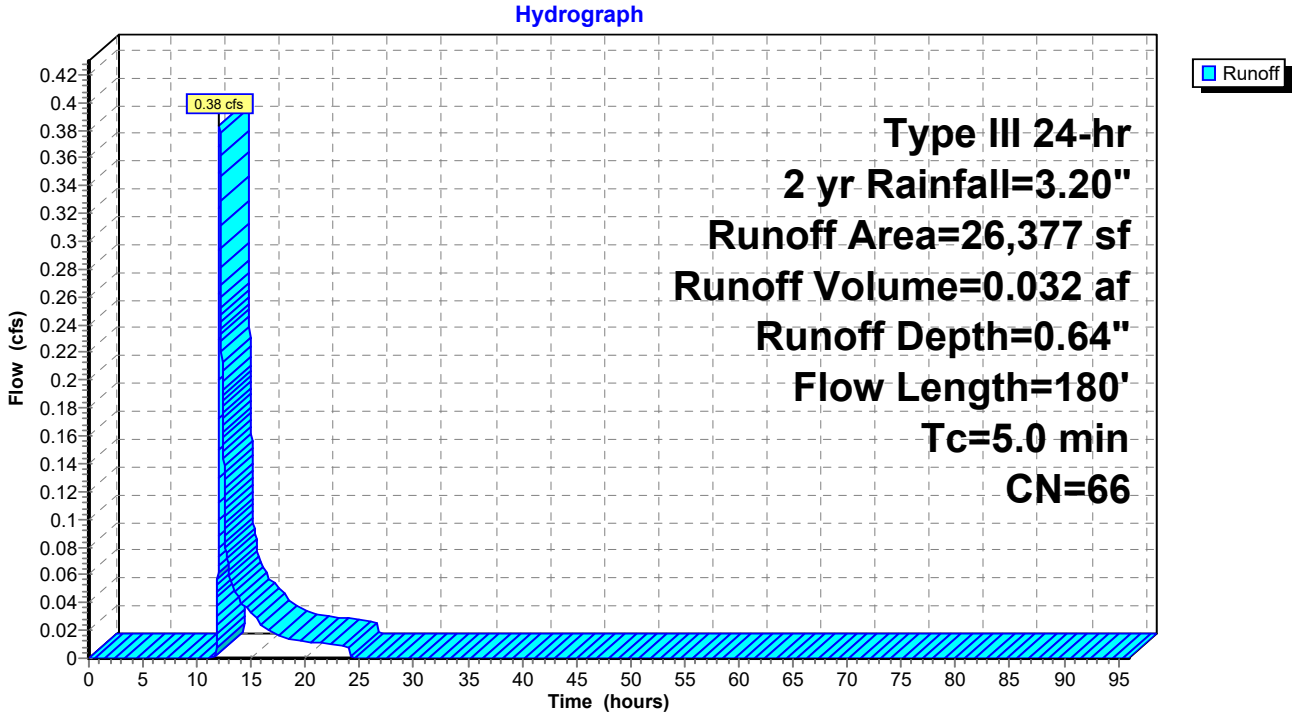
Runoff = 0.38 cfs @ 12.09 hrs, Volume= 0.032 af, Depth= 0.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.20"

Area (sf)	CN	Description
19,466	61	>75% Grass cover, Good, HSG B
6,911	80	>75% Grass cover, Good, HSG D
26,377	66	Weighted Average
26,377		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	41	0.5000	0.52		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.6	139	0.0647	4.10		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.9	180	Total, Increased to minimum Tc = 5.0 min			

Subcatchment PR 1.4: SUB PR 1.4



Summary for Subcatchment PR 1.6: SUB PR 1.6

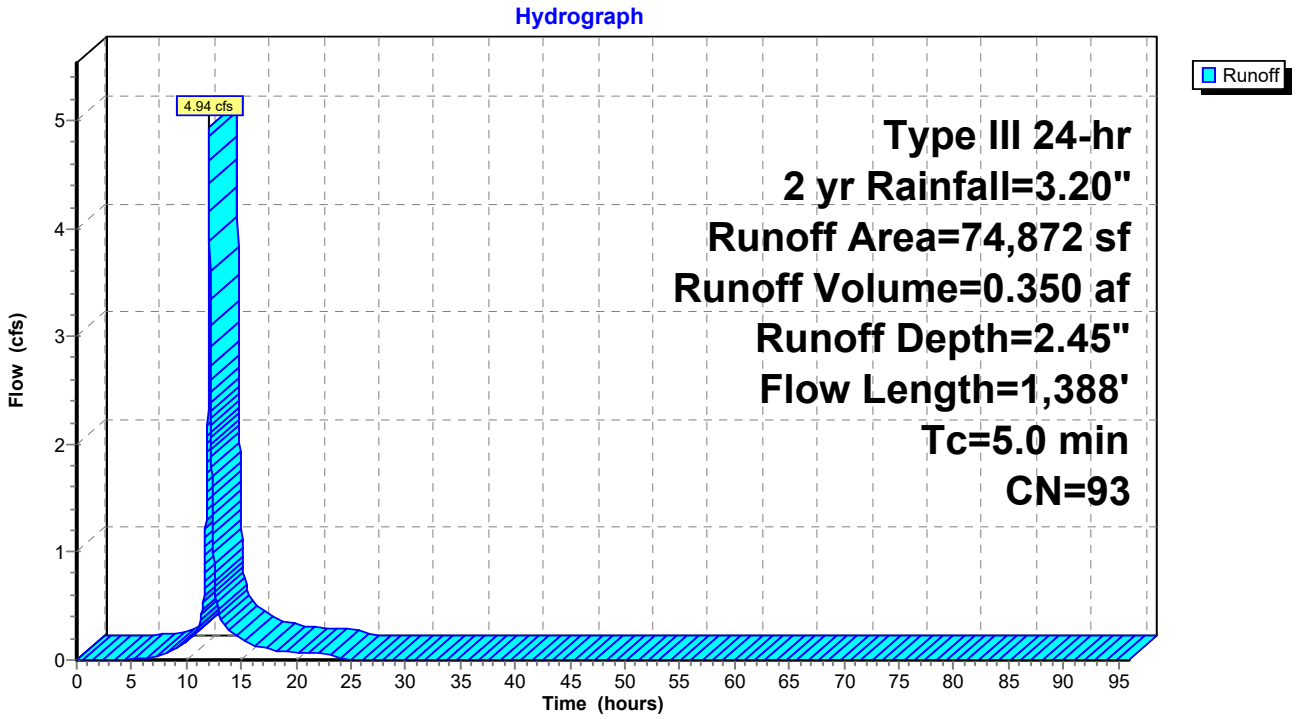
Runoff = 4.94 cfs @ 12.07 hrs, Volume= 0.350 af, Depth= 2.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.20"

Area (sf)	CN	Description
64,814	98	Paved parking & roofs
10,058	61	>75% Grass cover, Good, HSG B
74,872	93	Weighted Average
10,058		13.43% Pervious Area
64,814		86.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0294	1.40		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
1.4	243	0.0192	2.81		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.6	1,095	0.0183	7.12	8.74	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Concrete pipe, bends & connections
4.6	1,388	Total, Increased to minimum Tc = 5.0 min			

Subcatchment PR 1.6: SUB PR 1.6



Summary for Subcatchment PR 2.1: SUB PR 2.1

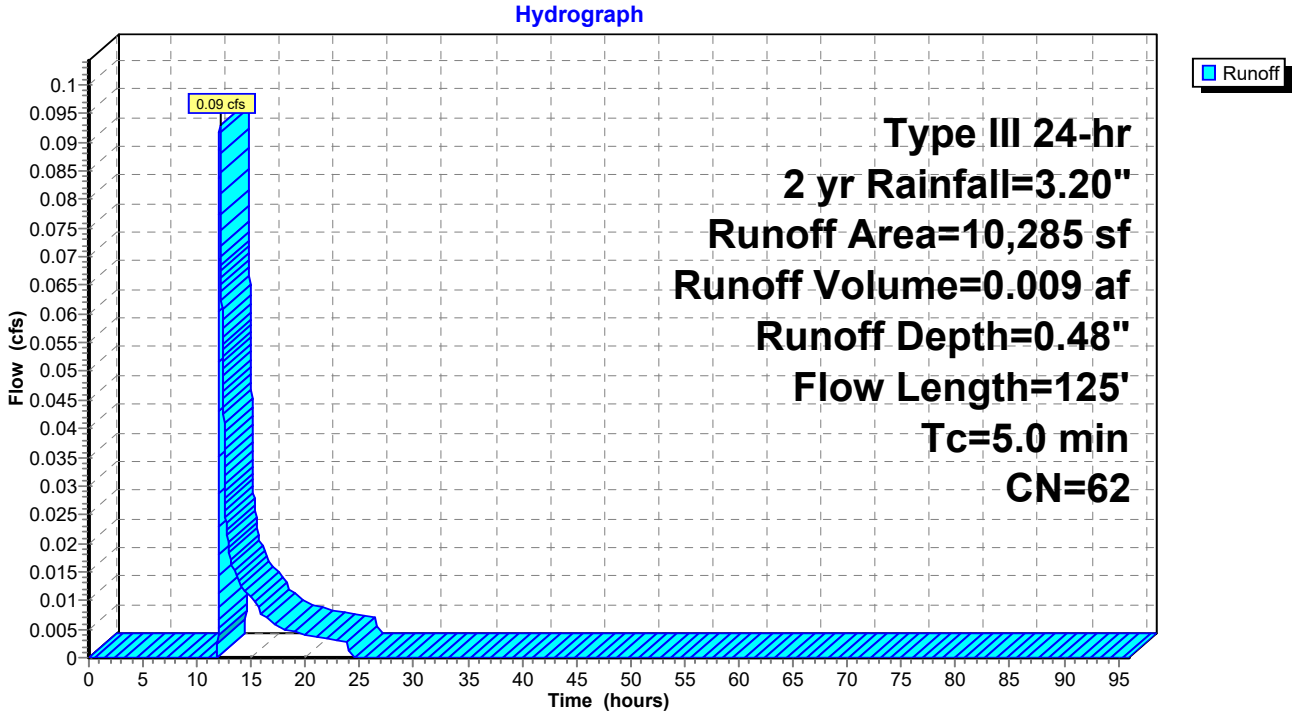
Runoff = 0.09 cfs @ 12.10 hrs, Volume= 0.009 af, Depth= 0.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.20"

Area (sf)	CN	Description
490	39	>75% Grass cover, Good, HSG A
8,567	61	>75% Grass cover, Good, HSG B
1,228	80	>75% Grass cover, Good, HSG D
10,285	62	Weighted Average
10,285		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.20		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.0	20	0.2857	8.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.3	55	0.0455	3.43		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
4.6	125	Total, Increased to minimum Tc = 5.0 min			

Subcatchment PR 2.1: SUB PR 2.1



Summary for Subcatchment PR 2.2A: SUB PR 2.2A

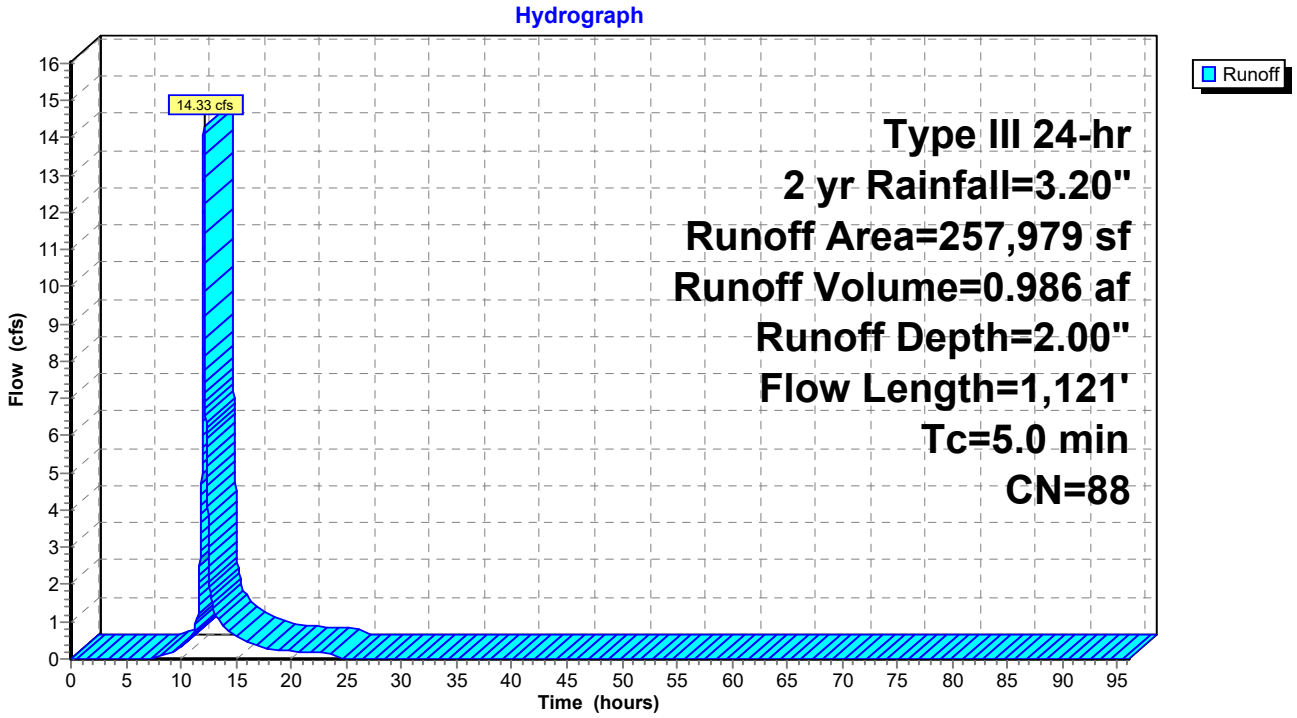
Runoff = 14.33 cfs @ 12.07 hrs, Volume= 0.986 af, Depth= 2.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.20"

	Area (sf)	CN	Description
	176,686	98	Paved parking, HSG B
	25,211	61	>75% Grass cover, Good, HSG B
	18,821	80	>75% Grass cover, Good, HSG D
*	37,261	61	Inf. Basin; >75% Grass cover, Good, HSG B
	257,979	88	Weighted Average
	81,293		31.51% Pervious Area
	176,686		68.49% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	50	0.0500	1.73		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
1.6	275	0.0196	2.84		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.1	796	0.0566	12.52	15.37	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Concrete pipe, bends & connections
3.2	1,121	Total, Increased to minimum Tc = 5.0 min			

Subcatchment PR 2.2A: SUB PR 2.2A



Summary for Subcatchment PR 2.2B: SUB PR 2.2B

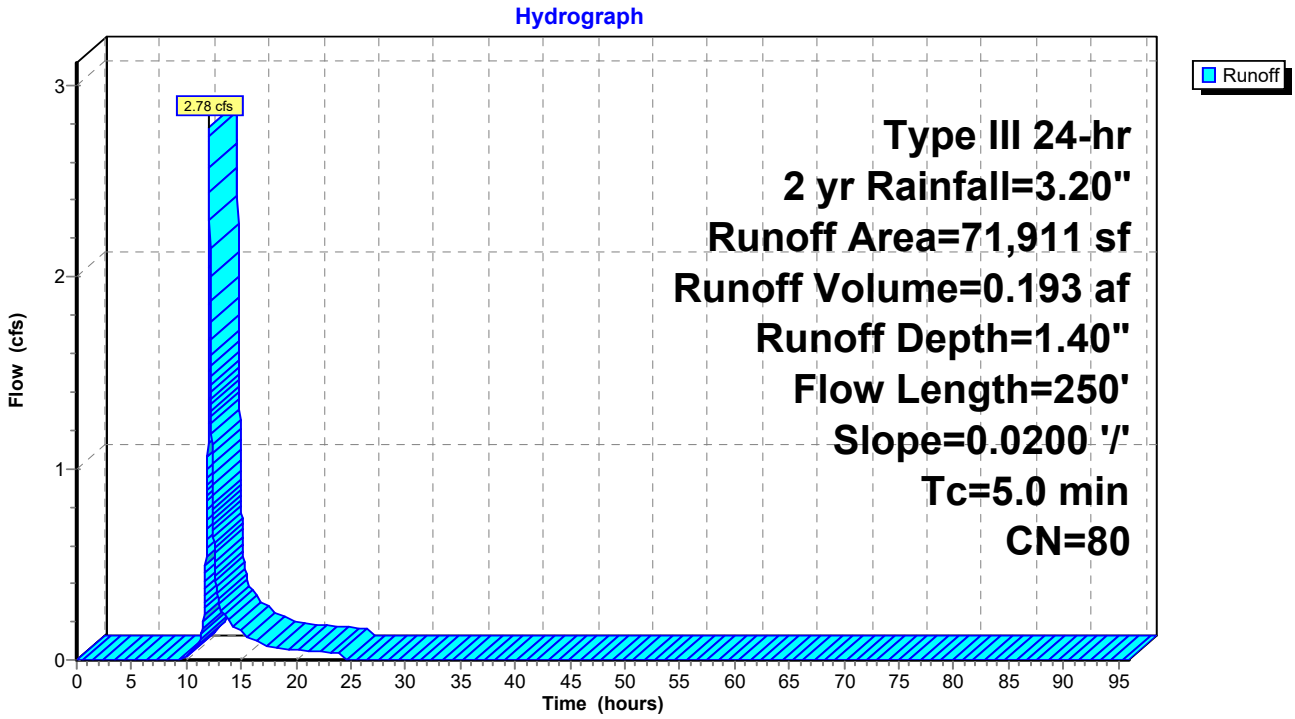
Runoff = 2.78 cfs @ 12.08 hrs, Volume= 0.193 af, Depth= 1.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.20"

	Area (sf)	CN	Description
	31,953	98	Paved parking, HSG B
	16,585	61	>75% Grass cover, Good, HSG B
	9,536	80	>75% Grass cover, Good, HSG D
*	13,837	61	Inf. Basin; >75% Grass cover, Good, HSG B
	71,911	80	Weighted Average
	39,958		55.57% Pervious Area
	31,953		44.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.20		**Sheet Flow, Sheet - ESTIMATE** Smooth surfaces n= 0.011 P2= 3.20"
0.5	200	0.0200	6.42	5.04	**Pipe Channel, Pipe - ESTIMATE** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Concrete pipe, bends & connections
1.2	250	Total, Increased to minimum Tc = 5.0 min			

Subcatchment PR 2.2B: SUB PR 2.2B



Summary for Subcatchment PR 2.3: SUB PR 2.3

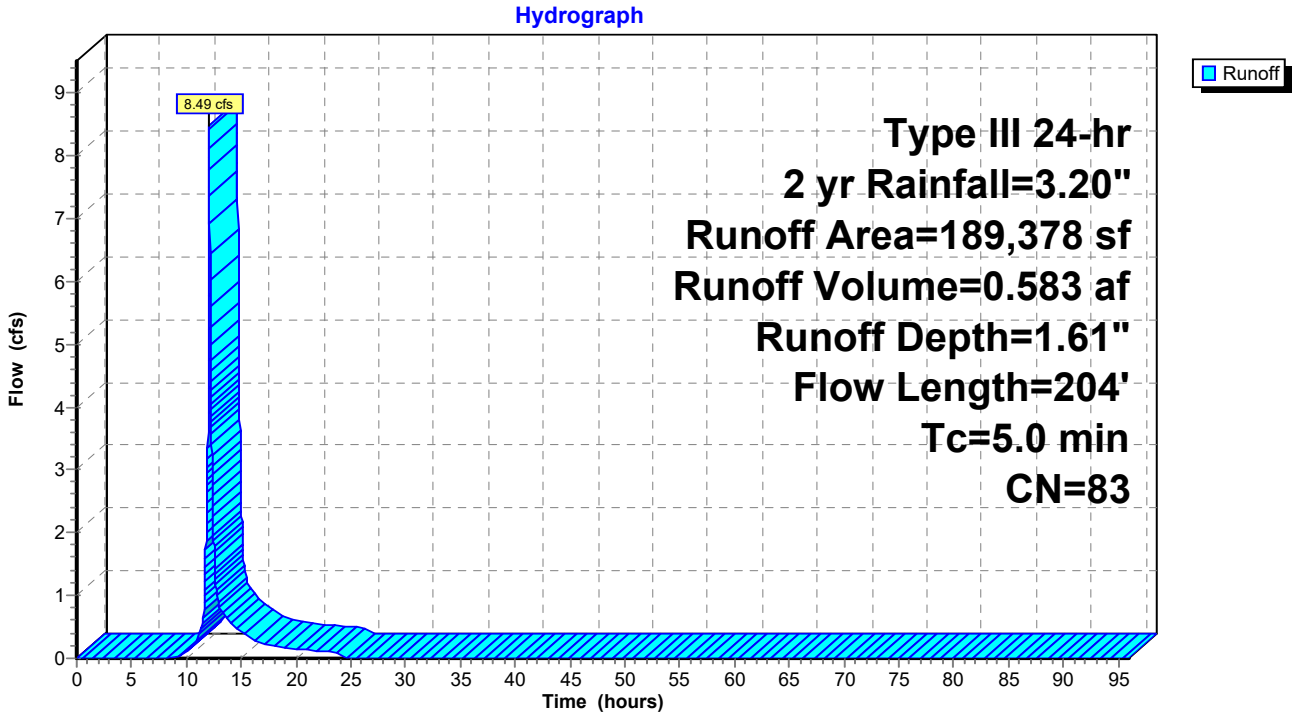
Runoff = 8.49 cfs @ 12.08 hrs, Volume= 0.583 af, Depth= 1.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.20"

Area (sf)	CN	Description
28,343	55	Woods, Good, HSG B
40,833	77	Woods, Good, HSG D
33,965	77	Wetland (Woods, Good, HSG D)
86,237	98	Paved parking & roofs
189,378	83	Weighted Average
103,141		54.46% Pervious Area
86,237		45.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.20		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.1	28	0.0643	4.08		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.3	81	0.0364	3.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.1	45	0.0200	7.44	9.14	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013
4.8	204	Total, Increased to minimum Tc = 5.0 min			

Subcatchment PR 2.3: SUB PR 2.3



Summary for Subcatchment PR 2.4: SUB PR 2.4

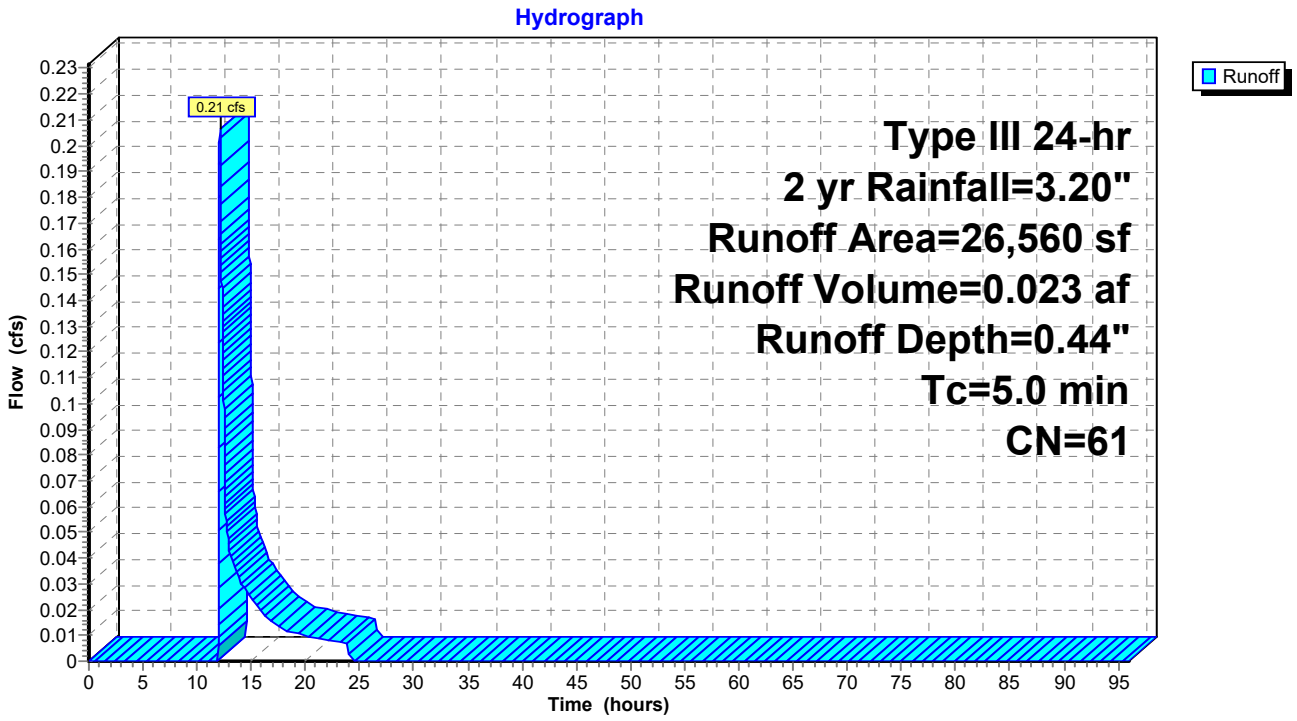
Runoff = 0.21 cfs @ 12.11 hrs, Volume= 0.023 af, Depth= 0.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.20"

Area (sf)	CN	Description
26,560	61	>75% Grass cover, Good, HSG B
26,560		100.00% Pervious Area

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

Subcatchment PR 2.4: SUB PR 2.4



Summary for Subcatchment PR 3.1: SUB PR 3.1

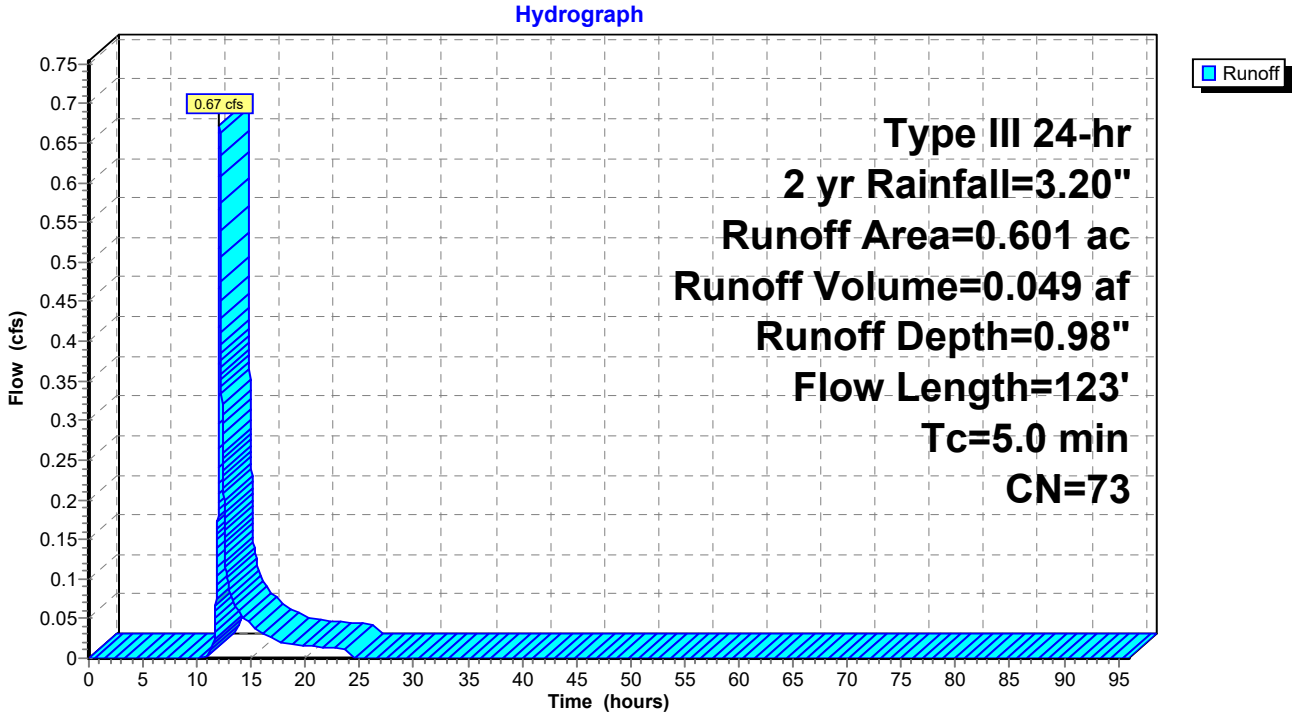
Runoff = 0.67 cfs @ 12.08 hrs, Volume= 0.049 af, Depth= 0.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.20"

Area (ac)	CN	Description
0.219	61	>75% Grass cover, Good, HSG B
0.382	80	>75% Grass cover, Good, HSG D
0.601	73	Weighted Average
0.601		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	33	0.5000	0.49		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.2	90	0.1444	6.12		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.3	123	Total, Increased to minimum Tc = 5.0 min			

Subcatchment PR 3.1: SUB PR 3.1



Summary for Subcatchment PR 3.2: SUB PR 3.2

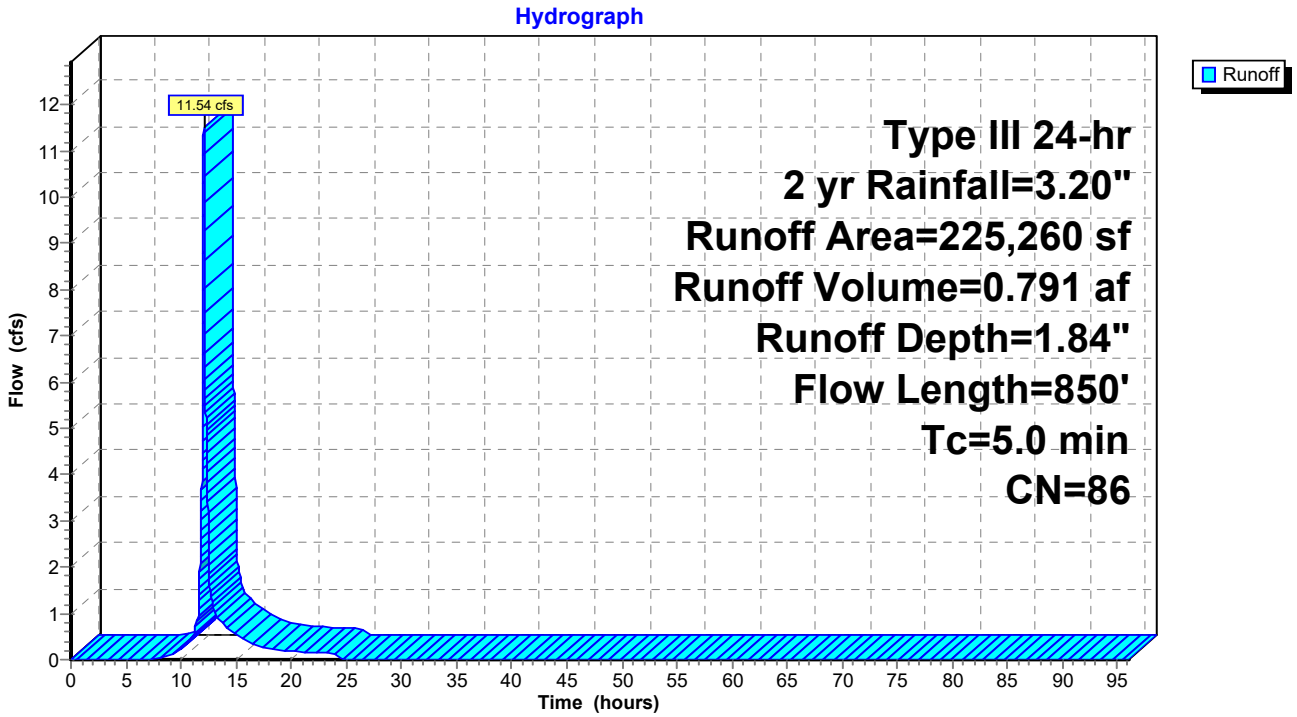
Runoff = 11.54 cfs @ 12.07 hrs, Volume= 0.791 af, Depth= 1.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.20"

	Area (sf)	CN	Description
*	151,349	98	Paved parking, Roofs, HSG B
	449	39	>75% Grass cover, Good, HSG A
	35,075	61	>75% Grass cover, Good, HSG B
	10,439	80	>75% Grass cover, Good, HSG D
*	27,948	58	Wetlands, Good, HSG B
	225,260	86	Weighted Average
	73,911		32.81% Pervious Area
	151,349		67.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.20		**Sheet Flow, Sheet - ESTIMATE** Smooth surfaces n= 0.011 P2= 3.20"
1.1	800	0.0500	11.77	14.44	**Pipe Channel, Pipe - ESTIMATE** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Concrete pipe, bends & connections
1.8	850	Total, Increased to minimum Tc = 5.0 min			

Subcatchment PR 3.2: SUB PR 3.2



Summary for Subcatchment PR 3.3A: SUB PR 3.3A

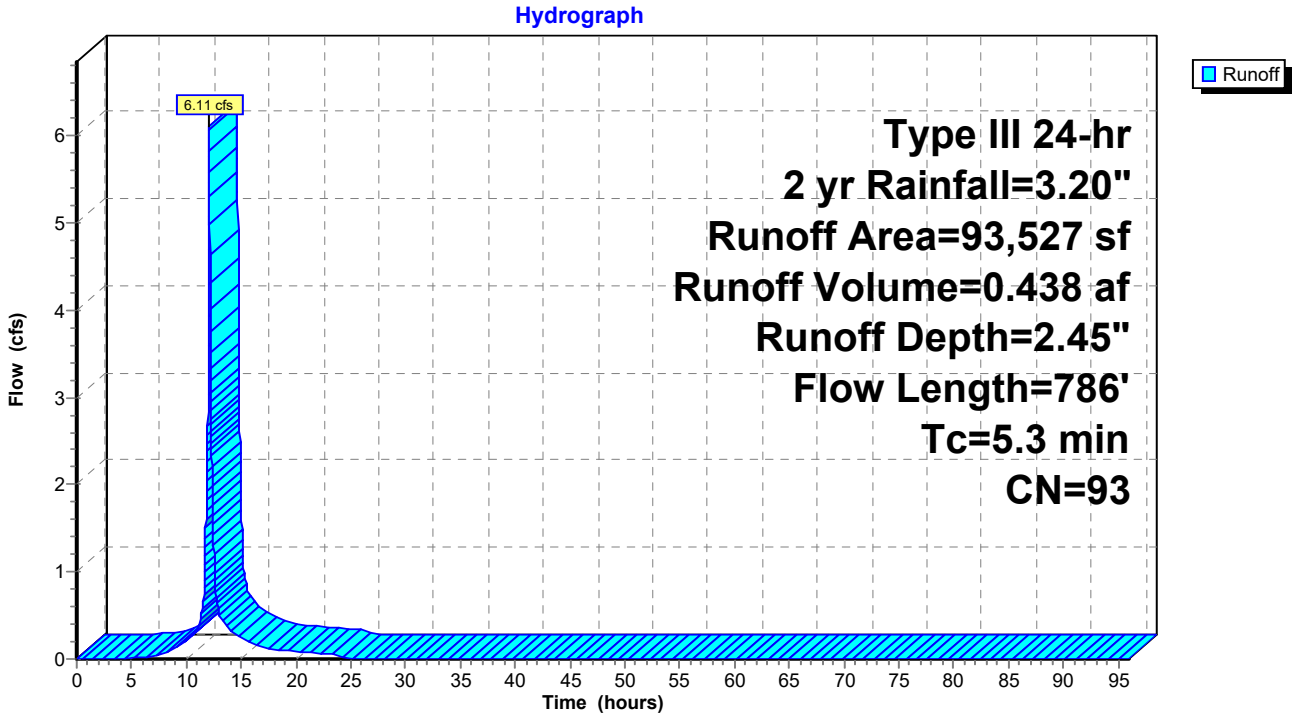
Runoff = 6.11 cfs @ 12.08 hrs, Volume= 0.438 af, Depth= 2.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.20"

Area (sf)	CN	Description
80,340	98	Paved parking & roofs
13,187	61	>75% Grass cover, Good, HSG B
93,527	93	Weighted Average
13,187		14.10% Pervious Area
80,340		85.90% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.7	50	0.0556	0.22		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.1	44	0.1000	5.09		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.0	218	0.0500	3.60		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.5	474	0.0759	14.50	17.80	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013
5.3	786	Total			

Subcatchment PR 3.3A: SUB PR 3.3A



Summary for Subcatchment PR 3.3B: SUB PR 3.3B

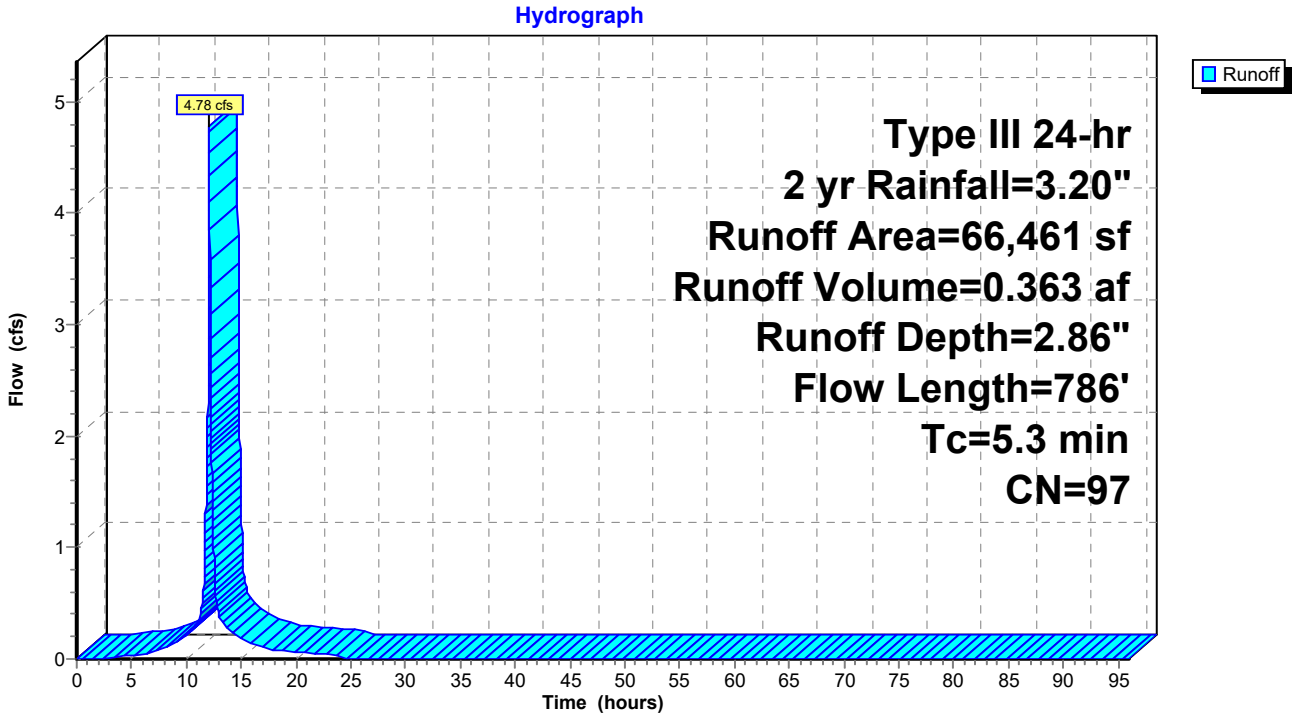
Runoff = 4.78 cfs @ 12.07 hrs, Volume= 0.363 af, Depth= 2.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.20"

Area (sf)	CN	Description
64,803	98	Paved parking & roofs
1,658	61	>75% Grass cover, Good, HSG B
66,461	97	Weighted Average
1,658		2.49% Pervious Area
64,803		97.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.7	50	0.0556	0.22		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.1	44	0.1000	5.09		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.0	218	0.0500	3.60		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.5	474	0.0759	14.50	17.80	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013
5.3	786	Total			

Subcatchment PR 3.3B: SUB PR 3.3B



Summary for Subcatchment PR 3.3C: PR 3.3C

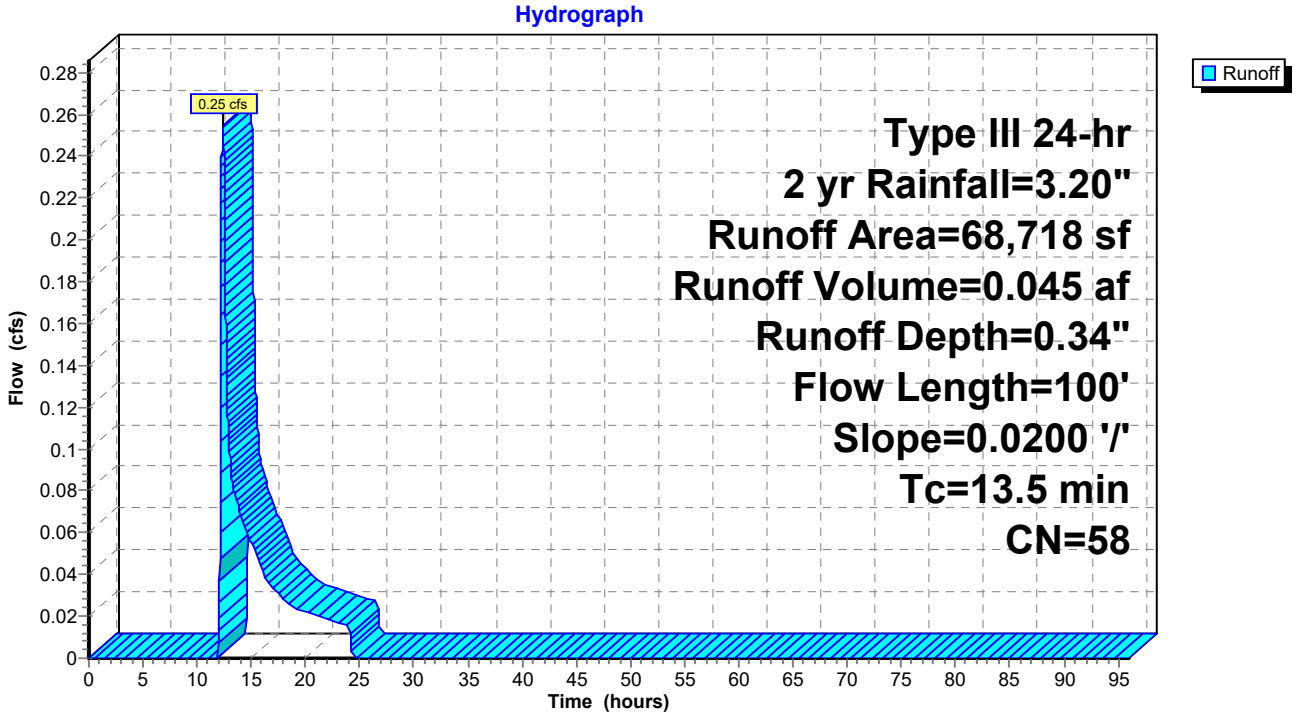
Runoff = 0.25 cfs @ 12.37 hrs, Volume= 0.045 af, Depth= 0.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.20"

Area (sf)	CN	Description
34,359	55	Woods, Good, HSG B
34,359	61	>75% Grass cover, Good, HSG B
68,718	58	Weighted Average
68,718		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		**Sheet Flow, Sheet - ESTIMATE** Woods: Light underbrush n= 0.400 P2= 3.20"
1.2	50	0.0200	0.71		**Shallow Concentrated Flow, Shallow Concentrated** Woodland Kv= 5.0 fps
13.5	100	Total			

Subcatchment PR 3.3C: PR 3.3C



Summary for Subcatchment PR 3.4: SUB PR 3.4

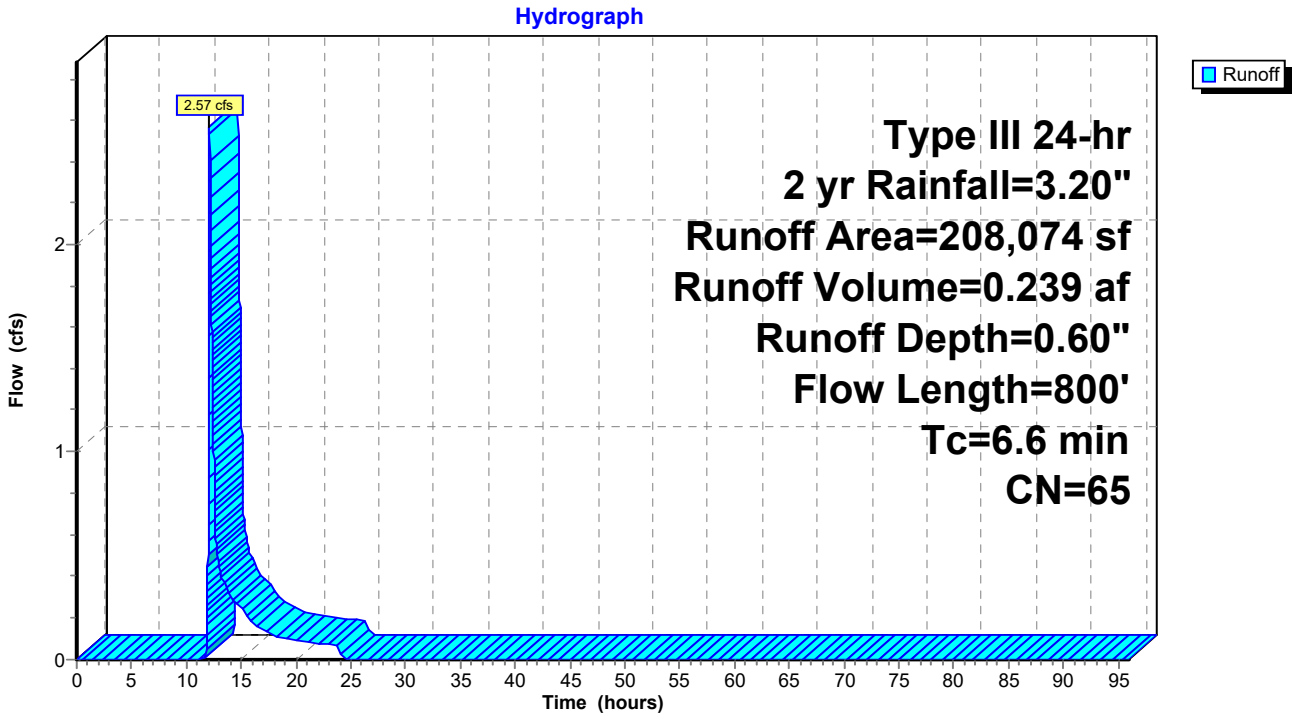
Runoff = 2.57 cfs @ 12.12 hrs, Volume= 0.239 af, Depth= 0.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.20"

	Area (sf)	CN	Description
	79,157	61	>75% Grass cover, Good, HSG B
	78,871	55	Woods, Good, HSG B
	21,288	77	Wetlands (Woods, Good, HSG D)
*	28,758	98	IMP Highway (EXISTING)
	208,074	65	Weighted Average
	179,316		86.18% Pervious Area
	28,758		13.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.20		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
5.7	675	0.0148	1.96		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.2	75	0.1333	5.88		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.6	800	Total			

Subcatchment PR 3.4: SUB PR 3.4



Summary for Subcatchment PR 3.5: SUB PR 3.5

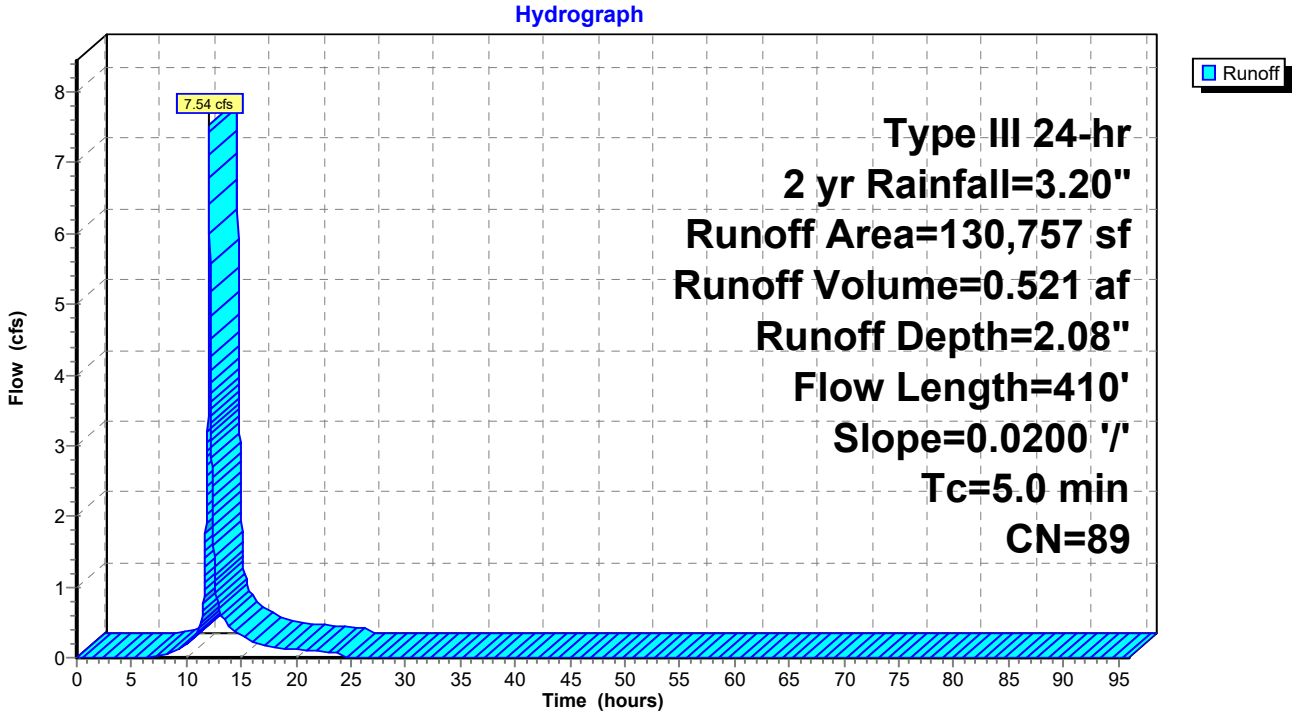
Runoff = 7.54 cfs @ 12.07 hrs, Volume= 0.521 af, Depth= 2.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.20"

Area (sf)	CN	Description
97,754	98	Paved parking & roofs
27,843	61	>75% Grass cover, Good, HSG B
5,160	80	>75% Grass cover, Good, HSG D
130,757	89	Weighted Average
33,003		25.24% Pervious Area
97,754		74.76% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.20		**Sheet Flow, Sheet - ESTIMATE** Smooth surfaces n= 0.011 P2= 3.20"
0.8	360	0.0200	7.44	9.14	**Pipe Channel, Pipe - ESTIMATE** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Concrete pipe, bends & connections
1.5	410	Total, Increased to minimum Tc = 5.0 min			

Subcatchment PR 3.5: SUB PR 3.5



Summary for Subcatchment PR 4.1: SUB PR 4.1

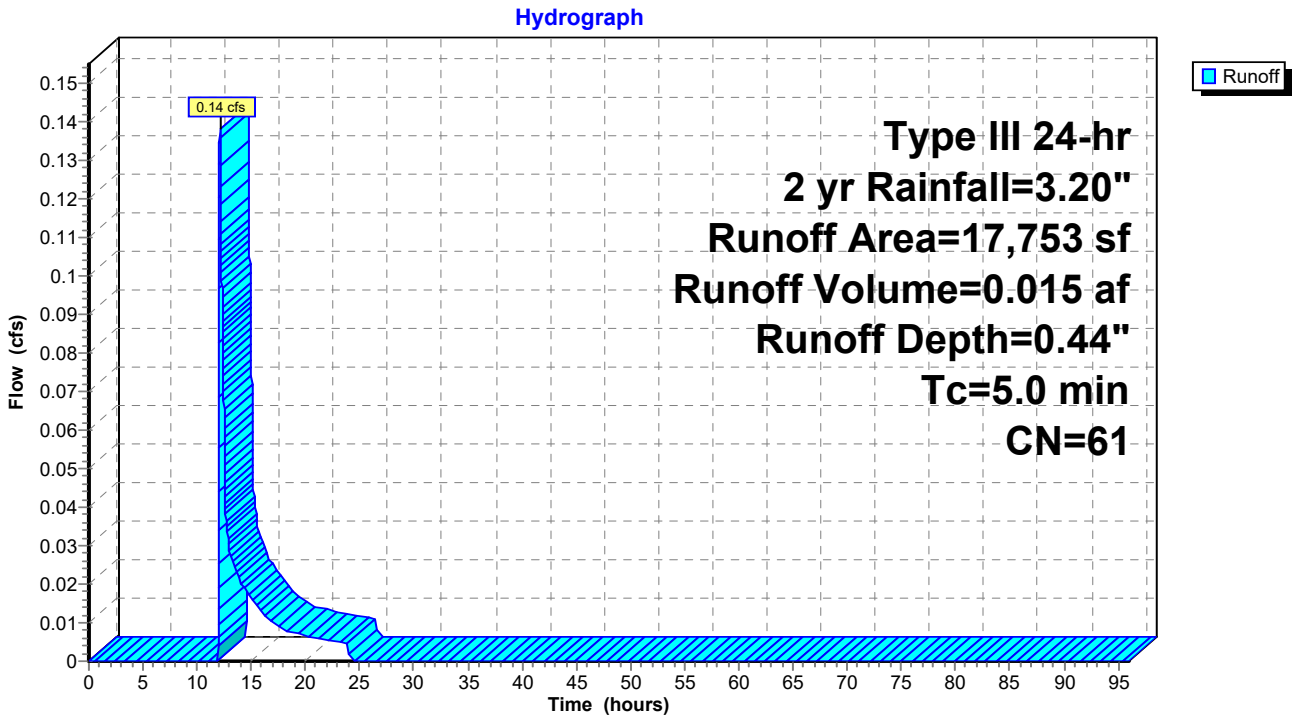
Runoff = 0.14 cfs @ 12.11 hrs, Volume= 0.015 af, Depth= 0.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.20"

Area (sf)	CN	Description
17,753	61	>75% Grass cover, Good, HSG B
17,753		100.00% Pervious Area

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

Subcatchment PR 4.1: SUB PR 4.1



Summary for Subcatchment PR 4.2: SUB PR 4.2

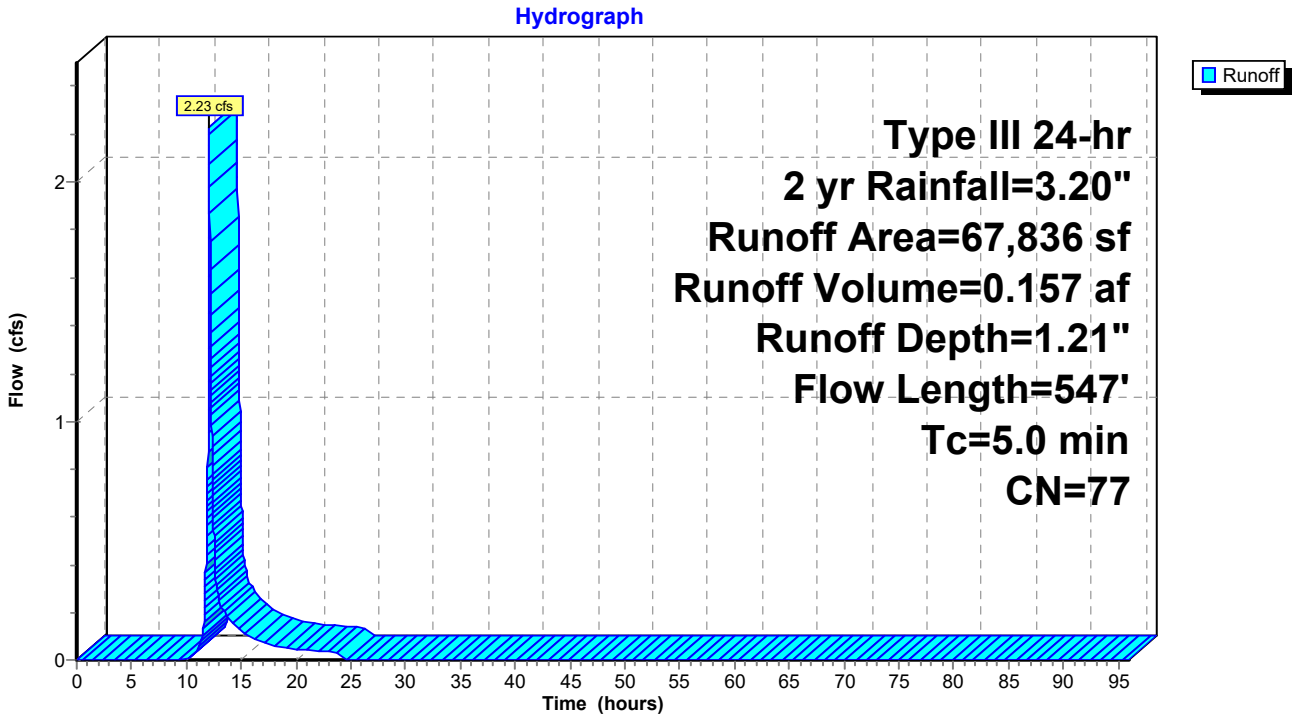
Runoff = 2.23 cfs @ 12.08 hrs, Volume= 0.157 af, Depth= 1.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.20"

Area (sf)	CN	Description
37,635	61	>75% Grass cover, Good, HSG B
30,201	98	Paved parking & roofs
67,836	77	Weighted Average
37,635		55.48% Pervious Area
30,201		44.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0230	1.27		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
0.8	144	0.0230	3.08		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.8	353	0.0210	7.63	9.36	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013
2.3	547	Total, Increased to minimum Tc = 5.0 min			

Subcatchment PR 4.2: SUB PR 4.2



Summary for Pond B-1: Basin 1

Inflow Area = 3.503 ac, 63.78% Impervious, Inflow Depth = 1.40" for 2 yr event
Inflow = 5.91 cfs @ 12.08 hrs, Volume= 0.409 af
Outflow = 0.33 cfs @ 14.76 hrs, Volume= 0.409 af, Atten= 94%, Lag= 161.1 min
Discarded = 0.18 cfs @ 14.76 hrs, Volume= 0.223 af
Primary = 0.16 cfs @ 14.76 hrs, Volume= 0.187 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 295.31' @ 14.76 hrs Surf.Area= 7,462 sf Storage= 8,807 cf

Plug-Flow detention time= 292.7 min calculated for 0.409 af (100% of inflow)
Center-of-Mass det. time= 292.7 min (1,134.5 - 841.8)

Volume	Invert	Avail.Storage	Storage Description
#1	294.00'	33,182 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

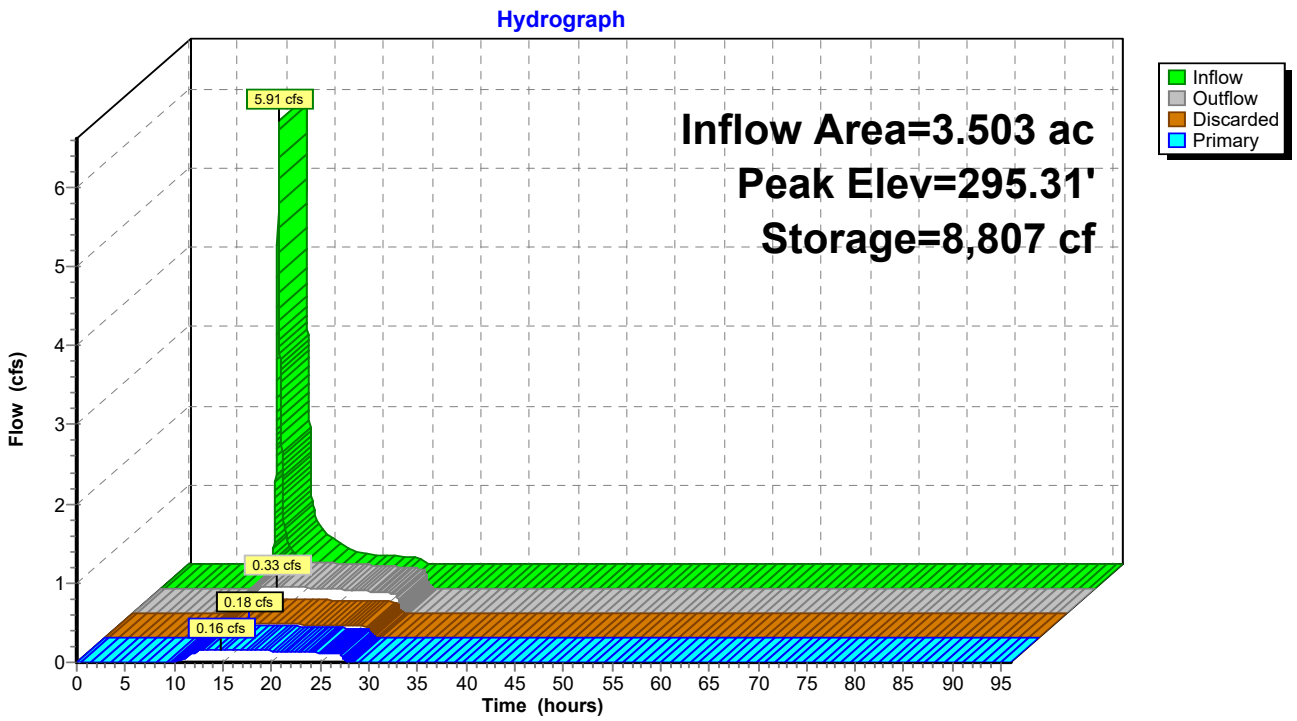
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
294.00	5,987	0	0
296.00	8,239	14,226	14,226
298.00	10,717	18,956	33,182

Device	Routing	Invert	Outlet Devices
#1	Discarded	294.00'	**1.020 in/hr Exfiltration over Horizontal area**
#2	Primary	293.00'	**18.0" Round Culvert** L= 50.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 293.00' / 292.50' S= 0.0100 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#3	Device 2	293.00'	**2.0" Vert. Orifice/Grate** C= 0.600
#4	Device 2	295.50'	**6.0" Vert. Orifice/Grate** C= 0.600
#5	Primary	297.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Discarded OutFlow Max=0.18 cfs @ 14.76 hrs HW=295.31' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.18 cfs)

Primary OutFlow Max=0.16 cfs @ 14.76 hrs HW=295.31' (Free Discharge)
├─**2=Culvert** (Passes 0.16 cfs of 10.45 cfs potential flow)
│ ├─**3=Orifice/Grate** (Orifice Controls 0.16 cfs @ 7.18 fps)
│ └─**4=Orifice/Grate** (Controls 0.00 cfs)
└─**5=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond B-1: Basin 1



Summary for Pond B-2: Basin 2

Inflow Area =	3.452 ac, 70.93% Impervious, Inflow Depth = 1.91" for 2 yr event				
Inflow =	8.03 cfs @	12.07 hrs,	Volume=	0.551 af	
Outflow =	0.43 cfs @	14.38 hrs,	Volume=	0.551 af,	Atten= 95%, Lag= 138.5 min
Discarded =	0.14 cfs @	14.38 hrs,	Volume=	0.374 af	
Primary =	0.29 cfs @	14.38 hrs,	Volume=	0.177 af	
Secondary =	0.00 cfs @	0.00 hrs,	Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 324.16' @ 14.38 hrs Surf.Area= 7,634 sf Storage= 13,791 cf

Plug-Flow detention time= 645.1 min calculated for 0.551 af (100% of inflow)
Center-of-Mass det. time= 645.2 min (1,463.1 - 817.9)

Volume	Invert	Avail.Storage	Storage Description
#1	322.00'	52,913 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
322.00	5,179	0	0
324.00	7,440	12,619	12,619
326.00	9,940	17,380	29,999
328.00	12,974	22,914	52,913

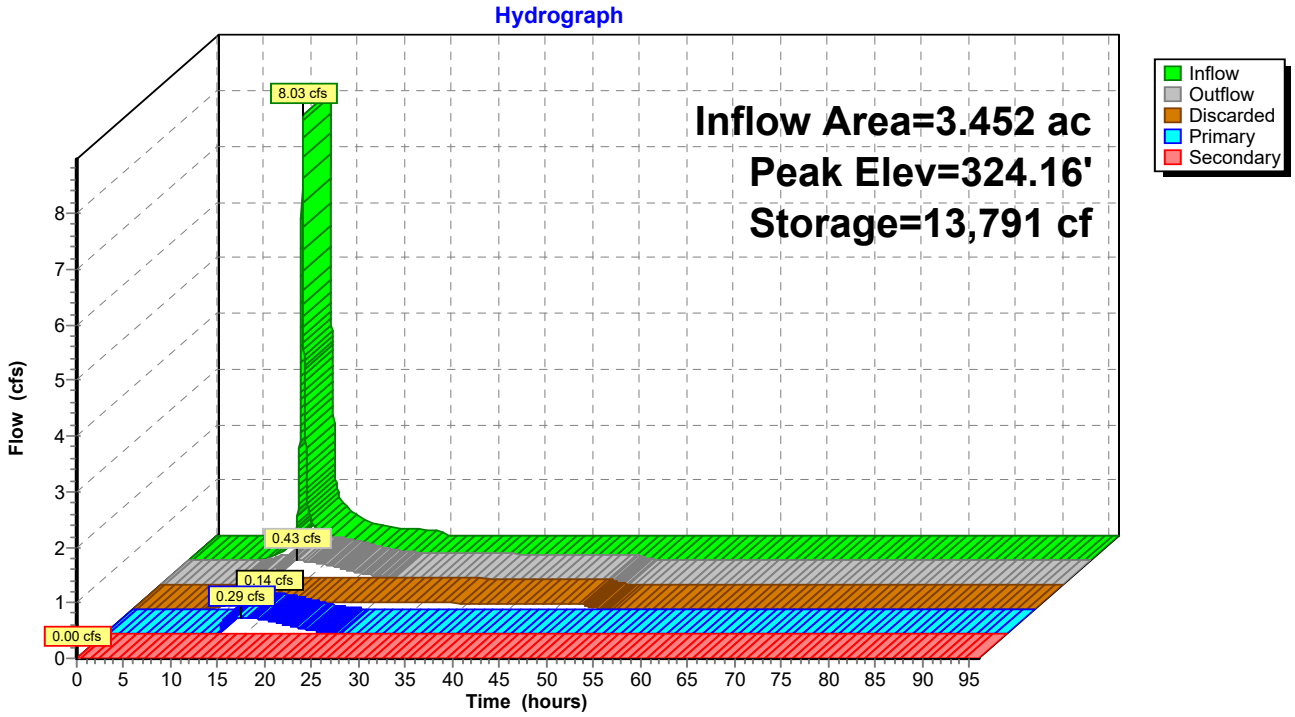
Device	Routing	Invert	Outlet Devices
#1	Discarded	322.00'	**0.770 in/hr Exfiltration over Horizontal area**
#2	Primary	321.00'	**18.0" Round Culvert**
			L= 80.0' RCP, sq.cut end projecting, Ke= 0.500
			Inlet / Outlet Invert= 321.00' / 320.00' S= 0.0125 '/' Cc= 0.900
			n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#3	Device 2	323.50'	**4.0" Vert. Orifice/Grate** C= 0.600
#4	Device 2	325.10'	**24.0" W x 6.0" H Vert. Orifice/Grate** C= 0.600
#5	Secondary	327.20'	**10.0' 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

Discarded OutFlow Max=0.14 cfs @ 14.38 hrs HW=324.16' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.14 cfs)

Primary OutFlow Max=0.29 cfs @ 14.38 hrs HW=324.16' (Free Discharge)
└─**2=Culvert** (Passes 0.29 cfs of 13.20 cfs potential flow)
  ├─**3=Orifice/Grate** (Orifice Controls 0.29 cfs @ 3.37 fps)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=322.00' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond B-2: Basin 2



Summary for Pond B-3A: Basin 3A

Inflow Area = 2.147 ac, 85.90% Impervious, Inflow Depth = 2.45" for 2 yr event
Inflow = 6.11 cfs @ 12.08 hrs, Volume= 0.438 af
Outflow = 0.57 cfs @ 12.92 hrs, Volume= 0.438 af, Atten= 91%, Lag= 50.7 min
Primary = 0.57 cfs @ 12.92 hrs, Volume= 0.438 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 371.00' @ 12.92 hrs Surf.Area= 5,000 sf Storage= 9,511 cf

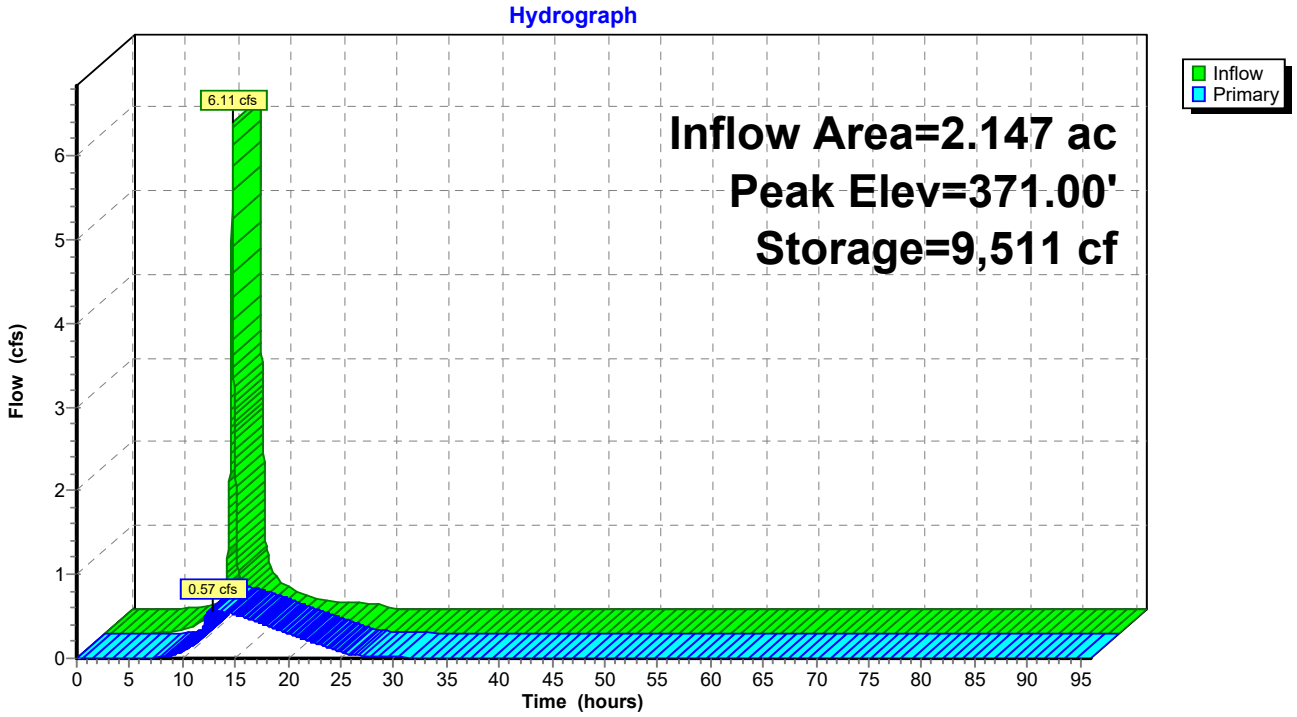
Plug-Flow detention time= 231.4 min calculated for 0.438 af (100% of inflow)
Center-of-Mass det. time= 231.7 min (1,023.8 - 792.0)

Volume	Invert	Avail.Storage	Storage Description
#1	369.00'	23,750 cf	**50.00'W x 100.00'L x 5.00'H Prismatoid** 25,000 cf Overall x 95.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Primary	369.00'	**18.0" Round Culvert** L= 100.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 369.00' / 368.00' S= 0.0100 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#2	Device 1	369.00'	**4.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	373.50'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.57 cfs @ 12.92 hrs HW=371.00' (Free Discharge)
└─**1=Culvert** (Passes 0.57 cfs of 9.52 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.57 cfs @ 6.52 fps)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond B-3A: Basin 3A



Summary for Pond B-3B: Basin 3B

Inflow Area = 1.526 ac, 97.51% Impervious, Inflow Depth = 2.86" for 2 yr event
Inflow = 4.78 cfs @ 12.07 hrs, Volume= 0.363 af
Outflow = 0.50 cfs @ 12.75 hrs, Volume= 0.363 af, Atten= 89%, Lag= 40.2 min
Primary = 0.50 cfs @ 12.75 hrs, Volume= 0.363 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 370.61' @ 12.75 hrs Surf.Area= 5,000 sf Storage= 7,644 cf

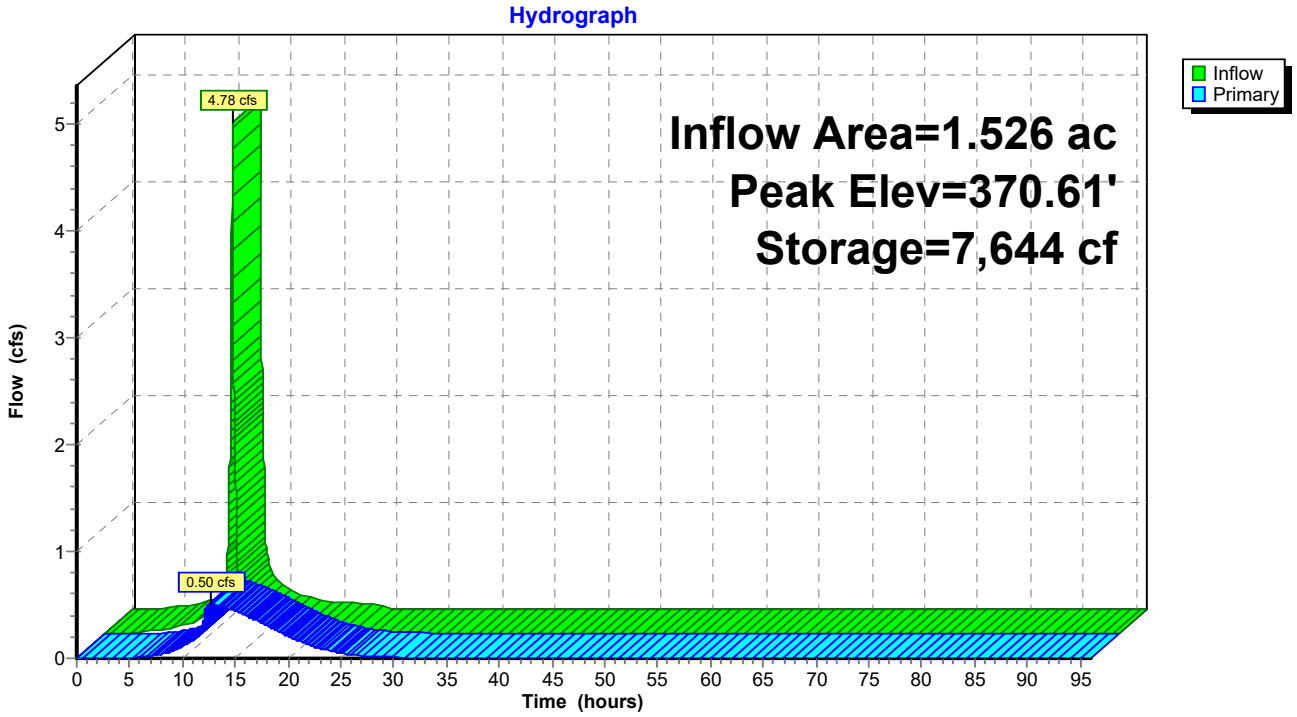
Plug-Flow detention time= 217.4 min calculated for 0.363 af (100% of inflow)
Center-of-Mass det. time= 217.3 min (982.7 - 765.4)

Volume	Invert	Avail.Storage	Storage Description
#1	369.00'	23,750 cf	**50.00'W x 100.00'L x 5.00'H Prismatoid** 25,000 cf Overall x 95.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Primary	369.00'	**18.0" Round Culvert** L= 70.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 369.00' / 366.00' S= 0.0429 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#2	Device 1	369.00'	**4.0" Vert. Orifice/Grate** C= 0.600
#3	Primary	373.90'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.50 cfs @ 12.75 hrs HW=370.61' (Free Discharge)
└─**1=Culvert** (Passes 0.50 cfs of 7.89 cfs potential flow)
  └─**2=Orifice/Grate** (Orifice Controls 0.50 cfs @ 5.78 fps)
└─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond B-3B: Basin 3B



Summary for Pond B-3C: Basin 3C

Inflow Area = 3.002 ac, 74.76% Impervious, Inflow Depth = 2.08" for 2 yr event
Inflow = 7.54 cfs @ 12.07 hrs, Volume= 0.521 af
Outflow = 0.63 cfs @ 13.06 hrs, Volume= 0.521 af, Atten= 92%, Lag= 59.4 min
Primary = 0.63 cfs @ 13.06 hrs, Volume= 0.521 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 332.40' @ 13.06 hrs Surf.Area= 5,000 sf Storage= 11,403 cf

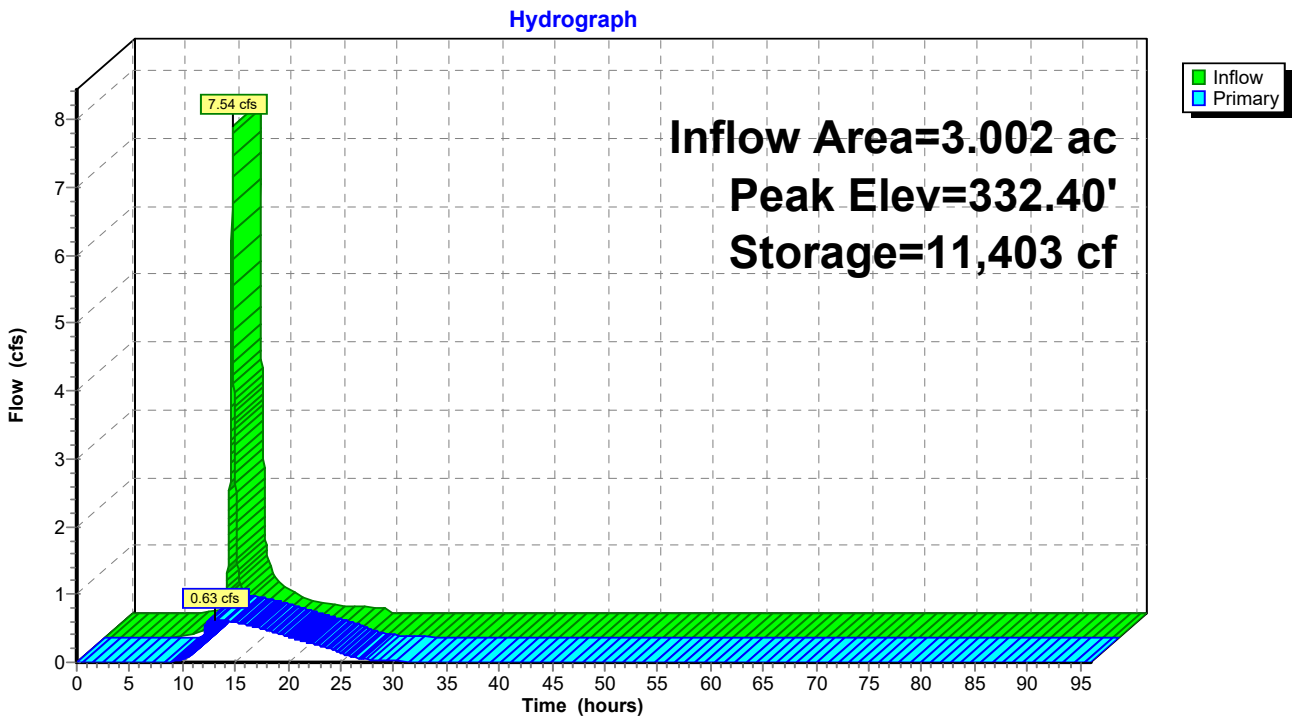
Plug-Flow detention time= 247.7 min calculated for 0.521 af (100% of inflow)
Center-of-Mass det. time= 247.6 min (1,057.8 - 810.2)

Volume	Invert	Avail.Storage	Storage Description
#1	330.00'	28,500 cf	**50.00'W x 100.00'L x 6.00'H Prismatoid** 30,000 cf Overall x 95.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Primary	330.00'	**18.0" Round Culvert** L= 100.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 330.00' / 328.50' S= 0.0150 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#2	Device 1	330.00'	**4.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	332.50'	**4.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	334.00'	**6.0" Vert. Orifice/Grate** C= 0.600
#5	Device 1	335.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.63 cfs @ 13.06 hrs HW=332.40' (Free Discharge)
└─**1=Culvert** (Passes 0.63 cfs of 10.93 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.63 cfs @ 7.20 fps)
  ├─**3=Orifice/Grate** (Controls 0.00 cfs)
  ├─**4=Orifice/Grate** (Controls 0.00 cfs)
  └─**5=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond B-3C: Basin 3C



Summary for Pond B-4: Basin 4

Inflow Area = 5.171 ac, 67.19% Impervious, Inflow Depth = 1.84" for 2 yr event
Inflow = 11.54 cfs @ 12.07 hrs, Volume= 0.791 af
Outflow = 0.58 cfs @ 14.71 hrs, Volume= 0.790 af, Atten= 95%, Lag= 158.3 min
Primary = 0.58 cfs @ 14.71 hrs, Volume= 0.790 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 326.07' @ 14.71 hrs Surf.Area= 11,598 sf Storage= 19,989 cf

Plug-Flow detention time= 466.9 min calculated for 0.790 af (100% of inflow)
Center-of-Mass det. time= 466.2 min (1,287.8 - 821.6)

Volume	Invert	Avail.Storage	Storage Description
#1	324.00'	47,494 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

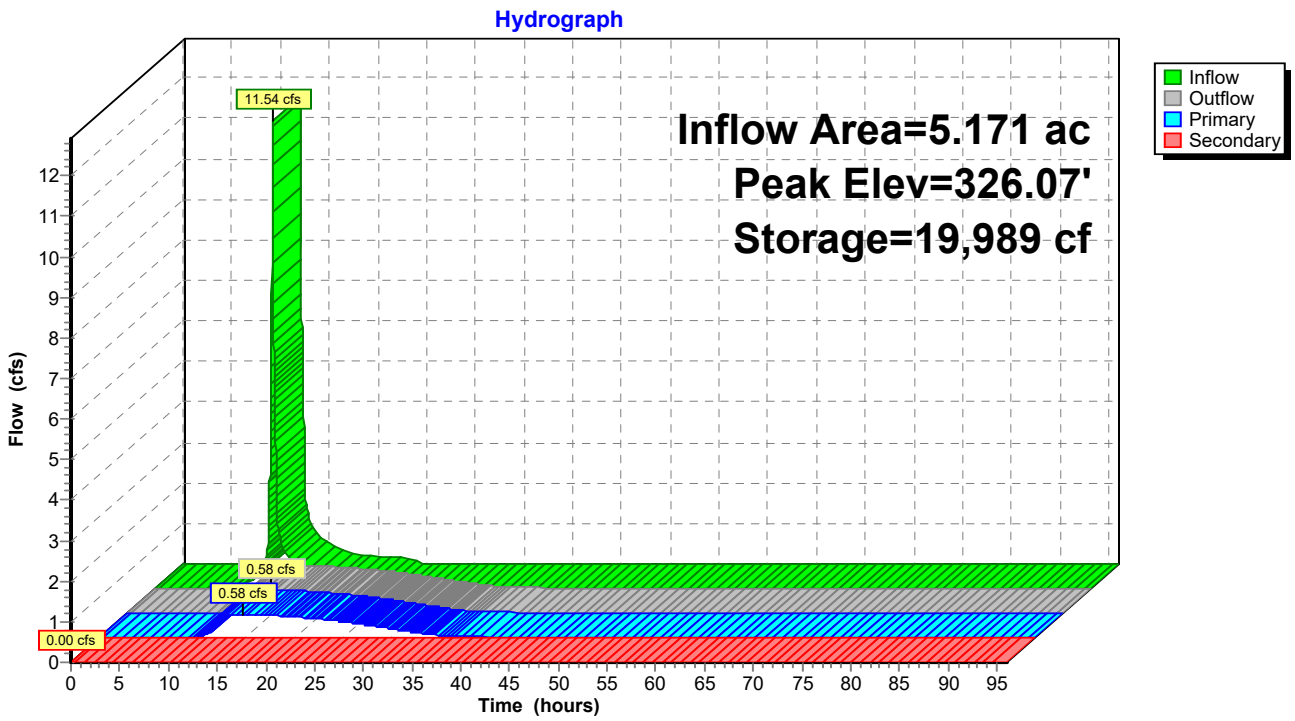
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
324.00	7,771	0	0
326.00	11,402	19,173	19,173
328.00	16,919	28,321	47,494

Device	Routing	Invert	Outlet Devices
#1	Primary	322.00'	**18.0" Round Culvert** L= 100.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 322.00' / 321.00' S= 0.0100 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#2	Device 1	324.00'	**4.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	326.10'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height
#4	Secondary	327.00'	**10.0' long x 30.0' 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=0.58 cfs @ 14.71 hrs HW=326.07' (Free Discharge)
└─**1=Culvert** (Passes 0.58 cfs of 14.69 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.58 cfs @ 6.64 fps)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=324.00' (Free Discharge)
└─**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond B-4: Basin 4



Summary for Pond B-5A: Basin 5A

Inflow Area =	10.270 ac, 58.77% Impervious, Inflow Depth = 1.73" for 2 yr event				
Inflow =	17.28 cfs @	12.09 hrs,	Volume=	1.482 af	
Outflow =	1.41 cfs @	14.08 hrs,	Volume=	1.482 af,	Atten= 92%, Lag= 119.4 min
Discarded =	0.15 cfs @	14.08 hrs,	Volume=	0.502 af	
Primary =	1.25 cfs @	14.08 hrs,	Volume=	0.980 af	
Secondary =	0.00 cfs @	0.00 hrs,	Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 355.51' @ 14.08 hrs Surf.Area= 12,750 sf Storage= 34,333 cf

Plug-Flow detention time= 565.7 min calculated for 1.482 af (100% of inflow)
Center-of-Mass det. time= 565.7 min (1,402.2 - 836.5)

Volume	Invert	Avail.Storage	Storage Description
#1	352.00'	71,591 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
352.00	7,400	0	0
354.00	9,862	17,262	17,262
356.00	13,687	23,549	40,811
358.00	17,093	30,780	71,591

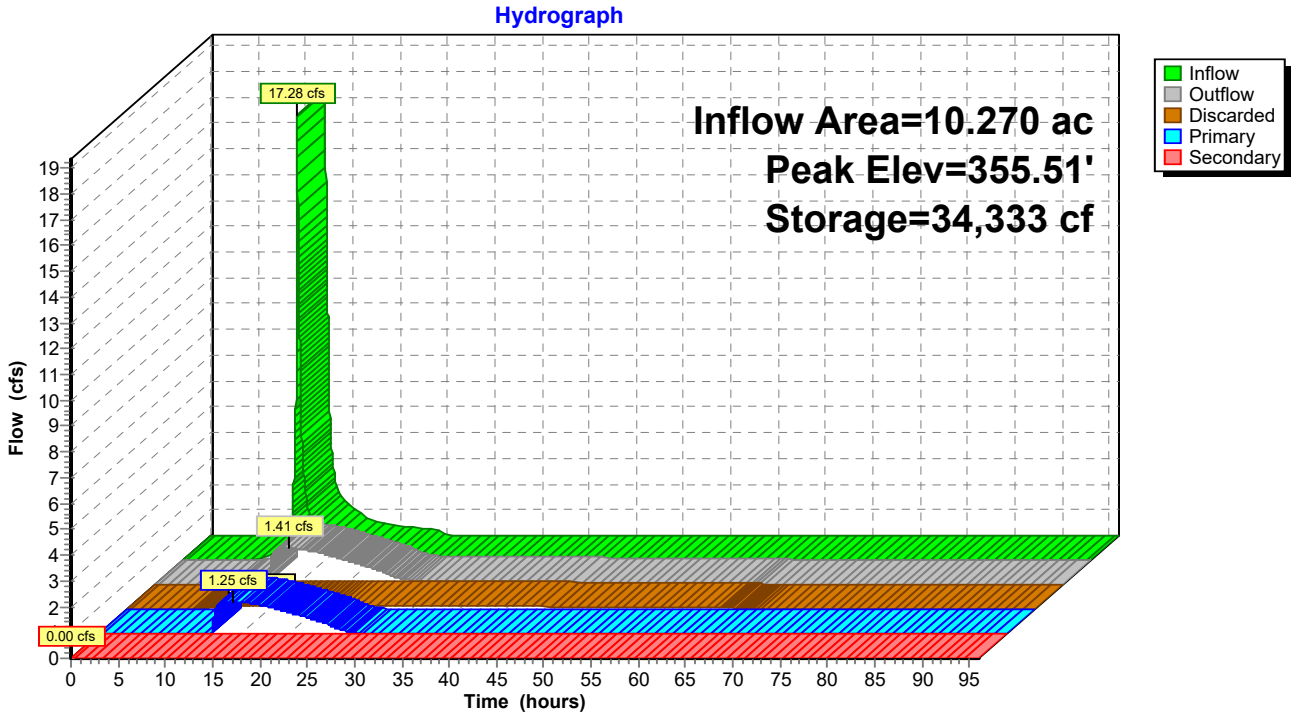
Device	Routing	Invert	Outlet Devices
#1	Discarded	352.00'	**0.520 in/hr Exfiltration over Horizontal area**
#2	Primary	350.70'	**24.0" Round Culvert** L= 50.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 350.70' / 350.00' S= 0.0140 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 3.14 sf
#3	Device 2	353.50'	**6.0" Vert. Orifice/Grate** C= 0.600
#4	Device 2	355.75'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 1.0' Crest Height
#5	Secondary	357.25'	**10.0' 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

Discarded OutFlow Max=0.15 cfs @ 14.08 hrs HW=355.51' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.15 cfs)

Primary OutFlow Max=1.25 cfs @ 14.08 hrs HW=355.51' (Free Discharge)
└─**2=Culvert** (Passes 1.25 cfs of 29.53 cfs potential flow)
  ├─**3=Orifice/Grate** (Orifice Controls 1.25 cfs @ 6.39 fps)
  └─**4=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=352.00' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond B-5A: Basin 5A



Summary for Pond B-5B: Basin 5B

Inflow Area =	1.651 ac, 44.43% Impervious, Inflow Depth = 1.40" for 2 yr event				
Inflow =	2.78 cfs @	12.08 hrs,	Volume=	0.193 af	
Outflow =	0.24 cfs @	13.33 hrs,	Volume=	0.193 af,	Atten= 91%, Lag= 75.3 min
Discarded =	0.03 cfs @	13.33 hrs,	Volume=	0.109 af	
Primary =	0.21 cfs @	13.33 hrs,	Volume=	0.084 af	
Secondary =	0.00 cfs @	0.00 hrs,	Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 351.92' @ 13.33 hrs Surf.Area= 2,774 sf Storage= 4,218 cf

Plug-Flow detention time= 701.1 min calculated for 0.193 af (100% of inflow)
Center-of-Mass det. time= 701.0 min (1,542.8 - 841.8)

Volume	Invert	Avail.Storage	Storage Description
#1	350.00'	41,172 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
350.00	1,623	0	0
352.00	2,823	4,446	4,446
354.00	5,169	7,992	12,438
356.00	7,145	12,314	24,752
358.00	9,275	16,420	41,172

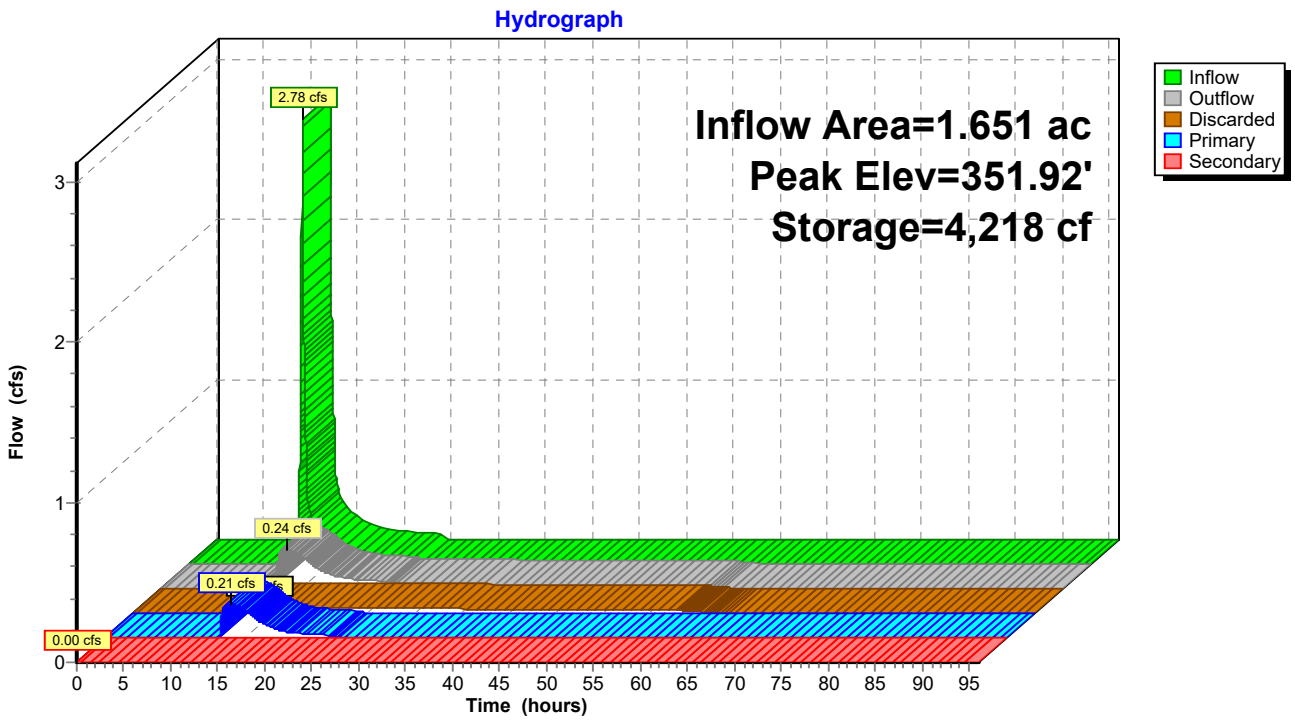
Device	Routing	Invert	Outlet Devices
#1	Discarded	350.00'	**0.520 in/hr Exfiltration over Horizontal area**
#2	Primary	348.40'	**24.0" Round Culvert**
			L= 50.0' RCP, sq.cut end projecting, Ke= 0.500
			Inlet / Outlet Invert= 348.40' / 348.20' S= 0.0040 '/' Cc= 0.900
			n= 0.013 Concrete pipe, bends & connections, Flow Area= 3.14 sf
#3	Device 2	351.50'	**4.0" Vert. Orifice/Grate** C= 0.600
#4	Device 2	353.00'	**6.0" Vert. Orifice/Grate** C= 0.600
#5	Secondary	357.00'	**10.0' 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

Discarded OutFlow Max=0.03 cfs @ 13.33 hrs HW=351.92' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.21 cfs @ 13.33 hrs HW=351.92' (Free Discharge)
└─**2=Culvert** (Passes 0.21 cfs of 22.68 cfs potential flow)
  ├─**3=Orifice/Grate** (Orifice Controls 0.21 cfs @ 2.42 fps)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=350.00' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond B-5B: Basin 5B



Summary for Pond B-6: Basin 6

Inflow Area = 3.750 ac, 76.96% Impervious, Inflow Depth = 2.24" for 2 yr event
Inflow = 9.28 cfs @ 12.07 hrs, Volume= 0.699 af
Outflow = 0.31 cfs @ 15.74 hrs, Volume= 0.699 af, Atten= 97%, Lag= 219.9 min
Discarded = 0.10 cfs @ 15.74 hrs, Volume= 0.221 af
Primary = 0.21 cfs @ 15.74 hrs, Volume= 0.479 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 390.99' @ 15.74 hrs Surf.Area= 8,614 sf Storage= 18,029 cf

Plug-Flow detention time= 606.8 min calculated for 0.699 af (100% of inflow)
Center-of-Mass det. time= 606.8 min (1,383.8 - 777.0)

Volume	Invert	Avail.Storage	Storage Description
#1	388.00'	52,408 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

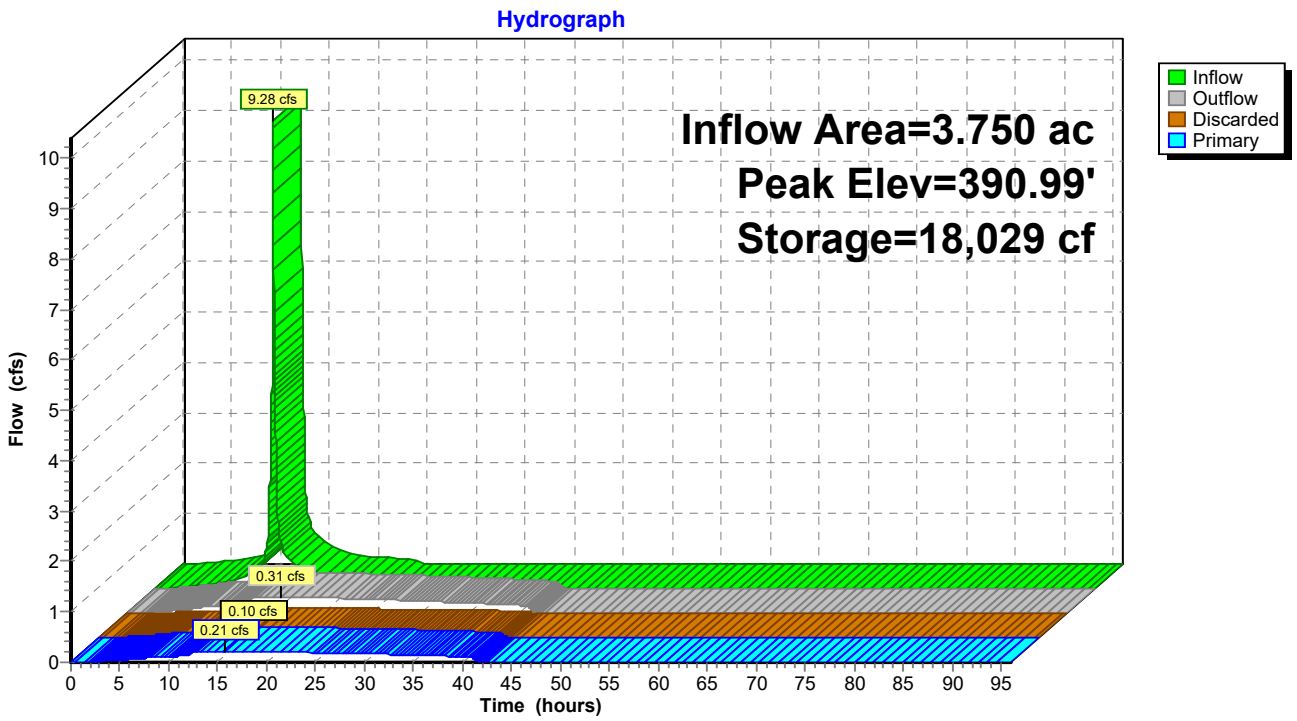
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
388.00	3,546	0	0
390.00	6,853	10,399	10,399
392.00	10,423	17,276	27,675
394.00	14,310	24,733	52,408

Device	Routing	Invert	Outlet Devices
#1	Discarded	388.00'	**0.520 in/hr Exfiltration over Horizontal area**
#2	Primary	387.00'	**24.0" Round Culvert** L= 100.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 387.00' / 386.50' S= 0.0050 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 3.14 sf
#3	Device 2	387.00'	**2.0" Vert. Orifice/Grate** C= 0.600
#4	Device 2	391.20'	**8.0" Vert. Orifice/Grate** C= 0.600
#5	Primary	393.00'	**10.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Discarded OutFlow Max=0.10 cfs @ 15.74 hrs HW=390.99' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.10 cfs)

Primary OutFlow Max=0.21 cfs @ 15.74 hrs HW=390.99' (Free Discharge)
├─**2=Culvert** (Passes 0.21 cfs of 23.99 cfs potential flow)
│ ├─**3=Orifice/Grate** (Orifice Controls 0.21 cfs @ 9.51 fps)
│ └─**4=Orifice/Grate** (Controls 0.00 cfs)
└─**5=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond B-6: Basin 6



Summary for Pond B-7: Basin 7

Inflow Area =	1.719 ac, 86.57% Impervious, Inflow Depth = 2.45" for 2 yr event				
Inflow =	4.94 cfs @	12.07 hrs,	Volume=	0.350 af	
Outflow =	0.34 cfs @	13.42 hrs,	Volume=	0.350 af,	Atten= 93%, Lag= 80.7 min
Discarded =	0.29 cfs @	11.18 hrs,	Volume=	0.314 af	
Primary =	0.05 cfs @	13.42 hrs,	Volume=	0.036 af	

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 316.82' @ 13.42 hrs Surf.Area= 16,082 sf Storage= 6,535 cf

Plug-Flow detention time= 168.8 min calculated for 0.350 af (100% of inflow)
Center-of-Mass det. time= 168.8 min (960.6 - 791.7)

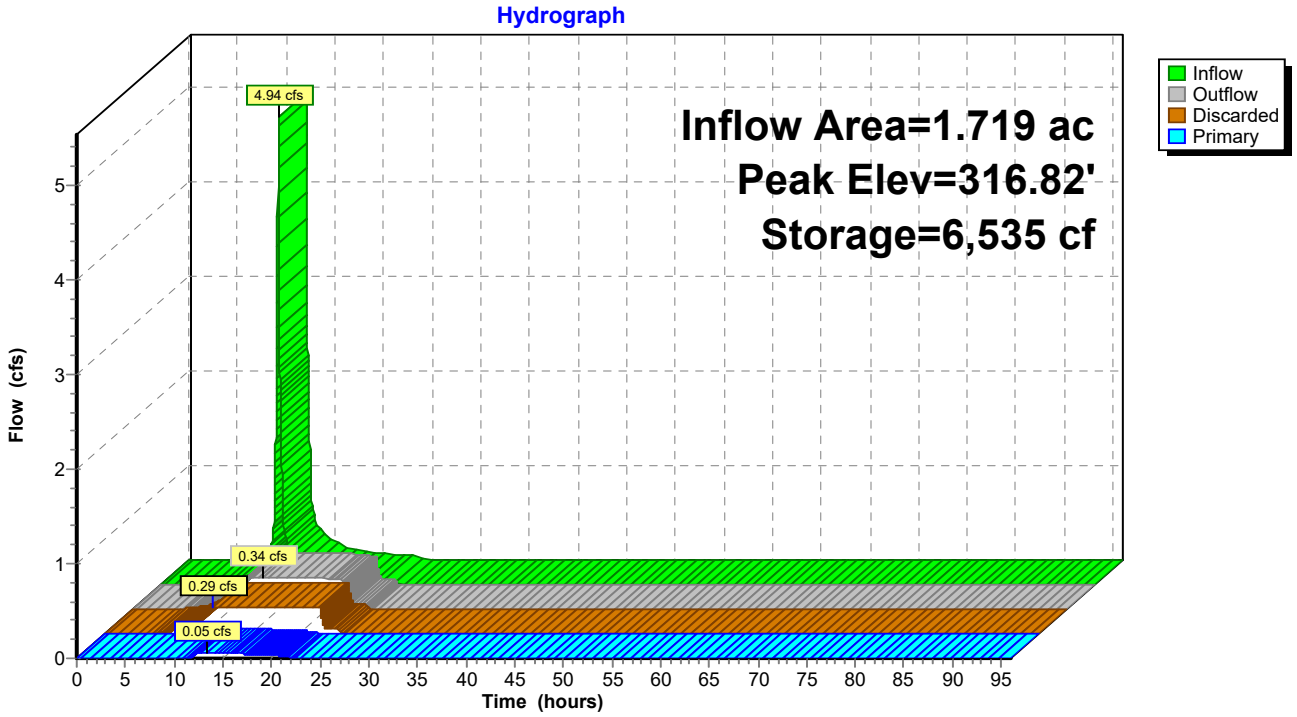
Volume	Invert	Avail.Storage	Storage Description
#1	316.00'	10,905 cf	**187.00'W x 86.00'L x 3.50'H Prismatoid** 56,287 cf Overall - 19,938 cf Embedded = 36,349 cf x 30.0% Voids
#2	316.50'	19,938 cf	**ADS_StormTech SC-740** x 434 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
		30,843 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	316.00'	**0.770 in/hr Exfiltration over Horizontal area**
#2	Primary	316.00'	**24.0" Round Culvert** L= 75.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 316.00' / 313.00' S= 0.0400 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 3.14 sf
#3	Device 2	316.00'	**1.5" Vert. Orifice/Grate** C= 0.600
#4	Device 2	317.80'	**8.0" Vert. Orifice/Grate** C= 0.600
#5	Device 2	319.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Discarded OutFlow Max=0.29 cfs @ 11.18 hrs HW=316.04' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.29 cfs)

Primary OutFlow Max=0.05 cfs @ 13.42 hrs HW=316.82' (Free Discharge)
└─**2=Culvert** (Passes 0.05 cfs of 3.76 cfs potential flow)
  ├─**3=Orifice/Grate** (Orifice Controls 0.05 cfs @ 4.20 fps)
  ├─**4=Orifice/Grate** (Controls 0.00 cfs)
  └─**5=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond B-7: Basin 7



Summary for Pond B-8: Basin 8

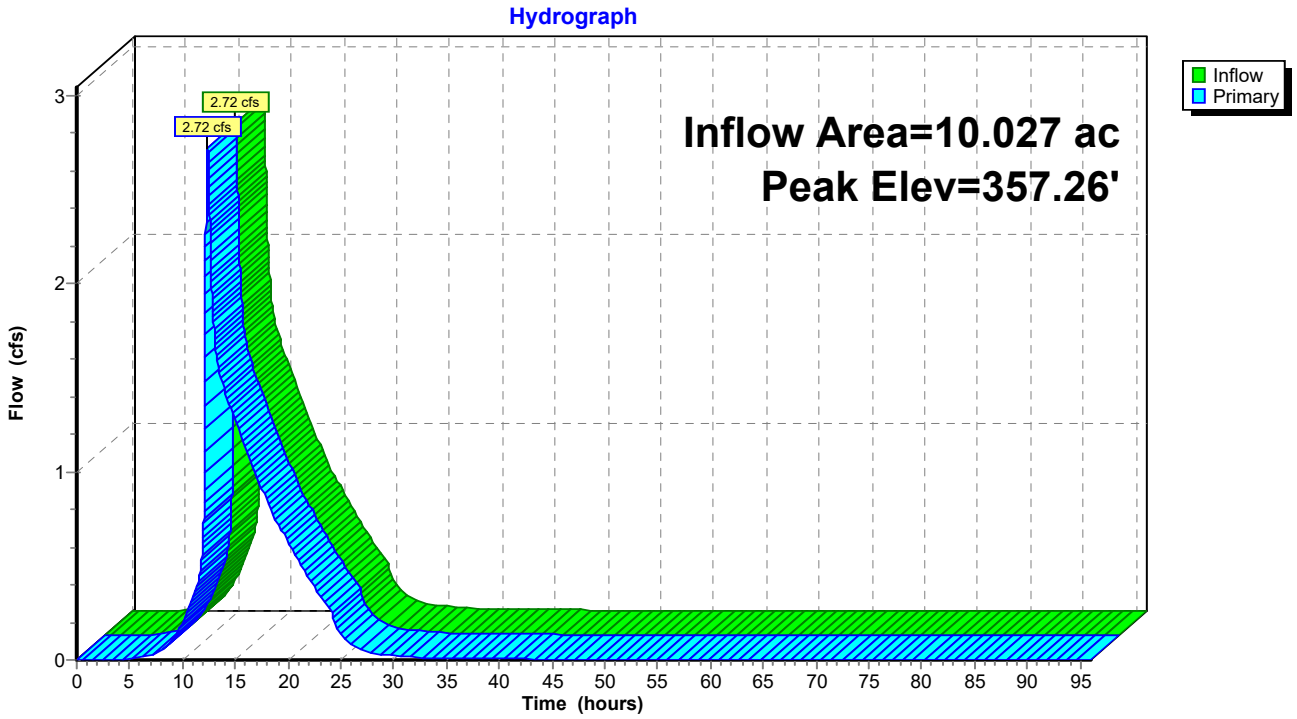
Inflow Area = 10.027 ac, 39.81% Impervious, Inflow Depth = 1.28" for 2 yr event
Inflow = 2.72 cfs @ 12.39 hrs, Volume= 1.071 af
Outflow = 2.72 cfs @ 12.39 hrs, Volume= 1.071 af, Atten= 0%, Lag= 0.0 min
Primary = 2.72 cfs @ 12.39 hrs, Volume= 1.071 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 357.26' @ 12.39 hrs
Flood Elev= 360.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	350.00'	**24.0" Round Culvert** L= 270.0' Ke= 0.500 Inlet / Outlet Invert= 350.00' / 330.00' S= 0.0741 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 3.14 sf
#2	Device 1	357.00'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=2.68 cfs @ 12.39 hrs HW=357.26' (Free Discharge)
└─**1=Culvert** (Passes 2.68 cfs of 37.84 cfs potential flow)
└─**2=Orifice/Grate** (Weir Controls 2.68 cfs @ 1.66 fps)

Pond B-8: Basin 8



Summary for Pond W5: WETLAND 5

Inflow Area = 4.777 ac, 13.82% Impervious, Inflow Depth = 0.60" for 2 yr event
Inflow = 2.57 cfs @ 12.12 hrs, Volume= 0.239 af
Outflow = 1.43 cfs @ 12.37 hrs, Volume= 0.226 af, Atten= 44%, Lag= 15.4 min
Primary = 1.43 cfs @ 12.37 hrs, Volume= 0.226 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 369.24' @ 12.37 hrs Surf.Area= 8,852 sf Storage= 1,680 cf

Plug-Flow detention time= 58.8 min calculated for 0.226 af (94% of inflow)
Center-of-Mass det. time= 30.5 min (926.4 - 895.9)

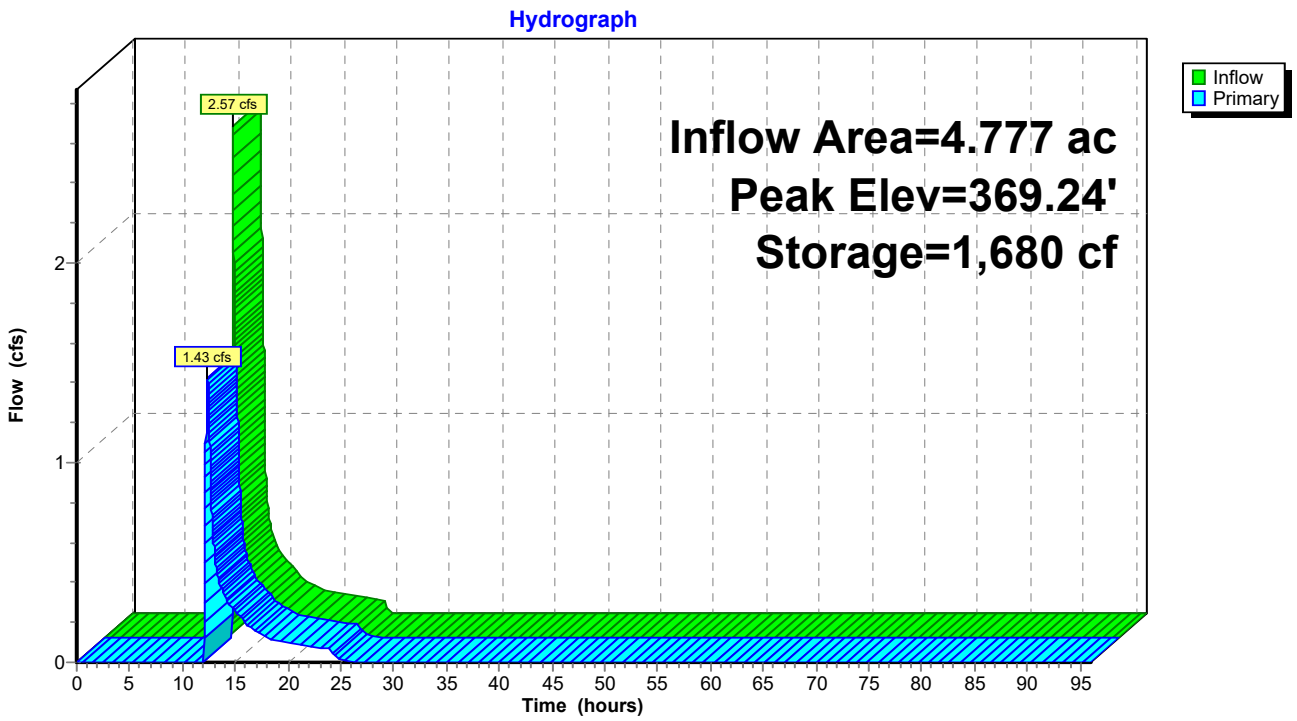
Volume	Invert	Avail.Storage	Storage Description
#1	369.00'	8,430 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
369.00	4,940	0	0
369.20	8,304	1,324	1,324
369.40	10,950	1,925	3,250
369.60	12,950	2,390	5,640
369.80	14,954	2,790	8,430

Device	Routing	Invert	Outlet Devices
#1	Primary	369.10'	**10.0' long x 64.0' 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=1.43 cfs @ 12.37 hrs HW=369.24' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** (Weir Controls 1.43 cfs @ 1.01 fps)

Pond W5: WETLAND 5



Summary for Pond W6: WETLAND 6

Inflow Area = 4.348 ac, 45.54% Impervious, Inflow Depth = 1.61" for 2 yr event
Inflow = 8.49 cfs @ 12.08 hrs, Volume= 0.583 af
Outflow = 4.58 cfs @ 12.20 hrs, Volume= 0.496 af, Atten= 46%, Lag= 7.4 min
Primary = 4.58 cfs @ 12.20 hrs, Volume= 0.496 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 372.66' @ 12.20 hrs Surf.Area= 26,354 sf Storage= 7,471 cf

Plug-Flow detention time= 114.1 min calculated for 0.496 af (85% of inflow)
Center-of-Mass det. time= 49.0 min (881.0 - 832.0)

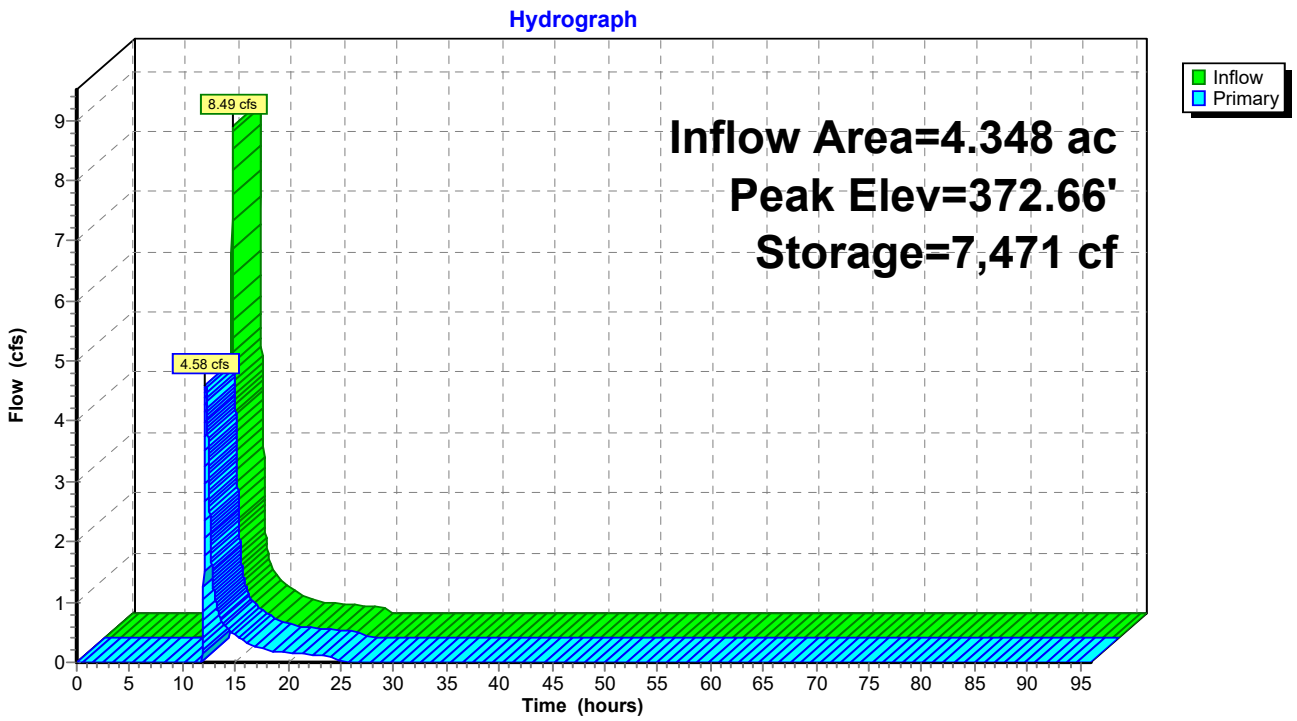
Volume	Invert	Avail.Storage	Storage Description
#1	372.20'	18,754 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
372.20	5,774	0	0
372.40	15,024	2,080	2,080
372.60	23,262	3,829	5,908
372.80	33,082	5,634	11,543
373.00	39,034	7,212	18,754

Device	Routing	Invert	Outlet Devices
#1	Primary	372.50'	**26.0' long x 16.0' 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=4.58 cfs @ 12.20 hrs HW=372.66' (Free Discharge)
└**1=Broad-Crested Rectangular Weir** (Weir Controls 4.58 cfs @ 1.08 fps)

Pond W6: WETLAND 6

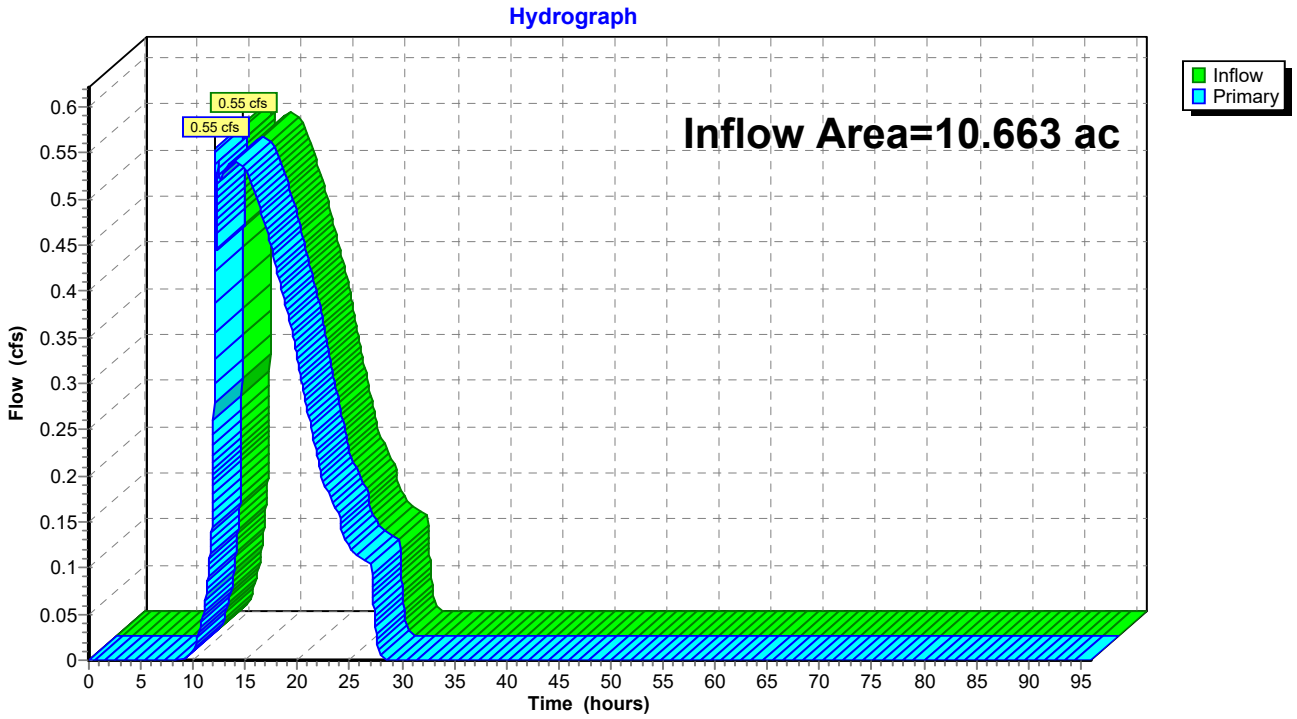


Summary for Link DP1: CHARLES RIVER/ WETLAND 3

Inflow Area = 10.663 ac, 57.86% Impervious, Inflow Depth = 0.49" for 2 yr event
Inflow = 0.55 cfs @ 12.09 hrs, Volume= 0.433 af
Primary = 0.55 cfs @ 12.09 hrs, Volume= 0.433 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs

Link DP1: CHARLES RIVER/ WETLAND 3

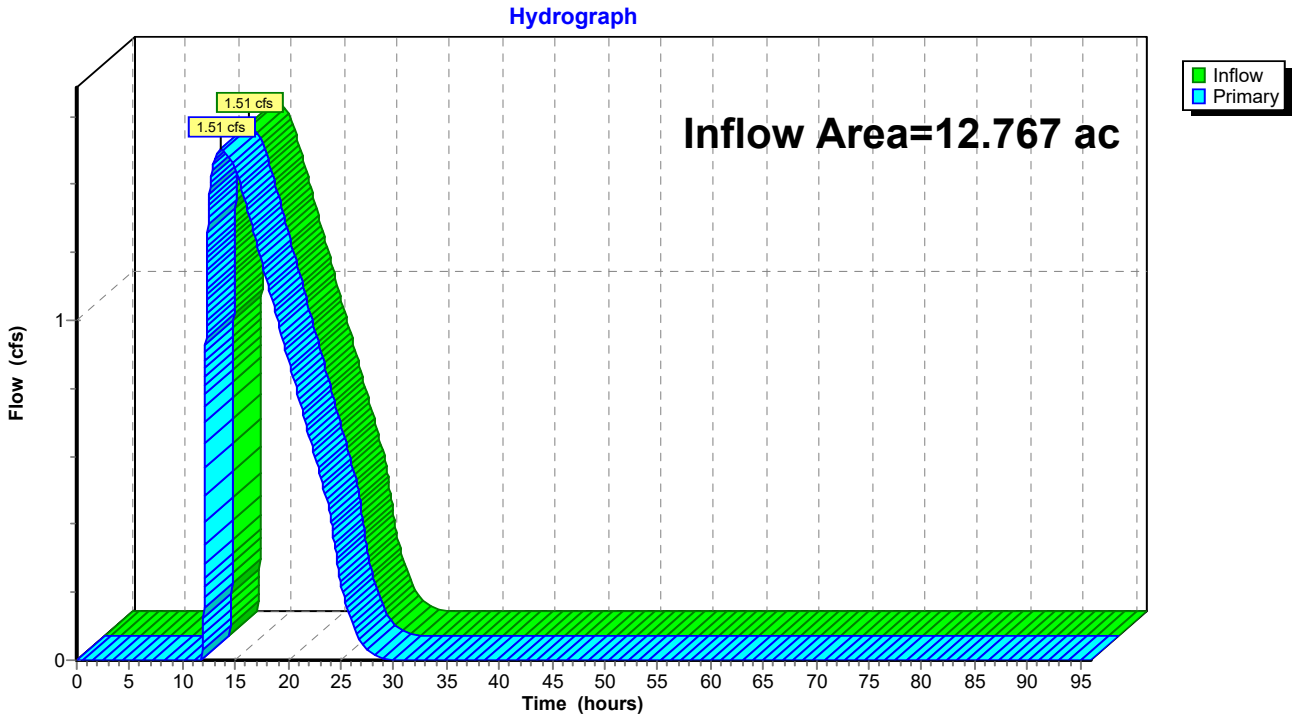


Summary for Link DP2: DEER BROOK/ WETLAND 4

Inflow Area = 12.767 ac, 53.02% Impervious, Inflow Depth = 1.03" for 2 yr event
Inflow = 1.51 cfs @ 13.65 hrs, Volume= 1.095 af
Primary = 1.51 cfs @ 13.65 hrs, Volume= 1.095 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs

Link DP2: DEER BROOK/ WETLAND 4

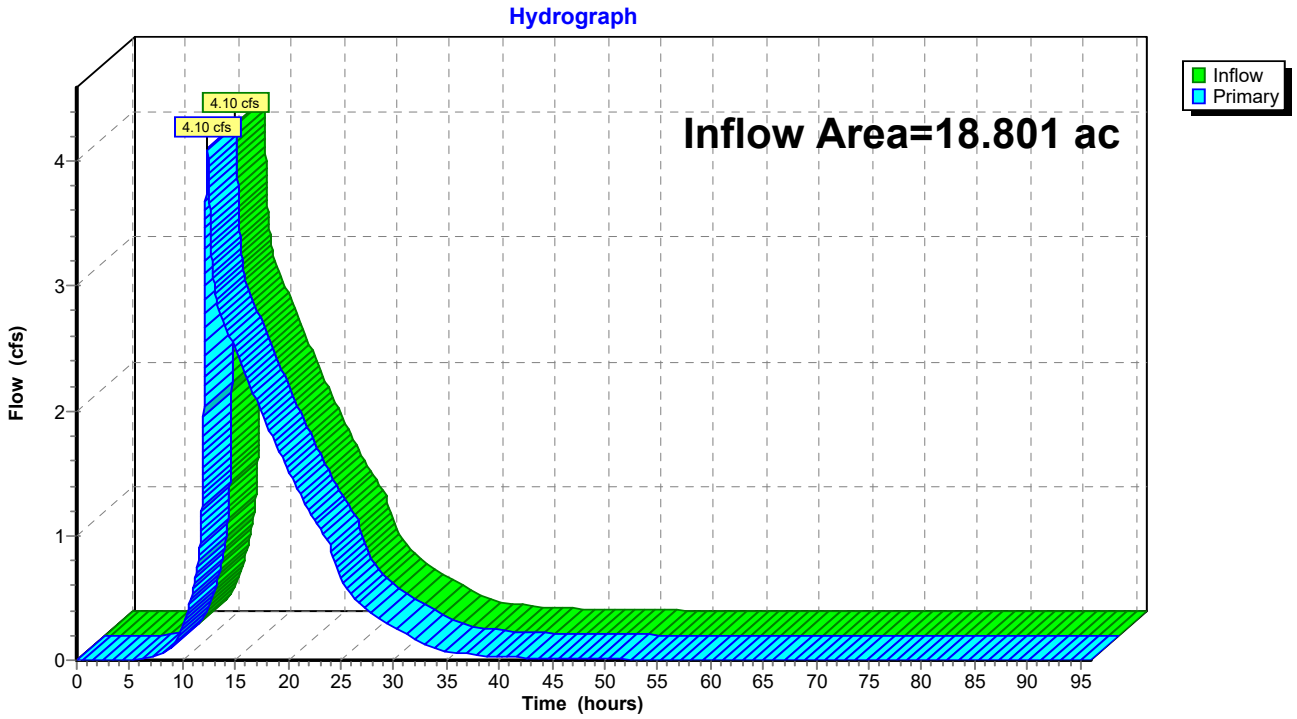


Summary for Link DP3: WETLAND 2

Inflow Area = 18.801 ac, 51.65% Impervious, Inflow Depth > 1.55" for 2 yr event
Inflow = 4.10 cfs @ 12.37 hrs, Volume= 2.431 af
Primary = 4.10 cfs @ 12.37 hrs, Volume= 2.431 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs

Link DP3: WETLAND 2

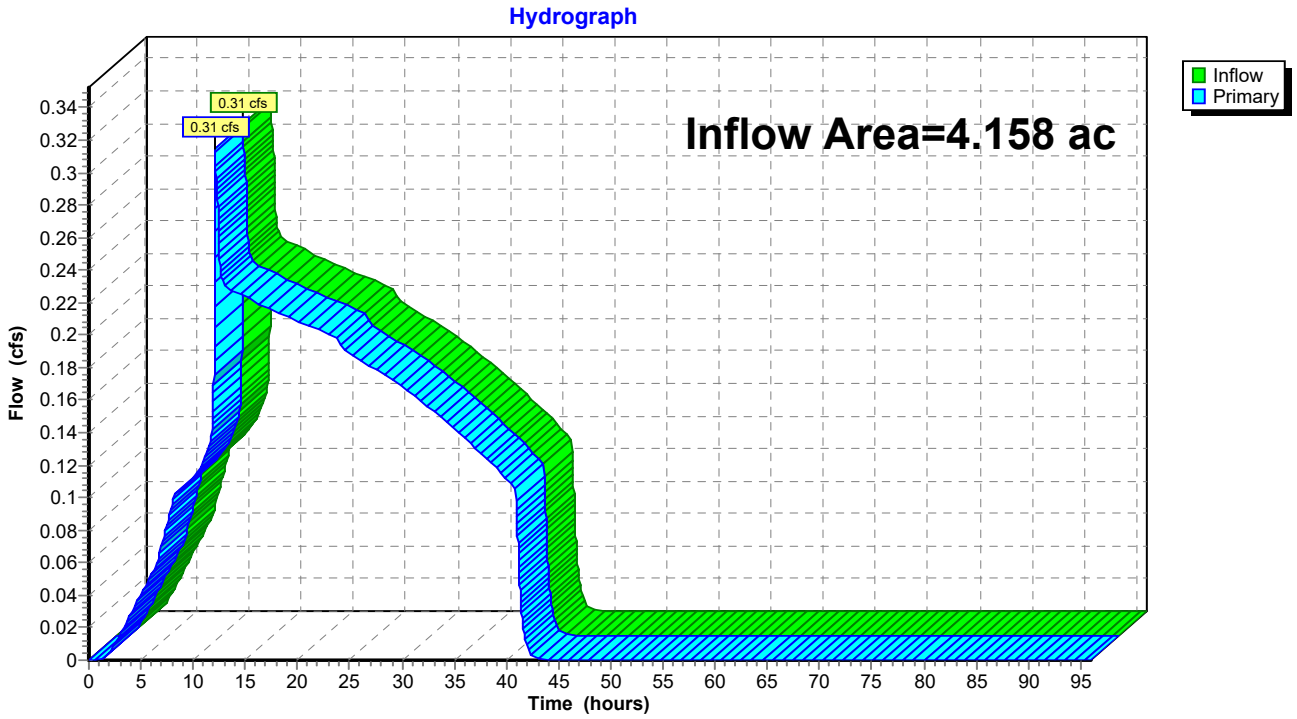


Summary for Link DP4: WETLAND 7/8

Inflow Area = 4.158 ac, 69.42% Impervious, Inflow Depth = 1.43" for 2 yr event
Inflow = 0.31 cfs @ 12.11 hrs, Volume= 0.494 af
Primary = 0.31 cfs @ 12.11 hrs, Volume= 0.494 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs

Link DP4: WETLAND 7/8



Summary for Subcatchment B2: BLDG 2

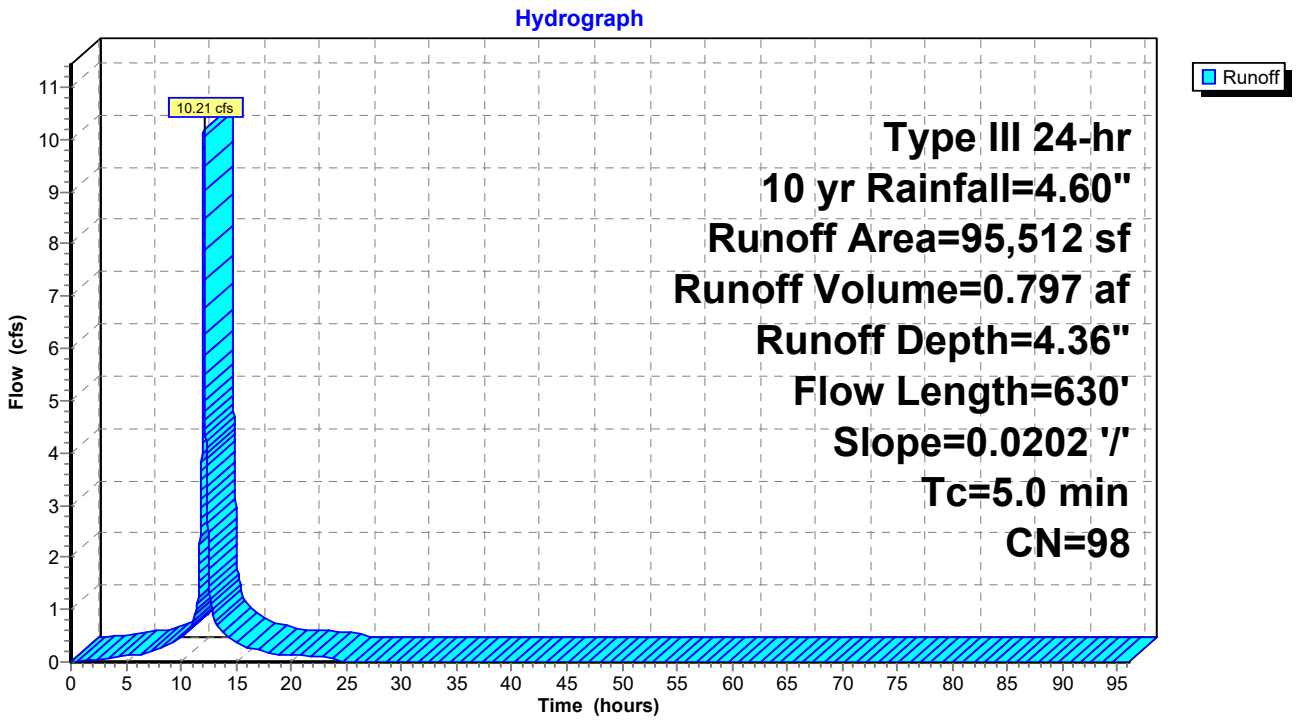
Runoff = 10.21 cfs @ 12.07 hrs, Volume= 0.797 af, Depth= 4.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.60"

	Area (sf)	CN	Description
*	95,512	98	Building
	95,512		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.4	630	0.0202	7.48	9.18	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013
1.4	630	Total, Increased to minimum Tc = 5.0 min			

Subcatchment B2: BLDG 2



Summary for Subcatchment PR 1.1: SUB PR 1.1

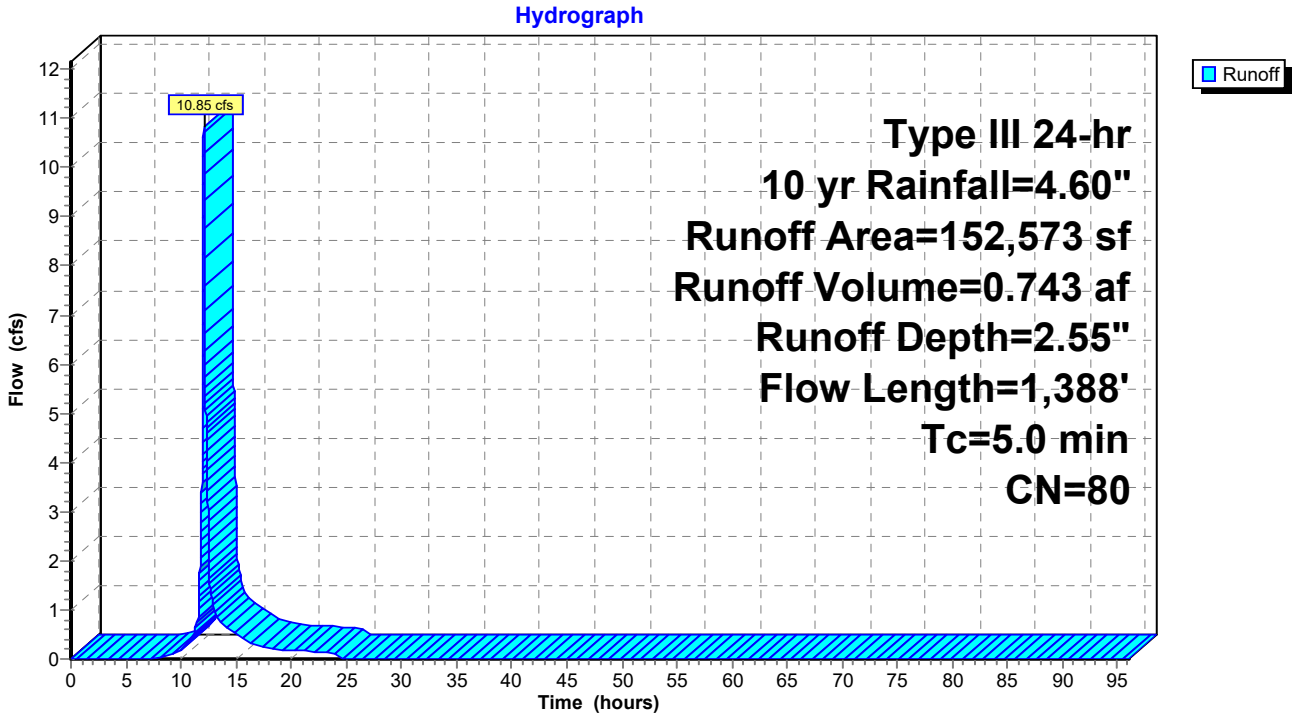
Runoff = 10.85 cfs @ 12.07 hrs, Volume= 0.743 af, Depth= 2.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.60"

Area (sf)	CN	Description
97,308	98	Paved parking & roofs
33,365	39	>75% Grass cover, Good, HSG A
21,353	61	>75% Grass cover, Good, HSG B
547	80	>75% Grass cover, Good, HSG D
152,573	80	Weighted Average
55,265		36.22% Pervious Area
97,308		63.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0294	1.40		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
1.4	243	0.0192	2.81		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.6	1,095	0.0183	7.12	8.74	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Concrete pipe, bends & connections
4.6	1,388	Total, Increased to minimum Tc = 5.0 min			

Subcatchment PR 1.1: SUB PR 1.1



Summary for Subcatchment PR 1.2: SUB PR 1.2

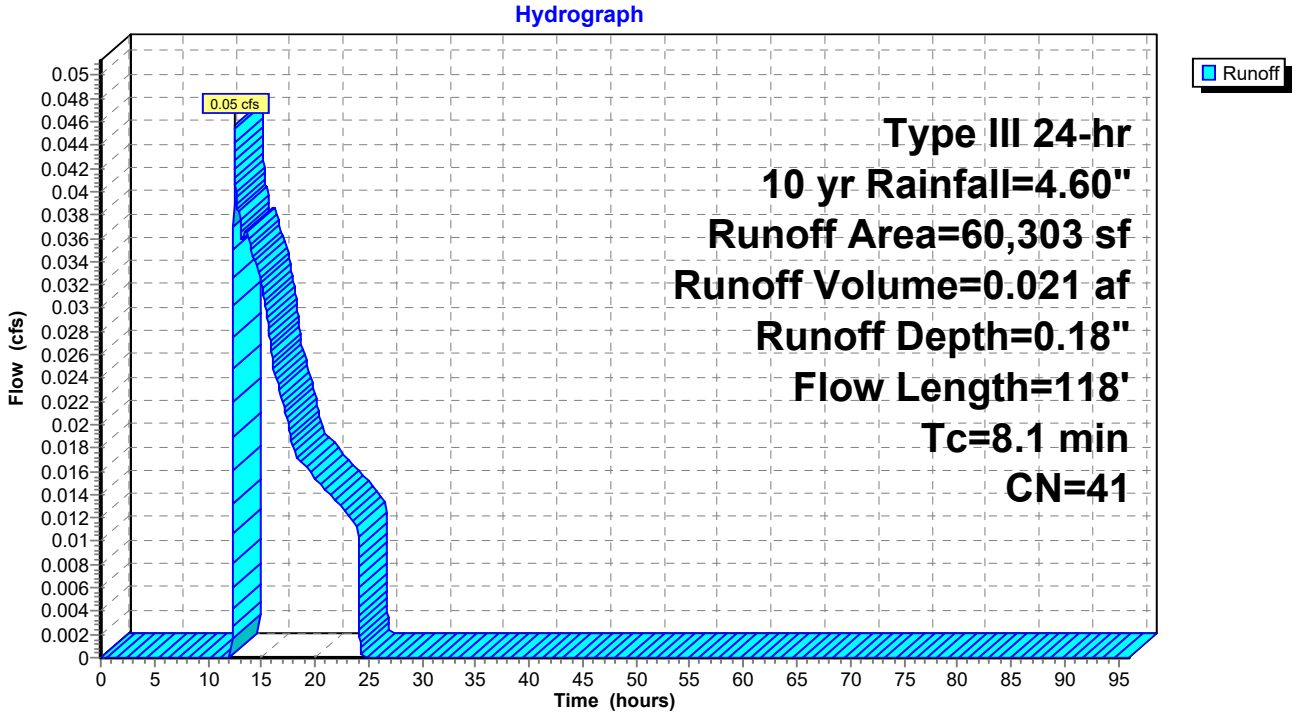
Runoff = 0.05 cfs @ 12.51 hrs, Volume= 0.021 af, Depth= 0.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.60"

Area (sf)	CN	Description
6,527	39	>75% Grass cover, Good, HSG A
38,151	30	Woods, Good, HSG A
8,676	61	>75% Grass cover, Good, HSG B
2,606	80	>75% Grass cover, Good, HSG D
4,343	77	Woods, Good, HSG D
60,303	41	Weighted Average
60,303		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0600	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.2	68	0.0880	4.78		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
8.1	118	Total			

Subcatchment PR 1.2: SUB PR 1.2



Summary for Subcatchment PR 1.3: SUB PR 1.3

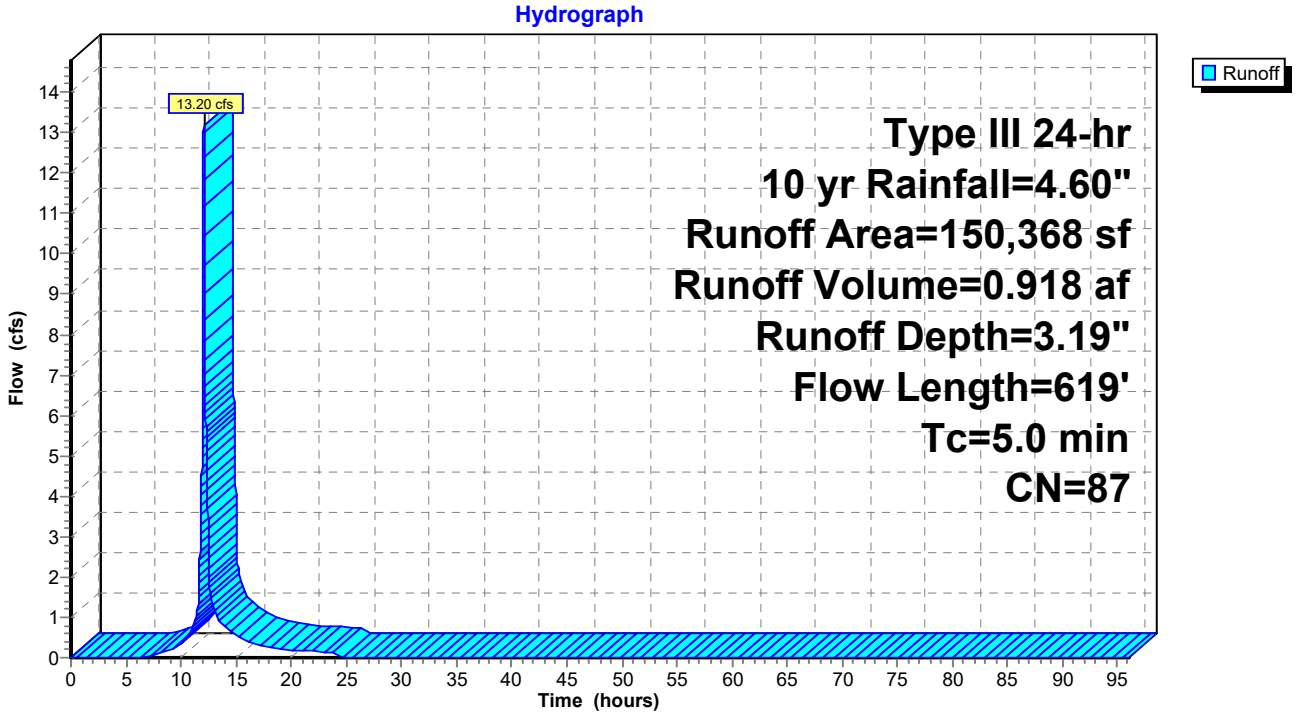
Runoff = 13.20 cfs @ 12.07 hrs, Volume= 0.918 af, Depth= 3.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.60"

	Area (sf)	CN	Description
*	106,654	98	Paved parking, Roofs, HSG B
	25,272	61	>75% Grass cover, Good, HSG B
*	18,442	61	Inf. Basin; >75% Grass cover, Good, HSG B
	150,368	87	Weighted Average
	43,714		29.07% Pervious Area
	106,654		70.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	50	0.0125	0.99		**Sheet Flow, Sheet - ESTIMATE** Smooth surfaces n= 0.011 P2= 3.20"
1.5	569	0.0200	6.42	5.04	**Pipe Channel, Pipe - ESTIMATE** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Concrete pipe, bends & connections
2.3	619	Total, Increased to minimum Tc = 5.0 min			

Subcatchment PR 1.3: SUB PR 1.3



Summary for Subcatchment PR 1.4: SUB PR 1.4

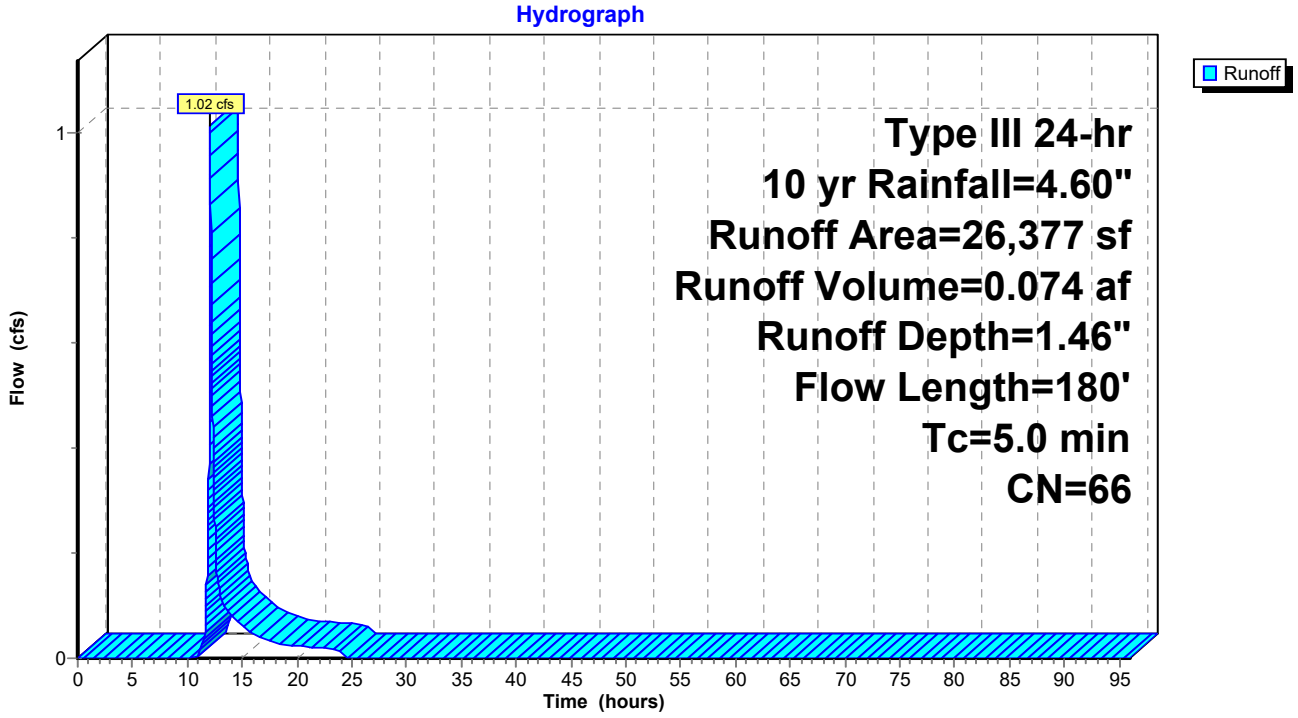
Runoff = 1.02 cfs @ 12.08 hrs, Volume= 0.074 af, Depth= 1.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.60"

Area (sf)	CN	Description
19,466	61	>75% Grass cover, Good, HSG B
6,911	80	>75% Grass cover, Good, HSG D
26,377	66	Weighted Average
26,377		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	41	0.5000	0.52		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.6	139	0.0647	4.10		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.9	180	Total, Increased to minimum Tc = 5.0 min			

Subcatchment PR 1.4: SUB PR 1.4



Summary for Subcatchment PR 1.6: SUB PR 1.6

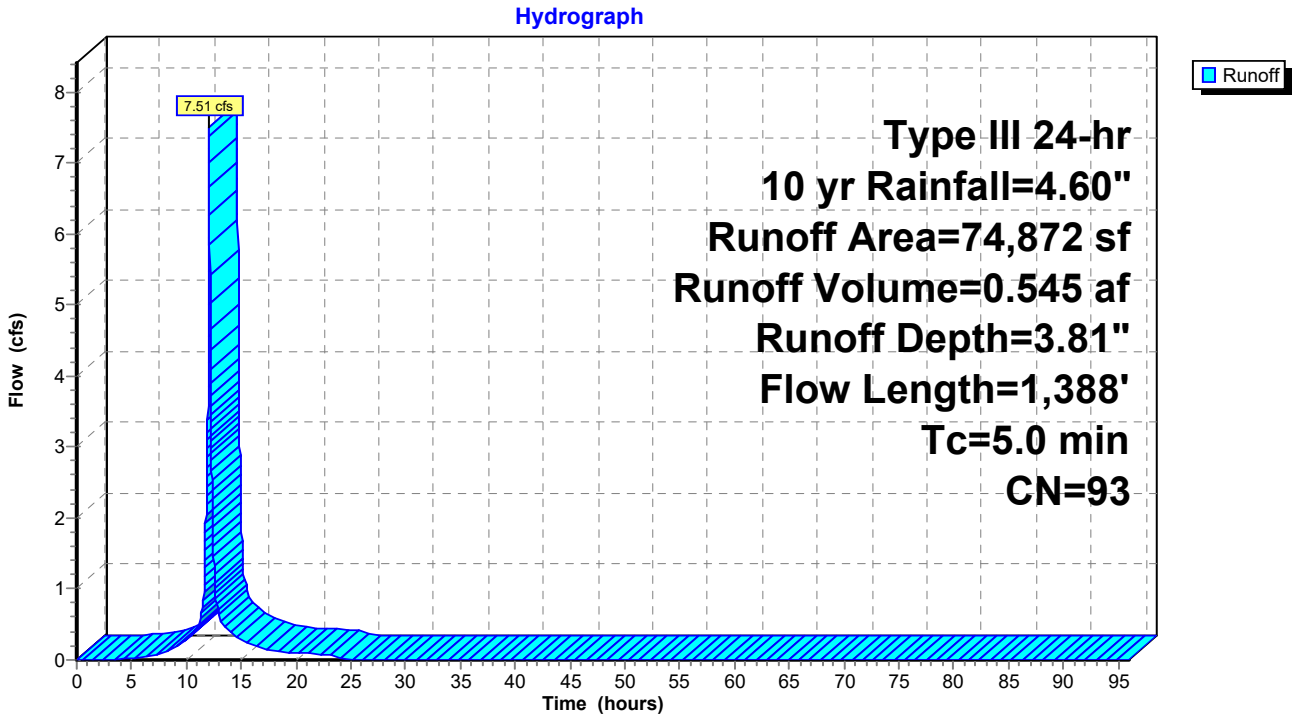
Runoff = 7.51 cfs @ 12.07 hrs, Volume= 0.545 af, Depth= 3.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.60"

Area (sf)	CN	Description
64,814	98	Paved parking & roofs
10,058	61	>75% Grass cover, Good, HSG B
74,872	93	Weighted Average
10,058		13.43% Pervious Area
64,814		86.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0294	1.40		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
1.4	243	0.0192	2.81		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.6	1,095	0.0183	7.12	8.74	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Concrete pipe, bends & connections
4.6	1,388	Total, Increased to minimum Tc = 5.0 min			

Subcatchment PR 1.6: SUB PR 1.6



Summary for Subcatchment PR 2.1: SUB PR 2.1

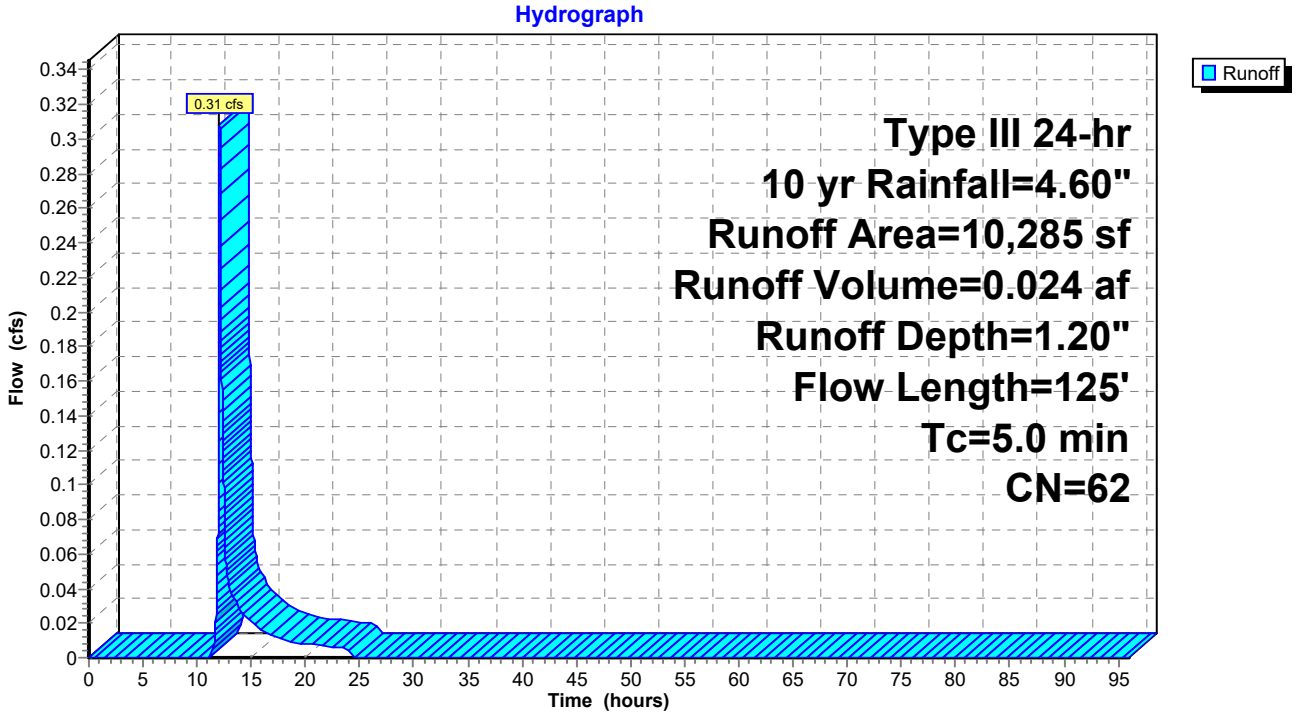
Runoff = 0.31 cfs @ 12.09 hrs, Volume= 0.024 af, Depth= 1.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.60"

Area (sf)	CN	Description
490	39	>75% Grass cover, Good, HSG A
8,567	61	>75% Grass cover, Good, HSG B
1,228	80	>75% Grass cover, Good, HSG D
10,285	62	Weighted Average
10,285		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.20		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.0	20	0.2857	8.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.3	55	0.0455	3.43		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
4.6	125	Total, Increased to minimum Tc = 5.0 min			

Subcatchment PR 2.1: SUB PR 2.1



Summary for Subcatchment PR 2.2A: SUB PR 2.2A

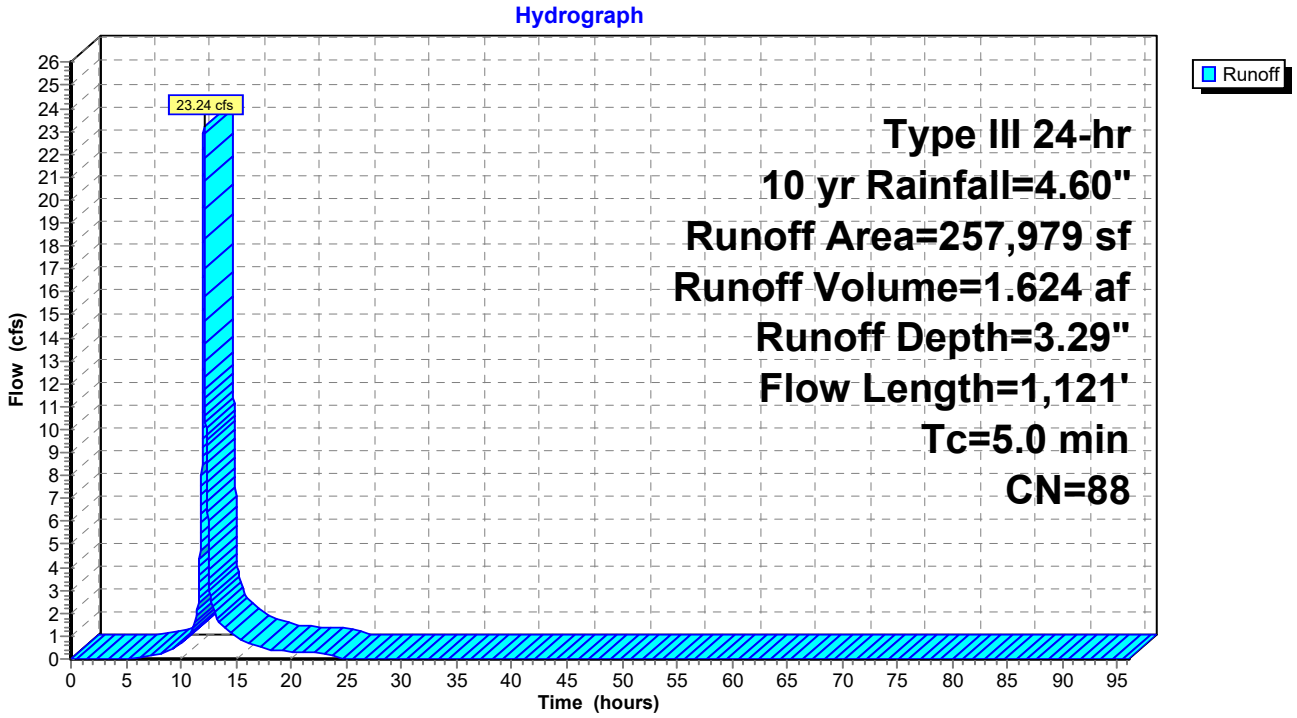
Runoff = 23.24 cfs @ 12.07 hrs, Volume= 1.624 af, Depth= 3.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.60"

	Area (sf)	CN	Description
	176,686	98	Paved parking, HSG B
	25,211	61	>75% Grass cover, Good, HSG B
	18,821	80	>75% Grass cover, Good, HSG D
*	37,261	61	Inf. Basin; >75% Grass cover, Good, HSG B
	257,979	88	Weighted Average
	81,293		31.51% Pervious Area
	176,686		68.49% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	50	0.0500	1.73		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
1.6	275	0.0196	2.84		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.1	796	0.0566	12.52	15.37	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Concrete pipe, bends & connections
3.2	1,121	Total, Increased to minimum Tc = 5.0 min			

Subcatchment PR 2.2A: SUB PR 2.2A



Summary for Subcatchment PR 2.2B: SUB PR 2.2B

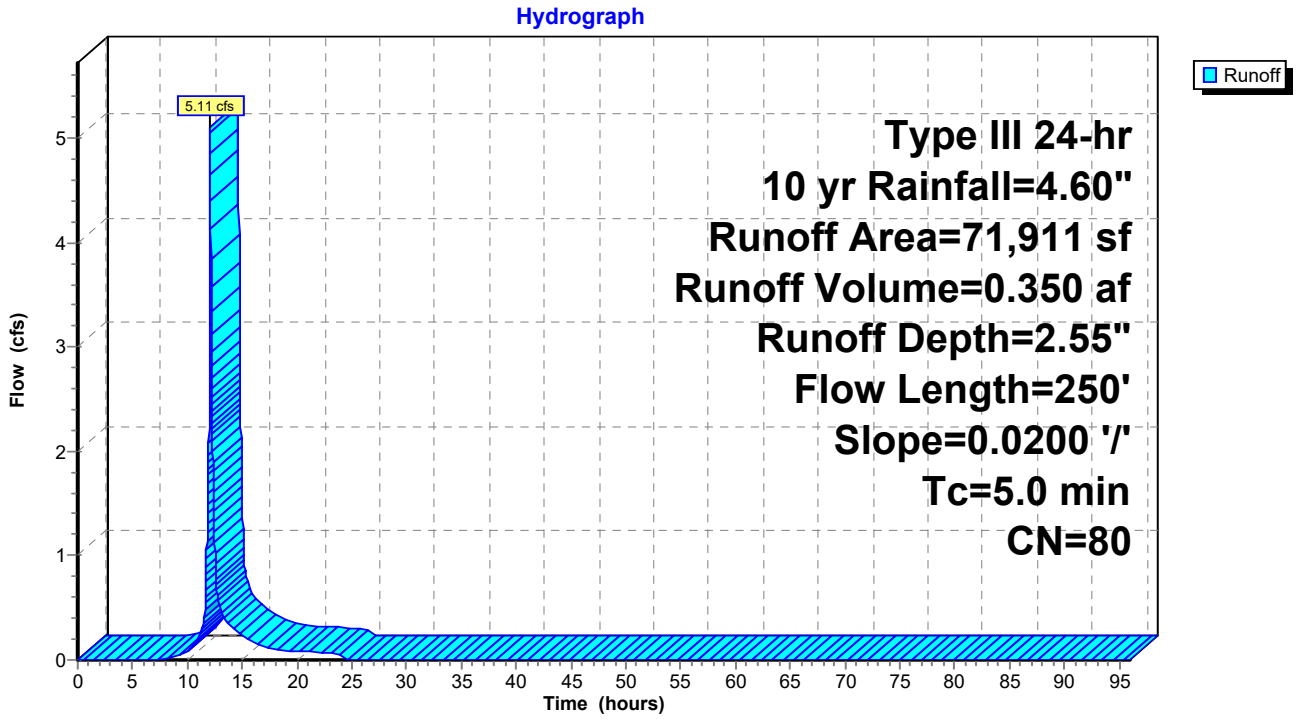
Runoff = 5.11 cfs @ 12.07 hrs, Volume= 0.350 af, Depth= 2.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.60"

	Area (sf)	CN	Description
	31,953	98	Paved parking, HSG B
	16,585	61	>75% Grass cover, Good, HSG B
	9,536	80	>75% Grass cover, Good, HSG D
*	13,837	61	Inf. Basin; >75% Grass cover, Good, HSG B
	71,911	80	Weighted Average
	39,958		55.57% Pervious Area
	31,953		44.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.20		**Sheet Flow, Sheet - ESTIMATE** Smooth surfaces n= 0.011 P2= 3.20"
0.5	200	0.0200	6.42	5.04	**Pipe Channel, Pipe - ESTIMATE** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Concrete pipe, bends & connections
1.2	250	Total, Increased to minimum Tc = 5.0 min			

Subcatchment PR 2.2B: SUB PR 2.2B



Summary for Subcatchment PR 2.3: SUB PR 2.3

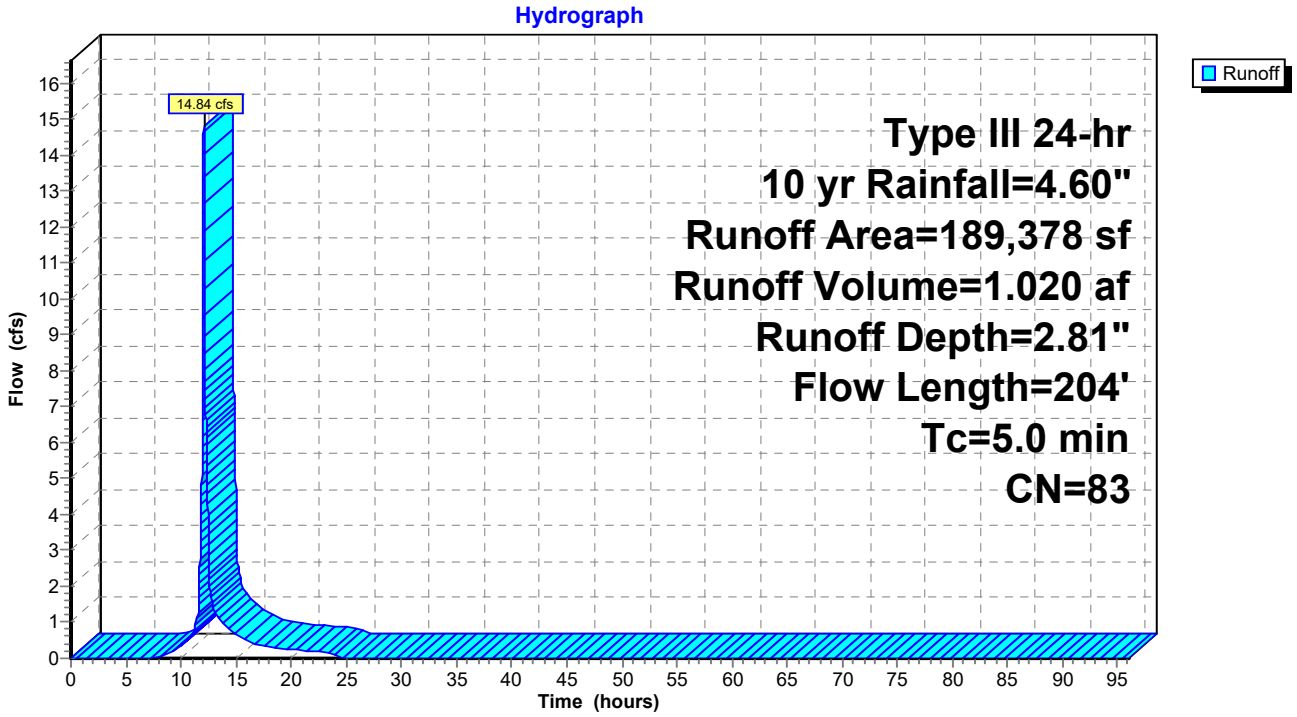
Runoff = 14.84 cfs @ 12.07 hrs, Volume= 1.020 af, Depth= 2.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.60"

Area (sf)	CN	Description
28,343	55	Woods, Good, HSG B
40,833	77	Woods, Good, HSG D
33,965	77	Wetland (Woods, Good, HSG D)
86,237	98	Paved parking & roofs
189,378	83	Weighted Average
103,141		54.46% Pervious Area
86,237		45.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.20		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.1	28	0.0643	4.08		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.3	81	0.0364	3.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.1	45	0.0200	7.44	9.14	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013
4.8	204	Total, Increased to minimum Tc = 5.0 min			

Subcatchment PR 2.3: SUB PR 2.3



Summary for Subcatchment PR 2.4: SUB PR 2.4

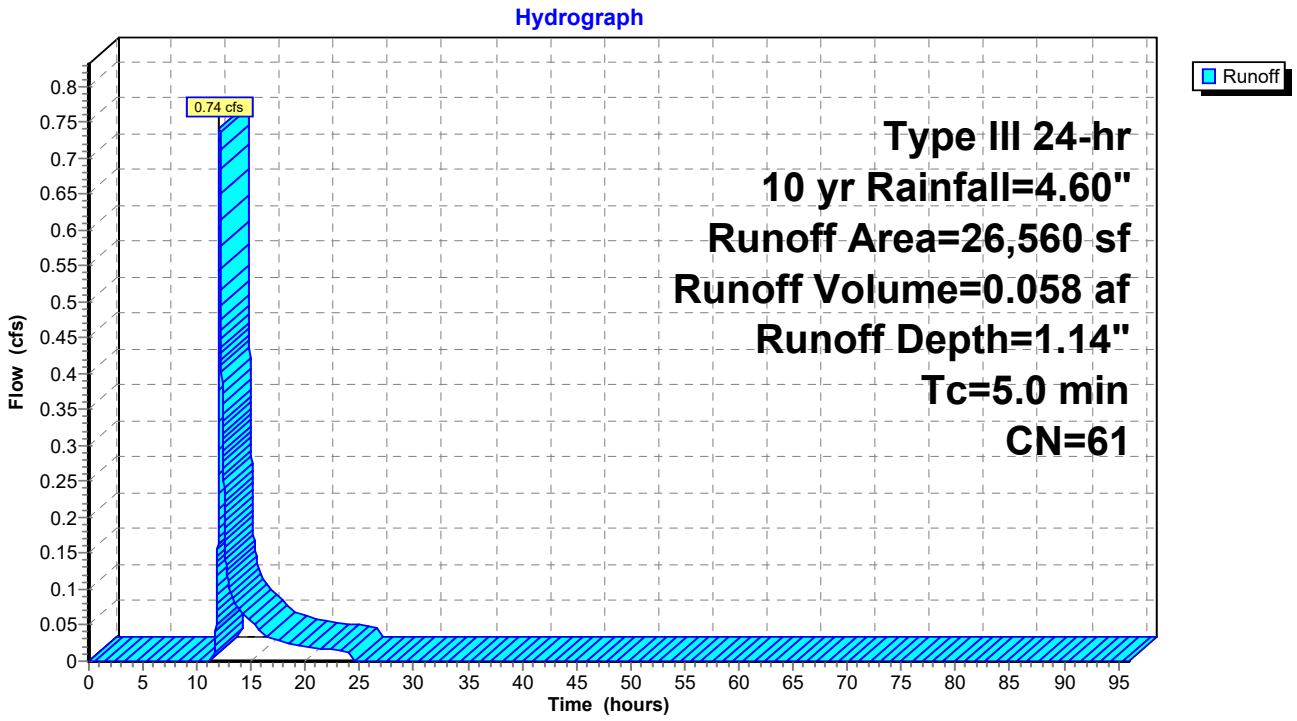
Runoff = 0.74 cfs @ 12.09 hrs, Volume= 0.058 af, Depth= 1.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.60"

Area (sf)	CN	Description
26,560	61	>75% Grass cover, Good, HSG B
26,560		100.00% Pervious Area

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

Subcatchment PR 2.4: SUB PR 2.4



Summary for Subcatchment PR 3.1: SUB PR 3.1

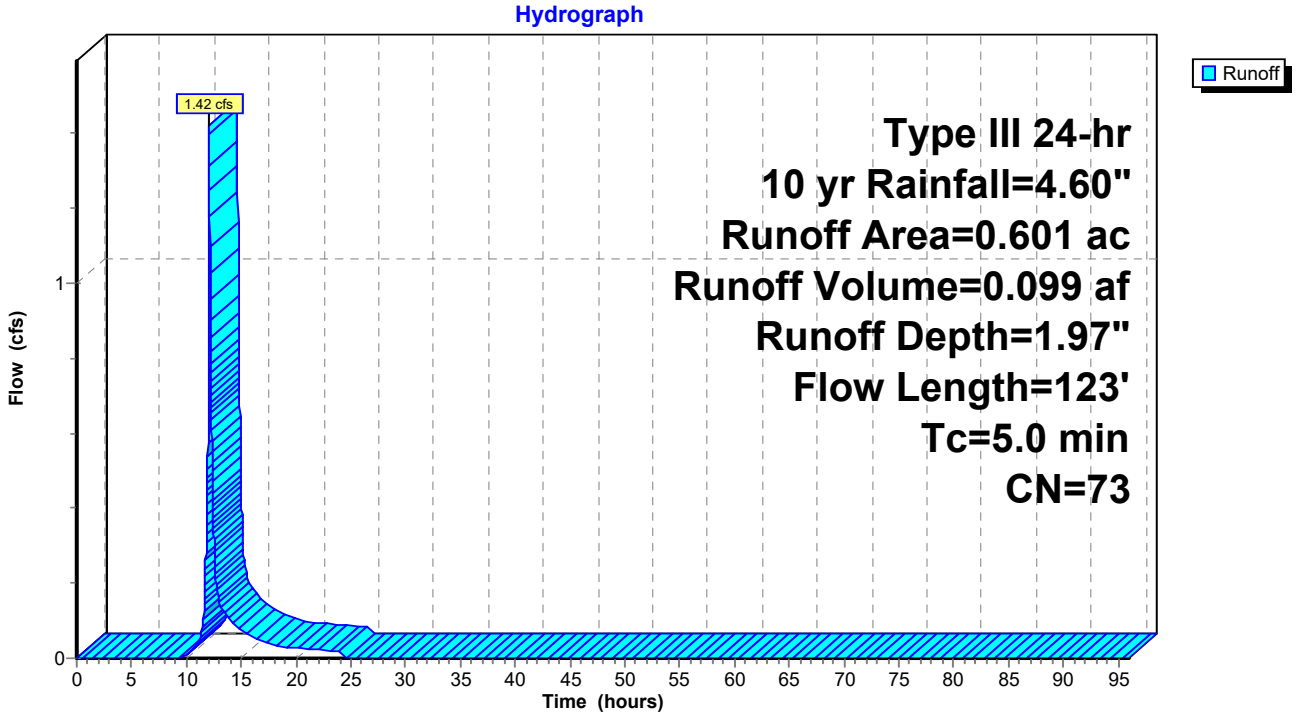
Runoff = 1.42 cfs @ 12.08 hrs, Volume= 0.099 af, Depth= 1.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.60"

Area (ac)	CN	Description
0.219	61	>75% Grass cover, Good, HSG B
0.382	80	>75% Grass cover, Good, HSG D
0.601	73	Weighted Average
0.601		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	33	0.5000	0.49		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.2	90	0.1444	6.12		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.3	123	Total, Increased to minimum Tc = 5.0 min			

Subcatchment PR 3.1: SUB PR 3.1



Summary for Subcatchment PR 3.2: SUB PR 3.2

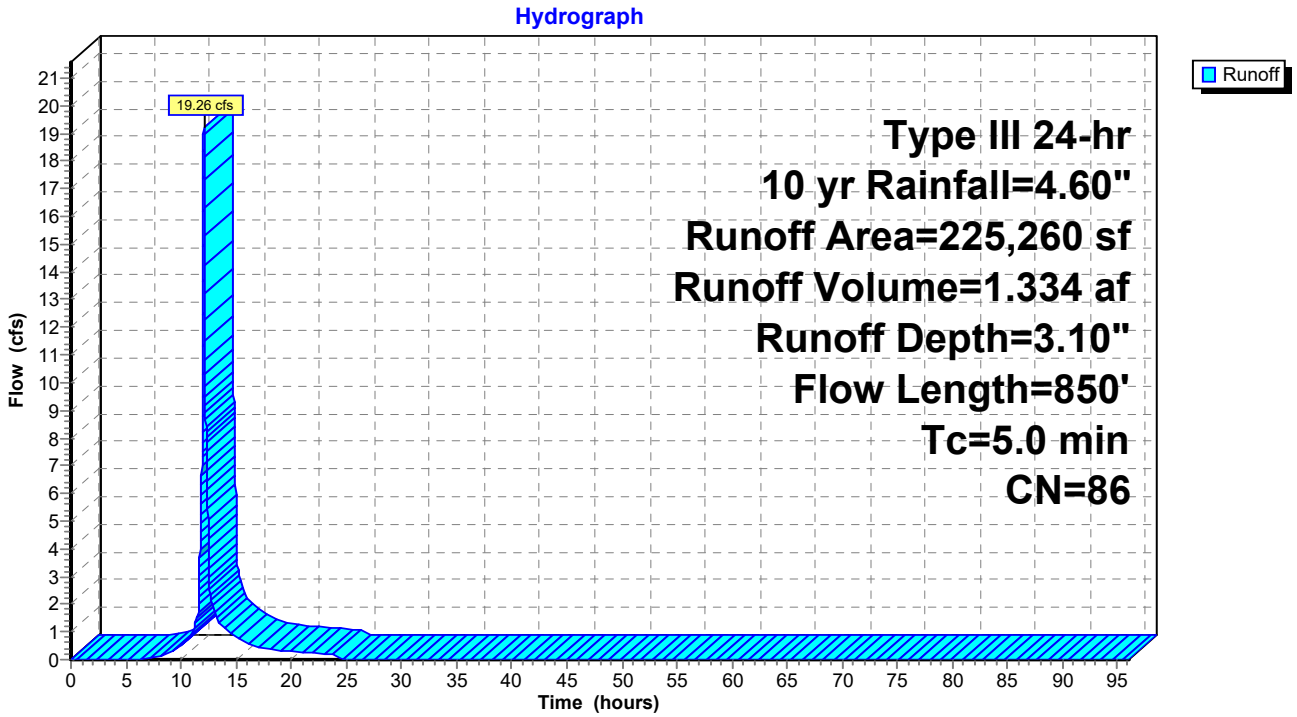
Runoff = 19.26 cfs @ 12.07 hrs, Volume= 1.334 af, Depth= 3.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.60"

	Area (sf)	CN	Description
*	151,349	98	Paved parking, Roofs, HSG B
	449	39	>75% Grass cover, Good, HSG A
	35,075	61	>75% Grass cover, Good, HSG B
	10,439	80	>75% Grass cover, Good, HSG D
*	27,948	58	Wetlands, Good, HSG B
	225,260	86	Weighted Average
	73,911		32.81% Pervious Area
	151,349		67.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.20		**Sheet Flow, Sheet - ESTIMATE** Smooth surfaces n= 0.011 P2= 3.20"
1.1	800	0.0500	11.77	14.44	**Pipe Channel, Pipe - ESTIMATE** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Concrete pipe, bends & connections
1.8	850	Total, Increased to minimum Tc = 5.0 min			

Subcatchment PR 3.2: SUB PR 3.2



Summary for Subcatchment PR 3.3A: SUB PR 3.3A

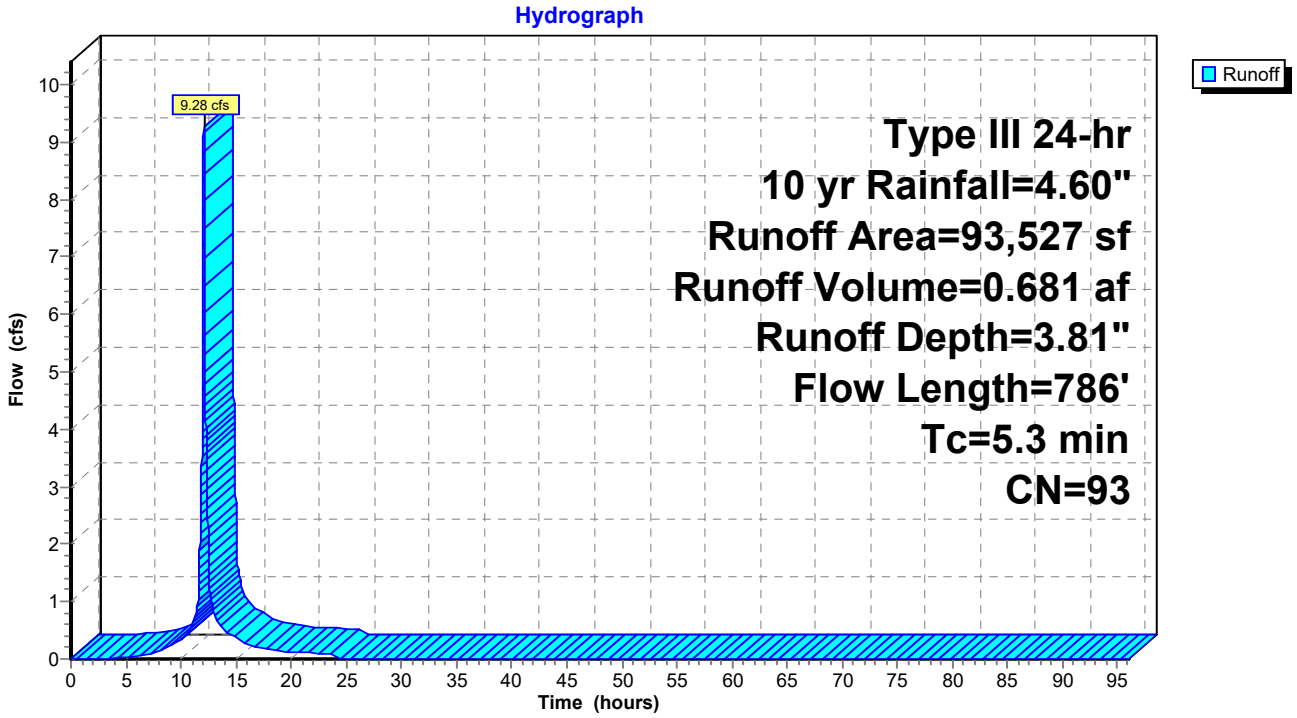
Runoff = 9.28 cfs @ 12.07 hrs, Volume= 0.681 af, Depth= 3.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.60"

Area (sf)	CN	Description
80,340	98	Paved parking & roofs
13,187	61	>75% Grass cover, Good, HSG B
93,527	93	Weighted Average
13,187		14.10% Pervious Area
80,340		85.90% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.7	50	0.0556	0.22		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.1	44	0.1000	5.09		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.0	218	0.0500	3.60		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.5	474	0.0759	14.50	17.80	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013
5.3	786	Total			

Subcatchment PR 3.3A: SUB PR 3.3A



Summary for Subcatchment PR 3.3B: SUB PR 3.3B

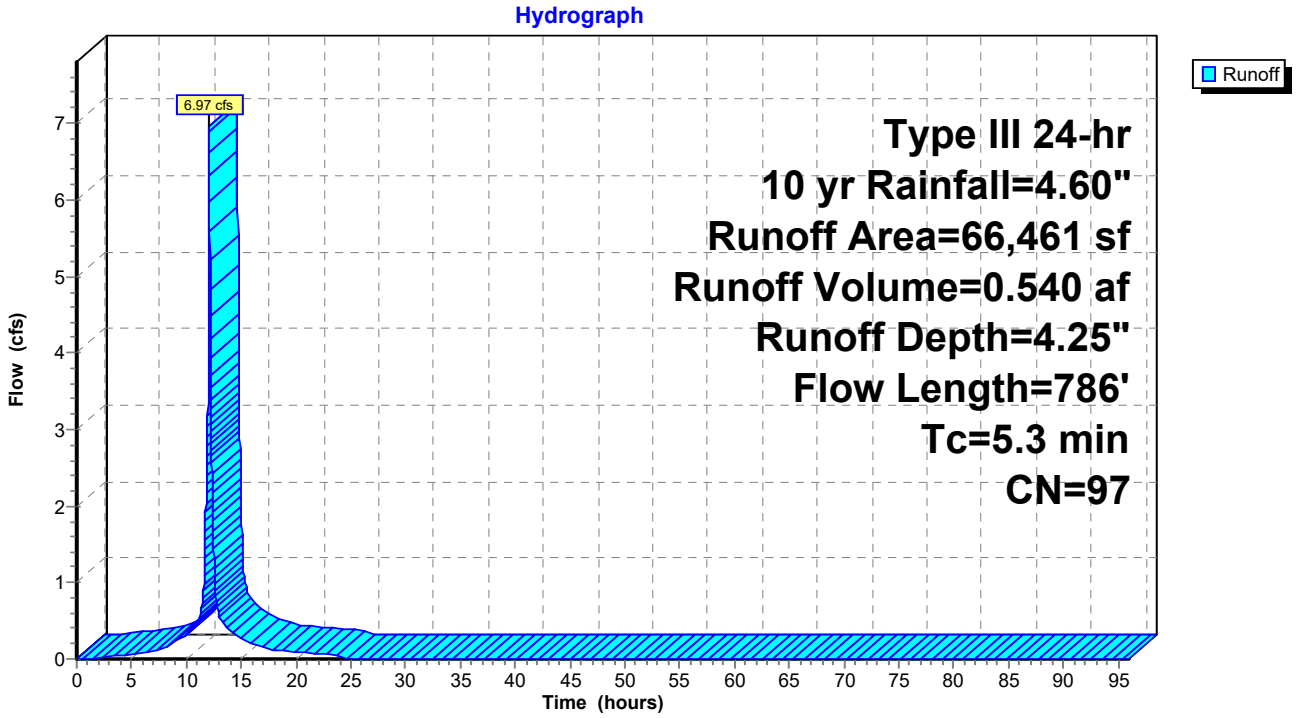
Runoff = 6.97 cfs @ 12.07 hrs, Volume= 0.540 af, Depth= 4.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.60"

Area (sf)	CN	Description
64,803	98	Paved parking & roofs
1,658	61	>75% Grass cover, Good, HSG B
66,461	97	Weighted Average
1,658		2.49% Pervious Area
64,803		97.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.7	50	0.0556	0.22		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.1	44	0.1000	5.09		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.0	218	0.0500	3.60		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.5	474	0.0759	14.50	17.80	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013
5.3	786	Total			

Subcatchment PR 3.3B: SUB PR 3.3B



Summary for Subcatchment PR 3.3C: PR 3.3C

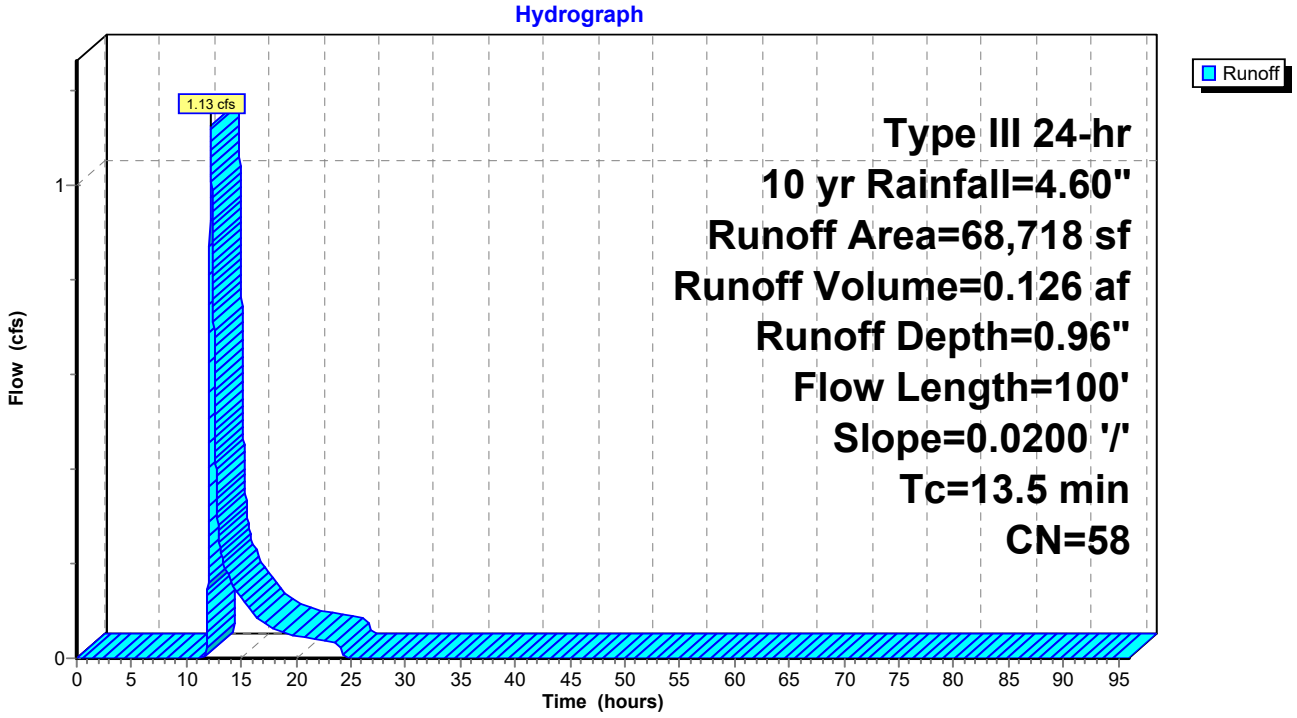
Runoff = 1.13 cfs @ 12.22 hrs, Volume= 0.126 af, Depth= 0.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.60"

Area (sf)	CN	Description
34,359	55	Woods, Good, HSG B
34,359	61	>75% Grass cover, Good, HSG B
68,718	58	Weighted Average
68,718		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		**Sheet Flow, Sheet - ESTIMATE** Woods: Light underbrush n= 0.400 P2= 3.20"
1.2	50	0.0200	0.71		**Shallow Concentrated Flow, Shallow Concentrated** Woodland Kv= 5.0 fps
13.5	100	Total			

Subcatchment PR 3.3C: PR 3.3C



Summary for Subcatchment PR 3.4: SUB PR 3.4

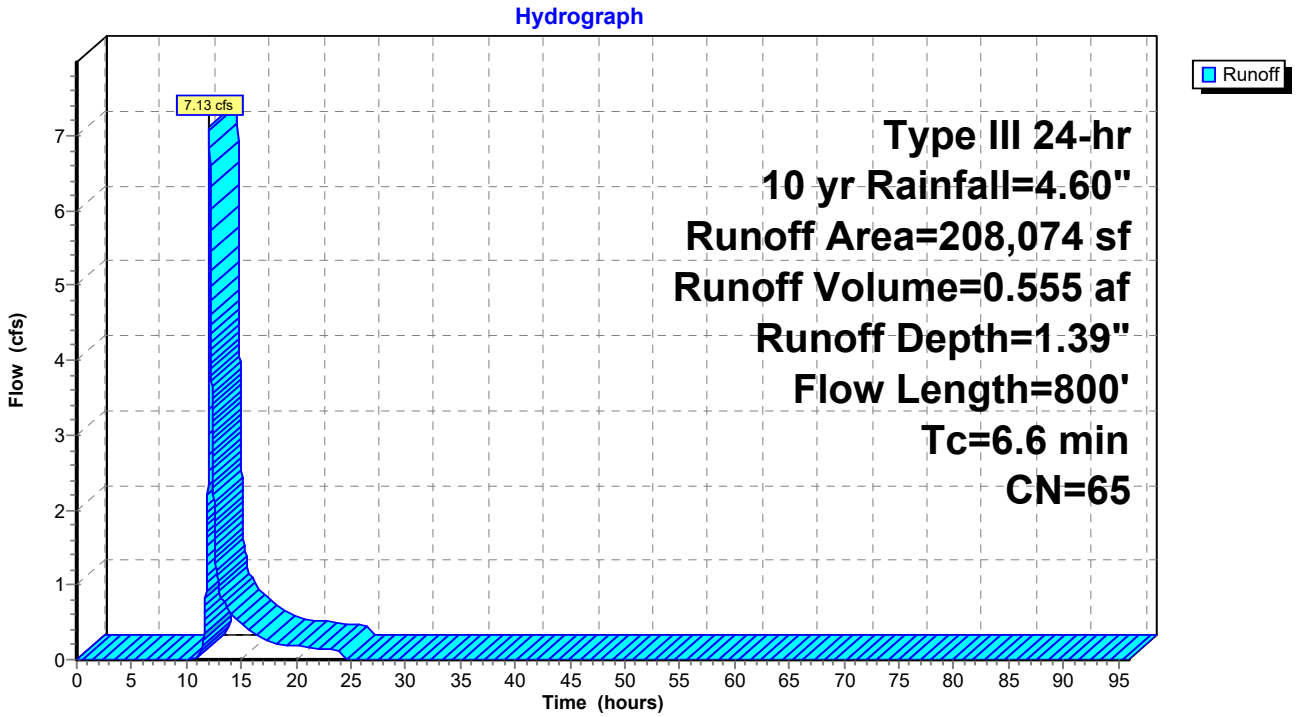
Runoff = 7.13 cfs @ 12.11 hrs, Volume= 0.555 af, Depth= 1.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.60"

	Area (sf)	CN	Description
	79,157	61	>75% Grass cover, Good, HSG B
	78,871	55	Woods, Good, HSG B
	21,288	77	Wetlands (Woods, Good, HSG D)
*	28,758	98	IMP Highway (EXISTING)
	208,074	65	Weighted Average
	179,316		86.18% Pervious Area
	28,758		13.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.20		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
5.7	675	0.0148	1.96		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.2	75	0.1333	5.88		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.6	800	Total			

Subcatchment PR 3.4: SUB PR 3.4



Summary for Subcatchment PR 3.5: SUB PR 3.5

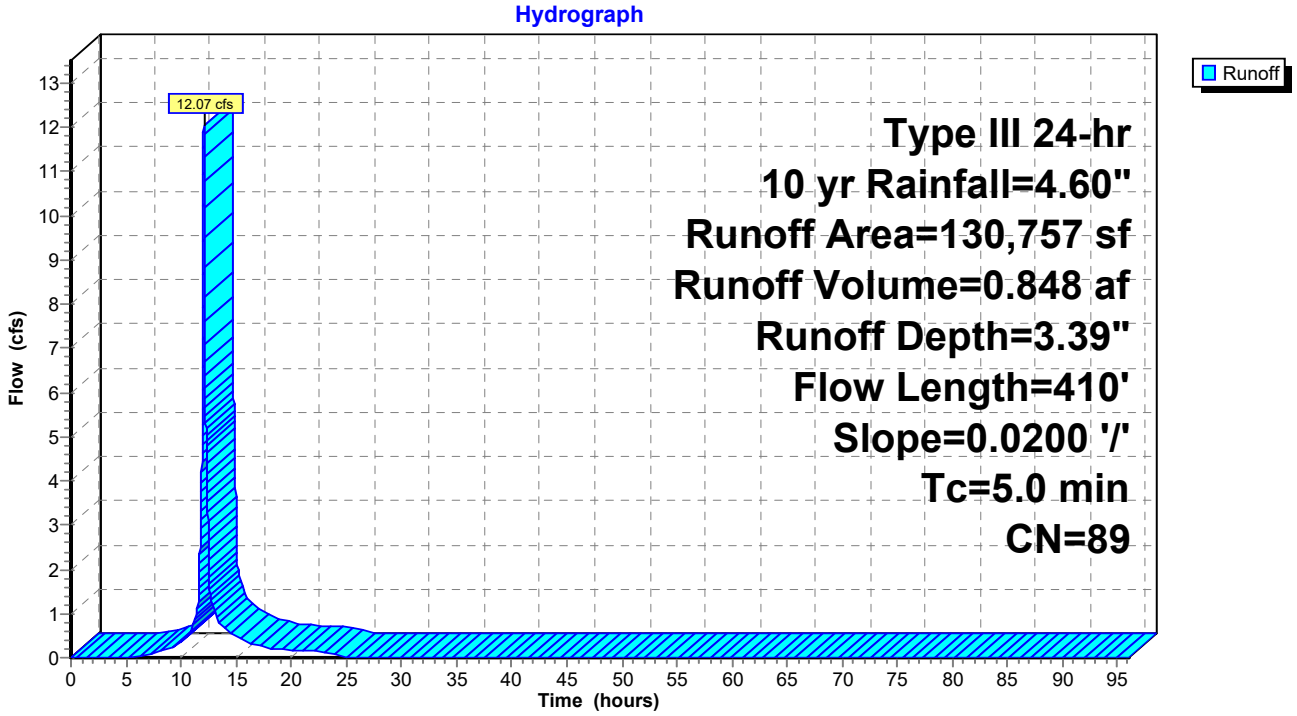
Runoff = 12.07 cfs @ 12.07 hrs, Volume= 0.848 af, Depth= 3.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.60"

Area (sf)	CN	Description
97,754	98	Paved parking & roofs
27,843	61	>75% Grass cover, Good, HSG B
5,160	80	>75% Grass cover, Good, HSG D
130,757	89	Weighted Average
33,003		25.24% Pervious Area
97,754		74.76% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.20		**Sheet Flow, Sheet - ESTIMATE** Smooth surfaces n= 0.011 P2= 3.20"
0.8	360	0.0200	7.44	9.14	**Pipe Channel, Pipe - ESTIMATE** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Concrete pipe, bends & connections
1.5	410	Total, Increased to minimum Tc = 5.0 min			

Subcatchment PR 3.5: SUB PR 3.5



Summary for Subcatchment PR 4.1: SUB PR 4.1

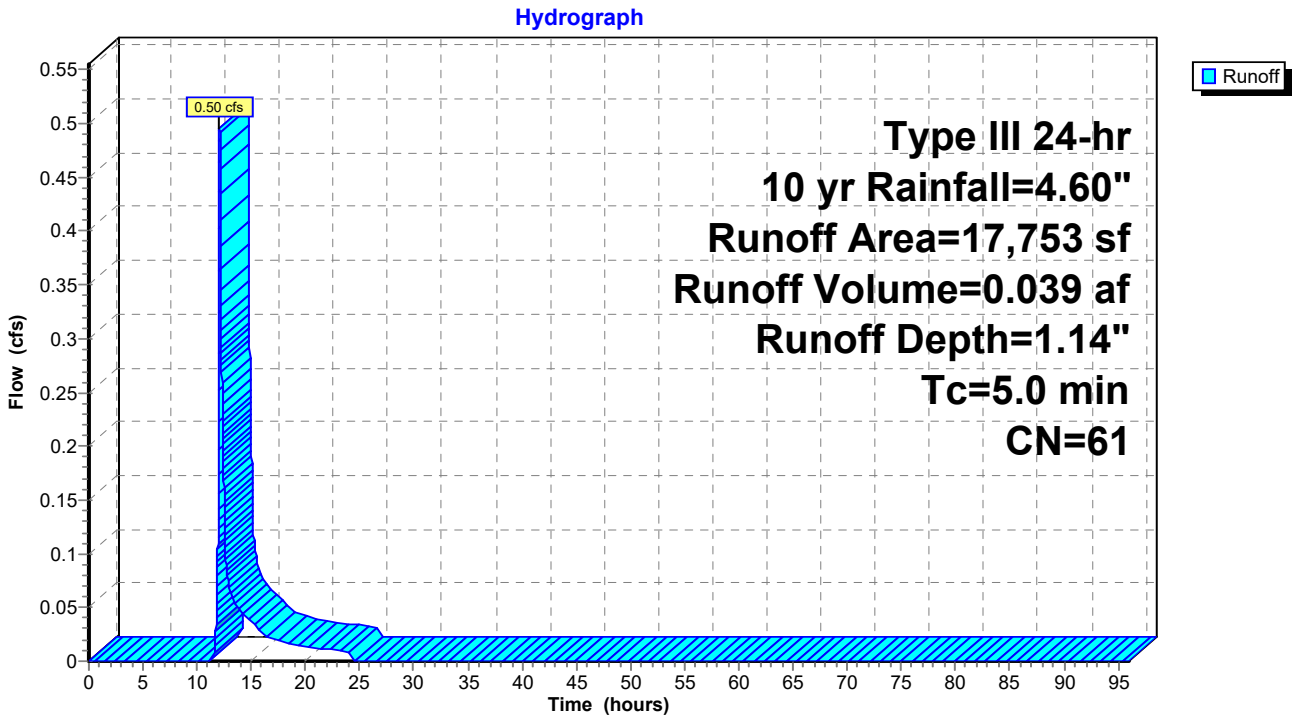
Runoff = 0.50 cfs @ 12.09 hrs, Volume= 0.039 af, Depth= 1.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.60"

Area (sf)	CN	Description
17,753	61	>75% Grass cover, Good, HSG B
17,753		100.00% Pervious Area

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

Subcatchment PR 4.1: SUB PR 4.1



Summary for Subcatchment PR 4.2: SUB PR 4.2

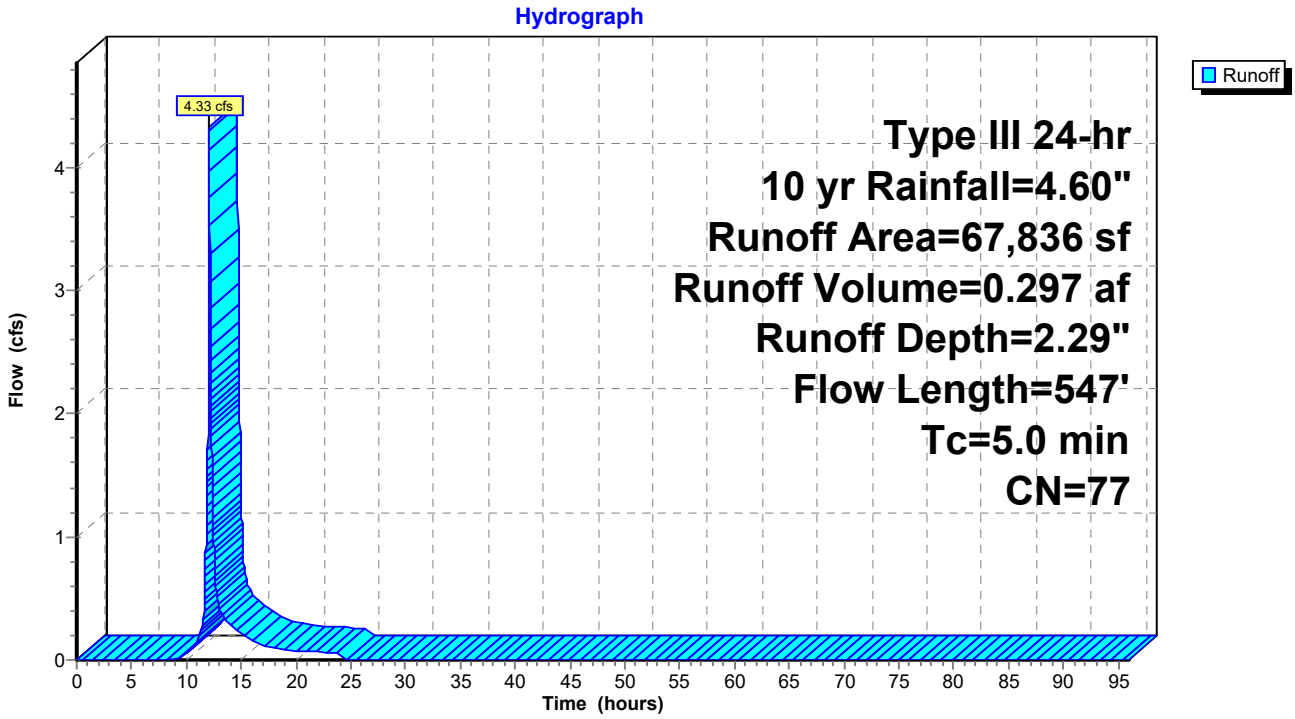
Runoff = 4.33 cfs @ 12.08 hrs, Volume= 0.297 af, Depth= 2.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.60"

Area (sf)	CN	Description
37,635	61	>75% Grass cover, Good, HSG B
30,201	98	Paved parking & roofs
67,836	77	Weighted Average
37,635		55.48% Pervious Area
30,201		44.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0230	1.27		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
0.8	144	0.0230	3.08		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.8	353	0.0210	7.63	9.36	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013
2.3	547	Total, Increased to minimum Tc = 5.0 min			

Subcatchment PR 4.2: SUB PR 4.2



Summary for Pond B-1: Basin 1

Inflow Area =	3.503 ac, 63.78% Impervious, Inflow Depth = 2.55" for 10 yr event				
Inflow =	10.85 cfs @	12.07 hrs,	Volume=	0.743 af	
Outflow =	0.96 cfs @	13.06 hrs,	Volume=	0.743 af,	Atten= 91%, Lag= 59.1 min
Discarded =	0.20 cfs @	13.06 hrs,	Volume=	0.307 af	
Primary =	0.76 cfs @	13.06 hrs,	Volume=	0.437 af	

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 296.13' @ 13.06 hrs Surf.Area= 8,395 sf Storage= 15,273 cf

Plug-Flow detention time= 305.6 min calculated for 0.743 af (100% of inflow)
Center-of-Mass det. time= 305.5 min (1,130.1 - 824.5)

Volume	Invert	Avail.Storage	Storage Description
#1	294.00'	33,182 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

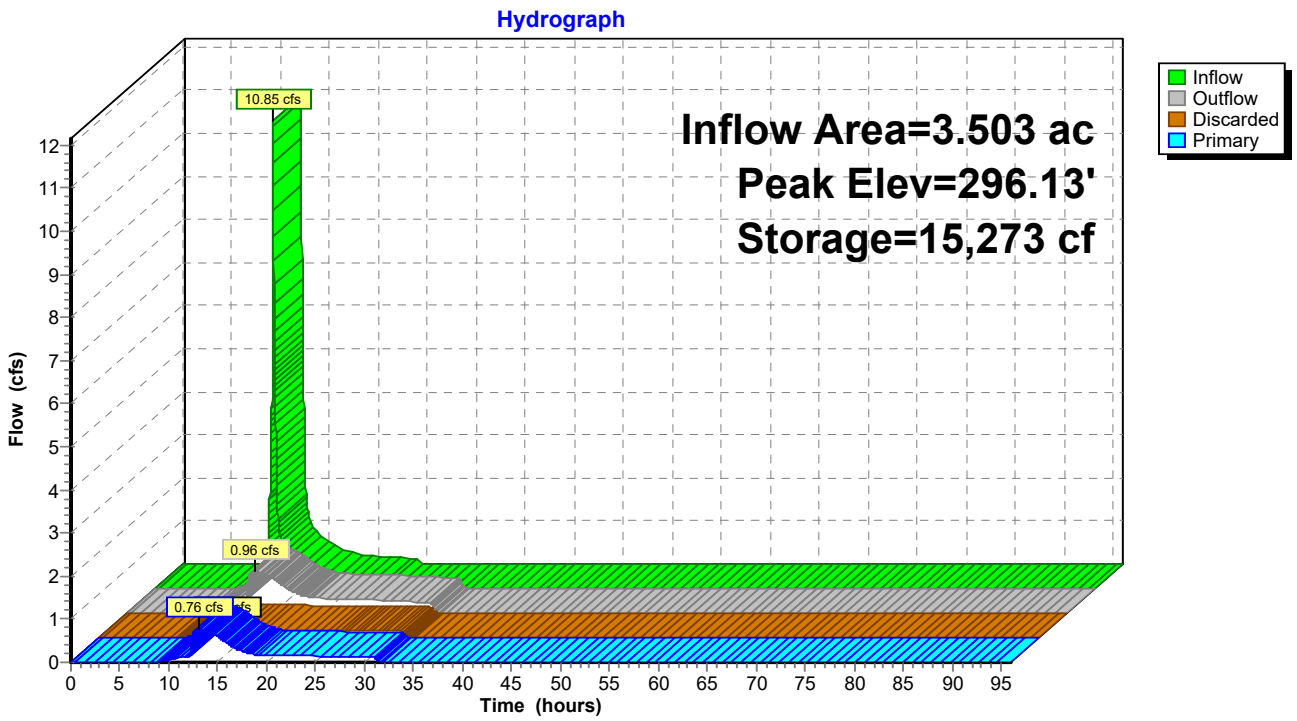
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
294.00	5,987	0	0
296.00	8,239	14,226	14,226
298.00	10,717	18,956	33,182

Device	Routing	Invert	Outlet Devices
#1	Discarded	294.00'	**1.020 in/hr Exfiltration over Horizontal area**
#2	Primary	293.00'	**18.0" Round Culvert** L= 50.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 293.00' / 292.50' S= 0.0100 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#3	Device 2	293.00'	**2.0" Vert. Orifice/Grate** C= 0.600
#4	Device 2	295.50'	**6.0" Vert. Orifice/Grate** C= 0.600
#5	Primary	297.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Discarded OutFlow Max=0.20 cfs @ 13.06 hrs HW=296.13' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.20 cfs)

Primary OutFlow Max=0.76 cfs @ 13.06 hrs HW=296.13' (Free Discharge)
├─**2=Culvert** (Passes 0.76 cfs of 13.12 cfs potential flow)
│ ├─**3=Orifice/Grate** (Orifice Controls 0.18 cfs @ 8.40 fps)
│ └─**4=Orifice/Grate** (Orifice Controls 0.58 cfs @ 2.95 fps)
└─**5=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond B-1: Basin 1



Summary for Pond B-2: Basin 2

Inflow Area =	3.452 ac, 70.93% Impervious, Inflow Depth = 3.19" for 10 yr event				
Inflow =	13.20 cfs @	12.07 hrs,	Volume=	0.918 af	
Outflow =	0.97 cfs @	13.32 hrs,	Volume=	0.918 af,	Atten= 93%, Lag= 75.1 min
Discarded =	0.16 cfs @	13.32 hrs,	Volume=	0.436 af	
Primary =	0.81 cfs @	13.32 hrs,	Volume=	0.482 af	
Secondary =	0.00 cfs @	0.00 hrs,	Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 325.22' @ 13.32 hrs Surf.Area= 8,969 sf Storage= 22,654 cf

Plug-Flow detention time= 559.8 min calculated for 0.918 af (100% of inflow)
Center-of-Mass det. time= 559.8 min (1,363.2 - 803.4)

Volume	Invert	Avail.Storage	Storage Description
#1	322.00'	52,913 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
322.00	5,179	0	0
324.00	7,440	12,619	12,619
326.00	9,940	17,380	29,999
328.00	12,974	22,914	52,913

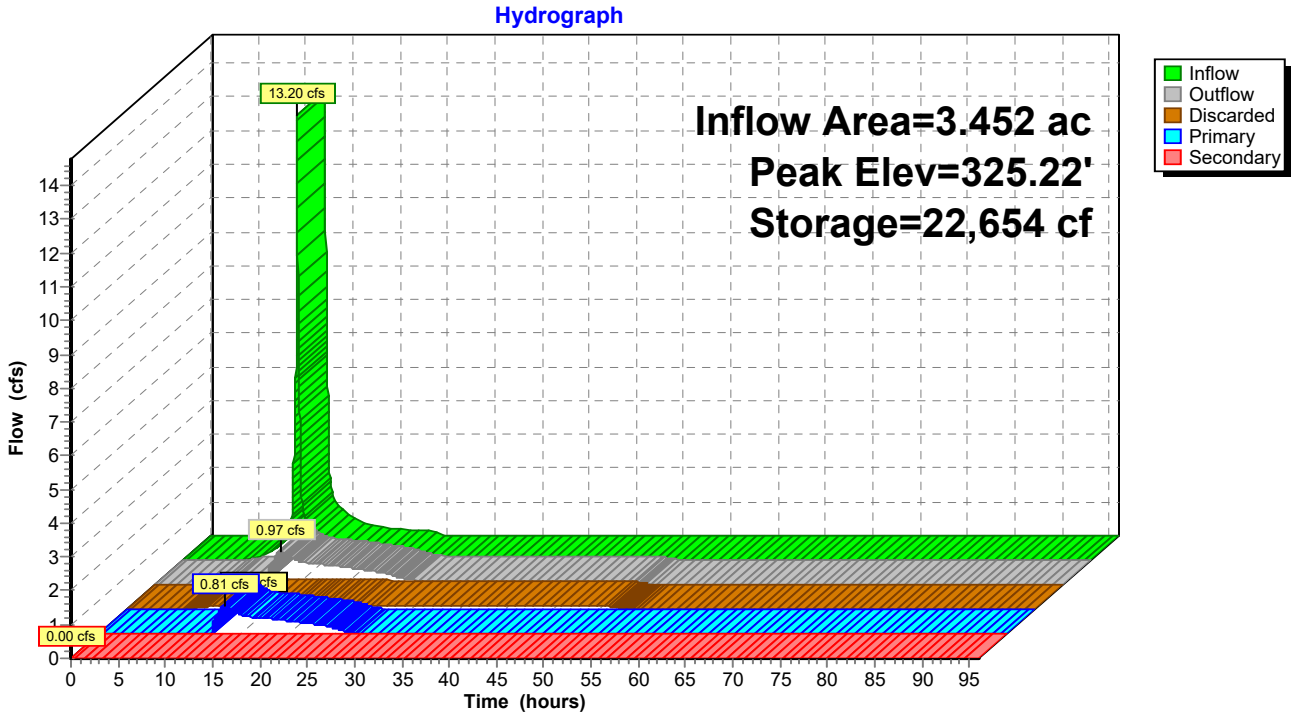
Device	Routing	Invert	Outlet Devices
#1	Discarded	322.00'	**0.770 in/hr Exfiltration over Horizontal area**
#2	Primary	321.00'	**18.0" Round Culvert**
			L= 80.0' RCP, sq.cut end projecting, Ke= 0.500
			Inlet / Outlet Invert= 321.00' / 320.00' S= 0.0125 '/' Cc= 0.900
			n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#3	Device 2	323.50'	**4.0" Vert. Orifice/Grate** C= 0.600
#4	Device 2	325.10'	**24.0" W x 6.0" H Vert. Orifice/Grate** C= 0.600
#5	Secondary	327.20'	**10.0' 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

Discarded OutFlow Max=0.16 cfs @ 13.32 hrs HW=325.22' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.16 cfs)

Primary OutFlow Max=0.80 cfs @ 13.32 hrs HW=325.22' (Free Discharge)
└─**2=Culvert** (Passes 0.80 cfs of 15.86 cfs potential flow)
  ├─**3=Orifice/Grate** (Orifice Controls 0.52 cfs @ 6.01 fps)
  └─**4=Orifice/Grate** (Orifice Controls 0.28 cfs @ 1.13 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=322.00' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond B-2: Basin 2



Summary for Pond B-3A: Basin 3A

Inflow Area = 2.147 ac, 85.90% Impervious, Inflow Depth = 3.81" for 10 yr event
Inflow = 9.28 cfs @ 12.07 hrs, Volume= 0.681 af
Outflow = 0.73 cfs @ 13.05 hrs, Volume= 0.681 af, Atten= 92%, Lag= 58.3 min
Primary = 0.73 cfs @ 13.05 hrs, Volume= 0.681 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 372.22' @ 13.05 hrs Surf.Area= 5,000 sf Storage= 15,312 cf

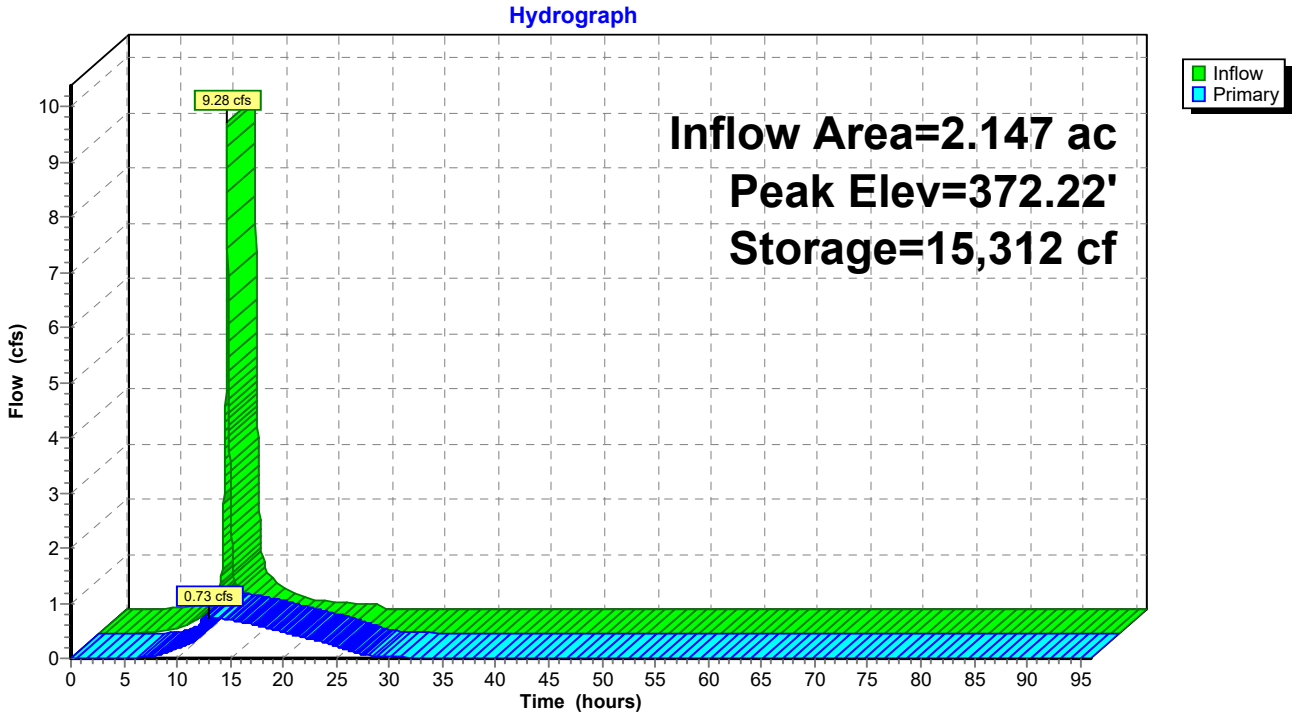
Plug-Flow detention time= 271.6 min calculated for 0.681 af (100% of inflow)
Center-of-Mass det. time= 271.9 min (1,052.1 - 780.2)

Volume	Invert	Avail.Storage	Storage Description
#1	369.00'	23,750 cf	**50.00'W x 100.00'L x 5.00'H Prismatoid** 25,000 cf Overall x 95.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Primary	369.00'	**18.0" Round Culvert** L= 100.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 369.00' / 368.00' S= 0.0100 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#2	Device 1	369.00'	**4.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	373.50'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.73 cfs @ 13.05 hrs HW=372.22' (Free Discharge)
└─**1=Culvert** (Passes 0.73 cfs of 12.83 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.73 cfs @ 8.42 fps)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond B-3A: Basin 3A



Summary for Pond B-3B: Basin 3B

Inflow Area = 1.526 ac, 97.51% Impervious, Inflow Depth = 4.25" for 10 yr event
Inflow = 6.97 cfs @ 12.07 hrs, Volume= 0.540 af
Outflow = 0.63 cfs @ 12.90 hrs, Volume= 0.540 af, Atten= 91%, Lag= 49.3 min
Primary = 0.63 cfs @ 12.90 hrs, Volume= 0.540 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 371.44' @ 12.90 hrs Surf.Area= 5,000 sf Storage= 11,595 cf

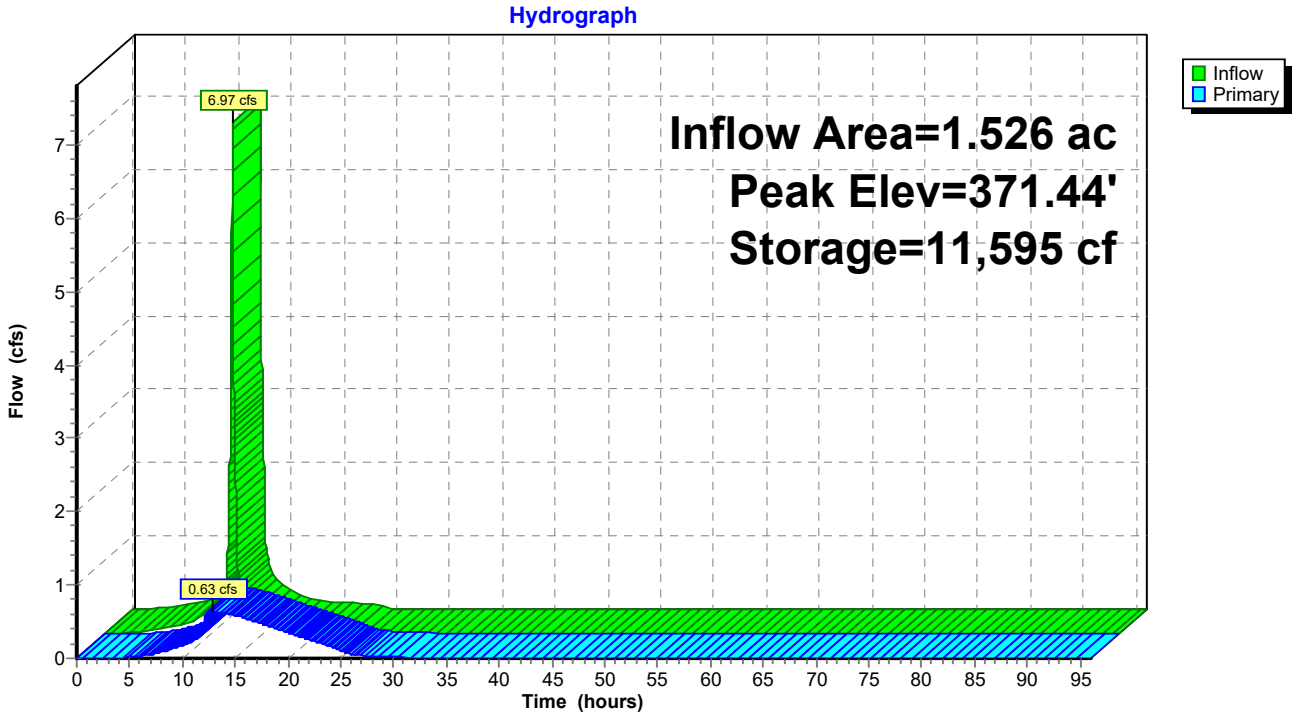
Plug-Flow detention time= 241.7 min calculated for 0.540 af (100% of inflow)
Center-of-Mass det. time= 242.0 min (998.9 - 756.9)

Volume	Invert	Avail.Storage	Storage Description
#1	369.00'	23,750 cf	**50.00'W x 100.00'L x 5.00'H Prismatoid** 25,000 cf Overall x 95.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Primary	369.00'	**18.0" Round Culvert** L= 70.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 369.00' / 366.00' S= 0.0429 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#2	Device 1	369.00'	**4.0" Vert. Orifice/Grate** C= 0.600
#3	Primary	373.90'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.63 cfs @ 12.90 hrs HW=371.44' (Free Discharge)
└─**1=Culvert** (Passes 0.63 cfs of 11.06 cfs potential flow)
  └─**2=Orifice/Grate** (Orifice Controls 0.63 cfs @ 7.26 fps)
└─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond B-3B: Basin 3B



Summary for Pond B-3C: Basin 3C

Inflow Area = 3.002 ac, 74.76% Impervious, Inflow Depth = 3.39" for 10 yr event
Inflow = 12.07 cfs @ 12.07 hrs, Volume= 0.848 af
Outflow = 1.26 cfs @ 12.80 hrs, Volume= 0.848 af, Atten= 90%, Lag= 43.4 min
Primary = 1.26 cfs @ 12.80 hrs, Volume= 0.848 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 333.85' @ 12.80 hrs Surf.Area= 5,000 sf Storage= 18,304 cf

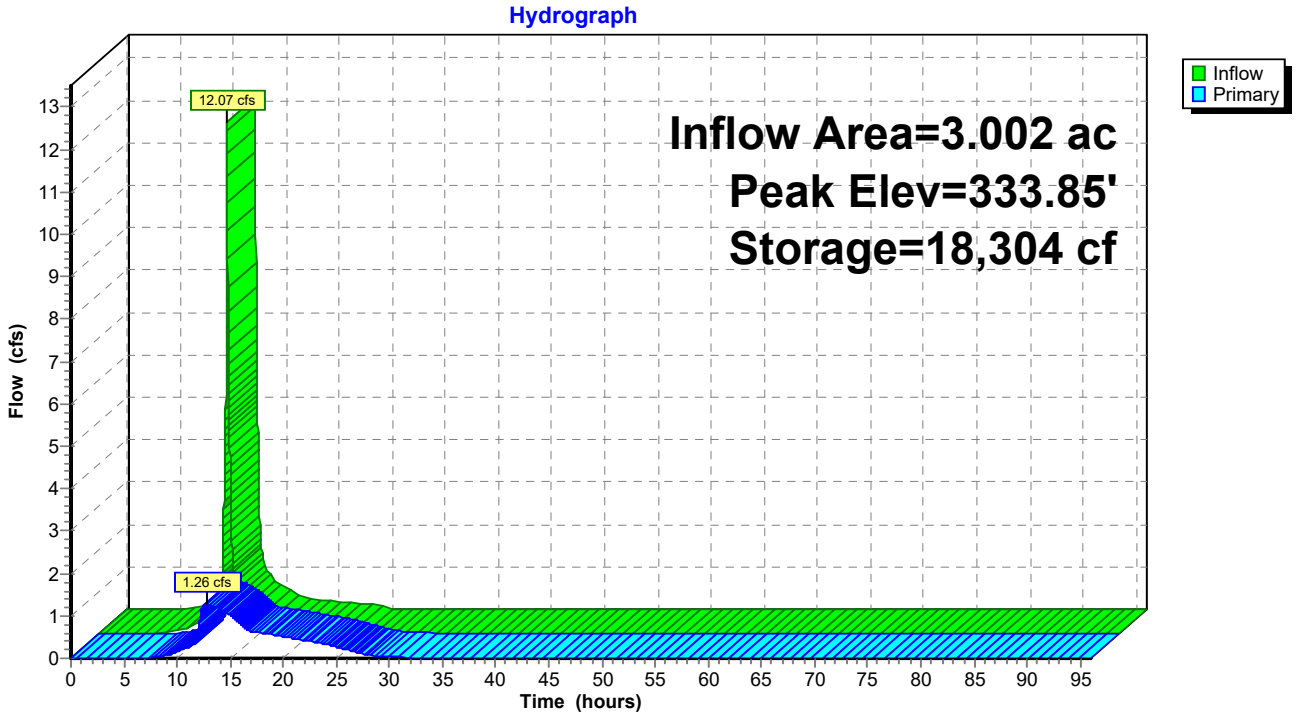
Plug-Flow detention time= 244.3 min calculated for 0.848 af (100% of inflow)
Center-of-Mass det. time= 244.3 min (1,040.7 - 796.4)

Volume	Invert	Avail.Storage	Storage Description
#1	330.00'	28,500 cf	**50.00'W x 100.00'L x 6.00'H Prismatoid** 30,000 cf Overall x 95.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Primary	330.00'	**18.0" Round Culvert** L= 100.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 330.00' / 328.50' S= 0.0150 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#2	Device 1	330.00'	**4.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	332.50'	**4.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	334.00'	**6.0" Vert. Orifice/Grate** C= 0.600
#5	Device 1	335.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=1.26 cfs @ 12.80 hrs HW=333.85' (Free Discharge)
└─**1=Culvert** (Passes 1.26 cfs of 14.99 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.81 cfs @ 9.25 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 0.46 cfs @ 5.25 fps)
  ├─**4=Orifice/Grate** (Controls 0.00 cfs)
  └─**5=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond B-3C: Basin 3C



Summary for Pond B-4: Basin 4

Inflow Area = 5.171 ac, 67.19% Impervious, Inflow Depth = 3.10" for 10 yr event
Inflow = 19.26 cfs @ 12.07 hrs, Volume= 1.334 af
Outflow = 5.75 cfs @ 12.40 hrs, Volume= 1.333 af, Atten= 70%, Lag= 19.4 min
Primary = 5.75 cfs @ 12.40 hrs, Volume= 1.333 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 326.53' @ 12.40 hrs Surf.Area= 12,878 sf Storage= 25,667 cf

Plug-Flow detention time= 341.8 min calculated for 1.333 af (100% of inflow)
Center-of-Mass det. time= 341.3 min (1,148.0 - 806.7)

Volume	Invert	Avail.Storage	Storage Description
#1	324.00'	47,494 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

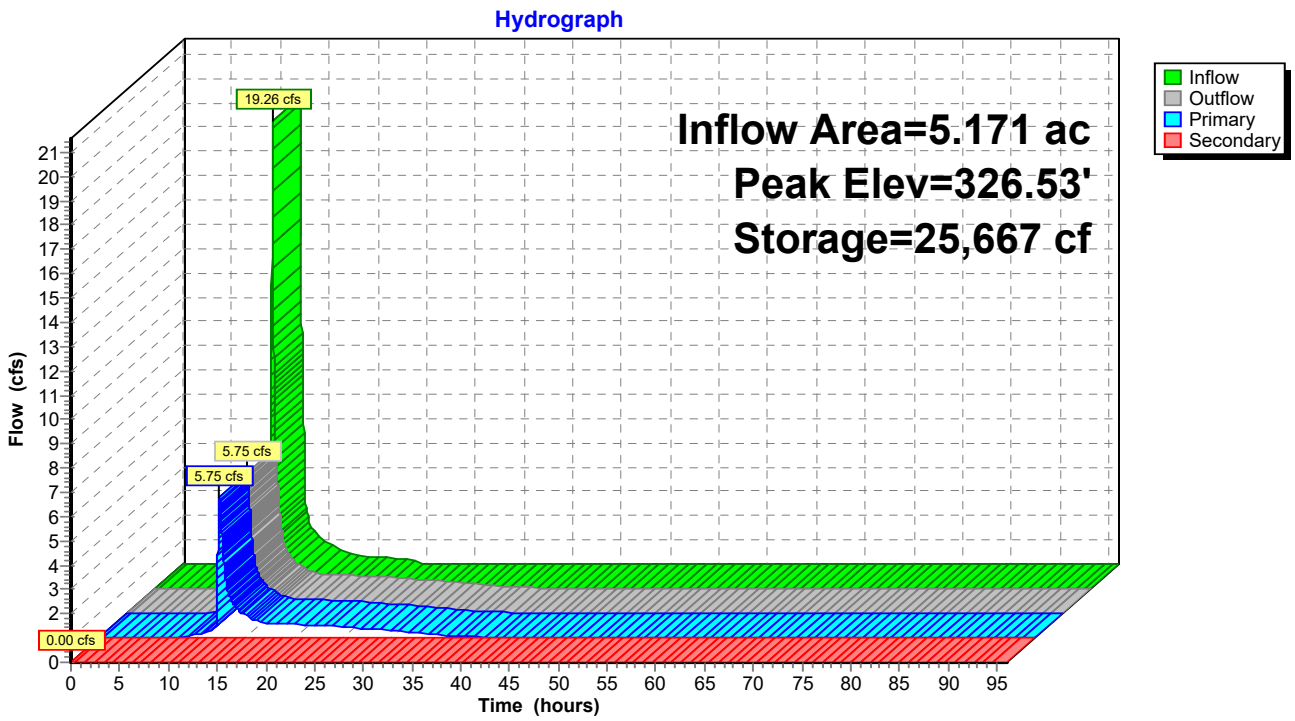
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
324.00	7,771	0	0
326.00	11,402	19,173	19,173
328.00	16,919	28,321	47,494

Device	Routing	Invert	Outlet Devices
#1	Primary	322.00'	**18.0" Round Culvert** L= 100.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 322.00' / 321.00' S= 0.0100 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#2	Device 1	324.00'	**4.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	326.10'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height
#4	Secondary	327.00'	**10.0' long x 30.0' 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=5.74 cfs @ 12.40 hrs HW=326.53' (Free Discharge)
└─**1=Culvert** (Passes 5.74 cfs of 15.61 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.65 cfs @ 7.41 fps)
  └─**3=Sharp-Crested Rectangular Weir** (Weir Controls 5.10 cfs @ 2.39 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=324.00' (Free Discharge)
└─**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond B-4: Basin 4



Summary for Pond B-5A: Basin 5A

Inflow Area =	10.270 ac, 58.77% Impervious, Inflow Depth = 2.99" for 10 yr event				
Inflow =	30.99 cfs @	12.08 hrs,	Volume=	2.557 af	
Outflow =	11.40 cfs @	12.46 hrs,	Volume=	2.557 af,	Atten= 63%, Lag= 22.6 min
Discarded =	0.17 cfs @	12.46 hrs,	Volume=	0.544 af	
Primary =	11.23 cfs @	12.46 hrs,	Volume=	2.013 af	
Secondary =	0.00 cfs @	0.00 hrs,	Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 356.43' @ 12.46 hrs Surf.Area= 14,421 sf Storage= 46,864 cf

Plug-Flow detention time= 393.3 min calculated for 2.557 af (100% of inflow)
Center-of-Mass det. time= 393.3 min (1,212.7 - 819.4)

Volume	Invert	Avail.Storage	Storage Description
#1	352.00'	71,591 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
352.00	7,400	0	0
354.00	9,862	17,262	17,262
356.00	13,687	23,549	40,811
358.00	17,093	30,780	71,591

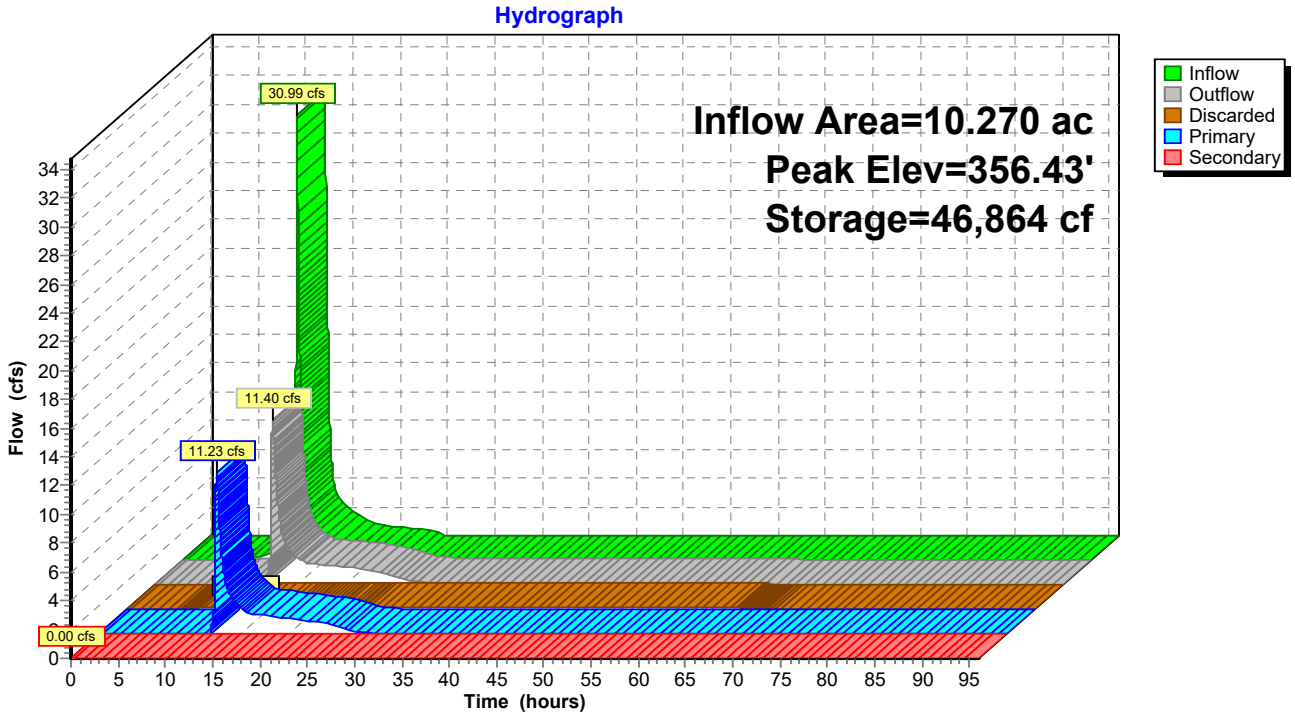
Device	Routing	Invert	Outlet Devices
#1	Discarded	352.00'	**0.520 in/hr Exfiltration over Horizontal area**
#2	Primary	350.70'	**24.0" Round Culvert** L= 50.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 350.70' / 350.00' S= 0.0140 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 3.14 sf
#3	Device 2	353.50'	**6.0" Vert. Orifice/Grate** C= 0.600
#4	Device 2	355.75'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 1.0' Crest Height
#5	Secondary	357.25'	**10.0' 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

Discarded OutFlow Max=0.17 cfs @ 12.46 hrs HW=356.43' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.17 cfs)

Primary OutFlow Max=11.22 cfs @ 12.46 hrs HW=356.43' (Free Discharge)
└─**2=Culvert** (Passes 11.22 cfs of 32.90 cfs potential flow)
  ├─**3=Orifice/Grate** (Orifice Controls 1.55 cfs @ 7.88 fps)
  └─**4=Sharp-Crested Rectangular Weir** (Weir Controls 9.68 cfs @ 2.92 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=352.00' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond B-5A: Basin 5A



Summary for Pond B-5B: Basin 5B

Inflow Area =	1.651 ac, 44.43% Impervious, Inflow Depth = 2.55" for 10 yr event				
Inflow =	5.11 cfs @	12.07 hrs,	Volume=	0.350 af	
Outflow =	0.52 cfs @	12.93 hrs,	Volume=	0.350 af,	Atten= 90%, Lag= 51.4 min
Discarded =	0.05 cfs @	12.93 hrs,	Volume=	0.118 af	
Primary =	0.47 cfs @	12.93 hrs,	Volume=	0.232 af	
Secondary =	0.00 cfs @	0.00 hrs,	Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 352.93' @ 12.93 hrs Surf.Area= 3,915 sf Storage= 7,583 cf

Plug-Flow detention time= 460.8 min calculated for 0.350 af (100% of inflow)
Center-of-Mass det. time= 460.7 min (1,285.2 - 824.5)

Volume	Invert	Avail.Storage	Storage Description
#1	350.00'	41,172 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
350.00	1,623	0	0
352.00	2,823	4,446	4,446
354.00	5,169	7,992	12,438
356.00	7,145	12,314	24,752
358.00	9,275	16,420	41,172

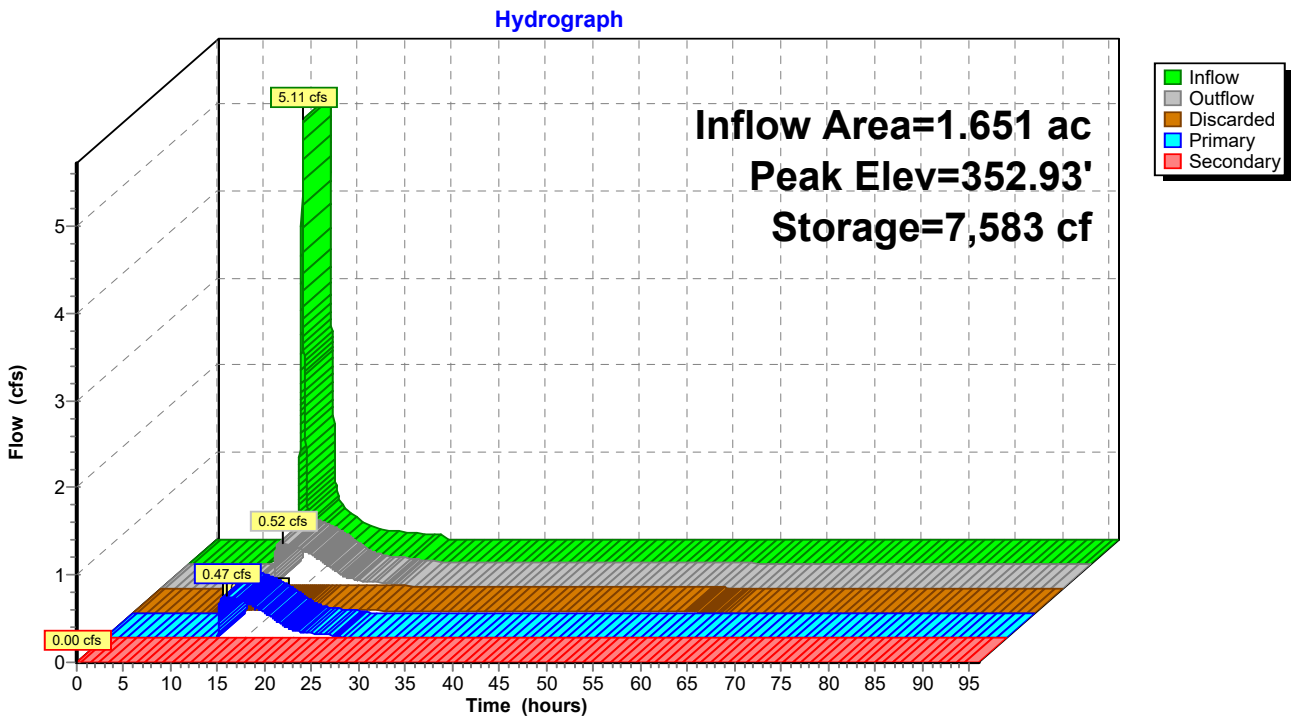
Device	Routing	Invert	Outlet Devices
#1	Discarded	350.00'	**0.520 in/hr Exfiltration over Horizontal area**
#2	Primary	348.40'	**24.0" Round Culvert** L= 50.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 348.40' / 348.20' S= 0.0040 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 3.14 sf
#3	Device 2	351.50'	**4.0" Vert. Orifice/Grate** C= 0.600
#4	Device 2	353.00'	**6.0" Vert. Orifice/Grate** C= 0.600
#5	Secondary	357.00'	**10.0' 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

Discarded OutFlow Max=0.05 cfs @ 12.93 hrs HW=352.93' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=0.47 cfs @ 12.93 hrs HW=352.93' (Free Discharge)
└─**2=Culvert** (Passes 0.47 cfs of 28.42 cfs potential flow)
  ├─**3=Orifice/Grate** (Orifice Controls 0.47 cfs @ 5.41 fps)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=350.00' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond B-5B: Basin 5B



Summary for Pond B-6: Basin 6

Inflow Area = 3.750 ac, 76.96% Impervious, Inflow Depth = 3.50" for 10 yr event
Inflow = 14.53 cfs @ 12.07 hrs, Volume= 1.095 af
Outflow = 1.18 cfs @ 13.04 hrs, Volume= 1.095 af, Atten= 92%, Lag= 58.2 min
Discarded = 0.12 cfs @ 13.04 hrs, Volume= 0.276 af
Primary = 1.06 cfs @ 13.04 hrs, Volume= 0.818 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 391.78' @ 13.04 hrs Surf.Area= 10,027 sf Storage= 25,409 cf

Plug-Flow detention time= 562.6 min calculated for 1.095 af (100% of inflow)
Center-of-Mass det. time= 562.6 min (1,334.0 - 771.4)

Volume	Invert	Avail.Storage	Storage Description
#1	388.00'	52,408 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

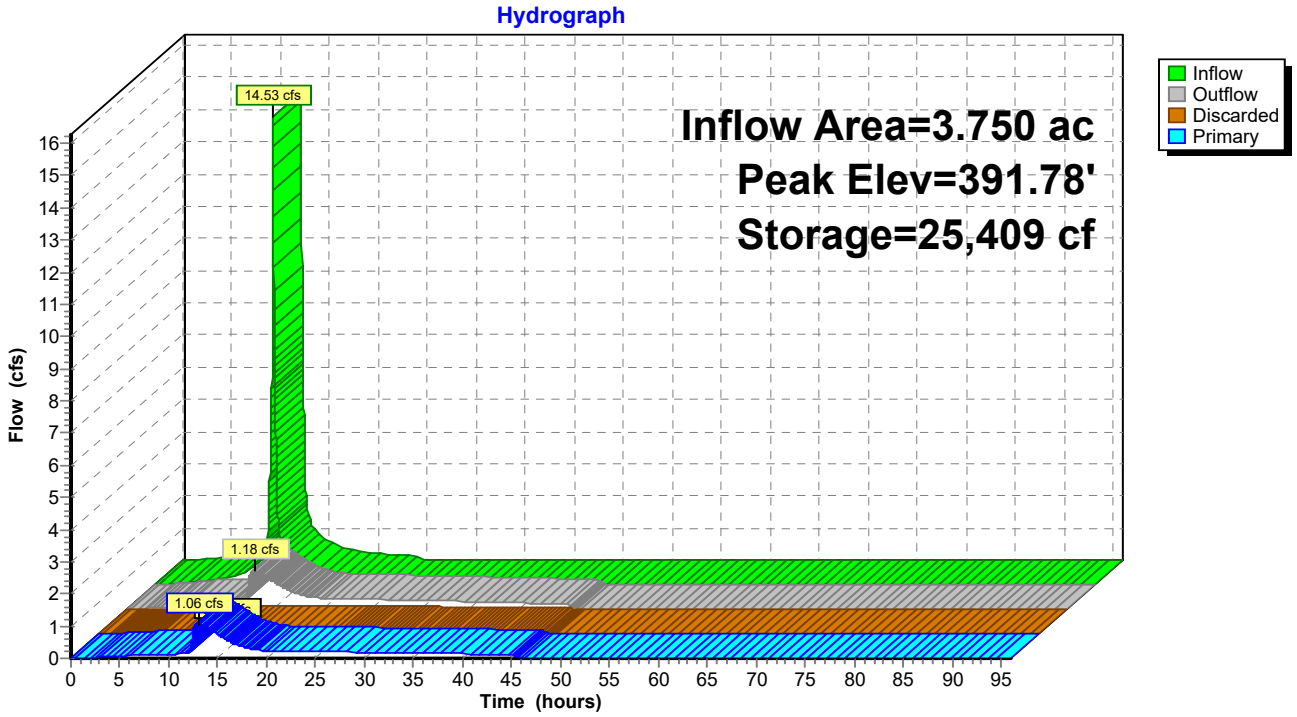
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
388.00	3,546	0	0
390.00	6,853	10,399	10,399
392.00	10,423	17,276	27,675
394.00	14,310	24,733	52,408

Device	Routing	Invert	Outlet Devices
#1	Discarded	388.00'	**0.520 in/hr Exfiltration over Horizontal area**
#2	Primary	387.00'	**24.0" Round Culvert** L= 100.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 387.00' / 386.50' S= 0.0050 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 3.14 sf
#3	Device 2	387.00'	**2.0" Vert. Orifice/Grate** C= 0.600
#4	Device 2	391.20'	**8.0" Vert. Orifice/Grate** C= 0.600
#5	Primary	393.00'	**10.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Discarded OutFlow Max=0.12 cfs @ 13.04 hrs HW=391.78' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.12 cfs)

Primary OutFlow Max=1.06 cfs @ 13.04 hrs HW=391.78' (Free Discharge)
├─**2=Culvert** (Passes 1.06 cfs of 27.55 cfs potential flow)
│ ├─**3=Orifice/Grate** (Orifice Controls 0.23 cfs @ 10.43 fps)
│ └─**4=Orifice/Grate** (Orifice Controls 0.83 cfs @ 2.59 fps)
└─**5=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond B-6: Basin 6



Summary for Pond B-7: Basin 7

Inflow Area =	1.719 ac, 86.57% Impervious, Inflow Depth = 3.81" for 10 yr event				
Inflow =	7.51 cfs @	12.07 hrs,	Volume=	0.545 af	
Outflow =	0.35 cfs @	14.40 hrs,	Volume=	0.545 af,	Atten= 95%, Lag= 139.5 min
Discarded =	0.29 cfs @	10.21 hrs,	Volume=	0.474 af	
Primary =	0.06 cfs @	14.40 hrs,	Volume=	0.071 af	

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 317.24' @ 14.40 hrs Surf.Area= 16,082 sf Storage= 11,758 cf

Plug-Flow detention time= 308.4 min calculated for 0.545 af (100% of inflow)
Center-of-Mass det. time= 308.4 min (1,088.2 - 779.9)

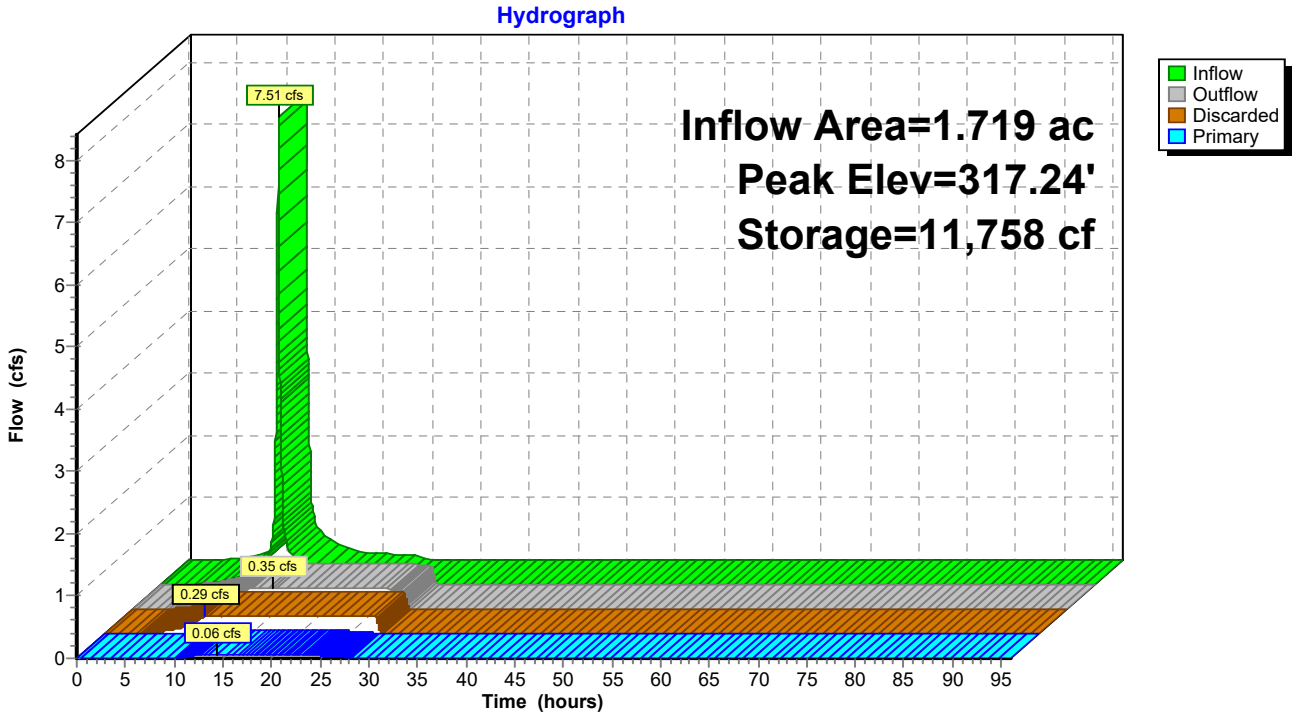
Volume	Invert	Avail.Storage	Storage Description
#1	316.00'	10,905 cf	**187.00'W x 86.00'L x 3.50'H Prismatoid** 56,287 cf Overall - 19,938 cf Embedded = 36,349 cf x 30.0% Voids
#2	316.50'	19,938 cf	**ADS_StormTech SC-740** x 434 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
		30,843 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	316.00'	**0.770 in/hr Exfiltration over Horizontal area**
#2	Primary	316.00'	**24.0" Round Culvert** L= 75.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 316.00' / 313.00' S= 0.0400 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 3.14 sf
#3	Device 2	316.00'	**1.5" Vert. Orifice/Grate** C= 0.600
#4	Device 2	317.80'	**8.0" Vert. Orifice/Grate** C= 0.600
#5	Device 2	319.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Discarded OutFlow Max=0.29 cfs @ 10.21 hrs HW=316.04' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.29 cfs)

Primary OutFlow Max=0.06 cfs @ 14.40 hrs HW=317.24' (Free Discharge)
└─**2=Culvert** (Passes 0.06 cfs of 7.80 cfs potential flow)
  ├─**3=Orifice/Grate** (Orifice Controls 0.06 cfs @ 5.23 fps)
  ├─**4=Orifice/Grate** (Controls 0.00 cfs)
  └─**5=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond B-7: Basin 7



Summary for Pond B-8: Basin 8

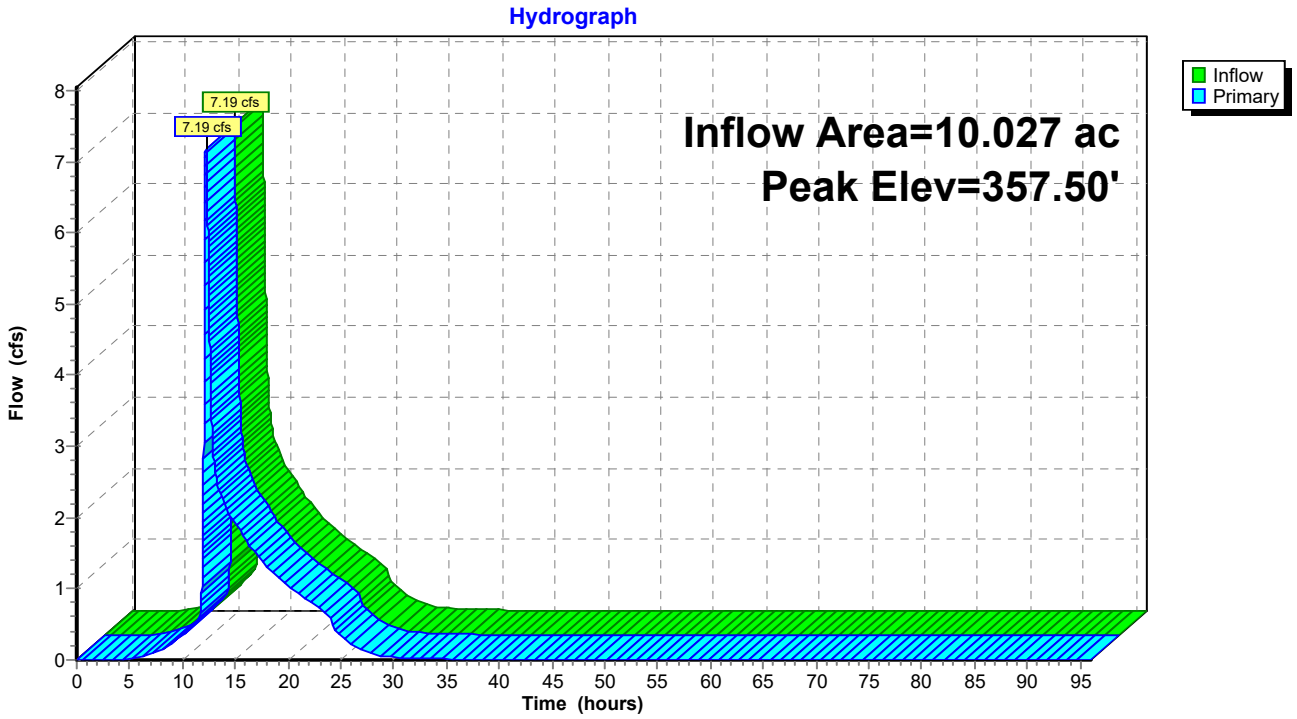
Inflow Area = 10.027 ac, 39.81% Impervious, Inflow Depth = 2.26" for 10 yr event
Inflow = 7.19 cfs @ 12.22 hrs, Volume= 1.888 af
Outflow = 7.19 cfs @ 12.22 hrs, Volume= 1.888 af, Atten= 0%, Lag= 0.0 min
Primary = 7.19 cfs @ 12.22 hrs, Volume= 1.888 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 357.50' @ 12.22 hrs
Flood Elev= 360.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	350.00'	**24.0" Round Culvert** L= 270.0' Ke= 0.500 Inlet / Outlet Invert= 350.00' / 330.00' S= 0.0741 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 3.14 sf
#2	Device 1	357.00'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=7.18 cfs @ 12.22 hrs HW=357.50' (Free Discharge)
└─**1=Culvert** (Passes 7.18 cfs of 38.55 cfs potential flow)
└─**2=Orifice/Grate** (Weir Controls 7.18 cfs @ 2.30 fps)

Pond B-8: Basin 8



Summary for Pond W5: WETLAND 5

Inflow Area = 4.777 ac, 13.82% Impervious, Inflow Depth = 1.39" for 10 yr event
Inflow = 7.13 cfs @ 12.11 hrs, Volume= 0.555 af
Outflow = 4.83 cfs @ 12.21 hrs, Volume= 0.541 af, Atten= 32%, Lag= 6.2 min
Primary = 4.83 cfs @ 12.21 hrs, Volume= 0.541 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 369.42' @ 12.21 hrs Surf.Area= 11,133 sf Storage= 3,452 cf

Plug-Flow detention time= 32.8 min calculated for 0.541 af (98% of inflow)
Center-of-Mass det. time= 19.6 min (886.4 - 866.8)

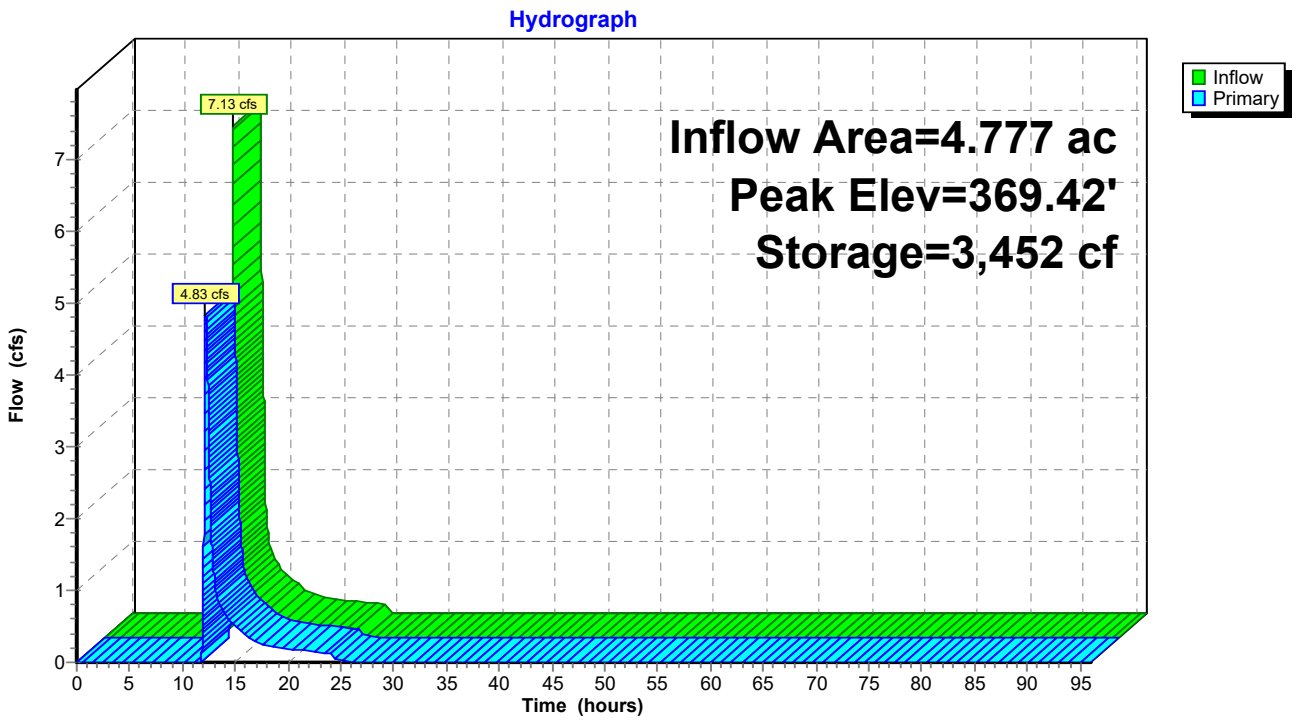
Volume	Invert	Avail.Storage	Storage Description
#1	369.00'	8,430 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
369.00	4,940	0	0
369.20	8,304	1,324	1,324
369.40	10,950	1,925	3,250
369.60	12,950	2,390	5,640
369.80	14,954	2,790	8,430

Device	Routing	Invert	Outlet Devices
#1	Primary	369.10'	**10.0' long x 64.0' 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=4.83 cfs @ 12.21 hrs HW=369.42' (Free Discharge)
└**1=Broad-Crested Rectangular Weir** (Weir Controls 4.83 cfs @ 1.52 fps)

Pond W5: WETLAND 5



Summary for Pond W6: WETLAND 6

Inflow Area = 4.348 ac, 45.54% Impervious, Inflow Depth = 2.81" for 10 yr event
Inflow = 14.84 cfs @ 12.07 hrs, Volume= 1.020 af
Outflow = 9.59 cfs @ 12.16 hrs, Volume= 0.933 af, Atten= 35%, Lag= 5.2 min
Primary = 9.59 cfs @ 12.16 hrs, Volume= 0.933 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 372.77' @ 12.16 hrs Surf.Area= 31,415 sf Storage= 10,448 cf

Plug-Flow detention time= 80.2 min calculated for 0.933 af (91% of inflow)
Center-of-Mass det. time= 37.3 min (853.2 - 815.9)

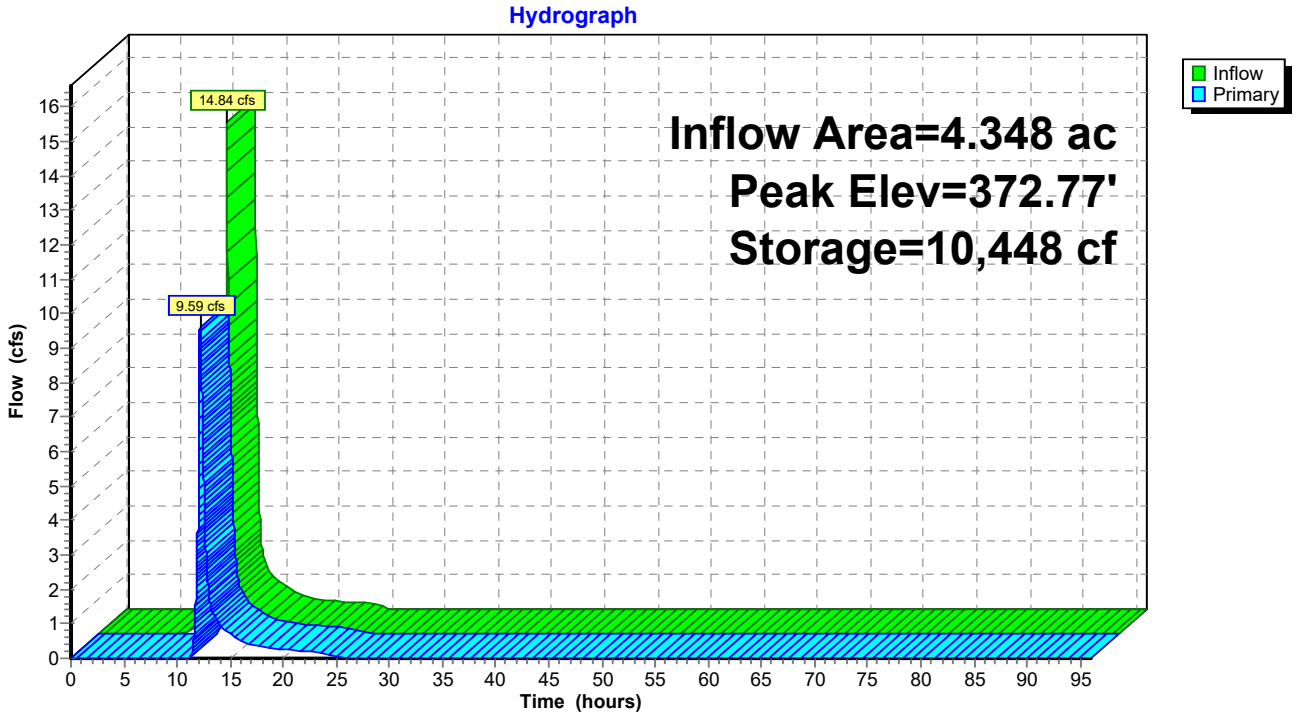
Volume	Invert	Avail.Storage	Storage Description
#1	372.20'	18,754 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
372.20	5,774	0	0
372.40	15,024	2,080	2,080
372.60	23,262	3,829	5,908
372.80	33,082	5,634	11,543
373.00	39,034	7,212	18,754

Device	Routing	Invert	Outlet Devices
#1	Primary	372.50'	**26.0' long x 16.0' 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=9.58 cfs @ 12.16 hrs HW=372.77' (Free Discharge)
└**1=Broad-Crested Rectangular Weir** (Weir Controls 9.58 cfs @ 1.39 fps)

Pond W6: WETLAND 6

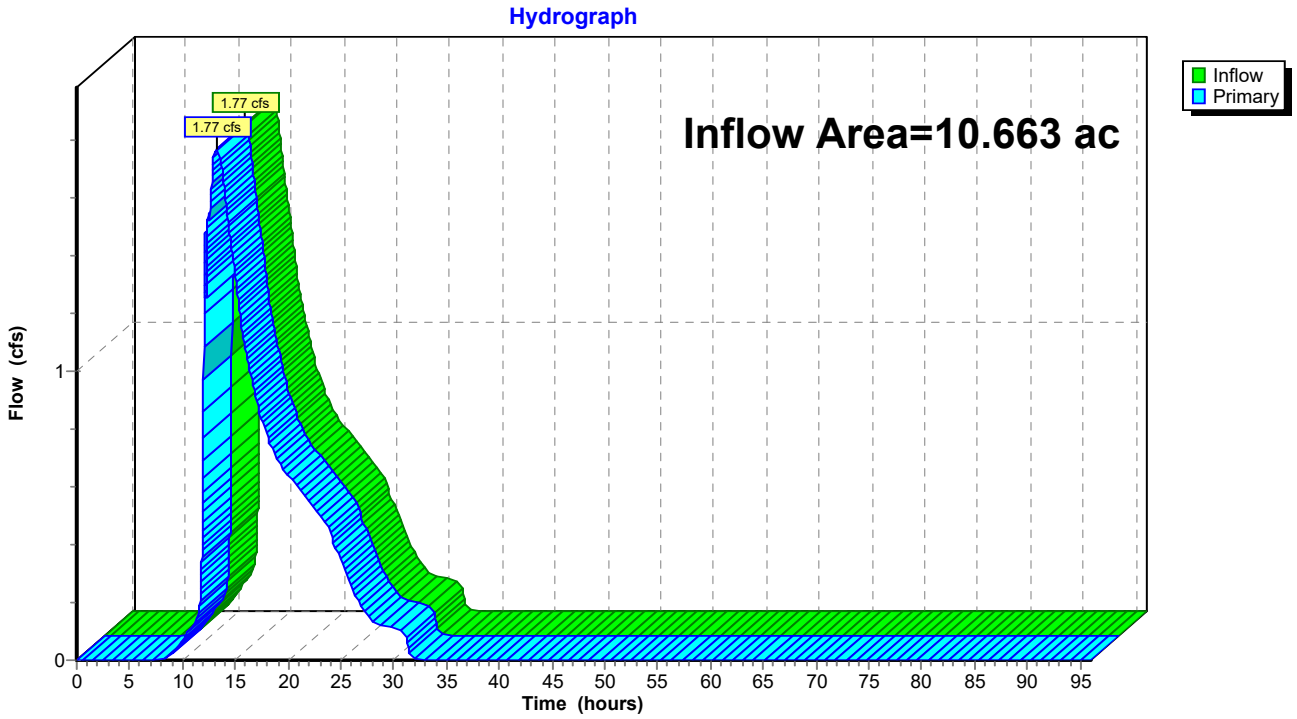


Summary for Link DP1: CHARLES RIVER/ WETLAND 3

Inflow Area = 10.663 ac, 57.86% Impervious, Inflow Depth = 1.22" for 10 yr event
Inflow = 1.77 cfs @ 13.22 hrs, Volume= 1.085 af
Primary = 1.77 cfs @ 13.22 hrs, Volume= 1.085 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs

Link DP1: CHARLES RIVER/ WETLAND 3

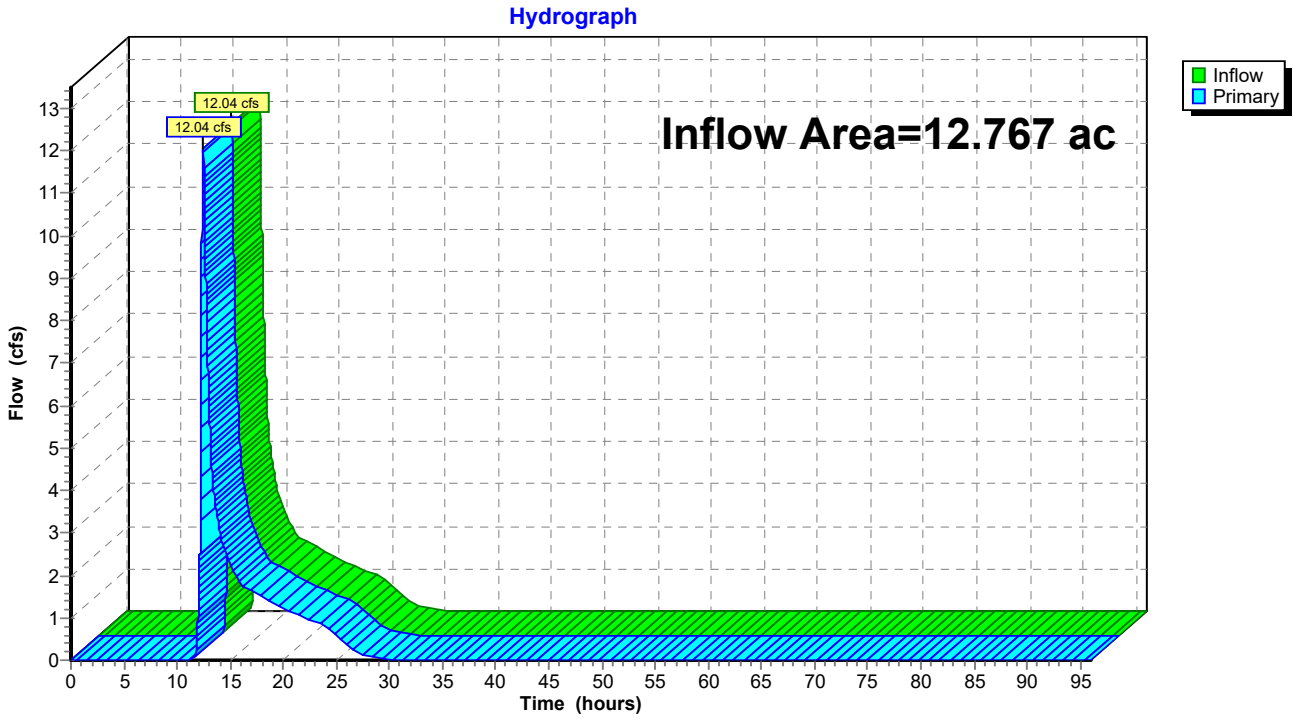


Summary for Link DP2: DEER BROOK/ WETLAND 4

Inflow Area = 12.767 ac, 53.02% Impervious, Inflow Depth = 2.19" for 10 yr event
Inflow = 12.04 cfs @ 12.45 hrs, Volume= 2.326 af
Primary = 12.04 cfs @ 12.45 hrs, Volume= 2.326 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs

Link DP2: DEER BROOK/ WETLAND 4

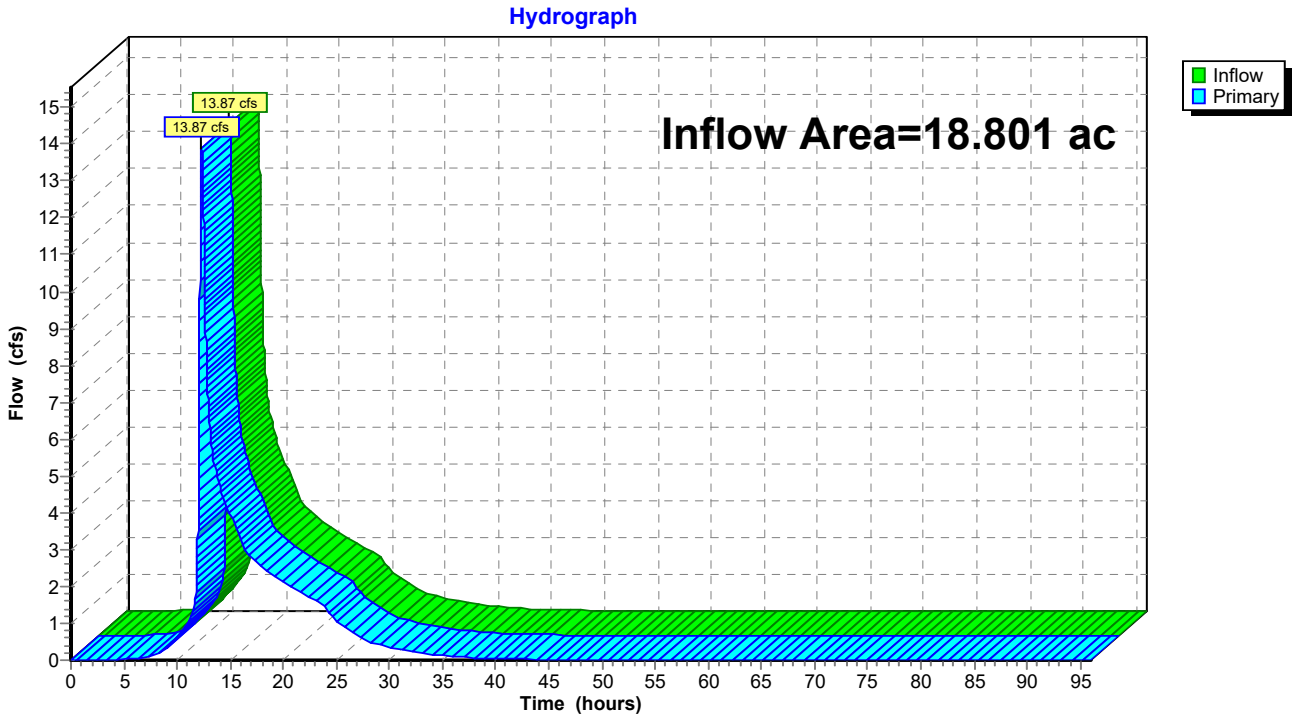


Summary for Link DP3: WETLAND 2

Inflow Area = 18.801 ac, 51.65% Impervious, Inflow Depth = 2.66" for 10 yr event
Inflow = 13.87 cfs @ 12.33 hrs, Volume= 4.168 af
Primary = 13.87 cfs @ 12.33 hrs, Volume= 4.168 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs

Link DP3: WETLAND 2

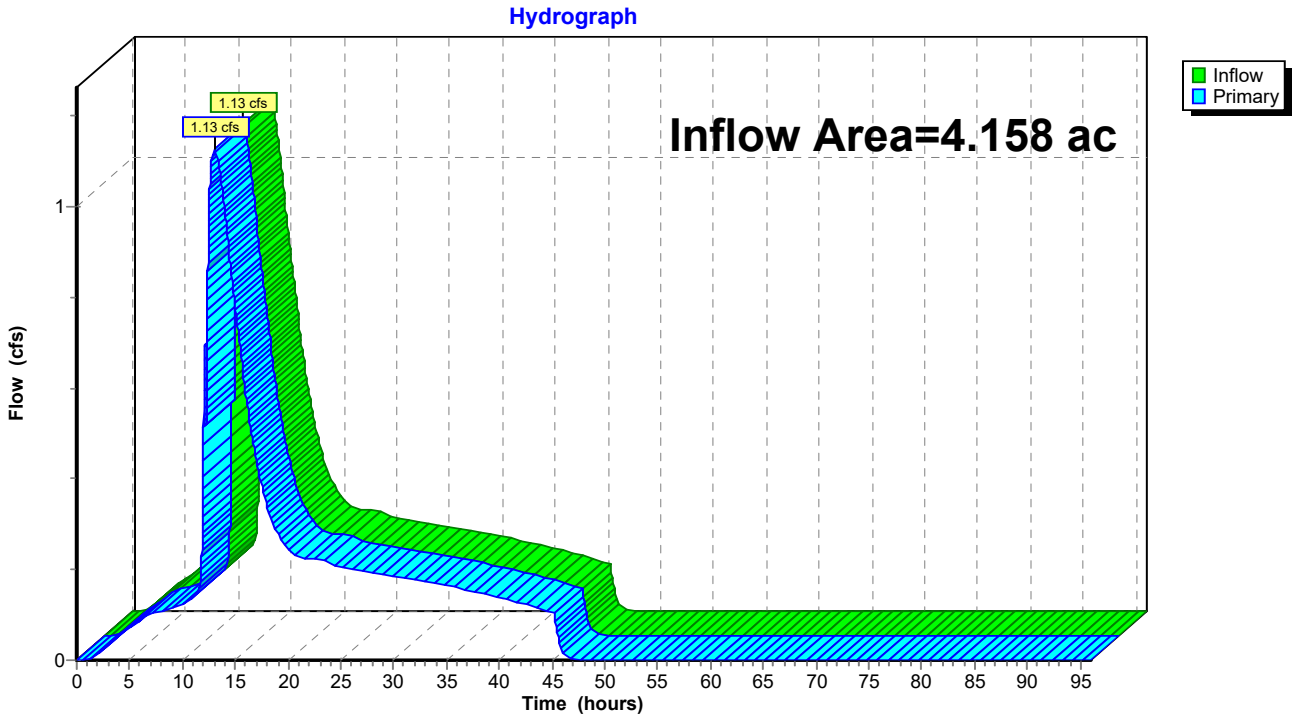


Summary for Link DP4: WETLAND 7/8

Inflow Area = 4.158 ac, 69.42% Impervious, Inflow Depth = 2.47" for 10 yr event
Inflow = 1.13 cfs @ 12.97 hrs, Volume= 0.857 af
Primary = 1.13 cfs @ 12.97 hrs, Volume= 0.857 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs

Link DP4: WETLAND 7/8



Summary for Subcatchment B2: BLDG 2

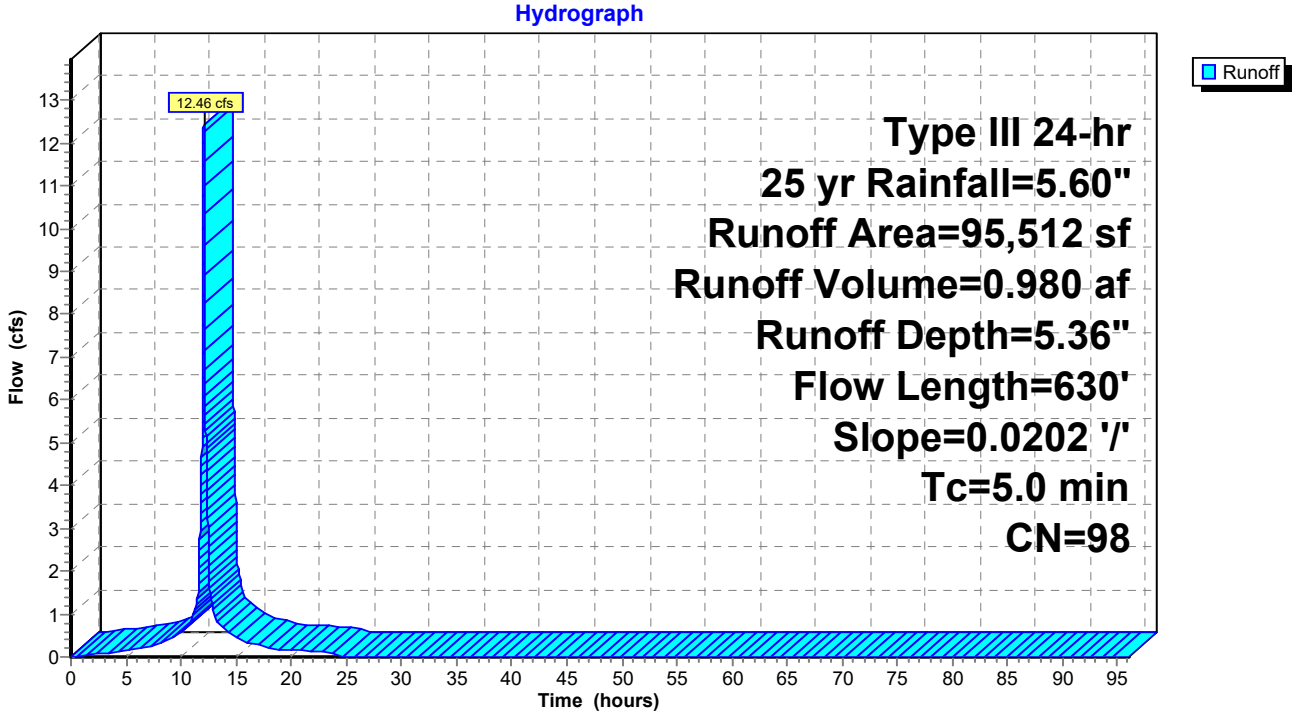
Runoff = 12.46 cfs @ 12.07 hrs, Volume= 0.980 af, Depth= 5.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 yr Rainfall=5.60"

	Area (sf)	CN	Description
*	95,512	98	Building
	95,512		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.4	630	0.0202	7.48	9.18	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013
1.4	630	Total, Increased to minimum Tc = 5.0 min			

Subcatchment B2: BLDG 2



Summary for Subcatchment PR 1.1: SUB PR 1.1

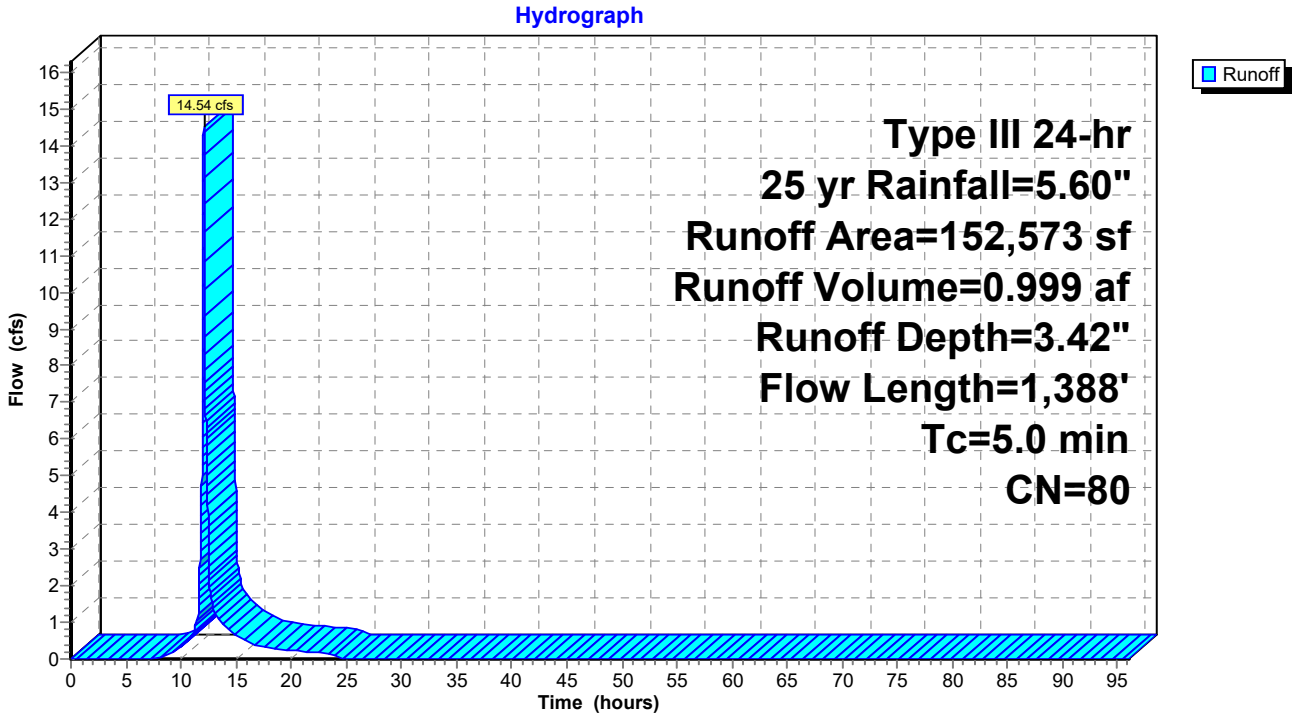
Runoff = 14.54 cfs @ 12.07 hrs, Volume= 0.999 af, Depth= 3.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 yr Rainfall=5.60"

Area (sf)	CN	Description
97,308	98	Paved parking & roofs
33,365	39	>75% Grass cover, Good, HSG A
21,353	61	>75% Grass cover, Good, HSG B
547	80	>75% Grass cover, Good, HSG D
152,573	80	Weighted Average
55,265		36.22% Pervious Area
97,308		63.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0294	1.40		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
1.4	243	0.0192	2.81		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.6	1,095	0.0183	7.12	8.74	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Concrete pipe, bends & connections
4.6	1,388	Total, Increased to minimum Tc = 5.0 min			

Subcatchment PR 1.1: SUB PR 1.1



Summary for Subcatchment PR 1.2: SUB PR 1.2

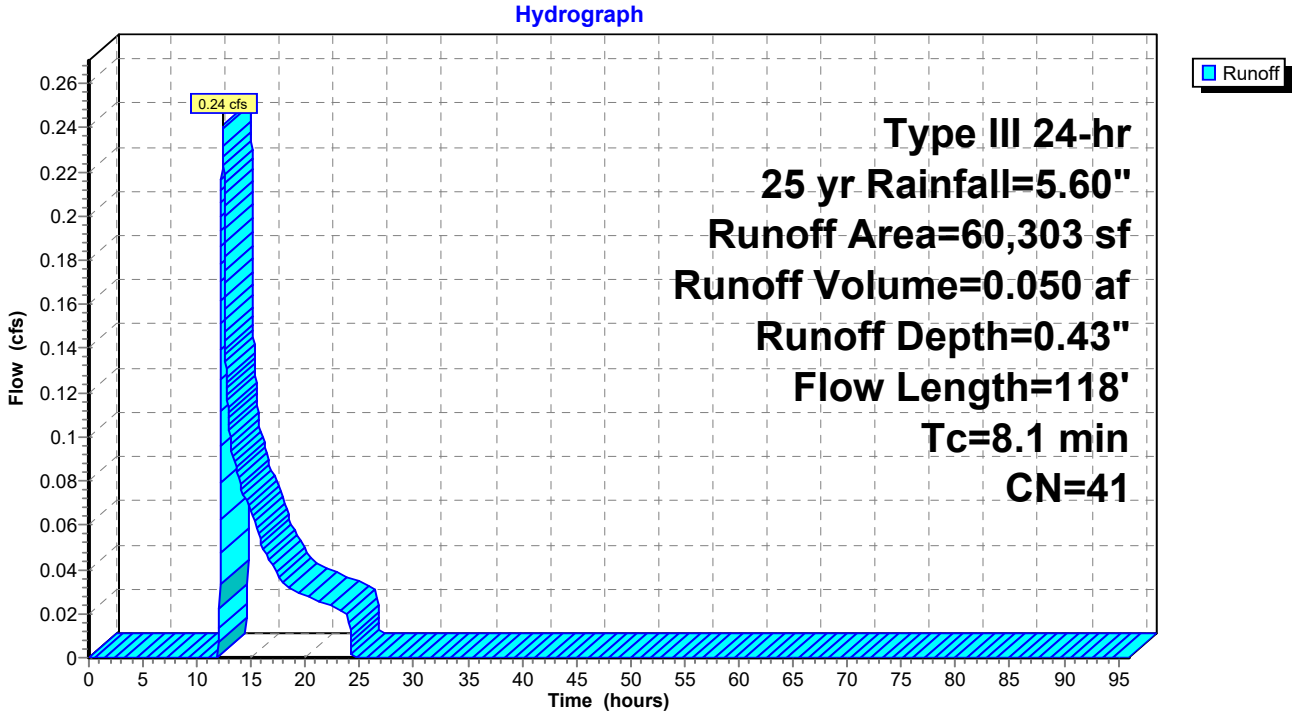
Runoff = 0.24 cfs @ 12.37 hrs, Volume= 0.050 af, Depth= 0.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 yr Rainfall=5.60"

Area (sf)	CN	Description
6,527	39	>75% Grass cover, Good, HSG A
38,151	30	Woods, Good, HSG A
8,676	61	>75% Grass cover, Good, HSG B
2,606	80	>75% Grass cover, Good, HSG D
4,343	77	Woods, Good, HSG D
60,303	41	Weighted Average
60,303		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0600	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.2	68	0.0880	4.78		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
8.1	118	Total			

Subcatchment PR 1.2: SUB PR 1.2



Summary for Subcatchment PR 1.3: SUB PR 1.3

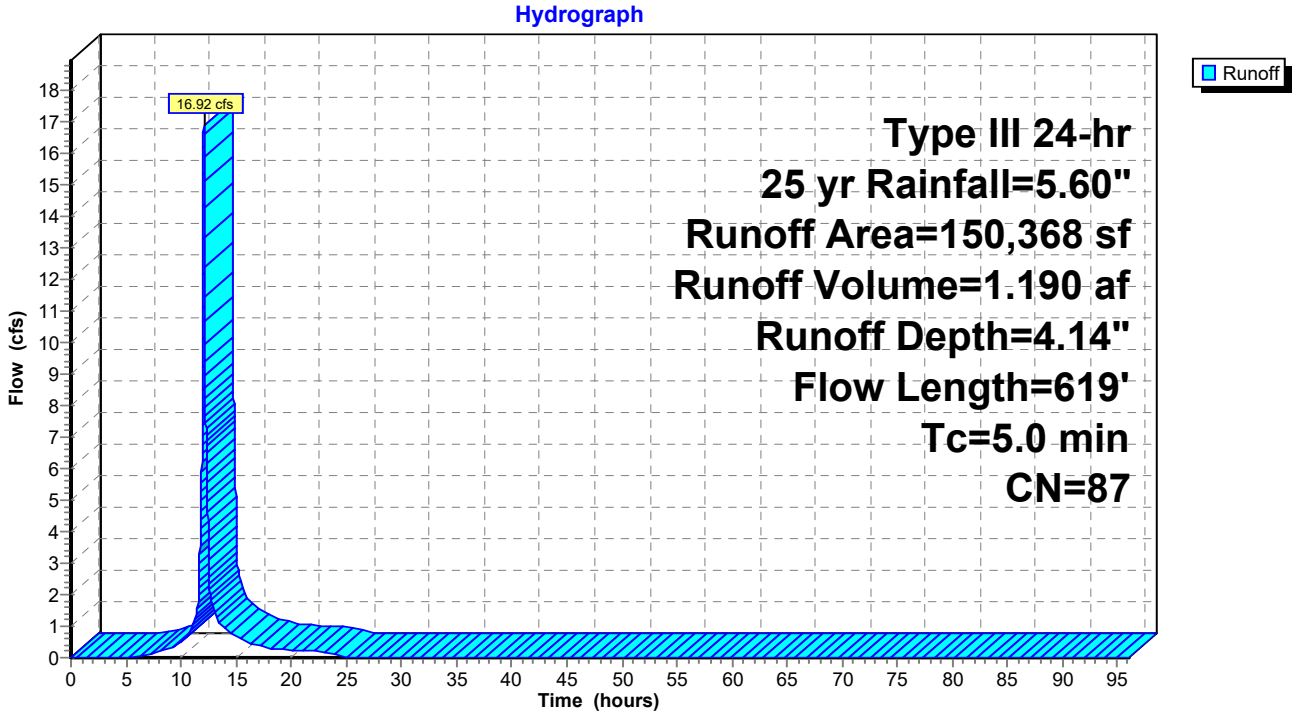
Runoff = 16.92 cfs @ 12.07 hrs, Volume= 1.190 af, Depth= 4.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 yr Rainfall=5.60"

	Area (sf)	CN	Description
*	106,654	98	Paved parking, Roofs, HSG B
	25,272	61	>75% Grass cover, Good, HSG B
*	18,442	61	Inf. Basin; >75% Grass cover, Good, HSG B
	150,368	87	Weighted Average
	43,714		29.07% Pervious Area
	106,654		70.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	50	0.0125	0.99		**Sheet Flow, Sheet - ESTIMATE** Smooth surfaces n= 0.011 P2= 3.20"
1.5	569	0.0200	6.42	5.04	**Pipe Channel, Pipe - ESTIMATE** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Concrete pipe, bends & connections
2.3	619	Total, Increased to minimum Tc = 5.0 min			

Subcatchment PR 1.3: SUB PR 1.3



Summary for Subcatchment PR 1.4: SUB PR 1.4

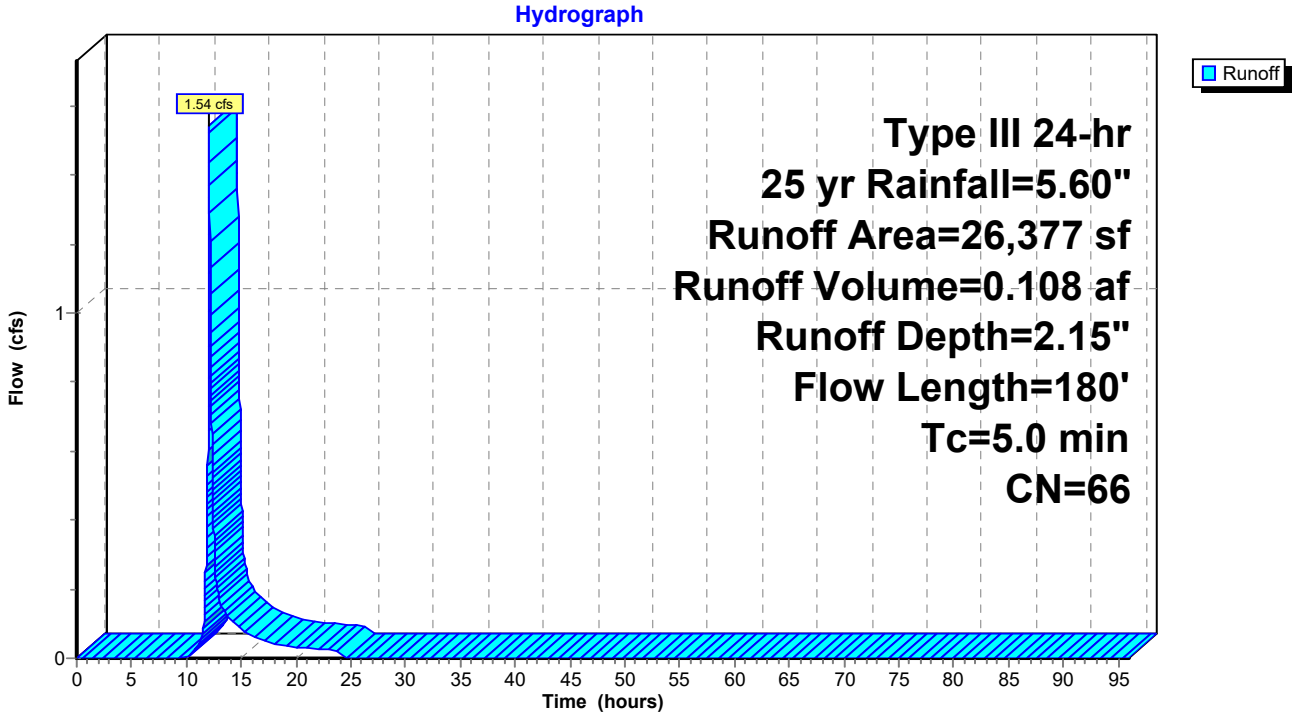
Runoff = 1.54 cfs @ 12.08 hrs, Volume= 0.108 af, Depth= 2.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 yr Rainfall=5.60"

Area (sf)	CN	Description
19,466	61	>75% Grass cover, Good, HSG B
6,911	80	>75% Grass cover, Good, HSG D
26,377	66	Weighted Average
26,377		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	41	0.5000	0.52		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.6	139	0.0647	4.10		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.9	180	Total, Increased to minimum Tc = 5.0 min			

Subcatchment PR 1.4: SUB PR 1.4



Summary for Subcatchment PR 1.6: SUB PR 1.6

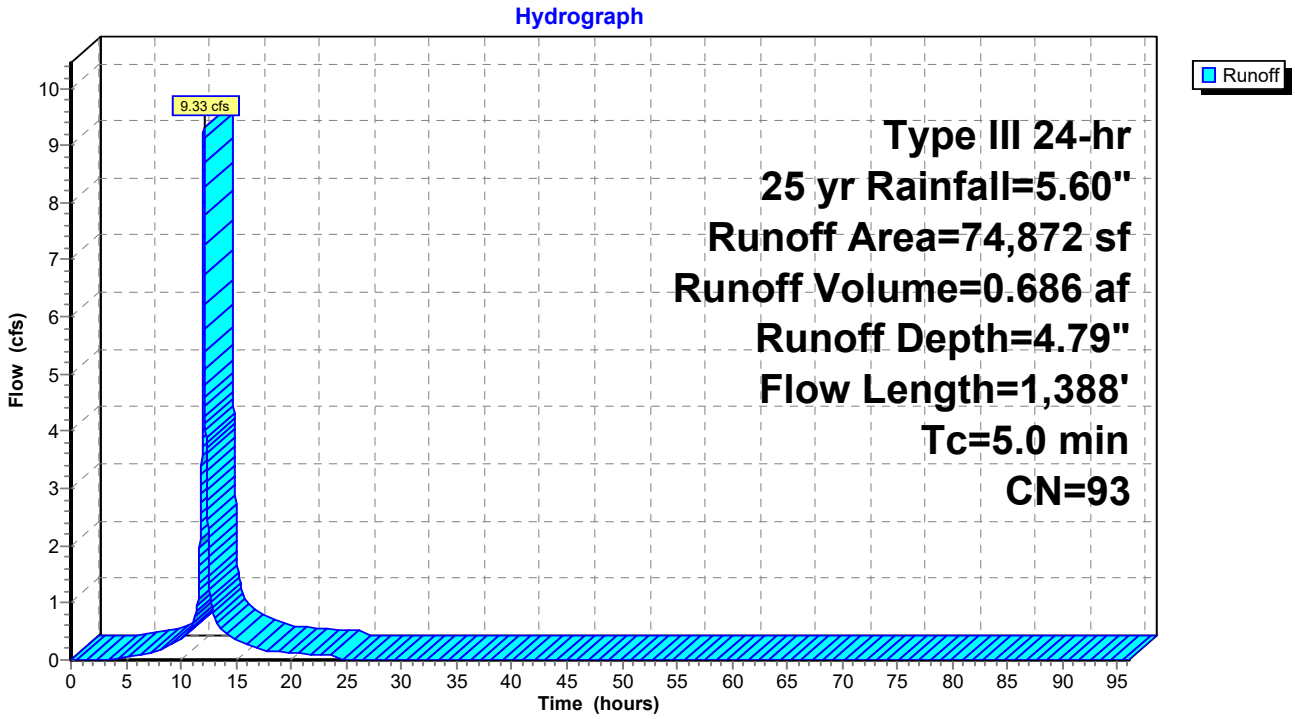
Runoff = 9.33 cfs @ 12.07 hrs, Volume= 0.686 af, Depth= 4.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 yr Rainfall=5.60"

Area (sf)	CN	Description
64,814	98	Paved parking & roofs
10,058	61	>75% Grass cover, Good, HSG B
74,872	93	Weighted Average
10,058		13.43% Pervious Area
64,814		86.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0294	1.40		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
1.4	243	0.0192	2.81		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.6	1,095	0.0183	7.12	8.74	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Concrete pipe, bends & connections
4.6	1,388	Total, Increased to minimum Tc = 5.0 min			

Subcatchment PR 1.6: SUB PR 1.6



Summary for Subcatchment PR 2.1: SUB PR 2.1

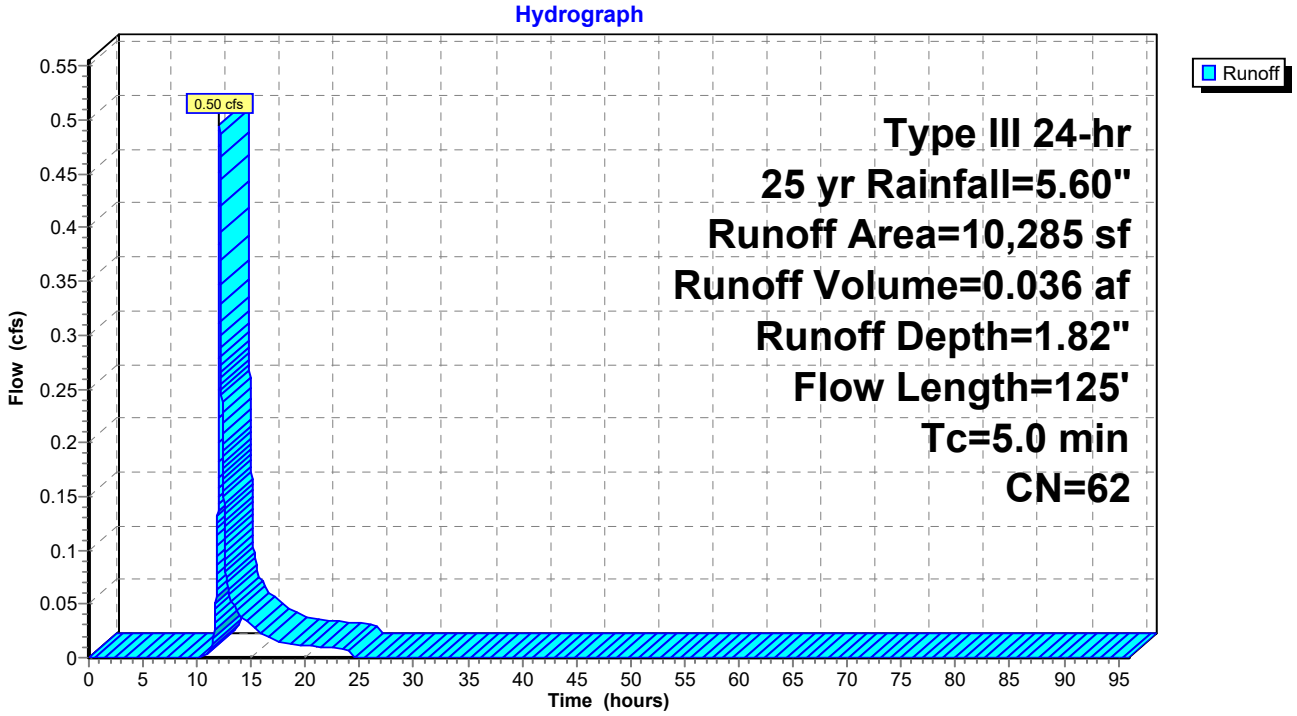
Runoff = 0.50 cfs @ 12.08 hrs, Volume= 0.036 af, Depth= 1.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 yr Rainfall=5.60"

Area (sf)	CN	Description
490	39	>75% Grass cover, Good, HSG A
8,567	61	>75% Grass cover, Good, HSG B
1,228	80	>75% Grass cover, Good, HSG D
10,285	62	Weighted Average
10,285		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.20		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.0	20	0.2857	8.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.3	55	0.0455	3.43		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
4.6	125	Total, Increased to minimum Tc = 5.0 min			

Subcatchment PR 2.1: SUB PR 2.1



Summary for Subcatchment PR 2.2A: SUB PR 2.2A

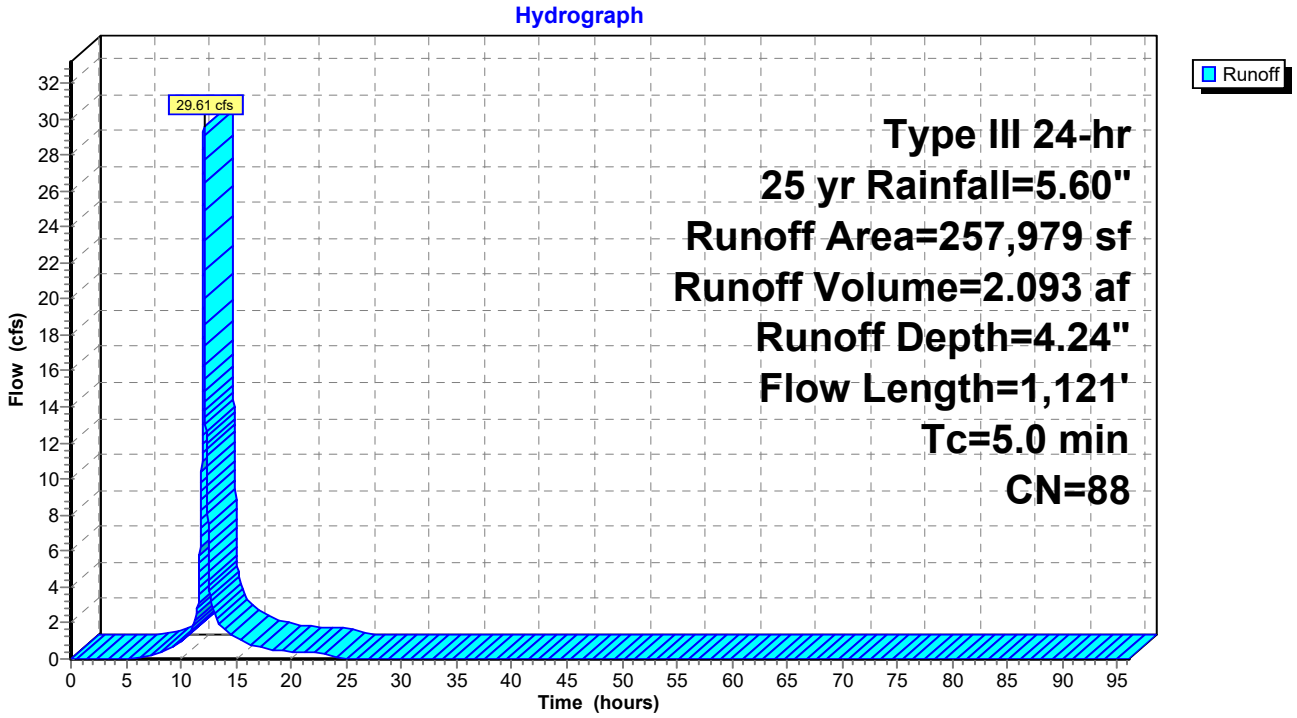
Runoff = 29.61 cfs @ 12.07 hrs, Volume= 2.093 af, Depth= 4.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 yr Rainfall=5.60"

	Area (sf)	CN	Description
	176,686	98	Paved parking, HSG B
	25,211	61	>75% Grass cover, Good, HSG B
	18,821	80	>75% Grass cover, Good, HSG D
*	37,261	61	Inf. Basin; >75% Grass cover, Good, HSG B
	257,979	88	Weighted Average
	81,293		31.51% Pervious Area
	176,686		68.49% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	50	0.0500	1.73		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
1.6	275	0.0196	2.84		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.1	796	0.0566	12.52	15.37	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Concrete pipe, bends & connections
3.2	1,121	Total, Increased to minimum Tc = 5.0 min			

Subcatchment PR 2.2A: SUB PR 2.2A



Summary for Subcatchment PR 2.2B: SUB PR 2.2B

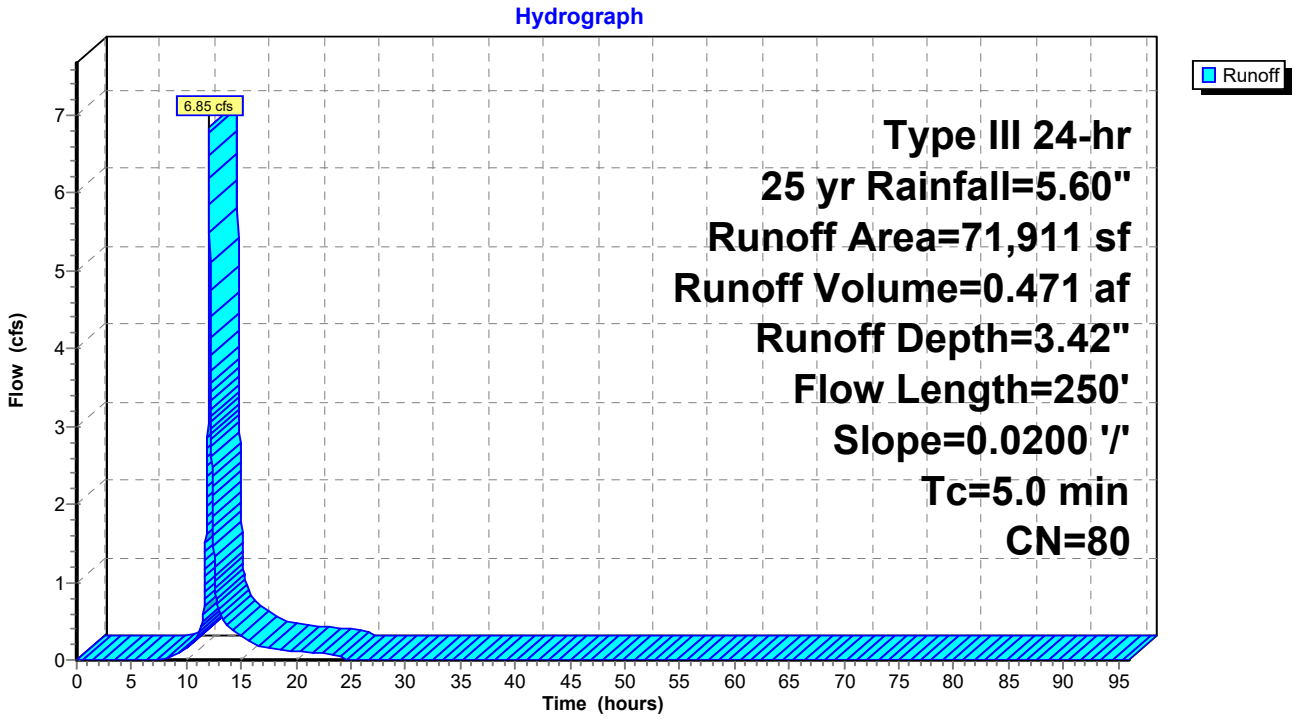
Runoff = 6.85 cfs @ 12.07 hrs, Volume= 0.471 af, Depth= 3.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 yr Rainfall=5.60"

	Area (sf)	CN	Description
	31,953	98	Paved parking, HSG B
	16,585	61	>75% Grass cover, Good, HSG B
	9,536	80	>75% Grass cover, Good, HSG D
*	13,837	61	Inf. Basin; >75% Grass cover, Good, HSG B
	71,911	80	Weighted Average
	39,958		55.57% Pervious Area
	31,953		44.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.20		**Sheet Flow, Sheet - ESTIMATE** Smooth surfaces n= 0.011 P2= 3.20"
0.5	200	0.0200	6.42	5.04	**Pipe Channel, Pipe - ESTIMATE** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Concrete pipe, bends & connections
1.2	250	Total, Increased to minimum Tc = 5.0 min			

Subcatchment PR 2.2B: SUB PR 2.2B



Summary for Subcatchment PR 2.3: SUB PR 2.3

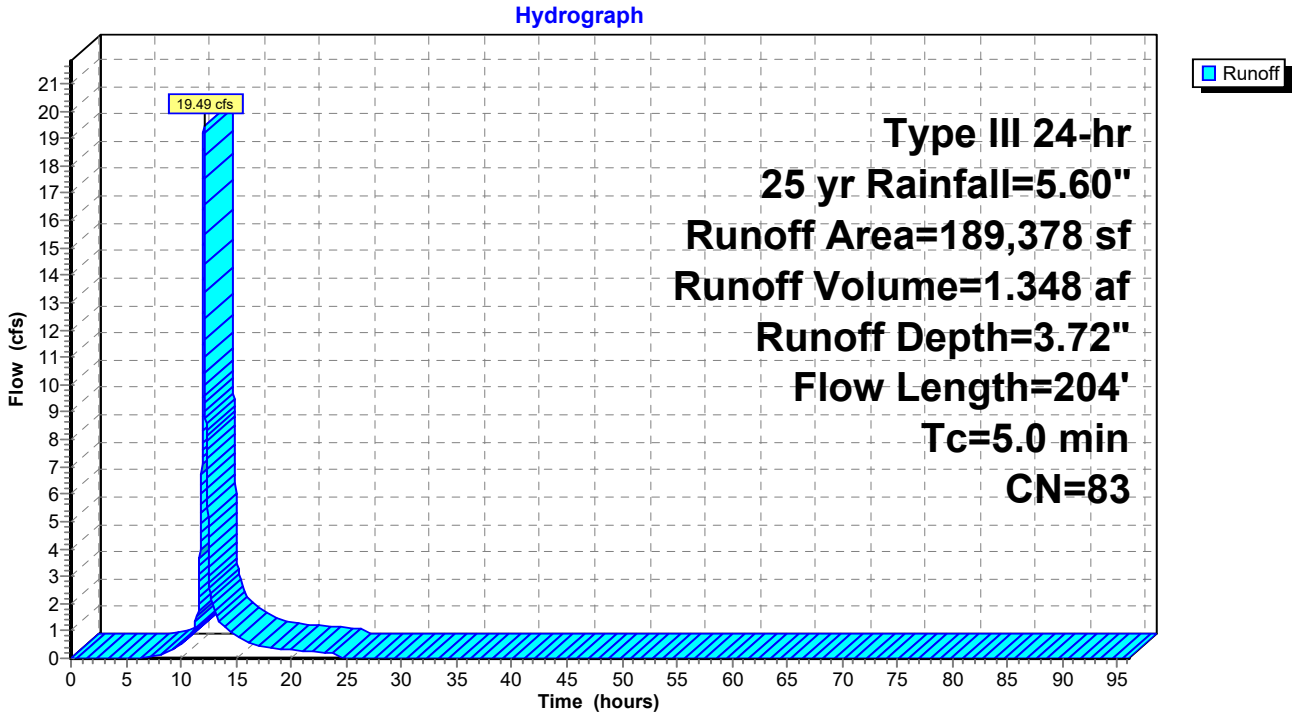
Runoff = 19.49 cfs @ 12.07 hrs, Volume= 1.348 af, Depth= 3.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 yr Rainfall=5.60"

Area (sf)	CN	Description
28,343	55	Woods, Good, HSG B
40,833	77	Woods, Good, HSG D
33,965	77	Wetland (Woods, Good, HSG D)
86,237	98	Paved parking & roofs
189,378	83	Weighted Average
103,141		54.46% Pervious Area
86,237		45.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.20		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.1	28	0.0643	4.08		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.3	81	0.0364	3.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.1	45	0.0200	7.44	9.14	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013
4.8	204	Total, Increased to minimum Tc = 5.0 min			

Subcatchment PR 2.3: SUB PR 2.3



Summary for Subcatchment PR 2.4: SUB PR 2.4

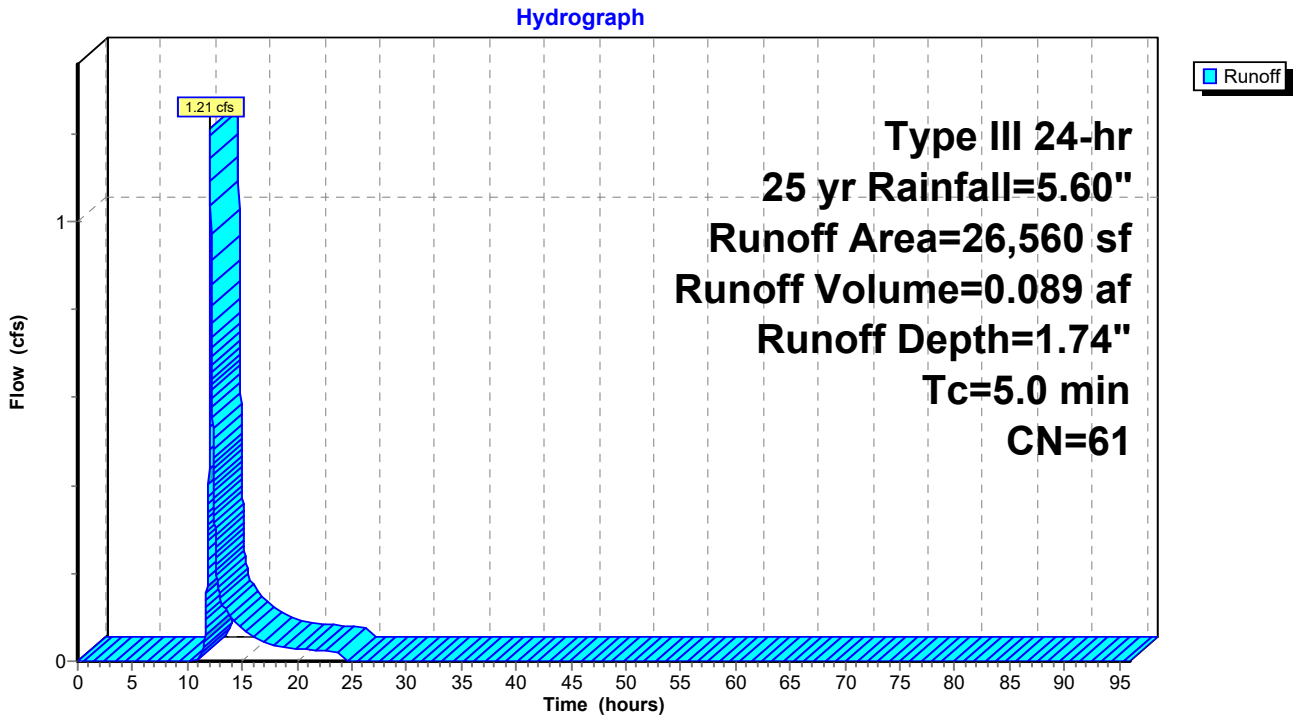
Runoff = 1.21 cfs @ 12.08 hrs, Volume= 0.089 af, Depth= 1.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 yr Rainfall=5.60"

Area (sf)	CN	Description
26,560	61	>75% Grass cover, Good, HSG B
26,560		100.00% Pervious Area

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

Subcatchment PR 2.4: SUB PR 2.4



Summary for Subcatchment PR 3.1: SUB PR 3.1

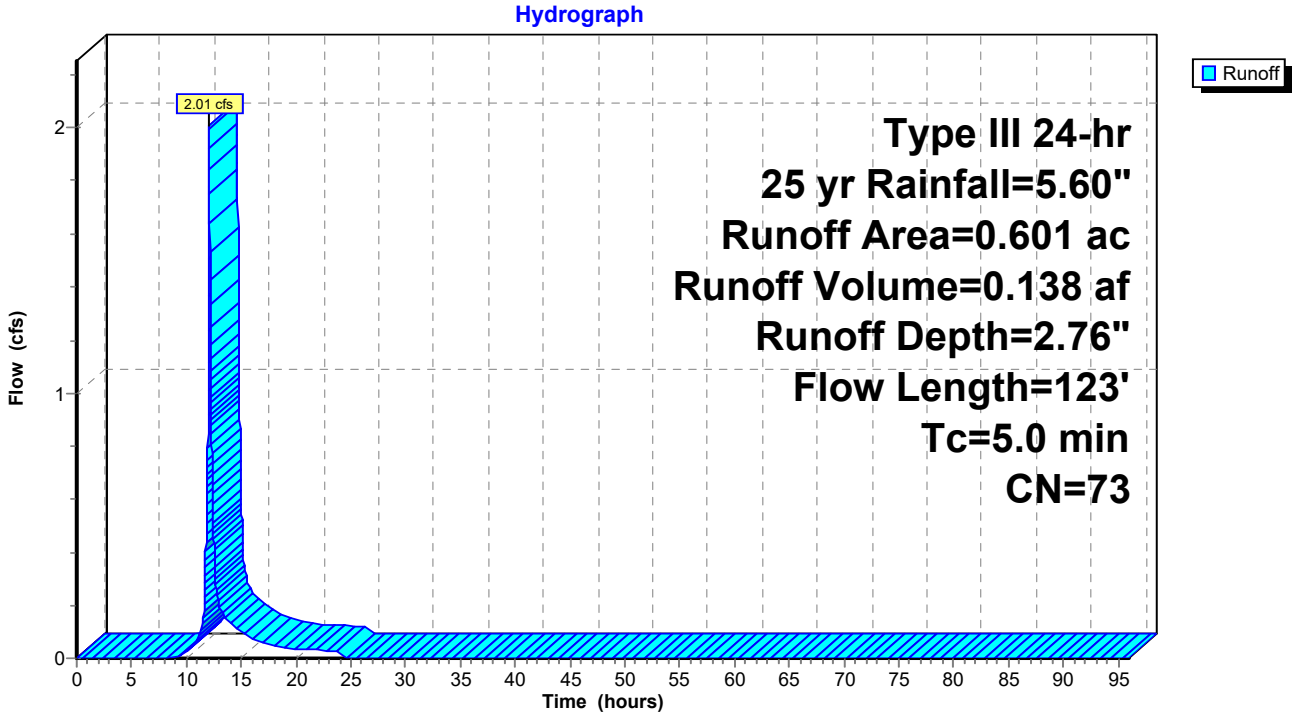
Runoff = 2.01 cfs @ 12.08 hrs, Volume= 0.138 af, Depth= 2.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 yr Rainfall=5.60"

Area (ac)	CN	Description
0.219	61	>75% Grass cover, Good, HSG B
0.382	80	>75% Grass cover, Good, HSG D
0.601	73	Weighted Average
0.601		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	33	0.5000	0.49		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.2	90	0.1444	6.12		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.3	123	Total, Increased to minimum Tc = 5.0 min			

Subcatchment PR 3.1: SUB PR 3.1



Summary for Subcatchment PR 3.2: SUB PR 3.2

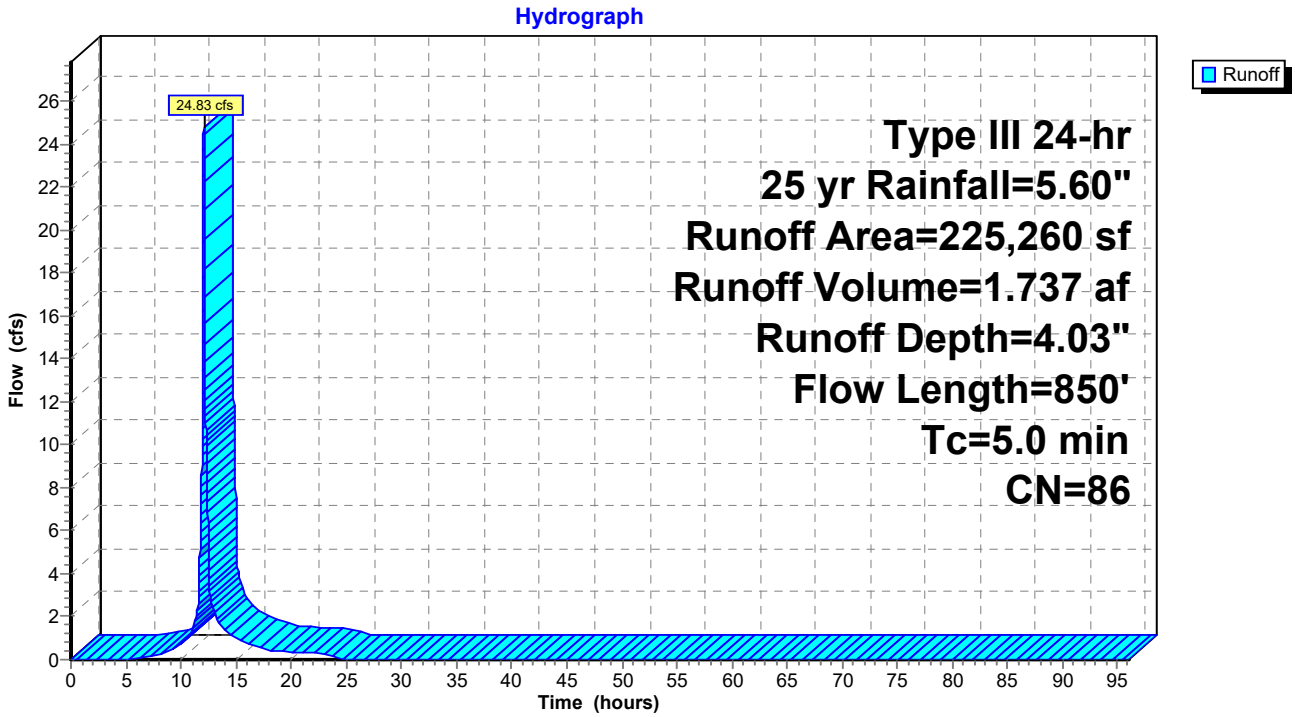
Runoff = 24.83 cfs @ 12.07 hrs, Volume= 1.737 af, Depth= 4.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 yr Rainfall=5.60"

	Area (sf)	CN	Description
*	151,349	98	Paved parking, Roofs, HSG B
	449	39	>75% Grass cover, Good, HSG A
	35,075	61	>75% Grass cover, Good, HSG B
	10,439	80	>75% Grass cover, Good, HSG D
*	27,948	58	Wetlands, Good, HSG B
	225,260	86	Weighted Average
	73,911		32.81% Pervious Area
	151,349		67.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.20		**Sheet Flow, Sheet - ESTIMATE** Smooth surfaces n= 0.011 P2= 3.20"
1.1	800	0.0500	11.77	14.44	**Pipe Channel, Pipe - ESTIMATE** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Concrete pipe, bends & connections
1.8	850	Total, Increased to minimum Tc = 5.0 min			

Subcatchment PR 3.2: SUB PR 3.2



Summary for Subcatchment PR 3.3A: SUB PR 3.3A

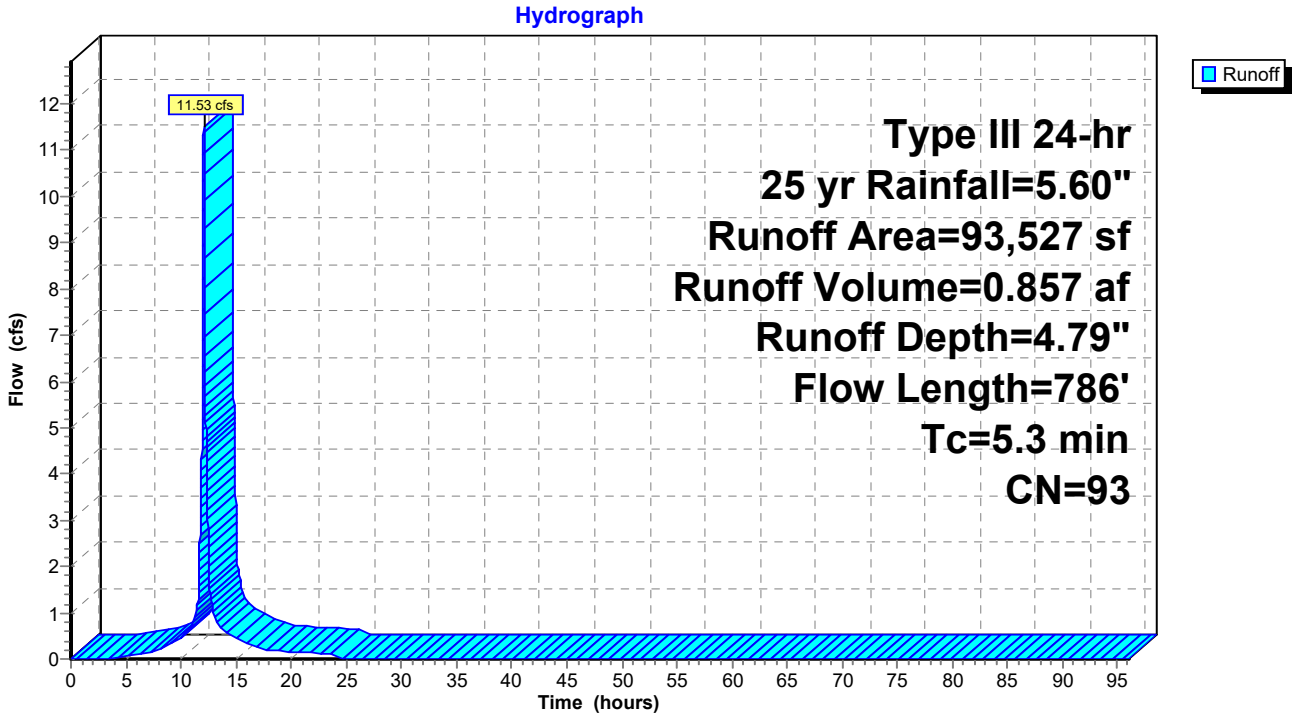
Runoff = 11.53 cfs @ 12.07 hrs, Volume= 0.857 af, Depth= 4.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 yr Rainfall=5.60"

Area (sf)	CN	Description
80,340	98	Paved parking & roofs
13,187	61	>75% Grass cover, Good, HSG B
93,527	93	Weighted Average
13,187		14.10% Pervious Area
80,340		85.90% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.7	50	0.0556	0.22		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.1	44	0.1000	5.09		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.0	218	0.0500	3.60		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.5	474	0.0759	14.50	17.80	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013
5.3	786	Total			

Subcatchment PR 3.3A: SUB PR 3.3A



Summary for Subcatchment PR 3.3B: SUB PR 3.3B

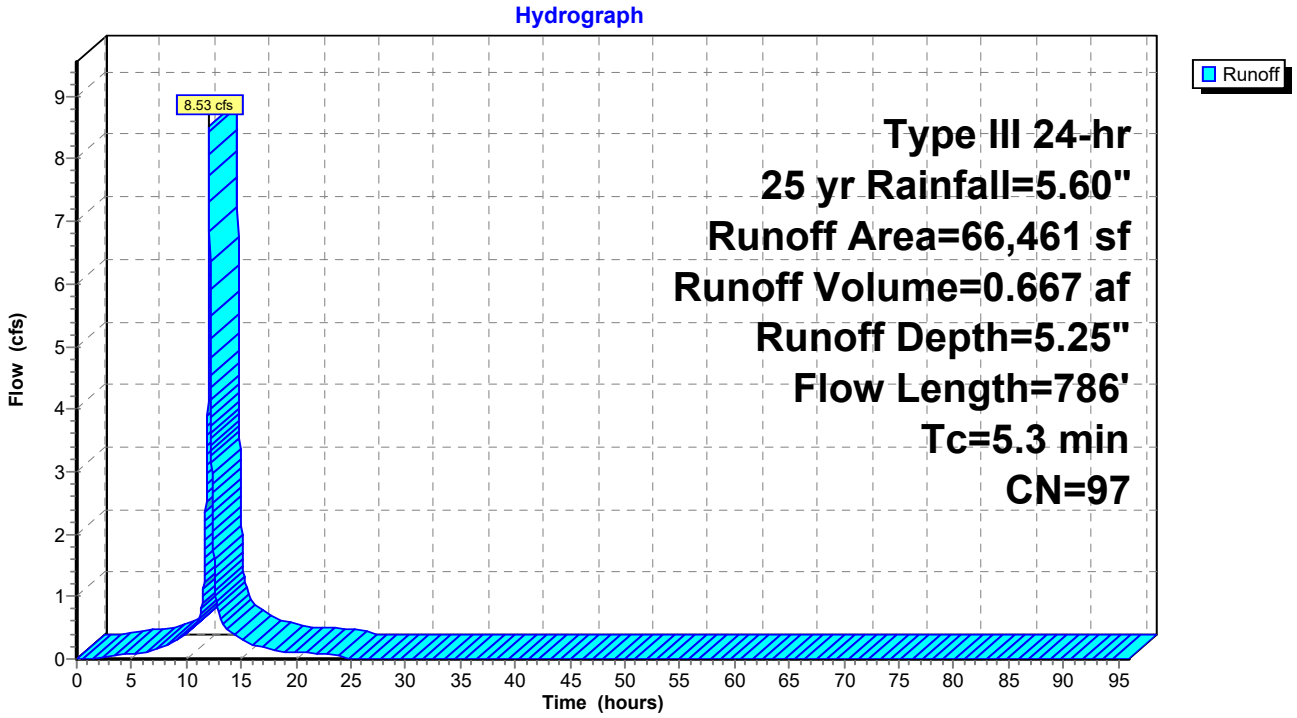
Runoff = 8.53 cfs @ 12.07 hrs, Volume= 0.667 af, Depth= 5.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 yr Rainfall=5.60"

Area (sf)	CN	Description
64,803	98	Paved parking & roofs
1,658	61	>75% Grass cover, Good, HSG B
66,461	97	Weighted Average
1,658		2.49% Pervious Area
64,803		97.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.7	50	0.0556	0.22		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.1	44	0.1000	5.09		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.0	218	0.0500	3.60		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.5	474	0.0759	14.50	17.80	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013
5.3	786	Total			

Subcatchment PR 3.3B: SUB PR 3.3B



Summary for Subcatchment PR 3.3C: PR 3.3C

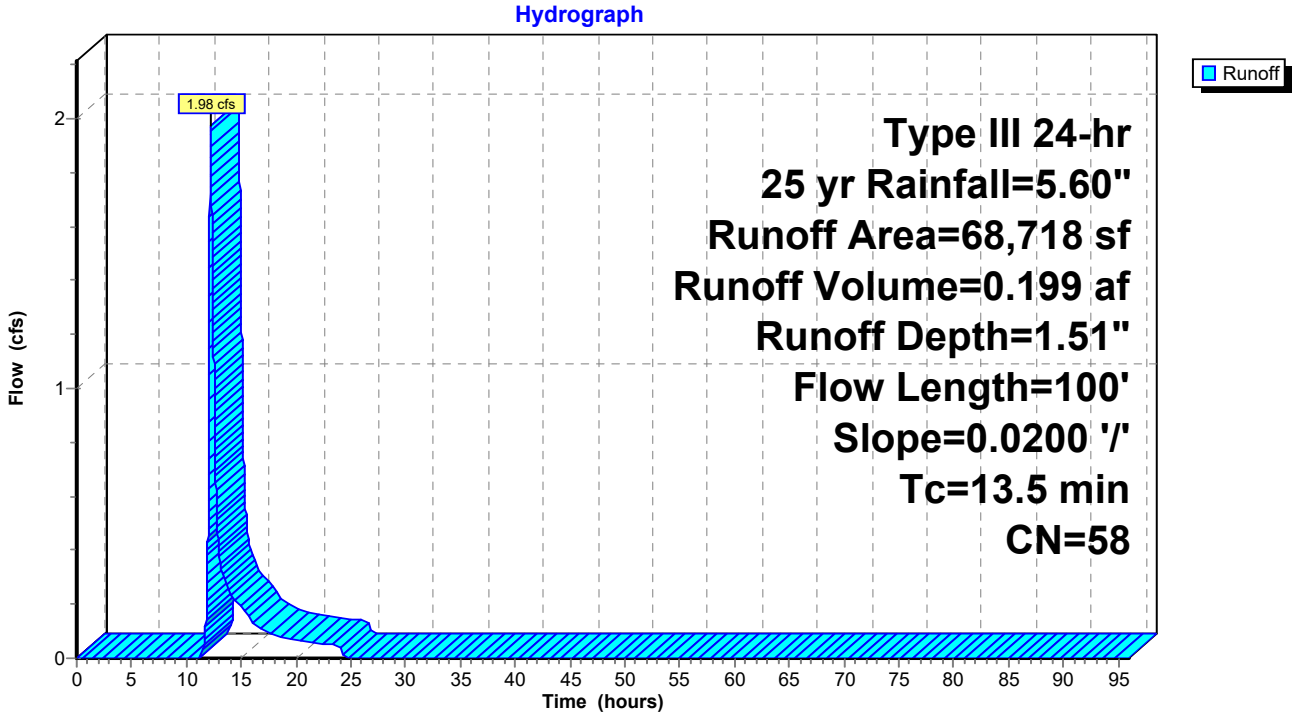
Runoff = 1.98 cfs @ 12.20 hrs, Volume= 0.199 af, Depth= 1.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 yr Rainfall=5.60"

Area (sf)	CN	Description
34,359	55	Woods, Good, HSG B
34,359	61	>75% Grass cover, Good, HSG B
68,718	58	Weighted Average
68,718		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		**Sheet Flow, Sheet - ESTIMATE** Woods: Light underbrush n= 0.400 P2= 3.20"
1.2	50	0.0200	0.71		**Shallow Concentrated Flow, Shallow Concentrated** Woodland Kv= 5.0 fps
13.5	100	Total			

Subcatchment PR 3.3C: PR 3.3C



Summary for Subcatchment PR 3.4: SUB PR 3.4

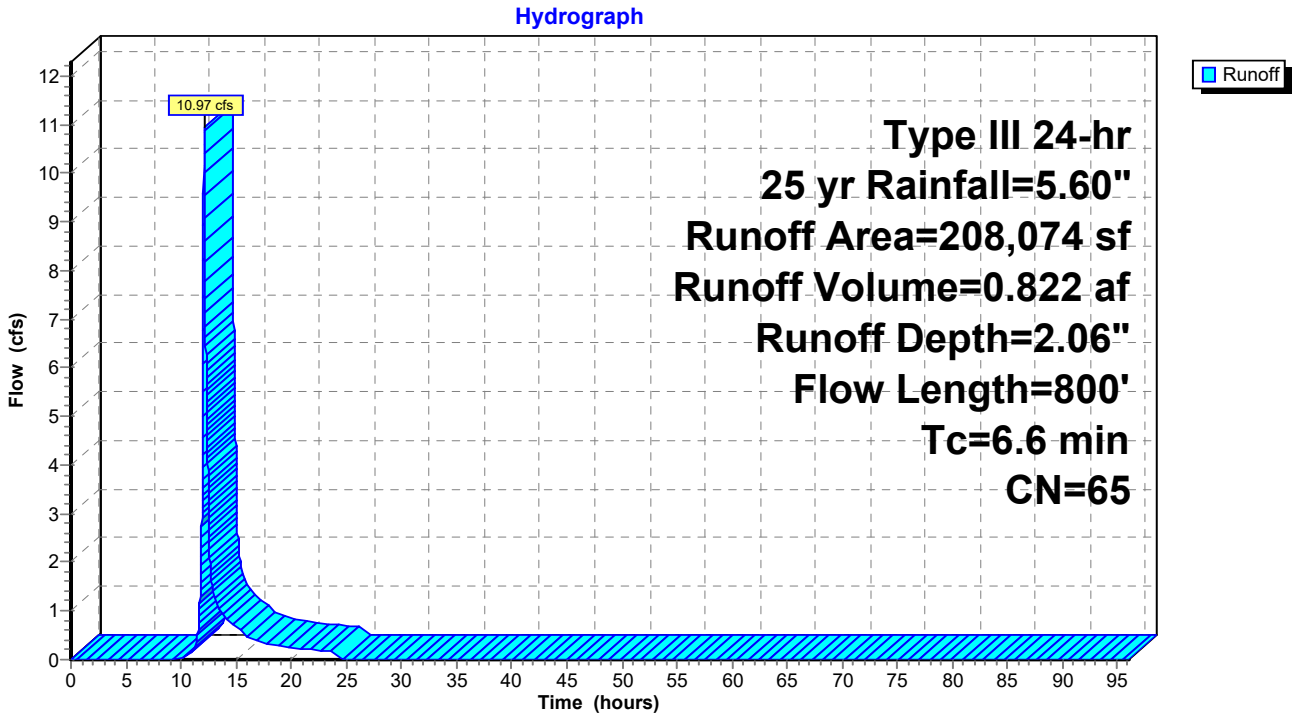
Runoff = 10.97 cfs @ 12.10 hrs, Volume= 0.822 af, Depth= 2.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 yr Rainfall=5.60"

	Area (sf)	CN	Description
	79,157	61	>75% Grass cover, Good, HSG B
	78,871	55	Woods, Good, HSG B
	21,288	77	Wetlands (Woods, Good, HSG D)
*	28,758	98	IMP Highway (EXISTING)
	208,074	65	Weighted Average
	179,316		86.18% Pervious Area
	28,758		13.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.20		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
5.7	675	0.0148	1.96		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.2	75	0.1333	5.88		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.6	800	Total			

Subcatchment PR 3.4: SUB PR 3.4



Summary for Subcatchment PR 3.5: SUB PR 3.5

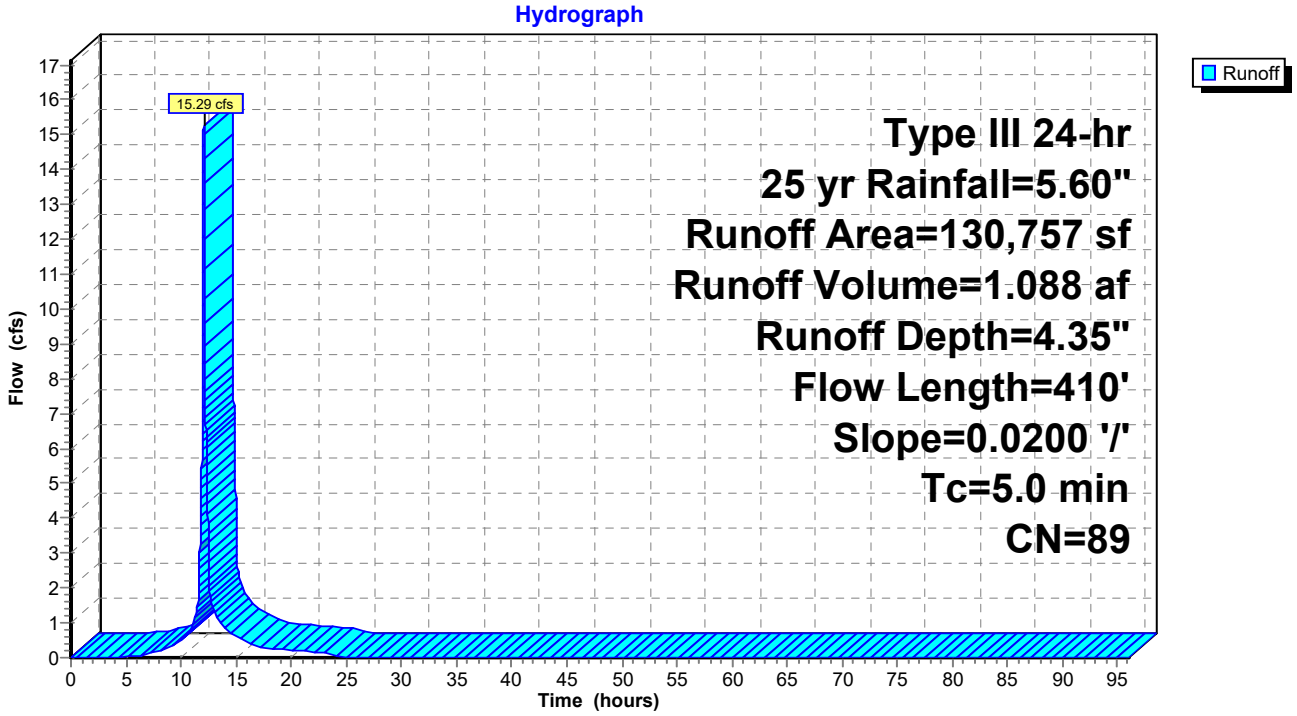
Runoff = 15.29 cfs @ 12.07 hrs, Volume= 1.088 af, Depth= 4.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 yr Rainfall=5.60"

Area (sf)	CN	Description
97,754	98	Paved parking & roofs
27,843	61	>75% Grass cover, Good, HSG B
5,160	80	>75% Grass cover, Good, HSG D
130,757	89	Weighted Average
33,003		25.24% Pervious Area
97,754		74.76% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.20		**Sheet Flow, Sheet - ESTIMATE** Smooth surfaces n= 0.011 P2= 3.20"
0.8	360	0.0200	7.44	9.14	**Pipe Channel, Pipe - ESTIMATE** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Concrete pipe, bends & connections
1.5	410	Total, Increased to minimum Tc = 5.0 min			

Subcatchment PR 3.5: SUB PR 3.5



Summary for Subcatchment PR 4.1: SUB PR 4.1

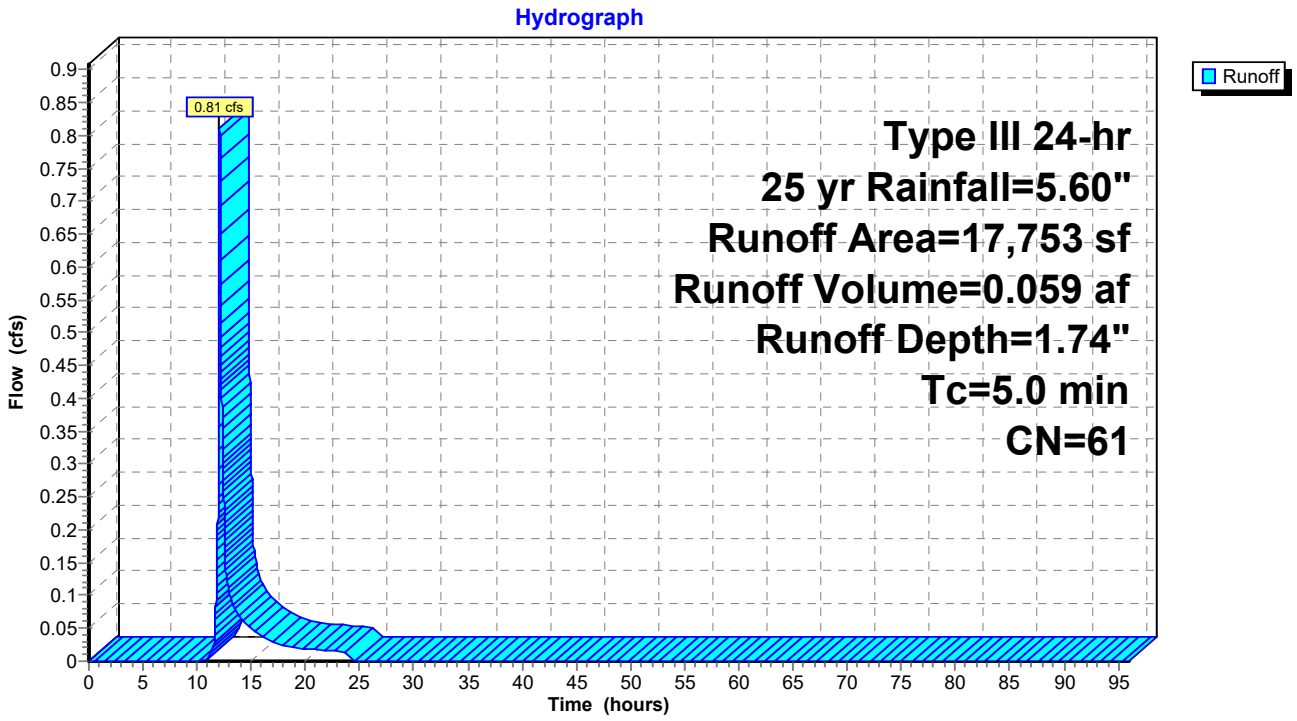
Runoff = 0.81 cfs @ 12.08 hrs, Volume= 0.059 af, Depth= 1.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 yr Rainfall=5.60"

Area (sf)	CN	Description
17,753	61	>75% Grass cover, Good, HSG B
17,753		100.00% Pervious Area

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

Subcatchment PR 4.1: SUB PR 4.1



Summary for Subcatchment PR 4.2: SUB PR 4.2

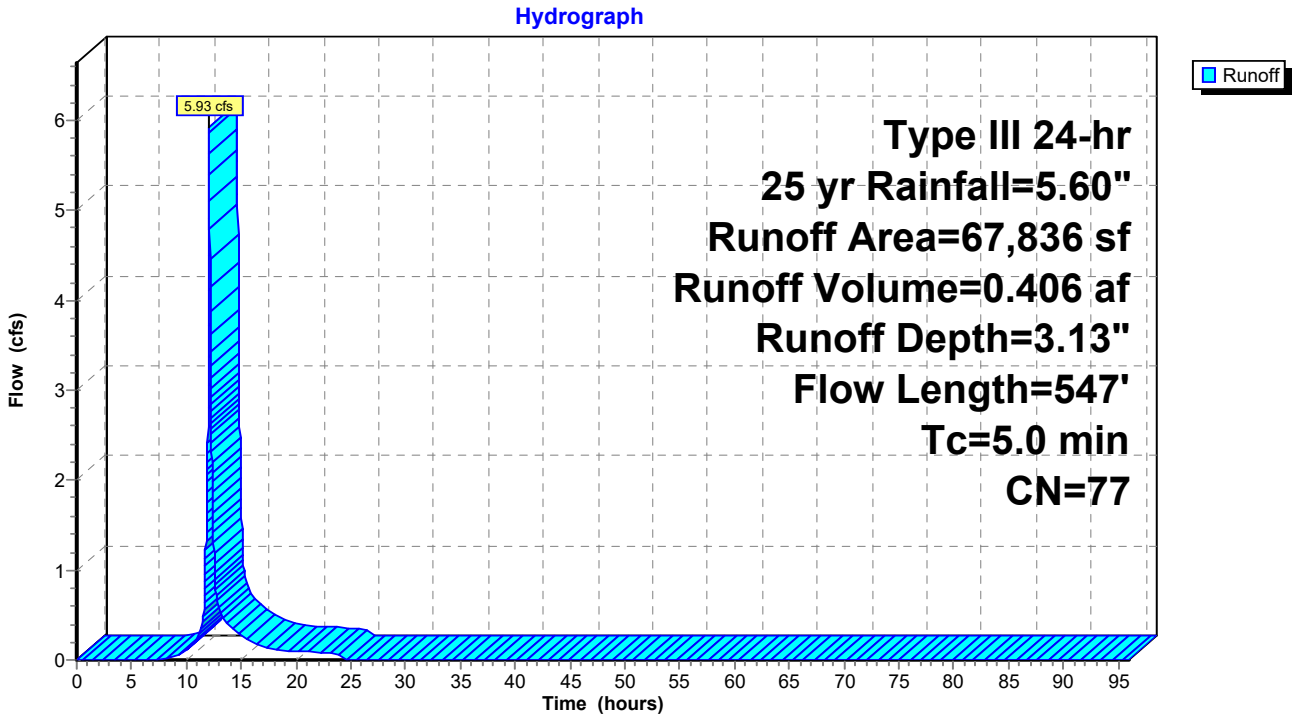
Runoff = 5.93 cfs @ 12.07 hrs, Volume= 0.406 af, Depth= 3.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 yr Rainfall=5.60"

Area (sf)	CN	Description
37,635	61	>75% Grass cover, Good, HSG B
30,201	98	Paved parking & roofs
67,836	77	Weighted Average
37,635		55.48% Pervious Area
30,201		44.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0230	1.27		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
0.8	144	0.0230	3.08		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.8	353	0.0210	7.63	9.36	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013
2.3	547	Total, Increased to minimum Tc = 5.0 min			

Subcatchment PR 4.2: SUB PR 4.2



Summary for Pond B-1: Basin 1

Inflow Area = 3.503 ac, 63.78% Impervious, Inflow Depth = 3.42" for 25 yr event
Inflow = 14.54 cfs @ 12.07 hrs, Volume= 0.999 af
Outflow = 1.36 cfs @ 12.97 hrs, Volume= 0.999 af, Atten= 91%, Lag= 54.0 min
Discarded = 0.22 cfs @ 12.97 hrs, Volume= 0.341 af
Primary = 1.15 cfs @ 12.97 hrs, Volume= 0.658 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 296.75' @ 12.97 hrs Surf.Area= 9,165 sf Storage= 20,727 cf

Plug-Flow detention time= 283.7 min calculated for 0.999 af (100% of inflow)
Center-of-Mass det. time= 283.7 min (1,099.8 - 816.1)

Volume	Invert	Avail.Storage	Storage Description
#1	294.00'	33,182 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

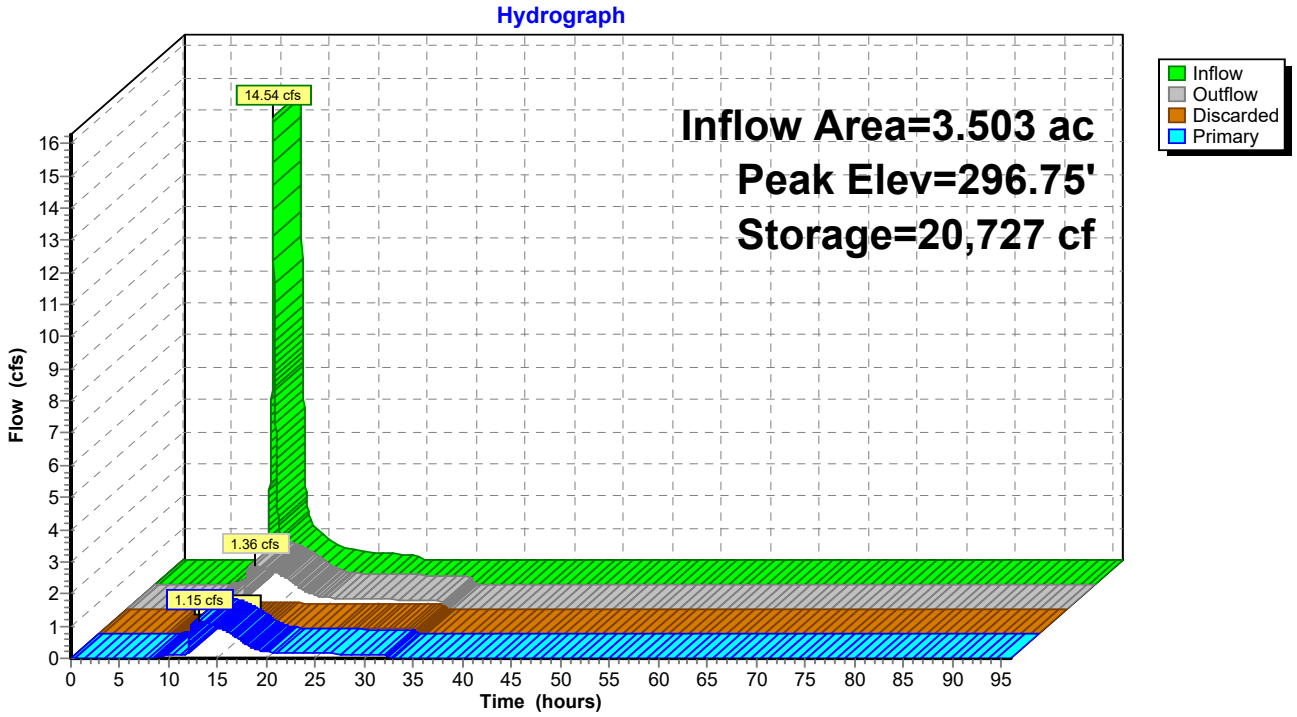
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
294.00	5,987	0	0
296.00	8,239	14,226	14,226
298.00	10,717	18,956	33,182

Device	Routing	Invert	Outlet Devices
#1	Discarded	294.00'	**1.020 in/hr Exfiltration over Horizontal area**
#2	Primary	293.00'	**18.0" Round Culvert** L= 50.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 293.00' / 292.50' S= 0.0100 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#3	Device 2	293.00'	**2.0" Vert. Orifice/Grate** C= 0.600
#4	Device 2	295.50'	**6.0" Vert. Orifice/Grate** C= 0.600
#5	Primary	297.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Discarded OutFlow Max=0.22 cfs @ 12.97 hrs HW=296.75' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.22 cfs)

Primary OutFlow Max=1.15 cfs @ 12.97 hrs HW=296.75' (Free Discharge)
├─**2=Culvert** (Passes 1.15 cfs of 14.73 cfs potential flow)
│ ├─**3=Orifice/Grate** (Orifice Controls 0.20 cfs @ 9.22 fps)
│ └─**4=Orifice/Grate** (Orifice Controls 0.94 cfs @ 4.81 fps)
└─**5=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond B-1: Basin 1



Summary for Pond B-2: Basin 2

Inflow Area =	3.452 ac, 70.93% Impervious, Inflow Depth = 4.14" for 25 yr event				
Inflow =	16.92 cfs @	12.07 hrs,	Volume=	1.190 af	
Outflow =	3.18 cfs @	12.51 hrs,	Volume=	1.190 af,	Atten= 81%, Lag= 26.2 min
Discarded =	0.17 cfs @	12.51 hrs,	Volume=	0.456 af	
Primary =	3.01 cfs @	12.51 hrs,	Volume=	0.734 af	
Secondary =	0.00 cfs @	0.00 hrs,	Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 325.63' @ 12.51 hrs Surf.Area= 9,475 sf Storage= 26,388 cf

Plug-Flow detention time= 467.2 min calculated for 1.190 af (100% of inflow)
Center-of-Mass det. time= 467.1 min (1,263.3 - 796.2)

Volume	Invert	Avail.Storage	Storage Description
#1	322.00'	52,913 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
322.00	5,179	0	0
324.00	7,440	12,619	12,619
326.00	9,940	17,380	29,999
328.00	12,974	22,914	52,913

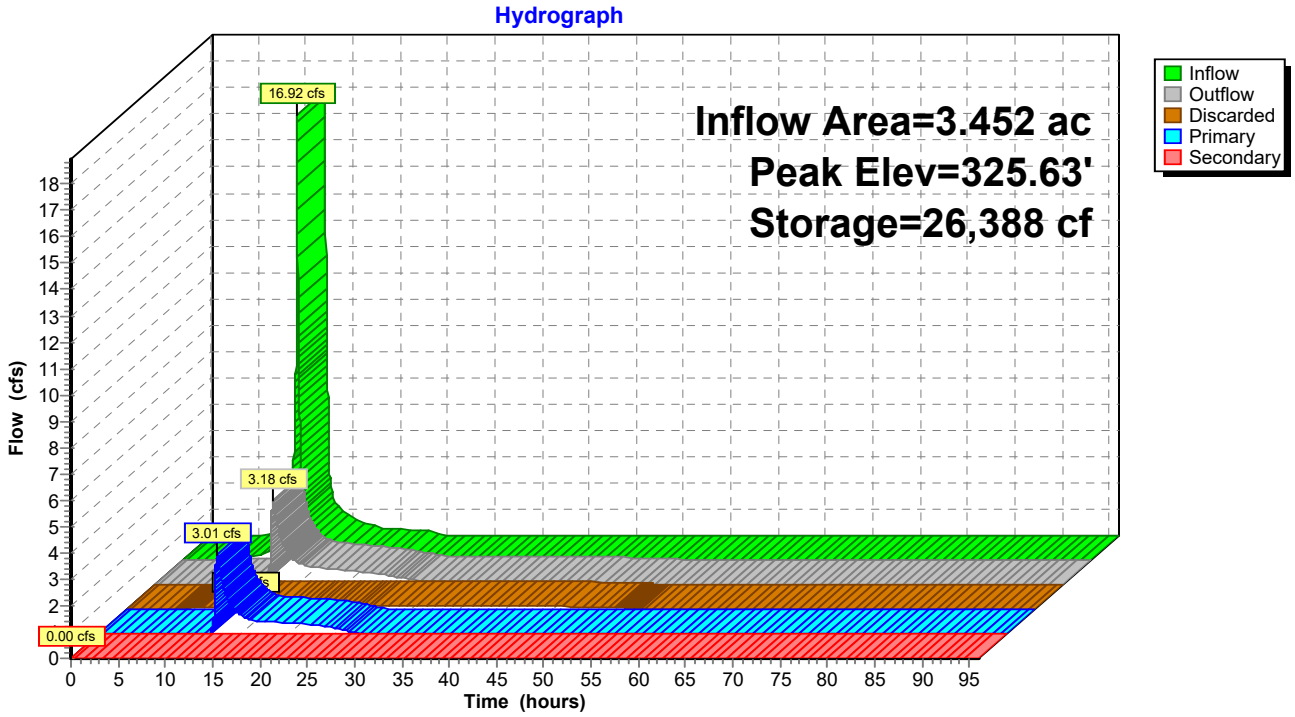
Device	Routing	Invert	Outlet Devices
#1	Discarded	322.00'	**0.770 in/hr Exfiltration over Horizontal area**
#2	Primary	321.00'	**18.0" Round Culvert**
			L= 80.0' RCP, sq.cut end projecting, Ke= 0.500
			Inlet / Outlet Invert= 321.00' / 320.00' S= 0.0125 '/' Cc= 0.900
			n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#3	Device 2	323.50'	**4.0" Vert. Orifice/Grate** C= 0.600
#4	Device 2	325.10'	**24.0" W x 6.0" H Vert. Orifice/Grate** C= 0.600
#5	Secondary	327.20'	**10.0' 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

Discarded OutFlow Max=0.17 cfs @ 12.51 hrs HW=325.63' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.17 cfs)

Primary OutFlow Max=3.02 cfs @ 12.51 hrs HW=325.63' (Free Discharge)
└─**2=Culvert** (Passes 3.02 cfs of 16.74 cfs potential flow)
  ├─**3=Orifice/Grate** (Orifice Controls 0.59 cfs @ 6.74 fps)
  └─**4=Orifice/Grate** (Orifice Controls 2.43 cfs @ 2.43 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=322.00' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond B-2: Basin 2



Summary for Pond B-3A: Basin 3A

Inflow Area = 2.147 ac, 85.90% Impervious, Inflow Depth = 4.79" for 25 yr event
Inflow = 11.53 cfs @ 12.07 hrs, Volume= 0.857 af
Outflow = 0.84 cfs @ 13.18 hrs, Volume= 0.857 af, Atten= 93%, Lag= 66.2 min
Primary = 0.84 cfs @ 13.18 hrs, Volume= 0.857 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 373.14' @ 13.18 hrs Surf.Area= 5,000 sf Storage= 19,642 cf

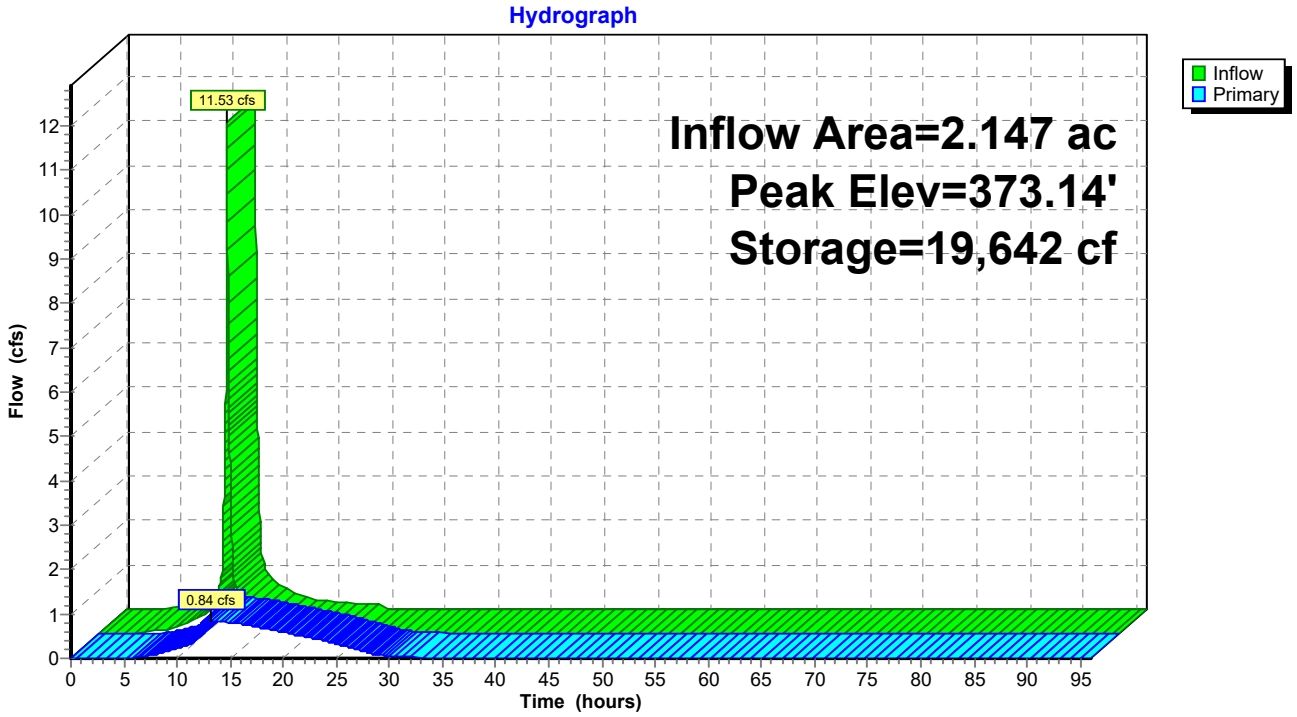
Plug-Flow detention time= 299.5 min calculated for 0.857 af (100% of inflow)
Center-of-Mass det. time= 299.8 min (1,074.1 - 774.3)

Volume	Invert	Avail.Storage	Storage Description
#1	369.00'	23,750 cf	**50.00'W x 100.00'L x 5.00'H Prismatoid** 25,000 cf Overall x 95.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Primary	369.00'	**18.0" Round Culvert** L= 100.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 369.00' / 368.00' S= 0.0100 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#2	Device 1	369.00'	**4.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	373.50'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.84 cfs @ 13.18 hrs HW=373.14' (Free Discharge)
└─**1=Culvert** (Passes 0.84 cfs of 14.82 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.84 cfs @ 9.59 fps)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond B-3A: Basin 3A



Summary for Pond B-3B: Basin 3B

Inflow Area = 1.526 ac, 97.51% Impervious, Inflow Depth = 5.25" for 25 yr event
Inflow = 8.53 cfs @ 12.07 hrs, Volume= 0.667 af
Outflow = 0.71 cfs @ 12.97 hrs, Volume= 0.667 af, Atten= 92%, Lag= 53.7 min
Primary = 0.71 cfs @ 12.97 hrs, Volume= 0.667 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 372.06' @ 12.97 hrs Surf.Area= 5,000 sf Storage= 14,530 cf

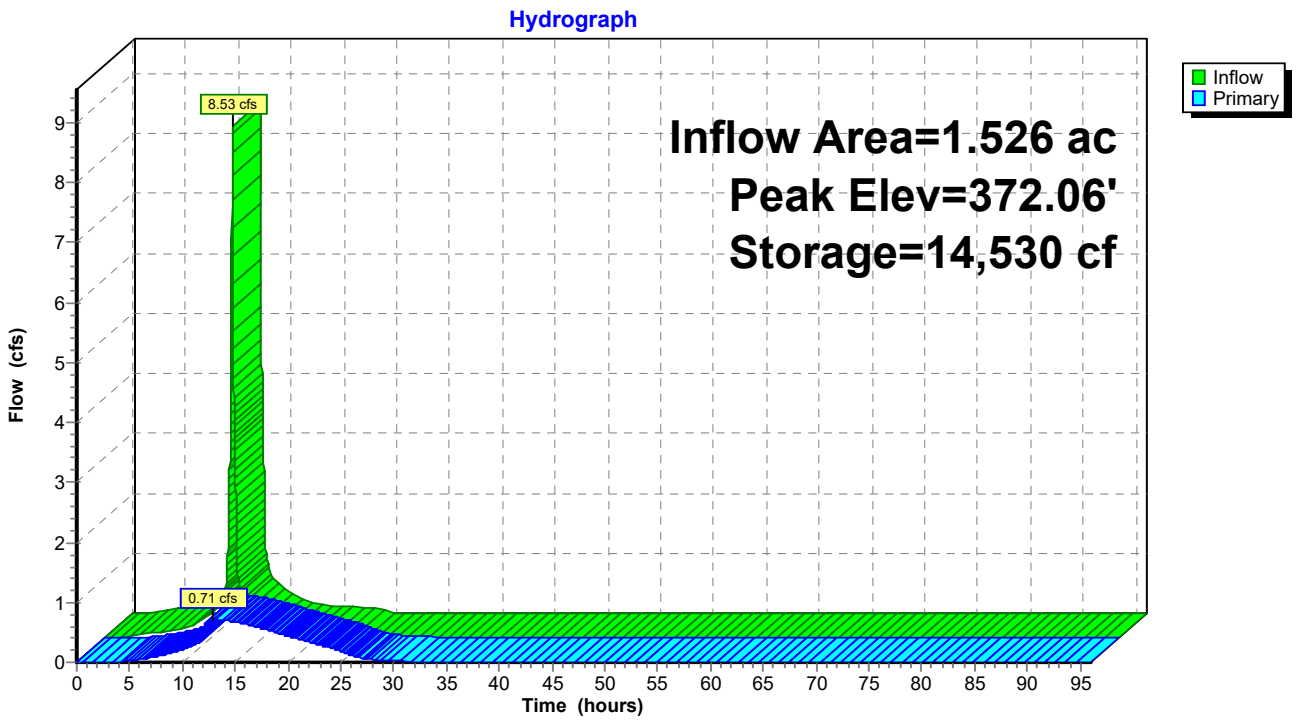
Plug-Flow detention time= 261.0 min calculated for 0.667 af (100% of inflow)
Center-of-Mass det. time= 261.4 min (1,014.2 - 752.8)

Volume	Invert	Avail.Storage	Storage Description
#1	369.00'	23,750 cf	**50.00'W x 100.00'L x 5.00'H Prismatoid** 25,000 cf Overall x 95.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Primary	369.00'	**18.0" Round Culvert** L= 70.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 369.00' / 366.00' S= 0.0429 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#2	Device 1	369.00'	**4.0" Vert. Orifice/Grate** C= 0.600
#3	Primary	373.90'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.71 cfs @ 12.97 hrs HW=372.06' (Free Discharge)
└─**1=Culvert** (Passes 0.71 cfs of 12.93 cfs potential flow)
  └─**2=Orifice/Grate** (Orifice Controls 0.71 cfs @ 8.19 fps)
└─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond B-3B: Basin 3B



Summary for Pond B-3C: Basin 3C

Inflow Area = 3.002 ac, 74.76% Impervious, Inflow Depth = 4.35" for 25 yr event
Inflow = 15.29 cfs @ 12.07 hrs, Volume= 1.088 af
Outflow = 2.23 cfs @ 12.56 hrs, Volume= 1.088 af, Atten= 85%, Lag= 29.1 min
Primary = 2.23 cfs @ 12.56 hrs, Volume= 1.088 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 334.82' @ 12.56 hrs Surf.Area= 5,000 sf Storage= 22,882 cf

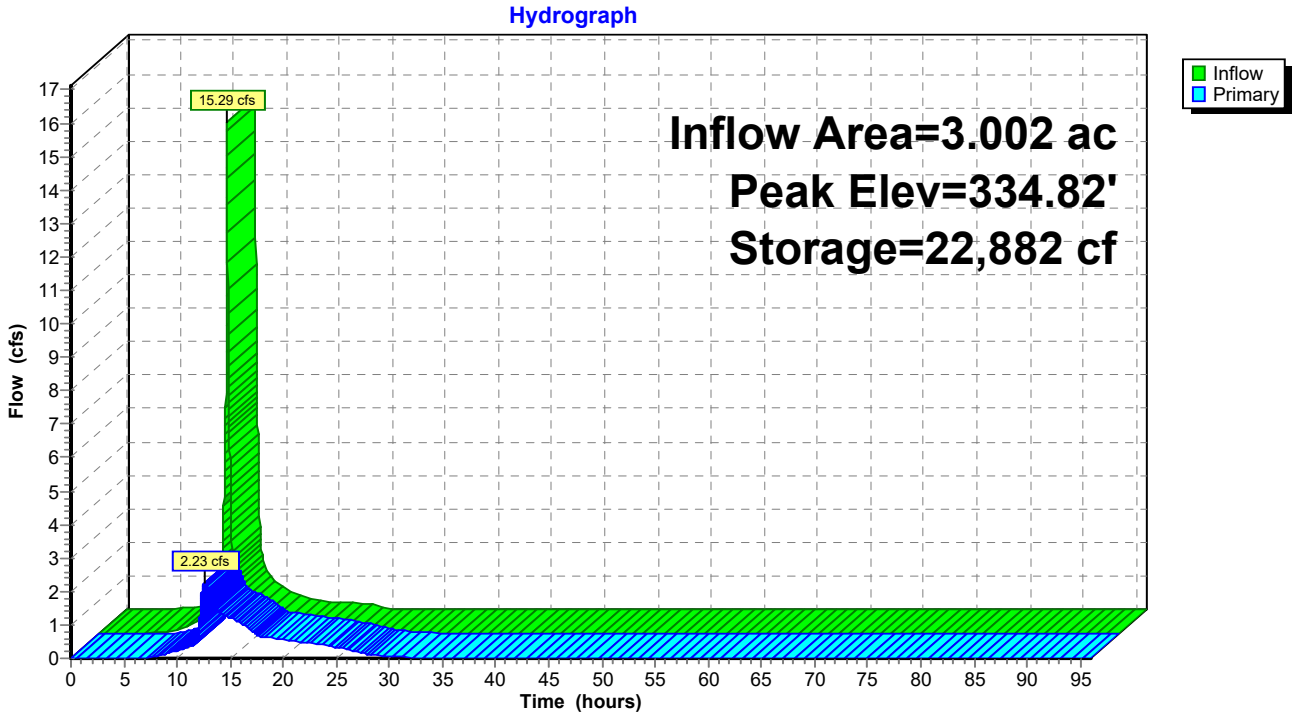
Plug-Flow detention time= 230.4 min calculated for 1.088 af (100% of inflow)
Center-of-Mass det. time= 230.4 min (1,019.9 - 789.6)

Volume	Invert	Avail.Storage	Storage Description
#1	330.00'	28,500 cf	**50.00'W x 100.00'L x 6.00'H Prismatoid** 30,000 cf Overall x 95.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Primary	330.00'	**18.0" Round Culvert** L= 100.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 330.00' / 328.50' S= 0.0150 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#2	Device 1	330.00'	**4.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	332.50'	**4.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	334.00'	**6.0" Vert. Orifice/Grate** C= 0.600
#5	Device 1	335.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=2.23 cfs @ 12.56 hrs HW=334.82' (Free Discharge)
└─**1=Culvert** (Passes 2.23 cfs of 17.06 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.91 cfs @ 10.38 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 0.62 cfs @ 7.06 fps)
  ├─**4=Orifice/Grate** (Orifice Controls 0.71 cfs @ 3.63 fps)
  └─**5=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond B-3C: Basin 3C



Summary for Pond B-4: Basin 4

Inflow Area = 5.171 ac, 67.19% Impervious, Inflow Depth = 4.03" for 25 yr event
Inflow = 24.83 cfs @ 12.07 hrs, Volume= 1.737 af
Outflow = 11.27 cfs @ 12.23 hrs, Volume= 1.736 af, Atten= 55%, Lag= 9.6 min
Primary = 11.27 cfs @ 12.23 hrs, Volume= 1.736 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 326.79' @ 12.23 hrs Surf.Area= 13,573 sf Storage= 29,003 cf

Plug-Flow detention time= 287.0 min calculated for 1.736 af (100% of inflow)
Center-of-Mass det. time= 286.7 min (1,085.9 - 799.3)

Volume	Invert	Avail.Storage	Storage Description
#1	324.00'	47,494 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

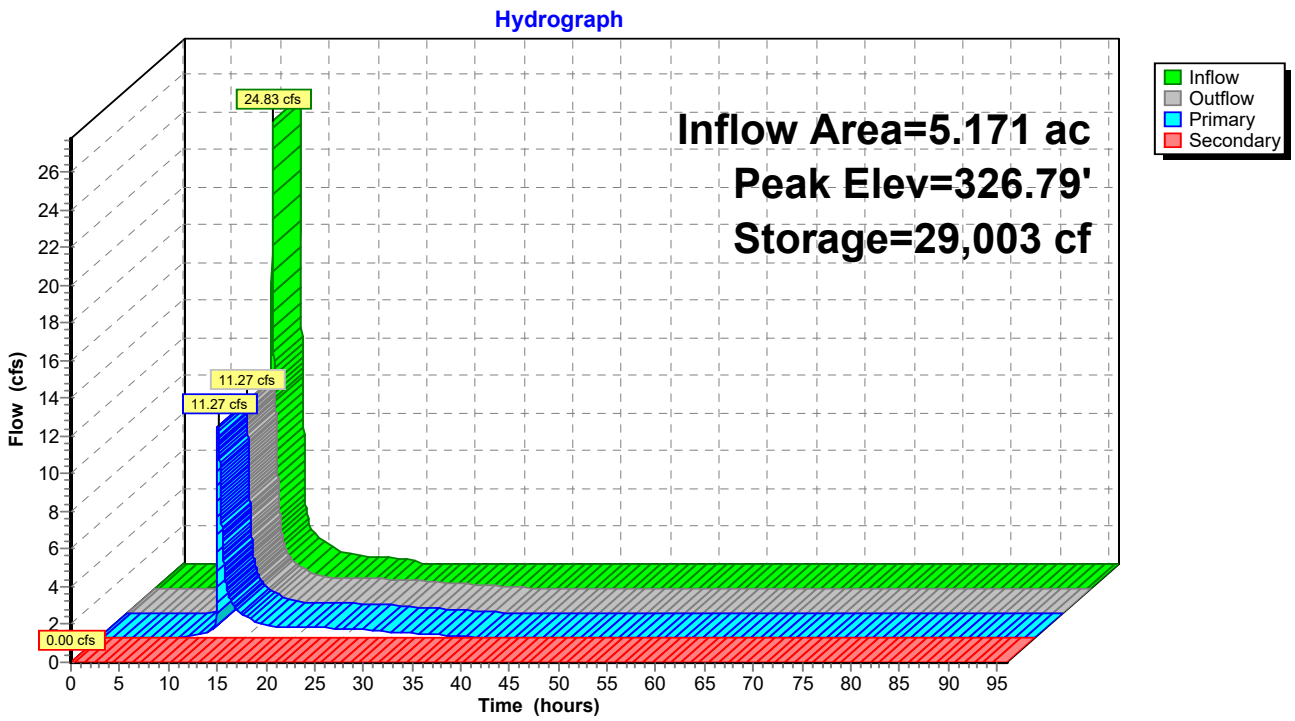
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
324.00	7,771	0	0
326.00	11,402	19,173	19,173
328.00	16,919	28,321	47,494

Device	Routing	Invert	Outlet Devices
#1	Primary	322.00'	**18.0" Round Culvert** L= 100.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 322.00' / 321.00' S= 0.0100 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#2	Device 1	324.00'	**4.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	326.10'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height
#4	Secondary	327.00'	**10.0' long x 30.0' 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=11.26 cfs @ 12.23 hrs HW=326.79' (Free Discharge)
└─**1=Culvert** (Passes 11.26 cfs of 16.09 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.68 cfs @ 7.79 fps)
  └─**3=Sharp-Crested Rectangular Weir** (Weir Controls 10.58 cfs @ 3.17 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=324.00' (Free Discharge)
└─**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond B-4: Basin 4



Summary for Pond B-5A: Basin 5A

Inflow Area =	10.270 ac, 58.77% Impervious, Inflow Depth = 3.92" for 25 yr event				
Inflow =	40.15 cfs @	12.08 hrs,	Volume=	3.355 af	
Outflow =	21.15 cfs @	12.31 hrs,	Volume=	3.355 af,	Atten= 47%, Lag= 13.8 min
Discarded =	0.18 cfs @	12.31 hrs,	Volume=	0.564 af	
Primary =	20.97 cfs @	12.31 hrs,	Volume=	2.791 af	
Secondary =	0.00 cfs @	0.00 hrs,	Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 356.81' @ 12.31 hrs Surf.Area= 15,067 sf Storage= 52,461 cf

Plug-Flow detention time= 321.6 min calculated for 3.355 af (100% of inflow)
Center-of-Mass det. time= 321.6 min (1,132.8 - 811.3)

Volume	Invert	Avail.Storage	Storage Description
#1	352.00'	71,591 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
352.00	7,400	0	0
354.00	9,862	17,262	17,262
356.00	13,687	23,549	40,811
358.00	17,093	30,780	71,591

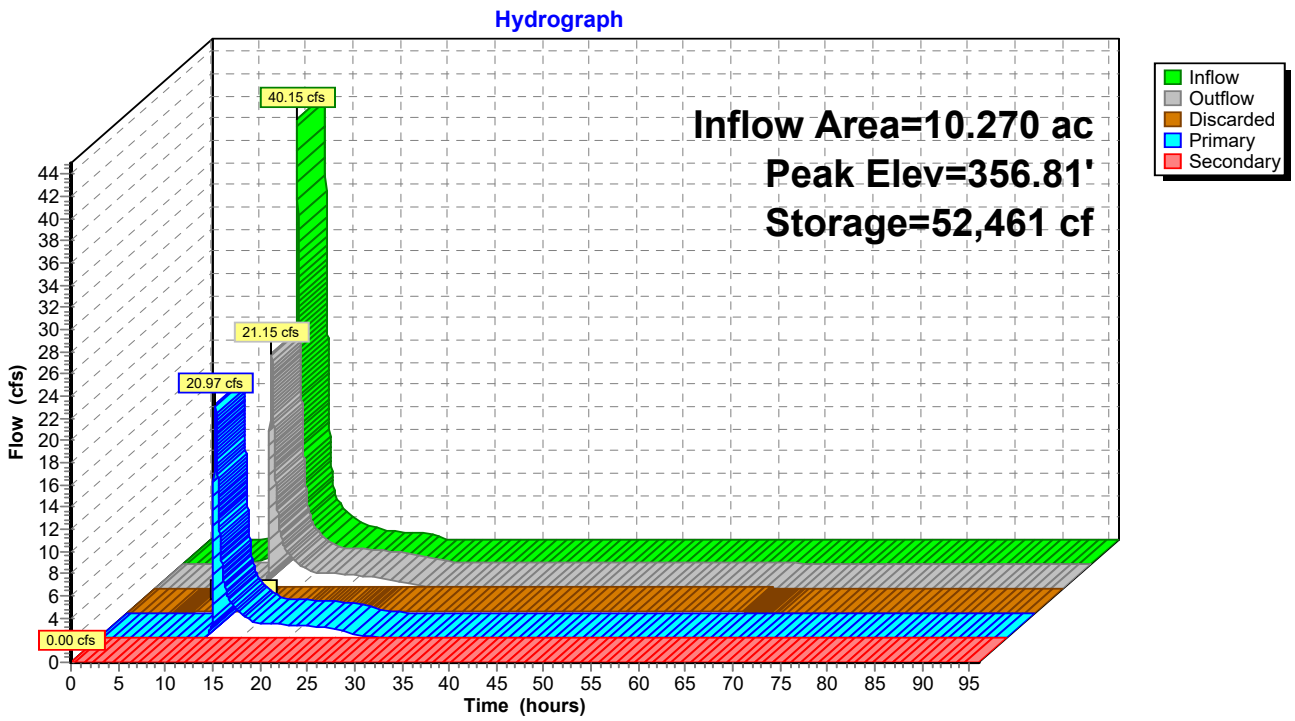
Device	Routing	Invert	Outlet Devices
#1	Discarded	352.00'	**0.520 in/hr Exfiltration over Horizontal area**
#2	Primary	350.70'	**24.0" Round Culvert** L= 50.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 350.70' / 350.00' S= 0.0140 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 3.14 sf
#3	Device 2	353.50'	**6.0" Vert. Orifice/Grate** C= 0.600
#4	Device 2	355.75'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 1.0' Crest Height
#5	Secondary	357.25'	**10.0' 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

Discarded OutFlow Max=0.18 cfs @ 12.31 hrs HW=356.81' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.18 cfs)

Primary OutFlow Max=20.96 cfs @ 12.31 hrs HW=356.81' (Free Discharge)
└─**2=Culvert** (Passes 20.96 cfs of 34.20 cfs potential flow)
  ├─**3=Orifice/Grate** (Orifice Controls 1.65 cfs @ 8.42 fps)
  └─**4=Sharp-Crested Rectangular Weir** (Weir Controls 19.31 cfs @ 3.80 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=352.00' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond B-5A: Basin 5A



Summary for Pond B-5B: Basin 5B

Inflow Area =	1.651 ac, 44.43% Impervious, Inflow Depth = 3.42" for 25 yr event				
Inflow =	6.85 cfs @	12.07 hrs,	Volume=	0.471 af	
Outflow =	1.08 cfs @	12.56 hrs,	Volume=	0.471 af,	Atten= 84%, Lag= 29.0 min
Discarded =	0.05 cfs @	12.56 hrs,	Volume=	0.124 af	
Primary =	1.02 cfs @	12.56 hrs,	Volume=	0.347 af	
Secondary =	0.00 cfs @	0.00 hrs,	Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 353.48' @ 12.56 hrs Surf.Area= 4,564 sf Storage= 9,928 cf

Plug-Flow detention time= 380.7 min calculated for 0.471 af (100% of inflow)
Center-of-Mass det. time= 380.6 min (1,196.7 - 816.1)

Volume	Invert	Avail.Storage	Storage Description
#1	350.00'	41,172 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
350.00	1,623	0	0
352.00	2,823	4,446	4,446
354.00	5,169	7,992	12,438
356.00	7,145	12,314	24,752
358.00	9,275	16,420	41,172

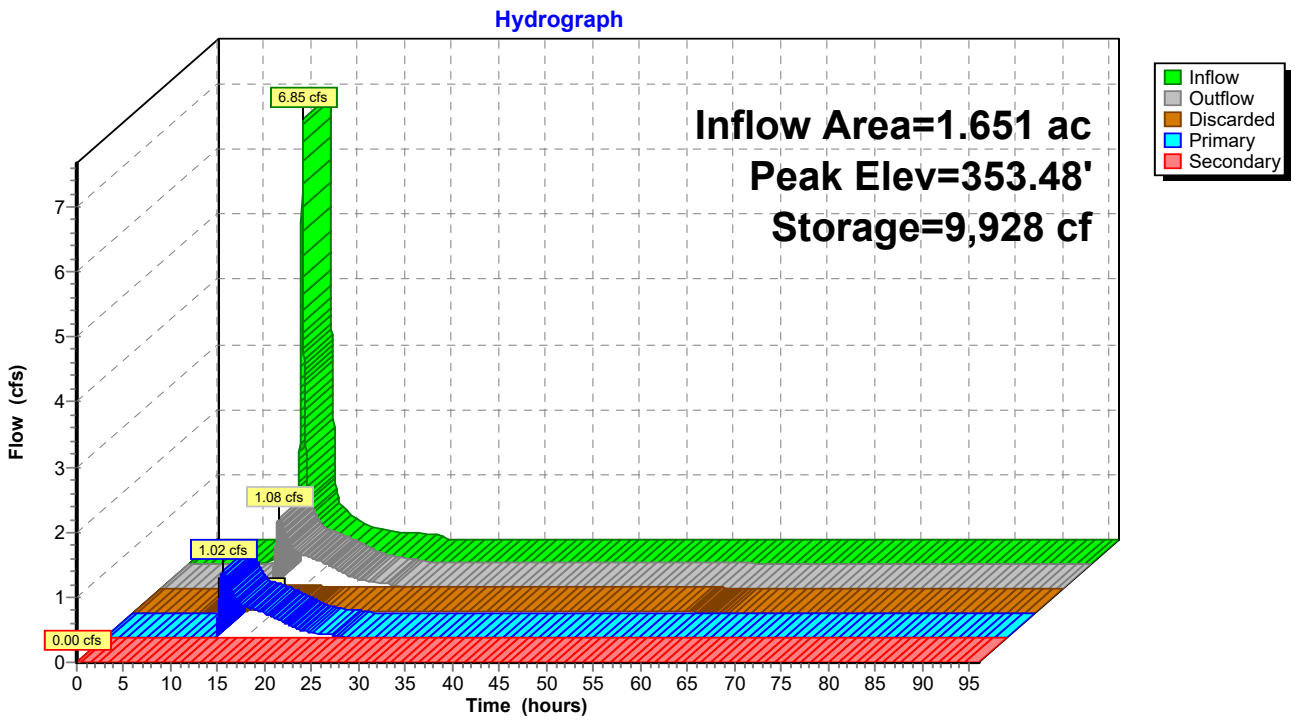
Device	Routing	Invert	Outlet Devices
#1	Discarded	350.00'	**0.520 in/hr Exfiltration over Horizontal area**
#2	Primary	348.40'	**24.0" Round Culvert**
			L= 50.0' RCP, sq.cut end projecting, Ke= 0.500
			Inlet / Outlet Invert= 348.40' / 348.20' S= 0.0040 '/' Cc= 0.900
			n= 0.013 Concrete pipe, bends & connections, Flow Area= 3.14 sf
#3	Device 2	351.50'	**4.0" Vert. Orifice/Grate** C= 0.600
#4	Device 2	353.00'	**6.0" Vert. Orifice/Grate** C= 0.600
#5	Secondary	357.00'	**10.0' 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

Discarded OutFlow Max=0.05 cfs @ 12.56 hrs HW=353.48' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=1.03 cfs @ 12.56 hrs HW=353.48' (Free Discharge)
└─**2=Culvert** (Passes 1.03 cfs of 30.57 cfs potential flow)
  ├─**3=Orifice/Grate** (Orifice Controls 0.57 cfs @ 6.49 fps)
  └─**4=Orifice/Grate** (Orifice Controls 0.46 cfs @ 2.37 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=350.00' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond B-5B: Basin 5B



Summary for Pond B-6: Basin 6

Inflow Area = 3.750 ac, 76.96% Impervious, Inflow Depth = 4.44" for 25 yr event
Inflow = 18.38 cfs @ 12.07 hrs, Volume= 1.386 af
Outflow = 1.88 cfs @ 12.81 hrs, Volume= 1.386 af, Atten= 90%, Lag= 44.3 min
Discarded = 0.13 cfs @ 12.81 hrs, Volume= 0.293 af
Primary = 1.75 cfs @ 12.81 hrs, Volume= 1.093 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 392.34' @ 12.81 hrs Surf.Area= 11,077 sf Storage= 31,292 cf

Plug-Flow detention time= 489.9 min calculated for 1.386 af (100% of inflow)
Center-of-Mass det. time= 489.9 min (1,258.2 - 768.3)

Volume	Invert	Avail.Storage	Storage Description
#1	388.00'	52,408 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

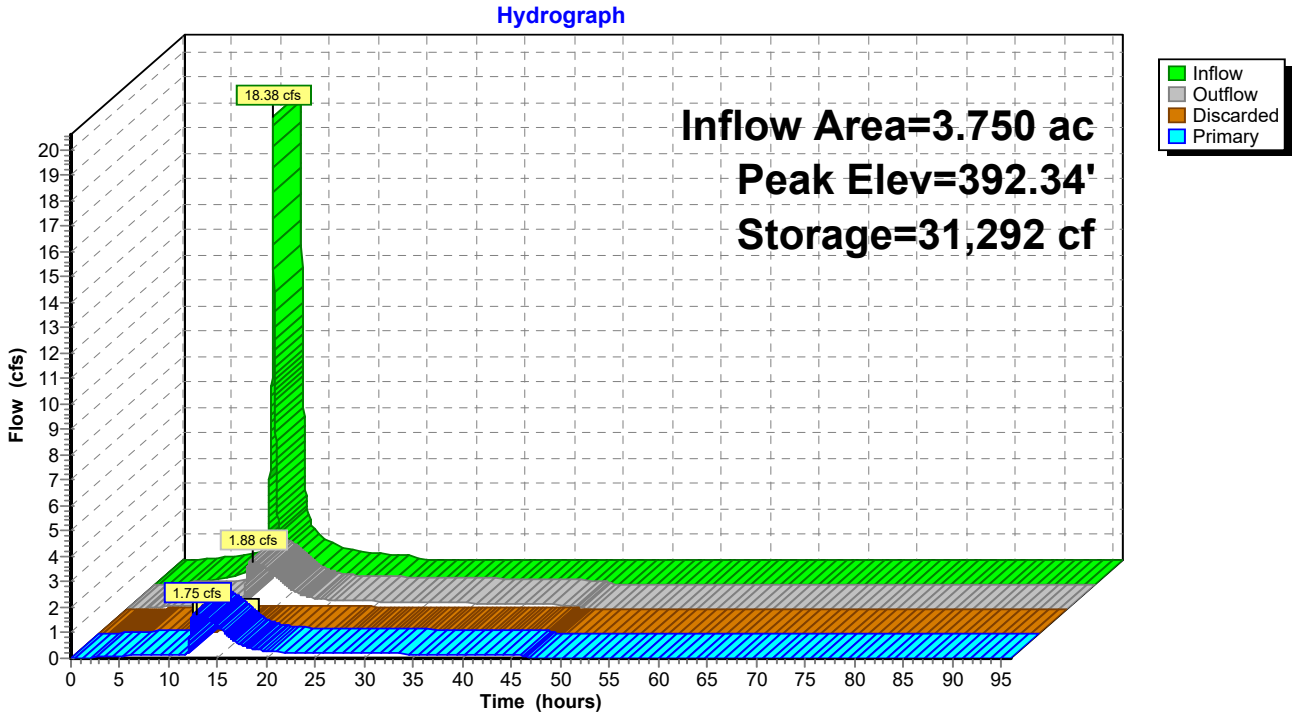
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
388.00	3,546	0	0
390.00	6,853	10,399	10,399
392.00	10,423	17,276	27,675
394.00	14,310	24,733	52,408

Device	Routing	Invert	Outlet Devices
#1	Discarded	388.00'	**0.520 in/hr Exfiltration over Horizontal area**
#2	Primary	387.00'	**24.0" Round Culvert** L= 100.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 387.00' / 386.50' S= 0.0050 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 3.14 sf
#3	Device 2	387.00'	**2.0" Vert. Orifice/Grate** C= 0.600
#4	Device 2	391.20'	**8.0" Vert. Orifice/Grate** C= 0.600
#5	Primary	393.00'	**10.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Discarded OutFlow Max=0.13 cfs @ 12.81 hrs HW=392.34' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.13 cfs)

Primary OutFlow Max=1.75 cfs @ 12.81 hrs HW=392.34' (Free Discharge)
├─**2=Culvert** (Passes 1.75 cfs of 29.80 cfs potential flow)
│ ├─**3=Orifice/Grate** (Orifice Controls 0.24 cfs @ 11.04 fps)
│ └─**4=Orifice/Grate** (Orifice Controls 1.51 cfs @ 4.32 fps)
└─**5=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond B-6: Basin 6



Summary for Pond B-7: Basin 7

Inflow Area =	1.719 ac, 86.57% Impervious, Inflow Depth = 4.79" for 25 yr event				
Inflow =	9.33 cfs @	12.07 hrs,	Volume=	0.686 af	
Outflow =	0.36 cfs @	15.05 hrs,	Volume=	0.686 af,	Atten= 96%, Lag= 178.7 min
Discarded =	0.29 cfs @	9.48 hrs,	Volume=	0.586 af	
Primary =	0.07 cfs @	15.05 hrs,	Volume=	0.100 af	

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 317.60' @ 15.05 hrs Surf.Area= 16,082 sf Storage= 15,955 cf

Plug-Flow detention time= 411.0 min calculated for 0.686 af (100% of inflow)
Center-of-Mass det. time= 411.0 min (1,185.0 - 774.0)

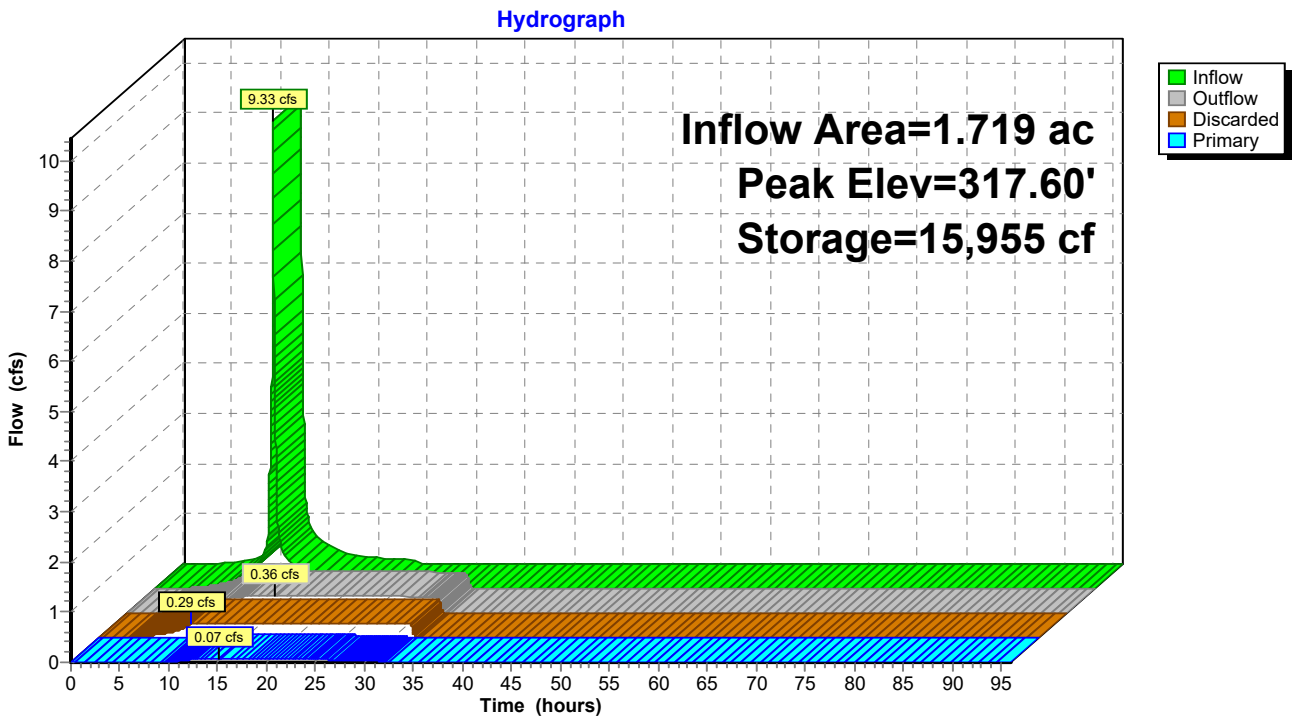
Volume	Invert	Avail.Storage	Storage Description
#1	316.00'	10,905 cf	**187.00'W x 86.00'L x 3.50'H Prismatoid** 56,287 cf Overall - 19,938 cf Embedded = 36,349 cf x 30.0% Voids
#2	316.50'	19,938 cf	**ADS_StormTech SC-740** x 434 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
		30,843 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	316.00'	**0.770 in/hr Exfiltration over Horizontal area**
#2	Primary	316.00'	**24.0" Round Culvert** L= 75.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 316.00' / 313.00' S= 0.0400 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 3.14 sf
#3	Device 2	316.00'	**1.5" Vert. Orifice/Grate** C= 0.600
#4	Device 2	317.80'	**8.0" Vert. Orifice/Grate** C= 0.600
#5	Device 2	319.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Discarded OutFlow Max=0.29 cfs @ 9.48 hrs HW=316.04' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.29 cfs)

Primary OutFlow Max=0.07 cfs @ 15.05 hrs HW=317.60' (Free Discharge)
└─**2=Culvert** (Passes 0.07 cfs of 11.60 cfs potential flow)
  ├─**3=Orifice/Grate** (Orifice Controls 0.07 cfs @ 5.97 fps)
  ├─**4=Orifice/Grate** (Controls 0.00 cfs)
  └─**5=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond B-7: Basin 7



Summary for Pond B-8: Basin 8

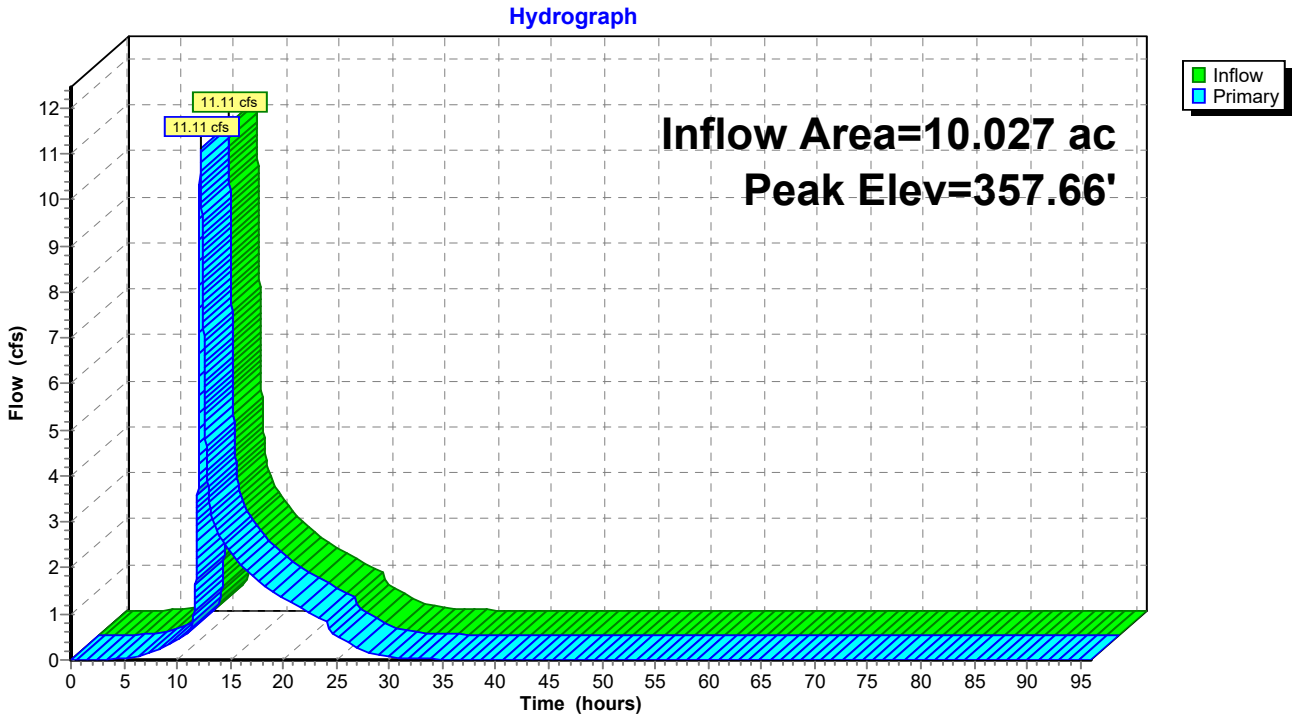
Inflow Area = 10.027 ac, 39.81% Impervious, Inflow Depth = 3.03" for 25 yr event
Inflow = 11.11 cfs @ 12.20 hrs, Volume= 2.531 af
Outflow = 11.11 cfs @ 12.20 hrs, Volume= 2.531 af, Atten= 0%, Lag= 0.0 min
Primary = 11.11 cfs @ 12.20 hrs, Volume= 2.531 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 357.66' @ 12.20 hrs
Flood Elev= 360.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	350.00'	**24.0" Round Culvert** L= 270.0' Ke= 0.500 Inlet / Outlet Invert= 350.00' / 330.00' S= 0.0741 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 3.14 sf
#2	Device 1	357.00'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=11.09 cfs @ 12.20 hrs HW=357.66' (Free Discharge)
└─**1=Culvert** (Passes 11.09 cfs of 39.05 cfs potential flow)
└─**2=Orifice/Grate** (Weir Controls 11.09 cfs @ 2.66 fps)

Pond B-8: Basin 8



Summary for Pond W5: WETLAND 5

Inflow Area = 4.777 ac, 13.82% Impervious, Inflow Depth = 2.06" for 25 yr event
Inflow = 10.97 cfs @ 12.10 hrs, Volume= 0.822 af
Outflow = 7.77 cfs @ 12.19 hrs, Volume= 0.809 af, Atten= 29%, Lag= 5.3 min
Primary = 7.77 cfs @ 12.19 hrs, Volume= 0.809 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 369.54' @ 12.19 hrs Surf.Area= 12,310 sf Storage= 4,831 cf

Plug-Flow detention time= 26.2 min calculated for 0.809 af (98% of inflow)
Center-of-Mass det. time= 17.0 min (871.6 - 854.6)

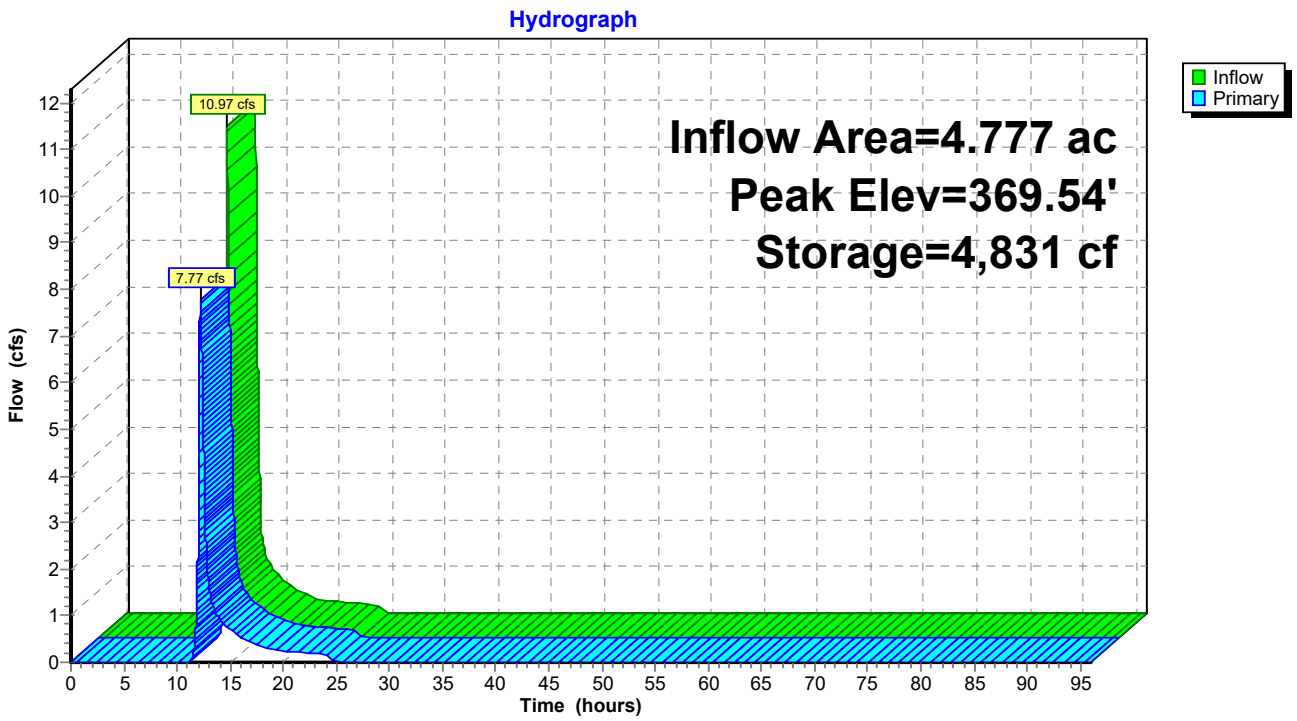
Volume	Invert	Avail.Storage	Storage Description
#1	369.00'	8,430 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
369.00	4,940	0	0
369.20	8,304	1,324	1,324
369.40	10,950	1,925	3,250
369.60	12,950	2,390	5,640
369.80	14,954	2,790	8,430

Device	Routing	Invert	Outlet Devices
#1	Primary	369.10'	**10.0' long x 64.0' 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=7.77 cfs @ 12.19 hrs HW=369.54' (Free Discharge)
└**1=Broad-Crested Rectangular Weir** (Weir Controls 7.77 cfs @ 1.78 fps)

Pond W5: WETLAND 5



Summary for Pond W6: WETLAND 6

Inflow Area = 4.348 ac, 45.54% Impervious, Inflow Depth = 3.72" for 25 yr event
Inflow = 19.49 cfs @ 12.07 hrs, Volume= 1.348 af
Outflow = 12.83 cfs @ 12.16 hrs, Volume= 1.261 af, Atten= 34%, Lag= 5.0 min
Primary = 12.83 cfs @ 12.16 hrs, Volume= 1.261 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 372.82' @ 12.16 hrs Surf.Area= 33,755 sf Storage= 12,299 cf

Plug-Flow detention time= 68.1 min calculated for 1.261 af (94% of inflow)
Center-of-Mass det. time= 33.7 min (841.7 - 808.0)

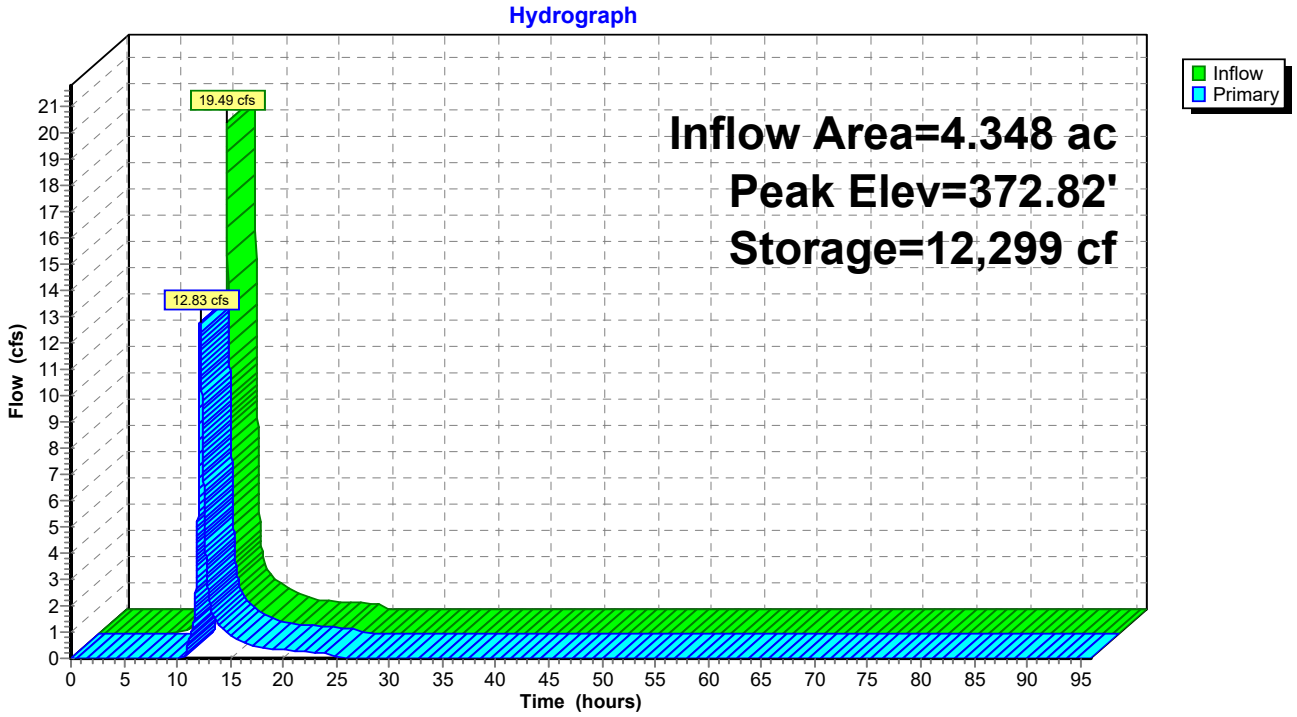
Volume	Invert	Avail.Storage	Storage Description
#1	372.20'	18,754 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
372.20	5,774	0	0
372.40	15,024	2,080	2,080
372.60	23,262	3,829	5,908
372.80	33,082	5,634	11,543
373.00	39,034	7,212	18,754

Device	Routing	Invert	Outlet Devices
#1	Primary	372.50'	**26.0' long x 16.0' 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=12.82 cfs @ 12.16 hrs HW=372.82' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** (Weir Controls 12.82 cfs @ 1.53 fps)

Pond W6: WETLAND 6

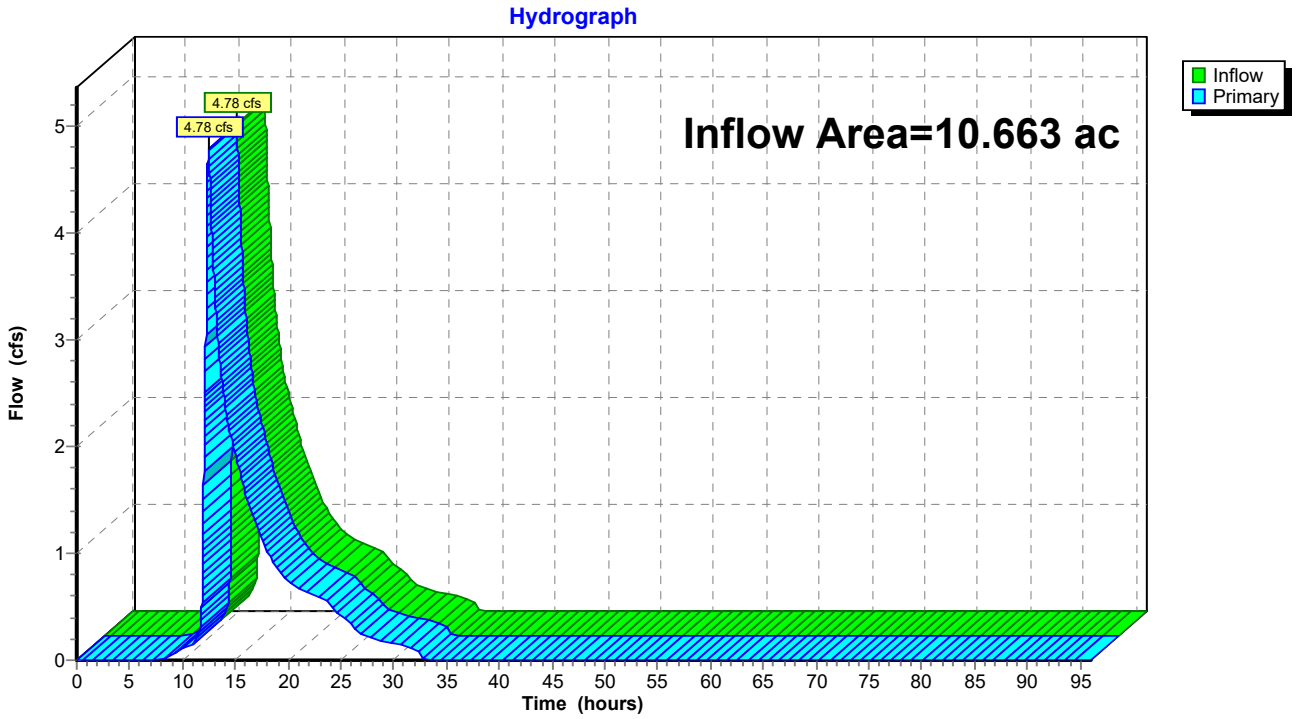


Summary for Link DP1: CHARLES RIVER/ WETLAND 3

Inflow Area = 10.663 ac, 57.86% Impervious, Inflow Depth = 1.86" for 25 yr event
Inflow = 4.78 cfs @ 12.46 hrs, Volume= 1.650 af
Primary = 4.78 cfs @ 12.46 hrs, Volume= 1.650 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs

Link DP1: CHARLES RIVER/ WETLAND 3

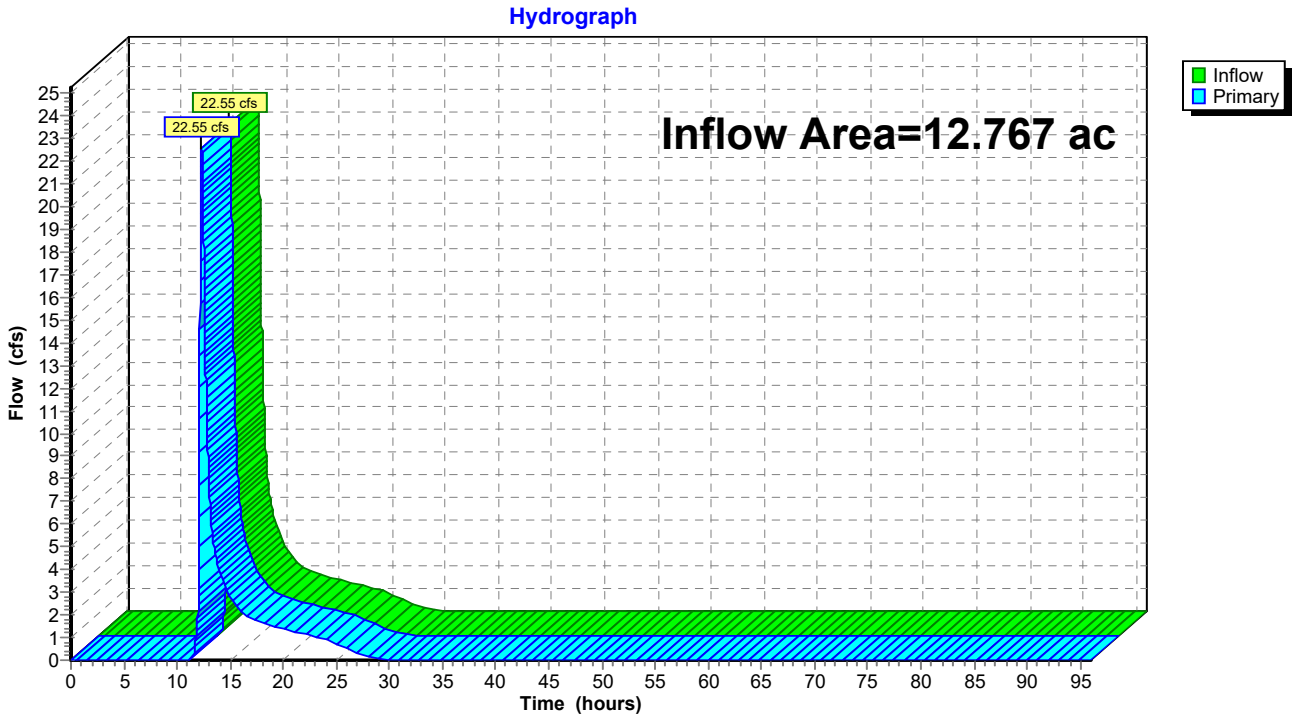


Summary for Link DP2: DEER BROOK/ WETLAND 4

Inflow Area = 12.767 ac, 53.02% Impervious, Inflow Depth = 3.07" for 25 yr event
Inflow = 22.55 cfs @ 12.31 hrs, Volume= 3.262 af
Primary = 22.55 cfs @ 12.31 hrs, Volume= 3.262 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs

Link DP2: DEER BROOK/ WETLAND 4

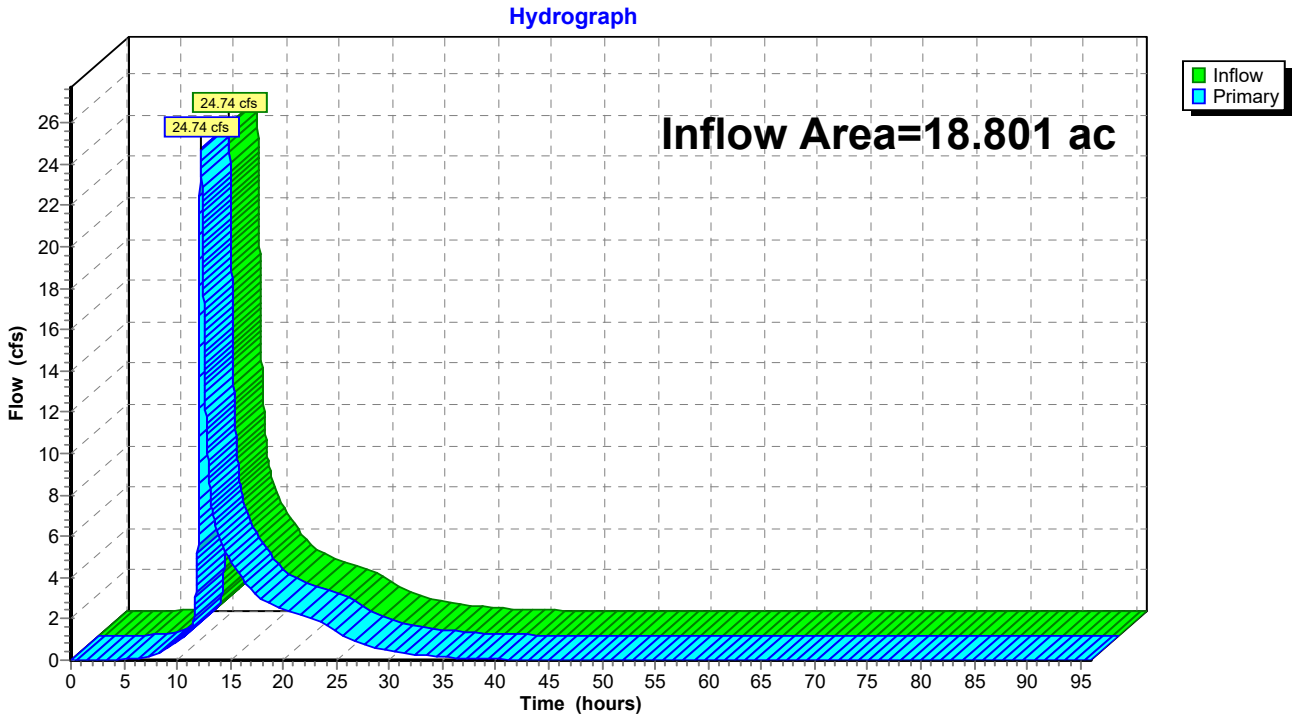


Summary for Link DP3: WETLAND 2

Inflow Area = 18.801 ac, 51.65% Impervious, Inflow Depth = 3.51" for 25 yr event
Inflow = 24.74 cfs @ 12.22 hrs, Volume= 5.493 af
Primary = 24.74 cfs @ 12.22 hrs, Volume= 5.493 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs

Link DP3: WETLAND 2

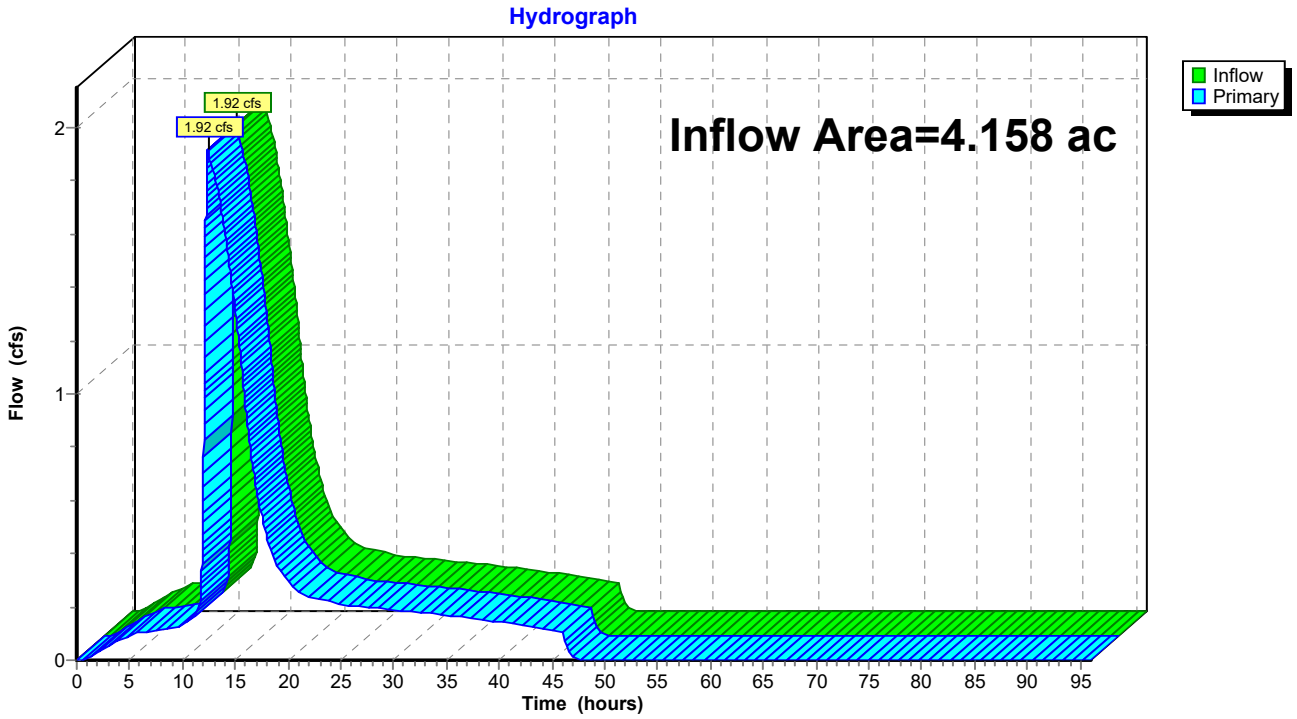


Summary for Link DP4: WETLAND 7/8

Inflow Area = 4.158 ac, 69.42% Impervious, Inflow Depth = 3.33" for 25 yr event
Inflow = 1.92 cfs @ 12.45 hrs, Volume= 1.152 af
Primary = 1.92 cfs @ 12.45 hrs, Volume= 1.152 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs

Link DP4: WETLAND 7/8



Summary for Subcatchment B2: BLDG 2

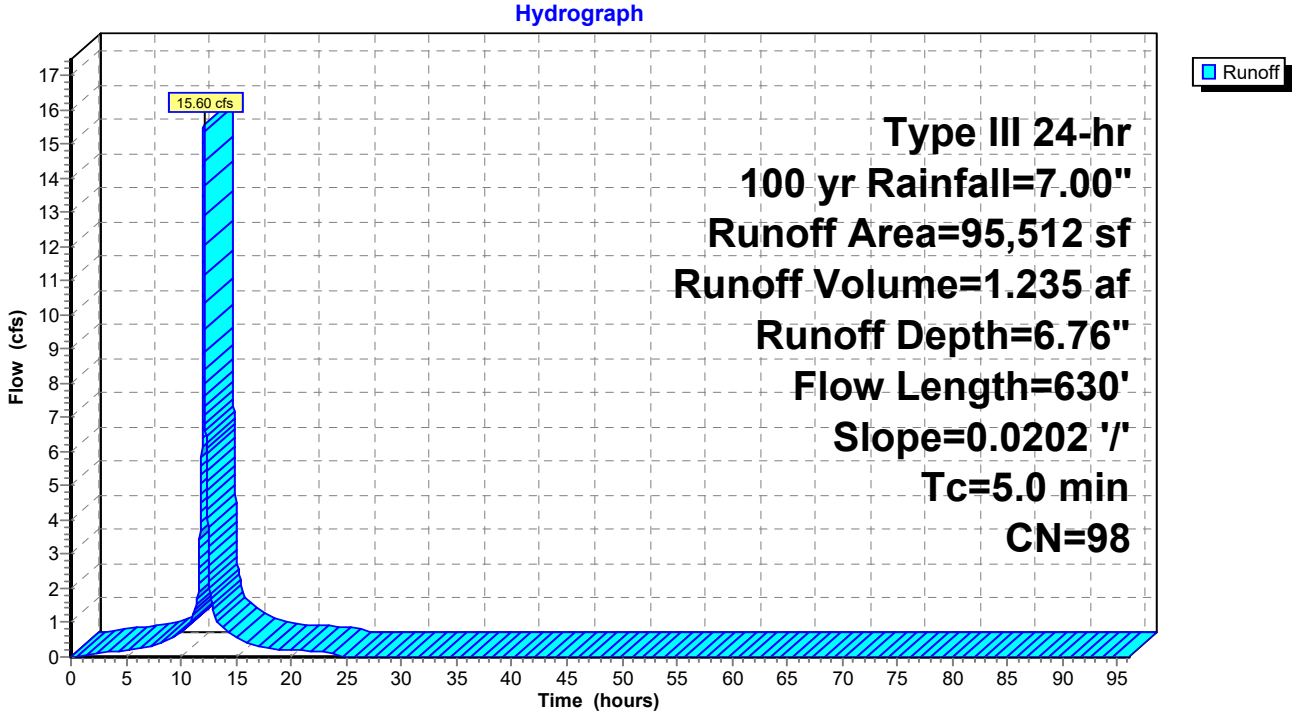
Runoff = 15.60 cfs @ 12.07 hrs, Volume= 1.235 af, Depth= 6.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=7.00"

	Area (sf)	CN	Description
*	95,512	98	Building
	95,512		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.4	630	0.0202	7.48	9.18	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013
1.4	630	Total, Increased to minimum Tc = 5.0 min			

Subcatchment B2: BLDG 2



Summary for Subcatchment PR 1.1: SUB PR 1.1

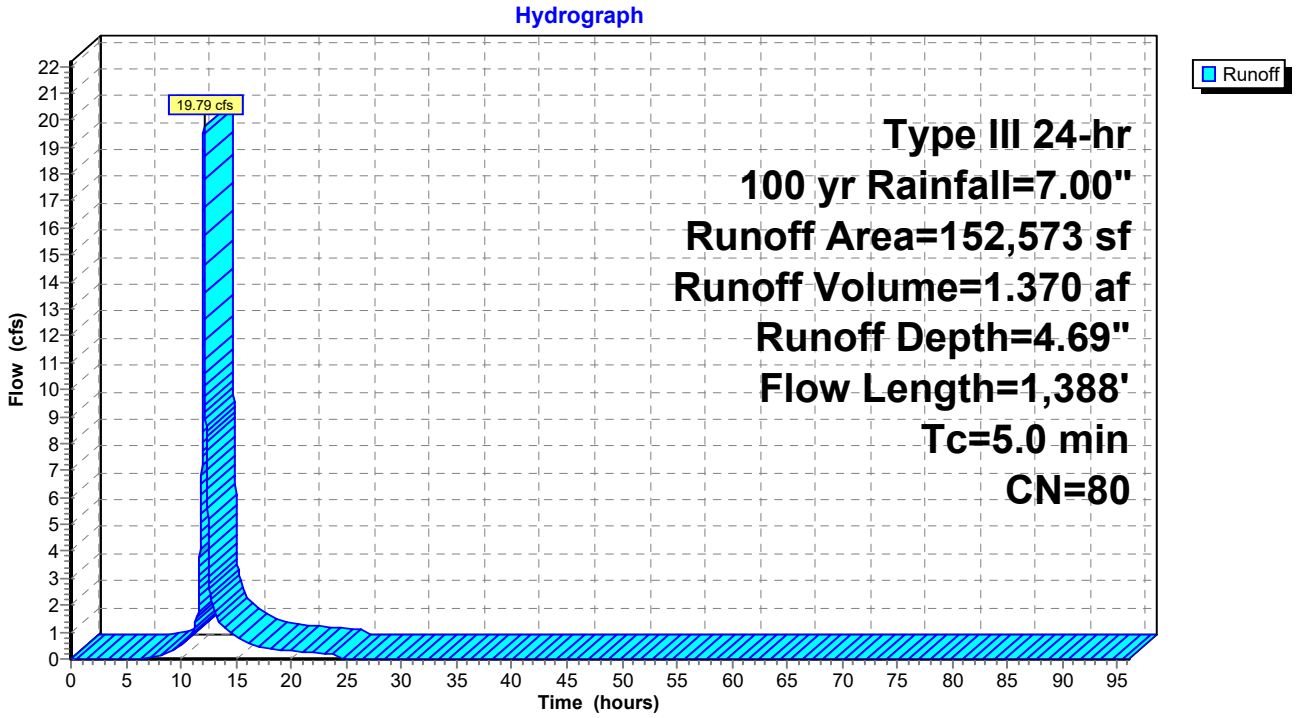
Runoff = 19.79 cfs @ 12.07 hrs, Volume= 1.370 af, Depth= 4.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=7.00"

Area (sf)	CN	Description
97,308	98	Paved parking & roofs
33,365	39	>75% Grass cover, Good, HSG A
21,353	61	>75% Grass cover, Good, HSG B
547	80	>75% Grass cover, Good, HSG D
152,573	80	Weighted Average
55,265		36.22% Pervious Area
97,308		63.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0294	1.40		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
1.4	243	0.0192	2.81		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.6	1,095	0.0183	7.12	8.74	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Concrete pipe, bends & connections
4.6	1,388	Total, Increased to minimum Tc = 5.0 min			

Subcatchment PR 1.1: SUB PR 1.1



Summary for Subcatchment PR 1.2: SUB PR 1.2

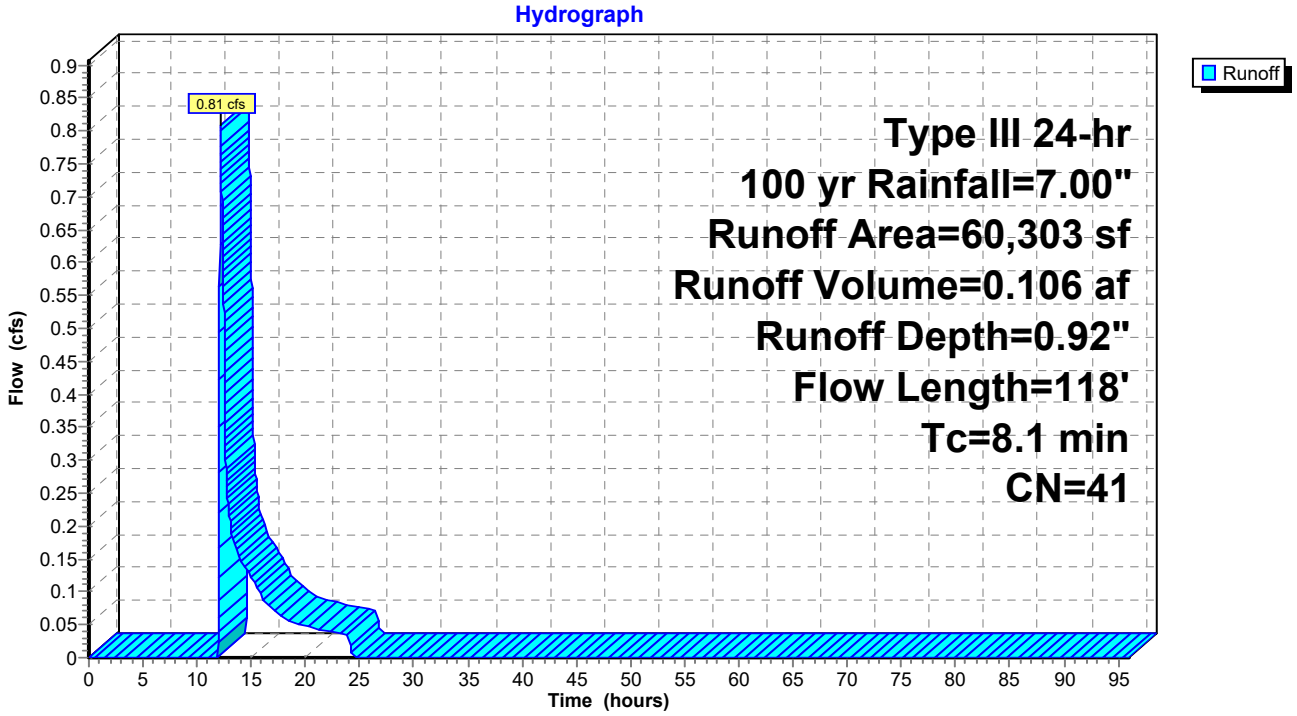
Runoff = 0.81 cfs @ 12.16 hrs, Volume= 0.106 af, Depth= 0.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=7.00"

Area (sf)	CN	Description
6,527	39	>75% Grass cover, Good, HSG A
38,151	30	Woods, Good, HSG A
8,676	61	>75% Grass cover, Good, HSG B
2,606	80	>75% Grass cover, Good, HSG D
4,343	77	Woods, Good, HSG D
60,303	41	Weighted Average
60,303		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0600	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.2	68	0.0880	4.78		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
8.1	118	Total			

Subcatchment PR 1.2: SUB PR 1.2



Summary for Subcatchment PR 1.3: SUB PR 1.3

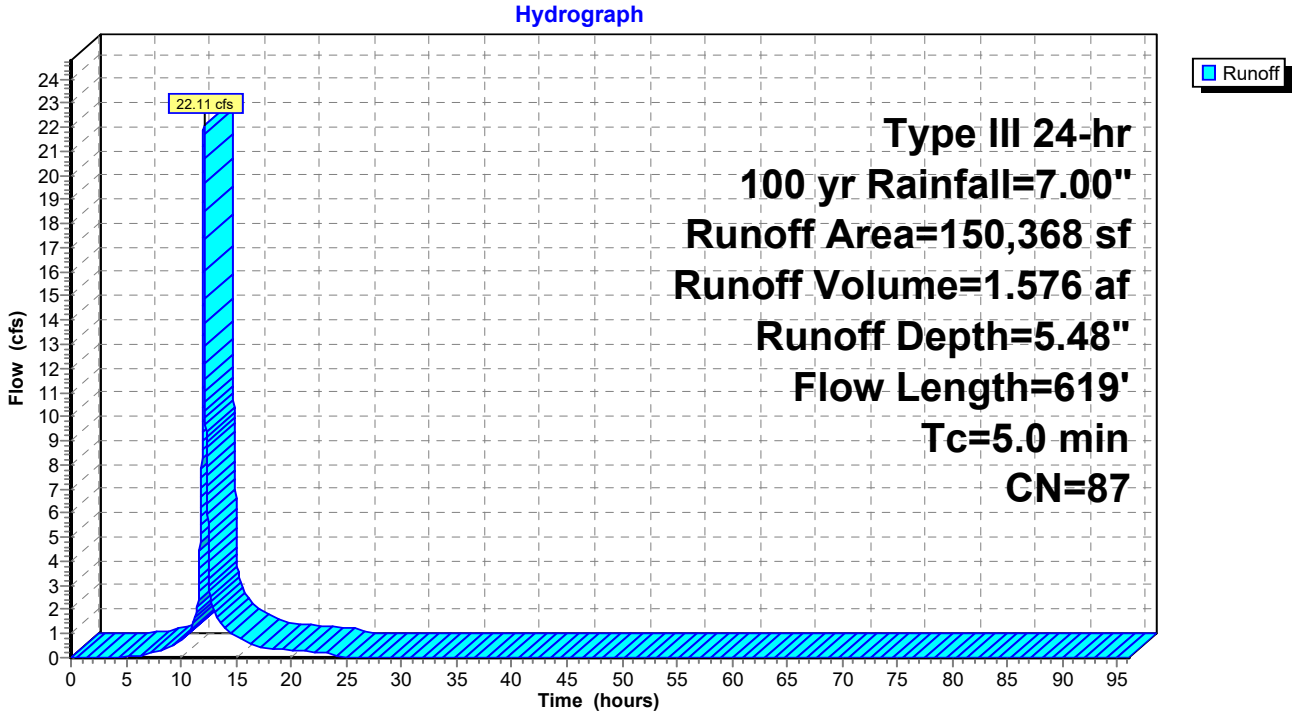
Runoff = 22.11 cfs @ 12.07 hrs, Volume= 1.576 af, Depth= 5.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=7.00"

	Area (sf)	CN	Description
*	106,654	98	Paved parking, Roofs, HSG B
	25,272	61	>75% Grass cover, Good, HSG B
*	18,442	61	Inf. Basin; >75% Grass cover, Good, HSG B
	150,368	87	Weighted Average
	43,714		29.07% Pervious Area
	106,654		70.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	50	0.0125	0.99		**Sheet Flow, Sheet - ESTIMATE** Smooth surfaces n= 0.011 P2= 3.20"
1.5	569	0.0200	6.42	5.04	**Pipe Channel, Pipe - ESTIMATE** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Concrete pipe, bends & connections
2.3	619	Total, Increased to minimum Tc = 5.0 min			

Subcatchment PR 1.3: SUB PR 1.3



Summary for Subcatchment PR 1.4: SUB PR 1.4

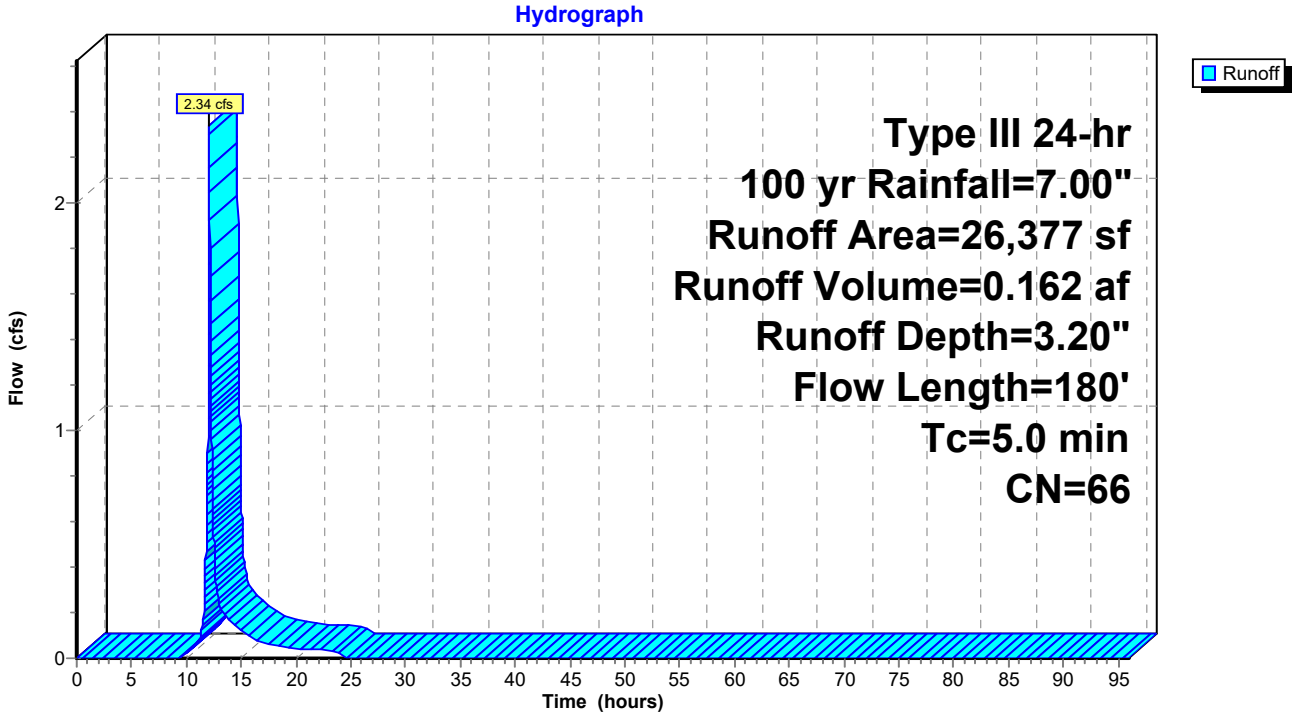
Runoff = 2.34 cfs @ 12.08 hrs, Volume= 0.162 af, Depth= 3.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=7.00"

Area (sf)	CN	Description
19,466	61	>75% Grass cover, Good, HSG B
6,911	80	>75% Grass cover, Good, HSG D
26,377	66	Weighted Average
26,377		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	41	0.5000	0.52		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.6	139	0.0647	4.10		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.9	180	Total, Increased to minimum Tc = 5.0 min			

Subcatchment PR 1.4: SUB PR 1.4



Summary for Subcatchment PR 1.6: SUB PR 1.6

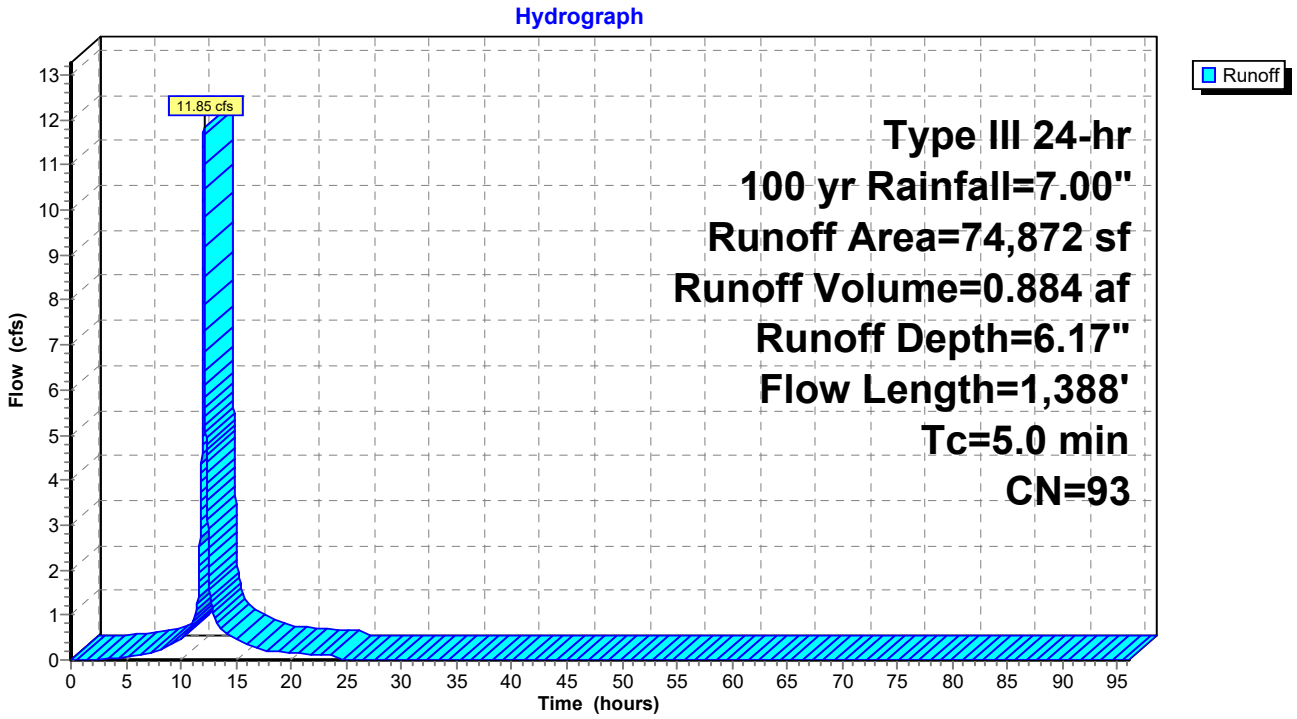
Runoff = 11.85 cfs @ 12.07 hrs, Volume= 0.884 af, Depth= 6.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=7.00"

Area (sf)	CN	Description
64,814	98	Paved parking & roofs
10,058	61	>75% Grass cover, Good, HSG B
74,872	93	Weighted Average
10,058		13.43% Pervious Area
64,814		86.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0294	1.40		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
1.4	243	0.0192	2.81		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.6	1,095	0.0183	7.12	8.74	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Concrete pipe, bends & connections
4.6	1,388	Total, Increased to minimum Tc = 5.0 min			

Subcatchment PR 1.6: SUB PR 1.6



Summary for Subcatchment PR 2.1: SUB PR 2.1

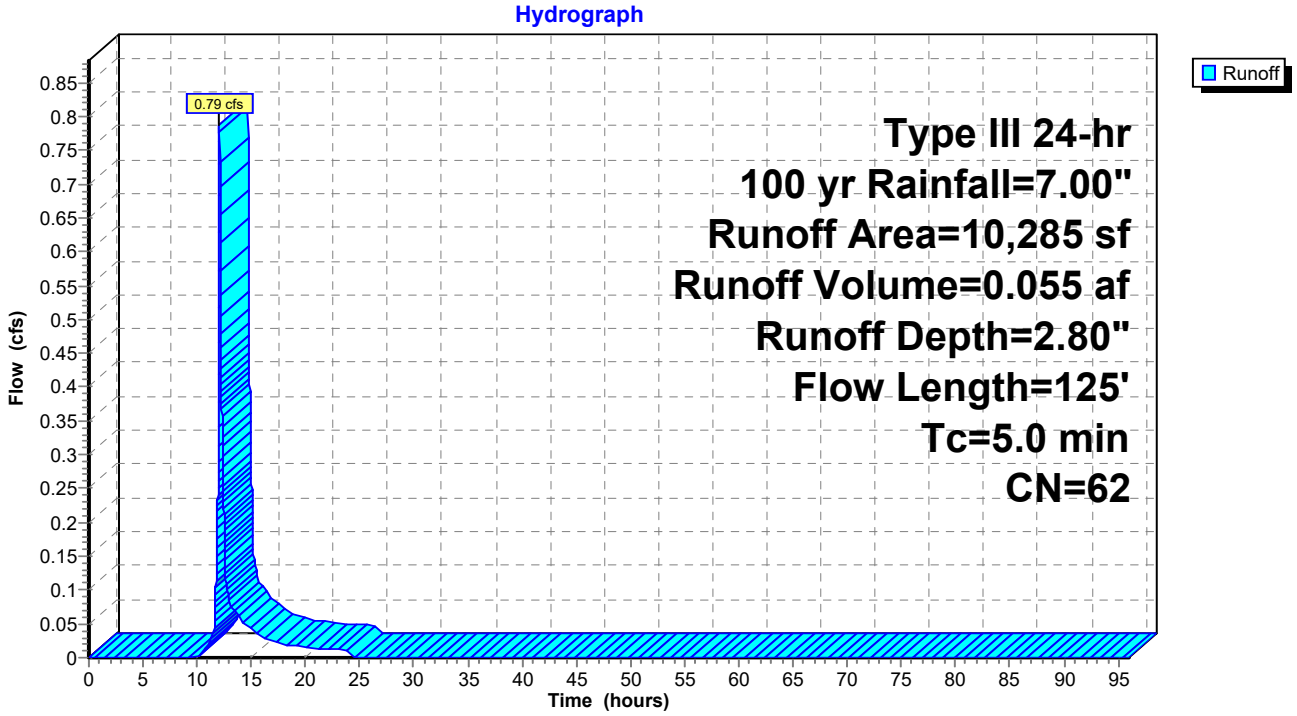
Runoff = 0.79 cfs @ 12.08 hrs, Volume= 0.055 af, Depth= 2.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=7.00"

Area (sf)	CN	Description
490	39	>75% Grass cover, Good, HSG A
8,567	61	>75% Grass cover, Good, HSG B
1,228	80	>75% Grass cover, Good, HSG D
10,285	62	Weighted Average
10,285		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.20		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.0	20	0.2857	8.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.3	55	0.0455	3.43		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
4.6	125	Total, Increased to minimum Tc = 5.0 min			

Subcatchment PR 2.1: SUB PR 2.1



Summary for Subcatchment PR 2.2A: SUB PR 2.2A

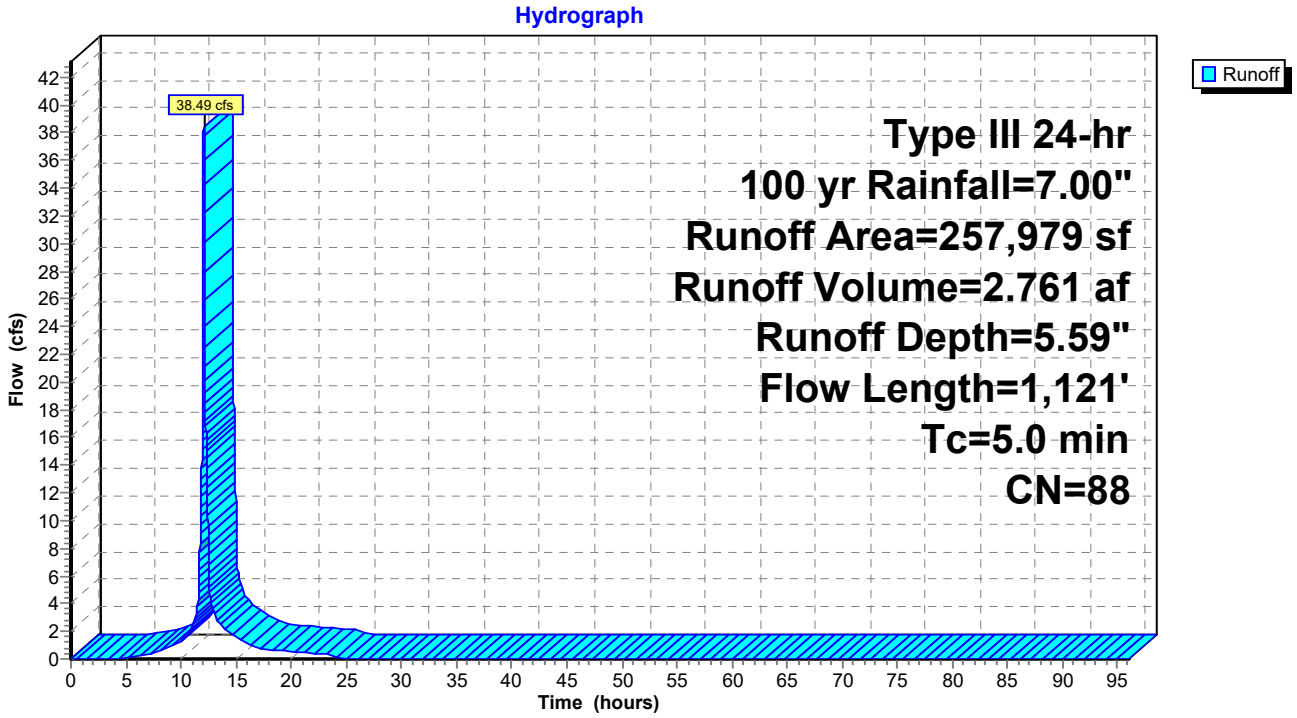
Runoff = 38.49 cfs @ 12.07 hrs, Volume= 2.761 af, Depth= 5.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=7.00"

	Area (sf)	CN	Description
	176,686	98	Paved parking, HSG B
	25,211	61	>75% Grass cover, Good, HSG B
	18,821	80	>75% Grass cover, Good, HSG D
*	37,261	61	Inf. Basin; >75% Grass cover, Good, HSG B
	257,979	88	Weighted Average
	81,293		31.51% Pervious Area
	176,686		68.49% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	50	0.0500	1.73		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
1.6	275	0.0196	2.84		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.1	796	0.0566	12.52	15.37	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Concrete pipe, bends & connections
3.2	1,121	Total, Increased to minimum Tc = 5.0 min			

Subcatchment PR 2.2A: SUB PR 2.2A



Summary for Subcatchment PR 2.2B: SUB PR 2.2B

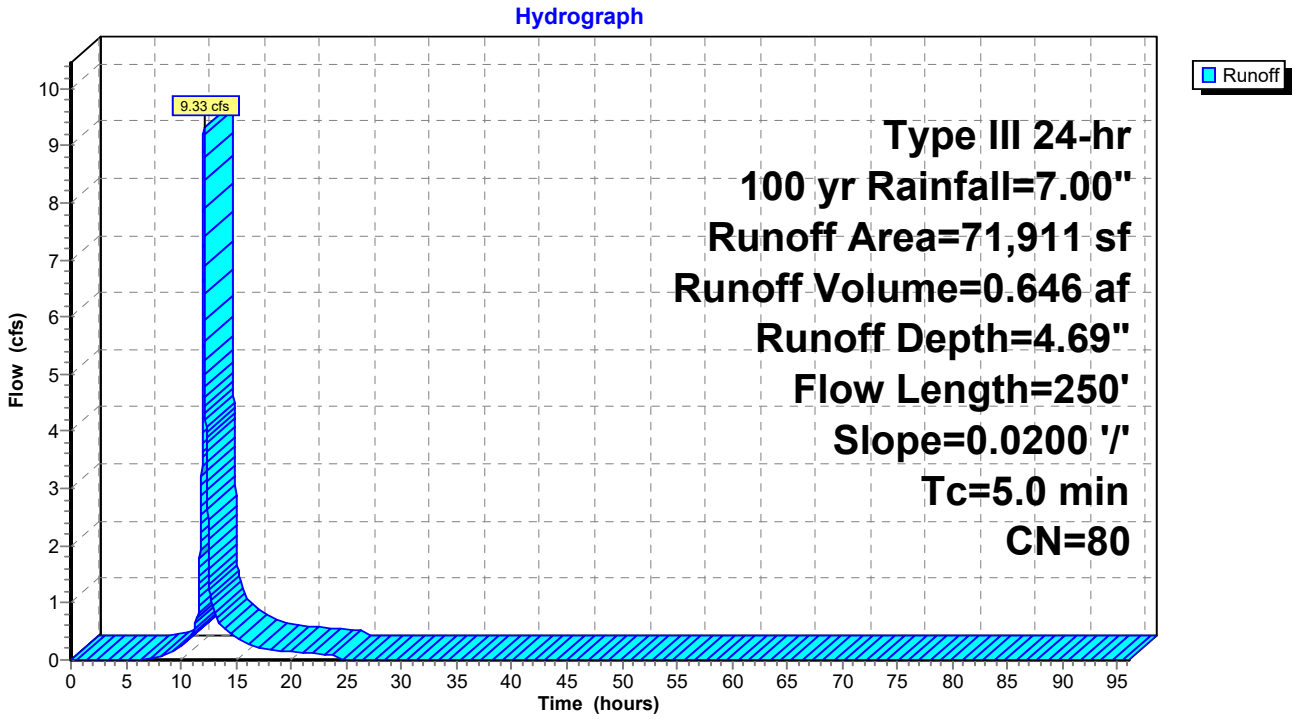
Runoff = 9.33 cfs @ 12.07 hrs, Volume= 0.646 af, Depth= 4.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=7.00"

	Area (sf)	CN	Description
	31,953	98	Paved parking, HSG B
	16,585	61	>75% Grass cover, Good, HSG B
	9,536	80	>75% Grass cover, Good, HSG D
*	13,837	61	Inf. Basin; >75% Grass cover, Good, HSG B
	71,911	80	Weighted Average
	39,958		55.57% Pervious Area
	31,953		44.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.20		**Sheet Flow, Sheet - ESTIMATE** Smooth surfaces n= 0.011 P2= 3.20"
0.5	200	0.0200	6.42	5.04	**Pipe Channel, Pipe - ESTIMATE** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Concrete pipe, bends & connections
1.2	250	Total, Increased to minimum Tc = 5.0 min			

Subcatchment PR 2.2B: SUB PR 2.2B



Summary for Subcatchment PR 2.3: SUB PR 2.3

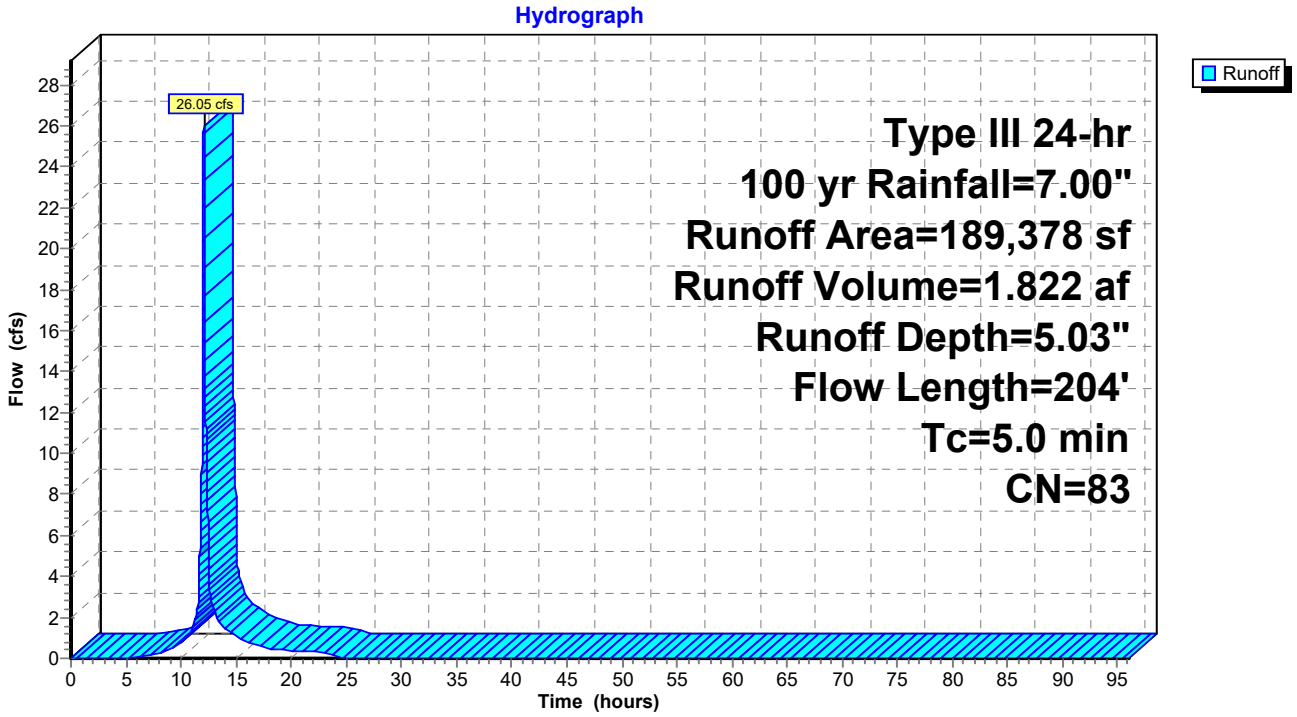
Runoff = 26.05 cfs @ 12.07 hrs, Volume= 1.822 af, Depth= 5.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=7.00"

Area (sf)	CN	Description
28,343	55	Woods, Good, HSG B
40,833	77	Woods, Good, HSG D
33,965	77	Wetland (Woods, Good, HSG D)
86,237	98	Paved parking & roofs
189,378	83	Weighted Average
103,141		54.46% Pervious Area
86,237		45.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.20		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.1	28	0.0643	4.08		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.3	81	0.0364	3.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.1	45	0.0200	7.44	9.14	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013
4.8	204	Total, Increased to minimum Tc = 5.0 min			

Subcatchment PR 2.3: SUB PR 2.3



Summary for Subcatchment PR 2.4: SUB PR 2.4

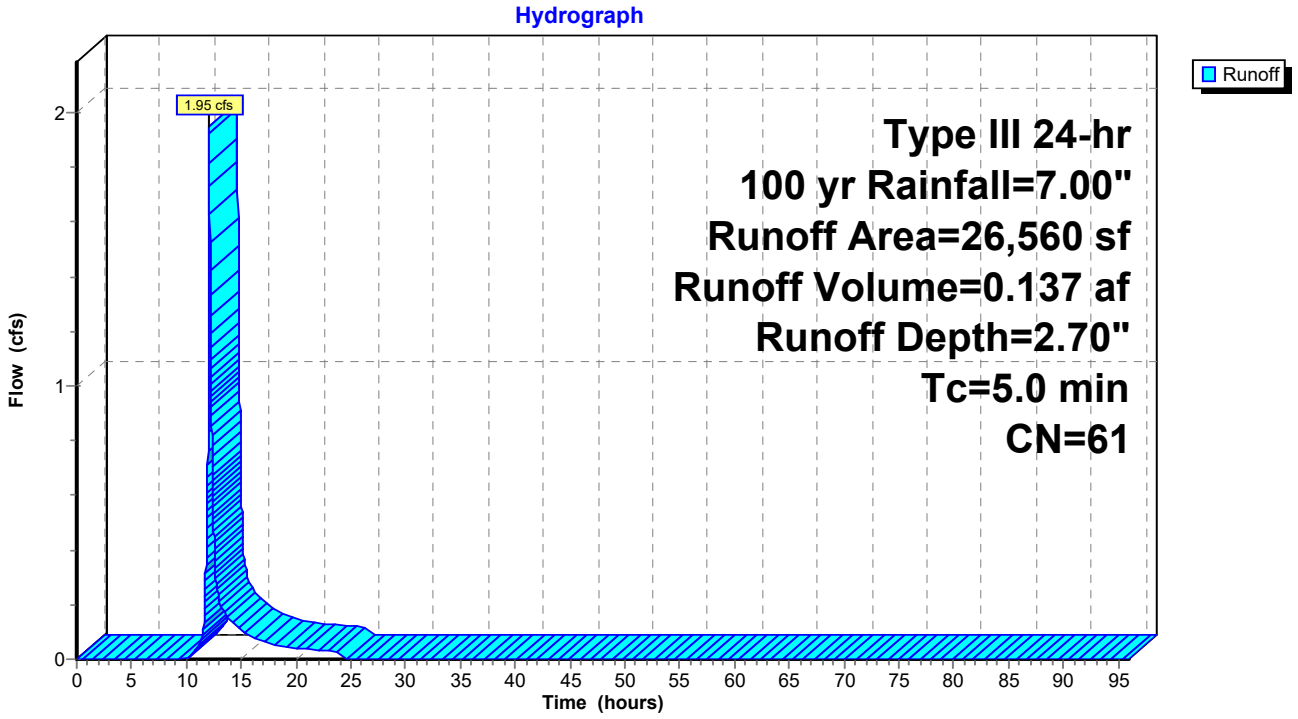
Runoff = 1.95 cfs @ 12.08 hrs, Volume= 0.137 af, Depth= 2.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=7.00"

Area (sf)	CN	Description
26,560	61	>75% Grass cover, Good, HSG B
26,560		100.00% Pervious Area

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

Subcatchment PR 2.4: SUB PR 2.4



Summary for Subcatchment PR 3.1: SUB PR 3.1

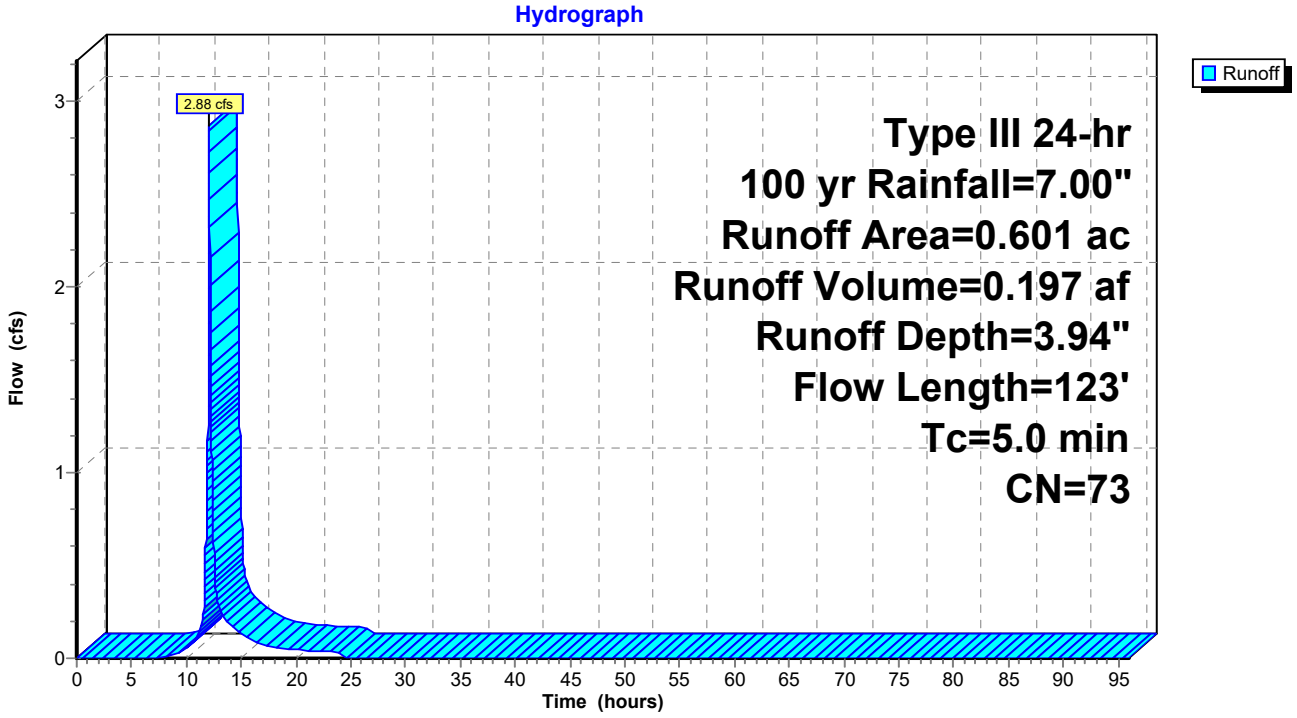
Runoff = 2.88 cfs @ 12.07 hrs, Volume= 0.197 af, Depth= 3.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=7.00"

Area (ac)	CN	Description
0.219	61	>75% Grass cover, Good, HSG B
0.382	80	>75% Grass cover, Good, HSG D
0.601	73	Weighted Average
0.601		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	33	0.5000	0.49		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.2	90	0.1444	6.12		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.3	123	Total, Increased to minimum Tc = 5.0 min			

Subcatchment PR 3.1: SUB PR 3.1



Summary for Subcatchment PR 3.2: SUB PR 3.2

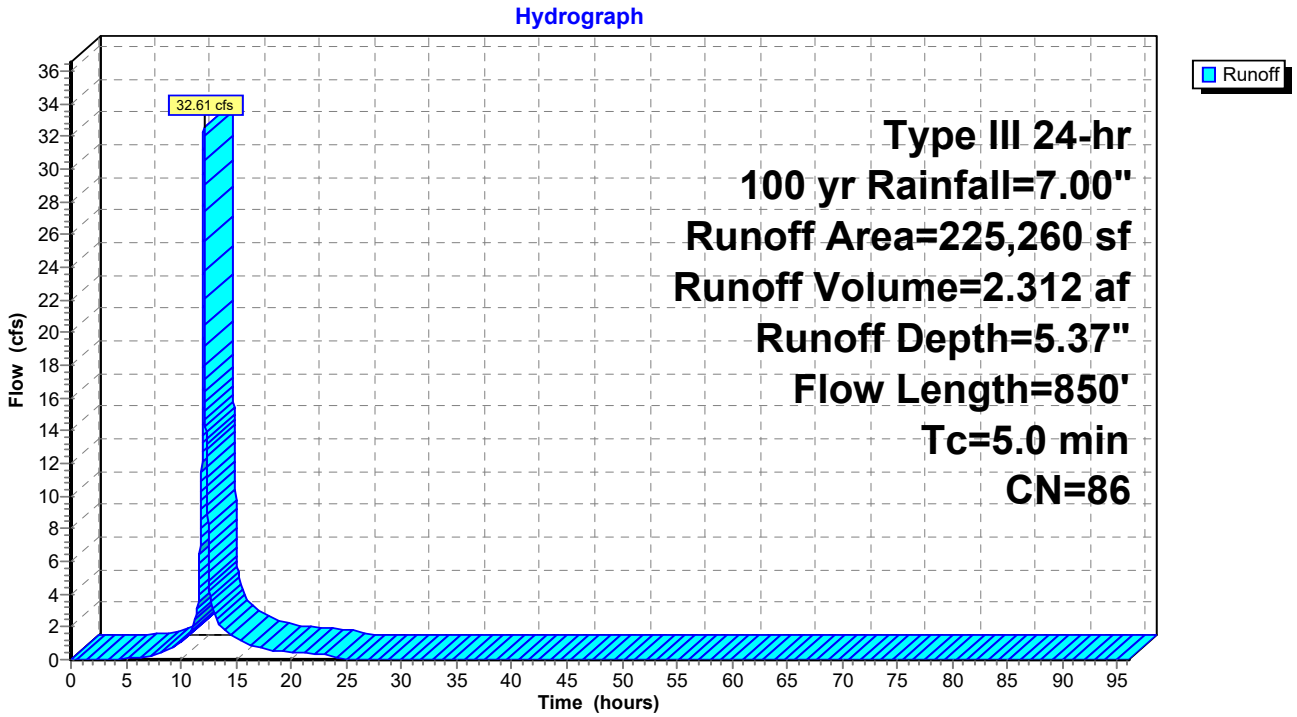
Runoff = 32.61 cfs @ 12.07 hrs, Volume= 2.312 af, Depth= 5.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=7.00"

	Area (sf)	CN	Description
*	151,349	98	Paved parking, Roofs, HSG B
	449	39	>75% Grass cover, Good, HSG A
	35,075	61	>75% Grass cover, Good, HSG B
	10,439	80	>75% Grass cover, Good, HSG D
*	27,948	58	Wetlands, Good, HSG B
	225,260	86	Weighted Average
	73,911		32.81% Pervious Area
	151,349		67.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.20		**Sheet Flow, Sheet - ESTIMATE** Smooth surfaces n= 0.011 P2= 3.20"
1.1	800	0.0500	11.77	14.44	**Pipe Channel, Pipe - ESTIMATE** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Concrete pipe, bends & connections
1.8	850	Total, Increased to minimum Tc = 5.0 min			

Subcatchment PR 3.2: SUB PR 3.2



Summary for Subcatchment PR 3.3A: SUB PR 3.3A

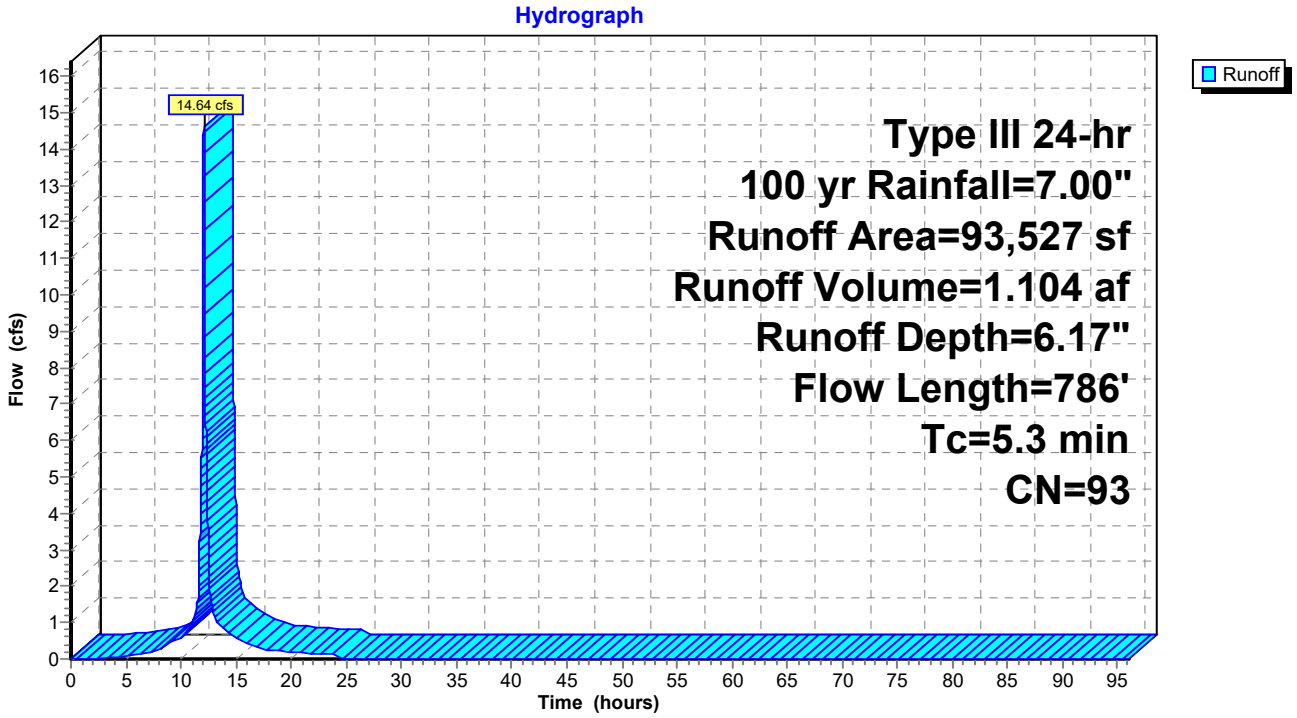
Runoff = 14.64 cfs @ 12.07 hrs, Volume= 1.104 af, Depth= 6.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=7.00"

Area (sf)	CN	Description
80,340	98	Paved parking & roofs
13,187	61	>75% Grass cover, Good, HSG B
93,527	93	Weighted Average
13,187		14.10% Pervious Area
80,340		85.90% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.7	50	0.0556	0.22		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.1	44	0.1000	5.09		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.0	218	0.0500	3.60		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.5	474	0.0759	14.50	17.80	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013
5.3	786	Total			

Subcatchment PR 3.3A: SUB PR 3.3A



Summary for Subcatchment PR 3.3B: SUB PR 3.3B

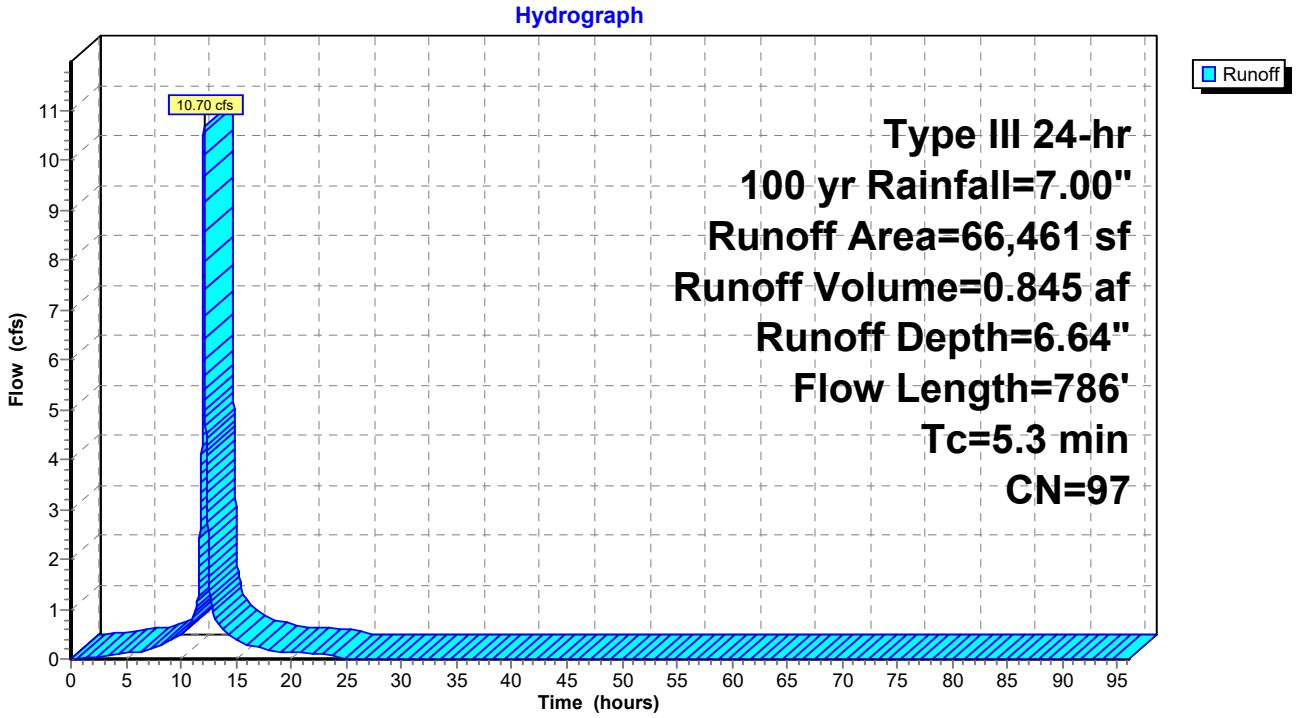
Runoff = 10.70 cfs @ 12.07 hrs, Volume= 0.845 af, Depth= 6.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=7.00"

Area (sf)	CN	Description
64,803	98	Paved parking & roofs
1,658	61	>75% Grass cover, Good, HSG B
66,461	97	Weighted Average
1,658		2.49% Pervious Area
64,803		97.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.7	50	0.0556	0.22		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
0.1	44	0.1000	5.09		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.0	218	0.0500	3.60		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.5	474	0.0759	14.50	17.80	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013
5.3	786	Total			

Subcatchment PR 3.3B: SUB PR 3.3B



Summary for Subcatchment PR 3.3C: PR 3.3C

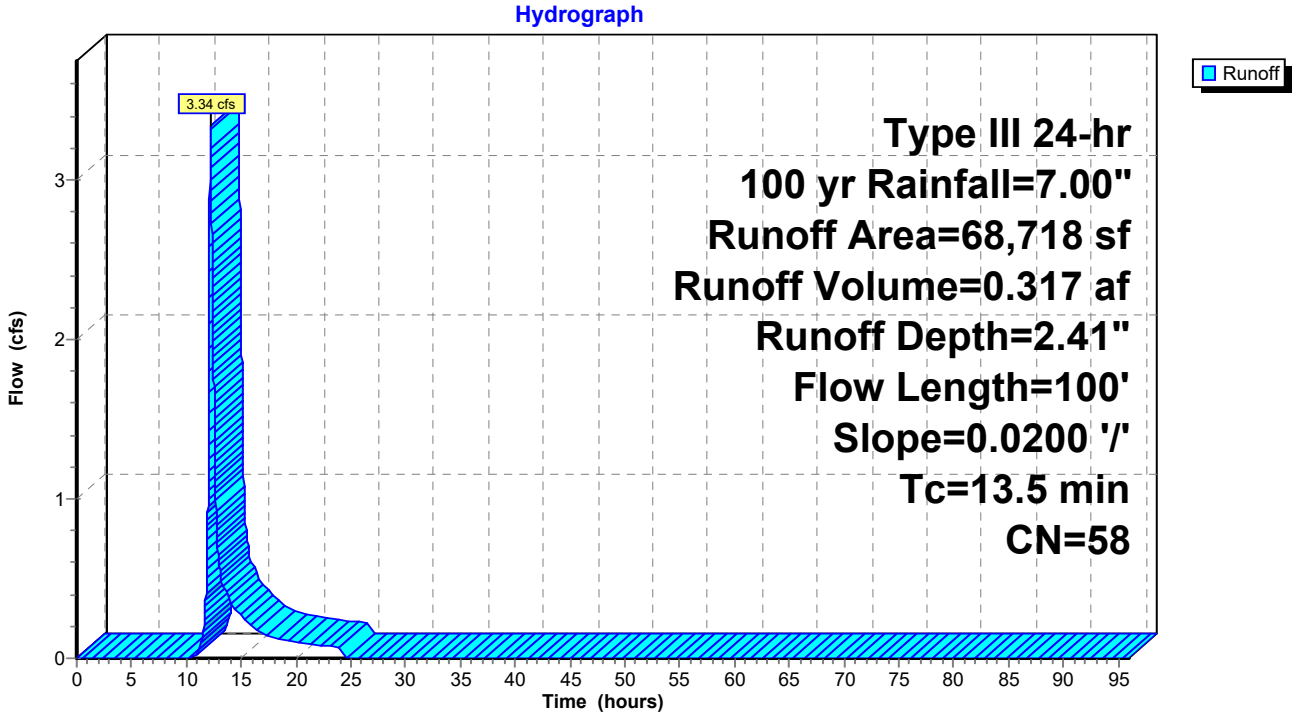
Runoff = 3.34 cfs @ 12.20 hrs, Volume= 0.317 af, Depth= 2.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=7.00"

Area (sf)	CN	Description
34,359	55	Woods, Good, HSG B
34,359	61	>75% Grass cover, Good, HSG B
68,718	58	Weighted Average
68,718		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		**Sheet Flow, Sheet - ESTIMATE** Woods: Light underbrush n= 0.400 P2= 3.20"
1.2	50	0.0200	0.71		**Shallow Concentrated Flow, Shallow Concentrated** Woodland Kv= 5.0 fps
13.5	100	Total			

Subcatchment PR 3.3C: PR 3.3C



Summary for Subcatchment PR 3.4: SUB PR 3.4

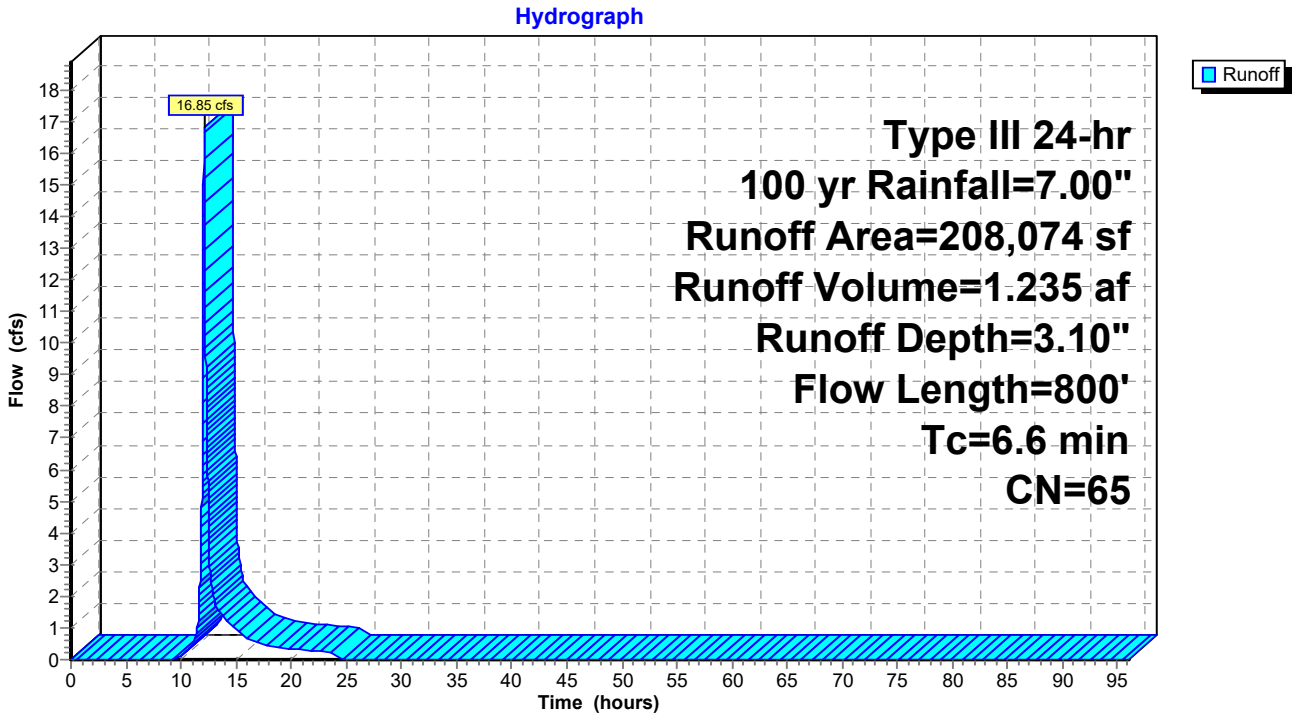
Runoff = 16.85 cfs @ 12.10 hrs, Volume= 1.235 af, Depth= 3.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=7.00"

	Area (sf)	CN	Description
	79,157	61	>75% Grass cover, Good, HSG B
	78,871	55	Woods, Good, HSG B
	21,288	77	Wetlands (Woods, Good, HSG D)
*	28,758	98	IMP Highway (EXISTING)
	208,074	65	Weighted Average
	179,316		86.18% Pervious Area
	28,758		13.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.20		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
5.7	675	0.0148	1.96		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.2	75	0.1333	5.88		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.6	800	Total			

Subcatchment PR 3.4: SUB PR 3.4



Summary for Subcatchment PR 3.5: SUB PR 3.5

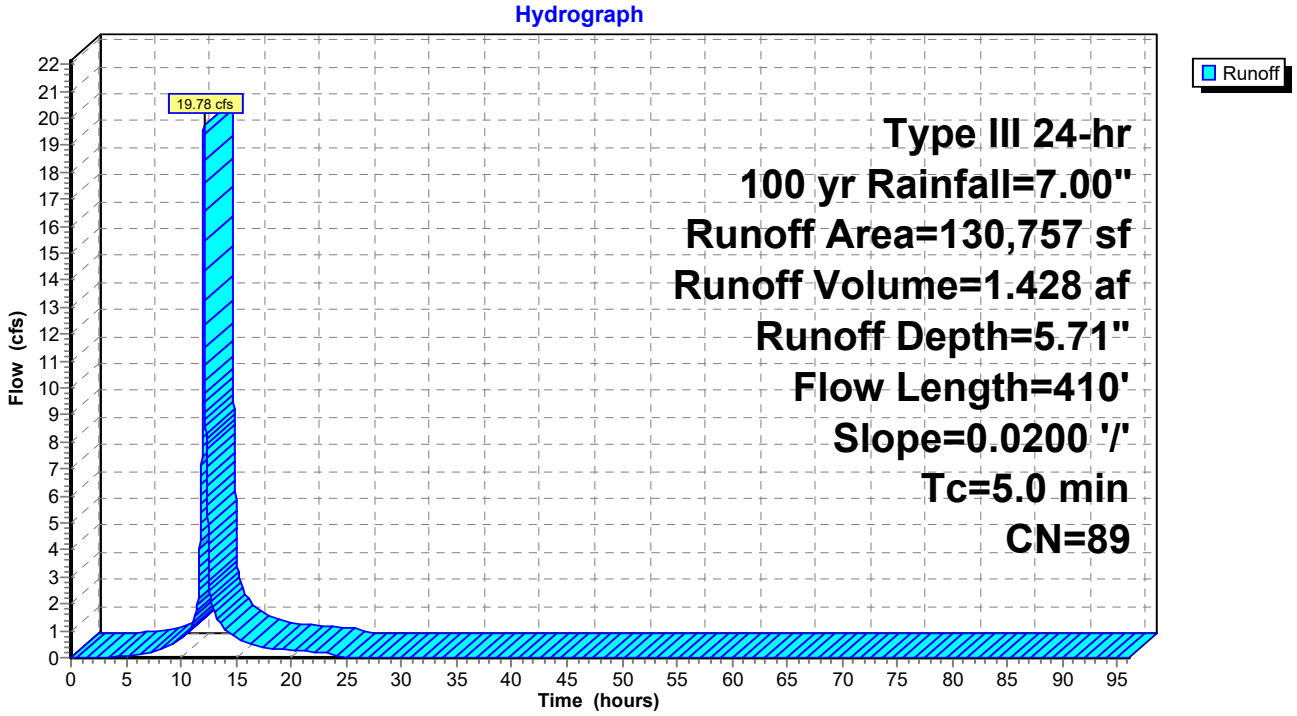
Runoff = 19.78 cfs @ 12.07 hrs, Volume= 1.428 af, Depth= 5.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=7.00"

Area (sf)	CN	Description
97,754	98	Paved parking & roofs
27,843	61	>75% Grass cover, Good, HSG B
5,160	80	>75% Grass cover, Good, HSG D
130,757	89	Weighted Average
33,003		25.24% Pervious Area
97,754		74.76% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.20		**Sheet Flow, Sheet - ESTIMATE** Smooth surfaces n= 0.011 P2= 3.20"
0.8	360	0.0200	7.44	9.14	**Pipe Channel, Pipe - ESTIMATE** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Concrete pipe, bends & connections
1.5	410	Total, Increased to minimum Tc = 5.0 min			

Subcatchment PR 3.5: SUB PR 3.5



Summary for Subcatchment PR 4.1: SUB PR 4.1

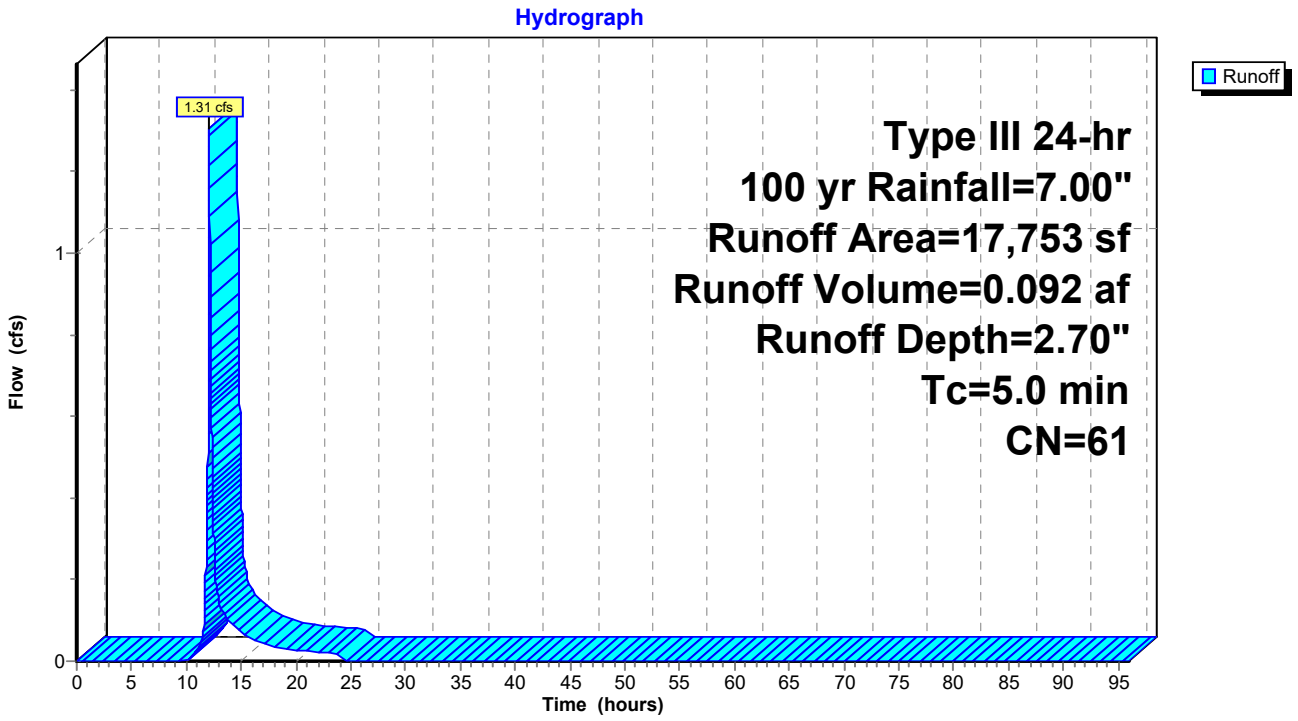
Runoff = 1.31 cfs @ 12.08 hrs, Volume= 0.092 af, Depth= 2.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=7.00"

Area (sf)	CN	Description
17,753	61	>75% Grass cover, Good, HSG B
17,753		100.00% Pervious Area

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

Subcatchment PR 4.1: SUB PR 4.1



Summary for Subcatchment PR 4.2: SUB PR 4.2

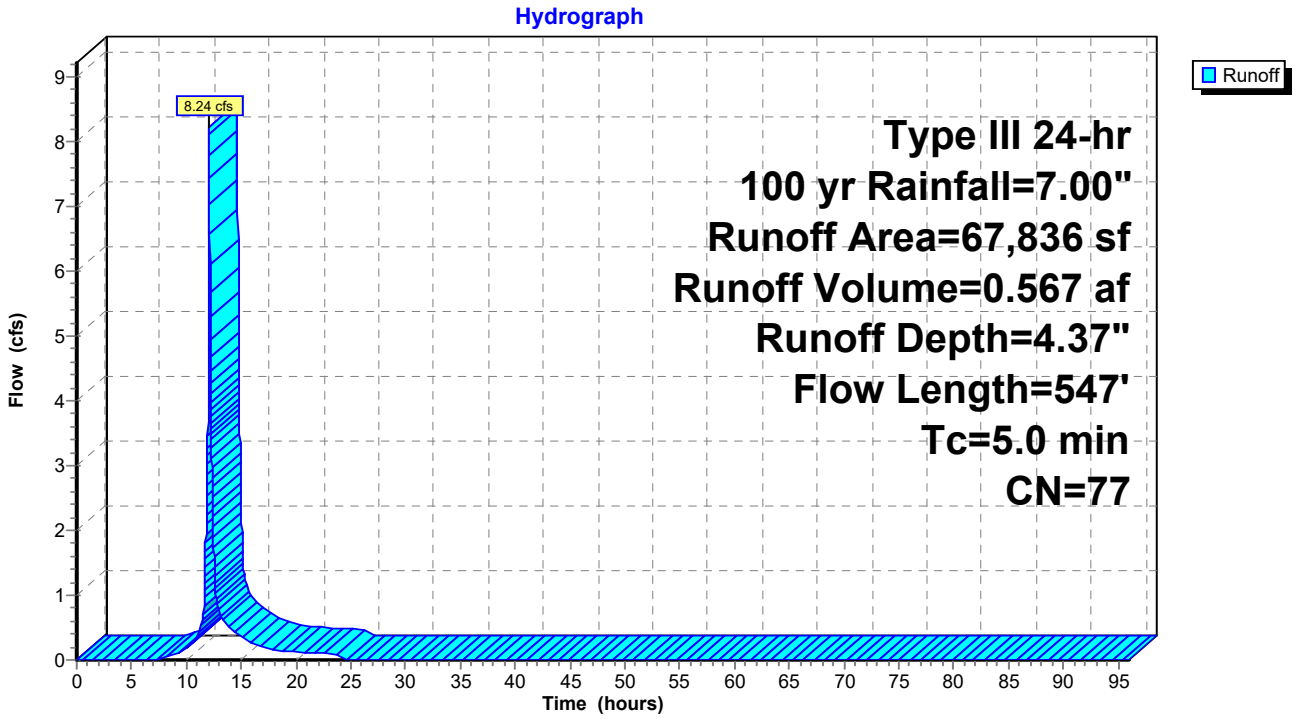
Runoff = 8.24 cfs @ 12.07 hrs, Volume= 0.567 af, Depth= 4.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=7.00"

Area (sf)	CN	Description
37,635	61	>75% Grass cover, Good, HSG B
30,201	98	Paved parking & roofs
67,836	77	Weighted Average
37,635		55.48% Pervious Area
30,201		44.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0230	1.27		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
0.8	144	0.0230	3.08		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.8	353	0.0210	7.63	9.36	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013
2.3	547	Total, Increased to minimum Tc = 5.0 min			

Subcatchment PR 4.2: SUB PR 4.2



Summary for Pond B-1: Basin 1

Inflow Area = 3.503 ac, 63.78% Impervious, Inflow Depth = 4.69" for 100 yr event
Inflow = 19.79 cfs @ 12.07 hrs, Volume= 1.370 af
Outflow = 4.47 cfs @ 12.48 hrs, Volume= 1.370 af, Atten= 77%, Lag= 24.1 min
Discarded = 0.23 cfs @ 12.48 hrs, Volume= 0.374 af
Primary = 4.23 cfs @ 12.48 hrs, Volume= 0.996 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 297.36' @ 12.48 hrs Surf.Area= 9,928 sf Storage= 26,609 cf

Plug-Flow detention time= 248.5 min calculated for 1.370 af (100% of inflow)
Center-of-Mass det. time= 248.6 min (1,055.6 - 807.1)

Volume	Invert	Avail.Storage	Storage Description
#1	294.00'	33,182 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

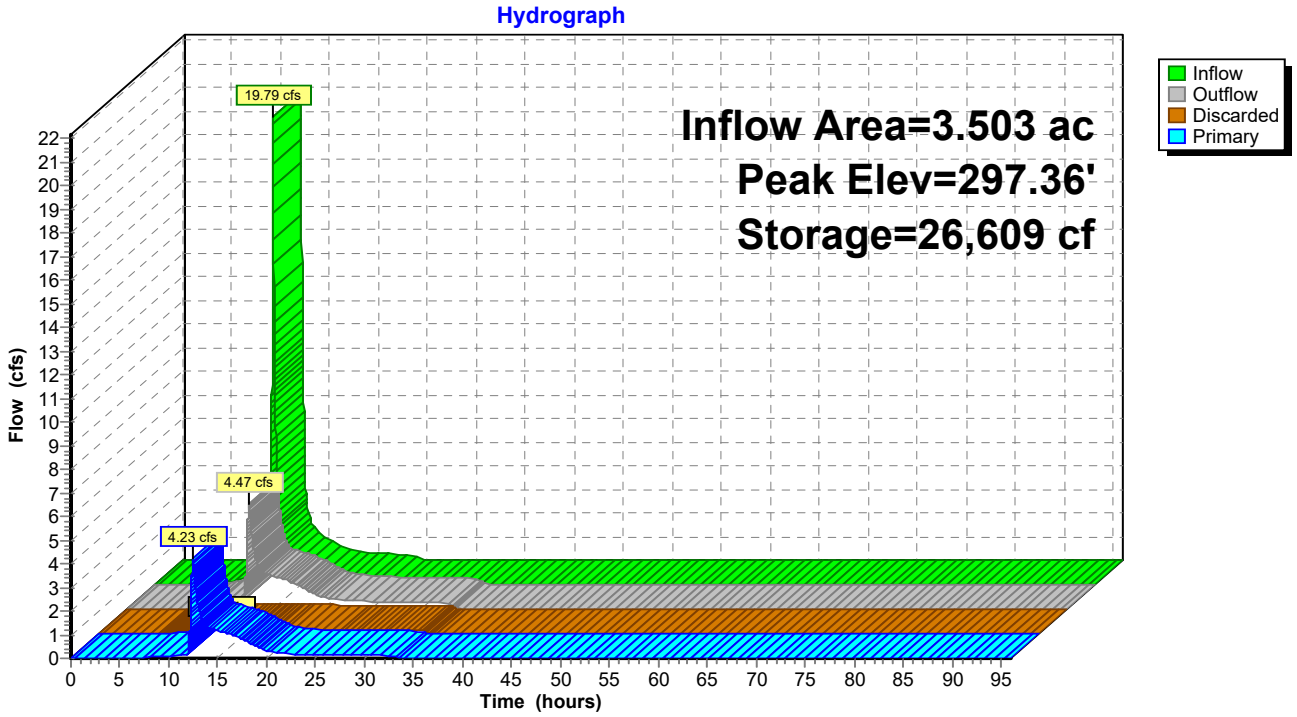
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
294.00	5,987	0	0
296.00	8,239	14,226	14,226
298.00	10,717	18,956	33,182

Device	Routing	Invert	Outlet Devices
#1	Discarded	294.00'	**1.020 in/hr Exfiltration over Horizontal area**
#2	Primary	293.00'	**18.0" Round Culvert** L= 50.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 293.00' / 292.50' S= 0.0100 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#3	Device 2	293.00'	**2.0" Vert. Orifice/Grate** C= 0.600
#4	Device 2	295.50'	**6.0" Vert. Orifice/Grate** C= 0.600
#5	Primary	297.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Discarded OutFlow Max=0.23 cfs @ 12.48 hrs HW=297.36' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.23 cfs)

Primary OutFlow Max=4.23 cfs @ 12.48 hrs HW=297.36' (Free Discharge)
├─**2=Culvert** (Passes 1.42 cfs of 16.17 cfs potential flow)
│ ├─**3=Orifice/Grate** (Orifice Controls 0.22 cfs @ 9.96 fps)
│ └─**4=Orifice/Grate** (Orifice Controls 1.20 cfs @ 6.12 fps)
└─**5=Sharp-Crested Rectangular Weir** (Weir Controls 2.81 cfs @ 1.97 fps)

Pond B-1: Basin 1



Summary for Pond B-2: Basin 2

Inflow Area =	3.452 ac, 70.93% Impervious, Inflow Depth = 5.48" for 100 yr event				
Inflow =	22.11 cfs @	12.07 hrs,	Volume=	1.576 af	
Outflow =	5.40 cfs @	12.44 hrs,	Volume=	1.576 af,	Atten= 76%, Lag= 22.3 min
Discarded =	0.18 cfs @	12.44 hrs,	Volume=	0.479 af	
Primary =	5.22 cfs @	12.44 hrs,	Volume=	1.097 af	
Secondary =	0.00 cfs @	0.00 hrs,	Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 326.25' @ 12.44 hrs Surf.Area= 10,314 sf Storage= 32,498 cf

Plug-Flow detention time= 385.6 min calculated for 1.576 af (100% of inflow)
Center-of-Mass det. time= 385.7 min (1,174.2 - 788.4)

Volume	Invert	Avail.Storage	Storage Description
#1	322.00'	52,913 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
322.00	5,179	0	0
324.00	7,440	12,619	12,619
326.00	9,940	17,380	29,999
328.00	12,974	22,914	52,913

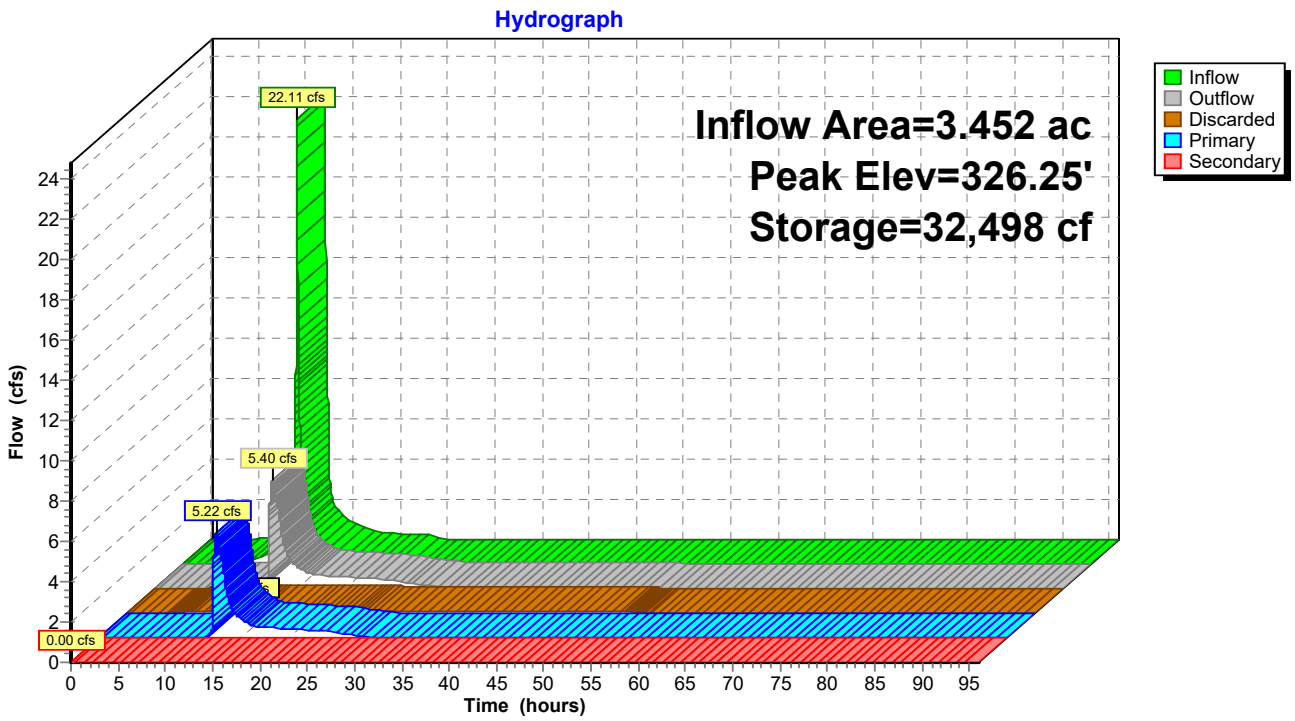
Device	Routing	Invert	Outlet Devices
#1	Discarded	322.00'	**0.770 in/hr Exfiltration over Horizontal area**
#2	Primary	321.00'	**18.0" Round Culvert**
			L= 80.0' RCP, sq.cut end projecting, Ke= 0.500
			Inlet / Outlet Invert= 321.00' / 320.00' S= 0.0125 '/' Cc= 0.900
			n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#3	Device 2	323.50'	**4.0" Vert. Orifice/Grate** C= 0.600
#4	Device 2	325.10'	**24.0" W x 6.0" H Vert. Orifice/Grate** C= 0.600
#5	Secondary	327.20'	**10.0' 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

Discarded OutFlow Max=0.18 cfs @ 12.44 hrs HW=326.25' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.18 cfs)

Primary OutFlow Max=5.22 cfs @ 12.44 hrs HW=326.25' (Free Discharge)
└─**2=Culvert** (Passes 5.22 cfs of 17.95 cfs potential flow)
  ├─**3=Orifice/Grate** (Orifice Controls 0.67 cfs @ 7.73 fps)
  └─**4=Orifice/Grate** (Orifice Controls 4.54 cfs @ 4.54 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=322.00' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond B-2: Basin 2



Summary for Pond B-3A: Basin 3A

Inflow Area = 2.147 ac, 85.90% Impervious, Inflow Depth = 6.17" for 100 yr event
Inflow = 14.64 cfs @ 12.07 hrs, Volume= 1.104 af
Outflow = 3.49 cfs @ 12.45 hrs, Volume= 1.104 af, Atten= 76%, Lag= 22.6 min
Primary = 3.49 cfs @ 12.45 hrs, Volume= 1.104 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 373.84' @ 12.45 hrs Surf.Area= 5,000 sf Storage= 23,001 cf

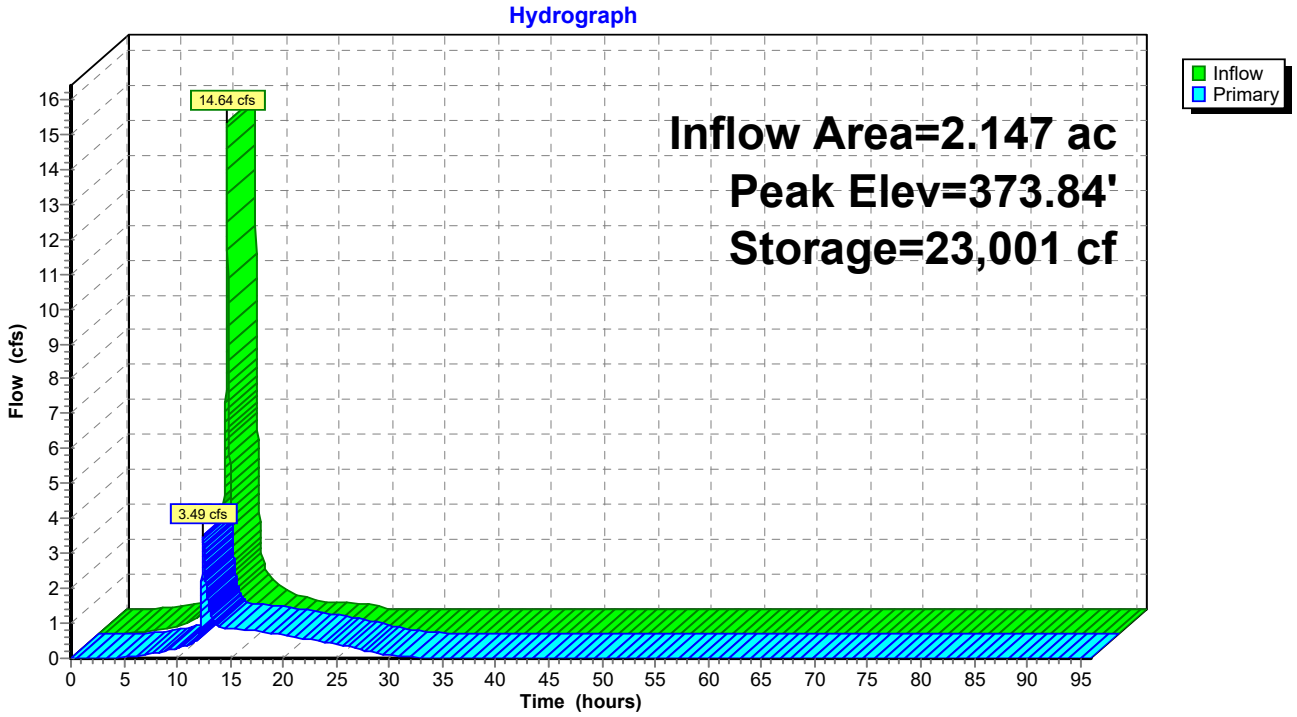
Plug-Flow detention time= 284.1 min calculated for 1.104 af (100% of inflow)
Center-of-Mass det. time= 284.1 min (1,052.2 - 768.1)

Volume	Invert	Avail.Storage	Storage Description
#1	369.00'	23,750 cf	**50.00'W x 100.00'L x 5.00'H Prismatoid** 25,000 cf Overall x 95.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Primary	369.00'	**18.0" Round Culvert** L= 100.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 369.00' / 368.00' S= 0.0100 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#2	Device 1	369.00'	**4.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	373.50'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=3.48 cfs @ 12.45 hrs HW=373.84' (Free Discharge)
└─**1=Culvert** (Passes 3.48 cfs of 16.20 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.91 cfs @ 10.41 fps)
  └─**3=Sharp-Crested Rectangular Weir** (Weir Controls 2.58 cfs @ 1.91 fps)

Pond B-3A: Basin 3A



Summary for Pond B-3B: Basin 3B

Inflow Area = 1.526 ac, 97.51% Impervious, Inflow Depth = 6.64" for 100 yr event
Inflow = 10.70 cfs @ 12.07 hrs, Volume= 0.845 af
Outflow = 0.82 cfs @ 13.05 hrs, Volume= 0.844 af, Atten= 92%, Lag= 58.5 min
Primary = 0.82 cfs @ 13.05 hrs, Volume= 0.844 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 372.95' @ 13.05 hrs Surf.Area= 5,000 sf Storage= 18,762 cf

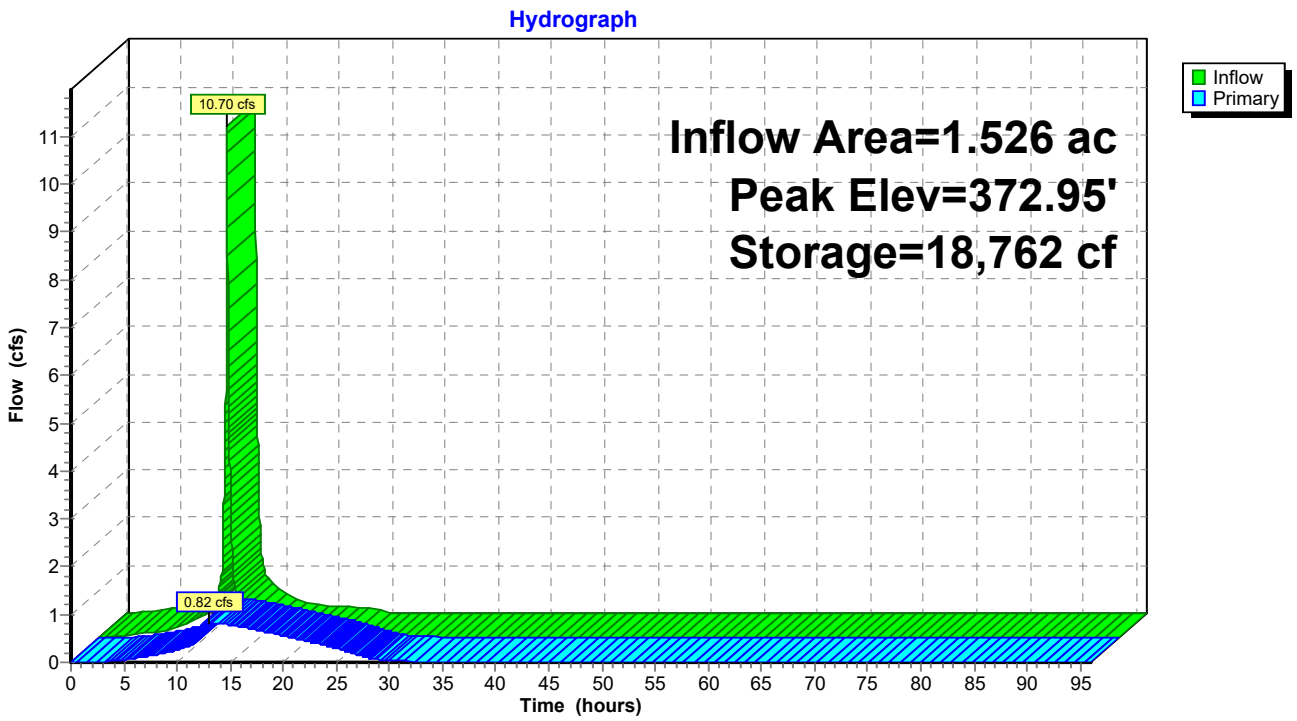
Plug-Flow detention time= 287.9 min calculated for 0.844 af (100% of inflow)
Center-of-Mass det. time= 288.2 min (1,036.9 - 748.7)

Volume	Invert	Avail.Storage	Storage Description
#1	369.00'	23,750 cf	**50.00'W x 100.00'L x 5.00'H Prismatoid** 25,000 cf Overall x 95.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Primary	369.00'	**18.0" Round Culvert** L= 70.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 369.00' / 366.00' S= 0.0429 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#2	Device 1	369.00'	**4.0" Vert. Orifice/Grate** C= 0.600
#3	Primary	373.90'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.82 cfs @ 13.05 hrs HW=372.95' (Free Discharge)
- **1=Culvert** (Passes 0.82 cfs of 15.22 cfs potential flow)
  - **2=Orifice/Grate** (Orifice Controls 0.82 cfs @ 9.37 fps)
- **3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond B-3B: Basin 3B



Summary for Pond B-3C: Basin 3C

Inflow Area = 3.002 ac, 74.76% Impervious, Inflow Depth = 5.71" for 100 yr event
Inflow = 19.78 cfs @ 12.07 hrs, Volume= 1.428 af
Outflow = 7.13 cfs @ 12.31 hrs, Volume= 1.428 af, Atten= 64%, Lag= 14.4 min
Primary = 7.13 cfs @ 12.31 hrs, Volume= 1.428 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 335.49' @ 12.31 hrs Surf.Area= 5,000 sf Storage= 26,086 cf

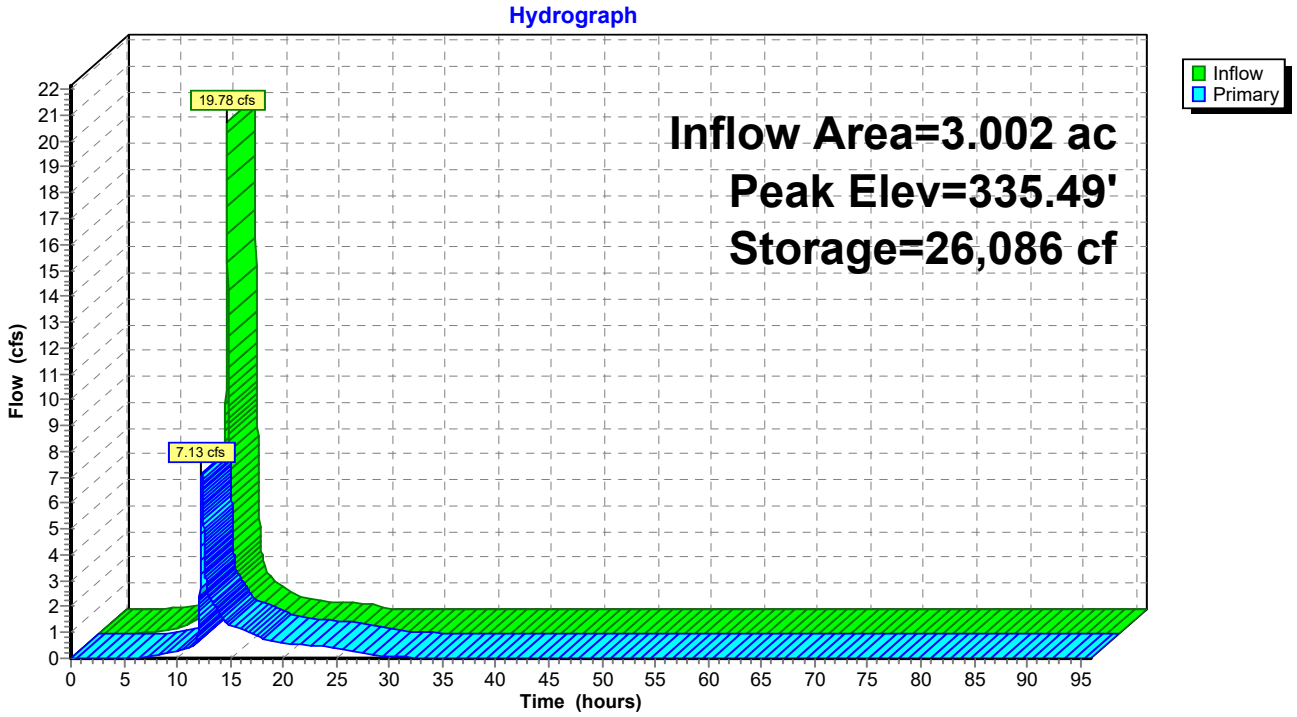
Plug-Flow detention time= 201.9 min calculated for 1.428 af (100% of inflow)
Center-of-Mass det. time= 202.2 min (984.5 - 782.3)

Volume	Invert	Avail.Storage	Storage Description
#1	330.00'	28,500 cf	**50.00'W x 100.00'L x 6.00'H Prismatoid** 30,000 cf Overall x 95.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Primary	330.00'	**18.0" Round Culvert** L= 100.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 330.00' / 328.50' S= 0.0150 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#2	Device 1	330.00'	**4.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	332.50'	**4.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	334.00'	**6.0" Vert. Orifice/Grate** C= 0.600
#5	Device 1	335.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=7.13 cfs @ 12.31 hrs HW=335.49' (Free Discharge)
└─**1=Culvert** (Passes 7.13 cfs of 18.21 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.97 cfs @ 11.11 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 0.71 cfs @ 8.09 fps)
  ├─**4=Orifice/Grate** (Orifice Controls 1.05 cfs @ 5.37 fps)
  └─**5=Sharp-Crested Rectangular Weir** (Weir Controls 4.40 cfs @ 2.29 fps)

Pond B-3C: Basin 3C



Summary for Pond B-4: Basin 4

Inflow Area = 5.171 ac, 67.19% Impervious, Inflow Depth = 5.37" for 100 yr event
Inflow = 32.61 cfs @ 12.07 hrs, Volume= 2.312 af
Outflow = 18.35 cfs @ 12.18 hrs, Volume= 2.311 af, Atten= 44%, Lag= 6.3 min
Primary = 16.76 cfs @ 12.18 hrs, Volume= 2.293 af
Secondary = 1.59 cfs @ 12.18 hrs, Volume= 0.018 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 327.15' @ 12.18 hrs Surf.Area= 14,578 sf Storage= 34,130 cf

Plug-Flow detention time= 238.7 min calculated for 2.311 af (100% of inflow)
Center-of-Mass det. time= 238.4 min (1,029.8 - 791.3)

Volume	Invert	Avail.Storage	Storage Description
#1	324.00'	47,494 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

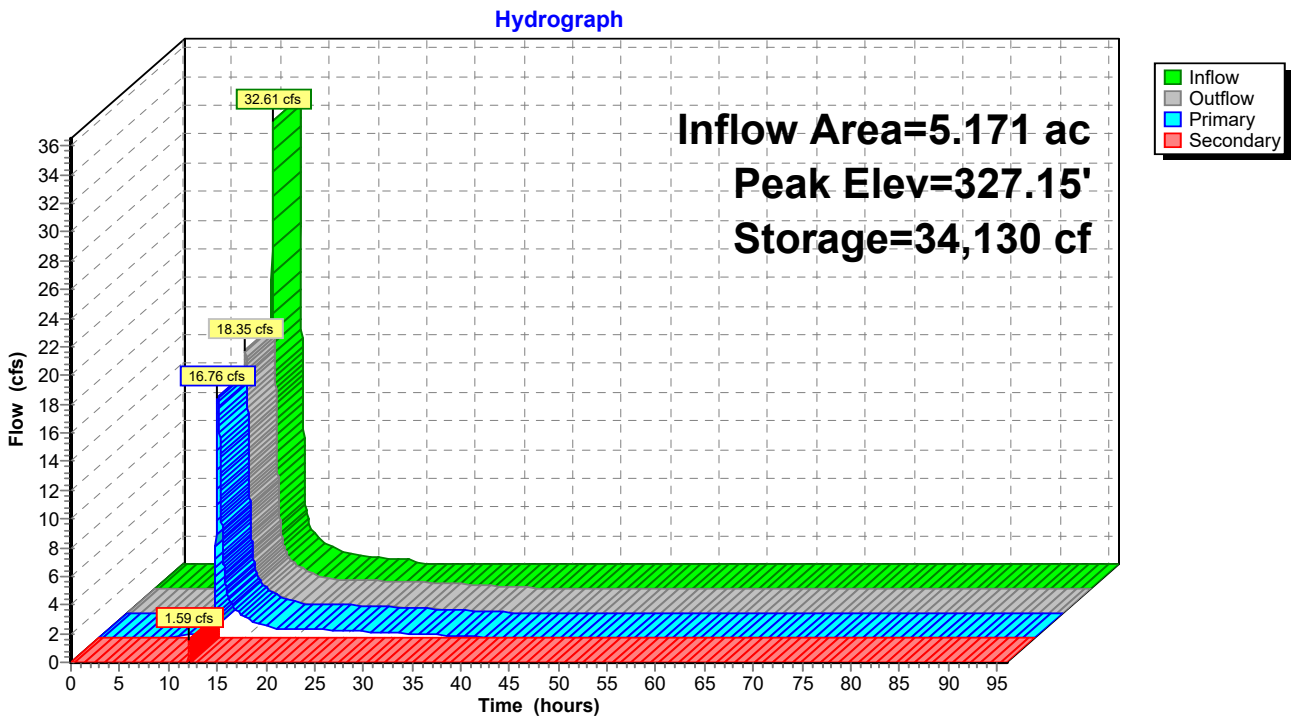
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
324.00	7,771	0	0
326.00	11,402	19,173	19,173
328.00	16,919	28,321	47,494

Device	Routing	Invert	Outlet Devices
#1	Primary	322.00'	**18.0" Round Culvert** L= 100.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 322.00' / 321.00' S= 0.0100 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.77 sf
#2	Device 1	324.00'	**4.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	326.10'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height
#4	Secondary	327.00'	**10.0' long x 30.0' 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=16.76 cfs @ 12.18 hrs HW=327.15' (Free Discharge)
└─**1=Culvert** (Barrel Controls 16.76 cfs @ 9.49 fps)
  ├─**2=Orifice/Grate** (Passes < 0.73 cfs potential flow)
  └─**3=Sharp-Crested Rectangular Weir** (Passes < 21.22 cfs potential flow)

Secondary OutFlow Max=1.58 cfs @ 12.18 hrs HW=327.15' (Free Discharge)
└─**4=Broad-Crested Rectangular Weir** (Weir Controls 1.58 cfs @ 1.04 fps)

Pond B-4: Basin 4



Summary for Pond B-5A: Basin 5A

Inflow Area =	10.270 ac, 58.77% Impervious, Inflow Depth = 5.25" for 100 yr event				
Inflow =	52.95 cfs @	12.08 hrs,	Volume=	4.495 af	
Outflow =	35.80 cfs @	12.20 hrs,	Volume=	4.495 af,	Atten= 32%, Lag= 7.2 min
Discarded =	0.19 cfs @	12.20 hrs,	Volume=	0.587 af	
Primary =	35.52 cfs @	12.20 hrs,	Volume=	3.907 af	
Secondary =	0.09 cfs @	12.20 hrs,	Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 357.27' @ 12.20 hrs Surf.Area= 15,848 sf Storage= 59,545 cf

Plug-Flow detention time= 260.6 min calculated for 4.495 af (100% of inflow)
Center-of-Mass det. time= 260.8 min (1,063.4 - 802.6)

Volume	Invert	Avail.Storage	Storage Description
#1	352.00'	71,591 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
352.00	7,400	0	0
354.00	9,862	17,262	17,262
356.00	13,687	23,549	40,811
358.00	17,093	30,780	71,591

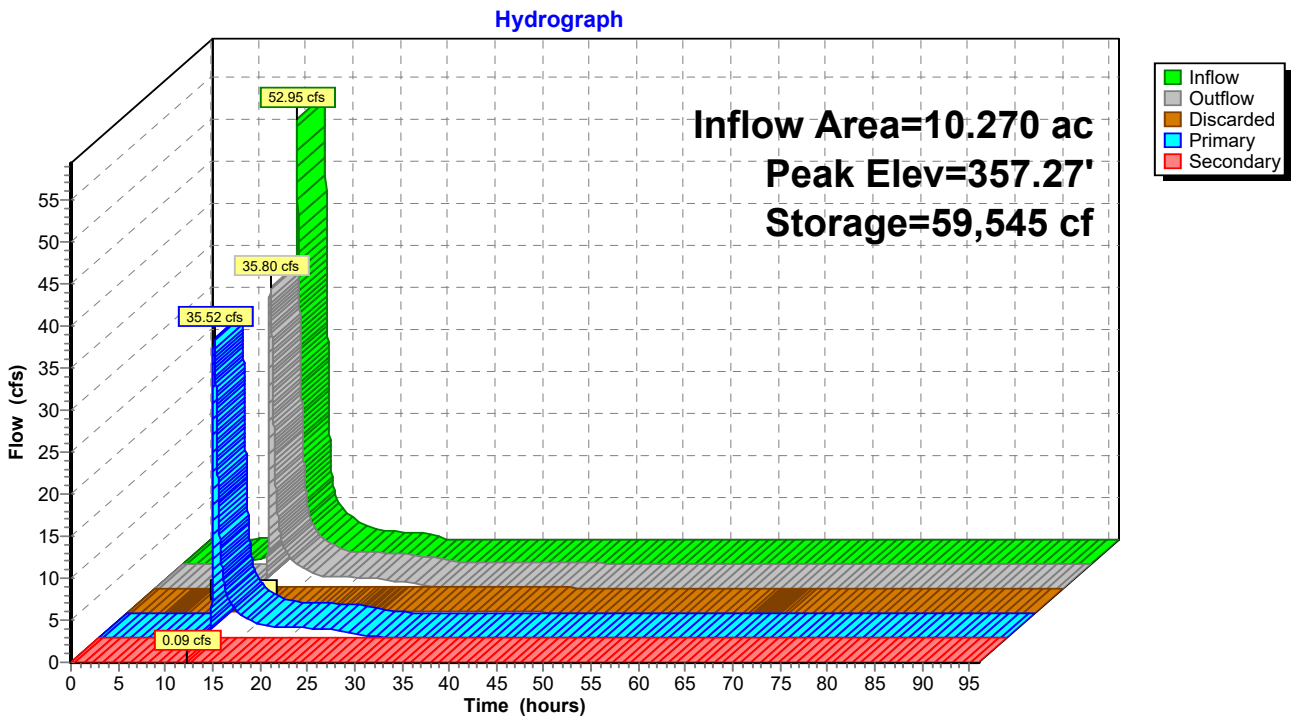
Device	Routing	Invert	Outlet Devices
#1	Discarded	352.00'	**0.520 in/hr Exfiltration over Horizontal area**
#2	Primary	350.70'	**24.0" Round Culvert** L= 50.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 350.70' / 350.00' S= 0.0140 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 3.14 sf
#3	Device 2	353.50'	**6.0" Vert. Orifice/Grate** C= 0.600
#4	Device 2	355.75'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 1.0' Crest Height
#5	Secondary	357.25'	**10.0' 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

Discarded OutFlow Max=0.19 cfs @ 12.20 hrs HW=357.27' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.19 cfs)

Primary OutFlow Max=35.70 cfs @ 12.20 hrs HW=357.27' (Free Discharge)
└─**2=Culvert** (Inlet Controls 35.70 cfs @ 11.36 fps)
  ├─**3=Orifice/Grate** (Passes < 1.77 cfs potential flow)
  └─**4=Sharp-Crested Rectangular Weir** (Passes < 34.07 cfs potential flow)

Secondary OutFlow Max=0.07 cfs @ 12.20 hrs HW=357.27' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir** (Weir Controls 0.07 cfs @ 0.36 fps)

Pond B-5A: Basin 5A



Summary for Pond B-5B: Basin 5B

Inflow Area =	1.651 ac, 44.43% Impervious, Inflow Depth = 4.69" for 100 yr event				
Inflow =	9.33 cfs @	12.07 hrs,	Volume=	0.646 af	
Outflow =	1.64 cfs @	12.53 hrs,	Volume=	0.646 af,	Atten= 82%, Lag= 27.4 min
Discarded =	0.06 cfs @	12.53 hrs,	Volume=	0.130 af	
Primary =	1.57 cfs @	12.53 hrs,	Volume=	0.516 af	
Secondary =	0.00 cfs @	0.00 hrs,	Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 354.17' @ 12.53 hrs Surf.Area= 5,337 sf Storage= 13,333 cf

Plug-Flow detention time= 310.3 min calculated for 0.646 af (100% of inflow)
Center-of-Mass det. time= 310.2 min (1,117.3 - 807.1)

Volume	Invert	Avail.Storage	Storage Description
#1	350.00'	41,172 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
350.00	1,623	0	0
352.00	2,823	4,446	4,446
354.00	5,169	7,992	12,438
356.00	7,145	12,314	24,752
358.00	9,275	16,420	41,172

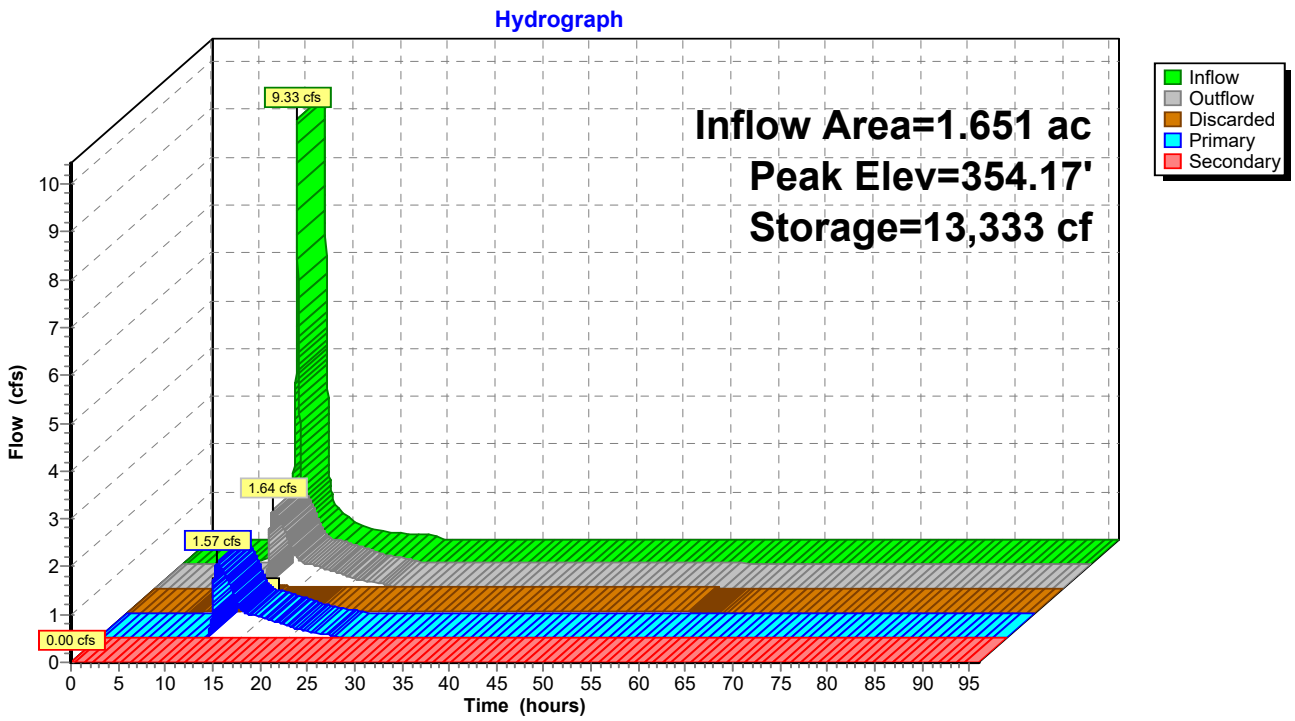
Device	Routing	Invert	Outlet Devices
#1	Discarded	350.00'	**0.520 in/hr Exfiltration over Horizontal area**
#2	Primary	348.40'	**24.0" Round Culvert** L= 50.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 348.40' / 348.20' S= 0.0040 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 3.14 sf
#3	Device 2	351.50'	**4.0" Vert. Orifice/Grate** C= 0.600
#4	Device 2	353.00'	**6.0" Vert. Orifice/Grate** C= 0.600
#5	Secondary	357.00'	**10.0' 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

Discarded OutFlow Max=0.06 cfs @ 12.53 hrs HW=354.17' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=1.57 cfs @ 12.53 hrs HW=354.17' (Free Discharge)
└─**2=Culvert** (Passes 1.57 cfs of 33.04 cfs potential flow)
  ├─**3=Orifice/Grate** (Orifice Controls 0.66 cfs @ 7.62 fps)
  └─**4=Orifice/Grate** (Orifice Controls 0.91 cfs @ 4.62 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=350.00' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond B-5B: Basin 5B



Summary for Pond B-6: Basin 6

Inflow Area = 3.750 ac, 76.96% Impervious, Inflow Depth = 5.77" for 100 yr event
Inflow = 23.83 cfs @ 12.07 hrs, Volume= 1.802 af
Outflow = 3.64 cfs @ 12.55 hrs, Volume= 1.802 af, Atten= 85%, Lag= 28.5 min
Discarded = 0.15 cfs @ 12.55 hrs, Volume= 0.313 af
Primary = 3.48 cfs @ 12.55 hrs, Volume= 1.489 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 393.11' @ 12.55 hrs Surf.Area= 12,571 sf Storage= 40,379 cf

Plug-Flow detention time= 426.5 min calculated for 1.802 af (100% of inflow)
Center-of-Mass det. time= 426.7 min (1,191.4 - 764.7)

Volume	Invert	Avail.Storage	Storage Description
#1	388.00'	52,408 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

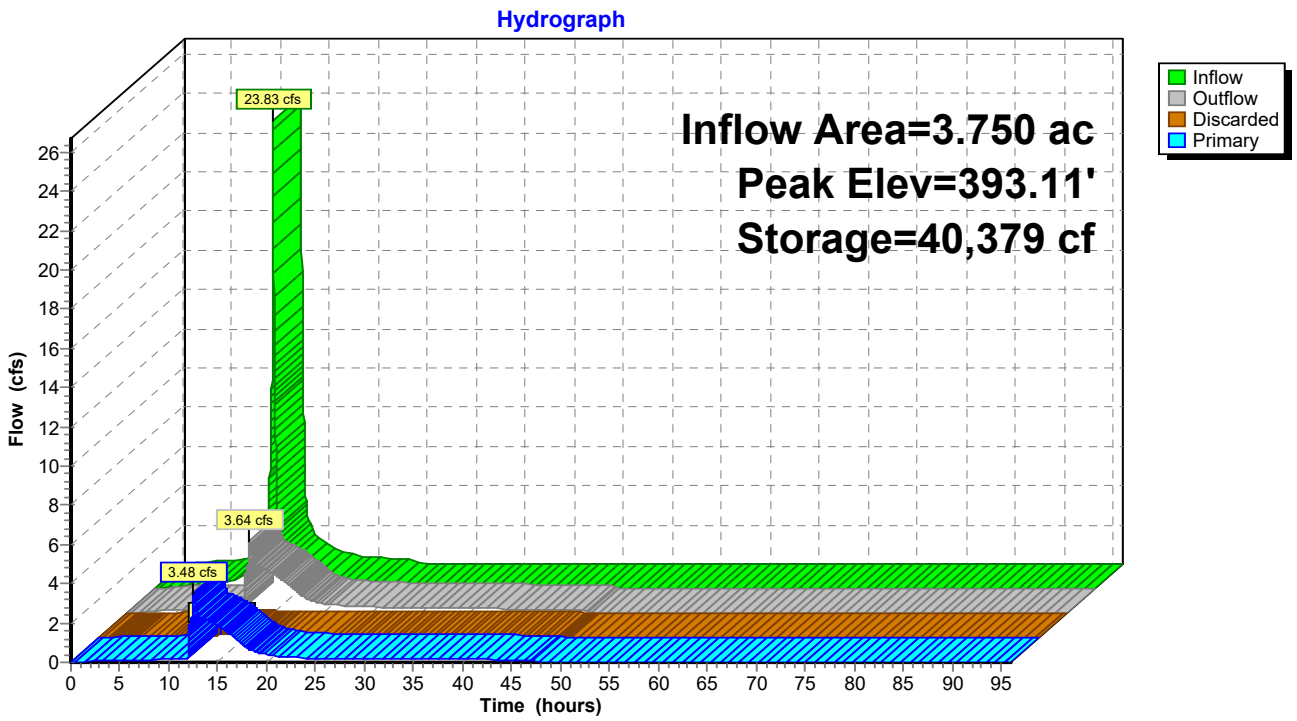
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
388.00	3,546	0	0
390.00	6,853	10,399	10,399
392.00	10,423	17,276	27,675
394.00	14,310	24,733	52,408

Device	Routing	Invert	Outlet Devices
#1	Discarded	388.00'	**0.520 in/hr Exfiltration over Horizontal area**
#2	Primary	387.00'	**24.0" Round Culvert** L= 100.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 387.00' / 386.50' S= 0.0050 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 3.14 sf
#3	Device 2	387.00'	**2.0" Vert. Orifice/Grate** C= 0.600
#4	Device 2	391.20'	**8.0" Vert. Orifice/Grate** C= 0.600
#5	Primary	393.00'	**10.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Discarded OutFlow Max=0.15 cfs @ 12.55 hrs HW=393.10' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.15 cfs)

Primary OutFlow Max=3.47 cfs @ 12.55 hrs HW=393.10' (Free Discharge)
├─**2=Culvert** (Passes 2.36 cfs of 32.65 cfs potential flow)
│ ├─**3=Orifice/Grate** (Orifice Controls 0.26 cfs @ 11.82 fps)
│ └─**4=Orifice/Grate** (Orifice Controls 2.11 cfs @ 6.04 fps)
└─**5=Sharp-Crested Rectangular Weir** (Weir Controls 1.11 cfs @ 1.06 fps)

Pond B-6: Basin 6



Summary for Pond B-7: Basin 7

Inflow Area =	1.719 ac, 86.57% Impervious, Inflow Depth = 6.17" for 100 yr event				
Inflow =	11.85 cfs @	12.07 hrs,	Volume=	0.884 af	
Outflow =	0.58 cfs @	14.15 hrs,	Volume=	0.884 af,	Atten= 95%, Lag= 124.9 min
Discarded =	0.29 cfs @	8.74 hrs,	Volume=	0.695 af	
Primary =	0.29 cfs @	14.15 hrs,	Volume=	0.189 af	

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 318.05' @ 14.15 hrs Surf.Area= 16,082 sf Storage= 20,885 cf

Plug-Flow detention time= 478.5 min calculated for 0.884 af (100% of inflow)
Center-of-Mass det. time= 478.5 min (1,246.4 - 767.9)

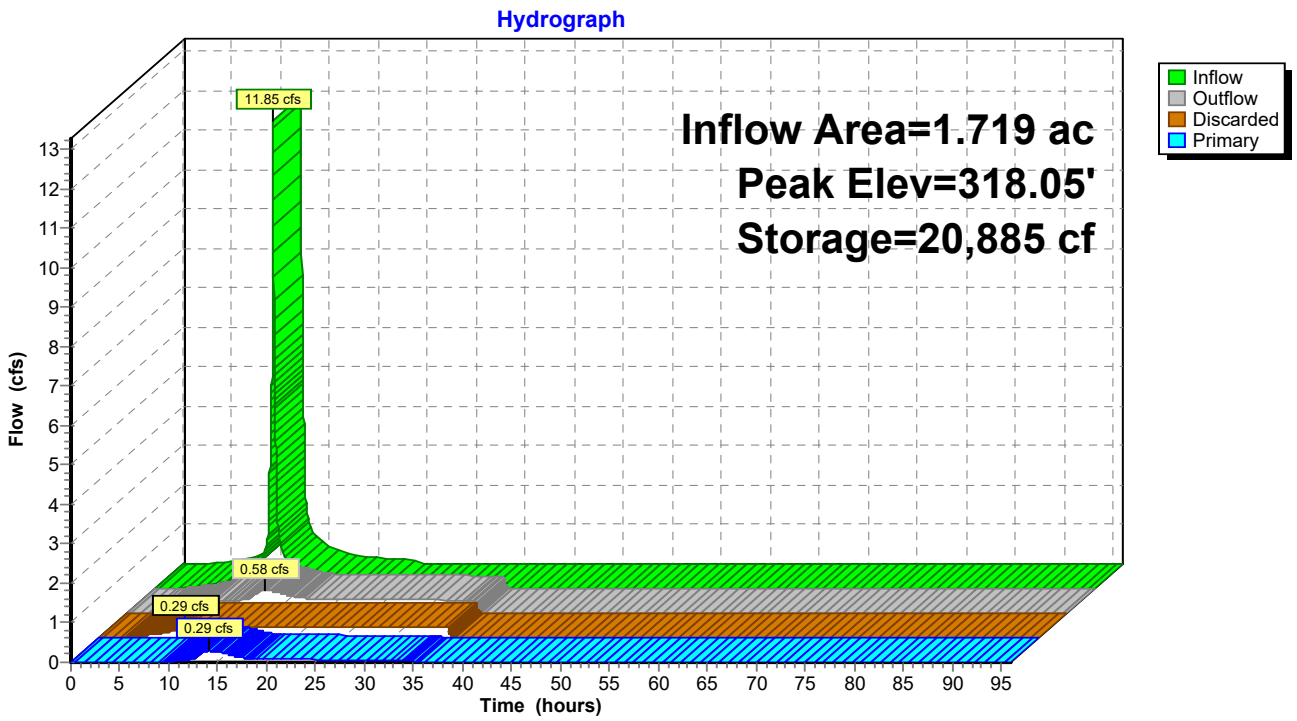
Volume	Invert	Avail.Storage	Storage Description
#1	316.00'	10,905 cf	**187.00'W x 86.00'L x 3.50'H Prismatoid** 56,287 cf Overall - 19,938 cf Embedded = 36,349 cf x 30.0% Voids
#2	316.50'	19,938 cf	**ADS_StormTech SC-740** x 434 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
		30,843 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	316.00'	**0.770 in/hr Exfiltration over Horizontal area**
#2	Primary	316.00'	**24.0" Round Culvert** L= 75.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 316.00' / 313.00' S= 0.0400 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 3.14 sf
#3	Device 2	316.00'	**1.5" Vert. Orifice/Grate** C= 0.600
#4	Device 2	317.80'	**8.0" Vert. Orifice/Grate** C= 0.600
#5	Device 2	319.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Discarded OutFlow Max=0.29 cfs @ 8.74 hrs HW=316.04' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.29 cfs)

Primary OutFlow Max=0.29 cfs @ 14.15 hrs HW=318.05' (Free Discharge)
└─**2=Culvert** (Passes 0.29 cfs of 15.51 cfs potential flow)
  ├─**3=Orifice/Grate** (Orifice Controls 0.08 cfs @ 6.79 fps)
  ├─**4=Orifice/Grate** (Orifice Controls 0.21 cfs @ 1.71 fps)
  └─**5=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond B-7: Basin 7



Summary for Pond B-8: Basin 8

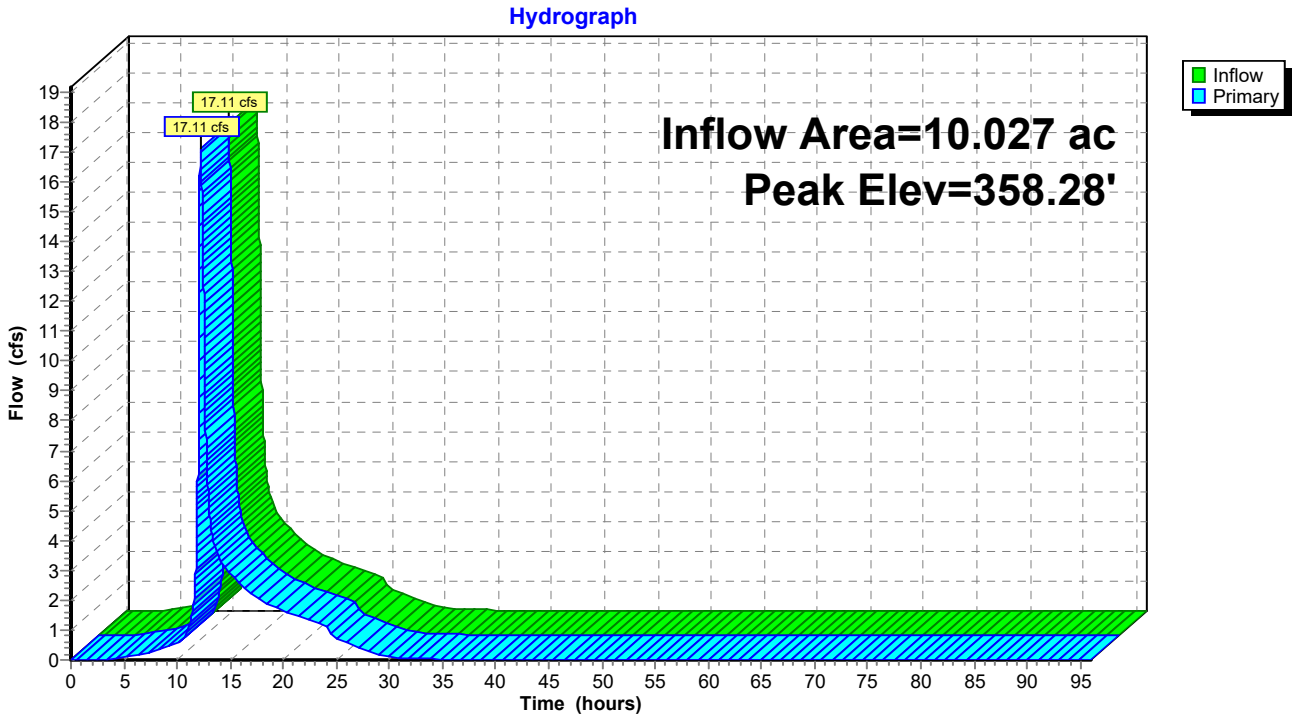
Inflow Area = 10.027 ac, 39.81% Impervious, Inflow Depth = 4.17" for 100 yr event
Inflow = 17.11 cfs @ 12.19 hrs, Volume= 3.487 af
Outflow = 17.11 cfs @ 12.19 hrs, Volume= 3.487 af, Atten= 0%, Lag= 0.0 min
Primary = 17.11 cfs @ 12.19 hrs, Volume= 3.487 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 358.28' @ 12.19 hrs
Flood Elev= 360.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	350.00'	**24.0" Round Culvert** L= 270.0' Ke= 0.500 Inlet / Outlet Invert= 350.00' / 330.00' S= 0.0741 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 3.14 sf
#2	Device 1	357.00'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=17.10 cfs @ 12.19 hrs HW=358.28' (Free Discharge)
└─**1=Culvert** (Passes 17.10 cfs of 40.81 cfs potential flow)
└─**2=Orifice/Grate** (Orifice Controls 17.10 cfs @ 5.44 fps)

Pond B-8: Basin 8



Summary for Pond W5: WETLAND 5

Inflow Area = 4.777 ac, 13.82% Impervious, Inflow Depth = 3.10" for 100 yr event
Inflow = 16.85 cfs @ 12.10 hrs, Volume= 1.235 af
Outflow = 12.22 cfs @ 12.18 hrs, Volume= 1.222 af, Atten= 27%, Lag= 4.9 min
Primary = 12.22 cfs @ 12.18 hrs, Volume= 1.222 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 369.69' @ 12.18 hrs Surf.Area= 13,847 sf Storage= 6,839 cf

Plug-Flow detention time= 21.4 min calculated for 1.222 af (99% of inflow)
Center-of-Mass det. time= 15.1 min (857.6 - 842.5)

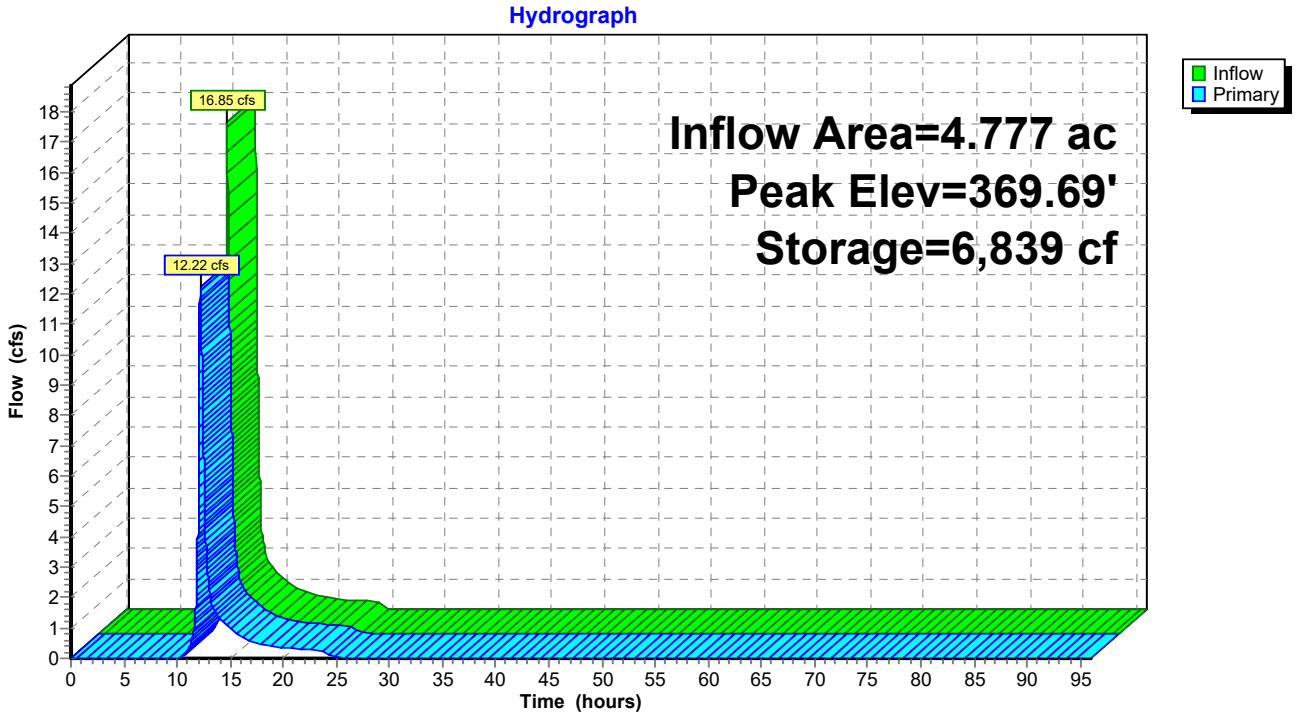
Volume	Invert	Avail.Storage	Storage Description
#1	369.00'	8,430 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
369.00	4,940	0	0
369.20	8,304	1,324	1,324
369.40	10,950	1,925	3,250
369.60	12,950	2,390	5,640
369.80	14,954	2,790	8,430

Device	Routing	Invert	Outlet Devices
#1	Primary	369.10'	**10.0' long x 64.0' 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=12.22 cfs @ 12.18 hrs HW=369.69' (Free Discharge)
└**1=Broad-Crested Rectangular Weir** (Weir Controls 12.22 cfs @ 2.07 fps)

Pond W5: WETLAND 5



Summary for Pond W6: WETLAND 6

Inflow Area = 4.348 ac, 45.54% Impervious, Inflow Depth = 5.03" for 100 yr event
Inflow = 26.05 cfs @ 12.07 hrs, Volume= 1.822 af
Outflow = 17.44 cfs @ 12.15 hrs, Volume= 1.735 af, Atten= 33%, Lag= 4.8 min
Primary = 17.44 cfs @ 12.15 hrs, Volume= 1.735 af

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs
Peak Elev= 372.90' @ 12.15 hrs Surf.Area= 35,915 sf Storage= 14,827 cf

Plug-Flow detention time= 57.0 min calculated for 1.734 af (95% of inflow)
Center-of-Mass det. time= 30.3 min (829.8 - 799.5)

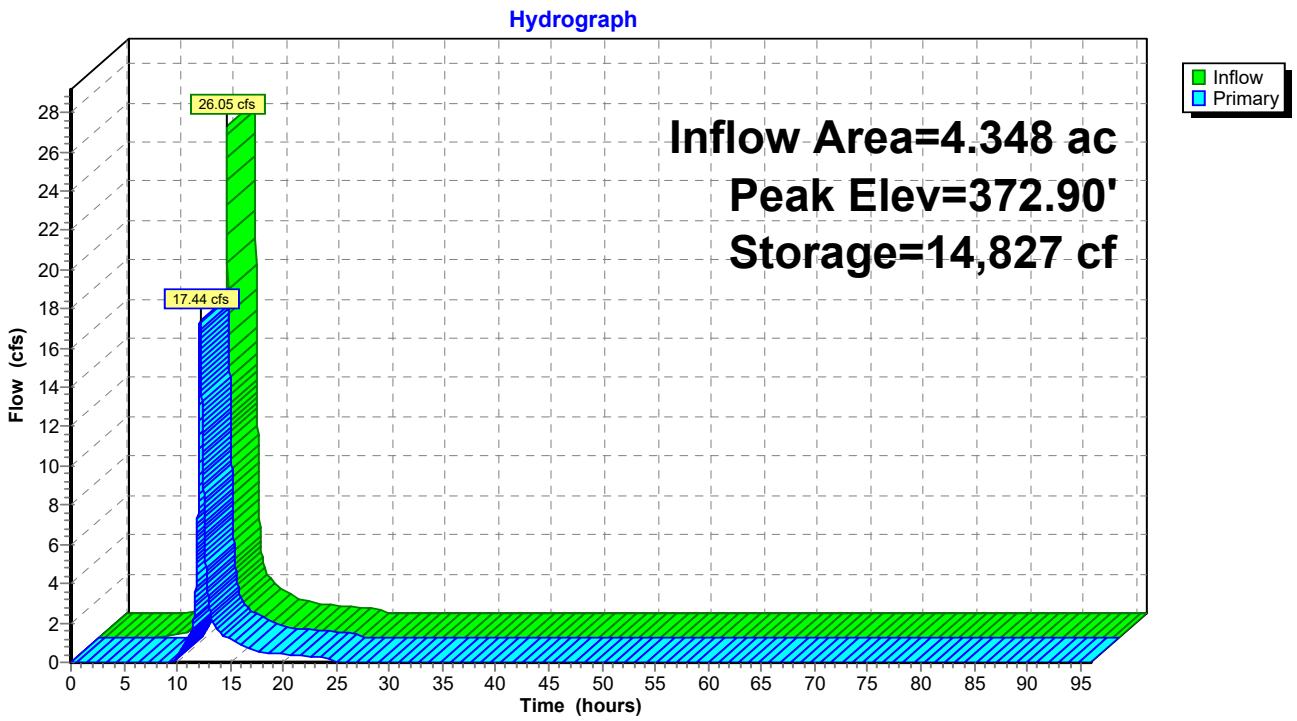
Volume	Invert	Avail.Storage	Storage Description
#1	372.20'	18,754 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
372.20	5,774	0	0
372.40	15,024	2,080	2,080
372.60	23,262	3,829	5,908
372.80	33,082	5,634	11,543
373.00	39,034	7,212	18,754

Device	Routing	Invert	Outlet Devices
#1	Primary	372.50'	**26.0' long x 16.0' 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=17.43 cfs @ 12.15 hrs HW=372.90' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** (Weir Controls 17.43 cfs @ 1.70 fps)

Pond W6: WETLAND 6

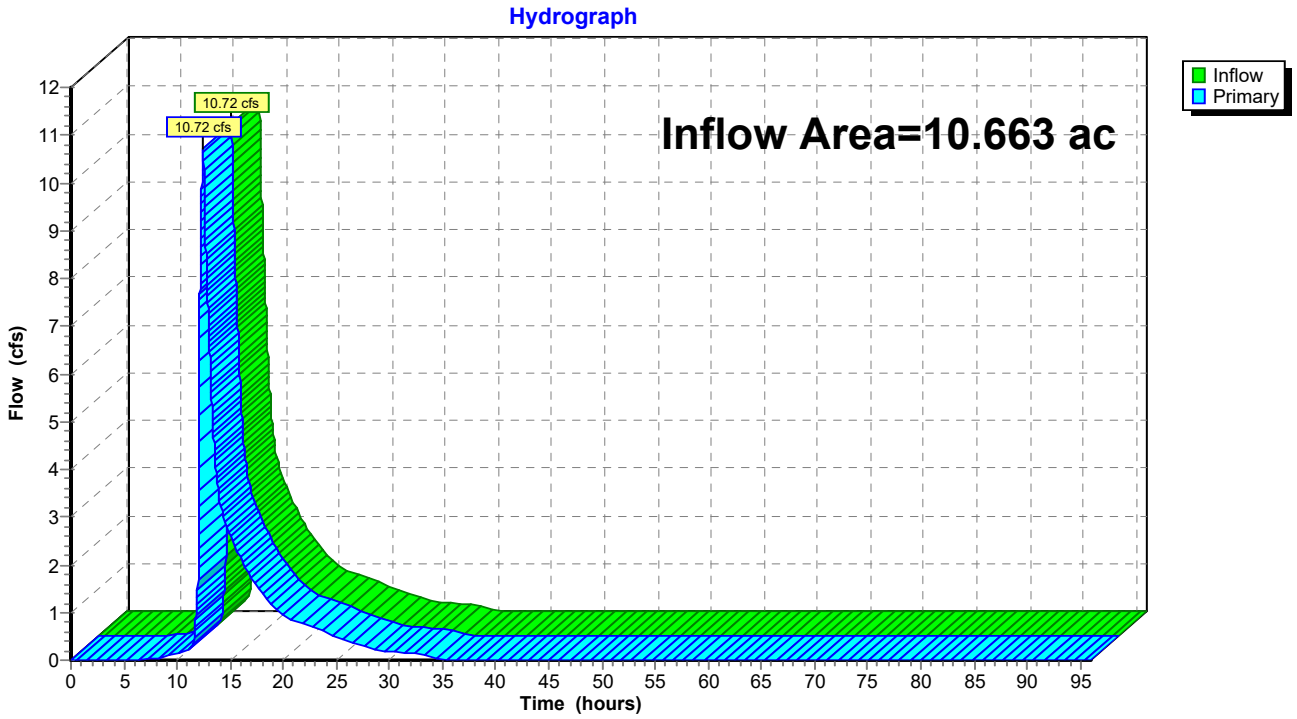


Summary for Link DP1: CHARLES RIVER/ WETLAND 3

Inflow Area = 10.663 ac, 57.86% Impervious, Inflow Depth = 2.87" for 100 yr event
Inflow = 10.72 cfs @ 12.43 hrs, Volume= 2.549 af
Primary = 10.72 cfs @ 12.43 hrs, Volume= 2.549 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs

Link DP1: CHARLES RIVER/ WETLAND 3

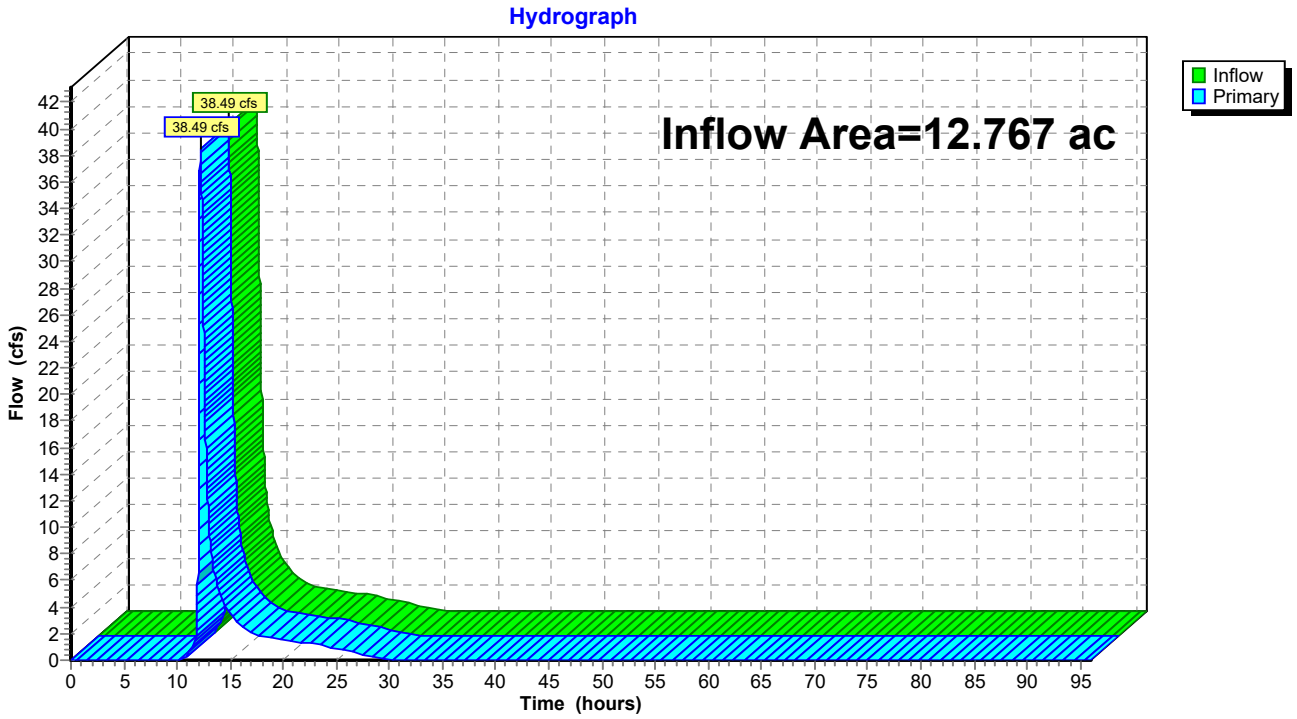


Summary for Link DP2: DEER BROOK/ WETLAND 4

Inflow Area = 12.767 ac, 53.02% Impervious, Inflow Depth = 4.34" for 100 yr event
Inflow = 38.49 cfs @ 12.19 hrs, Volume= 4.616 af
Primary = 38.49 cfs @ 12.19 hrs, Volume= 4.616 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs

Link DP2: DEER BROOK/ WETLAND 4

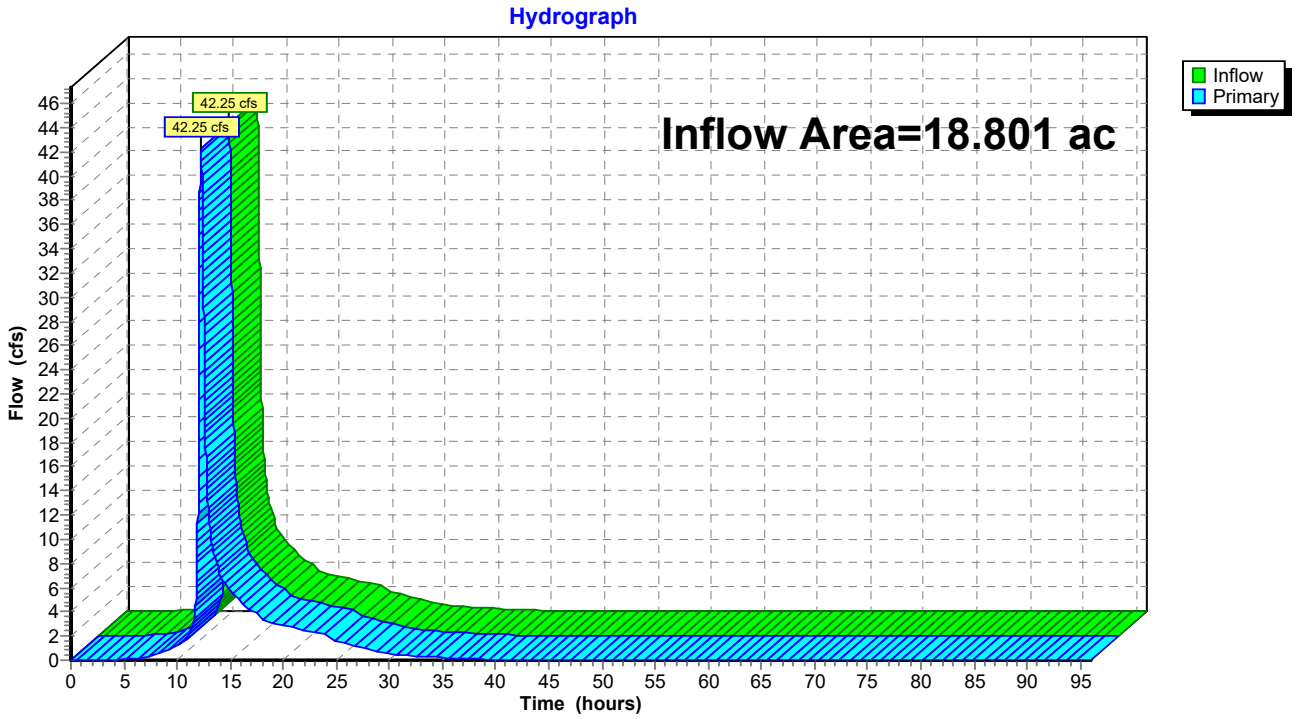


Summary for Link DP3: WETLAND 2

Inflow Area = 18.801 ac, 51.65% Impervious, Inflow Depth = 4.74" for 100 yr event
Inflow = 42.25 cfs @ 12.22 hrs, Volume= 7.423 af
Primary = 42.25 cfs @ 12.22 hrs, Volume= 7.423 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs

Link DP3: WETLAND 2

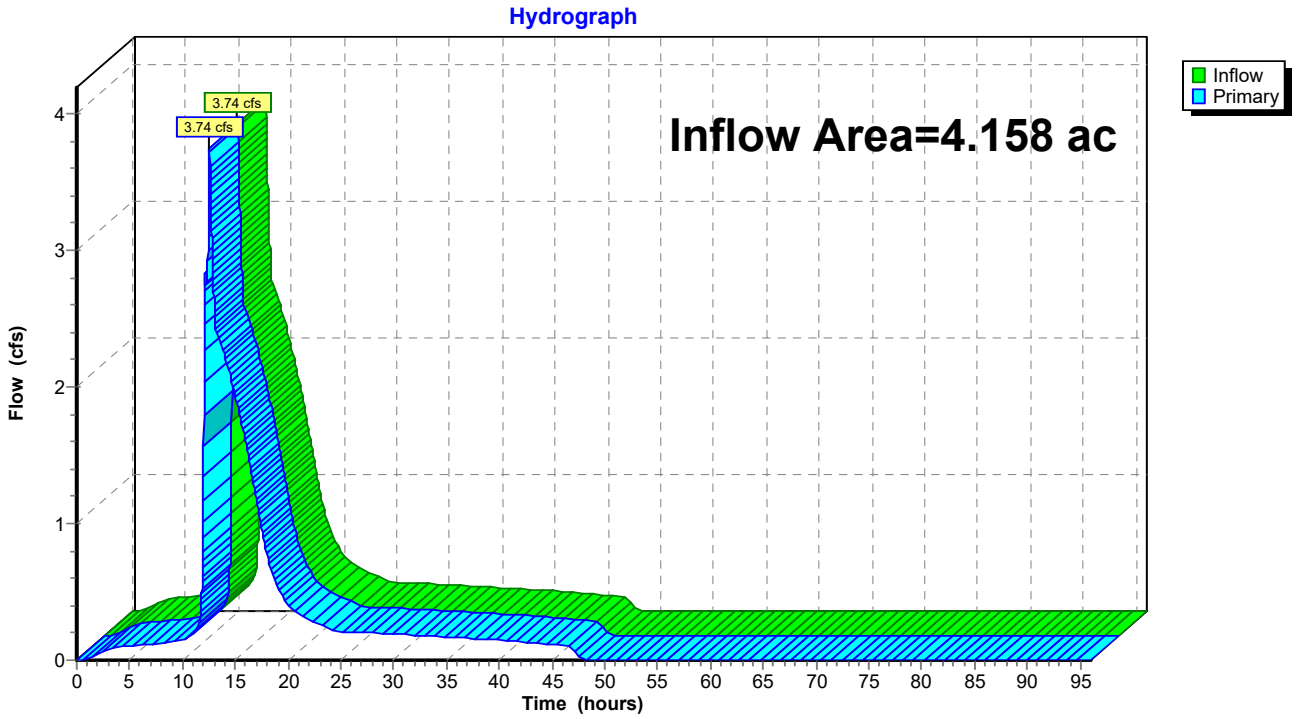


Summary for Link DP4: WETLAND 7/8

Inflow Area = 4.158 ac, 69.42% Impervious, Inflow Depth = 4.56" for 100 yr event
Inflow = 3.74 cfs @ 12.53 hrs, Volume= 1.581 af
Primary = 3.74 cfs @ 12.53 hrs, Volume= 1.581 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.01 hrs

Link DP4: WETLAND 7/8



7.3

Appendix 2: Operation and Maintenance Plan

Operation & Maintenance Plan

Project:

Residences at Stone Ridge

300-400 Deer Street
Milford, MA 01757

February 15, 2018

Prepared by,

SMMA

Symmes Maini & McKee Associates

Cambridge, MA

SMMA No. 17095

OPERATION AND MAINTENANCE PLAN

This Operation and Maintenance (O&M) Plan has been developed in accordance with the Massachusetts DEP Stormwater Management Standard No. 9 to ensure that the stormwater management system functions as designed.

Owner and Responsible Party

As the owner, the Gutierrez Company (200 Wheeler Road, Burlington MA) shall be the party responsible for adherence to the DEP Stormwater Management Policy after to completion of construction and until a Certificate of Compliance is issued by the Conservation Commission. The Gutierrez Company shall designate a Site Supervisor who shall assume responsibility for this maintenance plan, post construction, after a Certificate of Compliance has been issued. The Gutierrez Company shall be responsible for financing maintenance and emergency repairs of the system.

If the property owner changes, it shall be the responsibility of the Gutierrez Company to notify the future owner of the stormwater management system and its components, as well as the requirements for operation and maintenance.

The Town of Milford Zoning Board of Appeals shall be allowed to enter property at reasonable times and in a reasonable manner for the purpose of inspection of the systems.

Maintenance Activities

The following site maintenance activities are required to maintain optimal pollutant attenuation by the drainage system. A maintenance schedule follows in the next section.

<u>Catch Basins and Manholes</u>

Proper maintenance includes inspection of all grates, sumps, and outlets. Any debris or obstructions should be removed. Structural damage should be recorded and reported. The amount of sediment in each structure should be recorded. The sumps shall be cleaned when they are half full of sediment or debris (approximately 2 feet below outlet pipe.)

<u>Constructed Stormwater Wetland</u>

Unlike conventional wet basin systems that require large-scale sediment removal at infrequent intervals, constructed stormwater wetlands require small-scale maintenance at regular intervals to evaluate the health and composition of the plant species. Proponents must carefully observe the constructed stormwater wetland system over time. In the first three years after construction, inspect the constructed stormwater wetlands twice per year, once during the growing and once during the non-growing season. During these inspections, record and map the following information:

- The types and distribution of the dominant wetland plants in the marsh;
- The presence and distribution of planted wetland species;
- The presence and distribution of invasive wetland species (invasives must be removed); Indications that other species are replacing the planted wetland species;
- Percentage of standing water that is unvegetated (excluding the deep water cells which are not suitable for emergent plant growth);

- The maximum elevation and the vegetative condition in this zone, if the design elevation of the normal pool is being maintained for wetlands with extended zones;
- Stability of the original depth zones and the micro-topographic features; and
- Accumulation of sediment in the forebay and micropool; and survival rate of plants (cells with dead plants must be replanted).

Infiltration Basins

Infiltration basins are prone to clogging and failure, so it is imperative to develop and implement aggressive maintenance plans and schedules. Installing the required pretreatment BMPs will significantly reduce maintenance requirements for the basin.

The Operation and Maintenance Plan required by Standard 9 must include inspections and preventive maintenance at least twice a year, and after every time drainage discharges through the high outlet orifice. The Plan must require inspecting the pretreatment BMPs in accordance with the minimal requirements specified for those practices and after every major storm event. A major storm event is defined as a storm that is equal to or greater than the 2-year, 24-hour storm (generally 2.9 to 3.6 inches in a 24-hour period, depending in geographic location in Massachusetts).

Once the basin is in use, inspect it after every major storm for the first few months to ensure it is stabilized and functioning properly and if necessary take corrective action. Note how long water remains standing in the basin after a storm; standing water within the basin 48 to 72 hours after a storm indicates that the infiltration capacity may have been overestimated. If the ponding is due to clogging, immediately address the reasons for the clogging (such as upland sediment erosion, excessive compaction of soils, or low spots).

Thereafter, inspect the infiltration basin at least twice per year. Important items to check during the inspection include:

- Signs of differential settlement,
- Cracking,
- Erosion,
- Leakage in the embankments
- Tree growth on the embankments
- Condition of riprap,
- Sediment accumulation and
- The health of the turf.

At least twice a year, mow the buffer area, side slopes, and basin bottom. Remove grass clippings and accumulated organic matter to prevent an impervious organic mat from forming. Remove trash and debris at the same time. Use deep tilling to break up clogged surfaces, and revegetate immediately.

Remove sediment from the basin as necessary, but wait until the floor of the basin is thoroughly dry. Use light equipment to remove the top layer so as to not compact the underlying soil. Deeply till the remaining soil, and revegetate as soon as possible. Inspect and clean pretreatment devices associated with basins at least twice a year, and ideally every other month.

Pavement and Grass Areas

The pavement areas should be swept to remove solids and reduce the amount of suspended solids in the runoff. All accumulated trash and litter throughout the site should be collected and discarded.

Sediment Forebay

Sediments and associated pollutants are removed only when sediment forebays are actually cleaned out, so regular maintenance is essential. Frequently removing accumulated sediments will make it less likely that sediments will be re-suspended. When mowing grasses, keep the grass height no greater than 6 inches. Set mower blades no lower than 3 to 4 inches. Check for signs of rilling and gullying and repair as needed. After removing the sediment, replace any vegetation damaged during the clean-out by either reseeding or re-sodding. When reseeding, incorporate practices such as hydro-seeding with a tackifier, blanket, or similar practice to ensure that no scour occurs in the fore bay, while the seeds germinate and develop roots.

Snow Removal

Maintenance activities during the winter months are primarily limited to snow removal activities and removal of debris and trash throughout the site.

Snow removal operations will adhere to the Massachusetts Department of Environmental Protection – Bureau of Resource Protection Guidelines (dated March 8, 2001). Snow will be stockpiled as far away from resource areas as possible and removed as necessary under larger snow events. Stockpiling snow in this manner will allow meltwater to enter the drainage system and thereby receive pretreatment prior to discharging to receiving resource areas. Snow and ice that has accumulated around catch basin grates will be removed.

Subsurface Recharge Structures

The inlet and outlet of each system should be inspected and cleared of any debris that might clog the system. The system should be checked to ensure functionality after installation. The area above and immediately adjacent to the infiltration system should be checked for depressions. The area above and adjacent to the system should also be inspected to ensure that no unauthorized modifications have been made.

Water Quality Unit

The visual inspection should ascertain that the system components are in working order and that there are no blockages or obstructions in the inlet and separation screen. The inspection should also quantify the accumulation of hydrocarbons, trash, and sediment in the system. Measuring pollutant accumulation can be done with a calibrated dipstick, tape measure or other measuring instrument.

The water quality system should be cleaned when the level of sediment has reached 75% of capacity in the isolated sump or when an appreciable level of hydrocarbons and trash has accumulated. Performance will not be impacted until 100% of the sump capacity is exceeded however it is recommended that the system be cleaned prior to that for easier removal of sediment. The level of sediment is easily determined by measuring from finished grade down to the top of the sediment pile. To avoid underestimating the level of sediment in the chamber, the measuring device must be lowered to the top of the sediment pile carefully. Particles at the top of the pile typically offer less resistance to the end of the rod than consolidated particles toward the bottom of the pile. Once this measurement is recorded, it should be compared to the as-built drawing for the unit to determine whether the height of the sediment pile off the bottom of the sump floor exceeds 75% of the total height of isolated sump.

Cleaning of the systems should be done during dry weather conditions when no flow is entering the system. The use of a vacuum truck is generally the most effective and convenient method of removing pollutants from the system. Simply remove the manhole cover and insert the vacuum hose into the sump. The system should be completely drained down and the sump fully evacuated of sediment. The area outside the screen should also be cleaned out if pollutant build-up exists in this area.

Winter Salt & Sand Use

For concrete walkways and plaza areas, no binary chloride compounds shall be applied, i.e. sodium chloride, calcium chloride or magnesium chloride, for a minimum of 6 months after concrete installation is complete. This allows the concrete to cure to its optimal strength. For the first year, an aggressive snow removal process through mechanical means or hand shoveling followed by the use of sand or fine gravel mixtures optimal for the life of the sidewalks and plaza systems.

No sodium chloride is to be used within the 100 foot Buffer Zone.

Estimated Maintenance Budget

The estimated annual maintenance budget for this project is $8,000. Included in this estimate are all the necessary maintenance activities mentioned in this Operation and Maintenance Plan as well as allowances for documentation and record keeping. It should be noted that this cost will vary from year to year, as not all maintenance activities are required on a yearly basis.

MAINTENANCE SCHEDULE

Site Component	Required Action	Frequency
Catch Basins and Manholes	Inspect for depth of sediment, obstructions, structural damage, or other malfunction	Quarterly in first year, at least twice per year after
	Clean sumps of accumulated sediment	Clean sumps when they are 1/2 full of sediment/ debris (approx. 2-feet below outlet pipe) or once a year minimum. Document amount of sediment observed (inches below outlet pipe.)
Constructed Stormwater Wetlands	Inspect wetland during both the growing and non-growing seasons	Twice per year during first three years after construction
	Clean out forebays	Once per year
Infiltration Basins	Once the basin is in use, inspect it after every major storm for the first few months to ensure it stabilized and functioning properly	As necessary
	Inspect infiltration basin for signs of differential settlement, cracking, erosion, leakage in the embankments, condition or rip-rap, sediment accumulation and the health of the turf	Twice per year
	Mow buffer area, side slopes, and basin bottom. Remove grass clipping and organic matter.	Twice per year
	Remove sediment from the basin.	As necessary
Pavement and Grass Areas	Sweep pavement areas	Minimum twice per year, first after final snow melt then after final leaf fall. As necessary in Summer months.
	Remove accumulated trash, litter, and discarded materials throughout the site	Weekly
Sediment Forebays	Inspect sediment forebays	Monthly
	Clean sediment forebays	Four times per year and when sediment depth is between 3 to 6 feet.
Subsurface Infiltration Structures	Inspect inlets & outlets and remove any debris that might clog system	Quarterly in first year, at least twice per year after

	Inspect system for functionality	After first major rainfall event after installation
	Check for depressions in areas above & surrounding the infiltration system	Quarterly in first year, at least twice per year after
	Confirm that no unauthorized modifications have been performed to site over & surrounding the infiltration system	Yearly
	Inspect interior of infiltration system	Clean annually if needed
Water Quality Treatment Unit	Clean out sediment in basin/wetland system	As necessary, at a minimum of once every 10 years
	Inspect for depth of sediment, obstructions, structural damage, or other malfunction.	Twice per year, spring and fall
	Remove sediments and associated pollutants.	The system should be cleaned when the level of sediment has reached 75% of capacity in the isolated sump or when an appreciable level of hydrocarbons and trash has accumulated, at a minimum of once a year.

REPORTING & DOCUMENTATION

The Site Supervisor for the Gutierrez Company shall be responsible for maintaining an accurate Site Maintenance Log. The Site Maintenance Log shall be located on-site and made available to the Milford Conservation Commission upon request.

The Site Maintenance Log shall:

- Document the completion of planned maintenance tasks.
- Identify the person responsible for the completion of tasks.
- Identify any outstanding problems, malfunctions or inconsistencies identified during the course of routine maintenance.

The Site Supervisor shall be responsible for ensuring that the scheduled tasks are appropriately completed as described in this plan and the Site Maintenance Log accurately represents activities carried out as described in this plan.

Site Maintenance Log

A Site Maintenance Log shall be completed as described above, and shall, at a minimum include the following items:

- Completed Inspection Checklist.
- Date of activity performed.
- Specific maintenance task.
- Structural components maintained, as identified on the O & M Plan.
- Staff person or contractor performing activity on behalf of The Gutierrez Company.
- Supervisor verification of maintenance activity.
- Recommended additional maintenance task.
- Means to document identified areas of concern, erosion or systems discrepancies requiring attention.

Public Safety Features

On-site public safety features include the following:

- Heavy-duty covers and grates on all manholes and catch-basins designed to withstand H20 loading.
- Maintain or reduce peak runoff rates from pre-development to post-development.
- Creation and implementation of Operations & Maintenance Plan to ensure the ability of the stormwater management system to continue to operate as designed.

INSPECTION CHECKLIST

Date of Inspection _____ Checklist Completed By _____

Reviewed by Supervisor _____

Site Component	Required Action	Frequency	Comments
Subsurface Recharge Structures	Inspect inlets and outlets and remove any debris	Quarterly First Year, Semi-Annually After	
	Check for depressions in areas above and surrounding the recharge systems	Quarterly First Year, Semi-Annually After	
	Inspect Interior for sediment and clean as needed	Annually	
Catch Basins & Manholes	Inspect for depth of sediment, obstructions, structural damage, or other malfunctions	Quarterly First Year, Semi-Annually After	
	Clean out oils and sediment	When accumulation reaches two feet, or once a year minimum	
Pavement Areas	Sweet Pavement	Minimum twice yearly. First after snow melt and after final leaf fall. As necessary in summer months.	
	Remove trash, litter, and discarded materials	Weekly	
Grass Areas	Remove trash, litter, and discarded materials	Weekly	

Infiltration Basins	Once the basin is in use, inspect it after every major storm for the first few months to ensure it stabilized and functioning properly	As necessary	
	Inspect infiltration basin for signs of differential settlement, cracking, erosion, leakage in the embankments, condition or rip-rap, sediment accumulation and the health of the turf	Twice per year	
	Mow buffer area, side slopes, and basin bottom. Remove grass clipping and organic matter.	Twice per year	
	Remove sediment from the basin.	As necessary	
Constructed Stormwater Wetlands	Inspect wetland during both the growing and non-growing seasons	Twice per year during first three years after construction	
	Clean out forebays	Once per year	
Sediment Forebays	Inspect sediment forebays	Monthly	
	Clean sediment forebays	Four times per year and when sediment depth is between 3 to 6 feet.	
Water Quality Treatment Unit	Inspect for depth of sediment, obstructions, structural damage, or other malfunction.	Twice per year, spring and fall.	
	Remove sediments and associated pollutants.	The system should be cleaned when the level of sediment has reached 75% of capacity in the isolated sump or when an appreciable level of hydrocarbons and trash has accumulated, at a minimum of once a year.	

7.3

Appendix 3: Stormwater Calculations

SMMA

1000 MASSACHUSETTS AVENUE
CAMBRIDGE, MASSACHUSETTS 02138
T: 617.547.5400

The Gutierrez Company
Residences at Stone Ridge
SMMA Job No. 17095
Date: 3/9/2018
Calc by: DCC
Check by: WAP

Peak Discharge Rate Summary

Design Point	2-year			10-year			25-year			100-year		
	Existing	Previously Approved	Proposed	Existing	Previously Approved	Proposed	Existing	Previously Approved	Proposed	Existing	Previously Approved	Proposed
DP-1	1.08	1.07	0.55	5.21	5.21	1.77	9.44	8.41	4.78	16.99	16.32	10.72
DP-2	1.90	1.47	1.34	11.34	10.46	10.90	22.98	19.63	21.54	40.13	40.10	39.96
DP-3	4.13	3.07	4.10	13.84	9.54	13.87	26.21	18.95	24.74	47.05	38.23	42.25
DP-4	0.45	0.31	0.31	2.84	1.13	1.13	5.43	1.92	1.92	9.70	3.74	3.74

| ARCHITECTURE | ENGINEERING | INTERIOR DESIGN | PLANNING

1000 MASSACHUSETTS AVENUE
CAMBRIDGE, MASSACHUSETTS 02138
T: 617.547.5400

The Gutierrez Company
Residences at Stone Ridge
SMMA Job No. 17095
Date: 3/9/2018
Calc by: DCC
Check by: WAP

Required Recharge Volume & Dradown Calculations

Required recharge volume is calculated utilizing DEP's "static method".
Drawdown times are based on anticipated Rawls Rates of the soils where systems are located.

Required Recharge Volume

	Contributing Impervious Area			Target Depth Factor	Required Volume	
		sf	*acre*	*in*	*cf*	
Basin 2	HSG B	62834	1.4	0.35	1,833	1,982
	HSG D	17968	0.4	0.10	150	
Basin 3A	HSG B	80340	1.8	0.35	2,343	2,343
Basin 3B	HSG B	64803	1.5	0.35	1,890	1,890
Basin 3C	HSG B	86340	2.0	0.35	2,518	2,663
	HSG D	17400	0.4	0.10	145	
Basin 4	HSG B	94190	2.2	0.35	2,747	3,085
	HSG D	40506	0.9	0.10	338	
Basin 5A	HSG B	241457	5.5	0.35	7,042	7,212
	HSG D	20341	0.5	0.10	170	
Basin 5B	HSG B	27018	0.6	0.35	788	846
	HSG D	6964	0.2	0.10	58	
TOTAL		760161	17.5			20,022

1000 MASSACHUSETTS AVENUE
CAMBRIDGE, MASSACHUSETTS 02138
T: 617.547.5400

Provided Recharge Volume

	Width *ft*	Length *ft*	Bottom Area *sf*	Bottom of System *El.*	Low Outlet Elevation *El.*	Recharge Provided* *cf*
Basin 2			5,718	322.00	323.50	8,577
Basin 3A	50	100	5,000	332.00	337.00	0
Basin 3B	50	100	5,000	354.00	358.00	0
Basin 3C	50	100	5,000	355.00	358.00	0
Basin 4			7,771	322.00	323.00	0
Basin 5A			7,400	352.00	353.50	11,100
Basin 5B			1,623	350.00	351.50	2,435
TOTAL						22,112

Drawdown Time

	Recharge Volume *cf*	K (Rawls Rate) *in/hr*	Bottom Area *sf*	Time* *hr*
Basin 2	8,577	1.02	5,718	17.6
Basin 3A	0	0.555	5,000	0.0
Basin 3B	0	1.02	5,000	0.0
Basin 3C	0	1.02	5,000	0.0
Basin 4	0	0.555	7,771	0.0
Basin 5A	11,100	0.39	7,400	46.2
Basin 5B	2,435	1.02	1,623	17.6

*Time = Recharge Volume / K * Bottom Area

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: PR 1.3

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)
Deep Sump and Hooded Catch Basin	**0.25**	**1.00**	**0.25**	**0.75**
Proprietary Treatment Practice	**0.80**	**0.75**	**0.60**	**0.15**
Infiltration Basin	**0.80**	**0.15**	**0.12**	**0.03**
	0.00	**0.03**	**0.00**	**0.03**
	0.00	**0.03**	**0.00**	**0.03**

Total TSS Removal = **97%**

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

Project: **Residences at Stone Ridge**
Prepared By: **DCC**
Date: **3/9/2018**

*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

Mass. Dept. of Environmental Protection

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: PR 3.2

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)
Deep Sump and Hooded Catch Basin	**0.25**	**1.00**	**0.25**	**0.75**
Proprietary Treatment Practice	**0.80**	**0.75**	**0.60**	**0.15**
Sediment Forebay	**0.25**	**0.15**	**0.04**	**0.11**
Constructed Stormwater Wetland	**0.80**	**0.11**	**0.09**	**0.02**
	0.00	**0.02**	**0.00**	**0.02**

Total TSS Removal = **98%**

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

Project: **Residences at Stone Ridge**
Prepared By: **DCC**
Date: **3/9/2018**

*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

Mass. Dept. of Environmental Protection

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: PR 3.5

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)
Deep Sump and Hooded Catch Basin	**0.25**	**1.00**	**0.25**	**0.75**
Proprietary Treatment Practice	**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: **Residences at Stone Ridge**
Prepared By: **DCC**
Date: **3/9/2018**

*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

Mass. Dept. of Environmental Protection

7.4

Appendix 4: Subsurface Data Report

SHA
IMPROVING EARTH

SANBORN, HEAD & ASSOCIATES, INC.
1 Technology Park Drive ■ Westford, MA 01886
P (978) 392-0900 ■ F (978) 392-0987
www.sanbornhead.com

May 29, 2008
File No. 2928.00

Mr. Edward M. Scioli
The Gutierrez Company
One Wall Street
Burlington, MA 01803

Re: Subsurface Data Report
Stone Ridge
Milford, MA

Dear Ed:

Sanborn, Head & Associates, Inc. (SHA) has prepared this subsurface data report on behalf of The Gutierrez Company (Client) for the proposed Stone Ridge development located north of the intersection of Route 495 and Cedar Street in Milford, Massachusetts (site). The location of the project site is shown on the Locus Plan, Figure 1.

Test pits designated TP-1 through TP-16 were excavated in the proposed locations of the stormwater management basins and wetland replacement areas at locations selected by Vanasse Hangen Brustlin, Inc. of Watertown, Massachusetts (VHB). An additional nine test pits were excavated to provide subsurface data in proposed cut areas at the site. These test pits were designated (TP-17 to TP-26, excluding TP-19 which was not excavated). Test pit TP-19 was proposed in the north portion of proposed office Building 3, but could not be accessed due to the high quantity of boulders at the ground surface in the area. The approximate locations of the test pits are shown on Figures 2 and 3.

VHB staked the proposed test pit locations in the field. BMC Corporation of Pinehurst, Massachusetts excavated the 25 test pits between May 5 and 12, 2008. SHA observed the excavation of the test pits and prepared the attached logs of soil and groundwater conditions observed in the test pit excavations. Table 1 provides a summary of subsurface information obtained from the test pits TP-1 through TP-16 that were excavated in the proposed stormwater management basins and wetland replacement areas.

SHA collected soil samples for laboratory grain size distribution (sieve) analysis from TP-1, TP-2, and TP-9 through TP-14 to obtain data that could be used to estimate the permeability of the soil in the proposed stormwater management areas and the feasibility of stormwater infiltration. The soil laboratory testing was performed by GeoTesting Express, Inc. of Boxborough, MA and their soil laboratory reports are attached. Soil samples from other test pit locations were not submitted for laboratory testing due to either (1) the presence of shallow bedrock above the proposed infiltration elevation, or (2) because infiltration is not proposed at those locations. As requested by VHB, SHA used the laboratory data from the sieve analyses and the Kozeny-

Carman equation to estimate the theoretical permeability of the soil in the proposed stormwater management areas. The results are summarized on Table 1.

The groundwater levels noted on the test pit logs are based on the depth that groundwater seepage was observed on the sidewalls of the test pit excavation (if any), and therefore, are based on relatively short stabilization times. Actual groundwater levels may be higher at locations where low permeability soils exist. Consideration should be given to installation of groundwater monitoring wells in the proposed stormwater management basin and wetland replacement areas if it is necessary to obtain stabilized groundwater level measurements over time.

At locations where redoximorphic features (soil mottling) were observed that may indicate evidence of the seasonal high groundwater level, the depth has been noted on the logs. It should be noted that evidence of soil mottling was not observed in every test pit.

If you have any questions regarding the report, or require additional information, please call.

Very truly yours,
SANBORN, HEAD & ASSOCIATES, INC.

Brian Bettencourt	Vernon R. Kokosa, P.E.
Senior Project Engineer	Principal

BDB/VRK:bdb

Encl. Figure 1: Locus
Figure 2: Exploration Location Plan (North Side)
Figure 3: Exploration Location Plan (South Side)
Table 1: Stormwater Test Pit Data Summary
Test Pit Logs
Soil Laboratory Reports

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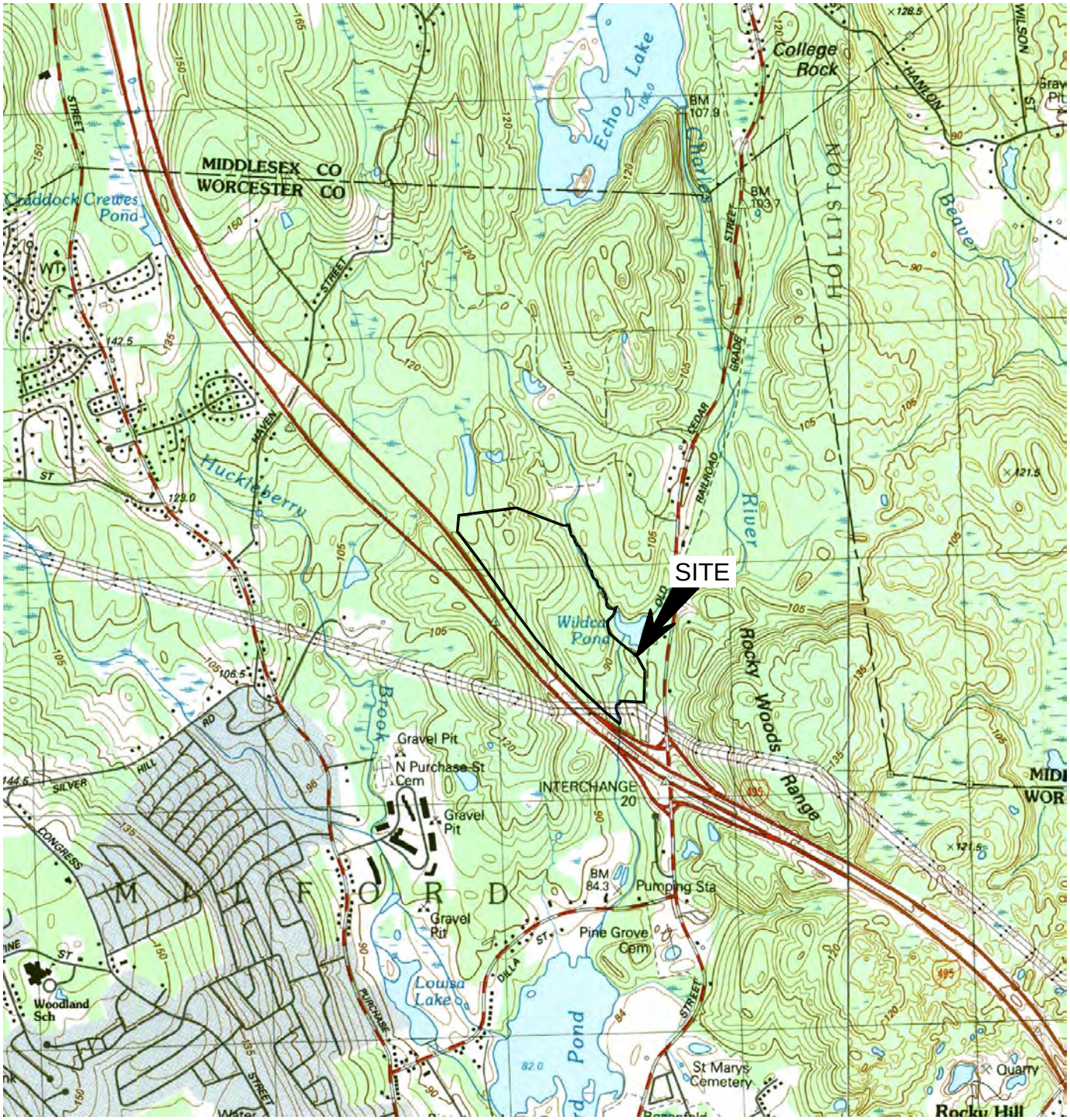
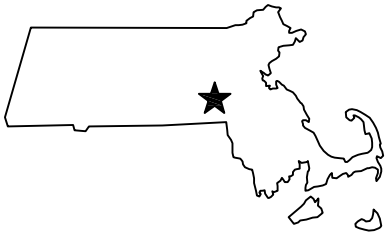


Notes:
Base map taken from MASSGIS website
7.5 minute USGS Quadrangle Maps:
Milford, Massachusetts, Revised: 1985



Scale: 1:25,000

SHA
IMPROVING EARTH

Drawn By: RWH
Designed By: BDB
Reviewed By: VRK
Date: MAY 08

Figure # 1

LOCUS PLAN

SUBSURFACE DATA SUMMARY REPORT
STONE RIDGE
MILFORD, MASSACHUSETTS

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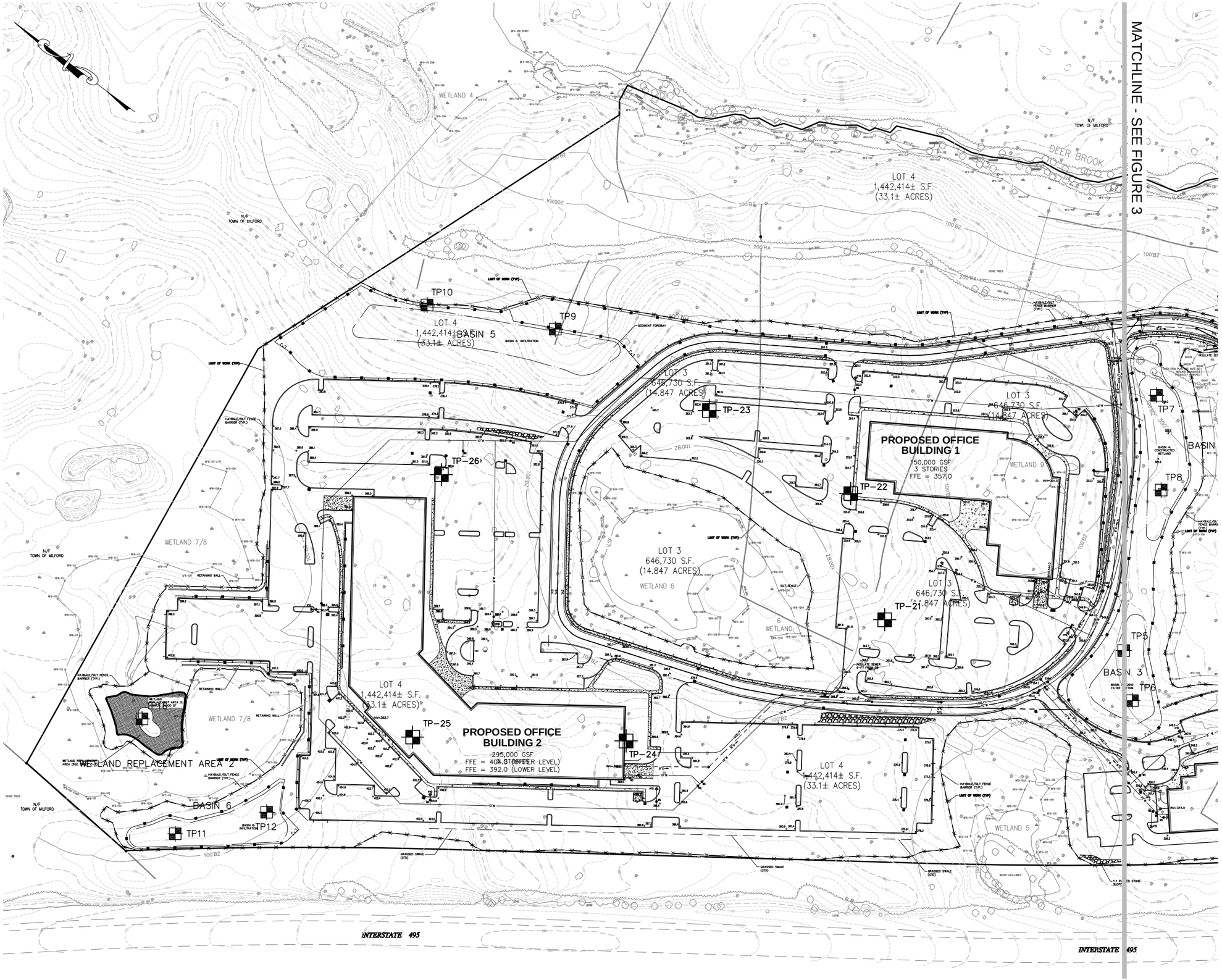

Figure # 2

EXPLORATION LOCATION PLAN

SUBSURFACE DATA SUMMARY REPORT

STONE RIDGE

MILFORD, MASSACHUSETTS

Drawn By: RWH
Designed By: BDB
Reviewed By: VRK
Date: MAY 08

Figure Narrative

The base map was drawn from a plan titled "Geotechnical Investigations", Prepared by Vanasse Hangen Brustlin, Inc. (VHB) of Watertown, Massachusetts. Dated April 22, 2008, Original scale: 1" = 120'

Test pits TP-1 through TP-26 were excavated by B.M.C. Corporation of Pinehurst, Massachusetts on May 7 to 13, 2008. TP-19 was not excavated due to location access issues. Test pits were observed by SHA and locations shown are based on pre-surveyed staked locations by VHB and taped offsets by SHA.

Legend

TP-1 Location and Designation of Test Pits observed by SHA

GRAPHICAL SCALE

0 80 160 240 FEET

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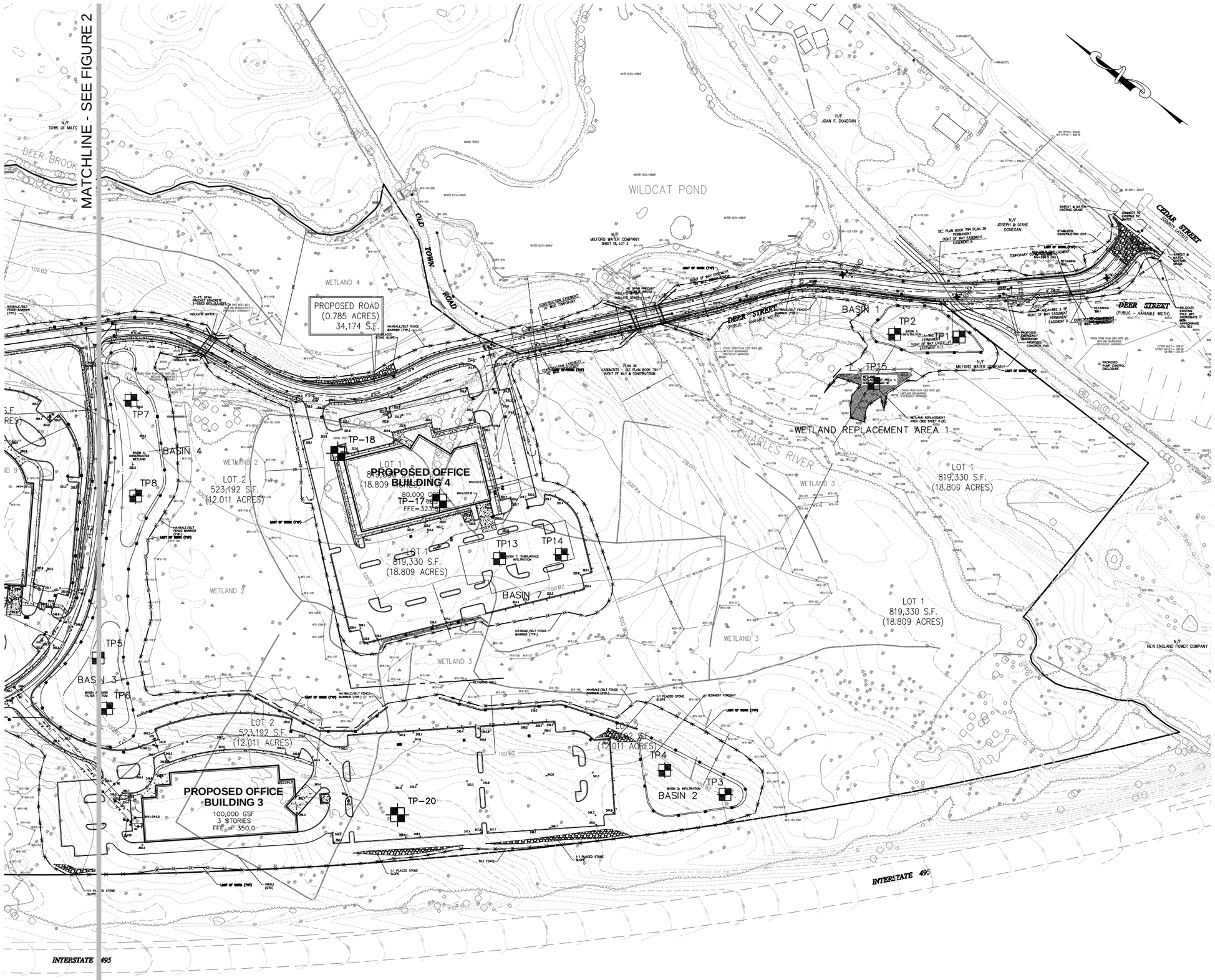

Figure # 3

EXPLORATION LOCATION PLAN

SUBSURFACE DATA SUMMARY REPORT

STONE RIDGE

MILFORD, MASSACHUSETTS

Drawn By: RWH
Designed By: BDB
Reviewed By: VRK
Date: MAY 08

Figure Narrative

The base map was drawn from a plan titled "Geotechnical Investigations", Prepared by Vanasse Hangen Brustlin, Inc. (VHB) of Watertown, Massachusetts. Dated April 22, 2008, Original scale: 1" = 120'

Test pits TP-1 through TP-26 were excavated by B.M.C. Corporation of Pinehurst, Massachusetts on May 7 to 13, 2008. TP-19 was not excavated due to location access issues. Test pits were observed by SHA and locations shown are based on pre-surveyed staked locations by VHB and taped offsets by SHA.

Legend

TP-20 Location and Designation of Test Pits observed by SHA

GRAPHICAL SCALE

0 80 160 240 FEET

SHA IMPROVING EARTH

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Table 1
Stormwater Test Pit Data Summary
Stone Ridge
Milford, Massachusetts

Test Pit	Basin Number	Existing Ground Elevation (ft)	Depth to Seasonal High Groundwater (ft)	Depth to Observed Groundwater (ft)	Depth of Excavation (ft)	Refusal Elevation (ft)	Kozeny-Carman Permeability Analysis (ft/day)	Comments
TP-1	1	297	NE	NE	7.0	< 290	626	Permeability analysis performed at 4'
TP-2	1	301	9.0	NE	12.0	< 289	14	Permeability analysis performed at 8'
TP-3	2	321	NE	NE	4.0	317	Shallow Rock	Gradation sample not collected: shallow rock
TP-4	2	323	NE	NE	7.0	316	Shallow Rock	Gradation sample not collected: shallow rock
TP-5	3	333	2.0	3.0	10.0	< 323	No Infiltration Prop.	
TP-6	3	335	NE	2.0	11.5	< 323.5	No Infiltration Prop.	
TP-7	4	325.5	NE	5.0	7.0	< 318.5	No Infiltration Prop.	
TP-8	4	326.5	NE	2.0	8.0	< 318.5	No Infiltration Prop.	
TP-9	5	340	NE	NE	6.0	< 334	4.3	Permeability analysis performed at 3'
TP-10	5	348	10.0	10.0	12.0	< 336	6.0	Permeability analysis performed at 8'
TP-11	6	393	NE	NE	9.0	< 384	3.2	Permeability analysis performed at 5'
TP-12	6	393	NE	NE	9.0	< 384	5.1	Permeability analysis performed at 5'
TP-13	7	321	NE	10.0	11.0	< 310	8.7	Permeability analysis performed at 7'
TP-14	7	317	3.0	NE	7.0	< 310	3.4	Permeability analysis performed at 4'
TP-15	WRA 1	290	2.0	4.0	6.0	< 284	No Infiltration Prop.	
TP-16	WRA 2	390	NE	8.0	9.0	< 381	No Infiltration Prop.	

Legend:
NE: Not Encountered.
< : Denotes "less than" the excavation termination elevation indicated.

Notes:
1. Test Pits were excavated by B.M.C. Corporation of Pinehurst, MA between May 5 and 12, 2008, and were observed by SHA.
2. Elevations referenced to National Geodetic Vertical Datum, 1929.

SHA
IMPROVING EARTH

Project: Stone Ridge
Location: Milford, MA
SHA Project No.: 2928.00

Test Pit No. TP-1

Ground Elevation: 297 ± feet
Datum: NGVD 1929
Weather: Sunny, 60's

Date: 05/07/08
Time Started: 07:50
Time Finished: 08:10

Logged By: J. Colby/P. Malone
Checked By: B. Bettencourt

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Test Pit	Stab. Time
05/07/08	08:10	Not Encountered		7'	10 minutes

Excavation Equipment

Contractor: BMC Corporation
Operator: R. Corsetti
Reach: 15 ft

Make: Komatsu
Model: PC300 LC
Bucket Capacity: 1 3/4 CY

Depth (ft)	Field Testing Data	Strata Depth (ft)	Geologic Description	Strata Depth (ft)	Excv. Effort	Boulder Qty & Class	Remarks
0		0	Dark brown, fine to coarse SAND, some Organic Silt, some visible Plant fibers. Moist. TOPSOIL.	0	E		1) Sample collected at 4 feet for laboratory grain size analysis.
		0.5		0.5			2) No groundwater encountered.
2						>10/A >5/B	
			Tan, fine to coarse GRAVEL, and Sand, trace Silt. Moist.				
4							
6							
		7	Test Pit terminated at 7 feet. No refusal encountered.	7			
8							
10							
12							
14							
16							
18							
20							

Excavation Effort

E	Easy
M	Moderate
D	Difficult

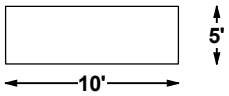
Boulder Size Classification

12" - 24"	A
24" - 36"	B
36" and larger	C

Soil Description
Minor Component Proportions

trace	0 - 10%
little	10 - 20%
some	20 - 35%
and	35 - 50%

Test Pit Plan



North Arrow

SHA
IMPROVING EARTH

Project: Stone Ridge
Location: Milford, MA
SHA Project No.: 2928.00

Test Pit No. TP-2

Ground Elevation: 301 ± feet
Datum: NGVD 1929
Weather: Sunny, 60's

Date: 05/07/08
Time Started: 08:30
Time Finished: 09:00

Logged By: J. Colby/P. Malone
Checked By: B. Bettencourt

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Test Pit	Stab. Time
05/07/08	08:50		Not Observed	12'	5 minutes

Excavation Equipment

Contractor: BMC Corporation
Operator: R. Corsetti
Reach: 15 ft

Make: Komatsu
Model: PC300 L
Bucket Capacity: 1 3/4 CY

Depth (ft)	Field Testing Data	Strata Depth (ft)	Geologic Description	Strata Depth (ft)	Excv. Effort	Boulder Qty & Class	Remarks
0		0	Dark brown, Organic SILT, some Sand, trace Roots. TOPSOIL.	0	E	3/A	1) Sample collected at 8 feet for laboratory grain size analysis.
		0.5	Tan, fine SAND, and Silt, trace Roots, trace Gravel. Moist.	0.5			2) Evidence of seasonal high groundwater at 9 feet.
		1.5	Tan, fine to medium SAND, little Silt, little Gravel. Moist.	1.5			
2		2.5	Tan/gray, fine to coarse SAND & GRAVEL, trace Silt. Stratified. Moist.	2.5			
4							
6		6	Tan, fine to coarse SAND & GRAVEL, trace Silt. Moist.	6	M	10/A 5/B <5/C	
8			Orange/brown, fine to coarse GRAVEL, and Sand, little Silt. Moist.				
10							
12		12	Test Pit terminated at 12 feet. No refusal encountered.	12			
14							
16							
18							
20							

Excavation Effort

E	Easy
M	Moderate
D	Difficult

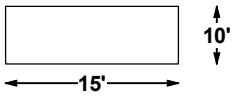
Boulder Size Classification

12" - 24"	A
24" - 36"	B
36" and larger	C

Soil Description
Minor Component Proportions

trace	0 - 10%
little	10 - 20%
some	20 - 35%
and	35 - 50%

Test Pit Plan



North Arrow

Sheet: 1 of 1

SHA
IMPROVING EARTH

Project: Stone Ridge
Location: Milford, MA
SHA Project No.: 2928.00

Test Pit No. TP-3

Ground Elevation: 321 ± feet
Datum: NGVD 1929
Weather: Cloudy, 60's

Date: 05/08/08
Time Started: 12:05
Time Finished: 12:30

Logged By: J. Colby
Checked By: B. Bettencourt

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Test Pit	Stab. Time
05/08/08	12:20	Not Encountered		4'	5 minutes

Excavation Equipment

Contractor: BMC Corporation
Operator: R. Corsetti
Reach: 15 ft

Make: Komatsu
Model: PC300 LC
Bucket Capacity: 1 3/4 CY

Depth (ft)	Field Testing Data	Strata Depth (ft)	Geologic Description	Strata Depth (ft)	Excv. Effort	Boulder Qty & Class	Remarks
0		0.3	Dark brown, Organic SILT, some visible Plant fibers, trace Sand. Moist. TOPSOIL.	0.3		2/C	1) No groundwater encountered.
			Dark tan, SILT, some Sand, little Gravel. Moist. SUBSOIL.		M		
2		2.5		2.5		5/A 5/B	
			Gray, fine to medium SAND, some Gravel, some Silt. Moist.		D		
4		4	Excavation terminated at 4 feet on bedrock.	4			
6							
8							
10							
12							
14							
16							
18							
20							

Excavation Effort

E	Easy
M	Moderate
D	Difficult

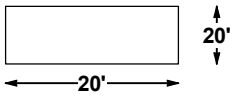
Boulder Size Classification

12" - 24"	A
24" - 36"	B
36" and larger	C

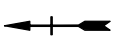
Soil Description
Minor Component Proportions

trace	0 - 10%
little	10 - 20%
some	20 - 35%
and	35 - 50%

Test Pit Plan



North Arrow



SHA
IMPROVING EARTH

Project: Stone Ridge
Location: Milford, MA
SHA Project No.: 2928.00

Test Pit No. TP-4

Ground Elevation: 323 ± feet
Datum: NGVD 1929
Weather: Cloudy, 60's

Date: 05/08/08
Time Started: 10:50
Time Finished: 11:15

Logged By: J. Colby
Checked By: B. Bettencourt

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Test Pit	Stab. Time
05/08/08	11:10	Not Encountered		7'	5 minutes

Excavation Equipment

Contractor: BMC Corporation
Operator: R. Corsetti
Reach: 15 ft

Make: Komatsu
Model: PC300 LC
Bucket Capacity: 1 3/4 CY

Depth (ft)	Field Testing Data	Strata Depth (ft)	Geologic Description	Strata Depth (ft)	Excv. Effort	Boulder Qty & Class	Remarks
0		0.3	Dark brown, Organic SILT, some visible Plant fibers, trace Sand. Moist. TOPSOIL.	0.3			1) No groundwater encountered.
			Dark tan, SILT, little Sand, trace Gravel, trace Roots. Moist. SUBSOIL.		E	5/A 5/B	
2		2		2			
					M	5/A 5/B 1/C	
4			Gray, fine to coarse SAND, some Silt, little Gravel. Moist.			5/A 5/B	
6					D		
		7	Excavation terminated at 7 feet on bedrock.	7			
8							
10							
12							
14							
16							
18							
20							

Excavation Effort

E	Easy
M	Moderate
D	Difficult

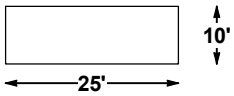
Boulder Size Classification

12" - 24"	A
24" - 36"	B
36" and larger	C

Soil Description
Minor Component Proportions

trace	0 - 10%
little	10 - 20%
some	20 - 35%
and	35 - 50%

Test Pit Plan



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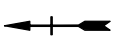


SHA
IMPROVING EARTH

Project: Stone Ridge
Location: Milford, MA
SHA Project No.: 2928.00

Test Pit No. TP-5

Ground Elevation: 333 ± feet
Datum: NGVD 1929
Weather: M. Cloudy, 60's

Date: 05/09/08
Time Started: 08:55
Time Finished: 09:10

Logged By: J. Colby
Checked By: B. Bettencourt

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Test Pit	Stab. Time
05/09/08	09:05	3'	Ground	10'	5 minutes

Excavation Equipment

Contractor: BMC Corporation
Operator: R. Corsetti
Reach: 15 ft

Make: Komatsu
Model: PC300 LC
Bucket Capacity: 1 3/4 CY

Depth (ft)	Field Testing Data	Strata Depth (ft)	Geologic Description	Strata Depth (ft)	Excv. Effort	Boulder Qty & Class	Remarks
0		0.5	Dark brown, Organic SILT, some visible Plant fibers, some fine to medium Sand. Moist. TOPSOIL.	0.5	M	2/C 5/A 5/B	1) Groundwater seepage from excavation sidewalls observed at 3' below ground surface.
2		3	Dark tan, SILT, and fine to medium Sand, little Gravel, little Roots. Moist. SUBSOIL.	3		10/A 5/B; 1/C 5/A 5/B	
4, 6, 8		10	Gray, fine to coarse SAND, some Gravel, little Silt. Wet.	10		10/A 5/B; 1/C 5/A 5/B; 5/A 5/B	
10			Excavation terminated at 10 feet. No refusal encountered.				
12, 14, 16, 18, 20							

Excavation Effort

E	Easy
M	Moderate
D	Difficult

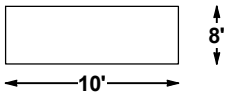
Boulder Size Classification

12" - 24"	A
24" - 36"	B
36" and larger	C

Soil Description
Minor Component Proportions

trace	0 - 10%
little	10 - 20%
some	20 - 35%
and	35 - 50%

Test Pit Plan



North Arrow

SHA
IMPROVING EARTH

Project: Stone Ridge
Location: Milford, MA
SHA Project No.: 2928.00

Test Pit No. TP-6

Ground Elevation: 335 ± feet
Datum: NGVD 1929
Weather: M. Cloudy, 60's

Date: 05/09/08
Time Started: 09:50
Time Finished: 10:30

Logged By: J. Colby
Checked By: B. Bettencourt

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Test Pit	Stab. Time
05/09/08	10:20	2'	Ground	11.5'	5 minutes

Excavation Equipment

Contractor: BMC Corporation
Operator: R. Corsetti
Reach: 15 ft

Make: Komatsu
Model: PC300 LC
Bucket Capacity: 1 3/4 CY

Depth (ft)	Field Testing Data	Strata Depth (ft)	Geologic Description	Strata Depth (ft)	Excv. Effort	Boulder Qty & Class	Remarks
0		1	Dark brown to black, Organic SILT, some visible Plant fibers, some Sand, trace Gravel. Moist. TOPSOIL.	1	M	3/C 15/A 10/B	1) Groundwater sepage observed at 2 feet.
2		2	Dark tan, SILT, some fine to medium Sand, trace Gravel, little Roots. Moist. SUBSOIL.	2		10/A 5/B	
4					D		
6			Gray, fine to coarse SAND, some Gravel, little Silt. Wet.				
8						15/A 10/B	
10							
12		11.5	Excavation terminated at 11.5 feet. No refusal encountered.	11.5			
14							
16							
18							
20							

Excavation Effort

E	Easy
M	Moderate
D	Difficult

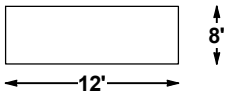
Boulder Size Classification

12" - 24"	A
24" - 36"	B
36" and larger	C

Soil Description
Minor Component Proportions

trace	0 - 10%
little	10 - 20%
some	20 - 35%
and	35 - 50%

Test Pit Plan



North Arrow

SHA
IMPROVING EARTH

Project: Stone Ridge
Location: Milford, MA
SHA Project No.: 2928.00

Test Pit No. TP-7

Ground Elevation: 325.5 feet
Datum: NGVD 1929
Weather: M. Cloudy, 70's

Date: 05/08/08
Time Started: 14:30
Time Finished: 14:45

Logged By: J. Colby
Checked By: B. Bettencourt

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Test Pit	Stab. Time
05/08/08	14:40	5'	Ground	7'	5 minutes

Excavation Equipment

Contractor: BMC Corporation
Operator: R. Corsetti
Reach: 15 ft

Make: Komatsu
Model: PC300 LC
Bucket Capacity: 1 3/4 CY

Depth (ft)	Field Testing Data	Strata Depth (ft)	Geologic Description	Strata Depth (ft)	Excv. Effort	Boulder Qty & Class	Remarks
0		0.2	Dark brown, Roots and Plant fibers, little Organic Silt, trace Sand. Moist. TOPSOIL.	0.2	E	1/C <5/A <5/B	1) Groundwater encountered during excavation at approximately 5 feet.
			Dark tan, SILT, some Sand, trace Gravel, trace Roots. Moist. SUBSOIL.		M		
2		2		2			
4			Gray, fine to coarse SAND, some Gravel, little Silt. Moist.		D	<5/A <5/B	
6						1/C <5/A <5/B	
		7	Excavation terminated at 7 feet. No refusal encountered.	7			
8							
10							
12							
14							
16							
18							
20							

Excavation Effort

E	Easy
M	Moderate
D	Difficult

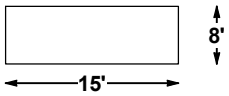
Boulder Size Classification

12" - 24"	A
24" - 36"	B
36" and larger	C

Soil Description
Minor Component Proportions

trace	0 - 10%
little	10 - 20%
some	20 - 35%
and	35 - 50%

Test Pit Plan



North Arrow

SHA
IMPROVING EARTH

Project: Stone Ridge
Location: Milford, MA
SHA Project No.: 2928.00

Test Pit No. TP-8

Ground Elevation: 326.5 feet
Datum: NGVD 1929
Weather: M. Cloudy, 70's

Date: 05/08/08
Time Started: 15:15
Time Finished: 15:30

Logged By: J. Colby
Checked By: B. Bettencourt

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Test Pit	Stab. Time
05/08/08	15:25	2'	Ground	8'	5 minutes

Excavation Equipment

Contractor: BMC Corporation
Operator: R. Corsetti
Reach: 15 ft

Make: Komatsu
Model: PC300 LC
Bucket Capacity: 1 3/4 CY

Depth (ft)	Field Testing Data	Strata Depth (ft)	Geologic Description	Strata Depth (ft)	Excv. Effort	Boulder Qty & Class	Remarks
0			Dark brown, Organic SILT, trace Sand, little Roots. Moist. TOPSOIL.		E	10/A 5/B	1) Groundwater seepage observed in the excavation sidewall at 2 feet below ground surface.
			Dark tan, Clayey SILT, little Sand, little Roots. Moist. SUBSOIL.		M	5/A 5/B 1/C	
2			Gray, fine to coarse SAND, some Gravel, little Silt. Wet.		E	5/A	
4							
6					M		
8			Excavation terminated at 8 feet. No refusal encountered.				
10							
12							
14							
16							
18							
20							

Excavation Effort

E	Easy
M	Moderate
D	Difficult

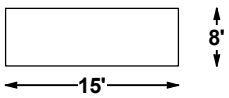
Boulder Size Classification

12" - 24"	A
24" - 36"	B
36" and larger	C

Soil Description
Minor Component Proportions

trace	0 - 10%
little	10 - 20%
some	20 - 35%
and	35 - 50%

Test Pit Plan



North Arrow

SHA
IMPROVING EARTH

Project: Stone Ridge
Location: Milford, MA
SHA Project No.: 2928.00

Test Pit No. TP-9

Ground Elevation: 340 ± feet
Datum: NGVD 1929
Weather: Showers, 60's

Date: 05/09/08
Time Started: 11:40
Time Finished: 12:05

Logged By: J. Colby
Checked By: B. Bettencourt

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Test Pit	Stab. Time
05/09/08	12:00	Not Encountered		6'	5 minutes

Excavation Equipment

Contractor: BMC Corporation
Operator: R. Corsetti
Reach: 15 ft

Make: Komatsu
Model: PC300 LC
Bucket Capacity: 1 3/4 CY

Depth (ft)	Field Testing Data	Strata Depth (ft)	Geologic Description	Strata Depth (ft)	Excv. Effort	Boulder Qty & Class	Remarks
0		0.3	Dark brown to black, Organic SILT, some visible Organic fibers, little fine to medium Sand, trace Silt. Moist. TOPSOIL.	0.3		1/C 5/A 5/B	1) No groundwater encountered. 2) Sample collected at 3-6 feet for laboratory grain size analysis.
2		3	Dark tan, SILT, some Sand, trace Gravel, little Roots. Moist. SUBSOIL.	3	M	5/A 5/B	
4		6	Gray, fine to coarse SAND, some Gravel, little Silt. Moist.	6			
6			Excavation terminated at 6 feet. No refusal encountered.				
8							
10							
12							
14							
16							
18							
20							

Excavation Effort

E	Easy
M	Moderate
D	Difficult

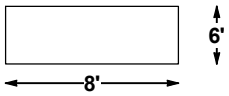
Boulder Size Classification

12" - 24"	A
24" - 36"	B
36" and larger	C

Soil Description
Minor Component Proportions

trace	0 - 10%
little	10 - 20%
some	20 - 35%
and	35 - 50%

Test Pit Plan



North Arrow

SHA
IMPROVING EARTH

Project: Stone Ridge
Location: Milford, MA
SHA Project No.: 2928.00

Test Pit No. TP-10

Ground Elevation: 348 ± feet
Datum: NGVD 1929
Weather: Drizzle, 60's

Date: 05/09/08
Time Started: 12:30
Time Finished: 12:45

Logged By: J. Colby
Checked By: B. Bettencourt

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Test Pit	Stab. Time
05/09/08	12:40	10'	Ground	12'	5 minutes

Excavation Equipment

Contractor: BMC Corporation
Operator: R. Corsetti
Reach: 15 ft

Make: Komatsu
Model: PC300 LC
Bucket Capacity: 1 3/4 CY

Depth (ft)	Field Testing Data	Strata Depth (ft)	Geologic Description	Strata Depth (ft)	Excv. Effort	Boulder Qty & Class	Remarks
0		0.5	Dark brown to black, Organic SILT, little Sand, some visible Plant fibers, some roots. Moist. TOPSOIL.	0.5		5/A 5/B 1/C	1) Groundwater observed seeping from the excavation sidewalls at 10 feet.
			Dark tan, SILT, some Sand, trace Gravel, little Roots. Moist. SUBSOIL.				2) Sample collected at 8 feet for grain size analysis.
2							
		3		3		5/A <5/B	
4					M		
						1/C 5/A <5/B	
6			Gray, fine to coarse SAND, and Gravel, little Silt. Moist.				
8						5/A <5/B	
10					D		
12		12	Excavation terminated at 12 feet. No refusal encountered.	12			
14							
16							
18							
20							

Excavation Effort

E	Easy
M	Moderate
D	Difficult

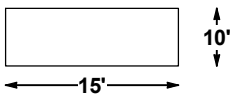
Boulder Size Classification

12" - 24"	A
24" - 36"	B
36" and larger	C

Soil Description
Minor Component Proportions

trace	0 - 10%
little	10 - 20%
some	20 - 35%
and	35 - 50%

Test Pit Plan



North Arrow

SHA
IMPROVING EARTH

Project: Stone Ridge
Location: Milford, MA
SHA Project No.: 2928.00

Test Pit No. TP-11

Ground Elevation: 393 ± feet
Datum: NGVD 1929
Weather: Cloudy, 40ºF

Date: 05/12/08
Time Started: 09:55
Time Finished: 10:15

Logged By: J. Colby
Checked By: B. Bettencourt

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Test Pit	Stab. Time
05/12/08	10:10	Not Encountered		9'	5 minutes

Excavation Equipment

Contractor: BMC Corporation
Operator: R. Corsetti
Reach: 15 ft

Make: Komatsu
Model: PC300 LC
Bucket Capacity: 1 3/4 CY

Depth (ft)	Field Testing Data	Strata Depth (ft)	Geologic Description	Strata Depth (ft)	Excv. Effort	Boulder Qty & Class	Remarks
0		0.3	Dark brown, Organic SILT, and fine to medium Sand, some Roots, trace Gravel. Moist. TOPSOIL.	0.3		3/C <5/A <5/B	1) No groundwater encountered.
			Dark tan, SILT, and fine to medium Sand, trace Gravel, little Roots. Moist. SUBSOIL.				2) Sample collected from 5 feet for laboratory grain size analysis.
2		2		2			
					M		
4							
			Gray, fine to coarse SAND, some Silt, little Gravel. Moist.			5/A <5/B	
6							
					D		
8							
		9	Excavation terminated at 9 feet. No refusal encountered.	9			
10							
12							
14							
16							
18							
20							

Excavation Effort

E	Easy
M	Moderate
D	Difficult

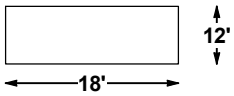
Boulder Size Classification

12" - 24"	A
24" - 36"	B
36" and larger	C

Soil Description
Minor Component Proportions

trace	0 - 10%
little	10 - 20%
some	20 - 35%
and	35 - 50%

Test Pit Plan



North Arrow

SHA
IMPROVING EARTH

Project: Stone Ridge
Location: Milford, MA
SHA Project No.: 2928.00

Test Pit No. TP-12

Ground Elevation: 393 ± feet
Datum: NGVD 1929
Weather: Cloudy, 40's

Date: 05/12/08
Time Started: 09:10
Time Finished: 09:25

Logged By: J. Colby
Checked By: B. Bettencourt

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Test Pit	Stab. Time
05/12/08	09:20	Not Encountered		9'	5 minutes

Excavation Equipment

Contractor: BMC Corporation
Operator: R. Corsetti
Reach: 15 ft

Make: Komatsu
Model: PC300 LC
Bucket Capacity: 1 3/4 CY

Depth (ft)	Field Testing Data	Strata Depth (ft)	Geologic Description	Strata Depth (ft)	Excv. Effort	Boulder Qty & Class	Remarks
0		0.3	Dark brown, Organic SILT, little Sand, some Roots. Moist. TOPSOIL.	0.3			
			Dark tan, SILT, and fine to medium Sand, trace Gravel, little Roots. Moist. SUBSOIL.		M	1/C 5/A <5/B	1) No groundwater encountered. 2) Sample collected from 5 feet for laboratory grain size analysis.
2		2.5		2.5			
4			Gray, fine to coarse SAND, some Gravel, some Silt. Moist.			5/A <5/B	
6							
8					D		
		9	Excavation terminated at 9 feet. No refusal encountered.	9			
10							
12							
14							
16							
18							
20							

Excavation Effort

E	Easy
M	Moderate
D	Difficult

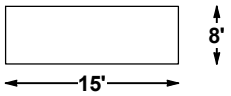
Boulder Size Classification

12" - 24"	A
24" - 36"	B
36" and larger	C

Soil Description
Minor Component Proportions

trace	0 - 10%
little	10 - 20%
some	20 - 35%
and	35 - 50%

Test Pit Plan



North Arrow

SHA
IMPROVING EARTH

Project: Stone Ridge
Location: Milford, MA
SHA Project No.: 2928.00

Test Pit No. TP-13

Ground Elevation: 321 ± feet
Datum: NGVD 1929
Weather: Sunny, 60-70's

Date: 05/07/08
Time Started: 11:45
Time Finished: 12:10

Logged By: J. Colby/P. Malone
Checked By: B. Bettencourt

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Test Pit	Stab. Time
05/07/08	12:05	10'	Ground	11'	5 minutes

Excavation Equipment

Contractor: BMC Corporation
Operator: R. Corsetti
Reach: 15 ft

Make: Komatsu
Model: PC300 LC
Bucket Capacity: 1 3/4 CY

Depth (ft)	Field Testing Data	Strata Depth (ft)	Geologic Description	Strata Depth (ft)	Excv. Effort	Boulder Qty & Class	Remarks
0		0	Dark brown, fine SAND, and Silt, little Roots. TOPSOIL.	0	D	3/C	1) Sample collected at 7 feet for laboratory grain analysis. 2) Groundwater observed seeping from the excavation sidewalls at 10 feet.
1		1	Dark tan, SILT, some Sand, trace Roots. Moist. SUBSOIL.	1		5/A <5B	
2		3	Tan/gray, fine to coarse SAND & GRAVEL, little Silt. Moist. Darker color at 8 feet.	3	M	1/C <5/A <5/B	
4							
6							
8							
10		11	Test Pit terminated at 11 feet due to excavation sidewall collapse.	11			
12							
14							
16							
18							
20							

Excavation Effort

E	Easy
M	Moderate
D	Difficult

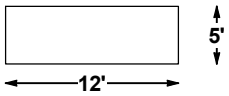
Boulder Size Classification

12" - 24"	A
24" - 36"	B
36" and larger	C

Soil Description
Minor Component Proportions

trace	0 - 10%
little	10 - 20%
some	20 - 35%
and	35 - 50%

Test Pit Plan



North Arrow

SHA
IMPROVING EARTH

Project: Stone Ridge
Location: Milford, MA
SHA Project No.: 2928.00

Test Pit No. TP-14

Ground Elevation: 317 ± feet
Datum: NGVD 1929
Weather: Sunny, 70's

Date: 05/07/08
Time Started: 12:25
Time Finished: 12:40

Logged By: J. Colby/P. Malone
Checked By: B. Bettencourt

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Test Pit	Stab. Time
05/07/08	12:35	Not Encountered		7'	5 minutes

Excavation Equipment

Contractor: BMC Corporation
Operator: R. Corsetti
Reach: 15 ft

Make: Komatsu
Model: PC300 L
Bucket Capacity: 1 3/4 CY

Depth (ft)	Field Testing Data	Strata Depth (ft)	Geologic Description	Strata Depth (ft)	Excv. Effort	Boulder Qty & Class	Remarks
0		0	Dark brown, Organic SILT, and fine Sand, trace Gravel, trace Roots. Moist. TOPSOIL.	0	E	5/A 5/B	1) Seasonal high groundwater features observed below 3 feet.
		1	Dark tan, fine SAND, and Silt, little Gravel, trace Roots. Moist. SUBSOIL.	1	D	1/C	2) Sample collected from 4 feet for laboratory grain size analysis.
2		2.5	Tan/gray, fine to coarse SAND & GRAVEL, some Silt. Moist.	2.5	M	1/C 10/A 10/B; 10/A 5/B	3) No groundwater observed.
4							
6		7	Test Pit terminated at 7 feet. No refusal encountered.	7			
8							
10							
12							
14							
16							
18							
20							

Excavation Effort

E	Easy
M	Moderate
D	Difficult

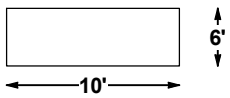
Boulder Size Classification

12" - 24"	A
24" - 36"	B
36" and larger	C

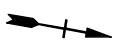
Soil Description
Minor Component Proportions

trace	0 - 10%
little	10 - 20%
some	20 - 35%
and	35 - 50%

Test Pit Plan



North Arrow



SHA
IMPROVING EARTH

Project: Stone Ridge
Location: Milford, MA
SHA Project No.: 2928.00

Test Pit No. TP-15

Ground Elevation: 290 ± feet
Datum: NGVD 1929
Weather: Sunny, 60's

Date: 05/07/08
Time Started: 09:30
Time Finished: 09:40

Logged By: J. Colby/P. Malone
Checked By: B. Bettencourt

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Test Pit	Stab. Time
05/07/08	09:35	4'	Ground	6'	5 minutes

Excavation Equipment

Contractor: BMC Corporation
Operator: R. Corsetti
Reach: 15 ft

Make: Komatsu
Model: PC300 L
Bucket Capacity: 1 3/4 CY

Depth (ft)	Field Testing Data	Strata Depth (ft)	Geologic Description	Strata Depth (ft)	Excv. Effort	Boulder Qty & Class	Remarks
0							
		1	Dark brown, fine to coarse SAND, little Organic Silt, little Roots. TOPSOIL.	1			1) Season high groundwater features observed at 2 feet.
2		2	Gray, fine to medium SAND, some Silt, trace Gravel, trace Roots. Moist.	2			2) Groundwater observed seeping from excavation sidewalls at 4 feet.
4			Brown, fine to coarse SAND, some Gravel, little Silt. Moist to wet.		E	5/A <5/B	
6		6	Test Pit terminated at 6 feet. No refusal encountered.	6			
8							
10							
12							
14							
16							
18							
20							

Excavation Effort

E	Easy
M	Moderate
D	Difficult

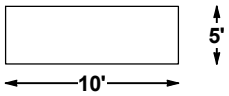
Boulder Size Classification

12" - 24"	A
24" - 36"	B
36" and larger	C

Soil Description
Minor Component Proportions

trace	0 - 10%
little	10 - 20%
some	20 - 35%
and	35 - 50%

Test Pit Plan



North Arrow

SHA
IMPROVING EARTH

Project: Stone Ridge
Location: Milford, MA
SHA Project No.: 2928.00

Test Pit No. TP-16

Ground Elevation: 390 ± feet
Datum: NGVD 1929
Weather: Rain, 60's

Date: 05/09/08
Time Started: 15:20
Time Finished: 15:30

Logged By: J. Colby
Checked By: B. Bettencourt

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Test Pit	Stab. Time
05/09/08	15:30	8'	Ground	9'	5 minutes

Excavation Equipment

Contractor: BMC Corporation
Operator: R. Corsetti
Reach: 15 ft

Make: Komatsu
Model: PC300 L
Bucket Capacity: 1 3/4 CY

Depth (ft)	Field Testing Data	Strata Depth (ft)	Geologic Description	Strata Depth (ft)	Excv. Effort	Boulder Qty & Class	Remarks
0		0.3	Dark brown, Organic SILT, some visible Plant fibers, little Sand, trace Gravel. Moist. TOPSOIL.	0.3	M	1/C 5/A 5/B	1) Groundwater seepage observed from excavation sidewall at 8 feet.
		1.5	Dark tan, SILT, some Sand, trace Gravel, little Roots. Moist. SUBSOIL.	1.5	D	5/A 5/B	
2							
4			Gray, fine to coarse SAND, some Gravel, little Silt. Moist.		M	5/A	
6							
8		9	Excavation terminated at 9 feet. No refusal encountered.	9			
10							
12							
14							
16							
18							
20							

Excavation Effort

E	Easy
M	Moderate
D	Difficult

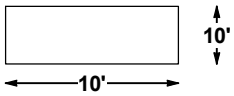
Boulder Size Classification

12" - 24"	A
24" - 36"	B
36" and larger	C

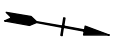
Soil Description
Minor Component Proportions

trace	0 - 10%
little	10 - 20%
some	20 - 35%
and	35 - 50%

Test Pit Plan



North Arrow



SHA
IMPROVING EARTH

Project: Stone Ridge
Location: Milford, MA
SHA Project No.: 2928.00

Test Pit No. TP-17

Ground Elevation: 333 ± feet
Datum: NGVD 1929
Weather: Cloudy, Breezy, 40's

Date: 05/12/08
Time Started: 14:05
Time Finished: 14:20

Logged By: J. Colby
Checked By: B. Bettencourt

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Test Pit	Stab. Time
05/12/08	14:15	Not Encountered		5'	5 minutes

Excavation Equipment

Contractor: BMC Corporation
Operator: R. Corsetti
Reach: 15 ft

Make: Komatsu
Model: PC300 LC
Bucket Capacity: 1 3/4 CY

Depth (ft)	Field Testing Data	Strata Depth (ft)	Geologic Description	Strata Depth (ft)	Excv. Effort	Boulder Qty & Class	Remarks
0		0.2	Dark brown/gray, Organic SILT, some fine to medium Sand, some Roots. Moist. TOPSOIL.	0.2	D	1/C 15/A 5/B	1) No groundwater encountered.
2		2.5	Brown, SILT, and fine to medium Sand, little Gravel, little Roots. Moist. SUBSOIL.	2.5			
4		5	Gray, fine to coarse SAND, some Gravel, little Silt. Moist.	5			
6			Excavation refusal at 5 feet on boulders.				
8							
10							
12							
14							
16							
18							
20							

Excavation Effort

E	Easy
M	Moderate
D	Difficult

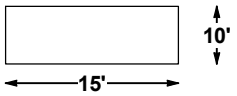
Boulder Size Classification

12" - 24"	A
24" - 36"	B
36" and larger	C

Soil Description
Minor Component Proportions

trace	0 - 10%
little	10 - 20%
some	20 - 35%
and	35 - 50%

Test Pit Plan



North Arrow

SHA
IMPROVING EARTH

Project: Stone Ridge
Location: Milford, MA
SHA Project No.: 2928.00

Test Pit No. TP-18

Ground Elevation: 326 ± feet
Datum: NGVD 1929
Weather: Cloudy, 40's

Date: 05/12/08
Time Started: 14:30
Time Finished: 14:40

Logged By: J. Colby
Checked By: B. Bettencourt

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Test Pit	Stab. Time
05/12/08	14:40	Not Encountered		5'	5 minutes

Excavation Equipment

Contractor: BMC Corporation
Operator: R. Corsetti
Reach: 15 ft

Make: Komatsu
Model: PC300 LC
Bucket Capacity: 1 3/4 CY

Depth (ft)	Field Testing Data	Strata Depth (ft)	Geologic Description	Strata Depth (ft)	Excv. Effort	Boulder Qty & Class	Remarks
0		0.2	Dark brown, fibrous PEAT and Silt, some Sand, trace Gravel, some Roots. Moist. TOPSOIL.	0.2	E	<5/A <5/B	1) No groundwater encountered.
			Dark tan, SAND, and fine to medium Sand, little Gravel, trace Roots. Moist. SUBSOIL.				
2		2	Tan, fine to medium SAND, little Gravel, trace Silt. Moist.	2			
4			Tan, coarse SAND, some Gravel. Moist.				
		5	Excavation terminated at 5 feet. No refusal encountered.	5			
6							
8							
10							
12							
14							
16							
18							
20							

Excavation Effort

E	Easy
M	Moderate
D	Difficult

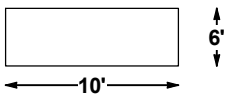
Boulder Size Classification

12" - 24"	A
24" - 36"	B
36" and larger	C

Soil Description
Minor Component Proportions

trace	0 - 10%
little	10 - 20%
some	20 - 35%
and	35 - 50%

Test Pit Plan



North Arrow

SHA
IMPROVING EARTH

Project: Stone Ridge
Location: Milford, MA
SHA Project No.: 2928.00

Test Pit No. TP-20

Ground Elevation: 353 ± feet
Datum: NGVD 1929
Weather: Cloudy, 70's

Date: 05/08/08
Time Started: 00:00
Time Finished: 13:05

Logged By: J. Colby
Checked By: B. Bettencourt

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Test Pit	Stab. Time
05/08/08	13:00	Not Encountered		9'	5 minutes

Excavation Equipment

Contractor: BMC Corporation
Operator: R. Corsetti
Reach: 15 ft

Make: Komatsu
Model: PC300 L
Bucket Capacity: 1 3/4 CY

Depth (ft)	Field Testing Data	Strata Depth (ft)	Geologic Description	Strata Depth (ft)	Excv. Effort	Boulder Qty & Class	Remarks
0		0.2	Dark brown, Organic SILT, some visible Plant fibers, trace Sand. Moist. TOPSOIL.	0.2			1) No groundwater encountered.
			Dark tan, SILT, and Sand, trace Gravel. Moist. SUBSOIL.		D	1/C	
2		2		2	M	5/A 5/B	
4			Gray, fine to coarse SAND, some Gravel, little Silt. Moist.				
6					E	<5/A	
8							
		9	Excavation terminated at 9 feet. No refusal encountered.	9			
10							
12							
14							
16							
18							
20							

Excavation Effort

E	Easy
M	Moderate
D	Difficult

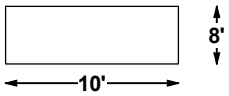
Boulder Size Classification

12" - 24"	A
24" - 36"	B
36" and larger	C

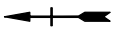
Soil Description
Minor Component Proportions

trace	0 - 10%
little	10 - 20%
some	20 - 35%
and	35 - 50%

Test Pit Plan



North Arrow



SHA
IMPROVING EARTH

Project: Stone Ridge
Location: Milford, MA
SHA Project No.: 2928.00

Test Pit No. TP-21

Ground Elevation: 365 ± feet
Datum: NGVD 1929
Weather: Sunny, 50's

Date: 05/13/08
Time Started: 11:05
Time Finished: 11:35

Logged By: J. Colby
Checked By: B. Bettencourt

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Test Pit	Stab. Time
05/13/08	11:30	Not Encountered		5'	5 minutes

Excavation Equipment

Contractor: BMC Corporation
Operator: R. Corsetti
Reach: 15 ft

Make: Komatsu
Model: PC300 LC
Bucket Capacity: 1 3/4 CY

Depth (ft)	Field Testing Data	Strata Depth (ft)	Geologic Description	Strata Depth (ft)	Excv. Effort	Boulder Qty & Class	Remarks
0		0.2	Dark brown, Organic SILT, some Sand, some Roots. Moist. TOPSOIL.	0.2	E	2/C 5/A 5/B	1) No groundwater encountered.
			Dark tan, SILT, and fine to medium Sand, trace Gravel, some Roots. Moist. SUBSOIL.		M	3/C 5/A 5/B	2) Large boulders observed at north and south ends of test pit.
2		2.5	Gray, fine to coarse SAND, some Gravel, little Silt. Moist.	2.5	D	2/C 5/A 5/B	
4		5	Excavation refusal at 5 feet on boulders.	5			
6							
8							
10							
12							
14							
16							
18							
20							

Excavation Effort

E	Easy
M	Moderate
D	Difficult

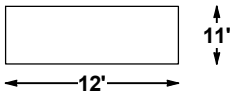
Boulder Size Classification

12" - 24"	A
24" - 36"	B
36" and larger	C

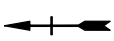
Soil Description
Minor Component Proportions

trace	0 - 10%
little	10 - 20%
some	20 - 35%
and	35 - 50%

Test Pit Plan



North Arrow



SHA
IMPROVING EARTH

Project: Stone Ridge
Location: Milford, MA
SHA Project No.: 2928.00

Test Pit No. TP-22

Ground Elevation: 367 ± feet
Datum: NGVD 1929
Weather: Sunny, 50's

Date: 05/13/08
Time Started: 09:35
Time Finished: 10:15

Logged By: J. Colby
Checked By: B. Bettencourt

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Test Pit	Stab. Time
05/13/08	10:10	Not Encountered		10'	5 minutes

Excavation Equipment

Contractor: BMC Corporation
Operator: R. Corsetti
Reach: 15 ft

Make: Komatsu
Model: PC300 LC
Bucket Capacity: 1 3/4 CY

Depth (ft)	Field Testing Data	Strata Depth (ft)	Geologic Description	Strata Depth (ft)	Excv. Effort	Boulder Qty & Class	Remarks
0		0.2	Dark brown, Organic SILT, some fine to medium Sand, some Roots. Moist. TOPSOIL.	0.2			1) No groundwater encountered.
			Brown, SILT, and fine to medium Sand, trace Gravel, some Roots. Moist. SUBSOIL.				
2		2		2	E	10/A 5/B	
4			Gray, fine to coarse SAND, little Silt, little Gravel. Moist.				
6					D	4/C 10/A 10/B	
8							
10		10	Excavation refusal at 10 feet on Boulders.	10			
12							
14							
16							
18							
20							

Excavation Effort

E	Easy
M	Moderate
D	Difficult

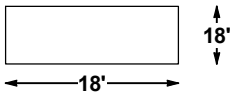
Boulder Size Classification

12" - 24"	A
24" - 36"	B
36" and larger	C

Soil Description
Minor Component Proportions

trace	0 - 10%
little	10 - 20%
some	20 - 35%
and	35 - 50%

Test Pit Plan



North Arrow

SHA
IMPROVING EARTH

Project: Stone Ridge
Location: Milford, MA
SHA Project No.: 2928.00

Test Pit No. TP-23

Ground Elevation: 367 ± feet
Datum: NGVD 1929
Weather: Sunny, 50's

Date: 05/13/08
Time Started: 08:10
Time Finished: 08:35

Logged By: J. Colby
Checked By: B. Bettencourt

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Test Pit	Stab. Time
05/13/08	08:30	10'	Ground	10'	5 minutes

Excavation Equipment

Contractor: BMC Corporation
Operator: R. Corsetti
Reach: 15 ft

Make: Komatsu
Model: PC300 LC
Bucket Capacity: 1 3/4 CY

Depth (ft)	Field Testing Data	Strata Depth (ft)	Geologic Description	Strata Depth (ft)	Excv. Effort	Boulder Qty & Class	Remarks
0		0.2	Dark brown, Organic SILT, some fine to medium Sand, trace Gravel. Moist. TOPSOIL.	0.2		1/C 5/A <5/B	1) Groundwater observed at 10 feet.
		1.5	Brown, SILT, and fine to medium Sand, trace Gravel, little Roots. Moist. SUBSOIL.	1.5	M	10/A 5/B	
2						1/C 10/A 5/B	
4			Gray, fine to coarse SAND, some Gravel, little Silt. Moist.		D	15/A 5/B	
6							
8							
10		10	Excavation terminated at 10 feet. No refusal encountered.	10			
12							
14							
16							
18							
20							

Excavation Effort

E	Easy
M	Moderate
D	Difficult

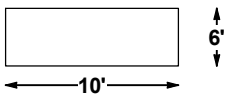
Boulder Size Classification

12" - 24"	A
24" - 36"	B
36" and larger	C

Soil Description
Minor Component Proportions

trace	0 - 10%
little	10 - 20%
some	20 - 35%
and	35 - 50%

Test Pit Plan



North Arrow

SHA
IMPROVING EARTH

Project: Stone Ridge
Location: Milford, MA
SHA Project No.: 2928.00

Test Pit No. TP-24

Ground Elevation: 397 ± feet
Datum: NGVD 1929
Weather: Cloudy, Breezy, 40's

Date: 05/12/08
Time Started: 12:30
Time Finished: 12:35

Logged By: J. Colby
Checked By: B. Bettencourt

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Test Pit	Stab. Time
05/12/08	12:30	Not Encountered		3'	5 minutes

Excavation Equipment

Contractor: BMC Corporation
Operator: R. Corsetti
Reach: 15 ft

Make: Komatsu
Model: PC300 LC
Bucket Capacity: 1 3/4 CY

Depth (ft)	Field Testing Data	Strata Depth (ft)	Geologic Description	Strata Depth (ft)	Excv. Effort	Boulder Qty & Class	Remarks
0		0.2	Dark brown, Organic SILT, little fine to medium Sand, some Roots. Moist. TOPSOIL.	0.2	M	2/C 10/A 5/B	1) No groundwater encountered.
			Brown, SILT, and fine Sand, trace Gravel, little Roots. Moist. SUBSOIL.				
2		2.5	Gray, SILT, and fine Sand, trace Gravel. Moist.	2.5	D	5/A 5/B	
		3	Excavation refusal at 3 feet on Bedrock.	3			
4							
6							
8							
10							
12							
14							
16							
18							
20							

Excavation Effort

E	Easy
M	Moderate
D	Difficult

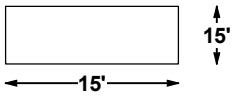
Boulder Size Classification

12" - 24"	A
24" - 36"	B
36" and larger	C

Soil Description
Minor Component Proportions

trace	0 - 10%
little	10 - 20%
some	20 - 35%
and	35 - 50%

Test Pit Plan



North Arrow

SHA
IMPROVING EARTH

Project: Stone Ridge
Location: Milford, MA
SHA Project No.: 2928.00

Test Pit No. TP-25

Ground Elevation: 399 ± feet
Datum: NGVD 1929
Weather: Cloudy, 40's

Date: 05/12/08
Time Started: 11:00
Time Finished: 11:20

Logged By: J. Colby
Checked By: B. Bettencourt

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Test Pit	Stab. Time
05/12/08	11:15	Not Encountered		9'	5 minutes

Excavation Equipment

Contractor: BMC Corporation
Operator: R. Corsetti
Reach: 15 ft

Make: Komatsu
Model: PC300 LC
Bucket Capacity: 1 3/4 CY

Depth (ft)	Field Testing Data	Strata Depth (ft)	Geologic Description	Strata Depth (ft)	Excv. Effort	Boulder Qty & Class	Remarks
0		0.3	Dark brown, Organic SILT, some fine to medium Sand, some Roots, trace Gravel. Moist. TOPSOIL.	0.3			1) Boulder encountered at 4 feet in east portion of the test pit.
			Brown, SILT, and fine to medium Sand, trace Gravel, trace Roots. Moist. SUBSOIL.				2) No groundwater encountered.
2		2		2			
4			Gray, fine to coarse SAND, some Gravel, little Silt. Moist.		M	5/A 5/B 1/C	
6							
8							
		9	Excavation terminated at 9 feet. No refusal encountered.	9			
10							
12							
14							
16							
18							
20							

Excavation Effort

E	Easy
M	Moderate
D	Difficult

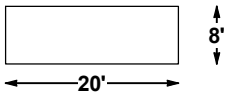
Boulder Size Classification

12" - 24"	A
24" - 36"	B
36" and larger	C

Soil Description
Minor Component Proportions

trace	0 - 10%
little	10 - 20%
some	20 - 35%
and	35 - 50%

Test Pit Plan



North Arrow

SHA
IMPROVING EARTH

Project: Stone Ridge
Location: Milford, MA
SHA Project No.: 2928.00

Test Pit No. TP-26

Ground Elevation: 398 ± feet
Datum: NGVD 1929
Weather: Cloudy, Breezy, 40's

Date: 05/12/08
Time Started: 13:10
Time Finished: 13:30

Logged By: J. Colby
Checked By: B. Bettencourt

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Test Pit	Stab. Time
05/12/08	13:25	Not Encountered		9'	5 minutes

Excavation Equipment

Contractor: BMC Corporation
Operator: R. Corsetti
Reach: 15 ft

Make: Komatsu
Model: PC300 LC
Bucket Capacity: 1 3/4 CY

Depth (ft)	Field Testing Data	Strata Depth (ft)	Geologic Description	Strata Depth (ft)	Excv. Effort	Boulder Qty & Class	Remarks
0		0.2	Dark brown, Organic SILT, some fine to medium Sand, some Roots. Moist. TOPSOIL.	0.2			1) No groundwater encountered.
			Dark tan, SILT, and fine to medium Sand, little Gravel. Moist. SUBSOIL.			1/C 5/A <5/B	
2		2		2			
4			Gray, fine to coarse SAND, little Gravel, little Silt. Moist.		D		
6						15/A 5/B	
8							
10		10	Excavation terminated at 9 feet. No refusal encountered.	10			
12							
14							
16							
18							
20							

Excavation Effort

E	Easy
M	Moderate
D	Difficult

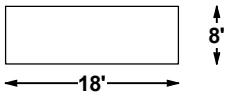
Boulder Size Classification

12" - 24"	A
24" - 36"	B
36" and larger	C

Soil Description
Minor Component Proportions

trace	0 - 10%
little	10 - 20%
some	20 - 35%
and	35 - 50%

Test Pit Plan

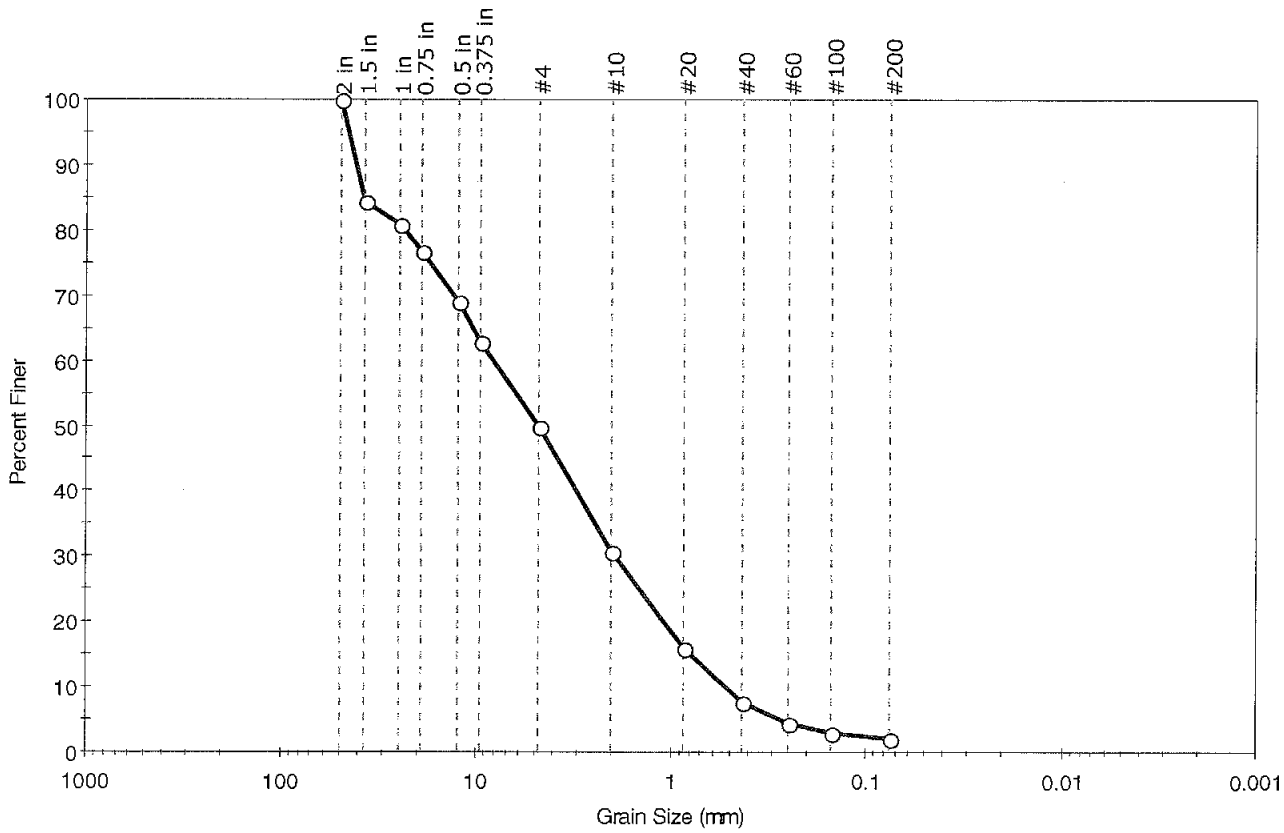


North Arrow

GeoTesting express
a subsidiary of Geocomp Corporation

Client:	Sanborn, Head & Associates		
Project:	Stone Ridge		
Location:	Milford, MA	Project No:	GTX-8192
Boring ID: ---	Sample Type: bag	Tested By:	ap
Sample ID:TP-1	Test Date: 05/08/08	Checked By:	jdt
Depth : 4 ft	Test Id: 130422		
Test Comment:	---		
Sample Description:	Moist, light olive brown gravel with sand		
Sample Comment:	---		

Particle Size Analysis - ASTM D 422-63 (reapproved 2002)



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	50.2	47.6	2.2

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
2 in	50.00	100		
1.5 in	37.50	84		
1 in	25.00	81		
0.75 in	19.00	77		
0.5 in	12.50	69		
0.375 in	9.50	63		
#4	4.75	50		
#10	2.00	31		
#20	0.85	16		
#40	0.42	8		
#60	0.25	4		
#100	0.15	3		
#200	0.075	2		

Coefficients

D_{85} = 38.0220 mm D_{30} = 1.9349 mm
D_{60} = 8.2099 mm D_{15} = 0.7794 mm
D_{50} = 4.8096 mm D_{10} = 0.5164 mm
C_u = 15.898 C_c = 0.883

Classification

ASTM Poorly graded gravel with sand (GP)

AASHTO Stone Fragments, Gravel and Sand (A-1-a (0))

Sample/Test Description

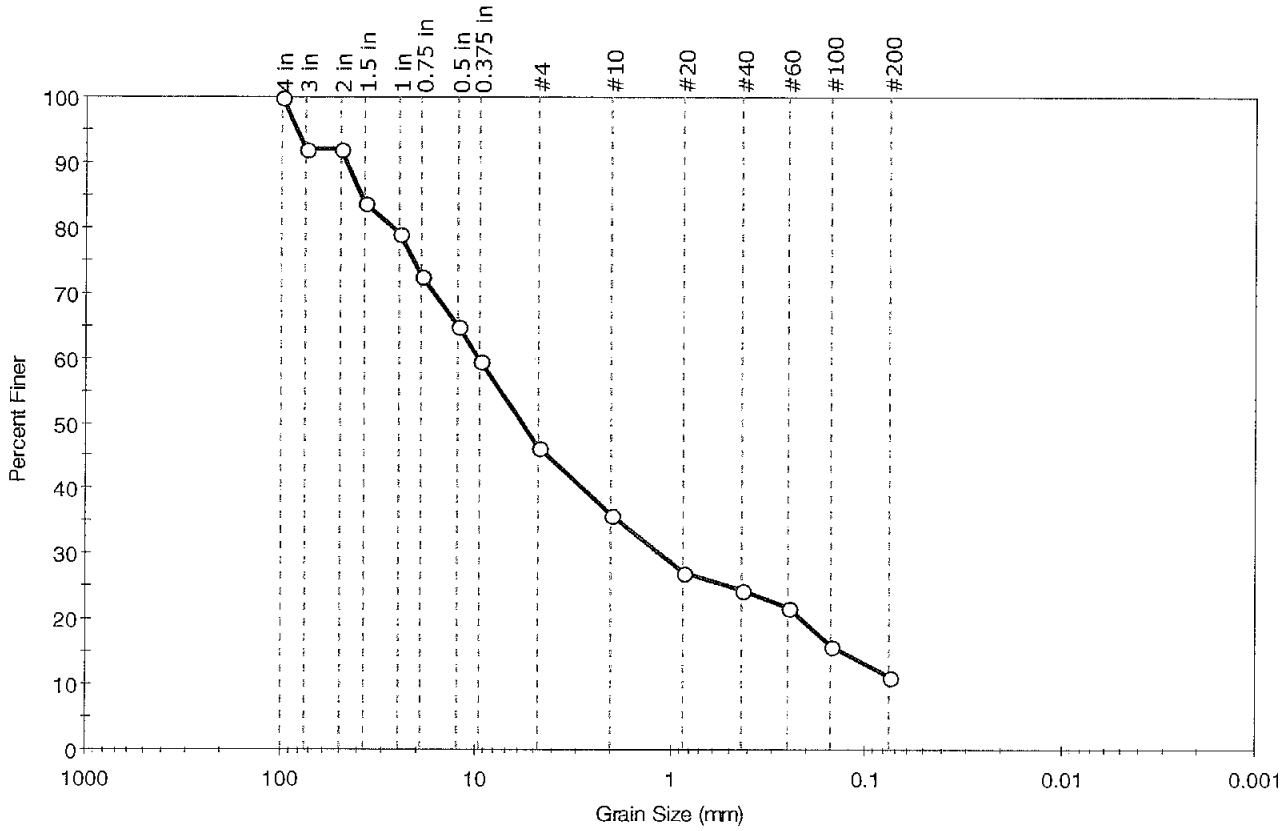
Sand/Gravel Particle Shape : ROUNDED

Sand/Gravel Hardness : HARD

GeoTesting express
a subsidiary of Geocomp Corporation

Client:	Sanborn, Head & Associates		
Project:	Stone Ridge		
Location:	Milford, MA	Project No:	GTX-8192
Boring ID: ---	Sample Type: bag	Tested By:	ap
Sample ID:TP-2	Test Date: 05/08/08	Checked By:	jdt
Depth : 8 ft	Test Id: 130423		
Test Comment:	---		
Sample Description:	Moist, yellowish brown gravel with silt and sand		
Sample Comment:	---		

Particle Size Analysis - ASTM D 422-63 (reapproved 2002)



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	53.5	35.2	11.3

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
4 in	100.00	100		
3 in	75.00	92		
2 in	50.00	92		
1.5 in	37.50	84		
1 in	25.00	79		
0.75 in	19.00	72		
0.5 in	12.50	65		
0.375 in	9.50	60		
#4	4.75	46		
#10	2.00	36		
#20	0.85	27		
#40	0.42	25		
#60	0.25	22		
#100	0.15	16		
#200	0.075	11		

Coefficients

D_{85} =39.1890 mm	D_{30} =1.1159 mm
D_{60} =9.6875 mm	D_{15} =0.1289 mm
D_{50} =5.7317 mm	D_{10} =0.0625 mm
C_u =155.000	C_c =2.057

Classification

ASTM N/A

AASHTO Stone Fragments, Gravel and Sand (A-1-a (0))

Sample/Test Description

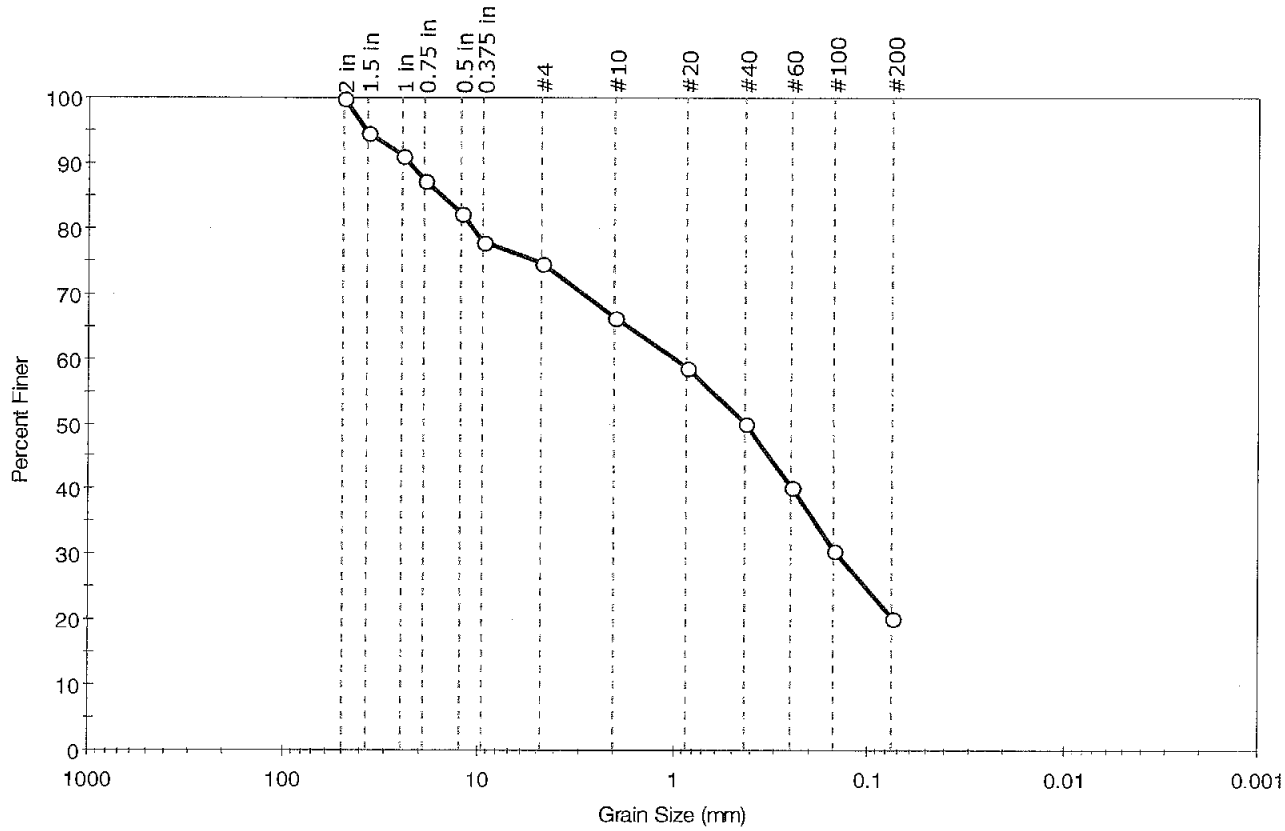
Sand/Gravel Particle Shape : ROUNDED

Sand/Gravel Hardness : HARD

GeoTesting express
a subsidiary of Geocomp Corporation

Client:	Sanborn, Head & Associates		
Project:	Stone Ridge		
Location:	Milford, MA	Project No:	GTX-8192
Boring ID: ---	Sample Type: bag	Tested By:	ap
Sample ID:TP-9	Test Date: 05/12/08	Checked By:	jdt
Depth : 3-6 ft	Test Id: 130730		
Test Comment:	---		
Sample Description:	Moist, light yellowish brown silty sand with gravel		
Sample Comment:	---		

Particle Size Analysis - ASTM D 422-63 (reapproved 2002)



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	25.3	54.2	20.5

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
2 in	50.00	100		
1.5 in	37.50	95		
1 in	25.00	91		
0.75 in	19.00	87		
0.5 in	12.50	82		
0.375 in	9.50	78		
#4	4.75	75		
#10	2.00	66		
#20	0.85	59		
#40	0.42	50		
#60	0.25	40		
#100	0.15	31		
#200	0.075	20		

Coefficients

D_{85} = 15.6061 mm D_{30} = 0.1444 mm
D_{60} = 0.9834 mm D_{15} = N/A
D_{50} = 0.4239 mm D_{10} = N/A
C_u = N/A C_c = N/A

Classification

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ROUNDED

Sand/Gravel Hardness : HARD

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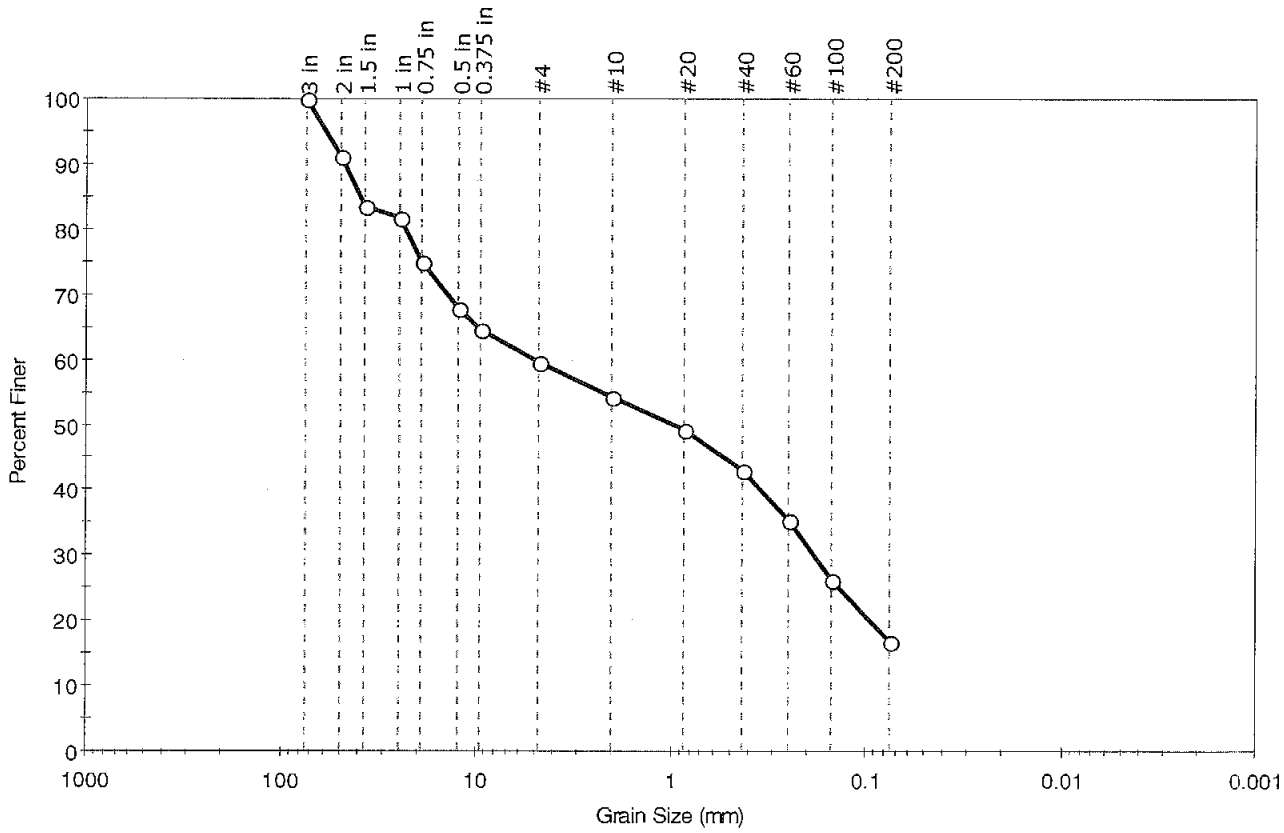
GeoTesting express
a subsidiary of Geocomp Corporation

Client:	Sanborn, Head & Associates		
Project:	Stone Ridge		
Location:	Milford, MA	Project No:	GTX-8192
Boring ID: ---	Sample Type: bag	Tested By:	ap
Sample ID:TP-10	Test Date: 05/12/08	Checked By:	jdt
Depth : 8 ft	Test Id: 130731		
Test Comment:	---		
Sample Description:	Moist, light yellowish brown silty sand with gravel		
Sample Comment:	---		

Particle Size Analysis - ASTM D 422-63 (reapproved 2002)



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	40.4	42.7	16.9

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
3 in	75.00	100		
2 in	50.00	91		
1.5 in	37.50	84		
1 in	25.00	82		
0.75 in	19.00	75		
0.5 in	12.50	68		
0.375 in	9.50	65		
#4	4.75	60		
#10	2.00	54		
#20	0.85	49		
#40	0.42	43		
#60	0.25	35		
#100	0.15	26		
#200	0.075	17		

Coefficients

D_{85} = 39.5601 mm D_{30} = 0.1848 mm
D_{60} = 5.0304 mm D_{15} = N/A
D_{50} = 0.9635 mm D_{10} = N/A
C_u = N/A C_c = N/A

Classification

ASTM N/A

AASHTO Stone Fragments, Gravel and Sand (A-1-b (0))

Sample/Test Description

Sand/Gravel Particle Shape : ROUNDED

Sand/Gravel Hardness : HARD

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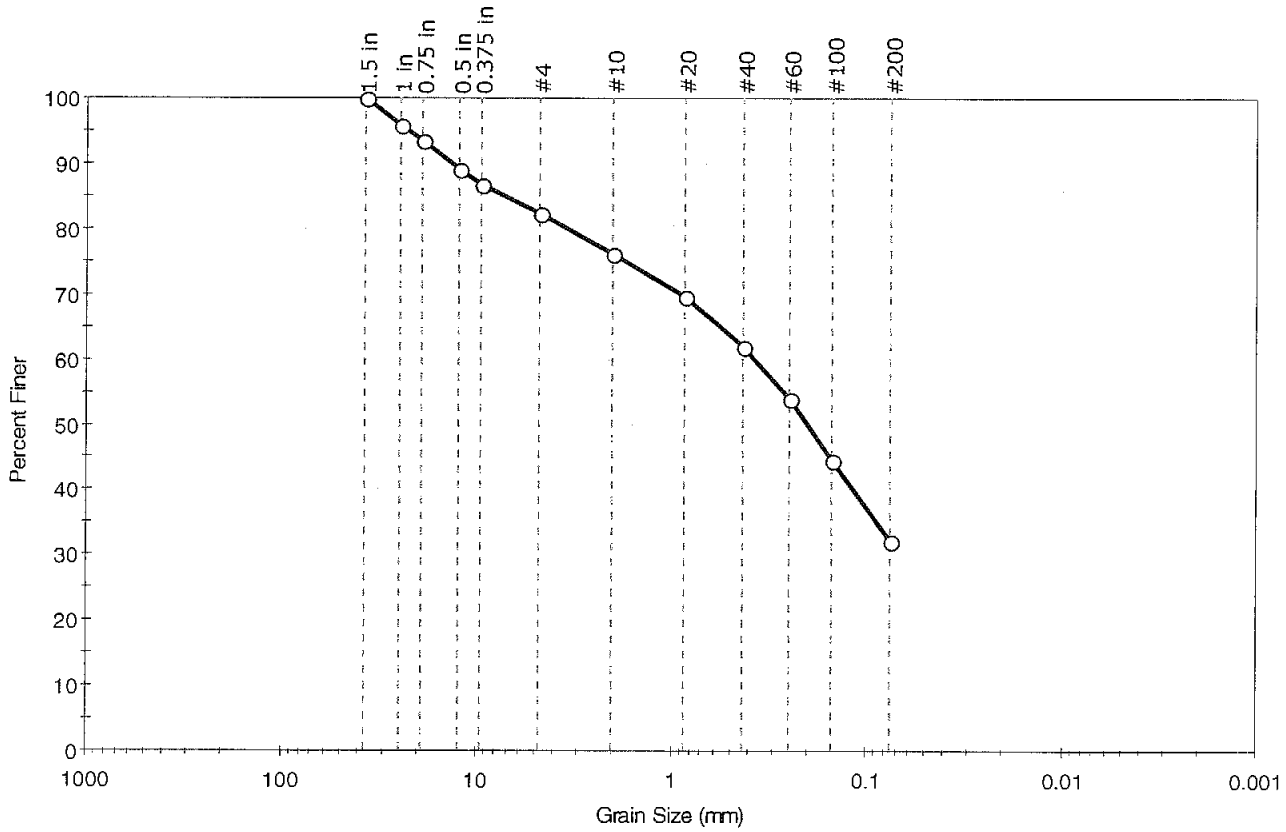
GeoTesting express
a subsidiary of Geocomp Corporation

Client:	Sanborn, Head & Associates		
Project:	Stone Ridge		
Location:	Milford, MA	Project No:	GTX-8192
Boring ID: ---	Sample Type: bag	Tested By:	ap
Sample ID:TP-11	Test Date: 05/13/08	Checked By:	jdt
Depth : 5 ft	Test Id: 130748		
Test Comment:	---		
Sample Description:	Moist, gray silty sand with gravel		
Sample Comment:	---		

Particle Size Analysis - ASTM D 422-63 (reapproved 2002)



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	17.6	50.3	32.1

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1.5 in	37.50	100		
1 in	25.00	96		
0.75 in	19.00	94		
0.5 in	12.50	89		
0.375 in	9.50	87		
#4	4.75	82		
#10	2.00	76		
#20	0.85	70		
#40	0.42	62		
#60	0.25	54		
#100	0.15	44		
#200	0.075	32		

Coefficients

D_{85} = 7.1574 mm D_{30} = N/A
D_{60} = 0.3745 mm D_{15} = N/A
D_{50} = 0.2019 mm D_{10} = N/A
C_u = N/A C_c = N/A

Classification

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

Sample/Test Description

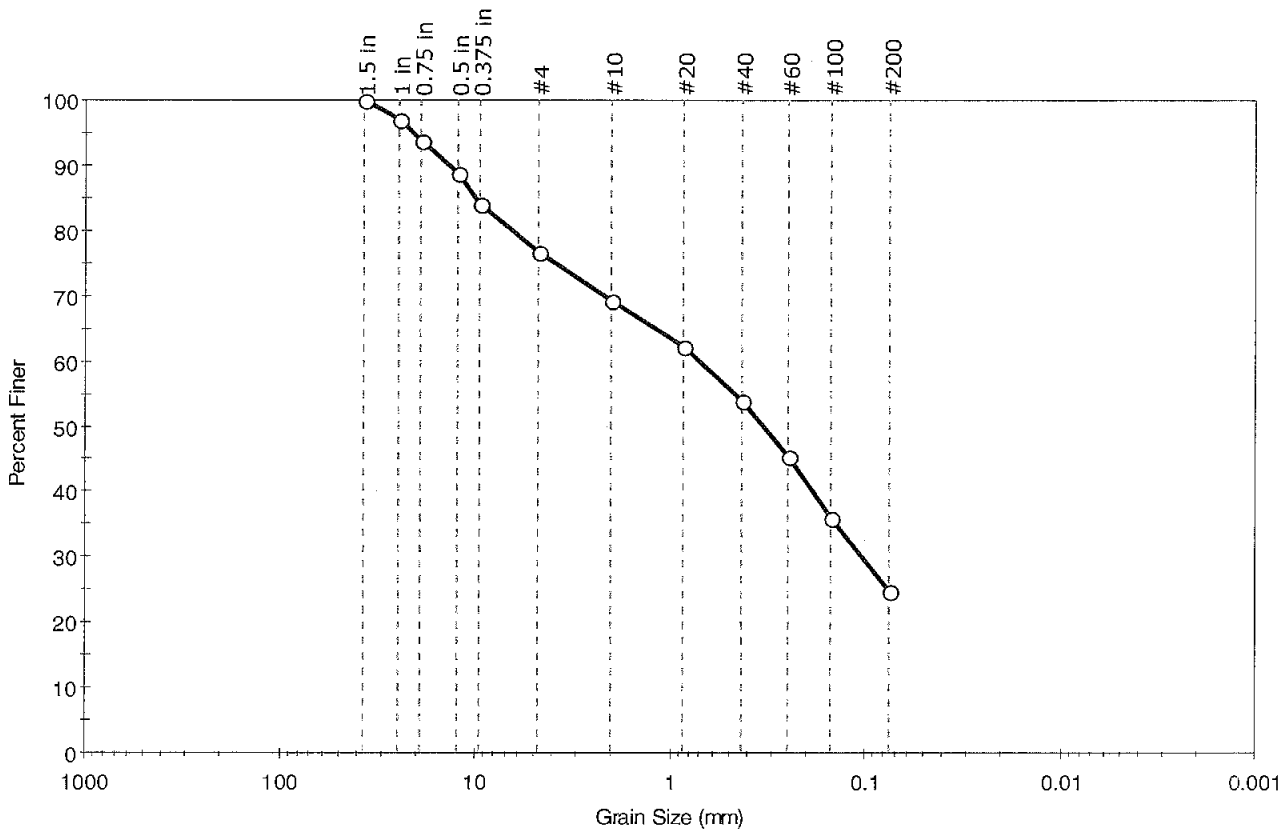
Sand/Gravel Particle Shape : ROUNDED

Sand/Gravel Hardness : HARD

GeoTesting express
a subsidiary of Geocomp Corporation

Client:	Sanborn, Head & Associates		
Project:	Stone Ridge		
Location:	Milford, MA	Project No:	GTX-8192
Boring ID: ---	Sample Type: bag	Tested By:	ap
Sample ID:TP-12	Test Date: 05/14/08	Checked By:	jdt
Depth : 5 ft	Test Id: 130749		
Test Comment:	---		
Sample Description:	Moist, light yellowish brown silty sand with gravel		
Sample Comment:	---		

Particle Size Analysis - ASTM D 422-63 (reapproved 2002)



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	23.2	52.2	24.6

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1.5 in	37.50	100		
1 in	25.00	97		
0.75 in	19.00	94		
0.5 in	12.50	89		
0.375 in	9.50	84		
#4	4.75	77		
#10	2.00	69		
#20	0.85	62		
#40	0.42	54		
#60	0.25	45		
#100	0.15	36		
#200	0.075	25		

Coefficients

D_{85} = 10.0232 mm D_{30} = 0.1038 mm
D_{60} = 0.7107 mm D_{15} = N/A
D_{50} = 0.3316 mm D_{10} = N/A
C_u = N/A C_c = N/A

Classification

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

Sample/Test Description

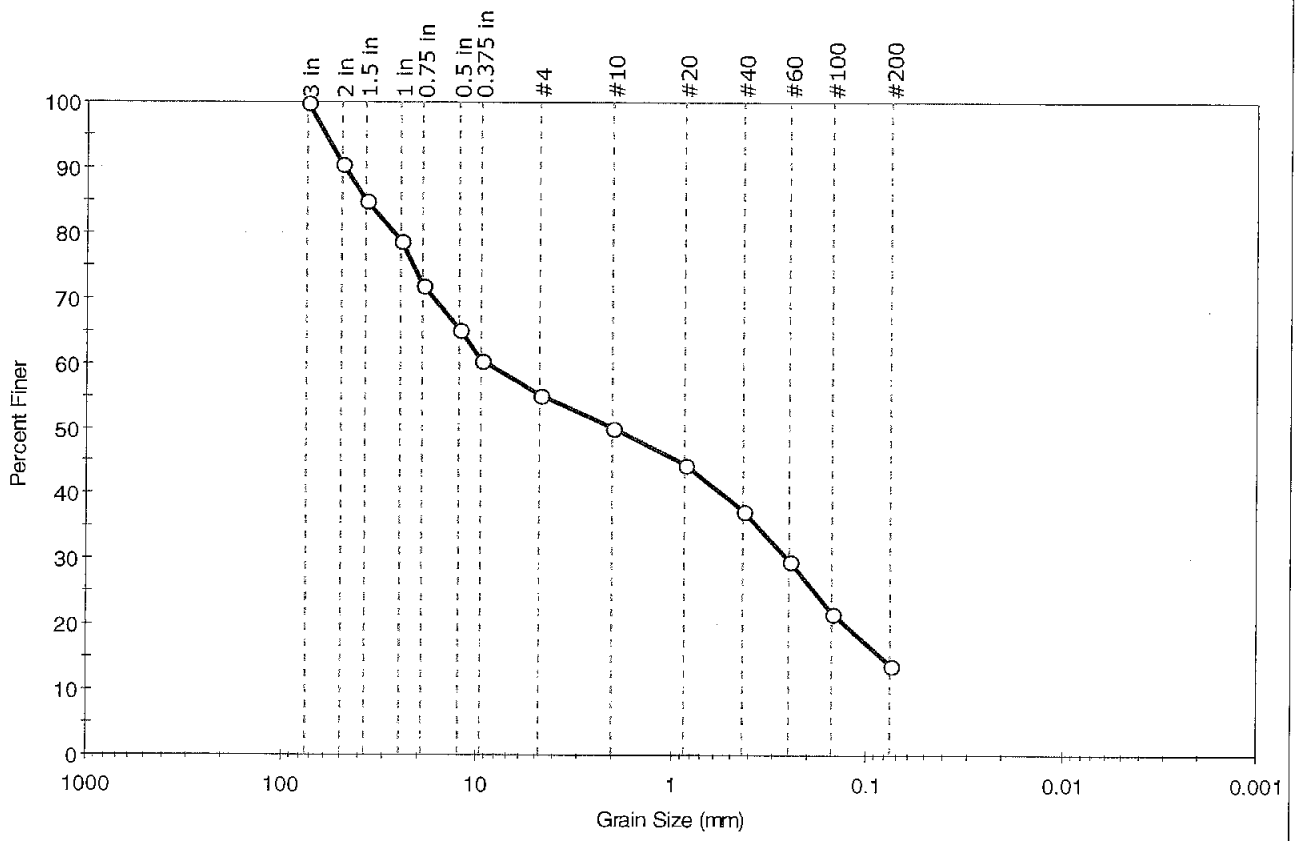
Sand/Gravel Particle Shape : ROUNDED

Sand/Gravel Hardness : HARD

GeoTesting express
a subsidiary of Geocomp Corporation

Client:	Sanborn, Head & Associates		
Project:	Stone Ridge		
Location:	Milford, MA	Project No:	GTX-8192
Boring ID: ---	Sample Type: bag	Tested By:	ap
Sample ID:TP-13	Test Date: 05/09/08	Checked By:	jdt
Depth : 7 ft	Test Id: 130424		
Test Comment:	---		
Sample Description:	Moist, olive brown silty gravel with sand		
Sample Comment:	---		

Particle Size Analysis - ASTM D 422-63 (reapproved 2002)



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	44.8	41.5	13.7

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
3 in	75.00	100		
2 in	50.00	90		
1.5 in	37.50	85		
1 in	25.00	79		
0.75 in	19.00	72		
0.5 in	12.50	65		
0.375 in	9.50	60		
#4	4.75	55		
#10	2.00	50		
#20	0.85	45		
#40	0.42	38		
#60	0.25	30		
#100	0.15	22		
#200	0.075	14		

Coefficients

D_{85} = 37.6176 mm D_{30} = 0.2556 mm
D_{60} = 8.9227 mm D_{15} = 0.0837 mm
D_{50} = 1.9945 mm D_{10} = 0.0541 mm
C_u = N/A C_c = N/A

Classification

ASTM N/A

AASHTO Stone Fragments, Gravel and Sand (A-1-b (0))

Sample/Test Description

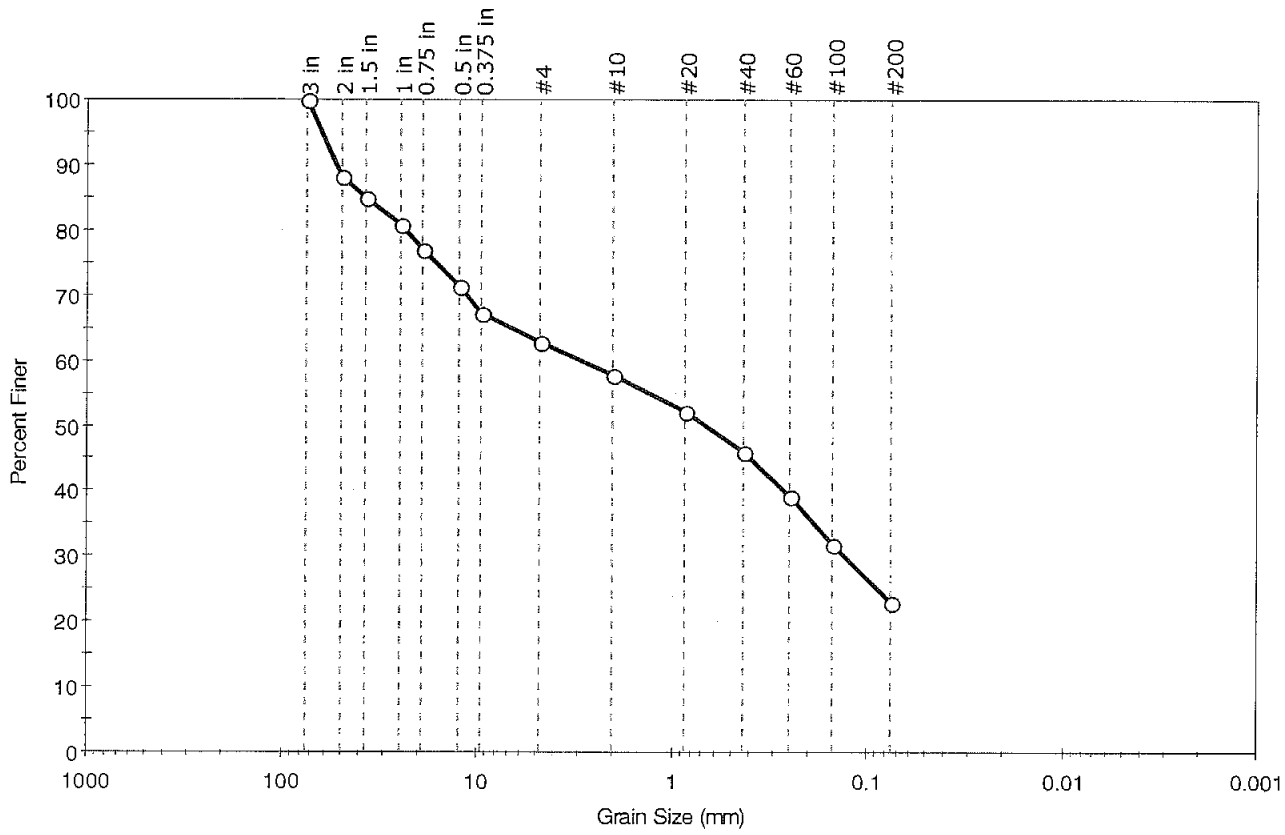
Sand/Gravel Particle Shape : ROUNDED

Sand/Gravel Hardness : HARD

GeoTesting express
a subsidiary of Geocomp Corporation

Client:	Sanborn, Head & Associates		
Project:	Stone Ridge		
Location:	Milford, MA	Project No:	GTX-8192
Boring ID: ---	Sample Type: bag	Tested By:	ap
Sample ID:TP-14	Test Date: 05/09/08	Checked By:	jdt
Depth : 4 ft	Test Id: 130425		
Test Comment:	---		
Sample Description:	Moist, yellowish brown silty sand with gravel		
Sample Comment:	---		

Particle Size Analysis - ASTM D 422-63 (reapproved 2002)



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	37.0	39.9	23.1

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
3 in	75.00	100		
2 in	50.00	88		
1.5 in	37.50	85		
1 in	25.00	81		
0.75 in	19.00	77		
0.5 in	12.50	72		
0.375 in	9.50	67		
#4	4.75	63		
#10	2.00	58		
#20	0.85	52		
#40	0.42	46		
#60	0.25	39		
#100	0.15	32		
#200	0.075	23		

Coefficients

D_{85} =37.4912 mm	D_{30} =0.1304 mm
D_{60} =2.9195 mm	D_{15} =N/A
D_{50} =0.6599 mm	D_{10} =N/A
C_u =N/A	C_c =N/A

Classification

ASTM N/A

AASHTO Stone Fragments, Gravel and Sand (A-1-b (0))

Sample/Test Description

Sand/Gravel Particle Shape : ROUNDED

Sand/Gravel Hardness : HARD

7.5

Appendix 5: Sewer Design Flow Calculations

Symmes Maini & McKee Associates SMMA

Sewer Design Flow Calculations

Project: Stone Ridge
Project #: 17095
Date: 3/8/2018
Calc by: WWP
Ckd by: PG

Previously Approved

	Design Flows					Pump Station Design			
Use	**Quantity**		**Rate**		**GPD**	**Hours Op.**	**Adj. Flow**	**Peak Factor**	**Peak GPD**
Office Park	625,000	sq. ft.	75	per 1000 sq. ft.	46,875	12	93,750	3.0	281,250
Total					**46,875**				**281,250**

^ Sewer Connection Permit ^ Design Flow for Pump

Currently Proposed - Short Term

	Design Flows					Pump Station Design			
Use	**Quantity**	**Unit**	**Rate**		**GPD**	**Hours Op.**	**Adj. Flow**	**Peak Factor**	**Peak GPD**
Restaurant Depot	63,085	sq. ft.	50	per 1000 sq. ft.	3,154	12	6,309	3.0	18,926
Residences	426	bedrooms	110	per bedroom	46,860	18	62,480	4.0	249,920
Total					**50,014**				**268,846**

Currently Proposed - Long Term

	Design Flows					Pump Station Design			
Use	**Quantity**	**Unit**	**Rate**		**GPD**	**Hours Op.**	**Adj. Flow**	**Peak Factor**	**Peak GPD**
Restaurant Depot	63,085	sq. ft.	50	per 1000 sq. ft.	3,154	12	6,309	3.0	18,926
Residences	426	bedrooms	110	per bedroom	46,860	18	62,480	4.0	249,920
Future Office 1	93,750	sq. ft.	75	per 1000 sq. ft.	7,031	12	14,063	3.0	42,188
Future Office 2	295,000	sq. ft.	75	per 1000 sq. ft.	22,125	12	44,250	3.0	132,750
Total					**79,171**				**443,783**

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